GRANULAR RESOURCE INVENTORY
- MACKENZIE -
CARCAJOU CANYON NTS 96D
(1:125,000)
Produced for Indian and Northern Affairs
by Dept. of Energy, Mines & Resources

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for - DEPARTMENT OF INDIAN AFFAIRS
AND NORTHERN DEVELOPMENT

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Summary

There are ample sources of granular material in the Carcajou Canyon map area but neither unconsolidated nor bedrock sources are close to the Mackenzie River. Several very small glaciofluvial deposits lie approximately 10 miles southwest of the River while most other sources are approximately 20 miles or more from the River.

Unconsolidated material may be recovered from fluvial deposits of the Keele and Little Bear Rivers and from glaciofluvial deposits of the Mackenzie Mountain front. Unconsolidated Tertiary sand and gravel deposits are extensive in the east central portion of the map area.

Carbonate bedrock north of Ration Creek and in the front range of the Mackenzie Mountains is coherent and suitable for crushed granular material.

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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 first rate sources of sand and gravel. Lacustrine and marine deposits are of variable quality while eolian material is of limited use because of its fine texture. Generally moraines have only been considered where they are known to be hummocky, and contain some coarse granular material. Terminal moraines are usually considered to be sources of granular material while ground moraines are not.

Bedrock has only been considered if it is coherent 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 as 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The information which appears in this report and on the accompanying map has been compiled largely from published and unpublished manuscripts and personal communication with officers of the Geological Survey of Canada.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 have 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 (Hughes, 1969). It is indexed as GSC open file (OF 26) 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 is 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

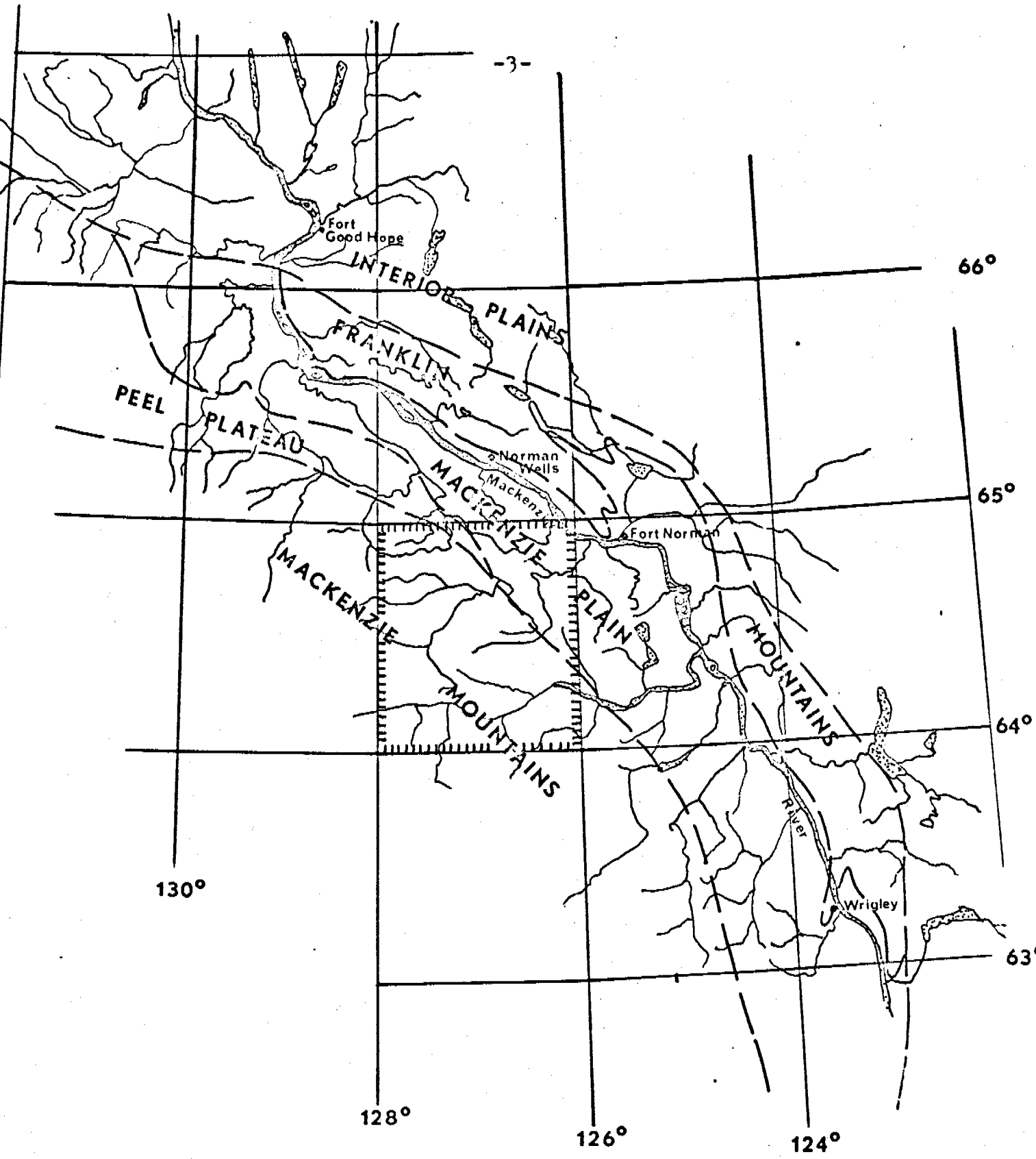
field observations provide additonal data on thickness, texture, ice content, drainage, and the variability of the deposits.

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 was estimated by using planimetered areas from the map. Average thickness for the 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 usable 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 a bedrock overlay sheet. This is intended to indicate where suitable bedrock for crushing or fill could be extracted if unconsolidated material is not available.

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.



PHYSIOGRAPHIC REGIONS

CARCAJOU CANYON

1 : 2,500,000

after Bostock 1948

II General Geology and Physiography

Three physiographic regions are shown in the Carcajou Canyon map area: the Mackenzie Plain in the northeast, the Peel Plateau in the north and the Mackenzie Mountains in the southwest (fig. 1). The bedrock geology of most of the map area has been mapped by Cook (1972), while Hughes (1969) has mapped the surficial geology of the Peel Plateau and the Mackenzie Plain which compose roughly the northeastern half of the map sheet.

Bedrock, exposed sporatically on the Mackenzie Plain and Peel Plateau but making up all of the Mackenzie Mountains, is composed of carbonates, sandstones, shales and unconsolidated sand and gravel which range in age from Precambrian to Tertiary. Unconsolidated surficial deposits are found mainly along the foot of the Mackenzie Mountains and along the river valleys to the east of the mountains. There are only a relatively small number of morainal till, glaciofluvial and glaciolacustrine deposits to indicate glaciers have covered the area. Post glaciofluvial deposits are abundant along most of the water courses of the map area. Only the glaciofluvial deposits and fluvial deposits from high energy streams contain significant amounts of granular material.

A Unconsolidated Deposits

(i) Glaciofluvial Deposits Gf (red)

Glaciofluvial deposits in this map sheet occur as channel deposits and eskers. The topography is generally flat to gently rolling (Hughes, 1969) but eskers, containing sand and gravel are sinuous ridges.

The glaciofluvial channel deposits of sand and gravel range in thickness from 35' to 50'; the eskers have an average height of 15'. Both types of deposits contain approximately 80% available granular material.

(ii) Fluvial Deposits F (green)

Only the fluvial deposits of high energy streams have an abundance of sand and gravel. The deposits are of two types: fluvial fans and fluvial plains. Recent sand and gravel deposits in parts of the Mackenzie River should also be considered as recoverable. The fluvial fans are formed at the base of the Mackenzie Mountains. They have moderate relief and contain a variable amount of sand and gravel. Fluvial Plain deposits are found along the Carcajou, Mountain, Little Bear and Keele Rivers and contain silt, sand and gravel. The relief is generally less than 10'.

The thickness of the fluvial deposits varies between 20' and 50'. They contain approximately 60% available sand and gravel material.

B Bedrock Geology

The Mackenzie Mountains consist of carbonates and shales of the Cambrian, Ordovician, Silurian, and Devonian Periods; Precambrian carbonates, quartzites, volcanics and some shales. Devonian shale, Cretaceous sandstone and shale, and unconsolidated Tertiary material underlie most of the Mackenzie Plain and Peel Plateau.

The Tertiary rocks consist of unconsolidated to poorly consolidated gravels, sandstones and mudstones and are a very good source of granular material. Good crushed material is available from the Ordovician and Devonian carbonate rocks and most of the Precambrian rocks. Shales and sandstones can also be crushed where inferior material is acceptable.

III Materials

The major sources of unconsoldiated granular materials in this map area are the fluvial deposits of the Keele, Little Bear and Carcajou Rivers; glaciofluvial deposits located between the Carcajou and Rouge Mountain Rivers; and Tertiary gravel and sand deposits in the extreme eastern part of the map sheet east of Ration Creek.

The large glaciofluvial units range in thickness from 35' to 50' and are composed of mixed sand and gravel of which 80% is available as a granular material. Smaller glaciofluvial units are of similar quality but are only 10' to 15' thick. The fluvial deposits of high energy streams contain abundant coarse granular material derived largely from the Precambrian rocks of the Mackenzie Mountains.

At the mountain front there are large fluvial fans containing very coarse material. These fan deposits, in some cases, may exceed 150' in thickness. The material however is so coarse it would require crushing. Further downstream, where the energy of the rivers has dissipated finer grained material may be found.

The unconsolidated Tertiary deposits are composed mainly of pebble size (1/2" to 6") chert, quartzite, and carbonate particles in a matrix of fine and medium sand and silt. Laminated sand beds and lenses, and conglomerate beds are common. Several sections contain ash deposits with shale and carbonaceous material (Yorath, 1972).

Unfortunately these three major sources are distant from the Mackenzie River where materials probably will be required. Large sources of granular material are 15 to 25 miles from the river.

There is a number of small eskers and glaciofluvial channel deposits within the Mackenzie Plain but these are small and widely scattered. They are, on the average, 10 miles from the River.

Suitable bedrock sources for crushed material are extensively exposed from the Mackenzie Mountain front westward. The mountain front is composed mainly of carbonate rocks of Ordovician and Devonian age. The mountain front is approximately 25 miles from the Mackenzie River.

A large spur of carbonate rocks extends northeastward from the mountains. This is well exposed in the area north of Ration Creek.

IV Tabular Summary

		area sq. mi.	thickness	estimated volumes of granular material ($yd^3 \times 10^6$) total	available
Area I SLATER RIVER					
a) Gfc glaciofluvial (channelled complex); gravel and sand.		0.37	35'	16.27	13.02
b) eskers, sand and gravel		1.00 mi	20'	0.035	0.028
Area II UPPER RATION RIVER					
a) 3 eskers, sand and gravel		2.0 mi	20'	0.069	0.056
b) F fluvial; gravel, sand and silt; thin cover of silt or peat.		8.98	20'	185.52	111.31
Area III RATION CREEK					
a) F, Fa fluvial (undifferentiated and fans); gravel.	F	7.92	20'	163.55	98.13
	Fa	11.86	50'	612.31	367.38
b) carbonate bedrock					
Area IV EAST OF AREA III					
Gf glaciofluvial; gravel and sand.		2.95	20'	61.03	48.82
Area V SOUTH OF AREA III					
carbonate bedrock					
Area VI KEELE RIVER					
F, Fa fluvial deposits (modern flood plains and low terraces); gravel and sand.		72.46	8'	748.19	231.91

Area VII LITTLE RIVER				
a) F fluvial (undifferentiated and fans); sand, silt and gravel.	2.00	10'	20.75	12.45
b) Gf glaciofluvial; gravel and sand.	.19	50'	10.17	8.14
Area VIII MOUNTAIN RIVER				
Gf glaciofluvial; gravel and sand.	7.91	50'	408.87	327.10
Area IX JACK CREEK				
a) Gf glaciofluvial; gravel and sand.	0.59	50'	30.51	24.41
b) Gfc glaciofluvial (channel complex); sand and gravel.	2.55	50'	132.22	105.77
Area X CARCAJOU CANYON				
a) Fp fluvial (modern flood plain; low terraces); sand and gravel; mantle of silt.	44.13	50'	455.67	273.40
b) Fa fluvial(fan or fan apron); gravel.	4.25	10'	43.94	26.36
c) F fluvial; sand, silt and gravel.	3.94	20'	40.68	24.41
d) Gfc glaciofluvial (channel complex); sand and gravel.	1.57	50'	81.36	65.09

Area XI WEST CARCAJOU RIVER				
Gfc glaciofluvial (channel complex); sand.	1.93	35'	69.77	55.82
Area XII EAST CARCAJOU RIVER				
Gfc glaciofluvial (channel complex; sand.	.83	35'	29.90	23.92
Area XIII TWENTY-MILE LAKE				
Gfc same as above.	.19	35'	7.12	5.69

V Sources of Information

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1948: Physiography of the Canada Cordillera, with special reference to the area north of the fifty-fifth parallel; Geol. Surv. Can. Mem. 247.

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Prest, V.K., Grant, D.R., Rampton, V.N.
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APPENDIX I, Part I

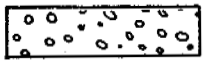
Unconsolidated Granular Materials

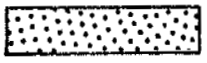
Each map sheet has a surficial geology legend (see appendix I, part IV). The following legend only indicates granular material, classified by genetic characteristics. In some cases, only part of a map unit has been patterned, indicating that only that portion is considered a suitable source for granular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

Legend

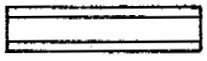
GLACIOFLUVIAL

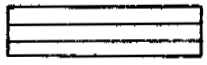

coarse grained granular material, cobbles, pebbles, gravel; may be mixed with some coarse sand.


mixed or interbedded sand and gravel


predominantly sand or sand with undesireable fines

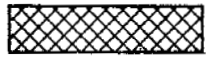
GLACIOLACUSTRINE


gravel, lacustrine

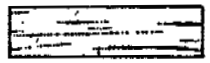

sand and gravel


sand

FLUVIAL

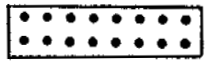

fluvial (only sand and gravel deposits are patterned)

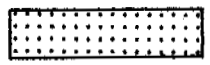
MORAINAL


morainal deposit

MARINE


coarse-grained material, cobbles, pebbles, gravel, may be mixed with coarse sand


mixed or interbedded sand and gravel


predominantly sand or sand with undesireable fines

EOLIAN

usually fine and medium-grained sandy material

COLLUVIUM

primarily coarse grained material

Symbols

<<<<<<< eskers

* * * * gravel mounds

morainal ridge found within moraine

APPENDIX I, Part II

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 (Cook 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 a mnemonic designating gross lithology e.g. 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

P - 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)

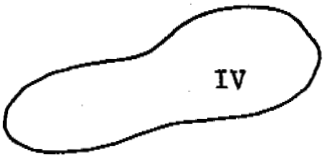
Boundary of bedrock unit inferred in areas of surficial cover

limit of mapping

APPENDIX I, Part III

GRANULAR RESOURCE UNITS

I GRANULAR RESOURCE AREAS (black)



granular resource area

(see text corresponding description)

IV Surficial Geology and Landforms

TEXTURE		GENESIS		MORPHOLOGY		SLOPE (superscript)	
f	fen	O	organic	v	veneer	1	moderate (<5°)
p	peat	M	morainic	p	plain		
c	clay	G	glaciofluvial	d	drumlin	2	steep (5° - 15°)
si	silt	L	lacustrine	s	fluted striated		
s	sand	A	alluvial	t	terrace		
g	gravel		fluvial	h	hummocky		>15° normally
b	boulder	C	colluvial	r	ridged		in Cx unit
t	till	E	eolian	e	eroded		
		U	upland, rolling bedrock controlled	a	fan		
				m	rolling		
		R	rock outcrop	c	channelled		
				k	kettled thermokarst		
				x	complex		

Complex Units:

e.g. in: Mp-f0, f0 constitutes 25% to 49% of area

: Mp f0, f0 = 5% - 24% of area

Using all four elements of the legend, a smooth ground moraine surface with moderate slope would be tMp^1; hummocky and ridged glaciofluvial gravel would be gGhr. Note that there are inconsistencies in the use of Mp and Mv mainly because of the difficulty in estimating till thickness.