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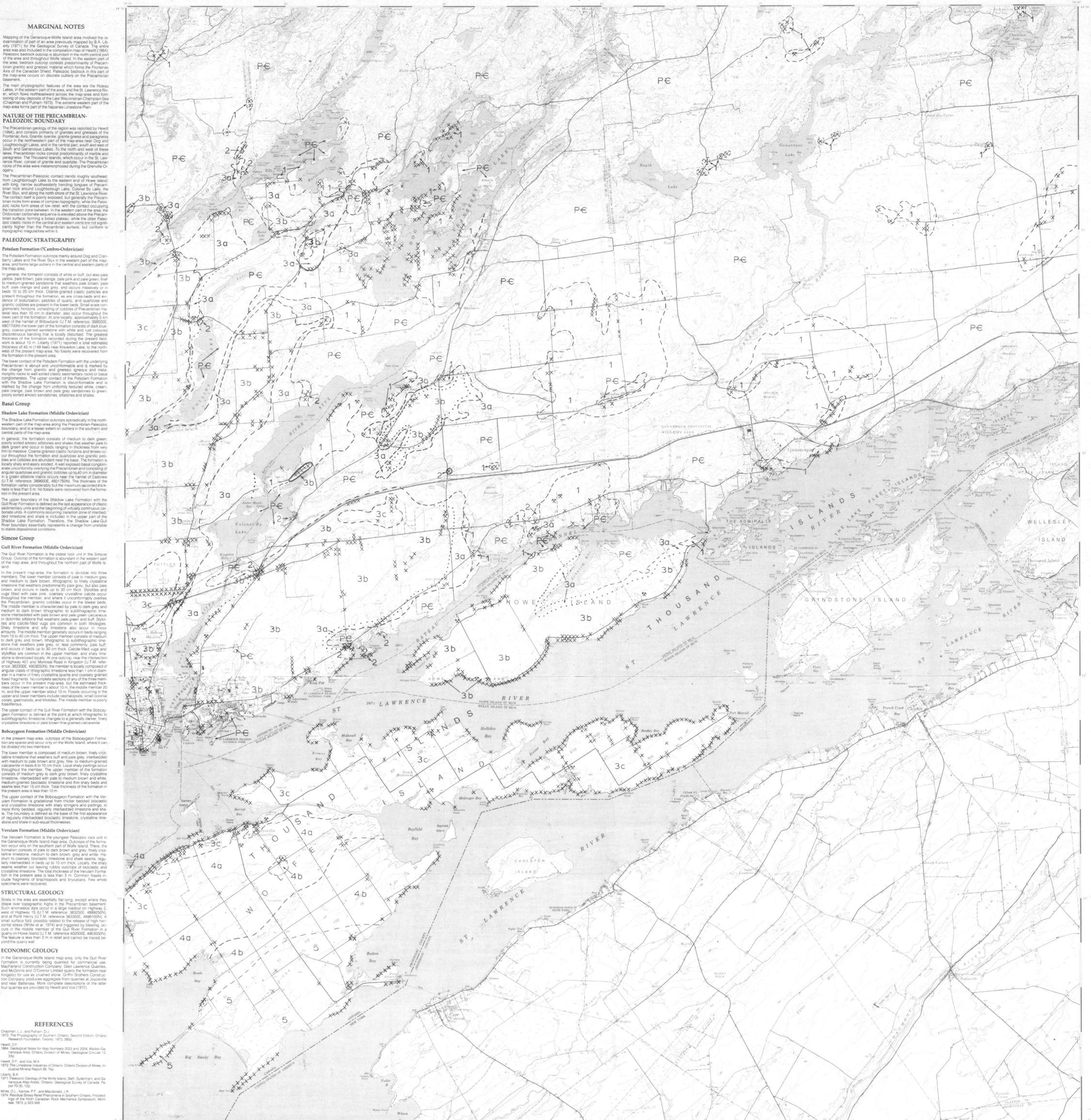
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MARGINAL NOTES

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). Precambrian geology is shown in the north-western part of the area and throughout Wolfe Island. In the eastern part of the area, bedrock outcrops consist 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 Nicolaus Lakes, in the western part of the area, and the St. Lawrence River, which flows north-south across the map area and forming a series of islands in the western part of the map area (Chapman and Putnam 1973). The extreme western part of the map area forms part of the Nicolaus limestone plain.

NATURE OF THE PRECAMBRIAN-PALEOZOIC BOUNDARY

The Precambrian geology of the region was reported by Hewitt (1964), and consists primarily of granitic and gneissic rocks of the Frontenac Axis. Granite, syenite, granite gneiss and paragneiss occur in the northwestern part of the area near Dog and Loughborough Lakes, and in the central part, south and west of South and Ganaroque Lakes. To the north and west of these areas, Precambrian rocks consist predominantly of mafic 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 Wolfe Island, with long, south-southwesterly trending tongues of Precambrian rock around Loughborough Lake, Colonel By Lake, the River Sky, 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 them. In the eastern 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 of the map area are higher than the Precambrian surface, but conform to topographic irregularities.

PALEOZOIC STRATIGRAPHY

Potsdam Formation (Cambro-Ordovician)

The Potsdam Formation outcrops mainly around Dog and Cranberry Lakes and the River Sky, 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 quartzite and granitic cobbles are abundant near the base. Small scale concretionary 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 3 km west of the hamlet of Willowbank (U.T.M. reference: 36E500E, 4807000N) the lower part of the formation is dark blue-grey, coarse-grained sandstone with white and rust-colored discontinuous banding that is locally disturbed. The thickness of the formation recorded during the present field work is about 10 m. Liberty (1971) reported a total estimated thickness of 45 m (149 feet) near Knowlton Lake, to the north-west 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 and conglomerates to the Potsdam Formation with the Shadow Lake Formation is disconformable and is marked by the change from uniformly bedded white, cream, pale orange, pale brown and pale grey sandstones to green, poorly sorted arenaceous sandstones, siltstones and shales.

Basal Group

Shadow Lake Formation (Middle Ordovician)

The Shadow Lake Formation outcrops sporadically in the north-western part of the map area along the Precambrian-Paleozoic boundary, and 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 arenaceous siltstones and shales that weather pale to dark green and occur in beds ranging in thickness from very thin to massive. Coarse grained calcareous and granitic pebbles and cobbles are abundant near the base. The formation is locally shaly and easily eroded. A well exposed basal conglomerate consisting of quartzite and granitic pebbles up to 60 cm in diameter in a green siltstone matrix occurs near the hamlet of Eastview (U.T.M. reference: 36E500E, 4807000N). 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.

Gull River Formation (Middle Ordovician)

The Gull River Formation is the oldest rock unit in the Simcoe Group. Outcrops of the formation are abundant in the northern 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 grey and medium to dark brown lithographic to sub-lithographic limestone interbedded with pale brown and pale grey calcareous or dolomitic siltstone that weathers pale green and buff. Stylolites and calcite-filled vugs are common in both lithologies. Shaly limestone and shaly siltstone 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 sub-lithographic 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 Main Street in Kingston (U.T.M. reference: 36E500E, 4803500N), the member is locally composed of angular clasts of lithographic limestone less than 1 cm in diameter in a matrix of finely crystalline, sparse and coarse-grained fossil fragments. No complete sections of any of the three members occur in the present map area, but the combined 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.

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 8 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 10 cm thick. Total thickness of the formation in the present area is less than 10 m.

Venusian Formation (Middle Ordovician)

The Venusian 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, siltstone to coarsely bioclastic limestone and shale seams, regular to coarsely bioclastic limestone and shale seams, regular to coarsely bioclastic limestone and shale seams, regular to coarsely bioclastic limestone and shale seams. The total thickness of the 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 dip over topographic highs in the Precambrian basement. Such anomalous dips occur in a large outcrop on Highway 2 west of Highway 15 (U.T.M. reference: 36E500E, 4896200N), and at Point Henry (U.T.M. reference: 36E500E, 4896100N), a small surface fold, possibly related to the release of high horizontal stress (White et al. 1974) and related to the erosion of the middle member of the Gull River Formation in a quarry on Wolfe Island (U.T.M. reference: 42Q020E, 4803500N). 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 Connor Limited quarry the formation near Kingston for use as crushed stone. Griffin Brothers Construction Company produces aggregates from quarries at Jocoyville and near Bathurst. More complete descriptions of the latter two quarries are provided by Hewitt and Vos (1972).

REFERENCES

Chapman, L.J. and Putnam, D.J.
1973. The Physiography of Southern Ontario. Second Edition. Ontario Research Foundation, Toronto, 193, 366p.

Hewitt, D.F.
1964. Geological Notes for Maps Numbers 2053 and 2054. Madoc-Ganaroque Area, Ontario Division of Mines, Geological Circular 12, 23p.

Hewitt, D.F. and Vos, M.A.
1972. The limestone industries of Ontario. Ontario Division of Mines, Industrial Mineral Report 39, 76p.

Liberty, B.A.
1971. Paleozoic Geology of the Wolfe Island, Bath, Sydenham, and Ganaroque Map Areas. Ontario Geological Survey of Canada, Paper 70-35, 12p.

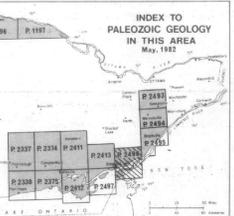
White, D.L., Kenyon, P.F. and Macdonald, J.R.
1974. Residual Stress Relief Phenomena in Southern Ontario. Proceedings of the North Canadian Rock Mechanics Symposium, Montreal, 1974, p.203-244.

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ONTARIO GEOLOGICAL SURVEY
MAP P. 2496
GEOLOGICAL SERIES - PRELIMINARY MAP
PALEOZOIC GEOLOGY
OF THE
GANANOQUE-WOLFE
ISLAND AREA
SOUTHERN ONTARIO

Scale 1:50,000
NTS References: 31 C 1, 1
OGM-GSC Aeromagnetic Map E5930

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LEGEND

- PALEOZOIC**
- 5 5 Venusian Formation: interbedded limestone and shale
 - 4 4 Bobcaygeon Formation (upper member): crystalline limestone and bioclastic siltstone
 - 4a 4a Bobcaygeon Formation (lower member): crystalline limestone and calcarenite
 - 3 3 Gull River Formation (upper member): brown and grey lithographic and sub-lithographic limestone
 - 3a 3a Gull River Formation (middle member): buff and greenish calcareous siltstone and brown lithographic limestone
 - 3b 3b Gull River Formation (lower member): brown, lithographic to finely crystalline limestone
 - 2 2 Shadow Lake Formation: shaly siltstone and shale
 - 1 1 Potsdam Formation: fine to medium-grained sandstone
- UNCONFORMITY**
- PRECAMBRIAN**
- Pe Undifferentiated Precambrian Rocks

- SYMBOLS**
- X Bedrock outcrop
 - Q Quarry
 - Geological boundary, observed
 - - - Geological boundary, position approximate
 - · · Geological boundary, position interpreted

SOURCES OF INFORMATION

Topography from Map 31 C 8 (Ganaroque) and Map 31 C 11 (Wolfe Island) of the National Topographic Series.

CREDITS

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

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