Ministry of Natural Resources
Ontario

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ONTARIO GEOLOGICAL SURVEY

MAP P.2425

MINERAL DEPOSITS SERIES

URANIUM AND THORIUM DEPOSITS OF ONTARIO

NORTHWEST SHEET

KENORA (PATRICIA PORTION) DISTRICT

Scale 1:1 013 760 or 1 Inch to 16 Miles

NTS References: 43 C,D,E,F,K,L,M,N; 53 A,B
ODM Geological Compilation Map: 2201

MARGINAL NOTES

INTRODUCTION

This map is one of four sheets (P.2424, P.2425, P.2426, P.2427) revising maps (P.969 to P.972) published in 1975 and shows the distribution and classification of Ontario's uranium and thorium deposits. The geological base is the 1:1 013 760 or 1 inch to 16 mile Geological Map of Ontario. No radioactive deposits have been reported from the Northeast sheet. An inset map of Bancroft, at a scale of 1:253 440 or 1 inch to 4 miles has been provided. In general the format of the first edition has been retained with the following major changes: 1) the symbols denoting the deposits have been made smaller thus obscuring the geological base less, 2) grade of occurrences has not been shown for those deposit types characterized by extremely variable mineralization, and 3) listings of the deposits present have been added to each sheet using well known or popular names for deposits thus allowing the map-user to undertake further research. Since the preparation of the first edition the exploration activity of the 1970s and the work of the Ontario Geological Survey in resource assessment, mineral inventory (Gordon *et al.* 1981; Robertson in preparation) and mapping projects has permitted the assemblage of new or previously unpublishd information.

The classification used (see below and legend) is based on that of Robinson (1958) and is similar to that used in Canadian and International Publications. (Lang 1952, 1958; Lang *et al.* 1962; Little 1974; O.E.C.D. 1979) particularly for aggregating data collected by a wide variety of individuals or agencies. More detailed genetic classifications have been given by Barnes and Ruzicka (1972) modified by Ruzicka (1975), McMillan (1977, 1978), Smirnov (1977) and in the manuals nd publications of the N.U.R.E. program of the U.S. Department of Energy (Bendix 1978). The Canadian deposits have also been discussed by Robertson and Lattanzi (1974), and the Ontario Deposits by J.A. Robertson (1978, 1981).

Classification of Deposits

Ontario's radioactive element deposits fall into two broad groupings; those associated igneous and metamorphic rocks and processes, and those which form an integral part of or were subsequently deposited in sedimentary rocks. The former may be: 1) disseminated magmatic deposits in granites, syenites, or carbonatites, or the metasomatic deposits (fenites) associated with the latter; 2) the metamorphic-magmatic deposits comprising a) pegmatitic segregations and apophyses related to igneous or metamorphic rocks, and b) disseminations in calc-silicates or skarns formed as the result of metasomatic and/or metamorphic processes; and 3) veins, previously considered the end stage of magmatic or metamorphic processes but which may in some cases be the result of supergene circulation of ground water. Several of these types may occur together, as in the Bancroft camp (related to the same assemblage of rock types) (Satterly 1956; Hewitt 1967; Robertson 1978; Masson and Gordon 1981), or as in the Theano Point - Montreal River area where they are related to differing geological settings; the Early Precambrian (Archean) granitic rocks (pegmatite) and the contact zones of Late Precambrian diabase dikes (veins) (Nuffield 1955; Robertson 1968a, 1978). In recent years many European geologists and those working on the Athabasca deposits in Saskatchewan and the East Alligator River area of Northern Territory, Australia (Smith 1974; and papers in Dunn 1976; IAEA 1980; Kimberley 1978; Hoere and Sisbald 1979) have proposed that many pitchblende-bearing veins are actually supergene deposits deposited in suitable traps near and typically below unconformities representing land surface and providing a plumbing system at the time of enrichment.

In many cases assessment or other data available may not be sufficient to permit diagnostic objective classification of a deposit. In particular, the distinction between igneous and metamorphic pegmatites and their subtypes is difficult. However the only commercial radioactive pegmatite deposits in Ontario are those of the complex unzoned pegmatites of the Bancroft area, which are related to the Bancroft Syenite belt and to the lowermost sedimentary units of the Grenville Supergroup in an area of amphibolite facies metamorphic effects with deposition facilitated by favourable structures and composition of the host rocks. Other pegmatite types of the Bancroft area, the white pegmatites of the Kaladar-Sharbot Lake area, the red pegmatites of the Kenora-Dryden area and the grey-white pegmatites of the English River Gneiss Belt (Breaks *et al.* 1978; J.A. Robertson 1978) and the Bearhead Lake-Favourable Lake area (Ayres 1969) have also been explored but grades are too low and factors such as location and mineralogy pose additional problems.

In addition to the pegmatite deposits calc-silicate units carrying disseminated uraninite also occur within the Bancroft area. A number of these with grades of approximately 0.5 kg U_3O_8 per ton have been explored and are included in resources. The marble units and some pyroxenites may be amenable to crushing and separation thus creating a concentrate suitable for addition to a conventional (acid leach) mill (J.A. Robertson 1978). Of the magmatic type deposits, one, the Manitou Island deposit in Lake Nipissing, was developed as a niobium-uranium prospect; in recent years an ijolite-nepheline syenite contact zone within the Prairie Lake Alkalic Complex north of Marathon has also been prospected (J.A. Robertson 1978).

The pitchblende occurrences at Montreal River (Nuffield 1955) are of historic interest because they include the first recorded uranium locality in Canada and provided one of the major steps to the discovery of the Elliot Lake deposits (Lang *et al.* 1962; J.A. Robertson 1968b).

The most important sedimentary radioactive element deposits in Ontario are the Blind River-Elliot Lake-Agnew Lake deposits (J.A. Robertson 1968b, 1976, 1978) which comprise 10 percent of the Free World's uranium resources exploitable at a cost of less than \$130.00 (US) per kg of uranium or less than \$175.00 (Can) per kg of uranium (O.E.C.D. 1979; E.M.R. 1979). These are Lower Huronian (Early Proterozoic) pyritic oligomictic conglomerates carrying in the matrix the minerals uraninite, brannerite, and monazite from which uranium, thorium, and yttrium can be recovered. The distribution of the minerals shows marked correlation with pebble size and other sedimentary features (Theis 1979). The uraninite and monazite are held to be detrital (J.A. Robertson 1968b; Roscoe 1969) but the "brannerite" may be the result of diagenetic or metamorphic mobilization of uranium from the uraninite and redeposition on titaniferous minerals (Thies 1979). The location of individual deposits is controlled by suitable Early Precambrian (Archean) source areas, ancient drainage channels and shorelines, and possibly by penecontemporaneous mafic volcanic piles (J.A. Robertson 1971, 1976, 1978; Roscoe 1969). Similar deposits occur throughout the world (Houston and Karlstrom 1979), and particularly in South Africa (Pretorius 1976), and Brazil (Gross 1968). Many geologists believe they formed prior to full development of an oxygen-rich atmosphere (D.S. Robertson *et al.* 1978). All such deposits of commercial interest in Ontario (i.e. a minimum outlined tonnage of 1 million tons with a grade in excess of 0.5 kg U_3O_8 per ton over at least 2 m) are within arkosic sequences in the Matinenda Formation of the Elliot Lake Group and are within a few hundred metres stratigraphically of the Middle-Early Precambrian (Proterozoic-Archean) unconformity, and are down-drainage from anomalously radioactive (u-channel) areas of Early Precambrian (Late Archean) quartz monzonite.

Scattered mineralization is found in the shoreward arkosic facies of the Mississagi Formation of the Hough Lake Group, but grade and continuity are poor and thorium content approximates uranium content. In the Upper Huronian red beds are present, and at one horizon in the Lorrain Formation, of the Cobalt Group, quartz conglomerate beds and sandstones, with iron oxides, zircon and monzonite, carry thorium but almost no uranium (J.A. Robertson 1968a, 1971, 1978). This attests to a change in chemical, and possibly atmospheric, environment during Huronian times. In the area northeast of the Sudbury basin, Lower Huronian rocks are again present, although precise correlation with those of the Blind River-Elliot Lake-Agnew Lake area is not possible (Meyn 1973). Sporadic conglomeratic deposits of Blind River type are known. There also is uranium mineralization in impure (argillaceous) sandstone and argillites (Thomson 1960; J.A. Robertson 1968a, 1978; Meyn 1973; Meyn and Matthews 1980, p. 141-142). The role of carbonaceous material in Ontario deposits is apparently minor. Thucholite occurs locally in the Blind River deposits and there is trace uranium mineralization in the lignite of the James Bay Lowlands and with anthraxolite veins near Thunder Bay. The anthraxolite veins near Thunder Bay may have been derived by lateral secretion from the country rocks containing them. In 1972 an airborne gamma-ray spectrometer survey led to the discovery of radioactive hydrocarbon, the uranium probably deposited from groundwater, in Paleozoic dolomitic sandstones in March Township near Ottawa (Jonasson and Dyck 1974). The March formation also carries minor amounts of copper mineralization.

PRODUCTION[1]

To the end of 1979 Ontario has produced 246 000 000 pounds U_3O_8 from 109 000 000 tons of ore with an average recovered grade of 2.25 pounds U_3O_8 per ton (including the leaching operation at Agnew Lake).

Between 1955 and 1979 the Blind River camp has produced (from 13 mines) approximately 234 000 000 pounds U_3O_8 from 102 000 000 tons of ore grading 2.29 pounds U_3O_8 per ton. The production reached a peak in 1959 when 12 150 tons U_3O_8 were produced. In 1979 three mines were operating in the Elliot Lake area:

Denison Mines Limited	Denison Mine: 4 495 800 pounds U_3O_8 from 2 440 000 tons, recovery 1.84 pounds U_3O_8 per ton
Rio Algom Limited	Quirke Mine: 5 294 000 pounds U_3O_8 from 2 348 000 tons, recovery 2.3 pounds U_3O_8 per ton
	Panel Mine: 394 000 pounds U_3O_8 from 247 000 tons (reopened in 1979), recovery 1.6 pounds U_3O_8 per ton (Company annual reports)

and preparations were underway to reopen the Stanleigh Mine. The Agnew Lake Mine was operating using leaching of broken ore in underground stopes and in a surface stockpile. In 1979 448 000 pounds U_3O_8 were recovered, however the operation did not come up to expectations and underground development was terminated in 1980 with leaching of broken ore continuing into 1981.

In the Bancroft camp between 1956 and 1969, four mines (Faraday, Bicroft, Dyno and Greyhawk) produced approximately 11 000 000 pounds U_3O_8 worth \$105 000 000 (Hewitt 1967, p.1) with average recovered grade of 1.79 pounds U_3O_8 per ton. Some 90 percent of the production came from the Faraday (average recovery 1.99 pounds U_3O_8 per ton) and Bicroft Mines (average recovery 1.73 pounds U_3O_8 per ton). The Faraday Mine reopened as Madawaska Mine in 1976 and since that date has produced 1 717 000 pounds U_3O_8 from 1 115 000 tons of ore with average recovery 95% and recovered grade 1.49 pounds U_3O_8 per ton. The 1979 production was 605 530 pounds U_3O_8. Ontario's 1980 production was 4 275 000 kg (11 115 000 lbs U_3O_8) worth \$413 481 000 and Canada's 6 386 000 kg Uranium (16 557 000 lbs U_3O_8) worth \$637 717 000 (EMR preliminary). The known Ontario deposits can support annual production in excess of 12 000 tons U_3O_8, the precise level depending on the grade tonnage characteristics and the timing of each operation; in the Elliot Lake operations increased tonnage will be offset partly by the lower grade of the mill feed. The increased mill capacity can be obtained by further expansion of some current operations, reopening of closed mines, and the development of new operations.

RESERVES

It has been estimated that the Ontario deposits, predominantly the sedimentary deposits of the Blind River-Elliot Lake-Agnew Lake area, contain some 553 000 metric tons[2] uranium of which 125 000 are Reasonably Assured (measured + indicated) and 428 000 are estimated additional (inferred + prognosticated) at a price of less than \$156 per pound U_3O_8 (1978 price) (URAG data provided to the Porter Commission). Their figures are compatible to those given by Roscoe for the total content of the Elliot Lake area, 500 000 tonnes uranium and the total figures given for Ontario by J.A. Robertson (1975) in the first edition of this map. Current allocations to economic and sub-economic categories, however, would reflect changes in costs and prices as well as operating experience and the earlier studies used different zones of influence for the measured, indicated, inferred and prognosticated categories. The data given to the Porter Commission (Porter 1978) was broken down as to measured 49 000 tU; indicated, 76 000 tU; inferred and prognosticated 182 000 tU; but not between economic and sub-economic. The Federal Government export allocation policy is based on the measured resources, 0.8 times the indicated resources and 0.7 times the inferred resources, and the prognosticated is regarded as so uncertain that it is not used for computing the allowable resource base. Indeed the 1978 and 1979 URAG assessments have reduced the Ontario prognosticated to 179 and 147 thousand metric tons respectively whereas there have only been minor changes in the other categories.

The reserves, in a mining sense, constitute some 7% of the Western world's reserves and also contain at least 100 000 tons of recoverable ThO_2. In 1979 Ontario had 62% of Canada's measured, indicated and inferred uranium resources whereas Saskatchewan had 33%. As discoveries continue to be made in Saskatchewan, Ontario's proportions of resources, which have remained static in absolute amount, will drop. Significant additions to resources continue to be made in Australia, Brazil and Nigeria (OECD 1979).

Extensive and costly exploration and development is required to confirm and transpose resources from prognosticated to inferred and ultimately to reserves. To allow for discovery, development, production, and processing such exploration must be underway in eight and preferably ten years before the anticipated use. It should be pointed out that licensing and construction of reactors may take up to fifteen years, adding to the uncertainty of forecasting of demand. Whilst the current uranium market and prices are relatively soft (\$25.00 US per pound U_3O_8, Northern Miner, 12 Feb. 1981) the longer term markets remain promising, although Ontario faces competition from the higher grade deposits being discovered in Saskatchewan and Australia. The continued escalation of hydrocarbon prices and the ecological and transportation problems facing the resurgent coal industry and the delays in developing breeder reactors, and other alternative energy sources, including fussion, ensure that uranium will be a major energy source well into the 21st century.

PROSPECTING

Prospecting for uranium (and thorium) is largely based on geological modelling followed up where suitable by geophysical and geochemical studies (including radiation and radon surveys) as in the Early Precambrian (Archean) and Grenville terrains or by diamond drilling. Drilling is the only reliable exploration tool for the buried Huronian deposits. Considerable use can be expected of gamma-ray spectrometry, both airborne (Darnley 1972) and for core logging. The use of miniaturized radiation detection and geophysical instruments for downhole logging is being developed (Hood 1981), particularly as the oil companies participate in the search for alternative energy sources.

The deeper parts of the Blind River-Elliot Lake area westward to north of Sault Ste. Marie, the area northeast of Sudbury, and the Agnew Lake area are exploration areas for sedimentary deposits in Ontario. The Bancroft area, and possibly the Kenora area are of interest for pegmatite-related deposits. Alkalic-carbonatite complexes, and "porphyry-type" deposits of non-ferrous base or precious metals in the Early Precambrian (Archean) remain hypothetical or speculative sources of by-product uranium or thorium. Metamorphic pegmatites (grey) are also possible sites for uranium deposits, particularly in the Grenville Supergroup. In the same sequence calc-silicate rocks have some potential.

Middle-Late Precambrian unconformities, for example at the margin of the Lake Superior Basin, are of interest for the so-called unconformity-vein type of deposit, and although there are indications that the appropriate processes were in operation there is as yet no indication that they were sufficiently effective to form significant deposits. It is anticipated that patterns revealed by metallogenic maps at this and, in future, at larger scales will assist in defining suitable geological and geographical environments for concentrated exploration.

The principle of using a systems approach to modelling: identifying geological factors critical to source, transportation, deposition, reconcentration and preservation, and the factors affecting extraction is strongly recommended. (see also Ruzicka 1977; Bendix 1978).

[1] Data compiled from Company Annual Reports and the public files of M.N.R.

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OCCURRENCE LIST FOR THE NORTHWEST SHEET

1. Bear Head Lake
   - East Showing
   - Camp Showing
   - Bear Creek Showing
   - Father Showing
   - Mother Showing
   - Crag Showing
   - Zones, A, B, C, D, E, F, H, I, K, M, and West
2. Hornby Lake
   - Zones A, B, and C
3. Schryburt Lake

LEGEND[a]

CENOZOIC
QUATERNARY
PLEISTOCENE AND RECENT
Sand, gravel, clay.

MESOZOIC[a]
CRETACEOUS
LOWER CRETACEOUS[r]
29 — *Clay, sand, lignite, fireclay, kaolinitic quartz sand.*

PALEOZOIC[a]
MISSISSIPPIAN
LOWER MISSISSIPPIAN
28 — *Shale, sandstone.*

DEVONIAN
UPPER DEVONIAN
27 — *Black shale.*
MIDDLE DEVONIAN
26 — *Limestone, dolomite, shale, gypsum.*
LOWER DEVONIAN
25 — *Sandstone, arkose, conglomerate, siltstone, shale, limestone.*

SILURIAN
UPPER SILURIAN
24 — *Limestone, dolomite, siltstone, shale, mudstone, sandstone, gypsum, salt.*
MIDDLE SILURIAN
23 — *Dolomite, limestone.*
LOWER SILURIAN
22 — *Sandstone, shale, dolomite.*

ORDOVICIAN
UPPER ORDOVICIAN
21 — *Shale, limestone, dolomite, sandstone.*
MIDDLE ORDOVICIAN
20 — *Limestone, shale.*
LOWER ORDOVICIAN
19 — *Dolomite, sandstone.*

CAMBRIAN
UPPER CAMBRIAN
18 — *Conglomerate, sandstone, shale.*
LOWER AND MIDDLE CAMBRIAN
17 — *Sandstone, conglomerate, shale.*

PRECAMBRIAN
MIDDLE TO LATE PRECAMBRIAN
CARBONATITE-ALKALIC COMPLEXES[b]
16 — *Carbonatite, nepheline and alkalic syenites, fenite and associated mafic and ultramafic rocks.*

LATE MAFIC IGNEOUS ROCKS[c]
15 — *Diabase, gabbro, diorite, ultramafic rocks and granophyre.*

LATE FELSIC IGNEOUS ROCKS[d]
14 — *Granodiorite, trondhjemite, quartz monzonite, granite, syenite, quartz porphyry, pegmatite, aplite, derived gniesses and migmatites.*
14A — *14A Anorthosite suite rocks; anorthosite, gabbroic anorthosite, tonalite, monzonitic and syenitic rocks, quartz monzonite, minor gabbro, ultramafic rocks and derived gneisses.*

GRENVILLE PROVINCE
MIDDLE TO LATE PRECAMBRIAN
EARLY MAFIC AND ULTRAMAFIC IGNEOUS ROCKS
13 — *Diorite, gabbro, peridotite, pyroxenite, anorthosite, and derived metamorphic rocks.*

METASEDIMENTS[e,f]
CARBONATE METASEDIMENTS
12 — *Marble, calc-silicate rocks, skarn.*

CLASTIC METASEDIMENTS
11 — *Conglomerate, greywacke, orthoquartzite, arkose, siltstone, chert, minor iron formation and metavolcanics.*

METAVOLCANICS[f]
MAFIC TO FELSIC METAVOLCANICS
10 — *Flows, tuff, breccia, minor iron formation and metasediments.*

SUPERIOR AND SOUTHERN PROVINCES
LATE PRECAMBRIAN
KEWEENAWAN
SEDIMENTARY AND VOLCANIC ROCKS[g]
9 — *Conglomerate, greywacke, arkose, ornate rocks, tuff, basalt and rhyolite flows, quartz porphyry.*

MIDDLE PRECAMBRIAN
ANIMIKIE[h]
8 — *Greywacke, shale, argillite, iron formation, limestone.*

HURONIAN
COBALT GROUP[j]
7 — *Conglomerate, greywacke, orthoquartzite, siltstone, argillite.*
ELLIOT LAKE, HOUGH LAKE AND QUIRKE LAKE GROUPS[k]
6 — *Conglomerate, greywacke, arkose, orthoquartzite, argillite, limestone, dolomite, basalt, rhyolite.*

EARLY PRECAMBRIAN
EARLY FELSIC IGNEOUS AND METAMORPHIC ROCKS[d]
5, 5M — *Granodiorite, trondhjemite, quartz diorite, quartz monzonite, granite, syenite, quartz and feldspar porphyries, pegmatite, aplite, undifferentiated migmatite; 5M predominately migmatitic metasediments and minor metavolcanics.*

KAPUSKASING GRANULITE COMPLEX
5 — *Granulite facies metasediments, metavolcanics and granite.*

EARLY MAFIC AND ULTRAMAFIC IGNEOUS ROCKS[m,q]
4 — *Diorite, gabbro, norite, pyroxenite, periodotite, dunite, serpentinite.*

METASEDIMENTS[n]
3 — *Conglomerate, greywacke, arkose, orthoquartzite, argillite, slate, marble, chert, iron formation, minor volcanics and related migmatites.*

METAVOLCANICS
FELSIC TO INTERMEDIATE METAVOLCANICS[p]
2 — *Rhyolite, rhyodacite and dacite (flows, tuffs, and breccias), chert, iron formation, minor metasediments and intrusive rocks, and related migmatites.*
MAFIC METAVOLCANICS[p,q]
1 — *Basalt, andesite (flows, tuffs and breccias), chert, iron formation, minor metasediments and intrusive rocks, and related migmatites.*

a A few small intrusive bodies of this age have been identified by radiometric age dating methods.
b May be in part post-Precambrian.
c A generalized distribution of diabase dikes is shown.
d Formerly classified as Algoman and/or Laurentian.
e Formerly classified as Grenville and/or Hastings Series.
f Rocks in these groups are subdivided lithologically and the order does not necessarily imply age relationship within or among groups.
g Includes Osler and Sibley Groups.
h Includes Gunflint and Rove Formations, and the formations of the Whitewater Group. The Whitewater Group Formations in the Sudbury area may be of Archean age.
j Includes Gowganda, Lorrain, Gordon Lake, Bar River Formations.
k These three groups collectively were formerly classified as Bruce Group. Included in these groups are the Matinenda, McKim, Ramsay Lake, Pecors, Mississagi, Bruce, Espanola, Serpent, Aweres Formations. Some of the rock units along the north shore of Lake Huron may be of Archean age.
m Formerly classified as Haileyburian.
n Formerly classified as Timiskaming, Windigokan, Seine, Steeprock, Keewatin, Linklater, Marshall Lake, Manitou, Couchiching.
p Formerly classified as Keewatin, Windigokan.
q Komatiitic and ultramafic volcanic flows have been included with these rocks in some localities.
r Middle Jurassic rocks are known to underlie the Lower Cretaceous rocks in the northern part of the Cretaceous basin.

[a] This Legend is from Ontario Geological Survey Map 2392, by S. B. Lumbers, 1979.

SYMBOLS

Deposit Type	Reasonably Assured Reserves: Occurrences	Less than 1 000 000 tons	More than 1 000 000 tons
RELATED TO IGNEOUS ROCKS			
Magmatic			
Carbonatites, alkalic complexes, fenite, calc-alkaline extrusive rocks			
Magmatic-Metamorphic			
Pegmatite and granitic rocks.			
Calc-silicate (skarn) rocks, pyroxenite			
Veins			
Pitchblende vein (simple), pitchblende complex, uraninite-calcite-apatite-fluorite			
RELATED TO SEDIMENTARY ROCKS			
Conglomerate			
Thorium Fe-oxide rich			
Uranium Fe-sulphide rich			
Argillite			
Semi-pelitic rocks, wacke			
Carbonaceous			
Lignite, anthraxolite, carbonaceous material in sedimentary rocks			

Grade is indicated for any of the above symbols in the following way: e.g. comglomerate, uranium rich occurrence.

Not indicated
Less than 0.75 pounds U_3O_8 per ton
0.75 to 1.5 pounds U_3O_8 per ton
More than 1.5 pounds U_3O_8 per ton

•22 Deposits not classified

SOURCES OF INFORMATION

The principal sources of Mineral Deposits information are the Mineral Resources Circulars for Uranium and Thorium Deposits of Northern and Southern Ontario (Robertson 1968a; Hewitt 1967; Gordon *et al.* 1981). This map supercedes Uranium and Thorium Deposits of Ontario, Ontario Division of Mines, Preliminary Map P.969, by J. A. Robertson, 1974.

Geological compilation by L. D. Ayres, S. B. Lumbers, V. G. Milne, and D. W. Robeson, Ontario Geological Survey and the Geological Survey of Canada, unpublished data on file with the Ontario Ministry of Natural Resources, interpretation of aeromagnetic maps, and other sources.

Assessment Files Research Office, Ontario Geological Survey, Toronto.

Resident Geologist's Files, Ministry of Natural Resources, Ontario.

Note: The Mines Group, Ontario Ministry of Natural Resources, would welcome comment, revisions, new data, and suggestions for the preparation of a later edition of this map. These should be sent to the Chief, Mineral Deposits Section, Ontario Ministry of Natural Resources, Ontario Geological Survey, Queen's Park, Toronto.

CREDITS

Compilation by J. A. Robertson 1973-1974, 1980-1981.

Plotting and drafting by K. L. Gould 1981, and C. J. Defend 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.

Issued 1982

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

Robertson, J. A.
1982: Uranium and Thorium Deposits of Ontario, Northwest Sheet, Kenora (Patricia Portion) District; Ontario Geological Survey, Map P.2425, Mineral Deposits Series, Scale 1:1 013 760 or 1 inch to 16 miles. Compilation 1973-1974, 1980-1981.