MARGINAL NOTES

Mapping of the Gananoque-Wolfe Island area involved the re-examination of part of an area previously mapped by B.A. Liberty (1971) for the Geological Survey of Canada. The entire area was also included in the compilation map of Hewitt (1964). Paleozoic bedrock outcrop is abundant in the north-central part of the area and throughout Wolfe Island. In the eastern part of the area, bedrock outcrop consists predominantly of Precambrian granitic and gneissic material which forms the Frontenac Axis of the Canadian Shield. Paleozoic bedrock in this part of the map-area occurs on discrete outliers on the Precambrian basement.

The main physiographic features of the area are the Rideau Lakes, in the western part of the area, and the St. Lawrence River, which flows northeastward across the map-area and fornsisting of clay deposits of the Late Wisconsinan Champlain Sea (Chapman and Putnam 1973). The extreme western part of the map-area forms part of the Napanee Limestone Plain.

NATURE OF THE PRECAMBRIAN-PALEOZOIC BOUNDARY

The Precambrian geology of the region was reported by Hewitt (1964), and consists primarily of granites and gneisses of the Frontenac Axis. Granite, syenite, granite gneiss and paragneiss occur in the northwestern part of the map-area near Dog and Loughborough Lakes, and in the central part, south and east of South and Gananoque Lakes. To the north and west of these lakes, Precambrian rocks consist predominantly of marble and paragneiss. The Thousand Islands, which occur in the St. Lawrence River, consist of granite and quartzite. The Precambrian rocks of the area were metamorphosed during the Grenville Orogeny.

The Precambrian-Paleozoic contact trends roughly southeast, from Loughborough Lake to the eastern end of Howe Island, with long, narrow southwesterly trending tongues of Precambrian rock around Loughborough Lake, Colonel By Lake, the River Styx, and along the north shore of the St. Lawrence River. The contact itself is poorly exposed, but generally the Precambrian rocks form areas of complex topography, while the Paleozoic rocks form areas of low relief, with the contact occupying the transition zone between. In the western part of the area, the Ordovician carbonate sequence is elevated above the Precambrian surface, forming a broad plateau, while the older Paleozoic clastic rocks in the central and eastern parts are not significantly higher than the Precambrian surface, but conform to topographic irregulatities within it.

PALEOZOIC STRATIGRAPHY

Potsdam Formation (?Cambro-Ordovician)

The Potsdam Formation outcrops mainly around Dog and Cranberry Lakes and the River Styx in the western part of the map-area, and forms large outliers in the central and eastern parts of the map-area.

In general, the formation consists of white or buff, but also pale yellow, pale brown, pale orange, pale pink and pale green, fine- to medium-grained sandstone that weathers pale brown, pale buff, pale orange and pale grey, and occurs massively or in beds 10 to 25 cm thick. Coarse-grained clastic particles are present throughout the formation, as are cross-beds and evidence of bioturbation; pebbles of quartz, and quartzose and granitic cobbles are present in the lower beds. Small scale conglomeratic horizons, consisting of cobbles of Precambrian material less than 10 cm in diameter, also occur throughout the lower part of the formation. At one locality, approximately 5 km west of the hamlet of Willowbank (U.T.M. reference: 398500E, 4907700N) the lower part of the formation consists of dark blue-grey, coarse-grained sandstone with white and rust coloured discontinuous banding that is locally disturbed. The greatest thickness of the formation recorded during the present fieldwork is about 10 m. Liberty (1971) reported a total estimated thickness of 45 m (149 feet) near Knowlton Lake, to the northwest of the present map-area. No fossils were recovered from the formation in the present area.

The lower contact of the Potsdam Formation with the underlying Precambrian is abrupt and unconformable and is marked by the change from granitic and gneissic igneous and metamorphic rocks to well sorted clastic sedimentary rocks or basal conglomerates. The upper contact of the Potsdam Formation with the Shadow Lake Formation is disconformable and is marked by the change from uniformly textured white, cream, pale orange, pale brown and pale grey sandstones to green, poorly sorted arkosic sandstones, siltstones and shales.

Basal Group

Shadow Lake Formation (Middle Ordovician)

The Shadow Lake Formation outcrops sporadically in the northwestern part of the map-area along the Precambrian-Paleozoic boundary, and to a lesser extent on outliers in the southern and central parts of the map-area.

In general, the formation consists of medium to dark green, poorly sorted arkosic siltstones and shales that weather pale to dark green and occur in beds ranging in thickness from very thin to massive. Coarse-grained clastic horizons and lenses occur throughout the formation and quartzose and granitic pebbles and cobbles are abundant near the base. The formation is locally shaly and easily eroded. A well exposed basal conglomerate unconformity overlying the Precambrian and consisting of angular quartzose and granitic cobbles up to 40 cm in diameter in a green siltstone matrix occurs near the hamlet of Eastview (U.T.M. reference: 389600E, 4901750N). The thickness of the formation varies considerably but the maximum recorded thickness is less than 5 m. No fossils were recovered from the formation in the present area.

The upper boundary of the Shadow Lake Formation with the Gull River Formation is defined as the last appearance of clastic sedimentary units and the beginning of virtually continuous carbonate units. A commonly occurring transition zone of interbedded limestone and shale is included in the upper part of the Shadow Lake Formation. Therefore, the Shadow Lake-Gull River boundary essentially represents a change from unstable to stable depositional conditions.

Simcoe Group

Gull River Formation (Middle Ordovician)

The Gull River Formation is the oldest rock unit in the Simcoe Group. Outcrop of the formation is abundant in the western part of the map area, and throughout the northern part of Wolfe Island.

In the present map-area, the formation is divisible into three members. The lower member consists of pale to medium grey and medium to dark brown, lithographic to finely crystalline limestone that weathers predominantly pale grey, but also pale brown, and occurs in beds up to 30 cm thick. Stylolites and vugs filled with pale pink, coarsely crystalline calcite occur throughout the member, and where it unconformably overlies the Precambrian, granitic cobbles occur in the lowest beds. The middle member is characterized by pale to dark grey and medium to dark brown lithographic to sublithographic limestone interbedded with pale brown and pale green calcareous or dolomitic siltstone that weathers pale green and buff. Stylolites and calcite-filled vugs are common in both lithologies. Shaly limestone and silty limestone also occur in minor amounts. The middle member generally occurs in beds ranging from 10 to 40 cm thick. The upper member consists of medium to dark grey and brown, lithographic to sublithographic limestone that weathers pale grey, or, less commonly, pale buff, and occurs in beds up to 30 cm thick. Calcite-filled vugs and stylolites are common in the upper member, and shaly limestone is developed locally. At one outcrop, near the intersection of Highway 401 and Montreal Road in Kingston (U.T.M. reference: 382300E, 4903550N), the member is locally composed of angular clasts of lithographic limestone less than 1 cm in diameter in a matrix of finely crystalline sparite and coarsely grained fossil fragments. No complete sections of any of the three members occur in the present map-area, but the estimated thickness of the lower member is about 10 m, the middle member 20 m, and the upper member about 10 m. Fossils occurring in the upper and lower members include cephalopods, small colonial corals, gastropods, and trilobites. The middle member is poorly fossiliferous.

The upper contact of the Gull River Formation with the Bobcaygeon Formation is defined at the point at which lithographic to sublithographic limestone changes to a generally darker, finely crystalline limestone or pale brown fine-grained calcarenite.

Bobcaygeon Formation (Middle Ordovician)

In the present map-area, outcrops of the Bobcaygeon Formation are sparse and occur only on the Wolfe Island, where it can be divided into two members.

The lower member is composed of medium brown, finely crystalline limestone that weathers buff and pale grey, interbedded with medium to pale brown and grey, fine- to medium-grained calcarenite in beds 6 to 10 cm thick. Local shaly partings occur throughout the member. The upper member of the formation consists of medium grey to dark grey brown, finely crystalline limestone, interbedded with pale to medium brown and white, medium-grained bioclastic limestone and thin shaly beds and seams less than 15 cm thick. Total thickness of the formation in the present area is less than 10 m.

The upper contact of the Bobcaygeon Formation with the Verulam Formation is gradational from thicker bedded bioclastic and crystalline limestone with shaly stringers and partings, to more thinly bedded, regularly interbedded limestone and shale. The boundary is defined as the base of the first appearance of regularly interbedded bioclastic limestone, crystalline limestone and shale in sub-equal thicknesses.

Verulam Formation (Middle Ordovician)

The Verulam Formation is the youngest Paleozoic rock unit in the Gananoque-Wolfe Island map-area. Outcrops of the formation occur only on the southern part of Wolfe Island. There, the formation consists of pale to dark brown and grey, finely crystalline limestone, medium to dark brown, grey and white, medium to coarsely bioclastic limestone and shale seams, regularly interbedded in beds up to 10 cm thick. Locally, the shaly seams weather out leaving rubbly outcrops of bioclastic and crystalline limestone. The total thickness of the Verulam Formation in the present area is less than 5 m. Common fossils include fragments of brachiopods and bryozoans. Few whole specimens were recovered.

STRUCTURAL GEOLOGY

Strata in the area are essentially flat-lying, except where they drape over topographic highs in the Precambrian basement. Such anomalous dips occur in a large roadcut on Highway 2, west of Highway 15 (U.T.M. reference: 383250E, 4899250N), and at Point Henry (U.T.M. reference 383350E, 4898100N). A small surface fold, possibly related to the release of high horizontal stress (White *et al.* 1974) and triggered by blasting, occurs in the middle member of the Gull River Formation in a quarry on Howe Island (U.T.M. reference 402000E, 4903550N). The feature is less than 2 m in relief and cannot be traced beyond the quarry wall.

ECONOMIC GEOLOGY

In the Gananoque-Wolfe Island map-area, only the Gull River Formation is currently being quarried for commercial use. MacFarland Construction Company, Glen Lawrence Quarries, and McGinnis and O'Connor Limited quarry the formation near Kingston for use as crushed stone. Griffin Brothers Construction Company produces aggregate from quarries at Joyceville and near Battersea. More complete descriptions of the latter four quarries are provided by Hewitt and Vos (1972).

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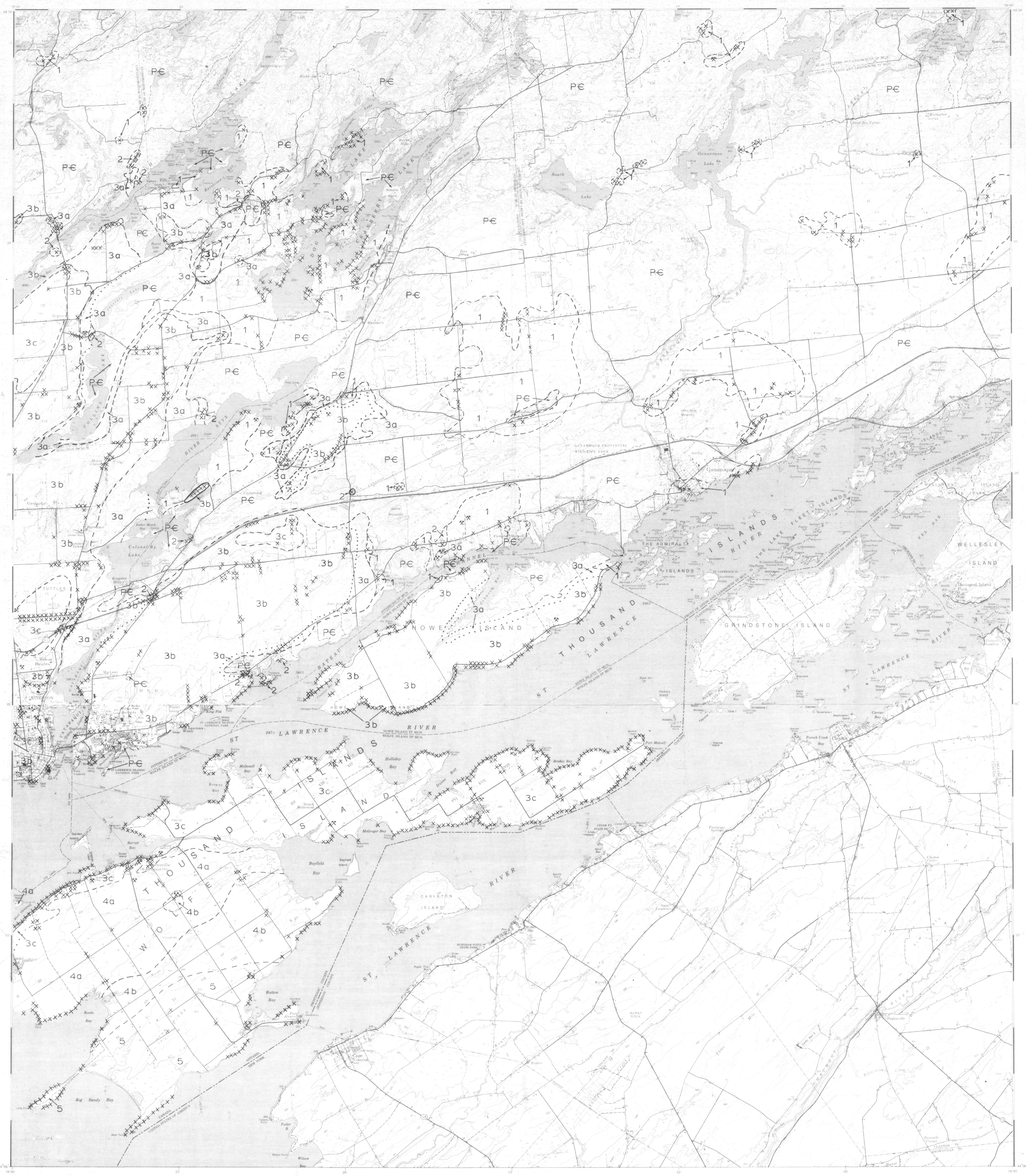

Ontario
Ministry of Natural Resources

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W.T. Foster
Deputy Minister

ONTARIO GEOLOGICAL SURVEY

MAP P.2496

GEOLOGICAL SERIES - PRELIMINARY MAP

PALEOZOIC GEOLOGY OF THE GANANOQUE-WOLFE ISLAND AREA

SOUTHERN ONTARIO

Scale 1:50 000

Mile 1 0 1 Mile
Metres 1000 0 1 Kilometre

NTS References: 31 C/8, 1
ODM-GSC Aeromagnetic Map: 8393G

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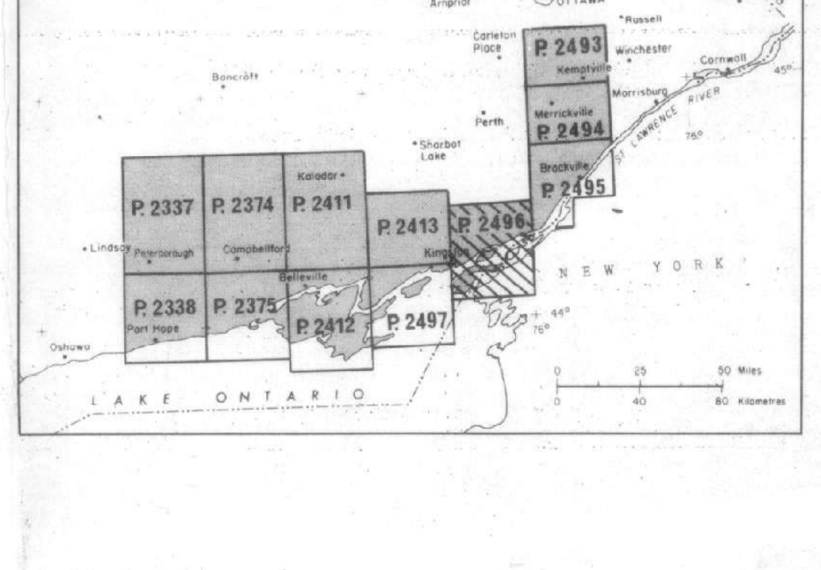
INDEX TO PALEOZOIC GEOLOGY IN THIS AREA
May, 1982

LEGEND

PALEOZOIC
MIDDLE ORDOVICIAN
SIMCOE GROUP

5	5	Verulam Formation: interbedded limestone and shale
4	4b	Bobcaygeon Formation (upper member): crystalline and bioclastic limestone
	4a	Bobcaygeon Formation (upper member): crystalline limestone and calcarenite
3	3c	Gull River Formation (upper member): brown and grey lithographic and sublithographic limestone
	3b	Gull River Formation (middle member): buff and green siltstone, dolomitic siltstone and brown lithographic limestone
	3a	Gull River Formation (lower member): brown, lithographic to finely crystalline limestone

BASAL GROUP

2	2	Shadow Lake Formation: arkosic sandstone, siltstone and shale

UNCONFORMITY

?CAMBRO-ORDOVICIAN

1	1	Potsdam Formation: fine- to medium-grained sandstone

UNCONFORMITY

PRECAMBRIAN

Pє	Undifferentiated Precambrian Rocks

SYMBOLS

×	Bedrock outcrop
⚒	Quarry
∼	Geological boundary, observed
╌	Geological boundary, position approximate
⋯	Geological boundary, position interpreted

SOURCES OF INFORMATION

Topography from Map 31 C/8 (Gananoque) and Map 31 C/1 (Wolfe Island) of the National Topographic Series.

CREDITS

Geology by D.M. Carson and assistants, 1981.

Every possible effort has been made to ensure the accuracy of the information presented on this map; however, the Ontario Ministry of Natural Resources does not assume any liability for errors that may occur. Users may wish to verify critical information; sources include both the references listed here, and information on file at the Resident or Regional Geologist's office and the Mining Recorder's office nearest the map-area.

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