



GRANULAR RESOURCE INVENTORY - MACKENZIE

SANS SAULT RAPIDS NTS 106/H

(1:125,000)

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Summary

Vast deposits of granular material are distributed throughout the Sans Sault map area. These deposits are mainly glaciofluvial and fluvial in origin. The principle glaciofluvial deposit in the central part of the map area covers over 125 square miles in area.

Suitable bedrock is available in the Mackenzie Mountains, Imperial HIIIs, Carcajou Ridge, East Mountain, Bat Hills, and in the Franklin Mountains. This area does not appear to have any serious problems with respect to recovery of large quantities of granular material.

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. limestone, 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The information which appears in this report and on the accompanying map has been compiled largely from published and unpublished manuscripts and personal communication with officers of the Geological Survey of Canada.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.

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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 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 these, a volume of available 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.

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after Bostock 1948

atte

II General Geology and Physiography

Five physiographic regions are represented in the Sans Sault Rapids map area. From northeast to southwest they are: the Interior Plains; Franklin Mountains; Mackenzie Plain; Peel Plateau; and Mackenzie Mountains. Most bedrock geology has been mapped (Cook, 1972); all surficial geology north of the Mackenzie Mountains has been mapped (Hughes, 1969).

Bedrock is well exposed in the Franklin and Mackenzie Mountains and on the Peel Plateau and consists of carbonates, sandstones and shales ranging in age from Precambrian to Cretaceous.

Unconsolidated surficial deposits are found at the foot of the Mackenzie Mountains on the Peel Plateau and the Mackenzie Plain. Glaciers produced a few ground moraines and extensive glaciofluvial outwash deposits. Since the retreat of the glaciers, fluvial plains and fans have formed along the major rivers and at the foot of mountains in the area. Wind has reworked some sands to form fine grained eolian deposits. The glaciofluvial outwash deposits, some fluvial deposits and the eolian deposits are the most important sources of granular material in this map sheet.

A Unconsolidated Material

(i) Glaciofluvial Deposits Gf (red)

In the Sans Sault Rapids map area a glacial outwash delta is the predominant glaciofluvial deposit. Other glaciofluvial deposits are small outwash plains and channels. The topography of these areas is flat except where it is interrupted by channels (Hughes, 1970).

The outwash delta has an estimated average thickness of 50' while the outwash plains and channels vary in thickness from 15' to 40'. Approximately 80% of all the glaciofluvial material is available as a granular resource.

(ii) Fluvial deposits Fp (green)

Only high energy streams produce fluvial deposits which are important as sources of granular material. At the base of the Mackenzie Mountains, the fluvial deposits have a characteristic fan appearance and a sloping topography. Along the Carcajou, Mountain and Hume Rivers' fluvial plains the deposits consist of sand and gravel.

The deposits range in thickness up to 30' and are usually covered by a veneer of finer material. Approximately 60% of this material is available as a granular material.

(iii) Eolian E (pink)

On the Mackenzie Plain some of the sand deposits have been reworked by wind action to produce fine to medium grained eolian sand deposits. The topography is variable.

The deposits average 20' in thickness; approximately 60% is available as granular material.

B Bedrock

The Franklin Mountains consist of carbonates, sandstones and shales of Ordovician, Silurian, Devonian and Cretaceous periods. It is thought that the Mackenzie Plain is underlain by Cretaceous rocks, (Cook, 1972). The Imperial Hills comprise the Peel Plateau in this map area and consist of east-west trending Devonian carbonates and shales. The Mackenzie Mountains consist of Devonian and Ordovician/Silurian carbonates and Precambrian rocks.

Good crushed material is available from the carbonate rocks and from most Precambrian rocks. Shales and sandstones can be crushed where inferior material for construction is acceptable.

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III Materials

There are extensive deposits of glaciofluvial and fluvial materials in the central part of the map area. Generally they are coarse grained or of mixed grain size. The principal glaciofluvial deposit is along the lower reaches of the Mountain River. It covers an area of approximately 125 square miles. Similar, but less extensive deposits lie along the Carcajou, Hume and Gayna Rivers. The flood plains of these rivers contain abundant coarse granular material. This material is, in part, derived from the Precambrian, Ordovician and Devonian rocks of the Mackenzie Mountains, while most of it is reworked glaciofluvial material. Eolian deposits composed mainly of fine and medium sand average 20 feet in thickness. These deposits lie close to the Mackenzie River and are suitable for fill. These deposits are probably not of great importance in an area of an abundant supply of material, however, in the north central part of the sheet there are fairly large bodies of eolian material on both sides of the Mackenzie River.

Coherent bedrock suitable for crushed stone is exposed extensively throughout the map area. The southern third of the area is almost entirely composed of Precambrian rocks. The Imperial Hills to the north, and the mountain front are composed of carbonate rocks of Ordovician and Devonian age which would provide good quality granular material. Similarly in the northeast portion of the map area, on the east side of the Mackenzie River, limestone and dolomite are exposed at Carcajou Ridge, East Mountain and Bat Hills. These possible sources of crushed granular material are all adjacent to the Mackenzie River. In the northeast corner of the map area suitable crushable material could be derived from rocks of the Franklin Mountains.

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IV Tabular Summary

| . • | | · · · · · · · · · · · · · · · · · · · | estimated | Estimated Volumes of Granular Material | | |
|------|------------------------------|---------------------------------------|---------------------|---|----------------------------------|--|
| | • | area (sq. mi.) | thickness (feet) | (yd ³ x total | :'10 ⁶) available | |
| | T Others Biller | | | | | |
| Are | a I Gibson Kidge | · | | | | |
| | <u>E</u> | 1.33 | 20' | 27.65 | 10.29 | |
| | eollan; sand | | • • | • | | |
| Are | a II Snafu Creek | | | | | |
| | E | 1,41 | 20' | 19.52 | 17.33 | |
| | eolian; sand | | | | • | |
| Are | a III Between Beavertail Mtn | • | | | | |
| | and Donnelly River | | • | | | |
| | E | 0.43 | 20' | 8.95 | 5.37 | |
| | eolian; sand | | | | ٠ | |
| Are | a IV East Mountain | - - | | • | | |
| a) | Е | •55 | 201 | 11.39 | 6.83 | |
| | eolian; sand | | | | | |
| b) | carbonate bedrock | | | | | |
| Area | V Carcajou Ridge | | | | | |
| a) | Gf | 3.58 | 50' | 55.53 | 33.32 | |
| | glaciofluvial; sand | | | | | |
| | and gravel | | | · · · · | | |
| b) | carbonate bedrock | • | | | | |
| Are | a VI Northern section betwee | n · | | | | |
| | Hume River and MacKenzi | e | | | | |
| | River | | • | | | |
| | | 4 66 | t | 102.02 | (1.06 | |
| a) | <u>E</u> eolian: sand | 4.98 | 201 | T03*97 | 01.30 | |
| A | eurran, sand | | | | | |
| Are | a VII | | | | | |
| a) | <u>Gfc</u> | 1.71 | 50' | 26.84 | 16.08 | |
| | giaciotiuvial (channel | | | | | |
| | complex); gravel and sand. | · · · · · | | | | |

1 - 2' veneer of eolian silt.

- 7 -

| | | - 8 - | | | · · · |
|---------------|-------------------------|-------|--------|------------|---------|
| | · · · · · · · · · · · · | Мар | | | |
| | | 0 00 | 501 | 35, 39 | 21.23 |
| Ъ) <u>Gf</u> | | 2.20 | | | |
| glacioflu | vial; gravel and | | • | | |
| sand. | | | | | |
| Area VIII | | | | | • ' |
| | | 2.43 | 501 | 44.11 | 28.91 |
| a) <u>GIC</u> | vial (channel | | | • | |
| gracionic | oravel and sand. | | | | |
| compieny | Braver and camer | • | | | · |
| Area IX Hume | River | | | | |
| Fp and Ft | • | 20.76 | 10' | 214.40 | 107.20 |
| fluvial (| flood plains | | | | |
| and terra | ices); gravel, | | | | |
| sand and | silt; cover | | | | |
| of organ: | ic silt and/or | | | | ٠ |
| peat. | | • | | | |
| Area X Betw | een Hume River | | | | |
| and 1 | Kountain River | | | | |
| and | Muntain Arver | (0.50 | FOT | 3 128 16 1 | .877.18 |
| a) <u>Gfc</u> | | 60.56 | 50 | 5,120,20 | , |
| glaciofl | ivial (channel | | | | |
| complex) | ; sand and | | | | |
| gravel. | | | · | | ED 70 |
| b) <u>Gf</u> | | 1.73 | 50' | 39.50 | 53.70 |
| glaciofl | uvial (outwash); | | • • | | |
| gravel a | nd sand; local | | | | |
| cover of | 1 to 2 feet of | | | | |
| eolian s | ilt. | | | | |
| c) <u>E</u> | | 4.33 | 201 | 90,88 | 54.16 |
| eolian; | sand | | | | |
| Area XI Mou | ntain River and | | | | |
| | anion Direr | | | | |
| Car | cajou kiver | | | 010 00 | 200 67 |
| Fp and F | <u>'t</u> | 69.12 | 10' | 8TA*30 | 222.01 |
| fluvial | (modern flood plains | | - | | |
| and terr | aces); gravel, sand | | | | |
| and silt | ; cover of organic | | | | |
| silt and | peat. | | | | |

•

, .

.

Area XII East shore of the

Mountain River

| Gfc | 0.78 | 50' | 40.68 | 24.40 |
|--------------------------------|------|-----|-------|-------|
| glaciofluvial (channel | | | | • . |
| complex); sand and | | | | |
| gravel; underlain by | | | • | |
| glaciolacustrine sand | . ' | | | |
| clay. | | | | |
| Area XIII Foot of the Imperial | | - | | |
| Hills | | • | | |
| Gfc | 0.47 | 50' | 24.40 | 14.64 |
| glaciofluvial (channel | | | | |
| complex); sand and | • | | | . • |
| gravel; local 2' veneer | • | | | |

of eolian silt.

Area XIV Maida Creek and Trail

Creek

| a) | Gfc | 4.49 | 50' | 185.52 | 111.31 |
|------------|------------------------------|-------|-----|--------|--------|
| | glaciofluvial (channel compl | .ex); | | | |
| | gravel and sand, local | | | | |
| | 2' veneer of eolian silt. | | • . | | |
| b) | E | 2.18 | 20' | 47.09 | 28.27 |
| | eolian; sand | | | | |
| c) | Gf | 2.56 | 50' | 105.78 | 63.46 |
| | glaciofluvial (outwash); | | | | |
| | gravel and sand; local | | | | |
| | 1-2' veneer of eolian | | | | |
| | silt. | | . 1 | | |
| Are | a XV Imperial Hills | · · · | | | |
| | bedrock; large area | | | | |

Area XVI East of Rankin Creek

| a) Gf | 0.34 | 50' | 18.30 | 10,48 |
|--------------------------------|-------|--------|--------|--------|
| glaciofluvial (outwash); | | | | |
| gravel and sand; local | • | | | |
| 1-2; veneer of eolian silt. | | | | |
| b) crushed material; small | | | • | |
| area. | | | • • • | |
| Area XVII Campsite, between | | | | |
| Imperial Hills and | | • | | |
| Mountain River | | | | |
| Gfc | 8.61 | 501 | 445.58 | 267.29 |
| glaciofluvial (channel | | 20 | | |
| complex); gravel and sand: | | | | • |
| 1-2' cover of eolian silt. | - | | | |
| Area XVIII Southern section of | | | | |
| the Mountain River | | | | |
| Fp | 26.40 | 10' | 272.95 | 139.66 |
| fluvial (plains and | | | | |
| terraces); gravel, sand | | | | |
| and silt; local 1-2' | a . | | | |
| cover of organic silt or | | - - | | |
| peat. | | | | |
| and Fa | | | | |
| fluvial (fans); gravel | | | | |
| and sand at the foot of | | | | |
| the Carcajou Range. | | | | |
| (contain large reserves | | | | |
| of aggregates). | | | | |
| Area XIX Virgin Creek | | | | |

| Gf | 3.15 | 501 | 162.73 | 97.64 |
|-----------------------------|------|-----|--------|-------|
| glaciofluvial (outwash); | | | | |
| gravel and sand; local 1-2' | | | | |
| cover of eolian silt. | | | | |

| Are | a XX | • | | | |
|------------|-------------------------------------|---------|-------------|--------|--------|
| | carbonate rocks; provides | · · · · | | | |
| | good source of rip-rap. | | | | |
| Are | a XXI Between Mountain River | | | | |
| | and Powell Creek | | · . · | | |
| | GE | 18.41 | 50' | 952.07 | 571.18 |
| | glaciofluvial (outwash); | • | | | |
| | sand and gravel | | | | |
| Are | a XXII Gayna River | • | • | | |
| a) | Gfc | 0.86 | 50' | 39.05 | 23.42 |
| | glaciofluvial (channel | | • | | |
| | complex); gravel and | | | | |
| | sand. | • | | | , |
| b) | Fp | 3.74 | 10' | 38,65 | 19.32 |
| | fluvial (plains and | | | | |
| | terraces); sand and | | | | |
| | gravel. | | | | |
| c) | Gf | 1.13 | 50' | 58.98 | 35.39 |
| | glaciofluvial (outwash); | | | | |
| | sand and gravel, | | | | |
| Are | a XXIII North-West of Gavna | | | | |
| | | | | | |
| | River | | | | |
| a) | Gf | 3.10 | 50' | 48.20 | 28.90 |
| | <pre>glaciofluvial (outwash);</pre> | | | | |
| | sand and gravel. | • | | | |
| b) | Gfc | 1.00 | 50 ' | 32.24 | 18.85 |
| | glaciofluvial (channel | | | | |
| | complex); gravel and | | | | |
| | sand; local 1-2' cover of | | | | |
| | eolian silt. | | | | |

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c) <u>F, Fa, Ft</u> 1.28 10' 13.41 6.70 fluvial (fans and terraces); sand, gravel and silt.
Area XXIV South of Hume River

| a) | Gf | 2.51 | 15' | 39.05 | 23.42 |
|----|--------------------------|------|-----|-------|-------|
| | glaciofluvial (outwash); | | | • | |
| | sand and gravel. | | | | |

b) small area of carbonate rocks

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V Sources of Information

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Appendix I, Part (11)

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 (Cooke 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 lower case designating gross lithology e.g. Dls - Devonian limestone.

LEGEND

I AGE

T - Tertiary

K - Cretaceous

M - Mississippian

D - Devonian

S - Silurian

0 - Ordovician

C - Cambrian

P - Precambrian

OS - Ordovician/Silurian

PC - Precambrian/Cambrian

SYMBOLS

GEOLOGICAL BOUNDARIES

boundary of bedrock unit approximate

boundary of unit inferred in area of surficial cover interpreted

limit of mapping

(111)

sh - shale

car - carbonates limestone and/or dolomite

ss - sandstone

II LITHOLOGY

no lower case modifier - rocks are

undifferentiated

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

| بالمتحدث والمتحدث والم |
|--|
| |
| |

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

< < < < < <

* * * gravel mounds

eskers

,-0-0-0-

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

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)

Appendix I, Part iv

Surficial Geology and Landforms

| TEXTURE | | GENESIS | | | MORPHOLOGY | | | SLOPE (superscript) | | |
|---------------------------------|--|--------------------------------------|---|---|--|------------------|---|--|--|--|
| f p c s g b t | fen peat clay silt sand gravel boulder till | O G L A C E U R | organic morainic glaciofluvial lacustrine alluvial fluvial colluvial eolian upland, rolling bedrock controlled rock outcrop | V P d s t h r e a m e k x | veneer plain drumlin fluted striated terrace hummocky ridge eroded fan rolling channelled kettled thermokarst complex | 1 2 1 1 | mod ate (5 [°] 5 [°] r n C> | derate 5 ⁰) eep 9 - 15 ⁰) normally t unit | | |

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 tMp¹; 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.