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GEOLOGICAL REPORT No. 1

LAUNAY TOWNSHIP

ABITIBI COUNTY

by

S. H. Ross



QUEBEC

RÉDEMPTI PARADIS

PRINTER TO HIS MAJESTY THE KING

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1939

LAUNAY TOWNSHIP

ABITIBI COUNTY

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LAUNAY TOWNSHIP

ABITIBI COUNTY

by S. H. Ross

INTRODUCTION

The report that follows presents the results of field work carried out by the writer in Launay township, Abitibi county, during the first half of the summer of 1937. The remainder of the season was devoted to the inspection of mining properties in those townships adjoining the Canadian National railway from Amos west to the Quebec-Ontario boundary, comprising, east to west, the townships of Dalquier, Trécesson, Launay, Royal-Roussillon, La Sarre, La Reine, and Desmeloizes. This inspection report was issued early in 1938 (1).

The object of the exploration in Launay township was three-fold. First, to trace and study from an economic viewpoint the eastern contact-zone of the Robertson Lake granite batholith with the Keewatin and to explore the adjacent area for outliers of the granite in the Keewatin and for mineralization. Second, to examine in detail all mining properties, prospects, and claims in the township. Third, to make a complete outcrop-map of the township on a scale of one inch to one mile.

Launay township is forty miles east of the inter-provincial boundary. The adjacent townships are: on the east, Trécesson; west, Privat; north, Guyenne; and south, Manneville. The west township-line is one mile east of Robertson lake and the village of Taschereau on the Canadian National railway, which crosses the middle of the township from east to west in ranges V and VI. The area of the township is approximately 100 square miles.

Most sections of the township are readily accessible by road. The east-west highway-route 45 crosses the township in range V. Intersecting this at Launay station is an automobile road, passable in dry weather, which traverses the central section of the township, following the west edge of a sand plain. This road extends several miles beyond the north limit of the township and south to the property of Quebec Consolidated Gold Mines, Limited, on Labretèche creek, one mile north of the south township line. Gravel roads also run north and south for two to three miles from the main highway along the east and west township lines, and a road branching from the highway follows lot-line 45-46 southward for two miles and then turns east along range-line II-III, continuing to

(1) Que. Bur. Mines, Preliminary Rept. No. 120, 1937, pp. 1-12.

the township line. A new road is under construction extending from lot-line 4-5, range-line III-IV, south for two miles to the property of Freegold Mines, Limited, in range II. Several old logging roads lead north from the main highway for three to four miles.

The north half of the township is devoid of canoe routes. The south half is traversed by the Villemontel river, which is navigable for about thirty miles of its length of forty miles across the township.

Portions of Launay township were mapped by A. H. Lang, in 1932, and by L. J. Weeks, in 1933. The field work of the writer consisted in re-examining many of the exposures shown on previous maps, locating additional outcrops, and studying the mineral deposits in detail. In this work he was ably assisted by F. Turcotte, J. C. Brown, and W. McDunnough.

For information and ready co-operation, the writer is indebted to Mr. Swayne Wendt-Wreidt, representative of the Quebec Consolidated Gold Mines, Limited, and to the staffs of Freegold Mines, Limited, and Rochette Gold Mines, Limited.

PHYSICAL FEATURES AND GENERAL CHARACTER OF THE AREA

Launay township lies within the clay belt that forms a large part of the northern region of Quebec and Ontario. The township may be subdivided conveniently into three physiographical divisions: the clay lowlands; a sand plain with morainal hills and ridges; and the rocky uplands. The first two divisions comprise practically 90 per cent of the area; rock outcrops occupy only about 8 per cent. Until recently, settlement had been restricted to the south half of the township, but homesteads are now being taken up in the western section, along range-line III-IV, and in the east, along range-line II-III. Launay station is at the centre of the township at an elevation of 1,067 feet.

A long, narrow sand plain, trending north and varying in width from 1,000 feet to 6,000 feet with an average of about 2,500 feet, occupies the central portion of the township. It is widest in ranges III and VII. Within this plain, crescent-shaped dunes with convexity to the east are fairly common, and kettle holes, some of them as much as 700 feet in diameter, occur at several localities. Most of the sand is extremely fine in grain, but in the south, where the Villemontel river cuts through the plain, several hills of stratified glacial débris, resembling kames, and an esker 6,000 feet long trending N.20°W., contain coarse sands, grits, and gravels. The physical character of the sand, the crescent-shaped dunes with convexity facing east toward the direction of the prevailing wind, and the kettle-holes, indicate that the sand plain originated through wind action on the surface of outwash plains.

This sand plain forms part of a large sand area which occupies a considerable portion of the townships of Privat, Guyenne, and Languedoc, and extends south into Manneville.

Small hills and ridges composed of sand, gravel, and boulders occur at various points within Launay township and in many places such material surrounds rock outcrops.

The rocky uplands are characterized by considerable relief, with northwesterly trending hills and ridges rising 150 to 200 feet above the clay lowlands. The most prominent of these uplands is the Robertson Lake granite batholith, in the west-central part of the township, which forms a high ridge with steep, rocky bluffs. Another pronounced ridge, about one and a half miles long and half a mile wide, trending north and south, rises directly east of the centre-line in ranges VII, VIII, and IX; its highest point, 1,199 feet above sea level, is the site of a Geodetic Survey triangulation station, located on lot 33, about 1,200 feet south of range-line VII-VIII. The most prominent topographical feature in the south half of the township is a ridge which rises abruptly about 150 feet above low ground-moraine and swamp land in lots 6 to 12, range IV. It can be seen for miles. There is a large upland area in lots 42 to 54, range IX, and several ridges are conspicuous along the northwest border of the township. In the southern part of the township, a few scattered ridges occur with bare, abrupt, rugged slopes, but most of the rock exposures consist of small, low, rounded ledges and knolls which project through the clay and are partially covered with gravel and boulders.

Two large rivers, the Villemontel and the Chicobi, have their source in Launay township. The Villemontel drains about three-quarters of its area. It follows a devious course of some forty miles across the southern half of the township, flowing, in turn, southwest, southeast, north, and southeast. With this direction it passes into Trécesson township, and finally it turns south to join the Kinojevis river in Villemontel township. It is joined at about midway of its course through the township by Labretèche creek, which rises in Manneville township and flows north.

The Chicobi flows northeast, draining Doyon lake. A smaller river, the Chevreuil, flows southwest for six miles across the northwest quarter of the township, entering Robertson lake in Privat township.

The subsidiary drainage consists of numerous small creeks and streams which vary widely in width and gradient.

There are no important lakes in Launay township. The largest is Doyon, 3,000 feet long north and south and 1,800 feet wide. Most of the lakes owe their form to the glacial drift deposited upon the bed-rock surfaces. They are therefore quite shallow. A few kettle-holes, now the sites of small ponds, occur in and adjacent to the sand plain.

Areas of muskeg are small and relatively unimportant. The largest, about one mile long east and west and 4,000 feet wide, is in range IX, on the east boundary of the township.

GENERAL GEOLOGY

The solid rocks of the township are all of Precambrian age. About four-fifths of the area is underlain by Keewatin volcanics, chiefly andesitic but including also acidic and basic types. Volcanic breccias

and tuffs, in very minor amount, are interbedded with the flows. Some narrow bands of iron formation are exposed on the property of Quebec Consolidated Gold Mines.

The Keewatin rocks are all highly folded, with steep to vertical dips. The characteristic alteration of the andesites, particularly along certain well developed zones of shearing, is chloritization, with lesser carbonatization.

The Keewatin rocks have been intruded in places by igneous rocks of diverse composition and including, in order of age from older to younger, peridotite, diorite (older gabbro), syenite, granite and related rocks, and 'later' gabbro. There are one or two relatively large bodies of granite and syenite, but otherwise these rocks occur as dykes or sills. From comparison with similar rocks in the townships both to east and west of Launay, it is believed that the intrusive rocks are all post-Temiscomian in age. There is no actual proof of this, however, as no Temiscomian rocks are known in the township.

TABLE OF FORMATIONS

RECENT AND PLEISTOCENE		Recent alluvium and glacial drift (chiefly clay) Sand, with some gravel and erratics Eskers Sand and gravel knolls and ridges
<i>Great unconformity</i>		
PRECAMBRIAN	Post-Temiscomian (?)	Olivine-gabbro and quartz-gabbro (later gabbro) Quartz-porphphyry, quartz-feldspar-porphphyry, feldspar-porphphyry, aplite, pegmatite Porphyritic granite, biotite-hornblende granite, hornblende granite and syenite, granodiorite Diorite, quartz-diorite (older gabbro) Peridotite
	<i>Intrusive contact</i>	
	Keewatin	Breccia, tuff, acidic extrusive rocks (trachyte, dacite, rhyolite) Basic extrusive rocks, chiefly andesite, basalt, flow breccias, fragmental lavas; iron formation

KEEWATIN

Keewatin rocks underlie about four-fifths of the area of the township, occurring as low knolls and ridges which parallel the prominent northwest shearing in these rocks. They consist of flows, usually of intermediate composition, with associated narrow bands of volcanic and tuff breccia, and thinly bedded recrystallized tuffs. Trachyte and rhyolite are less common than andesite; basalt is rare. The individual flows range in thickness from a few feet to several hundred feet. In places they exhibit ellipsoidal, brecciated, and ropy structures, in order of prevalence. Banded iron formation was observed on the Quebec Consolidated Gold Mines property, in lot 26, range II, where narrow bands of ferruginous chert and pyrite, two feet wide, occur in andesite and strike N.85°E. Altered fine-grained recrystallized tuffs and phyllites lie in steeply folded synclines and are conformable with the adjoining lavas.

BASIC AND INTERMEDIATE LAVAS:

The andesite flows are typically somewhat basic in composition, but gradations to acidic types are met with. Although the area underlain by these rocks is large, outcrops are relatively small, the largest, in lots 42 to 54, range IX, occupying an area of two square miles. The rocks are normally brownish on weathered surfaces and dark grey to green when fresh. The grain is usually fine, giving them a dense, almost glassy, aspect, often with a mottled appearance due to the presence of dark greenish-black specks. In the coarser types, the grain-size varies from 2 to 3 mm. Disseminated pyrite crystals, one millimeter in diameter, are frequently present in these rocks in the vicinity of intrusives. In shear-zones, the rock has been converted to a chlorite schist and is often carbonatized. The characteristic alteration, however, is chloritization.

Well developed pillow structure is not common. Where seen, the pillows average two feet in length, with a maximum of six feet. In lot 11, range IV, these pillow lavas have a westerly strike and their tops face south, and in lot 8, range-line I-II, they trend N.75°W. and their tops face southwest. On the other hand, in lots 60 and 61, range I, lot 45, range VII, and lot 47, range VIII, they strike northwest and their tops face northeast. This would indicate an anticlinal structure whose axis strikes northwest.

Ropy lava, in bands 100 feet wide which alternate with bands of flow-breccia and massive lava, is exposed in lot 38, range V, south of the Canadian National railway. Here, a cross-section from north to south shows flow-breccia, ropy lava, massive lava, and ropy lava.

Bands of coarse fragmental rock, intercalated between the flows, are common. They vary in width from 3 to 35 feet and consist of angular, as well as rounded, fragments of lava up to several feet in diameter in a chloritic matrix. The bands strike N.30°-50°W. Typical examples of this rock were seen in lot 33, range-line VIII-IX, and in lot 51, range IX.

Vesicular lavas, with quartz-filled amygdules ranging from one-eighth of an inch to four inches in diameter, occur intimately associated with breccia bands for widths up to ten feet. Such amygdaloidal bands were observed in lot 33, range VIII, just north of a Geodetic Survey triangulation station, and in lot 43, range IV.

TUFF BRECCIA, TUFF, AND ACIDIC EXTRUSIVES:

Tuff Breccia.—These rocks consist of rounded and angular fragments of all sizes up to four feet in diameter embedded in a matrix of finer fragments down to the size of dust. The strike of the bedding is N.30°-50°W. An excellent exposure of tuff breccia occurs in lots 60 and 61, range I, and other good examples were seen in lots 40 and 45, range IV, and in lots 34, 35, and 36, range VII.

Tuff.—Bands of fine-grained tuffaceous rock occur in the northern part of the township. They are best exposed in lots 4 and 5 in the extreme northwest corner, at the Launay-Guyenne boundary. Here, the bands range from 50 to 100 feet in width. The bedding is almost entirely obscured by shearing, at N.30°W., but it appears to strike in a northwest direction and to dip steeply to the northeast. Typically, the rocks are micaceous schists and phyllites, light grey to black in colour; but in some bands associated with bodies of rhyolite and trachyte, the rock is rusty, ferruginous, and carbonatized, with a pock-marked surface due to the leaching of the carbonate. In general, weathered outcrops exhibit a fine corrugated appearance, the result of differential weathering of the individual beds.

A very wide band — 600 feet — occurs in lots 34 and 35, on the north township-line. The beds strike N.35°W. and dip at 66° to the northeast. On the northeast, the tuffs are in contact with pillow andesite.

Light coloured cherty bands within the rhyolite and trachyte flows elsewhere in the township are probably tuffaceous in origin.

The tuffs have yielded readily to pressure. A band in contact with hornblende syenite on the north township-line is highly contorted in symmetrical folds (Plate I-C). Well developed drag-folds were also seen. In each case, the indicated movement was along a line striking N.30°E., with the south side displaced to the southwest.

Dacite.—In the field, fine-grained, light coloured and grey lavas, usually with no visible quartz, were classed as trachyte or dacite. In some places, rocks of this type which resemble andesite but contain a little quartz, occur at the margin of the granite masses. On weathered surfaces they show feldspar phenocrysts 2 to 5 mm. long in a glassy, green groundmass.

Porphyritic dacite which grades into ellipsoidal andesite is interbedded with bands of tuff breccia up to 25 feet in width, striking east, in a prominent ridge on the property of Rochette Gold Mines, in lots 7 to 12, range IV. A body of somewhat similar dacite, with quartz phenocrysts one to two millimeters in diameter, occurs in lot 20, range-line IV-V.

Trachyte and Rhyolite.—Highly siliceous rocks, which vary in colour from pale brown to white, or with pale sea-green tints, and which contain visible quartz, are classed as rhyolite; rocks similar in appearance, but more altered and without quartz, as trachyte. The two types occur together, weather alike, and are associated with bands of tuff breccia.

A highly sheared and altered body of trachyte and rhyolite, which is in part porphyritic and may be intrusive, occurs directly east of the centre line in ranges VII and VIII. The rock varies in colour from pale brown to greenish-white. The shearing is in two directions, namely, northeast and northwest.

Rhyolite and trachyte occurring about 250 feet south of lots 34 and 35, range-line VIII-IX, have been intensely sheared to a fissile sericitic schist, pale brown to white on weathered surfaces, with N.10°E. strike and dip 70° to the east. Their continuity is interrupted by a series of step-faults, about 75 feet apart, striking N.65°W. and dipping 45° to the northeast. Weathered surfaces of these rocks are mottled with specks of limonite or pitted with cavities due to leaching. Andesite flows in the vicinity do not exhibit this feature.

A band of sheared, light-coloured rhyolite occurs on the north township-line in lots 60 and 61. The rock is sheared in a northwest direction and is cut by a quartz-diorite dyke, 100 feet wide and 1,000 feet long, striking N.30°W.

Tuffaceous rhyolite occurs on the property of Quebec Consolidated Gold Mines in lot 27, range II, as a band 25 feet wide which strikes N.80°W.

White porphyritic rhyolite forms a band ten feet wide in lot 33, range VII. In this rock, phenocrysts of quartz and mica, one millimeter in diameter, are distributed through a white aphanitic groundmass of quartz, feldspar, and sericite.

Several small bodies of sheared porphyritic and tuffaceous rhyolite occur in lots 7 and 8, range III. The tuffaceous rhyolite is white with a sea-green tint and displays indistinct banding, the individual bands averaging 3 mm. in thickness. The porphyritic rhyolite is brownish in colour. In all these occurrences, the strike of the schistosity is N.70°W.

The characteristic alteration of the rhyolitic and trachytic rocks is sericitization.

POST-TEMISCAMIAN (?)

PERIDOTITE:

Peridotite, largely altered to serpentine, occurs near the eastern boundary of the township, immediately north of the Canadian National railway. Three bodies of the rock outcrop along a line striking N.45°W. and they appear to be parts of a single dyke or sill. The outcrops are

characteristically smooth and well rounded, and the rock has a somewhat soapy feel.

The most southerly of these three bodies is the largest. It outcrops on the east township line, in range V, as three parallel ridges, and on its northeast side is in contact with pillow andesite. The easterly ridge is composed of soft, dark green, fine grained rock, largely altered to serpentine; on weathered surfaces, it is dark brown. This rock closely resembles that of a mass in range X of Figuery township which has been classed as amphibolite. The rock of the southerly ridge is somewhat different in appearance, having a light greenish-grey colour and a spheroidal weathering which simulates pillow structure; also, it is cut, on the southwestern side of the ridge, by a later peridotite dyke, about 50 feet wide, which strikes N.82°W. The dyke weathers rusty-brown. Narrow veinlets of asbestos (chrysotile) traverse both ages of peridotite in this ridge. The peridotite, now composed almost entirely of serpentine, with some residual crystals of olivine, contains much disseminated fine-grained magnetite, due to which magnetic deflection over and in the vicinity of outcrops amounts to as much as thirty degrees.

The second of the three bodies of peridotite referred to is in lot 47, range VII, and the third, which is the smallest, outcrops seven lots farther west. In these bodies, the peridotite is of the light greenish-grey type.

DIORITE AND QUARTZ-DIORITE (Older Gabbro):

Bodies of diorite and quartz-diorite of irregular shape and ranging from a few hundred feet to 1,000 feet in diameter, and a diorite dyke that varies in width from 50 to 100 feet, cut the Keewatin volcanics in the north half of the township. The dyke and most of the other bodies have a northwest trend.

These rocks exhibit great variations in texture and a considerable range in composition. They are characterized by absence of shearing and apparently were intruded after the Temiscamian folding of the area was completed. They occur associated with peridotite bodies but are much fresher in appearance than the latter and probably intrude them. The fresh rocks are grey with a greenish cast and they weather dark green to greenish-brown. They are composed largely of dark green to black prismatic crystals of hornblende, in part altered to chlorite, and variable amounts of calcic plagioclase which is considerably altered and often greenish coloured. Quartz, when present, is in small amount.

The diorite dyke referred to cuts basic, ellipsoidal andesite in lots 49, 50, and 51, range IX. In its coarser phases, the grain size is 3 mm. Both on fresh and weathered surfaces the rock closely resembles the 'later' olivine-gabbro.

The diorite bodies occurring in lot 37, range IX, and lot 32, range X, are also fresh in appearance, like the 'later' gabbro. However, they exhibit a texture, consisting of well defined, needle-like hornblende crys-

tals scattered thickly through the rock, which is never present in the gabbro.

A flat-lying sill-like body of diorite, 80 feet wide and 200 feet long, dipping at a low angle to the west and striking N.37°E., intrudes porphyritic dacite in lot 8, range IV. Cutting both rocks is a mineralized quartz vein, two and a half feet wide, which strikes N.20°W. and dips 50°E.

A body of coarse grained (2 mm.) quartz-diorite occurs in range V, directly north of Launay village; and in lot 47, just south of range-line VII-VIII, is an outcrop, about 200 feet in diameter, of similar rock in contact with peridotite.

Scattered outcrops of diorite and quartz-diorite occur north of the granite mass in ranges VIII and IX. Actually, the rocks in these outcrops range in composition from dense hornblende types with no quartz on the one hand to granodiorite on the other, and in general they resemble strongly the Guyenne hornblende syenite farther north. They are here classified with the diorite and quartz-diorite because, like these rocks, they consist predominantly of hornblende and calcic plagioclase.

GRANODIORITE:

Several small intrusive bodies, 400 to 600 feet in diameter, intermediate in composition between the quartz-diorite and hornblende granite, occur at the contact between these rocks in ranges VII, VIII, and IX. They are classed as granodiorite. Weathered surfaces are usually light grey or white in colour, but the fresh rock is dark coloured and resembles diorite in texture. Typically, it is coarse-grained, averaging 2 mm., and consists of quartz (15 to 25%), hornblende (30 to 40%), and plagioclase feldspar. The body in lot 12, range IX, is cut by several barren tourmaline-quartz veinlets which strike N.75°E. In lot 12, range VII, milky quartz veins cut the rock at its contact with granite. The vein-zone is 15 feet wide and strikes N.30°E.

GRANITIC AND SYENITIC INTRUSIVES:

About one-fifth of the area of the township is underlain by granite or syenite, including the following types in order of age from the oldest to the youngest: hornblende syenite, biotite-hornblende granite, porphyritic granite, quartz- and feldspar-porphyry, and pegmatic and aplitic differentiates. With the exception of the 'later' gabbro dykes, these are the youngest intrusive rocks in the region.

These rocks occur as stocks, bosses, sills, and dykes—bosses being the most prevalent—which cut the Keewatin volcanics, usually with sharp contacts. They are usually massive and granitoid, but in places the structure is foliated, as in lots 4 and 5, range VIII, directly north of range line VII-VIII, and again in lots 11 and 12, range VII, directly north of range line VI-VII. In both instances, the shearing strikes slightly east of north.

Granite and Syenite.— The most abundant of these intrusive rocks is porphyritic granite. It contains, as an average, 30% quartz, 5% biotite or hornblende, and the balance feldspar. The hornblende and biotite content increase toward the margins of the masses, where the rock becomes a biotite-hornblende granite.

Hornblende syenite extends southward through range X and into range IX, from the mass of this rock in Guyenne township, which bounds Launay on the north. The rock consists of black crystals of hornblende, pinkish feldspar, biotite, and 5 to 10% quartz. The grain size averages 2 mm. The hornblende syenite is believed to be closely related to the granodiorite.

Quartz-Porphry.—Small dykes of quartz-porphry cut the acidic extrusive rocks. They vary in width from one to five feet, averaging two feet, and seldom exceed 100 feet in length. The strike is usually northwest, parallel to the most prominent jointing system, and the dip is to the northeast. The quartz-porphry can be identified easily by its white, weathered surface and porphyritic texture.

Examples of such dykes may be seen on the property of Rochette Gold Mines, in lot 10, range IV, and in lot 36, range VII, where a grey quartz-porphry dyke, 20 feet wide, strikes N.40°E., an exceptional trend for these dykes. Several white quartz-porphry dykes, averaging one foot in width, cut the rhyolite and acidic extrusive rocks on the north township-line, in lots 60 and 61. They have the usual northwesterly strike.

Feldspar-Porphry.—Feldspar-porphry dykes are of rare occurrence. One was seen in a prospect pit on lot 35, 160 feet north of range-line VIII-IX. It is about two feet wide and is exposed for a length of some 50 feet, with strike N.20°E., and dip vertical. It is fractured and cemented by a milky-quartz vein which is heavily tourmalinized.

Several feldspar-porphry dykes are exposed on the property of Quebec Consolidated Gold Mines, in lots 25, 26, and 27, range II. In these rocks, greenish-grey feldspar phenocrysts, 3 mm. long, are distributed through a dark green groundmass resembling dense basic andesite. The strike of the dykes is N.85°E.

A grey feldspar-porphry dyke, 30 inches wide, cuts the quartz-diorite mass in lot 47, range V. The strike is N.25°W. The dyke is faulted on a plane at right angles to the strike, with the north section offset dyke-width to the west.

Aplite and Pegmatite.—Aplite and pegmatite dykes, and quartz veins, are numerous cutting the granite masses and the older rocks adjacent to them. The pegmatites are characterized by large crystals of pinkish orthoclase, quartz, and biotite. The aplites are fine-grained and consist of quartz, albite, and biotite. Some of the pegmatitic quartz veins carry gold, and, in northeastern Privat township (which adjoins Launay on the west), molybdenite has been found in such veins.

OLIVINE GABBRO AND QUARTZ GABBRO (Later Gabbro) DYKES:

Two well defined, parallel dykes of 'later' gabbro occur in the northern part of the township. The longer of the two averages 50 feet in width and can be traced for three and a half miles, striking N.50°E. The other, in range VIII, directly east of the centre line, is 25 feet wide and can be traced for 3,000 feet. These dykes are easy to identify by their rounded, brown-weathered surfaces, which are in strong contrast to the rocks they intersect.

One or two similar dykes were observed elsewhere in the township. They are the youngest rocks in the area.

STRUCTURE

The structural features of the area may be divided into two main types, namely, those resulting from the folding of the Keewatin rocks and those connected with later fracturing and faulting.

The Keewatin rocks are highly folded into a series of anticlines and synclines, with the result that the flows and interbedded bands of tuff and tuff-breccia have a nearly vertical attitude. The axis of folding strikes in a general northwest direction, which is also the direction of the predominant shearing and fracturing in the area.

In the northwest quarter of the township, the average strike of the schistosity is N.25°W., but locally it is N.20°E. The schistosity with the latter trend may have been produced by the granitic intrusives. In the northeast quarter, the average strike is N.45°W.; and in the central part, in ranges VII and VIII, it averages N.30°E., but in places has a northwest trend, the variation being possibly due in part to minor intrusions of porphyritic rhyolite.

Two parallel zones of shearing, striking N.75°-80°W., occur on the properties of Quebec Consolidated Gold Mines and Freegold Mines. These zones lie approximately along the synclinal axis of the Privat band of Upper Keewatin altered tuffs, which strikes N.70°W. at its extreme southeast end, in Manneville township.

In the northeast quarter of the township, flow tops face northeast; in the southwest, they face southwest and south. Well developed pillow structure and bands of tuff-breccia occurring in the southeast of the township indicate that the tops of the flows there face north. The attitude of the flows thus indicates an anticlinal structure extending through the township in a general southeast direction.

The strike of the bedding, as indicated by exposures of tuff-breccia bands, is N.15°-25°W. in the north and central portions of the township and N.35°-45°W. in the south. A sharp change in the strike of the bedding and schistosity in the trachyte and rhyolite in ranges VII, VIII, and IX, directly east of the centre line, may indicate the presence of a minor fold whose axis strikes N.20°E. Bedding striking N.75°E. in lot 10, range IV, may be discounted because of nearness to the granite. A

clearly defined flow-contact, striking N.40°W., between flow breccia on the northeast and massive lavas on the southwest occurs in lot 32, range VII, 2,000 feet north of range-line VI-VII.

Drag-folding occurs along axes whose strike varies from N.45°W. to N.70°E., but the predominating direction is N.45°W., with movement of the north side northwest relative to the south side.

The attitude of the flows, the strike and dip of the bedding of the tuffs and tuff-breccias, and the direction and movement of the dominant drag-folding, all indicate that an anticlinal structure exists between the Guyenne band of tuffs exposed in northern Launay and the Privat band to the southwest. The axis of this anticline appears to extend southeast through the township from the northwest corner to the centre of the south township-line. The band of acidic extrusives in the northwest, central, and southeast sections of the township apparently lies on the south limb of a synclinal structure to the northeast of the major anticline.

Fracturing in the township occurs in two directions, namely, northwest and northeast, the former being the more prevalent. The strike of the later-gabbro dykes and the direction of the depression occupied by Chevreuil creek correspond to the northeast fracture system in the northwest quarter of the township.

The series of normal step-faults striking N.65°W. and dipping 45° northeast, in lot 35, range VIII, correspond to the movements which might occur on the limb of a syncline lying to the northeast.

ECONOMIC GEOLOGY

There are no producing mines in the township. The mineral deposits discovered to date are gold-quartz veins, carbonatized and silicified shear-zones, and replacements containing disseminated sulphides and gold values. The most important deposits occur in fractures or shear-zones in the Keewatin lavas where they are intruded by quartz veins. Other mineral occurrences consist of large pegmatitic quartz veins cutting the granitic rocks, and quartz veins associated with quartz-porphry and feldspar-porphry dykes.

FREGOLD MINES, LIMITED

Freegold Mines, Limited, was incorporated in Quebec in March, 1936, with an authorized capitalization of 3,000,000 shares of one dollar par value.

The property is in the southwest quarter of the township, nine miles from Taschereau, on the Canadian National railway. From that town, a good automobile road leads south two miles from route 45 (on range-line V-VI) along the west township-line as far as range-line III-IV. From this point to the mine, a distance of two and a half miles, the road was still under construction in the summer of 1937 and was passable only by teams. The mine may also be reached by following the

Quebec Consolidated Gold Mines road south from Launay station for four miles and then continuing westward for two and a half miles over a winter road in the south third of range II.

The property consists of thirteen claims, which total approximately 854 acres. Twelve of the claims are in one block, comprising lots 6 to 11 and the south half of lot 12, range II, and lot 7, range I. The remaining claim, which stands apart from the others, consists of the south half of lot 13, range VI. The claim numbers are: A.55624 to 55627, 55752, 55753, 57727, and 59558 to 59563. Development work has been mainly on claims 55624 and 55625, which form the south half of lots 8 and 9, range II.

The property is in an area of low relief and heavy overburden, through which the rock outcrops as low, rounded knolls or narrow, abrupt ridges with a northwesterly trend. With the exception of certain dykes, the rocks encountered are all Keewatin volcanics, chiefly andesite of somewhat basic type. Shearing, at $N.75^{\circ}W.$, is pronounced. It appears to be a continuation of that at the Quebec Consolidated Gold Mines property, three miles east, and it can be traced westward from Freegold ground for a mile and a half to Genest lake, in Privat township. There is also less prominent shearing at $N.80^{\circ}E.$ Numerous quartz veins, vertical or dipping steeply to the south, from a few inches up to three and a half feet wide, have intruded the volcanics. Most of them either parallel the schistosity or follow subsidiary fractures slightly inclined to it. They are probably genetically related to the Robertson Lake batholith, which is two and a half miles north of the property.

Andesite, felsite, and luxullianite dykes were reported encountered in the sinking of the shaft and in diamond-drill cores. The felsite is evidently later in age than the quartz veins, since the main vein is badly shattered where the felsite intersects it in the shaft.

The main vein cuts sheared and altered lavas, chiefly andesite, exposed in a ridge 1,000 feet long and 500 feet wide, with $N.60^{\circ}W.$ trend, which lies some 1,400 feet north of range-line I-II, on lot-line 8-9 (see accompanying map). It has been explored by means of a shaft (Figure 1) sunk to a depth of 125 feet and by 125 feet of drifting and cross-cutting at that horizon, and also by 3,000 feet of diamond drilling in eight holes.

The indicated length of the vein on surface is approximately 400 feet. About 30 feet west of the shaft, it is three and a half feet wide and strikes $N.70^{\circ}W.$, with dip 73° south. At the shaft, the width is five feet and the dip 80° south. East of the shaft, the vein does not appear at the surface.

The shaft was sunk in the vein, and, being vertical, it passed out of it at a depth of 33 feet. On the 125-foot level, a cross-cut was driven southward, normal to the strike of the vein, but where the latter should have been encountered it was found to be cut off by several intersecting dykes. From this point, a drift is being opened northwestward to pick

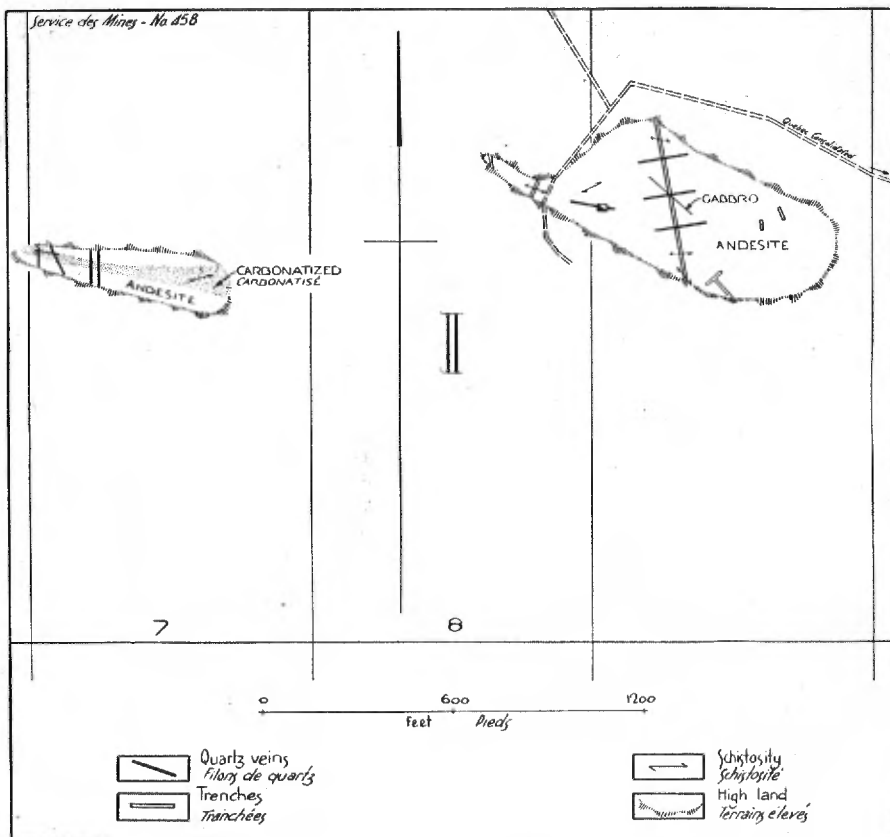


Figure 1. — Surface geology, Freegold Mines, Limited.

up the vein and also to intersect a well mineralized section of quartz that was encountered in drill-hole No. 3. On July 12th, this drift had advanced about 55 feet.

The vein consists of milky quartz with included fragments of chlorite schist (altered andesite), and bluish, vitreous quartz which appears to be later than the milky variety. The schist inclusions are heavily mineralized with finely disseminated pyrite (0.25 mm. grain), and pyrite is dispersed irregularly through the vitreous quartz. Arsenopyrite also is reported. Free gold, in very fine to microscopic specks, is associated with the pyrite in the schist and occurs also in the vitreous quartz.

The Company has reported that assays indicated \$15 in gold per ton across a width of five feet. A 4-foot channel sample cut by the writer across chlorite schist with quartz stringers at the face in the west drift on the 125-foot level yielded only a trace of gold; and a 30-foot channel

sample taken across a silicified and carbonatized zone exposed in an exploratory trench above diamond-drill hole No.5 gave only \$0.98 in gold per ton for the first 17 feet, and 'trace' for the remaining 13 feet, which was in highly sheared and carbonatized rock.

Diamond drilling results, as furnished by the Company, are summarized in the following table :

Hole No.	Dip	Strike	Depth	Remarks
1	45°	N.38°E.	271 ft.	Well mineralized schists for 70 feet. Assays 70 cents to \$1.40.
2	70°	N.38°E.	322 ft.	Well mineralized section from 176 to 180 feet. Assays 70 cents to \$15.40.
3	70°	N.25°E.	432 ft.	
4	60°	N.45°E.	208 ft.	Mainly chlorite schist and carbonatized schist. Section of quartz veins from 40 to 45 feet. Assays \$2.10.
5	65°	N.33°E.	580 ft.	Chlorite schist and carbonatized schist with small widths of granodiorite. Quartz veins having a maximum width of one and a half feet assayed from 35 cents to \$4.90.
6	70°	N.23°E.	464 ft.	Quartz veins in chlorite and rhyolite schist. Quartz-diorite dyke 2 feet wide. Quartz veins have a maximum width of 2 feet. Several faults indicated at a depth of 110 feet.
7	63° 30'	N.20°E.	258 ft.	At a depth of 90 feet a 30-foot section consists of quartz veins, two of which are about 6 feet in width.
8	Data not available			

Besides underground work and diamond drilling, a considerable amount of surface exploration has been carried out by means of stripping and trenching.

An exploratory trench 200 feet east of the shaft gives the following 500-foot section from south to north across the ridge already referred to:

Carbonatized and sheared andesite, including chlorite schist	170 feet
Quartz veinlets cutting basic green schists and striking N.80°E	15 "
Pillow lava	90 "
Chlorite schists in shear-zone, cut by 2½-ft. gabbro dyke striking N.49°W. and by a series of quartz veinlets parallel to the schistosity at N.80°E.	90 "
Coarse flow, cut by 18-in. quartz vein parallel to the schistosity	90 "
Phyllite (probably recrystallized tuff) sheared at N.76°W. and accompanied by minor folding	45 "

A carbonatized zone 1,200 feet west and 200 feet south of the shaft has been similarly explored. This zone follows the summit of a long, narrow ridge of basic andesite which rises rather abruptly from the surrounding swamp. It is about 700 feet long and 50 feet wide, with strike N.75°W. The zone is exposed by 14 trenches, averaging 50 feet in length, cut north and south at intervals of from 10 to 30 feet along the ridge. A series of short, lenticular veins varying in width from two inches to two and a half feet and striking from due north to N.26°W., cut the carbonatized zone normal to the schistosity, which is approximately east-west. There is evidence of movement parallel to the schistosity. This may have given rise to tension cracks, which would explain the presence here of cross veins. A 100-foot section from south to north across the carbonatized zone shows:

Carbonatized schist	30 feet
Dolomite, sheared at N.75°W.	6 "
Carbonatized schist	24 "
Dolomite schist, sheared at N.79°W.	10 "
Massive dolomite and dolomite schist	30 "

Buildings on the property include office, cookery, bunk house, power house, shaft, dry, smithy, and stable. A hydro-electric power-line passes within five miles of the mine.

There is a considerable supply of spruce and mixed timber on the property. Five or six acres surrounding the shaft have been cleared of timber and the wood cut up ready for use as fuel. The Villemontel river, one and a third miles north of the shaft, can furnish water sufficient for any requirements that may arise.

ROCHETTE GOLD MINES, LIMITED

Rochette Gold Mines, Limited, was incorporated in Quebec in September, 1936, with an authorized capitalization of 3,000,000 shares of one dollar par value.

The property is in the southwest quarter of the township, about six and a half miles by road from Taschereau. A good automobile road leads south two miles from route 45 on range-line V-VI, along the west township-line, as far as range-line III-IV. From this point to the property, a distance of two miles, the road is under construction and passable by team only.

The property consists of four claims, A.50394 to 50397, in one block, comprising lots 9 to 12, range IV, approximately 400 acres. The claims were staked by J. R. Rochette and C. L. Pickering, both of Taschereau, in 1934.

Water for all requirements is available in the Villemontel river, which flows through the north part of the property and is only 2,000 feet west of the main vein. The power line of the La Sarre Power Corporation passes along the highway one mile north of the property. Camp buildings include an office, a cookery, and a bunk house.

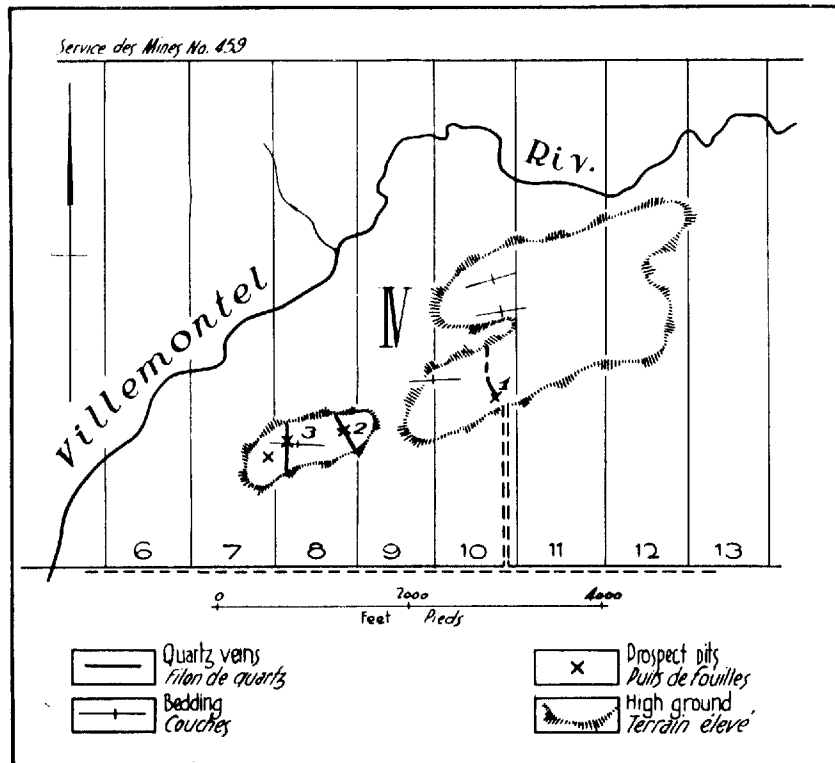


Figure 2. — Vein group on Rochette Gold Mines property.

A large, high ridge of Keewatin rocks, chiefly lavas and volcanic breccias, occupies about one-quarter of the area of the property. Surrounded on three sides by low moraine and swamp, and facing another ridge on the southwest, it is the most prominent topographical feature in the south half of Launay township and can be seen for miles, rising about 150 feet above the surrounding country. It is about 1,500 feet wide and 3,500 feet long, with a northeast trend.

The rocks exposed consist of a series of fragmental bands varying in width from 25 to 100 feet, striking N.75°E., alternating with porphyritic lavas which in many places exhibit well developed ellipsoidal structure.

The fragmental bands vary considerably in texture, and both flow and tuff breccias appear to be represented. Pillow structure is fairly common in the lavas, but exposures suitable for the determination of the attitude of the flows are rare. Usually, the ellipsoids are elongated in a direction parallel to the strike of the fragmental bands, N.75°E. The best exposure observed indicated that the tops face toward the south, with the strike of the flows N.80°E.

At the northeast tip of the ridge, the volcanics are cut by hornblende granite which occurs as a small knoll, 350 feet in diameter, flanking the steep northern cliff of the outcrop. This contact is 2,200 feet from the main showing on the property.

The main, or No. 1, vein is on claim 50395 (lot 10, range IV), 1,800 feet north of range-line III-IV, on the south edge of the ridge. It occupies a prominent fracture in a minor shear-zone which strikes northwest and dips at about 64° to the northeast. As exposed in a trench along the strike over a length of 340 feet, it varies in width from six inches to two feet. For 35 feet at the southern end of the exposed length, the strike is $N.40^\circ W.$, but beyond that it turns more northward, with strike $N.25^\circ W.$ The dip is to the northeast, with range from 48° to 64° .

The general features of the vein are best seen where it is exposed in a prospect pit 12 feet wide, 20 feet long, and 23 feet deep. An overhead trestle connects the pit to the ore dump (Figure 2). Here, the footwall consists of fragmental lava resembling a flow breccia, with fragments up to one foot in diameter, sheared at $N.40^\circ W.$ The rock actually in contact with the vein is a chlorite phyllite. The hanging-wall is a quartz-porphyrv dyke having a maximum width of 5 feet. It is characterized by a light olive-green to grey aphanitic groundmass in which are scattered a large number (5 to 10%) of conspicuous phenocrysts of quartz averaging 1 mm. in diameter. The rock is grey to green in colour, weathering white, and is largely altered to, or replaced by, serpentine and epidote. In contrast with this, the principal alteration of the country rock is chloritization.

The vein material is milky quartz, two feet wide. Mineralization, which consists of pyrite, chalcopvrite, and finely disseminated gold, is confined to schistose inclusions in the vein, the footwall schists, and the quartz-porphvry of the hanging-wall. The quartz itself is apparently barren. A grab sample taken by the writer from near the footwall, and consisting of mineralized quartz and mineralized schistose inclusions, assayed only a 'trace' of gold.

From two thousand feet of diamond drilling in ten holes, the vein is reported to maintain its width and to extend to a depth of at least 115 feet. The maximum width reported is 9 feet, in hole No. 3. The dip of the vein obtained from diamond-drill records varies from 48° to 52° to the northeast. At a footage of 128 feet 11 inches in inclined hole No. 2, the vein is reported to contain pyrite, sphalerite, chalcopvrite, pyrrhotite, galena, arsenopyrite, and visible gold. At this depth a vein width of 28 inches is said to have assayed \$425.25 per ton.

The Company proposes to sink a shaft a hundred feet northeast of the vein in order to intersect it at a depth of 150 feet.

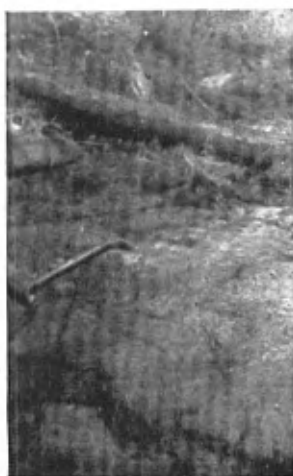
Two other veins on ground adjacent to the property, designated veins No. 2 and No. 3, have been explored by stripping and trenching. They are 650 feet apart, in lot 8, range IV, and both cut porphyritic



A.—Ellipsoidal grey lava, trending $N.30^{\circ}W.$;
lot 61, range I, looking north.



B.—Tuff breccia bands striking $N.36^{\circ}W.$;
lot 61, range I,
looking east.



C.—Symmetrical folding in
recrystallized tuffs, looking
 $N.60^{\circ}W.$; 600 feet north of
north township-line, on lot 18.



dacite. A quartz-porphry dyke, two feet wide, forms the footwall of No. 3 vein.

No. 2 vein is exposed for a length of 80 feet, striking N.20°W. and dipping at 50° to the east; it has a width of two feet or slightly more. No. 3 vein strikes N.10°W. and, unlike No. 2, it has a steep dip to the west. It is exposed for a length of 100 feet and has an average width of 3 feet 4 inches. Samples taken by the writer from both veins assayed only a 'trace' in gold.

QUEBEC CONSOLIDATED GOLD MINES, LIMITED

Quebec Consolidated Gold Mines, Limited, was incorporated in December, 1930, with an authorized capitalization of 5,000,000 shares of one dollar par value. The Company was a reorganization of Wendt-Wreidt Consolidated Mines, Limited, formed in 1928.

The property is in the southern part of the township, four miles in a straight line south of Launay village, which is seven and a half miles east of Taschereau, both stations on the Canadian National railway. An automobile road following the west edge of a north and south sand plain and passable in dry weather, leads from Launay station directly to the mine, a distance of about five miles.

The property consists of twelve claims in one block. Seven of them occupy the south half of lots 21 to 27, range II, and five the north half of lots 24 to 28, range I. The claim numbers are: A.43221 to 43224, 29435 to 29439, 29525, 29526, and 21327. Most of the work to date has been done on lot 26 and adjoining portions of lots 25 and 27, range II. Surface exploration was carried out by the present Company during 1932, 1933, and 1935, and by American Smelters for about two months in the spring of 1936. During 1937, the property was idle. Mr. Swayne Wendt-Wreidt, of Taschereau, is the Company's representative on the ground.

Camp buildings include guest house, bunk house with accommodation for thirty men, office, store house, cookery, stable, power house, and blacksmith shop. An adequate supply of water for domestic requirements, and for possible milling operations, is afforded by Labretèche creek, a stream 50 to 75 feet wide, which flows north through the property to join the Villemontel river, half a mile north.

The property is in an area of low relief and heavy overburden. Not more than 3 per cent of the claim-group is outcrop. With the exception of one or two narrow bands of iron formation, the rocks exposed are all altered Keewatin volcanics, dominantly flows of andesitic composition, with some associated later intrusives. They occur in low-lying ridges which are elongated in the direction of the schistosity, slightly north of west.

Mineralization occurs within an intensely carbonatized section of a shear-zone, 150 feet wide and 1,500 feet long, which strikes N.80°W., with dip practically vertical. This zone lies approximately on the line of

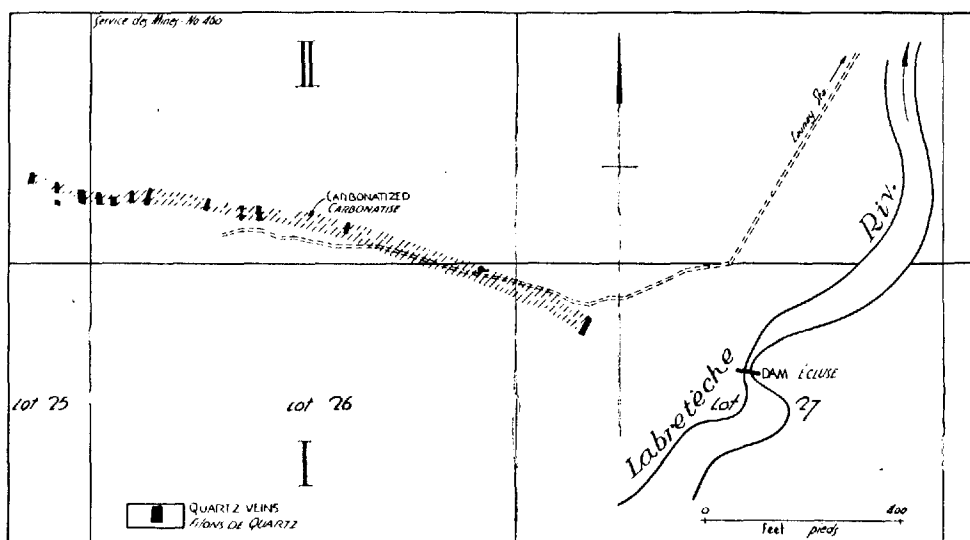


Figure 3. — Plan of veins on Quebec Consolidated Gold Mines property.

strike of the synclinal axis of the Privat band of Upper Keewatin altered tuffs. The carbonatized zone itself averages 30 feet in width and has been traced over a length of 1,200 feet. Within it, the rocks, which are light yellowish on fresh surface, are characterized by rusty-red weathering that extends to a depth of two to three inches. They are schists with associated feldspar-porphry dykes, and they are cut by veins and stringers of milky and ferruginous quartz, ranging from a quarter of an inch to two feet in width, which contain finely crystalline (0.5 to 1.0 mm.) disseminated pyrite. The quartz veins and stringers make up from ten to twenty per cent of the material of the carbonatized zone.

On the east, the carbonatized zone is cut off by a gabbro body, at Labretèche creek. It appears to die out to the west, so far as it has been possible to ascertain by means of four cross-trenches over a distance of 160 feet. Farther west, on the strike of the shear-zone, no outcrops were observed for a distance of about three miles, over most of which the bedrock is obscured by heavy overburden and muskeg. The nearest important granitic intrusive is in the middle of lot 14, range IV, three and a half miles northwest of the property.

The shear-zone has been explored by 2,200 feet of trenching, about eight test-pits 4 to 6 feet deep, and a two-compartment shaft sunk to a depth of 35 feet. A grab sample taken by the writer from No. 5 trench, 180 feet west of the shaft and 140 feet north of lot-post 25-26, range-line I-II, assayed \$23.80 in gold per ton. The sample was taken from a quartz vein 8 inches wide which averages 60 per cent disseminated pyrite. This sulphide concentration was not observed in the veins in the adjacent

trenches but may have been obscured by the oxidation and disintegration which has taken place in them.

A 20-foot channel sample cut from No. 2 trench, 150 feet east of the shaft, across a zone of carbonatized andesite averaging 10 per cent vein quartz and similar to the section exposed in the east wall of the shaft, assayed \$1.82 in gold per ton.

The results of the work to date indicate a series of mineralized quartz veins cutting schists in a carbonatized shear-zone 30 feet wide and 1,200 feet long. Evidence of faulting is lacking. Further knowledge of the value and extent of the veins in the deeply weathered and oxidized carbonatized zone could best be gained by diamond drilling. The possible extension of this zone to the west might be tested by means of a geophysical survey, followed by stripping, trenching, and sinking test-pits.

OTHER OCCURRENCES OF SULPHIDE MINERALIZATION

Lots 4 and 5, Directly North of Range-Line VII-VIII.—A strong shear-zone, striking N.18°E. and dipping 70° east, occurs at the western margin of a small body of hornblende granite exposed a short distance north of a larger granite mass. At its south end, it is about 75 feet wide, but it tapers toward the north and pinches out after continuing for 500 feet. The zone has been explored by six trenches, spaced at intervals of 100 feet along the strike. It consists of highly silicified and carbonatized rock cut by veins of coarsely crystalline quartz averaging one foot in width, and mineralized with disseminated pyrite. Some high gold assays have been reported.

Lot 11, Range VII.—About 1,400 feet south of range-line VII-VIII, a quartz vein 5 to 6 feet wide and 100 feet long, striking N.35°W., cuts pink biotite granite. It is associated with a pegmatite dyke. Pyrite crystals, three-quarters of an inch in diameter, are sparsely disseminated through the quartz.

Lots 11 and 12, Just North of Range-Line VI-VII. — A pegmatitic quartz vein, 10 feet wide and 125 feet long, cuts granite. The strike is N.15°E. and the dip 30° west. The vein contains about 15 per cent disseminated pyrite.

Lot 35, Range IX.—A quartz-tourmaline vein, 12 feet wide, and a nearly adjacent feldspar-porphry dyke, 2 feet wide, cut acidic extrusive rocks at a point 160 feet north of range-line VIII-IX. The dyke is fractured and cemented by the vein material, and both it and the vein are well mineralized with disseminated pyrite in crystals up to half an inch in diameter. Good gold assays have been reported. The tourmaline occurs in dense needle-like clusters, and appears to be confined to fracture planes in the quartz. This vein is exposed in a series of cross-trenches, and in two pits 8 feet by 20 feet, for a length of 200 feet along its strike at N.40°E. Its possible further extension in that direction is hidden beneath a swamp. Several other quartz-tourmaline veins cut the

same outcrop farther south, but none of these were observed to carry sulphide mineralization. In every case, the tourmaline appears to be later than the quartz.

Lot 53, Range IX.—A sulphide zone, 10 feet-wide, occurs here in ellipsoidal andesite, striking N.45°W. The andesite is cut by quartz-tourmaline veins, and 800 feet farther south is intruded by a body of quartz-diorite.

Minor occurrences of sulphide mineralization were noted at a number of other points within the township, as for example in the acidic lavas in the extreme northeast.

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