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PRELIMINARY REPORT ON CAUSAPSCAL AREA (EAST HALF), MATAPEDIA ELECTORAL DISTRICT

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HON. W. M. COTTINGHAM, MINISTER

GEOLOGICAL SURVEYS BRANCH

PRELIMINARY REPORT

ON

CAUSAPSCAL AREA (EAST HALF)

MATAPEDIA ELECTORAL DISTRICT

BY

C. W. STEARN

QUEBEC
1959

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PRELIMINARY REPORT

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INTRODUCTION

The east half of the Causapscal area was mapped by the writer during the summer of 1958. The area lies mainly on the east side of Matapédia river, near the base of Gaspé peninsula. It is bounded by latitudes 48°15' and 48°30', and by longitudes 67°00' and 67°15' and includes about 200 square miles. Included within the area mapped are large parts of Casault, Lepage, La Vérendrye, and Casupscull townships and small parts of Blais, Assemetquagan, and Matalic townships.

The area is easily reached by the Montreal-Halifax line of the Canadian National Railways and by Provincial Highway No. 6, both of which follow the Matapédia valley and pass through the southwestern part of the area. From the highway, gravel roads give ready access to nearly all parts of the region. Much of the area is farm land but the northeastern third is covered with dense woods. Numerous lumber roads and old trails traverse this wooded part in all directions but only a few are maintained in a condition that permits travel by automobile.

The land surface is a dissected upland. From points of vantage, such as the Casault Fire Tower which is built on the highest hill (1,870 feet), it appears to be formed of low, rolling hills with little relief. However, into this upland surface the rivers and their major tributaries have cut valleys up to 400 feet deep, producing a maximum relief in the area of about 1,500 feet. Most of the bedrock exposures are in stream valleys, for the gently sloping uplands are heavily covered with mantle and bush.

All the streams flow into Matapédia river, which traverses the southwestern part of the area. The valley of the

Matapédia is broad and open in its upper part, but near Ste-Florence it narrows and its sides become steep. The Causapscal river joins the Matapédia at the town of Causapscal. The best outcrops of bedrock occur along this river and its major tributaries, namely: Huit Milles, Petit Huit Milles, Quatre Milles, Petit Quatre Milles, and Trois Milles brooks. The northern boundary of the area crosses a region of low relief where water has accumulated in lakes Casault and Huit Milles and in extensive swamps along the south branch of the Causapscal river.

GENERAL GEOLOGY

General Statement

The area is underlain by sedimentary rocks of Silurian and Devonian age. These include sandstones, siltstones, slates, and limestones and constitute a section more than 20,000 feet thick. A lens of intermediate volcanic rocks about 700 feet thick is intercalated in the slates in the southern part of the area. The formations were deformed in the Devonian period into broad folds and broken along high angle faults.

A small dyke was intruded into the Devonian sedimentary rocks after the folding. Deposits of Pleistocene age are rare except in the Matapédia valley, but scattered erratic boulders indicate that the Laurentide ice sheet completely covered the area.

TABLE OF FORMATIONS

ERA	PERIOD	FORMATION (thickness in feet)	DESCRIPTION
Cenozoic	Pleistocene		Ice contact drift, minor till, erratics
Palaeozoic	Middle Devonian	York River-Heppel 12,000	Grey sandstone, red sandstone, siltstone calcareous siltstone, minor conglomerate
	Middle and/or Lower Devonian	Fortin (Thickness unknown) Ste-Marguerite member 700	Slate, phyllitic slate, thin beds of sandstone. Amygdaloidal and compact andesitic volcanics, minor breccia
	Lower Devonian	Grande Grève 3,500	Calcareous siltstone, silty limestone
		Cape Bon Ami 2,500	Argillaceous limestone, minor silty limestone, siltstone
	Middle to Upper Silurian	St-Léon 6,000 ± -	Calcareous siltstone, minor sandstone

Editor's Note: There is some doubt about the division of the Grande Grève and Cape Bon Ami formations in the band extending to the east-northeast from about 1 mile south of Causapscal village. One interpretation is shown on the accompanying map. A second is that the whole belt is Cape Bon Ami. A third interpretation is that the Cape Bon Ami-Grande Grève contact is south of the outcrops on and near Highway No. 6, thus cutting about 2/3 from the width of Grande Grève shown on the map. This problem will be given further consideration before the final map is published.

St. Léon Formation

The St. Léon formation is exposed in the crests of two anticlines which plunge in opposite directions. In these structures the upper 2,000 feet, approximately, of the formation is exposed. Most of the formation is greenish grey, calcareous siltstone in thick or thin beds which weather medium grey and shades of orange-grey. Intercalated with the siltstones are minor beds of greenish grey, medium- and fine-grained sandstone. The bedding planes show flow-casts in some localities but crossbedding, ripple-mark, and other evidences of shallow water deposition are lacking. A widely spaced cleavage is evident in most outcrops of this unit.

Associated Development's Causapscal No. 1 well, just beyond the western edge of the area, has been put down through this formation, to a depth of 4,696 feet. In the belief that the Ordovician "basement" had been penetrated at this depth, which is about 4,300 feet, the hole was abandoned. However, study of the core by the staff of the Quebec Department of Mines suggests that the Ordovician had not been reached, although there was some change of lithology and structure at about the 4,300-foot depth. This being so, the St. Léon here is at least 6,000 feet thick (in round figures: 2,000 feet above the well and 4,000 feet in the well). Thus, the St-Léon formation appears to be at least twice as thick in the Causapscal area as in the Lake Matapédia area (1932) to the north.

The only fossils found in the St-Léon were a few specimens of the graptolite Monograptus. On the basis of similar fossils, the formation was dated previously as Middle Silurian, but it is possible that the upper part is Late Silurian in age for it is apparently conformable with the Cape Bon Ami limestone.

Cape Bon Ami Limestone

The contact of the Cape Bon Ami with the St-Léon is not exposed in the east half of Causapscal area but no structural discordance is apparent between the beds of the two formations. The Cape Bon Ami formation is composed largely of dark grey, argillaceous and locally silty limestone, typically closely cleaved and slaty in the more argillaceous layers. Bedding is commonly difficult to detect but where the beds are defined in a large outcrop they are 2 to 3 feet thick. A thinner lamination may also be present. In a few outcrops the beds have been greatly contorted

by movement in the sediment while it was still unconsolidated, but generally the bedding is even and regular. A dark grey, non-calcareous siltstone unit about 100 feet thick occurs near the top of the formation. Near Huit Milles brook this siltstone is overlain by about 10 feet of light grey sandy rock that is possibly tuffaceous. This distinctive horizon could be traced over a limited area but does not seem to be regionally distributed.

The thickness of this formation is difficult to compute from its dips and width of outcrop for it is cross-folded in most of the area. It is estimated to be about 2,500 feet thick. Along the southern belt of outcrop in the present area the Cape Bon Ami stands almost vertically and its outcrop width is less than 1,000 feet. Flowage of this unit and of the overlying Grande Grève into the crest of the anticline to the north is presumed to have taken place for there is little evidence of faulting.

The only fossils found by the writer in these limestones are small brachiopods and these are very rare. More extensive fossil collections from other areas have been dated by paleontologists as Early Devonian in age.

Grande Grève Siltstone

The Grande Grève siltstone outcrops in a southern linear belt extending east and west from the southern outskirts of Causapscal, and in a northern, S-shaped belt. In the southern belt dips are steeply south, vertical, or overturned toward the north but in the northern belt dips are gentle. The formation is composed predominantly of calcareous siltstones which are interbedded with silty limestones. Most of the rocks placed in this formation react sluggishly to dilute hydrochloric acid, easily scratch glass, and weather to a non-calcareous, light grey rubble whose constituent fragments, although leached of carbonate entirely, are still coherent. The lower part of the Grande Grève formation is banded with thin, light grey, silt-rich layers. This banding and thin bedding have been used as criteria to distinguish the Grande Grève from the Cape Bon Ami. Small outcrops may be difficult to assign to one or other of these two formations without detailed study of their lithology especially where the Grande Grève has been sheared and has developed the closely spaced cleavage more typical of the Cape Bon Ami. Generally, the spacing of the cleavage planes is much closer in the latter. On vertical weathered surfaces of the Grande Grève formation, closely spaced silty laminae are etched into relief.

The lower contact is gradational but can generally be placed within a few hundred feet where argillaceous limestone

or dark grey, non-calcareous siltstone of the Cape Bon Ami changes to banded calcareous siltstone. The Grande Grève siltstone passes upward through an alternation of beds into the York River formation. The upper contact is placed for mapping purposes at the appearance of the first thick sandstone bed, although this procedure places many beds of Grande Grève lithology in the York River formation.

The Grande Grève siltstone is about 3,500 feet thick below the falls of the Causapscal river but in the southern belt it appears to have been tectonically thinned on the limb of a partly overturned anticline so that its outcrop width is 2,000 feet or less. On Trois Milles brook the Grande Grève is so thin and structurally disturbed that a fault is postulated between it and the York River-Heppel unit. Fossils are not common in rocks of this formation in the present area but an extensive fauna of Early Devonian age is known from these beds in eastern Gaspé.

Fortin Slate

The Fortin slate occupies a wide belt along the southern boundary of the east half of Causapscal area. It is separated from the York River-Heppel sandstones to the north by a fault. Its stratigraphical relationship to the other formations cannot be observed in this area. The formation consists of dark to medium grey, micaceous slate and phyllitic slate with intercalated beds of greywacke several tens of feet thick. Much of the slate is calcareous and a few beds approach the composition of limestone. Slaty cleavage is common throughout but closely spaced bedding laminae are conspicuous in most outcrops. Micaceous minerals seem to be more extensively developed near the fault which bounds the formation on the north, and in this zone the Fortin is a phyllite. Fossils are very rare and have been collected in this area at but a single greywacke outcrop southwest of Ste-Florence. The specimens are so sheared that their identification, even on a generic level, will be difficult.

The Fortin formation is extensively folded and lacks key beds so that no estimate of its thickness is possible in the present state of our information. McGerrigle has suggested, from evidence to the east, that the Fortin slates grade laterally and vertically into the Grande Grève and York River formations and represent a deeper water facies equivalent to these formations.

Ste-Marguerite Volcanics

A belt of igneous rocks was mapped just south of the northern margin of the Fortin group. These are dark green, fine-grained, generally amygdaloidal rocks and were

identified by Alcock (1935) as augite andesite. They are well exposed in two hills south and west of Ste-Marguerite and in the stream valleys of Fraser and Creux brooks. Between these outcrops the band can be traced by the float rocks but it appears to be sharply truncated 3 miles west of Ste-Marguerite. This truncation may be against the major fault north of the slates, as is assumed on the included map, or it may be against a cross fault. Just northeast of Ste-Florence, along the boundary fault, a sheared volcanic breccia crops out on the highway and on the hillside above the highway. The breccia is composed of fragments about 1 cm. in diameter of light grey aphanitic rock set in a chloritic matrix and interbedded with chloritic schist. Layers of chloritic schist are also found interbedded with the igneous rocks on Fraser and Creux brooks.

The Ste-Marguerite igneous rocks are considered to be volcanic because, although their contact with undoubted Fortin rocks is nowhere exposed, they are interbedded with schistose beds that seem to be tuffaceous; also, they are amygdaloidal and brecciated, and appear to be genetically related to the volcanic breccia near Ste-Florence. Their stratigraphic position in the complexly folded Fortin slates and their true thickness are both in doubt. However, on Fraser brook the Fortin slates near the volcanics dip 30 degrees south, and, if this dip continues through the volcanics, their thickness would be about 700 feet.

York River-Heppel Formation

The Grande Grève siltstones grade upward into a formation of interbedded sandstones and siltstones that has been called the York River in the north part of the east half of Causapscal area and the Heppel in the south part. The medium grey, calcareous siltstones and sandstones on the north occupy a shallow syncline in which less than 500 feet of beds is exposed. In the southern part of the area, the Grande Grève is conformably overlain by the Heppel formation, which is lithologically similar to the York River at its base but much thicker and different in its upper part. The Heppel formation consists in a general way of an upper and lower sequence of interbedded dark grey siltstones and sandstones, each 4,000 to 6,000 feet thick, separated by about 4,000 feet of reddish brown, thick bedded sandstone. The upper dark grey unit is possibly the lower part of the formation repeated by faulting or folding. The basal part of the Heppel is a correlative of the York River formation but the middle unit is lithologically distinct. The red sandstones are similar to those described by McGerrigle (MS.) as the middle member of the Gaspé Sandstone series in central Gaspé and mapped by him as the Lake Branch formation on the Quebec Department of Mines map No. 1000 (Gaspé). More detailed

work may show that York River, Lake Branch and Battery Point divisions can be mapped in the Heppel formation, but for the purposes of the present preliminary report they are mapped as one unit.

Marine fossils are common at many horizons in the York River-Heppel siltstones but they are particularly abundant in a group of calcareous siltstones about 2,000 feet above the base that Kindle (1938) has called the Four Mile Brook beds. This zone contains numerous brachiopods, pelecypods, bryozoa, trilobites, gastropods, and corals that locally build into biohermal masses. Although Kindle (1938) regarded this fauna as of Late Devonian age, Cooper (1942) has placed it in the Onondaga (Middle Devonian). Many beds of green and red siltstone contain poorly preserved, comminuted plant remains. At some localities the bedding planes are covered with a mat of this carbonized plant material.

Along the Matapédia valley the beds of the Heppel formation dip steeply south through an outcrop width of almost 3½ miles. At the relatively few localities where a determination of the tops of the beds is possible they face south. Along the fault that bounds the Heppel on the south the attitude of the beds is irregular. In the southeastern part of the Heppel belt the beds do not dip systematically but appear to be folded into a west-plunging open syncline. This structure may terminate against the homoclinal sequence to the west in a fault or its south limb may become overturned. Further study may make a choice between these alternatives possible and such a decision will have a profound effect on the interpretation of the stratigraphy and correlation of the Heppel formation.

STRUCTURAL GEOLOGY

A fault of unknown displacement and attitude separates the Fortin slates from the Heppel formation and strikes N.70°E. across the area. The fault is marked in the Fortin by an increase in micaceous minerals and by contorted and drag folded cleavage, and in the Heppel by disturbed bedding. As the formations on either side of the fault are little different in age, the fault may not have much stratigraphic displacement. However, it has brought together dissimilar facies.

The Fortin slates are folded into open anticlines and synclines whose limbs have dips up to 50 degrees. Many of the beds have dips of less than 35 degrees. In most outcrops where fold axes may be observed the limbs are symmetrical, but on Highway No. 6 at the south border of the area two faulted anticlines with steeper northern limbs are exposed in a road cut. In the absence of key beds it is difficult to follow folds

in the slates from one stream valley to another or to assess the part that faulting played in their deformation. The schistosity in this belt dips a few degrees north or south of vertical and strikes about N. 70°E.

North of this major fault the Silurian and Devonian rocks have been folded into two major anticlines that plunge in opposite directions. The south limb of the southern anticline is overturned at Quatre Milles brook but elsewhere it dips very steeply south. At both Trois Milles and Quatre Milles brooks there is evidence of minor faulting along this limb but to the east and west the beds are unbroken although probably sheared throughout. The St-Léon siltstones are exposed in the crest of this southern anticline on the east side of the area but are carried beneath the Cape Bon Ami limestones by its westward plunge about 2 miles east of Causapscal. The north limb of the anticline dips about 40 degrees but is complicated by a series of minor folds that are well exposed along Petit Huit Milles brook. Along the contact between the St-Léon and the Cape Bon Ami on this limb a change in regional strike takes place and the beds are extensively dislocated by minor faults, brecciated locally, and veined. This evidence points to a fault contact between the two formations.

The northern or Albertville anticline north of Causapscal appears to have symmetrical limbs dipping about 20 degrees, but few structural determinations could be made on its north limb due to lack of outcrop. The axis plunges northeast at a low angle and strikes N.45°E. except for a slight curve at the Causapscal river. South of Croche lake the north limb of this anticline steepens to 70 degrees and the gentle south limb is crossed by a series of folds. These minor folds have axes striking east-west but curving to the northeast and plunging in that direction.

The synclinorium between the two anticlines is complicated by several open, north-plunging cross-folds. These produce, in the centre of the area, a broad belt of Cape Bon Ami in which dips are only locally more than 10 degrees.

The northwestern corner of the Causapscal East area is occupied by a north-plunging synclinorium. This is a shallow structure, the limbs of which dip less than 10 degrees. The scattered nature of the outcrops of the York River formation in this synclinorium makes it difficult to define accurately the minor folds but possibly four or five anticlinal and synclinal axes are present.

All these rocks are cut by a consistent fracture cleavage that strikes about N.60°E. and dips north and south within a few degrees of vertical.

ECONOMIC GEOLOGY

Considerable interest in the petroleum possibilities of western Gaspé has been aroused by the drilling of Associated Developments' Causapscal No.1 well on Lot 20-A, Range I, Lepage township, about 1,000 feet west of the west border of the area. Geologically the well is located about 1,000 feet south of the axis of the Albertville anticline in the St-Léon siltstone. The operators hoped to locate porosity in the reefal limestones of the Sayabec formation below the St-Léon. Where they come to the surface about 20 miles to the north near Lake Matapédia, these limestones are porous and some beds have a tarry odour when broken. As pointed out in the section dealing with the St-Léon formation, Causapscal No.1 well was diamond-drilled to 4,696 feet without penetrating any formation recognizably older than the St-Léon. If the St-Léon should prove to be a satisfactory cap rock and the Sayabec, a satisfactory reservoir for gas and oil, many other drilling sites are available along this anticline where traps might be formed by slight irregularities in the plunge. The southern anticline could also act as a trap for petroleum, but it is more strongly deformed than the northern one and the additional fractures might let any possible oil or gas escape.

No mineral occurrences of economic importance were discovered.

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