# Workflow ORD - Modifying Terrain Model Ruled Boundaries When Adding Additional Survey Data

A completed survey dgn file houses a terrain model with a ruled boundary. In some cases, additional survey data needs to be added to the already completed survey dgn file. If the additional survey data is outside the area of the current terrain model, then we will need to modify the current ruled boundary to cover the newly surveyed area. This document guides users through the process of modifying the ruled boundaries of an existing terrain model to incorporate additional survey data.

Note: Throughout this workflow 23603ALLsurvey-topo.dgn file is used as the example. Replace all file names used in this document with the appropriate file names for your project.

Survey Data Review

1. In the following steps we will review what is in the current survey dgn file. Open the 23603ALLsurvey-topo.dgn file.

2. Zoom in to the area shown below. Notice that there is a ruled boundary by selecting the ruled boundary of the terrain model.
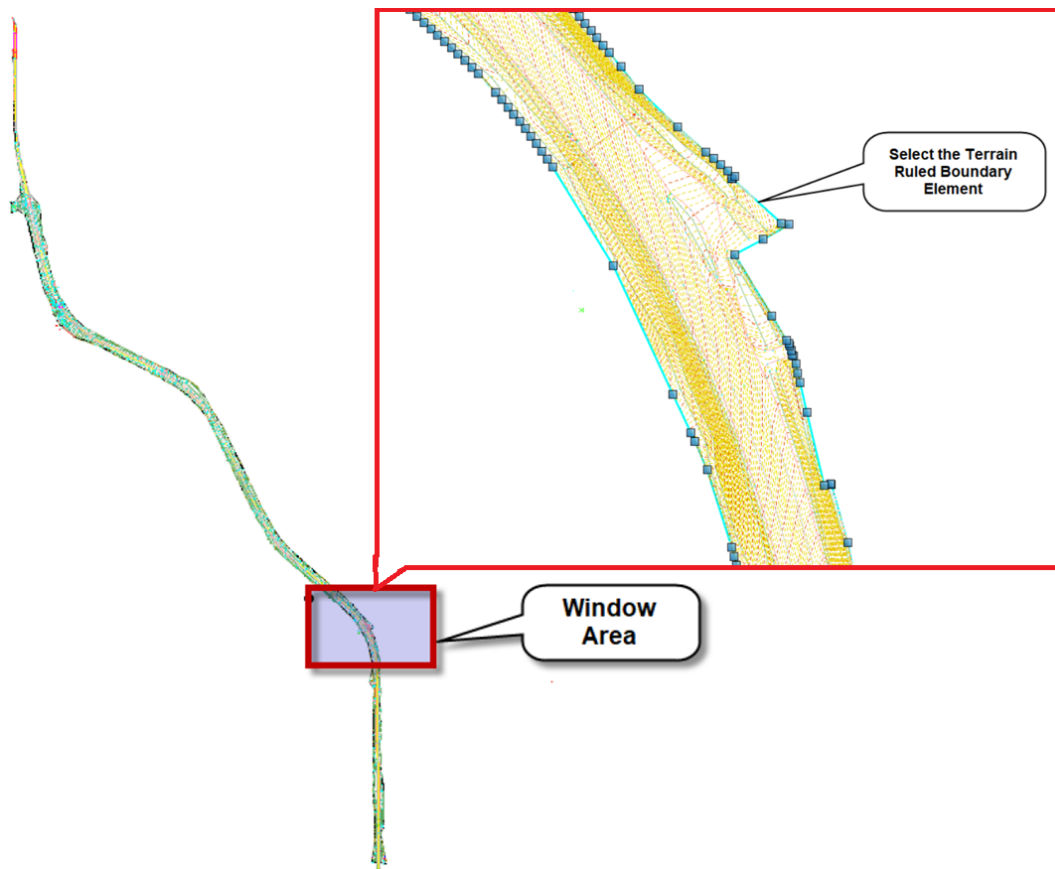
3. Notice that this survey file has a Ruled Boundary that has already been edited. Editing Ruled Boundaries can take time on larger surveys. In this case we have some additional survey data that needs to be added in the areas shown below. We do not want to delete the Ruled Boundary that exists as it could take some time to create a new one and go through the editing process all over again.
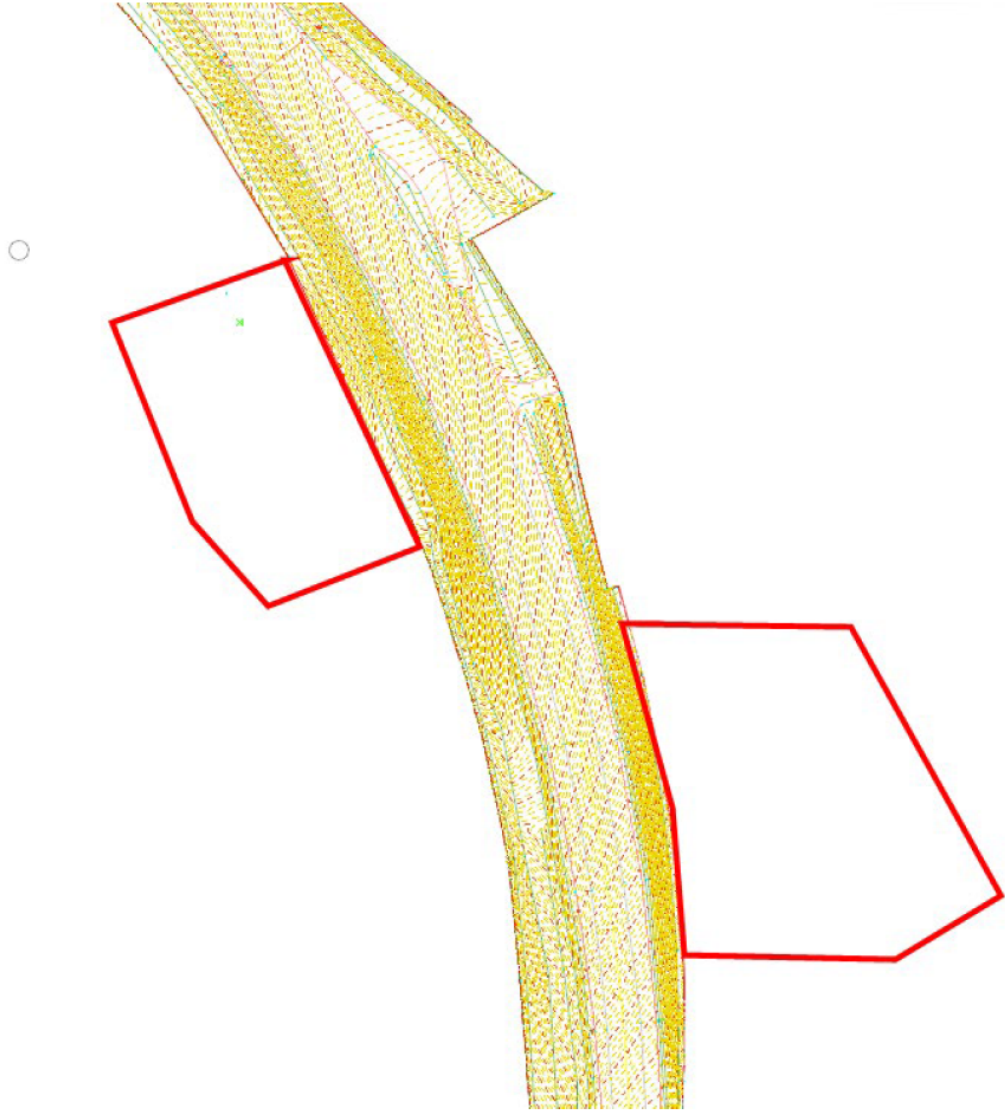
Processinging The Additional Survey Data

The steps below show how to add additional survey data to the fieldbook within the 23603ALLsurvey-topo.dgn file.

1. Open the **23603ALLsurvey-topo.dgn** file, if not already open.
2. Navigate to the **Explorer > Survey Tab** > **23603SURV_TopoALL fieldbook**.
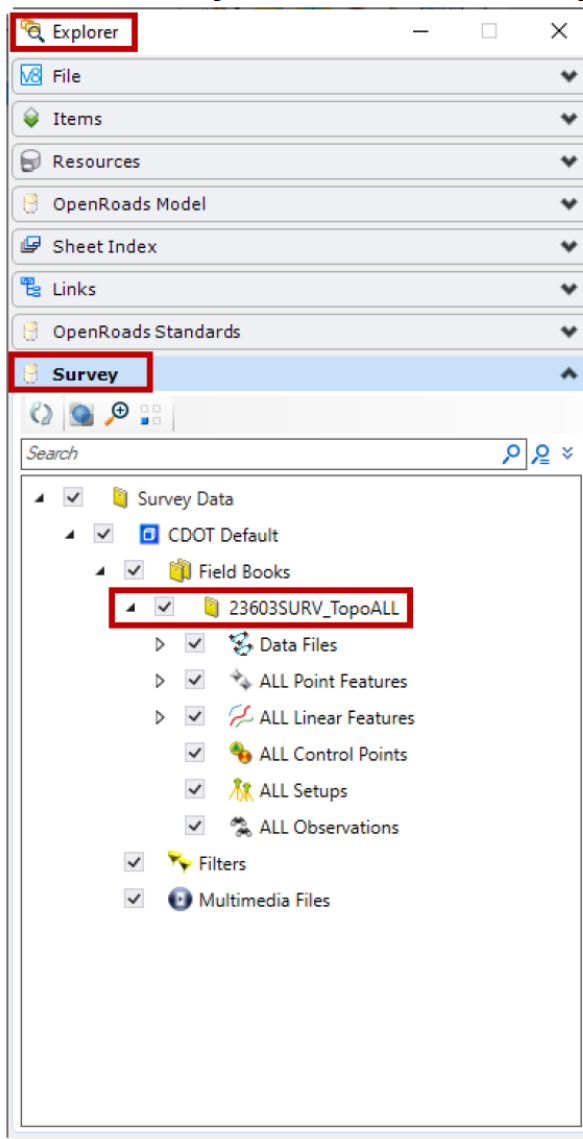
NOTE: In this example we will be importing Bentley survey format files or SQlite files. Other file formats can be used.

3. **Right-click** on the ***23603SURV_TopoALL*** fieldbook and select **Import > Bentley Survey Format**.

4. Navigate to the location of your additional survey data files. Select the ***23423_SUPPSURV_ALL.sqlite*** file.
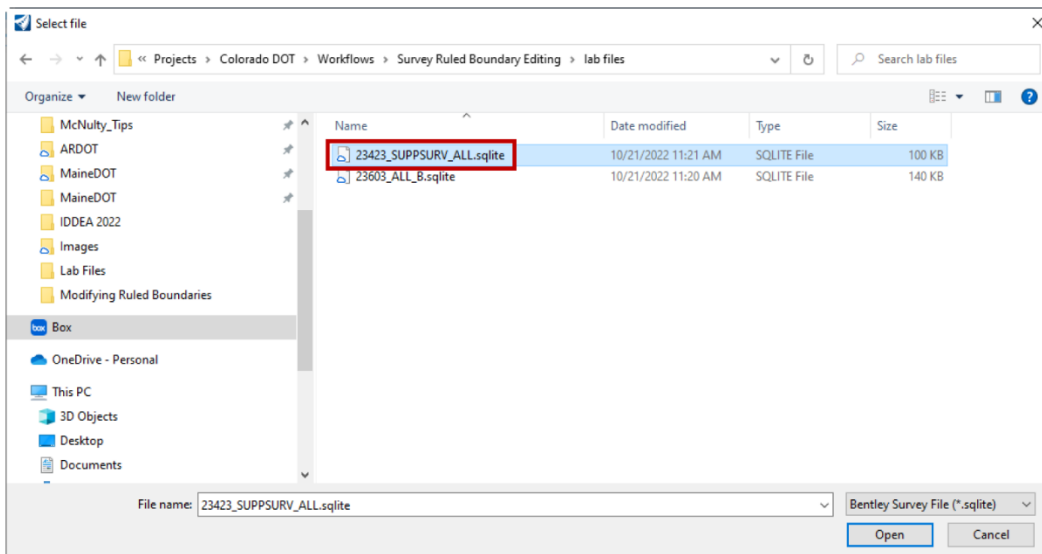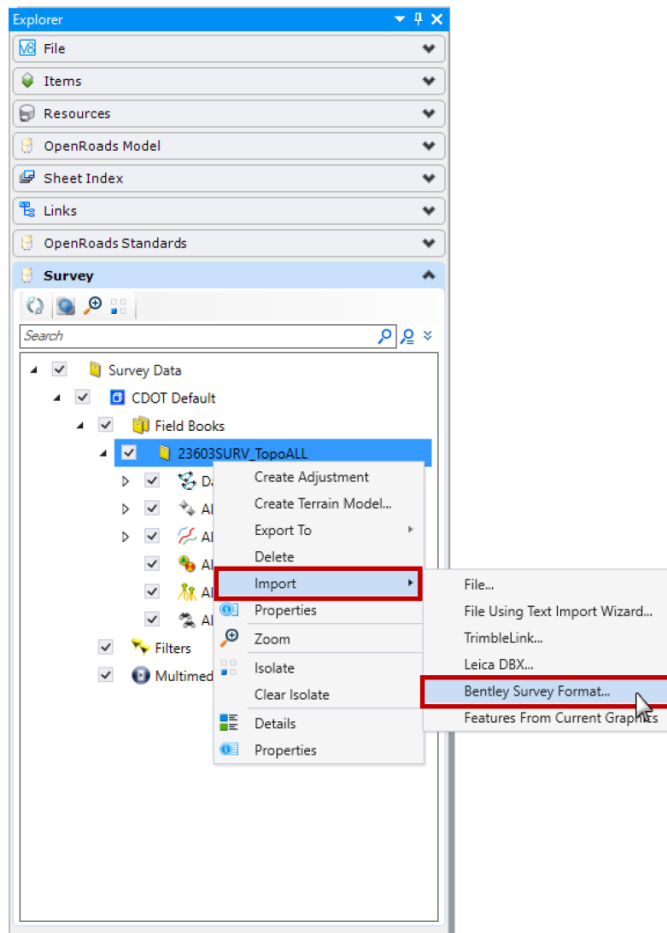
5. In the Bentley Survey File Dialog, **Select Import**.
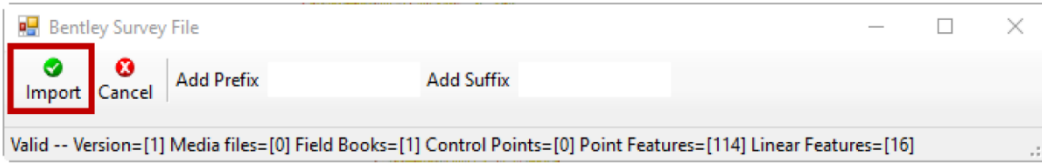
6. If there are duplicate line and/or point names in the survey file, you will receive the message in the image below. If there are no duplicate lines and points this step can be skipped. In this example, there are lines and points with duplicate names. In normal cases we would want to address these duplicate items, but because this workflow is for training purposes, we will go ahead and toggle on **Next Name** and add a **Suffix** of **A** in front of duplicate items then **Left-Click Apply All**.
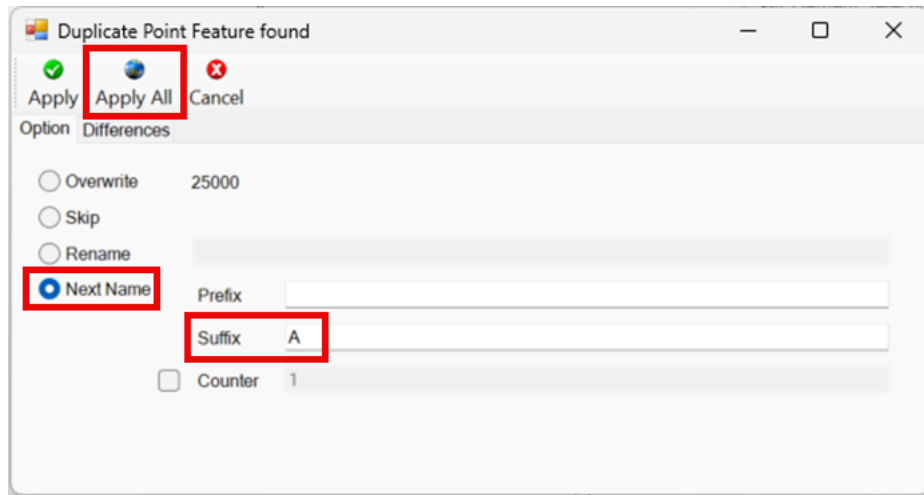

7. Complete the same process on steps 3-6. This time import *23603_ALL_B.sqlite*.

   Note: When sqlite files are imported, the data files that make up the sqlite file are added to the main survey file. Notice under Explorer > Survey > 23603SURV_TopoALL > Data Files that the file named 23423_SUPPSURV_ALL.dgn has 3 data files called 23423_SUPSURV_A02.txt, 23423_ADDTOPO_A04.txt and 23423_SUPSERV_A06.txt. These 3 data files can now be found in the 23603SURV_TopoALL fieldbook in the 23603ALLsurvey-topo.dgn file.

Creating Terrain Models and Ruled Boundaries For New Data

In the following steps additional Terrain Models are created from the additional survey data. Once the additional Terrain Models are complete, Ruled Boundaries for the additional Terrain Models are created.
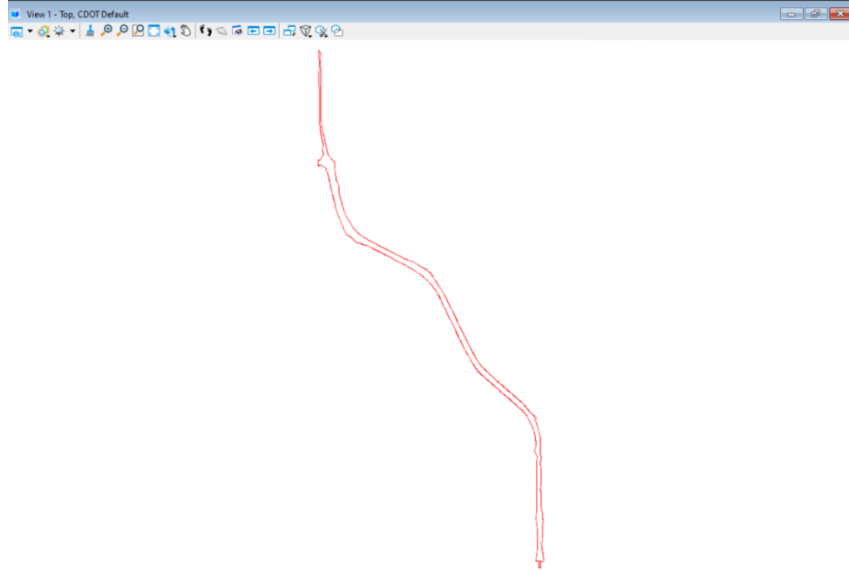
1. Continue in the DGN file used above.
2. In the Explorer, navigate to **Survey > 23603SURV_TopoALL** and turn off the entire fieldbook.
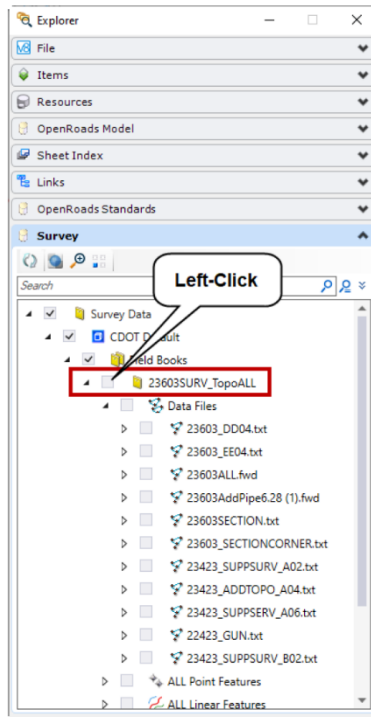
3. From the Ribbon Home tab, select Level Display. Turn off the TER_ levels.
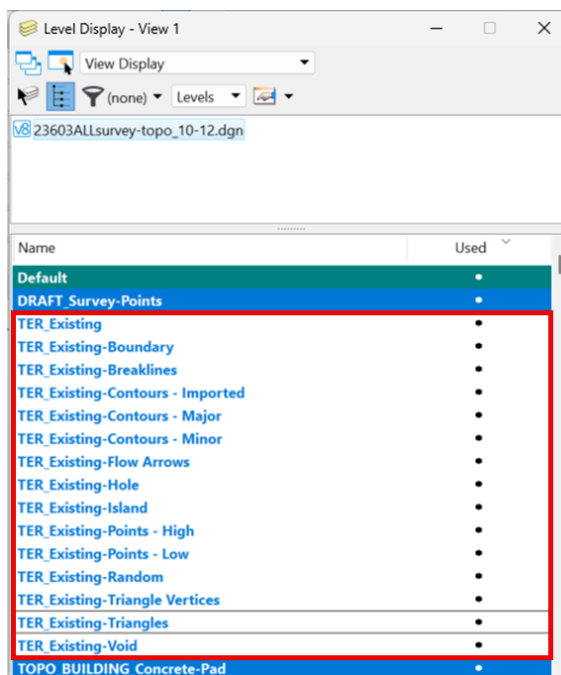
4. The only element that should be shown in the view window is the Existing Ruled Boundary.

Note: Next, turn on the data files from the newly imported survey. When an sqlite file is imported, the data files that make up the sqlite file will appear in the fieldbook underneath *Data Files*.

5. In the Explorer, navigate to **Survey > 23603SURV_TopoALL > Data Files**. Turn on the newly added data files by left-clicking in the checkbox to the left of the data files. The illustration below shows the files added for this example.
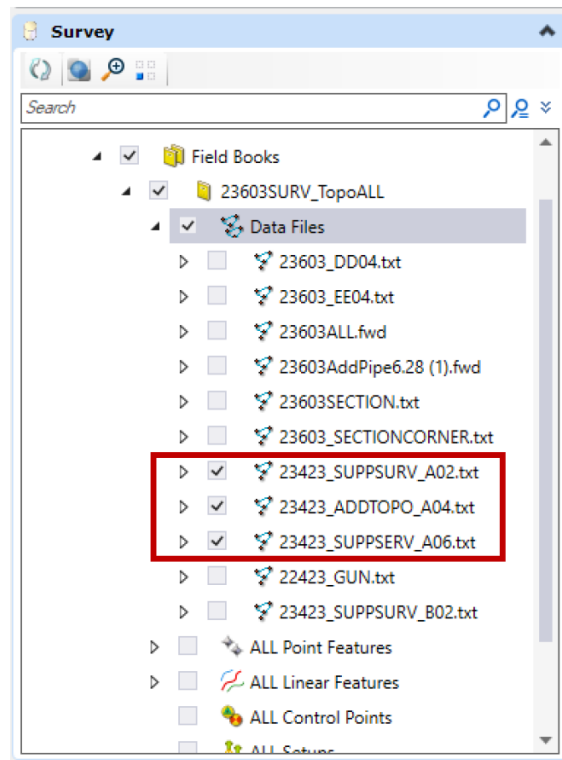
6. Create a selection set of the data files that have been turned on in the previous step using the **Element Selection Tool.**


7. With the data still in the selection set navigate to the **Survey Tab** of the Explorer. Hold the *Ctrl* key on the keyboard and don't let go. **Right-Click** on *Field Books* and select *Create terrain model from fieldbook selection set*. Let go of the *Ctrl* key once the terrain model has been created.
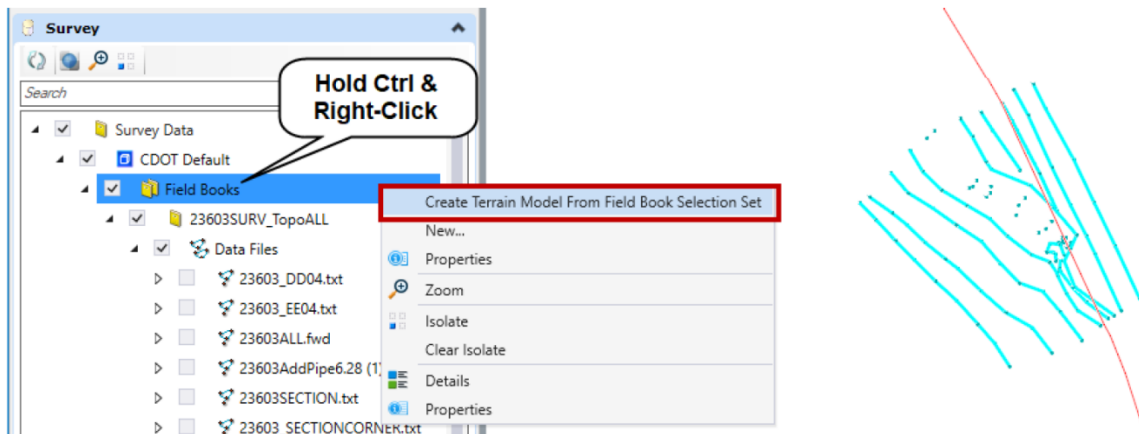

8. Repeat steps 2-6 for additional data files in other areas of the project. This will include turning off all data files and turning on the desired data files.

Next, create ruled boundaries for the newly created terrain models.

9. On the Ribbon Home tab, select the desired level and symbology. In this example, the level is set to TER_Existing-Boundary and the color is set to 3 (red). This will help the boundary element stand out from the survey data. This level and symbology is used for the ruled boundaries.
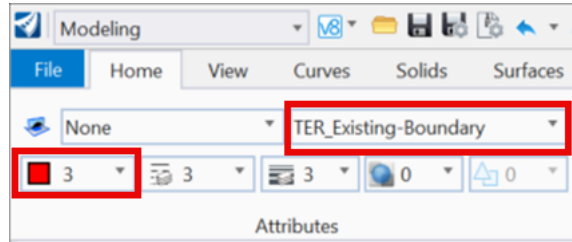
10. Navigate to the **Terrain Tab > Edit Group** and select the *Add Boundary* tool. Set the tool settings to **Add Ruled Boundary.**
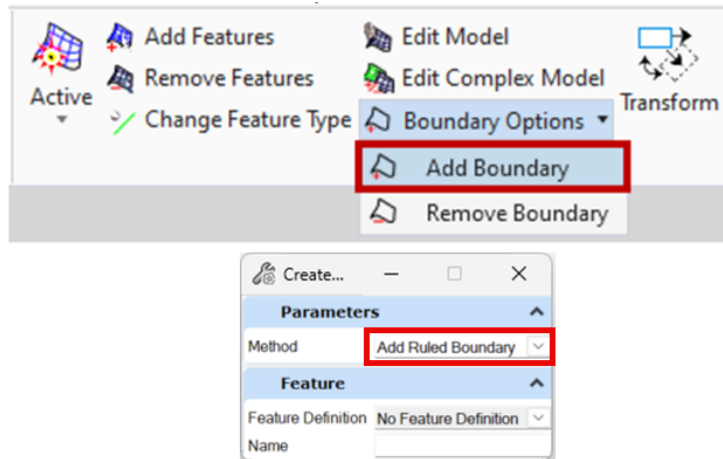

11. Select the desired terrain model and then **left-click** through the heads-up prompt to accept Add Ruled Boundary at the heads-up prompt.

12. Repeat step 10 and 11 for the other terrain model(s).

13. Once complete make any necessary adjustments to the Terrain Models by editing the newly created Ruled Boundaries using the MicroStation modify tools such as *Insert Vertex* and *Delete Vertex*.

Creating the Boundary Element For The Final Terrain Model

The following steps describe the method for combining the ruled boundaries into a complex shape which will be used as a boundary element to the terrain model.

1. In the Explorer, Navigate to **Survey > 23603SURV_TopoALL** and turn off the entire field book.
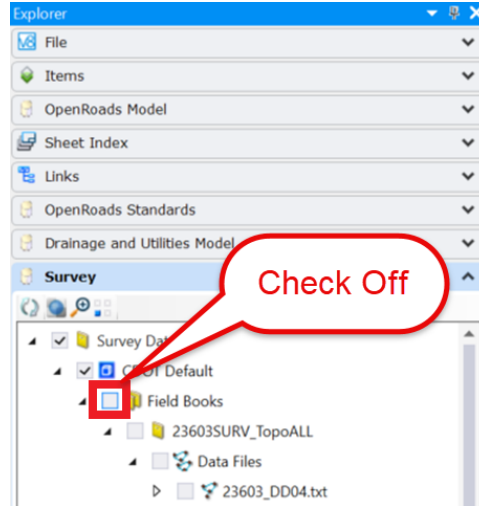

2. In the Explorer, Navigate to **Open Roads Model > Terrain Models** and delete all of the terrain models. A single terrain using all of the survey data will be created later.
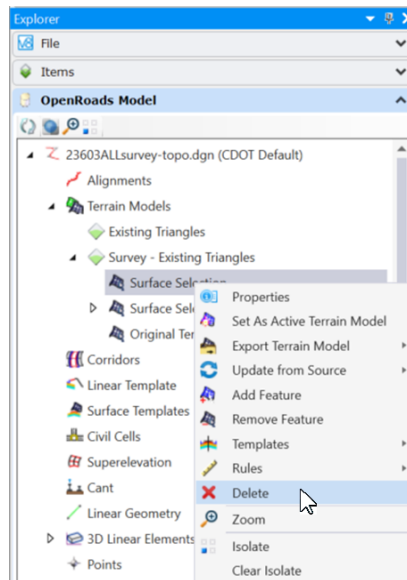
3. From the ribbon navigate to the **Drawing** tab > **Modify** group and use the available tools and the **Element Selection** tool to modify the terrain boundaries. Do this for each boundary element.
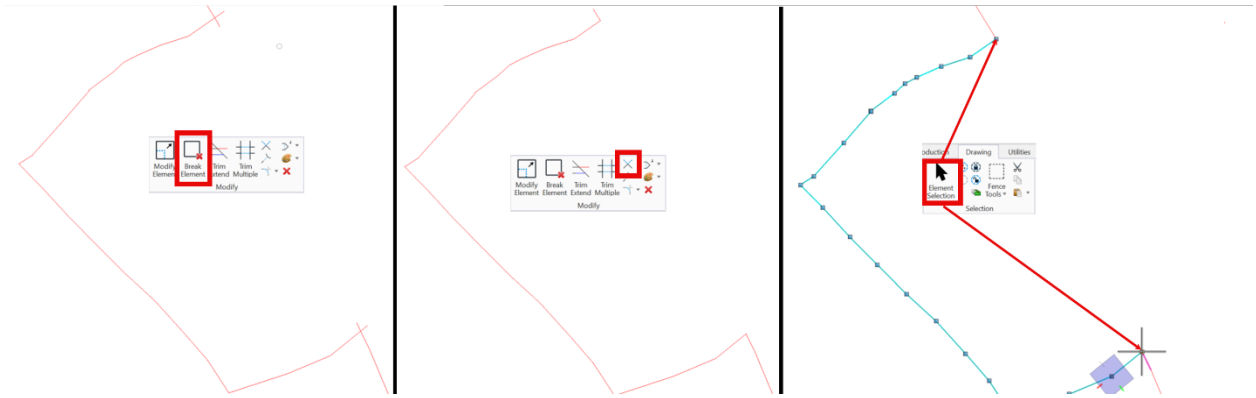

In the example above, the boundary elements were broken first, using Break Element. Next, Trim to Intersection was used to match the ends together. Finally, the Element Selection tool was used to remove any vertical difference in the end points of the elements. The vertical differences must be adjusted so that all ruled boundaries can be used to create the complex shape used as the final, single ruled boundary.
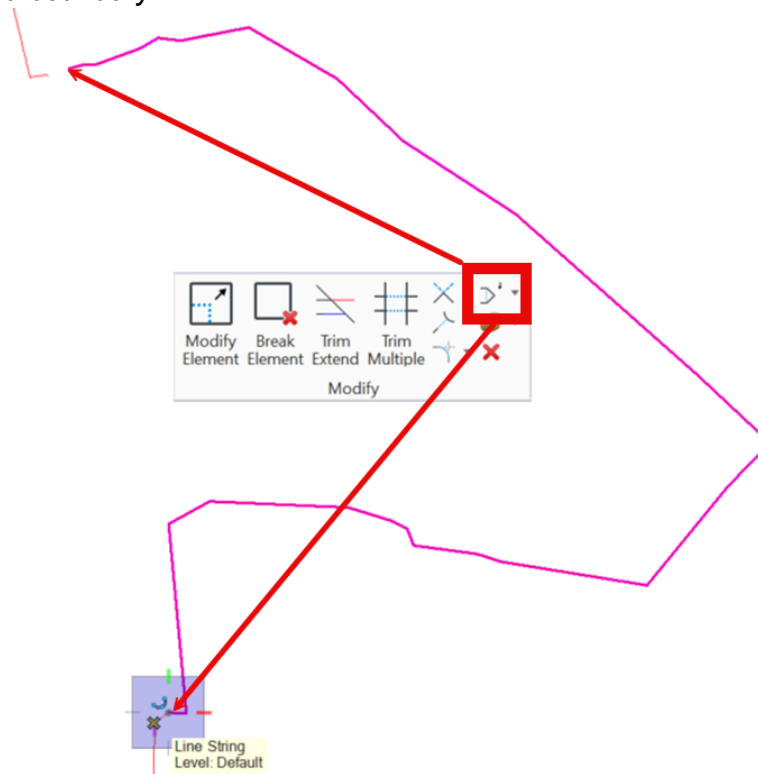

In the example above, the terrain models do not overlap. The boundary elements were broken first, using Break Element, as in the previous example. Next, the Insert Vertex command is used. By tentative snapping then left clicking to the end of each boundary element, they are connected without losing any of the original data from either element. This also eliminates any elevation differences.

Note: Rotating the view is a good way to verify that no elevation issues are included in the boundary.
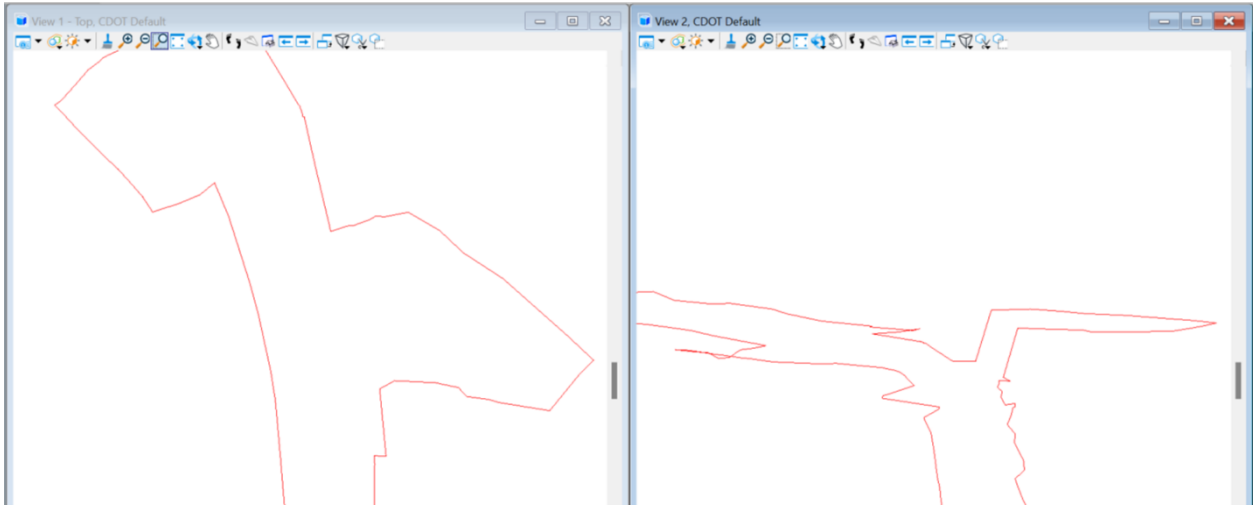
In this example, View 1 (left) shows the top view of the boundary. It appears correct. In the rotated View 2 (right), the elevation error is obvious.
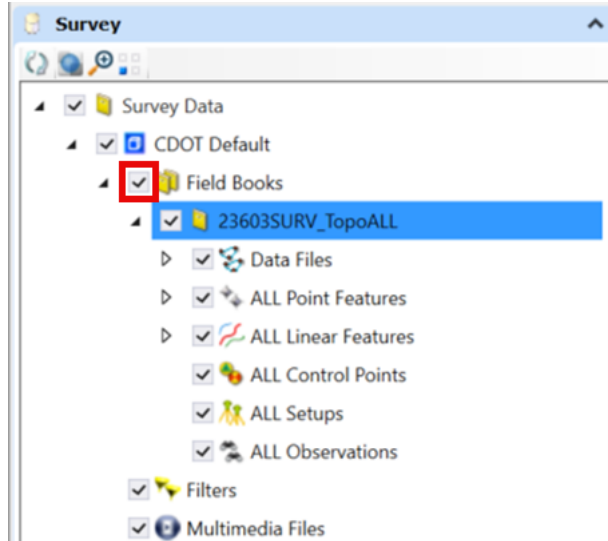
4. From the ribbon navigate to the **Drawing** tab > **Groups** group and use **Create Complex Shape** tool to combine the modified boundaries into a single element.
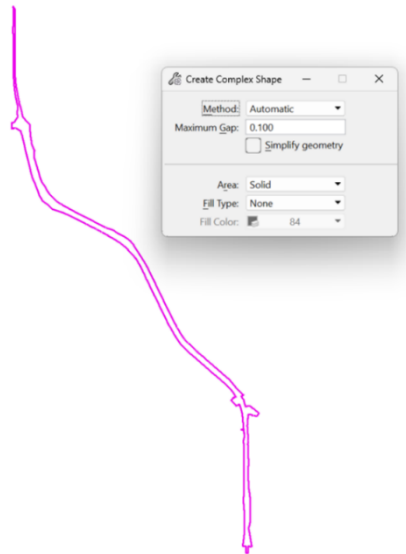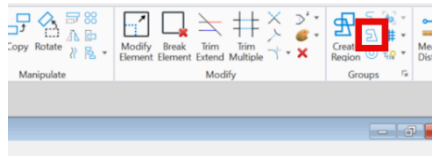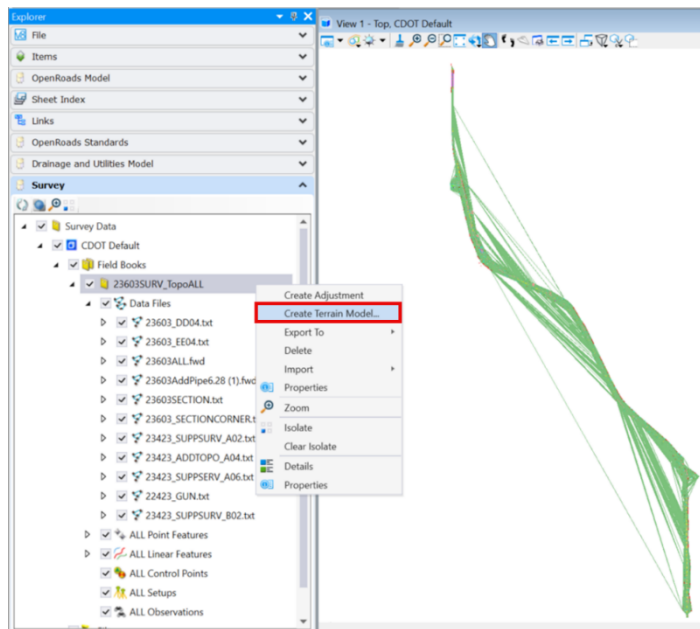
Creating Terrain Model and Applying Ruled Boundary

In the following steps, a new terrain model is created from the field book. Next, the complex element created above is added as the boundary to the field book terrain model.

1. In the Explorer, **Survey** tab, turn on the field book.

2. **Right-Click** on the **23603SURV_TopoALL** field book and select **Create Terrain Model**.

4. From the Ribbon, Navigate to the **Terrain** Tab > **Edit** Group and select the **Add Features** tool.

5. Select any feature of the **23603SURV_TopoALL** terrain model. In this example one of the triangles is selected. Note: The Terrain Model can also be selected in the Tool Settings dialog box.

6. The heads-up prompt asks *Locate Element To Add*. Select the complex shape from previous steps and then **right-click** to accept.
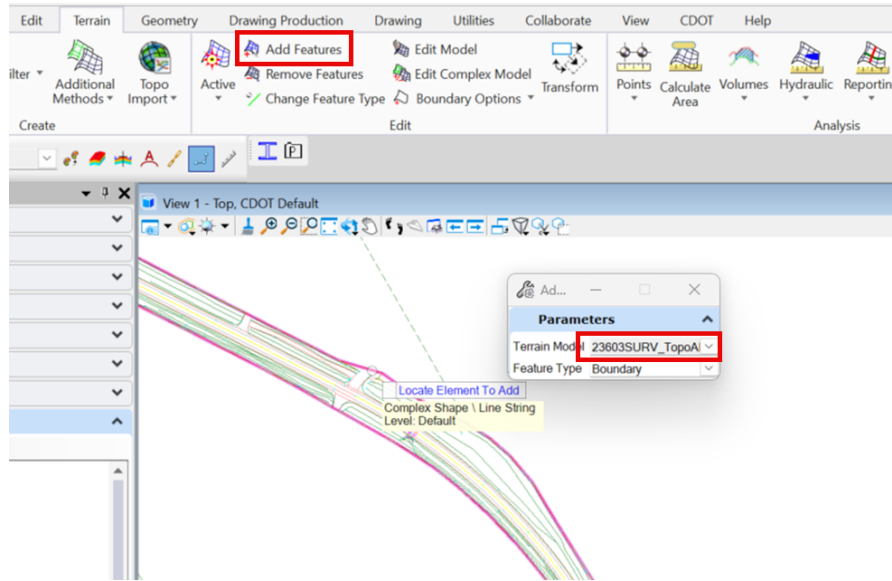
7. The next heads-up prompt asks to set the *Feature Type*. Press the down arrow on the keyboard and set the *Feature Type* to **Boundary** then **Left-Click.** Note: The Feature Type can also be selected in the Tool Settings dialog box.
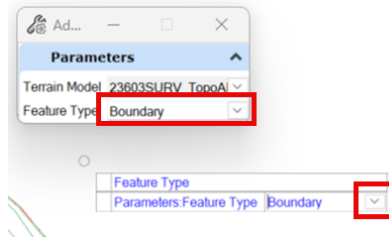
The terrain model is now constrained within the new boundary.