

# Chapter 8

## Mapping Survey Data

### Table of Contents

<b>A. MicroStation</b> .....	<b>8-2</b>
1. Create MicroStation Design File .....	8-2
2. Open MicroStation Design File .....	8-5
<b>B. Geopak SS3</b> .....	<b>8-6</b>
1. Project Explorer .....	8-6
2. Survey Details.....	8-10
3. Project Settings.....	8-11
<b>C. Measurement files</b> .....	<b>8-12</b>
1. Create Field Book .....	8-12
2. Import Survey Data .....	8-14
3. Adjust Survey Data .....	8-16
a. Adjustment Results.....	8-18
b. Warning Messages.....	8-19
<b>D. Coordinate Files</b> .....	<b>8-19</b>
1. Create Field Book .....	8-21
2. Import Survey Data .....	8-21
3. Mapped Survey Data .....	8-25
<b>E. Reviewing Mapped Data</b> .....	<b>8-27</b>
<b>F. Mapping Errors</b> .....	<b>8-29</b>
1. Vertical Outliers.....	8-30
2. Crossing Chains.....	8-30
3. Unknown Feature Codes .....	8-39
<b>G. Correcting Mapping Errors</b> .....	<b>8-40</b>

### 8. Mapping Survey Data

This chapter explains the procedures to import, process, and plot survey data in a MicroStation CAD file using Geopak design software. By carefully inspecting the mapped survey data, collection errors may become evident. It is necessary to correct these errors prior to submitting survey data to the Photogrammetry and Surveys Section (P&S).

Beginning in the Fall of 2013, all new WYDOT projects are being mapped in MicroStation with Geopak SELECT series 3 (SS3). However, survey additions to older projects are still being mapped in its original Geopak version. In early 2016, P&S will be introducing the latest feature code revision (PS15). Chapter 4 in this manual has been updated with the new PS15 feature codes and highlights the changes from PS09.

Survey data is submitted to P&S as measurement files and coordinate files. Measurement files are the product of conventionally collected survey data with an optical total station and consist of a series of angle and distance measurements. Due to accuracy requirements, specific features are collected in this fashion such as pavement and curb & gutter. All measurement files submitted to P&S should be in a native Trimble format as downloaded from the data collector.

Coordinate files are x, y, and z text files in a defined format. These coordinate files are submitted to P&S by WYDOT field offices for GPS/RTK surveys. Because WYDOT does not specify surveying equipment or processing software, all survey data submitted by consultants shall be submitted to P&S in this generic coordinate file format. Each coordinate file shall be accompanied by a signed and sealed cover letter. Refer to Chapter 10 in this manual regarding the transfer of survey data. The survey data in coordinate files has already been processed with other software and is mapped "as is". Because the survey data is accompanied by a signed and sealed document, P&S personnel are not able to make any corrections. It is up to the submitting party to make corrections.

#### A. MicroStation

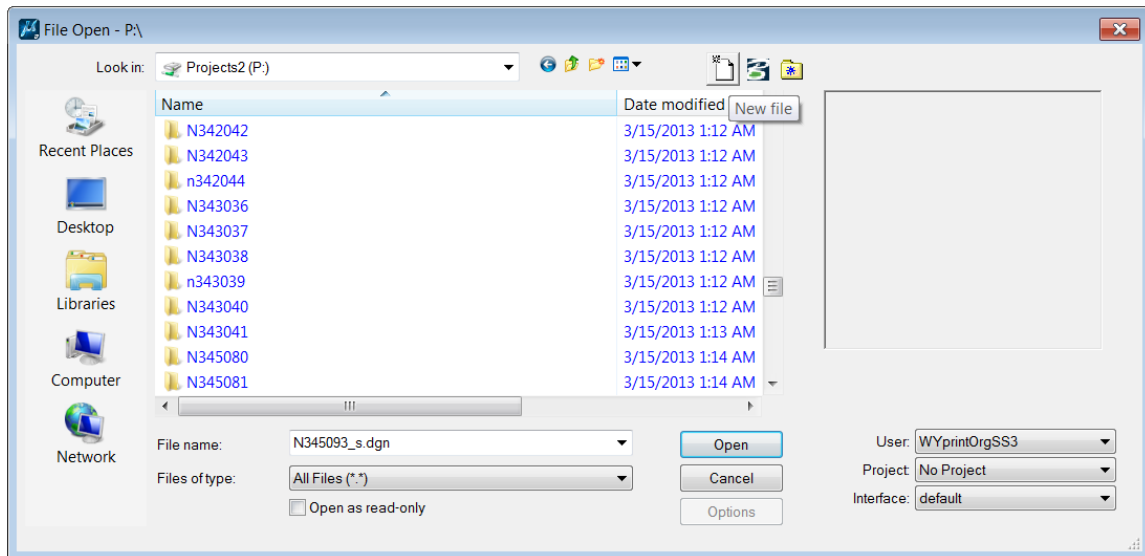
##### 1. Create MicroStation Design File

Double-click the MicroStation/Geopak SS3 desktop icon.



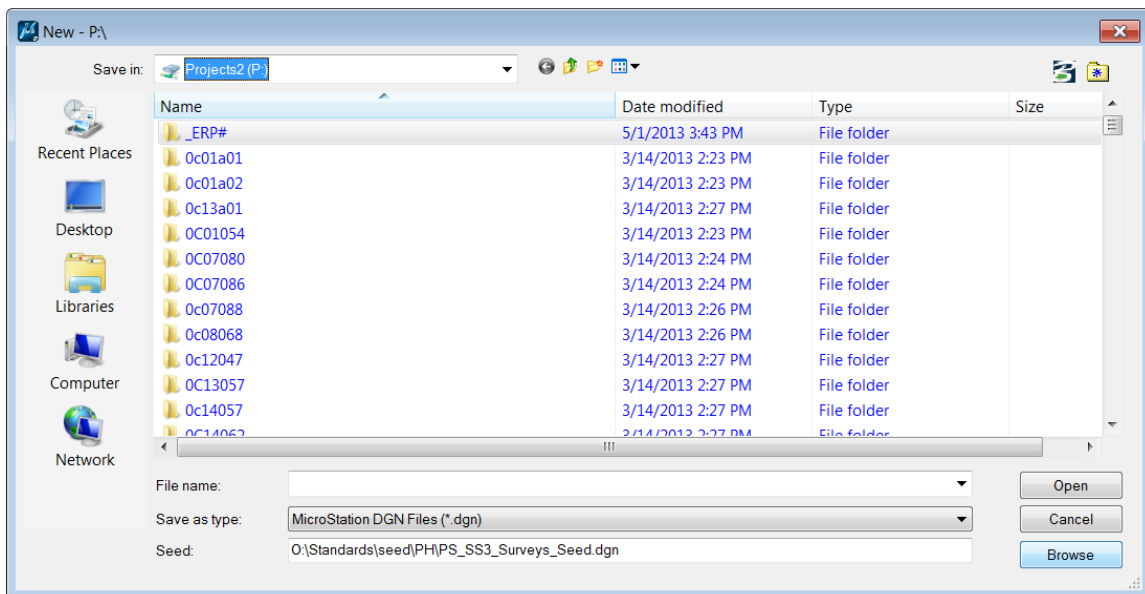
*Figure 8-1. Desktop icon.*

To create a new MicroStation design file, click on the *New file* icon from the *File Open* window.



*Figure 8-2. Create a new file.*

Click the *Browse* button to select the appropriate seed file. The path to the seed file folder is: **O:\Standards\seed\PH\**. Once the seed file has been selected, it will become the default seed file for subsequent MicroStation files.

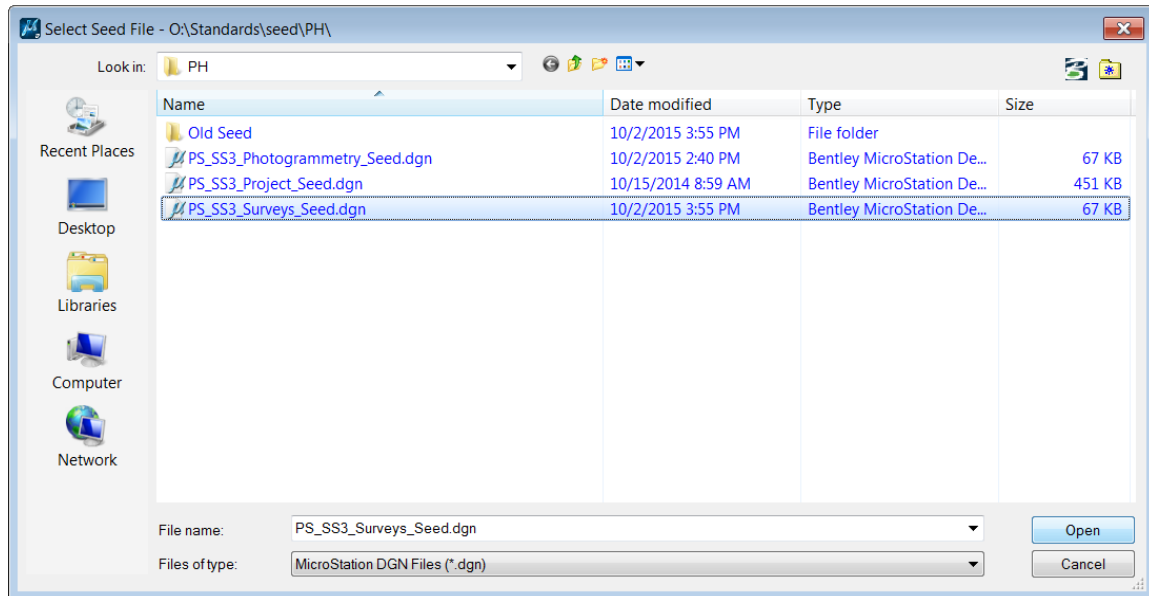


*Figure 8-3. Open a seed file.*

**Note:** A seed file is a template for each MicroStation design file. Every new design file will have the same global origin, color table, cell library attachments, working units, views, etc.

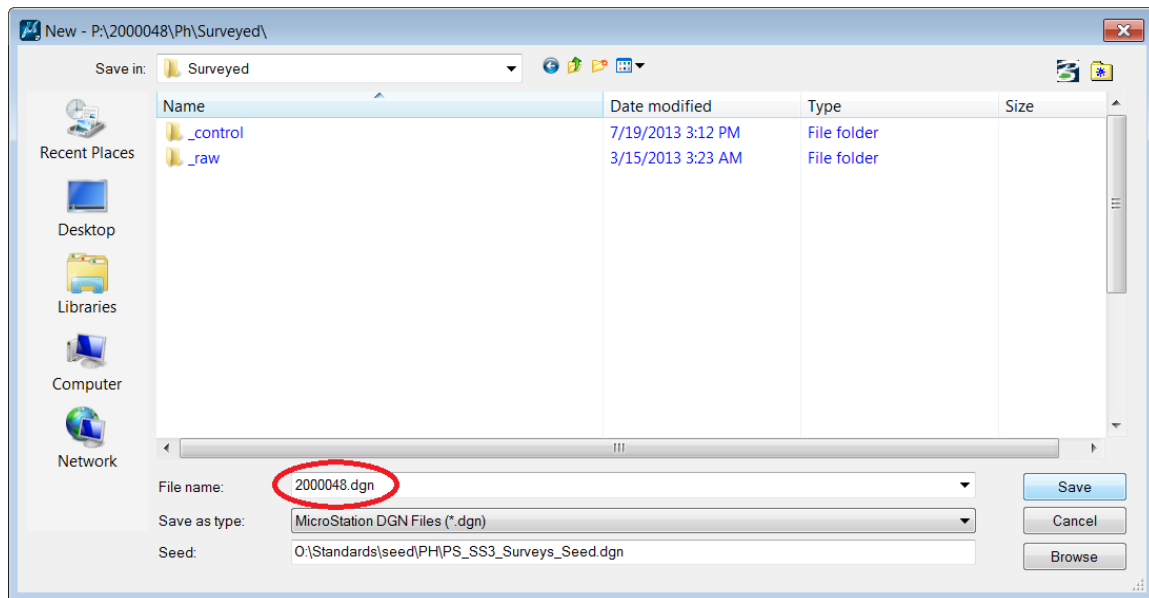
## Mapping Survey Data

Highlight the **PS\_SS3\_Surveys\_Seed.dgn** MicroStation seed file, and click the *Open* button.



*Figure 8-4. Seed file folder.*

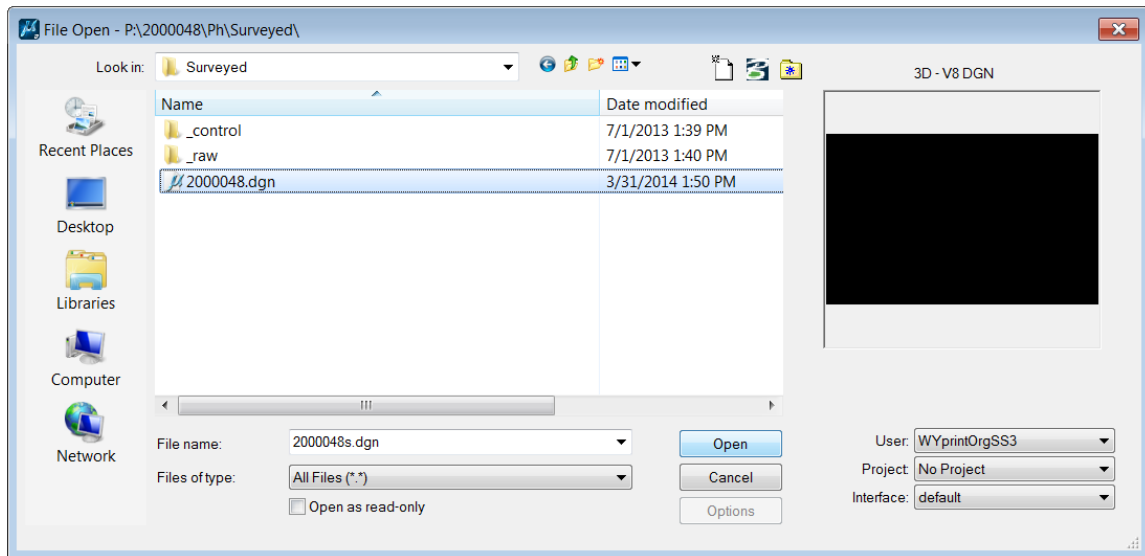
Enter a name for the new design file and click the *Save* button. In Figure 8-5, the project number is used for the file name (red oval).



*Figure 8-5. New file name.*

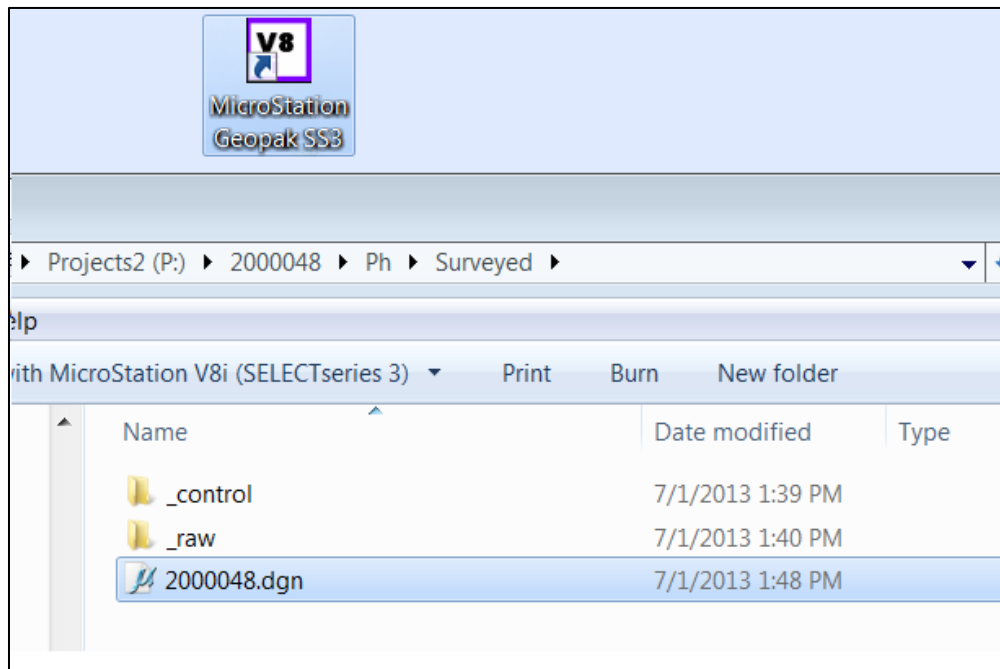
## 2. Open MicroStation Design File

Highlight the newly created design file and click the *Open* button.



*Figure 8-6. Open new design file.*

An existing design file may be opened by highlighting the file in Windows Explorer and "dragging and dropping" it on the MicroStation/Geopak SS3 desktop icon.

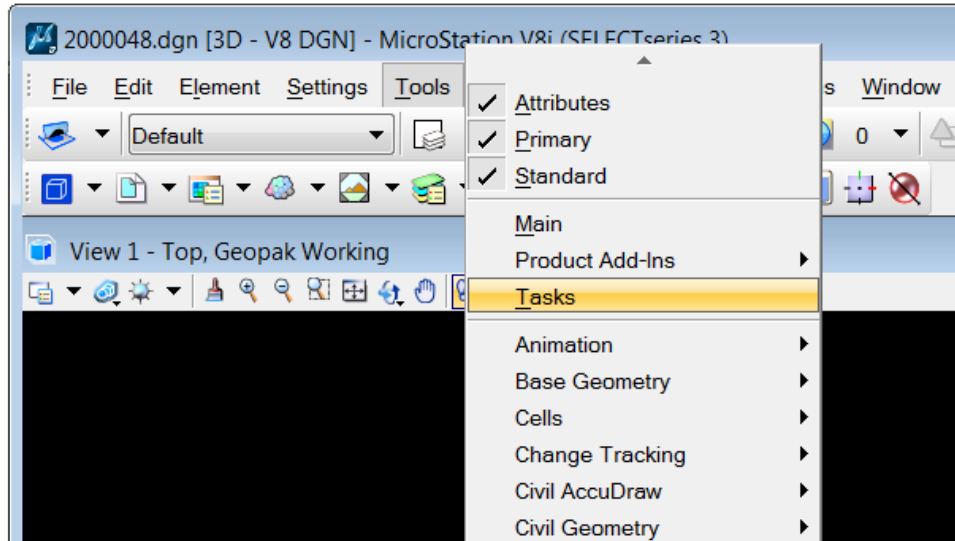


*Figure 8-7. Open existing design file.*

## B. Geopak SS3

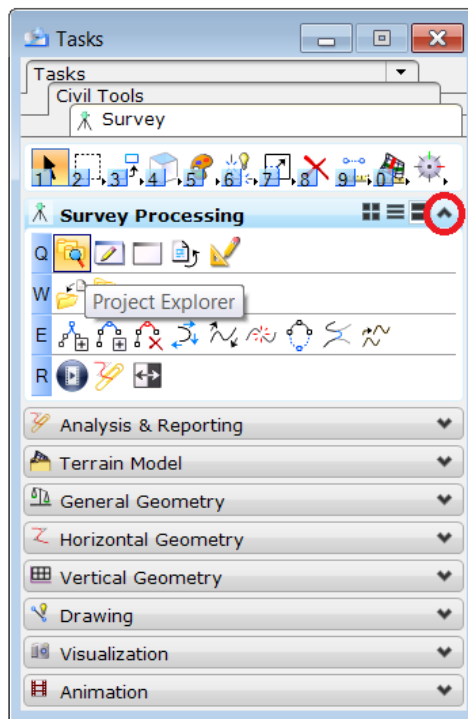
### 1. Project Explorer

Once the design file has been opened, click on the *Tools* header and select *Tasks*.



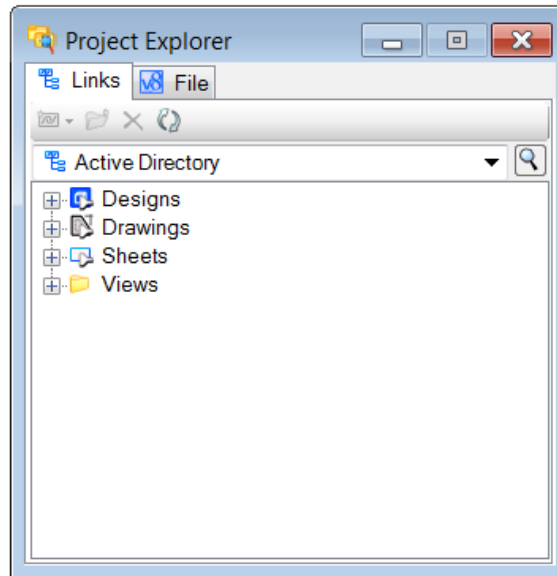
*Figure 8-8. Open Tasks toolbar.*

In the *Tasks* toolbar, click on the *Civil Tools* tab, then the *Survey* tab. Open the *Survey Processing* toolbox by clicking on the "Collapse/Expand Group" arrow (red circle). Next, click on the *Project Explorer* icon.



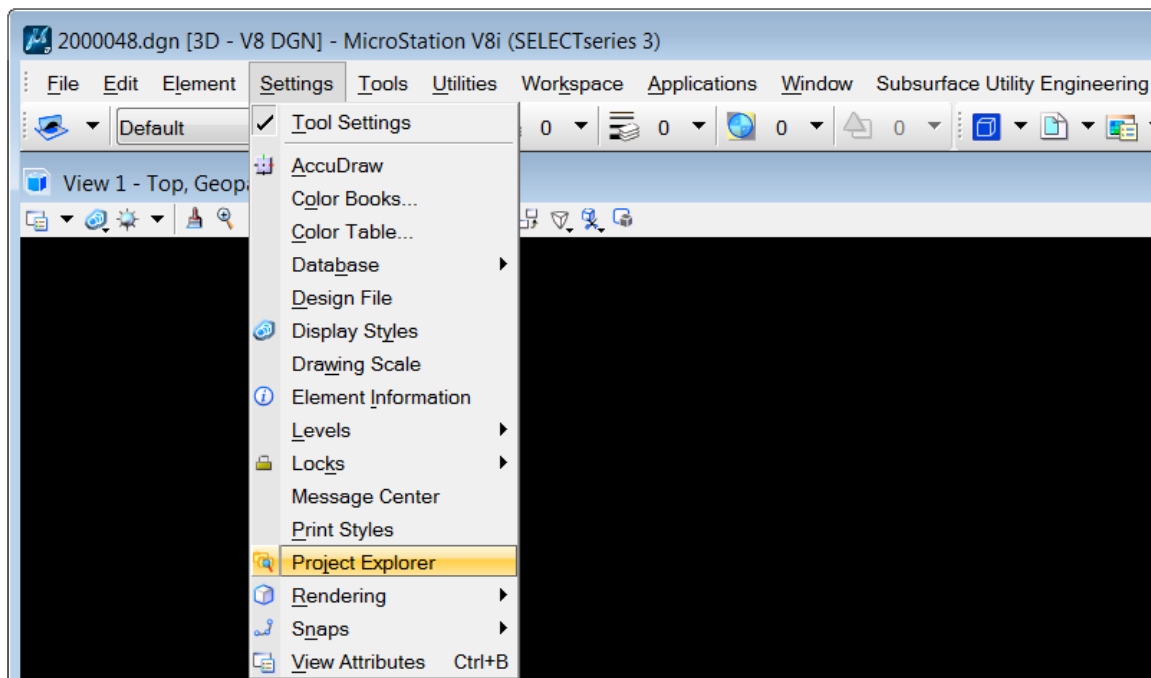
*Figure 8-9. Survey Processing toolbox.*

The *Project Explorer* window may be docked into the MicroStation file or moved to a second monitor screen for a larger CADD viewing area. There should be five tabs shown in Project Explorer: Links, File, Survey, Civil Standards, and Civil Model.



*Figure 8-10. Project Explorer.*

If all of the tabs are not shown, click on the *Settings* header and select *Project Explorer*.

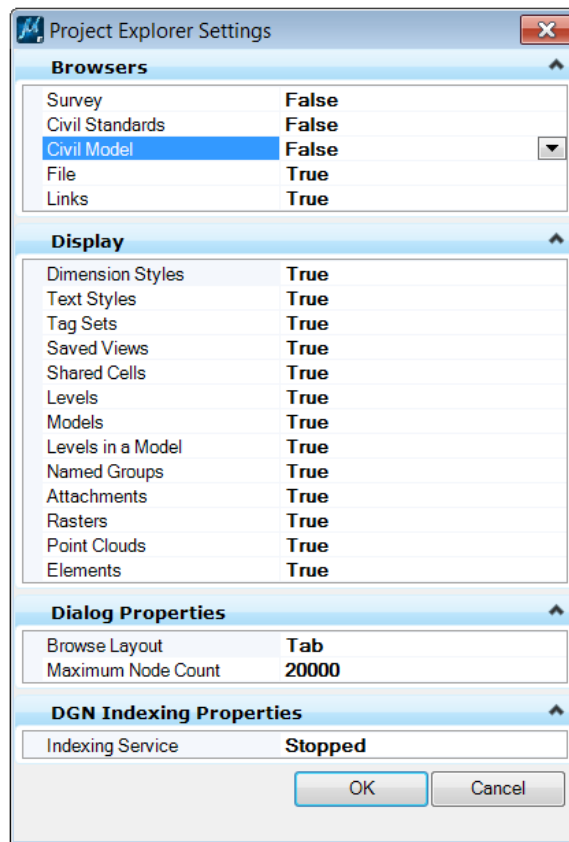


*Figure 8-11. Project Explorer settings.*

## Mapping Survey Data

---

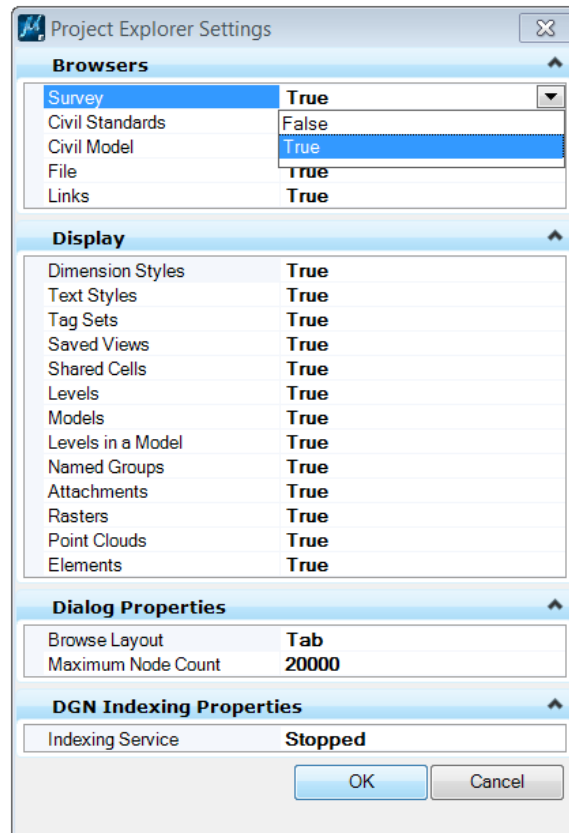
In the *Project Explorer Settings* window, the tabs can be turned on or off. To display the tabs, double-click on the *False* setting.



*Figure 8-12. Project Control settings.*

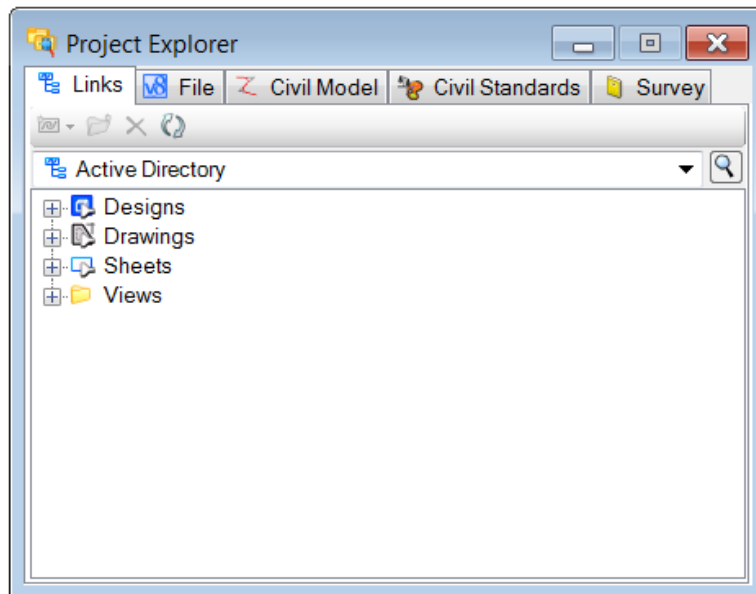


Select *True* for each setting and then click on the *OK* button.



*Figure 8-13. Edit settings.*

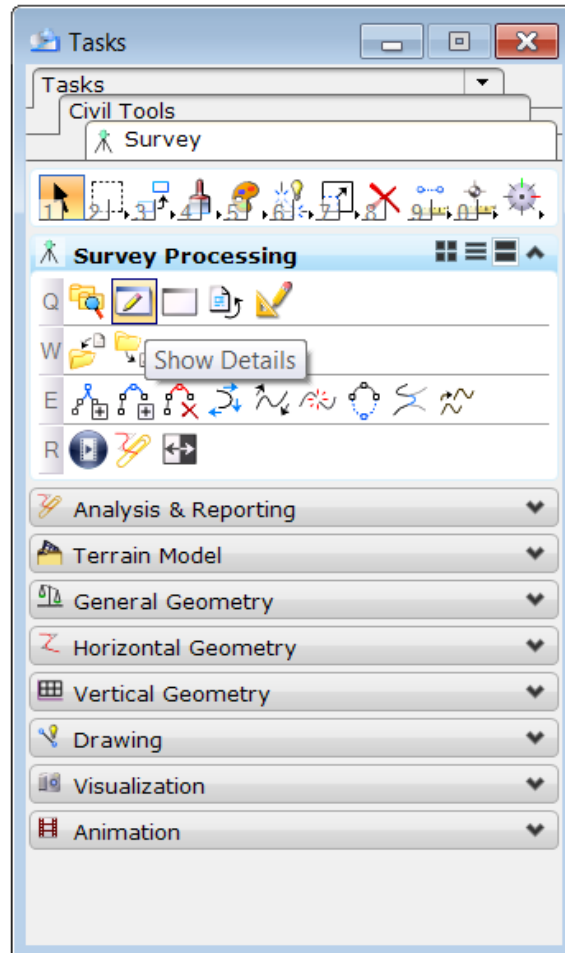
All of the *Project Explorer* tabs are now displayed.



*Figure 8-14. Project Explorer tabs.*

### 2. Survey Details

Click on the *Show Details* icon under the *Survey Processing* tab. The *Survey Details* window may be docked into the MicroStation file or moved to a second monitor screen for a larger CADD viewing area.



*Figure 8-15. Survey Details.*

### 3. Project Settings

The default survey settings may be reviewed in the *Civil Standards* tab. Under the *Libraries* section, click on the "+" symbol next to *Project Settings*, *PH\_Features.dgnlib*, and *Survey*. Right-click on *WY\_Settings* and select *Properties*.

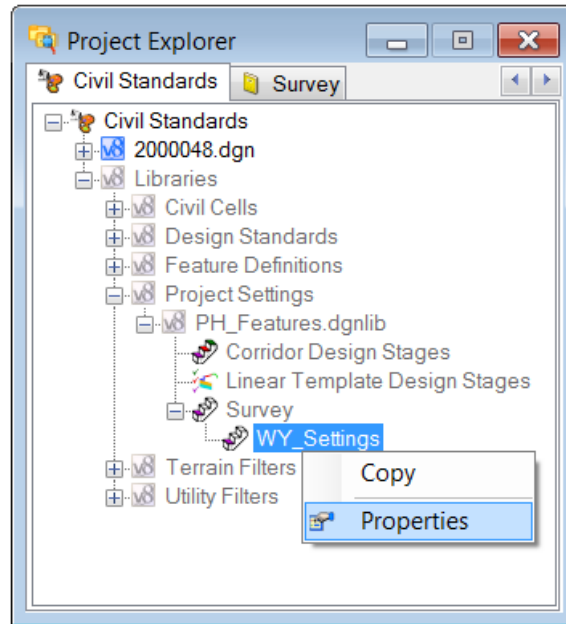


Figure 8-16. WY Settings.

The settings shown in Figure 8-17 are set by default. These settings may change with Geopak updates or changes in processing procedures.

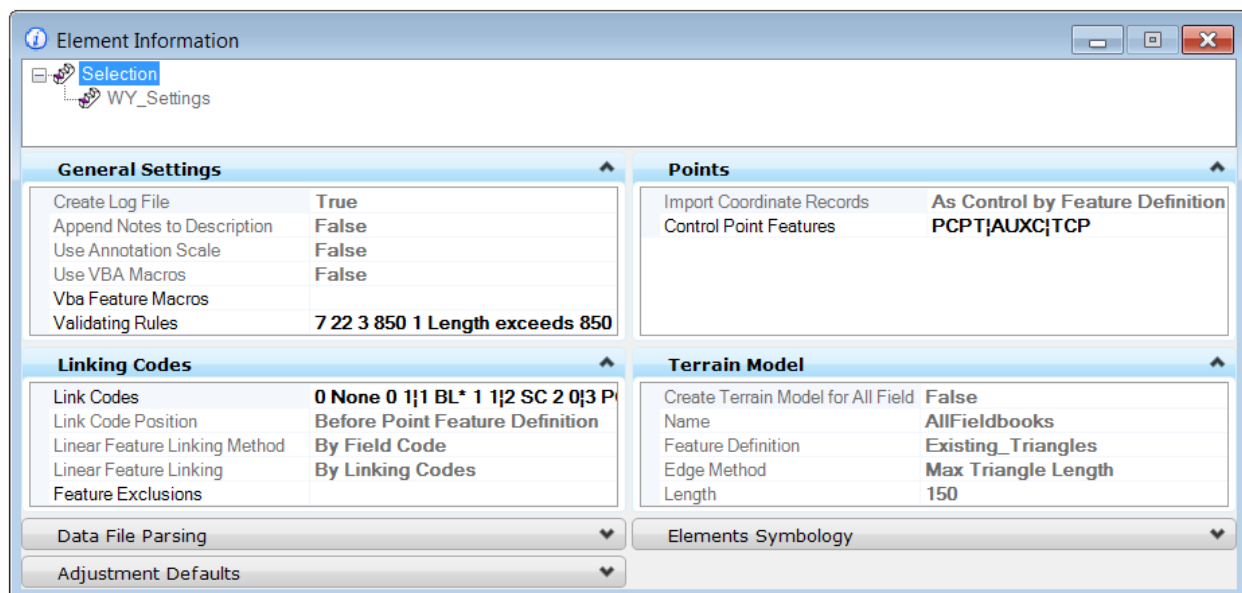
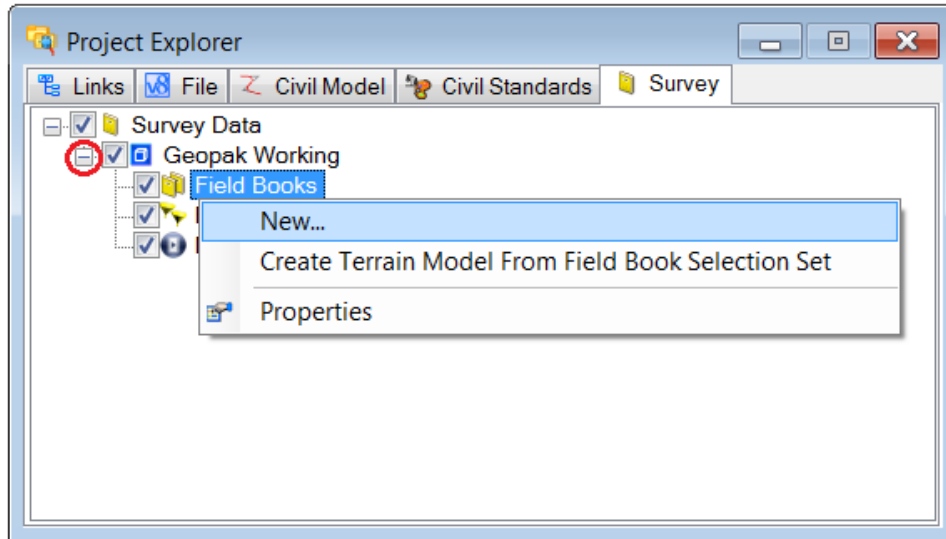


Figure 8-17. WY Settings defaults.

### C. Measurement files

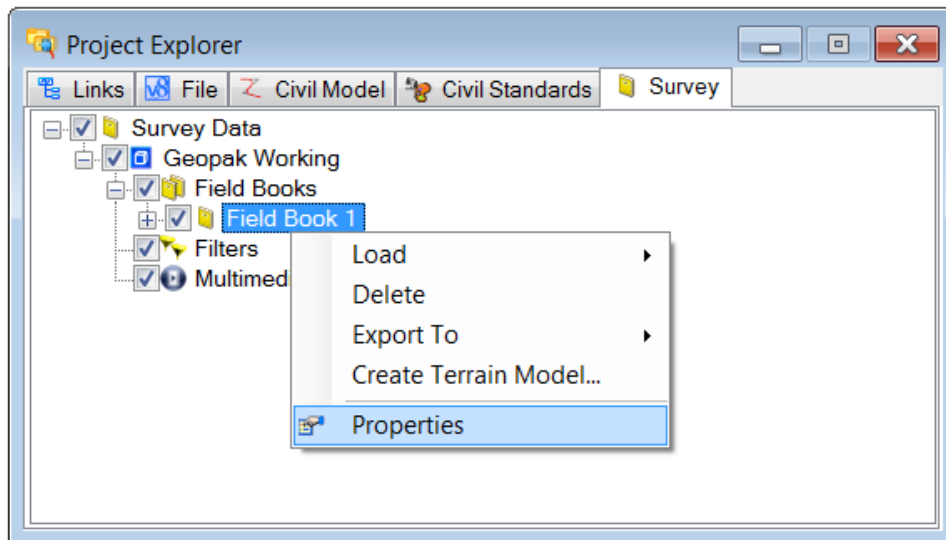
#### 1. Create Field Book

Select the *Survey* tab in the *Project Explorer* window, click on the "plus" sign (+) next to *Geopak Working* (red circle), right-click on *Field Books*, and select *New*.



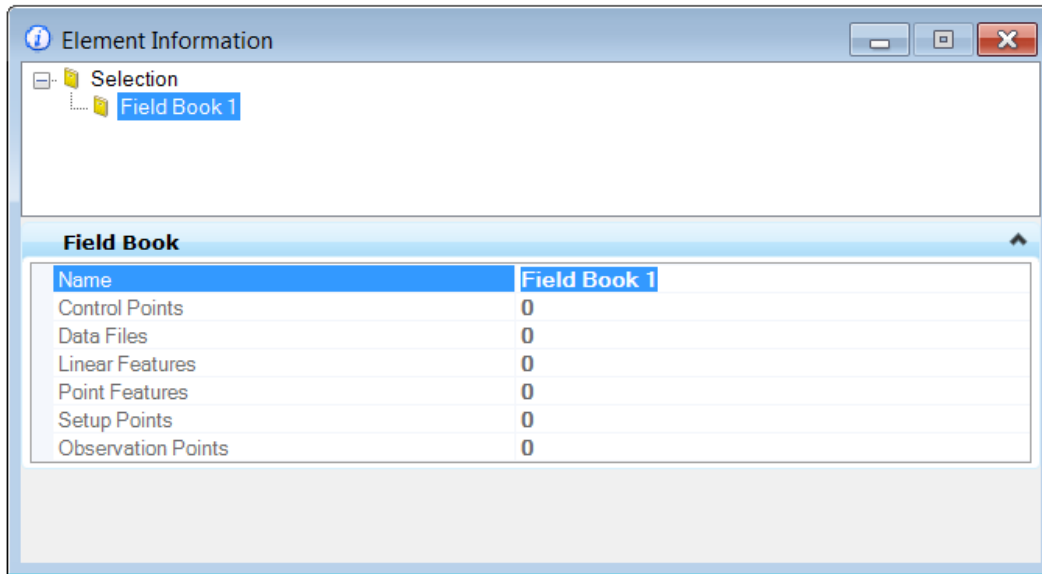
*Figure 8-18. New field book.*

Geopak will create the folder *Field Book 1*. To change the name, highlight the field book, right-click and select *Properties*.



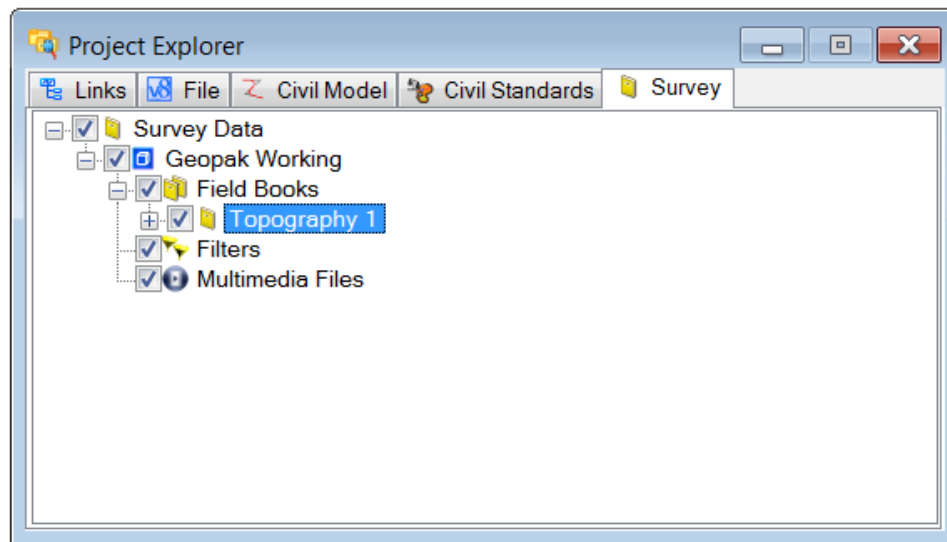
*Figure 8-19. Edit field book.*

Highlight the field book name as shown in Figure 8-20. A more descriptive name may now be entered. Click on the red "x" in the upper right corner when the field book has been renamed.



*Figure 8-20. Rename field book.*

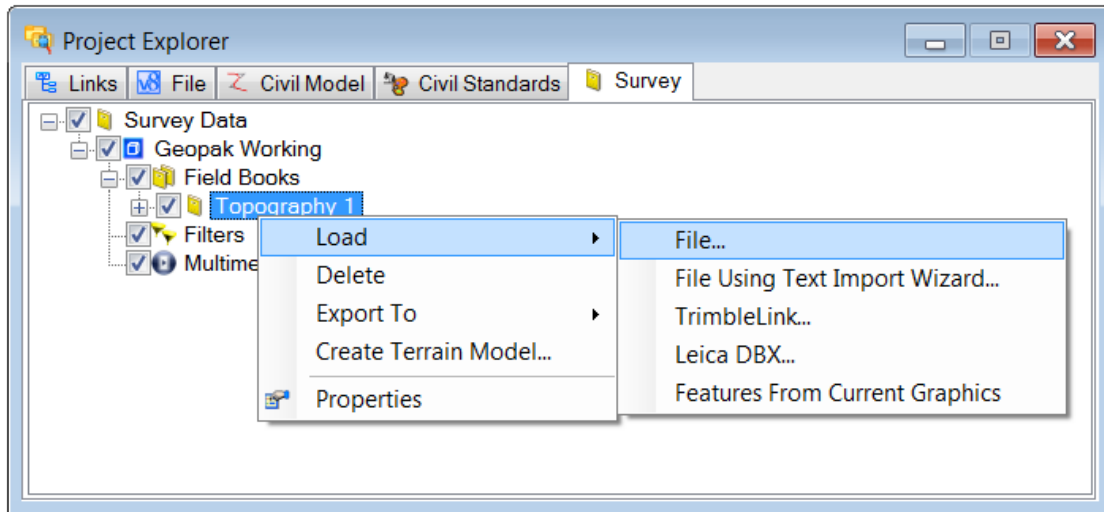
The field book has been renamed "Topography 1".



*Figure 8-21. New field book name.*

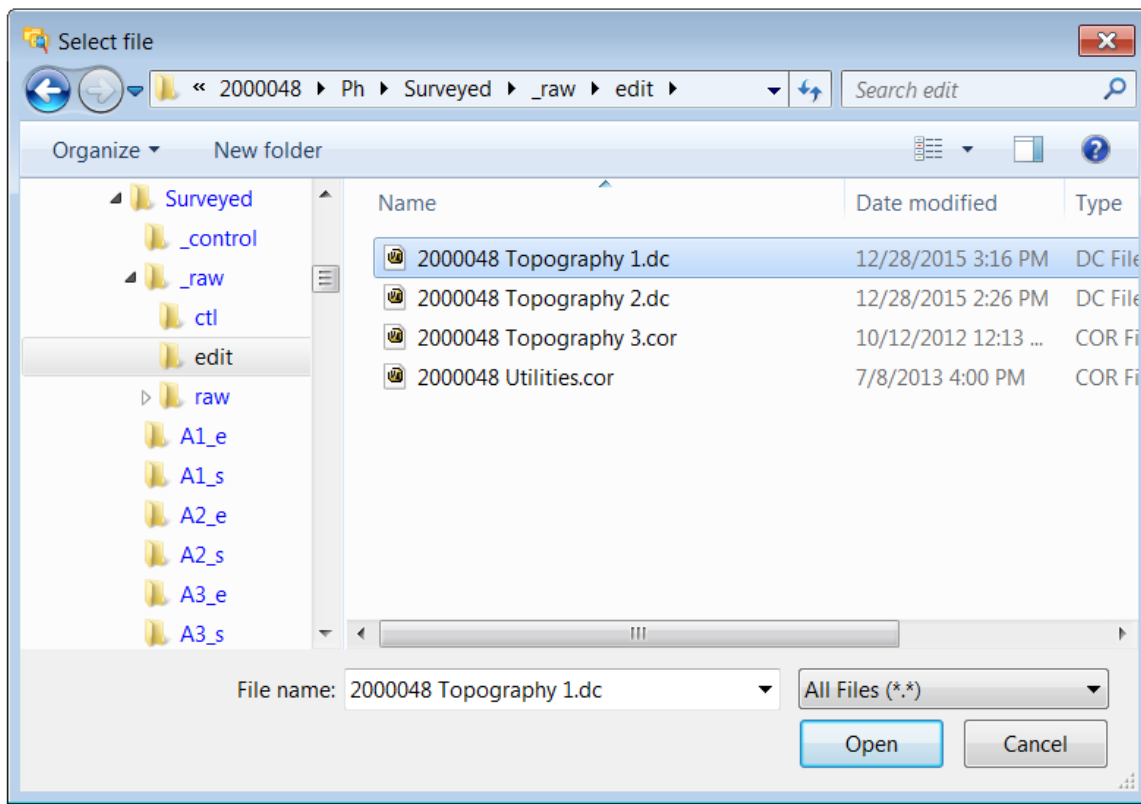
### 2. Import Survey Data

To import a survey file, right-click on the field book, select *Load*, and then *File* as shown in Figure 8-22.



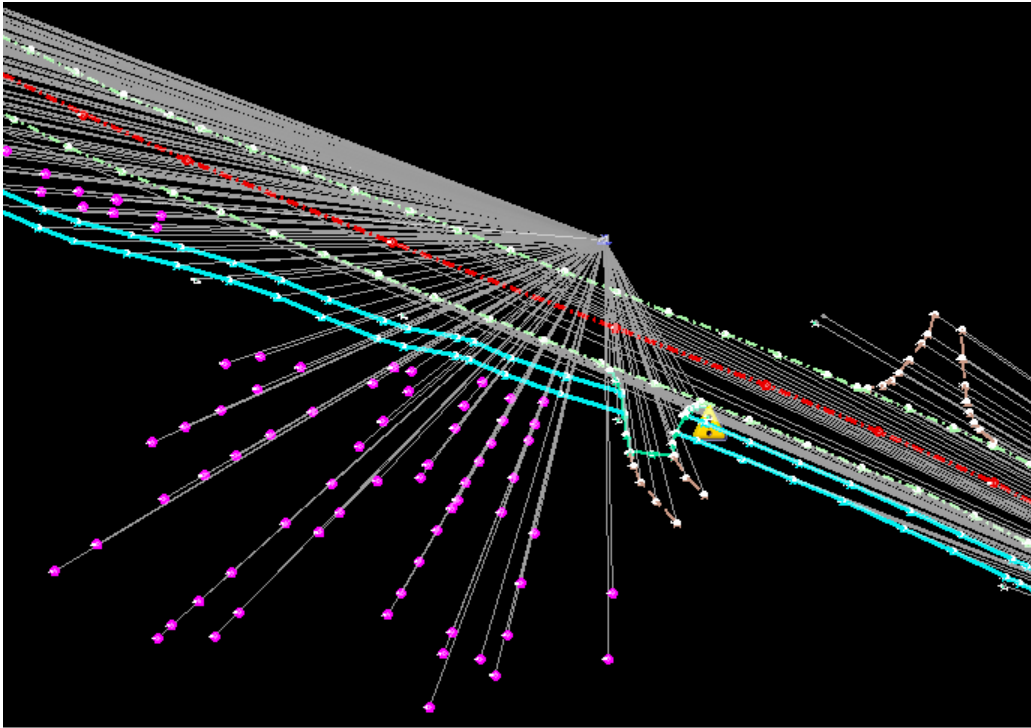
*Figure 8-22. Load file.*

Use the *Select file* window to locate the project control file. When the coordinate file has been selected, click the *Open* button.



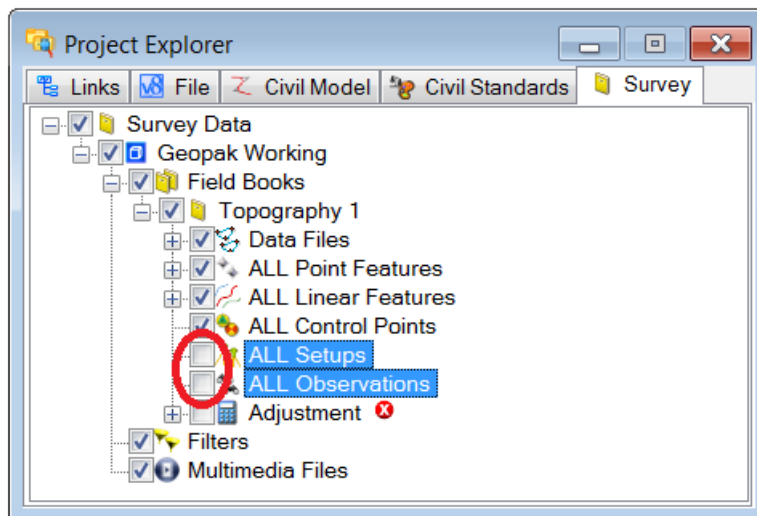
*Figure 8-23. Select survey file.*

After the survey file has been imported, the points, lines, and shapes from the collected survey data will be plotted. Backsight measurements and individual observations from the instrument will also be plotted as lines.



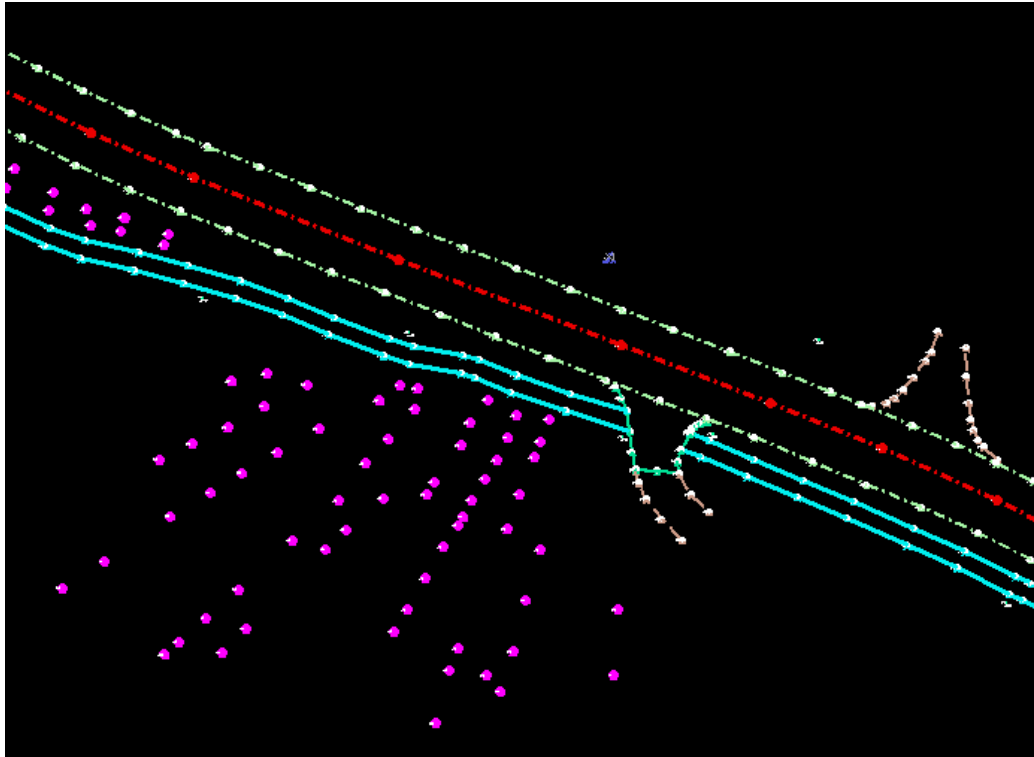
*Figure 8-24. Setting point range.*

The setup and observation lines may be turned off by removing the check marks in the boxes next to *All Setups* and *All Observations* (red oval).



*Figure 8-25. Remove observations.*

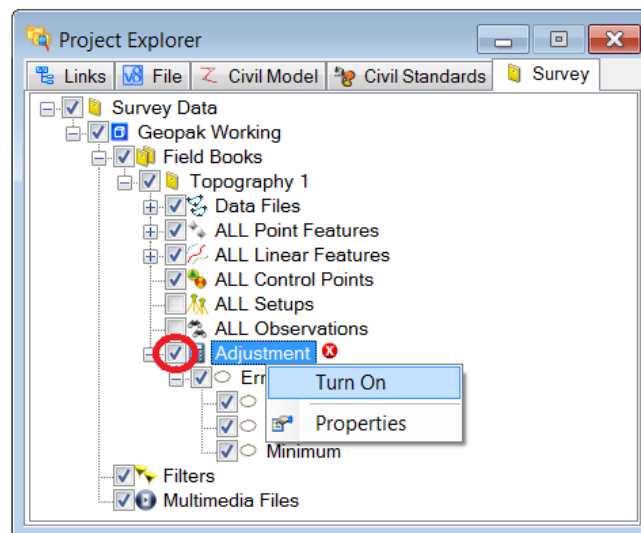
The survey can now be viewed without the setup and observation lines.



*Figure 8-26. Field book points.*

### 3. Adjust Survey Data

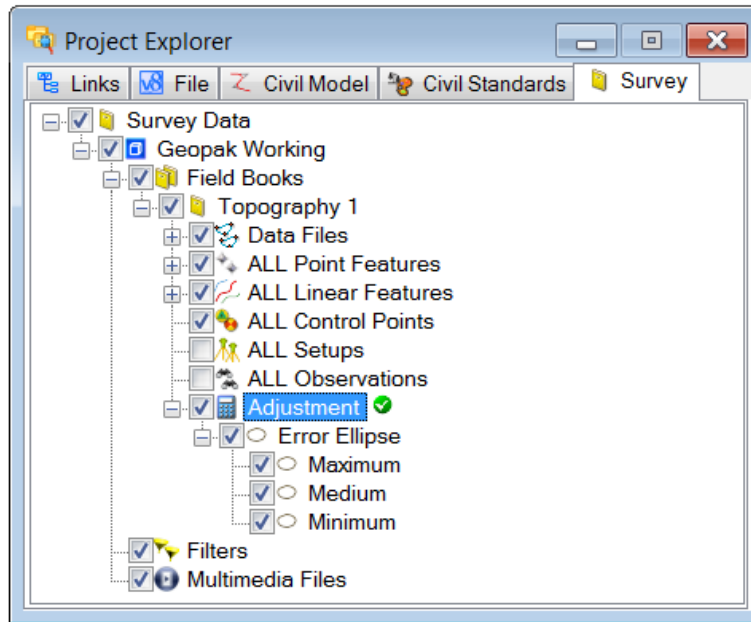
At this point, the survey measurements have been adjusted for the prism offset and the temperature and pressure PPM constant. After the survey file has been loaded, click on the "+" sign next to *Adjustment* and *Error Ellipse*, then click in the box to place a check mark "✓" (red oval). Right-click on *Adjustment* and select *Turn On*.



*Figure 8-27. Least squares adjustment.*

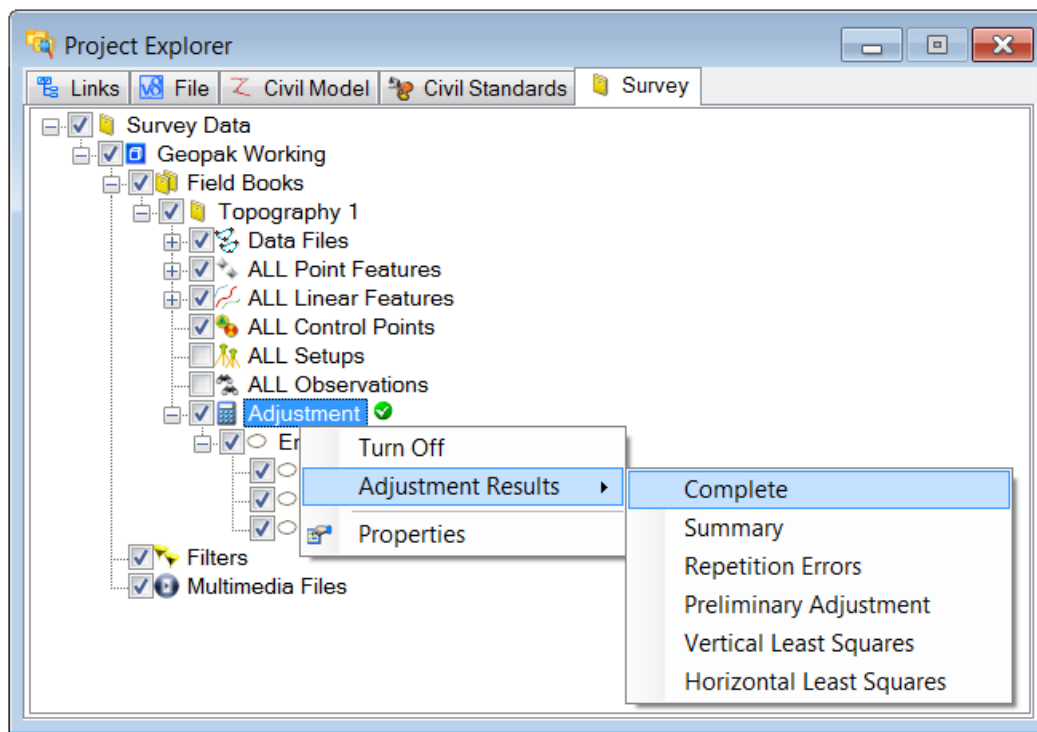


Prior to the least squares adjustment, a red circle with an "x" is displayed to the left of *Adjustment*. After the adjustment has been completed, a green circle with a "check mark" will be displayed.



*Figure 8-28. Adjustment completed.*

Right-click on *Adjustment*, select *Adjustment Results*, then *Complete*.



*Figure 8-29. View results.*

### a. Adjustment Results

The *Least Squares Complete Report* provides a statistical analysis of the adjustment for measurements between known points. The error analysis of the misclosures (or residuals) for azimuth, angle, and distance measurements should be reviewed to determine if the processed data is within acceptable limits. It may be necessary to edit or omit survey data in an effort to correct measurements with large misclosures.

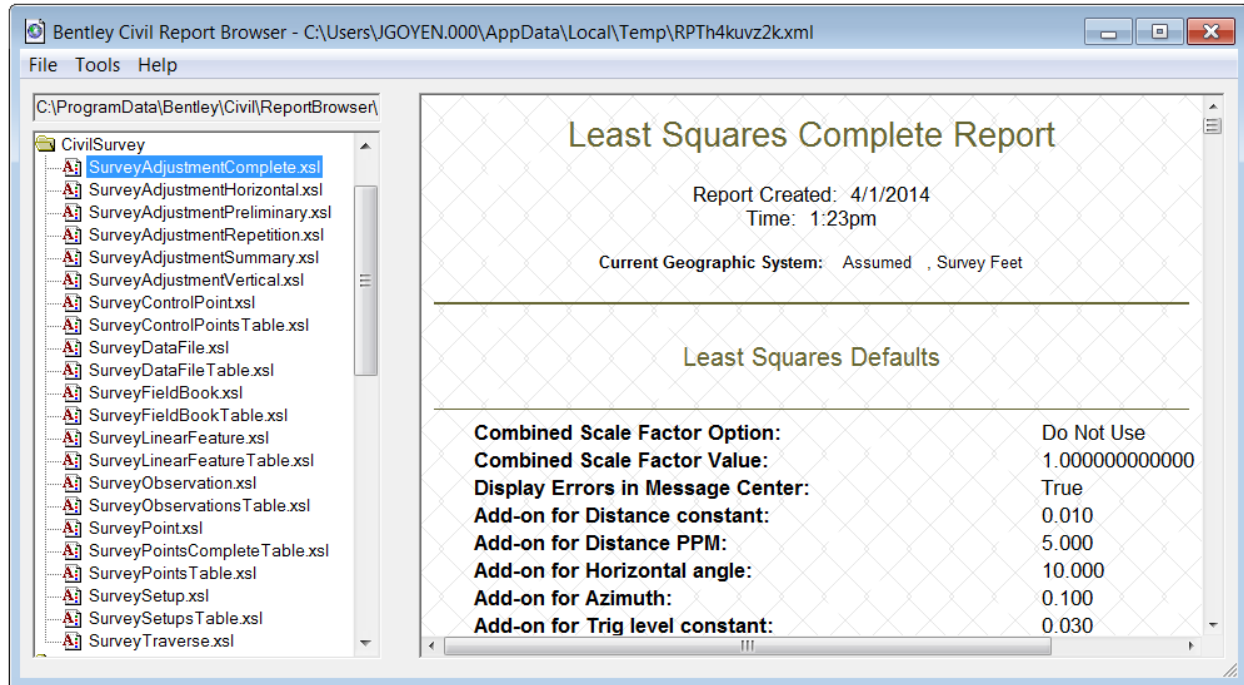
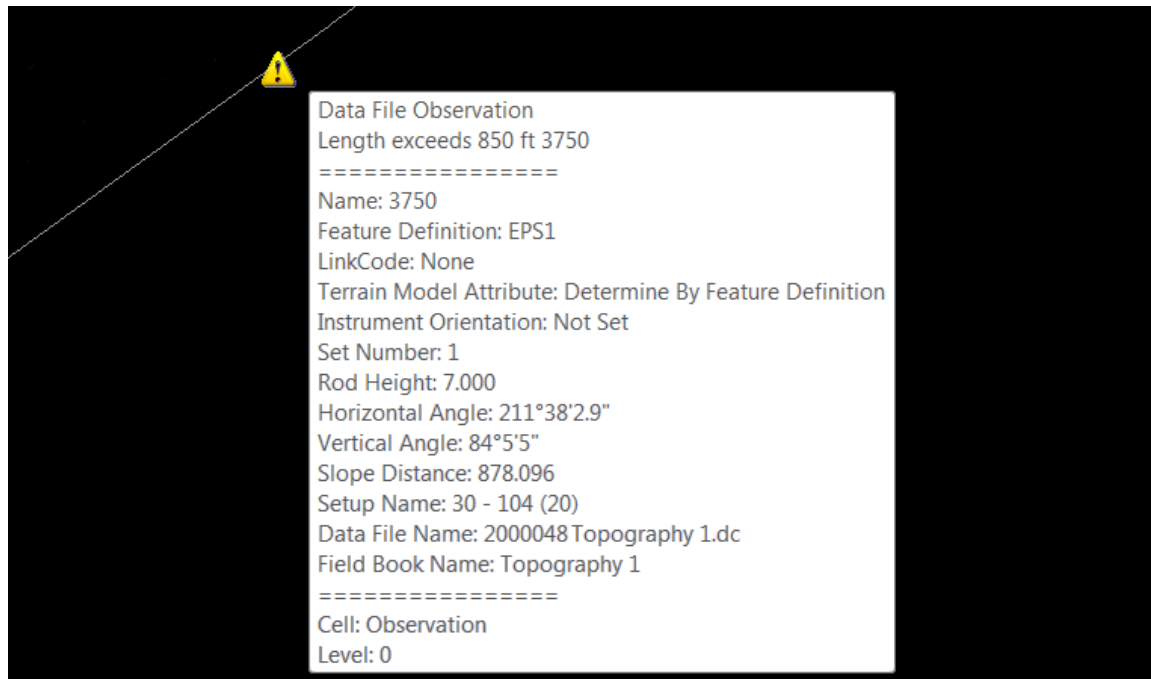


Figure 8-30. Complete adjustment report.

### b. Warning Messages

All warning messages (yellow triangle with a black exclamation mark) should be reviewed for potential survey errors. The error display in Figure 8-31 is an indication that the observation distance is greater than the allowable 850 ft. This will occur when the instrument and backsight are set on project control monuments which may be placed up to 1000 feet apart. However, the maximum distance for individual collection measurements should not exceed 850 feet.



*Figure 8-31. Error display.*

Additional surveys will need to be imported and adjusted in separate field books. Create a new field book as illustrated in Figure 8-18. By processing survey files in separate field books, the surveyor does not have to keep track of previously used point numbers for each subsequent survey. All surveys may begin with the same point number (e.g. 1000).

### D. Coordinate Files

Coordinate files contain specific point information that has already been processed by other software programs. Because coordinate files are accompanied by a signed and sealed cover letter, P&S cannot edit any data within these files. If processing errors are encountered, the PE/PLS submitting the survey will be notified. It is the responsibility of the PE/PLS to correct the errors and resubmit the survey to P&S with a revised signed and sealed cover letter.

Table 8-1 is an example of a coordinate file. All of the columns are separated by a "grave" symbol (`). The columns from left to right represent: point number, north coordinate, east coordinate, elevation, feature code with an "at" symbol (@), and attribute response(s). See Chapter 4 in this Manual for more information on feature codes and their attributes.

1000`563335.4039`678980.9867`4711.7821`FLP@
1001`563335.8592`678980.9119`4712.5288`BL*CULS@ CMP 18"
1002`563375.9554`678969.6295`4712.1113`EL*CULS@
1003`563376.2593`678969.5668`4711.2118`FLP@
1004`563376.0093`678938.0726`4712.7636`TBX@ Century Link
1005`563375.8330`678937.9239`4712.6955`BL*UTEL1@ Century Link
1006`563367.3610`678930.9891`4711.8723`UTEL1@
1007`563331.3443`678761.1151`4711.7946`UTEL1@
1008`563312.2842`678684.9153`4713.7017`UTEL1@
1009`563289.1477`678595.8805`4721.0141`UTEL1@
1010`563268.6086`678514.3511`4727.8214`UTEL1@
1011`563244.1558`678424.0831`4734.6940`EL*UTEL1@
1012`563295.6420`678855.1280`4712.5819`FLP@
1013`563295.8075`678855.0706`4713.9592`BL*CULS@ RCP 18"
1014`563330.3412`678844.8657`4713.5492`EL*CULS@
1015`563330.6646`678844.5701`4712.5826`FLP@
1016`563375.9445`678938.1829`4712.7482`BL*UTEL2@ Century Link
1017`563372.7576`678943.5732`4711.8864`UTEL2@
1018`563383.8684`679001.3788`4712.3676`UTEL2@
1019`563405.1268`679078.3285`4713.0624`UTEL2@
1020`563446.8010`679185.6841`4712.2597`UTEL2@
1021`563468.7447`679235.3597`4711.3295`UTEL2@
1022`563510.5503`679304.7831`4709.4901`EL*UTEL2@
1023`563510.7393`679305.3360`4709.5229`BL*UTEL3@ Century Link
1024`563510.5825`679304.9455`4709.5344`TBX@ Century Link
1025`563544.2665`679354.0814`4709.3586`UTEL3@
1026`563575.6033`679396.9939`4708.8222`UTEL3@
1027`563637.0938`679482.3522`4709.2658`UTEL3@
1028`563732.0131`679608.7647`4708.3812`UTEL3@
1029`563803.6566`679662.4698`4706.9611`EL*UTEL3@
1030`563736.0247`679692.4220`4708.1729`BL*UPOW1@ Wheatland REA
1031`563653.1729`679615.7283`4709.3681`UPOW1@
1032`563527.0278`679447.3153`4710.8657`UPOW1@
1033`563470.6626`679367.2481`4710.8200`UPOW1@
1034`563407.7908`679279.8930`4711.3330`UPOW1@
1035`563422.9674`679247.0834`4711.7325`BL*CULS@ CMP 18"
1036`563422.6597`679247.4313`4710.2719`FLP@
1037`563365.4050`679148.5833`4711.8455`EL*UPOW1@
1038`563364.4090`679147.5328`4711.6770`BL*OPOW1@ Wheatland REA 2
1039`563364.3926`679147.5320`4711.6452`PP@ Wheatland REA
1040`563377.6377`679171.4362`4711.8472`DGA@
1041`563464.1556`679217.9305`4711.1648`EL*CULS@
1042`563464.7128`679217.6518`4710.1620`FLP@
1043`563317.1166`679052.9017`4712.7466`PP@ Wheatland REA
1044`563317.1110`679052.8992`4712.7517`OPOW1@
1045`563300.7647`679025.7888`4713.0840`DGA@
1046`563483.6742`679035.6667`4711.7899`DGA@
1047`563453.0686`679038.7415`4712.8791`PP@ Wheatland REA
1048`563453.1111`679038.7705`4712.8830`EL*OPOW1@

*Table 8-1. Coordinate file example.*

## 1. Create Field Book

Create a new field book with a right-click on *Field Books* in the *Survey* tab and select *New* (see Figure 8-18). To change the field book name, highlight the field book, right-click and select *Properties* (see Figure 8-19).

## 2. Import Survey Data

Import the coordinate file with a right-click on the renamed field book, select *Load*, and then *File Using Text Import Wizard*.

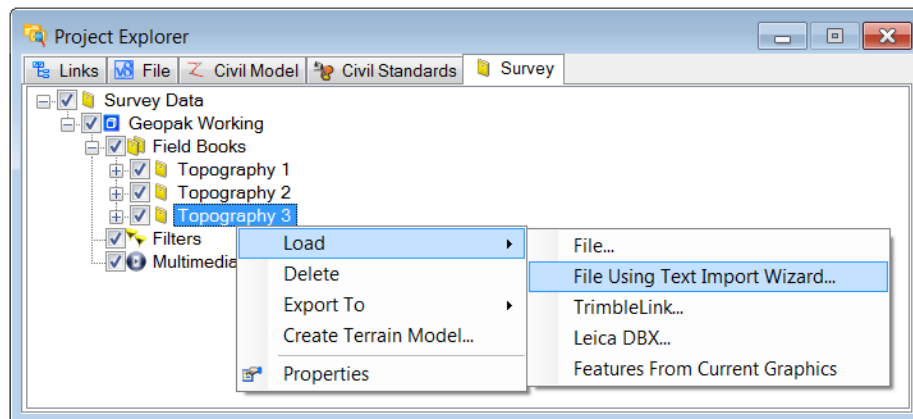


Figure 8-32. Load file.

Use the *Select file* window to locate the project control file. When the file has been selected, click the *Open* button.

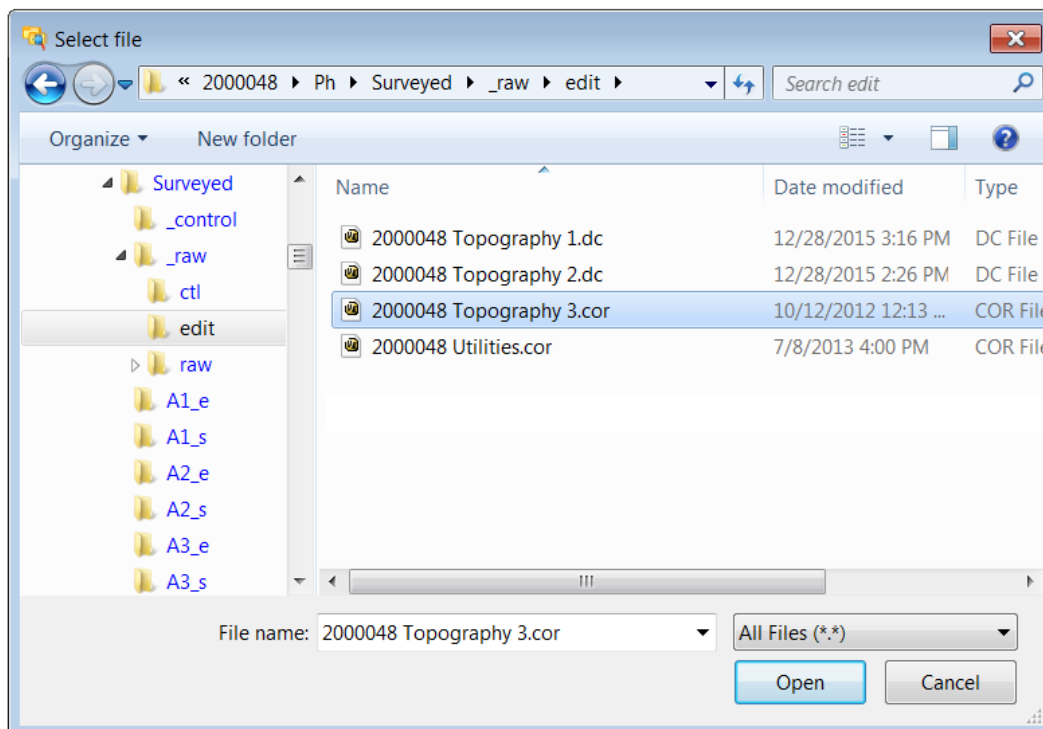
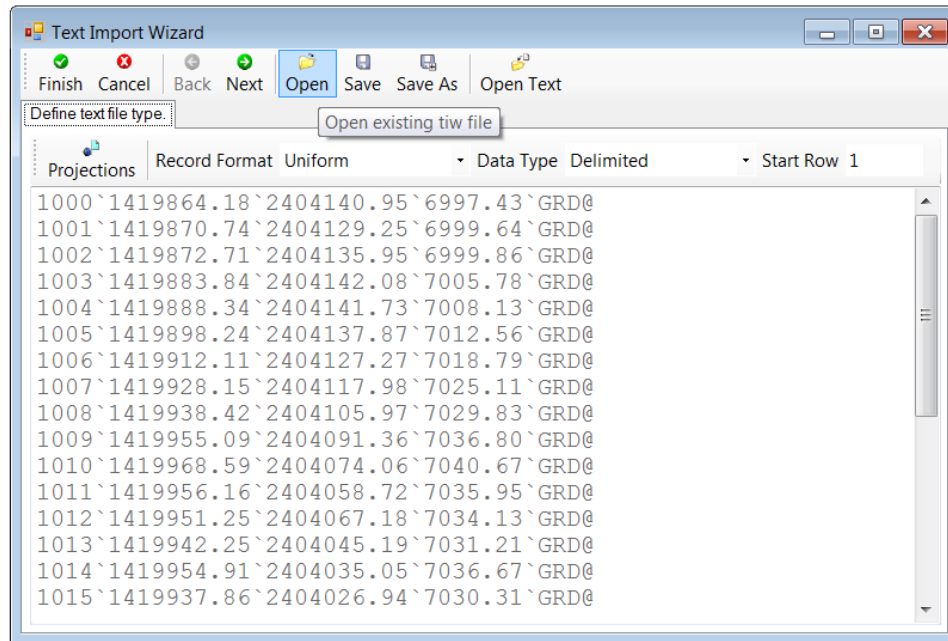


Figure 8-33. Coordinate file.

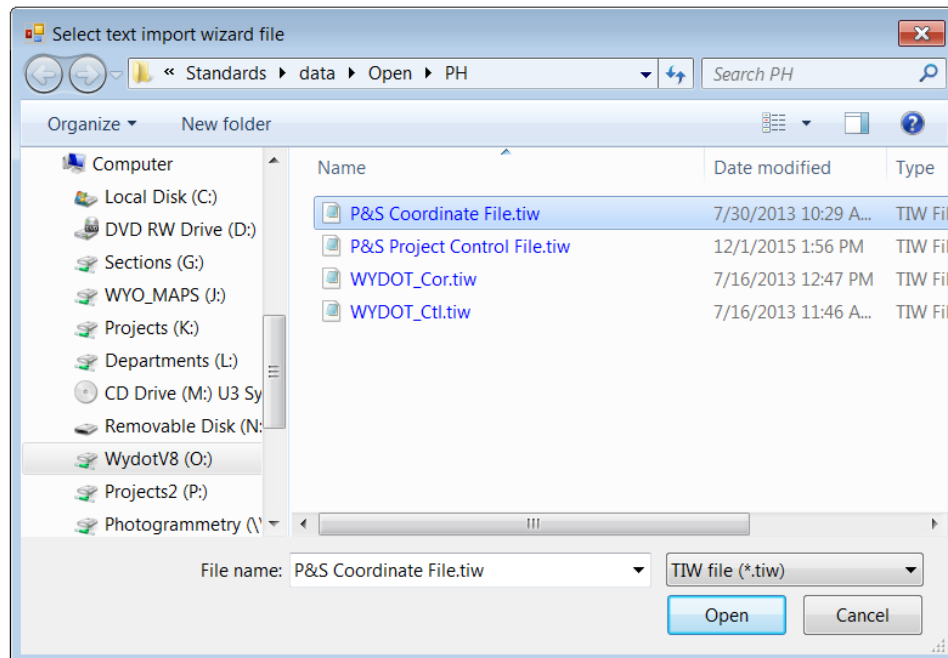
## Mapping Survey Data

The *Text Import Wizard* window will be displayed with the coordinate file. Click on the *Open* button to use an existing text import wizard with the appropriate format settings.



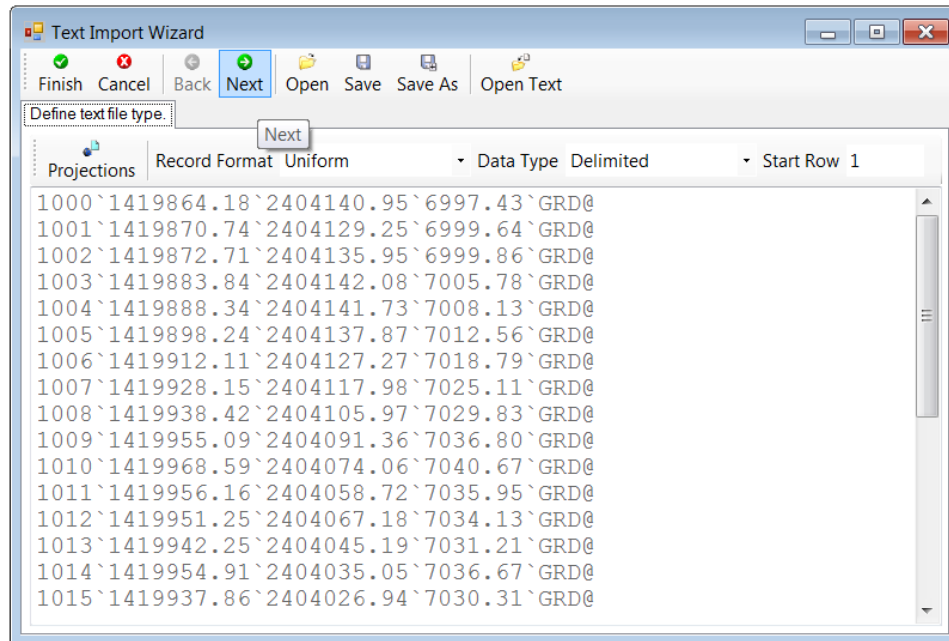
**Figure 8-34. Text import wizard.**

Select the *P&S Coordinate File.tiw* with the *Select text import wizard file* window. When the coordinate file has been selected, click the *Open* button. The path to the text import wizard format files is: "O:\Standards\data\Open\PH".



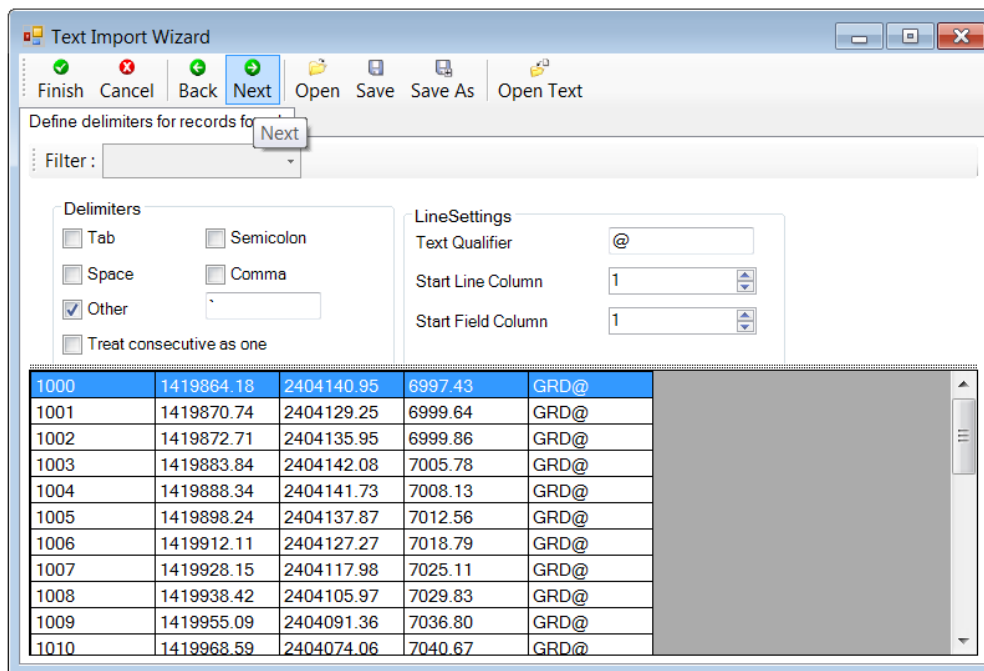
**Figure 8-35. Text import wizard file.**

The *Text Import Wizard* is formatted to begin reading the coordinate file. Click on the *Next* button.



**Figure 8-36. Text import wizard.**

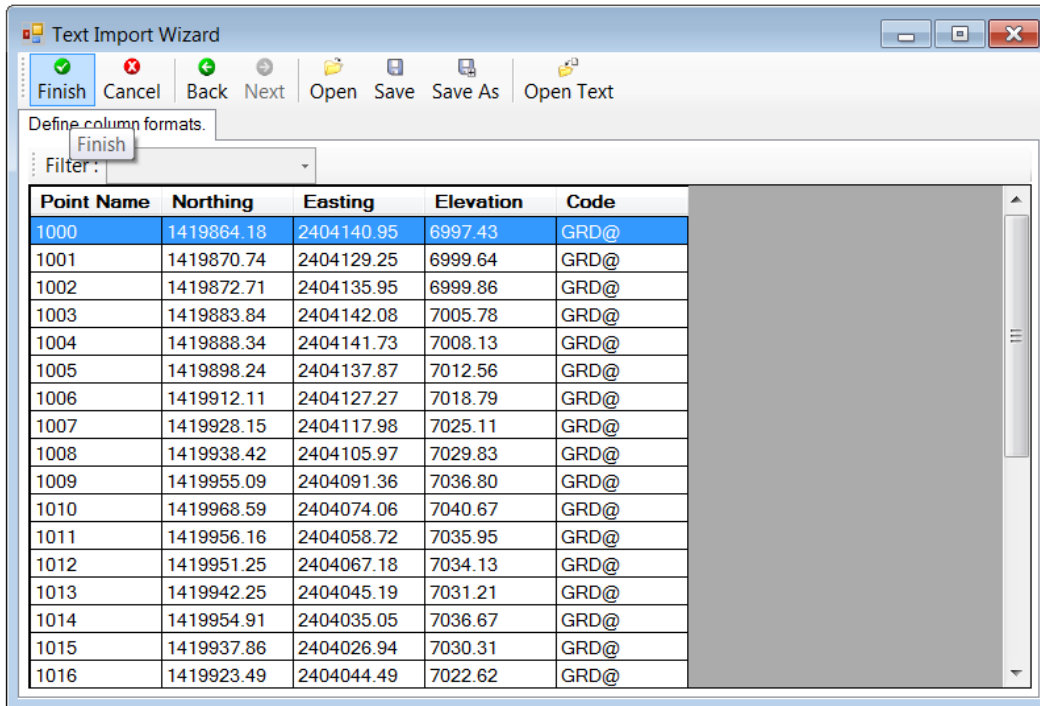
The column delimiter is set to *Other* with a check mark and a "grave" symbol ( ` ) is placed in the field to the right. An "at" symbol ( @ ) is set in the *Text Qualifier* field. Click on the *Next* button.



**Figure 8-37. Review Reports.**

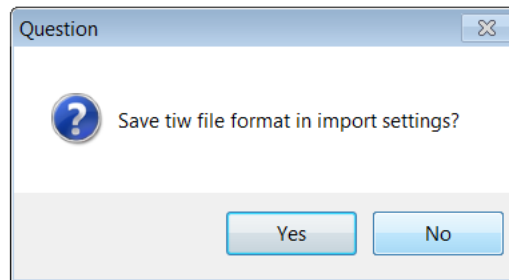
## Mapping Survey Data

The column headers are set as shown in Figure 8-38, click on the *Finish* button.



**Figure 8-38. Column headers.**

A *Question* window will be displayed asking if a text import wizard import file should be saved. Click on the *No* button.



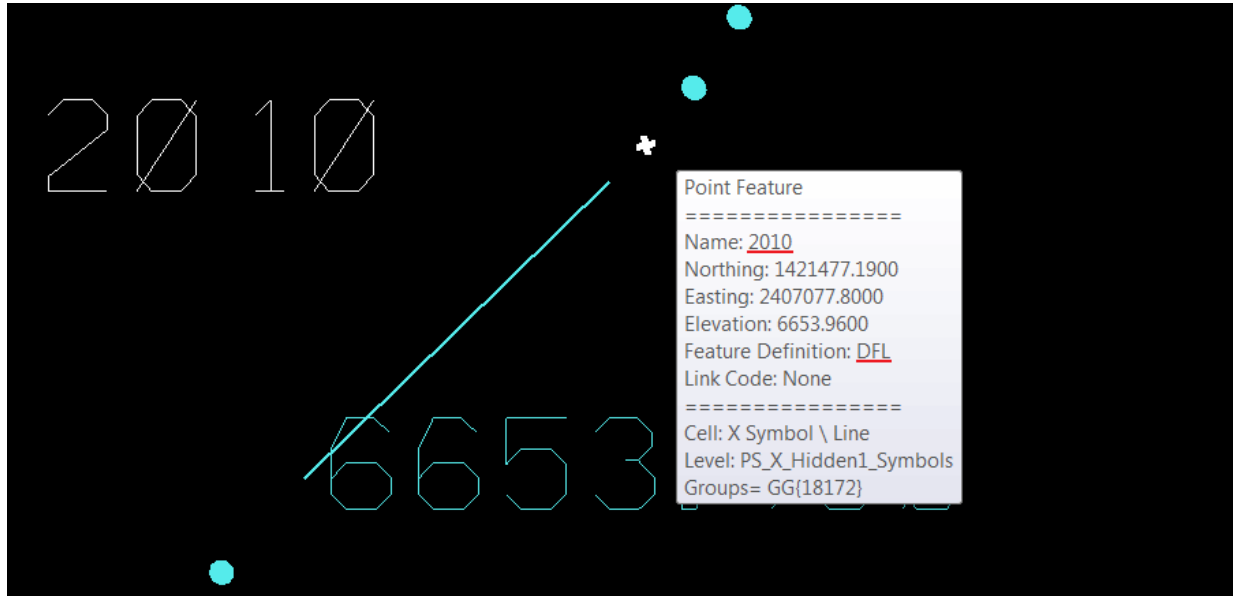
**Figure 8-39. Don't save tiw file.**

Because coordinate files are imported and mapped "as is", any further adjustments are not necessary. As with measurement surveys, additional coordinate files will be imported into separate field books.



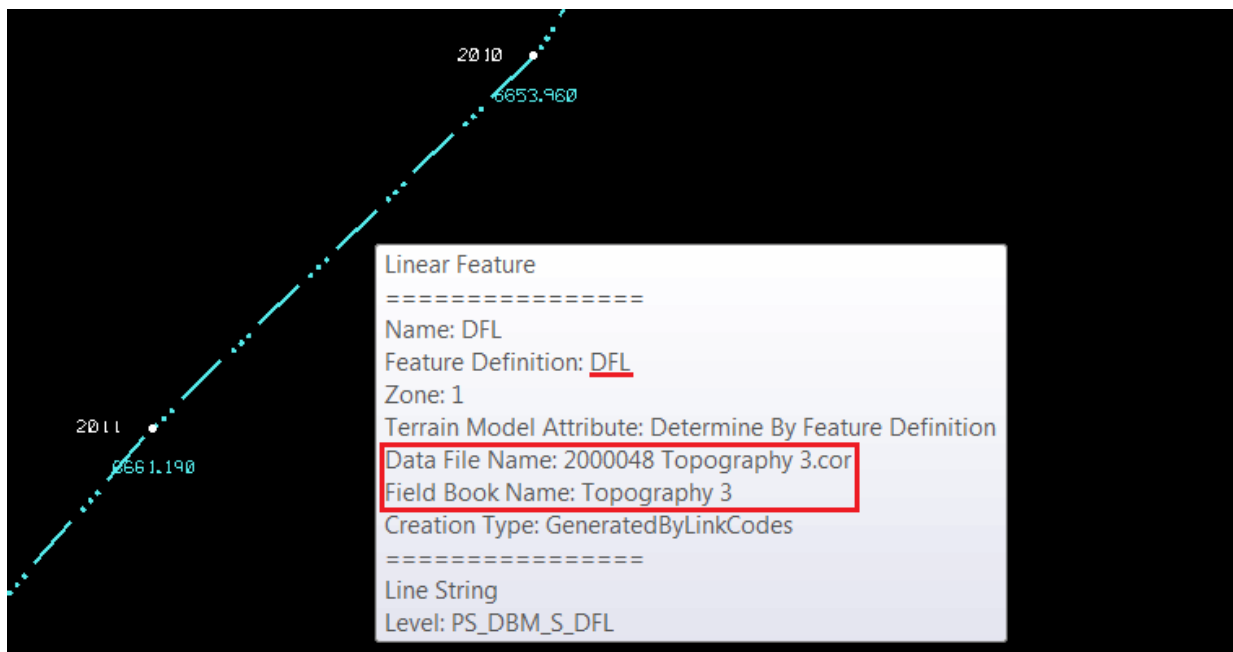
### 3. Mapped Survey Data

Figure 8-40 is a display of a point feature. By hovering over a point, the *Point Feature* window will be displayed. Note the *Name* (point number) and the *Feature Definition* (red underlines).



*Figure 8-40. Point feature.*

Figure 8-41 is a display of a linear feature. By hovering over a line or shape, the *Linear Feature* window will be displayed. Note the *Feature Definition* (red underline) and the *Data File Name* and *Field Book Name* (red box).

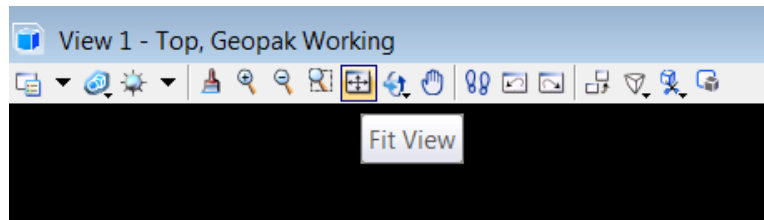


*Figure 8-41. Linear feature.*

## Mapping Survey Data

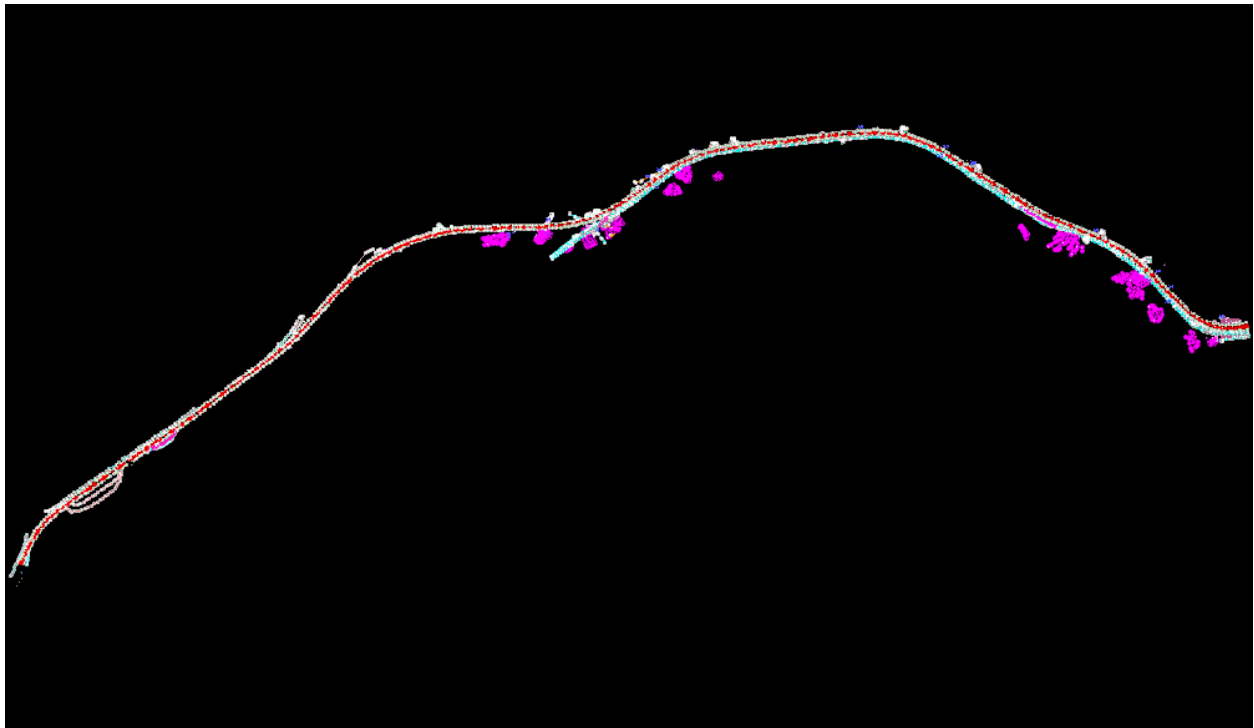
---

Click on the *Fit View* icon.



*Figure 8-42. Fit view.*

Figure 8-43 is a view of all the imported survey files.

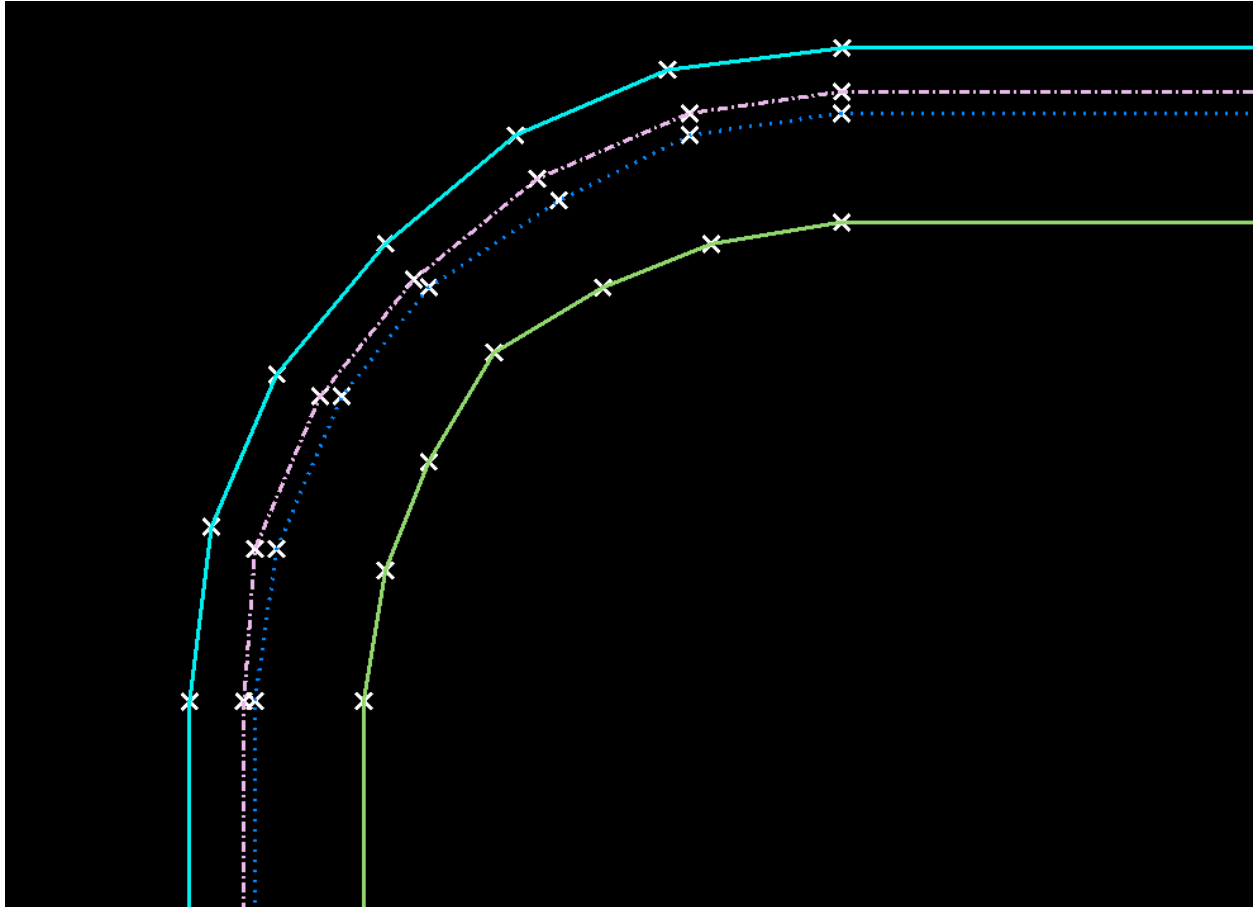


*Figure 8-43. Mapped surveys.*

### E. Reviewing Mapped Data

After the dataset has been visualized, carefully review the survey. Zoom in to view as much detail as needed. Look for points, lines, or shapes that appear to be missing or out of place. Inspect edge of sidewalk, top of curb, curb flow line, and edge of pavement lines especially at intersections where they are mapped around a curve. These features should be collected with enough point density to form parallel lines.

**Note:** The curve fit (CF) control code has been eliminated due to mapping errors. The placement of survey shots around curves should be of sufficient density to accurately define the curve.

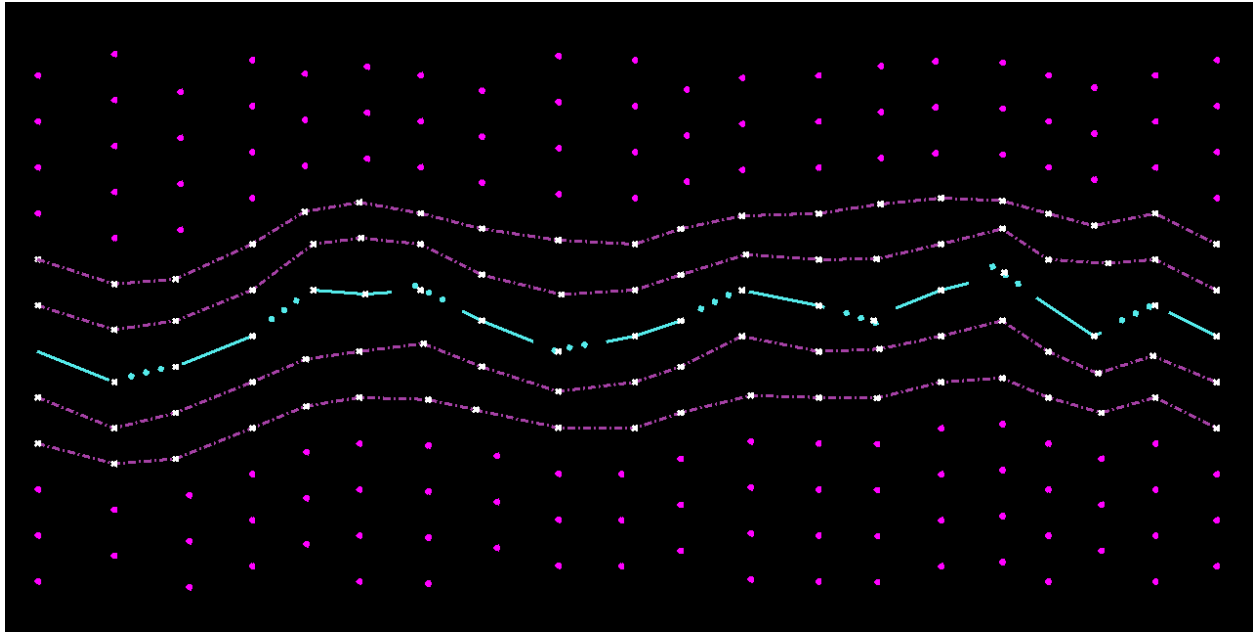


*Figure 8-44. Curve detail.*

## Mapping Survey Data

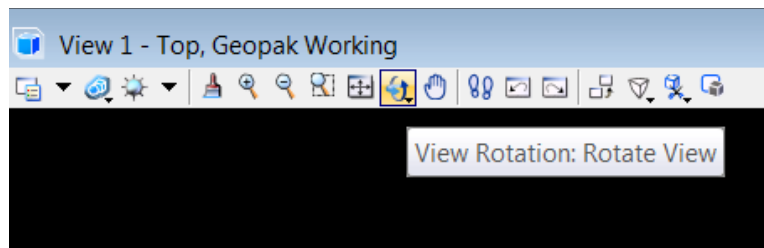
---

Topographic data, especially natural and man-made drainage channels, must also be collected with enough point density to accurately represent the terrain. The drainage area shown in Figure 8-45, includes a drainage flow line, breaklines, and ground shots.



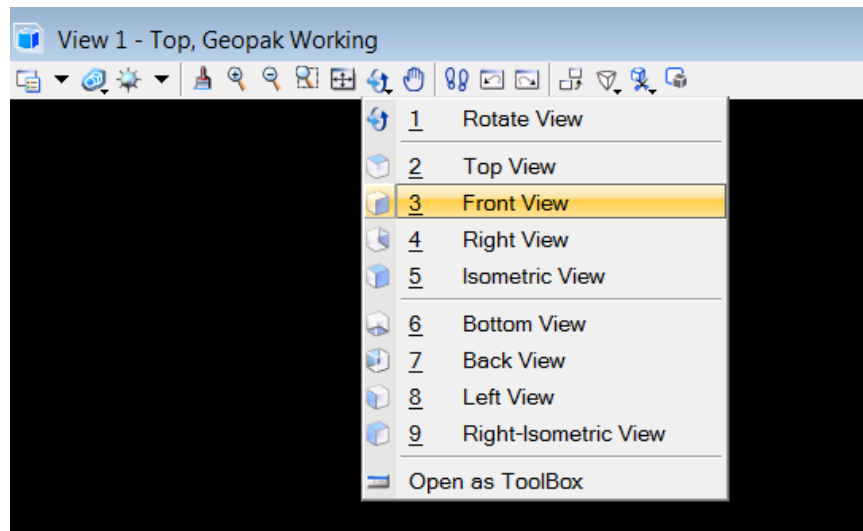
*Figure 8-45. Stream channel.*

The survey data can also be observed when the traditional top view is changed by clicking on the *View Rotation* icon.



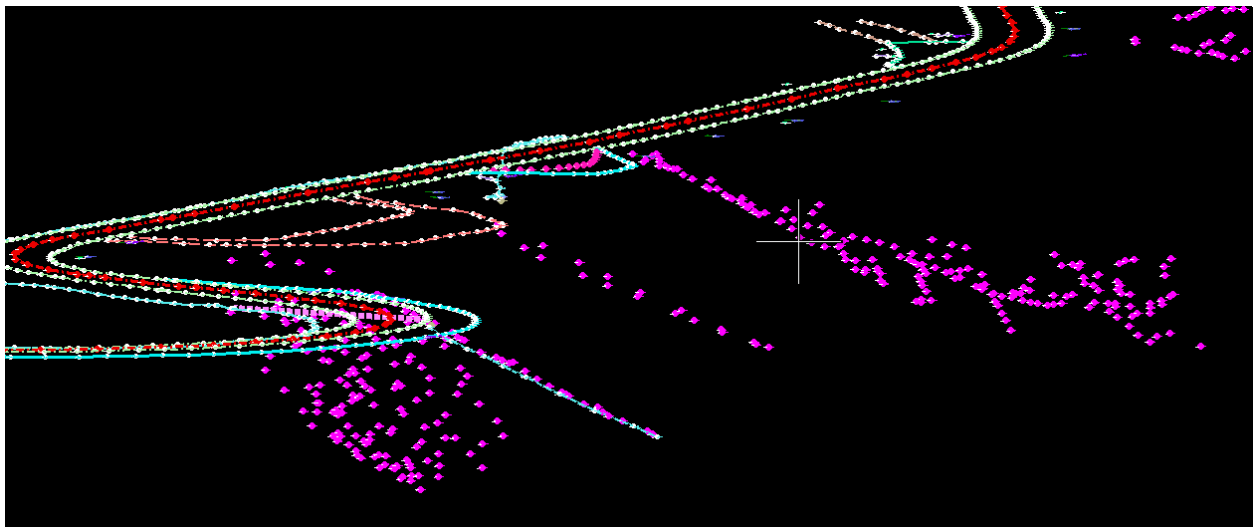
*Figure 8-46. View Rotation.*

There are several tools available to examine the dataset from a different perspective. The *Rotate View*, *Front View*, *Right View*, *Back View*, and *Left View* options may be selected from the *View Rotation* drop down menu.



*Figure 8-47. View rotation options.*

As shown in Figure 8-48 the terrain is sloping down from the roadway. The slope would not be evident if viewed from the top view.



*Figure 8-48. Rotated view.*

## F. Mapping Errors

There are a number of problems that may be encountered when processing a survey file. These errors must be identified and corrected prior to merging the dataset into the final mapping files. These problems include but are not limited to:

- A series of points which are meant to be connected as a line or shape but do not have the appropriate linking codes to map the feature.

## Mapping Survey Data

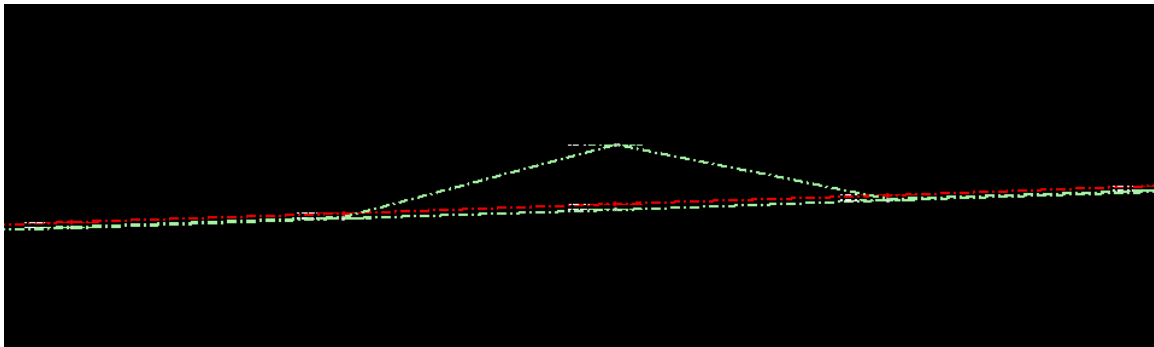
---

- Points that are horizontal or vertical outliers.
- DTM features that cross one another.
- A point, line, or shape collected with an incorrect feature code.
- Attribute responses incorrectly entered or not placed in the survey file.

It is up to the Geopak user to correct these errors by editing the survey data. If the data cannot be corrected, it may be necessary for the surveyor to re-collect all or a portion of the survey.

### 1. Vertical Outliers

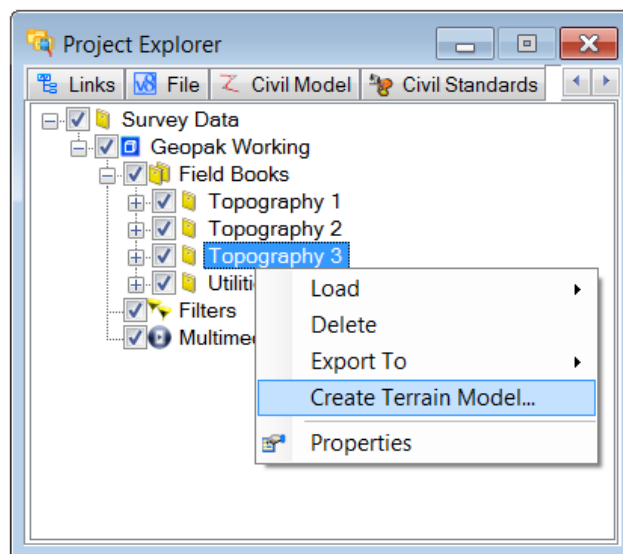
Points or lines which appear to spike above or below the majority of the mapping may be vertical outliers. These types of outliers are typically caused by measurements taken with an incorrect rod height. Figure 8-49 is a front view of the survey data, notice the point in the EPS line that is obviously above the others. In this case, the vertical offset was caused by a rod height error and easily corrected.



*Figure 8-49. Vertical outliers.*

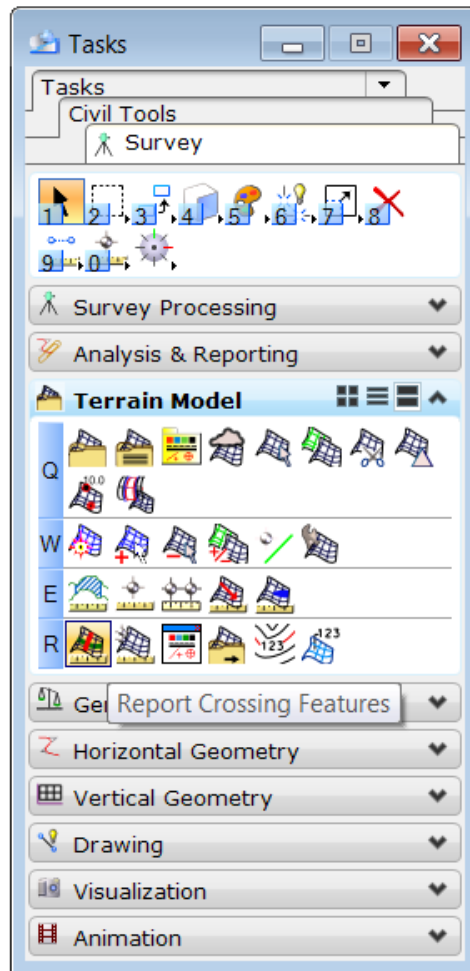
### 2. Crossing Chains

First create a terrain model. Right-click on a field book and select *Create Terrain Model*.



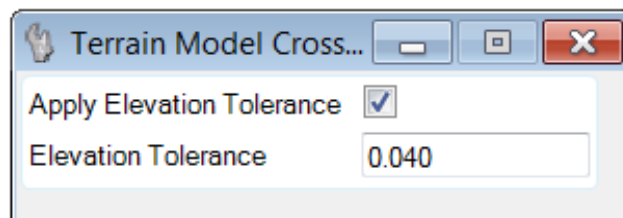
*Figure 8-50. Create terrain model.*

Next, in the *Tasks* tool bar, click on the *Civil Tools* tab, then the *Survey* tab. In the *Terrain Model* toolbox click on the *Report Crossing Features* icon.



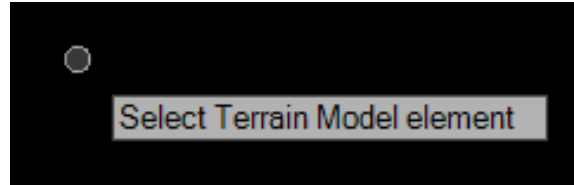
**Figure 8-51. Crossing features.**

In the *Terrain Model Crossing* window, check the *Apply Elevation Tolerance* box and set the tolerance value to "0.040".



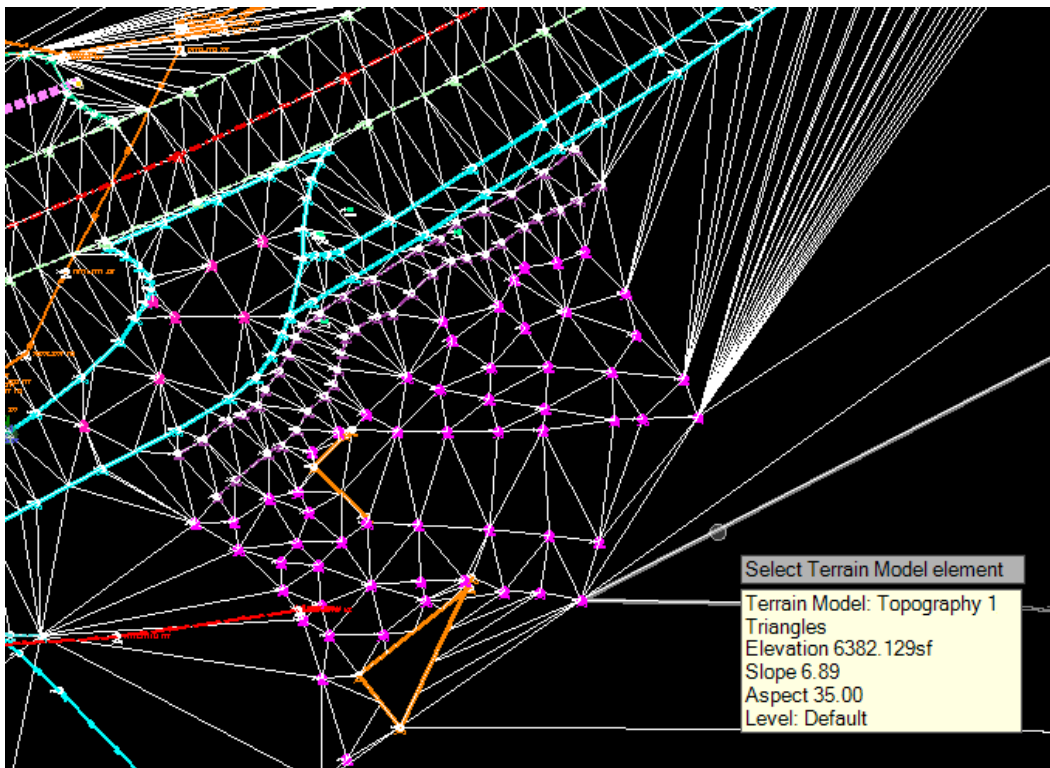
**Figure 8-52. Terrain Model Crossing.**

Attached to the cursor is the message "Select Terrain Model element".



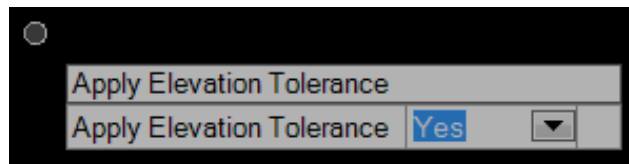
*Figure 8-53. Select Terrain model element.*

With the cursor, click on one of the terrain model triangle legs to begin the crossing chain detection tool.



*Figure 8-54. Select element.*

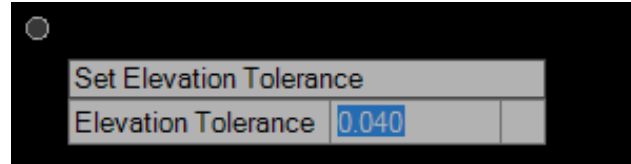
The next message attached to the cursor is "Apply Elevation Tolerance." Left-click with the mouse to accept.



*Figure 8-55. Apply elevation tolerance.*



The next message is "Set Elevation Tolerance." Left-click with the mouse to accept.



*Figure 8-56. Set elevation tolerance.*

When crossing chains are found, the *Terrain Crossing Features Report* will be displayed.

Intersection Point	Elevation On Feature 1	Elevation On Feature 2	Elevation Difference	Feature Type 1	Feature Type 2
2659758.726, 1082694.995	6861.473	6861.412	0.061	Breakline	Breakline
2661228.791, 1082225.640	6808.626	6809.580	0.954	Breakline	Breakline
2661229.379, 1082230.042	6808.641	6809.574	0.933	Breakline	Breakline
2661254.149, 1082779.532	6816.327	6816.431	0.104	Breakline	Breakline
2661549.219, 1083123.963	6810.742	6810.522	0.220	Breakline	Breakline
2663264.400, 1083629.090	6814.759	6824.045	9.286	Breakline	Breakline
2663265.796, 1083616.288	6814.812	6824.416	9.604	Breakline	Breakline
2663267.205, 1083603.373	6814.866	6824.133	9.267	Breakline	Breakline
2663500.759, 1083706.663	6818.962	6821.767	2.805	Breakline	Breakline
2663510.641, 1083725.373	6819.140	6824.519	5.379	Breakline	Breakline
2663520.424, 1083743.895	6824.827	6819.316	5.511	Breakline	Breakline
2663530.308, 1083762.608	6819.494	6824.541	5.047	Breakline	Breakline
2663539.210, 1083779.463	6822.379	6819.654	2.725	Breakline	Breakline
2663680.396, 1083856.049	6819.796	6817.536	2.260	Breakline	Breakline
2663687.615, 1083841.473	6825.062	6817.571	7.491	Breakline	Breakline
2663693.109, 1083830.380	6817.598	6825.335	7.737	Breakline	Breakline

*Figure 8-57. Crossing features report.*

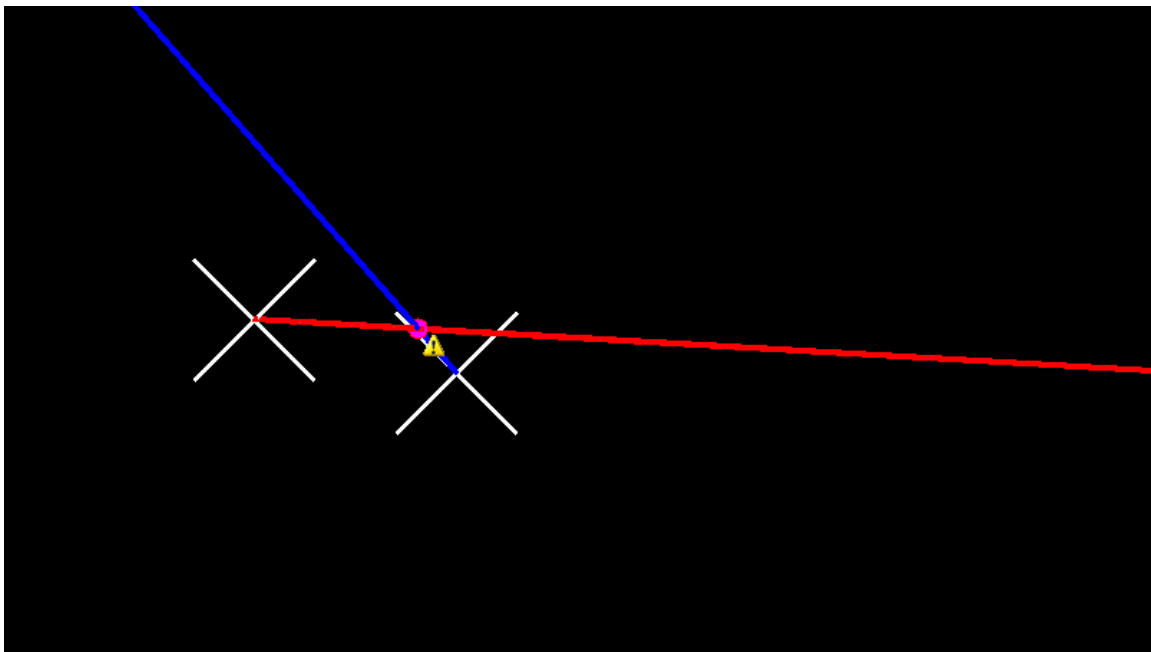
## Mapping Survey Data

Each crossing chain will need to be corrected. Typically, this can be accomplished by deleting one or more individual points in the chain. However, it is imperative that by deleting points the terrain is not misrepresented. All edits should be performed in the measurement file or coordinate file and not in the MicroStation design file. Highlight one of the crossing breaklines and click on the *Zoom To* button.

Intersection Point	Elevation On Feature 1	Elevation On Feature 2	Elevation Difference	Feature Type 1	Feature Type...
2659758.726, 1082694.995	6861.4	6861.412	0.061	Breakline	Breakline
2661228.791, 1082225.640	6808.626	6809.580	0.954	Breakline	Breakline
2661229.379, 1082230.042	6808.641	6809.574	0.933	Breakline	Breakline
2661254.149, 1082779.532	6816.327	6816.431	0.104	Breakline	Breakline
2661549.219, 1083123.963	6810.742	6810.522	0.220	Breakline	Breakline
2663264.400, 1083629.090	6814.759	6824.045	9.286	Breakline	Breakline
2663265.796, 1083616.288	6814.812	6824.416	9.604	Breakline	Breakline
2663267.205, 1083603.373	6814.866	6824.133	9.267	Breakline	Breakline
2663500.759, 1083706.663	6818.962	6821.767	2.805	Breakline	Breakline
2663510.641, 1083725.373	6819.140	6824.519	5.379	Breakline	Breakline
2663520.424, 1083743.895	6824.827	6819.316	5.511	Breakline	Breakline
2663530.308, 1083762.608	6819.494	6824.541	5.047	Breakline	Breakline
2663539.210, 1083779.463	6822.379	6819.654	2.725	Breakline	Breakline
2663680.396, 1083856.049	6819.796	6817.536	2.260	Breakline	Breakline
2663687.615, 1083841.473	6825.062	6817.571	7.491	Breakline	Breakline
2663693.109, 1083830.380	6817.598	6825.335	7.737	Breakline	Breakline

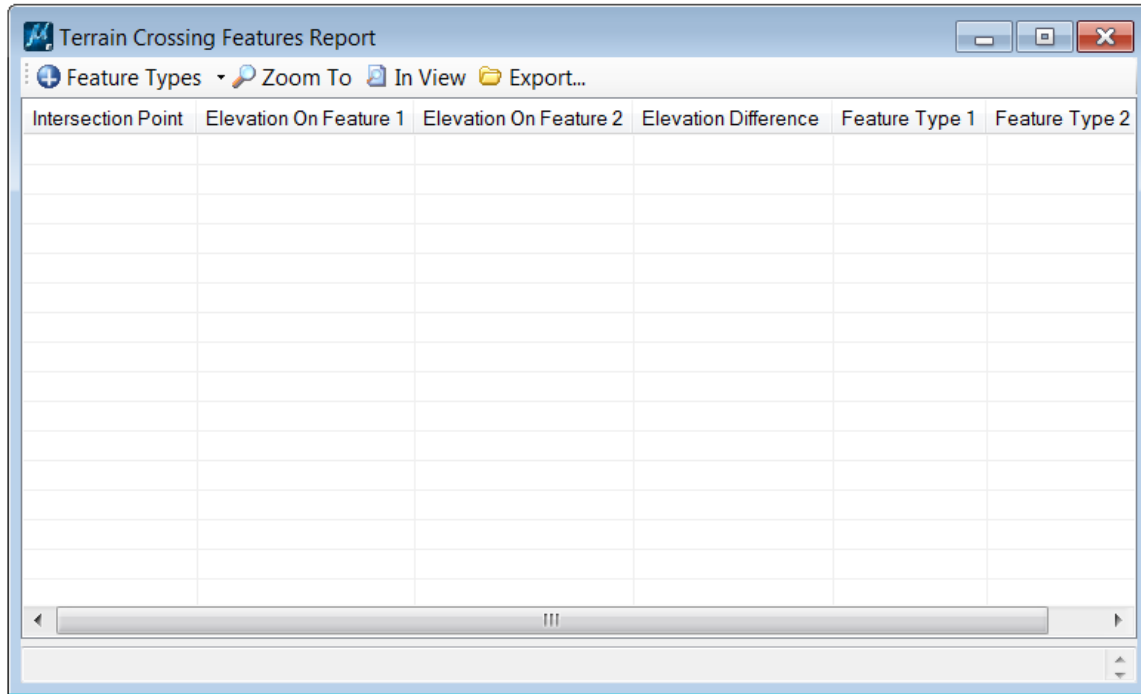
*Figure 8-58. Zoom to crossing.*

The crossing breaklines will be displayed.



*Figure 8-59. Crossing breaklines.*

If there are no crossing chains, the *Terrain Crossing Features Report* will be displayed without any entries.



The screenshot shows a software window titled "Terrain Crossing Features Report". The window has a standard Windows-style title bar with minimize, maximize, and close buttons. Below the title bar is a toolbar with icons for "Feature Types", "Zoom To", "In View", and "Export...". The main area of the window is a table with the following headers: "Intersection Point", "Elevation On Feature 1", "Elevation On Feature 2", "Elevation Difference", "Feature Type 1", and "Feature Type 2". The table is currently empty, with no data rows. At the bottom of the window, there is a horizontal scrollbar and a vertical scrollbar.

Intersection Point	Elevation On Feature 1	Elevation On Feature 2	Elevation Difference	Feature Type 1	Feature Type 2
--------------------	------------------------	------------------------	----------------------	----------------	----------------

*Figure 8-60. No crossing chains.*

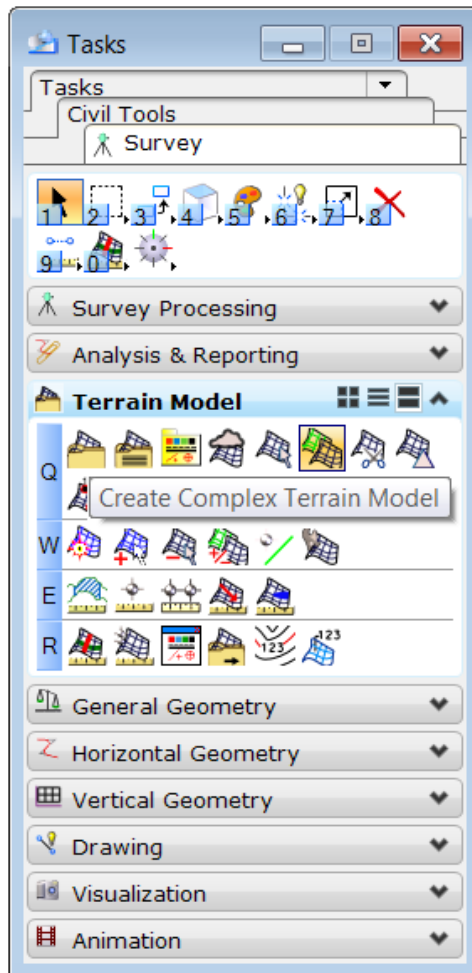
## Mapping Survey Data

---

For projects with multiple field books, combine all of the individual terrain models into a single terrain model. It is then possible to determine if a breakline from one field book crosses a breakline from another field book.

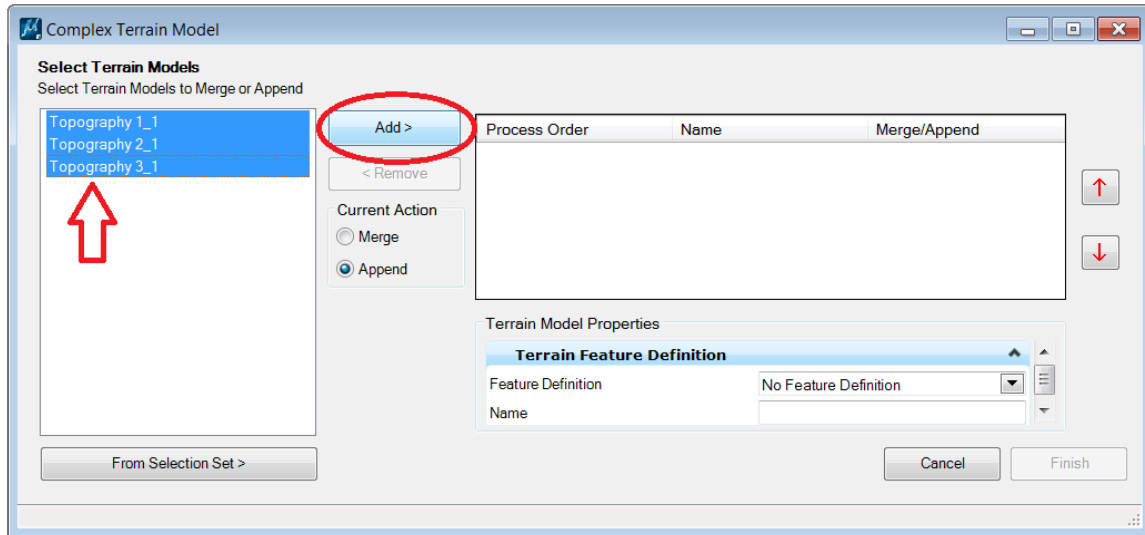
**Note:** Run the *Report Crossing Features* tool for each individual field book and correct any errors prior to combining the terrain models.

In the *Terrain Model* toolbox click on the *Create Complex Terrain Model* icon.



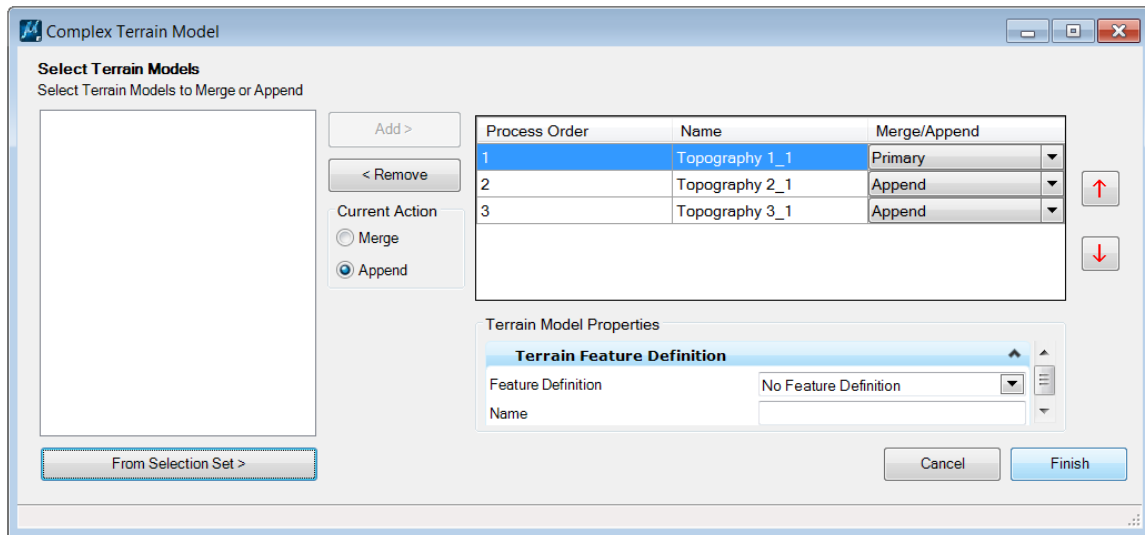
*Figure 8-61. Combine terrain models.*

In the *Complex Terrain Model* window, highlight the field book terrain models (red arrow) and then click on the *Add* button (red oval).



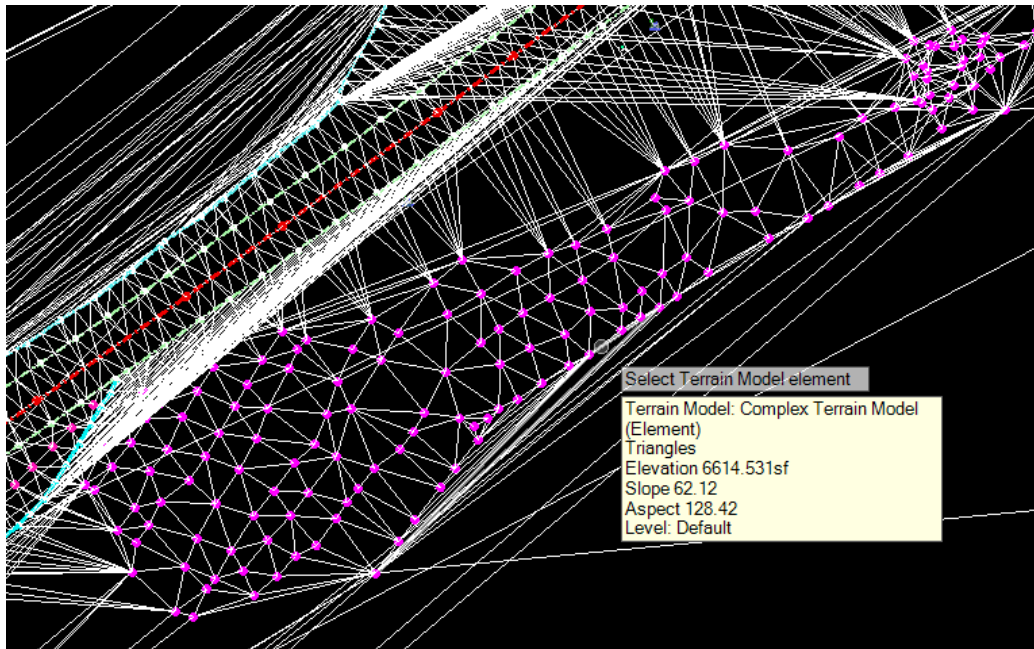
*Figure 8-62. Select terrain models.*

After the terrain models have been added, click on the *Finish* button.



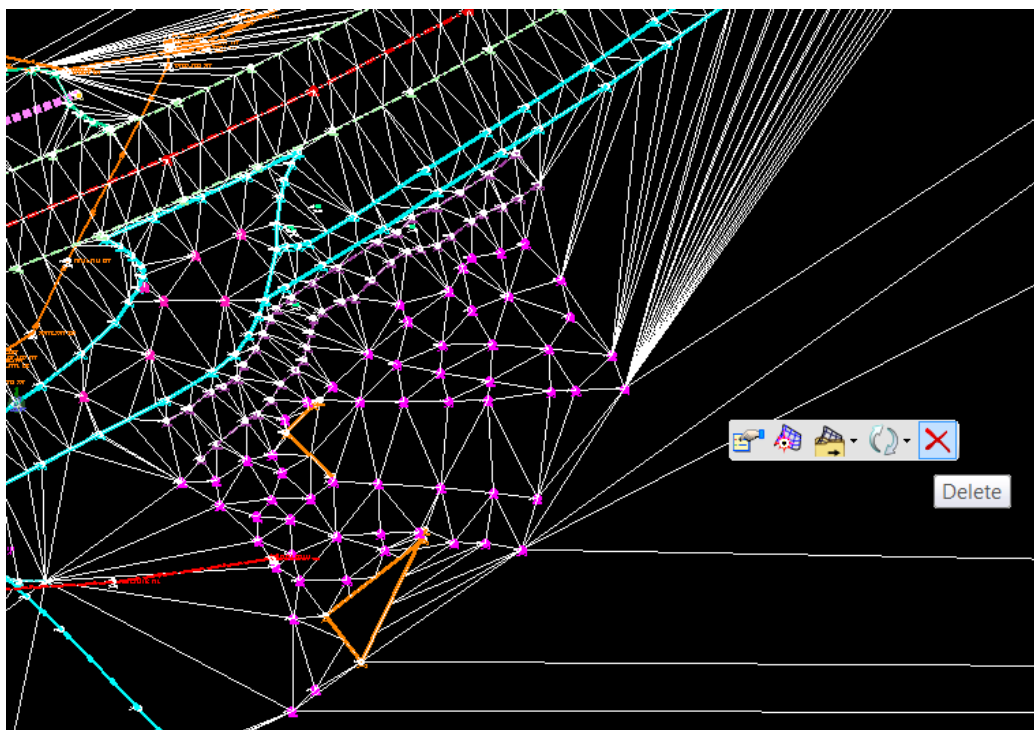
*Figure 8-63. Finish.*

The *Report Crossing Features* tool can now be used to detect crossing breaklines as previously described. Select the *Complex Terrain Model* as shown in Figure 8-64.



*Figure 8-64. Complex terrain model.*

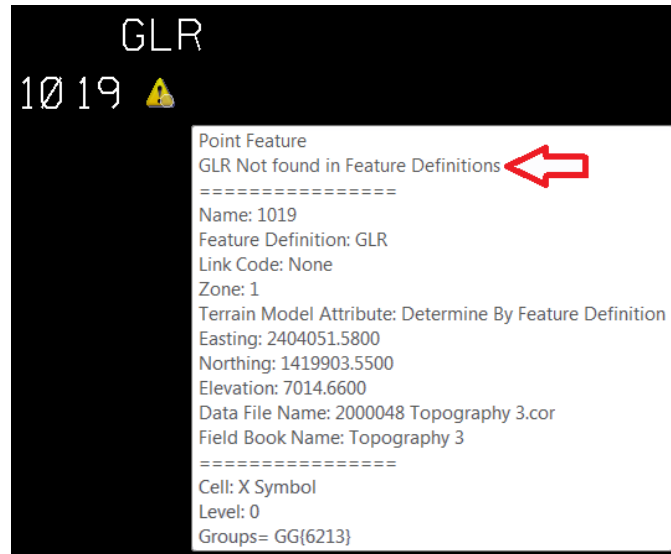
The terrain models can be deleted by using the element selection tool to click on one of the triangles of the model, then click on the *Delete* icon.



*Figure 8-65. Delete terrain model.*

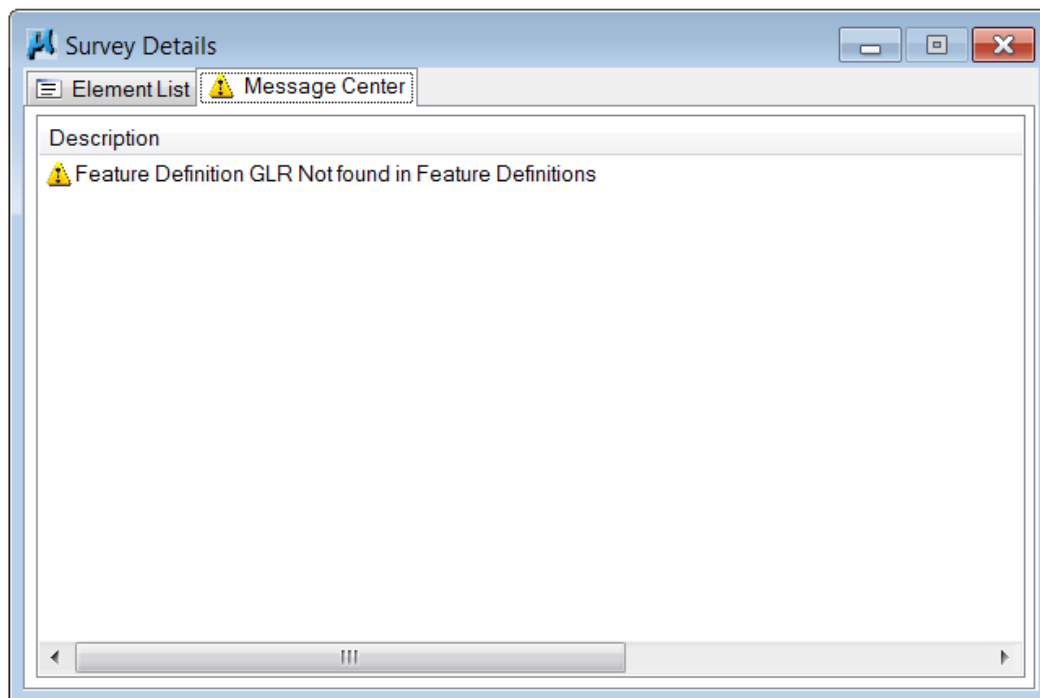
### 3. Unknown Feature Codes

When feature codes in the survey data do not match any of the defined feature codes in the latest feature code library, an "Alert" symbol will be displayed. By hovering over the point, a *Point Feature* window will show the message "GLR Not found in Feature Definitions" (red arrow).



*Figure 8-66. Unknown feature code.*

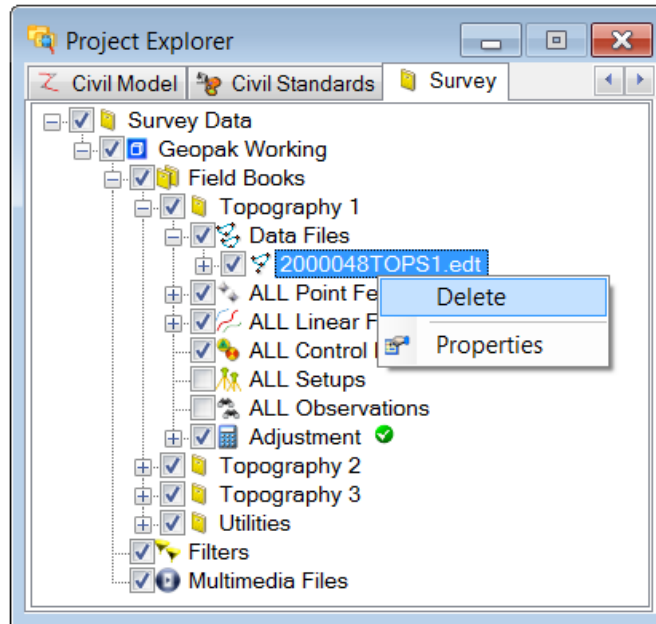
In the *Survey Details* window, click on the *Message Center* tab. The message "Feature Definition GLR Not found in Feature Definitions" is also displayed here.



*Figure 8-67. Message center.*

### G. Correcting Mapping Errors

When corrections to a survey dataset are necessary, the data file will need to be deleted. Click on the data file in the appropriate field book then right-click and select *Delete*. The survey file is then edited and re-loaded into Geopak SS3.



*Figure 8-68. Delete data file.*