Working with Trimble VX Scanned Data

TRIMBLE BUSINESS CENTER TUTORIAL

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About this tutorial

In this tutorial, you will import a survey project that includes scanned data and photo images captured with a Trimble VX Spatial Station while surveying a material pile. Then you will create a surface and calculate the volume of the pile.

Notes:

- To add surface boundaries as described later in this tutorial, you must be running **Trimble Business Center** software with the ***Survey Advanced*** product license. To verify the product license for your installation, select **Help > About Trimble Business Center** and click the **License** button. Licensed features are displayed in the **Features** list.
- If you need additional help at any time you are using the software, press **F1** to display the online help.

Step 1. Open the project

For this tutorial, you will use the project file *Working with Scanned Data.vce*. This file contains a surface that you will view later in the tutorial. Otherwise, no other data has been imported into the project.

1. On the **Trimble Business Center** menu bar, select **File > Open Project**. Or, click the **Open Project** icon on the toolbar.
2. In the **Open File** dialog, browse to ***C:\Trimble Tutorials\TBC\Projects\Working with Scanned Data.vce*** and click **Open**.

   If you installed the tutorial to a location other than the default location shown here, browse to that location.

   The project opens in the **Trimble Business Center** window.

   Note: This tutorial shows the **Plan View** with a black background. Your background may be white. If you want to change it to black, select **Tools > Options** and select **Background color: Black** in the **Options** dialog.

The project file is read-only. You can perform the tutorial steps without saving the project file. However, if you are interrupted while performing the tutorial, you can save it by selecting **File > Save Project As** and saving it to ***..\My Documents\Trimble Business Center***, which is the typical location for storing project files on your computer. Then, you can re-open the project to continue the tutorial at a later time.

You are now ready to import survey data into your project.

Step 2. Import survey data

In this step, you will import a JXL (.jxl) file into your project. During the import process, the following related files are imported along with the JXL file:

- Four Trimble Scan Files (TSF) containing the scanned information from the Trimble VX Spatial Station
- Numerous photo images captured with the Trimble VX during the survey
- A Feature Definition (.fxl) file containing definitions used to record and process feature codes

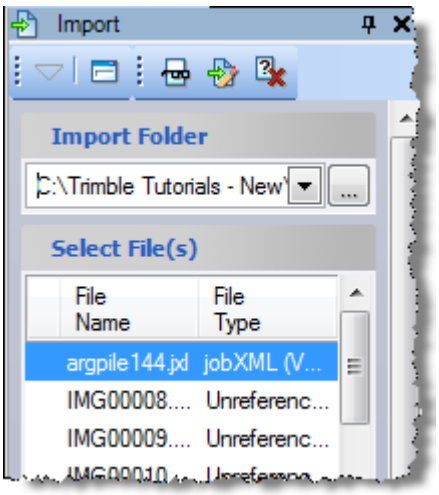
1. Select **File > Import.** Or, click the **Import** icon on the toolbar.

   The **Import** pane opens in the right side of the **Trimble Business Center** window.

2. In the **Import** pane, click the **Browse** button .

3. Browse to ***C:\Trimble Tutorials\TBC\Data\Working with Scanned Data*** and click **OK**.

   The *Working with Scanned Data* folder contains the JXL job file and related files, all of which display in the **Select File(s**) list in the **Import** pane.

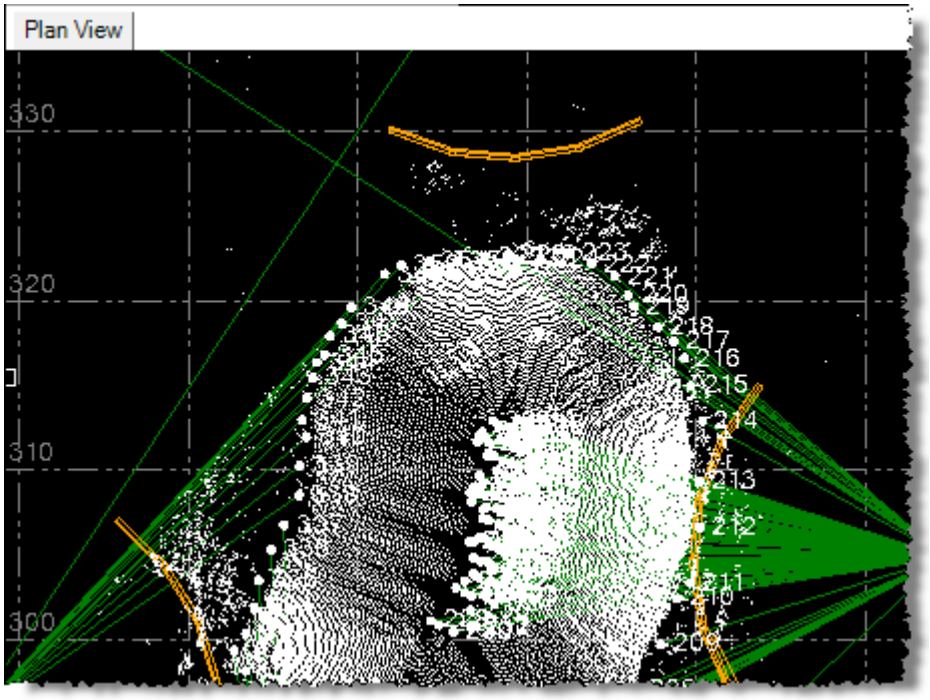


4. In the **Select File(s)** list, select *argpile144.jxl* and click the **Import** button.

   The content of the *Working with Scanned Data* folder is imported into your project. Survey data is displayed in the **Plan View.**

5. Click in the **Plan View** and use your mouse wheel to zoom in. Press the mouse wheel and move the mouse to center the points as shown here.

Photo images (reference images) taken during the job using the Trimble VX are represented by the orange lines in the **Plan View**. (If you zoom in, you will see these are actually wireframes that are used as placeholders for the images.) Scanned data displays as "point clouds."



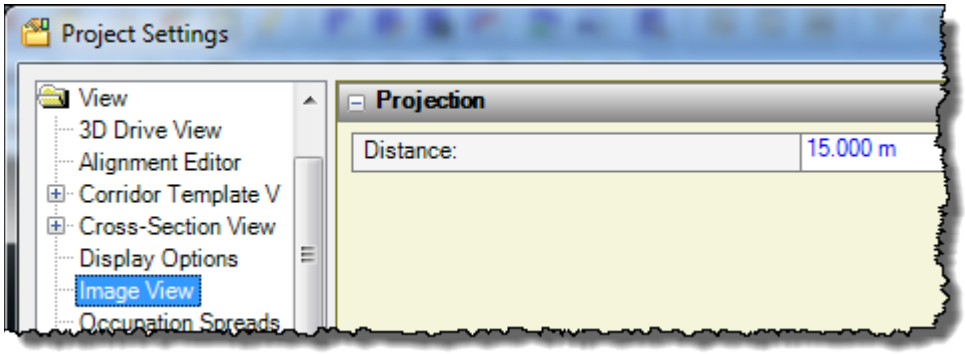
Step 3. View referenced photo images

The imported job includes numerous referenced photo images that can be viewed on the **Image View** tab. Note that the images are located at a default pseudo-distance from the instrument. This is because the images themselves do not have distance information.

You will start by verifying the default image view distance defined for your project.

1. Select **Project > Project Settings**. Or, click the **Project Settings** icon on the toolbar.

2. In the navigation (left) pane in the **Project Settings** dialog, select **View > Image View**.



In some instances, modifying this distance can help to correct the alignment of objects between multiple images. When the objects in the images are at a distance greater than or less than this default distance, changing the **Image View** distance to a more realistic distance will help with the object alignment.

However, for this tutorial you will not change the default distance.

3. Click **Cancel** to close the **Project Settings** dialog.

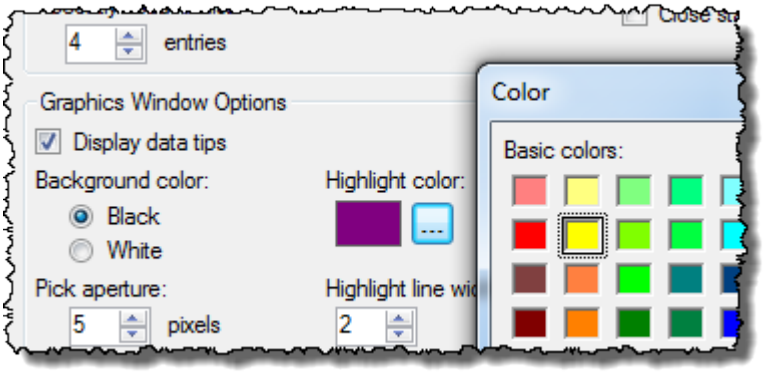
Next you will change the highlight color to make highlighted lines and point labels more visible in the various graphic views.

4. To change the highlight color, do the following:

   a. Select **Tools > Options**.

   b. In the **Options** dialog, click the **Browse** button for **Highlight color**.

   c. In the **Color** dialog, select bright yellow and click **OK**.



   d. In the **Options** dialog, click **OK**.

Note: Settings in the **Options** dialog are not specific to a single project. They are kept until you change them, regardless of the project you open. If you do not want to keep yellow as your highlight color for other projects, you can change it at any time.

The **Options** dialog includes a **Cloud point size** control that allows you to specify the pixel size of each point contained in a point cloud displayed in a graphic view. For this tutorial, you will leave it at the default size of *2 pixels*.

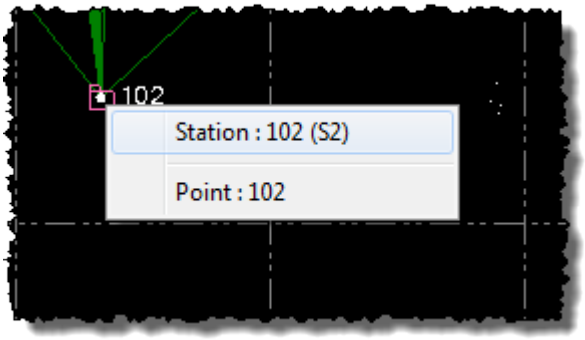
You can click the **Advanced** button to display the **Advanced Graphics Options** dialog. This dialog provides options for enhancing your graphics display and performance when you are exploring rich data sets in the various graphic views. For more information on this dialog, open it and press F1.

You are now ready to view photo images. You will start by selecting a station from which photos were taken.

5. In the **Plan View**, do the following:

   a. Click point *102* and select *Station: 102* in the context menu.

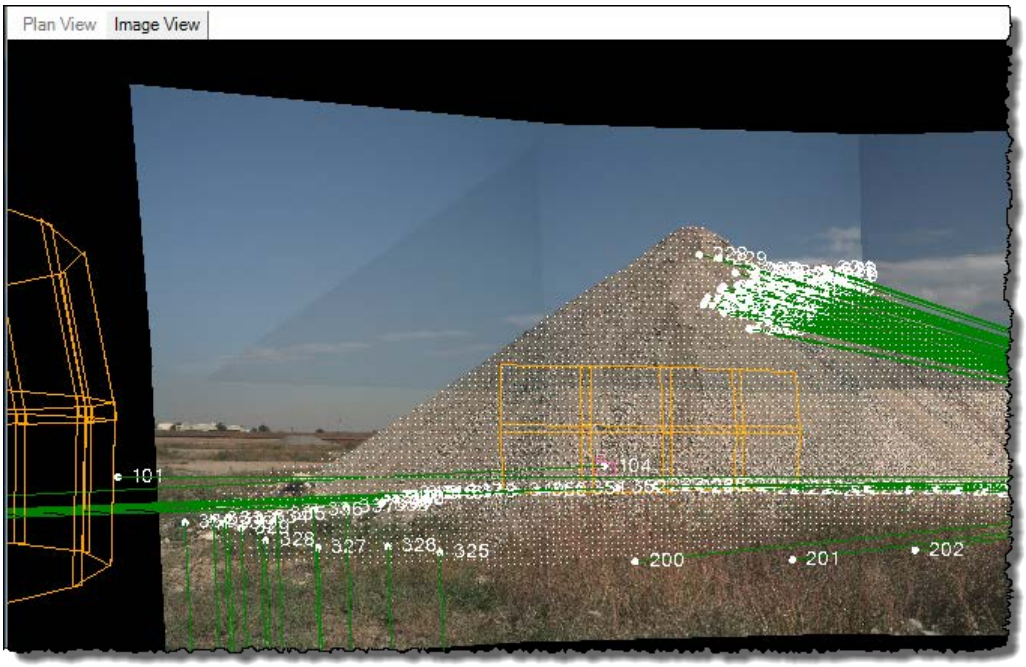
      Each station from which photos were taken is identified by a pink camera symbol in the **Plan View**.



   b. Right-click in the **Plan View** and select **New Image View**.

The **Image View** displays showing the array of photo images taken from *Station 102* interlaced in a panoramic view.

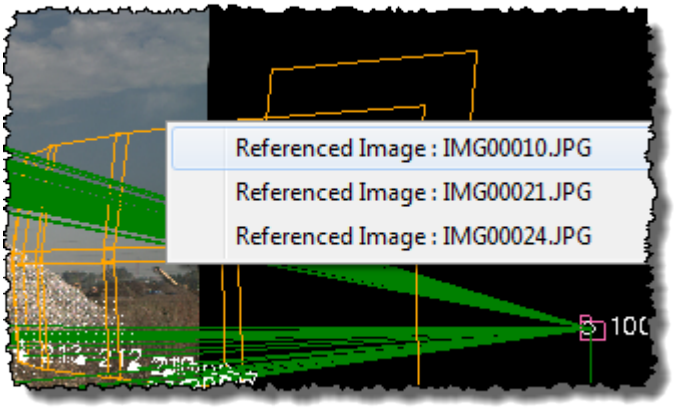
Notes: Depending on your computer configuration and available memory, it may take several moments to display the image.



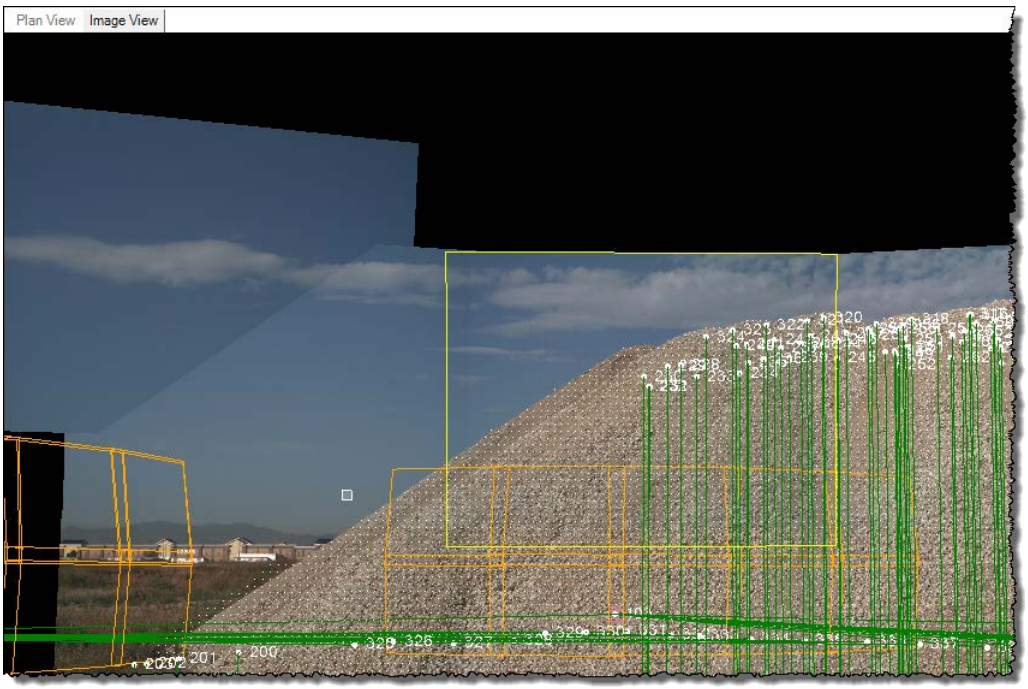
The orange wireframes displayed on the **Image View** represent photo image arrays taken from other station setups.

To view an array of photo images taken from a different station, you can either select a station (represented by a pink camera icon) or select one of the wireframes in the **Image View**. .

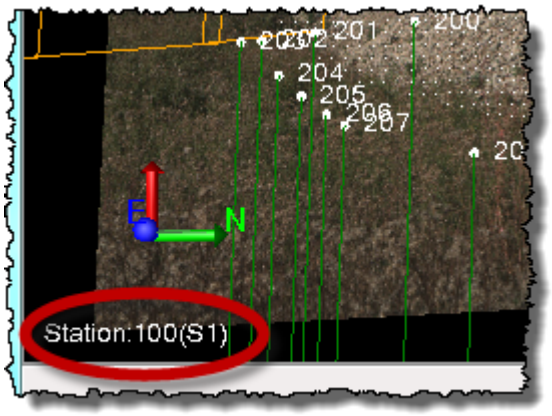
6. Click one of the wireframes in the array on the right side of the photo images from station *102*, and select *Referenced Image: IMG00010.JPG* in the context menu. Then right-click and select **New Image View** in the context menu.



The newly selected photo image, along with other photo images in the array, displays centered on the **Image View**, outlined by a yellow box.



Note that the name of the station from which the array of photo images was taken is displayed in the lower left corner of the **Image View**.

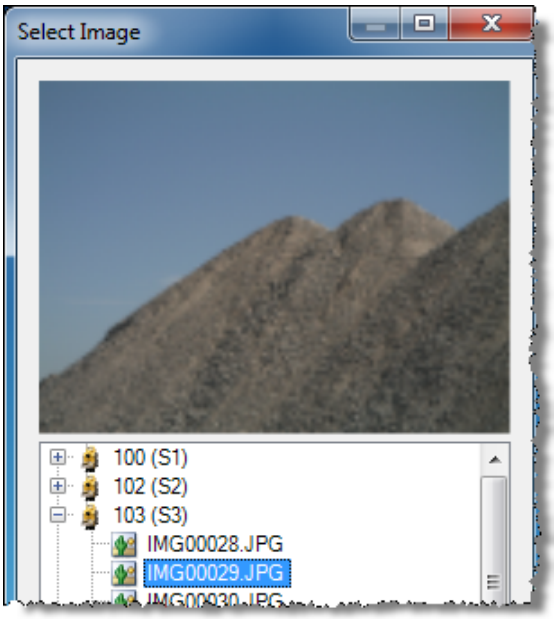


Note: Viewing a large number of images can require a lot of computer memory. If there is inadequate memory available to display all of the images, some images will display only as a green wireframe on the **Image View**. In this case, you should close and reopen the **Image View**.

Next you will try a different method of selecting an image to view.

7. Click on the **Image View** somewhere other than on an image or wireframe so that no image is selected. Then select **View > New Image View** in the menu bar.

   The **Select Image** dialog displays allowing you to select any station or image in the project to view the image(s) on the **Image View** tab.

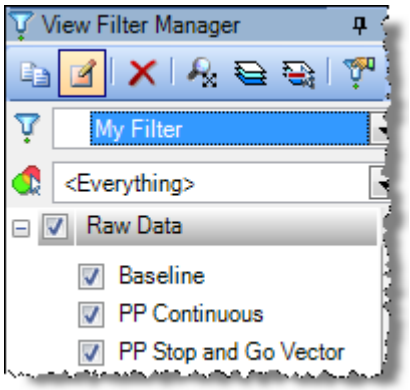


8. Click **Cancel** to close the **Select Image** dialog.

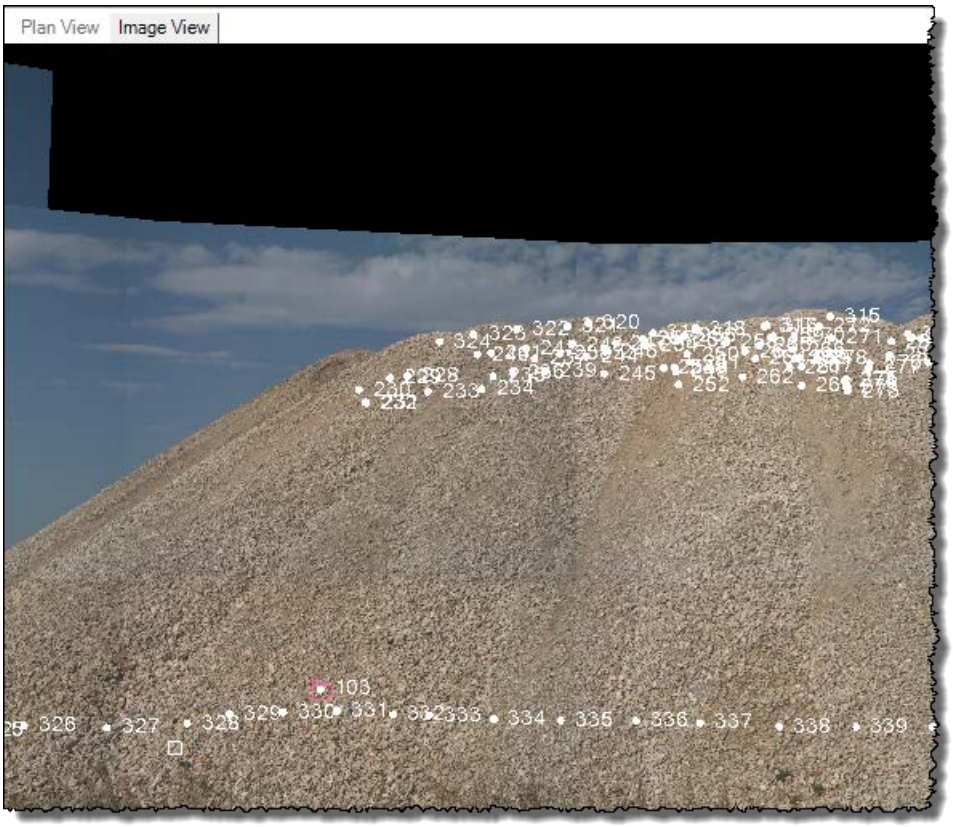
Next, you will use the **View Filter Manager** to change how your data is displayed.

Step 4. Filter the view

1. Select **View > View Filter Manager**.



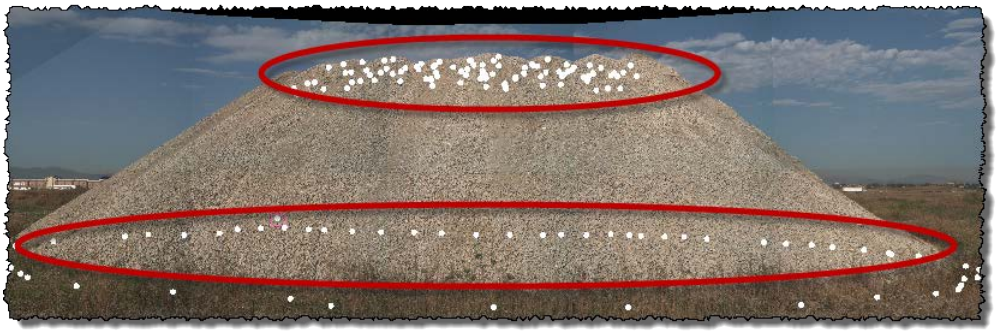
2. Deselect the following options in the **Raw Data** list to see how it affects your image.
   - **Referenced Frame**
   - **Scan Point**
   - **Total Station**



Only surveyed points are displayed.

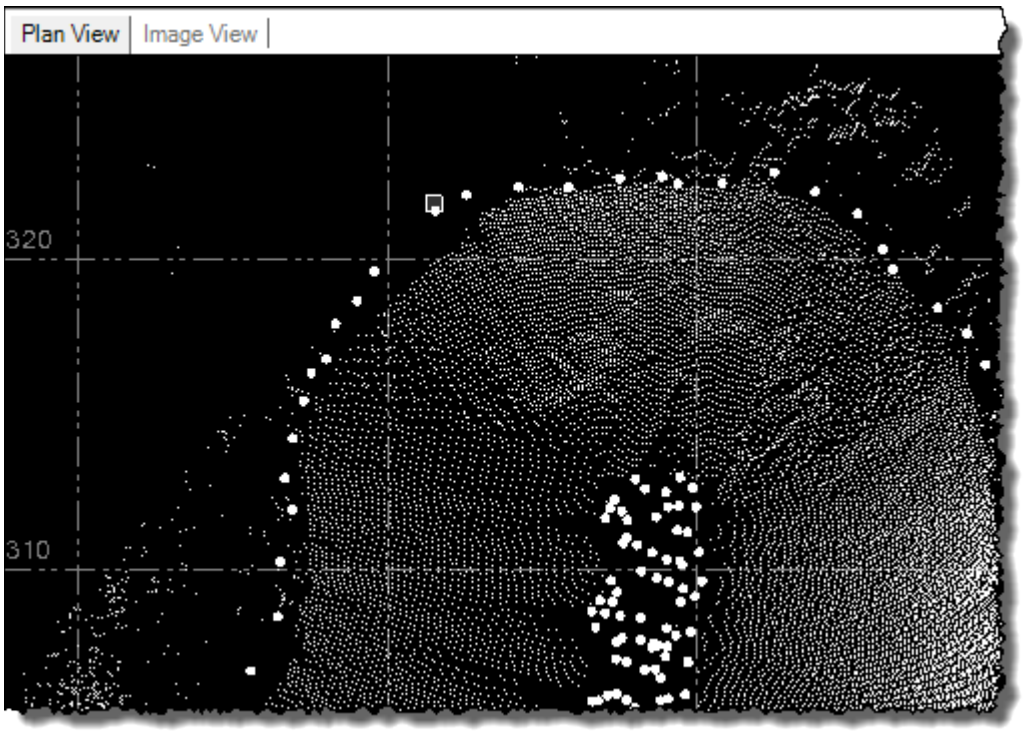
3. On the **Point** tab in the bottom of the **View Filter Manager** pane, deselect the **Show point label** option.

   The surveyed points circled in the following figure are on the backside and the top of the material pile. Because the images do not have depth, all surveyed points in the project are visible in the **Image View**.



4. Reselect the **Scan Point** option in the **Raw Data** list in the **View Filter Manager** pane. Then try viewing the data using other views:

   - Select the **Plan View** and use your mouse wheel to zoom out as shown here.



   - Select **View > New 3D View** and experiment with changing the perspective.
     - Use the mouse wheel to zoom in or out.
     - Press the **Ctrl** key and use the mouse wheel to rotate the view around the X axis.
     - Press the **Shift** key and use the mouse wheel to rotate the view around the Z axis.

- Press the **Ctrl** + **Shift** key and use the mouse wheel to exaggerate differences between elevations.
- Press the **Ctrl** key and use the mouse wheel along with moving the mouse to rotate the view freely in any direction.

5. Reselect the **Show point labels** option on the **Point** tab in the **View Filter Manager** pane.

In the next two steps, you will create a surface so that you can calculate the volume of the materials pile.

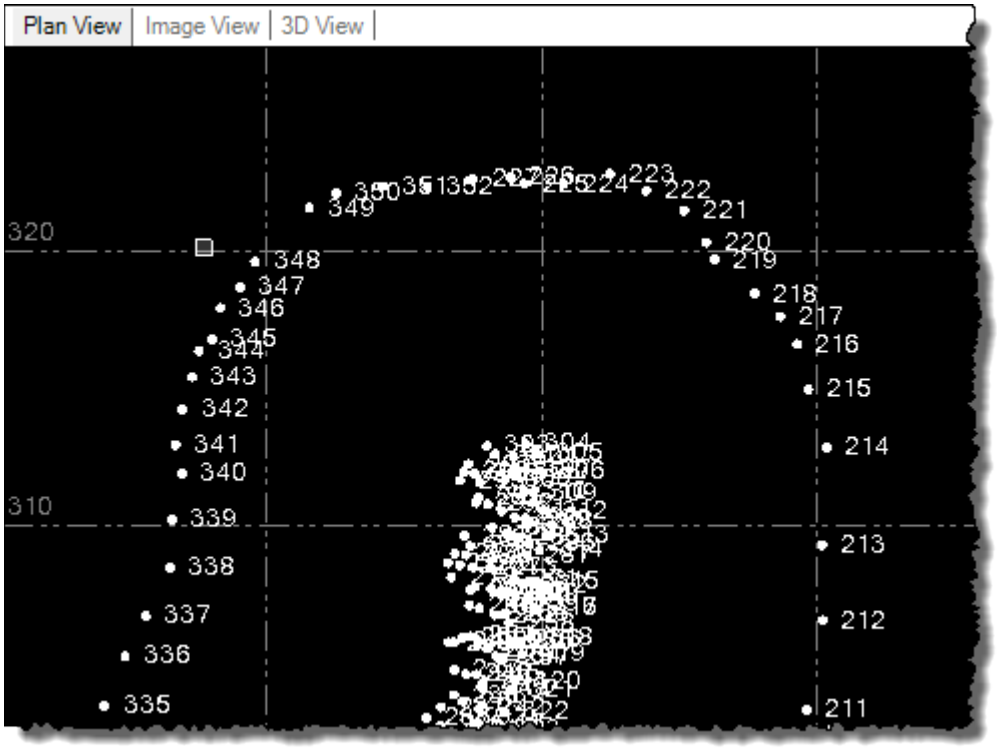
Step 5. Create a boundary for a surface

The scanned points around the perimeter of the materials pile are coded with appropriate feature codes to create four separate feature linestrings. In this step, you will first process the feature codes to create the linestrings. Then you will join the four linestrings into a single linestring to create a boundary for the material pile. Later in the tutorial, you will create a surface based on this boundary, and calculate the volume of the material pile.

For this project, the feature definitions required to process the feature codes were imported automatically when you imported *argpile144.jxl.* If they had not been, you would need to import a Feature Definition (.fxl) file prior to processing.

Note: For more information on working with feature codes, see the tutorial *Processing Feature Codes*.

1. To make it easier to see the feature linestring you are going to create, in the **View Filter Manager**, deselect the **Scan Point** option in the **Raw Data** list. Then select the **Plan View** tab.



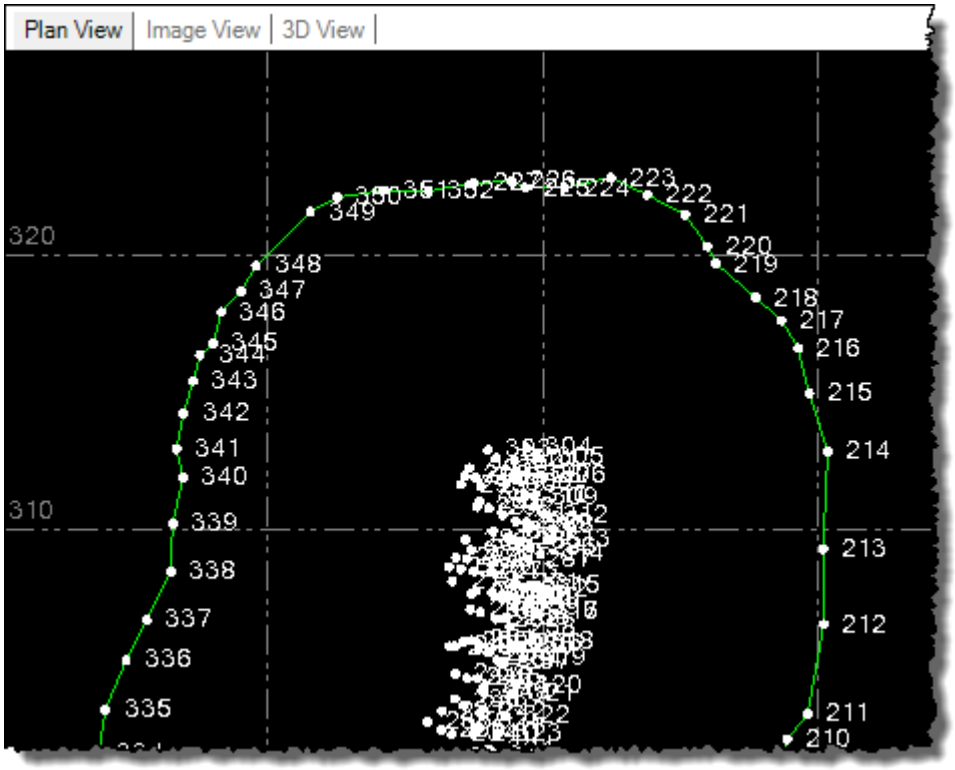
2. Process the feature codes as follows:

   a. Select **Survey > Process Feature Codes**. Or, click the **Process Feature Codes** icon on the toolbar.

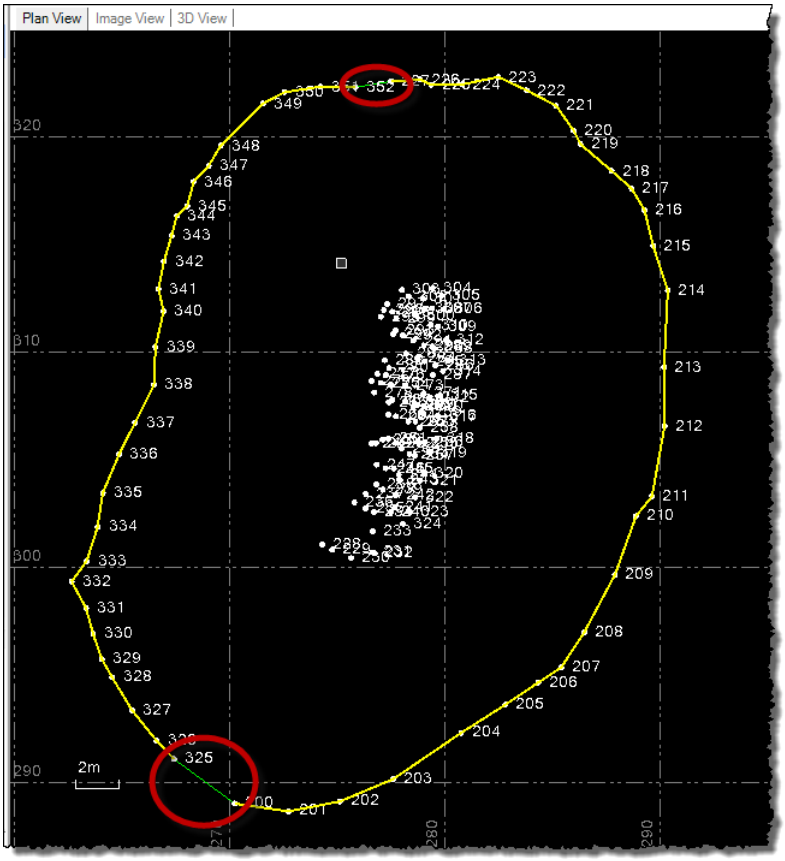
   b. In the **Process Feature Codes** pane, select the checkbox for *argpile144.jxl* and click the **Process Source(s)** button.

   After processing is complete, the **Feature Codes Processing** dialog displays asking if you want to view the *Feature Code Processing Report.* Click **No**.

A single line appears to connect all of the points around the perimeter of the material pile in the **Plan View**.



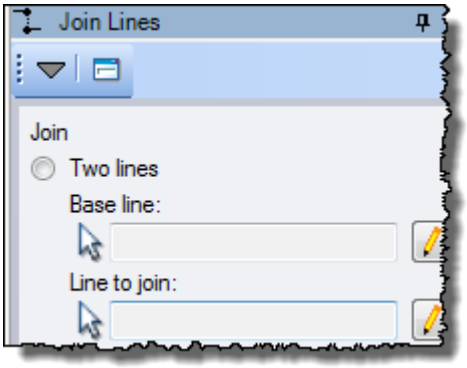
Actually, based on the feature codes assigned to the surveyed points, four feature linestrings were created: a longer linestring on each side of the pile in the **Plan View**, and a shorter linestring at the top and the bottom. In the following image, the two longer linestrings are selected (yellow). the two shorter linestrings are not selected (green) and are circled in red.



3. To combine the four separate linestrings into a single linestring for the surface boundary, do the following:

   a. Select **Lines > Join Lines** in the menu bar.

      The **Join Lines** pane displays.



   b. Select the **All selected lines** option.

c. Click in the **Lines to join** field.

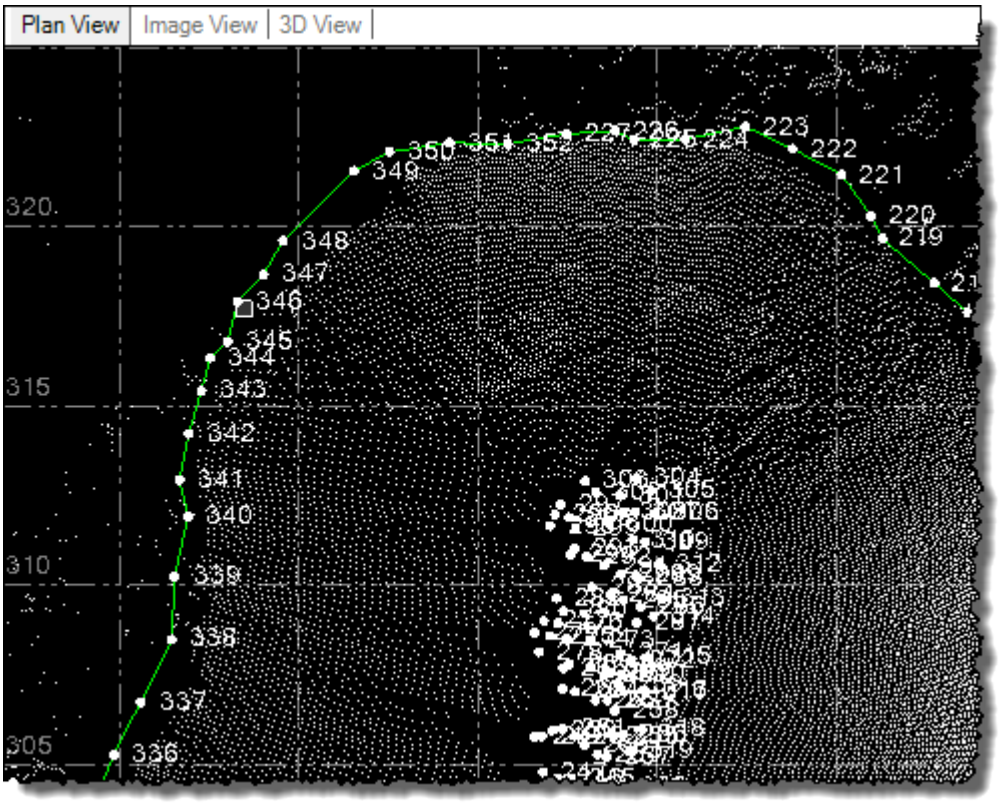
d. While holding the **Shift** key, click each of the four linestrings in the **Plan View**.

Each linestring turns yellow (highlighted) as you select it.

e. In the **Join Lines** pane, click the **Join** button.

The four separate linestrings are merged into a single linestring.

4. In the **View Filter Manager** pane, select the **Scan Point** option in the **Raw Data** list.

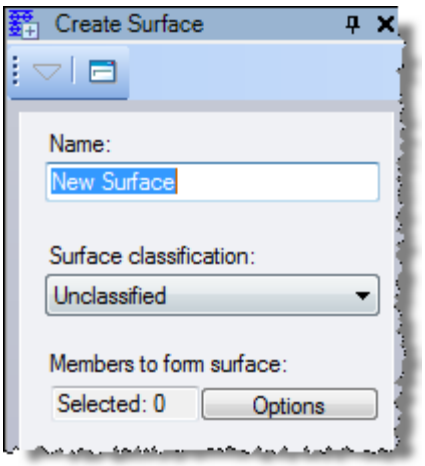


You are now ready to create a surface based on the new linestring boundary.

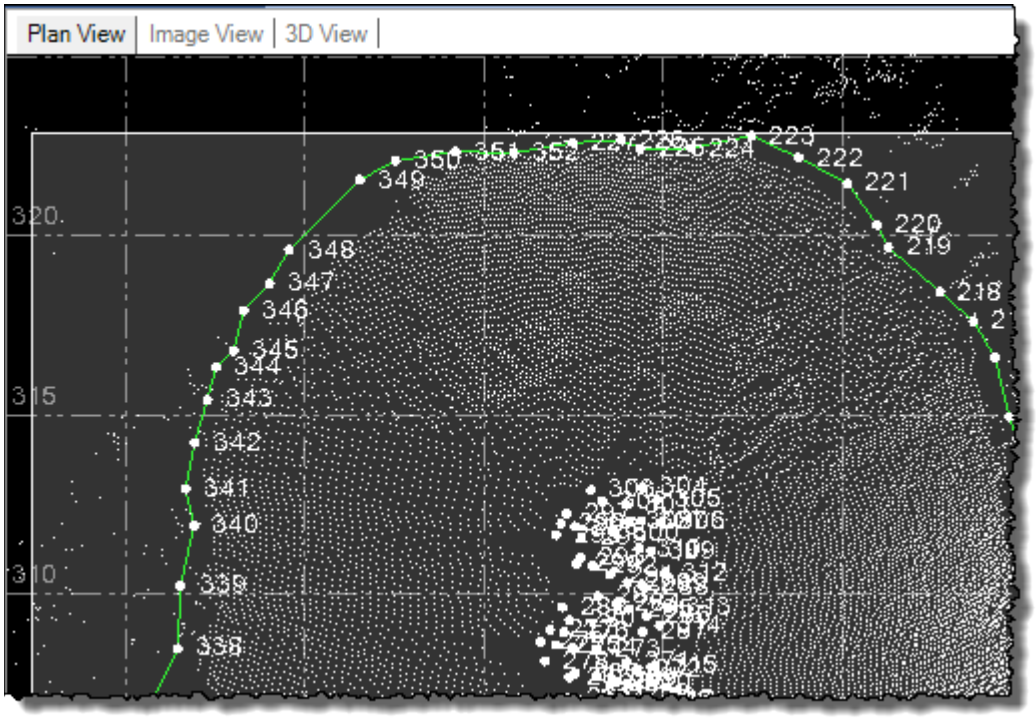
Step 6. Create a surface

1. Select **Surface > Create Surface**.

The **Create Surface** pane displays.

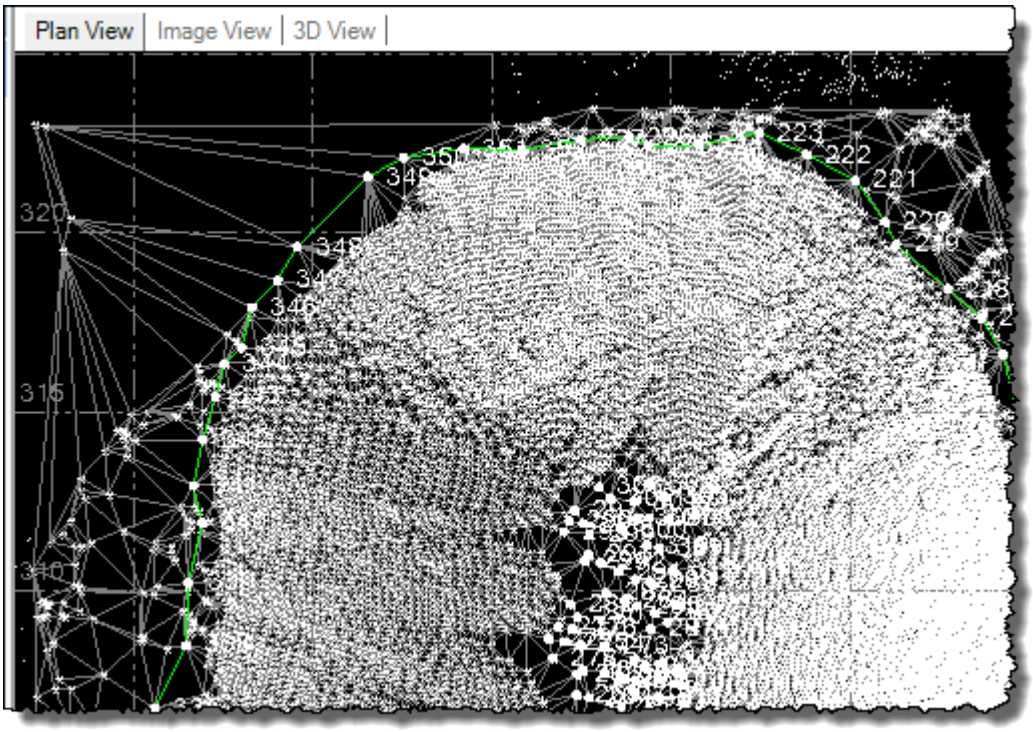


2. In the **Name** field, enter *MaterialPile*.
3. In the **Surface classification** drop-down list, select *Stockpile.*
4. Click in the **Members to form surface** field. Then, in **Plan View**, draw a box around the newly created green *Boundary* line.



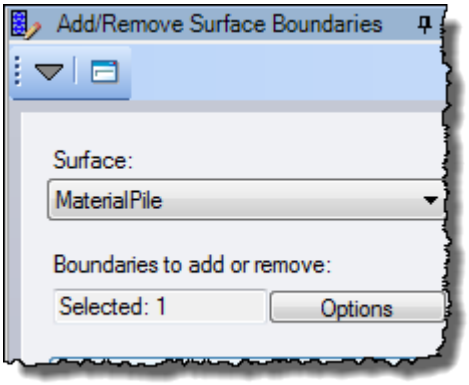
5. Click **OK**.

The new *MaterialPile* surface is displayed in the **Plan View**.

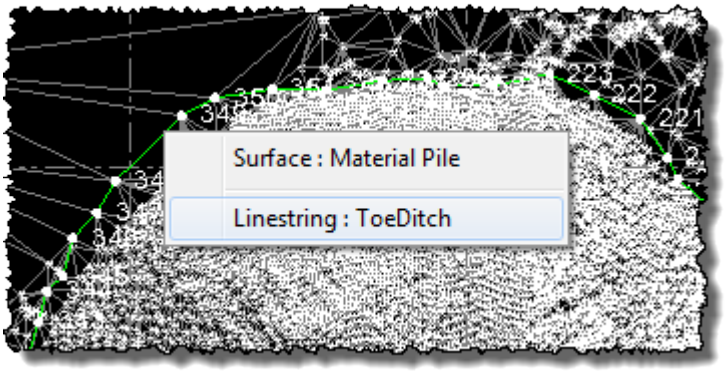


6. Select **Surface > Add/Remove Surface Boundaries**.

   The **Add/Remove Surface Boundaries** pane displays.

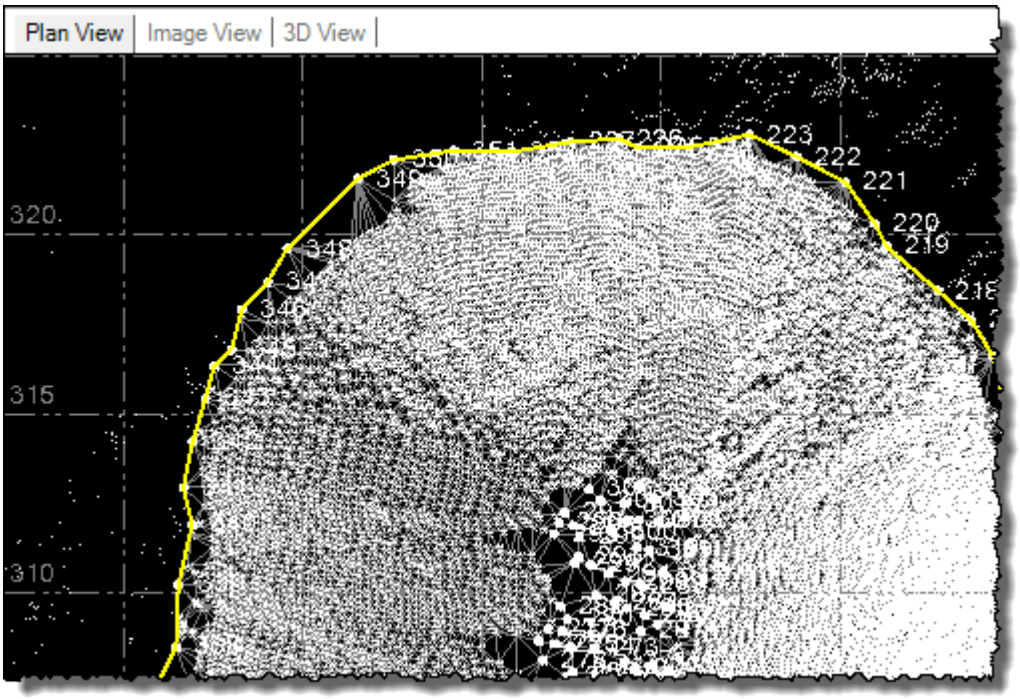


7. Click in the **Boundaries to add or remove** field. Then, in the **Plan View**, select the line created around the stockpile (*Linestring: ToeDitch*).



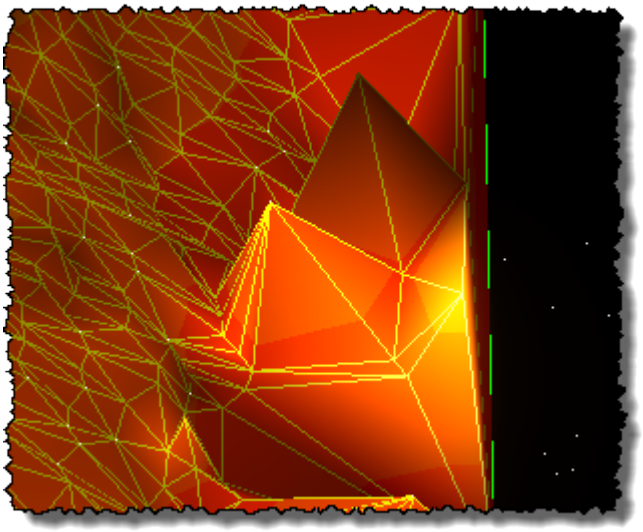
8. In the **Add/Remove Surface Boundaries** pane, click the **Add** button.

   The surface is trimmed to the boundary.

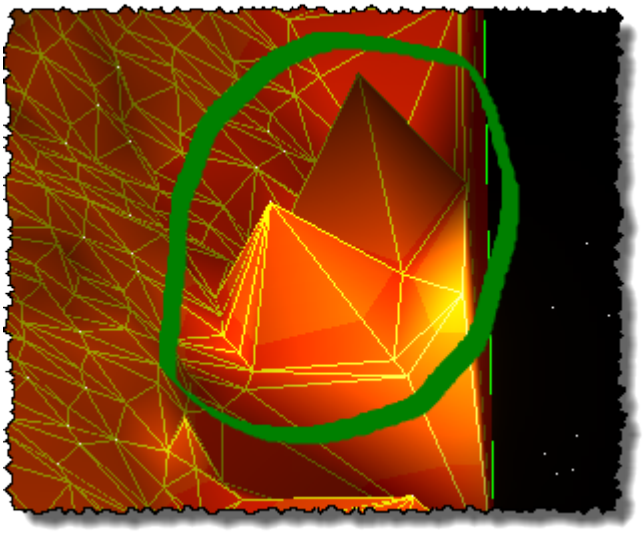


9. In the **Add/Remove Surface Boundaries** pane, click the **Close** button.
10. Select the **3D View tab** and view the edge of the material pile as shown in the following figure.
    - Use the mouse wheel to zoom in.
    - Press the **Ctrl** key and use the mouse wheel to rotate the view on the X axis.
    - Press the **Shift** key and use the mouse wheel to rotate the view on the Z axis. (Optionally, press the **Alt** key and click a location in the view to select a new rotation point.)
    - Select **View > 3D View Settings** to display a pane that allows you to perform these same actions using interface controls.

Note: Your view does not have to match this one, as long as you can see the irregular points along the surface boundary as shown here.



You can see variations in the surface around the perimeter of the surface (circled in green below). Most of these are the result of scan points being created based on measurements for weeds growing at the base of the pile.

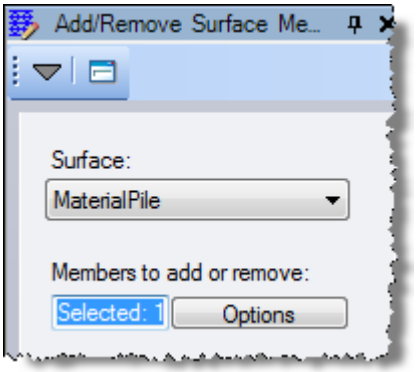


To ensure that your volume calculation is correct, you will need to remove these points since they do not represent the surface of the pile itself.

Step 7. Remove unwanted scan points from the surface

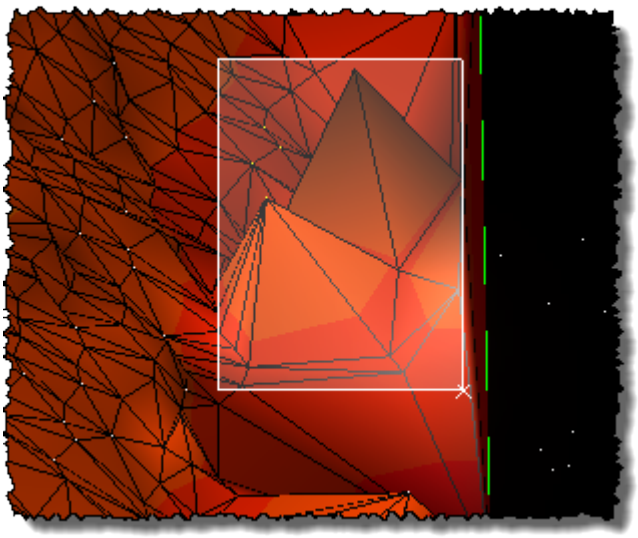
1. Click the *MaterialPile* surface on the **3D View** to select it. Then right-click and select **Add/Remove Surface Members**.

The **Add/Remove Surface Members** pane displays.



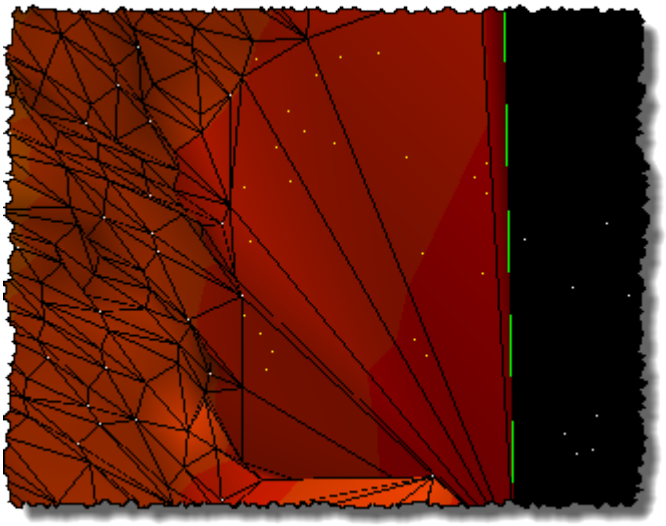
2. In the **3D View**, draw a box around some of the points you want to remove from the surface.

   The number of selected points is displayed in the **Members to add or remove** field.



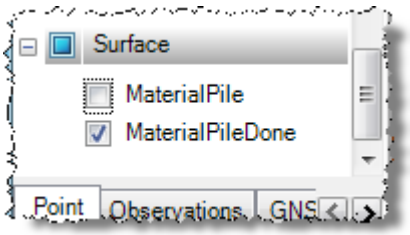
3. Click the **Remove** button to remove the selected points.

The change is reflected in the **3D View**.

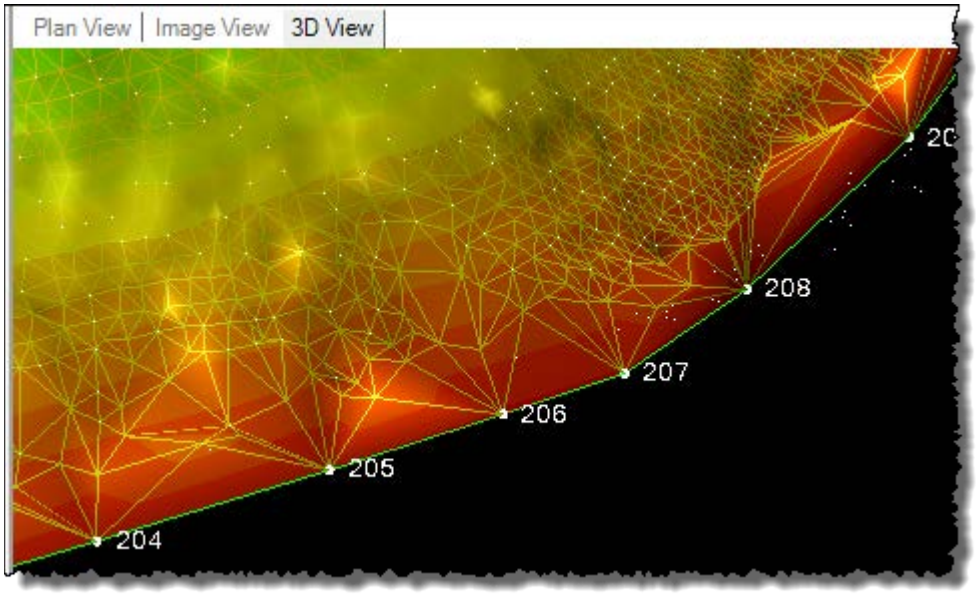


Typically you would repeat this procedure until you had removed all of the unwanted points. But for this tutorial, you are going to switch to a surface that was included in the project for which all unwanted points have already been reviewed.

4. In the **Add/Remove Surface Members** pane, click **Close**.
5. In the **View Filter Manager,** deselect *MaterialPile* in the **Surface** section of the list, and select *MaterialPileDone*.



The *MaterialPileDone* surface displays in the **3D View**. Note that the surface no longer includes the unwanted points.

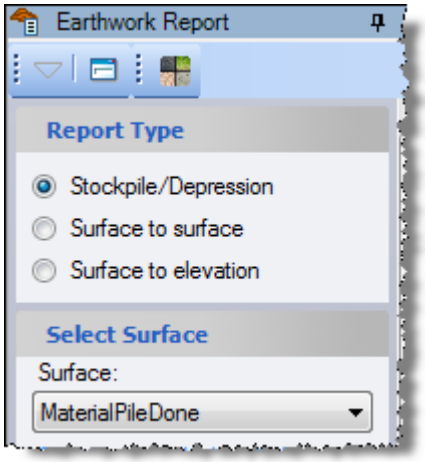


You are now ready to calculate the volume of the material pile.

Step 8. Calculate the volume of the material pile

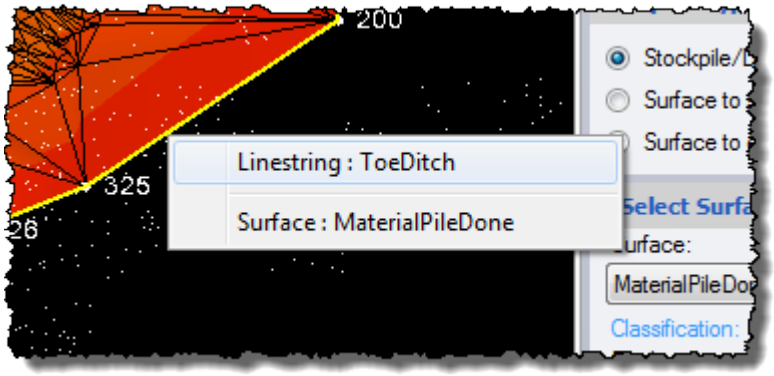
1. Select **Reports > Earthwork Report**.

   The **Earthwork Report** pane displays.



2. Select the **Stockpile/Depression** option.
3. In the **Surface** drop-down list, select *MaterialPileDone*.
4. Click in the **Boundary** box, then select the *Linestring: ToeDitch* in the **3D View**.

If necessary, zoom in to better see the linestring.



5. In the **Volume Breakdown** section of the **Earthwork Report** pane, select the **Volume totals only** option.
6. Click **OK**.

   The *Earthwork Report* opens in a browser window showing the volume calculation in the "Stockpile Volume Analysis" section.

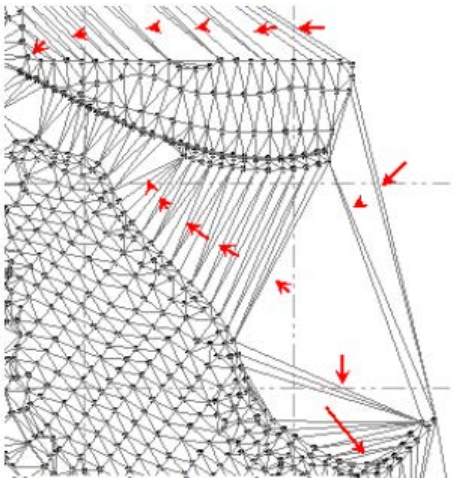
   You are done calculating the volume of the materials pile.
7. In the **Trimble Business Center** window, select **File > Close Project**.

   The **Save Changes** dialog displays. If you saved the project to a new location or with a new name, you can click **Yes**. Otherwise, click **No**.

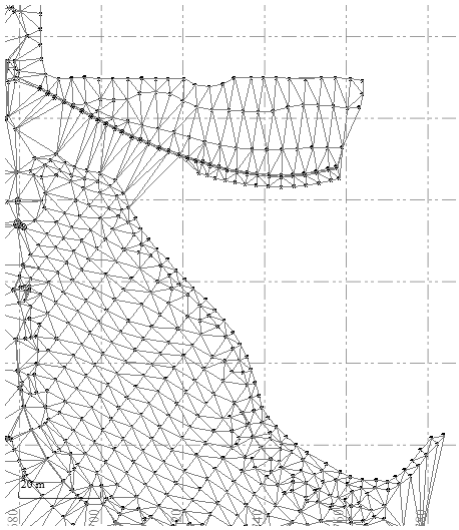
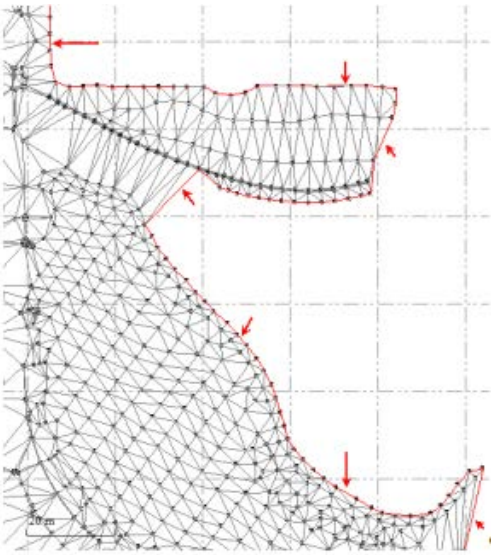
The next section explains how to use the **Create Surface Edge Breakline** command. Because the *Working with Scanned Data.vce* project file used for this tutorial does not include appropriate data to demonstrate this command, the section is explanatory only and does not include hands-on procedural instructions.

Note on using the Create Surface Edge Breakline command

The **Create Surface** command sometimes adds triangle on the boundary where they are not needed, as shown here:



Using the **Trim Surface Edge** command, you can remove these triangles.



However, subsequent editing of the surface can cause the triangles to be recalculated. To prevent the triangles from being recalculated, after trimming a surface you can use the **Create Surface Edge Breakline** command to draw a breakline around the existing surface parameter.