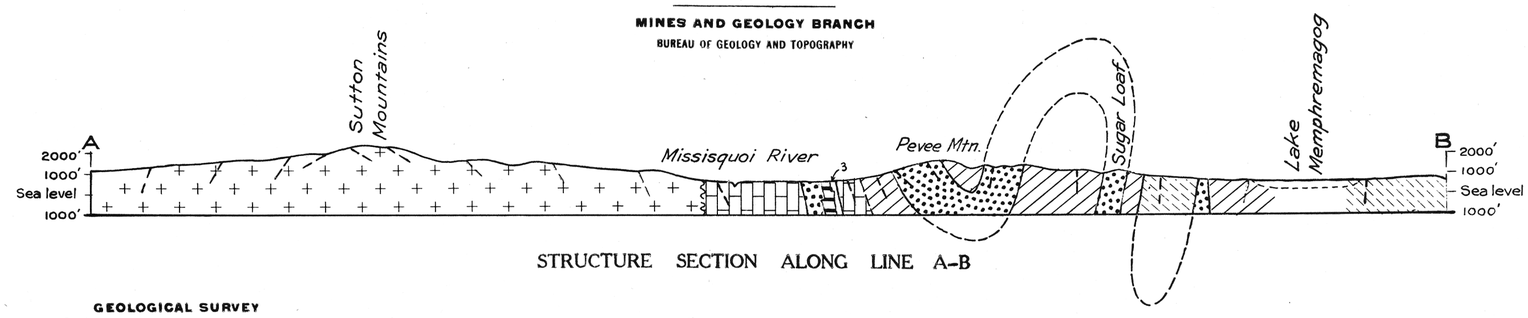
CANADA

DEPARTMENT OF MINES AND RESOURCES

MINES AND GEOLOGY BRANCH

BUREAU OF GEOLOGY AND TOPOGRAPHY



STRUCTURE SECTION ALONG LINE A–B

GEOLOGICAL SURVEY

DESCRIPTIVE NOTES

Palaeozoic and possibly some Precambrian rocks underlie the map area. The Sutton Group (1) consists of schistose sedimentary and volcanic rocks, and is folded into a broad anticline that trends north 15 degrees east. The schists exhibit increasing metamorphism from east to west; secondary feldspar crystals as large as peas, and a noticeable increase in crenulation, first appear along a line that extends northward from a point on the Mansonville-Dunkin highway, 1½ miles west of the east contact of the Sutton rocks, to reach the contact near Bolton Centre. East of this contact, and on either side of it in the southern part of the area, there is no distinction in degree of metamorphism. The more highly metamorphosed belt to the west is evidently truncated against the contact, which must therefore represent either an unconformity or a fault. This conclusion is supported by the observation that bedding, where it can be discerned, and the anticlinal axis, where it can be defined, are nearly or exactly parallel to the trend of the belt of more highly metamorphosed Sutton schists; that is, they too seem truncated by the eastern contact.

A slaty cleavage is developed throughout the region. This cleavage follows the axial planes of crenulations of the Sutton schists, where such crenulations are developed. The axes of the crenulations, as well as lines of intersection of slaty cleavage planes with planes of schistosity, plunge south in the Sutton schists. Similar axes and lines of intersection in rocks east of the contact plunge north. Since this slaty cleavage forms part of a widespread, uniform system extending far beyond the limits of the map-area, it must be supposed that the slaty cleavage in the Sutton schists and in the rocks east of the contact is of one and the same age and origin. Structural elements dependent on this cleavage should, therefore, have the same attitudes on both sides the contact, but this is not the case. They have been relatively displaced, and apparently the contact is a fault.

The strata (2,3,4) underlying most of the east half of the map-area dip 60 to 80 degrees east. The lower part, as exposed along the Missisquoi Valley, consists of numerous large lenses of grey quartzite in rusty-weathering graphitic slates. The lenses decrease in size and number eastward, and the boundary between the lower part of the series (2) and the upper slates (4) is arbitrarily placed east of the easternmost observed lens of grey quartzite. Volcanic rocks (3) consist mainly of altered basalt. Pillowed flows are common, and permit determination of stratigraphic tops. The flows resist weathering, and form all the prominent hills and ridges in the eastern half of the map-area. Along Missisquoi Valley they form long straight ridges. A curving series of flows constitutes Owl Head, Bear, and Hawk Mountains, and outlines a large syncline. A single Z-shaped ridge of pillowed flows can be followed continuously from the north end of Hogs Back, south around Sugar Loaf mountain, that is, around the end of a small, south-plunging anticline, thence north again to Pevee Mountain, the north end of the complementary syncline, and from there south to the Mansonville-Vale Perkins highway.

The Ordovician (Trenton) age of the upper part of the series is established from graptolites collected on Castle Brook, about two miles north of the northeast corner of the map-area. No diagnostic fossils have been found in the lower part; it may include some Cambrian.

The severity of post-Trenton folding is demonstrated by the Hogs Back-Sugar Loaf-Pevee Mountain folds. Except for minor faulting, the contact with the Devonian rocks is an almost straight line; the post-Trenton folds were reduced to a nearly level surface before Devonian sedimentation began.

Strata of Devonian age (5) appear in the Sargent Bay and Lake Memphramagog synclines. The Sargent Bay syncline is a canoe-shaped fold that extends from the northeast corner of the area southward to and beyond Vale Perkins. The limbs of the other syncline outcrop on either side of the lake. Dips of the beds are steep and the west limbs of both folds stand vertically or are overturned steeply to the west. Rocks of this age include a basal conglomerate up to 250 feet thick, overlain by 2,500 to 3,000 feet of shale with minor limestone members.

The possibility that some Silurian beds occur in this locality is suggested by a reported discovery of *Halysites catenulatus* Linné in one place on the east shore of the lake.

A northwest-dipping fault of large vertical displacement extends southwest from Mountain House Wharf, between Hawk and Bear Mountains. A small wedge of Devonian strata at Mountain House is on the downthrow side of this fault. The west flank of Sargent Bay syncline abuts against Ordovician slates near Peasely Pond, clearly along a cross-fault. There is evidence here, too, of a longitudinal fault along or near the synclinal axis. The presumed fault along the east contact of the Sutton Group must be post-Devonian, or at least there must have been movement along it in post-Devonian time.

Gabbro (6) forms swarms of dykes or sills and large single intrusions. It cuts Cambrian (?) - Ordovician strata, but none was seen in contact with Devonian beds. Gabbroic rocks, in part intrusive and in part coarse flows, are associated with volcanic flows, and are probably of the same age.

Several long, narrow bodies of serpentine (7) intrude Cambrian (?) - Ordovician rocks along Missisquoi Valley; a few dykes cut the Sutton Group, but none was found in contact with Devonian strata. One plug northwest of South Bolton and a dyke near Grass Pond are intruded along the east contact of the Sutton Group. Several other bodies are intruded below layers of lava or below large lenses of quartzite. The whole dips 65 to 80 degrees east. The serpentine formed from mixtures of peridotite and dunite. Peridotite predominates in the large intrusion; in others dunite is equally common. The intrusions are post-Ordovician in age; their presence along the Sutton fault (?) contact suggests they may be post-Devonian. Age relations to quartz diorite (8) are not yet clear.

Several small bodies of coarse-grained, post-Ordovician quartz diorite (8) outcrop between Bolton Center and Trouser Lake. The rock contains about 20 percent quartz, 50 percent feldspar, and chloritized mafic minerals. In places it is notably schistose.

Dykes and masses of grey post-Devonian granite (9) outcrop in the southwest corner of the map-area. Massive varieties are identical in appearance to Stanstead granite from Graniteville, east of Lake Memphremagog. Some of the dykes are much sheared and contorted.

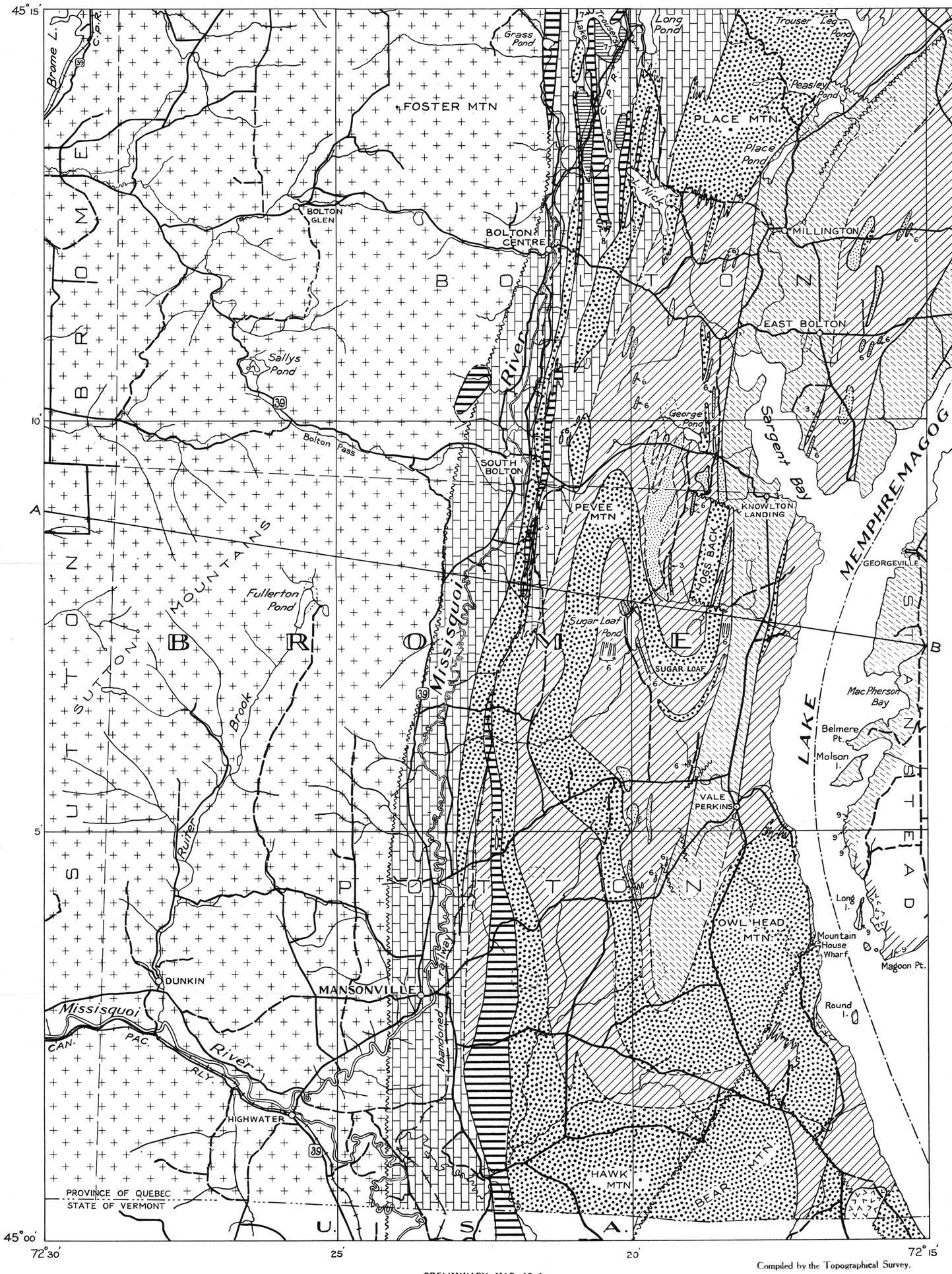
Numerous dykes two to three feet wide, of alkalic rocks probably related to the Monteregian suite, occur along the shores of Lake Memphremagog. They are post-Devonian and are notably fresh and unsheared.

Copper, talc, asbestos, and chromite deposits have been discovered in this map-area. Copper is found in deposits of three types. First, chalcopyrite is disseminated in small, lenticular bodies of heavily pyritized chlorite schist, cut by veinlets of glassy quartz. Several of these are known along the west (footwall) flank of the ridge of volcanic rocks east of the railway between South Bolton and Bolton Center. Second, one low grade deposit of massive pyrrhotite and chalcopyrite, replacing volcanic breccia is known on the west flank of Hogs Back mountain. Third, small deposits with chalcopyrite, pyrite, galena, sphalerite, and some silver and gold reported, are found associated with large veins of milky quartz in the southeast corner of the map-area.

Talc is found in many places in the Sutton Mountains, and along Missisquoi Valley. It is derived either from serpentine or chlorite schists, and commonly contains some pyrite, magnetite, carbonate, and chlorite. Talc is being produced from a deposit 1½ miles west Highwater.

Asbestos in small amounts is widespread in the serpentine bodies. Some ore was quarried from the west side of the dyke one mile south of Mansonville. Cross-fibre ¼ inch long and slip-fibre 3 inches long was seen in fragments on the dump, but the grade appears to be low.

Each of the ten or more bodies of serpentine outlined in the map-area is potentially chromite-bearing. Chromite was mined from the serpentine plug one mile northwest of South Bolton, and is reported to have been found in loose blocks in the drift covering the serpentine dyke near Grass Pond. Both of these bodies are intruded along the Sutton Group fault (?) contact.



LEGEND

9	Granite
8	Quartz diorite
7	Serpentine
6	Gabbro

PALAEOZOIC

DEVONIAN (May include some Silurian)

5	Shale, limestone, conglomerate

CAMBRIAN (?) AND ORDOVICIAN

4	Slate; some quartzite
3	Volcanic rocks
2	Quartzite; some slate

PRECAMBRIAN AND (OR) PALAEOZOIC

1	SUTTON GROUP: Quartz-mica-chlorite-albite schists; greenstone schist; quartzite

Fault

Geology by J. W. Ambrose, 1941.

International Boundary
County Boundary
Township Boundary
Road, well travelled
Road, not well travelled
Marsh

Compiled by the Topographical Survey.
Issued 1942.

PRELIMINARY MAP 42-1

MANSONVILLE

BROME AND STANSTEAD COUNTIES

QUEBEC

Scale:- 1 mile to 1 inch

1 0 1 2 3
Miles

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