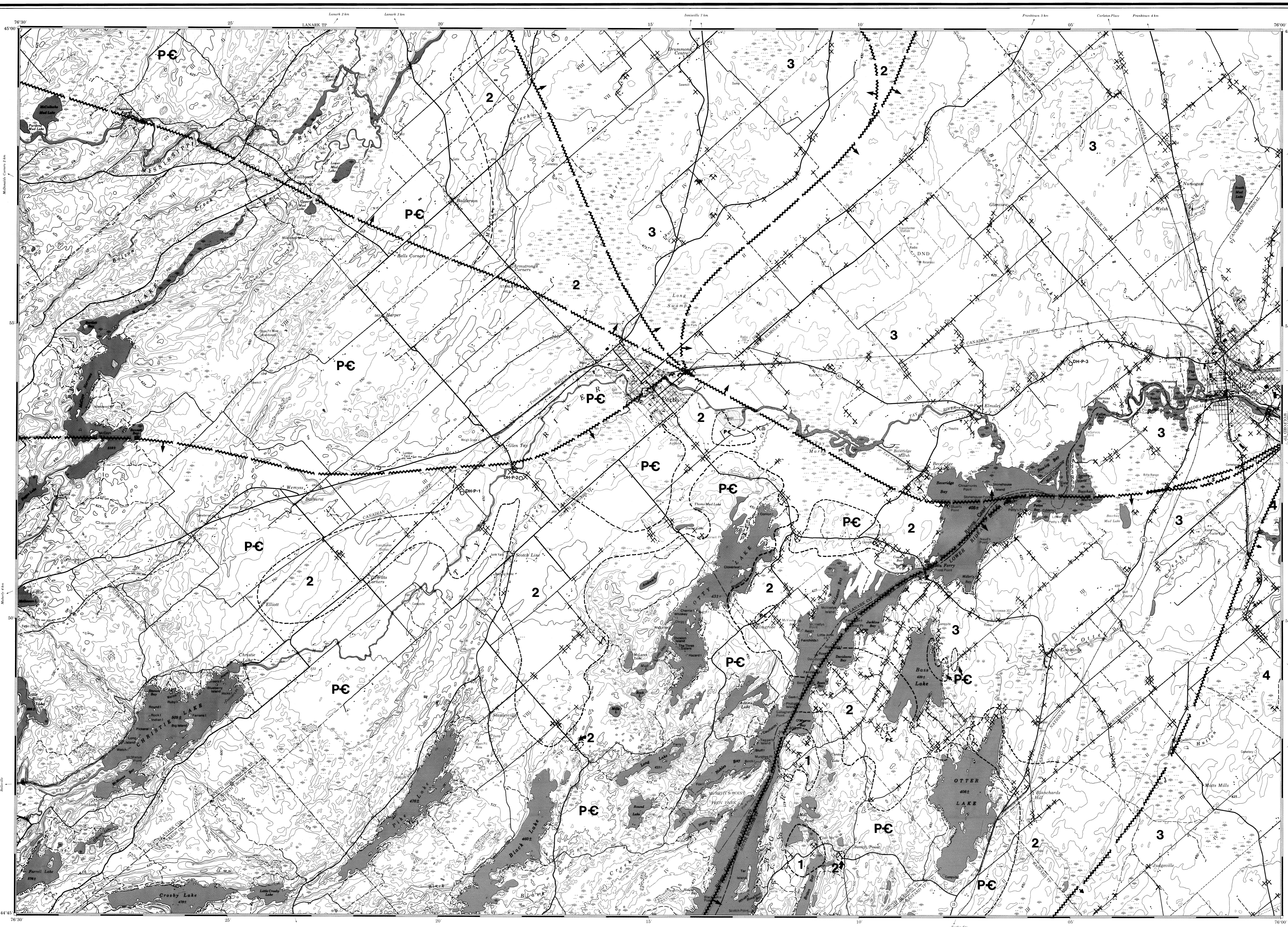

Ministry of Natural Resources
Ontario

Hon. Alan W. Pope
Minister

John R. Sloan
Deputy Minister

ONTARIO GEOLOGICAL SURVEY

MAP P. 2724

GEOLOGICAL SERIES – PRELIMINARY MAP

PALEOZOIC GEOLOGY

PERTH AREA

SOUTHERN ONTARIO

Scale 1:50 000

Mile 1 — 0 — 1 Mile
Metres 1000 — 0 — 1 Kilometre

NTS Reference: 31C/16
ODM–GSC Aeromagnetic Map. 11G
OGS Geological Compilation Map: 2418

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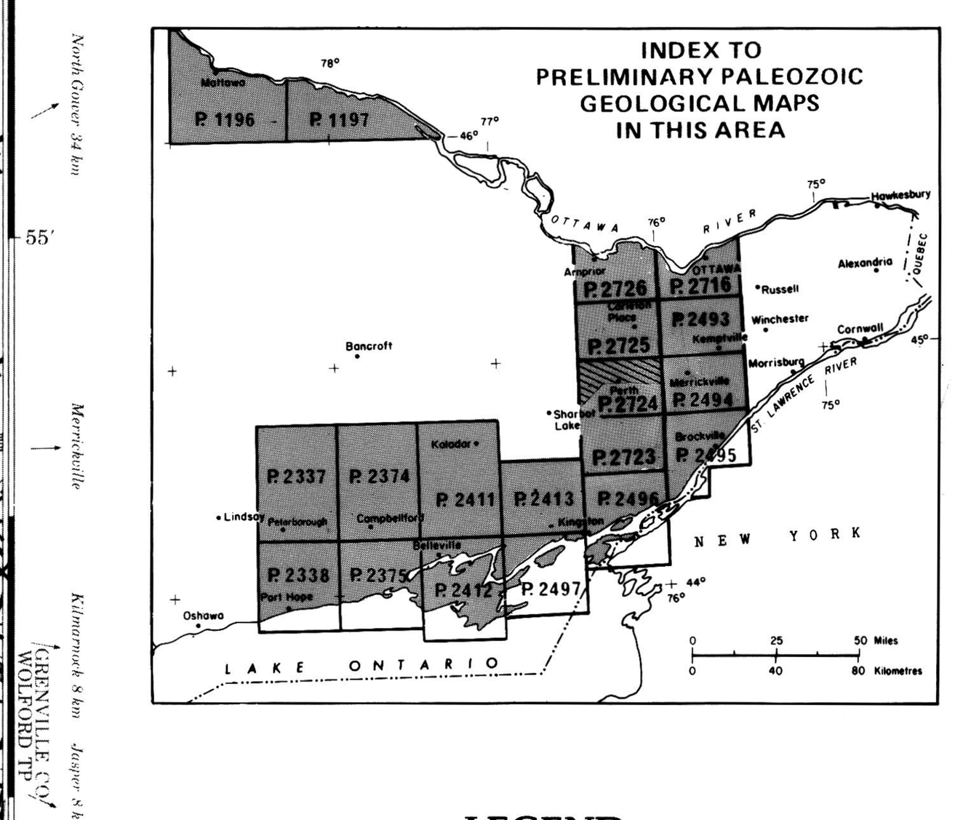

LEGEND

PHANEROZOIC
PALEOZOIC
UPPER ORDOVICIAN

13	Queenston Formation[1]: red to light greenish grey siltstone and shale, with interbeds of silty bioclastic limestone in lower part
12	Carlsbad Formation[1]: interbedded dark grey shale, fossiliferous calcareous siltstone, and silty bioclastic limestone
11	Billings Formation[1]: dark brown to black shale, with laminations of calcareous siltstone
10	Eastview Formation[1]: interbedded sublithographic to fine crystalline limestone and dark brown to dark grey shale
MIDDLE-UPPER ORDOVICIAN	
9	Lindsay Formation[1]: sublithographic to fine crystalline limestone, nodular in part, with interbeds of calcarenite and shale
MIDDLE ORDOVICIAN	
8	Verulam Formation[1]: interbedded bioclastic limestone, sublithographic to fine crystalline limestone, and shale
7	Bobcaygeon Formation[1]: interbedded calcarenite and sublithographic to fine crystalline limestone
6	Gull River Formation[1]: interbedded silty dolostone, lithographic to fine crystalline limestone, oolitic limestone, shale, and fine-grained calcareous quartz sandstone
5	Rockcliffe Formation: interbedded fine-grained light greenish grey quartz sandstone, shaly limestone, and shale; locally conglomerate at base; interbeds of calcarenite (St. Martin Member, 5a) and silty dolostone in upper part
LOWER ORDOVICIAN	
4	Oxford Formation: sublithographic to fine crystalline dolostone
3	March Formation: interbedded quartz sandstone, sandy dolostone and dolostone
CAMBRO-ORDOVICIAN	
2	Nepean Formation: fine- to coarse-grained quartz sandstone, partially calcareous in upper part
1	Covey Hill Formation : noncalcareous, feldspathic, fine- to coarse-grained quartz sandstone and quartz-pebble conglomerate

UNCONFORMITY

PRECAMBRIAN

P€	Undifferentiated metamorphic and igneous rocks

[1]This unit does not outcrop in this map area.

SYMBOLS

X	Bedrock outcrop	⚒	Quarry
— — —	Geological boundary, position approximate	DH o	Drillhole, with reference number *
	Fault, position approximate; arrow indicates downthrown side		

*Reference numbers:
P-1 OMNR L-A
P-2 OMNR L-B
P-3 OMNR L-E

MARGINAL NOTES

Geological mapping of the Perth area involved the re-examination of the area mapped by M.E. Wilson and Dugas (1961) for the Geological Survey of Canada. The area lies partially within the Ottawa-St. Lawrence Lowland, which is characterized by Paleozoic bedrock transected by a system of normal faults striking northeast to southeast.

The main physiographic features are Rideau Lake and the Rideau River, which form the Rideau Canal waterway and flow northeastward to eastward through the eastern part of the map area; and the Mississippi River, which flows eastward to northeastward through the extreme northwestern part of the area. The eastern part of the area forms part of the Smiths Falls Limestone Plain (Chapman and Putnam 1951, 1966).

Paleozoic bedrock outcrop is generally abundant within the Smiths Falls Limestone Plain, and consists of areas of pavement (within which several quarries have been developed).

Surficial deposits consist of till (which occurs as till plains, sometimes drumlinized), ice-contact stratified drift, marine (Champlain Sea) clay, sand, and gravel, and Recent alluvial sand and silt and organic bog deposit (Henderson 1973).

The Ontario Ministry of Natural Resources (Eastern Region) drilled the following wells within the map area: L-A (P-1), drilled to a depth of 5.2 m in Bathurst Township (concession II, lot 17); L-B (P-2), drilled to 14.9 m in Bathurst Township (concession II, lot 20); and L-E (P-3), drilled to 72.5 m. in North Elmsley Township (concession VI, lot 7) (Powell and Klugman 1979).

PRECAMBRIAN-PALEOZOIC BOUNDARY

Precambrian rock is exposed in the southern and western parts of the map area, and occurs as several inliers close to the main Precambrian-Paleozoic contact. Some previously mapped inliers, including 2 in the northeastern part of the map area, are no longer exposed due to construction activity. Paleozoic rock unconformably overlies Precambrian rock and outcrops mainly in the northern and eastern parts of the map area. Several Paleozoic outliers occur close to the main Precambrian/Paleozoic contact which displays a considerable amount of indentation. Bedding in the Paleozoic rock, normally close to horizontal, dips relatively steeply adjacent to contacts with Precambrian rock.

PALEOZOIC STRATIGRAPHY

The maximum thickness of Paleozoic rock intersected in a drillhole is 71.3 m (L-E), and the maximum amount of section that exists within the map area (excluding the small fault block in the extreme eastern part of the area in which the Rockcliffe Formation outcrops) is probably in the order of 110 m.

The occurrence of normal faults within the map area has resulted in the exposure of Paleozoic rock at various levels within the sequence.

Covey Hill Formation (Cambro-Ordovician)

Two outcrop areas of a very poorly sorted feldspathic conglomerate occur in the southern part of the map area. Wilson and Dugas (1961) concluded that the conglomerate may represent a basal Paleozoic unit not previously recognized in the region. The conglomerate is reddish brown and massive to poorly stratified. The clasts are pebble- to boulder-sized and subangular to subrounded, and are derived from Precambrian quartzite, marble, granite, and gneiss. Interbeds of poorly sorted brown to green conglomeratic sandstone occur. These 2 areas of feldspathic conglomerate are tentatively assigned to the Covey Hill Formation (Unit 1) as proposed by Williams, Rae, and Wolf (1984).

Nepean Formation (Cambro-Ordovician)

The Nepean Formation (Unit 2) (Wilson 1946, p.10-12) outcrops in a belt of variable width following the Precambrian-Paleozoic boundary in the western and southern parts of the Perth map area, and occurs as outliers in the southern part of the area. The thickness ranges from close to zero over Precambrian highs to a known total thickness of 36.9 m (drillhole L-E).

The formation consists primarily of medium-grained well-sorted quartz sandstone. Fine-grained beds predominate in the upper part of the formation, and interbeds up to a few metres thick of quartz-pebble conglomerate occur. The quartz grains are generally well rounded. The fresh surface is white to light brown, and small rusty spots are common. The weathered surface ranges from pure white to dark brown to brick red, and is usually cream to light brown. The unit is generally medium bedded, but beds range from very thin to massive (up to 2 m thick). Based on the nature of the cementing material, there are 2 common types of sandstone: a hard quartzite (resulting from secondary quartz overgrowth) and a more friable rock (resulting from calcite cement). Crossbedding is common, and cylindrical structures have been reported by Wilson and Dugas (1961). Various types of trace fossils, including *Climactichnites* (Wilson and Dugas 1961), occur.

The Nepean Formation is equivalent to the Cairnside Member of the Chateauguay Formation of the Montreal area.

March Formation (Lower Ordovician)

The March Formation (Unit 3) (Wilson 1946, p.12-14) outcrops extensively in the eastern part of the map area. About 34.4 m of the formation were intersected in the top of drillhole L-E, and the maximum thickness within the map area is probably about 65 m.

The formation consists of interbedded quartz sandstone, sandy dolostone, and dolostone. The lower contact is the base of the lowermost dolomitic bed, and the upper contact is the top of the uppermost sandy bed. There is a net upward decrease in sand content. Intraformational conglomerate commonly occurs in the lower part of the formation; it consists of clasts of muddy dolostone in a matrix of sandstone or sandy dolostone. The sandstone beds, identical in lithology to those of the Nepean Formation, are generally fine- to medium-grained, weather light brown to light yellowish brown, and include both quartz- and calcite-cemented types. A few thin beds of coarse-grained light green sandstone occur, the green colour being due to minor glauconite (C. Rogers, Petrographer, Ontario Ministry of Transportation and Communications, personal communication, 1982). The sandy dolostone and dolostone beds are fine crystalline and weather light grey to brownish grey. The sand grains in the sandy dolostone are coarse. All lithologies are thin to thick bedded. In the dolomitic beds, algal mats and stromatolites are common, and abundant gastropod shells occur along some bedding planes.

The March Formation is equivalent to the Norton Creek Member of the Chateauguay Formation of the Montreal area.

Oxford Formation (Lower Ordovician)

The Oxford Formation (Unit 4) (Wilson 1946, p.14-16) outcrops in the extreme eastern part of the map area. A thickness of up to 4.1 m was observed in sections within the area.

The formation consists of light to dark grey, thin- to thick-bedded, sublithographic to fine crystalline dolostone. The weathered surface is light grey to buff to reddish brown. Stromatolites and calcite-filled vugs are common.

The Oxford Formation is equivalent to the Beauharnois Formation of the Montreal area.

Rockcliffe Formation (Middle Ordovician)

The Rockcliffe Formation (Unit 4) (Wilson 1946, p.17-19) outcrops only in a small fault block in the extreme eastern part of the map area; a 50 cm thickness of very thin-bedded, very fine-grained, light green to light red calcareous quartz sandstone was observed.

The Rockcliffe Formation is equivalent to the Laval Formation of the Montreal area.

STRUCTURAL GEOLOGY

The northern part of the map area is transected by a series of steeply dipping normal faults and fault zones (including the Madawaska and Plevna faults of Kay 1942), and the northeast-striking Rideau Lake fault (Wynne-Edwards 1967, p.87-88) transects the southern part of the map area. The southern boundary of the Ottawa-St. Lawrence Lowland fault system occurs within the area. The traces of the Madawaska and Plevna faults are coincident with topographic lows along parts of their lengths, and the trace of the Rideau Lake fault is coincident with the Rideau Lakes topographic low. Bedding, normally close to horizontal, often dips steeply adjacent to faults and within fault zones. Fault traces are generally straight but are commonly curved in the vicinity of fault junctions, which generally consist of a single fault branching from another fault. A major fault junction occurs at Perth; 4 faults branch to the northwest from the junction. The displacement at a fault junction is approximately equal to the sum of the displacements along each set of faults which branches from the junction.

The erosion level within the fault block that occurs between the Madawaska and Plevna faults in the western part of the map area is everywhere below the Precambrian-Paleozoic contact; to the east, progressively younger strata are exposed in fault blocks. The total fault displacement across the area is at least 110 m.

Different fault blocks commonly have distinctive topographic features, exemplified in the Perth map area by the occurrence of Precambrian rock in areas of hummocky topography and the occurrence of the March Formation in areas of little relief.

ECONOMIC GEOLOGY

Many small quarries in the Nepean Formation were former sources of building stone. They included the Hughes quarry (North Elmsley Township, concession VII, Lot 26) (Hewitt 1964 p.16) and the Wilson quarry (Bathurst Township, concession I, lot 16) (Hewitt 1964, p.17).

The Nepean Formation is a potential source of silica sand. Keith (1949), Hewitt (1963), Powell and Klugman (1979), and Klugman and Yen (1980) have investigated the silica potential of southeastern Ontario. The vicinity of an abandoned quarry in Bathurst Township (concession III, lot 11) has been classified by Powell and Klugman (1979, p.10) as having a high silica potential. The Smiths Falls quarry of Ontario Building Materials Limited (Montague Township, concession V, lot 29) (Hewitt 1963, p.23) is a former producer of silica sand from March Formation sandstone.

The Covey Hill Formation is quarried for use as aggregate, the only presently licensed operation are the Mill Pond quarry of Ivan and Donald Wills (South Burgess Township, concessions II and III, lot 6). The Oliver quarry (North Elmsley Township, concession IX, lot 27) (Rogers 1980 p.70) is a former producer of aggregate from the Nepean Formation. The March Formation is quarried for use as aggregate, presently licensed operations are the Smiths Falls quarry of O. Shirley and Son (South Elmsley Township, concession III, lots 9 and 10) (Rogers 1980, p.68-69); and the Smiths Falls quarry of Warren Paving and Materials Group Limited (Dibblee Construction Company Limited) (Montague Township, concession V, lots 27 and 28) (Hewitt 1964, p.19; Rogers 1980, p.63). The Oxford Formation is also quarried for use as aggregate, the only presently licensed operation is the Newbliss quarry of G. Tackaberry and Son Construction Company Limited (Kitley Township, concession III, lots 14 to 16). Future aggregate quarries could be located within the March and Oxford Formations; the March Formation is a source of skid-resistant aggregate.

Post-Ordovician calcite-fluorite-barite-celestite-galena-sphalerite-chalcopyrite veins, striking east-west to southeast, occur in southeastern Ontario. The known occurrences within the Perth map area are hosted by Precambrian rock. Minor production has come from a barite vein located in North Burgess Township (concession X, lot 20); the vein, up to 60 cm thick, strikes southeast and has been traced for 300 m (Spence 1922, p.55; Guillet 1963 p.31). Stringers and veins of barite up to 50 cm thick occur in a zone 3 m wide in Bathurst Township (concession VI, lot 12); the zone strikes east-west and has been traced for 1 km (Spence 1922, p.52-53; Guillet 1963, p.27).

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SOURCES OF INFORMATION

Base map from Map 31C/16 (Perth) of the National Topographic Series.

Subsurface information mainly from Ontario Ministry of Natural Resources Oil and Gas Well Summary Cards on file with the Petroleum Resources Section, London, Ontario.

Magnetic declination approximately 12°13′W in 1982.

Contour interval: 25 feet.

Metric Conversion Factor: 1 foot = 0.3048 m

CREDITS

Geology by D.A. Williams and R.R. Wolf, 1982.

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 area.

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1984: Paleozoic Geology of the Perth Area, Southern Ontario; Ontario Geological Survey, Map P. 2724, Geological Series–Preliminary Map, scale 1:50 000. Geology 1982.