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PRELIMINARY REPORT ON WAKEFIELD AREA, GATINEAU COUNTY

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DEPARTMENT OF MINES
GEOLOGICAL SURVEYS BRANCH

PRELIMINARY REPORT
ON
WAKEFIELD AREA
GATINEAU COUNTY

BY

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GATINEAU COUNTY

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I N T R O D U C T I O N

Location and Means of Access

The Wakefield area, comprising 150 square miles, is between longitudes $75^{\circ}45'$ and $76^{\circ}50'$ and latitudes $45^{\circ}35'$ and $45^{\circ}45'$. It includes two-thirds of Wakefield township, the east quarter of Masham township, the northeast corner of Eardley township, and a strip across the northern part of Hull township.

Route No. 8 and a branch of the Canadian Pacific Railway follow the west side of Gatineau river from Hull to the north boundary of the area. A network of roads connects the principal villages and hamlets.

Topography, Drainage, and Unconsolidated Deposits

The area under study is on the edge of the Precambrian Shield. Narrow valleys and small rounded hills characterize this physiographic province. Between the hills are small attractive lakes, which are popular sites for summer camps.

Except in the northeast corner, where Ecluse lake and Blanche river flow eastward into Wakefield lake, the map-area is drained by Gatineau river, whose principal tributaries are La Pêche river and Blackburn, Meach, and Mullin brooks.

The low-lying parts of the area are covered with marine clay, through which numerous outcrops of rock protrude. Most of this low ground is along the valley of Gatineau river. Between Wakefield and Cascades, Gatineau river flows in a trench cut in a syenite massif, which is covered only lightly with clay. In the north, as far as Farrellton, and toward the west at Rupert, as well as in the valley of Blackburn brook south of Wilson Corners, the bedrock is crystalline limestone, which is more deeply eroded than the gneisses and syenites, and the clay deposits are more extensive.

The average elevation of the lowlands is 500 feet above sea level. The marine clay does not extend above a height of 600 feet. Between this elevation and 700 feet, partly eroded terraces of sand and gravel may mark the upper level of the Champlain sea. Fossils are rare in the clays; they were found only in fresh road-cuts on Route No. 8, close to Gattineau river. North of Wakefield, at an elevation of 340 feet, much weathered fragile shells of Saxicava rugosa and Macoma groenlandica occur. South of Wakefield, at elevations of 400 and 450 feet, better preserved specimens of the same species were found, together with fragments of barnacles. All the marine clays have the same grey colour, the same texture, and especially the same blocky fracture.

Gattineau river has cut a narrow valley about 200 feet deep in the marine deposits. The valley tends to be wider at the mouths of the main tributaries.

The masses of gneiss and igneous rocks that occupy the remainder of the area underlie a region of broken topography at a mean elevation of 1,000 feet. The largest of these masses extends south from the northern boundary of the map-area, between Farrellton and Ecluse lake, almost to Wilson Corners. Its central peak, 1,460 feet above sea level, is the highest point in the area. The overburden, which is rather thin on these masses, has a morainic appearance. It is unsorted, with pebbles and worn and rounded boulders in a red or brown matrix of sandy clay. True tills were not found. Bordering the masses of gneiss or igneous rock, and on the sides of some of the deep valleys, kame-like deposits were noted. In the lower parts of the masses, for example, at Newcombe lake and along the road that runs northeast from Wilson Corners, there are well sorted and stratified gravels and coarse sands, which are probably fluvial.

Although the nature of the overburden and its general appearance on the large uplands underlain by gneisses and igneous rock testify to the passage of Pleistocene ice sheets, it is in the lower levels, under the covering of marine deposits, that the polished surfaces, glacial striae, and roches moutonnées are best preserved. Observations made there indicate that the ice crossed the area in a general S.20°E. direction.

GENERAL GEOLOGY

All the bedrock is crystalline and Precambrian and is divided on the map accompanying this report into seven groups or formations, of which four are igneous. In the table of formations the granitic orthogneisses are not in their strictly proper position, if their age is considered, because some of them cut crystalline limestone, and, in some places, their intrusion resulted in the alteration of the limestone to hornblende rocks resembling amphibolites. However, the orthogneisses are intimately mixed with the paragneisses, and this to such an extent that several of the bands of orthogneiss shown on the map have almost as much of either metasedimentary rock injected by pegmatite or granitized rock as orthogneiss. Also, the origin of many of the gneisses is doubt-

ful. For these reasons, the orthogneisses and the paragneisses are not sharply separated in the table of formations.

Table of Formations

Post-Grenville

Fresh diabase (Keweenawan?)

Syenite

Diorite

Grenville

Pyroxene rock, hornblende rock, and amphibolites derived from crystalline limestones

Crystalline limestone - cut by pegmatite and granitic gneiss

Orthogneiss - grey or red granitic gneiss mixed with paragneiss

Quartzite, quartzose biotite gneiss, hornblende-biotite gneiss, rusty gneiss, garnet gneiss

Grenville Series

The metasedimentary rocks of the Grenville series are divided into two groups. The first is largely made up of crystalline limestone with layers of rusty gneiss and thin beds of very finely laminated quartzite. With these should be included diopside rock and hornblende rock, which are limestones altered by hydrothermal action. The second group consists of quartzose biotite-hornblende paragneisses and vitreous quartzites. The limestones crop out mostly in the western half of the area. Some are found also at Marble lake, near Wilson Corners and they crop out in two narrow bands in the central massif of gneiss.

The roof of the syenite batholith in the southwest corner of the map-area must have been limestone, as indicated by the many remnants of brucitic limestone between Wakefield and Cascades. The paragneisses crop out generally around the limestones and seem to be stratigraphically beneath them. They are found, mixed with orthogneisses, in the eastern half of the area. The most persistent bands of quartzite, deformed as they are, extend fairly regularly from Ecluse lake, along Little Dam lake, to the southern boundary of the map-area.

The quartzites are believed to be the base and the limestones to be the top of the Grenville series in this area. The paragneisses, which lie between the two, are rich in quartz near the quartzites and more aluminous near the limestones.

Quartzites, Paragneisses and Orthogneisses

The quartzites are made up largely of large grains of clear and glassy quartz, with interstitial feldspar and mica. In some layers, however, the quartz is blue and opalescent, and the interstices between the grains of quartz are filled with pink feldspar. In some places the feldspar is very abundant and replaces quartz, thus converting the quartzite into a granite-like rock.

All these quartzites retain recognizable traces of a primary stratification and several are well layered. Some quartzites grade laterally into micaceous paragneisses, which are rich in feldspars or in hornblende and are slightly garnetiferous.

The only gneissic rocks that have been mapped as paragneisses are those characterized by a marked layering, a result of the alternation of light and dark coloured layers. The layers of diverse composition weather differently, and the exposures are banded. Furthermore, the mineralogical composition of the paragneisses is different from that of the gneisses of igneous origin: some of the rocks have a high tenor of quartz (quartzitic layers), some of them have much biotite (some paragneisses are strongly schistose), some have small garnets, and some are rich in hornblende (former impure limestones). The rusty-weathering gneisses, which are disaggregated on the surface as a result of weathering of pyrite in them, are included with the paragneisses.

All the gneisses that do not have these characteristics, but approach the composition of igneous rocks, have been mapped as orthogneisses. Most of them are granitic in composition. They contain pink or yellowish feldspar, crushed lenses of quartz, and biotite or hornblende in various proportions. Some which are poor in quartz but richer in hornblende are found in the vicinity of syenite and diorite masses of which they are probably facies. Some are aplitic or pegmatitic and are only faintly gneissic and are composed almost entirely of blue quartz and pink feldspar and are similar to the quartzites described above from which they are distinguished with difficulty. Other gneisses, in the southeast corner of the area, are grey and coarse-grained and have the composition of hornblende granite.

The innumerable pegmatites should be mentioned. They cut all the other rocks except the diabase dykes. Their presence explains the evidence of granitization observed in the gneisses.

Rocks intermediate between true paragneisses and the granitic orthogneisses are found. They resemble paragneisses in their well marked layering - still only half effaced - in their content of hornblende and biotite, and particularly in the presence of small, widely scattered crystals of garnet. But they are so intruded by veinlets and micro-sills with pink feldspar and quartz that their composition is almost the same as that of the granitic gneisses. They are migmatites, that is granitized paragneisses. Besides, as noted above, the orthogneisses and the paragneisses do not crop out as distinct, homogeneous bodies as do the syenite and the limestones, but they are closely intermingled. The delimitation

of the two types of gneisses on the map accompanying this preliminary report is arbitrary and subject to revision.

Limestones, Pyroxene Rock, and Hornblende Rock

The crystalline limestone generally looks the same in this region as elsewhere in the Grenville sub-province. The grain is rather coarse, the colour is between grey, white, pink, or brownish according to the proportion of phlogopite and the colour of the calcite. The limestone is layered, and this layering is parallel to the stratification where it can be seen. In the vicinity of certain pegmatites and near the contact with the syenite, the limestone is impregnated with greenish diopside, yellow or green serpentine in granules or veins, with tremolite, feldspar, and mica. The limestone of the large inclusions in the syenite is brucitic. The brucite is not uniformly distributed, but is abundant only in the most magnesian layers, some of which contain serpentine as well.

Nearly everywhere in the map-area, but especially near Wilson Corners, layers or irregular bodies of more or less coarse grained, pale or deep green rock are found. They are composed of diopside or augite with tremolite, hornblende, and phlogopite, which minerals form a network of large crystals with, in the interstices, calcite, apatite and rarely feldspars. These are the pyroxene rocks in which deposits of mica and apatite occur. They appear at the edge of the limestone bodies. Even those observed in the large gneiss massif north of Wilson Corners are associated with narrow bands of limestone. The writer believes, therefore, that, at least in the Wakefield area, the "metamorphic pyroxenites" were formed principally by hydrothermal alteration of the crystalline limestone.

On the map, the pyroxene rocks have been grouped tentatively with amphibolites, which have plagioclase and hornblende, although some rocks consist almost entirely of hornblende and seem to have been formed by metamorphism of limestones near granitic gneisses. Similar amphibolites in the paragneisses also appear to be altered limy beds, although some of them may be altered diorites or gabbros.

Syenite and Diorite

A batholith of syenite underlies the southwestern part of the map-area. The boundaries of another mass of more irregular shape conform to the folds of the gneisses south and west of Ecluse lake. The syenite is associated with a dark grey diorite, which is probably a marginal facies of it. It is noteworthy that, in some places, where the syenite is in contact with paragneisses, it truncates their layering and sends off dykes and sills across their foliation. The contacts of diorite with paragneisses are concordant.

Although in the field, especially northeast of Cascades, there seems to be a gradual transition of syenite into diorite, in thin section the two rocks are very different. The syenite, grey or pinky mauve, is composed of perthitic microcline with a little plagioclase, a nearly opaque

amphibole of the hastingsite group, hornblende, biotite, and a little interstitial quartz. In the northern mass, plagioclase is more abundant than in the southern and can be observed with the naked eye. The diorite contains no microcline. Its ferromagnesian minerals are common hornblende, augite, and biotite. Quartz is abundant in places. Both syenite and diorite contain much sphene.

The two rocks are massive, medium - or coarse-grained, and slightly gneissic in places, and more so in others. This foliation is not primary. The feldspar crystals have been granulated, and the mafic minerals have been deformed into flat discs made up mainly of flakes of biotite. Generally the gneissic structure is parallel to the diorite contacts, vague though they are.

Diabase

Numerous diabase dykes, especially noteworthy because of their attitude, cross the area. They all strike nearly east-west and cut indifferently across all structures and other rocks. The fractures that they fill were opened after the earlier structure of the country had been established for a long time.

STRUCTURE

Folds

The gneisses and the limestone are moulded on the masses of syenite and diorite. The structural grain of the area strikes north-south, and the gneisses dip east. Within the gneissic massif, east of Gatineau river and south of Ecluse lake, the distribution and attitudes of the paragneiss bands outline several structural basins, which correspond to topographical depressions. These folded structures have been partly obliterated by the syenite and diorite.

Fractures and Faults.

North of Lascelles, some bands of paragneisses, interbedded with limestone, are displaced about fifty feet where cut by a dyke of diabase. No other fault was observed. Narrow, straight valleys with the same trend as the diabase dykes suggest faulting, but there is no proof that it has taken place.

All the rocks are cut by joints with diverse attitudes; some are occupied by dykes of pegmatite or aplite. Lakes in the form of squares or arrow heads in the northern part of the map-area are the result of etching of systems of conjugate joints.

MINERAL DEPOSITS

Brucite

Large inclusions or remnants of the limestone roof of the syenite contain brucite layers from which magnesia can be extracted.

Aluminum Company of Canada Limited has exploited for some time a deposit known as Maxwell quarry, which is north of Farm Point. The brucite is extracted by the Goudge method. It is converted into magnesia and sold to the makers of fire brick and chemical fertilizers, and to aluminum plants for the extraction of magnesium. As a by-product, slaked lime of excellent quality is obtained. There are other deposits in the neighbourhood which will doubtless be developed as the market expands.

Mica and Apatite

About thirty deposits of mica and apatite were visited; almost all of them had previously been developed or tested. The most important are situated near Wilson Corners in the layers of pyroxene rocks, not far from the syenite. The typical deposit is a vein or irregular pocket of pink calcite containing pale green diopside, tremolite, apatite, and phlogopite, all in crystals from two to six inches in diameter. These deposits are now all abandoned, although not exhausted.

Feldspar

Near the southern boundary of the map-area, about a mile west of Blackburn brook, a small feldspar quarry has been worked intermittently. It is in a mass of pegmatite and is a flesh-pink microcline, which shows cleavage faces several feet in diameter. The quarry was deserted at the time of the writer's examination.

Gravel

The best banks of gravel are in the neighbourhood of Farrellton. There are gravel pits nearly everywhere in the area, but deposits are of varying quality. The large and small gravel pits developed for road making are indicated on the map.

Iron

A small iron furnace operated north of Hull about 1880. The ore treated came from two deposits of magnetite and hematite situated about ten miles south of the area under study. In 1906, Fritz Cirkel examined for the Department of Mines, Ottawa (1), all the deposits and outcrops of iron ore known in the Gatineau valley from Hull to Maniwaki. In the Wakefield map-area the outcrops and deposits are limited to veinlets of magnetite in the crystalline limestone and some lenses of magnetite and hematite in the gneisses, all without any economic value.

Molybdenite.

At a road-cut a mile south of Alcove, small crystals of molybdenite were found in thin veinlets of calcite cutting Grenville limestone.

(1) Cirkel, Fritz, Report on the Iron Ore Deposits along the Ottawa (Quebec Side) and Gatineau Rivers; Can. Dept. Mines, Mines Branch, Pub. No. 23, 1909.