Donald G. MacDonald
2172 West 18th Ave.
Van. 8 B.C.
Phone
731-5113

OCTOBER 1965

REPORTS ON

COPPER - NICKEL - MINERAL OCCURRENCES

EAST SOOKE PENINSULA

VANCOUVER ISLAND. B. C.

PROPERTY FILE

INDEX

Contd. ...

6. Report on
Electromagnetic Survey
Performed on some Copper Prospects
in East Sooke, B.C.
by Geolectric Exploration Company Inc.
June 1951

7. Diamond Drill Logs and Assays
by P.A. Chubb
July 1951

8. Report on
East Sooke Drill Program
by P.A. Chubb
December 1951

9. Griffith Zone
by Frank Cook
October 6, 1948

10. Letter re
Willow Grouse
by. P.A. Chubb
November 12, 1951

11. G.S.C. Geological Survey of Canada
Memoir 96 - Extract
(Scoke and Duncan Map Areas)
by Clapp & Cooke

12. B.C. Minister of Mines Annual Report - Extract
by W.M. Brewer
1904

Contd.

13. Report on
Sooke Area
by D.C. Malcolm
December, 1964

14. Report of the Minister of Mines
Vancouver Island & Coast District
1916

15. Report of the Minister of Mines
Victoria Mining Division
1917

16. Report of the Minister of Mines
Jordan River District

17. Report of the Minister of Mines
1928

18. Report of the Minister of Mines
1931

19. SUNLOCH COPPER DISTRICT, B.C.
VICTOR DOLMAGE — G.S.C.,
20. SUMMARY REPORT 1919

REPORT OF MINISTER OF MINES
1948 — FYLES - SOOKE - PENINSULA

SOOKE COPPER - NICKEL GROUP

PROPERTY

Previously known as Iron Mine Hill, Willow-Grouse, Copper King or Margaret and Old Copper Mine now known as:

1. Cooke Zone (Willow-Grouse)
2. Huestis Zone (Margaret or Copper King)
3. Merryth Zone (Iron Mine Hill)
4. Griffith Zone (Old Copper Mine)

LOCATION

Approximately 20 miles S. W. of Victoria, Vancouver Island, B. C.

ELEVATIONS

Sea level to 850 feet above, which is highest summit in the area.

OWNERSHIP

F. Cooke; H. H. Huestis; Frank Merryth; all of Vancouver, B. C.

TRANSPORTATION

1. Paved highway for 16 miles, balance of 4 miles in good gravel road or a total of 20 miles from Victoria, B.C.
2. Good harbours for 500 ton freighters or barges.
3. C. N. R. Railway within 4 miles of property.

POWER

B. C. Hydro & Power Authority hydro-power within 2 miles or property.

PRECIPITATION

Not over 30 inches of rainfall per year - snowfall an unusual occurrence.

OUTCROPS

About 10 to 15 percent of moss.

MINERAL CLAIMS

Held by Crown Grant 8, and staked, 45. 14 other claims adjoin our group. Also one option on Lot 93.

MAPS

Accompanying report:

1. Vancouver Island, southern half 4 miles - 1 inch
2. Photostat Map showing geology and mineral claims and location of zones. Scale 1 inch - 2000'
3. Mineralized zones and breaks on Sooke Penninsula. Data from aerial photos - scale 1 inch - 1650'
4. Claim Map
5. East Sooke Geological Map 1674 by Cooke.
6. Sooke Sheet, Mapp 44 A by Clapp.

PREVIOUS GOVERNMENT REPORTS

Reports of Progress: Vol. 1 P. 40 A
11 19 T, 20 T
111 102 R, 151 T
1V 59 A, 60 H, 76 H
85 A

Dominion Geological Survey Reports

1908 - pages 57, 60
1912 - pages 41, 54
1913 - pages 106,108

Memoirs:

No. 13. (Southern Vancouver Island)
No. 98. (Sooke and Duncan Map Views)

Geological Survey Publications:

No. R1085 - Page 136

Provincial Mines Reports:

1874 page 36
1888 page 324 - 325
1893 " 1079
1902 " 220
1904 " 220
254
256
1907 Page 157
1912 " 198
1913 " 291
1914 " 386
1915 " 290
1916 page 280-366
1928 " 361
1929 " 368
1930 " 287
1931 " 161

SHIPMENTS

Cooke Zone - 1915, 1916, 1918, - 2413 tons
Grade - Cu. 4.75%, Au. .02 oz. Ag. .02 oz.

Hucstis Zone - 1917, 1918 - 559 tons
Grade - Cu. 3.9%, Au. .01, Ag. .02 oz

1 COOKE ZONE (WILLOW-GROUSE)

Location:

About 2000 feet south of highway. Old wagon road to property.

Elevation:

357 feet above sea level

Mineralization:

Mostly chalcopyrite with minor amounts of pyrrhotite, magnetite and molybdenite.

Gangue:

Hornblende, chlorite, feldspar and quartz.

Strike:

Northeasterly

Dip:

75° N.W.

Width:

At least 100 feet

Length:

Mineralization picked up for 500 feet. Zone continues for an undetermined length.

Quote: W. M. Brewer, B. C. Department of Mines, 1904.

"The occurrence of a fissure zone full 100 feet wide and of undetermined length has been fully established. Within this zone occur not only several extensive lenses or pockets of high grade chalcopyrite, but the gre[illegible] basic rock, which is really the matrix of the ore, is found to be thoroughly impregnated with masses and grains of chalcopyrite deposited as shoots and elongated kidneys. That the lenses of solid ore in this

zone possess extent is demonstrated by the fact that the main showing of ore, which carried 11 to 18 percent copper, is exposed in a deep open cut and shaft, at upwards to 70 feet in length, with solid ore still showing at north end of cut, and from 4 feet in width at the north end to about 11 feet in width at the south end. Surface stripping beyond the deep cut at the north end shows that the lenses occur lying in echelon to the one referred to, and these show an aggregate width of nearly 15 feet. At the south end of the open cut a vertical shaft has been sunk 50 feet in ore, and a crosscut tunnel has been driven from the bottom of the shaft towards the hang-wall, or westerly boundary of the ore-bearing zone.

At the time of the writers visit he was unable to make an examination of the underground workings, as they were full of water, however, when I visited the property in 1902 I saw the shaft being sunk in ore."

Quote: George Clothier, B. C. Department of Mines - 1931 - Page 161

"The minerals occur throughout the gangue, chiefly hornblende, or in lenses 6 to 7 feet wide of clean chalcopyrite. An open cut about 125 feet long shows that these lenses of chalcopyrite have been mined from the surface in this small area. Old reports state that about 1000 tons of 6 percent copper ore was shipped from these lenses, and that hand sorting later produced another 300 to 400 tons. It would seem reasonable to expect other lenses similar to those mined out, and therefore that close surface prospecting would be fully justified, and possibly diamond-drilling at the encouraging places."

Quote: H. C. Coole - Dominion Geological Survey, Mem. 96, Page 327 - 328

"The ore is developed in a shear zone 50 to 100 feet wide having a strike of N. 40° E. The entire shear zone is not, however, hornblendized or mineralized, but is subdivided into subsiduary shear zones of which only those close to the N.W. wall are well exposed, these are 6 feet, 15 feet and 20 feet wide. They are nearly parallel to the main shear zone, but vary somewhat in strike and dip steepl, to the N.W. at an angle of about 70 degrees. The ore mined is chalcopyrite, and occurs disseminated through all the subsiduary shear zones, although best developed in those along N.E. wall. The principal deposit is exposed for a distance of 150 feet in a caved stope and in an open cut adjoining the stope. Five hundred feet to the S.W. mineralized rock is exposed in a shallow pit, and it is probable that the zone between the two exposures is mineralized."

I (the writer) visited the property near the end of November, 1947. About 5000 tons of low grade ore was observed on the dump, and this could assay from around 1.75% to 2% copper. The underground workings were filled with water.

On the hand-wall side of zone at the North face showed about 3 percent copper ore, having an approximate width of 20 feet.

About 500 feet S. W. some good chalcopyrite mineralization was noted on the dump from a shallow pit. Part of the zone fills a strong depression, being covered with overburden. Only picked samples were taken to make tests for Nickel, Cobalt, and Platinum.

ASSAYS:

By Department of Mines, Victoria, B. C.
Spectrograph - Specimens

No. 4 - Chalcopyrite in an altered basic rock.
Cu 6%. Nickel .30%, Cobalt .20%, Molybdenum

No. 5 - Massive chalcopyrite in an altered basic rock.
Cu 11%, Nickel .30%, Cobalt .30% Molybdenum .20%
Zinc .10%. A fraction of one ounce of palladium is present.

4176 - Au. .01% Cu. 3.1%
4177 - Au. .02% Cu. 15.3%
4184 - Cu. 0.96%

ASSAY:

Simmilar to No. 5.
Cu. 11.30%, balance of assays for gold, silver, platinum nickel and cobalt are not completed at this time.

II HUESTIS ZONE (MARGARET)

Elevation: 450 feet above sea level

Location: About one mile south of highway with a possible gazetted road to the showing.

Mineralization: Chalcopyrite, with minor amounts of pyrrhotite and magnetite.

Gangue: Hornblende, chlorite, feldspar and considerable quartz.

Width: 250 feet

Length: Mineralization along 1000 feet zone continuous for at least 4500 feet.

Strike: North Easterly

Dip: 85° South East

Quote: W. M. Brewer, B. C. Department of Mines, 1917 Pages 262-263-264

"The portion of massive ore as contracted with waste exposed in the workings examined by the writer appears to be about 75 percent good ore to 25 percent waste.

The ore occurences of copper ore that have been so far developed occur in a shallow gulch or depression of variable width that appears to extend through the three claims, and appears to have been formed by erosion, which acted on the mineralized part of the shear zone, as this rock offered less resistance than the part of the gabbro-country-rock in which the shearing action had been less pronounced.

At the North Easterly or upper end of the gulch there is a large swamp, in which is exposed a body of almost solid ore opened by a shaft 25 feet deep and an open cut for a length of more than 200 feet, a width of about 12 feet in the North east end of the cut and to a depth of 25 feet below the level of the surface outcropping at this point.

A short distance to the S. W. and in the same open cut the ore-bearing gabbro has been proven to reach a width of 40 feet. When the open cut was first made it appeared as though the foot wall of the ore body was exposed on the northwesterly side, and in sinking the shallow shaft this so-called wall was made on one side of it, but later it was discovered that the wall was only the cleavage plane of a fracture in the shear zone, and when blasted into, the soldi ore was exposed beyond it. By a series of open cuts made towards the northwesterly side of the gulch, and into the rock that had suffered less from erosion, a still greater width of ore-bearing gabbro is exposed and at the time of examination the full width of the ore body on this portion of the property was undetermined.

In an adit to cross-cut the orebody at a point about 250 feet southwesterly from the shaft mentioned, a well-defined hanging wall occurs near the portal of the adit, dipping at about a vertical angle and striking northeasterly, conformable with the strike of the orebody exposed in the open cut already referred to. From the hanging wall, the orebody is cross cut for 10 feet, with the whole face of the cross cut in ore. Drifts are driven in both directions at right angles to the cross cut for a total of about 25 feet in length. These drifts are in solid ore with both faces in ore. About 1000 feet southwesterly from the adit there are located some old workings, the chief of which is a shaft, said to be 25 feet deep, now full of water. This shaft was sunk on an outcrop of hornblende, through which are disseminated lumps, grains, and small particles of chalcopyrite, and apparently the shaft is sunk in an extension of the shear zone in which the ore occurs. In addition to the old workings, there is an open cut 176 feet long which cross cuts the shear zone at this point and exposes low grade concentrating copper minerals, mainly chalcopyrite, disseminated through the hornblende, country rock the entire

length of the open cut, demonstrating that Clapp's estimate of the width of the shear zone, in the following paragraph from his report published in 1912 (Memoir 13) being about 200 feet, is well established.

Quote: Clapp

"On the southern slope of Mount Maguire are three claims - Margaret, Copper King and Eureka .. located on a wide shear zone some 200 feet wide, having a strike of N. 43° E. which is traceable for the whole length of the three claims. As a rule the metallic minerals, chiefly chalcopyrite, are disseminated throughout the entire shear zone, with the best values along the N. W. walls. Occassionally the chalcopyrite occurs in samll lenses and veins. Quartz stringers are very abundant."

Quote: H. C. Cooke, Memoir 96 page 328.

"The zone is intersected near the southwestern boundary of the Copper King claims by a smaller shear zone about 100 feet wide, striking N. 10° E. As a rule the metallic minerals, chiefly chalcopyrite, are disseminated throughout the shear zone. Occasionally the chalcopyrite occurs in samll lenses and veins and numerous quartz veins. Extensive mineralization is exposed only near the intersection of the two shear zones; the N. 10° E. zone is mineralized for about 1000 feet north of the intersection, although the outcrops are not continuous. Samples from the shear zone range from 1% to 6% of copper."

HUESTIS

I visited the property near the end of November 1947. About 1000 tons of ore are on the dumps; average grade might be around 2% copper. The workings are in good condition; the cross cut tunnel has been driven another 58 feet since Mr. Brewers' examination in 1916. Chip samples and specimens were taken only for tests.

ASSAYS: by Department of Mines, Victoria, B.C.

Spectrograph	Specimens
No. 1	Pyrrhotite and chalcopyrite and limonite in altered basic rock. Cu 0.3%, Nickel 0.60% Cobalt 0.20%.
No. 2	Chalcopyrite with small amount of pyrrhotite in altered baisc rock. Cu. 5.0% Nickel 0.30% Cobalt 0.20%
No. 3	Sheared baisc rock, few specks chalcopyrite Cu 0.30%, Nickel 0.05%
No. 6	Altered hornblendite, no mineral observed Cu. 0.40%, Nickel 0.05%

Note: All samples contain more than 10% magnesium oxide.

Channel Sample

Channel sample by Cooke & Huestis width 110 feet Cu 1.5% Au .01
Channel sample by Merryth 100 feet gouge on Hanging wall Cu 2.3% Au .04
Grab in drift by Merryth Cu 1.0% Au . 72.

Samples by Kenneco:

No.4151	Au - .02	Ag - 0.1	Cu 5.5% - Ni - .22%	
No.4152			Cu 2.2%	
No.4153			Cu 1.1%	
No.4154	Au - .01	Ag - 0.1	Cu 1.6%	
No.4155	Au - .01	Ag - 0.2	Cu 1.2%	
4156	Au - .005	Ag - 0.2	Cu Tr.	
No. 4157	Au - .02	Ag - 0.2	Cu 4.6%	

ASSAY: By G.S. Eldridge & Co.

Huestis No. 2. Chips from hanging wall section of crosscuts.
Cu 2.3% Au.04 oz. Ag Tr.

Huestis No. 1. Channel across 10 feet of gouge on footwall at end of cross cut (No mineralization noted) Cu 1.%

Huestis No. 3. Across 110 feet in open cut a ove cross cut.
Cu 1.5% Au.01 oz. Ag Tr.

MERRYTH ZONE (Iron Mine Hill) (Massive Deposit)

Elevation: Sea level to 100 feet above.

Location: S.W. corner Sooke Peninsula; road within a mile of property, good trail balance of way.

Mineralization: Most pyrrhotite, minor amounts of chalcopyrite and magnetite.

Gangue: Hornblende.

Width: 300 feet to 1,000 feet.

Length: Mineralization over a distance of 2,000 feet; zone length undetermined.

QUOTE: H.C. Cooke - Memoir 16, p. 326.

"A second type of mineral deposit, very subordinate both as regards quantity and value, is the magnetite-pyrrhotite deposits.

These deposits might be formed at two periods in the history of the consolidation of the stock. They might have resulted from the early separation and aggregation of iron minerals from the body of the gabbro-magma, as at Sudbury, and thus in age antedate the consolidation of nearly all its other phases; or they may have been formed in the last stages of differentiation at the time of the formation of the horn-blendite veins, and the

waters that formed there have been laden with excess of iron. This deposit is found in a large shear zone in the form of lenses greatly cracked and cut by later depositions of chalcopyrite. The chief value of the property in the past has been as an iron flux in copper smelting."

Channel Sample

		Kenneco samples:			
No.4181	Cu - 0.61%	No. 4163	Cu - 3.1%	No.4169	Cu - 0.9%
No.4182	Cu - 0.72%	No.4164	Cu - 0.5%	No.4170	Cu - 2.2%
No.4183	Cu - 1.60%	No.4165	Cu - Tr.	No.4171	Cu - 0.3%
		No.4166	Cu - 0.4%	No.4172	Cu - 0.3%
		No.4167	Cu - 0.1%	No.4175	Cu - Tr.
		No.4168	Cu - 0.9%	No.4179	Cu - 0.15%
				No.4180	Cu - 1.78%

Huestis: A few grab samples were taken from the dumps for assay.

ASSAY: Dept. of Mines, Victoria, B.C.

No. 8 Mostly pyrrhotite, some chalcopyrite in basic rock. Cu 2.%

Spectograph: Cu 2.5% Nickel .10% Cobalt .15%

GRIFFITH ZONE (Old Copper Mine)

Elevation: Sea Level.

Location: About 1 mile east of O'Brien Point in south coast of Sooke Peninsula.

Mineralization: Pyrite, Chalcopyrite and minor amounts of native copper (secondary).

Gangue: Calcite, quartz and sheared hornblende.

Width: 60 feet at least.

Length: Undetermined: on sea zone at beach, balance of zone filled with brush.

Strike: North (Approximately).

Dip: Vertical.

Huestis: The above property was worked on a small scale in 1864. The zone is a strong shear zone on the contact of augite gabbro and gabbro; the sheared rock is composed of a network of calcite stringers with native copper along slips within the show. On the dump several pieces of massive pyrite and chalcopyrite were seen.

H.H. Huestis: No. 206 Au - .01 Cu - 0.7% Ag - 0.2

Kennecco:	No.4158	Au - .08	Cu 11.50%
	No.4159		Cu 3.0%
	No.4160		Cu 3.1%
	No.4162		Cu Tr.
	No.4161		Cu Tr.

ASSAY: B.C. Dept. of Mines, Victoria, B.C.

Spectrograph	Specimen
No. 9	Massive pyrite, some chalcopyrite. Cu 3.0% Cobalt 0.10% Nickel .15%

CONCLUSIONS

Throughout the report I have quoted several governmental engineers' reports, as they seemed more fitting for these large prospects.

Clapp even remarks, in Memori #13, (quote): "There is every reason to believe these shear zones will extend to considerable depth. Since the chalcopyrite is usually disseminated through wide zones of sheared rock, the deposits are low grade. The ore-mineral could, however, be easily concentrated, hence the deposits are of great prospective value."

From the records of ore shipments, and assays of the few samples taken by the writer, I believe ore might have an overall average of 2% copper, plus low gold and silver values. The nickel content would have to be determined after a thorough sampling job was done.

Sampling is a large job and the only satisfactory way would be by diamond drilling. This would involve some $75,000 to $100,000 at least. However we must realize all monies appropriated for drilling would be spent almost one hundred percent on the property, which is unusual for, in most places, one has to spend a quarter of monies raised for roads, or transportation to the property.

The Tacoma Smelter lies only about 100 miles south-easterly of the property, which means cheap transportation via boat, probably not over 30¢ per ton of concentrates.

Labour conditions would be favourable, as mostly family men would be involved, where there are several locations for homes. Good water, hydro power is available within five miles of the property.

The above data has been respectfully submitted by

H.H. HUESTIS, Mining Prospector

January 7th, 1948

SUPPLEMENTARY REPORT on

EAST SOOKE COPPER SHOWING

VANCOUVER ISLAND. B. C.

by W. A. GRAY

SEPTEMBER 1950

SUPPLEMENTARY REPORT

ON EAST SOOKE COPPER SHOWING

VANCOUVER ISLAND, B. C.

As a supplement to Mr. Page's report, the writer is the associate mentioned that examined the copper showings in the month of September 1950.

As all geological data pertaining to the properties are given in the report I will just deal with the showings as seen.

WILLOW-GROUSE

The Willow Grouse showing occurs in a fault which is about 60 feet wide with cross faults cutting into the main fault at an angle of about 60 degrees. At the junction of where these faults occur usually there is high grade Chalco-Pyrite but it is also disseminated across the zone as far as can be seen for the overburden. At present around the vicinity of the 60 foot shaft you can see a well mineralized section about 50 feet wide which shows ore values in Chalco-Pyrite. One cannot see the high grade lenses which are spoken of in the report as they were mined out, but some of this material was found on the dump and assayed by the writer and ran 22.9% copper. You can see Chalco-Pyrite here and there in trenches for about 1000' along this zone.

COPPER KING

This showing can be seen in places for about 200 feet with a width of about 200 feet and in the writer's opinion shows the best mine making possibilities in the area. Chalco-Pyrite can be seen practically anywhere along this zone and it certainly looks like a major break.

Supplementary Report

In the old adit towards the West wall a gouge seam about 7 feet wide is to be seen and carries over 2% copper. The rest of the adit shows Chalco-Pyrite with some sections richer than others. About 2000 feet further south the zone shows a width of about 200 feet. A trench has been put across the shear at this point and one can see disseminated Chalco-Pyrite across the whole width with higher grade sections in places. The gouge seam at this point is about 5 feet wide and shows plenty of Chalco-Pyrite. A small shaft or Pit has been sunk at this point in the middle of the zone. The dump from around this place is well mineralized with Chalco-Pyrite.

MERRYTH ZONE

This zone occurs in the same general locality and although not mentioned in Mr. Page's report the writer is mentioning it as it is one of the showings in the area. The zone occurs at the shore of the Pacific Ocean, and can be seen for about 200 feet in length and is best seen at low tide. This zone is about 75 feet wide and it's hard for anyone to knock a piece of rock off without seeing Chalco-Pyrite.

CONCLUSIONS

I have tried to give a brief outline of the showings as they were seen but to realize the possibilities of the area anyone interested in, and knowing copper properties, should see this for themselves. Looking at the properties and keeping in mind that the showings are so available to transportation, water and power and only 100 miles from Tacoma, Washington, one wonders why something has not been done with them but as far as the writer is concerned there is just too much Chalco-Pyrite to walk

Supplementary Report

away from and any mining engineer or geologist that looks at the property I am sure will feel the same way.

I had an opportunity to visit the Sunlock property being developed by the Hedley Mascot people. They are located 20 miles along the shore from the East Sooke properties on the Jordan River and have the same structural conditions. They started out with 19 feet of 2% copper copper. According to Dr. Colmego their consultant they have developed about $7,000,000.00 worth of ore. I may say that from my observations there is more Chalco-Pyrite in the East Sooke section than there is at the Sunlock property.

W. A. Gray

A REPORT on the

WILLOW GROUSE and MARGARET

COPPER PROPERTIES

EAST SOOKE, VANCOUVER ISLAND, B. C.

by TREVOR W. PAGE, P.ENG.

FORT WILLIAM, ONTARIO

OCTOBER 10TH, 1950

A REPORT ON THE WILLOW GROUSE AND MARGARET GROUPS

OF MINING CLAIMS

EAST SOOKE PENINSULA, VANCOUVER ISLAND, B.C.

INTRODUCTION

During the course of academic studies of the structural and petrological relations of the East Sooke gabbro stock some 12 years ago, the writer had occasion to visit several of the old copper properties in this district that were worked during the early part of the century. While not engaged at that time in a study of the economic possibilities of these copper deposits, the strong structural conditions existing and the presence of sections of relatively high grade ore, together with substantial widths of lower grade material prompted and investigation of the situation in the light of the present demand for copper. As a result a field investigation was carried out by an associate of the writer during the month of September 1950. Upon the satisfactory results obtained therefrom, the two most promising properties, The Willow Grouse and The Margaret, were procured by staking and lease.

The ensuring report has been compiled from personal observation, reports of the Geological Survey of Canada, the B.C. Department of Mines and sampling results obtained by the present owners.

PROPERTY, LOCATION AND ACCESS

The Willow Grouse Group consists of the old Crown Granted claims, The Willow Grouse, Bluebird, Garden Thrush and Donaldson held under lease from the B.C. Department of Mines and newly staked claims Moffatt No.2-3-4-5-6 and Moffatt No.1 fraction.

The Margaret Group consists of the old Crown Granted claims, the Margaret, Copper King, Eureka and Copper King Fraction together with newly staked claims Hazel-G. Nos. 1 to 7 inclusive.

These properties are located on the East Sooke Peninsula some 20 miles southwest of Victoria, B.C. This peninsula is bounded on the southwest

These properties are located on the East Sooke Peninsula some 20 miles southwest of Victoria, B.C. This peninsula is bounded on the southeast by the Strait of Juan de Fuca, on the northwest by Sooke Harbour and on the northeast by Sooke Basin. The properties both lie within a mile of tidewater loading locations in the Sooke Basin.

Transportation is afforded by means of 16 miles of paved highway and four miles of gravel road, all of which are in good year round condition. The Willow Grouse Grouse Group is connected by some 2000 feet of truck road to the same highway.

Hydro-electric power is available within two miles and timber available in plentiful supply in the surrounding district.

Smelting facilities for copper ores are available at Tacoma, Washington, a distance of 100 miles by water transportation.

GENERAL GEOLOGY

Practically the entire East Sooke Peninsula, an area roughly 2 miles by 5 miles, is underlain by members of the Sooke Intrusives, collectively known in this locality as the Sooke Gabbro. These racks consist in the main of augite and olivine gabbro as well as some minor amounts of anorthosite. Aplite dikes and hornblendite replacement veins cut the earlier gabbro and represent the later stages of igneous activity. Clapp/1 places the Sooke Gabbro in the lower Oligocene era, tertiary period.

Seven periods of faulting have been listed by Cooke/2, at least two of which have been localized in pronounced shear zones which in general fall into two sets, one varying from north 10 degrees west to north 20 degrees east, and the other from north 45 degrees east to north 65 degrees east. These shear zones which range up to 250 feet in width are of dual importance. They have formed the channel way along which the solutions have ascended that formed the large hornblendite replacement veins in the gabbro. This same control has been responsbile for the guidance of copper

bearing solutions that formed the copper deposits in the hornblendite host rock.

1/Clapp,C.H., "Sooke and Duncan Map Areas" Geol. Surv. Can., Mem 96, 1917, pp. 174-180.

2/Cooke, H.C., "Gabbros of East Sooke & Rocky Point" Geol. Surv. Can. Mus. Bull. No. 30, 1919, p 24-25.

The intensity of hornblendization of the original gabbro varies along the strike of the shear zones and as typical replacement phenomena does not show a sharp line of demarkation between it and the gabbro wallrock. As the replacement has been dependent upon structural conditions, its variations in intensity are most likely a reflection of the shearing activity along the zone of faulting.

The final period of faulting has fractured, crushed and brecciated the hornblendite veins in varying degrees of intensity and formed the loci of deposition for copper mineralization.

An anlogy may be drawn between the part playing by these hornblendite veins in deposition of copper minerals and the part played by porphyry bodies in gold deposition in some of the Ontario gold areas.

As the shear zones form pronounced gulleys, the greater portion of their length is covered with overburden and small swamps such that preliminary surface methods of prospecting have been difficult to carry out.

THE WILLOW GROUSE GROUP

The Willow Grouse Group was originally staked in 1901 by Alex Donaldson and acquired by H.B. Thompson of Victoria Shortly afterwards. In 1903 the claims were Crown Granted by Thompson. In May 1915 R.G. McMinn, E. Hinsley and associates obtained the property under lease and bond and shipped 83/4 tons of copper ore to Tacoma from which 119,738 lbs. of copper was obtained. The majority of this material was obtained from two lenses of ore exposed by earlier work. Due to excess water (The working were in a creek bottom) and lack of capital the work was discontinued. The ore in place at this stage consisted of a body of high-grade chalcopyrite ranging up to 18% copper that was seven feet wide and 125 feet long developed by an open cut and 50 foot shaft.

In 1917 the Ladysmith Smelting Corp., took over the claims. This company resorted the dump and shipped 400 tons of ore to Tacoma in addition to which they stopped from the 50 foot level through to the surface. Since 1918 no development work has been carried out and the claims have passed from hand to hand to the present ownership.

SYNOPSIS OF EARLIER REPORTS

The Willow Grouse Group was reported on in 1912 by C.H. Clapp[1] during the time of his geological survey of Southern Vancouver Island. Clapp recognized the importance and prospective economic value of this and two other deposits nearby which he termed the "Sooke" type of shear zone deposit. He recommended a further detailed examination which was carried out in 1913 by H.C. Cook[2]. In his report Clapp describes the ore as being developed in:

> "a shear zone about 60 feet wide having a strike of N.40 deg.E. An enriched body of chalcopyrite occurrs at the junction of the wide shear with a narrow one having a strike of N.5 Deg.W., and a dip of 80 deg.W....The ore mineral is chalcopyrite and occurs disseminated through the wide shear zone, although best developed along the north wall. The enriched body, which occurrs at the intersection of the two shear zones, is about 7 feet wide and follows the smaller zone. It carries a good percentage of chalcopyrite, with vein-like masses of the pure mineral over a foot in width."

1. Clapp, C.H., "Southern Vancouver Island" Geol. Surv. Can., Mem.13, 1912, p. 174-180

2. Cooke, H.C., "Gabbros of East Sooke and Rocky Point", Geol. Surv. Can. Mus. Bull No.30, 1919 p 26-27.

It is evident that the 7 foot width of high grade ore mentioned above is the section from which Mellin and Hincks obtained their ore as reported by the Annual Report of the Minister of Mines in 1916.

H.C. Cooke in his report which is combined with that of Clapp and published in 1917,[1] describes the Willow Grouse deposit at a time when more work had been accomplished.

Cooke reports that .....

> "The ore is developed in a shear zone 50 to 100 feet wide, having a strike of North 40 deg. East. The entire shear zone is not, however, hornblendized or mineralized, but is subdivided into subsidiary shear zones of which only those close to the northwest wall are well exposed. These are 6 feet, 15 feet and 20 feet wide. They are nearly parallel to the main shear zone but vary somewhat in strike and dip steeply to the northwest at an angle of about 70 degrees.
> The ore mineral is chalcopyrite, and occurs desseminated thr ugh all the subsidiary shear zones although best developed along the northwest wall. The principal deposit is exposed for a distance of 150 feet in a caved stope and in an open cut adjoining the stope. Five hundred feet to the southwest mineralized rock is exposed in a shallow prospect pit, and it is probable that the zone between the two exposures is mineralized."

These reports of Clapp and Cooke check very closely with those of W.M. Brewer of the B.C. Department of Mines, who in 1904 reports as follows:

> "The occurrence of a fissure zone fully 100 feet wide and of undetermined width has been fully established. Within this zone occur not only several extensive lenses or pockets of high grade chalcopyrite, but the green basic rock, which is really the matrix of ore, is found to be thoroughly impregnated with masses and grains of chalcopyrite deposited as sheets and elongated kidneys. That the lenses of solid ore, in this zone possess extent is demonstrated by the fact that the main showing of ore, which carried 11 to 18 percent copper, is exposed in a deep open cut and shaft, at upwards to 70 feet in length, with solid ore still showing at the north end of the cut, and from

1. Clapp C.H., "Sooke and Duncan Map Area", Geol. Surv. Can., Mem. 96, 1919, p. 325-327.

4 feet in width at the north end to about 11 feet in width at the southend. Surface stripping beyond the [illegible] north end shows that the lenses occur lying [illegible] the one referred to, and these show an aggregate width of nearly 15 feet.

Again in 1917 Brewer reports..."The most important of these zones of enrichment occurs on the Willow Grouse mineral claim where the mine workings are located, and there the known length of enriched fissuring is about 150 feet and the width of the high grade ore bodies of which there are three, is 6 feet, 15 feet and 20 feet."

In quoting the foregoing reports the object has been to develop a conception of the conditions that existed prior to the removal of the high grade ore material. Apart from tracing the Lateral extent of the main shear zone, (which is indicated in areal photographs to be at least 5,000 feet,) the more detailed conditions of ore deposition are at present obscured by overburden. The extent of the earlier working is of sufficient size that it seems reasonable to assume that conditions of ore emplacement as were found there may be assume to be characteristic at least for purposes of preliminary exploration.

ORE DEPOSITS

The ore bearing structure of the Willow Grouse Group is typical of the East Sooke type of copper deposit. Large replacement veins of hornblendite have followed, the course of earlier shear zones and have subsequently been crushed, brecciated and sheared by a later period of movement also localized along the original shear zones or line of weakness. This final stage of shearing has preceded the deposition of metallic minerals and provided the entry channels and loci of deposition for the ascending mineral ladened solutions.

Mineralization of commercial interest consists of chalcopyrite as the most predominent mineral together with pyrite, pyrrohtite magnetite and molyldenite in minor amounts. Chemical analysis reveals the presence of copper, nickel, gold, silver, cobalt, palladium and molybdenum. In the richer shoots copper ranges up to 23% while in the wide zones of

disseminated mineralization it will average between one and two percent. Nickel values appear erratic in distribution but range up to 0.3% on the Willow Grouse. Palladium ranges from trace to 0.04 oz. per ton. Cobalt up to 0.3% and molybdenum 0.20%. Gold and silver values run .01 oz. and .25 oz. per ton respectively.

From the description of the deposit at the time it was being worked it is evident that there were three lenses of high grade ore 6 feet, 15 feet and 20 feet wide and 150 feet long lying an echelon in a subsidiary shear zone within the main shear which is 100 feet wide. Lower grade desseminated values were distributed throughout the entire width of this minor shear. Near the southerly end of the above section a smaller shear zone (north 3 deg. west) intersects the main zone and from the point of intersection back along the smaller shear a lense of high grade is reported to have been mined which was seven feet wide and contained stringers of solid chalcopyrite up to 1 foot in width.[1]

Five hundred feet southwest along the main shear zone the dump from a shallow pit shows hornblendite containing desseminated chalcopyrite. The intervening ground is drift covered so that only the topographic expression the main shear can be seen.

Concentration of chalcopyrite appears to form in the development of subsidiary shears and at the juncture with intersecting shear zones. The lower grade desseminated values have apparently a more consistant distribution throughout the main zone and will most likely vary in extent according to the development of the large hornblendite veins forms themselves. The main Willow Grouse shear zone may be traced on aerial photographs for 5,000 feet. Development has been over a length of approximately 200 feet and to a depth of 50 feet, so that by far the greator percentage favourable ground is as yet unexplored.

1. Cooke, H.C. & Clapp, C.H., "Sooke and Duncan Map Areas" Geol. Surv. Can Mem. 96, 1919 p. 327

SUMMARY & CONCLUSIONS

Copper deposits on the Willow Grouse group of claims are typical of the "Sooko" type of shear zone deposit. They consist essentially of large replacement veins of hornblendite localized within earlier well defined shear zones which veins have subsequently been subject to shearing, jointing and brecciation such that they have formed the host rock for later invading copper bearing solutions.

As the abundance of copper mineralization is predicated upon the degree of shearing or brecciation which is dependent to a large extent upon structural control, the richer sections of copper bearing material are localized within sections of greatest structural activity. It may be reasonably expected then that at points of intersection with other shear zones and at points of slight change in direction in the main shear zone that the greatest concentration of copper mineralization will be found. This local concentration will however be superimposed upon a more widespread dessemination of copper wherever the hornblendite is affected by shearing forces. As the hornblendite replacement veins are localized within a zone of structural weakness and appear to be effected in general by late shearing, it may be expected that the majority of this Host rock will contain copper values.

The Willow grouse deposit appears to confirm readily to the requirement of present day search for mineral deposits, namely presence of commercial values, structural conditions favourable for localization of Ore Sheets and transportation facilities already developed. As such there remains only the application of the present day methods and techniques of exploration to a property of obvious merit.

THE MARGARET GROUP

HISTORY

The Margaret, Copper King and Eureka claims were staked somewhat prior to 1916 by a Dan Campbell and Associates. Part of these claims lay on ground under Crown Grant to A.R. Johnson and B.H. Johns which parties under the old mining law also had title to the base metals. Some development work was done by B.H. Johns but it was not until 1917 when the property was leased to O.B. Gerle that any extensive work was undertaken. Mr. Gerle built a road from the property to tidewater and during 1917 and 1918 shipped 559 tons of ore to Tacoma which returned 6 oz. of gold, 92 oz. silver and 42,245 lbs. of copper.

SYNOPSIS OF EARLY REPORTS

The Margaret Group was reported on in 1912 by C.H. Clapp[1] during the time of his survey of Southern Vancouver Island. At this time he recognized the importance and prospective value of what he termed the "Sooke Type" of shear zone deposit. Upon his recommendation a further examination was carried out in 1913 by H.C. Cooke.[2] Cooke describes the property as follows:

> "On the southern slopes of Mt. Maguire are three claims: The Margaret, Copper King, and Eureka, located on a shear zone some 200 feet in width and having a strike of north 43 degrees east; the zone is traceable for the whole length of the three claims. This zone is intersected near the southwestern boundary of the Copper King claims by a smaller shear zone about 100 feet wide, striking north 10 degrees east. As a rule, the metallic minerals, chiefly chalcopyrite, are disseminated throughout the shear zones. Occassionally the chalcopyrite occurs in small lenses and veins and quartz stringers are very abundant. Extensive mineralization is exposed only near the intersection of the two shear zones, the north 10 degree east zone is mineralized for about 1,000 feet north of the intersection, although the outcrops are not continuous. Samples from the shear zones range from 1 to 6 percent of copper with traces of gold and silver".

1. Clapp, C.H. "Southern Vancouver Island", Geol. Surv. Can. Mem. 13, 1912.

2. Cooke H.C. "Gabbros of East Sooke & Rock Point" Geol. Surv. Can. Mus Bull, 30, 1917.

In the 1917 report of the B.C. Department of Mines, W.H. Brewer is quoted as follows:

> "The portionof massive ore as contrasted with waste exposed in the workings examined by the writer appears to be about 75% good ore to 25% waste."

The occurrences of copper ore that have been so far developed occur in a shallow gulch or depression of variable width that appears to extend through the three claims, and appears to have been formed by erosion which acted on the mineralized part of the shear zone, as this rock offered less resistance than the part of the gabbro-country-rock in which the shearing action had been less pronounced.

At the northeasterly or upper end of the gulch there is a large swamp, in which is exposed a body of almost solid ore opened by a shaft 25 feet deep and an open cut for a length of more than 200 feet, a width of about 12 feet in the north east end of the cut and to a depth of 25 feet below the level of the surface outcropping at this point.

A short distance to the southwest and in the same open cut the ore-bearing gabbro has been proven to reach a width of 40 feet. When the open cut was first made it appeared as though the foot wall of the ore body was exposed on the northwesterly side, and in sinking the shallow shaft this so-called wall was made on one side of it, but later it was discovered that the wall was only the cleavage plane of a fracture in the shear zone, and when blasted into, the solid ore was exposed beyond it. By a series of open cuts made towards the north-westerly side of the gulch, and into the rock that had suffered less from erosion, still greater width of ore-bearing gabbro is exposed and at the time of the examination the full width of the ore body on this portion of the property was undetermined.

In an adit to cross-cut the orebody at a point about 250 feet south-westerly from the shaft mentioned, a well-defined hanging wall occurs near the portal of the adit, dipping at about a vertical angle and

striking northeasterly, conformable with the strike of the orebody exposed in the open cut already referred to. From the hanging wall, the ore body is cross cut for 10 feet, with the whole face of the cross cut in ore. Drifts are driven in both directions at right angles to the cross cut for a total of about 25 feet in length. These drifts are in solid ore with both faces in ore. About 1000 feet southwesterly from the adit there are located some old workings, the chief of which is a shaft, said to be 25 feet deep, now full of water. This shaft was sunk on an outcrop of hornblendite, through which are dessemminated lumps, grains, and small particles of chalcopyrite, and apparently the shaft is sunk in an extension of the shear zone in which the ore occurs. In addition to the old workings, there is an open cut 176 feet long which cross cuts the shear zone at this point and exposes low grade concentrating copper minerals, mainly chalcopyrite, disseminated through the hornblende country rock the entire length of the open cut, demonstrating that Clapp's estimate of the widths of the shear zone, from his report published in 1912 (memoir 13) being about 200 feet, is well established.

Brewer further states that in March, 1915 the main (northerly) section on which operations were concentrated on outlined an orebody of presumably shipping ore 250 feet long and 25 feet wide which he estimates to the 25 foot level to contain 20,000 tons of ore. It was shortly after this that operations ceased.

ORE DEPOSITS

The ore-bearing structure of The Margaret Group is the largest of the presently known Sooke Type of copper deposits. A sheared and fractured hornblendite vein striking north 43 degrees east and dipping 85 degrees southeast reaches a width of 200 feet and has been traced for 4500 feet through the three claims. Fracturing appears to have been most

extensive near the intersection of the main shear with a smaller one 100 feet in width. As a consequence, the majority of the higher grade copper ore has been localized in this vicinity over a presently known length of 250 feet along the main shear.

Mineralization consists of chalcopyrite with minor amounts of pyrite, pyrroltite and magnetite. Values in nickel up to 0.6% and Cobalt up to 0.5% have been obtained but appear to be erratic. Gold and silver values are present but seldom over .01 oz and .5 oz respectively. Traces of Palladium have been obtained also.

The descriptionof the deposit as of the time it was being worked indicated that the shipping grade ore which is reported to have averaged around 8% was some 200 feet in length by 25 feet wide with lower grade material beyond this width. A recent sample by F. Cooke and Associates in an old cross cut a short distance south of the main workings returned 1% copper across 30 feet and 1.15% copper across 36 feet with an intervening ten foot section returning 0.1% copper. The whole averages .97% across 76 feet. Approximately 1000 feet southwesterly from this point as reported by Cooke and Brewer, an old open cut across the zone shows chalcopyrite mineralization across approximately 175 feet.

In all the ore zone on the Margaret Group as presently indicated has a length of 1,250 feet and width up to 175 feet throughout which copper mineralization may be found in varying concentration. With information that is available regarding the ore removed, it is probable that the zone would average between 1 and 2 percent copper in its original state. There is no apparent reason why such conditions should not be duplicated with exploration at depth. Equal opportunities should be found in lateral extensions along the 4500 foot length of the main shear zone or along the smaller intersecting shear.

SUMMARY AND CONCLUSIONS

The ore zone on the Margaret Group is in about the same stage of development as that of the Willow Grouse, which by to-day's standards is practically unexplored. No diamond drilling has been undertaken on any property on the East Scoke Peninsula. From the standpoint of preliminary exploration The Margaret Group offers a section of the main shear zone some 1200 feet long and up to 200 feet wide throughout which chalcopyrite mineralization is widespread. Commercial values up to widths of 76 feet have been indicated with the possibility of locating other sections at depth such as produced the shipping grade ore of previous operations. There remains 3300 feet of the main ore-bearing structure to be explored. With such conditions of structure and mineralization prevailing the Margaret Group surely warrants a programme of diamond drilling and exploration under prevailing modern techniques.

FORT WILLIAM, ONTARIO.
OCTOBER 10, 1950.

.....
Trevor W. Page, P. Eng.

A REPORT (SUPPLEMENT TO ONE DATED OCTOBER 10TH, 1950)

on the WILLOW GROUSE and

MARGARET GROUPS OF MINING CLAIMS

EAST SOOKE, VANCOUVER ISLAND, B. C.

by TREVOR W. PAGE, P.ENG.

PORT ARTHUR, ONTARIO

JANUARY 17TH, 1953

A REPORT ON THE

WILLOW GROUSE AND MARGARET GROUPS OF LIMING CLAIMS

EAST SOOKE, VANCOUVER ISLAND, B.C.

INTRODUCTION

This report is prepared as a supplement to one dated October 10, 1950, in which a comprehensive compilation is made of all information relative to these properties. This report is based on a personal examination made during December, 1952.

The Willow Grouse and Margaret Groups together with a number of other claims were optioned to Toronto interests during 1951. During the course of this option a geophysical survey was carried out on the Willow Grouse Group and two short diamond drill holes were put down in the main zone.

This group consists of the Willow Grouse, Donaldson and Garden Thrush Crown Granted claims held under lease from the B.C. Department of Mines.

THE WILLOW GROUSE GROUP

A copper orebody, mined on the Willow Grouse Group, was located at the intersection of two fault zones, one striking N.3W. and the other N.40E., this latter being the major zone. Early reports indicate that the greater amount of ore came from the N.40E. fault zone, a condition similar to that found on the Margaret Group as regards strike of orebodies. Following the major zone to the southwest the geophysical survey indicated an anomaly at the intersection of another minor fault zone. One diamond drill hole was put down from northwest to southeast to cross the main fault zone in the vicinity of the old workings. It intersected this zone just south of the intersection of the two fault zones mentioned. This hole intersected fault gouge and shattered gabbroic material. It included a one foot section containing scattered flecks of native copper.

The second hole was drilled from southeast to northwest, apparently to intersect the main ore bearing zone. The dip of the hole is steep enough in relation to the dip of the ore zone that it is dubious if this hole did little more than follow the general dip of the structure. Altered gabbroic rock is all that may be seen in the core.

CONCLUSIONS

Whereas structural conditions of ore deposition are similar in the Willow Grouse to those on the Margaret Group, less may be seen because of overburden. The main fault zone is not as large as on the latter property although in this case it is the one in which the main mineralization took place. This is in contrast to the location of the known orebody on the Margaret Group.

Exploration of the Willow Grouse zone would best be carried out in conjunction with exploration of the Margaret Group. In itself it would appear dubious whether the Willow Grouse would ever be a "large" property as the structural conditions are not developed on such a large scale as at the Margaret.

An investigation of the anomaly shown should be undertaken during any exploration program.

THE MARGARET GROUP

The Margaret Group consists of the old Crown Granted claims Margaret, Eureka, Copper King, and Copper King Fraction, held under lease from the B.C. Department of Mines. A number of claims were staked to cover adjoining ground in 1951 but these have all lapsed. (Re-staked to cover adjoining ground in April, 1953, F.C.)

No exploratory work was undertaken during the period of activity in 1951.

As described previously, copper ore was mined from a lense-like body some 200 feet by 40 feet at the maximum dimensions. This orebody

was contained, according to early reports, in a shear zone 100 feet wide striking N.43E. Mineralization was reported to have extended for 1000 feet north from the intersection of the two shears. This would place the northern extension of the mineralization in the vicinity of the orebody mined.

An examination of the ground and aerial photographs indicates that the true structural relationships of the orebody mined were evidently not realized by the early workers of this deposit. To facilitate an understanding of the structure a sketch is attached showing controlling faults and location of important mineralization. Faults A and B represent the two shear zones referred to in all previous descriptions.

It may be seen that the orebody mined, while it lies in the shear zone A as described, is actually subject to control by Fault C, a structure quite obvious both on the ground and in aerial photographs. It is of interest to note that this fault zone is parallel to the major structure B.

Fault D is not mentioned in early reports. Now that the northern portion of the ground is burned off it is possible to see two parallel faults, one on either side of the gully. The southern extension of this fault below zone B is readily observable in aerial photographs.

Except for a persistant gouge zone approximately three feet wide marking Fault A, the action of both Faults A and D appears to have been the development of a rather "tight" fracture zone. By this it is meant that whereas a relatively wide zone has been developed there is not extensive alteration of the rocks in the development of stress minerals and fine, closely spaced slip planes as is usually found in the case of a true shear zone. The fracturing has apparently had some

influence in guiding solutions responsible for the hornblendization. Fracturing of the rocks in the direction of fault zone C has developed more of the shear structure and appears to be mainly responsible for mineralization. Some 250 feet southerly from the location of the original lense a zone of fracturing more or less parallel to zone C is intersected by an adit 100 feet long ending in the gouge zone of fault A. Mineralization is distributed throughout this zone in small seams and patches. Sampling of the adit by Dr. Kidd of Vancouver, returned 30 feet averaging 1.15% copper and 36 feet averaging 1.0% copper. These sections when combined with a third lower grade section average .97% copper across 97 feet.

Near the intersection of zones A and B are to be found the old shaft and trench referred to by brewer in his report of 1917. Scattered seams and patches of chalcopyrite may be seen both in the trench and around the collar of the old shaft. While none of this material would be economic, its presence would seem to be of considerable significance in its relation to zone B. The structural relationships at this point are identical to that found in the lense of ore in Zone C. A three feet gouge seam of fault A is to be seen in the old trench.

CONCLUSIONS

Recent examination of the Margaret Group claims brings out quite positive evidence regarding structural control of ore deposition. Indications are that the ore has been controlled by northerly trending fault zones where they intersect more northerly trending zones. Two such fault zones are readily observable (B and C). Such a hypothesis accounts for concentration of the ore in lenticular form of limited length and also for the apparent discontinuous nature of mineralization along the zone formed by faults A and D.

Dense undergrowth and low swampy ground prohibit detailed surface examination in the vicinity of the intersection of zones A and B, and D and B. It is felt that these are particularly favourable sections for the location of other orebodies of substantial grade. Surface exposures at these points by no means exhaust such possibilities. Development of other lenses at depth in zone C is quite possible. Exploratory work should begin with careful, detailed geological mapping coupled with a limited amount of surface stripping.

PORT ARTHUR, ONTARIO
JANUARY 17, 1953

.....
Trevor W. Page

REPORT (SUPPLEMENTARY ASSAY REPORT)

SUPPLEMENTARY SAMPLING

by HUESTIS, KENNECO and COOKE

COOKE ZONE:

Besides the qualitative spectographic determinations of specimens, the foll wing assays were made:

Kenneco:

Au.	0.01	Cu,	Grab	3.1%				
Au,	0.04	Ag.	0.8	Cu	Grab	15.30%	Ni	0.25
				Cu	Grab	0.95%		

Palladium 0.03 oz. ton

Palladium 0.04 oz. ton

GRIFFITH ZONE:

The following assays were obtained from Grab Samples of the Griffith Zone:

By Huestis:

Au.	.01	Ag.	0.2	Cu.	0.7%
Au.	.08			Cu.	11.50%

By Kenneco:

				Cu.	11.5%
				Cu.	3.0%
				Cu.	3.1%

Composite of above samples

Au.	0.06	Ag.	0.1		

By Kenneco:

				Cu.	Tr.
				Cu.	Tr.

HUESTIS ZONE

Assays:

Besides the qualitative spectographic analysis of specimens taken, purely for the purpose of determining what economic minerals were present in the zone, the following grab samples were taken by Kenneco, Huestis, & Cooke:

By Cooke: from Huestis Zone

Au.	.01,	Ag.	Tr,	Cu.	110	foot channel	1.5%
Au,	.Tr,	Ag.	0.1,	Cu.		Grab	1.0%
Au.	.04,	Ag.	0.2,	Cu.	10	foot gouge	2.3%

By Kenneco:

Au.	.02,	Ag.	0.1	Cu.		Grab 5.5% Ni	0.22%
				Cu.		Grab 2.2%	
				Cu.		Grab 1.1%	
Au.	.01,	Ag.	0.1,	Cu.		Grab 1.6%	
Au.	.01,	Ag.	0.2	Cu.		Grab 1.2%	
Au,	.005,	Ag.	0.2,	Cu.		Grab Tr.	
Au,	.02	Ag.	0.2,	Cu.		Grab 4.6% Ni	0.22%

By Huestis:

Grab: Slight Mineralization

Palladium 0.009 oz. / ton.

MERRYTH ZONE:

Besides the qualitative spectographic determinations of specimens, the following assays were made:

Kenneco:

			Cu.	Grab	3.1%		
			Cu.	Grab	0.5%		
			Cu.	Grab	Tr.		
			Cu.	Grab	0.4%		
			Cu.	Grab	0.1%		
			Cu.	Grab	0.9%		
			Cu.	Grab	0.5%		
Au.	0.1	Ag.01	Cu.	Grab	0.2%		
			Cu.	Grab	0.3%		
			Cu.	Grab	0.3%	Ni.	12%

REPORT on

ELECTROMAGNETIC SURVEY

PERFORMED ON SOME COPPER PROSPECTS

IN EAST SOOKE, B.C.

by GEOLECTRIC EXPLORATION COMPANY INC.

JUNE 1951

REPORT ON AN ELECTROMAGNETIC SURVEY

PERFORMED ON SOME COPPER PROSPECTS

IN EAST SOOKE, B. C.

JUNE, 1951

FOREWARD

This report covers the geophysical surveys of the Hill-Donaldson, Merryth, Main Valley and Willow-Grouse Zones made by the Geolectric Exploration Company in June, 1951, upon the direction of Mr. Watkin Samuel of Toronto. These zones are located near East Sooke, B. C., on the southern end of Vancouver Island.

Four maps, found to the rear of this report, are each described in turn under their respective headings. At the end is included a brief description of the technique followed in making the surveys.

Due to the necessity of economy, no lines were cut, the party using the lines cut for the preliminary work. This fact, together with the difficult terrain, impeded progress and the short lines prohibited more exact interpretation. However, the areas were covered in a satisfactory manner. Not counting repeat stations and detail stations, a total of 587 fifty-foot stations, or about five and half miles of traverse, were made in six working days. A half day was lost in adjusting equipment, giving an average of a mile per day in making traverses. No trouble was encountered with power-line disturbance or serious atmospheric disturbances, allowing repeated station values within the noise level of plus or minus five micro-amperes. Tests in the Main Valley swamps showed little influence of wet overburden upon the measurements.

HILL - DONALDSON ZONE

A conductive zone starting 200' - 300' north of the boundary between the two properties runs as shown on the map, there being some indication of a westerly dip of the target after the swerve to the west. The zone appears to widen north of the showing, eventually branching, one arm continuing on its former strike and the other striking to the east of north. The curves are typical of the reaction to a good conductor and are no doubt reflective of the ore body outcropping at the adit.

There is a disturbance of some sort, possibly faulting or shearing at the boundary between the Hill-Donaldson properties. South of the boundary the ground appears more conductive though not of a nature reflecting an ore-body. The strong kick on the eastern end of the profile 1200' south of the boundary may warrant investigation if other information indicates. It is regretted that the conditions prevented the extension of the two profiles south of this in order to check its possibilities as a conductor.

MERRYTH

Work over the outcrops near the shore was impossible due to the underbrush and the cliffs, making it impractical to determine whether the disseminated ore could be detected. The southern half of the area is quite conductive, though this is probably due to strong overburden variation. The conductive area shaded is of interest as it appears to merge with the Main Valley Shear. An alternate position for the target could be a westward displacement of 200' on lines CT and CS, this based on scant evidence and a number of assumptions.

The Main Valley anomaly may swing across the Merryth and end at the showings, though this requires several profiles across the southern end to establish.

MAIN VALLEY SHEAR ZONE

At the southern end of the Main Valley the same trouble was encountered as that upon the southern end of the Merryth. A conductive zone does trend westerly toward the Main Valley showing (and possibly the Merryth) which may well be a continuation of the showing. It continues north as shown, disappearing at line BO. The profiles bear out the topography in indicating a disturbance at the junction of the Main and Merryth valleys. The scattered anomalies throughout the valley may be indicative of crossfaulting and resultant mineralization.

WILLOW-GROUSE ZONE

The terrain permitted no cross-lines proceeding north to station V. Several small conductive spots were passed, but probably they are of little interest. The anomaly at station V could be of interest, however, as a ravine joins the valley at that point. From the showing at Station J on to the north the ground is erratically conductive, possibly indicative of sporadic lenses of massive sulphides throughout the disseminated. The single profile across the shaft indicates the conductor still present to the west of the shaft.

CONCLUSION

In order of interest, the surveys showed the Hill property as the most favored, followed by the Main Valley, the north part of the Merryth and last, the Willow-Grouse.

Due to the before-mentioned difficulties in performing the survey, more explicit interpretation is unwise to attempt. The surveys showed conductive highs over certain magnetic lows, especially in the Main Valley, further investigation of these anomalies being advisable.

With certain alteration in equipment and technique, together with a better and more systematic layout, work can be performed at probably twice the rate and afford more information.

GEOLECTRIC EXPLORATION COMPANY, INC.

"A. E. Lehmberg."

APPENDIX I

DESCRIPTION OF TECHNIQUE

The equipment includes a low-frequency alternating current generator. The A. C. is supplied to a transmitter coil and generates a primary field which induces eddy currents in the ground, the intensity of which is proportional to the ground conductivity. These currents in turn generate an alternating magnetic field, which we shall call the secondary, and which induces currents in a receiver coil. These currents, to which we shall refer as resistive signals, are amplified and measured. Their intensity is proportional to the apparent conductivity of the ground.

In fact, the signal generated in the receiver coil is not only caused by the secondary alternating magnetic field retransmitted from the ground, the receiver coil is also energized by the primary magnetic field, which induces directly in the receiver coil signals of a much greater order of magnitude than the secondary magnetic field.

However, the intensity of these inductive signals depends upon the coefficient of a mutual induction of the two coils, which itself varies according to their position with respect to each other and to the magnetic permeability of the ground below the measuring system.

In Geolectric's device, only the resistive signal is read on the meter, the inductive signal being cancelled out. This is accomplished by a special circuit which discriminates against the effect of changes in coil spacing and of magnetic material in the ground.

At the same time, the circuits discriminate against secondary inductive signals which may be generated to the ground whenever the skin effect becomes appreciable.

Appendix I June, 1951

From what has been said, it can be understood that the device gives a measure of the ground conductivity below the point of measurement. The favorable conditions for its use are those in which the target generates strong signals, whereas the surrounding rocks have no action. Strong signals will be generated by shallow large bodies of highly conductive ore of the sulphide type, such as pyrite, pyrrhotite, chalcopyrite, bornite, etc., the restivity of which is of the order of 0.01 ohmammeter. Graphite, unfortunately, is also of low resistivity.[1]

Most other minerals are much more resistive. If the target is smaller and/or deeper, the signal generated is smaller, and if the surrounding formations are appreciably conductive, then the signal to noise ratio of the readings becomes less favorable.

The EM party consists of four men. The operator takes the notes, one man carries the electronics and one man carries each coil — all mounted on packboards. The two coilmen keep the cables taunt and level the coils briefly a few seconds for each reading. The coils are separated at a normal spacing of 100' with the other two men at the centre.

Upon starting the day, the equipment is allowed to warm up for about thirty minutes to permit the batteries to stabilize and the components to reach their operating temperature. The system, with the receiver coil in front and the transmitter 100' behind, move down the line for the first station. With the electronics man on the station the coil man level up and draw taunt while the operator takes the reading. Then the system moves along to the next station, 25' or 100' away. The whole action takes just a few seconds.

---

1 This suggests that large bodies are the shallow type.
Frank Cook, Prospector

7.

DIAMOND DRILL LOGS AND ASSAYS

by P. A. CHUBT

JULY 1951

D.D.H. #1

Merryth Zone: 25' north Station CF
Bearing . 258° Mag.
Dip. -55°
Depth. 250'

July 16th - 23rd, 1951

0 - 9 Medium grained dark grey gabbro, disseminated magnetite replacement.

0 - 72 Dark grey to black fine to medium grained slightly hornblendized gabbro; disseminated magnetite with pyrrhotite and chalcopyrite sparsly present along small slips and fractures and disseminated grains.

72 - 92 Mottled replacement of gabbro by hornblende and magnetite low disseminated sulphides in fractures.

92 - 120 Hornblendite, a few gabbro remnants, patchy sulphides.

120 - 200 Hornblendite, fracturedand replaced by sulphides. Minor amounts of magnetite. Pyrrhotite, pyrite, and chalcopyrite.

Sample 1:	92 - 97	rare sulphides		
2:	92 - 102	rare sulphides		
3:	102 - 107	3% sulphides,	½' lost	
4:	107 - 114	1% sulphides,	5½' lost	
5:	114 - 120	1% sulphides,	2' lost	
6:	120 - 125	4% sulphides,		
7:	125 - 130	6% sulphides,	1' lost	
8:	130 - 135	10% sulphides		
9:	135 - 139	20% sulphides,	heavy pyrrhotite	
10:	139 - 144	25% sulphides,	heavy pyrrhotite	1' lost
11:	144 - 148	15 "	" "	½' lost
12:	148 - 153	15% "	" "	½' lost
13:	153 - 158	5% "	1' lost	
14:	158 - 163	2% "	3' lost	
15:	163 - 170	10% "	1½' lost	
16:	170 - 175	15% "	½' lost	
17:	175 - 180	50% "	heavy pyrrhotite	
18:	180 - 185	50% "	" "	
19:	185 - 190	25% "	" "	
20:	190 - 195	5% "	1' lost	
21:	195 - 200	5% "	1½' lost	

200 - 250 Hornblendite, fine-grained, rare disseminated sulphides with scattered magnetite replacement, chloritized with calcite stringers 235 - 240.
158 - 163 possible gouge zone

" P. A. Chubb"

120 - 175 — 55' — 0.20%

"W.W.S."

DIAMOND DRILL HOLE # 2

Location:	Merryth Zone 40' North of Station C. F.
Bearing:	212°
Dip:	-45°
Depth:	268'

0 - 4	Casing, overburden
4 - 156	Coarse to fine-grained gabbro, fractured irregularly magnetite replacement as grains and fracture fillings with minor associated chalcopyrite and pyrrhotite sulphides
156 - 191	Fractured and broken dark grey to black gabbro, slightly altered to hornblende, dissemintaed and veinlets of magnetite with associated rare sulphides.
191 - 220	Hornblendite, well broken and fractured, rare sulphides.
209 - 211	2' lost
211 - 213	1' lost
213 - 216	2½' lost / Shear Zone Gouge
216 - 217	Core lost /
217 - 220	well fractured hornblendite, low sulphides
220 - 268	Mineralized zone. Pyrrhotite, chalcopyrite and pyrite

Cemented cave at 216'. Drill rods jammed by cave at 268' Unable to recover, attempted casing over rods but unsuccessful. Abandoned hole for the present.

Samples No.	Footage	Remarks
22	220 - 225	Patchy sulphides 1 - 40%
23	225 - 230	Sulphides 25%
24	230 - 235	" 30%
25	235 - 240	" 2%
26	240 - 245	" 3% 1 foot lost
27	245 - 250	" 10% ½ foot lost
28	250 - 255	" 5% ½ foot lost
29	255 - 260	" 1% 4' lost, shear zone
30	260 - 265	" 5% 4' lost shear zone gouge and chlorite breccia
31	265 - 268	" 10% 2½' lost chlorite breccia and gouge.

"P. A. Chubb"

DIAMOND DRILL HOLE #3

Location: Merryth zone, 240° & 160° from Station C. F.

Bearing: 250°

Dip: 45°

0 - 5	casing
5 - 56	Light gray fine grained gabbro, massive
56 - 73	Dark gray fine grained augite gabbro, massive
73 - 75	Aplite stringer, intrusive contact
75 - 111	Dark gray fine grained augite gabbro, massive
111 - 113	Hornblendite
113 - 150	Medium dark gray fine grained augite gabbro, flecks of native copper at 123
150 - 168	Olivine gabbro fine grained medium dark gray
168 - 199	Augite gabbro medium fine grained, massive
199 - 270	Olivine gabbro, medium grained, 2% disseminated sulphides at 184, some aplitic phases, well fractured.
270 - 417	Hornblendite, mineralized

Sample #

32	270 - 275	½% lost, 2% sulphides
33	275 - 280	30% sulphides, pyrrhotite
34	280 - 285	low sulphides
35	285 - 290	low sulphides, ½% lost
36	290 - 295	low sulphides
37	295 - 300	" "
38	300 - 305	" " , native copper @ 304°
39	305 - 310	" "
40	310 - 315	5% "
41	315 - 320	3% "
42	320 - 325	low sulphides, ½% lost
43	325 - 330	" " , ¾% lost
44	330 - 335	3% sulphides
45	335 - 340	low sulphides, ½% lost
46	340 - 345	10% " , ¾% lost
47	345 - 350	5% " , flecks of native copper, ¾% lost
48	350 - 355	5% "
49	355 - 360	low sulphides, ½% lost
50	360 - 365	" "
51	365 - 370	10% "
52	370 - 375	8% "
53	375 - 380	5% "
54	380 - 385	4% "
55	385 - 390	8% "
56	390 - 395	low "
57	395 - 400	low sulphides, ½% lost
58	400 - 405	2% " , ½% lost
59	405 - 410	low sulphides
60	410 - 415	low sulphides

P. A. Chubb
"P.A.C."

270° - 410° - 140° - 0.46% Cu
"J.S."

DIAMOND DRILL HOLE #4

Location: Cross Fault, Iron Mountain Zone
40' @ 290° from Station C. K.

Bearing: 290°

Dip: -35°

0 - 37½	Casing through, overburden, Sooke Formation, Sandstone and conglomerate
37½ - 80	Coarse grained dark grey augite gabbro, fractured with hornblende veinlets.
80 - 116	Coarse grained augite gabbro, slightly hornblendized, slightly sheared, rare scattered specks of native copper, disseminated grains of iron oxide
116 - 133	Coarse grained augite gabbro
133 - 150	Black fine grained hornblendized gabbro, disseminated iron oxides
150 - 174½	Crushed augite gabbro, chloritized. (shear)
174½ - 200	Aplite. Intrusive contact at 174½
200 - 231	Gradational contact between augite gabbro and aplite
231 - 302	Massive, coarse grained augite gabbro, streaks and stringers of hornblende, disseminated iron oxides.
302 - 342	Crushed, chloritized hornblendite, calcite stringers rare sulphides (shear zones)
342 - 356	Augite gabbro, slightly hornblendized
356 - 365	Aplite
365 - 420	Coarse grained augite gabbro
420 - 449	Coarse grained augite gabbro, slightly sheared and hornblendized well fractured, medium iron oxides. Very rare sulphides
449 - 460	Aplite

"P. A. Chubb"

No mineralization worth sampling.

"W.S."

DIAMOND DRILL HOLE #5

Location:	Main valley zone, 145' @ 45° from Station B. T.
Bearing:	270°
Dip:	-45°
Depth:	346'

0 - 2	Casing
2 - 14	Olivine gabbro, medium grained, dark grey
14 - 212	Coarse grained augite gabbro, low disseminated magnetite replacement, very rare sulphides in crystal slip planes and minor fractures. Flakes of native copper between 185 - 191. Some minor granulation and alteration.
212 - 242	Granulated, chloritized, carbonated augite gabbro, 20' lost.
242 - 266	Carbonated splitic shear zone, 19' lost
266 - 278	Granulated chloritized augite gabbro, 2' lost
278 - 301	Fractured slightly granulated augite gabbro, hornblendized and chloritized, diss. iron oxides and very rare sulphides.
301 - 346	Augite gabbro, slightly hornblendized and chloritized, minor fracturing with very rare sulphides.

"P. A. Chubb"

Note:- No mineralization worth samplying.

"W. S."

DIAMOND DRILL HOLE #7

Location:	Hill zone, Station D. I.
Bearing:	N 70° E
Dip:	-45°
Depth:	175'

0 - 15	Casing
15 - 29	Hornblendized augite gabbro, disseminated flecks of native copper
29 - 53	Augite gabbro, medium grained, rare specks native copper
53 - 66	Augite gabbro, crushed altered splitized in part, rare specks native copper, 6 feet lost.
66 - 132	Augite gabbro, in part chloritized, patchy disseminated magnetite, disseminated native copper
132 - 173	Hornblendite, slightly mineralized, chiefly pyrite lesser pyrrhotite, rare chalcopyrite.
173 - 175	Augite gabbro

Samples #	Footage	Remarks
83	138 - 143	2% sulphides
84	143 - 148	1%
85	148 - 153	2%
86	153 - 158	1%

"P. A. Chubb"

138 - 153 - - 15' - - 0.366% Cu

"W. S."

DIAMOND DRILL HOLE #8

Location:	Hill zone; 60' @ N 85 E from Station D. L.
Bearing:	N 85 E
Dip:	-45°
Depth:	176'

0 - 5	Casing
5 - 32½	Black felsitic hornblendite, slightly fractured with low disseminated sulphides, some patchy 5% sulphides
32½ - 47	Olivine gabbro, medium grained low disseminated sulphides and magnetite.
47 - 60	Olivine gabbro, patchy aplitic alte ation
60 - 123	Black felsitic hornblendite, patchy aplitic alteration rare sulphides, some patchy low chalcopyrite mineralization.
123 - 169	Same as above; 0 - 5% sulphides, percentage of chalcopyrite greater than normal, low native copper
169 - 176	Augite gabbro, coarse grained

Sample #	Footage
87	123 - 128
88	128 - 133
89	133 - 138
90	138 - 143
91	143 - 148
92	148 - 153
93	153 - 158
94	158 - 163

"P. A. Chubb"

DIAMOND DRILL HOLE #9

Location:	Willow-Course Zone, 80' @ 155° from Station D
Bearing:	315°
Dip:	-55°
Depth:	197'

0 - 9	Casing
9 - 23	Olivine anorthosite, white, coarse grained
23 - 197	Impure olivine anorthosite (Replacement of olivine gabbro?) Serpintine slip planes, olivine replaced in part by iron oxides. Fault zone 118 - 119½

"P. A. Chubb"

No mineralization worth sampling.

"W. S."

DIAMOND DRILL HOLE #10

Location:	Willow-Grouse Zone, 100' @ 168° from Station E
Bearing:	150°
Dip:	-45°
Depth:	101'
0 - 11	Casing
11 - 81	Impure olivine anorthosite, small patches of hornblende and olivine gabbro. Well broken and shattered. 47 - 50 fault gouge. Olivine partially altered to serpentine and iron oxides. Small patches porphyritic.
81 - 101	Impure olivine gabbro, partial anorthosite replacement

"P. A. Chubb"

No mineralization worth sampling.

"W. S."

DIAMOND DRILL HOLE #11

Location:	Merryth zone; 520' @ 152° from Station C. F.
Bearing:	280°
Dip:	-40°
Depth:	580'

0 - 171	Fine grained augite gabbro, a few aplite stringers, rare native copper on chloritic slips. Shown partial segregation of acid and basic phases. Wall fractured 79 - 98 iron sulphides 96 - 98, gauge seam 136
171 - 309	As above, medium grained, 208 - 215 chloritic hornblendite stringers; 6 inch anorthosite stringer at 265 containing 10% chaclopyrite
309 - 311½	Aplite stringer
311½ - 392	As 171 - 309
392 - 403	Fine grained black slightly hornblendized augite gabbro.
403 - 409	Gouge zone, core lost
409 - 455	Fine grained, slightly hornblendized augite gabbro containing 2 - 3 inch patches of good chalcopyrite fine disseminated native copper 442 - 498 poor core recovery 30 feet lost
455 - 501	Hornblendite, augite gabbro remants, highly shattered 20 feet lost, mud @ 461, gouge @ 490. rare sulphides
501 - 532	Fine grained augite gabbro, slightly hornblendized well fractured,
532 - 538	As above with aplite stringers.
538 - 580	Fine grained augite gabbro, fractured, aplite stringers.

"P. A. Chubb"

No mineralization worth sampling.

"W. S."

DIAMOND DRILL HOLE #12

Location:	Merryth zone, 520' @ 152° from Station C. F.
Bearing:	250°
Dip:	-30°
Depth:	420'

0 - 9	Casing
9 - 201	Fine grained dark grey augite gabbro, well fractured hornblendite slips, a few narrow aplite stringers.
201 - 240	Slightly hornblendized and chloritized augite gabbro well fractured, 2 - 3 inch patches of mixed sulphides separated by wide barren augite gabbro
240 - 325	Fine grained dark grey augite gabbro, very rare patches of sulphides
325 - 342	Hornblendized augite gabbro, very scattered narrow patches of sulphides of typical nature. 328 - 331, heavy pyrrhotite rare chalcopyrite. Fault breccia 338'
342 - 368	Fine grained slightly hornblendized gabbro
368 - 371	Fault breccia and gouge
371 - 420	Medium grained augite gabbro, aplite stringers. Fairly well fractured.

"P. A. Chubb"

No mineralization worth sampling.

"W. S."

C
O
P
Y

CERTIFICATE OF ASSAY

G.S. ELDRIDGE & CO. LTD.
Provincial Assayers, Analytical and Consulting Chemists
Metallurgical and Cement Inspectors

WE HEREBY CERTIFY that the following are the results of assays made by us upon samples of D.D. CORES herein described and received from MR. WATKIN SAMUEL.

August 1, 1951
FILE NO. 3223

Marked	Copper Per Cent.
#1	Trace
2	Trace
3	Trace
4	Trace
5	Trace
7	0.6
8 A	0.1
8 B	0.2
9	0.3
10	0.2
11	0.2
12	0.1
13	Trace
14	0.1
15	0.2
16	0.2
17	0.1
18	Trace
19	0.1
20	Trace
21	Trace

August 13, 1951
FILE NO. 3318

Marked	Copper Per Cent.
#22	0.2
23	0.3
24	0.4
25	0.2
26	0.1
27	0.2
28	0.1
29	Trace
30	0.1
31	0.2

August 20, 1951
FILE NO. 3403

Marked	Copper Per Cent.
#32	0.3
33	0.4
34	0.4
35	Trace
36	0.2
37	0.3
38	Trace
39	0.3
40	0.9
41	0.3
42	0.2
43	Trace
44	0.3
45	0.5
46	1.0
47	1.9
48	1.1
49	0.4
50	0.2
51	0.2

Marked	Copper Per Cent.
#52	0.6
53	0.4
54	0.5
55	0.4
56	0.7
57	0.7
58	0.4
59	0.3
60	Trace

C
O
P
Y

CERTIFICATE OF ASSAY

G.S. ELDRIDGE & CO. LTD.
Provincial Assayers, Analytical and Consulting Chemists
Metallurgical and Cement Inspectors

WE HEREBY CERTIFY that the following are the results of assays made by us upon samples of D.D. CORES herein described and received from MR. WATKIN SAMUEL.

October 11, 1951
FILE NO. 3835

October 18, 1951
FILE NO. 3882

Marked	Copper Per Cent.	Marked	Copper Per Cent.
#61	0.6	#83	0.3
62	0.3	84	0.2
63	0.2	85	0.6
64	0.6	86	0.1
65	0.2	87	0.2
66	0.2	88	0.5
67	0.3	89	0.2
68	0.3	90	Trace
69	0.2	91	0.1
70	0.2	92	Trace
71	0.3	93	Trace
72	0.2	94	Trace
73	0.3		
74	0.4		
75	0.3		
76	0.6		
77	0.6		
78	0.6		
79	0.7		
80	0.8		
81	0.6		
82	Trace		

8.

REPORT on

EAST SOOKE DRILL PROGRAM

by P. A. CHUBT

DECEMBER 1951

REPORT ON EAST SOOKE DRILL PROGRAM

December, 1951

General

During the period June 25 to November 18, 1951, a preliminary drilling program was undertaken to determine the approximate copper content of the more important mineral zones* occurring in the East Sooke gabbro, Southern Vancouver Island, B. C.

Partial and complete forest closures, incomplete drilling crews caused considerable delay.

Twelve (12) holes were completed for a total of 3,544 feet.

Holes 1, 2, 3, 11, 12 explored the Merryth zone. Hole 4 was located to investigate the Iron Mountain zone and the major cross fault offsetting the Merryth-Iron Mountain Zones. Hole 5 explored the Main Valley zone or Sooke River Break. The Hill zone was cross sectioned by three short holes 6, 7 and 8.

Drill hole plans and logs are attached.

Merryth Zone

Drilling showed a wide zone of mineralized hornblendite lying between the cross faults marked A and B on map. South of fault B the hornblendization is incomplete and mineralization negligible.

The zone between faults A and B is approximately 100 feet wide and trends north-south. South of fault B the zone is only 50 feet wide and trends N 30° W. This change in trend conforms to the magnetic contours previously mapped. Strong cross faulting is considered necessary for large scale hornblendization, re-fracturing and subsequent mineralization. This is shown on both the Hill and Merryth zones where they lie between two strong cross faults.

South of the explored zone of the Merryth, ie: under Juan de Fuca Straits is an area of strong cross faults (see aerial photographs for impingment of cross faults on shore.).

Note: Frank Cook - Did not include Copper King and old copper mine.

Drill core assays are averaged below for Merryth zone.

Hole 1: Averaged 0.2% copper across 65 feet

Hole 2: Averaged 0.3% copper across 48 feet. This hole lost without completely cross cutting zone.

Hole 3: Averaged 0.46% copper across 140 feet.

Hole 11: Negligible sulphides, not assayed

Hole 12: Negligible sulphides, not assayed

Hill Zone

The Hill zone was explored by three short holes spaced approximately 400 feet apart to cross section high, medium and low magnetic areas of the anomaly. Wide fairly massive pyrrhotite with later chalcopyrite in fracture filled stringers and disseminations was intersected in Hole 6. A narrow zone of low disseminated sulphides and sulphide filled fractures in hornblendite was intersected in holes 7 and 8.

Hole 6: Averaged 0.4% copper across 105 feet

Hole 7: Averaged 0.3% copper across 20 feet

Hole 8: Averaged 0.3% copper across 15 feet

Willow-Grouse Zone

Number 9 hole, planned to intersect mineralization* reported to occur in the main shear of the Willow-Grouse zone, cut the main shear below the shaft and open pits and Number 10 at a point approximately 100 feet southwest. The shear at these shallow depths is in olivine anorthosite and barren of mineralization.

The heavy sulphides at surface occur in a small shallow body of hornblendite and do not continue into the anorthosite.

Conclusion

The extension of the Hill zone northward under Sooke Harbour in the vicinity of its intersection with the Sooke River Break, the southern extension of the Merryth zone beneath the Straits of Juan de Fuca where cross fracturing appears more abundant offer the best possibilities for increased mineralization. The cost of exploring the extension of these zones except by aerial magnetometer is prohibitive.

---

* Note: Frank Cook - Doubtful if these two holes properly placed.

The Copper King and Copper Mine zones were not investigated. They both lie on the east flank of Mount Maquire which is chiefly olivine anorthosite and a condition similar to the Willow-Grouse may exist but at great depth.

P. A. CHUBB

1443 west 48th Ave.
Vancouver....B.C.
October the 6th/48.

To the Superintendent of
Exploration,
Mines Department
Trail....B.C.

Dear Sir:

Re - Copper showings, East Sooke,
Vancouver Island, B.C.

I have this day forwarded under separato cover a file on the group of claims held by associates and myself at East Sooke.

At present the claims are open for examination. The last company to examine being A.S.&.R. Representative A.C. Hall, 550 Burrard St. Vancouver.

The Merryth Zone (Iron Mine Hill) enclosed in folder some pictures of zone at beach, Ladysmith Smelter obtained some ore from open cut. During the periods of real low tide at this location considerable more chalcopyrite was noted and lesses amounts of pyrrhotite. Old reports refer to this zone as being composed of valueless metallic minerals, however from careful examination and considering the price of base metals today it is our opinion that the zone warrants further consideration. Dr Frank Zurbrigge during his examination ran a magnotometer survey for one thousand ft. over the iron mine hill, this zone mineralized for this distance and no doubt due to magnetite.

N.B The Griffith Zone (Old Copper Mine) Reports have very brief information. This zone has a shaft sunk 120 ft with good mineralization up to 11.50% C.u. on dump. Records in the Provincial Archieves show that this work was done in 1863, by a Captain Nagle and associates who were encouraged by the native copper at the surface.

Although traces of U 308 are present to date we have not examined any of the showings by Geiger Counter.

We would greatly appreciate an examination by one of your staff. If the Company wish to examine showings please contact me. In the event of Company being interested I am sure we could agree to the type of deal required as we realize that showings of this nature must first produce to pay. Further It would not be necessary to hold all claims, two showings are covered by Crown Grants, and we have done work on others were about eight claims would be sufficient to cover. Leaving town and returning 15th. Kindly advise if you are interested or not.

Best regards -

P.A. Chubb
R.R. #1, Victoria, B.C.
November 12, 1951.

Mr. Frank Cook,
3531 Nelson Ave.,
South Burnaby, B.C.

Dear Frank:

Have been intending to write and answer your letter and thank you for the enclosures re sampling of the various zones. The Copper King surface sampling looks very encouraging but it does not look as if we will get any option on this ground now. Application for assessment work has been made on the claims for the geological and physical work performed and I am assured that we will receive one years credit. Drilling will also be applied on assessment so most of the claims should be in good standing for at least 2 more years.

N.B. We D. drilled the Willow-Grouse to determine if values present in the main shear. No mineralization was intersected. The core in both holes almost entirely olivine anorthosite and it appears that the ore is confined to a saddle of hornblendite sitting in the anorthosite. A great disappointment.

We are completing the present drill grogram on the Merryth zone which to-date has been the best bet. The Hill also fell down. 0.3% copper.

With best regards to yourself and Gertie

(Signed) Phil

G.S.C. GEOLOGICAL SURVEY OF CANADA

MEMOIR 96 - EXTRACT

(Sooke and Duncan Map Areas

By CLAPP AND COOKE

EXTRACT FROM G. S. C. MEMOIR 96

SOOKE AND DUNCAN MAP AREAS

BY CLAPP AND COOKE

P. 327

N.B. All the ore bodies found have been confined to the East Sooke mass; the Rocky Point mass has not been faulted, so far as observed, and hence mineral deposits are lacking in it. 2

Several claims have been taken up on the Sooke deposits and numerous prospect pits have been made, but only a small amount of mining has been carried on. One thousand tons of picked ore from the Willow Grouse and Blue Bird claims was shipped to Tacoma in the autumn of 1916, and brought returns averaging about 5 percent copper. A few tons of ore was also shipped from the adjoining King George claim. A few attempts to mine the Iron Mountain Deposit have been made and some of the ore has been shipped. A road was built to a deposit on the southern coast several years ago, and presumably some ore was obtained, but the project has long since been abandoned.

DESCRIPTION OF PROSPECTS

The prospect on the Willow Grouse and Blue Bird claims is one of the three more important ones. It is situated on the northwest slope of Mt. Maguire, on section III. The ore is developed in a shear zone 50 to 100 feet wide, having a strike of north 40 degrees east. The entire shear zone is not, however, hornblendized or mineralized, but is subdivided into subsidiary shear zones, of which only those close to the north-west wall are well exposed. These are 6 feet, 15 feet, and 20 feet wide. They are nearly parallel to the main shear zone but vary somewhat in strike, and dip steeply to the northwest at an angle of about 70 degrees.

The ore mineral is chalcopyrite, and occurs disseminated through all the subsidiary shear zones although best developed in those along the northwest wall. The Principal deposit is exposed for a distance of about 150 feet in a caved stope and in an open-cut adjoining the stope. Five hundred feet to the southwest mineralized rock is exposed in a shallow prospect pit, and it is probable that the zone between the two exposures is mineralized. Three hundred feet to the northeast in the bed of a creek which drains the shear zone a prospect adit is driven in the sheared gabbro, which is there rather feldspathic, and has not been hornblendized or mineralized. Samples from the deposit range from 1 to a maximum of 18 percent of copper with hardly more than traces of gold and silver.

The deposit has been developed chiefly by a small shaft about 50 feet deep, and by a stope which was brought to the surface to the northwest of the shaft. From this stope about 3,000 tons of rock was removed during the autumn of 1916. Of this amount about 1,000 tons were shipped to Tacoma.

On the southern slope of Mt. Maguire are three claims; The Margaret, Copper King, and Eureka, located on a shear zone some 200 feet in width andhaving a strike of north 43 degrees east; the zone is traceable for the whole length of the three claims. This zone is intersected near the southwestern boundary of the Copper King claim by a smallershear zone about 100 feet wide, striking north 10 degrees east. As a rule, the metallic minerals, chiefly chalcopyrite, are disseminated throughout the shear zones. Occassionally the chalcopyrite occurs in small lenses and veins and quartz stringers are very abundant. Extensive mineralization is exposed only near the intersection of the two shear zones, and the north 10 degrees east zone is mineralized for about 1000 feet north of the intersection, although the outcrops are not continuous. Samples from the shear zones range from 1 to 6 percent of copper, with traces of

12.

B.C., MINISTER OF MINES ANNUAL REPORT -

EXTRACT

by W.M. BREWER

1904

EXTRACT FROM ANNUAL REPORT

B.C. MINISTER OF MINES

1904

By W.H. Brewer

P 254

GEOLOGY

The Sooke Peninsula is made up entirely of igneous rocks belonging to the Vancouver series, as described by the late Dr. Dawson. Evidently this peninsula was the scene of very heavy volcanic disturbances, which have been followed by the formation of mineral-bearing zones of considerable extent, in which have been deposited bodies of chalcopyrite, pyrrhotite and iron pyrite. All the rocks observed by the writer belong to the hornblende or pyroxene series, and in the areas mentioned are found to occur as masses and crystals desseminated through a highly basic intrusive rock, which in several placed on the peninsula occupies fissured zones, through which there have been considerable shearing movements subsequent to the eruptive action which produced these fissured zones, as is attested by the numerous slickensided cleavage planes, but not sufficient to produce well defined schistosity. So far as at present known, the most promounced of these zones occurs in the property described in this report. This is easily traceable for a long distance on the Blue Bird and Willow Grouse mineral claims, where its boundaries on either side are well defined and persistent, and are found to be composed of a coarsely-grained granitoid rock, which should probably be classified as a syenite.

N.B.

CHARACTERISTICS

At a point close to the No.1 stake of both the claims mentioned, the first discovery of an outcropping of chalcopyrite was made. This discovery was followed by a serious attempt on the part of the owners to determine the extent and probable permanency of the ore-body. This has determined several important characteristics of the main ore-body. The occurrence of a fissured zone fully 100 feet in width and of

undetermined length has been fully established. Within this zone occur not only several extensive lenses or pockets of high-grade chalcopyrite, but the green basic rock, which is really the matrix of the ore, is found to be thoroughly impregnated with masses and grains of chalcopyrite deposited as sheets and elongated kidneys.

As already stated, the full extent of the zone has not been determined, but where the main work has been carried on the width of ore-bearing ground opened up is fully 50 feet. This has been exploited by actual openings for a length of 150 feet, while about 500 feet in a south-westerly direction down the ravine there is exposed in a shallow open cut the same character of ore bearing material showing chalcopyrite as impregnations. Northerly from the main workings these surface indications, where such are exposed, show the green basic rock which fills the fissured zone where the ore-body has been opened, as well as the well defined boundaries on the hanging and foot-wall sides, clearly indicating that the zone maintains continuity in that direction for a considerable distance. The dip of the hanging-wall is almost vertical at the surface, the slight inclination there is being towards the west.

So far as the writer could see, the true foot-wall, while being generally well-defined has not been exposed in any of the workings, but is situated about 40 feet easterly from the shaft which has been sunk at the edge of the ravine. That the lenses of solid ore in this zone possess extent is demonstrated by the fact that the main showing of ore, which carries from 11 to 18 percent copper, as exposed in a deep open cut and shaft, is upwards of 70 feet in length, with solid ore still showing at the north end of the cut, and from 4 feet in width at the end of about 11 feet in width at the south end. Surface stripping beyond the deep part of the cut at the north end show that the lenses

occur lying in echelon to the one referred to, and these show an aggregate width of nearly 15 feet.

At the southerly end of the open cut a vertical shaft has been sunk 50 feet, and a crosscut tunnel has been driven from the bottom towards the hanging-wall, or western boundary of the ore-bearing zone. At the time of the writer's examination he was unable to make any inspection of these workings, because they were full of water and he had no facilities at hand to pump it out, but during the progress of sinking the shaft in 1902 he made two visits to the property, and saw that the shaft was being sunk in ore. As the crosscut through had not been made at that time, he is unable to describe the condition from personal knowledge. On information, and judging from the material on the dump, it would appear that this crosscut had been driven a portion of the distance through solid ore, and all of the distance where solid ore was not encountered through the green basic rock, which is the matrix of the ore, and a large portion of which carries sufficient ore as impregnations to give it commercial value.

DEVELOPMENTS

The work of development has been confined to the open cut and shaft, with crosscut from the bottom, together with several shallow prospecting pits and some surface stripping. As a result of the main workings, a dump containing probably 400 tons of chalcopyrite ore has been accumulated, which, judging from the samples taken by the writer at various times, will yield an average value of 10 percent copper, with low gold values. The length of the deepest part of the open cut is about 50 feet, and surface stripping has been done for a distance of about 50 feet in addition, thereby exposing ore at the particular point for a distance of 120 feet. Southerly from this cut, shallow

pits have been made, exposing ore a further length of probably 30 feet, while another shallow pit, sunk in the ravine about 500 feet distant from the main workings, also exposes the ore.

CONCLUSIONS

N.B. After having made a careful examination of this Sooke copper property and also other deposits on the Sooke Peninsula, which have in the past been prospected as iron properties, it is the opinion of the writer of this report that the Sooke copper property is a prospect possessing great possibilities, and meriting a most thorough exploitation and development. With regard to the so-called iron-ore deposits, the writer is of the opinion that they have no value when judged on their possibilities for producing iron ore of a commercial grade, but that when considered from the standpoint of their possibilities of developing into copper propositions, on the theory that the so-called iron ore is merely an iron capping covering a deposit of ore (copper ore) the writer is of the opinion that they also merit further and systematic exploitation.

There is every facility for carrying on mining operations on the Sooke copper property as economically as can possibly be done in other sections of the Province, when it is considered that this is a sinking proposition, but owing to the possibilities of extent of the mineral bearing ground, and the character of the rock, it will very probably be shown that the "glory hole" system of mining could be adopted, and a great saving in cost for the timbering thereby made.

The cost for transportation from the mine to salt water by means of a well constructed tramway should not exceed 10 cents per ton, while the cost for transportation to either of the British Columbia smelters on the east coast of Vancouver Island should not exceed 50 cents per ton.

The following analysis of an average sample from the dump, taken by

N.B { Mr. D.W. Moore, ore-buyer for the Canadian Smelting Works, of [illegible], shows that the ore is practically self-fluxing, and consequently, could be smelted at as low a cost as is possible: Gold, .03 oz. per ton; Silver, trace; copper 11.1 percent.; iron, 15.7 percent.; silica, 49 percent.; lime 2.8 percent.; sulphur, 13 percent.

13.

MACSAN EXPLORATIONS LTD.

REPORT ON SCOKE AREA

by

D.C. MALCOLM

DECEMBER, 1964

MACSAN EXPLORATIONS LTD.

REPORT ON SOOKE AREA

by

D.C. MALCOLM

DECEMBER, 1964

1. SUMMARY

Macsan Explorations was formed in 1962 and acquired claims and mineral rights over the best part of the area between Sooke, Sombrio Point, Leech River and the Strait of Juan de Fuca. The area was geologically mapped, soil sampled and prospected. Five large areas of low grade copper mineralization were found and many smaller areas remain to be explored. Diamond drilling is necessary for further exploration.

2. LOCATION

Lat. 48°15' to 48°30', Long. 123°40' to 124°15'. Elevation 0 to 2000 feet. The property extends for 30 miles between Sooke and Sombrio Point along the shore of the Strait of Juan de Fuca 20 to 50 miles west of Victoria. It extends northward to the Leech River - Loss Creek valley from 29 to 10 miles north of the sea.

3. HISTORY

Copper was first discovered on the Sooke Peninsula in 1863 and some ore was shipped to England from the deposits.

In 1915 copper was discovered at the Jordan River and is at present being mined by Cowichan Copper Ltd.

In 1955 the area was flown with a helicopter borne magnetometer. Positive anomalies were found over the western claims but technical difficulties made results over the eastern claims unreliable. Ground work was done by Rio Canadian Exploration and diamond drilling was recommended but not carried out.

cont'd...

Macsan Explorations Ltd. acquired the ground in 1962 and have since geologically mapped and soil sampled it as well as prospecting it in detail.

PROPERTY

704 located claims and base metal rights on 19,535 acres under agreement from Canadian Pacific Oil and Gas Company Limited.

GEOLOGY

(a) Topography.

The property extends along the South Coast of Vancouver Island and rises gently inland to a low mountain plateau at elevations of 2000 to 2500 feet, 6 to 8 miles north of the beach. The area has been covered with an evergreen forest now largely logged and replanted.

Highway 17 follows the coast line and logging roads reach to all parts of the area.

The climate is moderately wet but warm. A little snow falls at the higher elevations during the winter.

(b) General Geology.

The belt is in a downfaulted block of Eocene Metchosin Volcanics intruded by Miocene gabbro dikes and by younger hornblende gabbro plugs. These rocks are overlain uncomformably by remnants of flat lying Oligocene Sooke Sediments and by Pleistocene glacial gravels and interglacial tills. Permian Sicker schists bound the block to the north of the prominant Leech River fault. A conjugate system of northeast, northwest, north and east striking shears and faults have extensively shattered the whole area and formed wide deep shear zones and massive brecciated areas. Several large areas of basalts have been altered to serpentine. Basic and

Cont'd. ...

acid pegmatities (hornblendite and simple quartz feldspar rocks) have invaded the gabbro and basalt and chalcopyrite pyrrhotite magnetite mineralization is associated with this alteration.

(c) Rock Types

The rocks found on the claims are varied and described in ascending ages as follows:

(1) Metchosin Volcanics - These are the oldest rocks and their base is unexposed. They are a series of basaltic underwater flows separated by well bedded tuffs. The series become more acid near its top with andesite flows and agglomerates outcropping on the north part of the claims.

(a) Pillow and amygdaloidal lavas. These are massive fine to medium grained black rocks with well marked pillows in some outcrops. The pillows show amygdaloidal rims and show the flows strike easterly and dip from 45 to 90 degrees to the north. Areas where no pillows are formed show amygdaloidal flow tops. The rocks are largely hornblende and plageoclase feldspars in medium grained crystals. Magnetite occurs plentifully as an accessory mineral. The amygdules are filled with epidote, calcite and plageoclase and occasional vessicular beds occur.

(b) Tuffs. The tuffs are thin-bedded fine-grained hornblende rocks with some plageoclase and are similar in composition to the flows. The bedding is well marked and show the beds strike from west to north 70 west and dip from 20 to 90 degrees to the north. Some minor open folds occur but most of the contortions of the beds are due to movements along fault and shear planes.

(2) Gabbro - The rock varies in granitic texture from coarse to medium grain with about 50% augite and hornblende and 50% feldspar.

Cont'd. ...

Magnetite is present in most specimens. The feldspar has been determined by the Geological Survey of Canada as labradorite which makes the rock a gabbro. These intrusives occur as sills and dikes in the volcanics essentially as narrow bodies a few hundred feet in width and thousands of feet in length.

(a) Coarse Hornblende & Hornblendite - This is a coarse rock with hornblende crystals up to one inch in length and with large feldspar crystals and magnetite. Often it occurs as pure hornblendite. It intrudes both the gabbro and the volcanics and many of the rocks near it are completely altered to hornblende, both as coarse and extremely fine grained rocks.

3. Hornblende Granite - The hornblende granite is coarse to fine grained with equal amounts of free quartz and feldspar and porphyritic crystals of hornblende. The rocks form breccia zones near its borders with fragments of basalt and gabbro. Many dikes of the rock cut both the gabbro and the volcanics with sharp chilled borders with the older rocks.

4. Pegmatites - Hornblende granite dikes grade into a simple pegmatite with large crystals of quartz and feldspar and hornblende crystals up to several inches in length. In places these dikes finger out in the intruded rocks, the hornblende crystals diminish and the resulting quartz feldspar impregnates the older rock as fracture fillings. Some coarse magnetite and some coarse titanite occur in some of the larger dikes.

(a) Basalt and Andesite dikes. Some small dikes intrude all the previously described rocks. These are generally small and are not shown on the attached map. They are dark grey or black non mica lamp-

Cont'd. ...

rophyres and occur up to several feet in width.

5. Sooke Sediments. These sediments are a well bedded flat lying marine succession laid down in a shallow sea bordering a deeply weathered shore. Their total thickness is unknown to the writer but remnants of the rock occur up to the elevations of 1500 feet where they have filled depressions in the old erosion surface. Ochre and bauxite occur in the Sooke area in depressions in volcanics. The following rock types occur on the claims:

(a) Basil Conglomerate. This is the most common rock type. It is a coarse boulder conglomerate with large rounded gabbro and basalt boulders cemented by a fine sand and by a limonite cement. These conglomerates occur at all elevations on the claims and represent beach conditions.

(b) The coarse conglomerates are overlain by fine pebble conglomerates with a limy cement. The rock looks like a cement with basalt pebbles and forms flat lying beds up to 20 feet thick which resist erosion and form steep sided river canyons.

(c) This pebble conglomerate is overlain by a fine grained limy sandstone, usually brown colored from limonite. The rock resists erosion and forms a pavement and vertical walls to the creeks. Thicknesses up to 50 or 60 feet have been mapped.

(d) Interbedded with the sandstone are argillaceous limestones with numerous fossil shells occurring as very thin beds. Some pyritized fossils have been found, but most of the shells have been replaced by lime or fine sand.

6. Glacial and Interglacial. The claim area has been heavily glaciated and thick morrainal deposits of gravel occur at lower elevations

Cont'd. ...

on the claims. These are overlain by tillite in beds up to 30 or 40 feet in thickness.

The glaciation has removed the sediments and rounded the prominent outcrop areas and deposited unsorted gravels in the depressions over the Sooke Formation. The gravels have been derived partly from the claim areas and partly from the schist-granite complex north of Loss Creek.

(d) Hydrothermal Alteration

The rocks on the claims are extensively altered as follows:-

1. Hornblendization

The volcanics and gabbros are extensively altered to hornblende. Much of the basalt and basaltic tuffs near shear and breccia zones are completely altered to a mass of fine grained hornblende.

In the same areas coarse grained hornblende dikes intrude the older rocks and both coarse and fine grained hornblendite occur along its margins.

2. Quartz-feldspar alteration

The hornblendite, basalts and gabbros have been fractured and injected with pegmatitic material. In the shear and breccia zones a large percentage of the rock is composed of fracture fillings of quartz feldspar material. Generally these are fine white lines in a black or dark coloured rock.

3. Quartz carbonate

Some shear zones are altered to quartz and carbonate, (ankerite, calcite and occasional siderite), while the remainder of the rocks are not affected by this alteration.

(e) Structural Geology.

The belt is bounded on the north by the Leech River Fault. This

Cont'd. ...

is a wide fault with a pronounced escarpment. It is a reverse fault striking east or slightly north of east and dipping nearly vertically. It is at least 40 miles in length and separates Permian schists from the Tertiary rocks.

The most pronounced feature of the downdropped block of Tertiary rocks is the complete fracturing and brecciation in a very marked regular pattern striking east, north, northeast and northwest.

The gabbro dikes were intruded into the volcanics along a pronounced system of faults striking N70W and dipping steeply north. These faults or shears controlled the emplacement of the intrusive and later movements along them have formed breccia zones along the contacts.

A series of granite plugs seem to be emplaced along these same shears or along a set of shears parallel to the Leech River fault. These plugs are generally in breccia zones of large extent. Near the intrusives fragments of gabbro and basalt occur in a quartz feldspar or granitic matrix. The blocks are sometimes several hundred feet across.

In some areas of fine grained hornblendized basalt shear zones or areas of sheeting are up to 1000 feet in width and over several thousand feet in length. The sheeting often occurs in 2 or 3 directions in these areas.

(f) Mineralization

The mineralization throughout the area is uniform and consists of fracture fillings and sulphide veins in the sheared rocks. The sulphides are chalcopyrite, pyrrhotite, pyrite with traces of sphalerite and molybdenite. Magnetite occurs in some sections and pentlandite and bornite occasionally are found. The gabroic rocks generally have a slightly higher

Cont'd. ...

pyrrhotite, pentlandite, bornite, magnetite content in the fractures.

The surface values in copper are generally low but the reason for this is not known. Native copper is present at the surface in areas of most intense fracturing and relic cavities and maroon discoloration can be found. On the glaciated surfaces however the sulphides often blasting appear fresh and unoxidized. At the Gunro surface values are low for 100 feet below the surface. For example the C ore body at the surface shows sheeving which assayed Tr copper. Values increase until the grade becomes 2.0% copper below the 100 foot depth below surface.

(g) Deposits

1. East Sooke - The deposits on the Sooke peninsula were found in 1863 and some mining was done then. The deposits are in wide shear zones in gabbro. The following is a description of one deposit:

At Iron Mine Hill (Mcerryth) a N25E striking shear zone 100 feet wide has been traced for a length of 1500 feet. The shear is cut by cross zones striking north 60 degrees east and north 20 degrees west and contains magnetite, pyrrhotite, pyrite and chalcopyrite in hornblendite. Surface samples average 0.5% copper over a 25 foot width. Nickel values are erratic but range up to 0.3%. Assays show up to 0.3% cobalt, 0.2% molybdenum, 0.04 oz. per ton palladuim, 0.01 oz. per ton gold and 0.25 oz. per ton silver. Diamond drilling showed one intersection of 15 feet assaying 1.38% copper in a 100 foot zone averaging 0.5% copper.

2. J.K. The J.K. Group lies immediately south of the Leech River fault at Alligator Creek in the E and N Land Grant. In this area the Metchosin Volcanics are a fine grained uniform basalt with few if any gabbro or granite intrusions. The basalt is extensively fractured by east and north 70 east striking large shear zones and north 45 west and north 20 east shear-

ing zones. Five areas of outcrops in the group are separated by swamps and shallow lakes which conceal the major shear zones. The outcrops are all contain chalcopyrite and native copper fracture plane mineralization. The outcrops were trenched or pitted by 66 pits and bulk sampled. One area 1000 feet long and 500 feet wide averaged 0.26% copper and in this a 500 x 500 feet area average 0.3% copper. The location is ideal for open pit mining.

3. Ren 2 - An area 2 miles west of River Jordan about 1 mile north of the Port Renfrew road is underlain by uniform fine grained hornblendized basalt. The area is overburden and bush covered but outcrops occur along three creeks over a 3000' length. Mineralization occurs over widths of 600 to 800 feet in the creeks and samples from 15 pits and a number of outcrops averaged 0.38% copper.

The area is in a number of north and northwest striking sheared zones crossing a wide east striking sheeted zone in the basalt. Individual specimens show 3 directions of shearing with fracture plane mineralization in each set of shear planes. The airborn magnetometer survey shows a marked anomaly over the deposit which should lend itself to open pit mining.

4. Ren 1 - This deposit is 8 miles west of River Jordan on a steep side hill overlooking the Ocean at the headwaters of Boulder Creek. A uniform fine grained basalt is broken by a series of closely spaced north striking major shear zones and by some northwest striking zones. An east striking major shear zones and by some northwest striking zones. An east striking area of sheeting or closely spaced parallel planes of movement cover an area about 2000 feet wide and 1200 feet long. Mineralization is widespread in the rocks with up to 10% pyrrhotite and small amounts of chalcopyrite. Very little work has been done on the zone and 6 samples taken from better grade areas averaged 0.53% copper.

The whole area is in a magnetic high and soil samples show anomalous areas in it.

5. Miscellaneous - Many other areas show good mineralization as follows:-

(a) River Jordan - Rough Creek. An area 100 feet wide along the B.C. Hydro road at Rough Creek is in fine grained basalt and contains east striking shearing and fracture plane chalcopyrite. A northeast striking magnetic high cones the occurrence.

(b) Alligator Creek. A fractured breccia zone is mineralized over a 100 foot cut along the B.C. Hydro road and averages 0.3% copper.

(c) Pruno and Shaw. A wide zone of east striking shearing contains chalcopyrite and sphalerite.

(d) Sandcut Creek. A wide zone of fine grained sheared basalt contains low uniform chalcopyrite mineralization.

(e) Tugwell Creek. A single outcrop of sheared basalt assays 0.83% copper. The surrounding area is heavily earth covered.

CONCLUSIONS

The Hecsan Exploration Company's ground contains a number of areas of widespread mineralization with copper and low nickel values which could contain ore bodies suitable for open pit or underground mining.

RECOMMENDATIONS

The areas should be diamond drilled using AX or BX wire line equipment and holes at least 1500 feet deep.

REPORT OF THE MINISTER OF MINES

VANCOUVER ISLAND AND COAST DISTRICT

- 1916 -

The impregnated and replaced shear-zone type of copper-deposits is discussed very fully in Clapp's report, from which extracts are made by the writer. Clapp names it the Sooke type, because he only found representatives of this type on the East Sooke peninsula, on Vancouver Island, in the rock he has classified as Sooke gabbro. He states, on page 177 in his report, that:

"The association of minerals, especially the presence of the hornblendes, proves conclusively that the deposits were formed under conditions of high temperature and pressure. The disseminated chalcopyrite is so intimately connected with the large-bladed and fibrous amphiboles of the shear-zones that the two minerals have doubtless been formed by a similar and continuse process.

"Theconclusions reached regarding the origin of the 'hornblendites' of the shear-zones is that they were probably formed directly following the soidification of the gabbro through the influence of hot solutions, either liquid or gaseous, acting on the sheared rock, recrystallizing the basic constituents into amphibole. Following or virtually contemporaneous with the above changes, solutions carrying magnetite and sulphides of iron and copper were introduced and their contents were deposited as disseminations through the shear-zones. The metallic minerals may have been more abundant in the original gabbro along certain of these zones, formed by segregation in the primary gabbro magma.

"Metasomatic replacement has gone on to a very considerable extent, as is shown by the silicates with jagged, irregular, or obscure outlines that are included in the metallic minerals, even in the massive chalcopyrite. The large masses of sulphides and magnetite have apparently been formed in part where this process is most efficient. In the chalcopyrite-deposits marked replacement of hornblende has taken place only near the walls or at the intersection of two shear-zones. Replacement of the feldspar has, however, gone to a very considerable extent.

"Even after the formation of the 'hornblendites' in the shear-zones slipping has occurred, as is shown by the abundant slickensides. This movement continually opened up new passages for the solutions, so that the metallic minerals continually worked their way farther into the sheared rock, and more and more completely filled the small interstices between the hornblende crystals. The paragenesis of the minerals of the deposits always shows chalcopyrite to have been formed last."

VICTORIA MINING DIVISION

The occurrences of copper ore which have been found to possess commercial value in the Victoria Mining Division are found on the slopes of Mount Maguire, on the Sooke peninsula; on Mount Sicker; on Mount Gordon, south-west of Cowichan Lake narrows; and on the Koksilah river. Three distinct types of ore-deposits are represented - the Sooke type, occurring in shear-zones in the Sooke gabbro, on Sooke peninsula; the Tyee type, occurring on Mount Sicker; and the contact type, occurring on Mount Gordon and the Koksilah river.

..... 2

WILLOW GROUSE GROUP This group of mineral claims comprises six full-sized claims and one fraction, known as Golden Thrush, Willow Grouse, Willow Grouse Fraction, Blue Bird, Donaldson, Jack, and Sydney. The property is on the north-west slope of Mount Maguire, on the East Sooke peninsula, about twenty-five miles distant by wagon-road or by water from Victoria, and the mine-workings are about 3,000 feet from the nearest point in Sooke harbour, where vessels can lie well sheltered.

The group of claims was staked about 1901 by Alexander Donaldson for himself and associates. The property is at present owned by H.B. Thomson and others, of Victoria, but since May, 1915, has been operated under a lease and bond by a syndicate consisting of R.G. Mellin, R. Hincks and, others. Approximately 900 tons of copper ore has been shipped since that date to the Tacoma smelter, the copper content of which averages about 6 per cent, with about 50 cents in gold and silver values to the ton. The lessees mined from two lenses of ore exposed in the old workings, but were unable to continue further development because of the large quantity of water that flowed into the workings and lack of sufficient capital.

This occurrence of copper ore occurs in a shear-zone in gabbro country-rock, and is referred to by Clapp as belonging to the Sooke type of ore-deposits. The mineralization is chiefly chalcopyrite disseminated through a shear-zone striking N. 40° E., about 60 feet wide and of undetermined length, but with the richer portion of the ore-body along the north wall. A narrower shear-zone striking N. 3° W. and dipping 80° W. forms a junction with the wider one, near the south end of the mine-workings, at which point a body of solid chalcopyrite occurs that is 7 feet wide and, maintains that width for about 125 feet to the northward, following the narrower zone. The mine-workings consist of a deep open-cut about 125 feet long by about 20 feet wide, and shaft 50 feet deep, with crosscut at the bottom.

The mine-workings on this property cover a comparatively small area, but the wide shear-zones in the gabbro extend for a very considerable distance along the strike in both directions from the workings. No systematic prospecting-work has been done outside of the immediate vicinity of the workings, Although the formation is favourable for the development of low-grade ore-bodies.

MARGARET GROUP This group of mineral claims consists of three - the Margaret, Copper King, and Eureka - situated on the southern slope of Mount Maguire, Sooke peninsula. These claims are located on Crown-granted land owned by the estate of the late A.R. Johnson, of Nanaimo, and B.H. Johns, of Victoria. Some development work was done a few years ago by Dan Campbell and associates, who staked the claims on the presumption that the land was Government land and open to prospectors. During the past two years more development-work has been done by Mr. Johns on behalf of the owners of the Crown grant, who are entitled to all of the base minerals, including copper, found on the land, the stakers being only entitled to the precious metals (if any) that are associated with the copper.

On this property there is a shear-zone in the Sooke gabbro about 200 feet wide extending through the claims, striking N. 43° E., in which chalcopyrite

..... 3

WILLOW GROUSE This group was staked about 1901 and formerly contained eight Crown-granted claims. The three principal claims, Willow Grouse, Douglaston, and Jack, are now held by C.V. Brennan, Deltaunda Beach, the remaining claims having reverted to the Crown. They are situated on East Sooke peninsula, on the north-west slope of Mount Maguire, about 25 miles from Victoria and half a mile from tide-water at Sooke harbour.

The general rock formation of that area is the Sooke gabbro. The mineralization on this property is mainly chalcopyrite and pyrite, contained in a shear-zone in the gabbros up to 60 feet in width. The minerals occur either disseminated throughout the gangue, chiefly hornblende, or in lenses or masses up to 6 or 7 feet wide of clean chalcopyrite. An open-cut about 125 feet long shows that three lenses of chalcopyrite have been mined from the surface in this small area. Old reports state that about 1,000 tons of 6-per-cent. copper ore was shipped from these lenses, and that hand-sorting later produced another 300 or 400 tons. A shaft was sunk about 50 feet, but is full of water, and no information is available as to what was found at depth.

There are no evidences of further exploratory work anywhere along the zone, but it would seem reasonable to expect other lenses similar to those mined out, and therefore that close surface prospecting would be fully justified, and possibly diamond-drilling or sinking at the more encouraging places.

MARGARET This group of three Crown-granted claims - Margaret, Eureka and Copper King Frac.- is owned by W.H.R. and J.R. Collister, Victoria. The property is not far from the Willow Grouse, on the Sooke peninsula, on the south slope of Mount Maguire, about 2 miles by wagon-road from tide-water at Sooke harbour.

The mineral occurrences are very similar to those of the Willow Grouse; that is, chalcopyrite and pyrite replacement in a shearing of the gabbro country-rock. Comparatively little development has been done on this property, consisting of only an open-cut, about 30 feet long, from which I understand some shipments of chalcopyrite were made about 1915. Apparently the only handicap this and the Willow Grouse property have is that they are too accessible; no doubt they would be more thoroughly developed if they were situated 40 miles from nowhere.

N.B. In 1928 the property was bonded by the Pacific Tidewater Company, a subsidiary company of the British Metals Corporation, of London, England. A Radiore survey was made early in 1929, which succeeded in locating two areas on the Uglow and San Juan groups, which gave sufficiently favourable indications of sulphide mineralizations to justify further testing by diamond-drilling. The drilling, however, was unsatisfactory and nothing further has been done.

with chalcopyrite, and apparently representing an extension of the shear-zone in which the ore-deposit, already described, occurs. There are several tons of mineralized ledge material on the dump, in which there are many lumps of almost solid chalcopyrite. The most of the dump is made up of lumps of hornblende carrying grains and particles of chalcopyrite as impregnations. No sample was taken, because it was evident that the dump had been throughly sorted over, and also because no data relative to the dimensions of the ore-body exposed in the shaft could be obtained.

No prospecting has been done south-westerly from the old shaft, so far as the writer could ascertain.

KING GEORGE This mineral claim adjoins the Jack, of the Willow Grouse group, on the north-west, and is about half a mile distant from the workings on that property. The King George was staked by Frank Caffery, of East Sooke, on June 20th, 1911, who started development on an outcrop of chalcopyrite that occurred in a shear-zone in the gabbro, having its strike N. 80° W. During 1916 more extensive development-work was done by making deep open-cuts and following an ore-body some distance, with the view of prospecting it near the surface to locate the most desirable point to start sinking. The results from this work were shown by a considerable tonnage of good chalcopyrite ore on the dumps that had been taken from the open-cuts. The prospect has promise, but needs systematic and extensive prospecting.

REPORT OF THE MINISTER OF MINES

VICTORIA MINING DIVISION

- 1917 -

VICTORIA MINING DIVISION

There has been considerable activity in the Victoria Mining Division during 1917, but this has been confined to the East Sooke, Jordan River, and Cowichan Lake districts, in each of which continuous operations have been carried on in developing the ore-bodies to determine their extent. Regular shipments of copper ore have been made during the past year from only the Blue Grouse and Sunnyside groups, on Cowichan lake, but some shipments have been also made from the Margaret and Willow Grouse groups, at East Sooke.

There has been shipped a total tonnage of approximately 2,000 tons of copper ore of good grade from the properties mentioned during the past year. At the same time there has been more prospecting carried on in the Division than has been the case for some years back. The sections that have apparently been the most attractive to the prospectors are the neighbourhood of Duncan, Saltspring island, East Sooke peninsula, the Cowichan Lake district, and the mountains adjacent to the Jordan river.

In the Report of the Minister of Mines for 1916 most of the workings on the mineral claims in the groups were described, but, as there has been so much new work done since that report was made, it is deemed advisable to again describe the properties fully in the present report, especially when the important results that have been obtained from the further development-work is considered.

EAST SOOKE DISTRICT

WILLOW GROUSE GROUP This group contins the Golden Thrush, Willow Grouse, Willow Grouse Fraction, Blue Bird, Donaldson, Jack, Sidney and Sidney Fraction claims, on the north-west slope of Mount Maguire, about twenty-five miles by wagon-road or water from the city of Victoria, and about 3,000 feet from a well-sheltered harbour near the entrance to Sooke harbour. The property is owned by H.B. Thomson and associates, of Victoria, but is at present being worked by the Ladysmith Smelting Corporation, Limited, under a lease and bond. The writer visited the property on March 13th, 1918, and found a crew of miners working, with A. Macauley as foreman, under the superintendence of Harold Grant, of Victoria.

The occurrence of copper ore on this group of claims occurs in a shear-zone in the Sooke gabbro, as classified by C.H. Clapp in hismemoir on the Sooke and Duncan map areas, and is a typical representative of the Sooke type of ore-deposits. The mineralization is chiefly chalcopyrite, usually very pure, but there is often some iron pyrite associated with it. The gangue material is made up almost entirely of hornblende.

The chalcopyrite occurs disseminated through a wide shear-zone, the full width of which has not yet been determined. In the main zone there occur several fissures and subsidiary shear-zones, in some of which are zones of enrichment, varying from 5 to 20 feet in width, in which are found bodies of chalcopyrite carrying copper values averaging about 8 per cent., with the maximum as high as 18 per cent. The most important of these zones of enrichment occurs on the Willow Grouse mineral claim where the mine-workings are located, and where the known length of the enriched fissuring is about 150 feet and the width of the high-grade ore-bodies, of which there are three, is 6 feet, 15 feet and 20 feet. The general strike of these fissures is nearly parallel with the strike of the main shear-zone, or N. 40° E., and the dip is at an angle of about 70 degrees to

..... 2

the north-west; but there is one of the fissures which strikes N. 3° W. and dips 80 degrees west that forms a junction with the others near the southerly end of the mine-workings and apparently carries the richer portion of the ore-bodies.

Until recently no attempt had been made to prospect beyond the limits of the enriched zone where the ore was mined from a deep open-cut, hand-sorted, and the culled material, consisting of low-grade ore and waste, left in the cut. Since the Ladysmith Smelting Corporation has taken over the property the culled material has been again hand-sorted, about 400 tons of ore of a shipping grade selected and shipped and the waste material trammed out of the cut, so as to enable the miners to extend the development-work farther into the main shear-zone, beyond the joint-plane that has heretofore been considered the north-westerly boundary of the mineralization. This has recently been shown to be merely a joint or possibly a fault-plane in the ore-body, since blasting into the so-called wall exposed another ore-body lying parallel with those that have been mined.

The present operators propose extending their prospecting-work by boring with a diamond-drill to endeavour to determine the extent of the mineralized zone, as well as its continuity to deeper levels.

MARGARET GROUP This group consists of three mineral claims - the Margaret, Copper King and Eureka - at present being operated by O.B. Gerle and associates, of Victoria. This property was fully described in the Report of the Minister of Mines for 1916, but since that report was made there has been much more development-work done which shows important results.

Mineralogy - The metallic minerals present are chalcopyrite, magnetite, pyrrhotite, pyrite and native copper. The non-metallic, gangue minerals are amphibole, chlorite, feldspar and quartz. Chalcopyrite is the only important copper-bearing mineral and occurs in small disseminated grains, minute veinlets and in larger veins and masses.

The proportion of massive chalcopyrite occurring in the mineral-bearing zone varies considerably and is almost always associated with more or less magnetite. Sometimes, however, the chalcopyrite occurs comparatively pure and filling fissures from a foot or so in width up to several feet in width. In other parts of the shear-zone the chalcopyrite occurs in grains and particles as impregnations disseminated through the gabbro in sufficient quantity to so enrich the rock as to make a large proportion of it shipping-ore, while the remainder will be valuable if treated by concentration.

On the Margaret group of mineral claims the proportion of massive ore as contrasted with waste exposed in the workings examined by the writer appears to be about 75 per cent. good ore to 25 per cent. waste. The gangue material in which the ore occurs is almost wholly hornblende.

Characteristics of Ore-bodies - The ore-bodies on the Margaret group are typical representatives of the Sooke type. The occurrences of copper ore that have been so far developed occur in a shallow gulch or depression of variable width that appears to extend through the three mineral claims and appears to have been formed by erosion, which acted on the mineralized part of the shear-zone, as this rock offered less resistance than that part of the gabbro country-rock in which the shearing action had been less pronounced. At the north-easterly or upper end of the gulch there is a large swamp, in which is exposed a body of almost solid ore opened by a shaft 25 feet deep, and an open-cut for a length of more than 200 feet, a width of about 12 feet in the north-east end of the cut, and to a depth of 25 feet

..... 3

below the level of the surface outcropping at that point. A short distance to the south-west and in the same open-cut the ore-bearing gabbro has been proven to reach a width of 40 feet.

When the open-cut was first made it appeared as though the foot-wall of the ore-body was exposed on the north-westerly side, and in sinking the shallow shaft this so-called wall was made one side of it, but later it was discovered that the wall was only the cleavage-plane of a fracture in the shear-zone, and, when blasted into, that solid ore was exposed beyond it. By a series of open-cuts made towards the north-westerly side of the gulch, and into the rock that had suffered less from erosion, a still greater width of ore-bearing gabbro is exposed, and at the time of the examinations the full width of the ore-body on this portion of the property was undetermined.

In an adit driven to crosscut the ore-body at a point about 250 feet south-westerly from the shallow shaft mentioned, a well-defined hanging-wall occurs near the portal of the adit, dipping at an almost vertical angle and striking in a north-easterly direction, conformable with the strike of the ore-body exposed in the open-cut already referred to. From the hanging-wall the ore-body is crosscut for 10 feet, with the whole face of the crosscut in ore. Drifts are driven in both directions at right angles to the crosscut for a total of about 25 feet in length. These drifts are in solid ore, with the faces of both in ore.

Development-work - The development-work done since the holders of the lease took the property in the late autumn in 1916 consists of a deep open-cut, a shaft about 25 feet deep below the floor of the cut, and an adit at the south-westerly end of the main ore-body. The open-cut is more than 200 feet long, with a maximum width of about 40 feet, a minimum width of about 12 feet, and a face of about 40 feet in height at the widest part of the open-cut. The adit, including the open-cut approach, is about 50 feet in length, its portal is about 250 feet south-westerly from the shaft, and it is being driven as a drift under the long open-cut referred to above.

There has also been done a considerable amount of prospecting-work, such as stripping and open-cuts, some of which are located about 1,000 feet to the south-westward from the adit, and in these chalcopyrite occurs in a gangue of hornblende similar to the occurrences in the adit, open-cut and shaft.

About 1,000 feet south-westerly from the adit there are located some old workings, the chief of which is a shaft, said to be 25 feet deep and full of water, so could not be examined. This shaft was sunk in an outcrop of hornblende, through which are disseminated lumps, grains, and small particles of chalcopyrite and apparently the shaft is sunk in an extension of the shear-zone in which the ore occurs.

In addition to the old workings, there is an open-cut 176 feet long which crosscuts the shear-zone at this point and exposed low-grade concentrating copper minerals, mainly chalcopyrite, disseminated through the hornblendic country-rock the entire length of the crosscut, demonstrating that Clapp's estimate of the width of the shear-zone, in the following paragraph from his report published in 1912, being about 200 feet is well established:-

"On the southern slope of Mount Maguire are three claims - the Maynard, Copper King, and Eureka - located on a wide shear-zone some 200 feet wide, having a strike of N. 43° E., which is traceable for the whole length of the three claims. As a rule, the metallic minerals, chiefly chalcopyrite, are disseminated through the entire shear-zone, with the best values along the north-west wall. Occasionally the chalcopyrite occurs in small lenses and veins. Quartz stringers are very abundant. The deposit is opened only by four or five small pits or shafts."

The workings described in Clapp's report are those referred to by the writer as the "old workings."

The development-work done up to the time of the examination in March, 1918 indicates that the main ore-body has approximately the following dimensions: Length, about 250 feet; minimum depth from the surface to the floor of the adit or tunnel, 25 feet; maximum depth, 50 feet; average width, about 25 feet. The average width may prove to be still greater, as the cleavage-plane that was considered to be the foot-wall proves to be only a false wall, since blasting into it has proven that ore is found to occur beyond it and the definite foot-wall is not yet exposed.

Figuring from the dimensions given above, there is apparently about 20,000 tons of ore above the floor of the adit that can be classed as "probable" ore, meaning such ore as is only partially developed, not sufficiently so to admit of actual measurement, but of the occurrence of which the indications are sufficiently strong to warrant an assumption that such ore probably occurs.

IRON MINE HILL. Active prospecting has been carried on during the past winter along the coast of Juan de Fuca strait to the south-east of Iron Mine hill and east of Possession point, where A. McVittie, of Victoria, has been unwatering a shaft sunk several years ago on Crown-granted land owned by F.B. Pemberton, of Victoria. The prospects of exposing a body of copper-bearing ore on this property are said to be good, but the work had not progressed far enough at the time the writer visited East Sooke to enable him to make a thorough examination of the old workings.

CAFFREY. In the same neighbourhood as the old workings that McVittie is reopening there is a group of mineral claims owned by Frank Caffrey and associates, of East Sooke, on which, it is reported, there occur very promising outcroppings of copper ore in similar geological conditions to those which surround the occurrences on the Willow Grouse and Margaret groups. The writer expects to visit these Coast prospects during the coming spring to report on the progress made by the parties engaged in prospecting there.

REPORT OF THE MINISTER OF MINES

JORDAN RIVER DISTRICT

JORDAN RIVER DISTRICT

The neighbourhood of the Jordan River which flows into the Juan de Fuca strait appears to have first received attention from prospectors for lode mines in 1915, although placer-miners were prospecting the river bed and bars, as well as the black-sand deposits near the mouth of the river, several years ago, but without commercial success.

George E. Winkler, of Victoria, was the first prospector to discover copper-bearing ore in-place in this part of Vancouver Island, and he informed the writer that it was owing to reading the report of Chas. H. Clapp in Memoir No. 13, "Southern Vancouver Island," published in 1912, that he commenced a thoroughly systematic search for copper minerals in the mountains in the vicinity of the river. His search was rewarded by finding occurrences of outcrops of chalcopyrite in a country-rock that resembled very much the country-rock on the East Sooke peninsula. This resulted in his staking a group of mineral claims, on which he performed the assessment-work to give him possessory title, and during the spring of 1917 bonded his claims to R.H. Stewart and associates, of Vancouver, who organized the Sualech Mining Company, Limited, and has since been developing the property with a crew of miners, of which John Hanna is foreman.

GEOGRAPHY - As the Jordan River district is a new one so far as lode-mining is concerned the following short description of that part of Vancouver Island with regard to the geography, as well as the geology, is advisable as a part of this report:-

The Jordan river has its source in a series of small lakes and swamps in the vicinity of Jordan meadows, about fifteen miles distant in an air-line from the southerly coast of Vancouver Island and Juan de Fuca Strait. The distance by following the bends and sinuosities of the river is probably nearer thirty miles than fifteen, since the stream is quite crooked. For some considerable distance above its mouth the river flows between very precipitous banks, so steep as to be better described as the walls of a box canyon. The stream carries a very considerable volume of water and flows with heavy grade, so much so that the Vancouver Island Power Company, a subsidiary to the British Columbia Electric Railway Company, selected this river as a source to furnish water-power to generate electric power to run that company's street-car and electric-light systems in the city of Victoria and its interurban lines.

The company's power-house is located at the mouth of the river, and the water-supply is diverted from the upper reaches of the stream, about seven or eight miles above the mouth, where a concrete dam has been built, from which the ditch-line starts that carries the water to a second reservoir at an elevation of about 1,100 feet, about two miles from the mouth of the river and from which the water is carried through a pipe-line to the power-house.

GEOLOGY - In Clapp's report on the geology of Southern Vancouver Island, he states that the slaty and schistose rocks of the Leech River formation, in which the Jordan river has its source, are the oldest rocks of southern Vancouver island. They form a broad belt with an average width of about five miles, which extends from the east coast of the island to the west coast, in the vicinity of Port Renfrew. He also states: "Apparently unconformable upon the Leech River formation, although separated from it largely by faults, are rocks of lower Mesozoic age, the Vancouver group. The Vancouver group has been sub-

divided into the Nitinat formation, the Vancouver volcanics, the Sutton formation, the Sicker series, and the Metchosin volcanics."

The prevailing rock formation in thelower Jordan River district belongs to the Metchosin volcanics, which are composed of ophitic basalt flows, tuffs, and agglomerates, with intrusive diabase dykes. These rocks contact unconformably with those of the Leech River formation, about six miles up the river from its mouth, and the line of contact is represented by an extensive fault, of which Clapp says: "The southern boundary of the Leech River formation, with the Metchosin volcanics, is also an extensive fault. It is approximately parallel to the north boundary fault, but with the apparent upthrow to the north, the Metchosin volcanics being the younger. The character of this fault is also unknown."

<u>SUNLOCH GROUP</u> This group of mineral claims was examined on November 24th and 25th, 1917. The group is located on the Jordan river, about two miles above the mouth and forty-two miles by auto-road from Victoria. The mine-workings are about two miles from the power-station of the Vancouver Island Power Company, and about 6,000 feet from the end of a spur of a logging-railway built to the beach near the power-station, and which could readily be extended to the present main mine-workings on the <u>Sunloch</u> No. 6

The property known as the <u>Sunloch</u> group contains twenty-eight claims in all, but the development-work has been confined almost entirely to the <u>Sunloch</u> No. 6 claim and to the northern part of the claim which is intersected by the Jordan river. The banks of the river at this point on both sides rise very abruptly, so that, while the elevation of the river-bed is 550 feet above sea-level, the banks on each side reach an elevation of about 1,100 feet. The mining development-work is at elevations from 620 to 865 feet.

On the <u>Sunloch</u> No. 6 mineral claim there occurs a system of shear-zones in the Metchosin volcanic country-rock which strikes at nearly right angles to the course of the Jordan river and apparently maintains continuity across it, because at one point work on the westerly side has exposed the same character of ore occurring under practically similar conditions, geologically, as occurs on the easterly side.

Six mineralized shear-zones have been exposed, varying in width from about 20 feet to 68 feet, within a width of about 800 feet. These zones are cut by several quartz stringers and are mineralized with iron pyrite and chalcopyrite, with an appreciable quantity of silica in the gangue. The zones are practically parallel to each other and strike about N. 60° W.

The development-work done consisted of four adits or tunnels exposing three distinct zones, as well as extensive surface stripping across another, known as the "Centre" zone, where three open-cuts have been made on apparently three seperate minerlized zones at elevations between 780 and 865 feet. Each cut is about 20 feet long across an ore-body.

Low-grade copper ore also has been exposed on the opposite side of the river in a drift-adit 20 feet in length. This exposure occurs apparently as an extension of the "Centre" zone.

The zone known as the "North" zone, owing to its being the most northerly occurrence of ore opened on the property to date, has been exposed by a crosscut adit, driven 25 feet in length in ore the entire distance. This ore varies in assay values from 2.15 to 2.9 per cent. copper.

The zone known as the "Second North" zone is about 100 feet southerly from the "North" zone. This is being developed by a drift-adit, which was 100 feet in length and exposed an ore-body which assayed from 1.25 to 2.9 per cent. copper, and also carried about 50 cents to the ton in gold and silver values combined. It is purposed to continue driving this drift for a further distance, and then turn its course and crosscut the formation in both directions at right angles to the present course of the drift. The distance between the crosscut adit on the "North" zone and the drift-adit on the "Second North" zone is about 100 feet.

The distance in a south-westerly direction between the drift-adit on the "Second North" zone and, so far as is known at present, the most southerly mineralized zone, known as the "Cave" zone, is about 650 feet. Between these showings or zones the one known as the "Centre" zone occurs. The width of mineralization in the last-mentioned is undetermined, as the three open-cuts are all the development-work yet attempted, and it is not possible to say for certain whether these open-cuts expose three distinct mineralized zones or are all made on one zone, which, in such an event, would be nearly 170 feet wide. It is to determine that question that R.H. Stewart, the manager, proposes to drive a long crosscut from the face of the drift-adit on the "Second North" zone, which will cut the formation under the "Centre" zone at a depth of about 200 feet below the highest open-cut.

The work on the "Cave" zone is at an elevation of 620 feet above sea-level, and consists of an open-cut across the face of a steep bluff and a drift-adit driven on the strike of the ore-body exposed by the open-cut. There is a width of ore exposed in the cut of 68 feet that averages 1.2 per cent copper, while across 35 feet of that width the ore averages 2 per cent. in copper. The drift-adit is 40 feet in length and the ore exposed carries from 2.25 to 2.7 per cent. in copper.

The ore-body exposed in these workings is more siliceous than that exposed in the other workings on the Sunloch No. 6 mineral claim. This work on the "Cave" zone is located about 150 feet in an easterly direction from the south-westerly boundary of the Sunloch group of mineral claims.

No samples were taken by the writer, because he was permitted to see the assays from the sampling done systematically by the management as the work progressed up to November 24th, 1917, the time of his visit, and the values stated in the foregoing report are the results from that sampling.

REPORT OF THE MINISTER OF MINES

- 1928 -

WILLOW GROUSE This group, situated on the north-west slope of Mount McGuire, was last worked in 1917-18, at which time there were eight claims in the group. I examined the property this spring and it struck me that a very small amount of exploratory work, either laterally or to depth, had been done in the shear-zone in the volcanics, in which the chalcopyrite ore occurs in short lenses. Apparently a considerable tonnage of ore had been sorted and shipped from the surface ore-exposures, but there was little evidence of any other work having been done than taking out the ore, which at places was from 15 to 20 feet wide.

I think that the chances of finding recurrences of such ore-bodies are favourable and consider that a Radiore survey, tested by diamond-drilling, would be fully justified with such conditions.

MARGARET This old group of three claims is also situated on Mount McGuire and like the Willow Grouse, has had considerable ore mined and sorted from surface ore-bodies. More exploratory work has, however, been done on this group. The minerals, consisting of chalcopyrite, magnetite, pyrite and pyrrhotite, occur mainly in hornblende in a wide shear-zone in the volcanic country-rock. I was impressed with the extent of mineralization and the apparently small amount of exploration that has been done toward proving anything beyond what ore has been mined. The distribution of copper through such a wide belt would seem to indicate possibilities of a worth-while tonnage of milling-grade ore.

REPORT OF THE MINISTER OF MINES

- 1931 -

WILLOW GROUSE This group was staked about 1901 and formerly consisted eight Crown-granted claims. The three principal claims, Willow Grouse, Donaldson, and Jack, are now held by C.V. Brenton, Britannia Beach, the remaining claims having reverted to the Crown. They are situated on East Sooke peninsula, on the north-west slope of Mount Maguire, about 25 miles from Victoria and half a mile from tide-water at Sooke harbour.

The general rock formation of that area is the Sooke gabbro. The mineralization on this property is mainly chalcopyrite and pyrite, confined in a shear-zone in the gabbros up to 60 feet in width. The minerals occur either disseminated throughout the gangue, chiefly hornblende, or in lenses or masses up to 6 or 7 feet wide of clean chalcopyrite. An open-cut about 125 feet long shows that three lenses of chalcopyrite have been mined from the surface in this small area. Old reports state that about 1,000 tons of 6-per-cent. copper ore was shipped from these lenses, and that hand-sorting later produced another 300 or 400 tons. A shaft was sunk about 50 feet, but is full of water, and no information is available as to what was found at depth.

There are no evidences of further exploratory work anywhere along the zone, but it would seem reasonable to expect other lenses similar to those mined out, and therefore that close surface prospecting would be fully justified, and possibly diamond-drilling or sinking at the more encouraging places.

MARGARET This group of three Crown-granted claims - Margaret, Eureka and Copper King Frac.- is owned by W.H.R. and J.R. Collister, Victoria. The property is not far from the Willow Grouse, on the Sooke peninsula, on the south slope of Mount Maguire, about 2 miles by wagon-road from tide-water at Sooke harbour.

The mineral occurrences are very similar to those of the Willow Grouse; that is, chalcopyrite and pyrite replacement in a shearing of the gabbro country-rock. Comparatively little development has been done on this property, consisting of only an open-cut, about 30 feet long, from which I understand some shipments of chalcopyrite were made about 1915. Apparently the only handicap this and the Willow Grouse property have is that they are too accessible; no doubt they would be more thoroughly developed if they were situated 40 miles from nowhere.

N.B. In 1928 the property was bonded by the Pacific Tidewater Company, a subsidiary company of the British Metals Corporation, of London, England. A Radiore survey was made early in 1929, which succeeded in locating two areas on the Uglow and San Juan groups, which gave sufficiently favourable indications of sulphide mineralizations to justify further testing by diamond-drilling. The drilling, however, was unsatisfactory and nothing further has been done.

19.

SUNLOCH COPPER DISTRICT, B. C.

by

VICTOR DOLMAGE

GEOLOGICAL SURVEY
Summary Report
1919, Part B

The distribution of the other two formations in the vicinity of the claims is shown on Figure 1. The gabbro mass extends eastward, probably beyond the boundary of the Sooke sheet, and it is highly probable that it may be connected, at no great distance below the surface, with one of the gabbro masses which outcrop a short distance east of the Sooke sheet boundary. This is an important consideration with reference to the probable size of the Sunloch ore-bodies, because this small mass of gabbro, which is considered to be the source of the ore, might be expected to produce a much larger quantity of ore if it were an off-shoot of some nearby larger mass of gabbro and not a small independent and isolated mass.

METCHOSIN FORMATION

Distribution and Extent. Of the three formations the Metchosin is much the largest, occupying a belt from 5 to 7 miles wide, which extends along the southwest coast of Vancouver island from Albert head to Lost river, a distance of 35 miles. Except for two small remnants of the Sooke sediments, and five or six small intrusions of Sooke gabbro, the Metchosin volcanics are the only rocks outcropping in this area.

Lithology. This volcanic series includes all the usual types, such as amygdaloids, agglomerates, flow breccias, and tuffs, but all are distinctly basic in composition. The normal basalt consists of labradorite ranging from Ab30 An70 to Ab40 An60, and augite with accessory magnetite and apatite. It varies in texture from microcryptocrystalline to medium coarse-grained. It commonly has the diabasic structure well developed, and in some places it is distinctly porphyritic. The coarse-grained varieties strongly resemble the gabbro intrusions. The flows are found in places to be cut by diabase dykes which are clearly related to the volcanic types, and are identical with many of the basalts.

Metamorphism. The alteration of these basic lavas and tuffs has been slight. Only the less stable minerals, such as the ferromagnesians, have undergone chemical alteration. Even this alteration has not been intense, and consists in their replacement by small amounts of chlorite and serpentine.

Although generally only slightly altered, the Metchosin volcanics have been intensely contact-metamorphosed in the neighbourhood of the intrusions of Sooke gabbro, and this is particularly true of the basalts and tuffs exposed on the Sunloch and Vulcan mineral claims. Clapp says of this contact metamorphism:

"The contact zones are seldom more than 200 to 300 feet in width and are frequently narrower, although in a few places, especially along sheared zones, the contact-metamorphosed and mineralized areas are found at distances of a mile or more from any outcrop of the intrusives. Where less metamorphosed the original texture of the basalt is partially preserved since the feldspars remain unaltered and form diversely to subradially arranged laths set in a fine-grained lustrous groundmass which is clearly seen..... to consist largely of hornblende. On microscopic examination the original ophitic structure is conspicuous, but the augite is in most rocks replaced by a light sage to brownish green, weakly pleochroic fibrous to almost compact hornblende. The brownish and more compact hrenblende is very similar to that developed in the Sooke gabbro itself, and in a few places forms large poikilitic crystals.

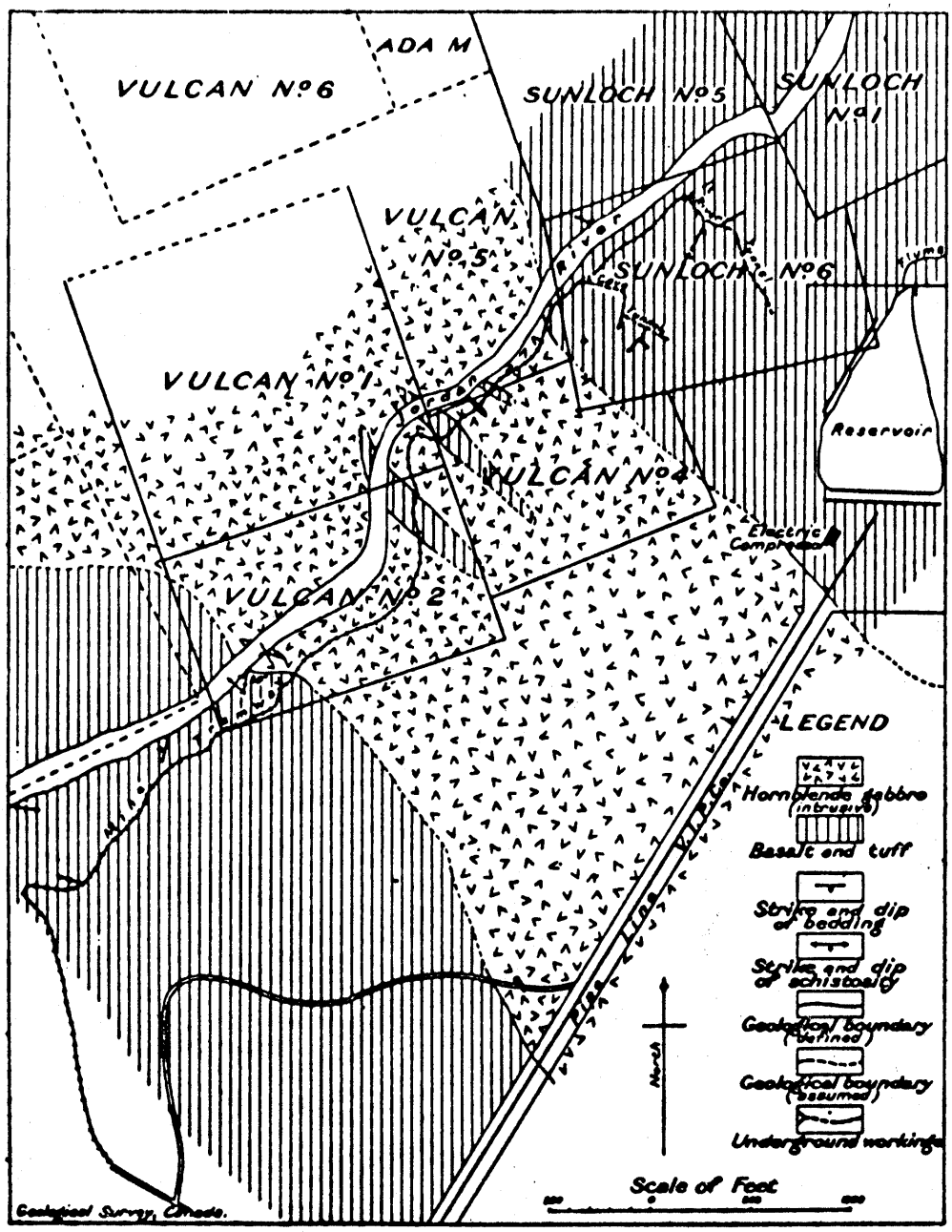

Figure 1. Sunloch copper deposits, Jordan river, Vancouver island, British Columbia.

In the more metamorphosed rocks the original ophitic texture is less conspicuous and irregular areas of actinolite and chlorite, as well as of uralite have been developed, and veinlets and replacements of epidote and zoisite are common. The feldspars remain unchanged. The more metamorphosed rocks have been impregnated with finely crystalline pyrite, pyrrhotite, and chalcopyrite and also replaced and cut by veinlets of these minerals. These metallic minerals are seldom abundant except in sheared zones in the comparatively unmetamorphosed rocks. Some of the shear zones are, however, highly metamorphosed and in them are numerous prospects. The sheared and mineralized rocks consist largely of aggregates of secondary minerals, chiefly hornblende, actinolite, epidote, chlorite, quartz, and secondary feldspar, cut by veinlets of quartz and epidote. The metallic minerals have developed late in the metamorphism of the rocks, and occur disseminated through the earlier secondary minerals, and in veinlets and irregular replacements, usually associated with quartz, cutting the earlier quartz epidote veins."

Metchosin Basalts in the Vicinity of the Sunloch Deposits. In the vicinity of the Sunloch and adjoining claims the Metchosin volcanics are both sheared and intruded by a considerable mass of gabbro and are in consequence metamorphosed to such a degree that the original character of the rocks is almost obliterated. In their original condition, no doubt, they were similar to many of the unaltered types found in the Sooke area and described briefly in a preceding paragraph, but all the volcanic rocks examined, and included in the accompanying map, are now metamorphosed by contact and dynamic action. They are composed of greenish and brownish hornblende, labradorite, occasionally augite and small amounts of magnetite, pyrite, chalcopyrite, and veinlets of quartz, epidote, zoisite, chlorite, calcite, and sericite.

Of these minerals the hornblende is the most abundant, forming from 50 percent to 90 percent of the rock. Two varieties were observed, a greenish brown hornblende, giving pleochroic shades of brownish green to yellowish green, and a deeper green variety, giving shades from light green to deep bluish green, the latter often forming veinlets which cut the brownish hornblende, as well as the labradorite and other minerals. The brownish hornblende is closely associated with small grans of augite and bears the same relation to the feldspars as the augite does in the less altered basalts. It is, therefore, believed to have been formed from the alteration of primary augite. The feldspar forms from 5 to 20 per cent of the specimens examined and occurs both as laths and well developed tabular crystals, which are more than ordinarily inclined to idiomorphism. It ranges in composition from rather basic labradorite to bytownite, the former predominating. It is usually characterized by very fine twinning lamellae, formed by both the albite and pericline laws. It is comparatively little altered, but in places was observed to be replaced by sericite, chlorite, quartz and actinolite. In the basalts of this vicinity augite is an extremely rare constituent, and in all the basalts that were collected in the neighbourhood of the mine only a few scattered grains of augite were noted, due probably to its alteration to hornblende. These were either small interstitial grains or larger allotriomorphic crystals enclosing blades of labradorite. All the secondary minerals, excepting the hornblende, occur in very small amounts. Quartz is on the whole the most abundant of the minerals, but is confined altogether to the vicinity of quartz veins and areas of basalt that have been extensively sheared. In these areas it is very abundantly disseminated in certain light coloured, gneissic-looking bands. Epidote is not so plentiful as one would expect in such highly altered volcanic rocks

and is seen only in very small veins associated with quartz and sulphides. The sulphides - chalcopyrite, pyrrhotite, and pyrite - are sporadic in their occurrence and irregularly distributed. They are, however, largely confined to areas in the vicinity of the gabbro contacts that have undergone considerable shearing, and it is in such areas that the commercial ore-bodies of these deposits are developed.

STRUCTURE. The Metchosin formation consists of a series of superimposed lava flows and beds of tuff ranging in thickness from 2 or 3 feet to 300 feet. As is always the case in such volcanic series the conformity existing between the beds is by no means perfect and many large irregularities occur in the planes of contact. Owing to such irregularities and to the difficulty of distinguishing the various flows, because of lithological similarity and metamorphism, the structure of the formation is not easily determined. In places, however, where cherty tuffs are exposed, or where the lava flows are thin, folding was observed and is found to have taken place along axes which strike north 60 degrees to 70 degrees west. The prevailing dips are to the northeast, and Clapp cites evidence which leads him to the conclusion that the part of this formation occupying the Sooke sheet forms a part of the southern limb of a geosyncline.

Besides this general folding on a large scale, local intense folding is observable, which is thought to be confined to the more incompetent beds. These minor folds have strikes approximating the direction of the main folds, but having more variable dips.

Shearing has been extensively developed in the Metchosin basalts along the great fault which bounds them on the north and to a lesser degree in the vicinity of the gabbro intrusives. As will be pointed out later, the shearing has an important bearing on the development of the mineral deposits of the district.

SOOKE GABBRO

General Character and Distribution. The gabbro mass exposed in the vicinity of the Sunloch and Vulcan mineral claims is considerably altered and its original character to a great extent obliterated, but in its present state of metamorphism it very strikingly resembles the metamorphosed parts of the Sooke gabbro and has the same relation to the Metchosin basalts.

This formation has been described in great detail by H. C. Cooke, of the Geological Survey.

The formation exposed in the Sooke map-area consists of five small bodies, the largest of which, occupying the East Sooke peninsula, forms an elliptical mass about 5 miles in length. The only known occurrence outside the Sooke and Duncan map-area is the one on the Sunloch claims, situated about 3 miles west of the boundary of that area.

These small stocks, besides being sheared and highly altered by mineralizing solutions, have undergone considerable magmatic differentiation, with the result that they now present a great variety of rock types. Cooke describes

the four following types: olivine gabbro, augite gabbro, anorthosite, and granite and it is probable, from its resemblance, that the Sunloch gabbro is a representative of the olivine gabbro in a state of intense alteration.

The olivine gabbro, as described by Cooke, is a medium, coarse-grained, grey to black rock, consisting approximately of 45 per cent to 50 per cent of bytownite feldspar, about the same amount of augite, 5 per cent of olivine and 1 per cent of ilmenite, but so irregular in composition that within short distances the above proportions may vary between wide limits. In its altered condition it carries from 50 per cent to 100 per cent of hornblende.

The Sunloch meta-gabbro, an altered phase of the Cooke gabbro, is a black, irregularly grained rock, consisting of 10 per cent to 45 per cent labradorite-bytownite feldspar, 50 per cent to 100 per cent hornblende, a very small amount of augite, and a few grains of ilmenite, magnetite, and titanite. No olivine was observed in the material collected. The almost total absence of augite is due to its alteration to hornblende, a change which took place before the rock was noticeably fractured and invaded by mineralizing solutions. The result of this early action on the augite is the development of a pale green, fibrous hornblende, strongly pleochroic from pale green to yellowish green. Several grains of augite in a partly altered state were observed. At a much later period the gabbro was strongly fractured and attacked by solutions which deposited great quantities of greenish brown hornblende as veinlets cutting the feldspars, augite, and the pale green hornblende. Another variety of hornblende, of yellowish brown color, probably titaniferous, is thought to be a primary constituent.

Structure. The gabbro masses intrusive into the Metchosin basalts and exposed in the Cooke map-area, are elongated along two parallel axes which conform to the direction of the main folding, i.e., north 60 degrees to 70 degrees west. The projection of the southern axis in a westerly direction beyond the boundary of the Cooke map-area would pass close to the Sunloch claims. It is, therefore, probable that the gabbro mass exposed on the Sunloch claims is a part of the large body presumably underlying the greater part of the Cooke map-area and with which the other stocks outcropping in the area are connected in depth. The Sunloch mass, in so far as it has been mapped, has two nearly parallel boundaries and would, therefore, be classed as a dyke rather than a boss or stock. Its northern contact, as exposed in the canyon of Jordan river, has a nearly vertical dip to the north. The southern contact is also nearly vertical, but more irregular than the northern.

ORE DEPOSITS

Distribution. Copper deposits occur on or near both contacts of the Sunloch gabbro dyke. About 300 feet beyond the northeast contact are several ore-bodies of the Sunloch group. On the southwestern contact where it crosses the river are several showings belonging to the Vulcan group of claims, and where this contact reaches Sinn Fein creek are the showings of the Black Hornet claim.

The Vulcan and Black Hornet deposits had not, up to the time of examination, been developed to any extent, and little can be said concerning them, except that the surface showings are strong and worth exploring.

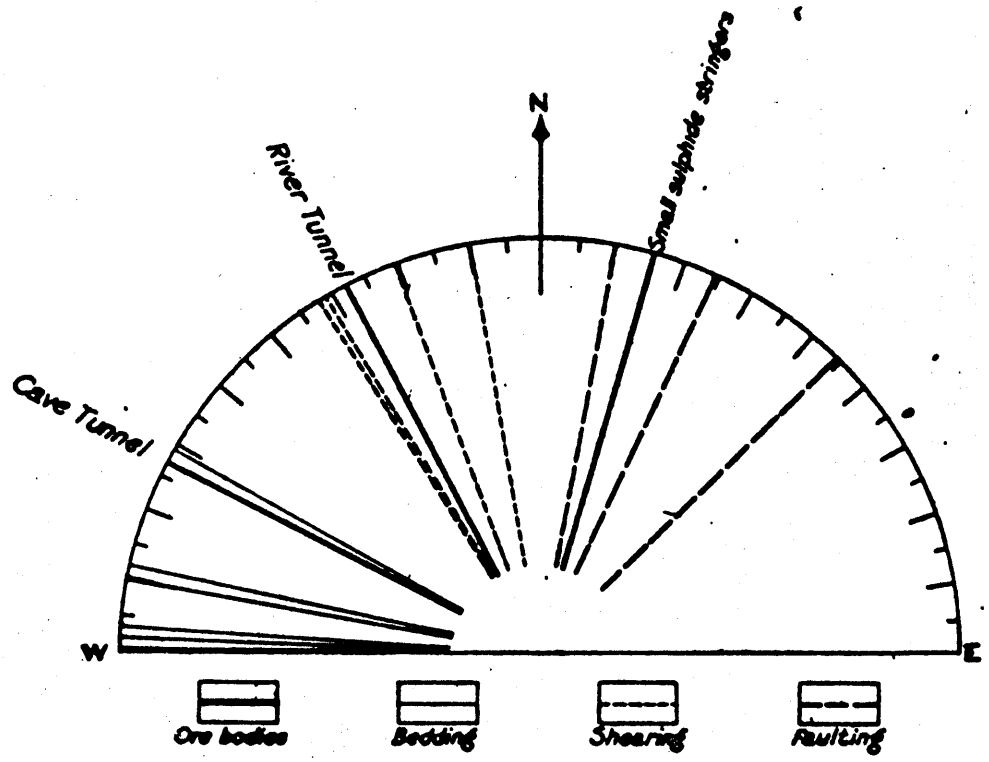

Figure 2. Diagram showing the relationship of the ore-bodies to the bedding, shearing, and faulting, Sunloch copper deposits, Jordan river, Vancouver island, B.C.

Structure of the Ore Deposits. A recognition of the structure obtaining in the country rocks is an important need in development work. The significant feature, which is shown on Figure 2, is: the bedding planes within a few miles of the deposit strike from north 60 degrees west to north 90 degrees west and dip from 60 degrees to 90 degrees in a northerly direction.

The probable trend of the axes along which the gabbro has been intruded is parallel to the main axis of folding in the basalts. The Lynlech gabbro, however, in the vicinity of the deposits, strikes north 50 degrees west and, therefore, cuts the bedding planes at an angle of about 30 degrees.

A pronounced schistosity has been developed in the basalt close to and parallel to the contacts of the gabbro. The basalts are cut also by a series of small faults striking north 10 degrees east to north 40 degrees east which are, therefore, nearly at right angles to the strike of the bedding planes. These faults are all small with throws of not more than a few feet and were mostly, if not all, formed prior to the periods of ore deposition.

A persistent set of closely spaced joints was observed in the tunnels, one group of which strikes north 30 degrees west and dips 80 degrees to the northeast, and the other group strikes north 55 degrees east and dips 83 degrees to the northwest.

Since the planes of schistosity are the most pronounced lines of weakness in the rocks they have provided the easiest channels for ore solutions and the largest and most promising ore-bodies are consequently developed in them.

The planes of bedding are another determining factor in the location of smaller deposits than those formed in the planes of schistosity; but because of the irregularity of these planes the ore-bodies formed in them are more irregular in size and direction. Such a deposit is that exposed in the Cave tunnels. A third set of ore-shoots, which are scarcely more than stringers, follows directions somewhat parallel to the faulting, but the stringers are too small to be of any value.

A projection of the two main ore-bodies along the strike indicates an intersection at a distance of about 1,000 feet and if mineralization occurs at this point, an ore-body larger than any yet discovered may be present, which would strike in the direction of the river zone and pitch to the northwest at an angle greater than 80 degrees.

Some of the more competent beds of volcanic rock are not sheared. These beds are devoid of mineralization and it is one of these competent beds which defines the northern boundary of the river zone. It has a steep dip to the north and conforms to the dips of the other beds in the vicinity.

The Ore. In hand specimens the ore consists of a sheared and hornblenditized basalt containing either a large proportion of finely disseminated chalcopyrite, or a smaller amount of chalcopyrite distributed in a network of small, filmy veinlets. Veinlets of either quartz and epidote carrying pyrite and chalcopyrite, or aplitic material, are occasionally seen. Alternating layers of rich and lean ore produce a banded appearance in the deposit. The ore is invariably finely granular, and large masses of pure sulphides are rarely seen. Small grains of pyrite are plentifully distributed throughout the ore.

The composition of the Sunloch ore is simple. The following is a complete list of the minerals, named in order of deposition: magnetite, hornblende, aplite, quartz, epidote, pyrite, molybdenite, chalcopyrite, limonite and chalcocite.

The magnetite is rare and occurs both in the ore and country rock, of which it is probably a primary constituent.

The hornblende is very abundant and was introduced at two different periods, the first soon after the intrusion of the gabbro when the augite was completely replaced by hornblende, and the second at a much later time and after some, at least, of the chalcopyrite had been deposited. This later hornblende is a deeper green variety associated with considerable actinolite and appears in the form of minute veinlets cutting the earlier hornblende as well as the pyrite and chalcopyrite.

The small aplite stringers were formed during the early period of alteration and are cut by other veinlets carrying quartz, epidote, pyrite and chalcopyrite.

The pyrite is in general much earlier than, and extensively replaced by, the chalcopyrite; but a small amount was introduced at a very late date in the periods of mineralization and occurs in the form of minute stringers of pyrite cutting all the other minerals excepting the limonite and chalcocite. Such late stringers of pyrite are, however, rare in ore of this class.

The deposition of the chalcopyrite was spread over a long and uninterrupted period, during which small quantities of molybdenite were also deposited.

The limonite is due to oxidation at a recent period and is found only in small amounts usually associated with pyrite rather than with chalcopyrite.

The chalcocite is probably of secondary origin and of a very recent period. It occurs in quantities much too small to have any commercial influence on the value of the ore.

SUNLOCH ORE-BODIES

On the Sunloch property there are three ore zones roughly parallel and approximately 300 feet apart. The most southerly, namely, the Cave ore zone, is about 400 feet north of the gabbro contact; the most northerly is the River zone, and between these lies the Archibald showing.

The River zone is the most important of the three, and, consequently, has been the most extensively developed. It is exposed at the surface in several good outcrops in the immediate vicinity of the portal and at several points to the north of the tunnel on the same side of the river. Several small stringers were found in the stream bed in a search for the extension of the ore-body across the river, but on the opposite bank no definite indication of its continuation had been found up to the time of this examination, though the search was being carried on with vigour. A tunnel, 720 feet in length at the time of the examination, had been driven along the strike of the ore-body and exposed,

except for a short distance in from the portal, an almost continuous body of ore carrying between 3 per cent and 4 per cent copper and small values in gold. The width of the zone has been tested by a crosscut at a point 240 feet in from the portal and also by two drill holes. The crosscut exposed 15 or 16 feet of ore averaging 3.7 per cent copper, and also a small zone 3 feet wide of 5.8 per cent ore separated from the larger body by 6 feet of barren rock. The diamond drill hole has proved this ore to a depth of 120 feet below the tunnel, and since the face of the tunnel is now about 440 feet vertically below the surface, the perpendicular dimension of the zone must be quite large. Though the extension of this zone across the river has not been proved, its continuation in the opposite direction for a considerable distance beyond the present face of the tunnel (which is in good ore) is highly probable. This zone is exposed also in a small crosscut tunnel 100 feet northeast of the portal of the River tunnel. This tunnel is on a continuation of the main ore-shoot of this zone and samples taken from it gave 2.5 per cent copper.

The Cave ore zone is more irregular, and, therefore, more difficult to follow and to outline. Its irregularity is probably due to the fact that it follows, in part at least, one of the irregular bedding planes between two flows of basalt, rather than the shear zones which are more uniform in strike and dip.

The tunnel was begun on an excellent surface showing and was driven 180 feet in a south 75 degrees east direction, the first 60 feet passing through ore averaging about 4 per cent copper. At 180 feet from the portal a crosscut was driven south 10 degrees west for a distance of 190 feet. The first 60 feet of the crosscut, 10 feet of which averaged 1.3 per cent copper, passed through low grade ore averaging 0.9 per cent copper. The next 20 feet encountered unmineralized rock and beyond this occurs 36 feet of ore averaging 2.58 per cent, one section of which averaged 5.1 per cent copper for a distance of 11 feet. For the remaining distance the tunnel passed through low grade ore.

At the point where the crosscut encountered the rich streak, a drift was driven south 60 degrees east for a distance of 200 feet, passing through good ore for the most part. It ends, however, in low grade ore, and small crosscuts driven short distances in both directions failed to locate any good ore. No work is being done at present on this ore-body.

About midway between the River and Cave zones outcrops of good ore, known as the Archibald showings, were discovered at an elevation of 260 feet above the levels of the tunnels. A diamond drill hole connecting the two tunnels underneath these showings proved the presence of 2 feet of 4 per cent ore and 10 to 12 feet of low grade material.

A crosscut was driven from the river tunnel to this ore and encountered better ore than was inferred from the values given by the drill cores. A drift a few feet in length has been driven on this ore.

SUMMARY AND CONCLUSIONS

Geologic History and Origin of the Deposits. The salient facts brought out in the preceding description, and upon which the conclusions are based, are the following:

The deposits occur in the Hotchosin formation, a series of basic lava flows and tuffs which were extruded in early Tertiary times.

These volcanic rocks were compressed into large folds striking north 60 degrees to 70 degrees west and have dips varying from zero to 85 degrees. The greater part of the formation exposed in the district forms the southern limb of a geosyncline and consequently dips to the northeast. The folding was accompanied by considerable fracturing in the less competent beds.

In the middle Tertiary the Hotchosin formation was intruded by a number of stocks and dykes of coarse, basic, gabbro which appear to have invaded the volcanics along two principal axes of folding, the southern of which passes through the Sunloch property.

These intrusions had a profound metamorphic action on the volcanic rocks adjacent to them. A pronounced shearing was developed roughly parallel to the contacts. The augite was replaced by hornblende so that great quantities of this mineral developed in the volcanics, and in parts of the gabbro itself, by solutions emanating from the interior parts of the gabbro and invading the volcanic rocks chiefly along shear and bedding planes.

Following these solutions were others which deposited more hornblende, actinolite, aplite, epidote, quartz, pyrite, molybdenite and chalcopyrite, the last in sufficient quantity to form commercial ore-shoots.

In very recent times oxidation to a slight extent has taken place, producing small amounts of limonite and chalcocite.

Status of the Sunloch Property. It will be seen from the descriptions of these ore deposits that a considerable tonnage of commercial ore has already been proved on this property and that, as yet, only part of the possible ore-bearing ground has been tested.

In his report to the company at the end of 1918, the managing director, Mr. R. H. Stewart, estimated that from 100,000 to 150,000 tons of ore, averaging 3 per cent to 5 per cent, had up to that time been proved. This estimate was based on actual measurements and numerous assays and should be nearly correct. Since that time development work has been continued with some success so that the above quantity has been materially increased.

Regarding future possibilities, it is the writer's opinion that the ore-body exposed in the River tunnel will continue in a southeasterly direction for a considerable distance, possibly as far again, beyond the present face of the tunnel. The ore will in all probability continue to a great depth below the present workings, possibly until the gabbro is reached and beyond, though not without variations in size and tenor. It does not seem to continue in a northwesterly direction.

The ore-body in the Cave tunnel appears to cease at the face of the present workings, but since it is a very irregular ore-body it may be found to regain its strength at some distance beyond the present face. Good showings, which might prove to be a continuation of this ore-body, occur on the opposite side of the river. The Cave ore zone will persist with depth, but owing to its irregular nature may be difficult to follow.

The Archibald zone has possibilities, but not as great as the other two.

It must be borne in mind that this deposit belongs to a class which is commonly found in the coast section of British Columbia, i.e. the class which consists of disseminations or small veins of ore formed in volcanic rocks at the contacts of plutonic intrusives, and which have been frequently very disappointing. They usually consist of disseminated bodies that are too low grade, or of veins which are too small, the reasons being that the impervious nature of ordinary volcanic rocks, and their high degree of chemical inertness resist the tendency to replacement by the mineralizing solutions. These two disadvantages, however, have been to some extent removed in the case of the Sunloch deposit by the shearing which has made the volcanics more pervious and by the presence of such unusually large quantities of hornblende which lends itself to the process of replacement more readily than the minerals usually found in volcanic rocks. It is for these reasons that the ore deposits of this district are found to be invariably confined to sheared and hornblenditized rocks.

It must also be remembered that the formations associated with these deposits are not developed on a very large scale, being confined to only a few hundred square miles, and that, therefore, the ore deposits in them cannot be expected to rank with the great ore deposits associated with continent wide formations; and again that the other similar copper deposits associated with these formations have all, up to the present, been proved to be quite limited in extent. From these considerations and even though there are 150,000 tons of ore proved already on the Sunloch property and another 100,000 tons of probable ore, yet one would expect the deposit to have a tonnage measured in the hundreds of thousands or a few millions at most. In other words it is a good deposit of moderate rather than great size.

20.

REPORT

of

THE MINISTER OF MINES

1948

SOOKE (48° 123° S.W.)

INTRODUCTION

COPPER

Copper Deposits on the Sooke Peninsula.

Copper ore was found at Sooke in 1863, and the [illegible] have received attention at intervals since. The copper deposits occur in a gabbroic intrusive that outcrops on the Sooke Peninsula some 15 miles west of Victoria. The numerous small rocky hills on Sooke Peninsula are largely free of overburden, but depressions between them are filled with glacial debris, which obscures the bedrock. Mount Maguire, the highest of the hills, rises to an elevation of 860 feet above sea-level. The timber cover is not heavy, but in many places the underbrush is dense.

The peninsula is bordered on three sides by the sea; Sooke Basin lying to the north, Sooke Harbour to the north-west, and Juan de Fuca Strait to the south-west and south-east. A gravel-surfaced road, a branch of the main highway from Victoria to Sooke, runs along the north-east and north-west shores of the peninsula, and trails and logging-roads connect it to some of the mine-workings. A trail a little over a quarter of a mile long runs from the main road to the Willow Grouse workings, and a logging-road about half a mile long runs from the main road to within a short distance of the King George workings. The Copper King workings are reached from the main road by an old logging-road about a mile long. This logging-road does not continue to the Old Copper mine on the south shore of the peninsula, less than a mile from the Copper King workings. A trail a little less than 1½ miles long runs from the main road along a valley east of Iron Mine hill to within a short distance of the showings on the Merryth zone.

HISTORY

In 1863 it is reported that Capt. Jeremiah Nagle, of Victoria, discovered copper ore at Sooke. In 1864 the Sooke Copper Mining Company shipped copper ore from Nagle's property to England to be assayed. It is likely that this old prospect is the "old copper mine" referred to by Clapp in Memoir 13 and in Reports of the Minister of Mines of British Columbia.

In 1893 Herbert Carmichael, the Provincial Assayer, visited the copper deposits on the Sooke Peninsula and found shafts and open-cuts in rock mineralized with chalcopyrite.

In 1900 the Pacific Steel Company, of Tacoma, Wash., took a bond on several claims on Lots 79 and 83 near Iron Mine Hill, with the object of developing a large body of magnetite. They found the magnetite to be high in sulphur and contaminated with copper. In 1917 A. McWittie, of Victoria, unwatered a shaft, sunk a number of years previously, on Crown-granted land belonging to F. B. Pemberton. This shaft was probably part of the old workings of the Pacific Steel Company.

Sometime prior to 1902 the Ralph Mineral Claim, said to be near Lot 111, was located by William Ralph. A shaft was sunk and some underground development was done.

About 1901 Alexander Donaldson staked the following claims for himself and his associates: Garden Thrush, Willow Grouse, Wild Grouse Partridge, Blue Bird, Donaldson, Jack, and Sydney, on the north-west slope of Mount Maguire. Shortly afterwards the claims were acquired by H. B. Thrupp and associates who had them Crown-granted in 1903. In 1915 and 1916 the Willow Grouse Syndicate, consisting of R. C. Mellin, E. Mucha, and others, leased the claims and shipped to Tacoma 83½ tons of copper ore containing 9 oz. of gold, 217 oz. of silver, and 119,733 lb. of copper. In 1917 and 1918 the Ledgewith Smelting Corporation took over the Willow Grouse group and shipped 547 tons of ore, yielding 64 oz. of silver and 15,630 lb. of copper. The total recorded production during the years 1915, 1916 and 1918 was 1,413 tons, yielding 9 oz. of gold, 281 oz. of silver, and 135,368 lb. of copper. In 1925 the Willow Grouse was Crown-granted to Alice G. Brennan, and in 1931 the Willow Grouse, Donaldson, and Jack were owned by C. V. Fresno, of Britannia Beach. The remainder of the Willow Grouse group had reverted to the Crown.

In 1911 Frank Caffery staked the King George, which adjoins the Jack claim, of the Willow Grouse group. In 1916 several open-cuts were made to outline an ore-body.

Prior to 1916 the Margaret, Copper King, and Eureka Mineral Claims, on the southern slope of Mount Maguire, were staked by Dan Campbell and associates on Crown-granted land owned by A. R. Johnson and B. H. Johns. Some development-work was done by Campbell before it was realized that the mineral claims carried rights to the precious metals only. Some development-work was done by Johns on behalf of the owners of the Crown grant. Early in 1917 O. B. Earle, of Pitt Meadows, leased the property and built a wagon-road from the mine-workings to a wharf on Dr. Francis' farm on Sooke Harbour. In 1917 and 1918, 559 tons of ore, containing 6 oz. of gold, 92 oz. of silver, and 42,245 lb. of copper, was shipped to Tacoma. In 1919 the Copper King, Copper King Fraction, Eureka, and Margaret were Crown-granted to W. H. R. Collister and J. R. Collister.

In 1947, of the old Crown grants, only the King George, owned by the estate of Frank Caffery, and the Sydney, owned by Harold P. Johns, were in good standing. Late in 1947 Frank Cooke obtained leases on the following reverted Crown grants: Blue Bird, Garden Thrush, Donaldson, Eureka, Margaret, and Copper King Fraction, and H. H. Huestis obtained leases on the Willow Grouse and Copper King. More than fifty mineral claims were located by Frank Cooke, H. H. Huestis, Frank Merryth, George Griffith, and associates over the old copper properties. Further stakings by Bert Goodridge and E. B. Johnson were recorded early in 1948.

GENERAL GEOLOGY

The Sooke Peninsula is underlain by a differentiated gabbroic intrusive of Tertiary age. Olivine gabbro underlies a large area of the central part of the peninsula. Augite gabbro outcrops around the edges of the intrusive, and small bodies of anorthosite occur principally near its centre.

Alteration of both types of gabbro to hornblende has taken place along zones of shearing. Some of these zones are more than 100 feet wide and half a mile long and are shown as major faults on Cooke's map of East Sooke. The

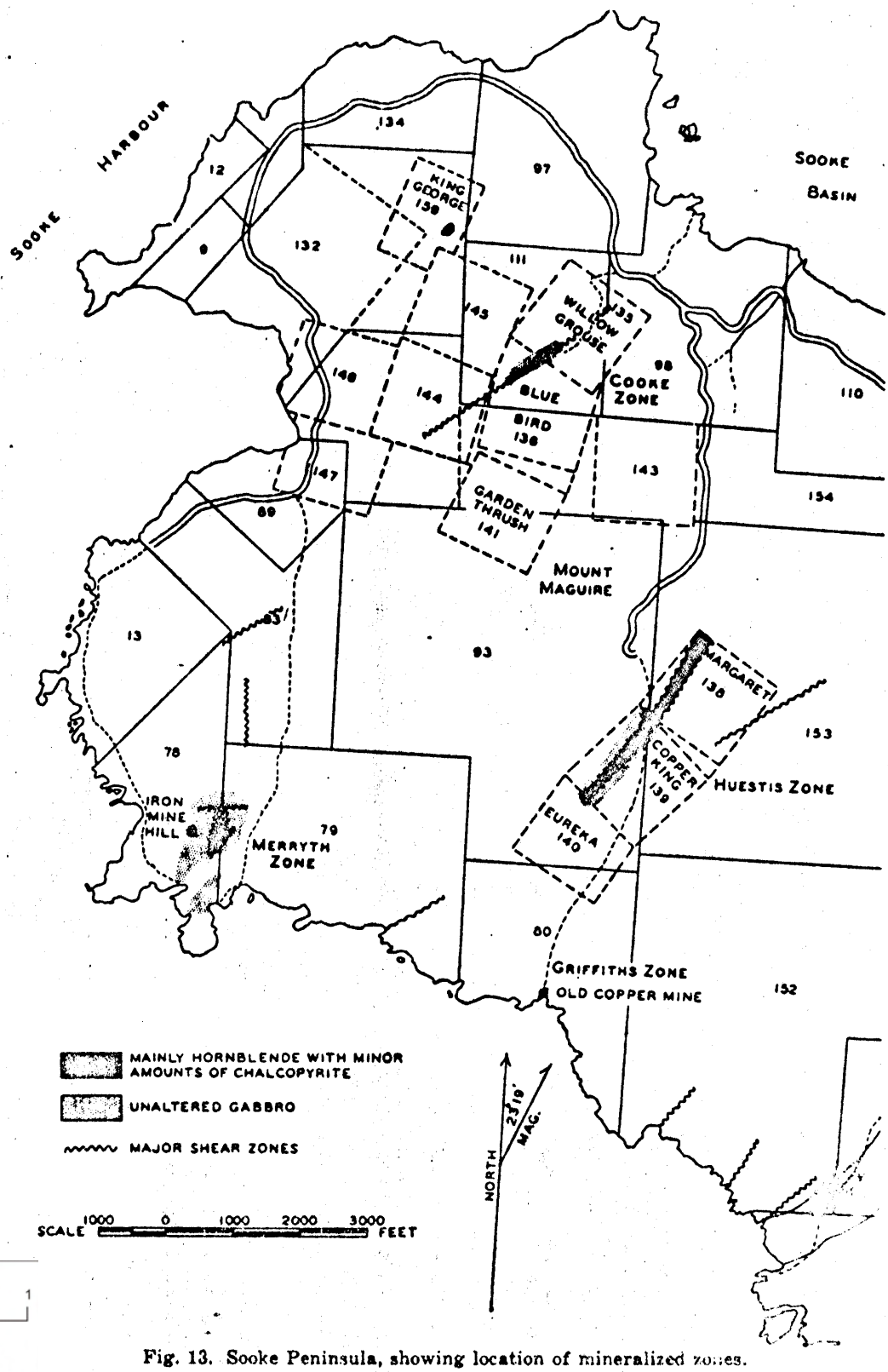

Fig. 13. Sooke Peninsula, showing location of mineralized zones.

degree and extent of the alteration varies, and hence the boundaries of the shear-zones are not well defined. Partial alteration of the gabbro, in which the augite has been changed to hornblende, is widespread, and the resulting rock has been termed hornblendite. Complete alteration has produced veins of coarse-grained, almost pure hornblende. Fractures and faults in the hornblendite and hornblende have been filled by chalcopyrite. Disseminated chalcopyrite occurs throughout much of the hornblendite, and the finer chalcopyrite is commonly associated with coarse-grained hornblende. Coarse hornblende and relatively high concentrations of chalcopyrite seem to occur at points where [illegible] intersect the main shear-zones.

At least five of these mineralized zones have been explored by adits, shafts, or open-cuts, and ore has been shipped from at least two of them. The properties on which these mineralized zones occur were originally named the Willow Grouse, Copper King, and Margaret, Old Copper mine and Iron Mine Hill, but recently the principal zones have been renamed the Cooke, Thestin, Griffith and Merryth zones. The fifth zone lies within the King George Mineral Claim. Little work has been done on the showings for many years, and many of the workings are caved, filled with debris, or heavily overgrown with underbrush.

DETAILED DESCRIPTIONS

Cooke Zone. - The principal showings on the Cooke zone lie within the Willow Grouse and Blue Bird Mineral Claims.

The mineralization occurs in what appears to be a major shear-zone which, near the workings, strikes about north 50 degrees east. It can be traced for more than 2,000 feet and shows on the surface as sub-parallel cliffs or scarps, 2 to 10 feet high, and as much as 100 feet long. At the main workings the zone is intersected by cross-faults, and lenses of chalcopyrite have developed along the faults and in the fractures adjacent to them. Only minor amounts of disseminated chalcopyrite were seen at other places in the shear-zone. Veins of coarse hornblende are abundant in the main workings, and hornblendite occurs at other places along the shear zone. The zone has been explored over a length of about 1,000 feet by an adit, a shaft, and several open-cuts and trenches.

A shaft and one large open-cut lie about 100 feet north of the boundary between the Willow Grouse and Blue Bird claims. The portal of an adit is about 275 feet north 65 degrees east from the shaft. The adit is caved and the shaft is full of water, but the cross-faults and mineralization can be seen in the open-cut. Several parallel faults striking about north 15 degrees east and dipping vertically or steeply to the west are exposed. Grooves on the fault-surfaces show that the movement has been nearly horizontal. Coarsely crystalline hornblende is present near the faults, and finer hornblende occurs farther away. The coarse hornblende which has grown with the length of the crystals about at right angles to the fault-planes has itself been sheared. Grains and lenses of chalcopyrite ranging from less than an inch to a foot in length and from a fraction of an inch to 2 inches in width cut the hornblende where it has been sheared. Most of the chalcopyrite seems to have been removed from the open-cut, as only a few stringers and small amounts of disseminated chalcopyrite appear in the walls. Hornblendite grades into unaltered gabbro 15 to 20 feet north of the north end of the cut, and little hornblende is present 10 feet west of the cut. The eastern edge of the mineralized zone is covered by waste rock.

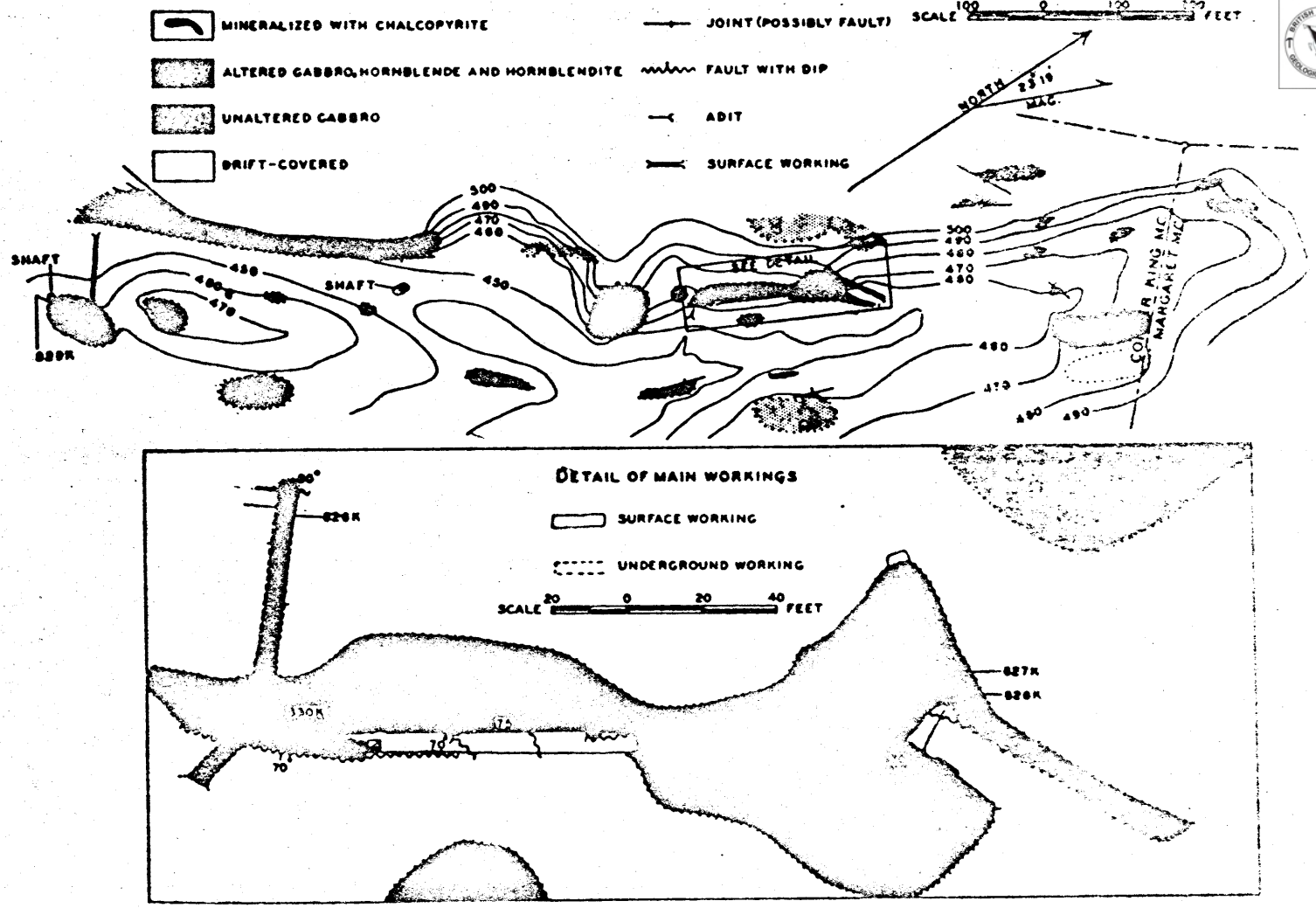

Fig. 15. Geology and workings on Huestis zone, Copper King and Margaret Mineral Claims.

and hence the edge of the hornblende-bearing zone is obscure. However, it is probably less than 150 feet long and 50 feet wide. A chip sample across a width of 4 feet of what appeared to be the highest-grade material from the south end of the open-cut assayed: Copper, 0.75 per cent.; silver, 0.1 oz. per ton; nickel, 0.07; no gold and not more than 0.05 per cent. cobalt.

About 500 feet south-west along the shear-zone from the main workings an open-cut exposes a vertical fault striking north 40 degrees east. Medium-grained hornblende containing small amounts of chalcopyrite has developed along this fault.

Several trenches have been made across the strike of the main shear-zone between the main workings and this last open-cut. Only in the first trench south of the main workings was any hornblende found, and in this only minor specks of chalcopyrite can be seen. Many of the trenches are filled with overburden, but bedrock that is exposed is relatively unaltered gabbro, and it seems probable that the zone contains lenticular mineralized masses that are not continuous between the workings.

Rhoetic Zone. - A zone at least 3,000 feet long and 100 to 200 feet wide runs through the Copper King and Margaret Mineral Claims. This zone contains hornblendite and in places coarse-grained hornblende. It is bounded on both sides by parallel scarps, those on the north-west side being most prominent. Chalcopyrite occurs in minor amounts throughout the zone, and in two places relatively high concentrations of chalcopyrite have been developed by shafts, adits, and open-cuts.

The main group of workings is about 500 feet south of the north-west corner of the Copper King Mineral Claim. Two short adits and two open-cuts have been driven to follow vertical faults striking about north 55 degrees east. Grooves on the fault-planes indicate that the movement on them has been nearly horizontal. Little chalcopyrite is present in the adits, and channel samples across 8 feet of the highest-grade material in the open-cuts above the adits averaged: Copper, 0.83 per cent; gold, 0.01 oz. per ton; silver, nil; and not more than 0.05 per cent. nickel, cobalt, or molybdenum. Most of the chalcopyrite appears to have been mined out, and a few feet either side of the cuts no chalcopyrite can be seen.

The positions where samples were taken are indicated in Fig. 15 and the assays are listed in the following table: -

Sample No.	Gold	Silver	Copper	Other Metals
	Oz. per Ton	Oz. per Ton	Per Cent.	Per Cent.
826K	0.01	Nil	0.31	*+
827K	0.01	Nil	0.76	*
828K	0.01	Nil	0.96	*
829K	0.01	Nil	1.35	*=
830K	0.01	Nil	1.54	*+

* Spectrochemical determinations-cobalt, nickel & molybdenum-not more than 0.05 per cent., except:-

+ Molybdenum not detected in 826K and 830K

= Nickel: 829K, 0.064 per cent.; 830K, 0.068 per cent

About 100 feet south-west of these workings is a trench 100 feet long, trending north 30 degrees east, and near its south end a shaft some 25 feet deep connects the trench with underground workings shown in Fig. 35. Most faulting in the trench strikes north 30 degrees east, but several minor faults strike due east. Some chalcopyrite is exposed near the minor faults but does not continue more than a few feet west of the trench. In the underground workings below the trench, relatively high-grade chalcopyrite-bearing material seems to have existed along a fault striking north 30 degrees east, but most of it has been removed. A channel sample across 6 feet of the highest-grade material near this fault in the underground workings assayed: Copper, 1.94 per cent.; gold, 0.01 oz. per ton; nickel, 0.068 per cent.; silver, nil; and not more than 0.05 per cent. cobalt and molybdenum. A crosscut about 60 feet long has been driven north-west from this fault and exposes sheared hornblendite but little chalcopyrite. One sample was taken 12 feet from the face. It assayed: Copper, 0.51 per cent.; gold, 0.01 oz. per ton; silver, nil; and not more than 0.05 per cent. cobalt and molybdenum across 5 feet.

About 1,000 feet farther south-west along the main shear-zone is a second group of workings consisting of several open-cuts and a shaft, now full of water. In most of the cuts only minor chalcopyrite in hornblende is exposed, but near the shaft more concentrated chalcopyrite mineralization has been found. This mineralization, in an area some 20 feet square, seems to follow no prominent shearing. A chip sample (No. 829K) across 11 feet of this zone assayed: Copper, 1.35 per cent.; gold, 0.01 oz. per ton; silver, nil; nickel, 0.064 per cent.; and not more than 0.05 per cent. cobalt and a trace of molybdenum.

A length of about 1,000 feet of the main shear-zone between the two groups of workings has been tested by two or three open-cuts and a shaft. In these and at a few other points minor amounts of chalcopyrite can be seen. Concentrations of chalcopyrite are small, but the shear-zone carrying hornblende is extensive and may contain other concentrations of chalcopyrite which are not now exposed.

Merryth Zone. - The Merryth zone is on the south-west shore of Sooke Peninsula due south of Iron Mine Hill. The main altered zone, containing hornblende and masses of unaltered gabbro, trends up the hill from the shore at about north 25 degrees east for 1,500 feet. The zone is irregular in width but averages 100 feet wide. It is not known to be continuous, as a drift-covered area separates the showings on the hill from those on the shore. Hornblendite is present not only in the main zone, but also in irregular masses several hundred feet on either side of the main zone. The Merryth zone, which is in augite gabbro, differs in this respect from the Sooke and Ineston zones, which are in olivine gabbro.

A little trenching and open-cutting has been done near the shore, and the mineralized zone is well exposed on the sea cliff. An area bout 100 feet wide and possibly 200 to 300 feet long has been partly altered to hornblende. It is bounded on the east and west by vertical faults striking about north 20 degrees east and is cut by cross-faults, the most prominent of which strike north 60 degrees east and north 20 degrees west. The sea has cut chasms along the bounding faults, and on the west side of the mineralized zone the chasm has been filled by stratified sands and gravels. The mineralized zone contains irregular bodies of fine-grained relatively unaltered gabbro which increase in size away from the shore. Fine-grained magnetite, pyrrhotite, pyrite, and chalcopyrite

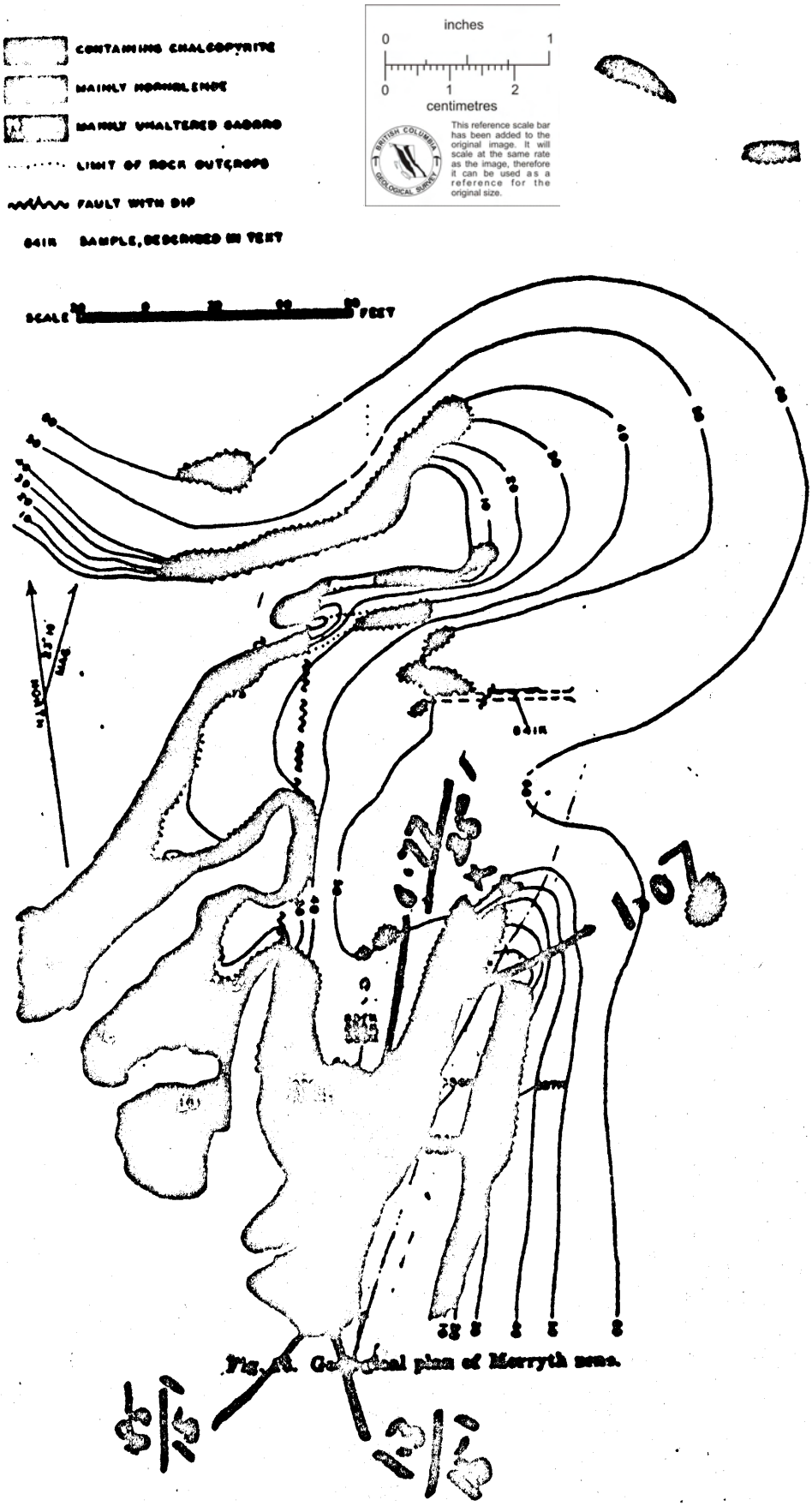

Fig. 41. Geological plan of Merryth area.

occur in the hornblende and less commonly in the unaltered gabbro. Sulphides are relatively massive near the centre of the zone, but toward the edges they become disseminated and occur as tiny veinlets throughout the hornblende. A [illegible] of hornblende containing magnetite occurs along the east side of the main mineralized zone. On top of the sea cliff the rocks are covered by overburden, but hornblende and sulphides are less abundant in exposures there than on the shore; in a trench 300 feet from the shore very little sulphide could be found.

Samples were cut along two lines on the face of the sea cliff. The lower line about 10 feet above high-tide mark averaged 0.83 per cent. copper across a width of 28 feet. These lower samples were taken in relatively unoxidized material from a section of the sea cliff that showed the highest-grade mineralization. The upper line of samples was taken across 16 feet of heavily oxidized material, and although the oxidized material was removed as far as possible before sampling, these samples may not be truly representative. They averaged 0.31 per cent. copper. A grab sample (No. 841K) across 20 feet of the highest-grade material in a trench about 200 feet north along the mineralized zone from the top assayed: Copper, 0.28 per cent. It appears from the assays and from field observations that the grade of the mineralization decreases upward and away from the shore. NB

*All samples on the Morryth zone were taken by cutting equal chips at 1-foot intervals across the face.

The positions where samples were taken are indicated in Fig. 16, and the assays are listed in the following table: -

Sample No.	Gold	Silver	Copper	Other Metals
	Oz. per Ton	Oz. per Ton	Per Cent.	Per Cent.
831K	0.01	Nil	[illegible]	*
832K	Trace	Trace	0.39	*‡
833K	Trace	Nil	0.79	*
834K	Nil	Nil	1.14	*
835K	Trace	Trace	1.42	*
836K	Nil	0.1	0.37	*
837K	Nil	0.1	0.17	*
838K	0.06	Nil	0.08	*
839K	Nil	Nil	0.53	*
840K	Nil	Nil	0.24	*
841K	Nil	Trace	0.28	*‡
842K	Nil	Nil	0.25	*

*Spectrochemical determinations - cobalt, nickel, and molybdenum - not more than 0.05 per cent.

‡Molybdenum not detected.

Irregular masses of hornblendite containing some sulphides lie west of the main zone and to a lesser extent east of the main zone. They apparently formed along cross-faults, especially where they intersect each other. One sample taken across 8 feet at such an intersection assayed: Copper, 0.25 per cent.

Two showings on the hill some 1,500 feet northeast of the shore were not examined in detail. Several cuts and a short adit expose [illegible] hornblende with abundant magnetite, but only small amounts of chalcopyrite, pyrite and [illegible]. The zone appears to end 1,400 feet north of the south-east corner post of Lot 78 at what appears to be a fault striking north 80 degrees east.

Griffith Zone.- The Griffith zone or Old Copper mine is a poorly exposed showing on the south shore of Cooke Peninsula. A shaft, now full of water but reported to be 102 feet deep, has been sunk 15 or 20 feet north of high-tide line. On the beach on either side of the shaft is a waste-dump containing chalcopyrite and highly oxidized material, probably hornblendite. Rocks on the shore contain hornblende and minor chalcopyrite and are cut by joints or faults striking about north 20 degrees east. Away from the shore there are no exposures of bedrock.

King George.- Two large open-cuts and several smaller ones on the King George Mineral Claim have been made in what Cooke describes as "poorly defined shear-zone about 100 feet wide striking nearly east and west." No definite shear-zone is apparent near the workings, but an area of hornblendite perhaps 70 to 80 feet wide and 200 feet long is exposed. Faults in the open-cuts strike north 30 to 40 degrees west.

Cooke states that "14 tons of picked ore was shipped in the autumn of 1916 and the smelter returns showed an average copper content of 13.1 per cent." Most of the copper-bearing material appears to have been removed, as very little chalcopyrite could be found in the walls of the larger cuts. One small cut, however, exposes a mass of high-grade chalcopyrite perhaps 3 feet wide and 6 feet long which grades off on all sides into barren hornblendite. A sample across 5 feet of the highest-grade material assayed: Copper, 7.95 per cent.; gold, 0.06 oz. per ton; silver, 0.3 oz. per ton; and not more than 0.05 per cent. nickel, cobalt, or molybdenum.