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OpenRoads
CONNECT Edition

ORD WORKFLOW

Title	InRoads DTM to ORD Terrain
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ORD Version	10.08.01.33
Overview	
This document will provide guidance on converting an InRoads .DTM into a text file that can be imported into an ORD Survey Field Book to create a Terrain.	

Overview:

This document describes the process for converting the features of an InRoads DTM to an ORD Terrain. The surface features will be converted to field codes with descriptions and attributes on certain field codes. The text file will be imported to an ORD Survey Fieldbook and a terrain created from the Survey Fieldbook. This process can be implemented on projects created in MicroStation V8i/InRoads that need to be updated to ORD.

Required:

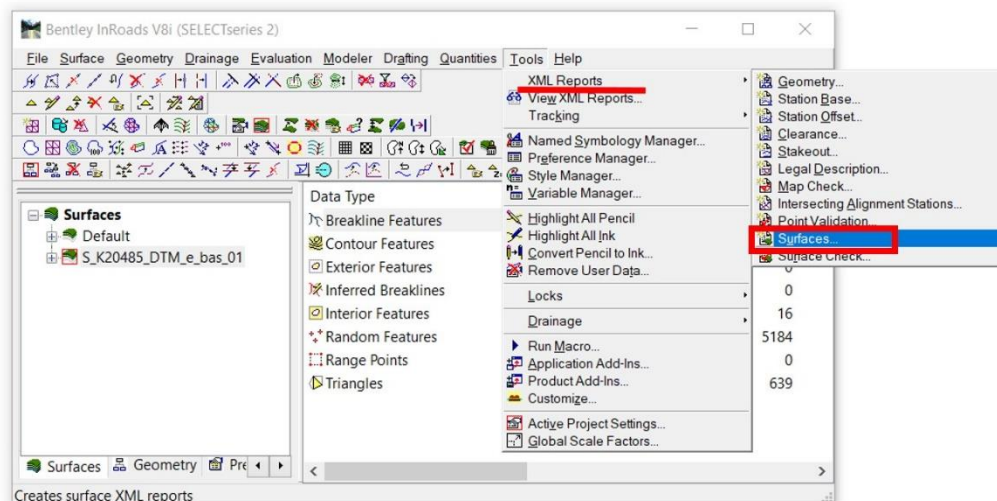
- MicroStation V8i .dgn basemap and corresponding InRoads SS2 .dtm **NOTE:** If you have surface features outside of the exterior boundary that are set to 'Triangulate', break those features at the exterior boundary and change them to 'Do Not Triangulate' prior to starting this process. Also confirm that all features in the .dtm have 'Existing' ..._E features style assigned. If a feature does not have ..._E feature styles assigned the correct field code cannot be determined.

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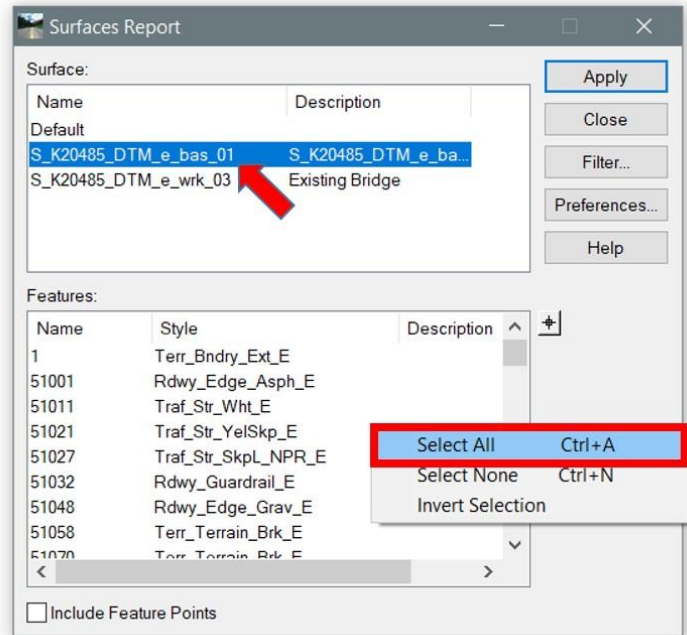
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A. Convert InRoads .DTM to text file

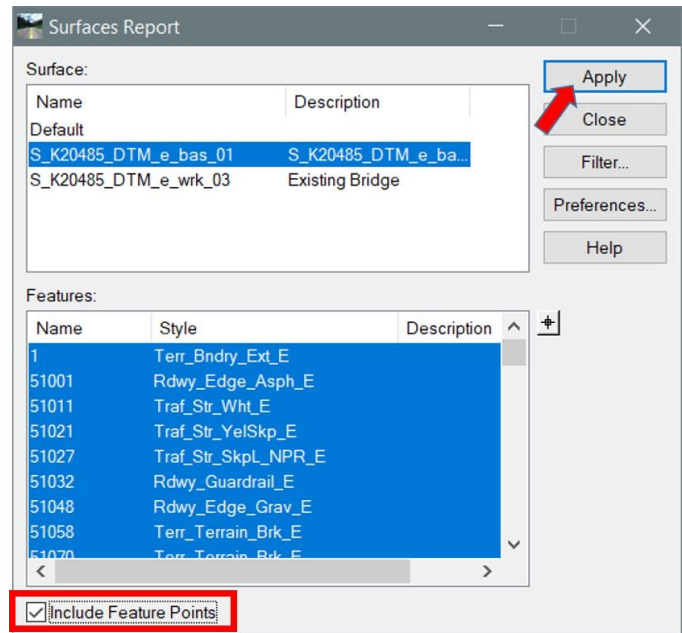
1. In MicroStation V8i/InRoads, open the .DTM file(s) that you want to convert.
2. With the .DTM loaded in InRoads, go to **Tools > XML Reports > Surfaces...** to open the Surfaces Report dialog.



- i. In the 'Surface' box, <D> on the surface that you want to convert.
- ii. In the Features box, **right-press** and "Select All" to select all of the DTM features to convert. If you do not want all of the features to be converted, you can manually select them from the list using Ctrl + <D> on individual feature or use the Filter button.



- iii. **Include Feature Points** should be checked on. If this is not checked, nothing will be included.
- iv. Select **Apply** and the Bentley Civil Report Browser will open.



3. In the Bentley Civil Report Browser, select the **Custom folder > ODOT_DTMtoORD_Export_v1_5.xsl stylesheet**

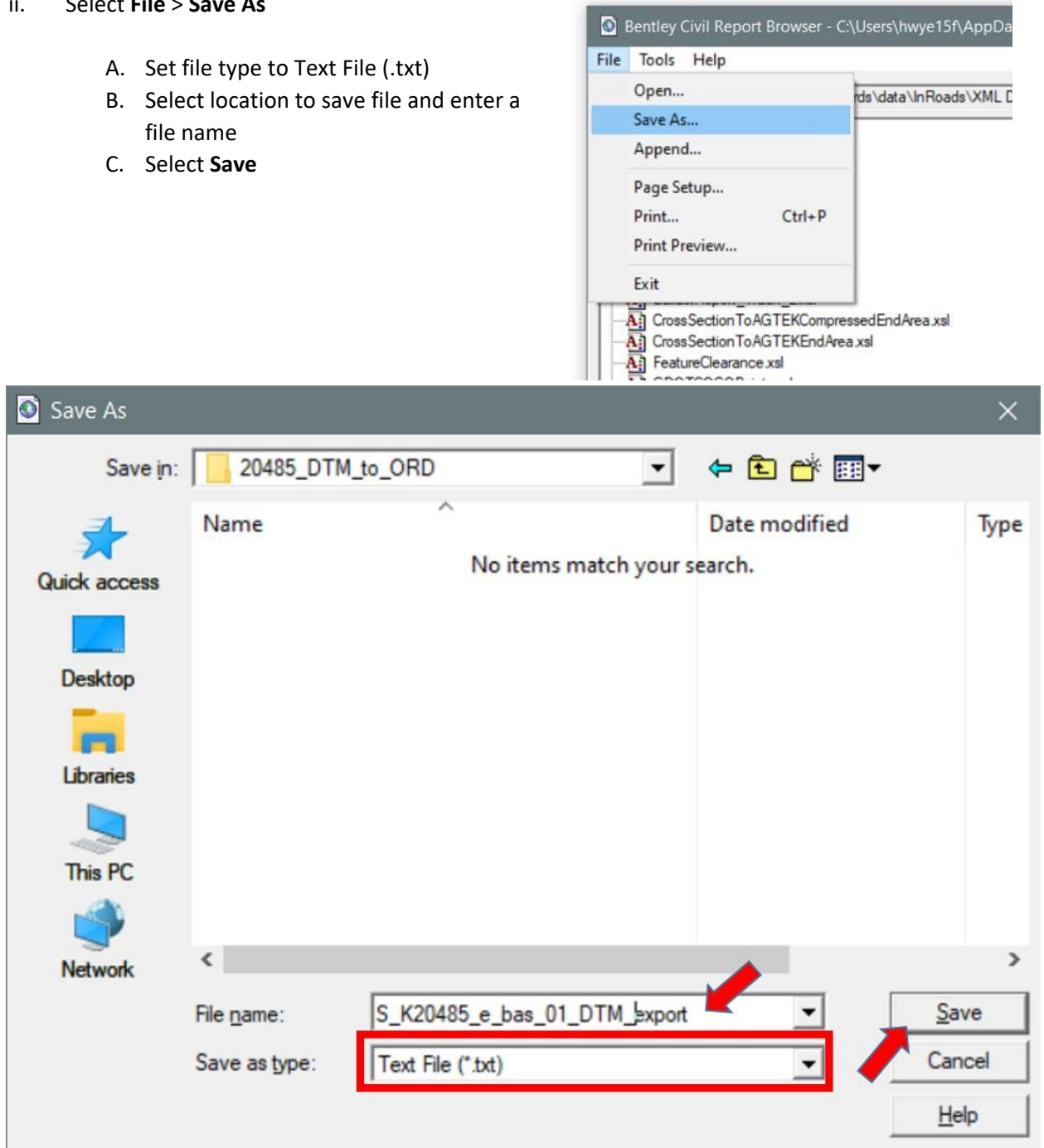
The screenshot shows the Bentley Civil Report Browser interface. The left pane displays a file tree with the 'Custom' folder selected. The right pane shows the preview of the report generated by the selected stylesheet. The preview includes a title, creation date, surface name, and a summary table of exported features.

Count	Feature Type	Count	Description
668	Total Features Exported	1	Features over 100 points
300	Point Features Exported	0	Features over 500 points
368	Linear Features Exported	0	Features over 1000 points

Below the summary table, the preview shows a list of points with their coordinates and descriptions. The header for this list is: Name;North;East;Elev;Code;Triangulate;Description;Att1=Val1;Att2=Val2;Att3=Val3. The list contains 31 points, each with a unique ID and a set of coordinates.

- i. The .DTM features will appear in the preview box to the right. The header in the preview will show the date the text file was created, the active surface name, the number of features exported, and finally the list of points, coordinates, field codes, and descriptions.
 - A. Verify if there are any features that contain more than 5000 vertices. If so, the feature will need to be renamed manually in Excel. This is unlikely to happen, but for example on a very large project (think Rose Quarter or OR217) the exterior boundary can have 4000+ vertices. Contact the author of this document or another person at Geometronics for assistance.

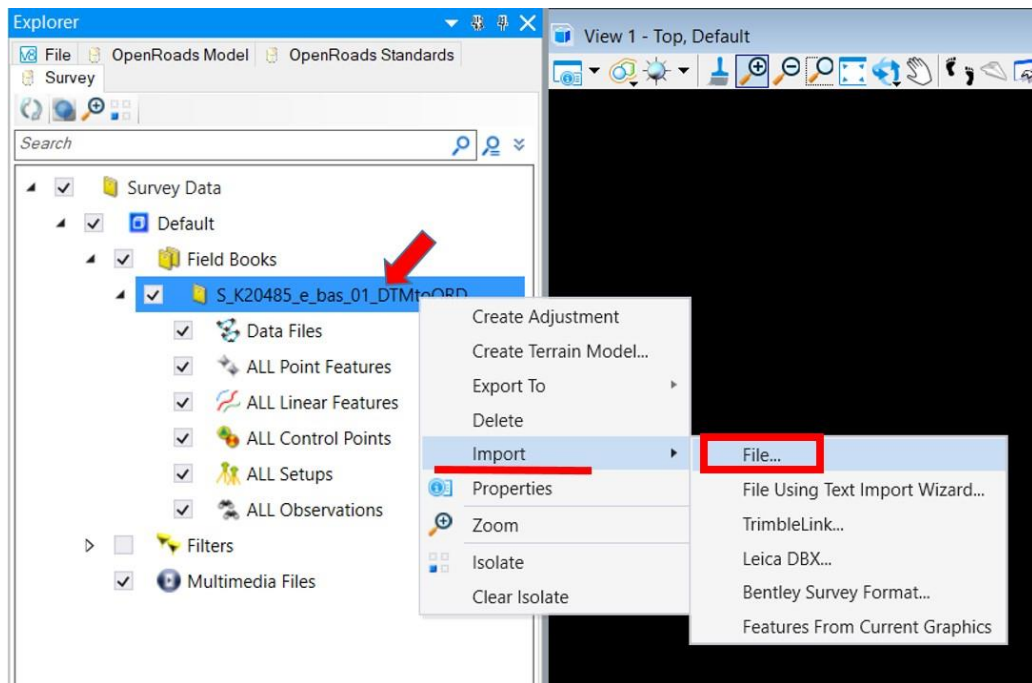
- ii. Select **File > Save As**
 - A. Set file type to Text File (.txt)
 - B. Select location to save file and enter a file name
 - C. Select **Save**



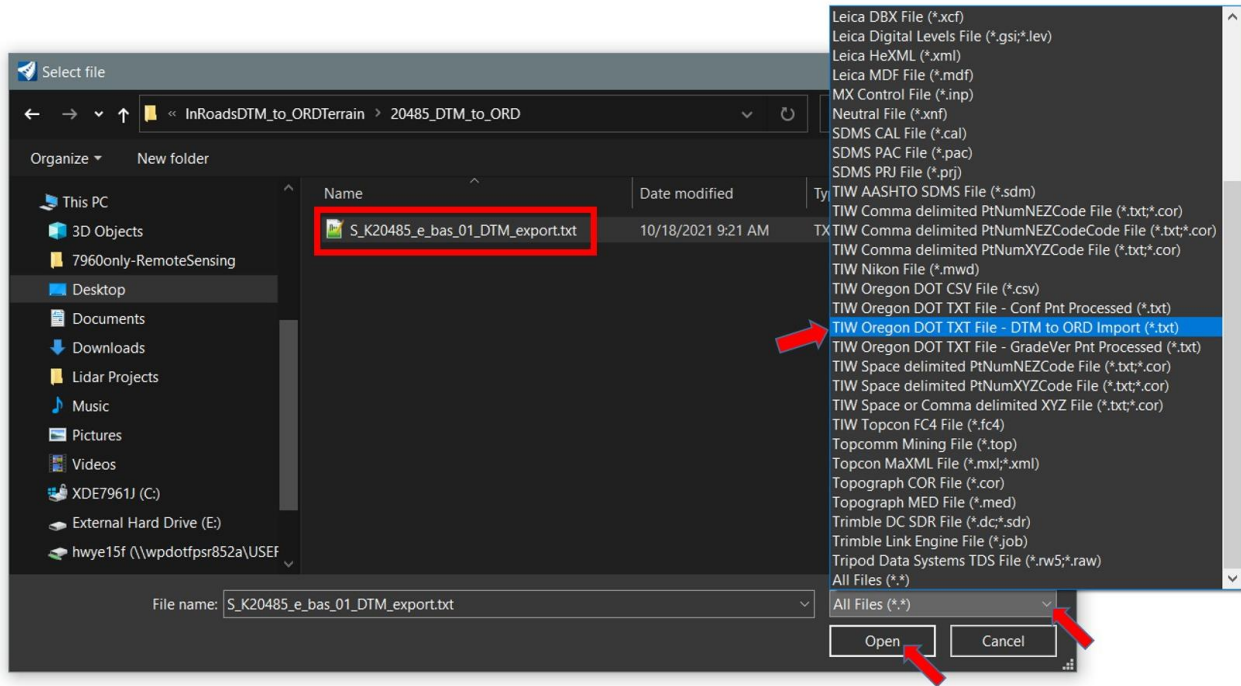
4. If you have other .DTM files to convert and they are loaded, you can select a different surface in the Surfaces Report dialog starting with step 2.i. and following. If you do not have other surfaces to convert, exit InRoads and MicroStation V8i.
5. Attribute Pairs and Descriptions can be edited in either the text file or the Survey Details after importing into the ORD Survey Field Book. Search/Replace in Notepad++ can be used to make edits if you choose to do it before importing. See Page 13, Step C.3., for information on Attribute Pairs.

B. Import .DTM Text File to ORD Survey Fieldbook and Create Terrain

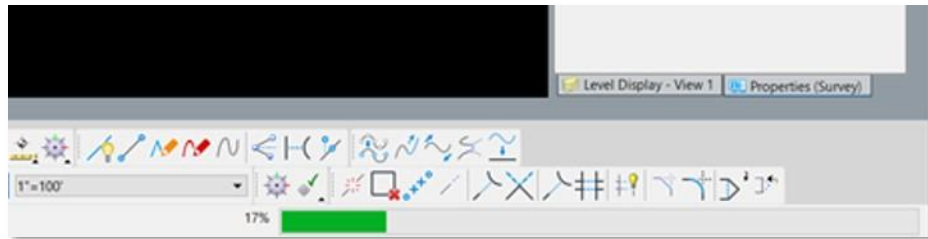
1. Create and open a new ORD file using the *Seed3d.dgn* seed file
 - i. If working in ProjectWise (PW), this will be the *S_K#####_TERR_e_wrk_###.dgn* file.
2. Create a new Survey Fieldbook
 - i. Name the Fieldbook so it is clear that this data is from an InRoads DTM. Example file name may be “*S_K#####_DTM_e_bas_##_DTMtoORD.*”
3. Import DTM text file into the ORD Survey Field Book
 - i. **<R>** on the Field Book name > **Import > File** ****NOTE:** **<R>** on the Field Book name skips the step of locating the Field Book.



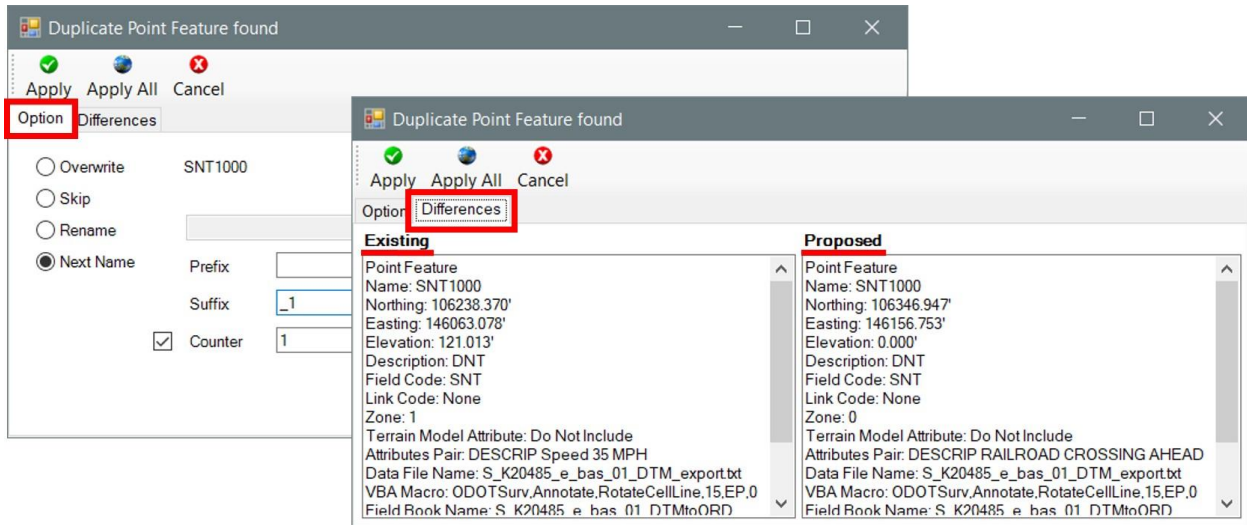
- ii. In the file type dropdown, select '*TIW Oregon DOT TXT File – DTM to ORD Import (*.txt)*'
- iii. Navigate to the text file saved in A.3.ii, **<D>** on the text file to import and select Open.



- iv. A green progress bar will appear in the lower right of your MicroStation window showing that the text file is importing. If the progress bar stops, there is likely a duplicate point feature and you will get a 'Duplicate Point Feature found' dialog box.

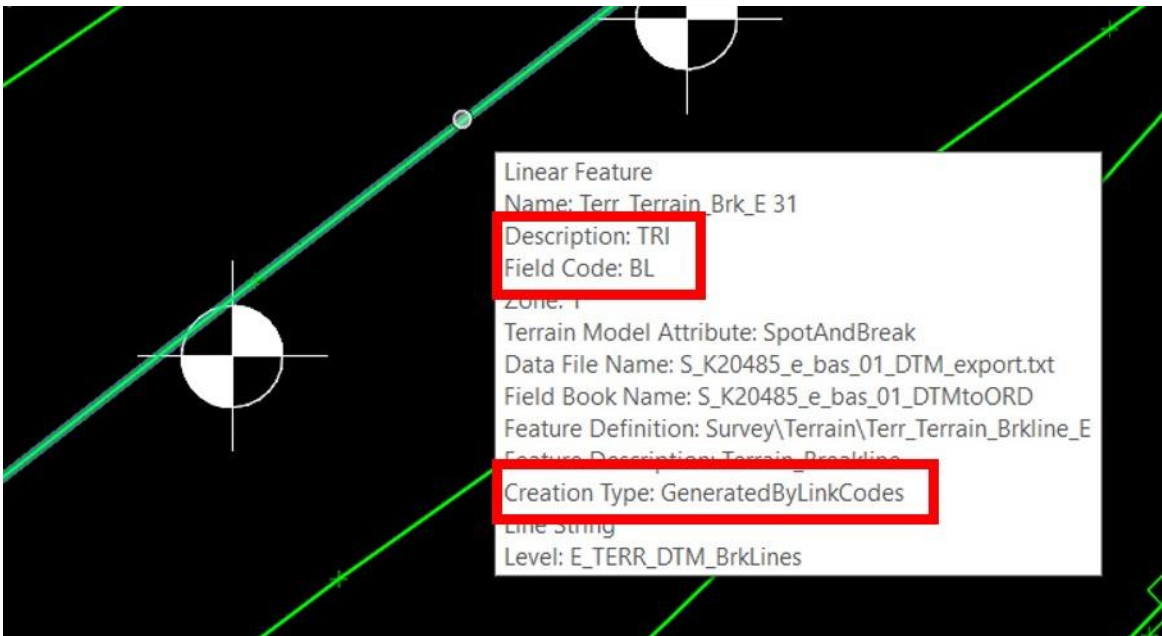


- A. If you have a duplicate point feature in your file it should be verified if the point needs to be kept or removed. In the **Differences** tab of the Duplicate Point Feature dialog verify the coordinates of the existing and proposed duplicate features and look at any other attributes that will clarify if these are two different features.
- B. Back in the **Option** tab choose the option to either keep the existing feature or rename/next name the proposed duplicate feature.



- C. Select Apply when you have selected the relevant options.
- D. The duplicate point feature dialog will appear for each duplicate point name. If you have a large number of duplicate points you should consider going back to either the exported DTM text file or InRoads and fixing the point names there.
- v. The DTM features will be imported into the ORD Survey Field Book as dynamic link features with the assigned DTM feature style converted to field codes as shown in the image below.

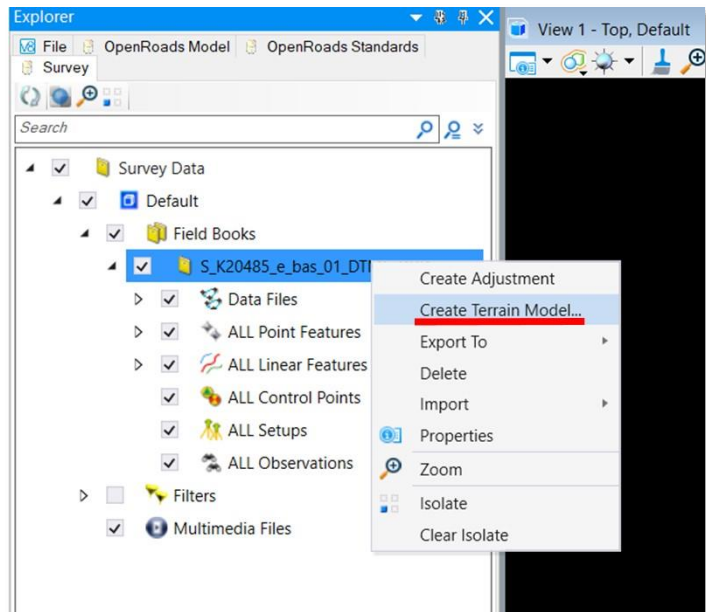
****NOTE:** If the .dtm had features that were not on the ..._E feature styles, the correct field code will not be assigned. ORD will assign the prior features field code to the feature.



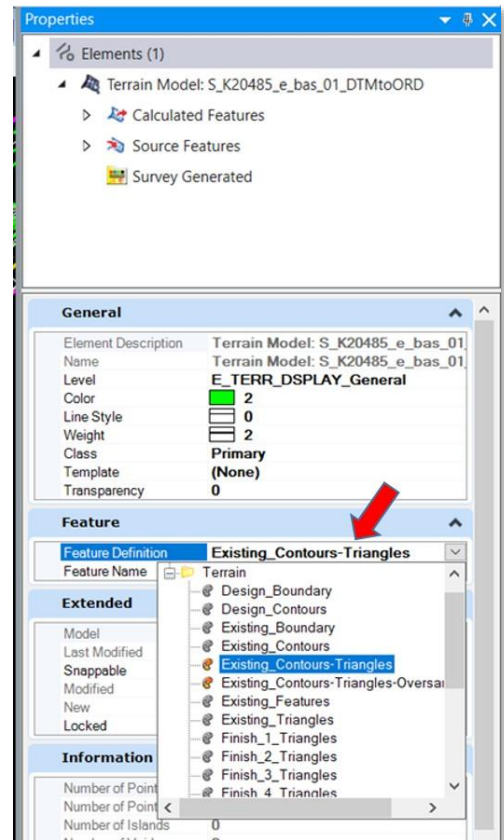
4. Create a Terrain from the Survey Field Book data. ****NOTE:** The Field Book and Terrain are linked and will dynamically update when edits to the Field Book are made. If your Field Book contains a large number of points this step should be completed after editing the features.

If you experience significant delays while editing, delete the terrain and re-create it after making edits to the Field Book.

- i. In the Explorer dialog, <R> on Fieldbook name > **Create Terrain Model**. The Terrain will be created with No Feature Definition



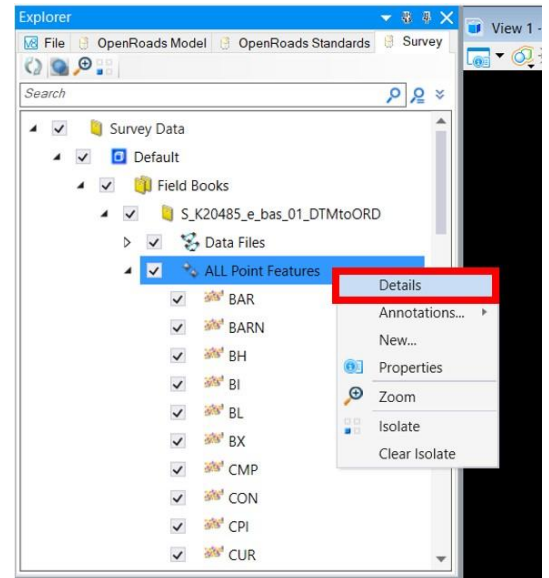
- ii. Assign a Feature Definition to the Terrain by selecting a triangle (which selects the Terrain) and in the Properties dialog > Feature group > Feature Definition > set to Existing_Triangles or Existing_Contours-Triangles



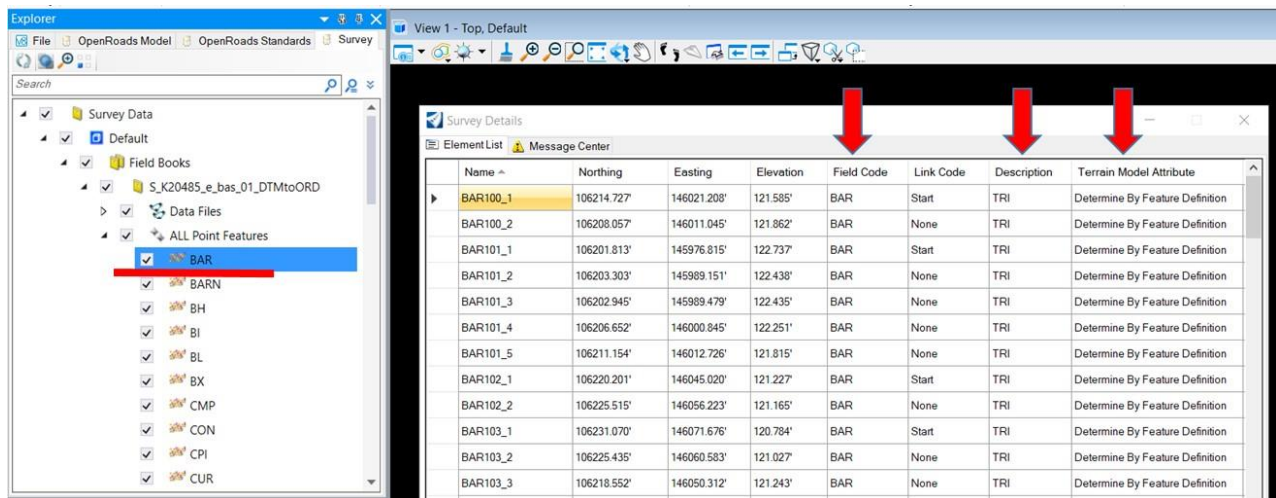
C. Edit Features

1. In the Explorer dialog, verify that there are no codes labeled DEFAULT and/or colored red. This is easiest to find by expanding All Point Features and/or All Linear Features dropdowns. Unless changes were made in the DTM text file after exporting from InRoads this is unlikely to be an issue.
2. Verify triangulation status of features

- i. **<R>** on **ALL Point Features > Details** to open the Survey Details dialog
- ii. In the Description column of the Survey Details, there will be a **“DNT”** or a **“TRI”**. This value comes from the triangulation status of the feature in InRoads. Many InRoads feature styles were often mixed up and the Exclude from Triangulation was simply checked or unchecked without actually changing the surface feature style. Some example field codes that often were confused and may need changed are the following (this list is not exhaustive): **GR/GRB, BAR/BARN, GLN/GBL, FEN/FNB**



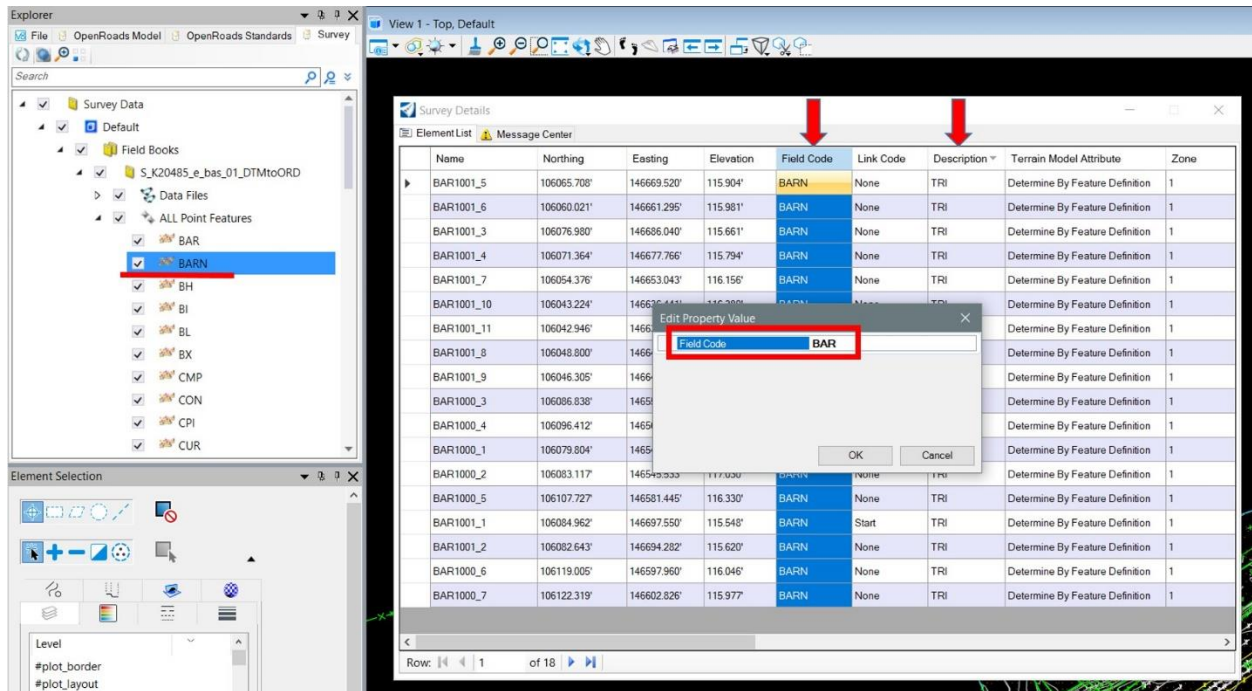
- iii. **<D>** on the first field code in the **“All Point Features”** dropdown to isolate those point features in the Survey Details dialog



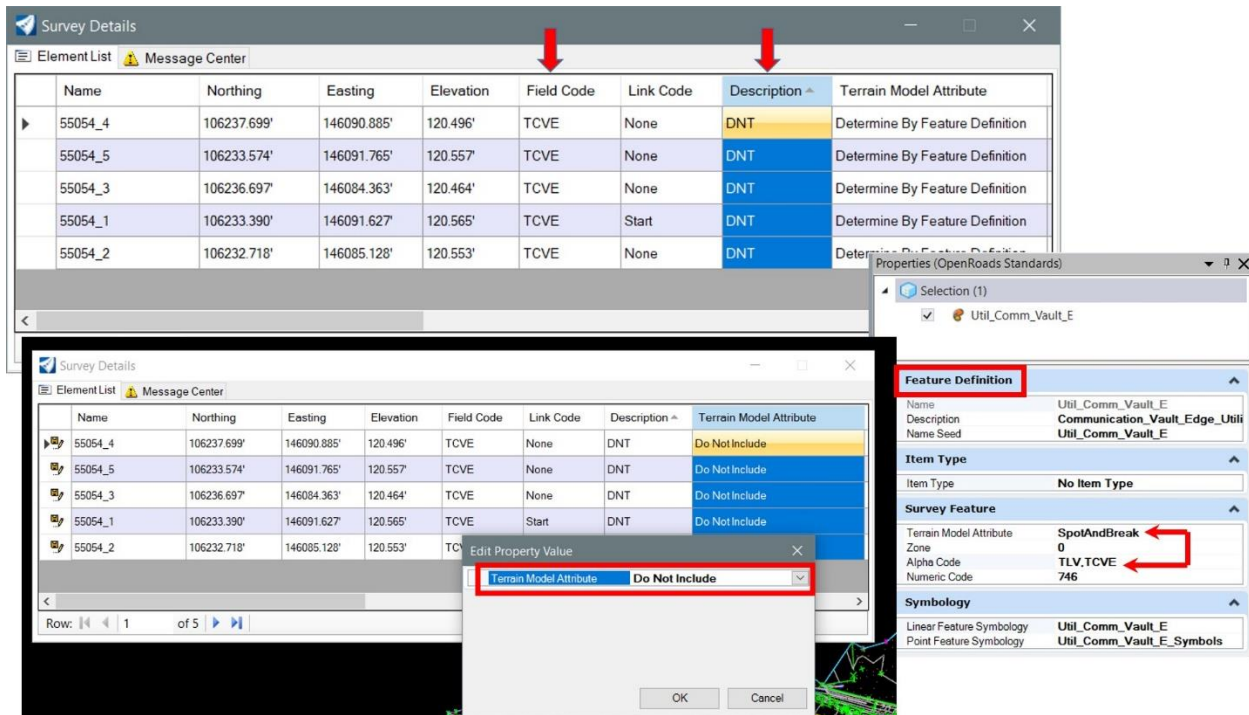
- iv. Compare the Description of **“TRI”** or **“DNT”** to the Field Code and Terrain Model Attribute. If they match then no changes are needed. If they don't match, change the field code first,

if possible. If there is not a field code with a corresponding terrain model attribute, then change the Terrain Model Attribute to the correct triangulation status

EXAMPLE: in the image below I have 18 points that imported with a BARN (Barrier, Do Not Triangulate) field code and “TRI” in the description field (they were set to triangulate in the InRoads DTM). For these 18 points the Field Code needs to be changed to BAR (Barrier, triangulate) to make them triangulatable in the ORD Terrain. Since the Terrain Model Attribute is set to ‘Determine By Feature Definition’ the BAR points will automatically be triangulatable (as set in the ODOT standard feature definition) and it is not necessary to modify the Terrain Model Attribute.

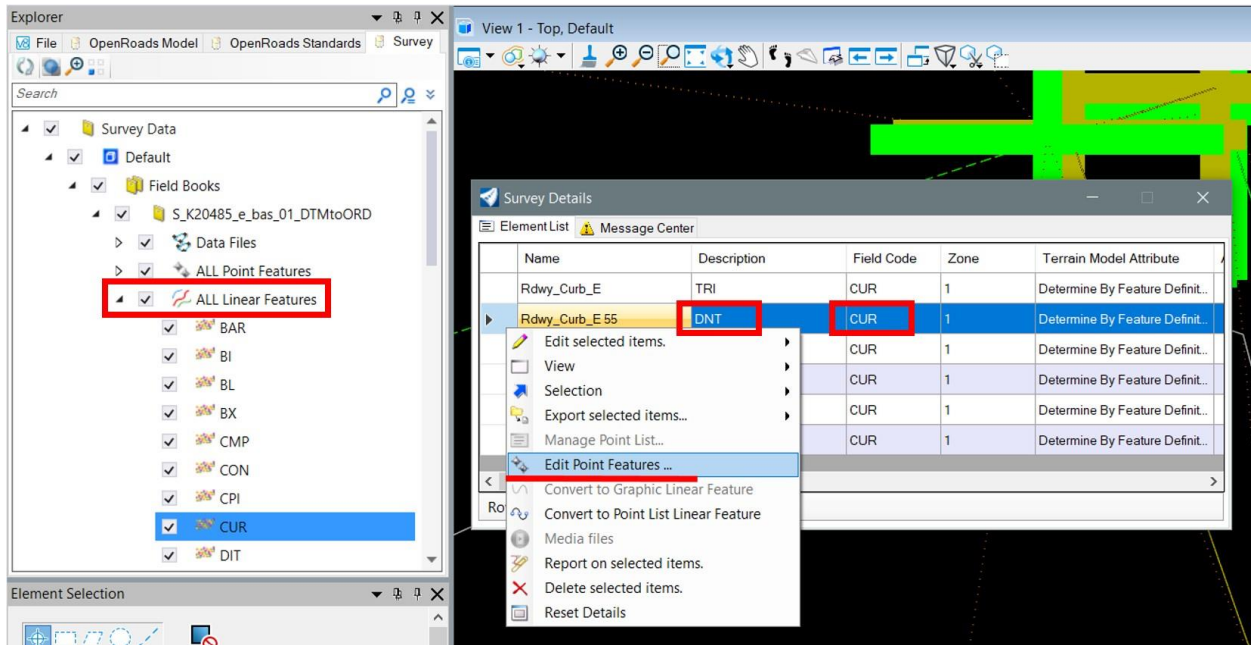


In the next image, there are 5 points with a field code of TCVE (Communication Vault). The Terrain Model Attribute for TCVE is set to ‘SpotAndBreak’, which means it is a triangulatable feature. There is not a field code for making this non-triangulatable so the Terrain Model Attribute needs to be set to ‘Do Not Include’.

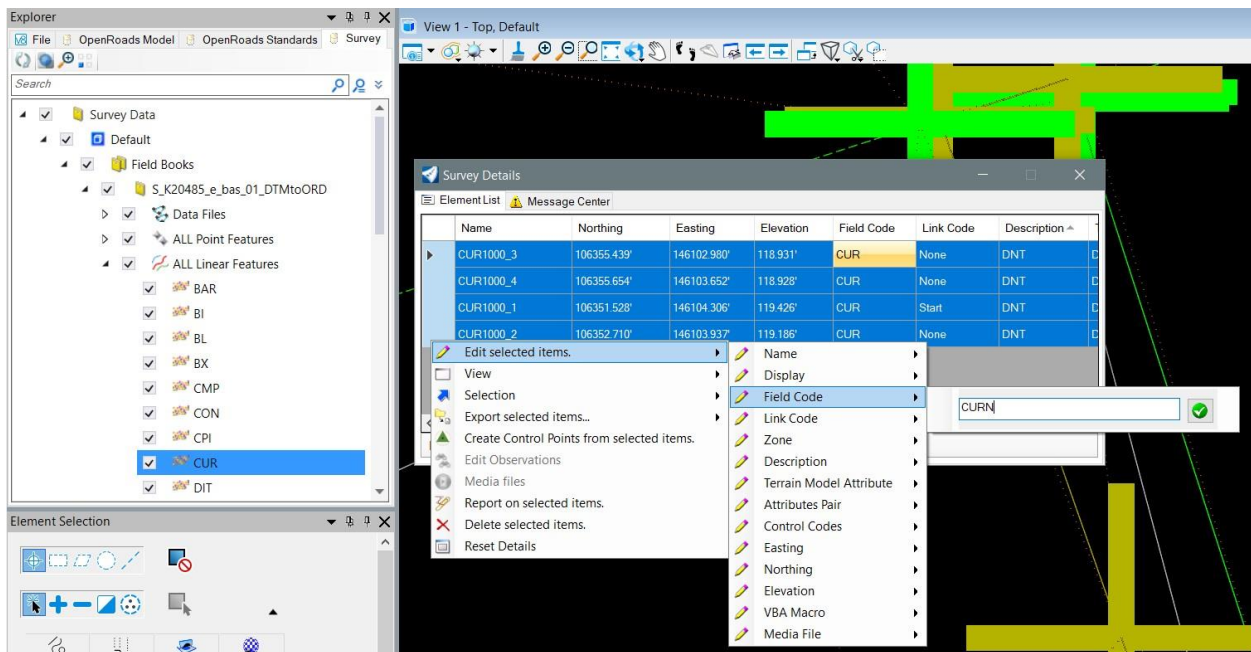


NOTE: In Appendix A, Section F, of the OpenRoads Survey training manual there is a table showing the Field Codes and their triangulation setting in ORD.

- v. Continue checking each Field Code under “All Point Features” and modifying as needed. As you modify the point features the corresponding linear features will automatically update since the imported features are dynamic link features.
- vi. With the Survey Details dialog still open, confirm the linear features by expanding the “All Linear Features” dropdown and checking each linear feature, comparing the Description of “TRI” or “DNT” with the Field Code. If you have correctly updated the point features, the linear features should be correct. This will act as a double check.
- vii. If changes are needed to a linear feature, you must make changes to the points that make up that linear feature since they are dynamic link features.
 - A. In the Survey Details dialog, **<D>** in the left most column of the linear feature that you want to change to select it.
 - B. With the linear feature selected, **<R>** and select **Edit Point Features...** to open the points that make up that linear feature.



C. Modify the point features as described in Step C.2.4. above.



- D. Continue checking the remaining linear features making changes as needed.
- viii. If you have features that are outside of the exterior boundary that are set to triangulate, change the Terrain Model Attribute of these features to 'Do Not Include'. ****NOTE:** This is easier to do in InRoads and should be done prior to importing into ORD per the **REQUIRED section on Page 1** of this document.

- Edit Attribute Pairs** – certain features have attribute pairs assigned when the DTM data is exported to a text file. The field codes with attribute pairs assigned to the text file include utilities, pipes, signs, fences, and trees. The input for the attribute pair values comes from the description field that was manually input to the InRoads surface feature. Typically we were inconsistent with our description inputs, so to use the attribute pairs correctly they will likely need to be edited manually. See the image below for an example of CMP pipe diameters that were in the description field in InRoads and will need edited in the ORD Survey Details dialog. **NOTE:** If the surface feature did not have a value in the Description field, the second Attribute Name will not be imported because it is empty.

Name	Northing	Easting	Elevation	Field Code	Link Code	Description	Attributes Pair
60603_1	106086.565'	146785.682'	112.563'	CMP	Start	DNT	DIAMINCH X TYPE 8" CMP
60603_2	106052.143'	146747.124'	134.753'	CMP	None	DNT	DIAMINCH X TYPE 8" CMP
60551_2	106024.867'	146387.314'	118.458'	CMP	None	DNT	DIAMINCH X TYPE 12" CMP
60531_2	106117.380'	146493.662'	133.978'	CMP	None	DNT	DIAMINCH X TYPE 8" CMP
60551_1	106059.473'	146387.966'	118.500'	CMP	Start	DNT	DIAMINCH 12 TYPE CMP
60621_1	106258.608'	146248.141'	116.645'	CMP	Start	DNT	DIAMINCH X TYPE 18" CMP
60676_1	106137.833'	146521.830'	134.336'	CMP	Start	DNT	DIAMINCH X TYPE 8"+/- CMP shot at aprox.f...
60676_2	106149.174'	146527.048'	134.336'	CMP	None	DNT	DIAMINCH X TYPE 8"+/- CMP shot at aprox.f...
60623_2	106196.086'	146082.808'	117.059'	CMP	None	DNT	DIAMINCH X TYPE 8" CMP #60623 shot at fl...

- Edit VBA Macros** – certain field codes will have VBA macros assigned upon importing based on the ODOT standard settings. These features will need to be checked for proper rotation and adjusted if needed. Using a VBA Macro is the only way to rotate features in the ORD Survey field book. See the image below for an example of the VBA macros assigned to the INL field code on import.

Name	Northing	Easting	Elevation	Field Code	Link Code	Description	VBA Macro
60673	106117.642'	146493.659'	136.480'	INL	None	DNT 1.7 X 1.2' SIN...	ODOTSurv.Annotate.RotateCellLine.5.GUT.0
60672	106137.192'	146522.136'	136.945'	INL	None	DNT 1.7 X 1.2' SIN...	ODOTSurv.Annotate.RotateCellLine.5.GUT.0
60675	106051.643'	146746.987'	136.576'	INL	None	DNT 1.7 X 1.2' SIN...	ODOTSurv.Annotate.RotateCellLine.5.GUT.0
60674	106030.988'	146716.653'	137.085'	INL	None	DNT 1.7 X 1.2' SIN...	ODOTSurv.Annotate.RotateCellLine.5.GUT.0
60616	106363.330'	146146.571'	118.577'	INL	None	DNT CURB INLET	ODOTSurv.Annotate.RotateCellLine.5.GUT.0
60615	106350.102'	146103.716'	118.758'	INL	None	DNT CURB INLET	ODOTSurv.Annotate.RotateCellLine.5.GUT.0
60618	106369.252'	146216.704'	113.770'	INL	None	DNT DITCH INLET...	ODOTSurv.Annotate.RotateCellLine.5.GUT.0
60617	106369.094'	146214.381'	114.895'	INL	None	DNT DITCH INLET...	ODOTSurv.Annotate.RotateCellLine.5.GUT.0

For assistance with editing, see the OpenRoads Survey training manual or contact Geometronics.

D. QC and Finalize for Delivery

1. Make the final quality checks when you are finished editing the features. If you created a Terrain in step B.4. above, delete it and recreate it. Recreating the Terrain ensures you have the latest triangulation if you made changes to any field book features.
2. Reference the V8i basemap file to the ORD Terrain DGN and compare the triangles visually. Make one set of triangles a different color/line style/weight to make any differences stand out. If differences are found investigate the surrounding features for field code and/or Terrain Model Attribute differences. Make edits to features as needed
3. Do a volume analysis between the ORD Terrain and the InRoads DTM.
 - a. Create a Terrain from the InRoads DTM
 - i. Create Terrain from File > import InRoads DTM to Terrain (triangles only)
 - b. If you created a Terrain from the ORD Survey Field Book and did not delete and recreate it in Step D.1., do so now to ensure you have the latest feature triangulation updates if you made changes to any field book features.
 - c. Use the Analyze Volume tool to compare the InRoads DTM to the ORD Terrain. **NOTE:** There may be small differences in the volumes due to the way ORD triangulates along the edge of the terrain to points beyond the exterior boundary that are triangulated in the InRoads DTM. This may/may not be an issue depending on how you created your exterior boundary in InRoads.
4. Analyze the confidence points against the ORD Terrain and compare the results to the InRoads DTM confidence point analysis. See the “ODOT Confidence Report” document on the [EAST ORD Survey Workflows page](#) for assistance. The results between the two programs should be the same.
5. If you have graphics in the basemap that are not in your InRoads DTM, the V8i basemap model can be referenced to the ORD basemap file and the needed graphics copied to the ORD basemap file.
6. If working in PW and when QC is completed, save the ORD working file to the 6_Design_Data folder as S_K#####_TERR_e_bas_###.dgn.