AN EVALUATION OF THE MINERAL POTENTIAL

of the

GARDEN RIVER INDIAN RESERVE No. 14

David S. Robertson & Associates Limited
Consulting Geologists & Mining Engineers
Blind River, Ontario

Earl J. Lalonde

# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUMMARY</td>
<td>010C</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>LOCATION. TOPOGRAPHY &amp; ACCESSIBILITY</td>
<td>3</td>
</tr>
<tr>
<td>REVIEW OF EXPLORATION DATA</td>
<td>5</td>
</tr>
<tr>
<td>GEOLOGY</td>
<td>5</td>
</tr>
<tr>
<td>Archean</td>
<td>5</td>
</tr>
<tr>
<td>Proterozoic</td>
<td>5</td>
</tr>
<tr>
<td>Paleozoic</td>
<td>6</td>
</tr>
<tr>
<td>Pleistocene and Recent</td>
<td>7</td>
</tr>
<tr>
<td>GEOPHYSICS</td>
<td>7</td>
</tr>
<tr>
<td>MINERAL OCCURRENCES</td>
<td>8</td>
</tr>
<tr>
<td>Copper</td>
<td>8</td>
</tr>
<tr>
<td>Lead-Zinc</td>
<td>10</td>
</tr>
<tr>
<td>Iron</td>
<td>11</td>
</tr>
<tr>
<td>Radioactive Minerals</td>
<td>11</td>
</tr>
<tr>
<td>Industrial Minerals</td>
<td>11</td>
</tr>
<tr>
<td>CONCLUSIONS AND RECOMMENDATIONS</td>
<td>12</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>15</td>
</tr>
</tbody>
</table>
continued

APPENDIX I

EXCERPTS FROM WORK REPORTS BY TOWNSHIPS

APPENDIX II

PUBLISHED INFORMATION ACCOMPANYING THIS REPORT

LIST OF ILLUSTRATIONS

FIGURE I: Map 2108, Sault Ste. Marie-Elliot Lake Compilation Sheet, Scale 1" = 4 Mi. In Pocket
SUMMARY

The evaluation of the mineral potential of the Garden River Indian Reserve No. 14, which lies north of the St. Marys River and just east of Sault Ste. Marie, Ontario, is based on both published and unpublished material and on personal knowledge of the area of some associates of David S. Robertson & Associates Limited. The mineral rights are held by the Indians in total for the Reserve, most of Kehoe Township and certain adjacent areas and the gold and silver alone are held by them in other parts of Kehoe and adjacent townships.

The Garden River Indian Reserve and the adjacent area are underlain by metavolcanic, metasedimentary and acid igneous rocks of the Archean era and sedimentary and basic volcanic rocks of the Proterozoic. Both the Proterozoic and Archean are intruded by basic igneous and felsitic rocks and cut by faults, a few of which appear as prominent linears.

The aeromagnetic surveys have outlined general trends in the exposed and buried Archean rocks. Neither the airborne electromagnetic nor the airborne radiometric surveys detected any significant anomalous zones.

Occurrences of erratically distributed and often spectacular chalcopyrite in quartz veins in, or associated with diabase are scattered through the Reserve and the adjacent area. Although many copper occurrences of the quartz-vein type associated with basic igneous rocks have been discovered in the western North Shore area of Lake Huron, only those at Bruce Mines have produced ore.
Galena-sphalerite mineralization with minor pyrite and specularite occurs as fracture fillings and replacements in a brecciated limestone south of Boss Lake within the Reserve. Lead-zinc veins in granite, less favourable geological environment than the Boss Lake situation, was mined recently in Jarvis Township, 3 miles north of the Reserve.

A uraniferous quartz-pebble conglomerate occurring near the base of the Duncan volcanic sequence outcrops just north of the Reserve in Duncan Township and holds some potential for the Reserve itself.

Marble, apple-green quartzite and jasper conglomerate, which occur within the Reserve and Kehoe Township, were never fully exploited, although some of these stones are quite unique. In an expanding Sault Ste. Marie and a more affluent society generally, the market potential for ornamental stone aggregate will continue to expand. Equal optimism might be expressed for stone and gravel generally where they are found on the Reserve close to the city.
INTRODUCTION

This report discusses and evaluates the mineral potential of the Garden River Indian Reserve No. 14, which lies north of the St. Marys River and just east of Sault Ste. Marie, Ontario. The appraisal is based on both published and unpublished material which forms an appendix to the report, and on the personal knowledge of some of the associates of David S. Robertson & Associates Limited.

In accordance with the terms of reference given in the contract with the Federal Department of Indian Affairs and Northern Development, the report includes:

a) Known mineral occurrences on, and for a reasonable distance beyond the perimeter of the reserve. The location, nature and potential of the mineral occurrences are noted.

b) Geological evaluation of the inferred mineral potential of the Garden River Indian Reserve.

c) A bibliography of published and unpublished technical data which will contribute toward present and future evaluation of the Reserve.

d) An appendix of technical data which was gathered from existing material relevant to the mineral potential of the Reserve.

The information given within the report and copies of available published and pertinent unpublished material in the appendix has been obtained from the following sources:
a) Assessment files of the Resident Geologist, Ontario Department of
Mines and Northern Affairs, 370 Lake Street, Sault Ste. Marie,
Ontario.

b) Publications and maps of the Geological Branch, Ontario Department
of Mines and Northern Affairs.

c) Publications and maps of the Geological Survey of Canada, Department
of Energy, Mines & Resources.

d) Geophysical sheets of joint Federal-Provincial Aeromagnetic Surveys.

e) Files of David S. Robertson & Associates Limited, Blind River,
Ontario.

The mineral rights of most of the Garden River Reserve are held in total
by the Indian Band and mineral rights for certain lands beyond the Reserve
are also held by the Band in total and in part. The Band holds all of the mineral
rights for most of Kehoe Township including the lands beneath Echo Lake.

The mineral rights on the lands beneath the waters of Duncan Township are
also held by the Band as well as the gold and silver of much of MacDonald,
Laird and Duncan Townships. Anyone interested in exploration in the Sault
Ste. Marie area would be well advised to investigate the deposition of mineral
rights, particularly in respect to what might be still held by the Indians.

Records on such matters are not readily available at Sault Ste. Marie, but
are obtainable through the legal section of the Department of Indian Affairs
and Northern Development.
LOCATION, TOPOGRAPHY AND ACCESSIBILITY

The Garden River Indian Reserve No. 14 is a rectangular area of about 50 square miles, bounded on the south by the St. Marys River, Lake George and Echo Bay, on the east by Echo River, Echo Lake and Kehoe Township, on the north by Duncan and Kehoe Townships and on the west by Indian Reserve No. 15D (Rankin Location). (See Figure 1).

The Sault Ste. Marie branch of the Canadian Pacific Railway and the Trans-Canada Highway cross the Reserve along the north shore of the St. Marys River. Most of the Reserve is readily accessible by secondary and/or bush roads which extend north from the Trans-Canada Highway. Charter ski or pontoon-equipped aircraft are available at Sault Ste. Marie within 5 miles of the Reserve.

The lands of the Reserve consist of a low lying, gently rolling marginal area to the south underlain by Paleozoic and Recent sediments, and a northern part of a rugged high hills underlain by the Archean and Proterozoic rocks. Much of Laird and MacDonald Townships are low farmland areas which at one time were lake covered. The Band lives in the low marginal area through which the transportation arteries funnel.

Sault Ste. Marie, a city of more than 50,000 people, has been a supply center for the resource industry for many decades. Dock installations along the St. Marys River are capable of handling bulk supplies and heavy equipment. Hydroelectric power, generated at several regional sites, is available...
from the national energy grid. High tension power lines cross the Reserve.

REVIEW OF EXPLORATION DATA

GEOLOGY

The rocks of the Garden River Indian Reserve, and for a reasonable distance beyond, can be divided into four groups on the basis of age, degree of metamorphism and structural deformation.

Archean:

The oldest rocks of the area are found north of and within the western part of the Reserve and adjoining Tarentorus Township. Highly metamorphosed basic and acidic volcanic rocks with associated sediments and pyroclastics, intruded by the Algoman granites, occur in adjoining Duncan Township. Lead-zinc deposits are found in and have been mined from Archean rocks within 3 miles of the Reserve and still other occurrences of base metals are found in greenstone areas farther north. The greenstone belt of Duncan Township undoubtedly underlies the Proterozoic rocks covering the Reserve. Granitic rocks in the northwestern part of the Reserve contain small copper showings in quartz veins along strong linears.

Proterozoic:

Proterozoic rocks belonging to the Huronian Super Group underlie most of the Reserve. Such strata consists of quartzites, basic volcanics, conglomerates and limestones and, except for strong induration show few visible metamorphic effects. The Huronian is intruded by basic Nipissing
and Keweenawan dykes with associated small occurrences of chalcopyrite in a quartz-carbonate gangue. Minor nickel and cobalt stage has been found regionally in such dykes. The basic volcanics contain significant accessory chalcopyrite in nearby areas to the east, but no copper deposits have been reported. Quartz-pebble conglomerates associated with the basal flows are radioactive and have received fair local and regional attention.

Chromium metasomatism along major faults in adjoining Kehoe Township have developed attractive fuchite bearing quartzites of an apple-green colour.

Conglomerates in the upper part of the Huronian contain significant concentrates of jasper pebbles suitable for aggregate use.

**Paleozoic:**

Cambrian sandstones and shales overlie Archean and Proterozoic rocks in the low lying south margin of the Reserve and westward through Sault Ste. Marie to Lake Superior. The sediments are part of a marine transgression over deeply weathered Precambrian rocks. Limestone members of the overlying Ordovician south of the St. Marys River are used locally as road metal and have received some attention for possible cement rock. No Ordovician is reported on the north side of the St. Marys River in Canada. Examinations of the basal Cambrian sediments for uranium deposits have been carried out from time to time, but the marine character of the Paleozoic strata makes them unsuited to uranium occurrence. No radioactivity in the Cambrian is known to the writers.
Pleistocene and Recent:

Overlying the Cambrian strata of the low ground along the south margin of the Reserve area, lake and river gravels of considerable thickness. Here and there, the gravels have been preserved from Recent erosion during the Great Lakes drainage history. These sands and gravels will be of increasing future value as the Sault Ste. Marie area of Canada and the United States continues to grow.

GEOPHYSICS

The Federal-Provincial Aeromagnetic Survey, flown at 1/4 mile spacings on north-south lines, broadly outlined areas of different rock types, and the trend of the isomagnetic contours correspond with the regional strike of the Archean basement rocks. Those diabase and gabbro intrusives not outlined by the survey are probably low in magnetic minerals. The Garden River Fault and other structural features were not delineated by the aeromagnetics because of the lack of magnetic contrast between the Archean fault blocks.

Airborne electromagnetic surveys, conducted over portions of Jarvis and Kehoe Townships, failed to locate any significant conductive zones. An airborne gamma-ray spectrometer survey over a portion of Kehoe Township conducted simultaneously with magnetic and electromagnetic recordings did not detect any significant radioactivity. Although the magnetic and electromagnetic tapes were disappointing, such data should be continuously reviewed with progressive exploration.
MINERAL OCCURRENCES

Prospecting, carried out with varying degrees of intensity since the discovery of copper at Bruce Mines in the early 1800's, has located numerous showings of copper, lead-zinc and uranium along the North Shore. After the discovery of commercial uranium in Long Township in the early 1950's, intensive exploration activity uncovered several radioactive occurrences in the western portion of the North Shore area near Sault Ste. Marie.

Copper:

Copper mineralization in the North Shore area of Lake Huron occurs in several different geological environments. Chalcopyrite, in places spectacular, occurs with varying amounts of iron sulphides in quartz veins closely associated with Nipissing diabase. Some disseminated chalcopyrite was located by drilling in Morin Township in Proterozoic basic volcanics, similar to the basic volcanics underlying portions of the Garden River Indian Reserve and Duncan Township. Brecciated quartz-feldspar porphyry stocks cemented with quartz and carrying chalcopyrite and pyrite, occur to the northwest in Archean rocks similar to those rocks which underlie the northwest portion of the Reserve. Several promising showings of chalcocite with carbonate, occur in the Sault Ste. Marie area or the edges of trap dykes.
A nickel and several copper occurrences within the Garden River Indian Reserve, and others a reasonable distance beyond the Reserve, are located and described as follows:

a) Tarentorus Township (Indian Reserve No. 15D), about 3/4 mile north of Crystal Creek and 1/4 mile west of the east boundary of Reserve 15D. Pyrite and chalcopyrite in quartz veins in greenstone schist inclusions in granite. Diabase dykes and many barren quartz veins occur parallel to and near the showing.

b) Kehoe Township, Section 28, Location 3E. Erratically distributed chalcopyrite in quartz veins intruding quartzite and associated with a major diabase intrusion.

c) Kehoe Township, Sections 25 and 36. Sparse and erratically distributed chalcopyrite and pyrite in quartz-carbonate veins in quartz diabase.

d) Kehoe Township, Section 4. Pyrite and chalcopyrite occur in granodiorite or diabase.

e) Garden River Indian Reserve on the southeast shore of Trotter Lake. Erratically distributed chalcopyrite and bornite in quartz veins a few inches wide associated with nearby diabase.

f) Garden River Indian Reserve. There are a few small occurrences of nickel on the west shore of the most easterly of two small lakes about 1-1/2 miles west of Echo Lake and 1-1/2 miles southwest of Trotter Lake.
Lead-Zinc:

Galena-sphalerite mineralization with lesser amounts of pyrite, specularite, chalcopyrite, magnetite, quartz and carbonate occur at Boss Lake on the Reserve as fissure fillings and replacements in and near fault zones. The origin of the mineralizing solutions is obscure, but they may be associated with nearby diabase similar to several lead-zinc showings north of the Reserve in Jarvis Township. Most of the lead-zinc occurrences in Jarvis Township are fissure fillings closely associated with Nipissing diabase. The possibility of an endogenetic relationship to the Proterozoic sediments cannot be ruled out.

The Jardun Mine (past producer) and the Boss Lake lead-zinc occurrence are located and briefly described as follows:

a) Jarvis Township, south central portion extending just into Duncan Township. Four replacement and fissure filling mineral zones in granite and diabase in or near a steeply dipping, north striking fault. Galena, sphalerite, chalcopyrite, pyrite, magnetite, quartz and carbonate are the principal minerals. The mineralization shows a strong association with diabase.

b) Garden River Indian Reserve about 1/4 mile south of the west end of Boss Lake. Galena-sphalerite mineralization with minor pyrite and specularite occurs mainly as fracture fillings in brecciated Bruce limestone in and near a fault zone, and to a lesser degree, as replacements of the limestone. The Bruce limestone of the Bruce
Group has been thrust over Gowganda argillite of the Cobalt Group.

Iron:

A hematite vein and hematite cementing fracture zones in the Lorrain Formation of the Cobalt Group occur in Sections 22 and 29 of MacDonald Township. Hard and soft hematite veins up to 15 inches wide occur in the Lorrain of Section 36, MacDonald Township, and extend into Section 31 of Meredith Township.

Radioactive Minerals:

A uraniferous quartz-pebble conglomerate outcrops in Sections 7, 14 and 15 of Duncan Township, and was intersected in diamond drill holes D-1, M-1 and M-3 drilled in Section 6 and 15 of Duncan Township. The uraniferous quartz-pebble conglomerate is from 5 to 15 feet thick, composed of interbedded conglomerates and grits, and occurs within the Duncan volcanic sequence about 100 feet above the base. The Duncan volcanics underlie the north-central portion of the Garden River Indian Reserve and the adjoining west-central portion of Duncan Township.

Industrial Minerals:

Some marble production came from the Espanola Formation within the area marked "Marble Location" in the Garden River Indian Reserve, but work ceased when the product was unable to meet building specifications because of its numerous fractures.

Although there has been a little production from an apple-green
quartzite in Section 26 of Kehoe Township, the deposit worked was small and the markets apparently were not expanded. Numerous other localities of the fuchsite-bearing quartzite were seen along the northwest trending faults near the original deposit but no attempt has been made to exploit them.

During 1961, in conjunction with the quartzite quarrying, some jasper pebble conglomerate was quarried in Section 26 of Kehoe Township for the manufacture of terrazzo. Work apparently ceased because of local market conditions and the washout of the Echo River bridge, since replaced.

CONCLUSIONS AND RECOMMENDATIONS

Although many spectacular copper occurrences of the quartz vein type associated with Nipissing diabase have been discovered within the western North Shore area of Lake Huron, only those at Bruce Mines have produced copper ore. Prospecting of the basic volcanics of Duncan Township and the Garden River Indian Reserve may locate disseminated copper mineralization of significance. Copper mineralized, brecciated quartz-feldspar porphyry stocks similar to those being mines at the Tribag and explored in Aweres Township, may be found by exploring the Archean of the Reserve and adjacent townships.

A check of Hay's nickel occurrences in the eastern portion of the Reserve should be made in order to determine whether further work is warranted.
A further examination of the Boss Lake lead-zinc showings with regional geochemical, geophysical and geological work is warranted. Surveys carried out along the strike of the thrust fault may locate commercial quantities of lead-zinc mineralization.

Although some narrow veins of hematite in Ontario have provided local sources of high grade iron ore in the past, they are not presently exploited because of their small size and resulting high cost of mining. Such projects have been considered from time to time in the Sault Ste. Marie area because of the local steel mills but no serious program has been undertaken.

The Duncan volcanics of the north-central portion of the Garden River Indian Reserve should be prospected and geologically mapped to locate additional exposures of uraniferous quartz-pebble conglomerate within the volcanic sequence. Four diamond drill holes put down east and northwest of Echo Lake in Kehoe Township in 1969 were unsuccessful in testing for uranium ore situations similar to that found at Elliot Lake; however certain uranium exploration possibilities remain open in the Duncan Township, Garden River Reserve area.

The mining rights to several unique ornamental stones are held by the Garden River Indian Band. The failure to expand markets for these products and to produce on a sufficiently large scale has led to several temporary quarrying operations. An expanding Sault Ste. Marie and area could form the market base for a local building products plant in
conjunction with a widely based mineral aggregates business.
BIBLIOGRAPHY

ONTARIO DEPARTMENT OF MINES & NORTHERN AFFAIRS:

Publications:

1890. Royal Commission on Mineral Resources of Ontario

1899, Vol. 8. Pt. 2

1923 Report of the Ontario Iron Ore Committee

1926. Vol. 35 Pt. 2 ................................................. Appendix I

1928, Vol. 37, Pt. 3

1957. Metal Resources Circular No. 2. ......................... Appendix II

1958, Vol. 67, Pt. 2. .................................................. Appendix II


1968, Mineral Resources Circular No. 9. ........................ Appendix II

1968. Mineral Resources Circular No. 10. ...................... Appendix II

1968. Mineral Resources Circular No. 11. ...................... Appendix II


Geological Maps:

23-1. North Shore of Lake Huron

35A. Sault Ste. Marie Area

2108. Sault Ste. Marie-Elliot Lake Sheet ........................ In pocket

P-303. Sault Ste. Marie Sheet .................................... Appendix II
Claim Maps:

Johnson, Tarbutt & Tarbutt Additional
Anderson
Laird
Aberdeen & Aberdeen Additional
Meredith
Chesley & Chesley Additional
Kehoe
Tarvis
Duncan
MacDonald
Tarentorus
Garden River Indian Reserve

GEOLOGICAL SURVEY OF CANADA, DEPARTMENT OF ENERGY, MINES & RESOURCES:

Publications:

Memoir 143, North Shore of Lake Huron
Paper 68-40, Huronian Rocks & Uraniferous Conglomerates in the Canadian Shield

Geological Maps:

23-1959, Echo Lake
32-1962, Bruce Mines
33-1962, Lake George.................................................. Appendix II
1969, Bruce Mines....................................................... Appendix II
1181A, Sault Ste. Marie-Ile Parisienne................................ Appendix II

Geophysical Maps:
2199G, Lake George, 1"=1 Mi........................................ Appendix II
2200G, Sault Ste. Marie, 1"=1 Mi....................................... Appendix II
2213G, Echo Lake, 1"=1 Mi............................................. Appendix II
3239G, Bruce Mines, 1"=1 Mi........................................ Appendix II
7068G, Blind River, 1"=4 Mi........................................... Appendix II
7069G, Sault Ste. Marie, 1"=4 Mi..................................... Appendix II

WORK REPORTS BY TOWNSHIPS

Garden River Indian Reserve No. 14:
Indian Affairs File 1, Marble Location................................ Appendix I
SSM 1209 - Algoma Central Railway.................................... Appendix I

Indian Reserve 15D (Rankin Location):
SSM 1340 - J. Bell claims.............................................. Appendix I

MacDonald Township:
No data on file

* Files of the Resident Geologist, Ontario Department of Mines & Northern Affairs, Sault Ste. Marie
Dunbar Robertson & Associates Limited

Duncan Township:
SSM 1281-Rio Algom Mines Limited.......................... Appendix I
Indian Affairs File 2, Drill Hole Location Map.................. Appendix I
Ontario Department of Mines, Photocopy, Vol. 35, Pt. 2, 1926... Appendix I

Kehoe Township:
SSM 117-Denison Mines Limited............................... Appendix I
SSM 118-A. Dolan Property........................................ Appendix I
SSM 119-Sylvanite Gold Mines..................................... Appendix I
SSM 122-Pitch-Ore Uranium Mines Limited......................... Appendix I
SSM 1447-The British American Oil Company Limited............. Appendix I
C46*-Gulf Minerals Company....................................... Appendix I
Indian Affairs File 3............................................. Appendix I

Chesley Township:
SSM 6-Glendale Mines and Properties............................ Appendix I

Chesley Additional Township:
SSM 7-R. J. Sabourin............................................. Appendix I
SSM 1447-The British American Oil Company Limited........... Appendix I
SSM 1474-Canadian Johns-Manville Co. Limited.................. Appendix I
SSM 468-Conwest Exploration Co. Limited........................ Appendix I

*Confidential files
Meredith Township:
No Data on file

Aberdeen Additional Township:
SSM 1474- Canadian Johns Manville Co. Limited
SSM 1563- Albert Allison
SSM 657- New Senator-Rouyn Ltd.
SSM 468- Conwest Exploration Co. Limited
SSM 1405- Radex Syndicate

Anderson Township:
SSM 6- Glendale Mines and Properties
SSM 44- Glendale Mines & Properties, Taylor Property
SSM 45- Hugo Schwartz

Laird Township:
SSM 729- Quartzite Quarry

Johnson, Tarbutt and Tarbutt Additional Townships:
SSM 1- Aberdoon Mines Limited
SSM 5- Tarbutt Mines Limited
SSM 2- Dr. L. R. Hill and J. Greston
SSM 3- Kennco Explorations (Can.) Limited
SSM 21- Desbarats Min. Co. Limited
SSM 1239- A. Ervin
Jarvis and Aweres Townships:

SSM 910-Jardun Mines Limited.......................... Appendix I
SSM 1558-H. K. Rundle................................. Appendix I

Note: for more geological information see:
Map 9108
Sault Ste. Marie - Elliot Lake Sheet
Geological Compilation Series
Ministry of Natural Resources
Ontario Geological Survey
Errata - Rest From Intl Affairs
Sept. 1972

# 14.

Walter Tom 3 understand with had remitted.

P11  fuchsite = fuchsite
there is considerable doubt as to whether or
green color is due to fuchsite.

I believe what was green had
remitted but may have been disrupted by
the great flood of 1970.