# GRANULAR RESOURCE EVALUATION

# BAKER LAKE, N.W.T.

DRAFT

Granular Program
Techncial Services Division

Department of Government Services
and Public Works

Government of the Northwest Territories
Yellowknife

January, 1993

# EXECUTIVE SUMMARY

Baker Lake, the only inland Inuit settlement in the N.W.T., is a rapidly growing community of over 1,000 people and one of the larger communities in the Keewatin. The Hamlet has recently been impacted by major capital projects that will require all grades of naturally occurring sand and gravel in the area.

The Granular Program, Department of Government Services and Public Works, has undertaken investigative field work, source sampling and testing, analysis of needs and reviewed pertinent economic and political factors to develop resource management options that will ensure that the community's long term granular material needs are met.

Two abandoned sites and nine active and potential sources of gravel were investigated as well as two potential quarry sites. A fundamental conclusion, is that the community is self-sufficient in all grades of granular material assuming that proper management of exiting and potential sources is implemented in terms of the optimum and best use of identified sources.

To aid in the management of these resources, it is suggested that the Hamlet establish a reserve on Source 6 as the primary community borrow source for future development and that all existing sources be depleted before developing future sites. Land reclamation of abandoned and active sources should become a high priority of the Municipality.

It is further recommended that the Granular Program, Department of Government Services and Public Works, mobilize a power screener when one becomes available, to aid in the processing of select grades or initiate the construction of a screener locally.

Also, in light of the close proximity of large amounts of good quality embankment class material, production projects normally implemented by the Program are not necessary at this time.

This recommended plan of action will guarantee the community a long term supply of quality granular materials.

# 4. GRANULAR SOURCES

This section provides an overview of the various active, abandoned, and potential sources within the study area. Each source is described in terms of location, genesis, volume, engineering properties, and development considerations. See Appendix A for laboratory analysis of samples, Note: The Source Location Map in Appendix B should be used as a reference.

## 4.1 ABANDONED SOURCES

Over the years, large quantities of granular material have been required for use in community infrastructure projects and for the construction of the existing airstrip. As a result, numerous abandoned and/or depleted borrow sources exist within and around the community. In some cases material still exists in these deposits; however, generally the remaining borrow material should be used for the restoration and reclamation of each borrow site. As well, ground truthing of these sources indicated that the remaining material is often at or below the water table and is poorly drained and frost susceptible. Within close proximity to Baker Lake there are a number of abandoned and/or depleted sources, two such borrow areas are noted below.

### 4.1.1 Source 1 / Community Pit-Temporarily Abandoned

Source 1 is located directly east and adjacent to the community situated between the newly constructed eastern subdivision and the road to the old sewage lagoon, directly east of the POL site. Access to the source is by the coastal road that traverses the area, west to east, separating the source area from the eastern subdivision. The road actually acts as the southern boundary of the deposit.

The existing pit is about 400 meters long parallel to the coastal road and 200 meters wide. The pit is bounded to the east by a drainage channel originating from Airplane Lake, the POL site to the west, the coastal road to the south, and an exposed sandstone bedrock ridge to the north. Existing pit boundaries can not be expanded further and excavation depth has reached the water table in most areas of the pit. The average thickness of the deposit is about 2.2 meters with beach sand and coarse till decreasing in thickness and quality southward toward the coastal road.

Surface drainage conditions on the lower terraces are poor due to the level topography. Thermokarst areas are prevalent throughout the upper level of the pit. Ponding has occurred in the lower levels. The permafrost table is at or near the surface of the existing pit floor and is developing within the numerous stockpiles.

The deposit has been developed extensively by the hamlet and is now temporarily abandoned; however, a considerable volume of granular material still remains in this deposit in numerous piles 'pushed-up' along the boundaries of the deposit and in stockpiles scattered over the depleted areas.

The source has been contoured into an upper terrace and lower level that merges with the coastal road. The source area is seen below ; the view is southwest.

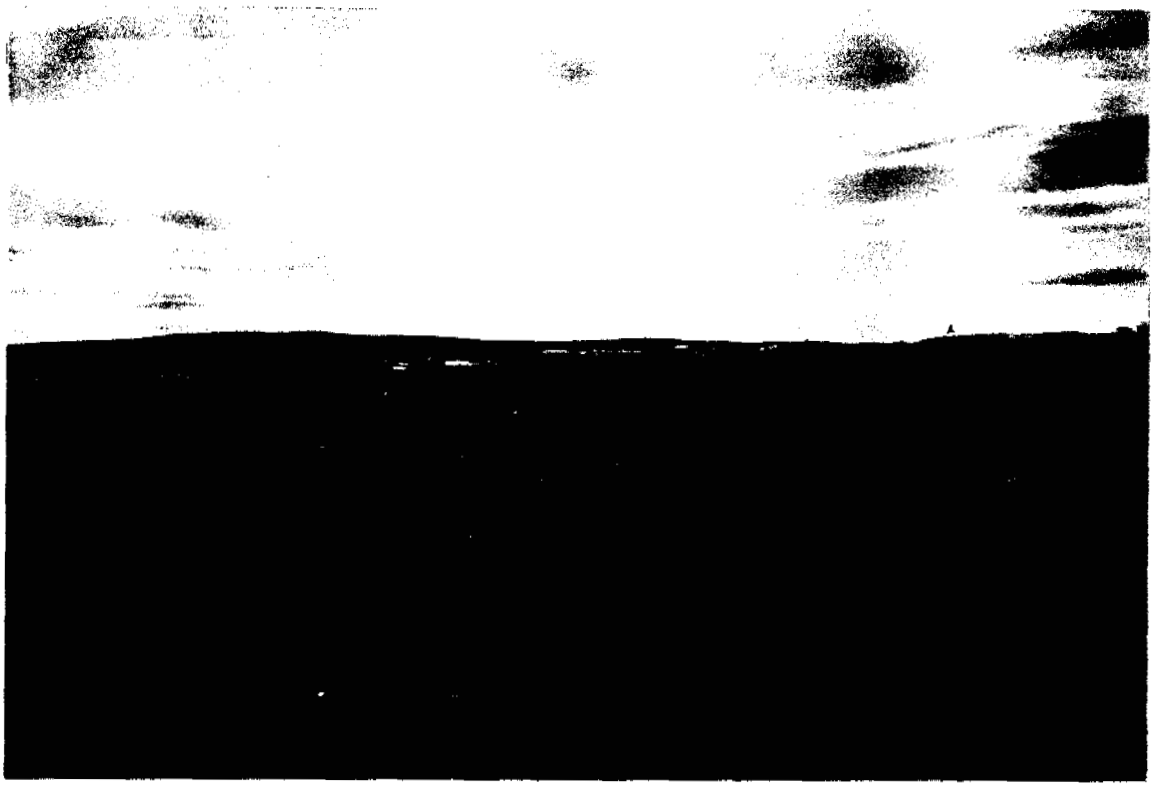

**PHOTO 5: Source 1 - behind existing POL site.**

The overall quality of remaining material in Source 1 varies considerably due to a complex depositional environment. Re-worked sandy beach ridge material developed over a coarse, grey-brown, boulder till. Throughout most of the deposit the glacial till is underlain by sandstone bedrock but as the source slopes down towards Baker Lake the till gradually merges with glaciolacustrine silts and clays deposited when the lake level was much higher. Subsequent excavation and contouring during the development of the deposit has mixed the stratified layers of material. As a result, remaining material consists of a heterogeneous mixture of poorly drained, poorly graded, silty sands and boulder gravel.

As mentioned, numerous small piles of silty gravel are scattered over the source area. A view of the material in one such gravel pile located on the upper terrace near the northern boundary of the Source is seen below.

**PHOTO 6: Stockpile of silty material - upper terrace of Source 1.**

On average the material consists of 32 % boulders to gravel, 56 % coarse to fine sand, and 12 % 'fines'. The boulders are rounded and average between 30 - 50 cm in diameter. The 'fines' vary considerably with a content of over 22 % found in stockpiled material located on the upper terrace. Material in the lower terrace is coarser and contains a much higher percentage of oversize in the cobble to boulder range. A view of the lower terrace area is noted on the following page.

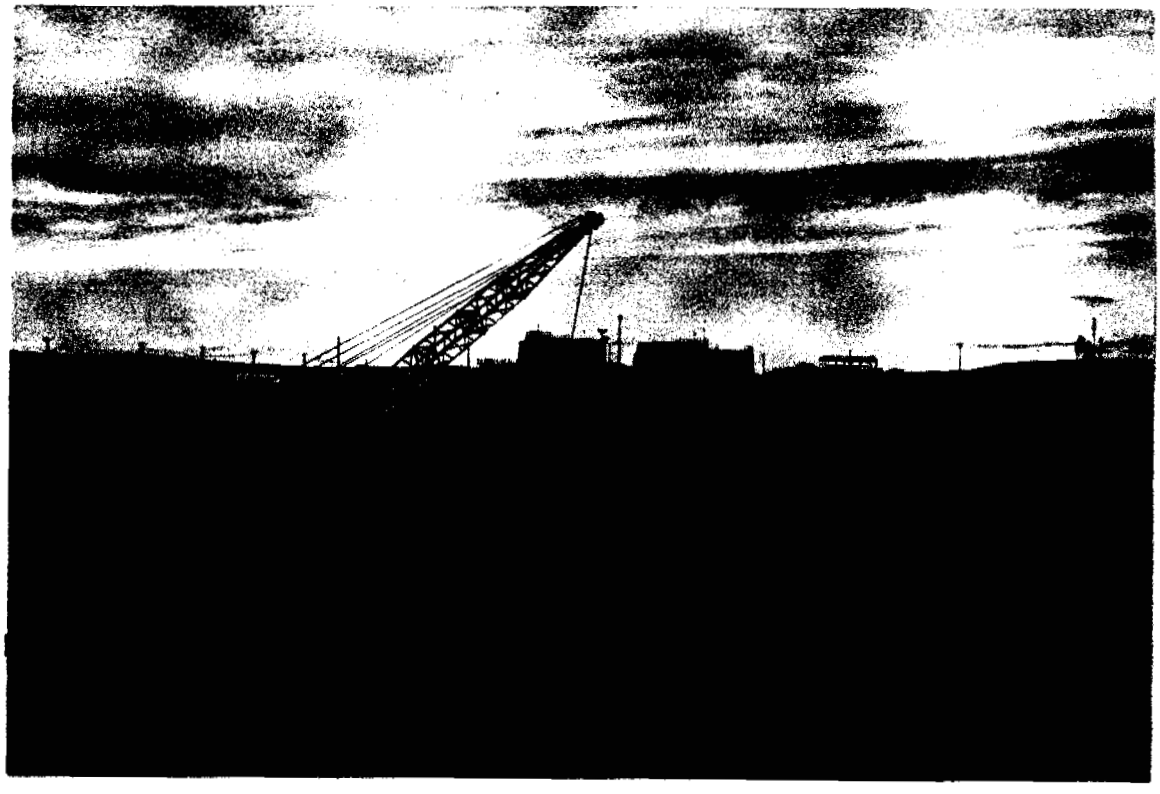

**PHOTO 7: Source 1 - lower terrace.**

Although the developed pit area has now reached the maximum extent of the deposit, Source 1 still contains about 10,000 $m^3$ of silty gravels and sand that has been pushed and piled into numerous ridges and small stockpiles that cover a large part of the northern and eastern sections of the pit. Coarse material in the boulder size range cover the surface.

### 3.1.2 Source 2 / Airport Source / Abandoned

Source 2 is a large deposit located directly southwest of the settlement, adjacent to the southeast slopes of Blue Berry Hill, approximately 6 kilometers from the centre of the community. The deposit is bounded to the east by the airport property, by the Blue Berry Hill road to the north and the bedrock ridges of Blue Berry Hill to the west. The source slopes gradually to the south to merge with the flood plain of the Thelon River. The actual boundaries of the source area have not been delineated as the deposit gradually merges with the steep slopes of Blue Berry Hill (Source 6) to the west and becomes discontinuous to the south and east.

Source 2 was used extensively by the community and covers a large area approximately 800 meters long and 500 meters wide. The deposit area has an irregular shape. Source 2 is seen below; the view is southeast.

**PHOTO 8: View of Source 2 - abandoned but not depleted.**

As mentioned, this deposit was used extensively during the construction of the airstrip and for community infrastructure projects. The source has been recently abandoned but still contains a considerable volume of material.

Material was removed form this source in a random manner without proper design or resource management. As result, material has been extracted through the development of numerous single user borrow pits. Abandoned borrow pits and exploratory test holes are found throughout the deposit. Old test pits indicate that the deposit had an average thickness of 2.0 meters before a sandstone bedrock was encountered. However, the average thickness to the deposit decreases up-slope. In undisturbed areas, frozen ground was encountered at a depth of 1.8 meters below the surface; vegetation and organic cover is minimal.

The deposit is an elongated raised beach ridge underlain by red sandstone bedrock which gives the material its' reddish colour. An all season road traverses the entire source area with smaller access roads, abandoned borrow pits, and test holes located on either side of the roads. Used machinery and broken equipment are found throughout the deposit area especially west of the access road. A view of this area is seen below.

**PHOTO 9: Abandoned borrow pits and test holes of Source 2.**

The material is poorly graded, well drained, red, gravelly sand with cobbles and boulders scattered over the surface and consists, on average, of 5 % oversize, 26 % cobbles to gravel, 67 % coarse to medium grained sand, and less than 2 % 'fines'.

The area was re-worked by wave action thus the 'fines' content of the material is low. A view of the material is seen below.

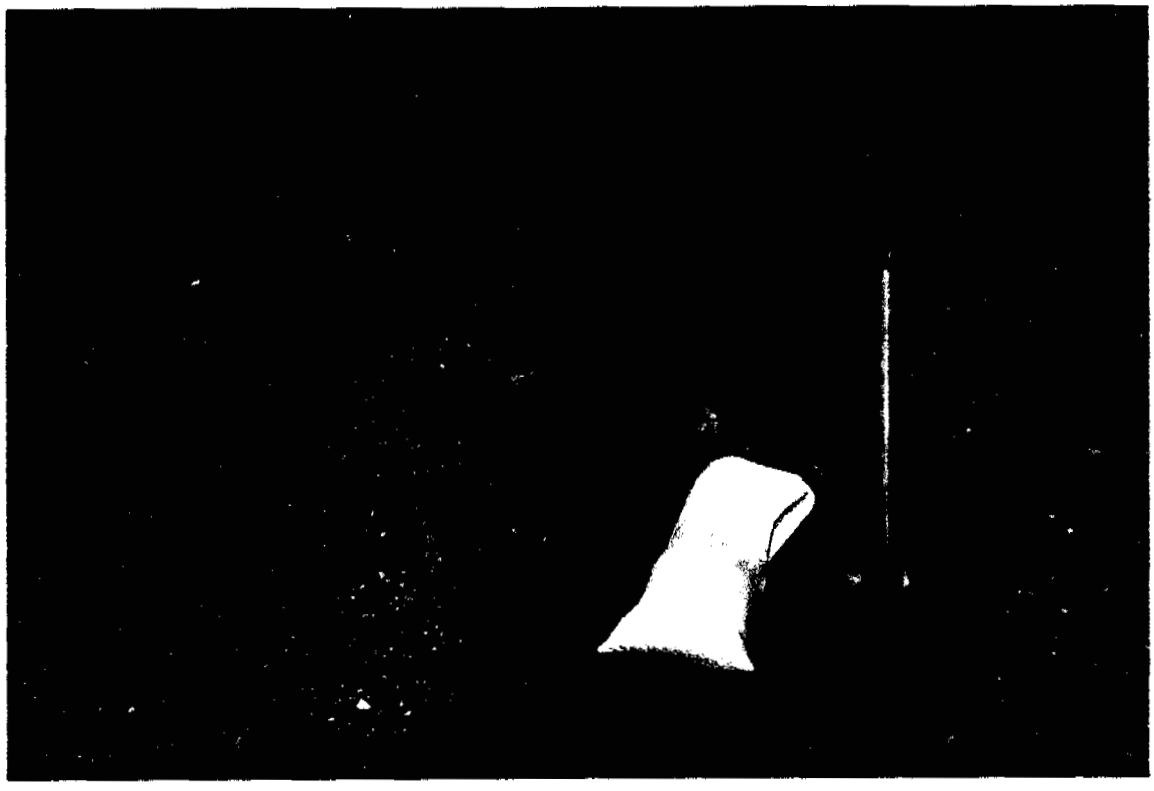

**PHOTO 10: Sandy material of Source 2.**

It is difficult to determine the amount of undisturbed area remaining due to the numerous abandoned borrow pits and piled material that is scattered randomly throughout the source area. Field reconnaissance indicates that Source 2 still contains a probable, recoverable volume in excess of 100,000 $m^3$ of clean, sandy material.

## 4.2 ACTIVE SOURCES

The active designation is used for sources that are currently being worked and still contain significant volumes of useable material. There are a large number of such sources within five kilometers of the community.

### 4.2.1 Source 3 / Community Pit

This is a large deposit located about 3.5 Km southwest of the community on the eastern slopes of Blue Berry Hill. The deposit is situated parallel and adjacent to the west side of the Blue Berry Hill access road. Source 2 is located another 0.5 kilometers southeast along this same road.

The present pit is rectangular in shape approximately 500 meters long, north to south parallel to the road, and 300 meters wide. The Blue Berry Hill road and existing pit floor provides excellent access to all areas of the deposit. Source 3 is seen below; the view is directly east towards the community from the western boundary of the deposit and only includes the central area of the existing pit.

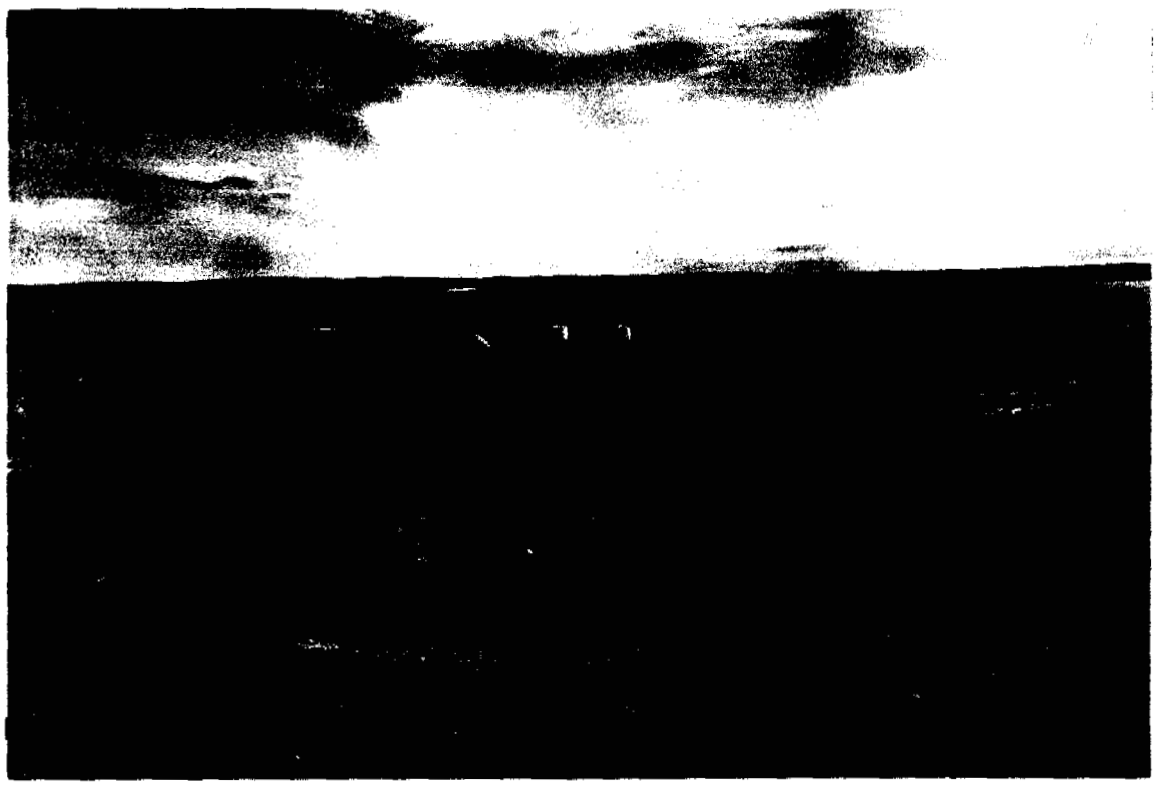

**PHOTO 11: Source 3 - view is directly east.**

The deposit is still used extensively as a source of granular borrow by local contractors and the community. Presently, excavation is limited to the northwestern sector of the pit. Pit operations have reached the maximum extent of the deposit to the south where the source merges with shallow bedrock and poorly drained terrain. To the east, the deposit area is bounded by the Blue Berry Hill access road. The existing boundaries of the pit can only be extended to the west and north. The central portion of the pit can be extended in a direction 100 meters north and 40 meters west to an average depth of 2.0 meters. The undisturbed area is a continuation of the sandy gravel beach ridge. Frozen ground was encountered at a depth of 1.8 meters. A thin organic mat covers the undisturbed area to a depth of 0.4 meters. .

The source is a gravelly sand, raised beach ridge underlain by badly weathered, fractured sandstone bedrock. As the pit was developed, material was 'pushed-up' into ridges and stockpiles that now cover the pit floor; presently, linear rows and small stockpiles of gravelly sand are scattered randomly between ridges of coarser material. As noted below, the sandy gravel material in these areas is well graded, well drained, and consists of 45 % gravel, 47 % sand, and 8 % 'fines;. the view is of the central portion of the pit near the present area of excavation.

**PHOTO 12: Sandy gravel material - Source 3.**

Material in the coarser ridges and stockpiles is poorly graded, well drained and consists of 15 % boulders to cobbles, 59 % cobbles to gravel, 18 % sand, and 3 % 'fines'. A view of this material is seen below; the area is near the northern boundary of the existing borrow area.

**PHOTO 13: Coarse and poorly graded material - Source 3.**

Test results indicate that neither the coarse grade cobbles and gravel piles or the gravelly sand stockpiles and ridges are suitable for screening. The surface drainage is poor over the developed areas of the pit due to the flat topography and lack of adequate drainage procedures; however, the material in the various piles and ridges is well drained and unfrozen.

It was difficult to ascertain the volume of material remaining in ridges and stockpiles over the pit floor, however, it is estimated that about 40,000 $m^3$ of material is still remain. Combined with about 12,000 $m^3$ remaining in the undisturbed area, Source 3 has a probable recoverable volume in excess of 52,000 $m^3$ of common grade material suitable as embankment to base class material and as non-frost susceptible general fill.

### 4.2.2 Source 4 / Sand Pit

Source 4 is located on the north side of the VOR access road about 1.3 Km west of the communication tower and 3.0 kilometers from the centre of the community. The source area is seen below; the view is northeast from the middle of the deposit; note the VOR road in the background.

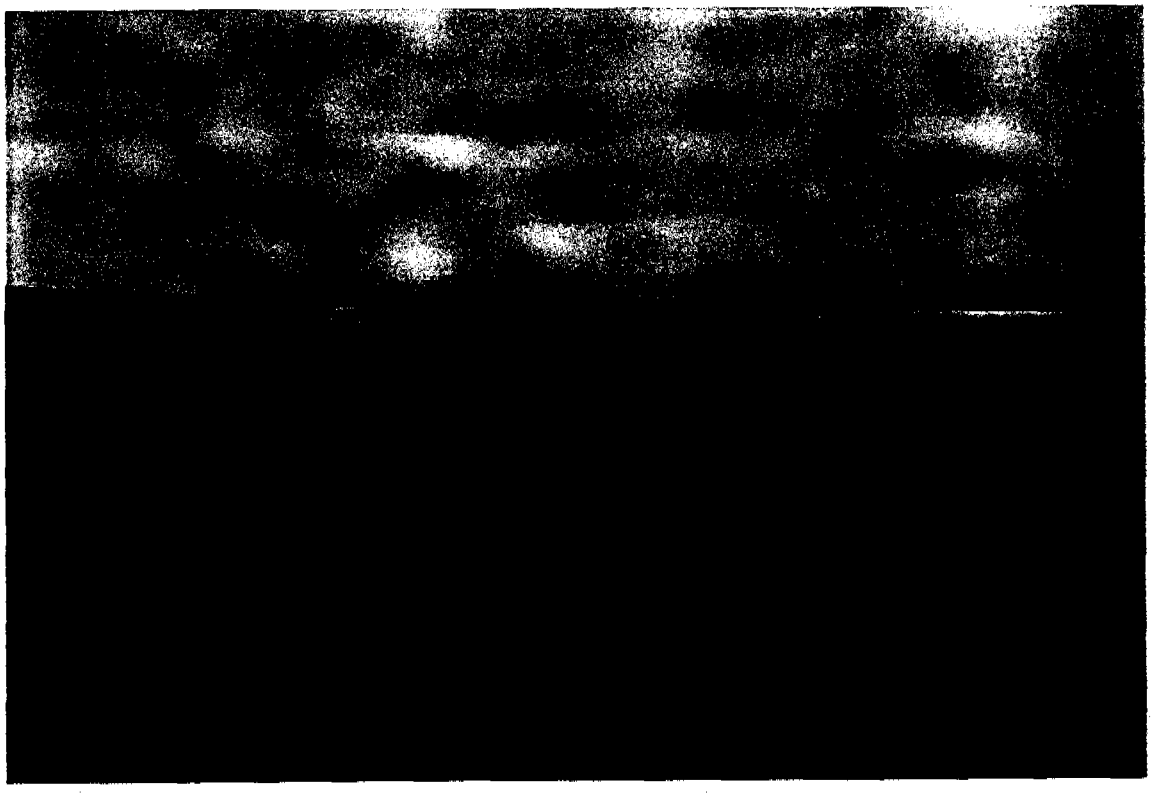

**PHOTO 14: Sand Pit along VOR road.**

The source is post glacial beach located on a poorly drained terrace. Wave action re-worked the sandy material removing most of the 'fines'. The source continues on the south side of the road but eventually merges into a poorly drained low lying area of marsh and thick peat.

The deposit has an irregular shape about 170 meters long, parallel to the road VOR road and between 80 - 1290 meters in width. The source gradually slopes to the north and south into poorly drained terrain and surface bedrock.

The material is a well graded, poorly drained coarse to medium sand with few 'fines'. Source 4 consists of 12 % gravel, 87 % sand, and less than 1 % 'fines'. The source area is highly susceptible to erosion. The deposit has an average thickness of 1.5 meters; frozen ground was encountered at a depth of 1.2 meters but surface ponding and thermokarst activity were prevalent throughout the disturbed area.

Source 4 still has a probable recoverable volume in excess of 10,000 m of coarse, non-frost susceptible sand suitable as general fill

### 4.2.3 Source 5 / VOR Pits--North / South

This source covers an extensive area on the eastern slopes of the VOR Hill, about 900 meters in total width, north-south axis, and 600 meters in length, west to east. The VOR access road separates the source area into two distinct segments--north and south of the VOR road. The community has used this source extensively and, as a result, there exists a number of abandoned and active borrow areas throughout both segments of the source area. The source area is approximately 4.0 kilometers southwest of the community along an all season road that terminates at the VOR beacon. The VOR road which separates the deposit is seen below; the view is directly east near the top of the VOR HIll. The deposit is located on both sides of the road.

**PHOTO 15: VOR Pit - Source 5**

Although the VOR access road separates the deposit, the entire sources consists of one large raised beach ridge deposited when the lake level was much higher. Terracing occurred as the lake level slowly dropped; as a result, the deposit varies in thickness and composition from west to east (down slope) but is relatively uniform in the north-south direction.

The northern segment is bounded by the VOR road to the south, the exposed rock ridges of the VOR Hill to the west, and poorly drained shallow terrain to the north and east. The deposit extends about 500 meters downslope from the top of the VOR Hill parallel to the road and about 450 meters north of the road. The northern boundary is not well defined as the deposit becomes shallow and discontinuous in this direction. A small bedrock ridge exposed at or near the surface traverses the middle of the northern segment. Two borrow pits have been developed in this segment , one on each side of this ridge.

The largest borrow area is located on the east side of the ridge. Access is directly from the VOR road onto the pit floor. The borrow area is approximately 250 meters long and 500 meters wide. Several piles of gravely sand and ridges of coarser material are scattered over the borrow area. A grizzly screener and a screened stockpile of material, about 800 $m^3$ of 2 inch minus, are located near the center of the pit. This area of the Source 5 and the screener are seen below.

**PHOTO 16: Source 5 North - Screener and 50 mm stockpile.**

A sieve analysis on the screened material showed that the product does not meet the required specifications for surfacing or base material. As a select grade, the material needs a 10 % 'blend' source to improve the gradation mostly in the fine sand to 'fines' range.

This area of the deposit is mostly a clean, sandy, gravel with cobbles and is well drained and poorly graded. The material consists of 62 % cobbles to gravel, 35 % sand, and 3 % 'fines'. Oversize is minimal. The lack of 'fines' indicate that the material would not be suitable for processing. Permafrost was not found within the stockpiled material. A view of the material is seen below.

**PHOTO 17: Source 5 - material on north side of VOR road.**

The borrow pit to the west of the ridge has been recently developed and is smaller, about 200 x 200 meters. Bedrock underlies this area and is often near or at the surface. Access is directly off the VOR road. .

The material is mostly a sandy gravel and fractured bedrock. The badly weathered bedrock has formed a detritus layer over the sandy gravel thus there is a higher content of boulders to cobbles than in the pit to the east of the ridge, however, the 'fines' content is still low, less than 2 %.

The southern segment of Source 5 has an irregular shape and covers a larger area. This area is bounded to north by the VOR Hill road, to the east and west by surface bedrock, and to the south by poorly drained terrain. The area is about 600 meters long, parallel to the VOR road and varies in width between 350 - 450 meters. The eastern area of this segment has been extensively developed and is temporarily abandoned. Long ridges of coarse material are located throughout this area of the source. The material is well graded and consists of 9 % boulders to cobbles, 60 % cobbles to gravel, 30 % sand, and less than 1 % 'fines'. A view of this area and the ridged material is seen below.

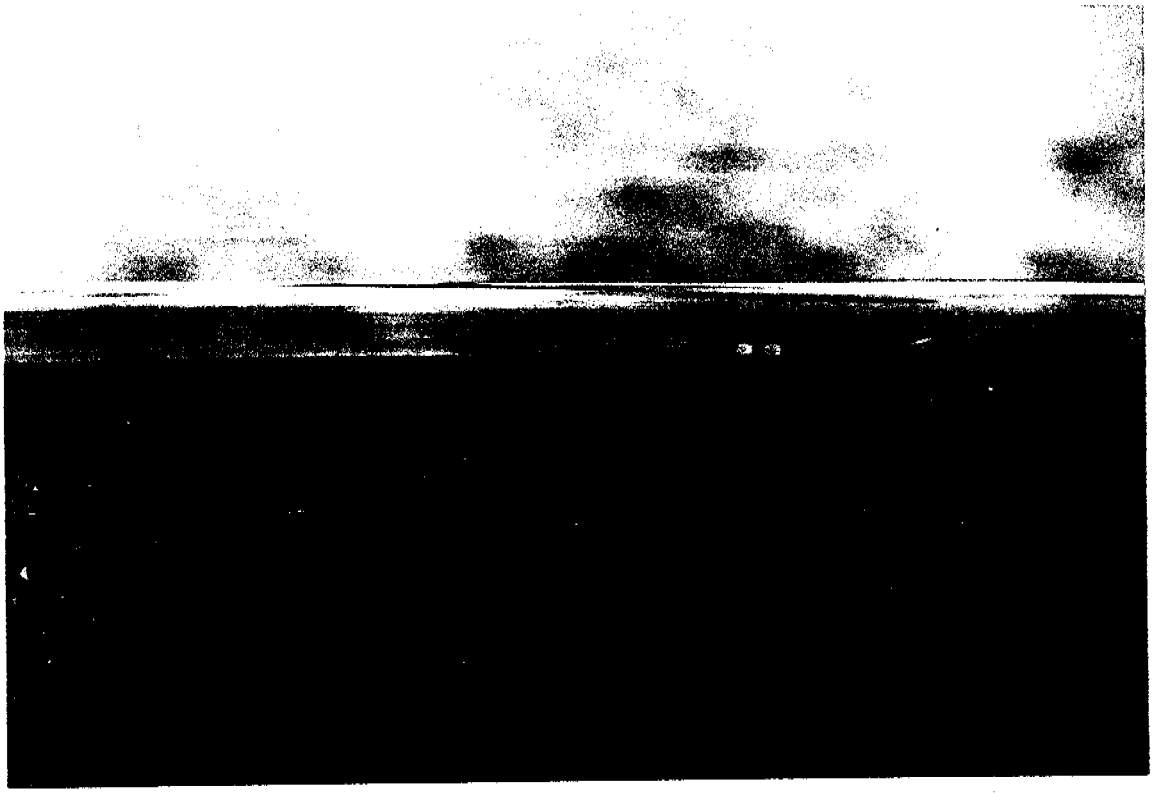

**PHOTO 18: Source 5 - borrow area on south side of VOR road.**

Presently, excavation is occurring at the very top of the VOR Hill, at the far western boundary of southern segment. In this area of the source, the thickness of the deposit is shallow , about 1.0 meters to bedrock. The material is a well graded sandy gravel and consists of 63 % cobbles to gravel, 36 % coarse sand, and less than 1 % 'fines'.

Pit development has now covered most of the deposit area with remaining material 'pushed-up' into long ridges or into stockpiles. Pit boundaries are poorly defined but remaining undisturbed areas are minimal. Permafrost was not encountered as the deposit is underlain by shallow bedrock which has been reached in most areas of the source. However, a tremendous volume of material still exists in the numerous ridges and stockpiles scattered over the source area.

Over all, tests results indicate that the granular material of Source 5 is only marginal for the production of select grades, although the material has been screened in the past. To meet select grade specifications, the material needs a 'blend' source to improve gradation and compaction.

Source 5 still contains a probable recoverable volume of 25,000 $m^3$ within the northern segment and 15,000 $m^3$ within the southern segment, for a total of 40,000 $m^3$ of common grade material.

## 4.3 POTENTIAL SOURCES

These are granular sources that are not being used at present, but contain significant volumes of naturally occurring good quality material. Normally these sources have to be developed upon initial identification through pit planning and design procedures and concludes with pit operations and restoration. There are a number of economically viable potential sources in close proximity to the community.

### 4.3.1 Source 6 / Blue Berry Hill

Source 6 is located on the eastern slopes of Blue Berry Hill, about 0.4 kilometers up-slope from the abandoned Source 2, approximately 6 kilometers southwest of the community. The source is actually the westward up-slope extension of Source 2. The boundary between the two sources is not well defined. Access is excellent in the summer by way of a narrow road that branches southwest from the Blue Berry Hill access road. The road climbs the beach terraces of Blue Berry Hill for about 1.5 kilometers and terminates near the top of the hill below a bedrock ridge. Winter access is not possible as the road is not used during the winter months.

The deposit consists of a series of wave-cut beach terraces bounded on the west and north by bedrock outcrops and poorly drained, shallow terrain to the east and south. In total, the terraces cover an area 400 meters long and 100 meters wide. A large flat terrace with large boulders and frost-shattered bedrock covers the top of the deposit just below the bedrock ridge that represents the top of Blue Berry Hill. A primitive ATV trail continues south around this ridge and terminates above a steep bluff.

Old exploratory test pits are found along the access road and terraces indicating that the source has been considered for development. The test pits show that red sandstone bedrock underlies the deposit area to an average depth of 2.0 meters. However, an area 100 m x 80 m, representing the top portion of the deposit, is relatively flat and shallow; this area is poorly drained with depth to bedrock less than 1.0 meters. Large boulders over 300 cm in width are found on the surface. The active layer varies considerably over the source area between 1.2 - 2.2 meters in depth. Tundra vegetation covers most of the area with an organic mat of 12 cm or more. A view of one of the terraces that comprise the source is noted on the following page; note the range of material sizes from sand to boulders.

**PHOTO 19: Source 6 - boulders to sand.**

The material is a poorly graded, sandy gravel and consists of 54 % boulders to gravel, 52 % coarse sand, and 4 % 'fines'. Source 6 contains a probable recoverable volume of over 60,000 $m^3$ of all grades of granular material, especially from the lower slopes. The poorly drained, flat terraced areas near the top of the deposit should remain undisturbed.

### 4.3.2 Source 7 / West on Till Plain

This source is located southwest of VOR Hill and northwest of Blue Berry Hill situated on the rolling terrain that extends west of the community about 7 Km southwest of the settlement. The large linear bedrock ridge that represents the summit of Blue Berry Hill separates this deposit from Source 6 that is situated east of the ridge on the slopes of the hill.

The source is a poorly developed, post-glacial, beach deposit that has formed over a low,,elongated, bedrock outcrop that extends west from the top of Blue Berry Hill. About 0.5 meters of broken, weathered, detritus has accumulated along the slopes and over the poorly developed gravel beach strand.

The deposit is bounded by marsh and poorly drained terrain on three sides, and the exposed bedrock ridge of Blue Berry Hill to the east. The deposit has an estimated average depth of 1.0 meters and appears well drained. A view of the deposit is seen below.

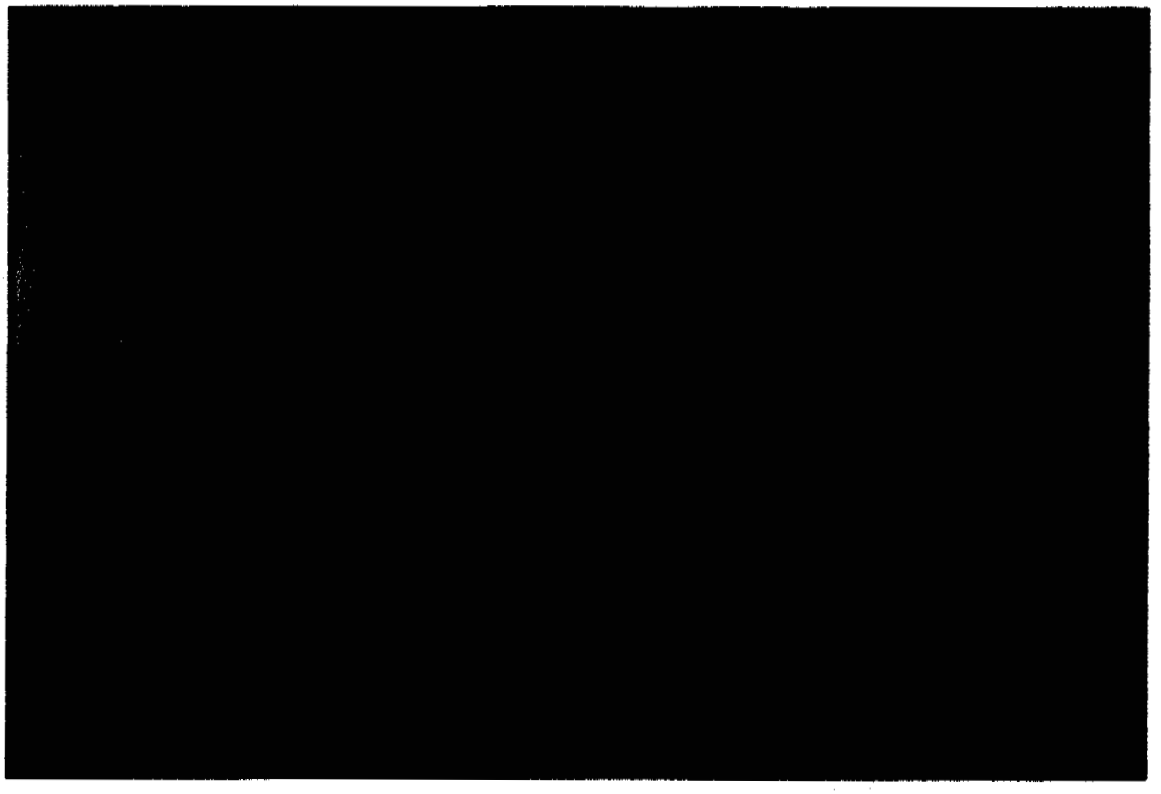

**PHOTO 20: Source 7 on Till Plain**

The material was frozen at an average depth of 0.4 meters below the surface. Actual thickness of the deposit was difficult to determine due to the fact that refusal occurred at about 0.5 meters. Oversize material was minimal and there was little to no vegetation cover. The material consists of over 20 % fine gravel, 59 % coarse sand with 'fines' estimated at less than 1 %.

Development of this source would be difficult as the only access is by an ATV trail that traverses around the eastern ridge and across poorly drained, low-lying terrain. Several marsh areas. small ponds, and bedrock ridges are located between the source area and the community. Construction of a 2 kilometer haul road would be necessary to connect the source area with the Blue Berry Hill access road located to the south.

Source 7 contains a probable recoverable volume in excess of 15,000 $m^3$ of common grade material.

### 4.3.3 Source 8 / Whitehills Road

Source 8 is located 5.5 Km directly north of the community situated along the proposed road alignment between the Hamlet of Baker Lake and Qamanaugatwaq Lake. A small part of the deposit and source material is seen bleow.

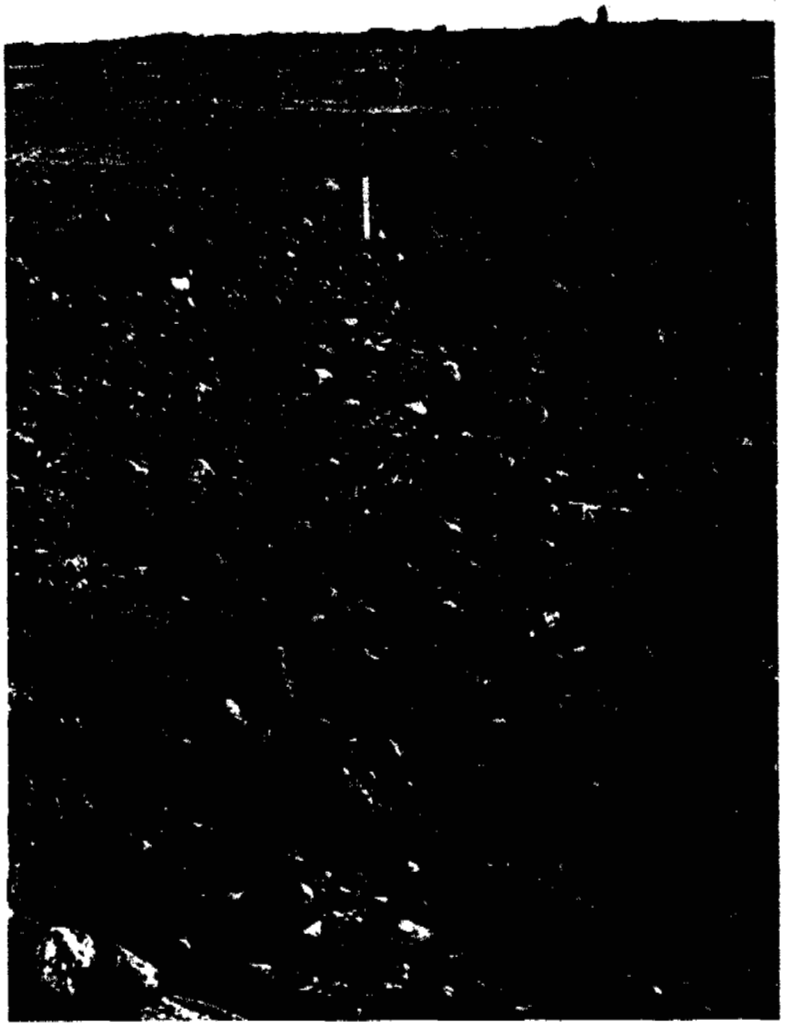

**PHOTO 21: Whitehills road material - Source 8.**

The deposit is an extensive beach ridge deposit about 1200 meters in length, along a southwest - northeast axis, and varies in width between 100 meters at the toe, toward the northeast, to about 250 meters at the south end of the source. The deposit has an average depth of 1.1 meters with the thickest part of the source towards the narrower northeast end or toe of the deposit. The material consists of 14 % cobbles, 82 % gravel sizes, 4 % sand, and no 'fines'. It was noted that the material becomes finer towards the toe of the beach ridge with the cobbles content decreasing to less than 1 % and the sand content increasing to 11 %. The material is poorly graded and well drained.. At present there is no direct land access to the source area.

Source 8 contains a probable recoverable volume in excess of 200,000 $m^3$ of common grade granular material. It should be noted that there are several other smaller granular deposits located along the proposed access route These deposits would not be cost-effective to develop for community infrastructure projects but would supply sufficient quantities of material for construction of the road, assuming required quantities are not available from Source 8.

### 4.3.4 Source 9 / East of Airplane Lake

This source is located 2 Km from the centre of the community just east of the existing community solid waste site and south of Airplane Lake. Access is by the existing all season road to the solid waste site that traverses the site area and continues eastward for about 500 meters up the moderate slope of a drumlinoid shaped ridge; the road terminates at the top of the ridge and continues as an ATV trail for about 3 Km southeast towards Nuvuttuaq Point.

Source 9 is situated at the top of the ridge and covers an area about 120 meters long, adjacent to the north side of the road, and 100 meters wide down the northern slope of the ridge facing Airplane Lake. The ridge is approximately 10 meters above the surrounding terrain.

Old test pits show that the deposit has an average depth of 2 meters to bedrock. Exploratory pits were found at the top and on the north slopes of the ridge. Although the deposit continues south of the road and down the south slope (facing Baker Lake), test pits show that the deposit is shallow and discontinuous over this area with bedrock at or near the surface. The north slopes of the deposit gradually merge with the poorly drained terrain south of Airplane Lake.

The source appears well drained but frozen ground was encountered at a depth of 0.8 meters below the surface; the permafrost table will be even closer to the surface on the north slope. Vegetation cover was thick with over 12 cm of organic mat covering the slopes of the ridge.

The material is a poorly graded, gray-brown sandy till over lacustrine silts and clays deposited when the lake level was much higher. The clay layer is found at about 1.5 meters below the surface and varies in thickness between 0.2 - 0.5 meters. The lacustrine clays are thin at the top of the ridge and increase in thickness down-slope and underlain by granitic bedrock.

On average, the material consist of 27 % cobbles to gravel, mostly within the till layer, 64 % coarse sand, and 8 % 'fines'. The 'fines' content varies considerably with location. The coarser material is found mostly within the first 0.5 meters below the surface.

Source 9 has a probable recoverable volume in excess of 24, 000 of common grade material.

### 4.3.5 Source 10 / East

This source is located 3 Km east of the community about 1 Km directly east of Source 9. The ATV trail that extends eastward and through Source 9 provides limited access to the site . The source area and access trail are seen below.

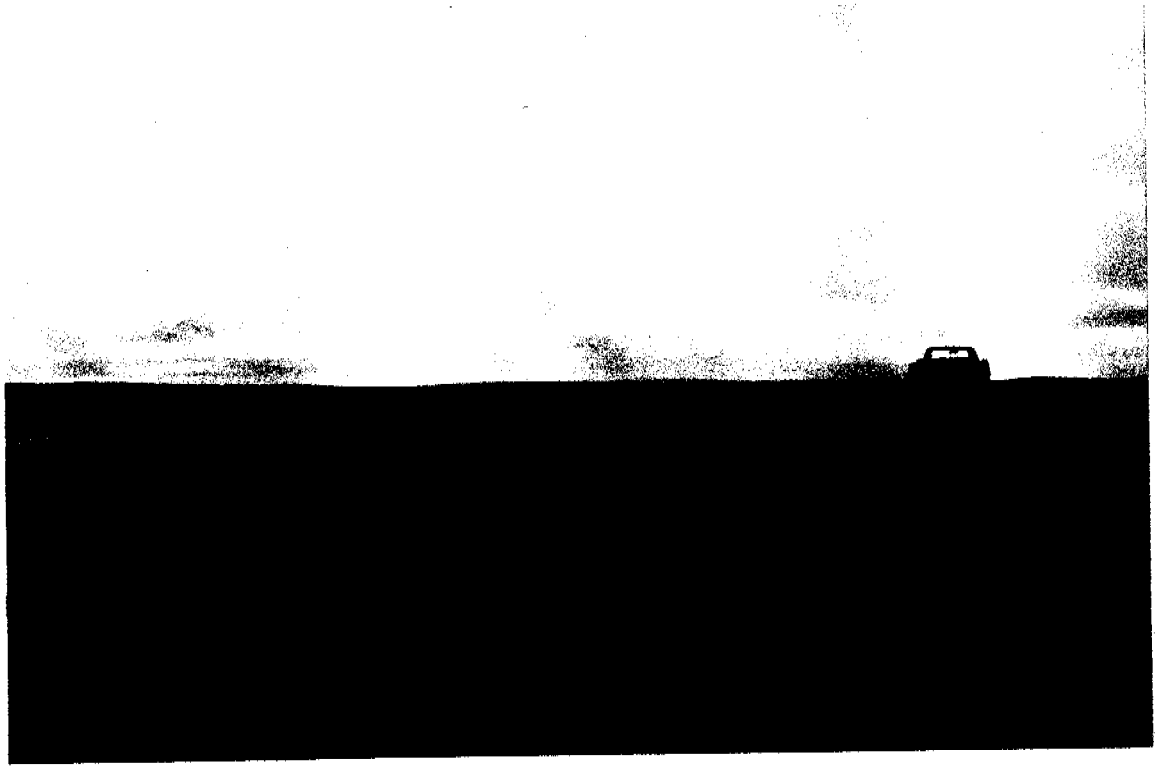

**PHOTO 22: Source 10 - Airplane Lake**

The source is an isolated beach terrace underlain by bedrock about 180 m long and 40 m wide. The ATV trail defines the southern boundary of the deposit. Although the deposit area rises about 2.5 meters above the surrounding poorly drained terrain, the average depth of the deposit to bedrock is only about 1.5 meters as the deposit is underlain by the bedrock ridge that rises above the surrounding terrain. Frozen ground was not encountered in the test pits. The vegetation cover is minimal.

The material is a well drained, well graded, coarse sand with some gravel and cobbles at the near surface. A view of the material is seen below.

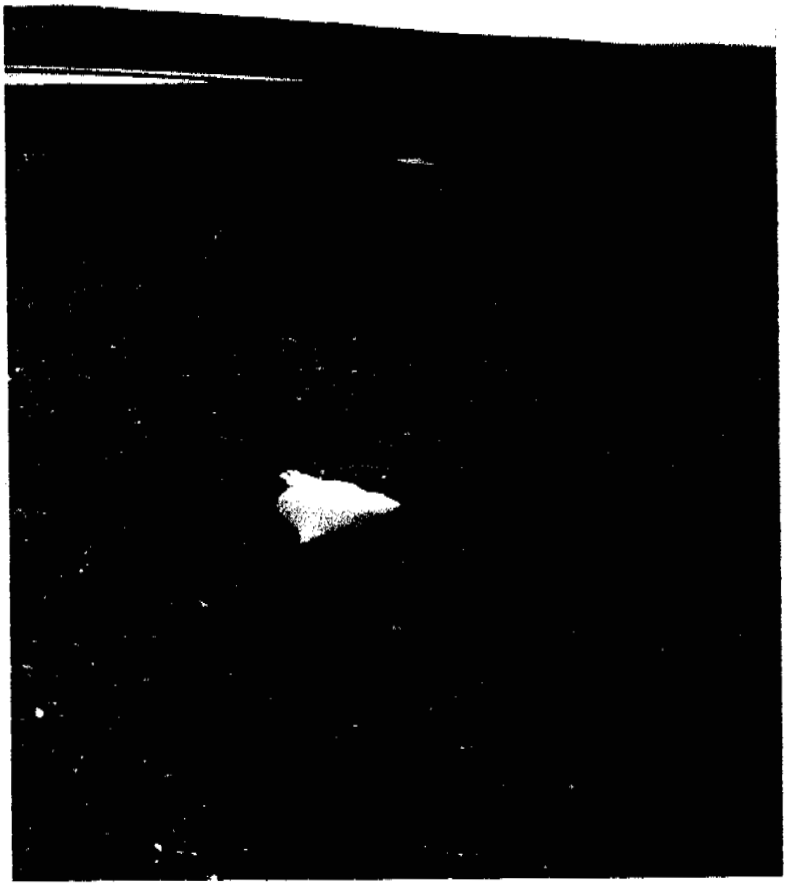

**PHOTO 23: Sandy gravel material of Source 10.**

The material consists of 21 % cobbles to gravel, 75 % sand, and 4 % 'fines'. Source 10 contains about 10,000 $m^3$ of common grade material suitable as general fill.

### 4.3.6 Source 11 / Beach Terrace

Source 11 is located about 6 Km east of the community along the raised shore of Baker Lake. The deposit would only be accessible by the construction of a winter ice road adjacent to the north shore of the lake. The deposit is a relatively modern beach terrace that rises steeply from the water of Baker Lake. The source covers an area about 150 meters long, east to west, and 100 meters wide and is surrounded by exposed bedrock ridge that rise about 10 meters above the relatively flat terrace. Source 11 is seen below; the view is directly west towards the community.

**PHOTO 24: Modern Beach Terrace - Source 11.**

Frozen ground was encountered at a depth of 1.2 meters, however, old test pits showed that the average depth of the deposit is at least 2.0 meters with the deposit increasing in thickness up-slope towards the bedrock ridges. Water was found at the bottom of the test pits indicating that the material is poorly drained and the permafrost table is at or near the surface.

The material is a poorly graded, coarse gravel and consists of 83 % cobbles to gravel, 16 % sand, and less than 1 % 'fines'. A high percentage of the cobbles were in the 75 cm - 170 cm range.

Source 11 contains a probable recoverable volume of common grade granular material in excess of 30,000 $m^3$

### 4.3.7 Rock Quarries - Q1 / Q2

Excellent rock quarry sites are located north and west of the community. A large west-east trending rock ridge complex ( Q1 ) is situated about 2 Km north of the community just north of the newly constructed solid waste site. A 100 meter access and haul road would have to be constructed over low-lying, poorly drained terrain that is situated between the recently constructed community solid waste site and the bedrock ridge complex. Part of the ridge complex is seen below; the view is directly north.

**PHOTO 25: Q1 - North.**

Surface rock is badly weathered and jointed due to frost-shattering but becomes massive and dense with depth. Accumulations of frost-shattered, angular material has occurred on the steep slopes of the ridges producing small scree deposits. Test results show that the rock is very hard with a low abrasion rate. Less than 2 % 'fines' were produced when crushed to 25 mm indicating that a 'blend' source will be necessary for the production of select grades. The ridge complex could provide in excess of 100,000 $m^3$ of blasted rock.

## 6.3 TABLE 2: COMPARISON OF GRANULAR RESOURCE SOURCES BAKER LAKE

| Source | Distance from community | Access | Material Type and Quality | Quantity cu. m. | Cost/cu/m Load, haul, place, & compact | Environmental Impact |
|---|---|---|---|---|---|---|
| 1 Abandoned | POL Site | Excellent | Silty Sand and gravel, high fines content (clay) with oversize | 10,000 | $10.00 | Minimal Land reclamation necessary |
| 2 Abandoned | 6.0 Km | Good Seasonal | Gravelly sand | 100,000 | $12.00 - $13.00 | Moderate |
| 3 Active | 3.0 Km | Excellent | All Grades good -excellent | 50,000 | $12.00 | Severe at present Proper pit management and land reclamation necessary |
| 4 Active | 3.0 Km | Good | Poorly graded gravelly sand | 10,000 | $12.00 | Minimal |
| 5 North Active | 4.0 Km | Good | Sandy gravel and coarse sand Screened Stocpile 50 mm material | 25,000 800 | $12.00 $18.00 | Moderate Land reclamation necessary |
| 5 South Active | 4.0 Km | Good | Mostly oversize and coarse sand | 15,000 | $12.00 | Severe Drainage and erosion control necessary |
| 6 Potential | 6.0 Km | Poor - Fair Seasonal | Sandy gravel Some oversize | 60,000 | $ 13.00 - $15.00 | Moderate Slope contouring and positive drainage necessary |
| 7 Potential | 8.0 Km | Poor - Seasonal | Gravelly sand | 15,000 | $12.00 plus development costs | Minimal Access and haul road necessary |

**TABLE 2 Continued: RESOURCE COMPARISON BAKER LAKE**

| Source | Distance | Access | Material Type and Quality | Quantity cu. m. | Costs per cu. meter | Environmental Impact |
|---|---|---|---|---|---|---|
| 8 Potential | 5.5 Km | Poor | Poorly graded cobbles and gravel | 200,000 | Part of Whitehills Raod Construction costs. | Minimal |
| 9 Potential | 2.0 Km | Fair | Silty sand with some gravel | 24,000 | $12.00 | Moderate Drainage and ersion control procedures necessary |
| 10 potential | 3.0 Km | Fair | Gravelly sand | 10,000 | $12.00 - $13.00 | Minimal |
| 11 Potential | 6.0 Km | Poor Ice road required | Cobble to gravel range , some sand | 30,000 | $ 15.00 - $17.00 | Minimal |
| Rock Quarry Q1 | 2.0 Km | Poor - Good | Blasted rock Size to grade | 100,000 + | $ 40.00 + Estimate | Moderate 100 meter access road needed |
| Rock Quarry Q2 | 6.0 Km | Poor | Blasted rock Size to grade | 40,000 + | $ 45.00 + Estimate | Moderate 100 meter access road and 3 Km upgrading of existing trail |
| | | | | | | |
| | | | | | | |

# 7. RECOMMENDATIONS

The following recommendations are based on an analysis of identified granular resources and the economic, political and other factors influencing gravel supply within the study area:

General

- the community is self-sufficient in all grades of granular material and thus granular production projects normally initiated by the Granular Program, Department of Government Services and Public Works, are not recommended for implementation at this time.
- to enhance the ability of the community to process select material, the Granular Program initiate the mobilization of a 90B Screen-All to the community when one becomes available.

Resource Management

- the Municipal Council direct, by resolution, that the resources discussed in this study be utilized only for the purposes as described in Section 6 of this report.
- the Municipal Council direct, by resolution, that further development of potential sources be deferred until existing active sources are depleted or for at least a three year period until 1997/98.
- the Municipal Council approve, by resolution, the establishment of a reserve, quarry license and land use permit on the entire Source 6 and that this site remain the primary source of potential embankment class material for community infrastructure projects.
- the Municipal Council approve, by resolution, that all environmental and operational guidelines be implemented for land reclamation and restoration of active borrow pits especially with regard to Source 3 and Source 5.

These recommendations have been prepared and presented through the quantitative assessment of identified granular sources and development costs as discussed in the various sections of the report. The recommendations represent a "best-case" scenario for satisfying the long term granular requirements of the community and should be evaluated by community officials in order to confirm preferred alternatives.

It is hoped that the foregoing report will contribute to the continual growth of the community by the timely and economical development of community granular resources.