Ontario Geological Survey

Northern Ontario
Engineering Geology Terrain Study 43

ROSLYN LAKE AREA

(NTS 42E/SW)
District of Thunder Bay

by

John F. Gartner

1979

Ontario

Ministry of Natural Resources

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THIS PROJECT WAS FUNDED BY
THE ONTARIO MINISTRY OF NORTHERN AFFAIRS
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*Map Unit, Public Service Centre, Room 6404, Whitney Block,
Queen's Park, Toronto,*
and the
Ontario Government Bookstore, 880 Bay Street, Toronto.

Orders for publications should be accompanied by cheque or money order
payable to the *Treasurer of Ontario.*

ISSN 0709-4671
ISBN 0-7743-4319-2

Gartner, John F.
1979: Roslyn Lake Area (NTS 42E/SW), District of Thunder Bay; Ontario Geological Survey, Northern Ontario Engineering Geology Terrain Study 43, 12p. Accompanied by Map 5079, scale 1:100 000.

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(accompanying report)

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1.0 INTRODUCTION:

This report contains an inventory of regional engineering terrain conditions in the Roslyn Lake area, District of Thunder Bay. The area, which covers NTS block 42E/SW, lies between Latitudes 49°00'N and 49°30'N and Longitudes 87°00'W and 88°00'W. It forms part of a series of publications which provide similar terrain data for some 370 000 km^2 of northern Ontario.

The purpose of the mapping is to provide a guide for engineering and resource planning functions at a level of detail consistent with a scale of 1:100 000. The terrain information is contained on the Data Base Map (OGS Map 5079, accompanying this report).

Interpretation of existing black and white aerial photographs, at scales of approximately 1:54 000, was the primary method of obtaining this

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terrain information. The interpretation was checked with existing published and unpublished literature which documented previous field visits and observations. During the summer of 1978, roads in the area were traversed and over 300 separate observation points recorded as further verification of the office studies. Thus, the map represents a reconnaissance overview of the engineering conditions of the terrain.

An engineering terrain legend was developed to facilitate the mapping and to provide a common information base for the entire map series. This legend is shown on the accompanying Data Base Map. Further information on the mapping techniques, legend format, and possible uses of this information is available in the "Ontario Engineering Geology Terrain Study Users' Manual" (Gartner, Mollard, and Roed, in preparation), a companion publication to this series of maps and reports.

2.0 GEOLOGICAL SETTING:

2.1 BEDROCK:

The map area is underlain by extremely rugged, well-exposed bedrock of Precambrian age, consisting of felsic igneous rocks, mainly granites, and a variety of migmatites. Metasediments, predominantly schists and gneisses, occur around Dickison Lake in the central part of the map-area and around Barbara Lake and Lake Jean in the northwest corner of the area. In the southeast corner of the area, numerous gold and some base metal occurrences are associated with a belt of intermediate to mafic metavolcanics, metasediments, and mafic to ultramafic igneous rocks (Carter *et al.* 1973). Keweenawan diabase sheets surround Georgia Lake in the northwest corner of the area, producing cuesta-like landforms of rugged relief.

The area is dissected by a number of distinctive, intersecting northeast- and northwest-trending faults. The most prominent of these is the Gravel River-Kamuck River fault, which crosses the central portion of the area. It has formed a steep-walled trench some 60 m wide, with sheer valley walls up to 150 m in height (Carter 1975).

The metasediments in the northwest corner of the map-area have medium potential, particularly for the occurrence of lithium-cesium-beryllium mineralization. Potential of the metavolcanic-metasediment belt in the southeast corner of the area is medium, particularly for gold, copper, and molybdenum. The remainder of the area has least to unknown mineral potential (Springer 1978).

2.2 QUATERNARY:

Glacial ice advanced from the northeast and deposited a very thin, discontinuous veneer of till over the bedrock. This overburden is somewhat thicker along the northern boundary of the map-area than elsewhere. Here, the drift represents the southern edge of a thick till deposit which extends northward into the Jellicoe map-area (Gartner 1979). As the glacial front retreated to the northeast, many of the fault-controlled valleys were filled with meltwater. Deposits of glaciofluvial sand and gravel can be found in many of these valleys, and in other lowland areas. A large esker-outwash complex lies east and north of Wintering Lake.

Zoltai (1967) described a temporary ponding of glacial meltwaters south of Wintering Lake; the present field work confirmed the presence of silt and very fine sand in this area. Carter (1975) attributed a deposit of fine whitish sand on the south shore of McKnight Lake to a glaciolacustrine origin.

3.0 ENGINEERING TERRAIN UNITS:

3.1 BEDROCK:

3.1.1 Description:

Rock knob (RN) terrain dominates the map-area. Fault-scarp valleys and abundant bedrock hills produce a rugged and complex landscape, with relief ranging from 30 to more than 210 m. Slopes are steep and varied, and many of the fault-controlled valleys have high sheer cliffs.

Drift cover in the bedrock areas is thin (less than 1 m) and bare bedrock is common. The overburden becomes thicker on the flanks of some bedrock hills, and boulders are scattered over much of the ground surface.

Typical symbols depicting this terrain unit are:

$$\frac{\text{RN(tMG/R)}}{\text{Hj-M}} \qquad \frac{\text{RN(tMG/R)}}{\text{Mnj-M}}$$

3.1.2 Significance:

RESOURCES: Portions of the rock can be used for crushed stone purposes, but detailed evaluations of suitability for aggregate use would be required. Ground water resources within the rock will be limited to fractures, faults, and fissures. The occurrence of aquifers is unpredictable and the terrain has only fair potential for ground water supplies.

GENERAL CONSTRUCTION: The major constraint in terms of construction is the presence of massive, irregular, and complex bedrock outcrops, and of large boulders on the ground surface. This means that, in most instances, below-ground excavations will require blasting. Site grading will be expensive and rock fills will be necessary in grading works. Foundation conditions should be excellent on the bedrock, but route alignments will require rock cut-and-fill operations.

Because of the shallow drift cover and complex bedrock slopes, development activities will be more difficult, and hence more expensive, than in areas of thicker overburden. Construction will be extremely difficult in those areas of high, sheer rock cliffs and steep bedrock hills. Also, management of the land for any development would be complex. The variable and steep rock slopes, combined with the shallow overburden, will make the terrain sensitive to surface erosion, especially when cleared of vegetation.

WASTE DISPOSAL: The bedrock terrain is not amenable, in its natural state, to the disposal of waste, whether it be garbage, septic tank effluent, or industrial liquid waste. Development of lagoons or tile fields would require extensive grading of rock materials and importation of soil fill. Fractures in the bedrock could act as conduits for migration of effluents, and impact on surface drainage courses could be significant.

3.2 MORAINAL LANDFORMS:

3.2.1 Description:

Ground moraine (MG) occurs either as a subordinate unit in conjunction with the bedrock, or as the dominant unit where the till cover is thicker. The latter condition is found along the northern boundary of the map-area.

Where the ground moraine till is dominant, it appears to range in thickness from about 1 to 3 m. The moraine materials are cobbly, stony, and bouldery silt and sand tills. Zoltai (1967) reported that two samples from the map-area contained 42 to 65 percent sand, 40 to 55 percent silt, and 3 to 5 percent clay. $CaCO_3$ varied from 0 to 12 percent.

In these morainal areas, bedrock controls the relief and the terrain is moderately undulating. Rock knobs are common, and areas of flat-lying bedrock were noted during the ground reconnaissance.

Examples of terrain unit symbols are:

$$\frac{\text{tMG/RN}}{\text{Lu-M}} \qquad \frac{\text{tMG/R(RN,pOT)}}{\text{Lu-M}} \qquad \frac{\text{tMG/R(RN)}}{\text{Mu-M}}$$

3.2.2 Significance:

RESOURCES: Sand and gravel resources are scarce within these terrain units, and at best, only small pockets of suitable materials can be expected.

Ground water resources are not expected to be significant. The till is generally too shallow to provide good aquifer conditions, and any water will likely be obtained from fractures in the bedrock.

GENERAL CONSTRUCTION: Because the glacial till is bouldery and often forms only a thin veneer over bedrock, there will be a number of construction problems associated with rock excavation and grading. Thus, excavations, except for very shallow ones, will likely intersect bedrock and zones of very bouldery soils. The till has a significant silt content, and re-use of the materials might entail local problems with handling and compaction, especially during wet weather conditions. Foundation conditions should be adequate for normal structures.

WASTE DISPOSAL: The bouldery nature of the till cover and the existence of bedrock close to surface place constraints on the siting of waste disposal facilities. Septic systems are probably feasible, but site-specific investigations would be required. The till is generally not deep enough to provide a good environment for solid or liquid waste disposal.

3.3 GLACIOFLUVIAL LANDFORMS:

3.3.1 Description:

Eskers (GE), *kames* (GK) and *outwash* (GO) form complex terrain units in the vicinity of Wintering Lake. Esker ridges trend in a southwesterly direction and are composed of gravelly sand and sandy gravel. These ridges are flanked by flat and kettled, sandy textured outwash plains. Knobby kame hills containing more bouldery soils are interspersed with bedrock knobs to complete the association of landform types found in these terrain units.

These units are not widespread within the map area, occurring mainly in the northeast quadrant. Small, isolated esker ridges do occur at a few random localities in other parts of the area. Symbols depicting these terrain units are:

$$\frac{\text{sgGE(RN,sgGK)}}{\text{Mrk-D}} \qquad \frac{\text{gGE,gsGK(RN)}}{\text{Mnr-D}}$$

$$\frac{\text{sgGK,sgGE,sgGO(RN)}}{\text{Lnrk-M}} \qquad \frac{\text{sgGK,sgGE/R(RN)}}{\text{Lun-M}}$$

Outwash (GO) covers some of the narrow valleys in the central and southern parts of the map-area. Here, the terrain has low relief, and terraces and kettles are evident. The material is gravelly sand to sandy gravel, as is the case at the southern end of Long Lake, and on the Gravel and the Jackpine Rivers near the southern boundary of the map-area. Typical terrain unit symbols are:

$\frac{\text{sgGO}}{\text{Lpkt-D}}$ $\frac{\text{gsGO}}{\text{Lt-D}}$ $\frac{\text{sgGO(RN)}}{\text{Lu-D}}$

An outwash deposit, extending from Upper Roslyn Lake to the south shore of Wintering Lake, contains appreciable amounts of fine sand and silt. These finer materials may represent glaciolacustrine sediments from a temporary glacial lake which occupied this area (Zoltai 1967). This deposit has been mapped as:

$\frac{\text{smGO(pOT,RN)}}{\text{Lu-W}}$ $\frac{\text{smGO,smGK(RN)}}{\text{Mn-M}}$

Outwash also occurs as a veneer overlying ground moraine in association with bedrock. Within this unit, meltwaters have modified the till surface, leaving various thicknesses of sand over the till. Boulders are often predominant, and bedrock outcrops are common. Typical terrain unit symbols are:

$\frac{\text{sGO/tMG}}{\text{Lu-M}}$ $\frac{\text{sGO/RN(RN)}}{\text{Lu-M}}$ $\frac{\text{sGO/tbMG(mAP,pOT,RN)}}{\text{Lup-Mh}}$

3.3.2 Significance:

RESOURCES: Potential sand and gravel deposits of commercial size and quality occur within the esker-kame complex east of Wintering Lake. Other similar, but smaller deposits occur about 8 km to the east and west of this major resource. Potential sources of sand and gravel are also found in the outwash deposits at the south end of Long Lake, and on the Gravel and Jackpine Rivers near the southern boundary of the map-area.

The flat outwash deposits, where they are continuous and deep, have some potential for ground water supply, but there does not seem to be any potential for the discovery of large aquifers.

GENERAL CONSTRUCTION: The following general comments describe the construction suitability of the glaciofluvial landforms:

1) Excavations will encounter few problems, except in areas with high water tables (e.g. near McKnight Lake), in areas where there are numerous boulders, and in areas of thin overburden.
2) Material will handle well and compaction should be satisfactory.
3) Bearing capacities for normal structures should be adequate, but site-specific investigations are necessary.
4) Earth grading conditions for general purposes should be good.

WASTE DISPOSAL: Because of the permeable nature of the materials and the possibility of connection between ground waters and surface waters, the disposal of liquid and solid wastes within these landforms must be approached with considerable caution. Septic systems, if properly designed, should cause few concerns. However, landfills and lagoons would require detailed hydrogeological investigations.

3.4 ORGANIC LANDFORMS:

3.4.1 Description:

Organic terrain (OT) is not particularly widespread within the map-area. Small pockets are associated with the rock terrain, but these are of little significance. Larger deposits are associated with the thicker overburden along the northern boundary of the area.

In many cases, the organic peat forms a veneer of varying thickness over outwash sand and/or ground moraine till. Water tables are at or above surface and the organic materials are soft and compressible. Typical terrain unit symbols are:

$$\frac{\text{pOT}}{\text{Lp-w}} \qquad \frac{\text{pOT/sGO/tMG(RN)}}{\text{Lu-w}} \qquad \frac{\text{pOT/sGO(RN)}}{\text{Lp-w}}$$

3.4.2 Significance:

The organic landforms within this map-area should be avoided by human activities. They do not constitute a resource, other than as a habitat for wildlife or as a mechanism for surface flow augmentation. Because the swamps are not extensive and the peat is suspected to form only a thin, variable layer over mineral soil, the organic terrain is of little economic significance.

Construction in the swamps would have to contend with soft ground conditions, high water tables, and poor access. They are poor locations for waste disposal sites.

4.0 SUMMARY OF ENGINEERING SIGNIFICANCE:

The preceeding section described the characteristics of the major landform types and the engineering and resource significance of these units. Table 1 is a summary of the general engineering significance of the more common terrain units found in the area. This table is intended only as a guide to help the reader in assessing the overall significance of the map-units. Site-specific work is necessary to better define actual ground conditions. Also, it must be realized that there are a number of conditions, such as drainage and slope, which are not considered in the table but which may affect the engineering significance of the various terrain units.

TABLE 1 SUMMARY OF ENGINEERING SIGNIFICANCE.

		BEDROCK	MORAINAL		GLACIOFLUVIAL			ORGANIC
		RN(tMG/R) Hj-M	tMG/R(RN) Mu-M	sgGE sgGK	smGO Lu-w	sgGO Lu-D	sGO/tMG Lu-M	pOT Lp-W
RESOURCE POTENTIAL	Sand & Gravel	Poor	Poor	Excellent	Poor	Excellent	Fair	N/A
	Ground Water	Poor	Poor	Fair	Good	Good	Fair	Poor
LIGHT CONSTRUCTION CONDITIONS	Excavation	Blasting	Fair	Good	Fair	Good	Fair	Poor
	Foundation	Excellent	Excellent	Good	Fair	Good	Good	Very Poor
	Grading	Difficult	Fair	Good	Fair	Good	Fair	Very Poor
	Material Re-Use	Rock Fill	Good	Excellent	Fair	Excellent	Good	Very Poor
WASTE DISPOSAL SUITABILITY	Septic	Very Poor	Fair	Fair	Fair	Good	Good	Very Poor
	Landfill	Poor	Fair	Fair	Poor	Fair	Fair	Very Poor
	Lagoons	Very Poor	Fair	Fair	Poor	Fair	Fair	Very Poor

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$$\frac{\text{smGO(pOT,RN)}}{\text{Lu-W}} \qquad \frac{\text{smGO,smGK(RN)}}{\text{Mn-M}}$$

Outwash also occurs as a veneer overlying ground moraine in association with bedrock. Within this unit, meltwaters have modified the till surface, leaving various thicknesses of sand over the till. Boulders are often predominant, and bedrock outcrops are common. Typical terrain unit symbols are:

$$\frac{\text{sGO/tMG}}{\text{Lu-M}} \qquad \frac{\text{sGO/RN(RN)}}{\text{Lu-M}} \qquad \frac{\text{sGO/tbMG(mAP,pOT,RN)}}{\text{Lup-Mh}}$$

3.3.2 Significance:

RESOURCES: Potential sand and gravel deposits of commercial size and quality occur within the esker-kame complex east of Wintering Lake. Other similar, but smaller deposits occur about 8 km to the east and west of this major resource. Potential sources of sand and gravel are also found in the outwash deposits at the south end of Long Lake, and on the Gravel and Jackpine Rivers near the southern boundary of the map-area.

The flat outwash deposits, where they are continuous and deep, have some potential for ground water supply, but there does not seem to be any potential for the discovery of large aquifers.

GENERAL CONSTRUCTION: The following general comments describe the construction suitability of the glaciofluvial landforms:

1) Excavations will encounter few problems, except in areas with high water tables (e.g. near McKnight Lake), in areas where there are numerous boulders, and in areas of thin overburden.
2) Material will handle well and compaction should be satisfactory.
3) Bearing capacities for normal structures should be adequate, but site-specific investigations are necessary.
4) Earth grading conditions for general purposes should be good.

WASTE DISPOSAL: Because of the permeable nature of the materials and the possibility of connection between ground waters and surface waters, the disposal of liquid and solid wastes within these landforms must be approached with considerable caution. Septic systems, if properly designed, should cause few concerns. However, landfills and lagoons would require detailed hydrogeological investigations.

3.4 ORGANIC LANDFORMS:

3.4.1 Description:

Organic terrain (OT) is not particularly widespread within the map-area. Small pockets are associated with the rock terrain, but these are of little significance. Larger deposits are associated with the thicker overburden along the northern boundary of the area.

In many cases, the organic peat forms a veneer of varying thickness over outwash sand and/or ground moraine till. Water tables are at or above surface and the organic materials are soft and compressible. Typical terrain unit symbols are:

$$\frac{\text{pOT}}{\text{Lp-w}} \qquad \frac{\text{pOT/sGO/tMG(RN)}}{\text{Lu-w}} \qquad \frac{\text{pOT/sGO(RN)}}{\text{Lp-w}}$$

3.4.2 Significance:

The organic landforms within this map-area should be avoided by human activities. They do not constitute a resource, other than as a habitat for wildlife or as a mechanism for surface flow augmentation. Because the swamps are not extensive and the peat is suspected to form only a thin, variable layer over mineral soil, the organic terrain is of little economic significance.

Construction in the swamps would have to contend with soft ground conditions, high water tables, and poor access. They are poor locations for waste disposal sites.

4.0 SUMMARY OF ENGINEERING SIGNIFICANCE:

The preceeding section described the characteristics of the major landform types and the engineering and resource significance of these units. Table 1 is a summary of the general engineering significance of the more common terrain units found in the area. This table is intended only as a guide to help the reader in assessing the overall significance of the map-units. Site-specific work is necessary to better define actual ground conditions. Also, it must be realized that there are a number of conditions, such as drainage and slope, which are not considered in the table but which may affect the engineering significance of the various terrain units.

TABLE 1 SUMMARY OF ENGINEERING SIGNIFICANCE.

		BEDROCK	MORAINAL		GLACIOFLUVIAL			ORGANIC
		RN(tMG/R) Hj-M	tMG/R(RN) Mu-M	sgGE sgGK	smGO Lu-w	sgGO Lu-D	sGO/tMG Lu-M	pOT Lp-W
RESOURCE POTENTIAL	Sand & Gravel	Poor	Poor	Excellent	Poor	Excellent	Fair	N/A
	Ground Water	Poor	Poor	Fair	Good	Good	Fair	Poor
LIGHT CONSTRUCTION CONDITIONS	Excavation	Blasting	Fair	Good	Fair	Good	Fair	Poor
	Foundation	Excellent	Excellent	Good	Fair	Good	Good	Very Poor
	Grading	Difficult	Fair	Good	Fair	Good	Fair	Very Poor
	Material Re-Use	Rock Fill	Good	Excellent	Fair	Excellent	Good	Very Poor
WASTE DISPOSAL SUITABILITY	Septic	Very Poor	Fair	Fair	Fair	Good	Good	Very Poor
	Landfill	Poor	Fair	Fair	Poor	Fair	Fair	Very Poor
	Lagoons	Very Poor	Fair	Fair	Poor	Fair	Fair	Very Poor

5.0 REFERENCES:

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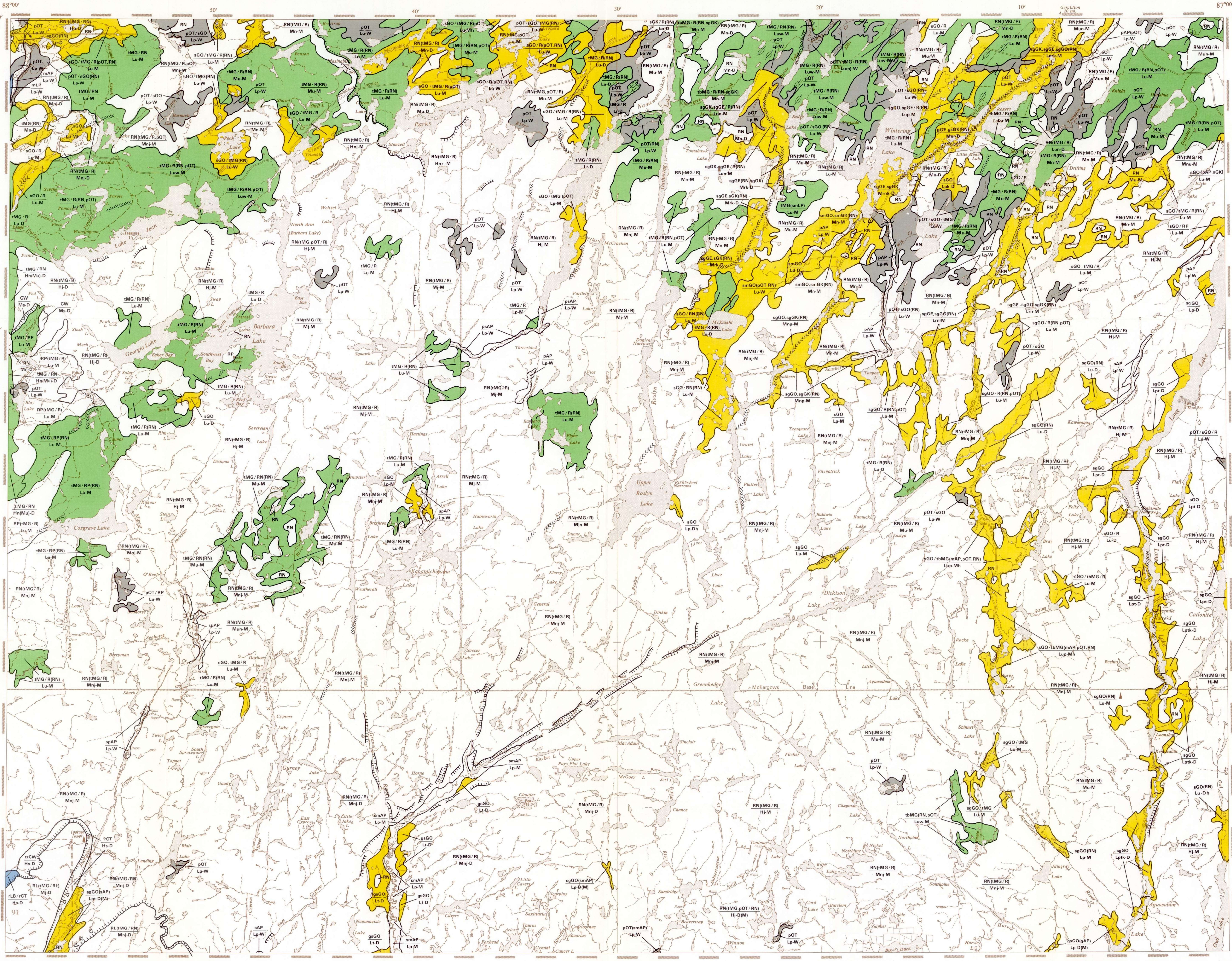


Published 1980. Base Map derived from 1 inch to 2 miles Provincial Series, Surveys and Mapping Branch, Ministry of Natural Resources.

Engineering Geology Terrain Evaluation By J. F. Gartner, GARTNER LEE ASSOCIATES LIMITED, TORONTO, ONT. 1978.

THIS PROJECT WAS FUNDED BY THE ONTARIO MINISTRY OF NORTHERN AFFAIRS

Ontario

Ministry of Natural Resources

Hon. James A. C. Auld
Minister

Dr. J. K. Reynolds
Deputy Minister

Ontario Geological Survey

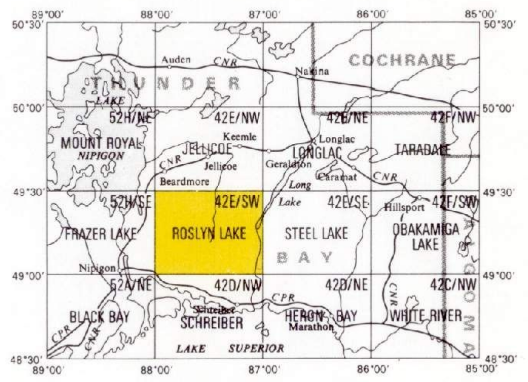
Map 5079

ROSLYN LAKE

NTS 42 E/SW

Data Base Map

Northern Ontario Engineering Geology Terrain Study



INDEX TO ADJOINING SHEETS

1:100 000

2 1 0 2 4 6

One centimetre represents one kilometre

LEGEND

LANDFORM

MORAINAL

- **ME** *End moraine*
- **MG** *Ground moraine*
- **MH** *Hummocky moraine*

GLACIOFLUVIAL

- **GD** *Ice contact delta, esker delta, kame delta, delta moraine*
- **GE** *Esker, esker complex, crevasse filling*
- **GK** *Kame, kame field, kame terrace, kame moraine*
- **GO** *Outwash plain, valley train*

GLACIOLACUSTRINE

- **LB** *Raised (abandoned) beach form*
- **LD** *Glaciolacustrine delta*
- **LP** *Glaciolacustrine plain*

ALLUVIAL

- **AP** *Alluvial plain*

COLLUVIAL

- **CS** *Slope failure*
- **CT** *Talus pile*
- **CW** *Slopewash and debris creep sheet; minor talus*

EOLIAN

- **ED** *Sand dunes*

ORGANIC

- **OT** *Organic terrain*

BEDROCK

- **RL** *Bedrock plateau*
- **RN** *Bedrock knob*
- **RP** *Bedrock plain*
- **RR** *Bedrock ridge*
- **/R** *Bedrock below a drift veneer*

MATERIAL

- **b** *boulders, bouldery*
- **c** *clay, clayey*
- **g** *gravel, gravelly*
- **p** *peat, muck*
- **r** *rubble*
- **s** *sand, sandy*
- **m** *silt, silty*
- **t** *till*

TOPOGRAPHY

LOCAL RELIEF

- **H** *Mainly high local relief*
- **M** *Mainly moderate local relief*
- **L** *Mainly low local relief*

VARIETY

- **c** *channelled*
- **d** *dissected, gullied*
- **j** *jagged, rugged, cliffed*
- **j*** *cliffed volcanic rock signature*
- **k** *kettled, pitted*
- **n** *knobby, hummocky*
- **p** *plain*
- **r** *ridged*
- **s** *sloping*
- **t** *terraced*
- **u** *undulating to rolling*
- **w** *washed, reworked*

DRAINAGE

SURFACE CONDITION

- **W** *Wet*
- **D** *Dry*
- **M** *Mixed wet and dry*
- **h** *Suspected high water table*

The letter codes describing the terrain units are made up of four components arranged as follows:–

MATERIAL	**LANDFORM**
TOPOGRAPHY	**DRAINAGE**

Examples:

1. **tMG(RN)** / **Mu(Hj)-D** — material; dominant landform; subordinate landform; drainage; relief of subordinate landform; local relief; topographic variety of dominant landform

2. **pOT/sGO** / **Lp-W** — slash indicates a veneer of one landform overlying a second landform

SYMBOLS

- *Significant end moraine or linear moraine-like feature*
- *Well expressed drumlins and drumlinoid ridges*
- *All other linear ice-flow features*
- *Esker ridge (continuous, discontinuous; the symbol does not indicate direction of flow)*
- *Abandoned shoreline (continuous, discontinuous)*
- *Local dune area (type and location of individual dunes not indicated)*
- *Abandoned river channel, spillway, or ice marginal channels*
- *Escarpment*
- ●10 *Sample location*
- *Small landslide scar*
- *Sand or gravel pit*
- *Quarry or mine workings evident from airphotos or field observation (crossed picks are shown in the area of open excavation)*
- *Other man-made features (rock dumps, tailings, lagoons, landfills, etc.: type of feature mentioned where identifiable)*
- *Steep-walled valleys, often bedrock-controlled features*
- *Talus (defined, inferred; base of talus triangle indicates downslope side of escarpment)*
- *Line joining the same terrain units*

NOTE 1:

This map is intended to be an inventory of regional engineering terrain conditions, as determined largely by airphoto interpretation. Its purpose is to provide a guide for engineering and resource planning functions. The boundaries of the terrain units shown on the map are approximate only, consistent with a 1:100 000 scale. Site specific investigations are required in order to obtain detailed information for a particular area. The map user should refer to the accompanying report for a fuller description of terrain in the study area.

NOTE 2:

Colour is used to enhance what is considered to be the dominant engineering condition in simple, complex or layered terrain units.

NOTE 3:

Not all letter and graphic symbols shown in the legend necessarily appear on this map sheet.

Information from this publication may be quoted if appropriate credit is given. Reference to this map is recommended as follows:

Gartner J. F.
1980: Northern Ontario Engineering Geology Terrain Study, Data Base Map, Roslyn Lake
Ontario Geological Survey, Map 5079, Scale 1:100 000