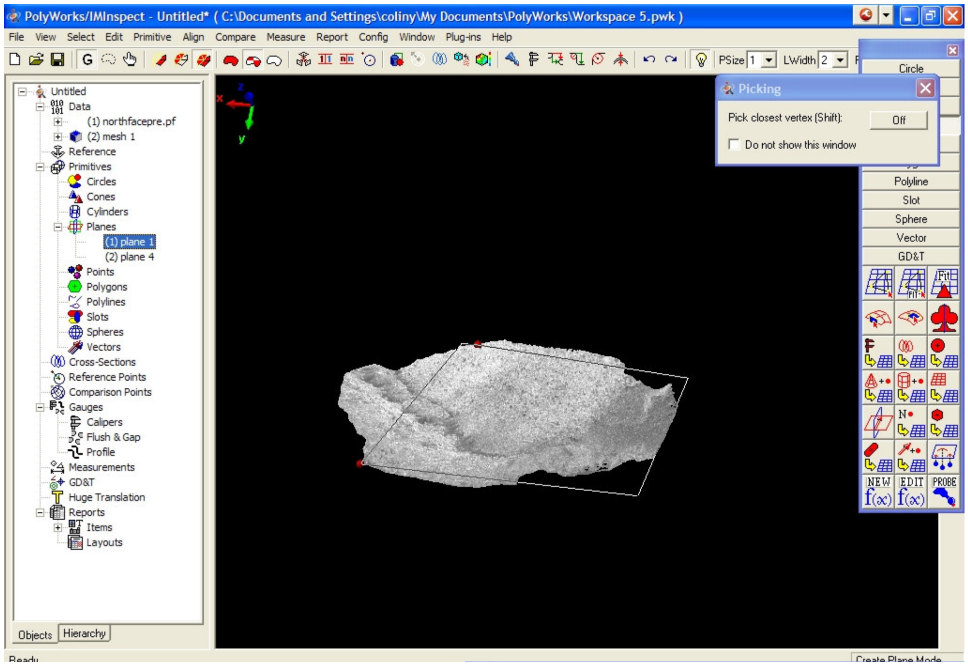
Calculating Pit Volumes

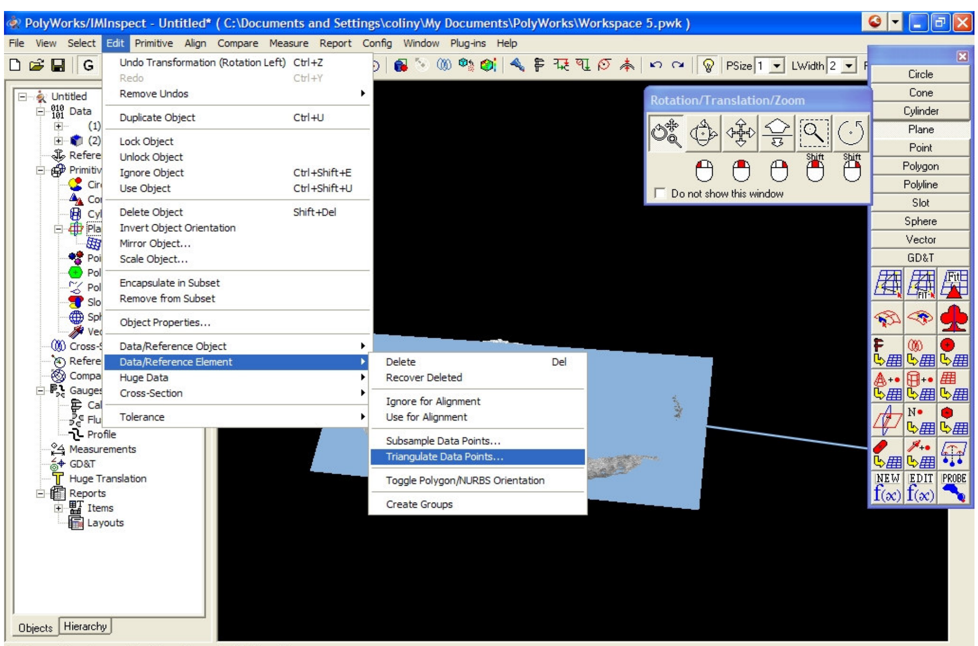
Written by: Colin Young Pow
Optech Incorporated
Imaging Division

Step 1 – Defining a Plane



Using the rim around the pit, the user should be able to define a plane, as seen above. If the scanner operator has captured a portion of the ground around the pit, the data processing person will be able to create a plane that approximates the average elevation of the ground.

Step 2 – Triangulating a Mesh Model



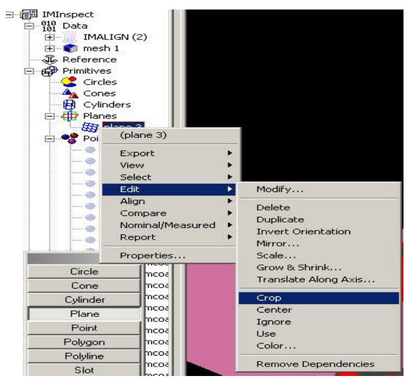
At this point, the user determines the limits of the area to be used in the volume calculation. . In this case we are interested in the pit in the picture above - highlighted red. Since the Polyworks software will calculate the volume for *any* area that is selected, it is important that care be taken in selecting the area to be included in the volume calculation. For example, if the user chooses the extended areas around the stockpile (buildings and other structures) an erroneous volume will be calculated. This will cause huge discrepancies with the customers expected volume.

The next step is to triangulate the point cloud into a solid mesh and this is done by choosing:

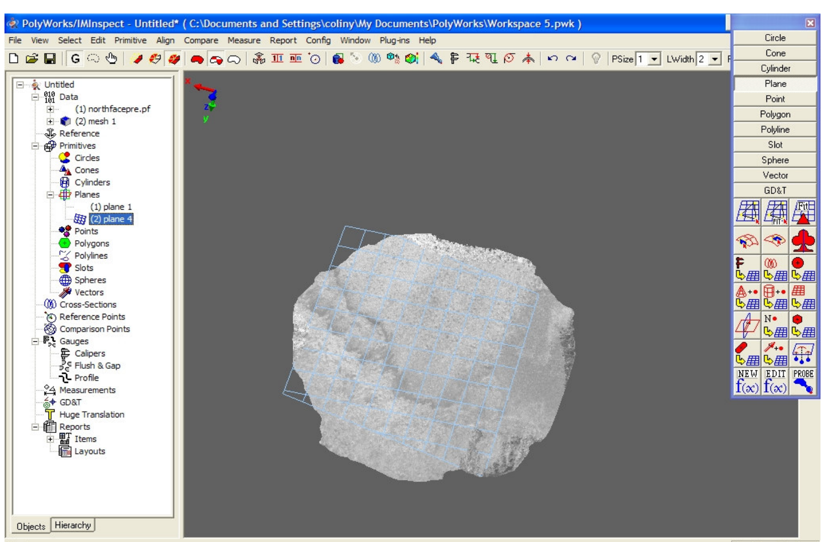
Edit -> **Data Reference Element** -> **Triangulate Data points** as seen above.

Step 3 – Crop the Plane

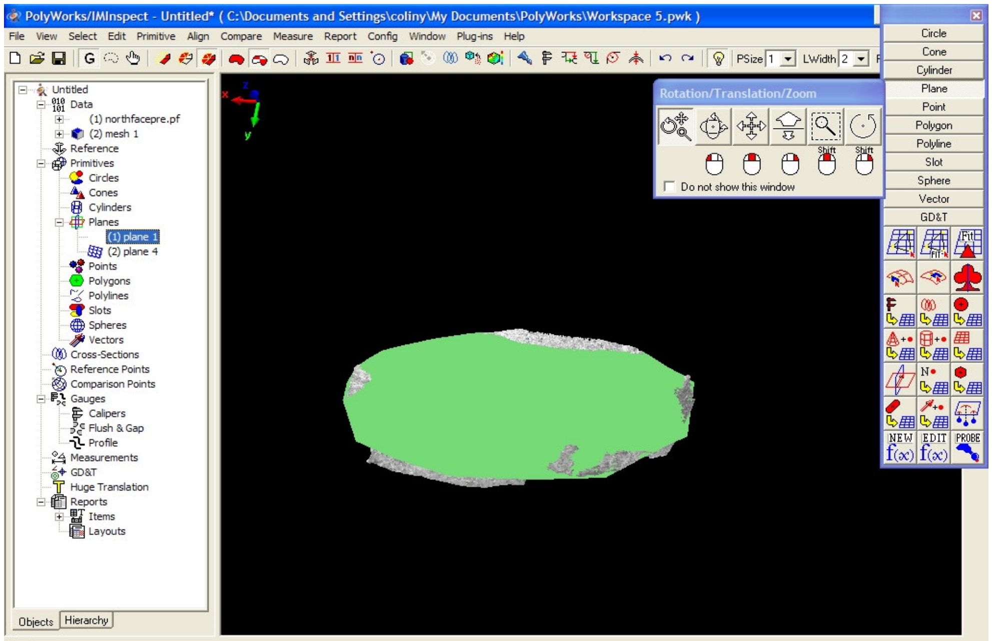
After creating the solid model, the plane, which was used to triangulate the pit, may not cover the whole study area as seen above. If this is the case, the plane should be cropped to fit the data. Using the right mouse button, the user selects **Edit** and then **Crop** - as seen below.



The screen will now show a gray background with the existing plane and the triangulated stockpile - as seen below. The user can now crop the plane so that it covers the pit.



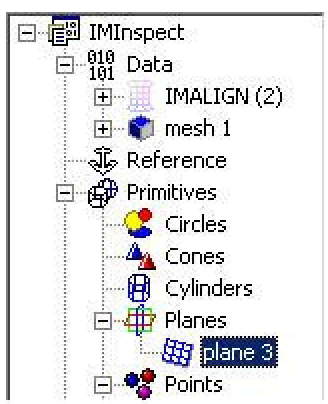
After cropping the results should look like the image below where the study area is entirely covered.



Step 4 - Deleting Unwanted Data Points Under the Plane

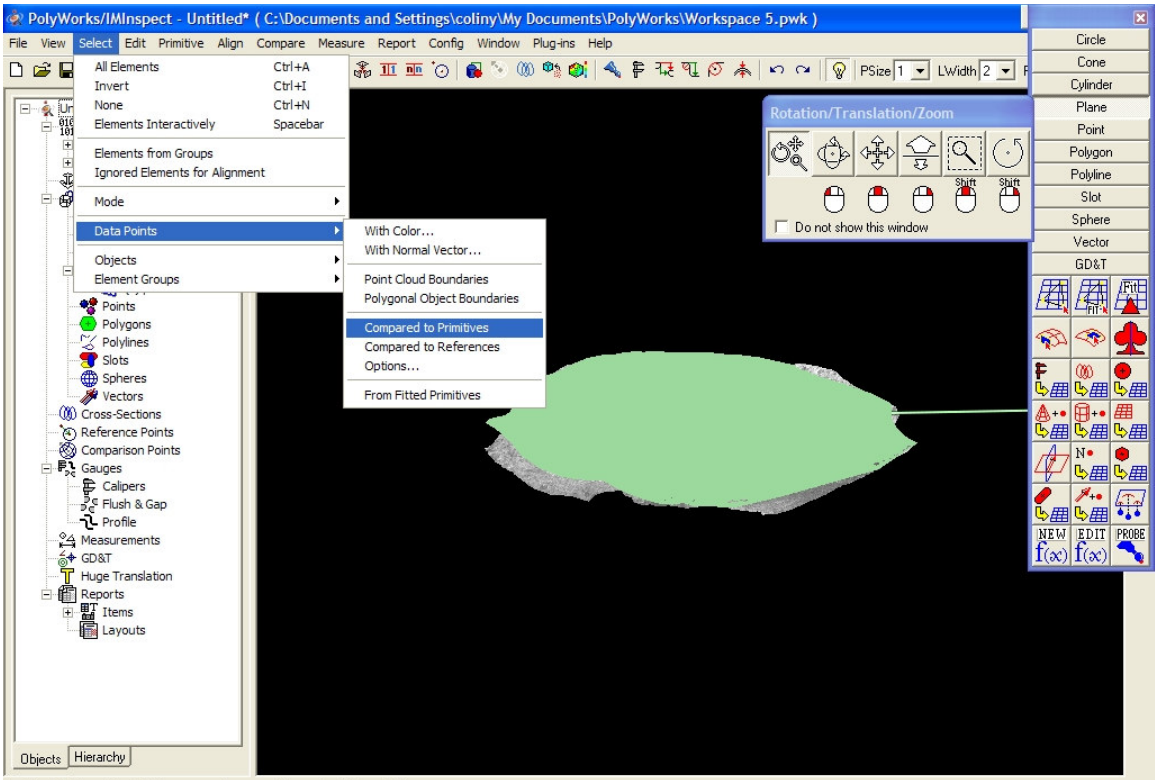
It is important to note that if the user does not delete the data below the plane, which represents the surface of the ground, unwanted volumes around and below the stockpile will be calculated and added to the total volume.

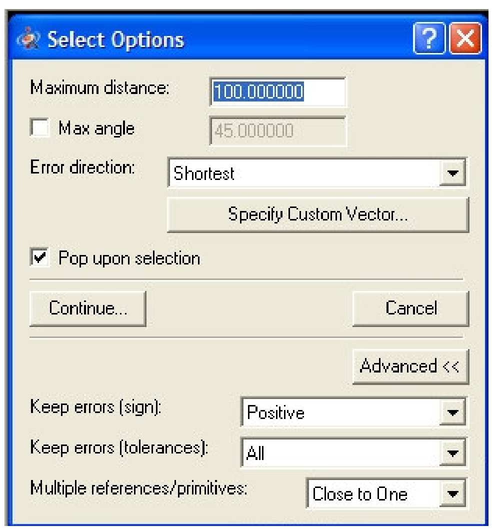
First, the user selects the plane to be used in the volume calculation. This plane can be found in the tree window as see below.



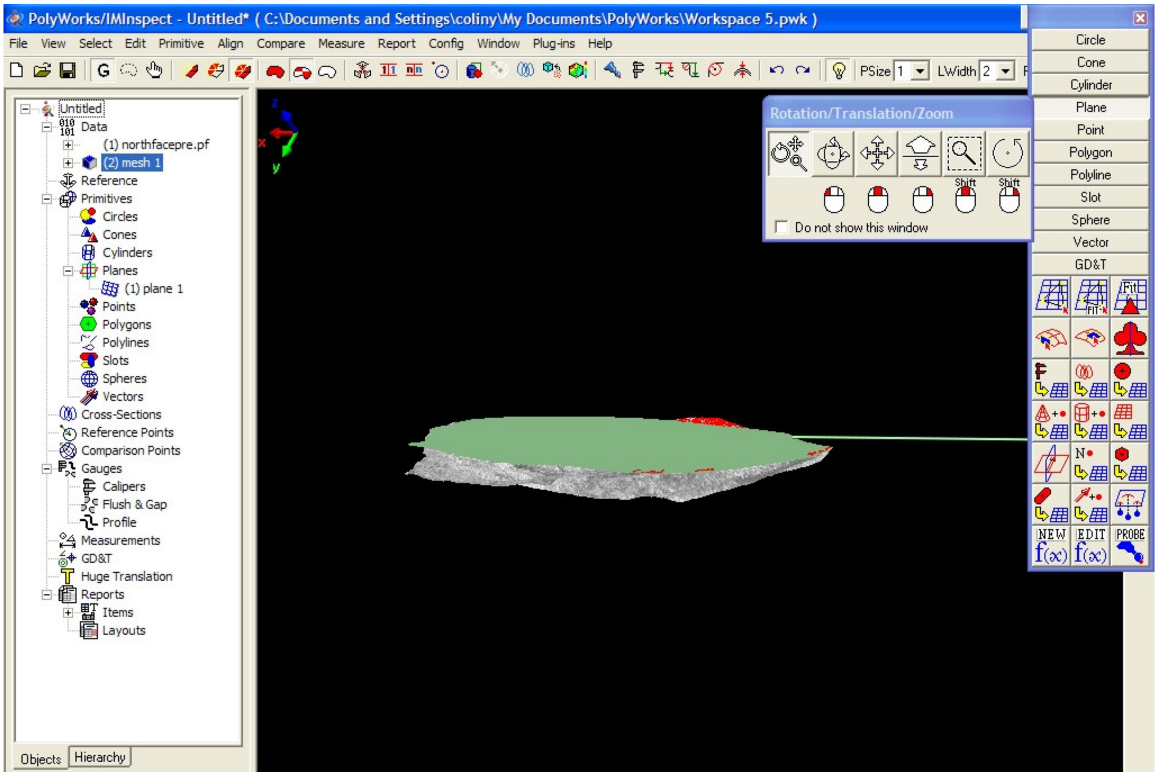
After highlighting the plane by selecting it, the user can now angle the image so that the areas above the plane become visible. These areas should be deleted so that they are not used in the final volume calculation. In this step, the plane becomes the highest part of the solid model, making the calculation more accurate.

To select the data under the plane, go to:
Select -> Data Points -> Compare to Primitive
as seen below.

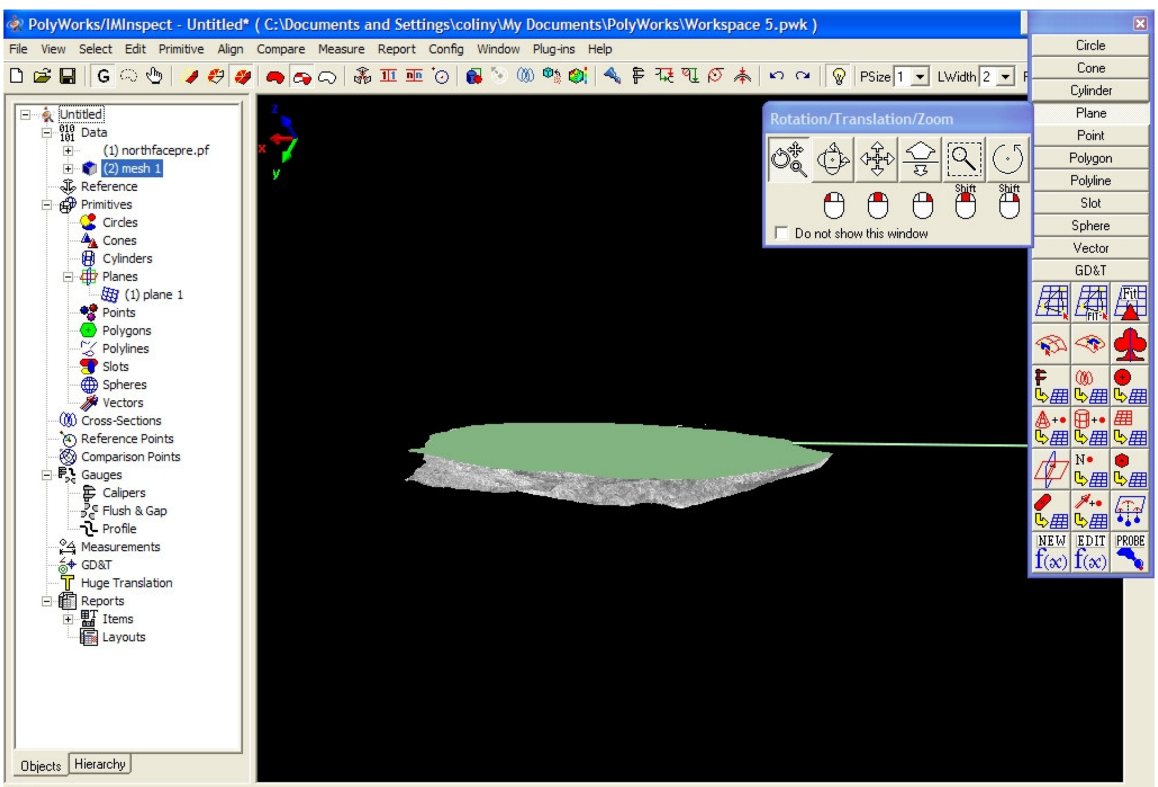




A dialogue box will pop up and the user will then select a **Maximum distance**. In this case we are using 100m to ensure that there is no data left above the plane. Clicking the advance button choose **Positive** in the **Keep errors (sign)** box. When this has been done click **Continue**.

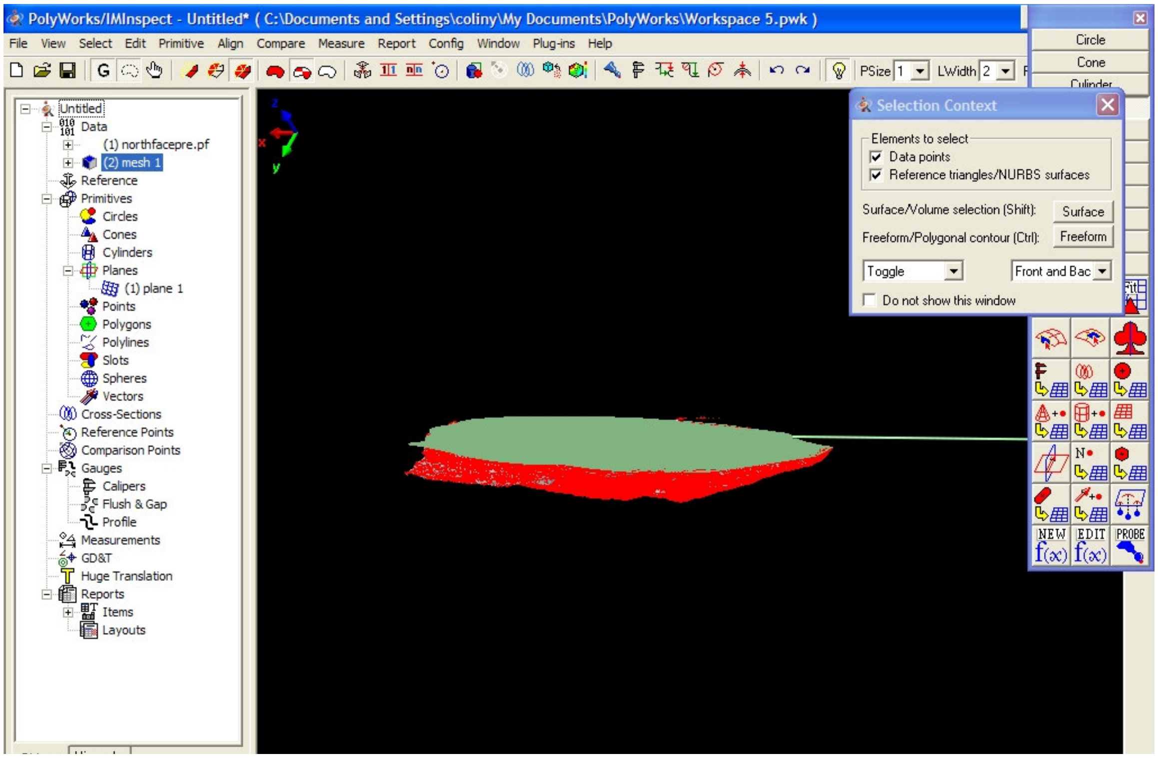


You will notice that the data below the plane has been highlighted as seen above. Clicking the delete button on the keyboard will delete the data - as seen below.



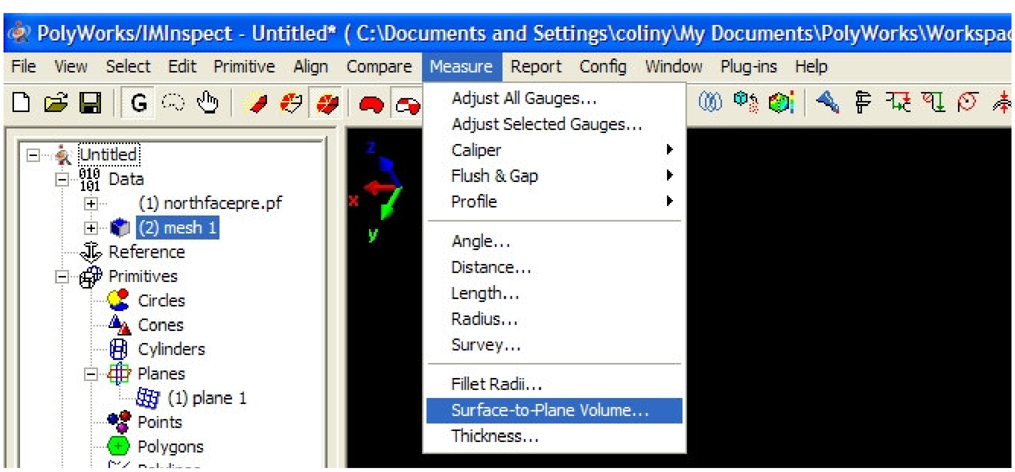
You are now ready to calculate the stockpile volume.

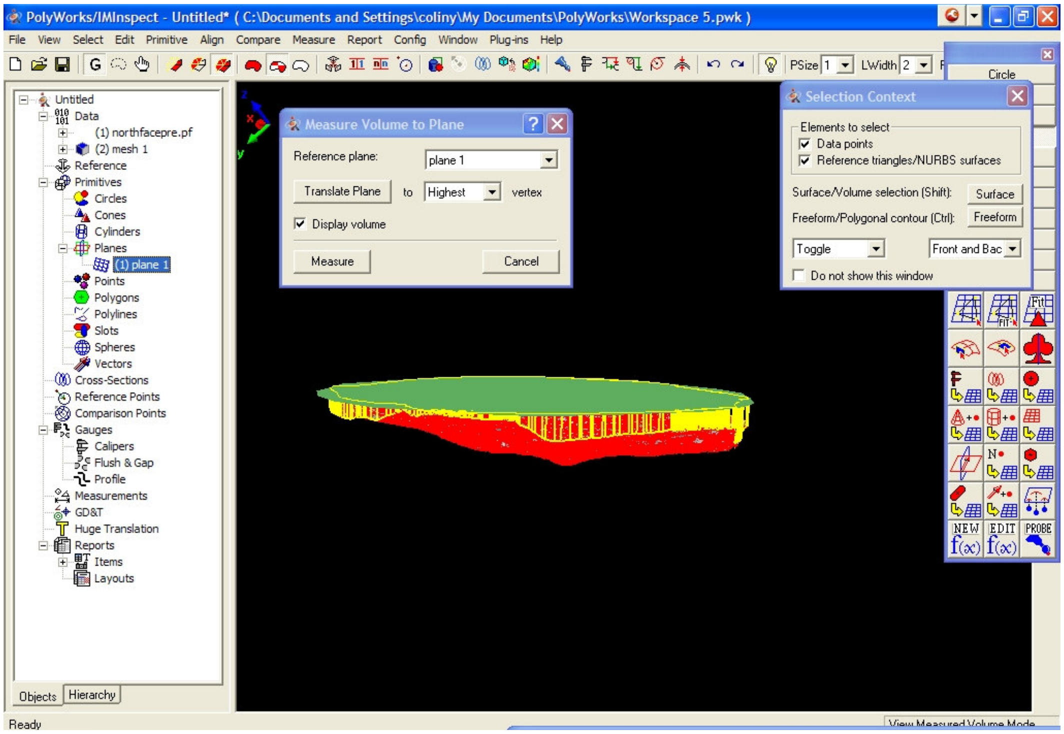
Step 5 – Volume Calculation



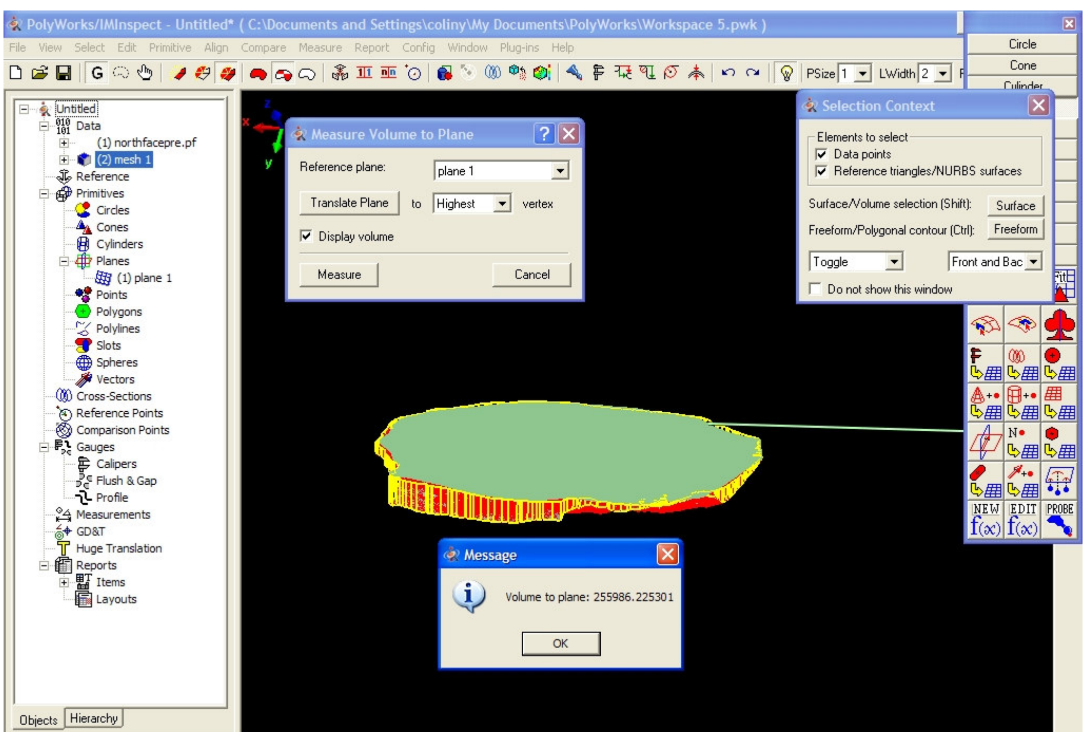
The first step in calculating the volume of the solid model is to select the stockpile as seen above, highlighted in red.

Select:
Measure -> **Surface-to-Plane Volume** (seen in the image below)





A dialogue box, as seen above, pops up on the screen. You will also see a yellow triangulated border around the solid model. These triangles extend from the edges of the data to the plane below and will be used to calculate the volume. The user then chooses the plane created earlier - in this case plane1. Click on Translate Plane to Lowest, and then click on Measure.



You will see that a volume measurement box will pop up and in this case it is the volume is: 255986 Cubic Meters