



Introductory Gold Tutorial

**Version 4.7.0**

Whittle Version 4.7.0 版本

# 露天金矿境界优化入门教程

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### **Product 产品**

GEOVIA Whittle™ 4.7.0

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**注记：在 GEOVIA 股份有限公司提供的英文版教程基础上，translate！**

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# About this tutorial 关于本教程

## Overview 概述

This tutorial introduces various parts of Whittle through a worked example. 本教程通过一个示例介绍了 Whittle 的各个部分。

In this tutorial, you will work with a validated block model from a general mine planning package (GMP) such as Surpac, GEMS, or another GMP. The block model in this tutorial is in the format **.mod** and has a corresponding **.par** file. 在本教程中，您将使用通用矿山规划包（GMP）（如 Surpac、GEMS 或其他 GMP）中经过验证的块段模型。本教程中的块体模型的格式为 **.mod**，并具有相应的 **.par** 文件。

For more information on any part of this tutorial: 有关本教程任何部分的详细信息：

- see the relevant information in the Whittle Help 请参阅 Whittle 帮助中的相关信息
- view demonstration datasets and read notes in the description tab for each node 查看演示数据集，并阅读每个节点的“说明”选项卡中的注释
- contact your local GEOVIA office for information about modules or training options 有关模块或培训选项的信息，请联系您当地的 GEOVIA 服务商

## Prerequisites 前置条件

Before proceeding with this tutorial, you need to have: 在继续本教程之前，您需要：

- Whittle 4.7.0 or later installed. 安装了 Whittle 4.7.0 或更高版本。
- The **tutorialsGold** data set, which includes the following files: 教程黄金数据集，其中包括以下文件：
  - the block model **training.mod** 块模型 **training.mod**
  - the parameters file **training.par** 参数文件 **training.par**
  - the block model validation report **training\_rpt.txt** 块段模型验证报告 **training\_rpt.txt**

For a default Whittle installation, the data set is installed in the default location **C:\Users\Public\GEOVIA\GEOVIAWhittle\<version>\projects\tutorialsGold** for the following operating systems: Windows 7 or Windows 10. 对于默认的 Whittle 安装，数据集安装在以下操作系统的默认位置

**C:\Users\Public\GEOVIA\GEOVIAWhittle\<version>\projects\tutorialsGold**: Windows 7 或 Windows 10。

 **Note:** The screen shots and results included in this tutorial were generated using Whittle 4.7 64-Bit.

注：本教程中包含的屏幕截图和结果是使用 Whittle 4.7 64 位生成的。

## Setup for this tutorial 本教程的设置

### Activity: Create a Whittle project 创建 Whittle 项目

1. To start Whittle: 启动 Whittle:

- double-click the desktop icon, or 双击桌面图标, 或者
- choose **Start > All Programs > GEOVIA > Whittle <ver>\Whittle <ver>**. 选择“开始”> “所有程序”> “GEOVIA” > “GEOVIA Whittle>\Whittle<ver>”。

Whittle starts and the *Project Selection* form appears. Whittle 启动并显示“项目选择”窗体。

2. Click **Create a new project**, and then click **OK**. 单击“创建新项目”, 然后单击“确定”。

The *New Project* form appears. 此时将显示“新建项目”窗体。

3. In the *New Project* form: 在新项目形式中:

- a. In the **Project Name** field, type a name for the project, **Gold\_Tutorial**.

The **Project Save File** field is updated to use the **Project Name** and the **.fxp** extension. 在“项目名称”字段中, 键入项目的名称 Gold\_Tutorial。

“项目保存文件”字段将更新为使用“项目名称”和.fxp

扩大。

- b. If you do not want to use the **Project Name** for the saved project file, type a different name in the **Project Save File** field. 如果不希望将“项目名称”用于已保存的项目文件, 请在“项目保存文件”字段中键入不同的名称。

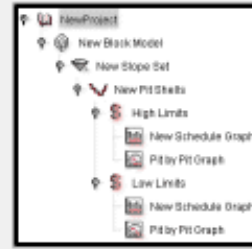
- c. In the **Project Directory**, choose the folder in which you want to save the project. 在项目目录中, 选择要保存专业-项目。

The **Project Working directory** is updated to use the same root folder as the **Project Directory**. **项目工作目录将更新为使用与项目目录。**

- d. If you do not want to use the **Project Directory** as the root location of the working directory of the project, choose a different location for the **Project Working directory**. 如果不想将项目目录用作项目工作目录的根位置, 请为项目工作目录选择其他位置。

- e. Click **OK**. 单击“OK”。

## Project details



Project Name:

Gold\_Tutorial

Project Save File:

Gold\_Tutorial.fxp

Project Directory:

C:\Users\User\Documents\Whittle Projects\Gold\_Tutorial\

Project Working directory:

C:\Users\User\Documents\Whittle Projects\Gold\_Tutorial\working\_Gold\_Tutorial

(Directories will be created if they don't already exist)

Help

OK

Cancel

The project node is added to the **Navigation Tree**. 项目节点将添加到导航树中。

## Import a block model 导入块模型

### Activity: Import a Model 导入模型

1. Right-click the **Gold\_Tutorial** node and select **Add > Import Block Model**.

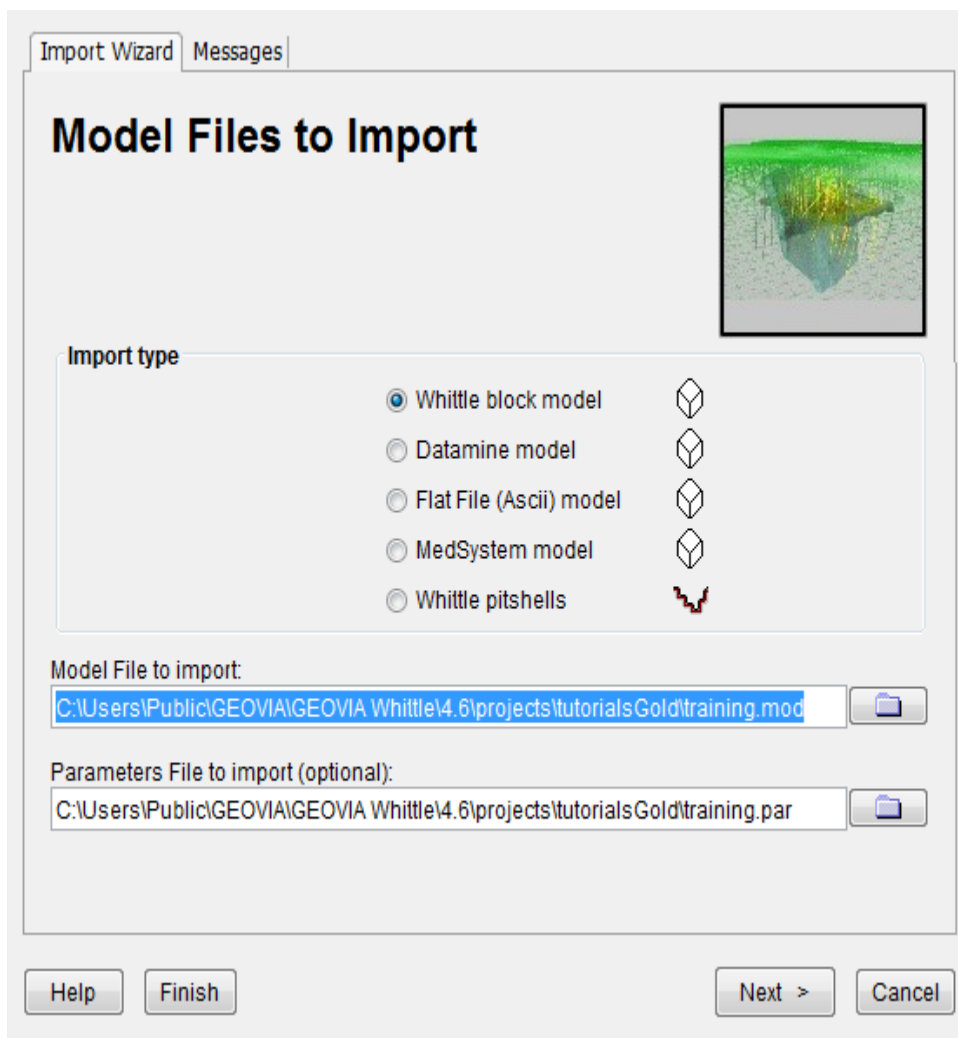
The *Select* form appears. 在“Gold\_Tutorial”节点上单击鼠标右键，然后选择“添加”>“导入块模型”。此时会出现“选择”窗体。

2. Select the model that you want to import, training.mod. 选择要导入的模型 **training.mod**
3. For this tutorial, the .mod and .par files are in <your projects folder>\tutorialsGold. 对于本教程，**.mod** 和 **.par** 文件位于 <yourprojects 文件夹>\tutorialsGold 中
4. Click Select. 单击“选择”。

The *Import Wizard* appears with the options and file locations filled using the location and file type of the model file you selected. 此时将显示“导入向导”，其中包含使用所选模型文件的位置和文件类型填充的选项和文件位置。

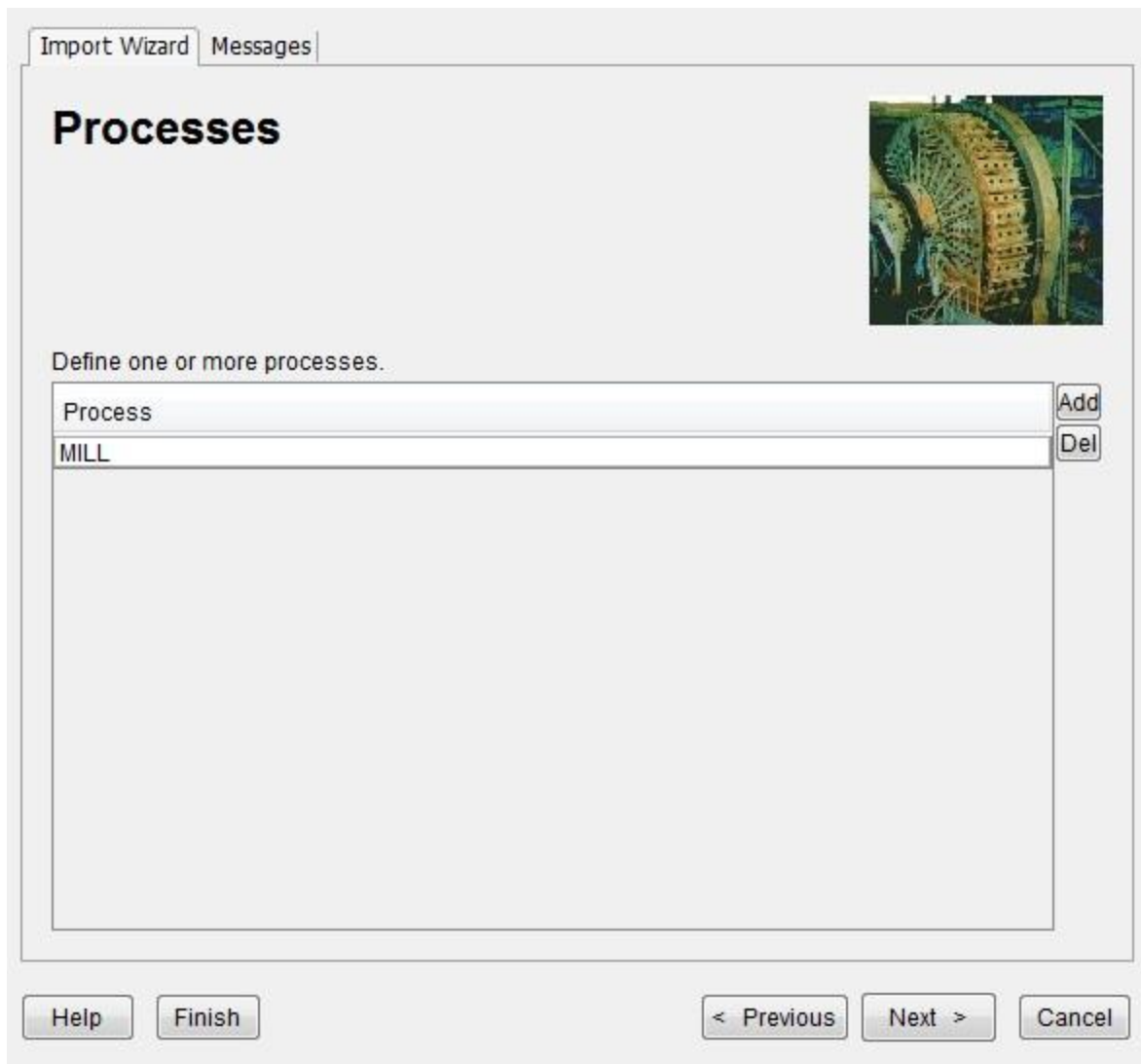
 **Notes:注意:**

- Whittle uses two block model import wizards. This tutorial uses a Whittle model, so the classic *Import Wizard* appears. If the model was a Surpac, Datamine, or Vulcan model, the *Import Block Model Wizard* would appear. Whittle 使用两个块模型导入向导。本教程使用 Whittle 模型，因此会出现经典的“导入向导”。如果模型是 Surpac、Datamine 或 Vulcan 模型，则会出现“导入块模型向导”。
- If the parameters file is in a different folder to the model file, you can change the location of the **Parameters File to Import**. 如果参数文件与模型文件位于不同的文件夹中，则可以将参数文件的位置更改为“导入”。



5. Click **Next**. 点击下一步。
6. Continue clicking Next without entering any values until you come to the Processes page (not the Process Description page). 继续单击“下一步”，不输入任何值，直到进入“流程”页面（而不是“流程描述”页面）。
7. In the Processes page, click Add, to add a process. 在“进程”页面中，单击“添加”以添加进程。 A row is added to the Process table. 一行将添加到 Process 表中。
8. Click the row you just added, and rename it to MILL. 单击刚刚添加的行，然后将其重命名为 **MILL**。

 **Note:** Renaming the row to MILL is important for a later stage of this tutorial. 注意：将行重命名为 MILL 对于本教程的后期阶段非常重要。



You will add more

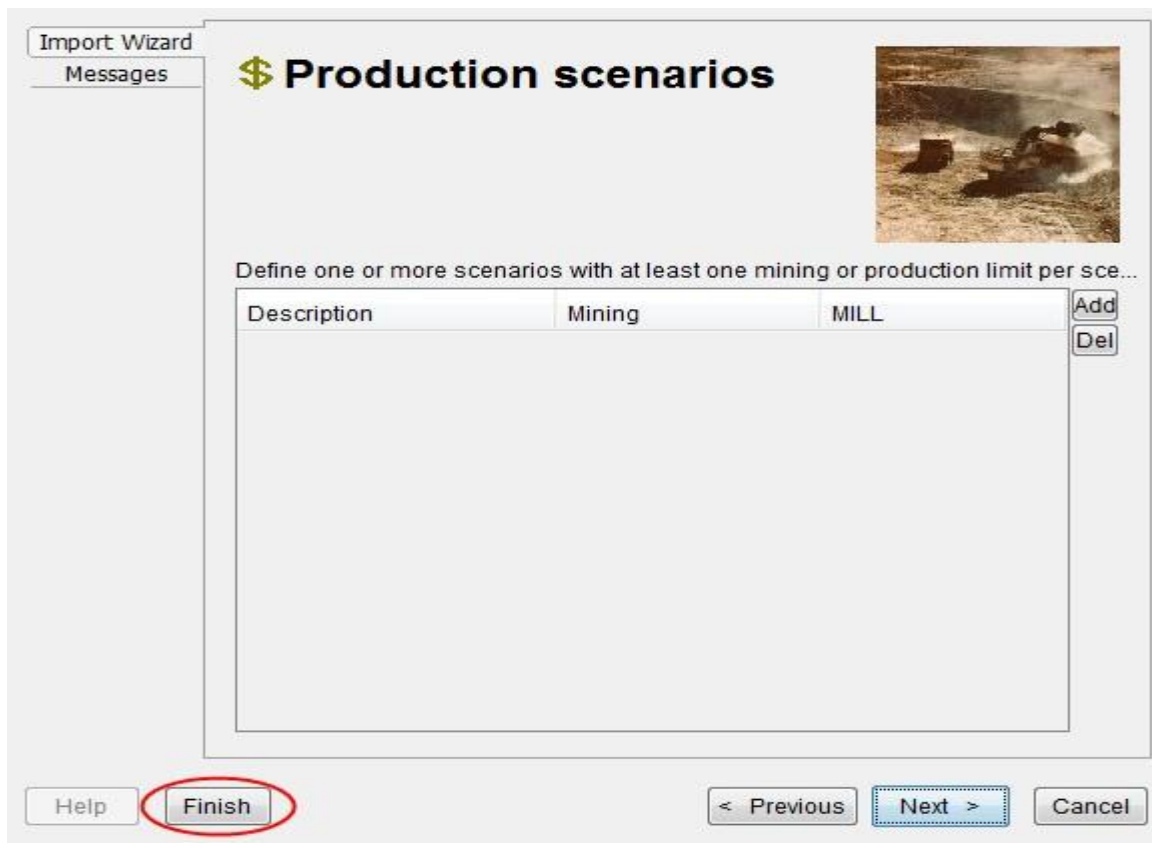
information later, after you have validated the model. 您将在验证模型之后添加更多信息。

Because no further changes are needed, you could click **Finish** on the **Processes** page and create the project. However, in this tutorial, continue clicking through the pages of the *Import Wizard* to identify the features of the wizard and their functions. 因为不需要进一步的更改，所以可以单击“流程”页面上的“完成”并创建项目。但是，在本教程中，继续单击导入向导的页面，以确定向导的功能及其功能。

9. Continue clicking **Next** to display more pages of the wizard until the **Next** button is no longer available.

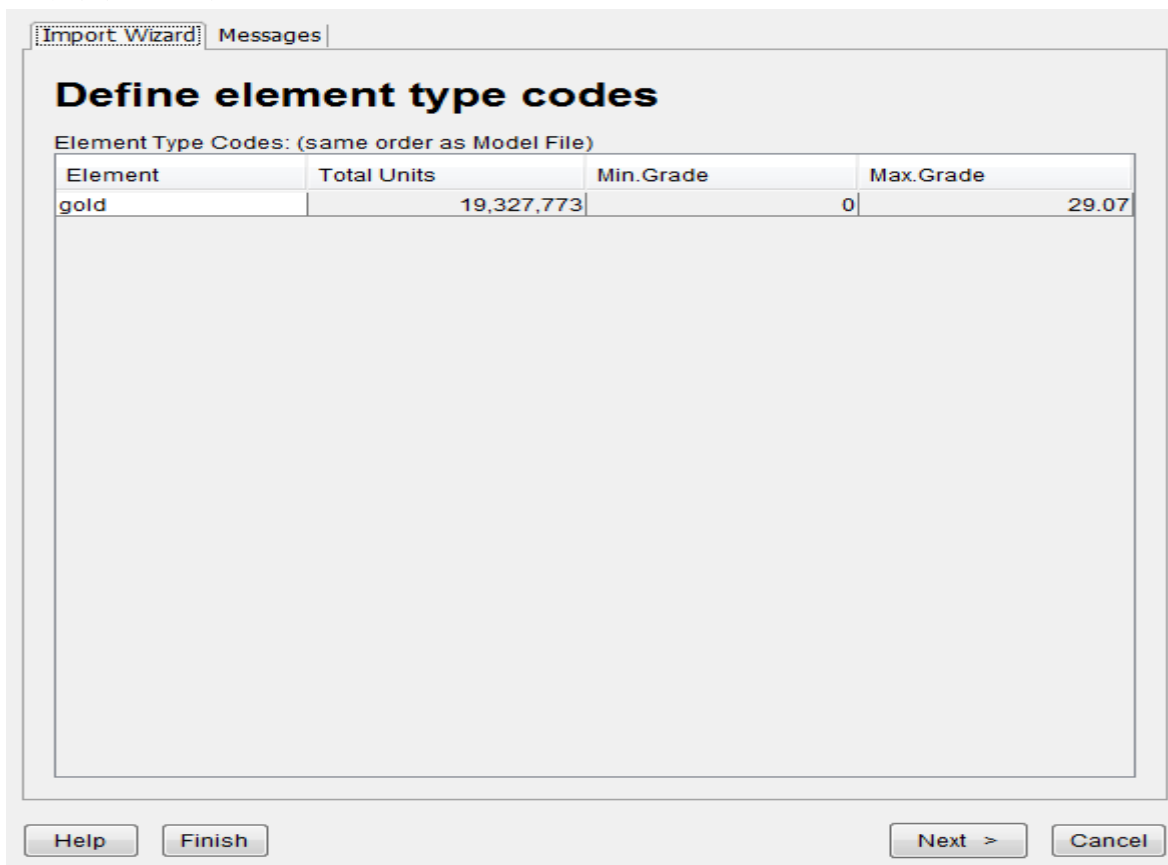
继续单击“下一步”以显示向导的更多页面，直到“下一个”按钮不再可用。

The next few pages of the *Import Wizard* show summary information for the grade element and allow editing of element names. Do not enter any information in these pages. 导入向导的后面几页显示了坡率元素的摘要信息，并允许编辑元素名称。不要在这些页面中输入任何信息。



10. Click **Finish**. 点击“完成”。

The block model is loaded, and the **Define Element Type Codes** page appears. 将加载块模型，并显示“定义图元类型代码”页面。



11. Click **Next** to display the **Define model dimensions** page. 单击“下一步”以显示“定义模型尺寸”页面。
- In this page you can edit the block model information, including dimensions, framework extents, origin, and azimuth. For this tutorial, you do not need to enter any information in this page. 在此页面中，可以编辑块模型信息，包括尺寸、框架范围、原点和方位角。对于本教程，您不需要在此页面中输入任何信息。

The screenshot shows the 'Define model dimensions' dialog box. It has two tabs at the top: 'Import Wizard' (selected) and 'Messages'. The main area is titled 'Define model dimensions' and contains three sections of input fields:

- Block Dimensions:** X: 10.0, Y: 20.0, Z: 10.0
- Model Framework Dimensions:** X: 90, Y: 40, Z: 35
- Origin co-ordinates:** X: 1200.0, Y: 7000.0, Z: -50.0, and Mine azimuth: 0.0

At the bottom of the dialog, there are four buttons: 'Help', '< Previous', 'Finish' (which is highlighted with a dashed border), and 'Cancel'.

12. Click **Finish**. 单击“完成”。
- You have now imported the model into Whittle. Whittle displays several analysis nodes that guide you through the mine-planning process. 现在，您已将模型导入到 Whittle 中。Whittle 显示了几个分析节点，可指导您完成矿山规划过程。

## Activity: Validate the imported model 验证导入的模型

1. To rename the block model node, click the Block Model node, click the Description tab, and in the Description field, type 10 x 20 x 10. 要重命名块模型节点，请单击“块模型”节点，单击“描述”选项卡，然后在“描述”字段中键入 10 x 20 x 10。

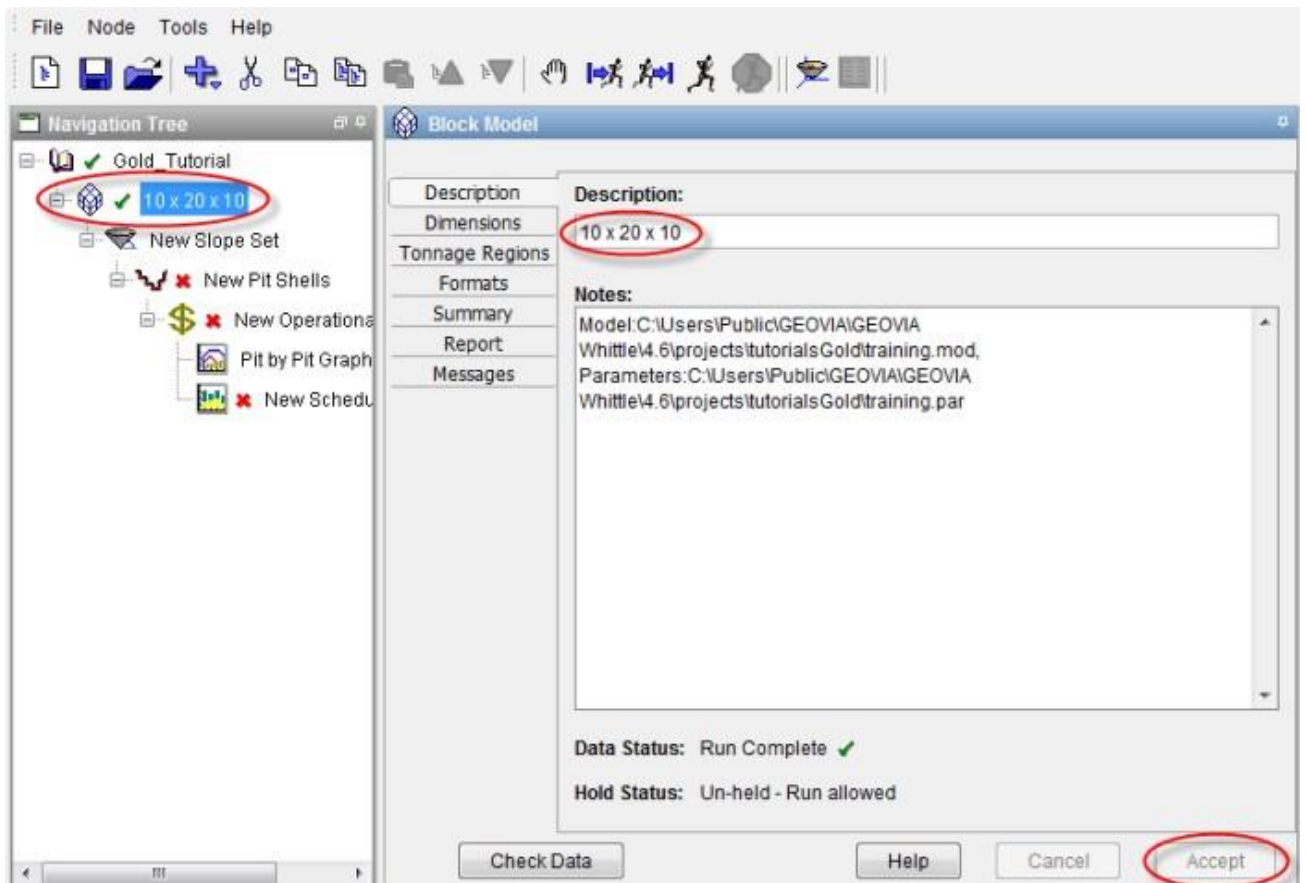
The new name is the dimensions for the model. Renaming the block model node helps you identify the block model. 新名称是模型的尺寸。重命名块模型节点有助于识别块模型。

In the Notes box, there are notes that specify the location of the original .mod and .par

files. If necessary, add more notes in this box. 在“注释”框中，有一些注释用于指定原始.mod 和.par 文件的位置。如有必要，在此框中添加更多注释。

2. To save your changes, click Accept. 要保存更改，请单击“接受”。

Because you changed the Description field, the name of the node in the Navigation Tree also changes. 因为更改了“描述”字段，所以导航树中节点的名称也会更改。



1. Click the Dimensions tab, and review the block size and model origin. 单击“尺寸标注”选项卡，然后查看块尺寸和模型原点
2. Click the **Report** tab, and compare the all the totals in Whittle against the validation report from the GMP. 单击“报告”选项卡，将 Whittle 中的所有总数与 GMP 的验证报告进行比较。

An example of a validation report from Surpac is in the same folder as the **training.mod** file.

The file name is **training\_rpt.txt**. Compare the total tonnes of rock of each rock type (fresh, transitional, and oxide), and the total number of gold grams, that is 'Total Element' for each rock type. Surpac 的验证报告示例与 training.mod 文件位于同一文件夹中。文件名为 training\_rpt.txt。比较每种岩石类型（新鲜、过渡和氧化物）的岩石总吨数和金克总数，即每种岩石的“总元素”。

 **Tip:** Tonnes of rock = tonnes of waste + tonnes of ore.  
提示：吨岩石=吨废物+吨矿石。

| Description     | Report Text: |  |  |  |  |  |  |  |
|-----------------|--------------|--|--|--|--|--|--|--|
| Dimensions      |              |  |  |  |  |  |  |  |
| Tonnage Regions |              |  |  |  |  |  |  |  |
| Formats         |              |  |  |  |  |  |  |  |
| Summary         |              |  |  |  |  |  |  |  |
| Report          |              |  |  |  |  |  |  |  |
| Messages        |              |  |  |  |  |  |  |  |

| Summary by rock type |               |          |          |              |               |         |               |         |
|----------------------|---------------|----------|----------|--------------|---------------|---------|---------------|---------|
| Rock Type            | No of Parcels | Mine CAF | Proc CAF | Total Tonnes | Total Element | Minimum | Grade Average | Maximum |
| FR                   | 132099        | 1.000    | 1.000    | 416634683    | 12217833.8    | 0       | 0.03          | 29.07   |
| TR                   | 159165        | 1.000    | 1.000    | 779083795    | 422894.20     | 0       | 0.07          | 12.85   |
| OX                   | 120413        | 1.000    | 1.000    | 192764471    | 687044.60     | 0       | 0.09          | 12.85   |
| TOT                  | 411677        | 1.000    | 1.000    | 513819510    | 19327772.6    | 0       | 0.04          | 29.07   |
| WASTE                |               | 1.000    | 1.000    | 0            |               |         |               |         |

| Export to whittle Report |             |              |             |           |           |           |
|--------------------------|-------------|--------------|-------------|-----------|-----------|-----------|
| Summary by rock type:    |             |              |             |           |           |           |
| Rock Type                | No. Parcels | Total Tonnes | Total Elem. | Min Grade | Avg Grade | Max Grade |
| FR gold                  | 132099      | 416634683    | 12217837.86 | 0.00      | 0.03      | 29.07     |
| TR gold                  | 159165      | 77908380     | 5422919.35  | 0.00      | 0.07      | 12.85     |
| OX gold                  | 120413      | 19276447     | 1687033.14  | 0.00      | 0.09      | 12.85     |
| TOT gold                 | 411677      | 513819510    | 19327790.35 | 0.00      | 0.04      | 29.07     |
| WASTE                    |             | 0            |             |           |           |           |

3. Scroll down the report, and examine the 'Summary by bench by rock type' section to see how the tonnes are distributed on each bench. 向下滚动报告，并检查“按岩石类型按台阶汇总”部分，以了解吨在每个台阶上的分布情况
4. Next use the 3D Viewer as a visual check. 接下来使用三维查看器进行视觉查看。
  - a. In the **Navigation Tree**, click the **Block Model** node. 在导航树中，单击“块模型”节点。
  - b. From the toolbar, click **Start Three-D Viewer** . 从工具栏中，单击“启动三维查看器” .



- c. In the *Select data to display* form, leave all the options selected, and click **OK**. 在“选择要显示的数据”窗体中，保持所有选项处于选中状态，然后单击“确定”。

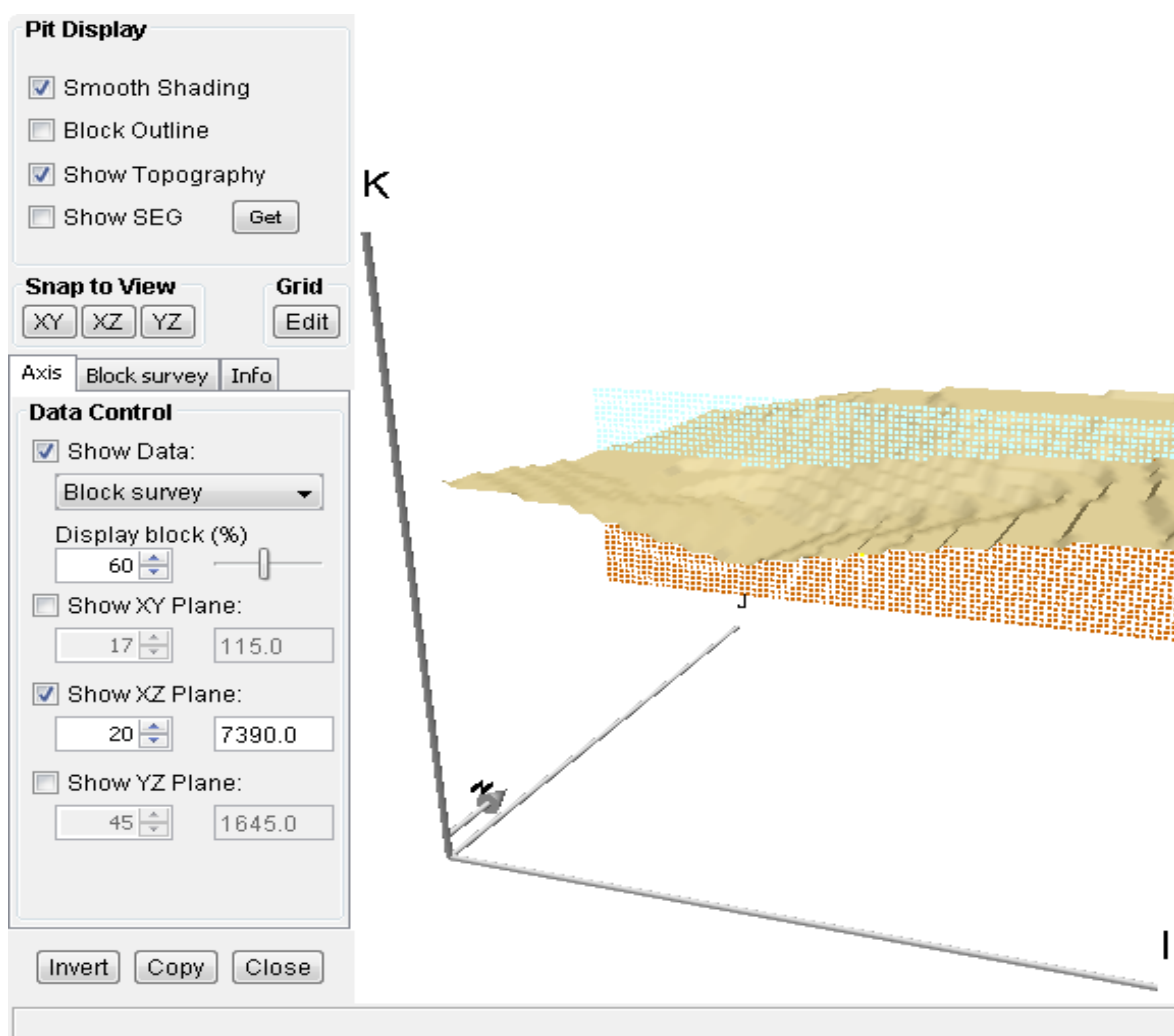


**Tip:** By clicking the **Block Model** node in the project tree, you bring the block model into the 3D Viewer. Later, you will visualise different things by clicking different nodes in the project tree. 提示：通过单击项目树中的“块模型”节点，可以将块模型带入三维查看器。稍后，您将通过单击项目树中的不同节点来可视化不同的内容。

- d. In the **3D Viewer**, in the **Pit display** section, select the **Show Topography** check box. 在三维查看器的“地坑显示”区域中，选中“显示地形”复选框。
- e. On the **Axis** tab, select the **Show XZ Plane** check box. 在“轴”选项卡上，选中“显示XZ平面”复选框。
- f. To rotate the view, click and drag the mouse. 若要旋转视图，请单击并拖动鼠标。
- g. To zoom the view, hold the wheel of the mouse and move the mouse away from you to zoom out or toward you to zoom in. 若要缩放视图，请按住鼠标滚轮，然后将鼠标从您身边移开以缩小视图，或将鼠标移向您身边以放大视图。
- h. To change the background of the 3D Viewer to white, in the lower left of the window, click **Invert**. 要将三维查看器的背景更改为白色，请在窗口的左下角单击“反转”。

**Note:** To help you save ink when you print this tutorial, many screen captures in this document have an inverted view. 注意：为了帮助您在打印本教程时节省墨水，本文档中的许多屏幕截图都有倒置的视图。

Your view appears similar to the following. You will explore the **3D Viewer** later. For now, it is enough to check the model visually. 您的视图如下所示。您稍后将浏览三维查看器。目前，对模型进行视觉检查就足够了。



You have now validated your model by comparing tonnes and by doing a visual check. 现在，您已经通过比较吨数和进行目视检查来验证您的模型。

**Note:** Whittle uses I, J, and K axes. The IJK value of each block is the relative position of that block from the origin of the model framework. For example, a block with an IJK value of 88, 38, 17 is 88 blocks from the origin in the X direction (the I axis), 38 blocks in the Y direction (J axis), and 17 blocks in the Z direction (K axis). The real world equivalent of the IJK position depends on the coordinates of the origin of the block model and the user block size. 注：Whittle 使用 I、J 和 K 轴。每个块的 IJK 值是该块与模型框架原点的相对位置。例如，IJK 为 88、38、17 的块在 X 方向（I 轴）上距离原点 88 个块，在 Y 方向（J 轴）上 38 个块，以及在 Z 方向（K 轴）上 17 个块。IJK 位置的真实世界等效值取决于块模型的原点坐标和用户块大小。Close the **3D Viewer**. 关闭 3D 查看器。

One final thing to do on the **Block Model** node is to set the units of the project to grams. You need to set the units because the unit of measure for the gold element is grams. 在“块模型”节点上要做的最后一件事是将项目的单位设置为克。你需要设置单位，因为金元素的计量单位是克

5. Click the **Formats** tab, and in the **Element data** table, in the **Units** cell, choose **gram**. 单击“格式”

选项卡，然后在“图元”数据表的“单位”单元中，选择“克”。

The screenshot shows a software configuration window with a sidebar on the left containing tabs: Description, Dimensions, Tonnage Regions, **Formats**, Summary, Report, and Messages. The main area is divided into three sections:

- Rock data**:
  - Units of mass: **tonne**
  - Report block mass as: **0**
  - Report total mass as: **0**
- Currency data**:
  - Units of currency: **\$**
  - Report unit currency as: **0.00**
  - Report total currency as: **0**
- Element data**:
 

| Elements | Units       | Block display |
|----------|-------------|---------------|
| gold     | <b>gram</b> | <b>0.00</b>   |
|          | gram        |               |
|          | 10kg        |               |
|          | kilo        |               |
|          | oz          |               |
|          | t.oz        |               |
|          | pound       |               |
|          | ppb         |               |
|          | ppm         |               |

Below the 'Element data' table is the **Other data** section:

- Period length: [dropdown menu]
- ☐ Value model b [dropdown menu]

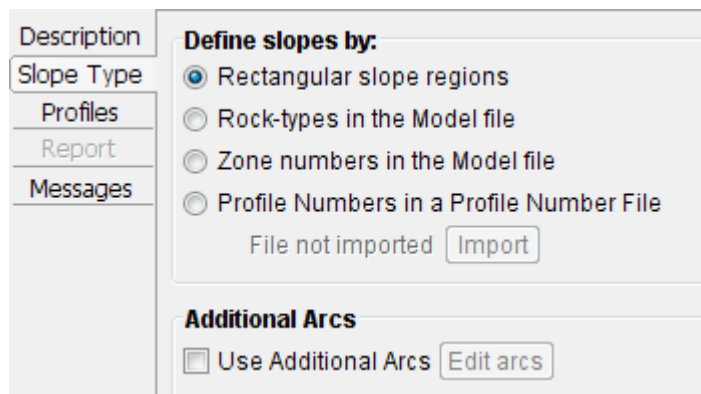
At the bottom left is a **Check Data** button.

- To save your changes, click **Accept**. 要保存更改，请单击“接受”

## Activity: Set pit slopes for the optimisation 设置矿坑坡度以进行优化

1. In the **Navigation Tree**, click the **New Slope Set** node. 在导航树中，单击“新建坡度集”节点。
2. Click the **Description** tab, and in the **Description** field, type the description **Slope Case 1 - 60 degrees below level 16**. 单击“描述/说明”选项卡，然后在“说明”字段中键入说明“坡率 1-level16 下 60 度”
3. To define the slopes, click the **Slope Type** tab, under **Define slopes by**, select **Rectangular slope regions**. 要定义坡度，请单击“坡度类型”选项卡，在“定义坡度依据”下，选择“矩形坡度区域”。

 **Tip:** Rock types are commonly used to specify slope angles. Alternatively, you can create an attribute in the block model and fill it with integers that specify different zones based on any data. 提示：岩石类型通常用于指定坡度角度。或者，可以在块模型中创建一个属性，并使用基于任何数据指定不同分区的整数填充该属性。



Next, in the **Profiles** tab, you will create two new slope profiles in addition to the default slope profile. 接下来，在“配置文件”选项卡中，除了默认坡度纵断面外，还将创建两个新的坡度纵断面。

4. Click the **Profiles** tab. 单击“配置文件”选项卡。
5. In the **Slope Profiles** section, create the following profiles with the specified slope angles: 在“坡度配置文件”中，使用指定的方位角、坡度角创建以下纵断面：

- Profile 1: Slope 45 degrees. 纵断面 1：坡度 45 度
- Profile 2: Slope 60 degrees. 纵断面 2：坡度为 60 度。



**Tip:** You can click **Add profile** to create a profile.

提示：您可以单击“添加配置文件”来创建配置文件。

Both profiles should have a **Benchmarks for slope generation** value of **16**. 两个纵断面的坡度生成值均应为 16。

**Slope Profiles**

Profile 1 (45.0)  
Profile 2 (60.0)

Add Profile Delete Profile Import

Bearing Slope Add Delete

0 60

Benches for slope generation: 16

Next, you will split the model into two 'slope regions', and assign each of the two profiles to a different slope region. 接下来，将模型拆分为两个“坡度区域”，并将两个纵断面中的每一个坡度指定给不同的坡度区域。

- To add a second slope region, in the **Slope Regions** section, click **Add**. 若要添加第二个坡度区域，请在“坡度区域”区域中单击“添加”。
- Split the regions using the Z value of the model. Change the values so that the following regions are defined, and then in the **Slope Profile** column assign the slope profile. 使用模型的 Z 值分割模型。更改值以定义以下区域，然后在“坡度纵断面”列中指定坡度纵断面。

| Region | Min X | Max X | Min Y | Max Y | Min Z | Max Z | Slope Profile    |
|--------|-------|-------|-------|-------|-------|-------|------------------|
| 1      | 1     | 90    | 1     | 40    | 16    | 35    | Profile 1 (45.0) |
| 2      | 1     | 90    | 1     | 40    | 1     | 15    | Profile 2 (60.0) |

**Slope Regions**

Rectangular regions to profile associations:

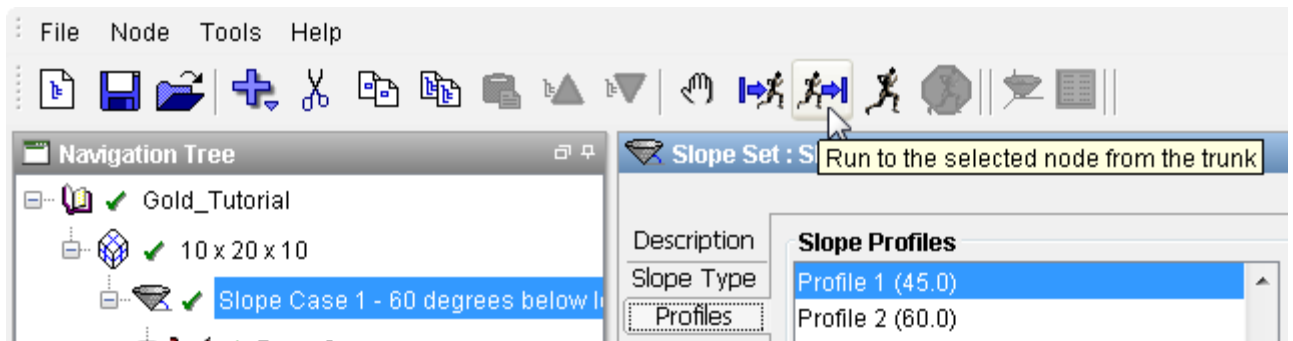
| Num. | Min X | Max X | Min Y | Max Y | Min Z | Max Z | Slope Profile    | Add Delete |
|------|-------|-------|-------|-------|-------|-------|------------------|------------|
| 1    | 1     | 90    | 1     | 40    | 16    | 35    | Profile 1 (45.0) |            |
| 2    | 1     | 90    | 1     | 40    | 1     | 15    | Profile 2 (60.0) |            |

Check Data Help Cancel Accept

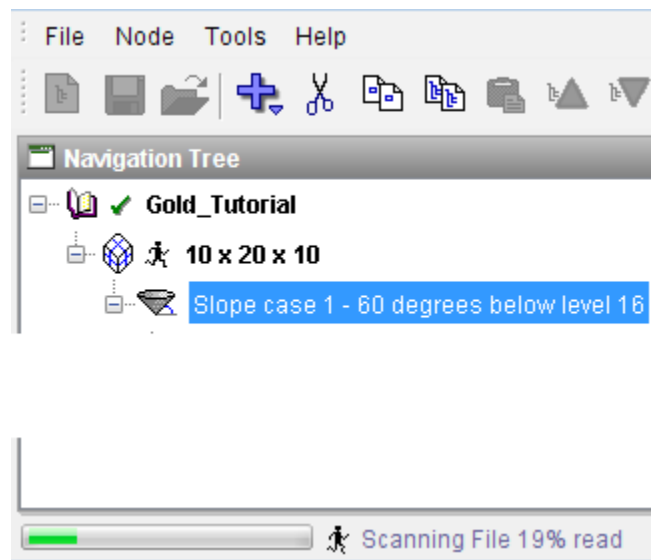
- To save your work, click **Accept**. 若要保存您的工作，请单击“接受”。  
Now you have entered all of the relevant information, the next step is to

generate the slope file to use in the optimisation. To generate the slope file, you must 'run' the analysis by clicking **Run To** . 现在您已经输入了所有相关信息，下一步是生成用于优化的坡度文件。若要生成坡度文件，必须通过单击“运行到”来“运行”分析 .

- To run the analysis from the top of the **Navigation Tree** down to a specific slope set node, click the **Slope Set** node you want, and then click **Run To** . 要从导航树顶部向下运行到特定坡度集节点的分析，请单击所需的“坡度集”节点，然后单击“运行到” .



The running icon  is displayed beside the node that Whittle is processing, and a **progress bar** is displayed in the lower left of the window. 运行图标  显示在 Whittle 正在处理的节点旁边，进度条显示在窗口的左下角。



- To check the slope errors, click the **Report** tab of the **Slope Set** node. 若要检查坡度错误，请单击“坡度配置”节点的“报告”选项卡。

 **Tip:** Slopes are created between blocks in the block model and, therefore, cannot exactly define the entered slope angle. However, the difference is usually small. 提示：坡度是在块模型中的块之间创建的，因此无法准确定义输入的坡度角度。然而，差异通常很小。

You have defined two different regions for applying the slopes. The profiles for the two

regions appear in the **Report** tab. 您已经定义了两个不同的区域来应用坡度。这两个区域的配置文件显示在“报告”选项卡中。

11. To review the two profiles for those regions, click the **Report** tab. 要查看这些区域的两个

```
Preparing the possible arcs list for slope region 1
```

With 16 levels, there are 29 possible arcs per block.

If these are applied repeatedly from a block mined at level 1, then the blocks shown below must be mined at level 16.

The diagram shows a 16x16 grid of small squares. A large 'X' is formed by the main diagonal and the anti-diagonal. On the left side, a 'Y' is formed by the main diagonal and the anti-diagonal. The grid is labeled with 'Y' on the left and 'X' at the bottom center.

If sampled all round at one-degree intervals:-

the minimum slope error is -0.0 degrees,  
the average slope error is 0.4 degrees,  
and the maximum slope error is 1.1 degrees.

```
Preparing the possible arcs list for slope region 2
```

With 16 levels, there are 37 possible arcs per block.

If these are applied repeatedly from a block mined at level 1, then the blocks shown below must be mined at level 16.

The diagram illustrates a sequence of 10 rows of symbols:

- Row 1: 28 asterisks.
- Row 2: Asterisk, followed by 7 plus signs, followed by asterisk.
- Row 3: Asterisk, followed by 14 plus signs, followed by asterisk.
- Row 4: Asterisk, followed by 21 plus signs, followed by asterisk.
- Row 5: Letter Y, followed by 14 plus signs, followed by a circle containing a plus sign, followed by 14 plus signs, followed by asterisk.
- Row 6: Asterisk, followed by 21 plus signs, followed by asterisk.
- Row 7: Asterisk, followed by 14 plus signs, followed by asterisk.
- Row 8: Asterisk, followed by 7 plus signs, followed by asterisk.
- Row 9: 14 asterisks, followed by X, followed by 14 asterisks.

If sampled all round at one-degree intervals:-

the minimum slope error is 0.1 degrees,  
the average slope error is 0.6 degrees,  
and the maximum slope error is 1.0 degrees.

10721180 arcs output to the Structure File.

配置文件，请单击“报告”选项卡。

These slope errors are acceptable. 这些斜率误差是可以接受的。

## Enter the mining costs 输入采矿成本

Before entering the cost information, you must build up the mining-cost model. In this tutorial, you have the following information: 在输入成本信息之前，必须建立采矿成本模型。在本教程中，您将获得以下信息：

- base mining cost \$1.50/tonne 基础采矿成本为 1.5 美元/吨
- mining cost increases 5c for each 10-metre bench below 230RL 230RL (m) 以下每 10 米台阶的采矿成本增加 5c

There are a number of ways to represent this data. In this tutorial, you will use the range function to enter an equation that describes the mining cost adjustment factor (MCAF). The range function is a standard function, with the format  $R(\text{IZ}, \text{MCAF}, \text{level}, \text{MCAF}, \text{level})$ , which describes the mining cost adjustment factor (MCAF) between two levels. 有许多方法可以表示这些数据。在本教程中，您将使用范围函数输入描述采矿成本调整系数 (MCAF) 的公式。范围函数是一个标准函数，格式为  $R(\text{IZ}, \text{MCAF}, \text{level}, \text{MCAF}, \text{level})$ ，用于描述两个 level 之间的采矿成本调整因子 (MCAF)。

Two methods you will explore in this tutorial are as follows. 您将在本教程中探索的两种方法如下。

### Activity: Method 1 - Use a range function alone 活动：方法 1-单独使用范围函数

1. Start Excel, and create a table with the following columns: 启动 Excel，然后创建一个包含以下列的表：

- ◆ RL crest
- ◆ RL toe
- ◆ IZ (block index in Z direction of model) (模型 Z 方向的块索引)
- ◆ Mining Cost 采矿成本
- ◆ MCAF (MCAF = Mining Cost of the current block / Mining Cost of the reference block). MCAF (MCAF = 当前块的采矿成本 / 参考块的采矿费用)

2. In the **RL crest** column, in cell A2, type 300 and then for cells A3 to A36, decrease the value for each cell by 10. 在 RL crest 列中，在单元格 A2 中键入 300，然后对于单元格 A3 至 A36，将每个单元格的值减少 10。



**Tip:** For each column, after you type the values for the first two cells, select both cells and then drag the fill handle to fill in the remaining cells with the appropriate values. This feature is called **Auto Fill Option** and is useful for quickly filling in a data series. See the Microsoft Help for more information. 提示：对于每列，键入前两个单元格的值后，选择两个单元格，然后拖动填充控制柄以使用适当的值填充其余单元格。此功能称为“自动填充选项”，可用于快速填充数据序列。有关详细信息，请参阅 Microsoft 帮助。

|   | A        | B      |
|---|----------|--------|
| 1 | RL crest | RL toe |
| 2 | 300      |        |
| 3 | 290      |        |
| 4 |          |        |
| 5 |          |        |

3. In the **RL toe** column, in cell B2, type 290, and then for cells B3 to B36 decrease the value for each cell by 10. 在 RL toe 列中，在单元格 B2 中，键入 290，然后对于单元格 B3 到 B36，将每个单元格的值减少 10。
4. In the **IZ** column, in cell C2, type 35, and then for cells C3 to C36 decrease the value for each cell by 1. 在 IZ 列中，在单元格 C2 中键入 35，然后对于单元格 C3 到 C36，每个单元格的值都减小 1。

5. In the **Mining Cost** column, for cells D2 -D8, type 1.5. For cells D9 to D36, increase the value for each cell by 0.05. 在“采矿成本”列中，为单元格 D2-D8 键入 1.5。对于单元格 D9 到 D36，将每个单元格的值增加 0.05。
6. In the **MCAF** column, for cells E2-E8, type 1. For cells E9-E36, type the formula  $=0.0333*C<row>+1.9667$ , where  $<row>$  is the row number. For example, for cell E9 the formula is  $=0.0333*C9+1.9667$ . 在 MCAF 列中，对于单元格 E2-E8 键入 1。对于单元格 E9-E36，键入公式  $=0.0333*C<row>+1.9667$ ，其中  $<row>$  为行号。例如，对于单元格 E9，公式为  $=0.0333*C9+1.9667$ 。

The table will look like the following example. 该表将类似于以下示例。

 **Note:** To save space, the table is shown as two side-by-side tables. In Excel, you would create a single table.

注意：为了节省空间，该表显示为两个并排的表。在 Excel 中，您可以创建一个表。

| RL crest | RL toe | IZ | Mining Cost | MCAF | RL crest | RL toe | IZ | Mining Cost | MCAF |
|----------|--------|----|-------------|------|----------|--------|----|-------------|------|
| 300      | 290    | 35 | 1.5         | 1    | 120      | 110    | 17 | 2.1         | 1.40 |
| 290      | 280    | 34 | 1.5         | 1    | 110      | 100    | 16 | 2.15        | 1.43 |
| 280      | 270    | 33 | 1.5         | 1    | 100      | 90     | 15 | 2.2         | 1.47 |
| 270      | 260    | 32 | 1.5         | 1    | 90       | 80     | 14 | 2.25        | 1.5  |
| 260      | 250    | 31 | 1.5         | 1    | 80       | 70     | 13 | 2.3         | 1.53 |
| 250      | 240    | 30 | 1.5         | 1    | 70       | 60     | 12 | 2.35        | 1.57 |
| 240      | 230    | 29 | 1.5         | 1    | 60       | 50     | 11 | 2.4         | 1.6  |
| 230      | 220    | 28 | 1.55        | 1.03 | 50       | 40     | 10 | 2.45        | 1.63 |
| 220      | 210    | 27 | 1.6         | 1.07 | 40       | 30     | 9  | 2.5         | 1.67 |
| 210      | 200    | 26 | 1.65        | 1.10 | 30       | 20     | 8  | 2.55        | 1.7  |
| 200      | 190    | 25 | 1.7         | 1.13 | 20       | 10     | 7  | 2.6         | 1.73 |
| 190      | 180    | 24 | 1.75        | 1.17 | 10       | 0      | 6  | 2.65        | 1.77 |
| 180      | 170    | 23 | 1.8         | 1.20 | 0        | -10    | 5  | 2.7         | 1.8  |
| 170      | 160    | 22 | 1.85        | 1.23 | -10      | -20    | 4  | 2.75        | 1.83 |
| 160      | 150    | 21 | 1.9         | 1.27 | -20      | -30    | 3  | 2.8         | 1.87 |
| 150      | 140    | 20 | 1.95        | 1.30 | -30      | -40    | 2  | 2.8         | 1.9  |
| 140      | 130    | 19 | 2.0         | 1.33 | -40      | -50    | 1  | 2.9         | 1.93 |
| 130      | 120    | 18 | 2.05        | 1.37 |          |        |    |             |      |

What you want to represent is described as follows: 您想要表示的内容描述如下：

*At the bottom of the model (level 1), use an MCAF of 1.93, at level 2 use 1.9, at level 3 use 1.87, and then continue on until at level 27 use 1.07. At level 28 use 1.03, and then at level 29 and above, use a value of 1 (up to the top of the model).* 在模型底部 (level1)，使用 1.93 的 MCAF，在 level2 使用 1.9，在 level3 使用 1.87，然后继续使用，直到 level27 使用 1.07。在 level28 处使用 1.03，然后在 level29 及以上处使用值 1（直到模型顶部）。

As an equation, you build the range function using the format: 作为一个方程式，您可以使用以下格式构建范围函数：

R(IZ,MCAF,level,MCAF,level, MCAF,level ..... ,level, MCAF,level MCAF,level),

for example: R(IZ,1.93,2,1.90,3,1.87,4.....,27,1.07,28,1.03,29,1)

It is easy to build up this formula in Excel using the concatenate function. 使用 concatenate 函数可以很容易地在 Excel 中建立这个公式。

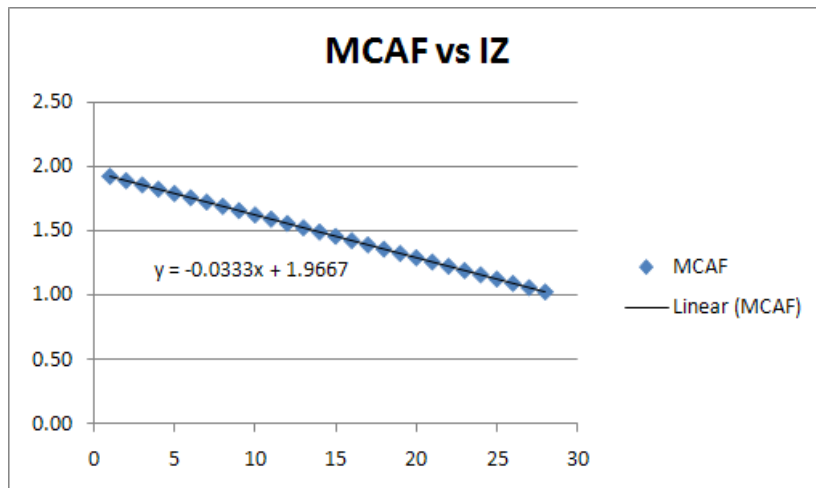
For more examples using the Range function, see the Expression Button topic in the Help.

有关使用 Range 函数的更多示例，请参阅“帮助”中的“表达式按钮”主题。

## Activity: Method 2 - Use a line of best fit within a range function 活动：方法 2-使用范围函数内的最佳拟合线

1. Start Excel, and create the table shown in method . 启动 Excel，创建**方法 1**所示的表格。
2. In the **IZ** column, select cells C9-C36, and in the **MCAF** column, select cells E9-E36. 在 IZ 列中，选择单元格 C9-C36，在 MCAF 列中选择单元格 E9-E36。
3. Click the **Insert** tab, and in the **Charts** group, click **Scatter**, and then click **Scatter with Straight Lines and Markers**. 单击“插入”选项卡，然后在“图表”组中，单击“散布”，然后单击“带直线和标记的散布”
4. Click the **Design** tab, and in the **Chart Layouts** group, click **Layout 1**, and update the chart name. 单击“设计”选项卡，在“图表布局”组中，单击“布局 1”，然后更新图表名称
5. To show the line and the markers, in the **Layout** tab, in the **Analysis** group, click **Trendline**, and then click **Linear Trendline**. 要显示线和标记，请在“布局”选项卡的“分析”组中，单击“趋势线”，然后单击“线性趋势线”。
6. To change the legend: 要更改图例：
  - a. Click the **Design** tab, and in the **Data** group, click **Select Data**. 单击“设计”选项卡，然后在“数据”组中，单击“选择数据”。
  - b. Select the legend entry, click **Edit**, and type the series name. 选择图例条目，单击“编辑”，然后键入系列名称。
7. To hide the axis names, click the **Layout** tab, and in the **Labels** group, click **Axis Titles**, and select **None** for both the primary horizontal and vertical axe. 要隐藏轴名称，请单击“布局”选项卡，然后在“标签”组中，单击“轴标题”，然后为主水平轴和垂直轴选择“无”。
8. To add the equation to the graph, click the **Layout** tab, and in the **Insert** group, click **Text Box**, and then type the equation in the text box. 要将公式添加到图形中，请单击“布局”选项卡，然后在“插入”组中单击“文本框”，然后在文本框中键入公式。

In other words, the line is  $MCAF = -0.0333 * IZ + 1.9667$ , and the scatter chart appears as follows. 换句话说，这条线是  $MCAF = -0.0333 * IZ + 1.9667$ ，散点图显示如下。



You can then use the range function and nest the line of best fit within the range function. What you want to represent is described as follows:

然后，您可以使用范围函数并将最佳拟合线嵌套在范围函数中。您想要表示的内容描述如下：

*Up to the 230RL (level 29), use the equation  $MCAF = -0.0333 * IZ + 1.9667$ . For level 29 and thereafter, use a value of 1 (up to the top of the model).* 在 230RL (level29) 之前，使用公式  $MCAF = -0.0333 * IZ + 1.9667$ 。对于 level29 及其后的，使用值 1（直到模型顶部）。

As an equation, you express this concept as:  $R (IZ, -0.0333 * IZ + 1.9667, 29, 1)$

作为一个方程，可以将这个概念表示为:  $R (IZ, -0.033 * IZ + 1.9667, 29, 1)$

以上内容仅为本文档的试下载部分，为可阅读页数的一半内容。如要下载或阅读全文，请访问：<https://d.book118.com/818127056142006067>