

# **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**

**NOGAP Project Manager:  
R.J. Gowan  
Department of Indian Affairs  
and Northern Development (DIAND)**

**Prepared by:  
R.J. Mahnic and T.J. Fujino  
Stanley Associates Engineering Ltd.**

**June, 1993**



---

**SECTION 5.**  
**TECHNICAL PANEL "C"**  
**TYPICAL BORROW MATERIALS USAGE**

# HISTORICAL BORROW DEMAND FORECASTS: MACKENZIE VALLEY CORRIDOR

T. Jack Fujino, P.Eng.

*Vice-President, Northern Region  
Stanley Associates Engineering Ltd., Edmonton, Alberta*

---

## ABSTRACT

Prior to the late 1960s, resource development in the Arctic had not gained any momentum and the demands for granular materials for community gravel airstrips, community infrastructure projects, small isolated mining projects, and winter access roads were easily met. There were few competing needs for the granular resources in the Mackenzie River Valley and Delta areas.

In the early 1970s, with the pending world oil shortages, major resource development and transportation projects were conceived for the Mackenzie Valley and detailed feasibility investigations were undertaken. In view of the extremely disturbance sensitive permafrost terrain in the Arctic, each of these industrial megaprojects required substantive quantities of granular materials to support major engineered facilities. Significant demands for granular materials were identified for oil and gas pipelines, oil and gas processing plants and related facilities, Beaufort Sea developments, the extension of the Mackenzie Highway system, deep seaports on the Beaufort coast, and extensive infrastructure upgrading in Mackenzie Valley communities. The demands for granular materials in the Mackenzie Valley came to a sudden and abrupt halt in the early to mid-1980s with the drop in world oil prices and postponement of megaproject activity in the region.

---

## Introduction

The demand for granular resources in the Mackenzie Valley, prior to the 1960s, was quite modest. The general requirements were for local community needs, for minor upgrading of winter access roads, and for occasional utilization for exploratory oil and gas seismic activities. After reaching peak demand forecasts in the late 1970s and early 1980s, because of the numerous hydrocarbon development projects for both onshore and offshore facilities, the need for extensive quantities of granular material appears to have diminished. Current demands for granular material resources are now centered around the specific needs of the individual northern communities.

Extensive information has been collected on borrow materials by northern frontier petroleum operators, oil and gas pipeline companies and government agencies. Under the Northern Oil and Gas Action Program (NOGAP) Granular Resources Inventory and Management Project, most of the existing information has been compiled and catalogued into a series of computer databases which have been linked with a digital mapping system. Therefore, the location,

accessibility, quality, available and recoverable quantities, development constraints and ownership of these numerous granular material resources in the Mackenzie Valley corridor has been catalogued in detail and is readily retrievable.

Historical demand forecasts for granular materials are not as readily accessible nor available in the public information domain. The various demand forecasts developed by pipeline operators and hydrocarbon developers during the application phase for these developments are difficult to retrieve because most records have been archived. The collective and cooperative information shared at this workshop will be used to update this historical granular resource information base.

This presentation of the historical demand forecast information focusses on the following:

- a) Oil and gas pipeline projects.
- b) Onshore gas processing facilities.
- c) Beaufort Sea offshore oil and gas developments.
- d) Major transportation facilities.

Community documents and reports used as reference material in the preparation of this presentation are listed in the bibliography section at the conclusion of this paper.

### Historical Demand Scenarios

Neither a detailed and comprehensive examination of existing and available industry and government documents and records, nor the integration of comments from the numerous individuals who had participated in the development and planning of the major energy and infrastructure projects in the Mackenzie Valley Corridor and Beaufort Sea was possible within the constraints of this review. Based on personal knowledge and past involvement in energy

resource development projects in the late 1970s and early 1980s, the historical demand forecasts for granular materials in the Mackenzie Valley have been extrapolated.

A summary of the "Historical Demand Forecasts" for Mackenzie Valley granular resources are presented in Tables 1 and 2. Table 1 shows, where information was available, the total of proposed pipeline and oil and gas processing facility granular requirements.

The most detailed studies of "potential demand" for granular material resources were carried out by the Department of Public Works Canada and Canadian Arctic Gas Pipeline Limited during the planning process for the Mackenzie Highway and the Arctic

**Table 1. Historical Granular Demand Forecasts: Private Industry Developments**

<b>MACKENZIE VALLEY CORRIDOR                      HISTORICAL DEMAND FORECASTS                      PRIVATE INDUSTRY DEVELOPMENTS                      (,000 Cubic Metres)</b>			
TYPE OF DEVELOPMENT	ORGANIZATION	HISTORICAL DEMAND	CURRENT DEMAND
<b>1. PIPELINE PROJECTS</b>			
ALASKA GAS PIPELINE	C.A.G.P.L.	27,743	
ARCTIC ISL. GAS P/L	POLAR GAS	27,743	
MACKENZIE DELTA OIL P/L	BEAUFORT DELTA GRP.	47,163	
NORMAN WELLS OIL P/L	INTERPROVINCIAL P/L		
<b>2. OIL &amp; GAS PROCESSING FACILITIES</b>			
TAGLU GAS PLANT	ESSO RESOURCES CANAD.	1,500	
NIGLINTGAK GAS PLANT	SHELL CANADA RESOURCES		
PARSONS LAKE GAS PLANT	GULF CANADA RESOURCES		
NORMAN WELLS REFINERY	IMPERIAL OIL CANADA		
<b>3. BEAUFORT SEA OFFSHORE DEVELOPMENTS</b>			
ARTIFICIAL ISLANDS	DOME/ESSO/GULF		
STAGING AREAS	DOME/ESSO/GULF		
<b>TOTAL</b>		<b>102,649</b>	

Table 2. Historical Granular Demand Forecasts: Public Sector Developments

<b>MACKENZIE VALLEY CORRIDOR</b> <b>HISTORICAL DEMAND FORECASTS</b> <b>PUBLIC SECTOR DEVELOPMENTS</b> (,000 Cubic Metres)			
TYPE OF DEVELOPMENT	ORGANIZATION	HISTORICAL DEMAND	CURRENT DEMAND
<b>1. COMMUNITIES</b>			
INUVIK	INUIVALUIT		178
AKLAVIK	INUIVALUIT		221
TUKTOYAKTUK	INUIVALUIT		316
FORT MacPHERSON	INUIVALUIT		
ARCTIC RED RIVER	INUIVALUIT		
FORT GOOD HOPE			
NORMAN WELLS			
FORT NORMAN			
FORT FRANKLIN			
WRIGLEY			
FORT SIMPSON			
ENTERPRISE			
FORT RESOLUTION			
HAY RIVER			
<b>2. TRANSPORTATION INFRASTRUCTURE</b>			
MACKENZIE HIGHWAY	PUBLIC WORKS CANADA	41,557	
MACKENZIE VALLEY RAILWAY	CNR - CPR	246,041	
DEMPSTER HIGHWAY	PUBLIC WORKS CANADA	330	
LIARD HIGHWAY			
<b>3. MISCELLANEOUS DEMANDS</b>			
HYDROELECTRIC DEVELOPMENTS			
OTHER (1975 CUMULATIVE)		117,742	907
<b>TOTAL</b>		<b>405,670</b>	<b>1,622</b>

Gas Pipeline projects. Estimated quantities for the, then, proposed "Mackenzie Valley Railway Project" were assembled by the Mackenzie Highway Granular Materials Working Group.

Detailed quantities for historical demand forecasts were not available to the author for the Beaufort Sea Offshore developments. The artificial drilling islands for exploration of oil and gas reserves in the shallow

near shore locations of the Beaufort Sea have consumed considerable quantities of identified and available granular material reserves. These reserves, located on Richards Island, were identified during the development of traditional borrow pit operations and by the dredging of suitable coarse grained granular materials from shallow waters in and around Richards Island. Quantities actually used and demand forecasts for future needs of these offshore energy resource

developments may be compiled through workshop sessions with industry participants at this granular materials workshop.

Concurrent with the studies and investigations being carried out by industry for the demands of these energy resource development projects, the Federal Government had initiated planning and feasibility studies into the development of transportation infrastructure projects. The Mackenzie Highway project, Dempster Highway project, and the Mackenzie Railway project were the three major projects under consideration. The Mackenzie Railway project was envisaged as the single largest consumer of granular materials, if the project were to proceed.

The historical demands for the granular material needs for the various communities in the Mackenzie Valley Corridor were, essentially, demands classified as "Other" in the 1975 Mackenzie Valley Granular Materials Working Group. Subsequently, as part of the land claim settlement process in the Northwest Territories, additional studies and evaluations for granular material requirements for each community in the Mackenzie Valley have been undertaken for Indian and Northern Affairs Canada (INAC). The historical and current demands for community and public sector developments, where available, are shown in Table 2.

### Summary and Conclusions

The total historical demands for granular material resources for private industry developments were in the order of 104 million cubic metres. The majority of the private sector demands were related to "Pipeline Projects", totalling 102.5 million cubic metres (shown in Table 1). Current demands of granular materials for private industry developments remain uncertain, either in terms of quantities or schedules.

The total historical demands for public sector developments were in the order of 405.6 million cubic metres. Of this total, in excess of 246 million cubic metres were identified as the potential requirement of the Mackenzie Valley Railway (Table 2). Current demands of granular materials for public sector developments are about 1.6 million cubic metres.

### Bibliography

Bennett, Lorne (1988) Granular Resources Database Manual - Territorial Land Claims Area. Ref. LBC88LMV. Copy 15. Doc. 280183.

Earth and Ocean Research Ltd. (1991) Atlas of Granular Resource Information - Phase II. Ref. EOR91WA. Copy 0. Doc. 280158.

EBA Engineering Consultants Ltd. (1976) Geotechnical Evaluation of Granular Material, Mackenzie Delta Area, 1976. Ref. EBA76MD. Copy 22. Doc. 22476.

EBA Engineering Consultants Ltd. (1986) Granular Resource Evaluation - Richards Island, NWT (NOGAP A4-07). Ref. EBA86RI. Copy 25. Doc. 280061.

EBA Engineering Consultants Ltd. (1987) Inuvialuit Settlement Sand and Gravel Inventory and Recommendations for Development: Aklavik, NWT (IFAIP 7.1a). Ref. EBA87IIA. Copy 49. Doc. 280250.

EBA Engineering Consultants Ltd. (1987) Inuvialuit Settlement Sand and Gravel Inventory and Recommendations for Development: Inuvik, NWT (IFAIP 7.1c). Ref. EBA87III. Copy 46. Doc. 280241.

EBA Engineering Consultants Ltd. (1987) Inuvialuit Settlement Sand and Gravel Inventory and Recommendations for Development: Tuktoyaktuk, NWT (IFAIP 7.1f). Ref. EBA87IIT. Copy 48. Doc. 280249.

Golder Associates (Western Canada) Ltd. (1987) Beaufort Region Quarry Rock Study (NOGAP A4-12). Ref. GAL87QR1. Copy 25. Doc. 280110.

Golder Associates (Western Canada) Ltd. (1988) Beaufort Region Quarry Rock Study: Supplementary Report (NOGAP A4-12). Ref. GAL87QR2. Copy 23. Doc. 280098.

Hardy BBT Limited (1991) Preliminary Granular Resources Demand: Mackenzie Delta Region. Ref. HBT91MDD. Copy 20. Doc. 0.

Hardy BBT Limited (1991) Evaluation of Granular Resource Potential: Mackenzie Delta Region. Ref. HBT91MDS. Copy 20. Doc. 0.

Inuvialuit Development Corporation (1988) Digitization of Granular Resource Data: Inuvialuit Settlement Area (IFAIP 7.4). Ref.

IDC88ID. Copy 3. Doc. 280258.

Klohn Leonoff Ltd. (1988) Western Beaufort Region  
Concrete Aggregate Study (NOGAP A4-09).  
Ref. KLL88CA. Copy 13. Doc. 280076.

Mackenzie Highway Granular Materials Working  
Group (1975) Granular Materials Inventory:  
Mackenzie River Valley, NWT. Ref.  
MHG75MH. Copy 2. Doc. 115.

Owen, E.B. (1974) Potential Demand for Granular  
Materials from the Pits and Quarries  
proposed by Canadian Arctic Gas Pipeline  
Limited in its Application. Ref.  
OwenEB74AG. Copy -99. Doc. -99999.

Owen, E.B. (1974) Summary of Granular Materials-  
Mackenzie District, NWT. Ref.  
OwenEB74DM. Copy -99. Doc. -99999.