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PLAN FOR THE RESERVATION AND DEVELOPMENT OF GRANULAR MATERIALS IN THE VICINITY OF PAULATUK, N.W.T.

Prepared For:

INDIAN AND NORTHERN AFFAIRS CANADA, OTTAWA

Prepared By:

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This project was a joint venture of Hardy BBT Limited,
Calgary, Alberta and Avati Associates,
Yellowknife, N.W.T.

DECEMBER, 1988

CE00992/P

ACKNOWLEDGEMENTS

This plan was produced in association with the Paulatuk Land Use Planning Working Group. Without their help, it could not have been developed. They are:

Noel Green	Paulatuk Harvesting Study
Peter Green	Paulatuk Hunters and Trappers Committee
Adam Ruben	Hamlet
Albert Ruben	Hamlet
Edward Ruben	Elders
Pat Ruben	Paulatuk Community Corporation

The following individuals/organizations were also consulted:

Stewart Embellton	Superintendent Community Airports, Airports Authority Group, Transport Canada, Edmonton
Leslie Huget	Senior Land Officer, Lands Division, Municipal and Community Affairs, GNWT, Yellowknife
Bill Jaycock	Project Leader, Airports Authority Group, Transport Canada, Edmonton
Kevin McCormick	Habitat Biologist, Canadian Wildlife Service, Yellowknife

SUMMARY OF RECOMMENDATIONS

This plan was produced as part of the implementation of the Inuvialuit Final Agreement. It recommends a strategy to reserve and develop supplies of sand and gravel on Inuvialuit lands in the vicinity of Paulatuk, N.W.T. Its goals are the reservation of adequate supplies of sand and gravel for the community's future needs, and the siting and management of these reserves so as to minimize the environmental and social impacts of their development. The plan was developed with members of the Paulatuk Land Use Planning Working Group. It is based on existing scientific and community information, and will be revised at least every 5 years. The plan assesses three potential sources of sand and gravel: Source 23, 2.5 km south of the community (see accompanying map, Figure 5), Source 12, north of Rat Lake, 10.5 km southeast of the community, and Source 22, immediately west of the community.

The recommendations of the plan are:

. Sources 23 and 12 should be investigated with a view to their future reservation. Source 23 is the optimal source for the community in terms of accessibility and the minimization of environmental impacts. Existing information suggests that the source could contain large volumes of medium quality granular materials. If this is proven to be the case, or if higher quality materials are discovered at the source, then it should be reserved for public community and Inuvialuit use.

. Existing information on Source 12 (Rat Lake) suggests that it may be a source of higher quality materials. Because of the greater cost of developing this source, and minor concerns with potential effects on the Bluenose Caribou Herd, it should be reserved and developed only if Source 23 proves to be lacking in the range of materials, particularly the higher quality materials that the community will require in the future.

- Development of Source 12 should be timed and executed so as to prevent any interference with the migrations and calving and post-calving stages of the Bluenose Herd.

- In order to minimize the number of pits in the Paulatuk area, granular development should be confined to the above sources until such time as they can no longer meet community and/or Inuvialuit requirements.

- Source 22 immediately west of the community should not be developed. The source likely contains poor quality, ice-rich materials. Furthermore, the community is concerned that its development could affect coastal stability and interfere with access across the source to the area southwest of the community.

- A granular development/environmental protection plan should be produced for each of the reserved sources prior to undertaking extensive excavation. It should lay out a 5-to-10 year strategy for the orderly development of each source (including access), so as to minimize the environmental and visual effects of the development and maximize the amount of materials recovered from each source. It should lay out procedures for the proper development and restoration of pits and it should integrate the development of a source with other planning initiatives on the part of the community. In the case of Source 23, the plan should integrate the development of the site with the relocation of the airstrip, the solid waste disposal site, and the water supply lake.

- The extraction and use of materials should be managed to minimize high grading (the use of better quality materials than are necessary for a job). This will be particularly important should higher quality materials prove to be in shorter supply in Paulatuk than is presently anticipated.

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INTRODUCTION

In March 1988, as part of the implementation of the Inuvialuit Final Agreement, Indian and Northern Affairs Canada (INAC) contracted Hardy BBT Limited of Calgary, Alberta and Thomas Nesbitt and Associates (now Avati Associates) of Yellowknife, N.W.T. to carry out the present study. The INAC departmental representative for the project was R.J. Gowan, Geotechnical Advisor, Land Management Division.

The terms of reference of the study were:

(1) To determine the potential environmental, cultural, and economic implications of the possible future exploitation of selected granular borrow deposits within and adjacent to Inuvialuit lands

(2) To identify and evaluate other community concerns

(3) To prepare recommendations on the establishment of reserves of granular borrow for public community needs

These objectives were met through the preparation of a plan outlining a strategy for the reservation and development of granular materials around each of the six Inuvialuit communities (Aklavik, Holman, Inuvik, Paulatuk, Sachs Harbour, and Tuktoyaktuk). The Paulatuk plan is divided into four parts:

Part 1 sets out the scope of the study: why it was undertaken, its objectives, how it was carried out, and how it is intended to be used. It also defines the technical terms used in the plan and outlines the potential impacts of granular development.

Part 2 describes the goals of the plan.

Part 3 presents the factual information upon which the plan is based and assesses different plan options.

Part 4 presents the plan recommendations.

PART 1: SCOPE OF THE STUDY

1.1 REASONS FOR UNDERTAKING THE STUDY

1.1.1 Requirements of the Inuvialuit Final Agreement

With the signing of the Inuvialuit Final Agreement (IFA) and the enactment and proclamation of the Western Arctic (Inuvialuit) Claims Settlement Act in 1984, the Government of Canada granted Inuvialuit title to substantial tracts of land in the vicinity of each of the six Inuvialuit communities. These lands, shown in Figure 1, are commonly known as Inuvialuit 7(1)(a) and 7(1)(b) lands, in reference to the sections of the Final Agreement where their interests are described. They are administered by the Inuvialuit Land Administration (ILA) and the Inuvialuit Land Administration Commission (ILAC).

In the Paulatuk area, 7(1)(a) lands cover approximately 1830 square kilometres (707 square miles), and directly surround the lands administered by the Hamlet. On these lands, Inuvialuit own both surface and subsurface rights. On 7(1)(b) lands, which cover approximately 12 600 square kilometres (4,864 square miles) in the general vicinity of the community, the Inuvialuit own surface rights only. Granular materials (sand and gravel) are surface resources. The Inuvialuit Final Agreement thus transferred ownership of most of the accessible sources of sand and gravel in the Paulatuk area, and indeed throughout the Western Arctic region, to the Inuvialuit. Because of this, and because of the general scarcity of suitable sand and gravel throughout the region, the Final Agreement also attached several

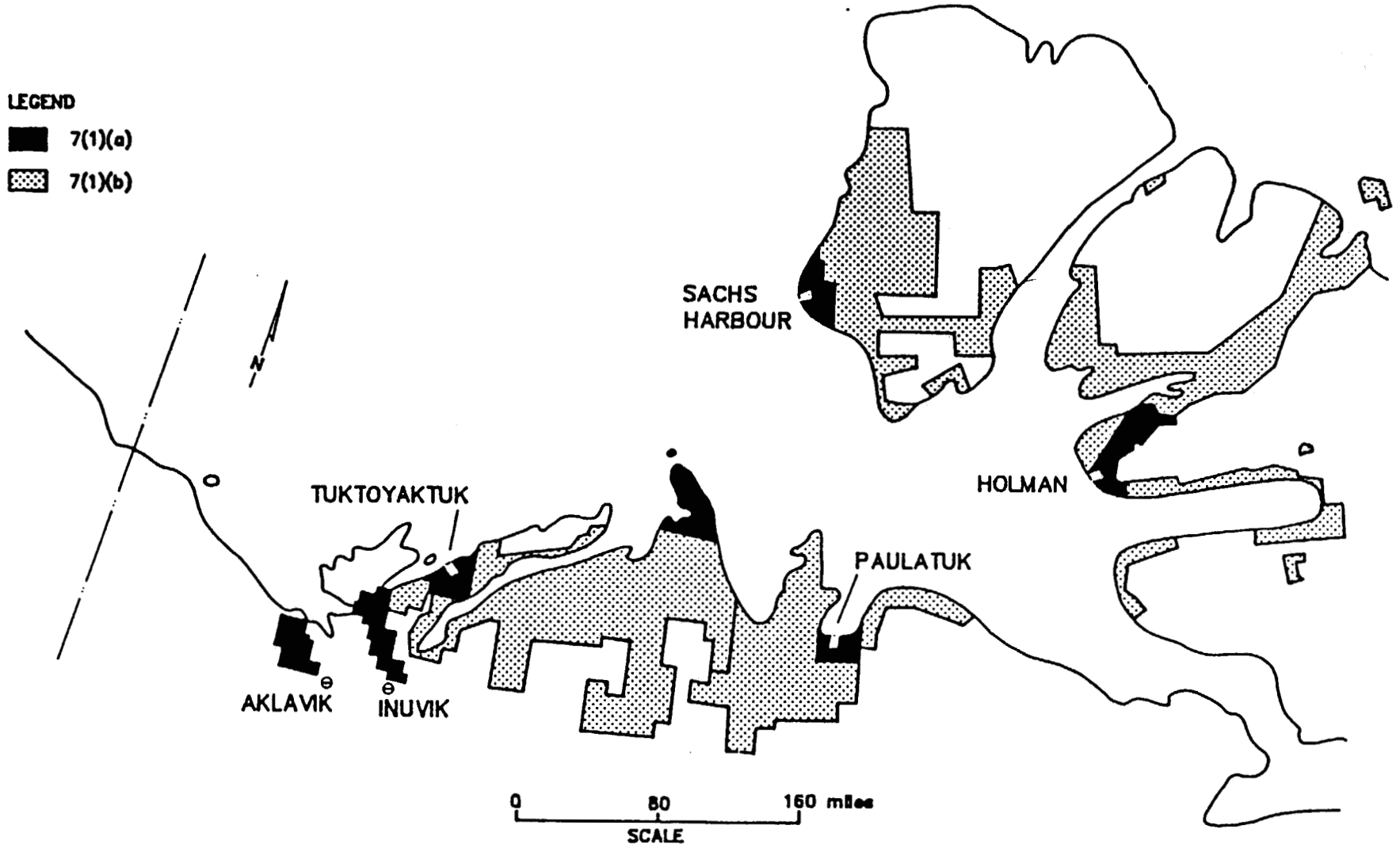

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FIGURE 1. INUVIALUIT LANDS LOCATION PLAN

conditions to Inuvialuit ownership and management of these resources.

The Agreement regulates the price which can be charged for sand and gravel. It also requires that the Inuvialuit establish and maintain reserves of sand and gravel on Inuvialuit lands. In the establishment of these reserves, the first priority is that adequate supplies of suitable materials be set aside to meet public community needs (IFA, Section 7(27)). These needs include granular requirements for the community's roads and airfields, community arenas, firehalls, and sewage lagoons. Reserves are also to be established, as a second priority, for the private and corporate needs of the Inuvialuit (Section 7(28)). Such needs include projects advocated and owned by the Inuvialuit, for example the proposed Tuktoyaktuk gas gathering system. As a third priority, sand and gravel are to be made available for any project approved by the appropriate government agencies (Section 7(29)). Examples of this sort of granular requirement include pads for oil rigs and rip rap for erosion protection on artificial islands.

This study focuses primarily on the establishment of granular reserves to meet Paulatuk's public community needs (the first priority above). The Final Agreement requires that the reserves be based upon reasonable 20-year forecasts of the volumes required from Inuvialuit lands. Reserves are to be of an appropriate quantity and quality to meet these forecasts, and are to be within reasonable transport distances of the communities. The demand forecasts upon which the reserves are based are to be

prepared jointly by the Inuvialuit and government. They are to be revised at least every 5 years.

1.1.2 Implementation

In order to implement the above-mentioned requirements of the Final Agreement, the Federal Government established a specific granular materials project as part of the IFA Implementation Program. This project, designated Task 7-Sand and Gravel Inventories, involves a four-phase process developed in consultation with the Territorial Government and the ILA.

(1) An analysis of the projected 20-year demand for sand and gravel and an inventory of potential sources to supply this demand was carried out by EBA Engineering Consultants Ltd. This study, completed in April, 1987, made recommendations on the development of specific sources of supply.

(2) The present study is designed to supplement the EBA information with environmental and socio-economic information, particularly from the community level. It is also designed to develop a plan, with community representatives and other affected parties, for the reservation and future development of granular materials for public community needs in each of the six Inuvialuit communities.

(3) The quality and/or quantity of materials at some of the recommended sources of supply will have to be confirmed by more-detailed site investigations. These investigations will be based on the recommendations of the communities.

(4) In order to assist the Inuvialuit with the preparation and implementation of granular resource development plans which can be managed at the local level, additional studies will be undertaken each year to 1994.

1.2 OBJECTIVES AND METHODS OF THE PRESENT STUDY

The ultimate objectives of the present study were:

(1) The identification of environmental, cultural, and economic concerns, particularly at the community level, associated with local granular resource development

(2) The development of a fair and reasonable plan which could be understood and managed at the local level

(3) The achievement of a consensus among the affected parties

In order to accomplish these ends, workshops of a full day's duration were carried out in each of the six Inuvialuit communities. The workshops were carried out primarily with members of the existing land use planning working group in each community. Other affected interests were also invited to participate.

The land use planning working groups were established in 1987 to provide each community with an ongoing land use planning capability, and a means of making recommendations on the use of lands surrounding the communities to the Beaufort/Delta Regional Planning Commission and the decision-making bodies at the community level. Each working group includes nominees from the community's Hunters and Trappers Committee, its Community Corporation, the Hamlet (or Town), the Elders, and other parties as deemed appropriate by community representatives.

The workshops supplemented the supply/demand information and recommendations produced in Phase 1 of the study (EBA 1987). They also identified potential economic, cultural, and environmental impacts of developing the sites identified in Phase I. The workshops were designed to

solicit community concerns and to allow the working groups to use the information in a planning context. They were facilitated by Tom Nesbitt, an environmental planning consultant who has worked extensively with the working groups in the past. Technical advice for the workshops was provided by Jim Howell, an environmental consultant and professional geologist.

Unless noted otherwise, the plan detailed in this report represents the consensus of the Paulatuk Workshop.

1.3 STATUS AND INTENDED USES OF THE PLAN

The conclusions of this report have the status of recommendations only. They are recommendations to INAC and the ILA/ILAC, the parties implementing the Inuvialuit Final Agreement and administering Crown and Inuvialuit lands respectively, and to the Hamlet and the GNWT as the administrators of Hamlet and Commissioner's Lands. The results will also be of interest to the various government departments and other granular resource users. Finally, the study can be considered a sectoral plan recommended to the Regional Land Use Planning Commission in the Beaufort/Delta region. As such, the conclusions of the study are subject to changes within the context of the larger planning exercise. Given the community basis of the plan, however, the authors do not expect fundamental changes to it.

1.4 TERMINOLOGY

Several terms describing the kinds of granular materials required by the communities and the confidence of volume estimates are used extensively throughout the plan. These terms are explained in this section.

1.4.1 Classification of Granular Resources

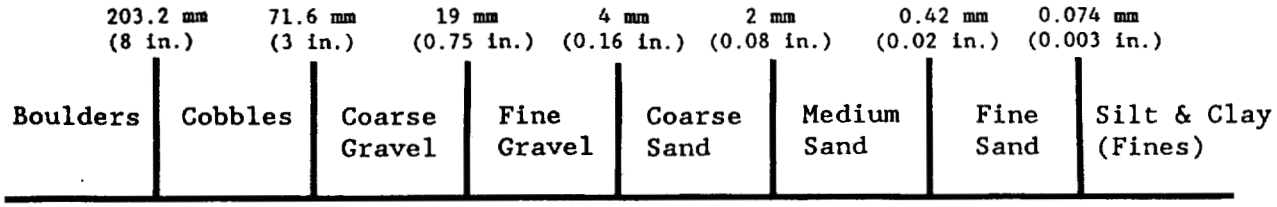
Granular resource supply and demand is discussed in terms of five classes of material:

Class 1 Excellent quality material
Class 2 Good quality material
Class 3 Fair quality material
Class 4 Poor quality material
Class 5 Bedrock, felsenmeer, and talus

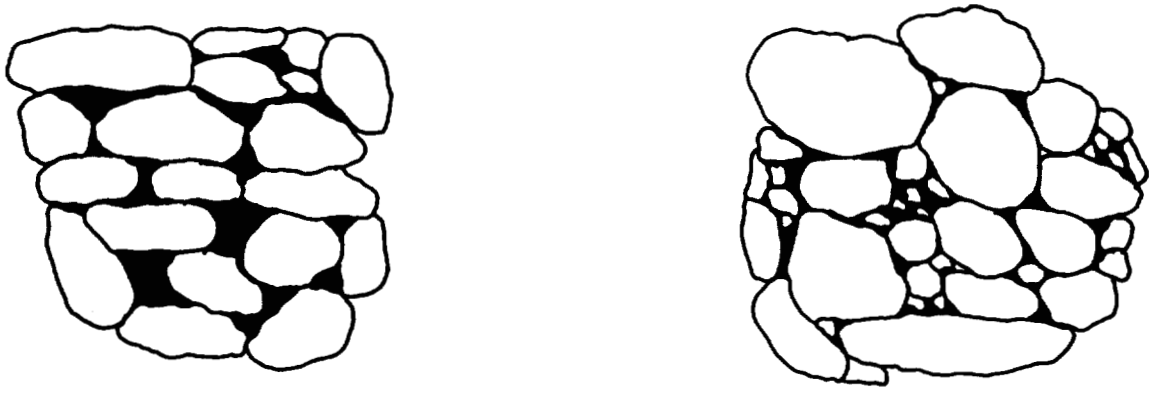
The first four classes are defined in terms of the gradation of the deposit. A brief discussion on gradation is necessary prior to describing these classes in more detail.

1.4.1.1 Gradation

The term gradation refers to the relative size of particles in a deposit. Granular resources can contain particles ranging in size from boulders through clay, as shown in Figure 2. Boulders and cobbles are usually undesirable in a granular deposit. They may be crushed to smaller sizes or discarded as waste. The gravel- and sand-sized particles are the more desirable components of a granular deposit. Silt- and clay-sized particles, also called fines, cannot be seen by the naked eye. These particles



2a. Particle size limits for gravel, sand, and fines. A well-graded granular deposit contains an equal amount of each gravel and sand size.



2b. Poorly-graded materials with all particles the same size or with a lack of certain particle sizes (left drawing) have more voids and are less stable than well-graded materials where the voids are filled by the smaller particle (right drawing).

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FIGURE 2. PARTICLE SIZE AND GRADATION

are undesirable in high proportions because they hold more water which, in the North, results in higher ice contents and a greater likelihood of frost heaving or thaw slumping.

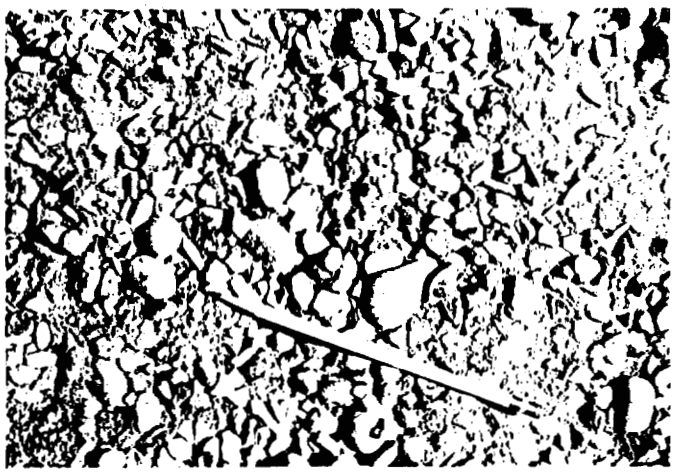
A well-graded granular deposit has an equal amount of each gravel and sand size and little or no fines. Deposits such as this are called "clean". A poorly-graded granular deposit has an excess of some particle sizes and a shortage or lack of others, or has nearly all particles the same size. Poorly-graded deposits can be processed to improve and upgrade their quality. Screening and washing can be used to remove undesirable particle sizes. Boulders and cobbles can be crushed to produce gravel and sand.

The importance of using well-graded materials for pads on which structures will be built is shown in Figure 2. With well-graded materials, the finer particles tend to fit between the coarse ones, reducing the amount of voids or empty spaces to a minimum and forming a strong pad. Pads formed of poorly-graded materials where many voids are present are more likely to shift when the weight of a structure is added.

1.4.1.2 Description of Granular Resource Classes

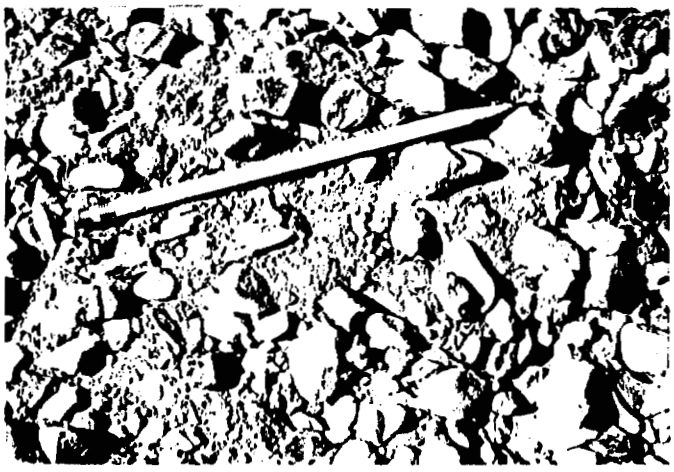
The five granular resource classes are defined below in terms of their gradation and recommended uses. Figures 3 and 4 show photographs of each class and examples of their use.

Class 1. Excellent quality material consisting of clean, well-graded, structurally-sound sands and gravels suitable



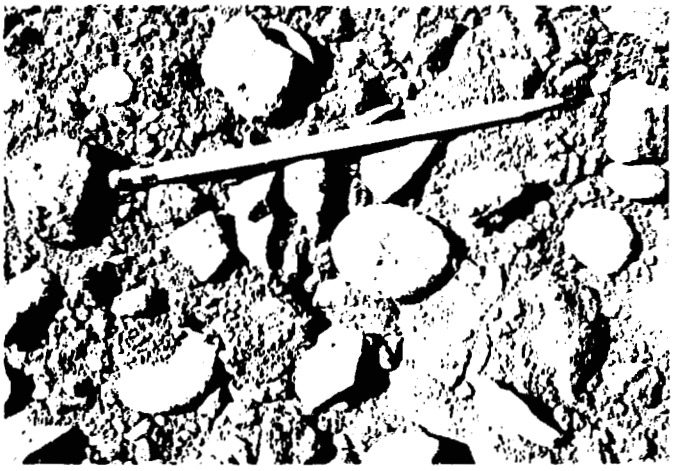
Class 1 - Excellent quality materials; well-graded, no fines.

Class 1 material used for a pipeline pumping station pad at Norman Wells

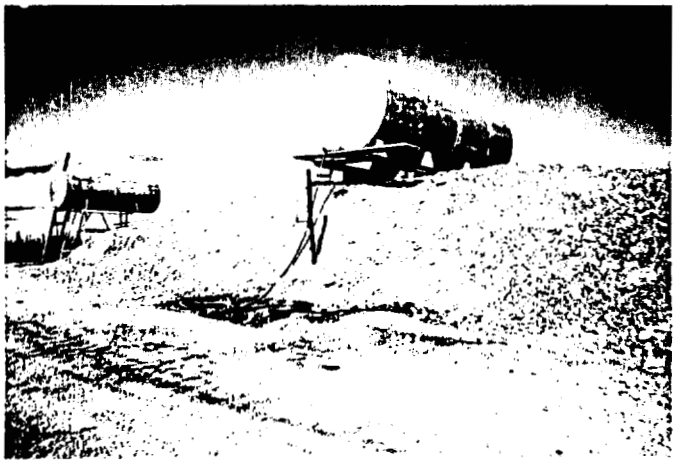


Class 2 - Good quality materials; generally well-graded, some fines

Class 2 material used for surfacing the Mackenzie Highway near Fort Simpson

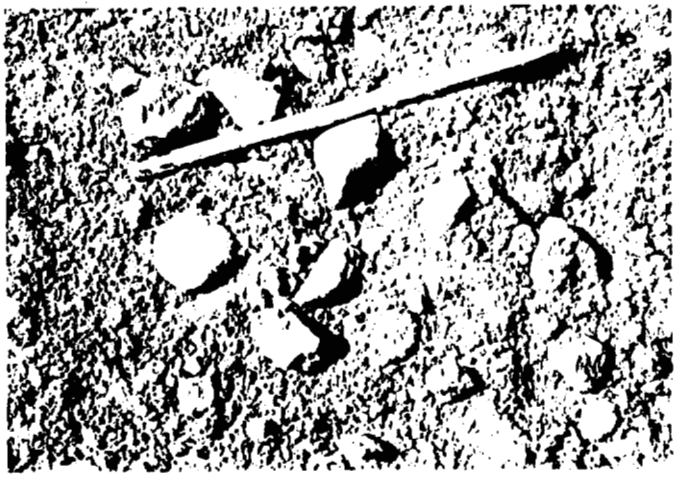


Class 3 - Fair quality materials; poorly-graded with substantial fines



Class 3 material used as a pad for fuel storage tanks

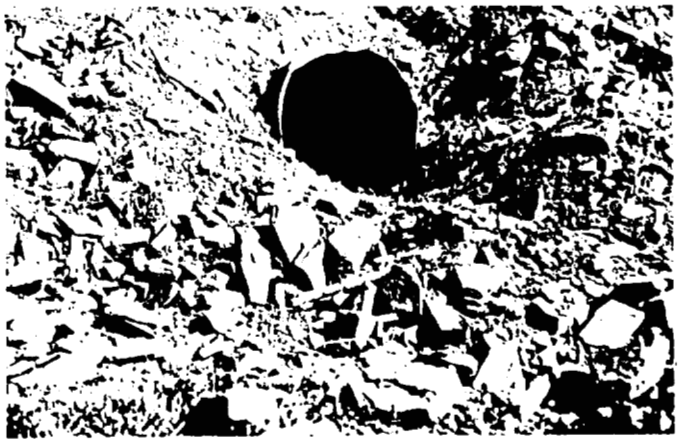
FIGURE 3. CLASS 1,2, AND 3 GRANULAR MATERIALS



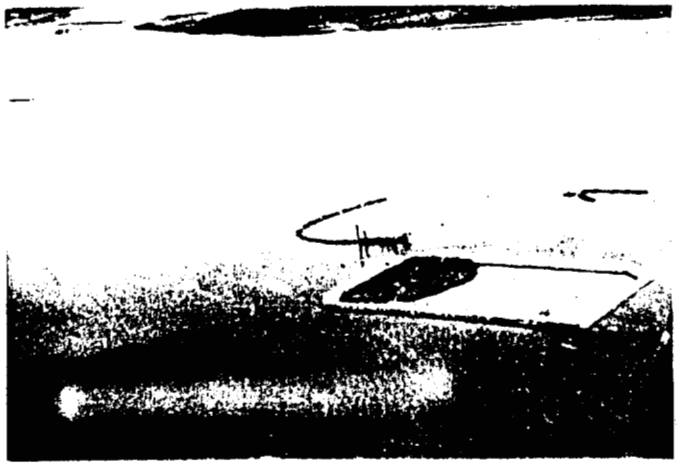
Class 4 - Poor quality materials; poorly-graded with minor gravel and a large proportion of fines

Class 4 material used as a berm around a fuel storage site

Class 5 - Outcropping of bedrock at Holman, N.W.T.



Class 5 material used as rip rap to protect a culvert outlet



Class 5 material used as armour stone around an artificial island in the Mackenzie River at Norman Wells

FIGURE 4. CLASS 4 AND 5 GRANULAR MATERIALS

for use as high-quality surfacing materials, or as asphalt or concrete aggregate, with a minimum of processing.

Class 2. Good quality material generally consisting of well-graded sands and gravels with limited quantities of silt. This material will provide good-quality base and surface-course aggregates or structure-supporting fill. Production of concrete aggregate may be possible with extensive processing, except where weak materials such as shale are present.

Class 3. Fair quality material consisting of poorly-graded sands and gravels with or without substantial silt content. This material will provide fair-quality general fill for roads, foundation pads, or lay-down yards.

Class 4. Poor quality material generally consisting of silty, poorly-graded, fine-grained sand with minor gravel. These deposits may also contain weak particles. These materials are considered suitable for general (non-structural) fill.

Class 5. Bedrock of fair to good quality, felsenmeer (open areas of broken rock), or talus (broken rock at the bottom of a slope). Potentially excellent sources of construction material, ranging from general fill to concrete aggregate or building stone if quarried and crushed. Also includes erosion control materials such as rip-rap or armour stone.

1.4.2 Confidence of Volume Estimates

The volume estimates for the granular material sources identified in the EBA (1987) report are classified as being proven, probable, or prospective.

A proven volume is one whose existence, extent, thickness, and quality is supported by ground truth information such as geotechnical drilling, test-pitting, and/or exposed stratigraphic sections. Usually the thickness of material encountered in a borehole is extrapolated to a radius not exceeding 50 metres around the hole.

A probable volume is one whose existence, extent, thickness, and quality is inferred on the basis of direct and indirect evidence, including topography, landform characteristics, airphoto interpretation, extrapolation of stratigraphy, geophysical data, and limited sampling.

A prospective volume is one whose existence, extent, thickness, and quality is suspected on the basis of limited direct evidence, such as airphoto interpretation and/or general geological considerations.

1.5 IMPLICATIONS OF GRANULAR MATERIAL EXTRACTION

The development of granular resource deposits normally involves three major tasks:

(1) Obtaining access to the deposit.
(2) Development of the deposit.
(3) Reclamation the pit.

Each of these tasks can have economic, cultural, and environmental implications associated with it.

1.5.1 Obtaining Access to the Deposit

The development of access to a source can involve significant economic costs. These costs will have a strong bearing on the cost of materials delivered to the community and on the ultimate feasibility of developing the source.

There are also several potential social and cultural impacts associated with the development of access to a granular source. The development of access, particularly year-round access, can lead to unforseen development activities in an area, and to long-term changes to an area or region which could not be anticipated at the time of the original development. Hunting, fishing, and trapping pressure on the area may increase, visitors to the region may gain access to an area that was previously accessible only to the limited population of the community, and there may be some interference with community activities in the area of the source. On the other hand, road construction may open an area to year-round recreational use by the community, or to possible tourism development benefits on the part of the community.

Environmentally, access road construction can create drainage and erosion problems and habitat destruction if proper construction techniques are not followed. Disturbance to the active layer in permafrost terrain can result in thawing and erosion. If eroded sediments enter

watercourses, fish habitat can be damaged or destroyed. Furthermore, the development of larger access roads could conceivably affect wildlife movements and result in habitat abandonment.

Access road impacts can be minimized by following guidelines presented in the INAC (1984) publication "Land Use Guidelines Access Roads and Trails".

1.5.2 Development of the Deposit

The development of a deposit involves the stripping of vegetation, the removal of overburden, and the extraction of granular materials. The amount of vegetative stripping and overburden removal required to develop a source will play an important role in the costs of development. A thick covering of silts or clays may make the development of the source unfeasible. Similarly, ease of extraction will affect costs. A dry deposit is much cheaper to develop than one with substantial volumes of ice, which may require blasting.

The opening of a pit may destroy important wildlife and fisheries habitat or may interfere with hunting, trapping, or fishing activities. The pit may be located in an area used for recreation by the community or be near enough to such an area that the presence of the pit will impair the aesthetics of the recreational site. As with the opening of an access road, pit development may lead to the discovery of heritage resource sites, but it also offers the opportunity to destroy such sites if their presence is not noted prior to extraction.

Environmentally, pit development offers the potential for drainage and erosion problems, habitat destruction, and wildlife disturbance. Vegetative stripping and overburden removal expose materials to wind and water erosion. The deposition of eroded materials in streams can result in damage to fish habitat. A high ice content in the deposit can result in further erosion and siltation when thawing occurs during extraction. Noise from equipment used during development can disturb wildlife during critical periods such as calving or nesting.

Guidelines to minimize the impacts of development of the deposits are available in the INAC (1982) publication "Environmental Guidelines Pits and Quarries".

1.5.3 Reclaiming the Pit

The costs of pit abandonment and reclamation should be factored into the costs of developing a source. Pits which have not been properly restored can be subject to unnecessary longer-term erosion and drainage problems. Pit reclamation can enhance the recreational and habitat capabilities of a site.

Reclamation guidelines for pits and quarries are included in the INAC (1982, 1987) publications "Environmental Guidelines Pits and Quarries" and "Reclamation Guidelines for Northern Canada".

PART 2: PLAN GOALS

The definitions, principles, and goals of the Inuvialuit Final Agreement form the basis of this plan.

The underlying goal of the community is the enhancement of an economy in the Paulatuk area that keeps different lifestyle options open, and that is consistent with the long term conservation of wildlife, wildlife habitat, and areas of high seasonal importance to the Inuvialuit hunting, fishing, and trapping way of life. This basic attitude is best expressed in the Working Group's definition of conservation:

> Conservation is ensuring that if we take caribou, there will be caribou the next year and the year after that. The same for anything else. This applies to all uses of the land: if it is used and enjoyed now, it must be left and preserved so that it will be there for the next year and for future years.

Specifically, the goals of this plan are:

(1) To reserve adequate supplies of appropriate quality granular materials for the community's future needs.

(2) To site and manage these reserves within reasonable distance of the community, and so as to ensure that granular development does not interfere with wildlife, archaeological resources, or with people out camping, hunting, fishing, or trapping.

(3) To minimize the negative environmental and visual effects of granular development (pits and access roads). To prevent drainage problems. To ensure that pits are fully restored when depleted.

(4) To ensure that the development of granular materials is well planned and managed so as to ensure that the materials in existing and planned pits are fully used. To ensure the integration of granular planning with other planning initiatives.

(5) To keep the plan simple. To produce a plan that can change and adapt to changes in the future. To concentrate on the 5 years ahead, readjusting the plan in 5 years if necessary.

(6) To produce a plan that is written in clear and concise terms, so that it can be understood, implemented, and revised at the local level.

PART 3: PRESENTATION AND ASSESSMENT OF RESOURCE INFORMATION

3.1 PHYSICAL SETTING

Paulatuk is located on the southern side of Darnley Bay, west of the mouth of the Hornaday River. The distribution of the granular deposits discussed in this plan is shown in Figure 5. All are on 7(1)(a) lands.

Most of the Paulatuk area is hummocky terrain with landforms and surficial sediments reflecting the extensive glaciation which occurred during the Quaternary Period (the last three million years, approximately). The presence of the Hornaday River has also played an important role in determining the types of surficial sediments and landforms in the area.

The granular deposits discussed in this plan occur in three types of sediments: glaciolacustrine, glaciofluvial, and fluvial.

Glaciolacustrine sediments were deposited in lakes that formed in front of and on glaciers. Sediments deposited along the beach and near shore area of these lakes typically consist of sands and gravels with minor amounts of fines. Source 22 is a glaciolacustrine beach deposit. Because it is located on the present-day coastline, this deposit has been reworked by wave action and is poorly graded.

Glaciofluvial deposits were deposited in streams flowing from the glaciers or within them. The deposits consist of

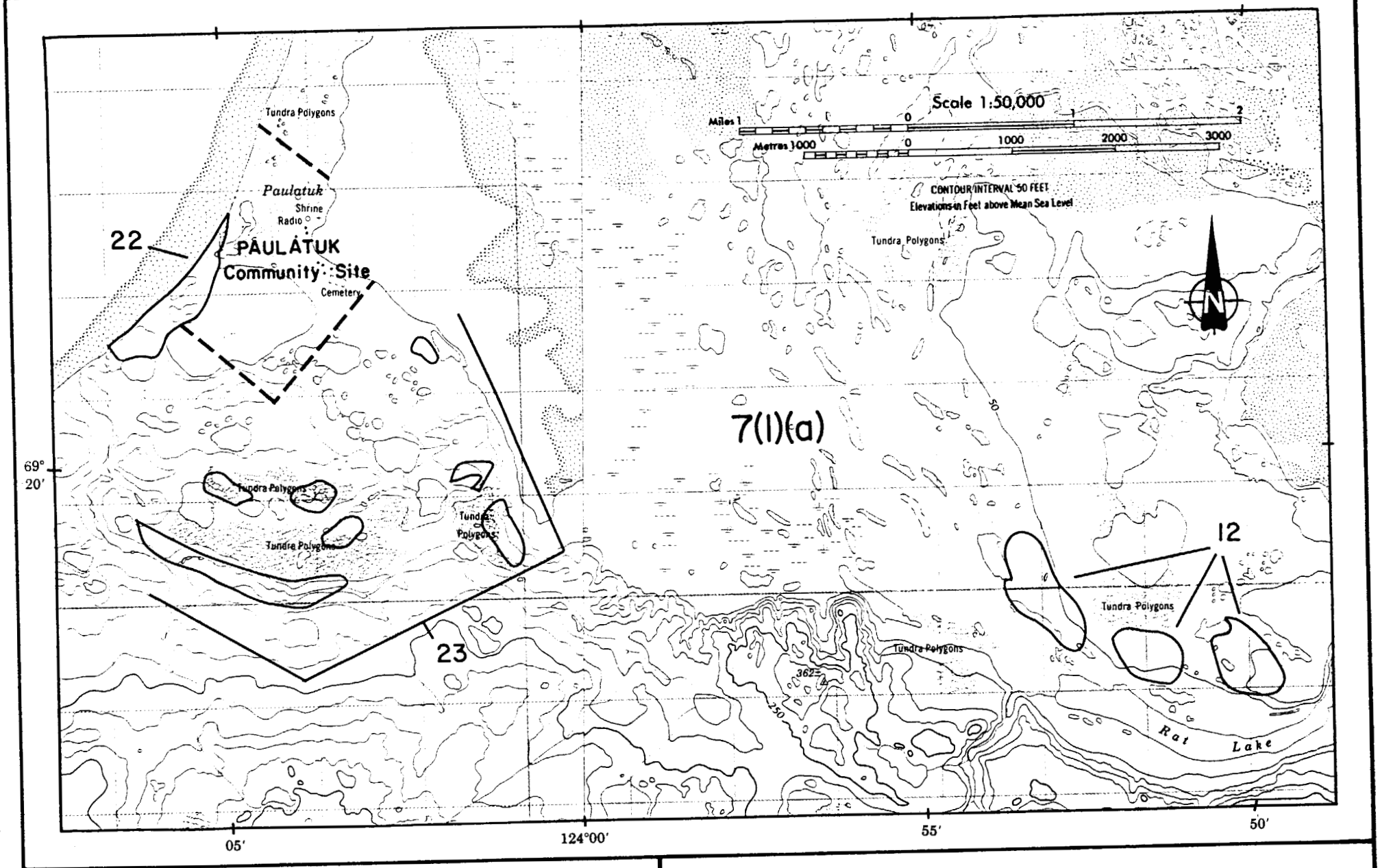


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Figure 5

Location of granular deposits,
Paulatuk, N.W.T.

sands and gravels. Source 23 is a glaciofluvial delta deposit formed as a stream discharged into a glacial lake. The deposit is composed of sand and gravel.

Fluvial deposits are gravels and sands deposited by active streams. They may occur as terraces along the stream or as deltas where the stream empties into a lake or ocean. Source 12 is on a terrace along the Hornaday River.

3.2 COMMUNITY SETTING

Paulatuk is a small Inuvialuit community located just east of the Parry Peninsula, on the southern coast of the Beaufort Sea. The area's recent history is one of change. According to Usher (1976), the area was temporarily abandoned prior to the turn of the century, in response to whaling and fur trading activity to the west. It was re-colonized in the 1920's, again in response to fur trading opportunities. Early fur trading successes were short-lived, however, and the families which remained in the area returned to the nomadic, subsistence way of life, based primarily on hunting. From 1935 to 1954, the Roman Catholic Church operated a mission and trading post at the site of the present community, with which most area families periodically traded. However, with the closing of the post in 1954, many people again left the area. Following the opening of the Distant Early Warning (DEW) Line station at Cape Parry (to the north of Paulatuk) in 1959, a small Inuvialuit settlement was established approximately five kilometres from the station. The establishment of this settlement signalled the abandonment of the more nomadic way of life, organized around extended

families, for community life. Subsequently, in the mid-1960's, when the Cape Parry settlement was abandoned, several families returned to the site of the old mission and the present community. In 1986, the population of the community was 193 (Statistics Canada 1986). In 1987, the community was incorporated as a Hamlet. There are presently 4 outpost camps south of the community.

As in many Arctic communities, the economy of Paulatuk is a blend of the cash economy and the hunting, fishing and trapping economy and way of life. Accurate and up-to-date figures on the relative contribution of different sectors to the overall cash economy are not, however, available. In non-quantitative terms, the community derives its income from local private service, transportation, contracting and tourism/big game hunting businesses; from work with the committees established under the Inuvialuit Final Agreement; from employment with the Hamlet, the Government of the Northwest Territories, the School, the Housing Association and the Nursing Station; from Federal and Territorial transfer payments; and from trapping (Lutra and Ruitenbeek 1985). Generally speaking, the economic orientation of the community is two-fold. On the one hand, it relies on a diversity of private businesses and wage employment for the income necessary in a modern community. On the other hand, Paulatuk continues to look to the hunting, fishing and trapping economy and way of life for a significant proportion of its food, and for many of its cultural and economic values.

3.3 NEED FOR GRANULAR MATERIALS (DEMAND)

Figure 6 presents the forecast 20-year demand for granular materials in Paulatuk, based on the EBA (1987) figures. Of a total forecast demand of approximately 376 000 cubic metres over 20 years, approximately 86 000 cubic metres will be required for the maintenance of community facilities, and 290 000 cubic metres will be required for local capital projects. Community maintenance projects include airstrip maintenance (6000 cubic metres of Class 2 materials) and road and general maintenance (80 000 cubic metres of Class 3 materials). Of the 290 000 cubic metres projected for local capital projects over the next 20 years, fully 260 000 cubic metres will be required for the construction of a new airstrip (10 000 cubic metres of class 2 and 250 000 cubic metres of Class 3 materials). The other main local capital users, as shown in the figure, include: sewage and solid waste improvement (9000 cubic meters, Class 4), land development (8400 cubic metres, Classes 2 and 3), a new school (1400 cubic metres, Classes 1 to 3) and water supply improvement (10 000 cubic metres, Classes 2 and 4).

Table 1 focuses more specifically on the volumes of different classes of material that will likely be required in the community. The Table points out the task of the present study: (i) to find the most suitable sources to supply approximately 24 000 cubic metres of Class 1 and 2 materials, 331 000 cubic metres of Class 3 materials, and 21 000 cubic metres of Class 4 materials; and (ii) to recommend the conditions under which these sources should be reserved and developed.

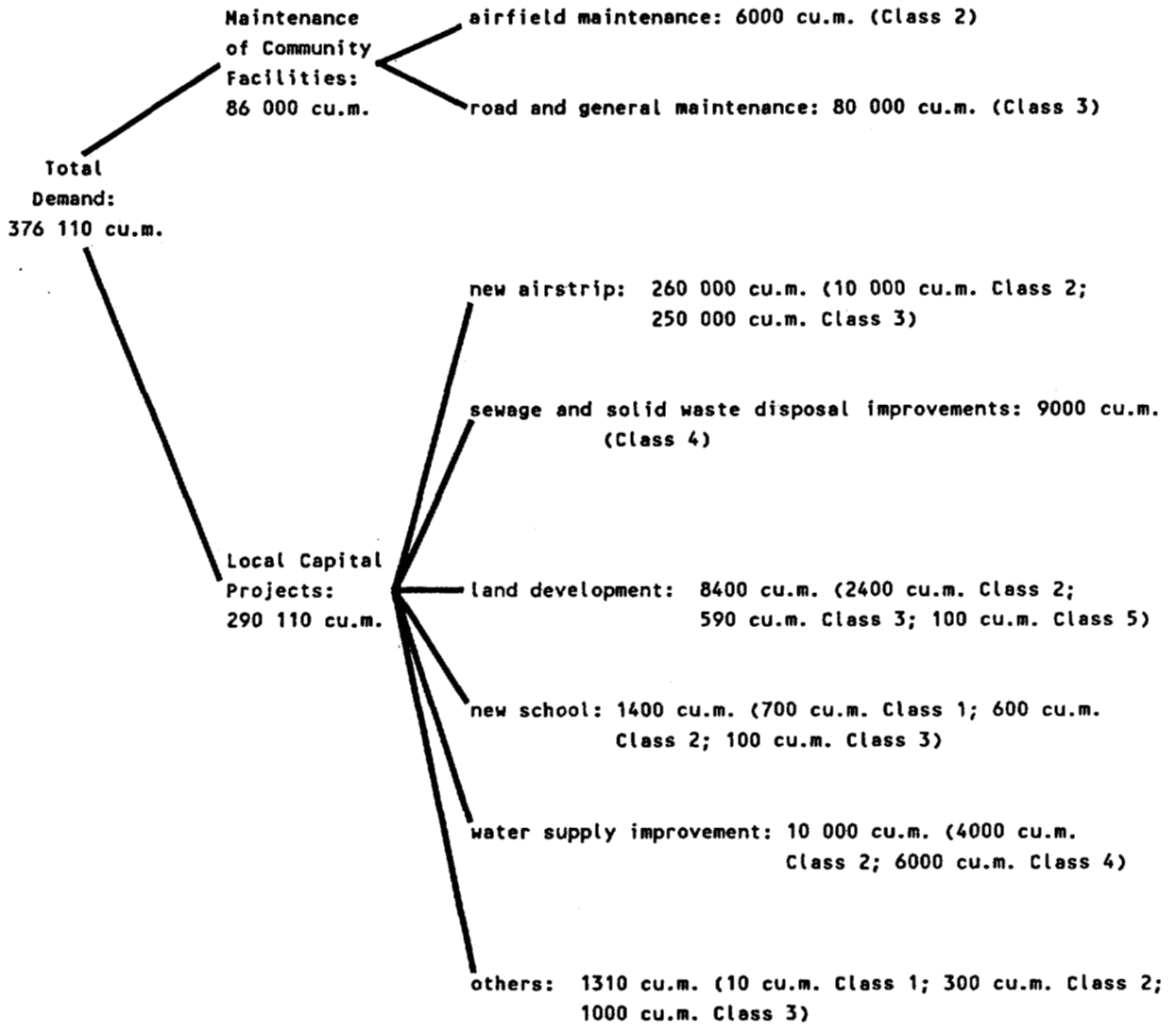

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FIGURE 6.

REQUIRED VOLUMES OF GRANULAR MATERIALS (DEMAND) BY MAIN USERS, PAULATUK 1987-2006 (EBA 1987)

TABLE 1

REQUIRED VOLUMES OF GRANULAR MATERIALS (DEMAND), IN CUBIC METRES, AND RECOMMENDED SOURCES OF SUPPLY, PAULATUK, 1987 - 2006 (FROM EBA 1987)

Class	1987-91	1992-96	1997-2001	2002-06	Totals	Recommended Sources
Class 1	700	0	0	0	700	12
Class 2	17 300	2 000	2 000	2 000	23 300	12
Class 3	270 900	20 000	20 200	20 000	331 100	23
Class 4	20 900	0	0	0	20 900	23
Class 5	100	0	0	0	100	23
				TOTAL	376 000 cu.m.	

Note: EBA figures used in this table have been rounded to the nearest 100 cu.m.

Two comments should be made on the above figures. First, while the construction of a new airstrip has been discussed for over 10 years in Paulatuk, the policy under which new airstrips for communities such as Paulatuk were to be constructed was suspended by the Federal Government in 1983 (Bill Jaycock, pers. comm.). The issue may be further complicated by the potential devolution of the responsibility for community airports to the Government of the Northwest Territories. Thus the timing of airstrip construction in Paulatuk (and the timing of the need for approximately 10 000 cubic metres of Class 2 materials and 250 000 cubic metres of Class 3 materials) is uncertain. While EBA had projected that these materials might be required in the first 5 years of the plan (Table 1), community representatives are not assuming that this will be the case. These uncertainties have, however, been dealt with in the plan.

Second, the present study was not mandated to revise the forecast demand figures. From a general examination, it would appear that the figures are somewhat underestimated, particularly in the latter part of the 20-year period. Airfield maintenance and road and general maintenance are the only demands accounted for, for example, in the latter 15 years of the 20-year period. On the whole, however, the figures appear to be sufficiently accurate for the purpose of setting aside granular reserves, particularly given that the demand forecasts are to be reviewed at least every 5 years.

3.4 GRANULAR MATERIALS SUPPLY

The granular materials sources in the Paulatuk area that are discussed in this plan are shown in Figure 5 and described in Table 2. The three sources are rated by EBA (1987) as Class 2, 3, and 4. There are no known sources of Class 1 or Class 5 material in the area.

The Hamlet of Paulatuk is presently drawing its gravel from a pit immediately south of the community on Inuvialuit lands. This pit is considered part of Source 23. It is nearing depletion and the community will thus be looking increasingly to other sources on Inuvialuit lands to supply its needs.

3.4.1 Class 1 and 2 Materials

EBA (1987) has recommended the reservation of Source 12 for the community's Class 1 and 2 requirements (Table 1). This source lies on Inuvialuit lands north of Rat Lake, approximately 10 km southeast of the community. Were it developed, it would likely be connected to the community by a winter ice road.

Source 12 has a prospective volume of 1.2 million cubic metres of Class 2 materials. Class 1 materials were not identified in the Paulatuk area. Class 2 materials (or any higher-quality materials discovered in the source) would therefore have to be substituted for Class 1 requirements. The community's projected 20-year demand for Class 1 and 2 materials is approximately 24 000 cubic metres (Table 1). Providing that the prospective volume of materials in

TABLE 2

GRANULAR MATERIAL SOURCES - PAULATUK
(FROM EBA 1987)

Source No.	Location	Estimated Volume	Access	Comments
12	10 km east-southeast of Paulatuk	1.2 million m^3 Class 2 (prospective)	Tundra/ice road in winter.	This source has not been examined in the field.
22	1 km west of Paulatuk	250 000 m^3 Class 4 (prospective)	Tundra/ice road in winter, summer access possible.	
23	0 - 2.5 km south of Paulatuk	2.2 million m^3 Class 3 (prospective)	Tundra/ice road in winter, summer access possible.	Currently being used as a source of granular materials for Paulatuk.

Source 12 is confirmed, the source should thus have ample materials for the community's future Class 1 and 2 needs.

3.4.2 Class 3, 4, and 5 Materials

EBA (1987) has recommended the reservation of Source 23 for the community's Class 3, 4, and 5 needs. This source lies approximately 2.5 km south of the community. Assuming that adequate materials were proven in the source, the Working Group would prefer to see it connected to the community by an all-weather road passing south over Source 22, and approaching Source 23 from the north and west.

Source 23 has a prospective volume of 2.2 million cubic metres of Class 3 materials. The community's Class 3, 4, and 5 requirements are approximately 352 000 cubic metres (Table 1). EBA recommends using Class 3 materials for the community's Class 4 needs because of the excess of Class 3 materials available, and so as to minimize the number of pits developed. Class 5 requirements are to be satisfied by using over-sized materials from Source 23.

EBA has recommended that, in order to minimize the number of pits developed, Source 22 not be developed. The source is located on lands administered by the Hamlet and is approximately 1 km west of the community proper. It has a prospective volume of 250 000 cubic metres of Class 4 materials.

3.5 ASSESSMENT OF POTENTIAL SOURCES

3.5.1 Source 12 (Rat Lake)

A relatively small part of the Bluenose Caribou Herd uses this area during its spring and fall migrations (on the eastward migration during late April and May, and on the westward migration during September and October). While workshop participants felt it unlikely that the development of this source would have any significant effect on the herd, the potential to significantly disturb the caribou during migrations and calving and post-calving stages does exist. On the other hand, Rat Lake is not used by local people for fishing. Nor are the Rat Lake area and the access routes to it used extensively for hunting, trapping, or camping. There are no locally-known archaeological resources in the area.

Despite minor concerns with potential effects on the Bluenose Herd, community representatives felt that the environmental and social impacts of the development of Source 12 would be acceptable were its development necessary to secure a source of higher quality materials for the community as a whole.

3.5.2 Source 23

This area is significant neither for wildlife nor for the local hunting, fishing, and trapping economy. Nor are there locally-known archaeological resources in the area. The consensus of the workshop was that the source could be reserved and developed without significant environmental or

social impacts. Community representatives felt, in fact, that the development of this source could be well integrated with the planned re-location of the community's airstrip, its water supply lake, and its waste disposal site.

3.5.3 Source 22

Community representatives concurred with EBA's (1987) assessment that Source 22 is likely of poor quality and should not be developed. They were concerned that the development of the source could lead to the erosion of the community's western shore line, a shore line already vulnerable to western storms. They were also concerned that the source's development could cut off community access to the area southwest of the community, in which the relocation of the community's waste disposal site has been planned. The development of Source 22 is therefore both environmentally and socially unacceptable.

3.6 COMPARATIVE ASSESSMENT OF SOURCES

A comparative assessment of the granular resource sites near Paulatuk is summarized in Table 3 and discussed below.

The potential environmental impacts of developing Source 23 were considered marginally lower than the potential impacts of developing Source 12. Materials extracted from Source 23 would also be less expensive than materials extracted from Source 12. While the development of Source 12 is acceptable if required, community representatives

TABLE 3

PREFERRED GRANULAR RESOURCE SOURCES - PAULATUK
(FROM EBA 1987)

Source	Use	Environmental and Aesthetic Considerations	Wildlife and Social-Cultural Considerations	Economic Considerations	Comments	Ranking: Significance of Impacts	Ranking: Acceptance of Development
12	Class 1&2 needs	None identified	Potential minor disturbance to the Bluenose Caribou Herd during spring and fall migrations.	10-km winter road required.	Workshop participants would prefer this source be developed only if Source 23 cannot supply the community's higher class needs.	Potentially significant. Could be mitigated by prohibiting development activities during periods of use by the Bluenose Herd.	Acceptable if Source 23 cannot meet Class 1 & 2 needs.
22	Class 4 needs	Development would lead to erosion of community's western shoreline.	Development would cut off access to the area southwest of the community in which the new waste disposal site is planned.	1-km winter road required.		Significant	Unacceptable
23	Class 3-5 needs	None identified	None identified	2.5-km winter or all-weather road required.	Preferred source of community needs.	Insignificant	Acceptable

would prefer that Source 23 be explored and developed prior to the development of Source 12.

PART 4: PLAN RECOMMENDATIONS

(1) The quality and quantity of materials in Sources 23 and 12 should be confirmed by site investigations. Were Source 23 proven to contain adequate quantities not only of Class 3 materials but also of Class 1 or 2 materials, then the investigation of Source 12 might be unnecessary.

(2) If the investigation of Source 23 proves adequate quantities of Classes 1, 2, or 3 materials, then this source should be reserved and developed for public community use in Paulatuk. Source 12 should be reserved and developed only if Source 23 proves to be lacking in the range of materials, and particularly in the higher quality materials, that the community will require in the future.

(3) Development of Source 12 should be timed and executed so as to prevent any interference with the migrations and calving and post-calving stages of the Bluenose Herd.

(4) The private and corporate interests of the Inuvialuit should be assured access to these reserves, provided that the estimated total (public and Inuvialuit) 20-year demand is within the estimated volume of the reserves.

(5) The development of granular materials for public (and Inuvialuit) needs should be confined to the recommended sources until such time as these reserves can no longer meet community requirements. Unless otherwise approved, these reserves should not be made available to other substantial users.

(6) Source 22 should not be developed.

(7) A granular development/environmental protection plan should be produced for each of the reserved sources prior to undertaking extensive excavations. The plan should lay out a 5-to-10 year strategy for the orderly development of each source (including access). It should ensure that each source is developed so as to minimize environmental and aesthetic effects, and maximum the amount of materials recovered from a

source. It should lay out procedures for the proper development of the source with other planning initiatives on the part of the community. In the case of Source 23, the plan should integrate the development of the site (including access to it) with the relocation of the airstrip, the solid waste disposal site, and the water supply lake.

(8) The extraction and use of materials should be managed to minimize high grading (the use of higher quality materials than are necessary for a job). This will be particularly important should higher quality materials prove to be in shorter supply in Paulatuk than is presently anticipated. Some use of Class 3 materials for Class 4 needs may, however, prove inevitable, given the apparent lack of Class 4 materials in the recommended sources.

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APPENDIX A

LETTER FROM NANCY WITHERSPOON, HABITAT MANAGEMENT BIOLOGIST, WESTERN ARCTIC AREA, FISHERIES AND OCEANS CANADA

Government of Canada / Gouvernement du Canada
Fisheries and Oceans / Pêches et Océans

May 29, 1988

Your file / Votre référence

Our file / Notre référence

Fisheries & Oceans
Western Arctic Area
Box 1871
Inuvik, NWT
X0E 0T0

Mr. Tom Nesbitt
Thomas Nesbitt and Associates
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GRAVEL EXTRACTION IN THE WESTERN ARCTIC AREA

Dear Tom:

We have looked at existing and potential sites for gravel extraction in our area and provide the following comments related to the fisheries resources:

1. Gravel extraction near creeks or lakes should be conducted so that:
   a) silt is not released into the water body
   b) bank disturbances are minimized as are changes to the shape and direction of the watercourse
   c) that watercourses are not dammed as a result of the activity
   d) pounding along side watercourses does not take place
   e) spawning gravels are not removed on creek or river bottoms
   f) refuse does not enter water bodies
   g) winter and summer road construction to the sites are constructed to minimize disruptions to water bodies as outlined above
   h) any summer operations near water bodies should be conducted outside fish migratory or spawning periods if they are conflicting

2. Underwater gravel extractions should be conducted giving consideration to;
   a) type of equipment used for extraction
   b) timing of migration and spawning of species in the area
   c) utilizing of the areas by fish for feeding or rearing

Specific sites identified that have fisheries concerns include:

1. Aklavik area sites 455 and 467

....2

2. Tuk area sites 155, 160, 162 and 158

3. Inuvik area sites 2.45, 2.44, 2.43,314, R28 and R29

4. Sachs Harbour sites 9, 10 and 11

5. Paulatuk sites 14 to 19

All sites could be reviewed in detail as they come up for development.

I hope this will assist you in producing your report and if you have any questions don't hesitate to contact me or Richard Barnes at (403)979-3314.

Yours truly,

Nancy Witherspoon

Nancy Witherspoon
Habitat Management
Biologist
Western Arctic Area

cc: D.V. Gillman
B. Wong
J. Stein
R. Barnes