



GRANULAR RESOURCE INVENTORY - MACKENZIE

AKLAVIK NTS 107B E/2

(1:125,000)

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SUMMARY

The Aklavik map area has large supplies of granular material which are suitable for construction purposes. Unfortunately the areal distribution of the deposits is not uniform. Almost all of the prime sources are concentrated in the northern third of the area where glaciofluvial and unconsolidated Tertiary sands and gravels are the major granular units. In the Inuvik area, the central and south central portions of the map sheet have only a few small unconsolidated deposits. In the south east corner of the map sheet the situation is more favourable because coarse glaciofluvial material is available.

The problem at present is finding sufficient material for future use in the Inuvik area. This can, in part, be solved by using crushed carbonates which are exposed extensively west of Campbell Lake and south of Inuvik in the vicinity of Dolomite Lake.

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I Introduction

This report attempts to assess the quantity of granular material available for construction use. Both unconsolidated and bedrock sources are considered. Glaciofluvial and fluvial materials are considered as first rate sources of sand and gravel. Lacustrine and marine deposits are of variable quality for construction use while eolian material is of limited use because it consists only of sand. Generally moraines have only been considered where they are known to be hummocky, and contain some coarse granular material. End moraines are usually considered to be sources of granular material while ground moraine is not.

Bedrock has only been considered if it is strong and resistant i.e. limestones, dolomites, sandstones and most rocks of Precambrian age. Other rock types i.e. shales have not been considered in this report even though they could be used for fill material for road and other construction uses.

The information which appears in this report and on the accompanying map has been compiled largely from published and unpublished manuscripts and personal communication with officers of the Geological Survey of Canada. Supplementary data, mainly on depths, thicknesses and, in some cases, on texture of deposits has been obtained from confidential reports of other government departments and industry. See appendix for details on information sources.

The basic document used in this compilation is a surficial geology map at a scale of 1:125,000 (Rampton, 1972). It is indexed as GSC open file () and may be viewed at Geological Survey of Canada offices in Ottawa, Calgary and Vancouver; ozalid copies may be obtained at nominal cost. All areal data are derived from this source; all major and most minor unconsolidated deposits of granular material are represented at this scale.

A derivative map for granular material has been produced from the basic

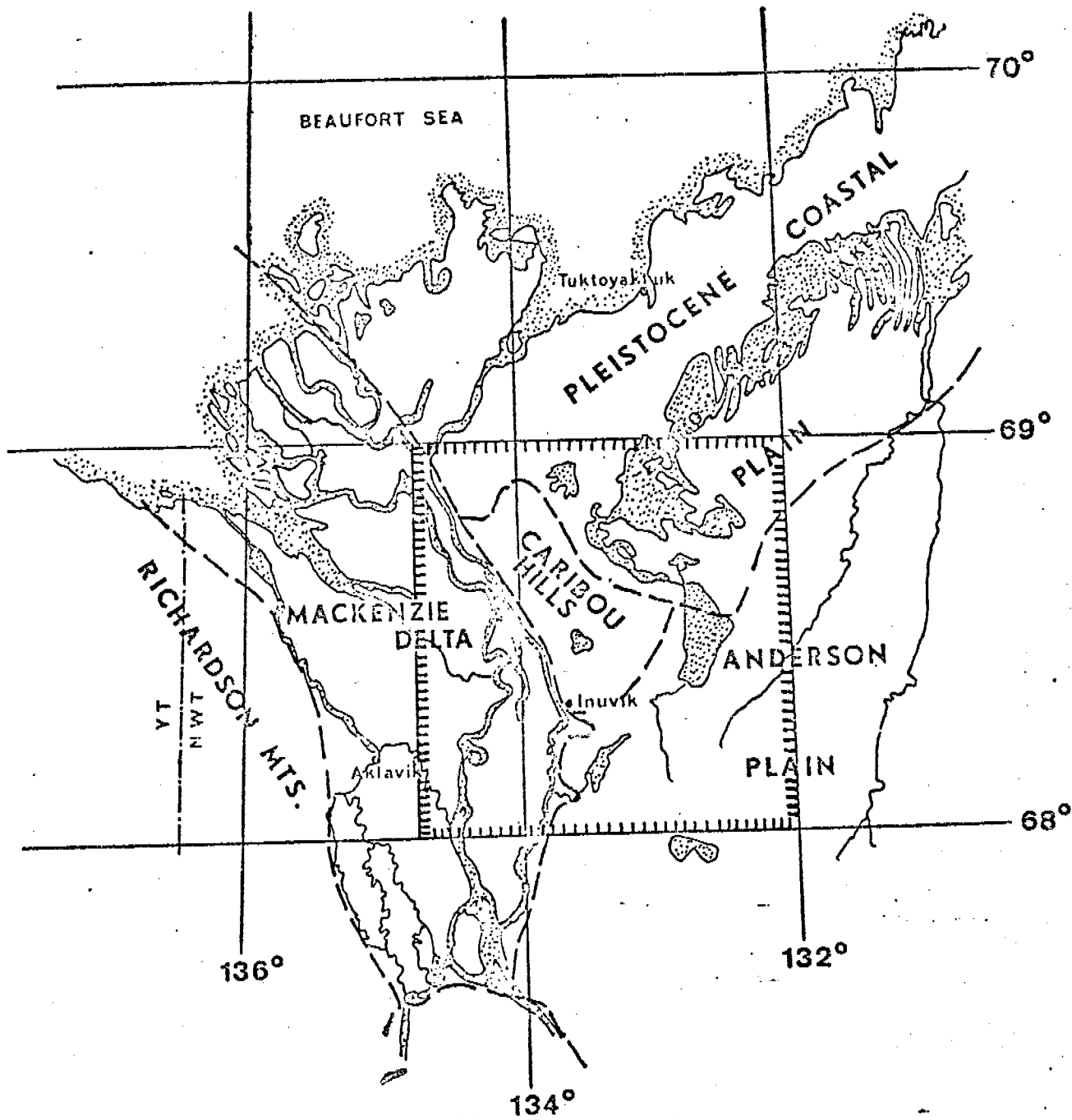
surficial geology map in close association with the field geologist. His field observations provide additional data on thickness, texture, ice content, drainage, and the variability of the map units.

To supplement thickness and textural data, additional information was gathered from seismic shot hole records and samples, and from other drill hole logs.

Areal extent of deposits were estimated by using planimetered areas from the map. Average thickness for each deposit was estimated from the data mentioned above and adjusted according to several other variables such as drainage, height above water table, amount of ground ice etc. From this a volume of granular material was estimated. All estimated volumes of material appear in a tabular summary in Section IV.

In addition to the estimates of unconsolidated granular material, a derivative bedrock geology map appears on an overlay sheet. This is intended to indicate where suitable bedrock could be extracted.

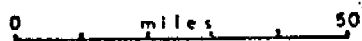
For purposes of description, areas of granular material are outlined on a transparent overlay and are numbered to correspond to a tabular summary of materials. Those areas containing either potential granular material or which require more detailed work are discussed in the body of this report.



AKLAVIK

PHYSIOGRAPHIC

REGIONS



Scale

after Fyles 1971

II General Geology and Physiography

The east half of the Aklavik map sheet is divided into four Physiographic Regions: (figure 1) Mackenzie Delta in the west and southwest; Caribou Hills in the northwest; Pleistocene Coastal Plain in the northeast; and the Anderson Plain in the southeast; (Fyles, 1971).

Bedrock predominantly carbonates, sandstones, shales and unconsolidated sand and gravel ranging in age from Precambrian to Tertiary is exposed or near the surface immediately east of the Mackenzie Delta and east of Sitidgi Lake (Norris, 1971). Granular materials are relatively abundant in the north part of the area and small quantities of sand and gravel also occur in the south east (Rampton, 1971). Bedrock is covered by dominantly silty morainal deposits of till of varying thickness and composition. Glaciofluvial deposits cover parts of the glacial moraine: outwash plains in the northern portion of the map and eskers to the east and south of Sitidgi Lake. Deposits of the Mackenzie Delta are predominantly silts of recent origin except where coherent bedrock is exposed south west of Inuvik. To the east of the delta recent fluvial sands and gravels are exposed in some river beds.

A Unconsolidated Deposits

(i) Glaciofluvial deposits (red)

Three types of glaciofluvial deposits are shown on the map: outwash plains, eskers and gravel mounds.

Outwash sand and gravel deposited in the form of a plain occurs in abundance in the northern portion of the map. The elevation of the outwash plain is generally less than 250 feet (Mackay, 1963).

Sand and gravel deposits in the form of sinuous ridged eskers occur sporadically between Sitidgi and Campbell Lakes. The eskers have a local relief of approximately 20 feet.

Gravel mounds, the third type of glaciofluvial deposit may be discontinuous eskers or kames (Rampton personal communication 1972).

The sands and gravels of the outwash plain have a thickness between 30' and 50'. The eskers and gravel mounds average 20' in height. All the glaciofluvial deposits have approximately 80% potential granular material.

(ii) Lacustrine Deposits - sand and gravel L^G (blue)

Lacustrine silts, sands and gravels were deposited where the meltwaters from the glaciers formed a lake. Only those areas which have an abundance of sand (s) and gravel (g) and thus of interest as a source of granular material are considered in this report. Development of thermokarst topography is prevalent in these areas. Local relief is usually less than 50'.

From the sand and gravel deposits of lacustrine origin, 80% of the material is usable and has an average thickness of 20'.

(iii) Fluvial Deposits - sand and gravel F^A (green)

As in other areas of the Mackenzie Delta the fluvial deposits of the Mackenzie River flood plain are composed almost entirely of silt and therefore are of little use as granular materials. To the east of the delta, however, some fluvial deposits have formed from faster flowing rivers and contain sand and gravel.

In the Aklavik map area fluvial sand and gravel deposits average 20' in depth. Of the material present, 80% may be used as a granular material.

(iv) Morainal Deposits - M (yellow)

Only those morainal deposits which contain some coarse materials are considered in this study. These morainal deposits may have a morphologic modifier for hummocky (h) and rolling (m) topography. These deposits have an

elevation of 200-300' (Mackay, 1963). Thermokarst activity has aided in producing this appearance.

The morainal deposits average 30' in depth and of the total volume only between 1% and 3% is usable granular material.

B Bedrock Geology

Bedrock in the area comprises primarily sedimentary rocks which range in age from Precambrian to Tertiary. The strata are horizontal to gently inclined.

Undifferentiated Precambrian rocks consist of dolomites, shales and sandstones. The Ordovician-Silurian dolomites are coherent rocks and occur as massive, thick bedded outcrops. The shales of Devonian and Cretaceous periods are variable in their coherence; increasing as the amount of siltstone increases. Devonian and Cretaceous sandstones are relatively resistant to weathering but tend to be weakly cemented (Norris, personal communication 1972). Undifferentiated Tertiary rocks comprise unconsolidated sands and gravels, shales, and lignite (a soft coal). The northern half of the Caribou Hills is composed of these unconsolidated materials which tend to be of coarser texture than those in the southern portion of the hills (Fyles, 1965).

The best source of granular material from bedrock is the unconsolidated Tertiary sands and gravels. The carbonate bedrock south of Inuvik provides an alternative source of material as do the shales and sandstones which are of lesser quality.

III Materials

The principal sources of granular material are the glaciofluvial sands and gravels found in the northern part of the map area.

Material deposited near the melting ice front tends to be coarse while material easily transported by meltwater (fine and medium sands) were deposited farther north. This is particularly evident if the Mackenzie Delta (107 c) and Aklavik (107 B) areas are examined simultaneously. These deposits are fairly thick (30-50') where extensive whereas the deposits that occupy smaller areas tend to be thinner (12-15'). Associated with much of the coarse glaciofluvial material is fine and medium grained sand of the same origin. The fine material would probably be acceptable for some construction purposes or could be upgraded to specification with the coarse material close at hand. In close association with the glaciofluvial units and in most cases immediately to the south of them, are morainal deposits. These deposits consist of till which, locally, contain coarse granular material (these are identified by an asterisk (*) on the map). This type of deposit is particularly abundant north of Sitidgi Lake. In the southern and central portions of the map area few coarse glaciofluvial deposits occur. These are located between Sitidgi and Campbell Lakes and in the vicinity of Lost Reindeer Lakes.

Where bedrock is close to the ground surface, the overlying colluvium may provide suitable construction materials.

This unit however is not extensive and Inuvik, in part is built on it. This precludes its exploitation to a large extent. Granular material can be crushed from bedrock sources in this area; limestone and dolomite of Devonian and Ordovician age outcrop exclusively to the south of Inuvik, and between Campbell Lake and the Mackenzie delta.

In the northwestern part of the area granular materials are abundant.

In addition to glaciofluvial units which are excellent sources of material and smaller fluvial and lacustrine units there are thick deposits of Tertiary unconsolidated sand and gravel. This material outcrops along the western front of the Caribou Hills in an eroded scarp which ranges in height from 100' to 400'. Problems of transportation could be minimized in this area because material could be barged from the Caribou Hills to points along the river.

Granular materials occur in only limited quantities, much of south-central part of the map area, the area between Sitidgi, Noell and Campbell Lakes and the Inuvik area.

IV Tabular Summary

Description and Material	Area (sq. mi.)	Thickness (feet)	Estimated Volumes of granular material (yd ³ x 10 ⁶)	
			Total	Available
Area I CAMPBELL LAKE NORTH SHORE				
a) <u>gsGp</u> glaciofluvial (plain); sand and gravel; partly covered by silt; at Inuvik.	0.87	20'	44.75	35.8
b) carbonate bedrock; covered by a thin veneer of overburden.				
Area II SOUTH AND EAST OF CAMPBELL LAKE				
a) <u>sgFp</u> fluvial deposits (flood plain); silt and gravel.	4.48	10'	140.30	70.1
b) <u>gGr</u> glaciofluvial (ridge); gravel.	.43	30'	13.42	10.74
c) Esker, 2, gravel, sand and silt.	1.00	20'	0.03	0.03
d) <u>Gt</u> glaciofluvial (terrace); sand and gravel with some silt.	.59	30'	18.30	14.64
e) Esker: ½ mile, 1 kame.		20'	0.02	0.01
f) carbonate bedrock, small areal extent.				

Area III NORTH CARIBOU LAKE
AND LOST REINDEER
LAKES

a)	<u>Gk</u> glaciofluvial (hummocky); sand or gravel and local silt.	0.90	20'	65.50	52.40
b)	<u>Gp and Gh</u> glaciofluvial (plain and hummocky); sand and gravel.	3.50	35'	126.73	101.39
c)	<u>gGh</u> glaciofluvial (hummocky); gravel.	1.54	50'	79.33	63.46

Area IV SOUTH OF SITIDGI LAKE

a)	<u>sgFt</u> fluvial (terraces); sand and gravel.	1.75	30'	54.9	43.92
b)	esker deposits of sand and gravel are distributed along the limits of the unit.	2.50	20'	0.04	0.07
c)	11 kames or isolated hills of gravel and/or sand.	6.00	20'	0.20	0.16
d)	<u>Gt, Gp</u> glaciofluvial (terrace and plain); sand or gravel, locally silt.	1.62	20'	33.36	26.69
e)	<u>Gm</u> glaciofluvial (rolling); sand or gravel.	.98	20'	20.34	16.27
f)	<u>gGt</u> glaciofluvial (terrace); gravel.	.75	20'	15.46	12.37

Area V SOUTH AND EAST SHORE OF
SITIDGI LAKE

a) <u>sL</u>	0.46	20'	9.72	7.77
lacustrine; sand.				
b) <u>sgL^G</u>	0.34	20'	7.25	5.8
glaciolacustrine; sand and gravel.				
c) <u>gFt</u>	0.11	30'	3.60	2.88
fluvial (terrace); gravel.				
d) <u>e</u>				
eskers: 1 3/4 mile, 2 kames; sand and gravel.				

Area VI WILLIAMS LAKE

a) <u>gsGp</u>	0.43	50'	22.38	17.90
glaciofluvial (plain); gravel and sand.				
b) <u>gGp</u>	0.39	50'	20.34	16.27
glaciofluvial (plain); gravel.				

Area VII SOUTH-EAST OF
ESKIMO LAKES

a) <u>sgGk</u>	1.54	50'	79.33	63.47
glaciofluvial (hummocky thermokarst); sand and gravel.				
b) <u>gGp</u>	4.53	50'	233.93	187.15
glaciofluvial (plain); gravel.				
c) <u>sGp</u>				
glaciofluvial (plain); abundant sand.				

Area VIII BETWEEN SITIDGI LAKE
AND ESKIMO LAKES

a)	<u>gsGh(k) - sgGk</u> glaciofluvial (hummocky thermokarst plain); sand and gravel.	14.52	30'	453.8	363.04
b)	<u>gsGp</u> glaciofluvial (plain); gravel and sand.	2.56	30'	132.23	105.78
c)	<u>gGh</u> glaciofluvial (hummocky); gravel.	1.54	30'	79.33	63.47
d)	35 kames or isolated hills of gravel and sand in one area; 4 kames in smaller area.				
e)	<u>sgGm</u> glaciofluvial (rolling); sand and gravel.	0.93	30'	29.20	23.36
f)	<u>gL^G</u> glaciolacustrine; gravel.				

Area IX BETWEEN OLD MAN LAKE
AND FIVE HUNDRED LAKE

a)	<u>gGp</u> glaciofluvial (plain); gravel.	2.01	50'	103.75	82.99
b)	<u>sgGpk</u> glaciofluvial (hummocky thermokarst); sand and gravel.	12.73	50'	657.06	525.65
c)	<u>sgL^G</u> glaciolacustrine; sand and gravel.	5.93	20'	123.47	98.76

Area X SOUTH OF BONNEVILLE POINT

a)	<u>gsGh</u>	5.22	30'	163.40	130.72
	glaciofluvial (hummocky); sand and gravel.				
b)	<u>sgGk</u>	7.80	30'	244.0	195.20
	glaciofluvial (hummocky due to thermokarst); sand and gravel.				
c)	<u>sgGp</u>	3.74	30'	115.95	92.76
	glaciofluvial (plain); sand and gravel.				
d)	<u>sgL^G</u>	0.78	20'	16.25	13.00
	glaciolacustrine; sand and gravel.				

Area XI BETWEEN PARSONS LAKE
AND ESKIMO LAKES

a)	<u>gsGk - sgGk</u>	11.36	50'	591.43	473.14
	glaciofluvial (hummocky); gravel and sand.				
b)	<u>gsFp</u>	2.41	30'	75.60	60.48
	fluvial (plain); gravel and sand.				
c)	<u>sgGk</u>	<u>4.68</u>	30'	146.4	117.12
	same as (a)				
d)	<u>gGk</u>	8.27	50'	427.19	341.75
	glaciofluvial (hummocky); gravel.				

Area XII WEST OF PARSONS LAKE

a)	<u>sGpk</u>	3.31	30'	170.88	136.70
	glaciofluvial (plain, hummocky due to thermo- karst); sand.				

b) GL 1.38 30' 71.20 56.96
 glaciofluvial (thermo-
 karst); sand, gravel
 and local silt.

Area XIII WOLVERINE LAKES -
 CARIBOU HILLS AREA

a) gGk 4.29 30' 88.69 70.95
 glaciofluvial (thermo-
 karst); gravel.

b) gGp and gGpk 7.21 20' 211.15 168.92
 glaciofluvial (hummocky
 thermokarst); gravel.

c) sgGk - Gk 41.76 20' 869.52 690.01
 glaciofluvial (hummocky
 thermokarst); sand and
 gravel.

d) gL 3.62 20' 75.52 60.41
 lacustrine (thermo-
 karst); gravel.

e) gFp 1.24 20' 30.00 31.2
 fluvial (plain);
 gravel.

f) sgGp 0.75 30' 15.46 12.37
 glaciofluvial (plain);
 sand and gravel.

g) unconsolidated Tertiary sands
 and gravels; Caribou Hill
 about 400' high.

Area XIV EAST OF REINDEER DEPOT

a) sgG 3.94 30' 122.06 97.64
 glaciofluvial (outwash);
 sand and gravel.

Area XV BETWEEN NOELL LAKE
AND ESKIMO LAKES

a) <u>gsGm</u>	6.11	50'	315.31	252.25
glaciofluvial rolling (outwash); sand and gravel.				
b) <u>gsGh</u>	3.74	30'	115.95	92.76
glaciofluvial (outwash, hummocky due to thermo- karst); gravel and sand.				
c) <u>sgGp and gsGp</u>	12.25	50'	632.65	506.12
glaciofluvial (outwash plain); sand and gravel.				
d) <u>gsFt and gFp</u>	1.67	20'	52.4	41.92
fluvial (terrace and plain); sand and gravel.				

Area XVI WEST OF NOELL LAKE

a) <u>G</u>	0.47	40'	14.65	11.72
glaciofluvial; undifferentiated sand or gravel.				
b) <u>gGp</u>	0.20	50'	6.10	4.88
glaciofluvial (outwash plain); gravel.				

V Sources of Information

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APPENDIX I, Part I

Unconsolidated Granular Materials

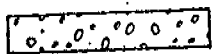
Each map sheet has a surficial geology legend (see appendix). This legend, differentiated by means of patterns, only indicates granular material classified by genetic characteristics. In some cases only part of a map unit has been patterned, indicating that only that portion is considered a suitable source for granular material.

Legend

GLACIOFLUVIAL



coarse grained granular material: cobbles, pebbles, gravel; may be mixed with some coarse sand

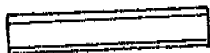


mixed or interbedded sand and gravel

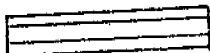


predominantly sand or sand with some fine material

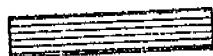
GLACIOLACUSTRINE



coarse grained granular material: cobbles, pebbles, gravel; may be mixed with some coarse sand.



mixed or interbedded sand and gravel



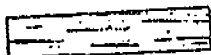
predominantly sand or sand with some fine material

FLUVIAL



only sand and gravel deposits are patterned

MORAINAL

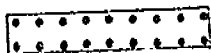


predominantly till; unsorted matrix of silt, clay, and sand imbedded with pebbles, cobbles and boulders

MARINE



coarse grained granular material: cobbles, pebbles, gravel; may be mixed with coarse sand



mixed or interbedded sand and gravel



predominantly sand or sand with some fine material

EOLIAN



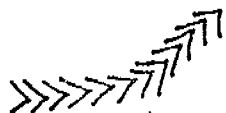
fine and medium sandy material

COLLUVIUM

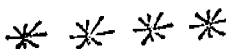


only the patterned area is coarse grained

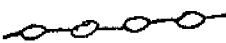
Symbols



eskers



gravel mounds



morainal ridge found within moraine

APPENDIX 1, Part 2

BEDROCK GEOLOGY
(black line overlay)

The rock units which appear on the accompanying overlay are an engineering geological grouping according to gross lithology and age.

These units were derived from a more detailed geological map (whose units were subdivided largely on the basis of airphoto and stratigraphic interpretation (Norris, 1972)). The units are identified by a two letter identification code. The first character is an upper case letter designating age which is followed by lower case letter mnemonic designating gross lithology eg. Dls - Devonian limestone.

LEGEND

I AGE

T - Tertiary

K - Cretaceous

M - Mississippian

D - Devonian

S - Silurian

O - Ordovician

C - Cambrian

P - Precambrian

OS - Ordovician/Silurian

PC - Precambrian/Cambrian

II LITHOLOGY

car - carbonates
limestone and/or dolomite

ss - sandstone

sh - shale

no lower case mnemonic modifier -
rocks are undifferentiated

SYMBOLS



Boundary of bedrock unit
approximate



Boundary of bedrock unit inferred in area
of surficial cover interpreted

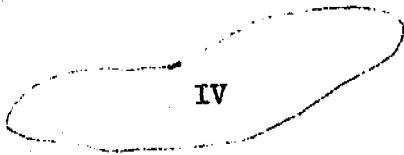


Limit of mapping

APPENDIX 1, Part 3

GRANULAR RESOURCE AREAS AND PROPOSED CONSTRUCTION ACTIVITY

I GRANULAR RESOURCE AREAS (purple)



granular resource area

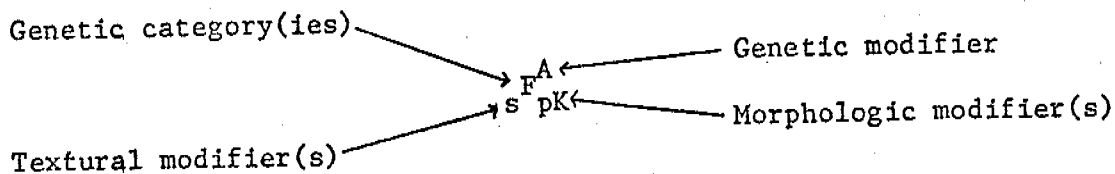
(see text for corresponding description)

Appendix I, Part III

SURFICIAL GEOLOGY AND LANDFORMS AKLAVIK (107 B)

LEGEND

Landform unit notation



Stratigraphic relationship given where thickness of upper unit is irregular and where underlying unit is known.

Genetic Categories

- C - colluvium
- G - glaciofluvial
- F - fluvial
- L - lacustrine
- M - morainal
- O - organic (see symbol for organic)
- R - bedrock
- U - undifferentiated or unknown; usually, M, L or G
- X - complex; usually M and R

Genetic Modifiers¹

- G - glacial
- A - geologic process responsible for category still actively affecting area.

Textural Modifiers²

- c - clay, clayey
- š - silt or interbedded clay, silt and fine sand
- s - sand, sandy
- g - gravel, gravelly
- r - rubble; cobbles, boulders
- x - complex

Morphologic Modifiers³




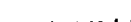













- e - eroded, gullied
- d - drumlinoid, glacially gouged
- f - fan
- h - hummocky
- m - rolling
- p - plain
- r - ridged, beach
- t - terrace
- v - veneer⁴
- K - thermokarst⁵

¹Mainly used to separate late Pleistocene glaciolacustrine deposits (L^G) from lacustrine deposits of thermokarst origin (L); to indicate areas where geologic process responsible for category is still active (A).

²Veneer indicates known thickness of category is less than 15 feet, commonly only 3 feet or less.

³Thermokarst indicates that a hummocky topography has developed as a result of subsidence and erosion where frozen sediments or ground ice have melted.

Symbols

-  - beach ridge or spit (gravel, locally sand)
-  - sea cliff or escarpment, ≥ 25 ft., constantly or periodically undercut (unconsolidated).
-  - abandoned glaciolacustrine shoreline, marked by cliffs, beaches, etc.
-  - stream-cut escarpment, constantly or periodically undercut (unconsolidated; bedrock in part)
-  - former stream-cut escarpment (unconsolidated; bedrock in part)
-  - canyon, ≥ 25 ft., edges are being constantly or periodically undercut (unconsolidated; bedrock in part)
-  - canyon, ≥ 25 ft., negligible present-day erosion along edges (unconsolidated, bedrock in part)
-  - former current direction in glaciofluvial channel
-  - esker (gravel, sand, locally silt)
-  - kame or isolated hill of gravel and/or sand
-  - lineation; drumlins, drumlinoid features, glacial gouges and striations, morainic ridges
-  - ground ice slump, mudflows locally
-  - pingos
-  - organic deposit, 5-15 ft. thick
-  - isolated bedrock outcrops
-  - boundaries (defined, approximate, assumed)
-  - meltwater channel, negligible present-day erosion along edges (unconsolidated, bedrock in part)