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PRELIMINARY REPORT ON NORMANVILLE AREA, SAGUENAY ELECTORAL DISTRICT

P. R. NO. 413

PROVINCE OF QUEBEC, CANADA

DEPARTMENT OF MINES

HON. W. M. COTTINGHAM, MINISTER

GEOLOGICAL SURVEYS BRANCH

PRELIMINARY REPORT

ON

NORMANVILLE AREA

SAGUENAY ELECTORAL DISTRICT

BY

P. J. CLARKE

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ERRATUM

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Page 5, paragraph 1, lines 8 and 9, should read: "are so abundant that the rock resembles a metamorphosed conglomerate. However, it is probable that the clots are the result of metamorphic segregation".

PRELIMINARY REPORT

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NORMANVILLE AREA

SAGUENAY ELECTORAL DISTRICT

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INTRODUCTION

The Normanville area, mapped during the summer of 1959, lies approximately 260 miles north-northwest of Sept-Iles, and directly north of Mt. Wright, in Saguenay electoral district. It includes most of Normanville, 2756 and 2855 townships and parts of 2854, 2856, and Raimbault townships.*

The area is bounded by latitudes 52°45' and 53°00', by longitude 67°30' on the west, and by a very irregular limit of mapping on the east. It covers an area of 180 square miles.

The area is most easily accessible by float-plane from Sept-Iles. It may also be reached by canoe from Sept-Iles along the Moisie or St. Marguerite river systems, or from the Quebec North Shore and Labrador Railway through Shabogamo and Wabush lakes. The proposed rail lines to Wabush lake and Mt. Wright will eventually provide good access to the area.

The greater part of the area is 2,050-2,650 feet above sea-level. In the southern part, resistant quartzite and ironstones are in ridges generally about 600 feet higher than the adjacent gneisses and schists. In the north the topography is flatter, the lack of relief probably resulting from the uniform resistance to erosion of the rocks exposed there. South-southeast-trending ridges of glacial moraine control stream and lake trends over much of the area.

Most of the area is drained through the lake system connecting Boulder lake with Bouteille lake to the west. In the southeast, Kissing lake drains southward into Carheil lake.

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* Township numbers refer to subdivisions, used only by the Department of Mines, of unsurveyed territory in the Province.

The waters of both these drainage systems flow ultimately into Pekans river. The height of land in the eastern part of the area separates waters flowing into the Pekans river and south to the St. Lawrence from those flowing into Wabush lake and east to the Atlantic.

Most of the area has a light cover of spruce forest and caribou moss. On hill-sides the bush is thicker and spruce and fir trees grow on some protected slopes. Hill tops are generally bare and alders are common along streams.

GENERAL GEOLOGY

Exposure throughout the area is generally good. In the south, quartzite and ironstone hills of the Mt. Wright range have a local relief of about 600 feet. In the north, although relief is low, overburden is generally thin except in the areas north and west of Green lake and south and west of Kissing lake. West of Boulder lake, glacial moraine is also thick but roches moutonnées of bedrock project through it.

The area is within the Grenville subprovince, and all consolidated rocks are of Precambrian age. They are believed to represent, in part, the metamorphosed equivalents of sedimentary rocks of the Labrador trough.

In the south, the rock types include biotite schist, gneiss and migmatite, biotite garnet schist, muscovite kyanite garnet schist, biotite schist with graphite, crystalline limestone, quartzite and quartz muscovite schist, quartz specularite and quartz magnetite ironstone and quartz-iron silicate-magnetite ironstone. These rocks have been injected by generally conformable bodies of muscovite-biotite granite and gabbro.

In the north, rocks probably equivalent to the biotite gneisses and schists, quartz grunerite magnetite schists, and gabbro have been metamorphosed to the granulite facies and injected and metasomatized by hypersthene-bearing granite.

The structure of the gneisses and iron-bearing series is characterized by isoclinal and overturned folds with northeast- or northwest-trending axes. The folds in the rocks of the granulite facies in the northern part of the area are equally tight but less complex.

TABLE OF FORMATIONS

RECENT PLEISTOCENE	Glacial and fluvio-glacial deposits		Glacial and fluvio-glacial deposits	
PRECAMBRIAN	NORTHWESTERN PART OF AREA GRANULITE FACIES		SOUTHEASTERN PART OF AREA AMPHIBOLITE FACIES	
	Fresh gabbro		Granite, gneissic-granite, migmatite gabbro, amphibolite	
	Igneous contact		Igneous contact and orogeny	
	Hypersthene granite and pegmatite Mottled dioritic hybrid rock	METAMORPHIC FACIES CHANGE		
	Igneous contact + metamorphism			
	Metamorphosed gabbro, pyroxenite			
	Strongly lineated biotite schist		Muscovite-garnet schist ± graphite and kyanite Unsegregated mica schist ± graphite	Upper Schists
	Quartz-silicate-magnetite ironstone		Silicate magnetite ironstone Oxide facies ironstone Quartzite and muscovite quartz schist Marble	Iron Formation
	Hypersthene-feldspar-blue quartz gneiss		Porphyroblastic biotite schist Biotite garnet schist Quartz-mica-feldspar gneiss Biotite feldspar gneiss ± hornblende	Lower Gneisses

AMPHIBOLITE FACIES

(Southeastern Part of Area)

Lower Gneisses

Quartz-feldspar-biotite gneiss

The oldest rocks of the area are quartz-feldspar-biotite gneisses. In the southwestern corner, near Pekans river, the gneisses are grey, rusty weathering, coarse-grained and, as a result of segregation of the mafic and felsic constituents, are banded or speckled. They generally contain about 25 per cent biotite, 50 per cent plagioclase feldspar, 15 per cent quartz, minor amounts of muscovite, garnet, hornblende, epidote and, rarely, pyrite. In places this paragneiss is permeated with potash feldspar and quartz, yielding a banded migmatite that grades here and there into a granitic gneiss. Bodies of this granitic gneiss are generally conformable, but cross-cutting does occur on a minor scale. The gneiss also carries concordant bands of green amphibolite which are generally less than one foot thick.

The coarse-grained segregated gneisses exposed in the southwestern corner of the area may represent rocks of the basement on which the metasedimentary group was laid, but no evidence of an unconformity between the two groups was seen.

Higher in the series the biotite gneisses are finer grained and poorly segregated, and muscovite becomes more abundant whereas hornblende disappears. These gneisses are also grey on the fresh surface but weather either grey or buff. A typical mineral composition is biotite 15 per cent, muscovite 15 per cent, quartz 30 per cent, plagioclase feldspar 40 per cent. Although lacking strong mineral banding the gneiss is foliated owing to the orientation of its micas. As this foliation generally parallels the foliation of the overlying iron-bearing sequence, it is believed to be a reflection of the original bedding planes. The gneisses are believed to be the metamorphosed equivalent of pelitic sediments that conformably underlie the iron formation sequence. Although generally below the iron formation sequence, scattered exposures of similar gneiss are found above this sequence in the Bloom Lake syncline and south of Mogridge and Quartz lakes.

Biotite garnet schist

Underlying the crystalline limestone in the southeastern corner of the area is a band of very coarse-grained, extremely garnetiferous, biotite schist. This rock generally contains 25 per cent biotite, 5 per cent hornblende, 30 per cent garnet, 25 per cent feldspar and 15 per cent quartz. The garnets are large and well formed, and are generally surrounded by feldspar and quartz in a groundmass of mixed biotite, feldspar and quartz.

Porphyroblastic-quartz-feldspar-biotite schist

Another coarse-grained schist, also rich in biotite but lacking garnet, forms a horizon-marker in the gneisses of the central part of the area. This schist is characterized by clots of feldspar and quartz, or quartz alone, in a matrix of coarse-grained, shiny, black biotite. The schist is intricately wrinkled for the most part and the quartz bodies are stretched into thin contorted lenses. In places the clots of felsic minerals are so abundant that the clots are the result of metamorphic segregation.

Iron Formation Sequence

The term "iron formation sequence" includes all the iron-bearing metasedimentary rocks regardless of their economic value, as well as the associated marble and quartzite.

Marble

Marble is exposed only in the southeastern corner of the area, south and east of Kissing lake. It seems to occur both above and below the ironstone units, but lack of exposure in critical areas makes its position uncertain. In adjacent areas the marble occurs at the base of the iron formation sequence.

It is a coarse-grained, equigranular calcite-dolomite or calcite-ankerite rock, buff to white on the fresh surface and weathering ash white to brown depending on the iron content. The marble commonly contains bands of quartz which, in contact with the carbonate, have reacted to form such calcium silicate minerals as tremolite, diopside and, rarely, actinolite. The quartz was mobile later than the carbonate, and has moved to bedding planes and joints in the marble. It generally makes up less than 20 per cent of the marble and may be totally replaced by calc-silicate minerals.

Quartzite, Quartz-muscovite Schist

Quartzite is more common in this area than marble. It occurs northwest of the marble in apparently the same stratigraphic horizon. The only place where the quartzite and marble were found in contact is about ½ mile north of Hook lake, where there is an abrupt change from marble on the east to quartzite on the west. Although the quartzite generally occurs below the ironstone units it may also occur within or, as near Bloom lake, above them.

It is generally medium- to coarse-grained, massive and white, grey or pink. In places, it is coarsely recrystallized and resembles vein quartz. Some of it has been deeply weathered and may be crumbled with the fingers.

Near its contact with the ironstones the rock is a quartz-muscovite schist, with about 30 per cent greenish muscovite. This facies is best exposed south of Mogridge lake, and also north and west of Kissing lake. Where quartz-muscovite schist is absent, the quartzite may contain minor amounts of specularite and grade imperceptibly into the ironstones. The gradational contact between quartzite and ironstones, and the interlayering of the two rocks at Bloom lake, suggest that they formed in similar environments and are essentially contemporaneous.

The resistance to erosion of the quartzite member is responsible for the greater relief of the southern part of the area.

Ironstone Units

The ironstones of the area include an oxide facies and a silicate facies, with the latter generally the higher stratigraphically. It is the oxide facies that is of commercial value.

The oxide facies may be subdivided into magnetite-rich and hematite-rich groups, which probably reflect the oxidation potential of the original sedimentary environment. In the western part of the area the oxide facies is predominantly of the hematite type. As it is followed eastward it becomes richer in magnetite, as at the central hump of the Bloom Lake syncline or the nose of the Daigle Lake syncline. Farther east the oxide facies diminishes and the silicate facies becomes predominant, as at Tupper and Kissing lakes. This variation is best explained as due to passage from a shallow water, oxygen-rich environment in the west to a deeper, less oxidizing environment in the east.

Rocks of the hematite oxide facies are generally blue-grey, medium-grained and banded to schistose. They contain 15 per cent to 45 per cent specular hematite, or a general average of about 35 per cent. A typical specimen consists of one-inch zones of half coarse-grained specularite and half mixed fine specularite and quartz, spaced 2 inches apart in a matrix of mixed, fine specularite and quartz. In places, the hematite iron formation is deeply weathered and friable. It contains zones of remobilization where the quartz and specularite have been separated and coarsely recrystallized.

The magnetite quartz ironstone is grey or black, fine- to medium-grained, and finely banded to massive. It is tough and compact owing to the mosaic texture of its quartz and magnetite grains. It contains 10 per cent to 40 per cent magnetite, or a general average of about 25 per cent. The magnetite and specularite facies grade into one another, and both may contain minor amounts of actinolite (?).

The silicate facies of the iron formation sequence is extremely variable in composition. It is characterized by the presence of magnetite and grunerite, either interbanded with quartz and, rarely, siderite or scattered through a matrix of fine grunerite. Where the amount of quartz is much greater than that of the iron silicates, the silicates occur as scattered blebs in a speckled, quartz-iron, silicate rock. In some places actinolite (?) is present as rims between the grunerite and quartz. The ironstone near Kissing, Daigle, and Tupper lakes is of the banded coarse-grained quartz-grunerite type, whereas that near Greenwater lake is fine-grained grunerite-magnetite schist. South of Jackson lake, some of the silicate ironstone has been metamorphosed to the granulite facies.

Near Boulder lake, there appear to be two layers of ironstone separated by several hundred feet of schist. Here, a lower layer of silicate magnetite ironstone is overlain by biotite schists followed by quartz specularite ironstone. The two ages of iron deposition also show in the Bloom Lake syncline.

Upper Schists

The upper schists are found overlying the ironstones between Kissing and Moiré lakes. This unit is, for the most part, similar to the biotite muscovite schists below the iron formation sequence in the western part of the area, but differs from them in the ability to recrystallize to a quartz-garnet-muscovite-kyanite schist which, in places, carries flakes of graphite. Such recrystallized schist occurs near Hook lake, and is characterized by its coarse grain, rusty weathered surface, high content of garnet and muscovite, and its clear quartz. In places it is interlayered with a banded quartz-feldspar-hornblende-epidote schist. The coarse-grained quartz-garnet-muscovite-kyanite schist grades into the enclosing quartz-feldspar mica schists, and is probably a coarsely crystallized phase derived from the same sediments. Fine-grained, graphite-bearing schist was found above the ironstone units in a shear zone near the small lake between Moiré and Hook lakes.

Gabbro, Amphibolite

Concordant bodies of diabase and gabbro are associated with the iron formation sequence throughout the area. The gabbro is grey to brown on the weathered surface, coarse-grained and commonly ophitic. Its composition is generally about 55 per cent calcic plagioclase, 15 per cent pyroxene, 25 per cent amphibole, and 5 per cent magnetite; traces of garnet may also be present. In some places, the mafic minerals form clots which stand in relief on the weathered surface, giving a blotchy appearance to the rock. Where the blotchy and massive types of gabbro are in contact the massive gabbro appears to cut the blotchy gabbro, and so is thought to be a later phase from the same parent mass.

In places, the gabbro has recrystallized to a garnet-bearing amphibolite with ellipsoidal patches of feldspar in a matrix of hornblende and garnet. The schistosity of this rock parallels that of the adjacent rocks.

Gabbro bodies are found most commonly in synclines of the iron formation sequence, and were probably injected syntectonically.

Granitic Rocks

In the southeastern part of the area, several small bodies of white granite with associated aplite and pegmatite inject the biotite gneisses. The granites are generally coarse-grained, massive to gneissic, white to pink on the fresh surface and white weathering. They carry about 10 per cent muscovite, 15 per cent biotite, 25 per cent quartz and 50 per cent white feldspar. Although they are generally concordant, they cut the gneiss at several places.

GRANULITE FACIES

(Northwestern Part of Area)

Hypersthene Gneisses

Rocks of the northern part of the area have been metamorphosed to the granulite facies. These rocks were probably derived from the same sediments as the biotite feldspar gneiss to the south and have been recrystallized to medium-grained, hard, massive, brown, rusty weathering gneisses. These gneisses are made up of various proportions of black pyroxene, olive feldspar with a waxy lustre, quartz and biotite. Biotite may predominate over pyroxene and is commonly found coating fracture faces. Several pyroxene cores surrounded by fibrous green amphibole were noted.

Although generally massive, these gneisses may be banded and there are common layers of coarse-grained rusty weathering pyroxene-biotite granite with waxy, olive feldspar and blue quartz. In places, these granitic bands are very thin and discontinuous, suggesting a local origin, but in other places they form more than 60 per cent of the outcrop and enclose blocks of gneiss. In these cases the blocks of gneiss are generally oriented parallel to one another and to the gneiss outside the granitic body. Also found within the gneisses are mafic segregations of dense, green, pyroxene-rich rock.

Hypersthene Granite ("Charnockite")

Inasmuch as the hypersthene granite in this region commonly contains pyroxene, it has been called "charnockite". It is found only in the granulite zone of metamorphism. It varies from medium-grained to pegmatitic, is massive to sub-graphic, and is characterized by quartz with a blue tint and plagioclase with a waxy lustre. A fresh, pink potash feldspar is present as well as the waxy, greenish, sericitized plagioclase. The mafic minerals are pyroxene, amphibole and biotite, the latter two probably being replacements of the pyroxene. Rims of fibrous amphibole surround pyroxene cores and biotite is most abundant on fracture planes.

A large mass of this granite occurs in the north central part of the area near Jackson lake. Here, the rock is similar in most respects to the thin, acid stringers found in the hypersthene gneisses throughout the area, but differs from them in being richer in potash feldspar and in weathering white rather than rusty. The charnockite body shown in the west central part of the area is the brown, rusty weathering type and is full of oriented inclusions of hypersthene gneiss.

Hybrid Charnockite Diorite

An intermediate phase of the charnockite occurs at the contact of the charnockite with the hypersthene gneisses. It is composed of 50 per cent green, waxy plagioclase, minor amounts of potash feldspar, and about 40 per cent hornblende and biotite. Fine sericite occurs throughout the rock. The hornblende and biotite are typically fine-grained and matted. They surround the feldspar or are in fractures within them, and thus give the rock a mottled to slightly gneissic appearance. They appear to be the alteration product of some other mineral, probably pyroxene.

Wherever this dioritic rock lies adjacent to the hypersthene gneiss, the trends of the two rocks are parallel. It is believed to be a hybrid rock resulting from alteration and digestion of the hypersthene gneisses by the charnockite, with consequent basification of the charnockite magma.

Iron Formation Sequence

In the zone of high grade metamorphism, iron-bearing sediments similar to those yielding the silicate ironstone of the east-central part of the area have been transformed to a fine-grained, compact, magnetite-quartz-iron silicate rock with a structure varying from massive to schistose depending on whether quartz or iron silicate predominates. It differs from the less metamorphosed ironstone in being much finer grained, and in not being segregated into compositional bands. The rock is quite variable in composition but commonly contains about 40 per cent quartz, 10 per cent magnetite, 25 per cent biotite, 15 per cent brown iron silicate, 5 per cent iron carbonate (now altered to limonite) and, in some places, garnet. This rock commonly carries irregular veins of quartz containing well formed rhombs of iron carbonate (now limonite). It averages about 10 per cent magnetite, with a maximum of about 20 per cent.

Lineated Biotite Schist

A little fine-grained, biotite-quartz-feldspar schist is associated with the ironstone just described. The composition of the rock is approximately 30 per cent biotite, 5 per cent silimanite, 35 per cent feldspar, 30 per cent quartz, and possibly a little graphite here and there. The most striking feature of this rock is its strong lineation, resulting from the elongation of the biotite. The linear habit of the biotite suggests that it formed by replacement of an elongate mineral, probably an amphibole. This rock type was probably developed by high-grade metamorphism of sediments associated with the ironstones.

Altered Gabbro and Pyroxenite

Within the granulite facies there are several occurrences of gabbro and associated pyroxenite. In most places, the gabbro resembles that described earlier but, near the eastern border of the area, it is fine-grained, dense, dark and slightly gneissic. It is composed of about 50 per cent calcic plagioclase, 15 per cent biotite, 30 per cent amphibole or pyroxene and 5 per cent magnetite. It appears to be a gabbro altered by the high grade metamorphism that developed the hypersthene gneisses. However, it may be a recrystallized lava.

A body of pyroxenite is associated with gabbro near the northeastern corner of the area. It is medium-grained, weakly foliated and, being comprised almost wholly of green pyroxene, is green on both fresh and weathered surfaces. It appears to grade into the nearby gabbro by an increase in feldspar.

Structure

The structure of the area is complex but can be mapped in detail owing to the good exposure and abundance of marker beds. Deformation seems to have been predominantly by folding for, although several faults or shears are mapped, their displacements are generally small. Small-scale structural features such as drag folds, chevron folds, crenulations, fluting, mineral lineation, and joints are widespread. However, all but the joints are better developed in the amphibolite facies than in the granulite facies of metamorphism.

Folds

The fold axes in the southern part of the area trend in one of two general directions, east to east-northeast or northwest. The easterly trending folds are the best developed. Cross folds are marked by the bends and buckles in the Daigle Lake and Bloom Lake synclines. Such cross folds result in a rough grid-like pattern of domes and basins with rocks of the iron formation sequence occurring in the basins. This pattern is recognizable in the rocks of the southern and central parts of the area, and is best developed between Boulder and Mogridge lakes.

The rocks of the granulite facies of metamorphism of the northern part of the area are also tightly folded. However, the trend of their foliation tends to be uniform over a larger area than that of the rocks in the south. Their trends vary from southeast at the western border through east to northeast in the northeastern corner of the area.

<u>Faults</u>

Although faults as such are not apparent several shears were noted within the area. One shear set tends to be parallel to the east-northeast fold axes and is probably comprised of high angle thrust faults formed at the time of folding. Another set strikes north-northwest perpendicular to the northeast fold structures. This set is stronger than the first and is well represented south of Mogridge lake, and in the Bloom Lake and Tupper Lake synclines.

<u>Joints</u>

Joints are conspicuous in most of the rocks of the area. The hypersthene gneisses are generally cut by a single set of joints which strike perpendicularly to the foliation and dip steeply. Where basic, green segregations occur within these gneisses, the joints are more common in the segregations than in the main body of the gneiss. They are believed to be tension joints formed perpendicularly to the direction of folding.

In the southern part of the area the joint systems are more complex but joints perpendicular to the fold axes as well as axial plane cleavage and joints can be recognized. Axial plane cleavage is especially prominent in the grunerite-magnetite schist member of the iron formation sequence.

<u>Lineations</u>

Lineations arising from mineral orientation and streaking are common in rocks of the iron formation sequence and in the overlying schists. Mineral orientation is the general rule in the high-grade biotite schists in the northern part of the area. Fluting is developed on quartz bands in the iron formation sequence where they are intersected by cleavage, and minor crenulations are common throughout the biotite schists and gneisses. All these types of lineation tend to lie parallel to the axes of adjacent folds.

Contact relations of the granulite and amphibolite facies.

The contact between rocks of the granulite and amphibolite facies crosses the area in a northeasterly direction. The contact itself was not seen but rocks of the two facies were found within $\frac{3}{4}$ of a mile of each other. West of Boulder lake, the hypersthene gneisses trend southeast to the contact. At this place the lower-grade biotite gneisses strike northeast parallel to the contact and dip southeast away from it; they appear to have been folded and faulted against the hypersthene gneisses. About $1\frac{1}{2}$ miles southeast of the contact the biotite gneisses are cut by northeasterly striking shears. West of Boulder lake the contact zone is buried by glacial drift.

As the hypersthene gneisses are cut off where the northeast tectonic trend begins they must have reached their high grade of metamorphism before the northeast folding occurred. Rocks of the two metamorphic facies were probably derived in part from the same sedimentary series, for ironstone occurs in both suites.

Glacial Deposits

Glacial deposits cover much of the area, being thickest in the central and west central portions where they form morainic hills and boulder-strewn plains. South-southeast-trending ridges of moraine trail off behind knobs of bedrock in the area west of Boulder lake, indicating glacial flow from the north-northwest.

Eskers and deposits of sorted glacial material are common in south-trending stream valleys, indicating that glacial and modern drainages follow essentially the same pattern. Modern drainage, however, is also influenced by the south-southeast glacial trend.

ECONOMIC GEOLOGY

The primary economic interest of the area lies in the ironstone units widely exposed in the south. Of the several types of ironstone, the quartz-specularite type is considered to have the best economic possibilities. Its iron content is variable but generally averages 25 per cent to 35 per cent over thicknesses of 30 to 300 feet. In some places, such as south of Mogridge lake, its width is increased by plastic flow or by repetition of units by folding. Some of this type is deeply weathered and friable, permitting easy crushing for concentration.

The magnetite-oxide ironstone facies carries about the same amount of iron as the specularite facies. It is exposed at the nose of the Daigle Lake syncline and in the Bloom Lake syncline. In both these areas the ironstone appears to have been thickened by folding.

Exploratory work was done in the Mount Wright - Mount Reed region by United Dominion Mining Company from 1947 to 1949. In 1952, interest was revived by United States Steel Corporation, which staked ground now being developed by Quebec Cartier Mining Company. The exploration rush began that year and continued into 1956, by which time the most promising iron occurrences were staked. Since then the major activity has been geological and geophysical mapping, diamond drilling, and metallurgical tests aimed at evaluating known deposits.

Although the area is of primary interest for its iron ore, deposits of sulphides also occur in several places. A highly altered mineralized zone containing arsenopyrite, pyrite, and small amounts of nicolite and cobaltite is exposed west of Bloom lake. This zone, known as the Walsh prospect (Denis, 1951), contains several irregular pods of sulphides within, and generally conformable to, quartz-grunerite-actinolite ironstone. The best mineral showings have been removed by trenching but, judging from large blocks lying nearby, pods varied from several inches to 2 feet long and up to one foot wide. Analyses of two grab samples yielded the following percentages:

	Cu	Ni	Co	Ag	Au	Bi
1.	nil	0.43%	6.0%	0.000	0.000	0.16%
2.	nil	0.23%	6.5%	0.000	0.000	0.33%

The sulphides are accompanied by a buff carbonate and a dark green amphibole, possibly actinolite. Nearby, the ironstone has been strongly recrystallized to yield a rock with large, oriented, magnetite porphyroblasts in a matrix of coarse quartz.

Several occurrences of sulphides were found in the hypersthene gneiss and one in the ironstone near the nose of the Daigle Lake syncline. These showings were all small in size and conformable to the foliation. One showing of sphalerite was found in the north-central part of the area. The sphalerite occurs as reddish, resinous crystals in a quartz-carbonate-muscovite rock adjacent to an outcrop of hypersthene gneiss. The host rock is poorly exposed and probably of lower metamorphic rank than the nearby gneiss. It may be a boulder but is possibly part of a sphalerite vein cutting the gneiss.

The pyrite occurrences in the northeastern corner of the area are arranged around the gabbro body there and are probably derived from it. Detailed prospecting about this and similar bodies probably would uncover additional, and possibly more interesting, deposits.

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