

This document was produced
by scanning the original publication.

Ce document est le produit d'une
numérisation par balayage
de la publication originale.

CANADA
DEPARTMENT OF MINES AND RESOURCES

HON. T. A. CRERAR, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER

MINES AND GEOLOGY BRANCH

JOHN McLEISH, DIRECTOR

BUREAU OF GEOLOGY AND TOPOGRAPHY

GEOLOGICAL SURVEY

PRELIMINARY REPORT

EAST HALF NELSON MAP-AREA
BRITISH COLUMBIA

BY

H. M. A. Rice

Paper 38-17

O T T A W A

1938

CANADA
DEPARTMENT OF MINES AND RESOURCES
MINES AND GEOLOGY BRANCH
BUREAU OF GEOLOGY AND TOPOGRAPHY
GEOLOGICAL SURVEY

EAST HALF NELSON MAP-AREA, BRITISH COLUMBIA

BY

H.M.A. RICE

PAPER 38-17

APRIL 1938

CONTENTS

	Page
Introduction	1
General geology	1
Economic geology	3
Properties	4

EAST HALF NELSON MAP-AREA, BRITISH COLUMBIA

By H.M.A. Rice

INTRODUCTION

The East Half Nelson Map-area lies in southeastern British Columbia between longitudes 116 degrees and 117 degrees and between latitude 50 degrees and the International Boundary. Field work in this area was commenced in 1936 and the results of the season's work were embodied in Preliminary Report 37-27. Field work was continued in 1937 and the present report is based on that season's work.

The area, embracing as it does the Purcell Range, is extremely mountainous and, although the two sides and the southern end are accessible by road, the interior can be reached only by trail. At the northern edge of the area the mountains rise to a maximum height of 10,000 feet above sea-level and are separated by deeply incised valleys. Towards the south the relief is less and most of the peaks and ridges are smoother and more heavily wooded.

GENERAL GEOLOGY

Except for a small, triangular area of Cambrian slates and quartzites in the centre, the map-area is underlain by granitic rocks and by late Precambrian sediments of the Purcell and Windermere series. The formations comprising these series have been described in detail in Summary Report 1928¹, Memoir 207², and Preliminary Report 37-27³.

Further discussion will be limited to a brief summary in the following table:

¹Walker, J.F.: Kootenay Lake District; Geol. Surv., Canada, Sum. Rept. 1928, pt. A.

²Rice, H.M.A.: Cranbrook Map-area, British Columbia; Geol. Surv., Canada, Mem. 207 (1937).

³Rice, H.M.A.: The Nelson Map-area; Geol. Surv., Canada, Preliminary Report 37-27, 1937.

Table of Formations

Late Mesozoic or early Tertiary		Granite; granodiorite; quartz diorite; diorite
Palaeozoic	<u>Cambrian</u> Eager formation	Fossiliferous, olive-green, purple, and grey shale
	Cranbrook formation	Siliceous, white, rose, purple, and grey quartzite and conglomerate
Unconformity		
Proterozoic	<u>Windermere series</u> <u>Tardeau formation</u>	Micaceous schist; limestone
	Badshot formation	Magnesian limestone
	Hamil formation	Grey, green, and white, siliceous quartzite
	Horsethief formation	Green, argillaceous quartzite; blue-grey limestone; arkose; pebble conglomerate
	Toby formation	Highly variable conglomerate
Unconformity		
	<u>Upper Purcell series</u> <u>Mount Nelson formation</u>	Varicoloured argillite; magnesian limestone; siliceous quartzite at base
	Dutch Creek formation	Varicoloured argillite with interbedded magnesian limestone; siliceous quartzite at base
Conformity		
	<u>Lower Purcell series</u> <u>Kitchener-Siyeh formation</u>	Calcareous argillite; magnesian limestone and argillite
	Creston formation	Green, purple, and grey argillaceous quartzite with some argillite
	Aldridge formation	Grey, rusty weathering argillaceous quartzite and argillite
	Base unexposed	

The sediments over almost the entire area are intruded by sills and dykes which are mainly quartz diorite, but which are in places as basic as gabbro. The age of these intrusives is pre-Jurassic and post-Lower Purcell.

The most important intrusives, both from an areal and economic standpoint, are the granitic rocks that occur as small batholiths and stocks of varying sizes throughout the north-western part of the map-area. They range in composition from granite to granodiorite or quartz diorite. They are light grey to pinkish coloured rocks and are commonly full of large orthoclase phenocrysts up to 2 inches long.

Structurally, the southern part of the area is characterized by a wide zone of northeasterly striking faults, both thrust and normal, which cuts across the area from the International Boundary in a north to northeasterly direction. Most of these faults dip steeply to the west. Within this zone the sediments are sliced into a number of fault blocks, in all of which the rocks dip west. North of the fault zone in the eastern half of the area the sediments lie in a broad anticline, plunging at a low angle to the north. The western limb of this anticline passes into a zone of close folding. Still farther to the west the folding gives place to a fairly regular succession of steeply dipping sediments, the youngest lying to the west.

ECONOMIC GEOLOGY

Two distinct types of mineral deposits are found in the area. One occurs exclusively in the diorite sills and is probably genetically related to them. It may be subdivided into quartz-calcite veins and disseminated sulphide deposits. The other type consists of quartz veins in granite or in Precambrian sediments.

The quartz-calcite veins carry chalcopyrite, pyrite, pyrrhotite, galena, and sphalerite in various combinations. Up to \$4 a ton in gold is reported to occur in one deposit, but most carry very low gold values. The veins in most places cut fairly directly across the sills, and may maintain a width of 5 feet or more from margin to margin. They do not extend into the sediments for any appreciable distance. Sulphides are mainly confined to that part of the vein extending from the upper margin of the sill down into the sill for 10 to 20 feet. The rest of the vein is usually barren or carries only very small amounts of sulphides. Many deposits of this type occur throughout the map-area, and on some considerable preliminary development has been done. As yet no ore has been mined from this type of deposit.

The disseminated sulphide deposits occur associated with certain of the quartz-calcite veins. They consist of sulphides, usually pyrrhotite, chalcopyrite, and pyrite, disseminated through the sill rock near the veins. Although these deposits have no distinct boundaries their localization is in some places controlled by a zone of fracturing in the diorite. In one deposit the disseminated sulphides occur in the sill on both sides of such a zone.

Quartz veins in sediments or granite occur throughout the area and constitute the most promising type of deposit. They vary from a few inches to 20 feet or more in width, and many can be traced for a considerable distance. In some places they cut across the bedding, at others they parallel it. They vary considerably in the nature of the sulphides they carry and in their precious metal content. They were formed after the principal folding and faulting in the area and are probably genetically connected with the granitic intrusives. Their localization is largely controlled by the folding and faulting and, for this reason, the most likely areas in which to find them are those which have been most deformed.

PROPERTIES

The following is a description of some of the more important properties in the area. Numbers 1 to 17 were described in Preliminary Report 37-27 and will only be treated in summary form.

(1) Prospector's Dream. Located on the Moyie River slope of Mount Baldy. Quartz vein in sediments and diorite carrying gold.

(2) Magnesite Claims of the Consolidated Mining and Smelting Company, Limited. Located at the head of Hellroaring Creek. Consist of a bed of Cambrian rock magnesite.

(3) Homestake Mine. Located on Manchester Creek, a tributary of Perry Creek. Quartz veins and stockworks in Creston quartzite, carrying gold.

(4) Running Wolf. Located on French Creek, a tributary of Perry Creek. Quartz veins in Creston quartzite, carrying gold.

(5) Rome and Valley. Located on Rome Creek, a tributary of Perry Creek. Quartz veins in Creston quartzite, carrying gold.

(6) Birdiel Group. Located on Perry Creek about 4 miles above Old Town. Owned by R.L. Bird, of Cranbrook, and associates. Irregular quartz veins carrying galena, sphalerite, and pyrite, in sheared sediments.

(7) Wellington Group. Located on Angus Creek (east fork of Hellroaring Creek) 7 miles from St. Mary Lake. Owned by S.A. Nogalski. Narrow, persistent quartz vein in sediments, carrying galena, pyrite, chalcopyrite, and tetrahedrite. Good gold values reported.

(8) Kimberly Gold Fields. Located at the head of Sawmill Creek, a tributary of Perry Creek. Quartz veins in Creston quartzite, carrying gold.

(9) Boy Scout Group. Located on the east side of Hellroaring Creek about 3 miles from St. Mary Lake. Owned by N.A. Wallenger and associates. Quartz veins carrying galena, sphalerite, pyrite, and arsenopyrite, in metamorphosed Aldridge quartzites close to a pegmatite stock.

(10) Evans Group. Located on the west slope of Evans Mountain, Whitefish Creek. Owned by C. and W. Evans of Marysville, B.C. Quartz-calcite veins and disseminated sulphides in diorite sills. Sulphides are chalcopyrite, pyrrhotite, and small amounts of galena and sphalerite.

(11) Dominion Group. Located on the north side of St. Mary River above the end of the auto road. Quartz veins in sheared Aldridge argillaceous quartzites carrying some galena and a little pyrite.

(12) Mystery Group. Located on Alki Creek. Owned by Robert Dewar of Fort Steele, B.C. Quartz-calcite veins and disseminated sulphides in a diorite sill. The sulphides are mainly chalcopyrite, pyrite, and pyrrhotite; small amounts of galena and sphalerite are also present. Up to \$4 a ton in gold is reported.

(13) Kole Prospect. Located on the southeastern slope of Bootleg Mountain. Brecciated Aldridge quartzite cemented by quartz and limonite and shear zones in diorite, the latter showing some galena and arsenopyrite.

(14) Petty Prospect (Gold Ledge Group). Located at the head of Alki Creek. Owned by S.A. Nogalski, Cranbrook, B.C. Quartz vein, in a fault zone cutting Aldridge quartzites, carrying arsenopyrite and some pyrite, galena, and gold.

(15) Great Dane Group. Located on the north side of the West Fork of St. Mary River. Quartz vein, in Creston quartzite, carrying galena, sphalerite, chalcopyrite, pyrite, and a little erythrite (Cobalt bloom).

(16) Welcome Group. Located on the south side of the West Fork of St. Mary River. Quartz veins, in sheared Kitchener limy argillites, carrying chalcopyrite and pyrite.

(17) Rose Pass Prospect. Located on the northeast side of Rose Pass close to the trail. Quartz veins, in Mount Nelson argillite, carrying galena, sphalerite, chalcopyrite, pyrite, stannite, and some silver.

The following properties were examined in 1937:

(18) Humbolt Claim. The Humbolt claim is at an elevation of 5,000 feet $\frac{1}{2}$ mile to the west of the summit of Rose Pass. The workings are beside the Crawford Bay-Rose Pass trail, 5 miles from the end of the Crawford Bay road. It is owned by Oscar Burden of Kaslo, B.C. It was located about the beginning of this century and no work has been done on it recently.

The workings consist of one adit, now partly caved, driven east on a flat-lying vein. Immediately to the south of the portal of this adit a small open-cut has exposed the same vein. About 50 feet to the north at the same elevation a second open-cut has been excavated. From these limited exposures it is difficult to make out the nature of the orebody or the structures in which it lies.

The main showing, visible in the adit and the south open-cut, consists of a flat-lying quartz vein, 4 feet in width, exposed for about 30 feet in one direction and 25 feet in the other. It is well mineralized with sphalerite, galena, pyrite, chalcopyrite, and a tin mineral which is probably stannite (copper, iron, tin sulphide).

The north open-cut is in barren rock except for some quartz that is exposed near the bottom. This may be another vein or the top of the vein in the adit moved down slightly by a fault between the two places.

The vein in the adit parallels the bedding in dark grey, micaceous argillites of the Mount Nelson formation. Apparently it occurs at the crest of a fold in the sediments, and is probably a saddle reef. Fairly close folding characterizes

the rocks between Silver Hill and Rose Pass and the Humbolt lies in these rocks. Some post-mineral faults occur, but few if any have a displacement of over a few hundred feet.

It is impossible to determine the economic possibilities of this prospect at its present stage of development. The vein in the adit is of good width and is well mineralized. The Rose Pass prospect (17) lies in the same structural belt about a mile to the east and shows the same mineral assemblage. The two properties almost certainly have a common origin, and it is quite possible that other similar bodies occur between them.

(19) Blue Bell Mine

References: Walker, J.F.: Geol. Surv., Canada, Sum. Rept. 1928, pt. A, pp.129-134. B.C. Minister of Mines Repts.: 1888; 1889; 1890; 1893; 1894; 1896; 1898; pp. 1081-1082; 1899, p. 699; 1905, p. 158; 1906, p. 142; 1907, p. 96; 1908, p. 92; 1909, p. 105; 1912, p. 14; 1913, p. 123; 1914, p. 284; 1915, p. 119; 1917, p. 154; 1918, p. 159; 1919, p. 153; 1920, p. 120; 1921, p. 131; 1924, p. 188; 1925, p. 232; 1926, p. 258; 1927, p. 281; 1929, p. 324; 1930, p. 254; 1931, p. 142.

The Blue Bell Mine at Riondel is one of the oldest mines in British Columbia. It was staked in 1882 and has been worked off and on from that time to 1931. In 1930 it was acquired by the Consolidated Mining and Smelting Company, who after doing some work on the two claims to the south, the Comfort and Kootenay Chief, closed the property down.

A full report by Walker appeared in the Summary Report cited under references. As access to the property was easier and the workings fresher at the time of Walker's examination the writer cannot do better than to refer the reader to his published report.

(20) Hotshot Prospect. This property lies on the hillside just above Riondel, and a rough auto road runs to within a short distance of the workings. It is owned by E.G. Davis and Jack Sutcliff of Riondel, B.C.

The workings consist of a short adit which, about half-way to the face, connects with the bottom of a 30-foot shaft. The workings have been driven along a fracture zone in altered pegmatite intruding metamorphosed Lardeau sediments. In places along the zone a badly altered feldspar porphyry dyke can also be recognized. A quartz vein well mineralized with sphalerite,

galena, pyrite, and some ruby silver follows the fracture zone. Some clear barite was also seen. High silver values are reported.

The vein in the first 20 or 30 feet of this adit is narrow, but from there to the bottom of the shaft, a distance of 30 feet, and up the shaft to the collar the average width of the vein is about 3 feet and it is well mineralized with sulphides. For 10 or 15 feet beyond the shaft there is very little vein matter. From there to the face, about 10 feet at the time of the writer's visit, a well-mineralized quartz vein about a foot wide occurs on each wall.

The present exposures are too limited to permit of evaluation of the property, but it deserves further exploratory work.

(21) Silver Hill Group

References: B.C. Minister of Mines Repts.: 1900, p. 849; 1901, p. 1031; 1903, p. H149; 1917, p. 154; 1925, p. 237; 1926, p. 259.

This property, which includes the Silver Hill and X-Ray groups, is owned by the B.C. Lead and Zinc Mines, incorporated in Calgary, and is at an elevation of 6,000 feet on the south side of Crawford Creek about 4 miles by trail from the end of the auto road.

The deposit has been worked intermittently by various owners since 1900. Over 2,700 feet of adits have been driven. In 1901 the property was a steady shipper, but since then it has been worked by leasers only. No figures are available as to the actual tonnage extracted. At the time of the writer's visit the property had just been taken over by the present owners who were constructing a tramway from the mine to Crawford Creek in order to ship the 2,000 to 3,000 tons of ore accumulated on the dumps. Some of the adits were in poor repair and many of the principal workings were inaccessible.

The deposit consists of one or more quartz veins, from 1 to 2 feet wide, that parallel the bedding in dark grey argillites of the Mount Nelson formation. In this locality the sediments and the interleaving quartz veins lie in a monoclinial roll and vary in dip from almost horizontal to 27 degrees west. The veins appear to be wider where they are most nearly horizontal. They have been dislocated in places by faults, probably none of

which has a displacement of more than a few hundred feet. The vein or veins have been traced by open-cuts, short adits, and inclined shafts for a distance of half a mile or more, and the width, though generally narrow, is fairly uniform for considerable distances. They are well mineralized with galena, sphalerite, tetrahedrite, and pyrite. Good silver assays are reported. The veins appear to be fissure fillings accompanied by little replacement of the wall-rock.

A considerable amount of ore undoubtedly remains in the deposit. The narrow widths, low dip, and distance from transportation will make its extraction costly.

(22) Dykes Option (Mineral Dyke)

References: B.C. Minister of Mines Repts.: 1929, p. 325;
1930, p. 254.

This property is a short distance north of the Crawford Bay-Kootenay Bay road. It is owned by C. Rossiter of Kaslo, B.C.

The deposit consists of pyrrhotite and chalcopyrite disseminated through an altered dark green sill. Platinum and palladium are also reported to occur. The sill is intruded by pegmatite dykes and is too badly altered to permit of positive identification, but before alteration was probably diorite. It is 30 or 40 feet thick and open-cuts show that it is mineralized best in its upper part. An adit driven under the surface showings by the Consolidated Mining and Smelting Company, who had an option on the property, failed to reveal any commercial ore.

(23) Gold King Claim

Reference: B.C. Minister of Mines Report, 1933, p. 240

The Gold King lies beside the main highway along Kootenay Lake about 2 miles south of Gray Creek. It is owned by R. McGregor, of Port Crawford, and associates.

The showing is a quartz vein in altered sediments of the Horsethief formation close to the contact with a granite stock. The vein, exposed in an open-cut and a shallow shaft, has a maximum width of about 6 inches and, in places, pinches down to a knife edge. Parts of it are well mineralized with chalcopyrite and pyrite and high gold values are reported.

Below the road and to the south of the open-cuts a crosscut adit has been driven. Little or no vein matter was encountered.

There seems no possibility of any considerable tonnage being developed from this vein, and only the high gold values reported make it of any interest.

(24) Valporaiso Group

References: B.C. Minister of Mines Repts.: 1900, p. 855; 1926, p. 285; 1927, p. 320; 1929, p. 356; 1933, p. 239.

The Valporaiso group lies at an elevation of 4,000 feet on the east side of Kootenay Lake directly above Columbia Point.

The property was staked prior to 1900. After various attempts to mine failed, it was acquired by the Sanca Mines, Limited, and leased by them to the Canada Smelters in 1933. Within the last two years several claims have been restaked by local inhabitants.

The principal deposit is a persistent quartz vein, with a north-south strike and an easterly dip of about 45 degrees, occurring in a large granite stock close to its contact with sediments. The vein is well exposed in shafts, adits, and open-cuts, and has been more or less continuously traced for a distance of 1,500 to 2,000 feet and probably continues considerably farther. It varies in width from 1 to 25 feet and probably averages between 3 and 5 feet. It is mineralized with pyrite, arsenopyrite, chalcopyrite, sphalerite, and galena, but only the two former are abundant. Gold occurs associated with the sulphides. Sulphides are scattered all through the quartz, but the principal concentrations are in bands of almost solid sulphides from a few inches to a foot in width.

The section of the vein best exposed is in drifts north and south off a crosscut adit where the vein has been opened up over a length of 200 feet. The last 120 feet of the north drift exposes a well-mineralized vein, and the face is also well mineralized. This shoot is from 2 to 3 feet wide with 6 to 8 inches of solid pyrite and arsenopyrite in places. South of this section the vein is low grade for about 80 feet, but in the face of the south drift the vein is again well mineralized. The vein in the main shaft on the Gold Relief is from 2 to 3 feet wide near

the collar, but the air was too bad to permit descent into the shaft. Well-mineralized sections of the vein are also exposed in several of the open-cuts.

Other parallel veins are reported, but were not seen by the writer.

The persistence of the vein, the apparent close spacing of ore shoots, and the proximity to transportation suggest that this deposit might be of economic value. The critical factor is, of course, the gold content, and this can be determined by careful sampling of the existing showings. In 1933 a trial shipment of 322 tons was made and returned 0.34 ounce of gold and about 3.5 ounces of silver to the ton.

(25) Gold Basin. This is an old property restaked in 1936 by J.W. Mullholland of Sanca Creek, B.C.

It lies in German Basin at an elevation of about 7,000 feet, on the south side of Akokli Creek. It is reached from the main highway along the east side of Kootenay Lake at Columbia Point by a trail about 5 miles long.

The deposit is essentially similar to the Valporaiso (24) and consists of a quartz vein in the same granite body as that deposit close to its contact with sediments. The vein is exposed for several hundred feet by closely spaced open-cuts. At least two adits, one several hundred feet long, and several raises have been driven on the vein, but these were inaccessible at the time of the writer's visit. The main adit is, however, being reopened by the present holders.

The vein strikes roughly north-south and dips about 30 degrees west. It is from 3 to 8 feet wide and is mineralized with galena, pyrite, and chalcopyrite. Gold values are reported. In one place the vein carries some light yellow scheelite (calcium tungstate).

(26) Lakeshore Mine

References: B.C. Minister of Mines Repts.: 1932, p. 195;
1933, p. 239.

The Lakeshore mine is situated beside the main highway along the east side of Kootenay Lake about one-half mile south of Sanca Creek. It is owned by W.R. Long and E.G. Timmons.

Round the mouth of Sanca Creek a small roof pendant of badly altered sediments occurs in a large body of granite. Near the south contact of this roof pendant with the granite the sediments have been deformed by a zone of fracturing running roughly north-south at right angles to the contact.

About 300 feet from the contact a shaft has been sunk on this zone, which here lies along the side of the road. Below the road, 50 to 100 feet vertically below the collar of the shaft, a crosscut adit has been driven which cuts the fracture zone some 50 feet north of the bottom of the shaft and with which it is connected by a drift along the zone. Short sub-level drifts have been driven north and south off this shaft from about half-way down it.

The fracture zone is from 10 to 20 feet wide and has involved, in places, a porphyry dyke. Lenses of galena, sphalerite, and a little chalcopryite and pyrite occur along this zone, most frequently as replacements of the dyke. Post-mineral faulting has shattered these lenses and, in places, dragged out ore along the zone. The largest lens is near the collar of the shaft where massive sulphides occur over a width of 3 to 4 feet and for about 20 feet both horizontally and vertically. In the sub-level drifts lenses are smaller and discontinuous. In the drift on the lower level ore is confined to two narrow veinlets on the two walls of the fracture zone.

The massive nature of the sulphides in the lenses has made it possible to make small shipments of clean ore, but the small size of the lenses and the amount of barren rock between them makes it unlikely that even small-scale operation will be profitable.

(27) Kitchener Iron Ore Deposits (Includes the Great War and C.P.R. groups)

References: B.C. Minister of Mines Repts.: 1919, p. 137; 1921, p. 147. Young, G.A., and Uglow, W.L.: Geol. Surv., Canada, Ec. Geol. Ser. 3, 1928, "Iron Ores of Canada, Vol. 1, British Columbia and Yukon".

Thirty-three Crown-granted claims and fractions have been located on Iron Range Mountain to the west of and parallel-ing Goat River north of Kitchener. On these claims a number of open-cuts, shafts, and adits have exposed a zone of fracturing running roughly north-south and dipping steeply west. This

zone is part of the main system of faulting that runs from the International Boundary near Creston in a north to northeast direction across the area. The fracturing involves Aldridge argillaceous quartzites and argillites and diorite sills. Hematite-quartz lenses from 2 to 20 feet wide and of undetermined length occur along this zone. The ore varies from nearly solid hematite to brecciated quartzites healed with quartz and hematite.

The property has been very completely reported on by Young, and the reader is referred to his description for fuller information. The observations of the present writer have fully borne out Young's conclusions. The quartz and hematite were evidently deposited by hydrothermal solutions passing along the zone of fracturing. These solutions probably originated from the granitic magma.

Regarding the economic possibilities Young says: "Unless then, the ore-bodies are long, or wider bodies remain undiscovered, or certain areas are characterized by a number of relatively small bodies so situated with respect to one another as to permit of economic mining methods, it is evident that the deposits on Iron Range Mountain are only of slight prospective value."

(28) Leadville Group

References: B.C. Minister of Mines Repts.: 1894, p. 739; 1900, p. 853; 1925, p. 250.

The Leadville group is situated on Goat River 5 miles by trail from Kitchener. An adit, shaft, and open-cuts, all in poor repair, expose several quartz-calcite veins in a large diorite sill. The vein in the adit is about 18 inches wide and well mineralized with chalcopyrite, galena, sphalerite, and some pyrrhotite. The width of the other veins is not known.

(29) Empire State Claim. This property, owned by W. Belger of Kitchener, B.C., is situated on the flats on the west side of Goat River 2 miles by auto road from Kitchener.

Open-cuts expose a tabular mineralized zone crossing a large diorite dyke. In the centre of this zone fractured and foliated diorite is traversed by stringers of quartz and calcite mineralized with chalcopyrite and pyrrhotite. On each side sulphides of the same kind are disseminated through more or less unaltered diorite. In the lowest open-cut, near the contact of the dyke with sediments, the zone is 4 to 5 feet

wide and well mineralized throughout. Away from the contact the mineralized zone is narrower and the sulphide content smaller until, 40 or 50 feet from the lowest open-cut, sulphides disappear almost completely. The localization of the disseminated ore along a zone of fracturing suggests that the sulphides were deposited from hydrothermal solutions rather than by magmatic segregation, an hypothesis that has been suggested for these disseminated deposits. The presence of nickel was reported by the owner and an analysis of the almost pure pyrrhotite made by Mr. Ellsworth of the Geological Survey gave 0.52 per cent of that metal.

(30) Delaware Prospect

References: B.C. Minister of Mines Repts.: 1928, p. 354;
1929, p. 360.

The Delaware prospect is situated at an elevation of 4,500 feet on the south slope of Rolf Mountain, to the north of Goat Mountain.

The deposit consists of quartz veins in strongly sheared Aldridge quartzites. It has been developed by two adits.

The lower adit is about 175 feet long. The first 135 feet has been driven along a quartz vein varying in width from a few inches to 5 or 6 feet. Near the end of this part of the adit the vein passes into the left wall. A short crosscut to the left picks up the vein, but the drift off this crosscut is to the left of the vein. At the face of this part of the drift quartz once more appears, but is probably another vein. A considerable amount of quartz, much of which carries galena, is piled on the dump. No other sulphides were seen.

The second adit is 50 feet long and lies about 50 feet vertically above the first. It is driven along a strong vein of vuggy quartz, which is up to 20 feet wide but pinches and swells, as does that in the lower tunnel. The vein in the face shows a considerable amount of galena.

(31) Senasael Group. This property is situated a little over a mile west of Kitchener, on the hillside about 1,000 feet above the railway. It is owned by Harry Redmile, of Kitchener, and associates.

The deposit consists of a quartz-calcite vein cutting across a relatively flat-lying diorite sill about 100 feet thick. Near the upper contact of the sill the vein is about 8 feet wide

and well mineralized with chalcopyrite and pyrrhotite. The amount of sulphides and the width of the vein decrease rapidly away from the contact until, about half-way down the sill, the vein is very narrow and almost barren. Near the bottom of the sill the vein widens out again, but is practically barren.

Although the open-cut in the vein near the top of the sill exposes a good width of well-mineralized vein, the deposit is probably confined to a fairly narrow zone along the upper part of the sill and it is doubtful if enough ore could be developed to make mining profitable.

(32) Creston Hill Mining Company

References: B.C. Minister of Mines Repts.: 1919, p. 138;
1934, p. E27.

The property of the Creston Hill Mining Company of Spokane, Washington (the old Sullivan group), lies on the north flank of the mountain above the railway, about 2 miles west of Kitchener.

The deposit is essentially of the same type as the Senasael (31) deposit and consists of several quartz-calcite veins cutting a flat-lying diorite sill probably a little over 300 feet thick.

A shaft and open-cuts on the main vein at the top of the sill expose a quartz-calcite vein 4 to 5 feet thick, well mineralized with chalcopyrite and pyrrhotite. Open-cuts farther down the sill expose the vein, which here shows very little sulphide. Near the bottom of the sill a long tunnel has been driven, in which little vein matter has been encountered. Several other good-sized veins are exposed in open-cuts, but none is as well developed as the main vein.

The value of the property hinges on the grade of the ore in the veins near the top of the sill, and on the depth to which the workable ore persists. The writer's impression is that 50 feet is probably a maximum for the latter.

(33) Alice Mine

References: B.C. Minister of Mines Repts.: 1900, p. 854; 1901, p. 1035; 1903, p. H149; 1904, p. 133; 1905, p. 169; 1909, p. 119; 1925, p. 249.

The Alice mine is situated on the west slope of Goat Mountain, 2 miles by auto road north of Creston. It is owned by F. Staples and associates, of Creston.

The property has been worked intermittently since 1900. Several hundred feet of underground work has been done and a number of carloads of ore shipped.

The deposit consists of veins and lenses of galena, with only a little pyrite and quartz and almost no sphalerite, in strongly sheared and faulted argillaceous quartzites in the main zone of faulting running north from Creston. Post-mineral faulting has disturbed the ore in many places, so that shoots are both difficult to find and to follow. No large ore shoots have as yet been found, but the absence of zinc and excellent transportation facilities make the ore ideal for small-scale operation with hand sorting. The ratio of silver to lead is about $1/3$ ounce to 1 per cent.

LM