Module 11

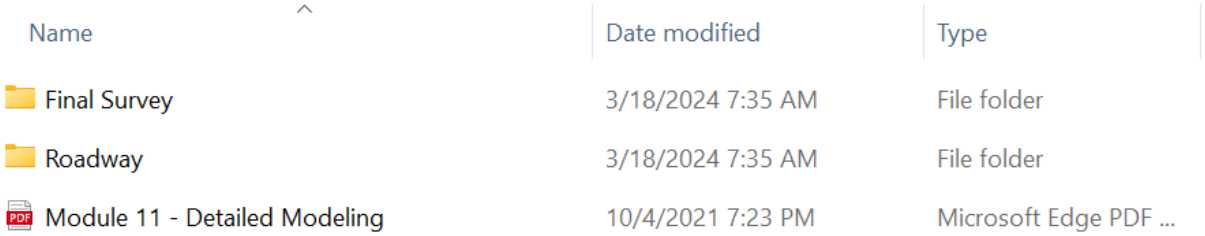
Detailed Modeling

(This page is intentionally left blank.)

Module 11 - Detailed Modeling

About this Practice Workbook...

- The Module 11 –Detailed Modeling.Zip file will be provided for download.
- Exact the zip file to the root C:\
- All files are then automatically extracted here: C:\NCDOT Training\Roadway\ Module 11 – Detailed Modeling
- With these subfolders:



The Module 11 –Detailed Modeling PDF will also be located here.

- This PDF file includes bookmarks providing an overview of the document. Click on the bookmark to quickly jump to any section in the file. You may have to turn on the bookmark function in your PDF viewer, such as Adobe Reader.

- The dataset used throughout this module uses English units and US Survey Feet.

- Each module in this series is self-contained. You can jump to any module and begin the exercises.

- The ***NCDOT_WorkSets.inp*** on your desktop should be set the following variables:
  - **NCDOT_USE_LOCAL_WORKSETS = L2**
  - **NCDOT_UNIT_TRAINING_WORKSETS = Roadway**
- This training module uses the **DOT-US North Carolina** WorkSpace, **R-2635C (Training)** WorkSet and **NCDOT_Roadway** Role. It is very important that you select the correct WorkSpace, WorkSet and Role.

- **For more information on setting up workspaces, click here.**

- The tool tips and help were copied from the Bentley Online Help. See this link for the complete list of tools and common usage.
  OpenRoads Designer CE Help (bentley.com)

- NCLUG/NCDOT Bentley ORD Open X presentations from each NCDOT Department:
  NCLUG - 2022 TECH Talks
- **This workbook was written with the release of OpenRoads Designer 10.10.XX.XX (2021)**
  OpenRoads Designer 2021 R2 update:

OpenRoads Designer Readme (bentley.com)
OpenRoads Designer 2021 Release 2 Introduction - YouTube

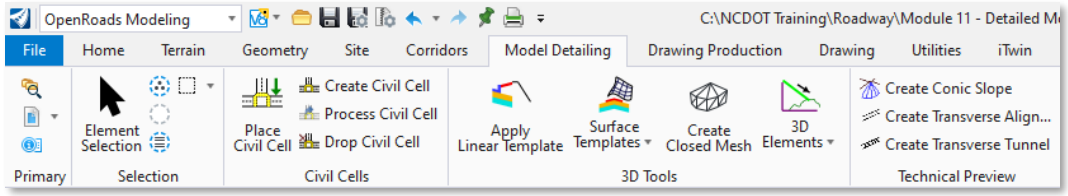
- **This workbook has been updated for the 2023 Release of OpenRoads Designer (23.00.00.129)**

Table Of Contents

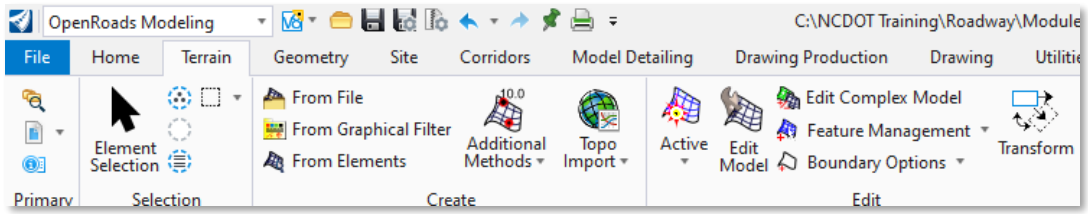
Overview

The intent of the Detailed Modeling module is to move beyond template-based modeling and focus on detail-oriented modeling. Because of the complexity of detail-oriented modeling, the module will focus on a wide range of concepts. This includes traditional corridor modeling, complex plan geometry, proposed terrain model development, and the introduction to a number of additional tools/techniques that fall outside of the traditional template-based modeling scope. By leveraging these tools and techniques, the user can take the traditional template-based corridor to a whole new level of detail and complexity. In addition to the tools that were introduced in the previous Corridor Modeling modules, the Terrain and Model Detailing ribbons will also play a major role throughout the Detailed Modeling module.

Model Detailing Ribbon



Terrain Ribbon



Key Concepts, Tools and Terminology

Design Intent

Design Intent is the act of preserving rules and relationships established during the design process in order to realize downstream benefits of automatic updates.

Linear Templates

Templates that can be applied quickly and easily to 3D linear elements but with less functionality when compared to corridor templates.

Surface Templates

A template made of components with an associated depth. These components are closed shapes such as asphalt, concrete, aggregate, grass etc. Surface Templates are used to apply material thickness to the surface of a terrain.

Terrain Modeling

A set of three-dimensional triangles mathematically computed from point data collected on the surface being modeled. Models are used to define highly irregular surfaces, particularly the surface of the earth, but can be generated for proposed surfaces, subsurface geotechnical layers, etc. Terrain models are also referred to as digital terrain models (DTMs), triangulated irregular networks (TINs), or triangulated surfaces.

Exercise 1 - Street Turnout Modeling

In this exercise, you will learn how to model a **Side Street Turnout** and **Concrete Channelization Island.** This includes the mainline pavement shearing, horizontal/vertical layout, application of linear templates, proposed terrain model development, surface template application, and various element profiling techniques. Design Intent will continue to be a major focus.

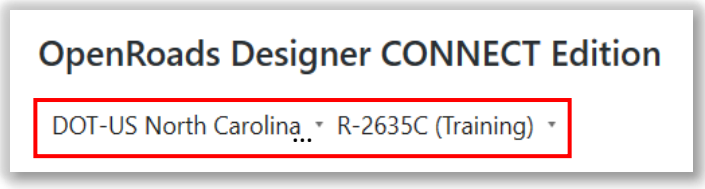
Throughout this exercise you will be working with NCDOT 2D dgn files exclusively. All design and corridor manipulation will be carried out within a 2-dimensional design plane.

1. **Launch OpenRoads Designer CONNECT Edition**

   Double-click on the NCDOT Roadway OpenRoads icon on your desktop to launch OpenRoads Designer into the NCDOT Roadway workspace.

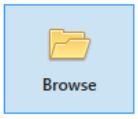
2. **Set the Workspace and Workset**

   Select DOT-US North Carolina from the Workspace menu.
   Select NCDOT R-2635C (Training) from the Workset menu.



3. **Open the Exercise 1 Corridor (CMD) dgn file and zoom in closely to the Y8 Corridor**

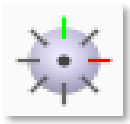
   A. Click the browse button and path to the **Module 11 (Detailed Modeling)** folder and open the R-2635C-RDY_CMD_Exercise1.dgn file.



B. Zoom in near the **Y8** Corridor as shown below. Notice that the Y8 alignment already has a base corridor. This base Y8 corridor will serve as a starting point for the Detailed Modeling exercise. See **the Initial Corridor Modeling Module** for detailed instructions for initial corridor development.

Note: All reference files that are required for the Detailed Modeling module have already been attached to the R-2635C_RDY_CMD_Exercise1.dgn file.

4. Load Civil AccuDraw and the Feature Definition Toggle Bar



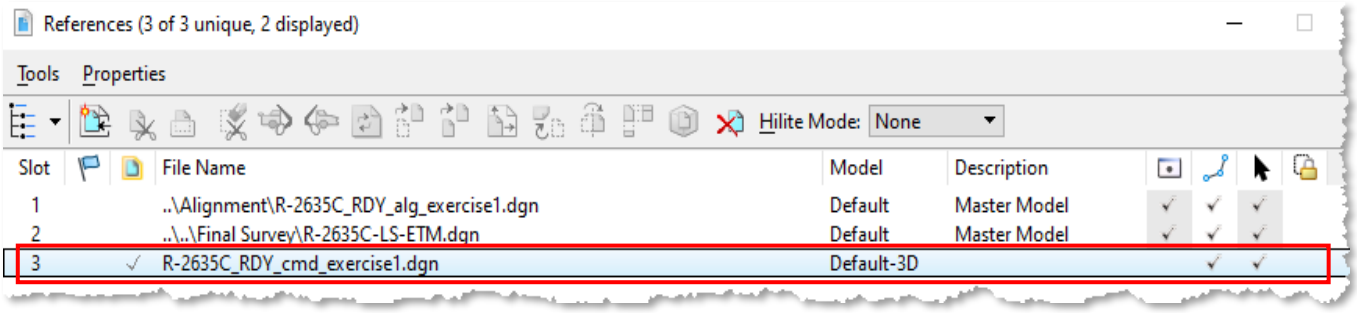
A. Click on the Civil AccuDraw button **(Geometry > General Tools > Civil Toggles > Civil AccuDraw)** to load the **Civil AccuDraw** toolbar.

B. Click on the Feature Definition Toggle Bar button **(Geometry > General Tools > Standards > Feature Definition Toggle Bar)** to load the **Feature Definition Toggle Bar**.

Tip: Both of these toolbars will be used throughout the design/modeling process. Because of this, it's recommended that both are docked for easy access.

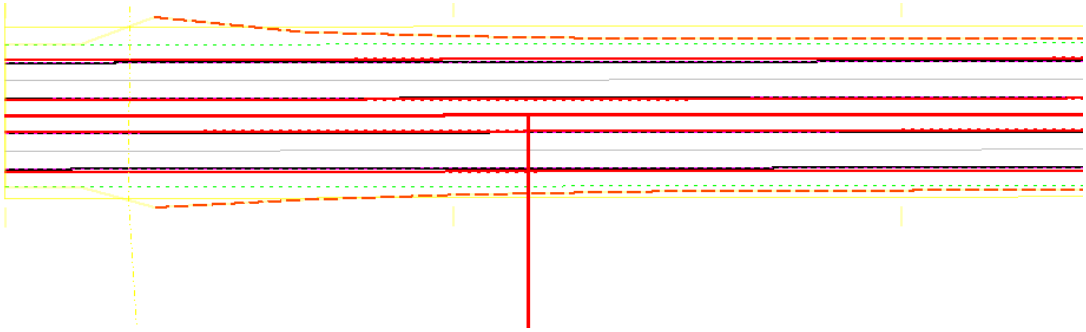
5. Adjust the level and reference file display as needed to better facilitate design/modeling

A. With the **View 1, Default** view in focus, turn the display of the **Default-3D** view off as shown below.

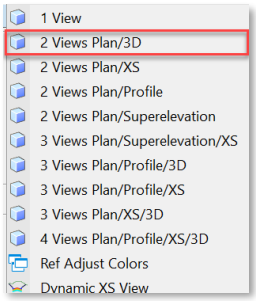


THE ETM FILE IS BROKEN UP LOADING IN, HAVE TO RE-REFERENCE IT TO MAKE IT WORK IN ADDITION, THE MONOLITHIC ISLAND IS ALREADY MODELED

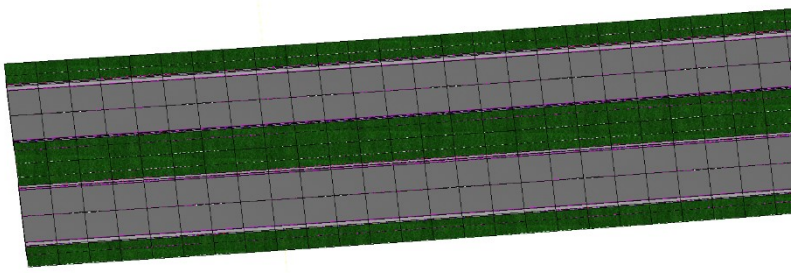
B. Notice that the 3D model has been turned off, leaving just the linework. Depending on your prefence, you may choose to turn off additional linear elements to avoid confusion.



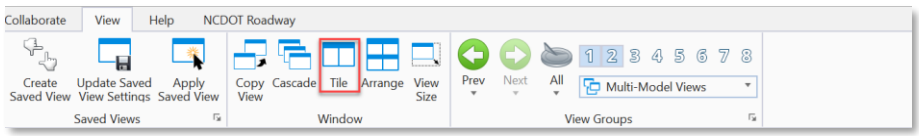
6. **Open an additional 3D view to better facilitate 3D modeling**
   A. Right-click within the **View 1, Default** view and hold to load the **View Control** menu. From there, select the **2 Views Plan/3D** option as shown below.



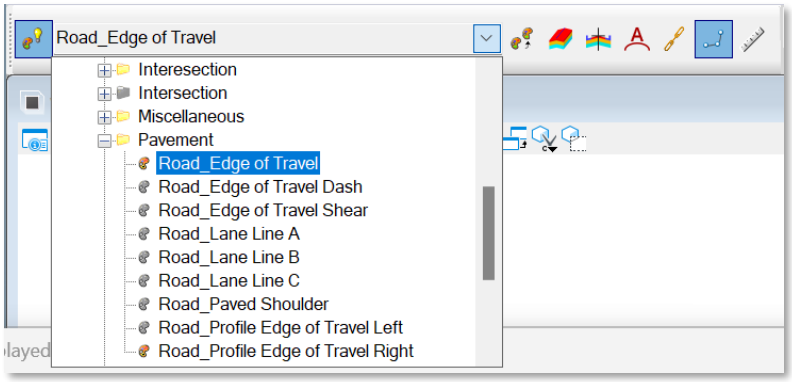
   B. This will load the **View 2, Default-3D** view in addition to the standard **View 1, Default** view as shown below. As you continue to develop your model you can now easily visualize it.



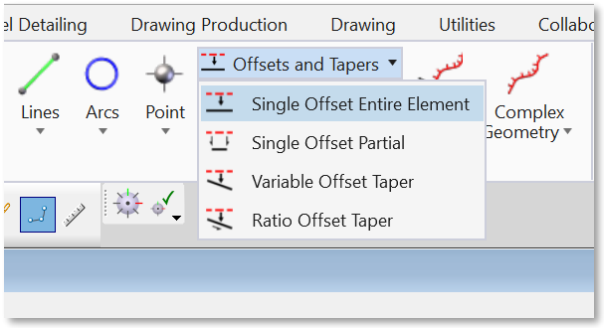
   C. Then**,** click the **Tile** button **(View > Window > Tile**) as shown below to tile the two (2) windows. This will make it easier to focus on both views at the same time.

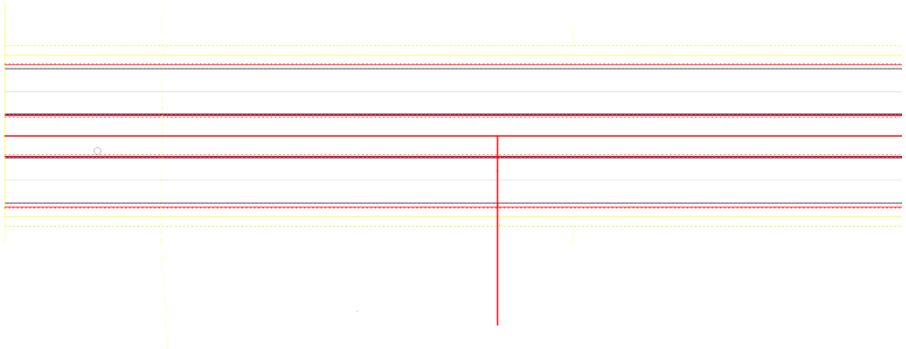


7. **Layout the Horizontal Geometry for the Street Turnout**
   A. From the **Feature Definition Toggle Bar**, toggle on the Use **Active Feature Definition** button and then select the **Road_Edge of Travel** feature from the **(Linear > Roadway > Pavement)** folder as shown below. Keep this **Feature** active throughout all steps that follow.

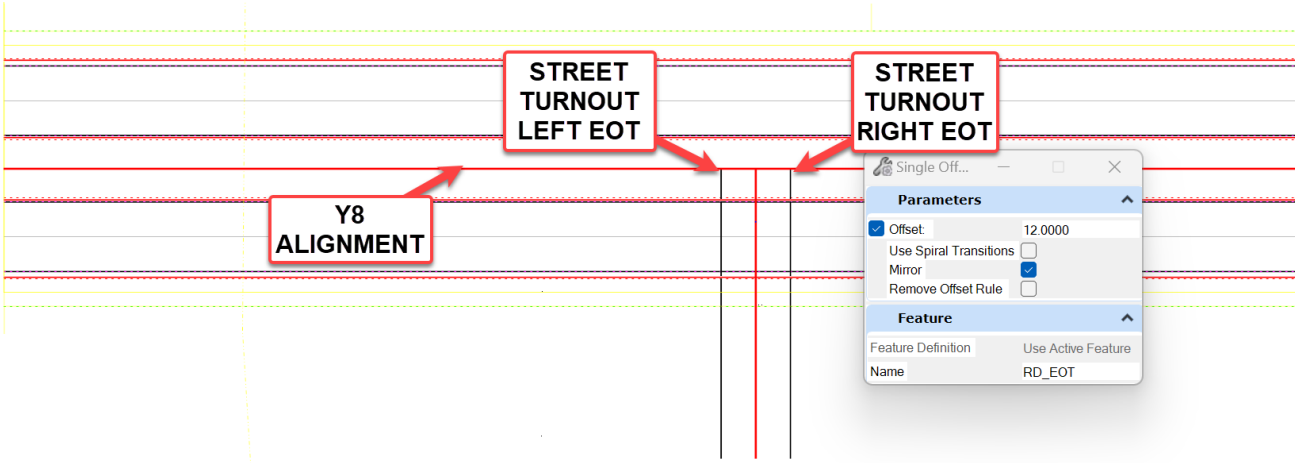


   B. Next, select the **Single Offset Entire Element** tool **(Geometry > Horizontal > Offsets and Tapers > Single Offset Entire Element)** and then select the street turnout centerline (**Y8A**) when prompted to locate element.

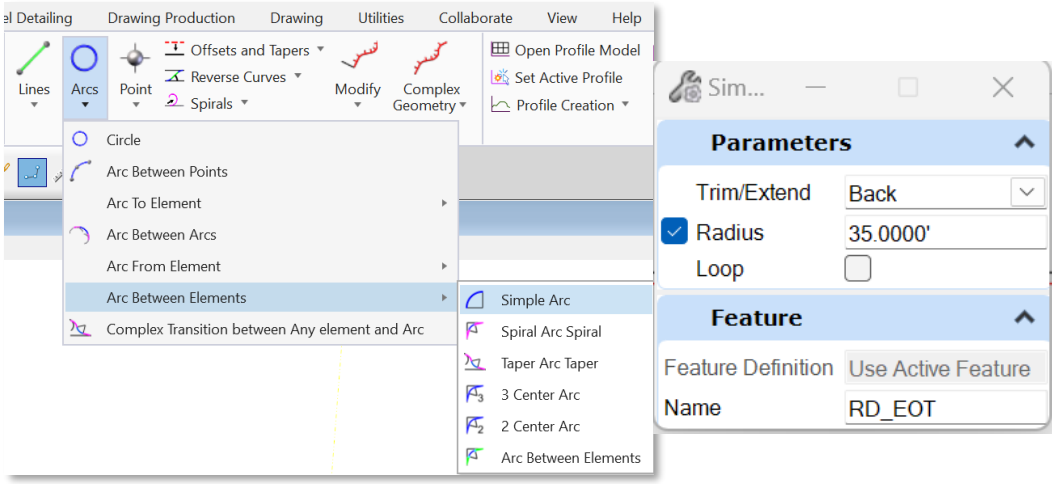




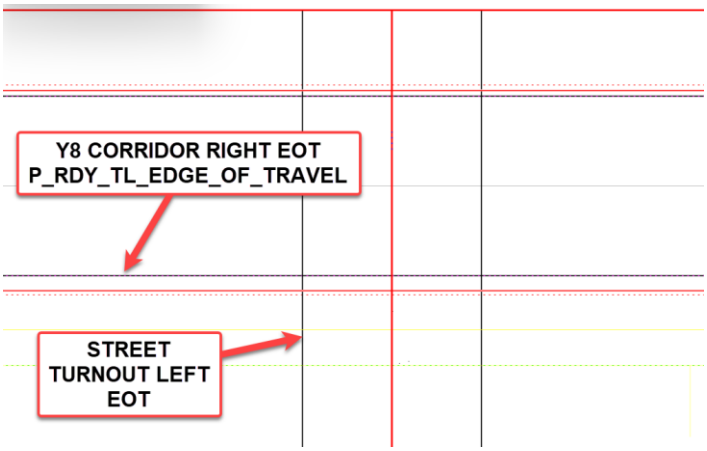
C. Set the **Offset** parameter to **12.0000** and toggle on the **Mirror** option within the **Single Offset Entire Element** dialog and click through the prompts to accept. This will draw the left and right EOT lines for the **Y8A** street turnout.



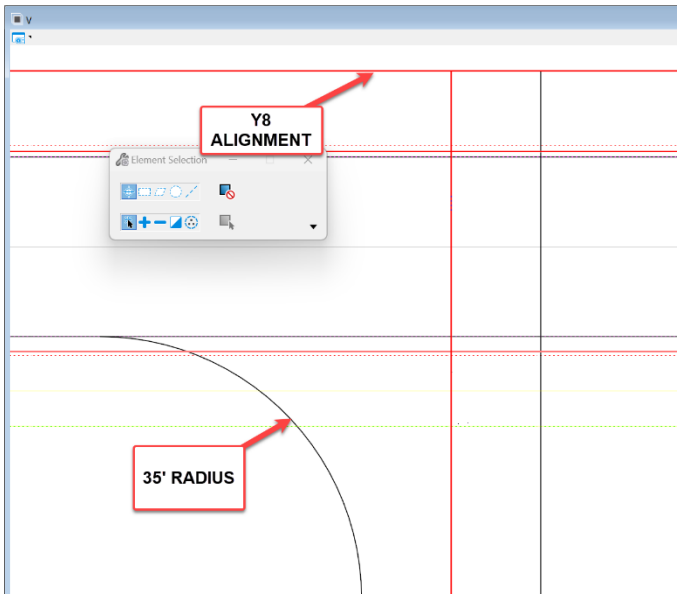
D. Now, select the **Simple Arc** tool **(Geometry > Horizontal > Arcs > Arc Between Elements > Simple Arc).** Set the **Radius** parameter to **35.0000'** and the **Trim/Extend** parameter to **Back** within the **Simple Arc** dialog as shown below.



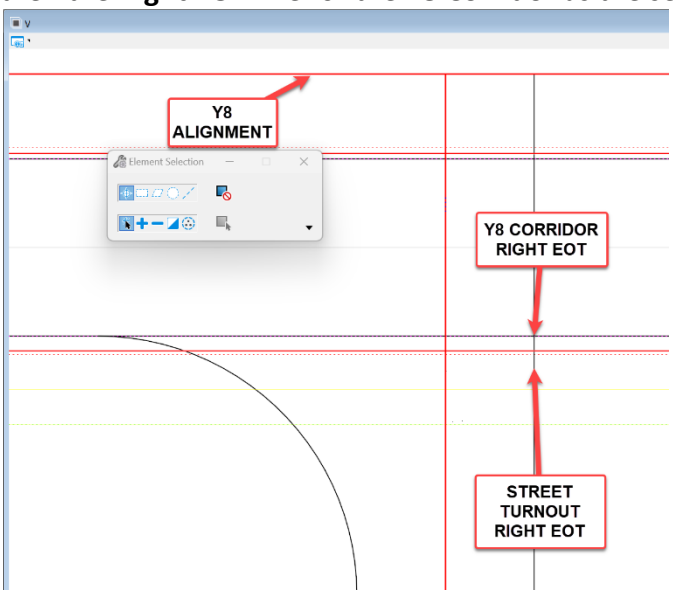
E. When prompted to **Locate First Element**, select the **Left EOT** line for the street turnout **(Y8A)** and then select the **Right EOT** line for the **Y8 Corridor** as the **Second Element.** When selecting the **Y8 Corridor Right EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's very **IMPORTANT** to select the correct linear element.



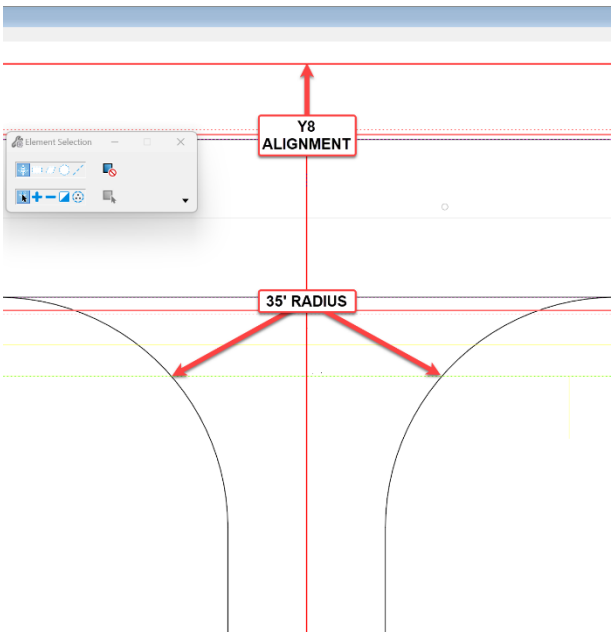
F. After selecting both elements, click through the additional prompts to place the **35'** radius as shown below.



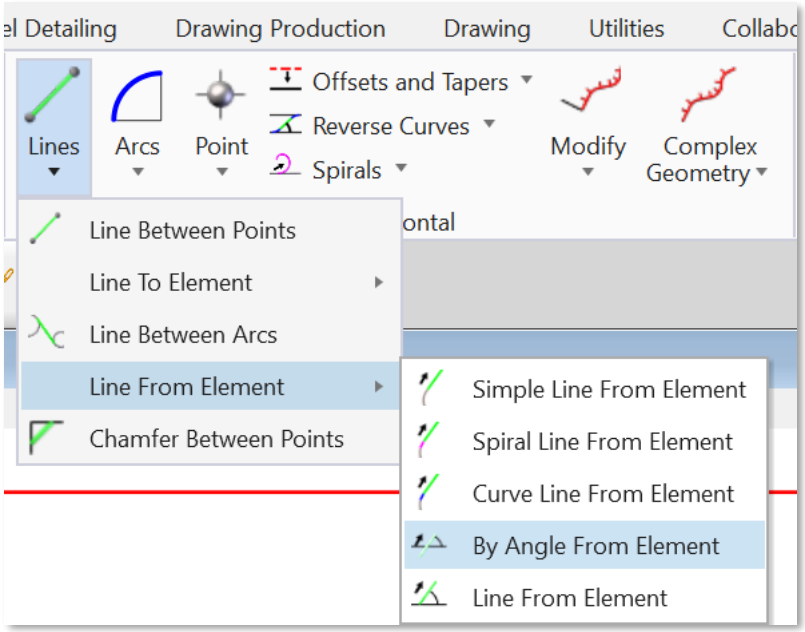
G. Now, place a **35'** radius return on the other side of the street turnout following the previous steps. This time select the **Right EOT** of the street turnout **(Y8A)** when prompted to **Locate First Element** and then the **Right EOT** line for the **Y8 Corridor** as the second.



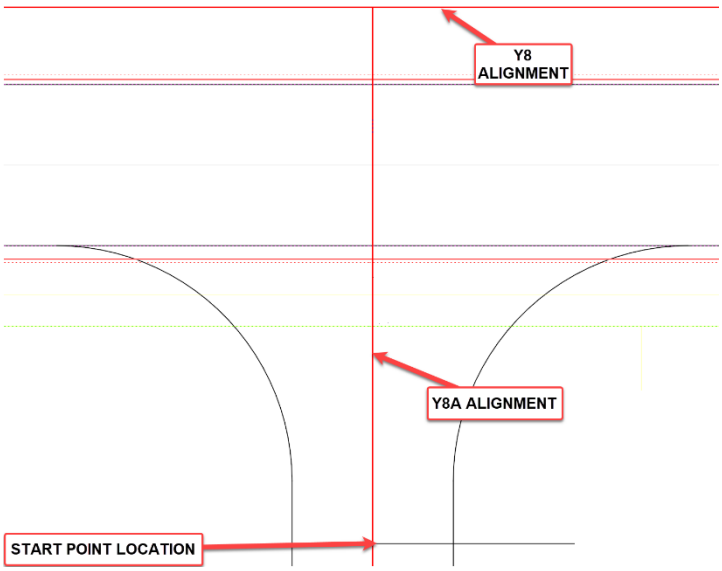
H. After selecting both elements, click through the additional prompts to place the **35'** radius as shown below.



I. Next, select the **By Angle From Element** tool **(Geometry > Horizontal > Lines > Line From Element > By Angle From Element).** Set and lock the **Skew** parameter to **90° 00' 00"**, the **Start Distance** parameter to **0.0000, End Distance** parameter to **-30.0000,** and **Name** to **Y8A TIE** within the **By Angle From Element** dialog as shown below.

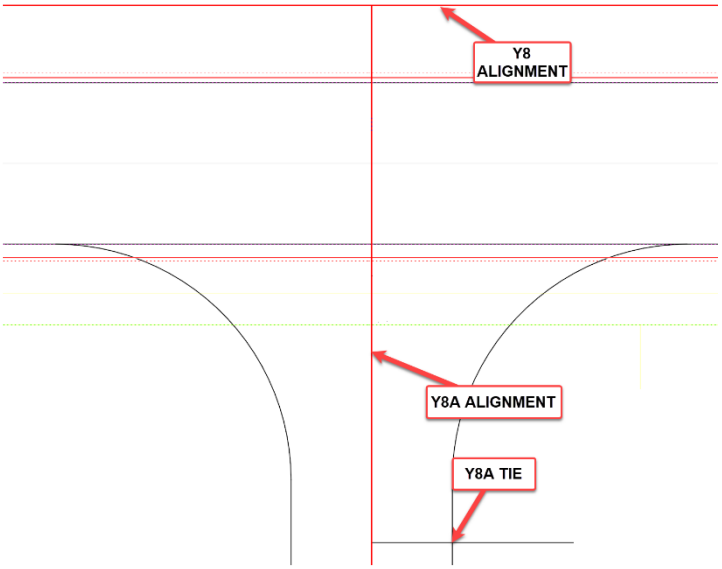


J. When prompted to **Locate Element**, select the centerline of the street turnout (**Y8A**). Drag your mouse just beyond the radius returns and **Left-Click** the screen when prompted to **Enter**

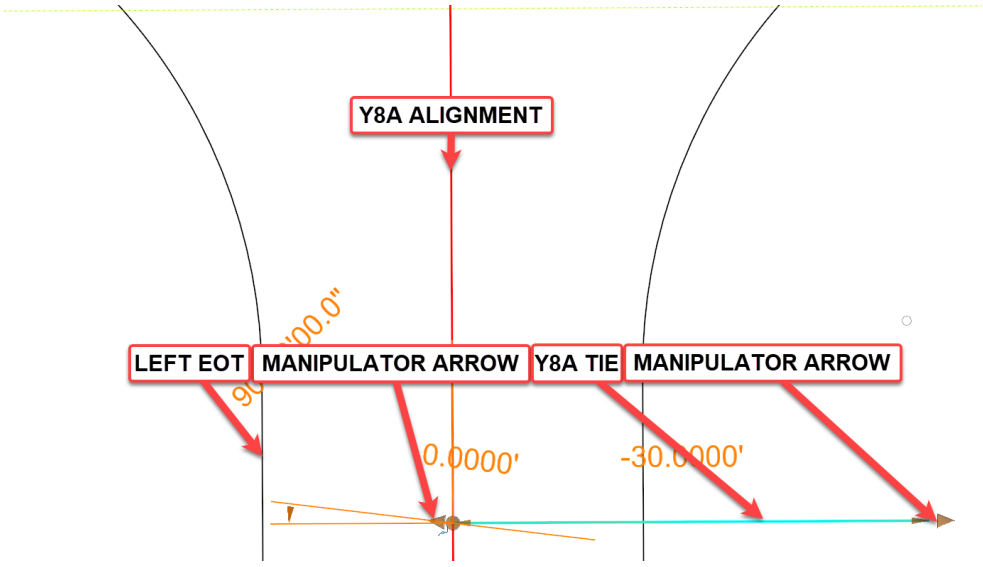


Start Point. This will define the start point of a line from the **Y8A** alignment at a **90°** skew as shown below.

K. Then, click through the additional prompts to finish placing the **Y8A TIE** line as shown below.

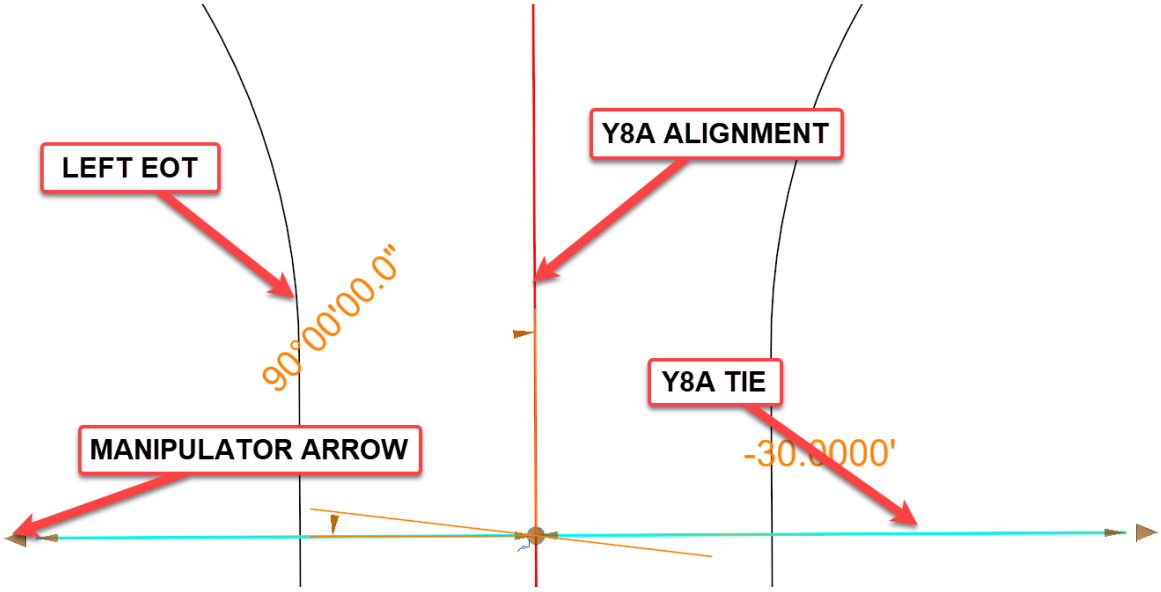


L. Now, click on the line that was just placed and notice the **Small Arrows** that are displayed on the outer end of each side. These **Arrows** can be used to manipulate the element they are associated with.

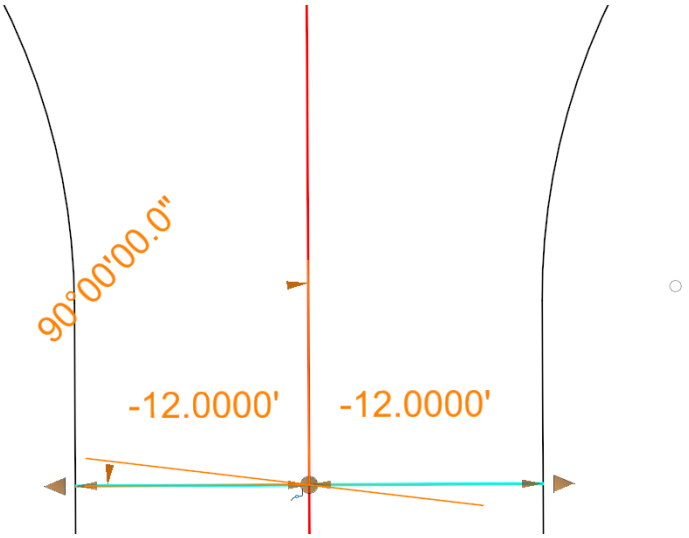


M. **Left-Click** and **Drag** the left side **Manipulator Arrow** just beyond the **Left EOT** of the **Side Street (Y8A)** as shown below.

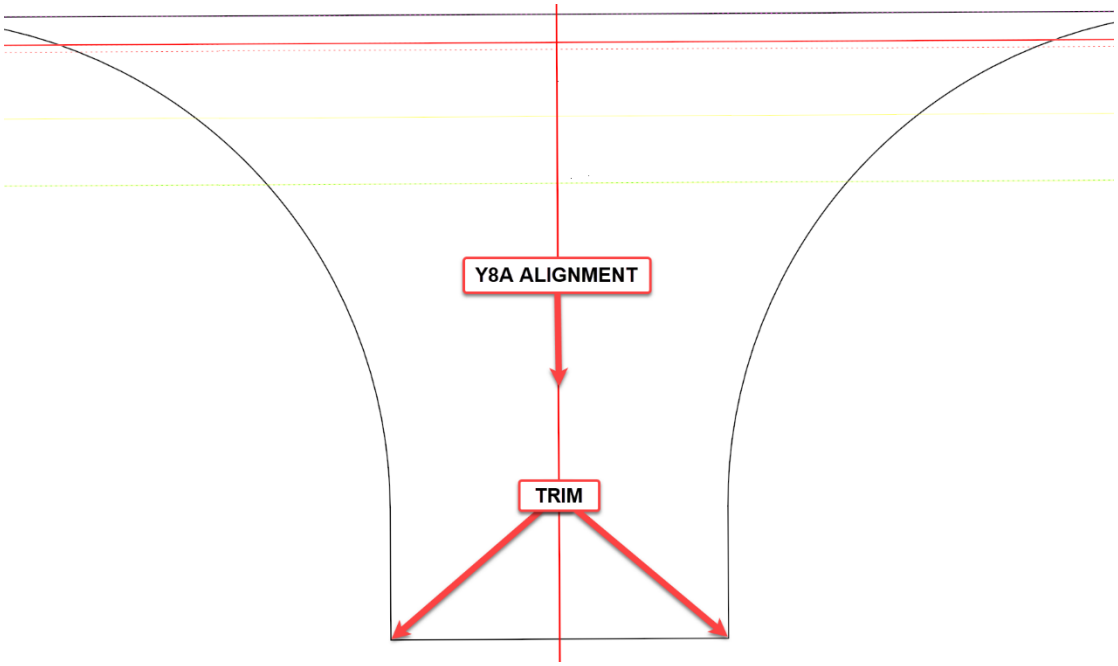
y8



N. Next, modify the **Y8A TIE** line widths on both sides of the **Y8A** alignment to **-12'** as shown below. The **Y8A TIE** line represents the location where the **Side Street (Y8A)** ties to existing.

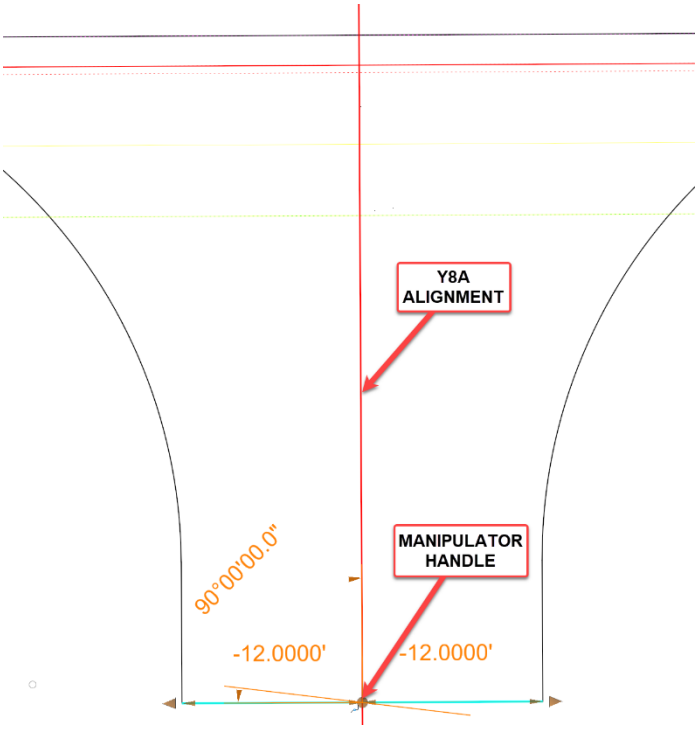


O. Next, select the **Trim To Intersection** tool **(Drawing > Modify > Trim To Intersection)** and trim the **Street Turnout (Y8A)** EOT and TIE lines and as shown below.

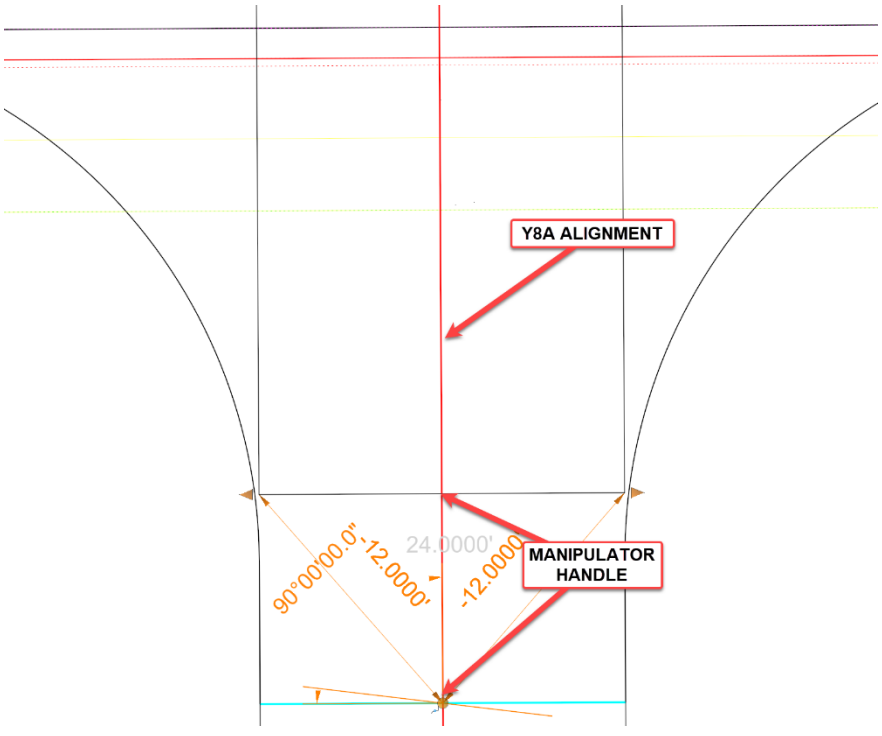


8. **Demonstrate the Horizontal Design Intent associated with the Street Turnout**

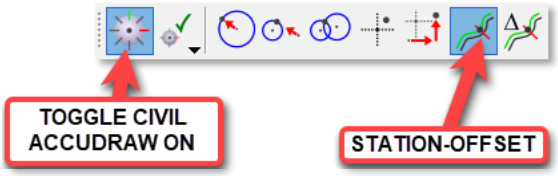
   A. When the **EOT** lines were **Trimmed** in the previous step, a **Rule** was created. Click the **EOT** line that was drawn at a **90°** degree angle from the **Y8A** alignment as shown below. Notice the **Manipulator Handle** that is displayed in the center.



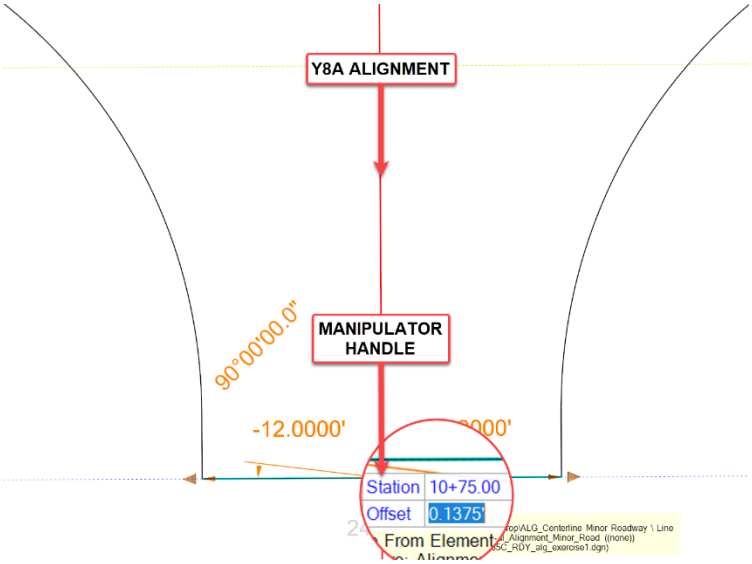
   B. Next, click, hold, and drag the **Manipulator Handle** at the intersection up and down along the **Y8A** alignment and notice that the line moves as well.



C. Now, Toggle **Civil AccuDraw** on and select the **Station-Offset** icon as show below.

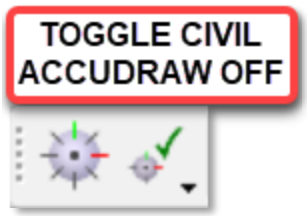


D. After activating **Civil AccuDraw**, click, hold, and drag the **Manipulator Handle** at the intersection again. Notice that the **Civil AccuDraw** dialog now loads as well, and is tracking your movement along the **Y8A** alignment as show below.

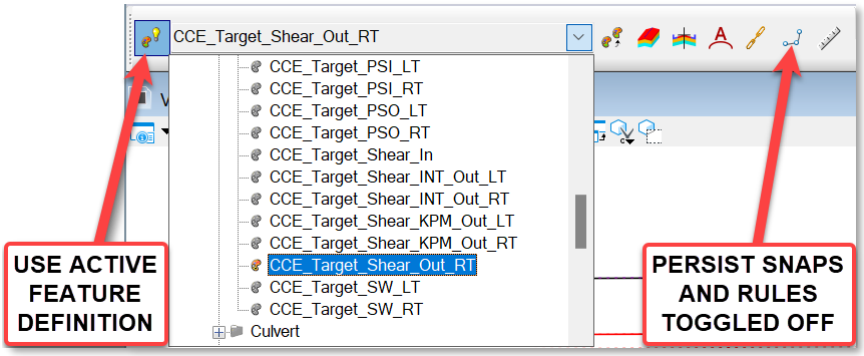


E. Key-in **10+75.00** and then left click the screen to place the line as shown above. Notice that the left and right EOT lines move as well because of the rule that was created previously when using the **Trim To Intersection** command.

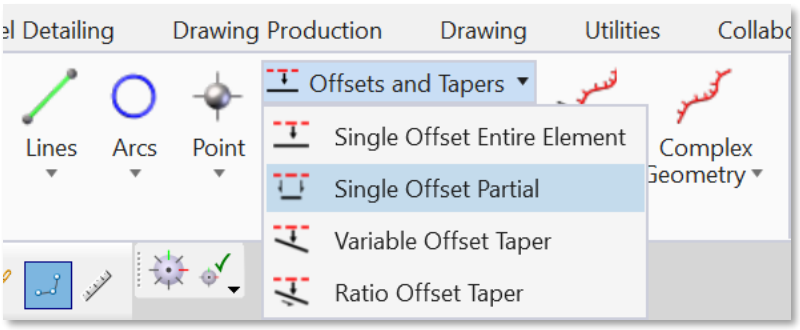
F. Toggle **Civil AccuDraw** off as shown below but keep the **Civil AccuDraw** toolbar loaded.

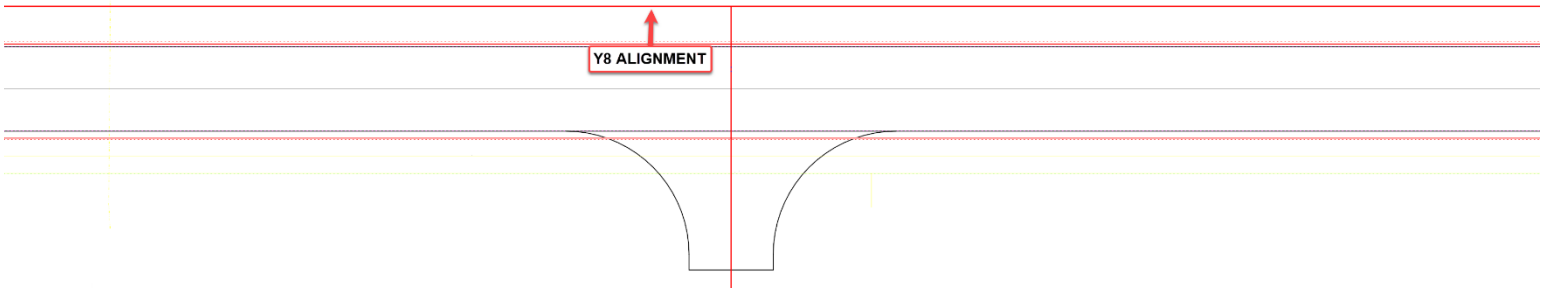


9. **Shear the Y8 pavement through the Y8A Side Street intersection**
   A. From the Feature Definition Toggle Bar, toggle **On** the **Use Active Feature Definition** button and then select the **CCE_Target_EOT_Shear_Out_RT** feature from the **(Linear > Roadway > Construction Class Element)** folder as shown below.

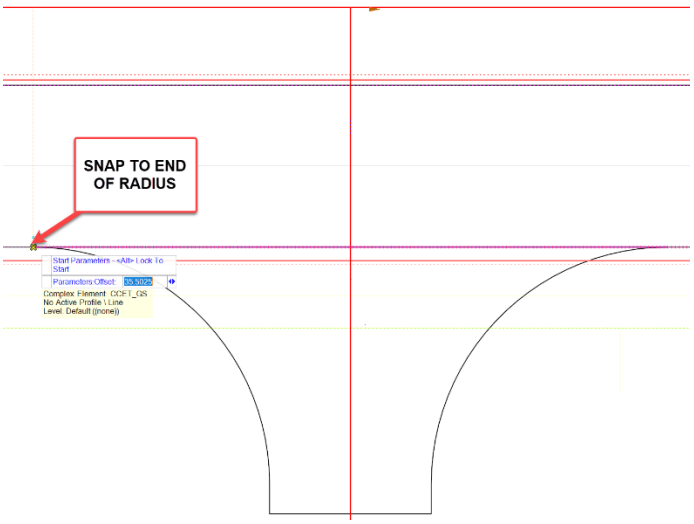


   B. Select the **Single Offset Partial** option **(Geometry > Horizontal > Offsets and Tapers > Single Offset Partial)** as shown below and select the **Y8** Alignment when prompted to **Locate Element.**

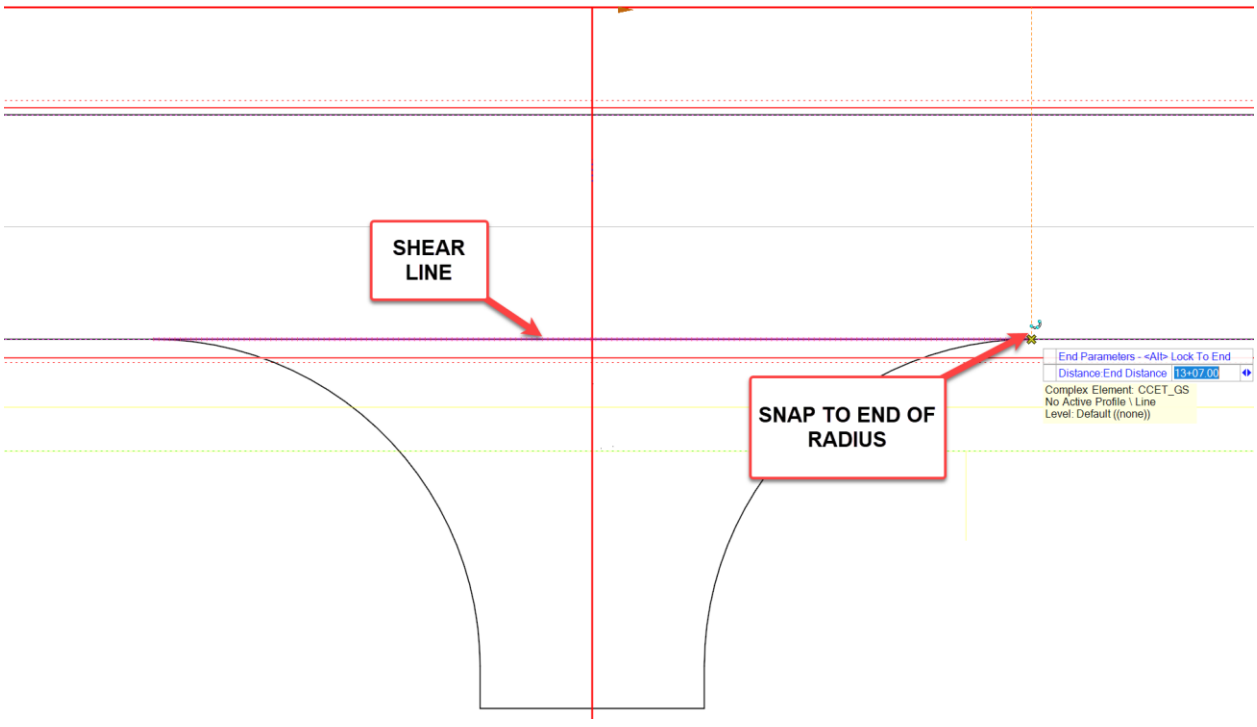




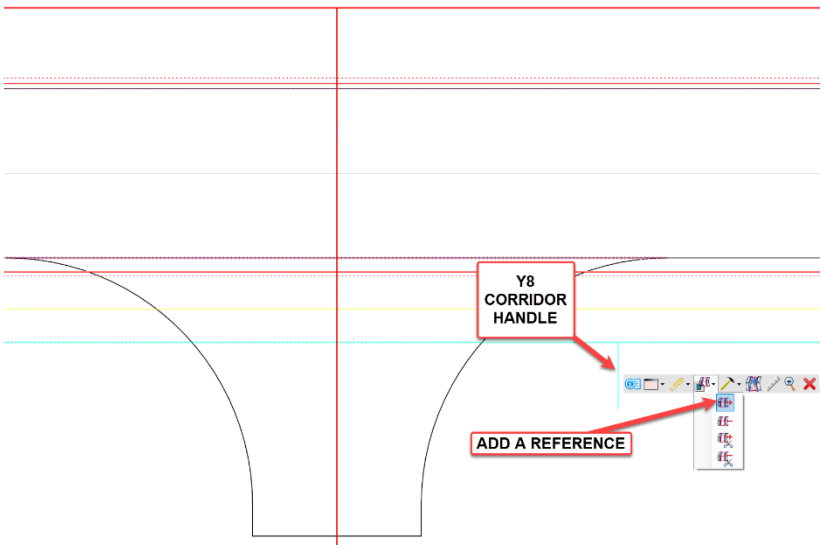
C. When prompted for a **Start Station**, snap to the end of the left-side radius as shown below.



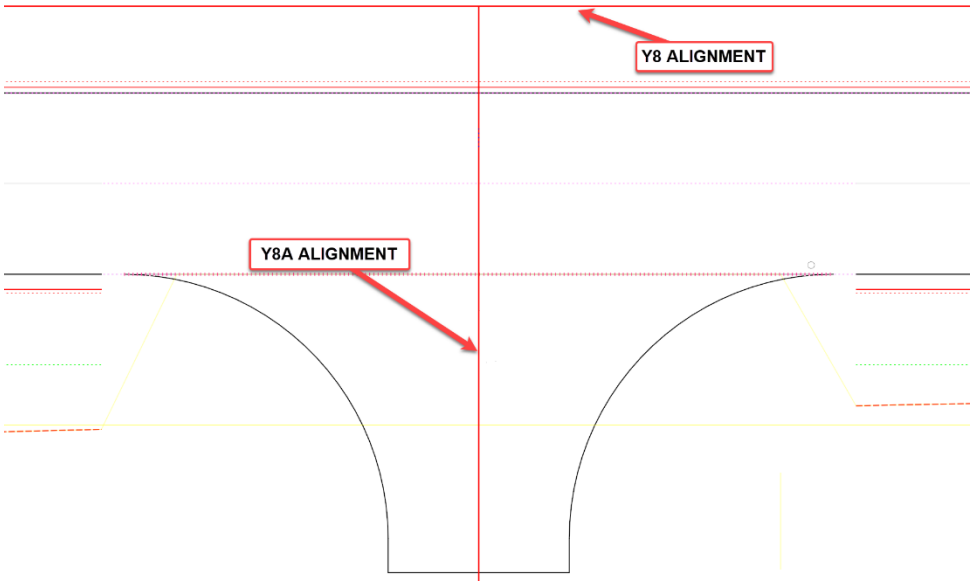
D. Next, snap to the end of the right-side radius as shown below to place the shear line as shown below.



E. Click the **Y8 Corridor** Object Handle, hover for a moment to display the menu, and then select the **Add Corridor Reference** option as shown below.



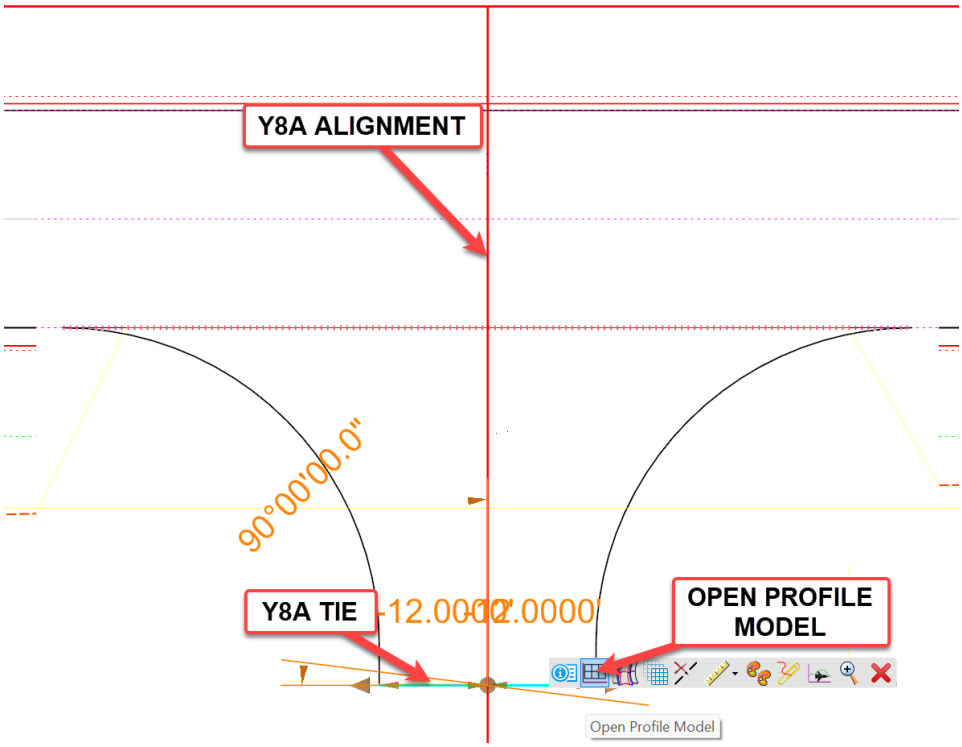
F. After adding the **Shear** line as a **Corridor Reference**, the **EOT** is sheared as shown below.



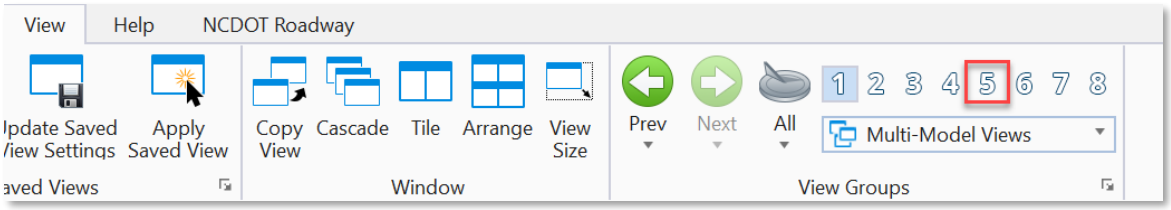
G. Notice that the pavement has also been sheared within the **View 2, Default-3D** view as well.

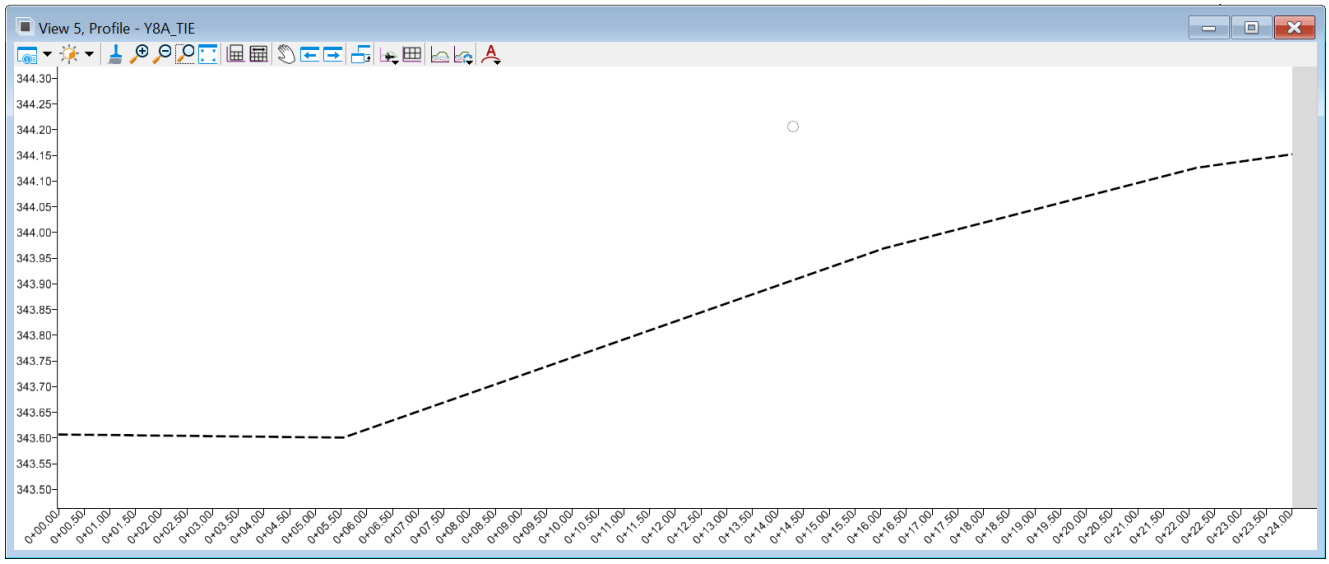
10. Profile the Side Street (Y8A) EOT lines

A. Click the **Y8A TIE** line shown below, hover for a moment to display the menu, and then select the **Open Profile Model** option.

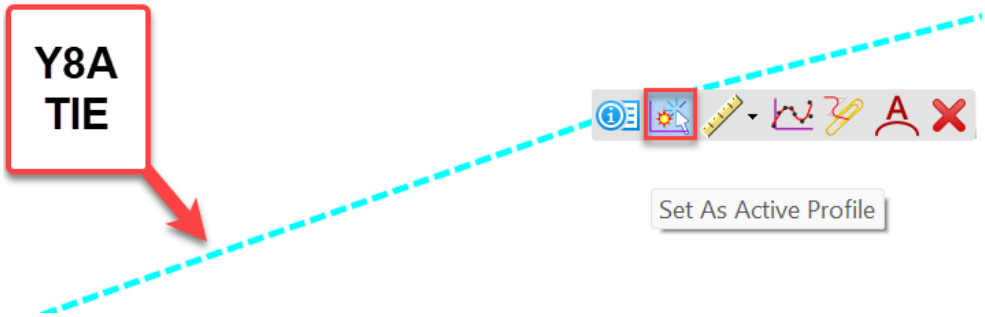


B. When prompted to **Select or Open View,** click the **View 5** option, within the **View Groups** group **(View > View Groups**) and then, left click within the view to open the **Y8A TIE** line profile view as shown below.

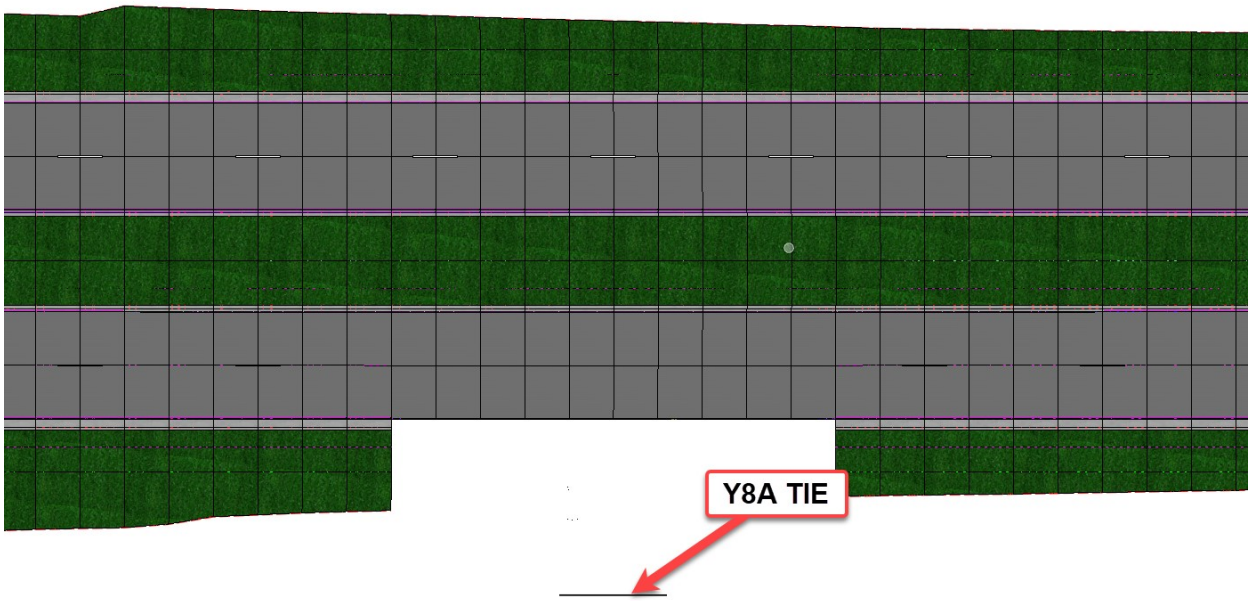




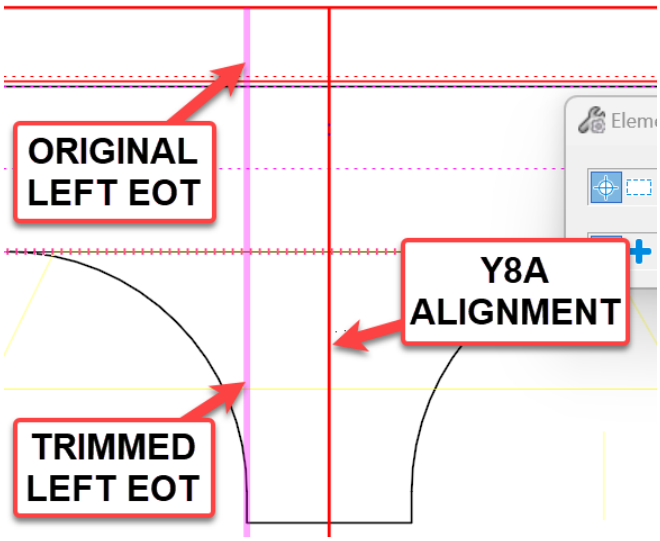
C. Now, Click the existing **Y8A TIE** line shown below, hover for a moment to display the **Profile Menu** as shown below, then select the **Set as Active Profile** option.



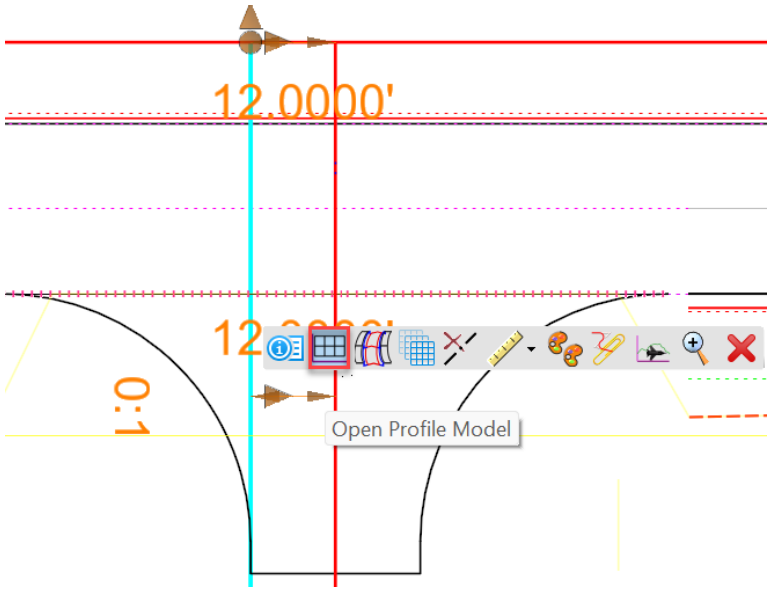
D. Notice in the **View 2, Default 3D** window that the **Y8A TIE** line is now displayed in the 3D model. This is because it now has a vertical attribute associated with it.



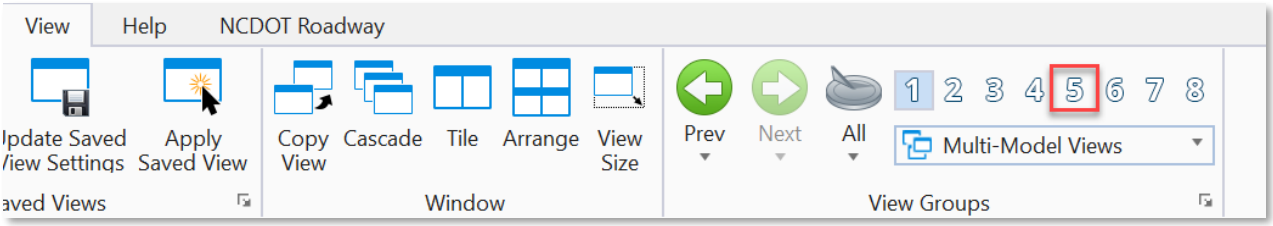
E. Move your mouse **12'** to the left of the **Y8A** alignment and notice the pink line as displayed below. This line represents the **Y8A** left **EOT** line in its original state before it was trimmed. This line acts as a parent to the small, trimmed EOT section that is still visible.



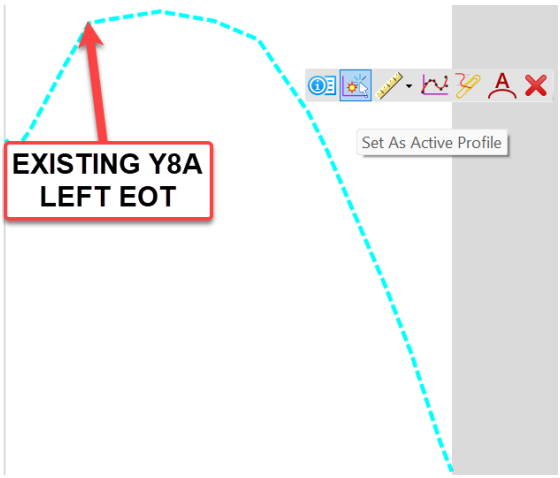
F. Click the **Left EOT** line shown below, hover for a moment to display the menu, and then select the **Open Profile Model** option.



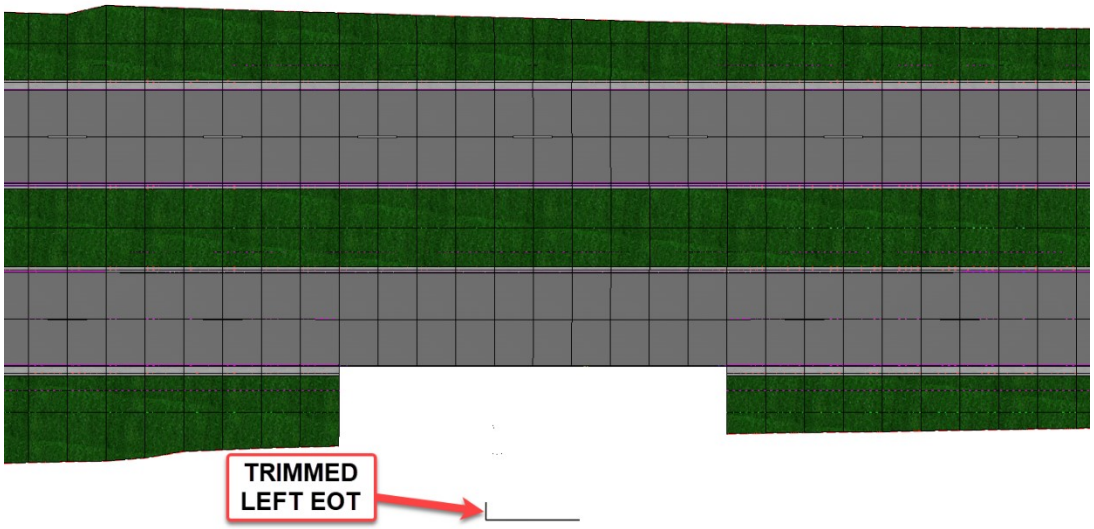
G. When prompted to **Select or Open View,** click the **View 5** option, within the **View Groups** group **(View > View Groups**) and then, left click within the view to open the **LEFT EOT** profile.



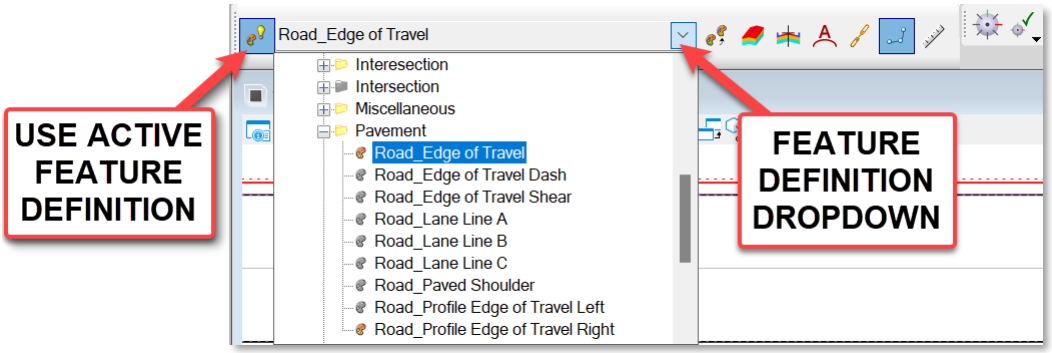
H. Now, click the existing **Y8A LEFT EOT** line shown below, hover for a moment to display the **Profile Menu** as shown below, then select the **Set as Active Profile** option.



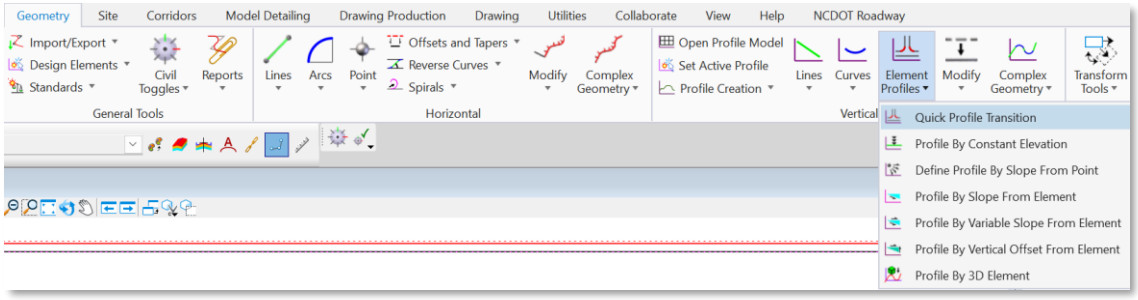
I. Notice in the **View 2, Default 3D** window that the **TRIMMED LEFT EOT** line is now displayed in the 3D model. This is because the **LEFT EOT** now has a vertical attribute associated with it and there is a **Parent/Child** relationship between the **LEFT EOT** line and the **TRIMMED LEFT EOT** line.



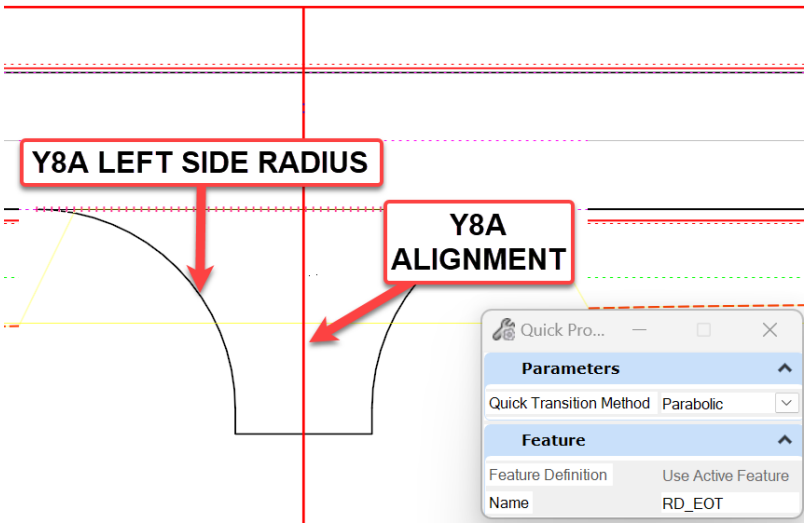
J. From the **Feature Definition Toggle Bar**, toggle on the Use **Active Feature Definition** button and then select the **Road_Edge of Travel** feature from the **(Linear > Roadway > Pavement)** folder as shown below. Keep this **Feature** active throughout all steps that follow.



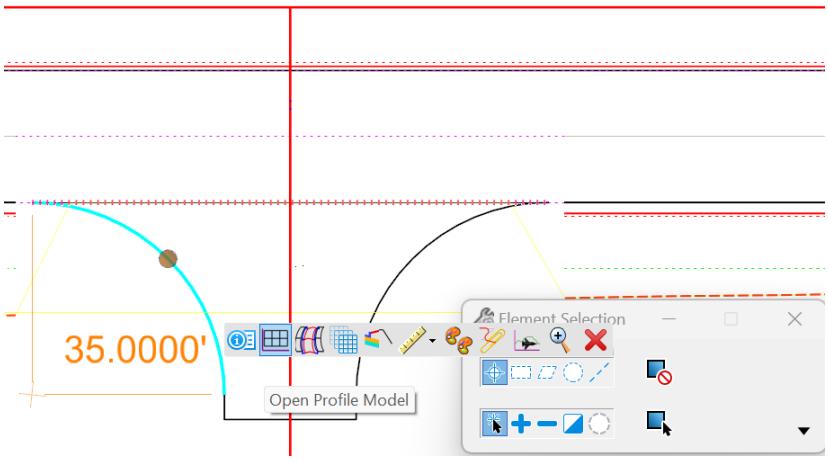
K. Next, select the **Quick Profile Transition** tool **(Geometry > Vertical > Element Profiles > Quick Profile Transition)** as shown below.



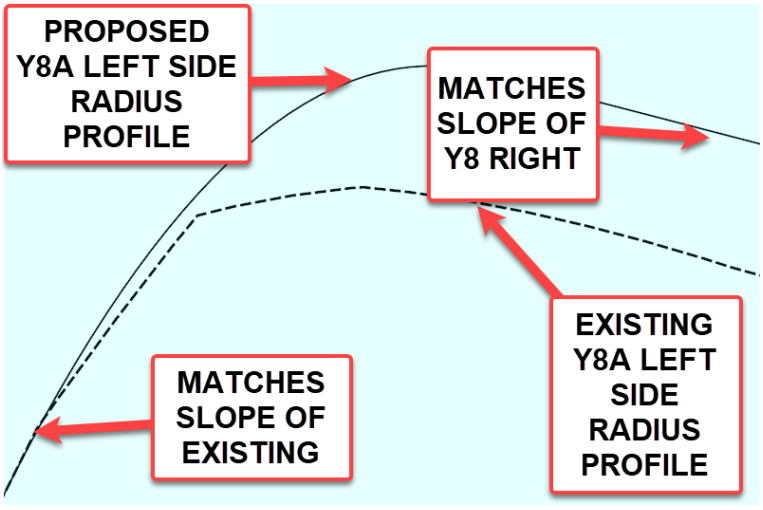
L. Then, set the **Quick Transition Method** to **Parabolic**, left click to accept, and then select the **Y8A Left Side Radius** on the left side of the **Y8A** alignment as shown below.



M. Click the **Y8A Left Side Radius** shown below, hover for a moment to display the menu, and then select the **Open Profile Model** option to open the **Proposed Y8A Radius** profile.



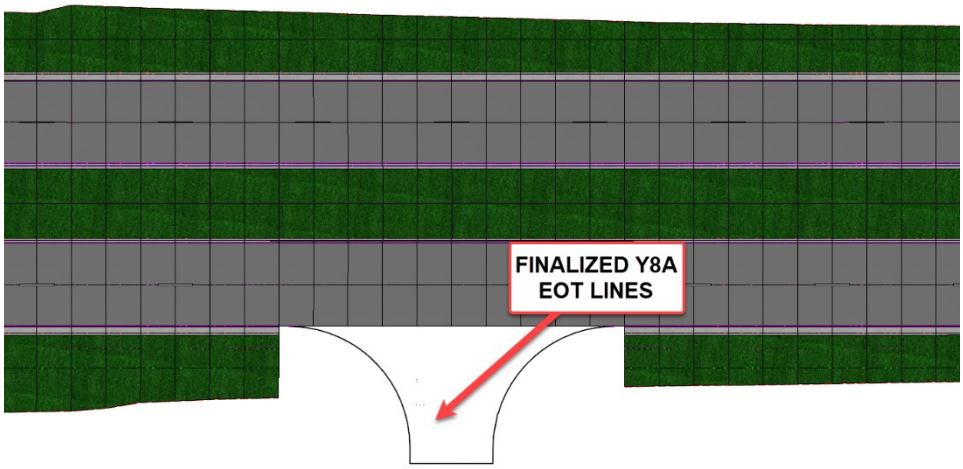
N. Notice the **Proposed Y8A Radius** profile that was created using the **Quick Profile Transition** tool. The **Quick Profile Transition** tool created a best-fit profile for the **Y8A Left Side Radius.**



Note: This profile is dynamic. If the Y8 profile is changed, the Proposed Y8A Left Side Radius will reflect this change.

O. Notice in the **View 2, Default 3D** window that the **Proposed Y8A Left Side Radius** is now displayed in the 3D model.

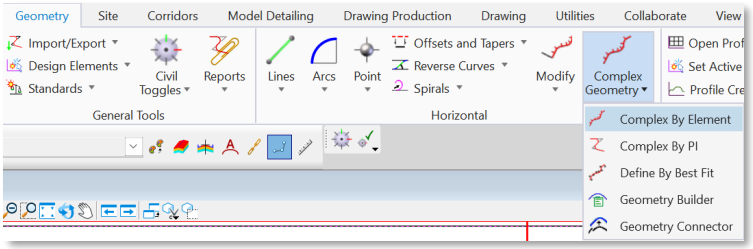
P. After profiling the **Y8A Left EOT** lines, follow these same steps and profile the **Y8A Right EOT** lines to finalize the **Side Street (Y8A)** vertical as shown below.



Note: The methodology used to profile the Y8A EOT lines is just one of several ways using OpenRoads Designer. See the Vertical Alignment module for more detailed information on OpenRoads Designer Vertical Geometry tools and methodology.

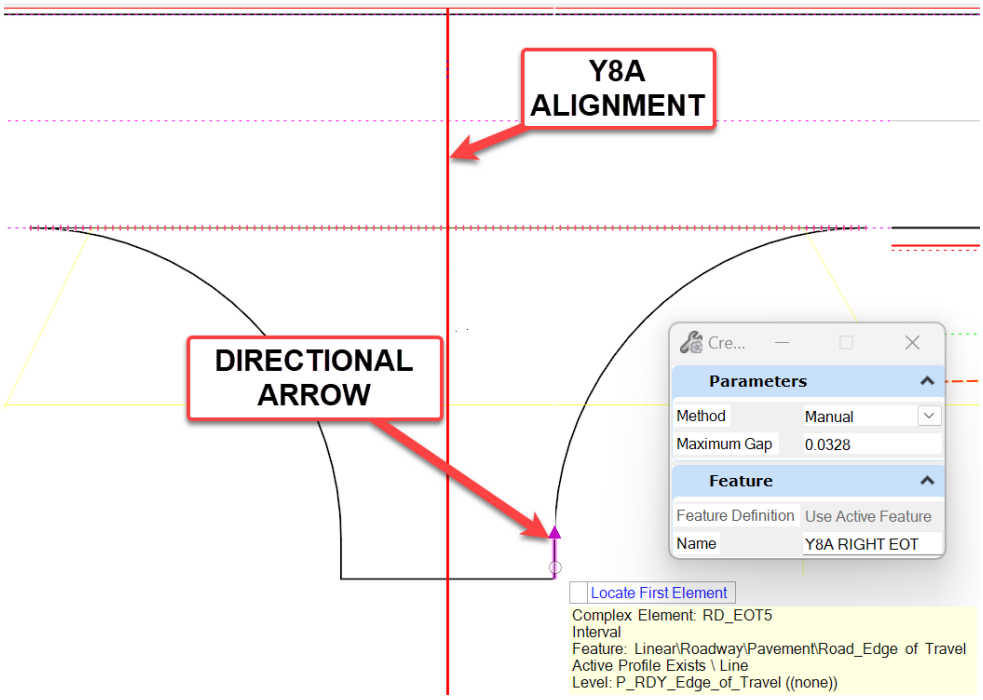
11. Complex the Side Street (Y8A) EOT lines

A. Select the **Complex By Element** tool **(Geometry > Horizontal > Complex Geometry > Complex By Element)** as shown below.

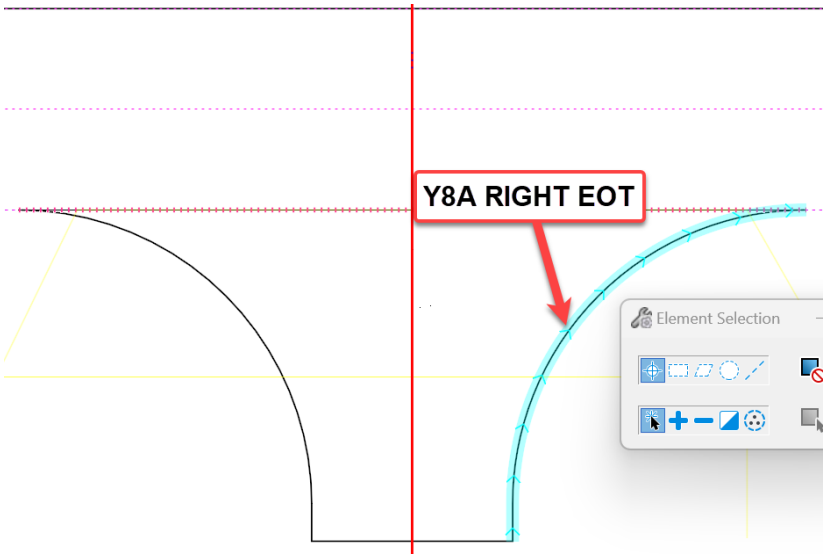


B. Then, Key the following parameters into the **Create Complex Element** dialog and select the small tangent **EOT** as shown below. When selecting the **EOT** line, make sure the **Directional Arrow** is pointing in the correct direction before accepting.

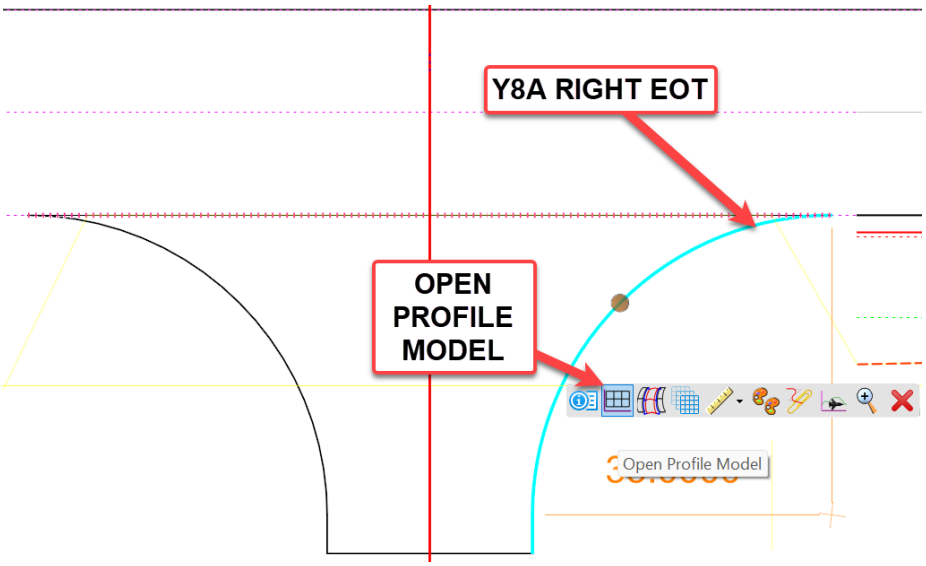
- **Method** = **Automatic**
- **Name** = **Y8A RIGHT EOT**



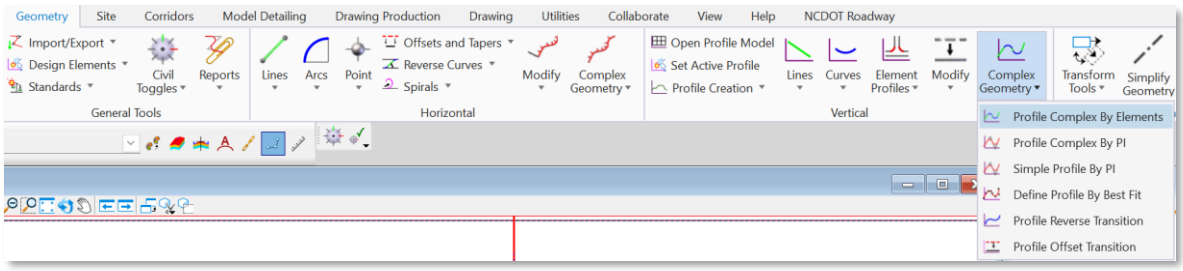
C. This creates a new complex element called **Y8A RIGHT EOT** as shown below.



D. Click the **Y8A Right EOT** shown below, hover for a moment to display the menu, and then select the **Open Profile Model** option to open the **Y8A Right EOT** profile.

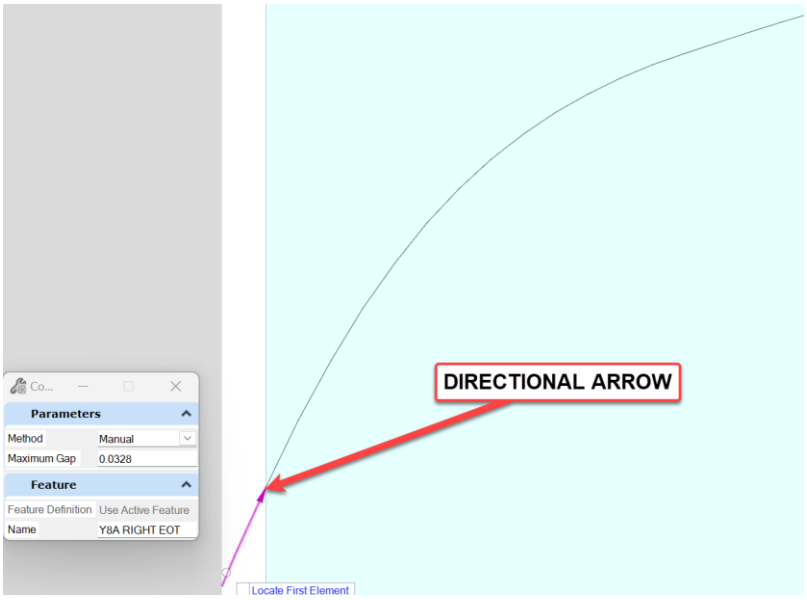


E. Select the **Profile Complex By Element** tool **(Geometry > Vertical > Complex Geometry > Profile Complex By Element)** as shown below.

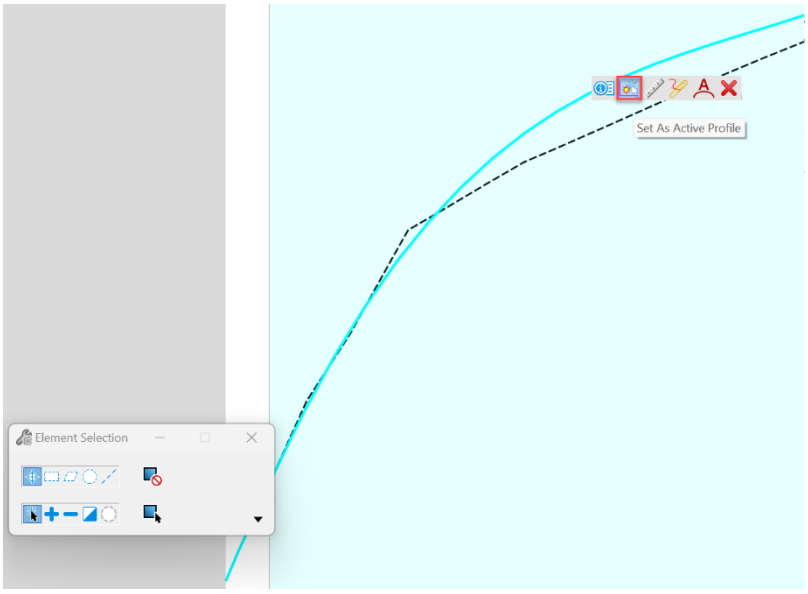


F. Then, similar to how the horizontal **Y8A Right EOT** was complexed, Key the following parameters into the **Create Complex Profile Element** dialog and select the small tangent **EOT** as shown below. When selecting the **EOT** line, make sure the **Directional Arrow** is pointing in the correct direction before accepting. It may be helpful to turn the existing ground line off if you have trouble selecting the tangent **EOT**.

- **Method** = **Automatic**
- **Name** = **Y8A RIGHT EOT**

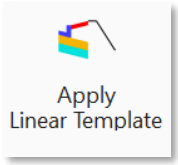


G. This creates a new complex vertical element called **Y8A RIGHT EOT** as shown below. Set **Y8A Right EOT** as the **Active Profile**.



H. After complexing the **Y8A Right EOT** lines, follow these same steps and complex the **Y8A Left EOT** lines.

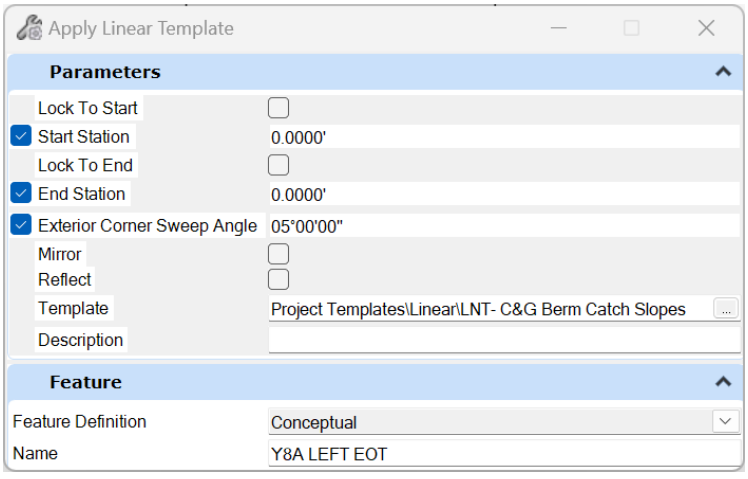
12. Apply Linear Templates to the Left and Right Y8A EOT lines



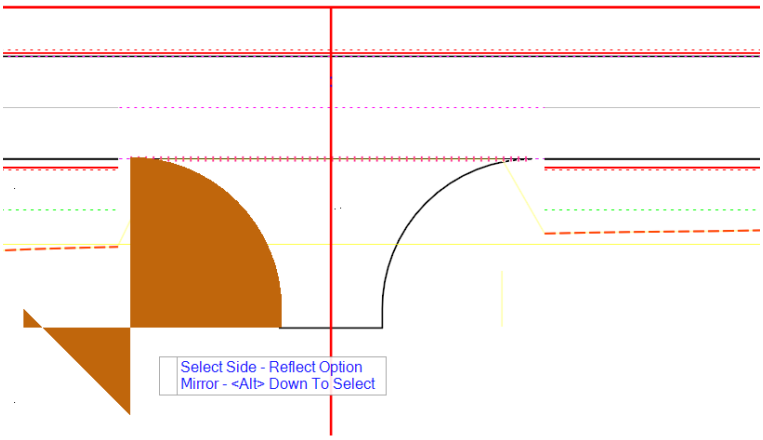
A. Select the **Apply Linear Template** tool **(Model Detailing > Apply Linear Template).**

B. Key the following parameters into the **Apply Linear Template** dialog.

- **Start** = **Lock To Start**
- **End** = **Lock To End**
- **Exterior Corner Sweep Angle** = **05° 00’ 00”**
- **Template** = **LNT - C&G Berm Catch Slopes**
- **Feature Definition** = **Design**
- **Name** = **Y8A LEFT EOT**

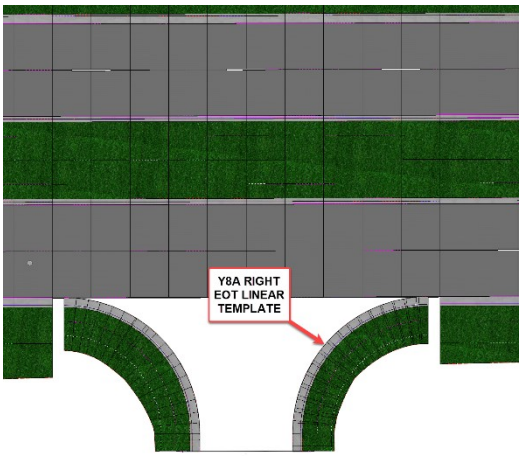


C. When prompted to **Locate Element To Apply Template**, select the **Y8A LEFT EOT** and begin clicking through the prompts. When prompted to **Select Side**, move your cursor as shown below and then continue clicking through the prompts to place the **Linear Template**.



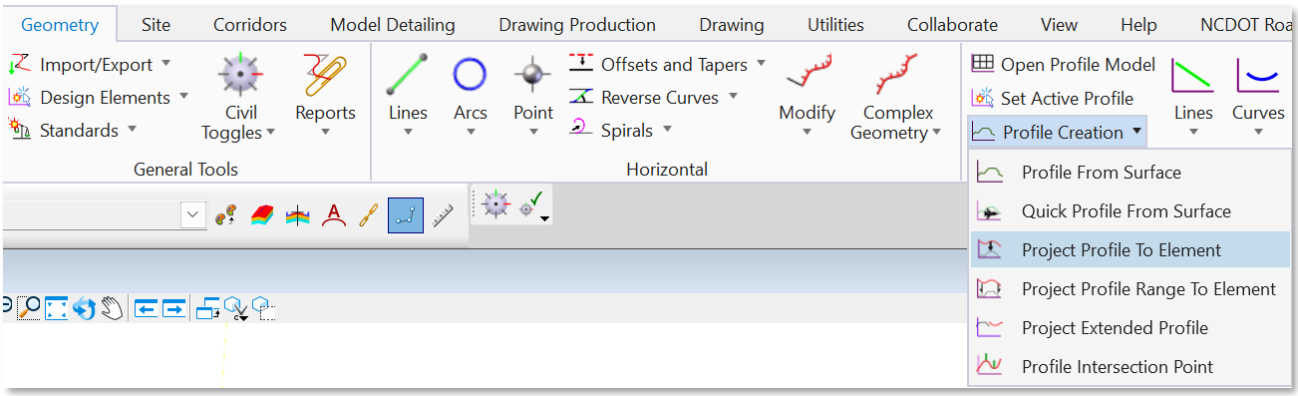
D. Notice in the **View 2, Default 3D** window that the **Y8A Left EOT Linear Template** is now displayed in the 3D model as shown below.

E. After applying the **Linear Template** to **Y8A Left EOT**, follow these same steps and apply the to the same **Linear Template** to **Y8A Right EOT** as shown below.

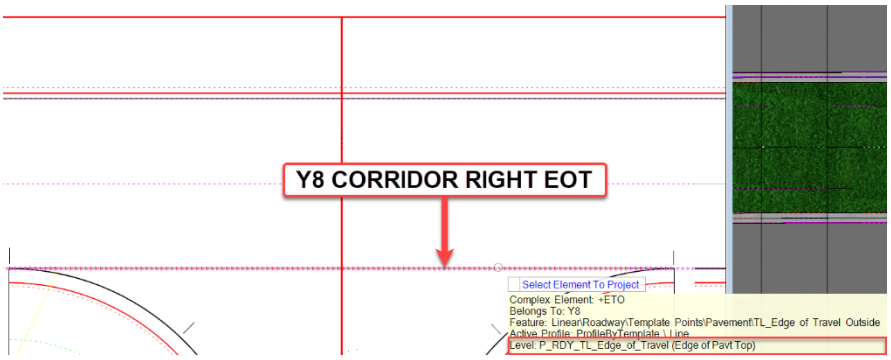


13. Create a Proposed Terrain for the Side Street (Y8A)

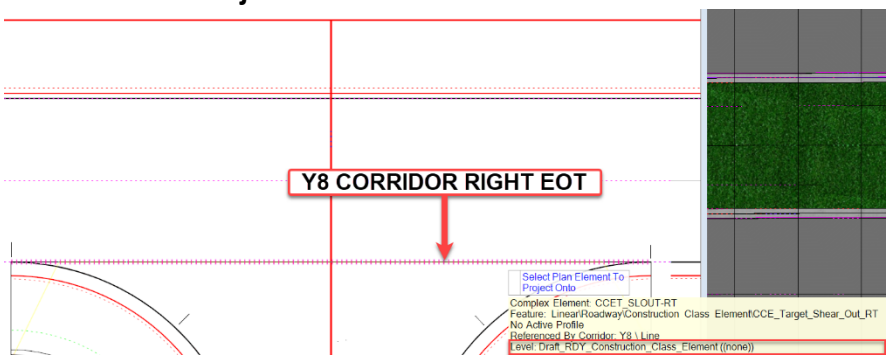
A. First, select the **Project Profile To Element** tool **(Geometry > Vertical > Profile Creation > Project Profile to Element)** as shown below.



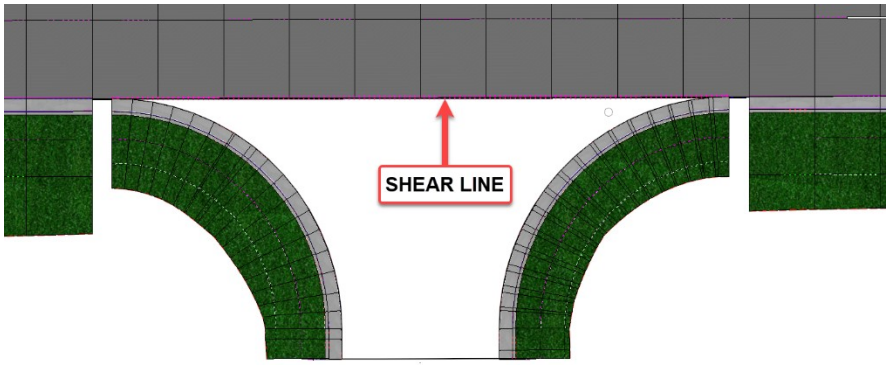
B. When prompted to **Select Element To Project**, select the **Right EOT** line for the **Y8 Corridor.** When selecting the **Y8 Corridor Right EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's very **IMPORTANT** to select the correct linear element.



C. Then select the **Shear Line** on level **Draft_RDY_Construction_Element** when prompted to **Select Plan Element To Project Onto.**

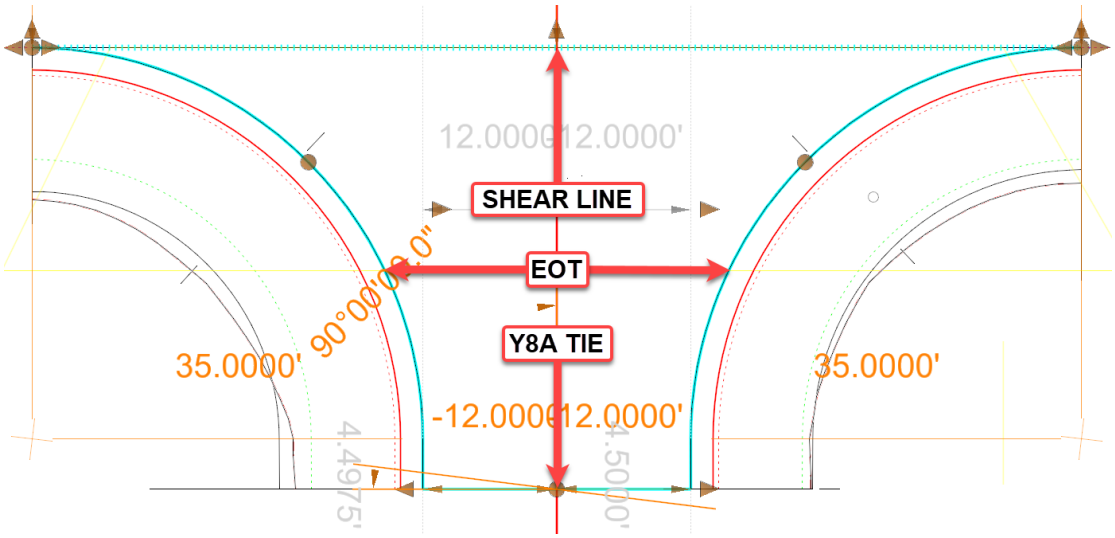


D. Notice in the **View 2, Default 3D** window that the **Shear Line** is now displayed in the 3D model matching the **Y8 EOT** as shown below.

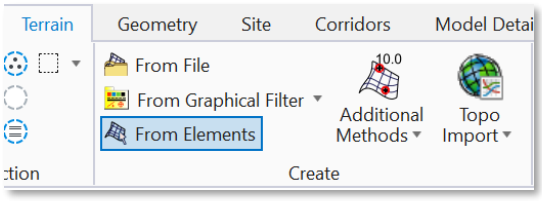


E. Now, select the **Element Selection** tool **(Terrain > Selection > Element Selection)** and **Toggle ON** the **Add** option as shown below.

F. Then, select he four (4) elements **Highlighted** in **Blue** below. Because there are multiple elements sitting on top of one another, you may need to **Right-Click** through the elements to select the ones you need. If your still having trouble, try turning off some of the additional levels.

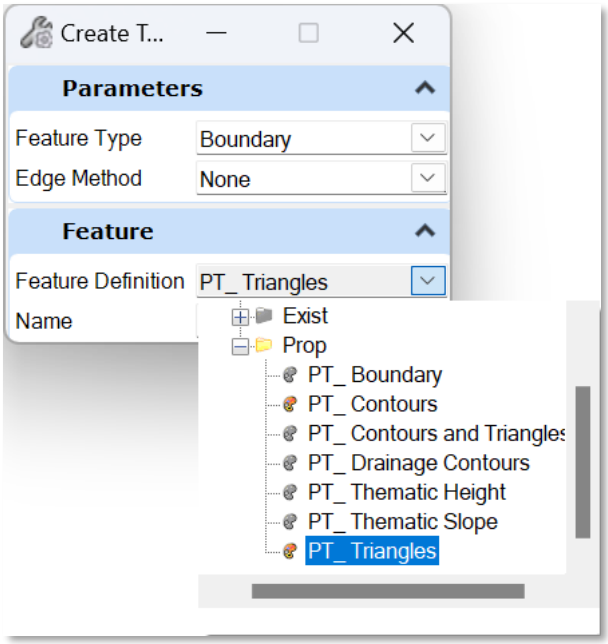


G. Now, select the **Create Terrain From Elements** tool **(Terrain > Create > From Elements)** as shown below.

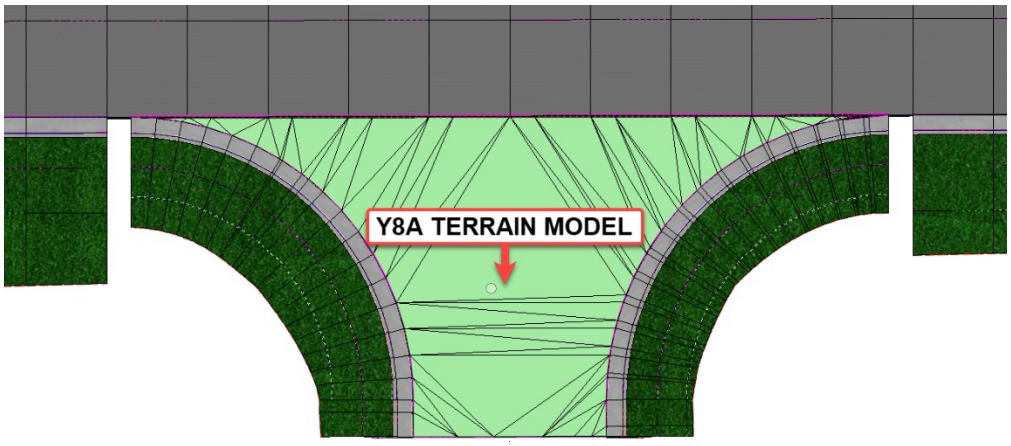


H. Still keeping those four (4) elements selected, key the following parameters into the **Create Terrain From Elements** dialog.

- **Feature Type** = **Boundary**
- **Edge Method** = **None**
- **Feature Definition** = **PT_Triangles**

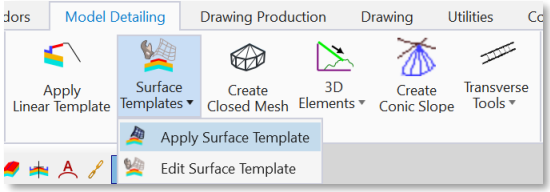


I. Finally, **Left-Click** through the prompts to create the **Side Street (Y8A) Terrain Model** as shown below.

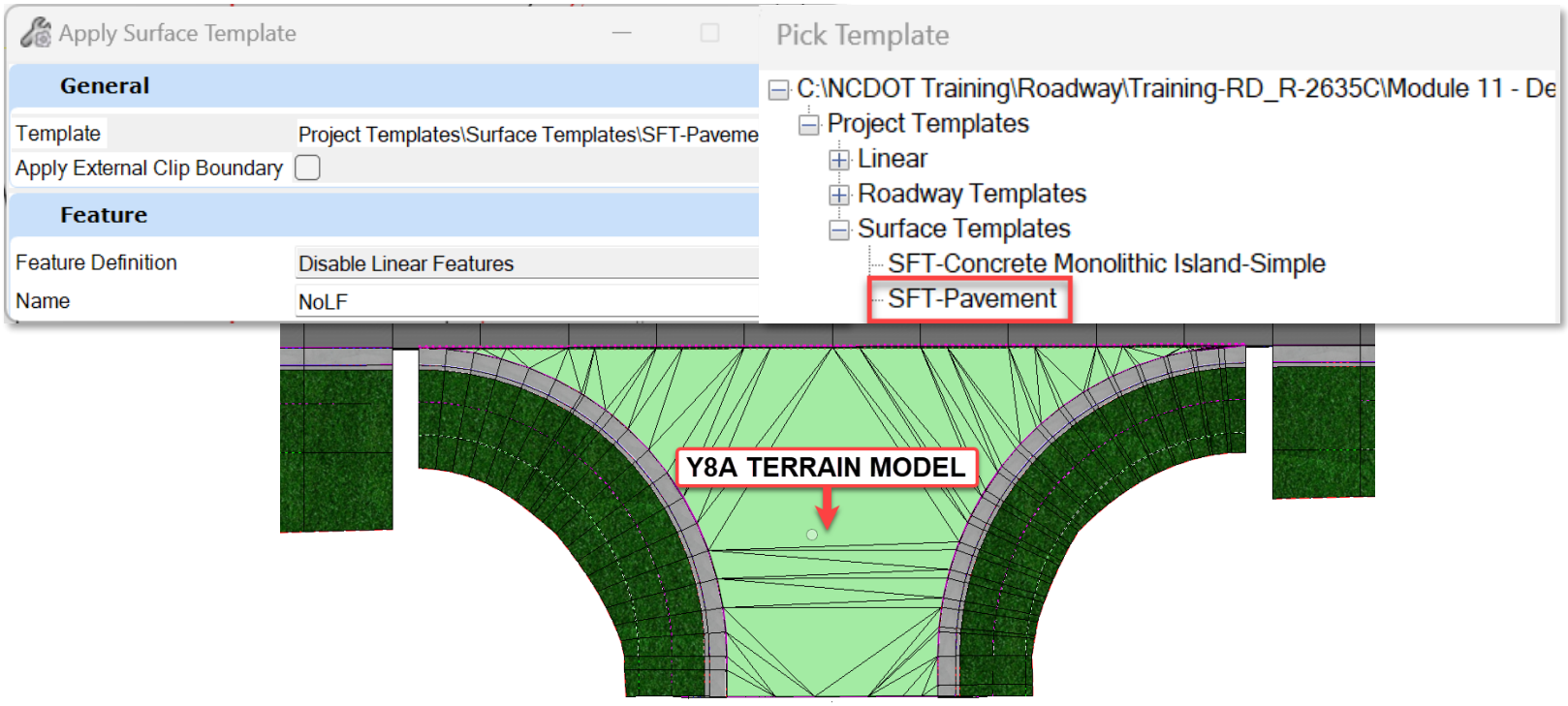


14. Apply Pavement Surface Template to the Side Street (Y8A) Terrain Model

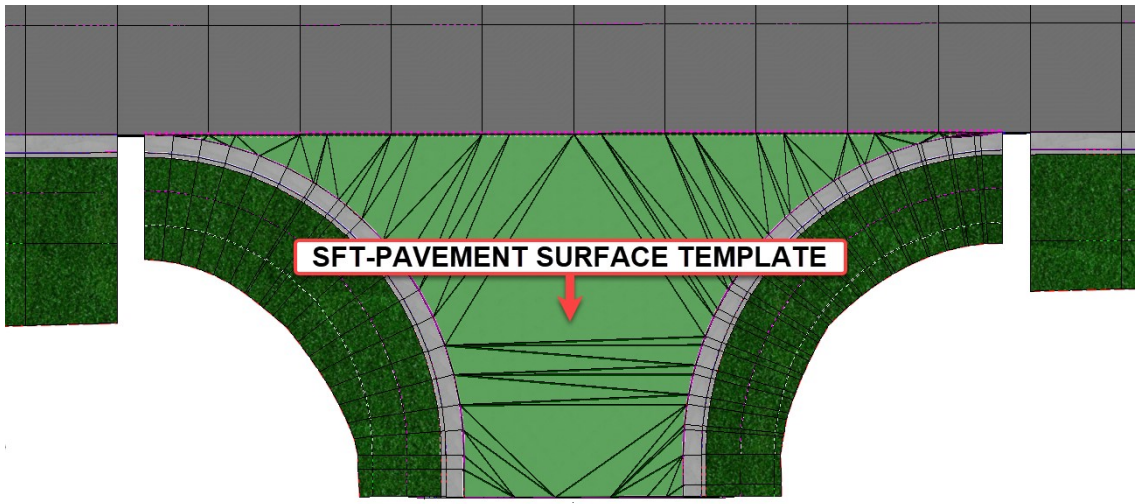
A. Select the **Apply Surface Template** tool **(Model Detailing > Surface Templates > Apply Surface Template)** as shown below.



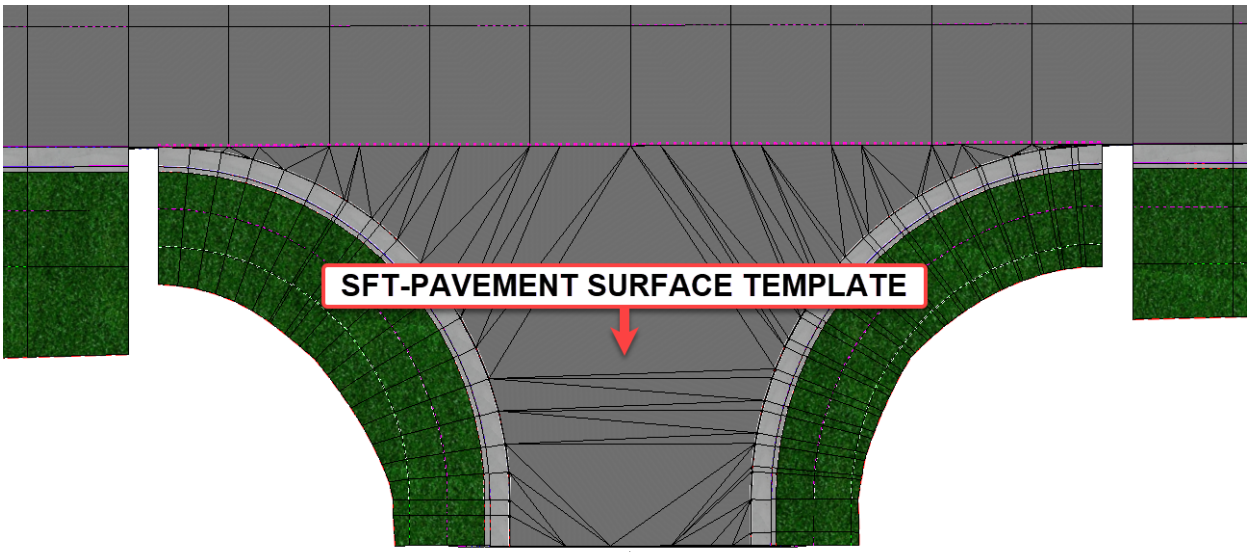
B. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Y8A Terrain Model** from within the **View 2, Default 3D** window when prompted to **Locate Terrain Model**.
   - **Template** = **SFT-Pavement**
   - **Feature Definition = Disable Linear Features**



C. Continue left clicking through the prompts to apply the **SFT-Pavement Surface Template** to the **Y8A Terrain** as shown below.

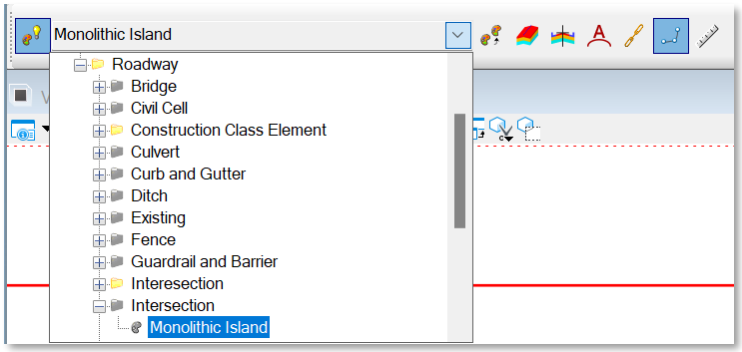


D. Turn off the Terrain Levels to better see the **SFT-Pavement Surface Template** as shown below.



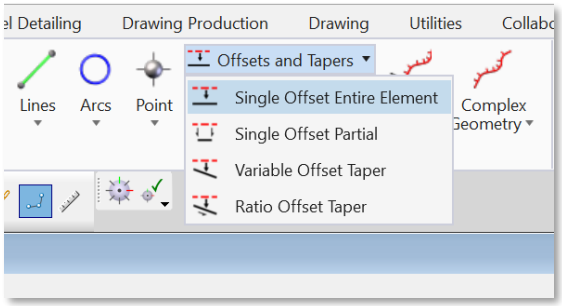
15. Add a Concrete Channelization Island to the Side Street (Y8A)

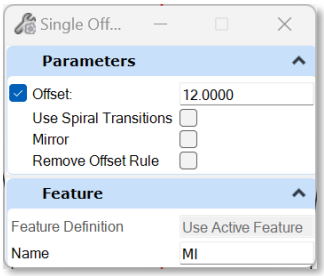
A. From the **Feature Definition Toggle Bar**, toggle on the **Use Active Feature Definition** button and then select the **Monolithic Island** feature from the **(Linear > Roadway > Intersection)** folder as shown below. Keep this **Feature** active throughout all steps that follow.



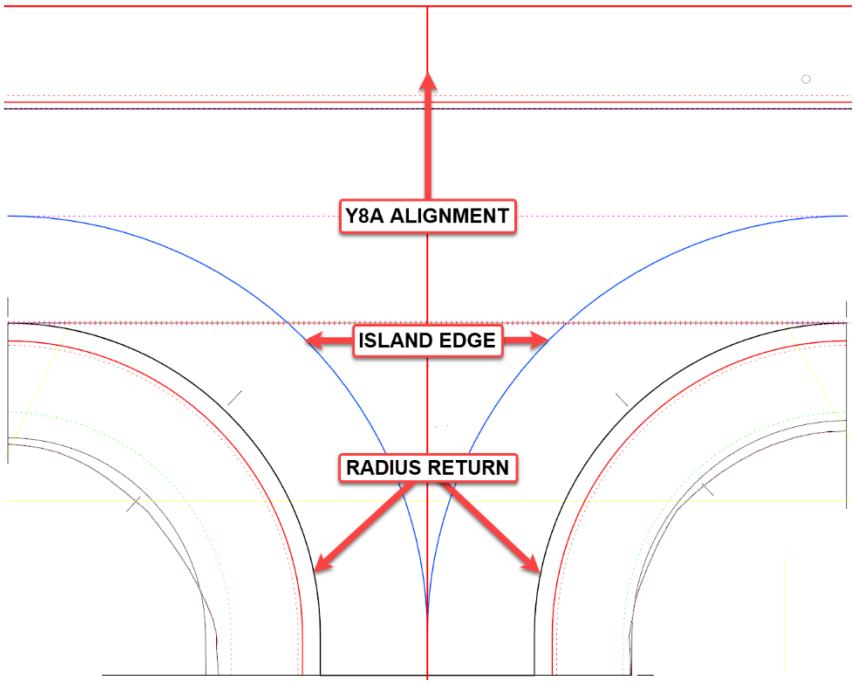
B. Next, select the **Single Offset Entire Element** tool **(Geometry > Horizontal > Offsets and Tapers > Single Offset Entire Element)** and key the following parameters into the as shown below.

- **Offset** = **12.0000**
- **Use Spiral Transitions** = **Unchecked**
- **Mirror** = **Unchecked**
- **Remove Offset Rule** = **Unchecked**

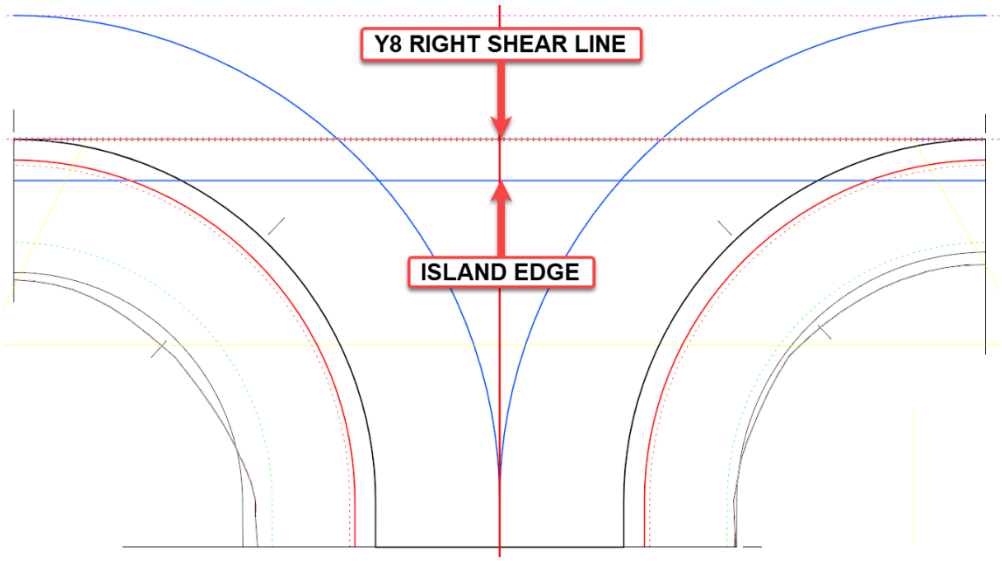




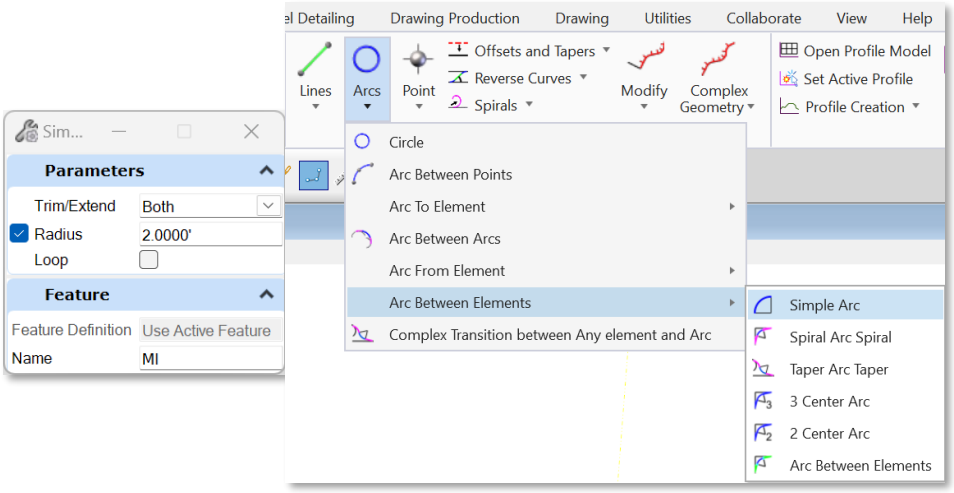
C. Then, select the two (2) **Y8A EOT** radius returns and follow the prompts to place the two (2) **Island Edges** as shown below.



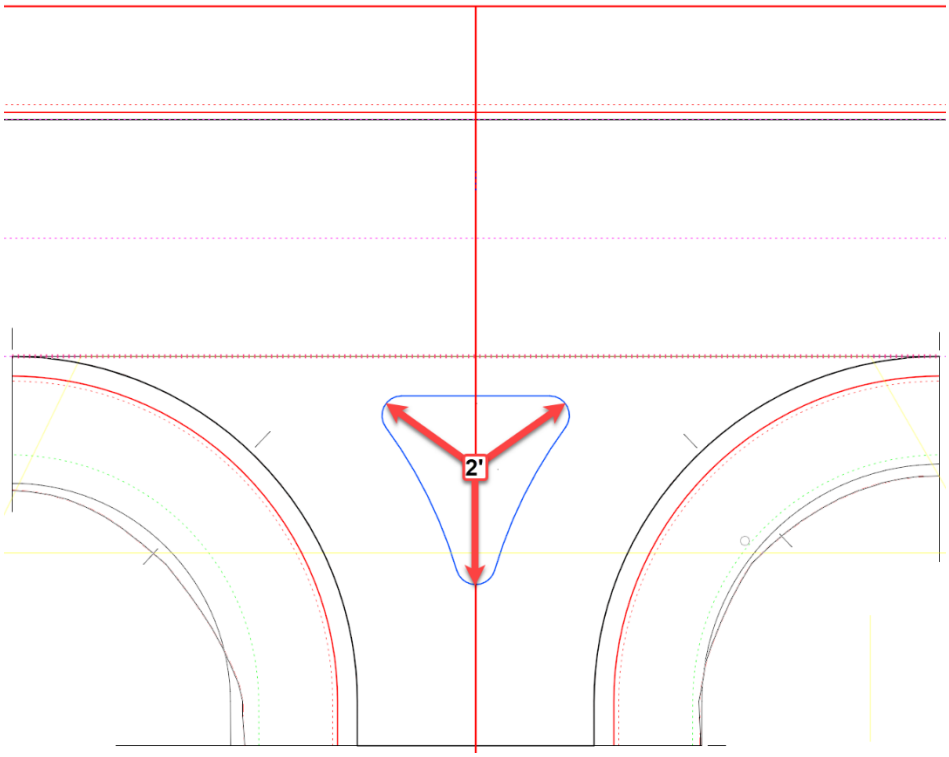
D. Change the **Offset** value to **4'** within the **Single Offset Entire Element** dialog, this time selecting the **Y8 Right Shear Line** as shown below to place the 3rd and final **Island Edge** line.



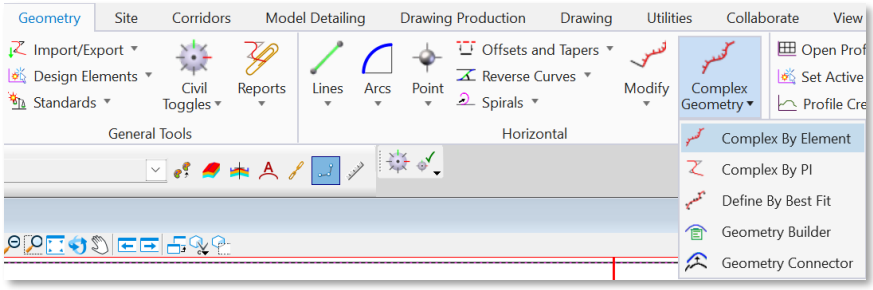
E. Next, select the **Simple Arc** tool **(Geometry > Horizontal > Arcs > Arc Between Elements > Simple Arc)**. Set the **Radius** parameter to **2'** and the **Trim/Extend** parameter to **Both** within the dialog as shown below.



F. Now, use the **Simple Arc** tool to fillet the three (3) corners of the concrete island as shown below.

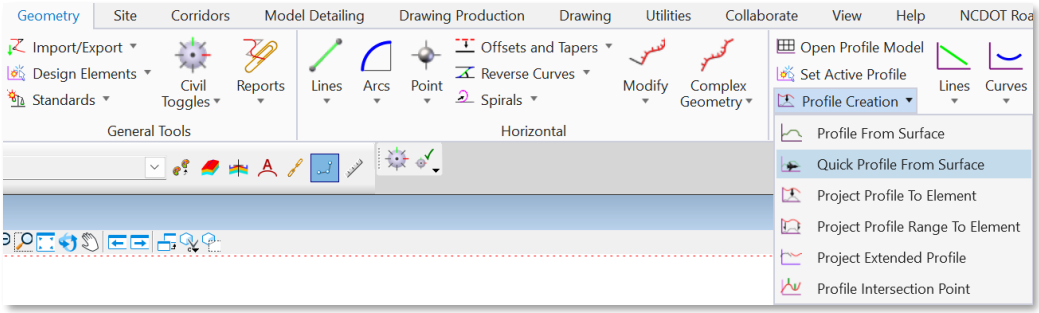


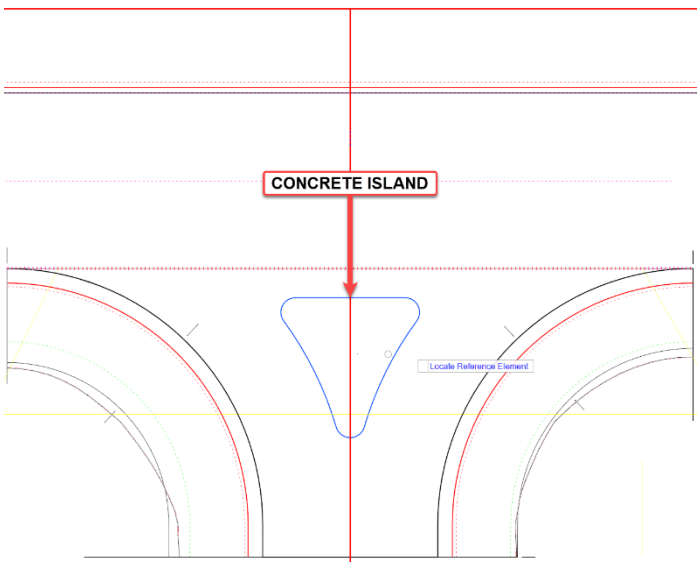
G. Select the **Complex By Element** tool **(Geometry > Horizontal > Complex Geometry > Complex By Element)**. Set the **Method** to **Automatic** and click on the **Concrete Island** when prompted.



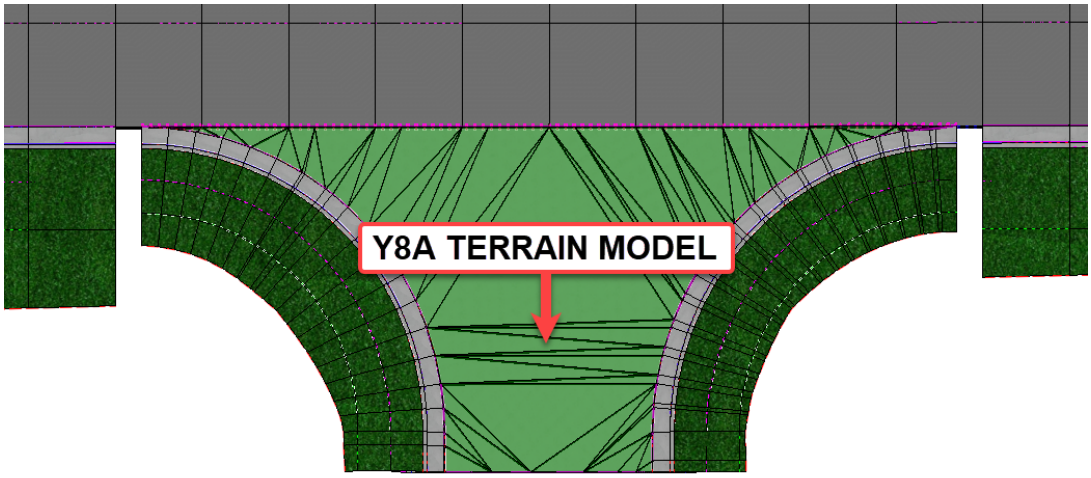
H. Click through the additonal prompts to complex the **Concrete Island**, making it a single complex element.

I. Next, select the **Quick Profile From Surface** tool **(Geometry > Vertical > Profile Creation > Quick Profile From Surface)** and select the **Concrete Island** when prompted to **Locate Reference Element.**

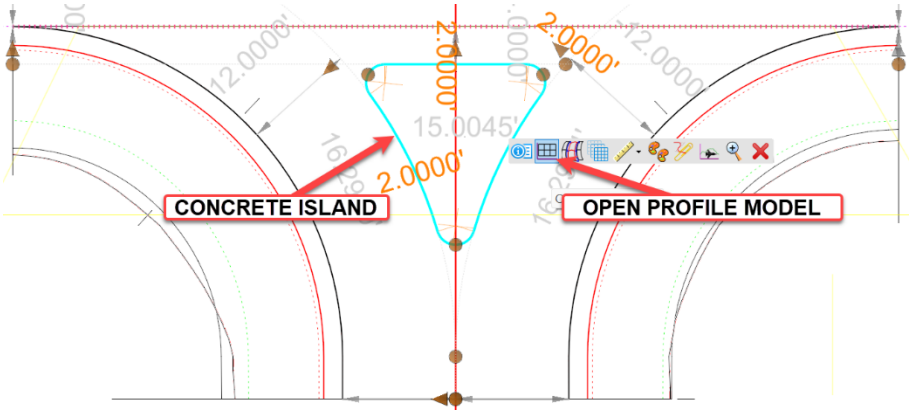




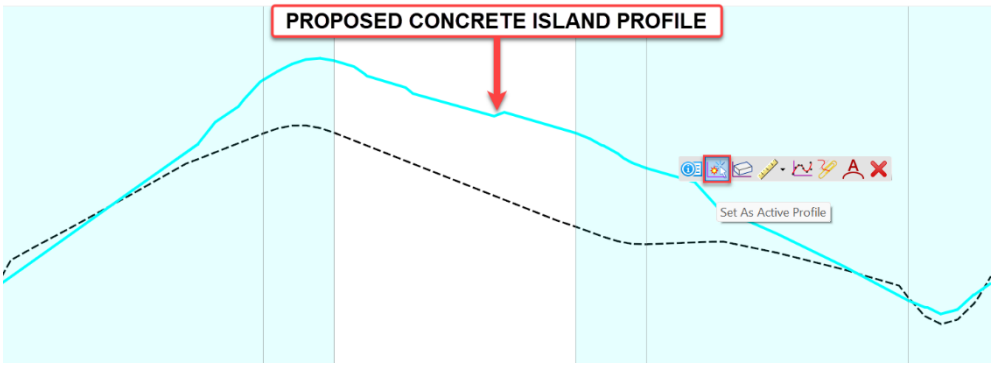
J. Then, select the **Side Street (Y8A) Terrain Model** when prompted to **Locate Reference Surface**. Right click to reset and finalize the command.



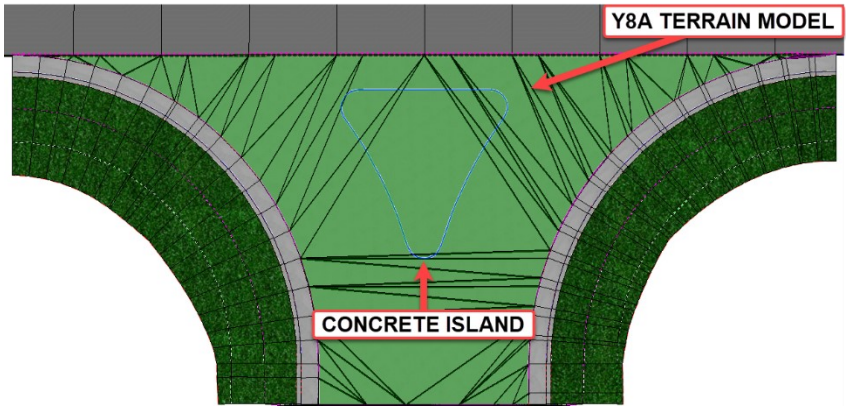
K. Click the **Concrete Island** shown below, hover for a moment to display the menu, and then select the **Open Profile Model** option to open the **Proposed Concrete Island** profile.



L. Notice the proposed **Concrete Island** profile that was created using the **Side Street (Y8A) Terrain Model** as shown below. Set this as the **Active Profile** and then close out of the profile window.

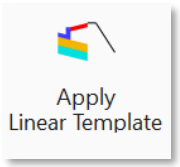


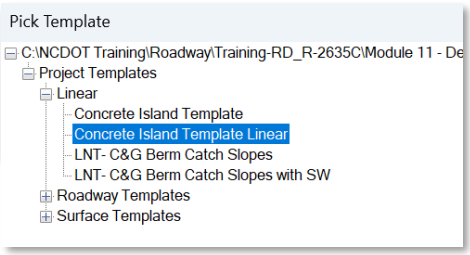
M. Notice in the **View 2, Default 3D** window that the **Proposed Concrete Island** is now displayed in the 3D model matching the surface of the **Side Street (Y8A) Terrain Model** as shown below.

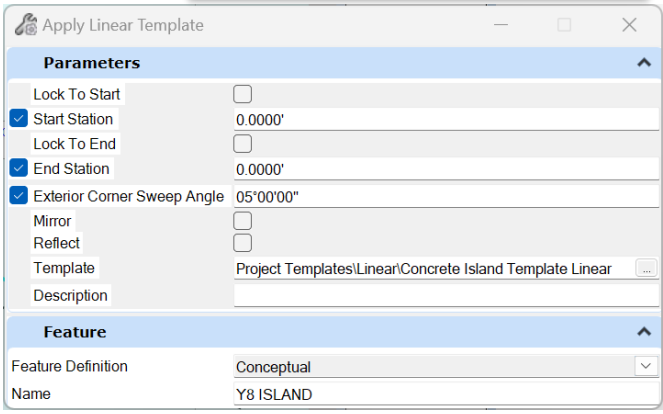


N. Select the **Apply Linear Template** tool **(Model Detailing > Apply Linear Template)** and key the following parameters into the **Apply Linear Template** dialog.

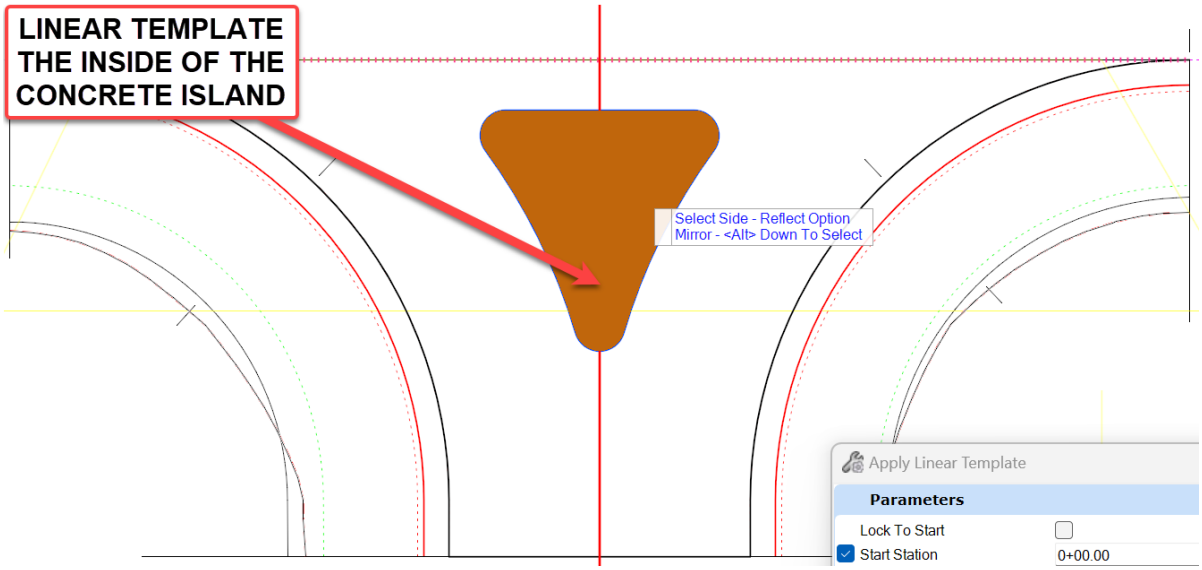
- **Start** = **Lock To Start**
- **End** = **Lock To End**
- **Exterior Corner Sweep Angle** = **05° 00’ 00”**
- **Template** = **Concrete Island Template Linear**
- **Feature Definition** = **Design**
- **Name** = **Y8A ISLAND**



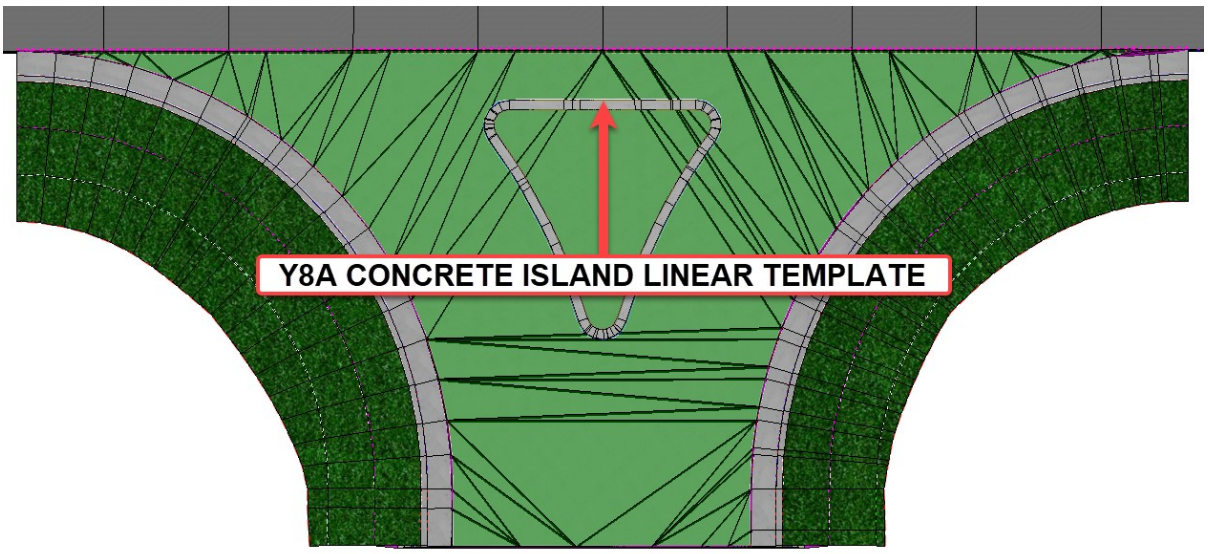




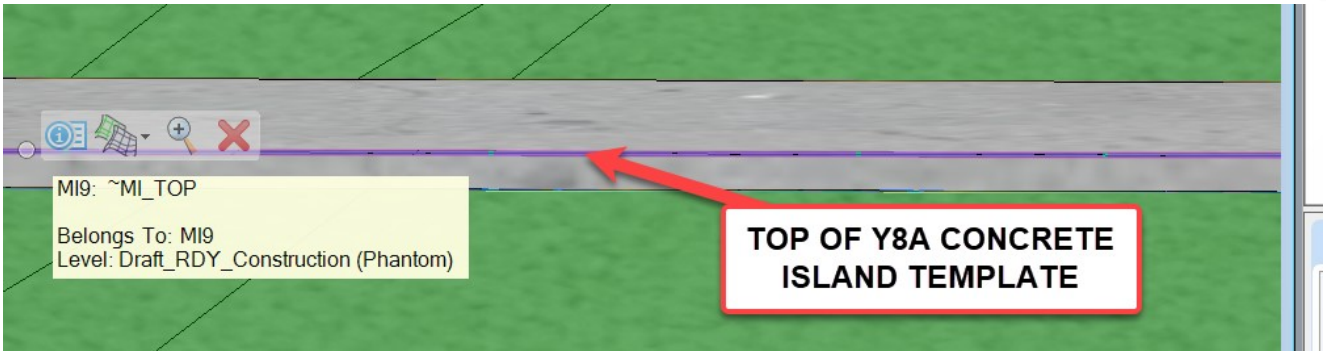
O. When prompted to **Locate Element To Apply Template**, select the **Concrete Island** and begin clicking through the prompts. When prompted to **Select Side**, move your **Cursor** to the inside of the **Concrete Island** as shown below and then continue clicking through the prompts to place the **Linear Template**.



P. Notice in the **View 2, Default 3D** window that the **Y8A Concrete Island Linear Template** is now displayed in the **3D Model** as shown below.

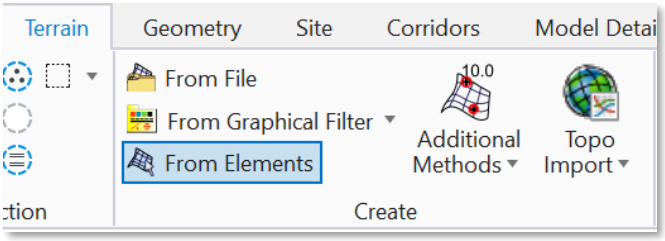


Q. Next, select the Element Selection tool **(Terrain > Selection > Element Selection)** and select the top of the **Y8A Concrete Island Linear Template**. See the element highlighted in blue below.



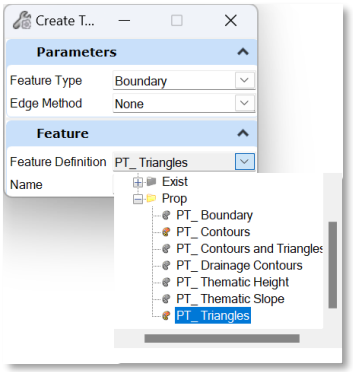
Tip: Zoom in closely and right click to tab through until you get the correct line.

R. Now, select the **Create Terrain From Elements** tool **(Terrain > Create > From Elements)** as shown below.

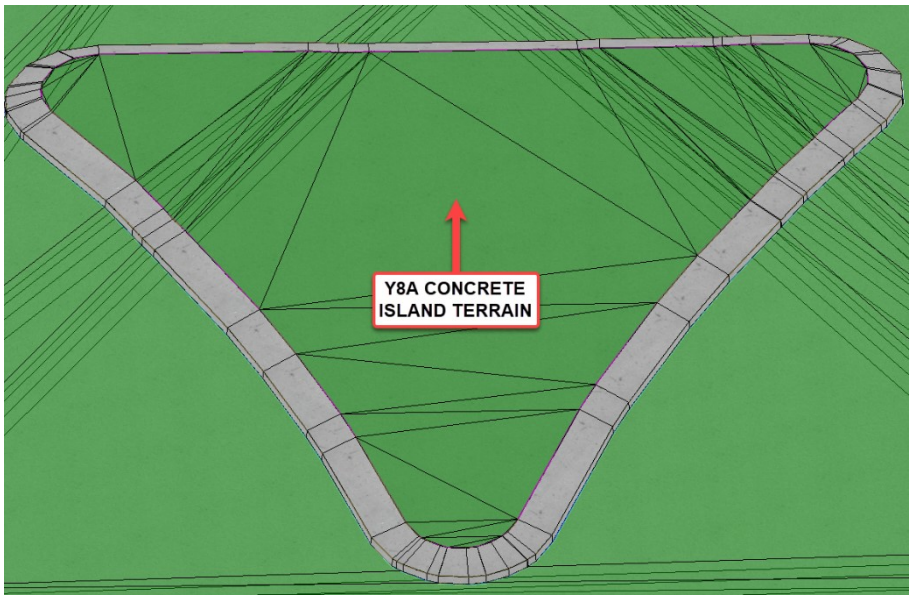


S. Still keeping the **Concrete Island Linear Template** selected, key the following parameters into the **Create Terrain From Elements** dialog.

- **Feature Type** = **Boundary**
- **Edge Method = None**
- **Feature Definition = PT_Triangles**



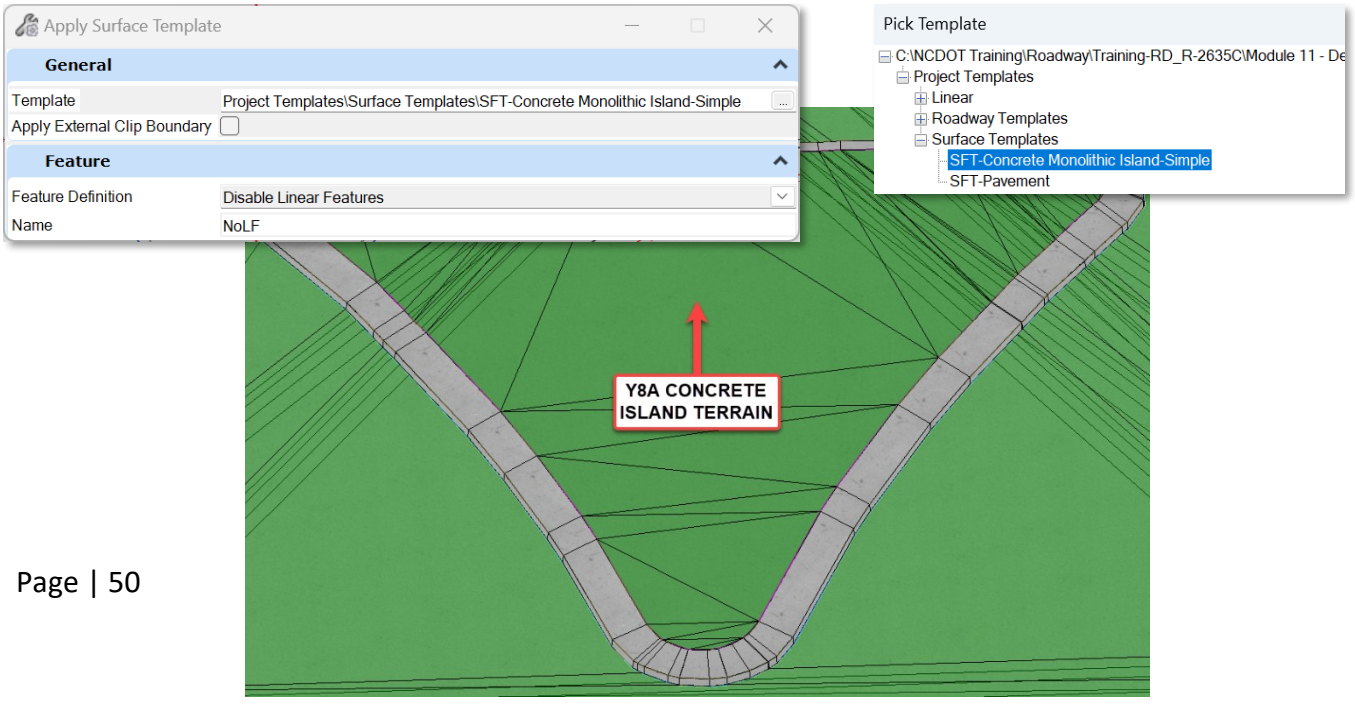
T. Left click through the prompts to create the **Y8A Concrete Island Terrain Model** as shown below.



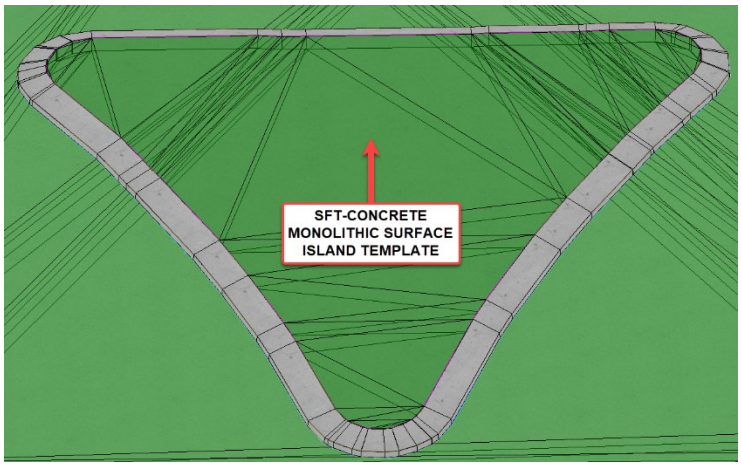
U. Select the **Apply Surface Template** tool **(Model Detailing > Surface Templates > Apply Surface Template)**.

V. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Y8A Concrete Island Terrain Model** from within the **View 2, Default 3D** window when prompted to **Locate Terrain Model**.

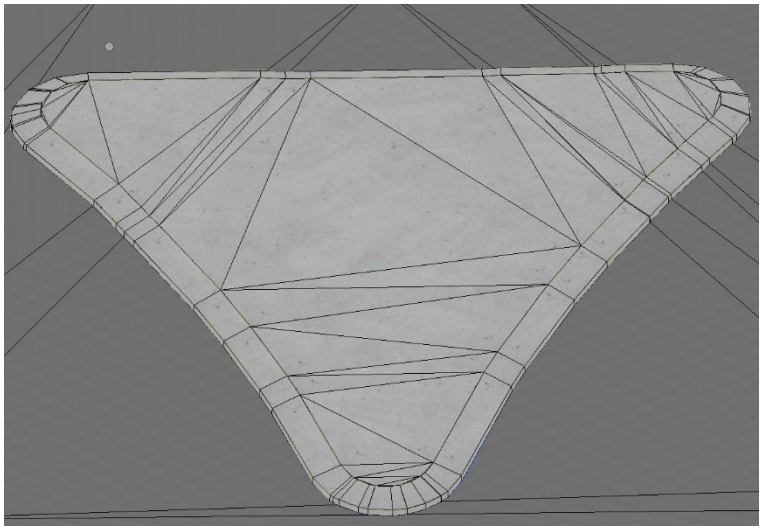
- **Template** = **SFT-Concrete Monolithic Island-Simple**
- **Feature Definition** = **Disable Linear Features**



W. Continue left clicking through the prompts to apply the **SFT_Concrete Monolithic Island-Simple Surface Template** to the **Y8A Concrete Island Terrain** as shown below.

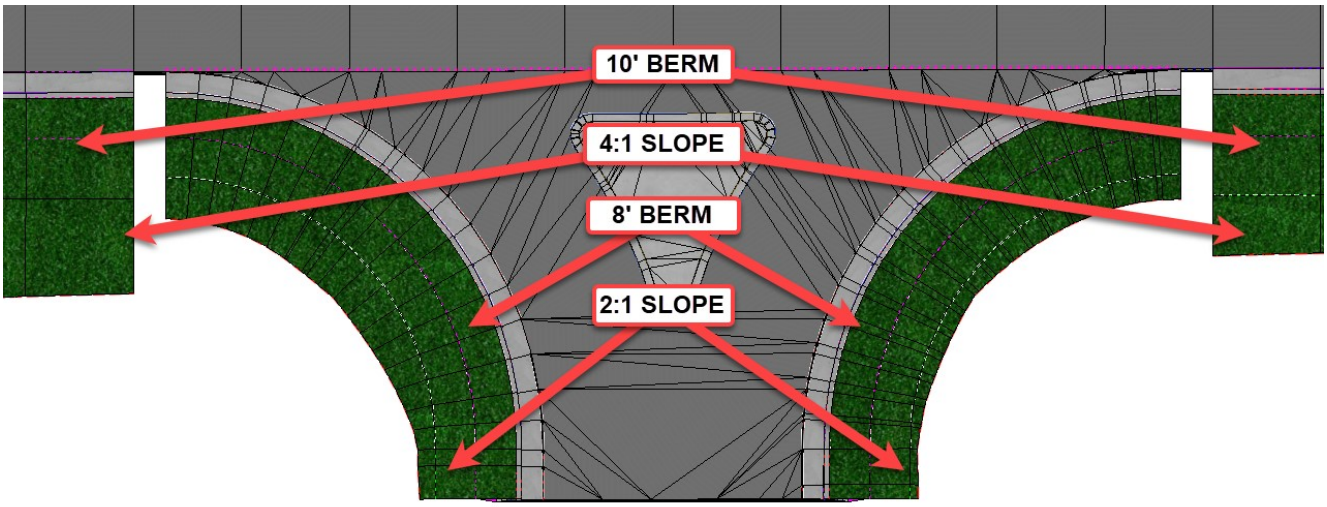


X. Turn off the Terrain Levels to better see the applied **SFT_Concrete Monolithic Island-Simple Surface Template.**

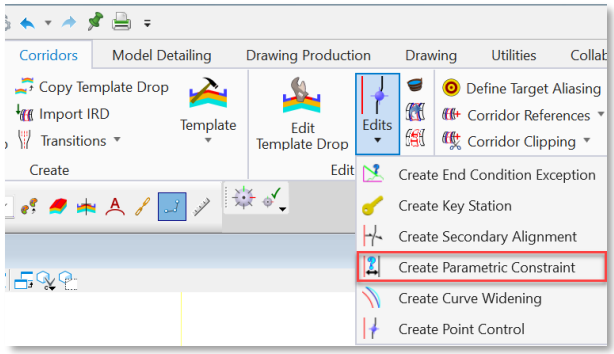


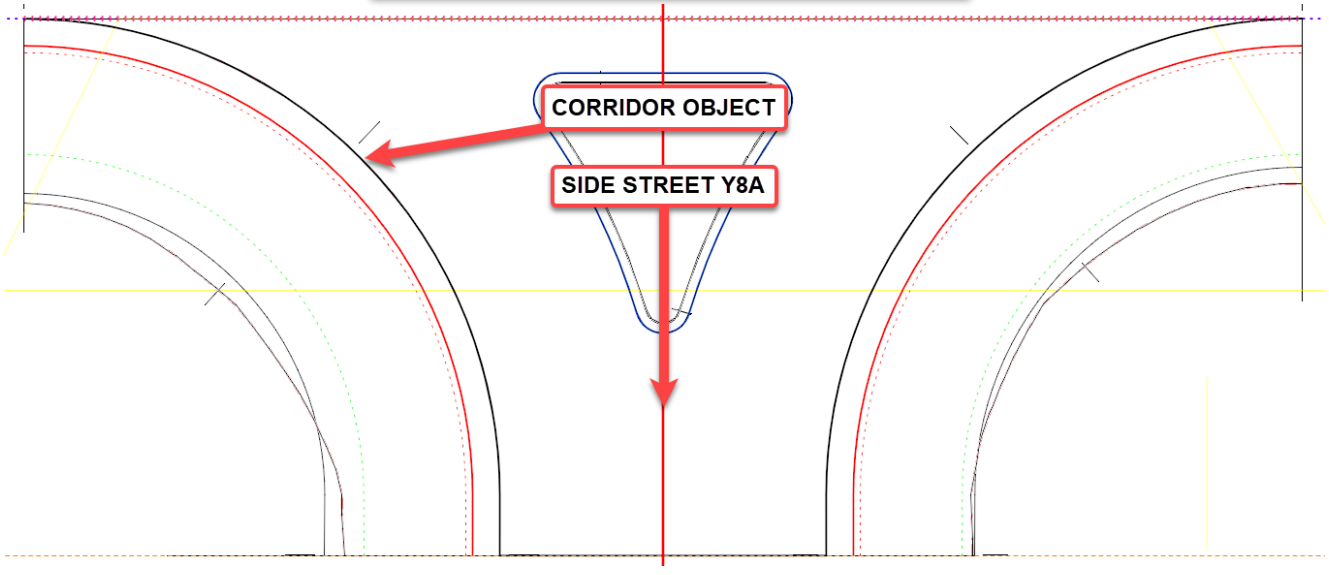
16. Adjust the berms and slopes of the Side Street (Y8A) Radius Returns to match Y8

A. Notice that the berm and slopes of the **Side Street (Y8A)** do not match the **Y8** as shown below. This can easily be resolved by using **Parametric Constraints**.

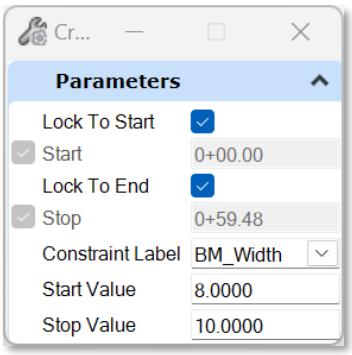


B. Select the **Create Parametric Constraint** option **(Corridors > Edit > Edits > Create Parametric Constraint)** and then select the **Side Street (Y8A)** radius return **Corridor Object** when prompted to **Locate Corridor.**



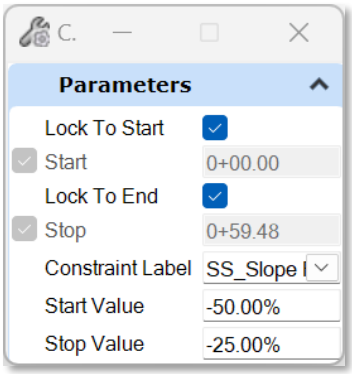


C. Key the following **Parameters** into the **Create Parametric Constrain**t dialog and click through the prompts to set the **BM_Width Parametric Constraint** and transition the **Berm Width** from **8'** to **10'** over the length of the **Radius Return** to match the **Y8 Berm**.



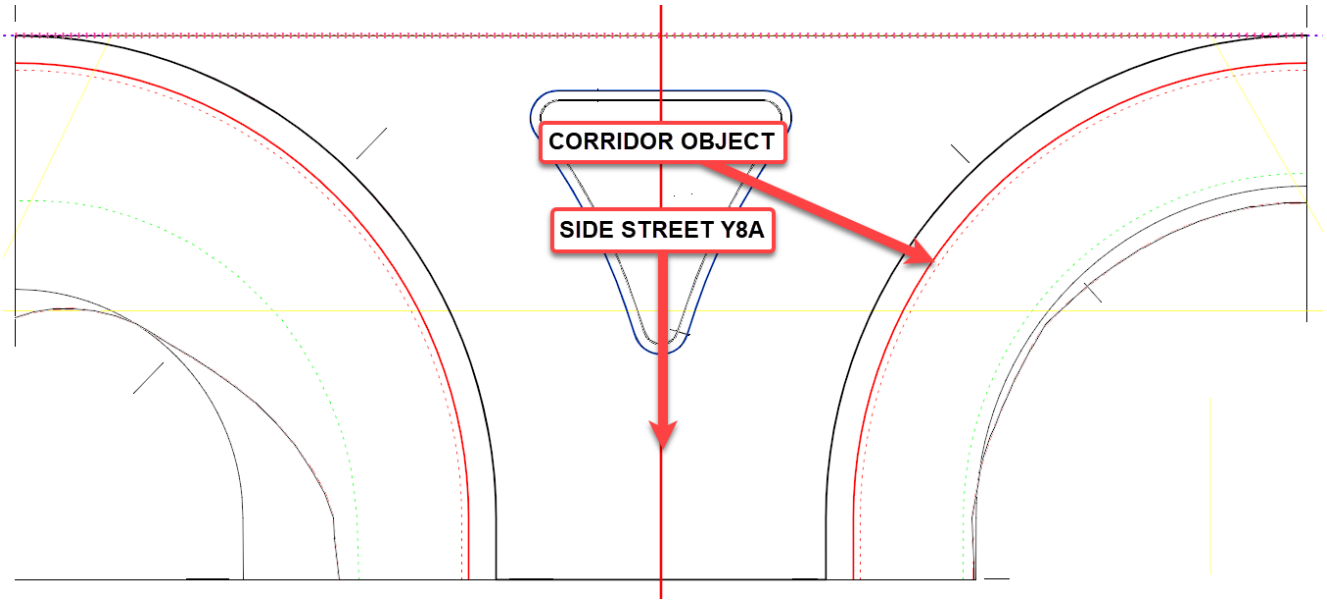
- **Start = Lock to Start**
- **Stop = Lock to End**
- **Constraint Label = BM_Width**
- **Start Value = 8.0000**
- **Stop Value = 10.000**

D. Next, use the **SS_Slope Fill Parametric Constrain**t to transition the **Y8A Fill Slope** from **2:1** to **4:1** over the length of the **Radius Return** to match the **Y8 Fill Slope.**



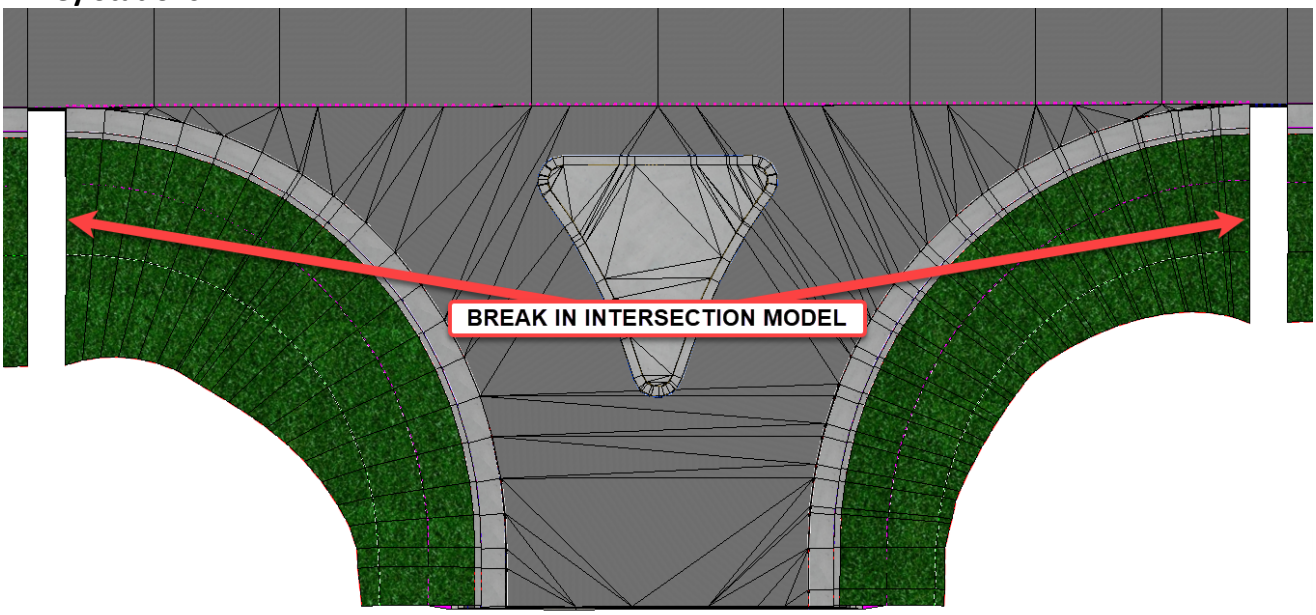
- **Start = Lock to Start**
- **Stop = Lock to End**
- **Constraint Label = SS_Slope Fill**
- **Start Value = -50.00%**
- **Stop Value = -25.00%**

E. Now, follow these same steps and do the same for the other **Y8A Radius Return** as shown below.



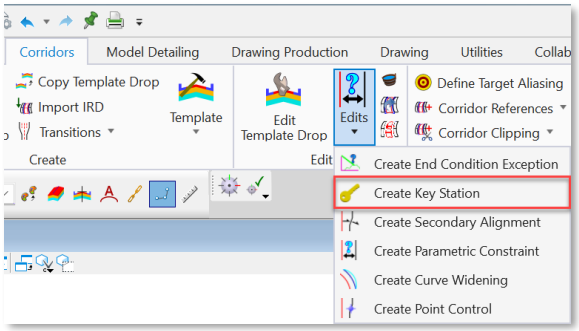
17. Clean up the breaks in the intersection using Key-Stations

A. Notice the breaks in the intersection model as shown below. This can be resolved by adding **Key Stations**.

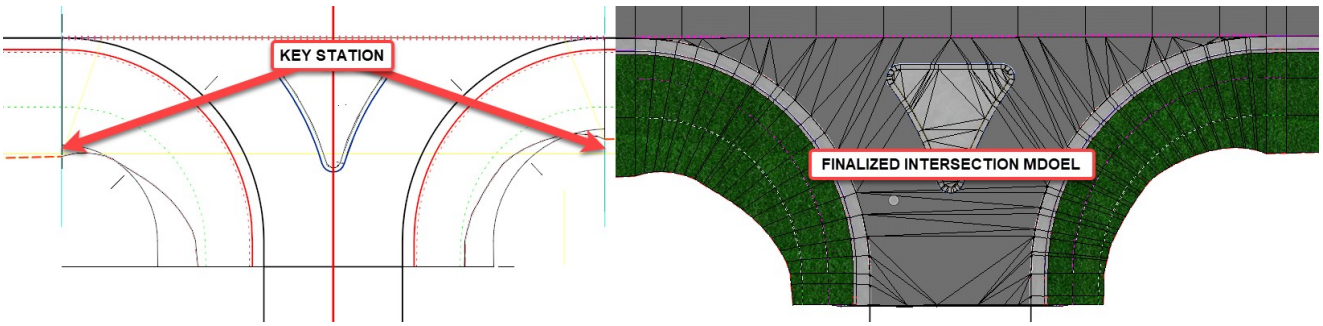


B. Select the **Create Key Station** tool **(Corridors > Edit > Edits > Create Key Station)** and add the following two (2) **Key Stations.**

- **Key Station 1 = 12+12.99**
- **Key Station 2 = 13+07.01**



C. This finalizes the **Side Street (Y8A)** intersection model as shown.



Exercise 2 – Directional Crossover with Median U-Turns Modeling

In this exercise, you will learn how to model a **Directional Crossover with Median U-Turns**. This includes pavement shearing, median/pavement switching, bulb-outs, directional median cross-over modeling, intersection radius modeling, application of linear templates, proposed terrain model development, surface template application, and various element profiling techniques. Design Intent will continue to be a major focus.

Throughout this exercise you will be working with NCDOT 2D dgn files exclusively. All design and corridor manipulation will be carried out within a 2-dimensional design plane.

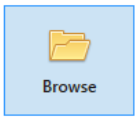
1. **Launch OpenRoads Designer CONNECT Edition**

   Doble-click on the NCDOT Roadway OpenRoads icon on your desktop to launch OpenRoads Designer into the NCDOT Roadway workspace.

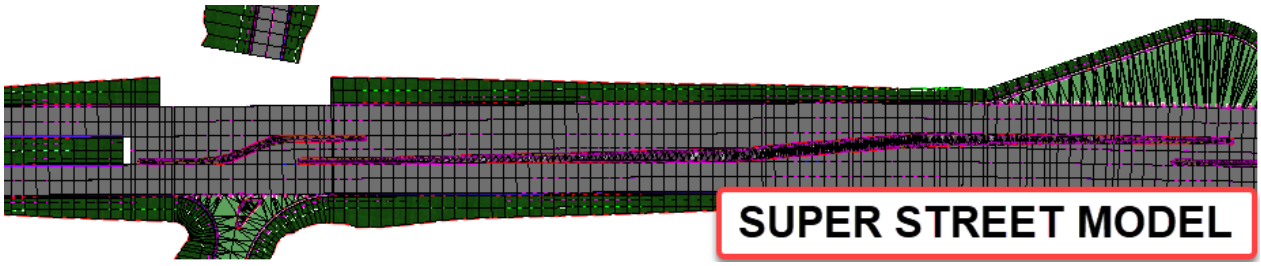
2. **Set the Workspace and Workset**

   Select DOT-US North Carolina from the Workspace menu.
   Select NCDOT R-2635C (Training) from the Workset menu.

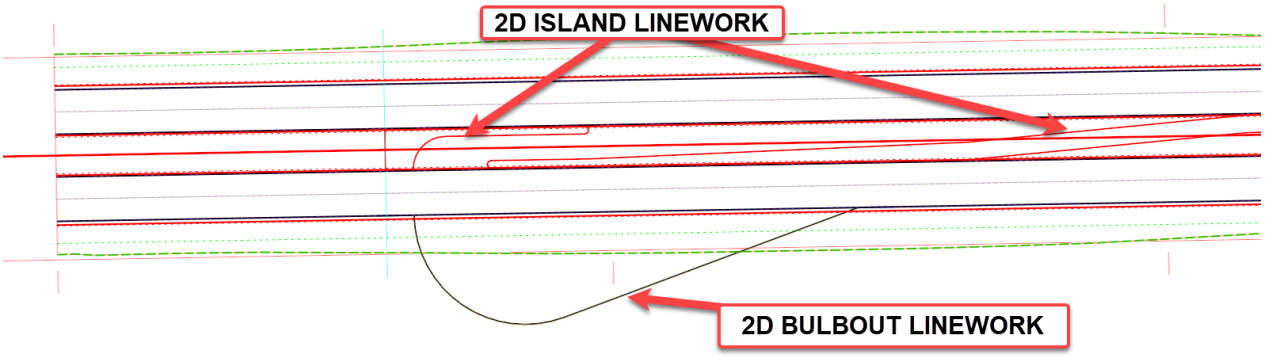
3. **Open the Exercise 2 Corridor (CMD) dgn file and zoom in closely to the Super Street Intersection**



   A. Click the browse button and path to the **Module 11 (Detailed Modeling)** folder and open the R-2635C-RDY_CMD_Exercise2.dgn file.
   B. Zoom in close to the intersection as shown below. For the sake of time and the avoidance of redundancy a number of elements have already been modeled. The end result after finishing **Exercise 2** will be a completed **Super Street** model.

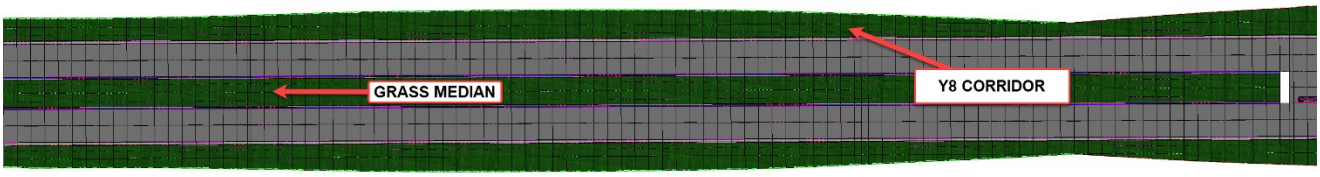


C. In addition to the preemptive modeling, notice that some of the 2D linework has already been designed allowing this module to focus more on **Detailed Modeling**. See the **Plan Geometry Module** for detailed instructions on 2D plan geometry development.

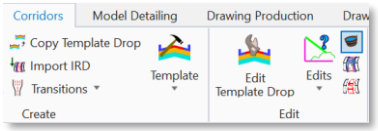


4. Remove the grass median and display pavement within the Super Street Intersection limits

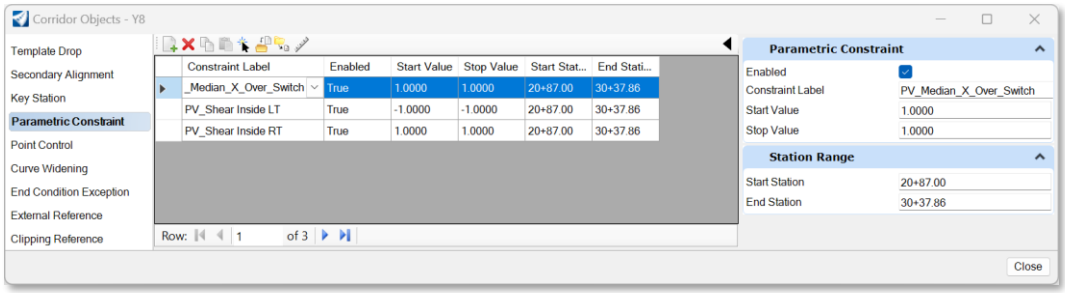
A. Notice that a portion of the **Y8** Corridor has a grass median within the limits of the **Super Street Intersection**. This can be adressed using **Paramtric Constraints** that are included within the attached **NCDOT** template.



B. Select the **Corridor Objects "The Bucket"** tool **(Corridors > Edit > Corridor Objects)** and then select the **Y8** corridor when prompted to **Locate Corridor**.

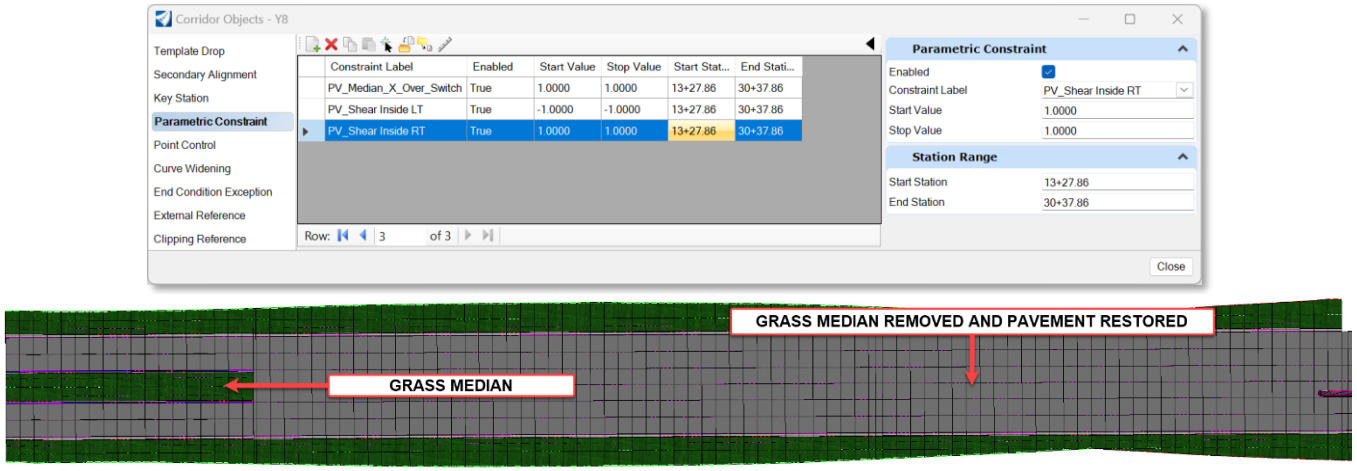


C. Notice the three (3) **Parametric Constraints** that have already been defined as shown below.



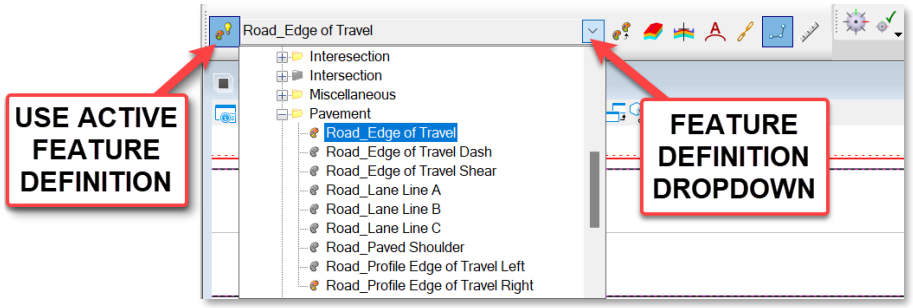
- **PV_Shear_Inside LT** = Shears the left Inside curb and median when set to -1
- **PV_Shear_Inside RT** = Shears the right inside curb and median when set to 1
- **X_Over_Switch** = Displays the median pavement when set to 1

D. Adjust the start station value for all three (3) **Parametric Constraints** to **13+27.86** as shown below. This will remove the median and display the pavement throughout the limits of the **Super Street Intersection**.

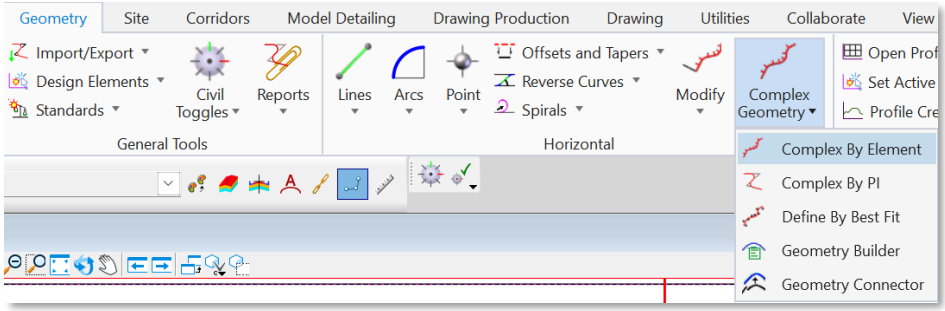


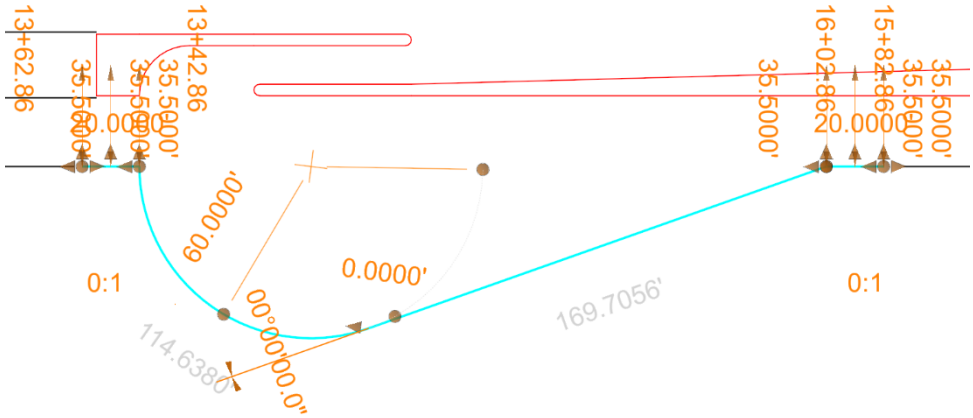
5. **Model the bulb-out on the right side of the Y8 corridor**

A. From the **Feature Definition Toggle Bar**, toggle on the Use Active Feature Definition button and then select the **Road_Edge of Travel** feature from the **(Linear > Roadway > Pavement)** folder as shown below. Keep this **Feature** active throughout all steps that follow.

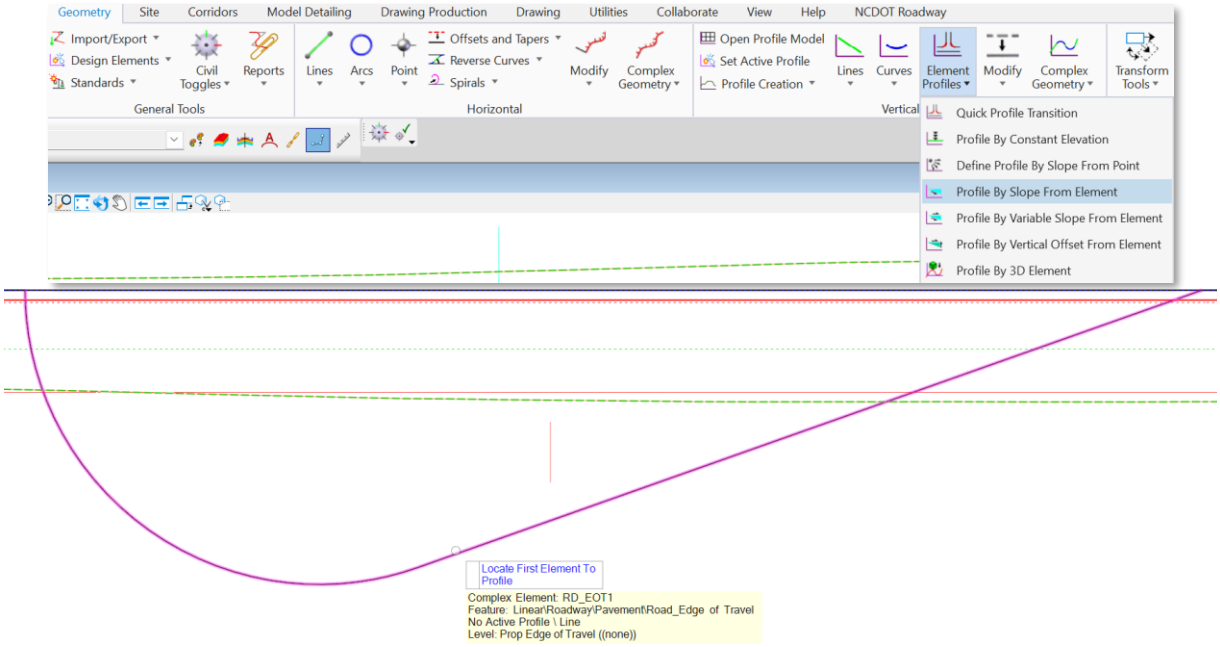


B. Use the **Complex By Element** tool **(Geometry > Horizontal > Complex Geometry > Complex By Element)** to complex the individual **2D Elements** that make up the bulb-out as shown below. Combining these and making a single complex element will be more efficient for modeling.

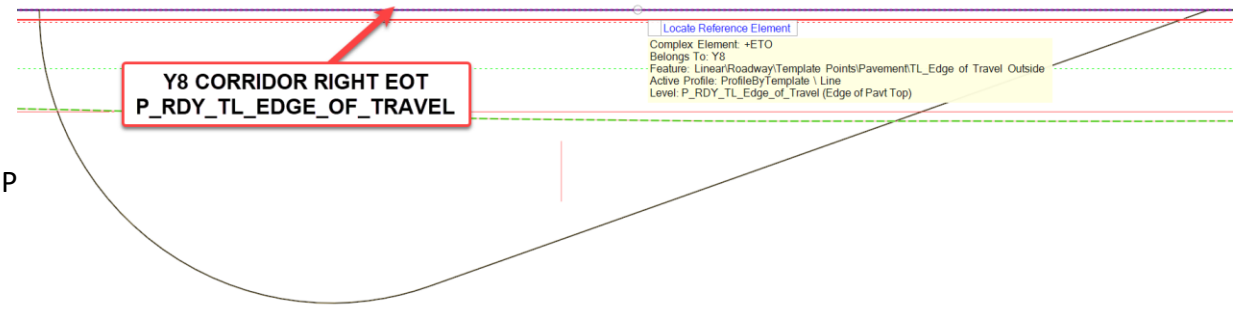




C. Next, select the **Profile By Slope From Element** tool **(Geometry > Vertical > Element Profiles > Profile By Slope From Element)** and select the **Complexed Bulb-Out Element** when prompted to **Locate First Element To Profile**. Then **Right-Click to Reset And Complete**.



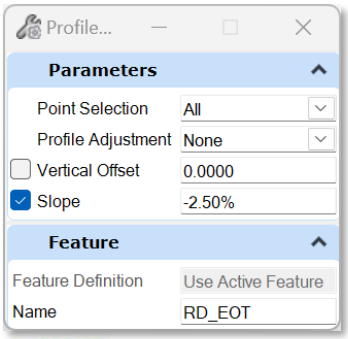
D. When prompted to **Locate Reference Element**, select the **Right EOT** line for the **Y8 Corridor**. When selecting the **Y8 Right EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's very **IMPORTANT** to select the correct linear element.

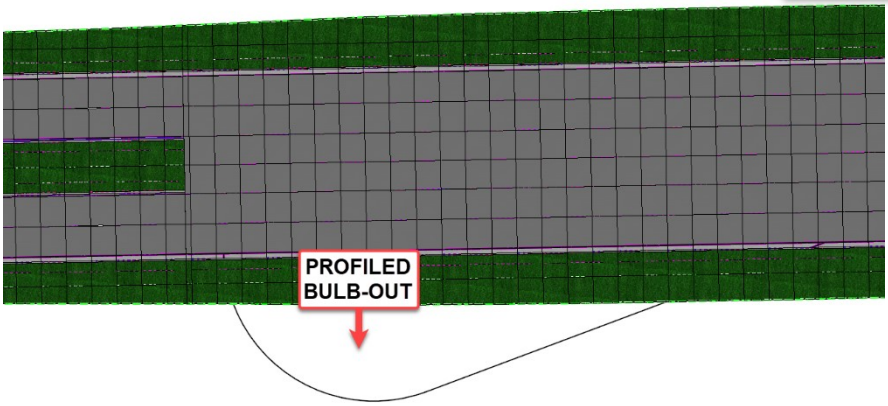


P

E. Then, key the following parameters into the **Profile By Slope From Element** dialog and click through the prompts to **Profile** the **Bulb-Out** element using a **-2.5%** slope from the **Y8 EOT** as shown below.

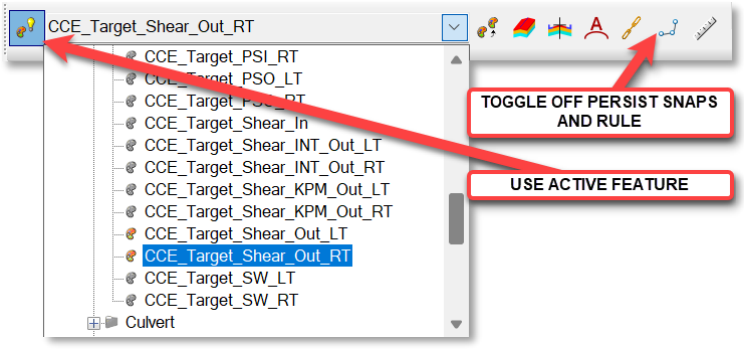
- **Point Selection** = **All**
- **Profile Adjustment** = **None**
- **Vertical Offset** = **0.0000**
- **Slope** = **-2.50%**



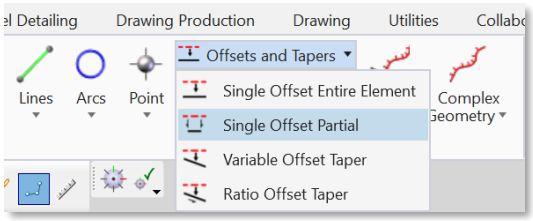


6. Shear the Y8 pavement through the Bulb-Out limits

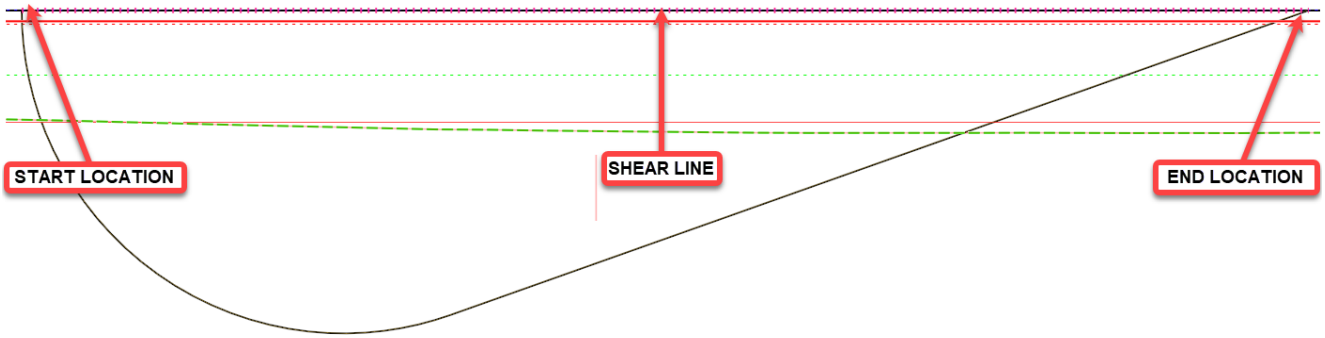
A. From the **Feature Definition Toggle Bar**, toggle **On** the **Use Active Feature Definition** button and then select the **CCE_Target_EOT_Shear_Out_RT** feature from the **(Linear > Roadway > Construction Class Element)** folder as shown below.



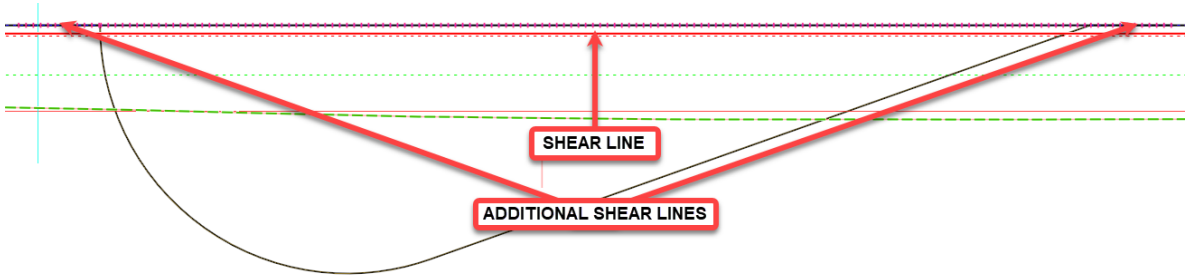
B. Select the **Single Offset Partial** option **(Geometry > Horizontal > Offsets and Tapers > Single Offset Partial)** as shown below and select the **Y8** alignment when prompted to **Locate Element.**



C. When prompted for a **Start** and **End Location**, snap to the following locations as shown below. This places the **Shear Line**.

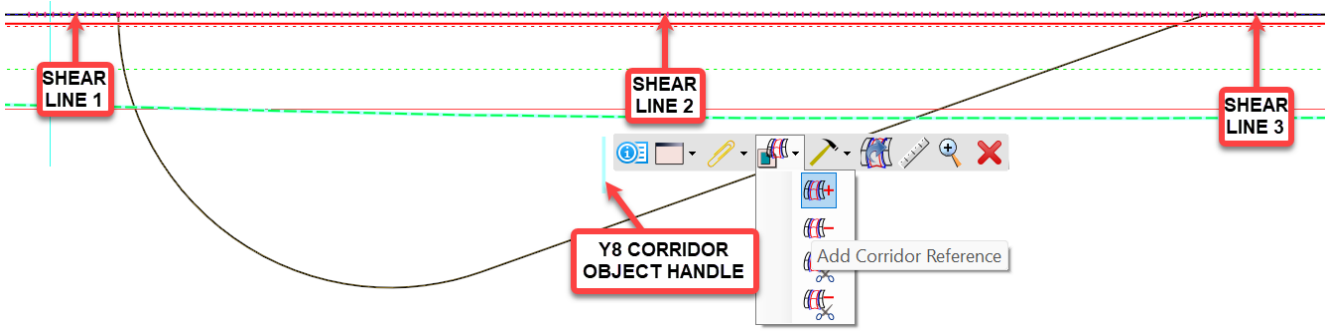


D. Then, follow the same steps to add two (2) additional **Shear Lines** that match the limits of the **20'** tangent lines at the beginning and end of the **Bulb-Out** as shown below.

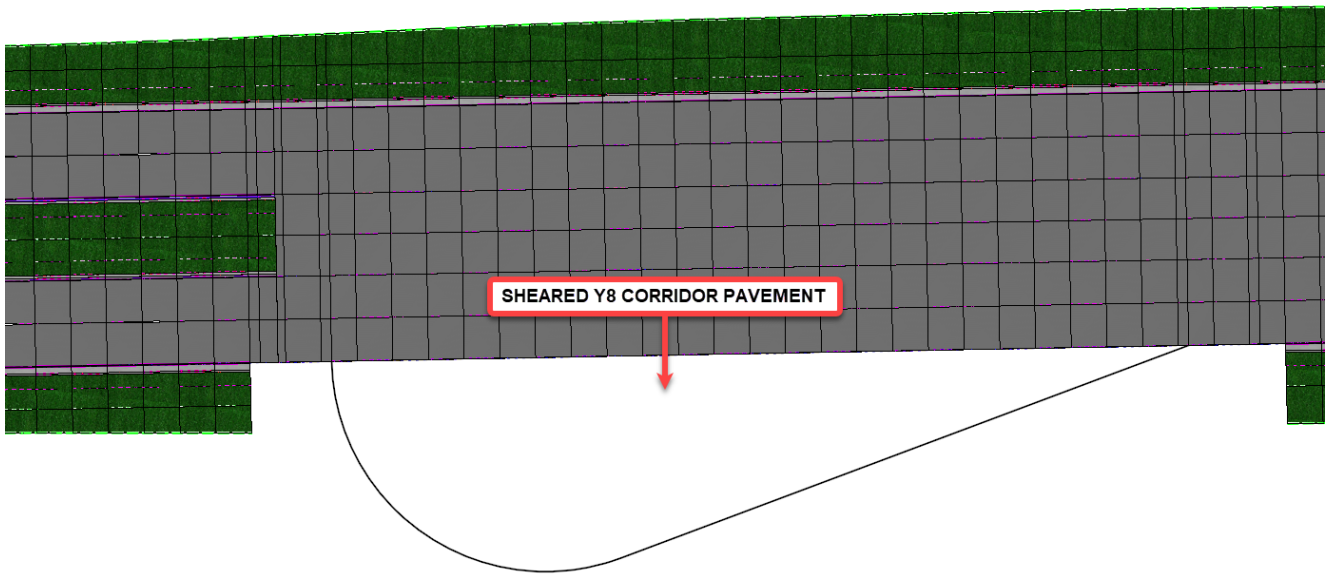


Note: These shear lines are broken up because the longer one in the middle will be used to build a terrain later in the module.

E. Next, click the **Y8 Corridor** Object Handle, hover for a moment to display the menu, and then select the **Add Corridor Reference** option and add the three (3) **Shear Lines** as shown below.



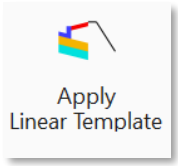
F. The **Y8** corridor pavement has been sheared to accommodate the proposed **Bulb-Out** as shown below.



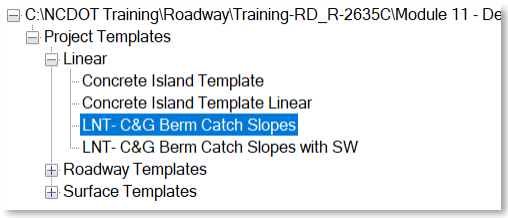
7. Apply a Linear Template to the proposed Bulb-Out linear element

A. Select the **Apply Linear Template** tool **(Model Detailing > Apply Linear Template).**

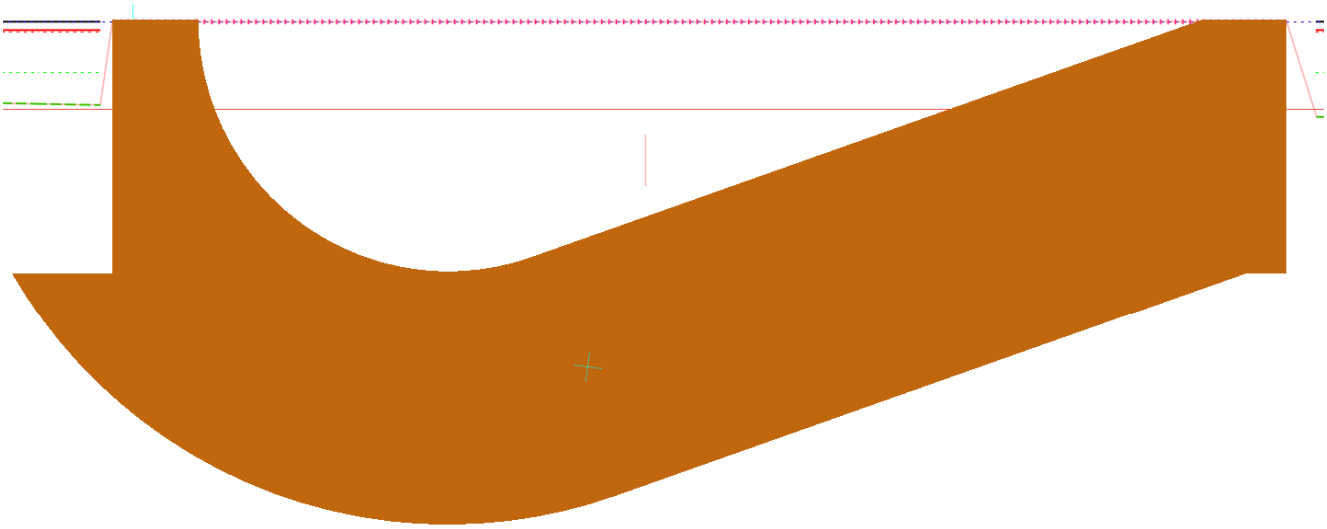
B. Key the following parameters into the **Apply Linear Template** dialog.



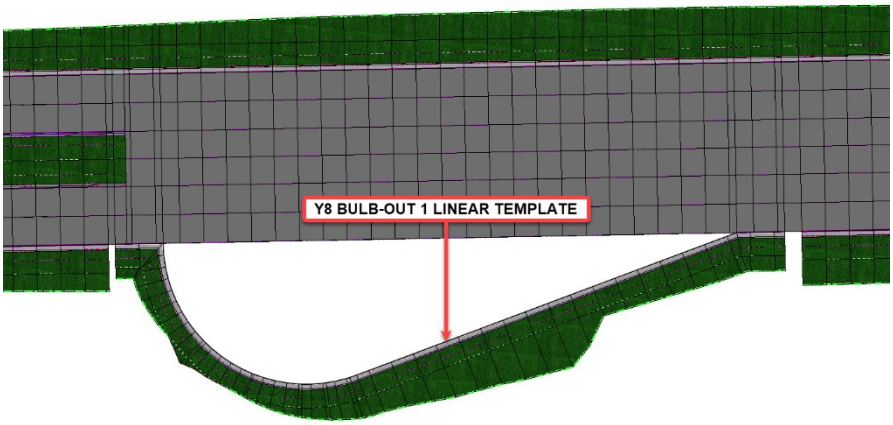
- **Start** = **Lock To Start**
- **End** = **Lock To End**
- **Exterior Corner Sweep Angle** = **05° 00’ 00”**
- **Template** = **LNT - C&G Berm Catch Slopes**
- **Feature Definition** = **Design**
- **Name** = **Y8 Bulb-Out 1**



C. When prompted to **Locate Element To Apply Template**, select the proposed **Bulb-Out** and begin clicking through the prompts. When prompted to **Select Side**, move your cursor as shown below and then continue clicking through the prompts to place the **Linear Template**.

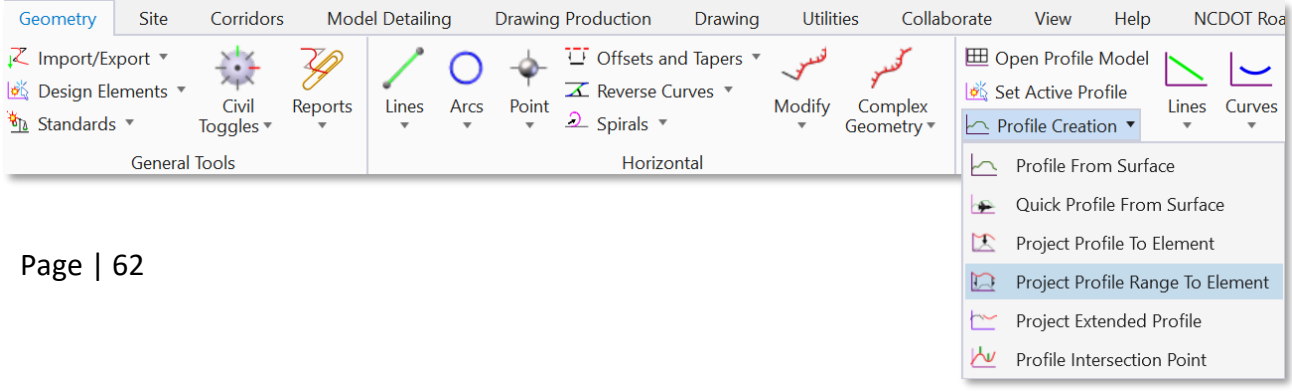


D. Notice in the **View 2, Default 3D** window that the **Y8 Bulb-Out 1 Linear Template** is now visible in the 3D model as shown below.

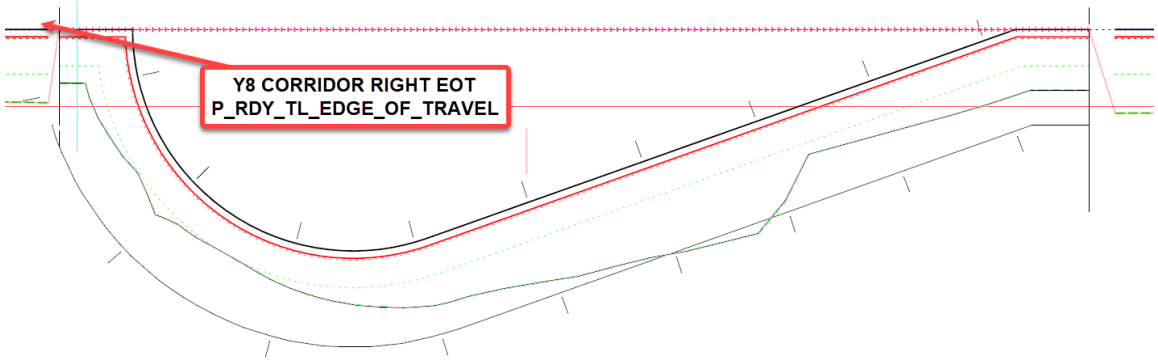


8. Create a Proposed Terrain for the Proposed Bulb-Out

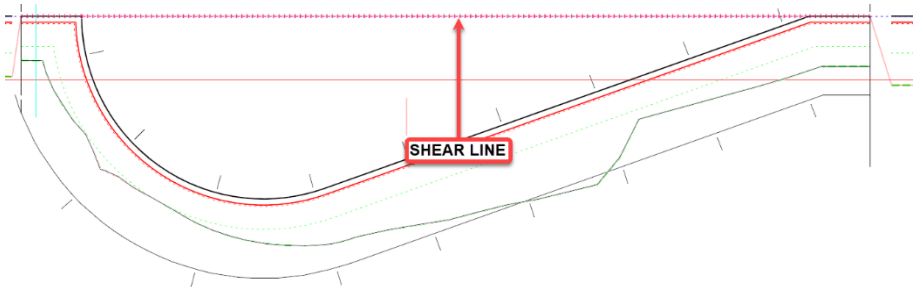
A. First, select the **Project Profile Range To Element** tool **(Geometry > Vertical > Profile Creation > Project Profile Range To Element)** as shown below.



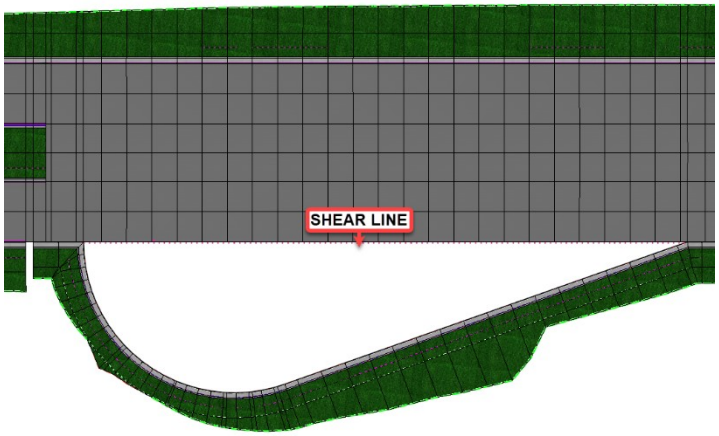
B. When prompted to **Select Element To Project**, select the **Right EOT** line for the **Y8 Corridor.** When selecting the **Y8 Corridor Right EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's very **IMPORTANT** to select the correct linear element.



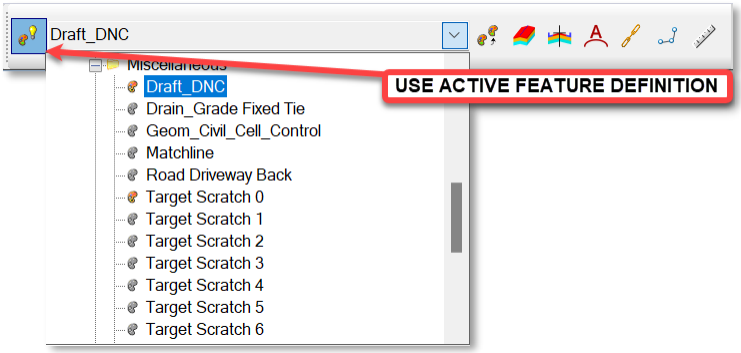
C. When prompted to **Select Plan Element To Project Onto**, select the **Shear Line** that was placed in the previous step. Use the **Alt-Key** to Lock the **Start/End** locations of the **Shear Line** and click through the prompts to finalize the profile projection.



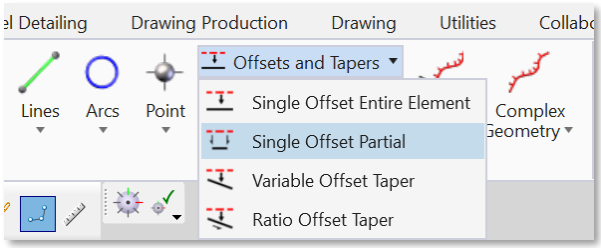
D. Notice in the **View 2, Default 3D** window that the **Shear line** is now visible in the 3D model as shown below. This will be used to produce a proposed terrain for the **Bulb-Out**.



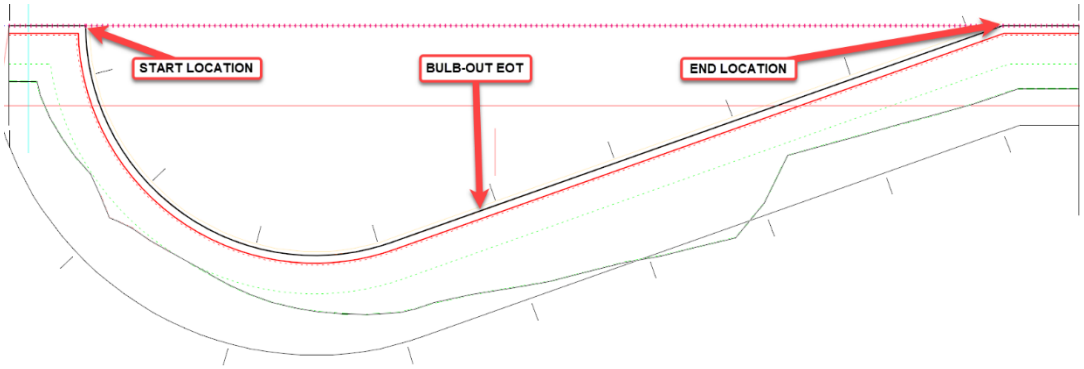
E. From the **Feature Definition Toggle Bar**, toggle On the **Use Active Feature Definition** button and then select the **Draft_DNC** feature from the **(Linear > Roadway > Miscellaneous)** folder as shown below.



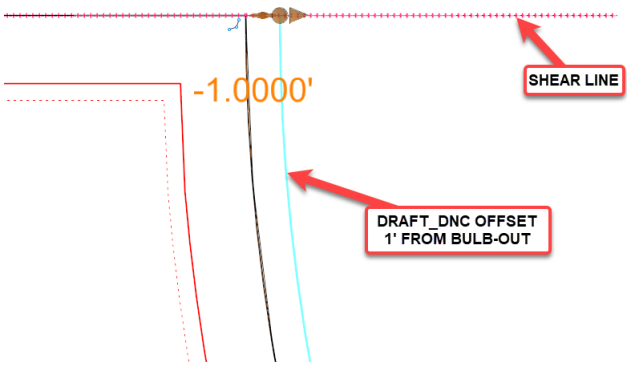
F. Select the **Single Offset Partial** option **(Geometry > Horizontal > Offsets and Tapers > Single Offset Partial)** as shown below and then set the **Offset** parameter within the **Single Offset Partial** dialog to **1.000.**



G. Select the **Bulb-Out EOT** when prompted to **Locate Element** and **Snap** to the **Beginning** and **End** locations of the shear line when prompted for a **Start** and **End Location** as shown.

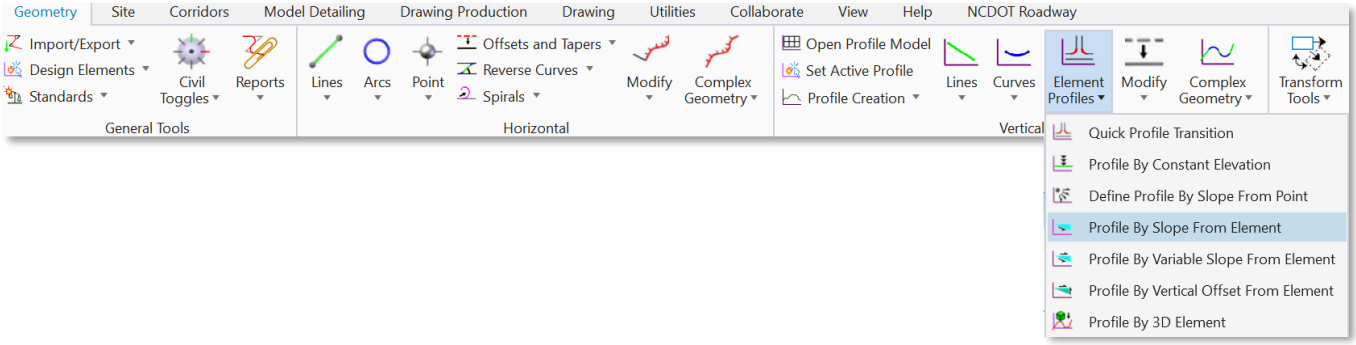


H. This will place a **Draft_DNC** construction class element with a **1'** offset from the **Bulb-Out** along the length of the **Shear Line** as shown below.

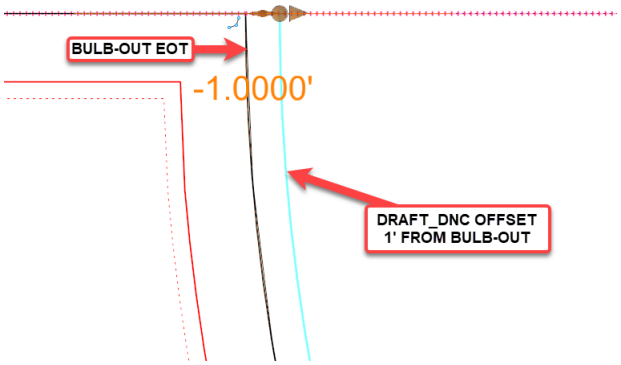


Note: The 1' offset is temporary and was used to make it easier to work with the Draft_DNC element.

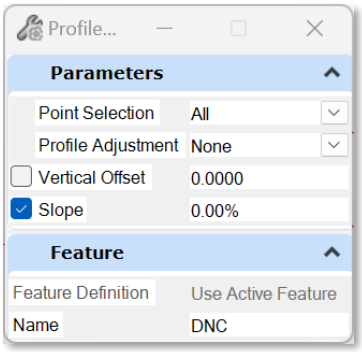
I. Next, select the **Profile By Slope From Element** tool **(Geometry > Vertical > Element Profiles > Profile By Slope From Element)** as shown below.



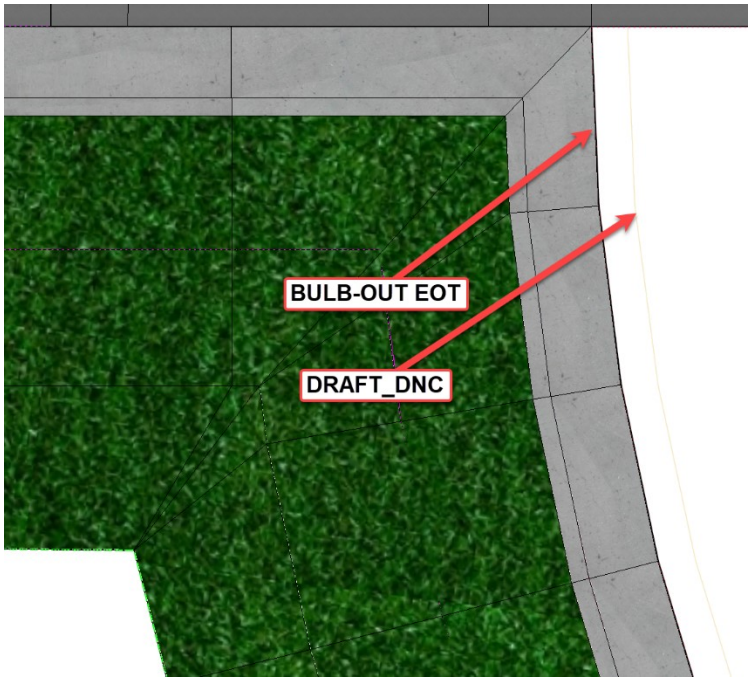
J. Select the **Draft_DNC** element when prompted to **Locate First Element To Profile**, then **Right-Click to Reset And Complete**. When prompted to **Locate Reference Element**, select the **Bulb-Out EOT** element.



K. Then, key the following parameters into the **Profile By Slope From Element** dialog and click through the prompts to **Profile** the **Bulb-Out** element using a **0.00%** slope from the **Bulb-Out EOT** as shown below.



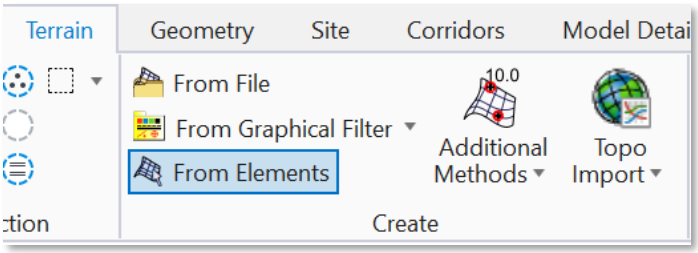
- **Point Selection = All**
- **Profile Adjustment = None**
- **Vertical Offset = 0.0000**
- **Slope = 0.00%**



L. Next, select the **Element Selection** tool **(Terrain > Selection > Element Selection).** Select the **Shear Line** and **Draft_DNC** elements as shown below. Be sure to select the **Shear Line**. See **Tip** below.

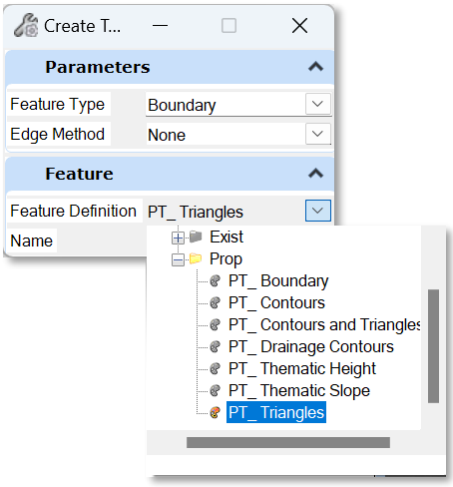
Tip: Zoom in closely and right click to tab through until you get the correct line.

M. Then, select the **Create Terrain From Elements** tool **(Terrain > Create > From Elements)** as shown below.

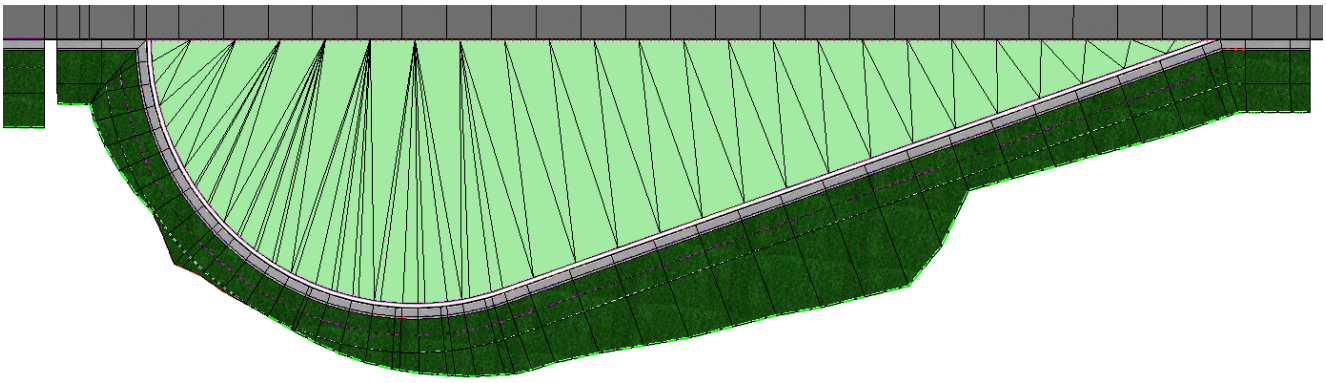


N. Still keeping the **Shear Line and Draft_DNC** elements selected, key the following parameters into the **Create Terrain From Elements** dialog.

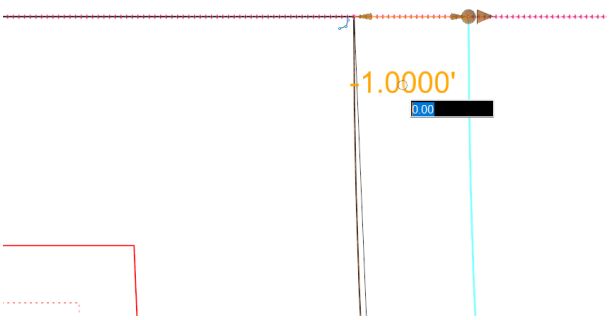
- **Feature Type** = **Boundary**
- **Edge Method** = **None**
- **Feature Definition** = **PT_Triangles**



O. Left click through the prompts to create the **Bulb-Out Terrain Model** as shown below.

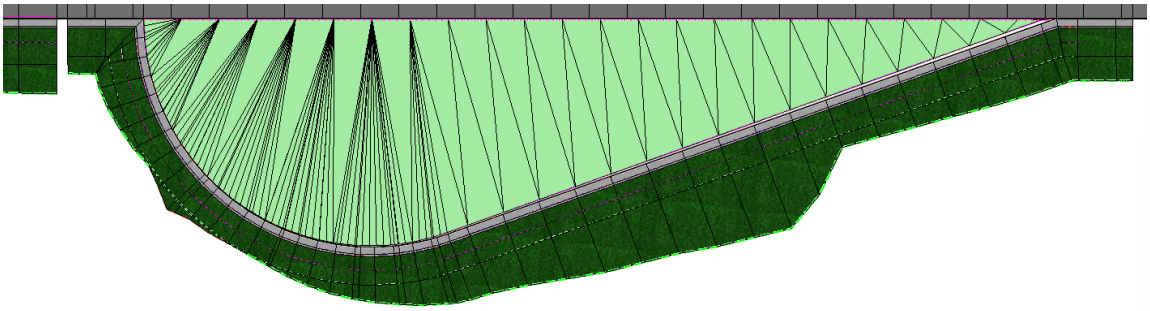


P. After the **Bulb_Out Terrain Model** has been created, change the **Draft_DNC** offset to **0.000'**, so that it sits directly on top of the **Bulb-Out EOT**. See **Note** below.

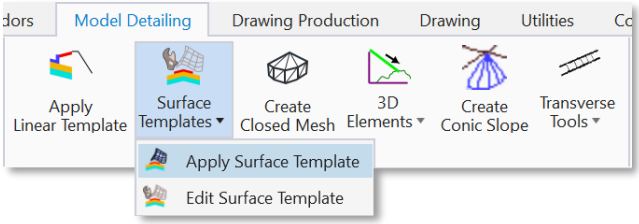


Note: As previously mentioned, the Draft DNC 1' offset was only temporary to make it easier to work with.

Q. Notice that the **Bulb-Out Terrain Model** has been adjusted and now runs along the **Bulb-Out EOT** line as shown below.

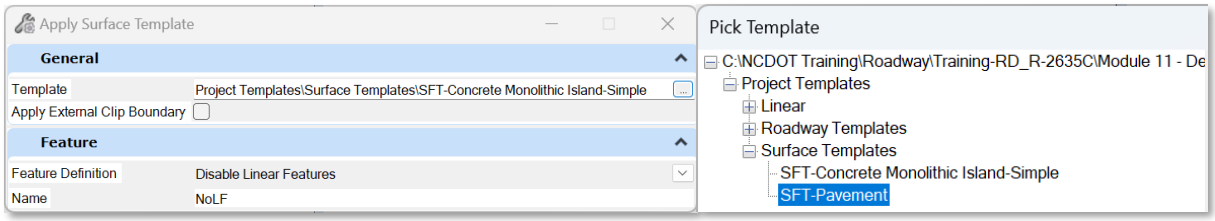


R. Next, select the **Apply Surface Template** tool **(Model Detailing > Surface Templates > Apply Surface Template)** as shown below.

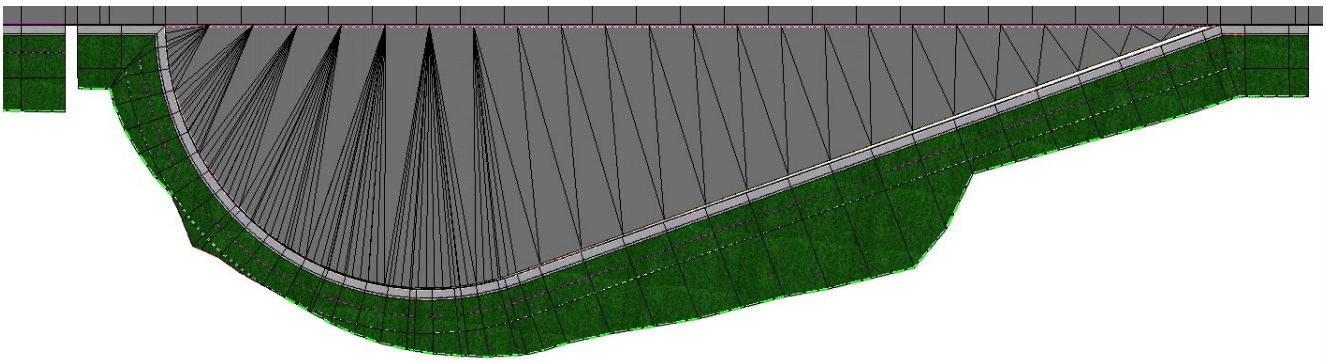


S. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Bulb-Out Terrain Model** from within the **View 2, Default 3D** window when prompted to **Locate Terrain Model**.

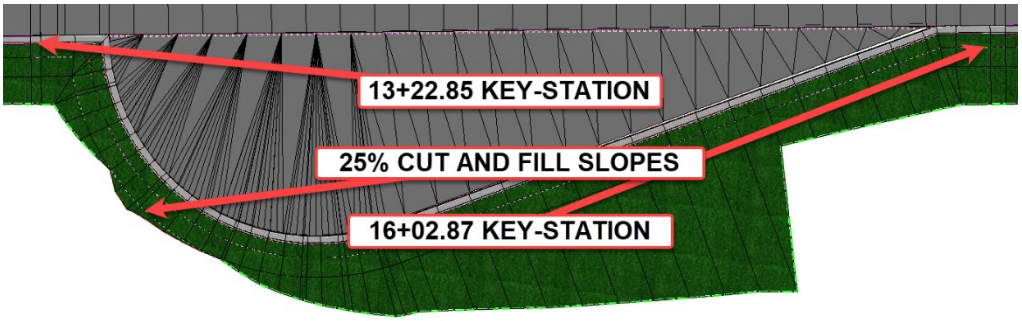
- **Template** = **SFT-Pavement**
- **Feature Definition** = **Disable Linear Features**



T. Continue left clicking through the prompts to apply the **SFT-Pavement Surface Template** to the **Bulb-Out Terrain Model** as shown below.

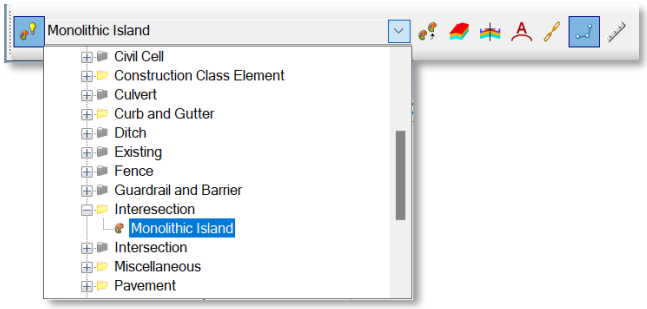


U. Use a combination of **Key-Stations** and **Parametric Constraints** to seamlessly connect the **Bulb-Out** to the **Y8 Corridor** as shown below.

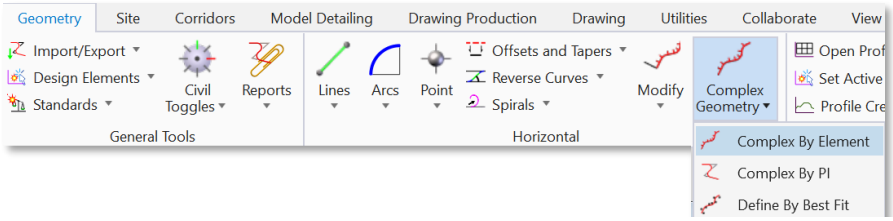


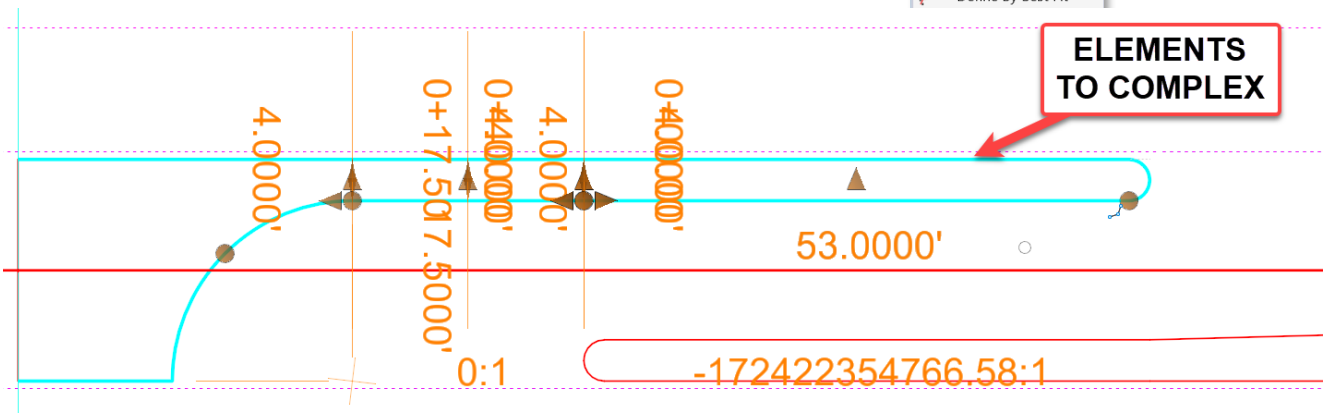
9. Model the Concrete Islands for Median U-Turns

A. From the Feature Definition Toggle Bar, toggle on the Use Active Feature Definition button and then select the **Monolithic Island** feature from the **(Linear > Roadway > Intersection)** folder as shown below. Keep this **Feature** active throughout all steps that follow.

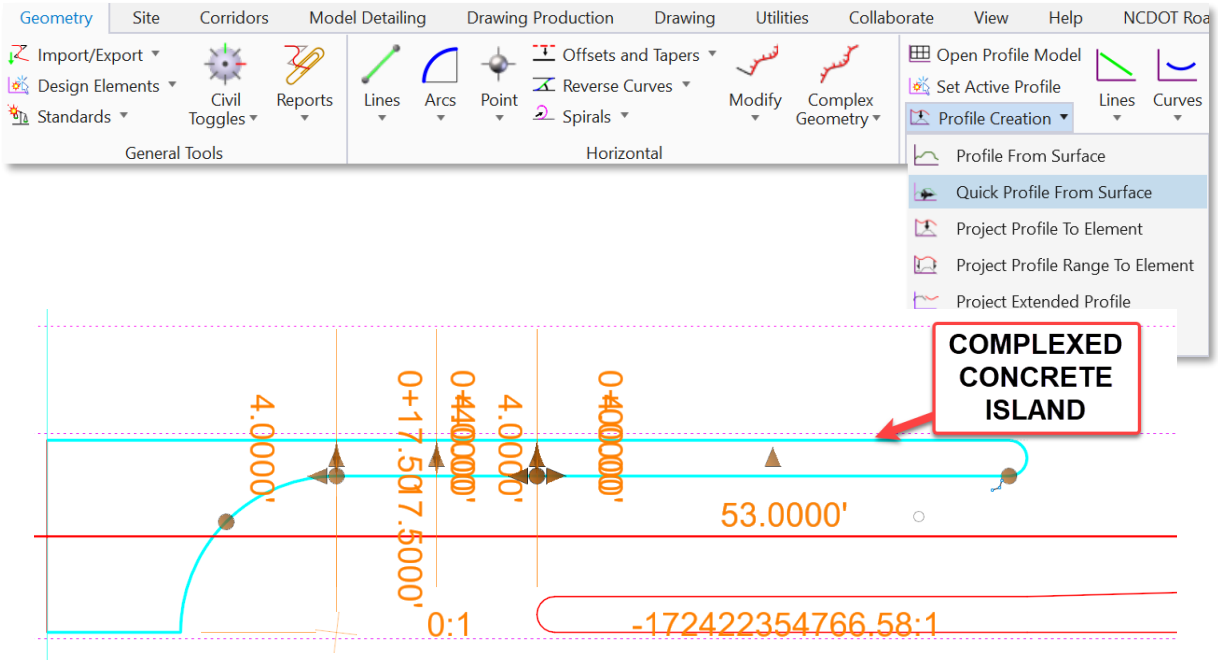


B. Next, select the **Complex By Element** tool **(Geometry > Horizontal > Complex Geometry > Complex By Element)**, set the **Method** Parameter to **Manual** and complex the elements highlighted in purple as shown below.

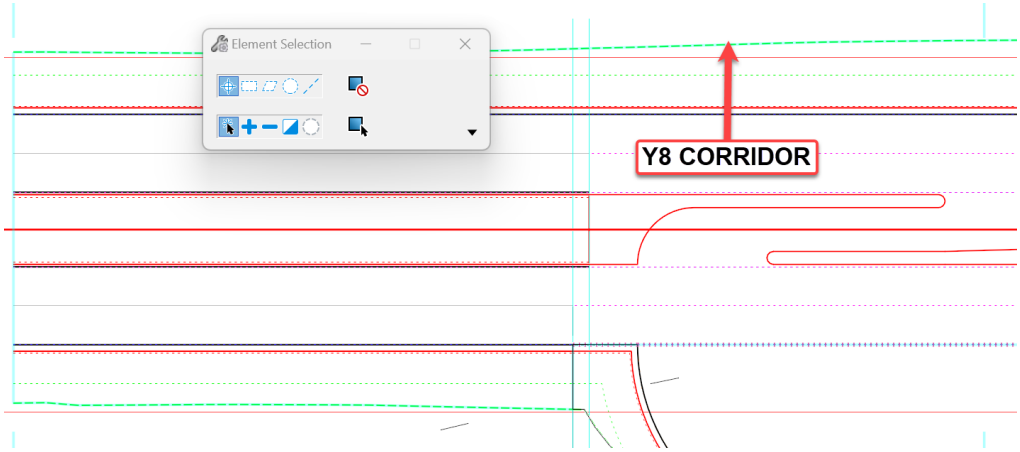




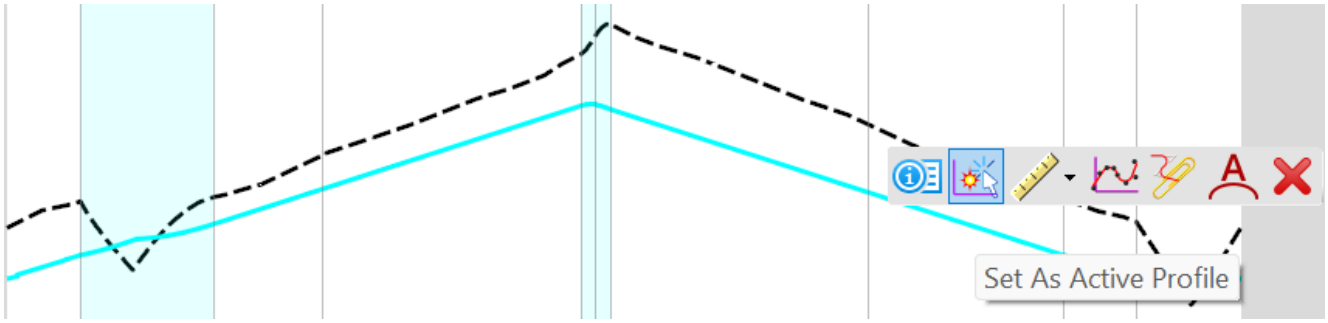
C. Next, select the **Quick Profile From Surface** tool **(Geometry > Vertical > Profile Creation > Quick Profile From Surface)** and select the **Complexed Concrete Island** when prompted to **Locate Reference Element**.



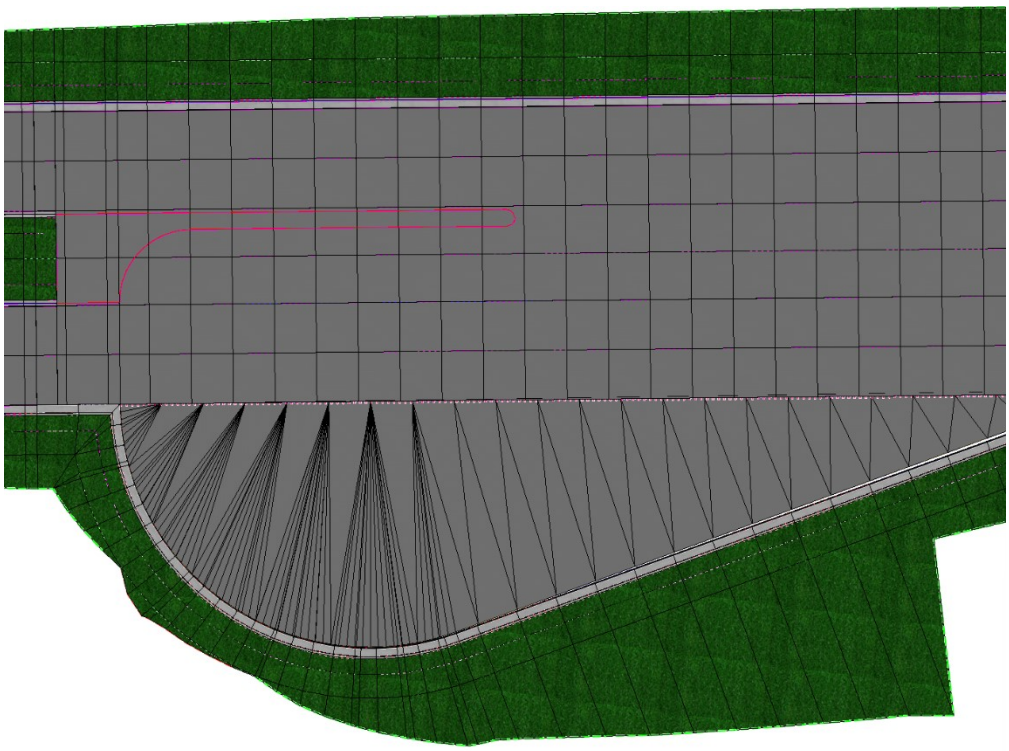
D. Then, select the **Y8 Corridor** when prompted to **Locate Reference Surface**. **Right-click** to reset and finalize the command.



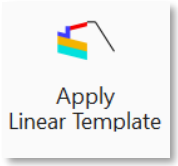
E. Now, open the **Profile View** for the **Complexed Concrete Island** and set the new profile to **Active** as shown below.



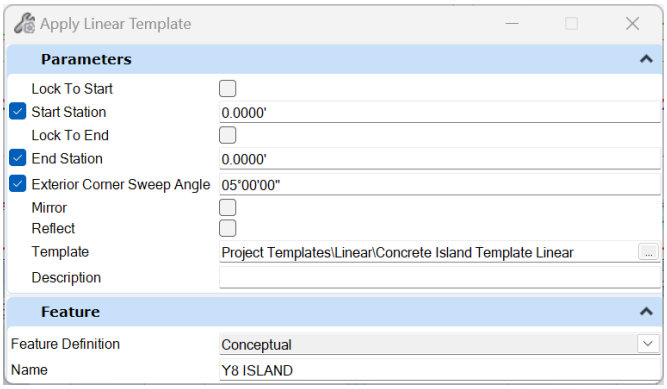
F. Notice in the **View 2, Default 3D** window that the **Concrete Island** is now displayed in the 3D model as shown below.

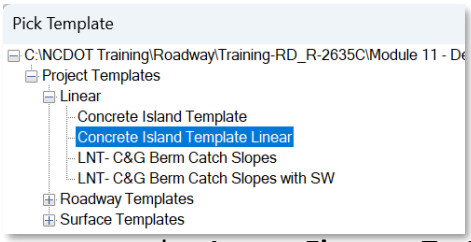


G. Next, select the **Apply Linear Template** tool **(Model Detailing > Apply Linear Template)** and key the following parameters into the **Apply Linear Template** dialog.

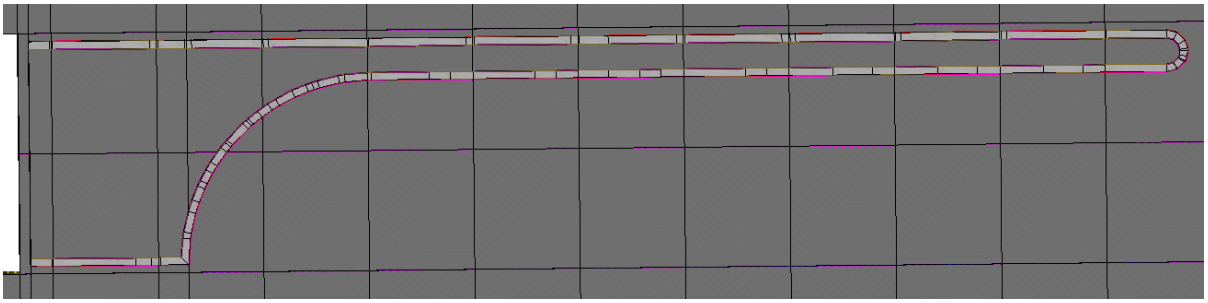


- **Start** = **Lock To Start**
- **End** = **Lock To End**
- **Exterior Corner Sweep Angle** = **05° 00’ 00”**
- **Template** = **Concrete Island Template Linear**
- **Feature Definition** = **Design**
- **Name** = **Y8 ISLAND**

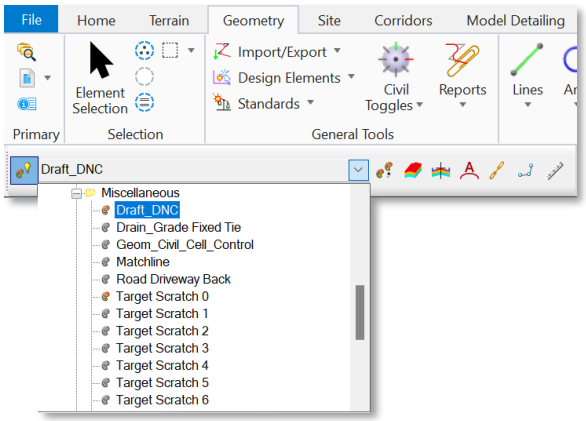




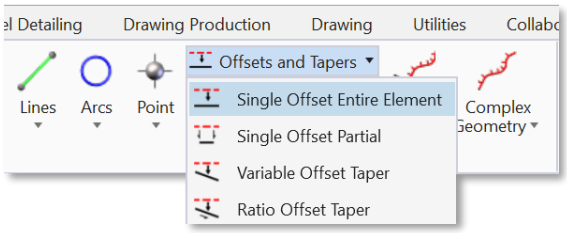
H. When prompted to **Locate Element To Apply Template**, select the **Concrete Island** and place the **Linear Template** as shown below.

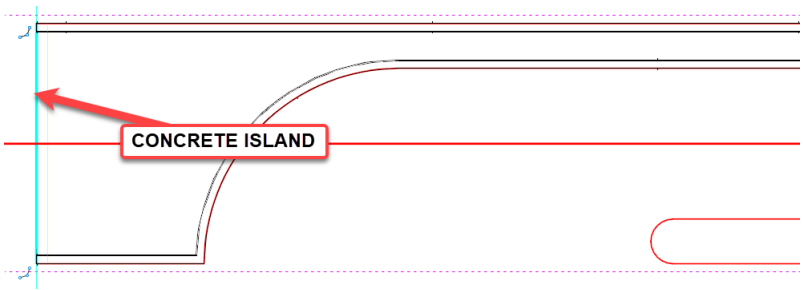


I. From the **Feature Definition Toggle Bar**, toggle **On** the **Use Active Feature Definition** button and then select the **Draft_DNC** feature from the **(Linear > Roadway > Miscellaneous)** folder as shown below.

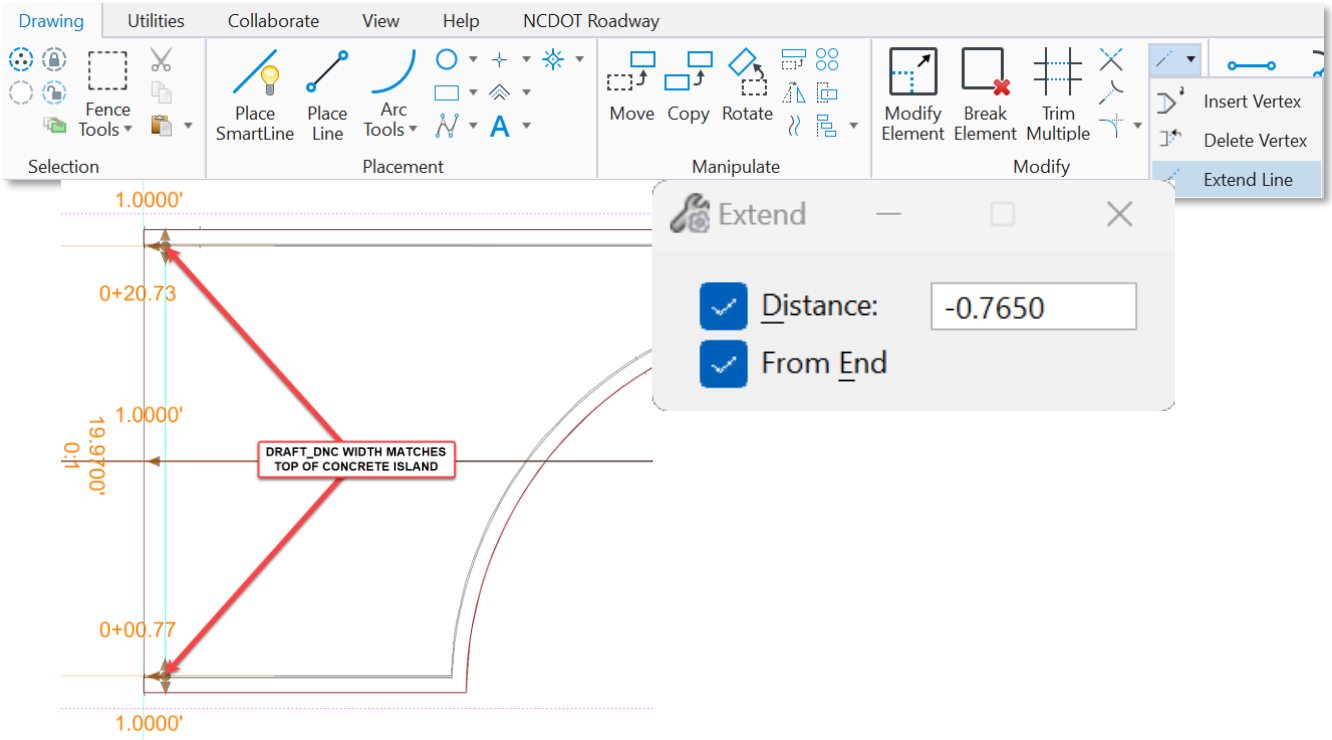


J. Select the **Single Offset Entire Element** option **(Geometry > Horizontal > Offsets and Tapers > Single Offset Entire Element)** as shown below. Then set the **Offset** parameter within the **Single Offset Partial** dialog to **1.000** and click the single portion of the **Concrete Island** when prompted to **Locate Element**.

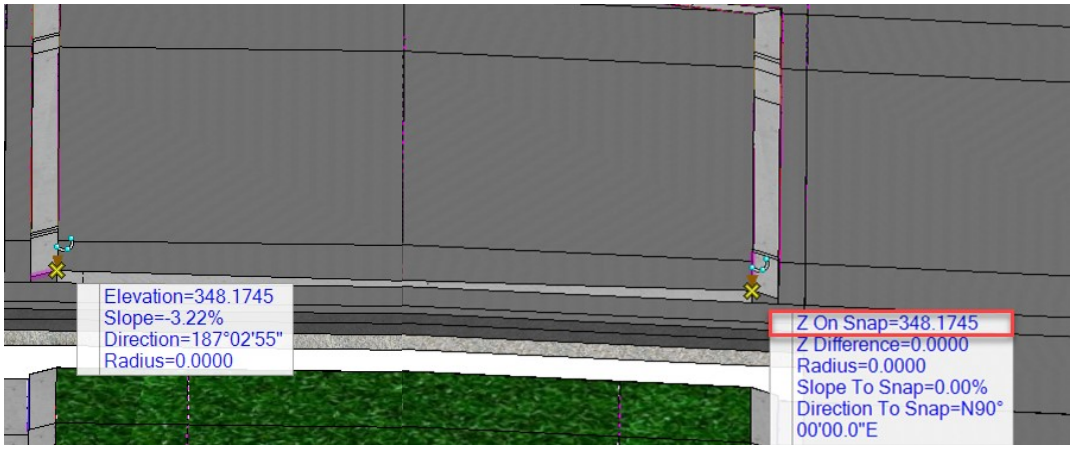




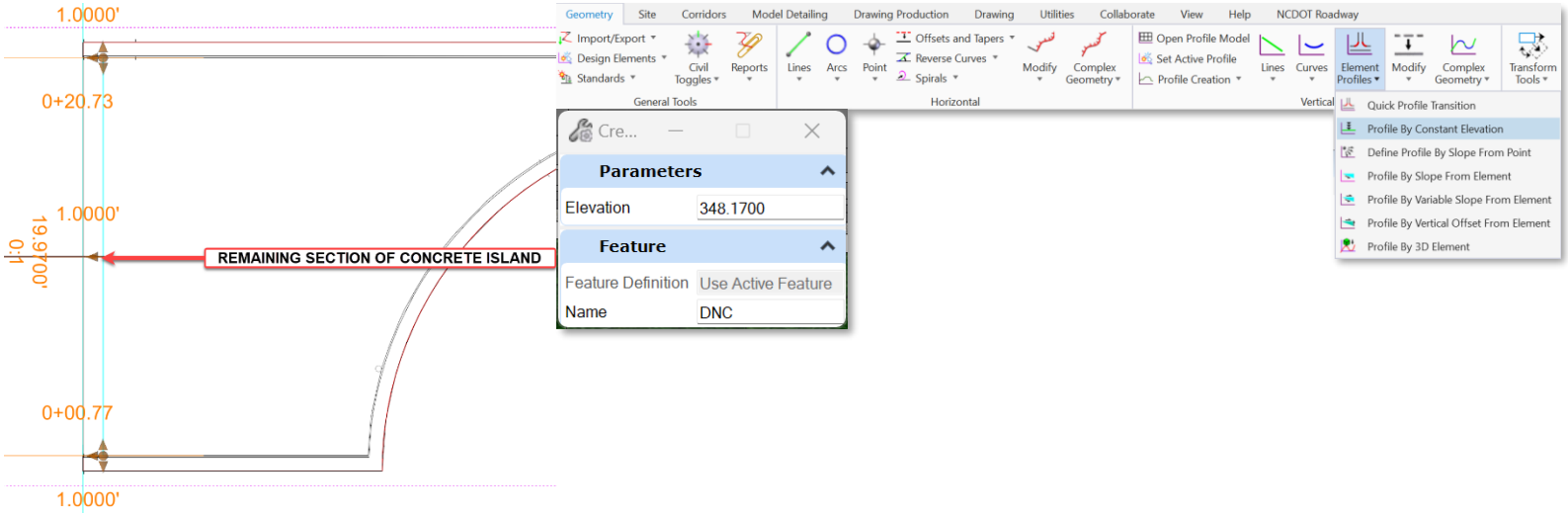
K. Next, select the **Extend Line** tool **(Drawing > Modify > Extend Line)** and shorten the **Draft_DNC** element that was just offset in the previous step by **-0.765** from both ends to match the width of the top portion of the **Concrete Island.**



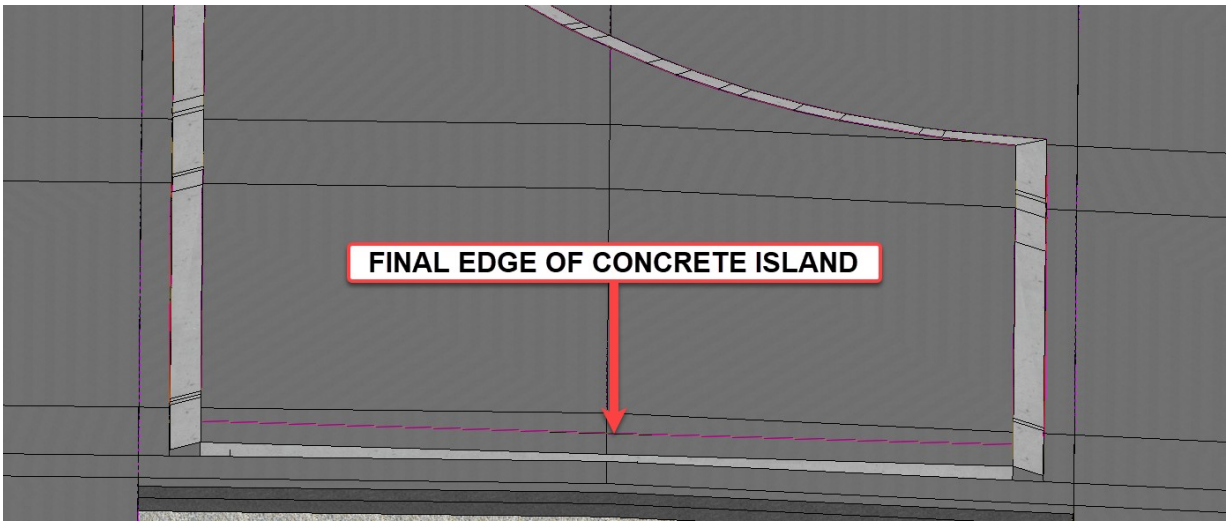
L. In the **View 2, Default 3D** window, **Snap** to the **Beginning** and **End** of the **Concrete Island** to determine the elevation at the top linear element. This will be used to set a **Profile** for the remaining section of the **Concrete Island.**



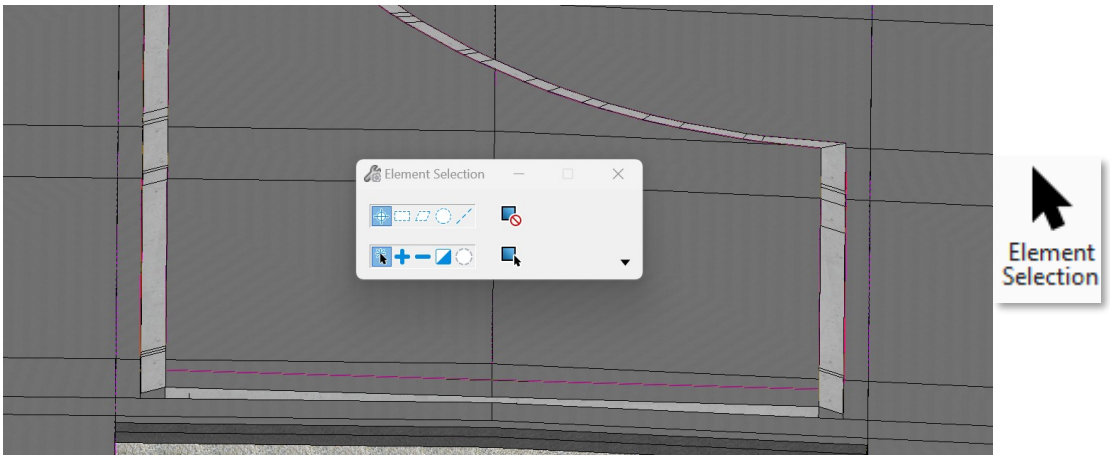
M. Next, select the **Profile By Constant Elevation** tool **(Geometry > Vertical > Profile Creation > Profile By Constant Elevation)**. Set the **Elevation** parameter to **348.17** and select the remaining section of the **Concrete Island** when prompted to **Locate Element.**



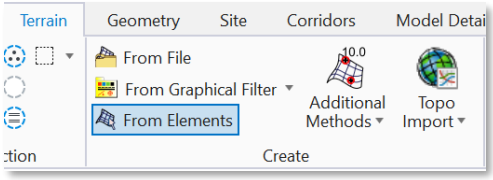
N. Notice in the **View 2, Default 3D** window that the final edge of the **Concrete Island** is now visible in the 3D model and matches the width and elevation of the previously modeled portion.



O. Next, select the **Element Selection** tool **(Terrain > Selection > Element Selection)** and select the **Concrete Island** linear elements as shown below.

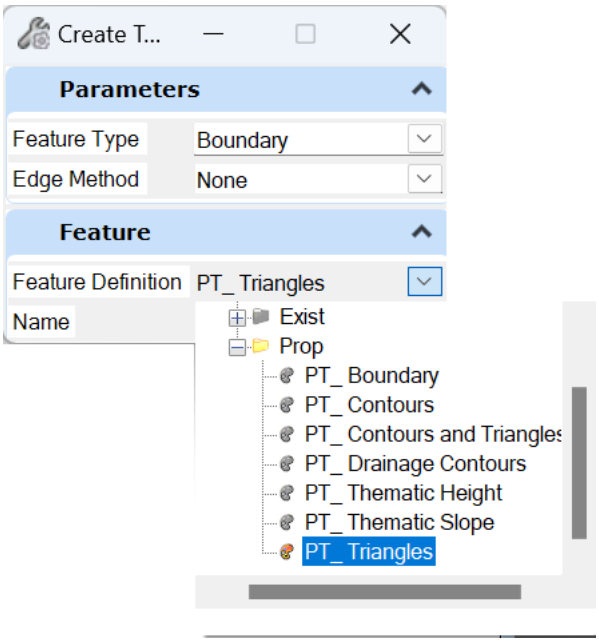


P. Then, select the **Create Terrain From Elements** tool **(Terrain > Create > From Elements)** as shown below.

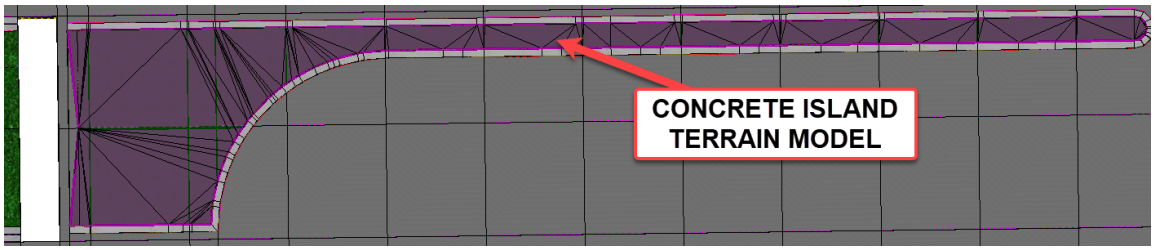


Q. Still keeping the **Concrete Island** elements selected, key the following parameters into the **Create Terrain From Elements** dialog.

- **Feature Type** = **Boundary**
- **Edge Method** = **None**
- **Feature Definition** = **PT_Triangles**

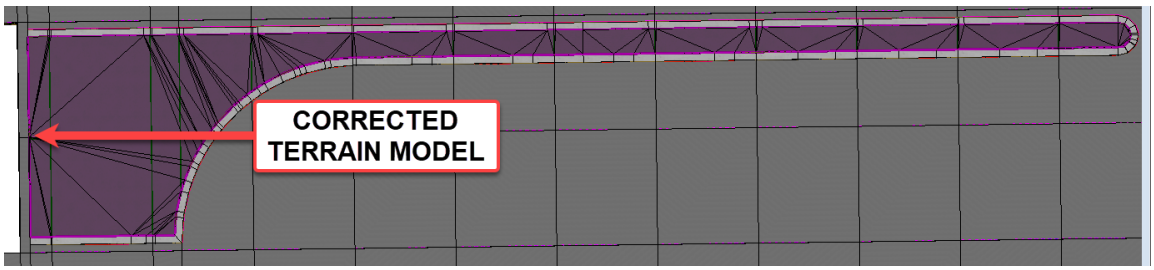


R. Left click through the prompts to create the **Concrete Island Terrain Model** as shown below. Notice that the **Terrain Model** doesn't look correct along the edge that was **Offset** by **1'**. To correct this, simply change the **Offset** to **0'**.

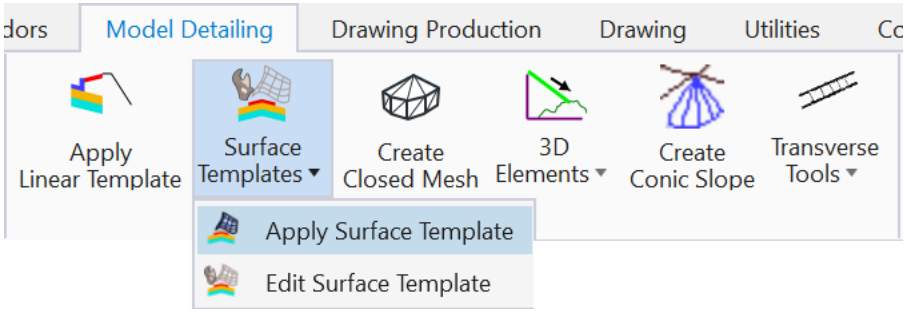


Note: The 1' offset was temporarily used to make it easier to manipulate the element.

S. After changing the **Offset** to **0'** the **Terrain Model** has been corrected as shown below.

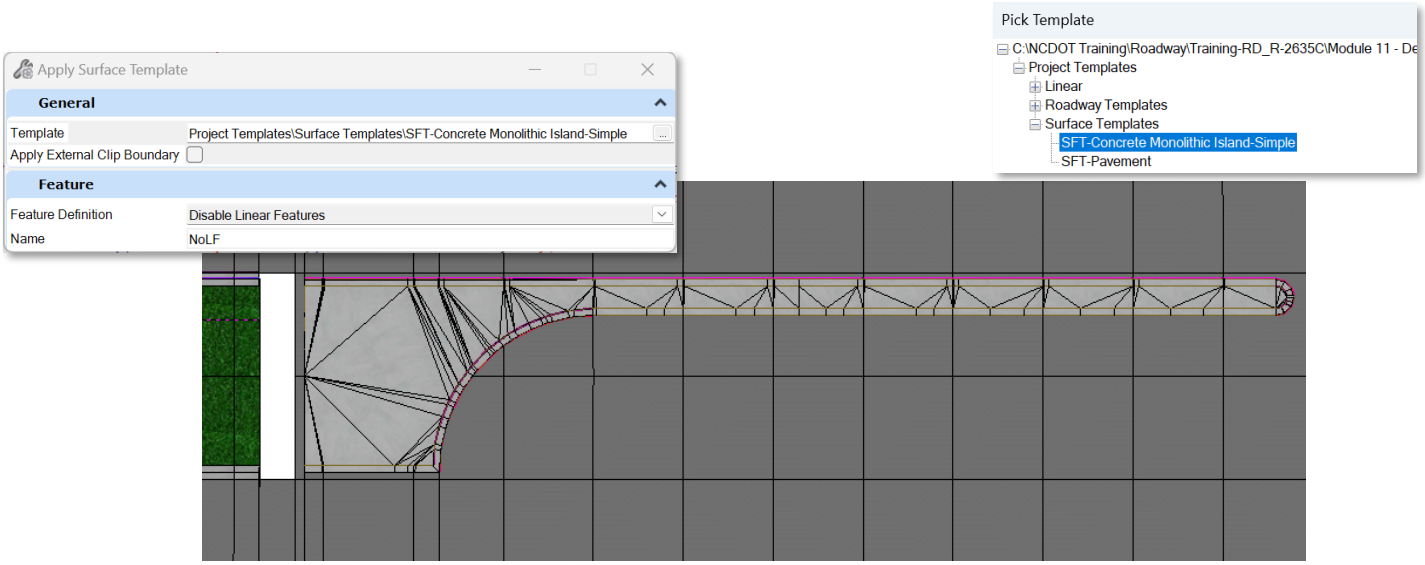


T. Select the **Apply Surface Template** tool **(Model Detailing > Surface Templates > Apply Surface Template)** as shown below.

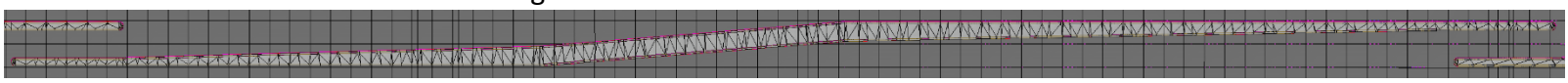


U. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Concrete Island Terrain Model** when prompted to **Locate Terrain Model**. This finalizes the **Concrete Island**.

- **Template** = **SFT-Concrete Monolithic Island-Simple**
- **Feature Definition** = **Disable Linear Features**

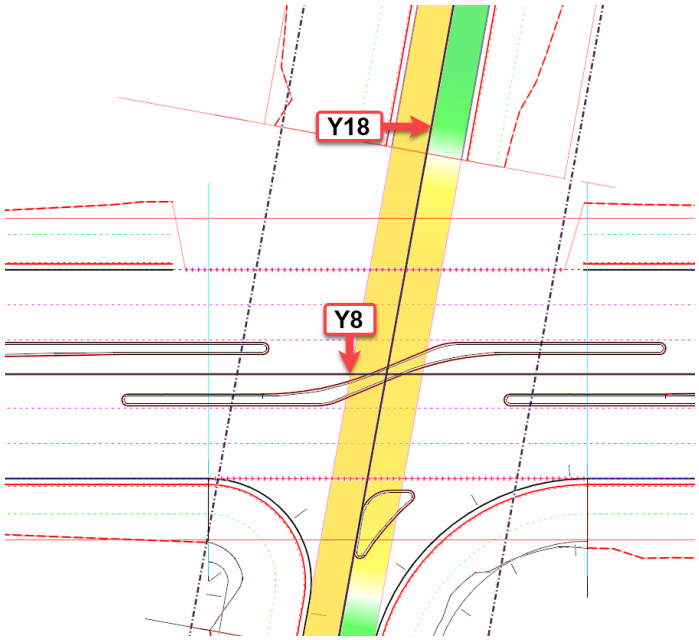


V. Using the skills taught throughout the **Detailed Modeling Module**, model the final **Concrete Island** that runs along the **Y8 Corridor** as shown below.



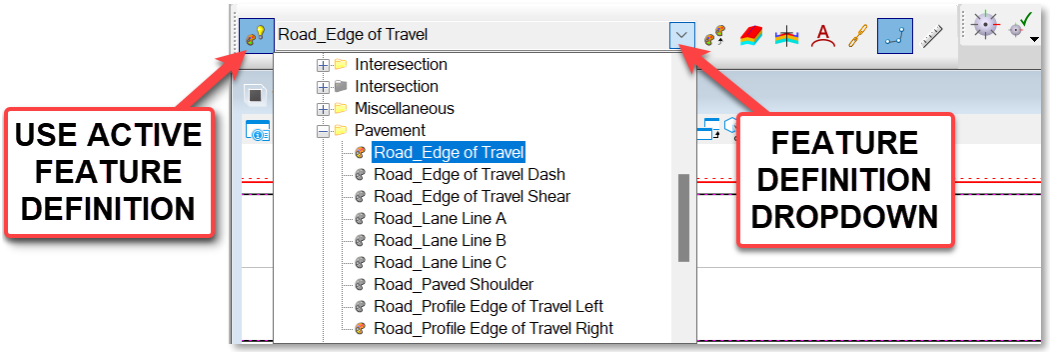
10. Layout the Radius Returns for the Northern side of the Y8/Y18 Intersection

A. Zoom in closely to the **Northern** side of the **Y8/Y18** Intersection.

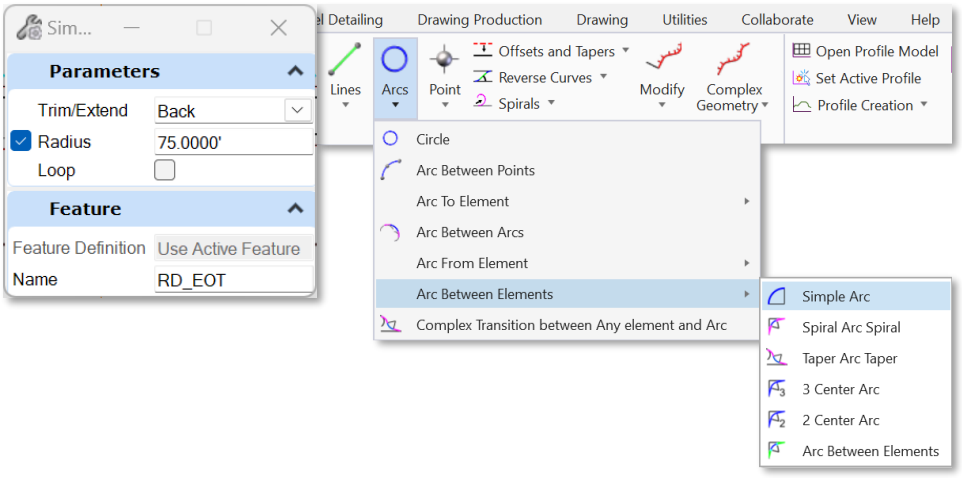


Note: Both Corridors are contained within a single CMD file for training purposes only. Typically, Detailed Intersection Modeling would be carried out within the Secondary Corridor CMD file. See File Management module for detailed information.

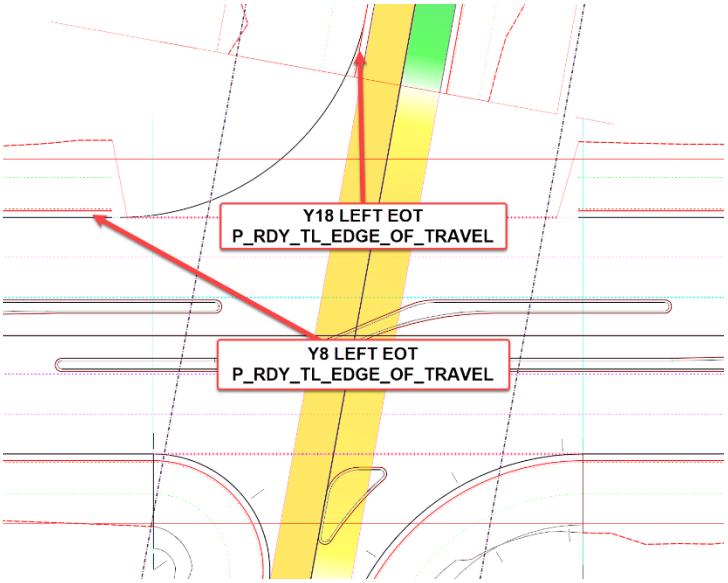
B. From the **Feature Definition Toggle Bar**, toggle on the **Use Active Feature Definition** button and the **Persist Snaps and Rule** option. Select the **Road_Edge of Travel** feature from the **(Linear > Roadway > Pavement)** folder as shown below. Keep this **Feature** active throughout all steps that follow.



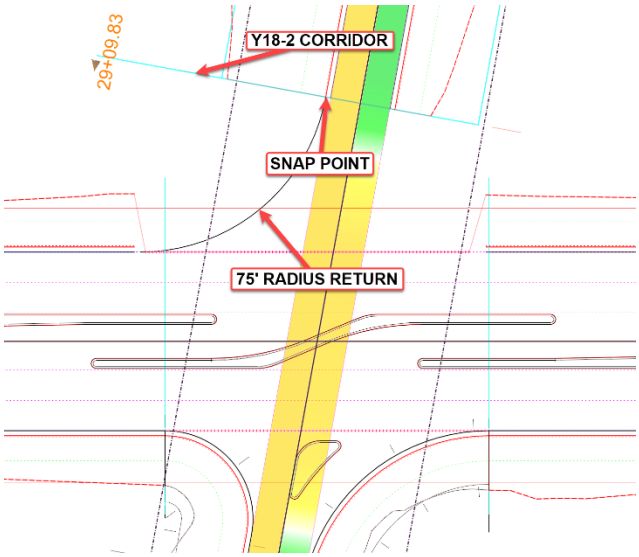
C. Now, select the **Simple Arc** tool **(Geometry > Horizontal > Arcs > Arc Between Elements > Simple Arc).** Set the Radius parameter to **75.0000'** and the **Trim/Extend** parameter to **Back** within the **Simple Arc** dialog as shown below.



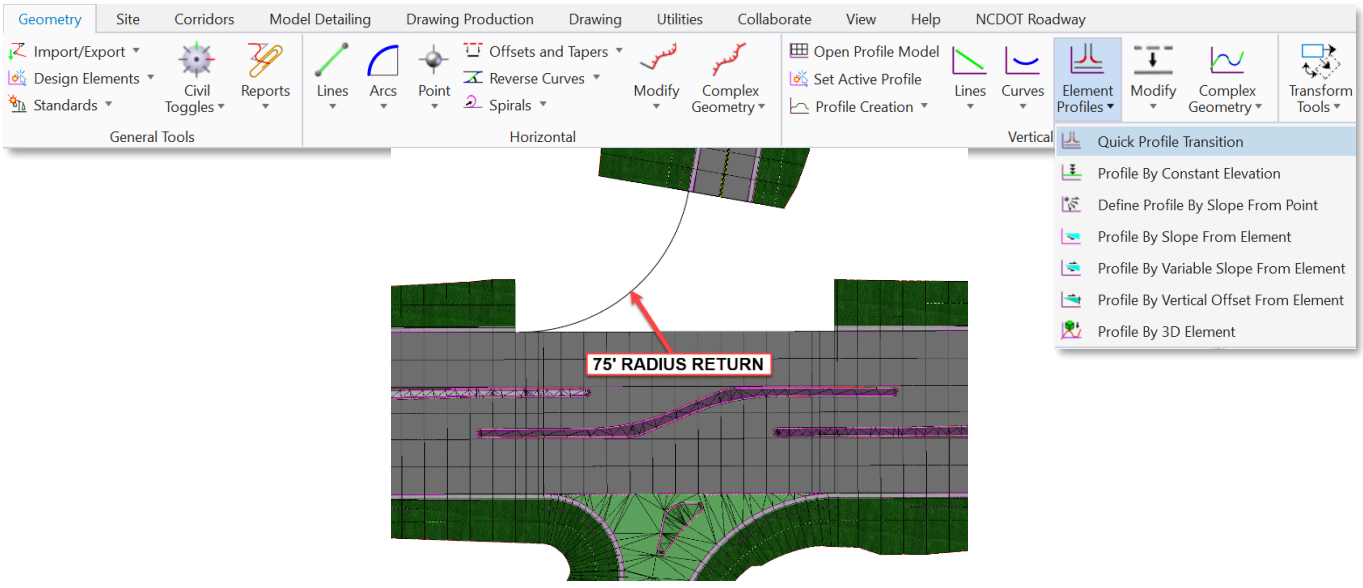
D. When prompted to **Locate First Element**, select the **Y18 Left EOT** line and then select the **Y8 Left EOT** line as the **Second Element.** When selecting the **EOT** lines you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel.** It's **IMPORTANT** to select the correct linear element. Continue **Left-Clicking** through the additional prompts that follow to place the **75' Radius Return** as shown below.



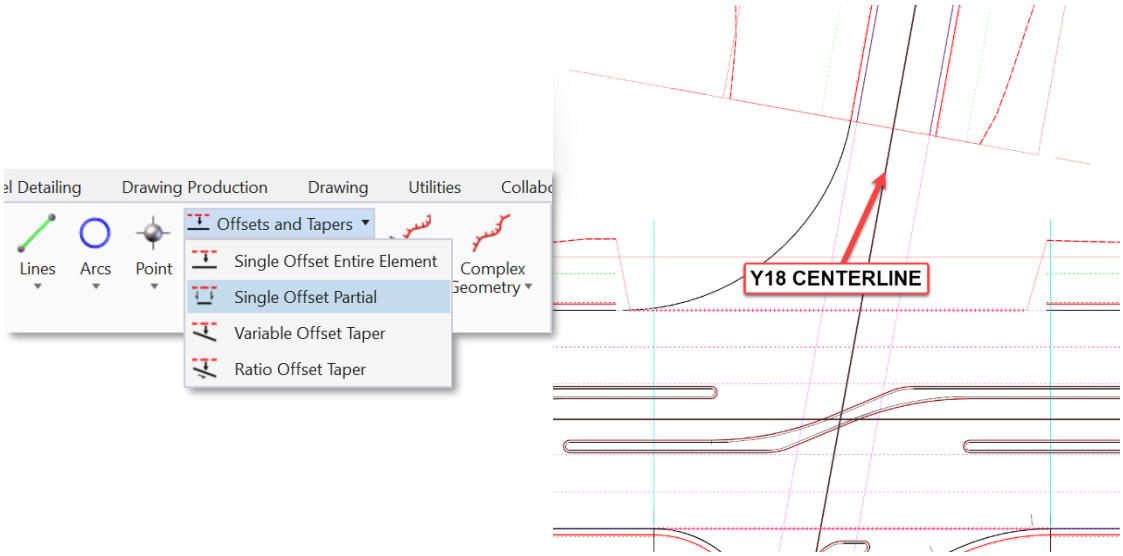
E. Now, adjust the beginning of the **Y18-2 Corridor** by **Snapping** to the end of the **75' Radius Return**.



F. Next, select the **Quick Profile Transition** tool **(Geometry > Vertical > Element Profiles > Quick Profile Transition)** and click the **75' Radius Return** to **Profile** it and add to the **3D Model** as shown below.

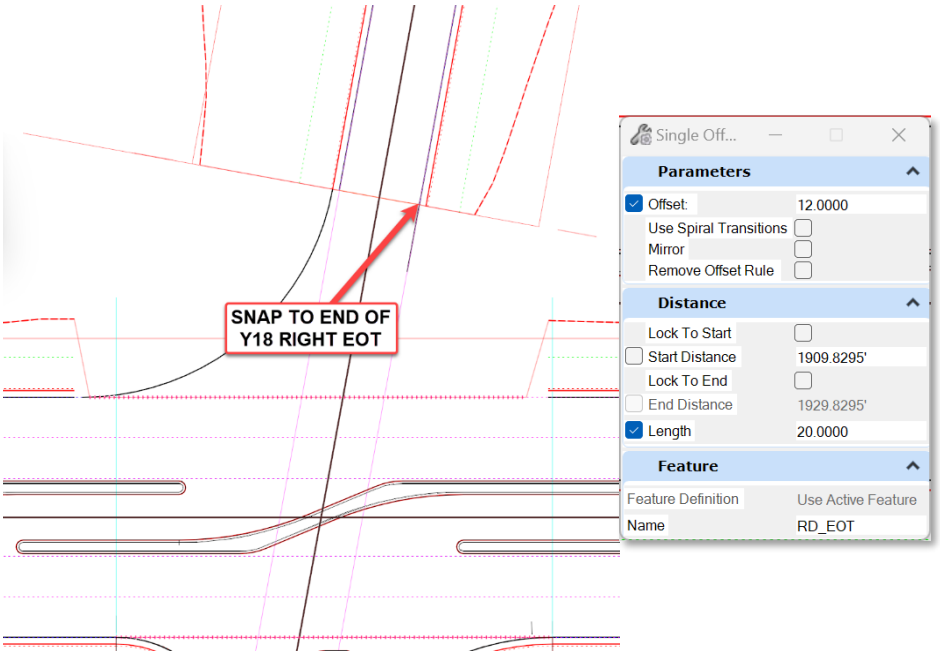


G. Then, select the **Single Offset Partial** tool **(Geometry > Horizontal > Offsets and Tapers > Single Offset Partial** and click the **Y18 Centerline** when prompted to locate element.

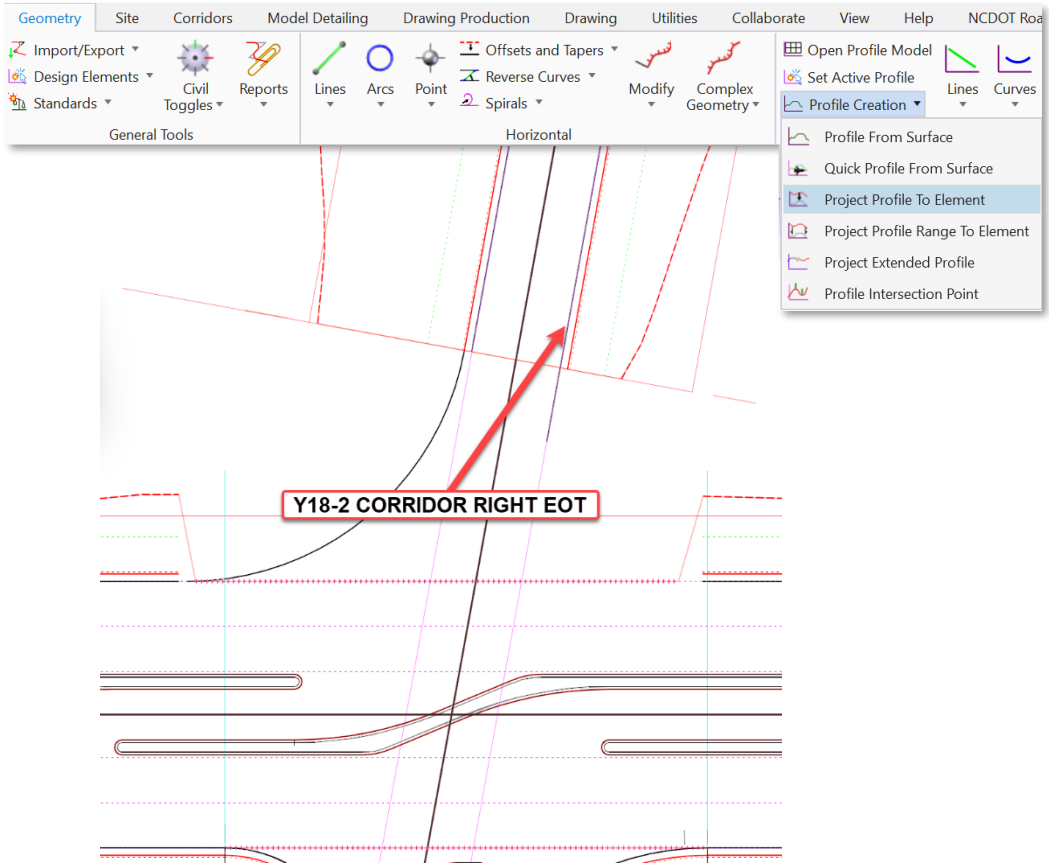


H. Set the following parameters within the **Single Offset Partial** dialog and then **Snap** to the end of the **Y18 Right EOT** line as shown below when prompted for a **Start** location. Click through the additional prompts to finalize and place **EOT** line.

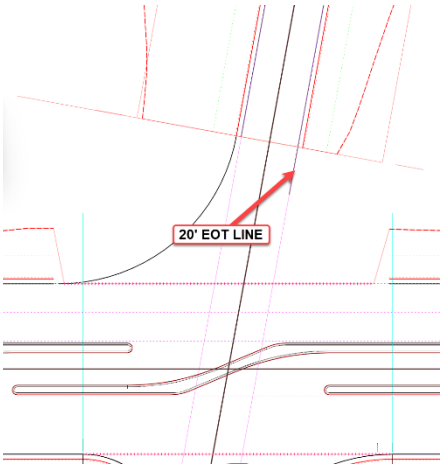
- **Offset** = **12.0000**
- **Length = 20.000**



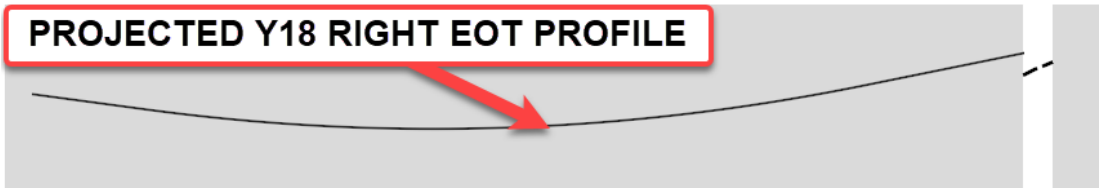
I. Next, select the **Project Profile To Element** tool **(Geometry > Vertical > Profile Creation > Project Profile To Element)** and click the **Right EOT** line from the **Y18-2 Corridor** as shown below when prompted to **Select Element To Project**.



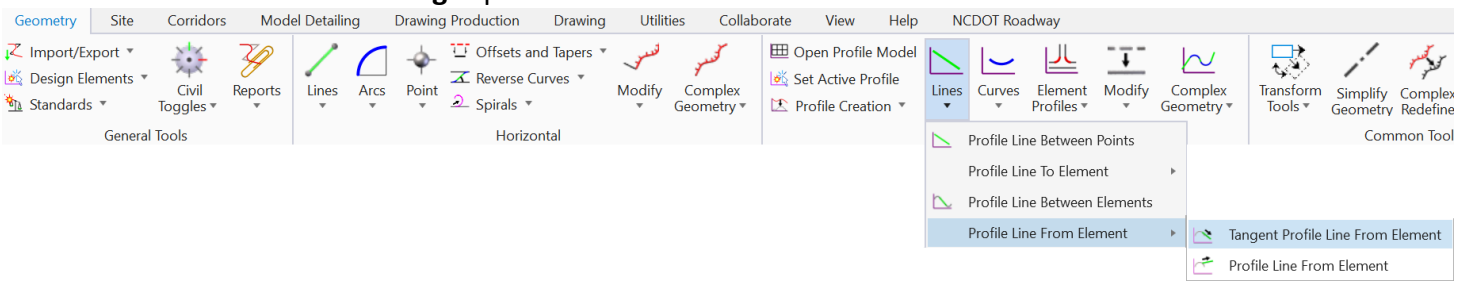
J. When prompted to **Select Plan Element To Project Onto**, click on the previously placed **20' EOT** line as shown below.



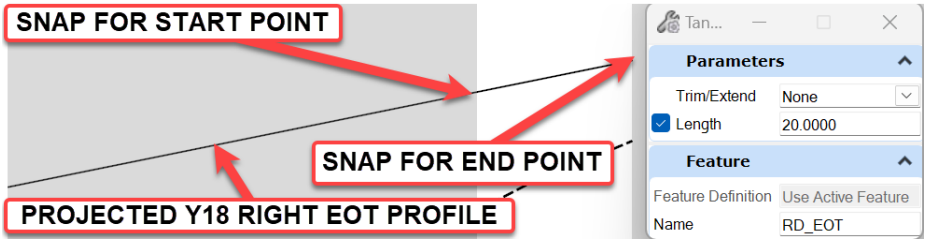
K. Then, open the **Profile** view for the **20' EOT** line and notice the **Projected Y18 Right EOT Profile** as shown below.



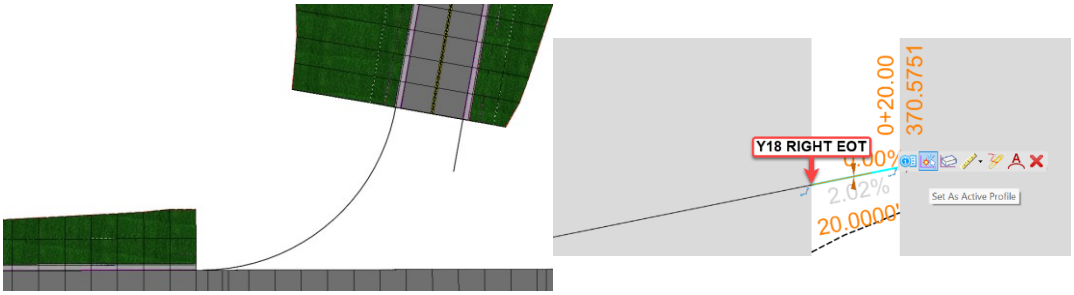
L. Next, select the **Tangent Profile Line From Element** tool **(Geometry > Vertical > Lines > Profile Line From Element > Tangent Profile Line From Element)**. Set the **Trim/Extend** parameter to **None** and the **Length** parameter to **20.000**.



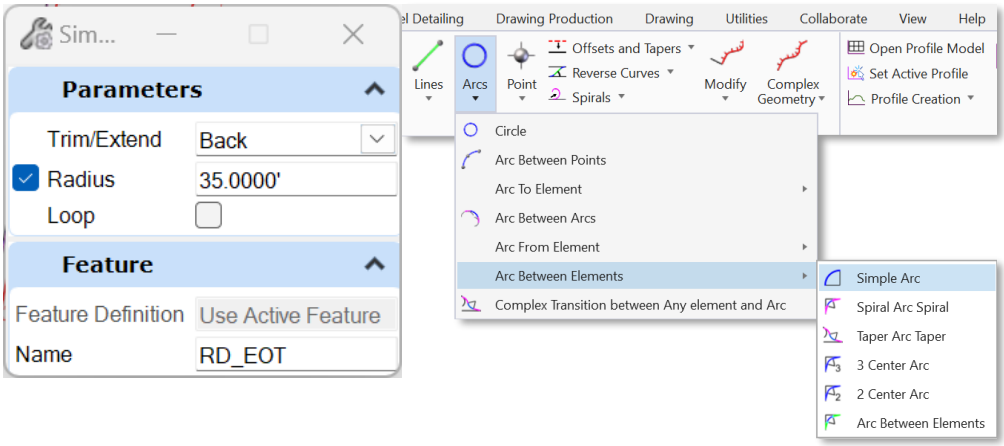
M. Then, select the **Projected Y18 Right EOT Profile** when prompted to **Locate Element** and **Snap** to the end of the **Projected Y18 Right EOT Profile** when prompted for a **Start Point**. **Left-click** through the additional prompts to place the new **20' Y18 Right EOT Profile** element as shown below.



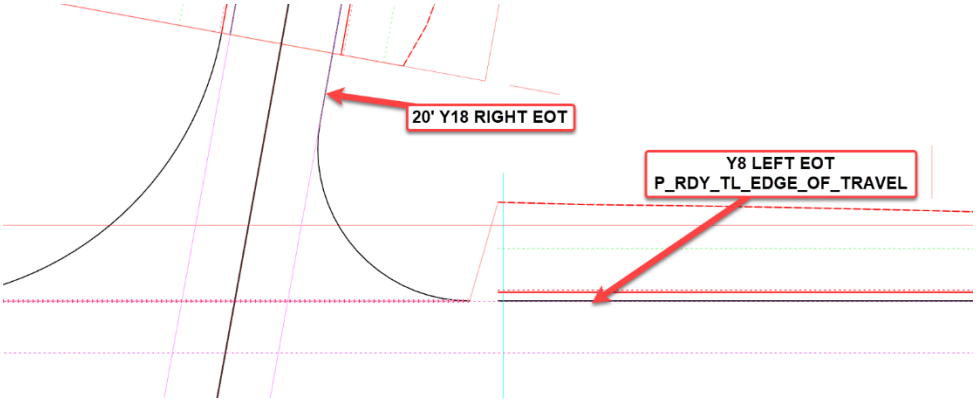
N. Click on the new **Y18 Right EOT** profile and make it **Active**. This will add it to the **3D Model** as shown below.



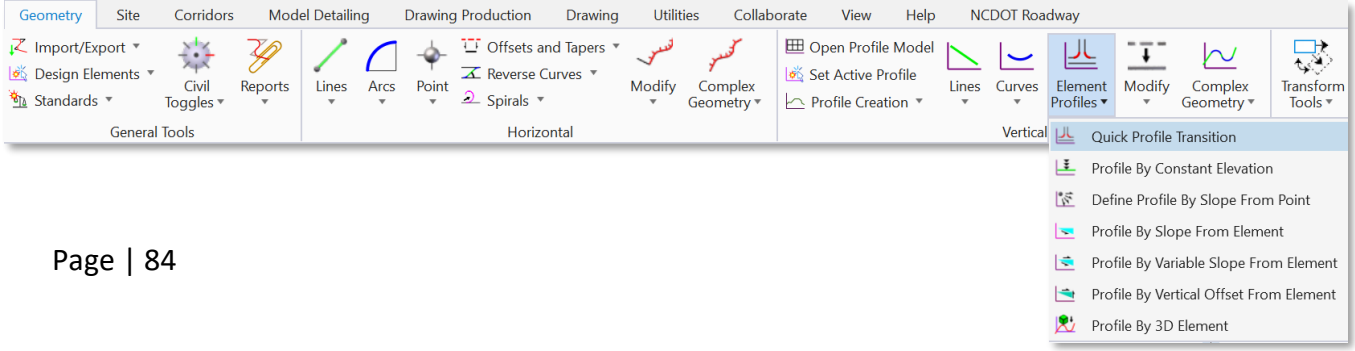
O. Now, select the **Simple Arc tool (Geometry > Horizontal > Arcs > Arc Between Elements > Simple Arc)**. Set the **Radius** parameter to **35.0000'** and the **Trim/Extend** parameter to **Back** within the **Simple Arc dialog** as shown below.

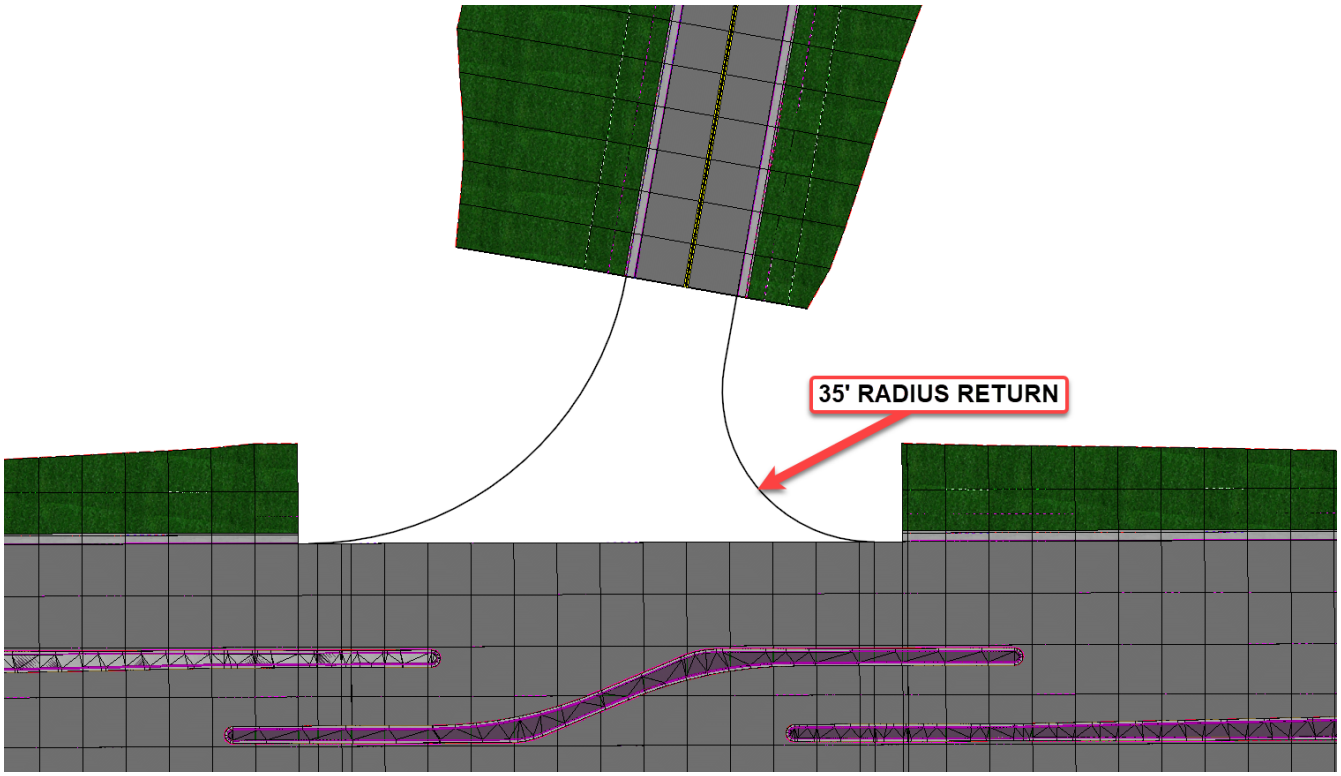


P. When prompted to **Locate First Element**, select the **20' Y18 Right EOT** line and then select the **Y8 Left EOT** line as the **Second Element.** When selecting the **Y8 Left EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel.** It's very **IMPORTANT** to select the correct linear element. Continue **Left-Clicking** through the additional prompts that follow to place the **35' Radius Return** as shown below.



Q. Next, select the **Quick Profile Transition** tool **(Geometry > Vertical > Element Profiles > Quick Profile Transition)** and click on the **35' Radius Return** to **Profile** and add it to the **3D Model** as shown below.



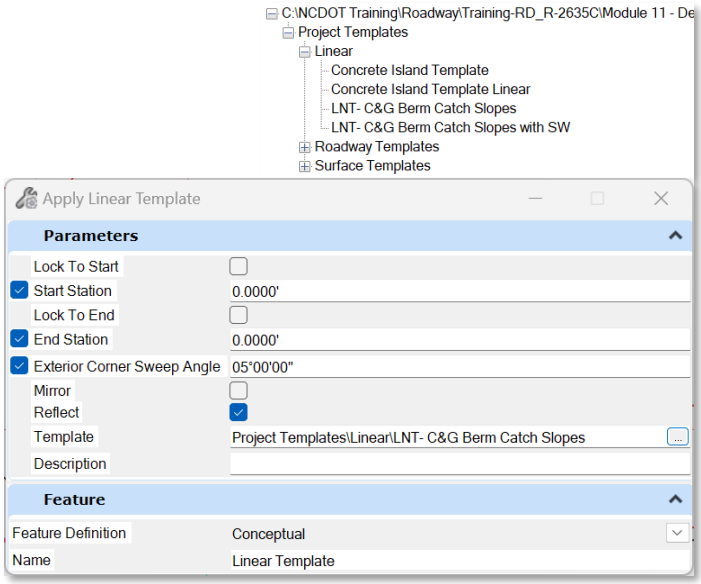


11. Apply Linear Templates to the Radius Returns for the Northern side of the Y8/Y18 Intersection

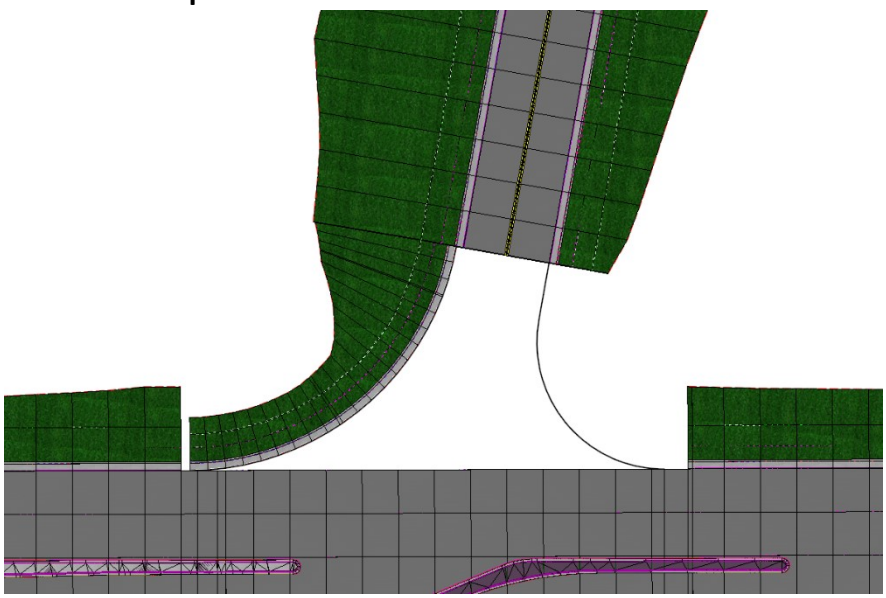
A. Select the **Apply Linear Template** tool **(Model Detailing > Apply Linear Template)**.

B. Key the following parameters into the **Apply Linear Template** dialog.

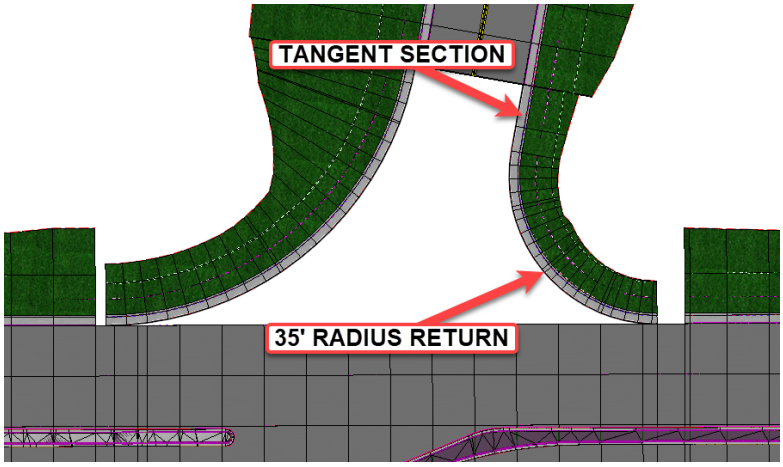
- **Start** = **Lock To Start**
- **End** = **Lock To End**
- **Exterior Corner Sweep Angle** = **05° 00' 00"**
- **Template** = **LNT - C&G Berm Catch Slopes**
- **Feature Definition** = **Design**



C. When prompted to **Locate Element To Apply Template**, select the **75’ Radius Return** and place the **Linear Template** as shown below.

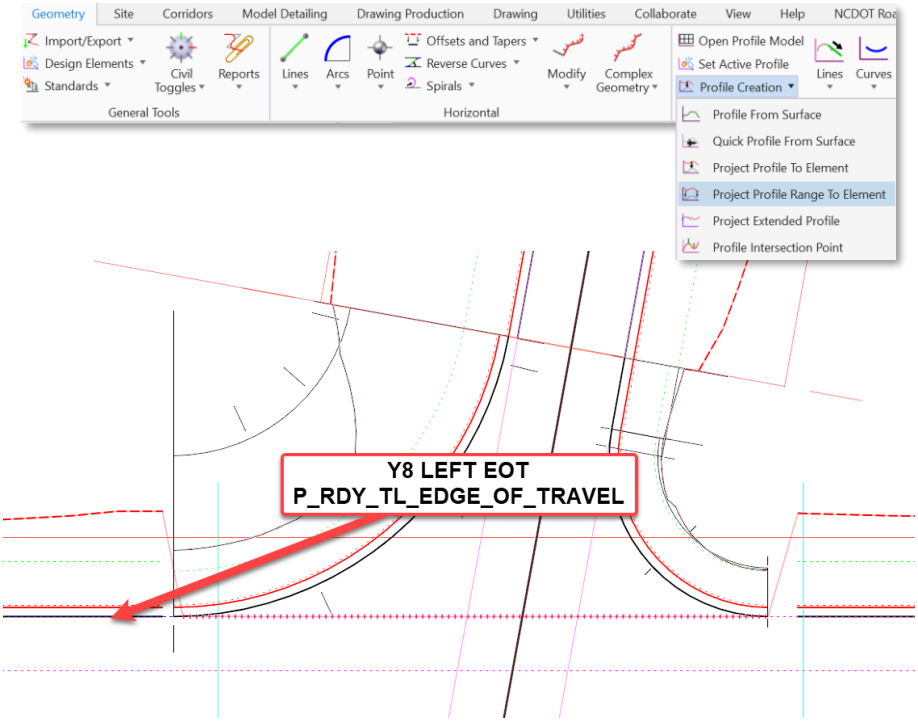


D. Then do the same for the **35’ Radius Return** and short **Tangent** section that it connects to.

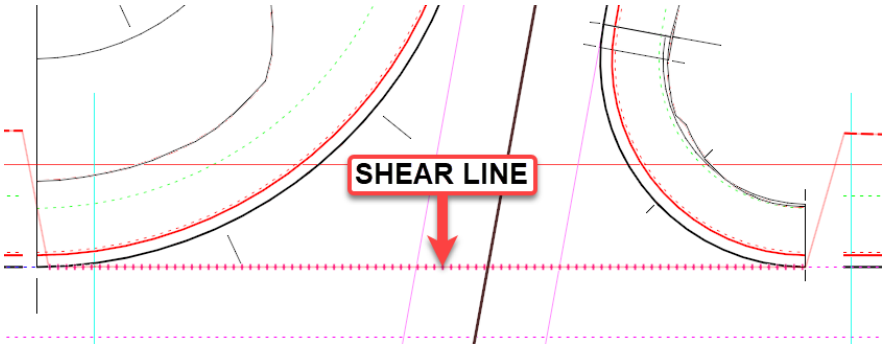


12. Create Terrain Model for the Northern side of the Y8/Y18 Intersection

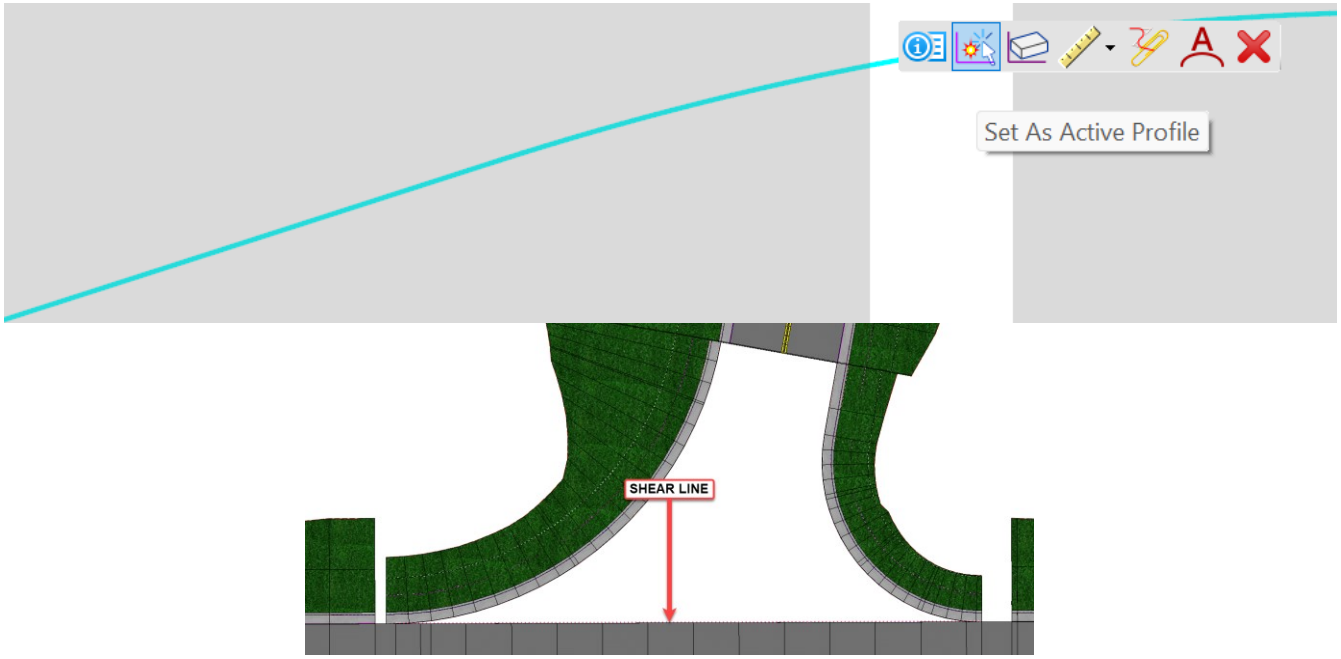
A. Select the **Project Profile Range To Element** tool **(Geometry > Vertical > Profile Creation > Project Profile Range To Element)** and click the **Y8 Left EOT** line when prompted to **Select Element To Project**. When selecting the **Y8 Left EOT** line you may notice multiple linear elements sitting on top of one another. To resolve this, **Right-Click** to cycle through them and choose the linear element on level **P_RDY_TL_Edge_of_Travel**. It's very **IMPORTANT** to select the correct linear element.



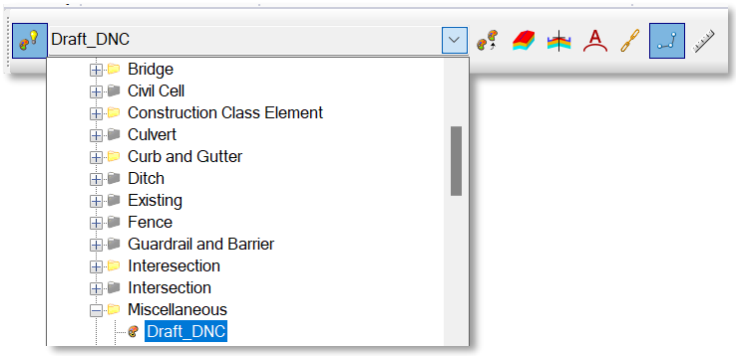
B. When prompted to **Select Plan Element To Project Onto**, select the **Shear Line** as shown below. Use the **Alt-Key** to Lock the **Start/End** locations of the **Shear Line** and click through the prompts to finalize the profile projection.



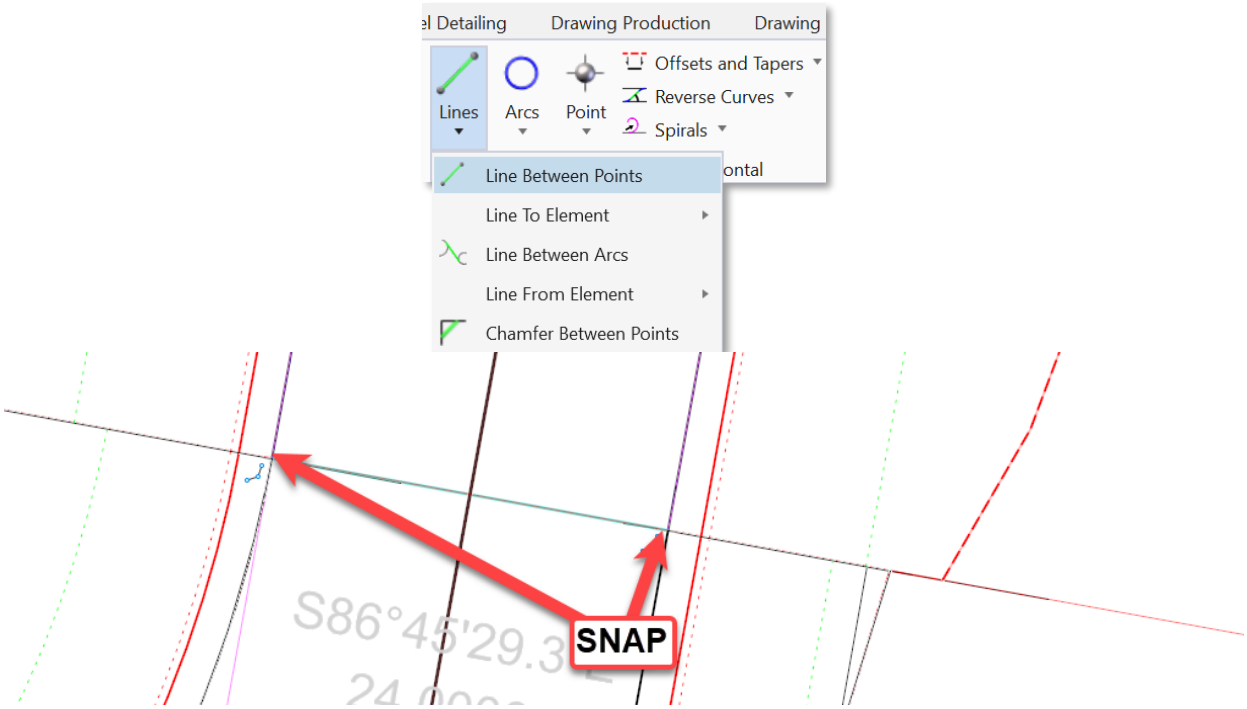
C. Open the **Shear Line Profile View** and set the **Projected Profile To Active**. This will add it to the **3D Model** as shown below.



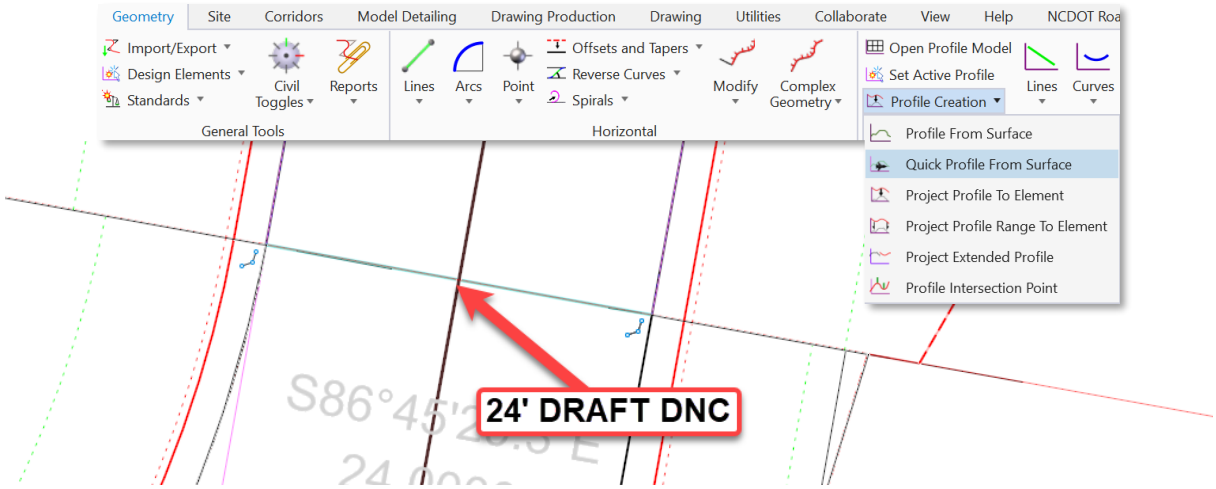
D. Now, from the **Feature Definition Toggle Bar**, toggle **On** the **Use Active Feature Definition Persist Snaps And Rule** buttons. Then select the **Draft_DNC** feature from the **(Linear > Roadway > Miscellaneous)** folder as shown below.



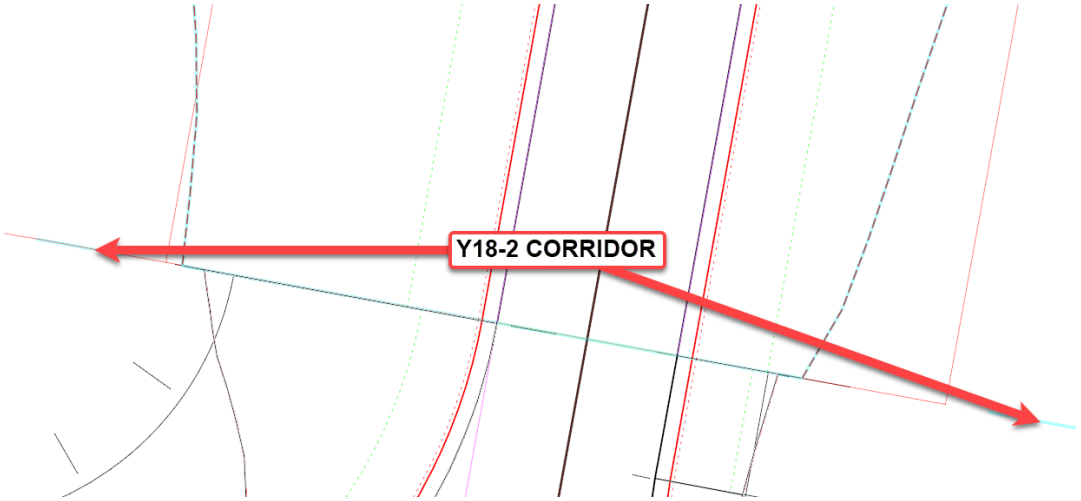
E. Then, select the **Line Between Points** tool **(Geometry > Horizontal > Lines > Line Between Points)** and **Snap** to the end of the two (2) **Y18-2 Corridor EOT Lines** as shown below.



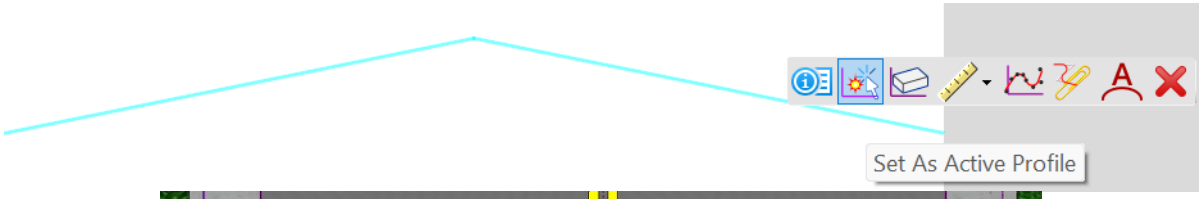
F. Next, select the **Quick Profile From Surface** tool **(Geometry > Vertical > Profile Creation > Quick Profile From Surface)** and select the **24' Draft_DNC** line placed in the previous step when prompted to **Locate Reference Element**.

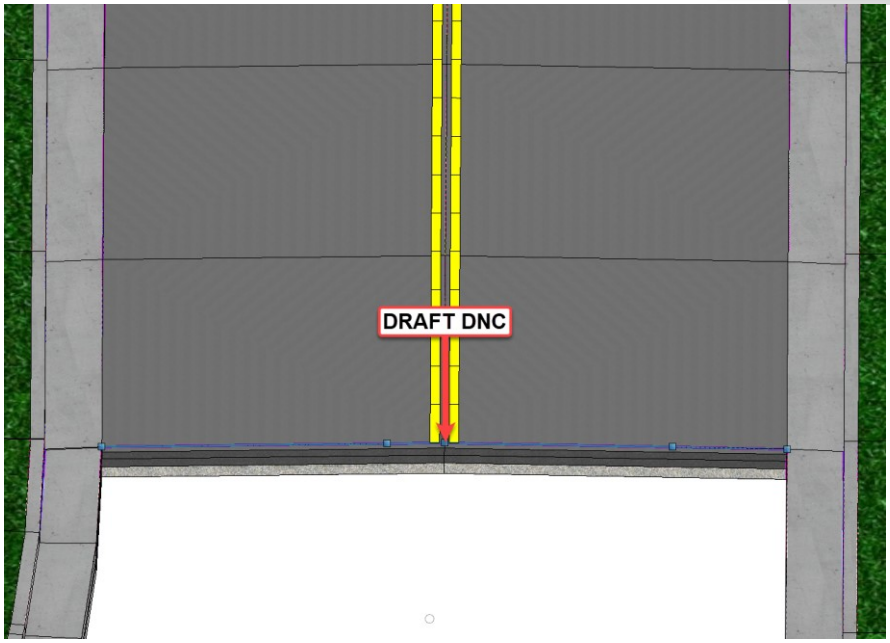


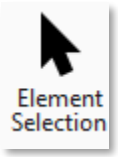
G. Then, select the **Y18-2 Corridor** when prompted to **Locate Reference Surface**. **Right-click** to reset and finalize the command.



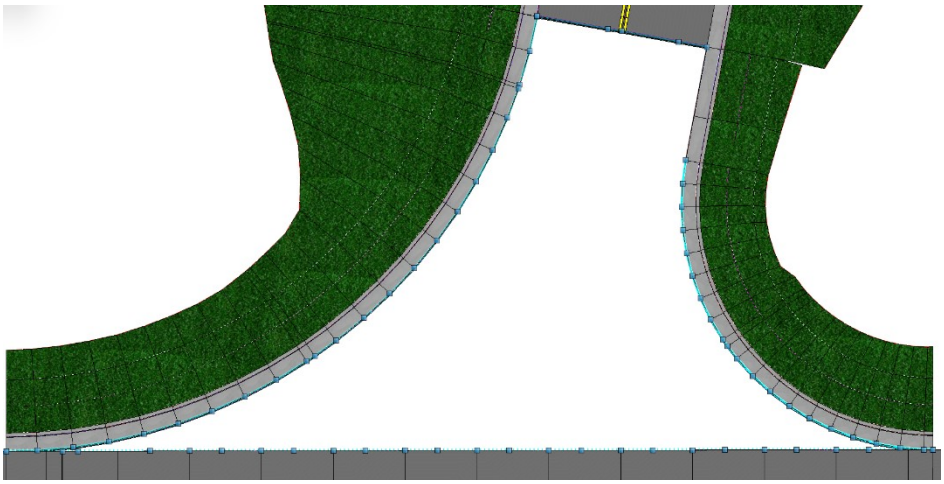
H. Open the **Draft_DNC Profile View** and set it as the **Active Profile**. This will add it to the **3D Model** as shown below. If the profile does not appear, you may have to offset the DNC line by .01 towards the corridor.



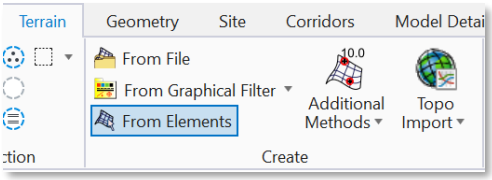




I. Next, select the **Element Selection** tool **(Terrain > Selection > Element Selection)** and select the **Linear Elements** from the **Northern Side** of the **Y8/Y18 Intersection** as shown below.

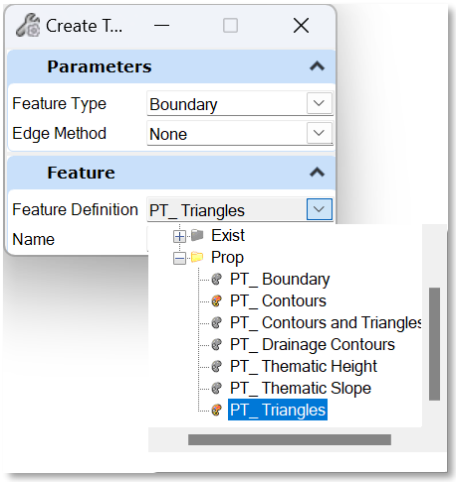


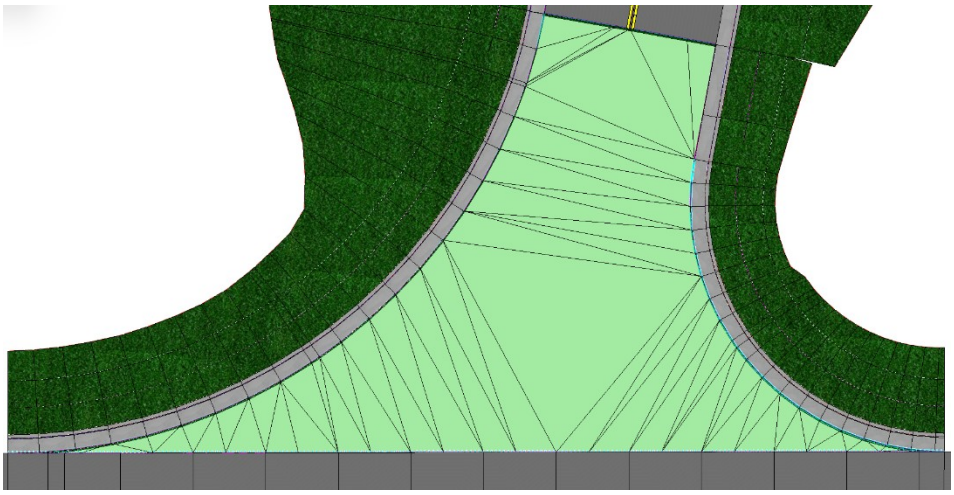
J. Then, select the **Create Terrain From Elements** tool **(Terrain > Create > From Elements)** as shown below.



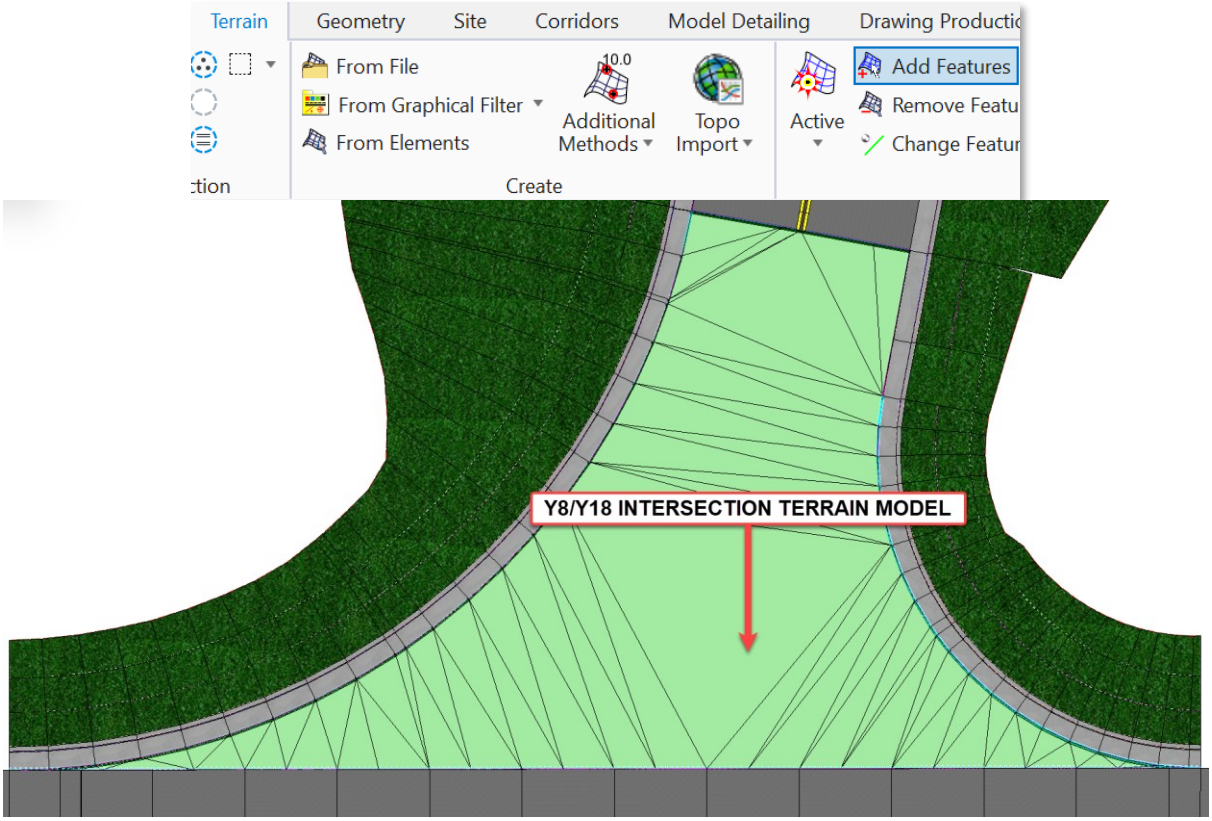
K. Still keeping the **Y8/Y18 Intersection** elements selected, key the following parameters into the **Create Terrain From Elements** dialog and **Left-Click** through the prompts to create the **Terrain Model** as shown below.

- **Feature Type** = **Boundary**
- **Edge Method** = **None**
- **Feature Definition** = **PT_Triangles**



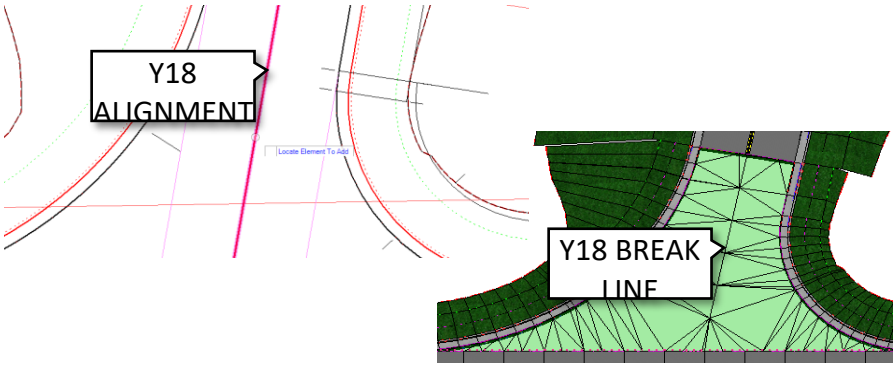


L. Next, select the **Add Features** tool **(Terrain > Edit > Add Features)**, set the **Feature Type** to **Break Line** and select the **Y8/Y18 Intersection Terrain Model** when prompted to **Locate Terrain Model To Add Elements**.



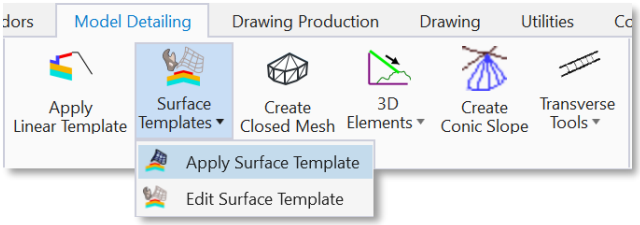
I COULD NOT GET THE BREAK LINE TO APPEAR UNLESS I ADDED A SEGMENT MATCHING THE Y18 ALIGNMENT FOR THE BREAKLINE SECTION. IT WOULD BREAK THE TERRAIN TRIANGLES, BUT NOT IN THE WAY IT WAS SUPPOSED TO. HENCE THE OLD PICTURES. 2023 ISSUE?

M. When prompted to **Locate Element To Add**, select the **Y18 Alignment** and **Click** through the prompts to add the **Break Line** to the **Terrain Model** as shown below.



13. Apply Pavement Surface Template to the Y8/Y18 Intersection Terrain Model

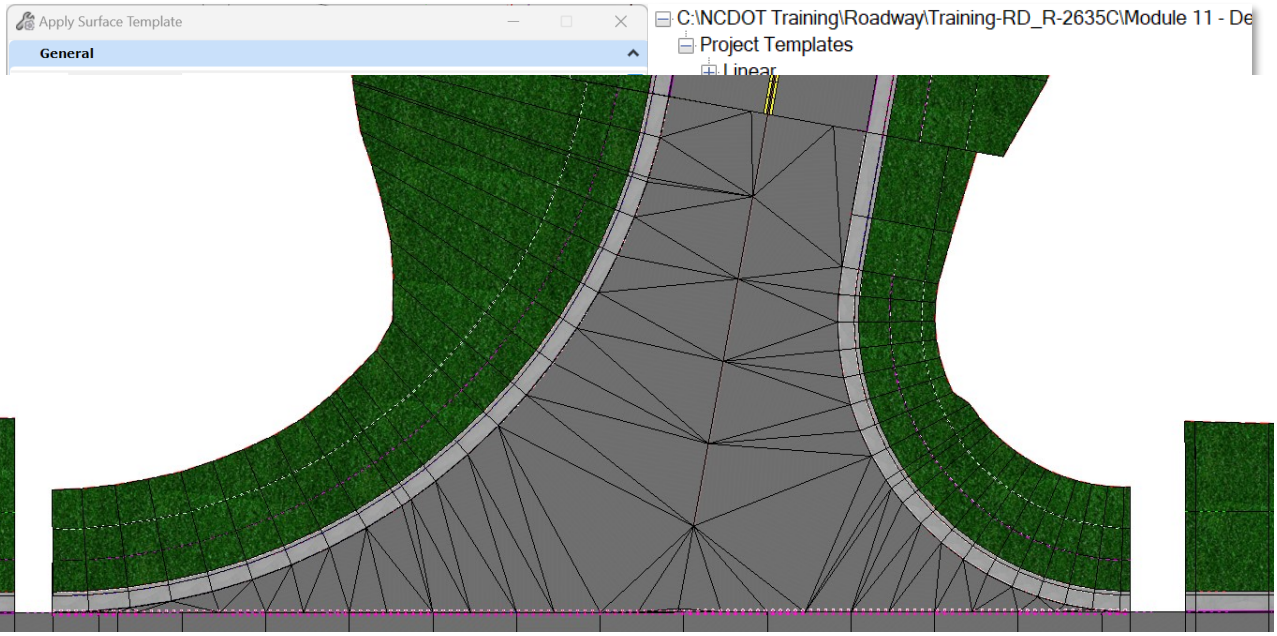
A. Select the **Apply Surface Template** tool **(Model Detailing > Surface Templates > Apply Surface Template)** as shown below.



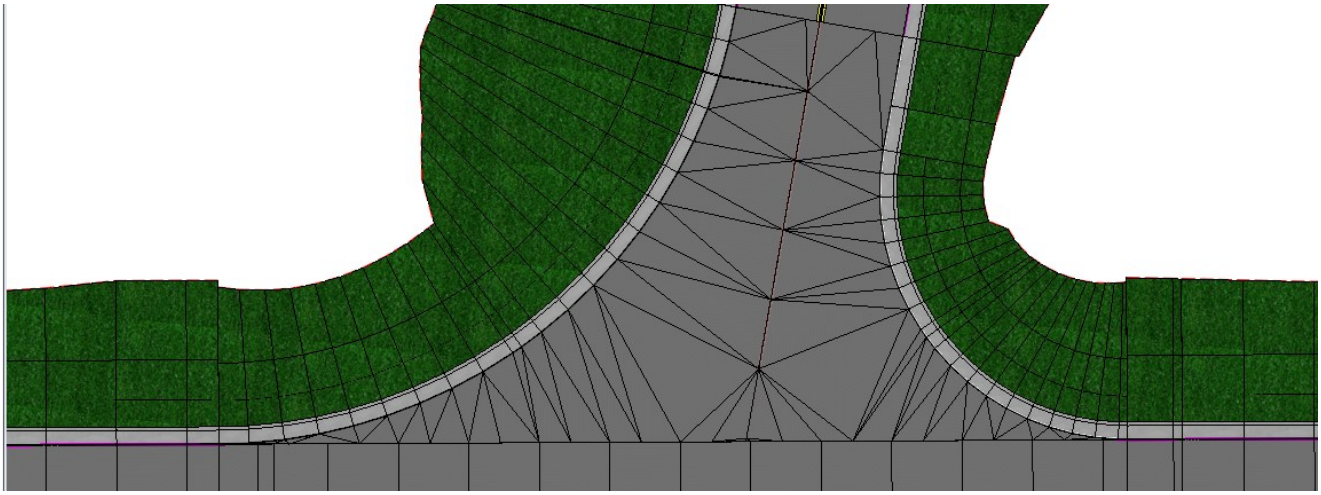
B. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Y8/Y18 Intersection Terrain Model** when prompted to **Locate Terrain Model**.

- **Template** = **SFT-Pavement**

- **Feature Definition = Disable Linear Features**



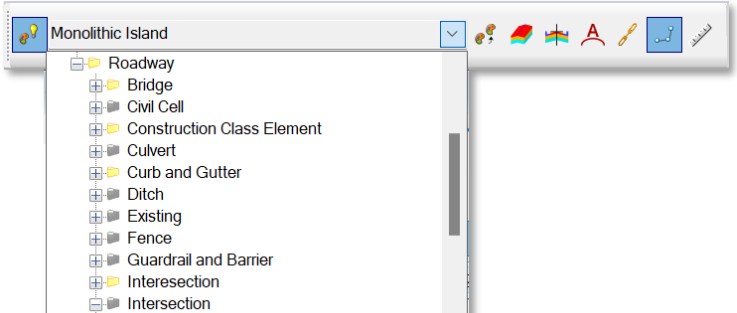
C. Continue clicking through the prompts to apply the **SFT-Pavement Surface Template** to the **Y8/Y18 Intersection Terrain Model** as shown below.



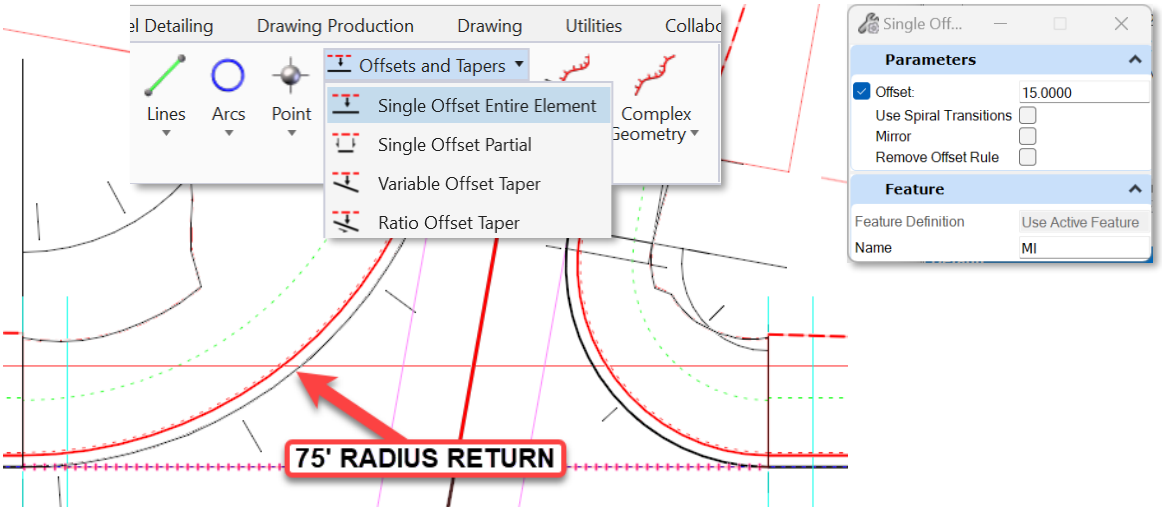
D. Use a combination of **Key-Stations** and **Parametric Constraints** to seamlessly connect the **Y8/Y18 Intersection** to the **Y8 Corridor** as shown below.

14. Add Concrete Channelization Island to the Northern side of the Y8/Y18 Intersection

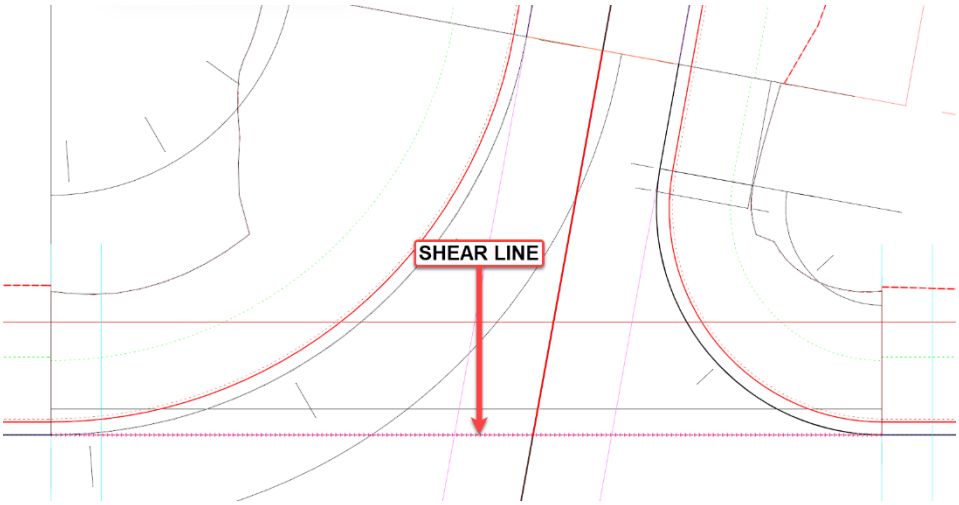
A. From the **Feature Definition Toggle Bar**, toggle on the **Use Active Feature Definition** button and then select the **Monolithic Island** feature from the **(Linear > Roadway > Intersection)** folder as shown below. Keep this **Feature** active throughout all steps that follow.



B. Next, select the **Single Offset Entire Element** tool **(Geometry > Horizontal > Offsets and Tapers > Single Offset Entire Element)**, set the **Offset** parameter to **15.0000** and select the **75' Radius Return** to place one (1) edge of the **Concrete Island** as shown below.

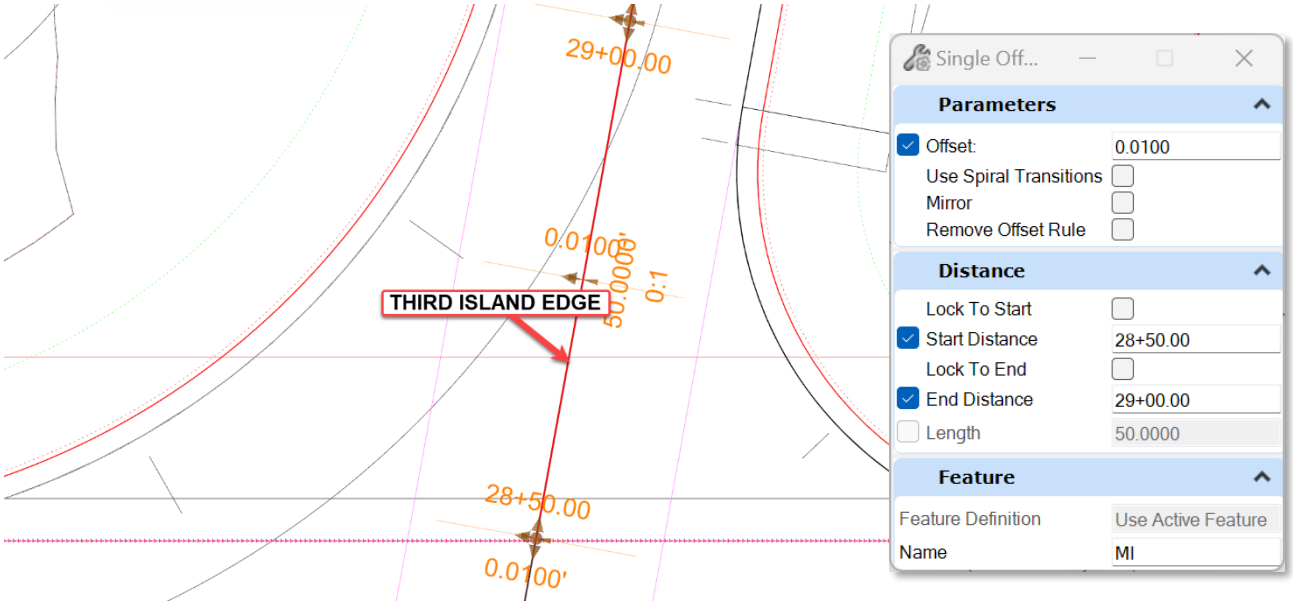


C. Then, continue using the **Single Offset Entire Element** tool and **Offset** the **Shear Line** by **4'** as shown below.

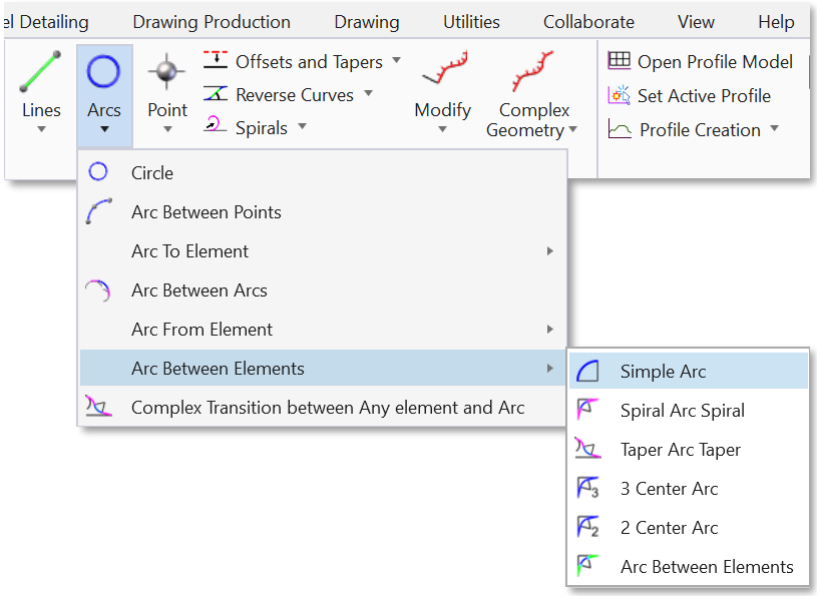


D. For the third **Concrete Island** edge, select the **Single Offset Partial** tool **(Geometry > Horizontal > Offsets and Tapers > Single Offset Partial)**, set the following parameters within the **Single Offset Partial** dialog, select the **Y18 Alignment**, and click through the prompts to place the third **Concrete Island** edge.

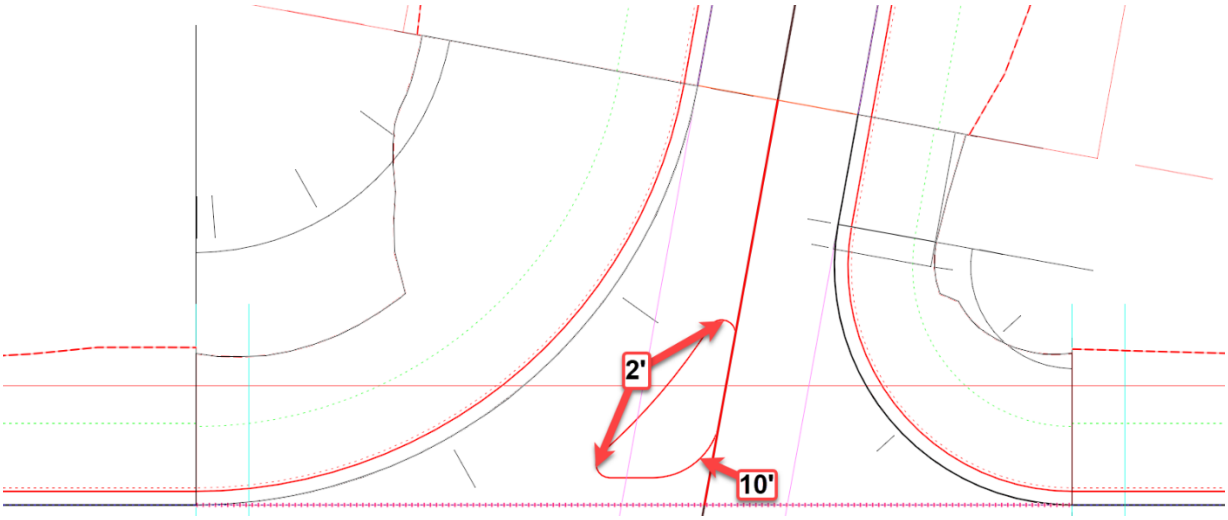
- **Offset** = **0.0100**
- **Start Distance** = **28+50.00**
- **End Distance** = **29+00.00**



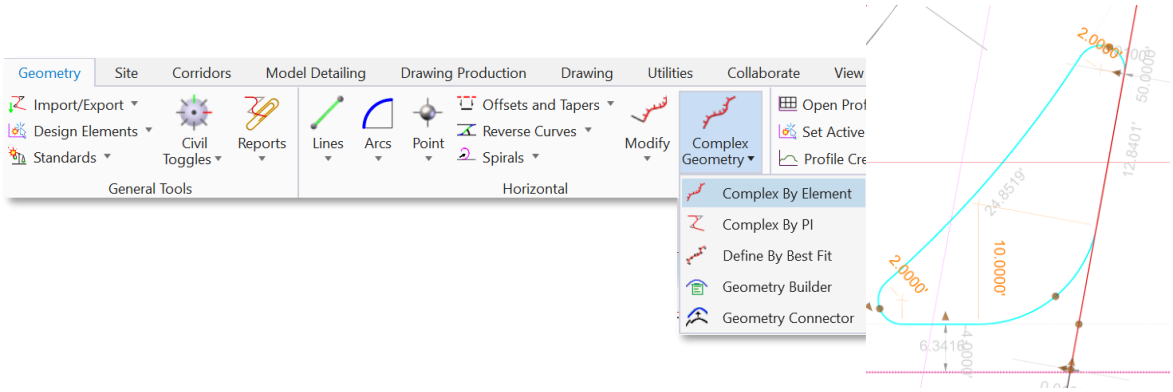
E. Next, select the **Simple Arc** tool **(Geometry > Horizontal > Arcs > Arc Between Elements > Simple Arc)**. Set the **Trim/Extend** parameter to **Both** within the dialog as shown below.



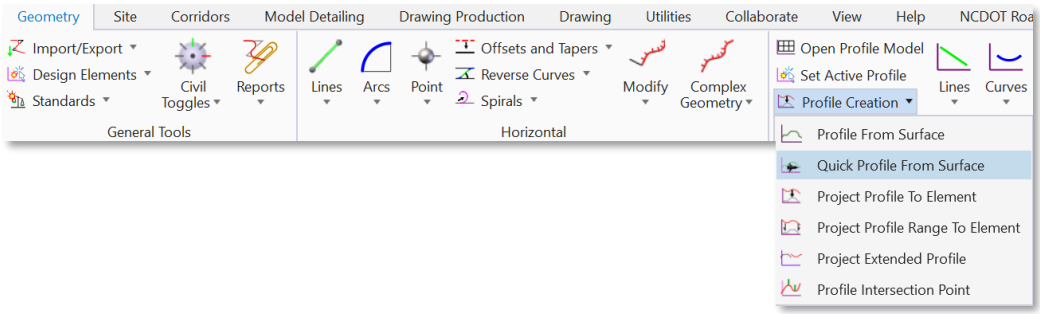
F. Now, use the **Simple Arc** tool to fillet the three (3) corners of the **Concrete Island** as shown below.



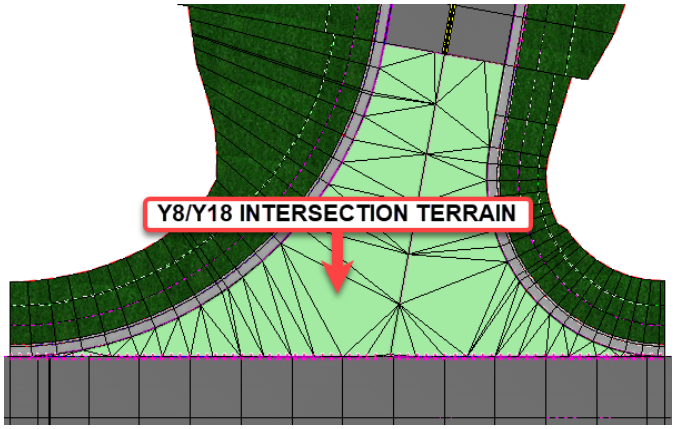
G. Use the **Complex By Element** tool **(Geometry > Horizontal > Complex Geometry > Complex By Element)**, set the **Method** to **Automatic** and **Complex** the individual 2D elements that make up the **Concrete Island** as shown below.



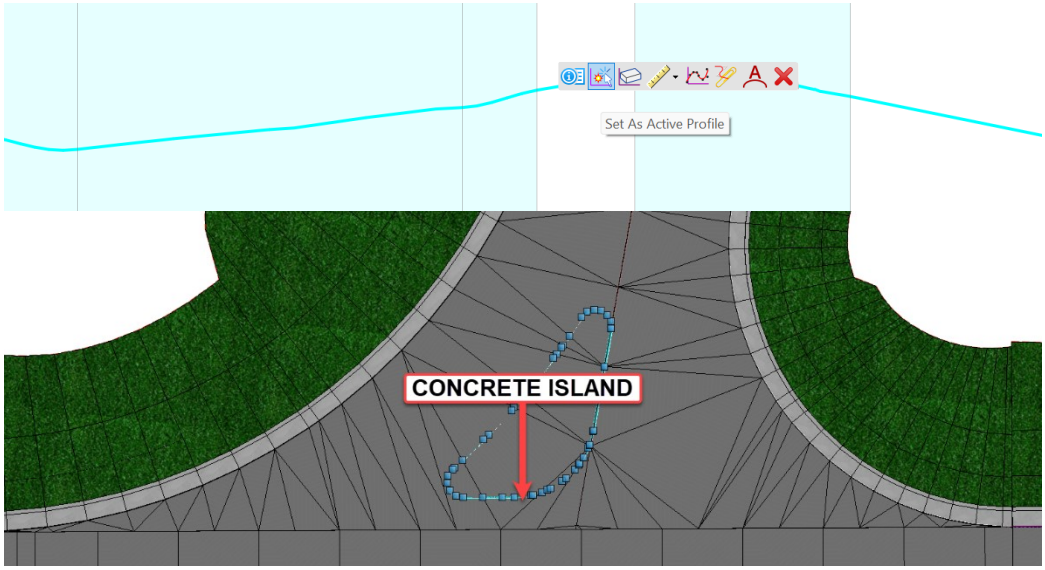
H. Next, select the **Quick Profile From Surface** tool **(Geometry > Vertical > Profile Creation > Quick Profile From Surface)** and select the **Complexed Concrete Island** when prompted to **Locate Reference Element**.



I. Then, select the **Y8/Y18 Intersection Terrain Model** when prompted to **Locate Reference Surface**. **Right-click** to reset and finalize the command.

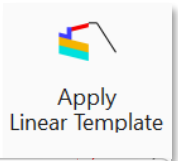


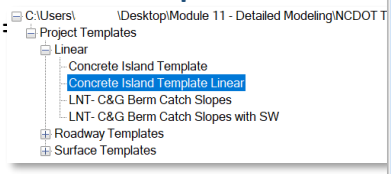
J. Open the **Concrete Island Profile View** and set it as the **Active Profile**. This will add it to the **3D Model** as shown below.

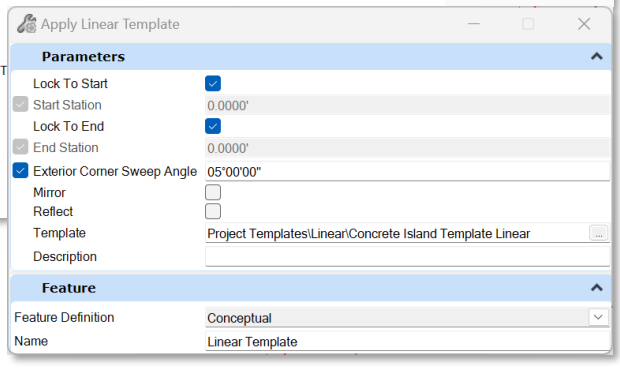


K. Next, select the **Apply Linear Template** tool **(Model Detailing > Apply Linear Template)** and key the following parameters into the Apply Linear Template dialog.

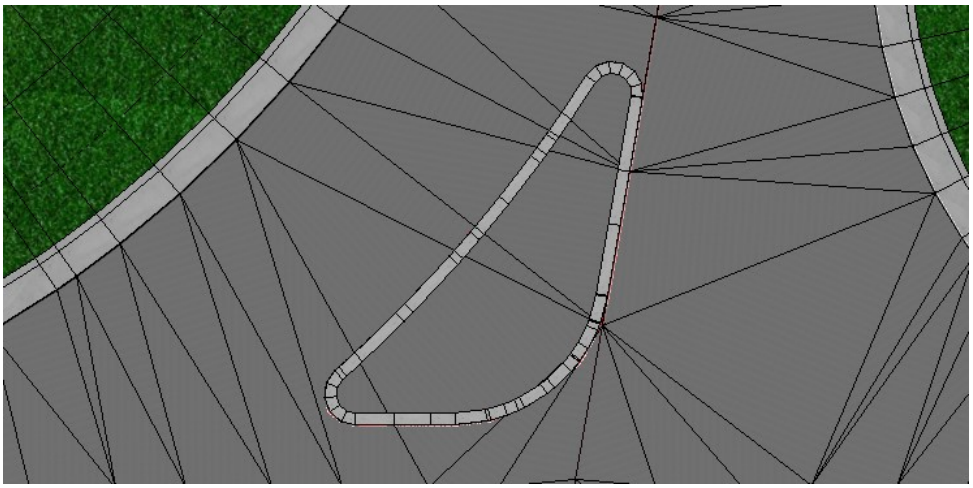
- **Start** = **Lock To Start**
- **End** = **Lock To End**
- **Exterior Corner Sweep Angle** = **05° 00’ 00”**
- **Template** = **Concrete Island Template Linear**
- **Feature Definition** =



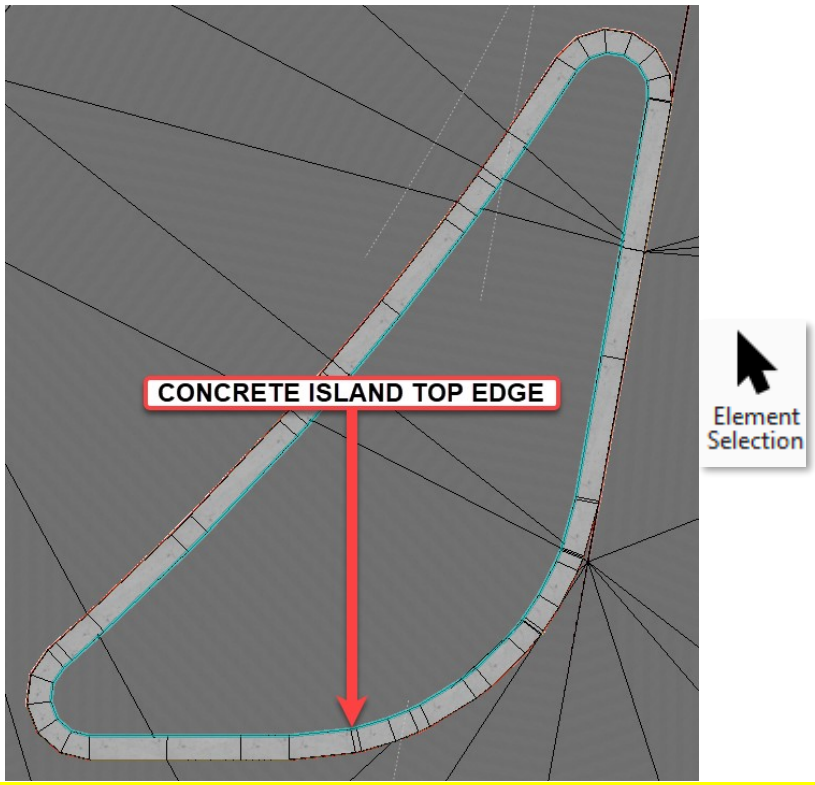




L. When prompted to **Locate Element To Apply Template**, select the **Concrete Island** and place the **Linear Template** as shown below.

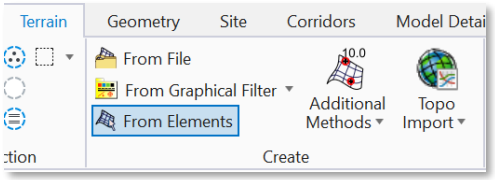


M. Next, select the **Element Selection** tool **(Terrain > Selection > Element Selection)** and select the **Top Edge** of the **Concrete Island** as shown below.



I WAS UNABLE TO SELECT THE TOP EDGE OF THE CONCRETE ISLAND UNTIL I RESET THE PROGRAM. NOT SURE WHY, MODELERS IN RDY WEREN'T EITHER, MAY BE 2023 ISSUE?

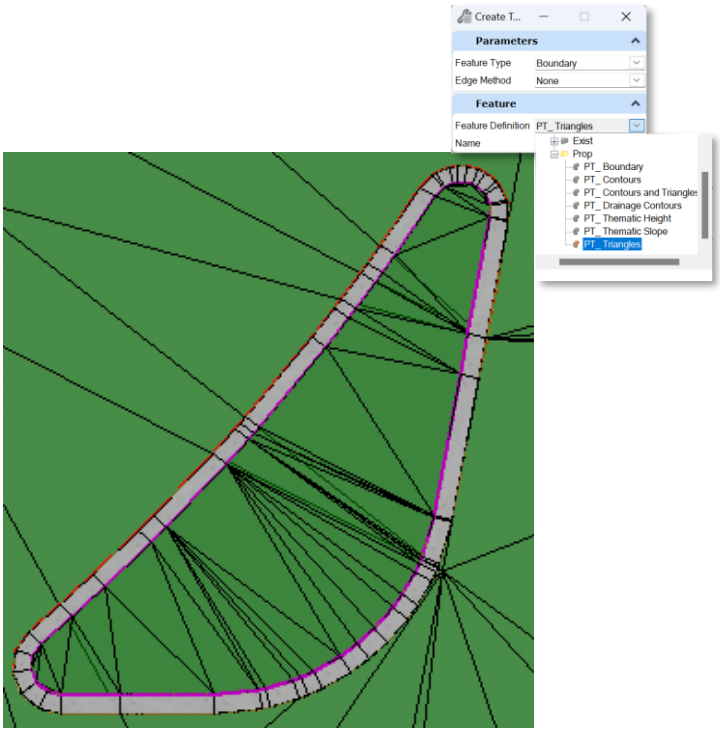
N. Then, select the **Create Terrain From Elements** tool **(Terrain > Create > From Elements)** as shown below.



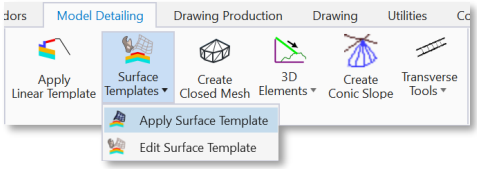
O. Still keeping the **Concrete Island** elements selected, key the following parameters into the **Create Terrain From Elements** dialog and **Left-Click** through the prompts to create the **Terrain Model** as shown below.

- **Feature Type** = **Boundary**

- **Edge Method = None**
- **Feature Definition = PT_Triangles**

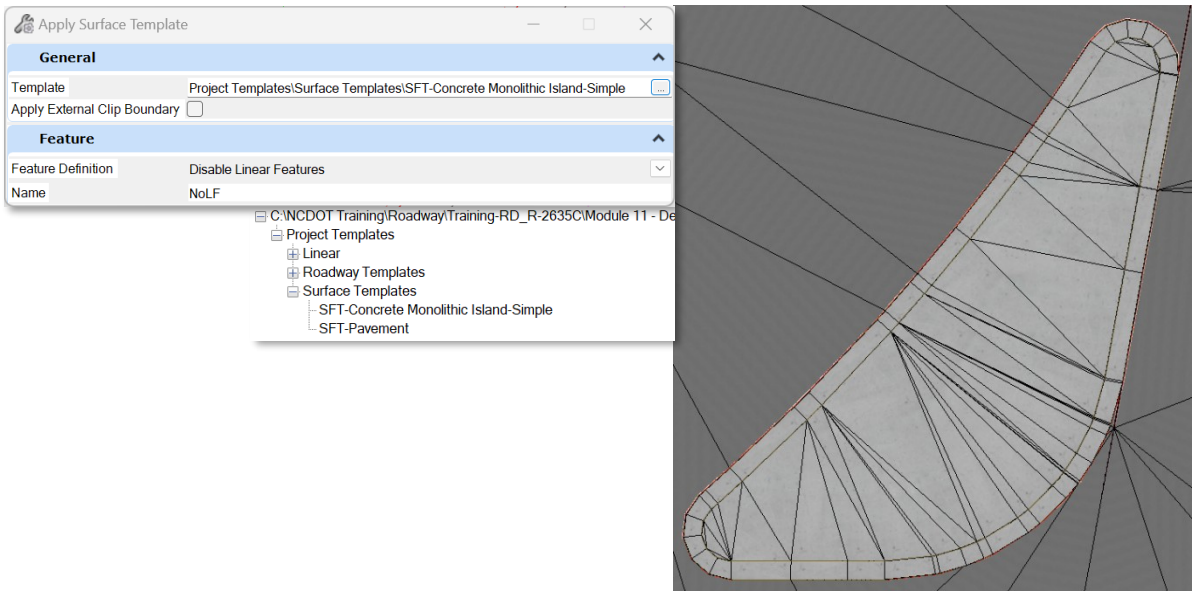


P. Select the **Apply Surface Template** tool **(Model Detailing > Surface Templates > Apply Surface Template)** as shown below.



Q. Then, key the following parameters into the **Apply Surface Template** dialog as shown below and select the **Concrete Island Terrain Model** when prompted to **Locate Terrain Model**. This finalizes the **Concrete Island**.

- **Template** = **SFT-Concrete Monolithic Island-Simple**
- **Feature Definition** = **Disable Linear Features**



15. Finalize the Directional Crossover with Median U-Turns Modeling by using a combination of Key-Stations and Parametric Constraints to seamlessly connect all the Corridors as shown below.