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

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PLAN FOR THE RESERVATION AND DEVELOPMENT OF GRANULAR MATERIALS IN THE VICINITY OF HOLMAN, 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/HI

ACKNOWLEDGEMENTS

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

Noah Akhiatak	Representing the Elders
Albert Elias	Holman Hunters and Trappers Committee (HTC)
Joseph Haluksit	Chief, Holman Community Corporation (CC)
Wallace Joss	Hamlet Foreman
Peter Malgokak	President, Holman HTC

The following individuals/organizations were also consulted:

Leslie Huget	Senior Land Officer, Lands Division, Municipal and Community Affairs, GNWT, Yellowknife
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 Holman, 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 Holman Land Use Planning Working Group and other representatives of the community. 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 in the Holman area: Source 8, which consists of several deposits along the perimeter of the community, including the Jacks Bay pit currently being used by the Hamlet, Source 7 (Ukpalik Hill), which lies immediately north of the community in Inuvialuit lands, and Source 5 (the Transport Canada pit) just west of the community runway.

The recommendations of the plan are as follows:

- All three sources should be reserved for public community use in Holman. These sources are the best situated from the perspective of accessibility, cost and the minimization of environmental and social impacts.

- The quality and quantity of materials in Sources 5, 7, and 8 should be more reliably determined by site investigation. The location of Source 8 should be more accurately mapped. Any decision to alter the reservation of these sources should be made on the basis of confirmed supply information and in consultation with the Holman Land Use Planning Working Group.

- The private and corporate interests of the Inuvialuit should be assured access to Source 7 and any parts of Source 8 that lie on Inuvialuit lands, provided that the estimated total (public and Inuvialuit) 20-year demand is within the estimated total volume of the reserves.

- 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.

- In order to minimize the environmental, visual, and safety-related effects of granular development, community representatives would prefer that the number of pits under development at any time be kept to a minimum. The Jacks Bay deposit and Source 5 are presently being developed, and are the best available to the Hamlet and Transport Canada from the perspective of the quality of materials required and the cost of their delivery. Sources 7 and further sections of Source 8 should thus be developed only as required.

- A granular development and environmental protection plan be produced for the development area as a whole. The plan should lay out a 5-to-10 year strategy for the orderly development of different sources, so as to ensure the integration of community planning and granular development planning. The plan should also ensure that the development of granular sources is consistent with the community's future plans for expansion, that sources are developed so as to minimize environmental and visual impacts, and that the amount of materials recovered from the area is maximized. It should also lay out procedures for the proper development and restoration of pits.

- Holman's future extraction and use of granular materials may have to be managed so as 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 than is presently anticipated. Some use of Class 3 materials for Class 4 work may, however, prove inevitable, given the apparent lack of Class 4 materials in the recommended sources.

. The majority of Source 8 lies on lands administered by the Hamlet. Source 7, and the remainder of Source 8, on the other hand, lie on Inuvialuit lands. If the recommendations of this plan are to be successfully implemented, then the parties using and managing granular materials and planning for the future development of the community (the Hamlet, ILAC, INAC, and Municipal and Community Affairs, GNWT) will have to cooperate in the implementation of the plan and in any follow-up work that is required. The logical focus for this cooperation may be the community's Land Use Planning Working Group. In any case, communications between the affected parties should be strengthened.

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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 Holman 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 Holman Island area, 7(1)(a) lands cover approximately 1830 square kilometres (708 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 10 525 square kilometres (7,539 square miles) of Victoria Island, the Inuvialuit own surface rights only. Granular materials (sand and gravel) are surface resources. The Inuvialuit Final Agreement thus transferred ownership of some of the more accessible sources of sand and gravel in the Holman 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

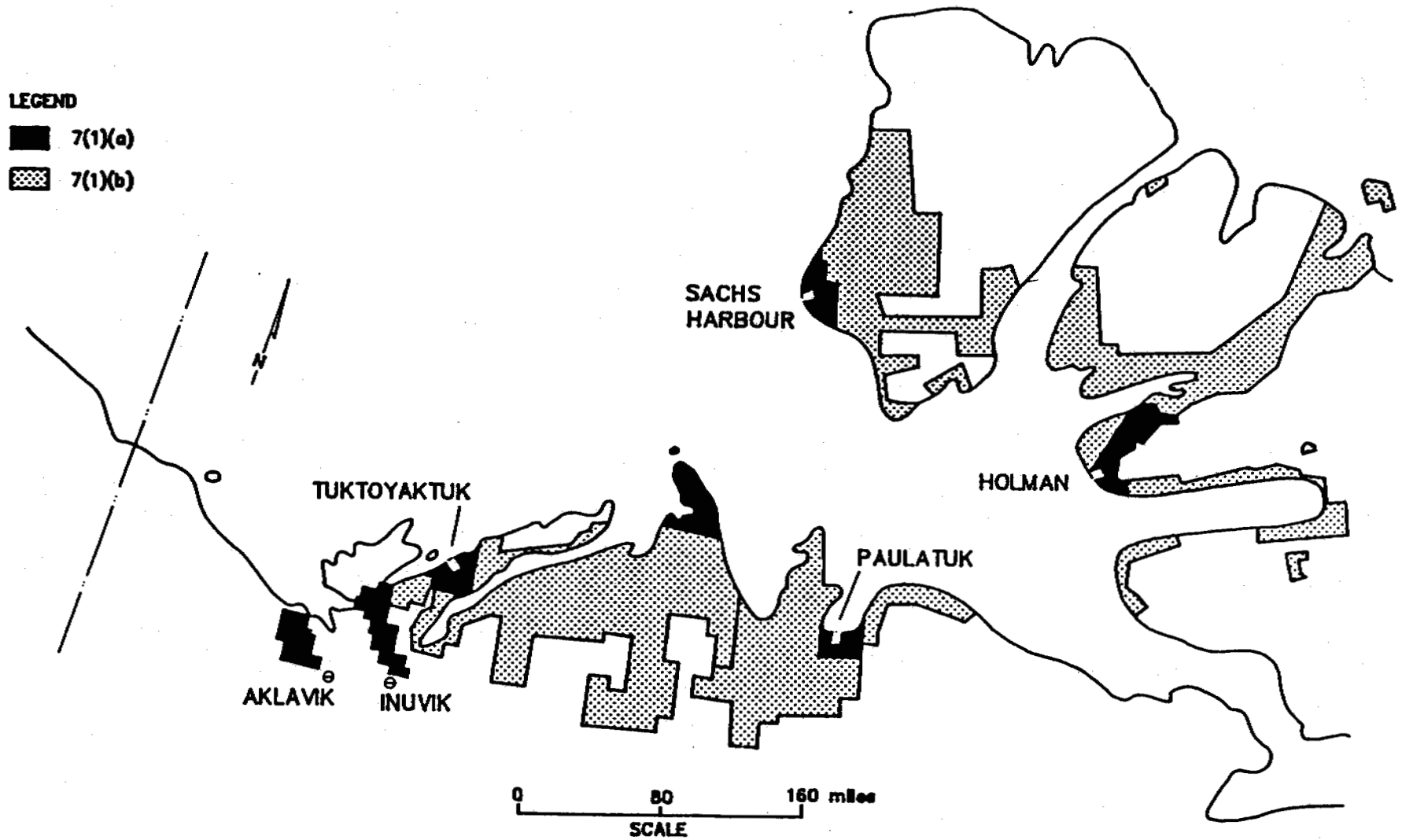

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FIGURE 1. INUVIALUIT LANDS LOCATION PLAN

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 Holman'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 Holman 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

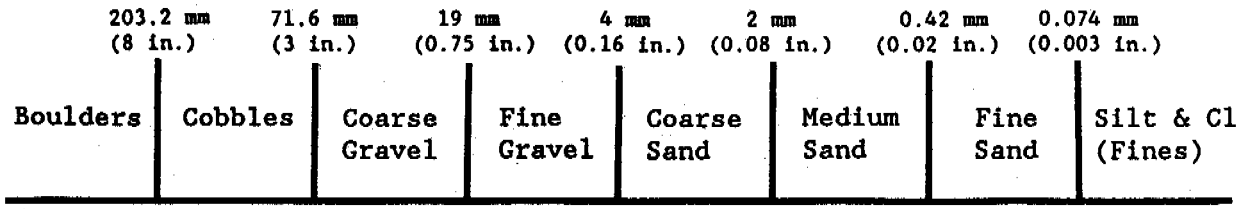
Granular resource supply and demand is discussed in terms of five classes of material:

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

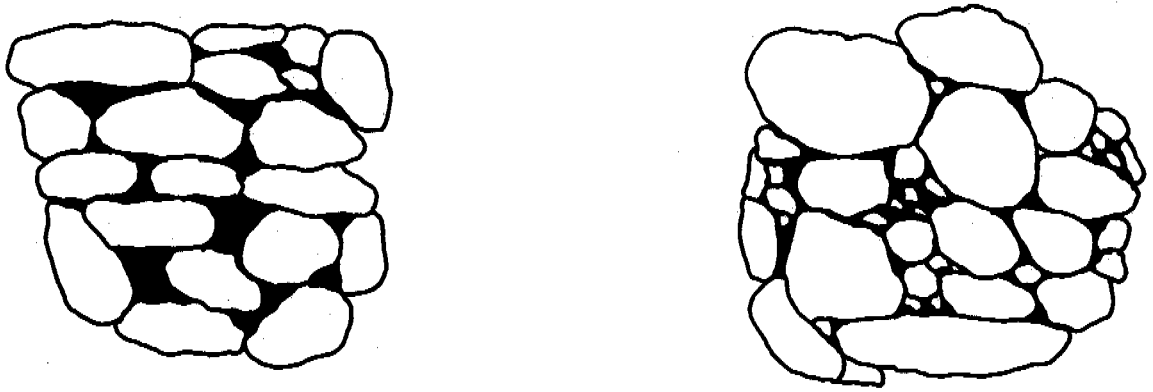
The first four classes are defined in terms of the gradation of the deposit. A brief discussion on gradation is necessary prior to describing these classes in more detail.

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.

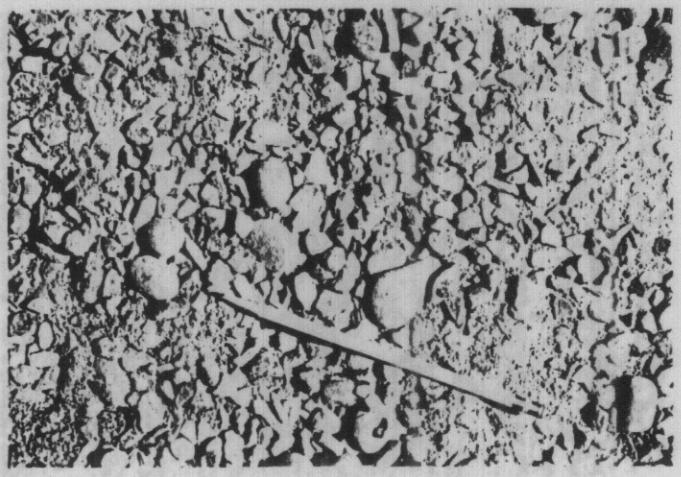
A well-graded granular deposit has an equal amount of each gravel and sand size and little or no fines. Deposits such as this are called "clean". A poorly-graded granular deposit has an excess of some particle sizes and a shortage or lack of others, or has nearly all particles the same size. Poorly-graded 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.

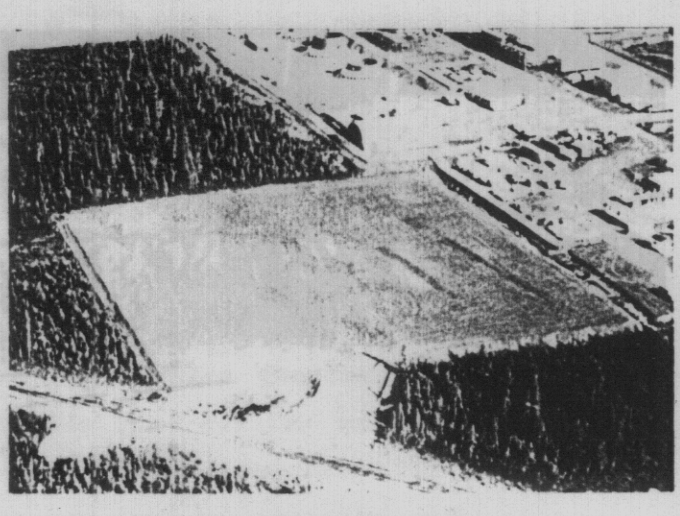
1.4.1.2 Description of Granular Resource Classes

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.

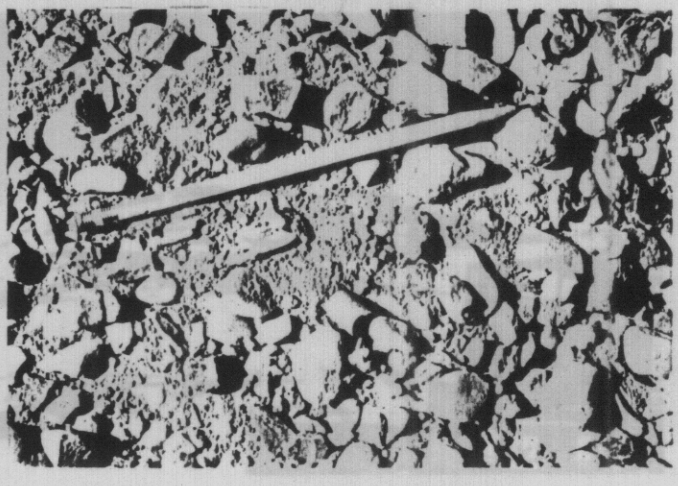
Class 1. Excellent quality material consisting of clean, well-graded, structurally-sound sands and gravels suitable



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

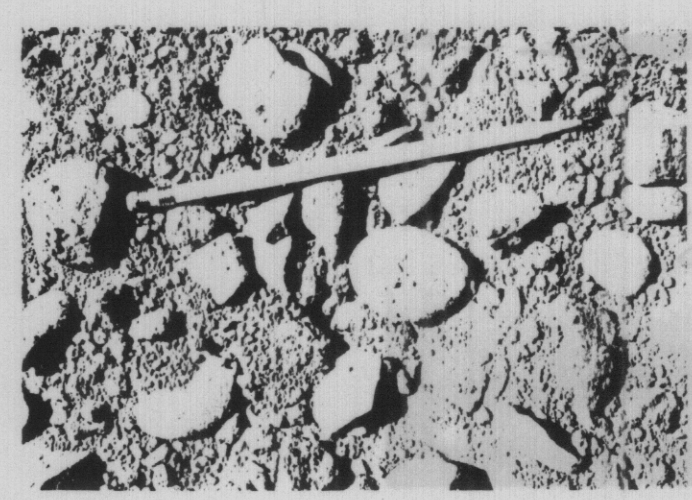


Class 1 material used for a pipeline pumping station pad at Norman Wells

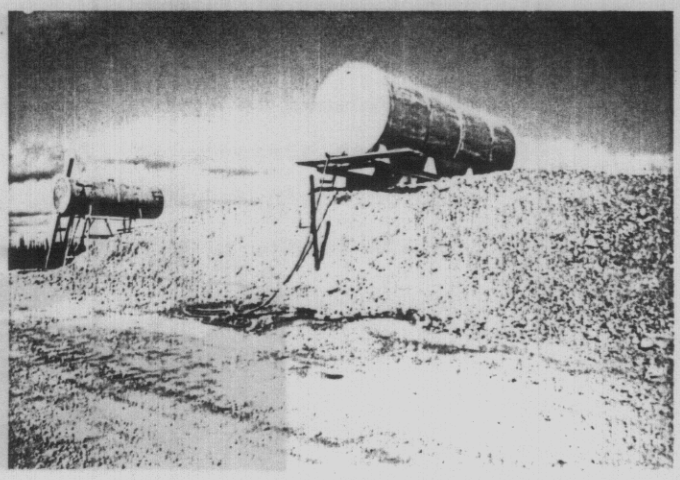


Class 2 - Good quality materials; generally well-graded, some fines

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

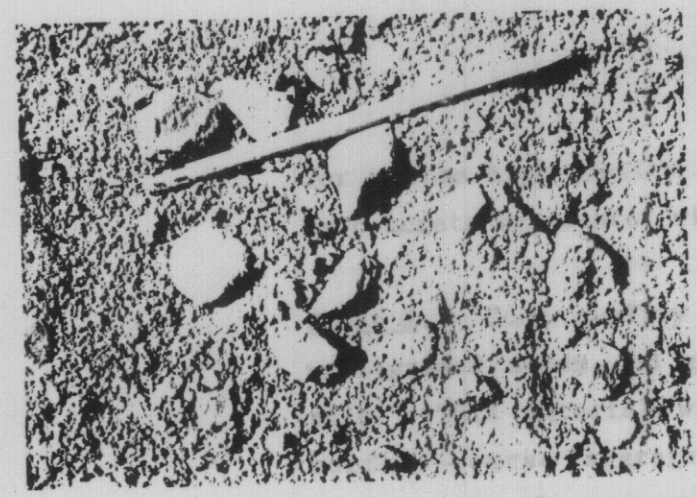


Class 3 - Fair quality materials; poorly-graded with substantial fines



Class 3 material used as a pad for fuel storage tanks

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

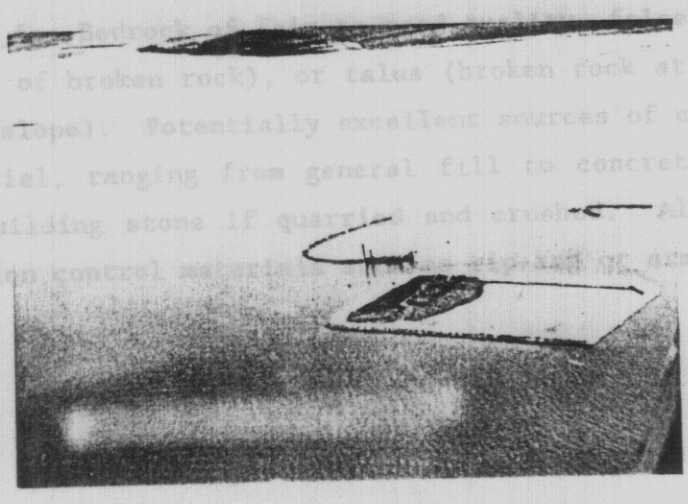


Class 4 - Poor quality materials; poorly-graded with minor gravel and a large proportion of fines

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 task has certain 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 an 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 Holman area that keeps different lifestyle options open for the community, 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 perhaps best expressed in the community's definition of conservation.

Conservation means protecting the environment - the lakes, the rivers, the land, the ocean - and the community's hunting, fishing, and trapping economy. Conservation is an ongoing thing. It means protecting these things in an ongoing way.

Specifically, the goals of the 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 distances 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 public safety near operating and abandoned pits. To ensure the integration of granular planning with other planning initiatives.

(5) 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

Holman is located on the western coast of Victoria Island on the Diamond Jenness Peninsula. The distribution of the granular deposits, as discussed in this plan and as mapped by EBA (1987), is shown in Figure 5. The deposits occur on 7(1)(a), 7(1)(b), and Hamlet lands.

The Holman area consists of moderately sloping terrain towards the northwest and the rugged flat-lying plateaux of the Shaler Mountains to the east and southeast. The surficial material consist of glacial deposits to the northwest, beach sediments along the coast, and broken bedrock and talus in the Shaler Mountains.

Glacial sediments, deposited during the extensive glaciation which occurred during the Quaternary Period (the last three million years, approximately), form Source 13. This source occurs on a glaciofluvial delta where a stream flowing from a glacier entered a lake, depositing sand and gravel.

Beach sediments form the majority of the granular material sources in the Holman area and five of the six sources discussed in this plan (Source 1, 4, 5, 7, and 8) are beach deposits. These deposits consist of flat clasts of gravel and broken rock. They were originally deposited by glaciers but were modified by wave action when the land was depressed by the weight of the glaciers.

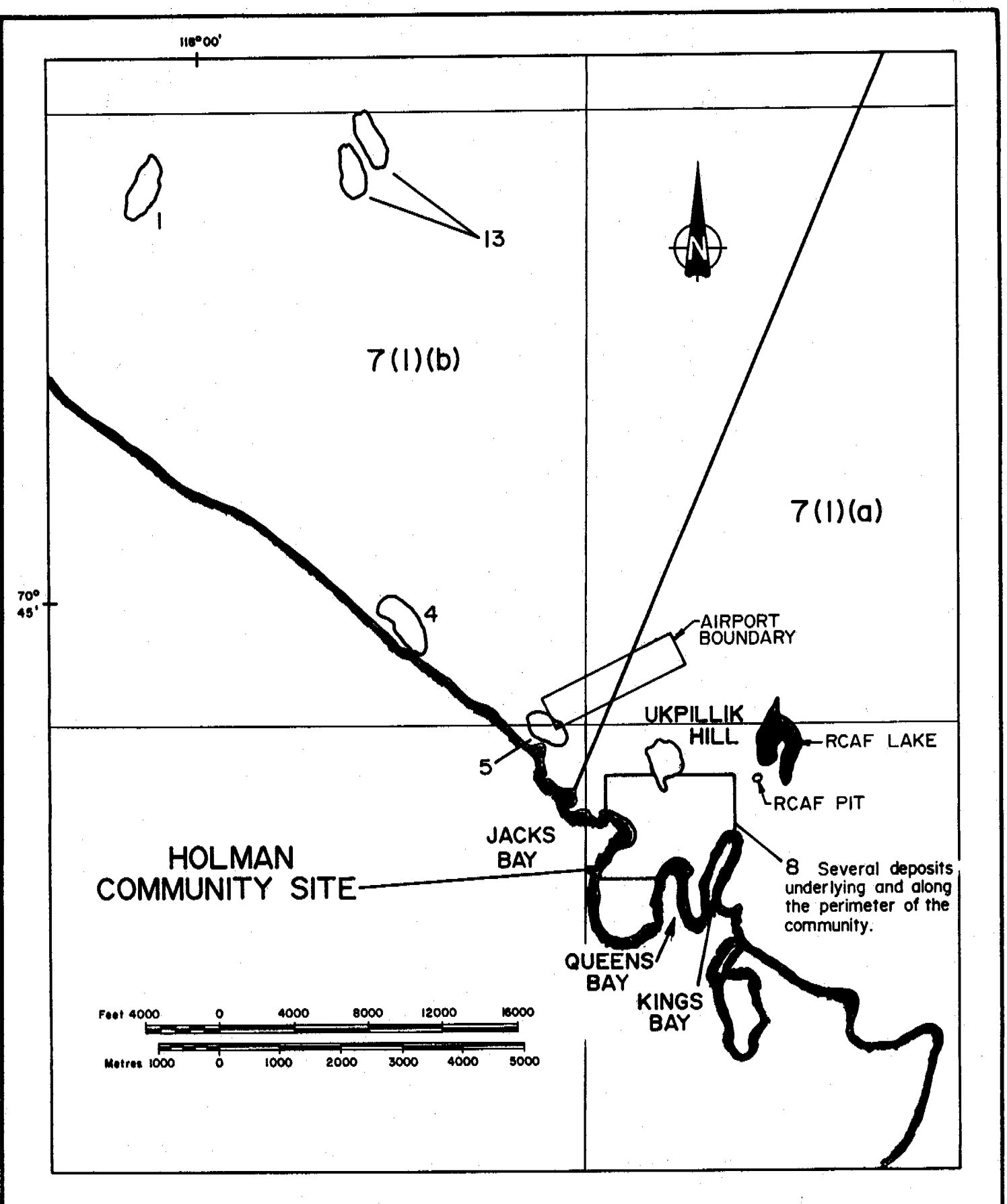


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Figure 5

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

The broken bedrock and talus of the Shaler Mountains provides a virtually unlimited supply of bedrock material for the area.

3.2 COMMUNITY SETTING

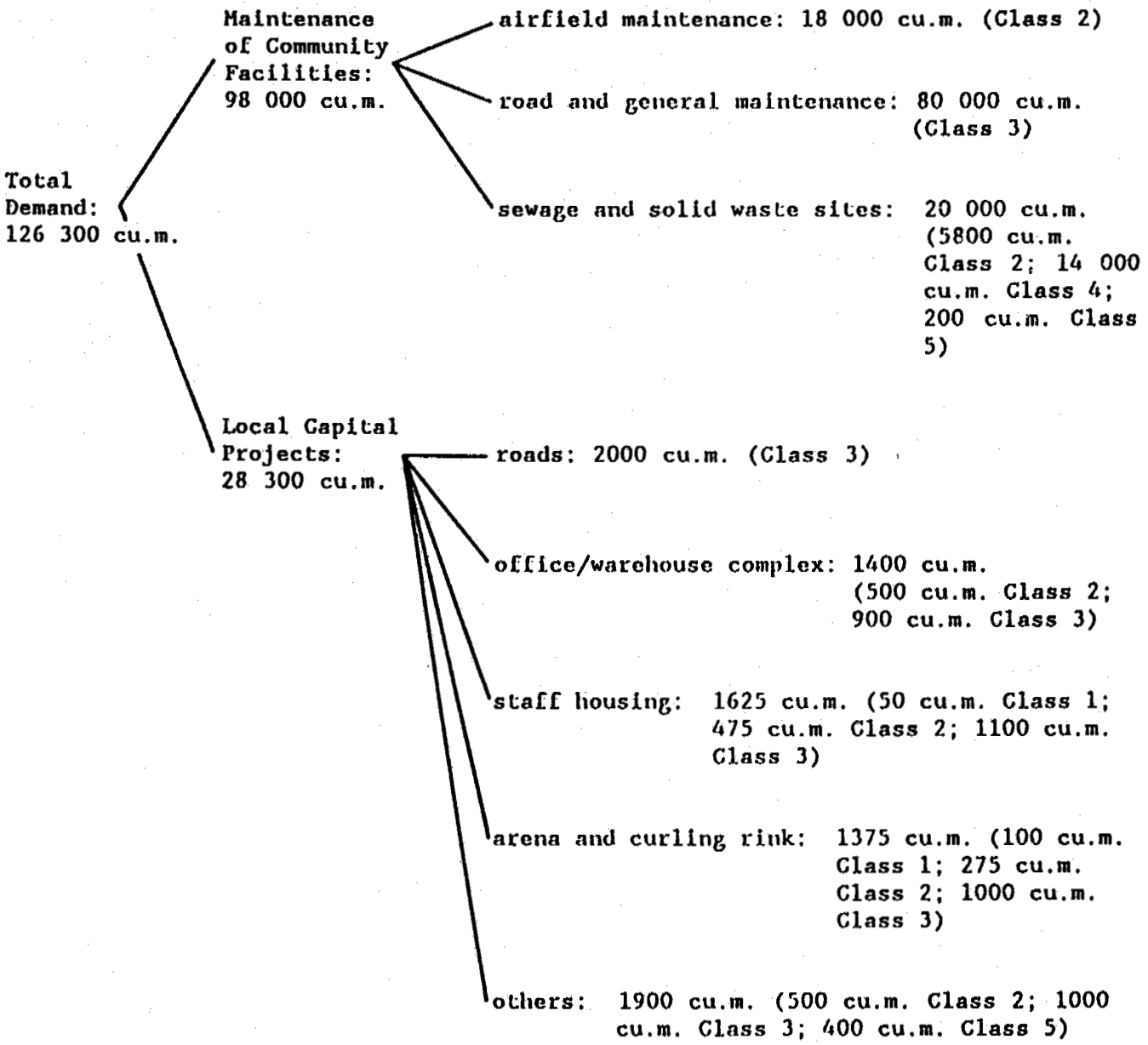
Holman is a small Inuit community located on the south-western coast of Victoria Island. According to Farquharson (1976), its population is derived from at least three distinct groups of people who, prior to their settlement in the community as we know it, hunted on a seasonal basis over large areas of Victoria and Banks Islands. In 1923, the Hudson Bay Company established a post approximately 29 km from the site of the present settlement, and trapping was introduced into the regional economy. The post was moved twice before being re-located in 1939 to its site close to the present settlement. A Roman Catholic mission was also established at Holman in 1939, and several families began camping in the area on a seasonal basis. By the mid-1960s, with the abandonment of the Hudson Bay post at Read Island to the south of the settlement, most families in the area had some sort of permanent dwelling in Holman. Hunting, fishing, and trapping continue to be a strong focus of the present community. Since the 1960s, however, they have been pursued on a seasonal basis from the home base of the community. In 1986, the population of Holman Island was 303 (Statistics Canada 1986). In 1987, the community was incorporated as a Hamlet.

As in many arctic communities, the economy of Holman Island 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, tourism, arts and crafts, transportation and construction businesses; 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 and the imputed value of the country food harvest (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, Holman 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. While the people of Holman want to diversify and enhance their local economy, they are also concerned that environmental quality and wildlife habitat and populations be preserved.

3.3 NEED FOR GRANULAR MATERIALS (DEMAND)

Figure 6 presents the forecast 20-year demand for granular materials in Holman, based on the EBA (1987) figures. Of a total forecast demand of approximately 126 000 cubic metres over 20 years, approximately 98 000 cubic metres will be required for the maintenance of community facilities, and 28 000 cubic metres will be required for local capital projects.



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CONSULTING ENGINEERING & PROFESSIONAL SERVICES

FIGURE 6.

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

Community maintenance projects include airstrip maintenance (18 000 cubic metres of Class 2 materials) and road and general maintenance (80 000 cubic metres of Class 3 materials). The main local capital users, as listed in the figure, include sewage and solid waste sites (20 000 cubic metres Classes 2, 4, and 5), roads (2000 cubic metres, Class 3), an office/ warehouse (1400 cubic metres, Classes 2 and 3), staff housing (1600 cubic metres, Classes 1, 2, and 3) and an arena and curling rink (1375 cubic metres, Classes 1, 2, and 3).

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 tasks of the present study: (i) to find the most suitable sources to supply approximately 26 000 cu.m of Class 1 and 2 materials, 86 000 cu.m of Class 3 materials, 14 000 cu.m of Class 4 materials, and 1000 cu.m of Class 5 materials; and (ii) to recommend the conditions under which these sources should be reserved and developed.

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

TABLE 1

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

Class	1987-91	1992-96	1997-2001	2002-06	Totals	Recommended Sources
Class 1	200	0	0	0	200	8
Class 2	10 600	5 800	5 000	5 000	26 400	5 and 8
Class 3	26 600	20 000	20 000	20 000	86 600	8
Class 4	14 000	0	0	0	14 000	8
Class 5	600	0	0	0	600	general area of the community
				TOTAL	127 800	

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

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 material sources in the Holman area that are discussed in this plan are shown in Figure 5 and described in Table 2.

3.4.1 Class 1 Materials

To supply the community's Class 1 requirements, EBA (1987) has recommended the reservation of a small pit approximately 200 metres south of RCAF Lake, and on the eastern side of the all-weather road to the Lake (see accompanying map, Figure 5). The RCAF Lake pit is part of Source 8. Whereas most of Source 8 lies to the south of this pit on lands administered by the Hamlet, the recommended pit lies just beyond the Hamlet's lands on Inuvialuit lands.

According to EBA, the pit contains a proven volume of 3000 cubic metres of Class 1 material. It is the only identified source of such materials in the area.

Community representatives suggest that materials in the pit in question are more likely Class 2 to Class 3 in quality. The pit is not used for the community's higher quality needs (Wallace Joss, pers. comm.). While lab tests of the quality of materials available in the pit were not carried out as part of the current study, the authors concur with

TABLE 2

GRANULAR MATERIAL SOURCES - HOLMAN
(FROM EBA 1987)

Source No.	Location	Estimated Volume	Access	Comments
1	14 km northwest of Holman	300 000 m^3 Class 2 (prospective)	Tundra/ice road in winter	
4	5.5 km northwest of Holman	150 000 m^3 Class 2 (prospective)	Tundra/ice road in winter; barge in summer	
5	At southwestern end of Holman airstrip	60 000 m^3 Class 2 (probable)	All-weather road	
7	Nose of Ukpillik Hill, immediately north of the Hamlet	75 000 m^3 Class 3* (probable)	All-weather road	
8	Several deposits located under and along the perimeter of the Hamlet	3000 m^3 Class 1 (proven) 300 000 m^3 Class 3 (probable)	All-weather road	Extent of the deposit has not been accurately mapped.
13	12.5 km northwest of Holman	700 000 m^3 Class 2 (prospective)	Tundra/ice road in winter	

* Source 7 was rated Class 2 in EBA's supply summary but Class 3 in their text and table on Class 3 granular resources. The Class 3 rating has been assumed for this document.

the lower-quality classification of materials remaining in the pit on the basis of a visual inspection of the site.

EBA (1987) reports that the Department of Public Works and Highways, Government of the Northwest Territories, has tested other Class 2 pits in the vicinity of the community and has a concluded that, with some processing, Class 1 aggregate can be produced in the Holman area. Given the very modest projected requirement for Class 1 materials in Holman (200 cubic metres), such sources should prove adequate for the community's needs.

3.4.2 Class 2 Materials

EBA (1987) has recommended that Holman's Class 2 airstrip requirements be supplied from Source 5, the Transport Canada pit. This pit is located just west of the current airstrip and is accessible on a year-round basis from the strip.

Source 5 has a probable volume of 60 000 cubic metres of Class 2 material. The community's projected 20-year airstrip requirement is for approximately 18 000 cubic metres of such materials (Figure 6). While the source is not currently available for other public community uses (Wallace Joss, pers. comm.), it should prove ample for the community's airstrip requirements.

To serve the community's other Class 2 needs, EBA has recommended the use of selected portions of Source 8. This source is described as consisting of several deposits located along the margin of the community, including the

pit on the road to RCAF Lake described above. The source has not, however, been accurately mapped. It has been assumed, in this plan, that Source 8 includes the deposit at the head of Jacks Bay, which is currently the primary source of supply for the community. Source 8 is located primarily within lands administered by the Hamlet, and is accessible on a year-round basis.

Apart from the RCAF Lake pit, Source 8 is described as having a probable volume of approximately 300 000 cubic metres of Class 3 material. The community's projected 20-year Class 2 requirement (excluding airstrip requirements) is approximately 8400 cubic metres. Community representatives suggest that the Jacks Bay portion of Source 8 also contains Class 2 material. This deposit has proven to be the source of the highest quality materials available to the Hamlet (Wallace Joss, pers. comm.). While lab tests to verify the quality of materials in the Jacks Bay pit were not carried out as part of the current study, the authors agree, based on a visual site inspection, that higher quality materials are available in this source.

Community representatives have also expressed in interest in the future use of Source 7. Source 7, locally known as Ukpillik Hill, lies just north of the community's boundaries, on Inuvialuit lands. It is accessible on a year-round basis. Source 7 is described as having a probable volume of 75 000 cubic metres of Class 3 materials.

EBA recommends the use of Sources 1, 4, and 13 for any large-scale community projects requiring Class 2 materials. These sources lie 14, 5.5, and 12.5 km northwest of the community respectively (Table 2). They are not currently accessible to Holman, and would likely, in the event of their development, be connected to the community by winter roads.

Sources 1, 4, and 13 have prospective volumes of 300 000, 150 000 and 70 000 cubic metres of Class 2 materials respectively. Larger community projects are not, however, currently foreseen in Holman. The reservation and development of these sources is thus unnecessary at this time.

3.4.3 Class 3 Materials

EBA (1987) recommends the use of Source 8, described above, to supply the community's Class 3 requirements. While the community's projected requirement is for approximately 86 000 cubic metres of Class 3 materials (Table 1), the source has a prospective volume of approximately 300 000 cubic metres.

3.4.4 Class 4 Materials

No Class 4 material was identified in any of the sources in the Holman area. EBA (1987) recommends the use of Class 3 materials from Source 8 to supply these needs. Holman's combined class 2, 3, and 4 requirement (excluding Class 2 airstrip requirements, to be met from Source 5) is approximately 110 000 cubic metres (Table 1). The prospective volume of Source 8 is 300 000 cubic metres. This source should thus prove ample for the community's future class 2, 3, and 4 needs.

3.4.5 Class 5 Materials

Holman has almost unlimited supplies of Class 5 material. EBA (1987) recommends the use of conveniently available materials for the community's very modest (600 cubic metre) Class 5 requirements.

3.5 ASSESSMENT OF POTENTIAL SOURCES

3.5.1 Source 5 (The Transport Canada Pit)

This source is currently being used exclusively by Transport Canada for airport maintenance. A buffer is maintained between the developed area and the shore line, and coastal erosion and other environmental problems have been avoided. The area is not significant for wildlife, the local hunting, fishing, and trapping economy, or other community activities. Nor are there locally-known archaeological resources in the area.

The consensus of the workshop was that Source 5 could be reserved and its development could continue without significant environmental and social impacts.

3.5.2 Source 7 (Ukpillik Hill)

Like Source 8, Source 7 is generally bare of overburden and vegetative cover. Extensive excavation and stockpiling of covering materials would thus be unnecessary. Other potential environmental problems were not obvious at the site. Because the source is situated immediately north of

a community dump, its development should cause no visual problems. The area is significant neither for wildlife nor for the local hunting, fishing, and trapping economy. Nor is it used for other community activities (e.g., camping). There are no locally-known archaeological resources in the area. The source is also accessible on a year-round basis, and is sufficiently close to the community that the costs of its development should prove acceptable to the community.

The consensus of the workshop was that Source 7 could be reserved and developed without significant environmental and social impacts.

3.5.3 Source 8

The Jacks Bay portion of Source 8 is currently the primary source being used by the Hamlet. Materials have been excavated by surface stripping, without significant visual effects. No drainage or erosion problems were visible at the site. While the source is at the head of Jacks Bay, a buffer zone is being maintained between the developed area and the coast. Coastal erosion is thus not a problem. Nor, although it is fairly close to the community, do community representatives consider the development of the source to have caused negative social impacts in the community. There have, however, been discussions at the hamlet level of the possible expansion of housing towards the Jacks Bay area and of situating an arena in the area. While no formal plans have yet been developed, there is thus a possibility that, within the 20-year time frame of

this plan, the Jacks Bay source will no longer be available.

Source 8 is generally free of vegetation and overburden. Stripping and stockpiling of these materials would thus be unnecessary. Because of its proximity to the community, Source 8 is also of essentially no importance to wildlife or the local hunting, fishing, and trapping economy. Nor are there locally-known archaeological resources in the area.

The consensus of the workshop was that Source 8 could be reserved and developed without significant environmental and social impacts, provided that developed areas are kept at a distance from the residential sections of the community, that ponding and drainage are controlled, and that the number of pits under development at any time in the community as a whole is kept to a minimum.

3.6 COMPARATIVE ASSESSMENT OF SOURCES

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

The consensus of the workshop was that Sources 5, 7, and 8 could all be developed without significant environmental and social impacts. In order to minimize the environmental, visual, and safety-related effects of granular development, however, community representatives would prefer that the number of pits under development at any time be kept to a minimum. The Jacks Bay deposit and Source 5 are already under development, and are the best

TABLE 3

COMPARISON GRANULAR RESOURCE SOURCES-
HOLMAN

Source	Use	Environmental and Aesthetic Considerations	Wildlife and Social-Cultural Considerations	Economic Considerations	Comments	Ranking	
						Significance of Impacts	Acceptability of Development
1	Class 2 needs	Not addressed	Not addressed	14-km winter road required	Recommended by EBA for any future large-scale projects requiring Class 2 materials.	Not determined	Not determined
4	Class 2 needs	Not addressed	Not addressed	5.5-km winter road required.	Recommended by EBA for any future large-scale projects requiring Class 2 materials.	Not determined	Not determined
5	Class 2 needs	None identified	None identified	Existing pit serviced by all-weather road.	Currently being used exclusively by Transport Canada for airport maintenance.	Insignificant	Acceptable
7	Class 3 needs	Situated adjacent to existing dump.	None identified	Minimal vegetative cover and overburden. Access by existing all-weather road.	Workshop participants recommend development of this source after Source 5 and Jacks Bay portion of Source 8 are depleted.	Insignificant	Acceptable
8	Class 1, 2, and 3 needs	Potential for coastal erosion if buffer not maintained.	Portions are under developed areas in Hamlet	Portions under developed areas are unavailable. Minimal vegetative cover and overburden. Year-round access. Jacks Bay area proposed for future development.	Jacks Bay portion currently being mined. Hamlet would like this area completely mined prior to opening additional pits.	Insignificant	Acceptable
13	Class 2 needs	Not addressed	Not addressed	12.5-km winter road required	Recommended by EBA for any future large-scale projects requiring Class 2 materials	Not determined	Not determined

available to the Hamlet and Transport Canada from the perspective of the quality of materials required, and the cost of delivering materials. Community representatives would thus prefer that Sources 7 and further sections of Source 8 be developed only as required.

PART 4: RECOMMENDATIONS

(1) Sources 5, 7, and 8 should be reserved for public community use in Holman. These sources are the best situated from the perspective of accessibility, cost, and the minimization of environmental and social impacts.

(2) The quality and quantity of materials in Sources 5, 7, and 8 should be more reliably determined by site investigation. The location of Source 8 should be more accurately mapped. Any decision to alter the reservation of these sources should be made on the basis of confirmed supply information and in consultation with the Holman Land Use Planning Working Group.

(3) The private and corporate interests of the Inuvialuit should be assured access to Source 7 and any parts of Source 8 that lie on Inuvialuit lands, provided that the estimated total (public and Inuvialuit) 20-year demand is within the estimated total volume of the reserves.

(4) 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.

(5) In order to minimize the environmental, visual, and safety-related effects of granular development, community representatives would prefer that the number of pits under development at any time be kept to a minimum. The Jacks Bay deposit and Source 5 are presently being developed, and are the best available to the Hamlet and Transport Canada from the perspective of the quality of materials required and the cost of their delivery. Source 7 and further sections of Source 8 should thus be developed only as required.

(6) A granular development and environmental protection plan be produced for the development area as a whole. The plan should lay out a 5-to-10 year strategy for the orderly development of different sources, so as to

ensure the integration of community planning and granular development planning. The plan should also ensure that the development of granular sources is consistent with the community's future plans for expansion, that sources are developed so as to minimize environmental and visual impacts, and that the amount of materials recovered from the area is maximized. In addition, it should lay out procedures for the proper development and restoration of pits.

(7) Holman's future extraction and use of granular materials may have to be managed so as 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 than is presently anticipated. Some use of Class 3 materials for Class 4 work may, however, prove inevitable, given the apparent lack of Class 4 materials in the recommended sources.

(8) The majority of Source 8 lies on lands administered by the Hamlet. Source 7, and the remainder of Source 8, on the other hand, lie on Inuvialuit lands. If the recommendations of this plan are to be successfully implemented, then the parties using and managing granular materials and planning for the future development of the community (the Hamlet, ILAC, INAC, and Municipal and Community Affairs, GNWT) will have to cooperate in the implementation of the plan and in any follow-up work that is required. The logical focus for this cooperation may be the community's Land Use Planning Working Group. In any case, communications between the affected parties should be strengthened.

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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
5210 Lundquist Road
Yellowknife, NWT
X1A 3G2

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
Habitat Management
Biologist
Western Arctic Area

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