

SUMMARY OF GRANULAR MATERIALS

MACKENZIE DISTRICT, N.W.T.

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## Summary of Granular Materials

### MacKenzie District, N.W.T.

#### Purpose

The chief purpose of this summary is to compare the quantity and quality of granular materials in deposits located within designated segments centered along the proposed routes of MacKenzie Highway and/or the C.A.G.P.L. pipeline with the projected demand for these materials for road and pipeline construction and for other facilities. Areas of potential surpluses and shortages have been determined. The latter are especially important because if haulage distances from other sources are too long it may be necessary to allot the available materials in some areas or permit an operator to develop a pit or quarry in an environmentally sensitive deposit.

#### Method

All known deposits of granular materials were plotted on the following 19 topographic map-sheets, approximate scale 1:125,000, which encompass an area extending north from the community of Fort Simpson to Tuktoyatuk, N.W.T. and West to Fort MacPherson.

|                   |       |
|-------------------|-------|
| Fort Simpson      | 95.H  |
| Sibbeston Lake    | 95.G  |
| Bulmer Lake       | 95.I  |
| Camsell Bend      | 95.J  |
| Wrigley           | 95.O  |
| Dahadinni River   | 95.N  |
| Fort Norman       | 96.C  |
| Mahoney Lake      | 96.F  |
| Norman Wells      | 96.E  |
| Sans Sault Rapids | 106.H |

|                  |           |
|------------------|-----------|
| Fort Good Hope   | 106.I     |
| Canot Lake       | 106.P     |
| Travaillant Lake | 106.O     |
| Arctic Red River | 106.N     |
| Fort MacPherson  | 106.M     |
| Aklavik          | 107.B E/2 |
| Aklavik          | 107.B W/2 |
| MacKenzie Delta  | 107.C E/2 |
| Mackenzie Delta  | 107.C W/2 |

Most of this information was obtained from reports and maps prepared by granular material consultants for the Department of Indian and Northern Affairs and by the Geological Survey of Canada.

On the map-sheet the deposits have been divided into 6 categories, two for bedrock and four for the unconsolidated material, according to their usefulness as construction material. Environmentally sensitive deposits have been identified. The locations of the proposed routes for MacKenzie Highway and the gas pipeline with its associated utilities were provided by the Department of Public Works and Canadian Arctic Gas Pipeline Limited.

To better delimit the areas of surpluses or shortages the region was divided into segments centered along the proposed routes of the Highway and/or pipeline. These segments are 20 miles in length and are divided laterally into 2 zones (A and B) approximately 4 and 10 miles wide respectively. The segments are shown on the map-sheet.

A compilation sheet was prepared for each segment. Each sheet lists the known granular material deposits within the segment according to the 6 categories along with an estimate of the quantity of material available. The Deposits were further sub-divided into those which were recommended

for development and those which, usually for environmental reasons, were not recommended. Deposits which have been reserved at the request of the Government of the Northwest Territories have been listed separately.

The potential demand for granular materials in each segment was provided by the Department of Public Works and by Canadian Arctic Gas Pipeline Limited. The quantities for "other future demand requirements" is the sum of the estimated requirements for granular materials of the Following: (Where no requirement was stated by either of the agencies a minimum of 100,000 cubic yards per segment per category was allowed).

1. Looping of the presently proposed gas pipeline: The quantity of material required was estimated to be same as that for the proposed pipeline.
2. Construction of an oil pipeline: The quantity of material required was estimated to be 1.7 times the requirement for the gas pipeline.
3. Construction of a Railroad: The quantity of material required was estimated to be 6 times the requirement for MacKenzie Highway with a minimum requirement of 200,000,000 cubic yards. It should be noted that including this figure in the calculations greatly increased the number of areas where shortages of granular materials have been determined.
4. Hydro dams and access roads: Only dams on Great Bear and MacKenzie Rivers were considered. The total requirements were estimated as 5,000,000 cubic yards of categories R-1 and R-2 (bedrock).
5. Miscellaneous: The estimated quantities here consisted of 25 percent of the total of items Nos. 1, 2, 3 and 4.

### Compilation Sheets

The data on the compilation sheets was compiled by consultants employed by the Department of Indian and Northern Affairs. Techman, Limited prepared the data on sheets Nos. 1-20, inclusive, 31-34, inclusive and 36-46, inclusive. E.W. Brooker and Associates prepared the remaining sheets. These consultants had previously been involved in preparing reports for the Department of Indian and Northern Affairs describing the granular material resources throughout most of the region. Some of the granular material deposits indicated on the map-sheets as having been located by the Geological Survey of Canada were not included in the compilation of surpluses or shortages as there was insufficient pertinent data available concerning them.

### Areas of Surpluses and Shortages

The following is a compilation of the surpluses and shortages of granular materials by segment as indicated on the compilation sheets. It should be noted that the shortages indicated in segments Nos. 43, 44, 45 and 46, south and west of the community of Fort Simpson, and in Nos. 40, 41 and 42 along the west side of MacKenzie Delta are due to lack of information regarding the occurrence of granular materials in these areas. The shortage figures actually represent the demand for materials in these areas as provided by C.A.G.P.L.

Compilation of surpluses and shortages  
by segment within approximately  
2 miles of MacKenzie Highway

Surpluses: 1,000 cubic yards  
Shortages: 1,000 cubic yards

| Segment No. | Category        |                |     |               |               |               | General Area                   |
|-------------|-----------------|----------------|-----|---------------|---------------|---------------|--------------------------------|
|             | R-1             | R-2            | 1   | 2             | 3             | 4             |                                |
| 1           | 8               |                | 22  | 2,429         | 100           | <u>12,825</u> | Fort Simpson                   |
| 2           | 8               | 1,015          | 22  | 3,553         | 100           | 2,436         |                                |
| 3           |                 |                | 26  | 4,363         | 1,982         | 1,915         |                                |
| 4           |                 |                | 555 | <u>4,363</u>  | 4,437         | 2,233         | Camsell Bend                   |
| 5           | 15              |                | 81  | 4,719         | <u>2,547</u>  | 14,450        | Willowlake R.                  |
| 6           | <u>10,000 +</u> |                | 262 | 3,127         | <u>14,140</u> | 5,032         | River Between<br>Two Mountains |
| 7           | 8               |                | 36  | <u>40,178</u> | 593           | 3,595         | Wrigley                        |
| 8           | <u>24,000 +</u> |                | 280 | 7,219         | 5,558         | 1,997         | Ochre R.                       |
| 9           | <u>3,000 +</u>  |                | 38  | 4,802         | <u>13,721</u> | 1,485         | Johnson R.                     |
| 10          | <u>985 +</u>    |                | 69  | <u>49,069</u> | <u>2,156</u>  | 1,020         | Blackwater R.                  |
| 11          | <u>18,767</u>   |                | 549 | 6,340         | <u>2,983</u>  | <u>2,900</u>  | Saline R.                      |
| 12          | 8               |                | 60  | <u>29,068</u> | 3,300         | 4,465         | Little Smith<br>Creek          |
| 13          |                 |                | 252 | 6,696         | 584           | <u>3,415</u>  | Old Fort Point                 |
| 14          | <u>4,442 +</u>  | 1,305          | 130 | 2,672         | 2,396         | 3,470         | Fort Norman                    |
| 15          | <u>2,000 +</u>  | 2,300          | 246 | 4,216         | <u>1,416</u>  | 100           | Vermillion Creek               |
| 16          | 8               | 1,305          | 99  | 4,472         | 4,130         | 4,485         | Norman Wells                   |
| 17          | 8               | <u>1,000 +</u> | 262 | <u>3,925</u>  | 4,119         | <u>8,400</u>  | Mount Morrow                   |
| 18          | <u>9,000 +</u>  |                | 38  | <u>2,302</u>  | 1,541         | <u>300</u>    | Hanna R.                       |
| 19          | <u>9,144 +</u>  | 3,444          | 46  | 5,917         | 3,184         | 100           | Chick L.                       |

Compilation of surpluses and shortages  
by segment within approximately  
2 miles of MacKenzie Highway

Surpluses: 1,000 cubic yards  
Shortages: 1,000 cubic yards

| Segment<br>No. | Category      |               |       |               |               |       | General<br>Area               |
|----------------|---------------|---------------|-------|---------------|---------------|-------|-------------------------------|
|                | R-1           | R-2           | 1     | 2             | 3             | 4     |                               |
| 20             | 732           | 1,813         | 288   | 6,576         | 884           | 100   | Tsintu R.                     |
| 21             | 1             | 150           | 78    | <u>26,839</u> | <u>3,404</u>  | 5,143 | Fort Good Hope                |
| 22             | <u>39,394</u> | 481           | 260   | 7,822         | <u>474</u>    | 100   | Rampart Plateau               |
| 23             | 126           | <u>29,850</u> | 29    | 3,575         | 2,937         | 2,655 | S. of Yeltea L.               |
| 24             |               |               | 536   | 4,305         | <u>30,206</u> | 100   |                               |
| 25             |               | 9,965         | 12    | 579           | 7,553         | 100   |                               |
| 26             | 1             | 682           | 2,008 | 12,888        | <u>10,328</u> | 7,225 | Thunder R.                    |
| 27             | 1             | <u>39,250</u> | 18    | 4,915         | <u>1,960</u>  | 100   | Travaillant L.                |
| 28             |               | <u>84,200</u> | 18    | 3,607         | 1,503         | 100   | Big Stone L.                  |
| 29             |               | <u>8,400</u>  | 2,000 | 9,219         | 744           | 2,125 | Wounded Bear L.               |
| 30             | 154           | <u>30,000</u> | 11    | 2,918         | 109           | 2,975 | Dempster Highway<br>Junction  |
| 31             | 5,902         |               | 320   | 6,451         | 5,616         | 3,727 | Inuvik                        |
| 32             |               |               | 8     | 366           | 366           | 100   | Noell L.                      |
| 33             |               |               | 104   | <u>7,019</u>  | <u>1,388</u>  | 100   |                               |
| 34             |               |               | 569   | <u>9,328</u>  | 1,972         | 100   | East Channel,<br>MacKenzie R. |
| 35             |               |               | 8     | 612           | 1,409         | 50    |                               |
| 36             |               |               | 236   | 1,946         | 4,437         | 100   | Arctic Red R.                 |
| 37             |               |               | 6     | 809           | 1,860         | 100   | Fort McPherson                |
| 38             |               |               | 9     | 393           | 393           | 100   | Dempster Highway              |
| 39             |               |               | 2,012 | 1,830         | 2,240         | 100   |                               |
| 40             |               |               | 4     | 569           | 1,400         | 100   | Mount Goodenough              |

Compilation of surpluses and shortages  
by segment within approximately  
2 miles of MacKenzie Highway

Surpluses: 1,000 cubic yards  
Shortages: 1,000 cubic yards

| Segment<br>No. | Category |     |     |       | 3     | 4   | General<br>Area               |
|----------------|----------|-----|-----|-------|-------|-----|-------------------------------|
|                | R-1      | R-2 | 1   | 2     |       |     |                               |
| 41             |          |     | 13  | 393   | 393   | 100 | Aklavik                       |
| 42             |          |     | 525 | 2,690 | 1,465 | 100 | West Channel,<br>MacKenzie R. |
| 43             |          |     | 240 | 1,794 | 2,515 | 100 |                               |
| 44             |          |     | 131 | 501   | 153   | 100 | Martin R.                     |
| 45             |          |     | 22  | 612   | 1,837 | 100 | Liard R.                      |
| 46             |          |     | 197 | 2,056 | 612   | 100 | Goose L.                      |



Compilation of surpluses and shortages  
by segment within approximately  
5 miles of MacKenzie Highway

Surpluses: 1,000 cubic yards  
Shortages: 1,000 cubic yards

| Segment<br>No. | Category        |                |     |               |               |               | General<br>Area                |
|----------------|-----------------|----------------|-----|---------------|---------------|---------------|--------------------------------|
|                | R-1             | R-2            | 1   | 2             | 3             | 4             |                                |
| 1              | 8               |                | 22  | 929           | 100           | <u>12,825</u> | Fort Simpson                   |
| 2              | 8               | 1,015          | 22  | 3,553         | 50            | 2,436         |                                |
| 3              |                 |                | 26  | 4,362         | 1,982         | 1,915         |                                |
| 4              |                 |                | 555 | <u>4,363</u>  | 4,437         | 2,233         | Camsell Bend                   |
| 5              | 15              |                | 81  | 4,719         | 2,547         | 14,450        | Willowlake R.                  |
| 6              | <u>10,000 +</u> |                | 262 | 3,127         | <u>15,140</u> | 5,032         | River Between<br>Two Mountains |
| 7              | 8               |                | 36  | <u>40,178</u> | 593           | 3,595         | Wrigley                        |
| 8              | <u>24,000 +</u> |                | 280 | 7,219         | <u>5,558</u>  | 1,997         | Ochre R.                       |
| 9              | <u>3,000 +</u>  |                | 38  | 4,802         | 13,721        | 1,485         | Johnson R.                     |
| 10             | <u>985 +</u>    |                | 69  | <u>89,069</u> | <u>2,156</u>  | 1,020         | Blackwater R.                  |
| 11             | <u>18,767 +</u> |                | 549 | 6,340         | <u>2,983</u>  | <u>2,900</u>  | Saline R.                      |
| 12             | <u>10,000 +</u> |                | 60  | <u>31,068</u> | 2,800         | 4,465         | Little Smith<br>Creek          |
| 13             |                 |                | 252 | 6,696         | 584           | <u>6,415</u>  | Old Fort Point                 |
| 14             | <u>4,442 +</u>  | 305            | 130 | 2,672         | 2,396         | 1,770         | Fort Norman                    |
| 15             | <u>7,000 +</u>  | 2,300          | 246 | 4,216         | 1,416         | 100           | Vermilion Creek                |
| 16             | 8               | 1,305          | 99  | 472           | 3,430         | 2,485         | Norman Wells                   |
| 17             | 8               | <u>1,000 +</u> | 262 | <u>3,925</u>  | 4,119         | <u>9,150</u>  | Mount Morrow                   |
| 18             | <u>9,000 +</u>  |                | 38  | <u>2,302</u>  | 1,541         | <u>300</u>    | Hanna R.                       |
| 19             | <u>9,144 +</u>  | 3,444          | 46  | 5,917         | 3,184         | 100           | Chick L.                       |
| 20             | 732             | 1,813          | 288 | 6,578         | 884           | 100           | Tsintu R.                      |
| 21             | 1               | 150            | 78  | <u>26,893</u> | <u>12,704</u> | <u>2,857</u>  | Fort Good Hope                 |

Compilation of surpluses and shortages  
by segment within approximately  
5 miles of MacKenzie Highway

Surpluses: 1,000 cubic yards  
Shortages: 1,000 cubic yards

| Segment No. | Category      |                |       |              |               |       | General Area                  |
|-------------|---------------|----------------|-------|--------------|---------------|-------|-------------------------------|
|             | R-1           | R-2            | 1     | 2            | 3             | 4     |                               |
| 22          | 69,394        | 481            | 260   | 6,262        | <u>9,224</u>  | 100   | Rampart Plateau               |
| 23          | <u>64,874</u> | <u>29,850</u>  | 29    | 3,575        | 2,937         | 3,655 | S. of Veltea L.               |
| 24          |               |                | 536   | <u>5,585</u> | 31,471        |       |                               |
| 25          |               | <u>19,965</u>  | 12    | <u>6,579</u> | 7,433         | 100   |                               |
| 26          | 1             | <u>59,318</u>  | 2,008 | 8,105        | <u>13,028</u> | 7,225 | Thunder R.                    |
| 27          | 1             | <u>79,250</u>  | 18    | 4,915        | 240           | 100   | Travaillant L.                |
| 28          |               | <u>174,200</u> | 18    | 207          | 1,103         | 100   | Big Stone L.                  |
| 29          |               | <u>49,000</u>  | 2,000 | 9,219        | 744           | 2,125 | Wounded Bear L.               |
| 30          | 154           | <u>30,000</u>  | 11    | 2,918        | 109           | 2,975 | Dempster Highway<br>Junction  |
| 31          | 5,902         | <u>10,000</u>  | 320   | 6,451        | 5,616         | 3,727 | Inuvik                        |
| 32          |               |                | 8     | 366          | 366           | 100   | Noell L.                      |
| 33          |               |                | 104   | <u>7,019</u> | 2,388         | 100   |                               |
| 34          |               |                | 569   | <u>9,328</u> | <u>5,978</u>  | 100   | East Channel,<br>MacKenzie R. |
| 35          |               |                | 8     | 612          | 591           | 50    |                               |
| 36          |               |                | 239   | 1,946        | 4,437         | 100   | Arctic Red R                  |
| 37          |               |                | 26    | 809          | -1,860        | 50    | Fort McPherson                |
| 38          |               |                | 9     | 393          | <u>4,607</u>  | 100   | Dempster Highway              |
| 39          |               |                | 2,012 | 1,830        | 2,240         | 100   |                               |
| 40          |               |                | 4     | 569          | 1,400         | 100   | Mount Goodenough              |
| 41          |               |                | 13    | 393          | 393           | 100   | Aklavik                       |
| 42          |               |                | 525   | 2,690        | 1,465         | 100   |                               |

Compilation of surpluses and shortages  
by segment within approximately  
5 miles of MacKenzie Highway

Surpluses: 1,000 cubic yards  
Shortages: 1,000 cubic yards

| Segment<br>No. | Category |     |     |       |       |     | General<br>Area |
|----------------|----------|-----|-----|-------|-------|-----|-----------------|
|                | R-1      | R-2 | 1   | 2     | 3     | 4   |                 |
| 43             |          |     | 240 | 1,794 | 2,515 | 100 |                 |
| 44             |          |     | 131 | 501   | 153   | 100 | Martin R.       |
| 45             |          |     | 22  | 612   | 1,837 | 100 | Liard R.        |
| 46             |          |     | 197 | 2,056 | 612   | 100 | Goose L.        |

The following are some of the more important points brought out by the data assembled on the compilation sheets:

1. With the exception of occurrences of dolomitic limestone adjacent to Dolomite Lake immediately south of Inuvik there is a shortage of bedrock suitable for the manufacture of concrete aggregate (Category R-1) in the area extending north of Fort Good Hope to Tuktoyatuk and west to Fort McPherson. A surplus of this material is indicated throughout most of the area extending north from River Between Two Mountains to Fort Good Hope. Bedrock of this category does not occur between the community of Fort Simpson and River Between Two Mountains. However, the requirement in this area is not large and could be satisfied by hauling from sources about 4 miles north of River Between Two Mountains or possibly by developing small quarries in environmentally sensitive areas along the west edge of the 'B' zones of segments 4 and 5.

2. The demand for poorer quality bedrock (Category R-2) is centered in the region between the communities of Fort Norman and Inuvik. Large quantities are available southwest of Yeltea Lake (Segment No. 23) and south, west and east of Travaillant Lake (Segments Nos. 27, 28, 29 and 30). Most of the demand for this material in other segments in this region could be met by opening quarries available in areas not considered environmentally sensitive.

3. There were no deposits of unconsolidated granular material considered suitable for use as concrete aggregate (Category No. 1) identified throughout the entire region. It is believed, however, that some of the material in Category No. 2 could, with proper processing, be used as concrete aggregate.

4. The demand for category No. 2 granular material throughout the region is sufficiently great that it has resulted in shortages in most

segment areas. Both C.A.G.P.L. and the Department of Public Works have proposed to make extensive use of this material. Most of the category No. 2 material occurs in extensive glaciofluvial deposits (eskers, kame terraces) which contain a relatively high proportion of gravel. The category No. 2 deposits have seldom been classified as environmentally sensitive.

Segments in which one or more category No. 2 deposits are located usually have a surplus of material. Examples are segment No. 10 (Blackwater River area), segment No. 12 (Little Smith Creek area) and segment No. 21 (Hare Indian River area).

In areas where shortages of category No. 2 material exists it may be necessary to utilize category No. 3 material. As indicated in the accompanying tables there are some segments which have a shortage of No. 2 and a surplus of No. 3 material. Further field investigations may be necessary in areas where there are shortages of both types of material.

5. Shortages of category No. 3 granular material are common throughout the region with the exception of the area between Willowlake River and Saline River (segments Nos. 5, 6, 8, 9, 10 and 11), and in segments Nos. 21 and 22 (Fort Good Hope area) and segments Nos. 26 and 27 (Travaillant Lake area).

Category No. 3 granular material is finer-grained than the No. 2 material. It is more diversified in origin (glaciofluvial, glaciolacustrine and Recent alluvium), usually occurs at lower elevations and frequently occurs in environmentally sensitive deposits.

In some areas where shortages of No. 3 material occurs category No. 2 material could be used if available (segments No. 4, 7, 12, 17, 18 and 34). In other areas extensive deposits of category No. 3 material, which for various reasons were not examined by the consultants, have been indicated

by the Geological Survey of Canada. These deposits could be further investigated as could some of the deposits described as environmentally sensitive.

6. Surpluses of category No. 4 granular material in the form of aeolian deposits (dunes) consisting of fine-grained sand occur in segment No. 11 (Saline River area), No. 13 (north of Old Fort Point) and No. 17 (west of Mount Morrow) and as sandy lacustrine deposits in segment No. 1 near the community of Fort Simpson and segment No. 11 in the Saline River area. Shortages of this material occur throughout the remainder of the region. However, as in the case of category No. 3 material, there are large deposits located in environmentally sensitive areas which warrant further examination to determine the feasibility of developing them.

Bibliography

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17. Arctic Red River, N.W.T., Granular Materials Inventory, R.K.L. International Ltd. for I.A.N.D. (1973)

18. Fort McPherson, N.W.T., Granular Materials Inventory, R.K.L. International Ltd. for I.A.N.D. (1973)
19. Granular Materials maps and reports prepared by the Geological Survey of Canada for the 19 map-sheets described on pages 1 and 2 of this report are available on open file.