

Granular Resource Requirements for Proposed Mackenzie Valley Pipelines:

Technical Papers and Workshop Proceedings

**Sponsored by:
Northern Oil and Gas Action Program (NOGAP) Project A4:
Granular Resources Inventory and Management**

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June, 1993



SECTION 4.

TECHNICAL PANEL "B"

***REGIONAL BORROW DEPOSITS
INVENTORIES***

GRANULAR RESOURCE POTENTIAL: LOWER MACKENZIE VALLEY

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ABSTRACT

The study was centred on the Lower Mackenzie River Valley, between Richards Island in the north, and Norman Wells in the south. Six management areas were identified. The study was compiled from previous granular borrow studies in the area.

The study identified over 300 potential granular sources in the Lower Mackenzie Valley and provided a summary of all pertinent geological and geotechnical parameters for each source. An overall assessment of these sources has further identified 52 deposits that are excellent or good prospects by virtue of the quality of granular material that they contain (excluding those within the Inuvialuit Land Selection areas).

This study was conducted under contract No. OST85-00393 for Indian and Northern Affairs Canada (INAC). The terms of reference were as follows:

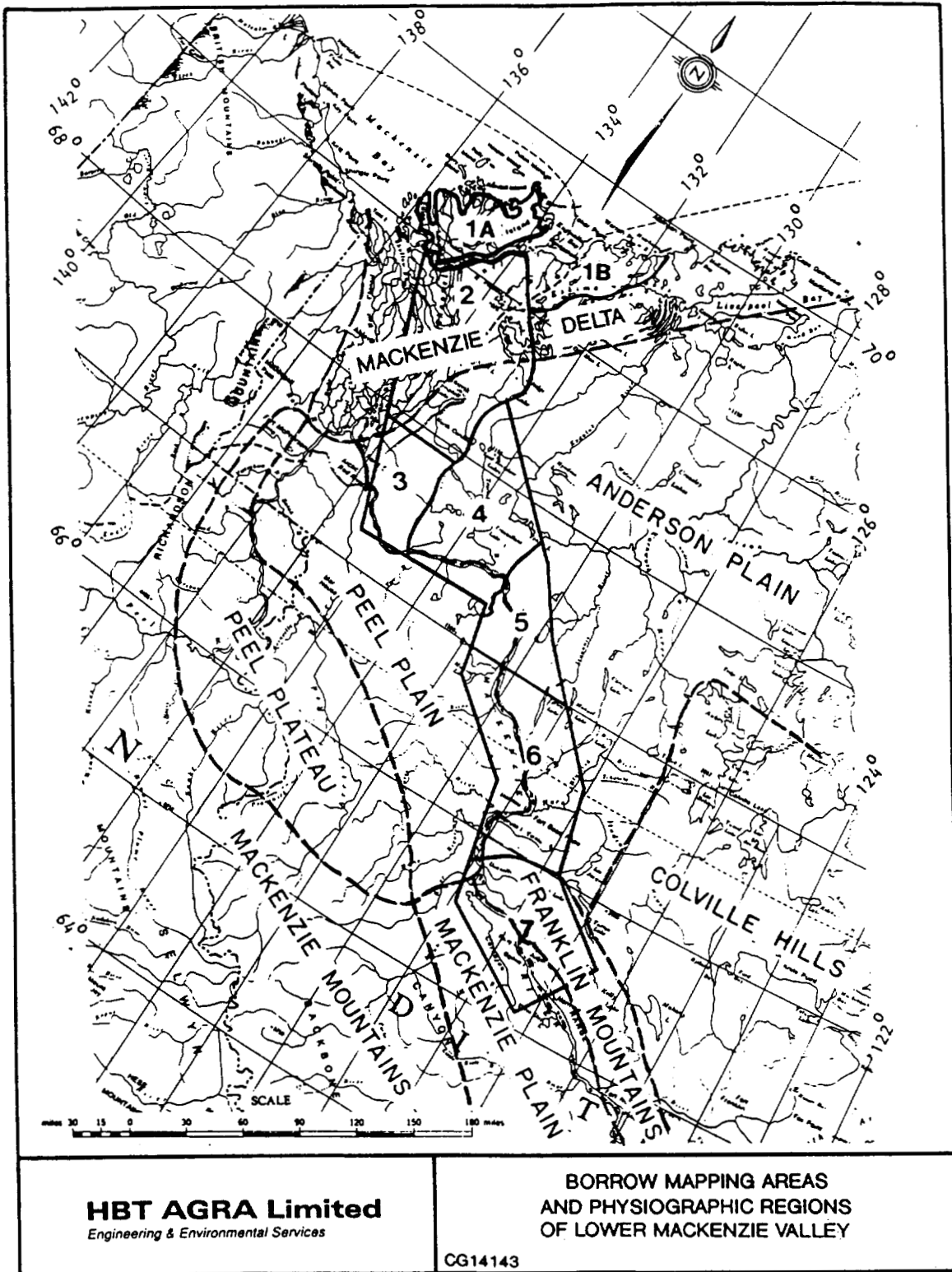
- conduct a review of published and unpublished geological and geotechnical literature pertinent to the distribution of surficial materials along the proposed Mackenzie Valley pipeline route;
- identify and delineate, on the basis of the literature review, knowledge of the area and selective airphoto interpretation, all potential granular resource deposits along the pipeline route;
- subdivide the pipeline corridor into several proposed borrow management areas based on physiographic regions, the regional supply/demand situation, and/or likely pipeline construction spreads;
- prepare preliminary estimates of proven, probable, and prospective quantities of various granular material types in each of the proposed borrow management areas;
- assign a priority rating for additional field testing of each borrow source based on estimated quantity and quality, anticipated ease of access, and anticipated level of local

borrow demand;

- identify any known physical/environmental constraints that are encountered in delineating the source;
- identify the extent of additional exploration work required to prove-up granular resource quantities and quality at selected high priority sites in each segment of the study area; and
- summarize the results of the study by preparing a table, or series of tables, for each proposed borrow management area indicating all sources identified, location, access, landform and generic origin of deposit, environmental concerns, quantity and quality of materials, additional work required, priority rating for field testing, and an overall assessment of the prospect.

Geological and geotechnical data was compiled from previous granular borrow studies in the Lower Mackenzie Valley. The sources of information included: Granular Material Inventories for DIAND, pipeline route investigations for industry, geotechnical investigations for the proposed northward extension of the Mackenzie Highway (Department of Public Works) and Geological Survey of Canada reports and maps. Figure 1 shows the numbered borrow mapping areas of the Lower Mackenzie Valley.

Figure 1. Borrow Mapping Areas of the Lower Mackenzie Valley



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The deposit outline and location of each potential borrow source were plotted on composite 1:250,000 scale map sheets. Where more than one study had been conducted on a particular deposit, the largest interpreted outline was plotted.

The sources of information were:

- EBA Engineering Conslts. (1973, 1973, 1976)
- Inglis (1976)
- Klohn-Leonoff Consultants (1974)
- Lawrence *et al.* (1972a, 1972b, 1973))
- NES (1974, 1976)
- Pemcan Services (n.d.)
- PWC (1975, 1976, 1981)
- Owen (1985)
- Ripley, Klohn and Leonoff (1973a, 1973b)
- Techman (1976)

Each potential borrow source was identified with a number which defines the following:

- i) the borrow management area in which the source occurs;
- ii) the source number; and,
- iii) the class of material which occurs in the source (in parentheses).

The borrow resource management areas were as follows:

<u>Area</u>	<u>Description</u>
1	Richards Island <ul style="list-style-type: none"> ● outside scope of study ● separate study by Hardy BBT Ltd.
2	Inuvik - Noel Lake <ul style="list-style-type: none"> ● Mackenzie Delta and Anderson Plain Physiographic Subdivisions ● Inuvialuit Land Area
3	Arctic Red River - Rengleng River <ul style="list-style-type: none"> ● Anderson Plain and Peel Plain Physiographic Subdivisions
4	Travaillant Lake <ul style="list-style-type: none"> ● Anderson Plain and Peel Plain Physiographic Subdivisions

<u>Area</u>	<u>Description</u>
5	Little Chicago - Tutsieta Lake <ul style="list-style-type: none"> ● Anderson Plain and Peel Plain Physiographic Subdivisions
6	Fort Good Hope - Teida River, Loon River, Hare Indian River <ul style="list-style-type: none"> ● Anderson Plain and Peel Plain Physiographic Subdivisions
7	Norman Wells <ul style="list-style-type: none"> ● Franklin Mountains, Peel Plain and Mackenzie Plain Physiographic Subdivisions

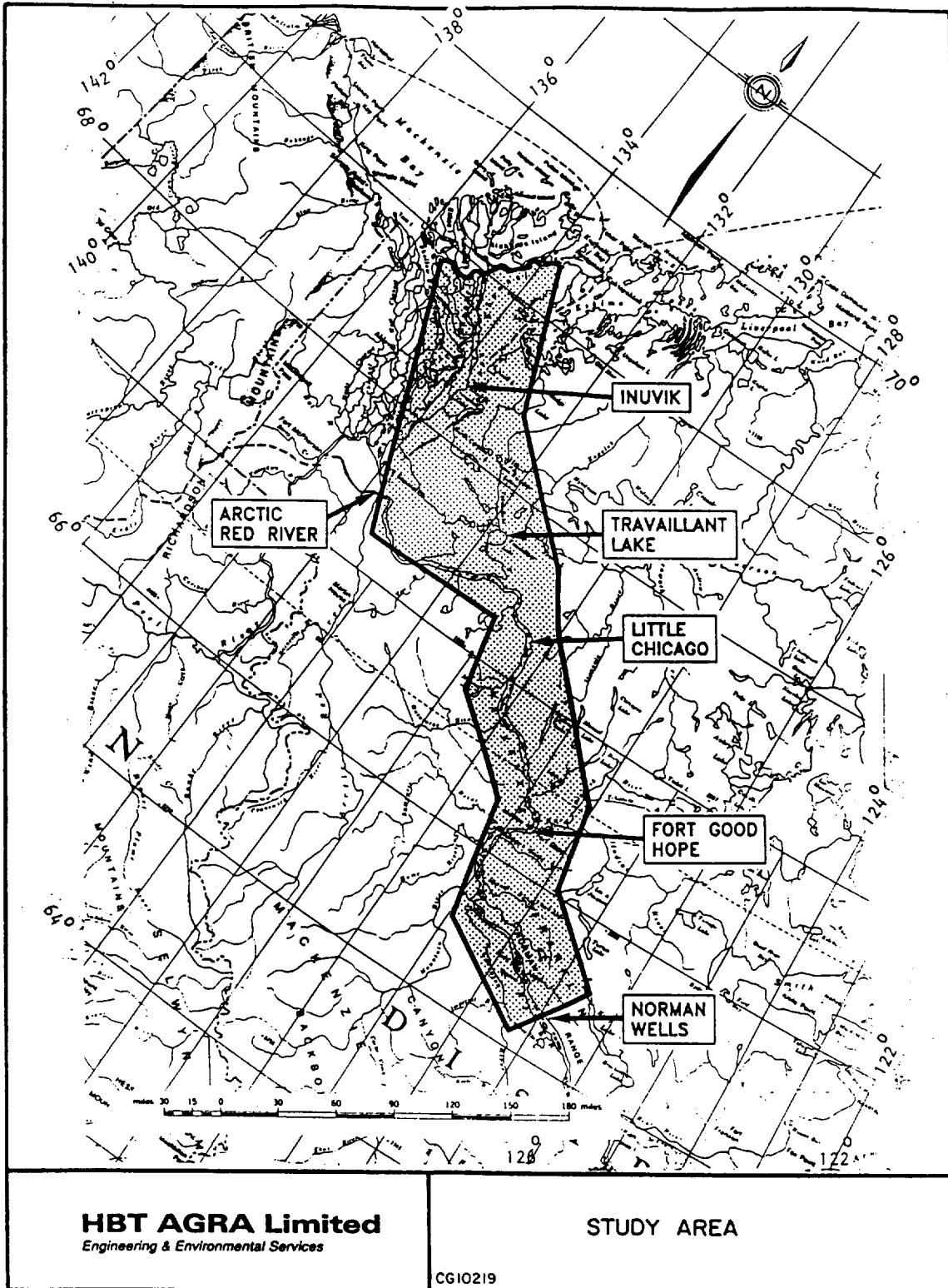
The resources were classified according to the following system, developed by DIAND:

Class 1	Excellent <ul style="list-style-type: none"> ● suitable for concrete aggregate with minimal processing
Class 2	Good <ul style="list-style-type: none"> ● well-graded sands and gravels ● potential silt or deleterious content ● good quality embankment fill
Class 3	Fair <ul style="list-style-type: none"> ● poorly-graded sands and gravels ● fair quality general fill
Class 4	Poor <ul style="list-style-type: none"> ● fine- or poorly-graded sands ● minor gravel ● generally unsuitable for construction
NG	Non-Granular <ul style="list-style-type: none"> ● fine-grained ● bedrock

The names and general spatial limits of Management Areas 2 to 7 are shown in Figure 2.

The granular resource potential for each Management Area is summarized in the series of eight tables following Figure 2. Only Class 1 to 3 prospects are indicated in the Management Area tables, with estimated volumes tabulated for proven, probable and prospective sources.

Figure 2. Resource Management Areas: Lower Mackenzie Valley



Management Area 2 (Inuvik - Noel Lake)				
Class	Proven	Probable	Prospective	Details
1	1.4	4	12	68 potential sources
2	15.3	59	173	2 excellent
3	33.5	295	1248	9 good
				33 favourable
				23 unsuitable

Management Area 3 (Arctic Red River)				
Class	Proven	Probable	Prospective	Details
1	0	0	0	23 potential sources
2	0	50	0	0 excellent
3	0.27	6.4	7.7	0 good
				9 favourable
				14 unsuitable

Management Area 4 (Travaillant Lake)				
Class	Proven	Probable	Prospective	Details
1	0	0	0	112 potential sources
2	5.5	80	175	0 excellent
3	5.8	145	534	18 good
				63 favourable
				31 unsuitable

Management Area 5 (Little Chicago)				
Class	Proven	Probable	Prospective	Details
1	0	0	0	47 potential sources
2	12.3	98	207	0 excellent
3	3.7	146	390	11 good
				30 favourable
				6 unsuitable

Note: All values are estimated total volumes ($\times 10^6 \text{ m}^3$)

Management Area 6 (Fort Good Hope)				
Class	Proven	Probable	Prospective	Details
1	0	0	0	92 potential sources
2	2.8	17	66	1 excellent
3	3.5	91	418	13 good
				47 favourable
				31 unsuitable

Management Area 7 (Norman Wells)				
Class	Proven	Probable	Prospective	Details
1	0	0	0	52 potential sources
2	4.6	19	34	0 excellent
3	2.2	30	95	4 good
				26 favourable
				23 unsuitable

Summary - All Borrow Sources				
Class	Proven	Probable	Prospective	Details
1	1.4	4	12	
2	40.5	273	709	
3	48.9	713	2693	

Summary - Excellent/Good Borrow Sources				
Class	Proven	Probable	Prospective	Details
1	1	3	11	
2	32.5	247	590	
3	19.2	118	303	

Note: All values are estimated total volumes (x 10⁶ m³)

Table 1. Projected Granular Material Demand: Lower Mackenzie Valley Communities

Community	REQUIRED VOLUME (m ³)					Total
	1986	1987	1988	1989	1990	
Arctic Red River	4,500	22,900	5,450	16,850	—	49,700
Fort Good Hope	900	200	650	—	2,650	4,400

Source: Government of the Northwest Territories, 5 Year Capital Plan.

Table 2. Granular Material Forecast: Lower Mackenzie Valley Communities

Community/ Material Type	REQUIRED VOLUME (m ³)					5 Year Total
	1986	1987	1988	1989	1990	
ARCTIC RED RIVER						
Embankment	3,450	15,150	2,250	11,800	—	
Sub-base	350	800	1,400	—	—	
Base	500	4,500	1,300	3,400	—	
Surface Material	200	2,250	500	1,500	—	
Concrete	—	—	—	—	—	
Aggregate	—	—	—	—	—	
Riprap	—	200	—	—	—	
Totals:	4,500	22,900	5,450	16,850		49,700
FORT GOOD HOPE						
Embankment	—	—	—	—	—	
Sub-base	300	—	450	—	1,050	
Base	600	200	200	—	800	
Surface Material	—	—	—	—	800	
Concrete	—	—	—	—	—	
Aggregate	—	—	—	—	—	
Riprap	—	—	—	—	—	
Totals:	900	200	650		2,650	4,400

In order to establish the granular demands, enquiries were made of the Government of the Northwest Territories in Yellowknife, plus the towns of Inuvik and Norman Wells. The data obtained is presented in the preceding two tables. Table 1 presents total granular materials demands for two Lower Mackenzie Valley communities (Arctic Red River and Fort Good Hope) and Table 2 includes a breakdown of the requirement for various material types (material classes) where these were available.

The granular material requirements for a future pipeline project between the Beaufort Sea and Norman Wells may be estimated for each of the Borrow Management Areas. According to various industry and government sources, two extremes of possible material requirements are 500 m³/km and 4,000 m³/km, and using these upper and lower bound values the following pipeline granular resource volume requirements for the Lower Mackenzie Valley region may be projected (Table 3).

Table 3. Pipeline Granular Resource Demands: Lower Mackenzie Valley

Management Area	Approximate Pipeline Length (km)	Total Granular Material Requirements, m ³	
		500 m ³ /km	4,000 m ³ /km
2	130	65,000	520,000
3	—	—	—
4	125	62,500	500,000
5	90	45,000	360,000
6	140	70,000	560,000
7	120	60,000	480,000