PERSHING TOWNSHIP MAP-AREA.

A thesis presented in partial fulfilment of the requirements for the Degree of Master of Science.

Marcel Tiphane.

Dept. of Geological Sciences,
McGill University,
Montreal,
Sept. 1947.

PERSHING TOWNSHIP MAP-AREA.

TABLE OF CONTENTS.

MAPS AND ILLUSTRATIONS.

PERSHING TOWNSHIP MAP-AREA, ABITIBI, QUEBEC.

INTRODUCTION.

General Statement.

During the last few years, G.W.H. Norman of the Department of Mines and Resources, Mines and Geology Branch, Ottawa, mapped in detail an area extending from Malartic on the west to Louvicourt Township on the east. This work yielded so much information, and prospecting was so extensive in this area, that the Geological Survey extended the work eastward from Norman's sheet. Three parties were organized in 1946 each to map one township at a scale of 1000 feet to one inch. One party under H.C. Norman mapped Vauquelin Township, the writer mapped Pershing Township, and the third party under K. Dawson mapped Haig Township. The work was under the supervision of G.W.H. Norman.

Acknowledgements.

The writer is deeply indebted to the Geological Survey of Canada and to the Chief Geologist who gave him the opportunity of writing this thesis at McGill University.

Dr. F.F. Osborne, of McGill University, directed the petrographic work and his critical suggestions were of a great assistance.

The writer was ably assisted during the field season by J. Macdougall, K. Bell and R.L. Slavin. Wm. Foster satisfactorily performed his duties as camp cook.

He also gratefully acknowledges the cooperation of the numerous exploration and mining companies active in the region. Special thanks are due to Mr. H. Parliment, geologist for the Inspiration Diamond Drilling and Exploration in the area who gave a whole-hearted cooperation.

Thanks are also due to Dr. G.W.H. Norman for the guidance offered by him to the field parties.

Previous work.

Geological maps of this area are on a scale of one mile to one inch and were made by L.V. Bell and A.M. Bell in 1931 and 1932 (ref.: Bell River Headwaters Map-Area, Ann. Rep. QBM. 1931, part B. and Assup River Map-Area, Ann. Rep. Q.B.M. 1932, part B.)

During the last two years, the maps of exposures of a few properties in the north-half of the township have also been made on a scale of 400 feet to one inch: those maps have been freely consulted by the writer and were of a great use in locating exposures on these properties. Elsewhere vertical airplane photographs, which were taken during the summer of 1945 by the Canadian Pacific Airways, were used. The location of drill holes was taken from plans kindly placed

at the writer's disposal by officials of the various mining-companies. Two drill holes in the south-east quarter of the map were marked in by aerial photographs and are expected to be of the same order of accuracy of position as the outcrop locations.

The topographic base map was prepared from aerial photographs by the Topographical Division of the Department of Mines and Resources, Ottawa.

Location and means of access.

Pershing Township is between parallels 48°00'N and 48°09'N, and longitude 76°56'W and 77°09'W. It is 24 miles south-south-east of Senneterre and 34 miles due east of Val d'Or (fig. 1, page 4).

Garden Island Lake and Lake Matchi Manitou afford landings for planes; it is the easiest way of reaching the district from Senneterre which is a station for commercial aviation. Garden Island Lake is 22 miles by plane from Senneterre, and Lake Matchi Manitou is 25 miles from the same station.

Since August 1946, the area can be reached by car; a new road from Senneterre to the Croinor Pershing Mines Ltd (fig. 2) which is in the north central part of the township has been completed. That road goes through the north-west corner of Pershing Township, a distance of 25 miles from

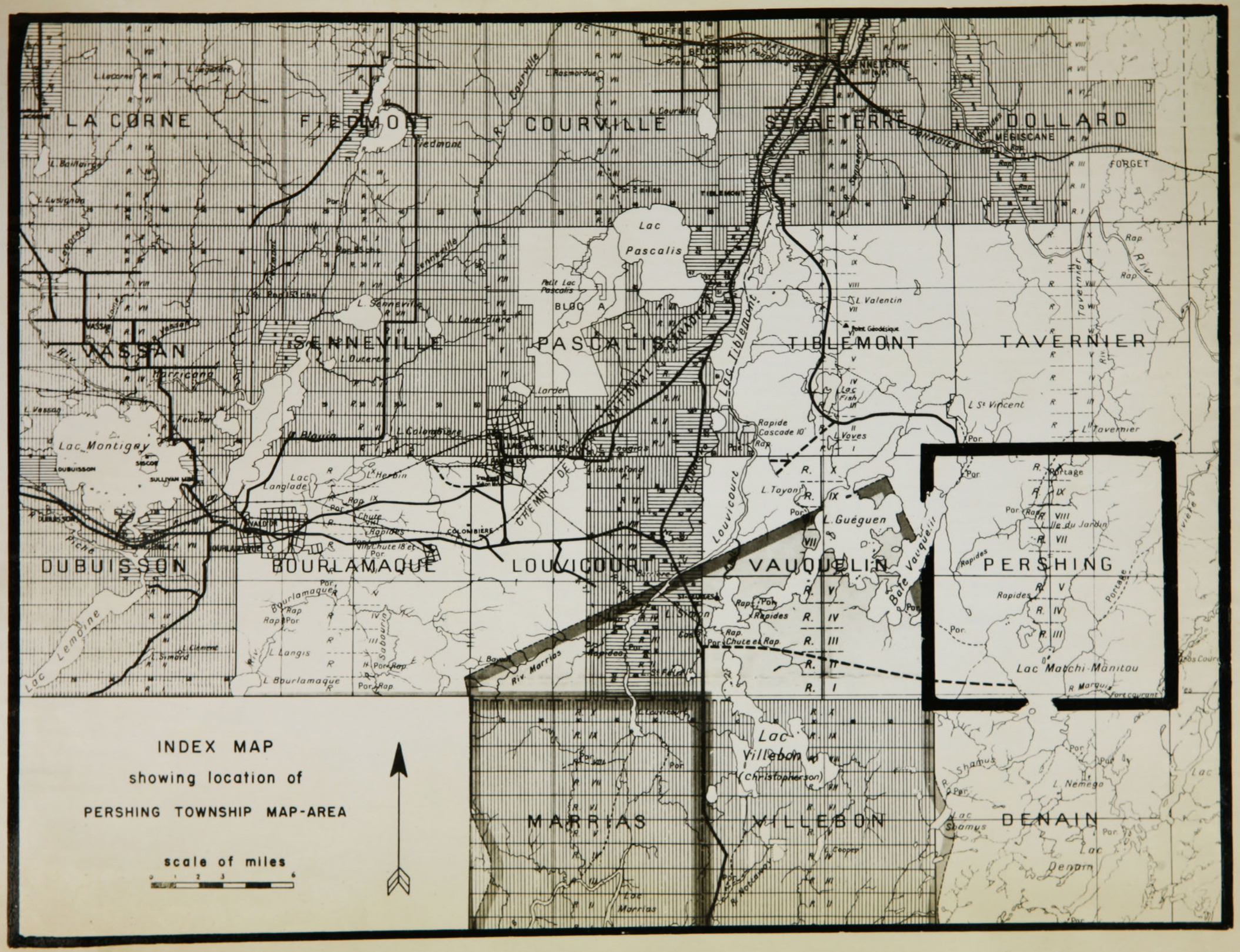

LA CORNE
FIEDMONT
COURVILLE
DOLLARD
FORGET
VASSAN
SENNEVILLE
PASCALIS
TIBLEMONT
TAVERNIER
DUBUISSON
BOURLAMAQUE
LOUVICOURT
VAUQUELIN
PERSHING
MARRIAS
VILLEBON
DENAIN
Lac Pascalis
Lac Tiblemont
Lac Montigny
Lac Langlade
Lac Villebon
(Christopherson)
Lac Marchi Manitou
Lac Denain
INDEX MAP
showing location of
PERSHING TOWNSHIP MAP-AREA
scale of miles
0 1 2 3 6

Fig. 2. Buildings of Croinor Pershing Mines Ltd. and end of new road. (Sept. 1946).

Senneterre in a general south-south-east direction; from there it passes a few hundred feet north of Garden Island Lake and ends at the shaft of the Croinor Pershing Mines Ltd.

The south-half of the township may be reached by canoe from Garden Island Lake through the river connecting the latter to Lake Matchi Manitou.

By water, the area could conveniently be reached from the Mont-Laurier-Senneterre Highway at the bridge across the Louvicourt River; the portages along this route are maintained in good condition by the fire rangers .

Most of the township lines are not now easily seen; the north-south centre line which is misplaced by a few hundred feet, has been recut lately and, therefore, is easily found. Many series of picket lines have been cut by the different companies for exploration purposes in the north half of the township. These lines, together with trails increase the accessibility of certain points away from canoe routes.

Physical Features.

The height of land passes to the south through the townships of Marrias, Villebon and Denain. It is about three miles south of the south-east corner of Pershing and ten miles south of the south-west corner of the same township.

Relief is low as it is characteristic of many parts of the Canadian Shield. A few seattered hills and sand ridges appear, but all of them are comparatively low, the height averaging about 100 feet above the water level of the area. There is however one exception in the southwest quarter where a hill, called Devil's Mountain, rises 690 feet above the water plane. Because of this low relief, muskegs cover about 20% of the area, and lakes about 15%. Most of these lakes are very shallow. However lake Matchi Manitou may be very deep in places.

The topographic relief reflects in general the character of the bedrock. Areas underlain by volcanics in the north half of the township are elongated in the direction of the

regional schistosity. Areas underlain by granitic rocks have no directions.

Clay, in the northwest quarter of the map, and boulder clay, in the southwest quarter, cover much of the bedrock. Some small bays on the west shore of lake Matchi Manitou are covered by sand composed of angular particles of quartz, feldspar and little biotite. The north-east arm of this lake is shallow and the bottom is a sand composed of quartz, feldspar, biotite, little magnetite and a few particles of garnet. The northwest arm is also shallow and boulders of granitic material come close to the surface of the water. The islands and the peninsula to the north of Lake Matchi Manitou are built of boulders of the same granite.

PLEISTOCENE GLACIATION.

The Pleistocene ice sheets passed across the area on their southward march. Hills of bedrock were smoothened and striae which are from S-5°W in the north-west quarter of the area to S-5°E in the north-east quarter were developed.

The constructive effects are more conspicuous. Glacial drift is found on the hills as well as on the depressions. The bottoms of the north and south sides of the hills are mantled with boulders. Sand and gravel ridges occur throughout area. They are elongated in a north-south direction and average 50 feet in height above the surroundings. One group of ridges, located near the north-south centre line of the Township, runs in a N-15°W. S-15°E direction. It is made of well-assor-

ted gravel and whose stratification dips slightly to the north as it may be seen on the accompanying photograph.

Fig. 3: Gravel pit, on south side of the road near the N-S centre-line of the township. North-south section, the north being to the left of the photograph.

These are esker-like ridges and were presumably formed by deposition from streams flowing in ice tunnels beneath the stagnant ice. This area, in which there are no exposures, supports a growth of spruces and fir trees.

The other group of ridges, in the east of the township, runs about north-south. It is made of sand which varies little in composition and is yellowish-brown. It occurs as shown on the map but the height varies with places and shows

about the same relief as the first group. Near the south end its trend changes to south-west until it reaches lake Matchi Manitou, where it ends abruptly. This group of sand ridges, in which no natural exposures were found, supports a growth of jack pine.

Another sandy area has been found near the south-east corner of the map. It covers a triangular area which is rather low and flat if we except a few esker-like ridges alongside the lakes near the township boundary. These ridges run about N-30°E. The rest is valley filling and is covered by moss and small trees. On the higher levels, small pines cover the area. The stream pattern of this area shows that the lakes drain into lake Matchi-Manitou through a shallow and winding river. These lakes have probably been formed by the glaciers and are of Pleistocene age. Their outlet is still shallow and winding because its bed has not been established yet. There are at least four rapids from Lake Matchi Manitou to the south-east corner of the township.

During the glaciation, the actual outlet of lake Matchi-Manitou to the north was probably blocked by the ice, and the waters had to find their way out somewhere else. An old river bed has been found joining the northwest arm of Lake Matchi Manitou to the shallow lake located at one mile from the shore (at parallel 48°03'N and longitude 77°07'W). This old river bed, joined to that lake which still drains into the river going to Vauquelin Bay, was the probable ou t-

let of lake Matchi Manitou during the glacial period. The sharp bend of the river joining Garden Island Lake to Vauquelin Bay is probably the result of the same phenomenon: the old river was blocked by the ice and the water found its way out the way it is now and stayed like this.

DRAINAGE.

The area drains northward into the Bell River. Lake Matchi Manitou is supplied by the waters of the Shamus River coming from the south-west and of the Marquis River coming from the east. It connects northward with Garden Island Lake into which it drains. The latter flows westward to Lake Vauquelin then to Gueguen Lake and finally to the Bell River through Lake Simon.

The north-east end of the township drains eastward into the Assup River which then flows northward into the Megiscane River.

GENERAL GEOLOGY.

The rocks of Pershing Township are all of PreCambrian age: the following table lists the formations which have been recognized within this area:

Table of Formations.

Quaternary	Recent and Pleistocene	Beach and swamp deposits, Clay, sand, gravel, Boulder clay.
Major Unconformity		
Proterozoic	Diabase, gabbro.	
Archaeozoic	Post Timiskaming	Hnb.-Granite, Hnb.-syenite, Pegmatite, Pegmatite-bearing Gran. Muscovite-Biotite Granite-Gneiss, Minor schistose Pegmatite and Biotite-Gneiss, Quartz-Feldspar Porphyry, Feldspar Porphyry, Diorite, Carbonatized Diorite.
	Timiskaming and Keewatin	Iron formation, some Greywacke, Greywacke, Conglomerate, Staurolite-Biotite Schist, Garnetiferous-Biotite Schist, Biotite Schist, Talc Schist.
	Keewatin	Andesite, some Tuffs, minor Diorite, Commonly light green Trachytes, Pyroclastic Rocks, Amphibolites.

DESCRIPTION OF THE FORMATIONS.

KEEWATIN.

This group of rocks consists of andesites, light green dacites to trachytes, basic tuffs, agglomerates with light colored fragments; it also includes amphibolites.

Andesite.

The andesites outcrop at three places in the township and at each of those places, the rock constitutes a different structural unit. The most important crops out as a belt which crosses the township from west to east. The band is from 4000 to 7500 feet wide. This band is highly schistose. The metasediments on the south side of the band are also schistose so that the contact is not easily recognizable. The north boundary, that is between the andesites and the intermediate lavas, has not been accurately determined in the west half of the area because nowhere its contact could be seen, and the line drawn between these andesites and the intermediate lavas is arbitrary.

The typical andesite is fine-grained, dark green, and schistose. The few pillows that could be recognized were much deformed and top determinations impossible. Igneous flow structures are apparent in places, and the grain gradation suggests that the flow tops face south. The strikes of the schistosity are from east to northwest, and the dips are from 90° to 50° north. If the top determination is correct, the

andesite is overturned. There are zones where the rock has undergone local shearing. In those zones the rock is rusty and carbonated. Such areas have been searched for gold by the various companies such as the Ansley Gold Mines Ltd., the Consolidated Mining and Smelting Co. Ltd. in the north-west quarter and another property of the C.M. and S. Co. Ltd., in the north-east quarter. Free gold has been reported by the officials of these companies but none could be seen by the writer. Exploration work was still under way at the time of the writer's visit on the Ansley Gold Mines Ltd.

One of the most difficult problems was to distinguish, in some areas, between diorites and coarsely-crystalline andesitic flows. In many exposures it was impossible to be certain whether an exposure is intrusive or merely a coarse-grained facies of a flow. Such indeterminate exposures have been shown on the map as lava.

Another belt of andesitic rocks, which extends beyond the mapped area to the north and east, occurs near the north-east corner of the township: this belt seems to be about parallel to that previously described. Only a few exposures could be seen and very little is known about these rocks; they are similar to the andesites of the other belt, they are dark green and fine grained, but rather massive which is the main difference between rocks of this belt and those previously described. Unfortunately no structural features could be

seen on those exposures that would show any indications of top of the flows. The strike of the foliation varies from S-85°E to S-80°E and their dip is vertical. K. Dawson reports that in the adjacent north-west quarter of Haig Township the corresponding andesite flows form bands alternating with the intermediate lava flows, a feature that was not shown in the few exposures of Pershing Township.

The third outcrop of rocks of the andesitic type occurs in the southwest quarter of the township. It is best exposed along the Denain-Pershing boundary at mile-post II. Similar rocks are also exposed on the east side of the hill, due north of the same mile-post. These rocks were mapped as andesites because of their similarity to the andesite to the north. The rock is rather massive, very dark and fine grained. Along the township boundary pillow structure still shows and confirms their volcanic origin. The study of thin-sections of this rock shows that it has been partly recrystallized and is almost an amphibolite. The average composition of the two thin-sections studied is:

Hornblende : 35%

Plagioclase An_{38} : 55%

Biotite : 5%

Zircon is accessory and is present as inclusions in the biotite.

The strike of this rock is N-85°E and the dip is very steep to the north.

Tuff and Agglomerate.

Bands of basic tuff occur in the northwest quarter of the map, interbedded with the andesitic lava flows; those bands are from six inches to 15 feet thick. The rock is very fine grained, dark grey in colour with few thin layers of lighter-colored material which shows the bedding more clearly. This bedding is usually parallel to the schistosity of the andesite, and wherever it is not, the angle between the two is always less than 5°.

A big lens-shaped body of coarse pyroclastics occurs in the andesite and extends from the western boundary of the Croinor Pershing property eastward. Its total length is unknown because its eastern extension could not be traced: no rock exposures have been found to the east and no record of drill-holes driven in this area has been made available. Its greater horizontal thickness is 2500 feet, near the buildings of the Croinor Pershing Mines Ltd; but it thins gradually to the west. The rock has a matrix similar to that of the tuffs: it is dark green due to the epidote through it, and the fragments are from 1/4" to 6" in diameter. The fragments are white and ellipsoidal. The rock has been called a basic agglomerate.

Intermediate lavas.

The writer uses the term "intermediate lavas" for lavas which are pale green to light grey in color with little or nor quartz. They seem to vary from dacites to trachytes.

The weathered surface is usually of a uniform cream color. No attempt has been made in the field to separate the two because of their great similarity in the macroscopic appearance and unfortunately no thin-sections have been made and studied.

These rocks occur as a band separating the andesites in the north half of the township: they outcrop over an average horizontal width of 14000 feet within the area. They are sheared to a small extent and show pillow structure in many places. The study of those pillows indicates that the tops face south in the area east and west of the centre-line of the township. Most of these top determinations just east of the small lakes near the north-south centre-line are not indicated on the map. There is however one determination further east that shows a top to face north. The determinations were based upon the shape of the pillows and also upon the amygdules which were concentrated on the upper edge of the pillows: these amydgules being formed by gas bubbles that came out of the pillows on cooling are concentrated at the top of these. The cavities are now filled by quartz, they are oval in shape and may be in length as long as one and a half inch. The strike of the foliation is from N85°E to N55°W and the dips from 50°N to 85°S.

The constant eastward trend of the foliation which is inclined to the trend of the band may indicate an uncon-

formity between the andesites and the "intermediate lavas". But, as said before, nowhere the contact between the two formations could be seen, so that no evidence of such an unconformity is available.

In addition to the rock types described above, there are also certain less abundant types; one of these is the flow breccia which has been found only at a few places in the andesite and in the intermediate lavas. In the andesites, it is best seen on the Ansley Mines Property (N-W quarter) near the south contact of the andesites with the greywacke. In the intermediate lavas it is well exposed 2000 feet west of the camps of the Norford-Vine Pershing Property in the north-east quarter of the map. The fragments of the breccia are of an acidic rock and embedded in a fine-grained matrix.

Amphibolites:

Rocks termed "amphibolites" occur in the south-west quarter of the map. They are massive, fine grained to coarse grained, dark green to black. The rock seems to grade in places into an andesite. The amphibolite and the andesite of this part of the area have been grouped together because of superficial lithological similarities which contrast rather sharply with the characteristics of the andesite group to the north.

The coarse grained amphibolite is darker in colour than the fine grained, and the field relationships seem to indicate that it is of intrusive origin and might have been derived from diorite, intrusive in the andesite. It might also be

derived from the coarse phases of the andesite. The western extension of the amphibolite in the south-east of Vauquelin Township is apparently an andesite.

The average composition of the coarse grained "amphibolite" may be summarized by the mineral composition of two thin-sections:

Minerals	1-24-A-T	3-24-A-T
Hornblende	63%	48%
Epidote	5%	20%
Plagioclase An_{70}	25%	30%
Biotite	-	acc.
Chlorite	5%	
Sericite	some	common in feldspars.

These rocks have been named "amphibolites" in the field, by the calcity of the plagioclase proves they are not. They show no definitely primary constituents: the rock is now a crystalloblastic aggregate of hornblende and plagioclase. The hornblende is strongly pleochroic: X-yellowish-green, Y: grass-green, Z: bluish-green, $Z \wedge C$: 15°-16°, $2V = 80^{\circ}$, $\gamma - \alpha = 0.020$.

On weathered surface, a "spotted" appearance is common in the coarse variety.

TIMISKAMING and KEEWATIN.

Timiskaming-type sediments.

Light to dark gray schists which appear to be derived from sediments occur to the south of the volcanics. The contact between the andesite and schist is not exposed at the surface; it has been determined by drill-cores one of which is along the Vauquelin-Pershing boundary and the others east of Garden-Island Lake.

The metasedimentary rocks form a relatively narrow and which is from 7000 feet at the west end to a minimum of 2500 feet at Garden Island Lake. The band widens abruptly in the east half of Pershing Township to a few miles and pinches out in Haig Township.

The rock exposures in the north-west show the bedding to be parallel to the schistosity and this is emphasized by the narrow black bands of magnetite interbedded with the light grey quartzose sediments. At the north-east end of Vauquelin Bay (in the north-west quarter), near the mouth of the river, there is locally a greater concentration of those magnetite bands. Wherever these bands appeared to constitute more than 40% of the formation, the rock has been classified as "iron formation". Elsewhere in this same area, the rock has been mapped as "greywacke". East of Vauquelin Bay, the iron formation fades out as a lens.

Another band of iron formation outcrops in the south half of the township. It is best exposed on the east shore of Lake Matchi-Manitou and appears to follow the highly folded

and contorted schists in which it is enclosed; no other exposures of this formation could be seen, but the cores of one drill hole on the Parkard Pershing Property show some iron bands. Magnetic anomalies given by a magnetometer survey of that same property seems to indicate the eastward continuation of that band as shown on the map. Outside of that property, abnormal readings with the Brunton Compass have also been reported which suggest continuation of that formation at least three miles inland in a general N 75° E direction. This band seems to be the continuation of a similar formation found and located with the magnetometer in the south east of Vauquelin Township. This band which appears at the south-west corner of Pershing continues for two miles in Denain Township and reappears in Pershing. Lake Matchi-Manitou may then be underlain by the same formation which would join withthe iron formation east of the lake. This assumption will be clarified when a magnetometer survey of the lake be made.

The rocks of this group, besides the iron formation, vary in composition from one place to the other. The main feature of these is the change in alteration and degree of metamorphism which they have undergone and which increases southward.

Because of lithological and stratigraphic analogies, this series has been correlated with the Kewagama Group of the clastic rocks of Gunning and Ambrose in the Cadillac-Malartic Area and of Norman in the Bourlamaque-Louvicourt area.

These authors found that this sedimentary series overlies the volcanics to the north. In Pershing, no evidence of this feature was seen, but the author presumes that the continuation of the same series must also overlie the volcanics: one criteria which might help in this assumption is the presence of basal conglomerate which outcrops on the east shore of Garden Island Lake. Presumably the same is found 3000 feet further east in a parallel position to the contact with the volcanics.

A talc zone has been traced near the volcanics: it is shown in D.D.H. no 12 located along the Vauquelin-Pershing boundary, 750 feet north of Vauquelin Bay; it is also shown in the cores of D.D.H. nos 24 - 30 - 31 of the Kenda Pershing Property, along the north-east shore of Garden Island Lake, west of the buildings shown on the map.

Sixteen thin-sections of these schists have been studied: the following table gives the average mineral composition of these sections and they are classified (left to right) from the north boundary with the volcanics towards the south. The location of these sections is given on page 23.

	4-20-S-T	6-20-S-T	1-19-Jy-M	2-2-A-T1	2-2-A-T2 666	5-2-A-T1	5-2-A-T2	6-2-A-T1	6-2-A-T2	4-9-A-T1	4-9-A-T2	1-13-A-M	2-13-A-M	1-14-A-M	1-25-A-T	2-25-A-T
Hornblende	40									Actinolite 65	Actinolite 70					Microcline 15
Biotite	5	10	15	25	25	20	20	30	20	5	5	15	20	35	10	
Plagioclase		An25 35	An28 40			An28 15	An28 30	45	45				An30 40		An36 40	An36 40
Orthoclase	45	20		35	35					10	5	40		10	40	25
Quartz		20	40	7	10	25	10	10	15	10	10	30	30	10	5	5
Garnet		some				15	35						5			
Staurolite				25	25	20						10		40		
Apatite			acc.	acc	acc.	acc.	acc	acc	acc	acc.	acc.	acc.	acc.	acc.	acc.	
Zircon		acc.	acc.	acc	acc.	acc.	acc	acc		acc.	acc.	acc.	acc.	acc.	acc.	
Chlorite	some	10	some	some	some			5	10	5	5			some	some	5
Calcite	5															
Magnetite							acc	5	10							
Epidote									some							5

Location of thin-sections.

4-20-S-T : Kenda Pershing, D.D.H. no24, 85'. On N-E shore of Garden Island Lake, 2000' W. of Centre-Line, near contact of lavas and schists.

6-20-S-T : Kenda Pershing, D.D.H. no 23, 400'. 800 ft south of D.D.H. no 24, in Garden Island Lake.

1-19-Jy-M: Midd-Pershing, Base Line 50, 700 ft east of Centre-Line, 1200 ft north of granite contact.

2-2-A-T : East shore of Lake Matchi-Manitou, latitude 48°02'N.

5-2-A-T : East shore of Lake Matchi-Manitou, 200 ft south of 2-2-A-T.

6-2-A-T : East shore of Lake Matchi-Manitou, in iron formation at Latitude 48°01'30"N.

4-9-A-T : Packard Pershing, D.D.H. no 2, 120'. At latitude 48°02'30"N, parallel 76°58'W.

1-13-A-M: At latitude 48°01'15" and parallel 76°58'45"W.

2-13-A-M: At latitude48°01'15"N and parallel 76°58'45"W.

1-14-A-M: At latitude 48°02'N, 1000 ft west of Haig-Pershing boundary.

1-25-A-T: On east shore of Lake Matchi Manitou, ½ mile south of Denain-Pershing boundary.

2-25-A-T: On east shore of Lake Matchi Manitou, ½ mile south of Denain-Pershing boundary.

It may be noted that the plagioclases are more calcic as we go south. Near the volcanics on the north, the anorthite content of the Plagioclase is 25; it is of 28 on the north-east shore of Lake Matchi-Manitou; of 30 a little south and east of the latter, and of 36 along the east shore of the same lake and 1/2 mile south of Pershing-Denain boundary.

Also the biotite content is greater in areas closer to the iron formation.

From Garden Island Lake east and southward, staurolite and garnet (spessartite) are found in most exposures of the metasediments. Usually both minerals are not found together: there is however one area on the north-east shore of Lake Matchi-Manitou where garnet is found associated with staurolite. Crystals of spessartite are found as inclusions in larger crystals of staurolite; the garnets average 1/4" in diameter and staurolite may be as long as 3 inches. South of the Marquis River, near the Denain-Pershing boundary, the staurolite is highly deformed and in places replaced by chlorite.

The staurolite is yellowish in thin-sections and is seen to contain many inclusions of quartz and, as said before, some inclusions of garnet. The staurolite is rich in ferrous iron and is a typical stress-mineral (1). It has then been formed from a sediment rich in iron and under high temperature and stress.

---

(1) Harker Alfred: Metamorphism, Methuen 1939.

The garnet is pinkish-yellow in thin-sections and isotropic with n=1.80. It is fractured irregularly in all directions. In thin-section no. 2-25-A-T which has been taken on the east shore of Lake Matchi-Manitou and 1/2 mile south of Denain-Pershing boundary, the garnet which still could be seen on the specimen, appears in thin-sections to be all replaced by chlorite and epidote which would mean a retrogression in metamorphism.

From all those changes in composition, it may be stated that, near the granite, the rocks have undergone a slightly higher degree of metamorphism, and a retrograde metamorphism near the southern boundary. In the south-west of Haig township, some andalusite is reported.

Norman believes that a fault or a series of parallel faults striking north-east exists in that zone of contact between the Temiscamian-Type sediments and the Grenville-type gneisses to the south-east (2). His assumption is based on features found in the Chibougamau District in 1935 and on the results of mapping of Pershing and Haig Townships in 1946. This fault system would exist all along that zone of contact from Chibougamau to at least our map-area and may be as far

---

(2) G.W.H. Norman: The Northeast Trend of Late PreCambrian Tectonic Features in the Chibougamau District, Quebec. Roy. Soc. Can. Trans. Third Series, Sect. IV, Vol. XXX, 1936.

as lake Huron. This theory may be true, but so little is known about it that it is impossible to approve or disapprove Norman.

Unfortunately the author cannot with so little informations on his own ground reach any conclusions on this contention, more work will be done to the south during the next field season. This should yield more informations.

POST-TEMISKAMING.

Intrusives.

a) Diorite:

One of the difficult problems in mapping the north half of the township is that of distinguishing between diorite and the dioritic facies of lava flows. Unfortunately, in many places, evidences for distinguishing the two could not be obtained, largely because of insufficient exposures. A few diorite bodies are represented on the accompanying map: those are considered intrusive, but some may be flows.

Many contacts between the diorites and volcanics were examined as carefully as possible. Most of them were from drill cores. It was found that the contacts were gradational or obscured by shearing. No volcanic textures were observed in the diorites mapped as such; wherever volcanic textures were seen, the rock has been mapped as lava.

The rock is fine to medium grained and except in a few phases the grain is very even. The granularity is apparent

in hand specimens, but the light colored minerals are commonly altered and cannot be identified; the cleavage faces of the amphibole are visible in hand specimens. Bluish quartz could also be recognized in some specimens from the Croinor Pershing property.

Diorites do not occur, or at least have not been found outside of the volcanics: there might have been some in the southwest corner of Pershing because some of the coarser-grained "amphibolites" may have an intrusive origin and consequently might have been derived from diorite as well as the fine grained equivalents might have been from andesite.

The study of thin-sections of these rocks reveals that they have been largely recrystallized, but they still show the igneous textures, especially ophitic texture.

A typical diorite of the Croinor Pershing Mines Ltd. (D.D.H. no 55, 360') gives the following mineral constituents:

Plagioclase An_{36}	: 45%
Actinolite (pale green)	: 15%
Chlorite	: 20%
Clinozoisite	: 12%

Accessories: Calcite, Quartz, Leucoxene.

Most of the quartz is secondary and calcite fills fissures. Pyrite is often found in the diorites and may form crystals as large as one inch.

The presence of quartz and pyrite in the diorites of the Croinor property is usually indicative of an ore zone.

There are also schist zones representing surfaces along which movements have accurred. Those schist zones vary in direction and dip which becomes almost flat in places.

The intrusive diorite is found as dykes, sills or irregular bodies which cut the volcanics. The most important economically follow the bedding and schistosity allowing the ore solutions to come through the planes of weakness. They are sills which may bulge locally and branch. Branching has been especially noted on the Croinor Property (1 mile northeast of Garden Island Lake) but the scale of the map did not allow the author to show it.

Although typical specimens of the volcanics and the diorites are readily distinguished from one another, even moderate shearing introduces factors which reduce nomenclature to a mere guess; this will remain a serious obstacle to any attempt to separate these rocks even should more detailed mapping be undertaken.

b) Acidic Porphyries:

Oligoclase porphyry dykes and sills are meet at a few places inthe north-half of the area. The largest which seems to be a sill occurs east of Garden Island Lake: it has been mostly outlined by diamond drill holes because only a few exposures could be seen. Another important occurrence is a dyke of a similar porphyry which cuts across the diorite and volcanics of the Croinor Property. It is about 100 feet wide

and strikes to the north-west. Its dip could not be determined on account of insufficient informations. An additional drill hole would definitely determine its attitude.

A few other narrow dykes have been found in the intermediate lavas of the north-east quarter. A striking fact is the surface alteration of the porphyry: it is kaolinized and the feldspar phenocrysts can be taken out and show their perfect crystal forms.

The phenocrysts vary in size from 1/2 inch to 1" and are set in a grey to pale green matrix.

Unfortunately no thin-sections of these porphyries have been made so that the constituents can not be determined.

Quartz-feldspar porphyry has been found as dykes in the south west quarter. The two most important dykes of which only one shows on the map occur 1/2 mile west of shore of the lake: the two are parallel and strike about north-west: the largest is from 100 to 200 feet, thick, the other is 600 feet north-east of the first one, about 40 feet wide and dies out towards the south-east. Other narrow dykes are also found along the Vauquelin-Pershing boundary.

The quartz phenocrysts stand out on the weathered surface in diameter. The matrix is pale green and has not undergone as much surface alteration as the feldspar porphyries of the north-east.

The study of two thin-sections of these porphyries gives the following average composition:

Plagioclase An_{28}	:	53%
Quartz	:	8%
Epidote	:	5%
Chlorite	:	
Orthoclase	:	30%
Sericite	:	
Apatite	:	accessory.

c) Granite:

Granite is by far the most abundant intrusive rock in the area, and it forms the most extensive mass: in fact the area of its surface exposure being more than 40 square miles, the mass may be called a batholith although the depth to which it extends is unknown.

Most of the granite is pink, but some grey is found, and a hornblende-granite. Other facies of the granite are present, and it is reasonable to assume more than one period of intrusion. On the east shore of Lake Matchi-Manitou, a coarse pink to grey porphyritic syenite is found, which also is not far from the schists, and a little further to the south-east, apparently within the schists, granite-gneiss is present.

No detailed study of the granitic rocks was undertaken: only a few thin-sections have been studied, one of those a typical hornblende-granite and taken to the north of Lake Matchi-Manitou gives the following mineral composition: (section 1-3-A-M)

Quartz	13%
Orthoclase	10%
Microcline	20%
Plagioclase An_{28}	28%
Hornblende	25%
Apatite	acc.
Sericite	acc.
Epidote	acc.

The "hornblende syenite", just east of Lake Matchi-Manitou gives the following minerals: (section 2-6-A-M)

Hornblende	15%
Biotite	15%
Microcline	35%
Plagioclase An_{33}	25%

Apatite, Quartz, Zircon: acc.

From this composition the rock is rather a monzonite than a syenite.

The granite-gneiss to the south-east of the "syenite" has the composition (section 2-5-A-S):

Quartz	35%
Plagioclase An_{27}	40%
Orthoclase	15%
Sericite	5%
Microcline	acc.

One amphibole which could not be identified, filling fis-

sures.

d) Dyke Rocks:

It is to be expected that in a region which has experienced repeated igneous activity, dyke rocks will be abundant. This is the case here. Unfortunately, extensive exposures which might show the mutual relationships of these dykes are lacking. A brief description of the principal types follows.

Pegmatites.

Several occurrences of pegmatite were noted and mapped all of which occur in the south-east quarter of the map-area. Pegmatite occurs as dykes of various width in the metasediments near their contact with the gneisses. The strike of the dykes is about north-east from the south end of the north-south centre-line and the dykes are from two feet to about 300 feet wide. The rock is quite uniform in grain and in general shows no banding. A few exposures on the east shore of Lake Matchi-Manitou and south of the Denain-Pershing boundary show some banding which is parallel to the schistosity of the schists.

Some minerals of economic interest have been found in the pegmatites: spodumene and amblygonite were found in the cores of one drill-hole of the Packard Pershing property located at longitude 76° 58'W and parallel 48° 02' 30"N. This dyke has not been plotted on this map on account of the

scale used for this thesis. This is the only exposure where these minerals have been found. L.P. Tremblay in his preliminary report on the Lacorne Township suggests that these "dykes are best mineralized when they encounter a favourable structure such as an embayment along a contact where fracturing has occurred and allowed precipitation of minerals from the pegmatitic solutions". In this case there may be an embayment in the biotite schists and iron formation.

Syenite.

A narrow syenite dike has been traced in the southwest quarter, ½ mile inland of Lake Matchi-Manitou and on the north contact of the porphyry dyke shown onthe map. Two thin-sections of this dyke have been studied and give the following mineral composition:

Plagioclase An_{40}	: 45%
Microcline	: 23%
Orthoclase	: 20%
Biotite & Epidote	: 7%
Apatite	: acc.
Leucoxene	: acc.

Again here, the field-name "syenite" should be changed to monzonite. This dyke seems to be a tongue of the granite to the north.

Gabbro.

A few gabbro dykes have been found to cut through the volcanics in directions from N 50° E to E-W. They average 100 feet in width and unfortunately have not been traced for very great distances. The minerals under the microscope are fresh and the composition of the rock is:

Augite	: 40% - 45%
Plagioclase An_{66}	: 45% - 50%
Quartz	: acc. and present as interstitial grains.
Apatite	: acc.
Hypersthene	: acc.

The structure is ophitic.

A gabbro dyke, not more than 10 feet wide has also been found along the Vauquelin-Pershing boundary near parallel 48° 04' N. Its strike is N 30° E and cuts through the hornblende granite. It is similar to that previously described, but the composition is a little different:

Augite	: 50%
Plagioclase An_{52}	: 35%
Hornblende	: acc.
Chlorite	: acc.

METAMORPHISM.

Metamorphism of the rocks in Pershing Township map-area produced changes of two types: first, mechanical; second, mineralogical.

The mechanical changes include drag-folding, schistosity and the development of linear structures such as elongation of pebbles, nodules and minerals.

The mineralogical changes consist of the change of original minerals into new minerals which were in equilibrium with the physical environment at the time of metamorphism.

The original sedimentary rocks of the area have been thoroughly recrystallized into a variety of schists such as biotite schists, staurolite schists, garnet schists, staurolite-garnet schists, and talc schists. The minerals of the paraschists did not form simultaneously and a difficulty arises as to the establishment of the paragenesis of these minerals.

Staurolite is a typical stress-mineral rich in ferrous iron. It is then thought to have been derived from sediments rich in iron minerals and formed in zones where shearing stress was maintained at or near its limiting value. On the other hand, garnet is also a stress-mineral as well as a high-pressure mineral. From the study of thin-sections, it is here believed that garnet was the first to crystallize and staurolite was formed later.

Biotite in some sections seems to be contemporaneous with staurolite and in others to be earlier than staurolite.

Chlorite is also present in some sections. It usually indicates retrograde metamorphism; its association would then suggest that the rock has retrogressed from a higher grade of

metamorphism. In some sections this retrogression may be due to the heat from near by intrusives, and in others to the hydrothermal alterations for carbonates and pyrite are present.

The plagioclase is from An_{25} to An_{36}. The calcity of the feldspar increases with the degree of metamorphism. From these changes in minerals and in the calcity of the plagioclases, it may be suggested that, from the north boundary of the schist towards the southern boundary of the township, there is a gradual increase in metamorphism. As sillimanite was not found in the area, the rocks are considered to be of a middle grade metamorphism.

STRUCTURAL GEOLOGY.

The area shows a contact between a series of volcanics that extends to the north, and a sedimentary series to the south which is cut through by granitic intrusives.

By compiling the facts observed in mapping the exposures and logging drill cores, the author will offer a structural interpretation, but he does not expect it to be accepted as final but as an hypothesis which will be modified as new informations are obtained.

The evidence that the sediments are younger than and overlie the volcanics in Pershing Township is inconclusive, but as this relationship is found in townships to the west and as the age relationship was evident in these areas,

the author presumes that the same applies here.

In Pershing, there are strong suggestions that the sediments (near the volcanics) had their tops facing south though the dips were to the north, and the basal conglomerate found near the volcanics seems to confirm this suggestion.

The intermediate lavas to the north show also their tops facing south except at one place just west of the sand ridge in the north-east quarter. These two, sediments and intermediate lavas, would confirm the idea that the sediments overlie the lavas, but in the basic lavas, one could not tell whether tops were facing south or north and wherever it could be suggested, the result was that tops face north which is the opposite of what should be expected.

If the relative ages of the volcanics and the sediments be regarded as established, the regional structure is defined by the distribution of these formations which form a broad arc concave to the south. The position of the volcanics on the convex side of the arc and dipping vertically or steeply to the north established the structure as an overturned syncline, plunging westward: the other limb of that syncline outcrops near the Denain-Pershing boundary on the west and meets the north limb east of Lake Matchi-Manitou. The strikes near the Haig-Pershing boundary seems to confirm this suggestion. If it could be proved that the sediments to the southwest face north, this theory would be confirmed.

This belt of volcanics and sediments striking about

S 60° E terminates abruptly in Haig township against the Grenville-type gneisses coming up in an approximate N-60°-E direction.

The details of the structure are far more complex than the broad features. The direction of the schistosity and of the bedding seems to be the same, they follow generally the trend of the formations except bear granite contacts, where disturbances have occurred.

In the far east, it should be noted that the strikes are not in harmony with the regional trend, but rather with the trend of the Grenville-type gneisses to the south-east. That feature would be an argument in favour of Norman's idea of a fault or a series of faults striking about N-60°-E between the two types of rocks.

From the study of magnetometer surveys made in the north-half of the township, it has been suggested that there may be a series of parallel faults with small displacements and striking approximately N-30°-E. None could be seen in the volcanics. But at the contact between the sediments and the hornblende-granite, a fault with a horizontal displacement of four feet parallel to the face of the fault was observed. The strike of the fault is N-25°-E and it is a left-hand fault.

Some drag folds may be seen in the schists of the east shore of Lake Matchi Manitou. They are S-shaped which means that the north side moved westward relatively to the south side. The beds of this area are very much folded, but

exposures are insufficient to try and conclude anything. These drag folds may be related to faulting of the area or to compression of the inner part of the syncline if the synclinal theory is adopted.

ECONOMIC GEOLOGY

General Statement.

Interest in the economic mineral possibilities of the area was awakened about fifteen years ago, when prospectors extending their search towards the east of the Quebec Gold Belt, found mineralized zones and also some free gold in the north half of the township.

Prospecting has been done in 1931 by the McIntyre-Porcupine Mines Limited. Their work has been concentrated near Garden Island Lake in the vicinity of the contact of the sediments and volcanics. They did some trenching in the sheared and carbonatized zones of that area. Later in the years 1938 to 1940, intensive prospecting, exploration and diamond diamond drilling has been done by the Consolidated Mining and Smelting Limited to the east and west along the same belt.

Since 1944, most of the north half of the township has been divided into mining properties, and companies have been formed. Mapping of exposures of each group has been made by most of the companies as well as expensive diamond drilling programs and geophysical surveys.

Results were encouraging on some properties, especially on the Croinor Pershing property. In the summer of 1946, the activity was greatly reduced and most of the work was concentrated on the Croinor property (7). Some diamond drilling was underway also on the adjoining Kenda Pershing property (6) and Hidd Pershing (12), some surface work was also going on, on the Ansley property (1).

The gold-bearing veins have been found in diorite, andesite and pyroclastics. They are all within the andesite belt, which does not mean that there are none outside of this belt. This is probably the result of more careful searches in this part of the field. Quartz veins are relatively abundant in the volcanics but many of them are barren and gold is mostly in veins containing sulphide mineralization. The sulphides are pyrite, pyrrhotite and some chalcopyrite. Sphalerite and galena has been found in the sediments on the west shore of Lake Matchi Manitou, but there is very little and no gold has been found in them.

In the pegmatite dykes of the south-east quarter, spodumene has been found at one place, but there is very little of it, and no other valuable minerals have been found with them. This occurrence of spodumene was seen in the drill cores of D.D.H. no 1 of the Packard Pershing property (17).

Sand and gravel ridges may be used and have been used for road gravelling and for concrete.

DESCRIPTION OF PROPERTIES.

1- Ansley Gold Mines Limited.

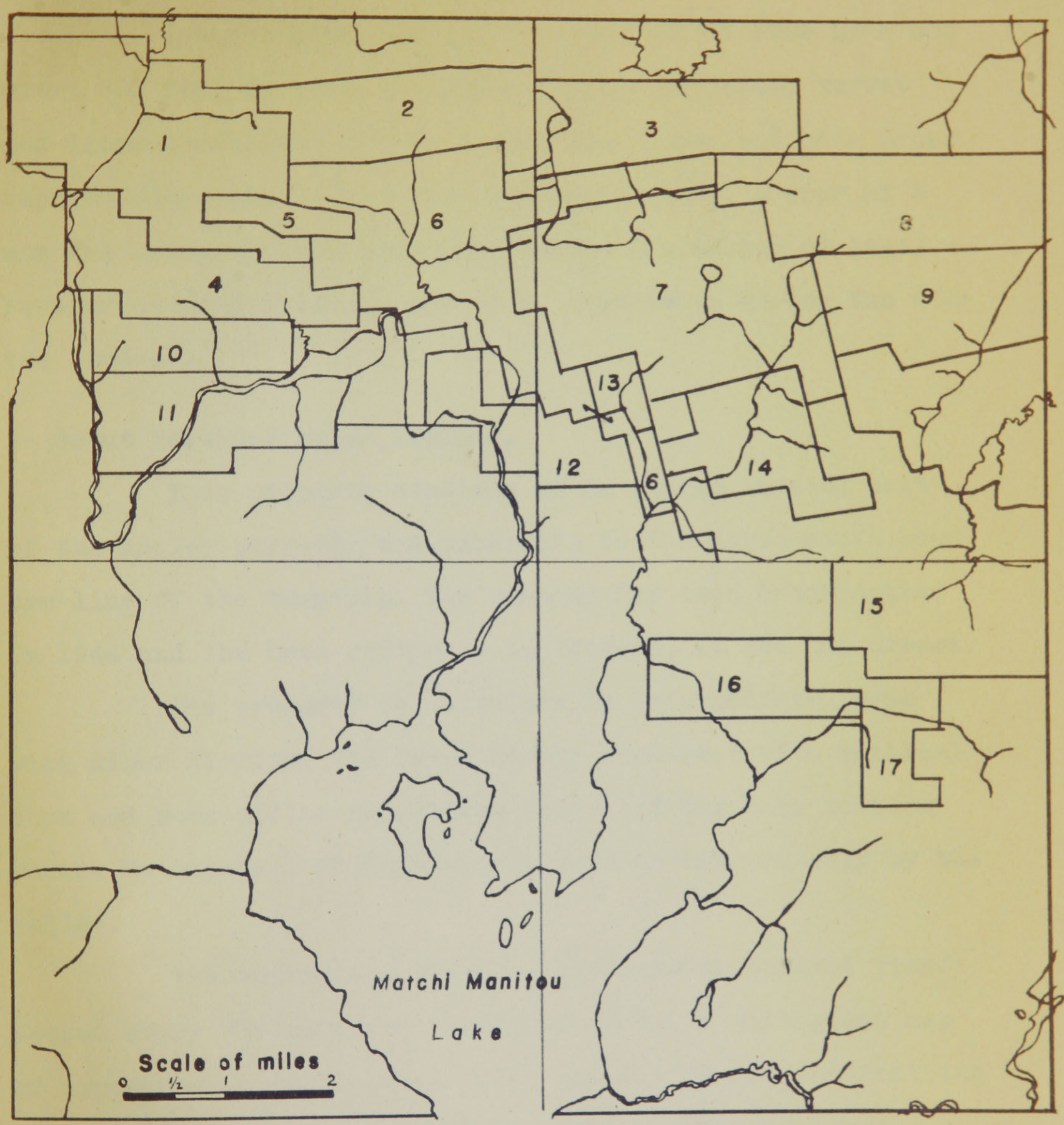
This property of 59 claims located in the north-west corner of the township has been incorporated in 1944. The head office of the company is in Toronto, at suite 1008 330 Bay Street.

Most of the property is underlain by Keewatin-type volcanics with narrow bands of tuffs. The north contact of the Temiscamian-type sediments goes across the southern part of the property. These sediments consist of greywacke and iron formation. A few sills of diorite intrude the volcanics and some narrow dykes of quartz porphyry have been found near the contact with the sediments. The strike of the rocks is from east-west to S-60°-E with steep dips to the north.

Three shear zones with mineralization have been worked: one to the south, in the andesites, is highly carbonated and contains some quartz veins. Trenching and sampling has been done and low gold values have been found. A second zone within the diorite and which may be the continuation of that in the diorite of the Croinor property has been trenched. Some quartz-tourmaline veins have also been found within the highly carbonatized schist zone. No gold has been reported in this area. A third zone, in the northern diorite sill has been found: the conditions of mineralization and shearing are about the same as the second zone.

Mining Properties

Pershing Township



1 Ansley
2 Scout Pershing
3 Lochland Pershing
4 Mitto Pershing
5-14 Cons. Mng. & Smelt.
6 Kenda Pershing
7 Croinor Pershing
8 Vine Pershing
9 Norford Pershing
10 Murbell
11 Canadian G. & Metal
12 Quebec Mng. Corp.
13 Pershon
15 Garden Pershing
16 Peribec
17 Packard Pershing

Control lines in a direction N-27°-E have been cut every 600 feet in 1944, followed by a magnetometer survey and diamond-drilling of the mineralized zones and of a cross section along the Vauquelin-Pershing boundary. A crew of 3 men was doing surface trenching during the summer of 1946. Further diamond-drilling was to be undertaken during the winter 1946-47.

2- Scout Pershing Mines Limited.

This property consists of 28 claims located east of the Ansley property and extending to the north-south centre-line of the township. The company has been incorporated in 1944 and the head office is in Toronto, at 226 Bay Street.

The property is underlain by intermediate lavas with minor diorite. The lavas strike east-west with vertical dips and some pillow structures indicated the tops to face south. No mineralization has been seen on the property by the author.

The workings consist of north-south control lines spaced every 600 feet across the property, a geological map of exposures, a north-south cross section of diamond-drilling in the center of the property and some surface workings.

3- Lochland Pershing Mines Limited.

This property of 30 claims is located east of the Scout Pershing property and north of the Croinor Pershing property. It has been incorporated in 1944 and the head office is in Toronto, at 226 Bay Street.

The property is underlain by intermediate lavas striking east-west to S-80°-E with steep dips and pillow structures indicating the top of flows to face south. No diorite has been seen, but a few barren quartz veins have been found. The lavas are cut across by a gabbro dyke which has not been traced all the way through as indicated on the map. No mineralization has been seen and there is not much chance according to the author to find any.

The workings consist of north-south control lines spaced every 600 feet across the property, a geological map of exposures, and some trenching.

4- Mitto Pershing.

The property consists of 28 claims and is located to the south of the Ansley property with "Baie Vauquelin" as the west boundary. The company was incorporated in 1945 and the head office is in Toronto, at room 404, 62 Richmond St.W.

The property is underlain by Temiscamian-type sediments consisting of greywacke and part of the iron formation, and also of the hornblende-granite whose east-west contact with the sediments goes approximately through the middle of the property. Very few exposures could be seen on the property and nothing of economic importance has been noted. Some diamond-drilling is supposed to have been done on the property, but no informations have been made available to the writer.

5 and 14: Consolidated Mining and Smelting Co. Ltd.

The company holds two groups of claims in the area, one (5) just east of the Ansley property, the other (14) south of the Croinor property.

The two groups are underlain by andesite volcanics and some sediments near their southern boundaries.

The first group (5) has been explored quite considerably in the years 1938 to 1940. A shaft has been sunk to an unknown depth, some underground exploration is believed to have been done and also some diamond-drilling, but no informations have been made available to the writer. According to a "rumor", some very good values in gold have been obtained in a quartz vein or rather a quartz lens near the shaft. This may be true because the author observed in the muck pile, near the shaft some quartz which must have come from there. For an unknown reason, the property has been closed down shortly after starting and nothing has been done since.

The rock is highly schistose and the strike is from S-80°-E to S-40°-E on the property which variation is considered to be considerable and also may indicate the presence of ore shoots if any. Some mineralization exists in the carbonatized and schisted rock.

The second group (14) is a larger property and is underlain by schisted and recrystallized rocks. The lavas and interbedded tuffs are not separable under these conditions and even diorite is so schisted that it has been very hard

to separate it from lavas. Some quartz-porphyry dykes are present and are also schisted so that the quartz phenocrysts are elongated. The strike of the schistosity is from S-75°-E to S-50°-E with dips averaging 55° to the north-east.

Workings on the property have been done between 1938 and 1940 and consist of control lines, mapping of exposures, and some diamond-drilling. Little informations have been made available by the company and nothing as to assays.

6- Kenda Pershing Mines Limited.

This property of 58 claims is located east of the Ansley property, west of the Croinor Pershing property and north of Garden Island Lake. It covers the whole width of basic volcanics and the south end is in the sediments. The company has been incorporated in 1944 under the Quebec laws, and the head office is in Toronto, room 710, 36 Toronto St.

The workings consist of control lines spaced at every 600 feet and in a N-27°-E direction, of a map of exposures, some trenching and 20,000 feet of diamond-drilling up to the end of 1946.

The rocks consist of andesite, basic tuff and agglomerate cut by diorite dykes and sills, feldspar porphyry to the south near the sediments and also a gabbro dyke. A talc zone in the sediments occurs near the contact with the volcanics and also some conglomerate has been found.

There are a few carbonatized shear zones in the volcanics and quartz veins. Some pyrite, pyrrhotite and chal-

copyrite have been seen in these zones and high gold assays have been obtained. The diorite seems to be the western extension of that of the Croinor. It has been mostly located through diamond-drill cores, but has been found to carry no gold. The feldspar porphyry, north-east of Garden Island Lake has also mostly been located with cores. The most interesting values have been obtained from drill cores near the same porphyry and efforts are made to locate gold orebodies in the diorite similar to that of the adjoining Croinor.

7- Croinor Pershing Mines Limited.

This property of 64 claims has been incorporated in 1944 under the Quebec laws and has its head office in Amos, Quebec. It is by far the most important prospect to date in the township. The property's area is 3142 acres of which 894 are held as a mining concession.

Before the Croinor took the property, Consolidated Mining and Smelting Co. Limited, and Ventures had some surface work done and about 15 holes drilled of which no cores and no records have been seen by the writer. Since 1944, the Croinor did much surface work, cut control lines every 300 feet at a N-27°-E direction, mapped the exposures of the property and did approximately 30,000 feet of diamond drilling mostly concentrated along the diorite sill which crosses the property in a N-65°-W direction. A vertical shaft, 275 feet deep has been sunk and about 1000 feet of lateral work has

been done on the two levels up to the end of October 1946.

Gold is known to occur east and west of the shaft and in places in quite considerable amounts.

The property is underlain chiefly by Keewatin-type volcanics consisting of andesitic flows and pyroclastic verying from fine altered tuffs to coarse agglomerates, also of intermediate lava flows to the north which are massive to pillowed. The sediments to the south, lie just outside of the property.

Intrusive in these volcanics are dykes and sills of diorite, feldspar porphyry and gabbro. The most important is a sill-like body of diorite which follows roughly the bedding and which bulges and branches locally. It is important, because it is mineralized and carbonatized quite commonly and gold has been found in the zones. Most of the exploration has been concentrated in that area. The schistosity is usually parallel to the bedding of the volcanics and the strikes are from S 80° E to S 55° E with dips of 50° to 60° to the north. It has been very difficult to differentiate between intrusive diorite and coarse grained volcanics, because of the alteration of the rocks and also because of their schistosity. The limits between the two may vary with the authors. Economically, the most important thing is the schist zone which is met rather on the north contact of the diorite with the volcanics. In that schist zone some quartz often occurs and

gold values are found in it. The gold values are also known to be erratic but mainly concentrated in this zone of adjustment though some has been found in the porphyry. Gold is usually found associated with pyrite replacing the surrounding rocks; this pyrite may occur as cubes or as seams. An ore zone has been indicated by diamond drilling for a length of 1450 feet with an average width of 11 feet at 0.24 oz. Au/ton. More systematic work has to be done and it seems highly probable that ore bodies of substantial size can be developed. The work has been concentrated in one diorite zone. Some in the other diorite bodies may also prove valuable.

8- Vine Pershing Mines Ltd.

This company holds 29 claims to the north-east of the Croinor with Haig-Pershing boundary as its eastern boundary. It has been incorporated in 1944 and the head office is located in Toronto, at 226 Bay Street.

The area is underlain by intermediate lavas which strike east-west to S 85° E with a steep dip to the north. Outcrops are few in number and of no particular interest. A sand ridge crosses the property in a north-south direction and permits the growth of jack pines.

The company associated with the Norford Pershing Mines Ltd built up two cabins along their common boundary and cut out control lines every 600 feet in a north-south direction and made a map of the exposures in 1945.

9- Norford Pershing Mines Ltd.

This company holds 31 claims to the south of Vine Pershing Mines Ltd. It has been incorporated in 1944 and has its head office in Toronto, at 226 Bay Street.

The property is underlain by volcanics of the intermediate type. Near the common boundary with Vine Pershing Mines Ltd., a flow breccia outcrops indicating that the top of the flows face north at this locality. Also a dyke of feldspar porphyry about 3 feet wide with feldspar phenocrysts up to 1½ inch in length is exposed on the property. It is very similar to one found on the Croinor property, ⅓ mile north-east of the shaft.

Workings consist of control lines spaced every 600 feet in a north-south direction, a map of exposures and a few trenches; those were made in 1945.

10- Murbell Gold Mines Ltd.

The company holds 15 claims south of the Mitto Pershing property in the north-west quarter. It has been incorporated in 1944 and has its head office in Toronto, at room 204, Victory Bldg.

The area is underlain by hornblende-granite and some of the border facies of the granite, hornblendite. Some surface work has been made on the property and no details been done available.

11- Canadian Gold and Metals Mining Co. Ltd.

The company holds several groups of claims, of

which one group of 53 claims is in Pershing Township and located to the south of the Murbell property. It is entirely underlain by the hornblende-granite, and very few exposures show at the surface. No work has yet been done by the company.

12- Midd-Pershing Gold Mines Ltd. (Quebec Mining Corp.)

The company hold 20 claims to the south-east of Garden Island Lake. It has been incorporated in 1945 and has its head office in Montreal at 360 St. James St. W.

The property is underlain by Temiscamian-type sediments and a part of the hornblende-granite batholith. The sediments are mostly biotite schists and staurolite schists with a band of conglomerate. The contact with the granite is well exposed where outcrops are shown on the map and has been determined near the centre-line by a drill hole driven by the company in 1946. No interesting values have been found or at least reported.

13- Pershon Gold Mines Ltd.

This small property of 5 claims is located to the south of the Croinor property. It has been incorporated in 1945 and has its head office at room 501, 67 Yonge St. Toronto.

It is underlain by basic volcanics and some tuffs. The volcanics are highly sheared and strike about S 80° E.

Some feldspar porphyry dykes cut across the volcanics and have been seen on the property at 3 places. A test pit about 20 feet deep has been dug in the porphyry which seemed to carry gold values. A few other trenches have been made and revealed some mineralization. Some drilling has also been done in 1945, but the cores have not been made available to the writer. A report says that two ore zones about 1500 feet apart have been outlined by this diamond drilling. The author cannot confirm this assertion.

15- Garden Pershing Mines Ltd.

This company holds 50 claims in the east end of the township. Its northern boundary is the east-west centre-line and the eastern boundary is Haig-Pershing boundary. The head office is in Toronto, at room 907, Victory Bldg.

The property is underlain by Keewatin basic volcanics and Temiscamian-type sediments. The contact between the two types of rocks is not visible but intense shearing, mineralization and alteration in the schists seems to be a good indication of the closeness of that contact. The sediments are represented by biotite schists striking in all directions and dipping vertically, with undeterminable tops. It is reported that at one place, gold values have been obtained from this mineralized schists.

Workings consist of control lines and some trenching.

16- Peribec Gold Mines Ltd.

This company incorporated in 1944, holds 20 claims to the north-east of Lake Matchi-Manitou. The head office is in Toronto, at room 1116, Federal Bldg.

The property is mostly underlain by Temiscamian-type sediments with the western end underlain by the hornblende granite. The schists are mainly staurolite-biotite schists and few exposures may be seen. The strike of these is N 20° W, following the contact with the granite. Some surface work has been made, but most of the trenches have not reached the solid rock. No mineralization was seen, though some has been reported...

17- Packard Pershing Mines Ltd.

The company holds a few groups of claims, one of which is in the south-east of Pershing township and consists of 17 claims to the south of Garden Pershing.

The property is supposedly underlain by sediments though no exposure could be found. A few trenches made by a crew could not reach the solid rock. Control lines have been cut and a magnetometer survey has been made in 1945; this revealed the presence of iron formation which with the help of Brunton compasses could be traced westerly to Lake Matchi-Manitou. Two drill holes have been made in 1946 and the cores revealed the presence of biotite schists, staurolite schists, iron formation and a few dykes of pegmatite, one of which contains some spodumene.

SUMMARY OF CONCLUSIONS.

The Pershing township map-area lies within the PreCambrian shield and has the characteristic features of that unit. In the north-west quarter, colonisation would be suitable if drainage be established.

The essential feature of the regional geology is a remnant of steeply-folded Keewatin volcanics overlain by Temiscamian-type sediments which are intruded by a granite batholith. The older formations are cut by porphyries, and the sediments by pegmatites. Gabbro dykes are found to cut the volcanics and the granite.

The grade of metamorphism varies with the localities: the difference is noted especially in the meta-sediments and metamorphism increases as we go from north to south as the presence of staurolite, garnet, chlorite is noted. The amphibolites to the south-west of the township, are considered to be meta-volcanics, and then represent a higher degree of metamorphism than the volcanics to the north. The coarse grained amphibolite is very similar lithologically to the gabbros found to the north.

As none of the diorites were found outside of the

gradational contacts between the "diorite" and volcanics occurs.

The economic mineral possibilities of the area are yet uncertain. On the Croinor Pershing property, an ore body has been outlined, but up to date, its extension to the west has not been located and very little work has been done eastward. Gold mineralization is widespread throughout the area but nothing of real importance has yet been found outside of the Croinor property. All the promising occurrences were found within the Keewatin basic volcanics but this may be due to more careful searching in this part of the area.

Most of the gold-bearing veins conform or tend to conform with the attitude of the schistosity of the enclosing rocks. Mineralization especially in the form of pyrite is widespread, but concentrations are rare and are not necessarily associated with gold values. Chalcopyrite, sphalerite and galena have also been found, but none appears to be of economic interest as a source of base metals.

THE END.

BIBLIOGRAPHY.

Bell, L.V. and Bell, A.M.: Bell River Headwaters Map-Area: Ann. Rep. Q.B.M. 1931, part B.

Bell, L.V. and Bell, A.M.: Assup River Map-Area: Ann. Rep. Q.B.M. 1932, part B.

Norman, G.W.H.: Louvicourt Township, Abitibi Cty, Que. G.S.C. Paper 45-10.

Norman, G.W.H.: Bourlamaque Twp., Abitibi Cty, Quebec. G.S.C. Papers 46-15, 46-16, 46-17, 46-18.

Norman, G.W.H.: Vassan-Dubuisson Twps, Abitibi, Que. G.S.C. Paper 42-12.

Norman, G.W.H.: LaMotte Map-Area, Abitibi, Que. G.S.C. Paper 44-9.

Ingham, W.N.: Mining Properties and Development in Abitibi and Temiscamingue Cties during 1944, (part III). Dept. of Mines, Div. of Min. Deposits, Quebec, 1945.

Tremblay, L.P.: Lacorne Twp., Abitibi, Quebec. G.S.C. Paper 46-13.

Gunning, H.C.: Cadillac Area, Quebec; G.S.C. Memoir 206.

Gunning, H.C. and Ambrose, J.W.: Malartic Area, G.S.C. Memoir 222.

Gunning, H.C.: Bousquet-Joannes Area, Quebec; G.S.C. Memoir 231.

Norman, G.W.H.: Major Faults, Abitibi Region, Quebec. C.I.M.M. Bull. 406, February 1946.

Norman, G.W.H.: Thrust Faulting of Grenville Gneisses northwestward against the Mistassini Series of Mistassini Lake, Que. Jour. Geol. Vol. XLVIII, no 5, July-Aug. 1940.

Norman, G.W.H.: Molybdenite Deposits and Pegmatites in the Preissac-Lacorne Area, Abitibi, Que. Econ. Geol. Vol. XL, no 1, Jan-Feb. 1945.

Norman, G.W.H.: The North-East Trend of Late Precambrian Tectonic Features in the Chibougamau District, Que. Roy. Soc. Can. 3rd Series, Sect. IV, Vol. XXX, 1936.

Norman, G.W.H.: Notes on the Structure of the Cadillac-Bourlamaque Area, Abitibi, Que. G.S.C. Paper 43-6.

The Financial Post: Survey of Mines 1947.

Gill, J.E.: Report on the Croinor Pershing Mines Ltd. Pershing Twp. Quebec. (Dec. 1946).

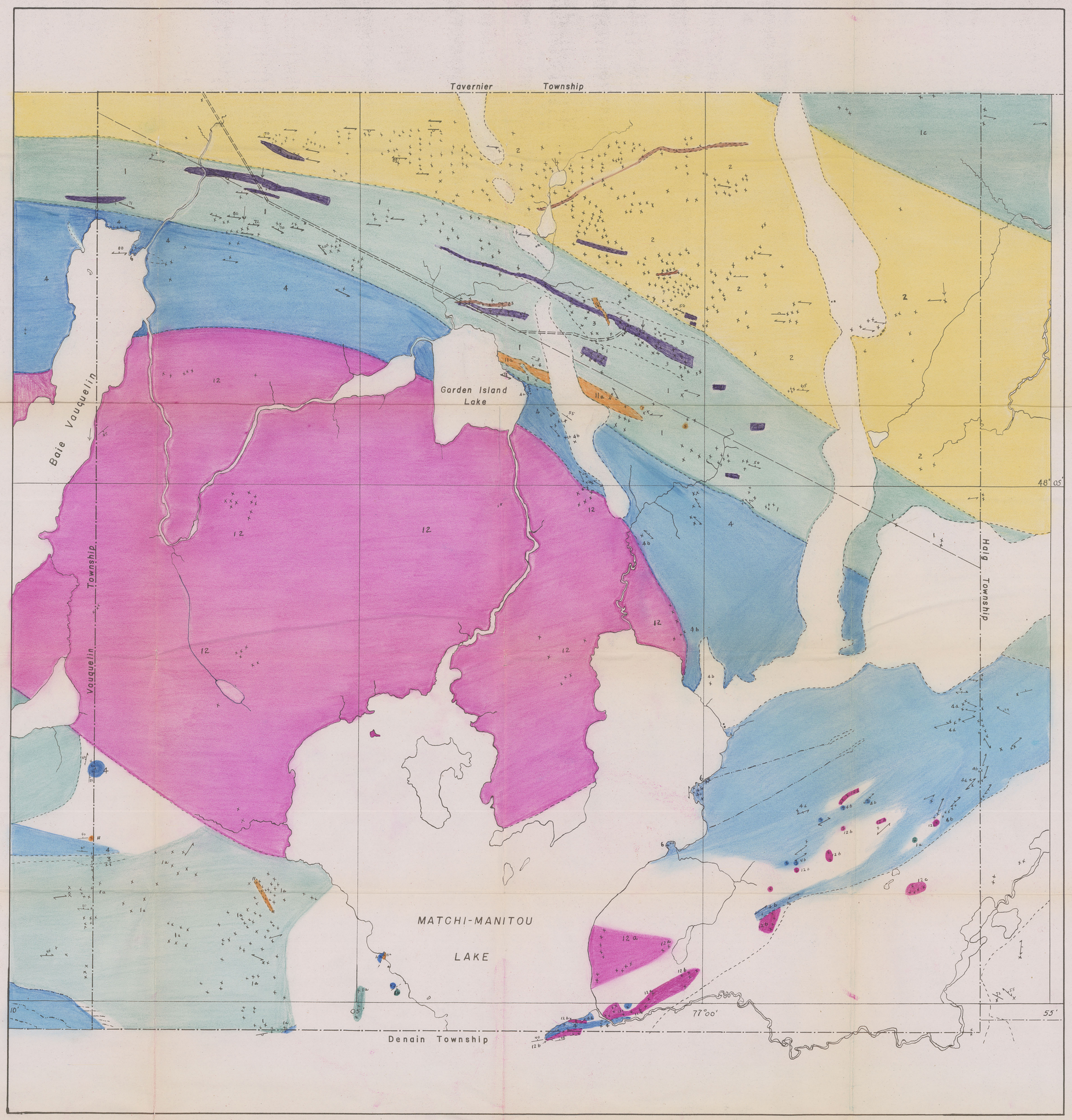
Billings, M.P.: Structure and Metamorphism in the Mt Washington Area, New Hampshire. GEol. Soc. Amer. Vol. 52, 1941, pp. 863-936.

Billings, M.P.: Regional Metamorphism of the Littleton-Moosilanke Area, N.H. Bull. Geol. Soc. Amer. Vol. 48, 1937, pp. 463-566.

Bowen, N.L.: The Evolution of the Igneous Rocks. Princeton 1928.

Harker, Alfred: Metamorphism, Methuen 1939.

Mawdsley, Cooke, James : Geology and Ore Deposits of Rouyn-Harricanaw Region. G.S.C. Memoir 166, 1931.



LEGEND

- 13 Diabase, Gabbro

Post-Timiskaming

- 12 Hornblende Granite
  - 12a Hornblende Syenite
  - 12b Pegmatite, Pegmatite bearing granite
  - 12c Muscovite-Biotite Granite-Gneiss, minor schistose pegmatite, biotite gneiss
  - 12e Hornblendite
- 11 Quartz-Feldspar Porphyry
  - 11a Feldspar Porphyry
- 7 Diorite, 7a carbonatized diorite

Timiskaming and Keewatin

- 6 Iron Formation, some Greywacke
- 4 Greywacke, 4a Conglomerate
  - 4b Staurolite-Biotite Schist
  - 4c Garnetiferous Biotite Schist
  - 4d Biotite Schist, 4e Talc Schist

Keewatin

- 3 Agglomerate and some Tuff
  - 3c partly amphibolitized
- 2 Pale green intermediate to trachytic lavas
  - 2h includes diorite and carbonatized diorite
- 1 Andesite and some Tuffs
  - 1a fine and coarse Amphibolite, minor diorite includes some partly recrystallized Andesite
  - 1c includes intermediate lavas
  - 1d carbonatized andesite
  - 1e includes diorite and carbonatized diorite

Sand and Gravel

Rock Outcrop x x x

Bedding (vertical, inclined)

Bedding (upper side of bed faces as indicated)

Schistosity (inclined, dip unknown)

Glacial striae

Iron formation as indicated by magnetic surveys

Road

Township line

Buildings

Surveyed line

Geology by G.W.H. NORMAN and M. TIPHANE
1946

PERSHING TOWNSHIP

ABITIBI COUNTY

QUEBEC

SCALE OF MILES
0 ½ 1 1½ 2 2½ 3