

THESE TERMS GOVERN YOUR USE OF THIS DOCUMENT

Your use of this Ontario Geological Survey document (the “Content”) is governed by the terms set out on this page (“Terms of Use”). By downloading this Content, you (the “User”) have accepted, and have agreed to be bound by, the Terms of Use.

Content: This Content is offered by the Province of Ontario’s *Ministry of Northern Development and Mines* (MNDM) as a public service, on an “as-is” basis. Recommendations and statements of opinion expressed in the Content are those of the author or authors and are not to be construed as statement of government policy. You are solely responsible for your use of the Content. You should not rely on the Content for legal advice nor as authoritative in your particular circumstances. Users should verify the accuracy and applicability of any Content before acting on it. MNDM does not guarantee, or make any warranty express or implied, that the Content is current, accurate, complete or reliable. MNDM is not responsible for any damage however caused, which results, directly or indirectly, from your use of the Content. MNDM assumes no legal liability or responsibility for the Content whatsoever.

Links to Other Web Sites: This Content may contain links, to Web sites that are not operated by MNDM. Linked Web sites may not be available in French. MNDM neither endorses nor assumes any responsibility for the safety, accuracy or availability of linked Web sites or the information contained on them. The linked Web sites, their operation and content are the responsibility of the person or entity for which they were created or maintained (the “Owner”). Both your use of a linked Web site, and your right to use or reproduce information or materials from a linked Web site, are subject to the terms of use governing that particular Web site. Any comments or inquiries regarding a linked Web site must be directed to its Owner.

Copyright: Canadian and international intellectual property laws protect the Content. Unless otherwise indicated, copyright is held by the Queen’s Printer for Ontario.

It is recommended that reference to the Content be made in the following form: <Author’s last name>, <Initials> <year of publication>. <Content title>; Ontario Geological Survey, <Content publication series and number>, <total number of pages>p.

Use and Reproduction of Content: The Content may be used and reproduced only in accordance with applicable intellectual property laws. *Non-commercial* use of unsubstantial excerpts of the Content is permitted provided that appropriate credit is given and Crown copyright is acknowledged. Any substantial reproduction of the Content or any *commercial* use of all or part of the Content is prohibited without the prior written permission of MNDM. Substantial reproduction includes the reproduction of any illustration or figure, such as, but not limited to graphs, charts and maps. Commercial use includes commercial distribution of the Content, the reproduction of multiple copies of the Content for any purpose whether or not commercial, use of the Content in commercial publications, and the creation of value-added products using the Content.

Contact:

FOR FURTHER INFORMATION ON	PLEASE CONTACT:	BY TELEPHONE:	BY E-MAIL:
The Reproduction of Content	MNDM Publication Services	Local: (705) 670-5691 Toll Free: 1-888-415-9845, ext. 5691 (inside Canada, United States)	Pubsales@ndm.gov.on.ca
The Purchase of MNDM Publications	MNDM Publication Sales	Local: (705) 670-5691 Toll Free: 1-888-415-9845, ext. 5691 (inside Canada, United States)	Pubsales@ndm.gov.on.ca
Crown Copyright	Queen’s Printer	Local: (416) 326-2678 Toll Free: 1-800-668-9938 (inside Canada, United States)	Copyright@gov.on.ca

LES CONDITIONS CI-DESSOUS RÉGISSENT L'UTILISATION DU PRÉSENT DOCUMENT.

Votre utilisation de ce document de la Commission géologique de l'Ontario (le « contenu ») est régie par les conditions décrites sur cette page (« conditions d'utilisation »). En téléchargeant ce contenu, vous (l'« utilisateur ») signifiez que vous avez accepté d'être lié par les présentes conditions d'utilisation.

Contenu : Ce contenu est offert en l'état comme service public par le *ministère du Développement du Nord et des Mines* (MDNM) de la province de l'Ontario. Les recommandations et les opinions exprimées dans le contenu sont celles de l'auteur ou des auteurs et ne doivent pas être interprétées comme des énoncés officiels de politique gouvernementale. Vous êtes entièrement responsable de l'utilisation que vous en faites. Le contenu ne constitue pas une source fiable de conseils juridiques et ne peut en aucun cas faire autorité dans votre situation particulière. Les utilisateurs sont tenus de vérifier l'exactitude et l'applicabilité de tout contenu avant de l'utiliser. Le MDNM n'offre aucune garantie expresse ou implicite relativement à la mise à jour, à l'exactitude, à l'intégralité ou à la fiabilité du contenu. Le MDNM ne peut être tenu responsable de tout dommage, quelle qu'en soit la cause, résultant directement ou indirectement de l'utilisation du contenu. Le MDNM n'assume aucune responsabilité légale de quelque nature que ce soit en ce qui a trait au contenu.

Liens vers d'autres sites Web : Ce contenu peut comporter des liens vers des sites Web qui ne sont pas exploités par le MDNM. Certains de ces sites pourraient ne pas être offerts en français. Le MDNM se dégage de toute responsabilité quant à la sûreté, à l'exactitude ou à la disponibilité des sites Web ainsi reliés ou à l'information qu'ils contiennent. La responsabilité des sites Web ainsi reliés, de leur exploitation et de leur contenu incombe à la personne ou à l'entité pour lesquelles ils ont été créés ou sont entretenus (le « propriétaire »). Votre utilisation de ces sites Web ainsi que votre droit d'utiliser ou de reproduire leur contenu sont assujettis aux conditions d'utilisation propres à chacun de ces sites. Tout commentaire ou toute question concernant l'un de ces sites doivent être adressés au propriétaire du site.

Droits d'auteur : Le contenu est protégé par les lois canadiennes et internationales sur la propriété intellectuelle. Sauf indication contraire, les droits d'auteurs appartiennent à l'Imprimeur de la Reine pour l'Ontario.

Nous recommandons de faire paraître ainsi toute référence au contenu : nom de famille de l'auteur, initiales, année de publication, titre du document, Commission géologique de l'Ontario, série et numéro de publication, nombre de pages.

Utilisation et reproduction du contenu : Le contenu ne peut être utilisé et reproduit qu'en conformité avec les lois sur la propriété intellectuelle applicables. L'utilisation de courts extraits du contenu à des fins *non commerciales* est autorisée, à condition de faire une mention de source appropriée reconnaissant les droits d'auteurs de la Couronne. Toute reproduction importante du contenu ou toute utilisation, en tout ou en partie, du contenu à des fins *commerciales* est interdite sans l'autorisation écrite préalable du MDNM. Une reproduction jugée importante comprend la reproduction de toute illustration ou figure comme les graphiques, les diagrammes, les cartes, etc. L'utilisation commerciale comprend la distribution du contenu à des fins commerciales, la reproduction de copies multiples du contenu à des fins commerciales ou non, l'utilisation du contenu dans des publications commerciales et la création de produits à valeur ajoutée à l'aide du contenu.

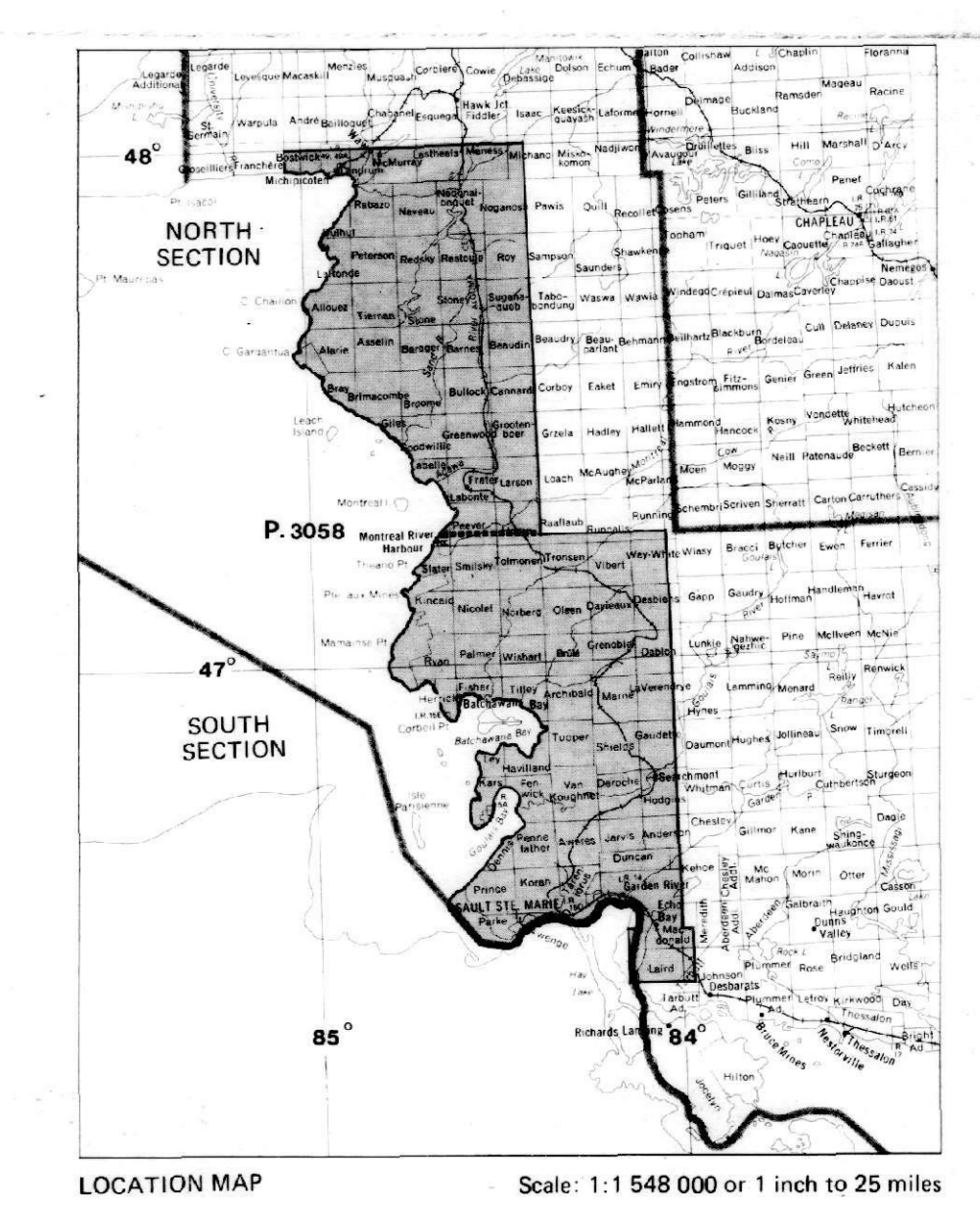
Renseignements :

POUR PLUS DE RENSEIGNEMENTS SUR	VEUILLEZ VOUS ADRESSER À :	PAR TÉLÉPHONE :	PAR COURRIEL :
la reproduction du contenu	Services de publication du MDNM	Local : (705) 670-5691 Numéro sans frais : 1 888 415-9845, poste 5691 (au Canada et aux États-Unis)	Pubsales@ndm.gov.on.ca
l'achat des publications du MDNM	Vente de publications du MDNM	Local : (705) 670-5691 Numéro sans frais : 1 888 415-9845, poste 5691 (au Canada et aux États-Unis)	Pubsales@ndm.gov.on.ca
les droits d'auteurs de la Couronne	Imprimeur de la Reine	Local : 416 326-2678 Numéro sans frais : 1 800 668-9938 (au Canada et aux États-Unis)	Copyright@gov.on.ca

PALEOZOIC GEOLOGY The Jacobsville Formation and Associated Units in Ontario

Scale 1:100 000
Kilometers 0 1 2 3 4
Miles 0 1 2 3 4
NTS Reference: 41 N.8.10.15.16; 41 N.17.8.9.10.15.16
CGM-GSC Aeromagnetic Maps: 21803, 21810, 21863, 21892, 21905, 21910,
22004, 22005, 22045, 22050
OGM Geological Compilation Map: 2220, 2419

© 1987 Government of Ontario
Printed in Ontario, Canada
Parts of this publication may be quoted if credit is
given and the material is properly referenced.
This map is published with the permission of V.G.
Mills, Director, Ontario Geological Survey.



- ### SYMBOLS
- Outcrop
 - Continuous outcrop enclosure
 - Geological contact, position approximate
 - Fault
 - Quarry

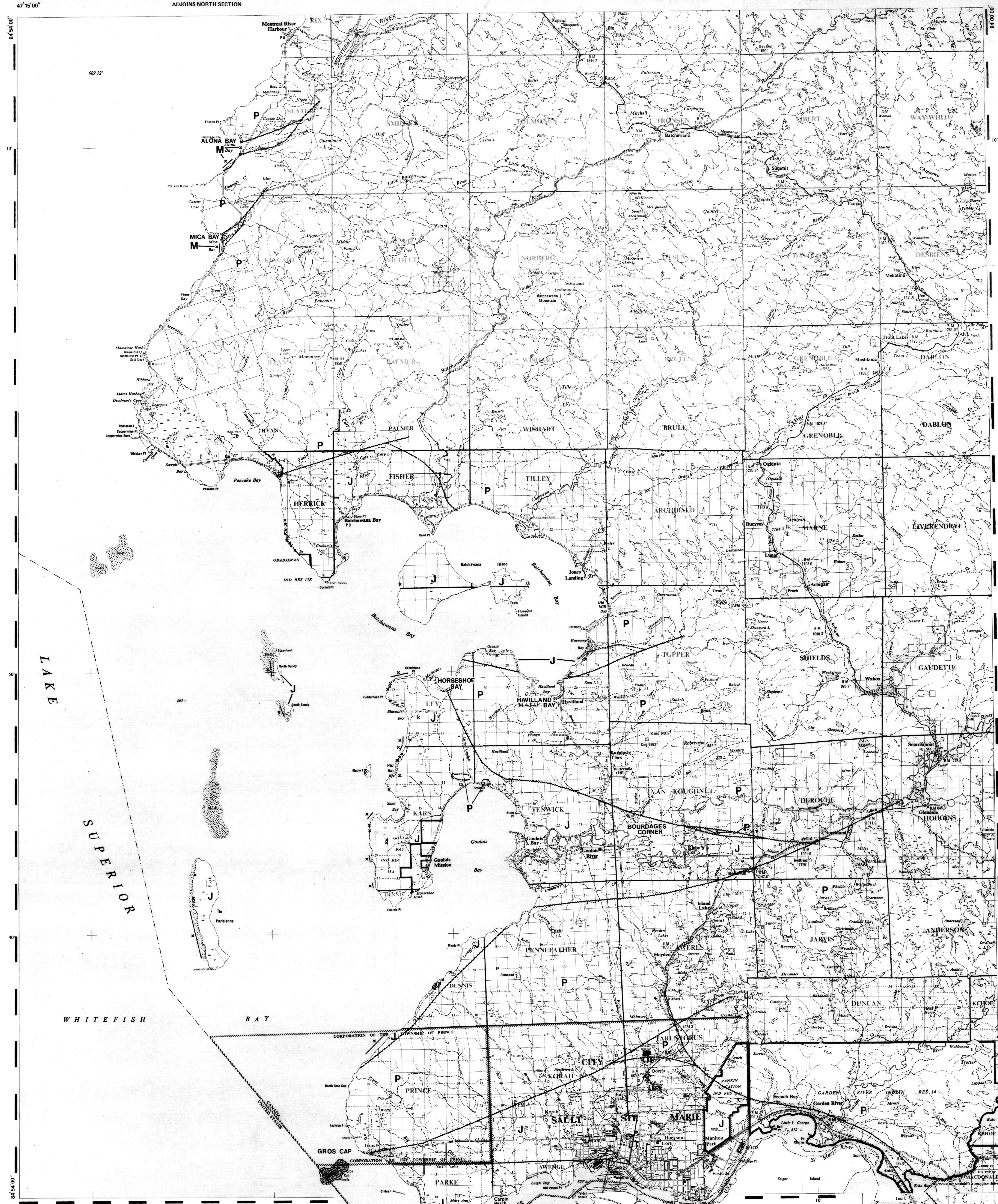
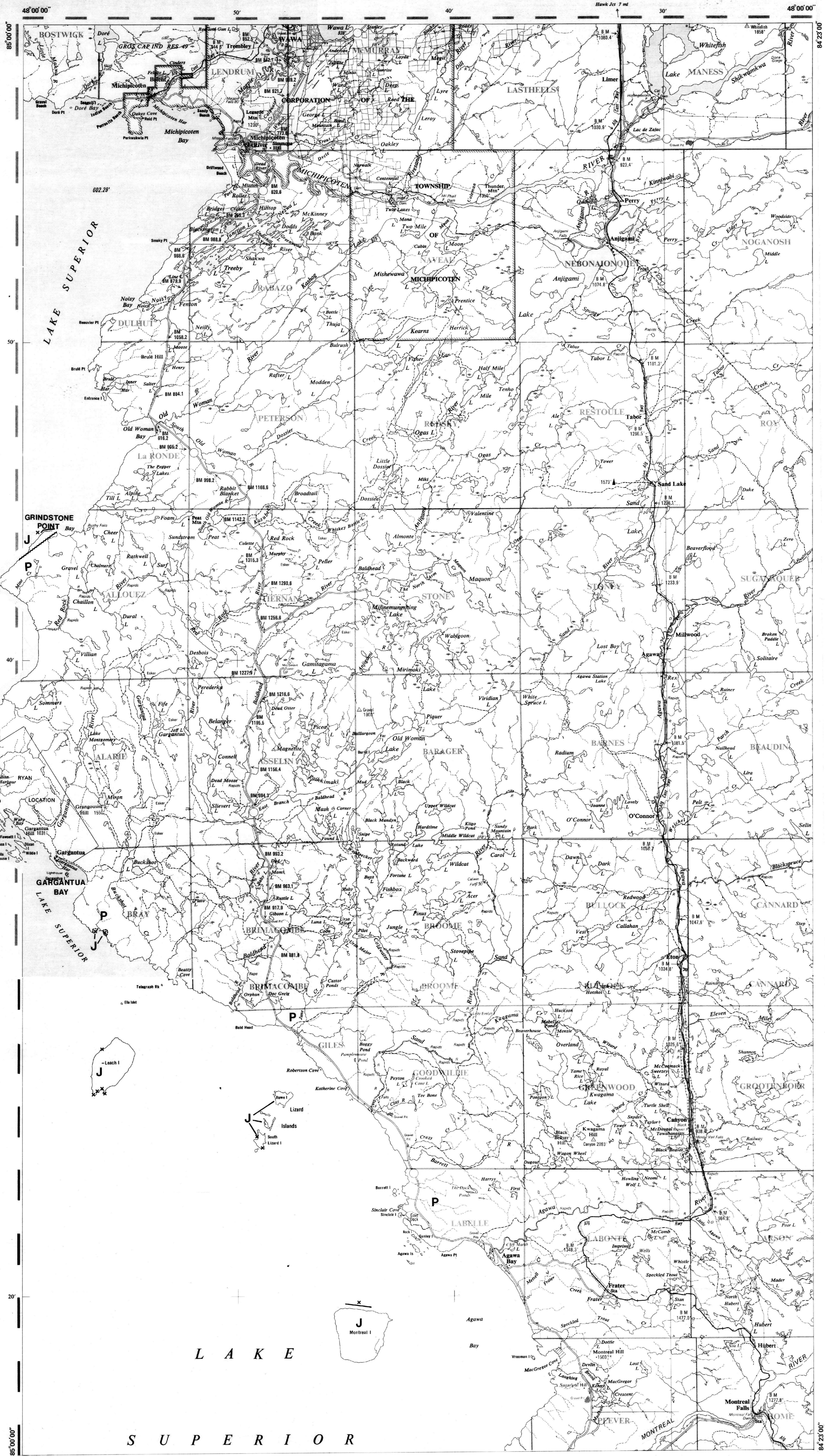
- ### GEOLOGICAL UNITS (Listed in Stratigraphic Order)
- J. Jacobsville Formation
 - M. Mica Bay Formation
 - P. Precambrian strata, undifferentiated

CREDITS

Geology by D.J. Russell, 1982.
Every possible effort has been made to ensure the accuracy of the information presented on this map. However, the Ontario Ministry of Northern Development and Mines 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 Assistant Regional Geologist's Office and the Mining Recorder's Office nearest the map area.

Information from this publication may be quoted if credit is given. It is recommended that reference be made in the following form:

Russell, D.J.
1987. The Jacobsville Formation and Associated Units in Ontario. Geological Series-Preliminary Map, Scale 1:100 000. Geological Survey of Ontario, Toronto.



MARGINAL NOTES

Introduction

The Jacobsville Formation is a thick sequence of predominantly red sandstones with some conglomerates which occur on the eastern and southern shores of Lake Superior. The eastern shore and the Ontario side of the Saint Mary's River east of Sault Ste. Marie are characterized by a series of low-lying areas underlain by the Jacobsville Formation. The thickness of the Jacobsville Formation varies from 100 to 1500 feet. The formation is named in honor of the Jacobsville area in Michigan. It is based on published and unpublished maps of J. Collins and co-workers (e.g. Collins and Lambert 1973), and on field work carried out in 1962 by the present author.

Stratigraphy of the Jacobsville Formation and Associated Units

The Jacobsville sandstone was named by Lane and Seaman (1957) from the base of that name at the base of the Keweenaw Peninsula in the Upper Peninsula of Michigan. Since most of the outcrop of the Jacobsville Formation in the area along the eastern and southern shores of the Upper Peninsula, the bulk of the stratigraphic and sedimentological data has been collected there. However, despite the importance of the unit, the age of the unit has not been determined unequivocally. Initially, based on radiometric evidence, Thwaites (1913) correlated the unit with the Late Keweenaw age Baraboo Group of Michigan. Hamlin (1958) favoured a Lower and Middle Cambrian age, based on petrographic evidence (mainly heavy mineral) distinguishing it from

older sediments and an unconformity separating it from the Upper Cambrian Marquette Formation. The width of subsequent surveys concerning field relationships (e.g. Backus 1975) and of geochronological data (Joy and Robertson 1978) has been in favour of a Late Keweenaw age (Kilgus 1982).

Through significant work, McConeil (1977) related the entire sequence of sandy units, embracing rocks of Late Keweenaw to Late Cambrian age, to the Lake Superior sandstone. The lower part of this unit is now referred to as the Freda Formation, described by Hamlin (1981) as an extensive fine grained sandstone and red silt shale, the same dominating the eastern part of the unit. All the outcrops in Ontario of what is now the Jacobsville Formation are assigned to Hamlin's (1981) Freda Formation. The general geology of the Ontario outcrops is a non-arenaceous sandstone with variable amounts of shale. All subsequent workers (e.g. Fray 1977; Liberty 1980) have applied the term Jacobsville to the red sandstone outcrops in Ontario, although Kilgus (1982) expresses some doubt in this regard.

Two outcrops of an older sequence of sediment occur at Mica Bay and along Bay two small bays south of Montreal Harbour. This unit, termed the Mica Bay Formation (Giblin 1974), has been correlated with the Freda Formation on Michigan grounds and due to its stratigraphic position below the Jacobsville Formation. The stratigraphic relationship between the Freda and Jacobsville Formations is discussed in McConeil (1977).

At the outcrop east of Bowdages Corner in the Goulais River valley, the Mica Bay Formation and the overlying Jacobsville Formation (Geoscience Data Centre, Ontario Geological Survey). The geochronological data of Joy and Robertson (1978) indicates that the Jacobsville sandstone at Sault Ste. Marie is significantly older than that on the Keweenaw Peninsula. Clearly, stratigraphic

relationships generated by use of standard lithostratigraphic techniques in the Mica Bay-Jacobsville area are more complex than those of the Freda Formation. The Freda Formation developed over stratification and some ripple marks. Paleocurrent directions determined from trough crossbeds in the Jacobsville sandstone by Hamlin, based on the above observations, is confirmed by Hamlin (1982), who reported the conglomerate facies as possibly representing the product of an alluvial fan environment.

Ontario has been reported as outcrops of the Jacobsville Formation are composed of medium-grained, moderately well-sorted, red sandstone with extensive crossbedding. The sandstone is high enough for the sandstone to be termed arenaceous. Through crossbedding and other features, the sandstone is clearly a sandstone and a conglomerate. The former is found in many localities, but is not continuous. It is not clear if the sandstone is only exposed in very restricted areas north of Gros Cap and near Goulais Harbour, both on the Lake Superior shore. The conglomerate is exposed in several places (Goulais and north of Sault Ste. Marie) but at Goulais Harbour (G) in the eastern part of the Jacobsville Formation is exposed, with large blocks of red sandy conglomerate interbedded with the sandstone. At the outcrop east of Bowdages Corner in the Goulais River valley, most of which have been thinned by faulting, the sandstone is composed of quartz pebbles and other pebbles, most of which have been thinned by faulting. The sandstone is composed of quartz pebbles and other pebbles, most of which have been thinned by faulting. The sandstone is composed of quartz pebbles and other pebbles, most of which have been thinned by faulting.

Sedimentology of the Jacobsville Formation

Hamlin (1982) identified three facies in the exposed outcrop of the Jacobsville Formation in Michigan. An impressionist based correlation of the Freda Formation is composed of locally derived clastic or other occurs in channel-fill sequences. The second facies is termed the "reticulate arenaceous" facies by Hamlin (1982). The name expressing the variable bedded thickness of the sandstone units. Trough crossbedding is the dominant feature of the facies,

3. Facies of either type 1 or 2 which have been concealed by red sands reworked by high lake levels during the Pleistocene epoch.

True bedding indicators are very difficult to determine because of the predominance of trough crossbedding at most localities. However, at the north end of Gros Cap Bay and on Highway 17 near Hayward Bay, examples of extensive, closely spaced, vertical beds occur in close proximity to the major fault in that area.

Economic Geology

No concentrations of potential ore minerals are known to occur in the Jacobsville Formation. A study was made in 1968 by a field party of the Ontario Geological Survey on Lake Superior. The study was designed to investigate the structural orientation of the Jacobsville Formation and to determine the potential for economic geology. The study was carried out by J. Collins and co-workers (e.g. Collins and Lambert 1973).

References

Backus, L.L.
1975. The Jacobsville Sandstone: Evidence for a Lower-Middle Cambrian Age. *Journal of Geological Research*, Volume 72, p. 1-11.

Fraser, M.J.
1977. Geology of the Huronian Belt between Sault Ste. Marie and Sault Ste. Marie. Ontario Geological Survey of Canada, Memoir 156, 126 p.

Giblin, P.E.
1974. Middle Keweenaw Rocks of Batchawana-Marmora Point Area. 20th Annual Meeting on Lake Superior Geology. Sault Ste. Marie, Ontario, p. 39-47.

Giblin, P.E. and Armstrong, G.A.
1973. Batchawana, Algoma District, Ontario. Ontario Division of Mines, *Current Map* 2251, 1:83 000.

Hamlin, W.K.
1958. Cambrian Sandstones of Northern Michigan. Michigan Geological Survey Publication 51, 149 p.

1972. The Jacobsville Sandstone: Evidence for a Lower-Middle Cambrian Age. *Journal of Geological Research*, Volume 72, p. 1-11.

1981. Stratigraphic Evolution of the Lake Superior Region from Late Keweenaw to Late Cambrian Time. Geological Society of America, Bulletin, Volume 72, p. 1-11.

Hamlin, W.K., Wood, R.J., and O'Hara, N.W.
1972. Geology and Magnetic Anomaly Studies of Lake Superior. *Journal of Geological Research*, Volume 72, p. 1-11.

1973. Geology of the Huronian Belt between Sault Ste. Marie and Sault Ste. Marie. Ontario Geological Survey of Canada, Memoir 156, 126 p.

1982. Jacobsville Sandstone, p. 147-155 in *Geology and Tectonics of the Lake Superior Basin*. Geological Society of America, Memoir 156, edited by R.J. Wood and W.J. Hertz.

Lane, A.C. and Seaman, A.L.
1957. Notes on the Geological Section of Michigan Part 1: The pre-Oriovian. *Journal of Geology*, Volume 65, p. 680-695.

Liberty, S.A.
1980. Paleozoic Stratigraphic Studies on the Michigan Basin's Northern Part, p. 33-40 in *Oriovian and Silurian Geology of the Northern Part of Michigan*. Michigan Basin Geological Society Field Conference.

McConeil, G.G.
1977. Sault Ste. Marie Area. District of Algoma, Ontario Department of Mines, Annual Report for 1976, Volume 20, Part 4, p. 1-15.

Roy, J.L. and Robertson, W.A.
1978. Paleogeography of the Jacobsville Formation and the Adjacent Polar Wandering Path for the Interval -1110 to -670 (7.7) for North America. *Journal of Geophysical Research*, Volume 83, 1269-1304.

Thwaites, T.L.
1913. Sandstones of the Western Coast of Lake Superior, Wisconsin. *Geological Natural History Survey, Bulletin*, Volume 25, p. 1-109.