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Granular Resources Forecast Model User's Guide

For Indian and Northern Affairs Canada and the Inuvialuit Land Administration

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1. Introduction

1.1. Background

Granular resources are an important construction material in the North. Historically, granular material has been used in the construction of roadways, airfield runways, embankments to support buildings and other physical structures, and in the construction of drilling pads and temporary offshore exploration structures in the shallow waters of the Beaufort Sea.

Granular resources (gravel) in the Mackenzie Delta region of the Northwest Territories are limited. Much work has been done during the past quarter century to quantify the volumes and quality of the various eskers (long, narrow ridge of coarse gravel deposited by a stream flowing in a decaying glacial ice sheet) located in the region.

Historically, management of granular resources was the responsibility of the Department of Indian and Northern Affairs, Canada. As part of the Inuvialuit Land settlement in 1984, however, much of the granular resources in the Mackenzie Delta region are now owned by the Inuvialuit. Thus, management of the resource is now divided between the Department and the Inuvialuit Land Administration.

One of the key variables in managing the resource is the ability to forecast potential demands on an ongoing basis. The Granular Resources Forecast Model provides for an efficient tool for archiving and analyzing these demands.

1.2. Forecast Model Overview

The primary objective of the project was to develop a Microsoft Access version of the model that will allow DIAND and the Inuvialuit Land Administration to forecast granular resource requirements in the Western Arctic Region.

The broad framework for the model is shown in Figure 1. As identified above, the model can focus on the past, present, and future. It draws this information from one central data base that will contain information pertinent to granular resource usage.

The intent in following this approach was to provide a tool that would help the various groups forecast granular resource usage and help in the management of current granular usage.
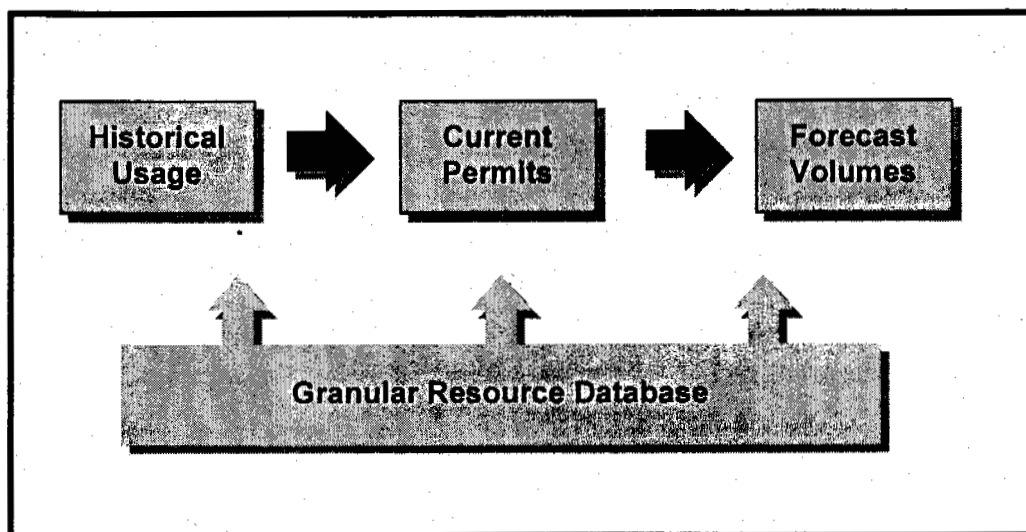

Figure 1 - Model Overview

1.3. Forecast Model Documentation

The Granular Resource Forecast Model© User's Guide describes the program and its underlying basis. It provides basic instructions, procedures and tips on how to use the tool in an effective and accurate manner.

The user's guide is intended for people of all experience levels. The information is organized into six sections. This introduction gives an overview of the contents and conventions. Section 2 defines the system requirements and provides instructions to install and use the Granular Resource Forecast Model©. It also gives an overview of the menu structure. Section 3 defines the Data Management portion of the program, and Section 4 the analysis half of the program.

It is important to understand the terms and notation conventions in this user's guide before using the Granular Resource Forecast Model©.

1.4. Conventions

General

- The word "choose" is used to select a menu button.

- Bold type in the text and procedures indicates words or characters that are typed or buttons that are selected.

- Bulleted (•) lists, such as this one, provide information, not procedural steps.

- A numbered list (1, 2, 3 ...) indicates a procedure with two or more sequential steps.

Mouse

- The documentation assumes that you have configured the left mouse button as the primary mouse button.

- "Point" means to position the mouse pointer until the tip of the pointer rests on what you want to point to on the screen. For example, "Point to the button **Add or Update Data**."

- "Click" means to press and immediately release the mouse button without moving the mouse. For example, "Click on the button named **Add or Update Data**."

- "Double-click" means to click the mouse button twice in rapid succession. For example, "Double-click on the Microsoft Excel icon to start Microsoft Excel."

Keyboard

- Key names match the names shown on most keyboards and appear in small capital letters. For example, the Shift key appears as SHIFT.

1.5. Technical Support

NORTH OF 60 ENGINEERING LTD. offers a variety of support options to help get the most from the Granular Resource Forecast Model©. These services include:

- Custom modifications to the model

- Customized training

- Technical support

If you encounter a problem or have a question about the application, first look in the printed documentation. If you cannot find the answer, phone or fax NORTH OF 60 ENGINEERING LTD. from 8 a.m. to 5 p.m. (Mountain Time) Monday through Friday.

NORTH OF 60 ENGINEERING LTD. support services are subject to prices, terms, and conditions in place at the time the service is required.

When you call, you should be at your computer with the Granular Resource Forecast Model© running. Be prepared to give the following information:

- The version of Microsoft Access you are using.

- The type of hardware and operating environment you are using.

- The exact wording of any messages that appeared on your screen.

- A description of what happened and what you were doing when the problem occurred.

NORTH OF 60 ENGINEERING LTD. can be reached by phone, fax or email:

Phone: (403) 263 - 2121
Fax: (403) 263 - 2122
Email: support@north60.com

2. Getting Started

2.1. System Requirements

The Granular Resource Forecast Model© has been developed under Microsoft Access running on the Windows operating system. To use the model you need the following minimum hardware:

- A Windows 98/ME/2000/XP machine with Microsoft Access 2000/2002 and Microsoft Excel 2000/2002 installed.

- Memory (RAM) requirements for Microsoft Access should be sufficient to operate the model.

- Disk space depends on the size of the database; however database size is typically 1 or 2 megabytes.

- A Microsoft Windows-compatible printer is optional.

2.2. Installing the Forecast Model

The following instructions describe how to install the Granular Resource Forecast Model© on your computer. Although the model is not copy protected, Indian and Northern Affairs Canada, and the Inuvialuit Land Administration may make copies only for business use. For complete details, please read the license agreement in Appendix A.

To install the Granular Resource Forecast Model©:

1. The model and the database are contained in a single Microsoft Access database file. The file can be copied to any folder on the system using Windows Explorer.

2. To use the help feature of the model, the help files must be copied to a folder called GRANMANUAL. This folder must be located in the same folder as the model.

2.3. File Structure of Model

The Granular Resource Forecast Model© has been developed as an application within Microsoft Access so it requires Access to operate. The installation procedure outlined in the previous section copied one file and one folder onto your hard drive. Their names and function within the application are summarized in Table 1.

File/Folder Name	Description
GRANULAR.MDB	Application and Database File
GRANMANUAL	Folder containing all the help files

Table 1 - Granular Resource Forecast Model® Files

2.4. Starting the Program

To run the Granular Resource Forecast Model© application:

1. Close any unnecessary applications that may be operating on your computer to maximize memory and system resources. This is done by selecting Exit from the File menu of the applications.

2. Open the GRANULAR.MDB file by double clicking on the file icon in Windows Explorer, or by using the File-Open command in Microsoft Access.
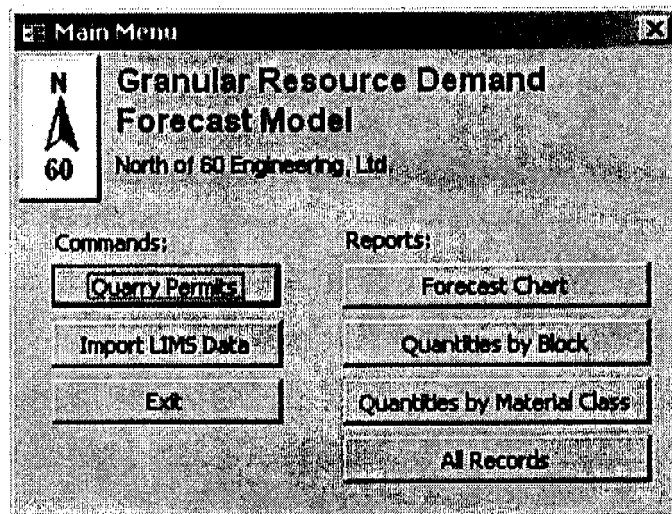
3. The Main Menu will appear:

Figure 2 - Main Menu

2.5. Program Structure

The Granular Resource Forecast Model© is a database of historical, current and future granular requirements. The application has been divided into two major components. The first half of the application is devoted to adding and maintaining information within the database. The details of the database will be discussed in the next section of the User's Guide.

The second half of the application is devoted to analyzing the information within the database, both from historical and future perspectives. You can, for example, compare actual granular usage to historical forecasts, or usage by area, source or quality. The analysis section also allows, with limitations, users to define their own criteria to study the data. The specifics on data analysis and the various reports that are available are presented in Section 4 of the User's Guide.

3. Granular Usage Database

3.1. Introduction

This section of the User's Guide focuses on the Granular Usage Database, its makeup and procedures to maintain it.

As a user, you access the database by clicking on the **Quarry Permits** button on the Main Menu (Figure 2). The program will then present the form shown below.

Figure 3 - Quarry Permits Form

Information is entered to describe the Permit in terms of when the granular material will be used, an estimate of the quantity and type of material needed for the project, the location of the source and the project, and actual permit values requested and used.

If a small square button appears next to an input, the button leads to more detailed information about that input, such as a wizard for entering latitude and longitude coordinates or a dialog box to edit the list of permit holders, etc.

Of particular use is the **Quick List** button, which brings up a table listing all the permits and estimates and allows the user to quickly find permits already entered in the system.

Book Year	Permit Number	Status	Permit Holder	Description	Modified
1984	ILA84SQ003	Inactive	ENVIRONMENT CANADA	BUILDING PAD	01/23/1900
1984	ILA84SQ003				01/24/1900
1985	ILA85IQ009	Inactive	E. GRUBEN'S TRANSPORT		04/01/1985
1985	ILA85IQ009	Inactive	EGT		04/01/1985
1985	ILA85IQ009	Inactive	EGT	OIL EXPLORATION	04/01/1985
1985	ILA85IQ009	Inactive	EGT	OIL & GAS EXPLORATION	04/01/1985
1985	ILA85IQ009	Inactive	EGT	OIL & GAS EXPLORATION	04/01/1985
1985	ILA85IQ010	Inactive	Transport Canada		11/01/1985
1985	ILA85IQ011	Inactive	CHEVRON CANADA RESOURCES	OIL & GAS EXPLORATION	10/01/1985
1985	ILA85TQ015	Inactive	EGT		01/20/1985
1985	ILA85TQ015	Inactive	EGT		01/28/1985
1985	ILA85TQ015	Inactive	EGT		01/28/1985
1985	ILA85TQ015	Inactive	EGT	OIL & GAS EXPLORATION	01/28/1985
1985	ILA85TQ015	Inactive	EGT		01/28/1985
1985	ILA85AQ016	Inactive	Tetra Leasing Inc.		10/01/1985
1985	ILA85TQ17	Inactive	STORRS & SONS		04/29/1985
1985	ILA85TQ25	Inactive	EGT	ROAD	05/21/1985
1985	ILA85TQ26	Inactive	EGT	ROAD/PAD CONSTRUCTION	05/21/1985
1985	ILA85SQ33	Inactive	AES, CANADA	PAD FOR FUEL TANKS	06/27/1985
1985	ILA85IQ84	Inactive	EGT		11/29/1985

Figure 4 - Quarry Permit List

Double clicking on a row will open that permit in the quarry permits form. Right clicking on a field name will bring up a context menu that includes various sorting options to reformat the list.

3.2. Database Fields

For those unfamiliar with database terminology a *database*, or *table* as it is often referred to, is a container for data about a particular subject, in this case, granular resource usage. There are two basic elements in a database. Each category of information is called a *field*. Thus, a telephone book has three fields: name, address, phone number. Each set of information is called a *record*. For example, this entry in a phone book constitutes a record:

Doe, John   13 Elm Street   555-4321

DATA	DESCRIPTION
Permit #	Permit Number
Permit Holder	Company responsible for permits
Date Modified	Date the record was modified
Status	Estimate, Active, Closed, Inactive
Source	Source Code Identification
Category	End user classification e.g. Private, Government, Military, Municipal
Year of Usage	Year of extraction and placement
Project Description	Description of project
LAT	Location Latitude (decimal degrees)
LONG	Location Longitude (decimal degrees)
Sponsor	Company Sponsoring the Project
Contractor	Company that is extracting gravel
Low Estimate	Low estimate of requirements
Most Likely Estimate	Likely estimate of requirements
High Estimate	High estimate of requirements
Estimate Default Value	Most Likely/Random/P50 – the value used in reports
Estimate Classification	Estimated material classifications
Requested Requirements	Requested requirements
Requested Class	Requested class of material
Actual Requirements	Actual amount extracted
Actual Class	Actual classification

Table 2 - Granular Resource Data Base

There are two basic arrangements for tracking data. The telephone book is a *tabular database*. The information is arranged in a table of columns and rows. Another way to look at the information within the database is through *forms*, much like a card file or Rolodex. The

Granular Resource Forecast Model© uses forms and tables to record and view granular usage.

The granular usage database contains many fields of information for each record. These fields are summarized in Table 2 and discussed in detail below.

Quarry Permit #: Is the quarry permit number.

Permit Holder: The person or company that is requesting the permits. This would generally be the person responsible for the payment of royalties and meeting the conditions of the permit.

Date Modified: This represents the date the record was first entered or last updated. It is entered by the user.

Status: This is the status of the specific project. The user should enter one of the following depending on the stage of development.

- Estimate
- Active
- Inactive
- Closed

Source: The gravel source number/ID within the block.

Category: A descriptive category for the sponsor. NORTH OF 60 ENGINEERING LTD. recommends that a limited number of categories be used. Possible examples are:

- Public
- Private
- Defence

Year of Use: The year that the material was used. Initially this would be an estimate, but would change to reflect actual year of use.

Project Description: A brief description of the project.

Project Location: The location of the project. Latitude and longitudes are recommended.

Sponsor: The name of the individual company or municipality that is sponsoring the project.

Contractor: The person or company actually undertaking the quarry operations. In many cases, this would be the same as the permit holder.

Low Estimate: A low side estimate of the amount of material to be required, expressed in cubic meters.

Likely Estimate: A likely estimate of the amount of material to be required, expressed in cubic meters.

High Estimate: A high side estimate of the amount of material to be required, expressed in cubic meters.

Estimate Default: Value to use in creating reports. The value is calculated based on a triangular distribution defined by the low/likely/high estimates as described above.

- Mean/Most Likely

- Random – random value each time

- P50 – 50% probability

Estimated Class: An estimate of the required class of material (1-5). The specific classes are defined in Appendix B of the User's Guide.

Requested Amount: The amount of material requested at the time of quarry permit application.

Requested Class: The class of material requested at the time of quarry permit application.

Actual Amount: The actual amount of material used. Generally speaking this would be based on trip tickets or an actual survey of the quarry site at the end of the project.

Actual Class: The actual class of the material used.

3.3. Data Management

Record Navigation Buttons

The record navigation buttons are used to scroll through the records on a form. Figure 5 shows the typical record navigation buttons in Microsoft Access. Navigating to the next or previous record is done by clicking on the arrow buttons. Navigating to the first or last record is

done by clicking on the buttons with arrows and bars. Creating a new record can be done by clicking on the button with an arrow and an asterisk "*". The record number can also be entered in the text box to navigate directly to a specific record.
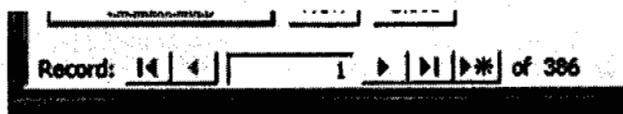

Figure 5 - Record Navigation Buttons

Adding, Updating or Deleting Records

To Add a Record

1. Display the Quarry Permits Form.
2. Choose the **New** Button.
3. Enter data in the new record's fields. Press TAB to move between fields.
4. Repeat steps 1 and 2 to add as many records as you want.

To Delete a Record

Note: Deleted records cannot be restored.

To delete a record:

1. Display the Quarry Permits Form.
2. Display the record you want to delete.
3. Choose the **Quick List** button. Make sure the record you want to delete is selected.
4. Push the DELETE key on the keyboard.

To Find a Record

1. Display the Quarry Permits Form.
2. Select the field that you want to search.
3. Choose the **Find** command from the edit menu or the toolbar.
4. Enter the criteria in the dialog box and choose **Find Next**.

It may be easier to search the permits by sorting the quick list to display the permits in a specific order.

To Edit Records

1. Display the Quarry Permits Form.
2. Locate the record to edit.
3. Edit each field you want to change. Press TAB to move between fields. To cancel changes of a record, press the ESC key on the keyboard.

To Return to the Main Menu

1. Choose the **Close** button when you are finished working in the data form.
2. Alternatively, choose the **X** button in the top right corner of the dialog box.

Special Controls

Some fields on the Quarry Permits Form have special controls that help select and manage the data entering in the field. These fields have a small button beside them that will open a dialog box to edit lists such as sources, company names and addresses, block areas, or latitude and longitude DMS entry.

View Database

To view the granular usage database in tabular form, choose the **Unhide** command from the **Window** menu. Select the database window and choose **OK**. Editing the tables directly requires advanced skill in Microsoft Access and Relational Database Design.

Backup Database

To backup the database, copy the GRANULAR.MDB file to a floppy disk, CD or alternate folder.

Compacting the Database

As records are modified and deleted the database increases in size. Periodically compacting the database is required to keep the database file small. Choose the **Compact & Repair Database** command from the **Tools** menu in Microsoft Access.

3.4. Importing LIMS Data

LIMS is an alternate database that contains granular resource information that can be imported into the model. This is an advanced feature that requires knowledge of Microsoft Access table linking. A procedure for importing LIMS using the LIMSSAMPLEDATA.XLS worksheet follows:

1. Choose **Import LIMS Data** from the main menu.

2. Choose **Link External Table** from the dialog box that appears.

3. A file open dialog box appears. Select the file that contains the LIMS data, and click on the **Link** button. You may need to change the file type to Microsoft Excel if the data is in a spreadsheet. For this example look for the LIMSSAMPLEDATA.XLS workbook in the GRANMANUAL folder.

4. The Microsoft Access Link Spreadsheet Wizard appears. Select the worksheet or named range that contains the data and choose **Next**.

5. If asked to use the first row as column headings, select the option and choose **Next**.

6. If asked to enter a table name, use the default name given and choose **Finish**. The LIMS data should be linked to the application.

7. When back to the LIMS Import dialog box, choose **Next** to add the LIMS data to the database, or **Cancel** to return to the main menu.

It is **extremely important** that the LIMS data be formatted in a table like the data in LIMSSAMPLEDATA.XLS. Particular attention should be made to the field names in the sample file.

4. Analyzing Granular Usage

4.1. Introduction

This section of the User's Guide describes the various options available to the user to analyze data within the database. It also covers the available reporting options.

4.2. Demand Analysis

Actual vs. Forecast

Selecting the **Forecast Chart** button on the menu produces a graph showing the historical granular usage. The graph shown in Figure 6 plots estimated requirements, requested amounts and actual usage. Over time, this plot will tell whether initial estimates are high or low.
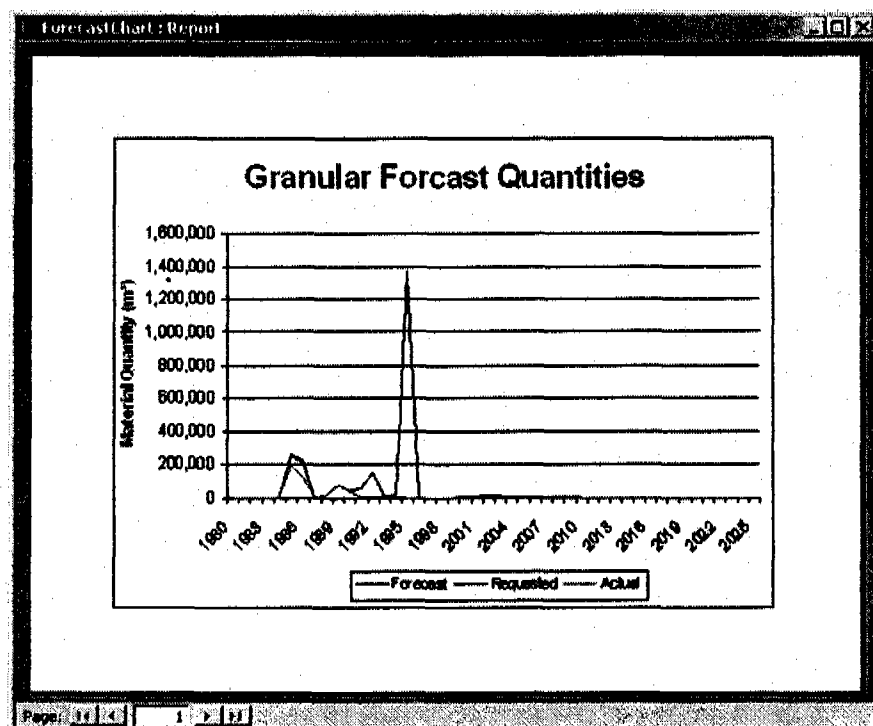
Figure 6 - Granular Resource Usage Graph

Usage by Area

Selecting the **Quantities by Block** button on the menu produces a cross-tabulation of the database showing the granular usage by area. Figure 7 is an example view of resource usage by area.

For those unfamiliar with cross-tabulations, or pivot tables as they are referred to in Excel, they are a subset of the database representing various categories within the database. In this case, the pivot table is summarizing the usage by year into the various areas. The table shows the years along the side (row) and areas across the top (column). The need and usage of this terminology will become more evident.

Year	AKLAVIK	INUVIK	PAULATUK	SACHS	TUK	(blank)	HOLMAN	Grand Total
1984				400		100		500
1985	0			250	254,980			255,230
1986	2,300	20,500	2,290	500	196,736			222,326
1988		11,465			9,095			20,560
1989		39,108	2,560	3,587	29,206			74,461
1990		25,300	9,000					34,300
1991			50,300	3,600	895			54,795
1992		11,500	140,000			1,400		152,900
1993		11,500		1,500				13,000
1994		6,350						5,350
1995		1,364,570						1,364,570
1997		250						250
1999							720	720
2000	6,700		3,750	2,000	10,400		3,820	26,670
Grand Total	9,000	1,489,543	207,900	11,037	501,312	1,500	4,540	2,225,632

Figure 7 - Granular Resource Usage by Area

Usage by Source and Quality

Selecting the **Quantities by Material Class** button on the menu produces a cross-tabulation of the database showing the historical granular usage by source and class of material. In this pivot table, the sources are listed by page (each page is one source) and the class of material along the top (column).

User Defined Analysis

The pivot tables can be modified to filter the data. The modifications are not permanent and will be reset the next time the application is opened. Proficient knowledge of Microsoft Excel pivot tables is recommended when modifying the pivot table reports.

Report All Records

Selecting the **All Records** button on the menu produces a report with table listing each permit and estimate that is entered into the database. The table shows each field that is available for each record and is formatted to print on tabloid sized paper.

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Appendix A - Program License

The Granular Resource Forecast Model © is copyrighted by NORTH OF 60 ENGINEERING LTD. and licensed to the Department of Indian and Northern Affairs and the Inuvialuit Land Administration pursuant to the general conditions set out in document 1632-99-0450. Users of this model may not make any use of Software that is not expressly provided for in the general conditions.

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Information in this Model is subject to change without notice and does not represent a commitment on the part of NORTH OF 60 ENGINEERING, LTD.

Appendix B - Granular Material Types

CLASS	MATERIAL DESCRIPTION
1	Excellent quality material consisting of clean, well-graded, structurally-sound sand and gravel suitable for use as high-quality (e.g. runway or roof) surfacing materials, or as asphalt or concrete aggregate, with a minimum of processing.
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 coarse aggregates or structure-supporting fill. Production of concrete aggregates may be possible with extensive processing, except where deleterious materials are present.
3	Fair quality material consisting generally of poorly-graded sands and gravels with or without substantial silt content. This material will provide fair quality general fill for roads, flexible foundation pads, or staging areas.
4	Poor quality material consisting of silty, poorly-graded, fine grained sand, with minor gravel. May also contain weak particles and deleterious materials and are considered suitable only for marginal, general (non structural) fills.
5	Bedrock of fair to good quality, felsenmeer or talus. Potentially excellent sources of construction material, ranging from general fill to concrete aggregate or building stone if quarried and processed. Also includes erosion control materials such as rip-rap or armour stone.