



# CREATING AND ANNOTATING CROSS SECTIONS

## Contents

<b>CONTENTS .....</b>	<b>1</b>
<b>OVERVIEW.....</b>	<b>3</b>
Process Provenance .....	3
<b>STATEMENT OF NEED .....</b>	<b>3</b>
<b>REFERENCES.....</b>	<b>3</b>
<b>PROCESS DESCRIPTION AND EXAMPLES.....</b>	<b>4</b>
Section I. File Settings and Setup .....	4
Procedure – Corridor File Settings .....	5
Procedure – Existing Features File Setup.....	8
Procedure – Cross Section File Setup and Settings .....	9
Section II. Creating Cross Sections.....	11
Procedure – Creating Cross Sections .....	11
Section III. Annotating Cross Sections – MDT Macro.....	14
Procedure – Annotate Feature Name.....	14
Procedure – Cross Section Labeler: Getting Started.....	17
Procedure – Cross Section Labeler: Slope Label Setup .....	18
Procedure – Cross Section Labeler: Elev/Off Label Setup.....	21
Procedure – Cross Section Labeler: Saving Preference File .....	25
Procedure – Cross Section Labeler: Drawing Cross Section Labels.....	26
Section IV. Annotating Cross Sections – OpenRoads Tool .....	28
Procedure – Annotate Cross Sections: Feature – CL Existing Ground .....	28
Procedure – Annotate Cross Sections: Feature – CL Subgrade.....	32
Procedure – Annotate Cross Sections: Feature – Elev/Offset.....	35



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Department of Transportation

Procedure – Annotate Cross Sections: Segment – Percent Labels ..... 38  
Procedure – Annotate Cross Sections: Segment – Run:Rise Labels..... 41  
Section V. Updating Cross Sections..... 45  
Procedure – Cross Section Synchronization Macro ..... 45

## Overview

This document is intended to serve OpenRoads users as a guide that illustrates the steps of both creating and annotating cross sections in OpenRoads.

### Process Provenance

- Date of development: *10/1/2021*
- Revision date: *N/A*
- Application/Tool(s): *Power GEOPAK V8i SS10*
- Version(s): *08.11.09.918*
- Environment(s): *OpenRoads (Enhanced) Workspace*
- Authors: [MDT EngOps Workflow Steering Committee](#)

## Statement of Need

Users need a documented workflow for creating and annotating cross sections in OpenRoads. This document describes two annotation workflows: the MDT Macro and the OpenRoads Tool. Time conditions and project milestone status must be considered when deciding which method to use for annotating cross sections.

The MDT Macro is the preferred workflow because annotation is customizable and in a format familiar to road plans checkers. In addition, a preference file can be saved, and labels can be redrawn with ease when cross sections are recreated. The MDT Macro method requires more initial set up time than the OpenRoads Tool method, but the MDT Macro method is more time efficient if cross sections are created and labeled more than once within the project's life. The MDT Macro method is recommended in most cases and may be required by checkers upon project delivery.

The OpenRoads tool is not as customizable as the MDT Macro and does not allow preference file saving for future labeling needs. The Annotate Cross Sections tool is recommended for use only when cross sections need to be labeled quickly to meet a deadline, as most of the labeling is done through presets.

## References

### [Road Design Manual Section 12.3.12](#)

Use for cross section labeling requirements. NOTE: This document does not include edge of subgrade labeling as current cross section labeling practice deviates from this Road Design Manual guidance. The edge of subgrade should not be shown on cross sections.

### [GEOPAK Criteria User Manual Section 39](#)

# Process Description and Examples

## Section I. File Settings and Setup

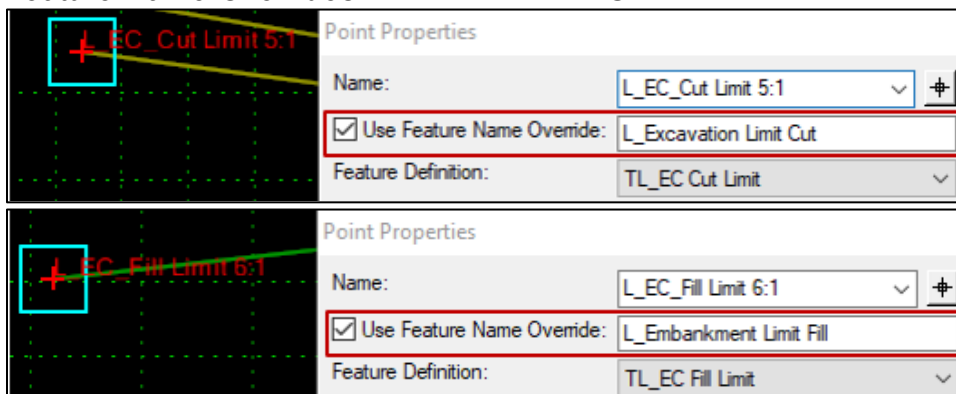
Template point names and feature name overrides are crucial for annotating cross sections.

**NOTE:** Important template points for cross section labeling may include but are not limited to the following:

- Proposed Centerline (CL)
- Centerline Subgrade (CL\_CAC Btm)
- Centerline Existing Ground (CL\_EX Grnd)
- Edge of Pavement Top (EOP Top)
- Hinge Point (EC\_Hinge)
- Ditch Foreslope (EC\_Ditch Foreslope)
- Ditch Bottom (EC\_Ditch Btm)
- Excavation Limit Cut
- Embankment Limit Fill



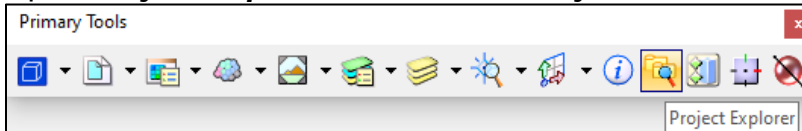
Cut Limit and Fill Limit end conditions have *Feature Name Override* applied, which applies a general name to make annotating more efficient. This document utilizes the *Feature Name Overrides* shown below for Cut Limit and Fill Limit end conditions.



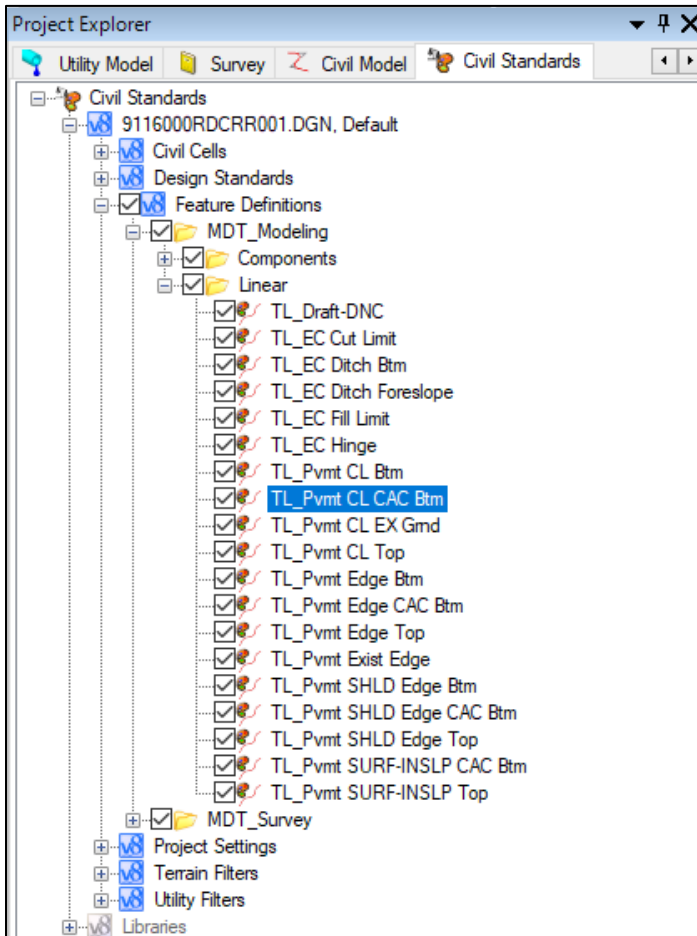
## Procedure – Corridor File Settings

Complete the following steps to verify that the TL\_Pvmt CL CAC Btm feature definition marker “X” will show up when creating cross sections and will allow labeling of points with this applied feature definition.

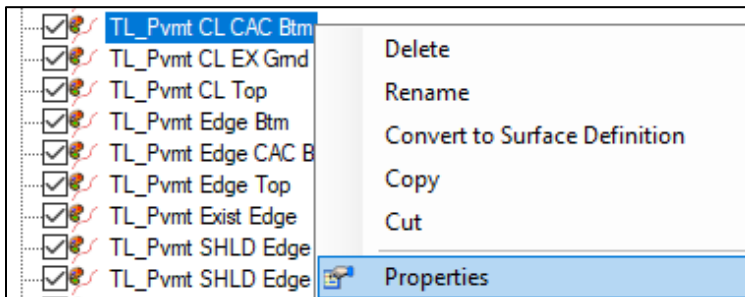
1. Open the project mainline corridor file.
2. Open **Project Explorer** from the **Primary Tools** bar.



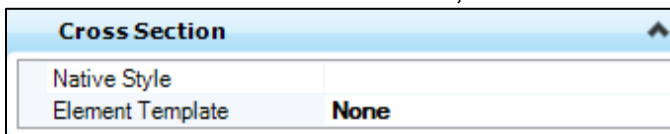
3. Navigate to the **Civil Standards** tab and expand the following drop-down: XXXXXXXRDCRRXXX.DGN > Feature Definitions > MDT\_Modeling > Linear.



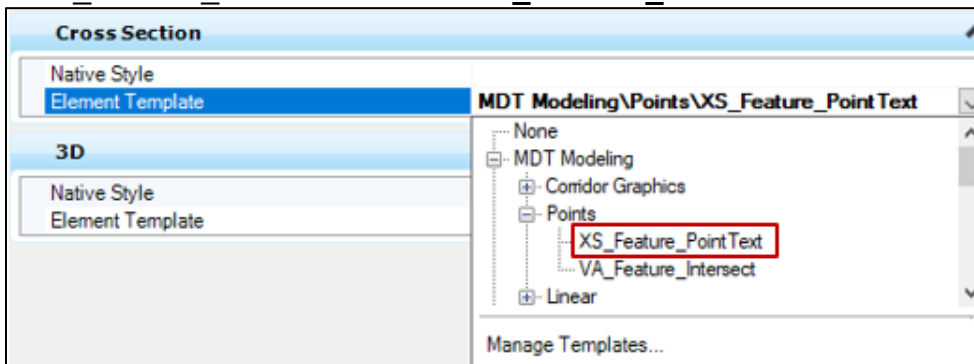
- Right-click on **TL\_Pvmt CL CAC Btm** and select **Properties** to open the **Element Information** tab.



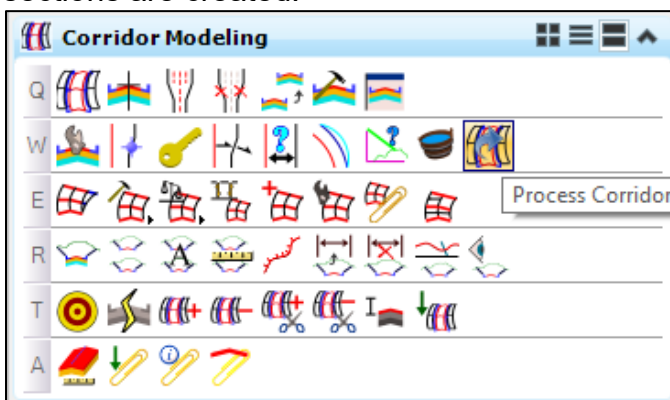
- In the **Element Information** tab, scroll down to the **Cross Section** heading.



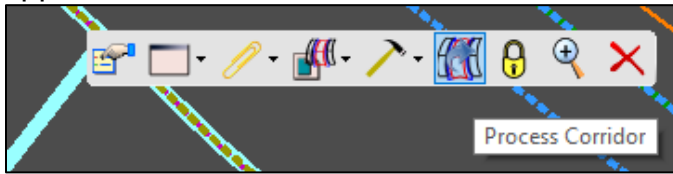
- Click the **Element Template** drop-down and navigate to **MDT Modeling > Points > XS\_Feature\_PointText**. Select **XS\_Feature\_PointText**.



- Return to the **Tasks** tab and navigate to **Corridor Modeling**. Select **Process Corridor** and follow the prompts. This will regenerate the corridor and apply the element template, which will allow this feature to be annotated after cross sections are created.



Alternatively, click on any corridor handle and wait for the contextual tab to appear, then click **Process Corridor**.



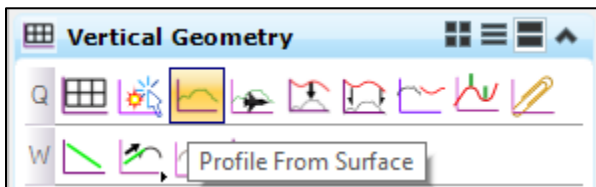
**NOTE:** After completing this step, check to see if the superelevation is still associated with the model; the superelevation may need to be reassigned to the corridor after processing it. It is unlikely that the superelevation will disassociate with the model, but it may happen.

8. Repeat Steps 1 - 7 for additional mainline corridor file(s).

## Procedure – Existing Features File Setup

Complete the following steps to verify that utilities and other desired survey linework will be drawn in the created cross sections.

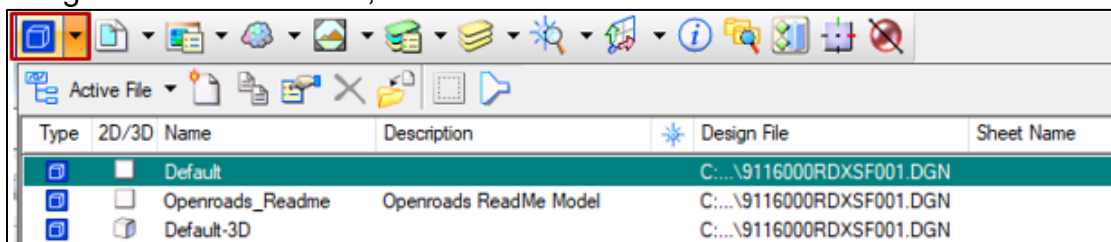
1. Open the project existing features file.
2. Reference the existing terrain model DGN file into the **Default** model and set it as the active terrain model.
3. Apply appropriate feature definitions to desired lines.
4. Select desired lines, then select **Profile From Surface** from **Vertical Geometry** task menu and follow the prompts. When prompted to *Locate Reference Surface*, choose *Reset for Active Terrain Model*. Continue to follow the prompts.



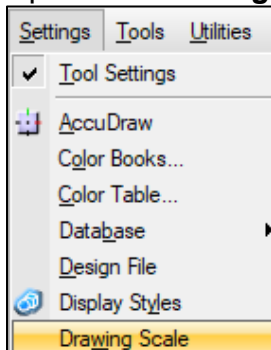


## Procedure – Cross Section File Setup and Settings

1. Open the project mainline cross section file.
2. Reference all relevant DGN files into the **Default** model.  
NOTE: References may include but are not limited to mainline alignment, mainline and approach corridors, existing terrain model, existing features, right-of-way map, and other alignment files.
3. Set the **Drawing Scale** in the **Default** and **Default-3D** models.
  - a. Select the drop-down on the **Models** tab on the **Primary Tools** bar. To navigate between models, double-click the desired model.

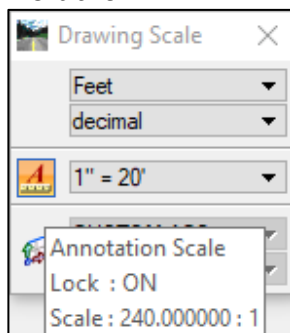


- b. Open the **Drawing Scale** dialog box from the **Settings** menu.

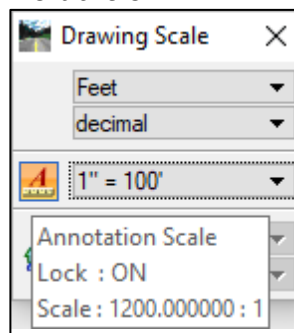


- c. Set the **Drawing Scale** to 1" = 20' in the **Default** model and 1" = 100' in the **Default-3D** model. Toggle the **Annotation Scale** ON in both models, as shown below.

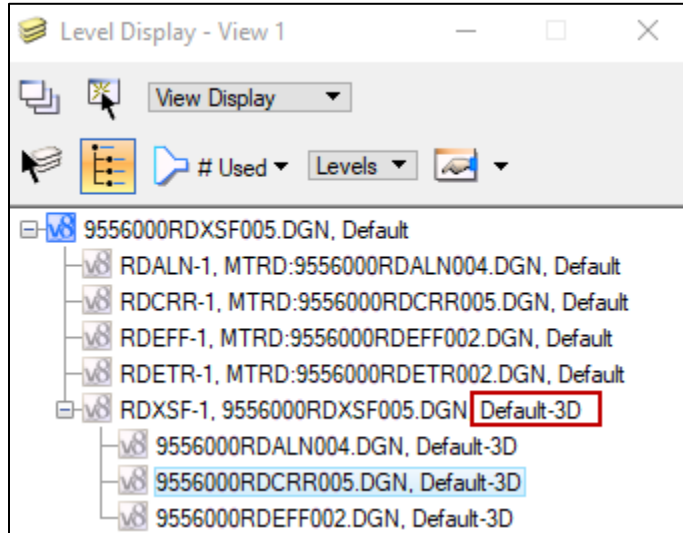
**Default** model



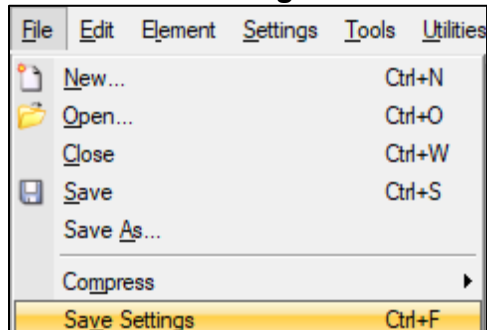
**Default-3D** model



4. Select references and levels to be displayed when creating cross sections.
  - a. Navigate to the **Default** model. Turn on references and levels that are desired to show when creating cross sections. NOTE: Levels must be turned on in both the **Default** references and the **XSF Default-3D** references.



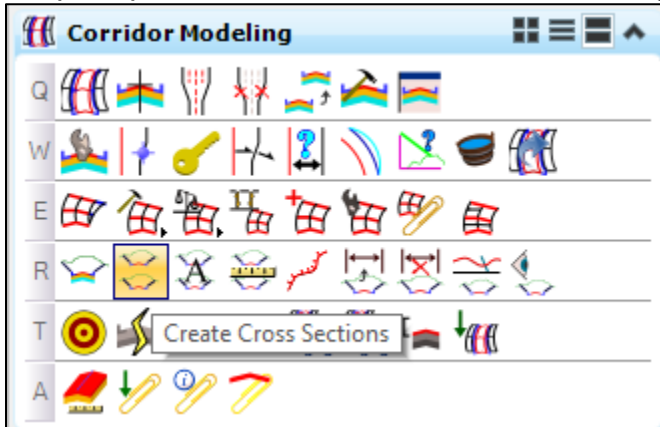
- b. Navigate to the **Default-3D** model. Turn on references and levels that are desired to show when creating cross sections.
    - c. Select **Save Settings** from the **File** menu.



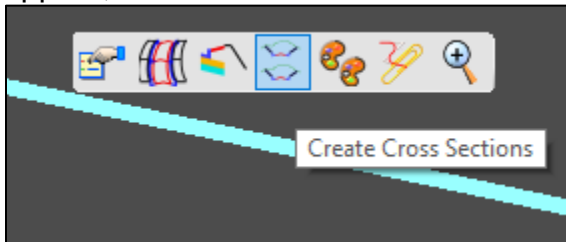
## Section II. Creating Cross Sections

### Procedure – Creating Cross Sections

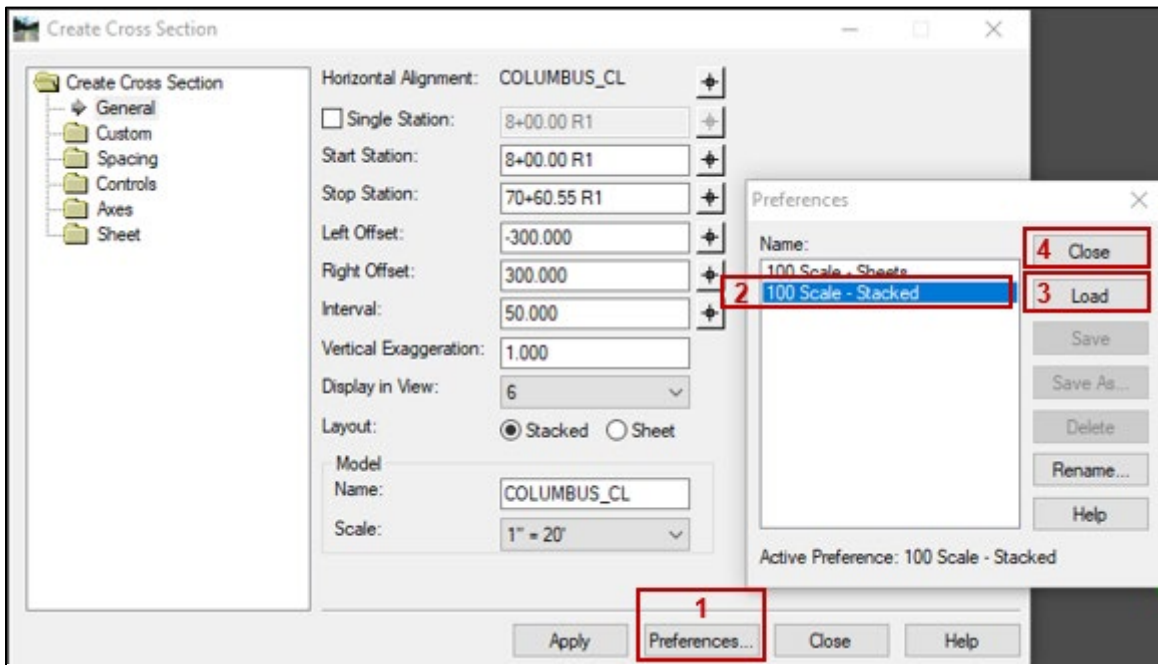
1. Select **Create Cross Sections** from **Corridor Modeling** task menu and follow the prompts. The **Create Cross Section** dialog box will open.



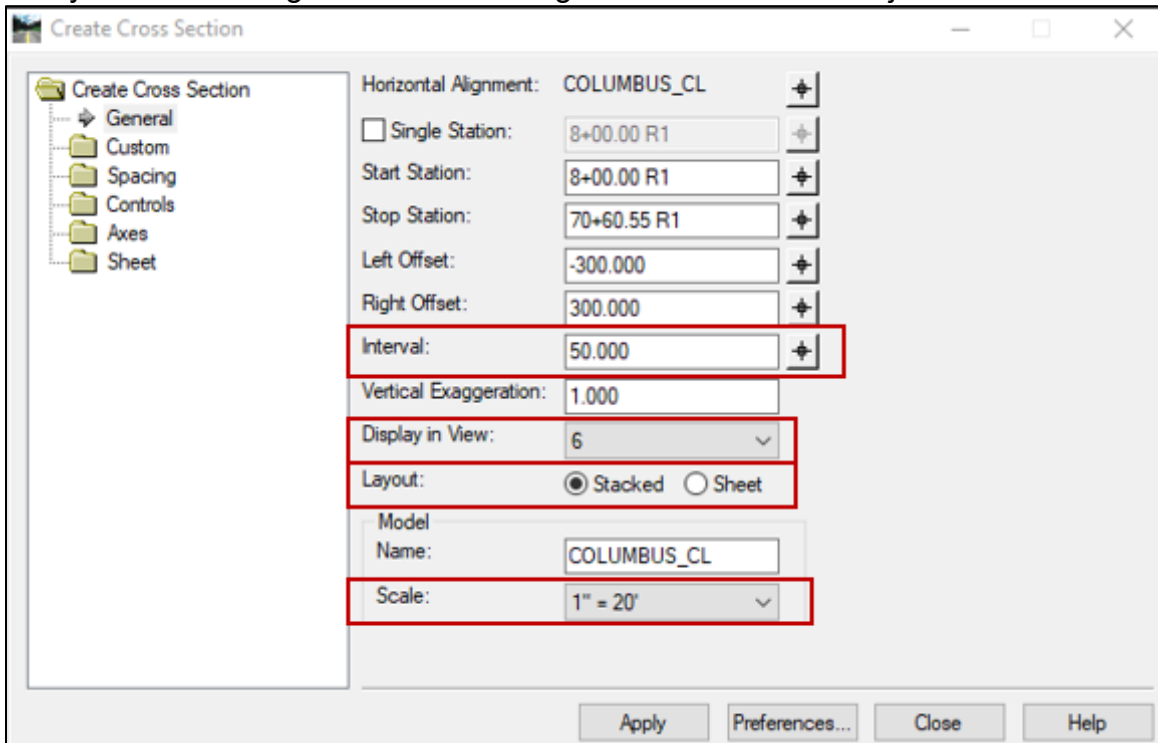
Alternatively, click on the alignment centerline and wait for the contextual tab to appear, then select **Create Cross Sections**. This will open the same dialog box.



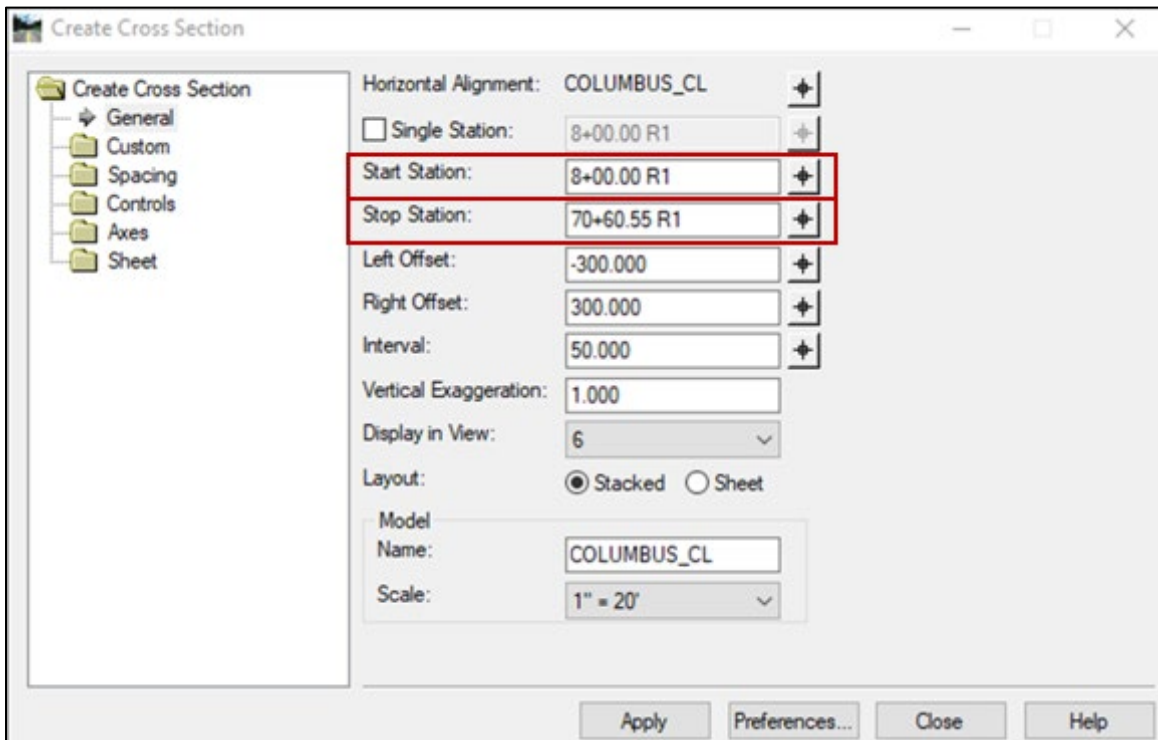
2. Click **Preferences** and then select **100 Scale - Stacked** from the list of defined preferences. Click **Load** then **Close** which will populate the setting needed for the cross section sheets.



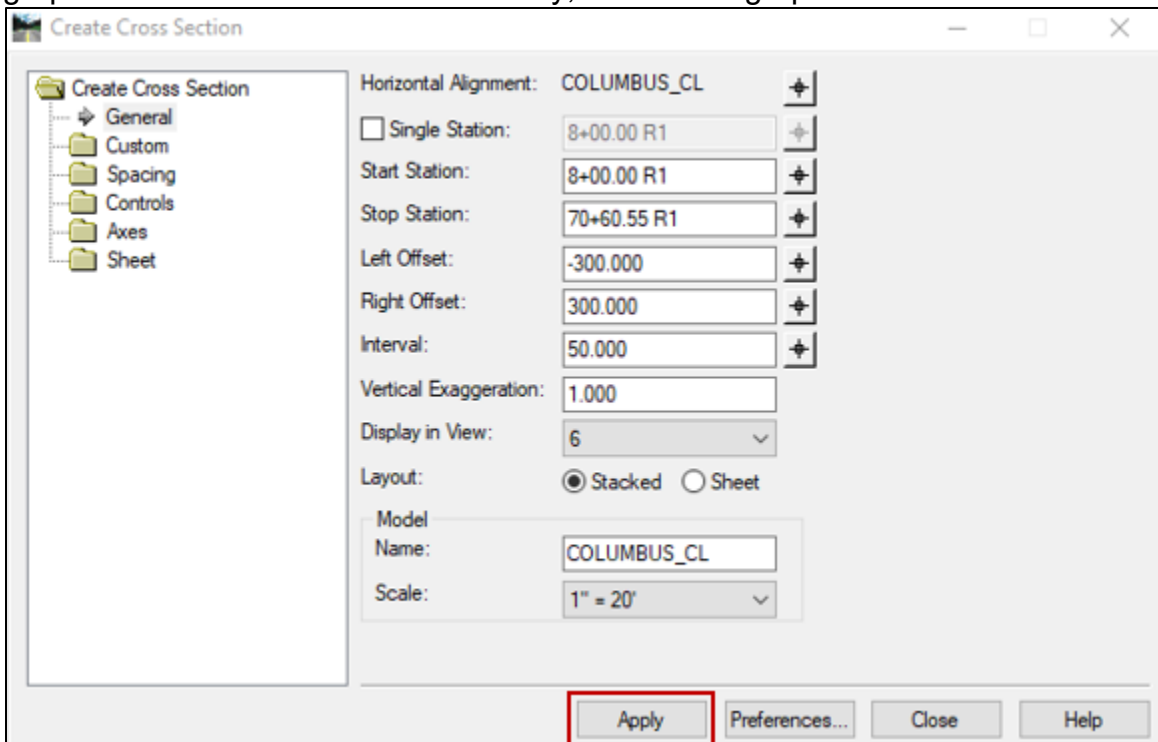
3. Verify that the settings match the settings shown below and adjust as needed.



4. The **Start Station** and **Stop Station** can be defined graphically, or by entering a station range. By default, it is set to the beginning and ending stations. A single station can also be defined.



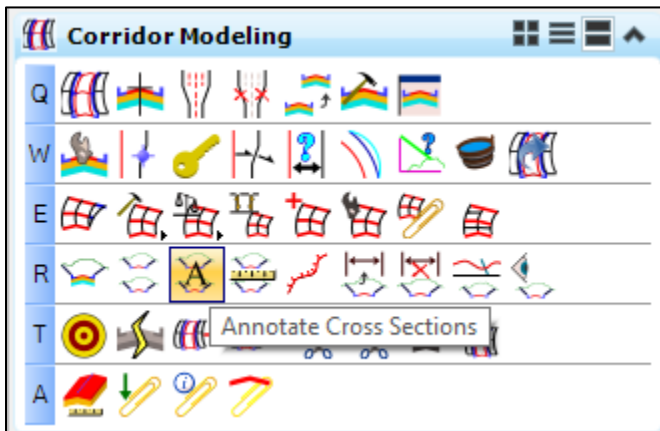
5. Click **Apply**. All open views will close and view 6 will open displaying the graphics of the new model. If necessary, fit the view graphics.



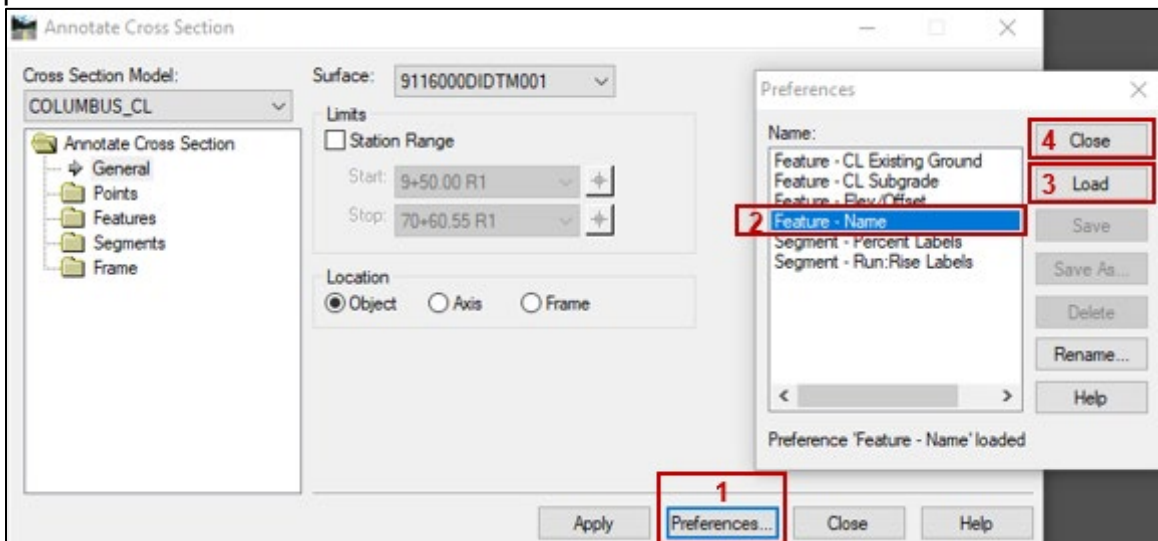
## Section III. Annotating Cross Sections – MDT Macro

### Procedure – Annotate Feature Name

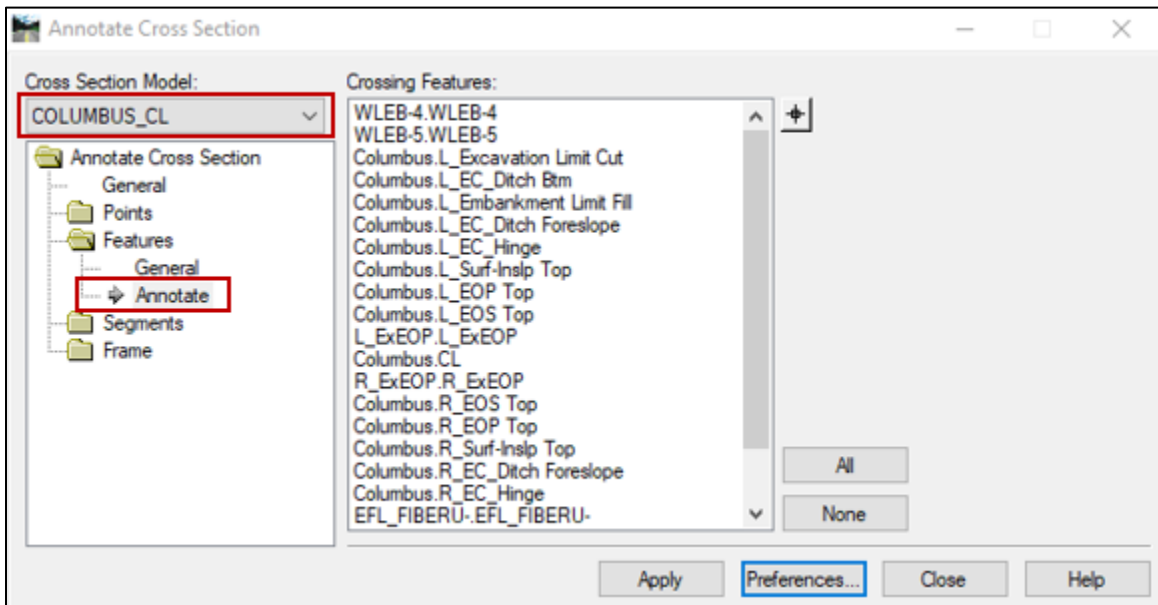
1. Continue in the project mainline cross section file.
2. If not completed already, open the cross section sheet model created from *Procedure – Creating Cross Sections* above.
3. Select **Annotate Cross Sections** from **Corridor Modeling** task menu.



4. Click **Preferences** and then select **Feature - Name** from the list of defined preferences. Click **Load** then **Close**.



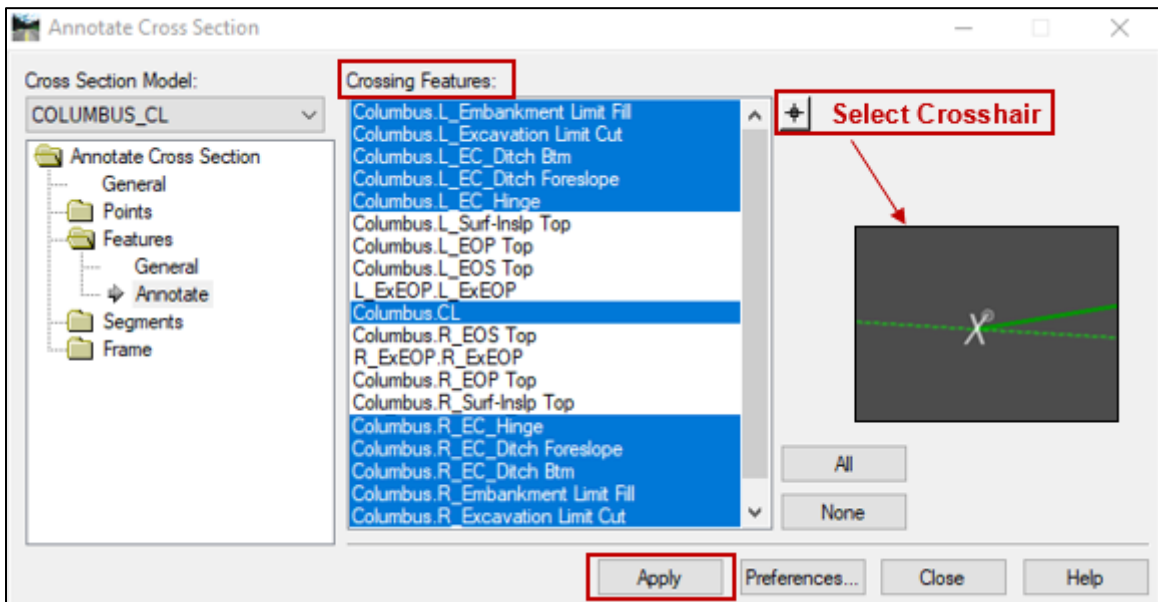
5. Click **Features** then **Annotate** in the dialog navigation panel. Select the model from the **Cross Section Model** drop-down.



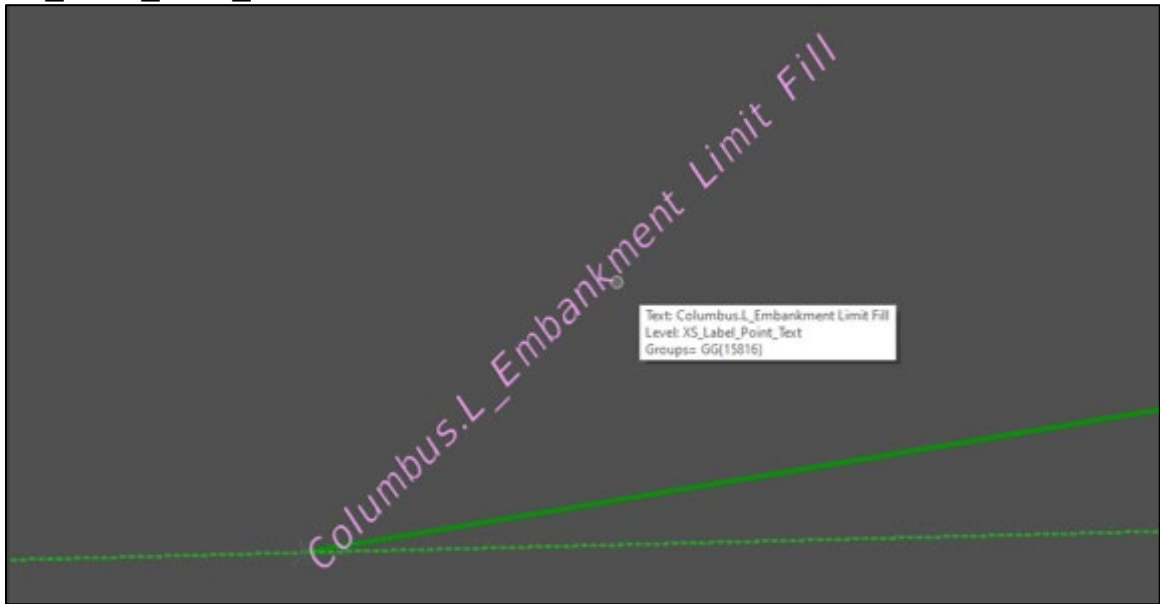
6. Select desired points from the **Crossing Features** list by holding down the **Ctrl** key and selecting, or by using the **Select Crosshair** tool to select the “X” for the desired points. Click **Apply**.

**NOTE:** **Crossing Features** may include but are not limited to the following:

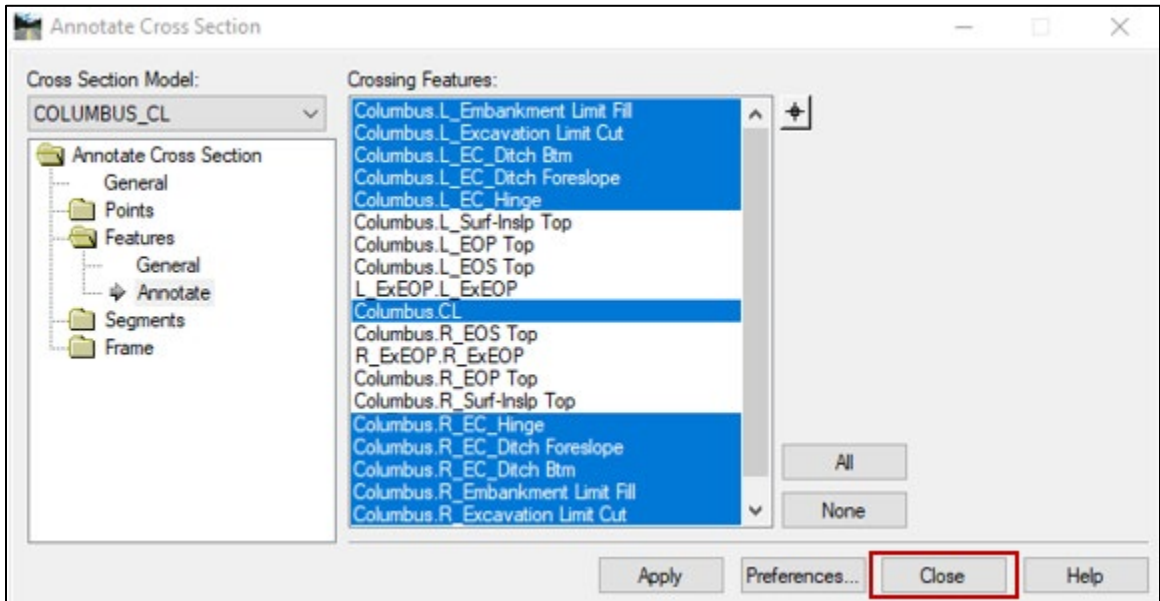
- Hinge Point
- Centerline Existing Ground
- Centerline Subgrade
- Embankment Limit Fill
- Excavation Limit Cut
- Ditch Bottom
- Ditch Foreslope



7. The labels should appear as shown below and will be placed on level XS\_Label\_Point\_Text.



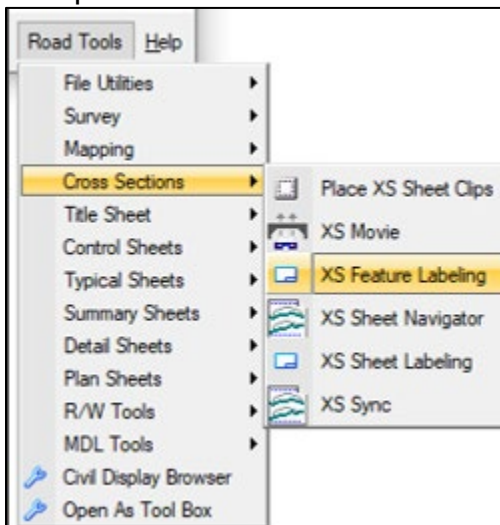
8. If all desired features are labeled, click **Close**. Otherwise, repeat Steps 6 - 7.



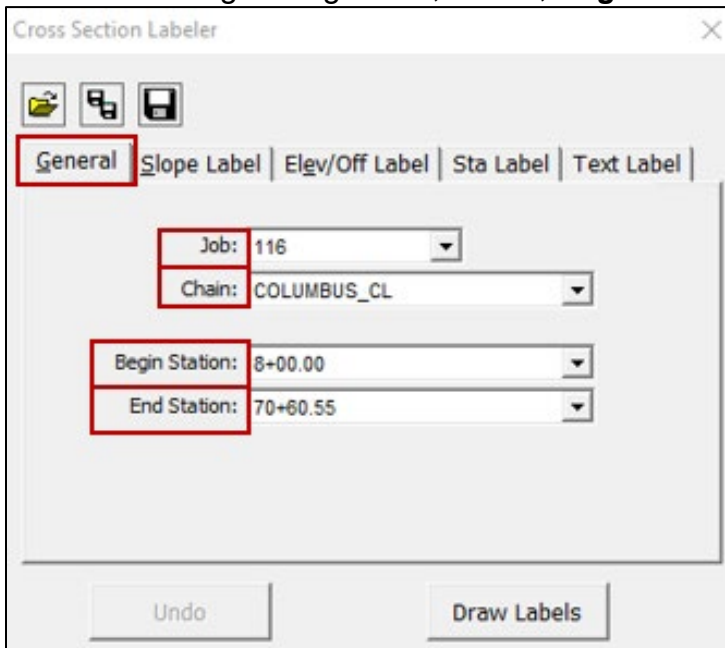


## Procedure – Cross Section Labeler: Getting Started

1. View project GPK file from DMS.
2. Navigate to **Road Tools > Cross Sections > XS Feature Labeling** as shown below. Click **XS Feature Labeling** and the **Cross Section Labeler** dialog box will open.

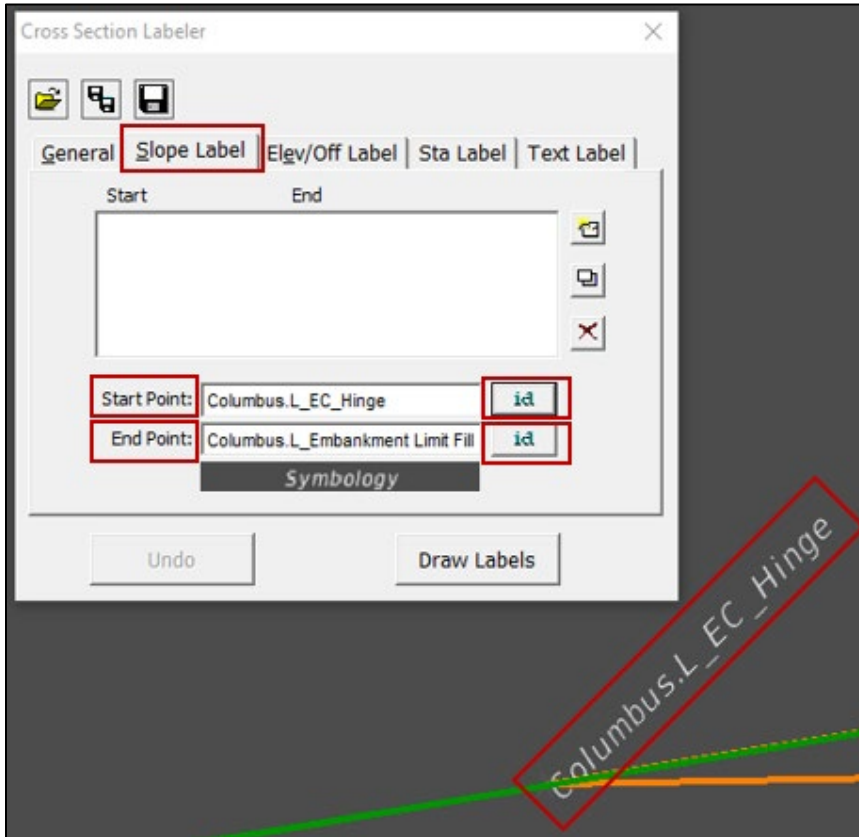


3. Navigate to the **General** tab.
4. Set the following settings: **Job**, **Chain**, **Begin Station**, and **End Station**.



## Procedure – Cross Section Labeler: Slope Label Setup

1. Navigate to the **Slope Label** tab.
2. Select **id** for the **Start Point**, select the feature name in the cross section model, then left click to accept.
3. Repeat for the **End Point**. Start and End points should be filled in as shown below.



4. Double click **Symbology** and the **Slope Label Attributes** dialog will open. The **Slope Label Attributes** below are recommended guidance and should be altered to meet project needs. NOTE: Label roadway slopes only where applicable.

Grading:

- Embankment Limit Fill
- Excavation Limit Cut
- Ditch Bottom
- Ditch Foreslope

Slope Label Attributes

Level: XS\_Label\_Segment\_Text

Color:  ByLv TH: 1.0

Weight: ByLevel TW: 1.0

Font: Engineering Regular

Decimal: 1 Justification

Offset: 1.0

Format Option

Format: RUN: 1

Add Suffix

OK Cancel

Roadway:

- Normal crown
- Superelevation

Slope Label Attributes

Level: XS\_Label\_Segment\_Text

Color:  ByLv TH: 1.0

Weight: ByLevel TW: 1.0

Font: Engineering Regular

Decimal: 2 Justification

Offset: 1.0

Format Option

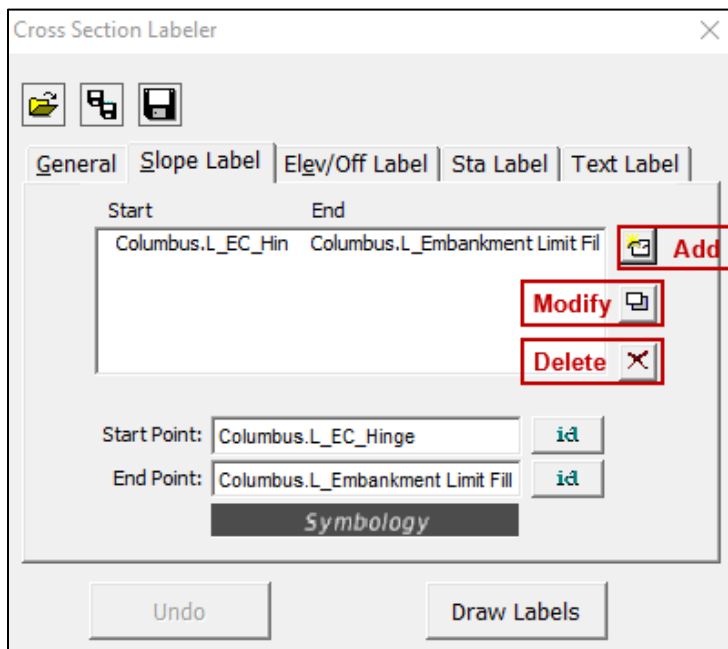
Format: 0.00%

Add Suffix

OK Cancel

5. Select **OK** on the **Slope Label Attributes** dialog to accept.

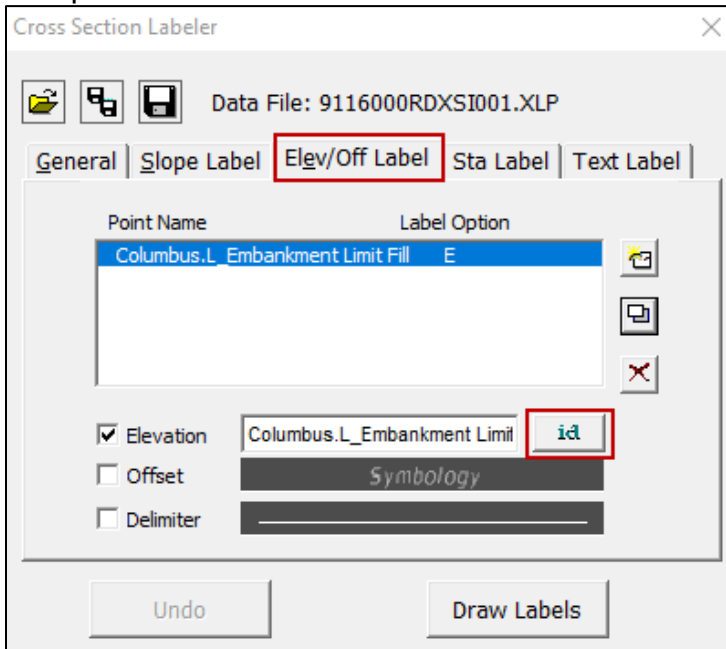
6. Select **Add**.



7. Repeat Steps 1 - 6 for each desired slope label.
8. To modify a label, select the label in the dialog box, modify as needed, then select **Modify**.
9. To delete a label, select the label in the dialog box then select **Delete**.

## Procedure – Cross Section Labeler: Elev/Off Label Setup

1. Navigate to the **Elev/Off Label** tab.
2. Select **id**, select the feature name in the cross section model, then left click to accept.



3. Click the **Elevation** and/or **Offset** boxes to check them on as needed. **NOTE:** **Offset** is not typically labeled but can be utilized for project specific occasions.
4. Double click **Symbology** and the **Elevation Offset Label Attributes** dialog will open. The **Elevation Offset Label Attributes** below are recommended guidance and should be altered to meet project needs. **NOTE:** If applicable, adjust **Suffix Offset** based on location to the centerline.

Grading & Roadway:

- Embankment Limit Fill
- Excavation Limit Cut
- Ditch Bottom
- Ditch Foreslope

Elevation Offset Label Attributes

Level: XS\_Label\_Elevation\_Off

Color:  ByLv TH: 1.0

Weight: ByLevel TW: 1.0

Font: Engineering Regular

Decimal: 2 Justification

Angle: 90

Horizontal Offset: 0

Vertical Offset: 2.5

Delimiter Space: 0

Prefix

Elevation

Offset:

Suffix

Elevation

Offset: 'LT.

OK Cancel

Subgrade at Centerline

Elevation Offset Label Attributes

Level: XS\_Label\_Elevation\_Off

Color:  ByLv TH: 1.0

Weight: ByLevel TW: 1.0

Font: Engineering Regular

Decimal: 2 Justification

Angle: 90

Horizontal Offset: 0

Vertical Offset: 6.0

Delimiter Space: 0

Prefix

Elevation

Offset:

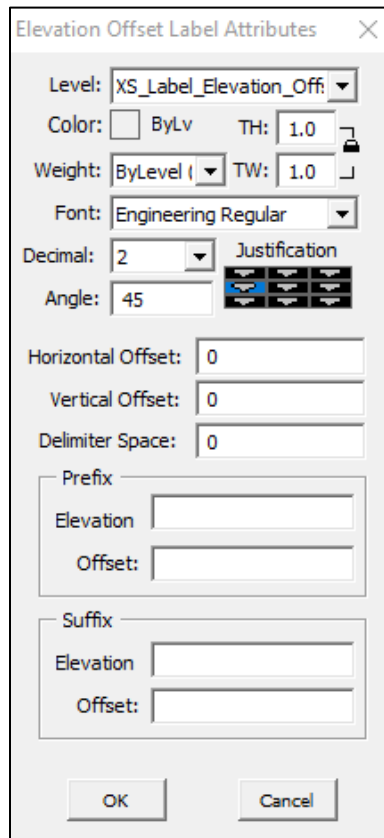
Suffix

Elevation

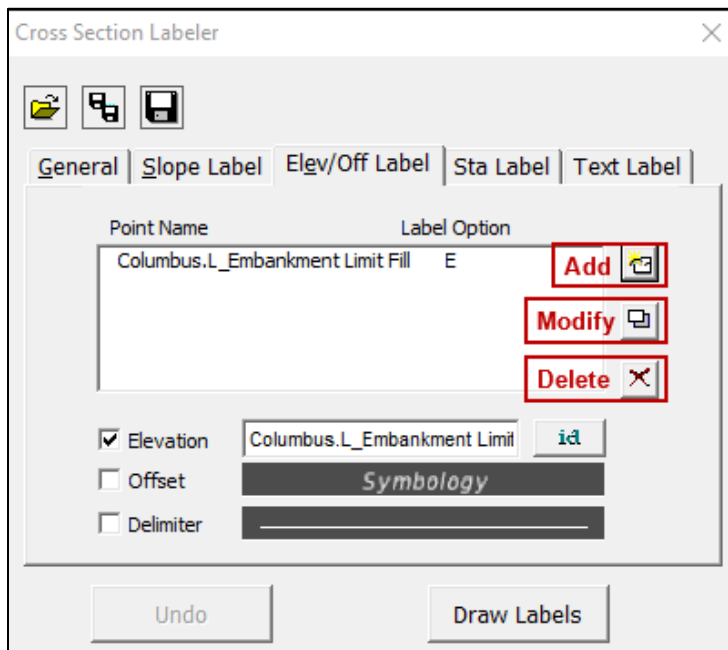
Offset:

OK Cancel

Existing Ground at Centerline



5. Select **OK** on the **Slope Label Attributes** dialog to accept.
6. Select **Add**.

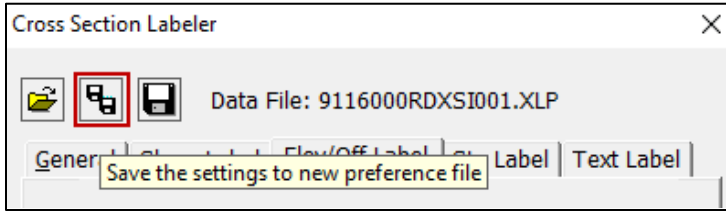


7. Repeat Steps 1 - 6 for each desired slope label.
8. To modify a label, select the label in the dialog box, modify as needed, then select **Modify**.
9. To delete a label, select the label in the dialog box then select **Delete**.

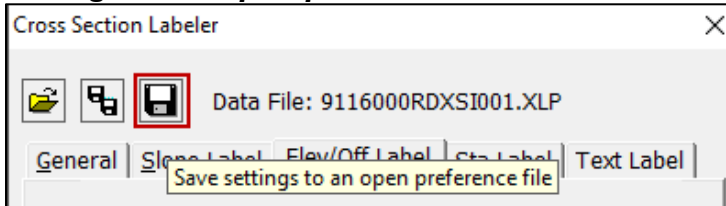


## Procedure – Cross Section Labeler: Saving Preference File

1. Select **Annotate Cross Sections** from **Corridor Modeling** task menu.

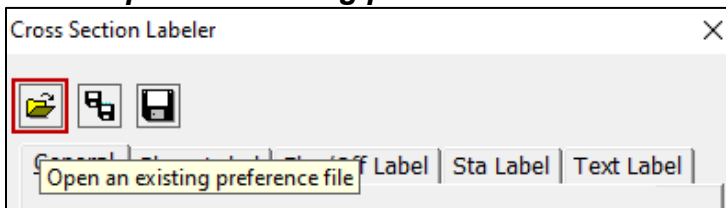


2. Set the file name to [8-digitUPN] RDXSI001. For example, 9116000RDXSI001.
3. Upload the .xlp file to DMS. Check out and update as needed.
4. If in an open preference file and it is necessary to save changes, select **Save settings to an open preference file**.

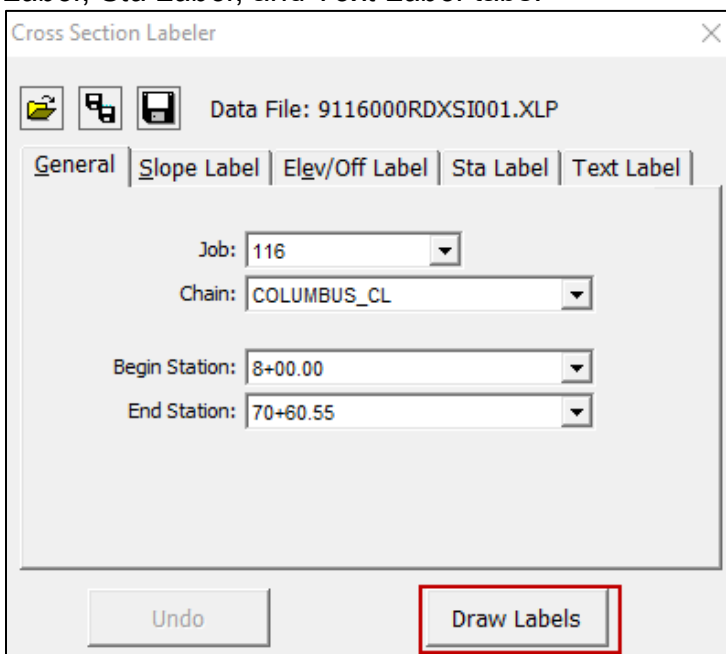


## Procedure – Cross Section Labeler: Drawing Cross Section Labels

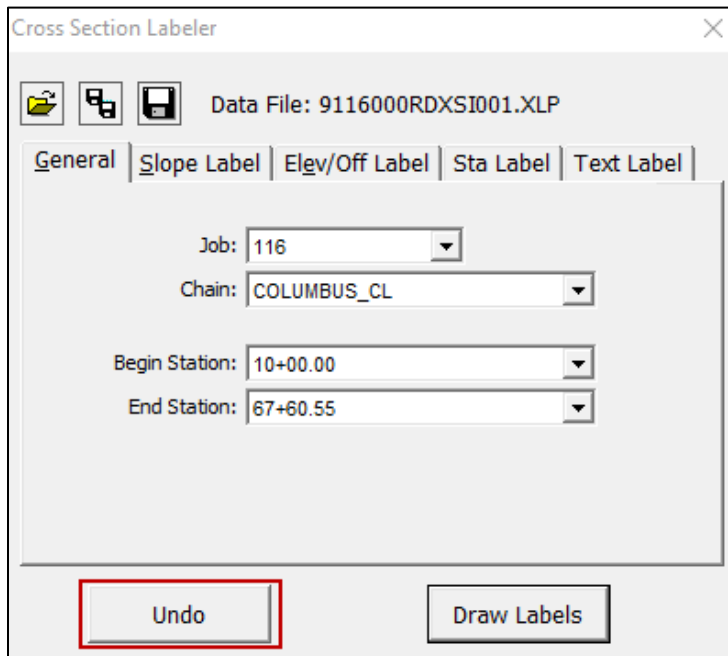
1. View project .xlp file from DMS or see *Cross Section Labeler* sections above.
2. Repeat Steps 1 - 2 of *Procedure – Cross Section Labeler: Getting Started*.
3. Select **Open an existing preference file**. Select the project .xlp file.



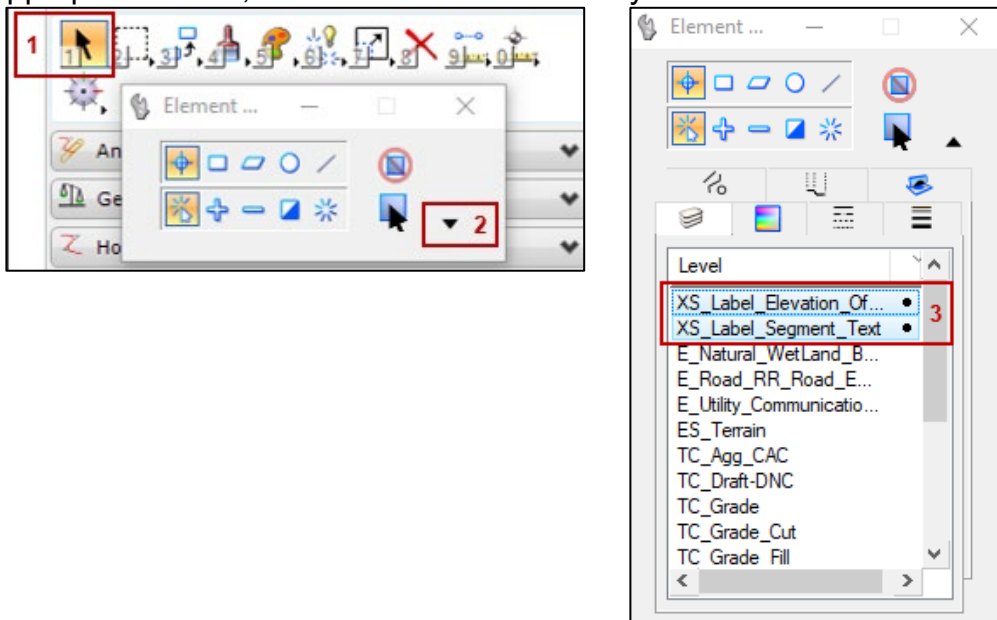
4. Repeat Steps 3 - 4 of *Procedure – Cross Section Labeler: Getting Started*.
5. Click **Draw Labels**. **NOTE:** This will draw all labels in the *Slope Label*, *Elev/Off Label*, *Sta Label*, and *Text Label* tabs.



6. To undo recently drawn labels select **Undo**. **NOTE:** Previous labels cannot be undrawn once the **Cross Section Labeler** dialog box has been closed.



- To delete previous labels after closing the **Cross Section Labeler** dialog box, open the **Element Section** dialog box, click the drop-down arrow, select the appropriate levels, and click **Delete** on the keyboard.

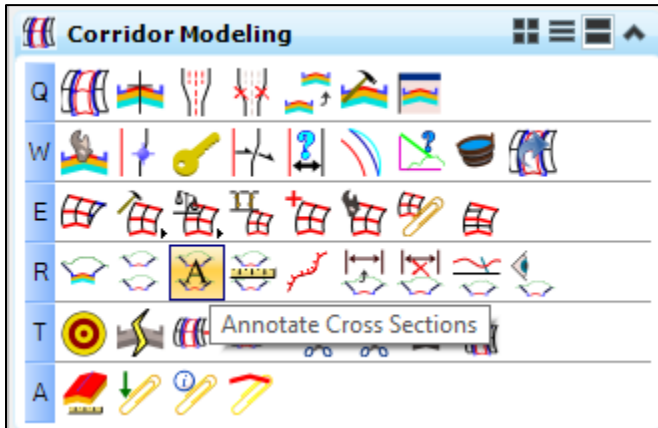


- To draw additional cells that were not drawn when creating cross sections (such as right-of-way or wetlands), use the GEOPAK **Draw Ancillary Features** tool. Guidance can be found in the [GEOPAK Criteria User Manual](#). **NOTE:** The cell library mentioned in Step 12 is now located at the following location: \\state\mdt\prd\Helena\CaddStandards\Bentley\OpenRoads\OPENROADS\cell\RD\_XS.

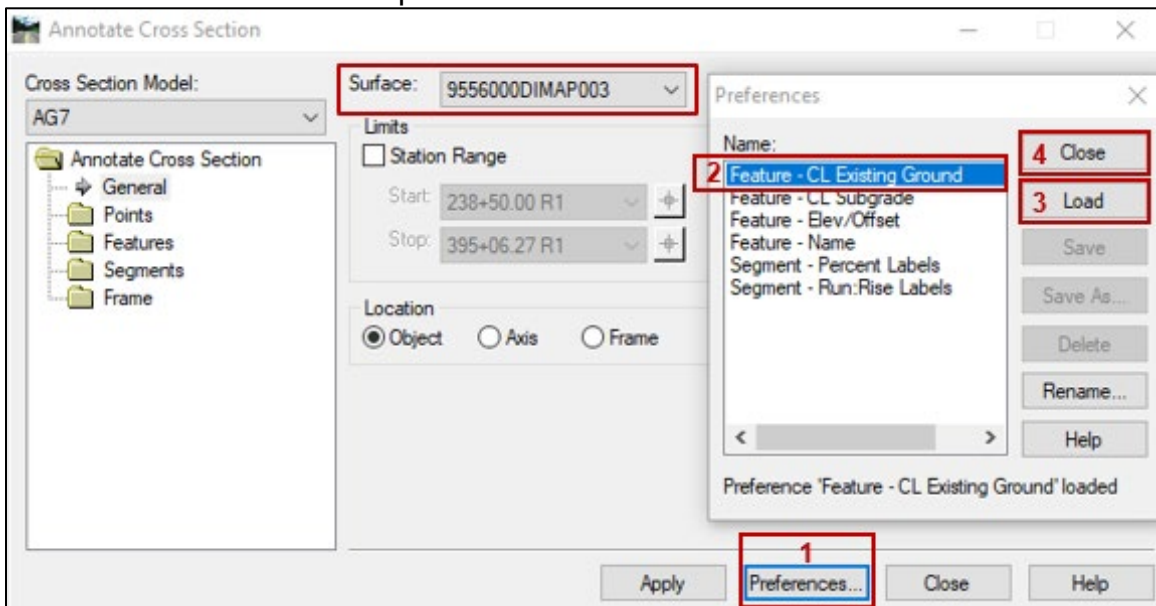
## Section IV. Annotating Cross Sections – OpenRoads Tool

### Procedure – Annotate Cross Sections: Feature – CL Existing Ground

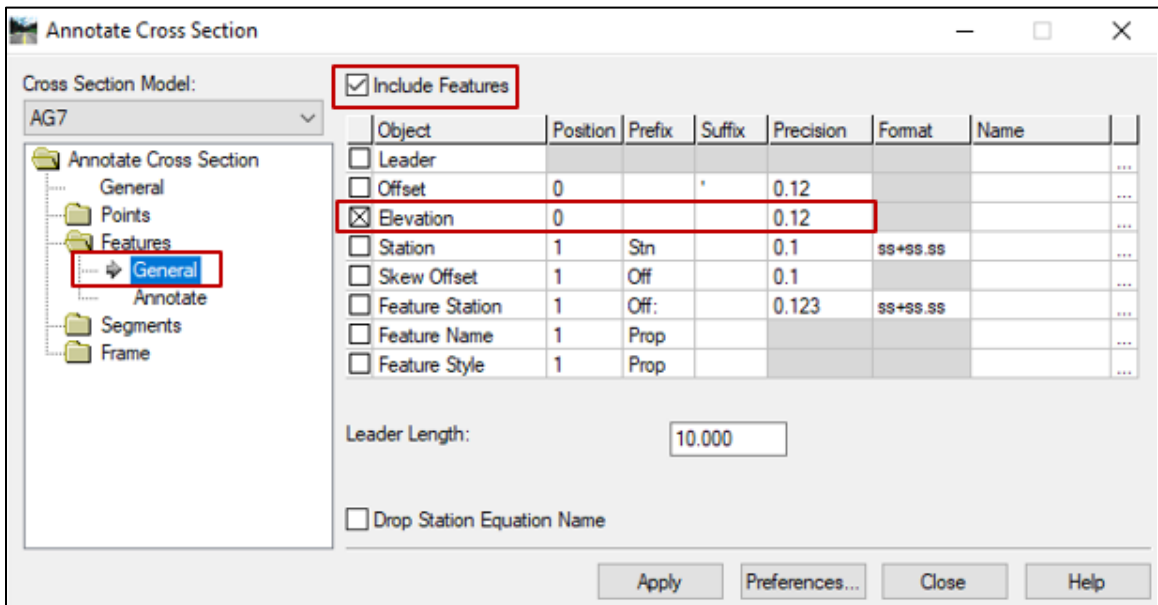
1. Select **Annotate Cross Sections** from **Corridor Modeling** task menu.



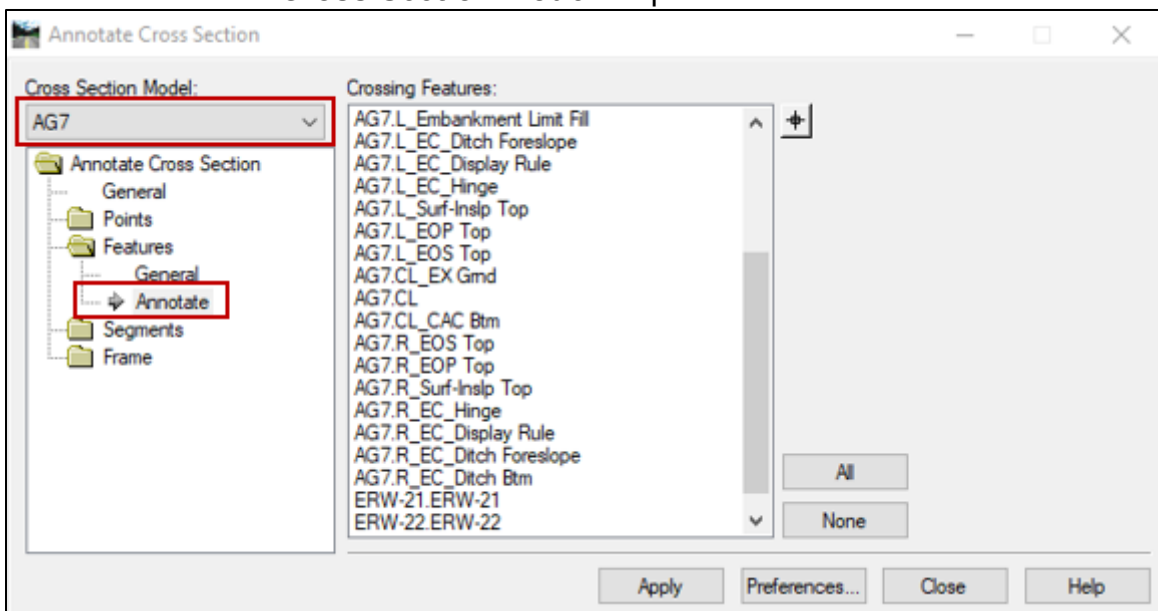
2. Click **Preferences** and then select **Feature - CL Existing Ground** from the list of defined preferences. Click **Load** then **Close**. Select the existing active terrain model from the **Surface** drop-down.



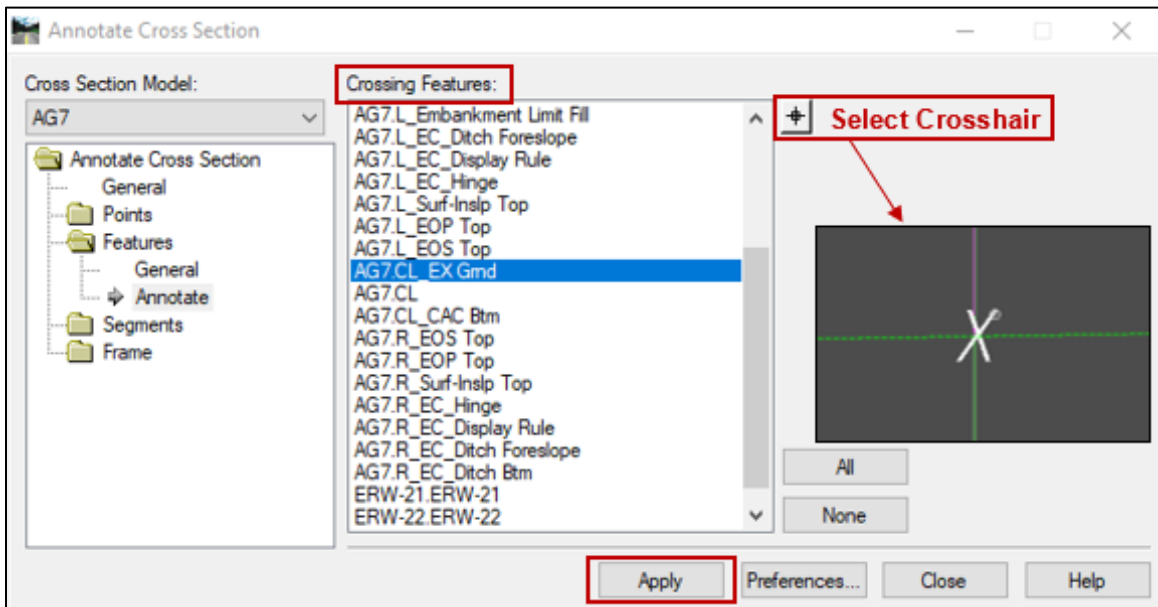
3. Click **Features** then **General** in the dialog navigation panel and verify that settings match the settings shown below.



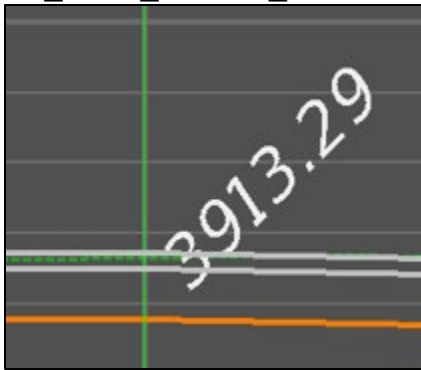
- Click **Annotate** under the **Features** folder in the dialog navigation panel. Select the model from the **Cross Section Model** drop-down.



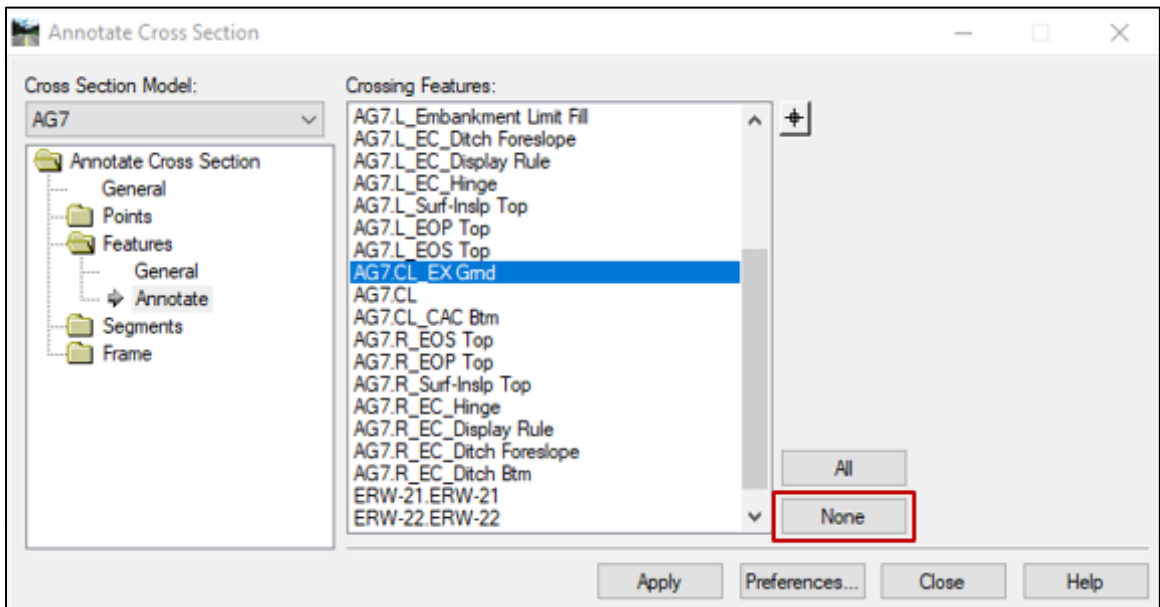
- Select the centerline existing ground (**CL\_EX Grnd**) from the **Crossing Features** list, or by using the **Select Crosshair** tool to select the "X" for the desired point. Click **Apply**.



6. The label should appear as shown below and will be placed on level XS\_Label\_Feature\_Text.

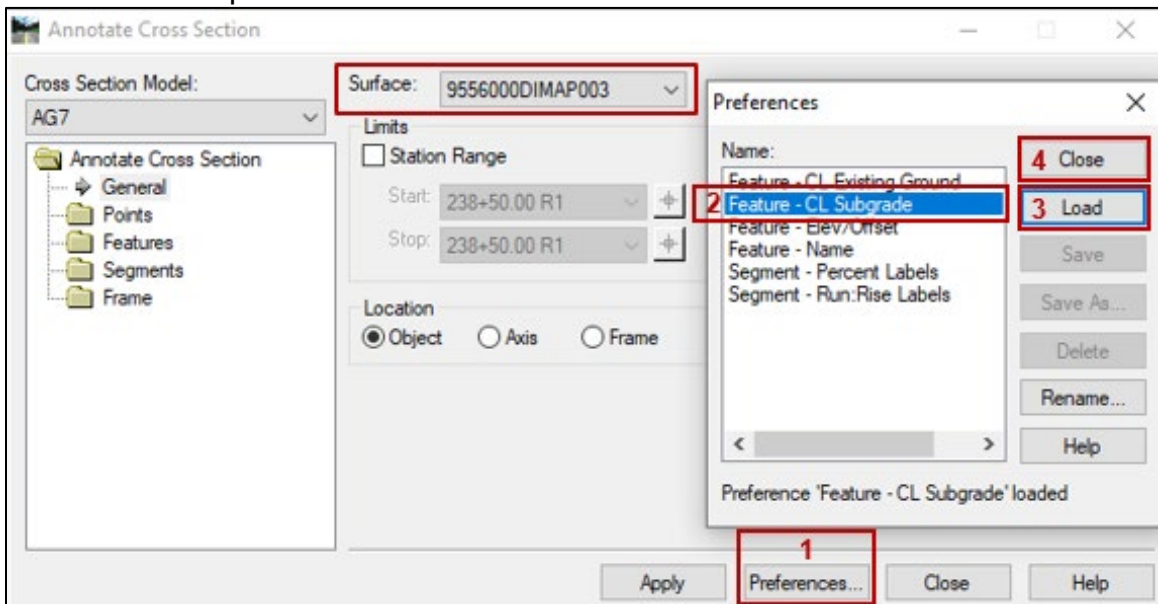


7. Click **None** to clear the **Crossing Feature** selection before proceeding to the next procedure. NOTE: If this step is not performed, previous selections will remain active in the other annotation preferences and will be labeled with other features.

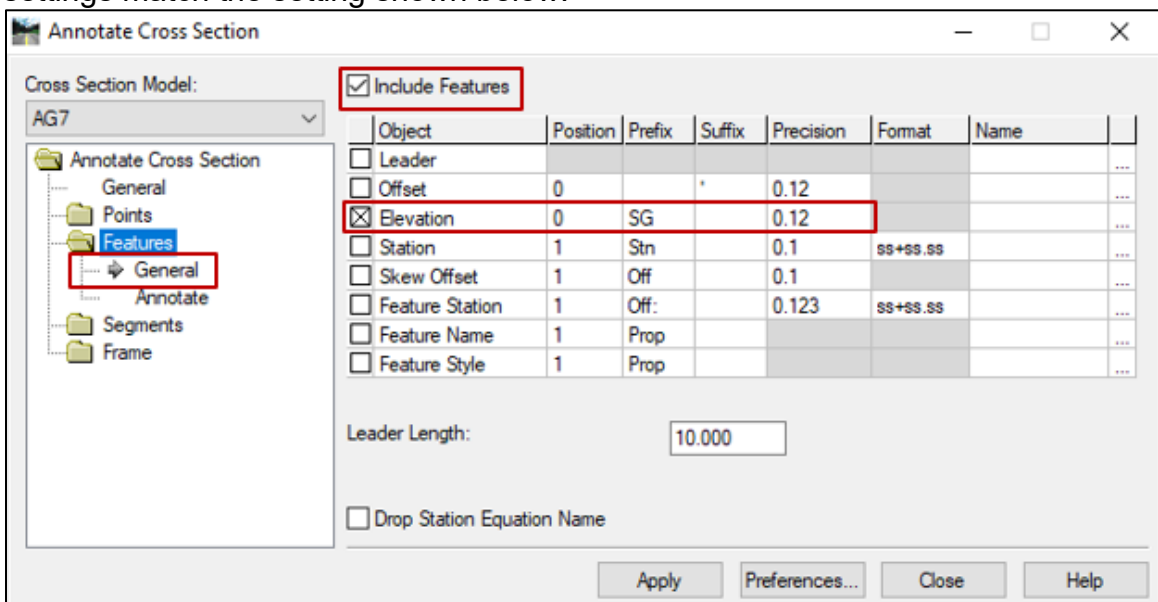


## Procedure – Annotate Cross Sections: Feature – CL Subgrade

1. Continue in the **Annotate Cross Section** dialog box.
2. Click **Preferences** and then select **Feature - CL Subgrade** from the list of defined preferences. Click **Load** then **Close**. Select the active terrain model from the **Surface** drop-down.

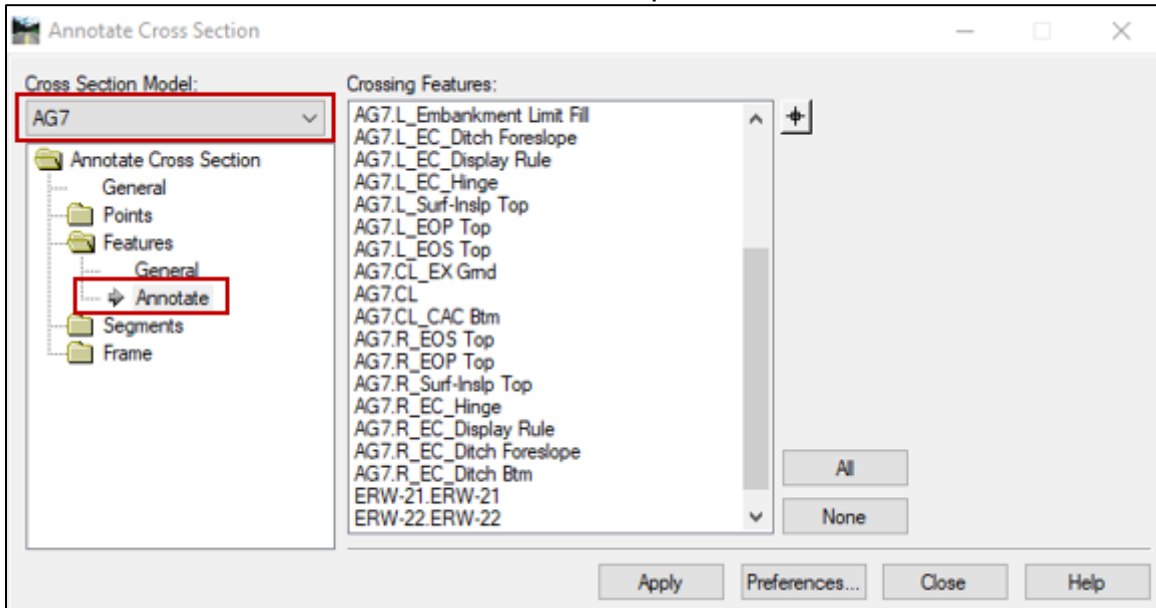


3. Click **Features** then **General** in the dialog navigation panel and verify that settings match the setting shown below.

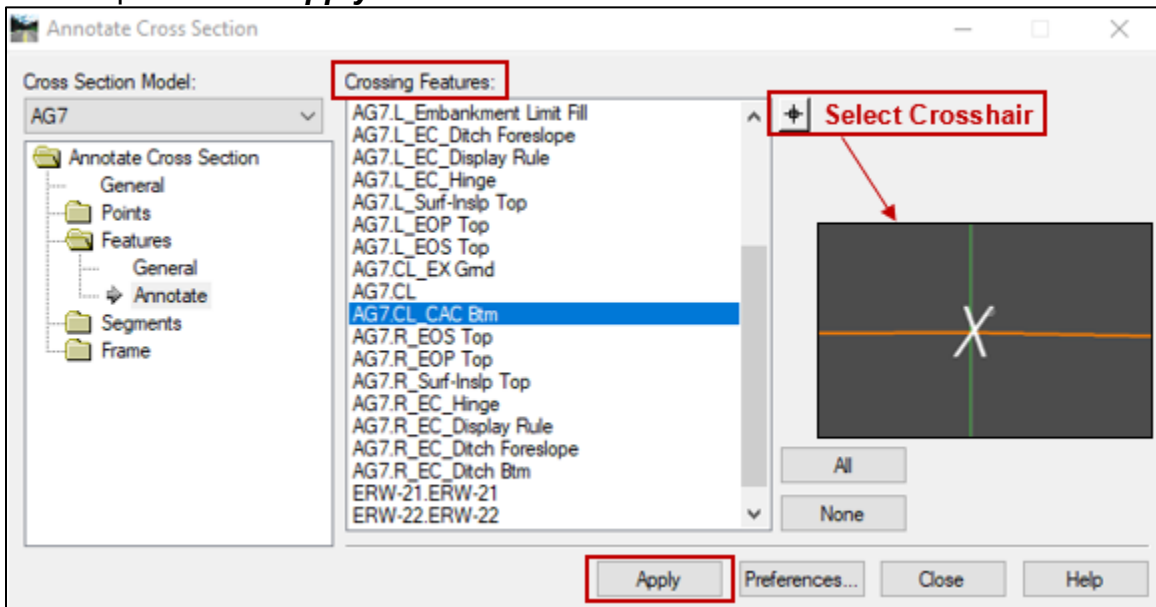




- Click **Annotate** under the **Features** folder in the dialog navigation panel. Select the model from the **Cross Section Model** drop-down.



- Select the centerline proposed subgrade (**CL\_CAC Btm**) from the **Crossing Features** list, or by using the **Select Crosshair** tool to select the "X" for the desired point. Click **Apply**.



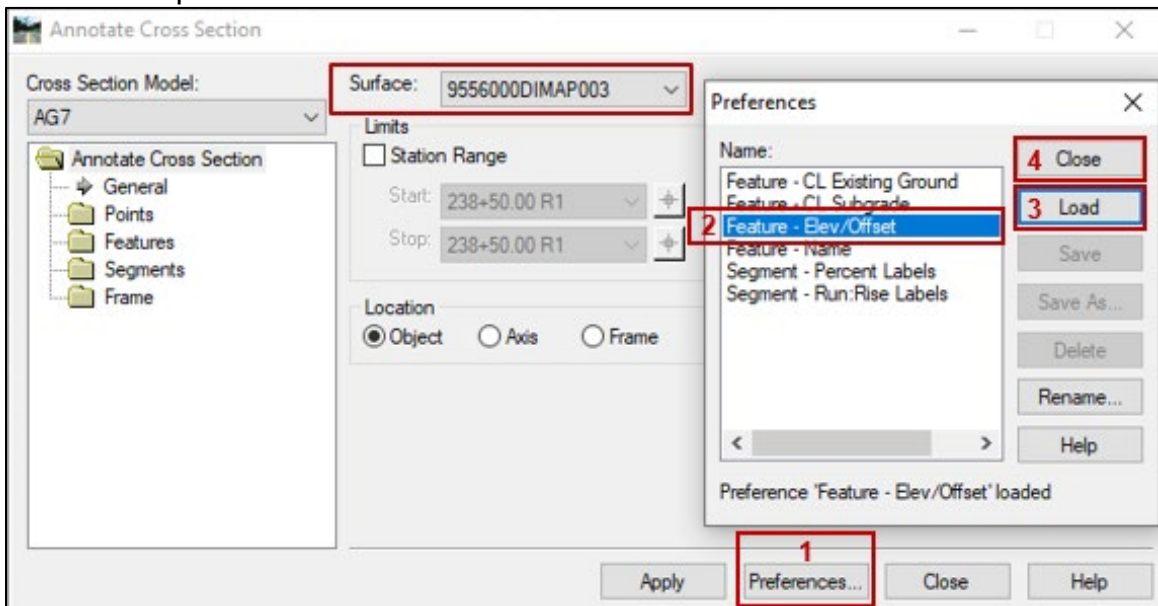
6. The label should appear as shown below and will be placed on level XS\_Label\_Feature\_Text.



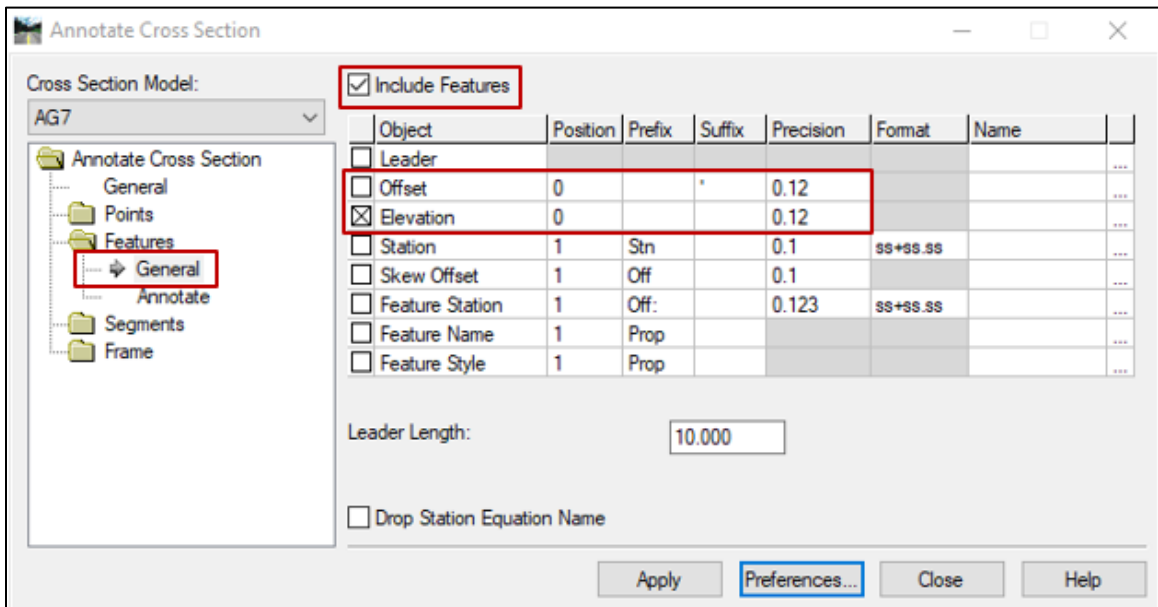
7. Click **None** to clear the **Crossing Feature** selection before proceeding to the next procedure.

## Procedure – Annotate Cross Sections: Feature – Elev/Offset

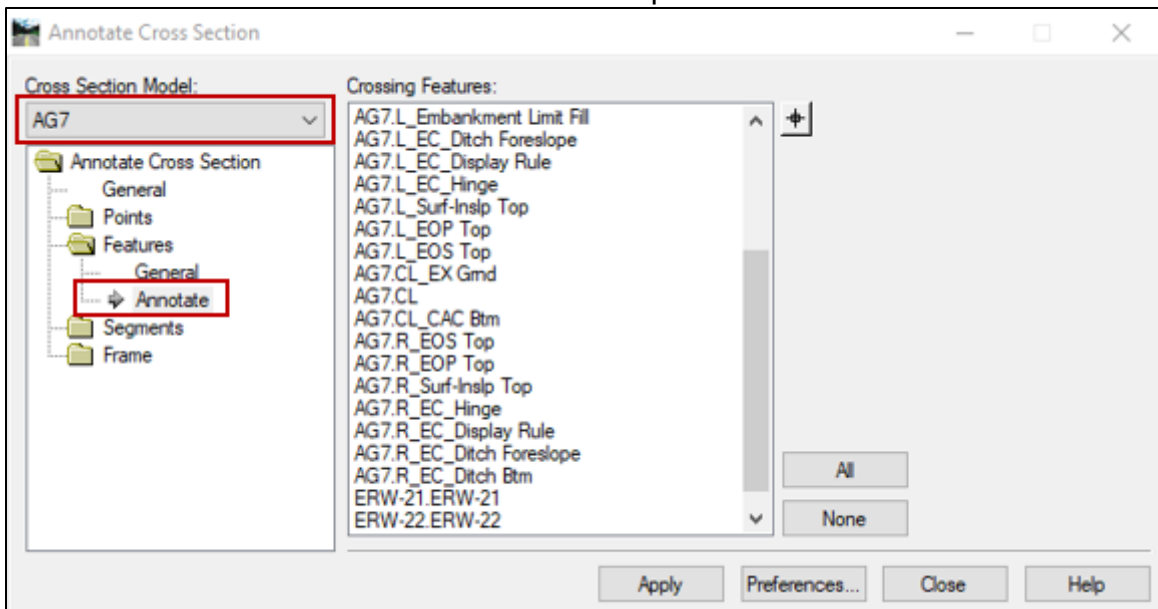
1. Continue in the **Annotate Cross Section** dialog box.
2. Click **Preferences** and then select **Feature – Elev/Offset** from the list of defined preferences. Click **Load** then **Close**. Select the active terrain model from the **Surface** drop-down.



3. Click **Features** then **General** in the dialog navigation panel and verify that settings match the settings shown below. **NOTE:** The **Offset** box will be checked **ON** with the default preferences loaded. Offsets are not typically labeled for final plans production; therefore, **uncheck** the Offset box. If offset labeling is required for project specific occasions, “**LT.**” and “**RT.**” denotations can be added to the **Offset Suffix** column based on location to the centerline. Please note that a negative, “**-**”, denotation will be placed in front of any offset left of the centerline.



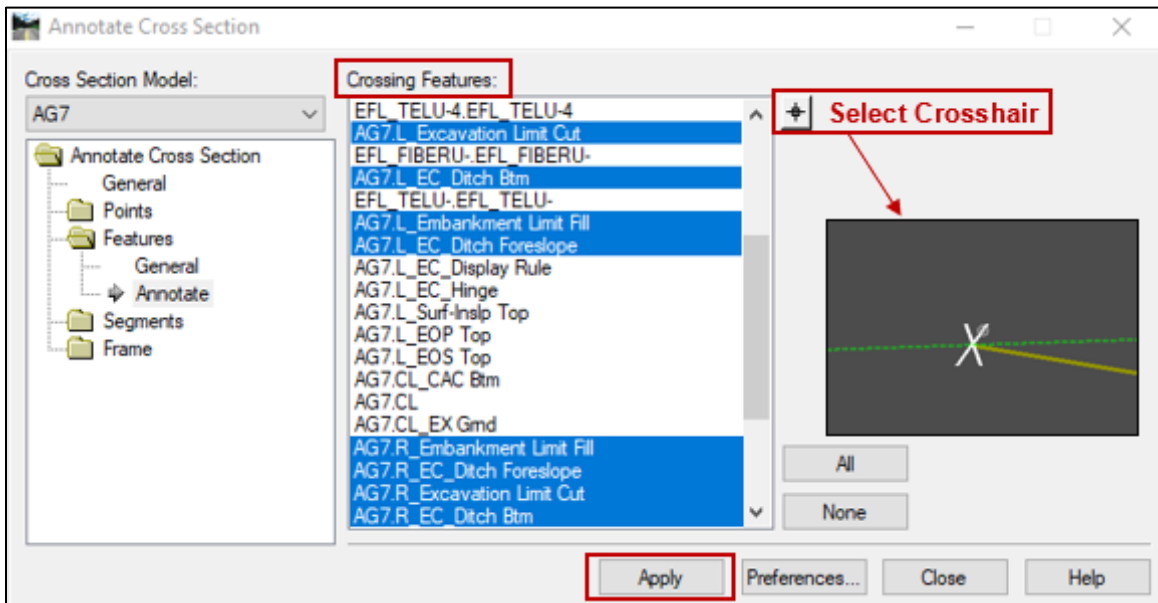
- Click **Annotate** under the **Features** folder in the dialog navigation panel. Select the model from the **Cross Section Model** drop-down.



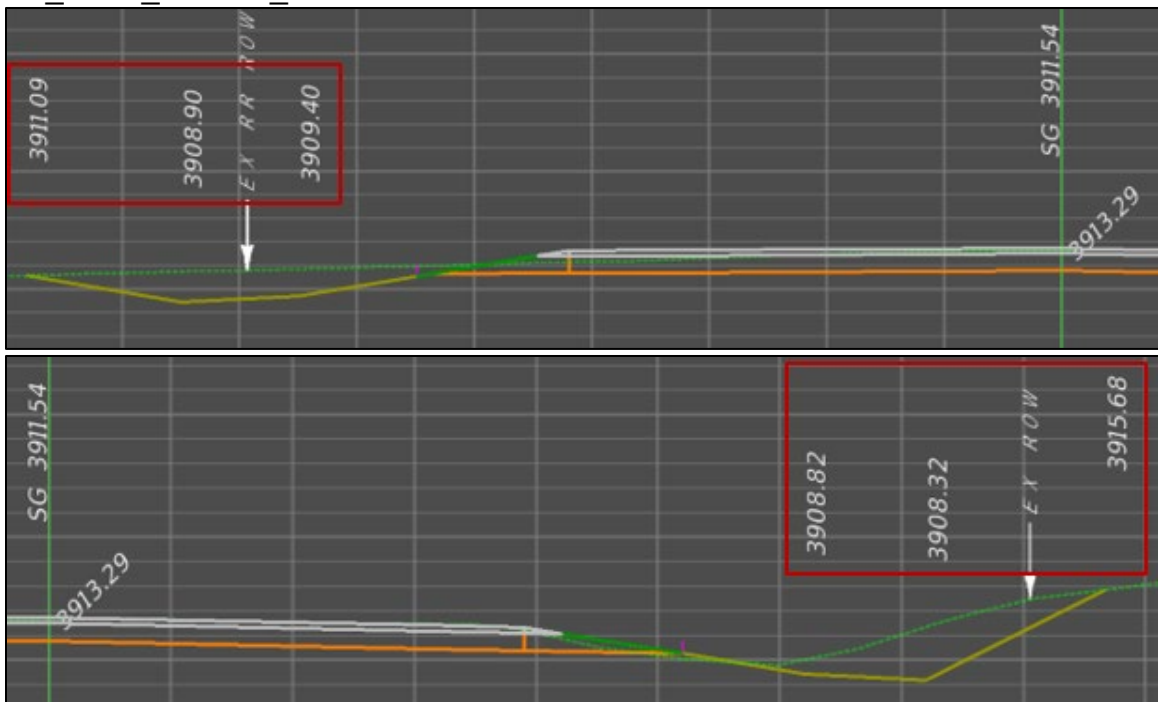
- Select desired points from the **Crossing Features** list by holding down the **Ctrl** key and selecting, or by using the **Select Crosshair** tool to select the "X" for the desired points. Click **Apply**.

**NOTE:** **Crossing Features** may include but are not limited to the following:

- Embankment Limit Fill
- Excavation Limit Cut
- Ditch Bottom
- Ditch Foreslope



6. The labels should appear as shown below and will be placed on level XS\_Label\_Feature\_Text.

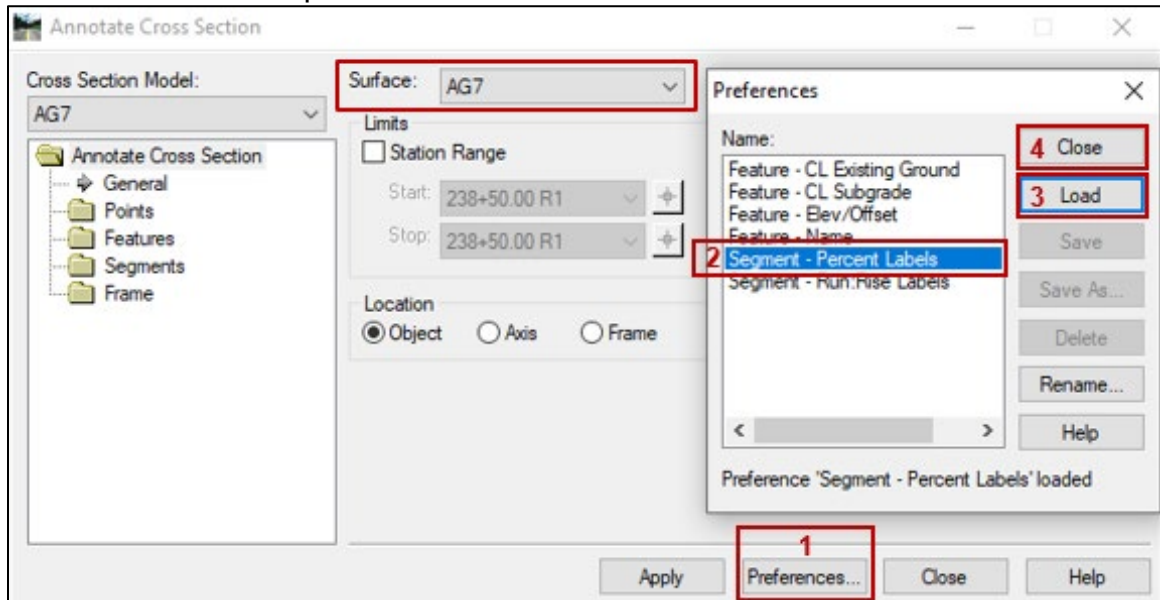


7. Click **None** to clear the **Crossing Feature** selection before proceeding to the next procedure.

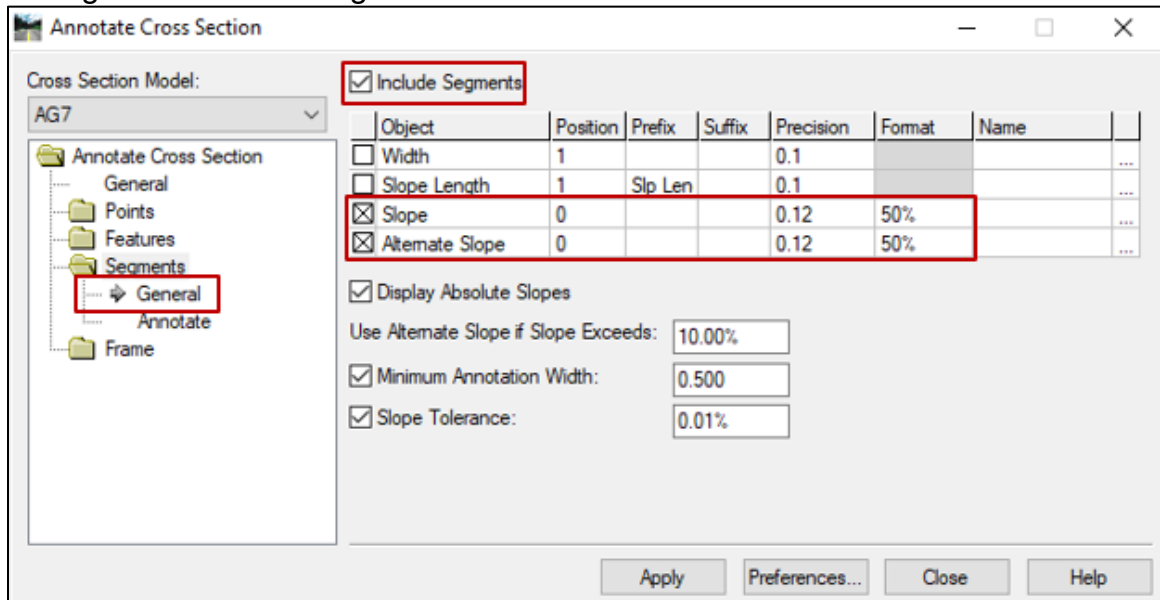
## Procedure – Annotate Cross Sections: Segment – Percent Labels

This procedure provides guidance on how to label roadway slopes, if applicable.

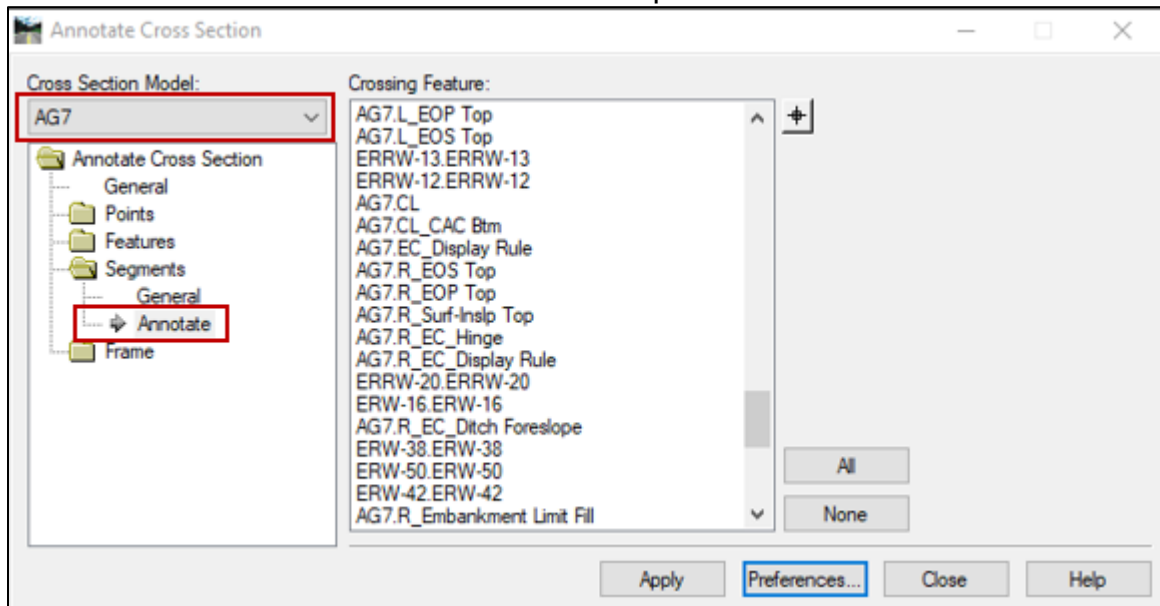
1. Continue in the **Annotate Cross Section** dialog box.
2. Click **Preferences** and then select **Segment – Percent Labels** from the list of defined preferences. Click **Load** then **Close**. Select the current corridor surface from the **Surface** drop-down.



3. Click **Segments** then **General** in the dialog navigation panel and verify that settings match the settings shown below.



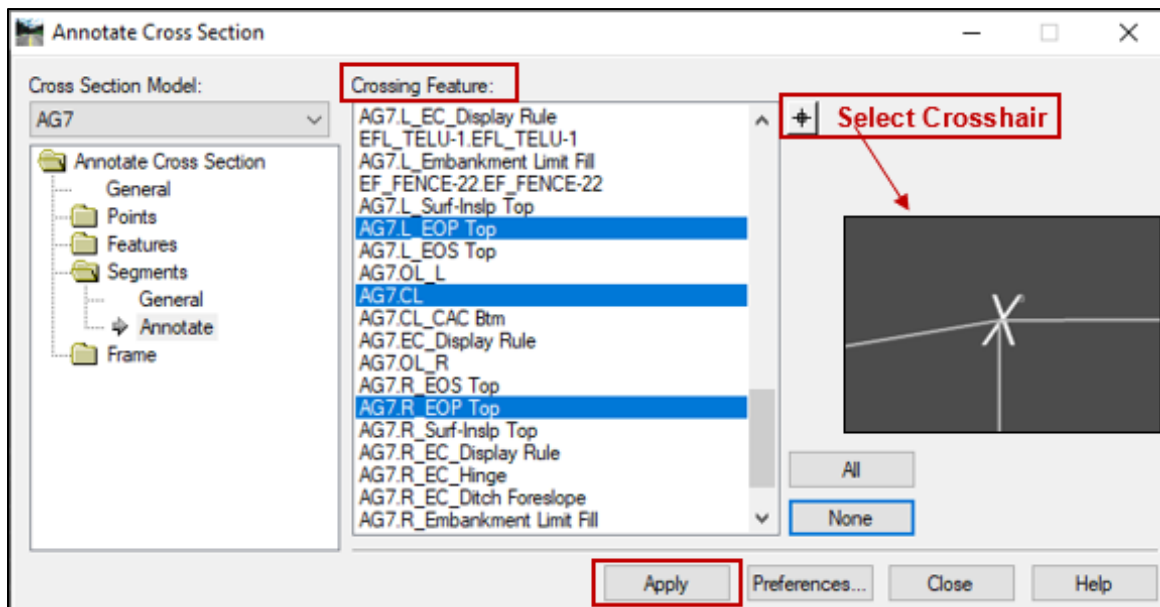
- Click **Annotate** under the **Segments** folder in the dialog navigation panel. Select the model from the **Cross Section Model** drop-down.



- Select desired points from the **Crossing Features** list by holding down the **Ctrl** key and selecting, or by using the **Select Crosshair** tool to select the “X” for the desired points. Click **Apply**.

**NOTE:** **Crossing Features** may include but are not limited to the following:

- Edge of Pavement Top
- Proposed Centerline



6. The labels should appear as shown below and will be placed on level XS\_Label\_Segment\_Text.

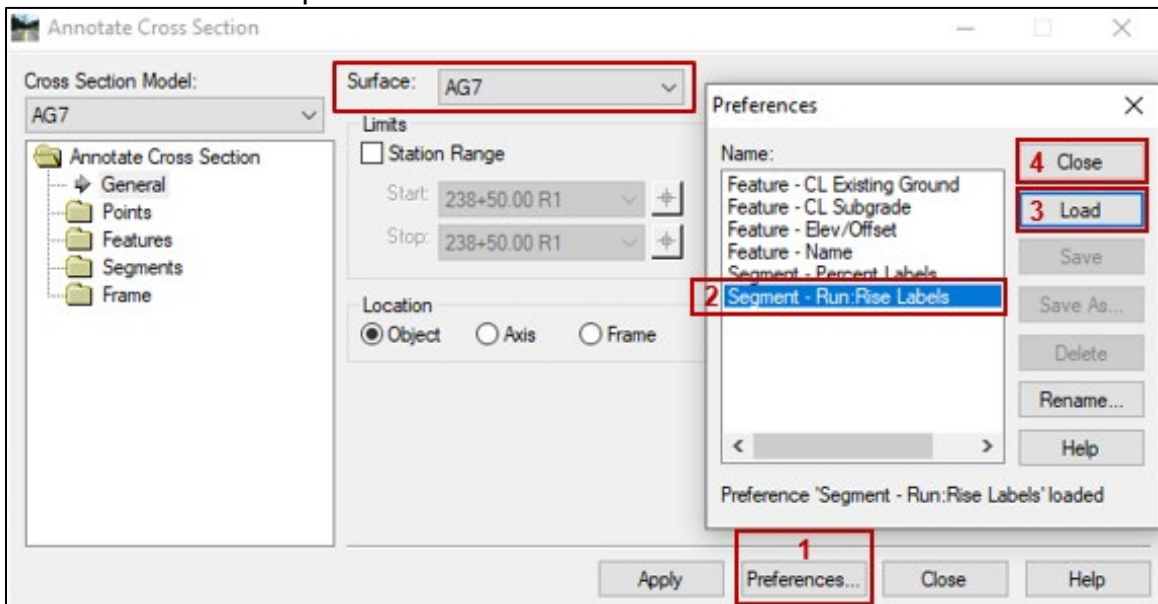


7. Repeat Steps 1 - 6 for additional mainline corridors in the **Surface** drop-down.
8. Click **None** to clear the **Crossing Feature** selection before proceeding to the next procedure.

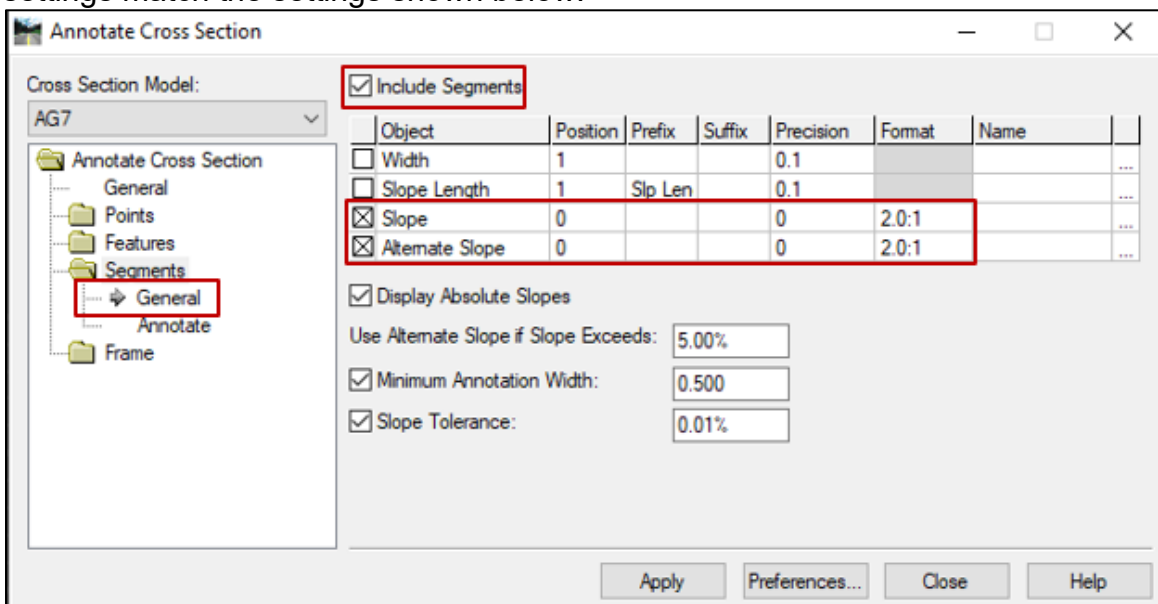


## Procedure – Annotate Cross Sections: Segment – Run:Rise Labels

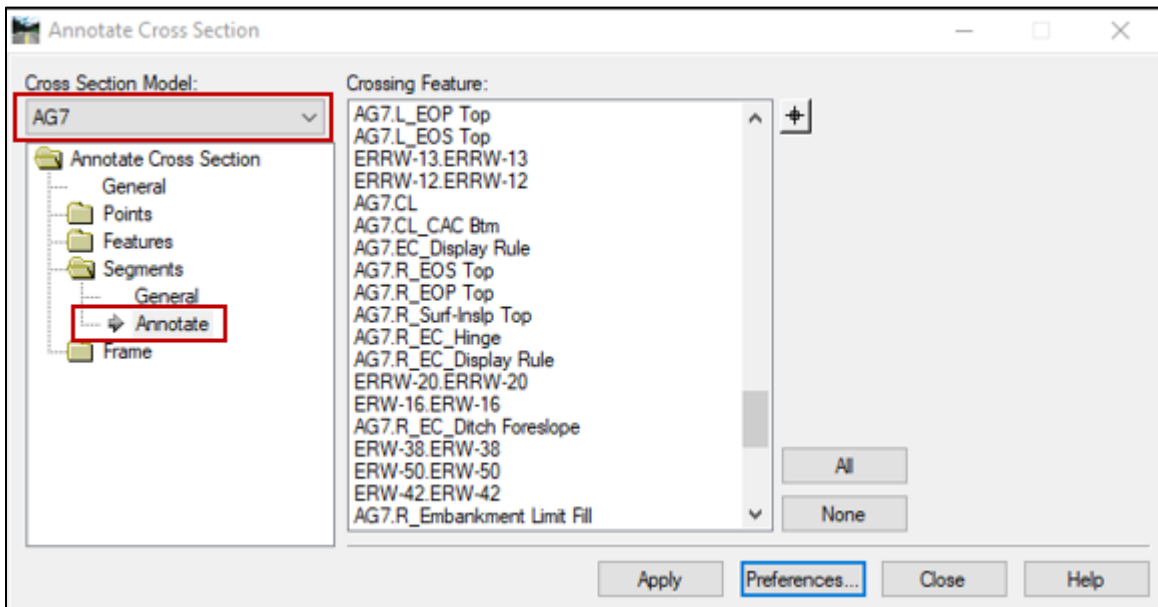
1. Continue in the **Annotate Cross Section** dialog box.
2. Click **Preferences** and then select **Segment – Run:Rise Labels** from the list of defined preferences. Click **Load** then **Close**. Select the current corridor surface from the **Surface** drop-down.



3. Click **Segments** then **General** in the dialog navigation panel and verify that settings match the settings shown below.



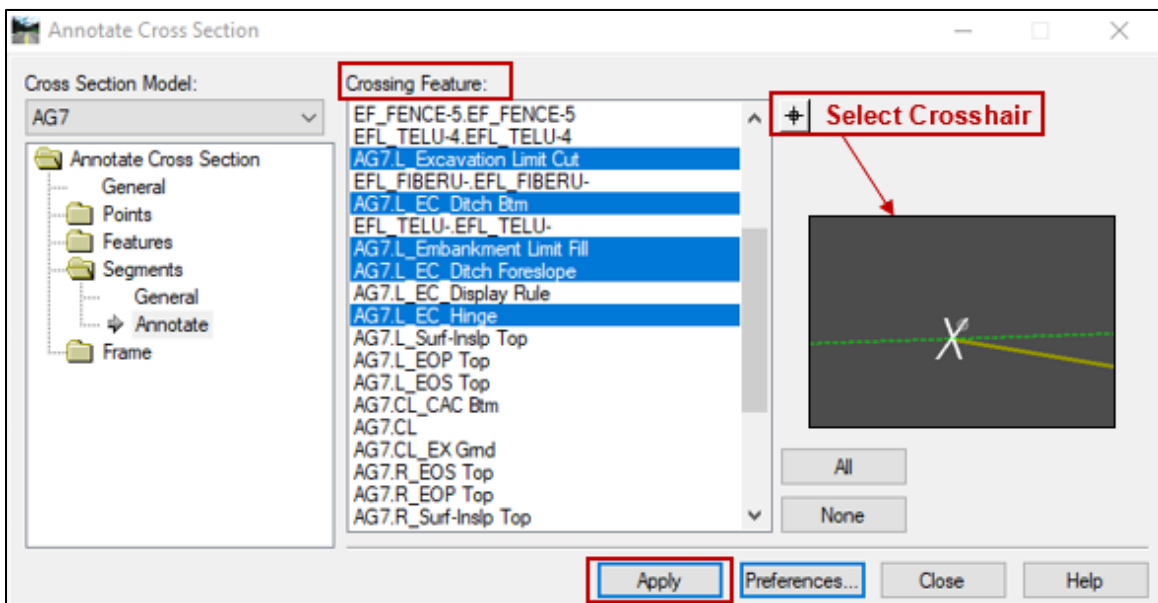
4. Click **Annotate** under the **Segments** folder in the dialog navigation panel. Select the model from the **Cross Section Model** drop-down.



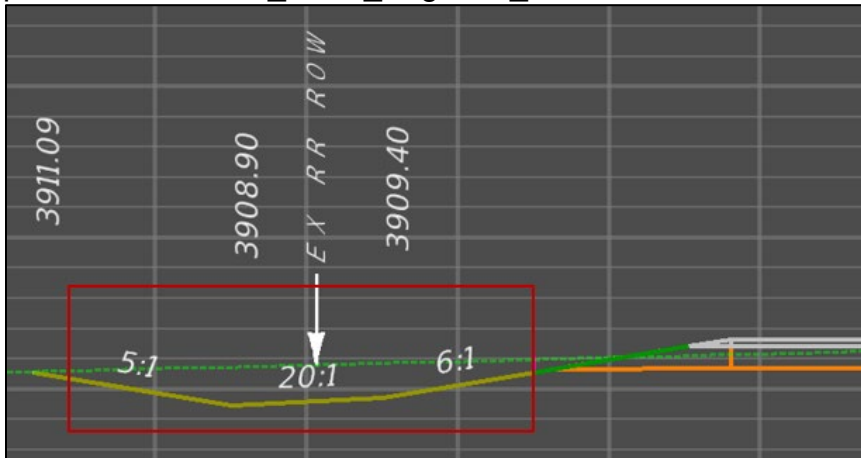
5. Select desired points from the **Crossing Features** list by holding down the **Ctrl** key and selecting, or by using the **Select Crosshair** tool to select the “X” for the desired points left of centerline. Click **Apply**.

**NOTE:** Left-side **Crossing Features** may include but are not limited to the following:

- L\_Embankment Limit Fill
- L\_EC\_Hinge
- L\_Excavation Limit Cut
- L\_EC\_Ditch Btm
- L\_EC\_Ditch Foreslope



- The labels should appear as shown below for points left of centerline and will be placed on level XS\_Label\_Segment\_Text.

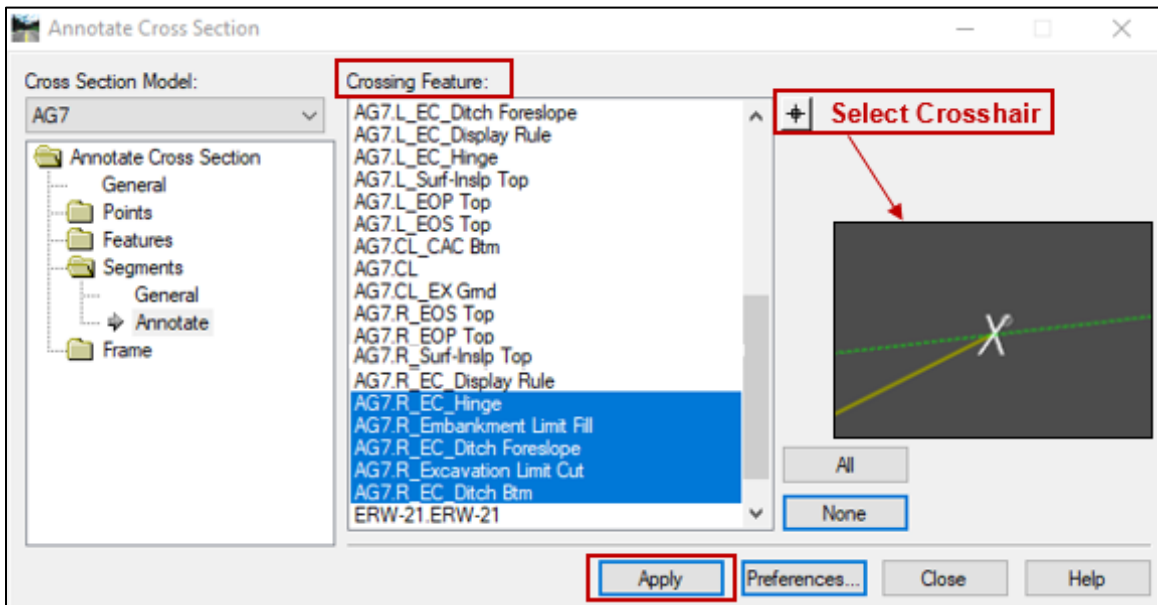


**NOTE:** If points right of centerline are included with this portion of labeling, slope labels will appear between the left and right hinge points and the process will need to be undone and repeated.

- Click **None** to clear the **Crossing Feature** selection before proceeding.
- Repeat Steps 1 - 4.
- Select desired points from the **Crossing Features** list by holding down the **Ctrl** key and selecting, or by using the **Select Crosshair** tool to select the "X" for the desired points right of centerline. Click **Apply**.

**NOTE:** Right-side **Crossing Features** may include but are not limited to the following:

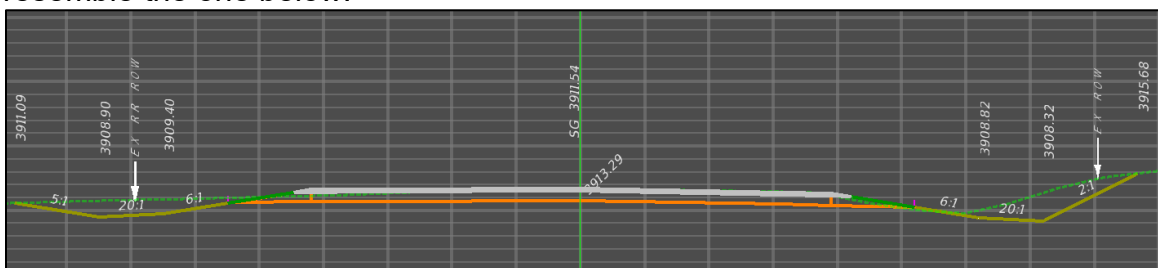
- R\_Embankment Limit Fill
- R\_EC\_Hinge
- R\_Excavation Limit Cut
- R\_EC\_Ditch Btm
- R\_EC\_Ditch Foreslope



10. The labels should appear as shown below for points right of centerline and will be placed on level XS\_Label\_Segment\_Text.



11. After completing the labeling process, the cross sections produced should resemble the one below:



12. If needed, repeat Step 8 of Section III, Procedure – Cross Section Labeler: *Drawing Cross Section Labels*, to draw additional cells in the cross section model by using the GEOPAK **Draw Ancillary Features** tool.

## Section V. Updating Cross Sections

### Procedure – Cross Section Synchronization Macro

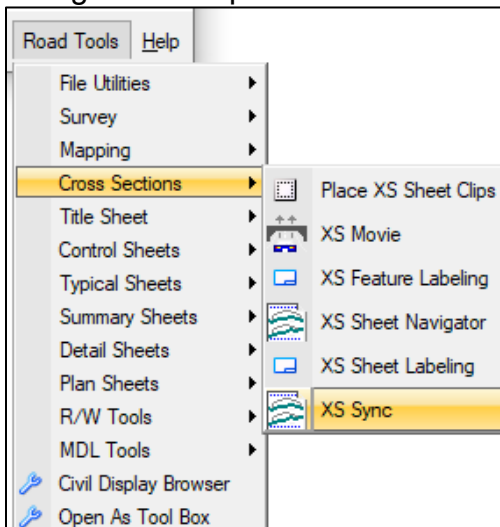
The following macro was created to address the problem of transferring notes and other hand-edited information when a new cross section model is created by utilizing OpenRoads software.

1. Open the project mainline cross section file.
2. Follow the procedures above to create and annotate a new cross section model.  
NOTE: Do **not** delete the old cross section model.

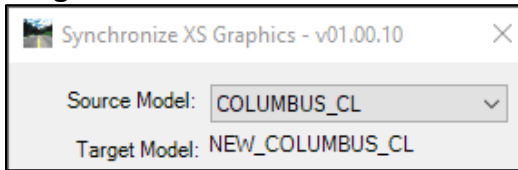
If not already, open the new cross section model. To do this, select the drop-down on the **Models** tab on the **Primary Tools** bar. Double-click the new cross section model to open this model. NOTE: For this example, the new cross section model is *NEW\_COLUMBUS\_CL*, and the old cross section model is *COLUMBUS\_CL*.

Type	2D/3D	Name	Description	Design File	Sheet Name
	<input type="checkbox"/>	Default		C:\...\9116000RDXSF001.DGN	
	<input type="checkbox"/>	Openroads_Readme	Openroads ReadMe Model	C:\...\9116000RDXSF001.DGN	
	<input type="checkbox"/>	Default-3D		C:\...\9116000RDXSF001.DGN	
	<input type="checkbox"/>	COLUMBUS_CL		C:\...\9116000RDXSF001.DGN	
	<input checked="" type="checkbox"/>	NEW_COLUMBUS_CL		C:\...\9116000RDXSF001.DGN	

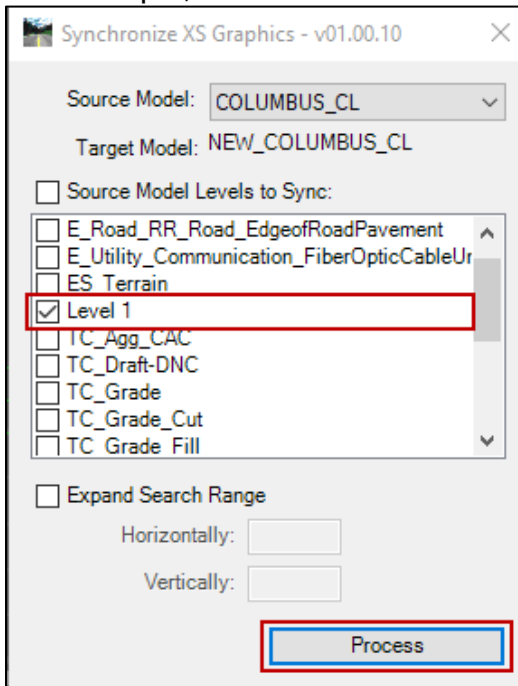
3. In the new cross section model, navigate to the **Road Tools > Cross Sections > XS Sync** as shown below. Click **XS Sync** and the **Synchronize XS Graphics** dialog box will open.



4. Select the old cross section model in the **Source Model** drop down menu. The **Target Model** will be the new cross section model.



5. Select desired levels to be copied to the new cross section model. NOTE: For this example, one EXAMPLE NOTE has been placed on Level 1.



6. Click **Process**. All selected levels will be copied to the new cross section model at the corresponding station as the old cross section model. NOTE: If a cross section station no longer exists in the new cross section model, levels located on the old station cross section will not be copied over.
7. A dialog box will appear detailing the number of elements copied. Click **OK** and close the **Synchronize XS Graphics** dialog box.
8. Items on the selected levels will appear in the new cross section model as shown below.

