OpenRoads Designer User Manual

U.S. Department of Transportation
Federal Highway Administration

Chapter 16

CROSS SECTIONS

2021 R2 Update 10 – Version 10.10.21.04 – WorkSpace 10.10V
January 2023

Chapter 16 Cross Sections

This chapter covers the creation of Cross Sections for Sheet Production.

TABLE OF CONTENTS

16A – Introduction to Road Cross Section Creation 16-3

16A.1 Corridor Components and 3D Linear Elements in Drawing Model 16-4
16A.2 Cross Section Production Flow Chart 16-5
16A.3 Warnings and Considerations for Cross Section Sheet Creation 16-6

16B – Create Cross Sections - Workflow 16-7

16B.1 Create and Setup the Cross Section ORD File 16-7
16B.2 Create the CROSS SECTION Named Boundary Elements 16-9
16B.2.a Initial Setup of the Named Boundary Dialogue Box 16-10
16B.2.b Place the CROSS SECTION Named Boundary Elements 16-16
16B.3 Create the Drawing Models and Sheet Models from Named Boundary Manager 16-21
16B.4 Setup Sheet Border Text Fields 16-23

16C – Skewed Cross Sections for Culverts – Workflow 16-24

16C.1 Create and Setup the Cross Section ORD File 16-25
16C.2 Create a Dummy Alignment that Matches with Drawing Seed 16-26
16C.3 Create the Skewed CROSS SECTION Named Boundary 16-28
16C.3.a Setup the Place Named Boundary Dialogue Box 16-28
16C.3.b Place the Skewed Named Boundary 16-30
16C.4 Resulting Skewed Cross Section Sheet 16-32

16D – Cross Section Annotations Basics 16-33

16D.1 Guide to the Default Cross Section Annotation Groups found in FLH WorkSpace 16-34
16D.2 Create, Remove, and Reapply Cross Section Annotations 16-35
16D.2.a Create Cross Section Annotations 16-35
16D.2.b Remove Cross Section Annotations 16-36
16D.3 Access and Setup of the Annotation Group Manager - Workflow 16-37
16D.3.a Load the Template Library used for Corridor Modeling 16-38
16D.3.b Set the Annotation Scale before Accessing the Annotation Manager 16-38
16D.3.c Access the Annotation Group Manager 16-39
16D.3.d Select the Corridor Template 16-40

16E – Configuring Cross Section Annotations 16-41

16E.1 Location: Specify which Template Points or 3D Linear Elements are Labeled 16-42
16E.1.a Location Sub-Menu 16-43
16E.1.b Filters 16-47
16E.2 Annotate: Specify the Label Type (Cell or Text element) 16-54
16E.2.a Text drop-down 16-55
16E.2.b Cell drop-down 16-56

16E.3 Leaders 16-57
16E.4 Placement: Specify the Position of Labels 16-59
16E.5 Slope Segment Labeling 16-62
16E.5.a Location: Specify which Segments are Labeled 16-63
16E.5.b Understanding the Filter Expressions used for Slope Labels 16-64

16F – Manipulating Offset/Elevation Labels 16-65

16F.1 Default Offset/Elevation Labels 16-66
16F.2 Add Custom Offset/Elevation Labels - Workflow 16-68

16G – Miscellaneous Cross Section Annotation Workflows 16-72

16G.1 Create Right-of-Way Annotations 16-72
16G.1.a Convert ROW Linework into 3D Linear Elements (Points) 16-72
16G.1.b Configure the "XS RW GRail and Cbl Bar Annotation" Group 16-75

16H – Troubleshoot Cross Sections 16-81

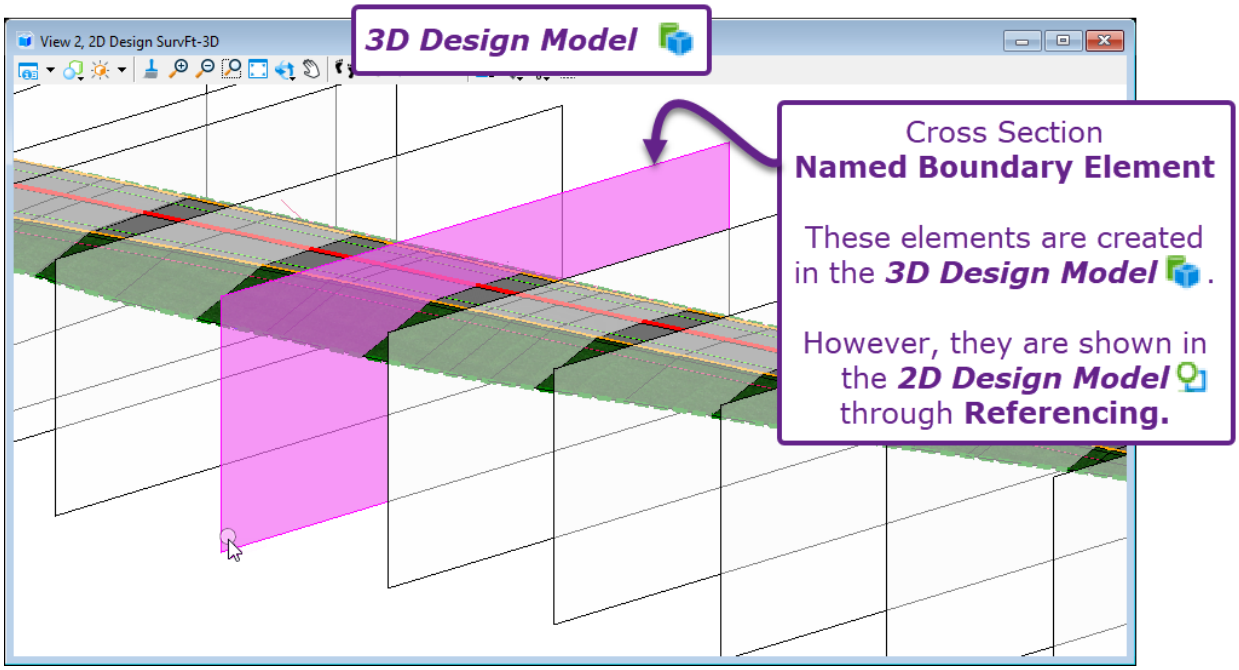
16H.1 Slope Stake Limit Points NOT Labeling 16-81
16H.2 Design Grade and Subgrade Elevation Labels are Absent 16-83
16H.3 Subgrade and Existing Ground Label Positioned to the Left 16-86
16H.4 Existing Ground Elevation Label ("Original Grnd") is Absent 16-87
16H.5 Update Sheet Number and Text Fields in the Sheet Borders 16-89
16H.6 "UPDATE ALIGNMENT NAME IN FILE PROPERTIES" Fix 16-90
16H.7 Cross Sections and Station Titles are Overlapping in Sheet Model 16-91
16H.8 Cross Sections Placed Beyond the Top of the Sheet Border 16-93

16I – Print Cross Sections 16-95

16A – INTRODUCTION TO ROAD CROSS SECTION CREATION

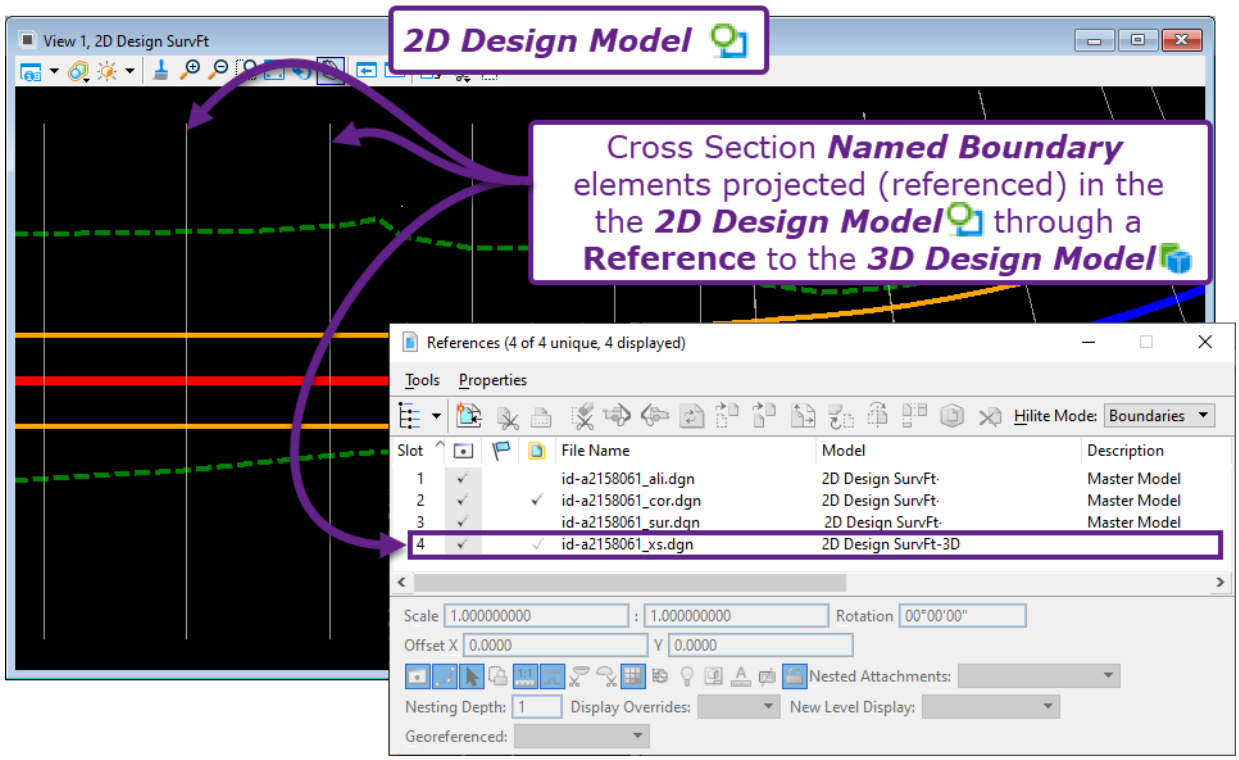
Many concepts used in the Plan and Profile sheet production are applicable to the production of Road Cross Sections sheets. For more information on Plan and Profile sheet production, see *Chapter 14 – Plan Sheet Production*.

Each cross-section station will require the creation of a *Named Boundary* element. Next a corresponding CROSS SECTION *Drawing Model* is created for each *Named Boundary* element.



Create Cross Section *Named Boundary* elements in the *3D Design Model*. However, place the Cross Section *Named Boundaries* from the *2D Design Model*.

IMPORTANT: Cross Section *Named Boundaries* are 3D elements.



16A.1 Corridor Components and 3D Linear Elements in Drawing Model

In the CROSS SECTION *Drawing Models*, there are two types of elements that comprise Road Cross Section graphics: *3D Linear Elements* (Points) and *Components* (shapes). All 3D elements that intersect with the Named Boundary elements will be shown in the CROSS SECTION *Drawing Models*.

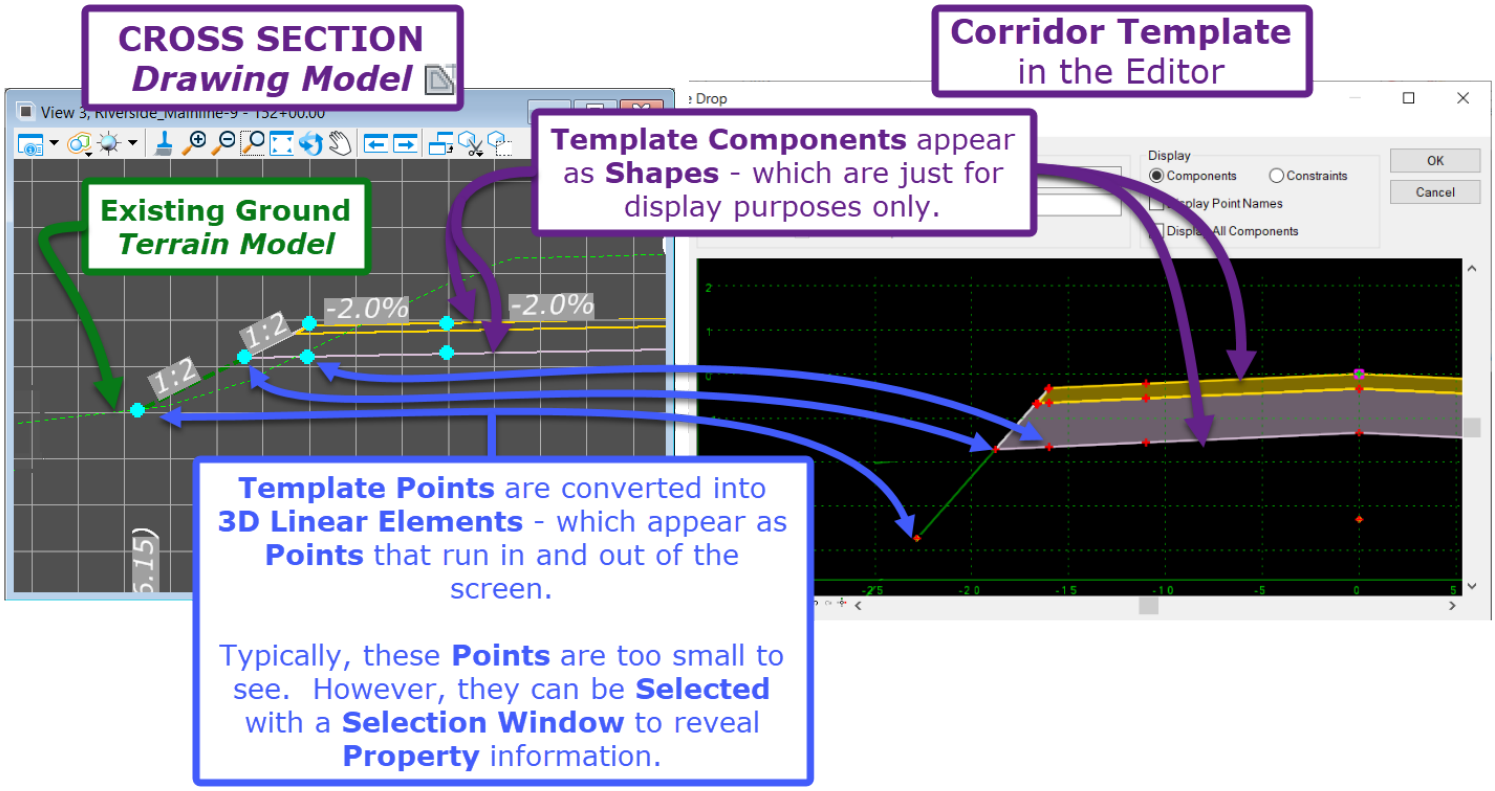
> ***NOTE:*** Both *Components* and *3D Linear Elements* (Points) are directly related to the Templates used to create Corridors, Linear Templates, and Surface Templates. Template Points and Components are created in the *3D Design Model* when a Corridor, Linear Template, or Surface Template is processed.

3D Linear Elements (Points): *3D Linear Elements* (Points) directly correspond to Template Points. A Template produces a *3D Linear Element* when a Corridor is processed. When placing labels and annotations, the *3D Linear Elements* (Points) are sought out by the *Annotation Group*. For more information on the labeling of *3D Linear Elements* (Points), see *16D – Cross Section Annotation Basics*.

> ***NOTE:*** In CROSS SECTION *Drawing Models*, Points are often imperceptible to the human eye (even when zoomed in). Use a *Selection Window* to identify a Point in the Properties box

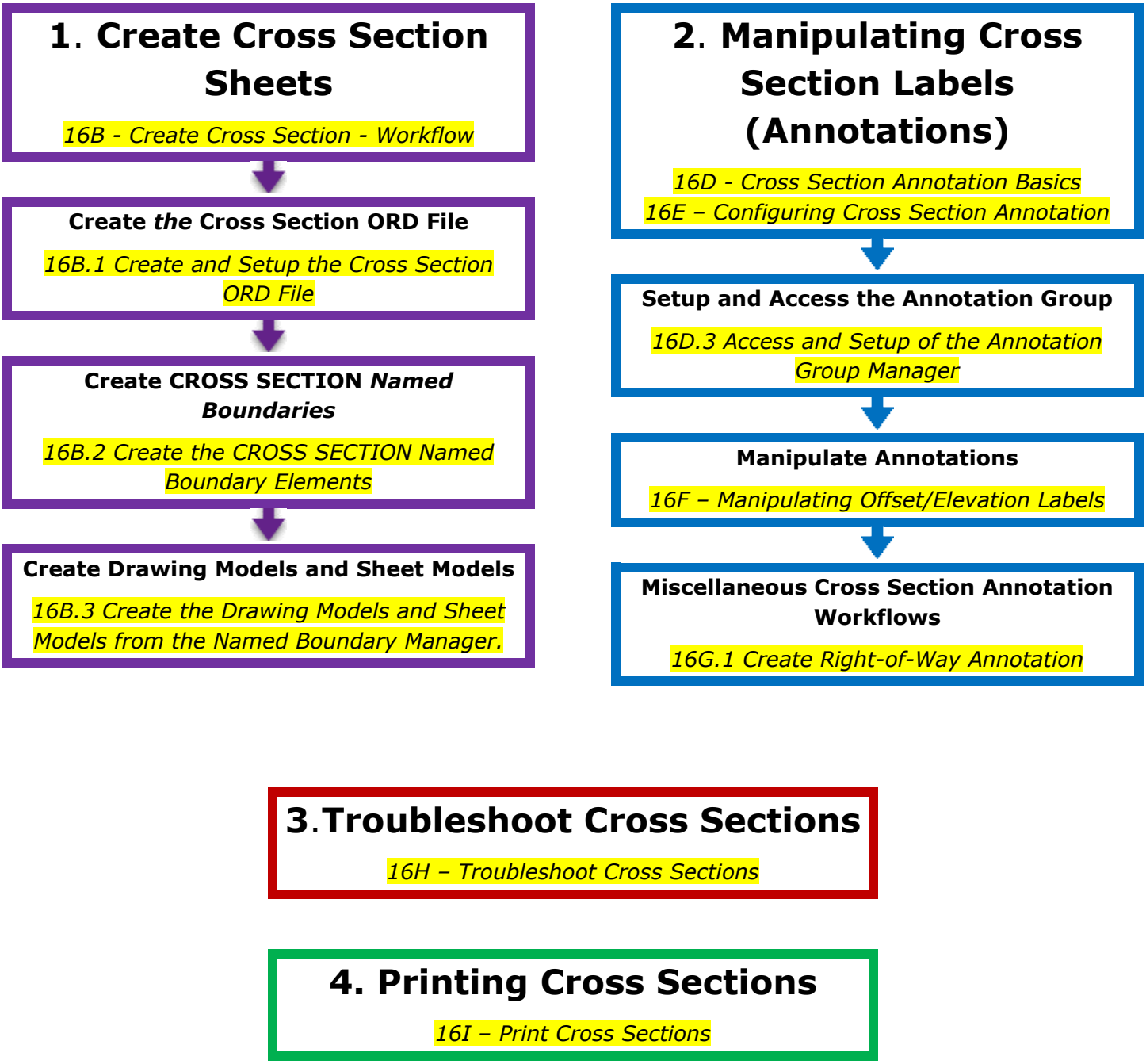
Components: Components directly correspond with Template Components. Within the CROSS SECTION *Drawing Models*, Components are for graphical display purposes only. Components are NOT used for labeling/annotation purposes.

> ***NOTE:*** Terrain Model (i.e., Existing Ground, Finished Ground) graphics are also found in Cross Section graphics. However, the User will generally NOT interact with these Terrain Model elements for annotation purposes.



16A.2 Cross Section Production Flow Chart

The flow chart below is intended to provide an overview for processes required to produces Cross Section sheets.



16A.3 Warnings and Considerations for Cross Section Sheet Creation

IMPORTANT: The creation of Cross Sections is a straightforward procedure. However, if CROSS SECTION *Named Boundary* elements are created incorrectly, they are difficult or impossible to rectify. In other words, if Cross Sections are created incorrectly, the User will have to re-create them.

WARNING: Do NOT create CROSS SECTION *Drawing Models* and *Sheet Models* until ALL CROSS SECTION *Named Boundary* elements have been created and their placement reviewed.

DESIGN ITERATIONS WARNING: As a design evolves and the Alignment is adjusted, it is very likely that Cross Sections will have to be re-created for each design milestone (30%, 70%, 95%, Final). As discussed below, CROSS SECTION *Named Boundary* elements will NOT reposition if the Alignment is edited (shifted or moved).

WARNING: It is crucial that the User understands that CROSS SECTION Named Boundary elements are NOT dynamic after creation. The dimensions (width and height) and position (in respect to the Alignment) of CROSS SECTION Named Boundary elements CANNOT be changed after creation.

> **Edits to the Alignment:** If the Alignment is altered (even slightly), the CROSS SECTION Named Boundary elements will NOT reposition to accommodate the horizontal change. In other words, CROSS SECTION Named Boundary elements will NOT be centered or perpendicular to the Alignment after edits to the Alignment. Similarly, all Named Boundary elements down-station of an Alignment edit will be at an uneven station location (i.e., 10+25.43).
>
> **Edits to the Profile:** CROSS SECTION Named Boundary elements will NOT reposition vertically if the Profile were to change. Minor edits to the Profile may be acceptable, assuming the Cross Section graphics do NOT shift outside of the height limits of the CROSS SECTION Named Boundary elements.
>
> **Edits to the Corridor Template:** Edits to Corridor Template may be acceptable. However, the User will have to re-create Cross Section Annotation Labels to reflect the new Corridor Template Point configurations. ***NOTE:*** If the Corridor Template is to significantly widen, then the cross-section graphics may shift outside of the width limits of the CROSS SECTION *Named Boundary* elements – in which case, the Cross Section will have to be re-created with wider *Named Boundary* elements.

WARNING: After CROSS SECTION *Named Boundary* elements have been created, the User CANNOT change the dimensions of the Cross Section Grid or Vertical Exaggeration. The dimensions of the Profile Grid directly correlate with the dimensions of the *Named Boundary* elements. If the dimensions of the *Named Boundary* elements are unacceptable, then the User will have to re-create them.

MORE INFORMATION ABOUT THE CROSS SECTION GRID: The HEIGHT of the Cross Section Grid is slightly different for each Cross Section. The height of the Grid is dependent on the *Top* and *Bottom Clearances* and the critical high/low point in the Cross Section graphics. See *16B.2.a.ii Top and Bottom Clearances and the Cross Section Grid Height*.

16B – CREATE CROSS SECTIONS - WORKFLOW

This section covers the overall workflow for creating Cross Sections and the associated FLH Cross Section sheets.

Before creation of Cross Section, see the ***WARNINGS*** on the previous page.

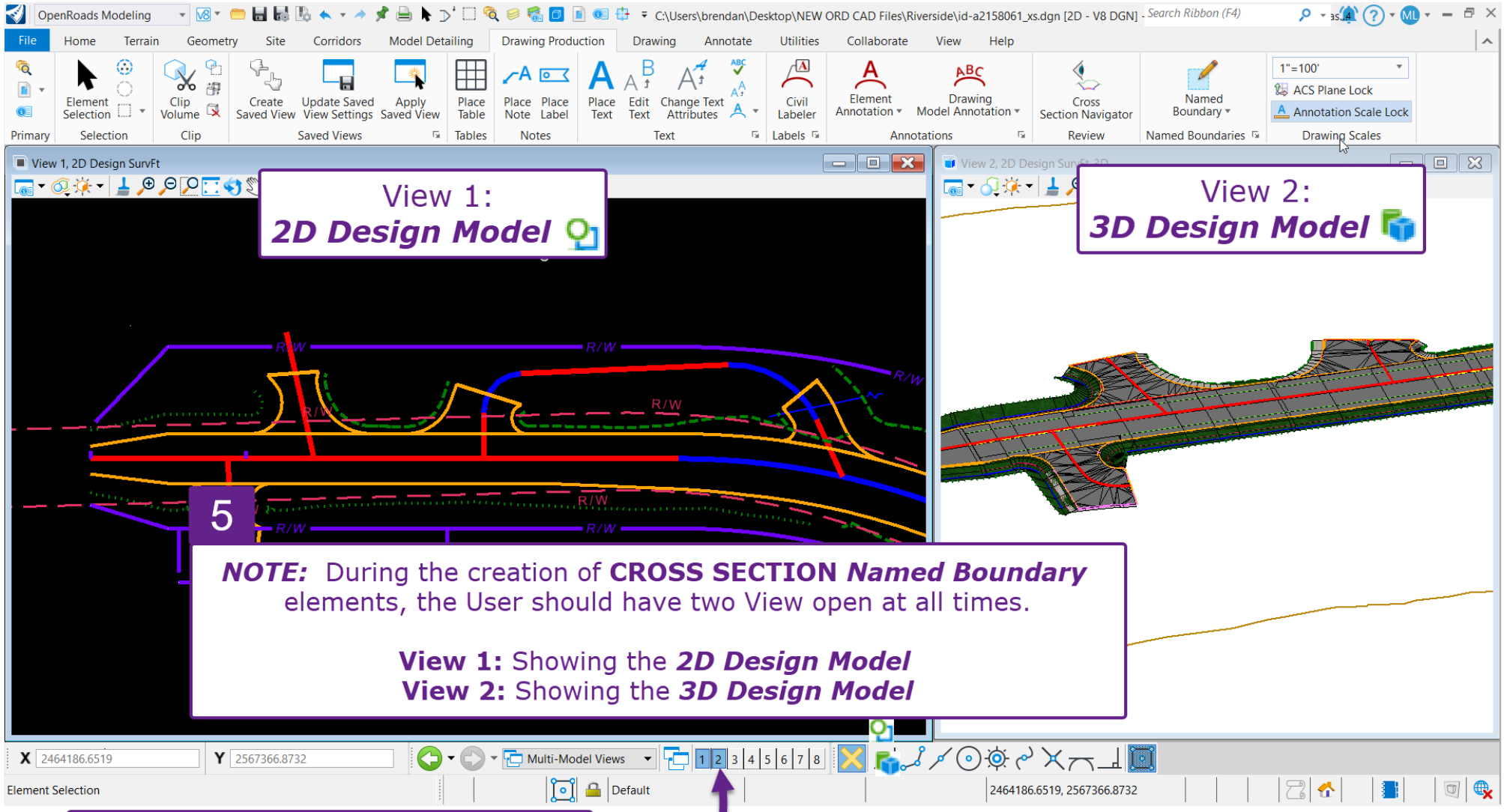
16B.1 Create and Setup the Cross Section ORD File

Cross Sections should be placed in a new ORD File.

WARNING: **Do NOT create Cross Sections in the Corridor ORD File or other Design ORD Files.**

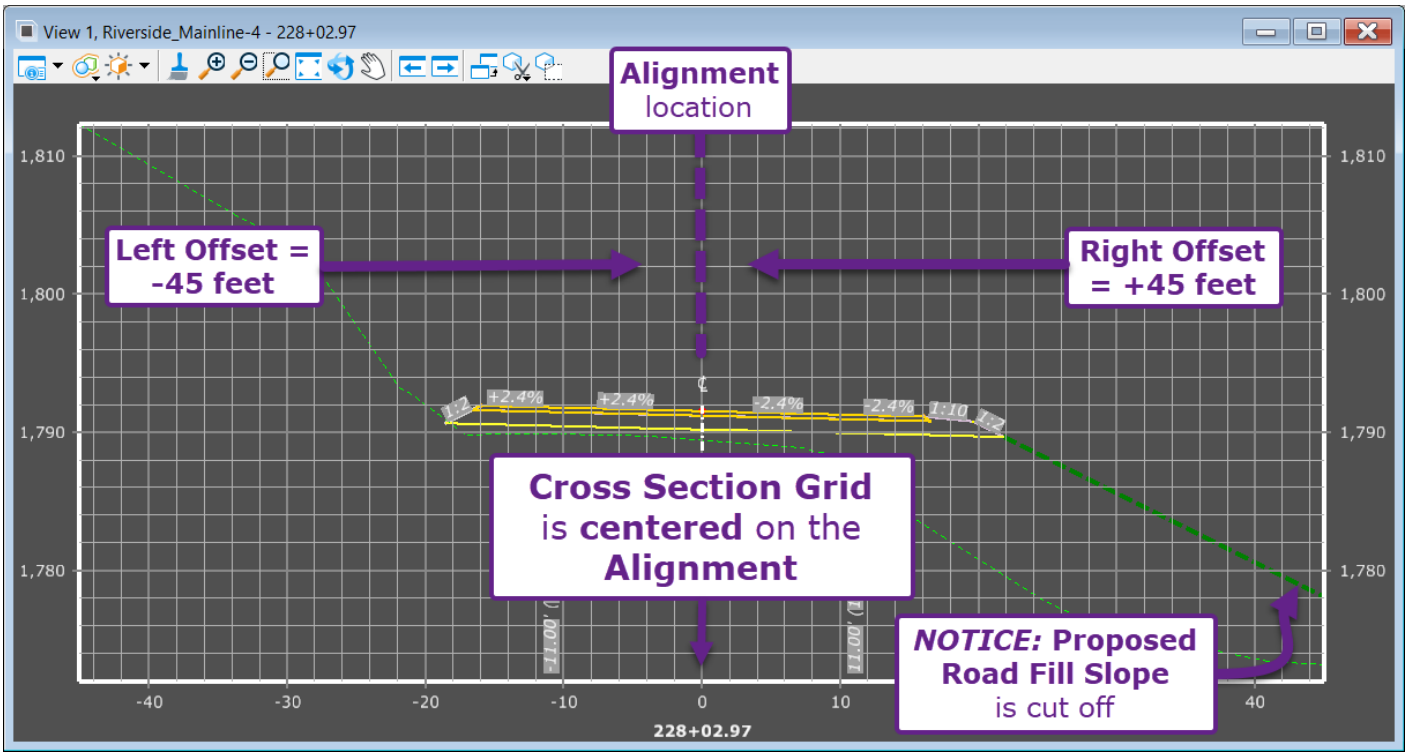
1	Create a new ORD File. For the overall procedure for new ORD Files, see *3B – Create a New ORD File*. Refer to *3C – ORD File Naming Conventions* for naming of the Cross Section File.
2	Set the Coordinate System for the new ORD File. See *3D.1 Set the Coordinate System*.
3	In the new ORD File, Reference in the following ORD File types: • Survey ORD File and/or Existing Terran ORD File* • Mainline Alignment ORD File • Corridor ORD File • Any other Design ORD Files that contain 3D Modeling elements that should appear in the cross sections (i.e., Approach, Driveway, and Intersection modeling files). • Existing and Proposed Right-of-Way Files (e_row.dgn and p_row.dgn)** ***NOTE*:*** For Cross Section creation, it is necessary to activate the Existing Ground Terrain Model. Survey linework is NOT strictly necessary for the Cross Section creation or labeling purposes. If the Existing Ground Terrain Model is contained in a dedicated ORD File, then it is NOT necessary to reference in the Planimetric Survey ORD File. ***NOTE**:*** Existing and Proposed ROW Linework can be copied into the active Cross Section ORD File and projected into the cross sections. This procedure is shown in *16G.1 Create Right-of-Way Annotation*. If the ROW linework does NOT need to be projected into the Cross Sections, then there is no need to reference the ROW ORD Files into the Cross Section ORD File.
4	Set the Existing Ground Surface as *Active*. For more information on *Activating* the Existing Ground Terrain Model, see *3D.3 Activate the Existing Ground Terrain Model*. ***NOTE:*** After the Existing Ground Surface is activated in the *2D Design Model*, then a corresponding *3D Design Model* will automatically be created in the ORD File. See *3D.3.a Creation of the 3D Design Model after Terrain Model Activation*.
5	Open a second View and set the second View to show the *3D Design Model*. Perform all procedures in the *2D Design Model*, but the *3D Design Model* should be open for processing purposes. ***WARNING:*** If attempting to create CROSS SECTION *Named Boundaries* without the *3D Design Model*, then an error message will be displayed.

TIP: Opening multiple *View* windows and controlling the Model shown in a *View* is discussed in *1A.3.b Open and Navigate the 3D Design Model*.

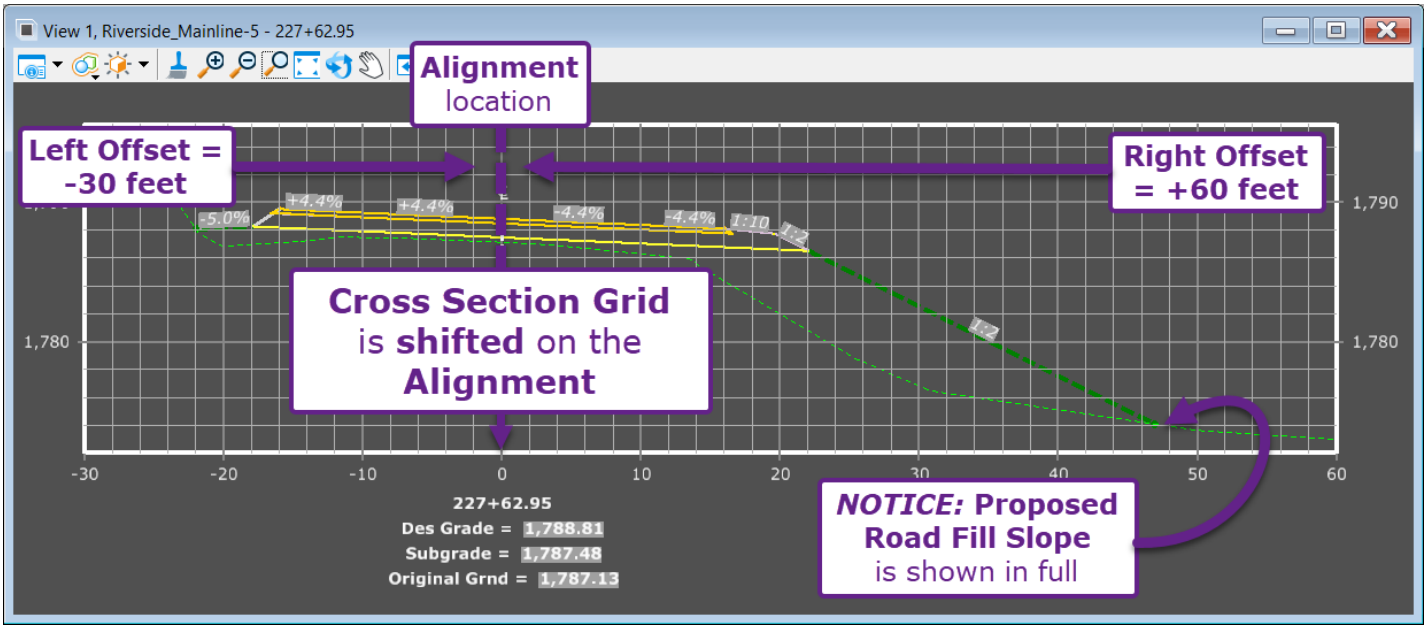


16B.2 Create the CROSS SECTION Named Boundary Elements

IMPORTANT: If Cross Sections *Named Boundary* elements are created incorrectly, they are difficult or impossible to rectify after *Drawing Models* and *Sheet Models* have been created. For this reason, the User should take care to review the placement of each CROSS Section *Named Boundary* element before creating *Drawing Models* and *Sheet Models*. For example, if a CROSS SECTION *Named Boundary* element is too narrow, then the Proposed Road might sprawl past the horizontal limits of the Grid.

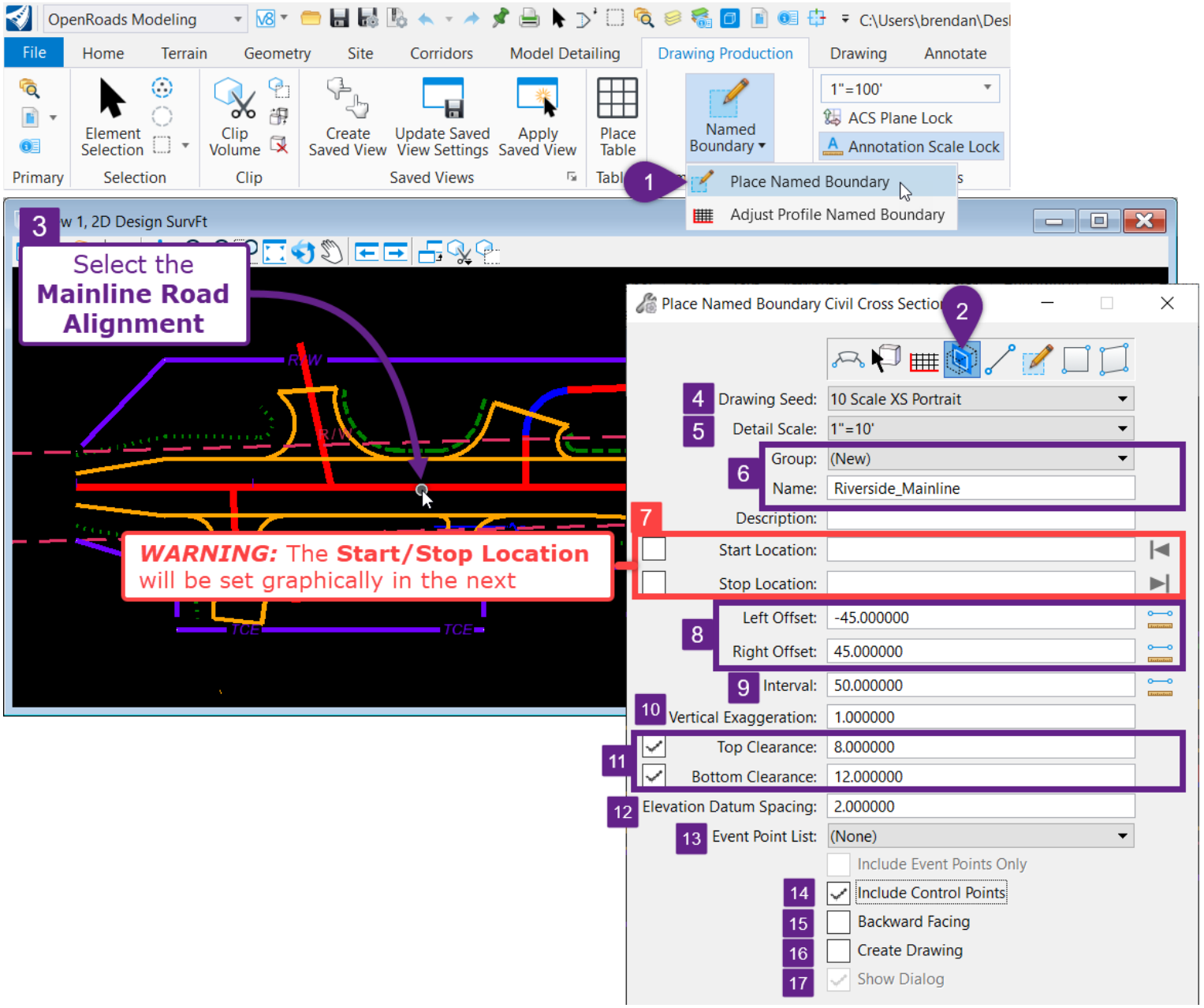


In the example shown above, it is possible to fit the entire Proposed Road fill slope into the Cross Section Grid by staggering the **Left Offset** and **Right Offset** for a specified station range. By doing so, the Cross Section Grid won't be exactly centered on the Alignment. Instead, the Grid will be shifted to capture the Proposed Road fill slope within in the specified station range. This procedure is shown in *16B.2.b.ii Place Shifted Named Boundaries*.



16B.2.a Initial Setup of the *Named Boundary* Dialogue Box

In this step, the *Named Boundary* dialogue box is setup.



1	From within the *2D Design Model*, select the *Place Named Boundary* tool from the Ribbon: [***OpenRoads Modeling*** → ***Drawing Production*** → ***Named Boundaries***].
2	In the *Place Named Boundary* Dialogue Box, select the ***Civil Cross Section*** mode by clicking on the icon .
3	*Prompt: Place Named Boundary Civil Cross Section > Identify Path Element* – Select the Alignment.

4	**Drawing Seed:** The *Drawing Seeds* corresponds to the design scale that Cross Section will be shown at on the *Sheet Models*. Most roadway project utilize the **10 Scale Portrait** or **20 Scale Portrait** *Drawing Seeds*. The *Drawing Seed* directly corresponds with the *Total Cross Section Length* that can be shown in the sheets. For example, the **10 Scale Portrait** *Drawing Seed* can show a total of 90 feet of a roadway cross section (45 feet on each side of the Alignment). See *16B.2.a.i Cross Section Drawing Seed Table and Total Lengths* for Total Cross Section Length available for each *Drawing Seed*. ***TIP:*** The User should have a rough idea of how much cross-sectional length is needed when choosing a *Drawing Seed*. For example, if the average existing right-of-way width is 100 feet, then the **10 Scale Portrait** *Drawing Seed* would be insufficient, because it only shows a total cross-sectional width of 90 feet. ***IMPORTANT:*** The Drawing Seed will automatically set the Left Offset and Right Offset.
5	**Detail Scale:** The *Detail Scale* is automatically set by the **Drawing Seed**. ***WARNING:*** Do NOT manually change the *Detail Scale*.
6	**Group:** When creating the first set of *Named Boundaries*, the **Group** will be set to *(New)*. After the first set is finally placed, a *Group* (with the **Name** shown just below) is created and is selectable in this drop-down. ***TIP:*** When creating additional *Named Boundary* elements, ALWAYS select the previously-created **Group** from the drop-down. ***BEST PRACTICE:*** All *Named Boundary* elements in the Cross Section ORD File should be assigned to the same **Group**. In later steps, all *Named Boundaries* must be contained in the same **Group** to be displayed continuously in the *Sheet Models*. ***WARNING:*** The **Group Name** is also important in sheet production because it will be prominently shown in the Title Block of the resulting *Sheet Models*. For information about the *Fields* contained within the Title Block, see *16B.3 Setup Project Information and the Sheet Index for Sheet Production*). When the Alignment (path element) is selected, the **Group Name** will take the same Name as the Alignment – which should be named in accordance to the FLH Naming Convention. See *3F - Naming Convention for Proposed ORD Features*.
7	**Start Location** and **End Location:** These Locations can be determined by clicking on the intended location along the Alignment. ***WARNING:*** Do NOT set **Start/End Location** at this point. **Start/End Location** are set in the next process: *16B.2.b.i - Place the First Set of CROSS SECTION Named Boundary elements*.

8	**Left Offset** and **Right Offset:** The *Left/Right Offsets* determine the width of the CROSS SECTION *Named Boundary* element. *Left/Right Offsets* widths are relative to the Alignment (which was selected in the step 3). The combined sum (absolute value) of the *Left/Right* Values will determine the TOTAL width of the Cross Section. For example, *Left Offset = -45.000* and *Right Offset = 45.000* will create a Cross Section that is 90 feet wide and is centered on the Alignment. ***TIP:*** The *Left/Right Offsets* can be varied to show more cross section width on one side of the Alignment, and less width on the other. However, the combined sum (absolute value) of the *Left/Right* Values should always equal to the **Total Cross Section Length** need for the selected *Drawing Seed*. **Total Cross Section Length** values are shown in *16B.2.a.i Cross Section Drawing Seed Table and Total Lengths*.
9	**Interval:** The *Interval* sets the cross section spacing. Typically, roadway design projects will require an *Interval* of 25, 50, or 100 feet. ***NOTE:*** To place a Cross Section element on the PC/PT of Horizontal Curves (along with other important horizontal geometry points), the **Include Control Points** box must be CHECKED. ***NOTE:*** Regardless of the start station of the Alignment, CROSS SECTION *Named Boundaries* will always be placed at round, even stations. For example, with an Interval of 50 feet, if the Alignment starts at station 9+76.58, then the first *Named Boundary* will be placed at this 9+76.58 starting location. The subsequent *Named Boundaries* will be placed at 10+00, 10+50, 11+00, etc…
10	**Vertical Exaggeration:** If desired, set a *Vertical Exaggeration* value. For typical FLH Projects, road cross sections are NOT vertically exagerated (i.e., Vertical Exaggeration = 1).
11	**Top Clearance** and **Bottom Clearance:** *Top/Bottom Clearance* is automatically set by the *Drawing Seed*. ***IMPORTANT***: The **Top** and **Bottom Clearance** are the only control the User has on the Cross Section Grid height. If *Top/Bottom Clearance* are NOT used (boxes are UNCHECKED), then the Grid height directly corresponds with the **Critical High Point** and the **Critical Low Point**. For a graphical depiction of *Top/Bottom Clearance* and the *Critical High/Low Point*, see *16B.2.a.ii Top and Bottom Clearances and the Cross Section Grid Height*. **Bottom Clearance:** The amount of Grid that will be created below the LOWEST POINT in the cross section (*Critical Low Point*). The LOWEST POINT critical point can correspond to either the Existing Ground or Sub-Grade of the Corridor, depending on which is lower. **Top Clearance:** The amount of Grid that will be created above the HIGHEST POINT in the cross section (*Critical High Point*). The HIGHEST POINT can correspond to either Existing Ground or Finished-Grade of the Corridor, depending on whichever is higher.

12	**Elevation Datum Spacing:** The Cross Section **Grid** will always begin on a multiple of the value entered into this box. For example, for a value of 2.000, the bottom axis will begin at elevations that are multiples of 2 (i.e., 2842, 8546, 9550, etc.). ***TIP:*** When a value of 0.000 is entered, then the elevation of the bottom axis is unrounded and placed with respect to the Bottom Clearance and Critical Low Point. ***BEST PRACTICE:*** For road cross sections, use the default value, which is automatically set by the *Drawing Seed.* Typically, the default value is 2.0000. However, it may be desirable to coordinate this value with the Vertical major axis labels – which are typically shown every at elevation values of 10 (i.e., 1790, 1800, 1810). For example, an Elevation Datum Spacing of 10.0000 would assure that a Vertical major axis label is always placed at the bottom of the grid.
13	**Event Point List:** If Event Point Lists (not covered in this manual) are used, then a Cross Section is created at each station that corresponds with an Event Point. Event Point Lists are NOT used in FLH Cross Section sheets.
14	**Include Control Points:** If this box is CHECKED, then a Cross Section is created at each horizontal Alignment geometry point (i.e., PC/PT of curves). For typical FLH Projects, it is conventional to place Cross Sections at Control Points (ensure box is CHECKED).
15	**Backward Facing:** If CHECKED, the Cross Sections will be mirrored (backwards). This box should be UNCHECKED.
16	**Create Drawing:** If this box is CHECKED, then CROSS SECTION *Drawing Models* and *Sheet Models* are created immediately after use of this tool. If this box is UNCHECKED, the *Drawing/Sheet Models* must be created the *Named Boundary Manager.* ***BEST PRACTICE:*** Keep this box **UNCHECKED** to create Drawing Models and Sheet Models from the Named Boundary Manager – as shown in *16B.3 Create the Drawing Models and Sheet Models from the Named Boundary Manager*.
17	**Show Dialog:** This option is only available if the **Create Drawing** box is CHECKED**.** When this box is CHECKED, then the User will be presented with the *Named Boundary Dialogue Box* before creation of the CROSS SECTION *Drawing Models* and *Sheet Models*. If this box is UNCHECKED, then the *Dialogue Box* is NOT shown.

16B.2.a.i Cross Section Drawing Seed Table and Total Lengths

The table below shows the **Total Length** available for each Cross Section *Drawing Seed*.

NOTE: The **Total Length** is the absolute value sum of the default **Right Offset** and **Left Offsets**.

The table below is also useful for placing uncentered (shifted) CROSS SECTION *Named Boundary* elements relative to the Alignment. This is performed by varying the **Right Offset** and **Left Offsets**. Although the **Right Offset** and **Left Offsets** may be varied, their combined (absolute value) sum should still equal to the **Total Length** – as shown in the table below.

For example, when using the *20 Scale XS Portrait* **Drawing Seed**, the User might use the following configuration to shift the *Named Boundary* elements 30 feet to the right:

Drawing Seed: *20 Scale XS Portrait* (**Total Length** = 180 ft)

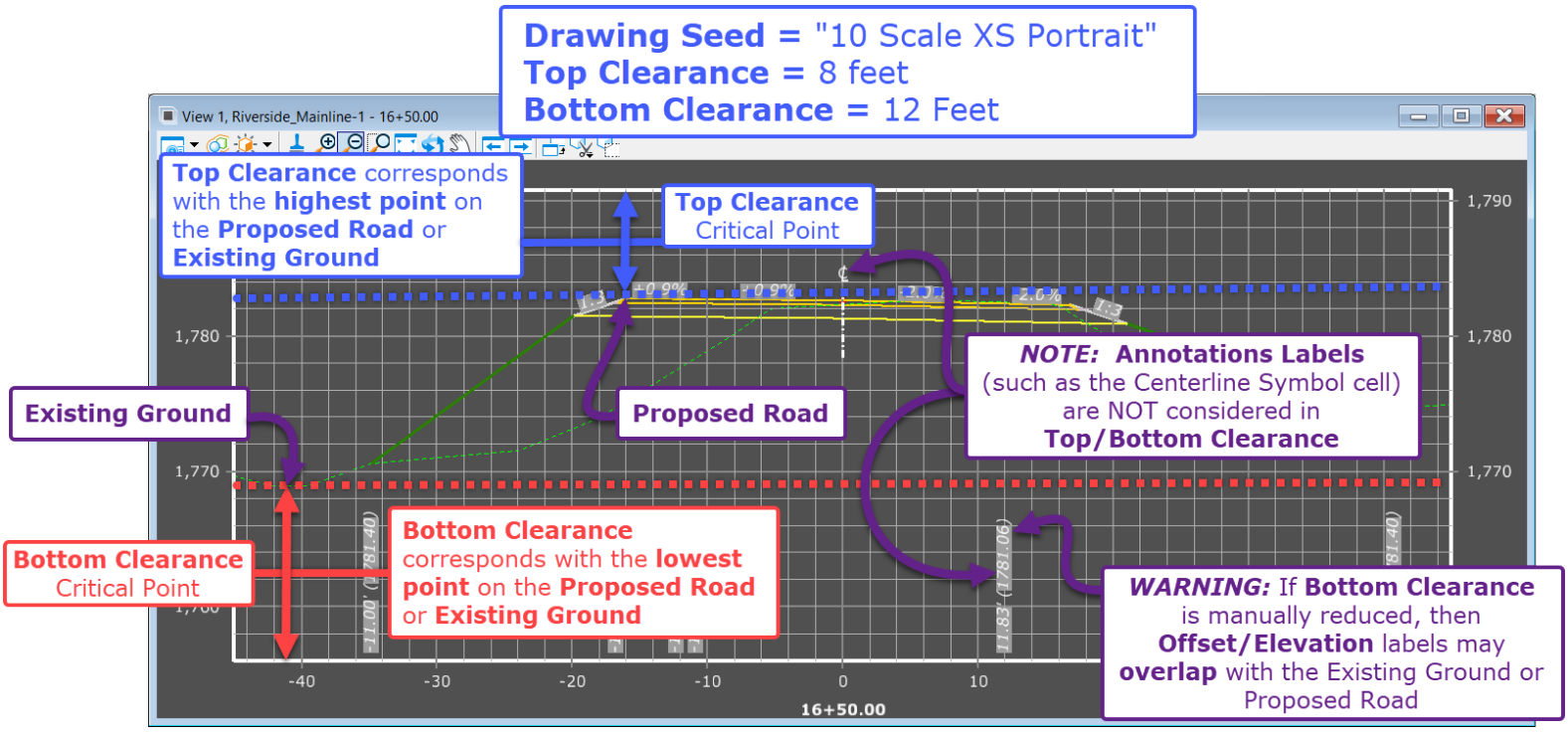
Shifted Left Offset = -60 ft (Default Left Offset = -90 ft)
Shifted Right Offset = +120 ft (Default Right Offset = +90 ft)

|-60 ft| + |+120 ft| = 180 ft (**Total Length**)

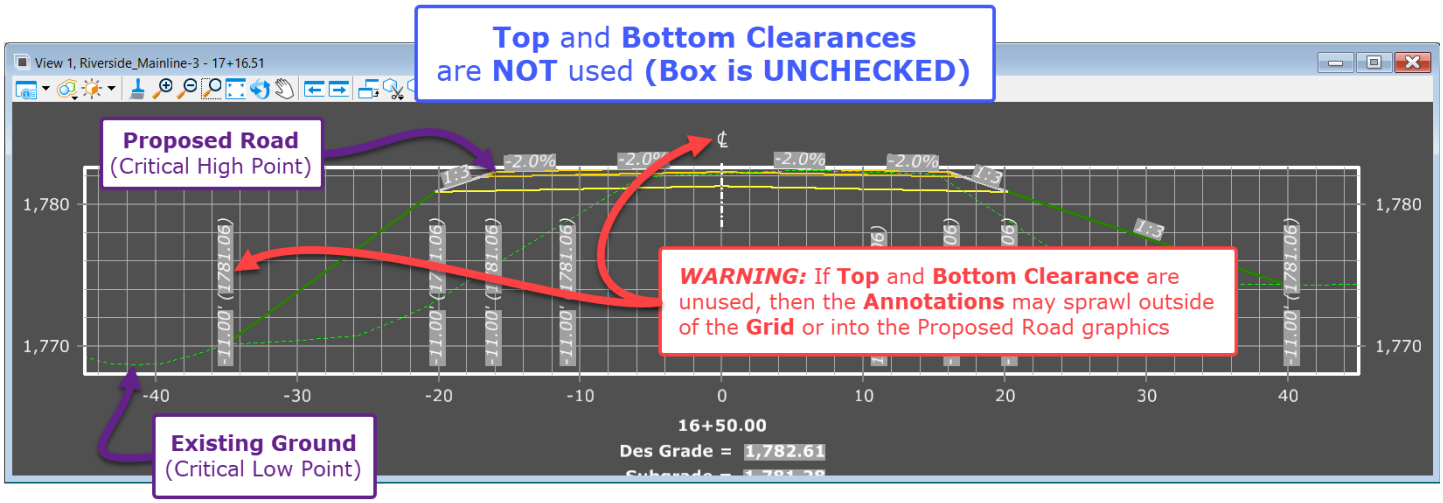
Drawing Seed	Sheet Size	Sheet Orientation	Default Left Offset	Default Right Offset	Total Length	Top / Bottom Clearances
10 Scale XS Landscape	11”x17”	Landscape	-75 ft	+75 ft	**150 ft**	8 ft / 12 ft
10 Scale XS Landscape Letter	8.5”x11”	Landscape	-45 ft	+45 ft	**90 ft**	8 ft / 12 ft
10 Scale XS Portrait	11”x17”	Portrait	-45 ft	+45 ft	**90 ft**	8 ft / 12 ft
20 Scale XS Landscape	11”x17”	Landscape	-150 ft	+150 ft	**300 ft**	16 ft / 30 ft
20 Scale XS Landscape Letter	8.5”x11”	Landscape	-90 ft	+90 ft	**180 ft**	16 ft / 30 ft
20 Scale XS Portrait	11”x17”	Portrait	-90 ft	+90 ft	**180 ft**	16 ft / 30 ft
30 Scale XS Landscape	11”x17”	Landscape	-225 ft	+225 ft	**450 ft**	24 ft / 44 ft
30 Scale XS Portrait	11”x17”	Portrait	-135 ft	+135 ft	**270 ft**	24 ft / 44 ft
40 Scale XS Landscape	11”x17”	Landscape	-300 ft	+300 ft	**600 ft**	32 ft / 62 ft
40 Scale XS Portrait	11”x17”	Portrait	-180 ft	+180 ft	**360 ft**	32 ft / 62 ft

16B.2.a.ii Top and Bottom Clearances and the Cross Section Grid Height

The graphic below shows how the *Top* and *Bottom Clearances* will interact with the resulting height of the CROSS SECTION *Named Boundary* elements. For the configuration below, the "10 Scale XS Portrait" *Drawing Seed* is used and the *Top* and *Bottom Clearance* boxes are CHECKED.



If the *Top* and *Bottom Clearance* boxes are UNCHECKED, then height of the *Named Boundary* element is reduced. The height of the Grid is exactly the height needed to vertically fit the Existing Ground and Proposed Road within the Cross Section Grid – as shown below.



NOTE: The actual *Bottom Clearance* value (as measured by the User from the bottom axis of the Grid to the LOWEST POINT critical point), will be slightly larger than specified because the bottom of the grid must honor the **Elevation Datum Spacing** value. The **Elevation Datum Spacing** value is used to place the bottom of the grid at a nice, round elevation value.

16B.2.b Place the CROSS SECTION Named Boundary Elements

After the initial setup of the *Named Boundary Dialogue Box*, the User can begin to layout the *Named Boundary* elements for eventual creation of the *Drawing Models* and *Sheet Models*.

16B.2.b.i Place the First Set of CROSS SECTION Named Boundary Elements

In this step, the User will need to pay attention to both the *Prompts* and the *Place Named Boundary* dialogue box. It is very IMPORTANT for the User to know which *Prompt* is currently displayed in the lower left-hand corner of the ORD Software window.

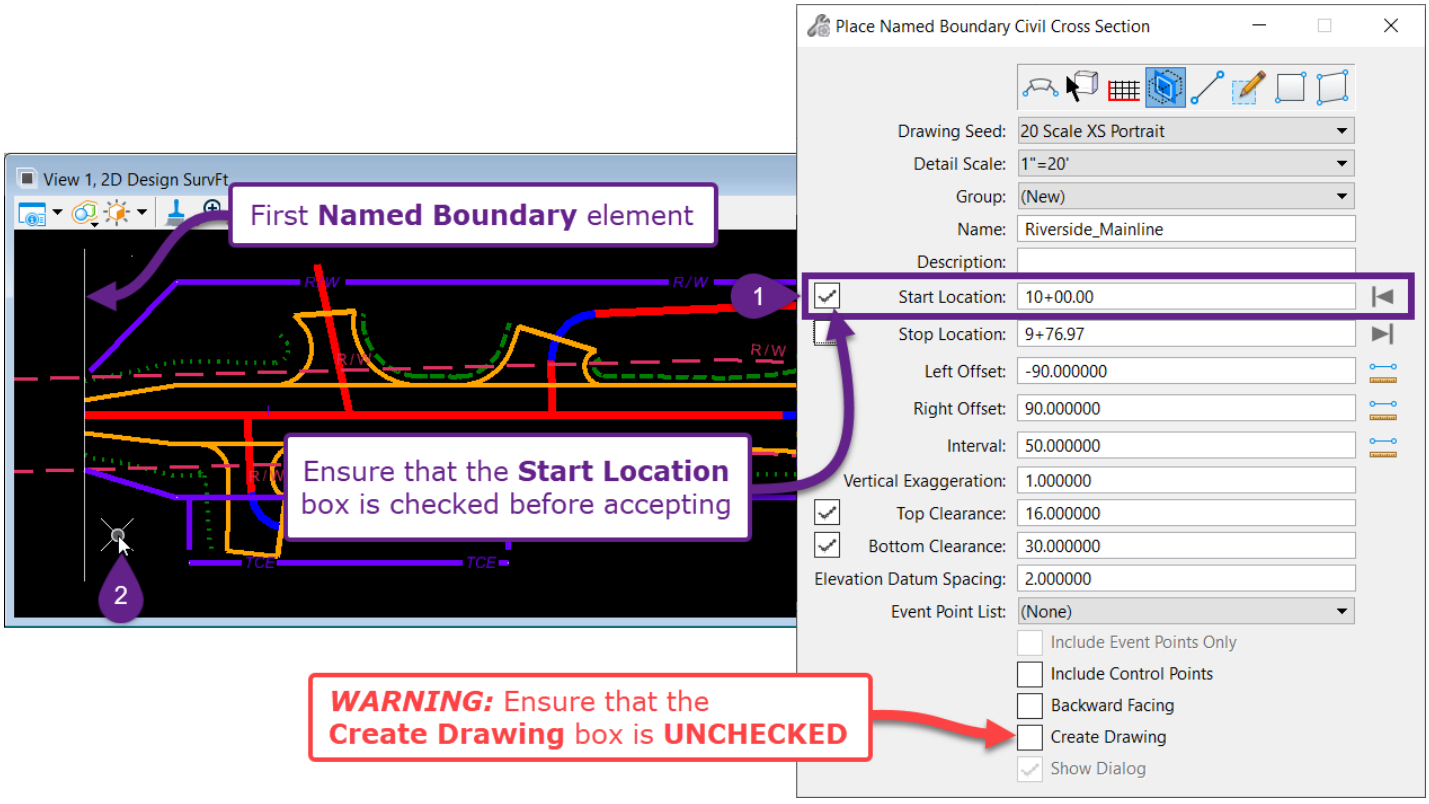
IMPORTANT: To avoid placing CROSS SECTION *Named Boundary* elements that do NOT capture the entire road section, the User should examine each *Named Boundary* element before accepting placement. By scrolling the Mouse Cursor along the Alignment, a preview of each *Named Boundary* element will be shown. The User should ensure that the *Named Boundary* extends past the Slope Stake Limits, Right-of-Way, and other important features to be shown in the cross sections.

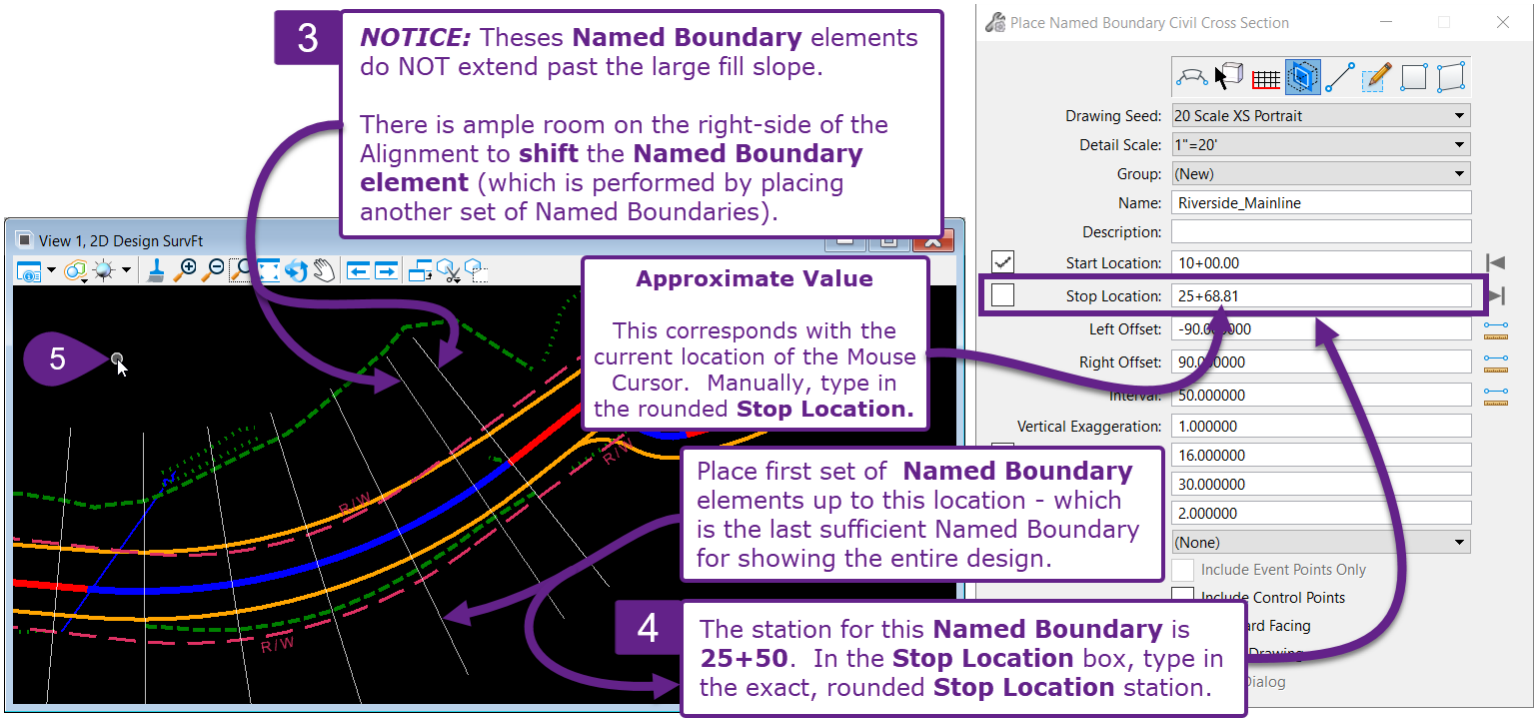
At this point in the workflow, the Alignment should have already been selected as the *Path Element*.

See 3 of *16B.2.a Initial Setup of the Named Boundary Dialogue Box*.

1	*Prompt: Accept/Reject. Identify Path start point to place boundary* - In the *Place Named Boundary* dialogue box, type in the *Start Location* (this is the Start Station of the project) and press the ENTER key to lock it (when the box is CHECKED, then the *Start Location* is locked).
2	Ensure that the box next to *Start Location* is checked. Left-Click in the *View* to accept the *Start Location* and advance to the next Prompt. ***NOTE:*** The User may have to Left-Click in the *View* twice to advance to the next Prompt.

IMPORTANT: In the next step, carefully examine the placement of all *Named Boundary* elements





3	*Prompt: Place Named Boundary Civil Plan > Identify Path end point to place boundary –* By moving the mouse cursor along the length of the Alignment, the User will see a preview of where each *Named Boundary* element will be placed. Examine each *Named Boundary* element for sufficiency. If the *Named Boundary* element does NOT extend past all Slope Stake Limits, Right-of-Way, and other important features, then hover the mouse up to the LAST station that is sufficient. ***NOTE:*** If the placement of ALL *Named Boundary* elements were examined and found to be sufficient, then proceed to *16B.3 Create the Drawing Models and Sheet Models*.
4	In the *Named Boundary Dialogue Box*, the approximate station of the LAST sufficient *Named Boundary* is shown in the *Stop Location* box. ***WARNING:*** Do NOT place the STOP Location at an unrounded value (i.e., 25+68.81). This is usually mistakenly done by accepting the *Stop Location* by graphically left-clicking in the *View*. Instead, in the *Place Named Boundary* dialogue box, type in the ROUNDED *Stop Location* station. (i.e., 25+50.00). Press the ENTER key to lock in the ROUNDED *Stop Location* station. ***WARNING:*** Before accepting placement of the *Stop Location*, ensure that the *Create Drawing* box is UNCHECKED. If this box is CHECKED, then the resulting *Sheet Models* will NOT contain the correct Sheet Numbers. Additionally, subsequent *Named Boundaries* to be placed will NOT be continuous with the first set when scrolling through the resulting Cross Section sheets. *Drawing Models* and *Sheet Models* will eventually be created in the *Named Boundary Manager* – as shown in *16B.3 Create the Drawing Models and Sheet Models from the Named Boundary Manager*.
5	***WARNING:*** Before placing the Named Boundary elements, ensure the **Create Drawing** box is UNCHECKED. Ensure that the box next to *Stop Location* is checked. Left-Click in the *View* to place the first set of CROSS SECTION *Named Boundary* elements.

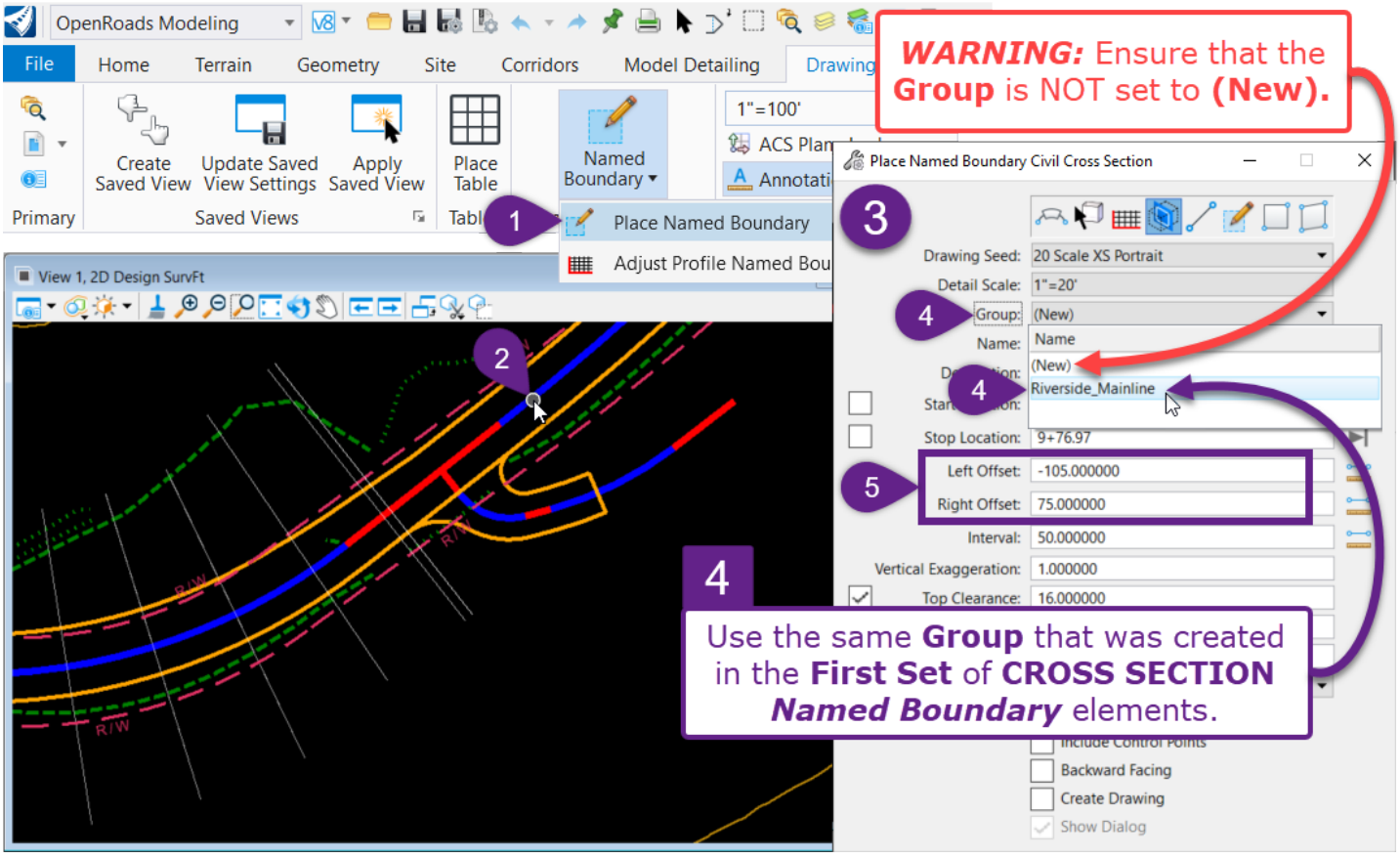
16B.2.b.ii Place Shifted Named Boundaries

If the placement of ALL *Named Boundary* elements were found to be sufficient in the previous step, then proceed to *16B.3 Create the Drawing Models and Sheet Models from the Named Boundary Manager*.

In this procedure, the *Named Boundary* elements will be shifted to the left to accommodate a large fill slope on the left side. The *Named Boundary Dialogue Box* will be set up with the same configuration shown in *16B.2.a Initial Setup of the Named Boundary Dialogue Box*. However, the *Right Offset* and *Left Offset* parameters will be altered so that the *Named Boundaries* are uncentered (shifted) relative to the Alignment.

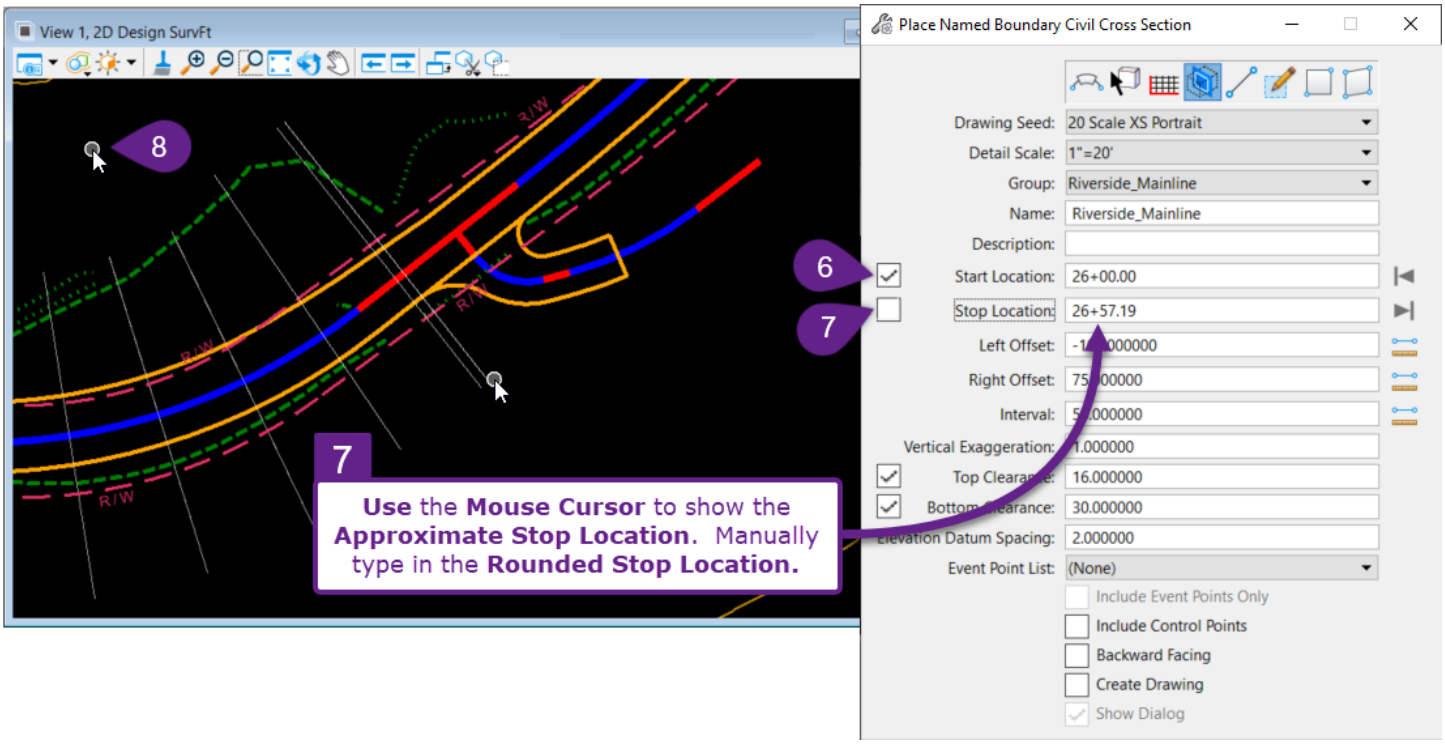
Place the shifted *Named Boundary* elements only in the station range in which it is necessary to show the entire cross-sectional design.

WARNING: Create the shifted set of CROSS SECTION *Named Boundary* elements using the same **Group** as was used in the initial set. If a different *Group* is used, then initial and subsequent sets of cross section sheets may contain discontinuous Sheet Numbers and introduce further problems.



1	From within the *2D Design Model*, select the *Place Named Boundary* tool from the Ribbon: [***OpenRoads Modeling*** → ***Drawing Production*** → ***Named Boundaries***].
2	*Prompt: Place Named Boundary Civil Cross Section > Identify Path Element* – Left-Click on the Alignment.
3	Setup the *Place Named Boundary* Dialogue Box as shown in *16B.2.a Initial Setup of the Named Boundary Dialogue Box.* However, setup of the **Group** and **Left/Right Offsets** will be shown in the next steps.

4	**Group:** From the *Group* drop-down, select the **Group** that was created previously. ***NOTE:*** At this point, only the previously-created **Group** should be available. ***WARNING:*** Ensure that the *Group* drop-down is NOT set to *(New)* for subsequent sets of *Named Boundary* elements.
5	**Left Offset** and **Right Offset:** In order to shift the CROSS SECTION *Named Boundary* elements – such that they are uncentered on the Alignment – the **Left** and **Right Offsets** need to be unequal. However, when the **Left** and **Right Offsets** are adjusted, they should still equal to the **Total Length** that corresponds with the selected **Drawing Seed**. For more information *16B.2.a.i Cross Section Drawing Seed Table and Total Lengths*. In this case, in order to show the large fill, the CROSS SECTION *Named Boundary* elements will be shifted 15 feet to the left. This is performed by varying the offsets as shown: **Drawing Seed:** *20 Scale XS Portrait* (**Total Length** = 180 ft) **Shifted Left Offset** = -75 ft (Default Left Offset = -90 ft) **Shifted Right Offset** = +105 ft (Default Right Offset = +90 ft)



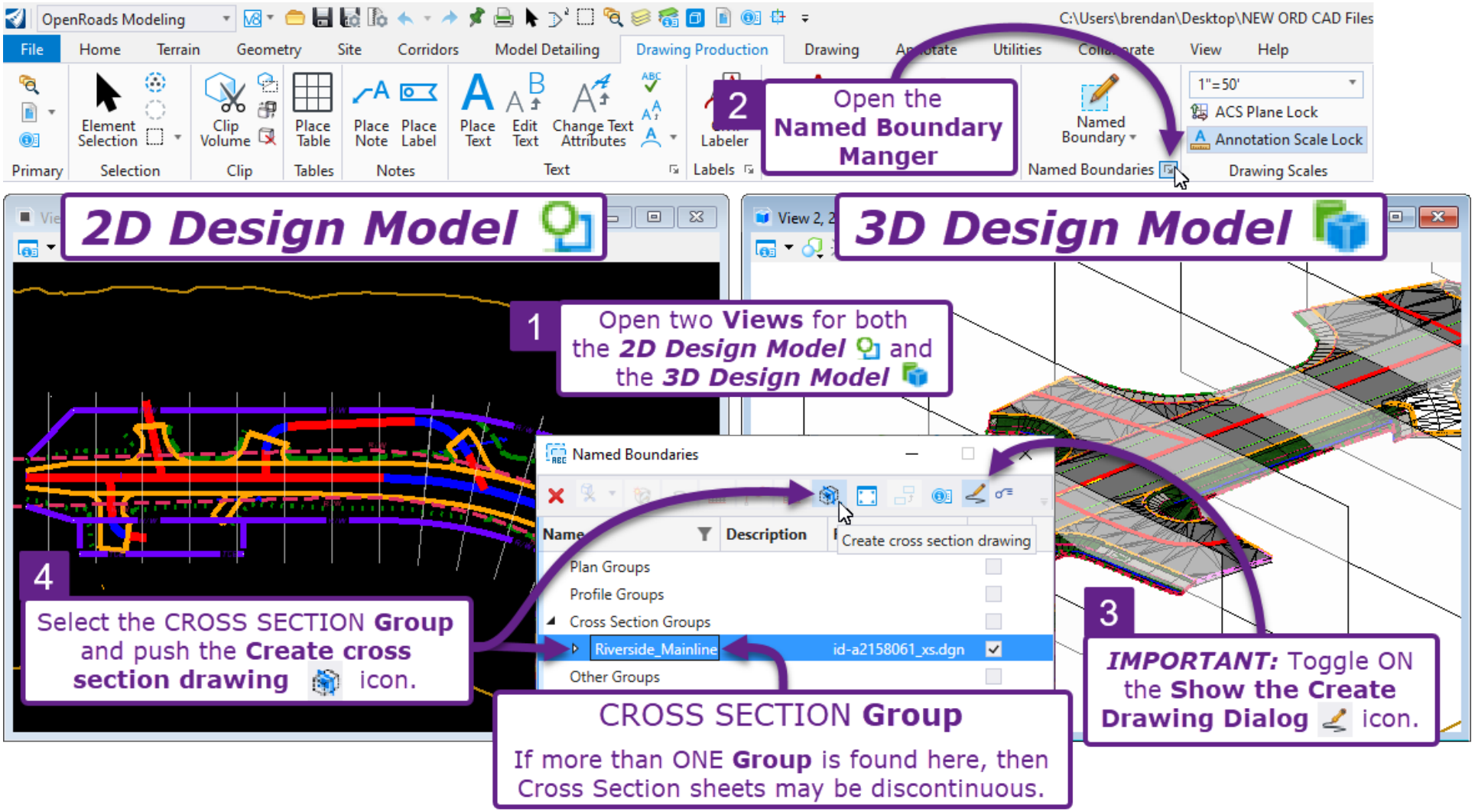
6	**Start Location:** The desired *Interval* spacing and *Start Location* should be coordinated and with the station of the last *Named Boundary* element placed in *16B.2.b.i Place the First Set of CROSS SECTION Named Boundaries*. In this case, the last Cross Section (for the first set) was placed at 25+50. Since the *Interval* being used is every 50 ft, the *Start Station* for this subsequent set should be set to 26+00. Type in the *Start Location* and press the ENTER key to CHECK and lock the *Start Location* box. Left-Click in the *View* to accept the *Start Location* and advance to the next Prompt.
7	*Prompt: Place Named Boundary Civil Plan > Identify Path end point to place boundary* – Using the Mouse Cursor, determine the **Stop Location** for this set of shifted, uncentered *Named Boundary* elements. In the *Named Boundary Dialogue Box*, type in the ROUNDED *Stop Location* station. (i.e., 26+50). Press the ENTER key to lock in the ROUNDED *Stop Location* station.
8	***WARNING:*** Before placing the Named Boundary elements, ensure the **Create Drawing** box is UNCHECKED. Ensure that the box next to *Stop Location* is checked. Left-Click in the *View* to complete placement of the shifted, uncentered *Named Boundary* elements.

Create the remaining *Named Boundary* elements as shown in *16B.2.b.i Place the First Set of CROSS SECTION Named Boundary Elements*. However, return the **Left** and **Right Offset** values to the default values.

16B.3 Create the Drawing Models and Sheet Models from Named Boundary Manager

After all CROSS SECTION *Named Boundaries* have been placed, the CROSS SECTION *Drawing Models* and *Sheet Models* can be generated from the *Named Boundary Manager*. For a more detailed overview of the *Named Boundary Manager*, see *14A.3 Place Named Boundary tool and the Named Boundary Manager* and *14B.6 STEP 8: Create Drawing Models and Sheet Models*.

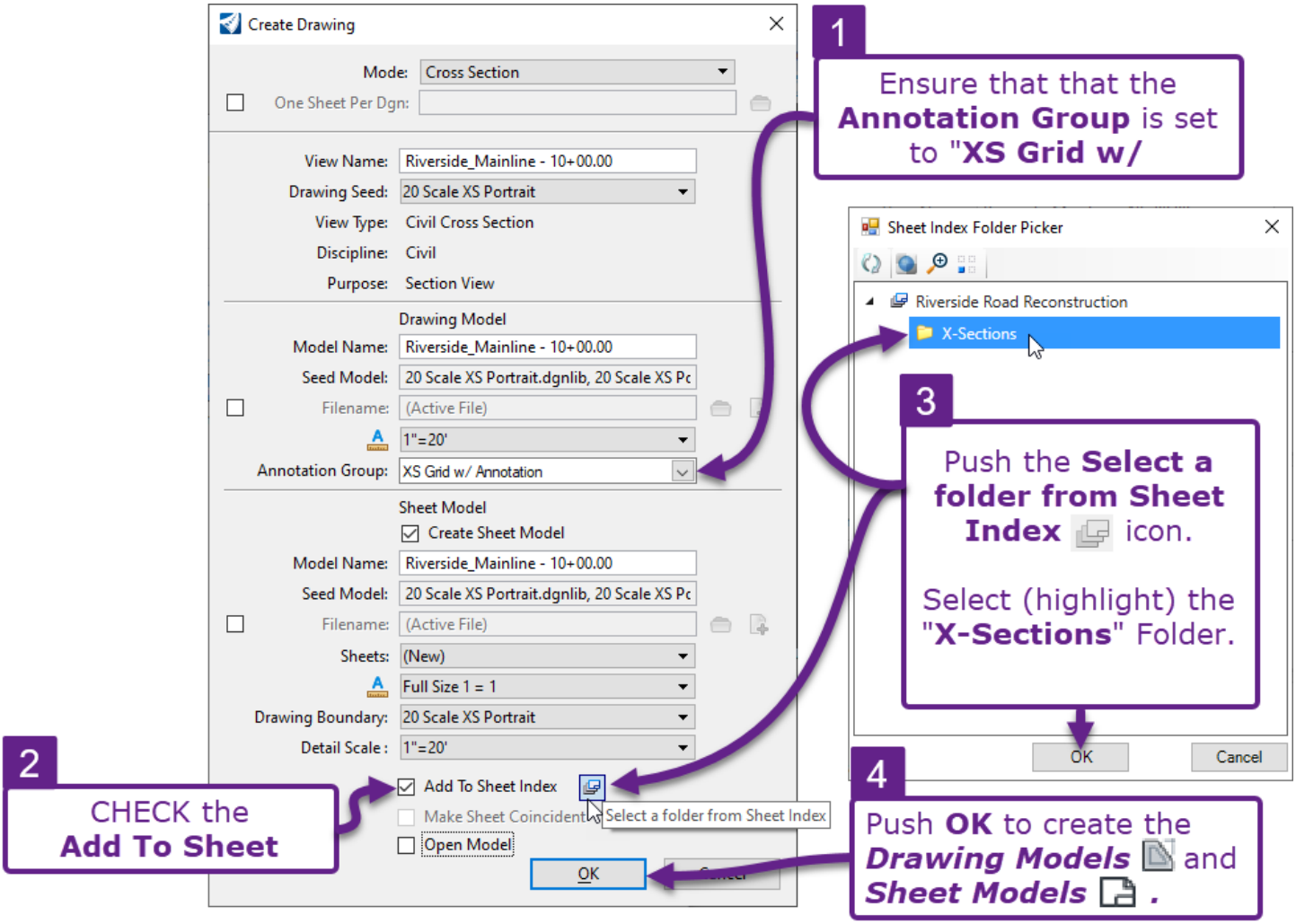
IMPORTANT WARNING: Before opening the *Named Boundary Manager*, ensure that a *View* showing the *3D Design Model* is opened. If these two *Views* are NOT opened, then an error message will be displayed, and Cross Section sheets will NOT be created.



The *Create Drawing Dialogue Box* must be setup to specify the Annotation Group and to place all new sheets in the Sheet Index.

IMPORTANT: Ensure that the **Annotation Group** is set to "XS Grid w/ Annotation". This Annotation Group is responsible for automatic labeling of the cross sections. The "XS Grid w/ Annotation" group can be customized to accommodate the custom Corridor Templates. See *16E – Configuring Cross Section Annotations*.

If a Standard Road Template from FLH Library was used in the Corridor, then it is unlikely that the Annotation Group will require modification.



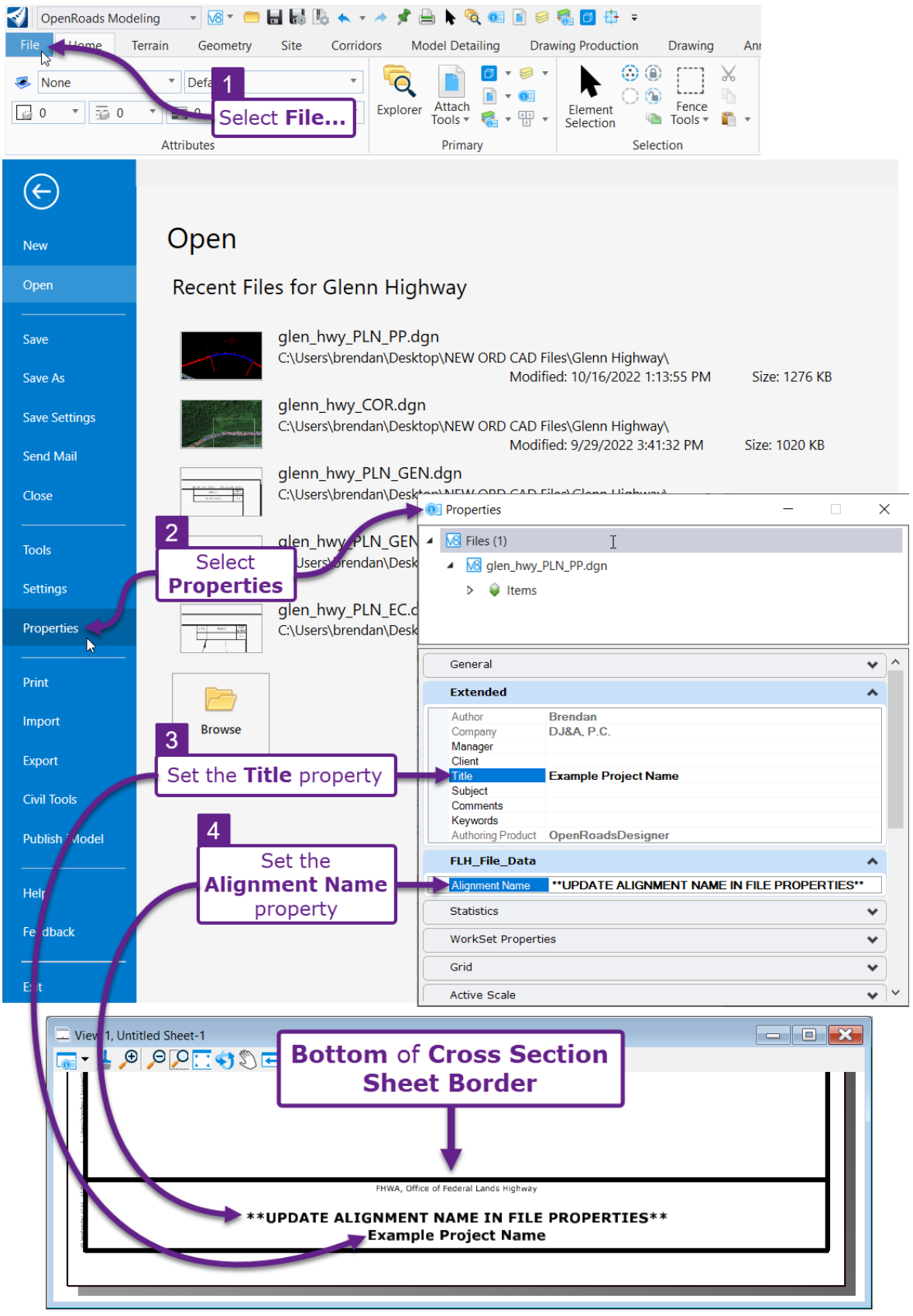
NOTE: In step 3, the new sheets are placed in the Sheet Index. Place the sheets in the "X-Sections" folder. If the "X-Sections" folder is NOT shown, then it is possible that the project WorkSet and FLH WorkSpace is NOT setup correctly. See *Chapter 2 – Project Setup*.

To manually add the X-Sections folder to the Sheet Index, see *Chapter 18 – Sheet Index*.

16B.4 Setup Sheet Border Text Fields

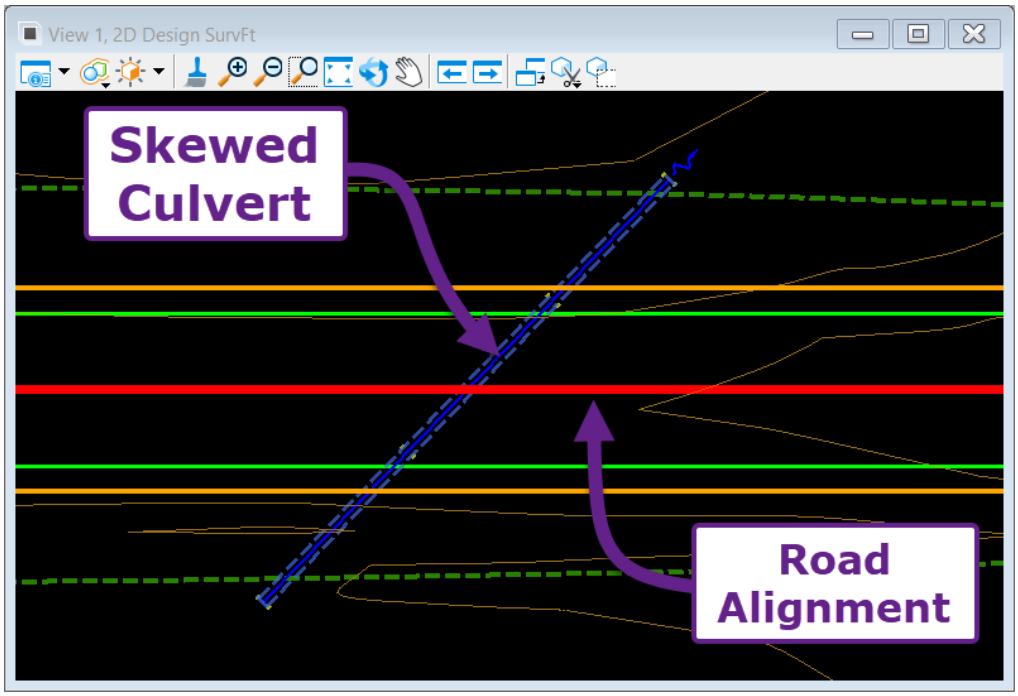
The bottom of the cross-section Sheet Borders contain text fields that are linked to the Properties of the active ORD File. Properties of the active ORD File are edited in the following location:

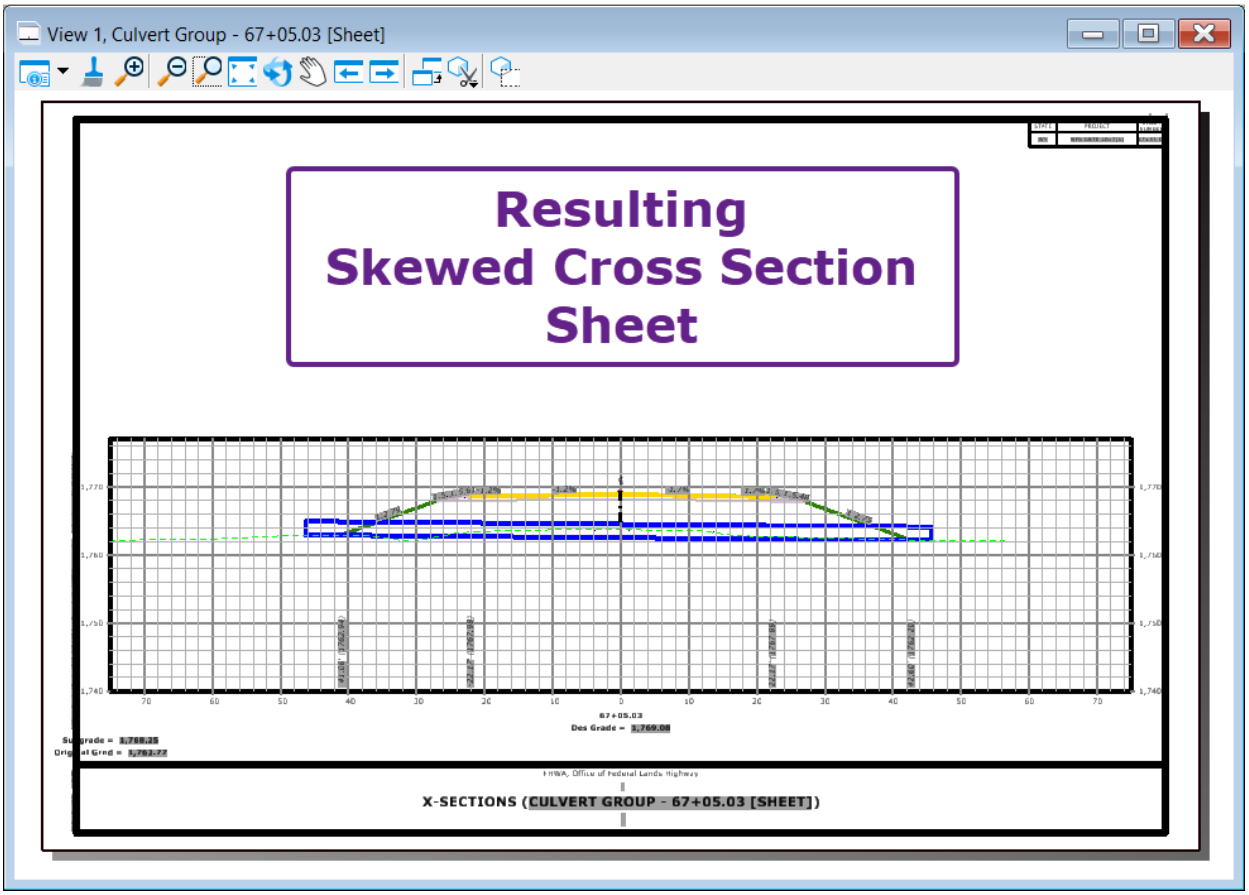
File → Properties



16C – SKEWED CROSS SECTIONS FOR CULVERTS – WORKFLOW

Using the *Civil Cross Section By 2 Points* mode, Cross Sections that are skewed relative to the Alignment can be created. In this example, a CROSS SECTION *Named Boundary* will be placed inline with a skewed culvert for presentation in a Plan Set.





16C.1 Create and Setup the Cross Section ORD File

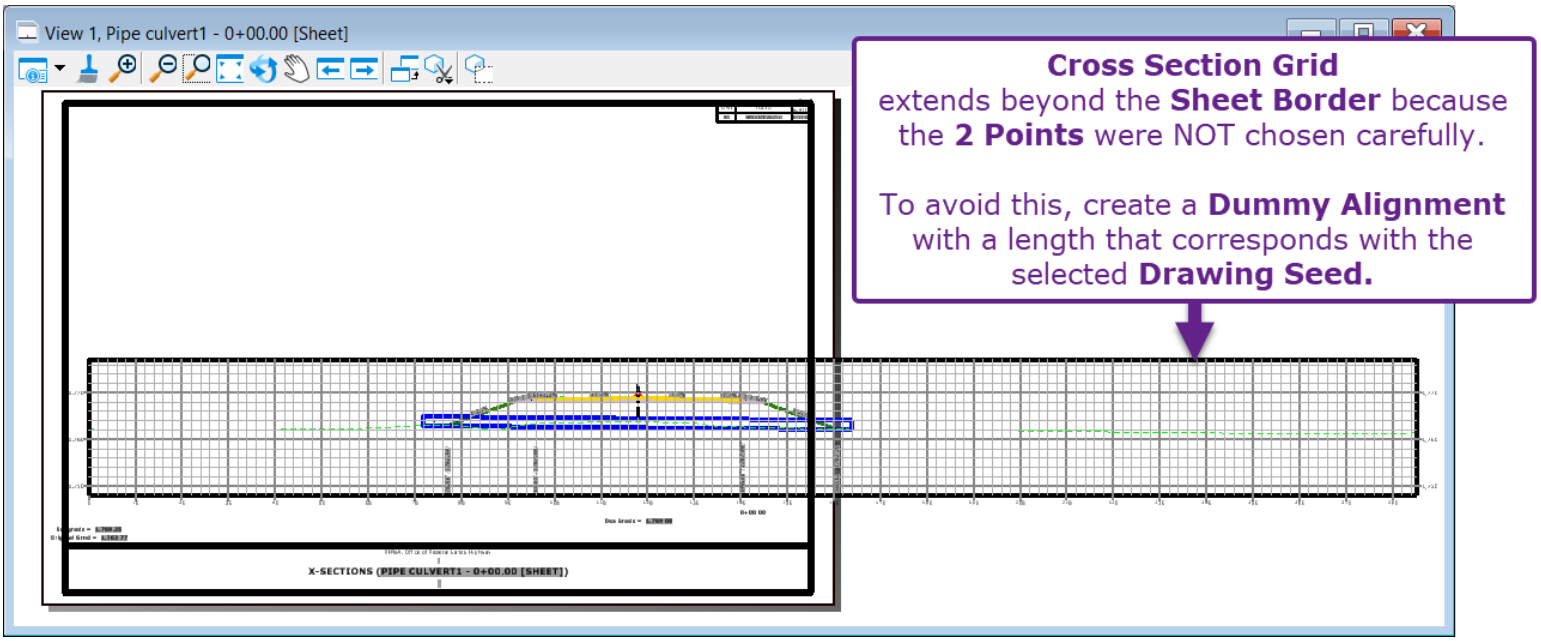
WARNING: Do NOT place skewed Cross Sections in Design ORD Files (i.e., Corridor ORD File or Culvert Design ORD File) or other design files.

Skewed Cross Sections for culverts should be placed in a dedicated Plan Sheet ORD File.

1	Create a new Plan Sheet ORD File. For the overall procedure for new ORD Files, see *3B – Create a New ORD File*. Refer to *3C – ORD File Naming Conventions* for naming of Plan Sheet Files.
2	Set the Coordinate System for the new ORD File. See *3D.1 Set the Coordinate System*.
3	In the new ORD File, Reference in the following ORD File types: • Existing Survey ORD File and/or Existing Terran ORD File***** • Mainline Alignment ORD File • Corridor ORD File • Culvert Design ORD File ***NOTE*:*** For Cross Section creation, it is necessary to activate the Existing Ground Terrain Model. Survey linework is NOT strictly necessary for the Cross Section creation or labeling purposes. If the Existing Ground Terrain Model is contained in a dedicated ORD File, then it is NOT necessary to reference in the Planimetric Survey ORD File.
4	Set the Existing Ground Surface as *Active*. For more information on *Activating* the Existing Ground Terrain Model, see *3D.3 Activate the Existing Ground Terrain Model*. ***NOTE:*** After the Existing Ground Surface is activated in the *2D Design Model*, then a corresponding *3D Design Model* will automatically be created in the ORD File. See *3D.3.a Creation of the 3D Design Model after Terrain Model Activation*.
5	Open up a second View and set the second View to show the *3D Design Model*. The User will perform all procedures in the *2D Design Model*, but the *3D Design Model* should be open for processing purposes. ***WARNING:*** If CROSS SECTION *Named Boundaries* are attempted to be created without the *3D Design Model*, then an error message will be displayed.

16C.2 Create a Dummy Alignment that Matches with Drawing Seed

With the **Civil Cross Section 2 Points** mode, the resulting CROSS SECTION *Named Boundary* (and Cross Section grid) is the exact length between the User-specified 2 Points. This is problematic because the resulting Cross Section grid may be too wide or too narrow when placed in the *Sheet Model*. If the 2 Points are NOT selected carefully, then the resulting Cross Section Grid may extend beyond the Sheet Border in the *Sheet Model* - as shown below.

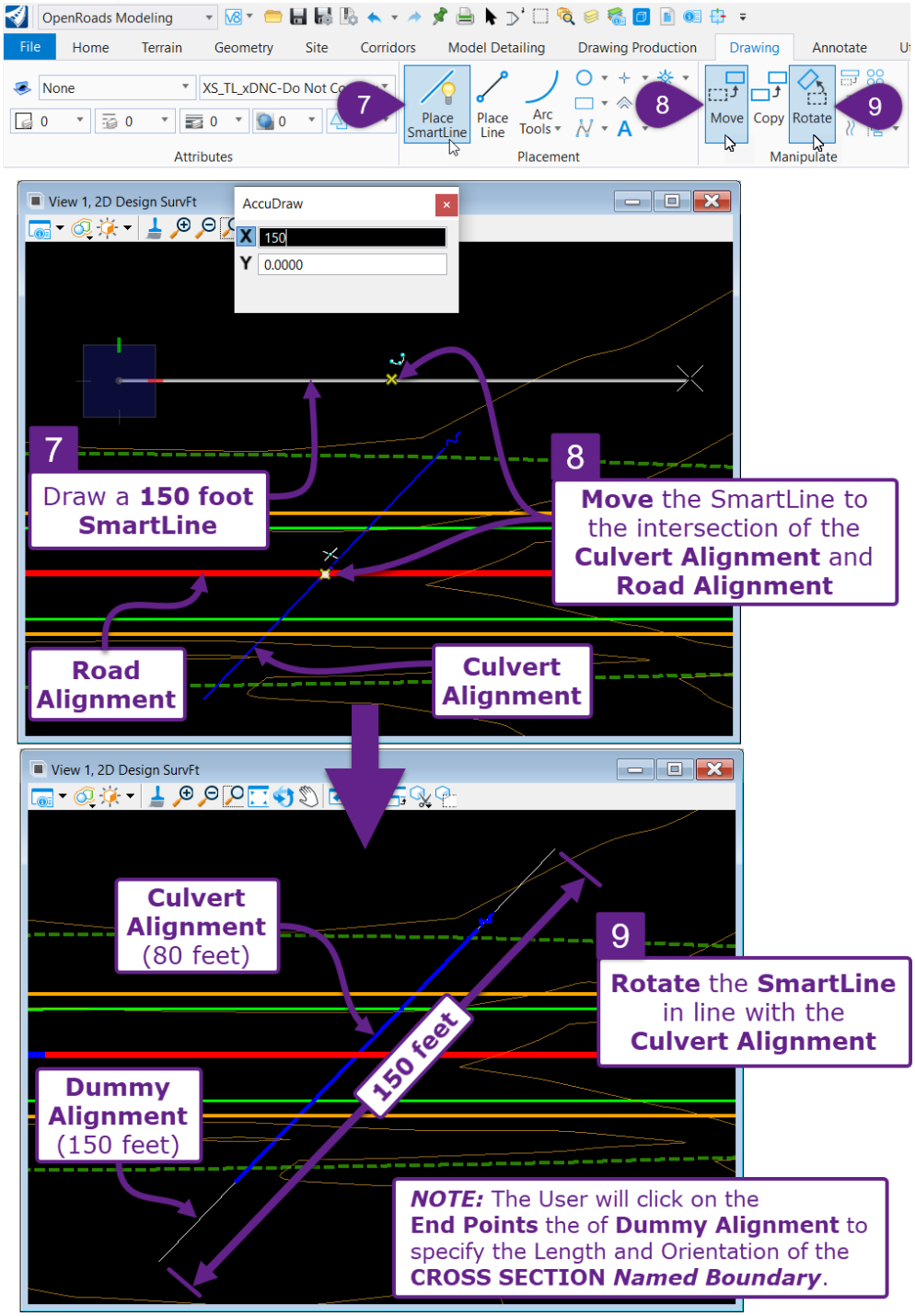


To align the Cross Section Grid width with the Sheet Border, a Dummy Alignment can be created atop the Culvert Alignment to assist in specifying the 2 Point locations. The length of the Dummy Alignment should be coordinated with the desired CROSS SECTION *Drawing Seed* and Drawing Scale (i.e., 1" = 20'). As discussed in *16B.2.a.i Cross Section Drawing Seed Table and Total Lengths*, each *Drawing Seed/Scale* corresponds with a total maximum Cross Section Grid length.

In placement, the User will select the end points of the Dummy Alignment to ensure the CROSS SECTION *Named Boundary* element is created with the appropriate width.

6	Based on the Culvert length, select an appropriate *Drawing Seed* from the table shown in *16B.2.a.i Cross Section Drawing Seed Table and Total Lengths*. The **Total Length** of the *Drawing Seed* should be larger than the culvert length to fit the entire culvert design into the Cross Section Grid. In this case, the culvert length is 80 feet. The "10 Scale XS Landscape" is selected because it has a **Total Length** of 150 feet and produces an 11" x 17" sheet in a Landscape orientation. ***TIP:*** For plan sets, it is conventional to use 11" x 17" sheet size in a Landscape orientation. Do NOT use "Landscape Letter" or "Portrait" *Drawing Seeds* for Culvert Plan Sheets to be included in the plan set.
7	In the *2D Design Model*, draw a SmartLine (Dummy Alignment) with a length that equals to the *Drawing Seed* **Total Length**. In this case, a SmartLine that is 150 feet is created.

8	Use the *Move* tool to place the SmartLine (Dummy Alignment) atop the Culvert Alignment. ***TIP:*** To ensure the culvert graphics are centered on the Road Alignment within the Profile Grid, choose the SmartLine midpoint as the move basepoint. Place the SmartLine midpoint directly onto the intersection of Culvert Alignment and Road Alignment. ***IMPORTANT:*** By placing the midpoint of the Dummy Alignment exactly onto the intersection with the Road Alignment, the horizontal axis label will be 0 at the Road Alignment – which is conventional in FLH Plans. For a graphical depiction of this concept, see *16C.4 Resulting Skewed Cross Section Sheet*.
9	Use the *Rotate* tool to rotate the SmartLine (Dummy Alignment) in line with Culvert Alignment.

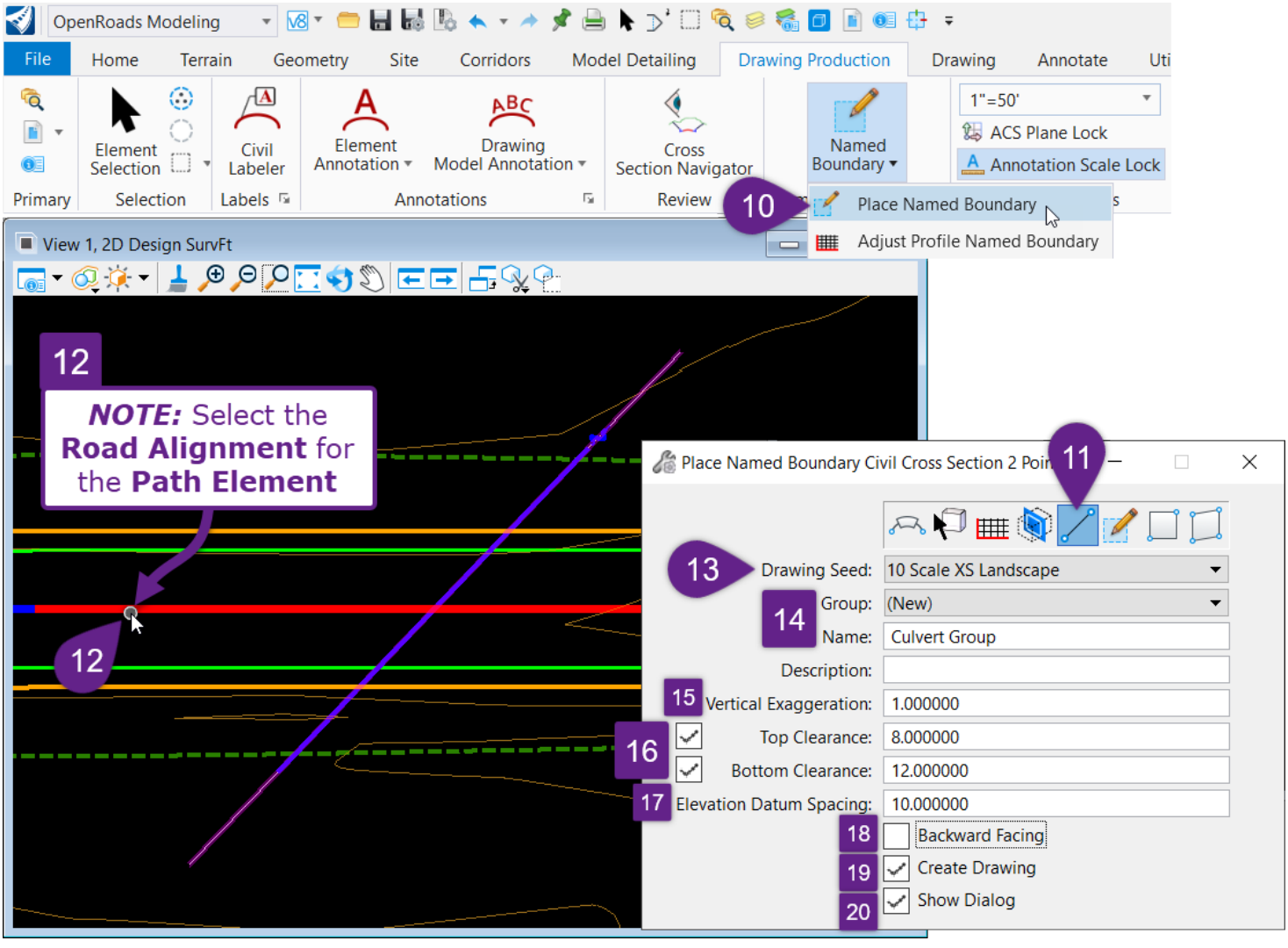


16C.3 Create the Skewed CROSS SECTION Named Boundary

WARNING: If CROSS SECTION *Named Boundaries* are attempted to be created without the *3D Design Model*, then an error message will be displayed. Ensure that a second *View* is opened and displaying the *3D Design Model*.

16C.3.a Setup the Place Named Boundary Dialogue Box

In this procedure, the *Place Named Boundary Dialogue Box* is setup. All settings found in this dialogue box are discussed in detail in *16B.2.a Initial Setup of the Named Boundary Dialogue Box*.



10	From within the *2D Design Model*, select the *Place Named Boundary* tool from the Ribbon: [***OpenRoads Modeling*** → ***Drawing Production*** → ***Named Boundaries***].
11	In the *Place Named Boundary* Dialogue Box, select the ***Civil Cross Section 2 Points*** mode by clicking on the icon .
12	*Prompt: Place Named Boundary Civil Cross Section 2 Points > Identify Path Element* – In the *2D Design Model*, Left-Click on the **Road Alignment**. ***IMPORTANT:*** To automtaically show the Road Alignment Stationing in the title of the resulting Sheet Border, use the **Road Alignment** as the **Path Element**.

13	**Drawing Seed:** In the *Place Named Boundary* dialogue box, set the **Drawing Seed** from the drop-down. Use the **Drawing Seed** selected in step 6 - which should be coordinated with the Dummy Alignment length. In this case, the "10 Scale XS Landscape" *Drawing Seed* is used.
14	**Group and (Group) Name:** When creating the first CROSS SECTION *Named Boundary* in the ORD File, the **Group** will be set to "(New)". Assign the **Group** to be created a logical name. In this case, "Culvert Group" is typed into the *Group Name* box. When creating subsequent CROSS SECTION *Named Boundaries*, select the **Group** created in this step from the drop-down.
15	**Vertical Exaggeration:** If desired, enter in a *Vertical Exaggeration* value. Typically, Culvert Cross Sections are NOT exaggerated (i.e., Vertical Exaggeration = 1).
16	**Top Clearance** and **Bottom Clearance:** *Top/Bottom Clearance* is automatically set by the *Drawing Seed*. In this case, the default values are used. Top/Bottom Clearance and the Critical High/Low Point are discussed in *16B.2.a.ii Top and Bottom Clearances and the Cross Section Grid Height*. ***IMPORTANT***: The **Top** and **Bottom Clearance** are the only control the User has on the Cross Section Grid height. If *Top/Bottom Clearance* are NOT used (boxes are UNCHECKED), then the Grid height directly corresponds with the **Critical High Point** and the **Critical Low Point**.
17	**Elevation Datum Spacing:** The Cross Section **Grid** will always begin on a multiple of the value entered in this box. For example, for a value of 2.000, the bottom axis will begin at elevations that are multiples of 2 (i.e., 2842, 8546, 9550, etc.). ***TIP:*** It may be desirable to coordinate this value with the Vertical major axis labels – which are typically shown every at elevation values of 10 (i.e., 1790, 1800, 1810). For example, an **Elevation Datum Spacing** of 10.0000 would assure that a Vertical major axis label is always placed at the bottom of the grid.
18	**Backward Facing:** If CHECKED, the Culvert Cross Section will be mirrored (backwards). Typically, this box remains UNCHECKED.
19	**Create Drawing:** In this case, this box is CHECKED in order to create *a Drawing Model* and *Sheet Model* immediately after placement of the *Named Boundary*.
20	**Show Dialog:** To ensure the correct *Annotation Group* is used, this box should be CHECKED.

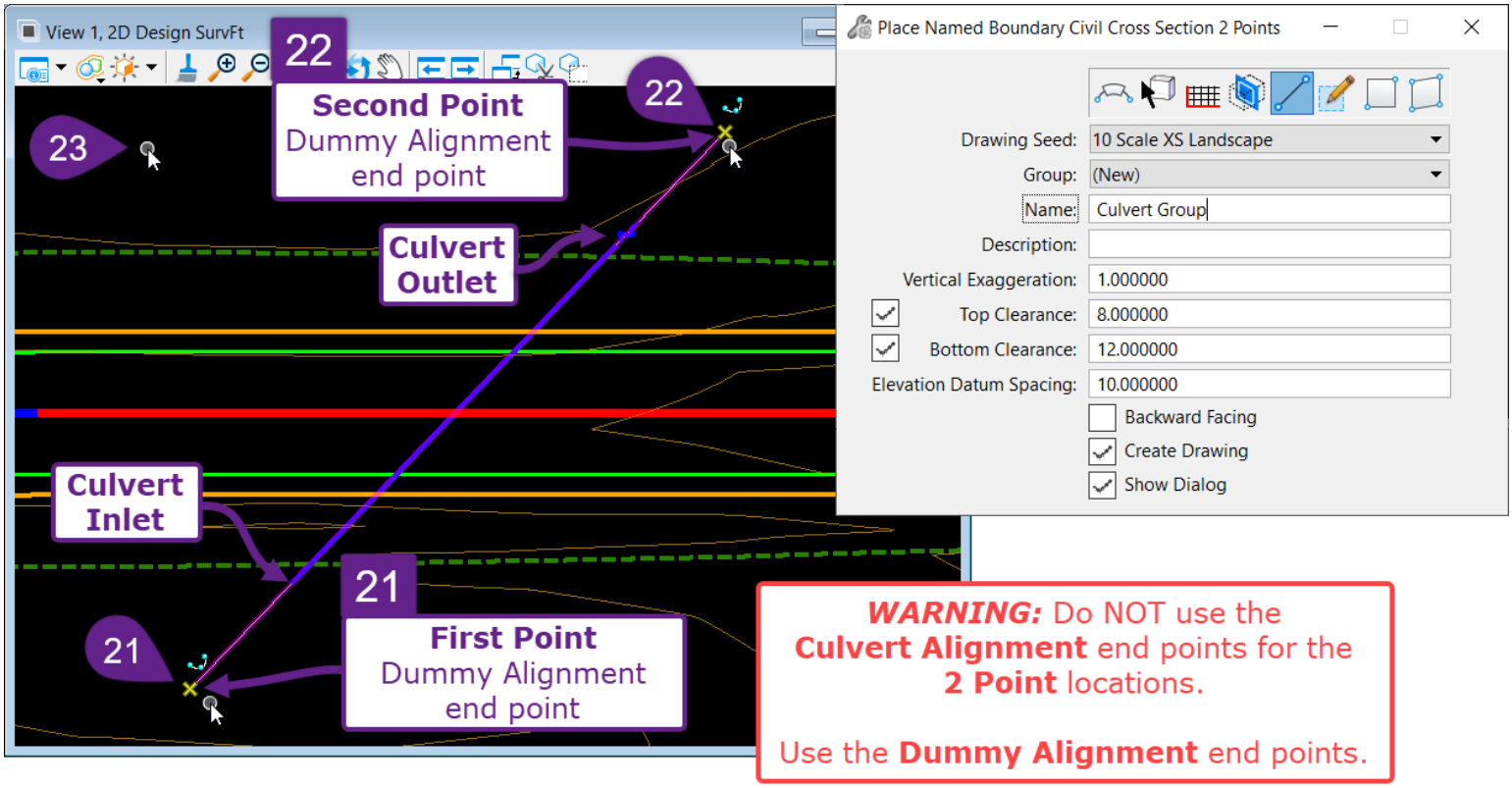
16C.3.b Place the Skewed Named Boundary

In this *procedure, the 2 Points that define the resulting Named Boundary length and rotation are specified.*

IMPORTANT: Use the Dummy Alignment end points as the 2 Point locations. Use the *Key Point* Snap to Dummy Alignment end points.

> ***TIP:*** The clicking order of the 2 Points will define the direction of the Cross Section Grid. The first point corresponds with the left-side of the Grid. The second point corresponds with the right-side of the Grid. In this example, the inlet side of the culvert is used as the first point to show the culvert sloping downward from left to right in the Cross Section Grid.

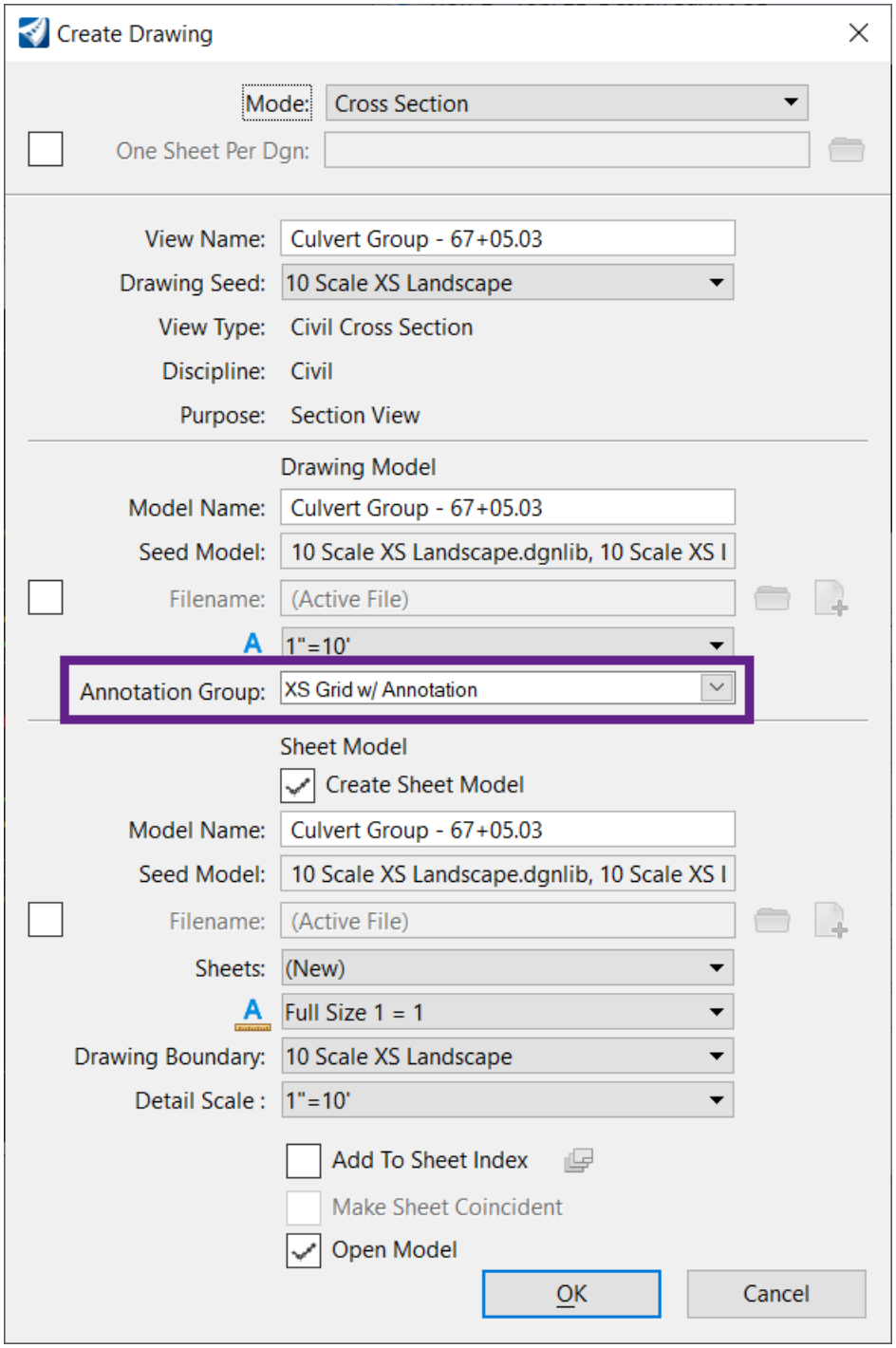
WARNING: If CROSS SECTION *Named Boundaries* are attempted to be created without the *3D Design Model*, then an error message will be displayed. Ensure that a second *View* is opened and displaying the *3D Design Model*.



21	*Prompt: Place Named Boundary Civil Cross Section 2 Points* > ***Enter First Point*** – Left-Click on the Dummy Alignment end point located near the **inlet** of the culvert.
22	*Prompt: Place Named Boundary Civil Cross Section 2 Points* > ***Enter Second Point*** - Left-Click on the Dummy Alignment end point located near the **outlet** of the culvert.
23	*Prompt: Place Named Boundary Civil Cross Section 2 Points* > *Accept/Reject. Data Point in Plan View to place boundary* – Left-Click anywhere in the *2D Design Model* to accept and create the CROSS SECTION *Named Boundary* elements.

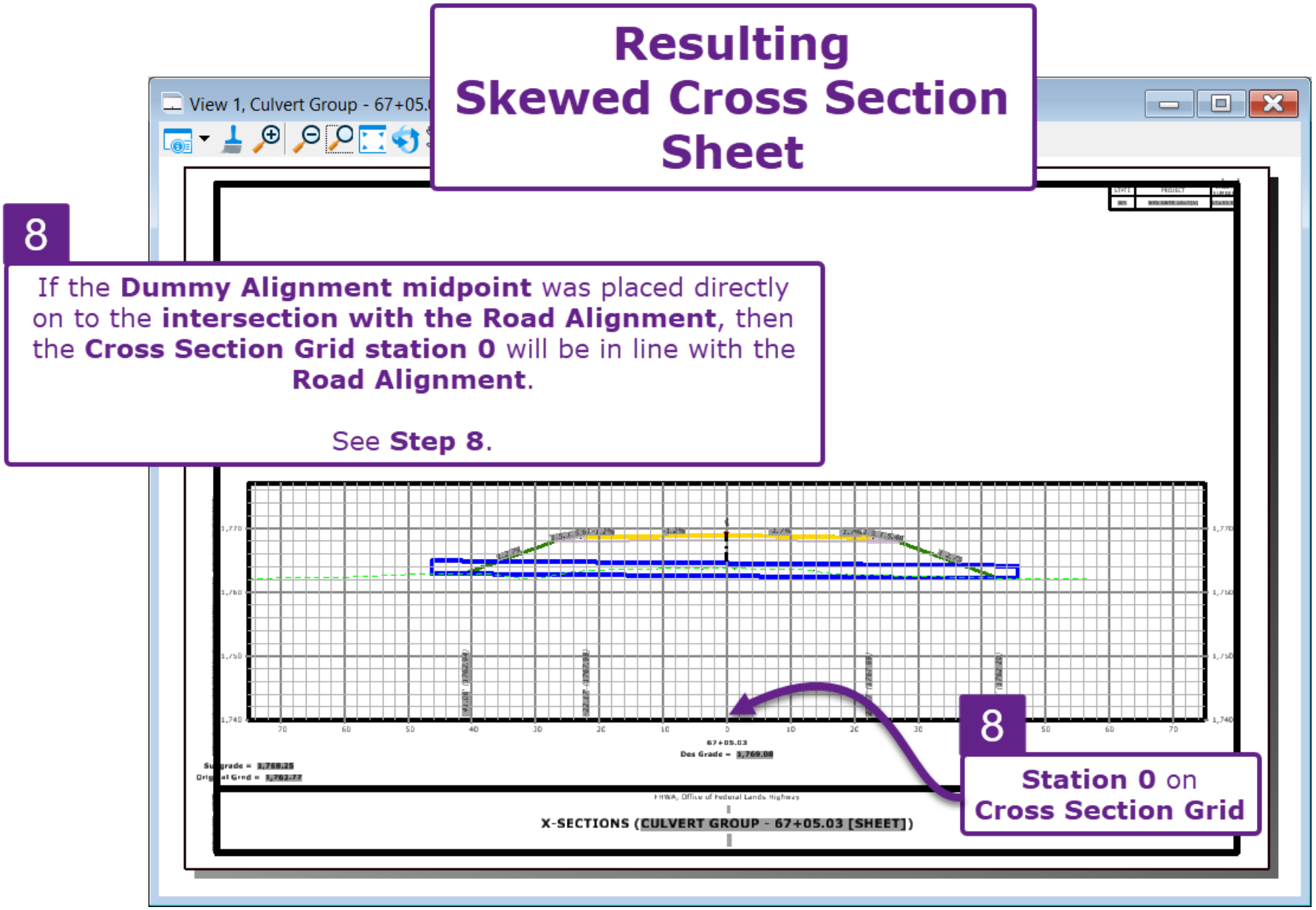
If the *Show Dialog* box was CHECKED in step 20 , then the *Create Drawing* dialogue box will be shown. Typically, there is no configuration required for this dialogue box. However, ensure that the Annotation Group ("XS Grid w/ Annotation") is selected.

The *Annotation Group* controls the appearace of the Cross Section Grid and annotation labels that will be used. See *16D – Cross Section Annotation Basics* and *16E – Configuring Cross Section Annotations*.



After the OK button is pushed, the CROSS SECTION *Drawing Model* and *Sheet Model* will be created.

16C.4 Resulting Skewed Cross Section Sheet

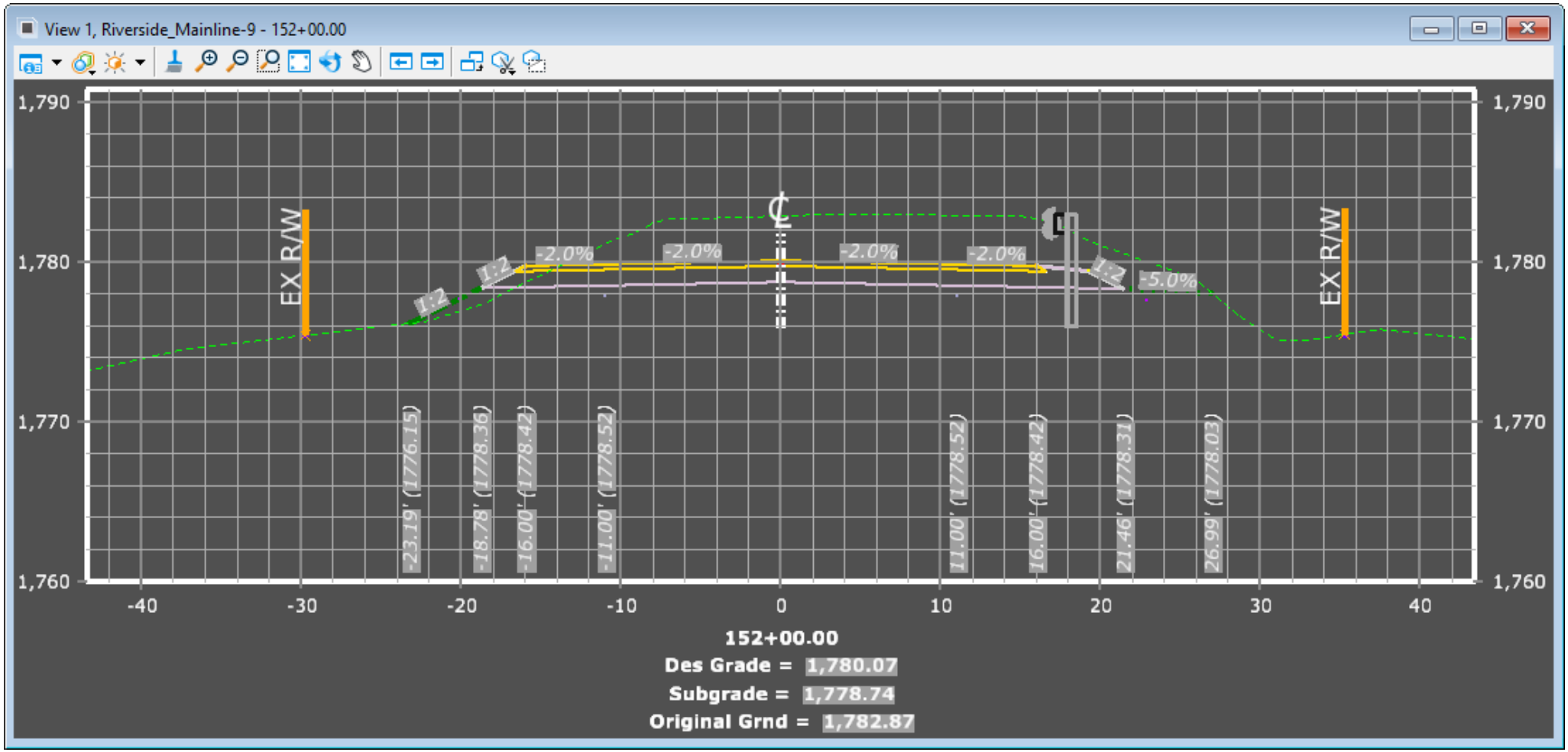


16D – CROSS SECTION ANNOTATIONS BASICS

In highway design, the roadway cross-sectional geometry often varies from project to project. For this reason, the default Annotation Group ("XS Grid w/ Annotations") - found within the FLH WorkSpace – may require customization to accommodate project-specific cross-sectional geometry.

In general, Cross Section Annotations operate under many of the same concepts present in *15D – Civil Annotations (Stationing & Profile)*.

Cross Section Annotation labels are found and created within CROSS SECTION *Drawing Models* .



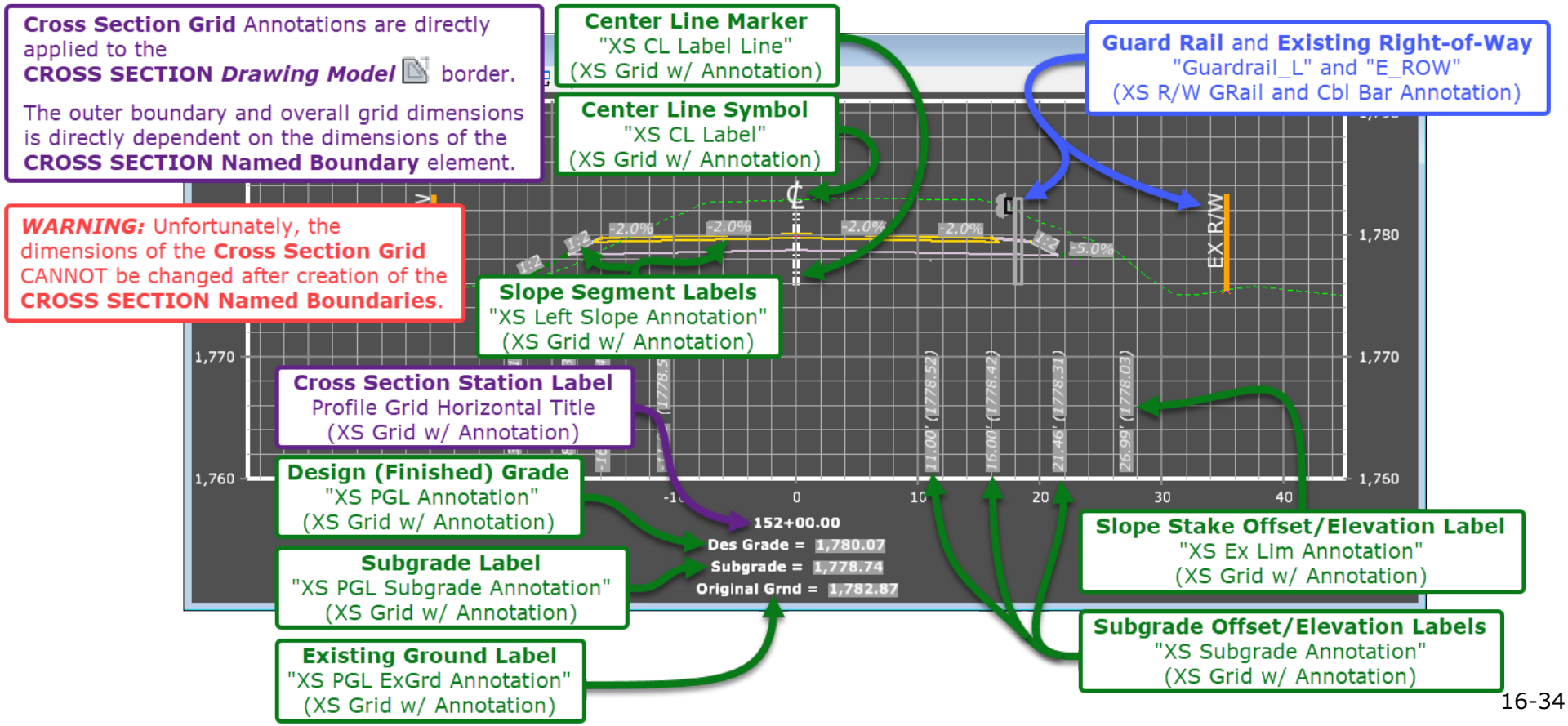
16D.1 Guide to the Default Cross Section Annotation Groups found in FLH WorkSpace

Cross Section Grid and Annotation elements belong to Cross Section *Annotation Groups*. There are only two Cross Section *Annotation Groups* configurations found in the FLH WorkSpace:

XS Grid w/ Annotation: This is the base Annotation Group. This Annotation Group works by labeling *3D Linear Elements* (Points) based on their specific **Template Point Name**. Only points generated by a Corridor *Template* will be labeled. For more information labeling, see *16E – Configuring Cross Section Annotations*. The "XS Grid w/ Annotation" group contains all **Cross Section Grid** elements and annotates other features, including:

- Cross Section Grid Labels
- Design Grade, Subgrade, and Existing Grade Labels
- Offset/Elevation Labels
- Slope Segment Labels
- Guardrail graphics
- Centerline Symbol and Line Label

XS R/W and Utilities: This Annotation Group is placed atop the base "XS Grid w/ Annotation" group to label Right of Way and Utility elements. For the "XS R/W and Utilities" group to locate the correct elements, all R/W and Utilities elements must be assigned to an appropriate Feature Definition and contain an active Profile. ***NOTE:*** This Annotation Group will NOT label the grid and road points. Apply this Annotation Group after the base "XS Grid w/ Annotation" group has been used.



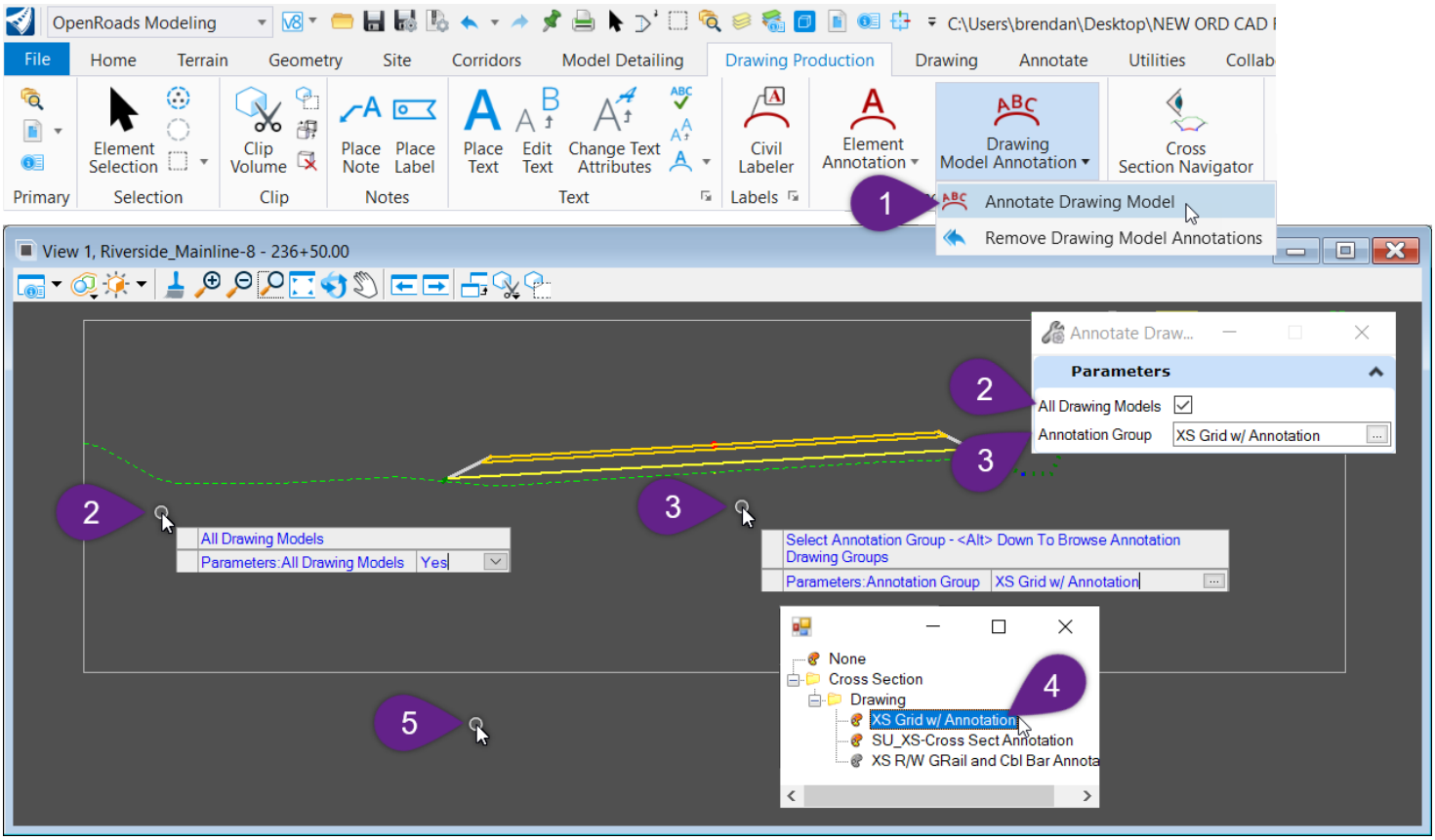
16D.2 Create, Remove, and Reapply Cross Section Annotations

16D.2.a Create Cross Section Annotations

As shown below, Cross Section Annotations are created with the *Annotate Drawing Model* tool. This tool may also be used to apply the "XS R/W and Utilities" labels atop of the "XS Grid w/ Annotation" labels.

NOTE: Cross Section annotations are typically automatically generated in the *Drawing Model* and *Sheet Model* creation process. However, when experimenting and configuration *Annotation Groups*, it is necessary to remove and recreate annotations.

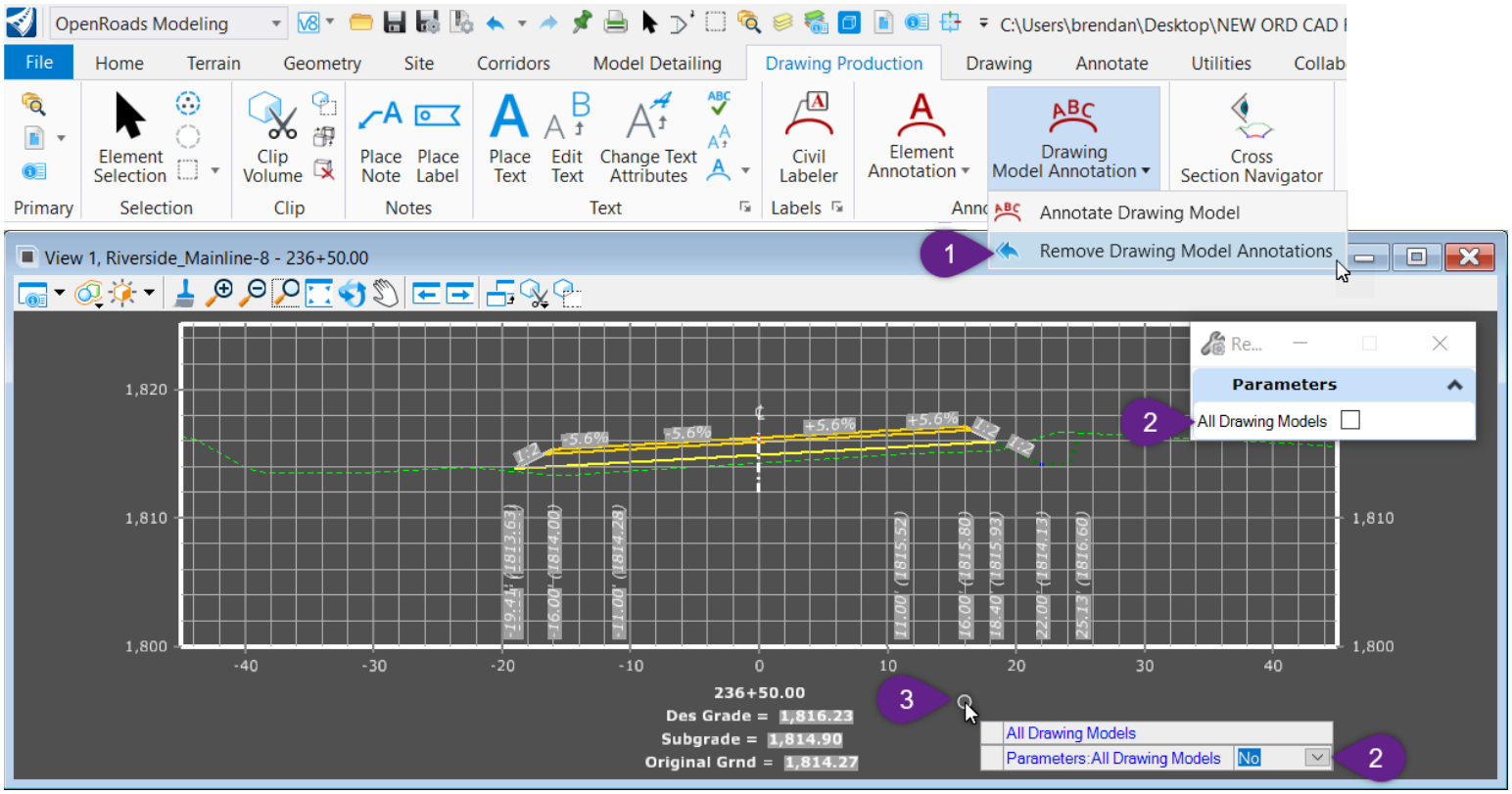
TIP: When experimenting with configuration of Annotation Groups, remove and re-create Annotations for a single cross section model. This will help to avoid long processing times that occur when **All Drawing Models** are annotated.



1	From the Ribbon, select the *Annotate Drawing Model* tool: [***OpenRoads Modeling*** → ***Drawing Production*** → ***Annotations***].
2	*Prompt: All Drawing Models* – If **Yes** is selected, then ALL CROSS SECTION *Drawing Models* in the active ORD File will be annotated. If **No** is selected, ONLY the active (current) CROSS SECTION *Drawing Model* will be annotated.
3	*Prompt: Select Annotation Group - <ALT> Down to Browse Annotation Drawing Groups* – Open the *Annotation Group* selection box by simultaneously pressing the ALT and DOWN arrow key.
4	Select the desired annotation group. In this case, the "XS Grid w/ Annotation" group is used.
5	Left-Click anywhere in the *View* to complete the command and annotate the *Drawing Model*.

16D.2.b Remove Cross Section Annotations

To update or refresh the Cross Section Grid or Annotations, the User must remove and re-create the Annotations. Cross Section Annotations are removed with the *Remove Drawing Model Annotations* tool.



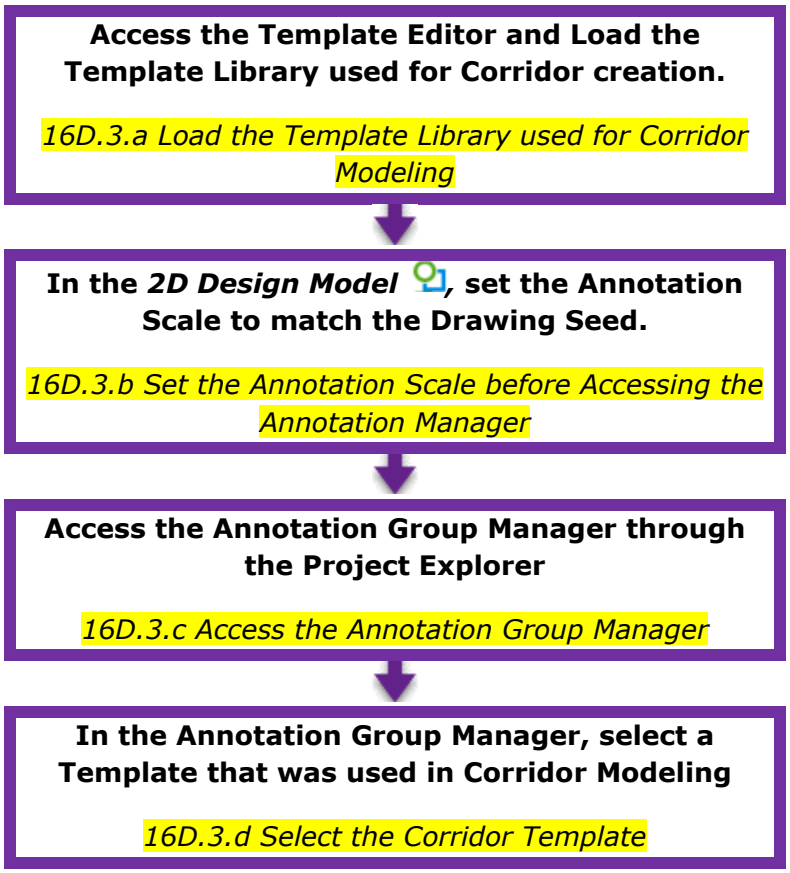
1	From the Ribbon, select the *Remove Annotate Drawing Model* tool: [***OpenRoads Modeling*** → ***Drawing Production*** → ***Annotations***].
2	*Prompt: All Drawing Models* – If **Yes** is selected, then annotations will be removed from ALL CROSS SECTION *Drawing Models* in the active ORD File. If **No** is selected, ONLY the annotations in the active (current) CROSS SECTION *Drawing Model* will be removed.
3	Left-Click anywhere in the *View* to complete the command and remove annotations from the *Drawing Model*.

16D.3 Access and Setup of the Annotation Group Manager - Workflow

The *Annotation Group Manager* for Cross Sections functions in the same manner as Stationing and Profile Annotations, which is discussed in *15D - Civil Annotations (Stationing & Profile)*.

However, there are a few processes that should be performed prior to accessing the Cross Section *Annotation Group Manager*. Similarly, after accessing the *Annotation Group Manager*, a Corridor Template should be loaded to quickly preview modifications made to the group.

The overall process for accessing and setting up the *Annotation Group Manger* is as follows:

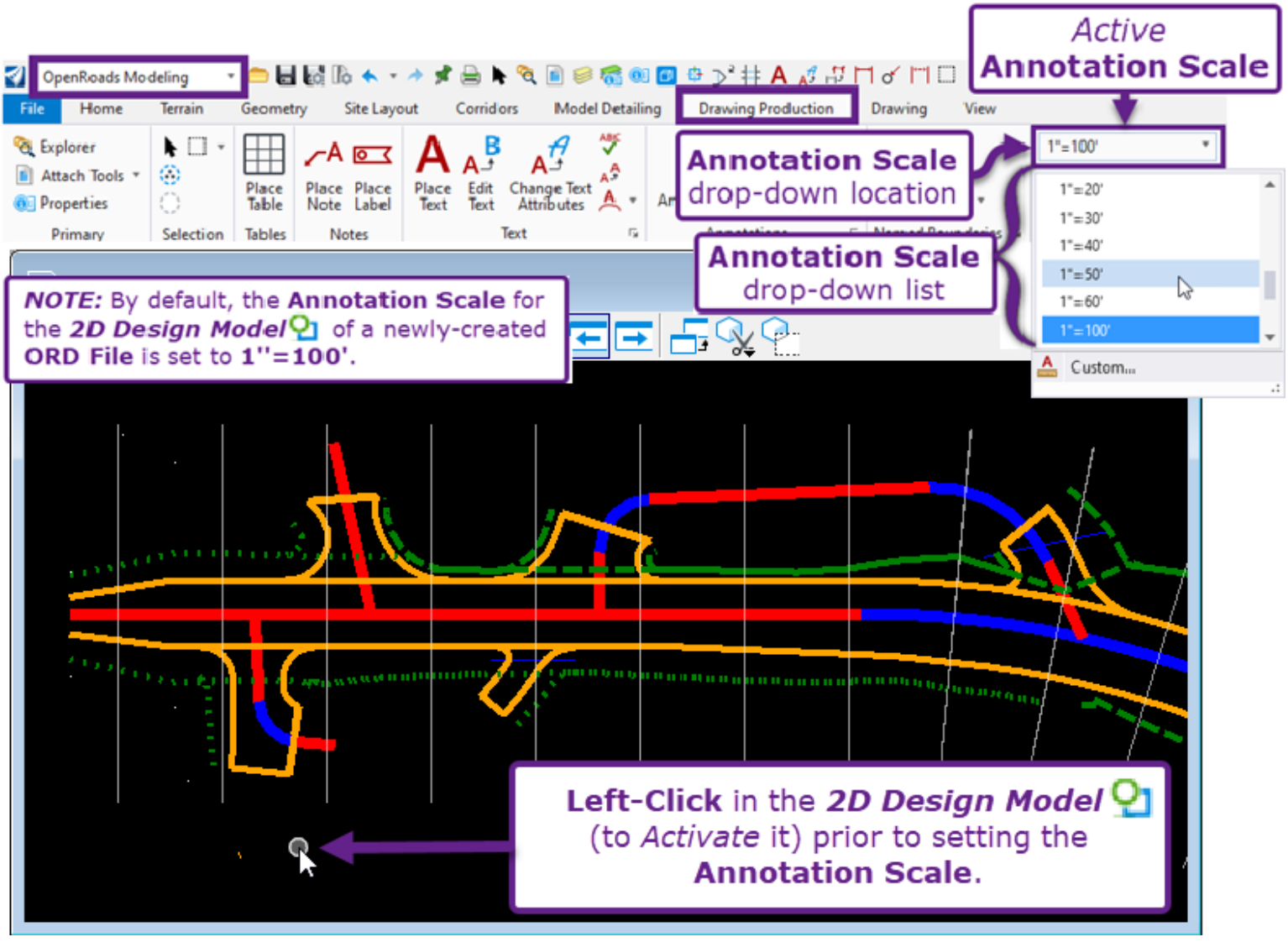


16D.3.a Load the Template Library used for Corridor Modeling

Before accessing the *Annotation Group Manger*, load the Template Library (.itl file) used in creation of the mainline Corridor. When creating and manipulating labels in the *Annotation Group Manager*, the User will directly interact with Corridor Templates. The Points to be labeled can be directly selected from Templates. See *8B.1 Accessing the Template Editor and Template Libraries*.

16D.3.b Set the Annotation Scale before Accessing the Annotation Manager

The *Annotation Group Manger* contains a preview window that is sensitive to the Annotation Scale set in the *2D Design Model*. By default, for a new ORD File, the Annotation Scale is set to 1" = 50'. If the Annotation Scale is set to a large value (i.e., 1" = 50), then the Labels shown in the *Annotation Group Manager* preview window will be too large and overlap. Set the *Annotation Scale* to match the *Drawing Seed,* which is typically 1" = 20' or 1" = 10'. For more information on the *Annotation Scale*, see *15A.2 Annotation Scale*.



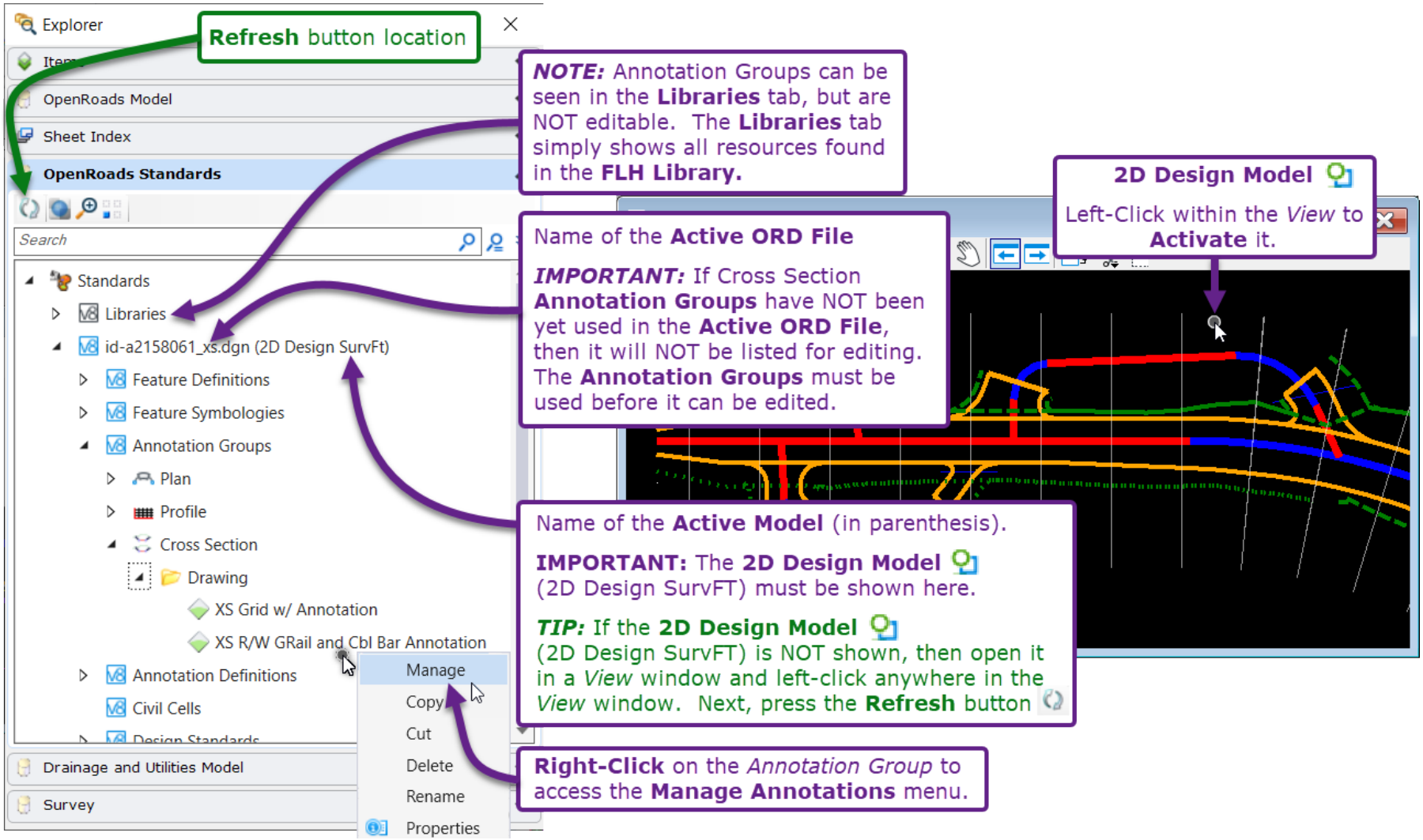
16D.3.c Access the Annotation Group Manager

The *Annotation Group Manger* is accessed in the same manner shown in *15D.5 Editing Alignment (Plan) Annotation Groups*. The Cross Section **Annotation Groups** are accessed through the Explorer in the following location:

OpenRoads Standards → *Active ORD File* (2D Design SurvFT) → Annotation Groups → Cross Section → Drawing

WARNING: The Cross Section **Annotation Groups** are only accessible when the *2D Design Model* is active. In other words, Left-click anywhere in a *View* that is showing the *2D Design Model* before attempting to access the Annotation Group.

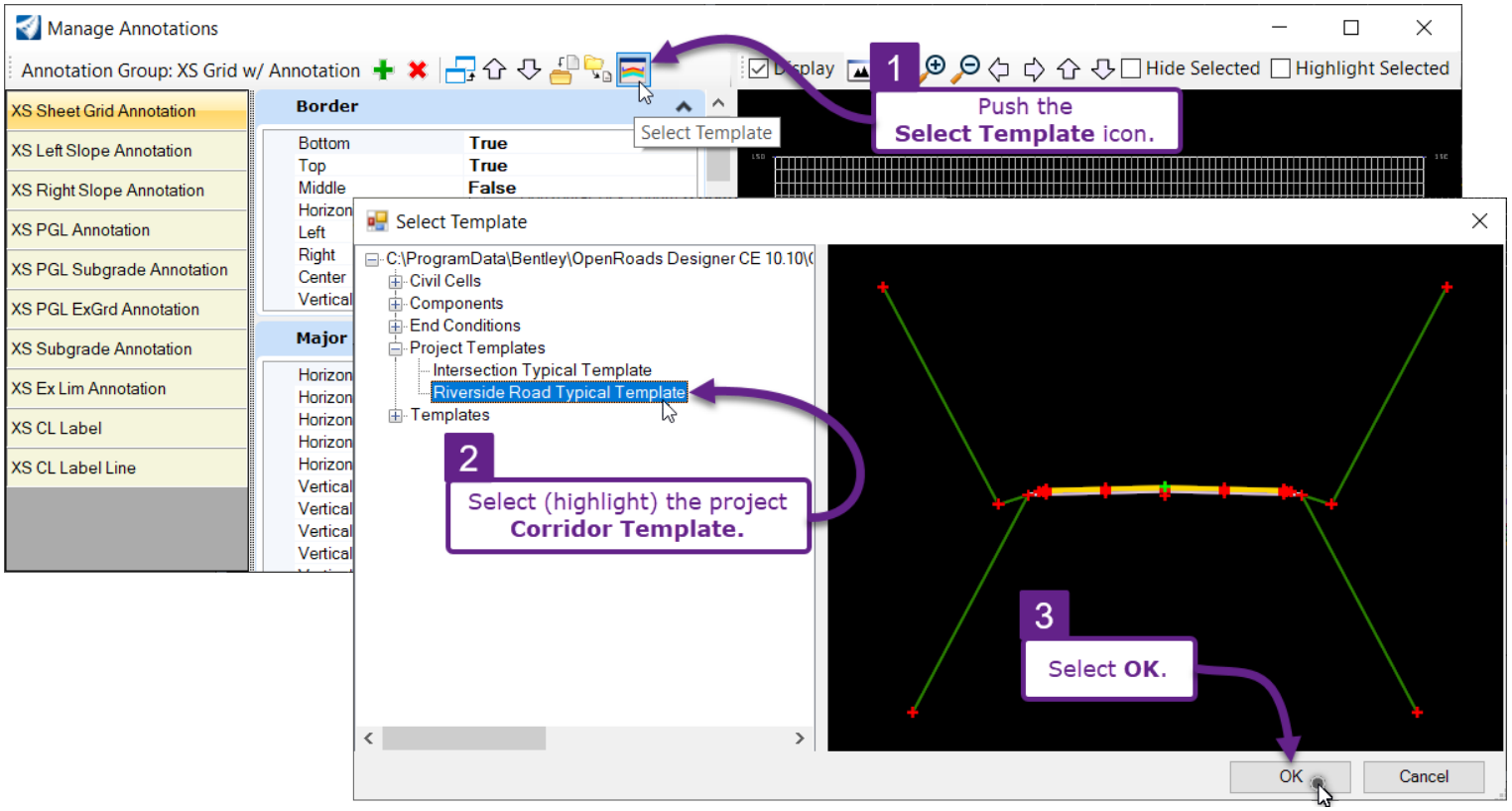
WARNING: **Annotation Groups** will NOT be shown in the *Explorer* until used in the *Drawing Models* of the active ORD File.

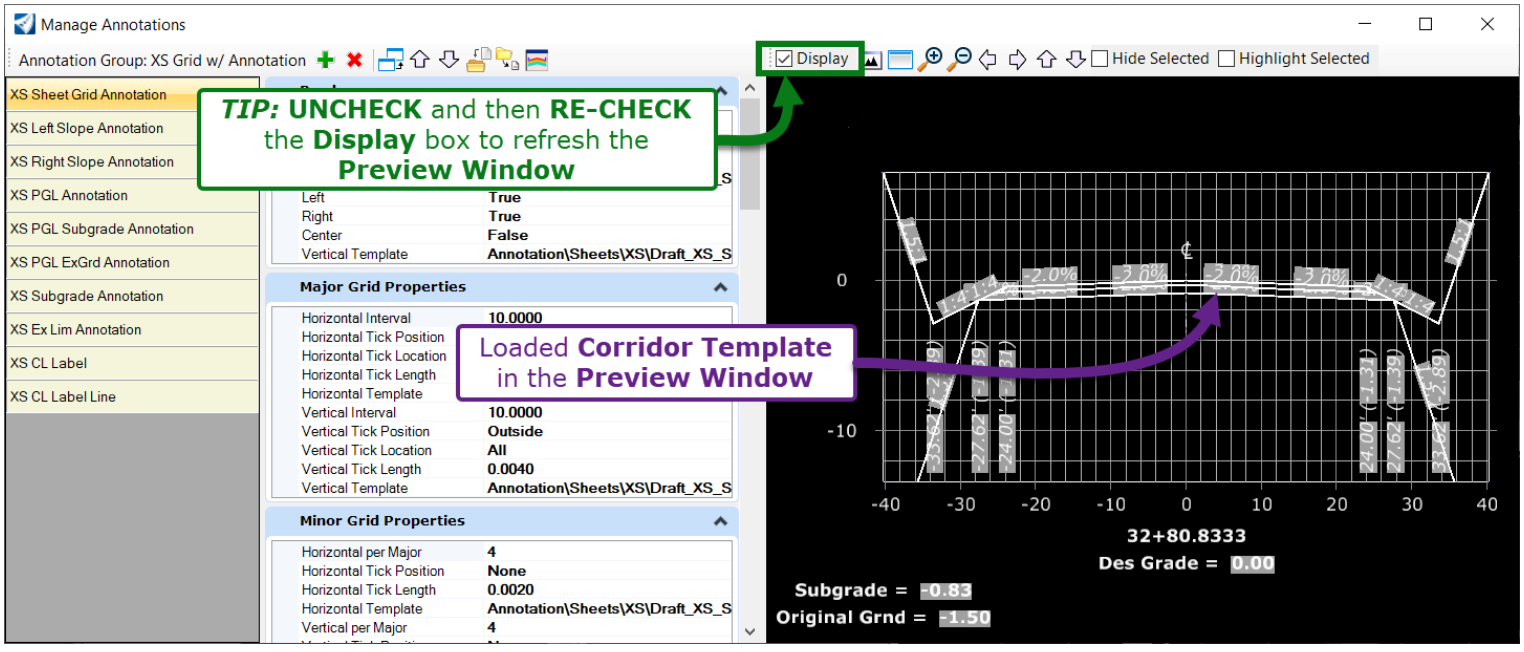


16D.3.d Select the Corridor Template

Before manipulation of a Cross Section Annotation Group, use the *Select Template* icon to load a Template that was used in the creation of the Corridor Model.

WARNING: If project Corridor Templates are not available, it means that Template Library (itl. file) has NOT been loaded in the Template Editor. See *16D.3.a Load the Template Library used for Corridor Modeling*.

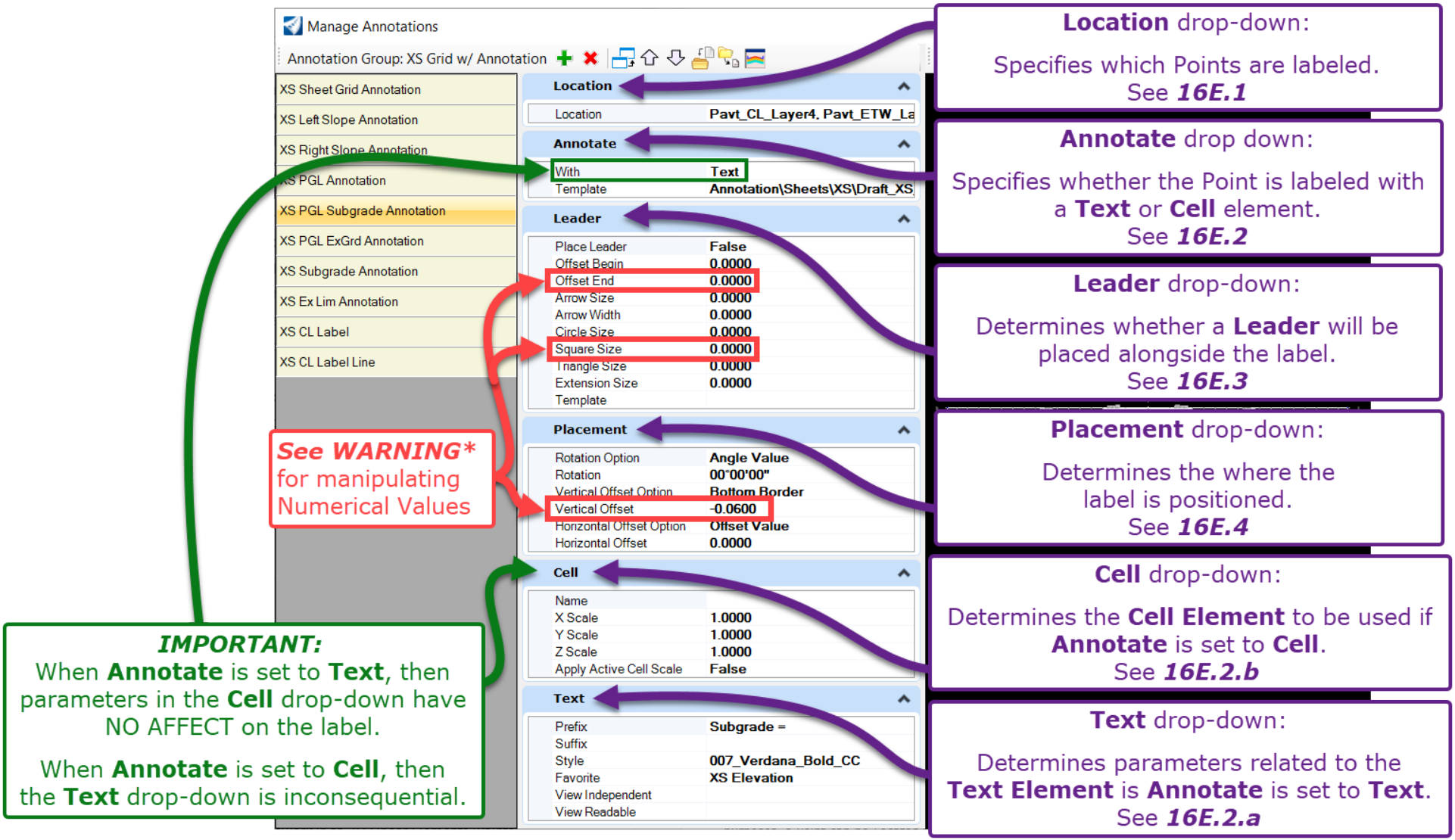




16E – CONFIGURING CROSS SECTION ANNOTATIONS

The *Annotation Group Manager* is arranged into six dropdowns that control which Points are labeled and how the label is placed.

WARNING* for manipulating Numerical Values: All Numerical Values (i.e., Offset End, Vertical Offset, and Square Size) are unadjusted for the *Annotation Scale*. These values will be multiplied by the *Annotation Scale* factor in the *Drawing Models* . This concept is discussed in *15D.5.b Understanding the Annotation Scale within the Manage Annotation Menu*.

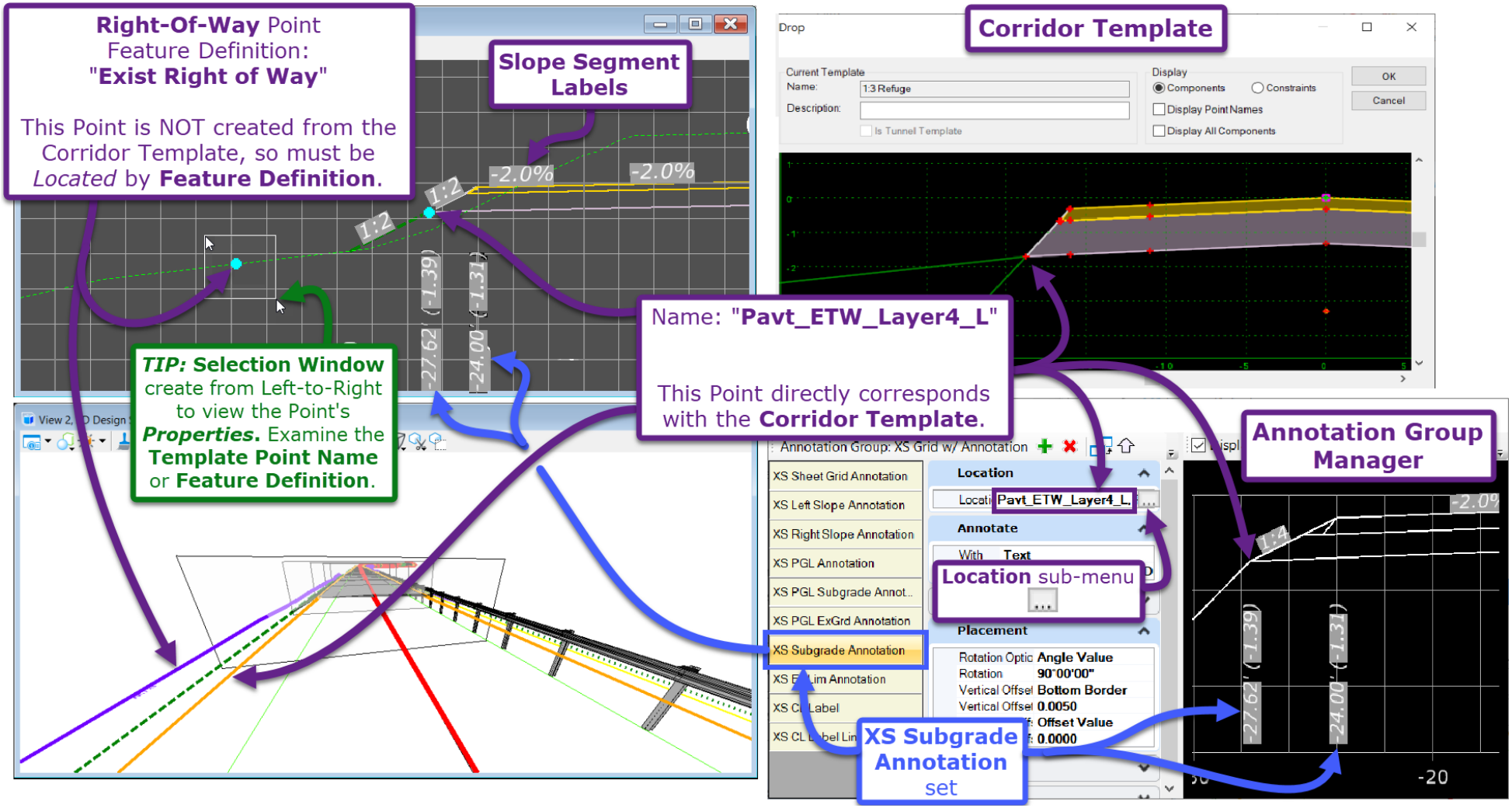


16E.1 Location: Specify which Template Points or 3D Linear Elements are Labeled

Most Cross Section *Annotations* work by labeling the position of *3D Linear Elements* (Points) within the *Drawing Model*. For labeling purposes, a Point can be *Located* by either it's **Template Point Name** or the assigned **Feature Definition**. The method used for Point *Location* is specified in the ***Location*** sub-menu – which is discussed in on the next page.

The **Template Point Name** method is typically used to label Points that were generated by the Road Corridor Template.

With the **Feature Definition** method, any Point assigned to a specified Feature Definition will be labeled. This method is used to label custom-created *3D Linear Elements* – such as Right-of-Way and Guardrail.

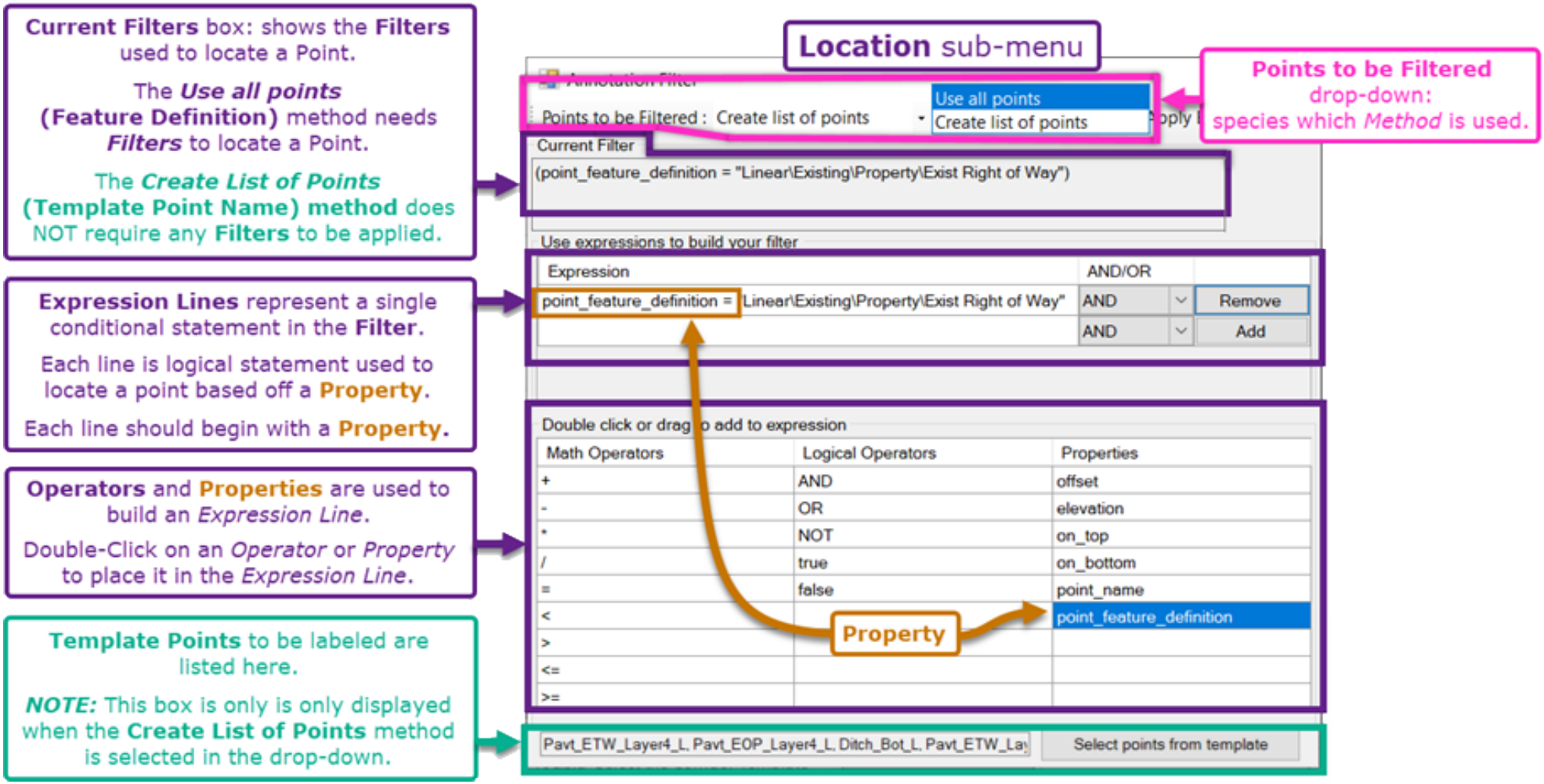


16E.1.a Location Sub-Menu

In the *Annotation Group Manager*, the **Location** sub-menu is used to specify which *Points* will be labeled. This sub-menu operates differently depending on the method selected in the *Points to Be Filtered* drop-down.

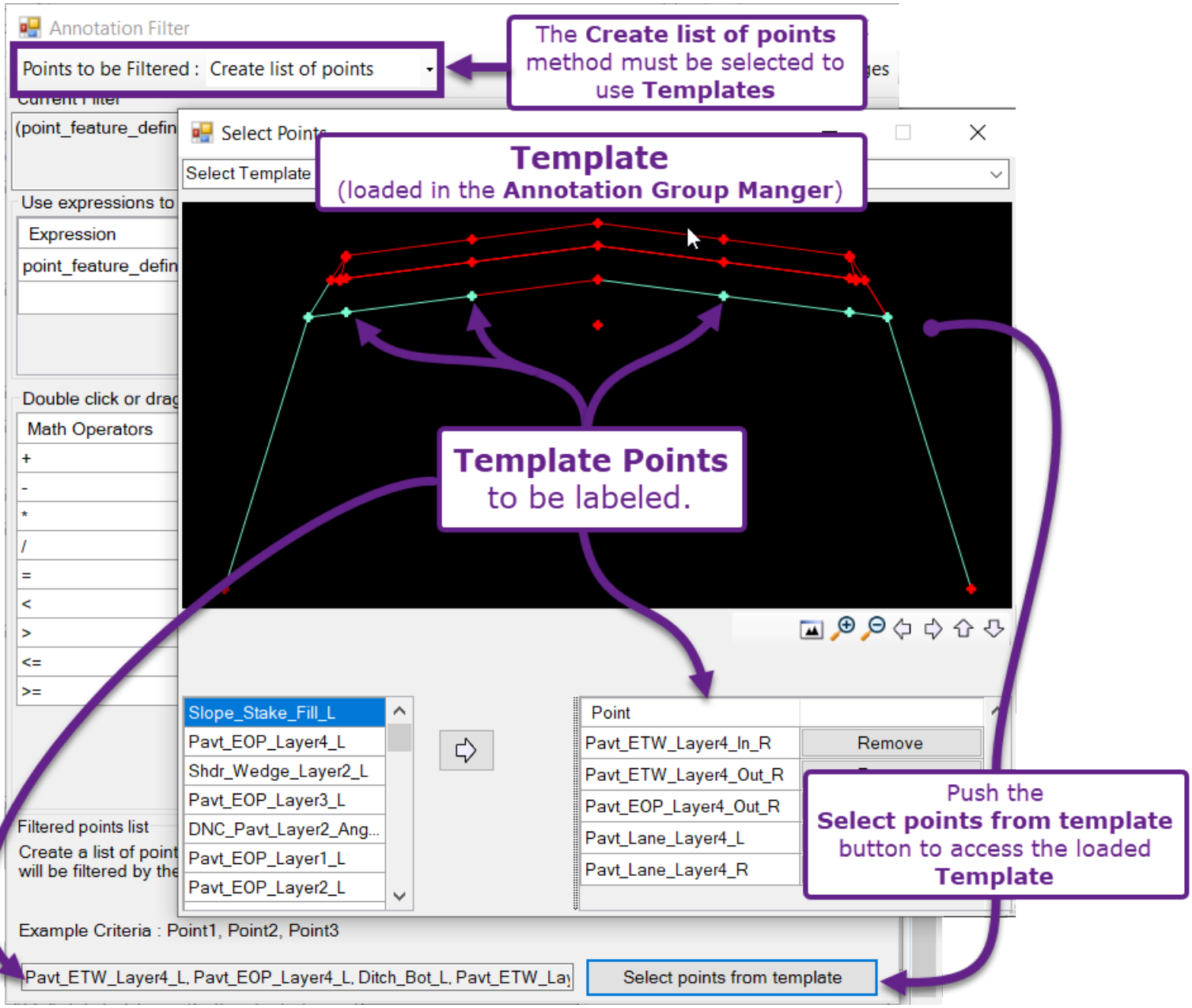
Create List of Points corresponds with the **Template Point Name** method discussed on the previous page. This method works by loading project Templates and graphically selecting which Point to label. A detailed overview of this method is discussed in *16F - Manipulating Offset/Elevation Labels*.

Use All Points is used to label a Point by the **Feature Definition** or other *Filter Properties*. *Filters* are discussed in depth in *16E.1.b Filters*.



16E.1.a.i Template Point Name (Create List of Points) overview

When the *Create List of Points* method is used, the currently loaded Template is used to select which *Points* will be labeled.



When CROSS SECTION *Drawing Models* are annotated, the label will seek out ANY Corridor Template Point which contains a listed **Template Point Name**. This means it is NOT necessary to load every Template used to create the Corridor if consistent Pointing naming was used among the multiple Templates.

TIP: The **Template Point Name** for a *3D Linear Element* can be found in the Properties Box. Select the *Template Point* in the CROSS SECTION *Drawing Model* with a *Selection Window.*

Below are a listed of disadvantages for *Create List of Method*:

- ONLY points generated by a Corridor, Linear Template, or Surface Template model are eligible for labeling. *3D Linear Elements* (Point) created manually by the User (i.e., Right-of-Way, Guardrail, Fences) CANNOT be labeled with this method.

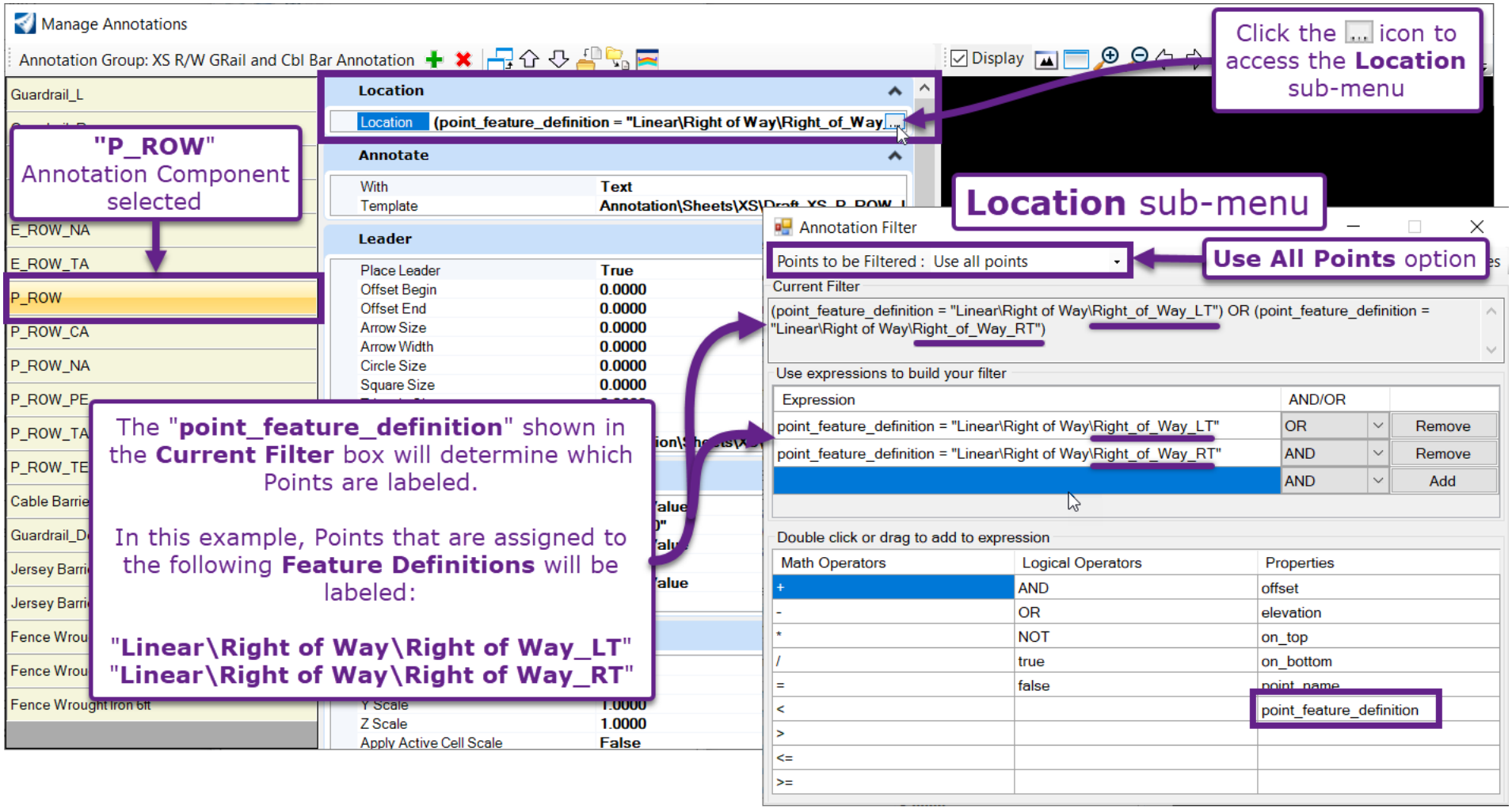
- For longer Corridors, the **Template Point Naming** schemes between *Template Sections* should ideally be consistent between multiple *Template Drop Sections*. This is something to watch out for because generally *Templates* are created in an earlier phase of the overall design process. Inconsistent and sloppy **Template Point Naming** among multiple *Templates* requires the User to manually select each *Template Point* that contains a unique name, which can be very inefficient. Similarly, the User may have trouble locating **Template Point Names** that were created in the override of *Template Drop Sections* (as discussed in *9E.6 Edit (Override) Template Drop tool*).

16E.1.a.ii Feature Definition and Filter (Use All Points) Overview

When the *Use All Points* option is used, the User will identify *Points* to be labeled based on **Feature Definition** or other *Filter Properties* criteria. This method must be used to label 3D Linear Elements (i.e., Right-of-Way, Guardrail, Fences linework), that are NOT included in a Corridor Template. However, this method is compatible with Corridor Template Points that meet the *Filter* criteria. Within the **Location** sub-menu, the Feature Definition to be labeled is specified with a *Filter*. *Filters* are discussed in *16E.1.b Filters*.

IMPORTANT: The "XS R/W GRail and Cbl Bar Annotation" group solely uses the **Use All Points** method to label points.

The graphic below shows the configuration of Filter that is seeking out Points for specific two specific **Feature Definitions**: "Right of Way_LT" OR "Right of Way_RT".

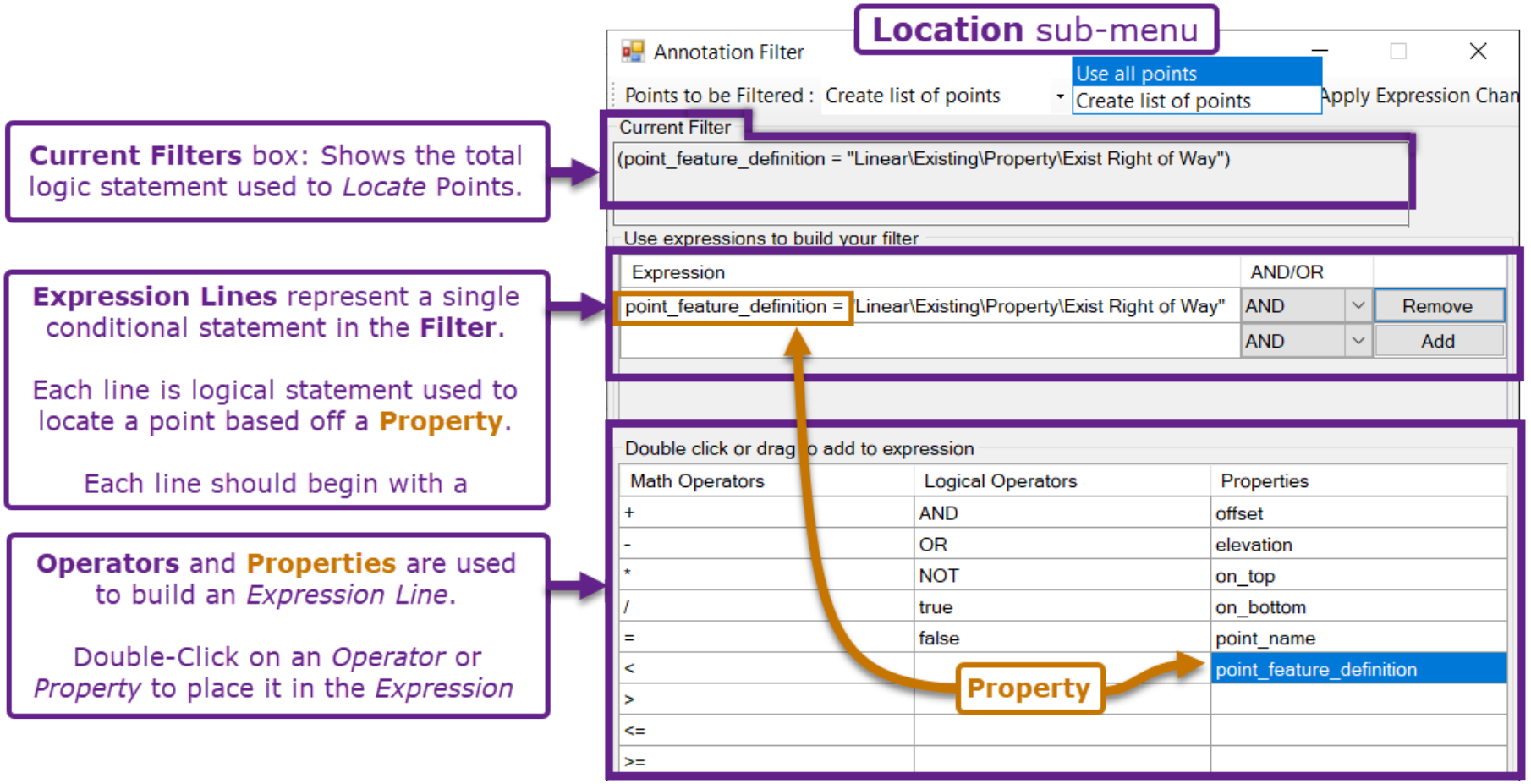


16E.1.b Filters

Filter Expressions are created in the **Location** sub-menu. Filters Expressions are applicable ONLY when the *Use All Points* (**Feature Definition**) method is used. The *Use All Points* method needs at least ONE Filter Expression to specify which *3D Linear Elements* (Points) are labeled. If NO Filter Expressions are applied, then literally every Point in the CROSS SECTION *Drawing Model* will be labeled (which explains why the method is called *Use All Points*).

When creating Filter Expressions, the User will work from bottom to top of the menu. Most tasks are performed by Double-Clicking on Properties (always selected first), Math Operators, and Logical Operators – which are located in the bottom portion of the **Location** sub-menu.

IMPORTANT: All Filter Expressions must begin by selecting a **Property** (i.e., offset, elevation, on_top, on_bottom, point_name, or point_feature_definition).

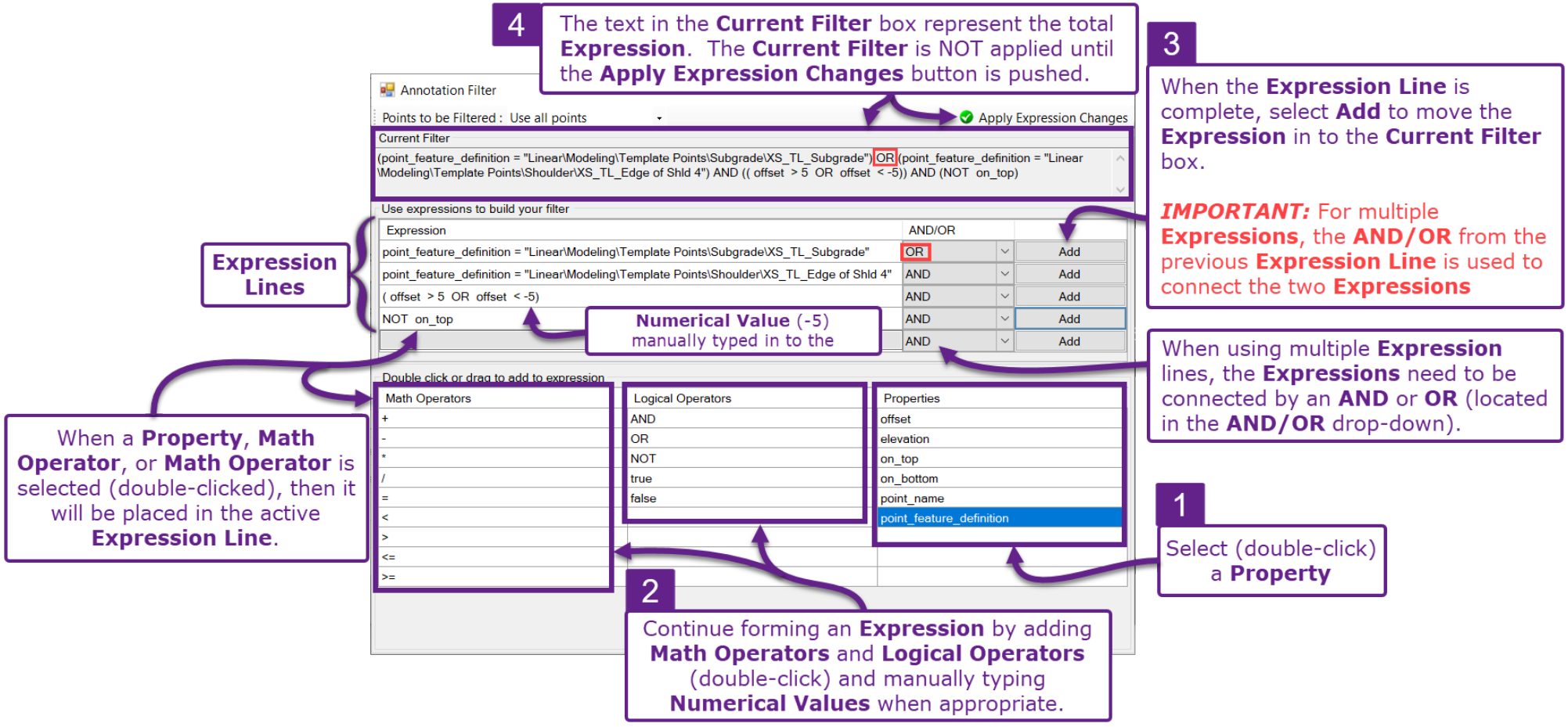


16E.1.b.i Basic Filter Creation Workflow

The steps below show the basic procedure and techniques for building a Filter Expression. A **Property** should always be the first part of an Expression Line. For an explanation and examples of each Property, see *16E.1.b.ii Property Types*.

The text for the **Current Filter** implies the following criteria. All criteria must be satisfied for a Point to receive a Label:

Expression 1: The Point must be assigned to the "XS_TL_Subgrade" Feature Definition.
OR
Expression 2: The Point must be assigned to the "XS_TL_Edge of Shdr 4" Feature Definition.
AND
Expression 3: The Point must be located 5 feet to the right of the Alignment OR 5 feet to the left of the Alignment
AND
Expression 4: The Point must NOT be located on the top-string of Points that comprise the Cross Section.

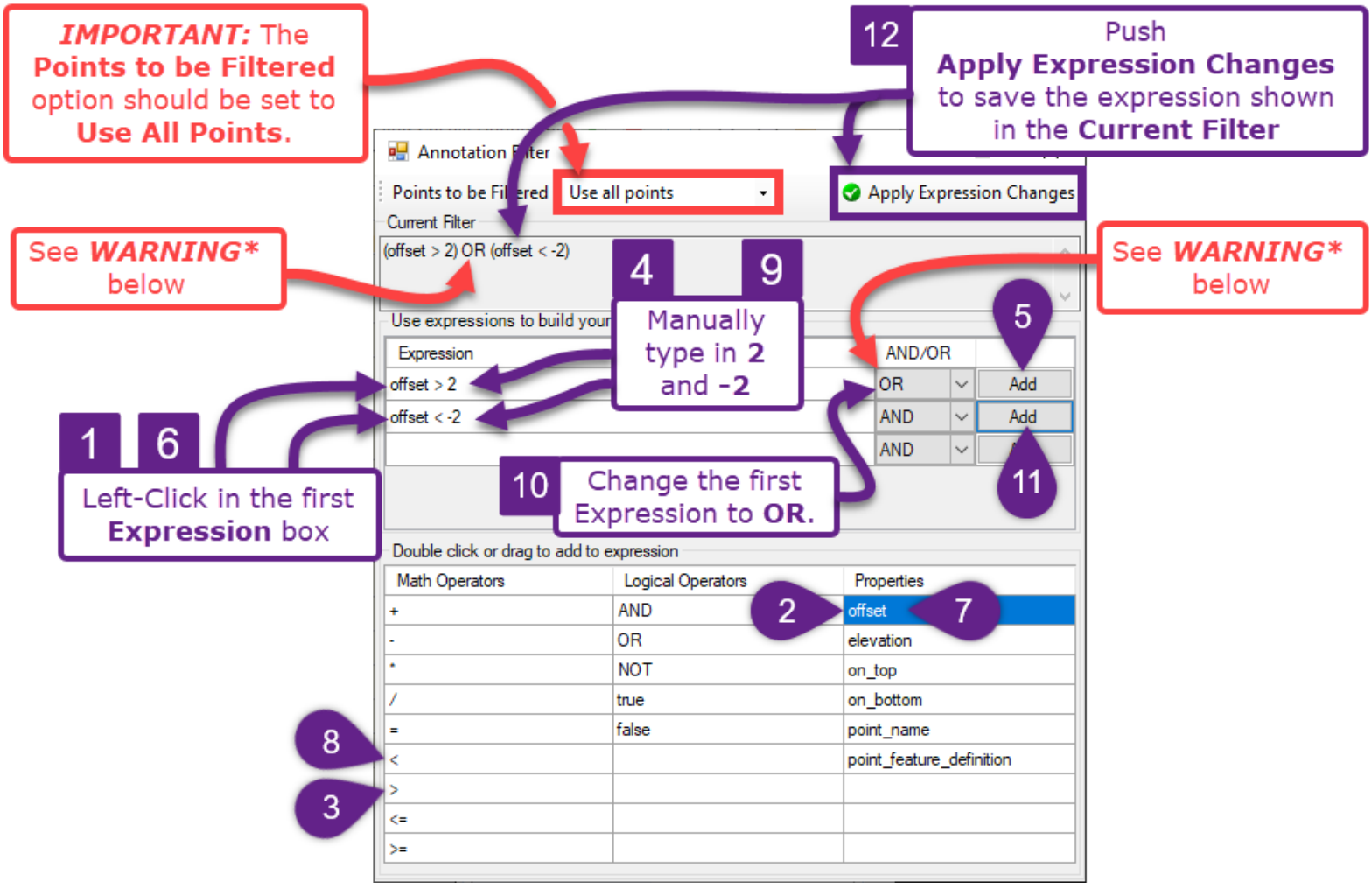


16E.1.b.ii Property Types

In this section, the available Property types are explained with example Filter Expressions.

Offset: Any Point that satisfies the Offset expression will be labeled. This Property type must be used in conjunction with a Math Operator (typically, a greater than [>] or less than [<] operator).

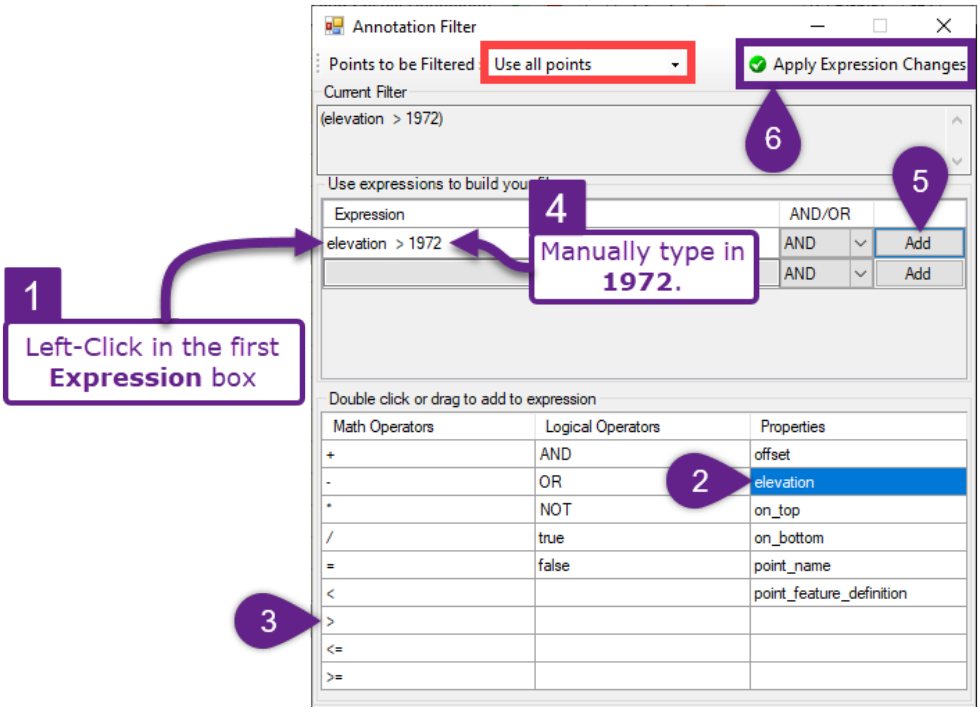
> **Example Expression:** "(offset > 2) OR (offset < -2)"
>
> Any Point that is horizontal located more than (greater than) than 2 feet to the right (positive direction) of the Alignment OR located more than (less than) than 2 feet to the left (negative direction) will be labeled. In this configuration, Points within 2 feet of the Alignment will NOT be labeled.



WARNING*: Ensure that the first expression is set to OR in the AND/OR column drop-down. By default, this parameter is set to AND – so it must be changed before the second expression is added. If the entire expression (in the *Current Filter* box) were to read: "(offset > 2) **AND** (offset <-2)", then no Points would be labeled. This is because the two expressions are conflicting. A single Point CANNOT be simultaneously placed 2 feet to the right **AND** 2 feet to the left of the Alignment. However, with the **OR** operator selected, only a single sub-expression needs to be satisfied to produces a label.

Elevation: Any Point that satisfies the Elevation expression will be labeled. This Property type must be used in conjunction with a Math Operator (typically, a greater than [>] or less than [<] operator).

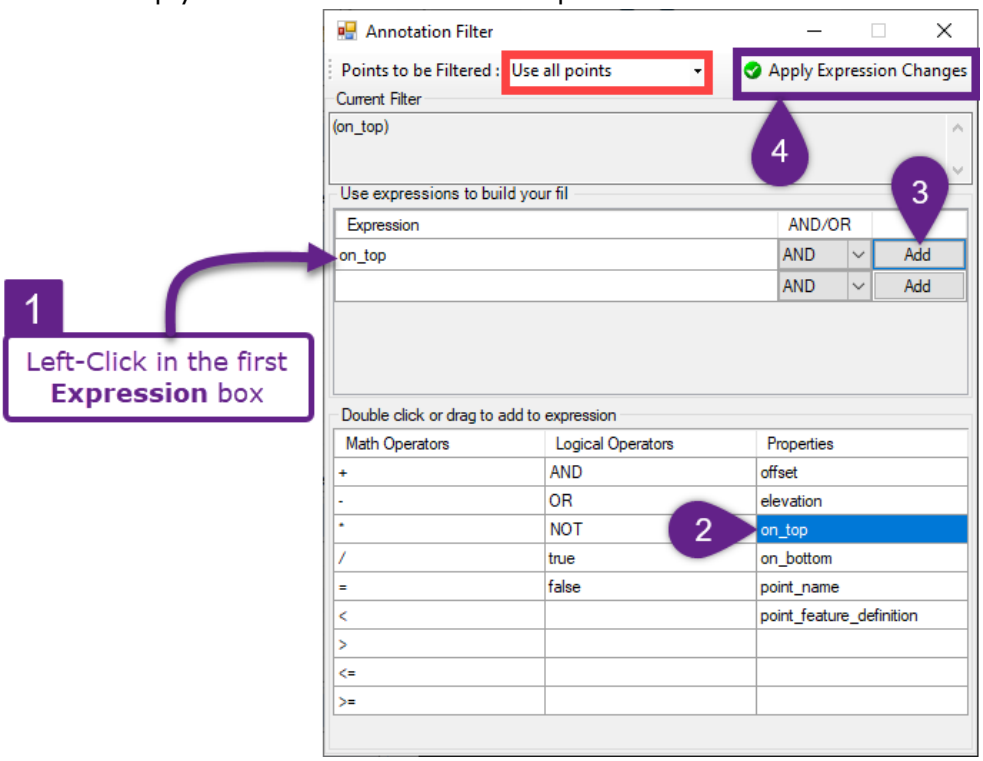
Example Expression: "elevation > 1972"
Any Point that is greater than 1972 in elevation will be labeled.



On_Top: For a Corridor Template, any Point that is located on the top string of points will be labeled.

Example Expression: "on_top"
Any Point on the top of the Cross Section will be labeled.

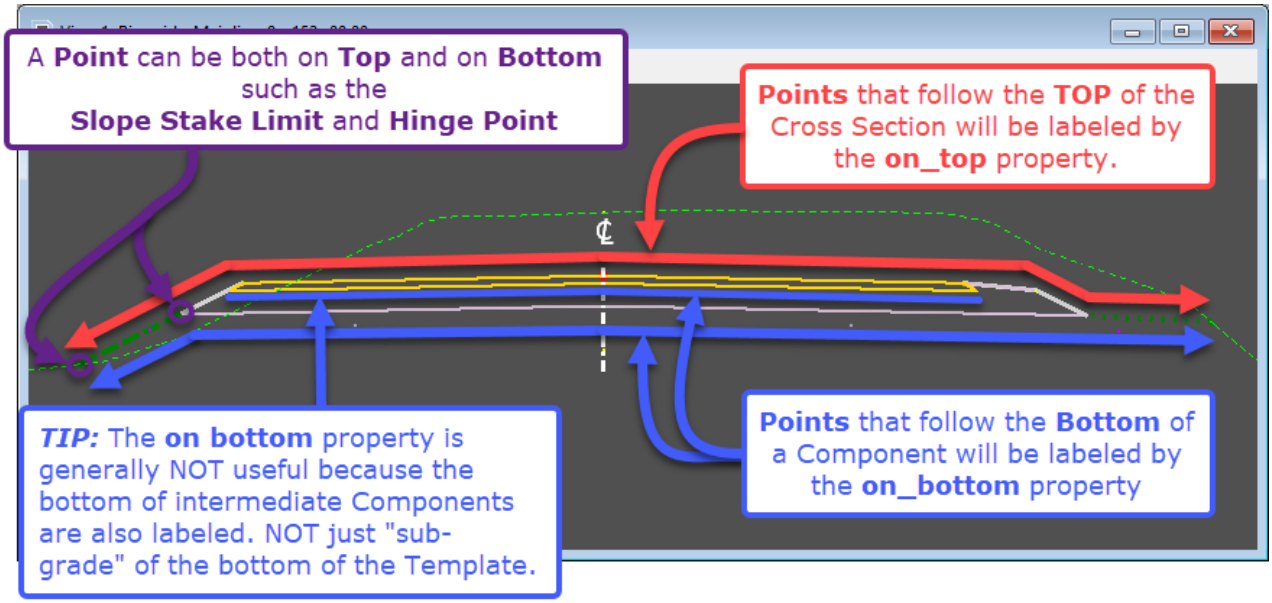
IMPORTANT: This Property does NOT require any Mathematical Operators or numerical values. It simply works as a stand-alone Expression.



On_Bottom: For a Corridor Template, any Point that is located on the bottom string of points will be labeled.

Example Expression: "on_bottom"
Any Point on the bottom of the Cross Section will be labeled.

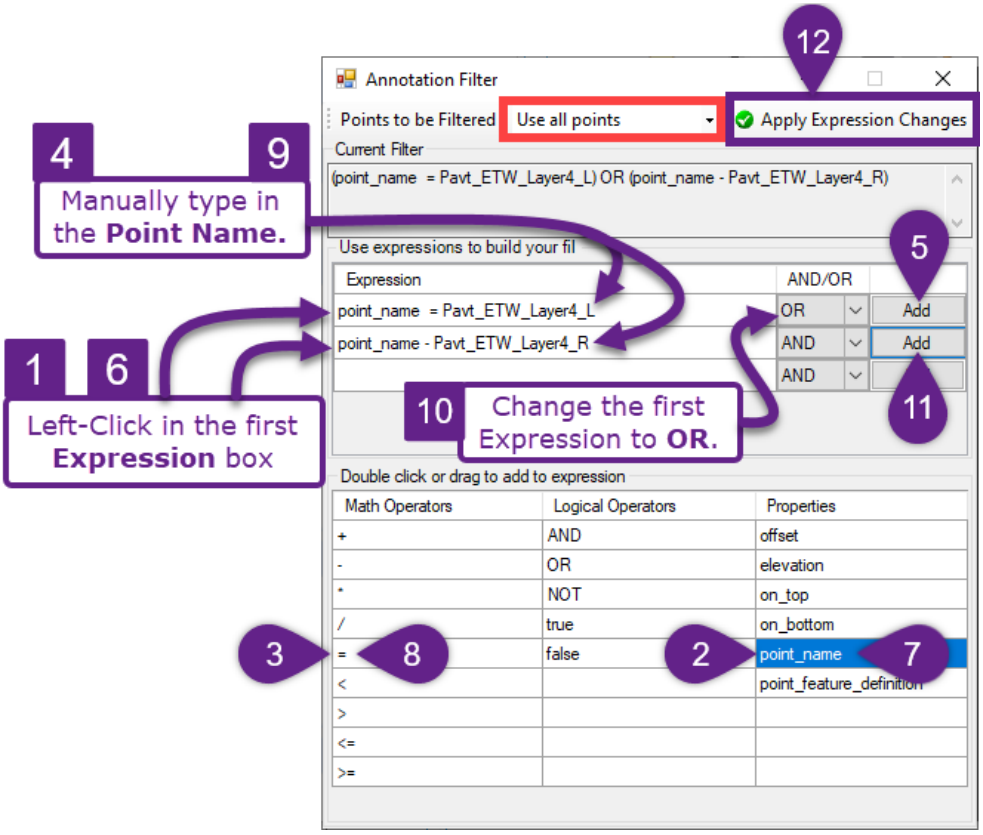
IMPORTANT: This Property does NOT require any Mathematical Operators or numerical values. It simply works as a stand-alone Expression. See the "on_top" graphic for formulation of this expression. Choose the "on_bottom" for step 2 .



Point_Name: Any *3D Linear Element* (Point) with the specified Name will be labeled. Must be used with the equals (=) Math Operator.

Example Expression:
"(point_name = Pavt_ETW_Layer4_L) OR (point_name = Pavt_ETW_Layer4_R)"

Any *3D Linear Element* (Point) that is named "Pavt_ETW_Layer4_L" OR "Pavt_ETW_Layer4_R" will be labeled.



***WARNING*:** Ensure that the first sub-expression is set to OR in the AND/OR column drop-down. By default, this parameter is set to AND – so it must be changed before the second expression is added. If the entire expression (in the *Current Filter* box) was to read:

"(point_name = Pavt_ETW_Layer4_L) **AND** (point_name = Pavt_ETW_Layer4_R)"

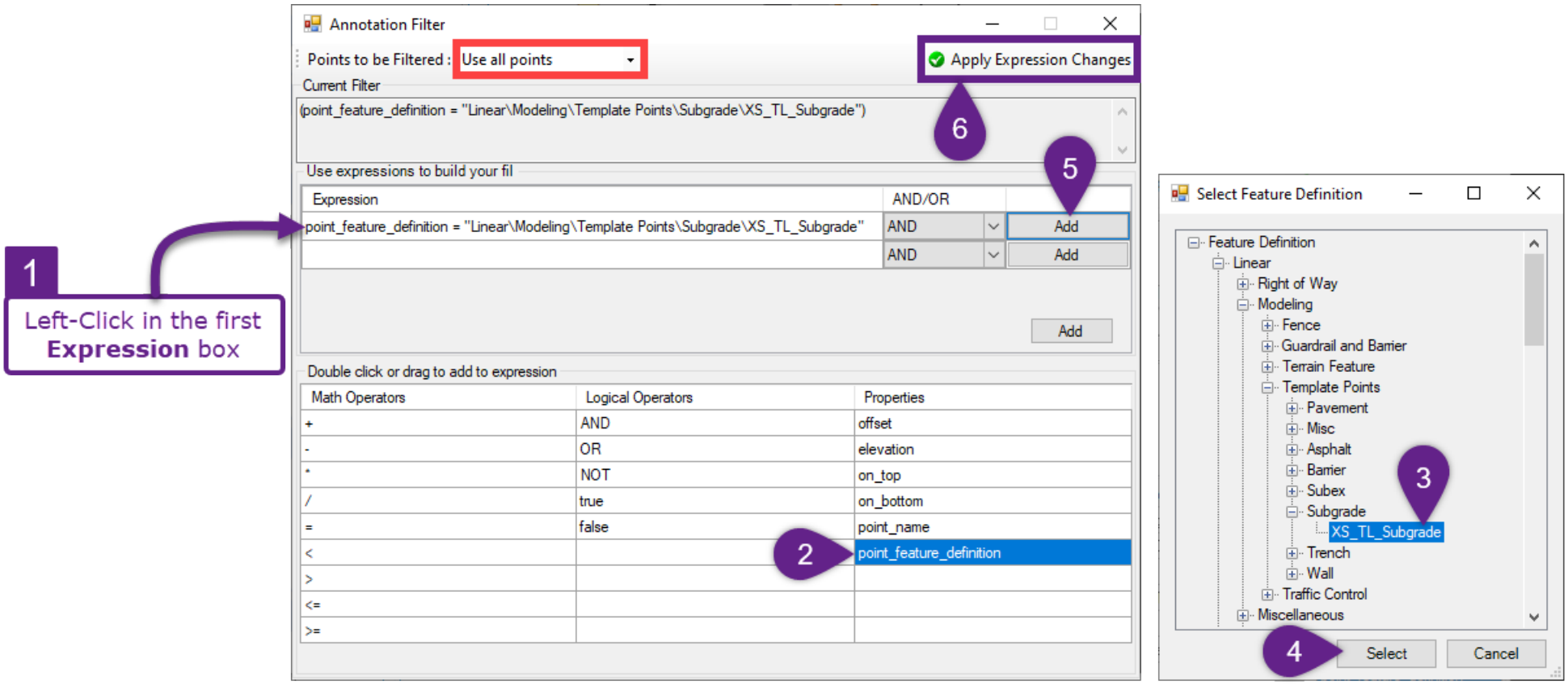
then no Points would be labeled because the expression would be because both sub-expressions would have to be satisfied (by a single point) – which is impossible. A single *3D Linear Element* Point CANNOT contain two Point Names. However, with the **OR** operator selected, only a single sub-expression needs to be satisfied to produce a label.

Point_Feature_Definition: Any *3D Linear Element* (Point) that is assigned to the specified Feature Definition will be labeled. When this option is used, the User will be prompted to select a Feature Definition from the FLH Library. The User does NOT need to manually type in the Feature Definition name.

Example Expression:

"point_feature_definition = " Linear\Modeling\Template Points\Subgrade\XS_TL_Subgrade""

Any *3D Linear Element* (Point) that is assigned to the "XS_TL_Subgrade" will be labeled.



16E.2 Annotate: Specify the Label Type (Cell or Text element)

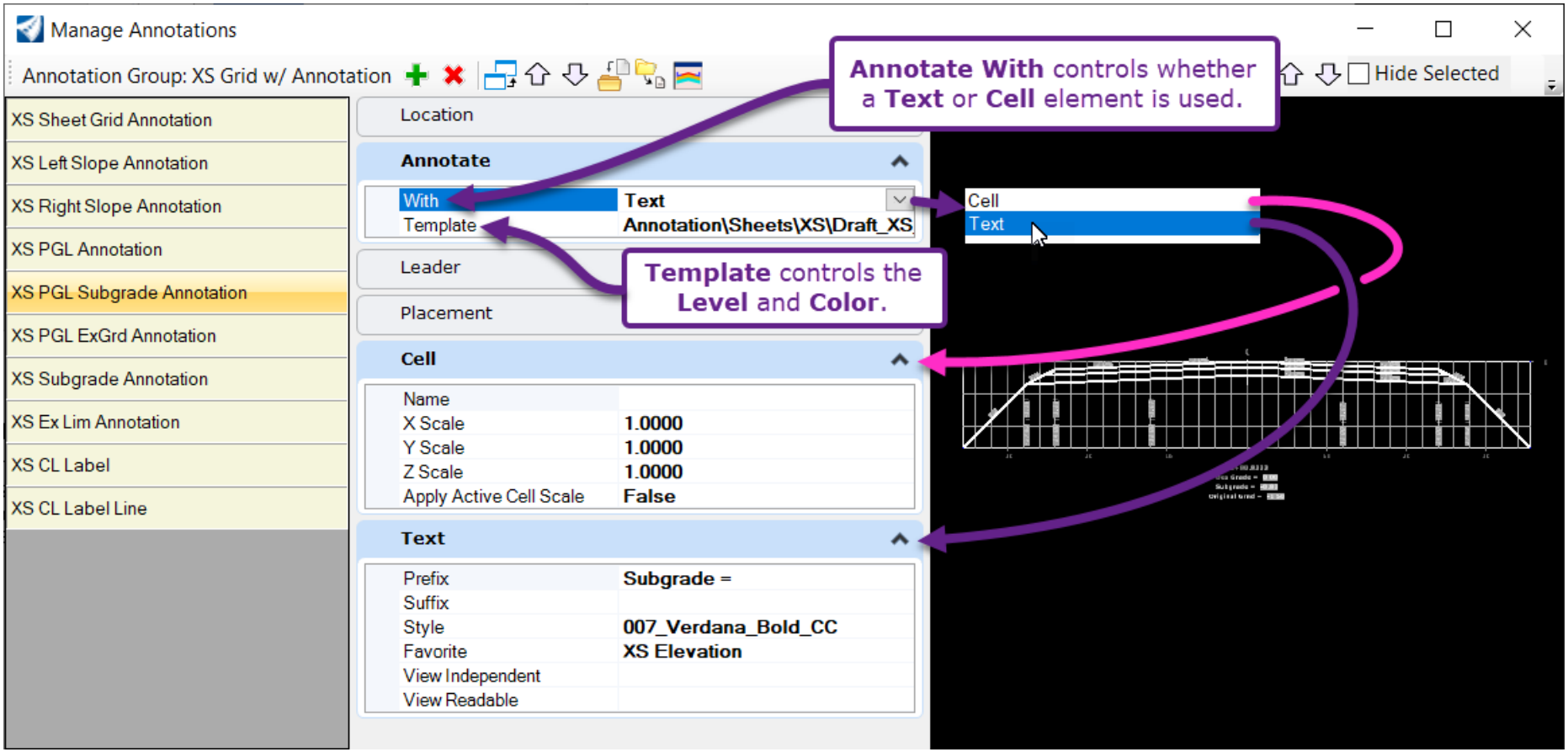
The **Annotate** drop-down only has two parameters: **With** and **Template.**

With: Specifies whether a **Cell** or **Text** element is used to label the Point.

When a **Cell** element is used, then the **Cell** drop-down is used to specify which Cell is used from the FLH Cell Library. Guardrail, ROW, and other graphical labels use **Cells**.

When a **Text** element is used, then the **Text** drop-down is used to specify the *Text Favorite* and other text related parameters that are used. Offset/Elevation labels use **Text** and *Text Favorites* to populate the label.

Template: Specifies the *Element Template* which is applied to the resulting label. *Element Templates* control the Symbology (i.e., Level, Color, Weight, etc…) of the resulting Text label. *Element Templates* are discussed in more detail in *15D.5.a Manage Annotation Menu Overview*.

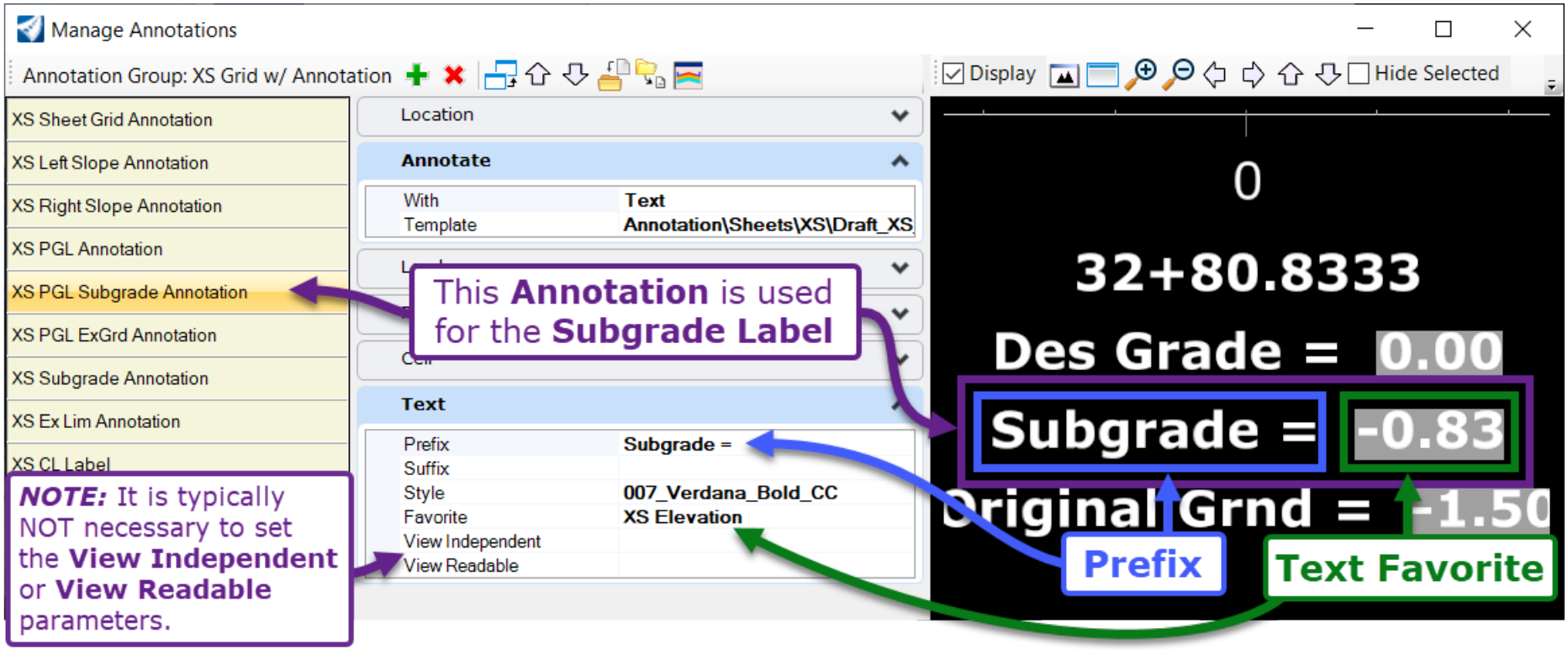


16E.2.a Text drop-down

The Text drop-down is only used when the **Text** is set in the **Annotate With** option.

The most important parameter is (Text) *Favorite*. For Cross Section labeling, the *Text Favorite* controls which *Field* types are used (i.e., elevation value, offset value, slope value). *Fields* and *Text Favorites* are discussed in *15C – Fields, Text Favorites, and Labels*.

Parameter	Description
Prefix/Suffix	A prefix or suffix can be added in conjunction with the **Text Favorite** text string.
(Text) Style	A Text Style can be used to set the Size, Font, and Justification of the Text Element. Text Styles are discussed in detail in *15B.4.a.ii FLH Text Styles Descriptions and Usages*.
(Text) Favorite	Controls which *Text Favorite* is used from the FLH Text Favorite Library.
View Independent	If set to TRUE, the Text Element is automatically rotated to align with the *Drawing Model* .
View Readable	If set to TRUE, the Text Element is ALWAYS rotated with the *Sheet Models* orientation.

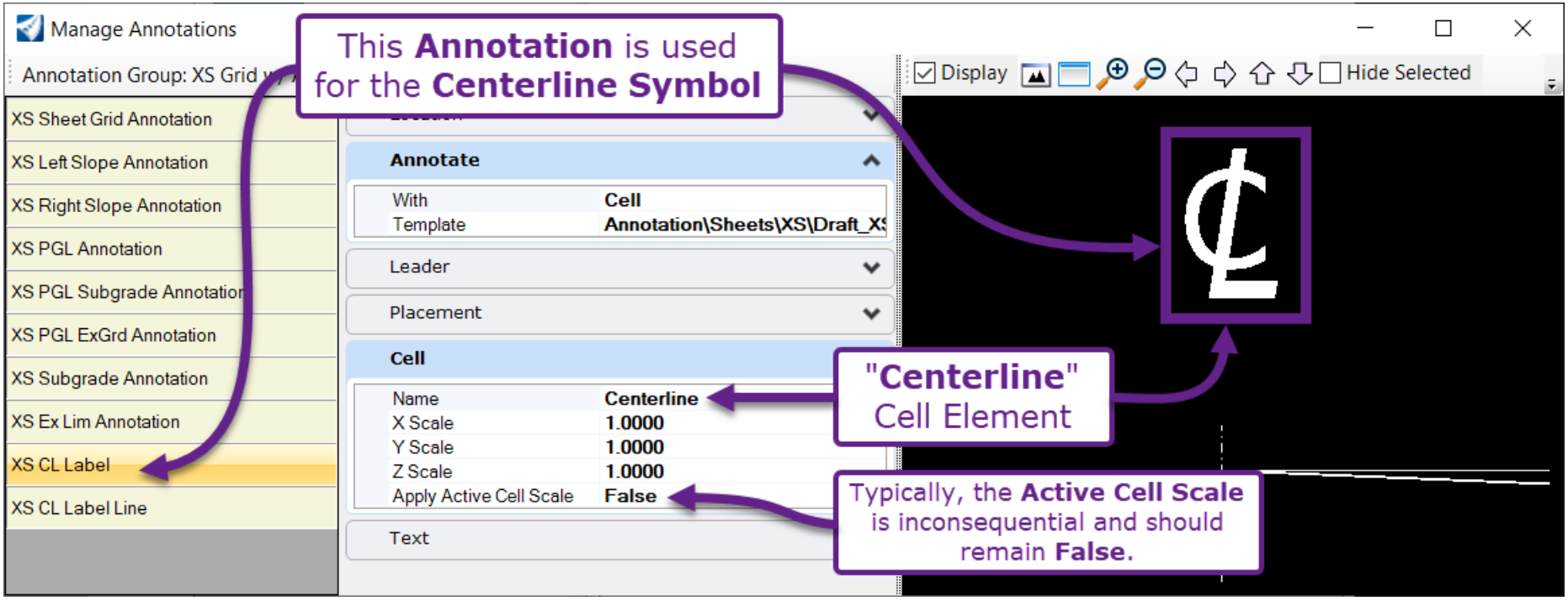


16E.2.b Cell drop-down

The Cell drop-down is only relevant when **Cell** is set in the **Annotate With** option. The **Name** parameter is used to choose a Cell from the FLH Cell Library.

NOTE: When placed in *Drawing Models* , the Cell element is shrunk or enlarged by the Annotation Scale.

Parameter	Description
Name	Used to choose a Cell element from the FLH Cell Library
X, Y, and Z Scale	Multiplies (scale) the size of the Cell element. The X, Y, and Z Scale should have the same value to look proportionally correct. Typically, the X, Y, and Z Scale is set to 1 and shouldn't be unaltered by the User.
Apply Active Cell Scale	If the Cell was originally created in the presences of an Annotation Scale, then that specific Annotation Scale multiplier will be used.

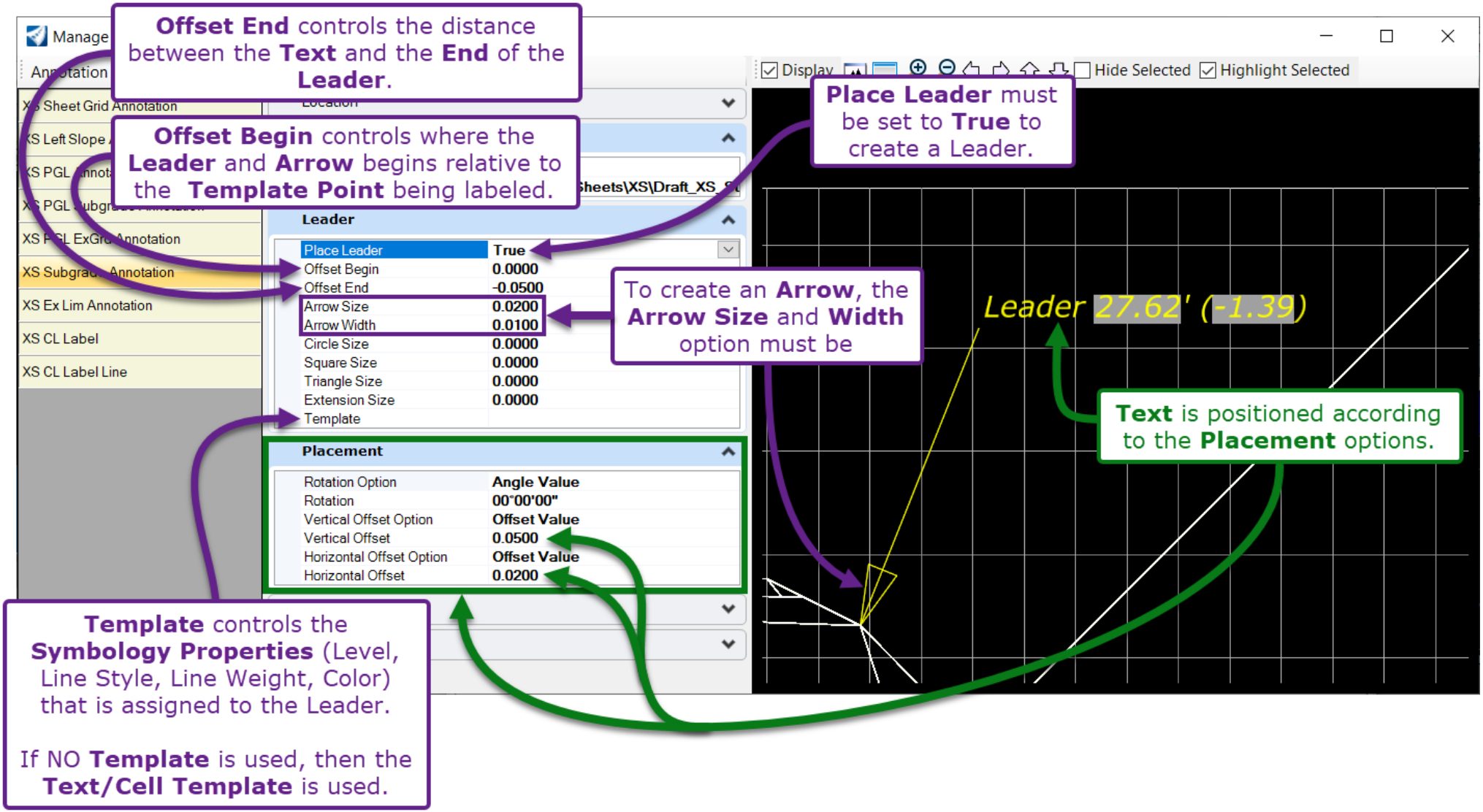


16E.3 Leaders

A *Leader* is simply a Line drawn between the *Text* or *Cell* element and the point that is labeled. The leader can be configured with a Terminator (i.e. *Arrow*, *Circle*, *Square*, or *Triangle*).

If the **Place Leader** parameter is set to FALSE, then no Leader is used.

NOTE: Leaders do NOT have the capability to create a Landing near the text.



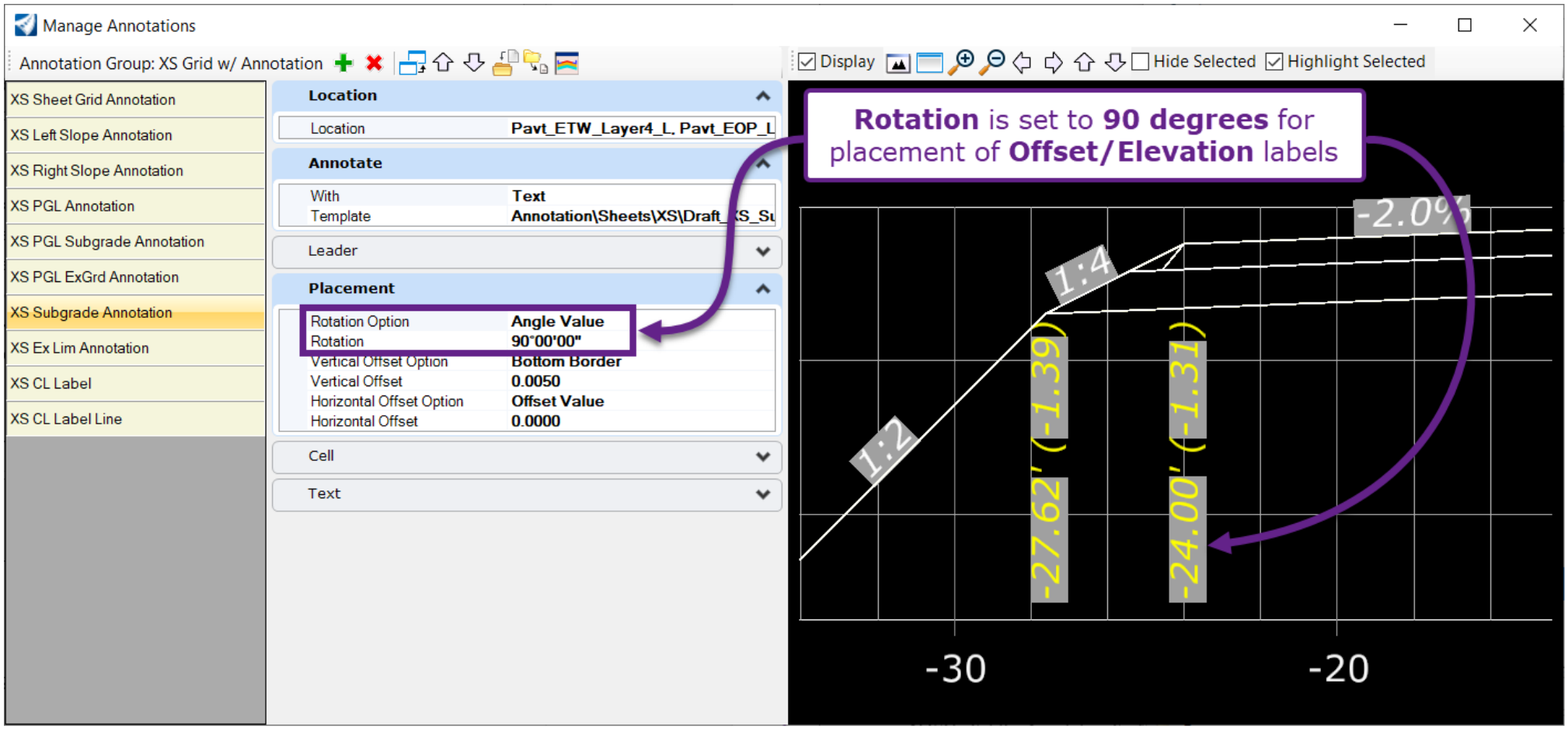
Option	Description
Offset Begin	Controls the gap distance between the Point being labeled and the beginning of the Leader/Terminator
Offset End	Controls the gap distance between the Text/Cell element and the end of the Leader. ***NOTE:*** As shown in the graphic on the previous page, this value may need to be NEGATIVE to be placed in close proximity to the Text/Cell element.
Arrow Size/Width	If these options are zeroed out, then no Arrow is created. Determines the length (Arrow Size) and width (Arrow Width) of the Arrow Terminator.
Circle Size	If these options are zeroed out, then no Circle is created. If this option is populated, then a Circle is drawn around the Template Point.
Square Size	If these options are zeroed out, then no Square is created. If this option is populated, then a Square is drawn around the Template Point.
Triangle Size	If these options are zeroed out, then no Triangle is created. If this option is populated, then a Triangle is drawn around the Template Point.
Extension Size	If these options are zeroed out, then no Extension is created. If this option is populated, then a Line or Tick is drawn atop the Template Point. The resulting Extension Line is drawn perpendicular to the Leader. ***NOTE:*** Leaders do NOT have the capability to create a Landing near the text.
Template	Controls the Symbology Properties (Level, Line Style, Line Weight, Color) that is assigned to the Leader when created in the *Drawing Model* . ***NOTE:*** If this is blank, then the Template specified in the *Annotate With* drop-down is used.

16E.4 Placement: Specify the Position of Labels

The **Placement** drop-down is used to control the position of the Cell or Text label in the *Drawing Model* . The *Placement* parameters are relative to *3D Linear Element* (Point) location. The **Placement** of labels is primarily affected by the by the *Vertical/Horizontal Offset Options* and *Rotation Option*.

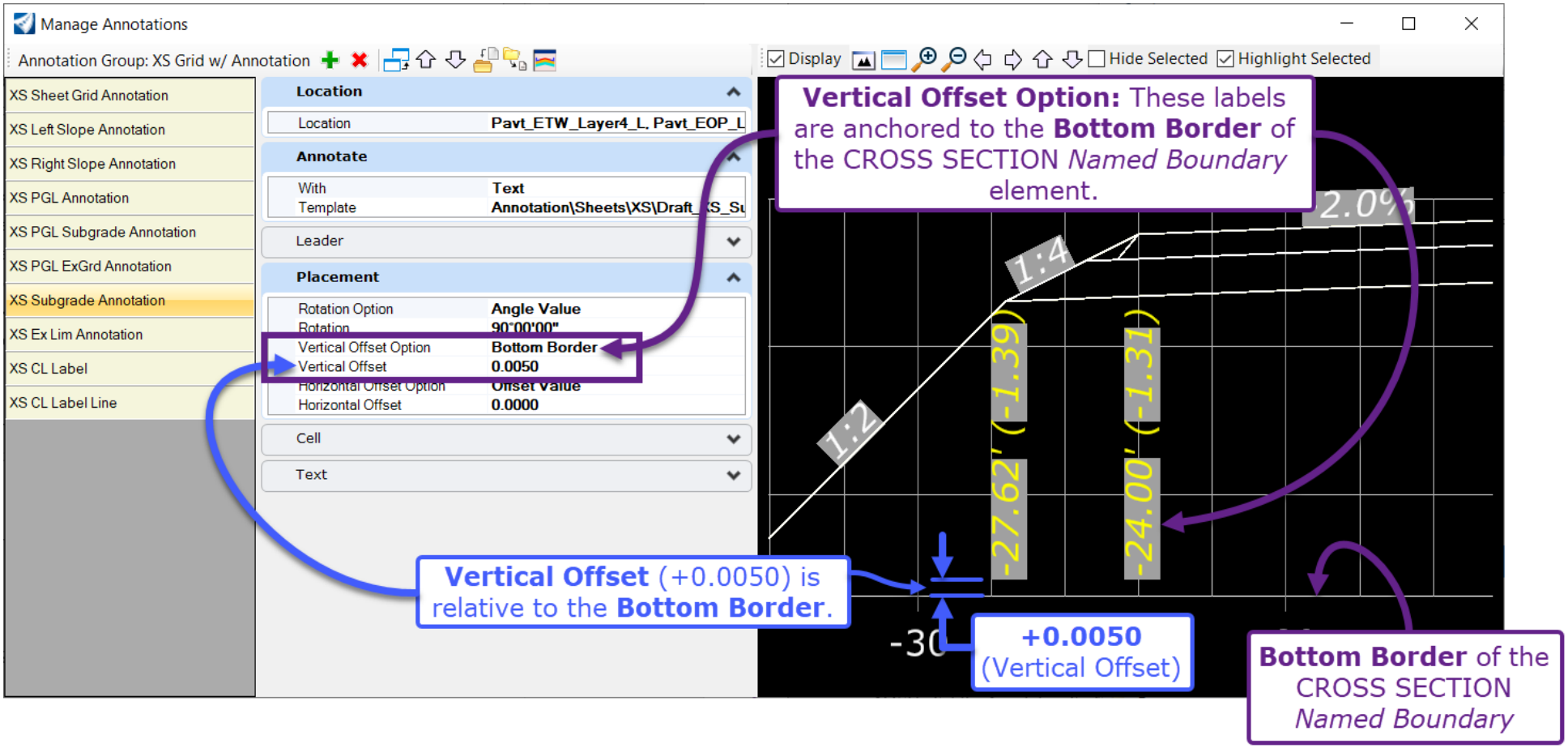
Rotation Option: Controls the rotation of the Cell or Text element. In the example below, the **Rotation** value is set to 90° to tilt the Text element vertically. If the **Rotation** value is set to 0°, then the Text element will be placed horizontally.

TIP: Always keep the **Rotation Option** set to *Angle Value*.



Vertical Offset Option: Controls where the label is anchored vertically. In the example below, the Text element is anchored to the **Bottom Border** of the CROSS SECTION *Named Boundary* element.

IMPORTANT: When placed in Drawing Models, the Numerical Values relating to **Placement** parameters are multiplied by the Annotation Scale (as set by the Drawing Seed). See *15D.5.b Understanding the Annotation Scale within the Manage Annotation Menu*. For example, as shown below the numerical value for the Vertical Offset is set to 0.005. When placed in a Drawing Models set to a 1"=20' Annotation Scale, the actual Vertical Offset will be 1.2 feet = (0.005 x 240). ***NOTE:*** The Design to Paper multiplier for a 1"=20' Annotation Scale is 240.



Vertical Offset Options

Option	Description
Offset Value	The label is placed DIRECTLY anchored directly atop the Point. The Vertical Offset parameter is used to move the label away from the point in the up (positive) or down (negative) direction. If a positive value is used, then the Label will be moved upwards. If a negative value is used, the Label will be placed downward.
Top Side	The label is anchored just above the Point. The bottom edge of the label is placed just above the Point.
Bottom Side	The label is anchored just below the Point. The top edge of the label is placed just below the Point.
Top Border	The label is placed vertically in line with the Point. However, the Point is anchored to the top border of the CROSS SECTION Named Boundary.
Bottom Border	The label is placed vertically in line with the Point. However, the Point is anchored to the bottom border of the CROSS SECTION Named Boundary. There are many default Annotations which use this option – including Offset/Elevation Labels and "PGL Subgrade Annotations".

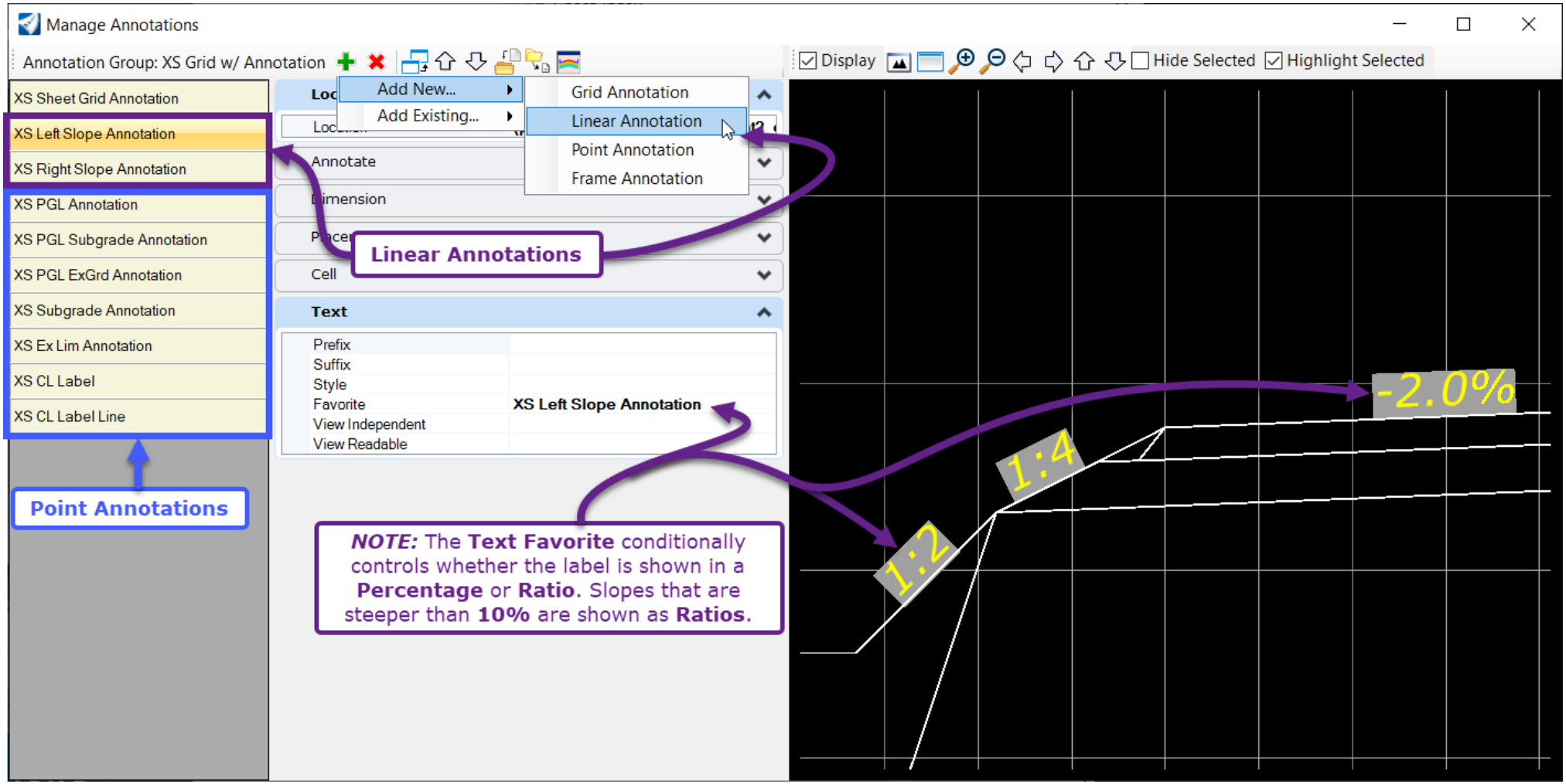
Horizontal Offset Option: Controls where the label is anchored horizontally. These options operate similarly to *Vertical Offset Options* shown above.

There are very few default Annotations that utilize *Horizontal Offset Options*. Typically, labels are kept in exact horizontal alignment with the Point (being labeled) by setting the *Horizontal Option* to *Offset Value*. If the *Horizontal Offset Value* is then set to 0, then NO horizontal offset is used

16E.5 Slope Segment Labeling

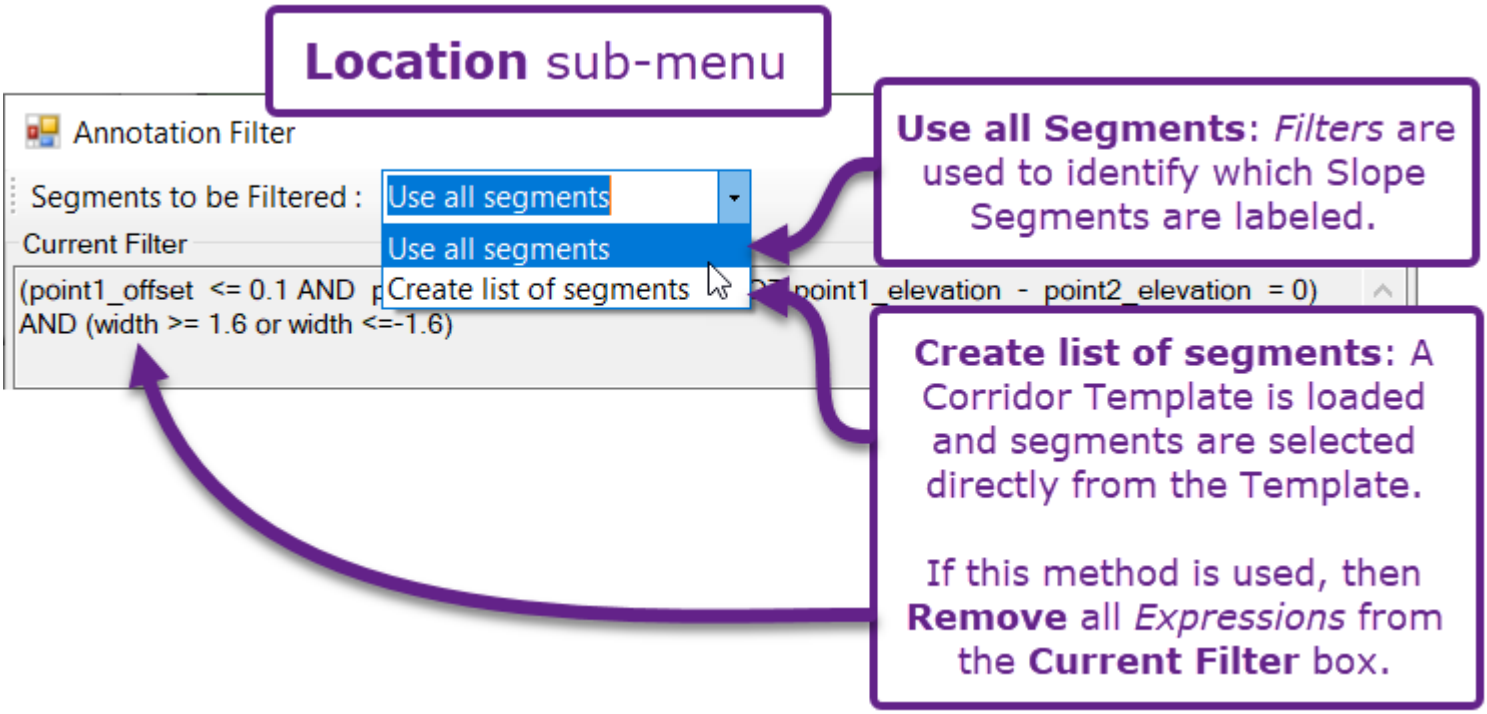
Slope Segments operate by labeling the Slope between two adjacent Points. Within the "XS Grid w/ Annotations" group, the "XS Right Slope Annotation" and "XS Left Slope Annotation" are responsible for Slope Segment labeling.

NOTE: Slope Segments are considered *Linear Annotations* - which are specifically meant to label a slope or dimension between two Points. Most other labels used in Cross Section labeling are considered *Point Annotations*. *Point Annotations* do NOT have the ability to label slopes.



16E.5.a Location: Specify which Segments are Labeled

Segments for slope labeling are identified in the **Location** sub-menu. Similar to the discussion in *16E.1.a Location sub-menu*, there are two methods for identifying segments to be labeled: *Use all segments* (Filters) and *Create list of segments* (Template).



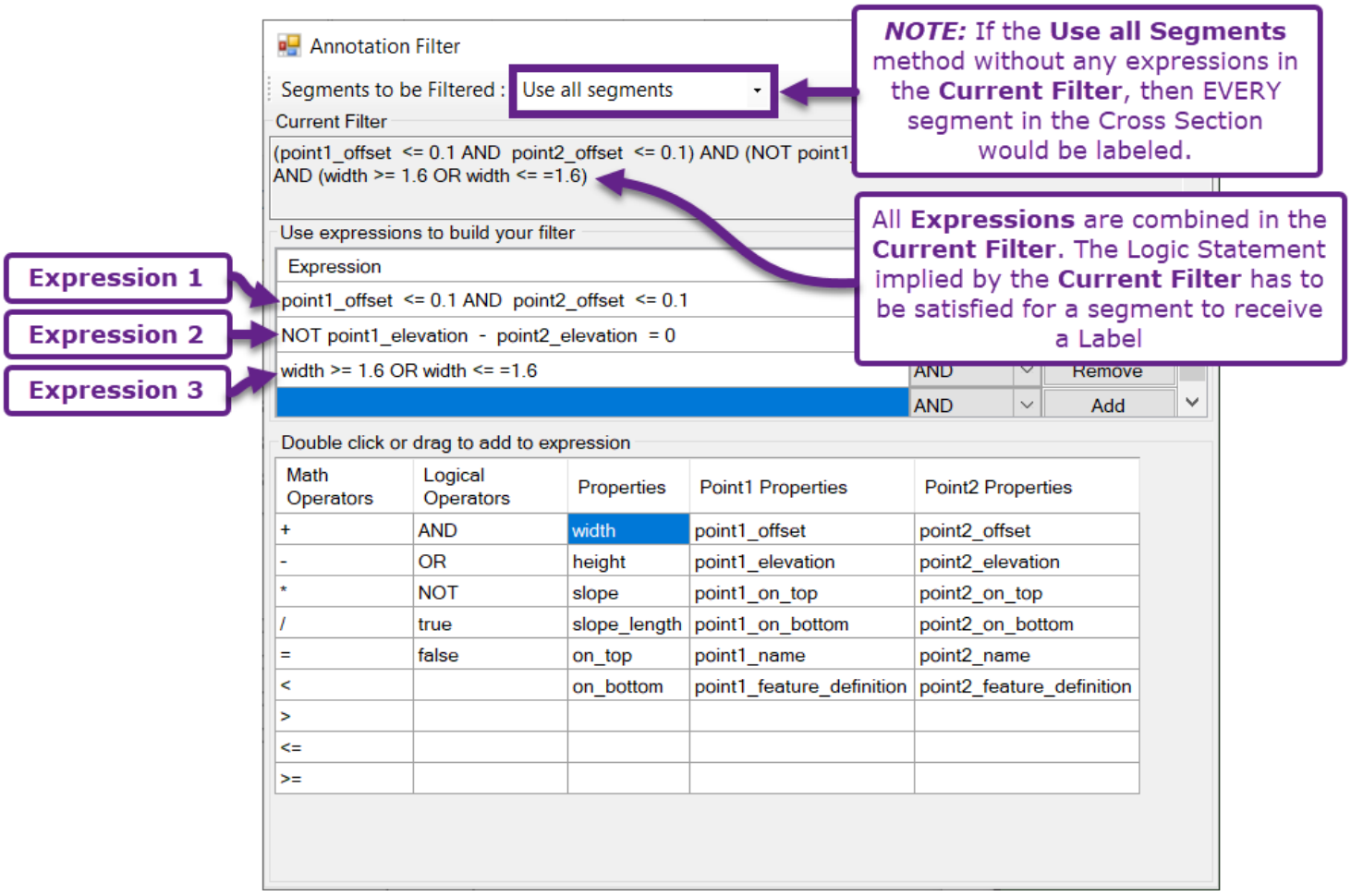
In the default configuration, the "XS Left/Right Slope Annotation" label is set to the *Use All Segments* method. By default, Filter Expressions are used to identify which segments are labeled. *Filters* are discussed in *16E.1.b Filters*.

Typically, the User shouldn't need to modify the default Slope Segment labels.

TIP: The *Create list of segments* (Template) method is almost identical to the process described in *16E.1.a.i Template Point Name (Create List of Points) overview*. If this method is used to identify Slope Segments, then **REMOVE all Filter Expressions** from the **Location** sub-menu.

16E.5.b Understanding the Filter Expressions used for Slope Labels

In this section, the Filters Expressions used by the default Slope Segment labels are analyzed for better understanding of how segments are labeled.



Expression 1: *point1_offset <= 0.1* AND *point2_offset <= 0.1*

This expression is used to ONLY label Slope Segments on the Left-side of the Alignment. This expression is specific to the "XS **Left** Slope Annotation" label. *Point1_offset* and *Point2_offset* are relative to the Alignment. This expression will NOT label any segments that are horizontally located (offset) more than 0.1 feet to the **Right (Positive)** of the Alignment.

Expression 2: *NOT point1_elevation – point2_elevation = 0*

If the difference in elevation between two adjacent Points equals to 0, then the segment will NOT be labeled. In other words, flat segments (slope = 0.00%) will NOT be labeled. ***TIP:*** Remove this Expression to label flat segments.

Expression 3: *width >= 1.6 OR width <= -1.6*

In simplest terms, this expression requires the horizontal distance between two Points to be greater than 1.6 feet in order to receive a Slope Segment label. ***TIP:*** Change the 1.6 value to a larger value to forgo labels on smaller segments and reduce clutter in the overall Cross Section. ***WARNING:*** For End Conditions that require a horizontal distance of less than 1.6 feet to be solved, no Slope Segment Label will be created – as implied by this Expression.

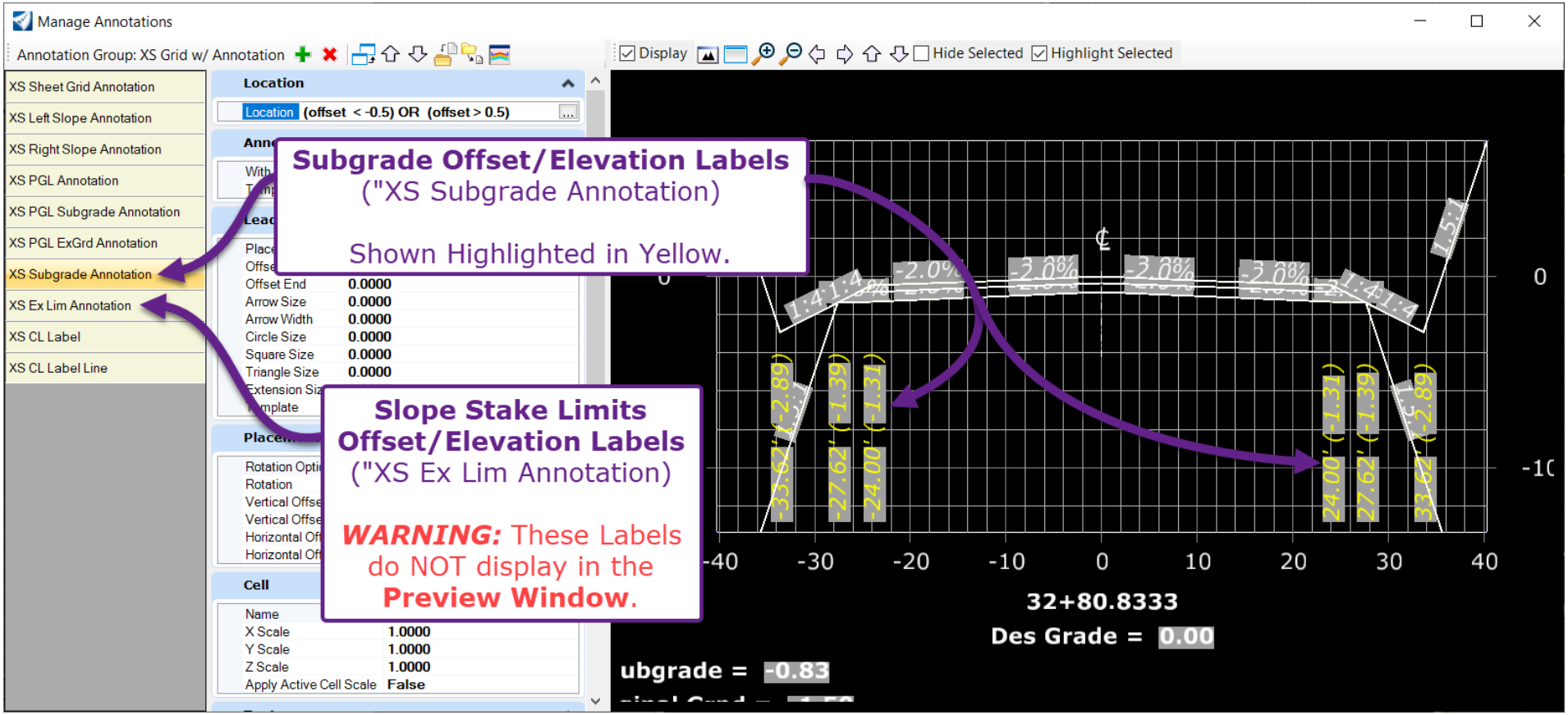
16F – MANIPULATING OFFSET/ELEVATION LABELS

Excluding delineation of Right-Of-Way, Guardrail, and Jersey Barriers, the majority of edits are performed to the "XS Grid W/ Annotations" group.

Most commonly, the "XS Grid W/ Annotations" group needs to be edited to place Subgrade Offset/Elevation Labels at the correct locations for the project-specific Cross Section points.

Subgrade Offset/Elevation Labels are controlled by the "XS Subgrade Annotation" component. The exception is Offset/Elevation Labels for Slope Stake Limits – which is controlled by the "XS Ex Lim Annotation" component.

The "XS Subgrade Annotation" and "XS Ex Lim Annotation" components are configured identically and produce identical labels. However, the "XS Ex Lim Annotation" component is specifically intended for Slope Stake Limits, which are technically NOT at subgrade elevation and explains why these components are separated out.



16F.1 Default Offset/Elevation Labels

Subgrade and Slope Stake Limits Offset/Elevation Labels are setup to seek out Template Points that contain specific **Template Point Names**.

> ***TIP:*** The default **Template Point Names** that are found in the "XS Grid w/ Annotations" are intended to correspond with **FLH Standard Templates**.

The subgrade **Template Point Names** that will be labeled with the default "XS Grid w/ Annotations" group configuration are as follows:

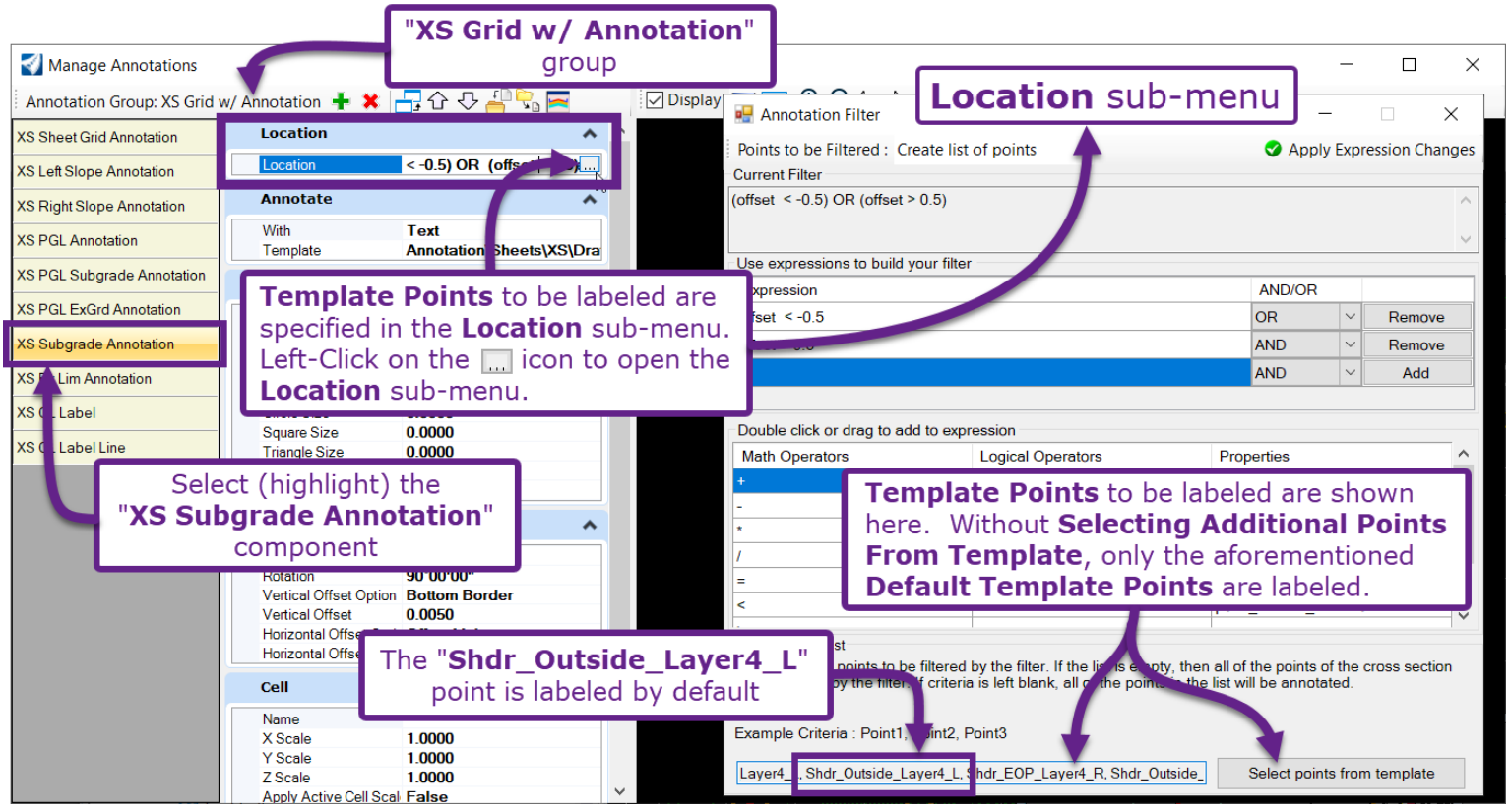
- "EOG_Layer4_Btm_Outside_L" and "…_R"
- "Ditch_Bot_L" and "…_R"
- "Daylight_Bot_L" and "…_R"
- "Construction_Limit_L" and "…_R"
- "Slope_Stake_Cut_L" and "…_R"
- "Slope_Stake_Fill_L" and "…_R"

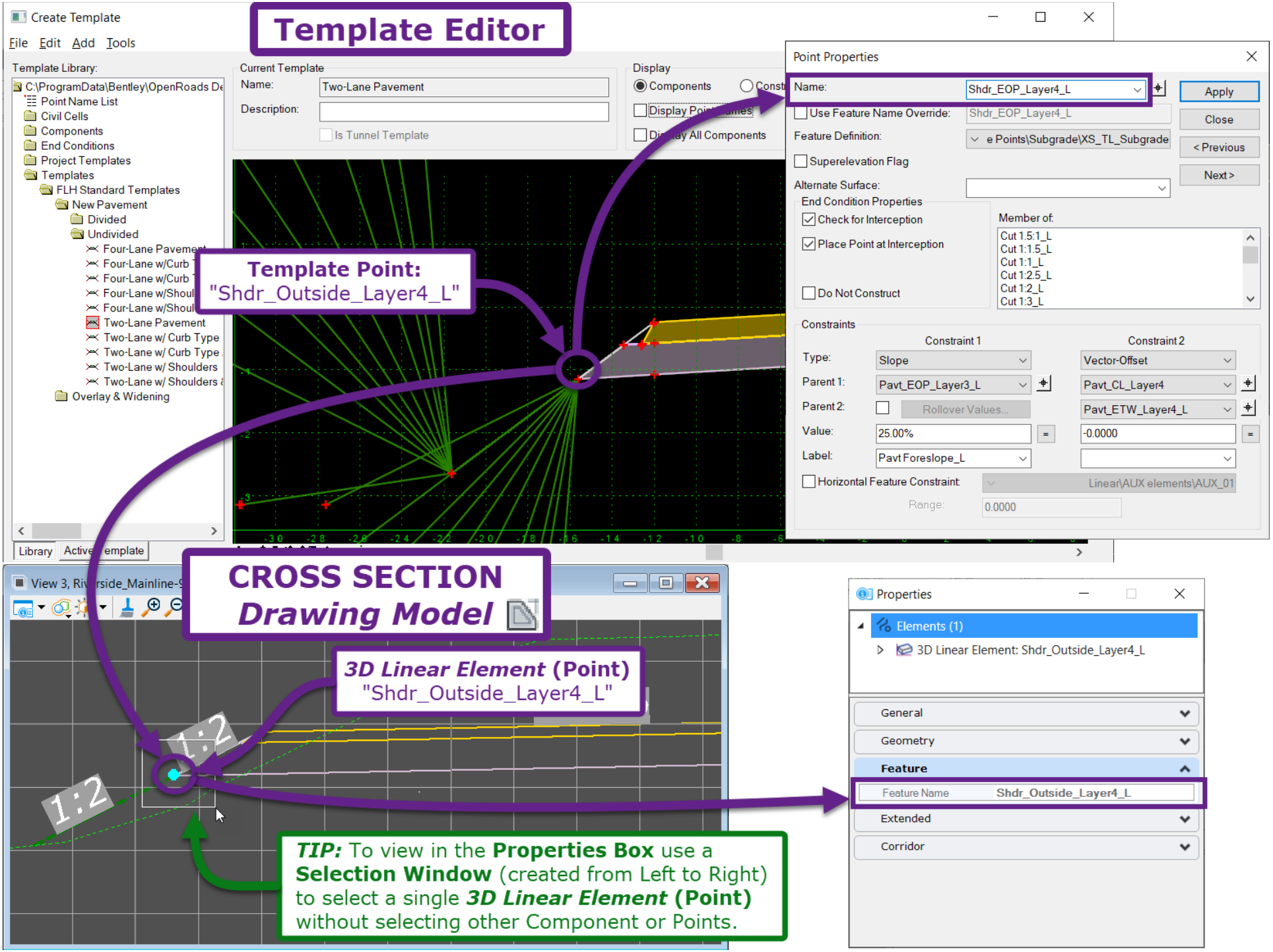
The graphic below demonstrates how a **Template Point** and its corresponding **Name** (referred to in the Properties box as a *Feature Name*) interact with the Template Point. The Road Template shown on the next page is the "Two-Lane Pavement" from the FLH Template Library:

(Templates → FLH Standard Templates → New Pavement → Undivided → "Two-Lane Pavement")

The **Template Point** examined here is **Named** "Shdr_Outside_Layer4_L" – which is found in the default "XS Grid w/ Annotation" group.

The **Location** where **Template Points** to be labeled is shown below. The process for adding additional **Template Points** to be labeled is covered in more detail in *16F.2 Add Custom Offset/Elevation Labels - Workflow*.




Template Editor
Create Template
File Edit Add Tools
Template Library:
Current Template
Name: Two-Lane Pavement
Description:
Is Tunnel Template
Display
Components
Point Name List
Civil Cells
Components
End Conditions
Project Templates
Templates
FLH Standard Templates
New Pavement
Divided
Undivided
Four-Lane Pavement
Four-Lane w/Curb
Four-Lane w/Curb
Four-Lane w/Shoul
Four-Lane w/Shoul
Two-Lane Pavement
Two-Lane w/ Curb Type
Two-Lane w/ Curb Type
Two-Lane w/ Shoulders
Two-Lane w/ Shoulders
Overlay & Widening
Library
Template Point:
"Shdr_Outside_Layer4_L"
Point Properties
Name: Shdr_EOP_Layer4_L
Use Feature Name Override: Shdr_EOP_Layer4_L
Feature Definition: e Points\Subgrade\XS_TL_Subgrade
Superelevation Flag
Alternate Surface:
End Condition Properties
Check for Interception
Place Point at Interception
Do Not Construct
Member of:
Cut 1.5:1_L
Cut 1:1.5_L
Cut 1:1_L
Cut 1:2.5_L
Cut 1:2_L
Cut 1:3_L
Apply
Close
< Previous
Next >
Constraints
Constraint 1
Constraint 2
Type: Slope
Vector-Offset
Parent 1: Pavt_EOP_Layer3_L
Pavt_CL_Layer4
Parent 2:
Rollover Values...
Pavt_ETW_Layer4_L
Value: 25.00%
-0.0000
Label: Pavt Foreslope_L
Horizontal Feature Constraint
Linear\AUX elements\AUX_01
Range: 0.0000
CROSS SECTION
Drawing Model
3D Linear Element (Point)
"Shdr_Outside_Layer4_L"
1:2
1:2
TIP: To view in the Properties Box use a Selection Window (created from Left to Right) to select a single 3D Linear Element (Point) without selecting other Component or Points.
Properties
Elements (1)
3D Linear Element: Shdr_Outside_Layer4_L
General
Geometry
Feature
Feature Name Shdr_Outside_Layer4_L
Extended
Corridor

16F.2 Add Custom Offset/Elevation Labels - Workflow

For custom labeling to occur, the User will have to add **Template Points** to the "XS Subgrade Annotation" component, which is located in the "XS Grid w/ Annotations" group.

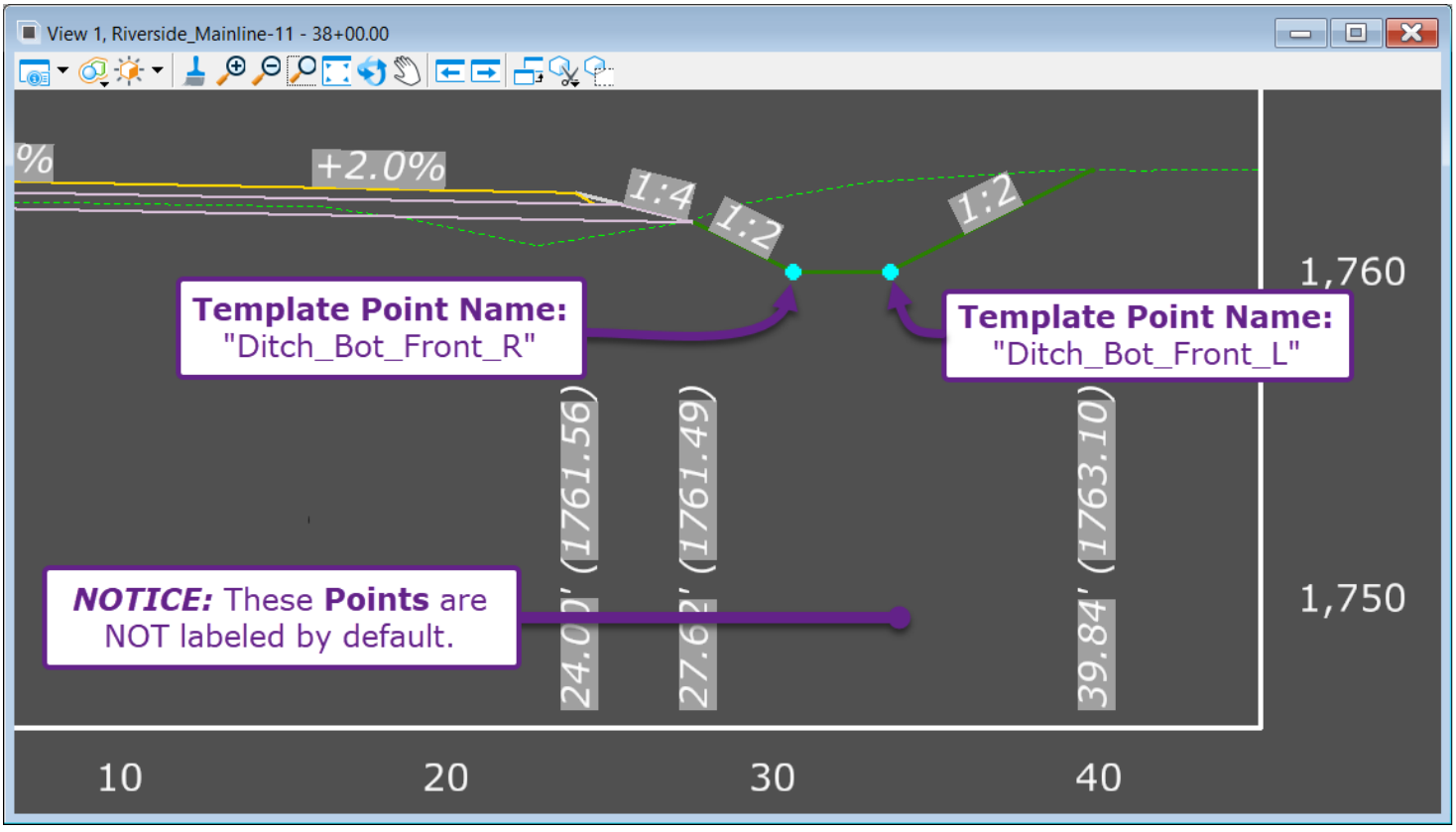
WARNING: Before **Template Points** can be added, load and select the custom Template that was used with the Corridor. See *16D.3.d Select the Corridor Template*.

IMPORTANT: As discussed in *16E – Configuring Cross Section Annotations*, when Template Points are labeled within CROSS SECTION *Drawing Models*, the **Template Point Name** is sought out. If multiple Templates were used in the creation of the mainline Corridor, it is NOT necessary to repeat this process for each Template, assuming that the exact same **Template Point Names** were consistently used for all Templates. If **Template Point Names** are inconstant across the multiple Templates, then each Template will have to be loaded and this process repeated for each unique **Template Point Name**.

In this workflow, the Template contains two custom Points that are NOT found by default in the "XS Grid w/ Annotations" group. Points that are labeled by default are discussed in *16F.1 Default Offset/Elevation Labels.*

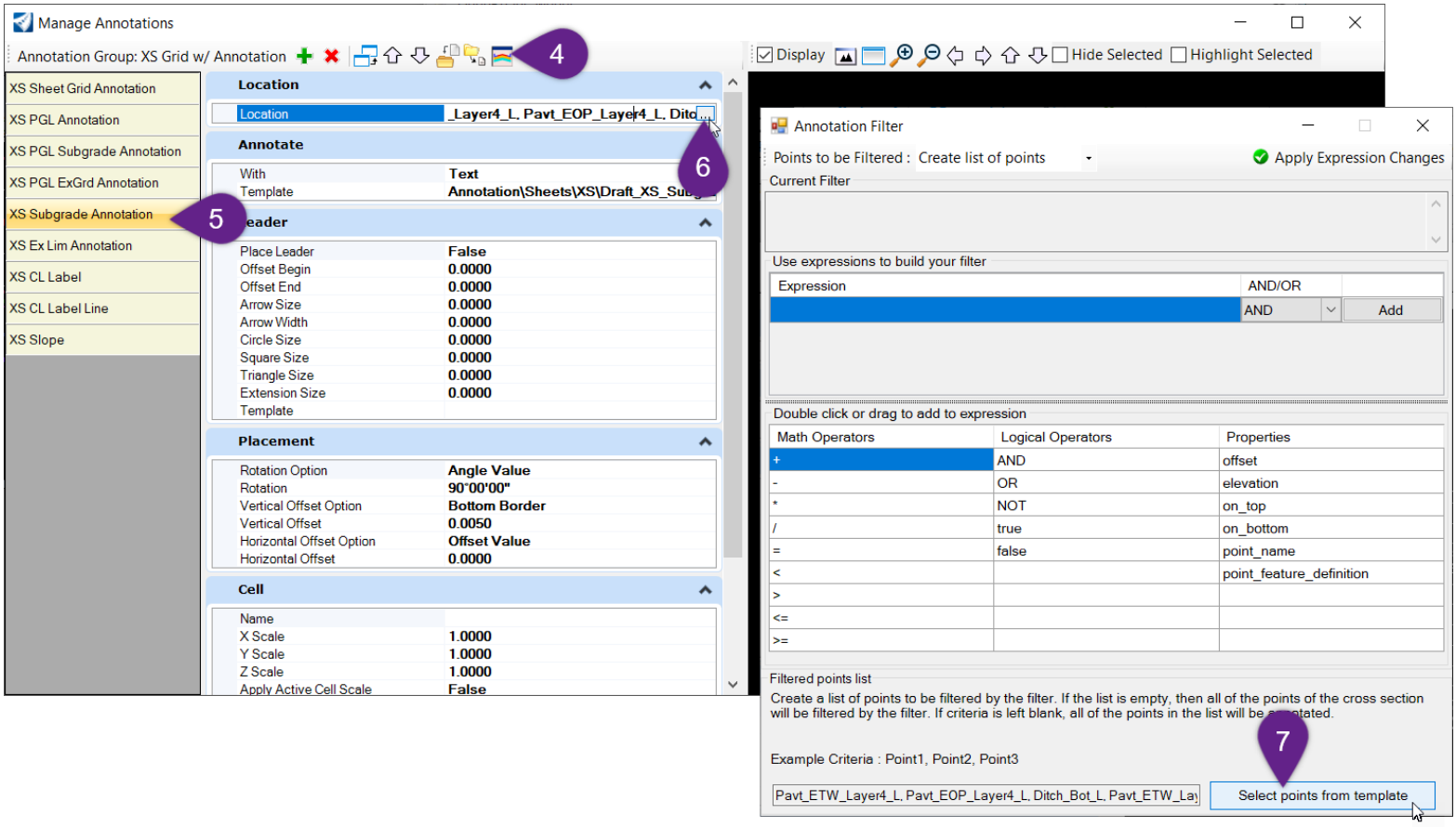
In this workflow, the following **Template Points** will be labeled:

"Ditch_Bot_Front_R" and "…_L"
"Ditch_Bot_Back_R" and "…_L"

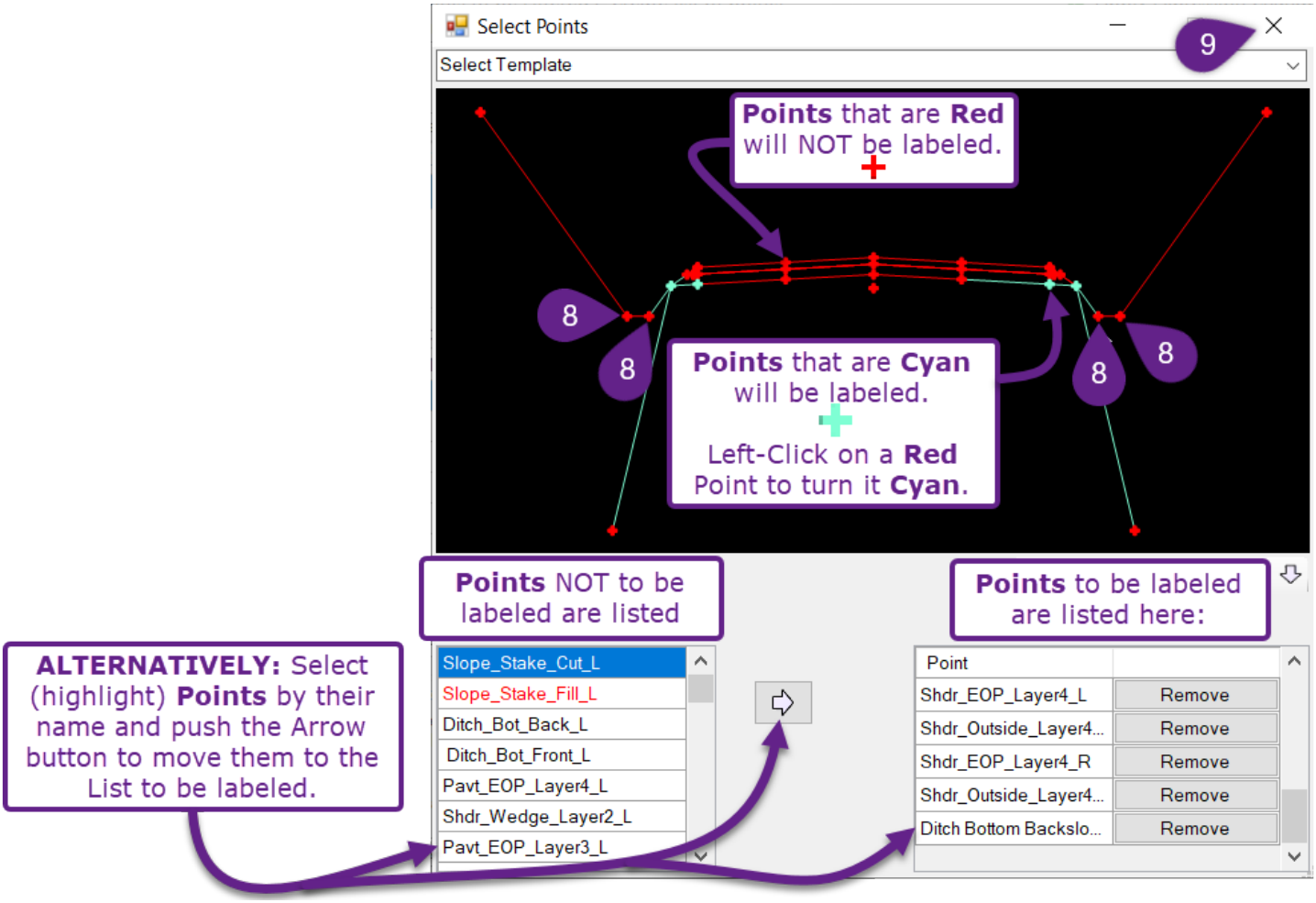


Before beginning this workflow, perform the tasks discussed in *16D.3 Access and Setup of the Annotation Group Manager*.

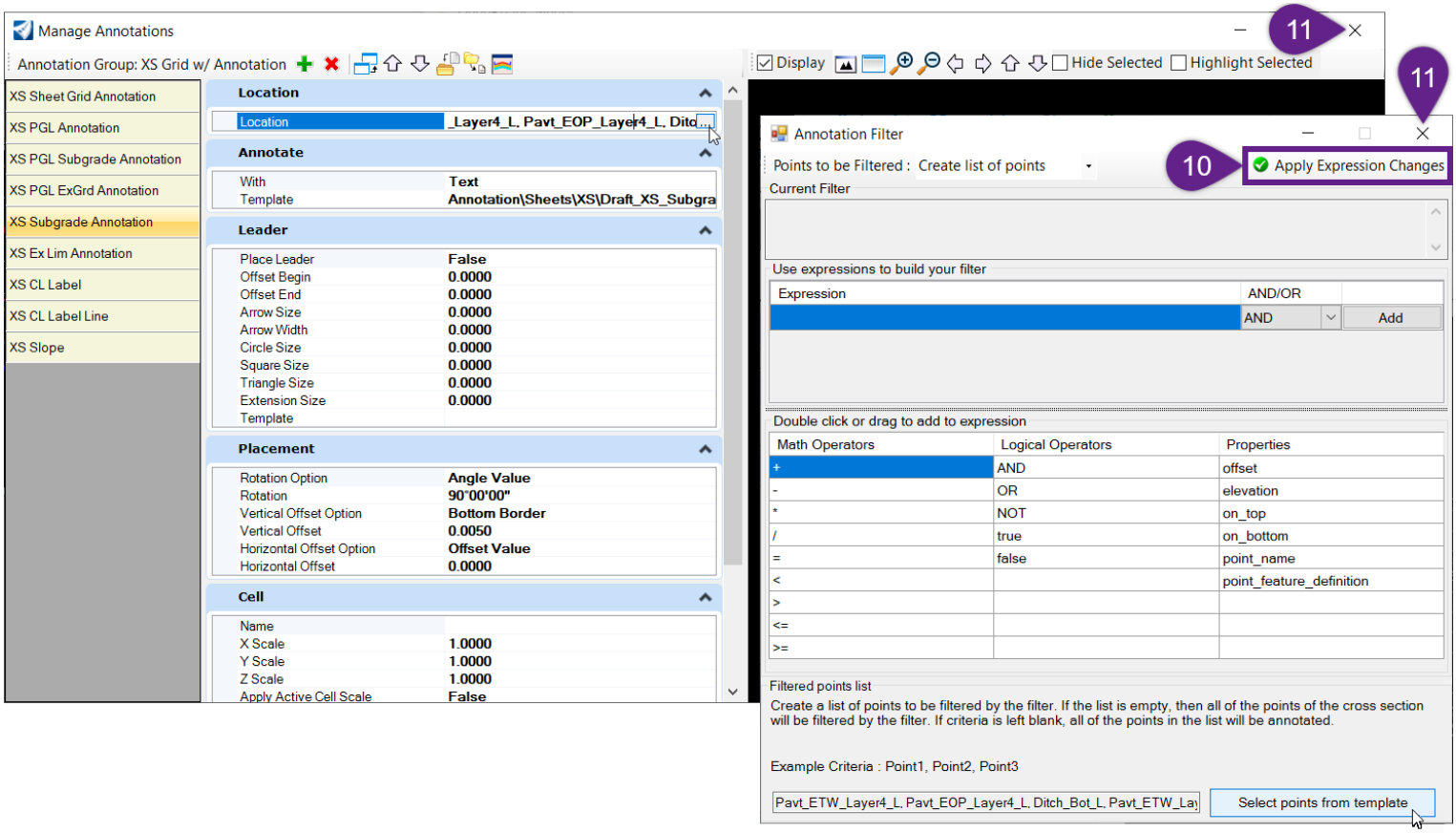
1	Load the Template Library which the points to be labeled belongs to: *16D.3.a Load the Template Library used for Corridor Modeling*.
2	Set the Annotation Scale which corresponds with the Drawing Seed used to create the CROSS SECTION *Named Boundary* elements: *16D.3.b Set the Annotation Scale before Accessing the Annotation Manager*.
3	Open the Annotation Group Manager for the "XS Grid w/ Annotations" group: *16D.3.c Access the Annotation Group Manager*. ***TIP:*** Ensure that the 2D Design Model is showing in the active *View* when accessing the *Annotation Group Manager* through the Project Explorer.
4	In the Annotation Group Manager, load the Template that contains the Template Points to be labeled: *16D.3.d Select the Corridor Template*.



5	Select (highlight) the "XS Subgrade Annotation" component.
6	In the **Location** box, click the ... icon to access the *Annotation Filter* menu.
7	In the *Annotation Filter* menu, push the *Select points from Template* button.



8	In the *Select Points* menu, graphical select (left-click on) the Points to be labeled. ***ALTERNATIVELY:*** Locate and highlight the Points to be labeled from the list on the left. Push the Arrow icon to move them to the list on the right – which represent the Points to be labeled.
9	Exit out of the *Select Points* menu.
10	In the *Annotation Filter* menu, push the *Apply Expression Changes* button to save changes made in this workflow.
11	Exit out of the *Annotation Filter* menu and the *Annotation Group Manager*.
12	To apply the changes that were made to the *Annotation Group*, Cross Section Annotations must be removed and then re-created in a *Drawing Model* . See *16D.2.b Remove Cross Section Annotations* and *16D.2.a Create Cross Section Annotations*.


Manage Annotations
Annotation Group: XS Grid w/ Annotation
XS Sheet Grid Annotation
XS PGL Annotation
XS PGL Subgrade Annotation
XS PGL ExGrd Annotation
XS Subgrade Annotation
XS Ex Lim Annotation
XS CL Label
XS CL Label Line
XS Slope
Location
Location
_Layer4_L, Pavt_EOP_Layer4_L, Ditc
Annotate
With
Text
Template
Annotation\Sheets\XS\Draft_XS_Subgra
Leader
Place Leader
False
Offset Begin
0.0000
Offset End
0.0000
Arrow Size
0.0000
Arrow Width
0.0000
Circle Size
0.0000
Square Size
0.0000
Triangle Size
0.0000
Extension Size
0.0000
Template
Placement
Rotation Option
Angle Value
Rotation
90°00'00"
Vertical Offset Option
Bottom Border
Vertical Offset
0.0050
Horizontal Offset Option
Offset Value
Horizontal Offset
0.0000
Cell
Name
X Scale
1.0000
Y Scale
1.0000
Z Scale
1.0000
Apply Active Cell Scale
False
Display
Hide Selected
Highlight Selected
11
11
Annotation Filter
10
Apply Expression Changes
Points to be Filtered :
Create list of points
Current Filter
Use expressions to build your filter
Expression
AND/OR
AND
Add
Double click or drag to add to expression
Math Operators
Logical Operators
Properties
+
-
*
/
=
<
>
<=
>=
AND
OR
NOT
true
false
offset
elevation
on_top
on_bottom
point_name
point_feature_definition
Filtered points list
Create a list of points to be filtered by the filter. If the list is empty, then all of the points of the cross section will be filtered by the filter. If criteria is left blank, all of the points in the list will be annotated.
Example Criteria : Point1, Point2, Point3
Pavt_ETW_Layer4_L, Pavt_EOP_Layer4_L, Ditch_Bot_L, Pavt_ETW_Lay
Select points from template

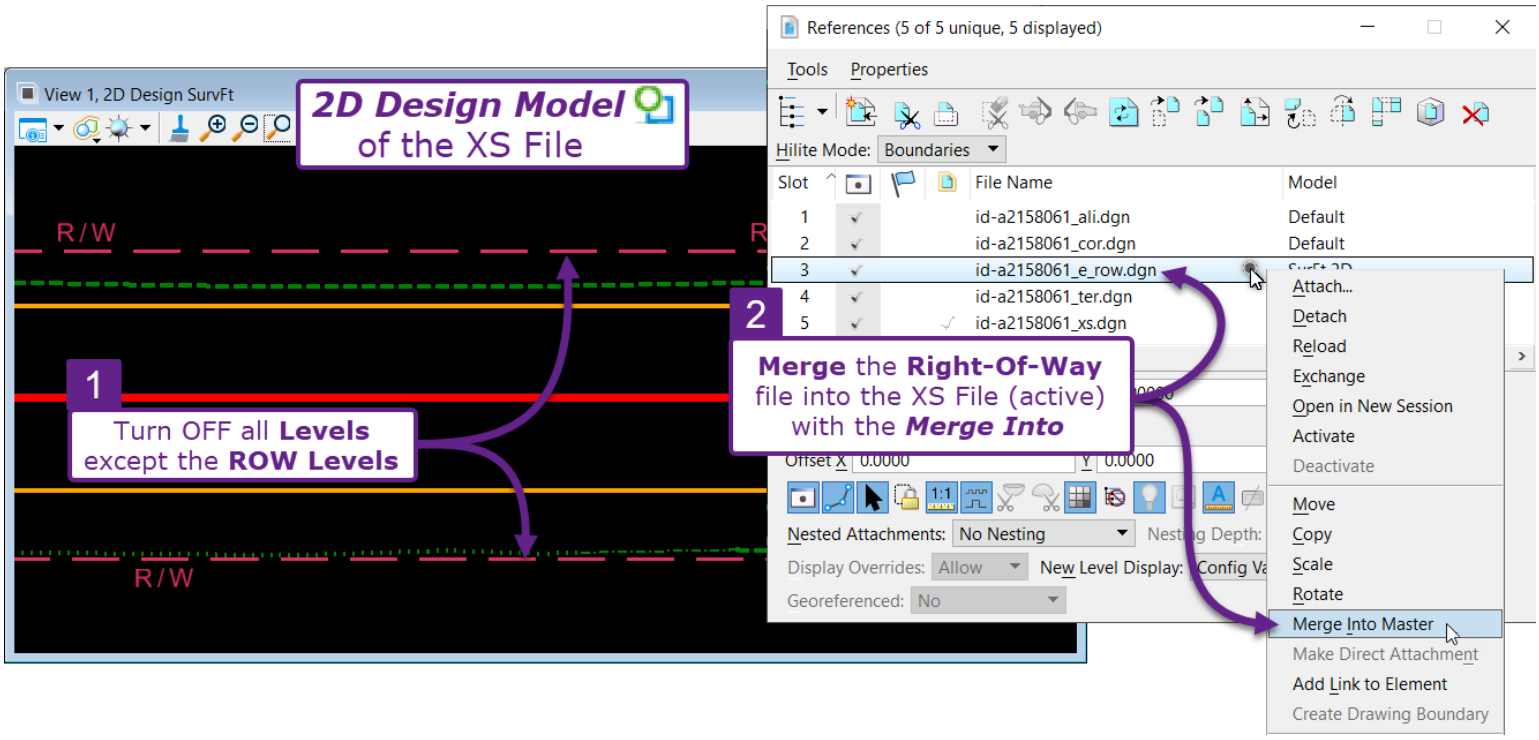
16G – MISCELLANEOUS CROSS SECTION ANNOTATION WORKFLOWS

16G.1 Create Right-of-Way Annotations

In this workflow, annotations are created to denotate Right-of-Way locations in the Cross Sections.

This process involves converting 2D Right-of-Way elements into *3D Linear Elements* that are draped onto the Existing Ground Terrain Model. ***IMPORTANT:*** Typically, Right-of-Way elements is created by the survey department as 2D linework. 2D linework CANNOT be labeled. Only *3D Linear Elements* that intersect with the CROSS SECTION *Named Boundary* elements can be labeled.

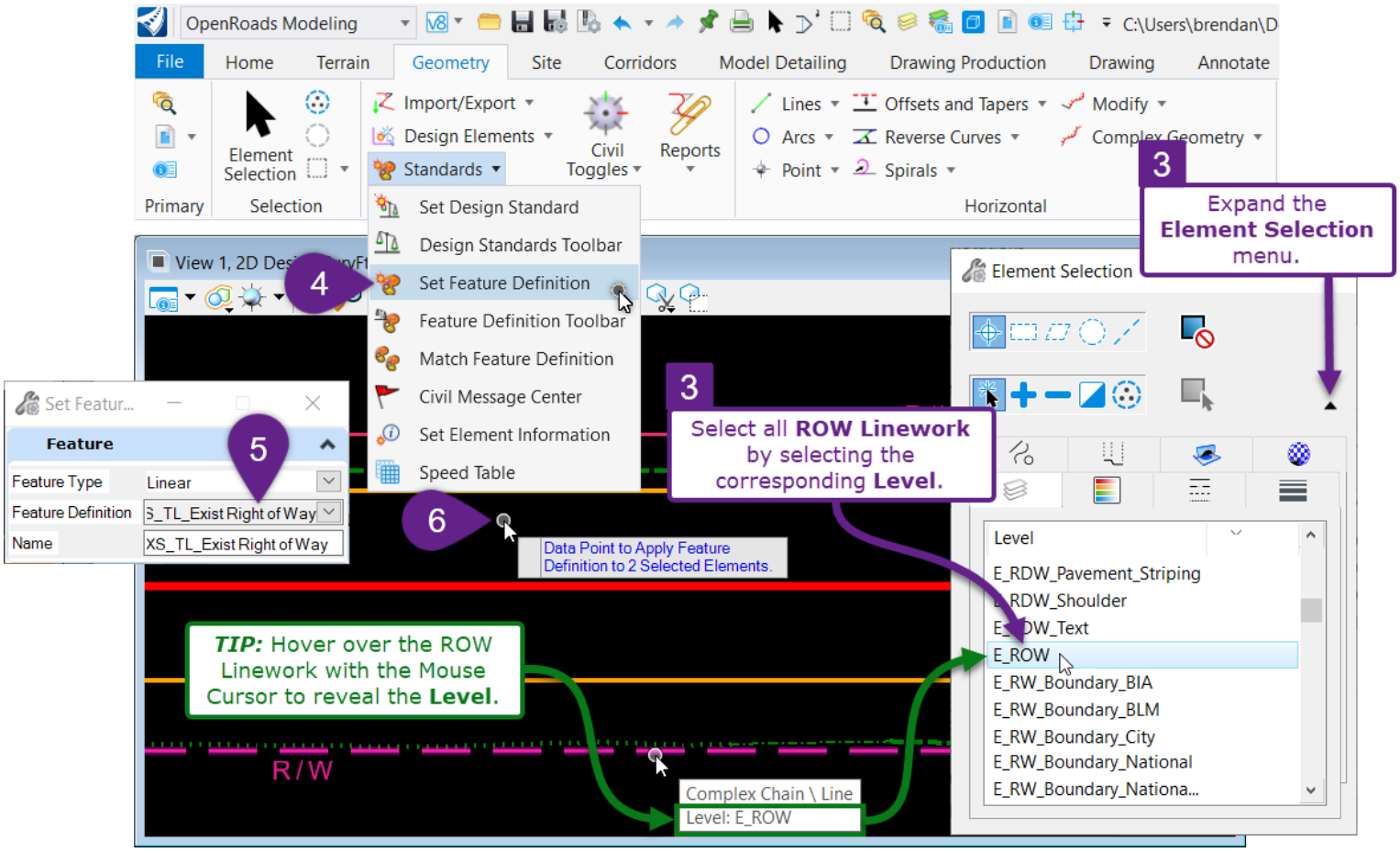
16G.1.a Convert ROW Linework into 3D Linear Elements (Points)



This workflow is performed from the Cross Section ORD File. The ORD File which contains Right-Of-Way linework must be referenced into the Cross Section ORD File.

1	For the Reference File that contains the Right-of-Way Linework, turn off all Levels except those containing ROW Linework.
2	In the References Manager, bring the Right-of-Way Linework into the active ORD File by using the *Merge Into Master* tool. Right-Click on the Reference File and select *Mere Into Master*. ***ALTERNATE:*** Use the *Copy* tool to bring the Right-of-Way Linework into the active ORD File.

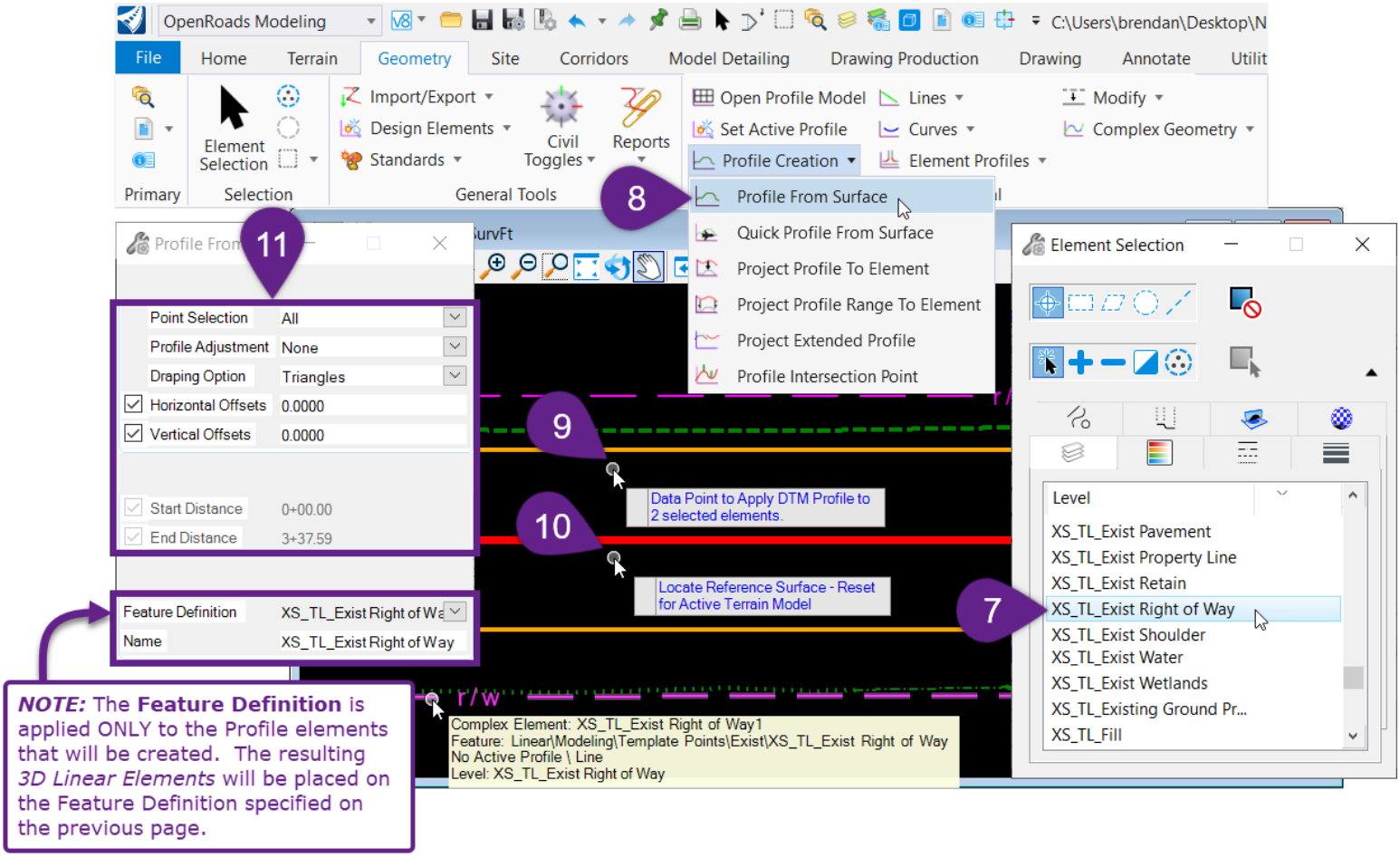
For Cross Section labeling, the Right-Of-Way Linework needs to be assigned to a Feature Defintion. In this case, the ROW Linework is assigned to the "XS_TL_ExistRight of Way" Feature Defintion by using the *Set Feature Defintion* tool.



3	Select all ROW Linework. This can be easily accomplished by expanding the **Element Selection** menu and highlighting the ROW Linework *Level*.
4	With all the ROW Linework elements selected, use the *Set Feature Definition* tool: [***OpenRoads Modeling*** → ***Geometry*** → ***General Tools***].
5	In the *Dialogue Box*, select the appropriate Feature Definition. In this example, the "XS_TL_ExistRight of Way" Feature Definition is used.
6	Left-Click in the *View* to assign the Feature Definition to all ROW Linework.

NOTE: For the current FLH WorkSpace and default Annotation Groups, Right-of-Way labeling has NOT been setup properly. In an ideal default configuration, there would be a Feature Definition that corresponds with a Label found in the "XS RW GRail Cbl Bar Annotation" group. Due to this fact, the User can choose any Feature Definition that seems appropriate. At this time, the User will have to manually configure the "XS RW GRail Cbl Bar Annotation" group – as shown in *16G.1.b Configure the "XS RW GRail Cbl Bar Annotation" Group*. The Feature Definition assigned in step 3 will be manually inputted in this *Annotation Group* for labeling.

At this point of the workflow, the ROW Linework is 2-Dimensional (which means its found in the *2D Design Model* ONLY). For Cross Section labeling, the ROW Linework needs to be converted to a *3D Linear Element* (which are found in the *3D Design Model*). The *3D Linear Elements* needs to intersect with CROSS SECTION *Named Boundary* elements for display in the *Drawing Models*. To assure the resulting ROW Linework *3D Linear Elements* are placed at the Existing Ground elevation, the *Profile From Surface* tool is used to drape the ROW Linework onto the Existing Ground Terrain Model.



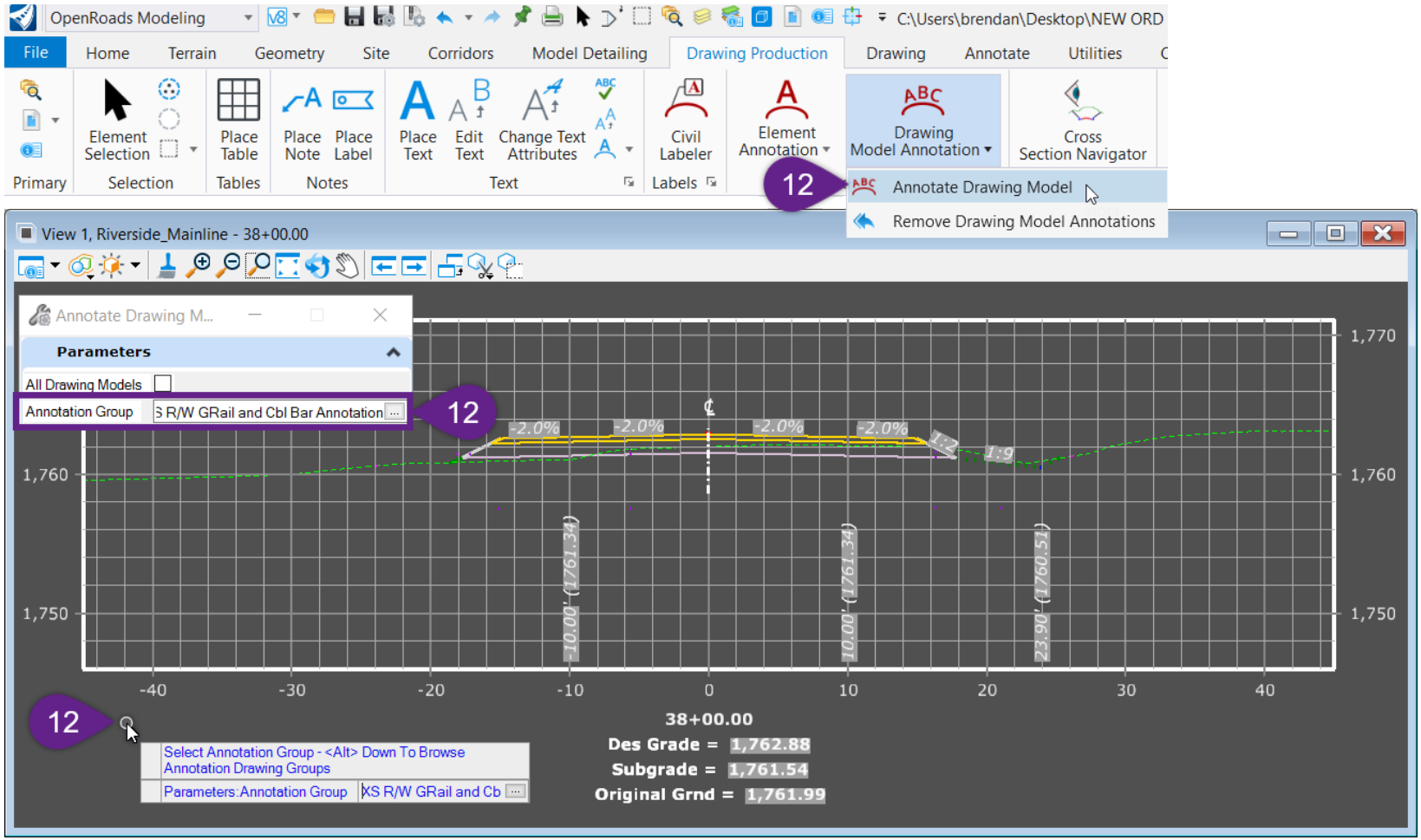
7	Select all ROW Linework. This can be easily accomplished by expanding the **Element Selection** menu and highlighting the ROW Linework *Level*. ***WARNING:*** From the previous page, after all ROW Linework has been assigned to a Feature Definition, the Level may be different. Verify the Level by hovering over the ROW Linework with the mouse-cursor.
8	With all the ROW Linework elements selected, use the *Profile From Surface* tool: [***OpenRoads Modeling*** → ***Geometry*** → ***Vertical***].
9	*Prompt: Data Point to Apply DTM Profile to x selected elements* – Left-Click in the *View* to advance to the next prompt.
10	*Prompt: Locate Reference Surface – Reset for Active Terrain Model* – The Existing Ground Terrain Model should have been activated in the creation of the Cross Section ORD File. Right-Click in the *View* to accept the Existing Ground Terrain Model as the Reference Surface.
11	Follow and advance through the remaining *Prompts* with the *Profile From Surface* tool. This tool and its parameters are discussed in detail in *7E.4.a Profile From Surface*.

16G.1.b Configure the "XS RW GRail and Cbl Bar Annotation" Group

In this process, the "XS RW GRail and Cbl Bar Annotation" group is configured to place labels on the ROW *3D Linear Elements* (Points). The *Annotation Group* will be configured to seek out *3D Linear Elements* (Points) that are assigned to the Feature Definition specified in step 5. In this example, the "XS_TL_ExistRight of Way" Feature Definition was specified.

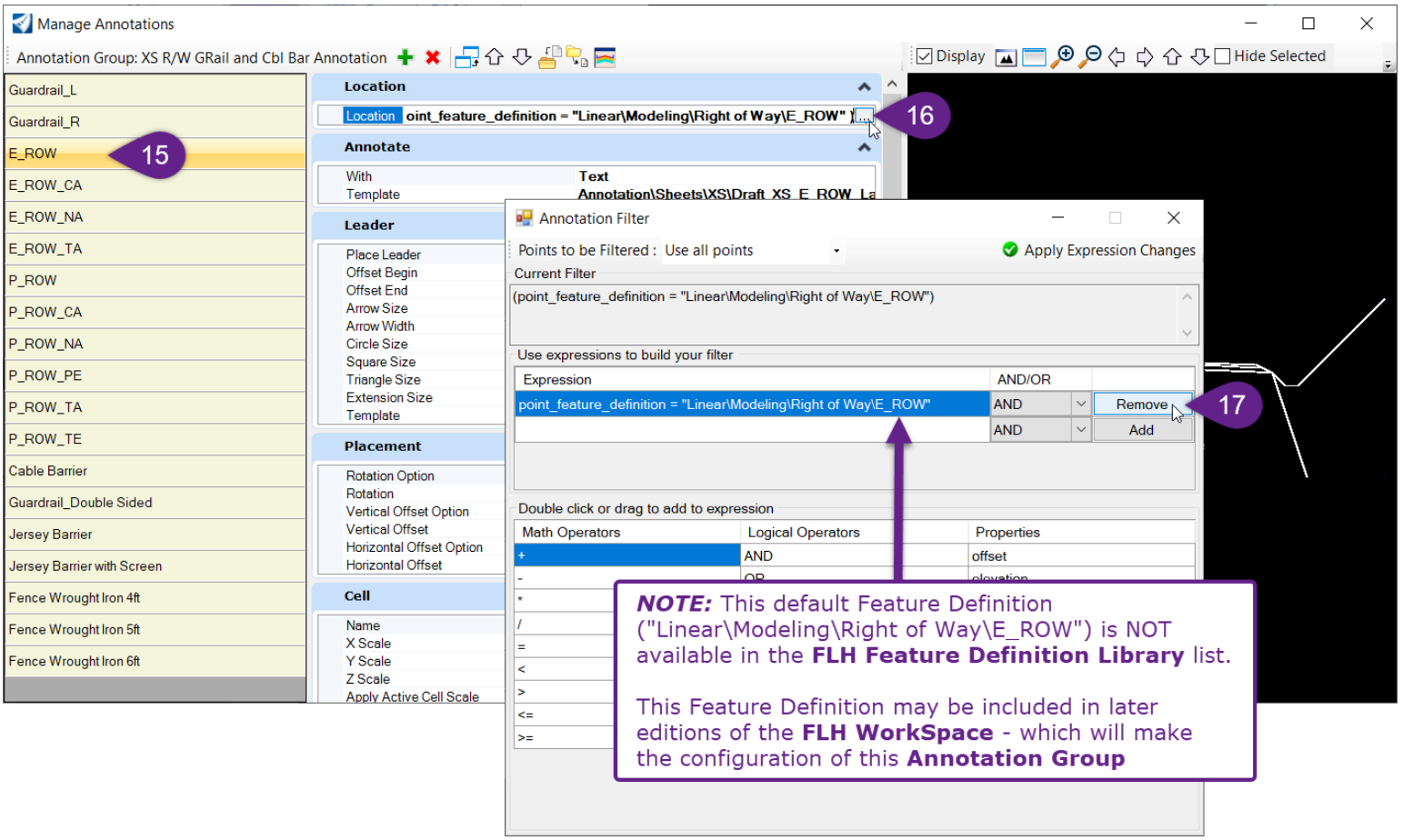
WARNING: For the "XS RW GRail and Cbl Bar Annotation" group to be displayed in the *Project Explorer* and edited, then first, the User will have to apply this Annotation Group in at least one CROSS SECTION *Drawing Model*.

12	Enter a CROSS SECTION *Drawing Model* and *Annotated the Drawing Model* with the "XS RW GRail and Cbl Bar Annotation" group. See *16D.2.a Create Cross Section Annotations*.



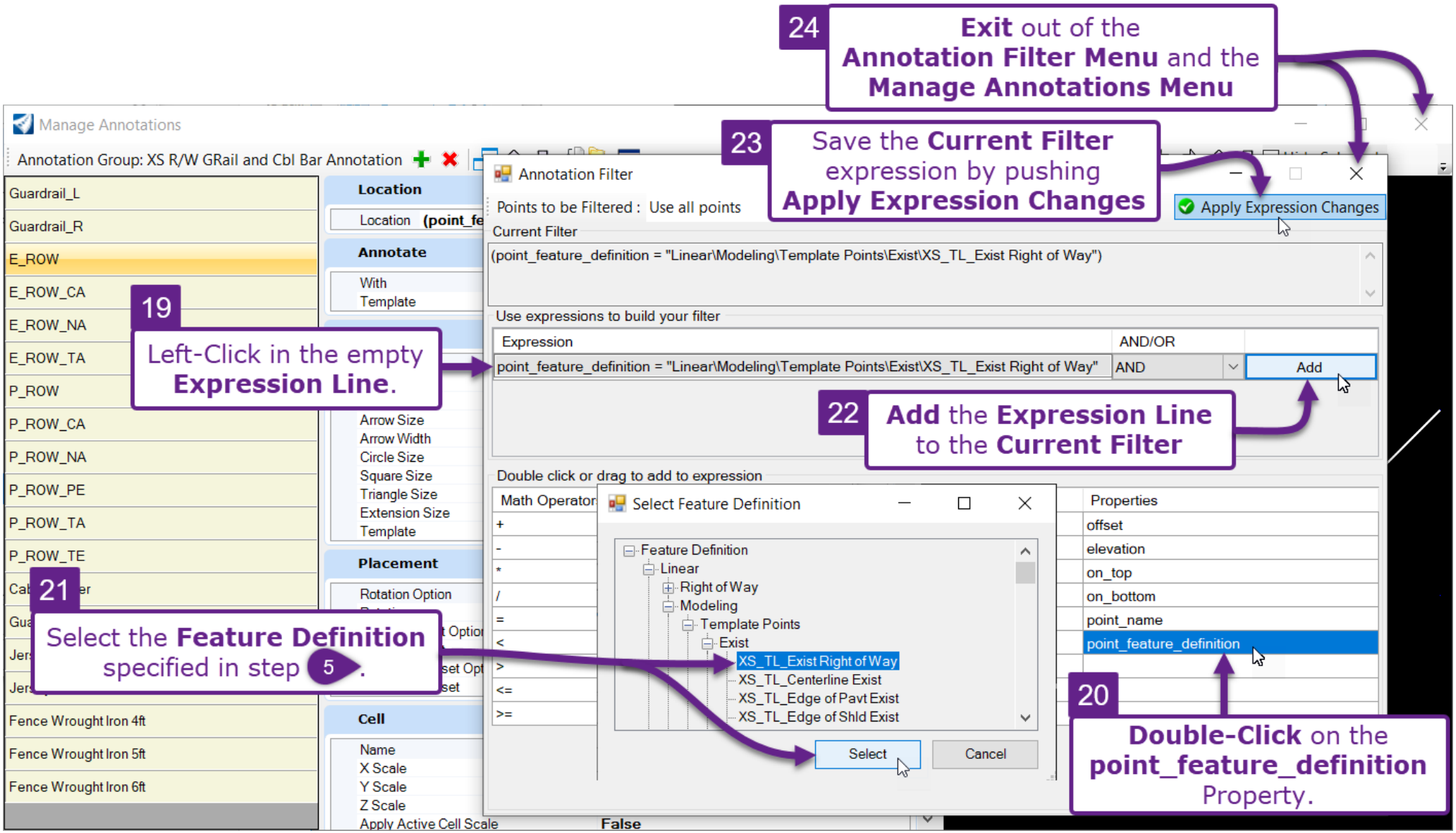
Access the "XS RW GRail and Cbl Bar Annotation" group as shown in *16D.3.c Access the Annotation Group Manager*. ***NOTE:*** For this workflow, it is NOT necessary to load the Corridor Template because the ROW *3D Linear Elements* are NOT generated from a Template.

13	Set the Annotation Scale which corresponds with the Drawing Seed used in creation of the CROSS SECTION *Named Boundary* elements: *16D.3.b Set the Annotation Scale before Accessing the Annotation Manager*.
14	Open the Annotation Group Manager for the "XS Grid w/ Annotations" group: *16D.3.c Access the Annotation Group Manager*. ***TIP:*** Ensure that the 2D Design Model is showing in the active *View* when accessing the *Annotation Group Manager* through the Explorer .

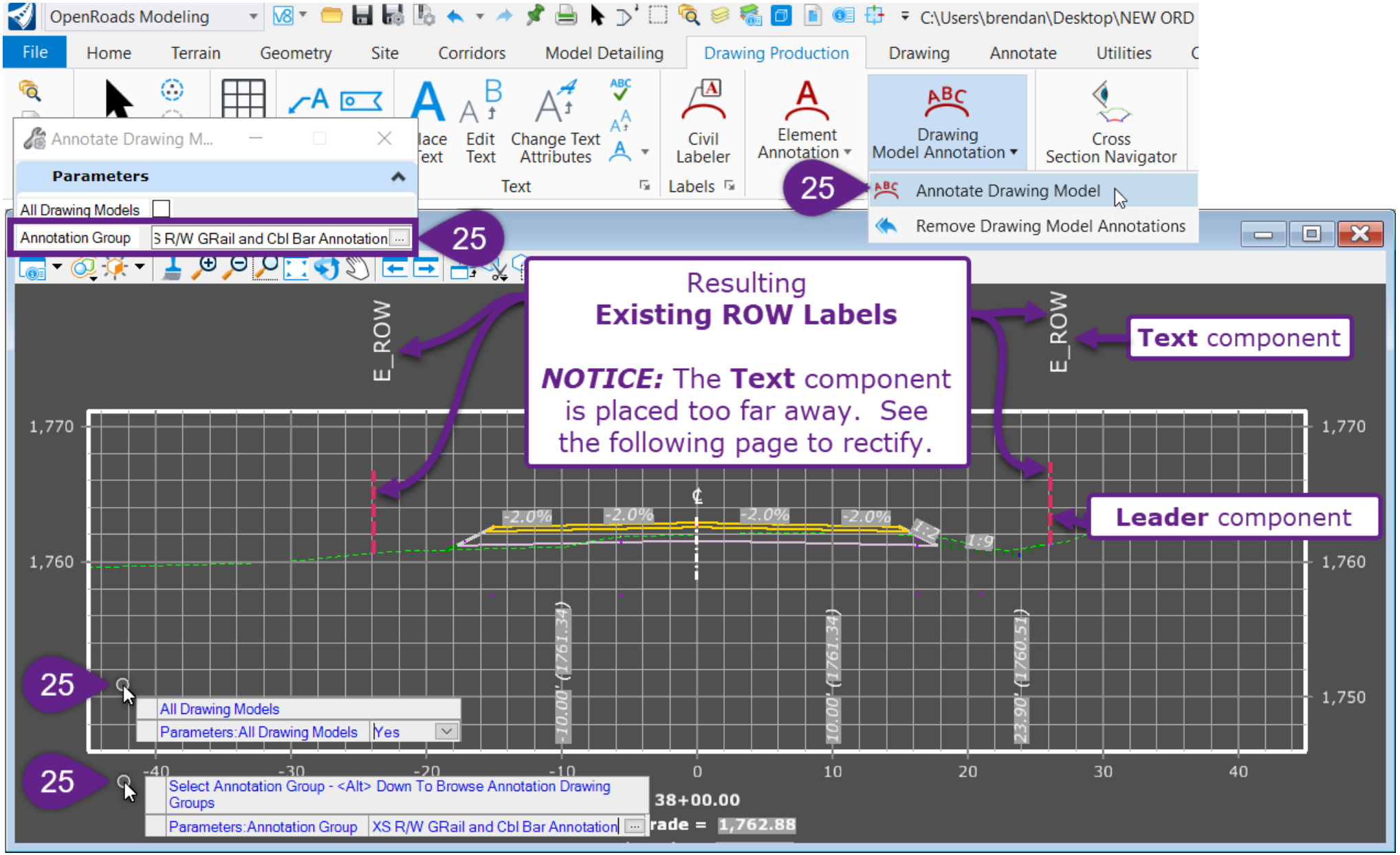


15	Select (highlight) the "E_ROW" component.
16	In the **Location** box, click the ... icon to access the *Annotation Filter* menu.
17	In the *Annotation Filter* menu, push the *Select points from Template* button.
18	Remove the default Feature Definition from the *Current Filter* box by pushing the *Remove* button next to the Expression Line.

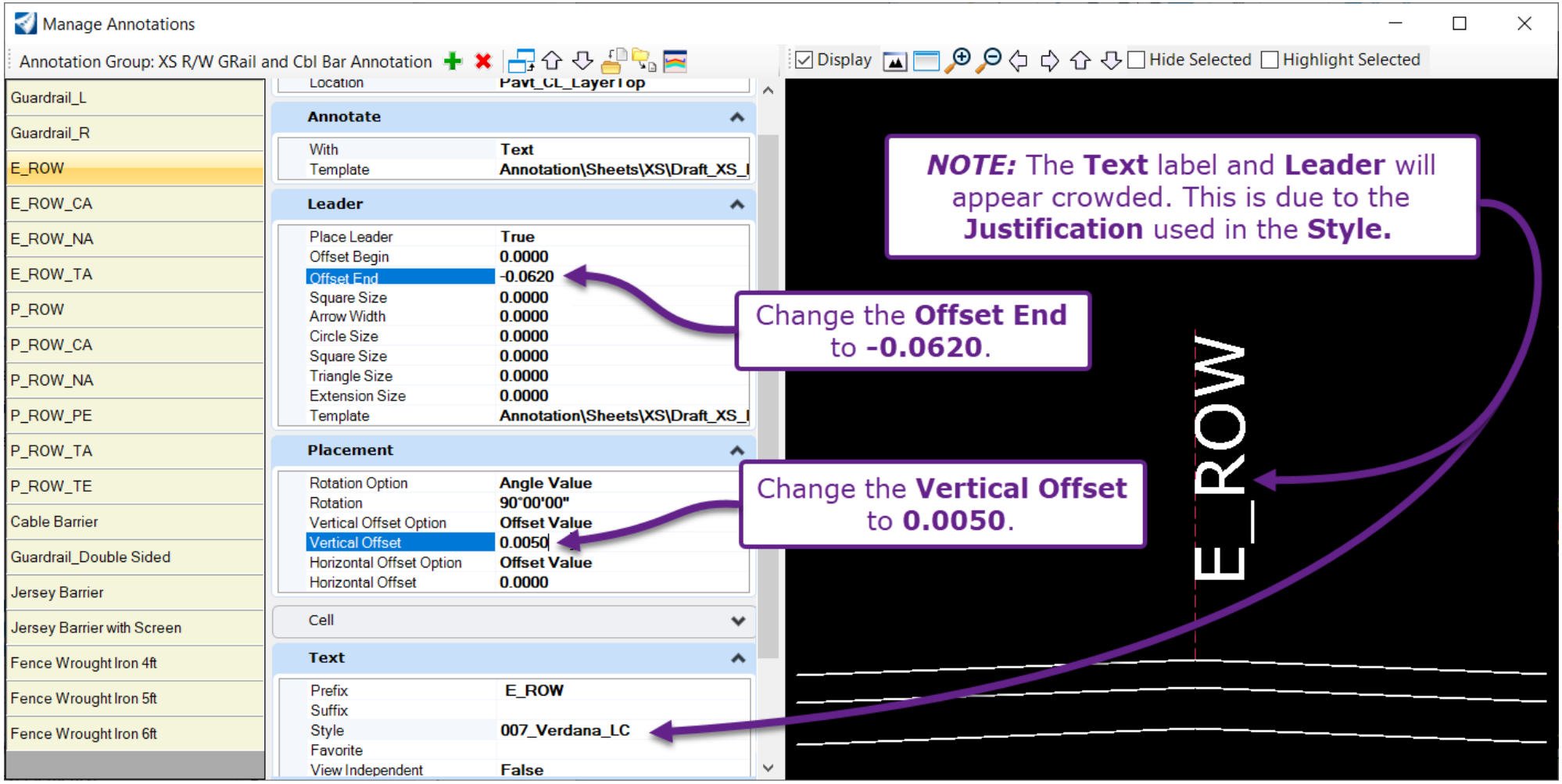
In the processes shown below, the "XS_TL_ExistRight of Way" Feature Definition (specified in step 5) is added to the E_ROW component.



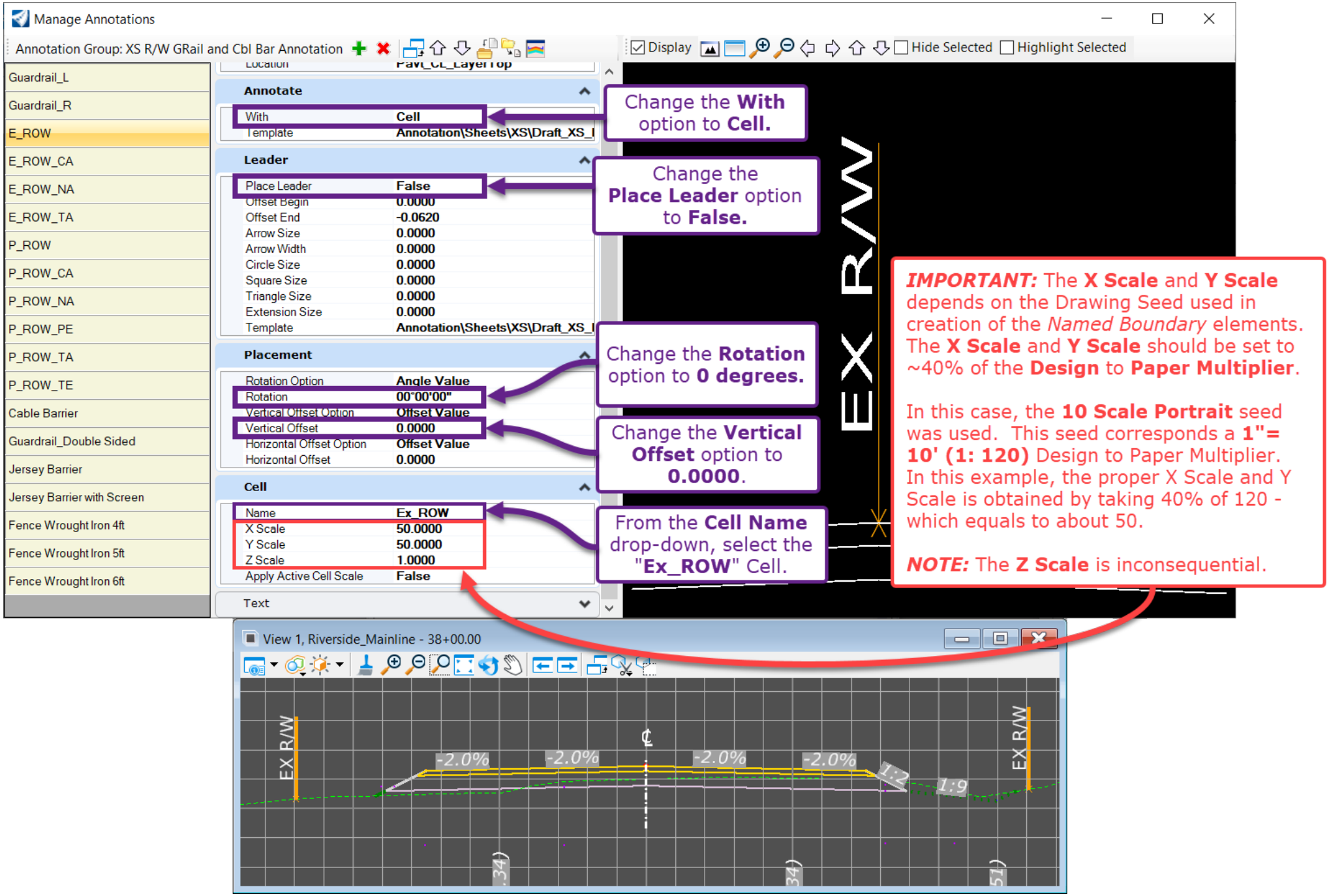
25	After exiting out of the *Annotation Filter Menu* and *Manager Annotations Menu* (step 24), then proceed to apply the "XS RW GRail and Cbl Bar Annotation" group to all CROSS SECTION *Drawing Models*. See *16D.2.a Create Cross Section Annotations*. ***TIP:*** The "XS RW GRail and Cbl Bar Annotation" group is placed atop the "XS Grid W/ Annotations" group.



To rectify the placement of the **Text Component**, re-enter the **Annotation Group Manager** for the "XS RW GRail and Cbl Bar Annotation" group. Select (highlight) the "E_ROW" component and make the following changes. Additional information about the placement of labels is discussed in *16E.4 Placement: Specify the Position of Labels*.



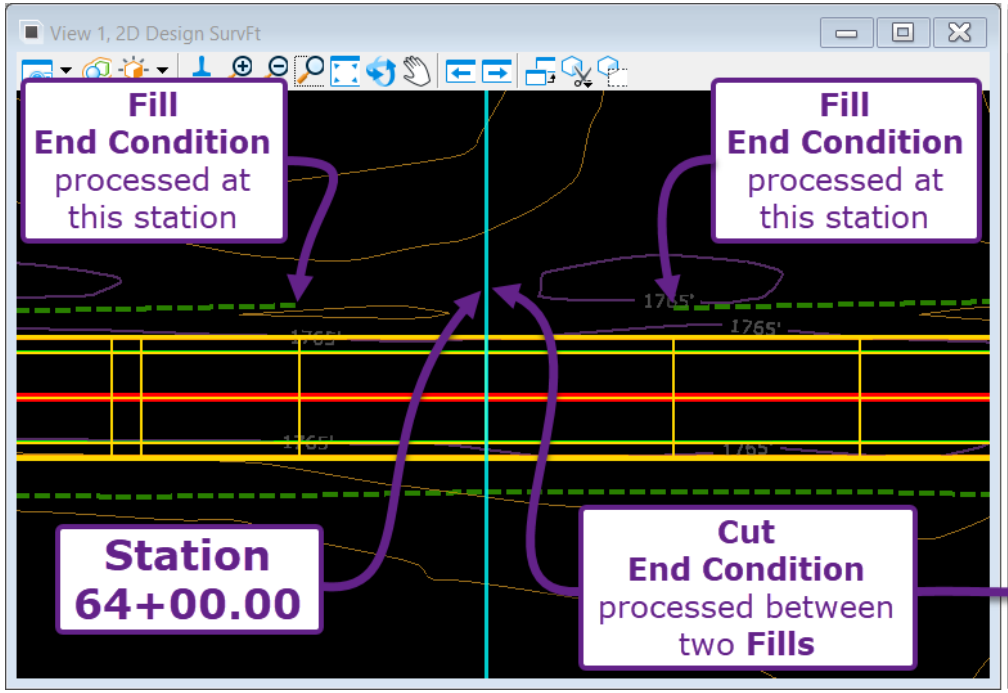
The following figure shows an alternative configuration of the Existing ROW Label.

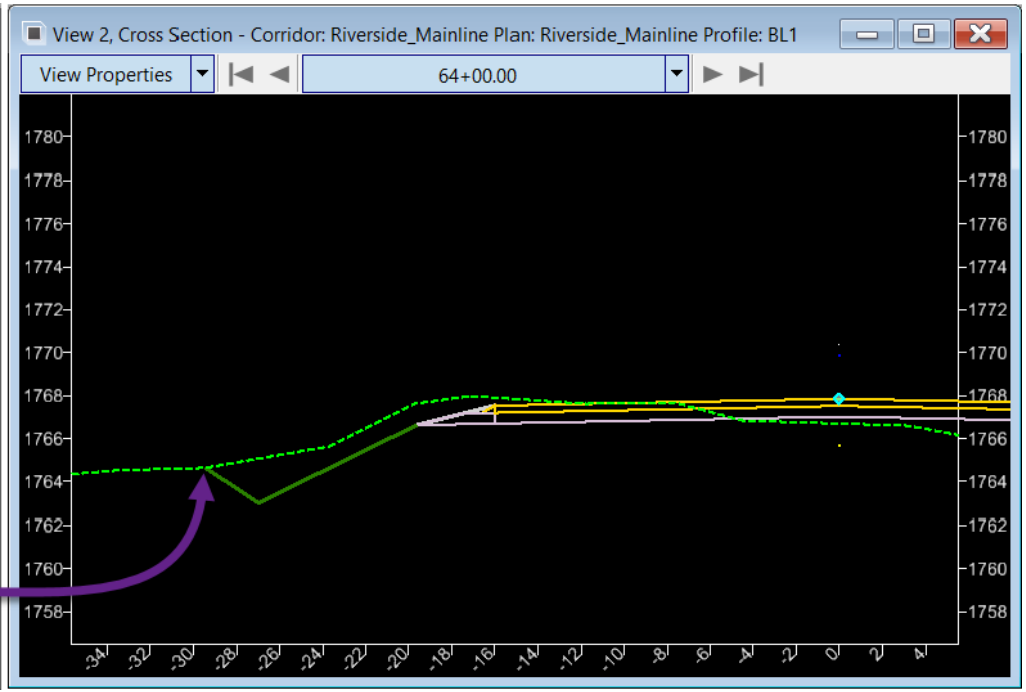

Manage Annotations
Annotation Group: XS R/W GRail and Cbl Bar Annotation
Display
Hide Selected
Highlight Selected
Guardrail_L
Guardrail_R
E_ROW
E_ROW_CA
E_ROW_NA
E_ROW_TA
P_ROW
P_ROW_CA
P_ROW_NA
P_ROW_PE
P_ROW_TA
P_ROW_TE
Cable Barrier
Guardrail_Double Sided
Jersey Barrier
Jersey Barrier with Screen
Fence Wrought Iron 4ft
Fence Wrought Iron 5ft
Fence Wrought Iron 6ft
Annotate
With Cell
Template Annotation\Sheets\XS\Draft_XS_I
Leader
Place Leader False
Offset Begin 0.0000
Offset End -0.0620
Arrow Size 0.0000
Arrow Width 0.0000
Circle Size 0.0000
Square Size 0.0000
Triangle Size 0.0000
Extension Size 0.0000
Template Annotation\Sheets\XS\Draft_XS_I
Placement
Rotation Option Angle Value
Rotation 00°00'00"
Vertical Offset Option Offset Value
Vertical Offset 0.0000
Horizontal Offset Option Offset Value
Horizontal Offset 0.0000
Cell
Name Ex_ROW
X Scale 50.0000
Y Scale 50.0000
Z Scale 1.0000
Apply Active Cell Scale False
Text
Change the With option to Cell.
Change the Place Leader option to False.
Change the Rotation option to 0 degrees.
Change the Vertical Offset option to 0.0000.
From the Cell Name drop-down, select the "Ex_ROW" Cell.
EX R/W
IMPORTANT: The X Scale and Y Scale depends on the Drawing Seed used in creation of the Named Boundary elements. The X Scale and Y Scale should be set to ~40% of the Design to Paper Multiplier.
In this case, the 10 Scale Portrait seed was used. This seed corresponds a 1"= 10' (1: 120) Design to Paper Multiplier. In this example, the proper X Scale and Y Scale is obtained by taking 40% of 120 - which equals to about 50.
NOTE: The Z Scale is inconsequential.
View 1, Riverside_Mainline - 38+00.00
EX R/W
-2.0%
-2.0%
-2.0%
-2.0%
1:2
1:9
EX R/W

16H – TROUBLESHOOT CROSS SECTIONS

16H.1 Slope Stake Limit Points NOT Labeling

The graphic below shows an instance where a CUT Slope Stake Limit label will NOT be labeled.



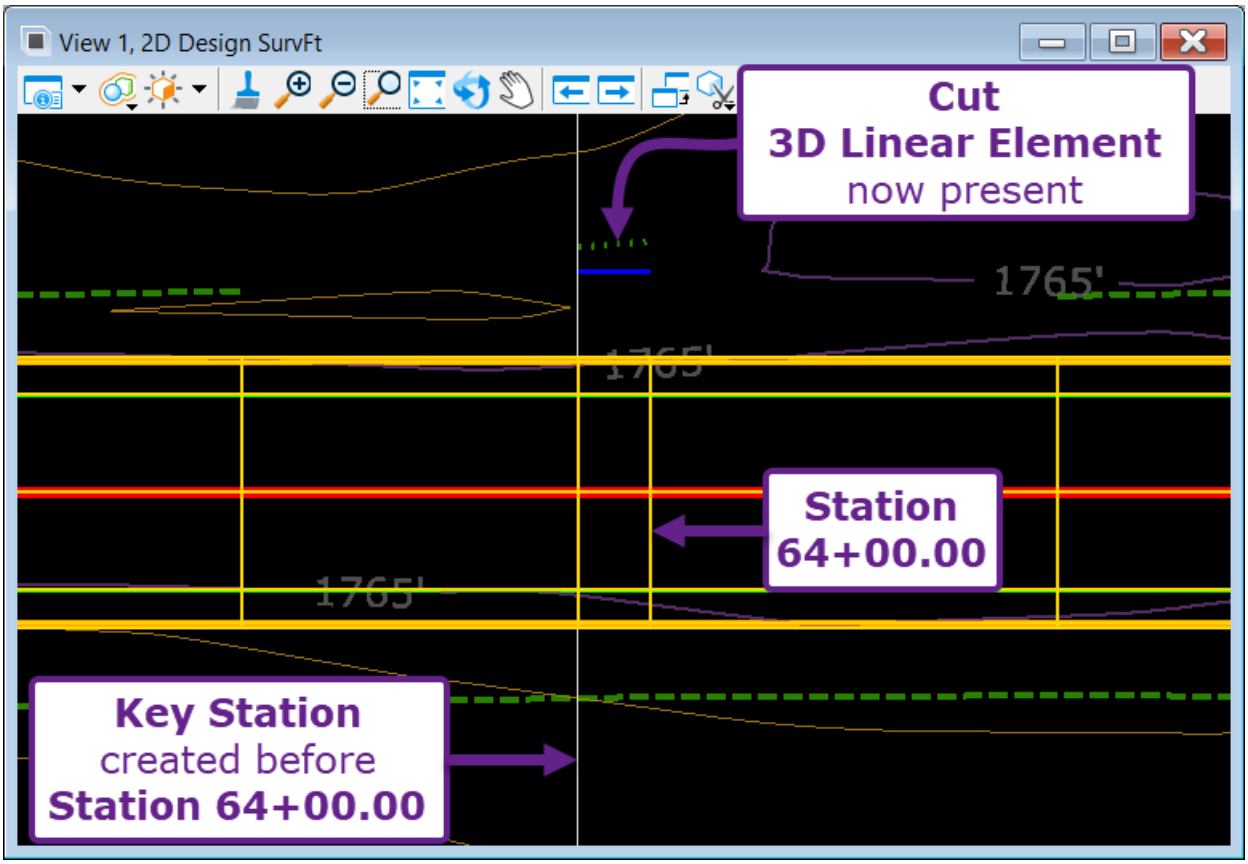


As shown below, in the graphic below, a single Cut End Condition is created between two stations that are solved as a Fill End Condition. This configuration will NOT produce a label for the lone Cut End Condition.

EXPLANATION: Because the Cut End Condition is processed at a singular location, a *3D Linear Element* is NOT produced. As discussed in *16E.1 Location: Specify which 3D Linear Elements (Points) are Labeled*, labels seek out *3D Linear Elements* that intersect the CROSS SECTION *Named Boundary* element. See the next page for a solution to remedy this situation.

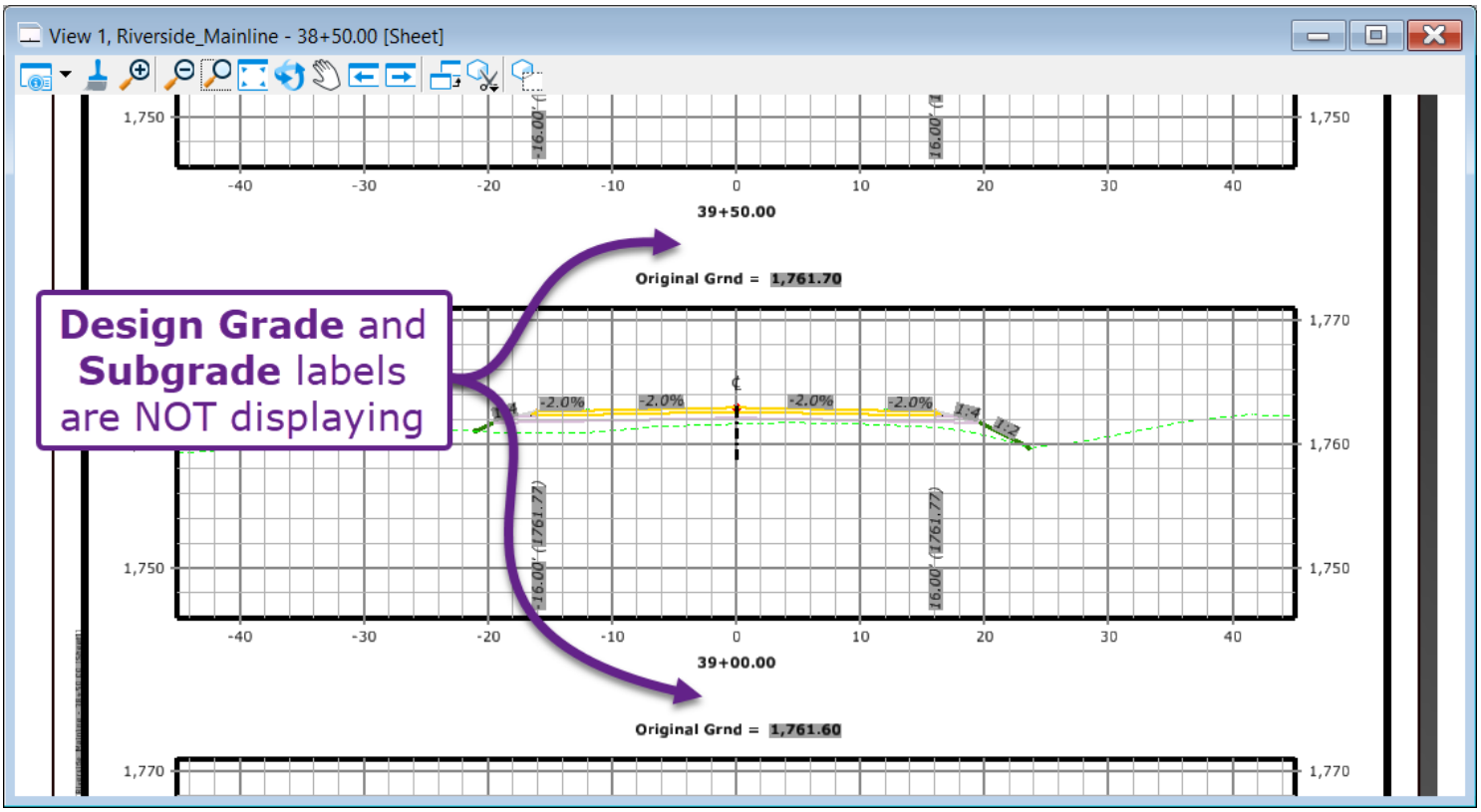
The situation on the previous page can be rectified by editing the Corridor. Place a *Key Station* on either side of the singular Cut End Condition station. Creation of *Key Stations* is shown in *9G.3 Key Station*.

NOTE: For this workaround to work, the custom *Key Station* must solve in Cut End Condition. If two Cut End Conditions are solved consecutively, then a *3D Linear Element* is created between the two stations. Therefore, if a Cut *3D Linear* element is found at the station coinciding with the CROSS SECTION *Named* Boundary, then a label can be created.

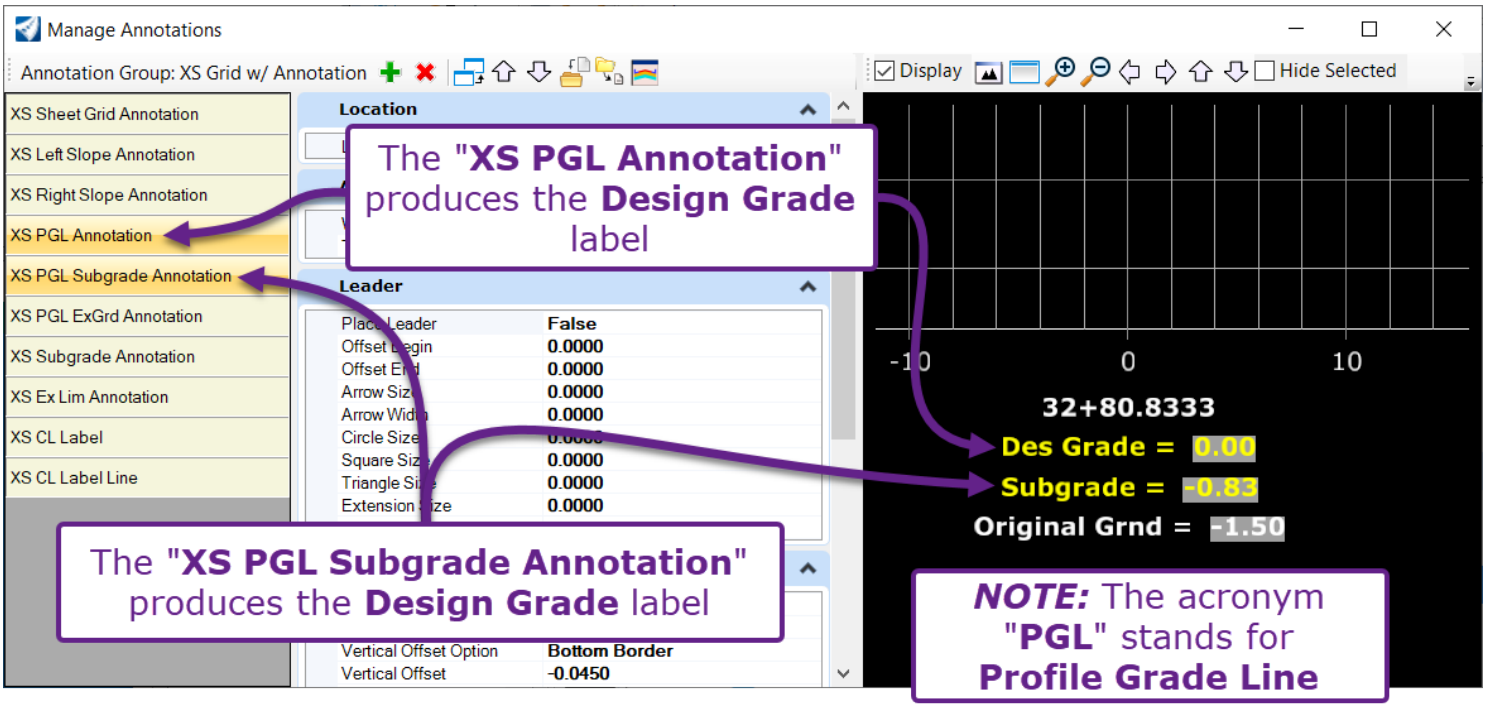


16H.2 Design Grade and Subgrade Elevation Labels are Absent

For Road Cross Sections, it is FLH Convention to show the Design Grade ("Des Grade") and Subgrade elevation below the Cross Section grid for each station. If this label is NOT displaying, it is likely due to incorrect Template Point Names used in the road Corridor Templates.



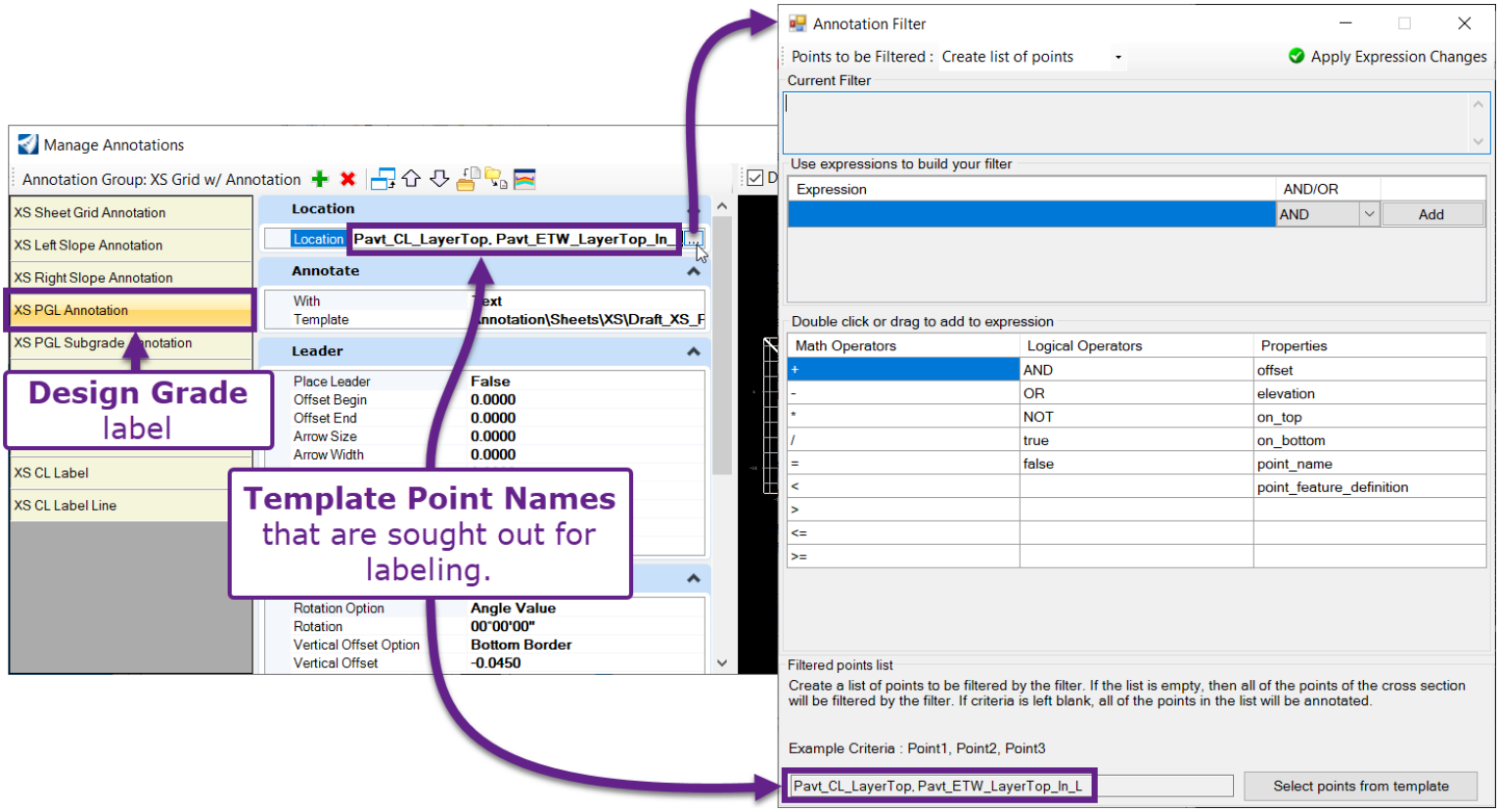
Design Grade and Subgrade Elevation labels are placed by the "XS PGL Annotation" and "XS PGL Subgrade Annotation" respectively. These labels are pre-configured to seek out certain Template Point Names. If the Road Template does NOT utilize these exact Point Names, then labels will not be created



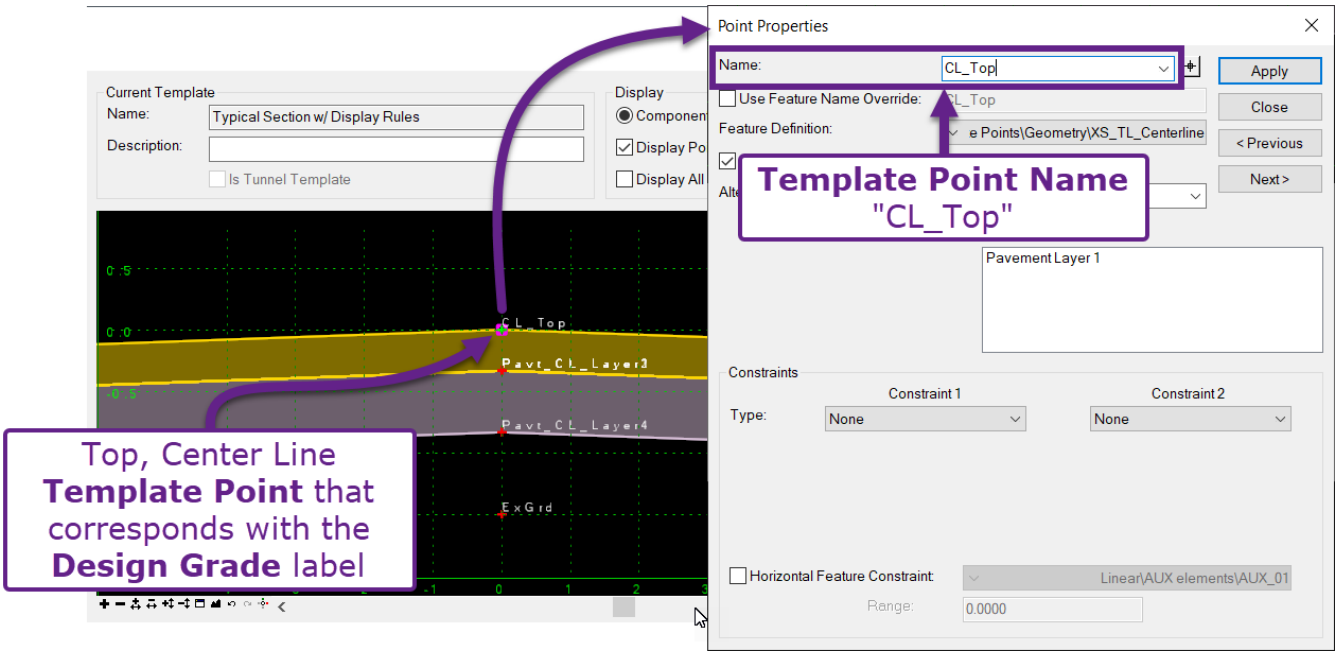
Design Grade ("XS PGL Annotation") – By Default, the Design Grade label is seeking out road Template Points that are named:

- "Pavt_CL_LayerTop"
- "Pavt_ETW_Layertop_In_L"

The Template Points that are sought out for labeling are specified with the **Location** option.



In the road Template shown below, the Center Line Point is named "CL_Top", which means the default Design Grade label will NOT be created because it is NOT found by the label.



To rectify this mismatch and produce the desired labels, there are two options available:

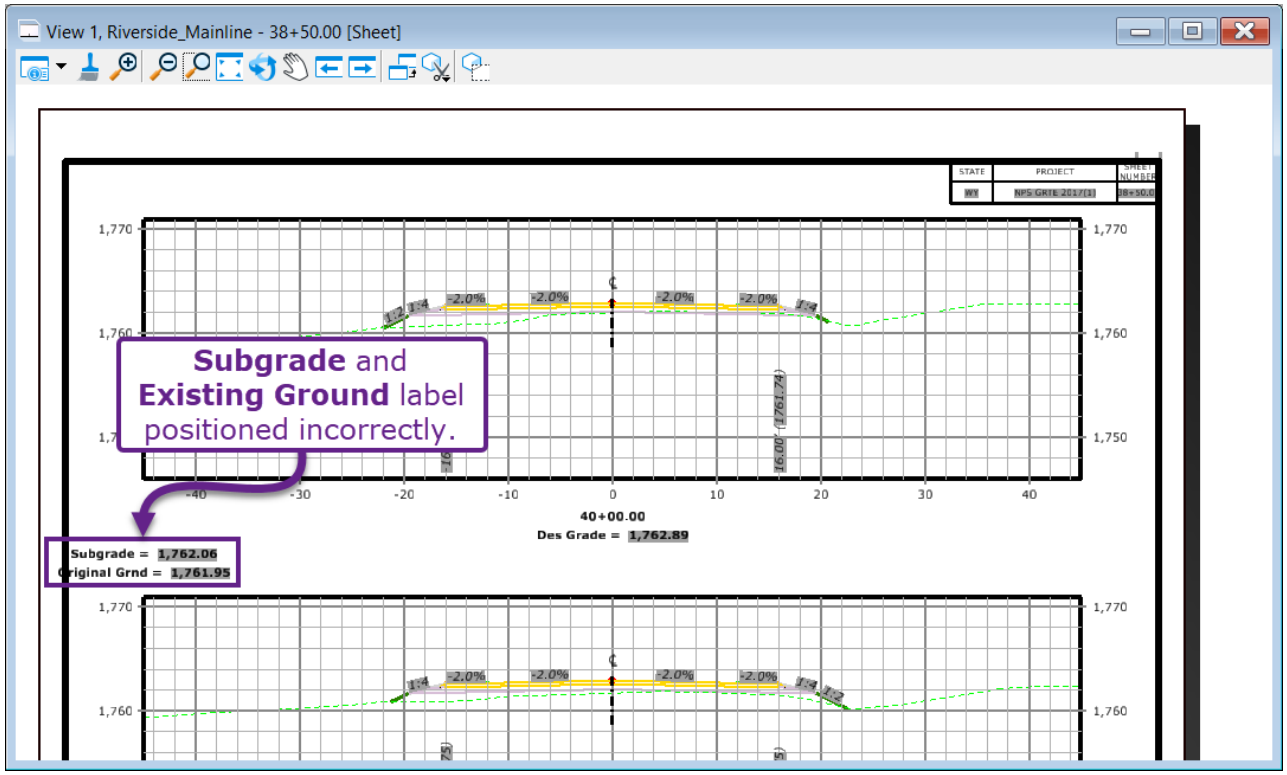
OPTION 1: Edit the Corridor Template: This option involves editing each Template used in the Corridor and changing the Template Point Names to match the Names sought after by the Annotation label.

OPTION 2: Edit the Annotation Label Location: Using information described in *16E.1 Location: Specify which 3D Linear Elements (Points) are Labeled*, edit the Annotation Label to seek out the Template Point Name used in Corridor Modeling.

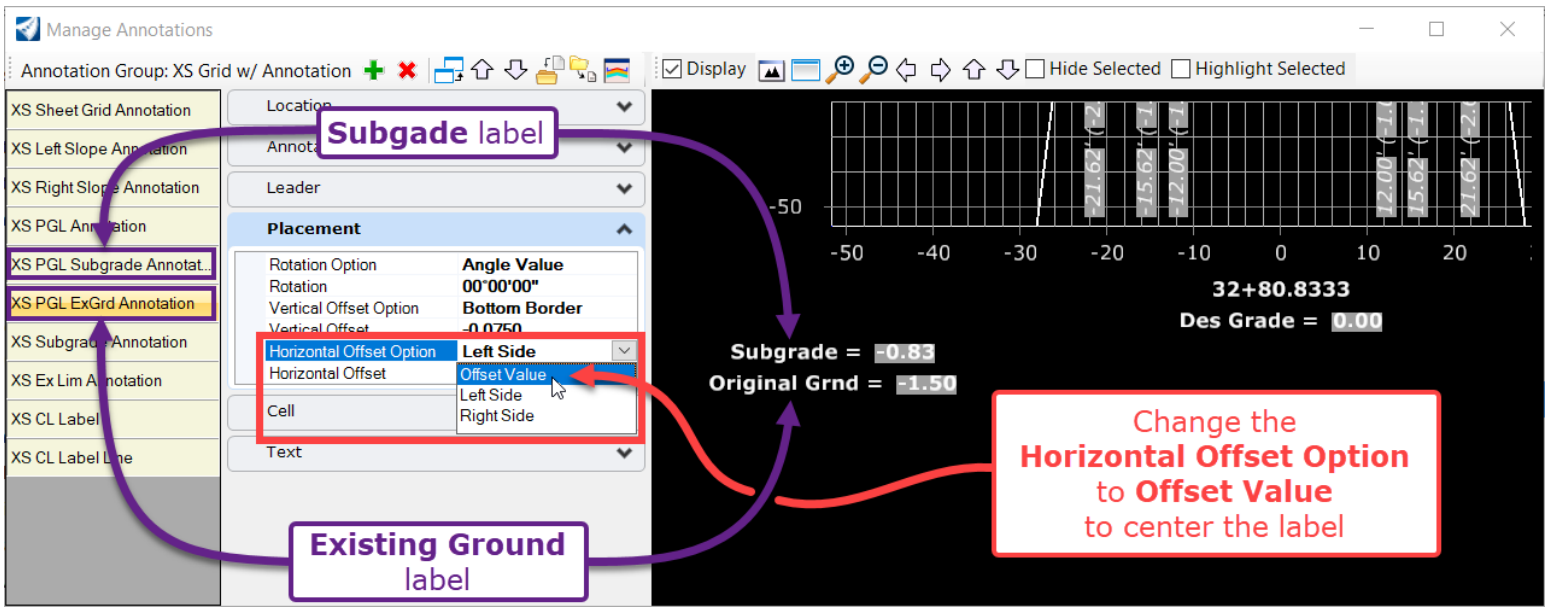
After performing one of the options listed above, remove and reapply Cross Section annotations. See *16D.2 Create, Remove and Reapply Cross Section Annotations*.

16H.3 Subgrade and Existing Ground Label Positioned to the Left

As shown below, the Subgrade and Existing Ground ("Original Grnd") label are non-centered and positioned to the left.



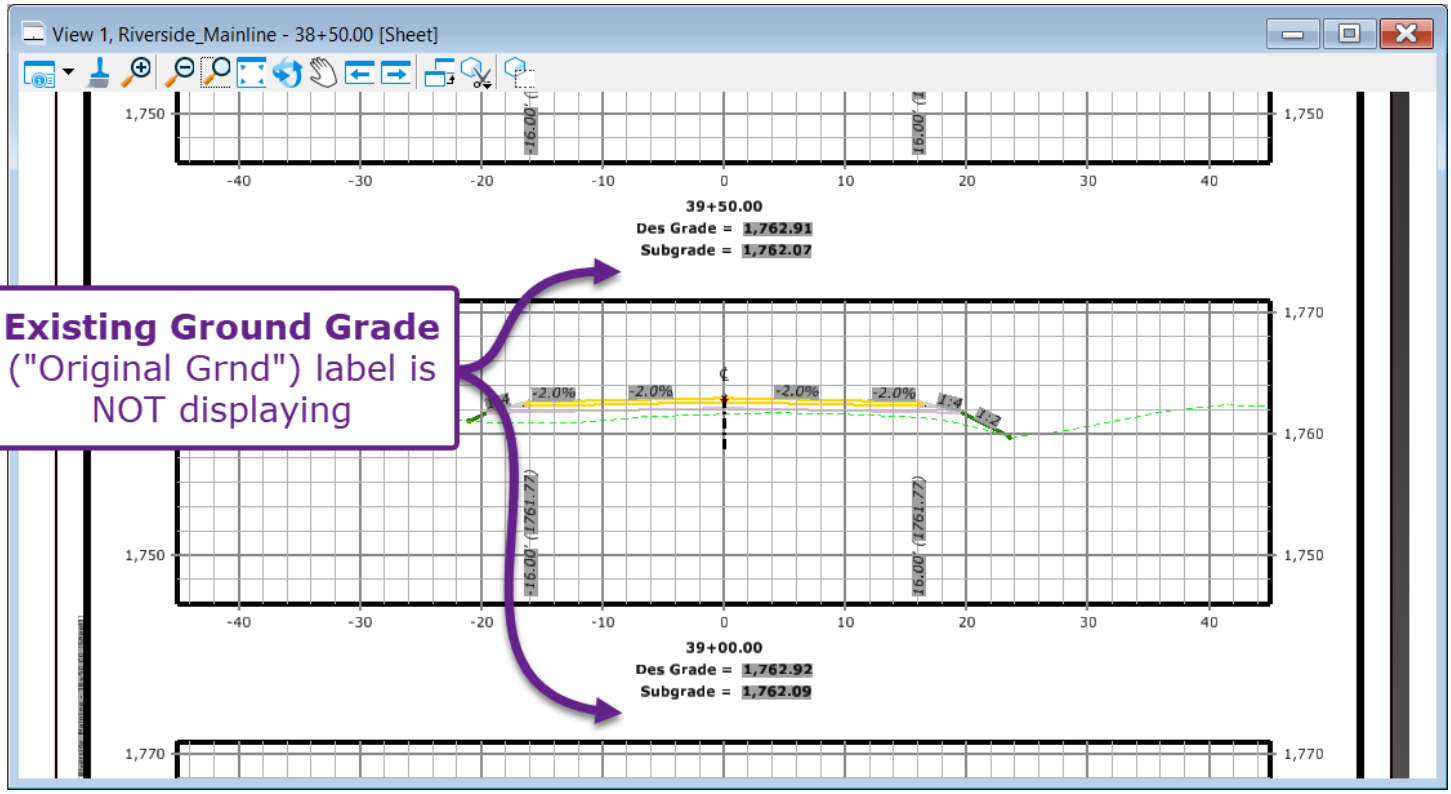
The misposition of the Subgrade and Existing Ground label is due to an incorrect *Placement* setting. The *Horizontal Offset Option* needs to be changed from "Left Side" to "Offset Value".



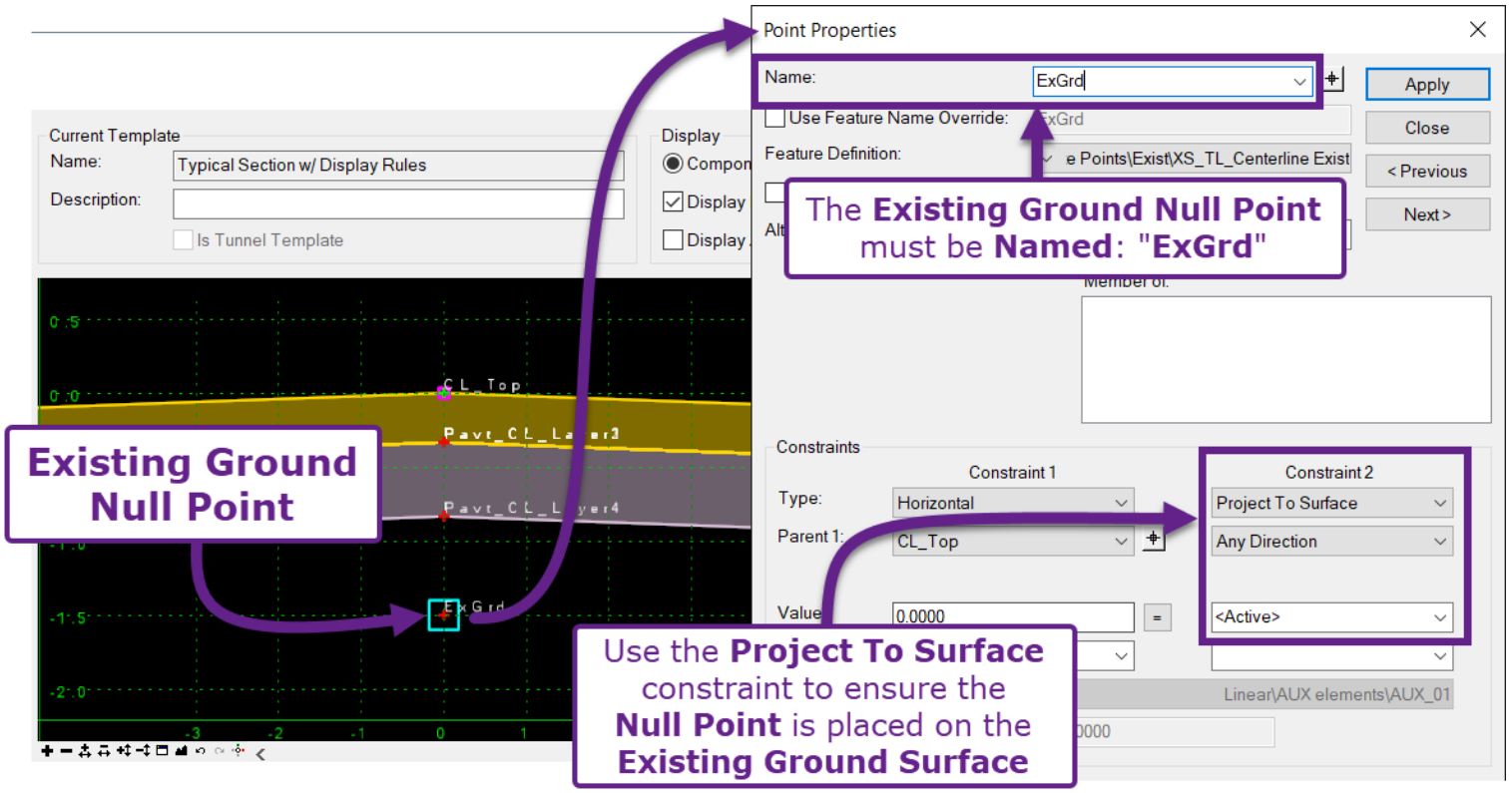
After changing the *Horizontal Offset Option* for both the Subgrade and Existing Ground label, remove and reapply the Annotation Group in the CROSS SECTION *Drawing Model*. See *16D.2 Create, Remove and Reapply Cross Section Annotations*.

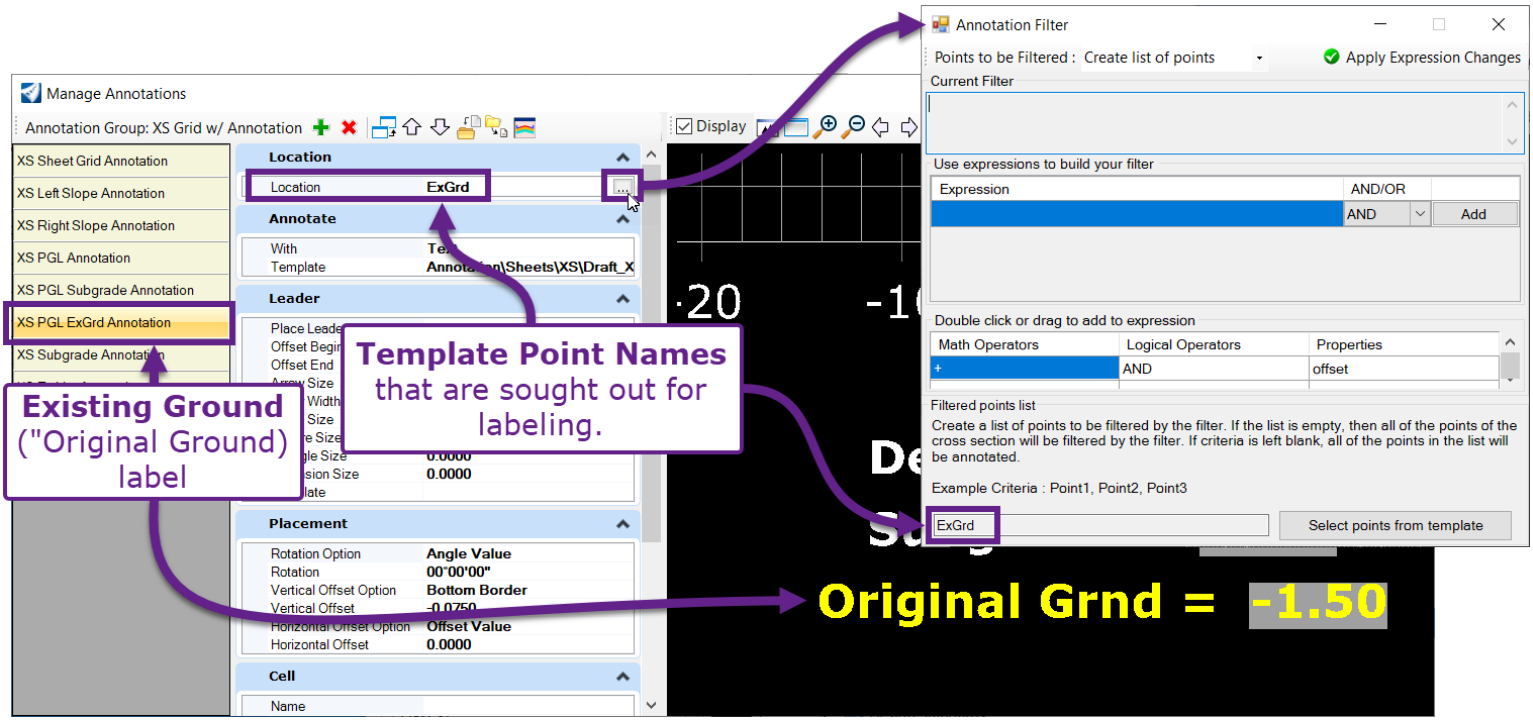
16H.4 Existing Ground Elevation Label ("Original Grnd") is Absent

For Road Cross Sections, it is FLH Convention to show the Existing Ground Grade ("Original Grnd") elevation below the Cross Section grid for each station.



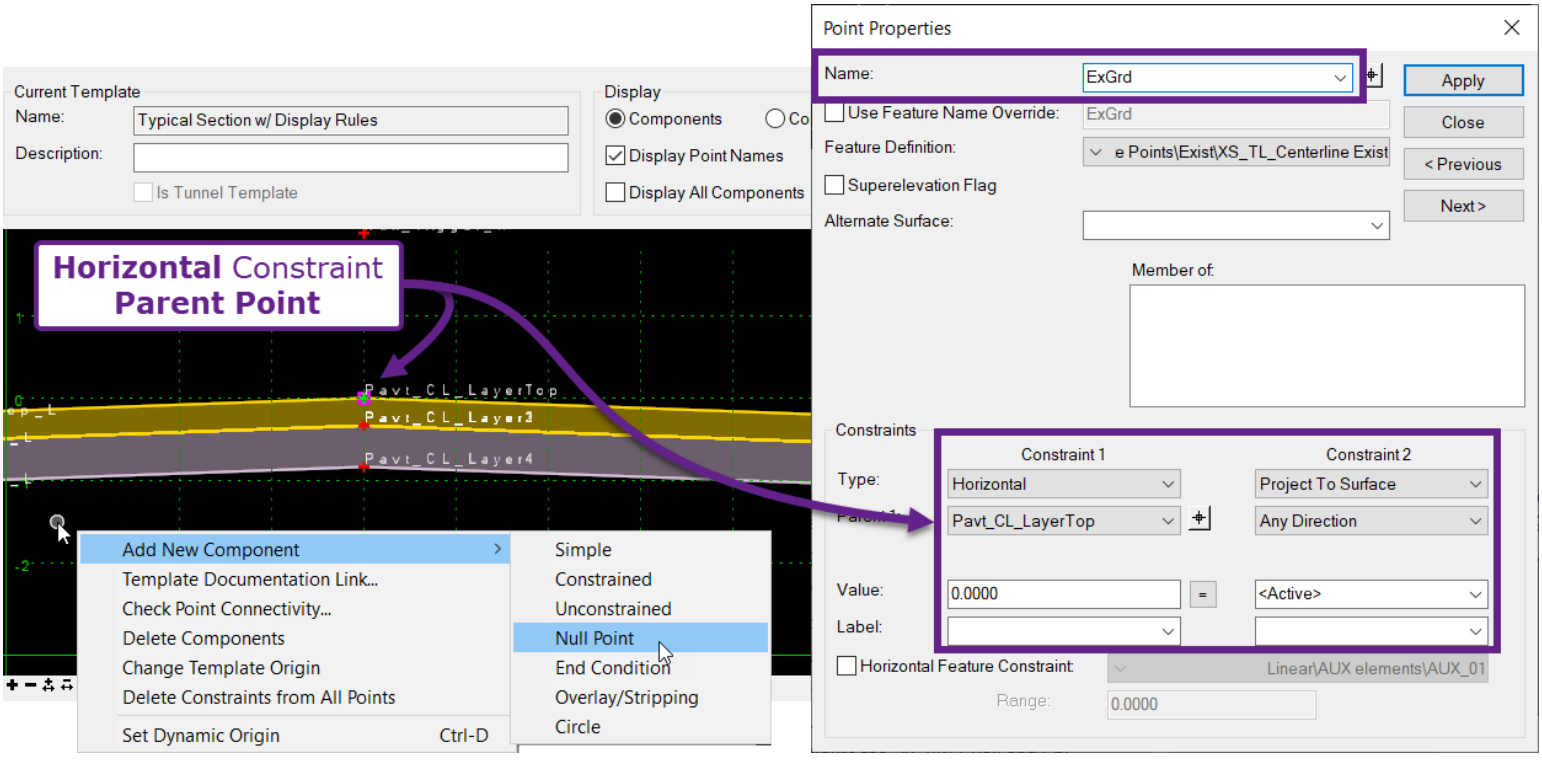
If this label is NOT displaying, it is probably because the **Existing Ground Null Point** is NOT present in the road Corridor Template.





To ensure the Existing Ground Grade ("Original Grnd") elevation is labeled in Cross Section sheets, each Template used in the Corridor must be edited to include the Existing Ground Null Point. After creating the Existing Ground Null Point, remove and reapply Cross Section annotations. See *16D.2 Create, Remove and Reapply Cross Section Annotations*.

The Existing Ground Null Point must be exactly named "ExGrd". Use the **Project To Surface** constraint type (set to <Active>). Also, the Existing Ground Null Point must use the **Horizontal** constraint type (Value = 0) with a Center Line point as the *Parent Point*. Template Point creation is discussed in *Chapter 8 – Template Library*.

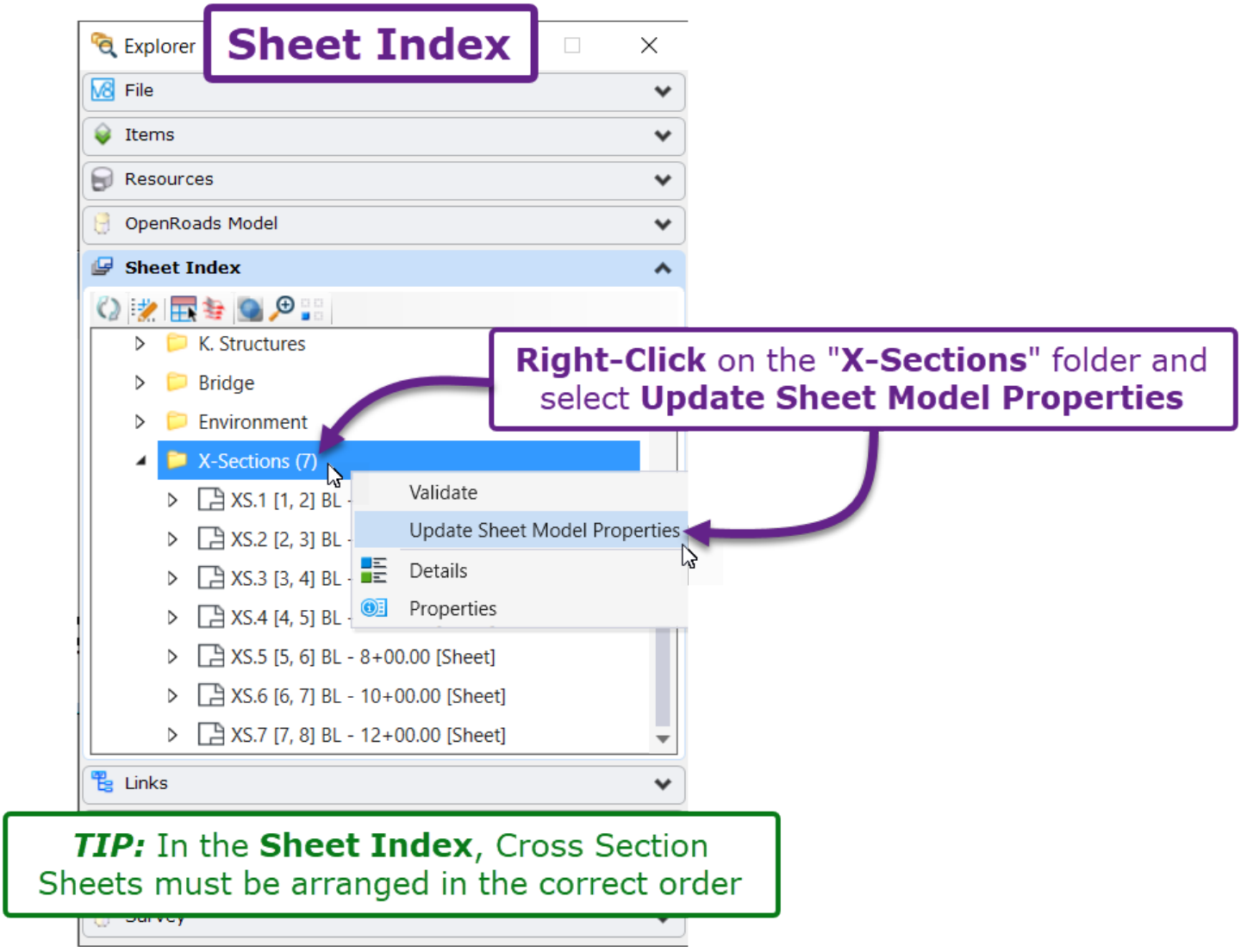


16H.5 Update Sheet Number and Text Fields in the Sheet Borders

For this procedure, the Cross Section *Sheet Models* must be added to the Sheet Index. The *Sheet Models* are typically added to the Sheet Index in creation of the *Sheet Models*. See *16B.3. Create the Drawing Models and Sheet Models from the Named Boundary Manager*.

If the *Sheet Models* were NOT added to the Sheet Index in creation, then manually add them in the process shown in *18B.1 Alternate Method for Adding Sheets to the Sheet Index*.

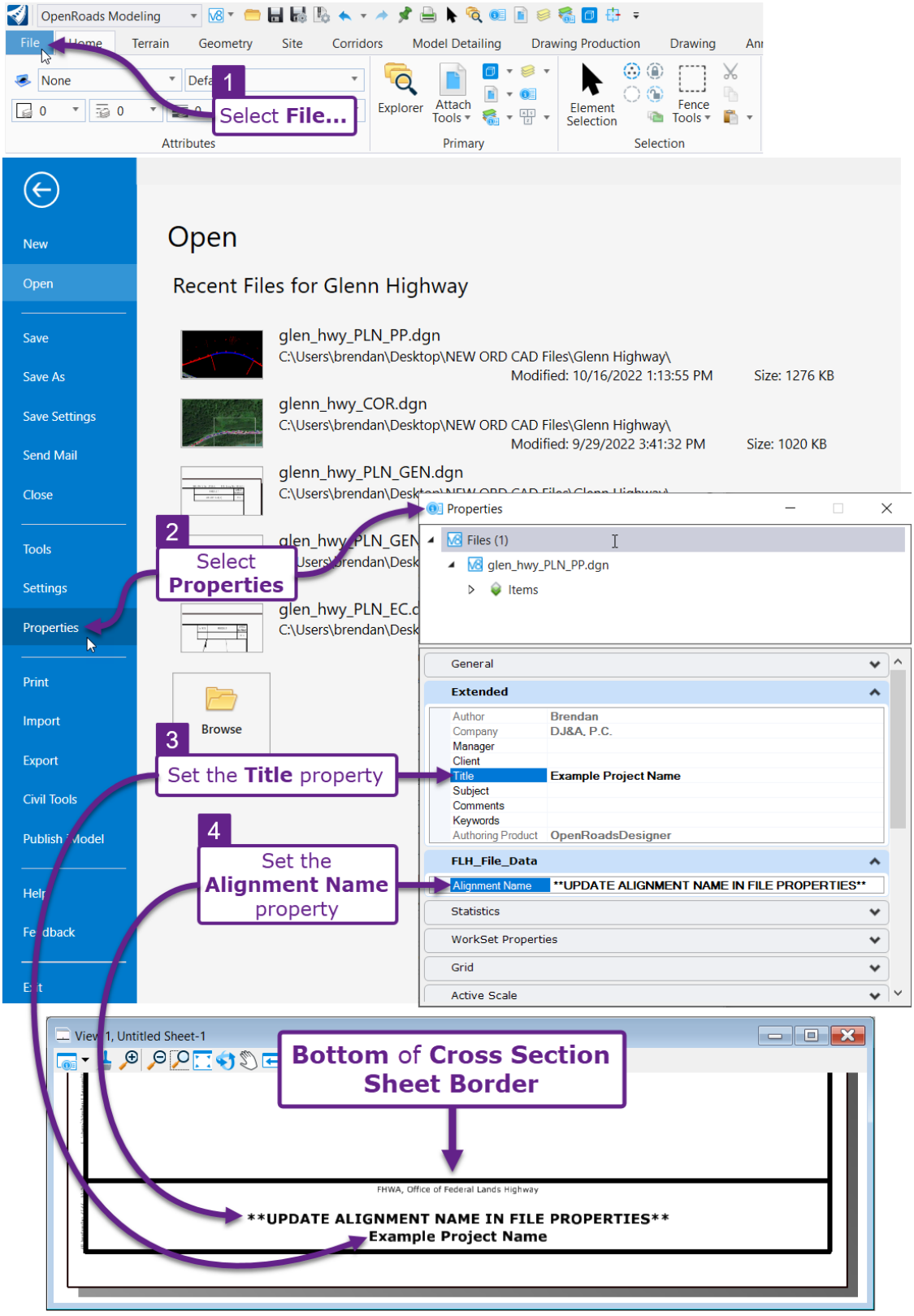
When added to the Sheet Index, a Sheet Number is assigned to each *Sheet Model*. The Sheet Number field text is updated through the Sheet Index. Right-Click on the "X-Sections" folder and select *Update Sheet Model Properties*. All text fields in all Cross Section *Sheet Models* will be updated.



16H.6 "UPDATE ALIGNMENT NAME IN FILE PROPERTIES" Fix

The bottom of the cross section Sheet Borders contain text fields that are linked to the Properties of the active ORD File. Properties of the active ORD File are edited in the following location:

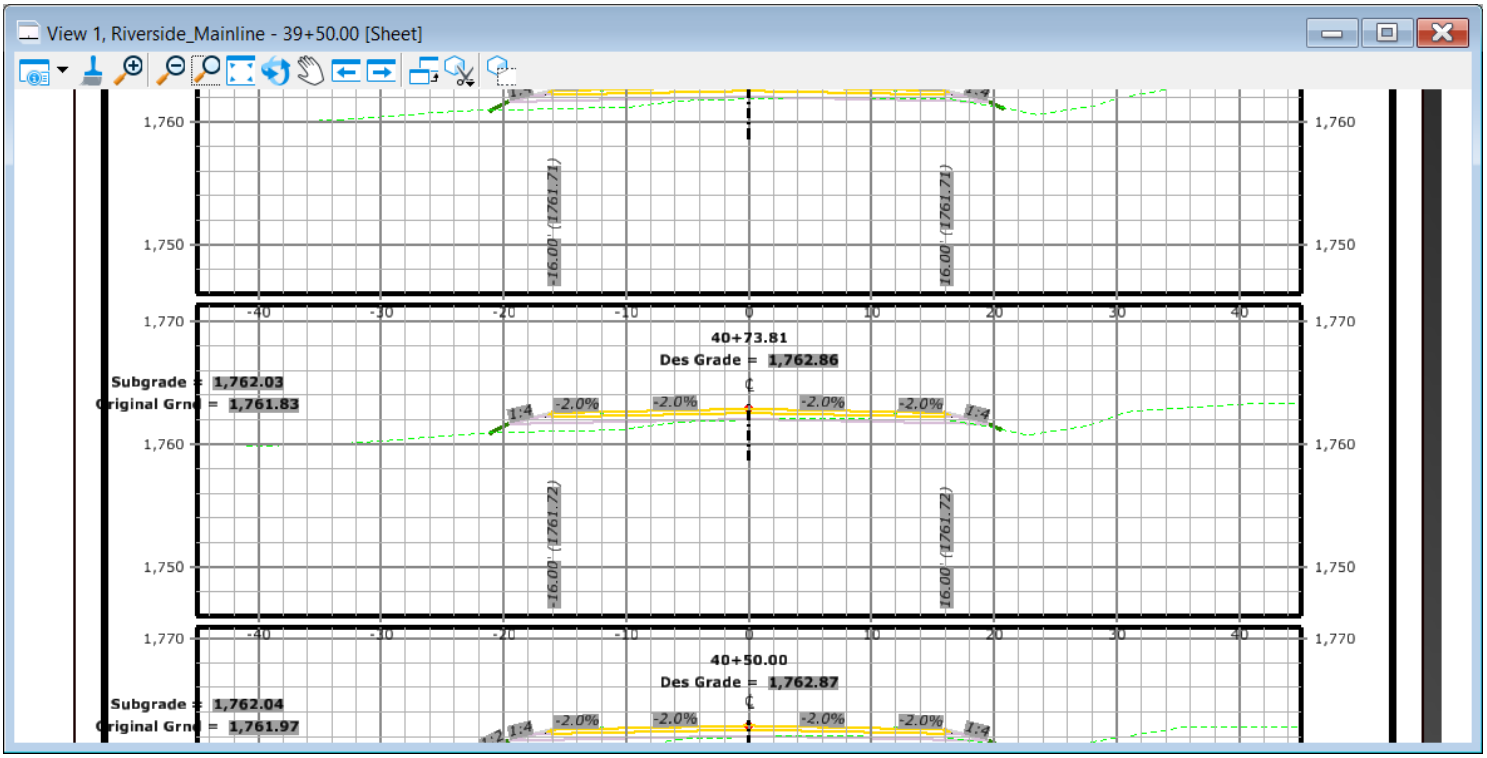
File → Properties



TIP: After updating the properties shown above, use the *Update Sheet Model Properties* tool shown on the previous page. This tool will update the text fields in all Cross Sections sheets.

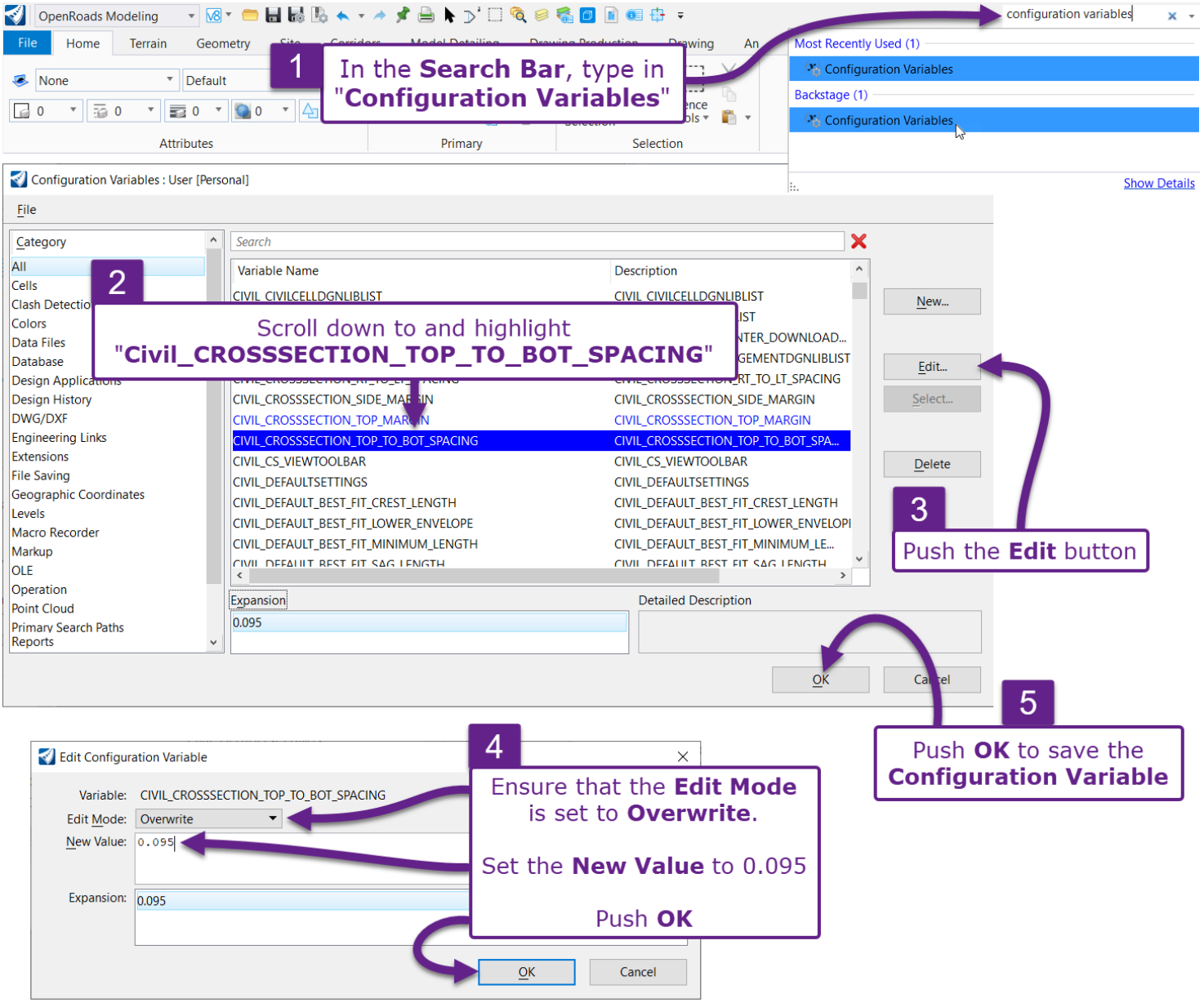
16H.7 Cross Sections and Station Titles are Overlapping in Sheet Model

As shown below, Cross Sections may overlap if a Configuration Variable is set incorrectly.



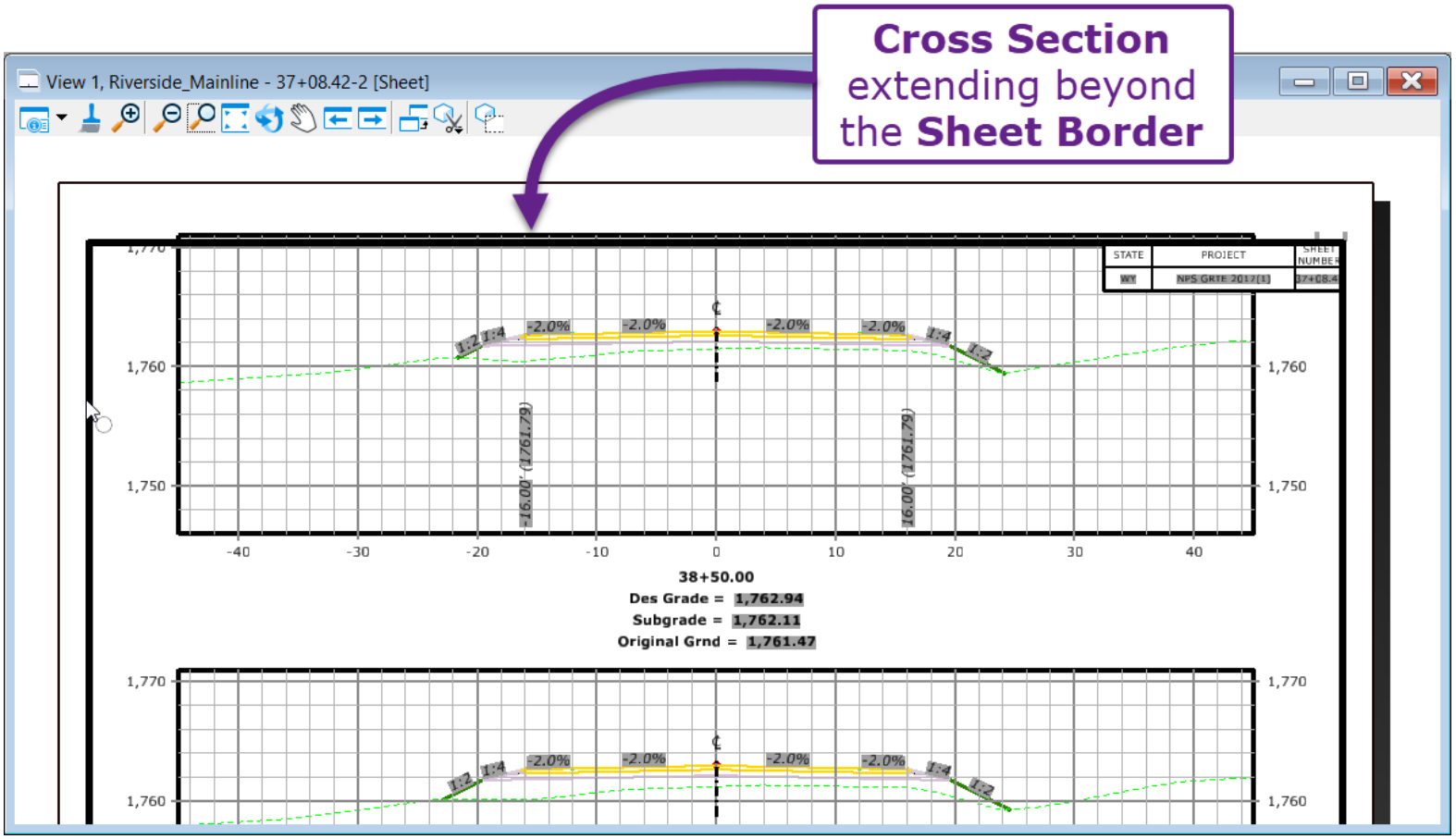
For appropriate vertical spacing between Cross Sections, the configuration variable called "CIVIL_CROSSSECTION_TOP_TO_BOT_SPACING" should be set to a value of 0.095. See the next page.

IMPORTANT: After the procedure shown below is performed, CROSS SECTION *Drawing Models* *and Sheet Models* need to be re-created to reflect the spacing changes.



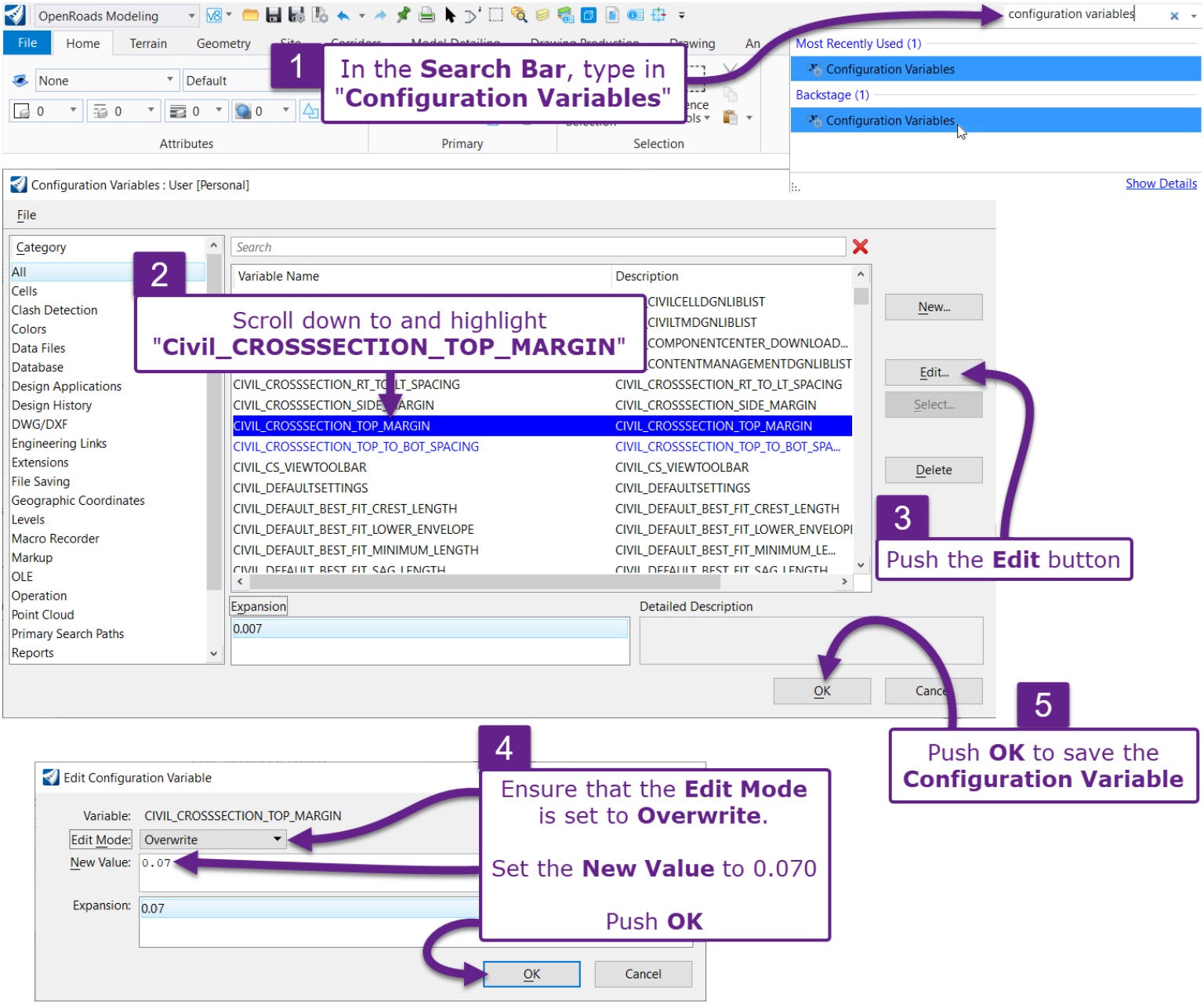
16H.8 Cross Sections Placed Beyond the Top of the Sheet Border

As shown below, top Cross Sections may extend beyond the top of the Sheet Border if a Configuration Variable is set incorrectly.



For appropriate vertical spacing between Cross Sections, the configuration variable called "CIVIL_CROSSSECTION_TOP_MARGIN" should be set to a value of 0.070. See the next page.

IMPORTANT: After the procedure shown below is performed, CROSS SECTION *Drawing Models* and *Sheet Models* need to be re-created to reflect the spacing changes.

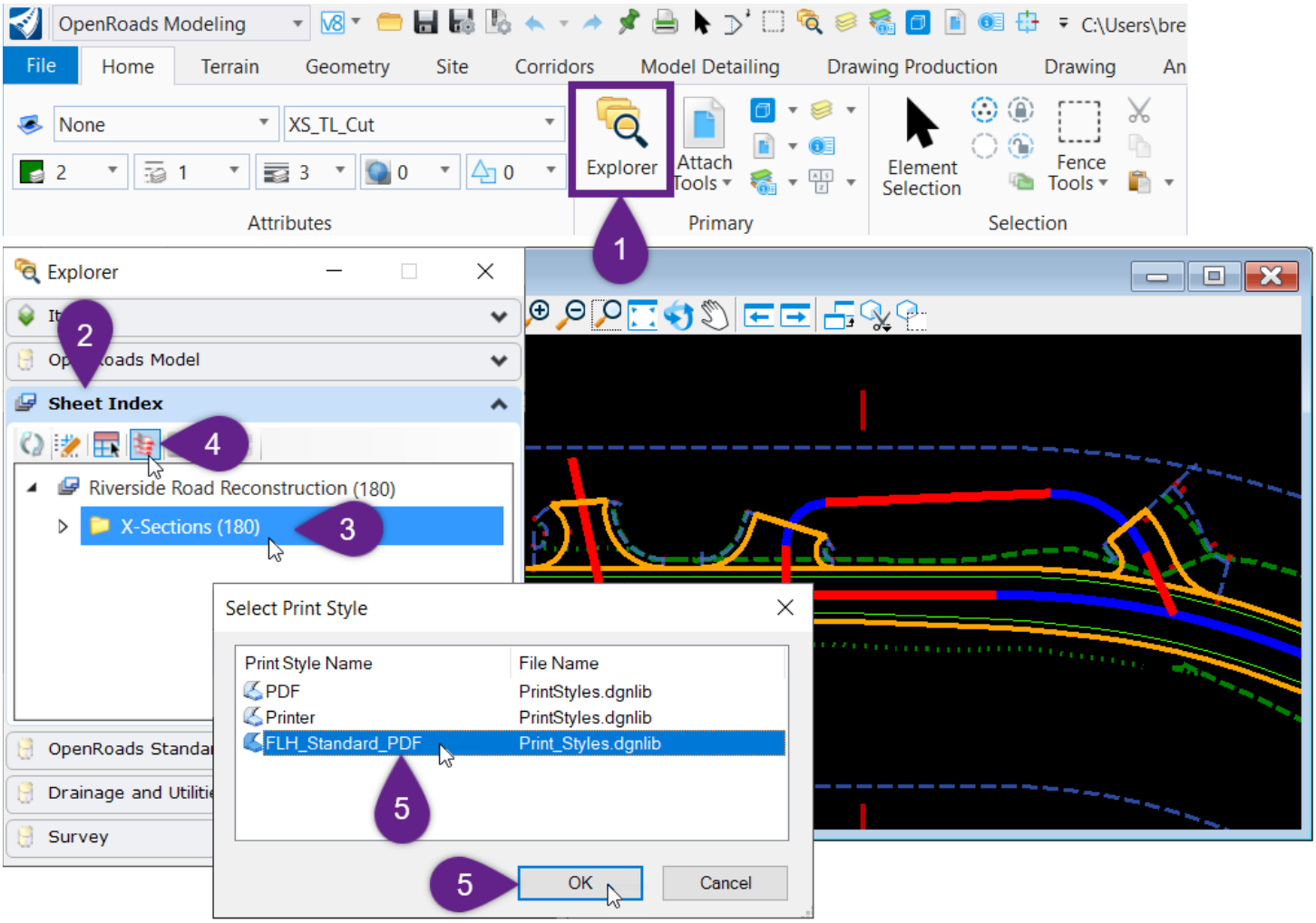


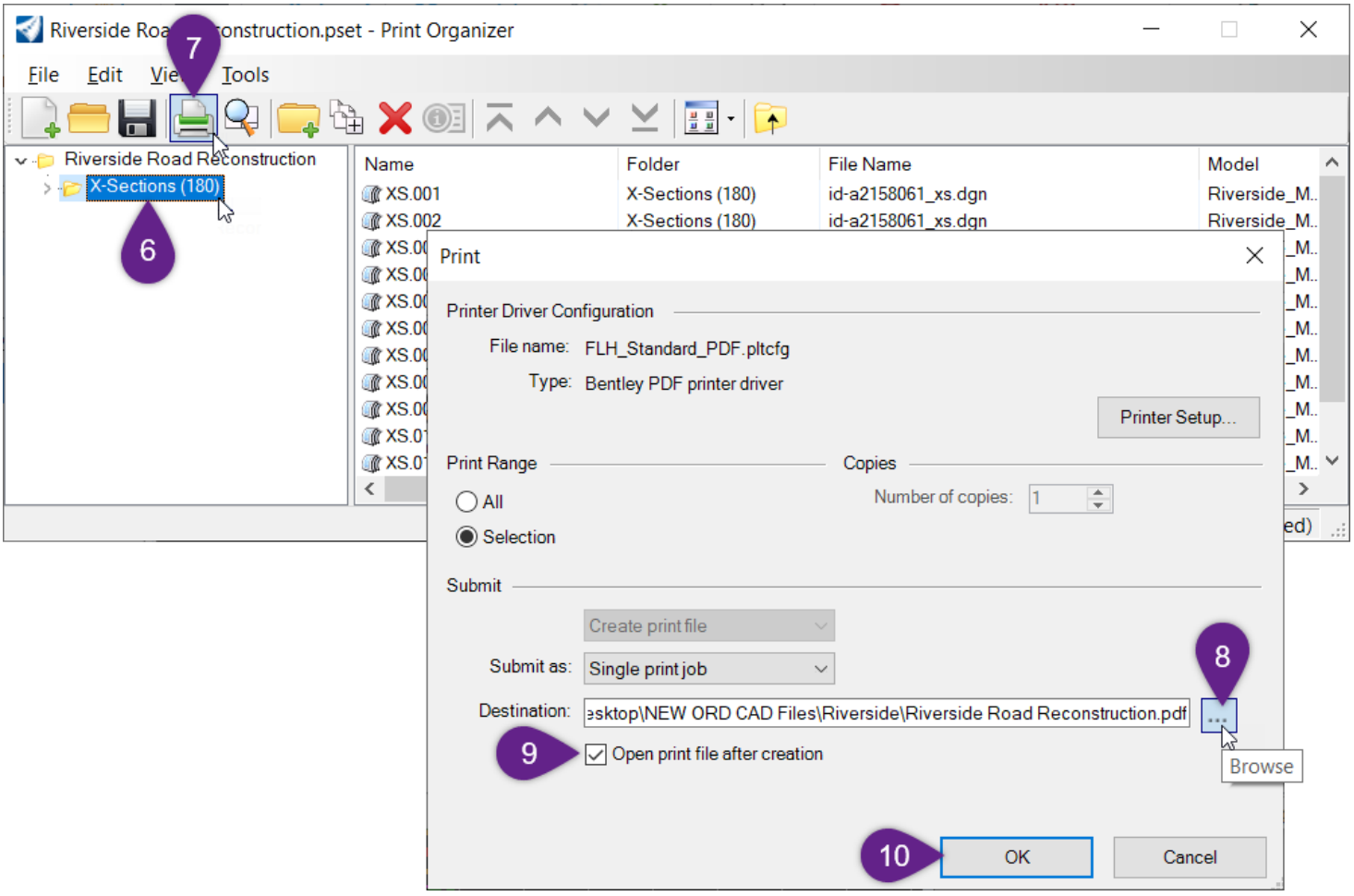
16I – PRINT CROSS SECTIONS

Cross Section *Sheet Models* must be added to the Sheet Index before printing. The *Sheet Models* are typically added to the Sheet Index in creation of the *Sheet Models*. See *16B.3 Create the Drawing Models and Sheet Models from the Named Boundary Manager*.

If the *Sheet Models* were NOT added to the Sheet Index in *Sheet Model* creation, then manually add them in the process shown in *18B.1 Alternate Method for Adding Sheets to the Sheet Index*.

TIP: Before printing, use the *Update Sheet Model Properties* to automatically refresh all Sheet Numbers and text fields in the Cross Section sheet borders. See *16H.5 Update Sheet Number and Text Fields in the Sheet Borders*.



1	Open the Explorer.
2	In the Explorer, navigate to the *Sheet Index* tab.
3	Expand the project *Sheet Index* and select (highlight) the "X-Sections" Folder.
4	Left-Click on the *Open Print Organizer* icon.
5	The User will be prompted to select a *Print Style*. Select (highlight) the "FLH_Standard_PDF" options and push OK.

6	In the *Print Organizer*, select (highlight) the "X-Sections" Folder.
7	Push the *Print* icon.
8	In the *Print* dialogue box, select the desired folder for the resulting PDF, by clicking the icon next to the *Destination* box.
9	In the *Print* Dialogue box, consider checking the *Open print file after creation* box. If this box is CHECKED, then the PDF will be automatically opened after completion of printing.
10	Select OK to proceed with printing. ***WARNING:*** Printing operations may take an extended period of time.