State of Florida
Department of Transportation

FDOT Roadway Design & 3D Modeling

<u>Basic 2D Rule Based Design</u>
(Introduction & Chapters 2, 3, & 4)

<u>Advanced 3D Modeling</u>
(Introduction & Chapters 1, 5, 6, 7, 8, 9 & 10)

Course Guide

October 31, 2018

PRODUCTION SUPPORT CADD OFFICE

TALLAHASSEE, FLORIDA

http://www.fdot.gov/cadd/

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FDOT Roadway Design and 3D Modeling

Basic 2D Rule Based Design Training

Description

This is a 2-day training course to include the Introduction and Chapters 2, 3, and 4 of the course guide. Participants will be introduced to Bentley GEOPAK V8i SELECT Series4 (SS4) OpenRoads Technology tools for design and modeling; specifically for Florida Department of Transportation (FDOT) projects using the FDOTSS4 Workspace. Several new technologies will be introduced including:

- Civil Elements, Civil Features, and Civil Geometry
- Design Intent and Design Standards
- Civil AccuDraw and Civil Cells
- Project Explorer: Civil Model
- Task Menus and Cursor Context Menus

Objectives

- Use Civil Geometry Elements in the design file to calculate and define a proposed centerline of construction.
- Use Civil Geometry Elements in the design file to define the roadway features of the proposed design.
- Apply Civil Cells delivered within the FDOTSS4 Civil Cell DGN library.
- Use Civil Geometry Elements in the design file to define the vertical profiles of a proposed centerline.

Audience

- FDOT Roadway Designers and Engineers

Prerequisites

Participants need to have a basic understanding of Computer Aided Drafting and Design (CADD) using MicroStation, a basic understanding of GEOPAK concepts and a solid understanding of the engineering necessary to design a Roadway.

***Duration:* 16 Hours**

***Professional Credit Hours:* 16 PDHs**

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FDOT Roadway Design and 3D Modeling

Advanced 3D Modeling Training

Description

This is a 2-day training course to include the Introduction and Chapters 1, 5, 6, 7, 8, 9, and 10 of the course guide. Participants will continue to learn the Bentley GEOPAK V8i SELECT Series4 (SS4) OpenRoads Technology tools for design and modeling within the FDOTSS4 workspace. Several advanced concepts and technologies will be introduced including:

- Rule Based Superelevation Design Parameters
- Associating Template Points to Superelevation Lanes
- Constructing 3D Elements
- Building Intersection Terrains from 3D Elements
- Appling a Surface Depth to Terrain Elements
- Placing 3D Civil Cells
- Configuring Advanced 2D and 3D Civil Cells
- Corridor and Terrain Model Clipping
- Applying Linear Templates to 3D Elements
- Building DTM, XML Files for Construction Deliverables

Objectives

- Create a Superelevation Shape Model.
- Create Superelevation Sections and Lanes.
- Calculate and Assign Superelevation to a Corridor.
- Create an Intersection Terrain Model from 3D Elements.
- Create a Traffic Separator Nose Model on the Corridor Model.
- Create an Island Model on an Intersection.
- Apply Linear Corridors along 3D Elements.
- Create 3D Driveway on a Corridor Model.
- Create 3D Sidewalk Ramps on Intersection Model.
- Prepare the Files Necessary for Construction Deliverables.

Audience

- ***FDOT Roadway Designers and Engineers***

Prerequisites

Participants need to have a basic understanding of Computer Aided Drafting and Design (CADD) using MicroStation, a basic understanding of GEOPAK concepts and a solid understanding of the engineering necessary to design a Roadway.

In addition to the above, the participant is required to complete:

FDOT Roadway Design and 3D Modeling - Basic Training.

Duration:* *16 Hours

Professional Credit Hours: ***16 PDHs***

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Table of Contents

INTRODUCTION

This course was developed to introduce Roadway Designers to the V8i SELECTSeries4 (SS4) OpenRoads Technology tools for design and modeling on Florida Department of Transportation (FDOT) projects. The curriculum was developed within the FDOTSS4 Workspace to provide sample exercises for most of the new Civil Tools on a sample project data set.

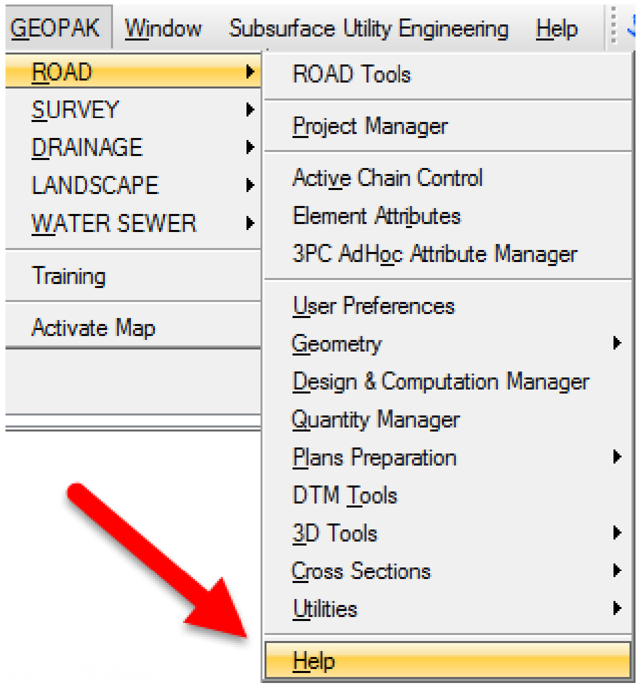
COURSE OBJECTIVES

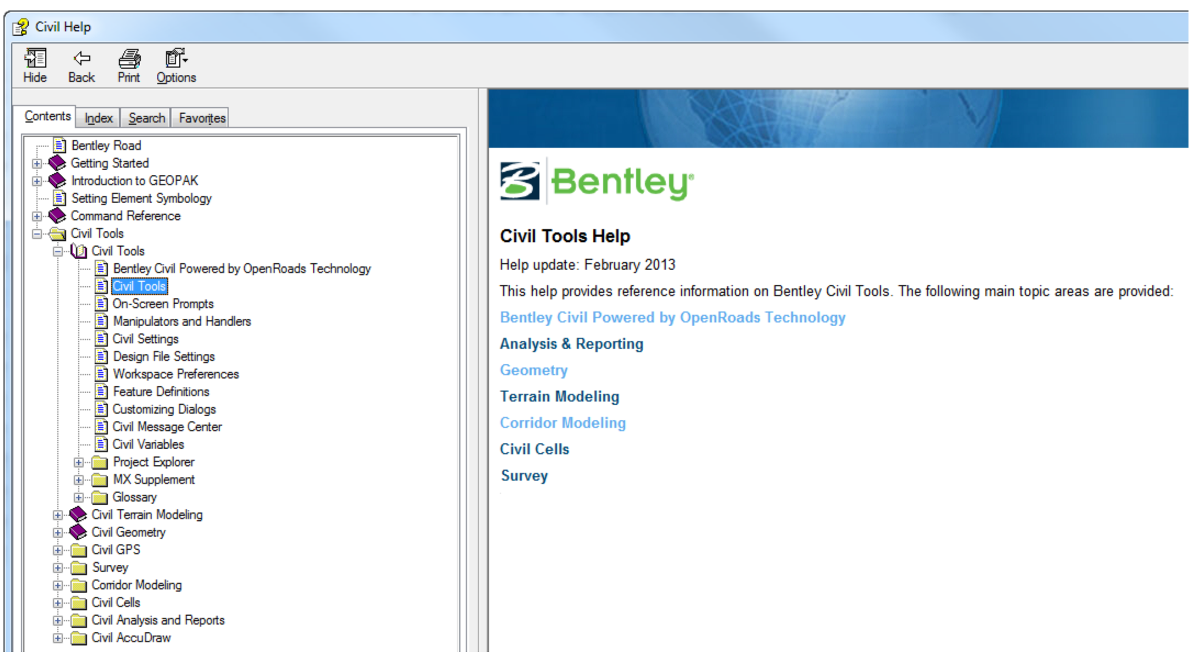
Participants of this course will be introduced to the newest OpenRoads Technology and a Workflow for designing two dimensional (2D) Plans, Profiles, Cross Sections and three dimensional (3D) Models for Construction Deliverables. At successful completion they will have learned how to:

- Create a Terrain Element from the existing surface to be used as a reference for the project.
- Develop Existing Feature Terrain Surfaces to be shown on cross sections and used in earthwork calculations.
- Use Civil Geometry Elements in the design file to calculate and define a proposed centerline of construction and while using the built in Design Standards Criteria checking.
- Use Civil Geometry Elements in the design file to define the roadway features of the proposed design.
- Apply Civil Cells delivered within the FDOTSS4 Civil Cell DGN library.
- Use Civil Geometry Elements in the design file to define the vertical profiles of a proposed centerline.
- Use the Standard Components and Templates within the FDOTSS4 Template library.
- Create a 3D Model of the existing and proposed Roadways.
- Reference 2D Civil Geometry Elements to a Corridor Model by adding the elements for use as design model control lines.
- Apply varying Typical Section conditions along the project, including: variable medians, special ditches, handrail checks, gravity wall placement, slope conditions, left and right turns, etc.
- Define the Superelevation Standards along a corridor.
- View Dynamic Cross Sections for review, updates, and design checks along the project before cross sections are created for printing.
- Create and display 3D Models for better designing and visualization.
- Use the Milling Overbuild and Overlay Components on a project corridor.
- Apply Corridor Modeling Techniques used for developing driveways and intersection, etc.

EXPECTATIONS – WHAT THIS COURSE PROVIDES

This course provides a standard workflow for designing a project with Bentley Systems GEOPAK OpenRoads Technology within the FDOTSS4 Workspace. Although the majority of tools are used throughout, this course does not provide a description of every Bentley Systems GEOPAK OpenRoads Technology Civil Tool. Integrated help for each of the tools can be found by selecting from the Main Menu in MicroStation: **GEOPAK > ROAD > Help**.





DOCUMENT STYLE

Style conventions used throughout the course guide are shown in the following table.

Item	Convention	Example
Menu names and commands	Bold N (Names separated with > symbol)	• **File > Open** • **File > ComSelect > Design**
Dialog box Actions	Bold	• Click the **Apply** button. • Click the **Graphic Select** button to the right of the *Horizontal Alignment Include* box. • In the *Segment Type* list, click **Lines**.
Dialog box Field Names	Italic	• Key in **Hemfield Road** in the *Alignment Name* field. • Click the **Graphic Select** button to the right of the *Horizontal Alignment Include* field. • In the *Segment Type* list, click **Lines**.
Key-ins	Bold	• Key in **Hemfield Road** in the *Alignment Name* field.
File Names	Italic	• Open the file *Working Graphics.dgn* in the C:\Bentley Training\GEOPAK 101\Project Setup\Practice\ folder.
File Paths	Non italic	• Open the file *Working Graphics.dgn* in the C:\Bentley Training\GEOPAK 101\Project Setup\Practice\ folder.
New Terms or Emphasis	Italic	• The Template Library contains *templates*, which represent typical sections of the proposed roadway.

FILE TYPES

The Bentley Systems GEOPAK OpenRoads Technology road design process now uses a single source file type, the *DGN* file. All pertinent design data is stored in the design file. This information can be viewed through the Project Explorer and reported on in the Civil Report Browser.

Below is a brief description of the legacy file types used in GEOPAK which can be imported or exported **(i/o)** with OpenRoads Technology.

File Type Description:

- *Surface.tin* (i/o) - A binary file, also known as a GEOPAK digital terrain model (DTM),that stores features made up of random points, break lines, and boundary data along with triangulated surface model. The features and the triangles together represent an existing ground surface.
- *Surface.dat (i)* - A binary (or ASCII) file containing string and point information that is used for digital terrain model construction.
- *Surface.dtm (i/o)* – A binary file, also known as a Roadway Designer digital terrain model that stores features made up of components, break lines, and boundary data along with triangulated surface model. The features and the triangles together represent either existing ground surface or the proposed roadway corridor model.
- *Geometry Project.gpk (i/o)* - A binary file (*job###.gpk*) created when starting a coordinate geometry (COGO) session for the first time or created through Project Manager, that stores geometric data including points, lines, curves, spirals, parcels, chains, and profiles. The file may be appended to during the design process. Multiple users can access this file at the same time. Only one file should be created for each project. The "###" is the only variable in this filename. It represents a job number (1 to 3 alphanumeric characters) unique to a project and is user defined upon creation.
- *CMJobxx.alg (i)* – A binary file containing the imported Chain, Profiles, and MicroStation Plan Elements necessary on a project in the Select Series 2 Version of GEOPAK Corridor Modeling.
- *Template Library.itl (i)* - Stores templates and template components. Different components can be assembled to build templates, which define the typical sections of a roadway. Only one Template Library file may be open for editing at a given time.
- *Project.rdp* – Stores the corridor modeling preferences imported geometry, DTM, and plan graphics in the Select Series 2 Version of GEOPAK Corridor Modeling. This file is not used or imported in the Select Series 3 release.
- *Project.ird (i)* – Stores Corridor Definitions including; Limits, Template Drops, Parametric Constraints, Superelevation, Point Controls, Key Stations, Etc. in the Select Series 2 Version of GEOPAK Corridor Modeling. This file can be imported in the Select Series 3 release.

LEARNING RESOURCES

There are several resources available for learning about the various Bentley Systems GEOPAK OpenRoads Technology tools. Among them are:

- Bentley Communities:

  http://communities.bentley.com/products/road___site_design/w/road_and_site_design__wiki/7021.openroads-support-clips-technotes-faqs.aspx

- Bentley Learn:

  Bentley Institute site is for registered user and may require a Select Server site license to participate: https://learn.bentley.com

- Bentley Product OpenRoads:

  Videos are available on a variety of topics: https://www.Bentley.com

- YouTube:

  Bentley OpenRoads Videos are available on a variety of topics:

  http://www.youtube.com/user/BentleyCivil

- YouTube Search - Google:

  Bentley OpenRoads returns several sites with videos for learning how to apply the technology on project specific situations.

- Production Support Office | CADD (CADD) Website: http://www.fdot.gov/cadd/

  Webinar training recordings are available on many of the subjects covered in this manual:

  http://www.fdot.gov/cadd/main/FDOTCaddTraining.shtm

  http://www.fdot.gov/cadd/downloads/webinars/Posted.shtm#loadSection

  https://www.youtube.com/channel/UCqbY8kqZuXp1pyYV6lIQw_A

COURSE SUPPORTING FILES

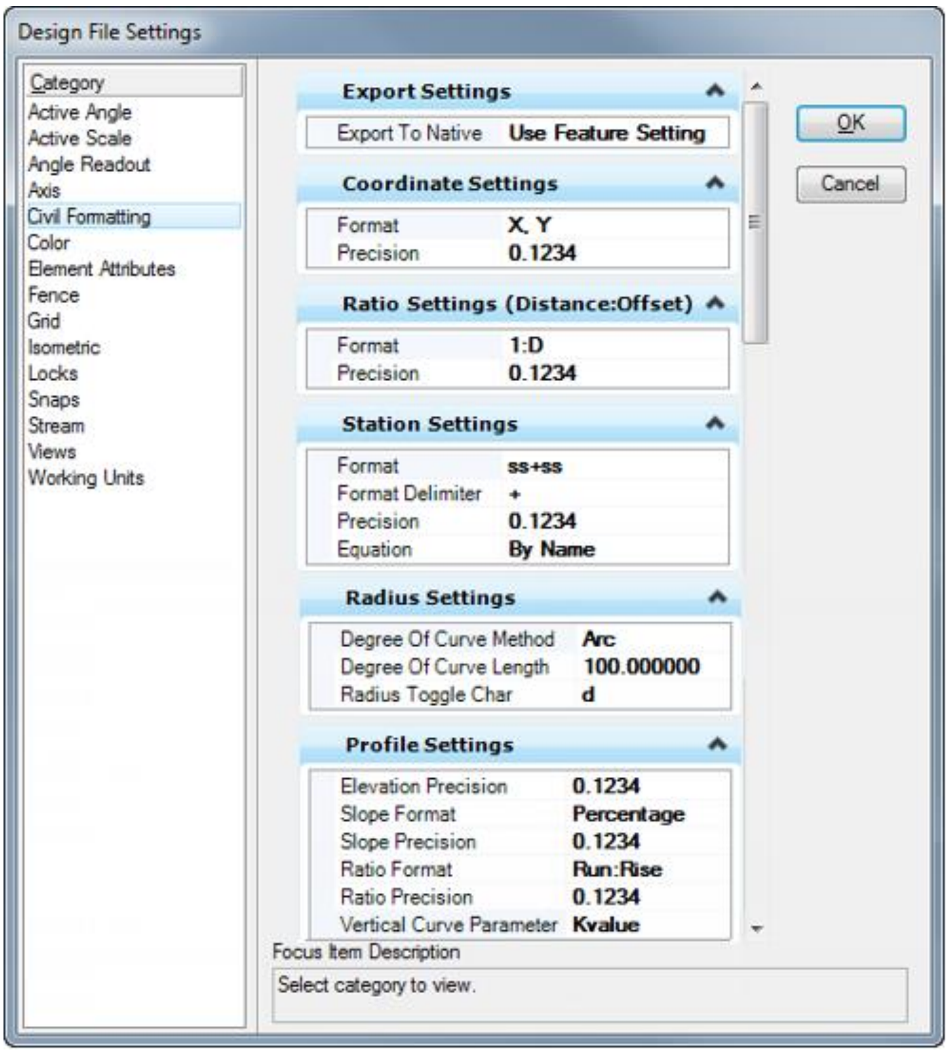
The exercises for each chapter are independent of one another and can be used without having to complete the exercises in previous modules. The exercise files are organized into separate comSelected zip files for each chapter. All files used in this course are located also at this link:

http://www.fdot.gov/cadd/downloads/documentation/FDOTRDAnd3DM/FDOTRDAnd3DM.shtm

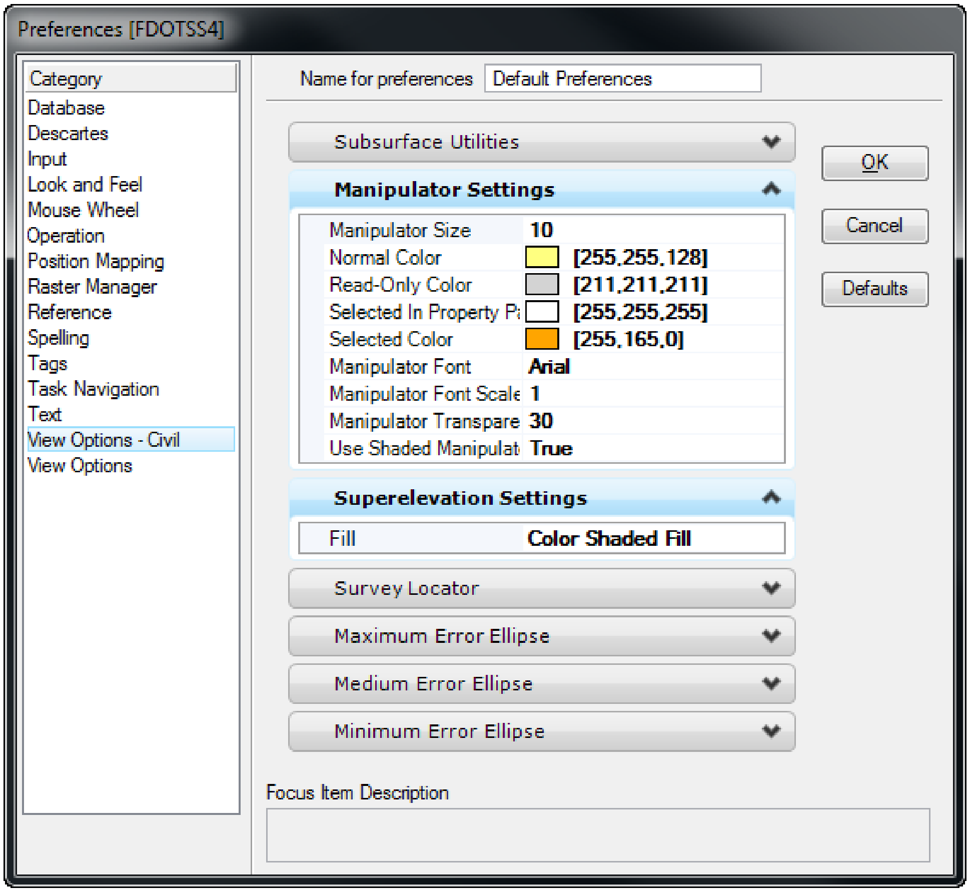
INTRODUCING A NEW WORKSPACE

FDOTSS4 PREDEFINED SETTINGS

DESIGN FILE SETTINGS:

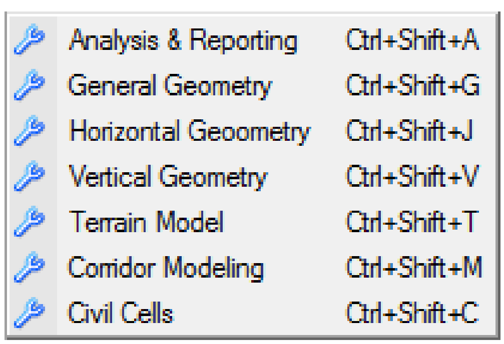


FDOTSS4 Workspace Preferences:



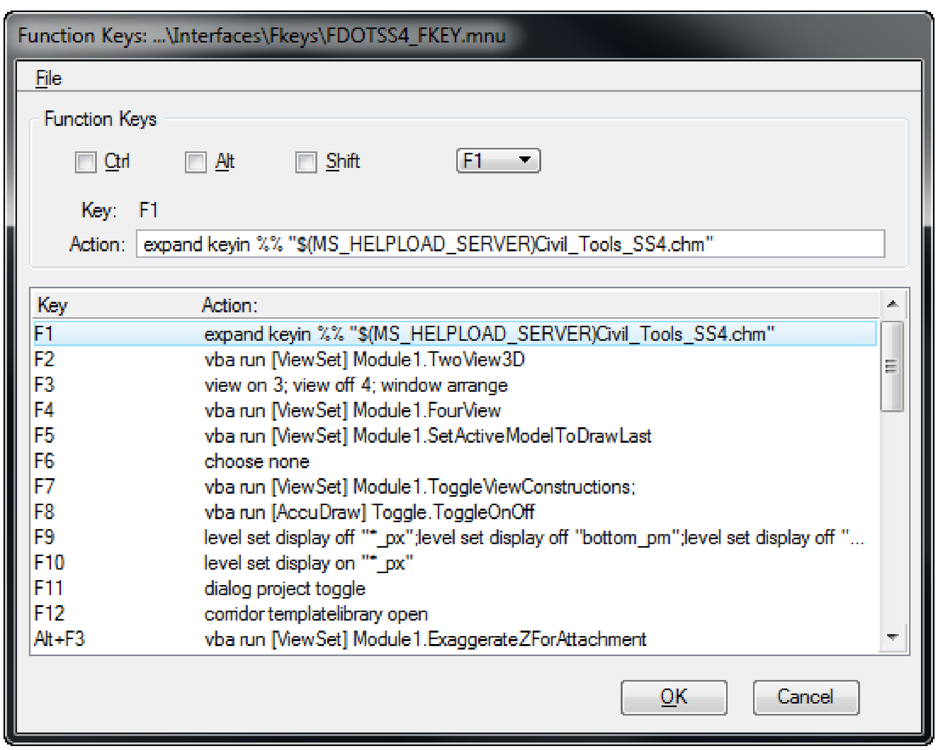
FDOTSS4 Keyboard Shortcuts

These will open the Civil Tasks on your cursor as shown below.

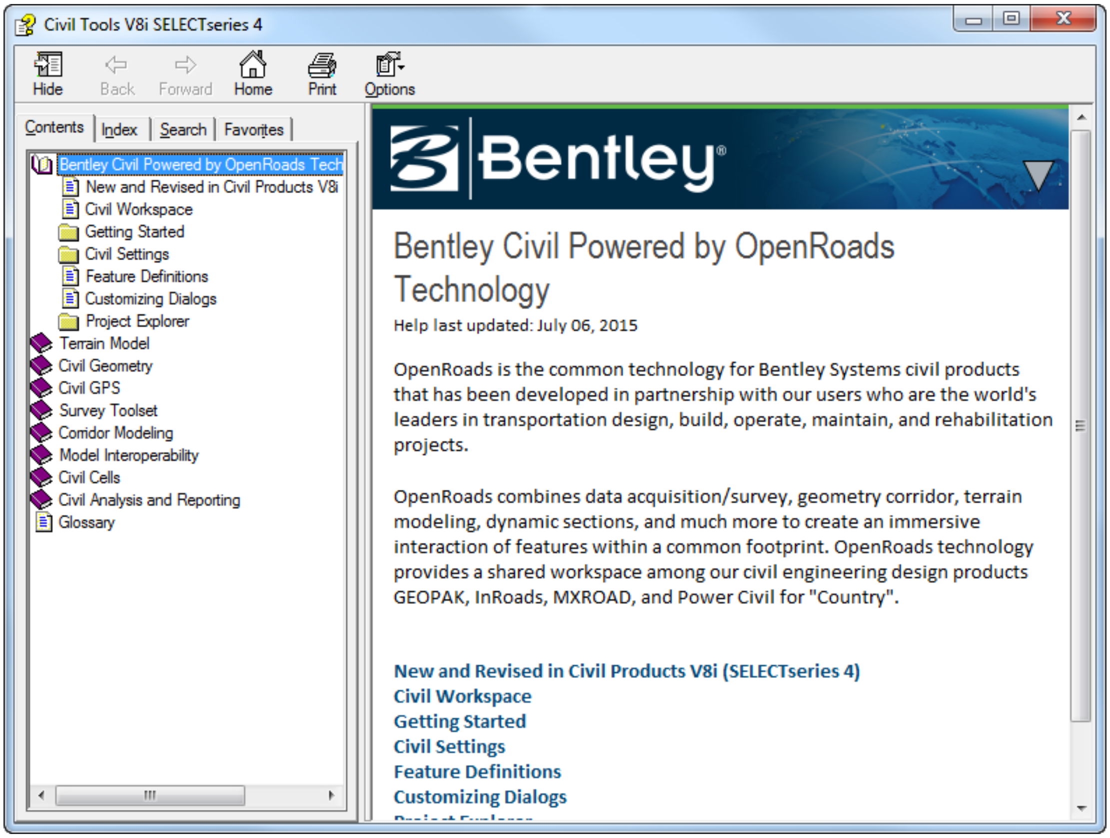


FDOTSS4 Function Keys

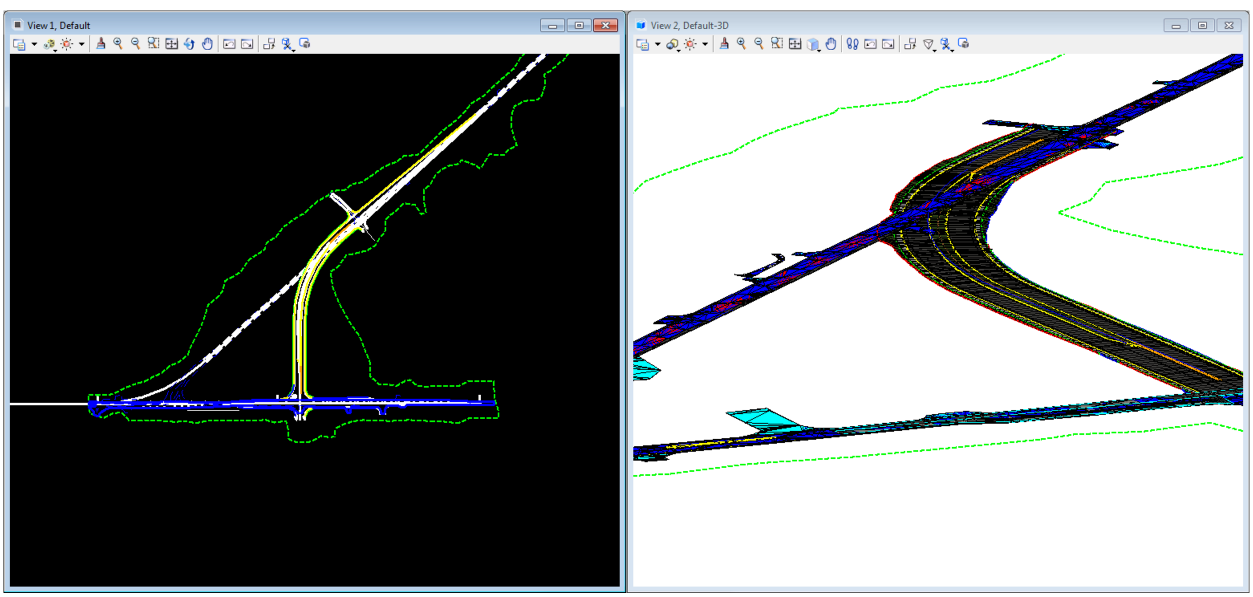
	FDOTSS4 Function Key Assignments
F1	Opens the Civil Help. Ctrl+F1 Closes all Views except View 1
F2	Open View 1 (2D Plan) and View 2 (3D Isometric) and fits both views.
F3	Opens View 3 (2D Plan), closes all View 4, and arranges all Views.
F4	Open View 1 (2D Plan) , View 2 (3D Isometric), View 1 (2D Plan), View 1 (2D Plan) & Fits All views
F5	Toggles Dim References ON/OFF
F6	Resets out of any ongoing commands.
F7	Toggles the Construction view attribute off and on.
F8	Toggles between MicroStation AccuDraw and Civil AccuDraw.
F9	With 3D Model view active, Toggles Off 3D proposed model shapes and bottom lines.
F10	With 3D Model view active, Toggles On 3D proposed model shapes.
F11	Toggles (opens or closes) the Project Explorer dialog.
F12	Opens the Create Template dialog.



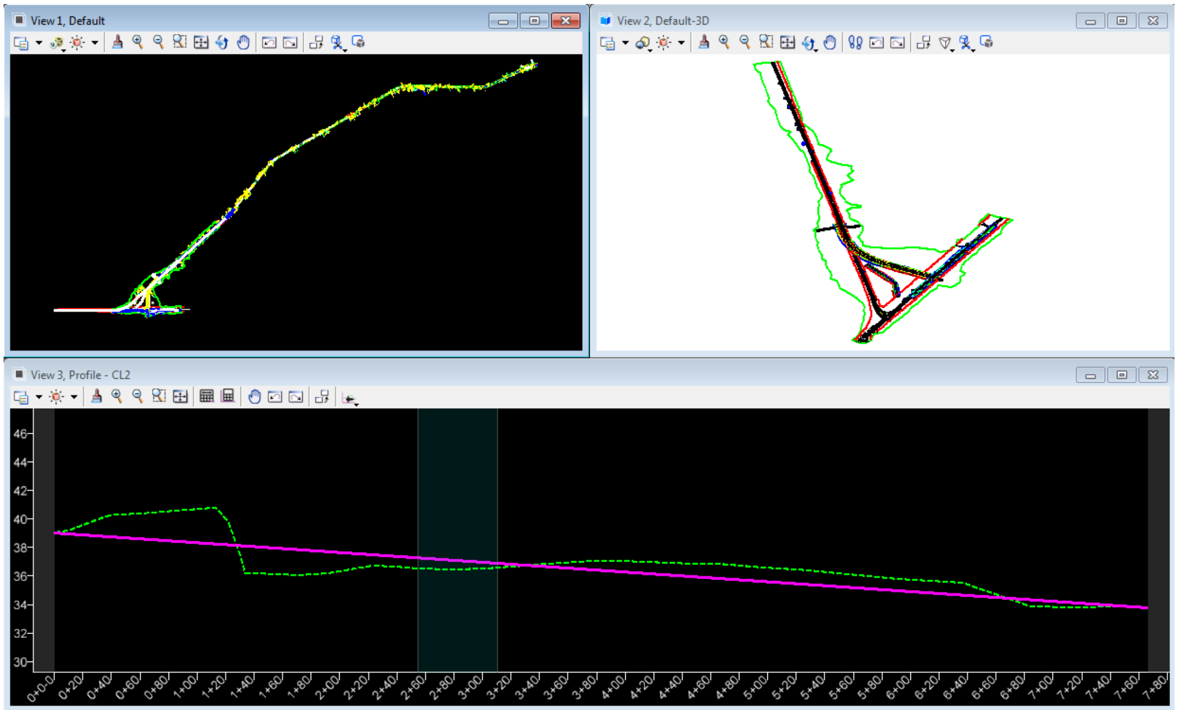
- Function Key F1 – Civil Help



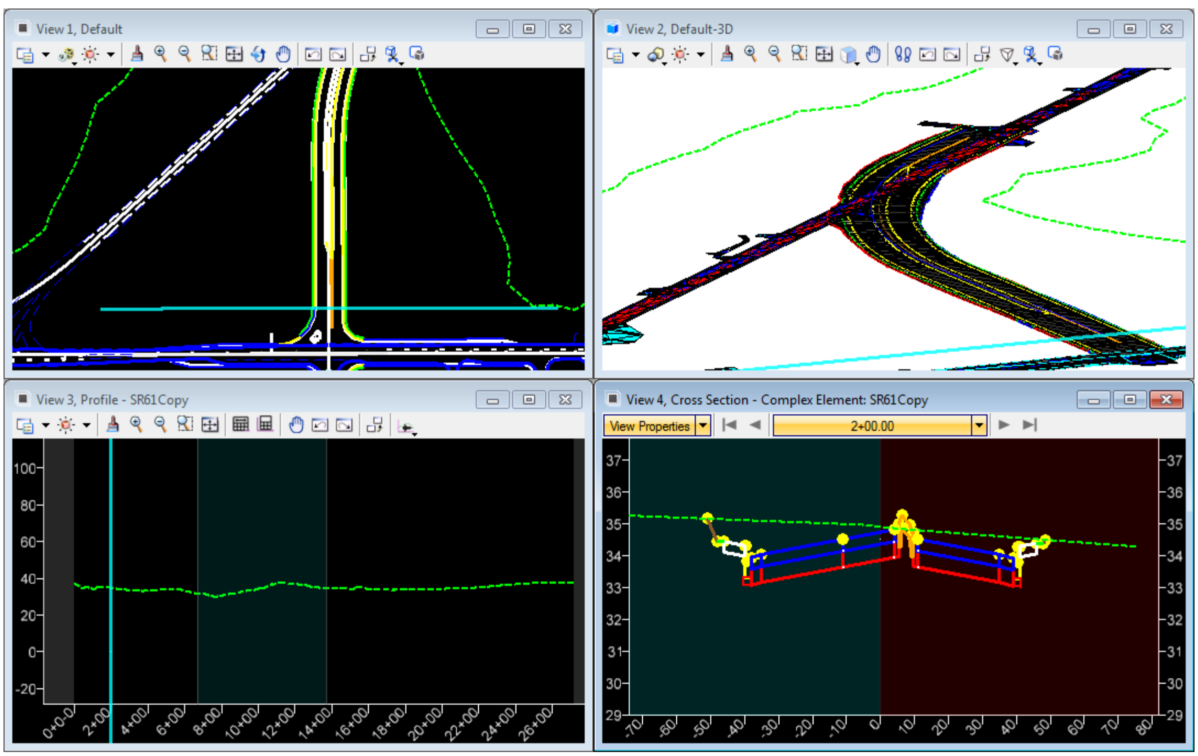
- Function Key **F2** – Open and Fits Two Views Setup; View 1- 2D Plan, View 2-Isometric



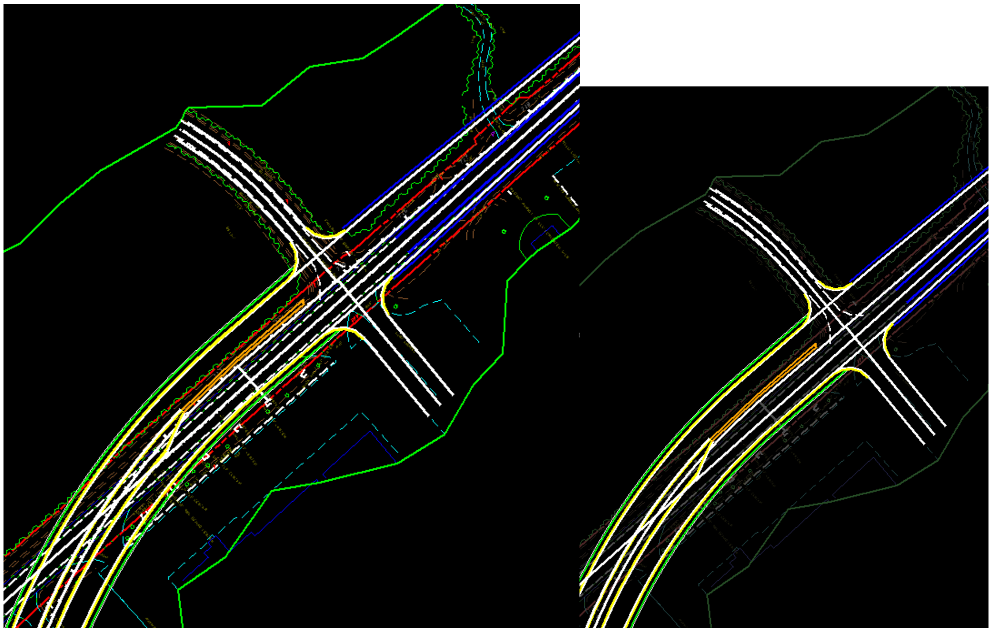
- Function Key F3 – Opens View 3; Closes View 4 and Arranges Views



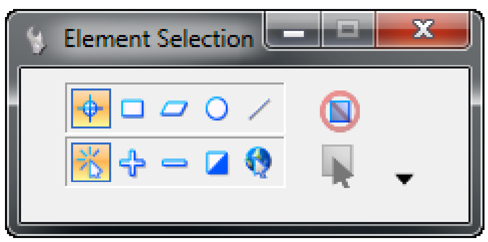
- Function Key **F4** – Opens and fits Four View Setup; View 1- 2D Plan, View 2-Isometric, View 3,4 - custom



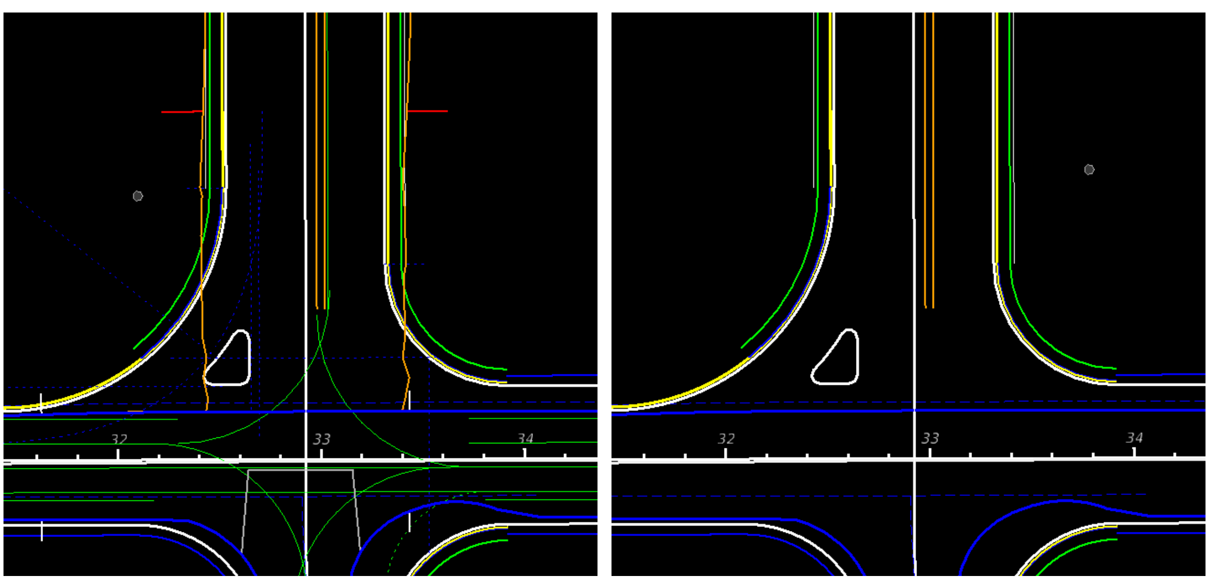
- Function Key **F5** – Toggle Dim References



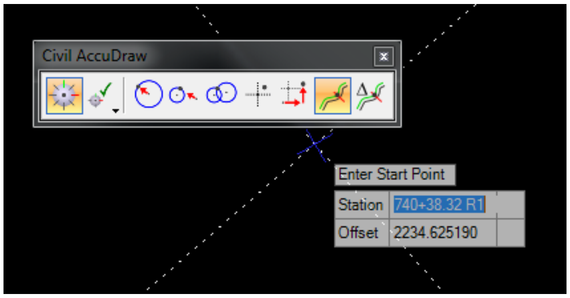
- Function Key **F6** – Resets Out of Any Ongoing Commands.

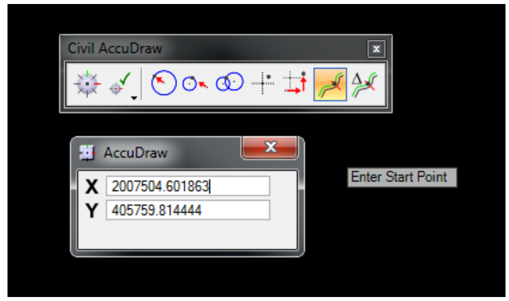


- Function Key **F7** – Toggles On/Off Construction View Attributes

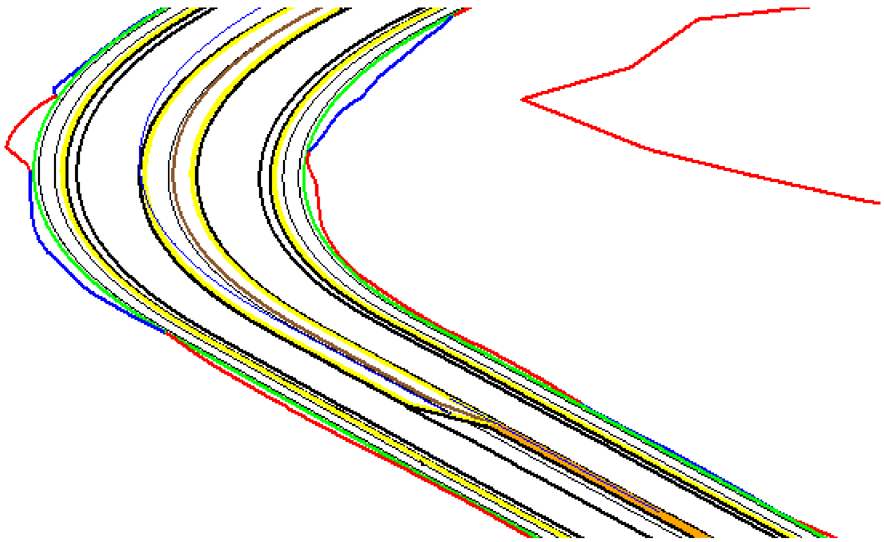


- Function Key **F8** – Toggles Between MicroStation AccuDraw and Civil AccuDraw

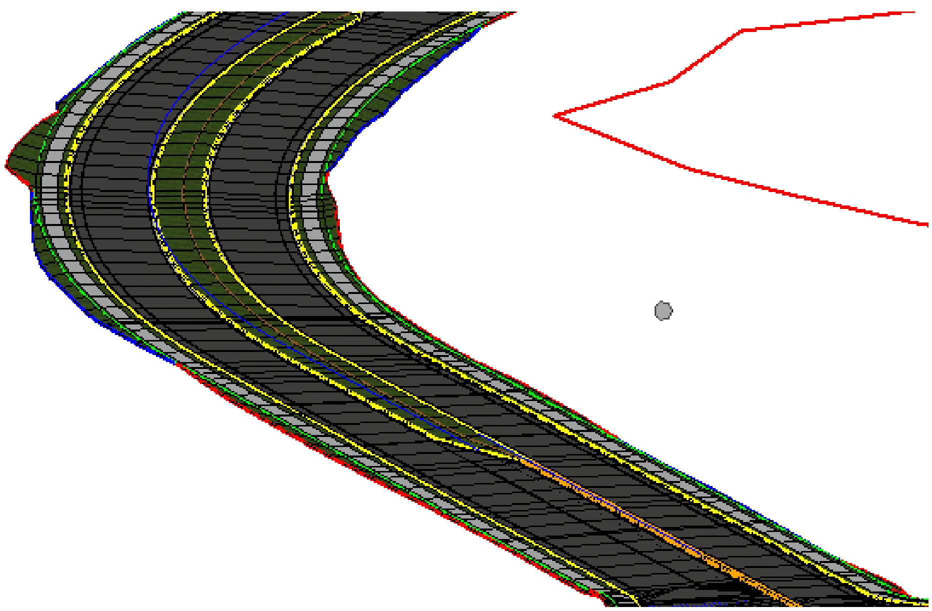




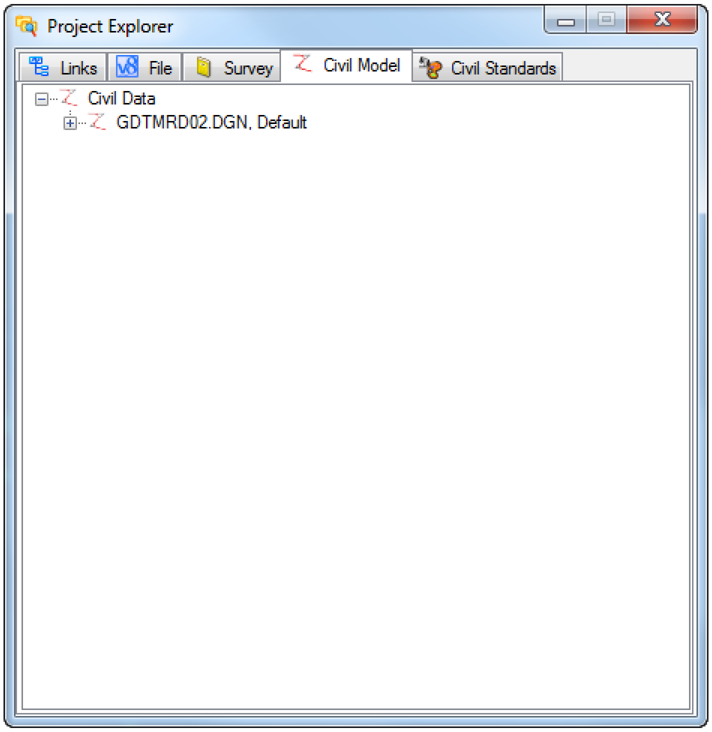
- Function Key **F9** – With 3D Model View Active, Toggles Off 3D Shapes and Bottom Lines



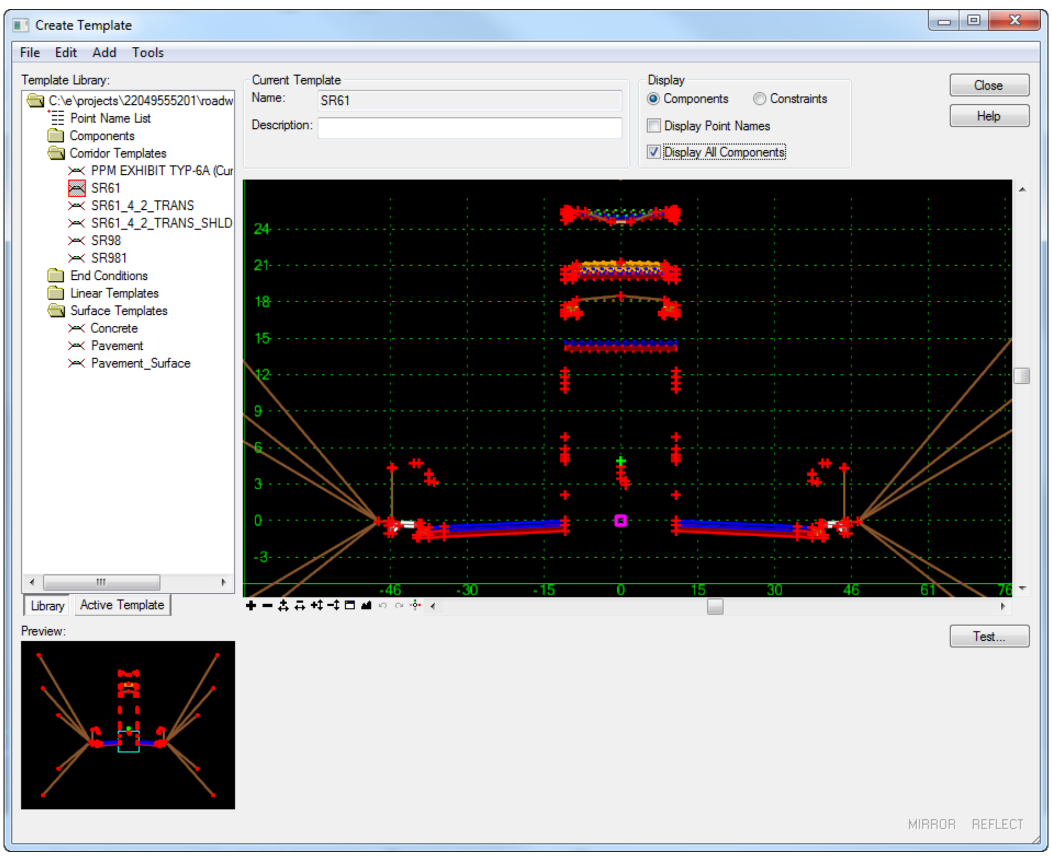
- Function Key **F10** – With 3D Model View Active, Toggles On 3D Shapes.



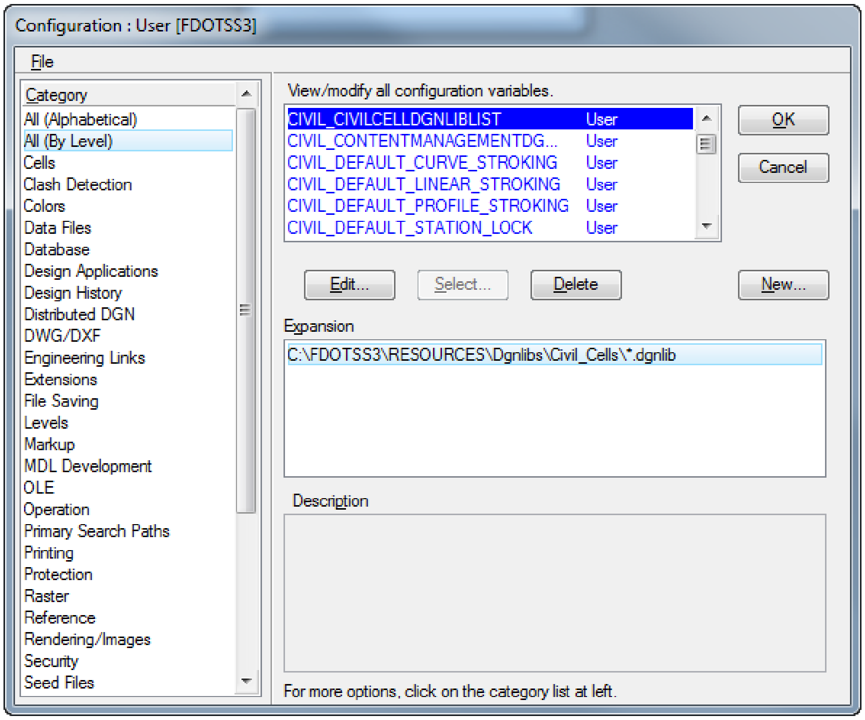
- Function Key **F11** Toggles Project Explorer Dialog Open/Close.



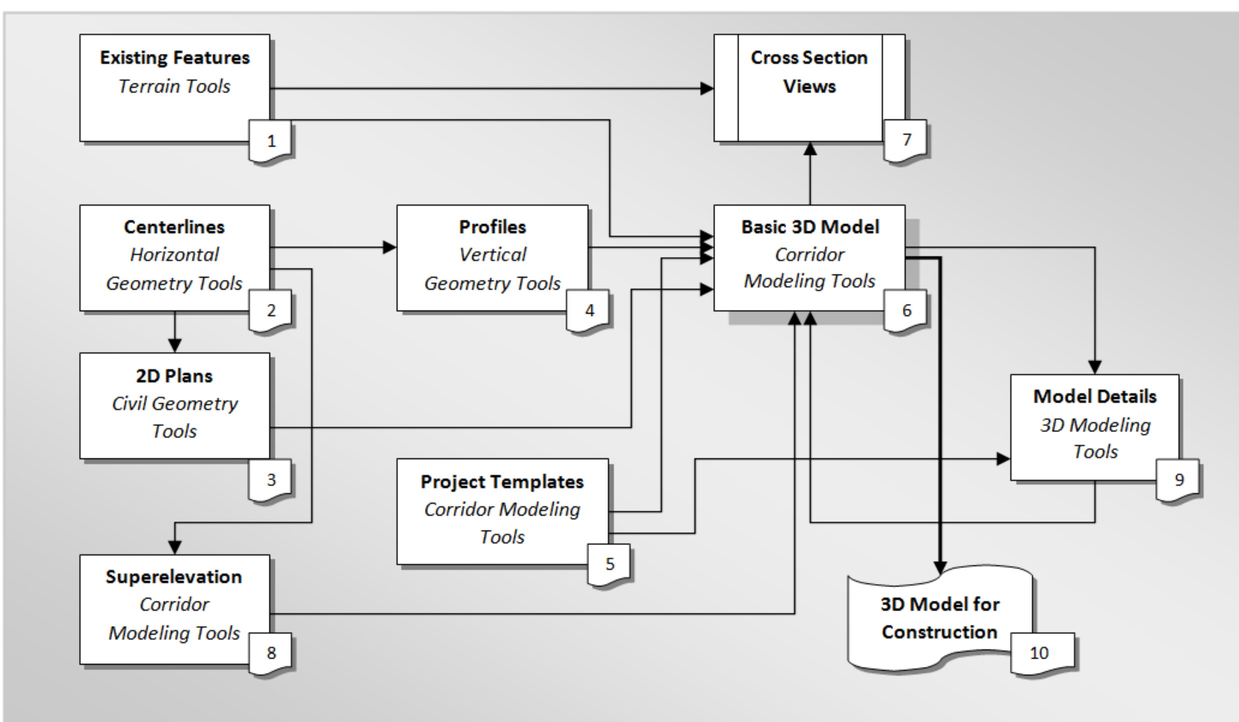
- Function Key **F12** Corridor Modeling, Opens Create Template Dialog.



FDOTSS4 User Configuration Variables



FDOT SS4 Design and 3D Modeling Overview



General Workflow and Chapter Outline

1. Existing Terrain and Existing Features
2. Design Centerlines Alignments and Prepare Station Annotations
3. Prepare 2D Plan Layout
4. Design Profiles
5. Define Project Templates
6. Create 3D Design Model and add 2D References
7. Create Cross Section View
8. Define Superelevation and Assign to the Corridor Model
9. Detail Modeling for Intersections, Median Traffic Separator Nose, Side Roads, Driveways, Curbs Ramps, etc.
10. Prepare Construction Deliverables.

Recommended MicroStation Settings

Various tools and settings will be used throughout the workshop. Therefore for quick accessibility, several of the dialogs are better docked on the sides the MicroStation view.

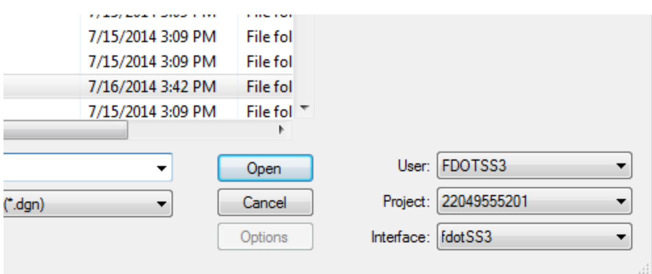
Getting Started

1. (Optional) Extract the 22049555201(1).zip file in the Data Set folder to the c:\e\projects folder. If this is a class environment, then this step has already been completed.

2. (Optional) Copy the *22049555201.pcf* file in the Data Set folder to the c:\e\projects folder. If this is a class environment, then this step has already been completed.

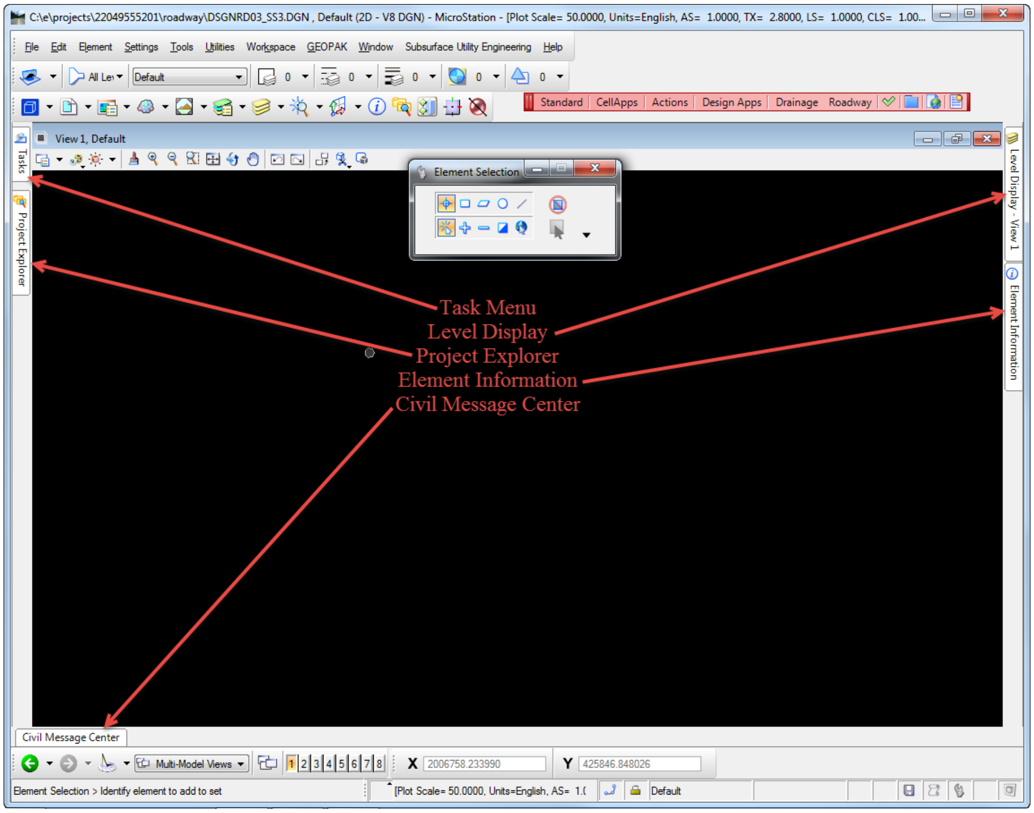
3. Click on the **FDOTSS4** icon on the windows task bar <OR> double click on the **FDOTSS4** icon in the **FDOTSS4** folder on the desktop to open the Workspace.

4. In the lower right corner of the File Open dialog, set the *User* to **FDOTSS4**, *Project* to **224049555201**, and *Interface* to **FDOTSS4**.

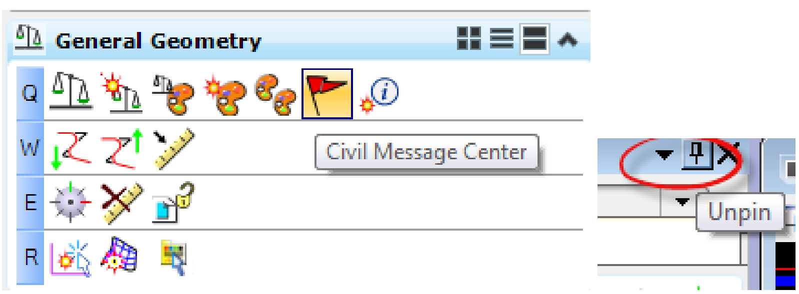


5. Navigate to the *Roadway* folder, select *TYPSRD01.dgn* and click **Open**.

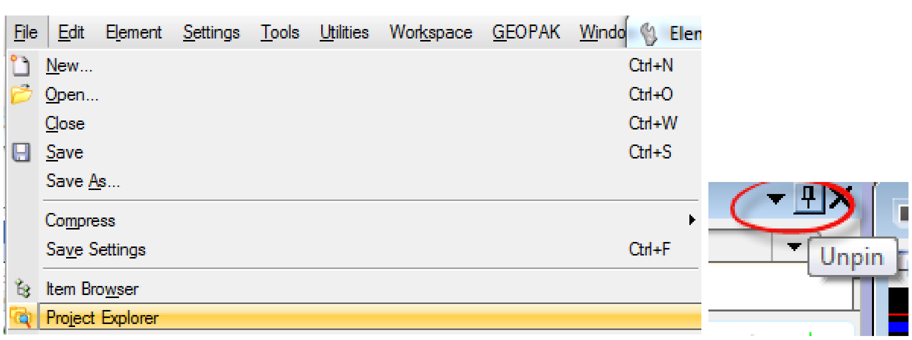
MENU DOCKING



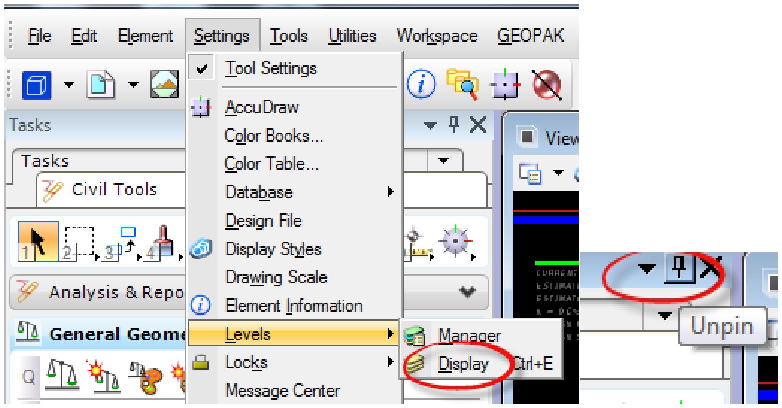
1. Verify that the *Civil Message Center* tool is already docked on the bottom; if not, select it from the *General Geometry Task* group, dock and unpin.



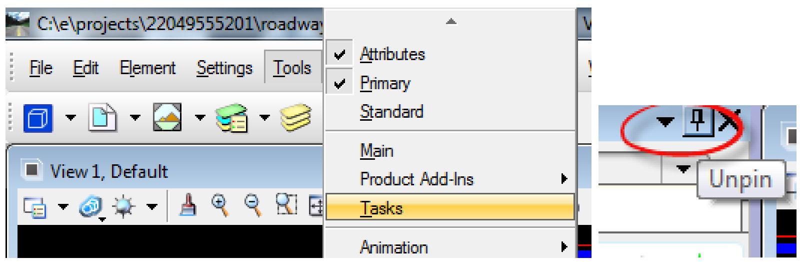
2. Verify that the *Project Explorer* is docked on the left side; if not, from the main menu bar, select **File > Project Explorer**, dock and unpin…Or use the F11 function key to toggle ON/OFF the dialog.



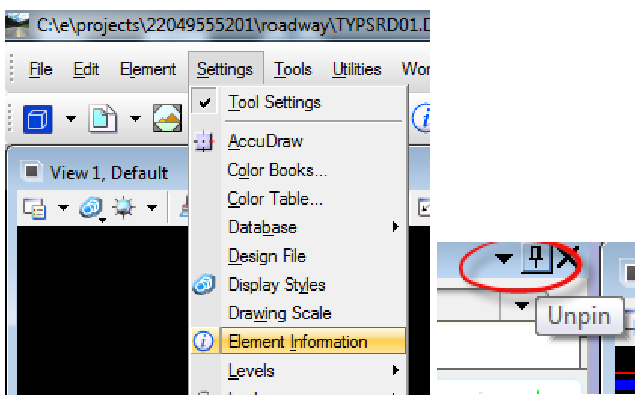
3. Verify that the *Level Display* is docked on the right side; if not, from the main menu bar, select **Settings** > **Levels** > **Display**, dock and unpin.



4. Verify that the *Task Bar* is docked on the left side; if not, from the main menu bar, select **Tools** > **Tasks**, dock and unpin.



5. Verify that the *Element Information* is docked on the right side; if not, from the main menu bar, select **Settings** > **Element Information**, dock and unpin.



HINT Many of the dialog settings are stored in user preferences defined in xml data files located in the users data folders i.e. C:\Users\rd964vd\AppData\Local\Bentley.

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1 EXISTING TERRAIN AND FEATURES

INTRODUCTION

This chapter will introduce the OpenRoads Technology tools to use for viewing the existing terrain and creating 3D existing features in design models in FDOTSS4.

CIVIL TERRAIN MODELING

As defined in the **Bentley** Civil Tools help files:

> *"A terrain model is 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, and etcetera. Terrain models are also referred to as digital terrain models (DTMs), triangulated irregular networks (TINs), or triangulated surfaces.*
>
> *The MicroStation Terrain Model tools support importing and labeling terrain contours and spots on terrain models. You can import a terrain model into a DGN to use its data. Terrain models imported from the LandXML file format are supported within MicroStation. However, any manipulation or importing from Civil products must be done within Bentley Civil.*
>
> *Bentley Civil provides a robust set of tools to create, edit, analyze, and work with terrain models.*
>
> *A terrain model is recognized as a MicroStation element type as of MicroStation V8i (SELECTseries 4). When you select a terrain model, the Element Selection tool Element Type tab indicates that it is a Terrain element type."*

Several terrain model civil features have been developed for the FDOTSS4 Workspace to be used on FDOT projects. Terrain elements created in the design file can be selected from these features in the various Terrain Model Tasks.

WORKFLOW INFORMATION

The workflow process for getting existing features to appear on cross sections has changed significantly in FDOTSS4. No longer will the legacy existing features criteria be used. Instead the existing features will be created in a 3D model following the steps outlined in the exercises to follow.

- Levels containing the existing features will be identified from the SURVRD01 OR TOPORD01 file and copied into a GKLNRD file.
- Closed shapes will be created to contain areas representing the existing features. These are the features which are typically required to be the on cross sections.

The table below is a list of the Levels that contain these features.

Level	Existing Feature
CGBack_ep	Curb Back Line
CGep_ep	Curb Edge of Pavement
ConcSlabs_ep	Concrete Slabs
Driveway_ep	Driveway Pavement
PavtAsphalt_ep	Pavement (Roadway)
PavtMisc_ep	Pavement (Miscellaneous)
ShldrPaved_ep	Shoulder Pavement
SidewalkFront_ep	Sidewalk Front Line *
SidewalkBack_ep	Sidewalk Back Line
TrafSeparator_ep	Traffic Separator
* *A sidewalk front line may not be present when the sidewalk is adjacent to curb*.	

- The existing Terrain will then be clipped by each shape individually to create separate existing feature Terrains
- A surface template is then applied to the terrain features to define the sub-surface depth to the terrain.
- For the non-uniform depth curb and gutter a linear template is applied.
- A profile is added to the R/W Existing lines in order to display the R/W line symbol in a cross section view

When finished, the file will contain 3D existing features developed from the original existing DTM terrain and TOPORD01 files. As a result of creating this file, any cross section created while the terrain elements are displayed in the 3D model will show existing features below the surface.

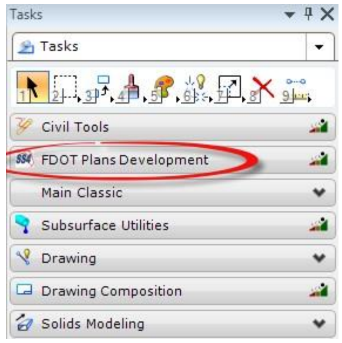
EXERCISE OVERVIEW

1.1 Create and Set Up the GKLNRD file
1.2 Create Shapes Using FDOT Create Existing Features
1.3 Create Existing Feature Terrains (External)
1.4 Clip Terrains within Terrain, i.e. Medians/Traffic Separators
1.5 Create Existing Traffic Separator Terrains
1.6 Apply Surface Templates
1.7 Edit Existing Feature Depth
1.8 Add Curbs to the Existing Features
1.9 View Existing Cross Sections
1.10 Add Existing R/W Lines for Cross Section Viewing
1.11 Add Existing Utility Lines for Cross Section Viewing

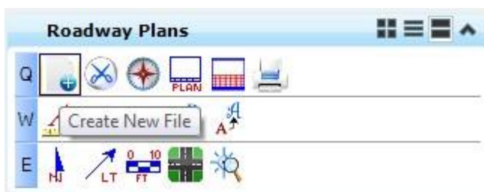
Exercise 1.1 Create and Set Up the GKLNRD file

In this exercise, the GKLNRD01.dgn file will be created and the FDOT Create Existing Features tool will be used to reference the SURVRD01 file which contains the existing survey. The RWDTRD01 file will also be referenced.

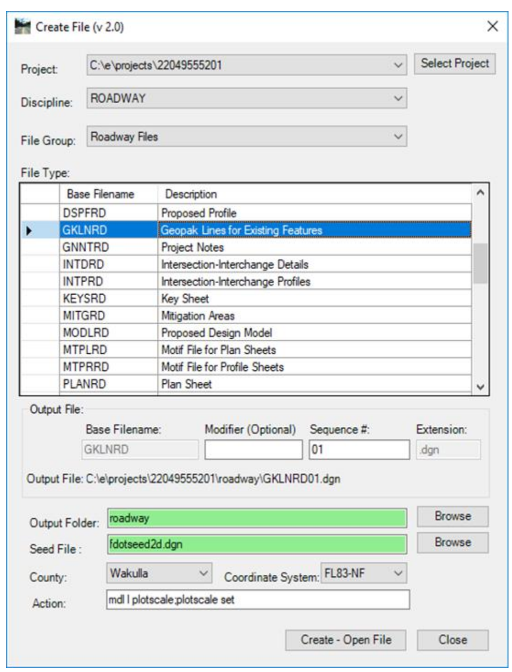
1. From the main Tasks bars, select the FDOT Plans Development task.



2. From the *FDOT Plans Development, Roadway Plans* Task, select the **Create New File** icon. The Create File dialog displays.



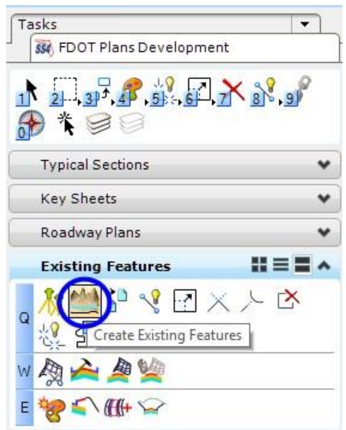
3. Create a *GKLNRD01.dgn* file with the Create File/Project dialog as shown below.



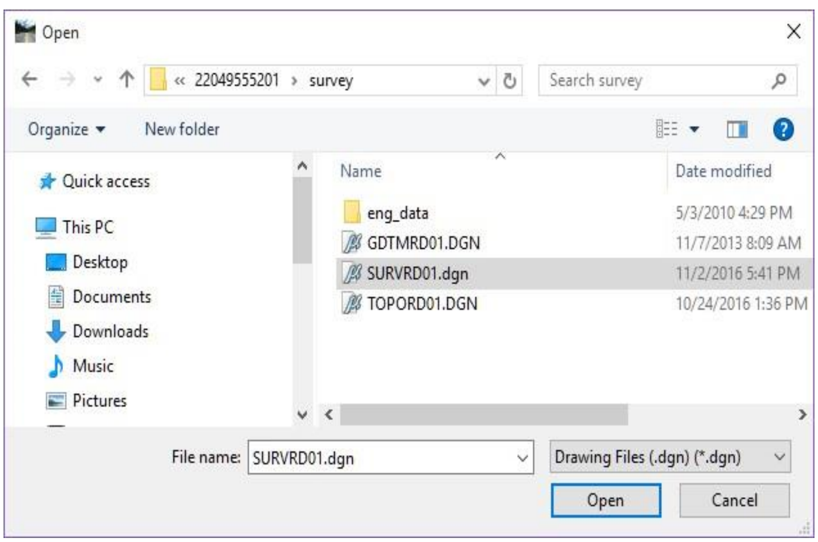
4. Click **Create – Open File** to create the file, *GKLNRD01.dgn*. Click **Open File**, *GKLNRD01.dgn* displays. Set/Update Plot Scale displays. Use the default settings and click **OK**.

5. Click **Close** to close the Create File dialog.

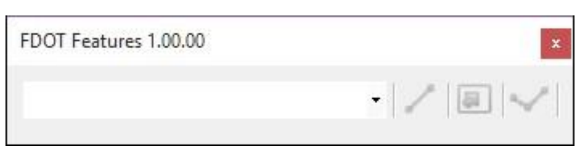
6. From the *FDOT Plans Development, Existing Features* Task, select the **Create Existing Features** icon.



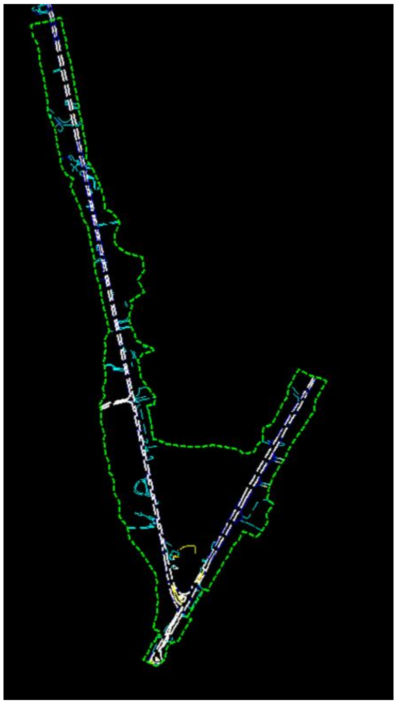
7. At the Open dialog, navigate to the project **survey** directory and select the *SURVRD01.dgn* file.



8. Click **Open**. *FDOT Features 1.00.00* opens. (The tool has attached the reference file, copied in the elements, and then turn off the display to the reference file.)



9. Select MicroStation **Fit View** to see the elements copied into the file.



10. Delete the DTM element from the file.

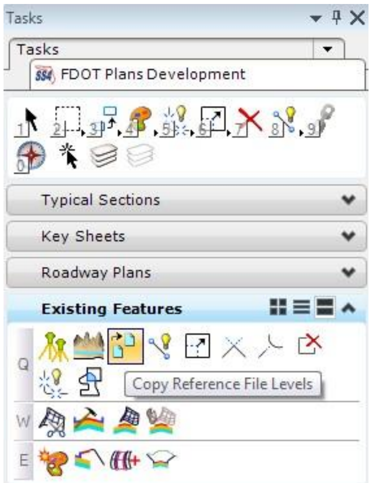
11. Turn on the display for the referenced SURVRD01 file.

12. Turn off all the levels in the reference SURVRD01 file except the DTM_ep and DTM_ex.

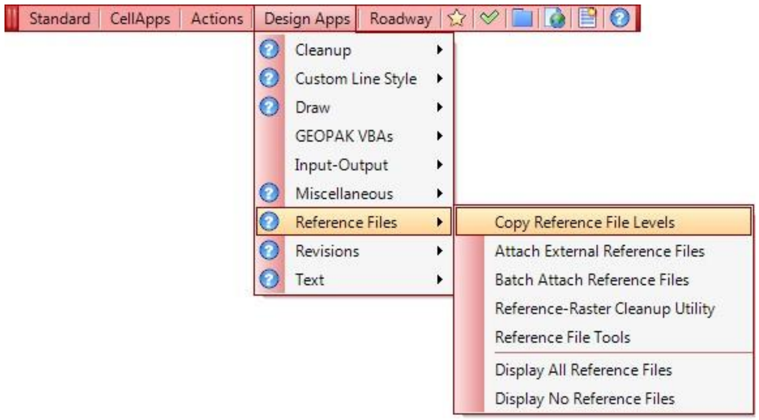
➢ *To Add Lines from R/W*

1. From the MicroStation menu select **File** > **References** and attach the following files: C:/e/projects/rwmap/*RWDTRD01.dgn*

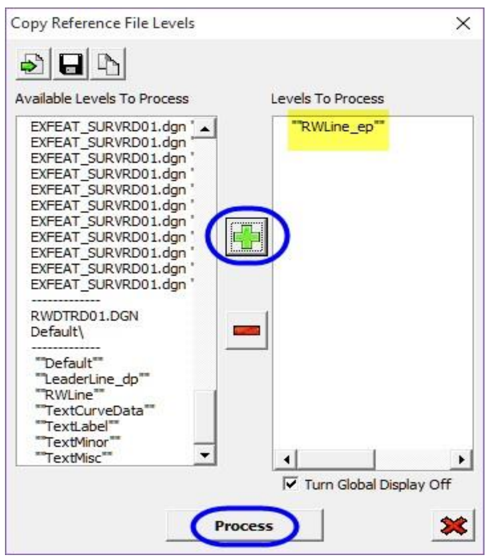
2. From the FDOT Plans Development, Existing Features Tasks, select the Copy Reference File Levels icon.



<OR> From the FDOTSS4 Menu select Design Apps > Reference File > Copy Reference **File Levels**.

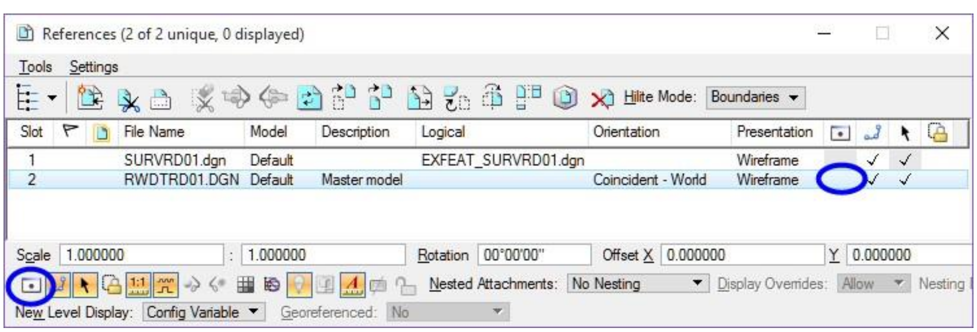


3. Select the level **RWLine_ep** and click the **Add** button. When finished select **Process**.

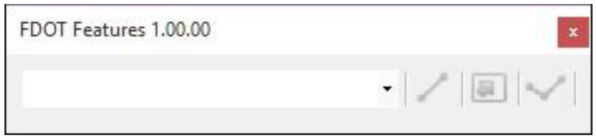


4. Click the **X** button to close the application.

5. From the *Reference* file manager, turn the display off for the *RWDTRD01.dgn* file.

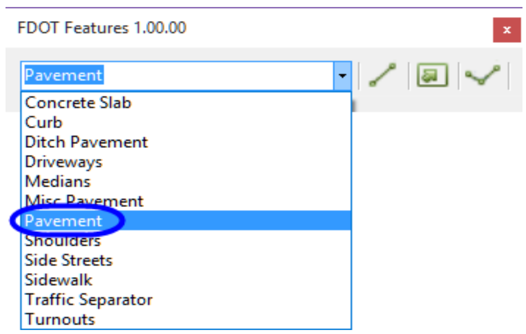


Exercise 1.2 *Create Shapes Using FDOT Create Existing Features*

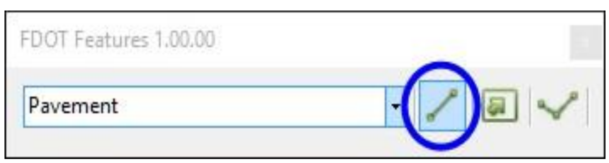


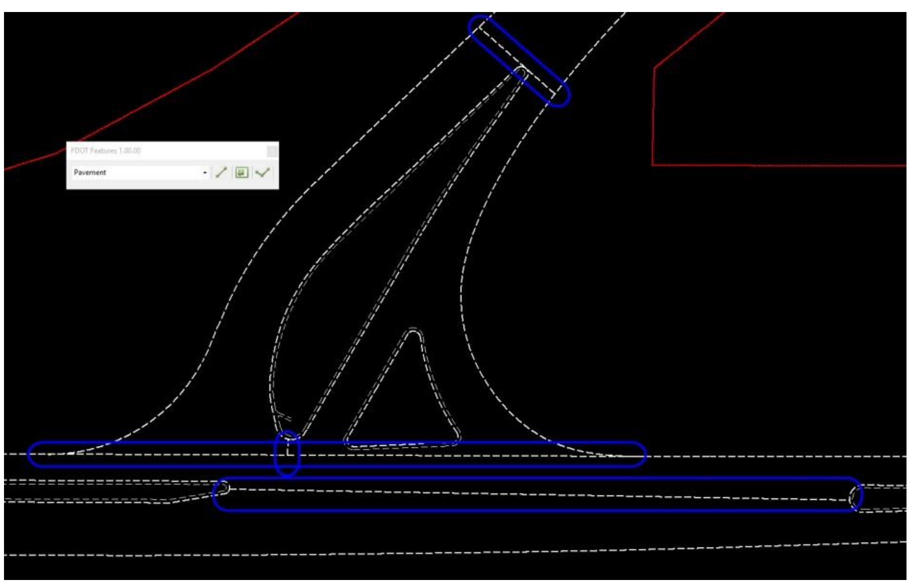
The FDOT Features tool will be used to assist in closing areas and creating the necessary shapes for the existing features to be modeled. The tool contains a drop-down menu and 3 tool icons. The drop-down menu allows for the selection of the active existing feature. Levels are turned on/off to help isolate the areas where shapes are needed. In order to create a continuous shape around the existing features, miscellaneous lines are drawn in the file at various locations. The first icon, Place Feature Line, activates the Place Feature Line tool. The second and third icons are used to create the shapes either by the flood method or by selecting the elements to trace.

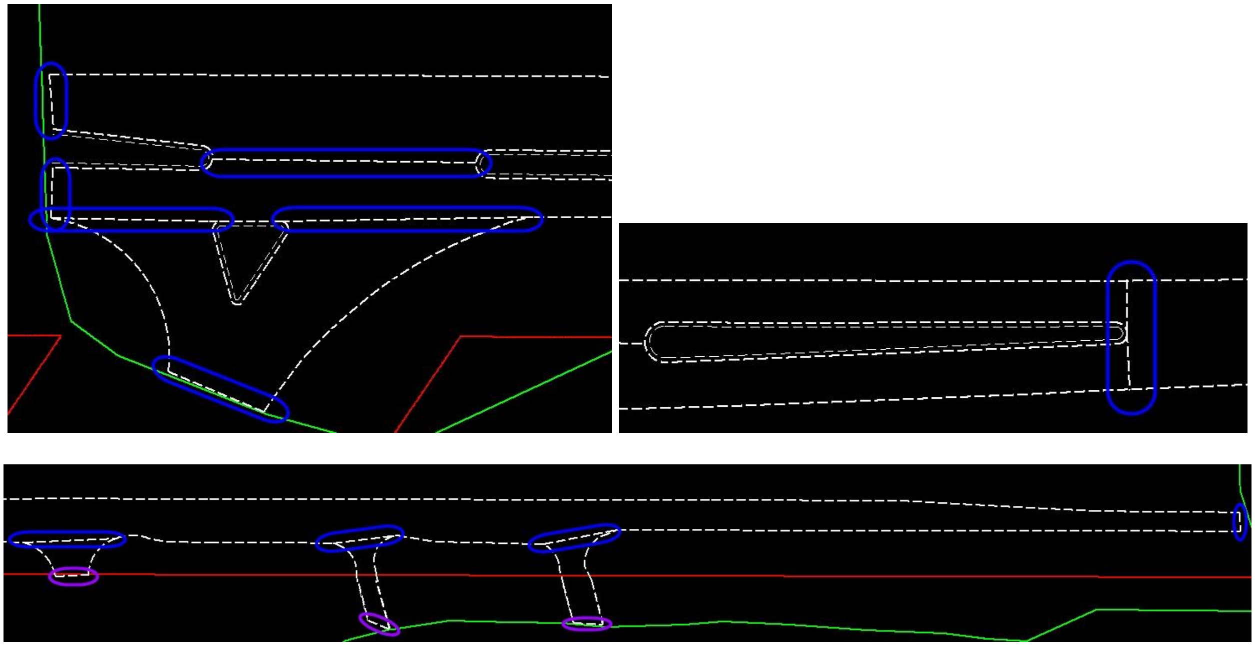
1. On the FDOT Features dialog, select Pavement from the dropdown list.



2. Select Place Feature Line and place lines to separate the 2 existing roadways and close off the pavement areas as shown.

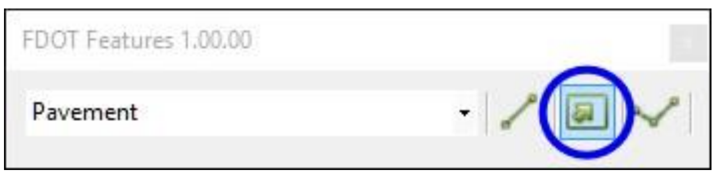






Note The lines drawn to close the turnouts (purple) beyond the RW line can be used to create shapes for either Turn Out or Pavement depending on preference

3. Select the icon Create Feature Shape by Flood.



4. Data point inside each area defined with step 2 to create the required shapes. The tool will highlight and zoom the area to fit the view before accepting each shape. Click again in the screen to accept. Zooming out to see the entire shape before selecting inside an area is not necessary.

5. Repeat the steps to create closed shapes for each of the following types of features.

Note Place lines to close line work differentiating existing features. It may be necessary to modify the **Tolerance** value when creating the shapes. The *Flood Feature Tolerance* dialog box will pop up when the *Create Feature Shape by Flood* tool is activated.

Existing Features Types:
Shoulders
Driveways,
Existing Traffic Separator
Turnouts
Side Streets
Medians
(CGFace_ep and CGBack_ep elements will be used in later exercises.)

Note This exercise is meant to demonstrate the procedures for adding existing features into a 3D model. There may be more features on a typical project and the steps outlined here can be used to achieve the desired results.

6. Close the FDOT Features tool and then close MicroStation.

Exercise 1.3 Create Existing Feature Terrains (External)

Once the shapes are created, those shapes can be used to create individual terrains from the existing DTM. This is referred to as External Clipping. In this exercise, the Open Roads Civil tool, Clip Terrains will be used to create the terrains for the pavement, shoulders, driveways, and turnouts.

1. Open up the MicroStation file C:\e\projects\22049555201\Roadway\GKLNRD01.dgn.

    a. Set the *Active Level* to **PavtAsphalt_ep** and turn **Off** all the other *Used Levels*.

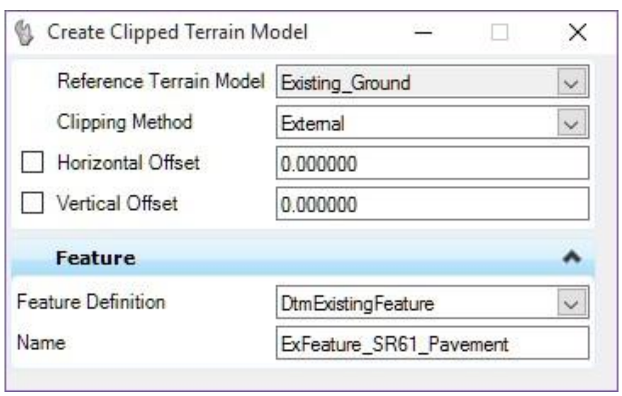
    b. Make sure the Reference file display for the *Terrain* is turned **On**.

2. Use the *Existing Features*, **Clip Terrain** tool to create a *Terrain for Existing Features*.

Note If you did not close the file when completing Exercise 1.2 and the file crashes when activating this tool, use Clear Crash to close the MicroStation session. Reopen the file and start this exercise from step 1.

3. On the Create Clipped Terrain Models dialog, under the *Feature* section set the *Feature Definition* to **DtmExistingFeature** and enter **ExFeature_SR61_Pavement** for the *Name*.

Note DtmExistingFeature is a terrain feature used for Surface Templates. It is a construction class terrain element and can be turned OFF with the F7 function key.



    a. Following the prompts on the end of the cursor, locate the *Reference Terrain Model* element. This will be the terrain you are clipping from; which in most cases will be the *Existing Terrain Model*. Select the **GDTMRD boundary** as the *Reference Terrain*.

    b. Locate the *Clipping Element*; the shape for which you want to create a terrain. Select the **shape** created for the *left existing pavement* for *SR 61* and data point to accept it as the *Clipping Element*.

HINT Some of the shapes may overlap each other. **Right-click** or **Tab** through the shapes and select the correct one. Select **F6** to exit the command and then restart the command if needed.

c. Right click to **Reset** when finished to stop selecting *Clipping Elements*.

d. Set the *Horizontal Offset* to **0.0** and **left-click** to accept.

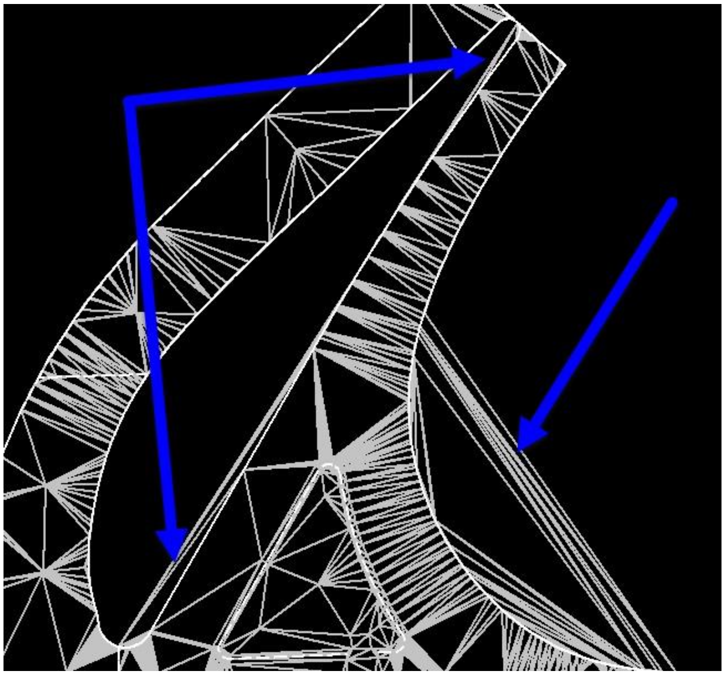
e. Set the *Vertical Offset* to **0.0** and **left-click** to accept.

f. Set the *Clipping Method* to **External** and **data point** to accept.

Note When selecting multiple shapes, the dialog will flip and lock to the internal method. External boundaries can only be selected one boundary at a time.

Internal clipping elements will be added in another exercise.

4. Repeat step 3 to create the terrain for the right side of SR61. The tool will automatically rename the terrain by adding a 1 to the end. (Notice that the triangle for the right side of SR61 are triangulating outside of the boundary.)



5. A *clipped terrain* is created and placed in the 3D Model of the *GKLNRD01*. The 3D Model is then referenced to the 2D Model. To Edit a terrain, it must be done in the 3D model. Select the *Function Key* **F2** to open both the 2D and the 3D Model.

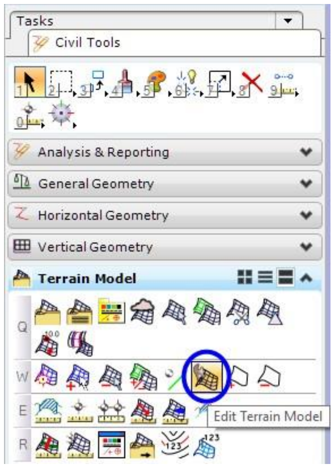
6. Change the *View Rotation* to **Top** and zoom in to the area of triangles that are incorrect.

7. Select the Function Key **F11** to open Project Explorer.

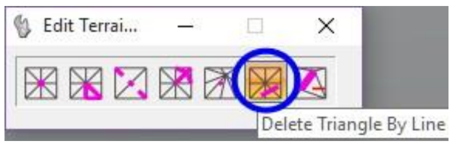
8. Under the Civil Model tab, go to GKLNRD01.dgn, **Default > Terrain Models > Terrain Model**: **ExFeature_SR61_Pavement1** (the right side existing terrain for SR 61).

9. Right Click on the Terrain Model and select Rules > Remove Rules.

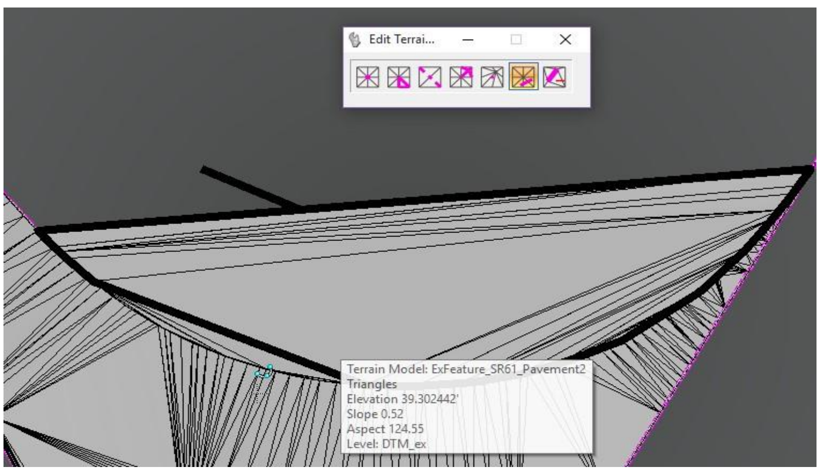
10. With the 3D view active, go to **Tasks** > **Civil Tools** > **Terrain Model** > **Edit Terrain Model**.



11. The Edit Terrain toolbox opens. Select the option to Delete Triangle By Line.



12. In the 3D view, select the terrain boundary and then draw a line across the unwanted triangles.



13. Continue deleting triangles until removed from all 3 areas. When done, close the 3D view.

14. Repeat the Step 3 **Clip Terrain** command for each of the following existing shapes. Use the table below to record the *Status*.

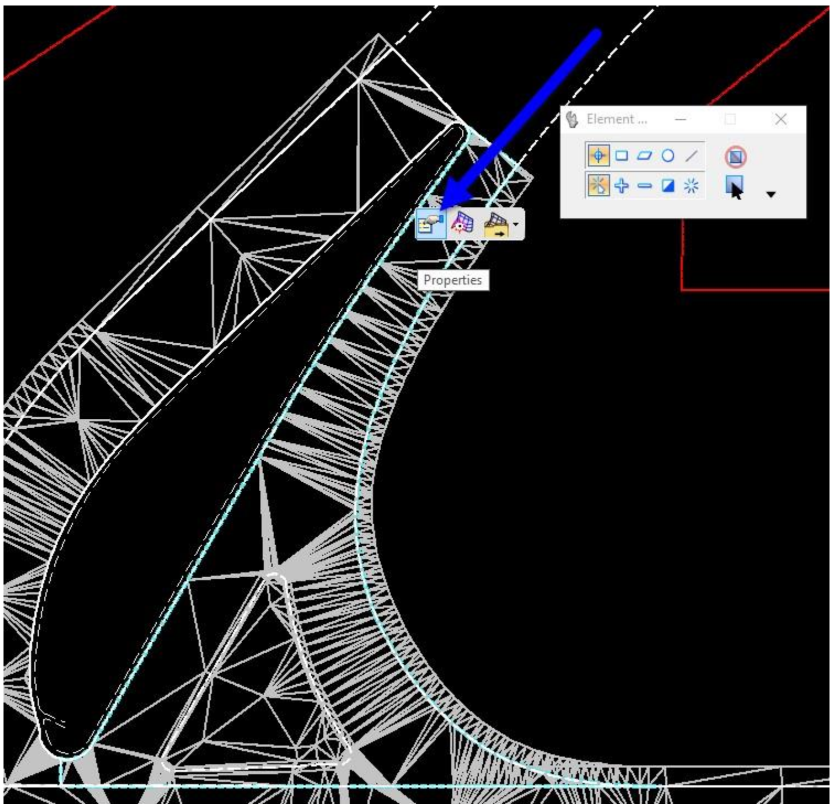
Existing Feature Terrain Name	**Status**
ExFeature_SR61_Pavement	completed
ExFeature_SR61_Shoulder	
ExFeature_US98_Pavement	
ExFeature_US98_Shoulder	
ExFeature_US98_Driveway	
ExFeature_US98_Turnout	

Exercise 1.4 Clip Terrains within Terrain, i.e. Medians/Traffic Separators

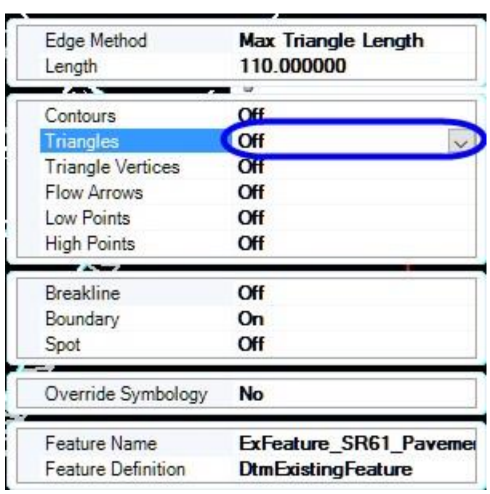
In some cases, the terrain created may include areas that they should not. Examples include Traffic Separator, Medians, or Curbed Islands within a terrain created for a pavement area. These smaller sections need to be clipped out of the larger terrain. This is referred to as Internal Clipping. The tool creates a new terrain with the area(s) clipped out. It does not modify the existing terrain.

In this exercise, a terrain will be created using the internal method for the pavement terrain created in the previous exercise on the right side of SR 61.

1. Select the **Terrain** and hover over the boundary to display the Context Menu. Select the Properties dialog.



2. From the Properties dialog, set the *Triangles* option to **Off.**



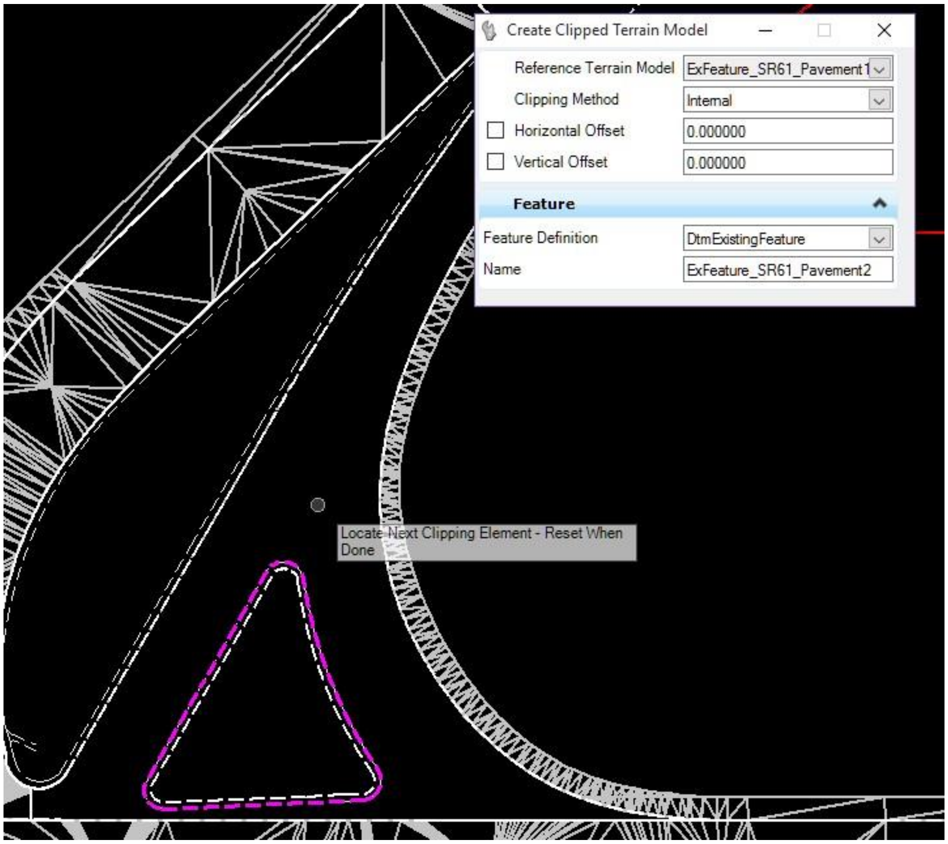
3. Use the *Existing Features*, **Clip Terrain** tool to create a clip boundary within a *terrain for Existing Features*.

a. On the Create Clipped Terrain Models dialog, select the *Reference Terrain Model* **ExFeature_SR61_Pavement1.**

b. Enter the *Name* **ExFeature_SR61_Pavment2**.

c. Then locate the **shape** inside the *ExFeature_SR61_Pavement1 boundary*.

d. **Reset** when finished.



HINT Multiple internal clipping elements can be added one time.

e. Change the *Clipping Method* to **Internal**.

f. **Data point** to create the clipped Terrain.

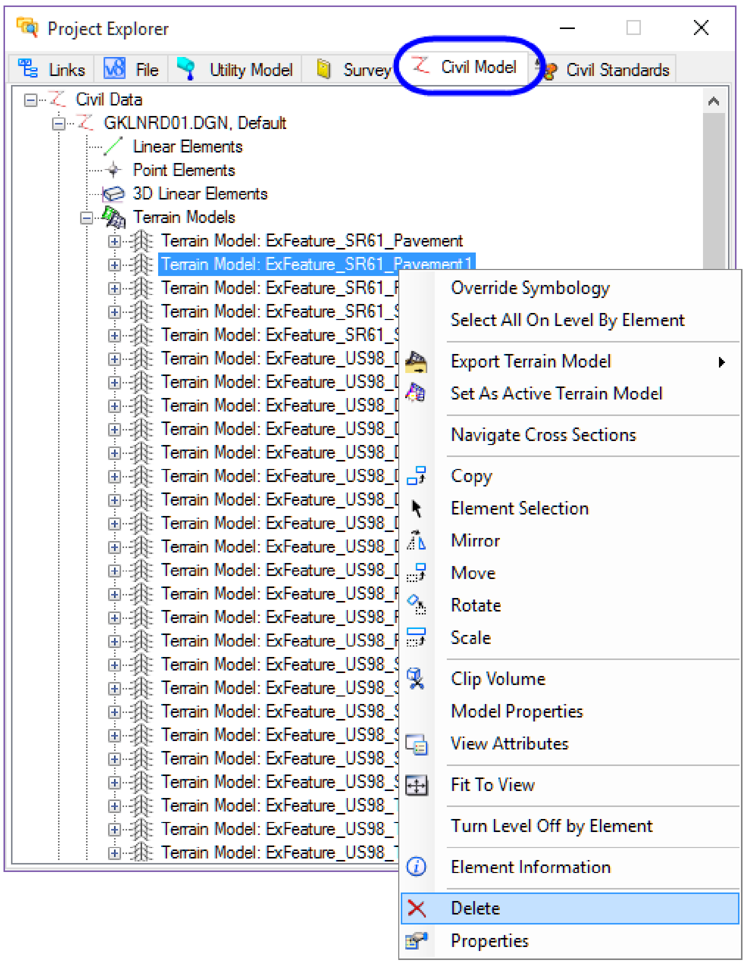
4. To delete the first **ExFeature_SR61_Pavement1** *Terrain.*

   a. Select **F11** to launch Project Explorer.

   b. Select the **Civil Model** tab.

   c. Navigate to the *Civil Data > GKLNRD01.DGN, Default > Terrain Models* folder.

   d. Right-click on the **Terrain Model: ExFeature_SR61_Pavement1** and select **Delete**.



Exercise 1.5 Create Existing Traffic Separator Terrains

So far the Existing Pavement Terrain area has been created for ExFeature_US98_Pavement, now the Existing Traffic Separator Terrain can be created.

1. On the reference dialog, turn off the Display for the Default 3D model. (This will make it easier to select the traffic separator shape.)

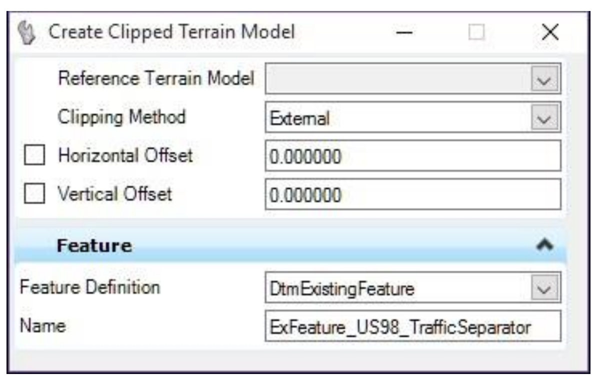
2. Use the *Existing Features*, **Clip Terrain** tool to create a terrain for Existing Traffic Separator island shape.

3. On the Create Clipped Terrain Models dialog, select the *Reference Terrain Model* **GDTMRD01.**

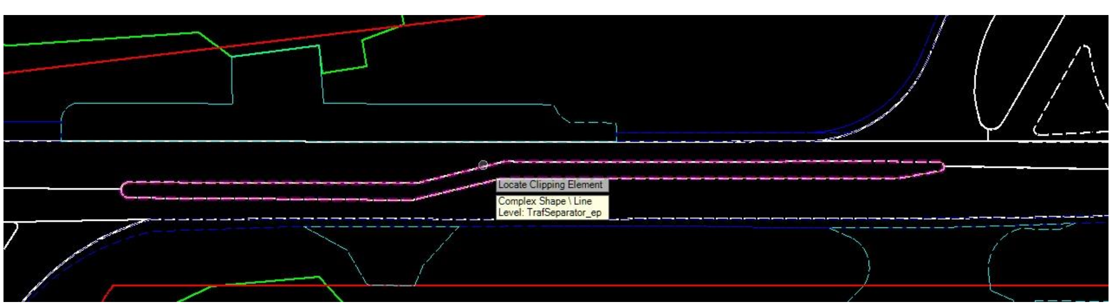
4. Set the *Clipping Method* to **External.**

5. Set the *Feature Definition* to **DtmExistingFeature**.

6. Enter **ExFeature_US98_TrafficSeparator** for the *Name*.



7. Select the **Traffic Separator Island** *Shape*.



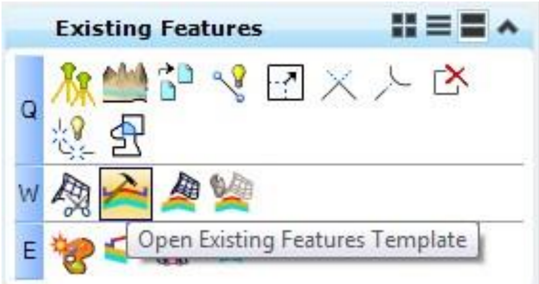
Note The curb islands will be created in exercises to follow using linear templates.

8. Turn back on the display for the Default 3D model to see the terrain triangles.

Exercise 1.6 Apply Surface Templates

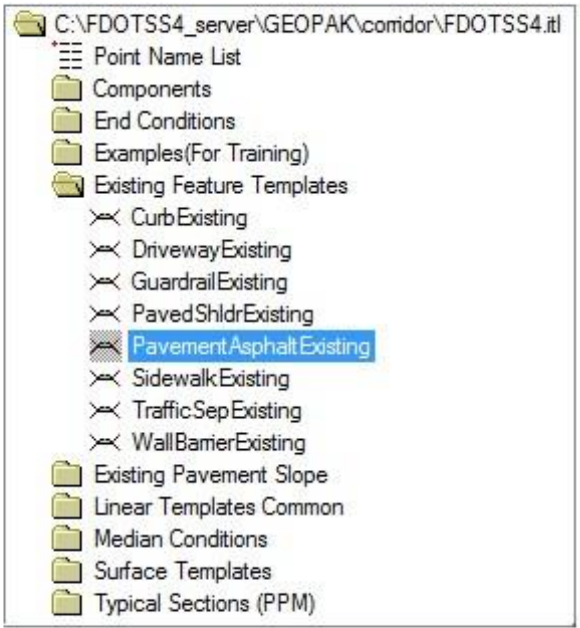
In this exercise the Surface Template will be applied to each of the existing terrains created from the previous exercises.

1. Use the *Existing Features*, **Open Existing Features Template** to view Surface Templates to apply to each Clipped Terrain.

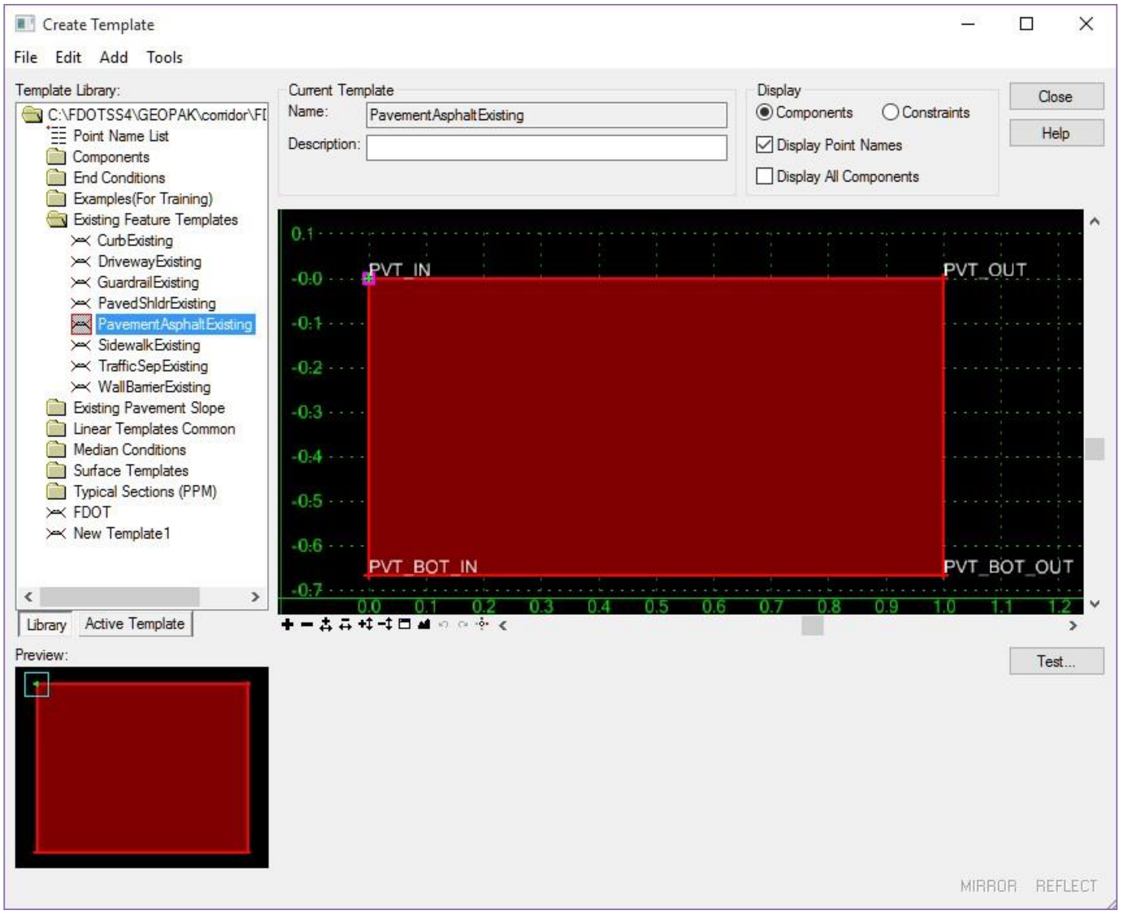


   a. The Create Template dialog displays the *FDOTSS4.itl* file.

   b. Navigate the left folders to the **Existing Feature Templates** *folder*.

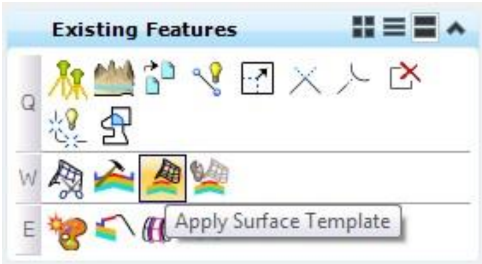


c. Double click on **PavementAsphaltExisting**. (This is an example of the template to be used for the existing pavement.)

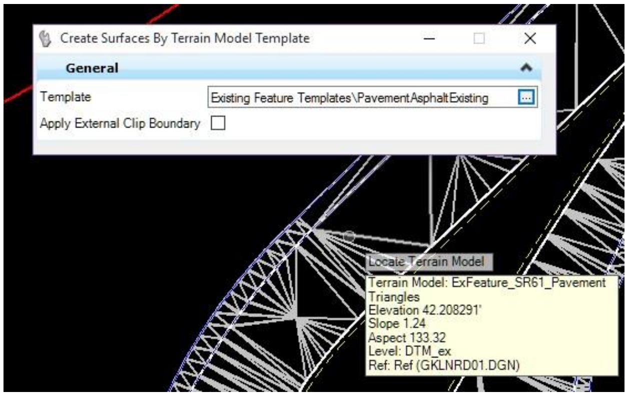


d. Click **Close** to exit the dialog.

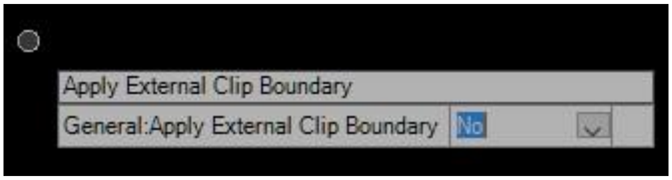
2. Use the *Existing Features*, **Apply Surface Template** to apply Surface Templates to each Clipped Terrain.



a. Following the prompts on the end of the cursor, locate the *Terrain Model* and select the **ExFeature_SR61_Pavement** *Terrain*.

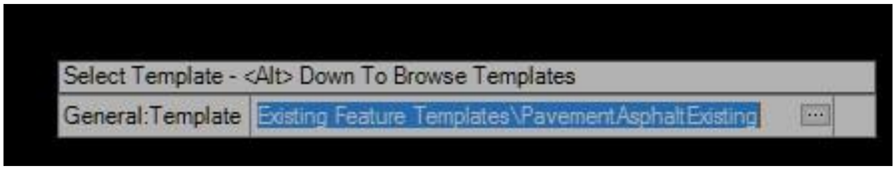


b. Set the *Apply External Clip Boundary* to **No**. (The arrow keys on the keyboard can be used to toggle through the options.)



c. **Data point** to accept.

d. Set the General *Template* to **PavementAsphaltExisting**.



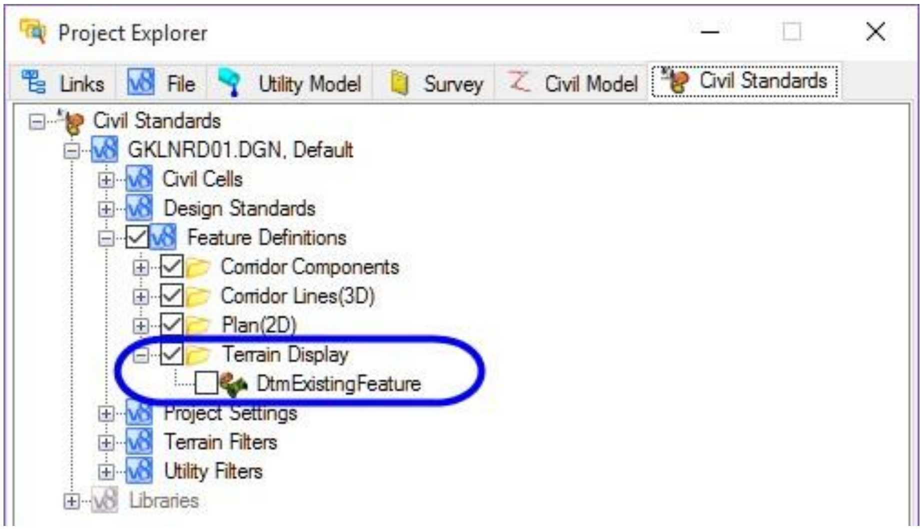
HINT The Template library can be opened by Selecting **Alt+↓** on the keyboard.

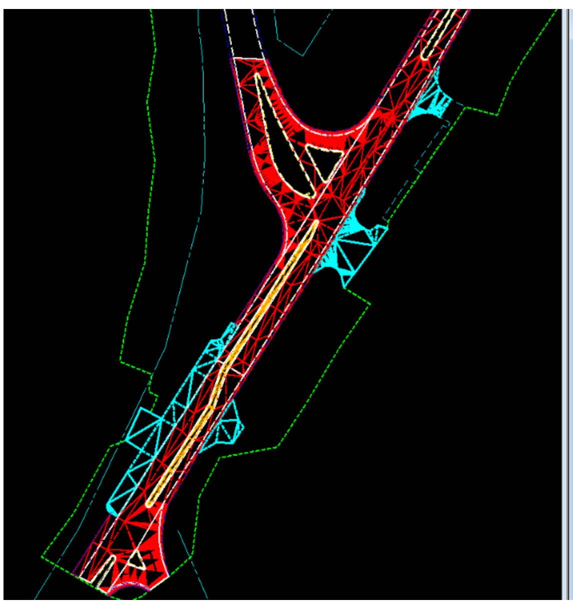
e. Data point to accept that template. A surface will be applied to that terrain with the correct feature.

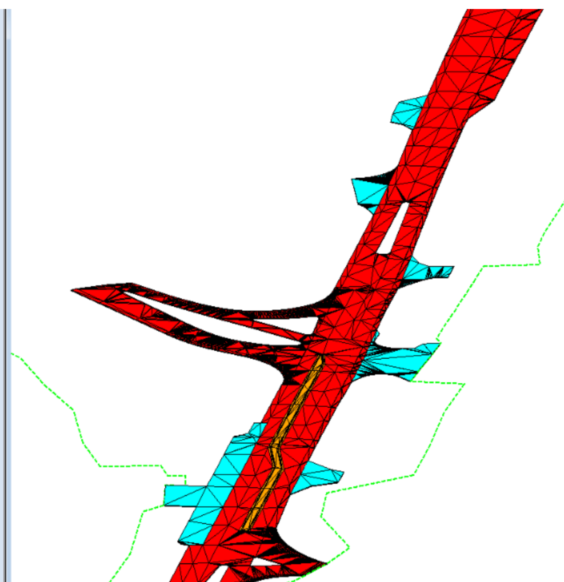
3. Repeat this procedure for each of the *Existing Feature Terrains* shown in the table below.

Existing Feature Terrain Name	Existing Feature Template
ExFeature_SR61_Pavement2	PavementAsphaltExisting
ExFeature_SR61_Shoulder(s)	PavedShldrExisting
ExFeature_US98_Pavement(s)	PavementAsphaltExisting
ExFeature_US98_Driveway(s)	DrivewayExisting
ExFeature_US98_Shoulder(s)	PavedShldrExisting
ExFeature_US98_TrafficSeparator	TrafficSepExisting
ExFeature_US98_Turnout(s)	PavedAsphaltExisting

4. To view those *Existing Features* created in the 3D Model without the *Existing Feature Terrain* triangles, click **F11** to open *Project Explorer*, then navigate to **Civil Standards > GKLNRD01.dgn, Default > Feature Definitions > Terrain Display** and toggle **OFF** either the **Terrain Display** or **DtmExistingFeature** option.







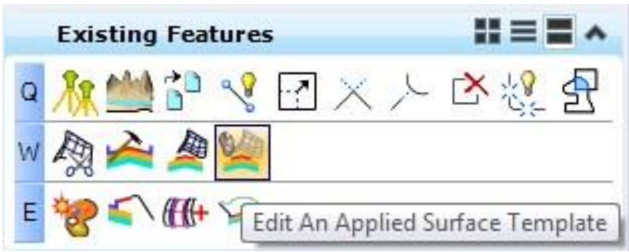
Exercise 1.7 Edit Existing Feature Depth

The surface templates that have been applied are set with a default depth. In many cases, these depths may be acceptable. If not, they will need to be edited.

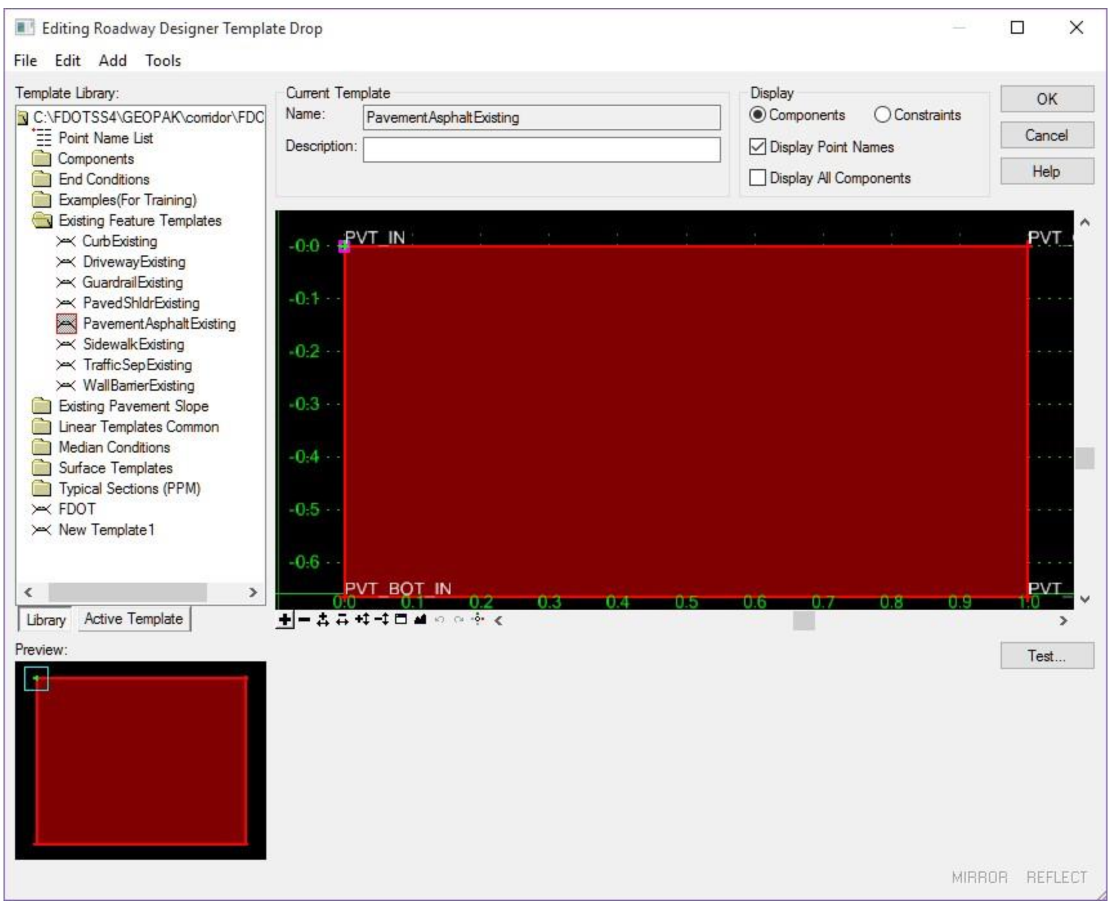
1. Click F2 to open the views showing both the 2D and 3D models.

2. Select the 3D view to make it active. (A dialog will pop up asking to accept settings. This is due to the Survey attached to the file. Click on the X to close the dialog.)

3. Click on the **Existing Features > Edit An Applied Surface Template** icon.

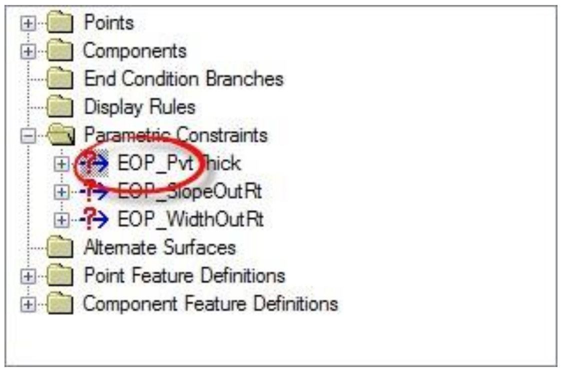


4. In the 3D view, select one of the surface templates. The Editing Roadway Design Template Drop dialog (the interface is identical to the Template Library dialog) opens with the current template shown with the Library tab active.

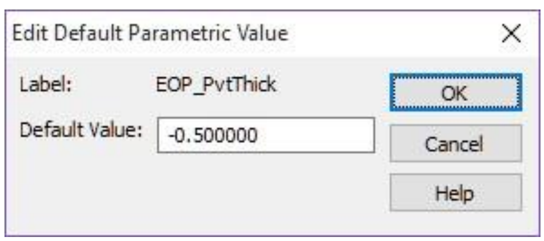


5. Click on the **Active Template** tab.

6. On the left hand menu, navigate to the *Parametric Constraints* folder and double click on the **EOP_PvtThick** item.

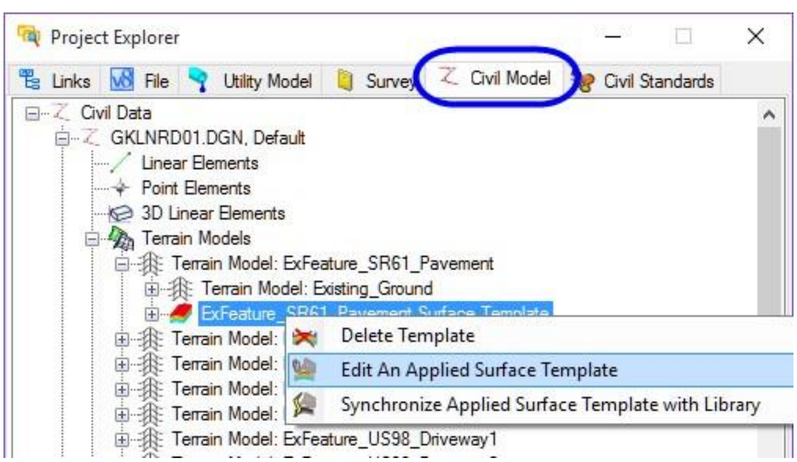


7. Set the *Default Value* to **-.5** and click **OK**.



8. Click **OK** to close the Editing Roadway Designer Template Drop dialog. You do not have to select **File** > **Save** to save your edits.

Note Another Option is to open Project Explorer and navigate to the Terrain's surface template and right click to choose Edit and Applied Surface Template.

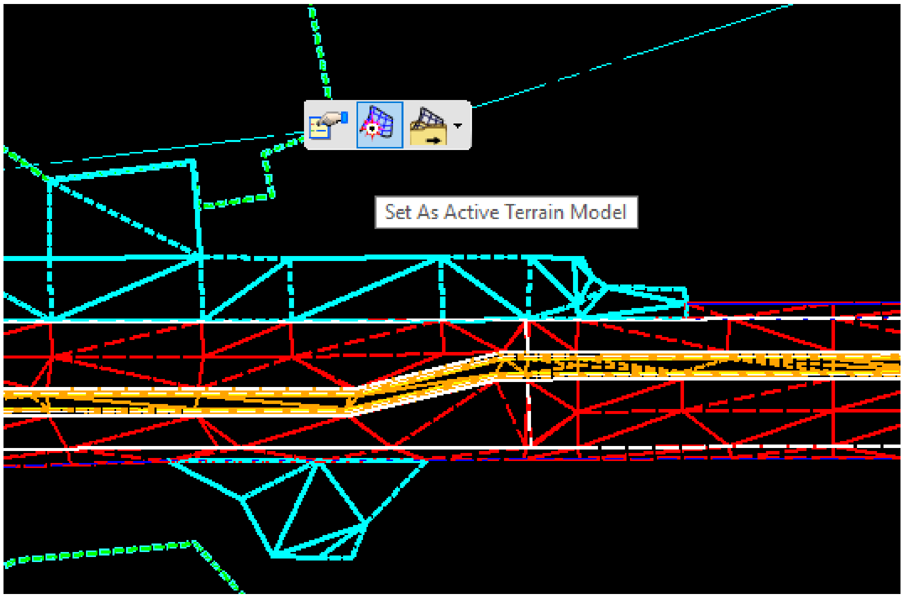


Exercise 1.8 Add Curbs to the Existing Features

In this exercise a model of the existing curbs will be developed. In order to use the Civil Tools to create the Existing Curb Model, MicroStation elements will need to be changed to Civil Features. Linear templates will then be applied to the feature elements to generate the depth needed for curbs.

1. Select **Ctrl + F1** to return to a *One View* only of the project.

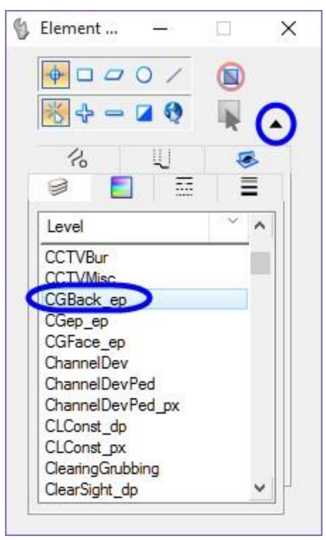
2. Select the *Existing Terrain Boundary*, and when the Context Menu displays, click on the **Set As Active Terrain Model**. (This will allow for profiles to be displayed on elements.)



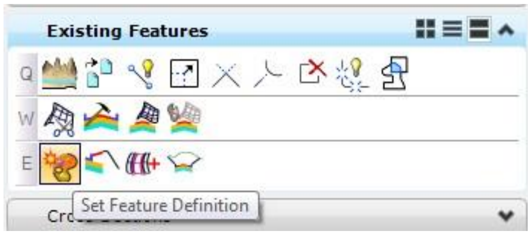
3. In the Level Display dialog, right click on the *Ref, **GKLNRD01.DGN,** default-3D* file and **Uncheck** the display.

4. In the Level Display dialog, click on ***GKLNRD01.DGN,*** *default* file, set the *Active Level* to **CG_ep**, and turn **OFF** all other *Levels* except for **CGBack_ep** and **PavtAsphalt_ep**.

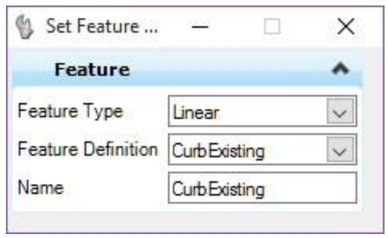
5. Create a *Selection* of the median shapes made from the *Back of Curb* (level CGBack_ep) elements**.**



a. Use the *Existing Features*, **Set Feature Definition** to set the *Back of Curb* shapes to the *Civil Roadway Feature*, **CurbExisting**.



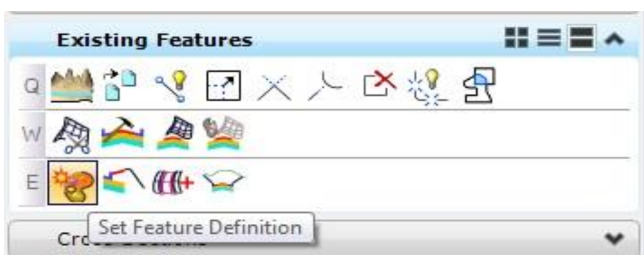
b. On the Set Feature Definition dialog, set the *Feature Type* to **Linear** and navigate the *Feature Definition* to **Plans (2D) > CurbGutter > CurbExisting**. The *Name* will automatically populate.



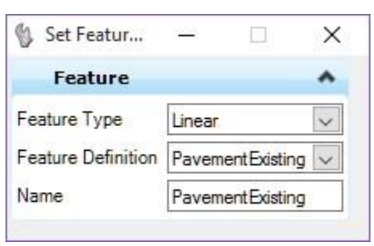
c. **Data Point** to apply *Feature* to the selected elements.

6. Right click and hold to access the context menu and select **Select All On Level By Element**. Click on one of the edge of pavement shapes to create a *Selection* of the median shapes made from the *Existing Pavement (PavtAsphalt_ep)* elements**.**

   a. Use the *Existing Features*, **Set Feature Definition** to set the *Existing Pavement (PavtAsphalt_ep)* shapes to the *Civil Roadway Feature*, **PavementExisting**.



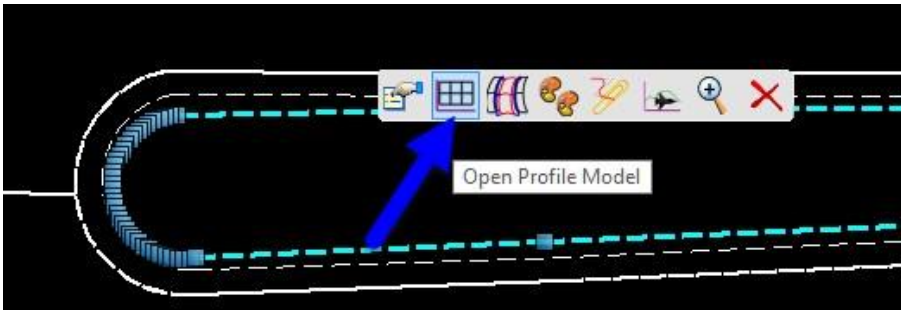
   b. On the Set Feature Definition dialog, navigate to the *Feature Definition* to **Plans (2D)** > **PavementExisting**. The *Name* will automatically populate.



   c. **Data point** to apply *Feature* to the selected elements. ➢ ***Open Profile Model for Back of Curb.***

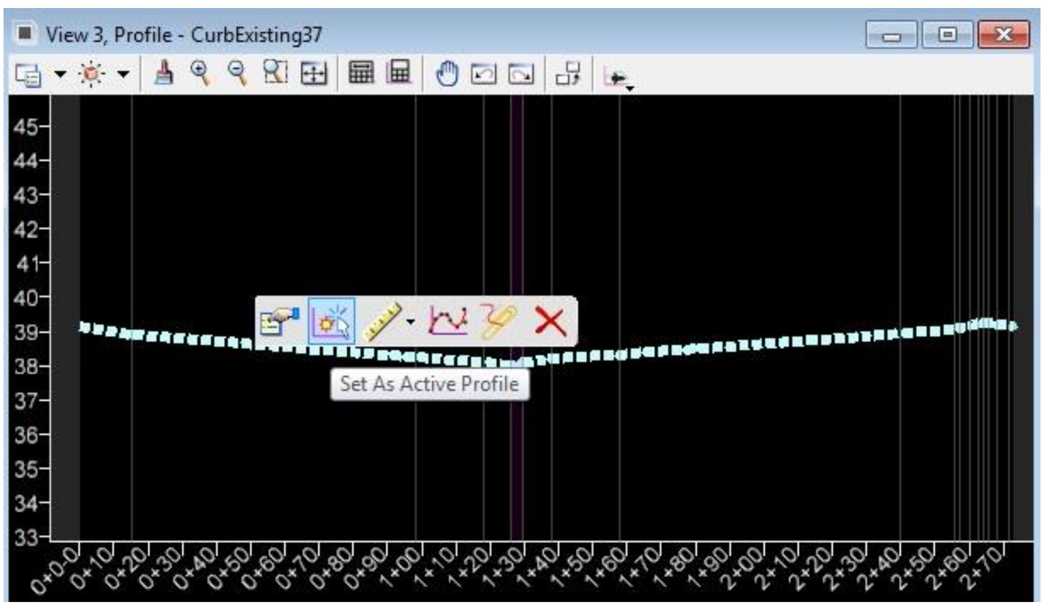
7. Turn **ON** the *CGFace_ep* level.

8. Select the **Back of Curb** shape and hover over the highlighted line until the Popup Menu displays.



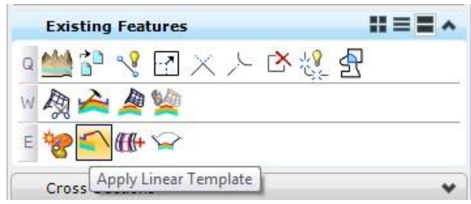
9. Select the **Open Profile Model** icon and select **View 3** at the bottom of the MicroStation window to open the *Profile* view, then data poin inside **View 3**.

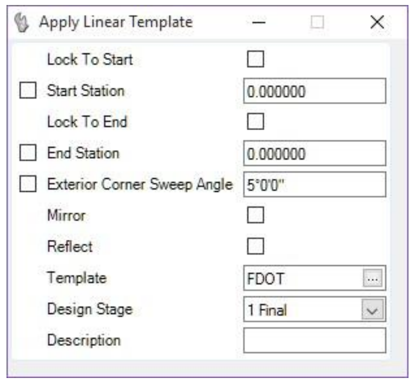
10. In the *Profile* view, select the **Existing Ground Profile** to display the Popup Menu and then select the **Set Active Profile** icon. Close the *Profile* view window.



➢ *Appling an Existing Curb Template*

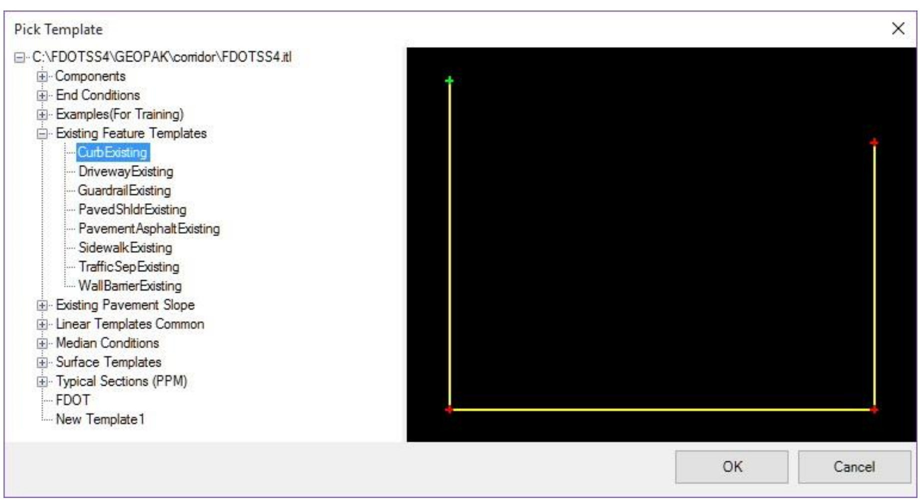
1. Use the *Existing Features*, **Apply Linear Templates** to create a **3D Existing Curb** *Feature*.





a. At the prompt locate element and select the **CurbExisting** *Feature* (i.e. back of curb line).

b. Hold **Alt** *down arrow* key to pick the **CurbExisting** *Template.*



c. Click Ok and then data point to accept.

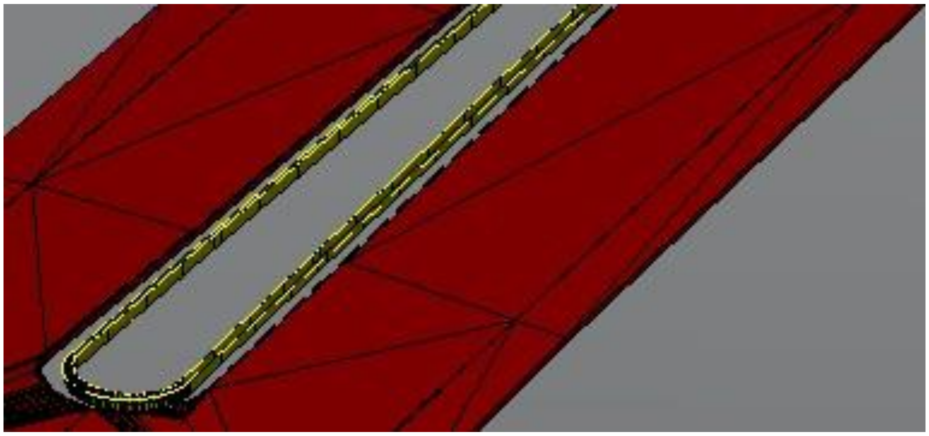
d. Press the **Alt** key to lock the *Start* and then **data point**. Press the **Alt** key to lock the *End*, and then **data point** again.

e. Select the **side** to place the curb and **data point** outward from the *back of curb*.

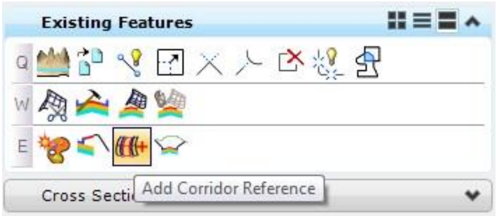
f. Enter (<OR> accept) **1 degree** for the *Exterior Corner Sweep Angle*.

g. Enter **Existing Curb** for the *Description.* Data point to accept.

2. Select the **F2** *Function Key* to open the *3D model View*. The *3D Curb* bottom shape will appear in the model.



3. Use *Existing Feature*, **Add Corridor Reference** tool to add the *Template Target Feature*, **PavementExisting**, to the *CurbExisting Template*.

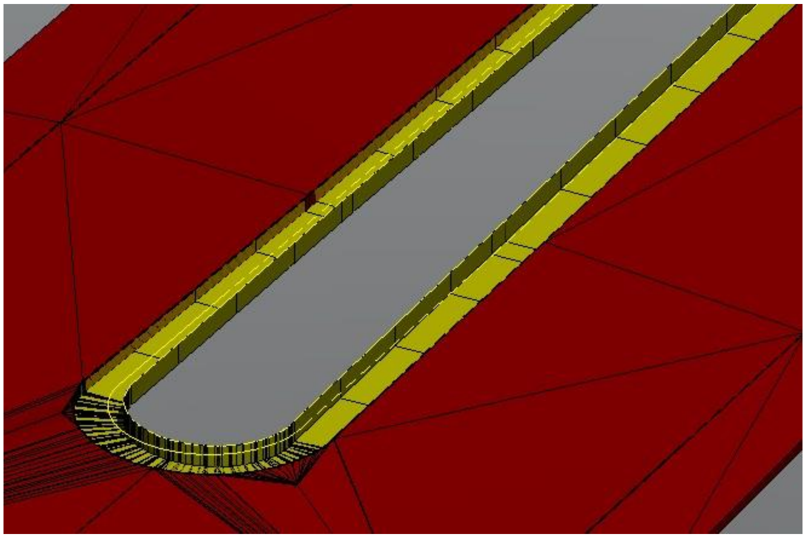


   a. At the prompt, select the **CurbExisting** *corridor boundary element handle* on level *CorrHndlStg3_dp*.

   b. Select the **PavementExisting** line in front of the *CurbExisting Feature*.

   c. Click **F6** to end the command.

Note The Existing curb in the 3D model should stretch from the back to the edge of pavement as shown in the image below.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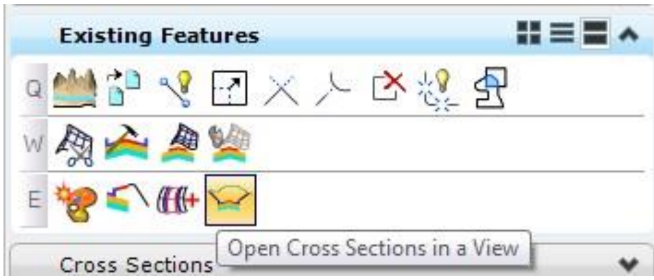
Exercise 1.9 View Existing Cross Sections

Once the Existing Feature Terrains have been created a cross section view can be created to verify the model data. In this exercise a base line in the TOPO reference file will be used to create a cross section view.

1. Use **Reference Display** to display the attached *SURVRD01.DGN* file. This file has the *Survey Baseline* elements displayed to use for cross sections.

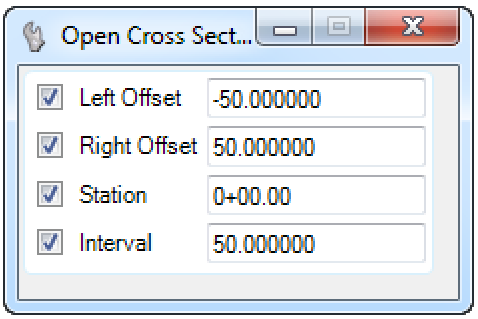
2. Use *Existing Features*, **Open Cross Sections in a View** tool.



3. At the prompt, select the *Alignment* shown below.

4. Enter information in the dialog as shown:

Note Be sure to **check** the *Station* box or the Program may crash!



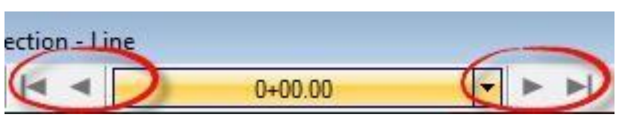
5. **Data point** in the view to accept EACH of the settings from above.

6. Open **View 4** and **data point** in the view to display the **Cross Section**.

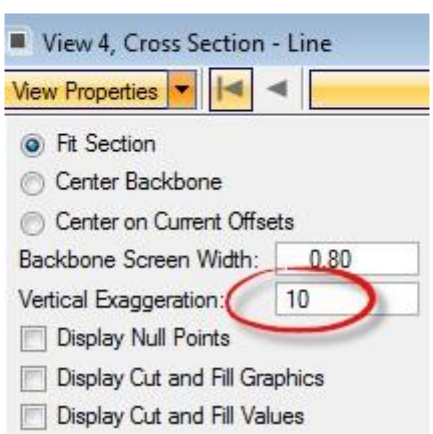
7. For the Cross Section View 4*:*

   a. Notice many of the MicroStation **Zoom, Pan, etc**. *commands* will operate as normal.

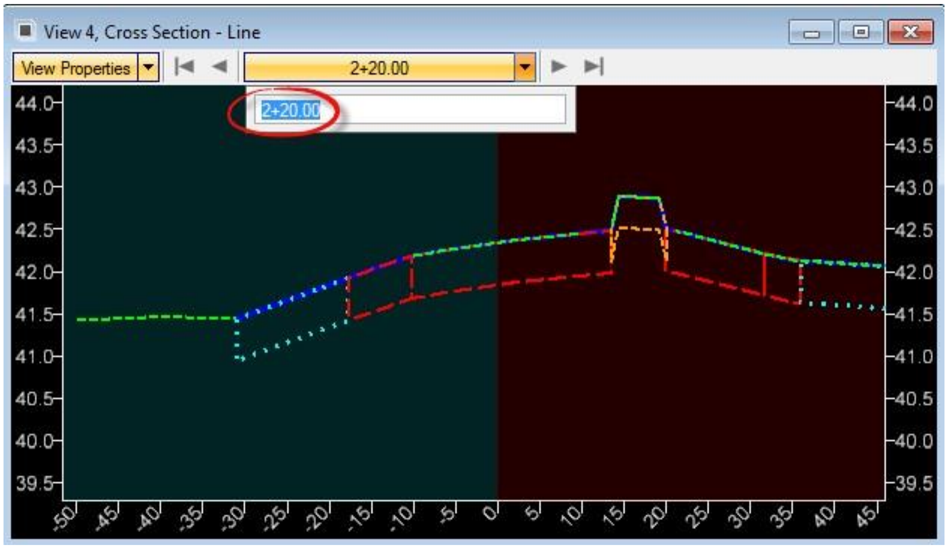
   b. Use the *Cross Section* **View Navigation** tools to examine the Existing Features.



   c. Select **View Properties** and set the *Vertical Exaggeration* to **10** and then select the **View** to see the changes.

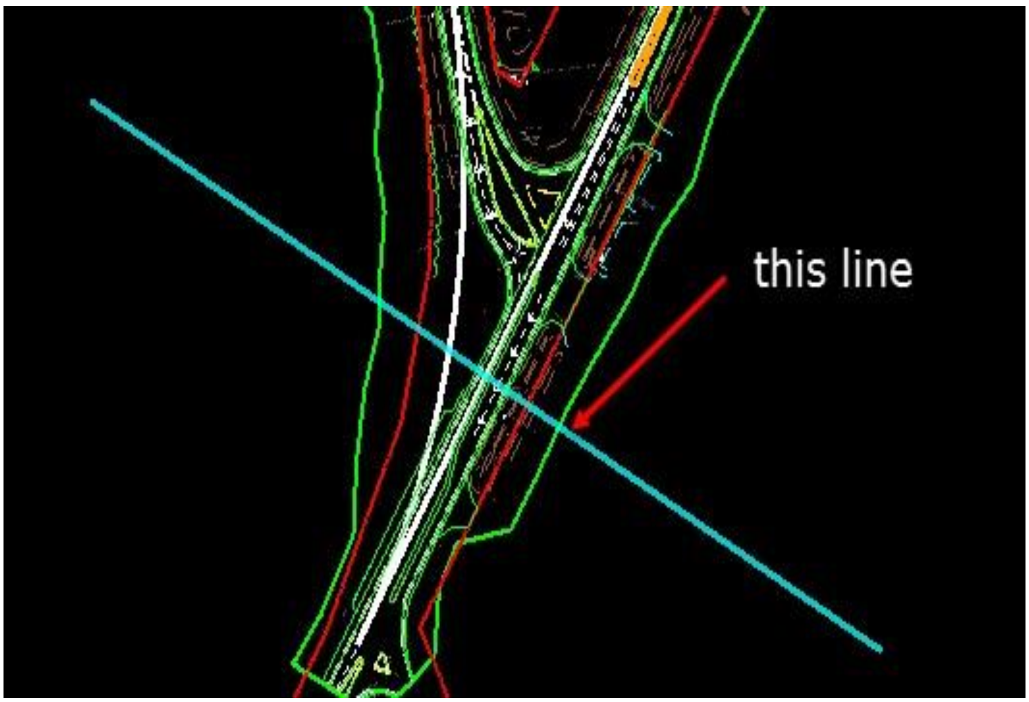


d. Select the **Station** pull down menu and change to *Station* **2+20, (**i.e. key in 220 and Enter**)**.



8. Navigate the cross section stations and notice the blue line in the plan view designating the current cross section view station.

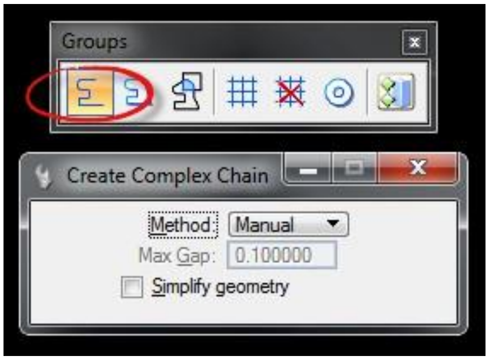
Note This line will also appear in the Profile Model if open.



Exercise 1.10 Add Existing R/W Lines for Cross Section Viewing

1. Select **CTRL + F1** to return to a single plan view of the *GKLNRD01.DGN* file.

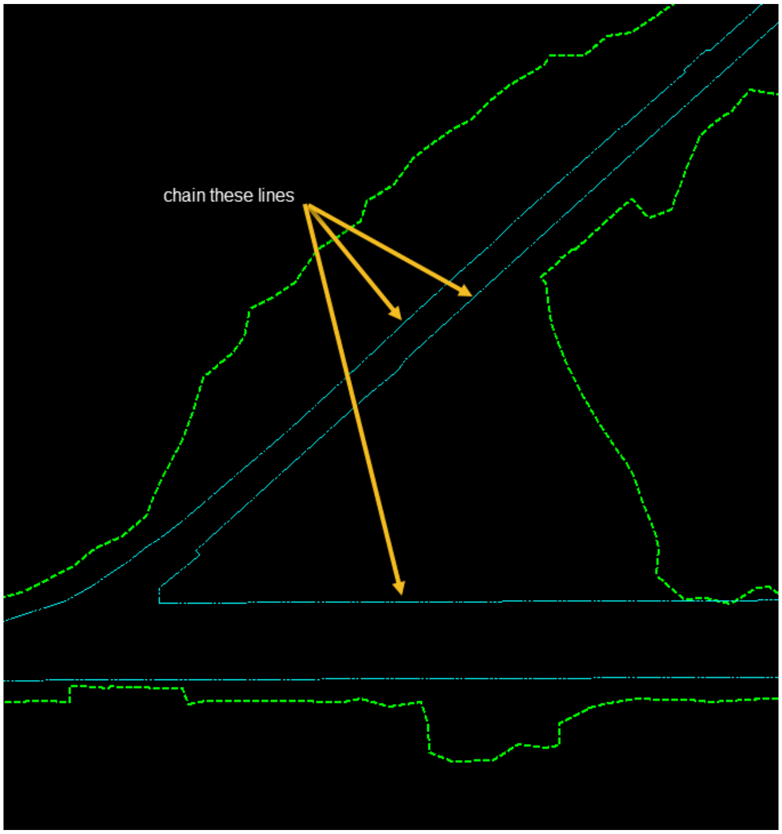
2. From MicroStation, select the menu **Tools > Groups Menu > Create Complex Chain**.



3. Set the *Active Level* to **RWLine_ep.**

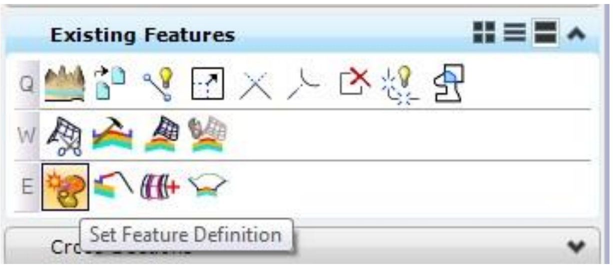
HINT Optional: Turn off all other levels.

4. Set the Create Complex Chain *Method* to **Automatic** and chain together the **RWLines** in the active file within the project Existing Terrain Limits.

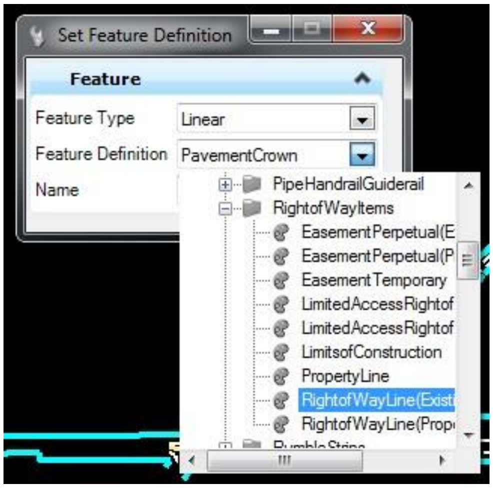


➢ ***Create a Selection Set of RWLine_ep.***

1. Use *Existing Feature* > **Set Feature** tool to create *Civil Features* of the **RW lines** in the selection set.



   a. In the *Feature Definition*, navigate and select the **RightofWayItems > RightofWayLine(Existing)** *Feature*.

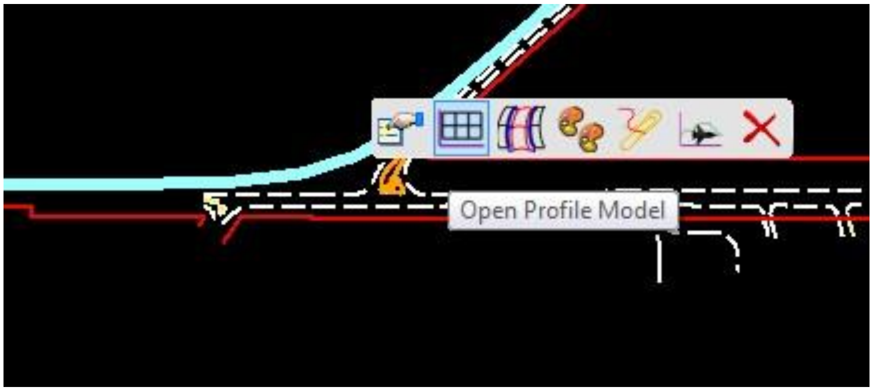


   b. The *Name* will be set to **Exist. R/W**.

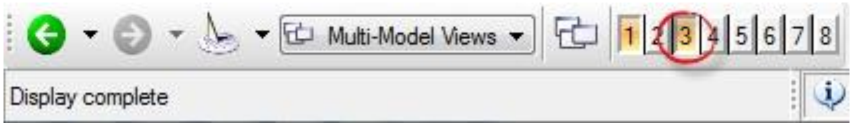
   c. **Data point** in the view to *Apply Feature Definitions* to elements.

   d. Hover over an element to verify the new *Feature Definition*.

2. Select the line to display the Context Menu and select **Open Profile Model**.

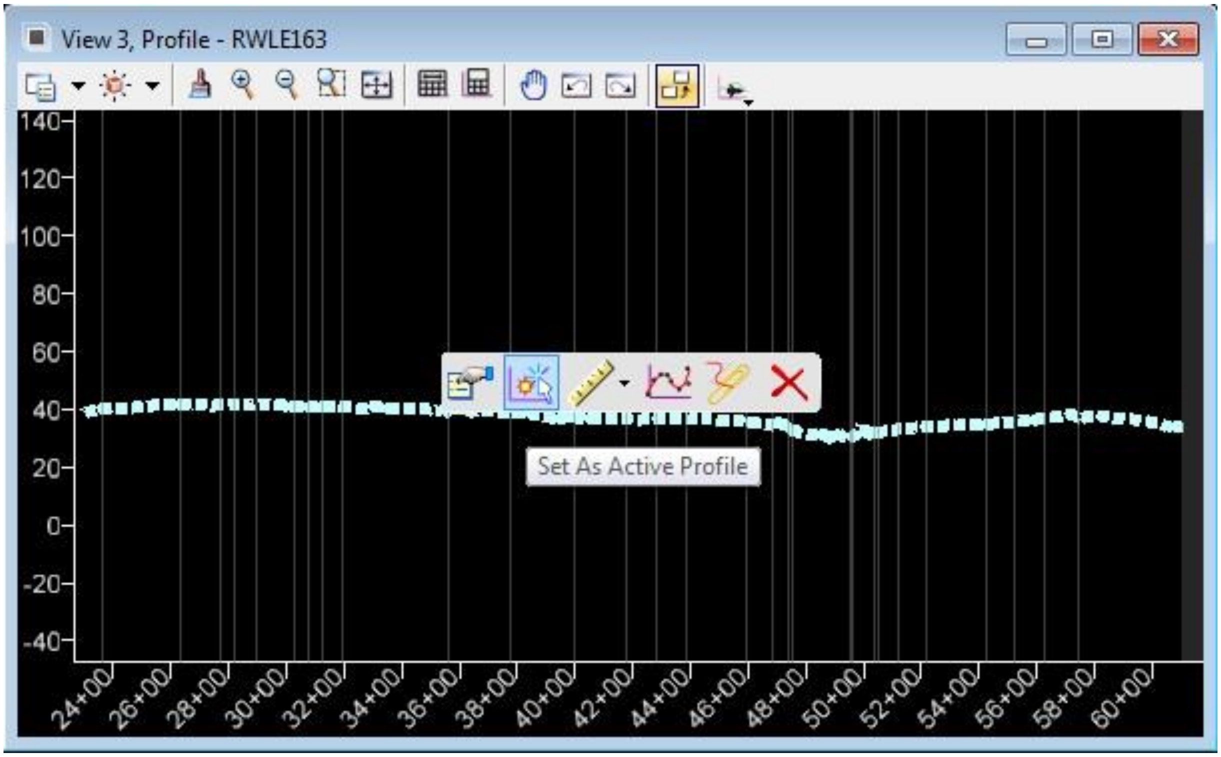


3. At the cursor prompt, select **View 3** to open and draw the profile.



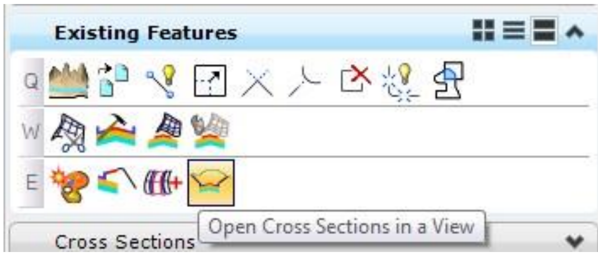
4. Select the line and select **Set as Active Profile**.

HINT To create an offset profile line, 2 feet below the surface, use the Vertical Geometry, Profile Offset Transition Command in the Civil Tools Task Menu.

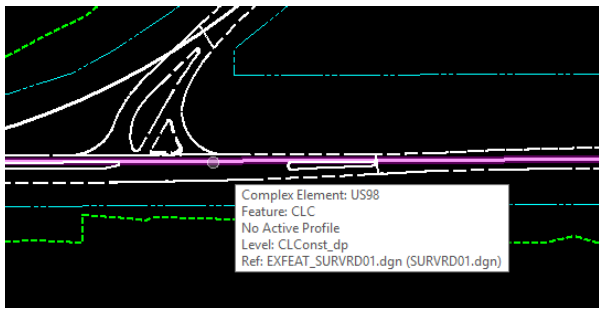


5. Repeat these steps for each of the **R/W lines** in the file.

    a. Use *Existing Features*, **Open Cross Sections in a View** tool.



    b. Select the **Baseline Survey** line in the SURVRD file as the *Alignment.*



    c. Enter **-100** feet for the *Left Offset*, data point in the view

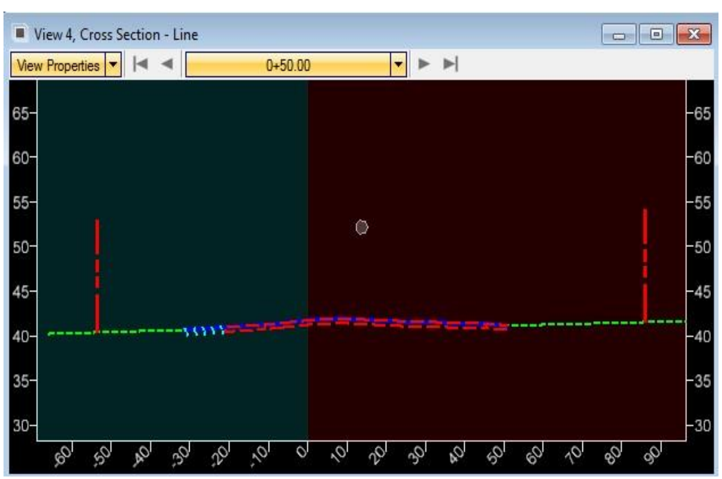
    d. Enter **100** feet for the *Right Offset*, data point in the view

    e. Enter the *Start Station* value **0+00**, data point in the view

    f. Enter or lock the *interval* to **50** feet, data point in the view

    g. Open **View 4** and data point to display the *Cross Section.*

6. The existing *R/W lines* appear on the cross sections.

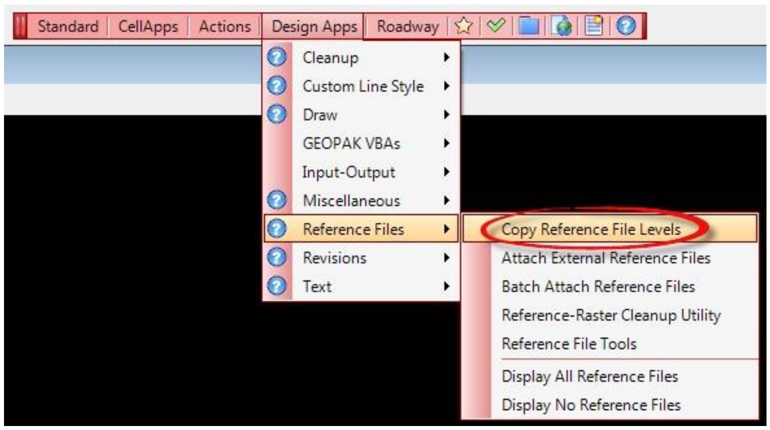


Exercise 1.11 Add Existing Utility Lines for Cross Section Viewing

1. Select **Ctrl + F1** to return to a single plan view of the *GKLNRD01.DGN* file.

2. Turn On the EXFEAT_SURVRD01.dgn, SURVRD01.dgn reference attachment.

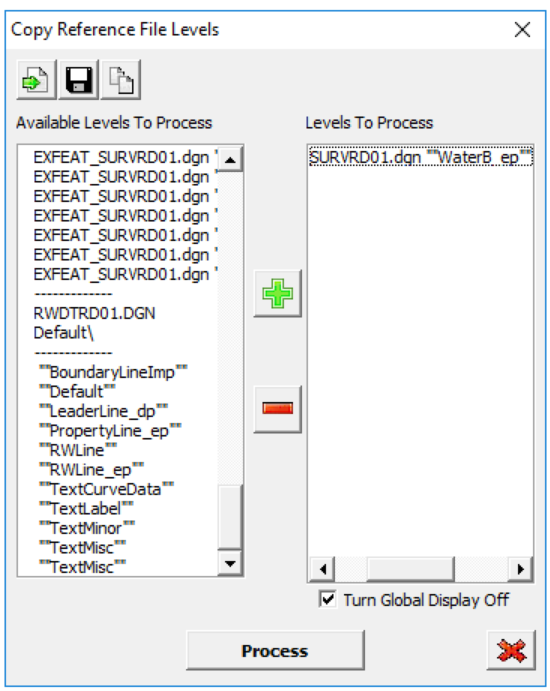
3. On the FDOTSS4 Menu, select the **Design Apps** > **Reference Files**> **Copy Reference File Levels**.



   a. On the Copy Reference File Levels dialog, from the *Available Levels To Process* column, select the **WaterB_ep** item.

   b. Click the “**plus**” sign to add it to the levels to process.

   c. Click the **Process** button, close the dialog.



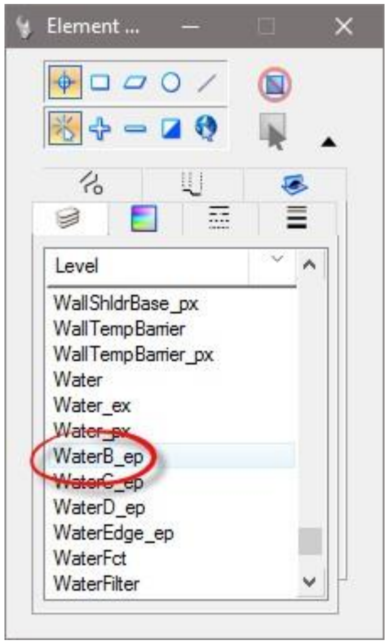
4. Turn **OFF** the *Reference file* display for the utilities.

5. Delete any **WaterB_ep** elements in the active file outside of the *terrain boundary limits*. They are not necessary for the project limits.

6. Set the *Active Level* to **WaterB_ep.**

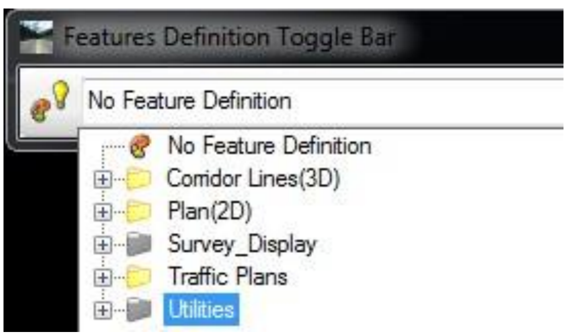
7. Use **Create Complex Chain**, set *Method* to **Manual** and chain together the **WaterB_ep** lines in the active file within the project Existing Terrain Limits.

8. Create a *Selection Set* of **Water_ep**.

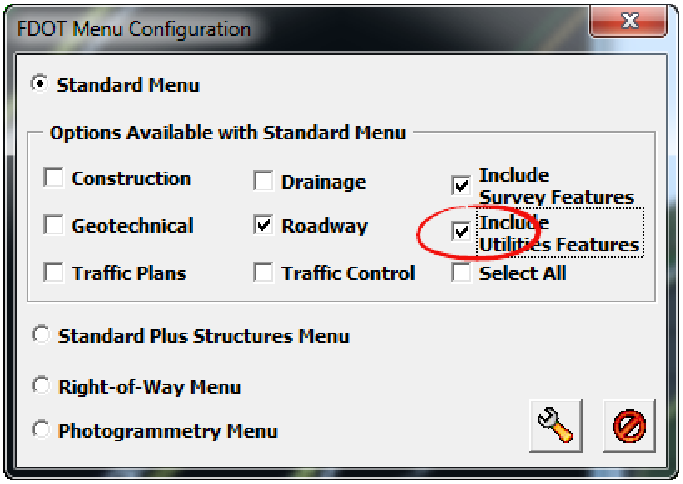


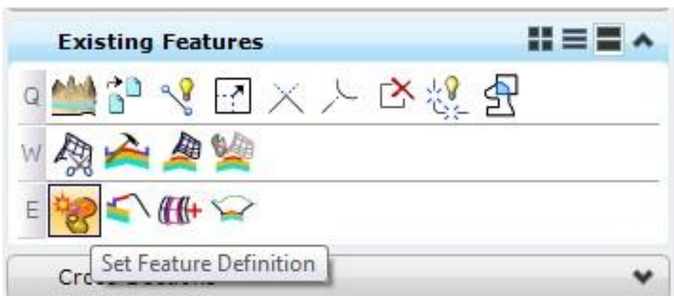
9. Use **Existing Feature, Set Feature** tool to create *Civil Features* of the **Water Lines** in the *Selection Set*.

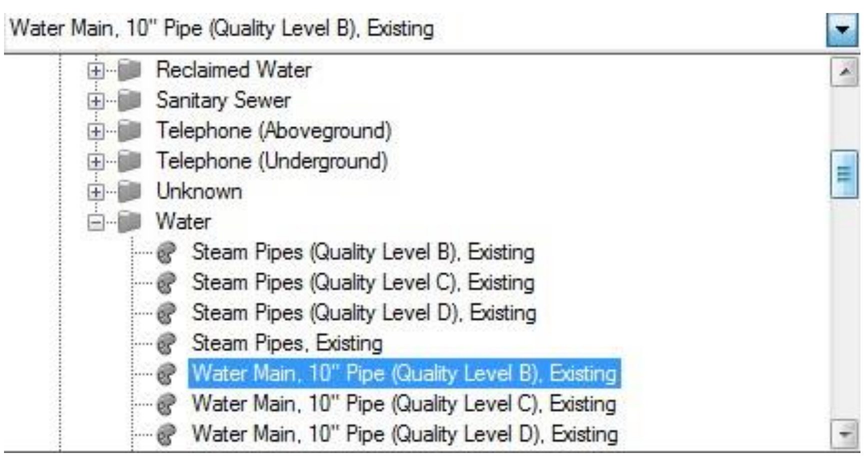
Note Existing and Proposed Utility features are located the Utilities folder in the Feature List.



Note This folder will be shown when the Include Utilities Features box is checked on the FDOT Menu Configuration dialog.

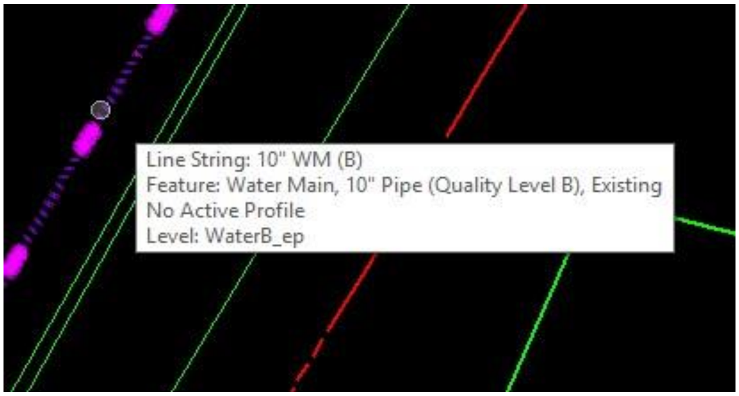




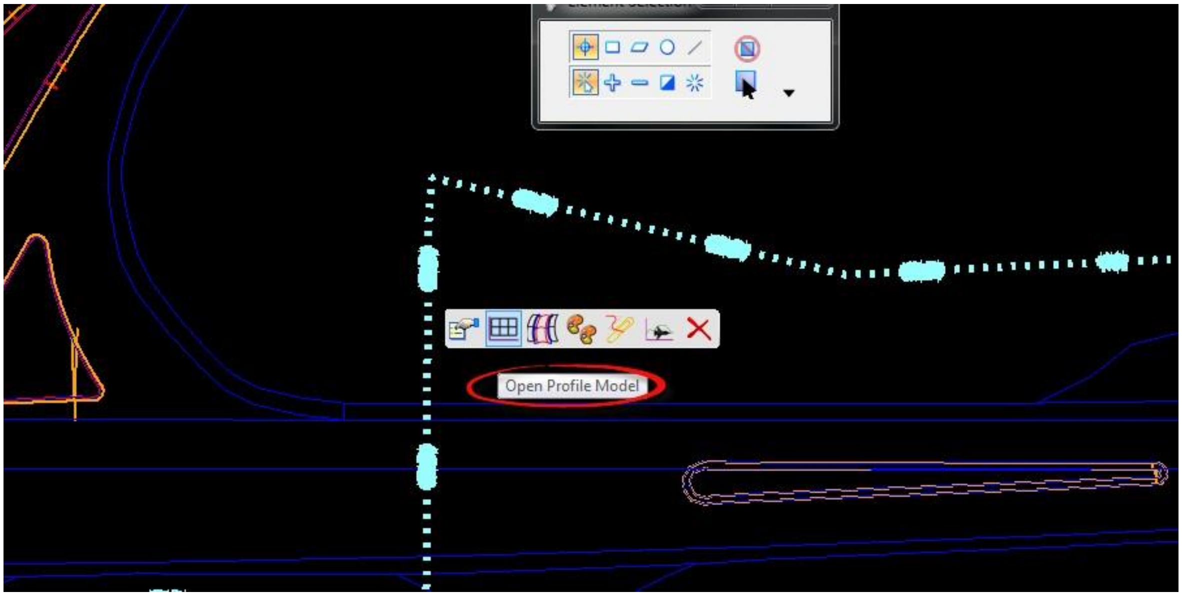


10. **Data point** in the view to *Apply Feature Definitions* to elements.

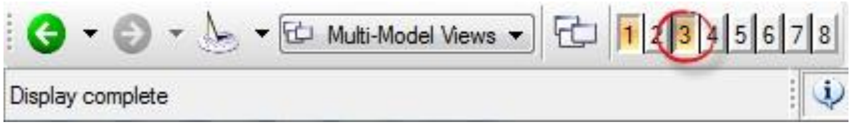
11. Use the **Selector** tool to identify the new *Feature* and hover over an element to verify the new *Feature Definition.*

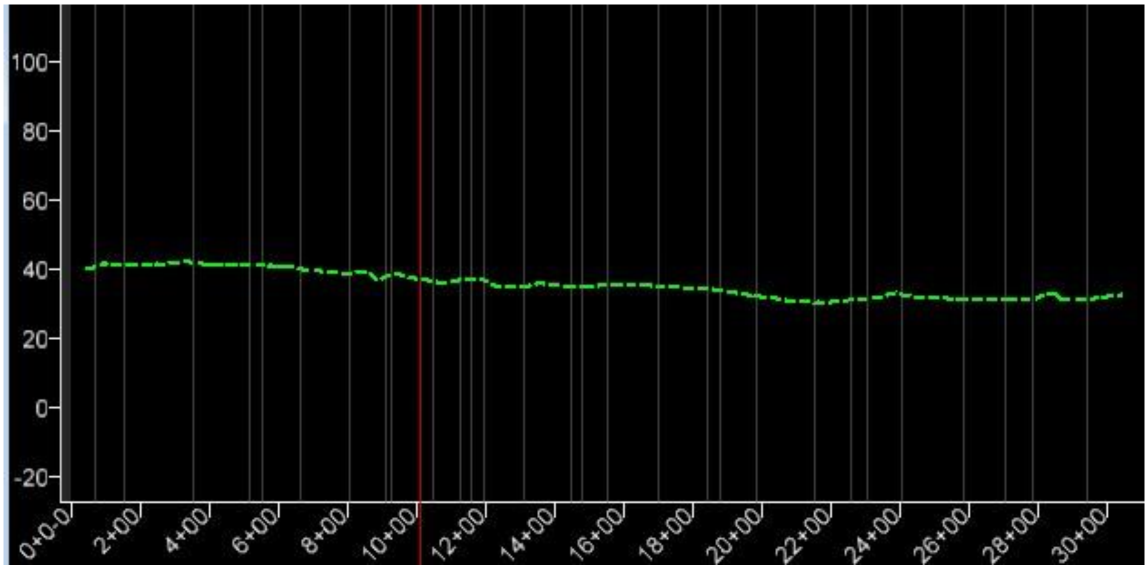


12. Select the line to display the Context Menu and select **Open Profile Model**.

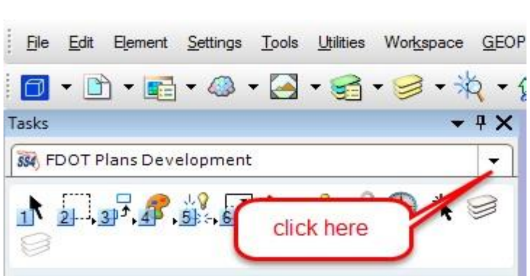


13. At the cursor prompt, select **View 3** to open and draw the profile.

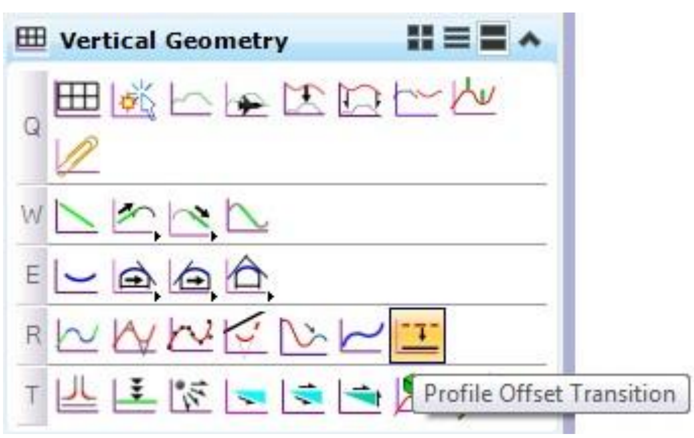




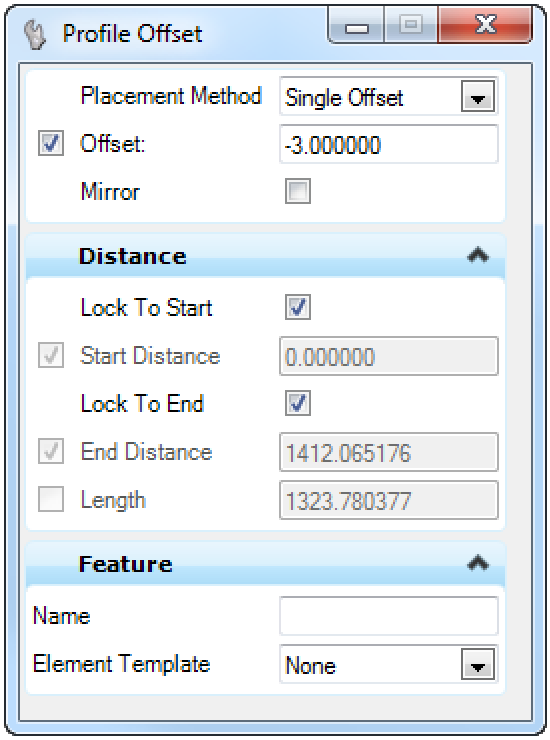
14. Set the sidebar tasks to **Civil Tools**.



15. To *offset* the Utility Profile line **3 feet below** the existing Terrain surface, on the Civil Tools Task Menu, select the **Vertical Geometry** > **Profile Offset Transition** tool.



a. Set the *Placement Method* to **Single Offset**.



b. Following the prompt on the cursor select the water profile line in **View 3**.

c. Enter **-3.0** for the *Offset* value.

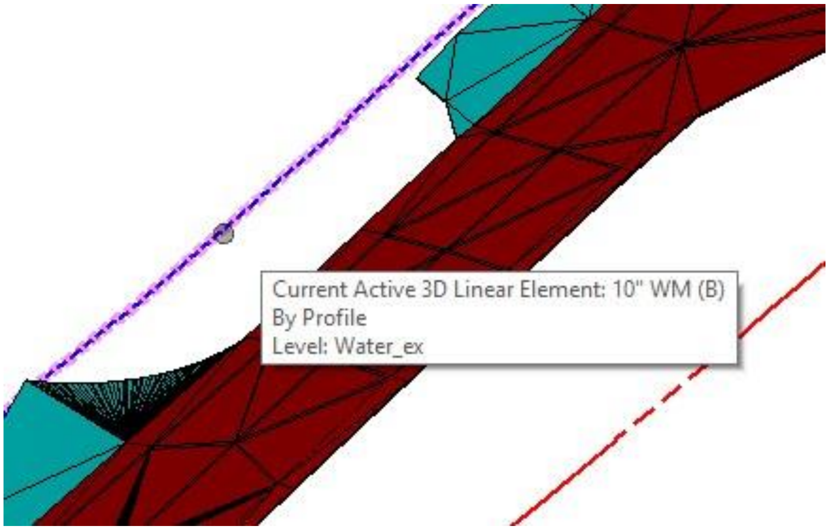
d. Press the key and press **Alt** to lock the profile to the start point. Data point to accept the offset and start point.

e. Press **Alt** to lock the profile to the end point and data point to accept the end point. f. Set *Mirror* to **No**.

g. Data point to place the profile line the view.

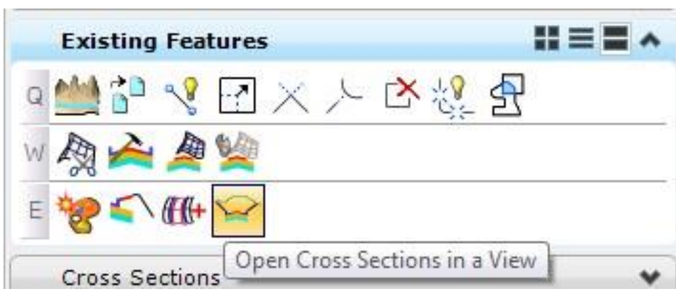
16. Select the water profile line in **View 3** and hover over it to display the Context Menu. Select **Set As Active Profile**.

17. Press the **F2** key to open the 3D view and view the 3D water line.

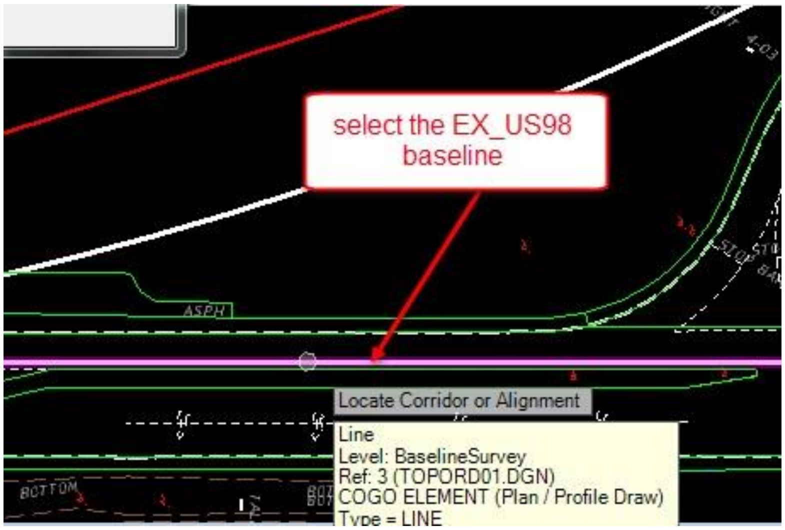


18. Repeat these steps for each of the *Utility Lines* in the file.

19. Use *Existing Features*, **Open Cross Sections in a View** tool.



a. Select the **Baseline Survey** line in the TOPO reference file as the *Alignment.*



b. Enter **-100** feet for the *Left Offset*, then data point in the view.

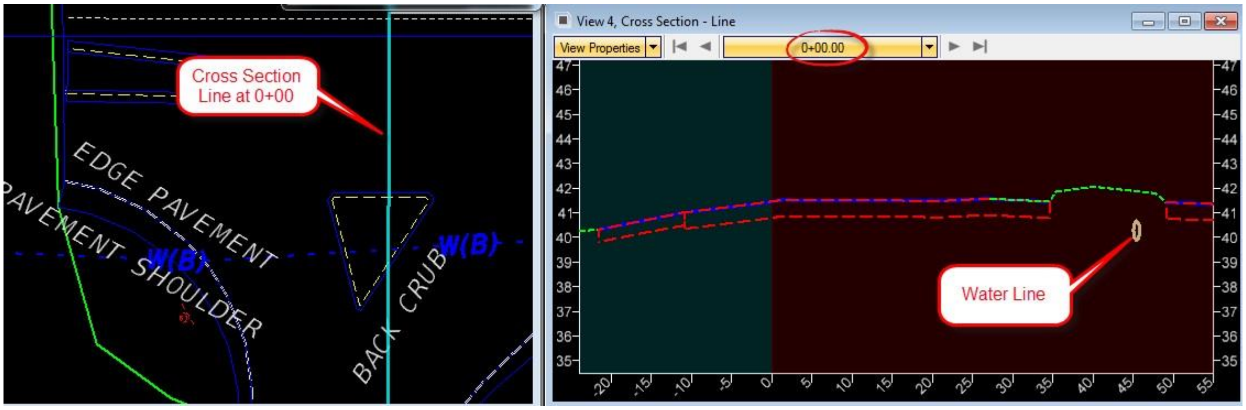
c. Enter **100** feet for the *Right Offset*, then data point in the view.

d. Enter the *Start Station* value **0+00**, then data point in the view.

e. Enter or lock the *Interva*l to **50** feet, then data point in the view.

f. Open **View 4** and **data point** to display the *Cross Section.*

20. The existing **Water Utility** displays on the cross section.



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2 CENTERLINE ALIGNMENTS

INTRODUCTION

This chapter will introduce three (3) important OpenRoads Technologies for creating geometry/line work while designing in FDOTSS4. They are:

- Feature Definitions
- Civil Geometry Design Intent
- Design Standards

FEATURE DEFINITIONS

As defined in the Bentley Civil Tools help files:

> *"Feature Definitions are used to control symbology, annotation, and various other properties that are applied to the geometric elements. The feature definitions are built by using your existing feature table from GEOPAK (DDB), InRoads (XIN), or MX (PSS). These existing feature tables are utilized by way of a link to the file, plus the addition of more settings to enhance capabilities. The feature definitions are used to:*
>
> - *Define what the geometric elements actually are. What is being modeled such as curb, centerline, edge of pavement, etcetera.*
> - *Control symbology in various views, including capability to define differing symbology in plan, profile, and 3D spaces*
> - *Define terrain modeling attributes (spot, break line, void, etcetera)*
> - *Define surface display characteristics*

An extensive *FDOTCivilFeatures.dgnlib* has been developed for the FDOTSS4 Workspace to be used for all FDOT projects. All elements placed in the design file should have a defined Feature definition. The Civil Geometry tools can be set with and Active FDOT Civil Features for element creation and assignment. They can be viewed in the Project Explorer and in the Feature Toggle Bar.

CIVIL GEOMETRY - DESIGN INTENT

As defined in the Bentley Civil Tools help file:

> *"Design intent builds associations and relationships between civil elements. Object information (how, where, and by what method it was created) is stored with the object to insure the original intent is retained and honored in the design. If an element is modified, any related elements will recreate themselves based on these stored relationships.*

Civil Geometry or rule-base elements are created intelligently as the tools are used and elements are constructed. The FDOTSS4 Workspace and design development workflow is highly dependent on using Civil Geometry for the 2D plan layout rather than traditional MicroStation place elements tools.

CIVIL GEOMETRY DESIGN STANDARDS

Also known as Design Geometrics and Criteria and as defined in the Bentley Civil Tools help files:

> *"Design standards can be used to maintain required curvature and other alignment checks when performing geometric layouts. They work at two levels:*
>
> - *Provide values for the element creation tools (for example, minimum radius and transition lengths)*
> - *Check the suitability of complex elements (for example, check for kinks in the alignment)*
>
> *Design standards are very alignment oriented. You may find limited value for using design standards for non-alignment computations.*
>
> *When a design standard is violated, feedback is provided in two ways:*
>
> - *An icon in the graphics on the element that has the problem. Hover over the icon to reveal a tool tip report of the error.*
> - *In the Civil Message Center*

An extensive FDOTDesignGeometricsCriteria.dgnlib has been developed for the FDOTSS4 Workspace to be used for all FDOT projects. Alignments created in the design file either with Civil Geometry Tools or Imported should have a set Design Geometrics Criteria. FDOT Design Geometrics Criteria can be viewed in the Project Explorer and in the Design Standard Toggle Bar.

EXERCISE OVERVIEW

In this chapter exercise, the existing roadway Baselines for SR61 and US98 will be imported from a provided (*.gpk)* file. A new Centerline of Construction for the SR61 roadway is required to improve the intersection with US98. The new intersection will be located across from the School entrance on US98. It will be a 90 degree angled intersection from US98. The centerline will require a new horizontal curve following the PPM design guidelines as follows. In order to provide minimal property impacts to a local business on SR61 the alignment will be offset from existing baseline to the west 30 feet and will re-join SR61 at a small skew that does not require a horizontal curve.

Design Geometrics and Criteria	Plans Preparation Manual, Volume 1
Design Speed	50 MPH
Facility	Urban Arterial with Curb
Maximum Tangent Deflection w/out curve	1 degree Table 2.8.1a
Minimum Horizontal Radius	881 feet Table 2.83
Minimum Length of Curve	750 feet Table 2.8.2a

2.1 Design New SR61 Centerline

2.2 Import Side Roads

2.3 Import Baseline

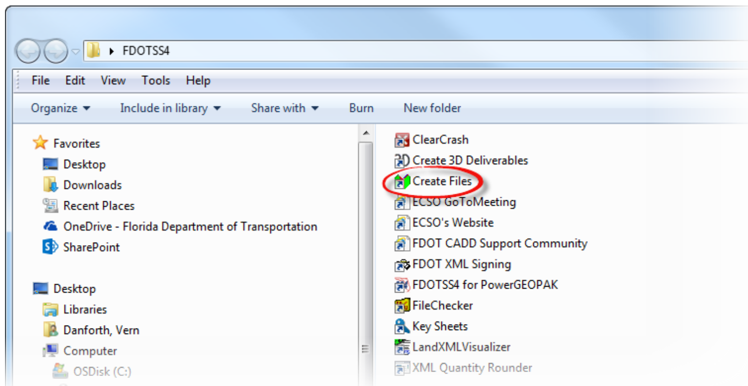
2.4 Create ALGNRD01 Stationing Annotation Models

Exercise 2.1 *Import Baseline*

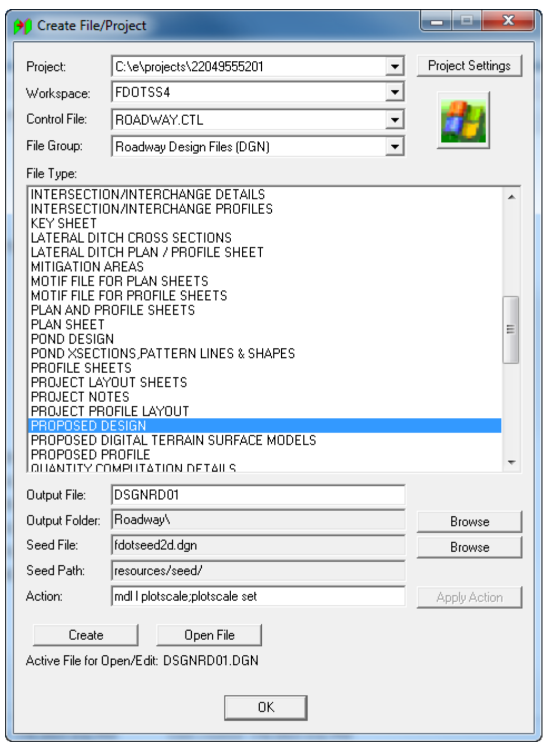
Import Baseline In this exercise, the user will create a new design file and import chains from the *job00.gpk* file provided from the survey.

1. (Optional) Extract the *22049555201(2).zip* file in the *Data Set* folder to the c:\e\projects folder.

2. From the desktop FDOTSS4 folder, double-click on the **Create Files** icon.



3. Create a *DSGNRD01.dgn* file with the dialog as shown below.



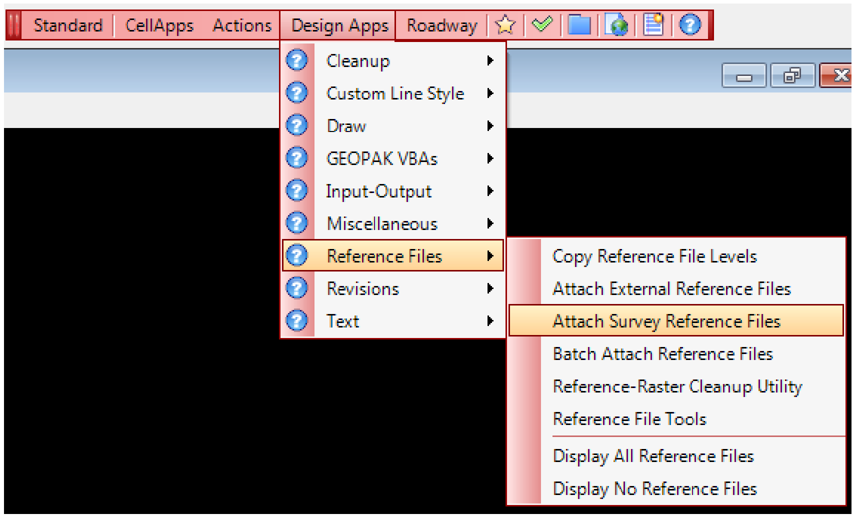
a. Click **Create** to create the file, *DSGNRD01.dgn*.

b. Click **Open File**, *DSGNRD01.dgn* displays.

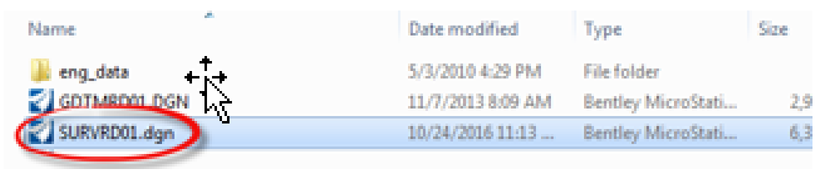
c. Set/Update Plot Scale displays. Use the default settings and click **OK**.

d. Click **OK** to close the Create File/Project dialog.

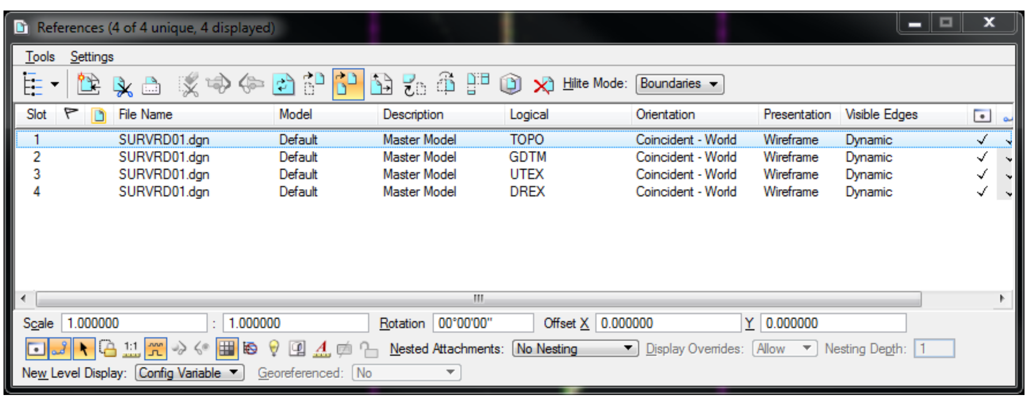
4. If the SURVRD file exists, Use the **Attach Survey Reference Files** tool from the FDOT Menu. Otherwise skip to step 7.



5. Select the *SURVRD01.dgn* file.



6. From the MicroStation menu select **File** > **References** to view the attached files:

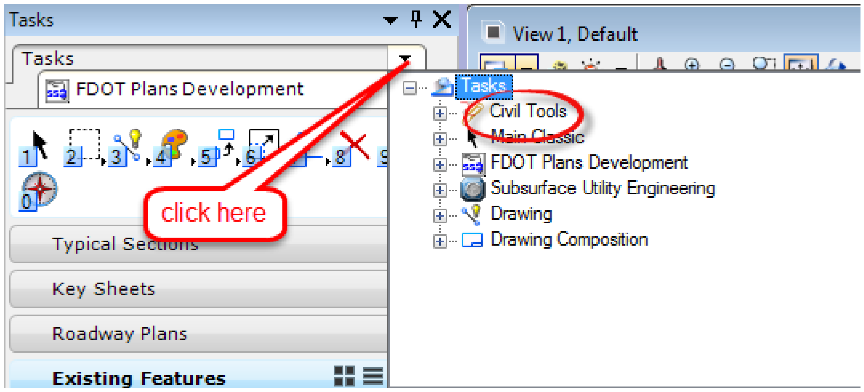


7. From the MicroStation menu select **File** > **References** and attach the following files:

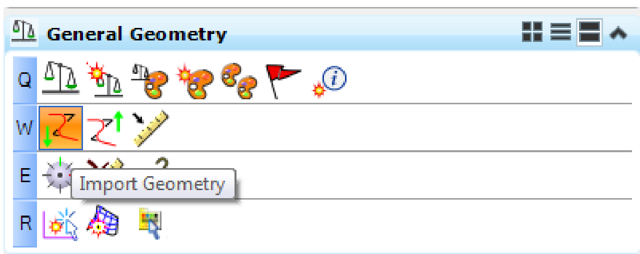
- C://e/projects/survey/*TOPORD01.dgn (disregard if SURVRD exists)*
- C://e/projects/rwmap/*RWDTRD01.dgn*
- C://e/projects/roadway/*AERIALS.dgn*

8. Fit View and Save Settings, select Ctrl F.

9. Change the *Task Menu* to **Civil Tools.**

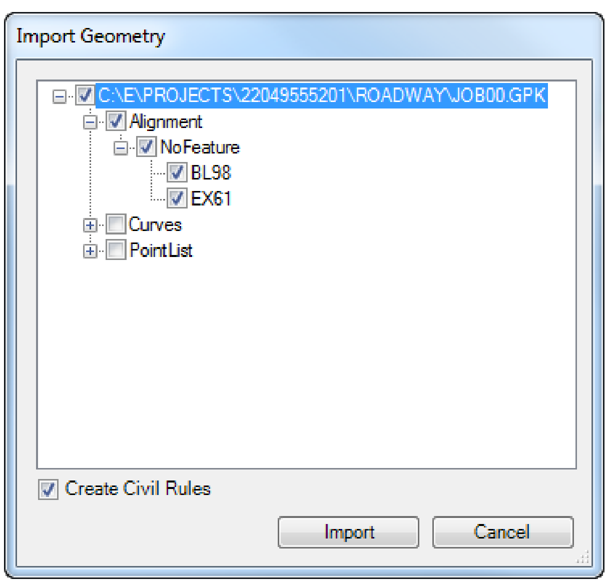


10. Use *General Geometry*, **Import Geometry** tool and select the **job00.gpk** file in the *Roadway* folder.



   a. Navigate to the **Alignment > No Features** folder.

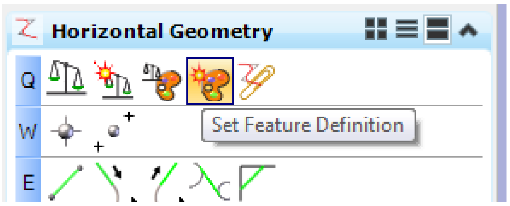
   b. Click in each box to select **BL98** and **EX-61.**



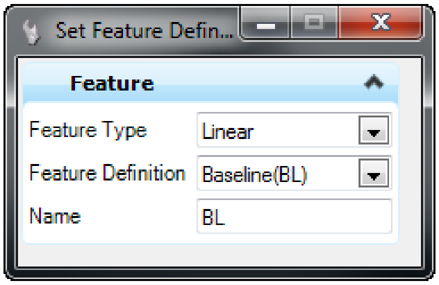
   c. Click **Import.**

11. Zoom to the intersection of **EX-SR61** and **US98**, hover over the *baseline* to verify the *alignment* imported in the previous step.

12. Use *Horizontal Geometry*, **Set Feature Definition** tool.

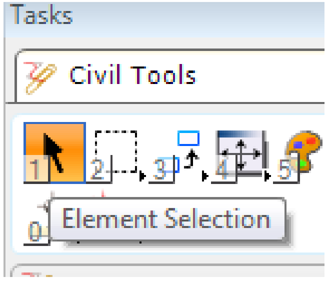


   a. Set the *Feature Definition* to **Baseline(BL).**



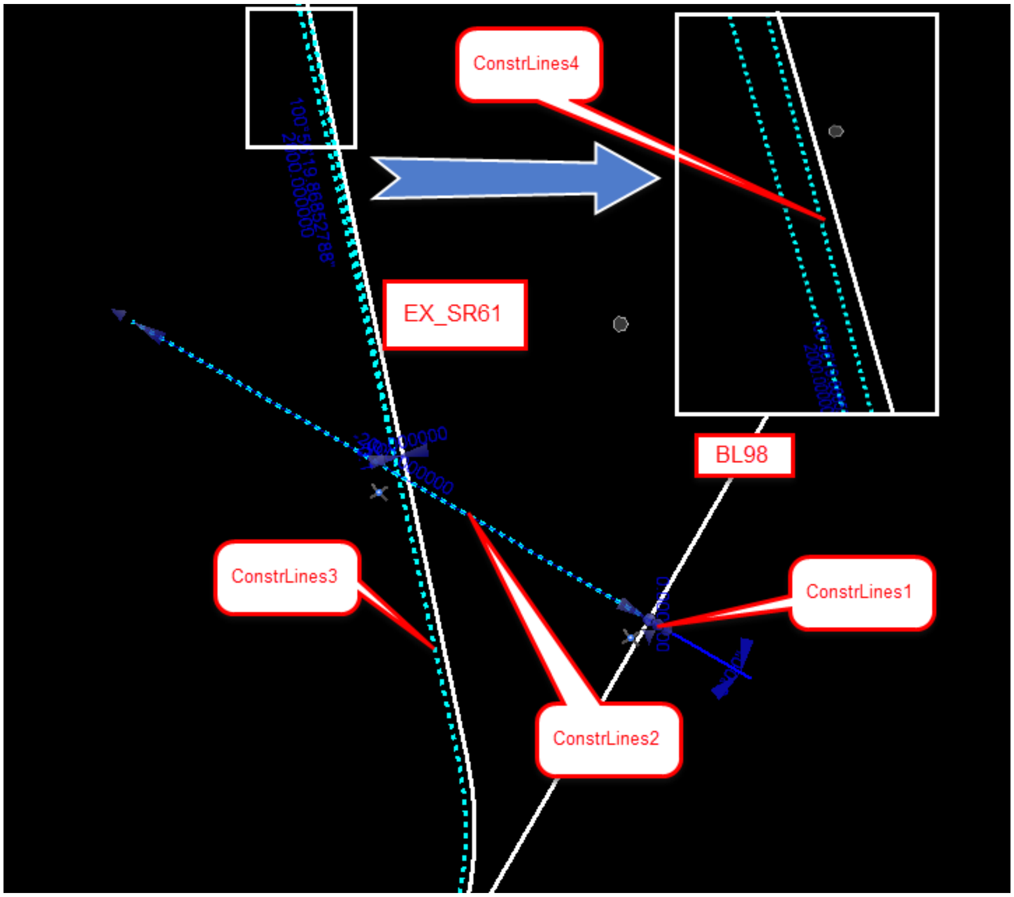
   b. Select both **EX-SR61** and **US98** line, then click **Reset** to set the **Baseline(BL)** *feature* on the lines.

13. Select the **Element Selection** to exit the command.



Exercise 2.2 Design New SR61 Centerline

This exercise will use several Construction lines to create the final Centerline as shown below.

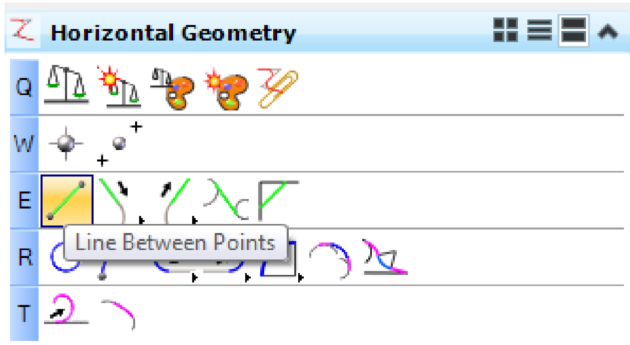


- ***ConstLines1***

1. Locate the **Driveway** into the school off US98 between the baseball field and the parking lot.

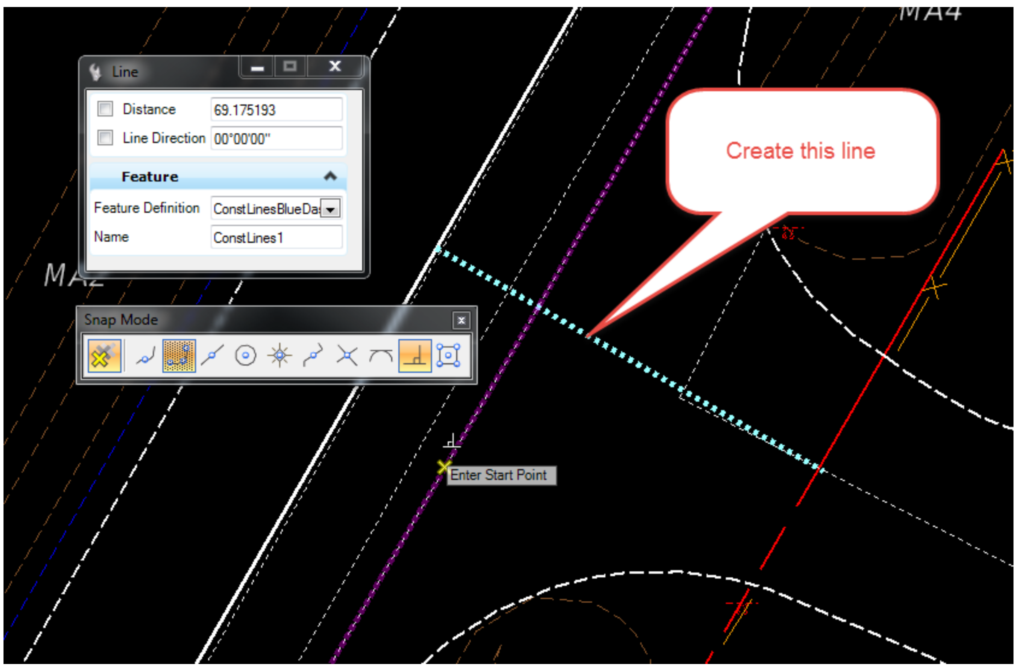
2. Now that the new intersection is located, turn the *display* **OFF** for the *Aerial Reference file.*

3. Use the *Horizontal Geometry*, **Line Between Points** tool.



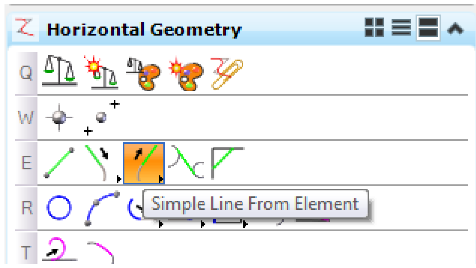
a. Use *Feature Definition* **ConstLinesBlueDash** and *Name* **ConstLines1.**

b. Start a line perpendicular to *BL98* and ending at in the middle of the *Driveway*. Be careful not to snap to anything on the second point.



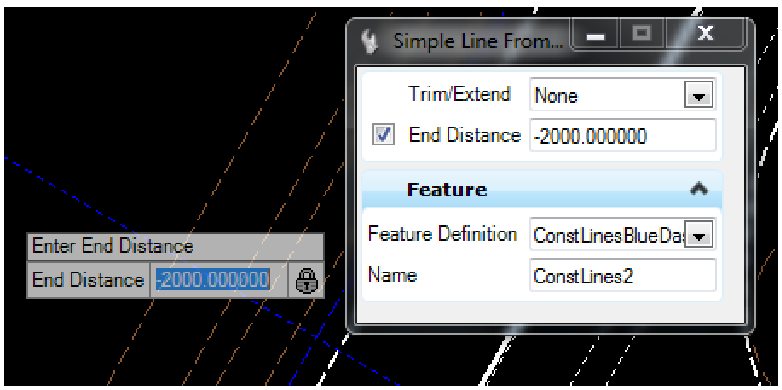
➢ ***ConstrLines2***

1. Use *Horizontal Geometry*, **Simple Line From Element** tool.



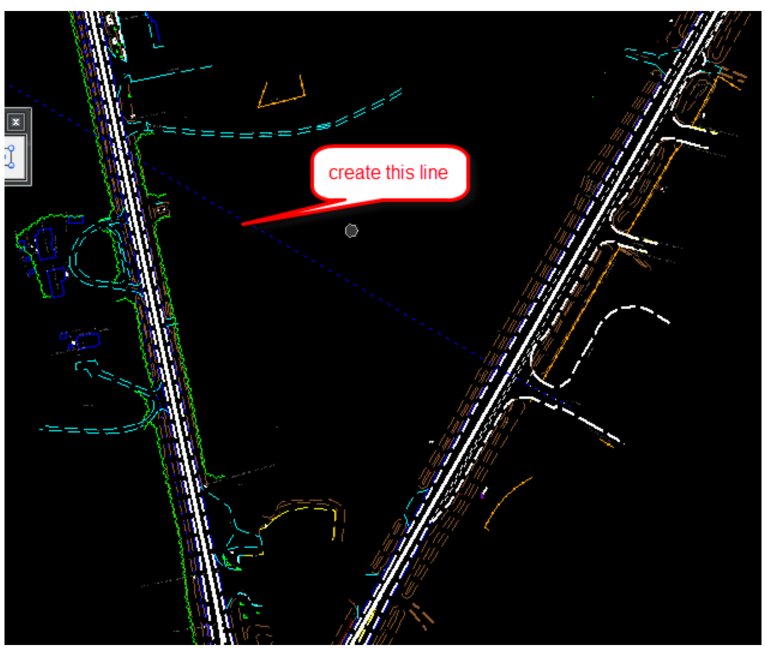
2. Use *Feature Definition* **ConstLinesBlueDash** and *Name* **ConstLines2**

3. First select **ConstLines1,** then use the AccuSnap to locate the beginning of the line at *BL98.*



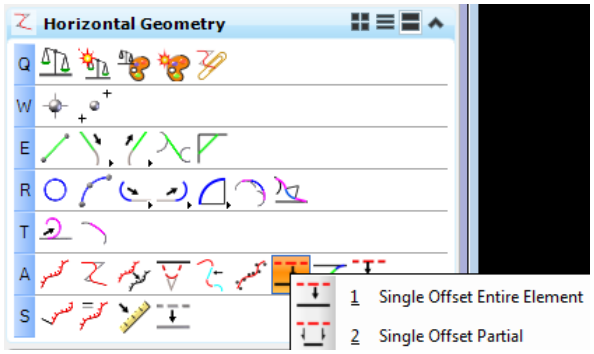
4. Enter a *Distance* of **-2000 feet**. **Data point** in the View to accept the *Distance*.

5. Data point to accept Trim None.



➢ *ConstrLines3*

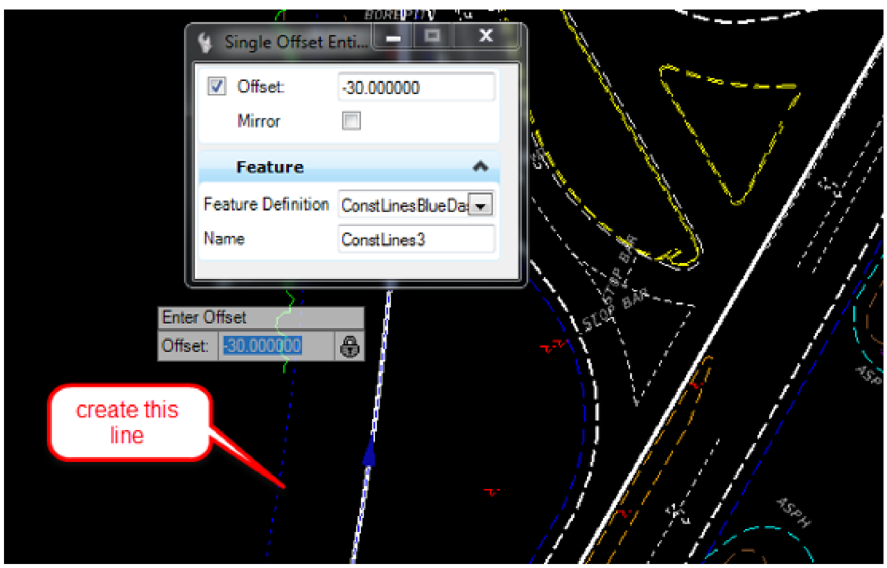
1. Use the *Horizontal Geometry*, **Single Offset Entire Element** tool.



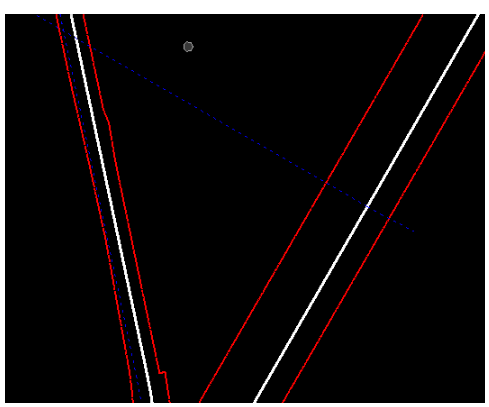
2. Use *Feature Definition* **ConstLinesBlueDash** and *Name* **ConstLines3.**

3. **Data point** in the View to create a line **-30 feet** *Offset* to **EX-61**.

4. Uncheck the *mirror option* to **No**, and click in the **View**.



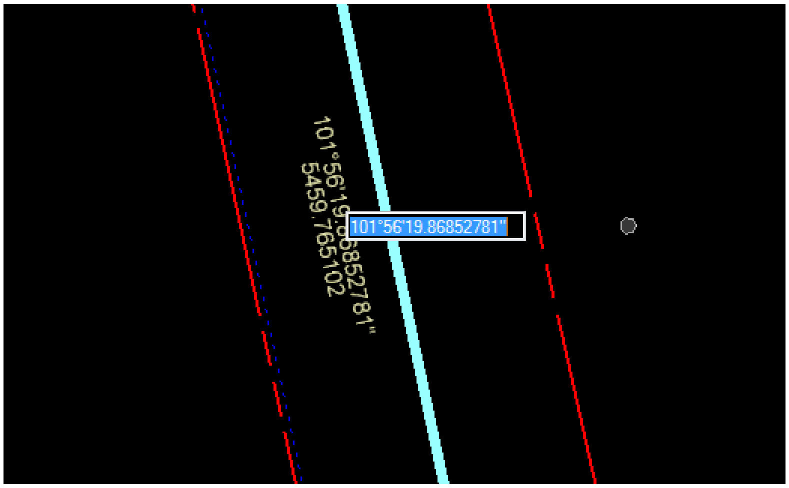
5. Once the new line is created, turn the *Display* **OFF** for the *TOPORD Reference* file.



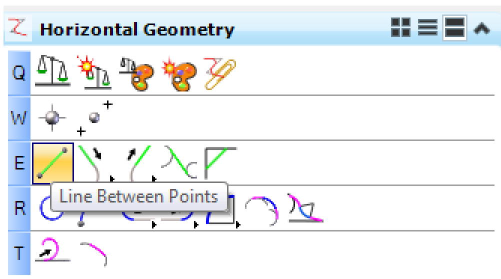
➢ *ConstrLines4*

Next step, create a line from the Offset line to intersect the EX-SR61 line at a 1 degree deflection angle.

1. Find the *Azimuth angle* of **EX-61**, select the element and click the Context Menu **Description**. Copy the *bearing value* into the buffer space selecting **Ctrl C** <OR> right-click **Copy**.

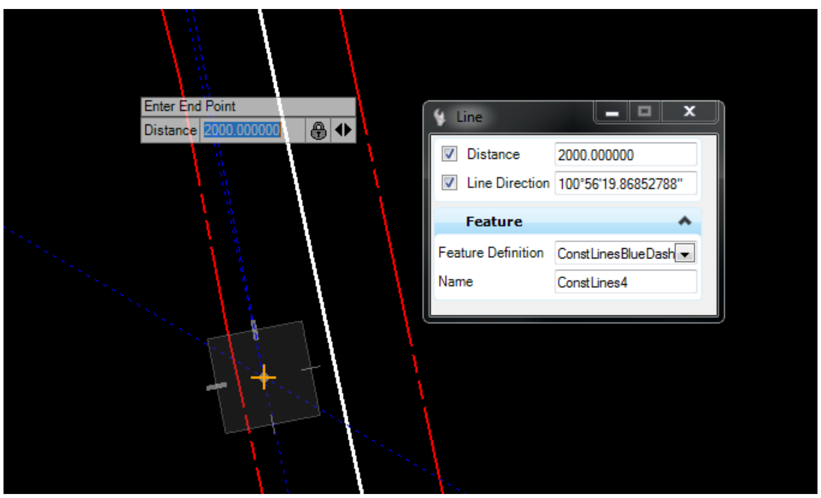


2. Use the *Horizontal Geometry*, **Line Between Points** tool.

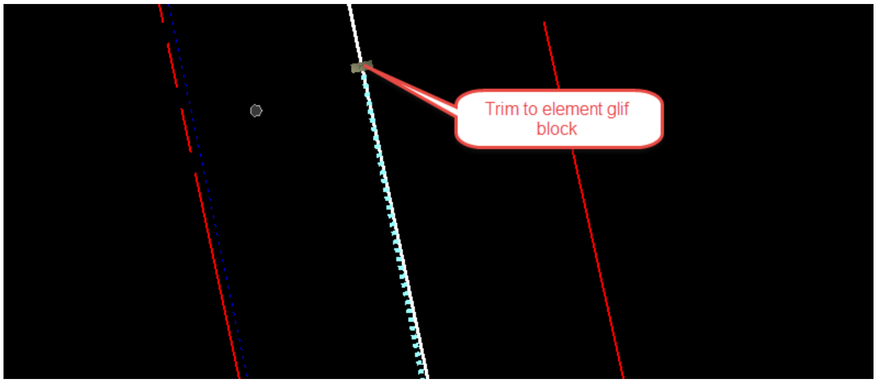


3. Use *Feature Definition* **ConstLinesBlueDash** and *Name* **ConstLines4.**

4. Start a line at the *intersection* of **ConstLine2** and **ConstLine3** enter a value of **2000 feet** for the *Length* and use the **Bearing** in the buffer as the *Line Direction* **minus 1 degree**.

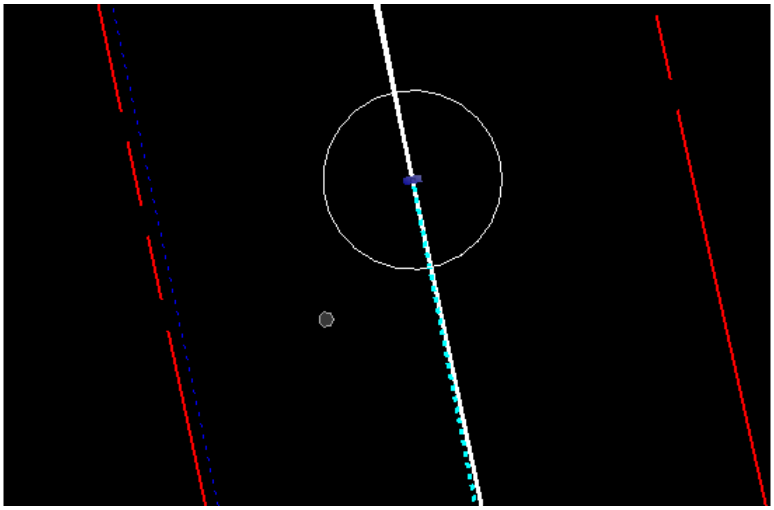


5. Use MicroStation **Trim to Element** and extend the **ConstLines4** line to intersect **EX-61**. This step will create an interval element ConstLines5.

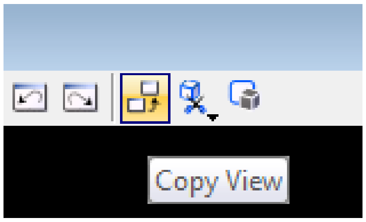


- ***Verify the Construction Lines Maintain Design Intent***

1. Change the Active Level to Scratch1_dp. Use MicrosStion Drawing to Place Circlee with MicroStation with a center at the end of **ConstrLines5**

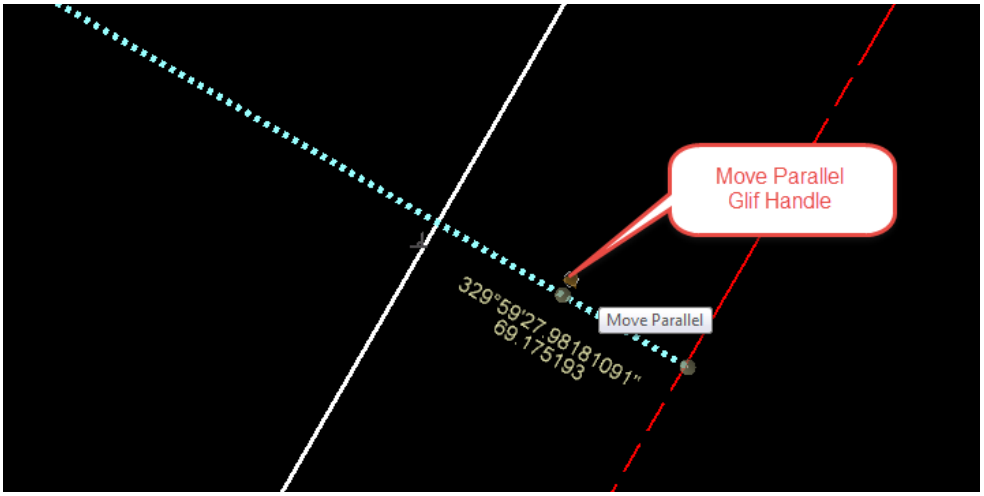


2. Open View 4 and use Copy View from View 1. Zoom into the School Entrance in View 4

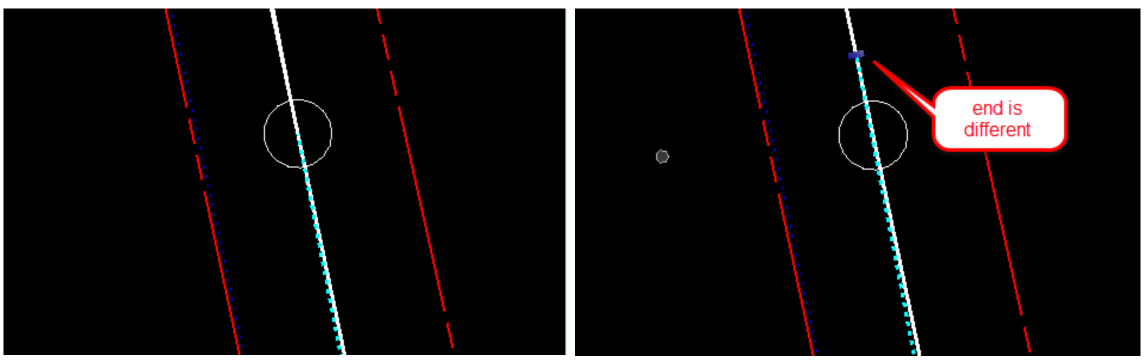


3. Move the location of the **ConstLines1** and check the end of **ConstLines5** to see if the location has been corrected.

HINT 1: Select the first line and Use the manipulator tool handle in the middle to move parallel location.



HINT 2: Select ConstLines5, Use MicroStation Undo/ Redo to see the end change location.



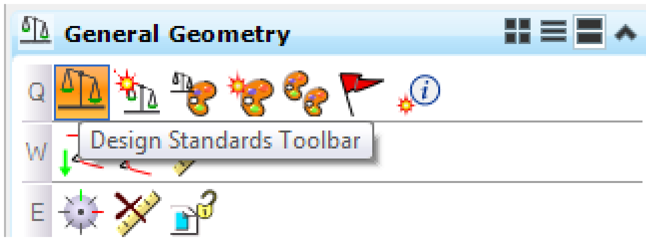
4. Select **Ctrl Z** to undo change.

5. (Extra Exercise) Change the *Offset Distance* of **ConstrLines3** from **-30** to **-40** to verify that the end of **ConstrLines4** will change.

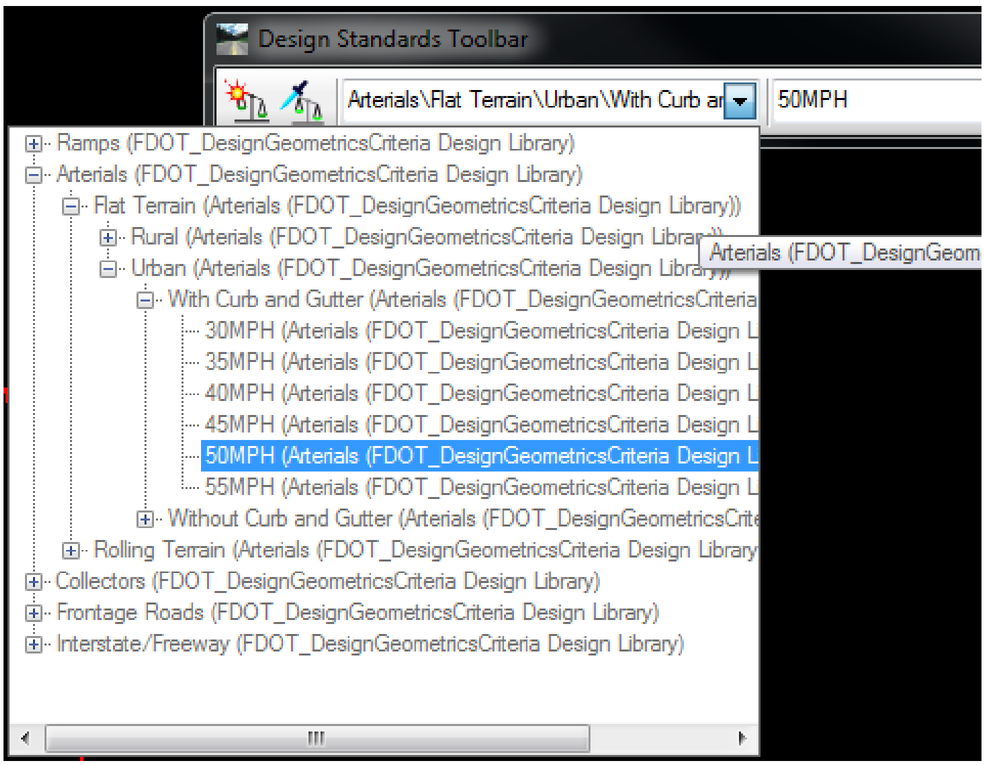
6. Select **Ctrl Z** to undo change.

- ***Construct a Horizontal Curve between ConstLines2 and ConstLines5 to Meet Geometric Standards*.**

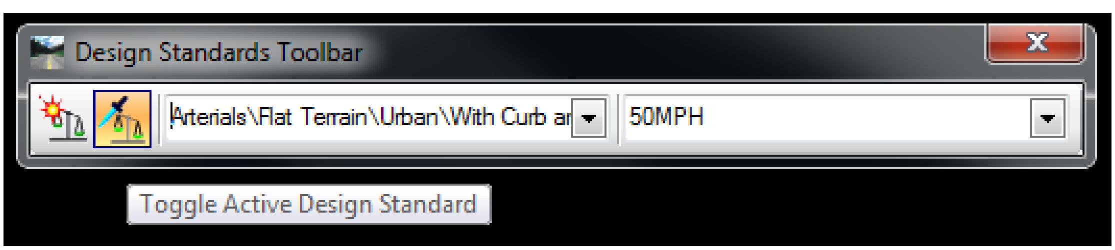
1. Use the *General Geometry*, **Design Standards Toolbar**.



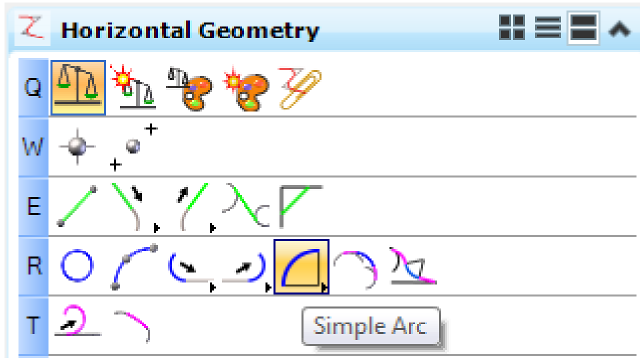
2. Set Active the *Design Facility Standard* to: **Arterial, Flat, Urban, with Curbs, 50 MPH**.



3. Activate the Toggle Active Design Standard icon.

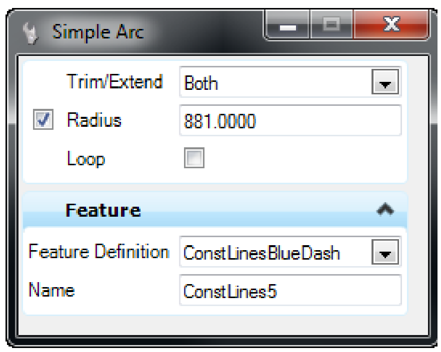


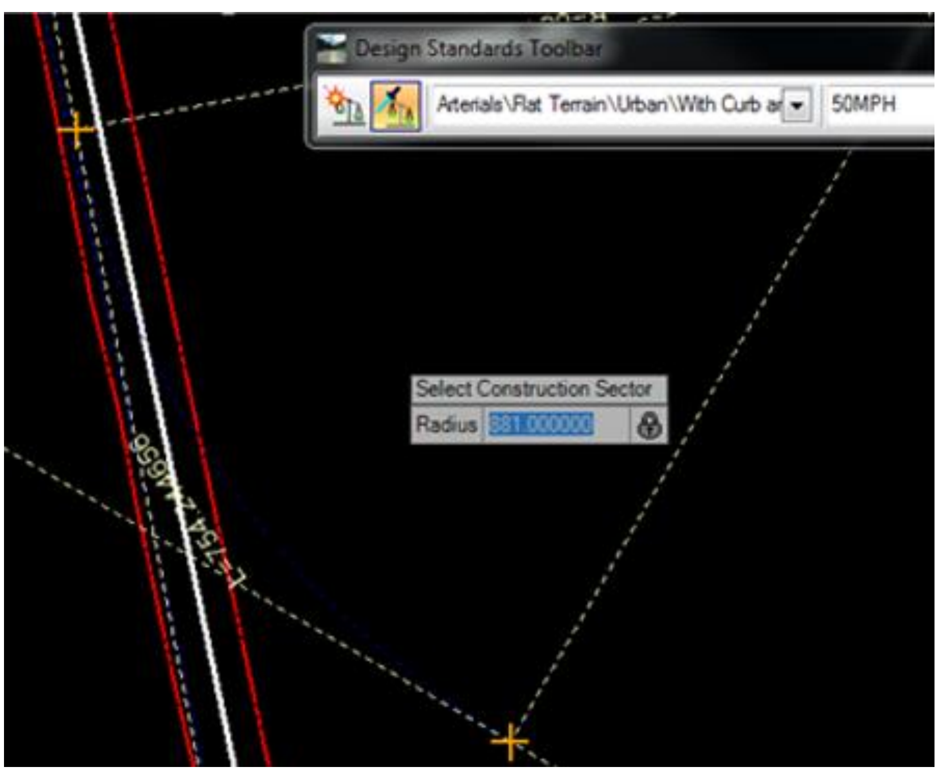
4. Use the *Horizontal Geometry*, **Simple Arc** tool.



5. Use *Feature Definition* **ConstLinesBlueDash** and *Name* **ConstLines6.**

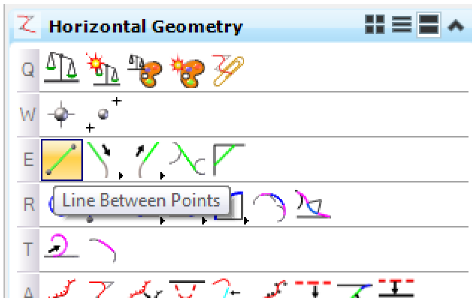
6. Create a *Radius* between **ConstLine2** and **ConstLine5** using the *default value* 881.4738, Set *Trim/Extend* to **Both**.





➢ ***Make a Longer Driveway into the School.***

1. Use *Horizontal Geometry*, **Line Between Elements** tool;

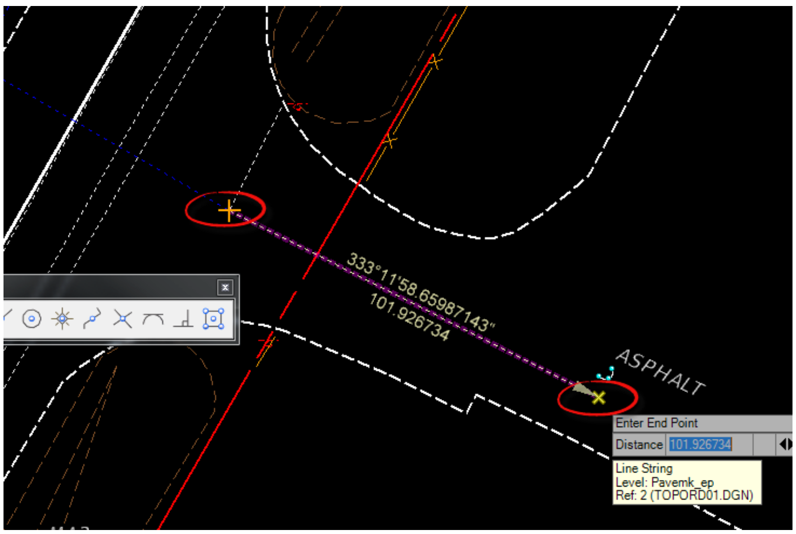


2. Turn **ON** the *TOPORD* file.

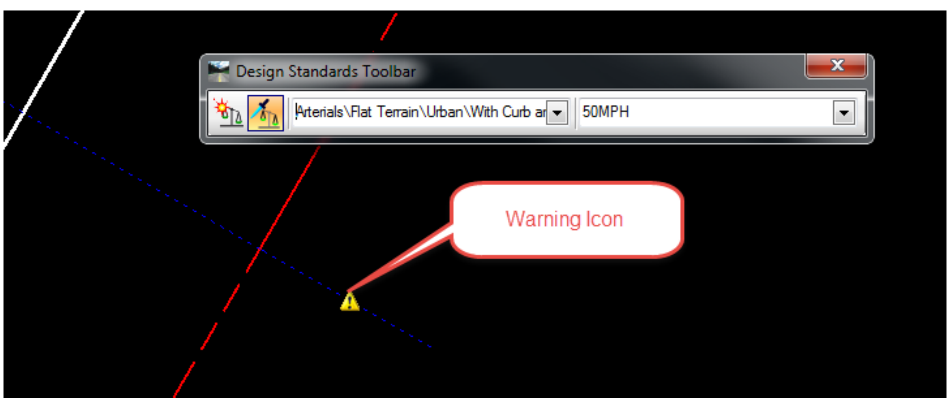
3. Use *Feature Definition* **ConstLinesBlueDash** and *Name* **ConstLines6.**

4. First, snap to the end of the first *Construction line* placed, **ConstLines1**.

5. Then snap to the end of the *Existing Centerline* in the **TOPORD** file.

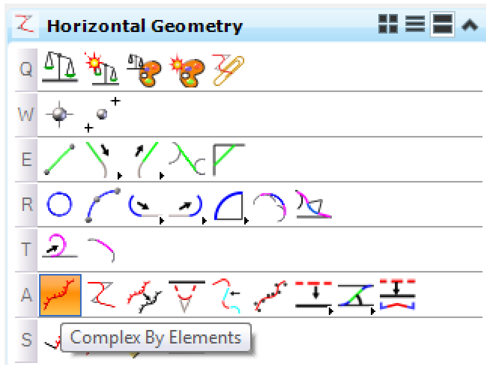


Note After the line is constructed a *Warning* icon may appear on the line because the *Active Design Standard* icon is being toggled **ON** and the *tangent length* may be *less than the minimum* **100 feet**.

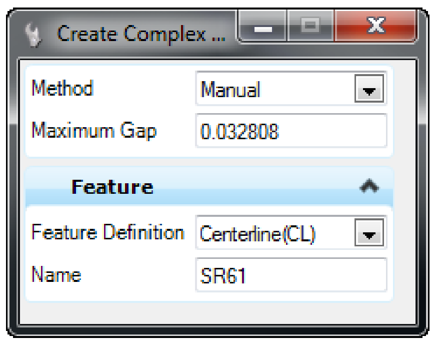


➢ *Next, Create a Centerline of All the ConstrLines.*

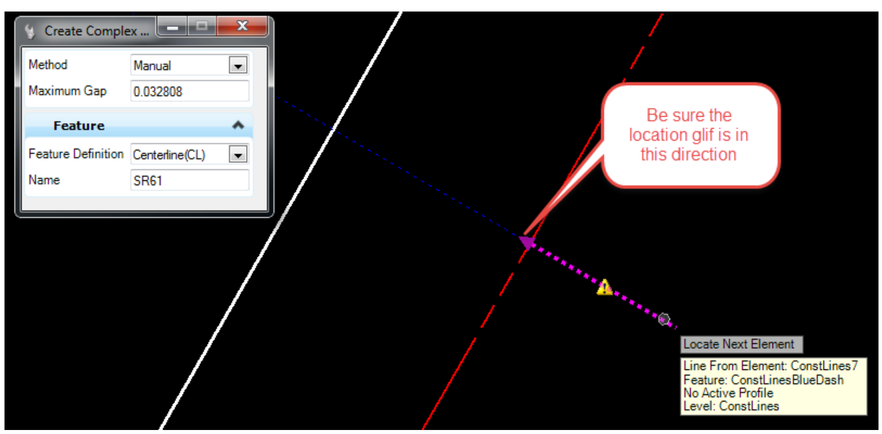
1. Use the *Horizontal Geometry*, **Complex by Element** tool.



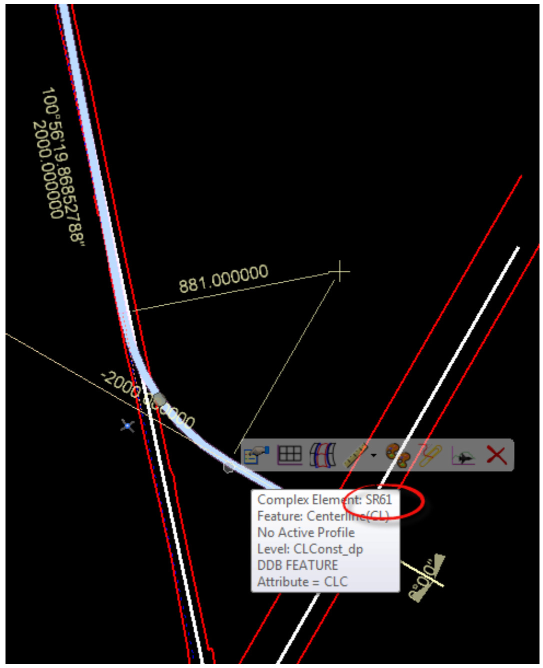
2. Create the new *Alignment* by connecting the elements. Use *Feature Definition* **Centerline(CL)** and *Name* **SR61**, with no spaces. Use the **Manual** *Method.*



3. Be careful to select at the school side first and near the start of the line.



4. Continue until New Centerline is constructed as shown below.



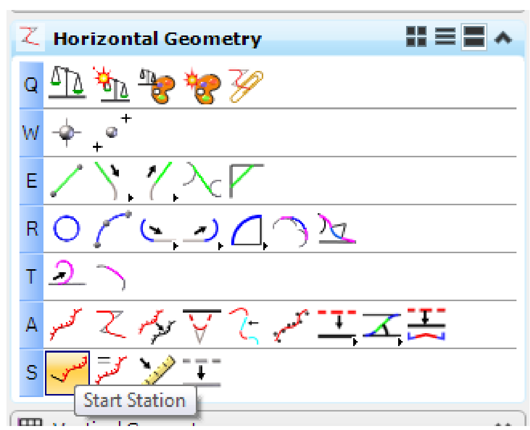
➢ ***Set a Begin Station Value at the Intersection of BL98***

1. Use the Horizontal Geometry, Start Station tool.

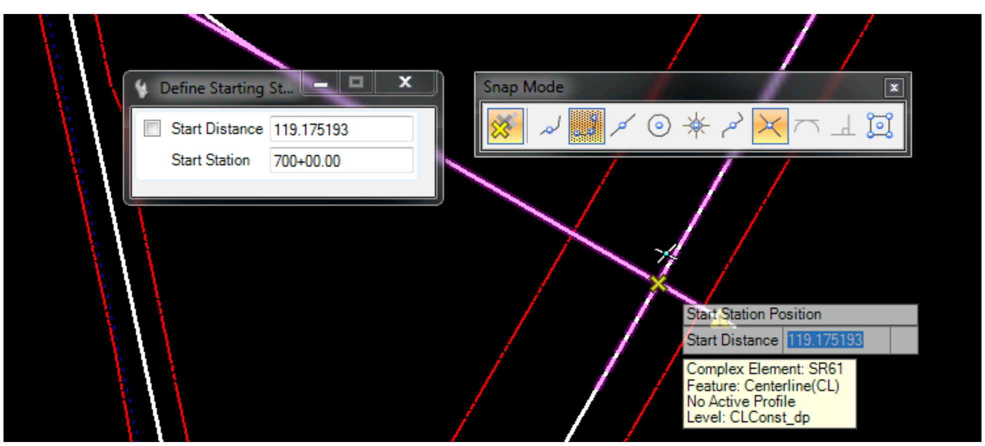
2. Set a *Begin Station* value of **700+00** at the intersection of **SR61** and **BL98**.

3. Select the new **SR61** *Centerline(CL).*

4. Use **AccuSnap** to locate the *Intersection* with **BL98** and **data point** to accept.

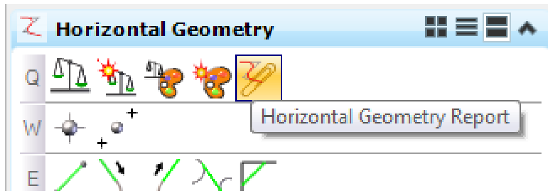


5. Enter **70000** and select **Enter** <OR> **data point** to accept.

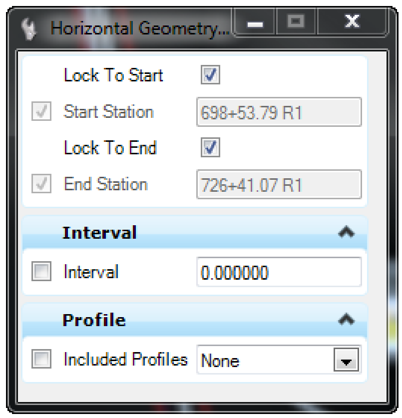


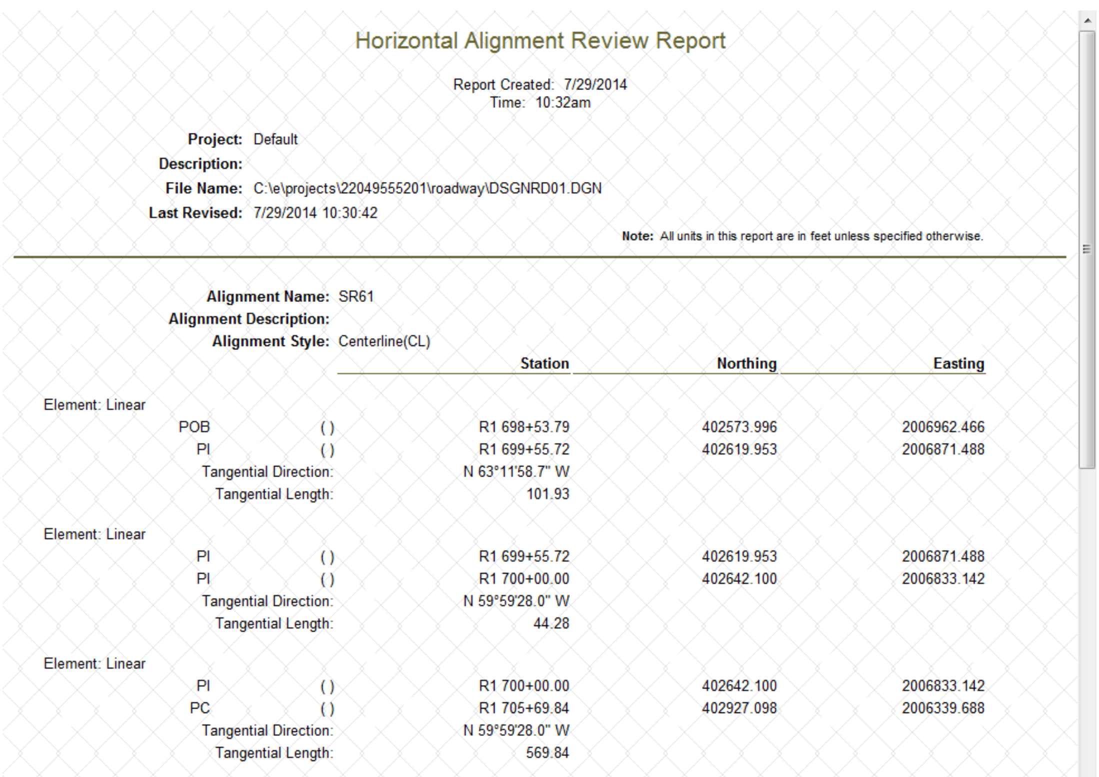
➢ *Describe the New Centerline Geometry*

1. Use *Horizontal Geometry*, **Horizontal Geometry Report** tool.



2. Select the **SR61** C*enterline (CL)*. Use the settings below at the prompt to generate the report shown.




Horizontal Alignment Review Report

Report Created: 7/29/2014
Time: 10:32am

Project: Default
Description:
File Name: C:\e\projects\22049555201\roadway\DSGNRD01.DGN
Last Revised: 7/29/2014 10:30:42

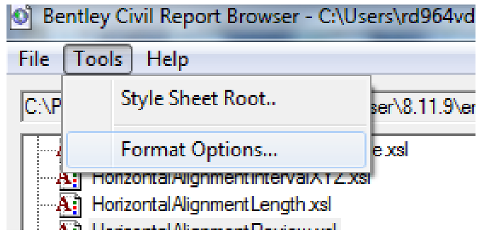
Note: All units in this report are in feet unless specified otherwise.

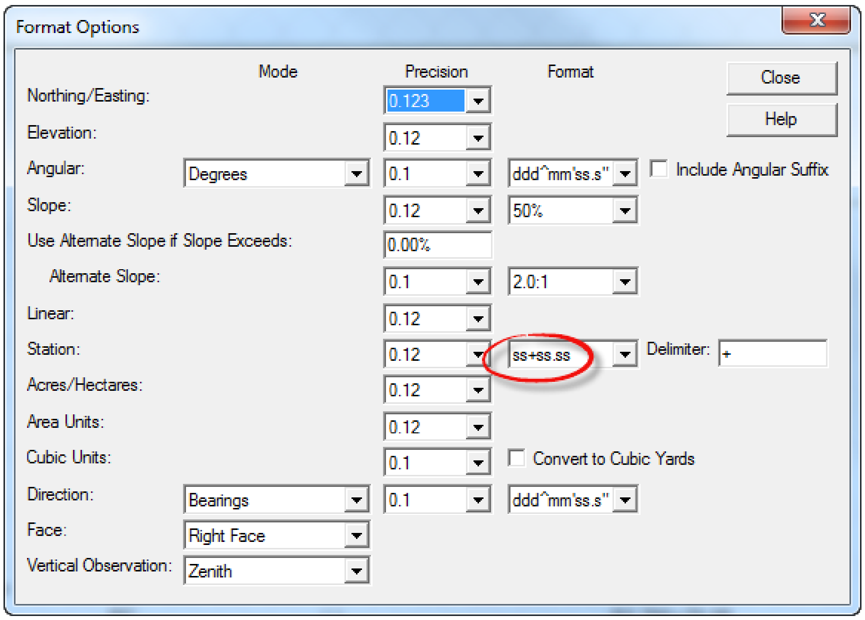
Alignment Name: SR61
Alignment Description:
Alignment Style: Centerline(CL)

			Station	Northing	Easting
Element: Linear					
	POB	( )	R1 698+53.79	402573.996	2006962.466
	PI	( )	R1 699+55.72	402619.953	2006871.488
	Tangential Direction:		N 63°11'58.7" W		
	Tangential Length:		101.93		
Element: Linear					
	PI	( )	R1 699+55.72	402619.953	2006871.488
	PI	( )	R1 700+00.00	402642.100	2006833.142
	Tangential Direction:		N 59°59'28.0" W		
	Tangential Length:		44.28		
Element: Linear					
	PI	( )	R1 700+00.00	402642.100	2006833.142
	PC	( )	R1 705+69.84	402927.098	2006339.688
	Tangential Direction:		N 59°59'28.0" W		
	Tangential Length:		569.84		

Element: Circular

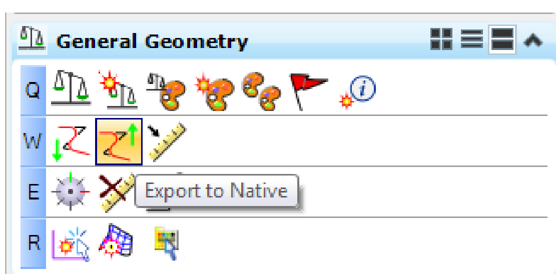
HINT If the Stationing format is not displayed correctly, In the *Bentley Civil Report Browser*, select **Tools Format Options**





➢ ***Save the SR61 Centerline to the job00.gpk***

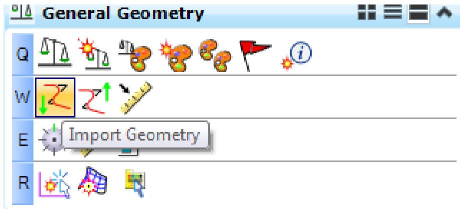
1. Use the *General Geometry*, **Export to Native** tool and save the **SR61** C*enterline* to the *job00.gpk* file.



Exercise 2.3 Import Side Roads

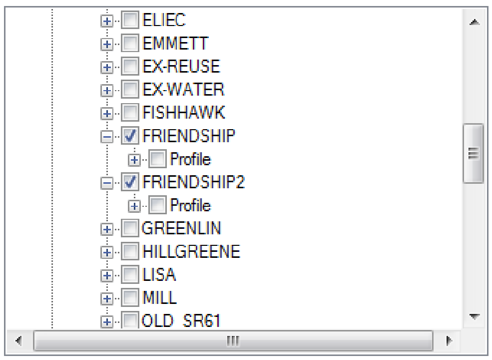
1. Use *General Geometry*, **Import Geometry** tool.

2. Navigate to the **Alignment** > **NoFeature** folder.

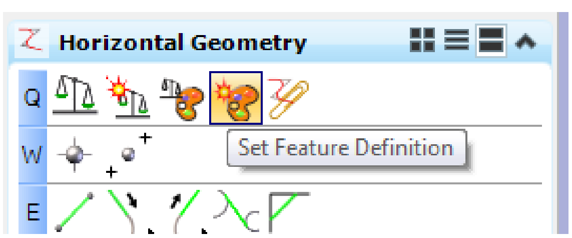


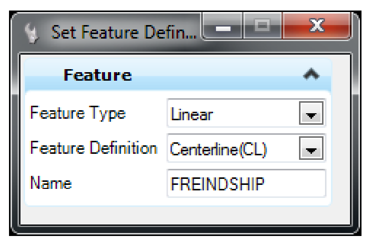
3. Select the following *GEOPAK chains* from the *job61.gpk* file: **Friendship, Friendship2.** Be certain to **Uncheck** the *Profile* before clicking the **Import** button..

Note This file may be named *job61.org* in the dataset, copy and rename it *job61.gpk*



4. Use *Horizontal Geometry*, **Set Feature Definition** tool.

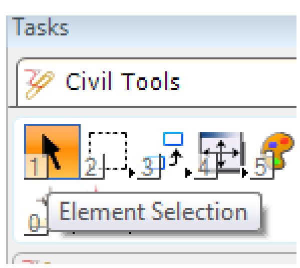




a. Set the *Feature Definition* to **Centerline(CL).**

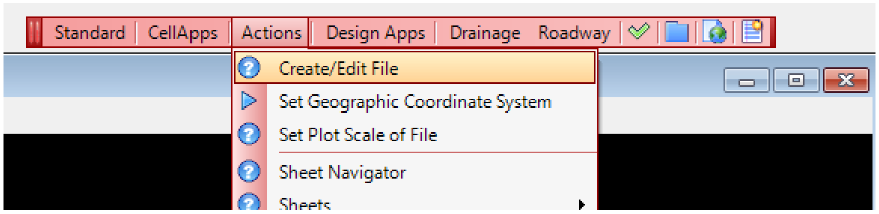
b. Select both **FREINDSHIP** and **FREINDSHIP2** line, then click **Reset** to set the **CenterLine(CL** *feature* on the lines.

c. Select the **Element Selection** to exit the command.

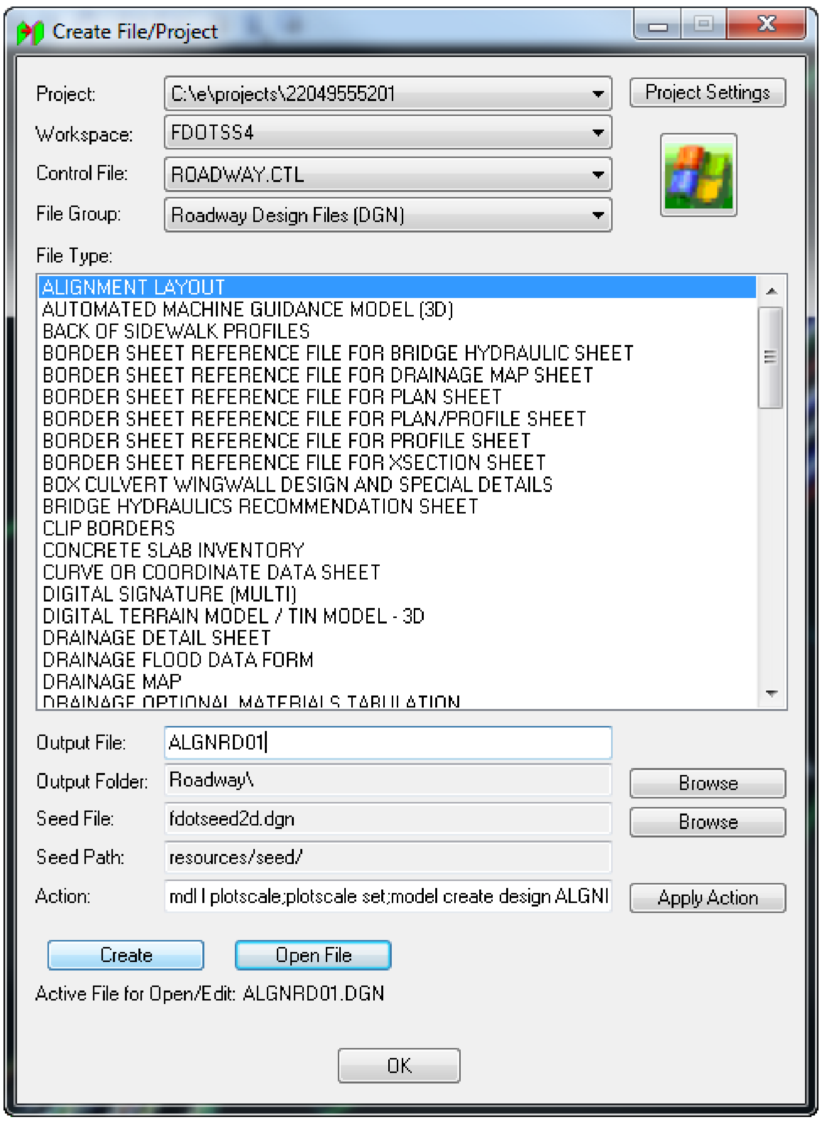


Exercise 2.4 Create ALGNRD01 Stationing Annotation Models

1. From the FDOTSS4 menu, select **Actions > Create/Edit File**.



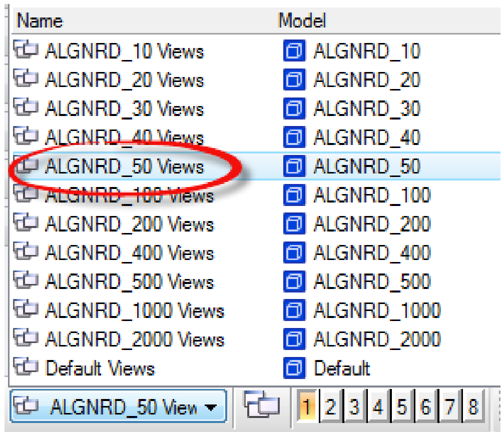
2. Create an *ALGNRD01.dgn* file with the dialog as shown below.



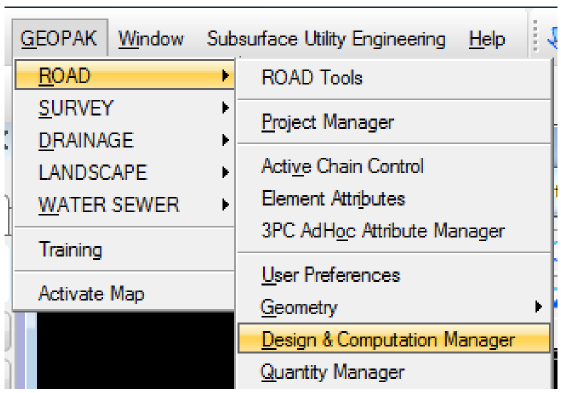
3. Click **Create** to create the file, *ALGNRD01.dgn*. Click **Open File**, *ALGNRD01.dgn* displays. Click **OK**.

Note This tool now creates multiple models to display Stationing at different scale once the Open File button is clicked.

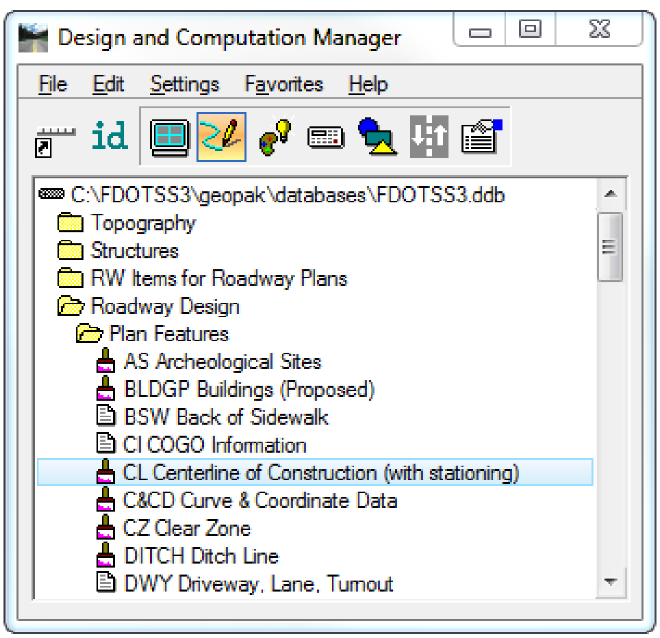
4. Verify the *Active Model* in the design file is **ALGNRD_50.**



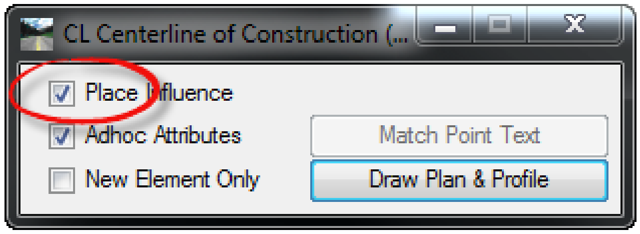
5. In MicroStation, select GEOPAK > ROAD > Design & Computation Manager.



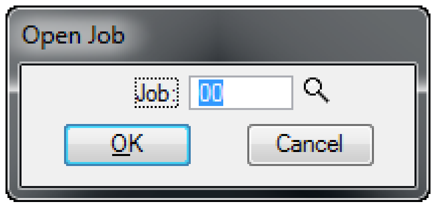
a. Navigate to the *Roadway Design > Plan Features* folder and select **CL Centerline of Construction (with stationing)**.



b. On the CL Centerline of Construction dialog, check the **Place Influence** box and click the **Draw Plan & Profile** button.



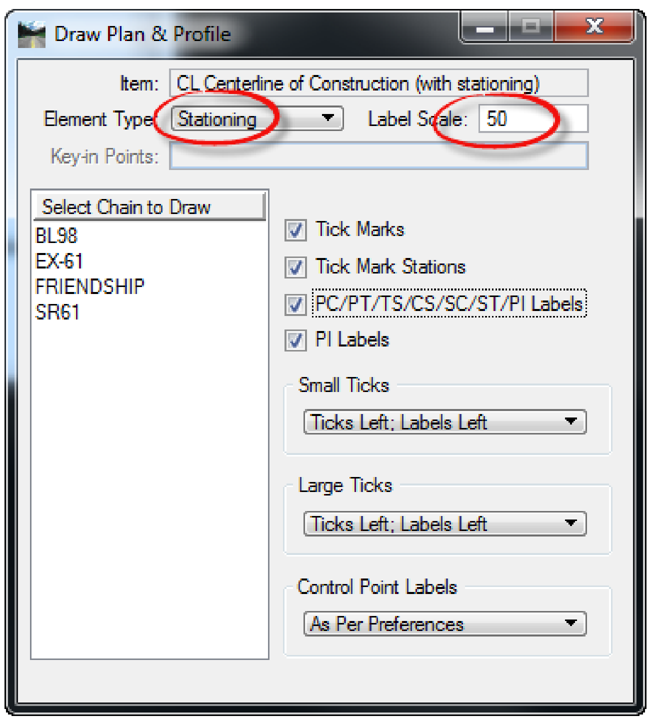
c. On the Open Job dialog, browse to the *job00.gpk Job* file and click **OK.**



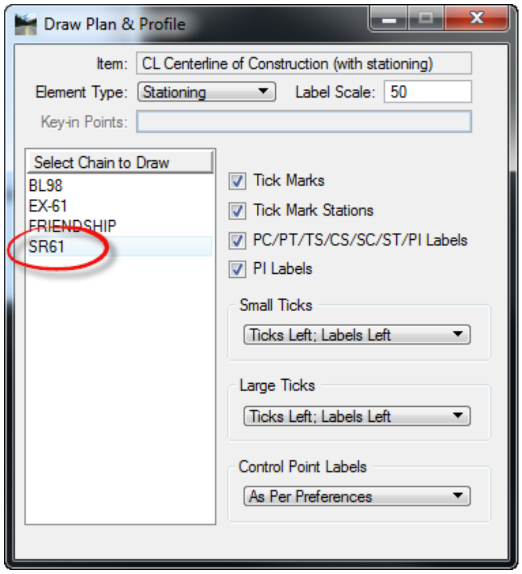
6. On the Draw Plan & Profile dialog,

   a. Change the *Element Type* to **Stationing**.

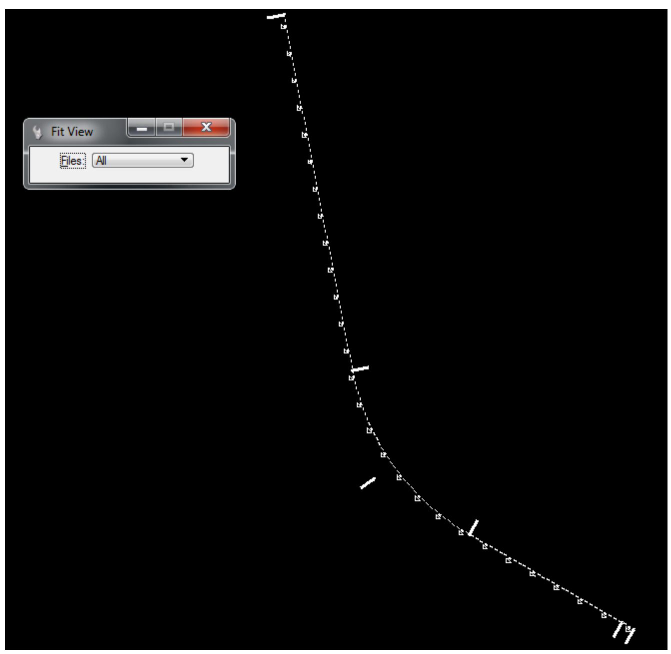
   b. Enter **50** for the *Label Scale*.



c. In the *Select Chain to Draw List* box, select on **SR61**.



7. Close each of the Design & Computation Manager dialogs (3) and click **Fit View** to see the results.



8. In MicroStation, select **File > Save Settings** <OR> select **Ctrl F**.

9. (Optional) Continue to add the *Stationing Annotations* by repeating these steps for the different scale models.

10. **Return / Open** to the *DSGNRD01* file and attach the *Reference* in the **ALGNRD01_50** *Model* file.

3 2D PLANS

INTRODUCTION

This chapter will continue to use the OpenRoads Technology for Horizontal Geometry. Rather than use traditional MicroStation element creation tools, these exercises will provide participants with practice using the Civil Tools. Using Civil rule-based Feature Definitions assures *design intent* is incorporated into the two dimensional (2D) plan layout. This will, in turn, prove valuable when design changes or “what if scenarios are needed or tested.

This chapter also introduces two (2) important new OpenRoads Technologies for creating geometry / line work while designing in FDOTSS4. They are:

- Civil AccuDraw
- Civil Cells

CIVIL ACCUDRAW

As defined in the Bentley Civil Tools help files:

“Use Civil AccuDraw to allow precise input of points, whether the points are physical points or end points of linear geometry. The Civil AccuDraw values can be persisted as rules on the points by locking both values in the Civil AccuDraw input. Several methods can be used, among them are:

- *Distance and Direction, to set the order of ordinate entry to distance then direction, with both sharing a common point of origin.*
- *Dist-Dir, to set the order of entry to distance for the first ordinate then direction for the second ordinate, without a common point of origin.*
- *Dist-Dist, to set the order of entry to distance for the first ordinate then distance for the second ordinate, without a common point of origin.*
- *XY, to set the order of ordinate entry to X-axis then Y-axis, with the two sharing a common point of origin.*
- *DX DY, to set the order of ordinate entry to the difference in X coordinate then the difference in the Y coordinate, with the two sharing a common point of origin.*
- *Station-Offset, to set the order of ordinate entry to station identification then offset value, with both sharing a common point of origin*

The delivered methods are those configured by default. These defaults can be edited, removed, or additional methods may be added.

CIVIL CELLS

As defined in the Bentley Civil Tools help files:

"A civil cell is a collection of civil elements - geometry, templates, and terrain models - which can be placed repeatedly in a design. The collection of civil elements will have been created relative to one or more reference elements. When you place the civil cell, you choose the new reference elements, and a new collection of civil elements is then created relative to them. A civil cell can therefore be thought of as a copy of the original collection of civil elements, relative to the geometry of the new reference elements. Civil cells can be 2D or 3D. They can consist of 2D (plan) elements only, or 3D elements (2D elements with profiles), and can include terrains, linear templates, area templates, and simple corridors.

When the new civil elements are created, all of the rules associated to them are also created. This means that the new civil elements retain their relationships, both with each other and with the reference elements, and therefore know how to react when these relationships change. In addition, the Civil and MicroStation toolsets can still be used on the new civil elements, to adjust and further refine the design as required, because there is no difference between a civil element created by a civil tool, and one created by placing a civil cell.

Civil cells can save a lot of time and effort, because they replicate the complete series of steps needed to create the civil elements. They also help to ensure compliance with design standards, by making a civil cell available to the design team.

EXERCISE OVERVIEW

3.1 Preparation for 2D Plans

3.2 BL98 Milling Limits

3.3 BL98 Side Street

3.4 BL98 Widening

3.5 BL98 Widening Taper Line

3.6 For SR61 New Construction Template Lines

3.7 Add Right Turn lane on BL98

3.8 Add the School Entrance right Turn Lane off BL98 Intersection

3.9 Create/Edit the Intersection Curve Radii

3.10 Trim Back Sidewalk and Curb Lines to the Curve Radii

3.11 Use Civil Cell Technology to Place Curb and Sidewalk Around the Radii

3.12 Create a Custom Civil Cell for Other Radii

3.13 Place Left Turn with Traffic Separator

3.14 Place Right Turn Island

3.15 For BL98 Intersection Crosswalks Lines

3.16 Create BL98 Turnouts

3.17 For BL98 Intersection Shoulders

3.18 For Friendship Intersection

Exercise 3.1 *Preparation for 2D Plans*

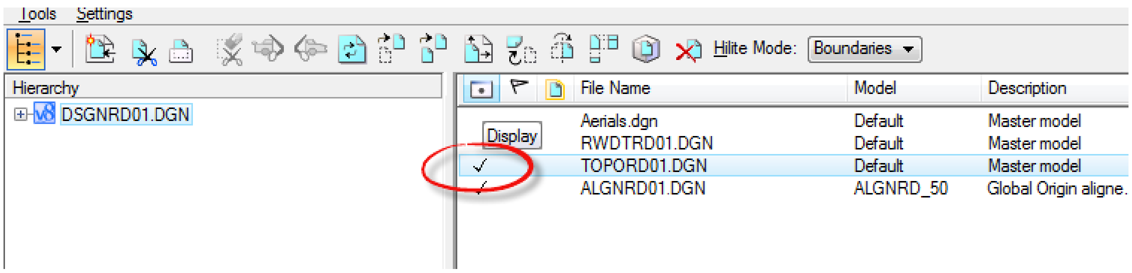
1. (Optional) Extract the *22049555201(3).zip* file in the c:\e\projects folder.

2. Open the *DSGNRD01.dgn* file of the c:\e\projects\22049555201\roadway\ folder in the FDOTSS4 Workspace in MicroStation.

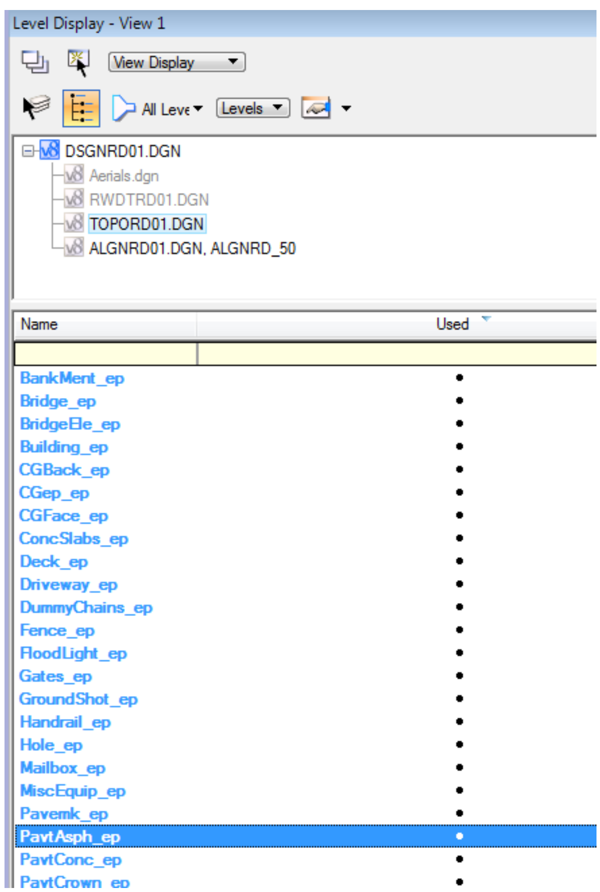
Exercise 3.2 *BL98 Milling Limits*

In this exercise the exiting pavement edge lines from the TOPORD file are copied to be used as the Milling Lines for the proposed improvements.

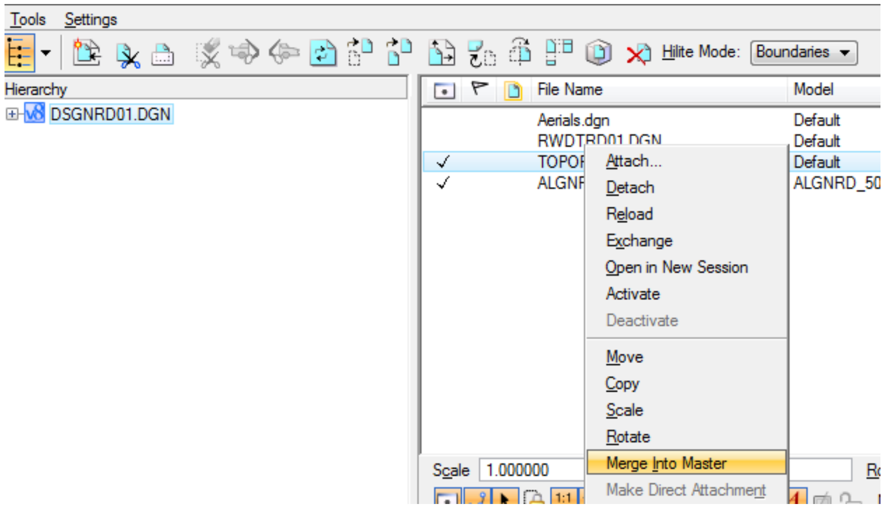
1. Use MicroStation **References** to attach and display the *TOPORD01* and RWDTRD01 *Reference* files.



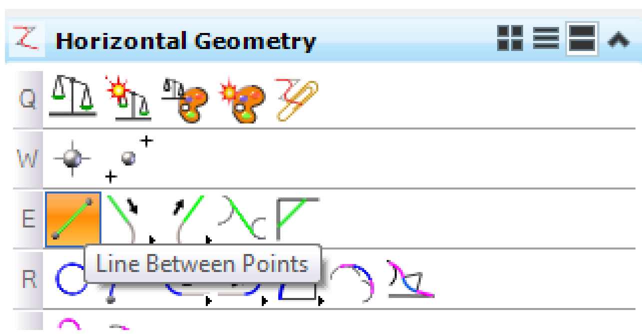
2. Use MicroStation **Level Display** to turn **OFF** all the *TOPORD01 Levels* except the **PavtAsphalt_ep**.



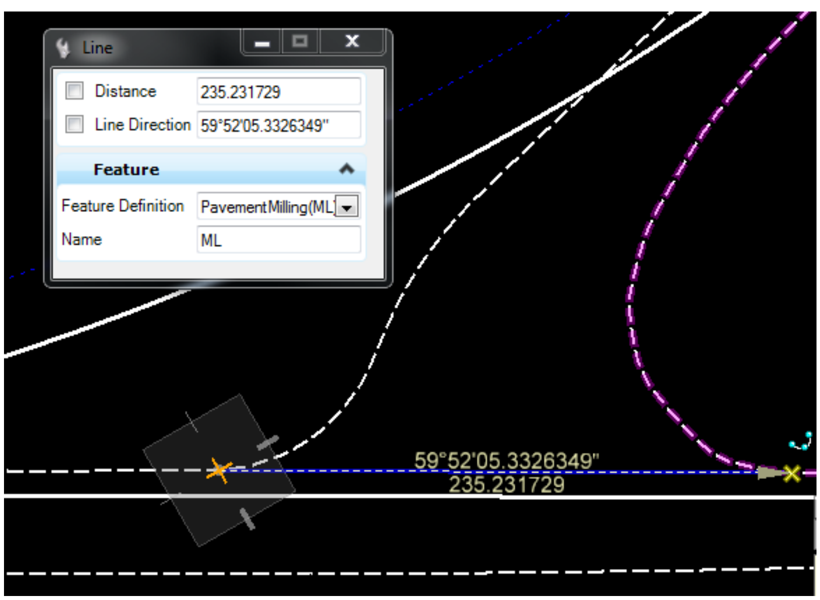
3. Use MicroStation *References*, **Merge into Master** tool to copy existing edge **PavtAsphalt_ep** lines into the active *DSGNRD01* file.



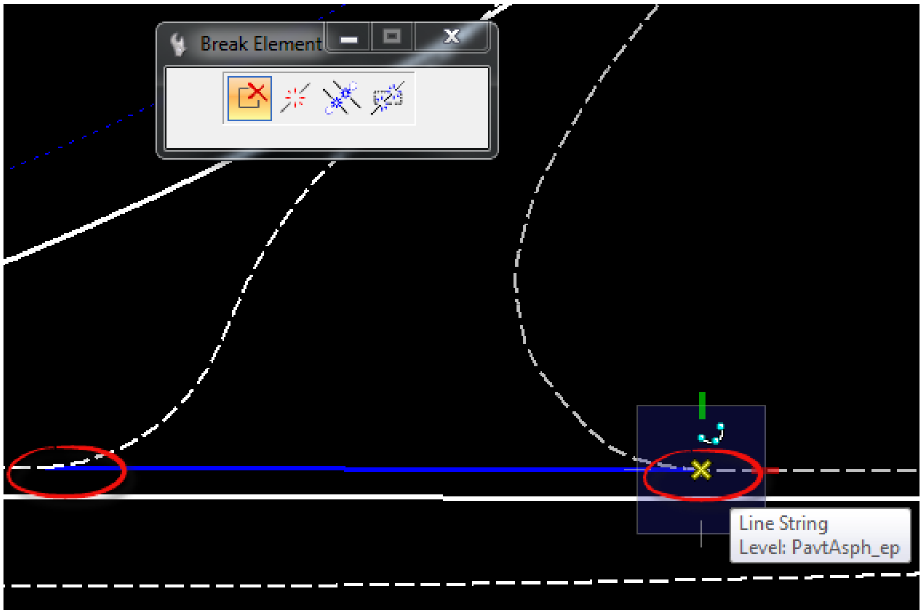
4. Use the *Horizontal Geometry*, **Line Between Points** tool.



5. Create a **PavementMilling(ML)** line across the *existing intersection* of **SR61** and **BL98.**

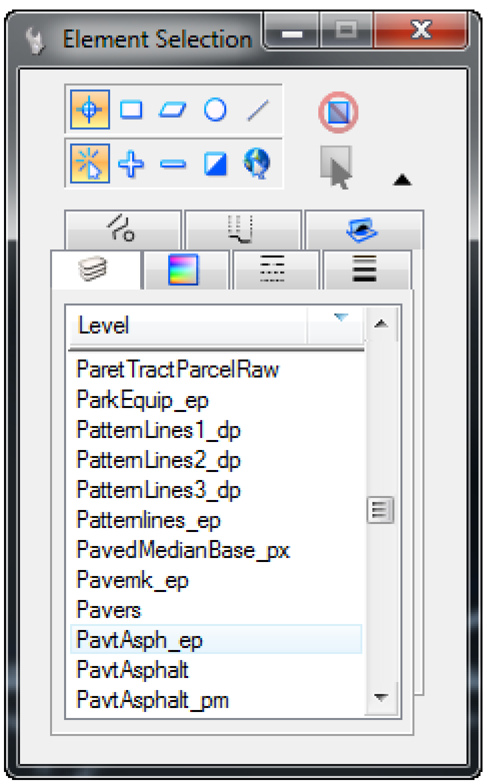


6. Use MicroStation **Break Element** on the **PavtAsphalt_ep** line string elements where the new *PavementMilling(ML)* line intersects.

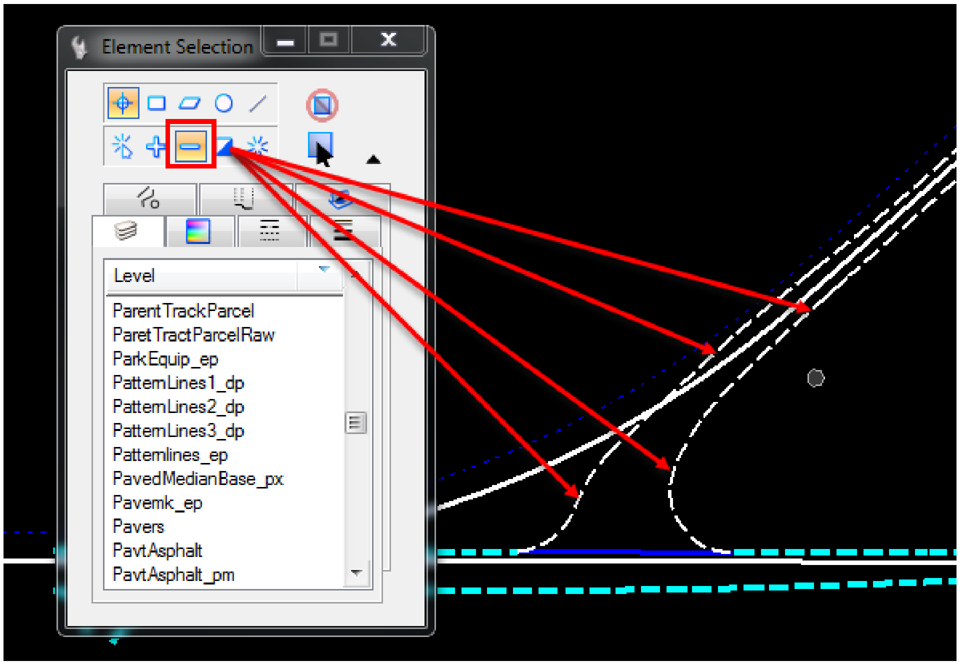


7. Repeat these steps for the other **side roads** along *BL98.*

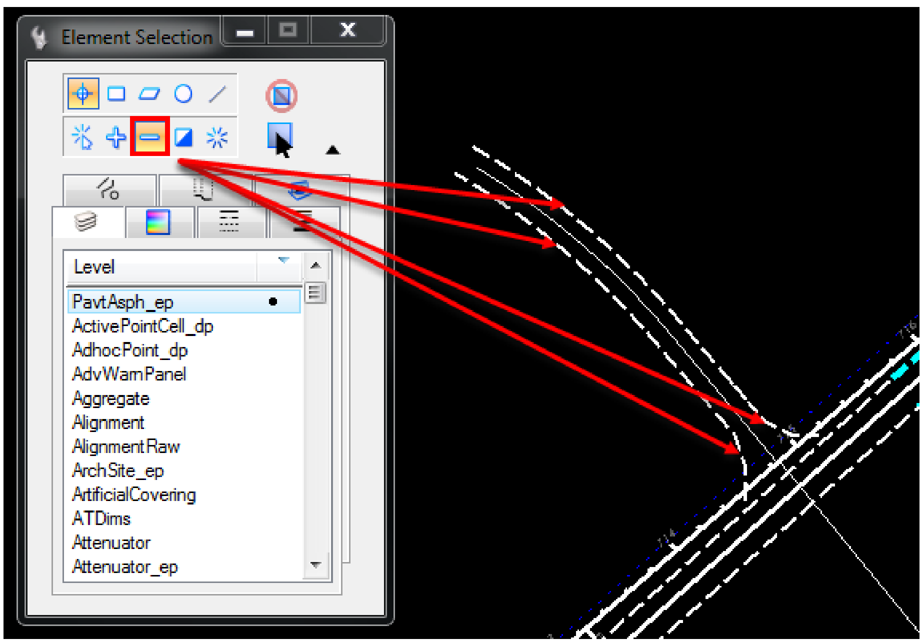
8. Create a *Selection Set* of the **PavtAsphalt_ep** by level.



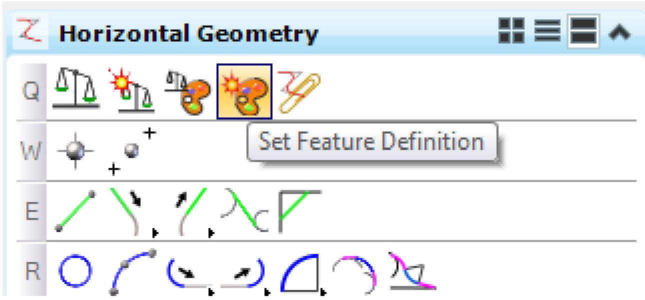
a. Subtract out of the *Selection Set* the **Intersection lines at SR61**; these will not be *PavementMilling(ML)* lines.



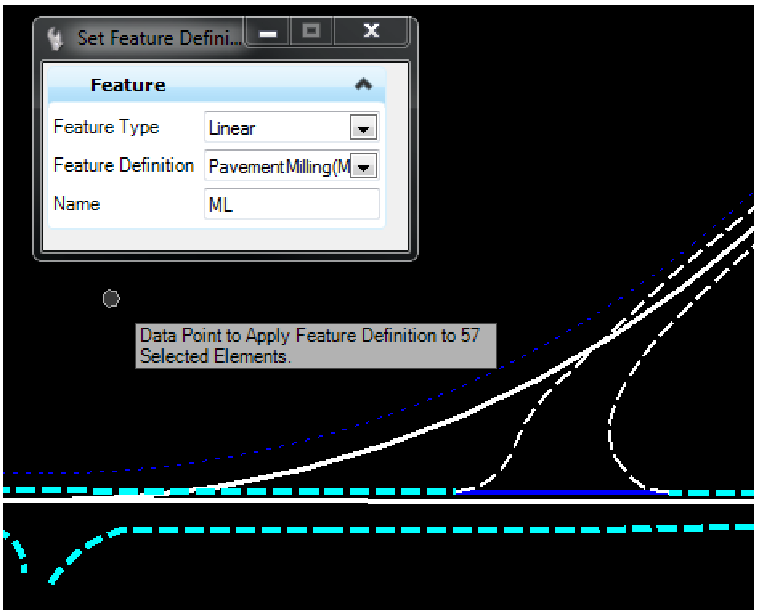
b. And also subtract out of the *Selection Set* the **Intersection lines at Friendship Road.**



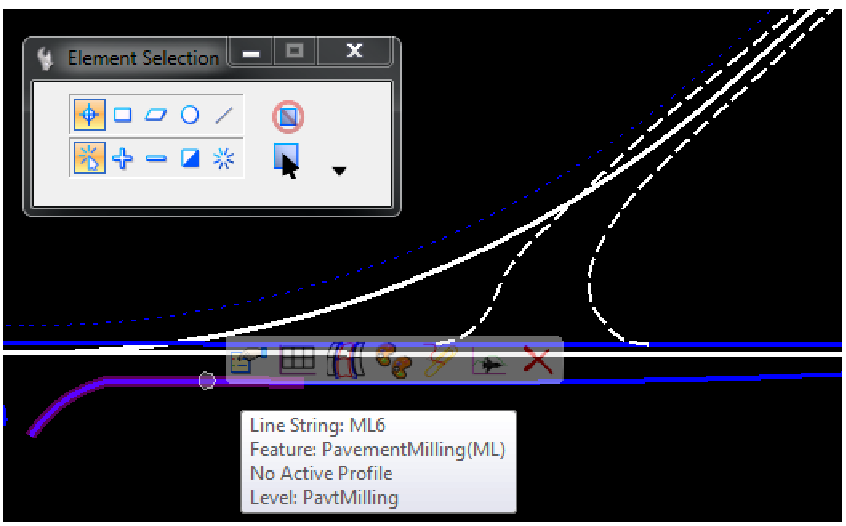
9. Use the *Horizontal Geometry*, **Set Feature Definition** tool.



10. **Data point** to change the elements to the *Feature Definition*, **PavementMilling(ML).**



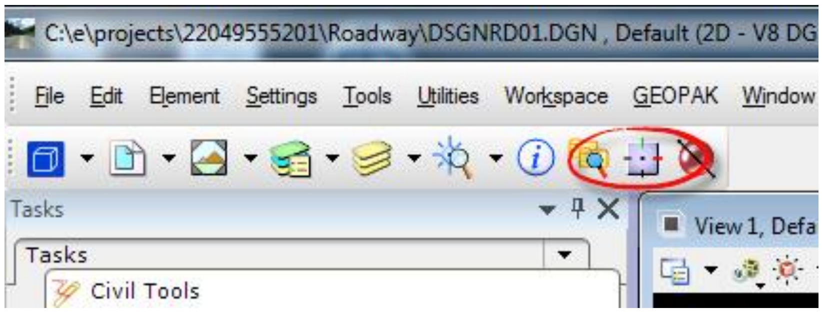
11. Change the *Selector* tool back to **New** and verify the *New Feature Definition* by hovering over a line until the Context Menu displays.



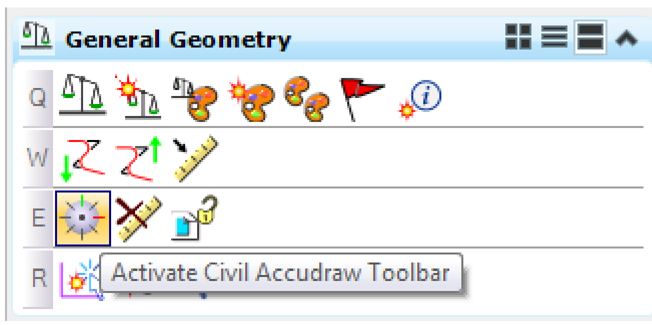
Exercise 3.3 BL98 Side Street

In this exercise Civil AccuDraw is used to help construct a side road centerline on BL98.

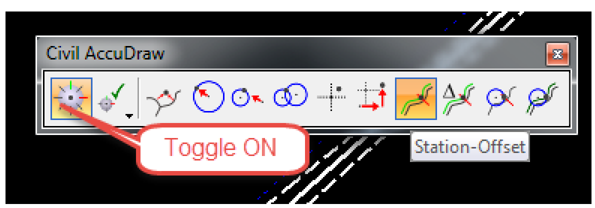
1. MicroStation AccuDraw and Civil AccuDraw should never be toggled **ON** at the same time because both use some of the same *Shortcut Key ins*. Toggle **OFF** the MicroStation AccuDraw.



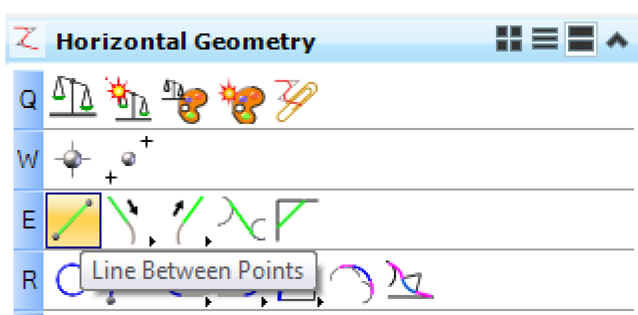
2. Use *General Geometry*, **Civil AccuDraw** tool to activate the Civil AccuDraw toolbar.



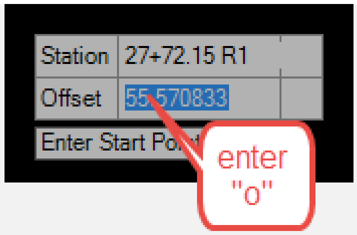
3. Click on the *Mode* **Station-Offset** to toggle **ON.**

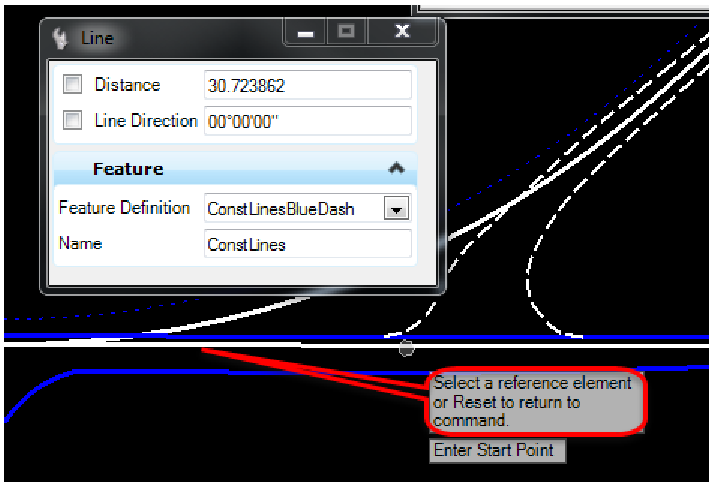


4. Use the *Horizontal Geometry*, **Line Between Points** tool to create a **ConstLineBlueDash** line perpendicular to the *BL98* at *Station* **39+00** for a *Length* of **80 feet** used as a side road centerline. Here are the steps to use Civil AccuDraw with the *Station Offset* option:

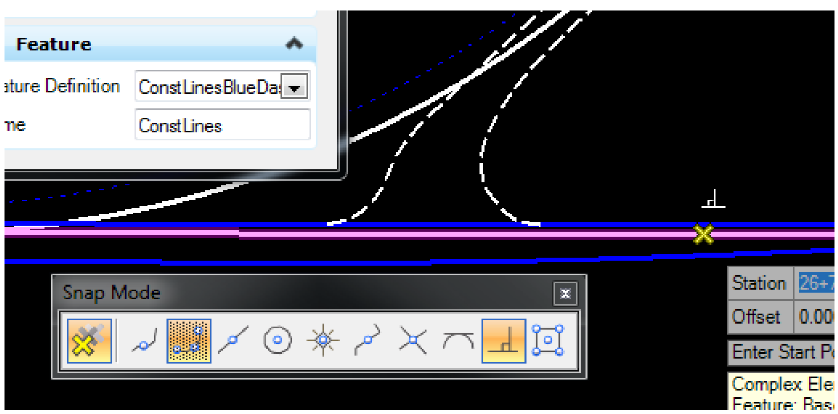


Important! *On the cursor prompt, tab to the offset field and use the Shortcut Key-in* ***o****, and select the reference line* ***BL98****. The cursor will now track the station and offset.*

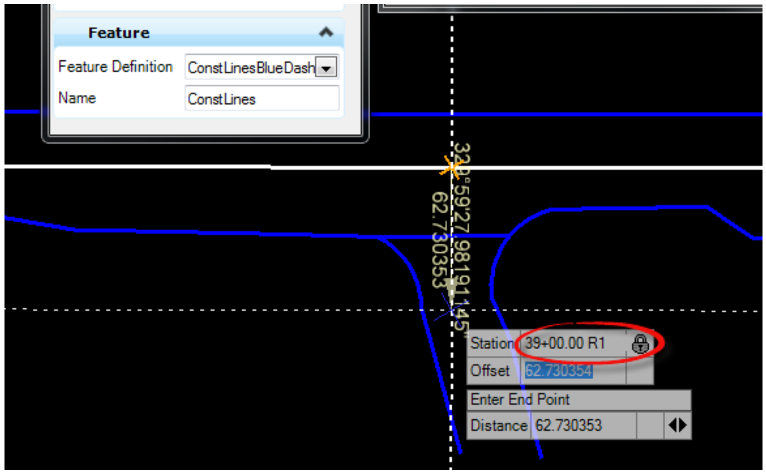




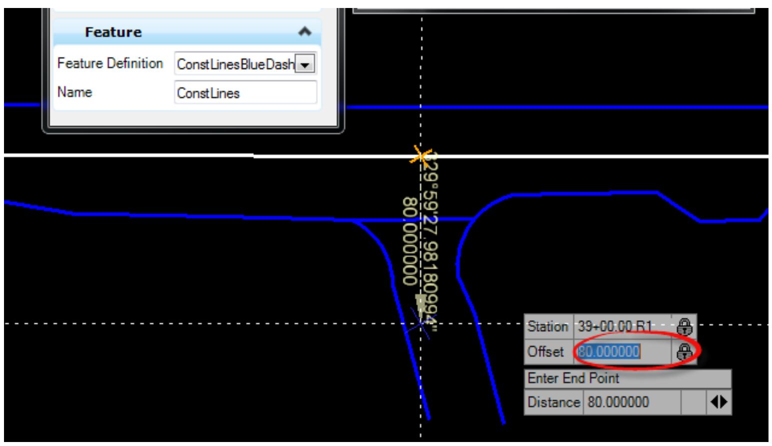
a. For the first data point, set the *Snap Locator* button to **Perpendicular**, and select on the **BL98.**



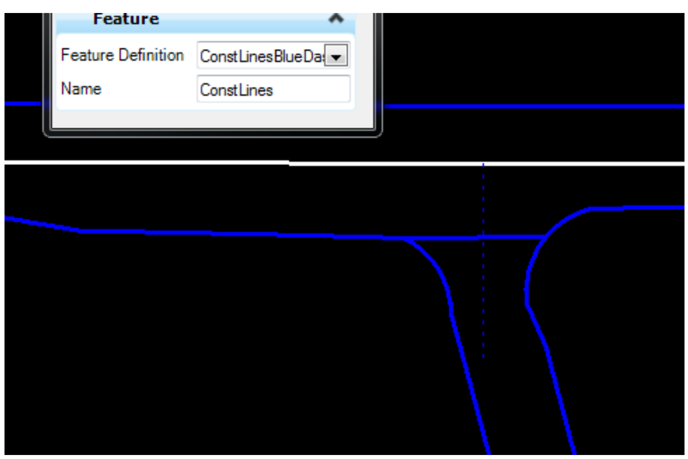
b. For the second point tab to the *Station* field in the AccuDraw Cursor Prompt dialog, enter *Station* value **39+00**, select **Enter** to lock in on the station.



c. Tab to the *Offset* field in the AccuDraw Cursor Prompt dialog, Enter *Offset* value **80**, select **Enter** to lock.



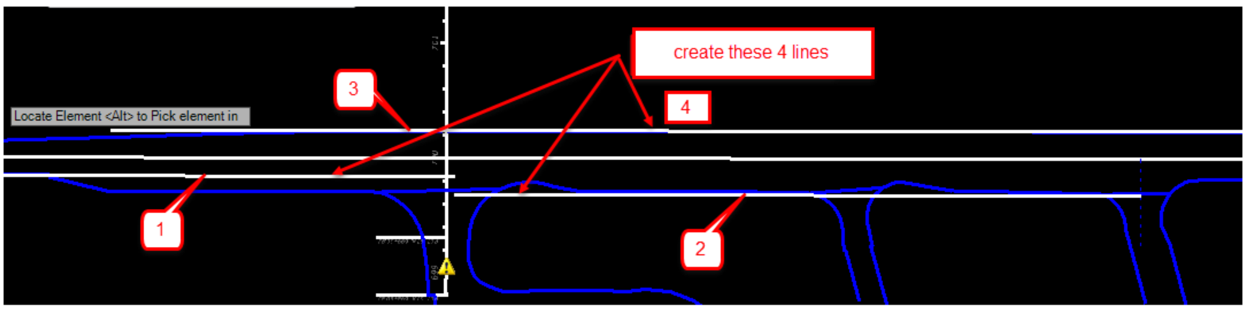
d. **Data point** in **View** to place the point.



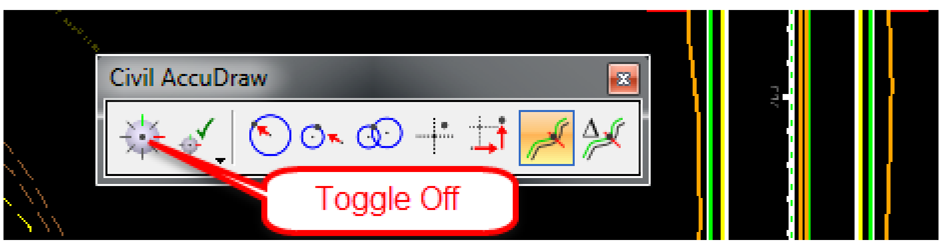
Exercise 3.4 BL98 Widening

In this exercise, the proposed Pavement Lines used for widening on BL98 are created at the following locations:

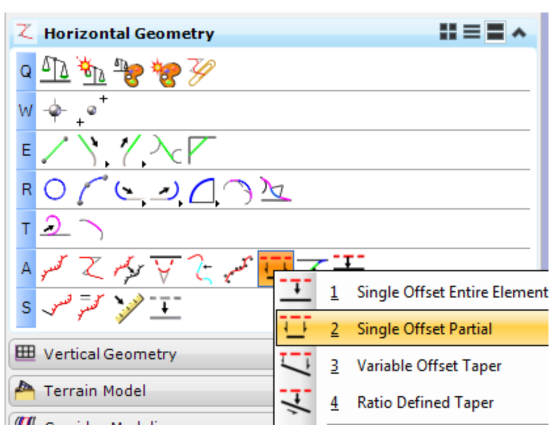
	START STATION	OFFSET	LENGTH
1	28+00	16 feet	500 feet
2	33+00	32 feet	600 feet
3	30+00	-24 feet	300 feet
4	33+00	-24 feet	1000 feet



1. Toggle **OFF** *Civil AccuDraw* tool.

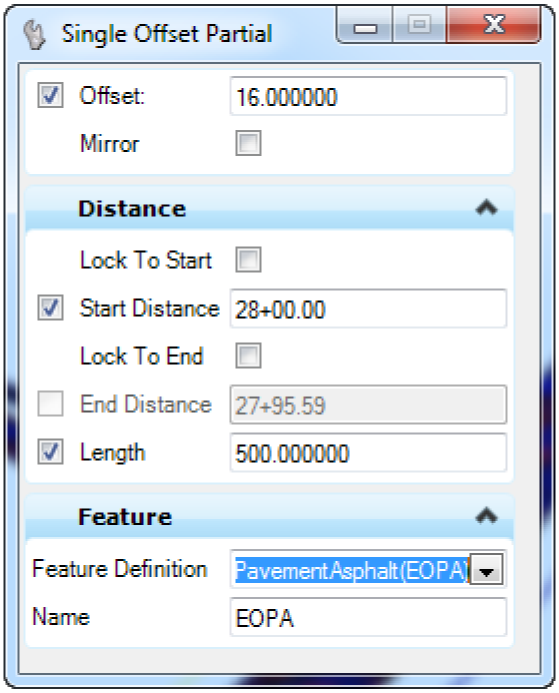


2. Use the *Horizontal Geometry*, **Single Offset Partial** tool.



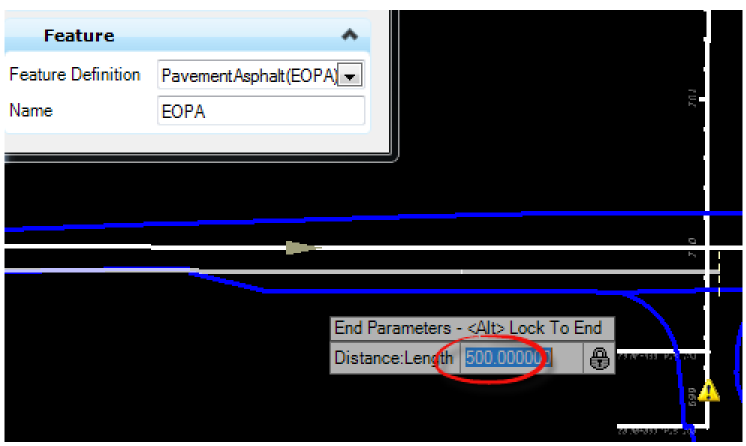
   a. Select the **BL98 line** at the prompt to *Locate Element.*

b. Fill in the Single Offset Partial dialog as shown below.



c. **Data point** in the **View** to accept the *Offset*.

d. **Data point** in the **View** to accept *Length*.



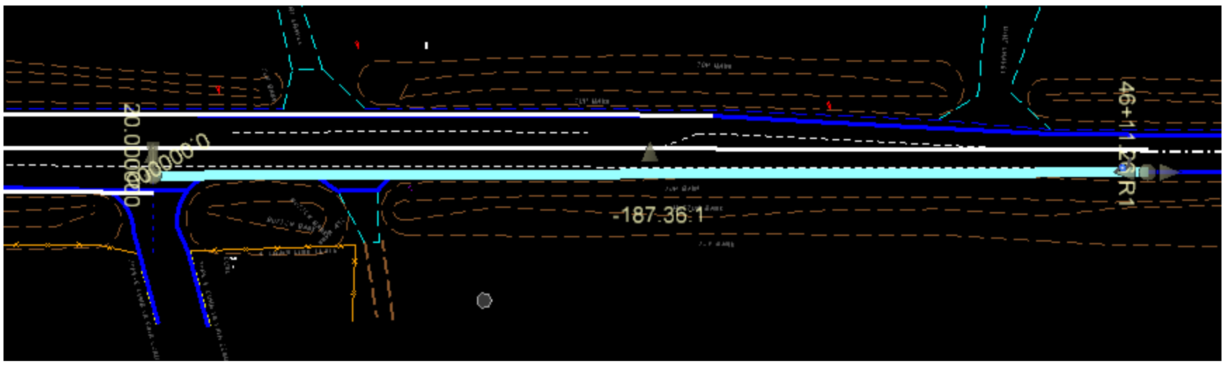
e. **Data Point** in the **View** to accept **No** at the *Mirror* option prompt.

3. Repeat this procedure for each of the **PavementAsphalt(EOPA)** widening lines diagram and table above.

Exercise 3.5 *BL98 Widening Taper Line*

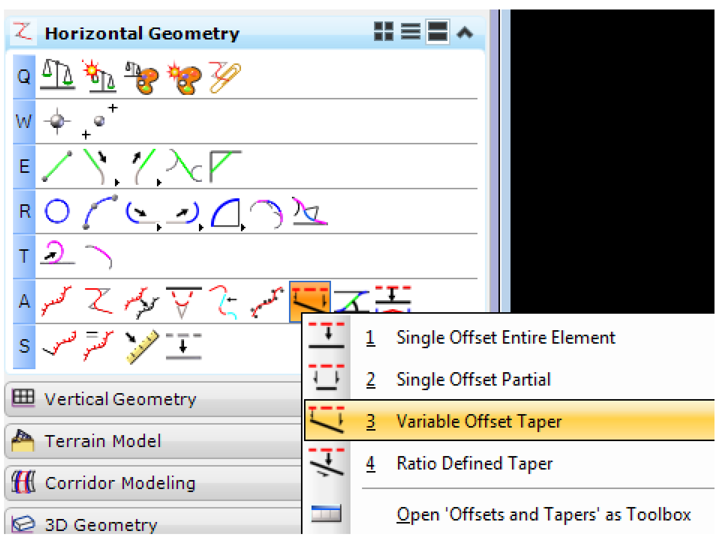
In This exercise a tapered Pavement Asphalt (EOPA) line off BL98 is created at the following location. Select **Alt** to enter the *End Station*.

START STATION	START OFFSET	END STATION	END OFFSET
39+00	20 feet	Alt to end Station Lock	Snap Nearest



HINT Toggle On the Civil AccuDraw.

1. Use the *Horizontal Geometry*, **Variable Offset Taper** tool.

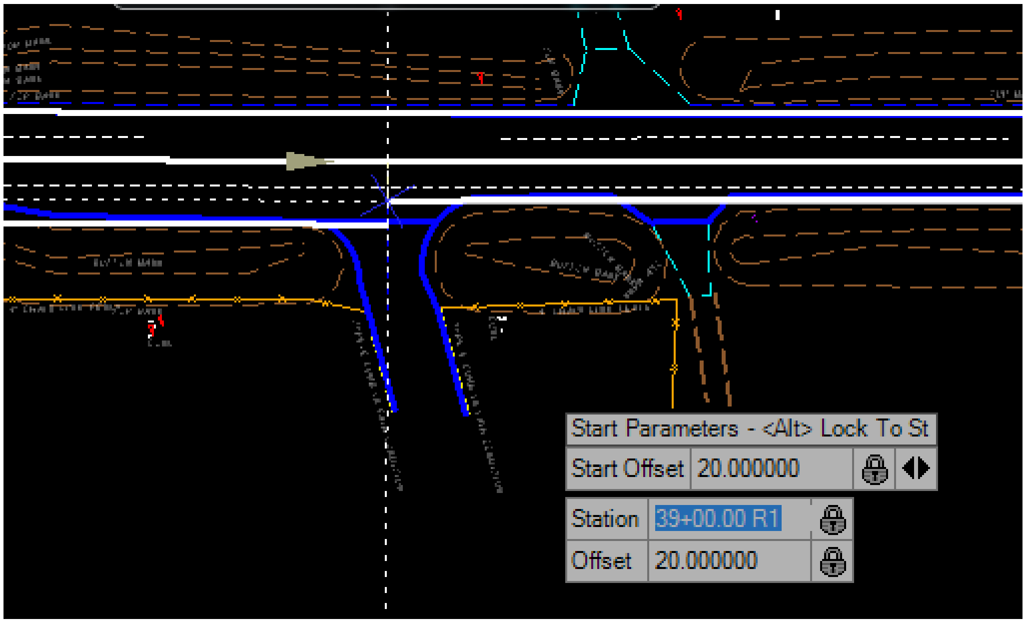


2. Select the **BL98** element to *offset* from.

3. Enter the *Station* at **39+00** and select **Enter** to lock the value.

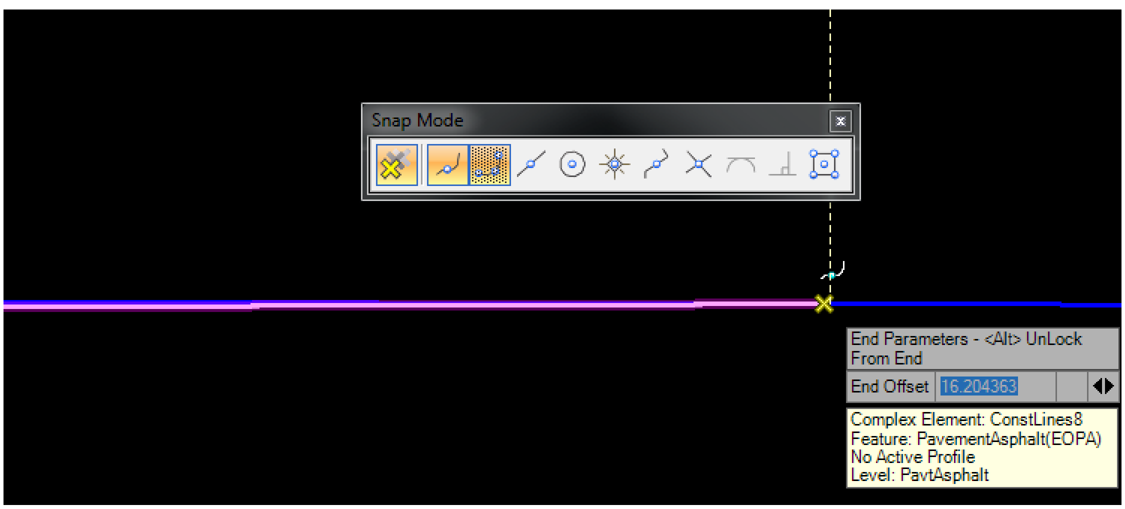
4. Tab to the *Offset*, enter **20** and select **Enter** to lock the value.

5. **Data Point** in the View to set the first point.



6. Select **Alt** key to lock the *End Station* value.

7. Set the *AccuSnap tool* to **Nearest**, hover over the right **PavmentMilling(ML)** until the *Snap Mode* displays.

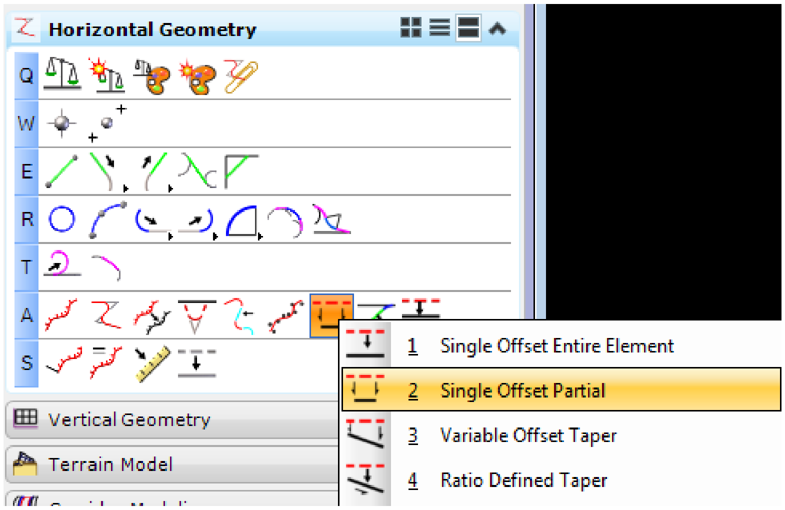


8. **Data Point** to place the second point and complete the command.

Exercise 3.6 For SR61 New Construction Template Lines

First, it is necessary to create a Template Limits line for the Project Typical PPM Civil Cell. This is a Construction type element which is used to define the Begin and End Station limits.

1. Use the *Horizontal Geometry*, **Single Offset Partial** tool.

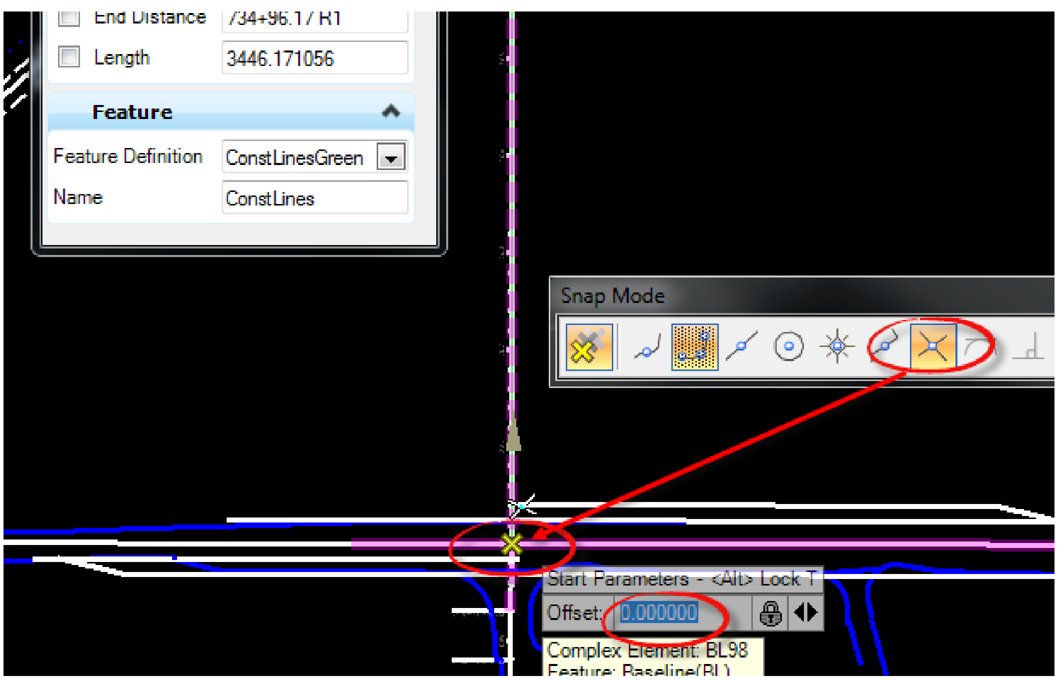


2. Create a *Feature line*, **ConstLinesGreen**.

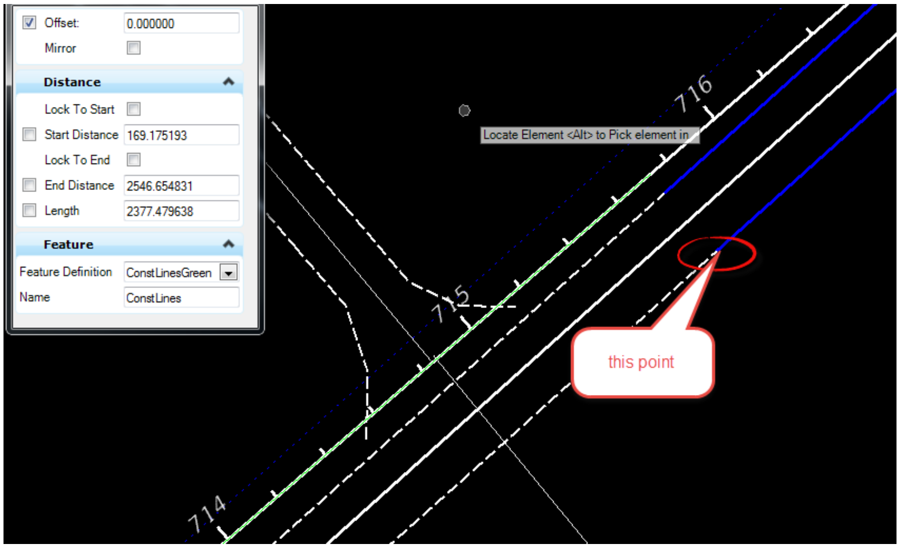
    a. Select the SR61 Centerline(CL).

    b. Set the Offset to 0.00.

    c. For the first point, set AccuSnap to Intersection and select the intersection of SR61 and BL98.

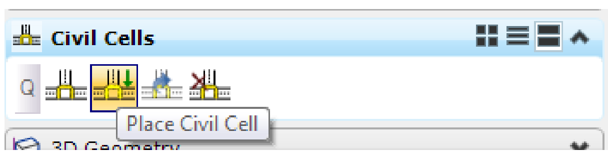


d. For the second point, zoom out to the first *intersection* after the end of the *SR61* curve and snap to the right **PavementMilling(ML)** of existing SR61 <OR> Key in *Station* **716+50**.

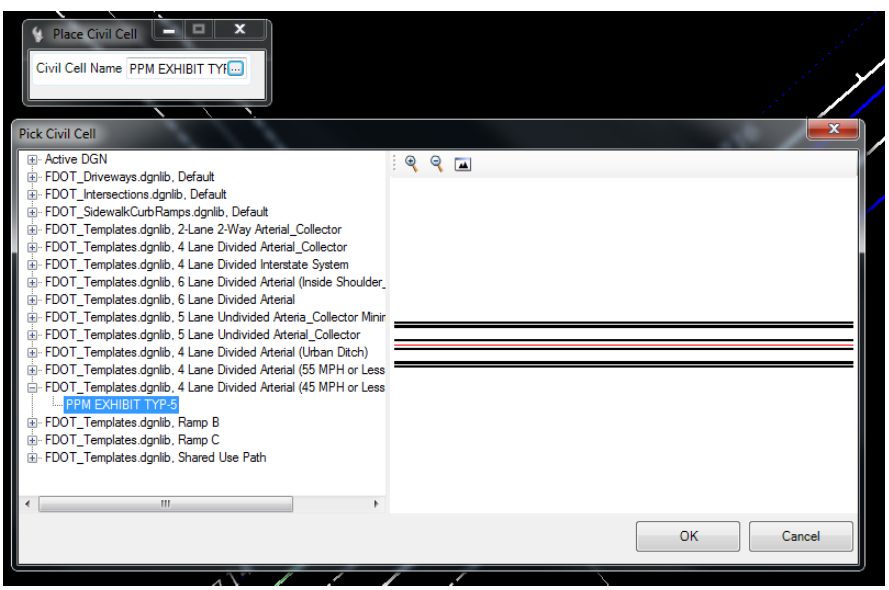


Hint Use Intersect Snap and to place first point and Key Point snap for the second point.

3. Use *Civil Cells* task, **Place Civil Cell** tool.



a. Navigate to the FDOT_Templates.dgnlib, 4 Lane Divided Arterial(45 MPH or Less) and select **PPMEXHIBIT TYP5.**



b. Click **OK** and follow the prompts to complete the *Place Civil Cell* command.

c. Locate *Reference Element*, select the **GreenConstLine.**

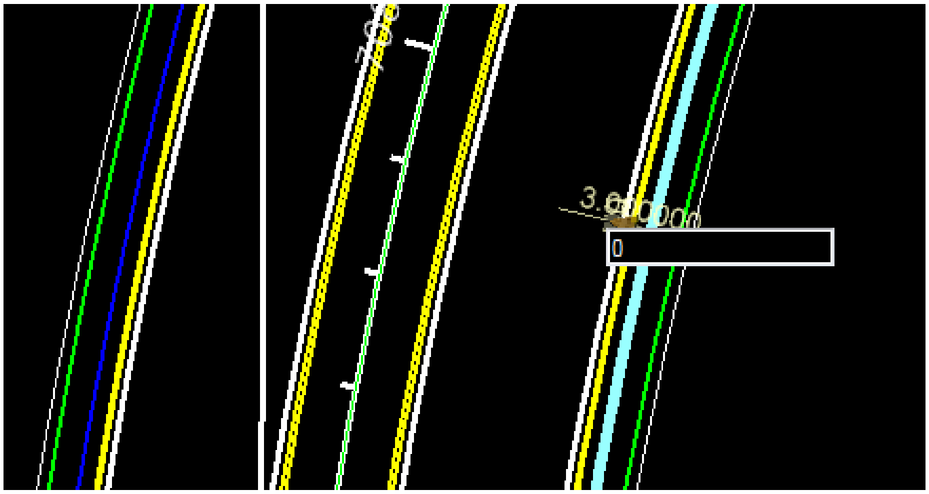
HINT Use the tab key to after clicking on an element to get to the last place GreenConstLine.

d. **Reset** to Skip View Alternates.

e. Data point to accept Civil Cell Placement.

4. Change the Front Sidewalk Utility Strip Width to **0ft** and the Sidewalk Width to **6ft**,

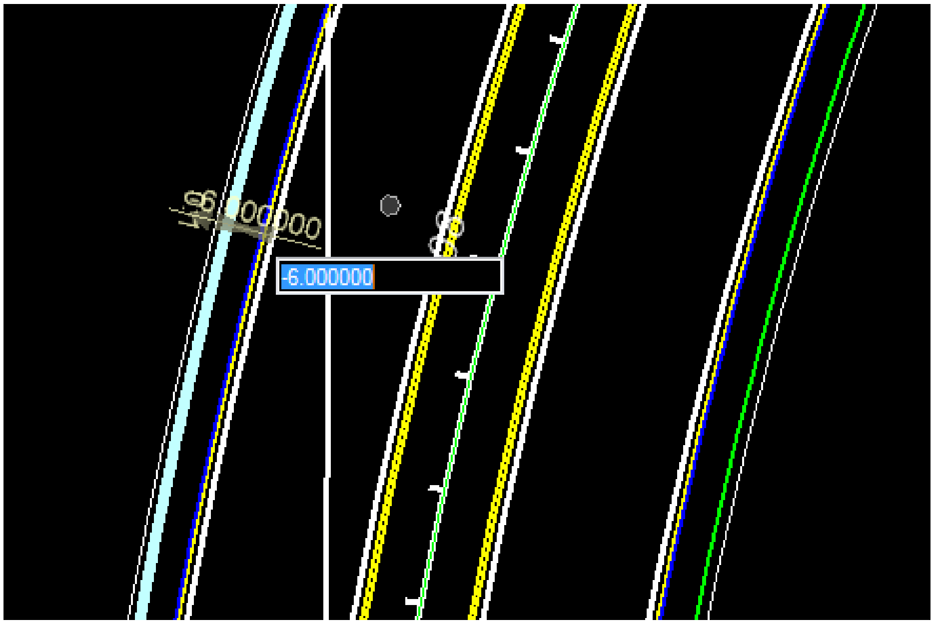
   a. Select the **SidewalkFront** *Feature* and zoom to find the Context Menu near the middle of the element.



   b. Change the *SidewalkFront Dimension* from **3** to **0**.

   c. Change the *SidewalkBack* from **5** to **6**.

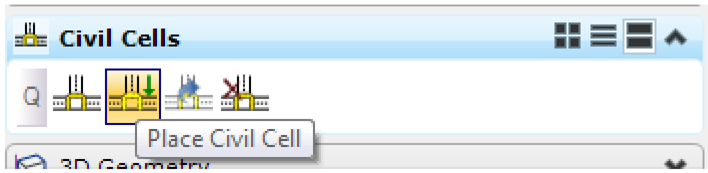
   d. Repeat this for *both sides* of the roadway.



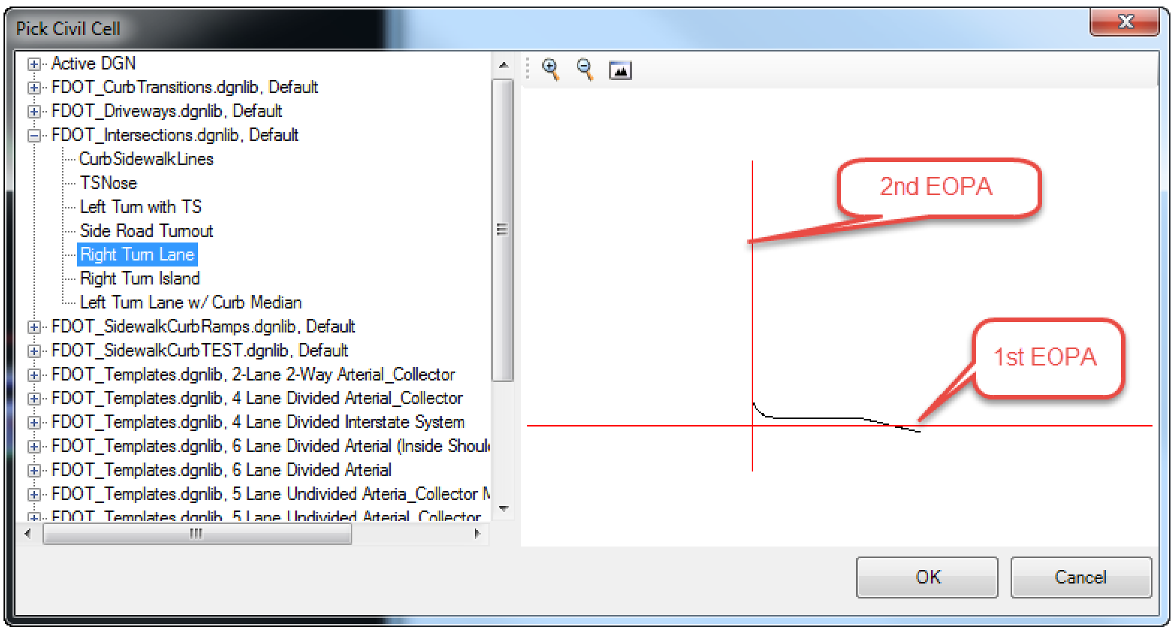
Exercise 3.7 *Add Right Turn Lane on BL98*

This exercise uses Civil Cells to add a right turn lane to the BL98.

1. Use *Civil Cells*, **Place Civil Cell** tool**.**



2. From the Place Civil Cell dialog, navigate to the *FDOT _Intersections.dgnlib* and select **Right Turn Lane.**

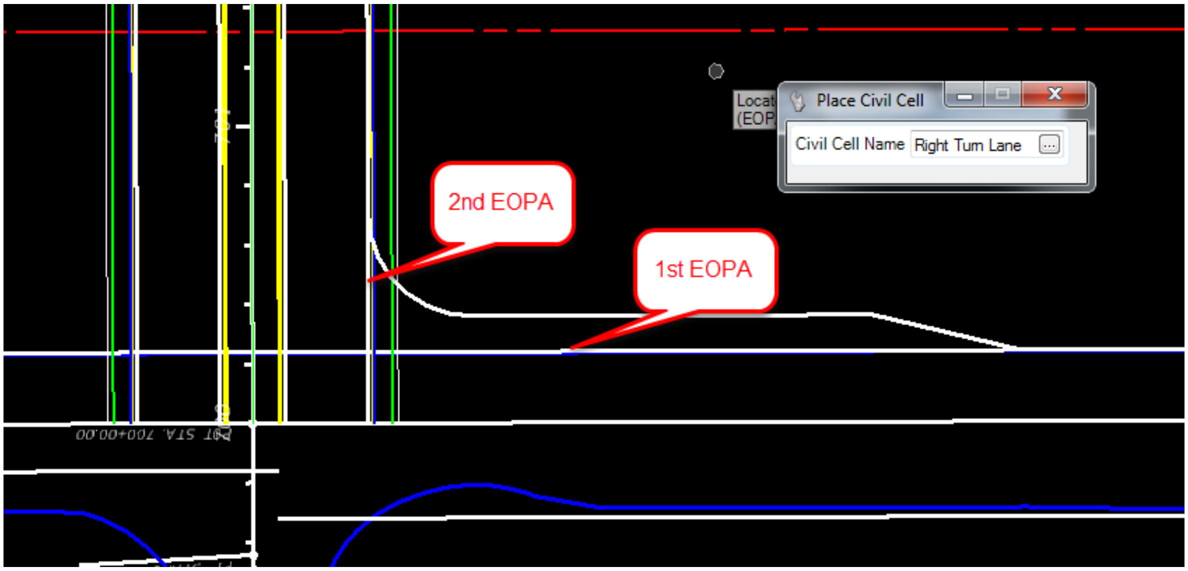


3. At the prompt, for the first *Reference*, select the **widening PavementAshaplt(EOP)** line.

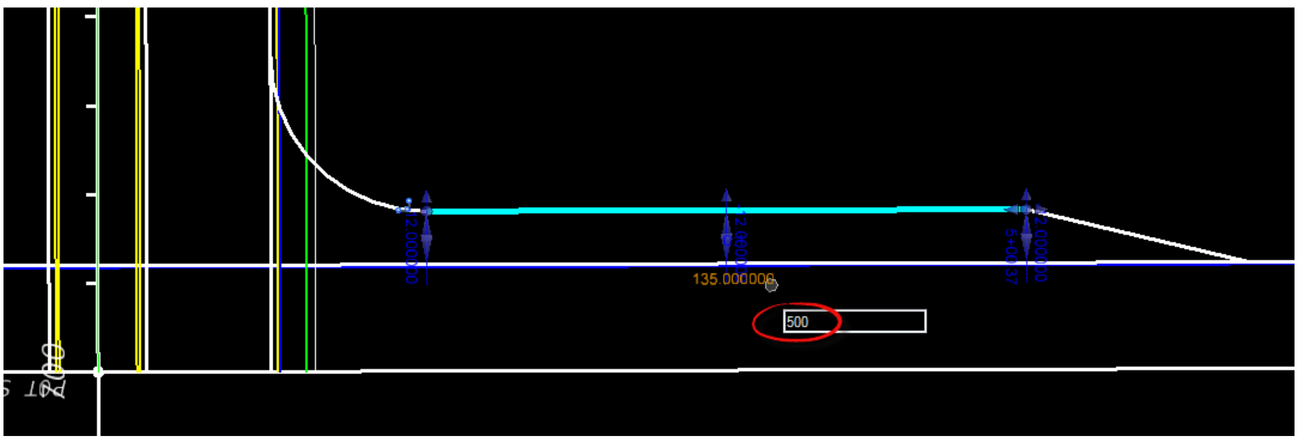
4. For the second *Reference*, select the **SR61 Right EOP Out PavementAshaplt(EOP).**

5. Reset to Skip Elements to View Alternatives.

6. **Data point** to accept *Civil Cell Placement*. The right turn lane is added.



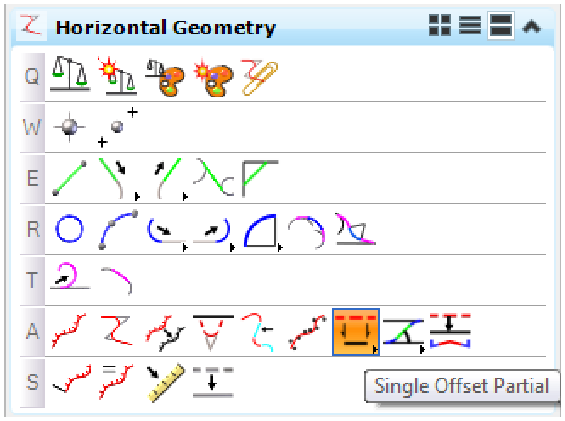
7. Edit the storage length for first *Right Turn Lane* placed, select the **tangent line** and change the *Length* from **135** to **500 feet**.



8. Use MicroStation *Trim to Intersection* to correct the PavementAsphalt(EOPA) lines.

Exercise 3.8 Add the School Entrance Right Turn Lane off BL98 Intersection

1. Use the *Horizontal Geometry*, **Single Offset Partial** tool**.**

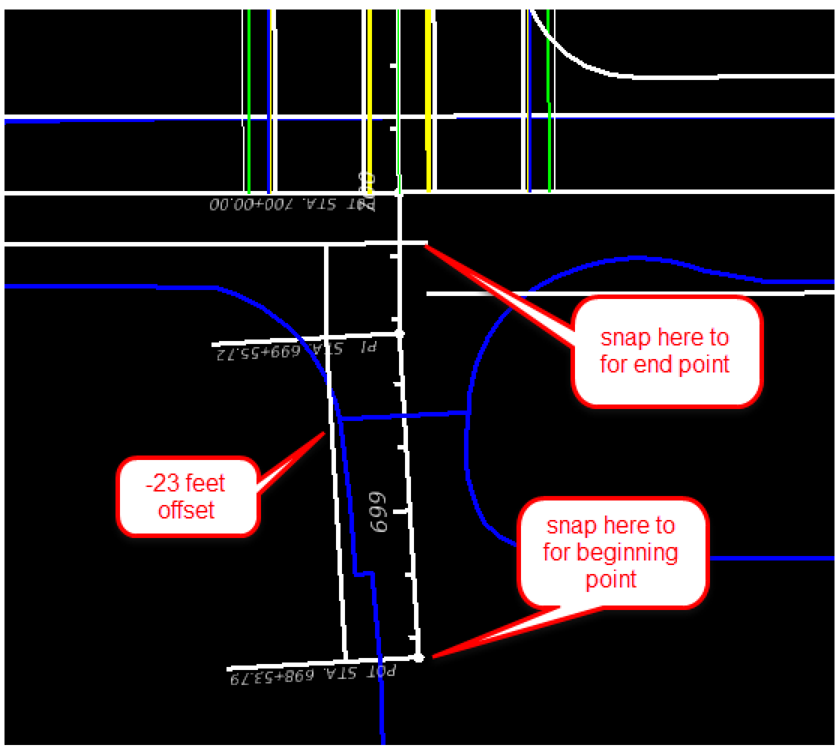


2. Create the side road **PavementAsphalt(EOPA)** opposite *SR61* left *offset* -**23 feet**.

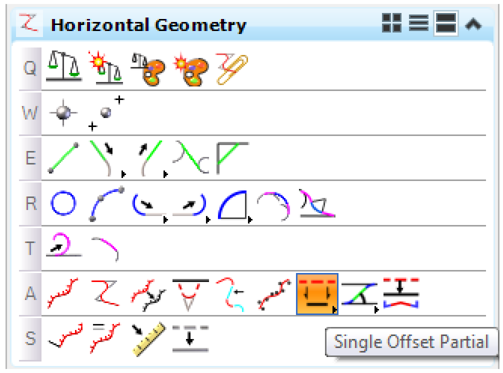
   a. For the *beginning*, snap to beginning of **SR61**.

   b. For the *end*, snap to the BL98 widening line end point at **SR61**.

   c. Uncheck *Mirror* to set to **No**.



3. For the opposite side, use the *Horizontal Geometry*, **Single Offset Partial** tool.



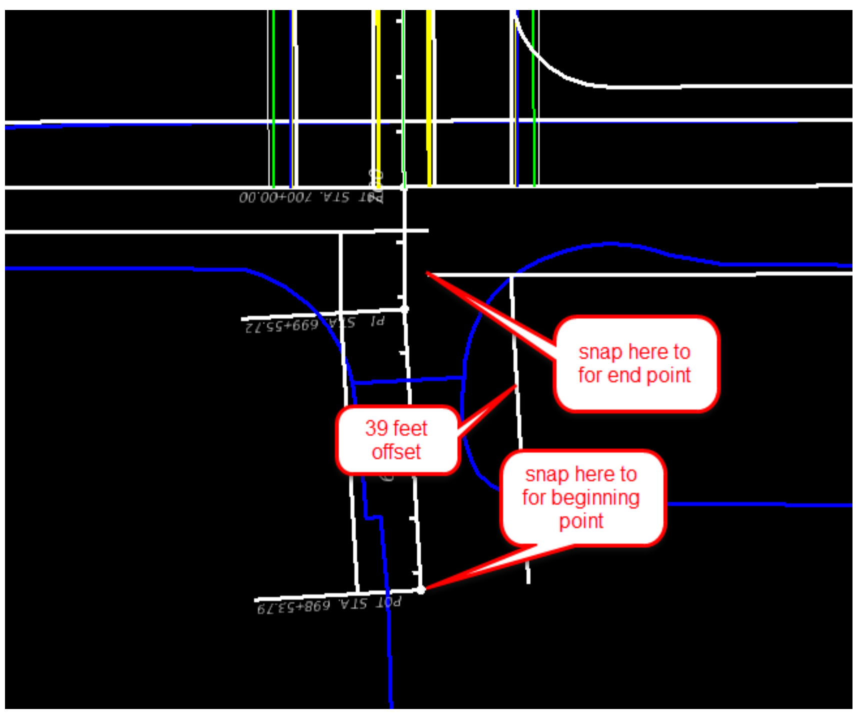
4. Create the side road **PavementAsphalt(EOPA)** opposite *SR61 Left Offset* **39 feet**.

    a. For the *beginning*, snap to beginning of **SR61**.

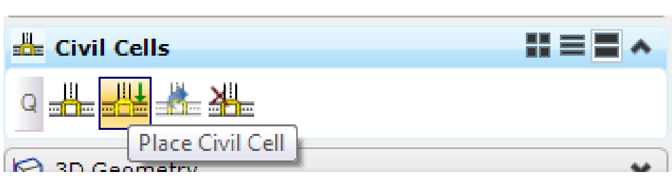
    b. For the *end*, snap to the BL98 widening line end point at SR61.

    c. Uncheck *Mirror* to set to **No**.

HINT If necessary, Let the tool place the line on the opposite side and edit it after it is placed

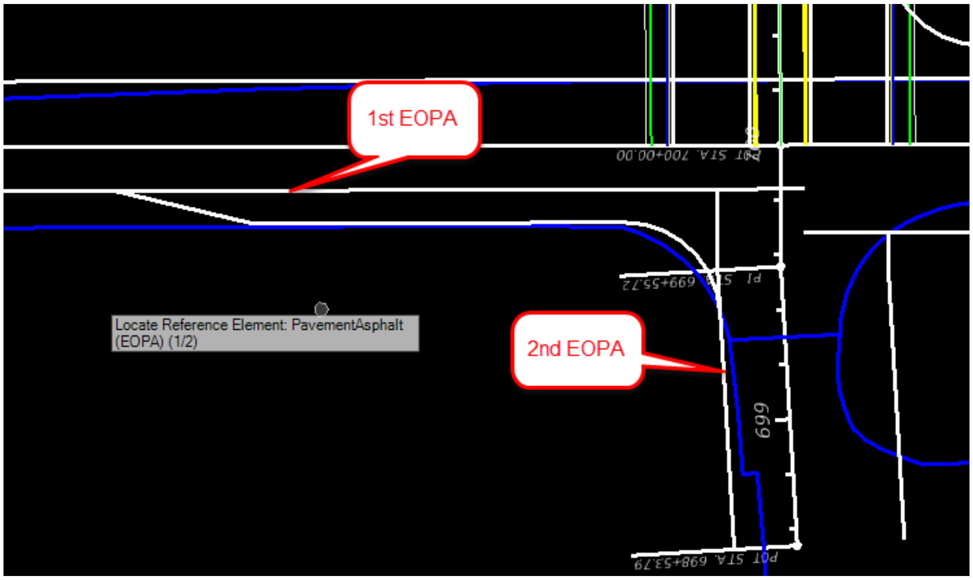


5. Add another **Right Turn Lane** Civil Cell on the opposite side of the intersection.



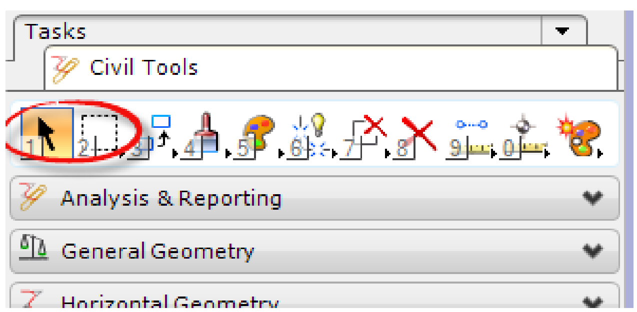
a. At the prompt, for the first *Reference*, select the **widening PavementAshaplt(EOPA)** line.

b. For the second *Reference*, select the **intersection PavementAshaplt(EOPA)** line.

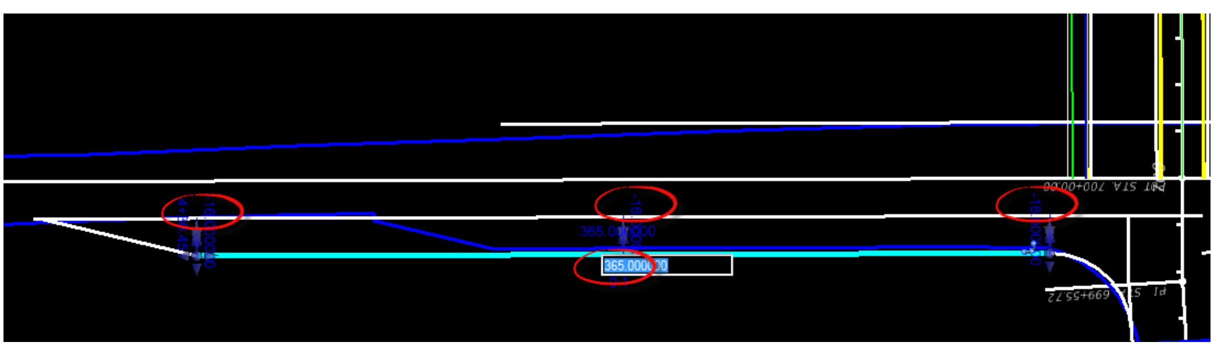


c. **Data point** to accept **Civil Cell Placement.** The Right Turn Lane is added.

6. Click on the Select Tool Set icon to exit the Place Civil Cell command <OR> F6 Function Key.

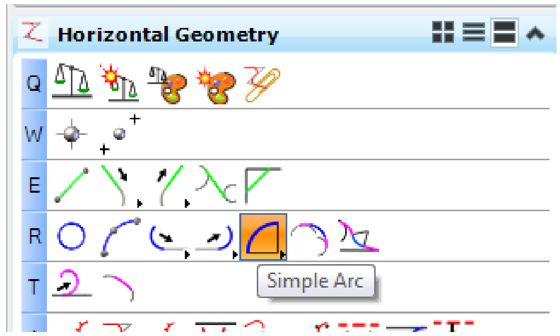


7. Edit the storage length for the second Right Turn Lane placed, select the tangent line and change the Length from 135 to 365 feet. Change the lane width to -16 feet.



Exercise 3.9 Create/Edit the Intersection Curve Radii

1. Use the *Horizontal Geometry*, **Simple Arc** tool.

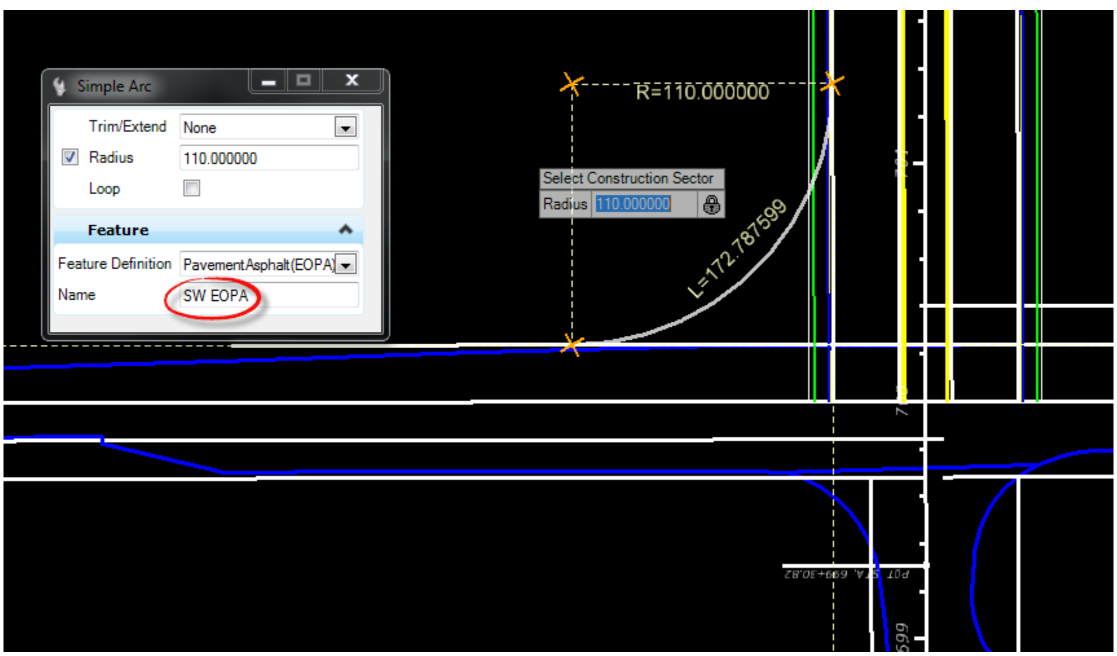


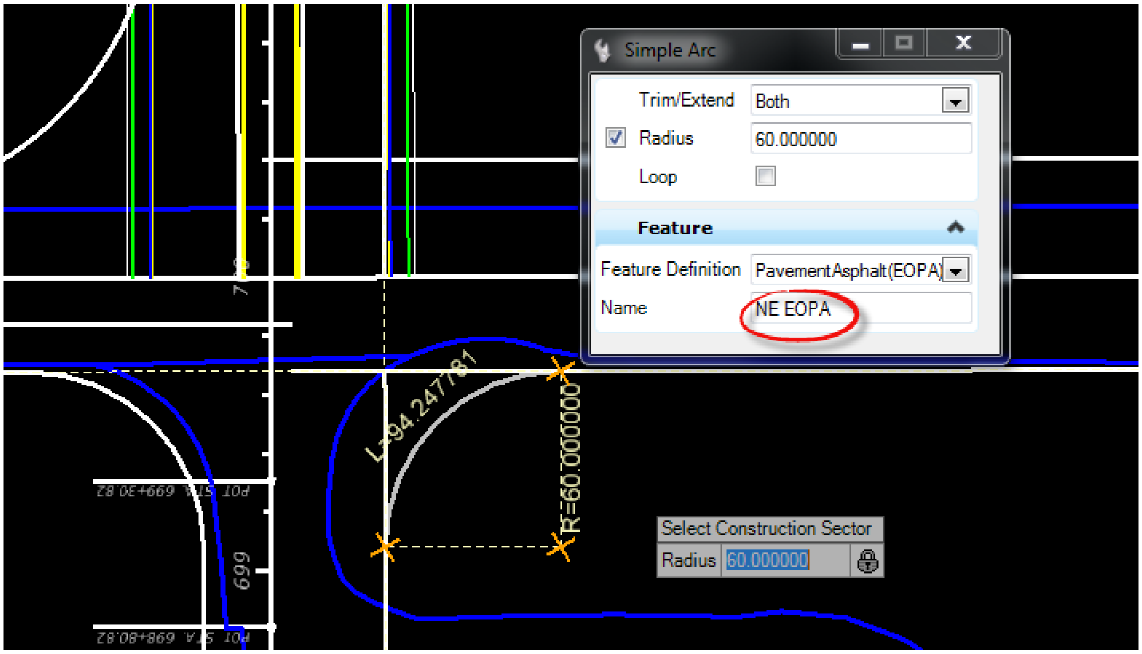
2. Create/Edit the **Curve** returns.

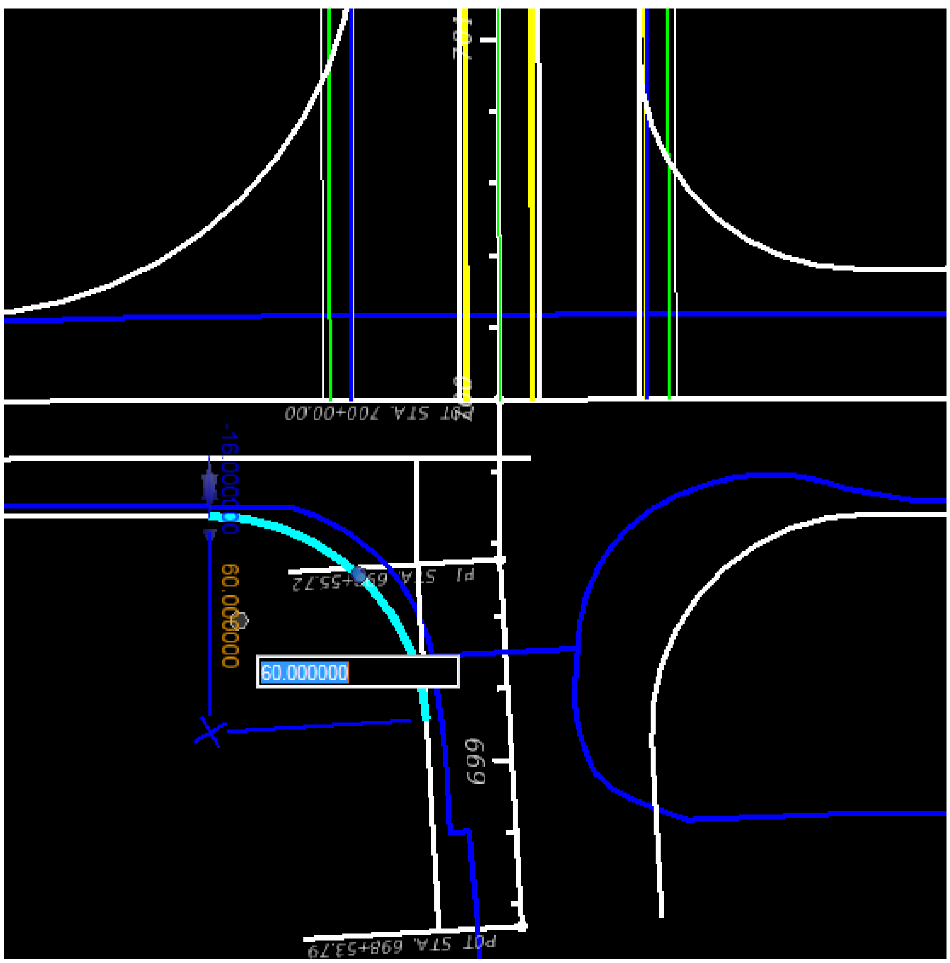
3. Select *Feature Definition*, **PavementAsphalt(EOPA)** to place remaining curve radii.

4. Follow the cursor prompt to select the two Roadway **PavementAsphalt(EOPA)** *reference lines*.

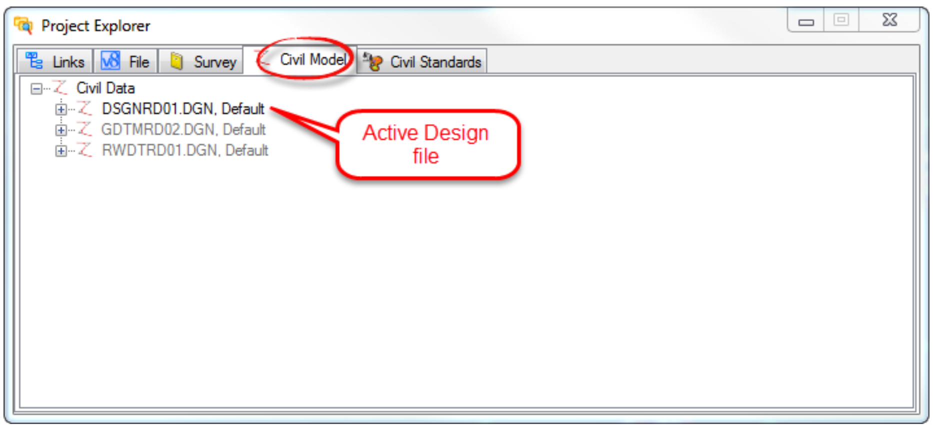
HINT Select the two PavementAsphalt(EOPA) in each quadrant. Use the value shown and trim both for each of the following quadrants: Southwest 110 feet,
Southeast 60 feet,
Northeast 60 feet,
Northwest 60 feet



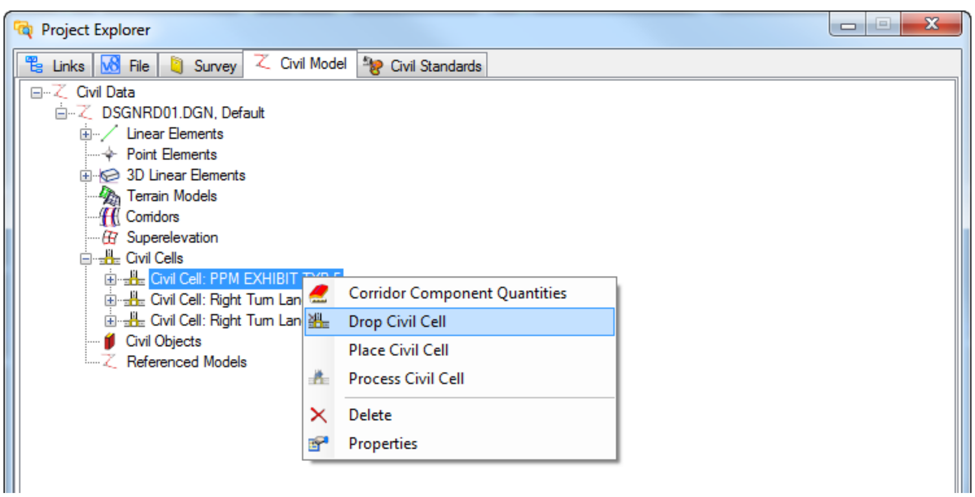

Simple Arc
Trim/Extend
Both
Radius
60.000000
Loop
Feature
Feature Definition
PavementAsphalt(EOPA)
Name
NE EOPA
L=94.247781
R=60.000000
Select Construction Sector
Radius
60.000000


60.000000
60.000000

5. Select **F11** to open the *Project Explorer* menu options; change the tab to **Civil Model**.



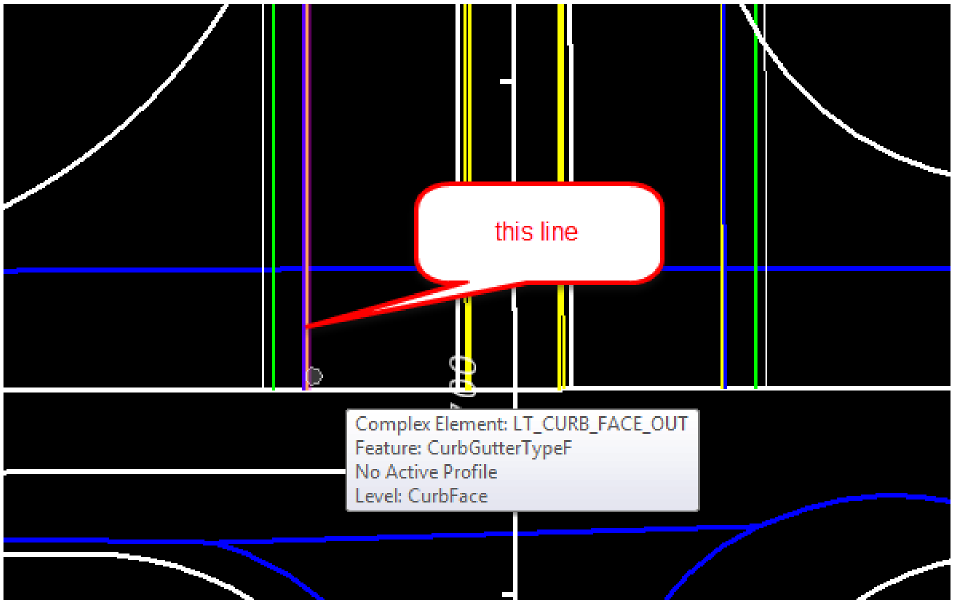
6. Navigate to the *Civil Cells* listed in the active design file, right click on *each* and select **Drop Civil Cell**. This allows for editing the Civil Geometry elements individually in future exercises.



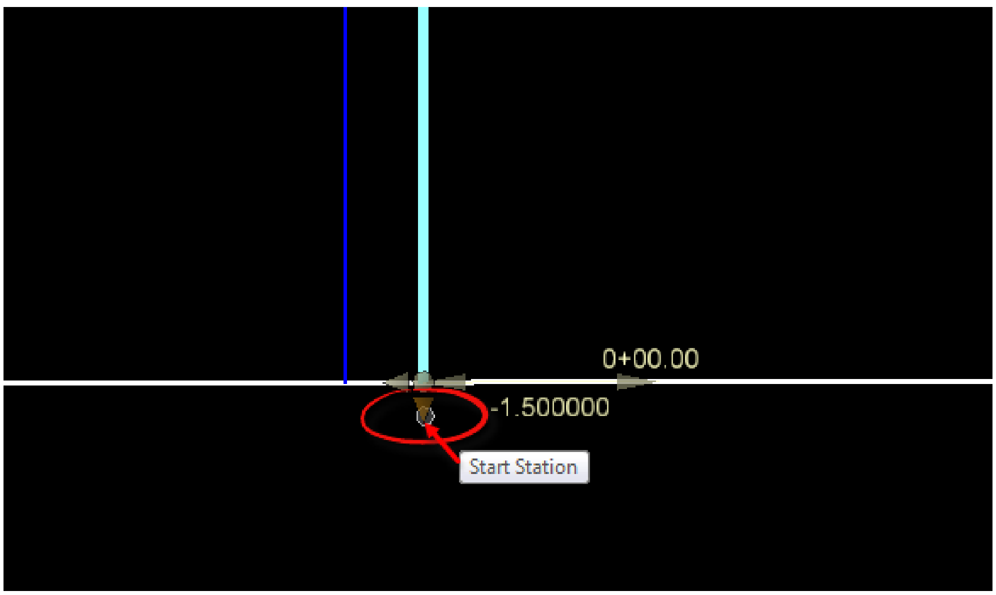
Exercise 3.10 Trim Back Sidewalk and Curb Lines to the Curve Radii

This exercise takes advantage of design intent to modify the curb and sidewalk lines off SR61 to the new curve radius end point.

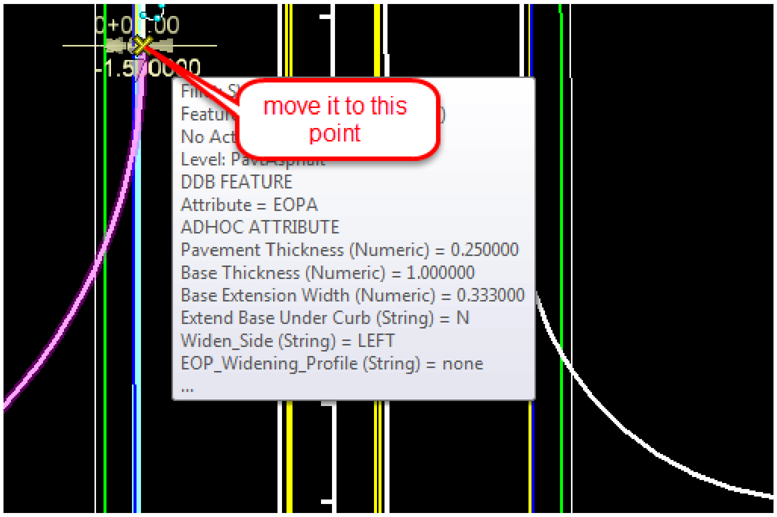
1. Select the **LT_CURB_FACE_OUT** line.



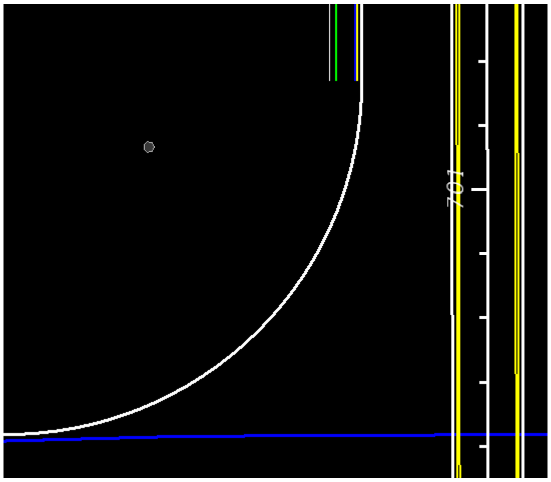
2. When the *Context Manipulators* display, zoom into the beginning point and select the **Start Station** *handle* OR the *Station* value to move the end.



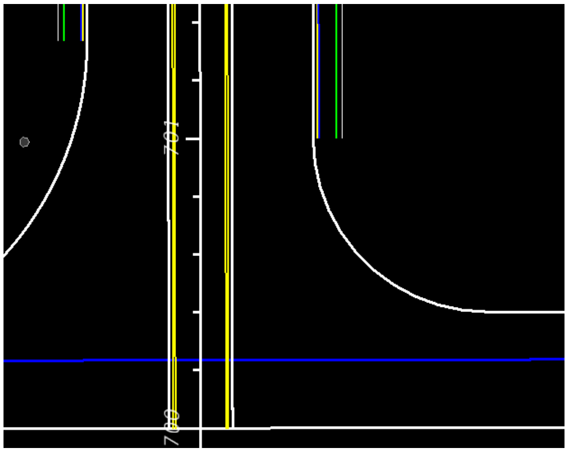
3. Drag the handle while zooming out and select the **End Radius** point to move the point.



4. Notice the results. The curb and sidewalk move as one because of the built in design intent relationship.

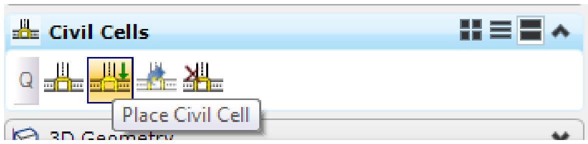


5. Repeat these steps to move the **RT_CURB_FACE_OUT** line back to the *curve radius* on the right Roadway.

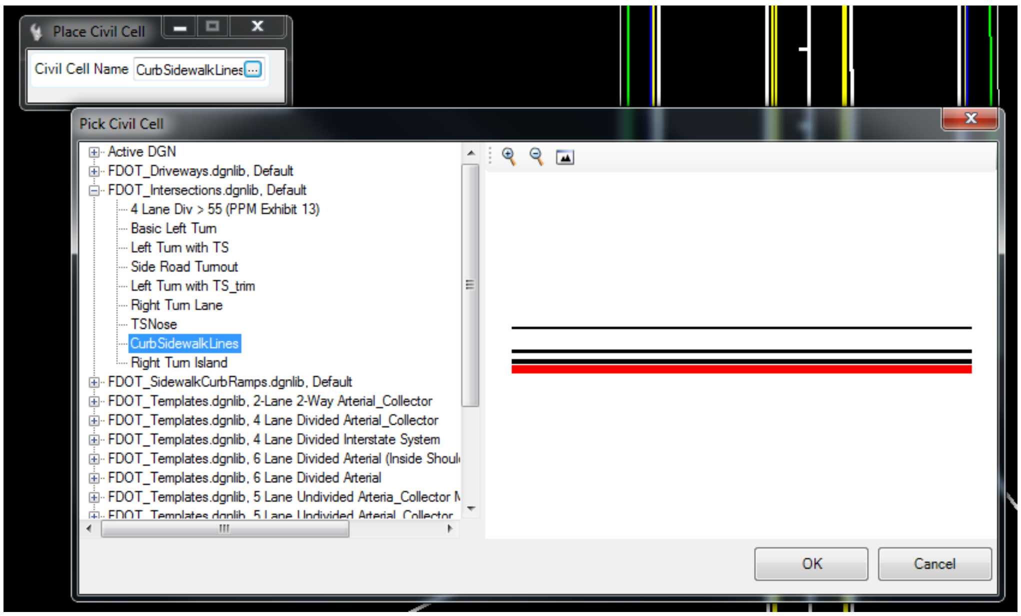


Exercise 3.11 Use Civil Cell Technology to Place Curb and Sidewalk Around the Radii

1. Select *Civil Cells*, **Place Civil Cell** tool.

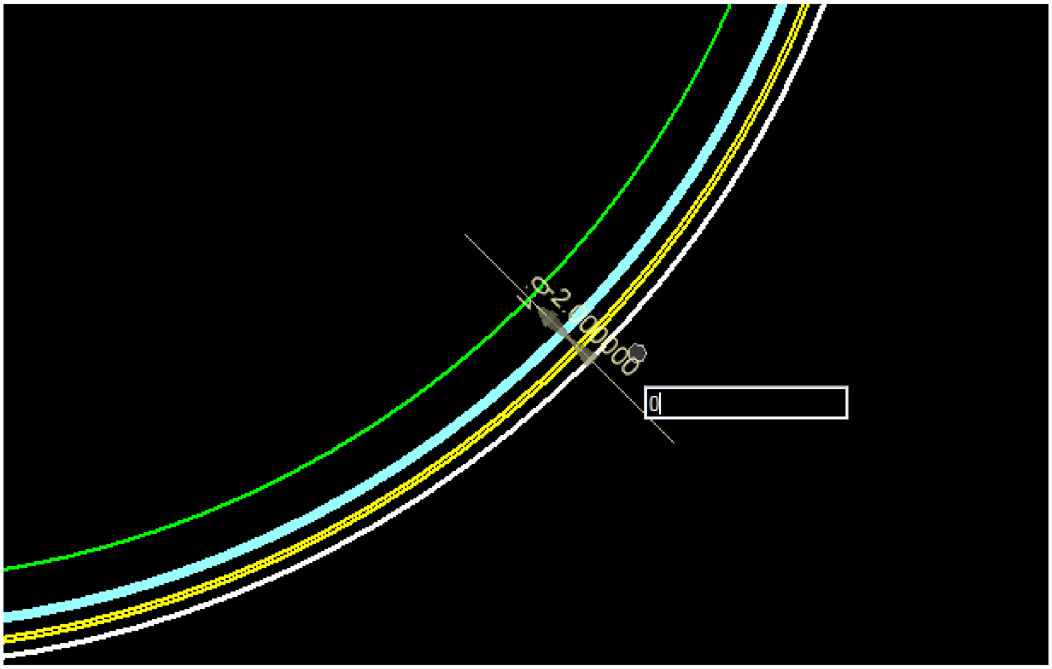


2. Navigate to the *FDOT _Intersections.dgnlib* and select the **CurbSidewalkLines** *civil cell*.

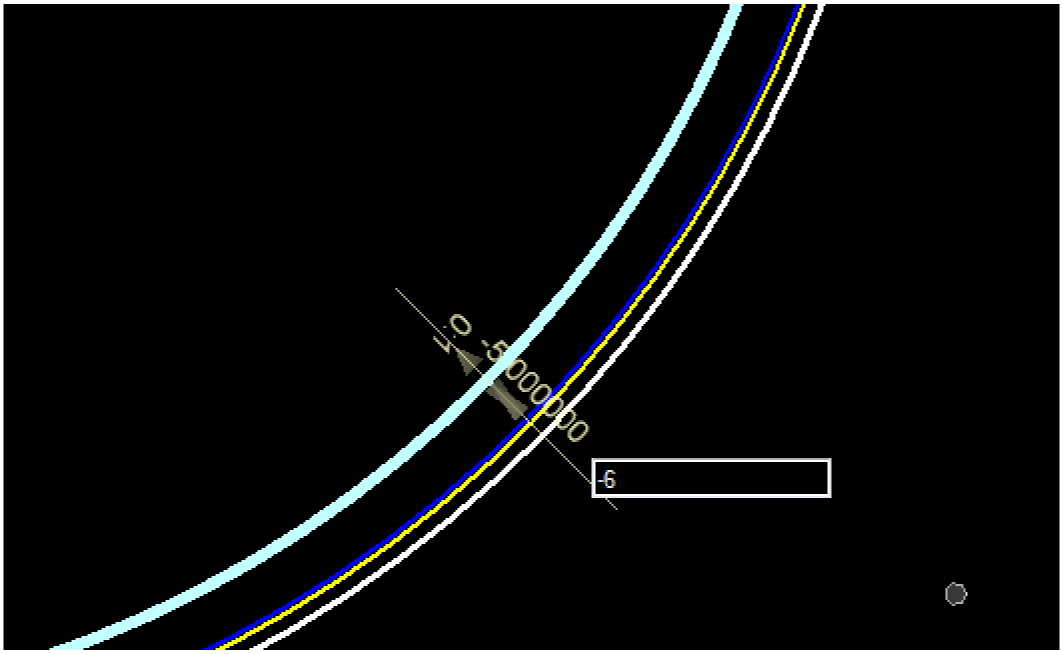


3. At the prompt, select the **SW EOPA** *radius line*, reset to **View Alternates** and then data point to accept the **Civil Cell Placement**.

4. Edit the *SidewalkFront* to be **0 feet** from the **CurbBack** line at the middle of the element.

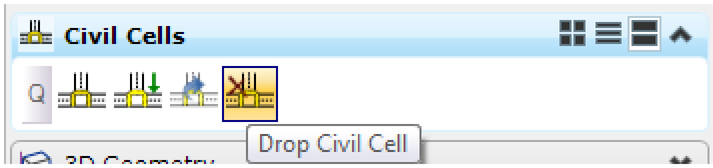


5. Edit the *SidewalkBack* line to be **6 feet** from the **SidewalkFront** line of the element.



Exercise 3.12 Create a Custom Civil Cell for Other Radii

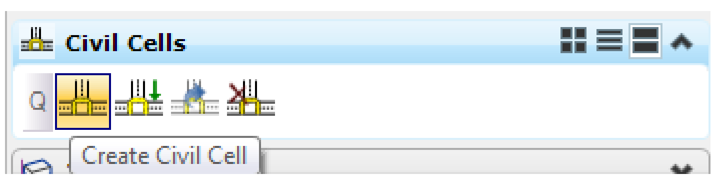
1. Select *Civil Cells*, **Drop Civil Cell** tool.



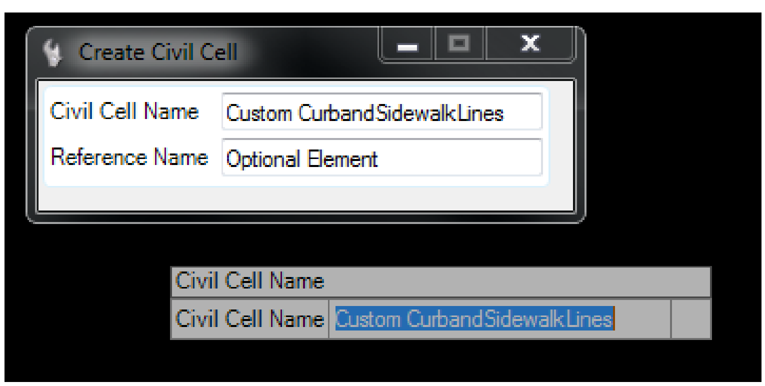
2. Select the **CurbSidewalkLines** *Civil Cell* in the *View* and data point to drop the Civil Cell.

HINT Move the cursor over the curb or sidewalk lines to see it highlight

3. Use *Civil Cells*, **Create Civil Cell** tool.

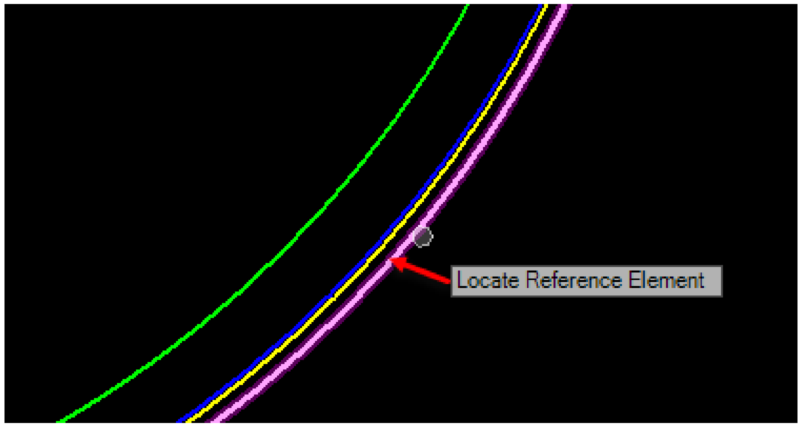


   a. Enter the *Civil Cell Name*: **Custom CurbandSidewalkLines**.



   b. Data point to accept the new *Name*.

c. At the prompt, locate *Reference Element* and select the **SW EOPA** line.

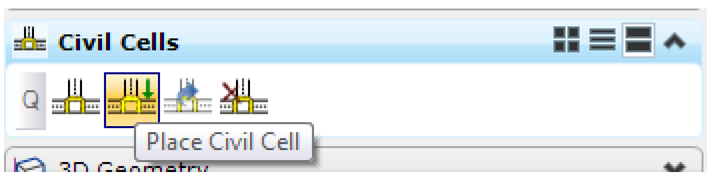


d. Reset to Locate Reference Element.

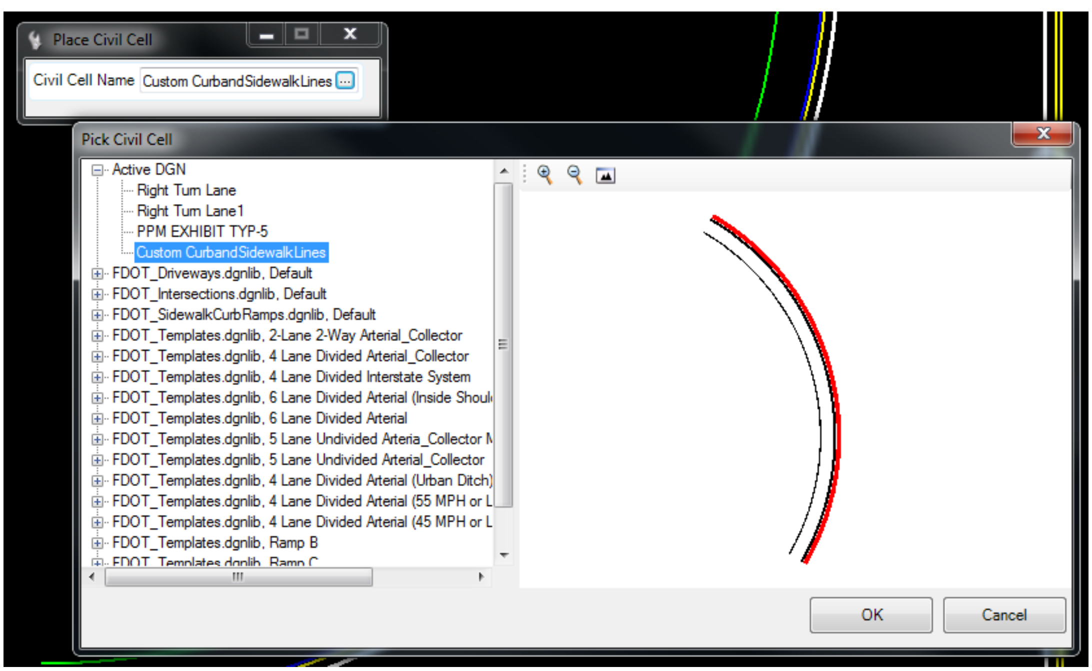
e. Reset to Optional Reference.

f. Data Point to accept **Civil Cell**.

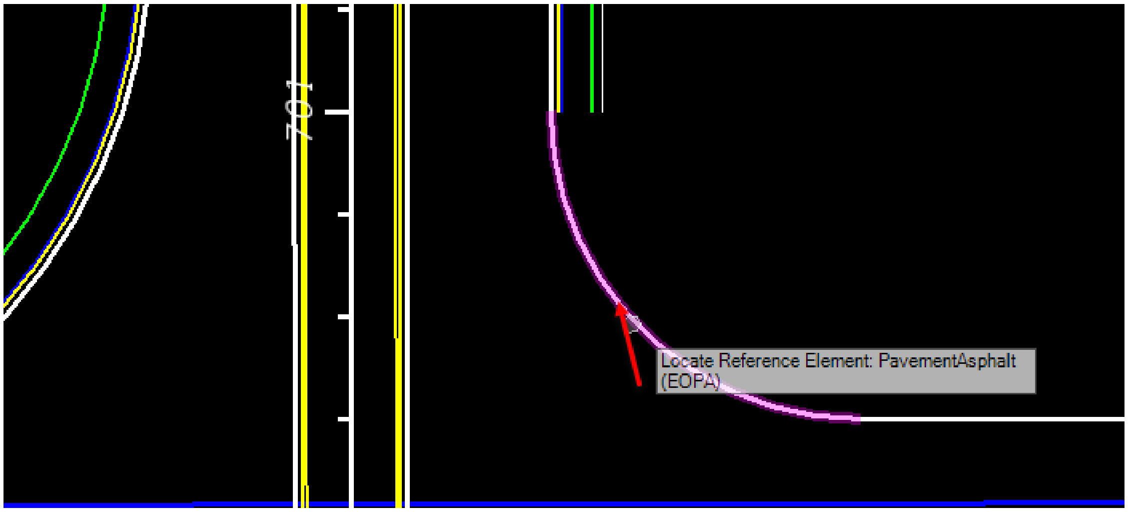
4. Use the new *Civil Cell* to place for the other *Radii*; use *Civil Cell*, **Place Civil Cell** tool.



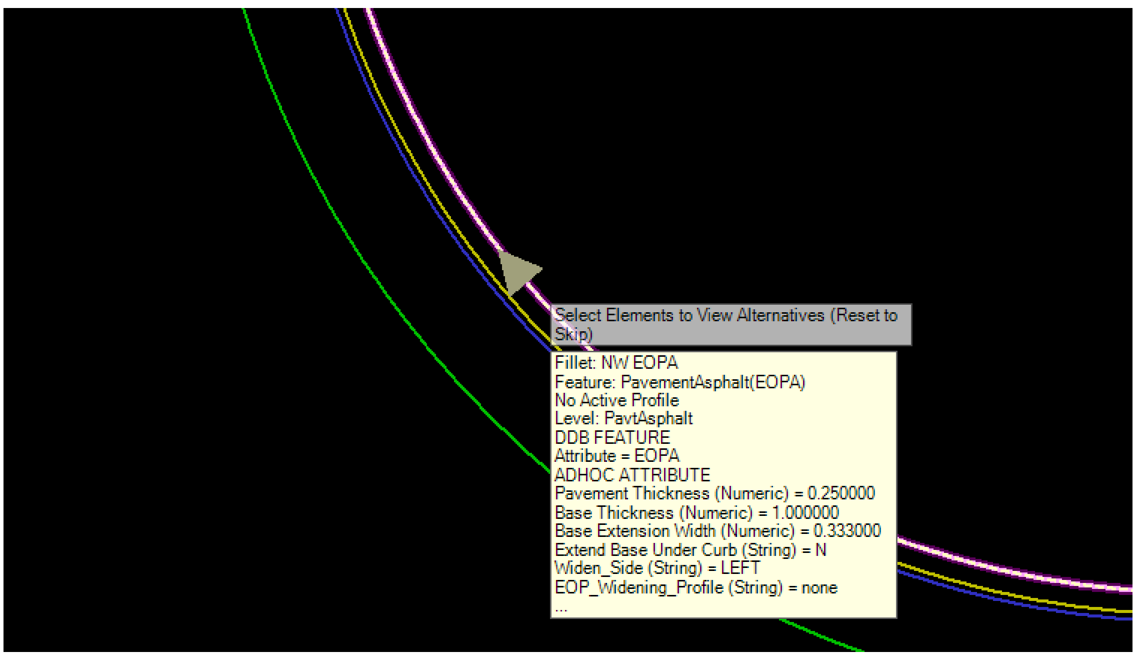
a. If the **Custom CurbandSidewalkLines** is not active, navigate to the *Active DGN* and select it from the list. Click **OK.**



b. At the prompt, select the **NW EOPA** *Radius line*.

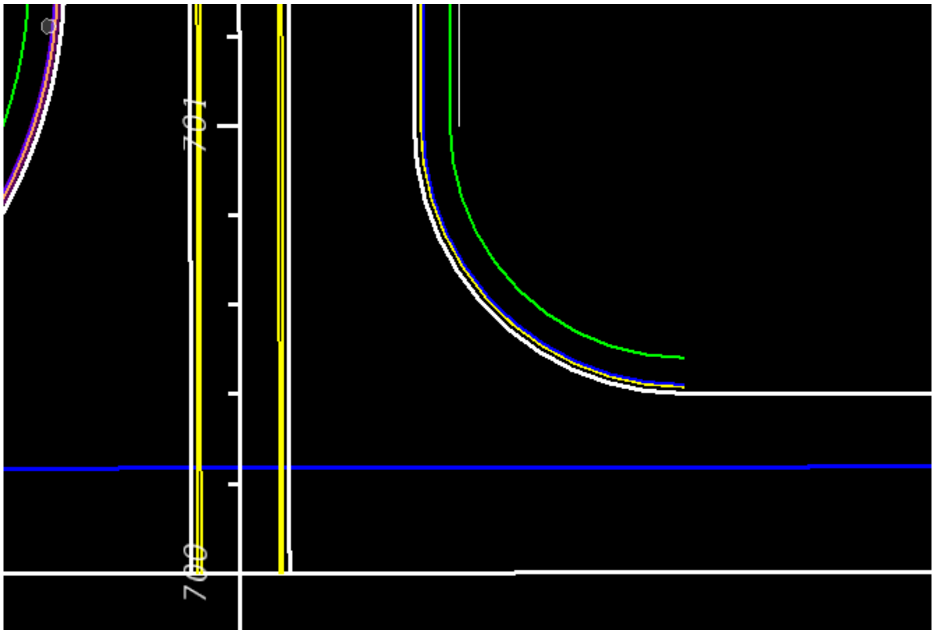


c. At the prompt, select **Element to View Alternatives**, move the cursor over the *EOP line* and click on the **Arrow** to reflect the Civil Cell to the correct side.

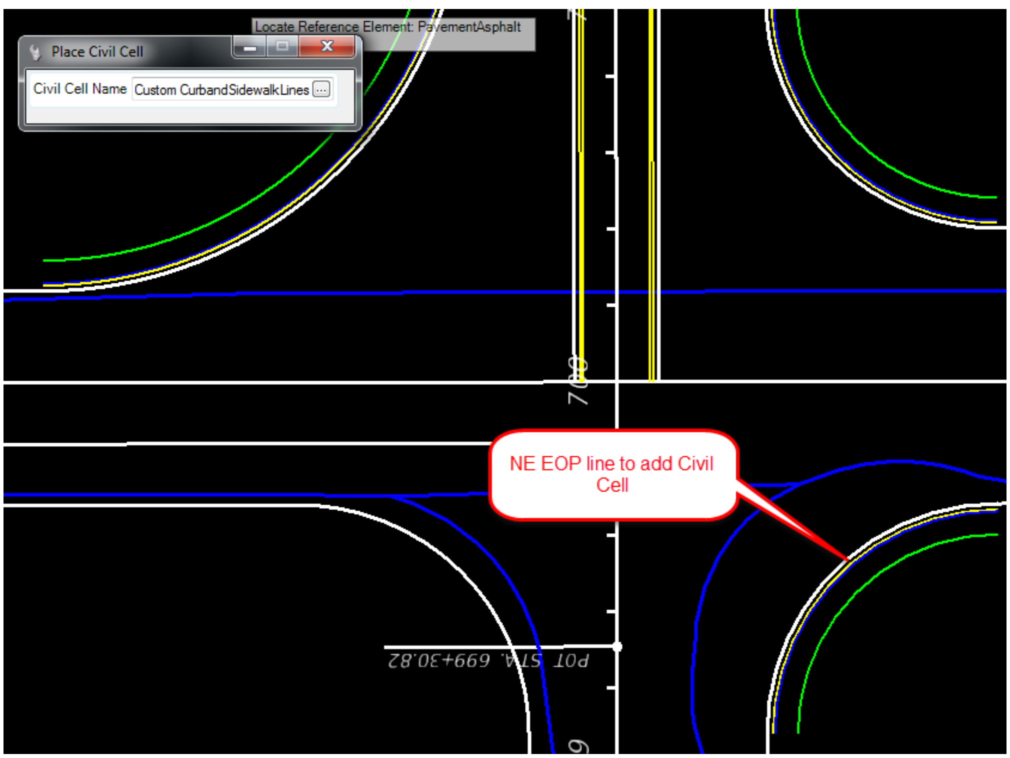


d. Reset to View alternates.

e. Data Point to accept the **Civil Cell Placement**.



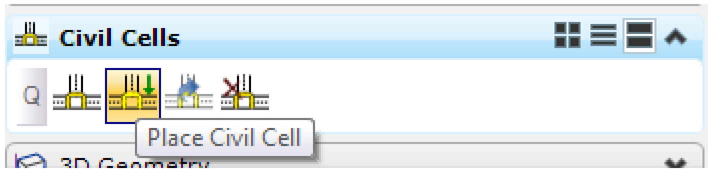
5. Repeat these steps to place the **Custom CurbandSidewalkLines** *Civil Cell* on the **NE EOPA** *Radius*.



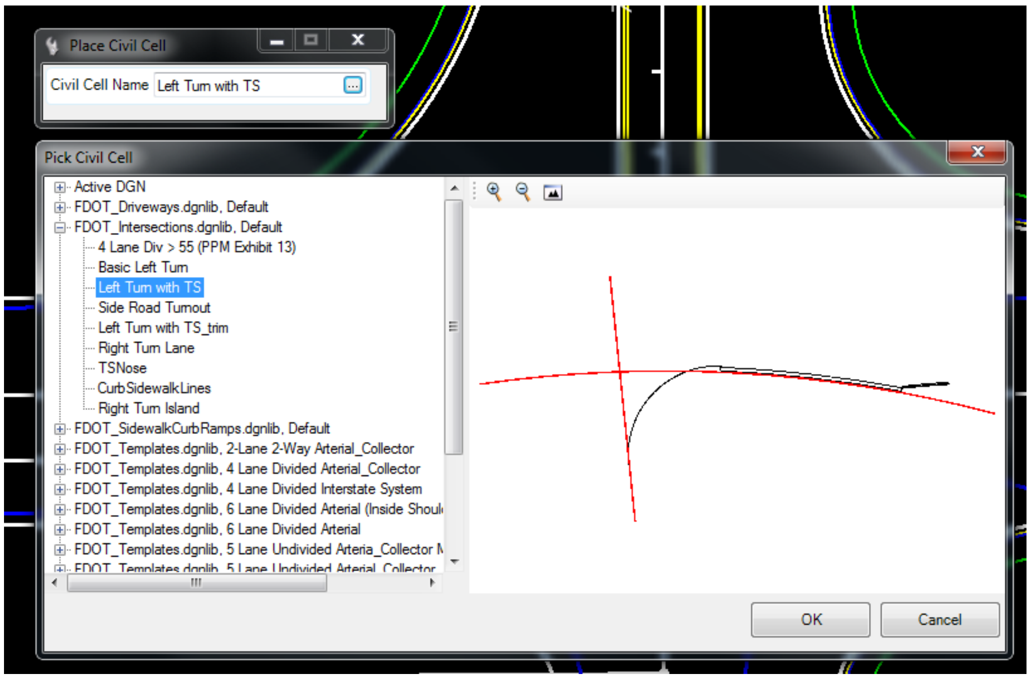
6. Leave the **SE Radius** without curb and sidewalk.

Exercise 3.13 Place Left Turn with Traffic Separator

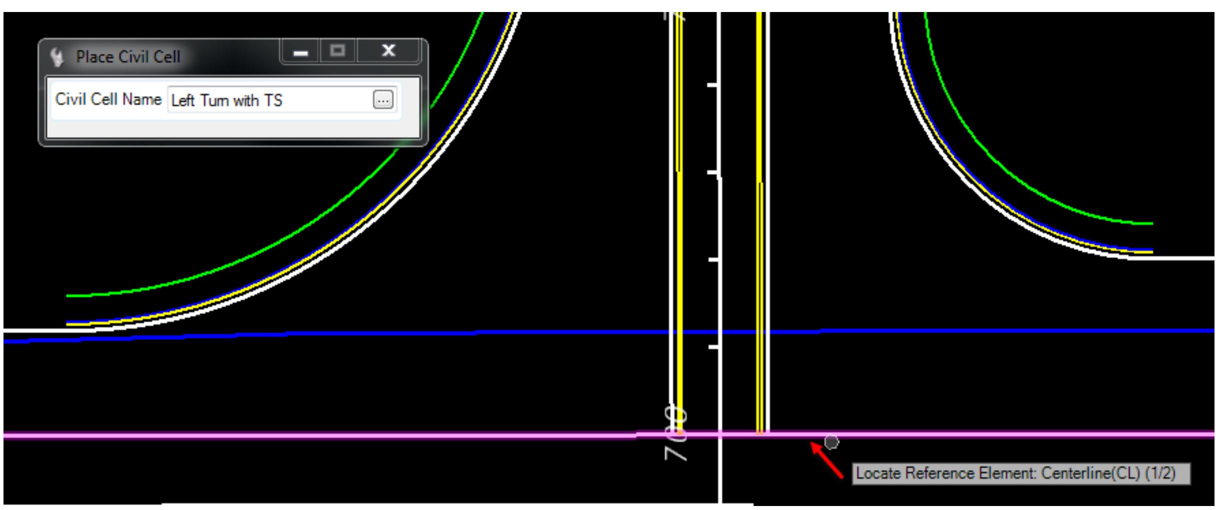
1. Use *Civil Cells*, **Place Civil Cell** tool.



a. Navigate to the *FDOT _Intersections.dgnlib* and select **Left Turn with TS** *civil cell*.

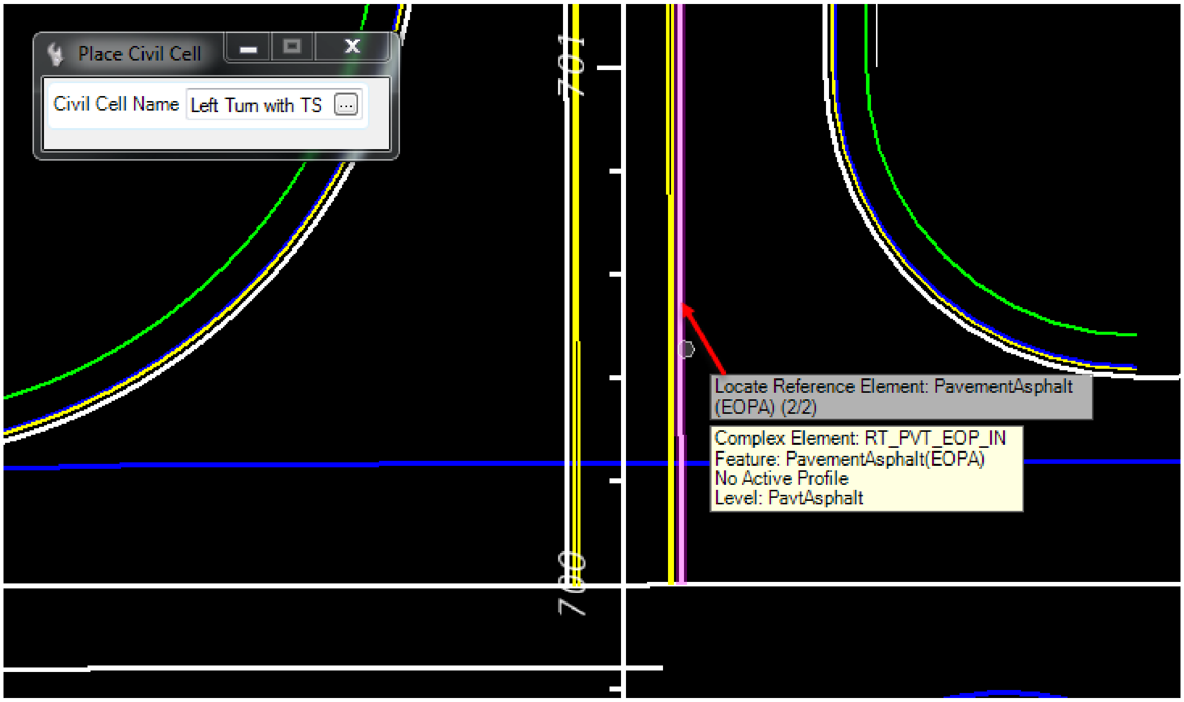


b. At the *Locate Reference Element Centerline*, select the **BL98** line in the View.

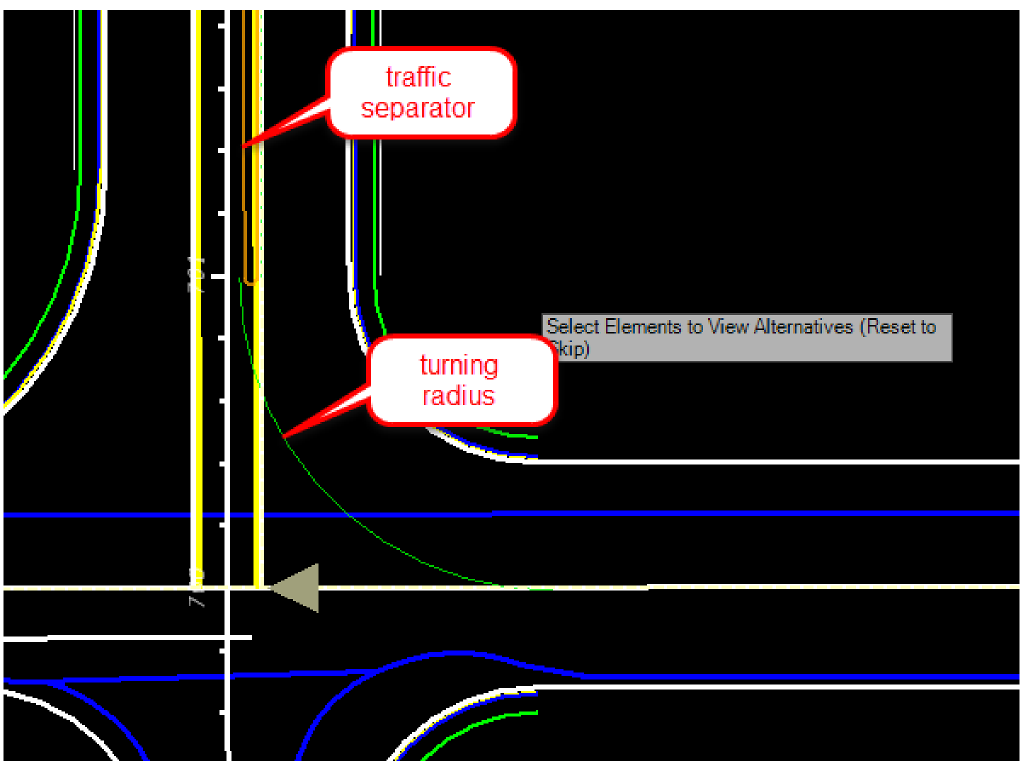


c. At the *Locate Reference Element PavementAsphalt(EOPA)*, select the **RT_PVT_EOP_IN** line in the View.

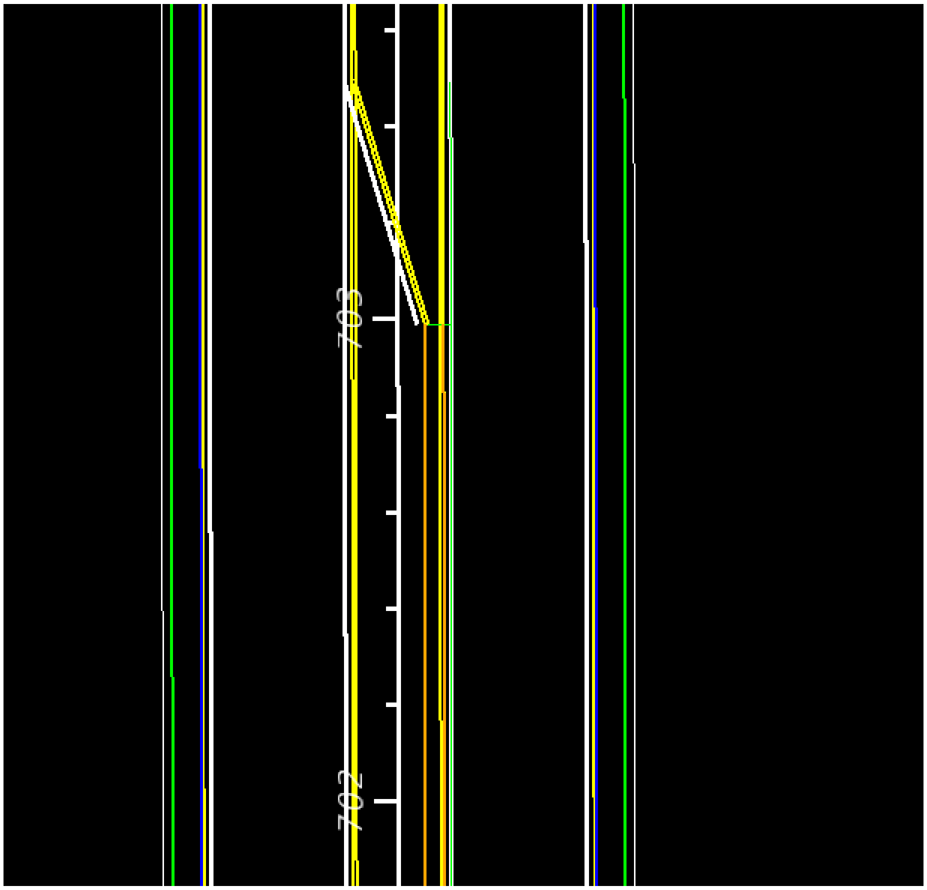
HINT For the direction of travel I, this is always the left median EOP line



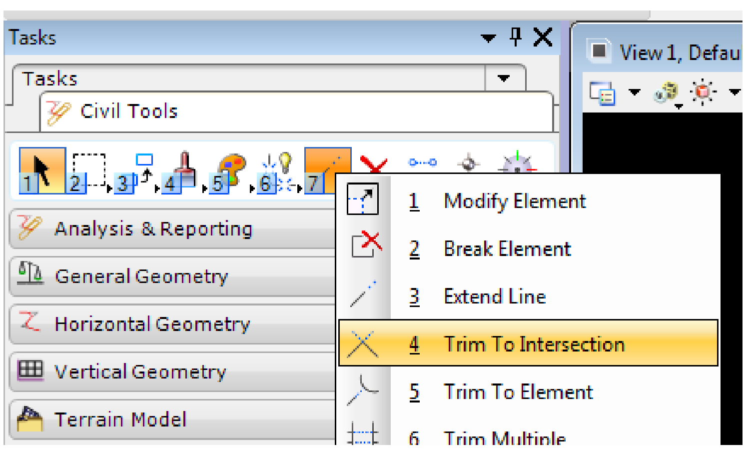
d. Click on the **Arrow** of both *Reference Elements* to **View Alternates**, when the *Green Turning Radius* and *Traffic Separator* are both in the correct place, **Reset** to skip**.**



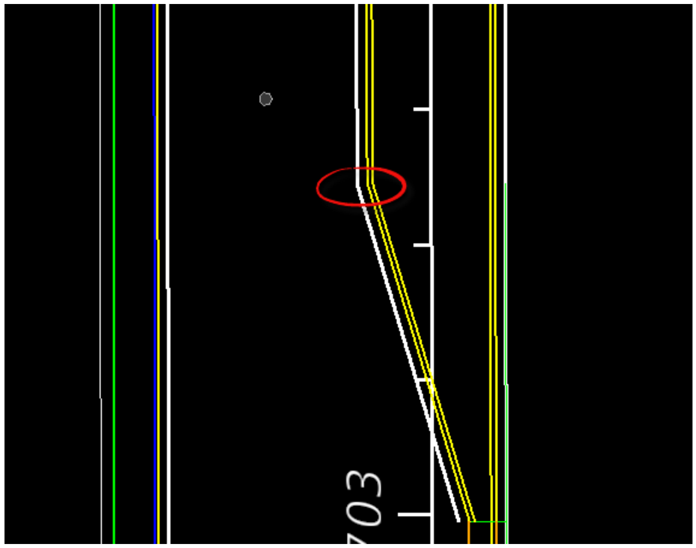
e. Data point to accept the **Civil Cell Placement** and view the left turn lane on **SR61** at *BL98 Intersection*.



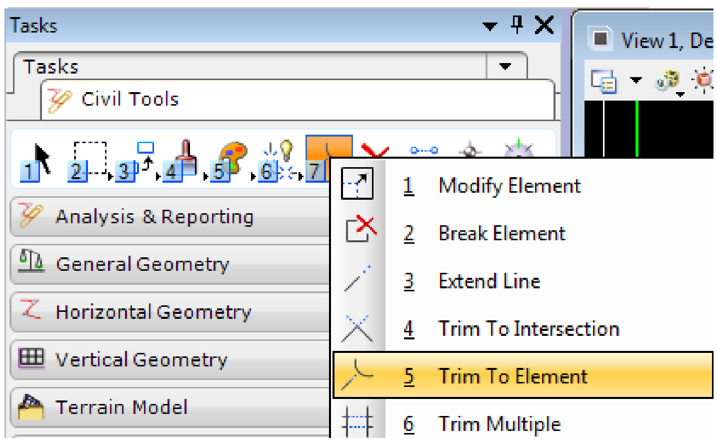
2. Use MicroStation **Trim to Intersection** tool.



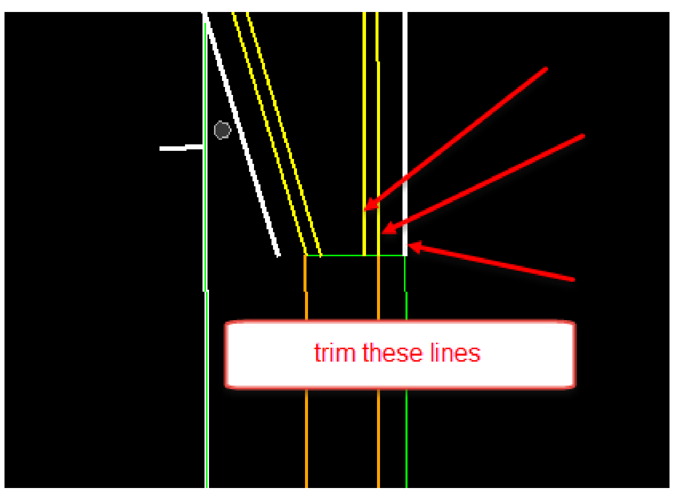
3. Trim the *curb median elements* at the **begin taper** as shown.



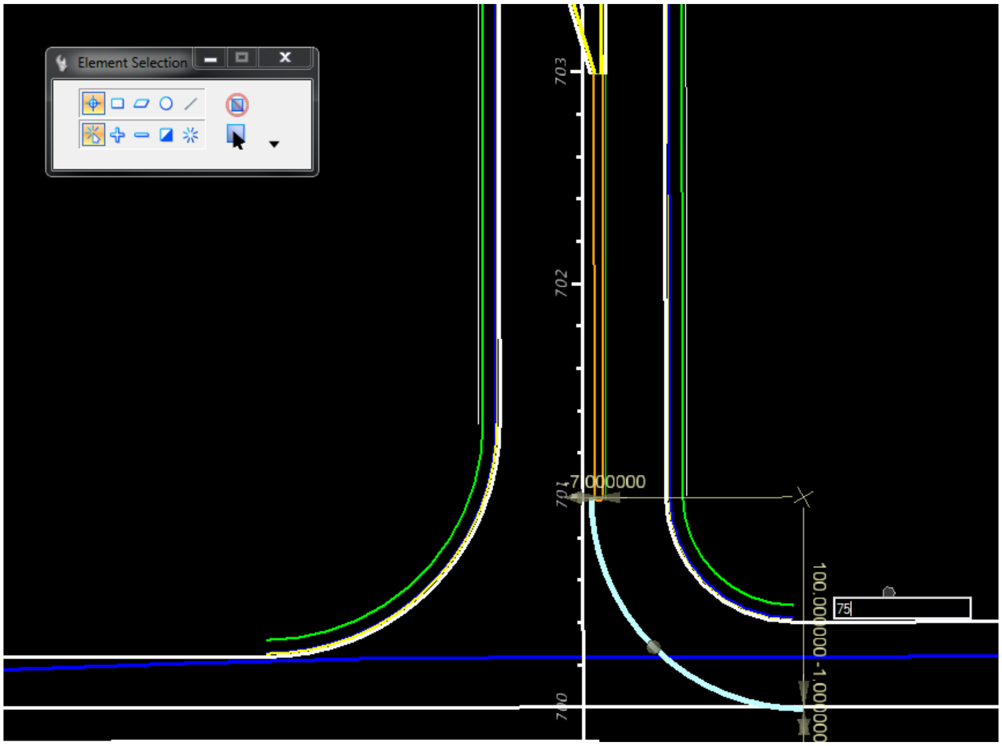
4. Use MicroStation **Trim to Element** tool.



5. Trim the elements at the *Curb Median lines* at the **Traffic Separator** as shown, leave the *green line.*

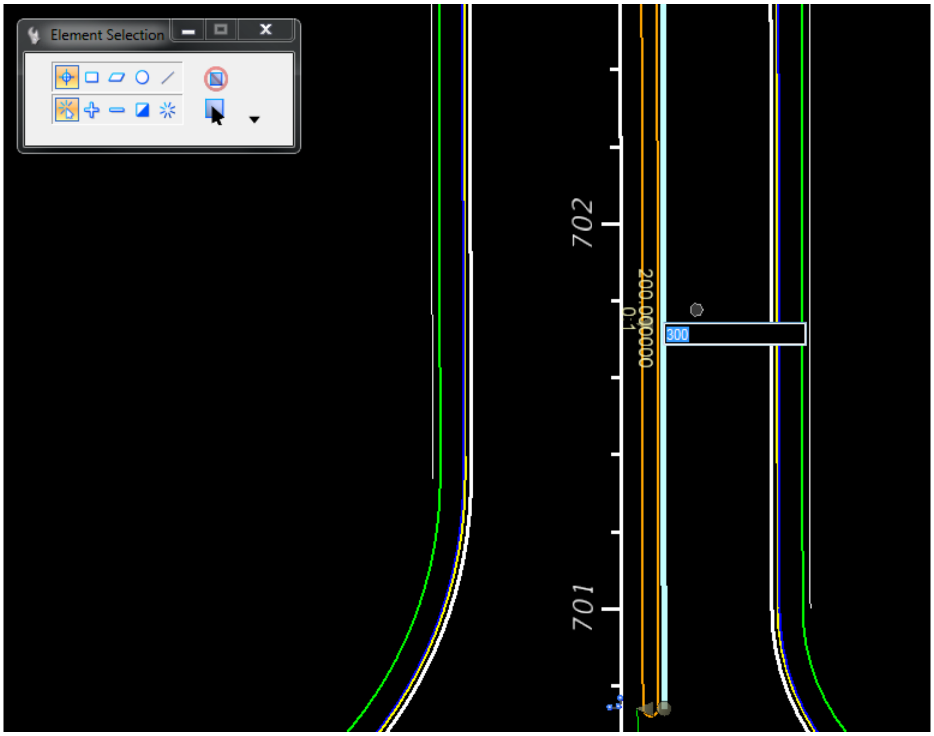


6. View the placed left turn, change the *Turning Radius* from **100 feet** to **75 feet**.

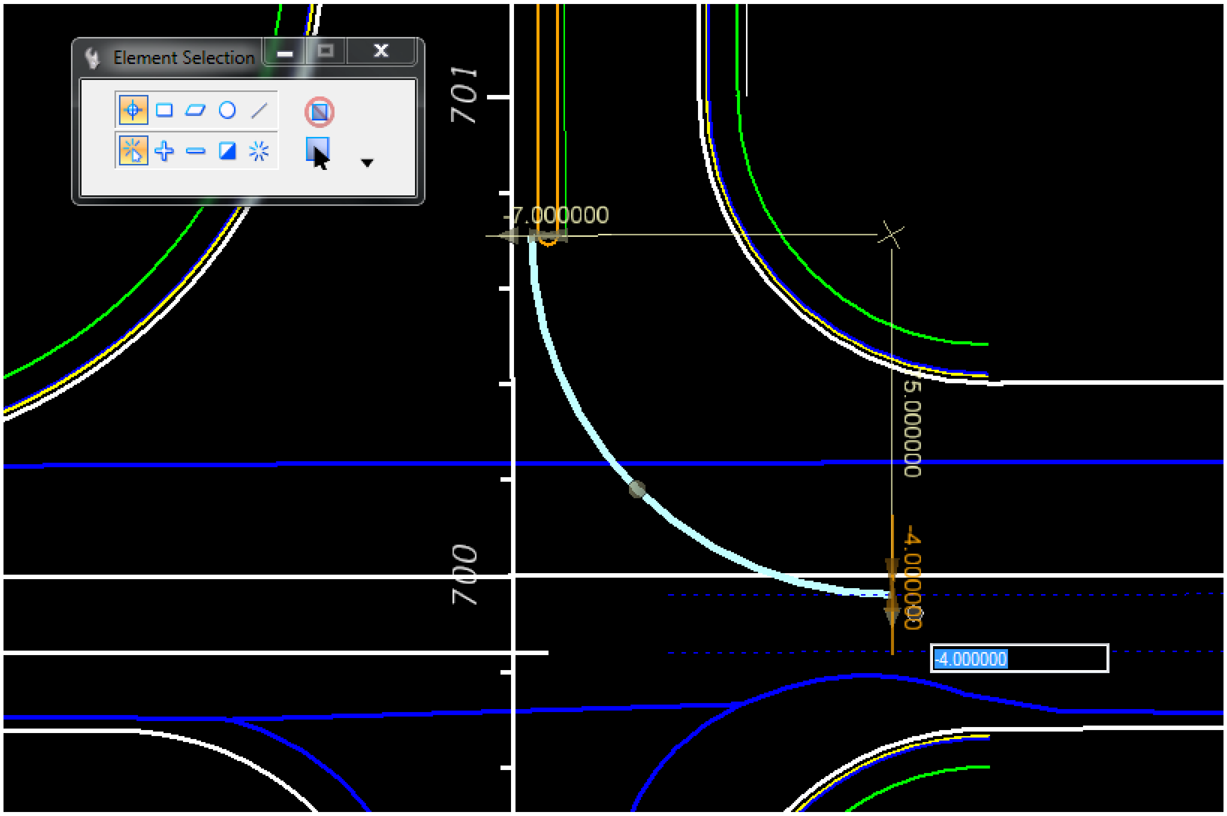


7. View the placed left turn, change the *Storage Length* from **200 feet** to **300 feet**.

HINT Select the green line, then select the length text.

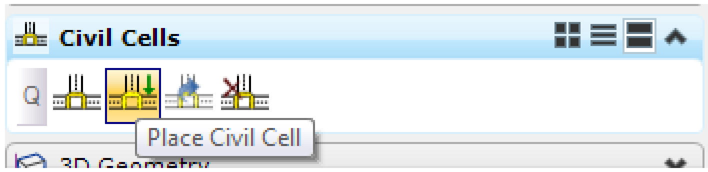


8. Zoom to the *Turning Radius Offset Dimension*, change the *value* from -1 **feet** to **-4 feet**.

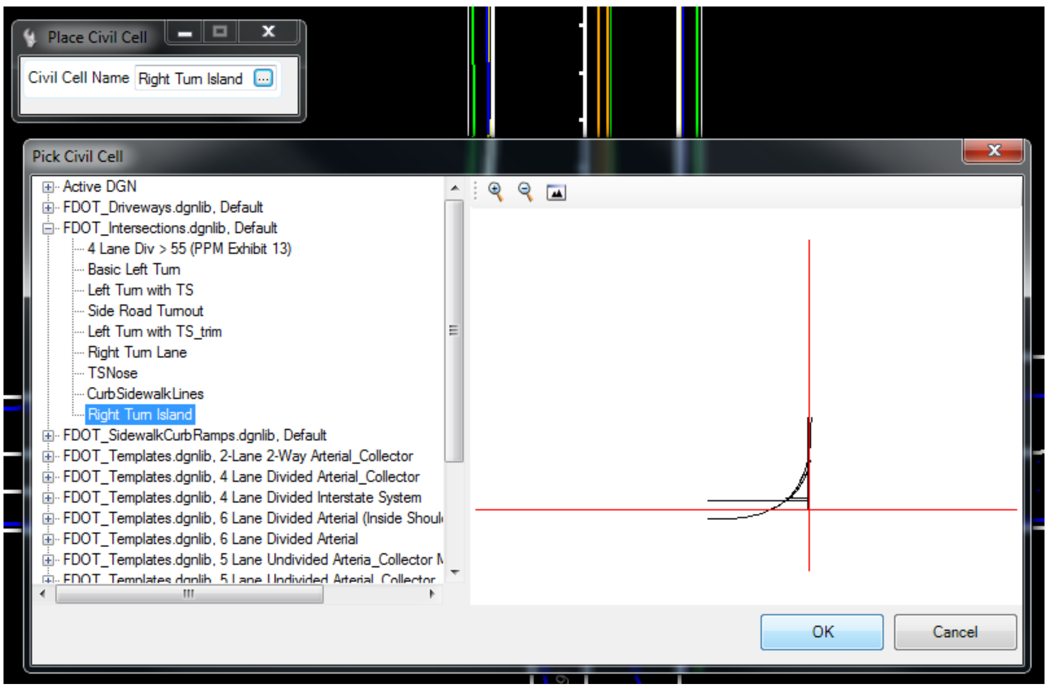


Exercise 3.14 Place Right Turn Island

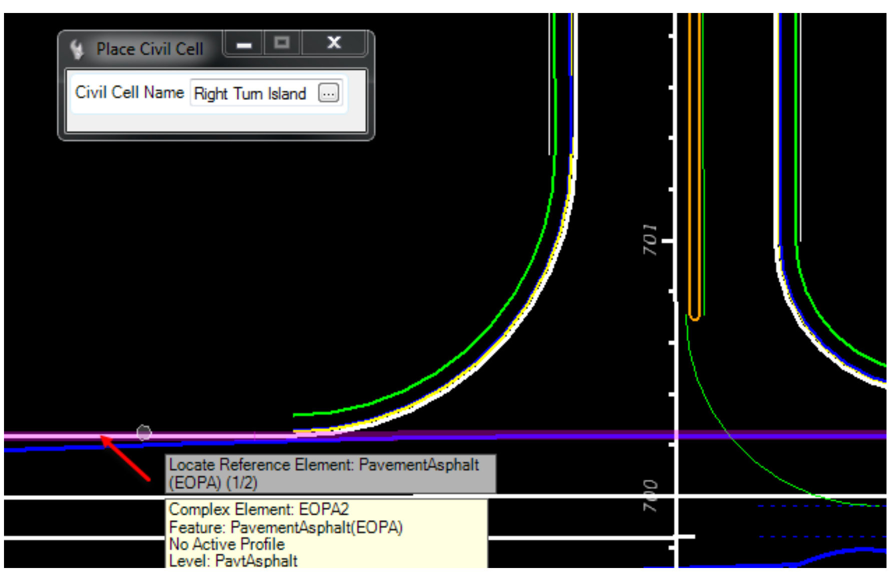
1. Use *Civil Cells* task, **Place Civil Cell** tool.



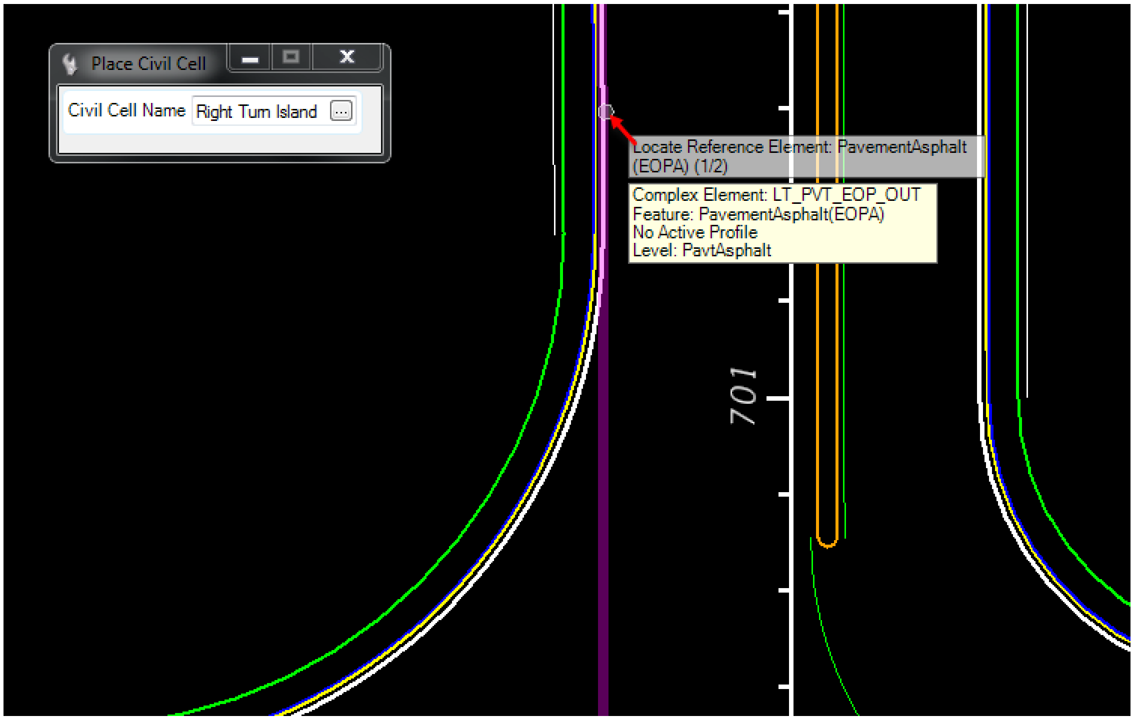
2. Navigate to the *FDOT Intersections.dgnlib*, select **Right Turn Island**. Click **OK.**



3. Select the first **PavementAsphalt(EOPA)** lines.

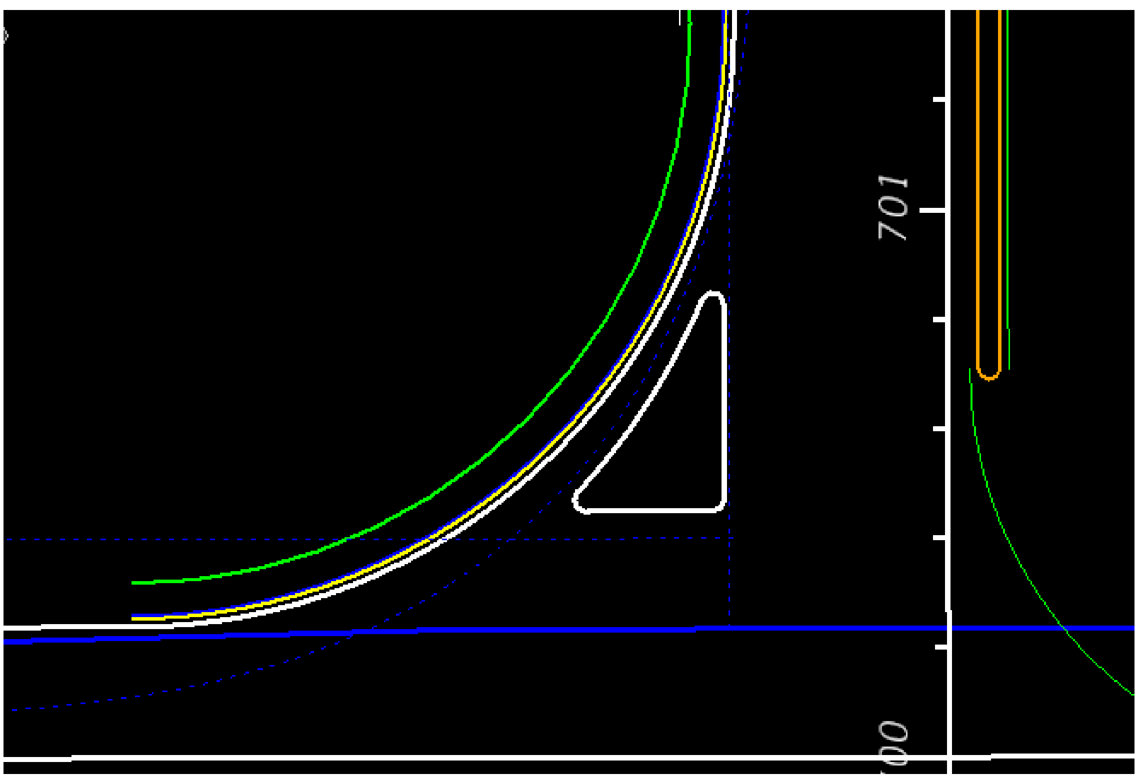


4. Select the second **PavementAsphalt(EOPA)** line.



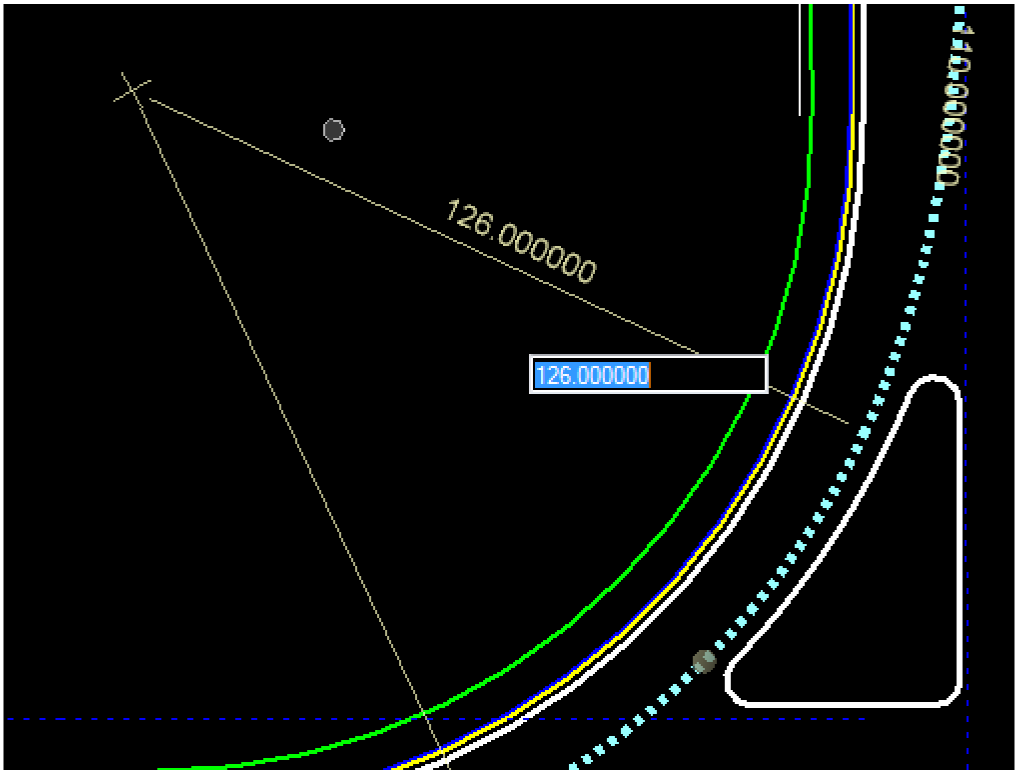
5. Reset to Skip Alternates.

6. Data Point to accept the **Civil Cell**.

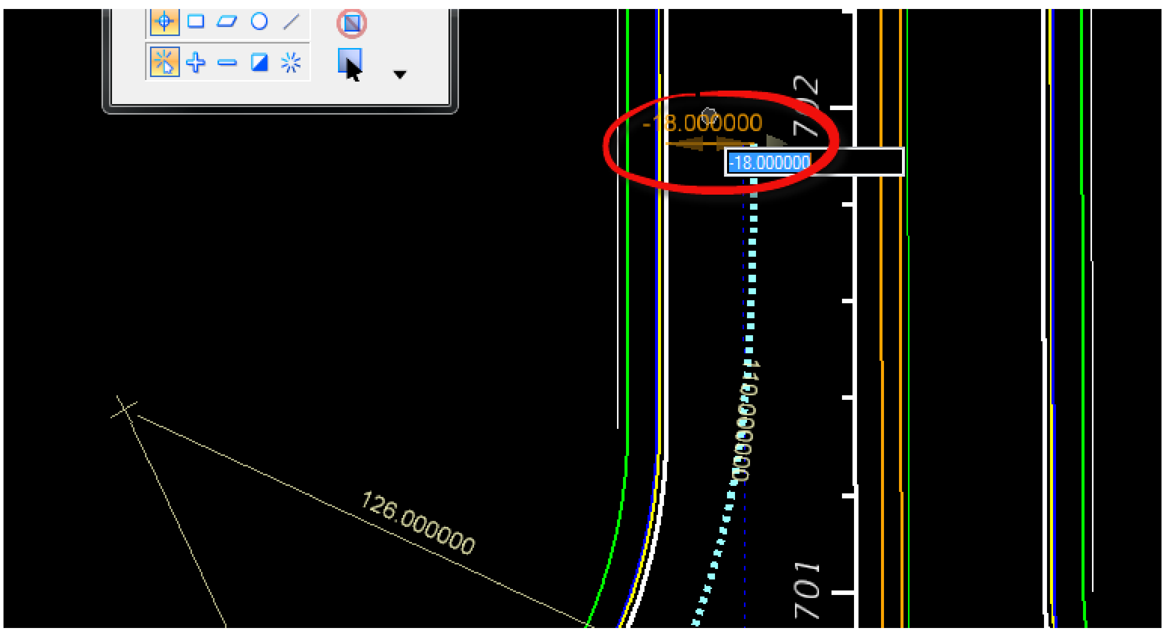


➢ *Change the Right Turn Island Parameters*

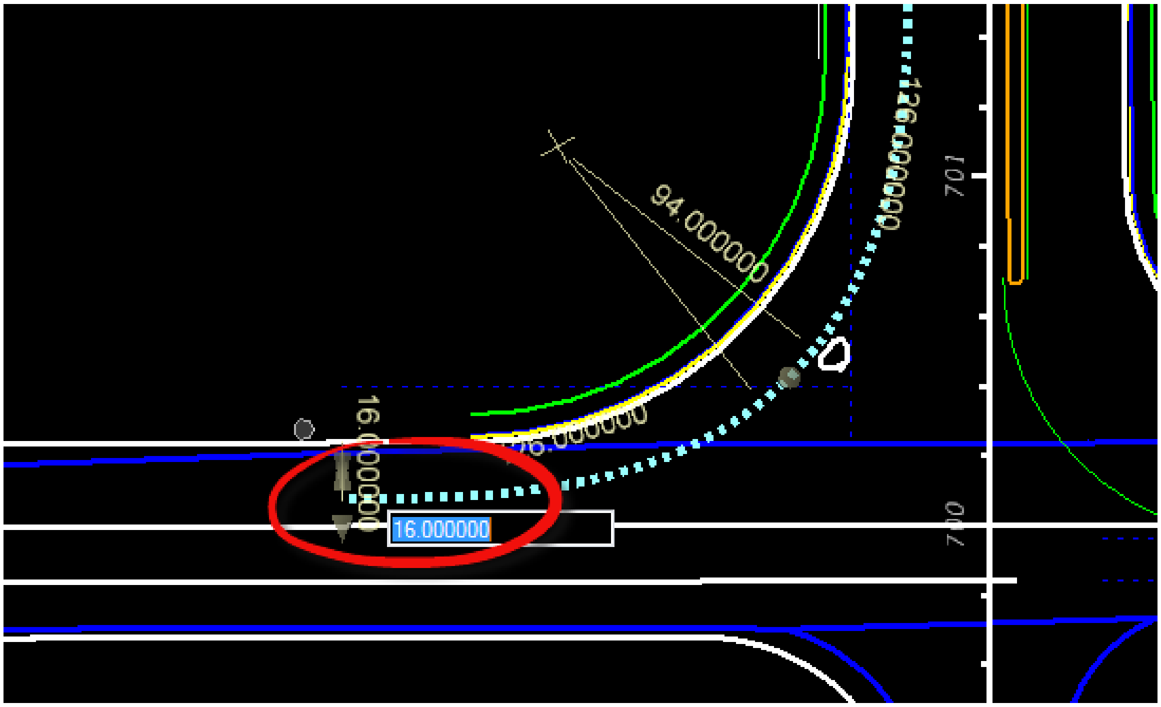
1. Change *ConstLinesBlueDashed Arc Radius* from **110 feet** to **126 feet**.



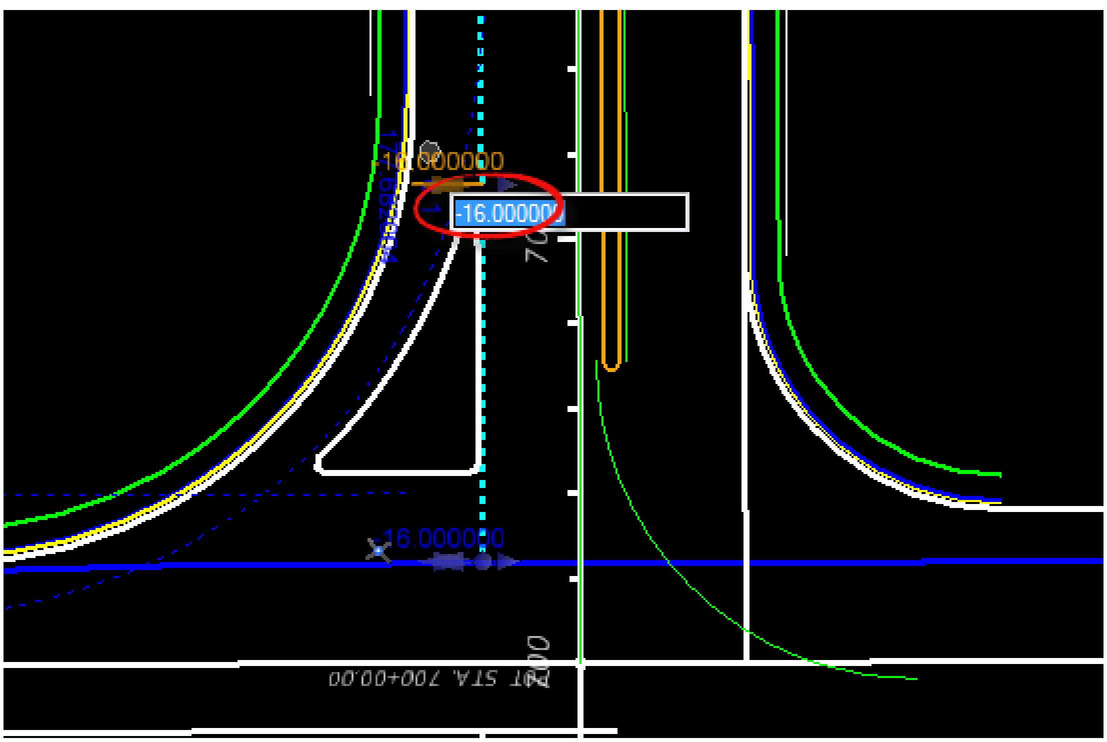
2. Check ConstLinesBlueDashed Begin Arc Offset is **-18 feet**.



3. Check ConstLinesBlueDashed End Arc Offset is **-16 feet**.

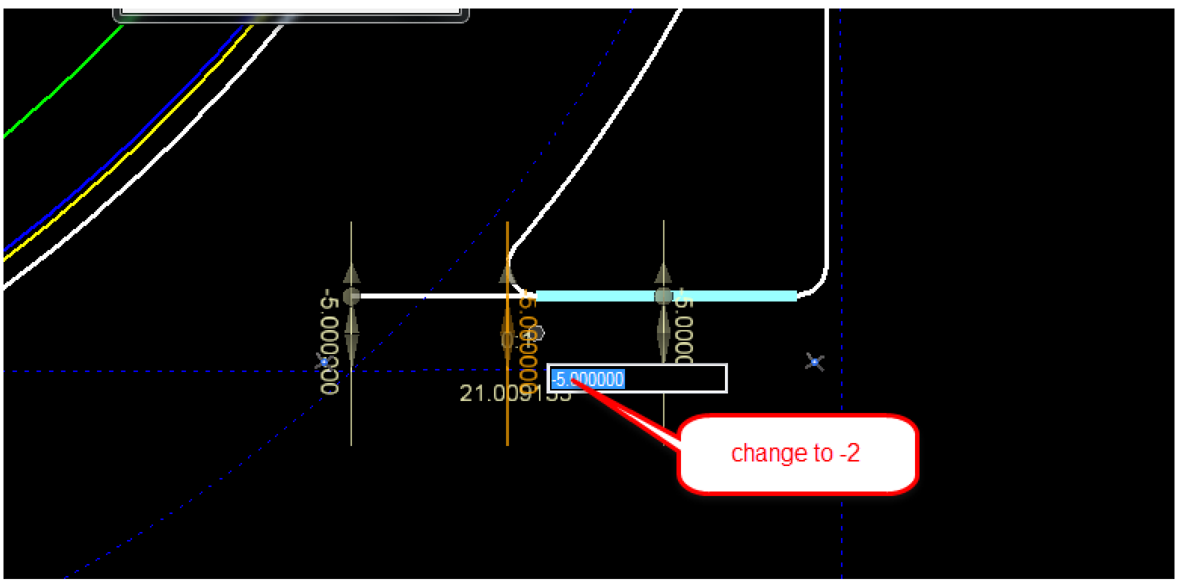


4. Change the straight *ConstLinesBlueDashed SR61 EOP Offset* from **1 foot** to **-16 feet.**

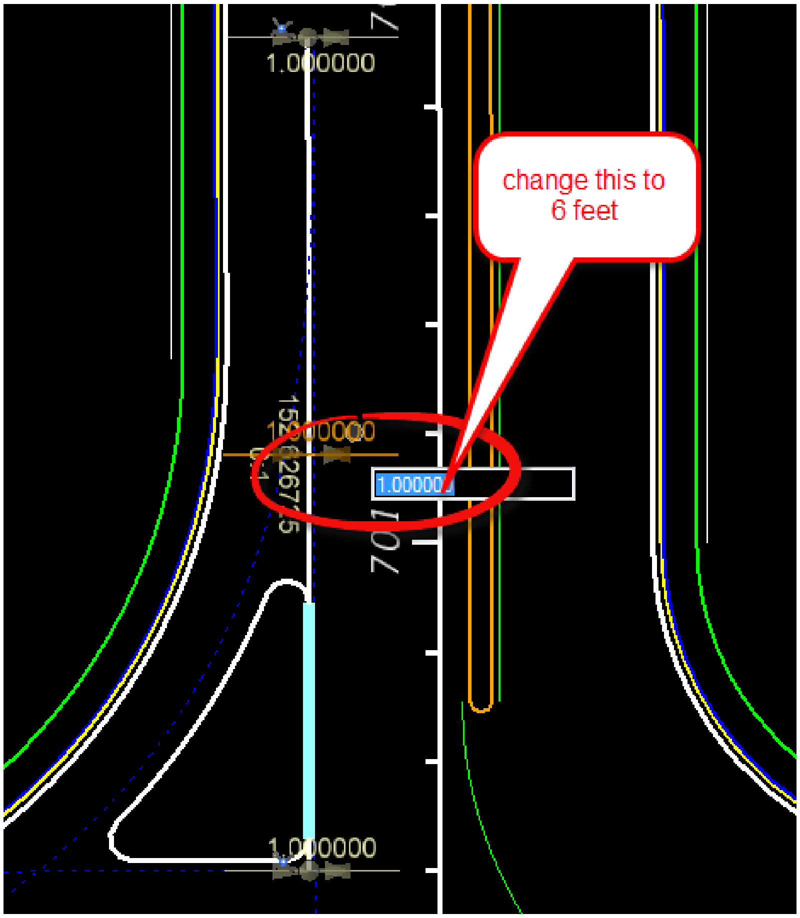


5. Check ConstLinesBlueDashed BL98 EOP Offset is **-16 feet**.

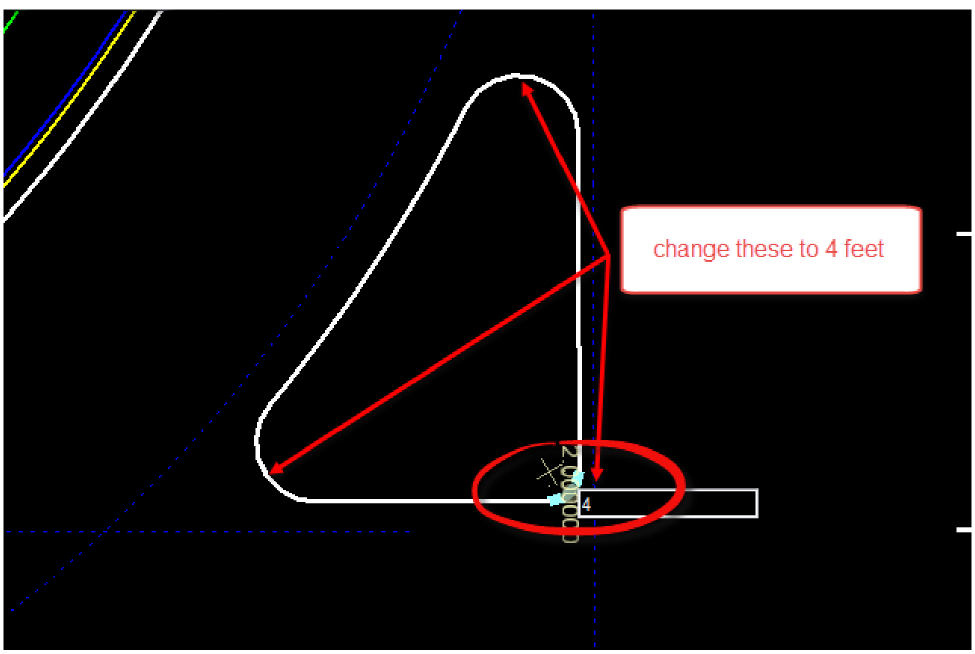
6. Change *Island EOP Offset* from the ConstLinesBlueDashed BL98 from **-5 feet** to **-2 feet**.



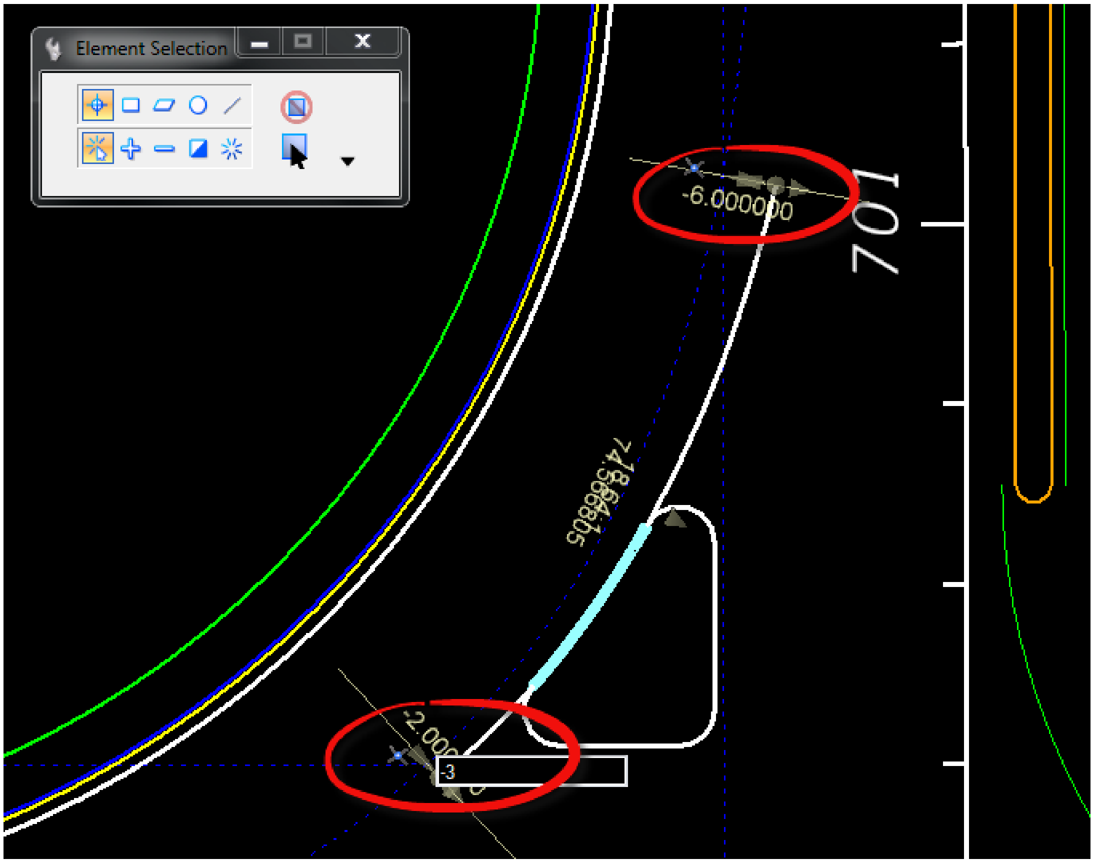
7. Change *Island EOP Offset* from the ConstLinesBlueDashed SR61 from **1 foot** to **6 feet.**



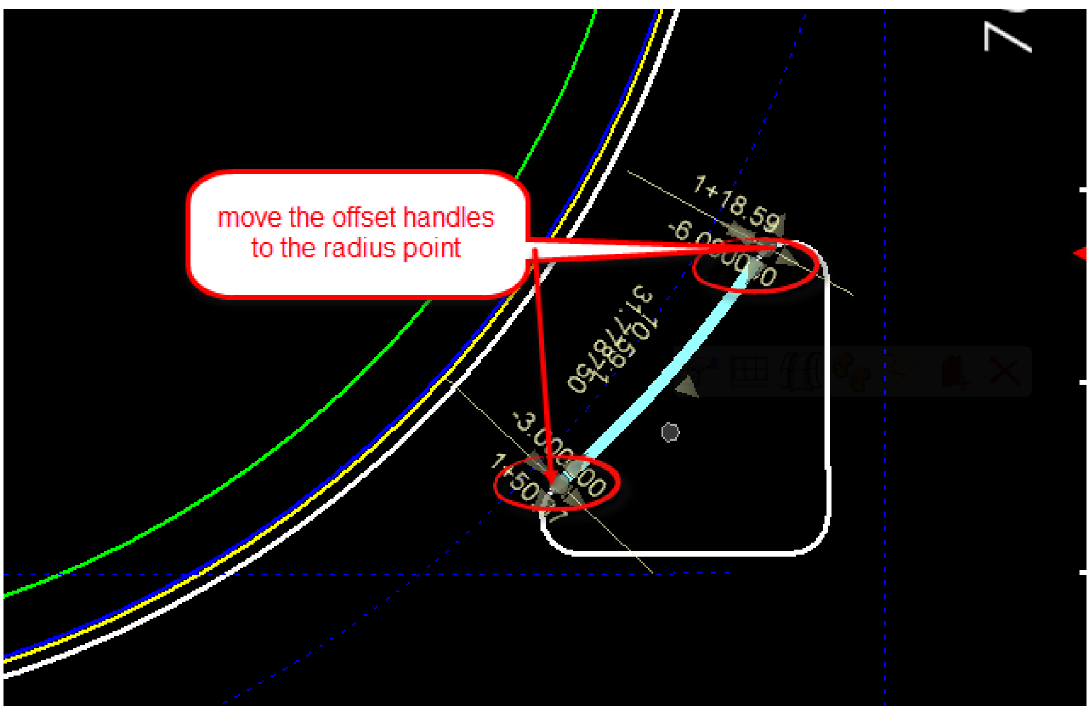
8. Change *Island Radii* to **4 feet.**



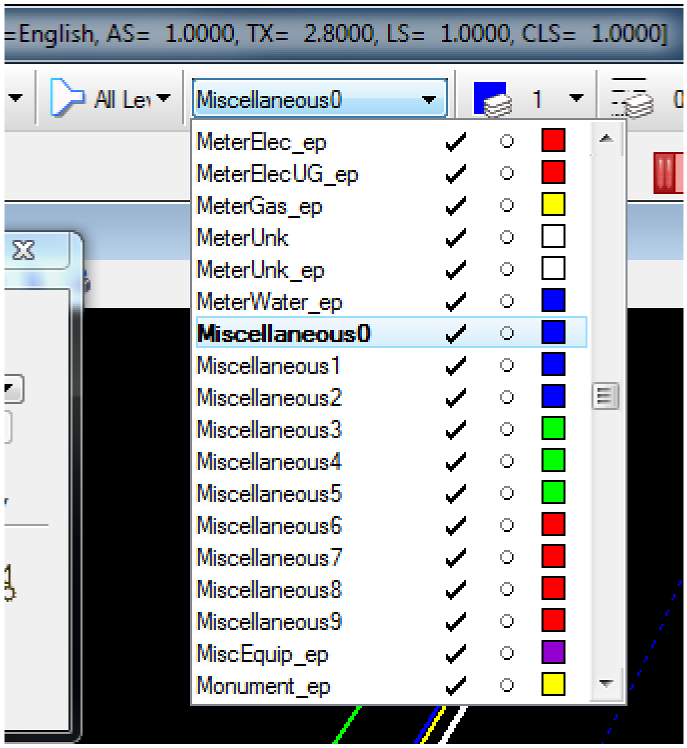
9. Change the Island ingress Offset **-6 feet** and Island Egress Offset **-3 feet.**



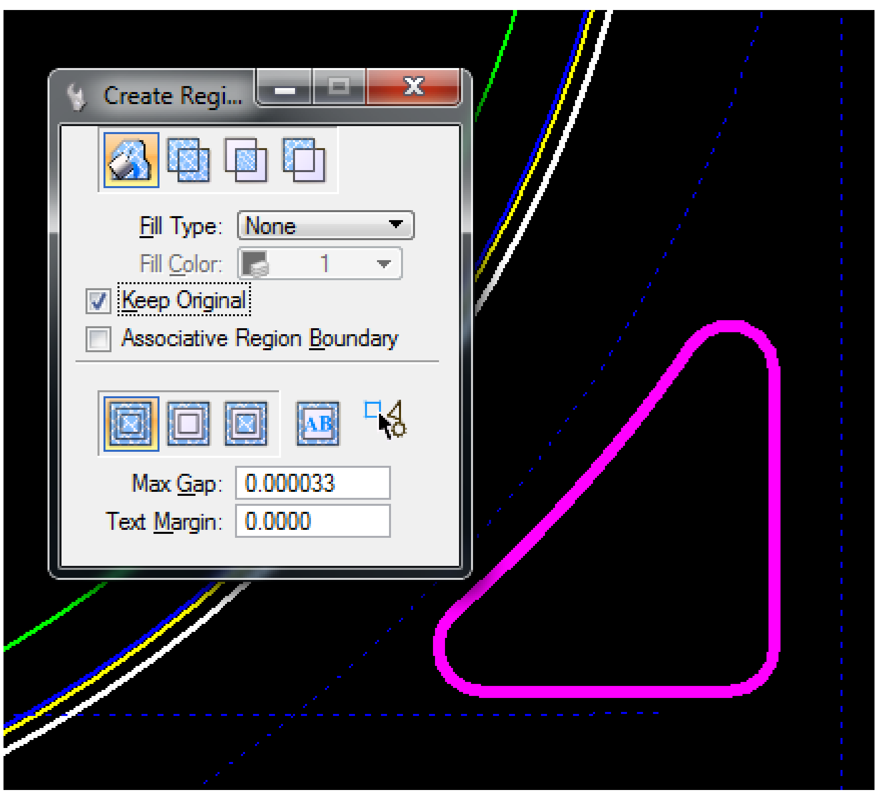
10. Move the *Offset* handles to the **Radius Point**.



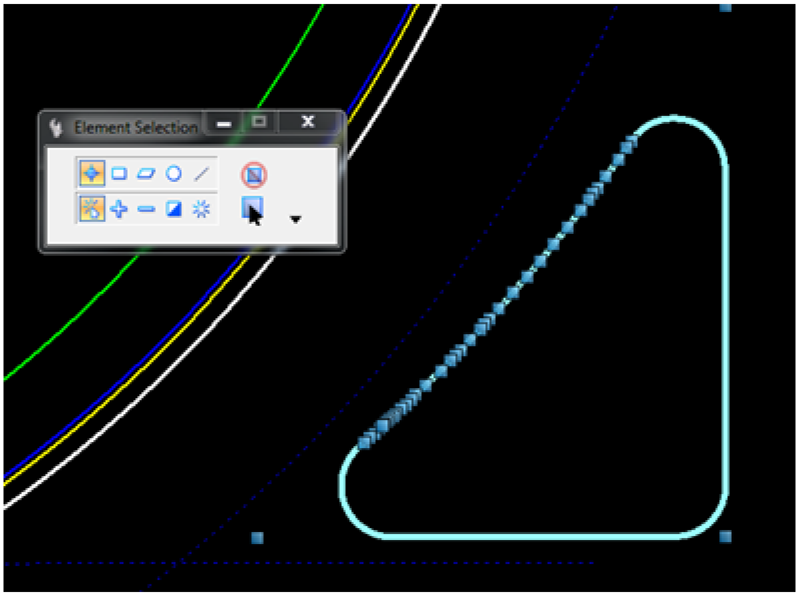
11. Change the *Active Level* to **Miscellaneous0.**



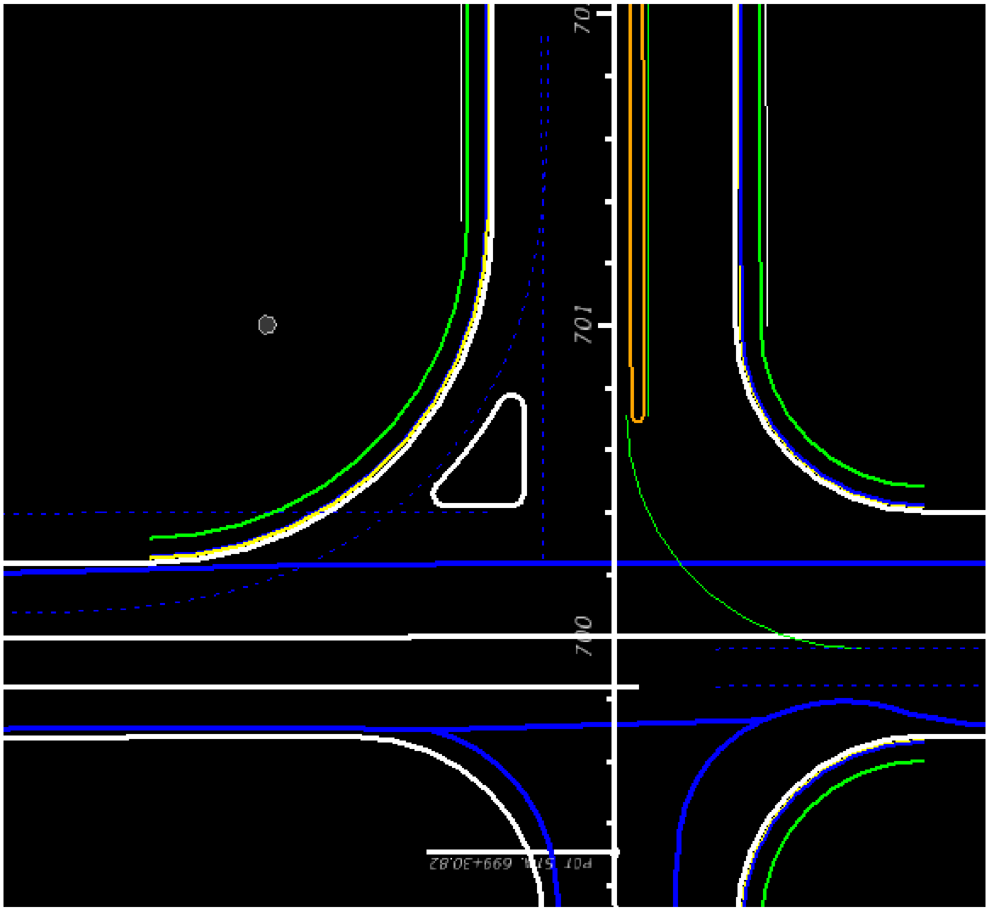
12. Use the MicroStation **Crate Region Flood** tool, select the **center of the island**, and then data point to accept the *closed element*.



13. Use the MicroStation **Select** tool to view the properties of the new island. Record the Area _____.

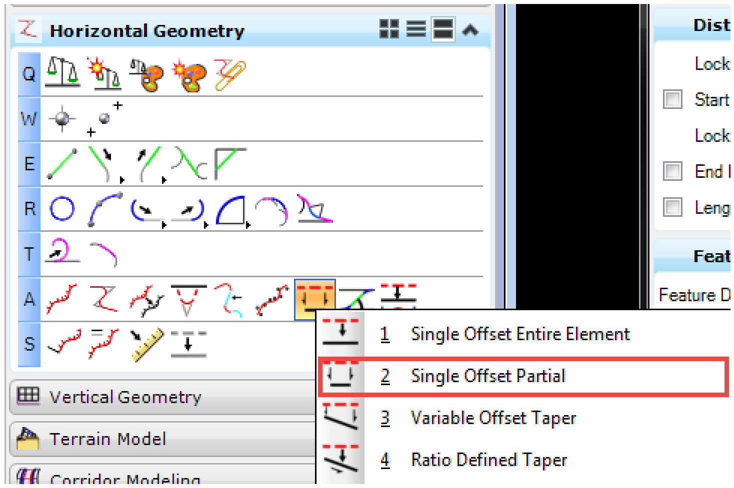


14. View the modified **Right Turn Island.**

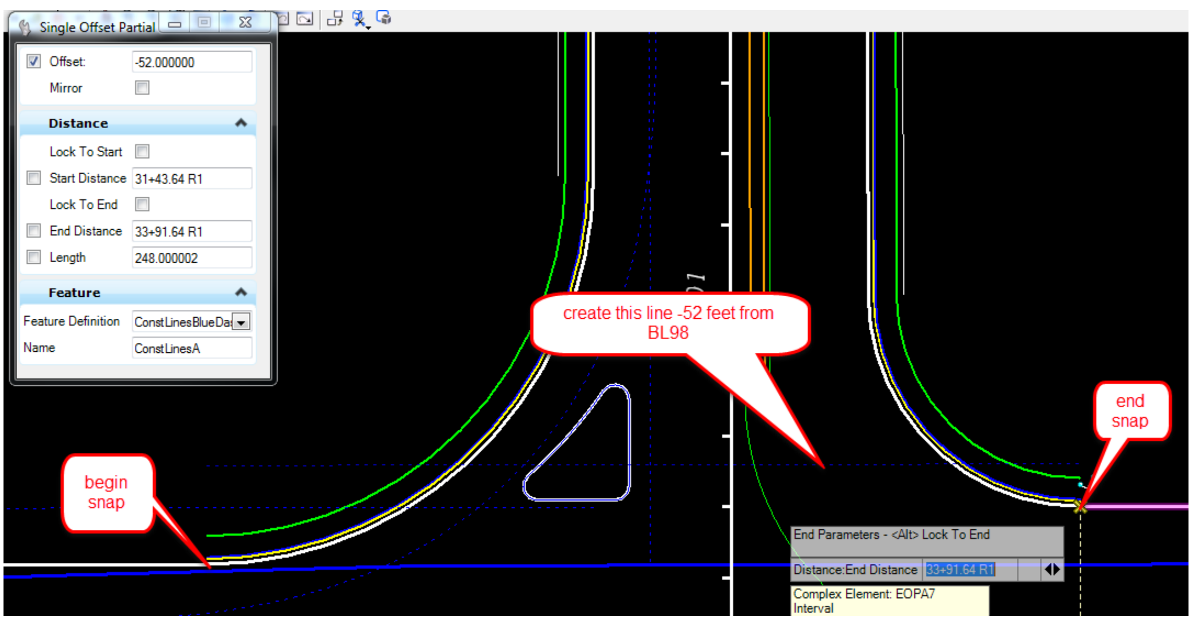


Exercise 3.15 For BL98 Intersection Crosswalks Lines

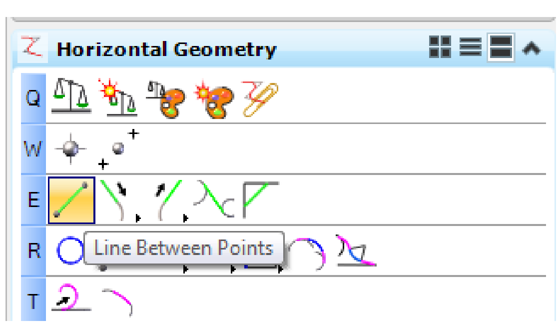
1. Use the *Horizontal Geometry*, **Single Offset Partial** tool.



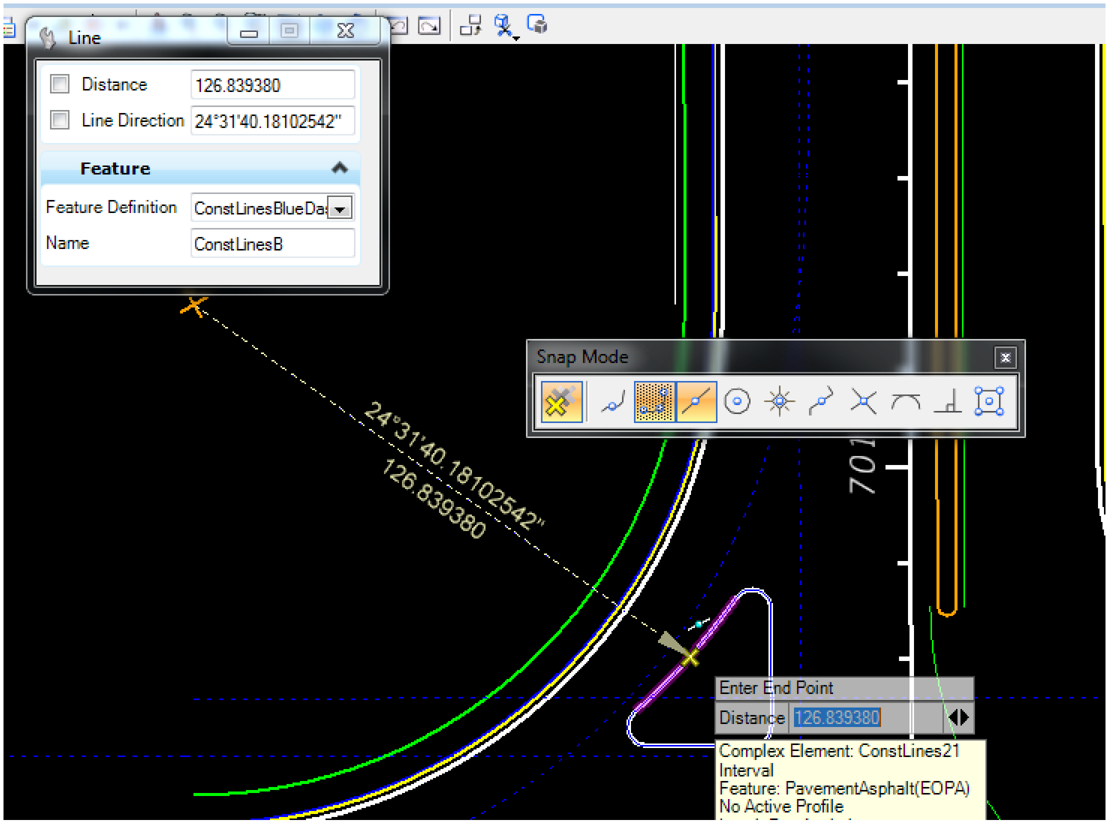
2. Create a **Partial Offset** line from *BL98* **-52 feet** across the intersection. Use *Feature Definition* **ConstLinesBlueDash** and *Name* **ConstLineA.**



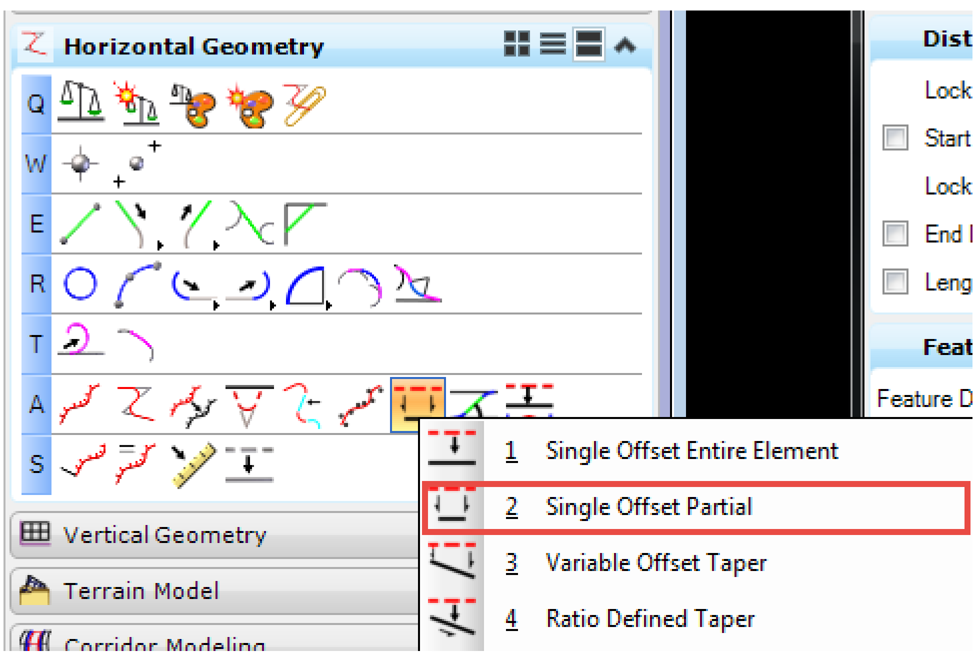
3. Use *Horizontal Geometry*, **Line Between Points** tool.



4. Create a line from the curve center to the midpoint of the *Island Radius EOP*. Use *Feature Definition* **ConstLinesBlueDash** and *Name* **Line B.**

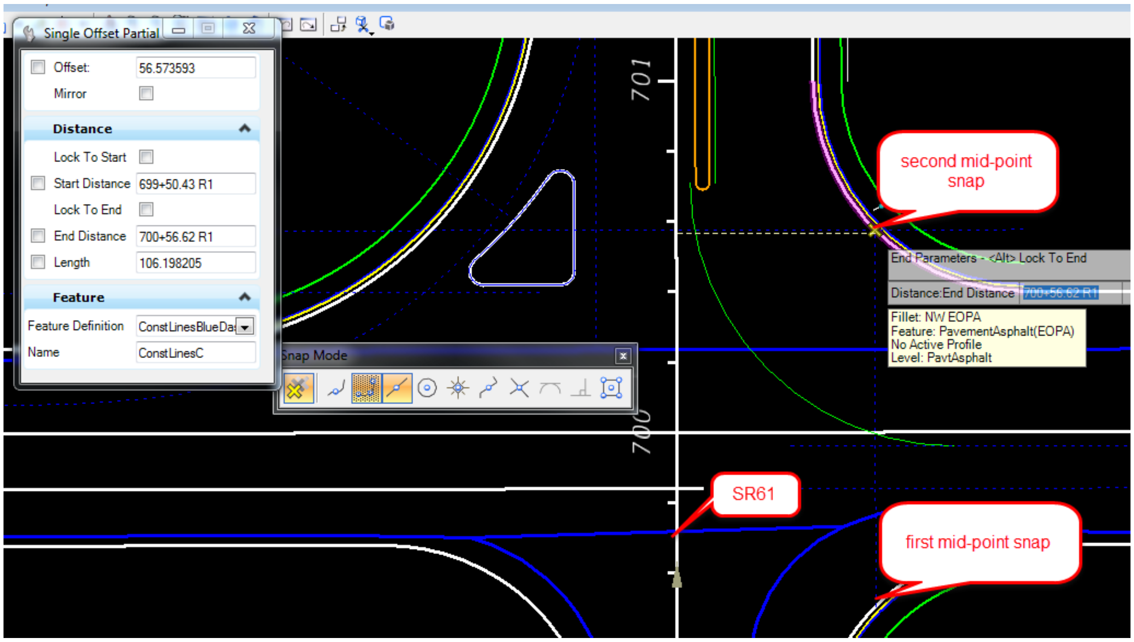


5. Use the *Horizontal Geometry*, **Single Offset Partial** tool**.**



6. Create a **Partial Offset** line from *SR61* across the intersection. Use *Feature Definition* **ConstLinesBlueDash** and *Name* **ConstLineC**.

HINT Snap to the mid-point of the radii.

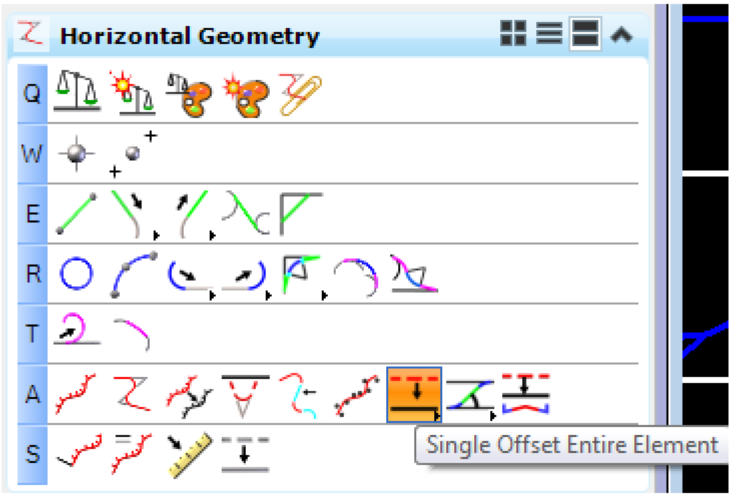


Note Use these lines in later exercises to place *3D Sidewalk Ramp Civil Cells*.

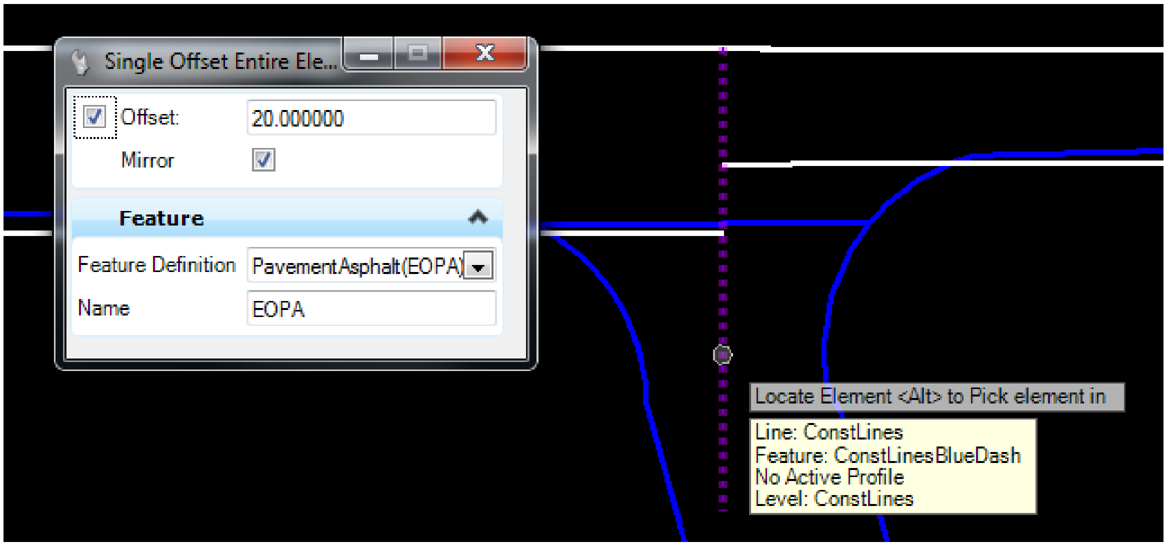
Exercise 3.16 Create BL98 Turnouts

In this exercise the additional rural turnouts can be added to BL98.

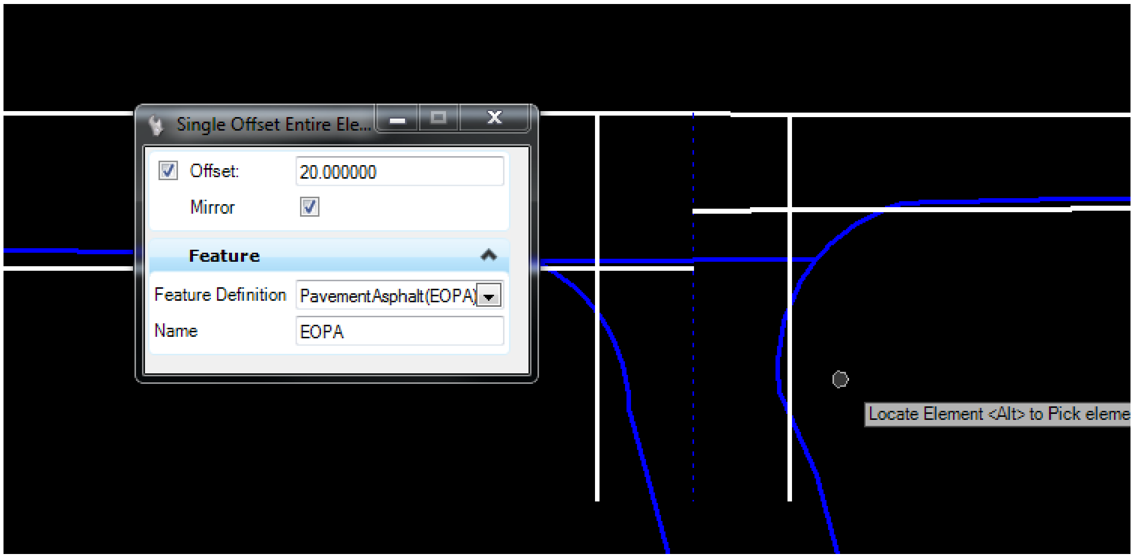
1. Use *Horizontal Geometry*, **Single Offset Entire Element** tool**.**



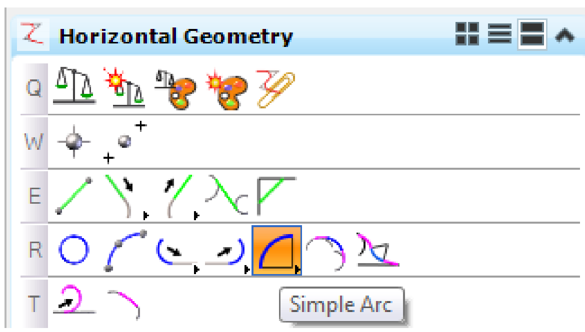
   a. Select the **ContLineBlueDash** *Turnout* line.



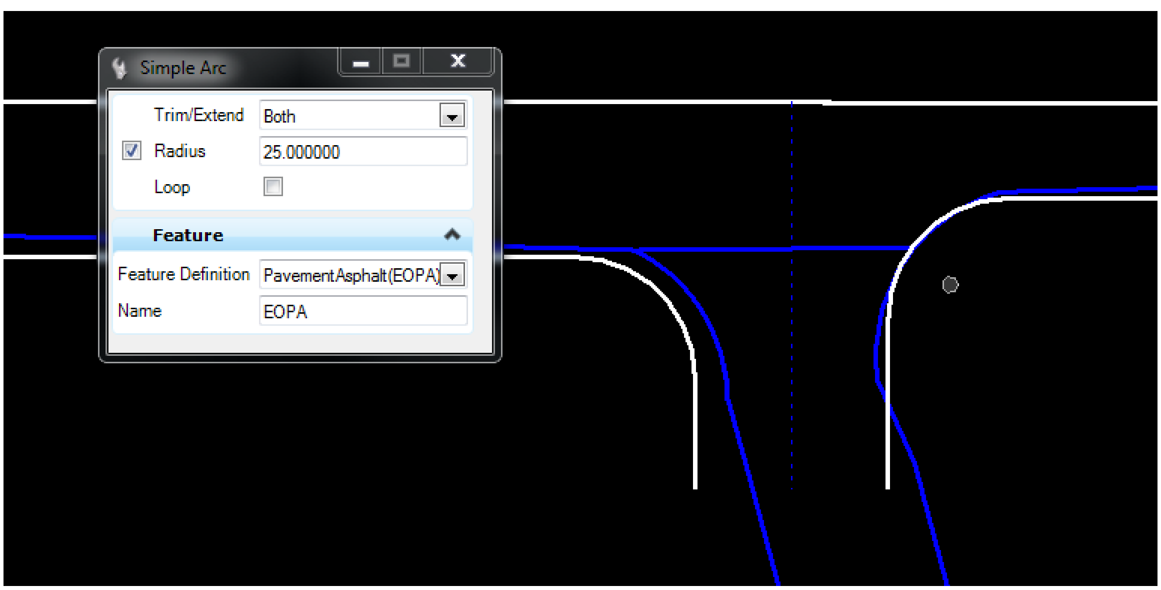
b. Accept the **-20 feet** *Offset* and *Mirror*.



2. Use *Horizontal Geometry*, **Simple Arc** tool**.**

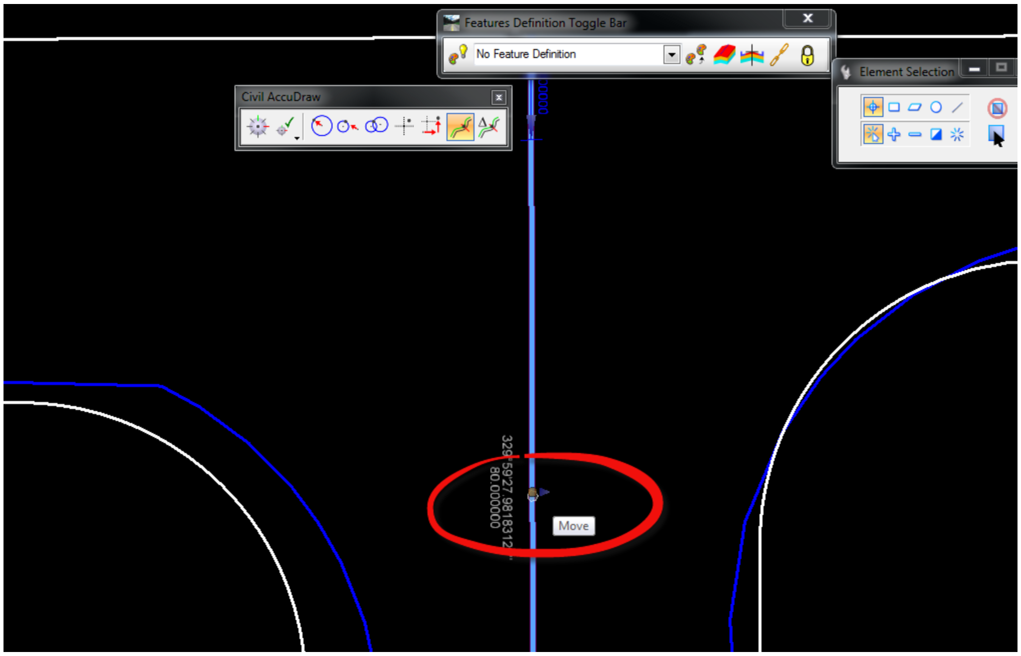


a. Place the *Radius* on both side and set *Trim/Extend* to **Both**.



b. Change the *Geometry* to fit the existing driveway.

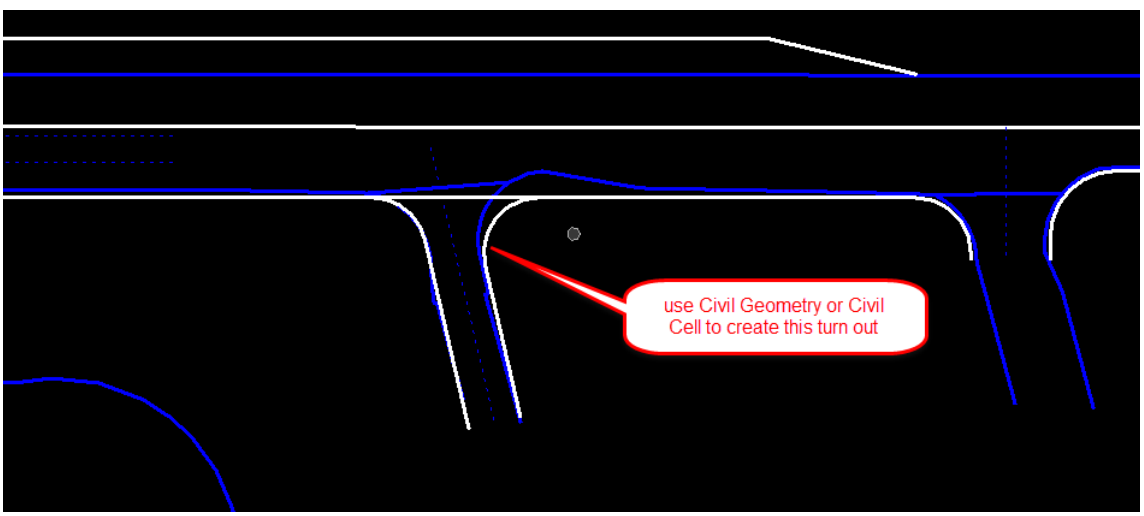
HINT Use the centerline snap and dimensions to modify the location, length and angle. Use the Offset PavementAsphalt(EOPA) Dimensions to change the width.



3. (EXTRA Exercise) Repeat the steps above to create an addition **Turnout** as shown below

<OR> use the *Civil Cell*, *FDOT Intersection.dgnlib*, and Side Road Turnout.

However, first place the *Side Road Centerline*.



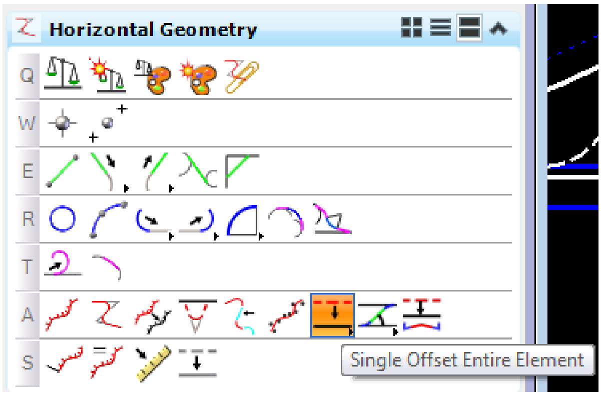
HINT When using the Side Road Turnout Civil Cell; there was an issue delivered. Drop the placed civil cell, fit the view and delete the extraneous element placed.

Exercise 3.17 For BL98 Intersection Shoulders

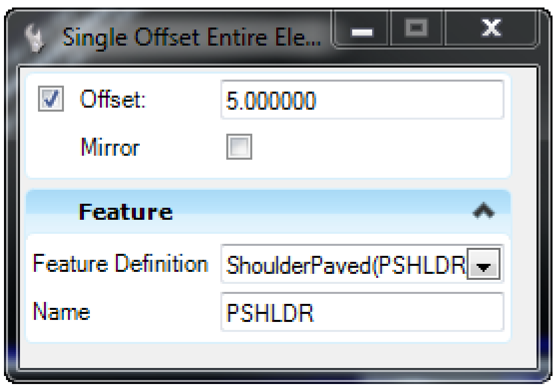
This exercise uses the PavementAsphalt(EOPA) to create the **5 feet ShoulderPaved(PSHLD) Offset** lines.

1. Turn **ON** the *ShldrPaved* level.

2. Use *Horizontal Geometry*, **Single Offset Entire Element** tool**.**



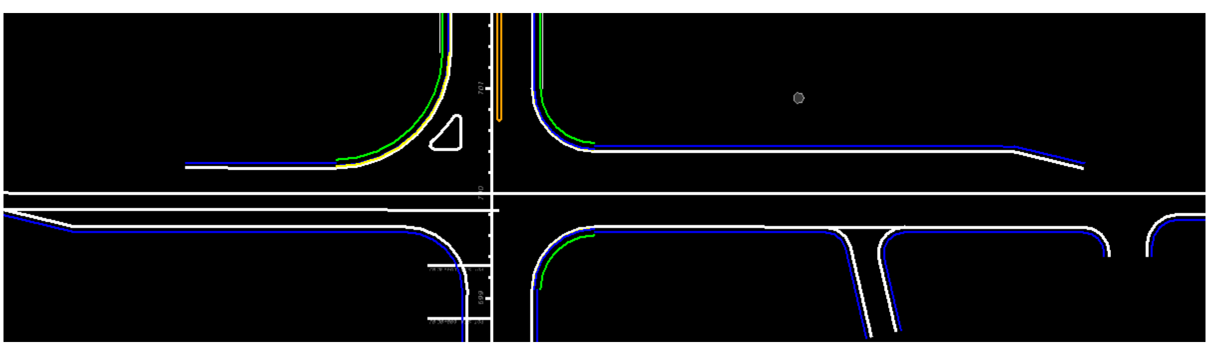
3. Set the *Offset* to **5 feet** and the *Feature Definition* to **ShoulderPaved(PSHLD).**



4. Select the **PavementAsphalt(EOPA)** lines from the previous steps.

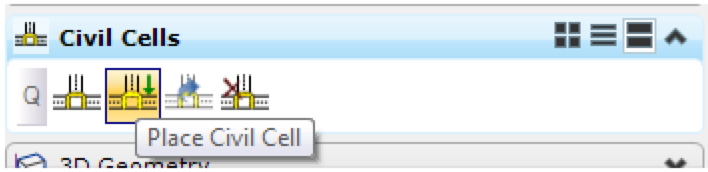
5. Repeat these steps to add the remaining *Shoulder lines* for the widening along BL98.

6. View the intersection below for complete details.

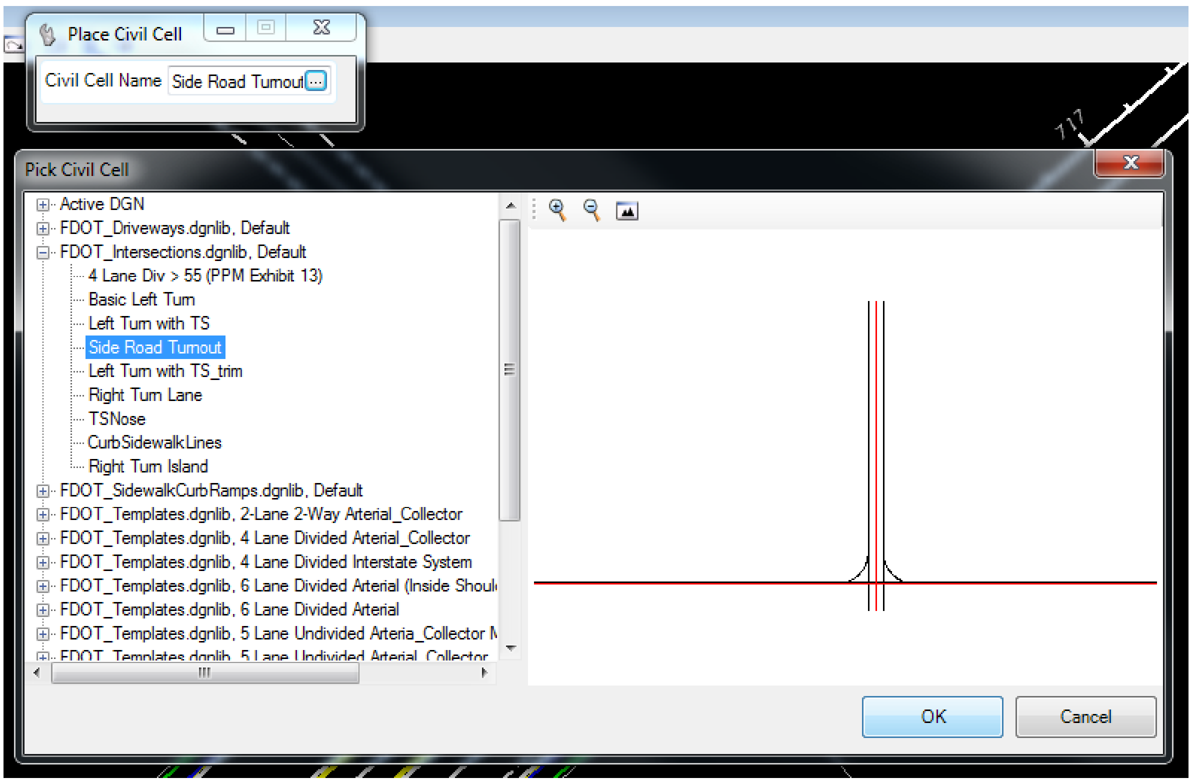


Exercise 3.18 For Friendship Intersection

1. Use *Civil Cells*, select **Place Civil Cell** tool.



   a. From the Place Civil Cell dialog, navigate to the *FDOT _Intersections.dgnlib* and select **Side Road Turnout**.



   b. Add **Side Road Turn Out** *civil cell* to both sides of the Intersection with *Friendship* and *Friendship 2 Centerlines*.

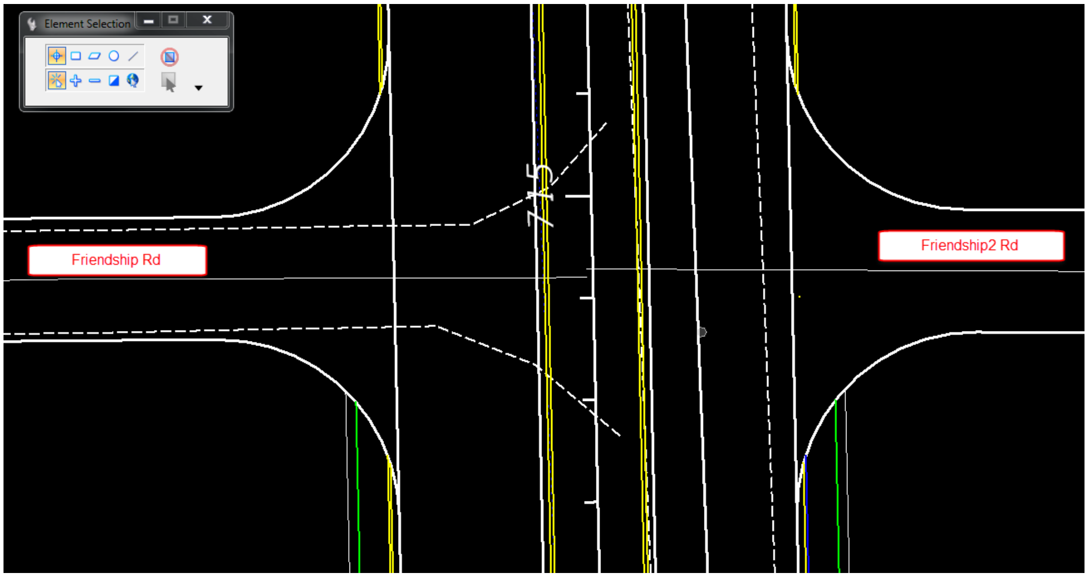
HINT When using the Side Road Turnout Civil Cell; there was an issue delivered. Drop the placed civil cell, fit the view and delete the extraneous element placed.

   c. Use **Modify Element** to clean the extra curb line and sidewalk lines across the intersection.

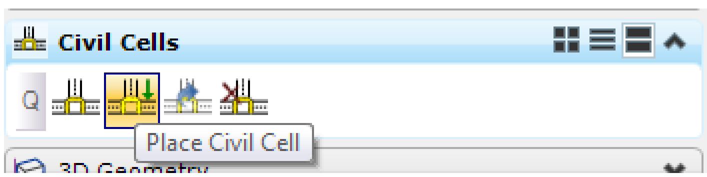
   d. Change all *Radii* to **35 feet.**

   e. Change Friendship2 Side Road Offsets to **20 feet**.

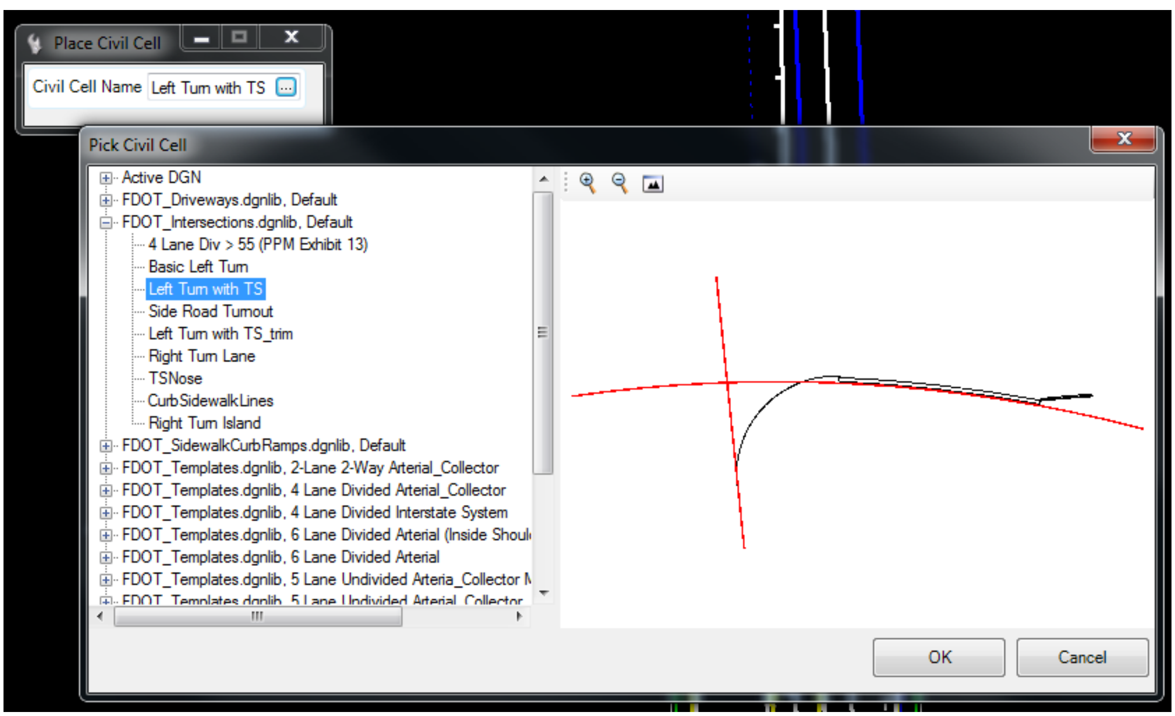
   f. Change *Centerline Length* to **100 feet**.



2. Use *Civil Cells*, **Place Civil Cell** tool.

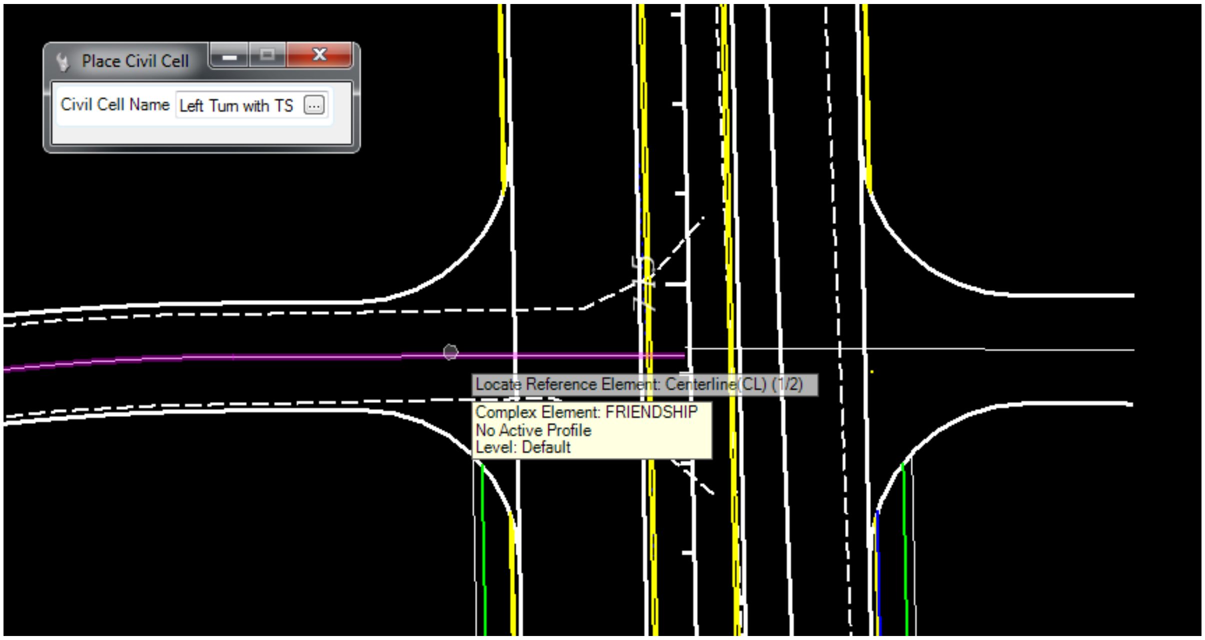


a. From the Place Civil Cell dialog, navigate to the *FDOT _Intersections.dgnlib* and select **Left Turn with TS**.

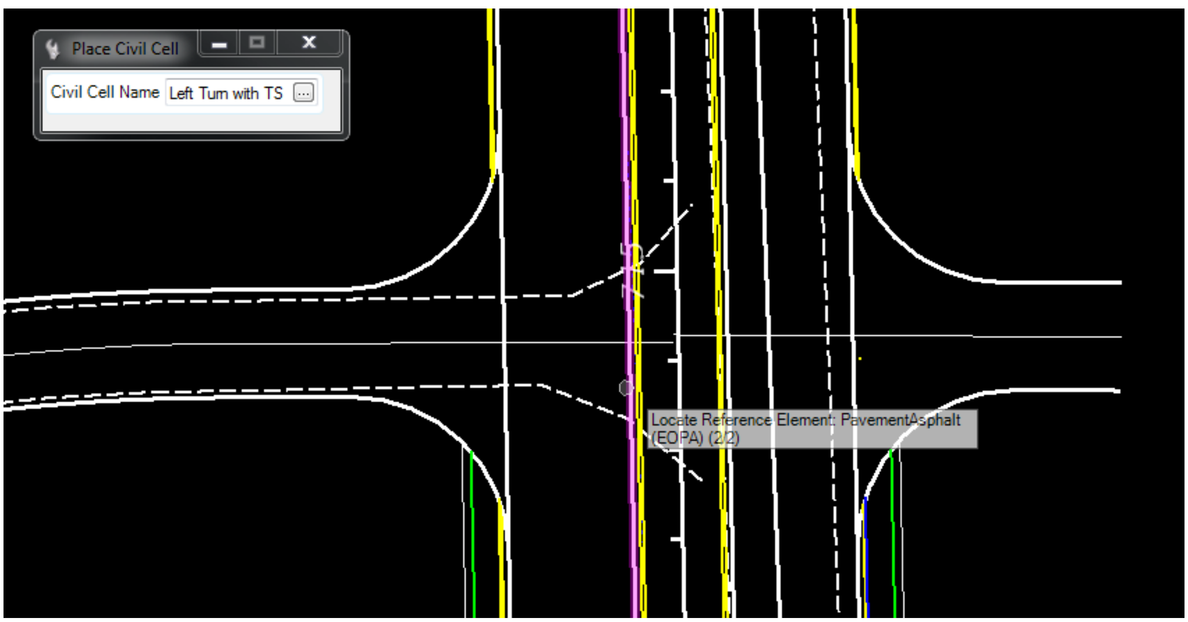


b. Use *FDOT _Intersections.dgnlib*, **Left Turn with TS** *Civil Cell* to a place left turn lane on SR61 at *Friendship Intersection*.

c. For the first *Reference* element, select the **Friendship Rd Centerline.**



d. For the second *Reference* element, select the *left median* **PavementAsphalt(EOPA)** line.

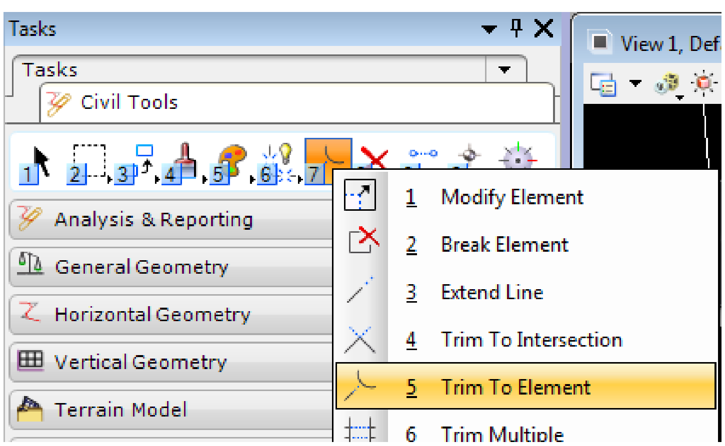


e. Reset to Skip Alternates and data point to accept Civil Cell Placement.

f. Change the turning *Radius* to **50 feet.**

g. Change the turning lane storage length to 300 feet.

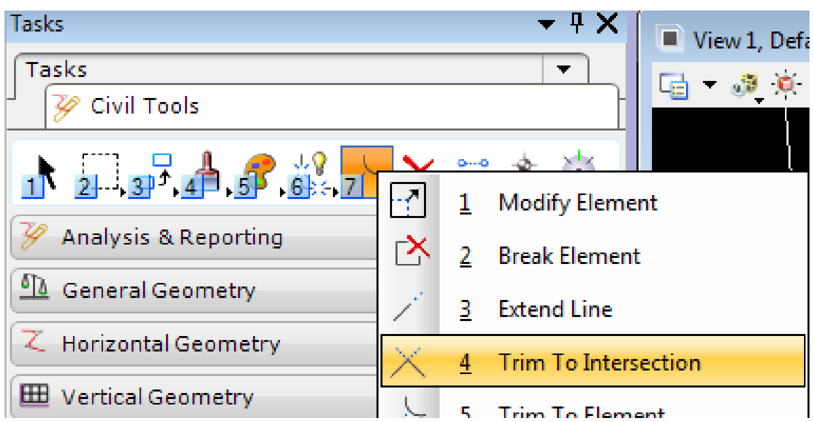
3. Use MicroStation **Trim to Element** tool**.**



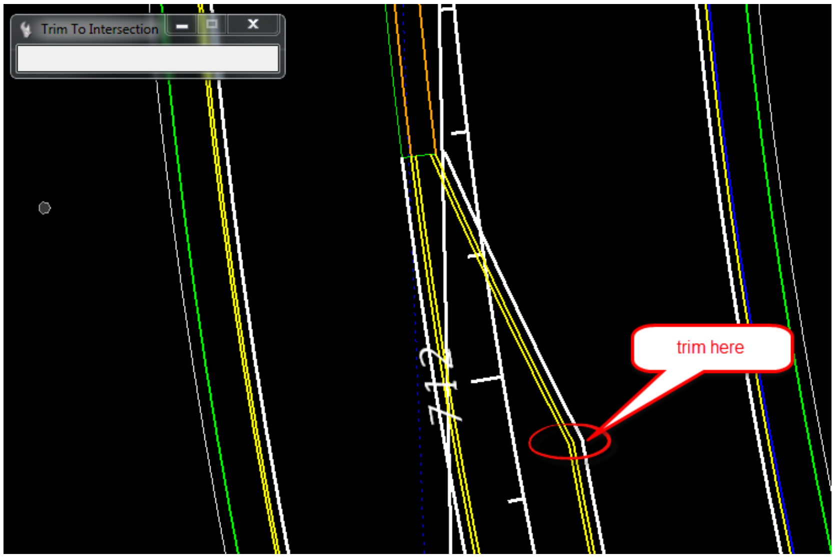
4. Move the **LT_PVT_EOP_IN** to the beginning of the *Traffic Separator*.

HINT Use the ConstLinesGreen as the cut element

5. Use MicroStation **Trim to Intersection** tool.



6. Trim the **Curb** and **EOP** lines to the beginning of the *median Taper line*.



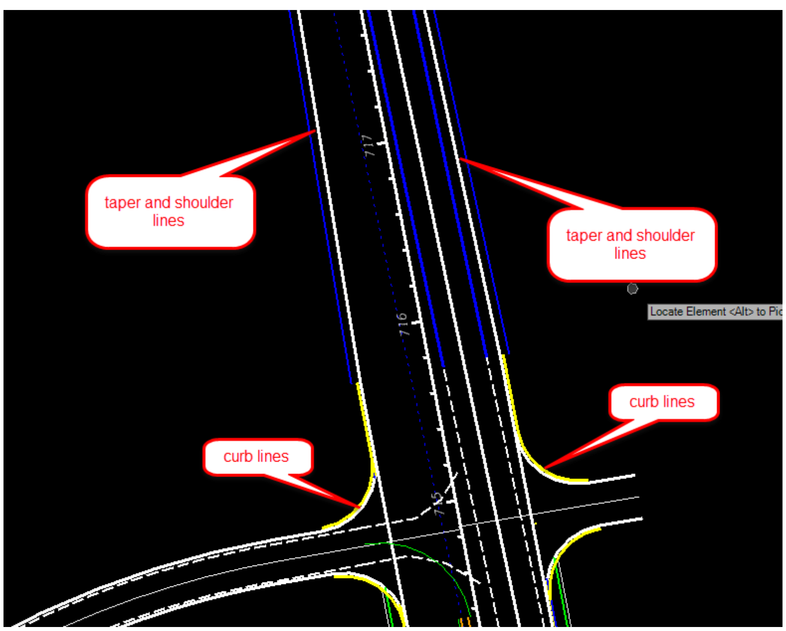
7. (EXTRA Exercises) Complete the *Intersection* with *Civil Geometry* tools as follows below:

    a. Add **Curb lines** for each of the *Radius*.

    b. Trim **Sidewalk lines** into the *Radius Curb* lines. There is no sidewalk along SR61 north of Friendship Road.

    c. Add **Asphalt Pavement(EOP) Taper lines** from the Intersection Radii at Friendship to the End Station of SR61 11 left.

    d. Add **ShoulderPaved(PSHLDR)** lines to both sides along the *Taper*.



4 PROFILES

INTRODUCTION

This chapter will continue to use the OpenRoads Technology Civil Tools, Vertical Geometry. Rather than use traditional GEOPAK Profile creation tools, these exercises will provide participants with practice using the Civil Tools. Using Civil rule-based Feature Definitions assures *design intent* is incorporated into the vertical geometry layout. This will be beneficial for design when changes need to be reflected and considered through-out the development process.

This chapter introduces important new OpenRoads Technologies for creating vertical geometry line work while designing in FDOTSS4.

OPEN PROFILE MODEL

The Open Profile Model generates a MicroStation View that presents the desired feature in profile thus enabling the Vertical Geometry tools to interact with the chosen feature.

Open the Civil Tools Task pane to the Vertical Geometry section then click the Open Profile Model icon. Move the cursor into the Workspace and note that it is accompanied by a command prompt requesting that you, "Locate Plan Element". Select the element with which you wish to work in profile. The cursor is now equipped with a prompt that says, "Select or Open View". Data point or left-click in it a view to present a profile of the selected element. If no other view is open, click one of the view icons on the View Groups toolbar then click again in the new View. Vertical Geometry tools can then be used to edit/create vertical profile data in the design.

EXERCISE OVERVIEW

4.1 Preparation for SR61 Profile

4.2 Create SR61 Profile

4.3 Edit SR61 Profile

4.4 BL98 Profile

4.5 Friendship Profile

Exercise 4.1 *Preparation for SR61 Profile*

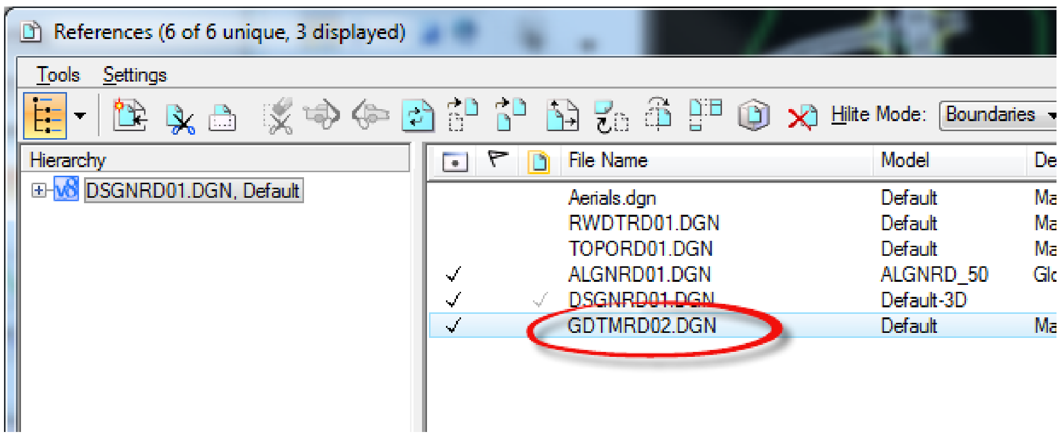
1. (Optional) Extract the *22049555201(4).zip* file in the c:\e\projects folder.

2. Open the *DSGNRD01.dgn* file of the c:\e\projects\22049555201\roadway\ folder in the *FDOTSS4* Workspace in MicroStation.

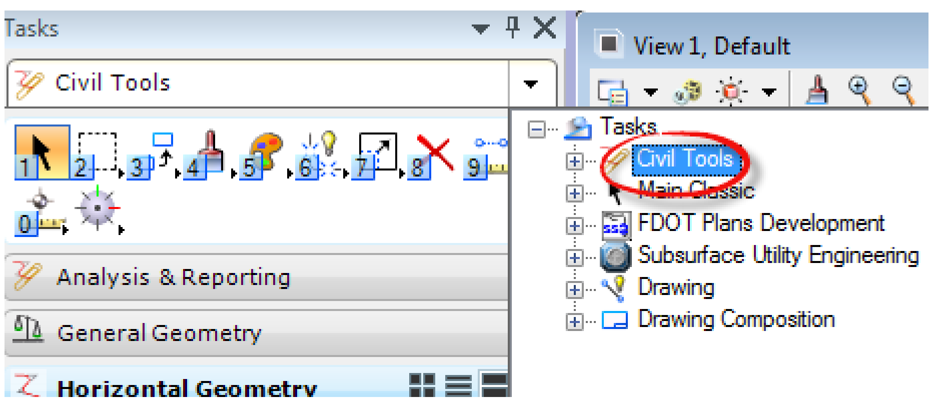
3. Use MicroStation, **References** tool to attach the **Existing Terrain** file,

   c:\e\projects\22049555201\survey\ *GDTMRD02*

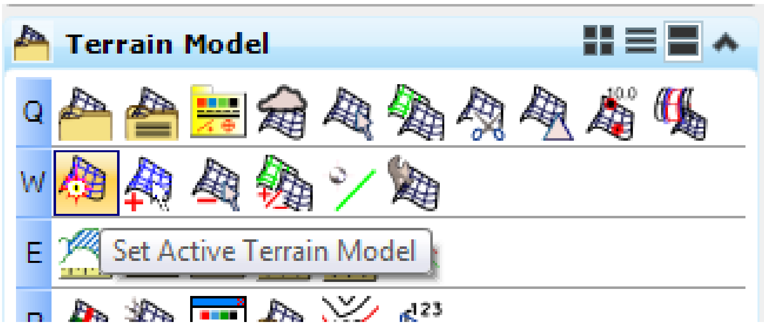
Note If the SURVRD file exist the **SURVRD01 -GTMRD** logical can be used



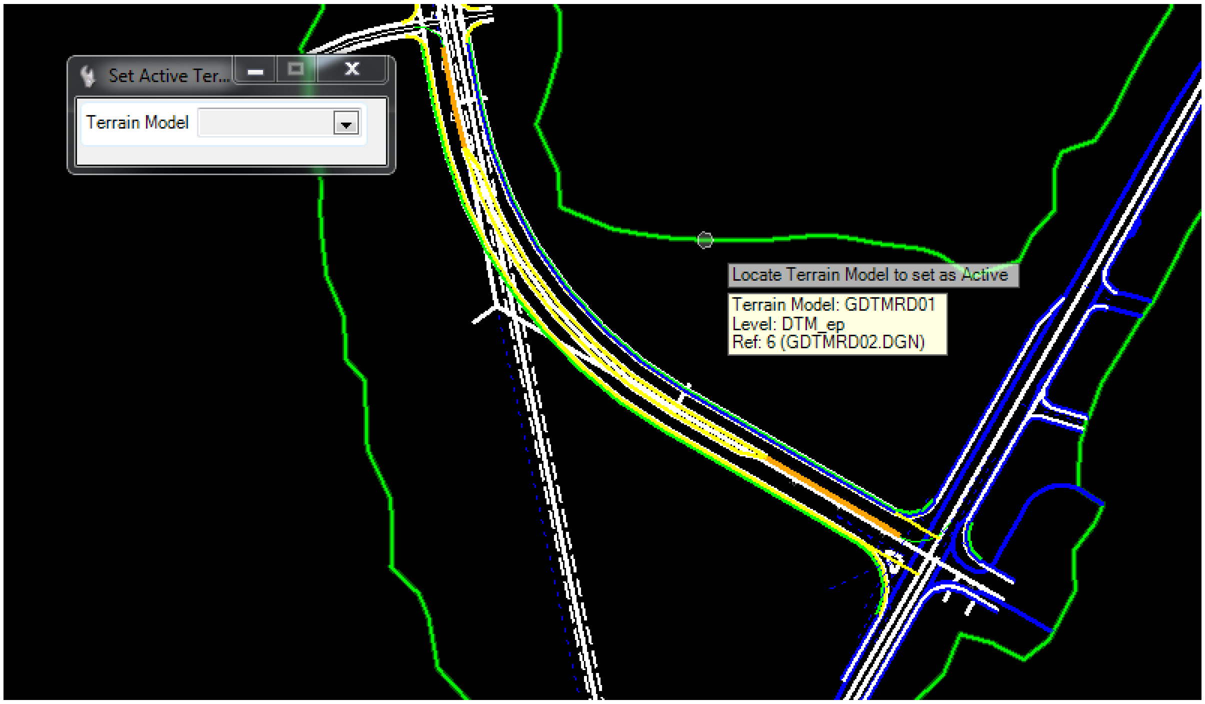
4. Select the **Tasks** list and set the *Menu Tasks* to **Civil Tools.**



5. Use the *Terrain Model*, **Set Active Terrain Model** tool**.**



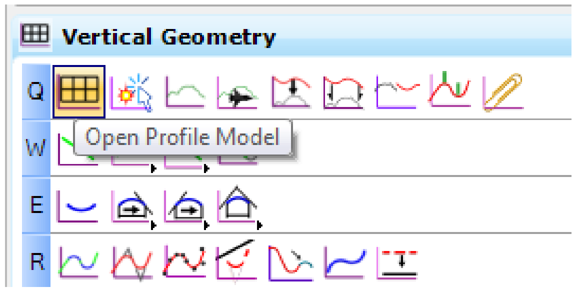
6. At the cursor prompt, select the **Terrain Boundary** green line from the attached *GDTMRD02 Reference* file <OR> pick it from the list on the dialog.



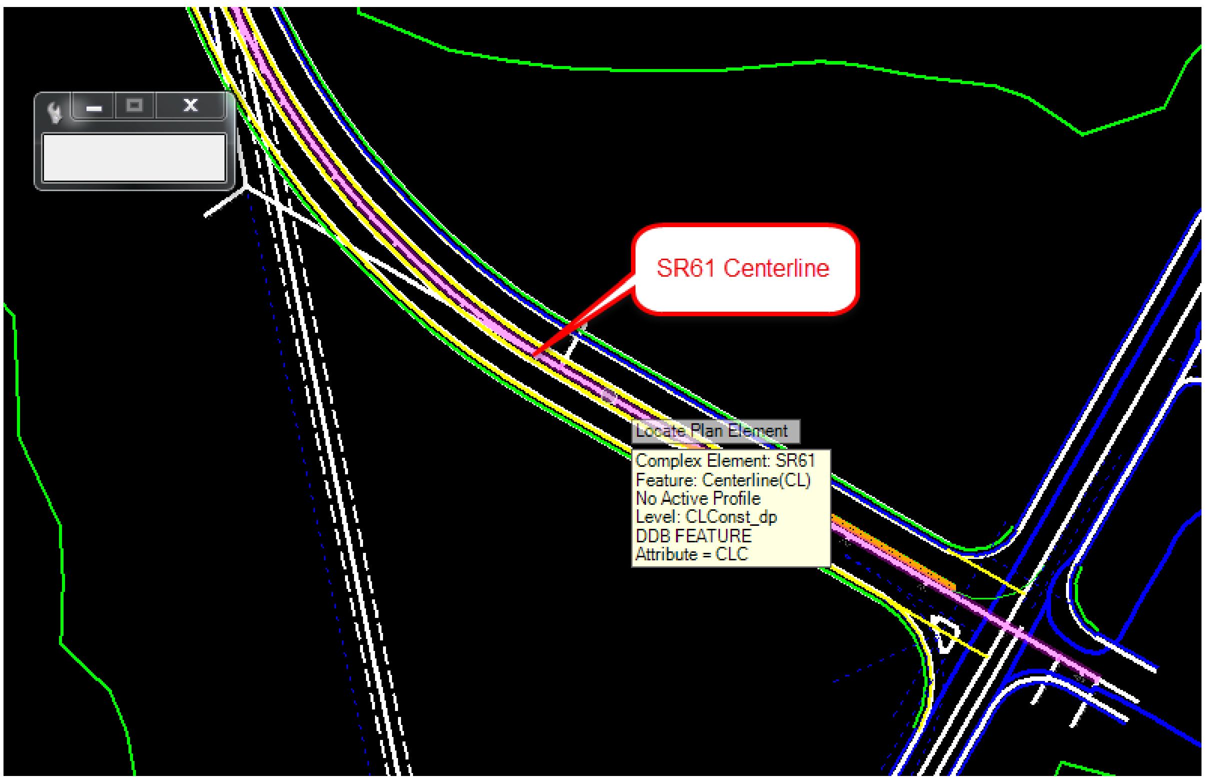
Exercise 4.2 Create SR61 Profile

In this exercise, several Vertical Geometry tools are used to create a proposed profile for SR61.

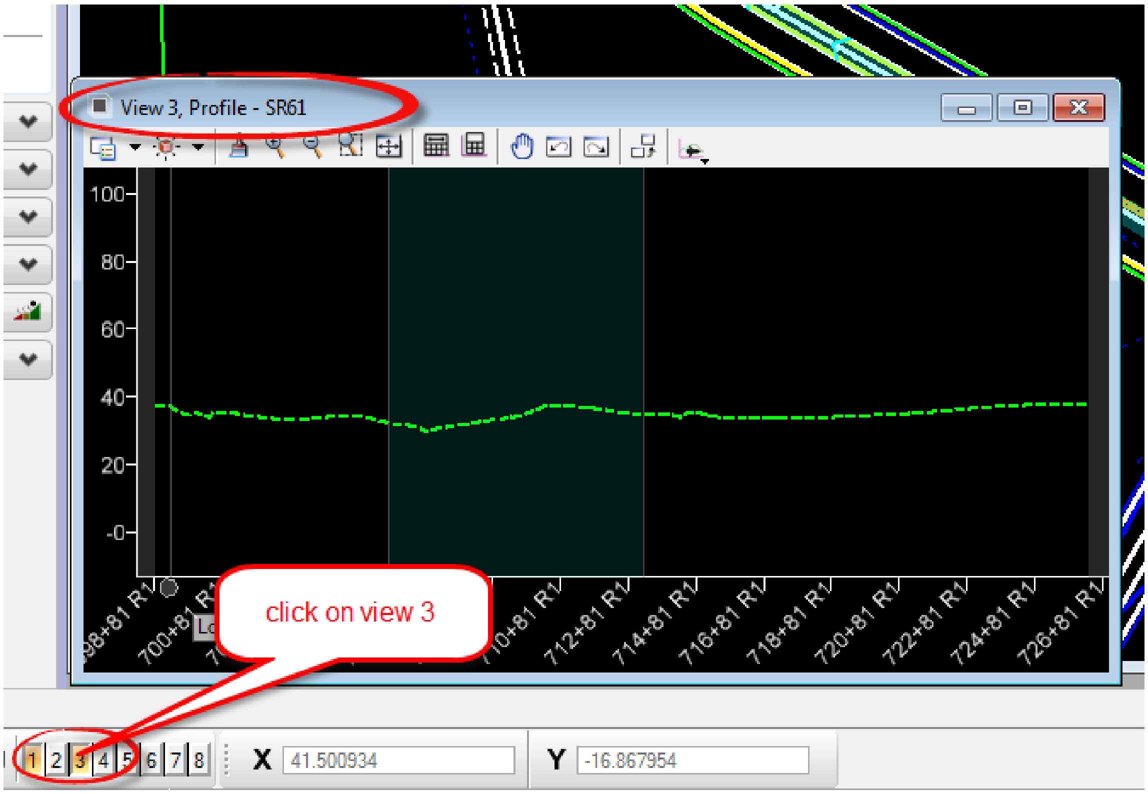
1. Use the *Vertical Geometry*, **Open Profile Model** tool.



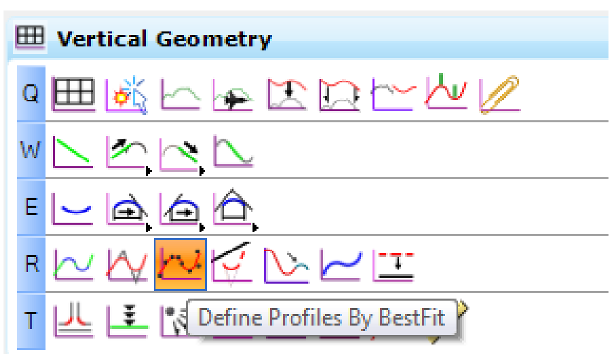
   a. At the cursor prompt, select on the mainline **SR61** *Centerline***.**



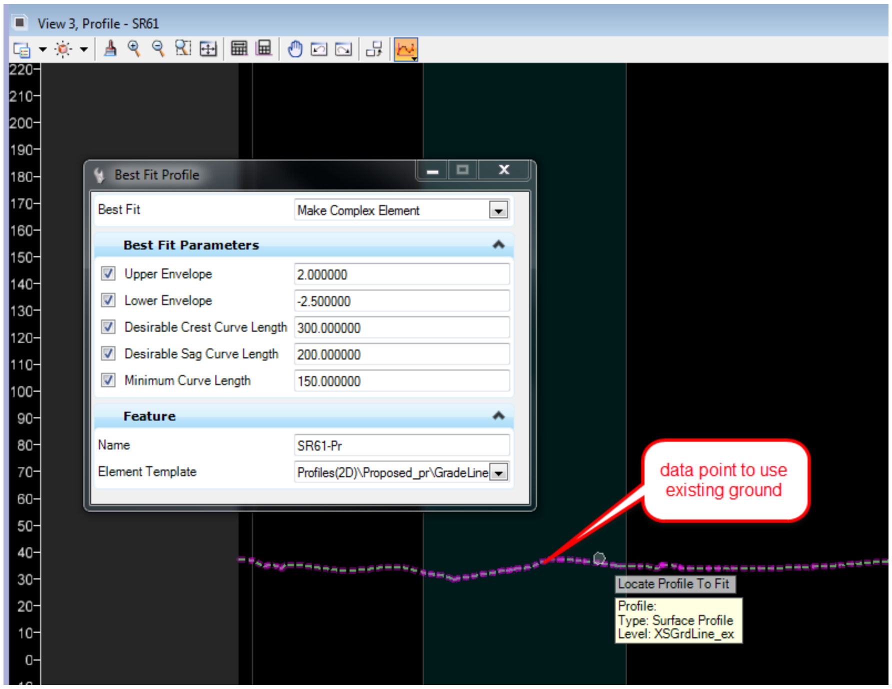
b. At the prompt select to open View 3, then data point in the View.



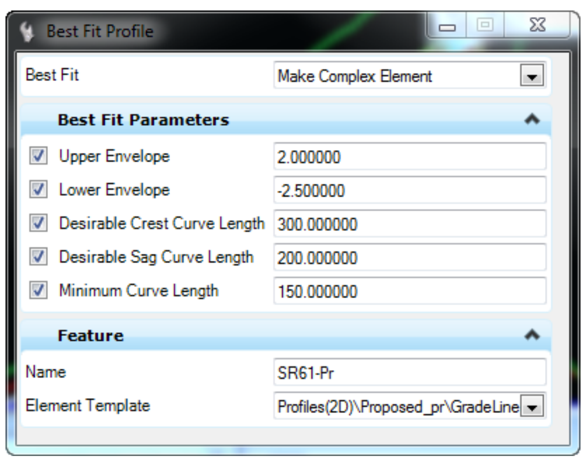
2. Use the *Vertical Geometry*, **Define Profiles by Best Fit** tool.



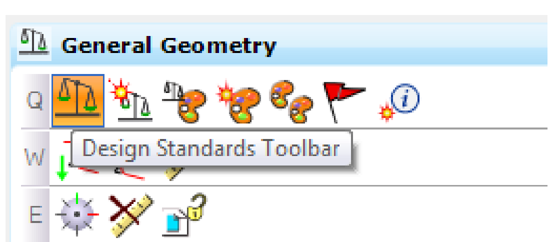
a. At the cursor prompt, data point to **Make Complex Element** option. Enter the *Profile Name* , SR61-PR, and then data point on the green line in the profile.



b. Follow the prompts to enter the **Best Fit Parameters** as shown.

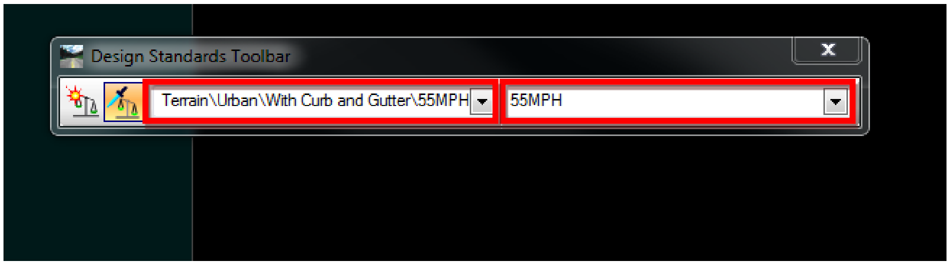


3. Use the *General Geometry*, **Design Standards Toolbar** tool.

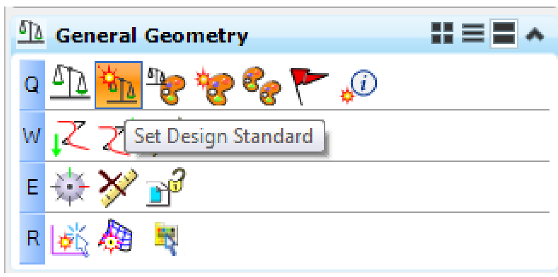


4. On the Design Standards Toolbar, navigate to *Arterials, Flat Terrain, Urban, With Curb and Gutter* and select **55MPH**. Toggle **On** the Active Design Standard.

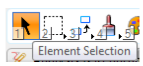
HINT Be sure to set left and right fields to 55 MPH

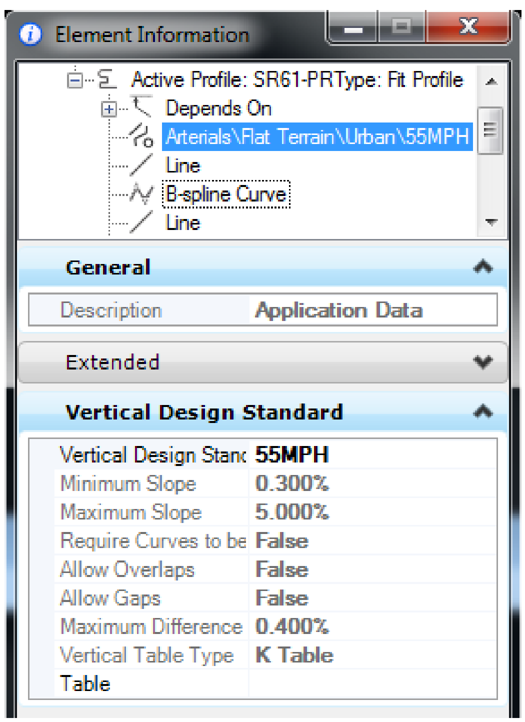


5. Use the *General Geometry*, **Set Design Standard** tool.

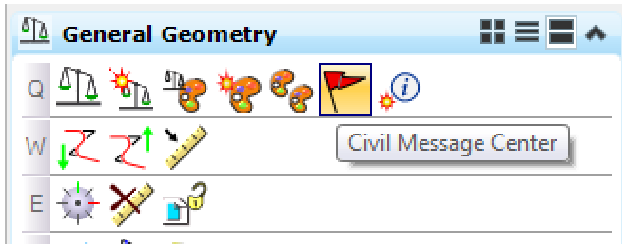


a. At the prompt, select the **Best Fit Profile** created in the previous steps. The profile now has *a Vertical Design Standard rule* placed on it.

b. Using the Select Tool,  select the profile element and view its properties in the **Element Information** dialog.

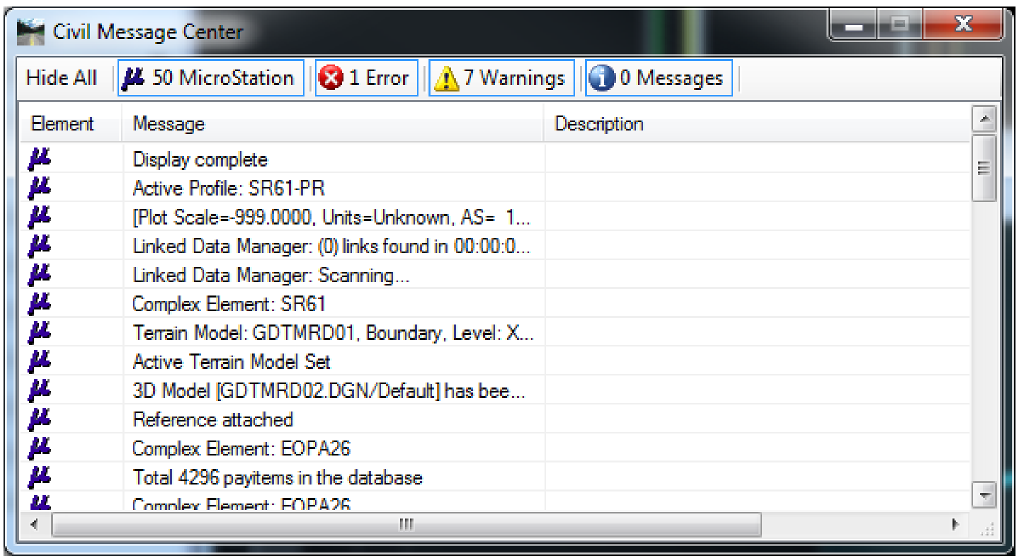


6. Use the *General Geometry*, **Civil Message Center** tool.

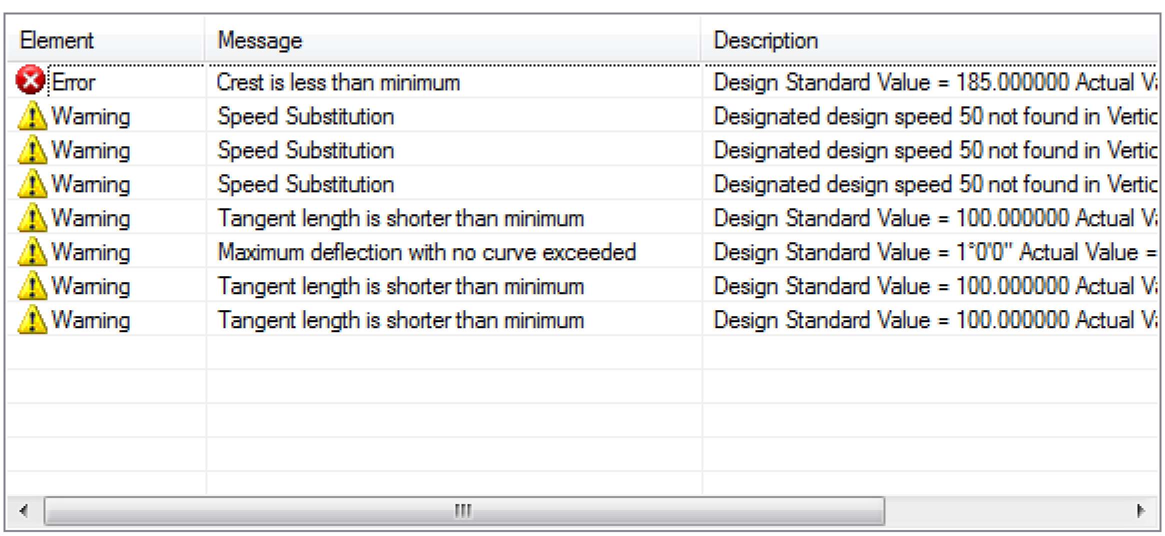


a. The Civil Message Center dialog displays to view the results.

Note It may be docked at the bottom of the screen, click on the Tab



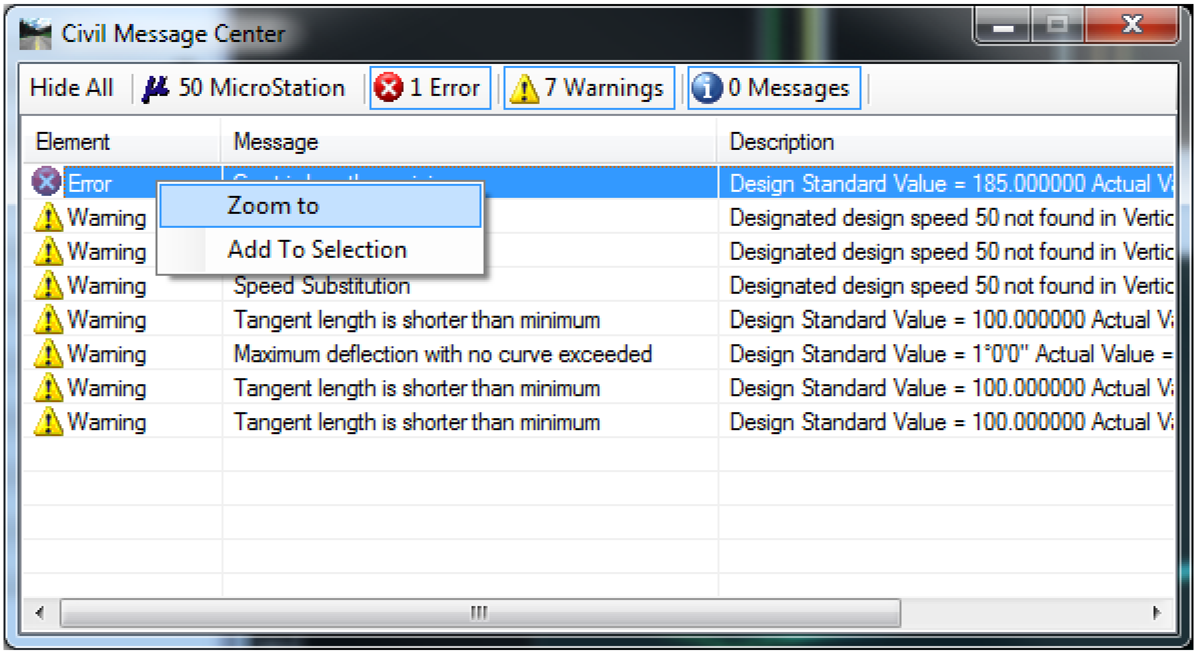
b. In the Civil Message Center dialog, select on the **MicroStation** tab. This will toggle **Off** all the general messages for MicroStation and leave only *Errors* and *Warnings* in the list.



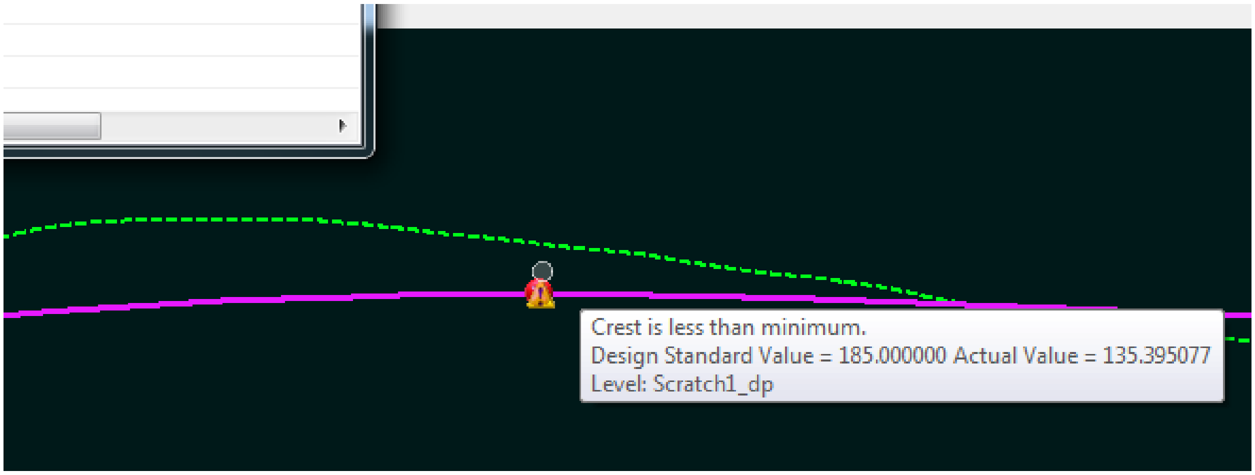
Element	Message	Description
Error	Crest is less than minimum	Design Standard Value = 185.000000 Actual V:
Warning	Speed Substitution	Designated design speed 50 not found in Vertic
Warning	Speed Substitution	Designated design speed 50 not found in Vertic
Warning	Speed Substitution	Designated design speed 50 not found in Vertic
Warning	Tangent length is shorter than minimum	Design Standard Value = 100.000000 Actual V:
Warning	Maximum deflection with no curve exceeded	Design Standard Value = 1°0'0" Actual Value =
Warning	Tangent length is shorter than minimum	Design Standard Value = 100.000000 Actual V:
Warning	Tangent length is shorter than minimum	Design Standard Value = 100.000000 Actual V:

c. In the Civil Message Center, review the *Errors* and *Warnings*.

d. Select the **first error**, then right click over the error and select **Zoom To** from the popup box.

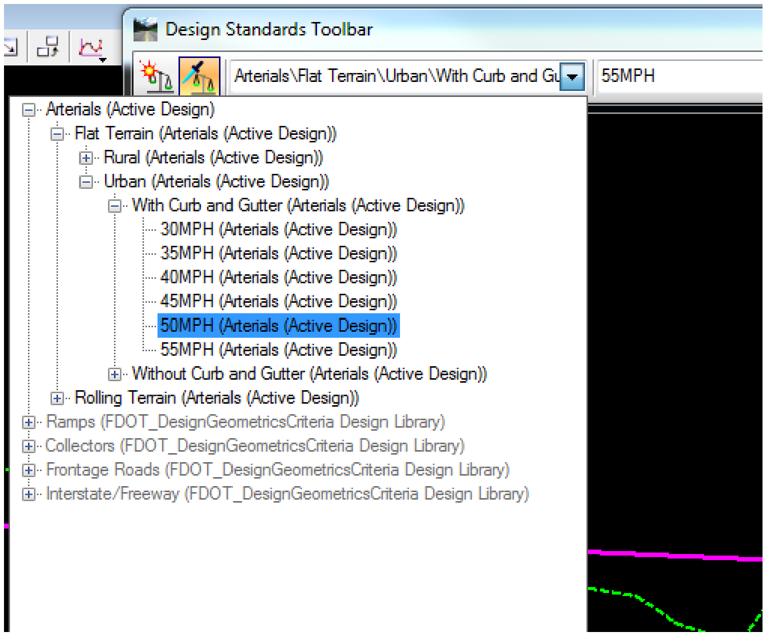


e. Notice the *Error* is now centered in the profile view. Hover the cursor over the *Error* icon to display the *Error Message* description.

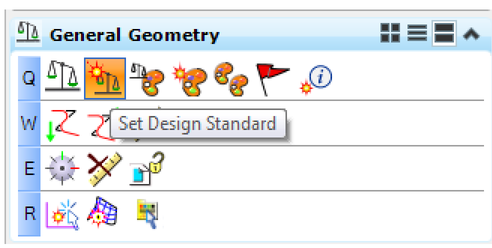


Note The values are given in whole stations, i.e. 3.5 station equals 350 feet

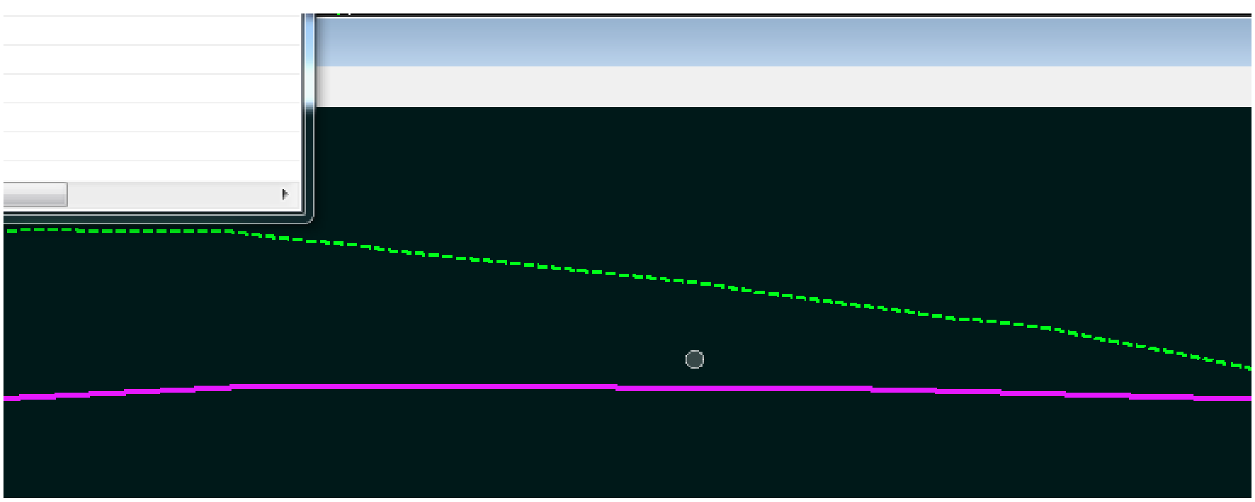
7. On the Design Standards Toolbar, navigate to *Arterials, Flat Terrain, Urban, With Curb and Gutter* and select **50MPH.**



8. Use the General Geometry, Set Design Standard tool.



9. At the prompt, select the **Best Fit Profile** created in the previous steps. Notice the *Error* icons are no longer displayed.



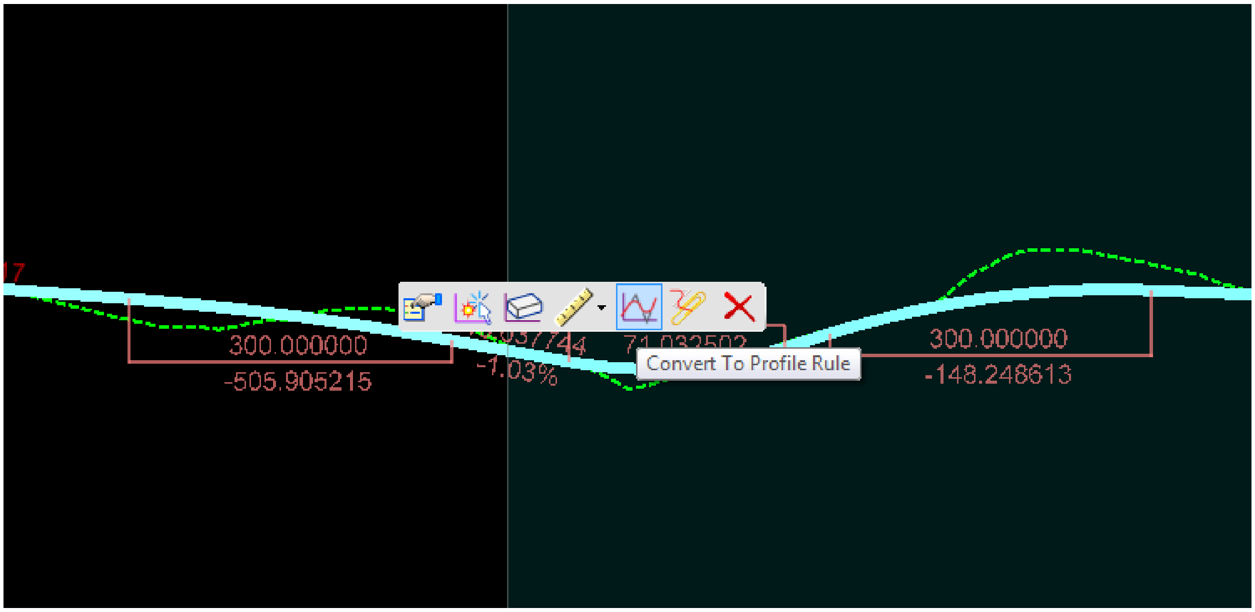
Exercise 4.3 Edit SR61 Profile

This exercise changes the profile using Civil AccuDraw and MicroStation Modify Element.

➢ *Edit the Best Fit Profile*

In order to edit this profile, because it was created from the “Profile by BestFit” the rule must first be removed.

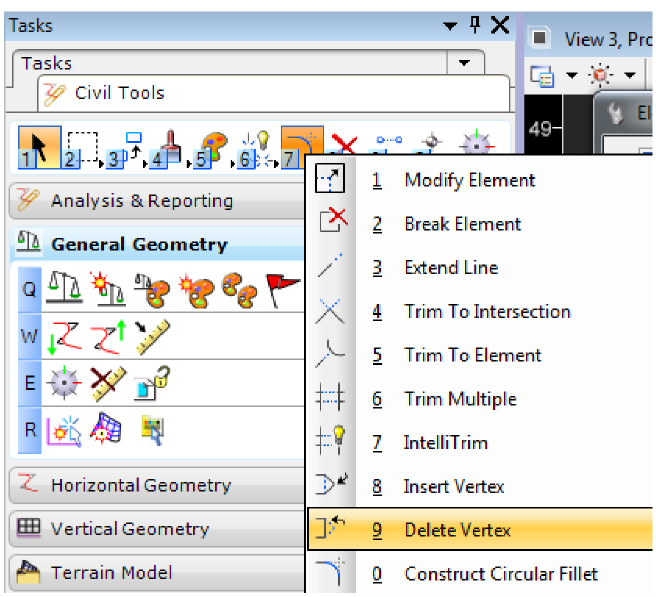
1. Select the **Profile Element** and hover over the element to display the Context Menu.



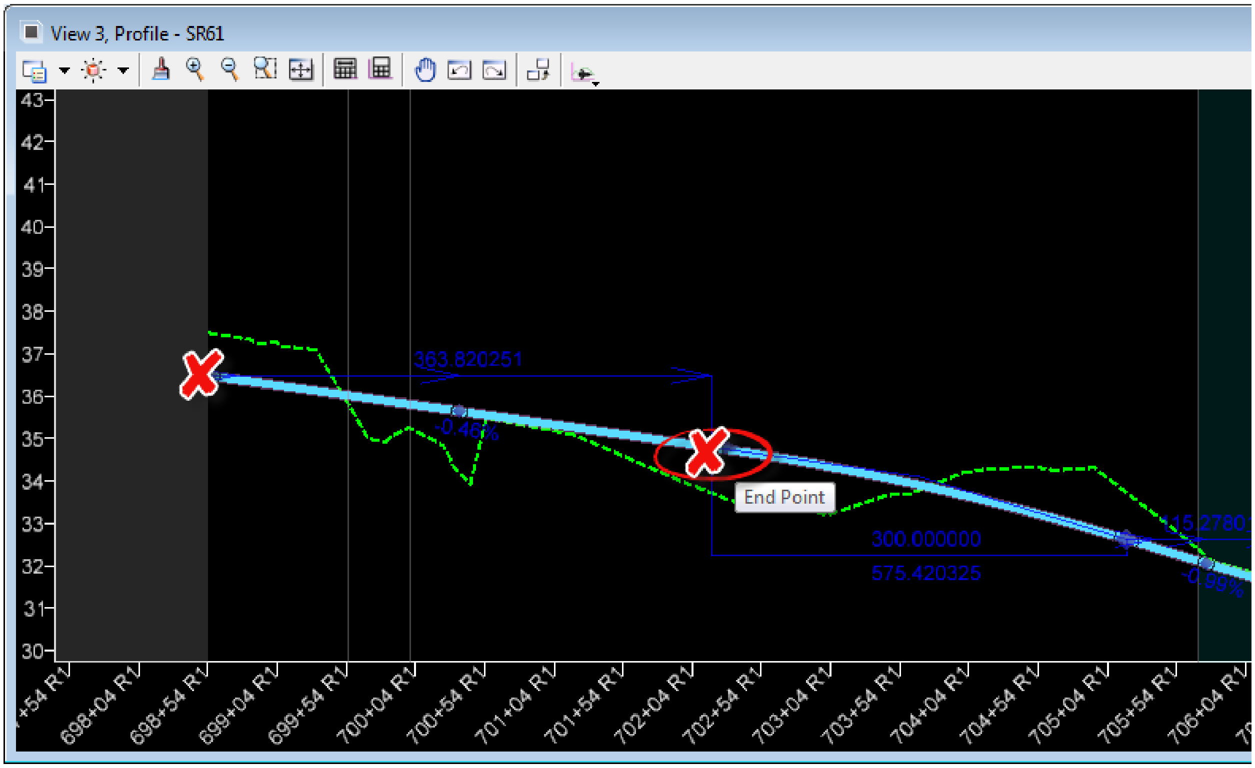
2. Select the Convert to Profile Rule tool.

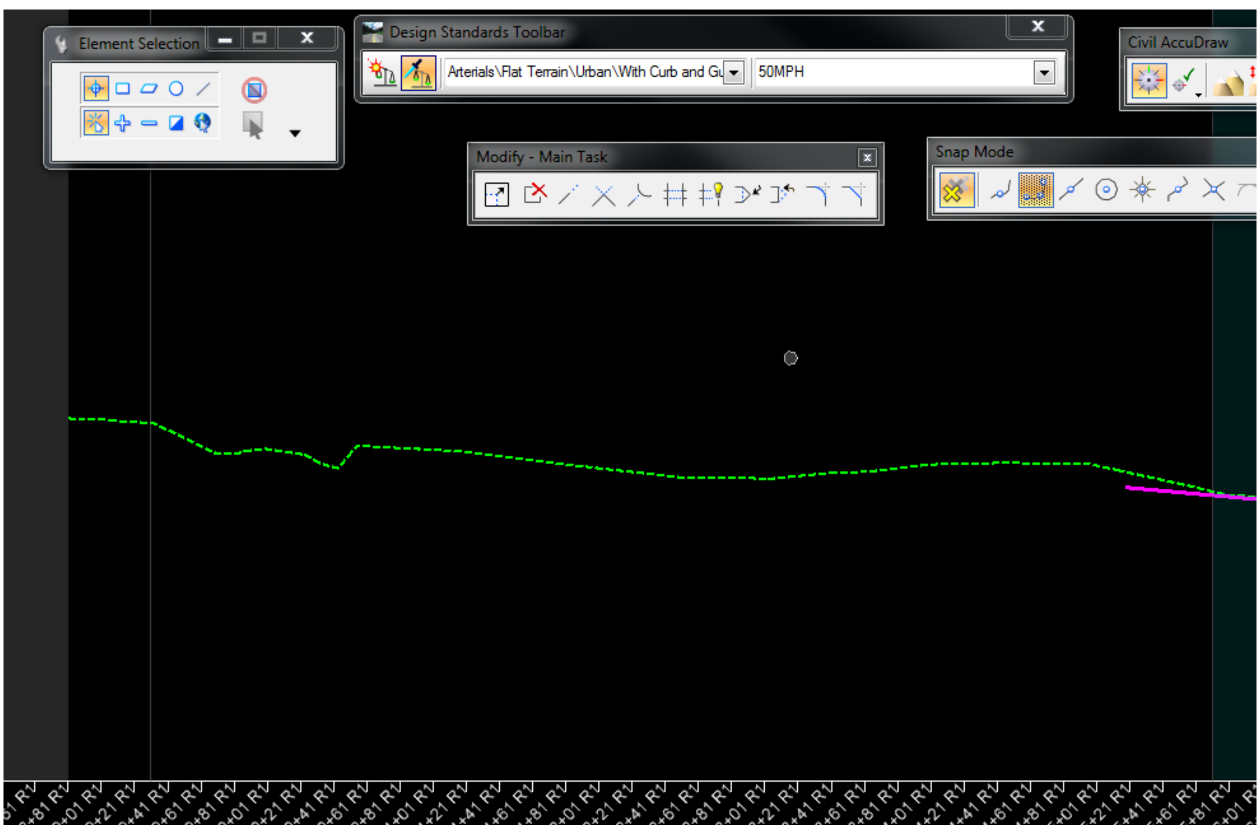
➢ *Delete PIs*

1. Use MicroStation *Modify*, **Delete Vertex** tool**.**



2. Zoom to the *beginning* of the Profile and delete the first two **Vertical Elements**.

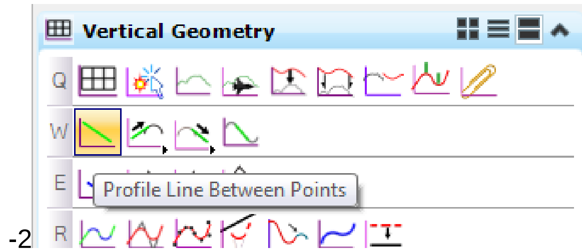




➢ *Create Profile with Place Vertical Line*

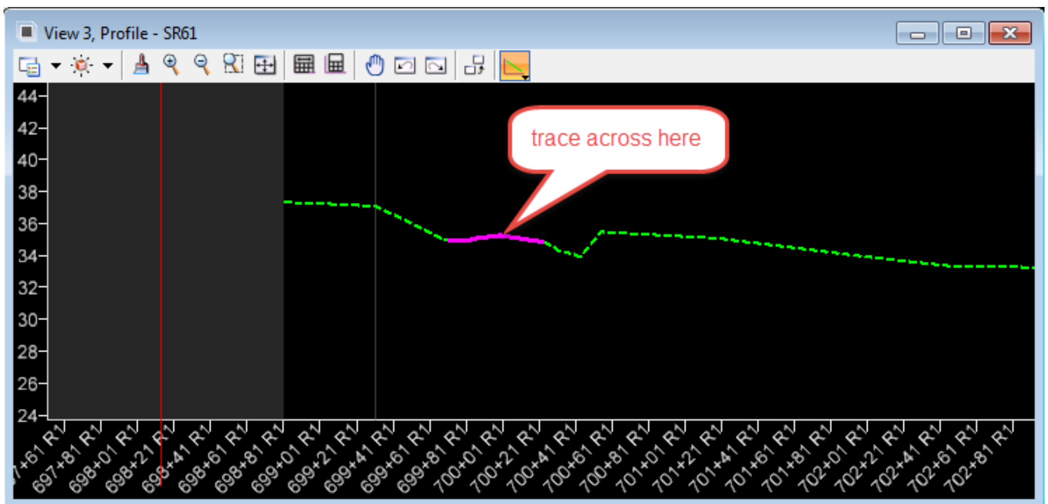
New vertical civil profile elements are added to match the existing profile across US98.

1. Use *Vertical Geometry*, **Profile Line Between Points** tool**.**



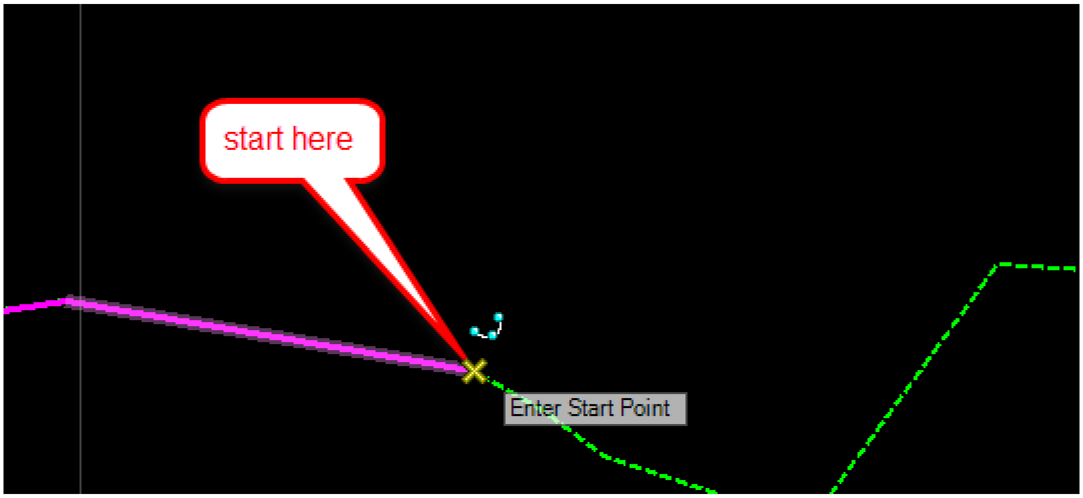
2. Place **Line Elements** on the *Existing Ground* points to trace the Profile across BL98.

Note This is not exact, simply trace a few lines.

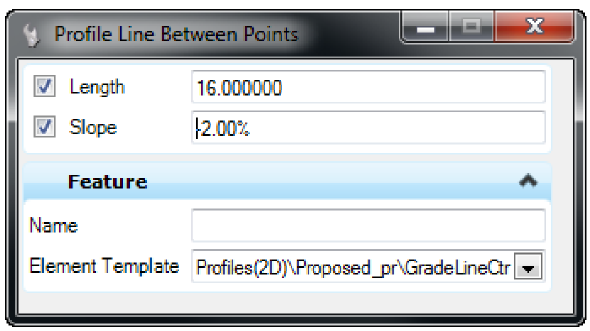


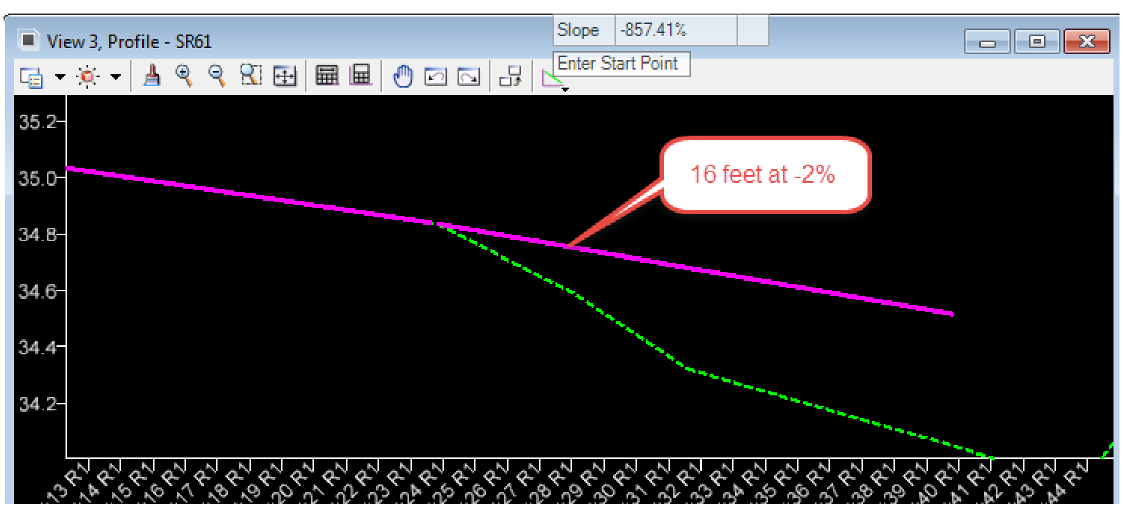
3. Continue using the Profile Line Between Points tool

   a. Begin at the edge of the existing pavement or connect to the proposed profile line from the step above.

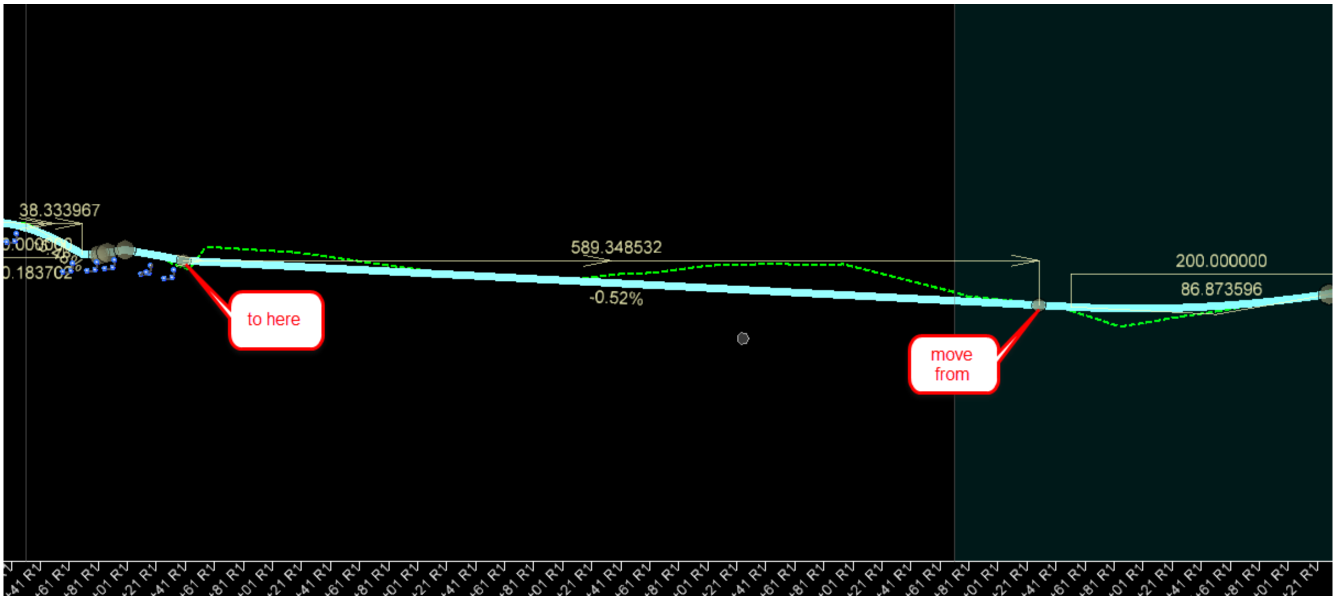


   b. In the Profile Line Between Points dialog, check the *length* and *slope*, *length* of **16 feet** and *slope* of **-2%. Click a data point in the view to create the line as defined in the dialog.**



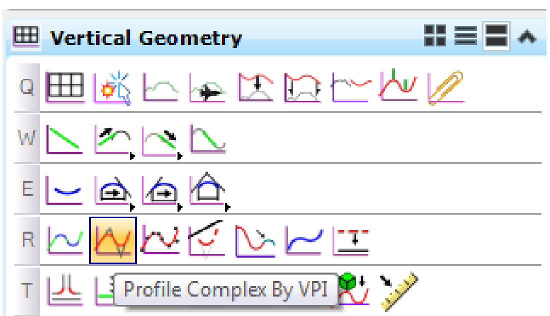


c. Using *Line Between Points* to join the two profiles, place another **Profile line** between the *"16' at 2%"* line and the *Best Fit Profile*.



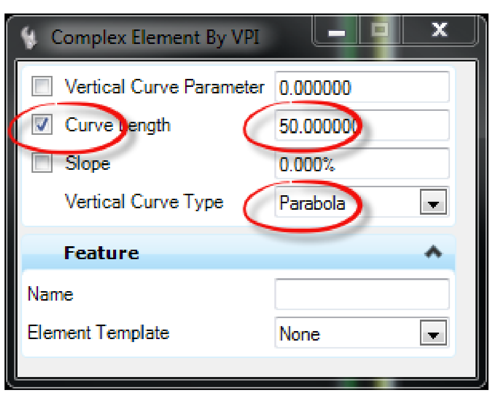
➢ ***Profile by VPI's***

1. Zoom to the Beginning of the profile, Use *Vertical Geometry*, **Profile Complex By VPI** tool.



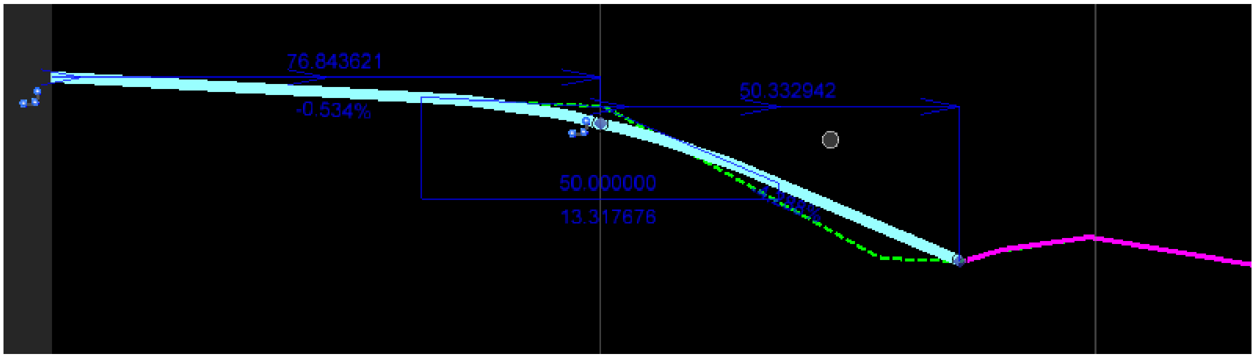
2. Toggle **OFF** the *Active Design Standard*, set the *Curve length* to **50 feet.**

HINT Check that the Vertical Curve Type is set to Parabola

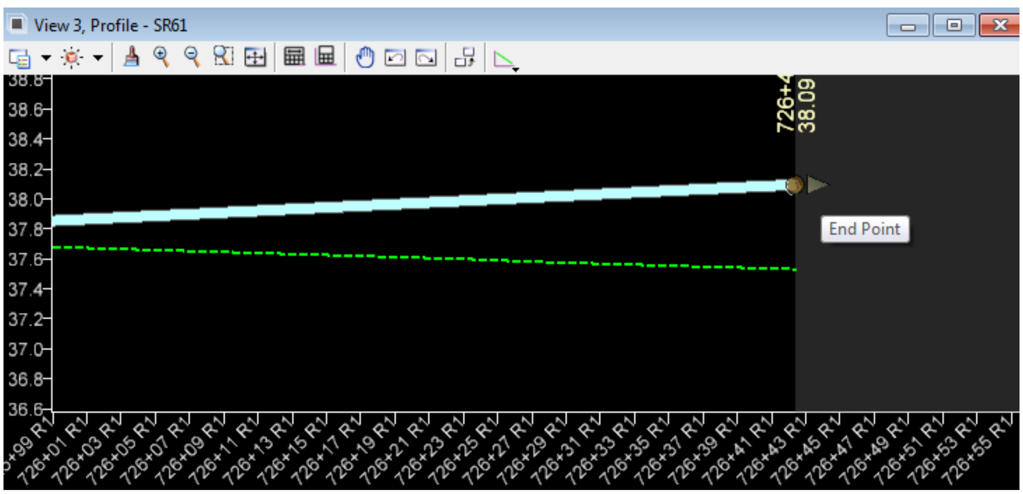


3. Start by snapping to the **Beginning Point** on the ground and complete the *Profile Segment* as shown below.

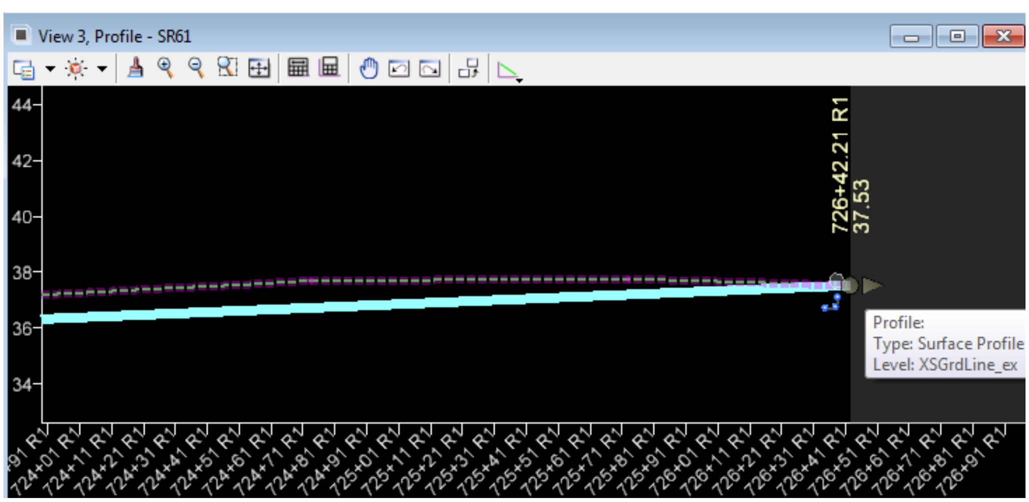
HINT This is not exact, snap to 3 points



4. Zoom to the End of the Profile, select the **Line** and move the last **End Point** to snap to the *Existing Ground*.

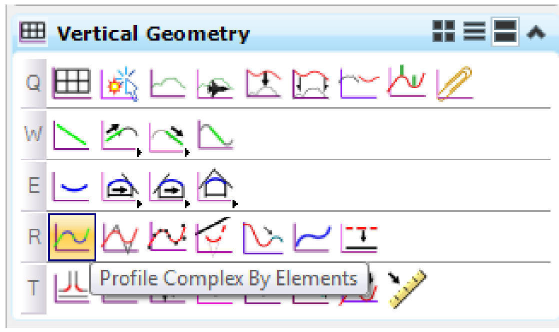


HINT Click on the solid ball manipulator at the end of the line to move it in both directions



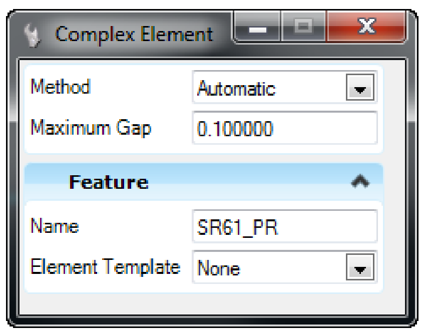
➢ ***Complex Profile Elements***

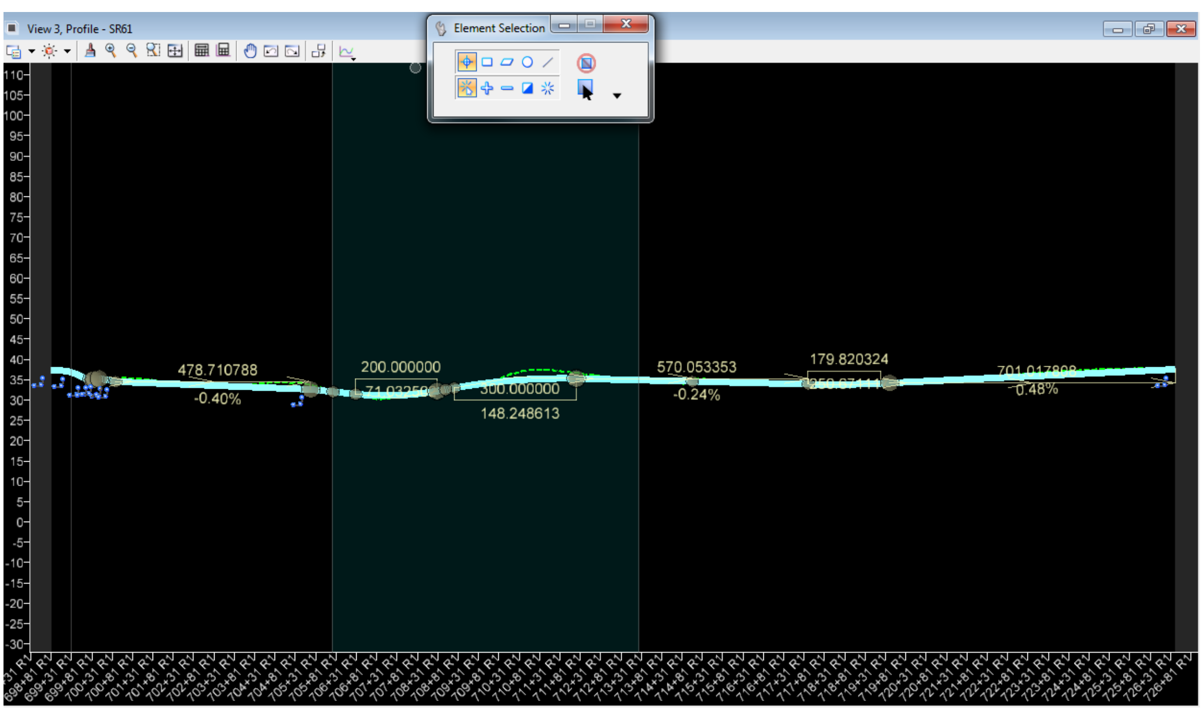
1. Use *Vertical Geometry*, **Profile Complex by Elements** tool**.**



2. Keyin the name SR61_PR on the dialog and Start at the Beginning Profile line and create a new **Connected Profile**.

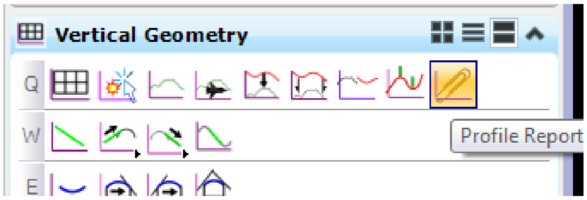
HINT On the Profile Complex by Element tool setting, enter the **Feature Name.** This is the P*rofile Name* assigned to the Profile.



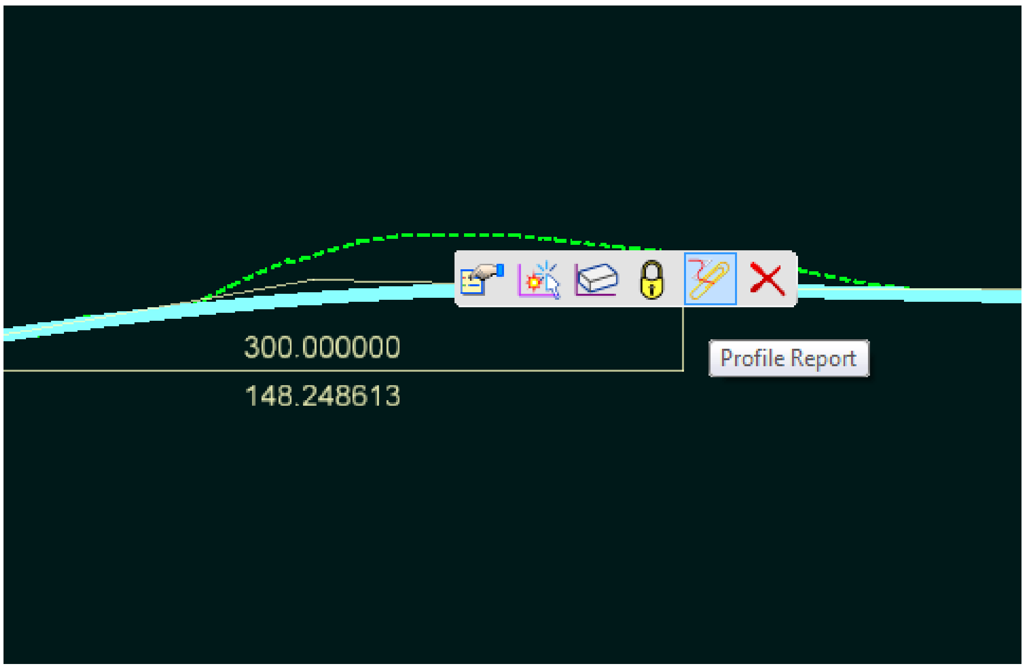


➢ *Profile Report*

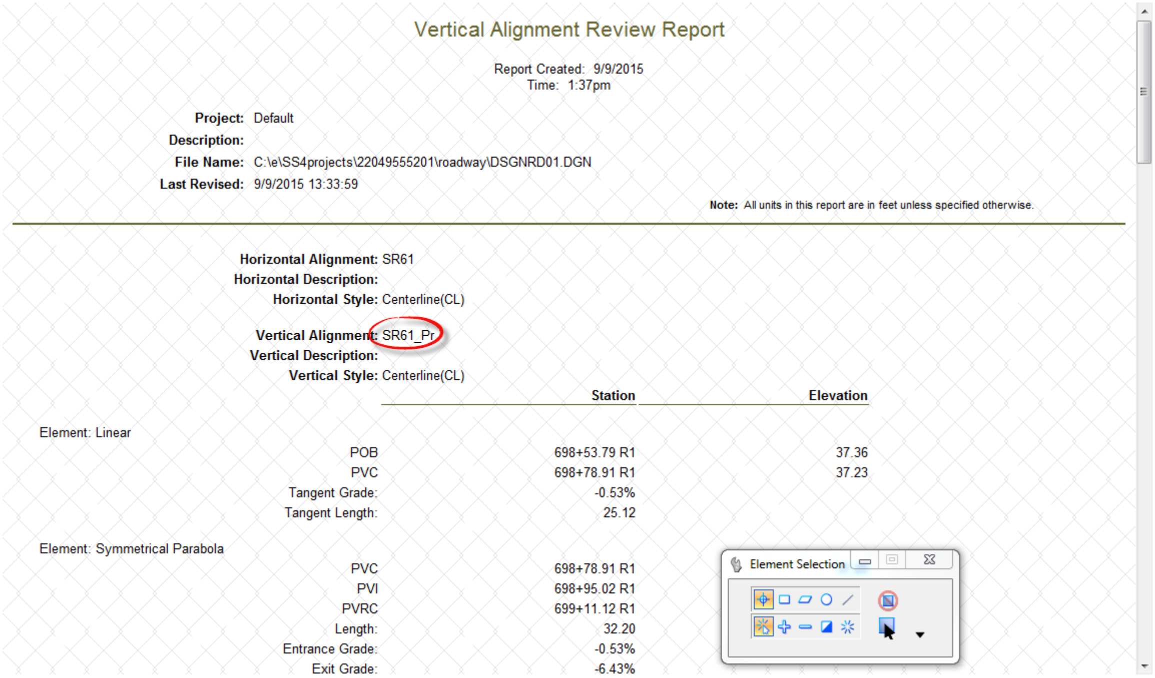
1. Use *Vertical Geometry*, **Profile Report** tool**.**



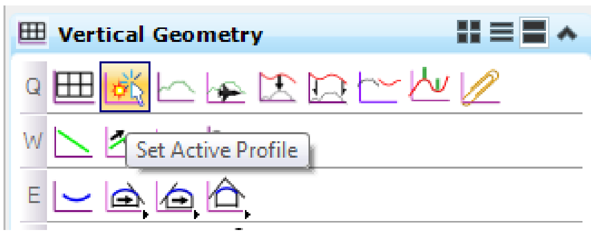
<OR> With the *Profile* selected, hover over the element to display the Context Menu and select the **Profile Report**.



2. The Bentley Civil Report browser displays the Vertical Alignment Review Report for the Profile. Close the Civil Report browser.



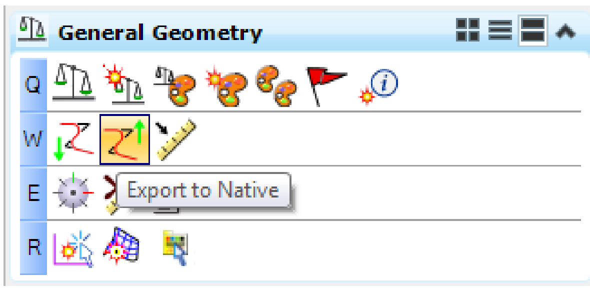
3. Use *Vertical Geometry*, **Set Active Profile** tool.



<OR> With the **Profile** selected, hover over the element to display the Context Menu and select **Set Active Profile**.

➢ ***Export Profile***

1. Use the *General Geometry*, **Export to Native** tool.



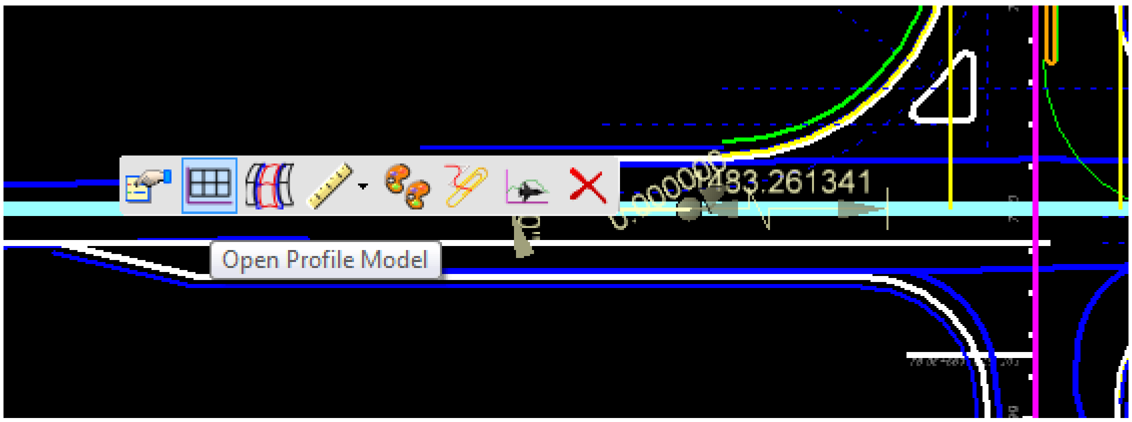
HINT Always check that the profile has a **Feature Name** before saving to the GPK file

2. Select the **SR61** *Profile* and save it to the *job00.gpk* file.

Exercise 4.4 BL98 Profile

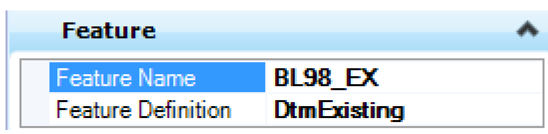
1. With the **BL98** selected in the *Plan View*, hover over the element to display the Context Menu and select the **Open Profile Model**.

2. Select **View 3** to view the *Existing Ground Profile* for the mainline **BL98** *Centerline*.

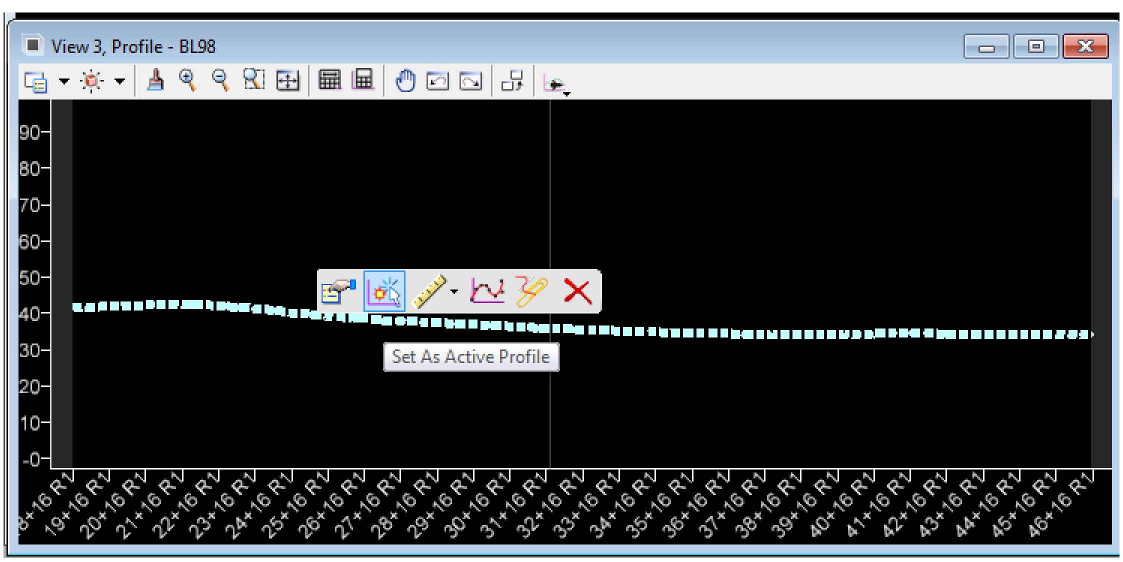


3. With the **Profile** selected, hover over the element to display the Context Menu and select the first icon **Properties**

4. In the name field enter **BL98_EX**



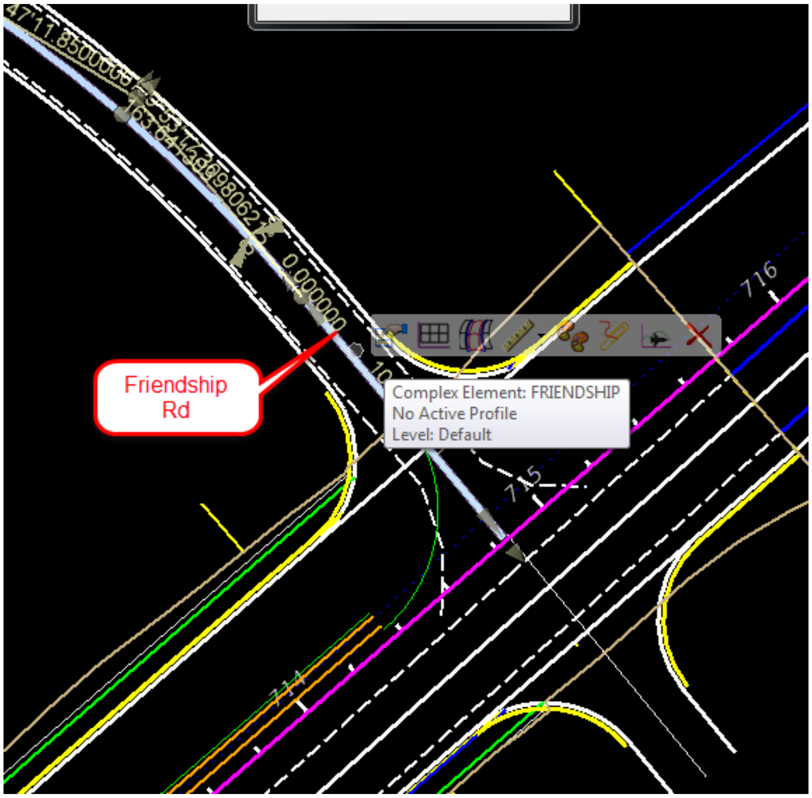
5. With the **Profile** selected, hover over the element to display the Context Menu and select **Set As Active Profile**.



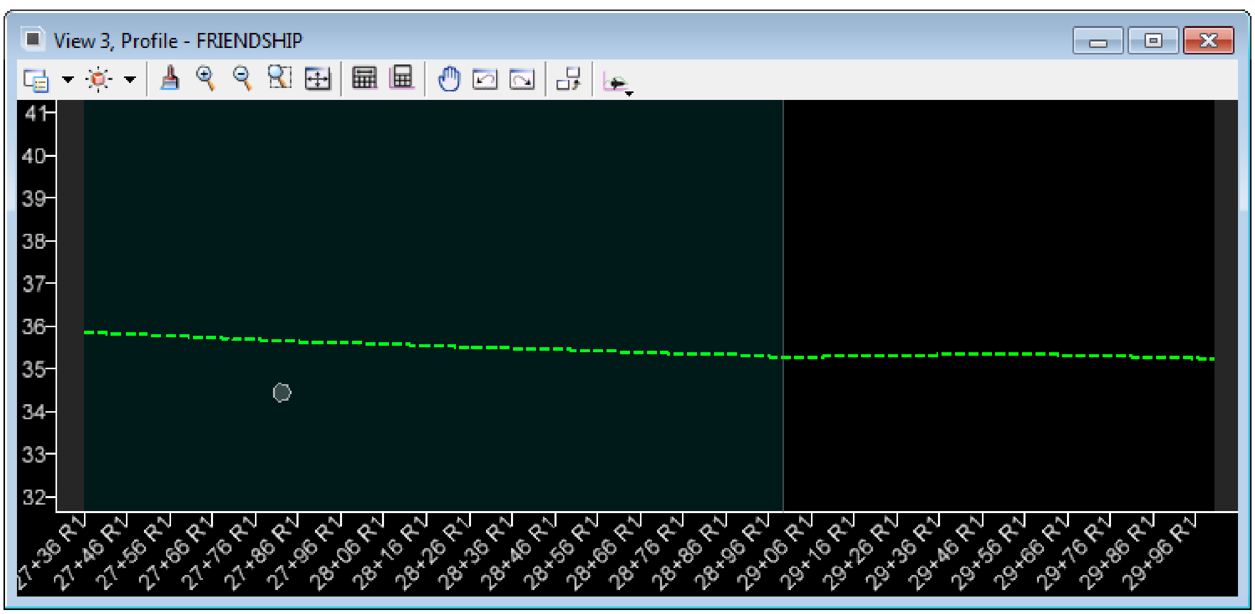
6. Use the *General Geometry*, **Export to Native** tool, select the **BL98_EX** *Profile* and save it to the *job00.gpk* file.

Exercise 4.5 Friendship Profile

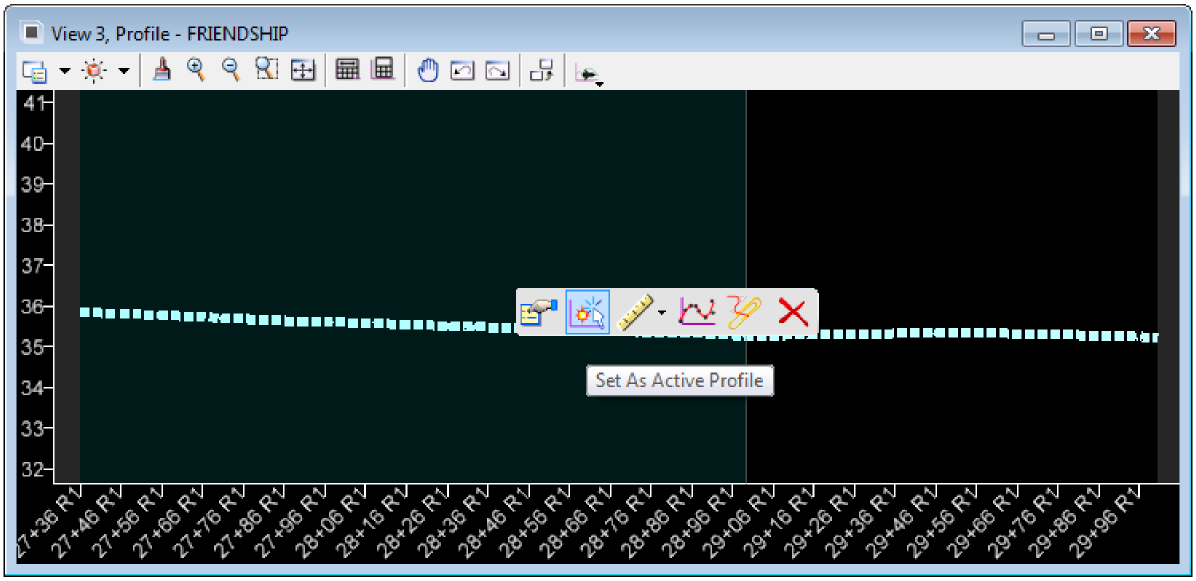
1. With the **Friendship** selected in the *Plan View*, hover over the element to display the Context Menu and select the **Open Profile Model.**



2. Select **View 3** to view the *Existing Ground Profile* for the mainline *Friendship Centerline*.



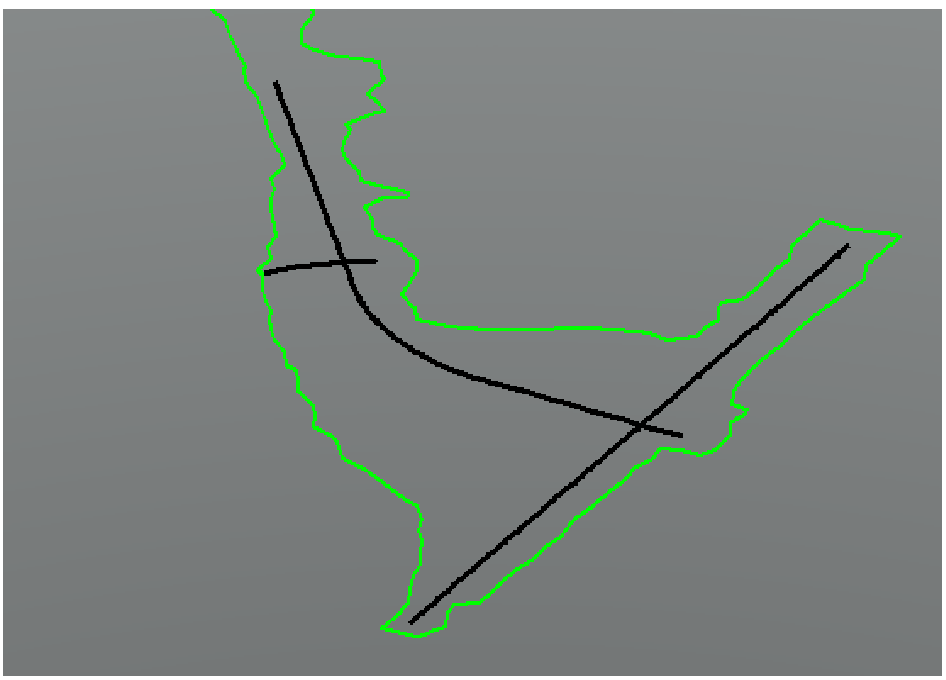
3. With the **Profile** selected, hover over the element to display the Context Menu and select **Set As Active Profile**.



4. Repeat the steps for **Friendship2 Rd.**

5. Open View 2 using the F2 Function Key to see the 3D alignment cernterlines for the project

6. Notice the **3D lines** displays in *View 2*.



5 TEMPLATE DESIGN

OVERVIEW

The Create Template command generates the transverse geometry that is central to roadway design. A template comprises a series of points and components that represent break line features that are processed using Corridor Modeling commands. Roadway features that have been processed are saved to the design surface. Templates are stored in a template library (**.itl)*.

TEMPLATE BASICS

- The FDOTSS4 Workspace provides an extensive Template Library.
- FDOTSS4 Templates closely follow CADD Manual, PPM and FDOT Design Standards and should be used to start a project.
- FDOTSS4 Templates are designed from the PPM typical sections of the proposed roadway.
- FDOTSS4 Templates are stored in the *FDOTSS4.itl*.
- The *FDOTSS4.itl* Templates have Features, Point Names, Component Names, Parametric Constraints and Display Rules which follow a standard naming convention.
- A project specific Template Library is created and FDOTSS4.itl file templates are copied to that library and are modified to meet the specific needs of the project.
- New and modified templates should adhere to the template standards of the *FDOTSS4.itl* file.
- When applied to a Corridor, templates are written to the design file and can be edited within the file.
- Once templates are in a design file, they can be copied to another Project Template Library or design file.

APPLYING TEMPLATES

- Templates create a model of the proposed roadway.
- Template points generate longitudinal break line features in the model.
- Templates are used to create a proposed model of the roadway.
- Templates are assigned to specific stations along an alignment at a specific interval, which are called template drops.
- When a corridor is processed, the points of the template drops are connected to form a model of the roadway.
- The connected template points also form longitudinal break line of the surface model.
- The model can be exported into a traditional surface Terrain model.

CREATE TEMPLATE DIALOG

The Create Template dialog is accessed from the Corridor Modeling, Create Template tool. To create or edit a Template Library, click the Open Create Template icon on the Corridor Modeling dialog. This displays the Create Template dialog.

The Create Template dialog is the primary place where templates are created and edited. This is also where templates are copied from a standard Template Library to a project Template Library using Tools > Template Library Organizer.

- User Definable Folder Structure
- Create Templates, Components and End Conditions
- Right-click Functions
- Copy and Paste, and Drag and Drop
- Red-colored Box Indicates Current Template
- Drag and Drop Components to Current Template Window

On the left side of the dialog, you will find the Template Library area, which contains a Windows-like folder structure. The root folder is the name and location of the Template Library that is currently open. Only one Template Library may be open at a time.

To navigate the folder structure, double-click the folders you want to open or close. Inside any folder you can create and organize your templates and subfolders. The organization of the folder structure is user definable. The folder structure also supports common Windows functions, such as drag and drop, cut and paste, etc.

Most commonly used commands can be accessed by right clicking on the folders and templates. If you double click a template, it becomes the Current Template and is signified by a red box around the Template icon. The Current Template is also identified in the Current Template area next to the Template Library area. To assemble or edit a template, it must be the Current Template.

CURRENT TEMPLATE WINDOW

- Templates Assembled and Edited
- Right-click To Create Components
- Double-click To Edit Points and Components
- View Commands Bottom of Window

In the center of the Create Template dialog is the main graph for creating templates. The graph is called the Current Template window. The Current Template window uses its own graphics engine and is not a MicroStation View. The scale of the graph is dynamic and changes as you zoom in and out.

The center point of the Current Template window is marked by the dynamic origin, which is a magenta-colored box. The dynamic origin is used as a reference point and can be moved to any location in the graph.

At the bottom of the graph there are numerous view commands, which are similar to MicroStation View commands. There are two buttons that look like the MicroStation View Previous and View Next commands, however, they are used to undo and redo template creation operations.

If your mouse has a scroll wheel, it can be used to pan and zoom. The CTRL-Z keyboard hot key will undo your last edit or creation. In the graph area you can right-click to access commands and you can double-click elements in the graph for editing purposes.

TEMPLATE PREVIEW WINDOW

- Previews Templates and Components
- Works on Non-current Templates
- Placement Point Location Denoted by a Cyan-colored Box
- Click Point to Move Placement Point Location
- Drag and Drop from Preview Area to Current Template Window

Under the Template Library area is the Preview area. When you highlight (single click) a template, the template is displayed in the Preview area.

You can use the Preview to assemble templates from their parts or components. This is accomplished using drag and drop functions. The cyan-colored box in the Preview represents the insertion point for any drag and drop operation. You can change the insertion point location by clicking the desired insertion point on the preview.

DYNAMIC SETTINGS

- Tools > Dynamic Settings Command
- Precision Input Template Points
- XY = Absolute Coordinates
- HS = Horizontal Delta Distance and Slope from Last Point Placed
- DL = Enter Delta Coordinates from Last Point Placed

The Dynamic Settings dialog is used for precision input of the template components and to assign point names and styles when creating components. It also serves as a compass for the location of your cursor with respect to the dynamic origin. The dynamic origin can be moved using Set Dynamic Origin, located at the bottom of the Dynamic Settings dialog.

The Dynamic Settings dialog is accessed by selecting the menu option **Tools > Dynamic Settings** or using the View Control icons located below the Current Template window.

The Key-in pull-down specifies the type of key-in to be performed:

XY = key-in absolute coordinates

DL = key-in delta coordinates from last point placed (defaults to the dynamic origin if it is the first point of a component)

HS = key-in horizontal delta distance and slope from last point placed

VS = key-in vertical delta distance and slope from last point placed

OL = key-in delta coordinates from dynamic origin

OS = key-in horizontal delta distance and slope from dynamic origin

COMPONENTS

- Components are Parts of the Template
- Curb and Gutter, Median Barrier, Pavement Layers, Cut and Fill, etc.
- Simply Drag and Drop Components Together to Create a Complete Template
- When Two Points Coincide, Heavy White Plus Sign Appears
- Existing Connection Point Name Override Dropped Point Name

Components are logical parts of a template. Portions of the template that are separated into components are normally based on tabulation considerations. Examples of components include curb and gutter, median barrier, pavement layers, cut and fill slopes, and ditches.

Components are normally kept in a separate folder in the Template Library and are used to assemble complete templates. Drag and drop the components to the Current Template window to create a complete template. When connecting two components, the connecting point will change to a white colored plus sign prior to placing the component. This is the indication that the points coincide. When the components are connected together, using drag and drop from the Template Library folders, any coincident component points will use the point names of the previously placed component. Template point names can be edited anytime during the creation process.

Components are normally created with point names that are not specific to being on the left or right side of the roadway. When they are used to create completed templates, prefixes and suffixes to the template points can be automatically added during component placement. Prefixes and suffixes are controlled using **Tools > Options** in the Create Template dialog and can be set and cleared in the Dynamic Settings dialog during placement using the Apply Affixes check box.

MERGING COMPONENTS

- Right-click Between the Components to Merge
- Select the Merge Components Command

When combining two components of a pavement section together, two separate components are produced with a vertical segment dividing them. To remove the vertical segment, position the cursor over the vertical segment and right-click. Then select Merge Components.

EXERCISE OVERVIEW

5.1 Creating a New Project Template Library

5.2 Create Template Library Folders

5.3 Using the Template Library Organizer

5.4 Naming Project Templates

5.5 Creating A Resurfacing Template

5.6 Editing Templates

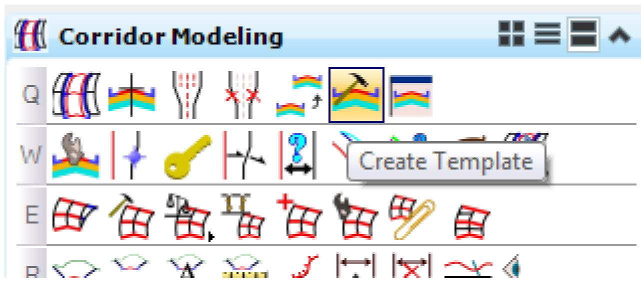
Exercise 5.1 Creating a New Project Template Library

This exercise opens the proposed roadway design file, *DSGNRD01.dgn*, with GEOPAK using the FDOT Workspace and Project configuration. The Create Template dialog displays and a new Template Library file created for the project in the project *symb* folder. This new project Template Library is the container for all the components and templates used to develop the design model for the project design.

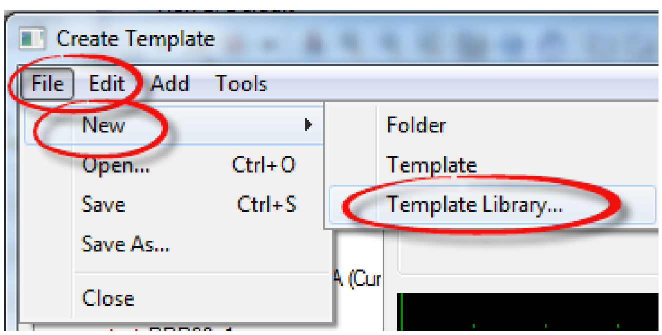
1. (Optional) Extract the *22049555201(5).zip* file in the c:\e\projects folder.

2. Open the *DSGNRD01.dgn* file of the c:\e\projects\22049555201\roadway\ folder in the FDOTSS4 Workspace in MicroStation.

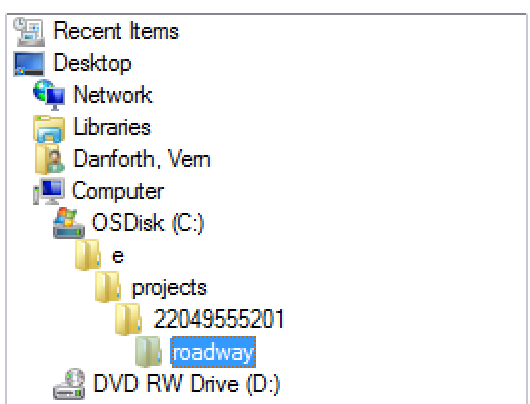
3. Use *Corridor Modeling*, **Create Template** tool.



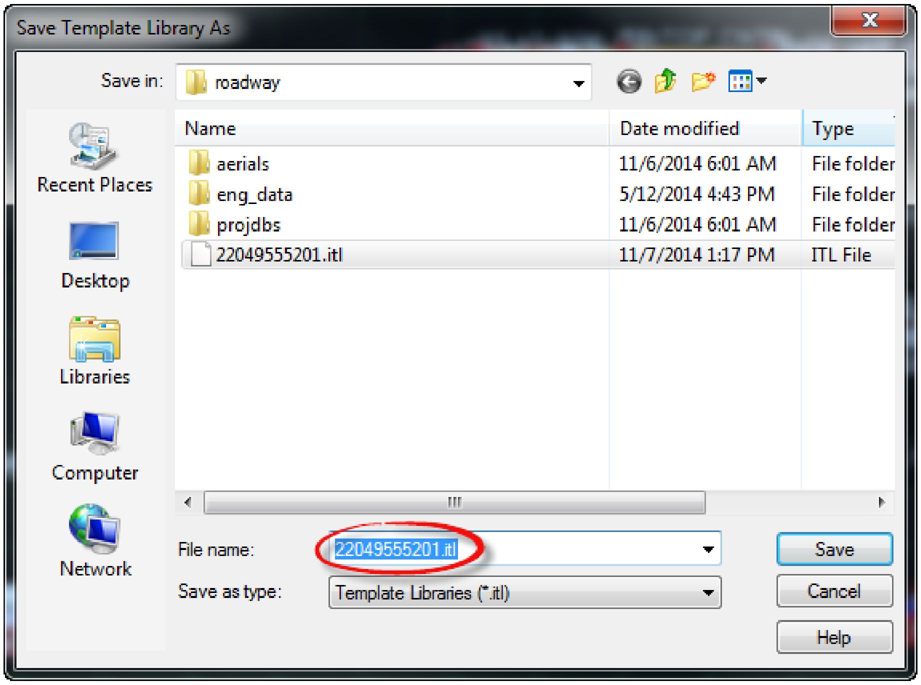
4. Open the Create Template dialog and select **File** > **New** > **Template Library**.



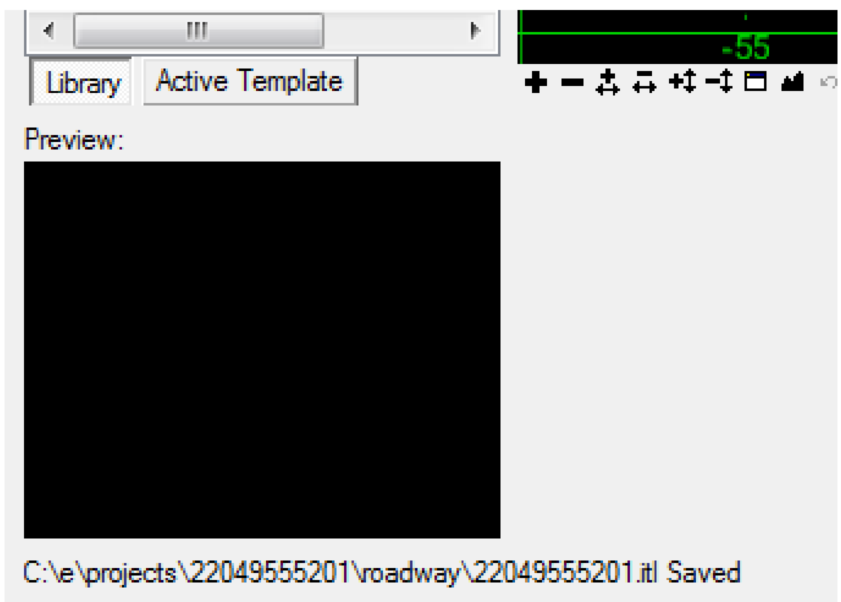
5. Navigate to the Project **roadway** folder, C:\e\projects\22049555201\roadway\.



6. Enter the new *Template Library Name*, **22049555201**. Click **Save**.



7. Select **File** > **Save** again to verify, then close the Create Template dialog. Click **Close**.



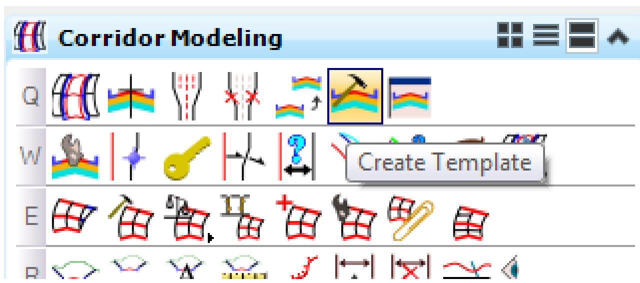
Exercise 5.2 *Create Template Library Folders*

- Components
- Corridor Templates
- End Conditions
- Linear Templates
- Surface Templates

The Components, End Condition, Linear Templates, Surface Templates folders contain parts of the full Templates and is obtained from the FDOTSS4 Template Library.

The Corridor Templates folder contains the constructed templates for the corridor. The Project Templates in the exercises to follow are named and saved in stages or phases in order to track the progress of the design. This method is also recommended to provide a backup and/or history for potential trouble shooting along the way.

1. Use *Corridor Modeling*, **Create Template** tool.

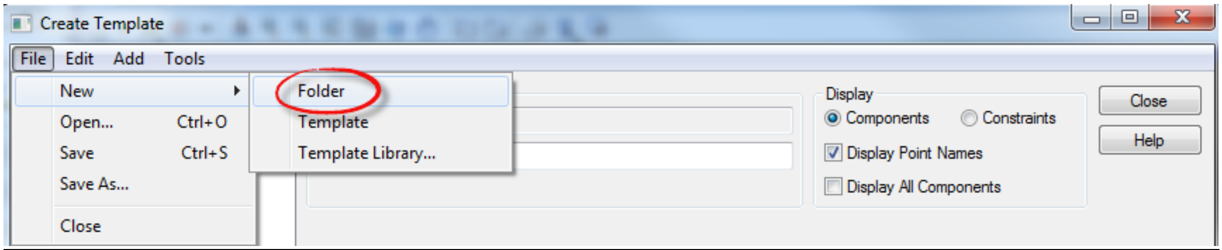


2. From the Create Template dialog, select **File** > **Open** and navigate to the FDOTSS4/GEOPAK/corridor directory and choose the **EmptyProject.itl** *Template Library***.**

3. From the Create Template dialog, select **File** > **Save As** to copy the blank *Project Template Library* over the **22049555201 .itl** *Template Library* created earlier. This will save the next few steps.

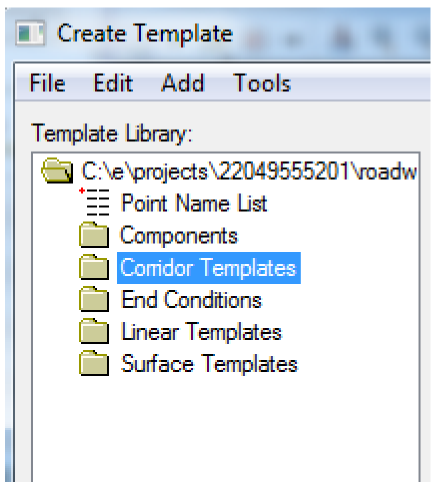
➢ *Optional Steps*

1. Create new folders in the *Project Template Library*.



2. Create and re-name five folders. Select the **Root** folder and repeat steps to include all the following folders:

   - Components
   - Corridor Templates
   - End Conditions
   - Linear Templates
   - Surface Templates

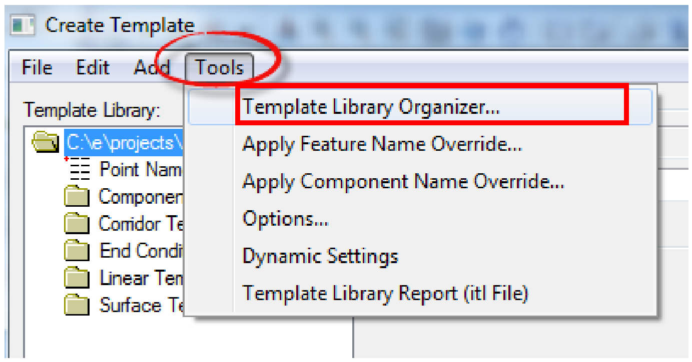


3. Select **File** > **Save** to save the project *Template Library .itl* file.

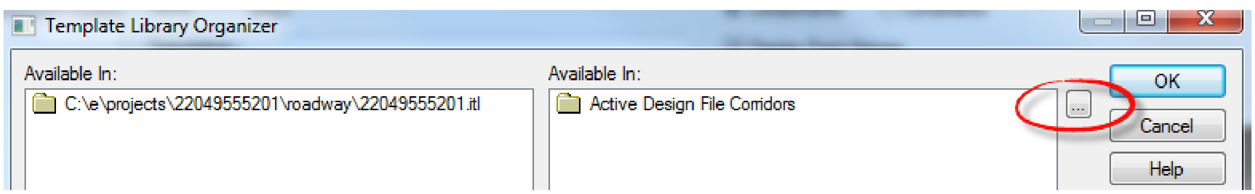
Exercise 5.3 Using the Template Library Organizer

This exercise uses the Create Template dialog to open the Template Library Organizer from the *Tools* menu option. Various components and templates from other Template Libraries and Roadway Designer files are obtained from using the Template Library Organizer. For the Chapter exercises to follow, the FDOTSS4 Template Library contains a basic Typical Section and all of the components used for the project design.

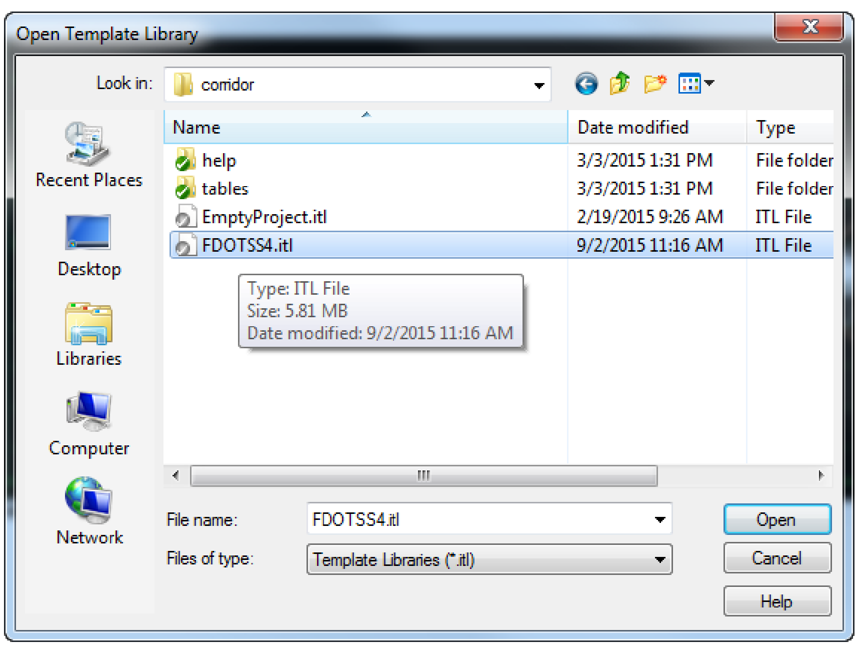
1. Use *Create Template* and select Tools > Template Library Organizer.



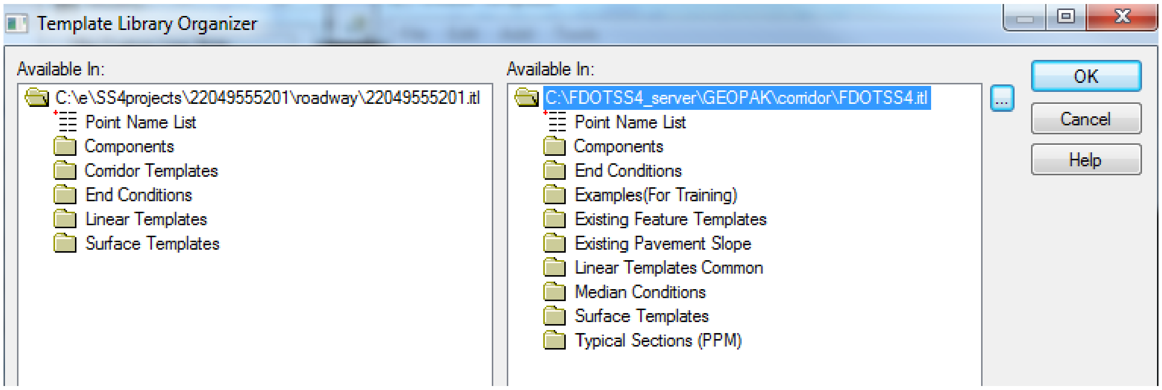
2. From the Template Library Organizer dialog, click the **Ellipses** icon next to the **OK** button. The Open Template Library window displays.



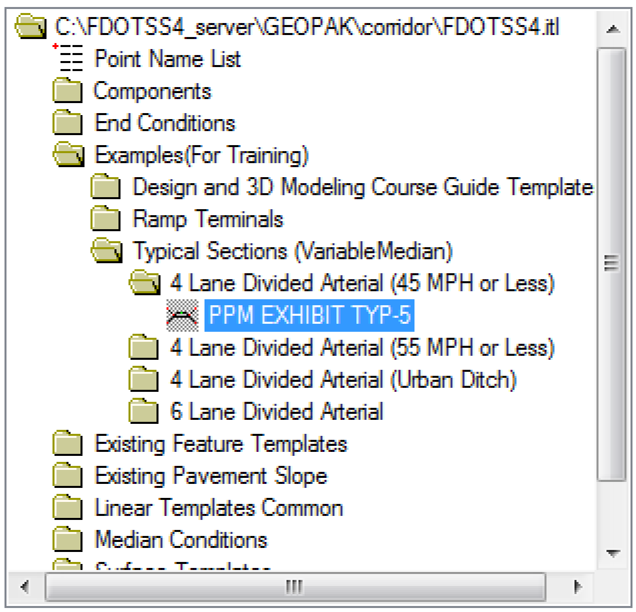
3. From Open Template Library, navigate to the c:\FDOTSS4\GEOPAK\corridor folder and select the **FDOTSS4.itl** *Template Library* file. Click **Open**.



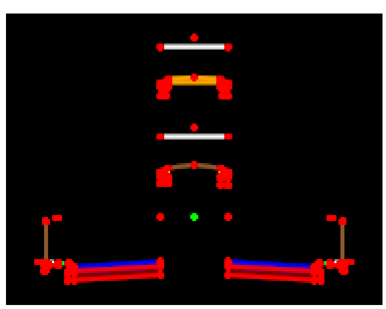
4. The Template Library Organizer dialog displays with the *.itl* file listed in the right *Available In:* window pane.



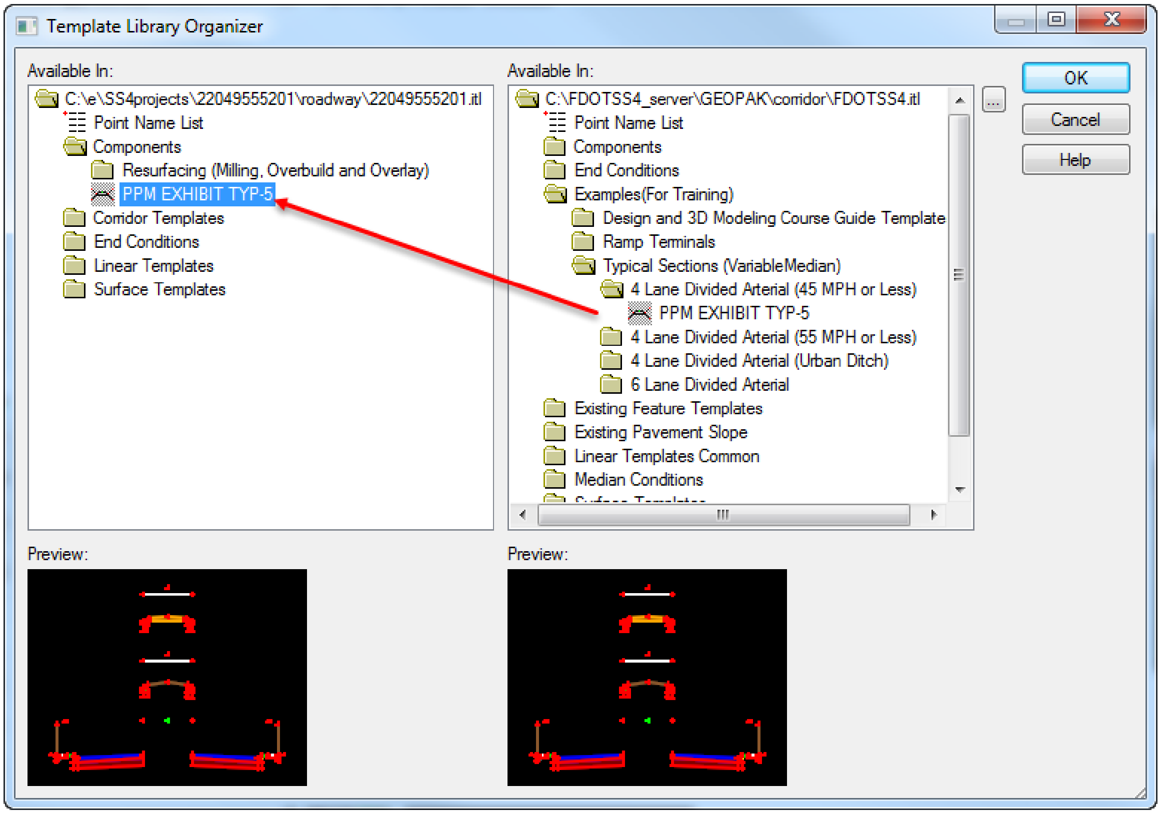
5. From the Template Library Organizer, navigate to the **FDOT** folder shown below.



6. Select the **PPM EXHIBIT TYP-5** to preview the template in the *Preview* window below the directory view.



7. Drag the **Template** from the *right side* to the *left side* onto the *Components* folder for the project.



8. Collect the following items from the *FDOTSS4 Template Library* and drag them to the *Project Folders Locations* as shown below

FDOTSS4 Template Location	**Project Folder Location**
Examples/Typical Sections(Variable) /4 Lane Divided Arterial (45 MPH or Less)	PPM EXHIBIT TYP-5 to Components
End Conditions/Parts	Entire Parts folder to End Conditions
Component/Pavement/Resurfacing	Entire Resurfacing folder to Components
Component/Curb & Gutter	Curb Type E Inside to Linear Templates
Linear Templates Common	Outside Lane w/ Paved Shoulder to Linear Templates
Linear Templates Common	Outside Lane w/ Type F Curb to Linear Templates
Surface Templates	Pavement Asphalt to Surface Templates

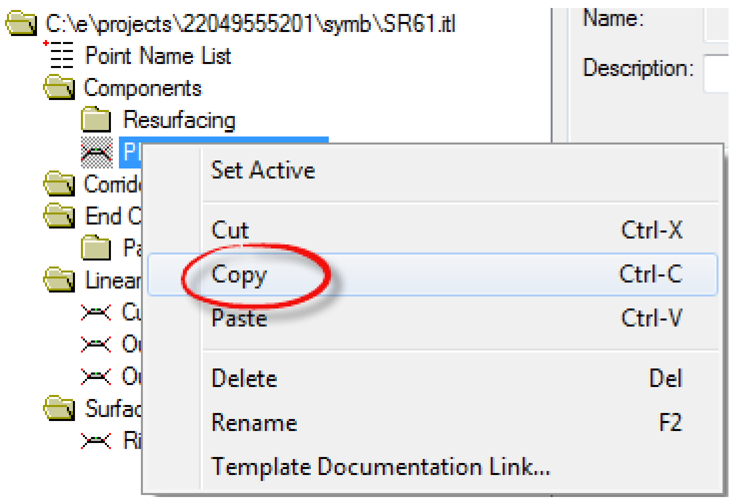
9. Click **OK** to return to the Create Template dialog and click **Yes** to the *"Save data to file…* The FDOT Standard Items are now saved in the Project Template Library.

Exercise 5.4 *Naming Project Templates*

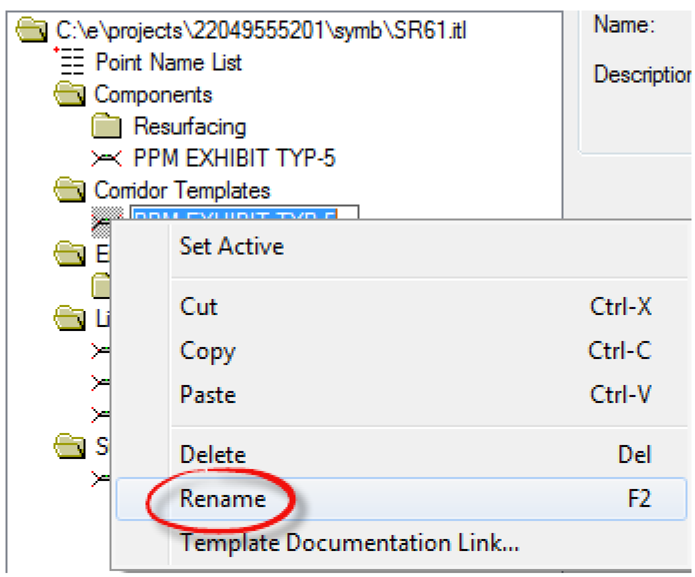
This exercise copies and renames the Typical Section obtained from the FDOTSS4 Template Library in the project Template Library template folder using the Create Template dialog. The Create Template dialog has functionality similar to Window Explorer to help manage templates for each project.

> ***Note*** A consistent project template naming convention is valuable as the design progresses. As more are added to the template design, create a backup copy and add a suffix to the name "_1, _2, _3, etc.

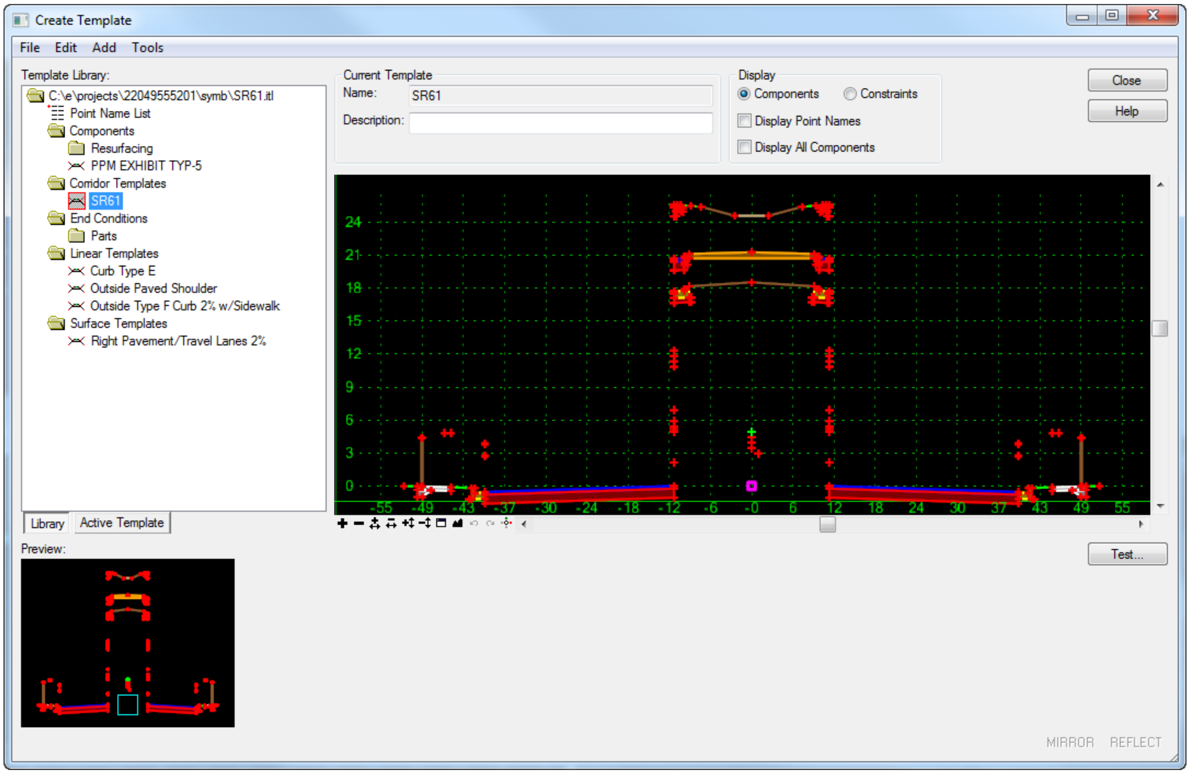
1. In the *Components* folder, right click on the ***PPM* EXHIBIT TYP - 5** *Template*, and select **Copy**.



2. Right click on the *Corridor Templates* folder and select **Paste**. Right click on the copied **EXHIBIT TYP – 5** Template and select **Rename**.



3. Change the *Name* of the Template to **SR61**. Right click on the **SR61** *Template* and select **Set Active**. A small red box will indicate the *Active Template*.

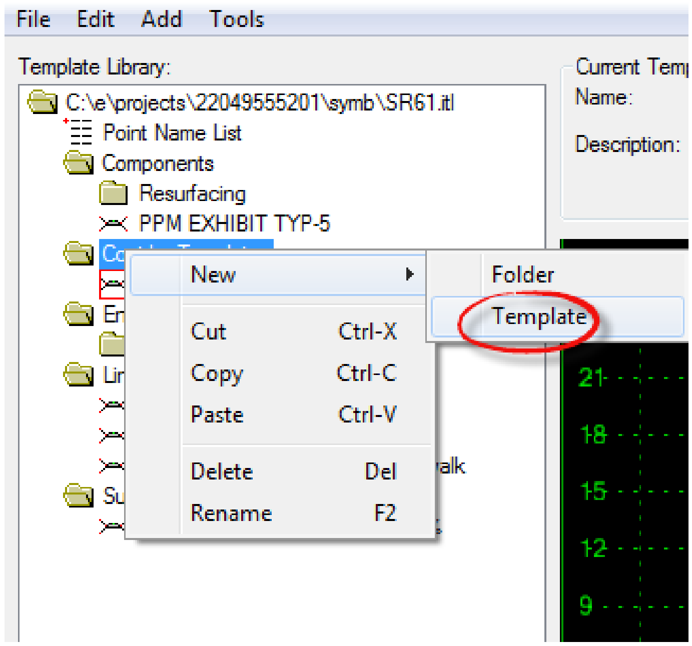


4. Select **File** > **Save** to save the *Project Template Library*.

Exercise 5.5 Creating a Resurfacing Template

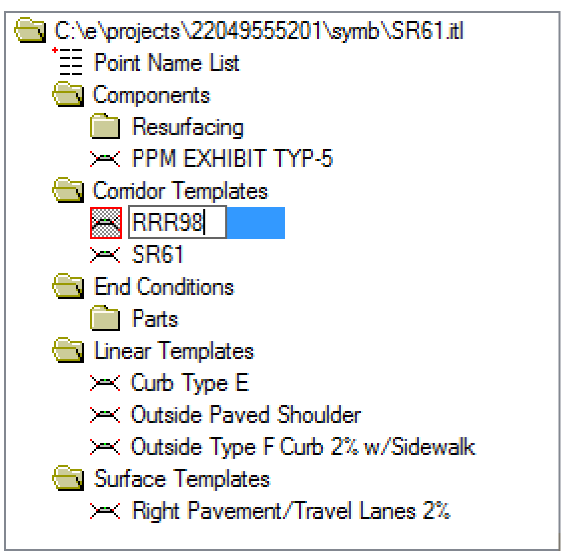
This exercise creates a Resurfacing Template within the project Template Library. This exercise helps provide a basic understanding of the basic template creation methods from the FDOTSS4 Template library components types, connection points, constraints, targets, etc.

1. Right click on the *Corridor Templates* folder and select **New > Template**.



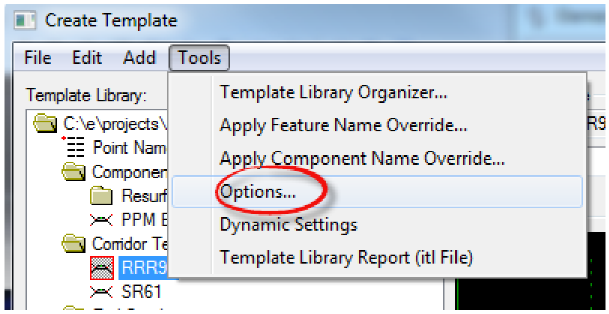
2. Right click on the *New Template1* and select **Rename**. Change the *Name* to **RRR98** and Select **Enter** to store the name.

3. Right click again on the *RRR98* and select **Set Active.**

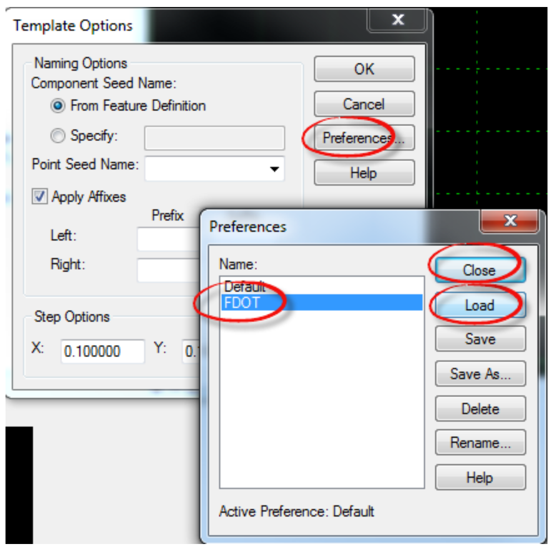


➢ ***Before Adding Components, Open Preference File to Add a Prefix to the Point Names.***

1. Select the **Tools** > **Options** from the Create Template dialog to launch the Template Options dialog.

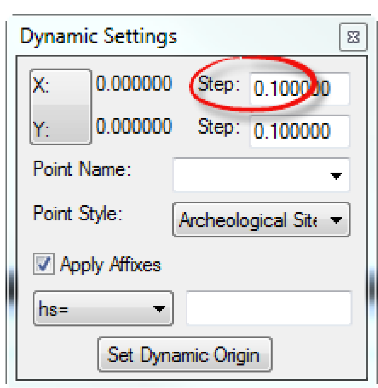


2. Click the **Preferences** button and then select the **FDOT** list item. Click **Load** and then **Close** the Preferences dialog. Click **OK** to close the Template Options dialog.



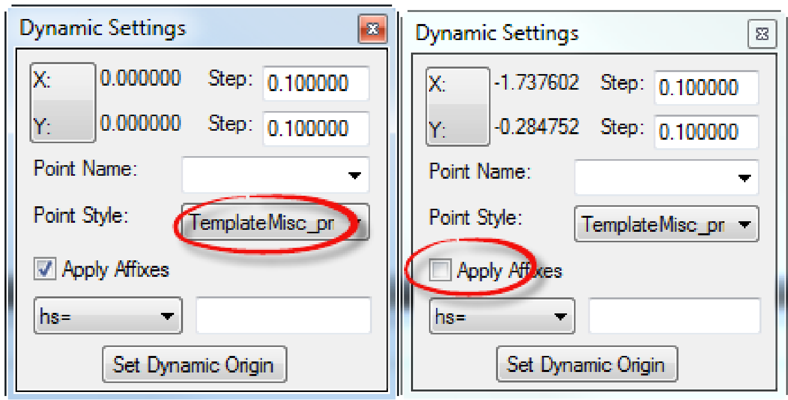
3. Select the **Tools** > **Dynamic Settings** from the Create Template dialog. This provides a toolbox like dialog for placing components.

Note	The X and Y Step value 0.1000 functions similar to a grid lock in MicroStation when placing the components



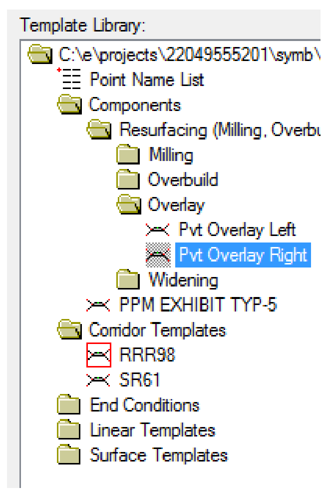
a. Change the *Point Style* to **Template Miscellaneous.**

b. Uncheck Apply Affixes.

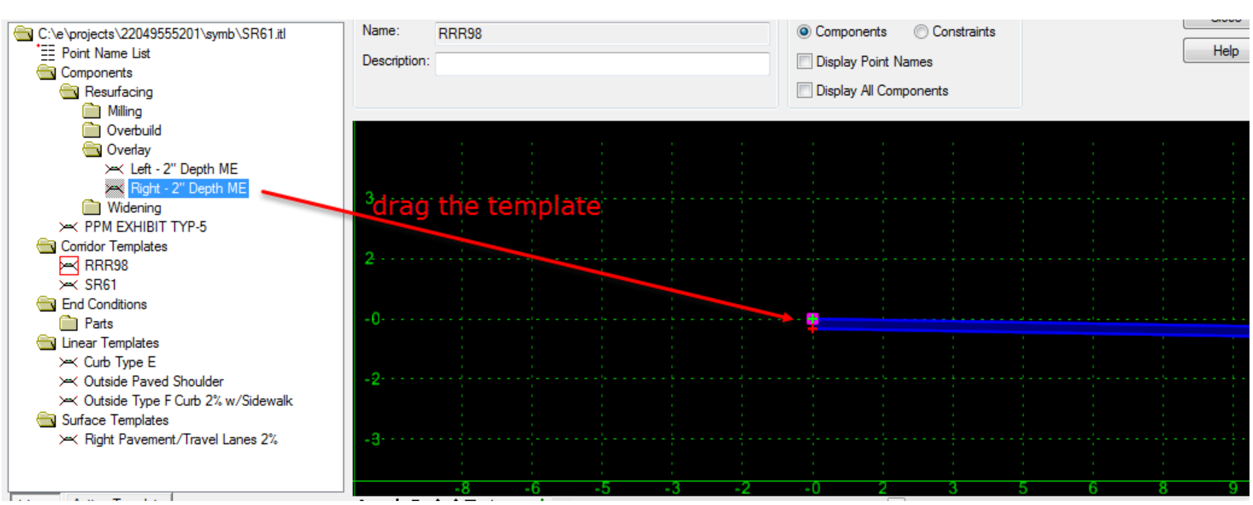


➢ ***Add Components***

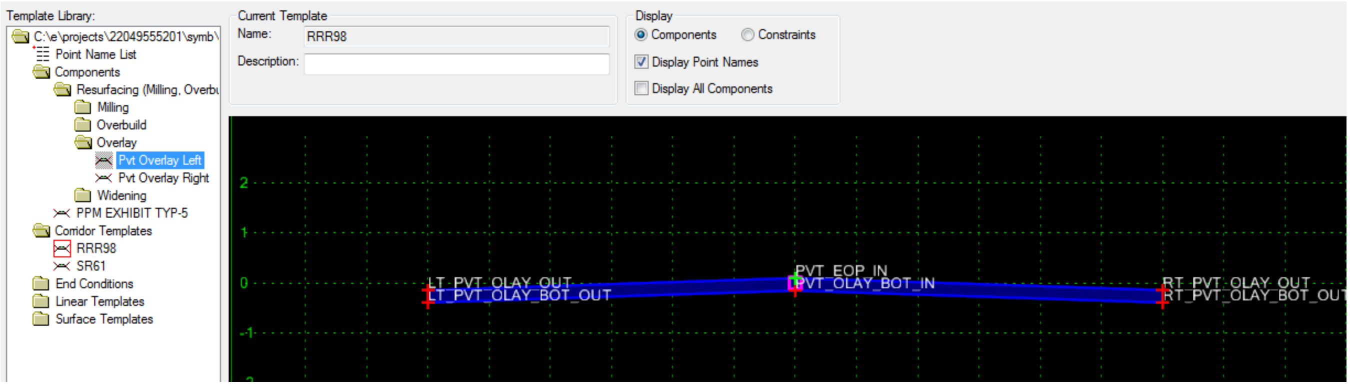
1. Navigate to *Components/Resurfacing/Overlay* and select the **Pvt Overlay Right** *Component*.



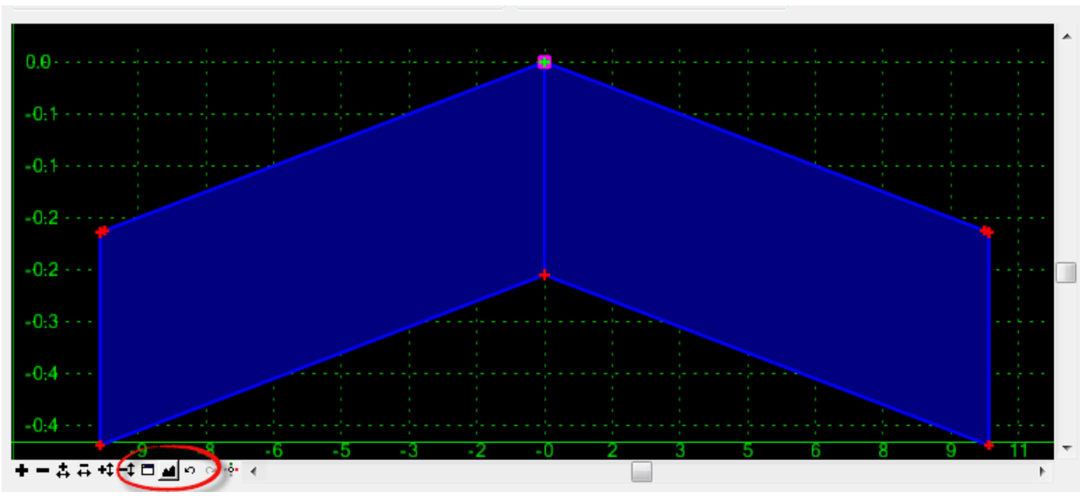
2. Drag the **Component** to the small magenta square in large *View*.



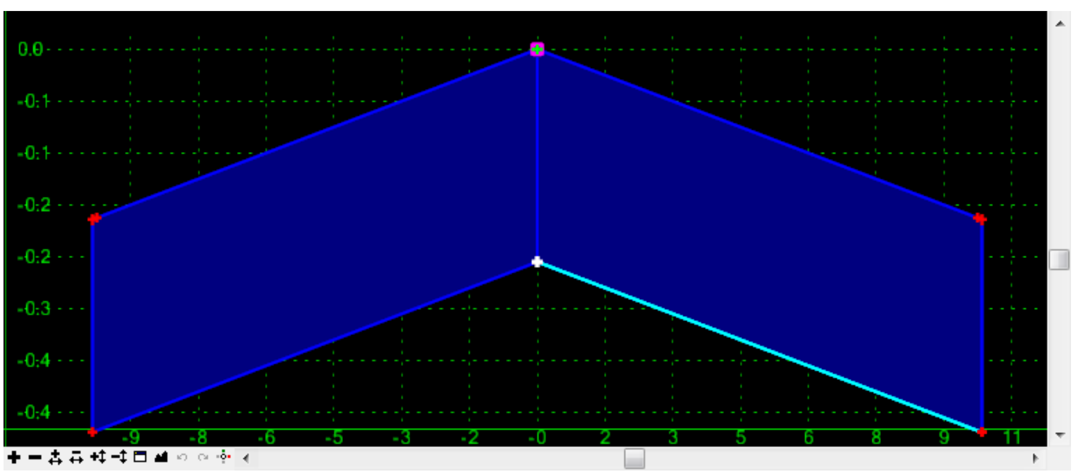
3. Repeat this step to place the **Pvt Overlay Left** *Component* on the small magenta square.



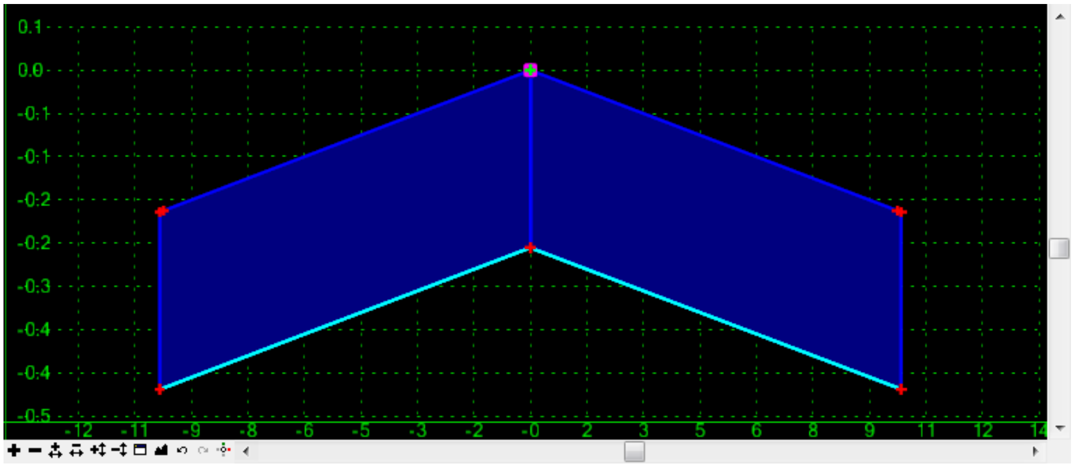
4. Fit View by selecting the **Fit** icon below the *Active Template* window.



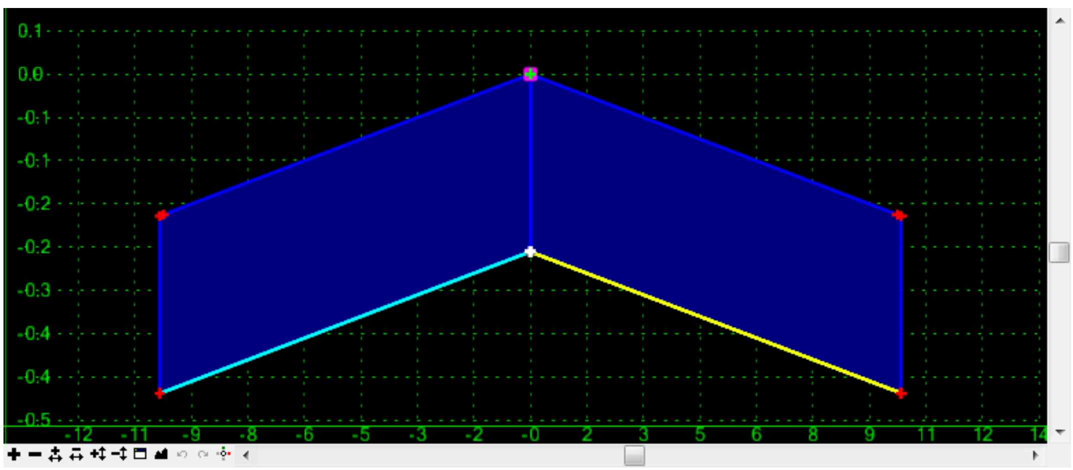
5. Drag and drop the **Resurfacing/Milling/ Pvt Milling Right** *Component* and connect it to the bottom side of the **Overlay** *Component* in the Template. The cursor will turn white when it is lock on the location.



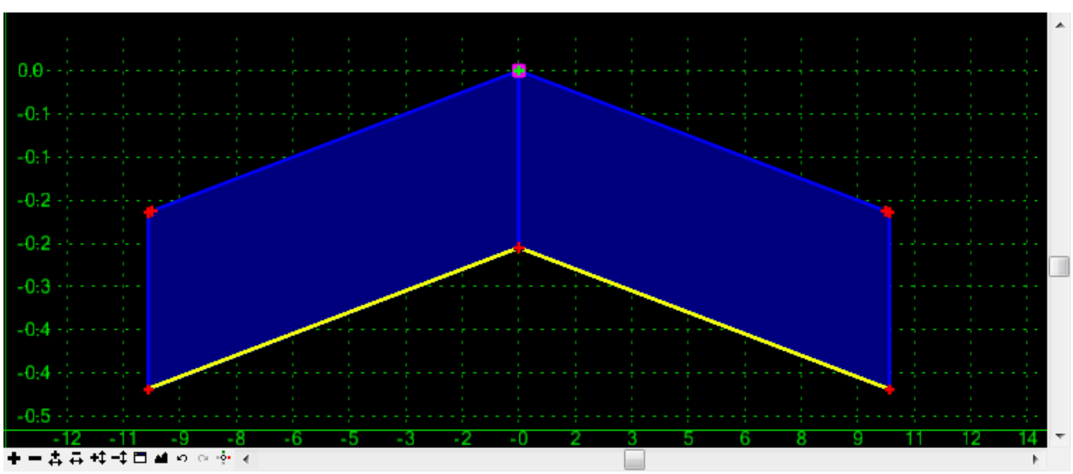
6. Repeat this step for the **Left Milling** *Component*.



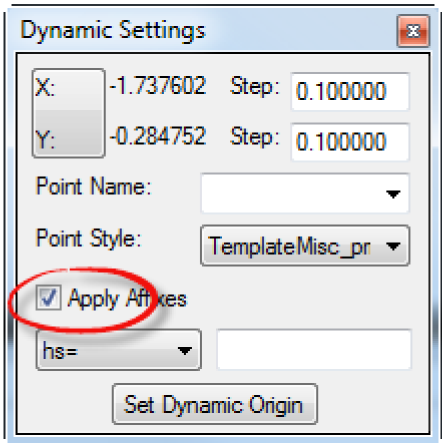
7. Drag and drop the **Resurfacing/Overbuild/ Pvt Overbuild Right** *Component* and connect it to the bottom side of the **Overlay** *Component* in the template. The cursor will turn white when it is lock on the location.



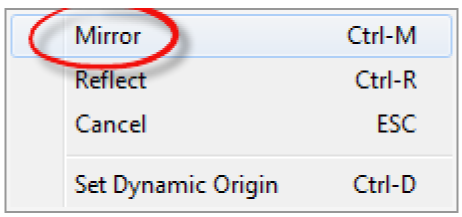
8. Repeat this step for the **Left Overbuild** *Component*.

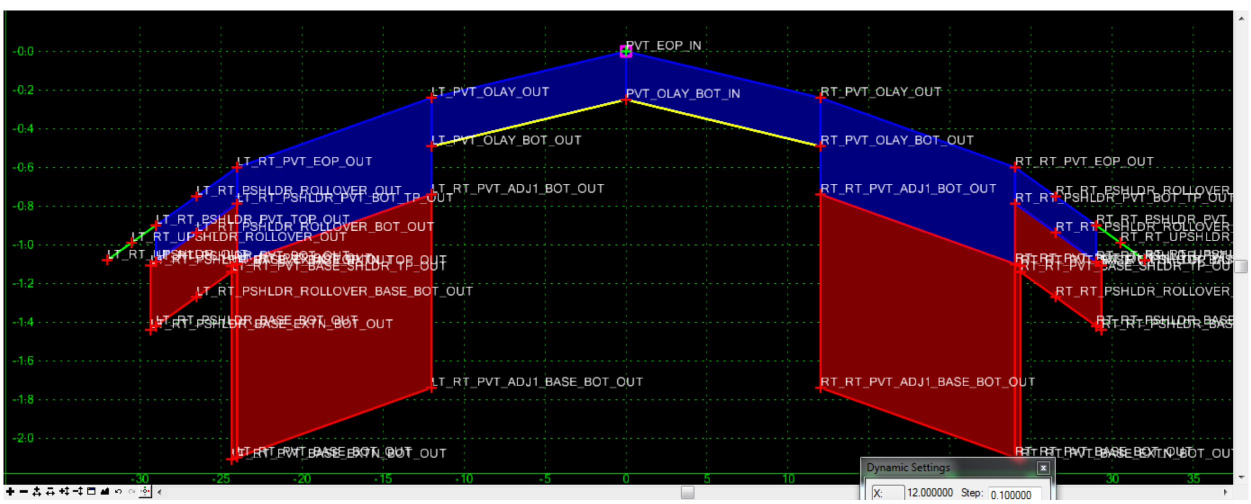


9. Check **Apply Affixes** on the Dynamic Settings dialog.



10. Drag and drop the **Linear Templates/Outside Lane w/ Paved Shoulder** *Component* and connect it to the top side of the widening template. While dragging Right click and turn **On** *Mirror.*

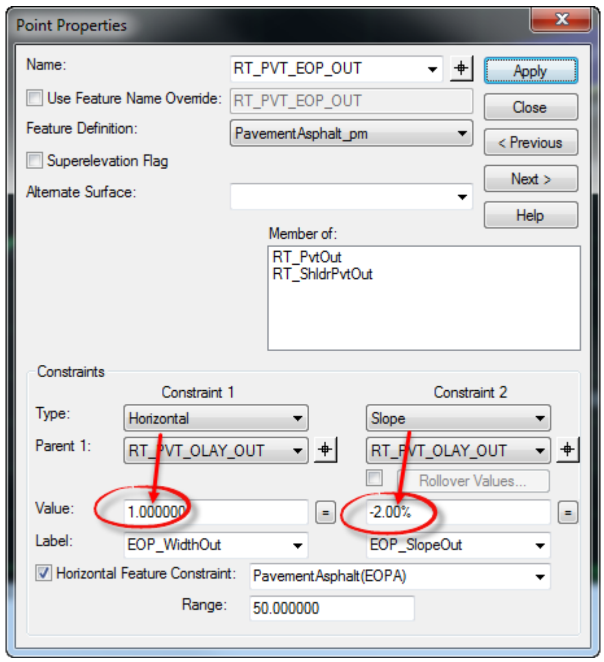




11. Modify the **Widening** lane W*idth* and *Slope*,

    a. Edit the *Point* **RT_PVT_EOP_OUT**, double click on the *Point* to open the Point Properties dialog.

    b. Change the Horizontal Constraint Value to **1** and Slope Constraint Value to **-2%.**

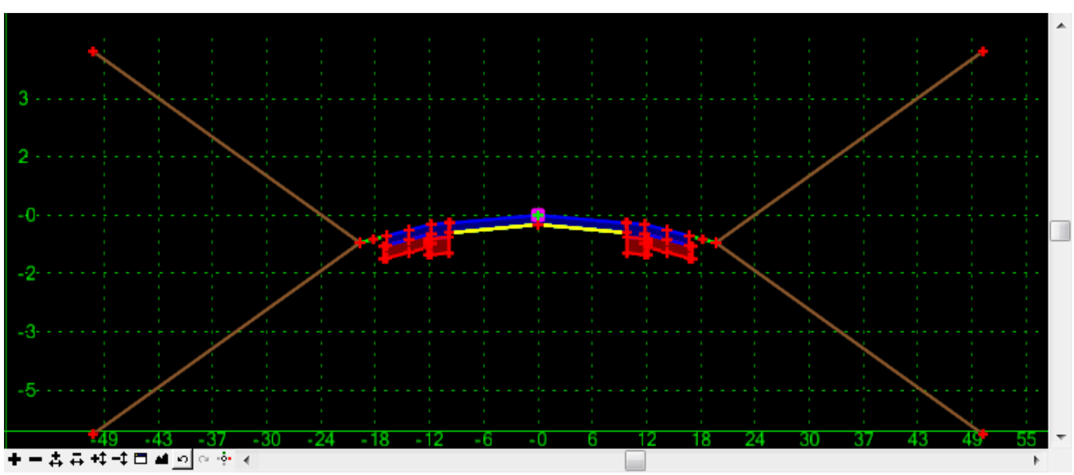


12. Repeat for the *Left Side Widening Pavement*, **LT_PVT_EOP_OUT**, use *Horizontal* value **-1**, and *Slope* value **2.0%.**

➢ ***Add End Conditions to the SR61 and RRR98 templates***

1. Drag and drop the **End Conditions/Parts 6:1 Cut** and **6:1 FILL TO 5'** *Components* to both sides.

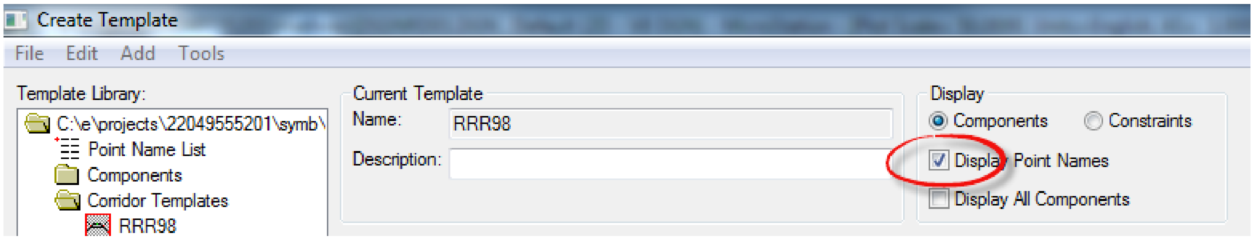
2. Select **File** > **Save** to save the Template changes.



Note The undo icon is also at the bottom of the view.

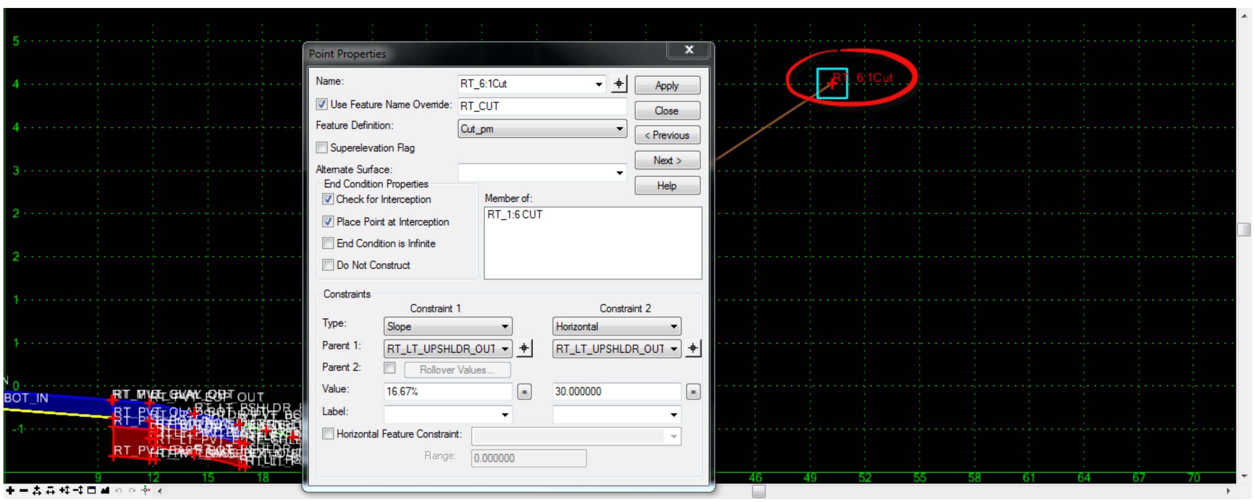
Exercise 5.6 Editing Templates

1. On the Create Template dialog, check **On** the *Display Point Names* option.

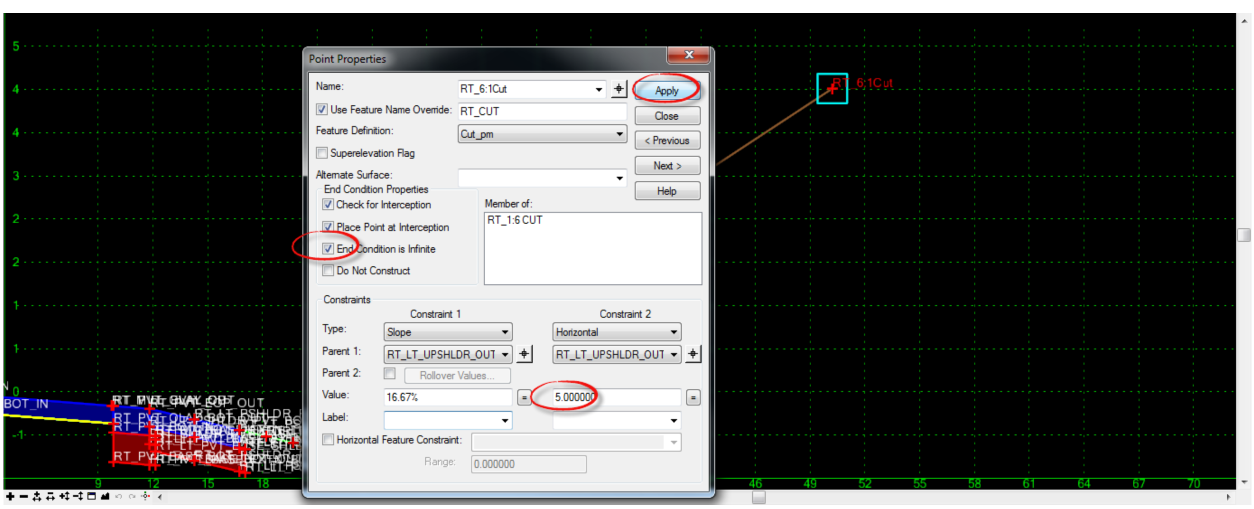


➢ ***Change End Condition Point Properties***

1. Double click on the **RT 6:1 Cut** P*oint* to launch the Point Properties dialog.

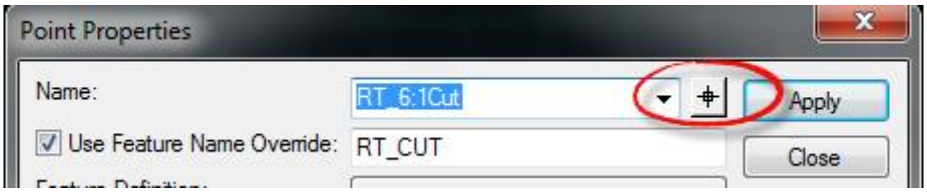


2. Check the **End Condition is Infinite** box and change *Constraint 2, Horizontal Value*, from **30** to **5 feet**. Click **Apply** and then **Close**.

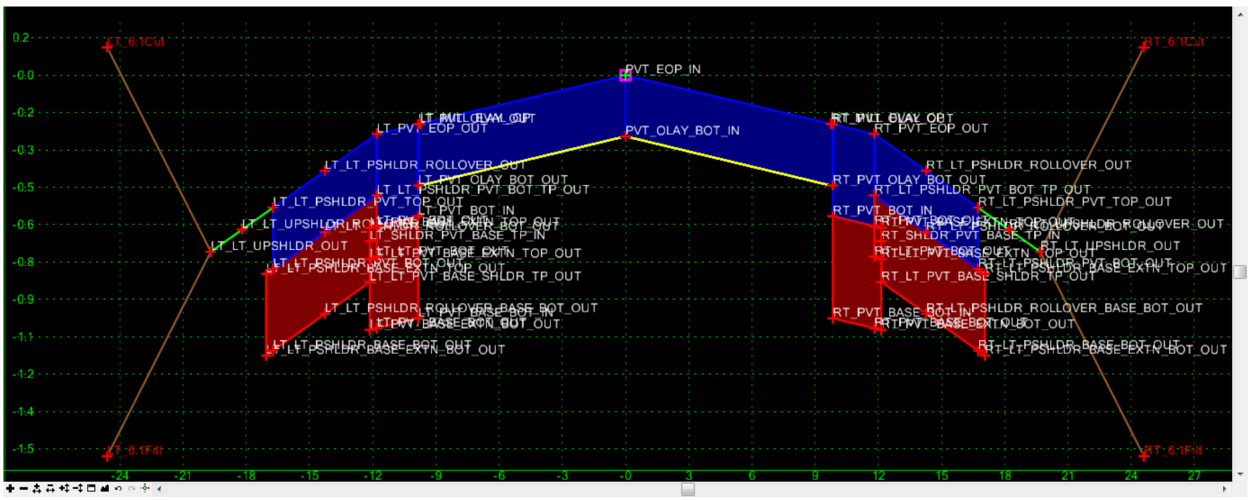


3. Repeat these changes for the remaining *End Conditions*; **RT 6:1Fill, LT 6:1Cut, RT 6:1Fill.**

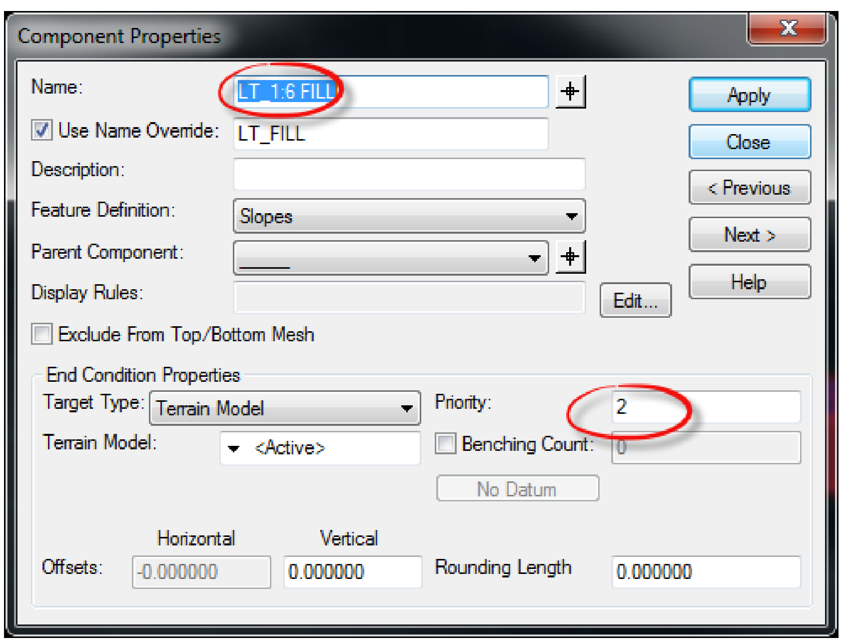
HINT Use -5 for left side points. To edit consecutive points, click the pick icon next to the point name and select the next point.



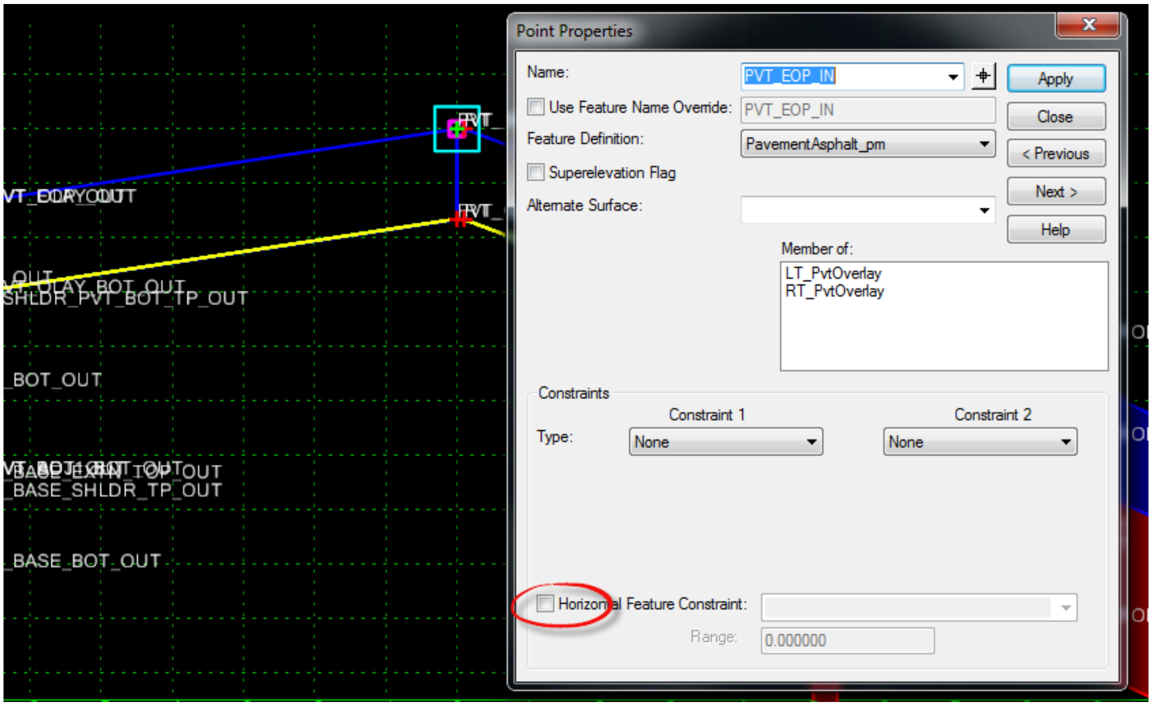
4. Select **Fit View** the *Active Template* and changes.



5. Rich click on the each Fill components and choose edit properties. Change the Priority Value to 2



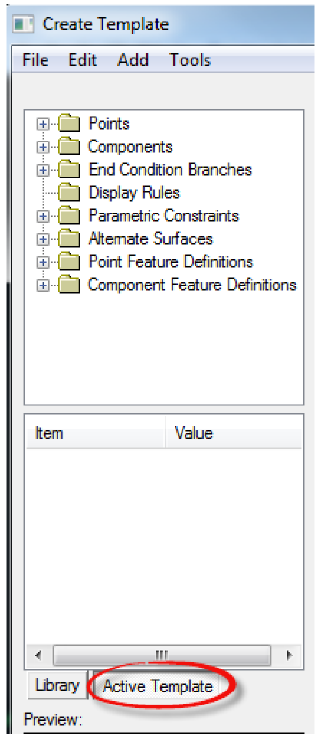
6. Turn **OFF** the *Horizontal Feature Constraint* on the middle point, **PVT _EOP_IN Point.**



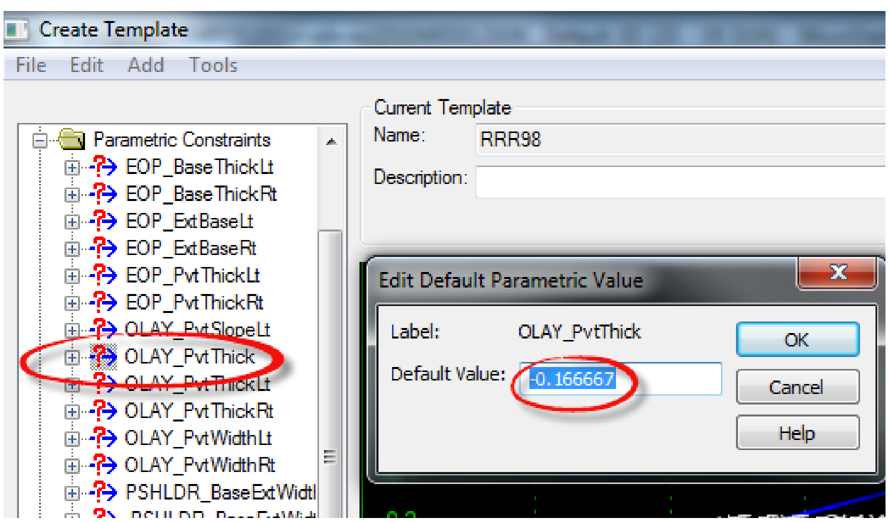
7. Select **File > Save** to save the Template changes.

➢ *Change the Overlay Depth Properties*

1. Change the bottom tab on the left side of the Create Template dialog to **Active Template.**



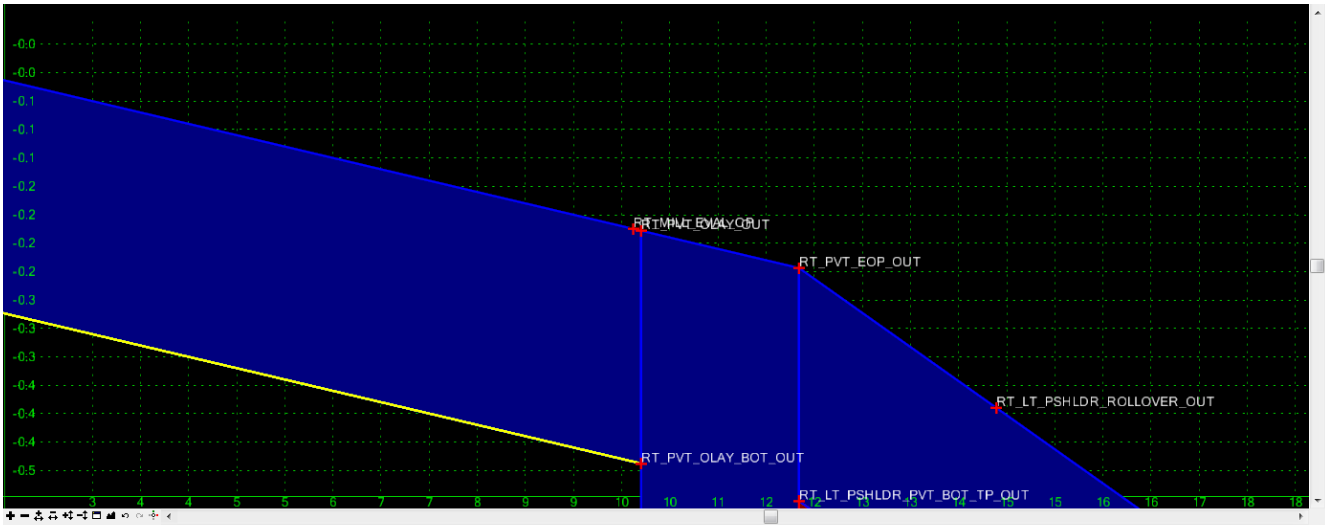
2. Open the **Parametric Constraints** folder, double click on the **OLAY_PvtThick** *Label* and change the *Default Value* from **-.25** to **-2/12**. Click **OK**.



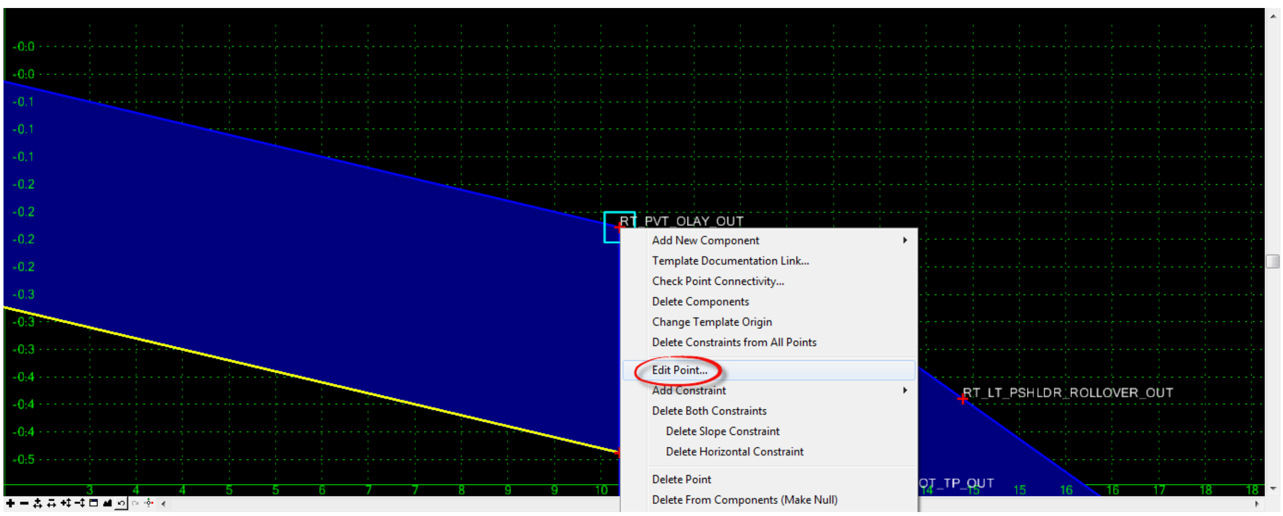
3. Repeat these steps for the **OLAY_PvtThickLt** and **OLAY_PvtThickRt** *Labels*.

➢ ***Change the Milling Point Properties***

1. Zoom in the *Active Template* View to the **Right Widening** side.



2. Right click on the **RT_PVT_OLAY_OUT** and select **Edit Point**.

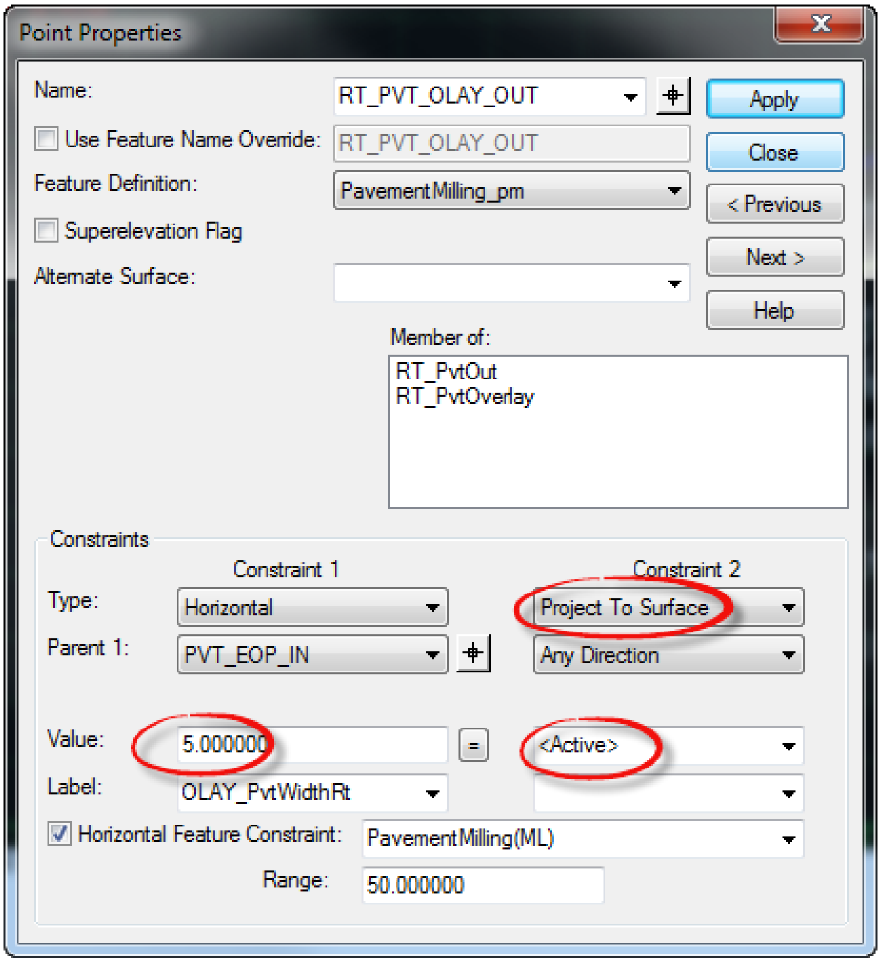


a. Change the Constraint 1, Horizontal Value from 12 to **5 feet**.

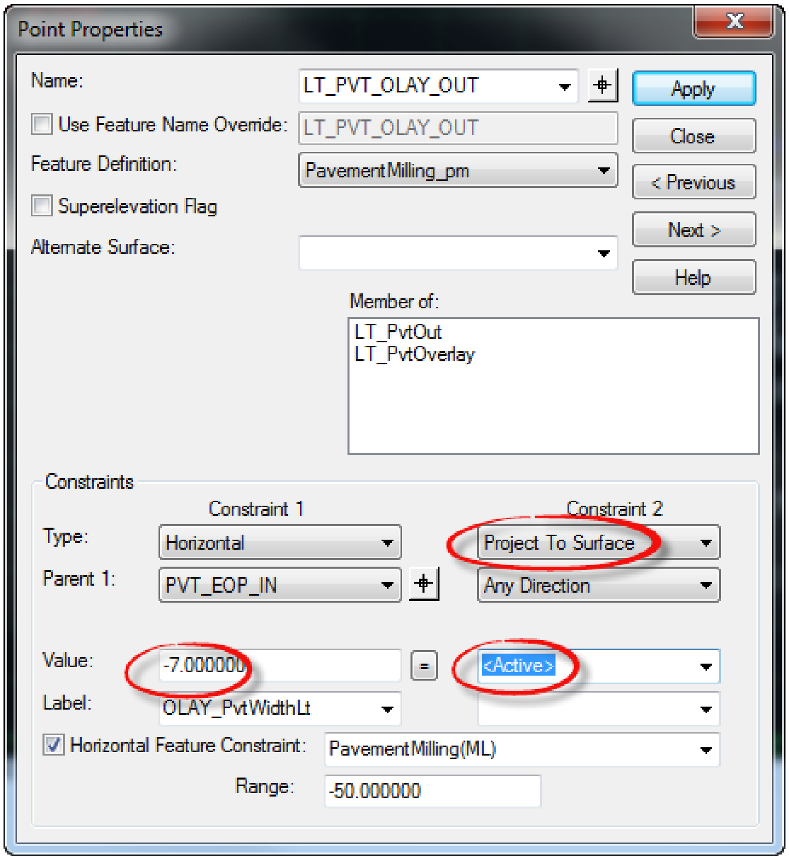
b. Change *Constraint 2*, from **Slope** to **Project to Surface.**

c. Set the *Constraint 2* Value to **Active**.

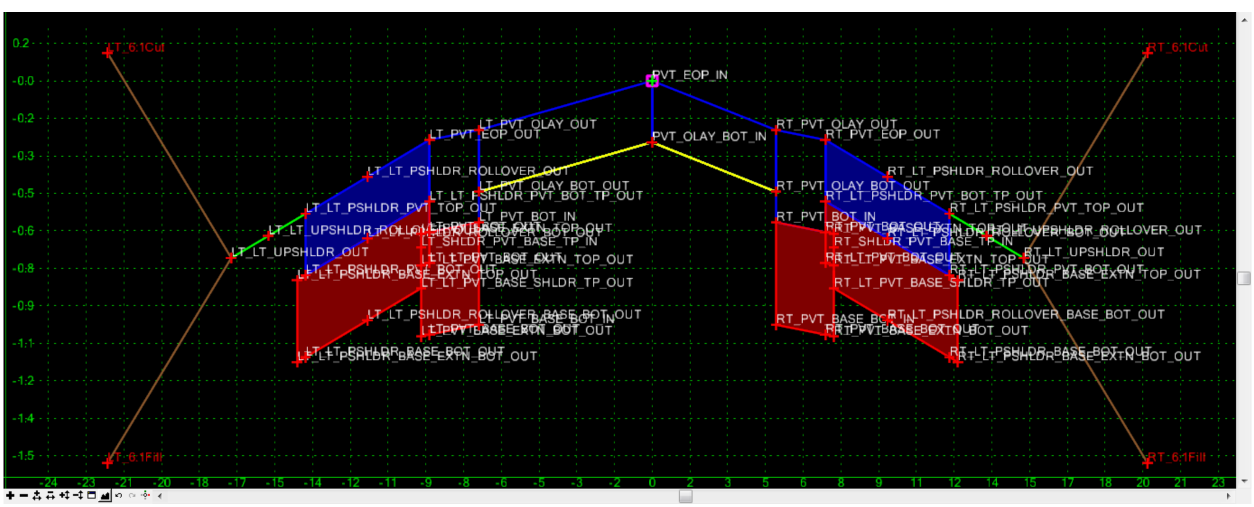
d. Click **Apply** and then **Close**.



e. Repeat these steps for the **LT_PVT_OLAY_OUT**, change the *Horizontal Value* from **-12** to **-7** and *Slope* to **Project to Surface**.



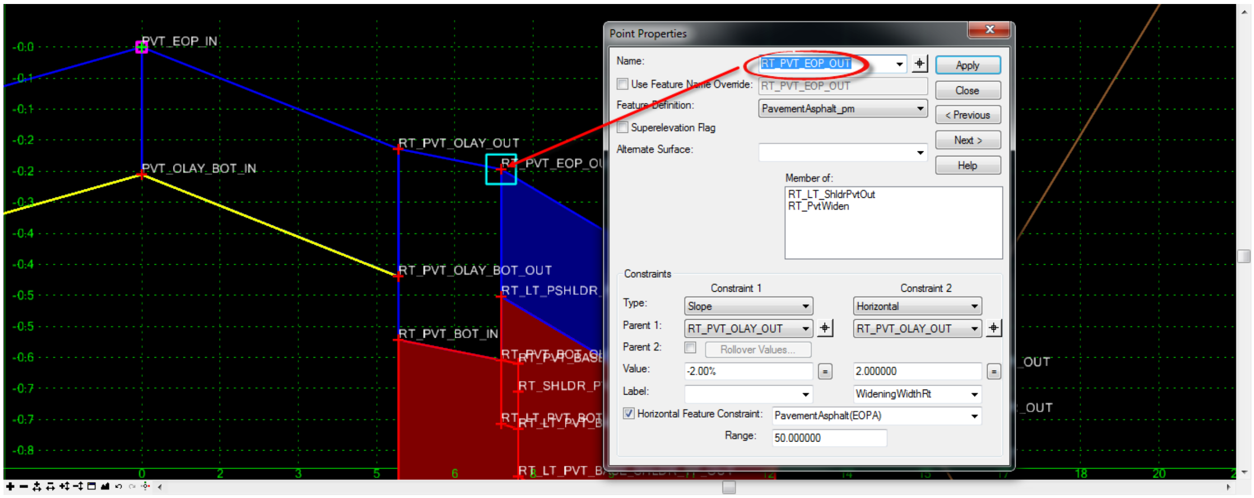
3. Zoom out of the *Active Template* to view the results.



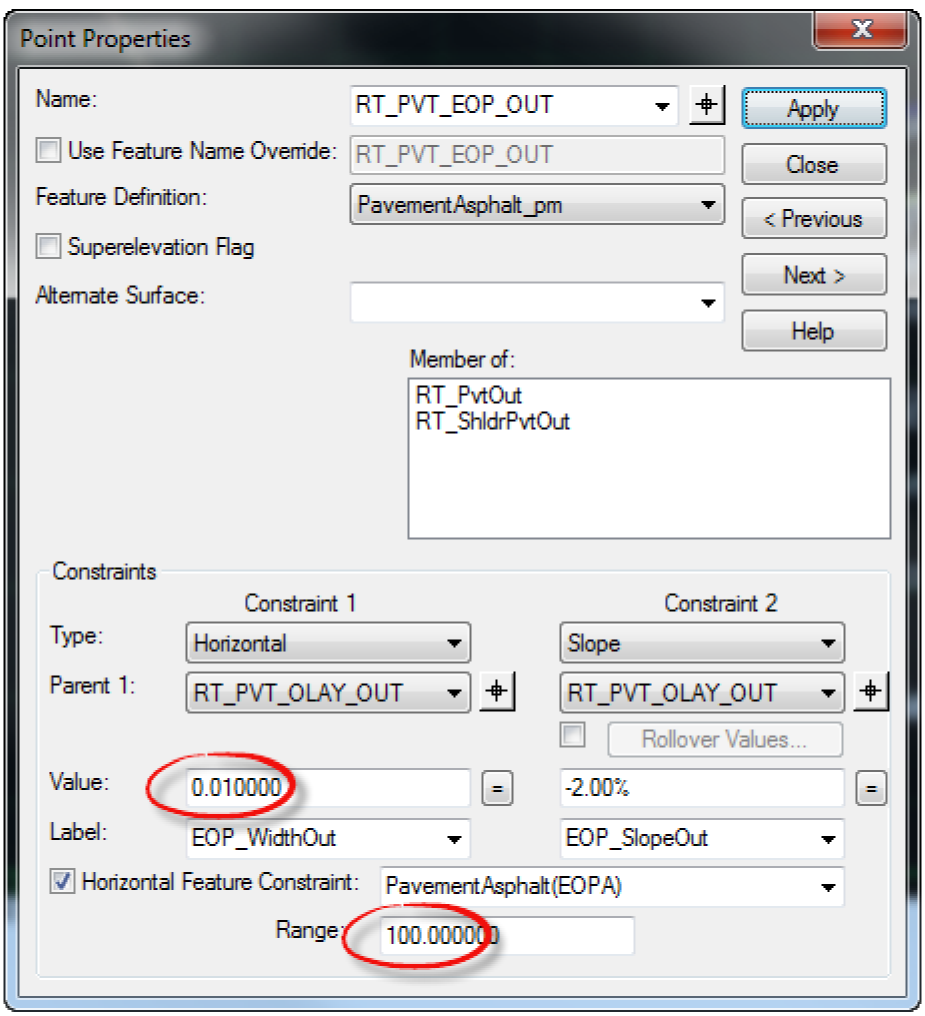
4. Select **File** > **Save** to save the Template changes.

➢ ***Change the Widening Point Properties***

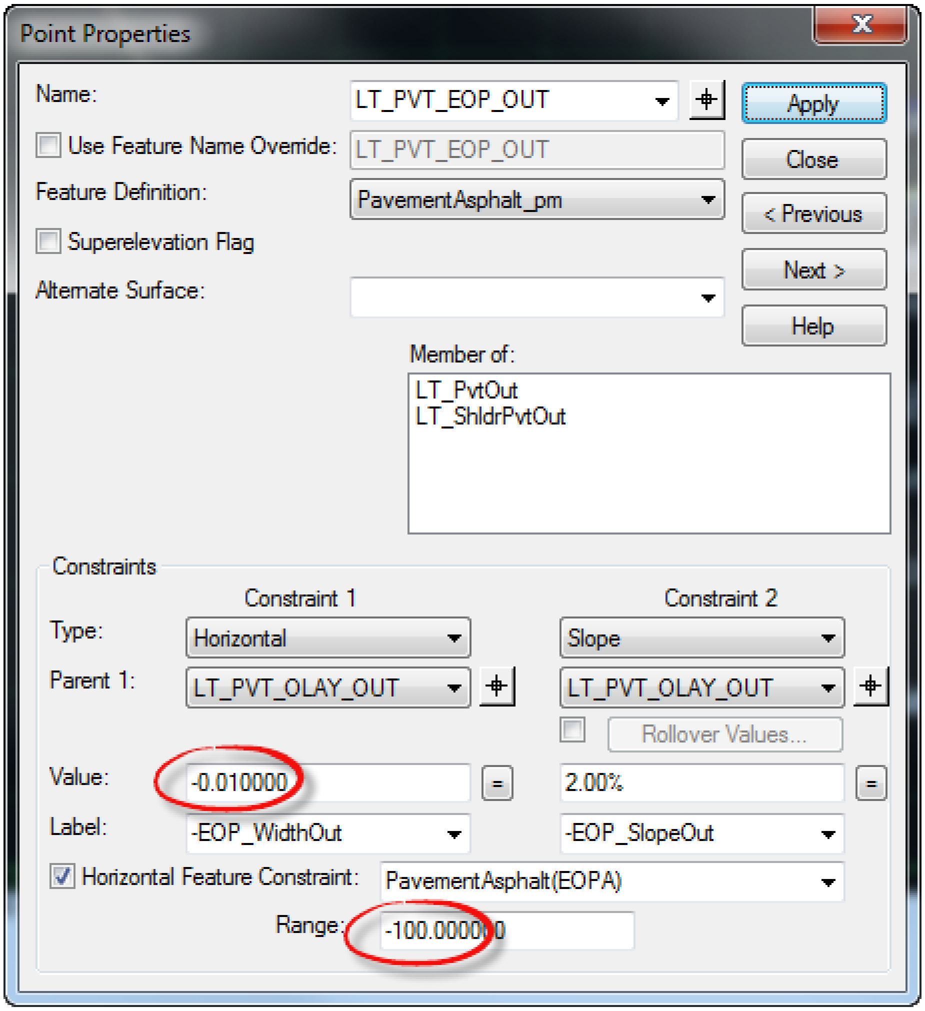
1. Double click on the **RT_PVT_EOP_OUT** to edit the *Point Properties*.



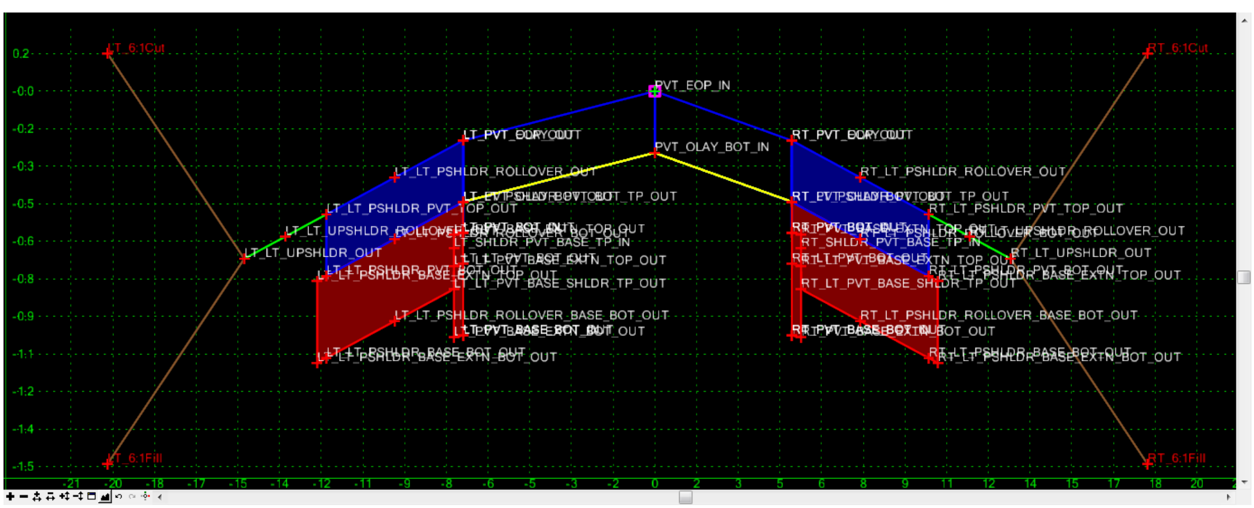
2. Change the *Constraint 1*, *Horizontal Value* from **1** to**.01 feet** and *Horizontal Feature Constraint Range* from **50** to **100 feet**. Click **Apply** and then **Close**.



3. Repeat these steps for the **LT_PVT_EOP_OUT**, change the *Horizontal Value* from **-1** to **-.01** and *Horizontal Feature Constraint Range* from **-50** to **-100 feet**. Click **Apply** and then **Close**.



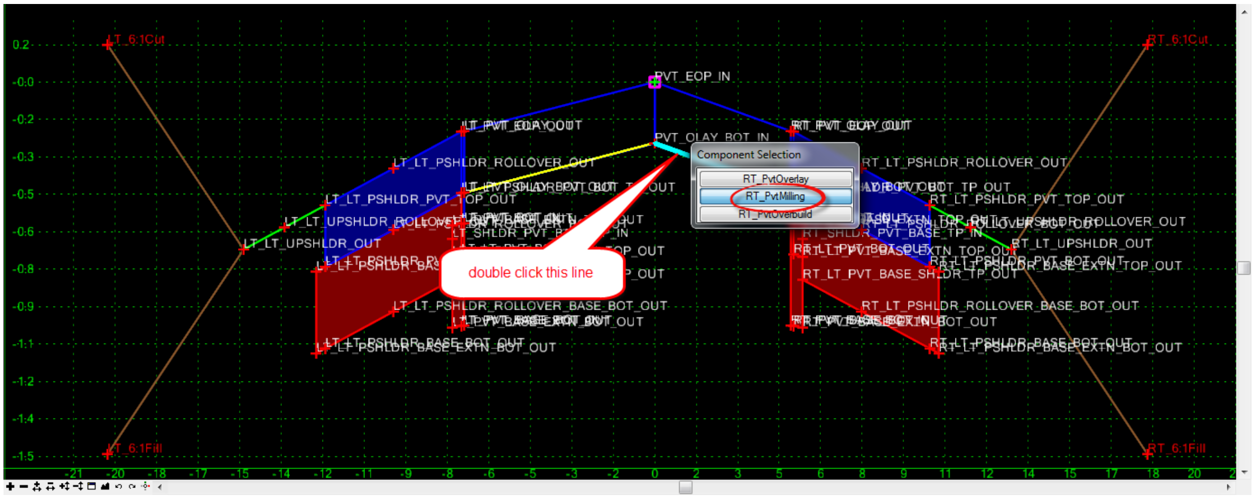
4. **Fit View** the *Active Template* to view the results.



5. Select **File** > **Save** to save the Template changes.

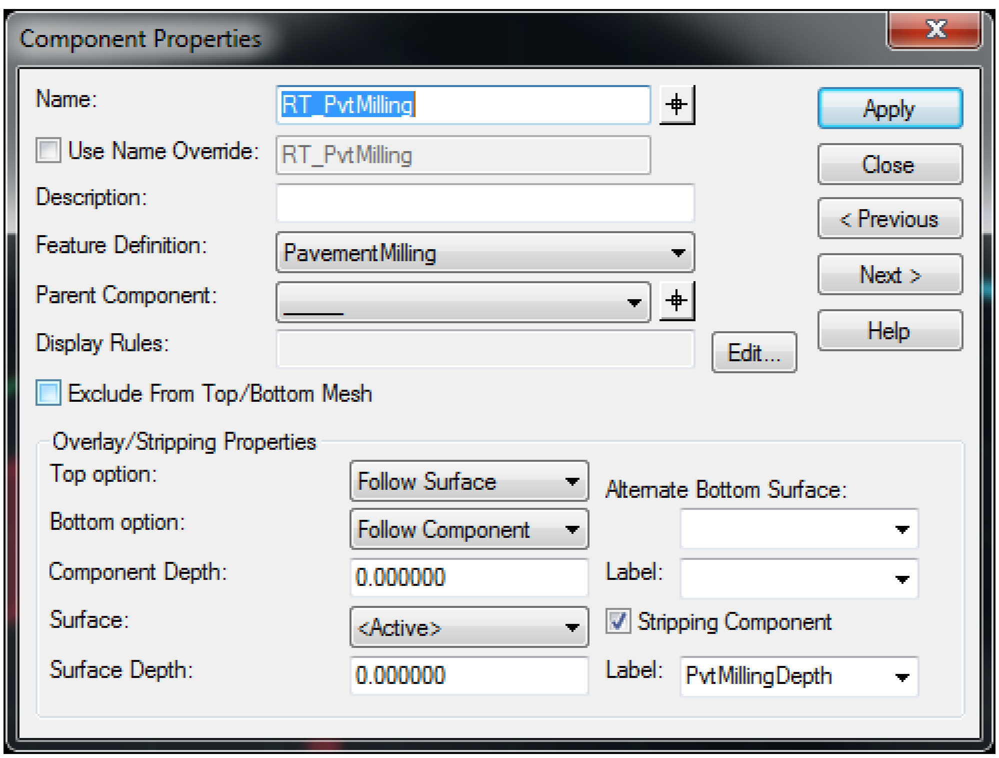
➢ *Check the Milling Component Properties*

1. Double click on the bottom line of the **RT_PvtOverlay** to open the Component Selection dialog and select the **RT_PvtMilling** option to edit the Component Properties.

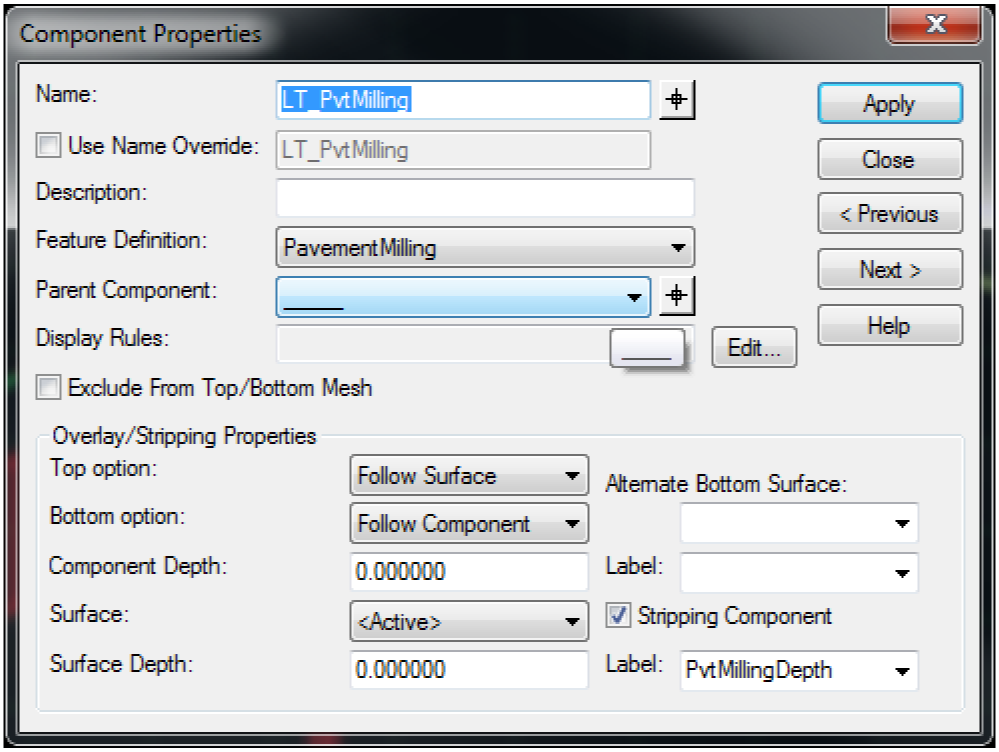


2. Change the *Overlay/Stripping Properties / Bottom* option from **Follow Surface** to **Follow Component**. Click **Apply** and then **Close**.

Note This is the appropriate setting for constant depth milling to match existing pavement slope between two points.



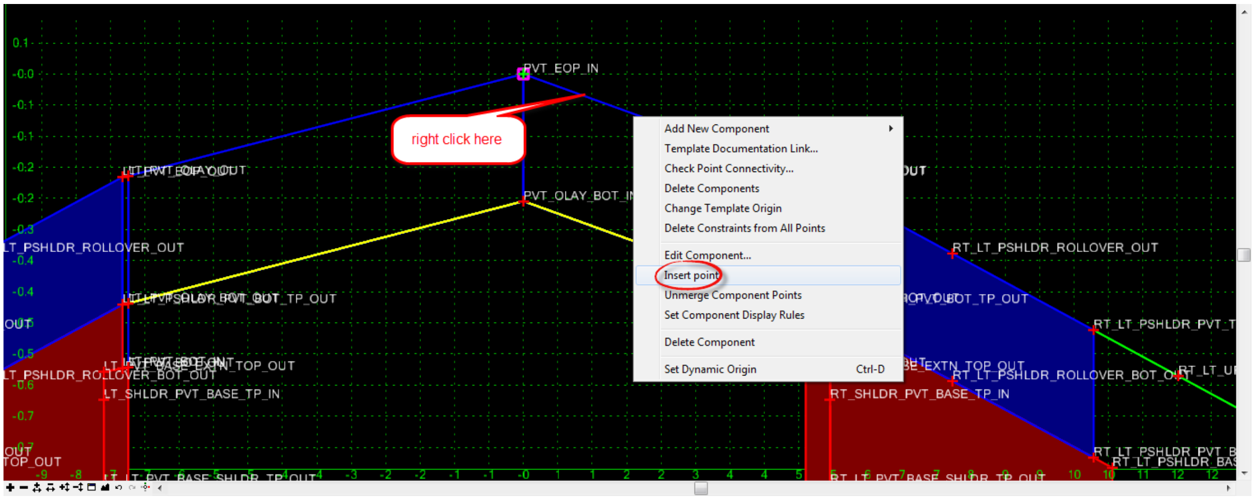
3. Repeat these steps for the **LT_PvtMilling** C*omponent*, change the *Overlay/Stripping Properties* / *Bottom* option from **Follow Surface** to **Follow Component**. Click **Apply** and then **Close**.



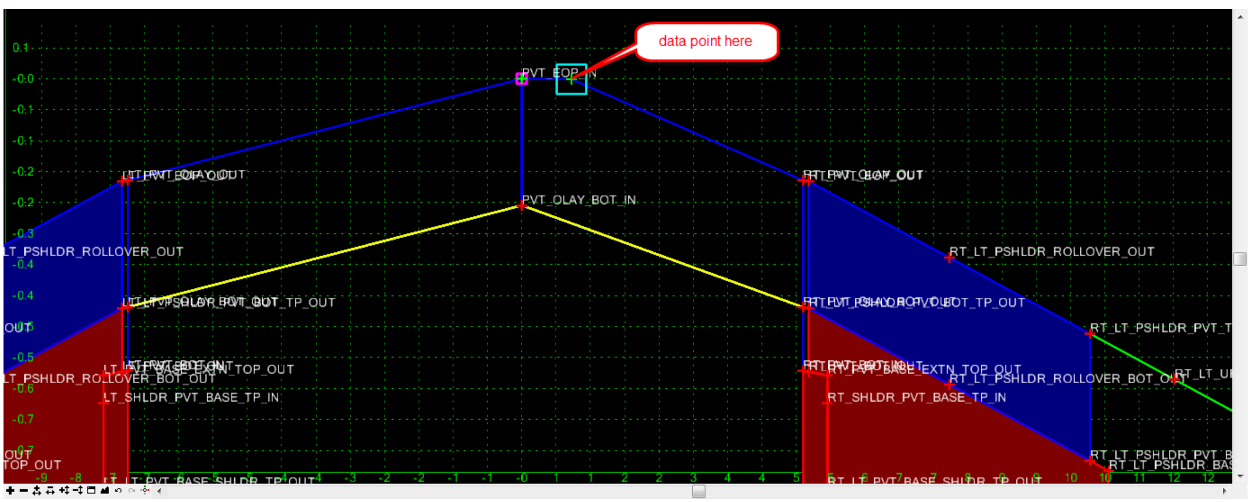
4. Select **File Save** to save the Template changes.

➢ *Insert a Milling Slope Break Template Point*

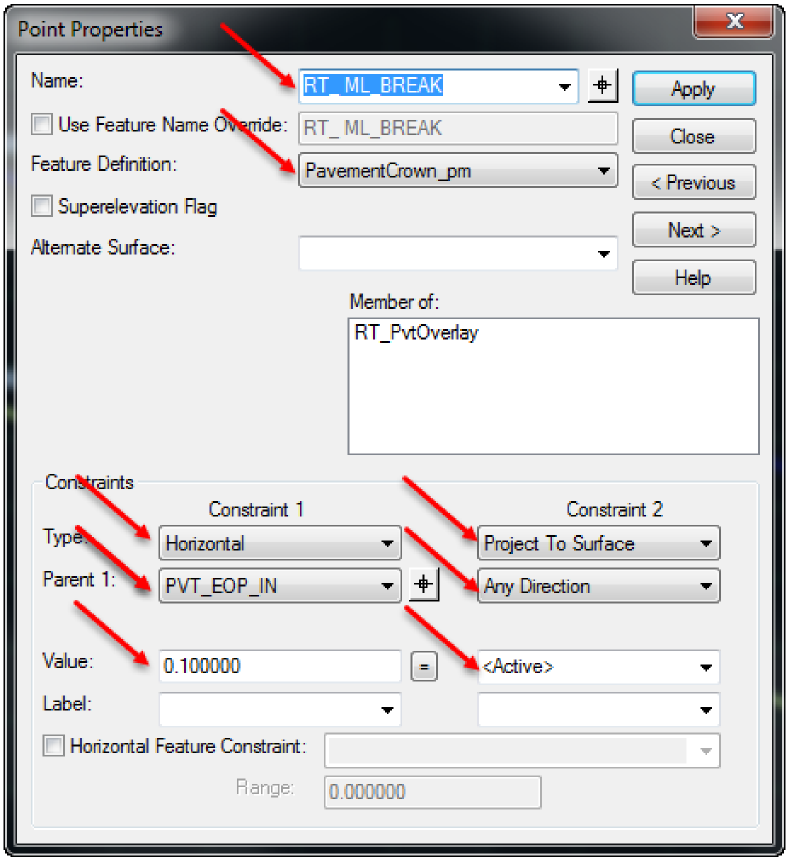
1. Right click on the **RT_PvtOverlay** *Component* and select **Insert Point**.



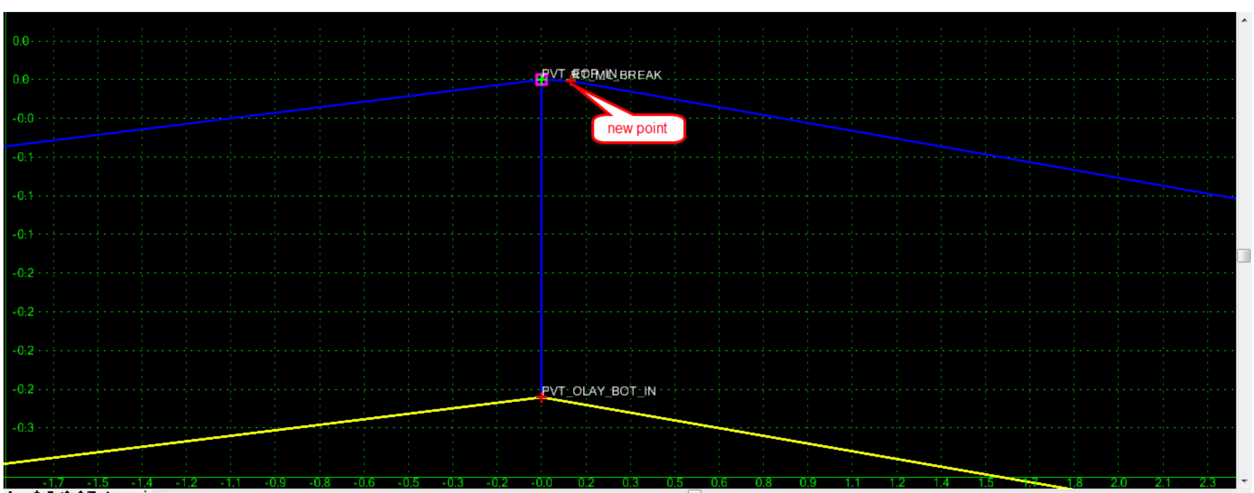
2. Data point in the *Active Template View* to store a point. Right click and select **Finish.**



3. Double click on the new *Point* to edit the **Point Properties**. Change the **Point Constraints** as shown.

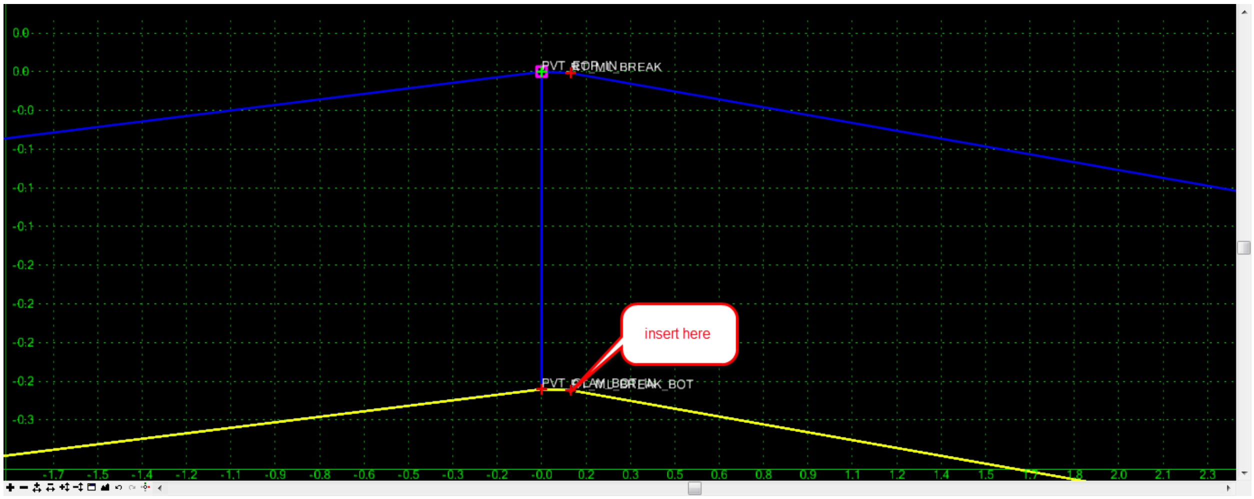


4. Click **Apply** and then **Close**.

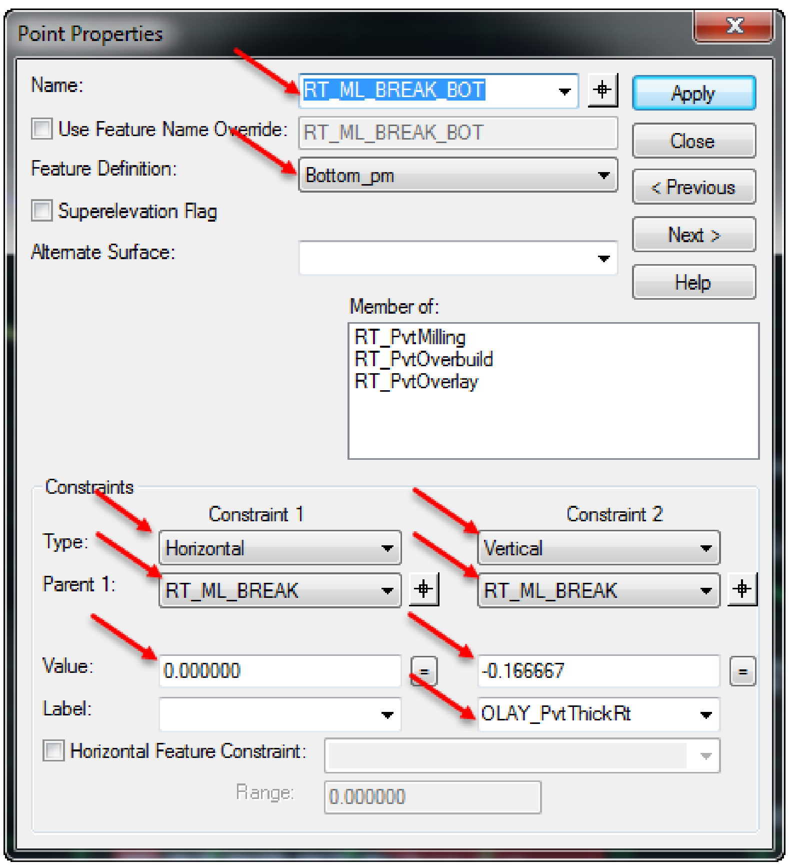


5. Repeat the steps above to insert *Points* on the bottom of the **PvtOverlay, PvtMilling,** and **PvtOverbuild** *Components*.

HINT If insert point option is not available for the last component, use add point

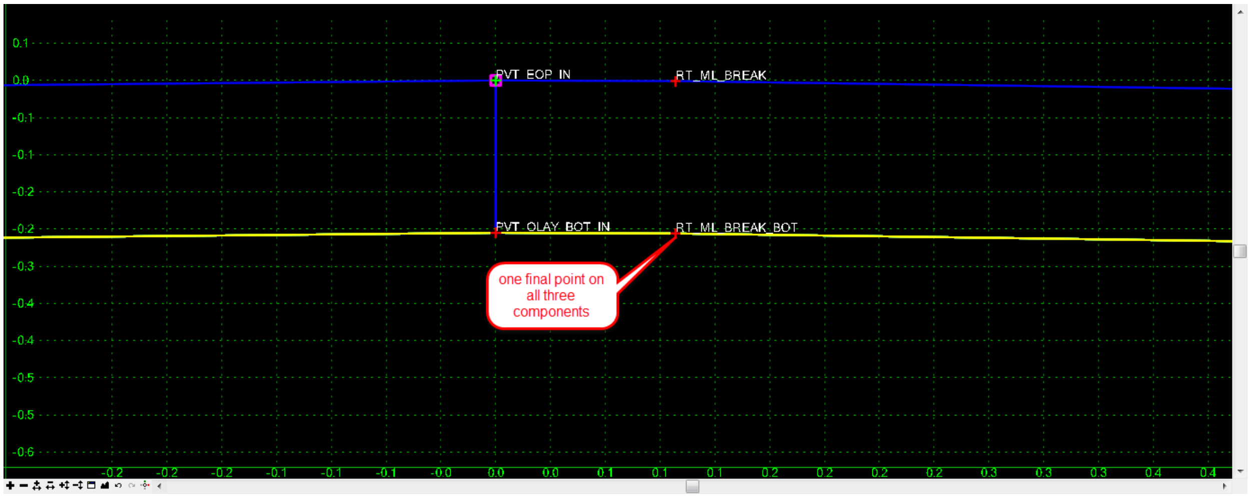


6. Set the **Point Properties** as shown.



HINT When inserting the point on the PvtMilling and PvtOverbuild components, data point on the RT_ML_BREAK_BOT point to save from setting any other Point Properties edit steps.

7. Merge the three points into one final point.



8. Select **File** > **Save** to save the Template changes and then close the Create Template dialog.

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6 BASIC CORRIDORS MODELS

CORRIDOR MODELING OVERVIEW

As defined in the Bentley Civil Help:

> *"The Corridor Modeling toolset is a group of highly interactive commands to create new design surfaces that represent a new roadway or other type of surface. Tools for creation, modification, management, and report functions are supported.*
>
> *Corridor Modeling tools aggregates a variety of civil data. The geometry is created with the Horizontal and Vertical Geometry tools, while the existing ground is defined by a MicroStation mesh or Civil Terrain Model. Plan view elements, such as edges of pavement, shoulders, curbs, etc. can be 2D or 3D. Superelevation information is defined within a design file using standards or imported data. Templates are utilized from one or more template libraries.*
>
> *Reference files can be used extensively with Corridor Modeling. On a simple project, the data may be all in one file; larger projects may have geometry in one file, plan view graphics in a second, terrain in another, superelevation in a fourth and the actual model in a fifth. All files can reference the others, to present a complete picture of the project.*
>
> *When working with Corridor Modeling, you can draw in 2D or 3D. When using 2D (such as for plan-view graphics), a 3D view is automatically created and maintained. For example, when a vertical geometry element is initially defined for a horizontal geometry element, the Default-3D model is created, if there isn't one already. The 3D baseline (combination of horizontal and vertical element) is drawn into the 3D model. As template drops are added, and progressed, they are added to the 3D model automatically.*
>
> *When starting to create a corridor, basic information can be used. A single template can be used, along with preliminary geometry and a high level terrain model. As the design progresses, more detail can be added. Instead of a single template drop, perhaps more templates better define the roadway. Transitions can be added to smoothly move from one template to another. There may be multiple roadways all interconnected using the target aliasing tools. All the while, as changes are made, the corridor model is updating, so you see up-to-the minute results. Simple projects may not require all the tools, and a basic corridor model may be sufficient. But all the tools are available to handle basic to complex, small-scale to large-scale projects.*

The following are minimum requirements to use Corridor Modeling.

- Civil horizontal element
- Civil vertical element
- Template stored in a template library

A terrain model is not required for corridor modeling. If the template includes end conditions and no terrain model is defined, the software generates as much of the model as possible, but will not complete the end condition that ties to ground and no error message is given.

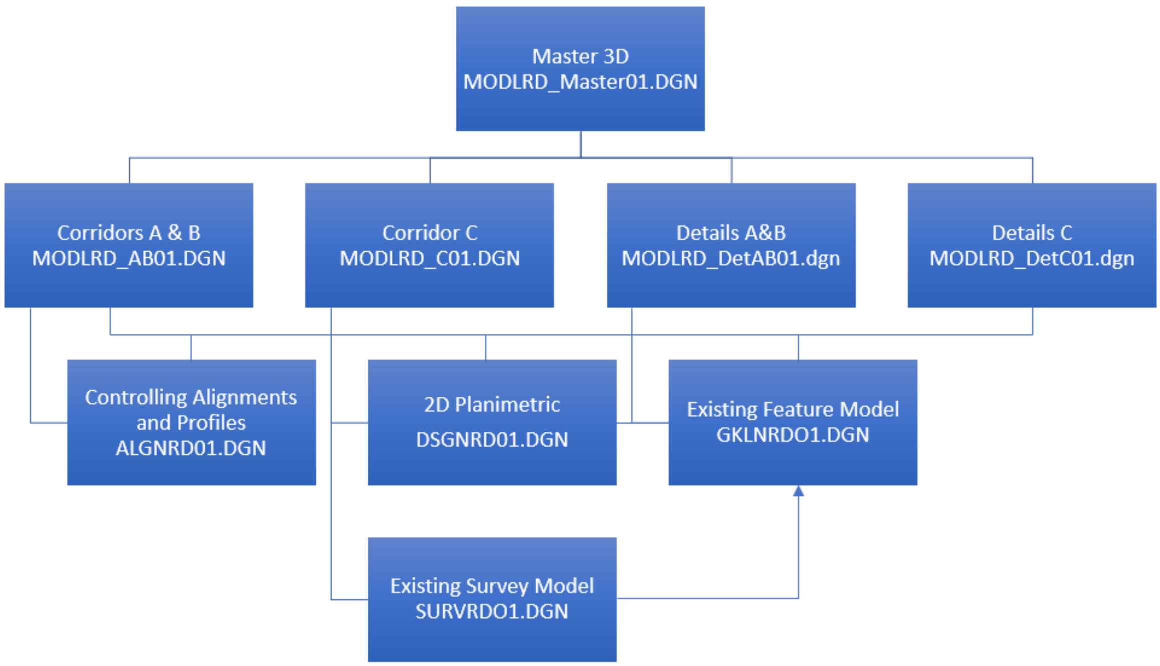
Corridor Modeling Planning

It is recommended to plan out the 3D modeling approach on a project. Some have referred to this a Model Management Plan. This plan will attempt to outline the following:

- Determine how to break up the project into logical independent corridors
- Determine which sections of the project are needed for detail modeling and surface modeling
- Determine the files and filenames to be used for corridors and details.

Note The project 3D Model may be in separate files or all combined into one file.: The FDOT file defined to be used for Corridor and Detail Models is MODLRDxx.

Below is a sample diagram of a typical Model Management Plan:



Exercise Overview

6.1 Prepare to Create Corridor Model for SR61

6.2 Create Corridor, SR61

6.3 Variable Medians, SR61 Templates

6.4 Add Corridor References, SR61

6.5 Add Corridor Point Controls, SR61

6.6 Add Corridor Key Stations, SR61

6.7 Change Corridor Design Stage, SR61

6.8 Review Corridor Objects, SR61

6.9 Create RRR Corridor Model, BL98

6.10 Create Template Drop, RRR98

6.11 Add Corridor References, RRR98

6.12 Template Point Control, RRR98

Exercise 6.1 Prepare to Create Corridor Model for SR61

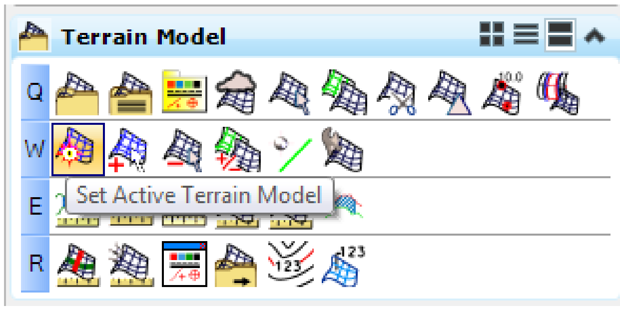
1. (Optional) Extract the *22049555201(6).zip* file in the c:\e\projects folder.

2. Use the create file tool to create the *MODLRD01.dgn* file to be used for corridor models.

3. Open the *MODLRD01.dgn* or *DSGNRD01.dgn* file of the c:\e\projects\22049555201\roadway\ folder in the *FDOTSS4* Workspace in MicroStation.

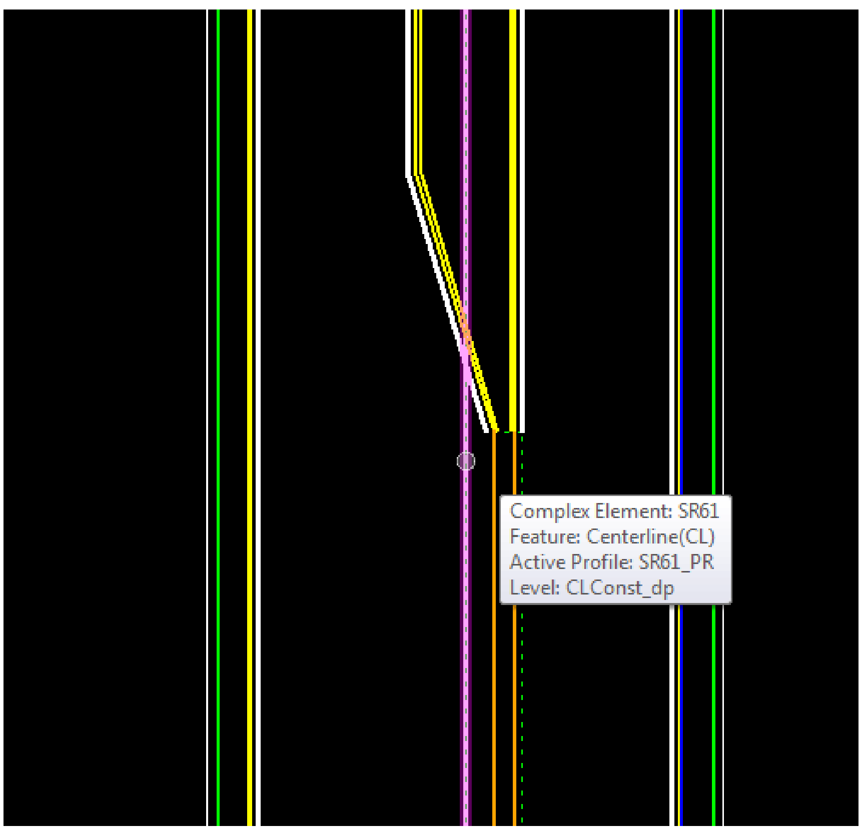
4. If using the *MODLRDO1 file*, attach the terrain, 2D plan and survey files as references.

5. Use the *Terrain Model*, **Set Active Terrain Model** tool.

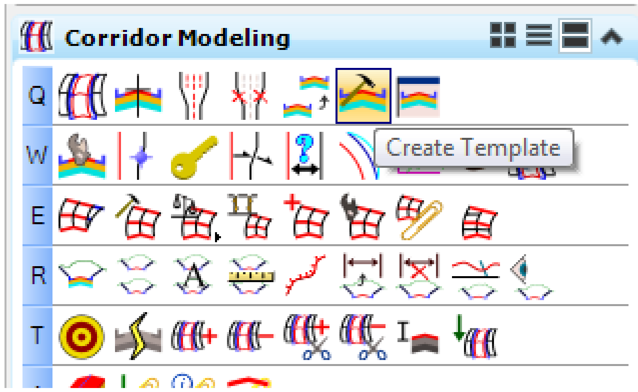


6. At the cursor prompt, select the **Terrain Boundary** green dashed line from the attached *GDTMRD01 reference* file. This will set the *terrain model* as **Active**.

7. Move the cursor over the **SR61** *Centerline Feature* and verify an **Active Profile**.

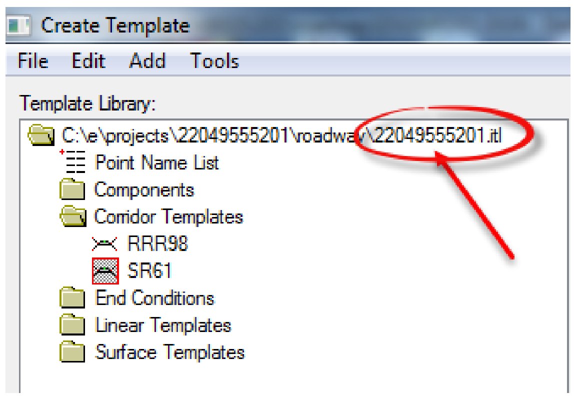


8. Use the *Corridor Modeling*, **Create Template** tool.

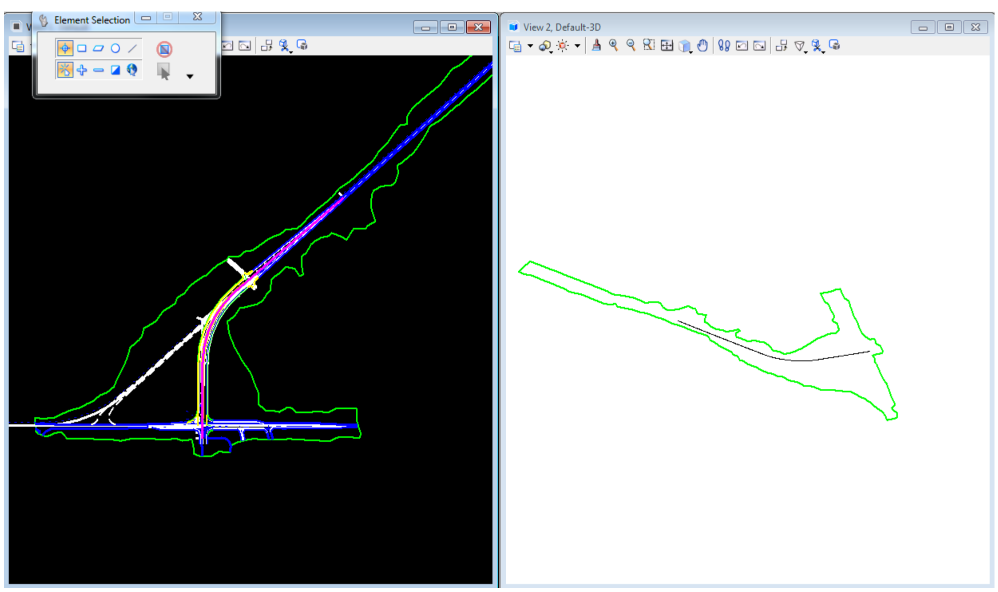


HINT Use the F12 function key to access the Create Template Dialog.

9. Verify that the correct Template Library is loaded **Close** the Create Template dialog.

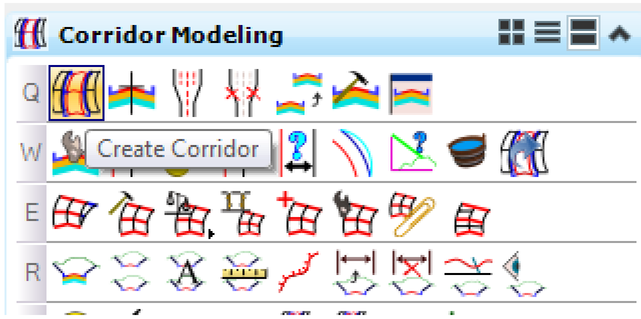


10. To set up the *Views* for viewing the **2D Plan** and **3D Model** simultaneously in the FDOTSS4 Workspace, Select the **F2** *Function Key* on the keyboard. This will open an *Isometric View* of the project.

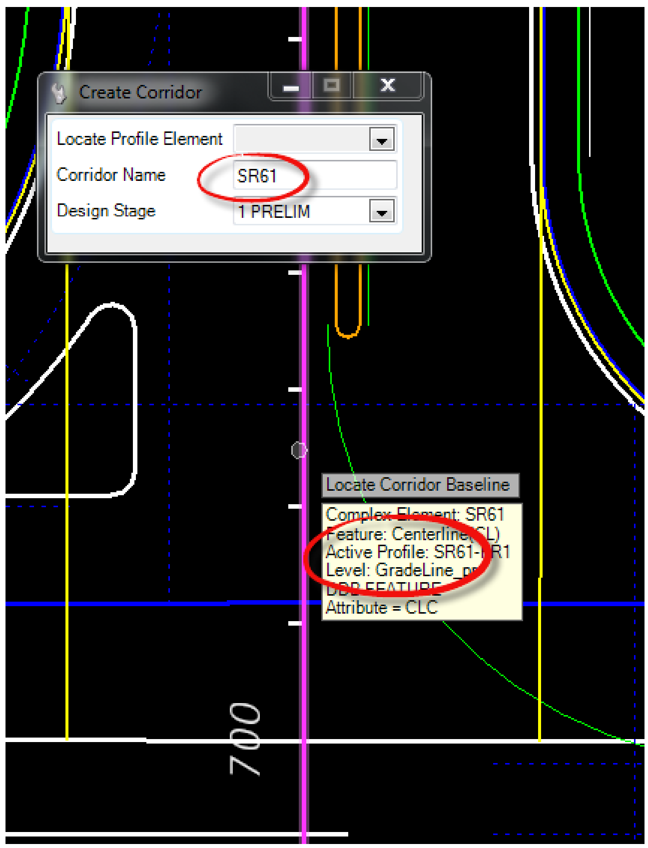


Exercise 6.2 Create Corridor, SR61

1. Use the *Corridor Modeling*, **Create Corridor** tool.



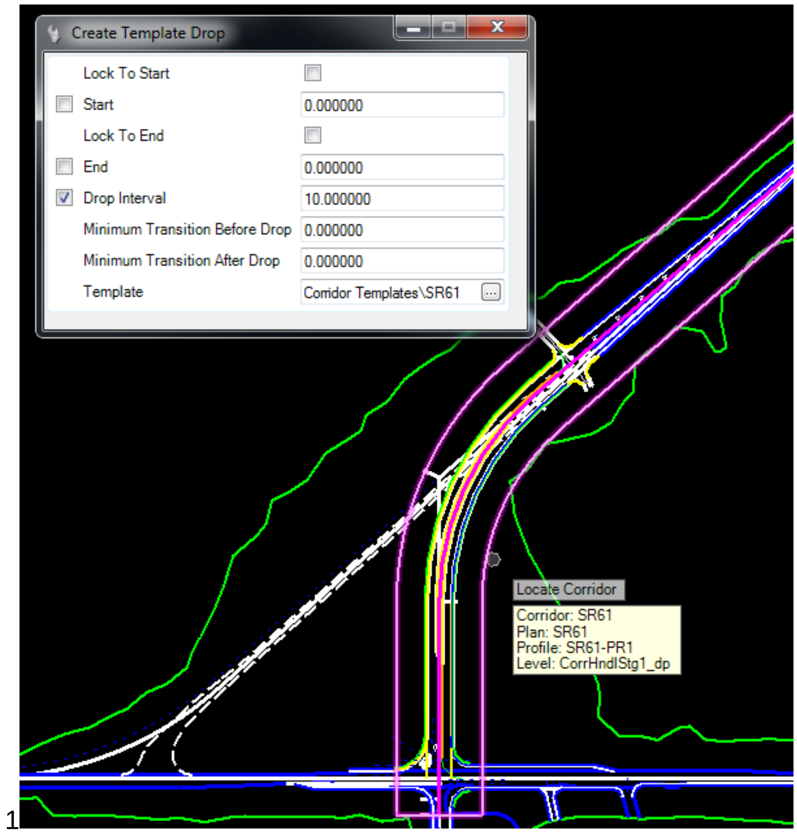
2. Enter the *Corridor Name*, **SR61**, in the Create Corridor dialog and then select the **SR61 Centerline** in the Plan View.



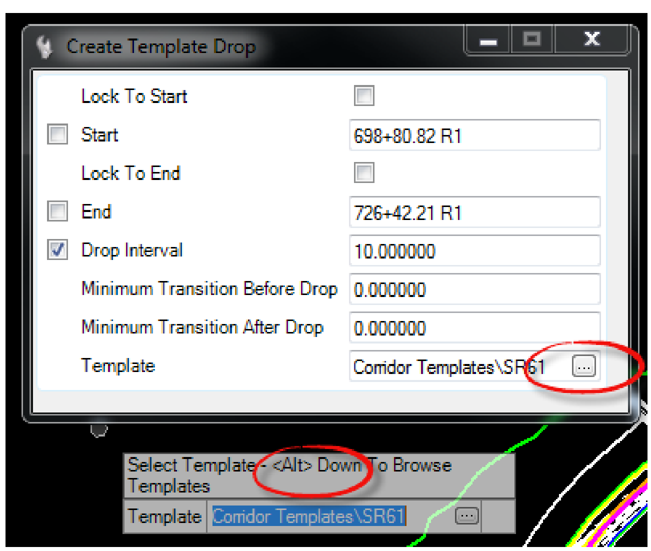
3. Reset to accept the **Active Profile**. This profile resides with the *SR61 Civil Feature Centerline*.

4. Data point to accept the *Name of the Corridor*, **SR61**. The corridor is created AND the integrated Create Template Drop dialog launches.

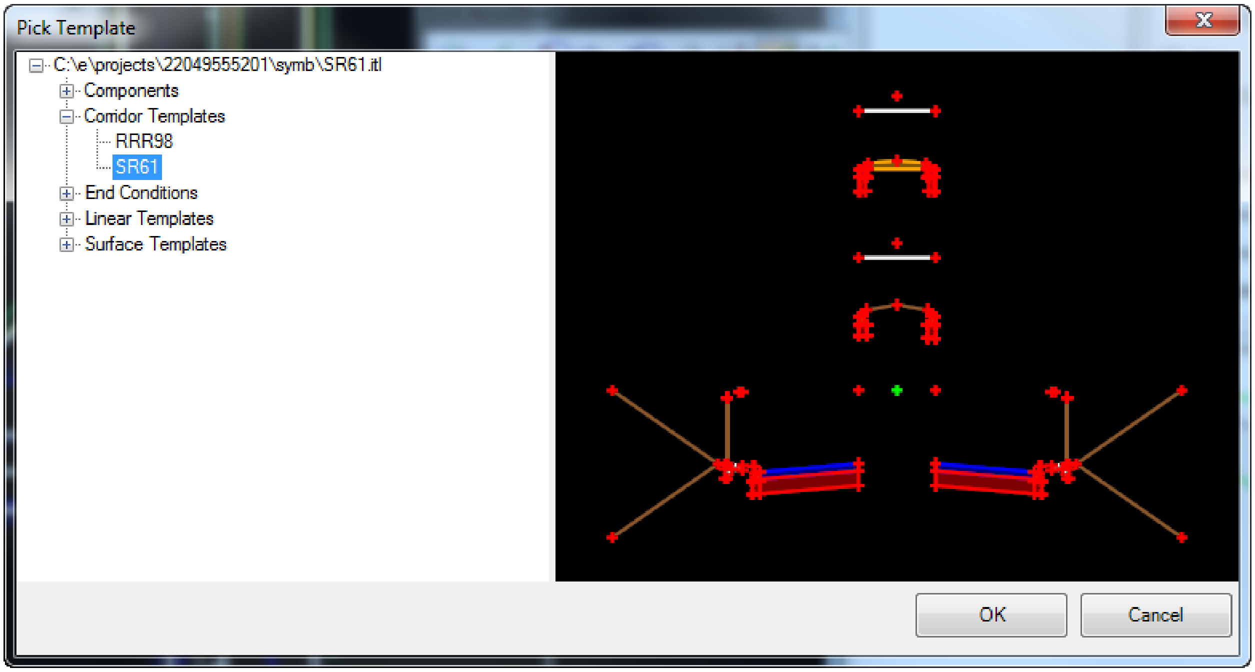
Note Once a Corridor is created, a shape boundary is placed in the Plan View representing its outline. This shape is initially placed on the CorrHndlStg1_dp level. It has several properties which can be seen by clicking on the shape and choosing first icon. One of the properties is the Design Stage.



5. Once the Create Template Drop dialog is opened, first select the **corridor template** to be placed on the corridor. Either use the **icon** on the dialog <OR> select **ALT down arrow** to pick a template.



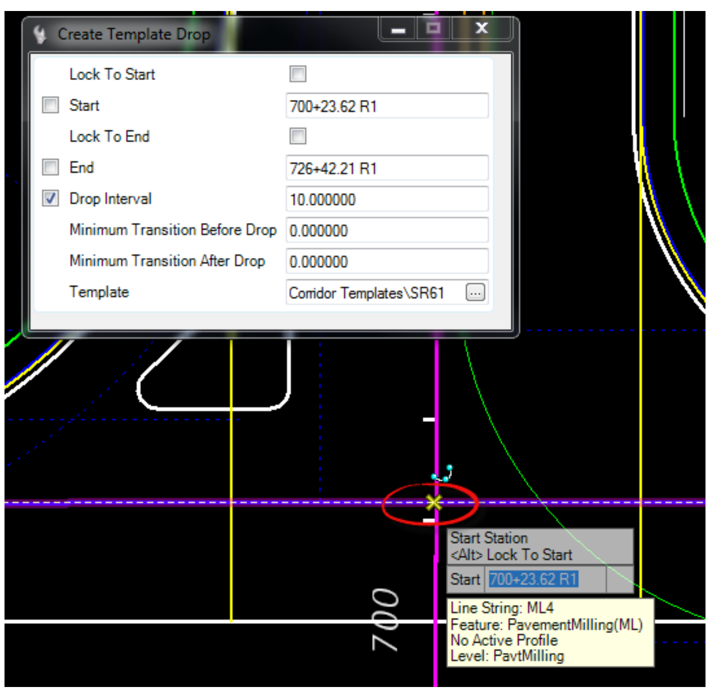
6. Find the **SR61** *template* in the *Corridor Templates* folder of the active Project Template Library.



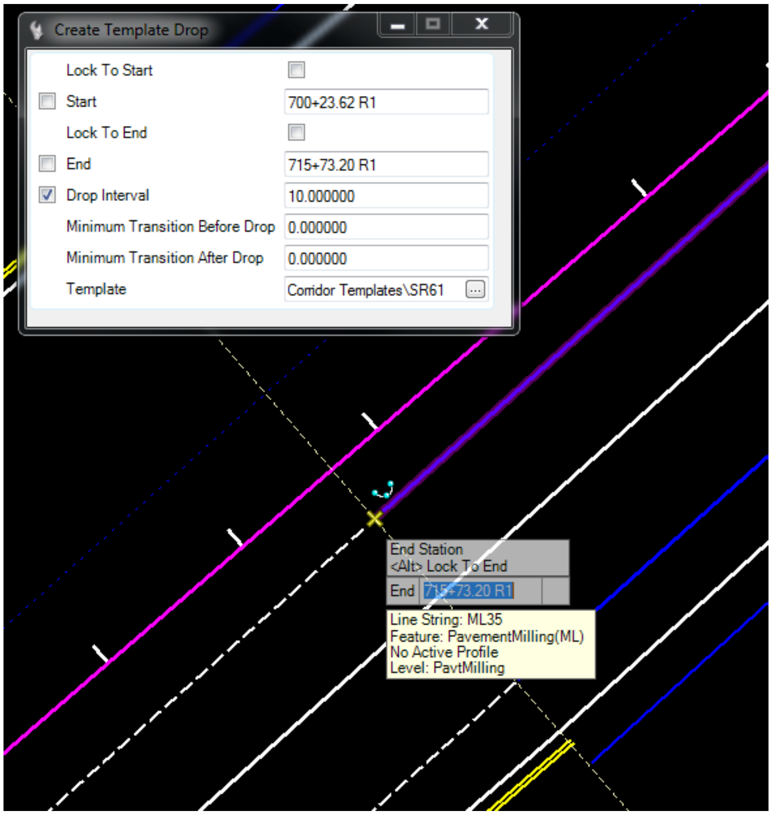
7. Data point to accept the **Template** and move to the next setting.

8. Continue to define the Create Template Drop dialog information entering and accepting the following for the **SR61** *Corridor*:

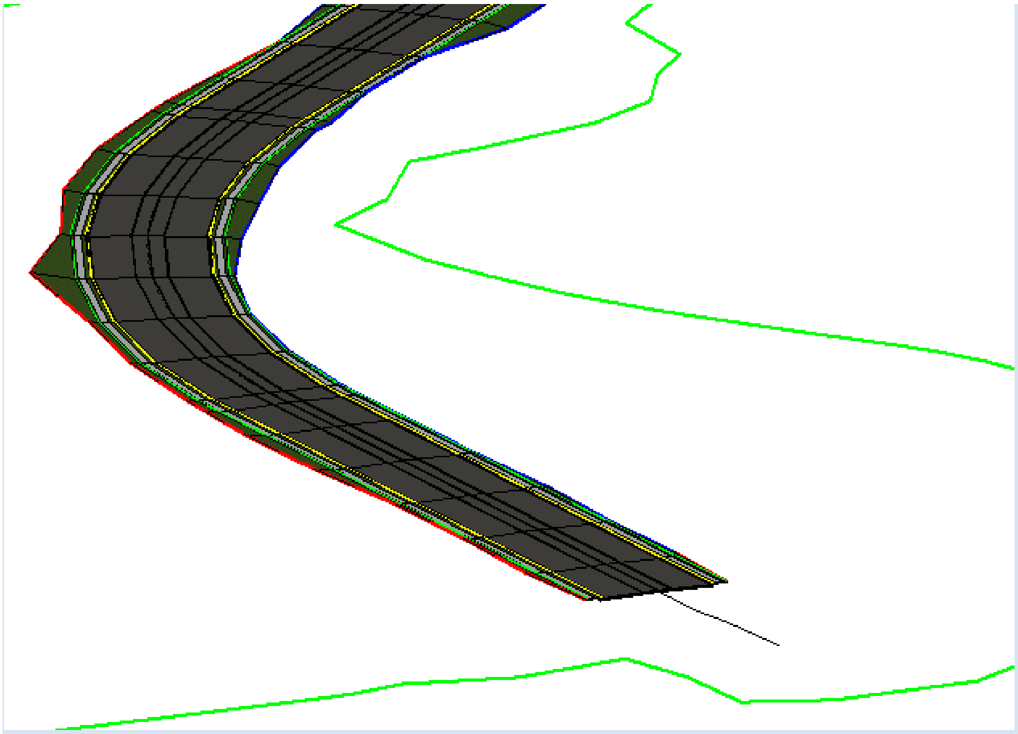
   a. *Start* – Use keypoint or intersect snap click to the *ML line* on 98, *Station* **700+23.62.**



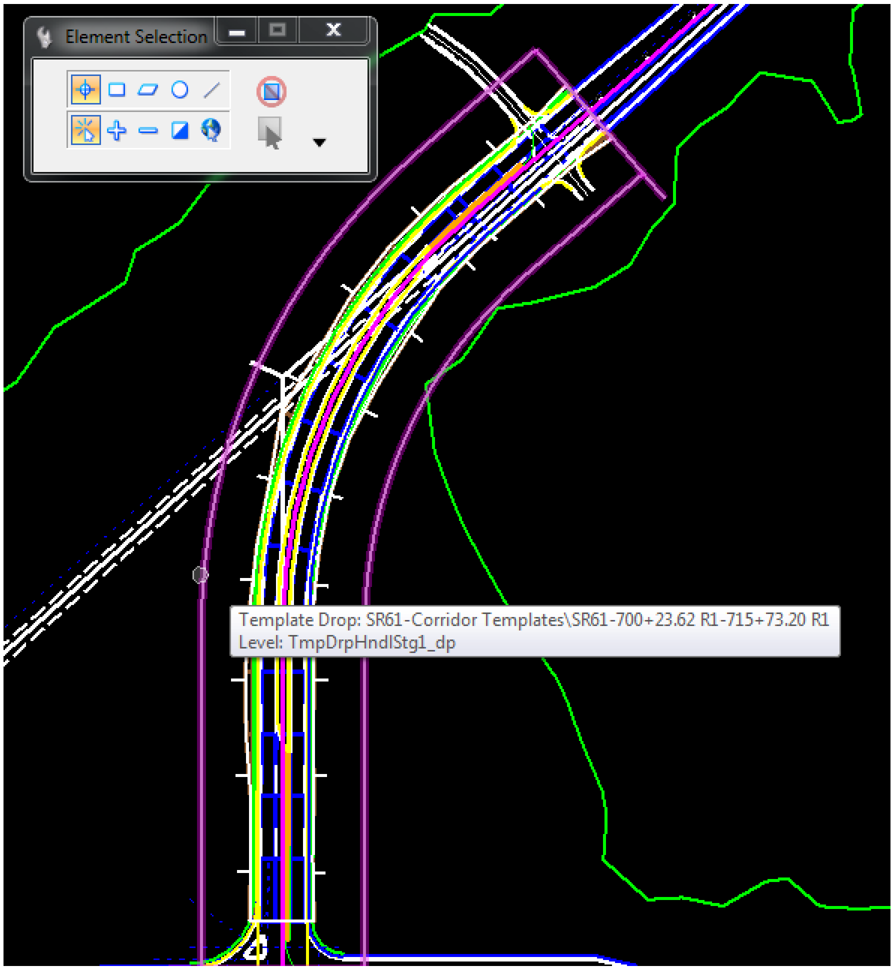
b. *End* - snap to the beginning of the *milling*, *Station* **715+73.20.** Complete dialog as shown below.



9. Upon completion of the *Corridor Processing* bar in the lower right hand side of the MicroStation status bar, the **3D model** will be displayed in **View 2**.



Note Once a Template Drop is created, a shape boundary is placed in the Plan View represent its outline. This shape is initially placed on the TmpDrpHndlStg1_dp level. It has several properties which can be seen by clicking on the shape and choosing first icon. One of the properties is the Design Stage.

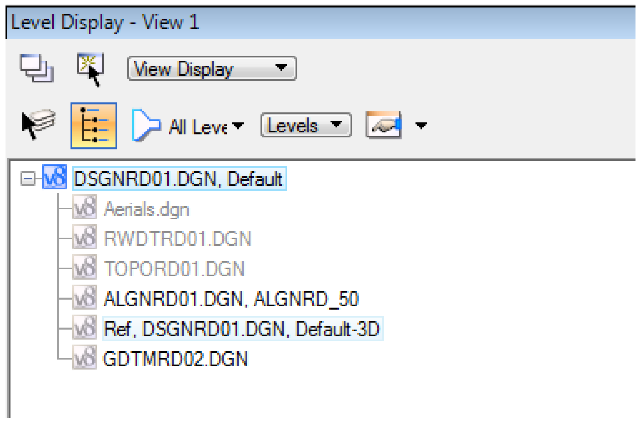


➢ *Turn 3D Reference File Display Off in the Plan View*

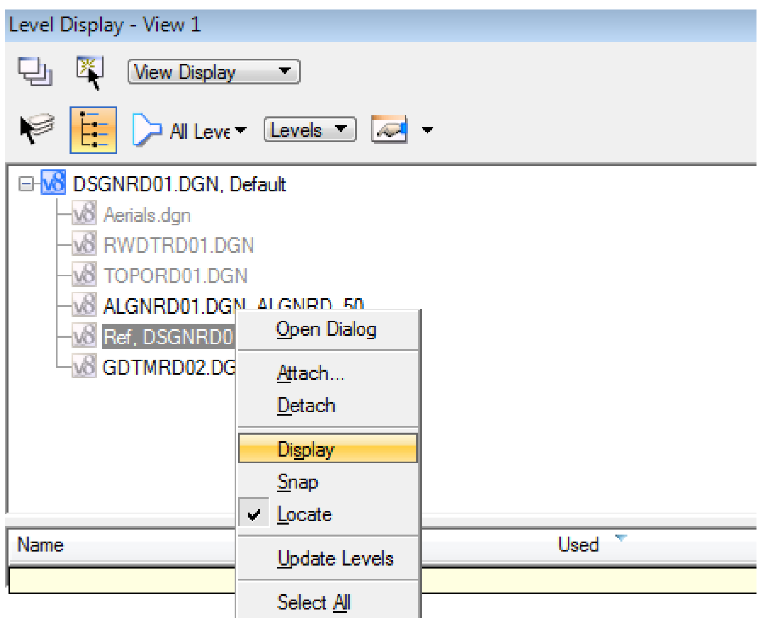
At times the line work in the Plan View can become confusing with 3D lines over top of the 2D lines. This View can be simplified by turning the 3D Model Reference file display Off.

1. Data Point somewhere in **View 1** to make it active.

2. On the MicroStation Level Display dialog, navigate to the **Ref. DSGNRD01 Default-3D** file or **Ref. MODLRD01.DGN Default-3D** file.



3. Right click on the file and un-check the **Display** option.



Exercise 6.3 Variable Medians, SR61 Templates

The *FDOTSS4.itl* file contains some PPM Exhibit Templates which are delivered with variable medians included. The median can vary with the following conditions or component sets:

- Curb Median with or without Left Turns
- Crossovers at Intersections
- Traffic Separators with Left Turns

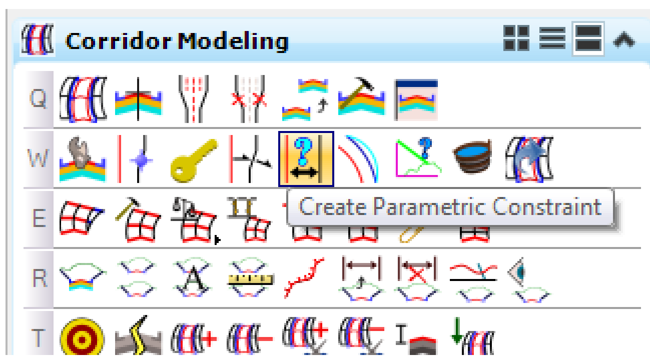
To properly operate the median condition templates consider the following:

- The various median component sets have a parent end condition search lines that targets plan features; e.g. CurbType E, Traffic Separator.
- Each of the median components sets are displayed ONLY if the target is found. This is by the Parent/Child relationship of the Template components.
- The LT and RT PGL Handles control the overall width of the median and can be modified to fit any project.
- Many of the median components have Horizontal Feature Constraints (HFC) defined to locate the 2D civil features and the horizontal range will need to be modified to fit the project.

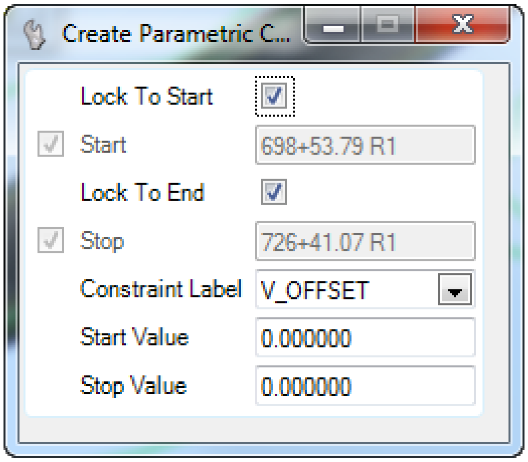
➢ *Add Parametric Constraint for Variable Median, SR61 Template*

The templates used have variable median conditions built within that needs to be set in place for the corridor.

1. Use the *Corridor Modeling*, **Create Parametric Constraint** tool.



2. Identify the **Corridor Boundary** *handle*. Continue to define the Create Parametric Constraint dialog information.



3. Enter and accept the following for the **SR61 Corridor**:

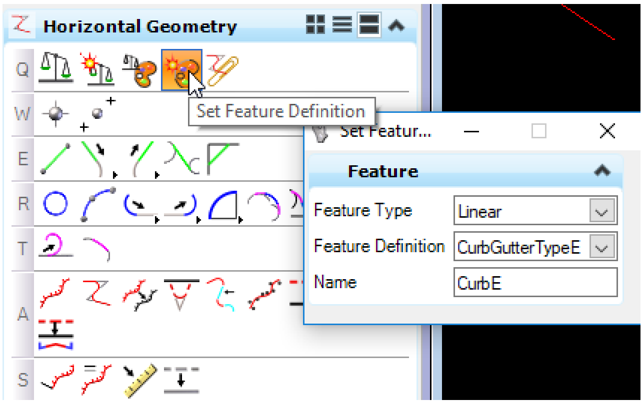
Start Station	**Alt for Begin**
Stop Station	**Alt for End**
Constraint Label	**V_Offset**
Start Value	**0.0**
Stop Value	**0.0**

4. The variable median conditions are placed at the correct location vertically. This will ensure the median is at the correct elevation for the next exercise.

Exercise 6.4 Add Corridor References, SR61

Corridor References are related to the template points having a Horizontal Feature Constraint to control the location of the point on the corridor. They are 2D graphical Civil Features that need to be added to a corridor. For the SR61 corridor a selection of median Civil Features are used for template external references.

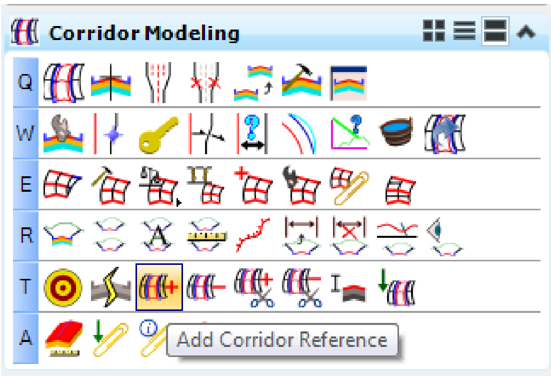
1. The SR61 template is designed to target CurbGutterTypeE lines in the median. Use the Set Feature Definition tool to change the two median CurbFace feature lines to CurbGutterTypeE features.



2. Create a selection set of the following 12 features in the plan view:

    - 2 - PavementAsphalt(EOP) lines in the median
    - 4 - PavementAsphalt(EOP) taper lines in the median
    - 2 – CurbGutterTypeE lines in the median (step 1 above)
    - 2 – CurbGutterTypeE taper lines in the median
    - 4 - TrafficSeparatorTypeI(4 feet) lines in the median

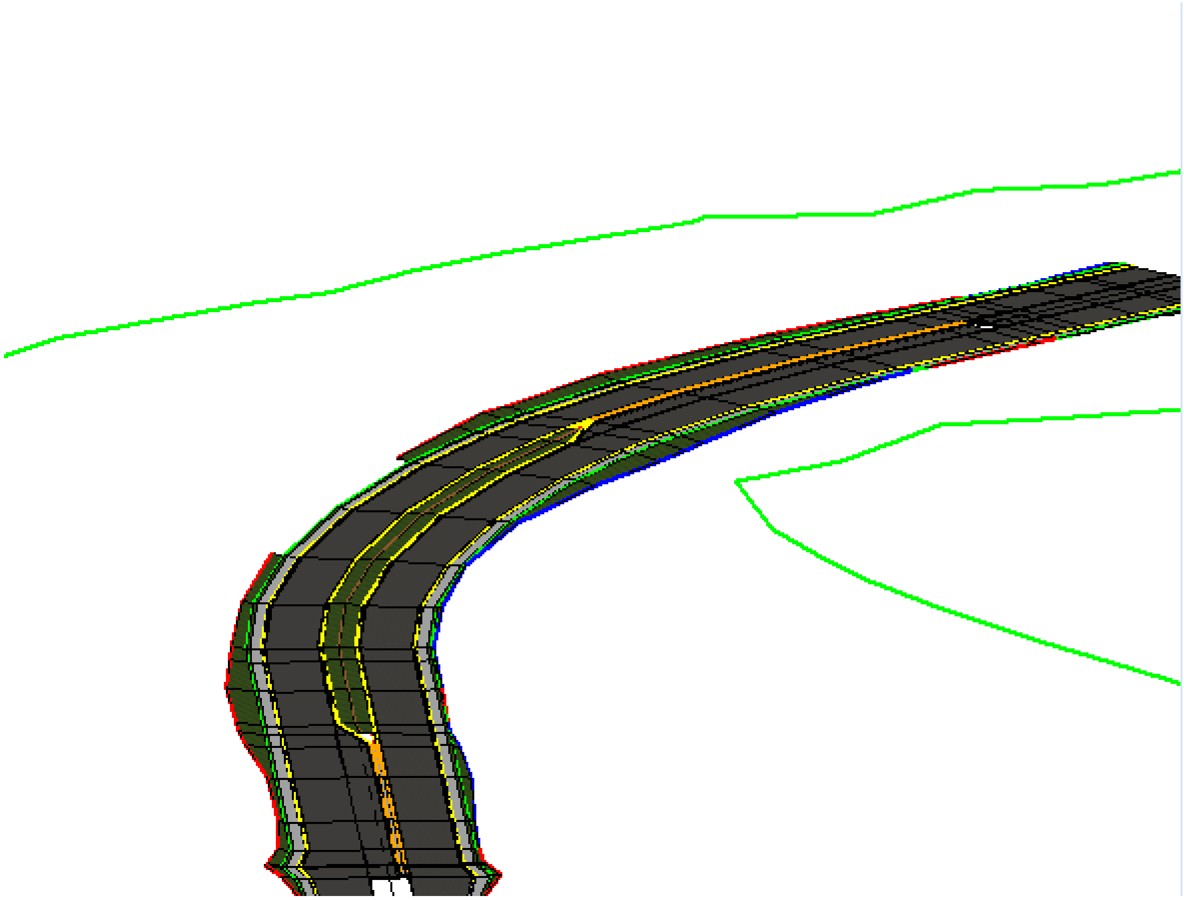
3. Use the Corridor Modeling, Add Corridor References tool.



4. Identify the **Corridor** *handle* and then data point to add the selected lines as listed above to the corridor.

5. Once the **Reference Lines** have been added, the Corridor will automatically process to include the new **Horizontal Feature Constraints**.

HINT Modeling the TrafSeparator level, do not add the Nose Radius Element to the Selection Set. This will be modeled in Chapter 9 with a 3D Civil Cell.

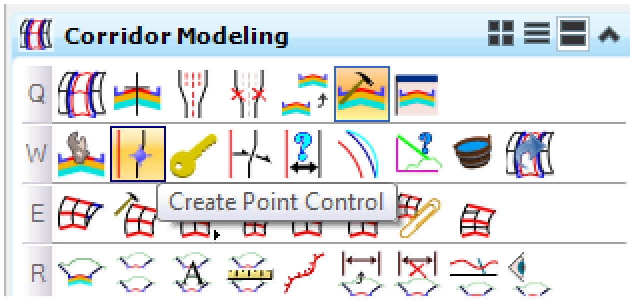


Exercise 6.5 Add Corridor Point Controls, SR61

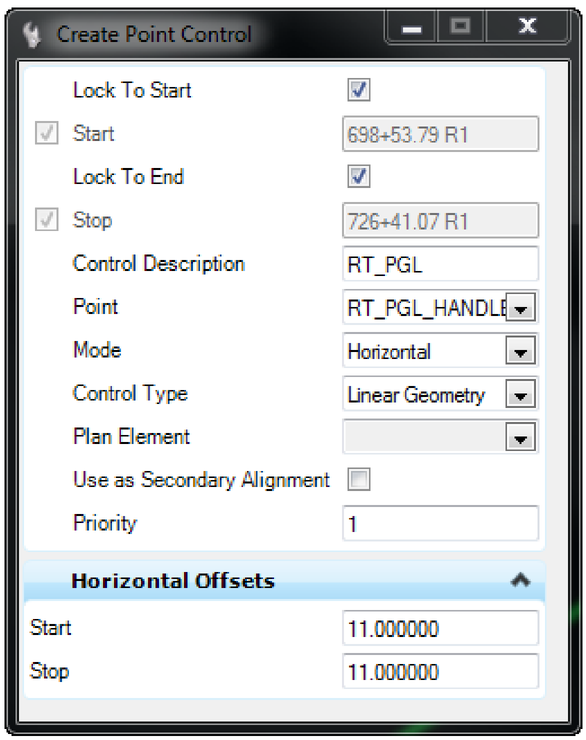
This exercise defines the LT and RT PGL to be a fixed distance from the centerline, 11 feet.

HINT On projects where the PGL lines vary from parallel to the centerline, use the linear option and select the feature lines that represent the varying PGL's.

1. Use the *Corridor Modeling*, **Create Point Control** tool.



2. Identify the **Corridor Boundary** *handle*. Continue to define the Create Point Control dialog information.

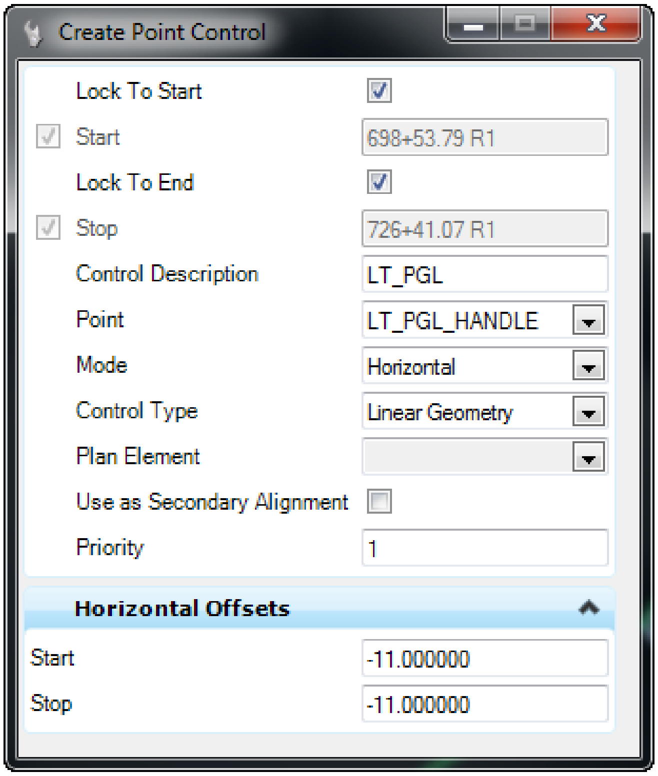


3. Enter and accept the following for the SR61 Corridor:

- *Start Station* **Alt for Begin**
- *End Station* **Alt for End**
- *Control Description* **RT_PGL**
- *Point* **RT_PGL_HANDLE**
- *Mode* **Horizontal**
- *Control Type* **Linear Geometry**
- *Start Value* **11.00**
- *End Value* **11.00**

Note At the prompt to select an element, choose the SR61 centerline

4. Repeat the previous steps to add the *Point Control* for the **LT_PGL**.



5. Enter and accept the following for the **SR61 Corridor**:

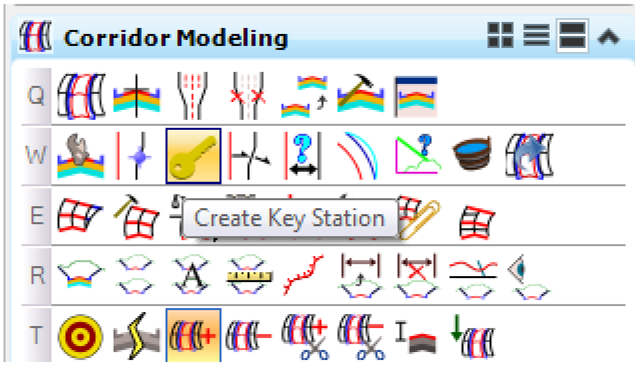
○ *Start Station*	**Alt for Begin**
○ *End Station*	**Alt for End**
○ *Control Description*	**LT_PGL**
○ *Point*	**LT_PGL_HANDLE**
○ *Mode*	**Horizontal**
○ *Control Type*	**Linear Geometry**
○ *Start Value*	**-11.00**
○ *End Value*	**-11.00**

Note At the prompt to select an element, choose the SR61 centerline

Exercise 6.6 Add Corridor Key Stations, SR61

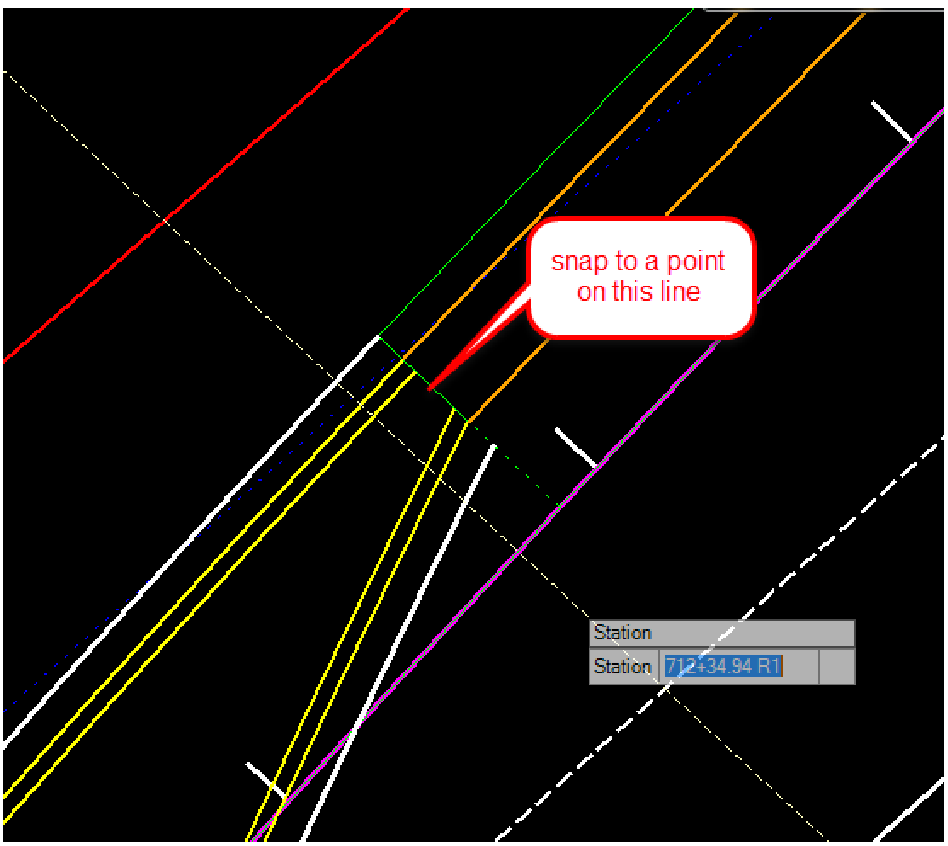
Create Key Station tool is useful to add stations that are not coincident with the template interval. When the median conditions change abruptly, it is desirable to include the station for processing.

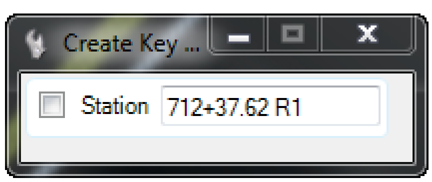
1. Use the *Corridor Modeling*, **Create Key Station** tool.



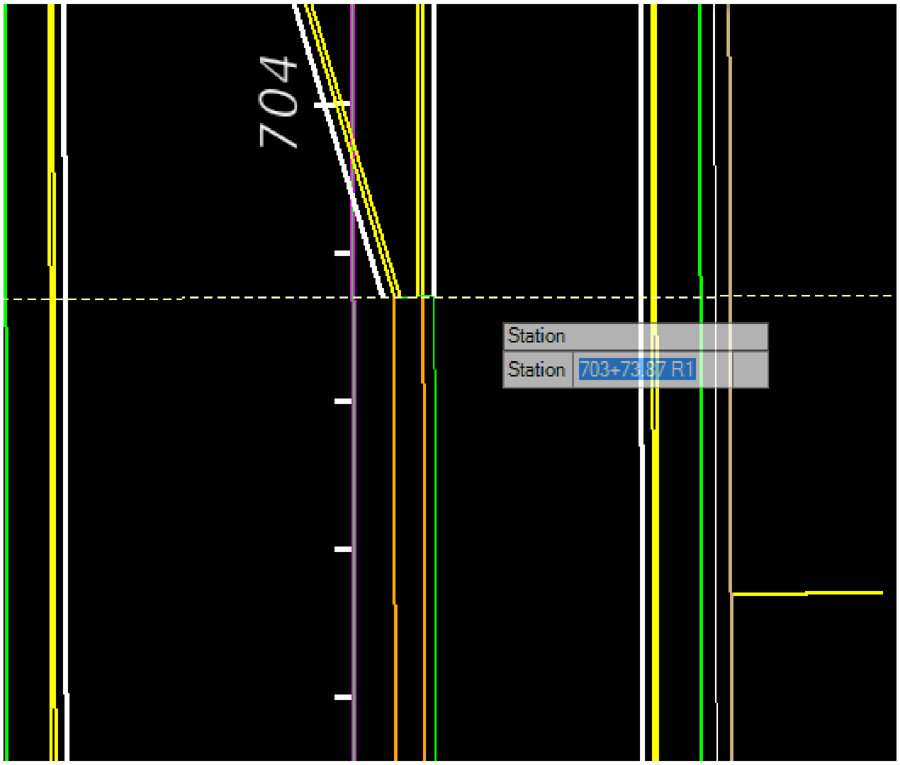
2. Identify the **Corridor Boundary** *handle*.

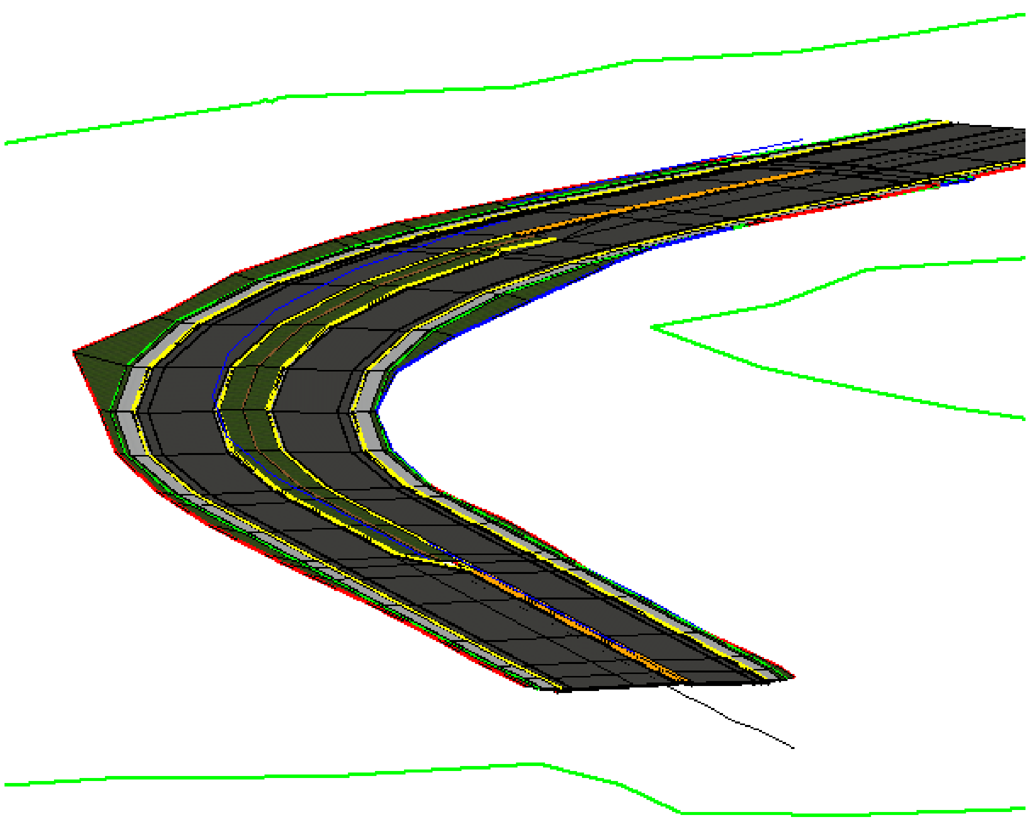
3. Use AccuSnap to locate the Plan View **CurbMedian / Traffic Separator** *division line.*





4. Repeat these steps for both **Traffic Separator** locations in the *Plan View*.





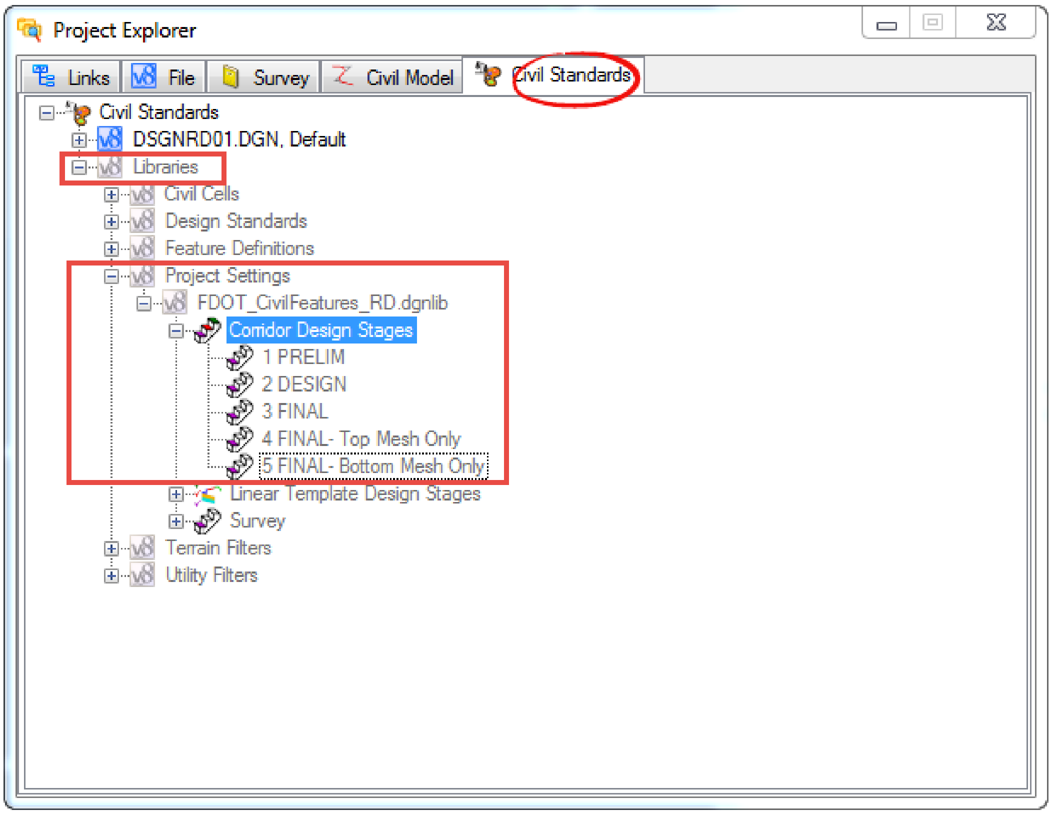
Exercise 6.7 Change Corridor Design Stage, SR61

The FDOTSS4 Workspace defines Corridor Stages to help with various tasks for Design and 3D Modeling. Depending on the Active Stage, processing the Corridor will take longer.

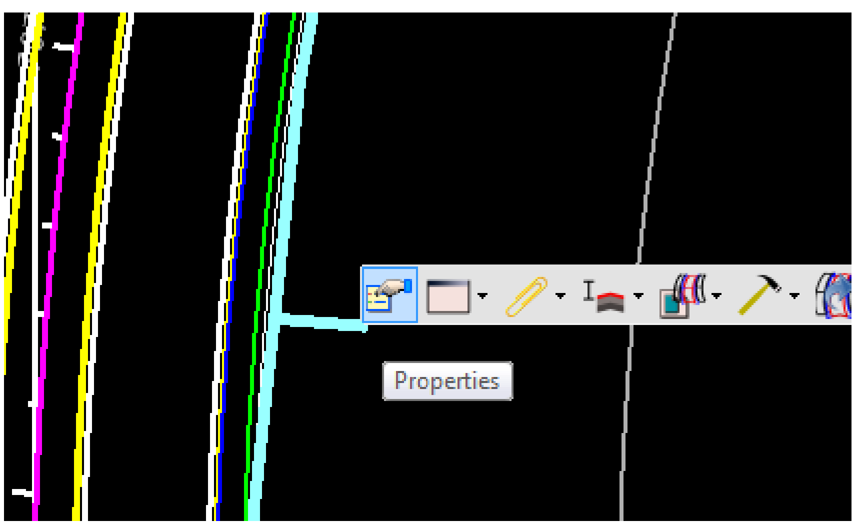
1. Open the Project Explorer dialog, select the **F11** *Function Key*.

2. Select the **Civil Standards** tab and expand the **Libraries** option list.

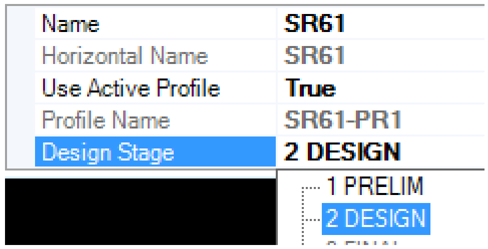
3. Locate the **Corridor Design Stages** under *Project Settings > FDOT_CivilFeatures_RD*.



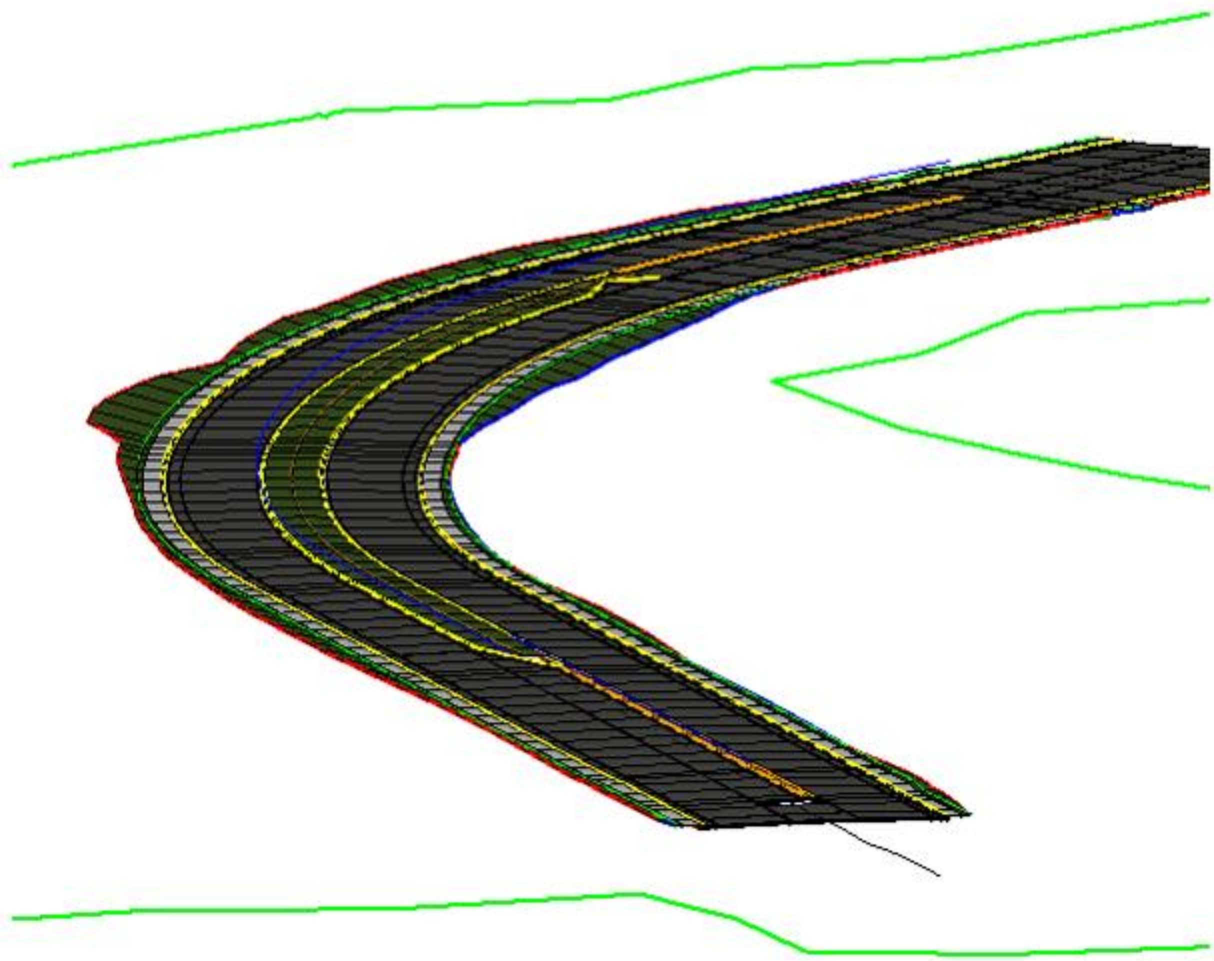
4. Select the **Boundary** of the Corridor and locate the **Properties** icon when the menu displays.



5. Select the **Properties** icon and change the *Design Stage* from **1 PRELIM** to **2 DESIGN.**



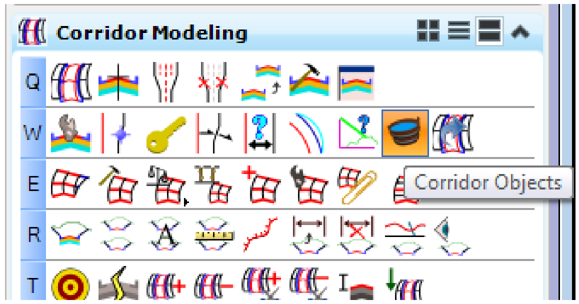
6. The Corridor will re-process and the 3D Model will re-draw with a tighter interval.



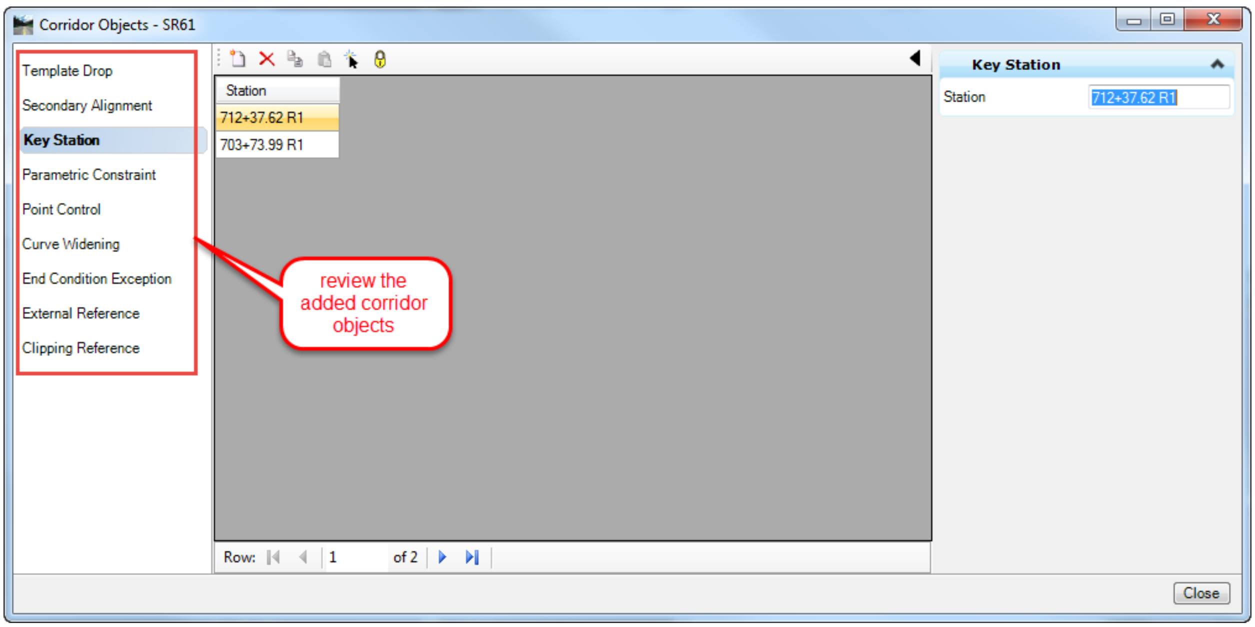
Exercise 6.8 Review Corridor Objects, SR61

The Corridor Objects dialog is a summary of all Corridor Modeling objects and provides an excellent method of managing data.

1. Use the *Corridor Modeling*, **Corridor Objects** tool.



2. Identify the **Corridor Boundary** *handle* to open the Corridor Objects dialog.



➢ ***Additional Template Edits, SR61***

1. Change the *sidewalk buffer* from **3 feet** to **0 feet** on both roadways.

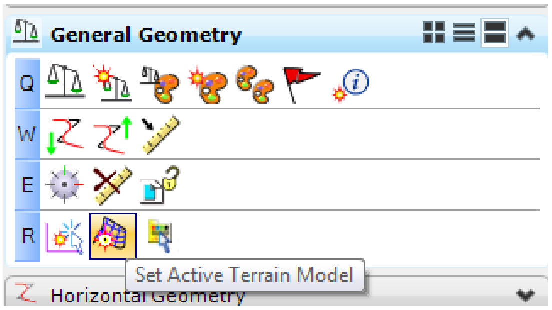
2. Either change the *sidewalk width* to **6 feet** or add the *sidewalk back lines* to the Corridor as **References** for the *template* **HFC**.

3. Add **End Conditions 2:1 Cut & Fill** *components* to each side with *Mirror* and *Affixes* checked **ON**.

Exercise 6.9 Create RRR Corridor Model, BL98

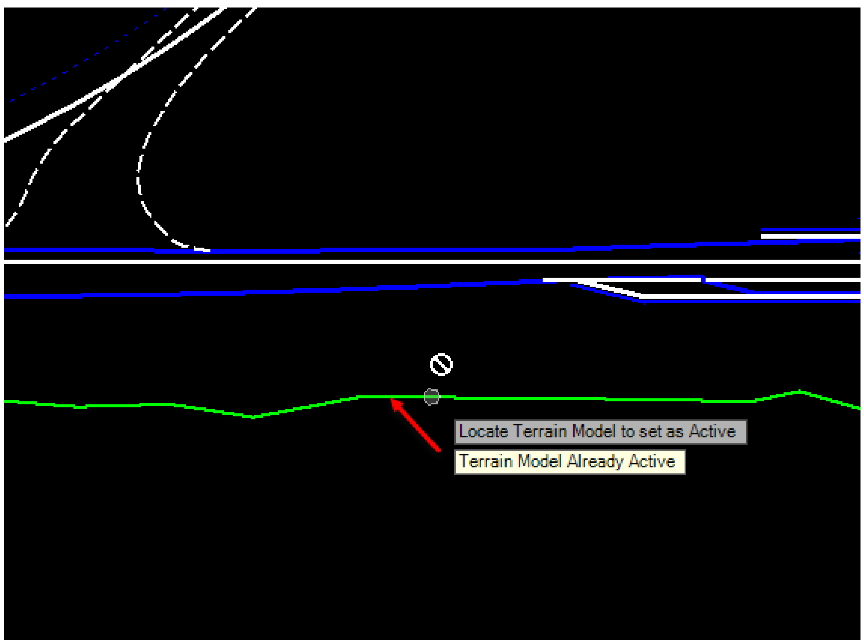
1. Continue in the DSGNRD01.dgn or MODLRD01.dgn file.

2. *Optional*: Use the *General Geometry*, **Set Active Terrain Model** tool.

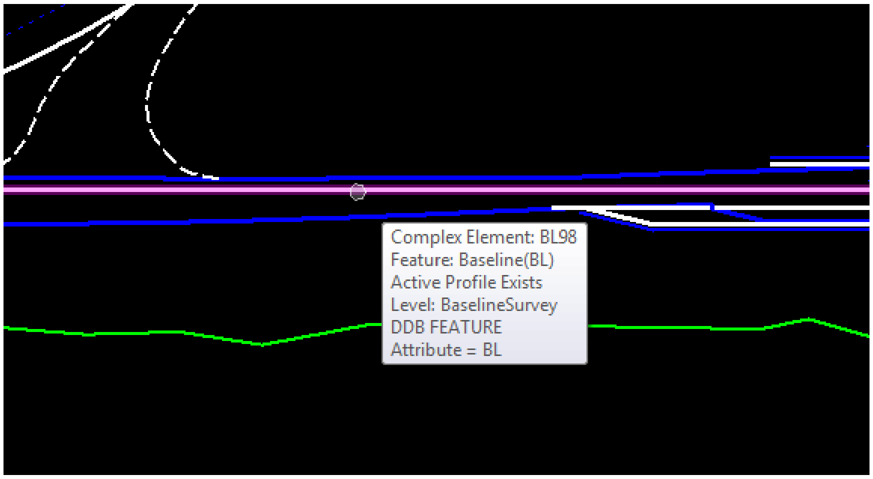


Note This tool can also be found on the Terrain Model Workflow Task.

3. At the cursor prompt, click on the **Terrain boundary line** from the attached *GDTMRD02* Reference file. If the Terrain Model is *Active*, a message will display, **Terrain Model Already Active.**

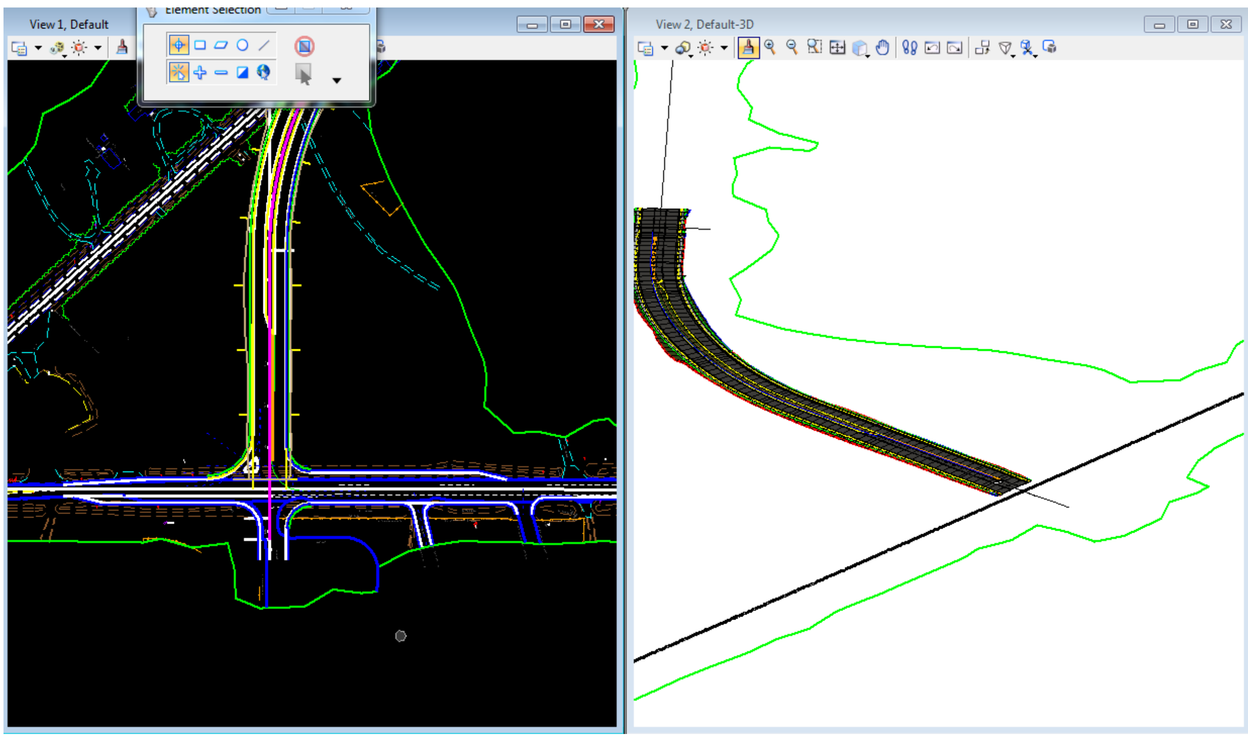


4. Move the cursor over the **BL98 centerline** *Feature* and verify an **Active Profile**.

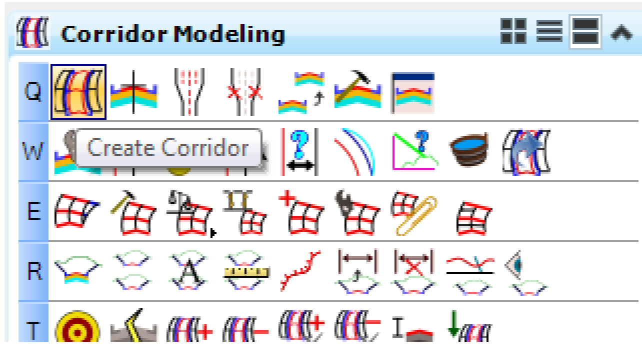


5. To set up the *Views* for viewing the **2D Plan** and **3D Model** simultaneously in the FDOTSS4 Workspace, select the **F2** *Function Key* on the keyboard. This will open an **Isometric View** of the project.

HINT Use the Shift Key and Middle Button to rotate the 3D view.



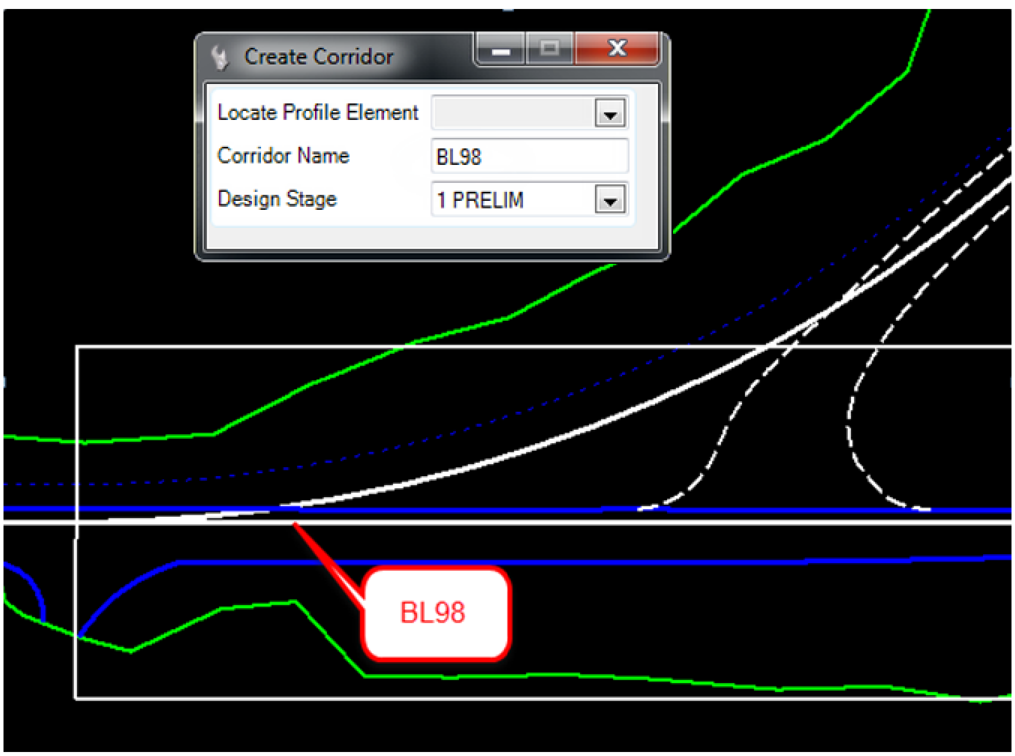
6. Use the Corridor Modeling, **Create Corridor** tool.



7. Enter the ***Corridor*** *Name*, **RRR98**, in the Create Corridor dialog and then select the **BL98 centerline** in the *Plan View*.

8. Reset to accept the **Active Profile**. This profile resides with the *BL98 Civil Feature Centerline*.

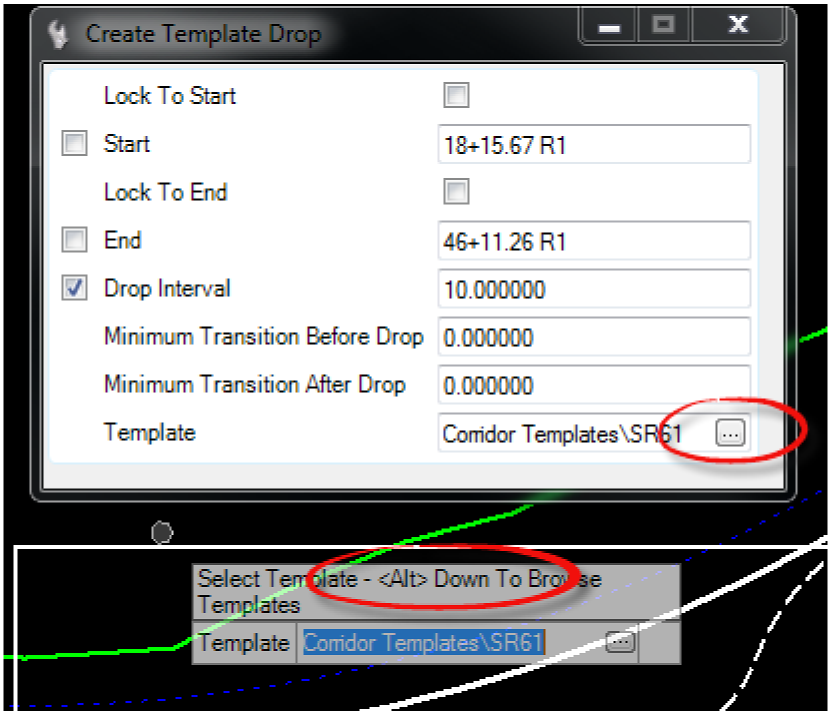
9. Data point to accept the *Name of the Corridor*, **BL98**. The corridor is created AND the integrated Create Template Drop dialog launches.



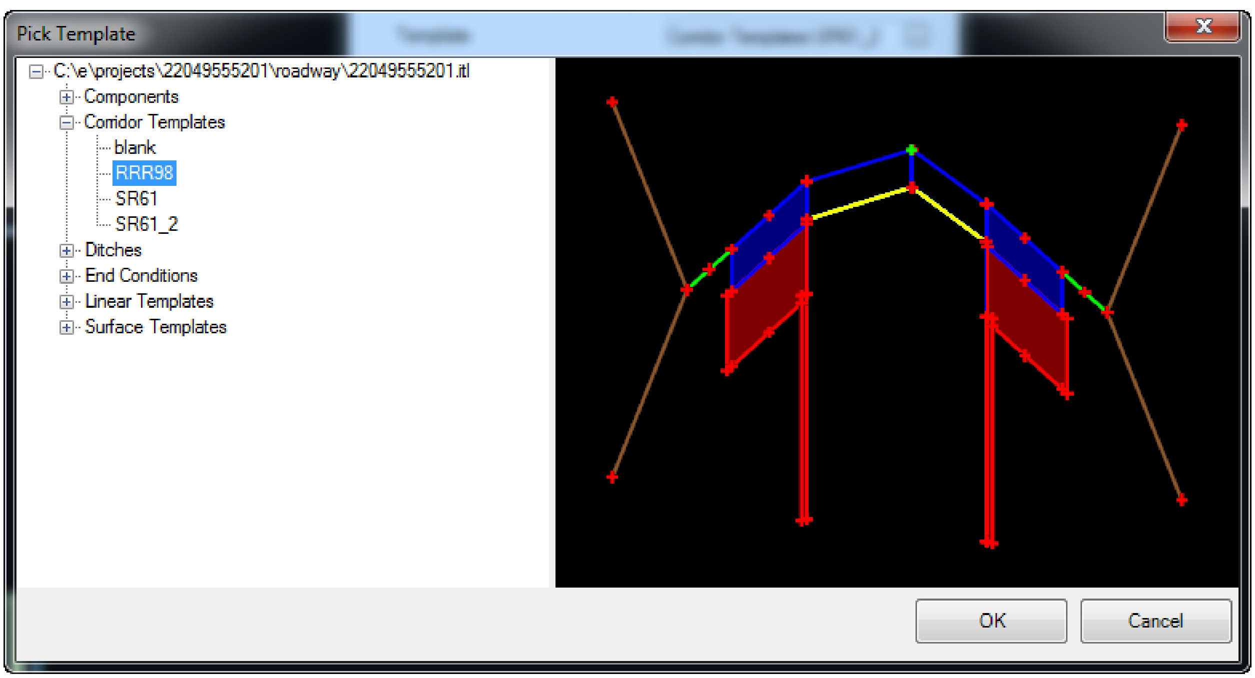
Note Once a Corridor is created, a shape boundary is placed in the Plan View representing its outline. This shape is initially placed on the CorrHndlStg1_dp level. It has several properties which can be seen by clicking on the shape and choosing first icon. One of the properties is the Design Stage.

Exercise 6.10 Create Template Drop, RRR98

1. Once the Create Template Drop dialog displays, first select the **corridor template** to be placed on the corridor. Either use the **icon** on the dialog <OR> Select **ALT down arrow** to pick a template.

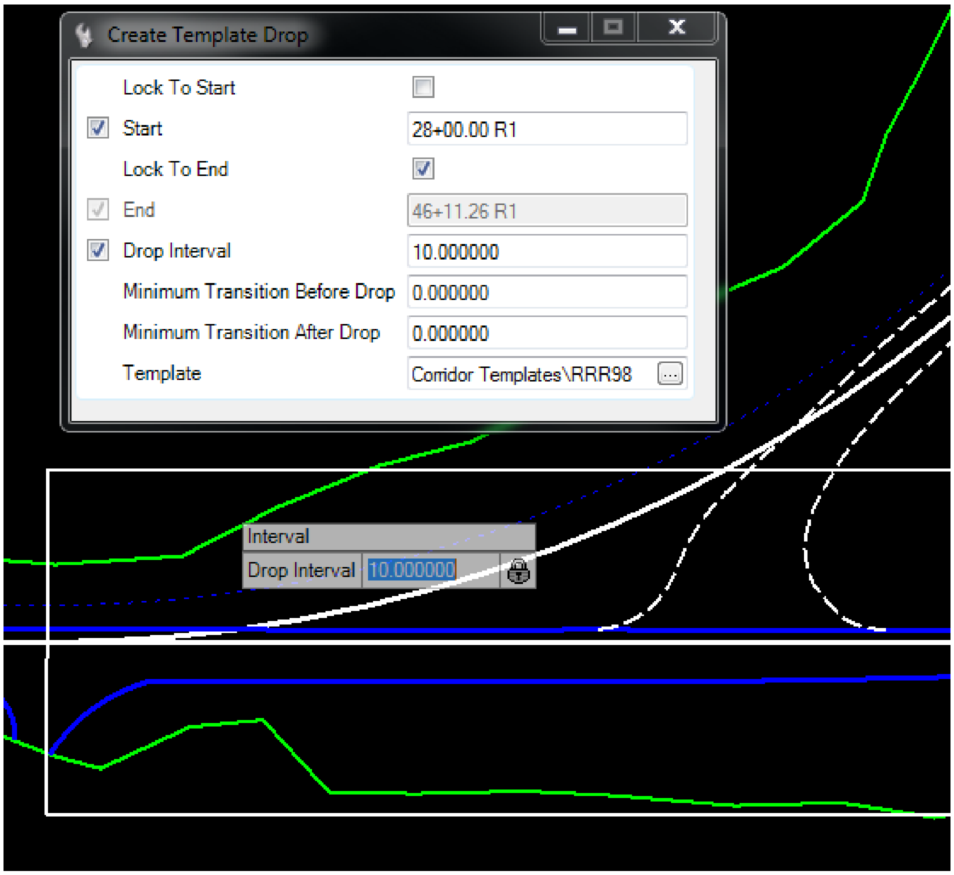


2. Select the **RRR98** template in the *Corridor Templates* folder. Click **OK**.

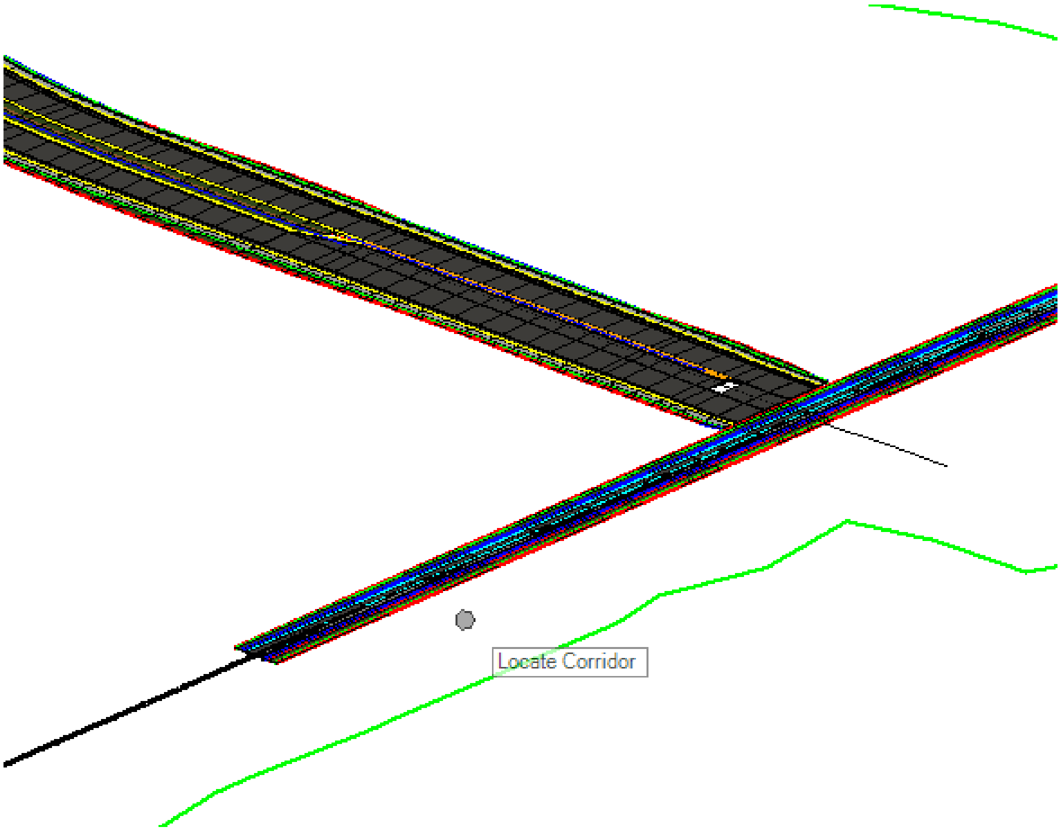


3. Data point to accept the **Template** and move to the next setting. Continue to define the Create Template Drop dialog information entering and accepting the following for the **SR61** *Corridor*:

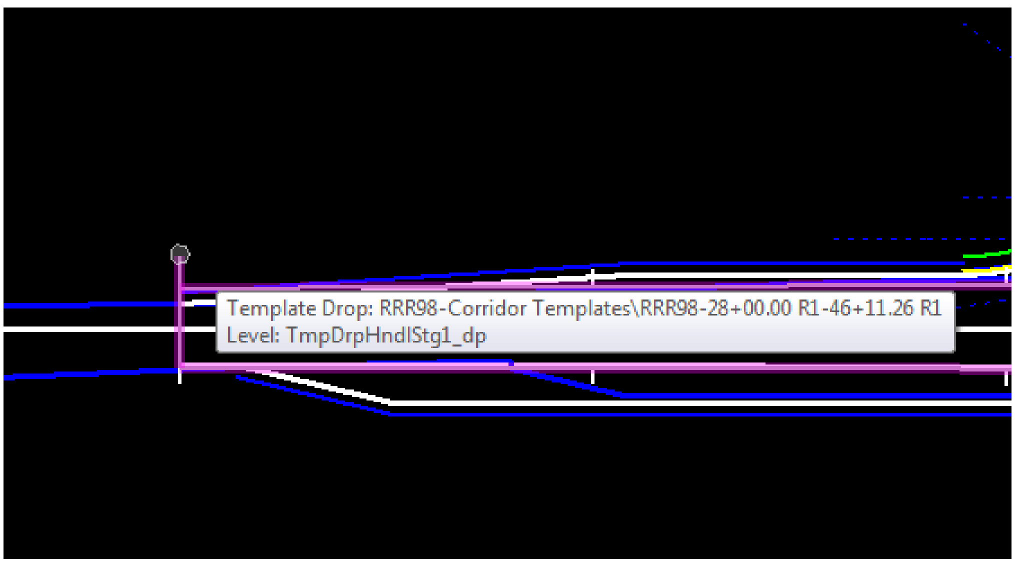
   - Start Station **28+00**
   - End Station **Alt for the end station**
   - Drop Interval **10.0**
   - Min. Tran. Before **0.0**
   - Min. Tran. After **0.0**



4. Upon completion of the Corridor processing bar in the lower right hand side of the MicroStation status bar, the *3D Model* will be displayed in **View 2**.



Note Once a Template Drop is created a shape boundary is placed in the Plan View represent its outline. This shape is initially placed on the TmpDrpHndlStg1_dp level. It has several properties which can be seen by clicking on the shape and choosing first icon. One of the properties is the Design Stage.



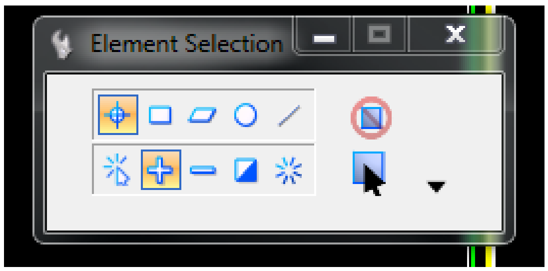
Exercise 6.11 Add Corridor References, RRR98

Corridor References are related to the template points having a Horizontal Feature Constraint to control the location of the point on the corridor. They are 2D graphical Civil Features that need to be added to a Corridor. For the RRR98 Corridor add the following Civil Feature References:

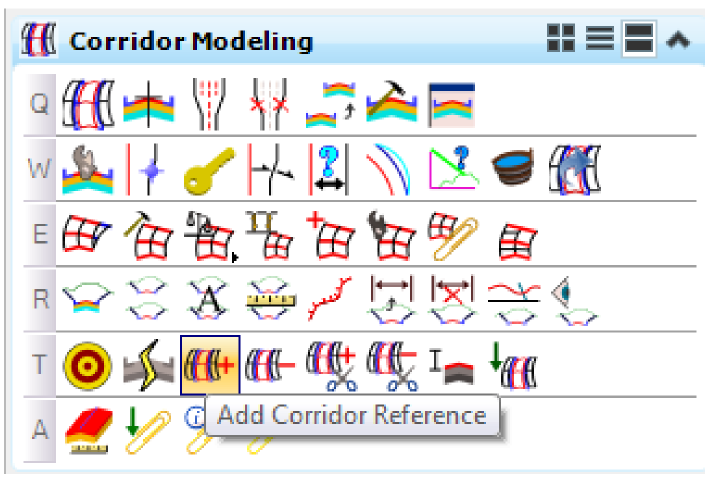
- PavementMilling(ML)
- Widening PavementAsphalt(EOPA)

1. Select the lines as listed above to add to the Corridor.

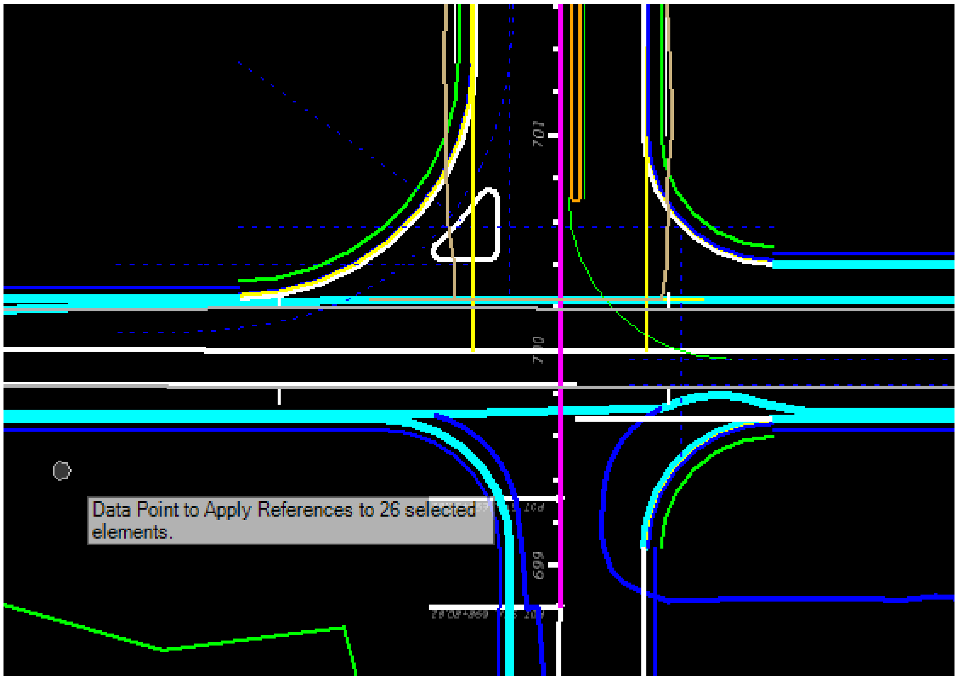
HINT Use the Selector Tools with in MicroStation to assist.



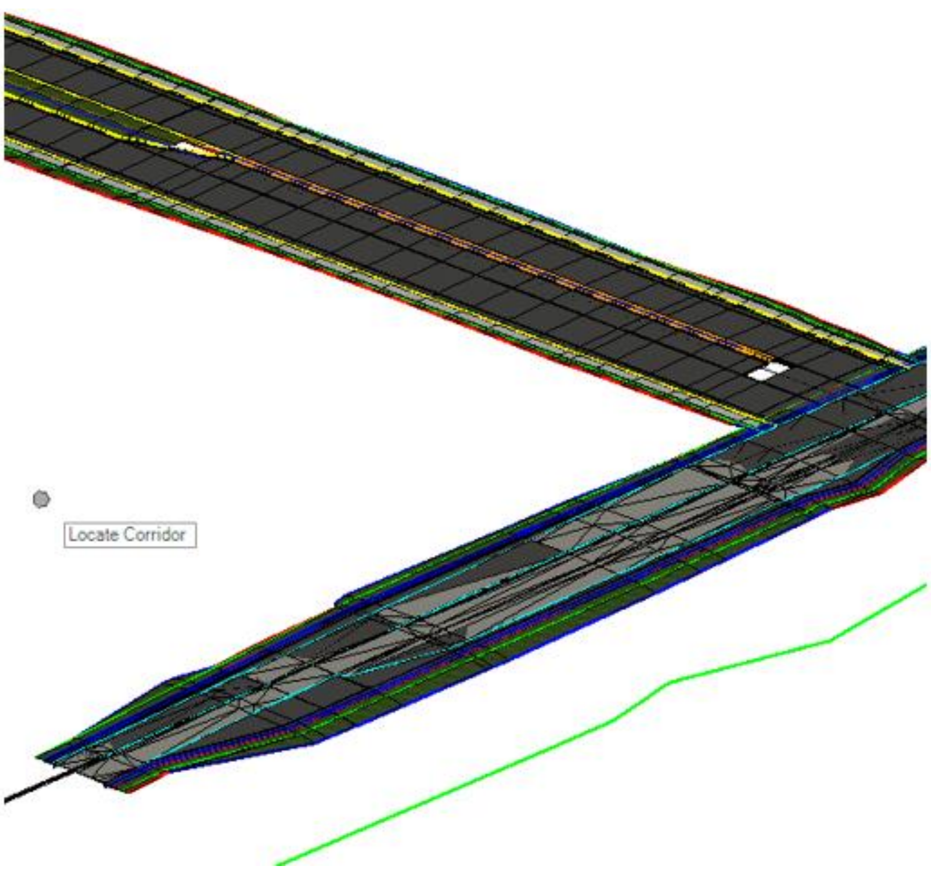
2. Use the *Corridor Modeling*, **Add Corridor Reference** tool.



3. At the prompt, select the **corridor handle** or **boundary**, data point to accept the selected elements as *corridor references*.



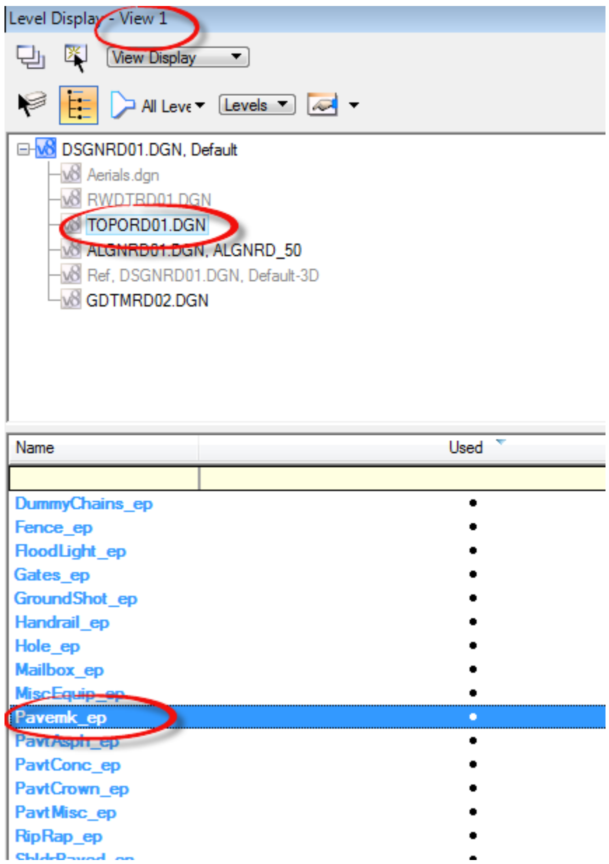
4. Once the *Reference lines* have been added, the Corridor will automatically process to include the new *Horizontal Feature Constraints*.



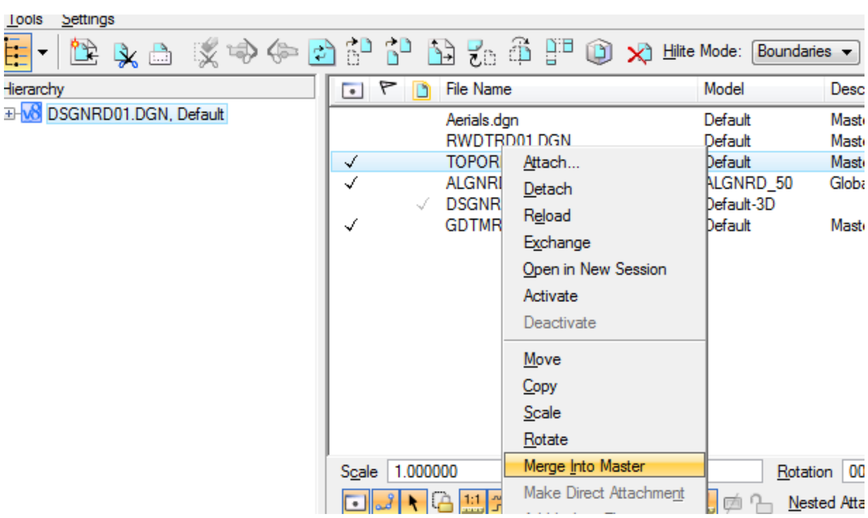
Exercise 6.12 Template Point Control, RRR98

The template used has milling slope break points built within meant to follow normal slope breaks in the existing pavement. These lines add Point Controls for the Corridor.

1. With **View 1** active, turn **Off** all *Levels* in the *TOPORD* file and turn **On** the **Pavemk_ep** *Level*.

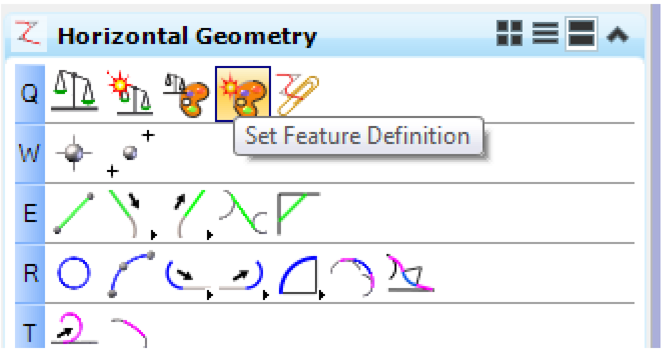


2. Use *References*, **Merge Into Master** tool to copy the **Pavemk_ep** lines into the *DSGNRD or MODLRD* file.



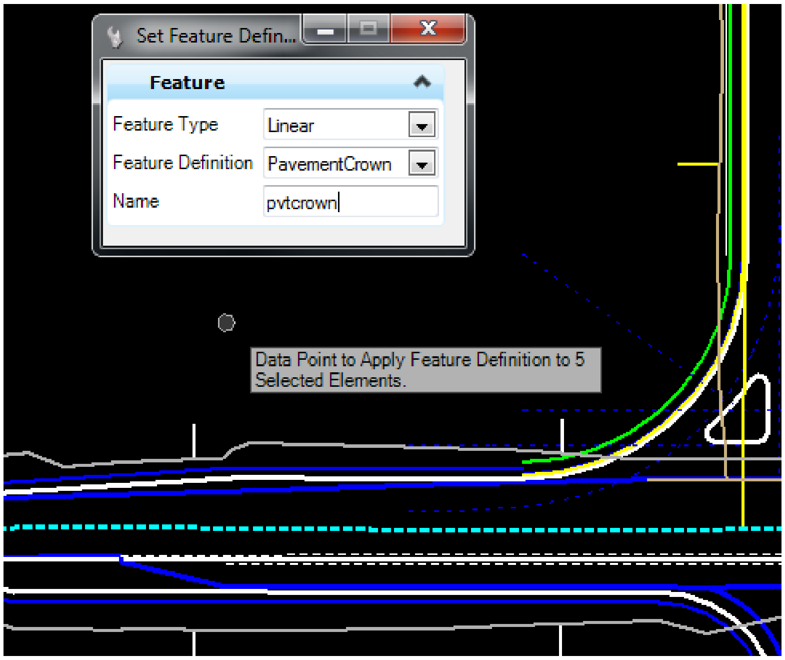
3. Create a *Selection Set* of the middle **Pavemk_ep** lines.

4. Use *Horizontal Geometry*, **Set Feature Definition** tool.

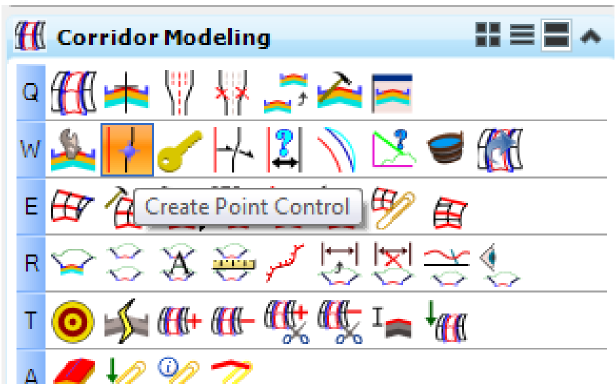


5. Select the **PavementCrown** *Feature Definition* and **pvtcrown** *Name.*

6. Data point to accept the **Feature Definition** to selected elements**.**

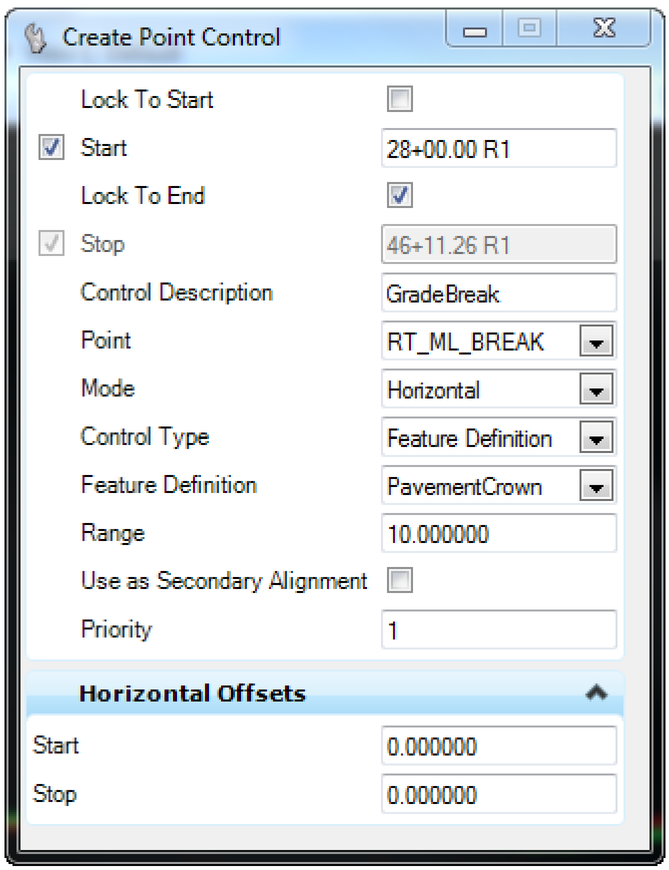


7. Use the *Corridor Modeling*, **Create Point Control** tool.



8. Identify the **Corridor Boundary** handle. Continue to define the Create Point Control dialog information entering and accepting the following for the **RRR98** *Corridor*:

Start Station	**28+00**
End Station	**Alt for End**
Control Description	**GradeBreak**
Point	**RT_ML_Break**
Mode	**Horizontal**
Control Type	**Feature Definition**
Feature Definition	**Pavement Crown**
Range	**10**
Priority	**1**
Horizontal Offset Start	**0.0**
Horizontal Offset Stop	**0.0**

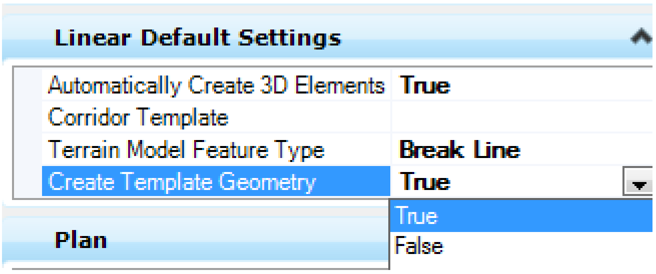


- ***To validate the model verses the plan, Complete the Following***

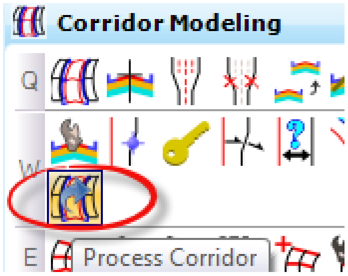
1. Open Project Explorer, Civil Standards, DSGNRD01.DGN or MODLRD01.DGN, Feature Definitions, Corridor Lines(3D)

2. Select the PavementAsphalt_pm and then right click to select the properties

3. In the Properties dialog, change the Linear Default Setting, Create Template Geometry setting to True

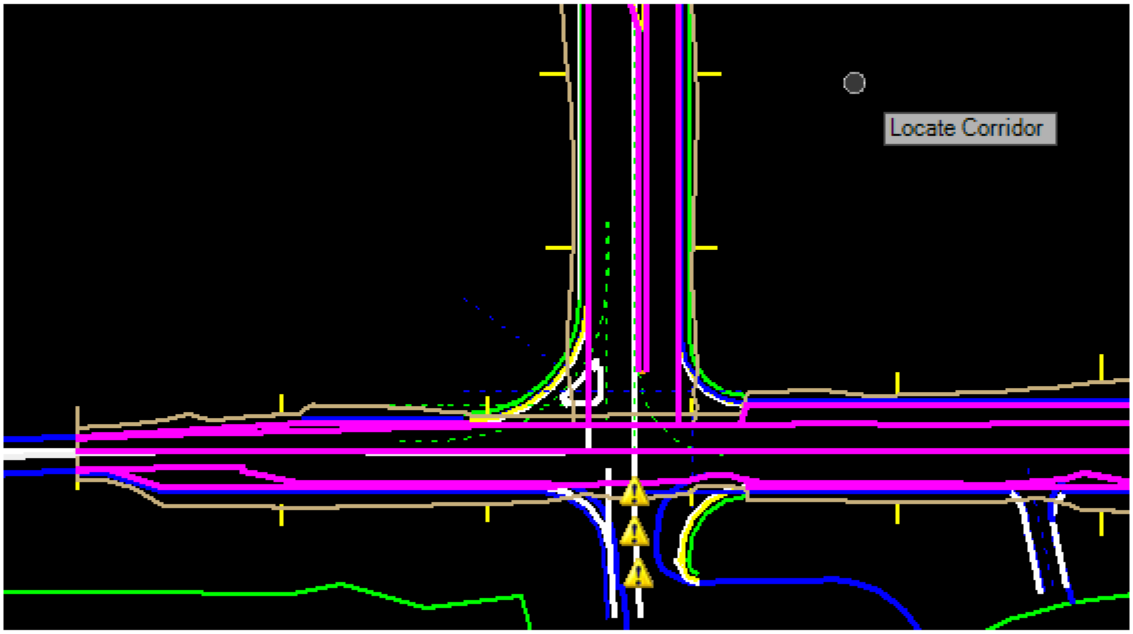


4. Re-process the Corridors



5. Verify that the construction lines in magenta, line up with the plan lines.

6. Repeat the steps for the Milling_pm lines



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7 OPEN CROSS SECTION VIEW

INTRODUCTION

This section will cover the Cross Section View tool. This is a single Cross Section View tool and is not for producing final plan cross sections to print or other production needs. Refer to the ***FDOT Plan Development Workflows*** training manual.

The Cross Section View tool creates a single section plane through any displayed elements in the "default- 3D model" of the DGN file, thus having the ability to see a true slice or cross section through the model. The graphics can be created from a Roadway Corridor, Drainage Network, Bridge Structure, or any other 3D solid element in the design file or reference file.

The cross section view created is dynamic and will change as the model elements in the design file or reference file changes.

This Cross Section View tool will also display a location line in the plan view, profile view and 3D model view. This line is also tied to an element or alignment for specific location identification and navigation. The Cross Section View tool is essential to evaluate the design and to make design decisions.

EXERCISE OVERVIEW

7.1 Opening a Cross Section View

7.2 SR61 Corridor Cross Section View

7.3 BL98 Alignment Cross Section View

7.4 SR61/BL98 Turn Lane Cross Section View

7.5 Create a 3D Drive-Through Animation

Exercise 7.1 Opening a Cross Section View

This exercise teaches the user to open a View and set it to a Cross Section Model View.

➢ ***Corridor Modeling Tool Used***

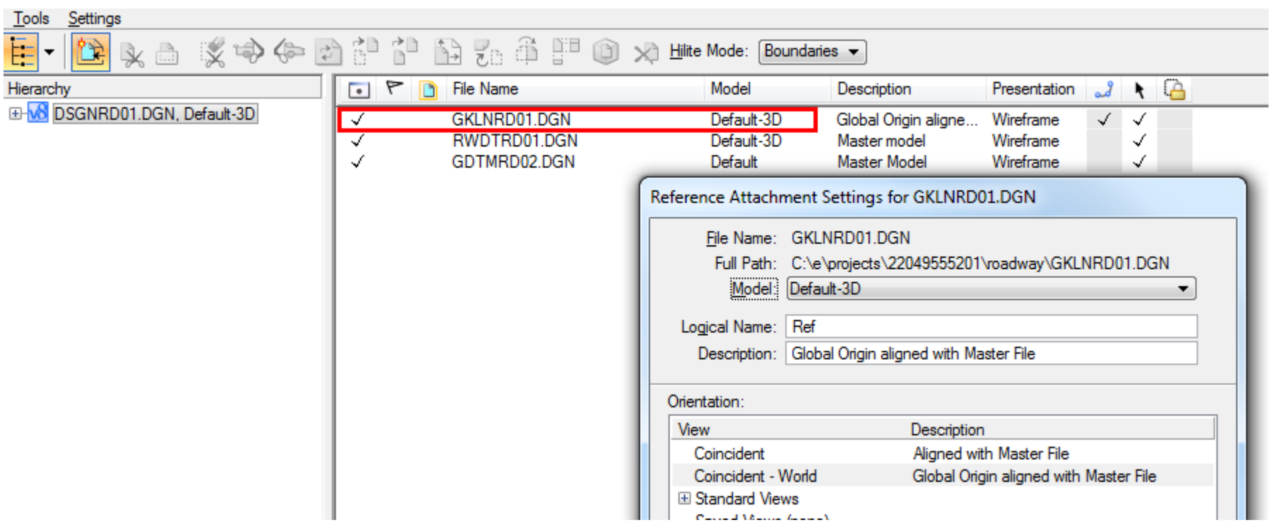
1. (Optional) Extract the *22049555201(7).zip* file in the c:\e\projects folder.

2. Open the *DSGNRD01.dgn OR MODLRD01.dgn* file of the c:\e\projects\22049555201\roadway\ folder in the FDOTSS4 Workspace in MicroStation.

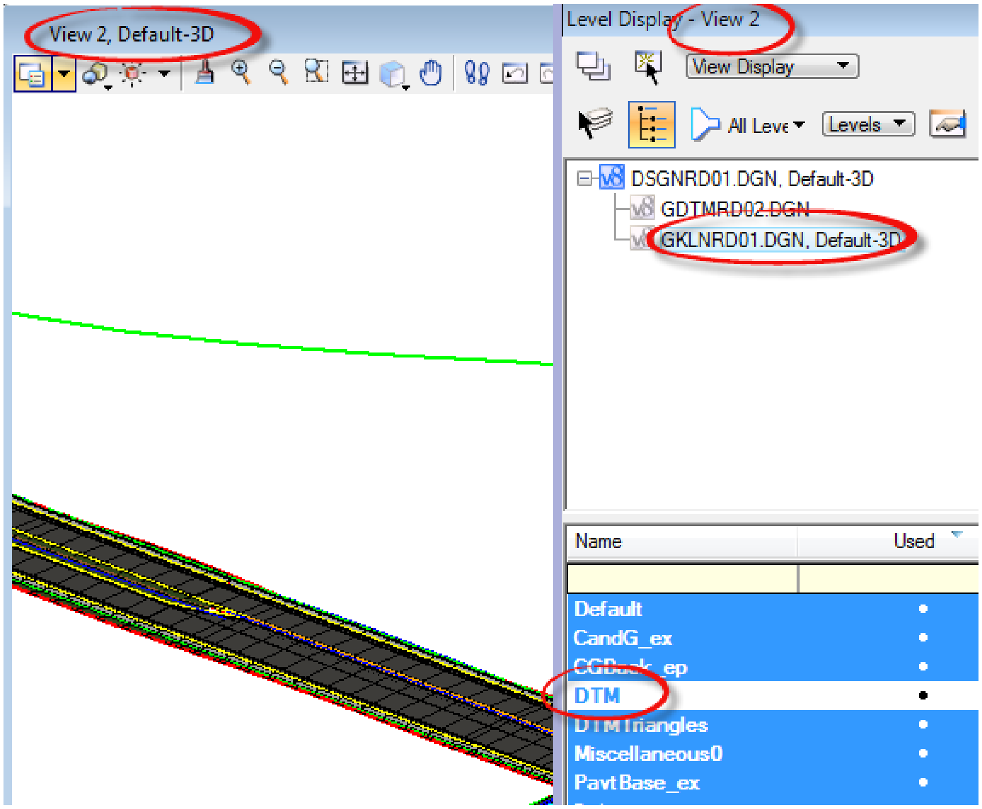
HINT Check on the Reference file display for the TOPORD, and GDTMRD files

3. Select the *Function Key* **F2** to open **View 2** the 3D Model. Click on the **View 2** window to make it active.

4. Use **Reference Display** to attach the *GKLNRD Default-3D* file. This is the file with the *Existing Feature model* elements.



5. Click in **View 2** to make it *Active.* Use *Level Display* to toggle **Off** the **DTM** *Level* in the *GKLNRD Reference* file.

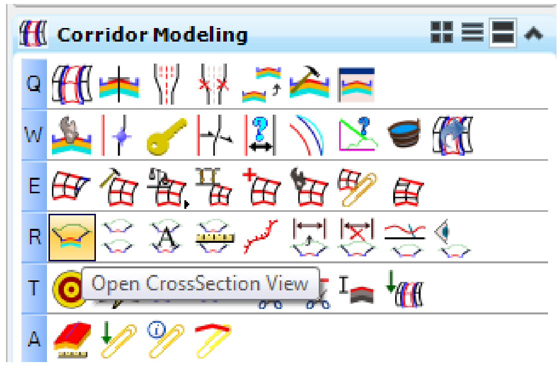


6. Select the *Function Key* **F4** to open **Views 1-4**.

7. Use the MicroStation **Select** tool to select the **SR61 centerline.** Click the **Open Profile Model** icon on the Context Menu and select **View 3** to place the **Profile View** of *SR61*.

Exercise 7.2 *SR61 Corridor Cross Section View*

1. Use *Corridor Modeling*, **Open CrossSection View** tool.



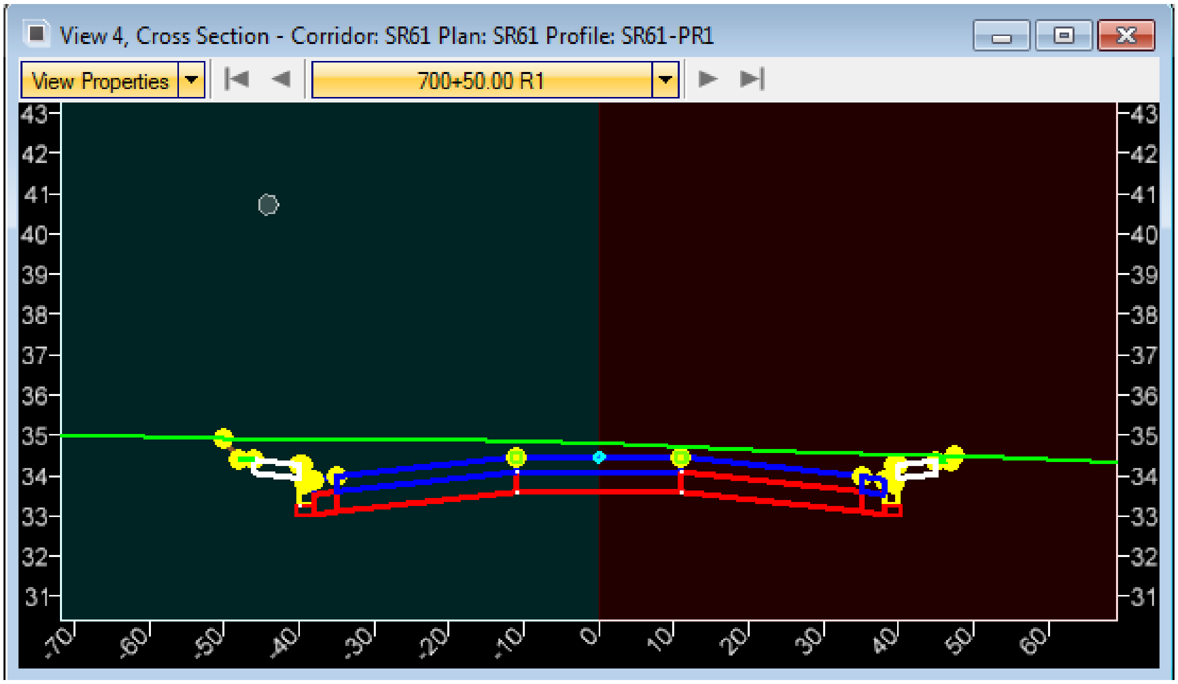
2. Select the *Corridor*: **SR61** by the handle or near the boundary and click in **View 4** to display the *Corridor Cross Section*.

Note When used on a Corridor, the Cross Section View tool will determine the following from the corridor properties:

- Left Offset
- Right Offset
- Interval
- Start Station

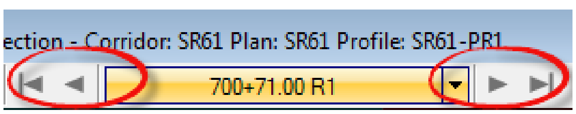
3. For the **SR61** Cross Section View 4:

Note There is a known issue with SS4 Dynamic Cross Sections; the program will crash if you zoom and scroll at the same time when the cursor is over a yellow point. To turn off the yellow points, go to the Project Explorer Civil Standard Tab and turn off the 3D Lines features.

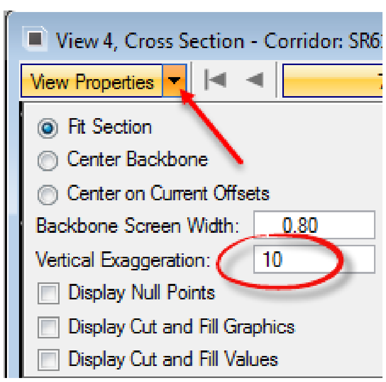


a. Notice many of the MicroStation **Zoom, Pan, etc**. *commands* will operate as normal.

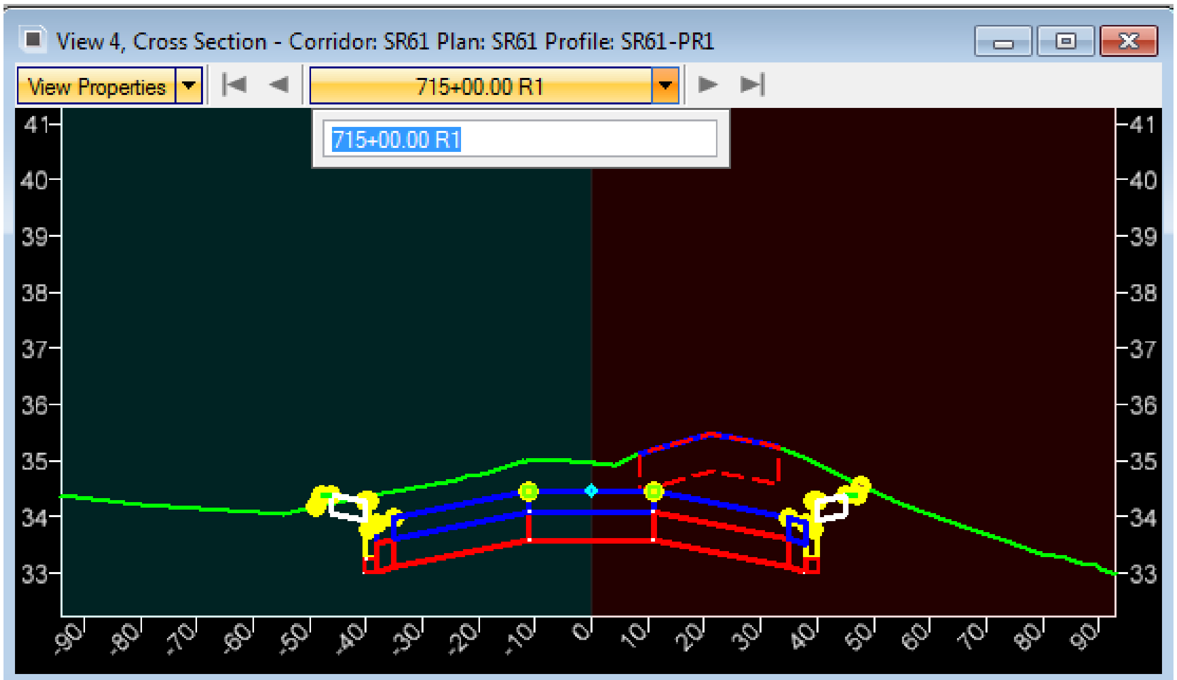
b. Use the *Cross Section* **View Navigation** tools to examine the Corridor Model.



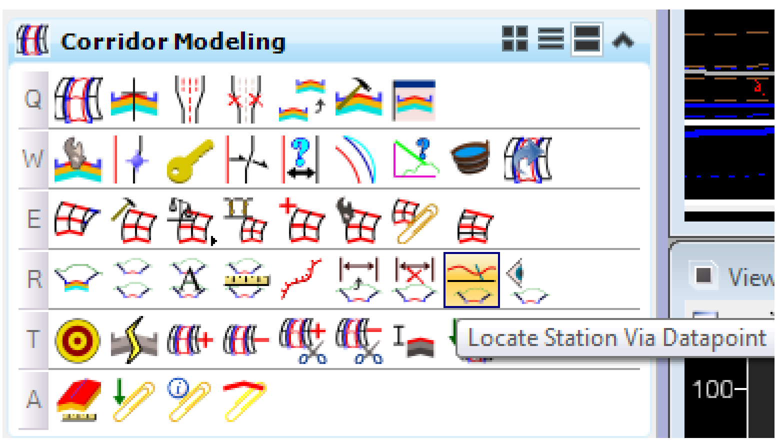
c. Select **View Properties** and change the *Vertical Exaggeration* to **10** and then click the **View** to see the changes.



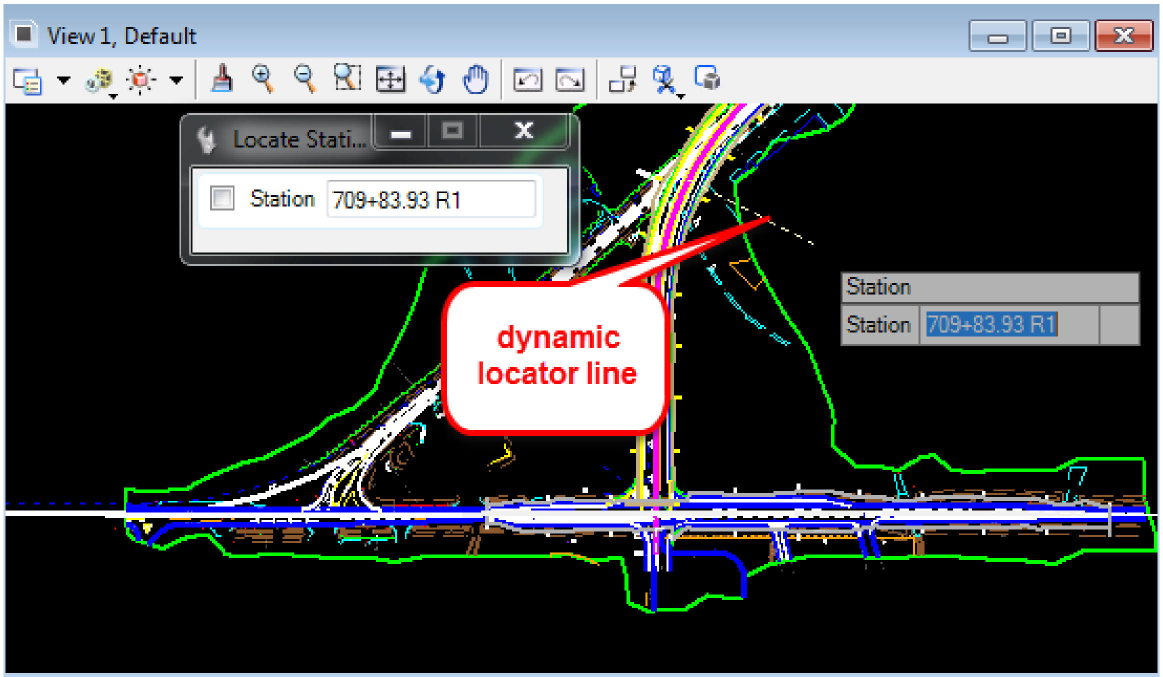
d. Select the **Station** pull down menu and change to *Station* **715+00**.



4. Use *Corridor Modeling*, **Locate Station Via Datapoint** tool;



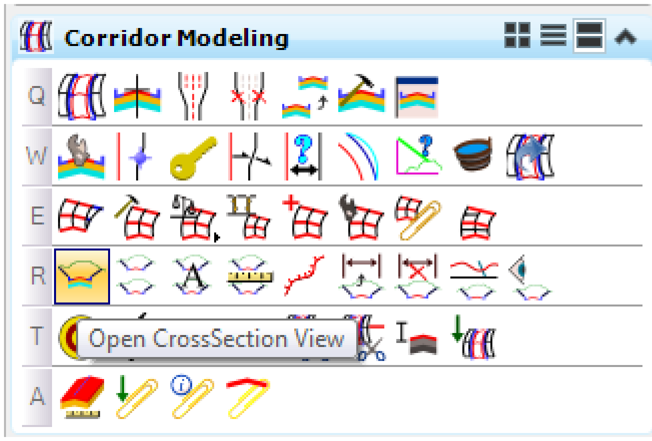
5. Select the **Corridor boundary** to see a dynamic locater line perpendicular to the Centerline. Data point at any station along the alignment and click in **View 4** to see its *Cross Section*.



HINT Another way to access the tool is to hold down a Right Click in the Cross View to select the Locate Station via Data Point

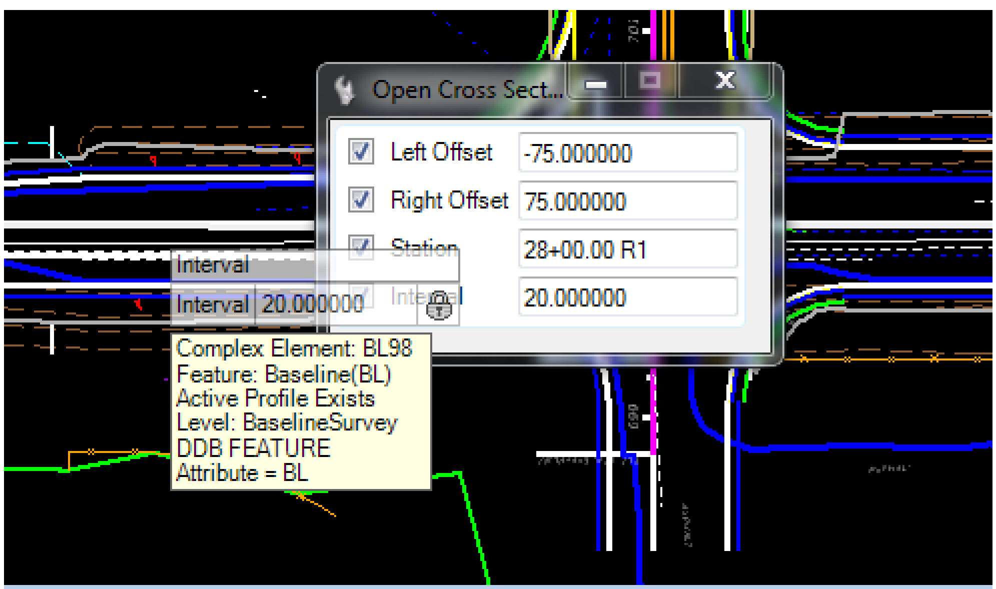
Exercise 7.3 BL98 Alignment Cross Section View

1. Use *Corridor Modeling*, **Open Cross Section View** tool.

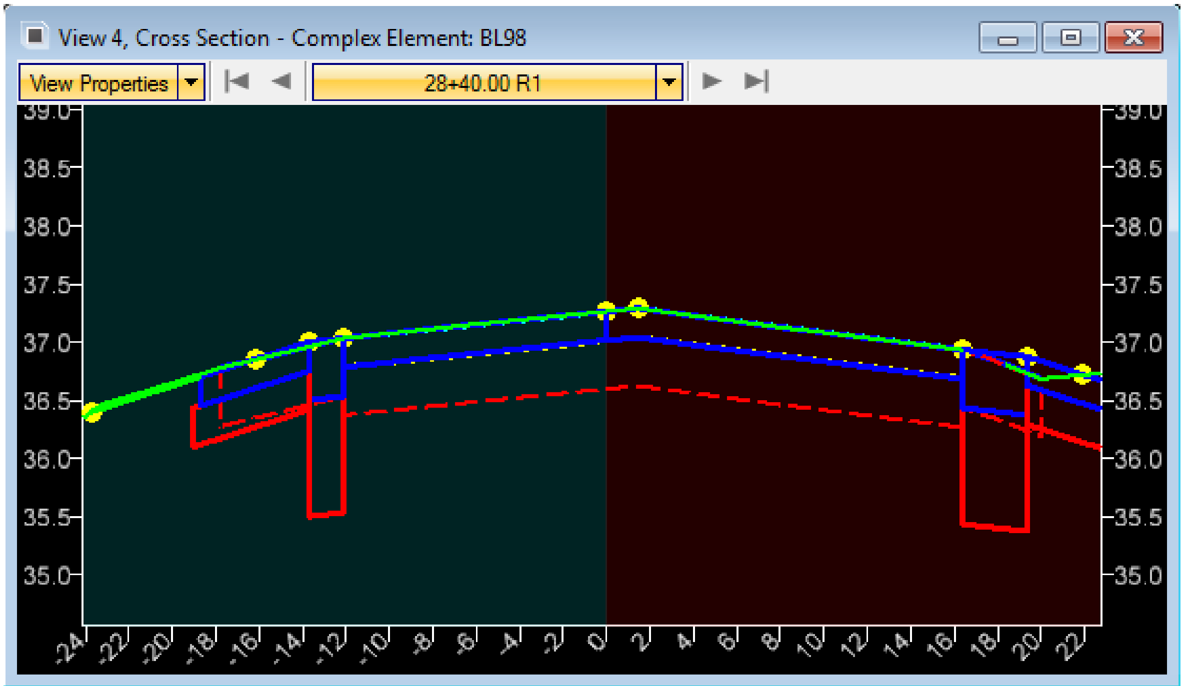


2. Select the *Alignment* **BL98** and enter the following:

Left Offset	**-75**
Right Offset	**75**
Start Station	**28+00**
Interval	**20**



3. Left click in **View 4** to display the *Corridor Cross Section*.



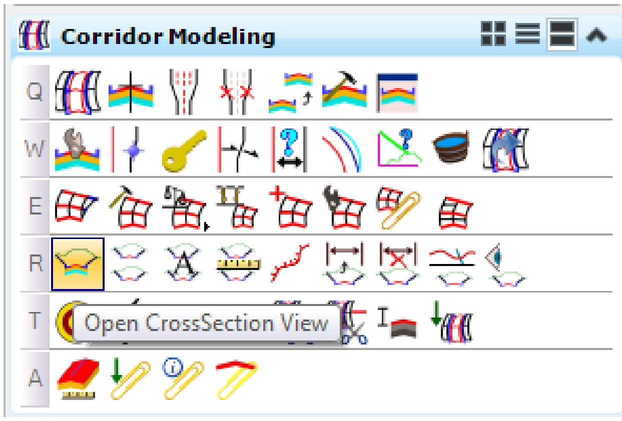
HINT Hold down a right click to Turn Off the Baseline cell level.

4. Evaluate the *RRR98 Model* using the **Cross Section** tool.

Note The Cross Section View tool works with Corridors, Civil Geometry, MicroStation Line or Line String Elements.

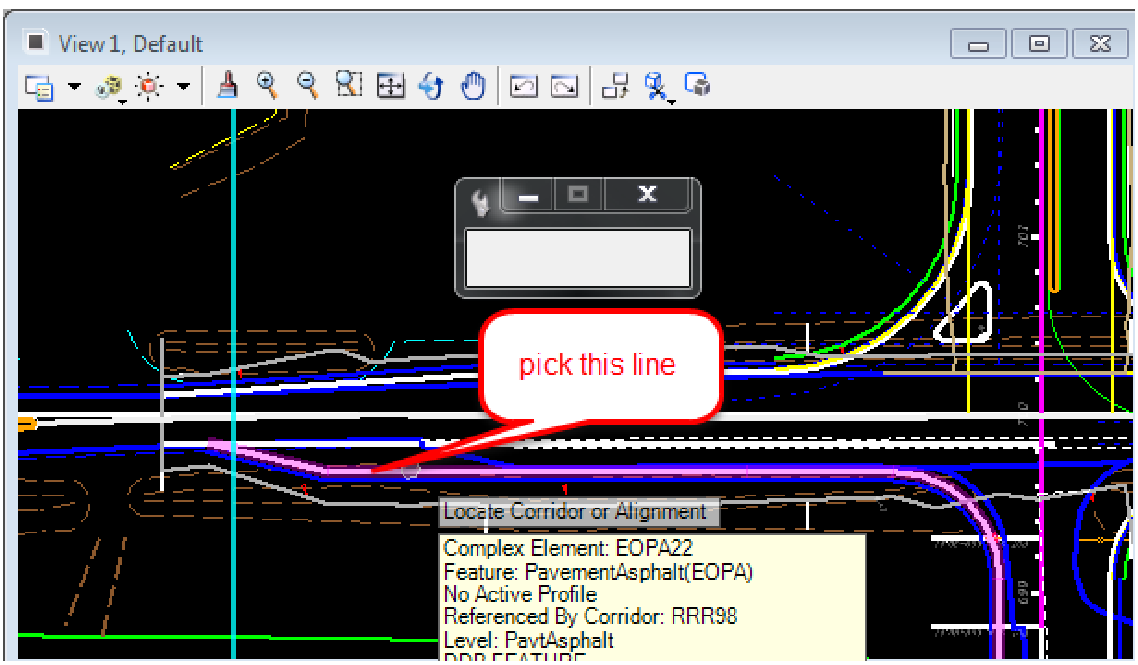
Exercise 7.4 SR61/BL98 Turn Lane Cross Section View

1. Use *Corridor Modeling*, **Open CrossSection View** tool.

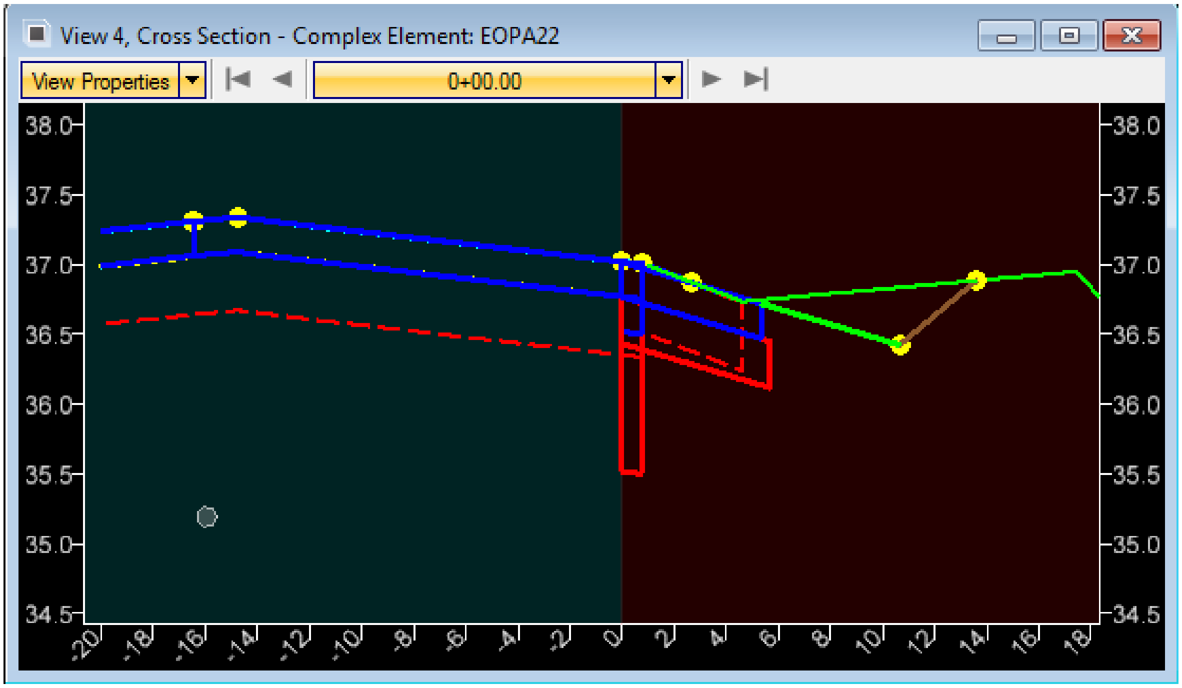


2. Select the **PavementAsphalt(EOPA)** line on the *SW turning lane* at the SR61 Intersection with BL98 and enter the following:

   - *Left Offset* **20**
   - *Right Offset* **20**
   - *Start Station* **0+00**
   - *Interval* **10**



3. Left click in **View 4** to display the *Corridor Cross Section*.

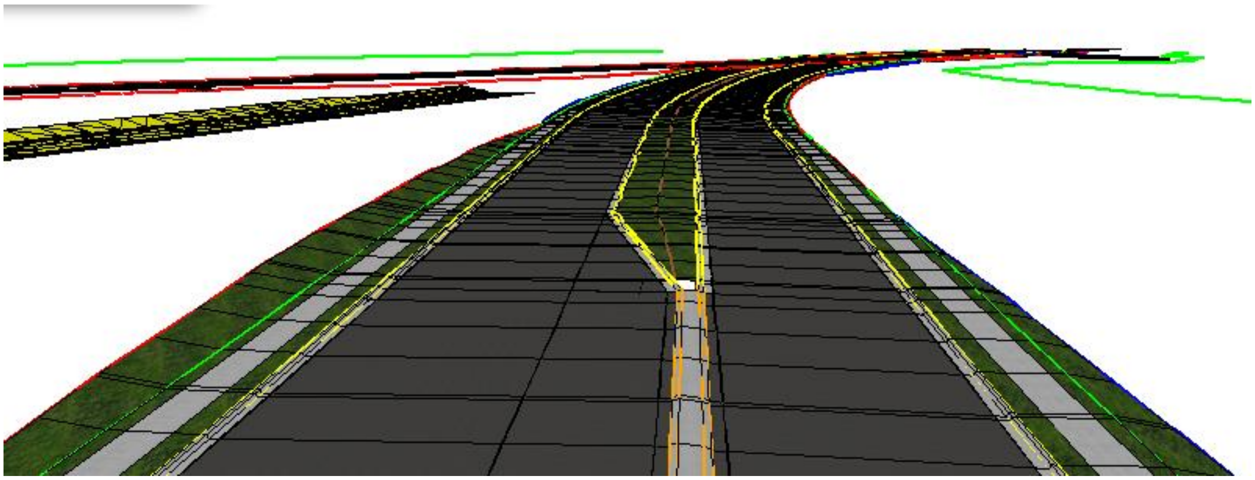


4. Evaluate the **Model** along the *Curve Radii* using the **Cross Section** tool.

Note Since the intersection model is not yet built, there is no widening or shoulder drawing in the cross section around the radius.

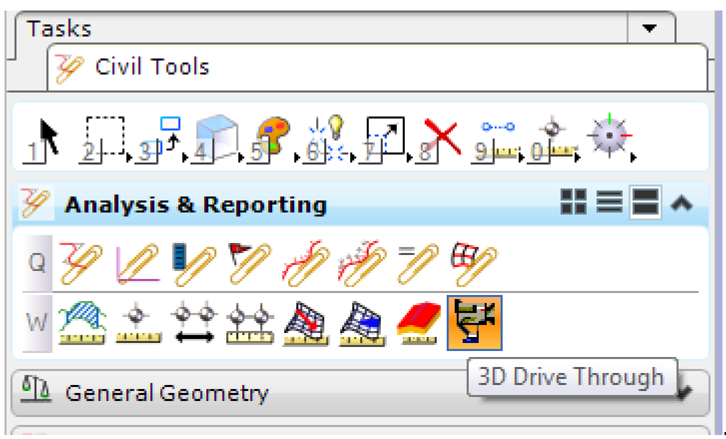
Exercise 7.5 *Create a 3D Drive-Through Animation*

Creating a drive through along the project requires a 3D view and a 3D path to follow. This exercise explains how to use the new Drive Through tool in SS4 along the proposed SR61 3D Model.



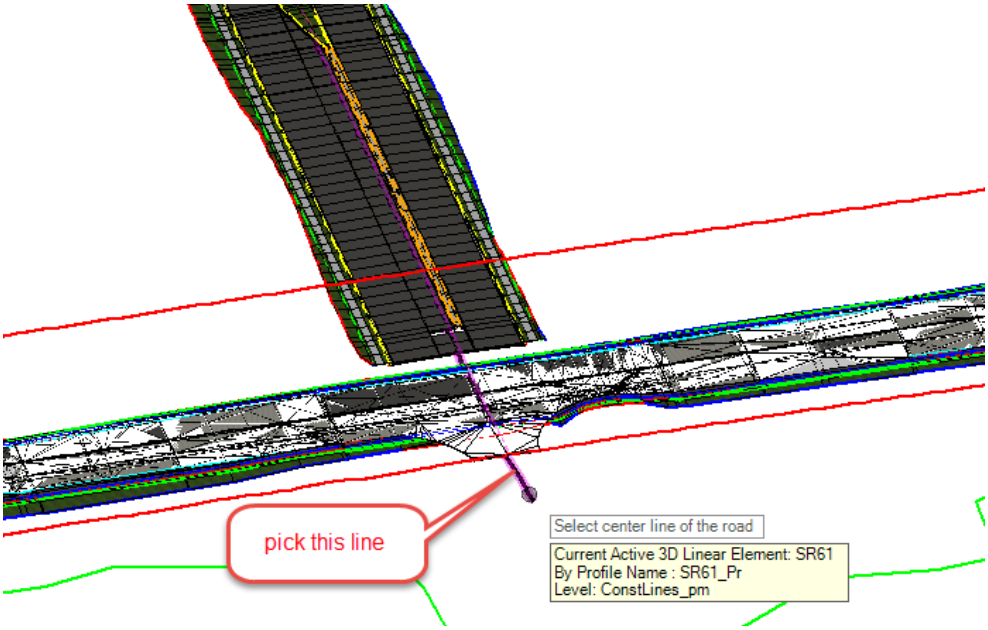
➢ ***To Setup the Animation Drive Through***

1. Maximize **View 2 Default-3D** model to set it as the *Active View*.
2. Turn **OFF** the **ConstLines** and **XSMisc_px** *levels.*
3. Use *Analysis & Reporting*, **3D Drive Through** tool.

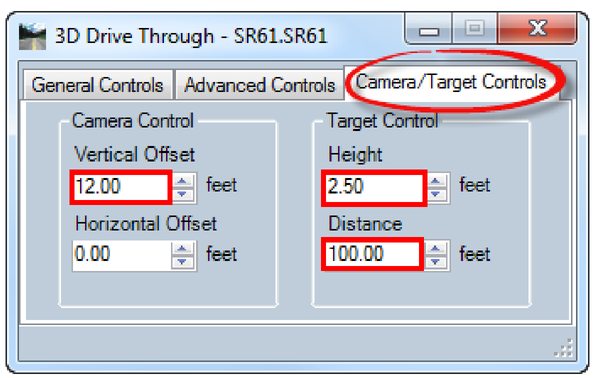


4. At the prompt, *Select a 3D view*, left click inside View 2.

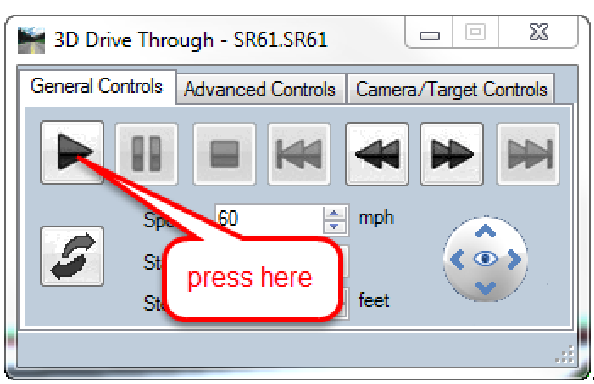
   a. At the prompt, *Select the center line of the road*, pick the 3D line in the view shown below.



   b. On the 3D Drive Through dialog, change to the tab **Camera/Target Controls** and enter the values as shown below.



   c. Change the tab back to the **General Controls** and Select the play button.



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8 SUPERELEVATION

OVERVIEW

Superelevation rotates the pavement cross slopes through a curve so that vehicles can maintain stability and speed while on a turning roadway. Elevation banking is applied to help offset centrifugal force. Superelevation standards also define the transition length required to rotate from a normal crown to a fully banked curve and back again.

Superelevation can be calculated in two ways:

- *Rules-based* – using a set of preferences (SEP or SRL files) the station and associated cross slopes of the transitions are based on design speed, curvature, and other design parameters. As the design progresses and parameters change (i.e., design speed exceptions) superelevation can be reprocessed to the revised parameter(s).
- *Import* – using a comma separate values (CSV) file to import the station and associated cross slope of each transition. In this option, the rules are not utilized; the data is simply applied to the superelevation lanes.

The result of superelevation is a DGN file of graphic superelevation lanes with cross slope attributes. This file can be referenced to a corridor model and associated, so the superelevation transitions are incorporated into the corridor model. The superelevation data can be in its own DGN file, or can be drawn into any of the other project DGN files with geometry, corridor, etc.

EXERCISE DESCRIPTION

In this workshop, the SR61 Centerline has a single curve to define superelevation. Once the required superelevation is determined from a predefined FDOT rule file, it will be assign to the SR61 corridor the results will be reviewed in the Cross Section View. Also, the results will be reviewed in the table editor and generate reports will be generated as other methods to review data.

As an alternative to calculating supers with rules, we'll also import a dataset from a FDOT Curve Table (csv file generated from Excel).

The general workflow for superelevation is listed below.

- Create RDXSRD File to draw superelevation lane shapes
- Reference the ALGNRD File
- Create Superelevation Sections
- Create Superelevation Lanes
- Calculate Superelevation Based on FDOT Tables
- Project Explorer Edits, Graphical Edits
- Assign Superelevation to Corridor, Associate Points
- Special Template Point, Superelevation Flag Box
- Template Inside Lane Vector Offset Constraint
- Superelevation Diagram and Reports

EXERCISE OVERVIEW

8.1 Create Superelevation Model

8.2 Create Superelevation Sections

8.3 Create Superelevation Lanes

8.4 Calculate Superelevation

8.5 Graphical Edits

8.6 Project Explorer Edits

8.7 Superelevation Reports and Diagram Editing

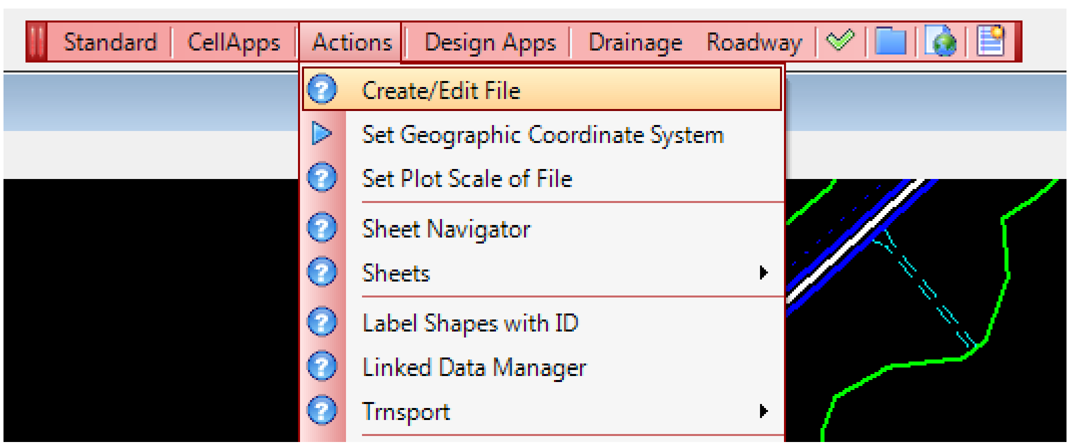
8.8 Assign Superelevation to Corridor

Exercise 8.1 Create Superelevation Model

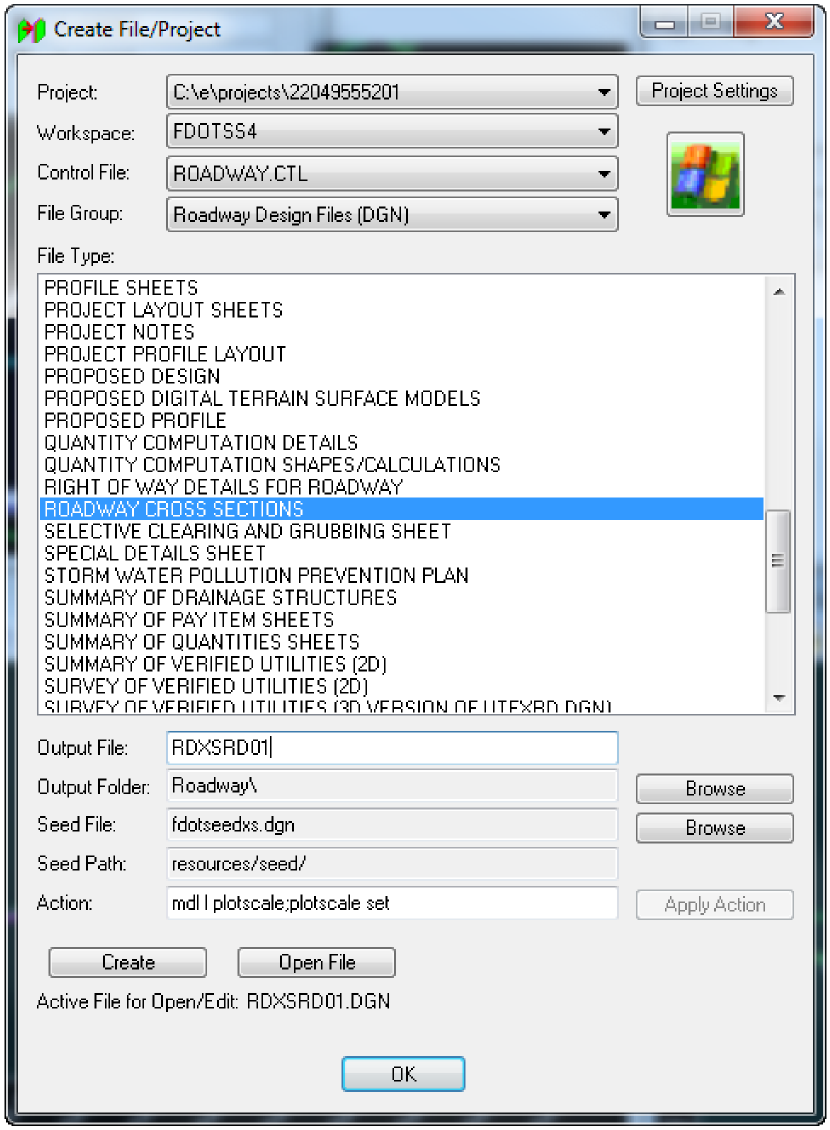
1. (Optional) Extract the *22049555201(8).zip* file in the c:\e\projects folder.

2. Open the *DSGNRD01.dgn* file of the c:\e\projects\22049555201\roadway\ folder in the FDOTSS4 Workspace in MicroStation.

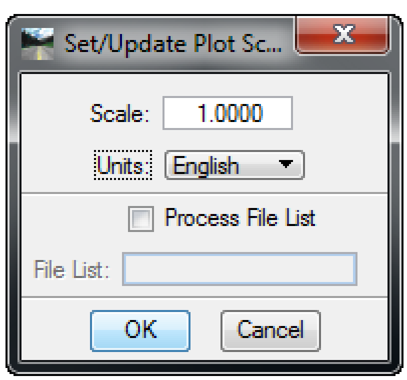
3. From the FDOTSS4 Menu, select **Actions** > **Create/Edit File.**



a. From the Create File/Project dialog, locate the **ROADWAY CROSS SECTIONS** from the **Roadway Design Files** *File Group* and click **Create**.

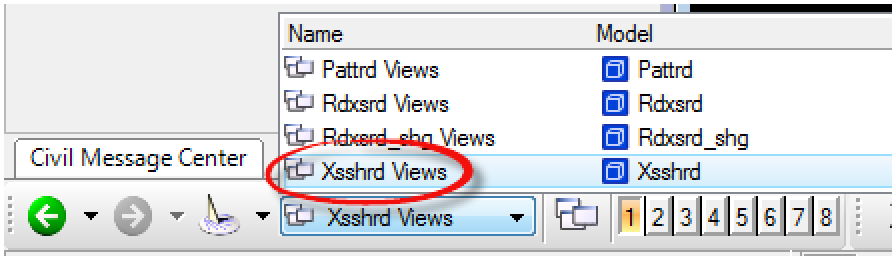


b. Click **Open File**, and set the Set/Update Plot Scale dialog displays.

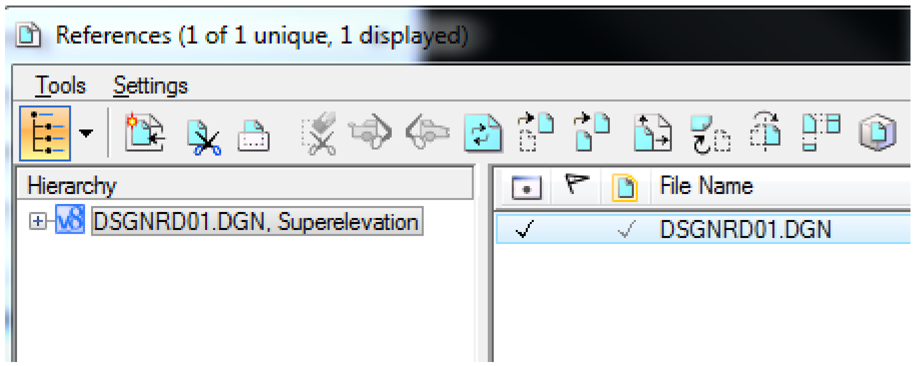


c. Click **OK** on the Set/Update Plot Scale dialog. Click **OK** on the CreateFile/Project dialog.

4. Locate the *View Group* toggle on the bottom left of the MicroStation window and change the *View Group/Model* to **Xsshrd Views.**



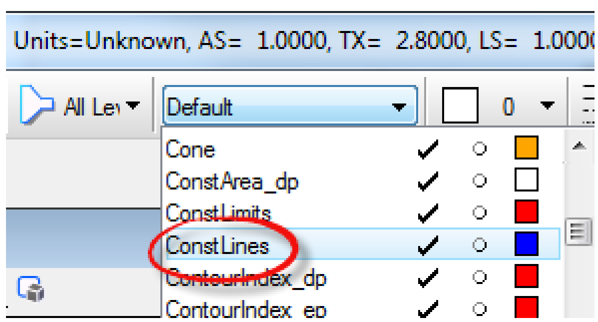
5. On the MicroStation **References** tool, attach the *DSGNRD01* file.



Note The Superelevation tools utilize the active MicroStation symbology.

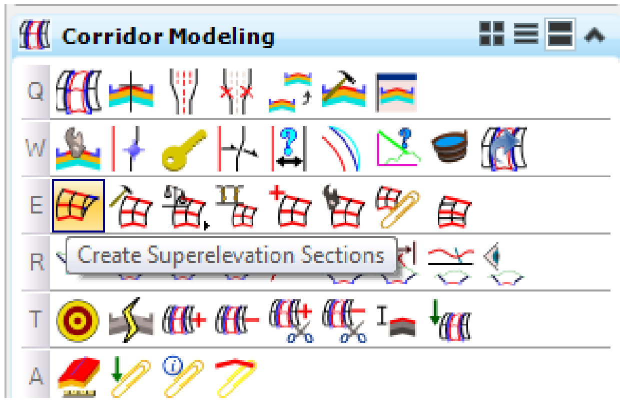
6. Window into the **Proposed Roadway** in the *DSGNRD01 Reference file*.

7. Set the MicroStation active *Level* to **ConstLines** and select **File > Save Settings (Ctrl +F).**



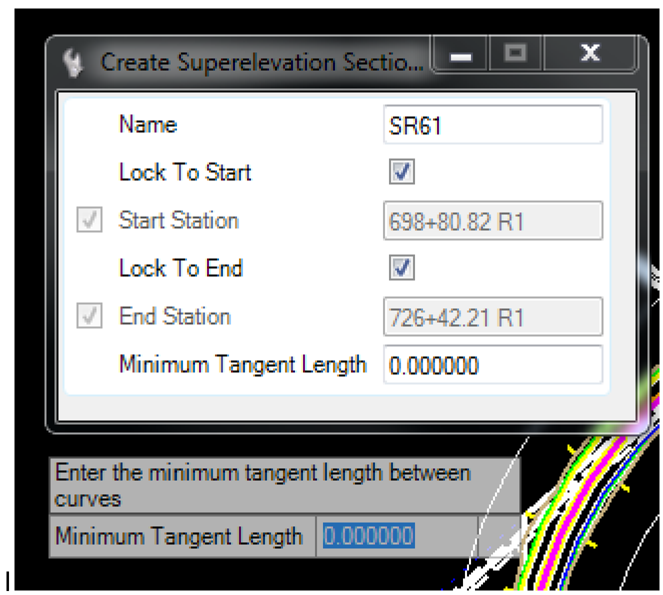
Exercise 8.2 Create Superelevation Sections

1. Use *Corridor Modeling*, Create Superelevation Sections tool.

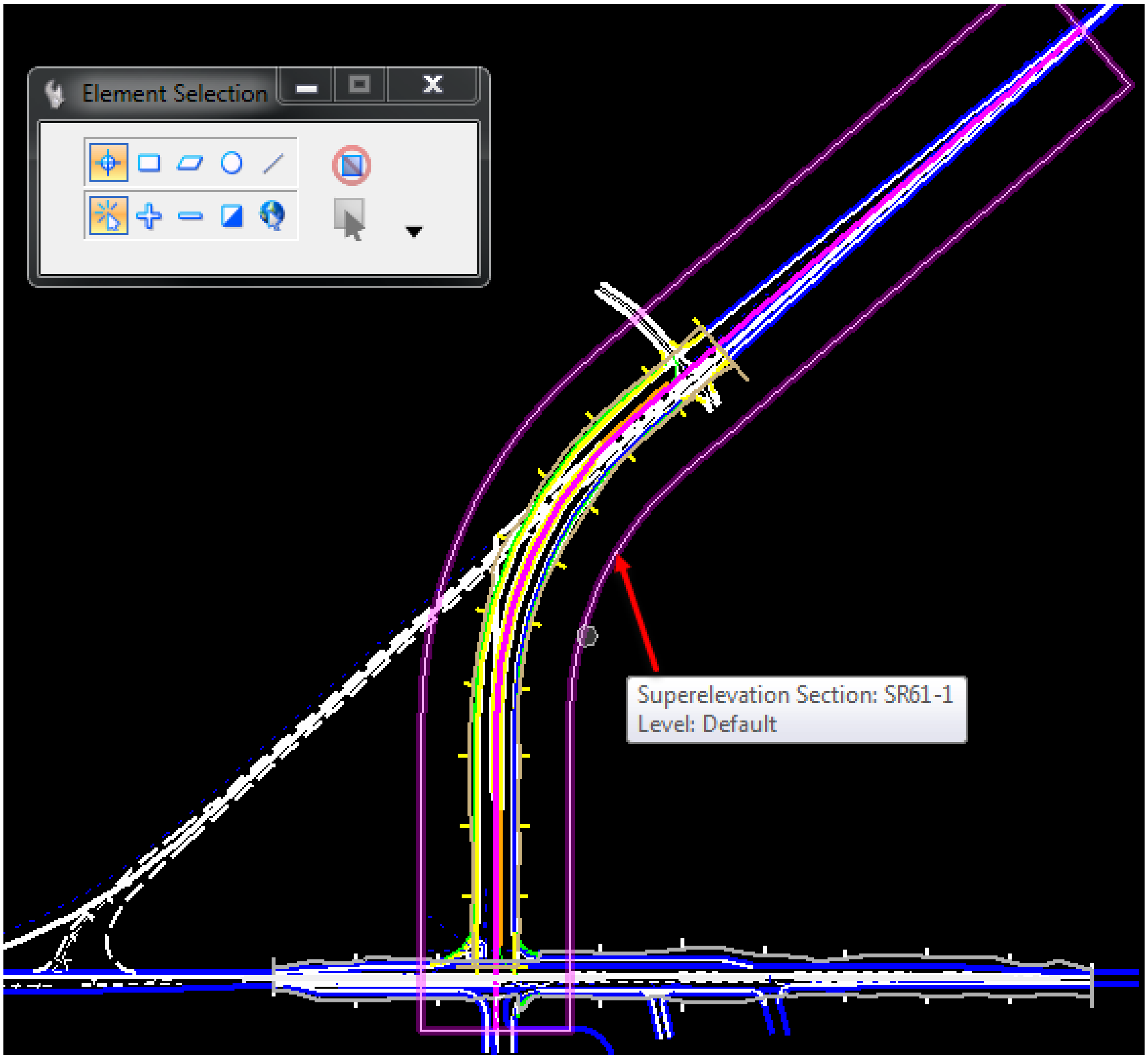


2. On the Create Superelevation Sections dialog, enter as shown below:

   - *Name* **SR61**
   - *Start Station* **Alt to lock to Begin**
   - *End Station* **Alt to lock to End**
   - *Minimum Tangent* **0**



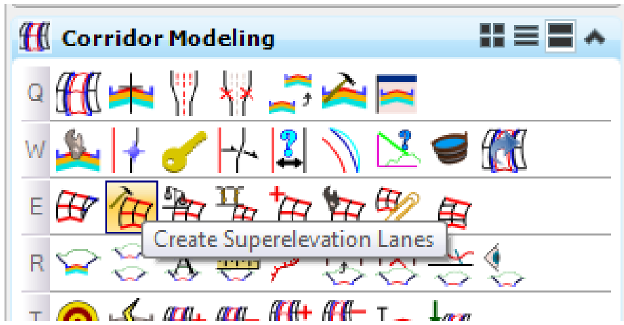
3. The *Superelevation Sections* are drawn and the Create Superelevation Lanes dialog is launched.



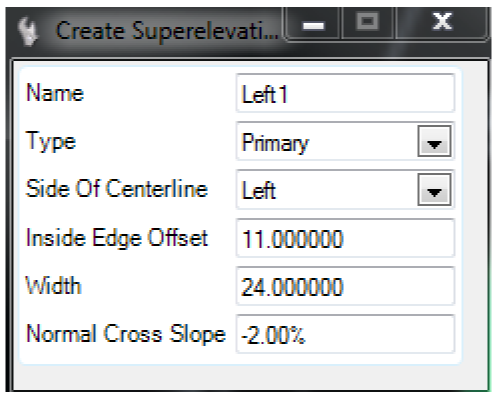
Note Use the Function Key F5 to dim the references

Exercise 8.3 Create Superelevation Lanes

1. Use the *Corridor Modeling*, **Create Superelevation Lanes** tool.

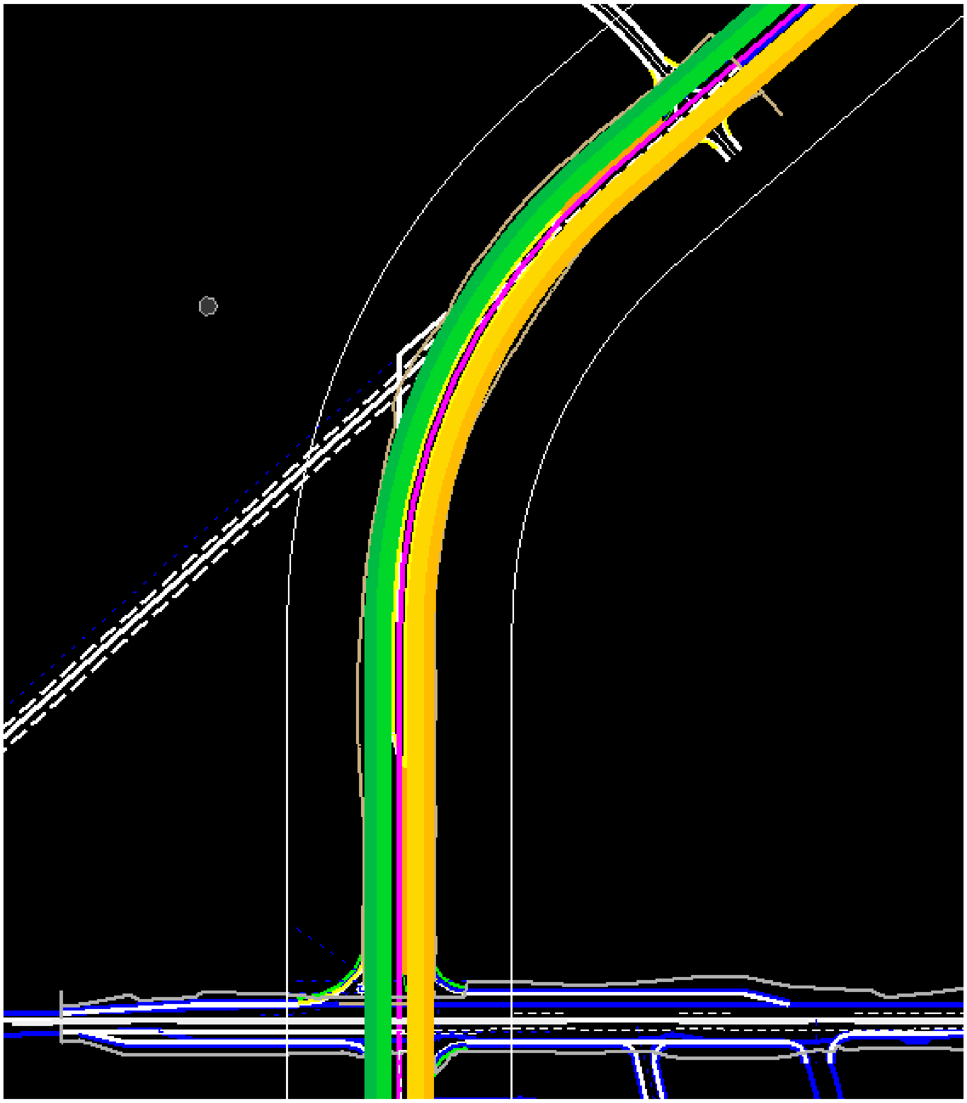


2. Define each of the **Super Elevation Lanes** as shown below, following the prompt to enter and data point to accept data:



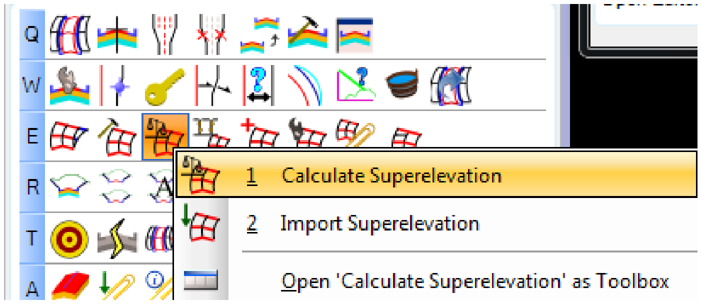
Name	Left1	Left2	Right1	Right2
Type	Primary	Primary	Primary	Primary
Side	Left	Left	Right	Right
Inside Edge Offset	11	35	11	35
Width	24	16	24	16
Normal Cross Slope	-2.00%	-3.00%	-2.00%	-3.00%

3. The *Superelevation Lanes* are drawn and the Calculate Superelevation Lanes dialog is launched.

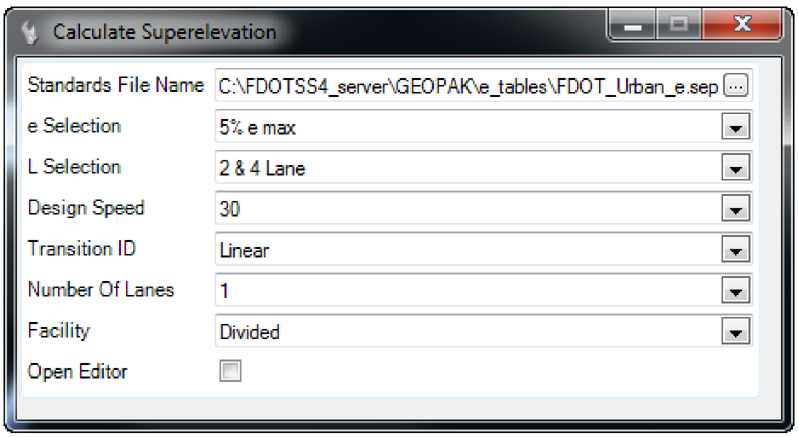


Exercise 8.4 Calculate Superelevation

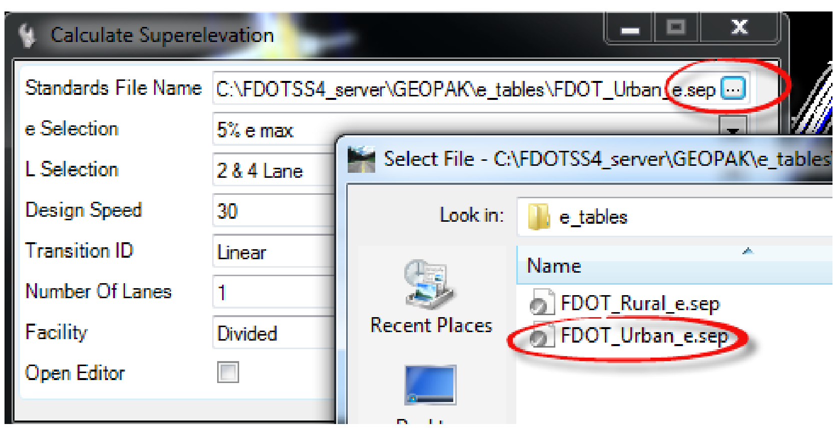
1. Use the *Corridor Modeling*, **Calculate Superelevation** tool.



2. On the Calculate Superelevation dialog:

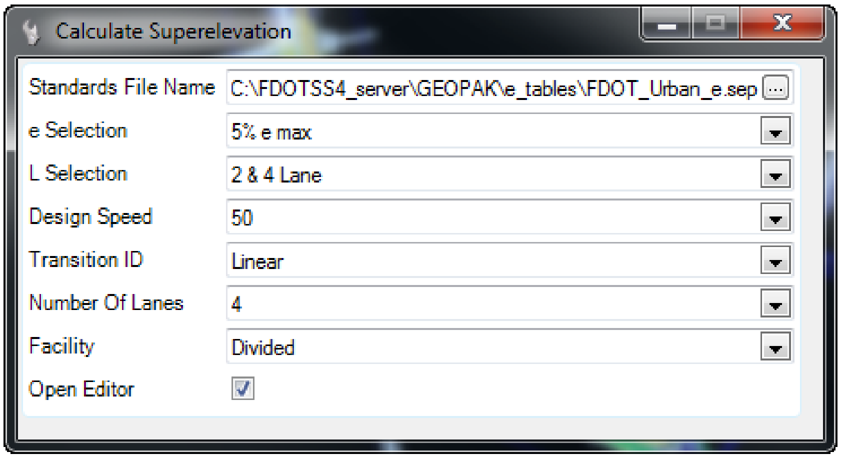


3. Select the **Browse** button and navigate to select the **FDOT_Urban_e.sep** *file* from the \FDOTSS4\GEOPAK\e_tables\ directory.

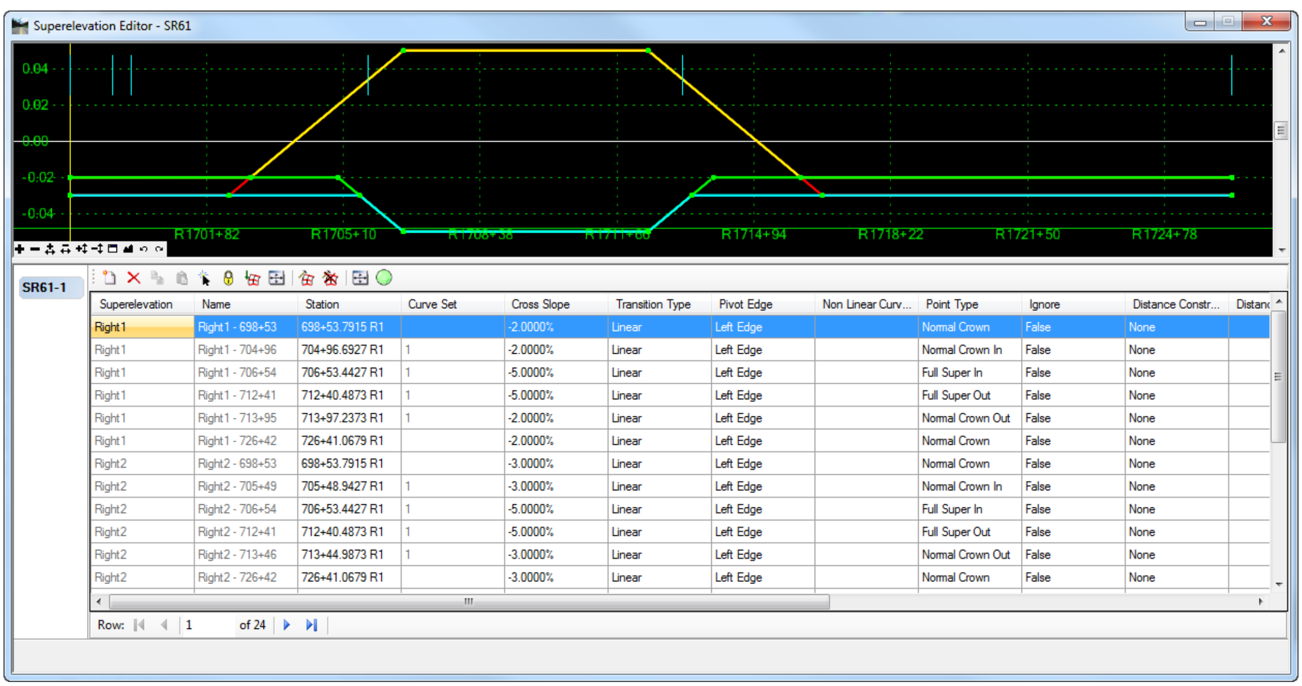


4. Enter the necessary dialog information as shown at the prompt and data point to accept data:

e Selection	**5% e max**
L Selection	**2&4lane**
Design Speed	**50**
Transition ID	**Linear**
Number of Lanes	**4**
Facility	**Divided**
Open Editor	**Yes, check**

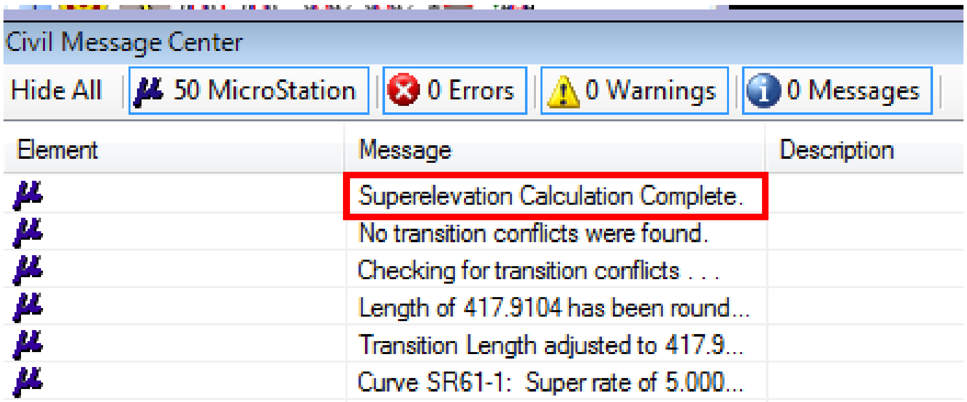


5. The *Superelevation Lanes* are now applied with **Superelevation** and the Superelevation Editor dialog is launched.



6. **Review** the data and **Close** the Superelevation Editor dialog.

7. Open the *Civil Message Center* to review the **Superelevation Notes**.

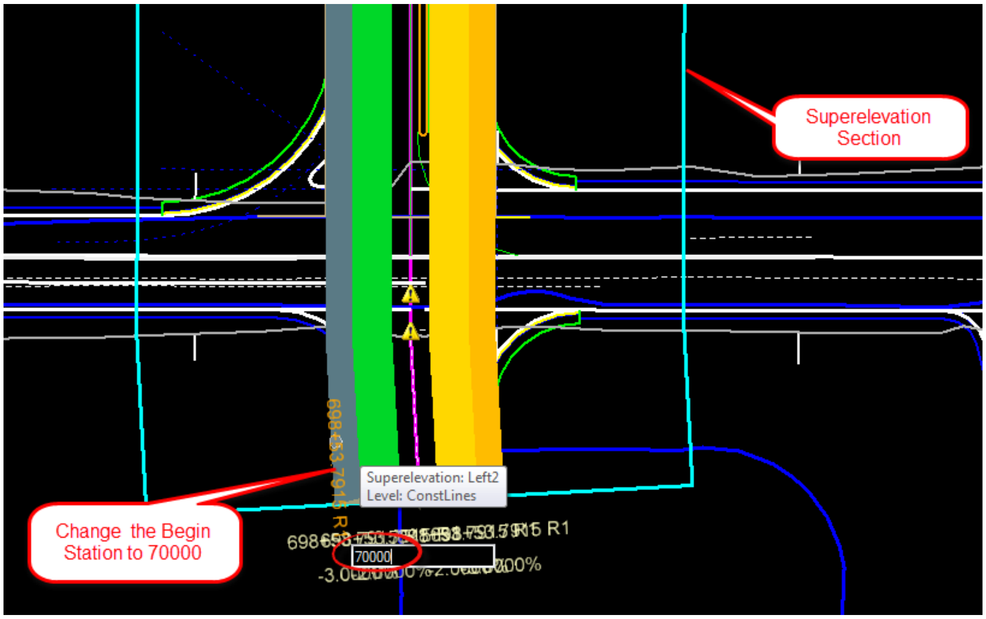


Exercise 8.5 Graphical Edits

➢ ***Superelevation Sections***

1. Use the MicroStation **Element Selection** tool and select the **Superelevation Section**. The *graphic handlers* now display.

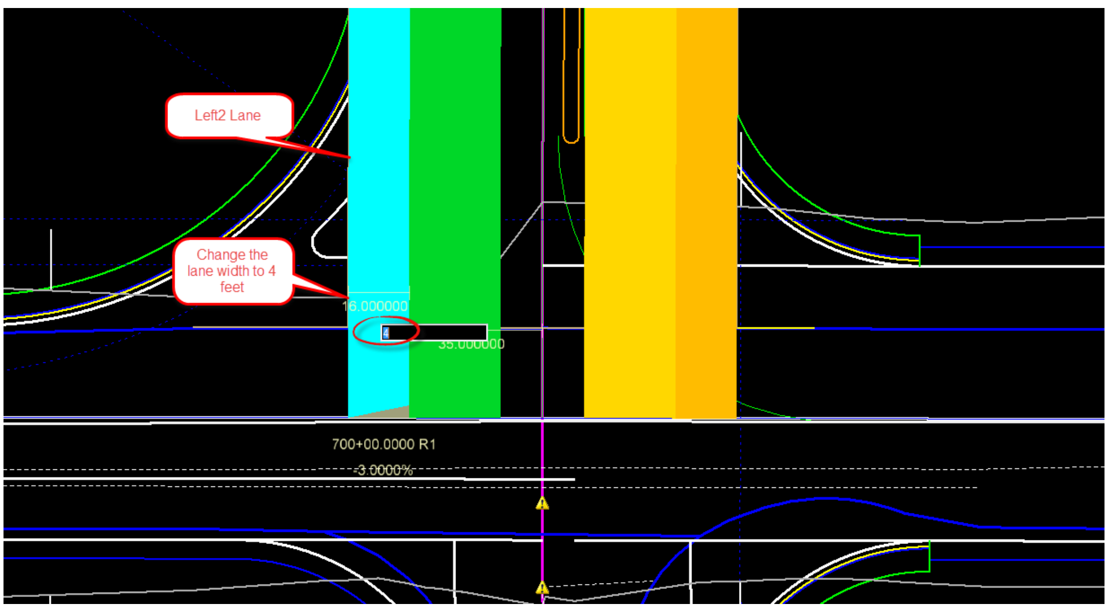
2. Change the *Begin Station* to **70000.**



➢ ***Superelevation Lanes***

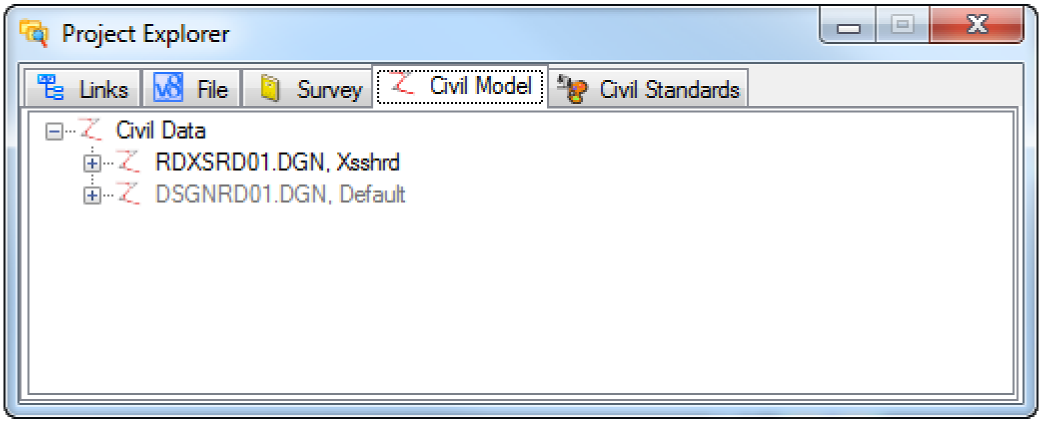
1. Using the MicroStation **Element Selection** tool, select the **Left2 lane** of the *Superelevation Lanes*. The *graphic handlers* now display.

2. Change the *Left2 Lane width* to **4 feet**, repeat for the *Right2 Lane.*

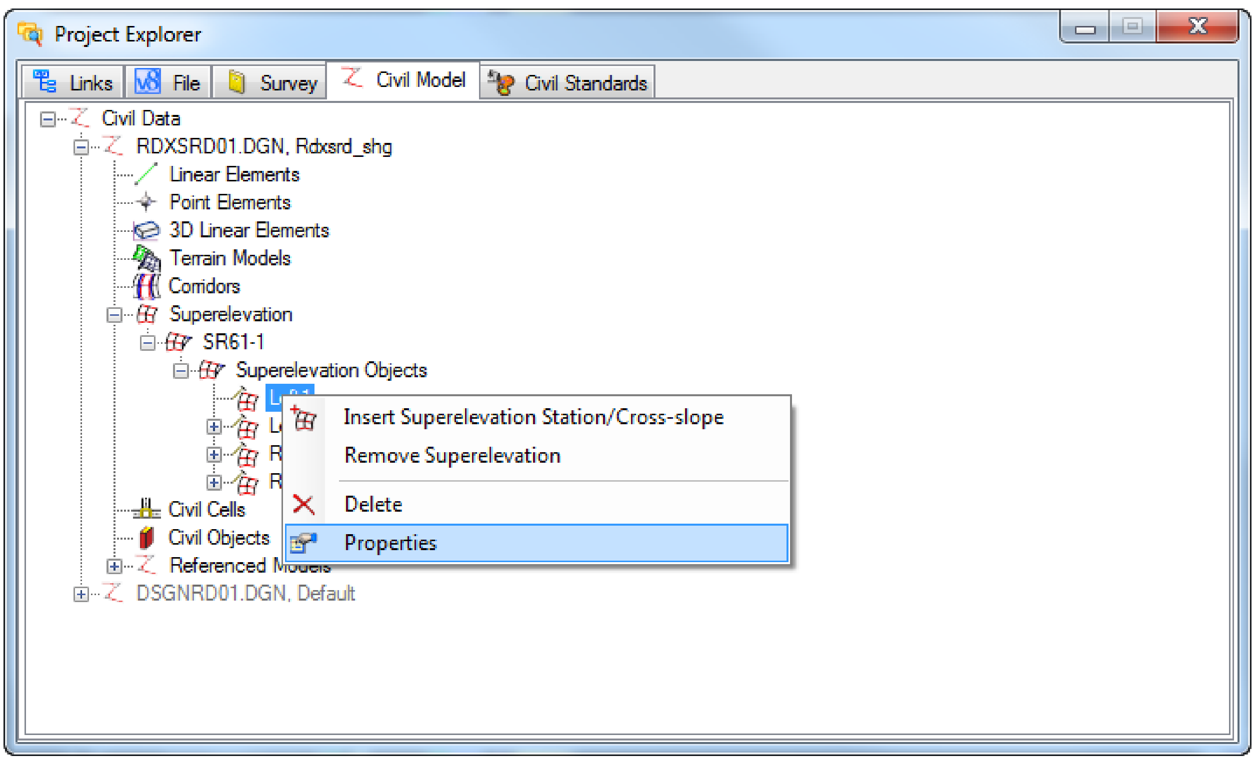


Exercise 8.6 Project Explorer Edits

1. Open the Project Explorer, Select **F11** and select the **Civil Model** tab. If this tab is not shown click on the small arrow in the top right corner of the dialog.

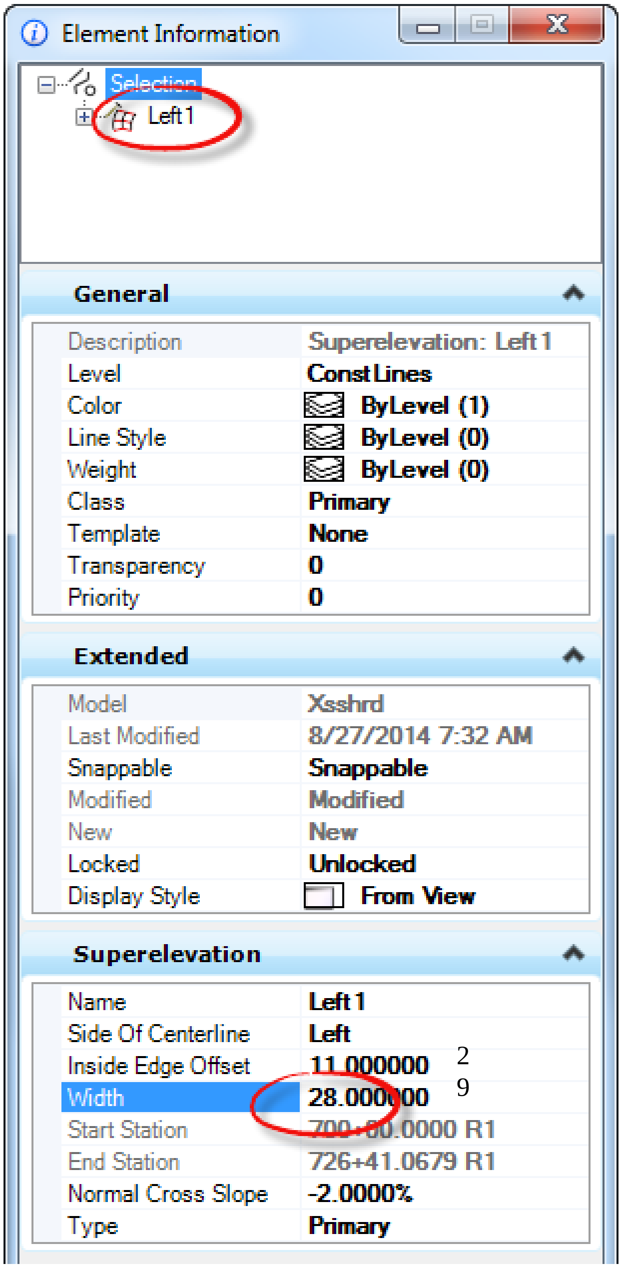


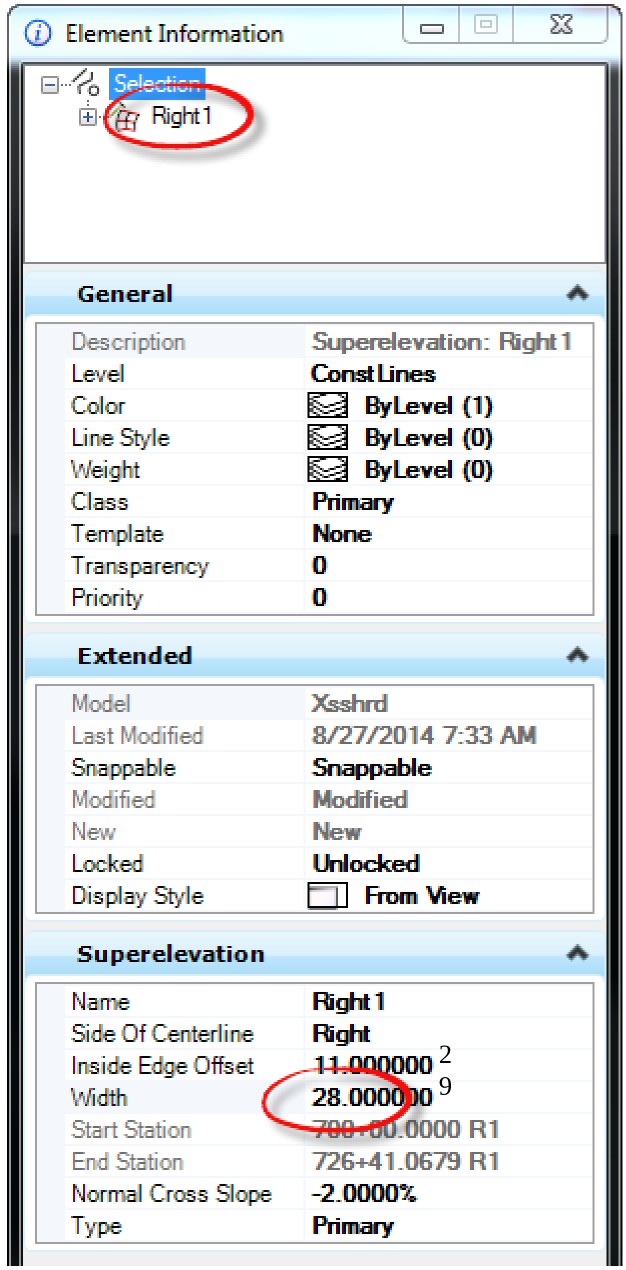
2. Expand the *RDXSRD01.dgn* data tree and navigate to **Superelevation** > **SR61-1** > **Superelevation Objects** > **Left 1**. Right click and select **Properties**.



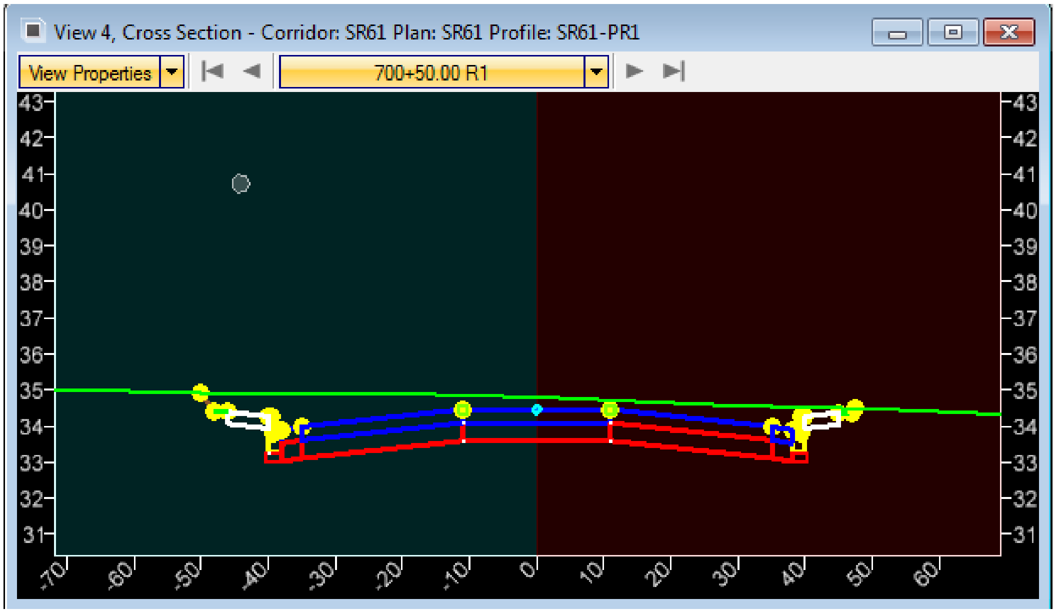
3. In the Element Information dialog, review the **Superelevation Lane Properties**.

4. Change the *Left1 Lane width* to 29 feet, repeat this for the *Right1 Lane Width.*



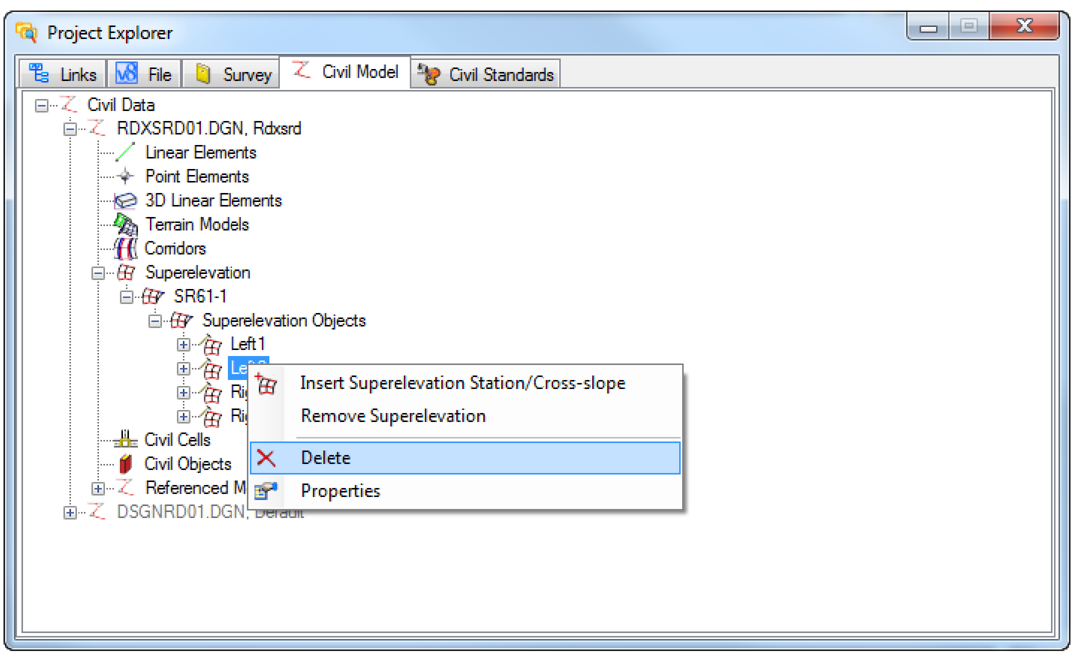


Note For this project template, there is no slope break or outside lane so Left2 and Right2 will be remove from the Superelevation design.



➢ ***Delete Lane Shapes for this project template***

1. In the Project Explorer dialog, right click on the *Left2 Lane* and select **Delete.** Repeat for *Right2 Lane*.

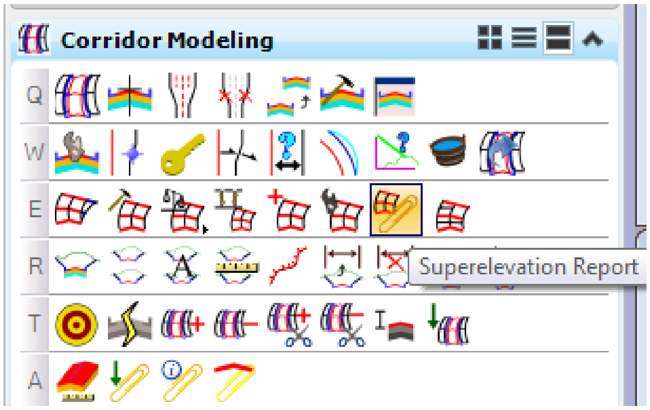


2. Close the Project Explorer dialog.

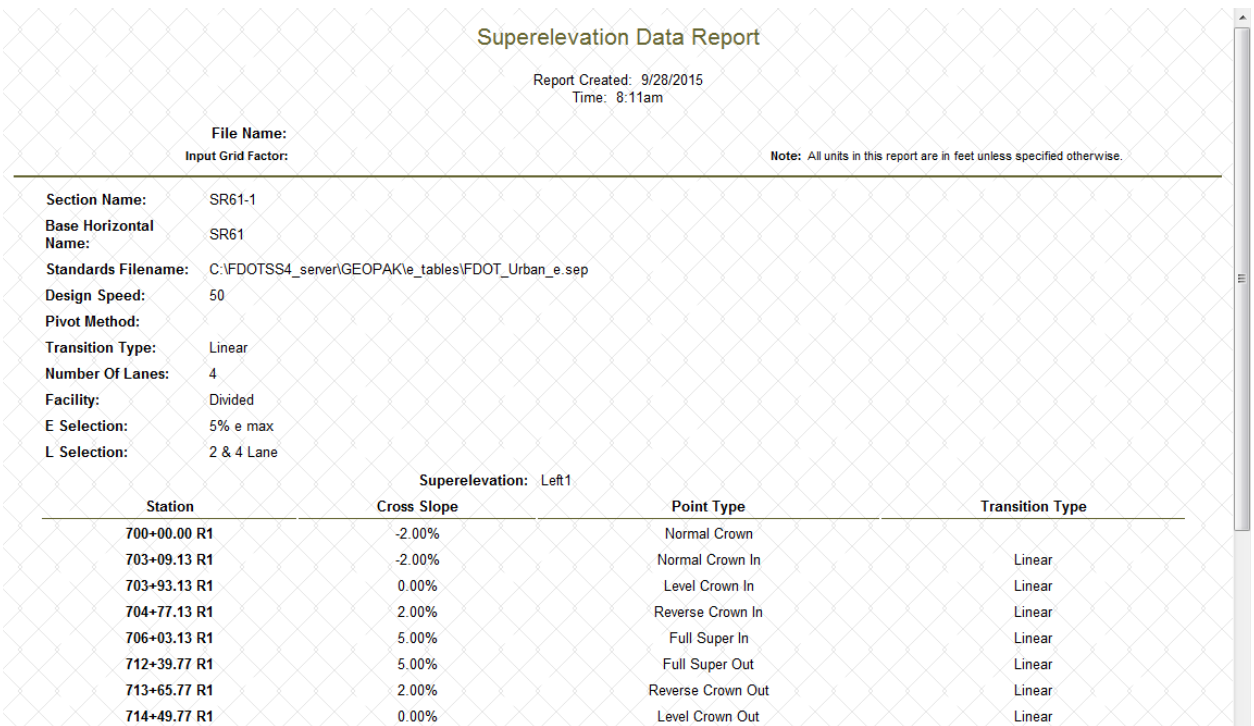
Exercise 8.7 Superelevation Reports and Diagram Editing

➢ *Create a Superelevation Report*

1. Use the *Corridor Modeling*, **Superelevation Report** tool.



2. Select the **SR61 Superelevation Section** and right click to accept.



Superelevation Data Report

Report Created: 9/28/2015
Time: 8:11am

File Name:
Input Grid Factor:

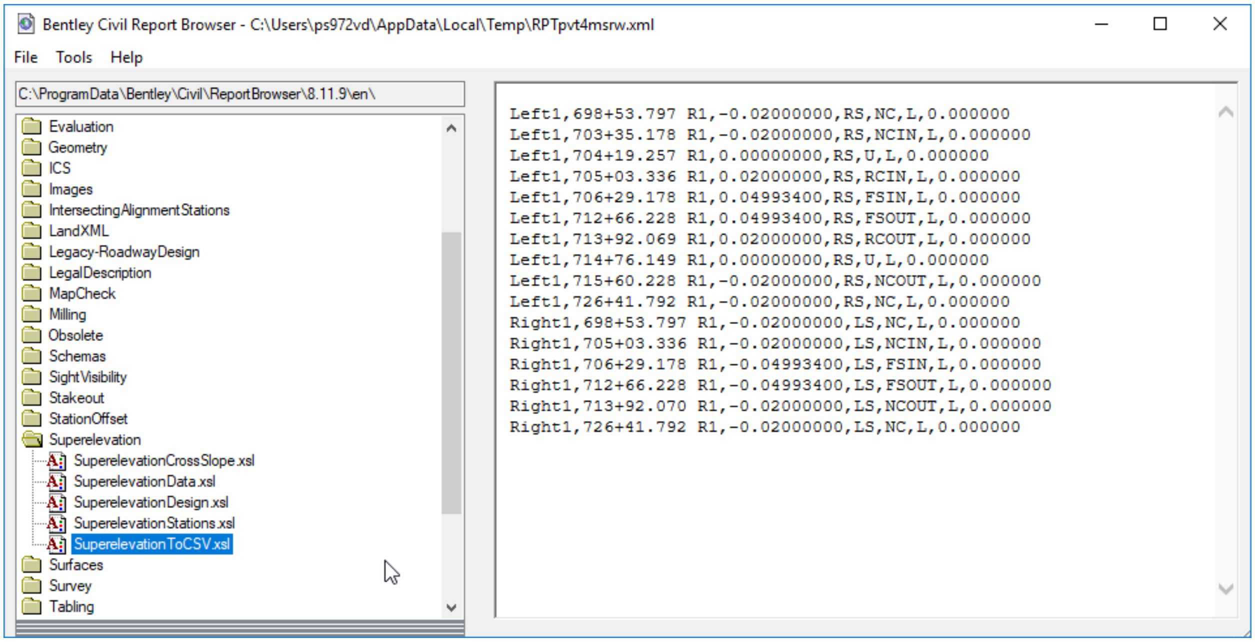
Note: All units in this report are in feet unless specified otherwise.

Section Name:	SR61-1
Base Horizontal Name:	SR61
Standards Filename:	C:\FDOTSS4_server\GEOPAK\e_tables\FDOT_Urban_e.sep
Design Speed:	50
Pivot Method:	
Transition Type:	Linear
Number Of Lanes:	4
Facility:	Divided
E Selection:	5% e max
L Selection:	2 & 4 Lane

Superelevation: Left1

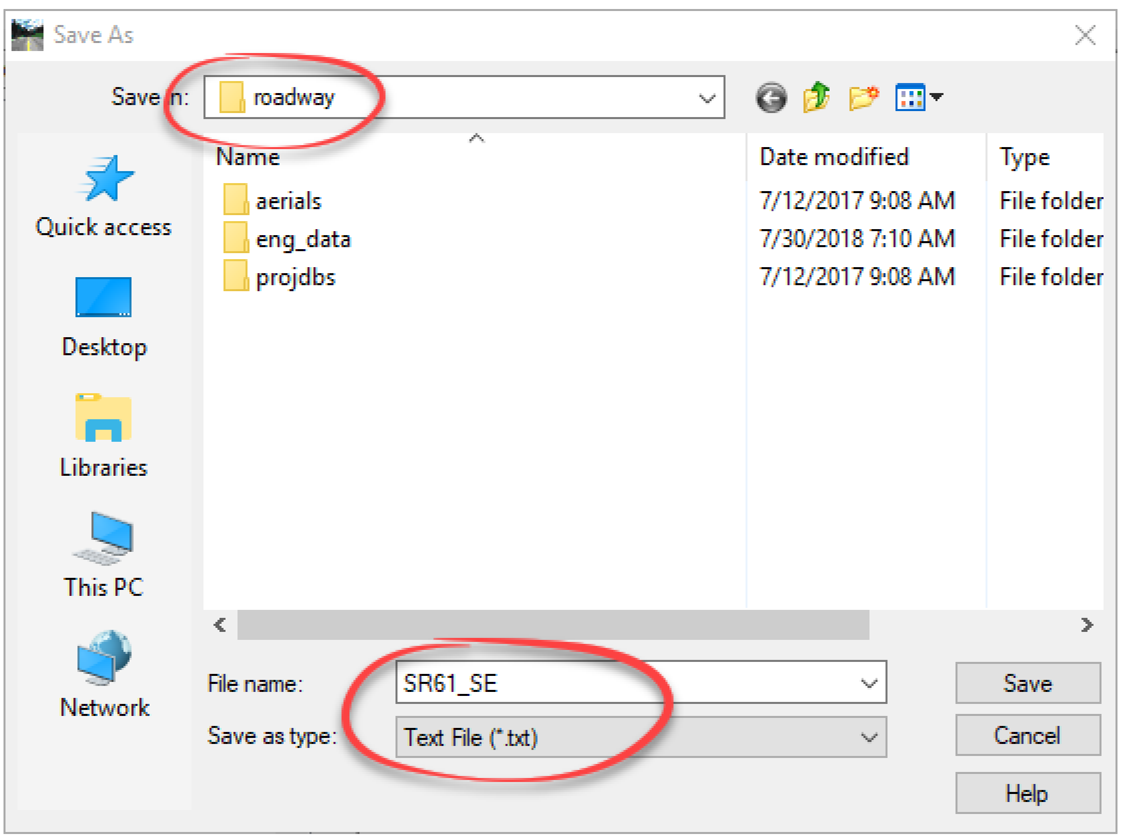
Station	Cross Slope	Point Type	Transition Type
700+00.00 R1	-2.00%	Normal Crown	
703+09.13 R1	-2.00%	Normal Crown In	Linear
703+93.13 R1	0.00%	Level Crown In	Linear
704+77.13 R1	2.00%	Reverse Crown In	Linear
706+03.13 R1	5.00%	Full Super In	Linear
712+39.77 R1	5.00%	Full Super Out	Linear
713+65.77 R1	2.00%	Reverse Crown Out	Linear
714+49.77 R1	0.00%	Level Crown Out	Linear

3. In the Civil Report Browser, Change the report format stylesheet to SuperelevationToCSV.xsl



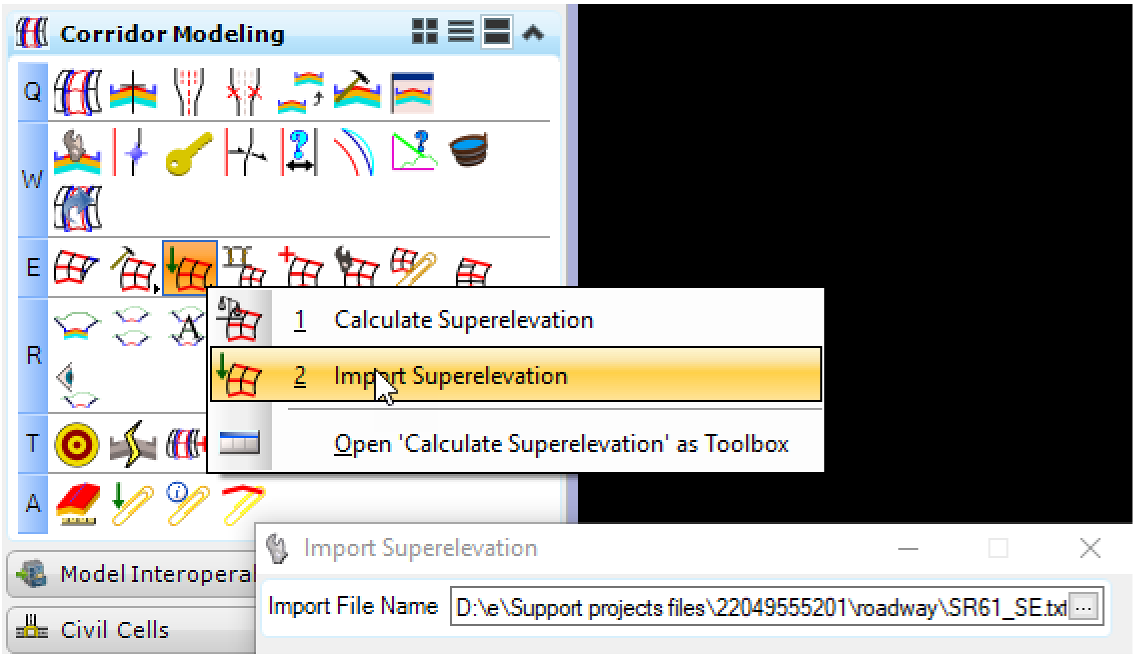
4. In the Civil Report Browser, select **File** > **Save As**.

5. Change the *path folder* to C:\e\projects\22049555201**Roadway** and the *File Name* to **SR61_SE** use the *Save as type* **Text File (*.txt).**



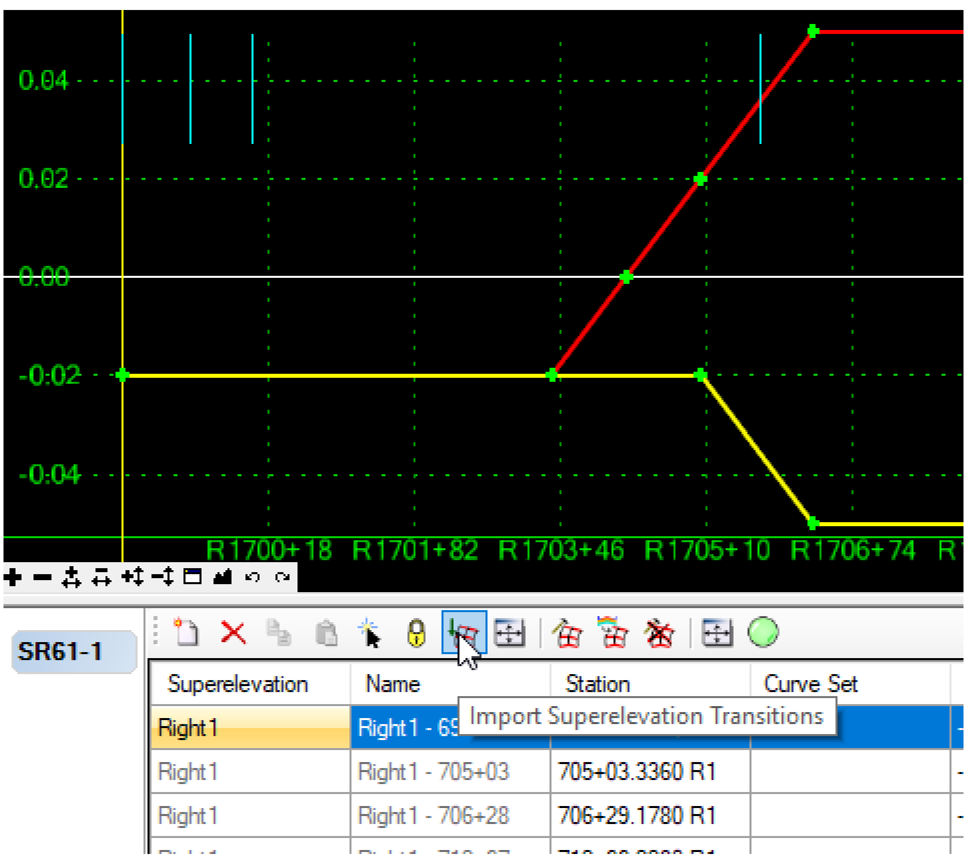
6. Choose Save and Exit the Civil Report browser.

7. This file can be used to edit and re-import superelevation values for the corridor.



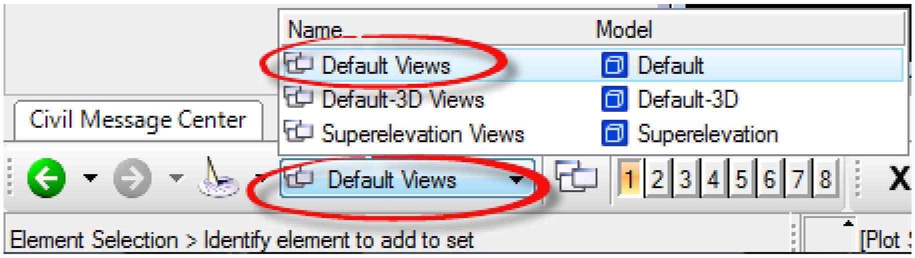
8. To use the modified CSV values, first delete all the entries in the Superelevation Editor diagram then using this tool,

9. Locate the csv file in the Roadway directory and import the Superelevation.

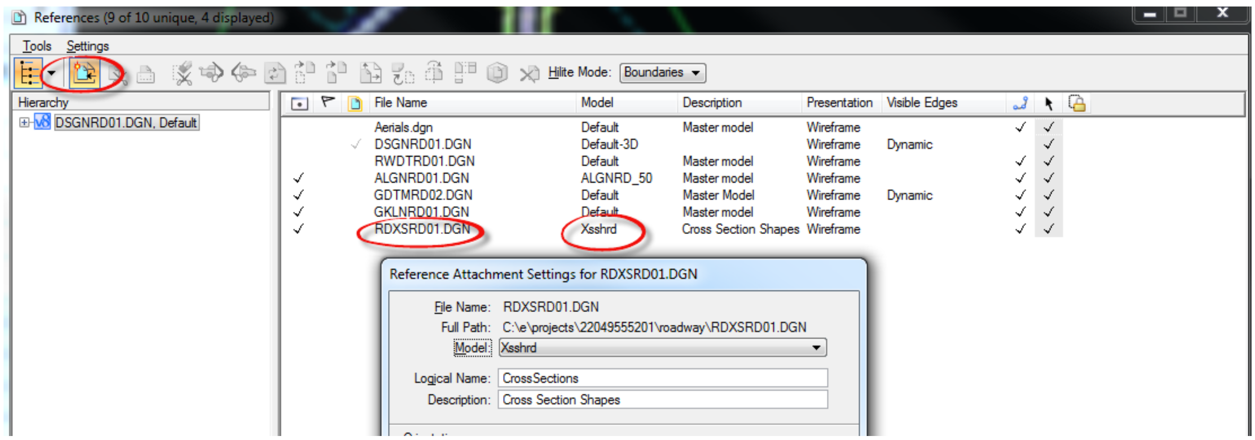


Exercise 8.8 Assign Superelevation to Corridor

1. Return to the **Default** *Model* of the *DSGNRD01 or MODLRD01* file.



2. Attach the **Superelevation Design** from the *RDXSRD01-Xsshrd Model* as a *Reference* file.

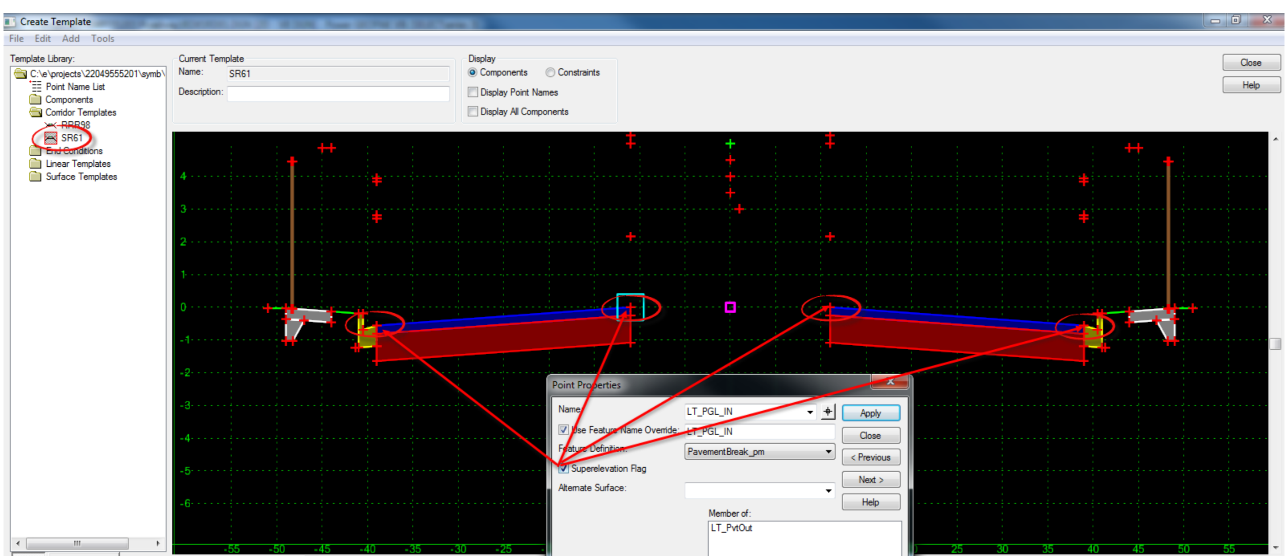


➢ ***Check the Active Template for Superelevation Flags***

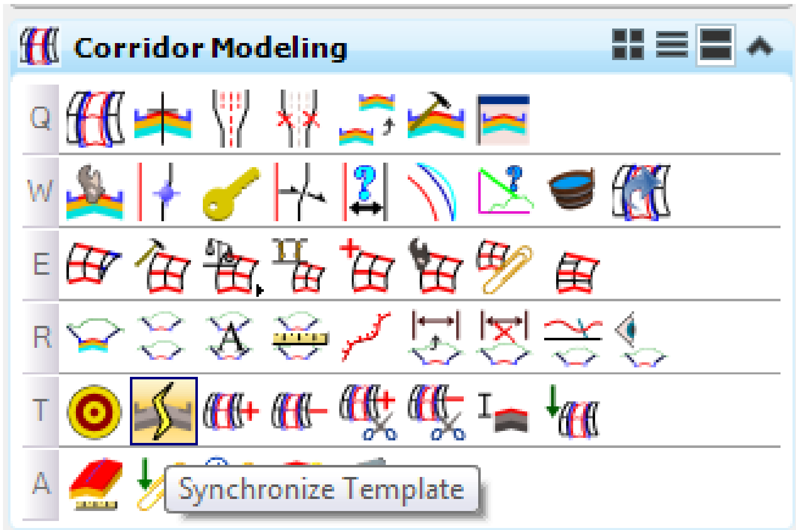
1. Use *Corridor Modeling*, **Create Template** tool.

   a. Set active the **SR61** *Template***.**

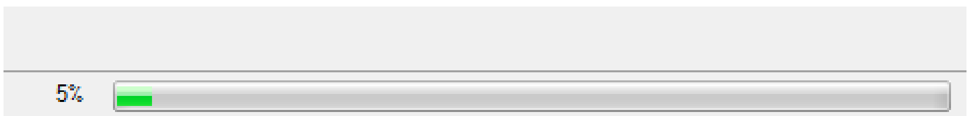
   b. Open each of the **4 Pavement Edge** *Points Properties*, and check **ON** the *Superelevation Flag* option.



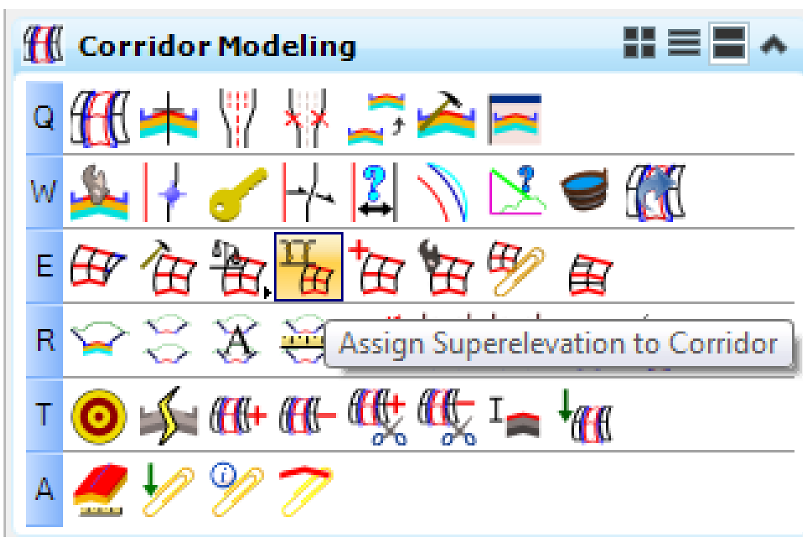
2. Use *Corridor Modeling*, **Synchronize Template** tool.



3. Select the **SR61** *Template Drop Handle*, the Corridor will begin to Re-Process.



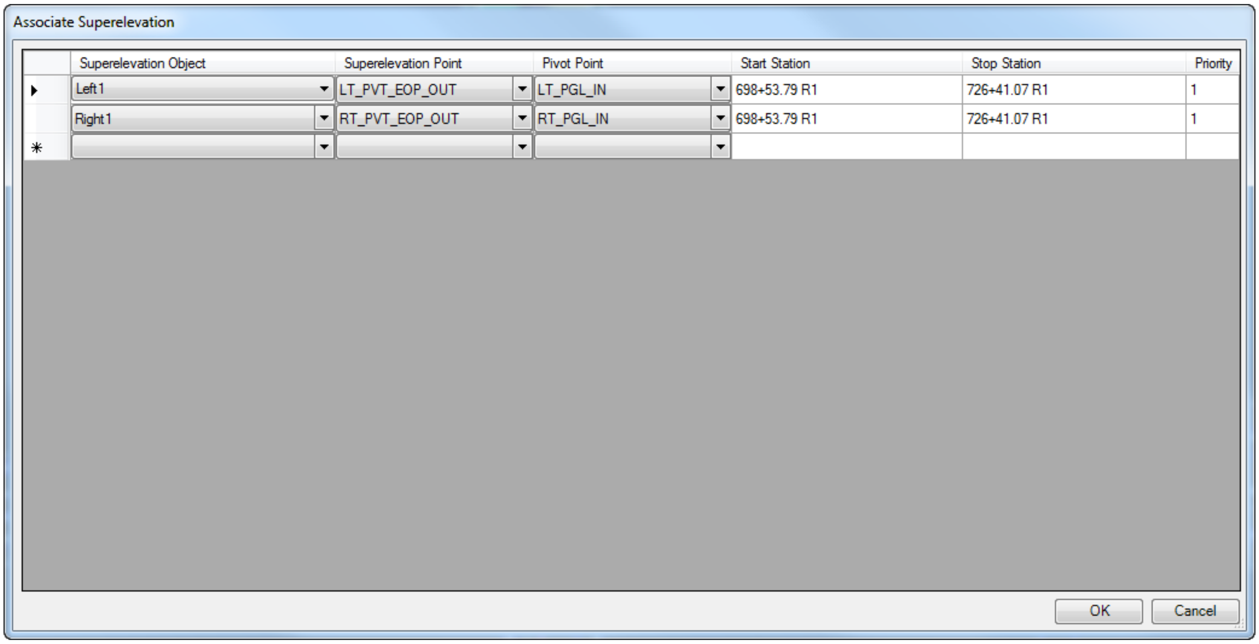
4. Use Corridor Modeling, Assign Superelevation to Corridor tool.



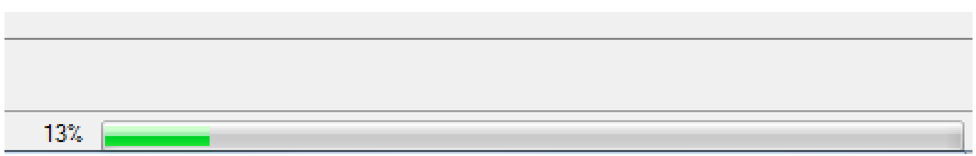
a. Select the *Reference* Superelevation Section boundary.

b. Select the **Corridor Boundary** for *SR61*.

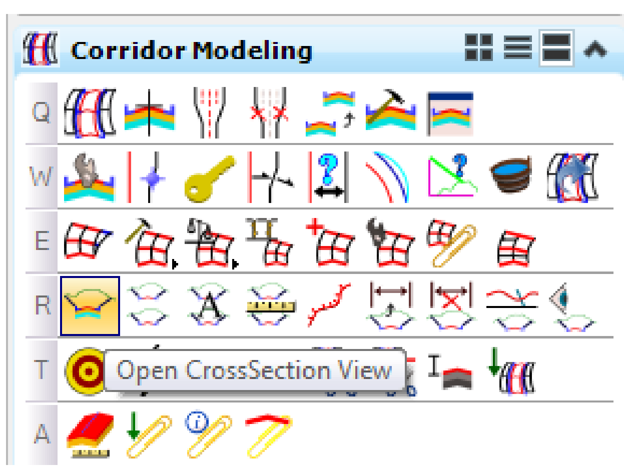
c. The Associate Superelevation dialog displays. Review the **Pivot Point** and **Superelevation Point** *assignment* and then click **OK**.



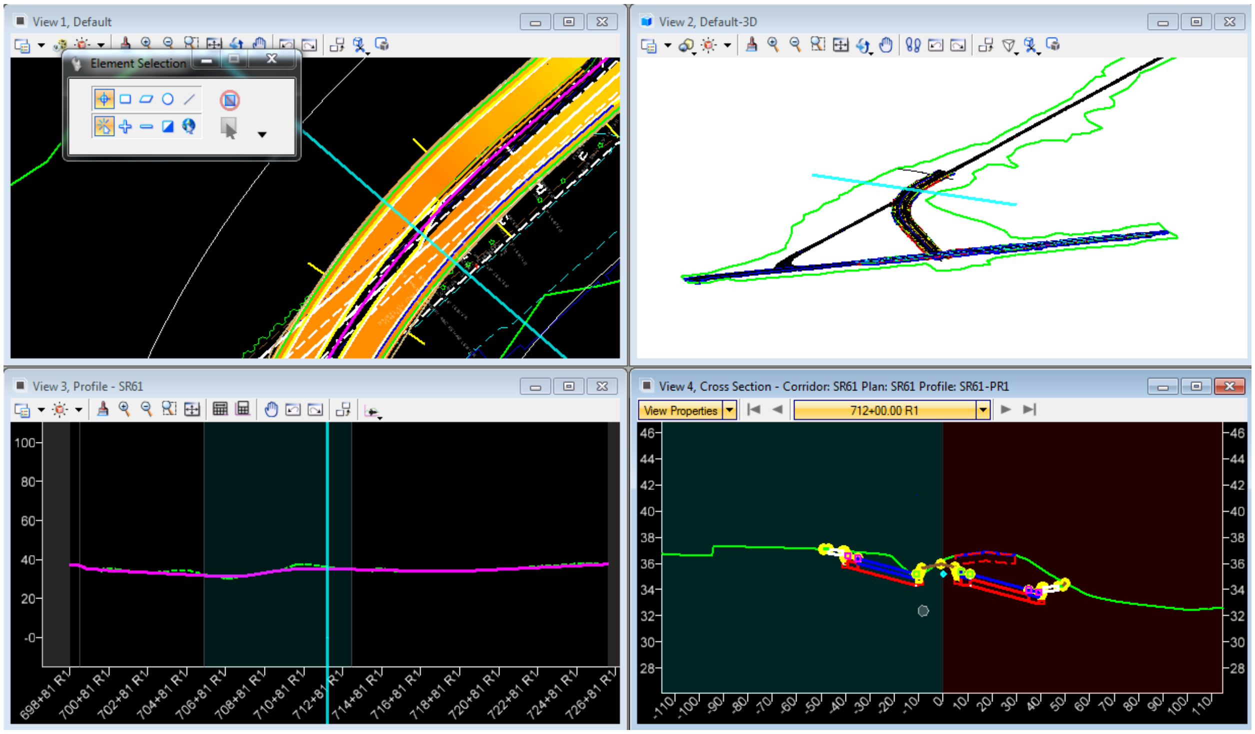
5. The *Corridor* will begin to process and display the new model.



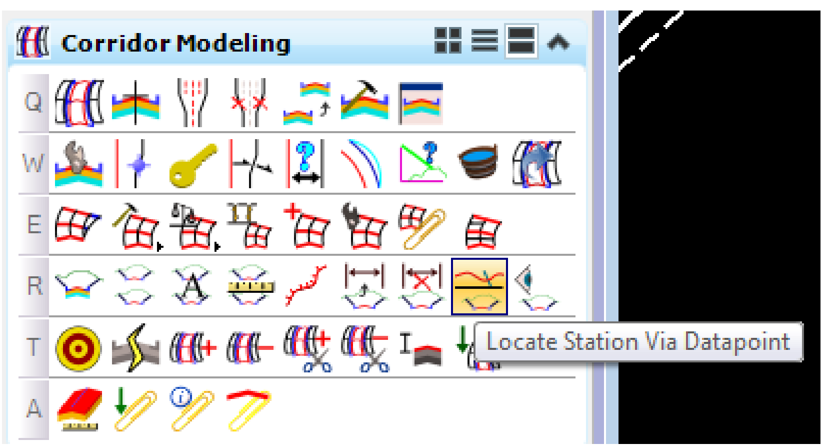
6. Select the *Function Key* **F4** to open *4 Views***.** Use the **Open CrossSection** tool to display and review the *Superelevation* on the Corridor.



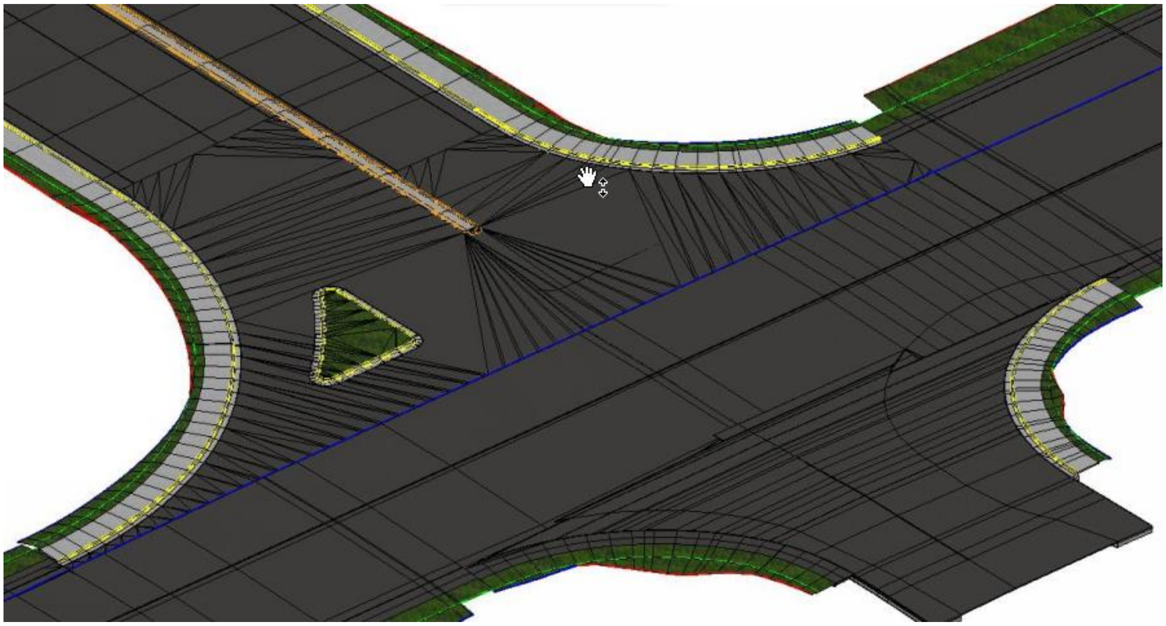
7. Follow the cursor prompts to display the **cross section** in *View 4*.



HINT Use the **Locate Station via Data** point tool to navigate to the curve area of the alignment with superelevation.



9 DETAIL MODELING



SR61 CORRIDOR DESIGN DETAILS EXERCISES

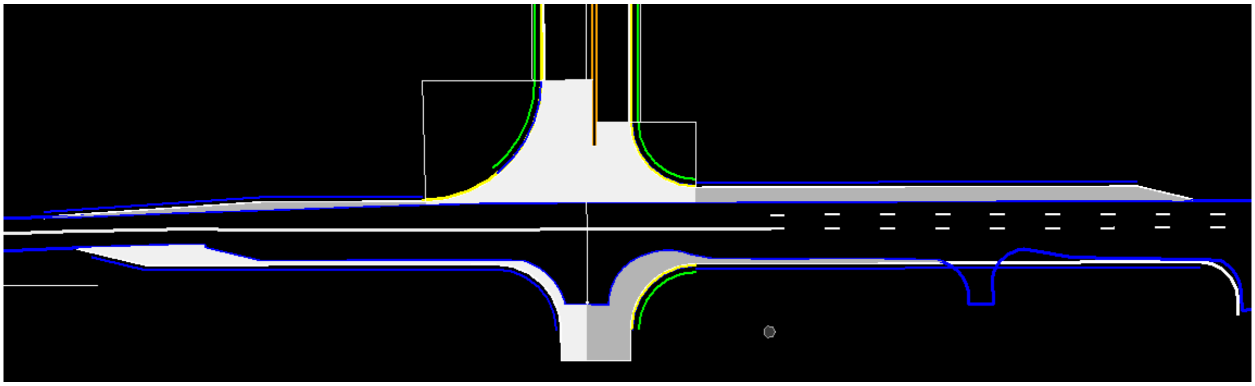
- Intersection Design
  - Build Intersection Terrain at BL98
  - Including TS Nose and Turn Island

OTHER DESIGN DETAILS

- Build Intersection Terrain at School Entrance
- Transition Template for the End of the Project
- Build Intersections for Friendship Road
- Add 3D Urban Driveway
- Add 3D Sidewalk Ramps
- Add 3D Rural Turn Out
- Superelevation Vector Offsets for the Median Widening and Curb Gutter Points
- Superelevation Vector Offsets for the Traffic Separator Widening

INTERSECTION DESIGN

The intersection can be built in parts as shown in the diagram:



The following exercises provide instructions on how to model these with Civil Tools other than the Normal Corridor Templates. The steps to design the SR61 intersection have been detailed in the Chapter, Exercises 9.1 through 9.12. Once completed follow the same methodology to add further design details 9.13 and 9.14.

EXERCISE OVERVIEW

9.1 Plan to Build Intersection Terrain at BL98

9.2 Add a Component Switch to the RRR98 Template

9.3 Constructing Vertical Profiles from 3D Model Elements

9.4 Construct 3D Radius Lines

9.5 Construct 3D Intersection Limit Lines

9.6 Build the Intersection Terrain from 3D Elements

9.7 Create an Intersection Pavement Surface

9.8 Traffic Separator Nose

9.9 SR61 Corridor Clipping References

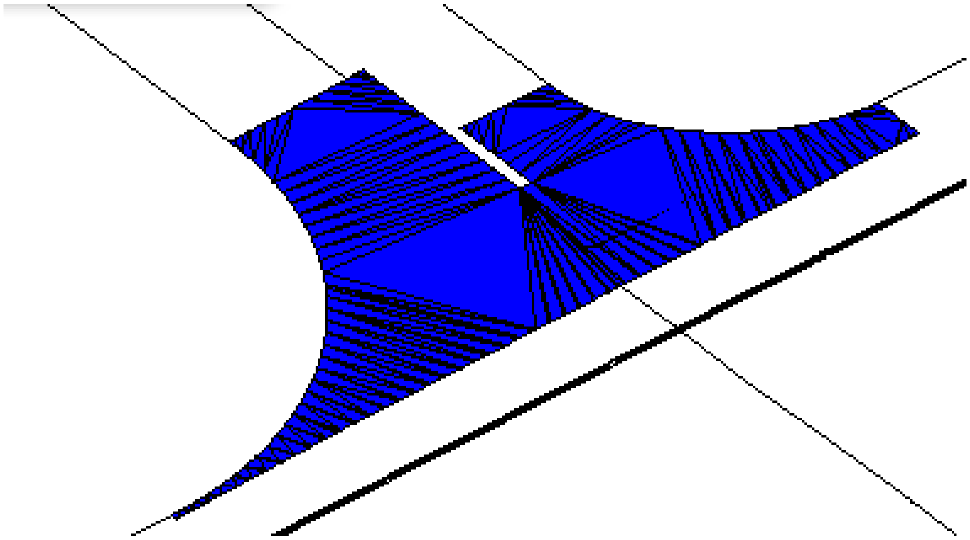
9.10 Model Curb and Sidewalk around Radii

9.11 Right Turn Island

9.12 RRR98 Corridor-Build Intersection Terrain at School Entrance (On Your Own)

9.13 SR61 Corridor-Build Intersection Terrain at Friendly Road (On Your Own)

Exercise 9.1 *Plan to Build Intersection Terrain at BL98*



The general methodology for building intersection design come from the concept of creating new 3D model boundary lines from profiles on the corridor surfaces and 3D lines. Transition profiles are easily produced with the civil tools for the radii.

These are the general steps to follow:

1. Develop a seam line between corridors through the intersection,
2. Create a switch or trigger line on the crossing corridor templates,
3. Remove outside corridor component elements through the limits of the intersection,
4. Construct 2D elements around the perimeter of the intersection,
5. Develop/design the profiles for each of the perimeter line,
6. Build an intersection terrain boundary using the 3D perimeter elements,
7. Add break lines if necessary to the intersection terrain,
8. Add surface templates to the intersection terrain,
9. Use linear templates along the perimeter edge lines to help transition corridors,
10. Use corridor clipping tool to clean overlaps between corridor and linear templates.

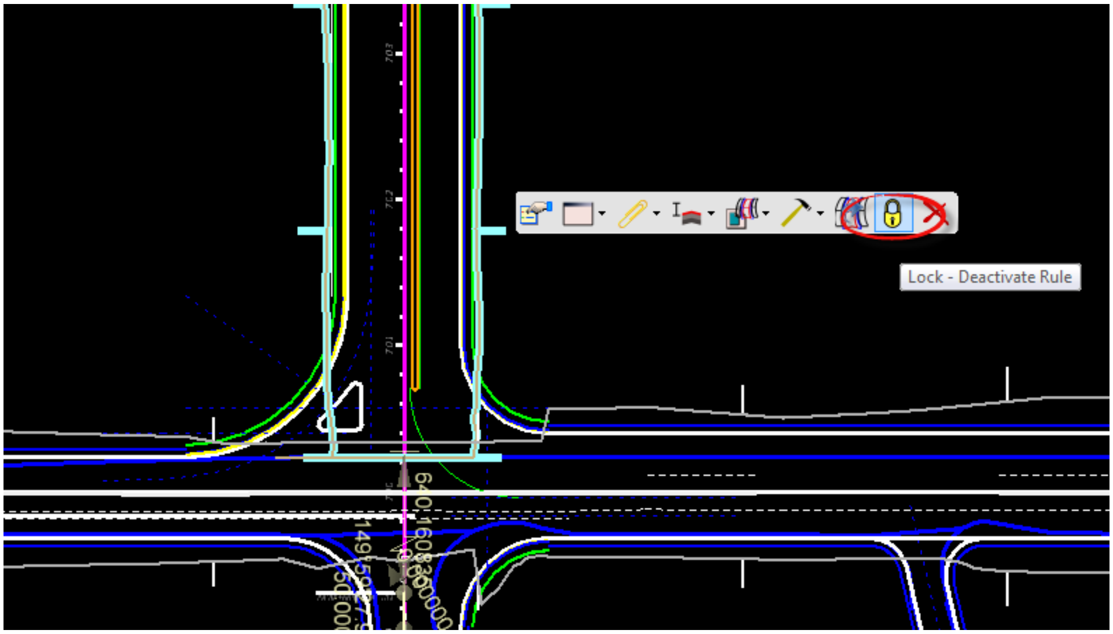
(Optional) Extract the *22049555201(9).zip* file in the c:\e\projects folder.

Open the *DSGNRD01* file and zoom into the *Intersection* of **SR61** and **BL98**.

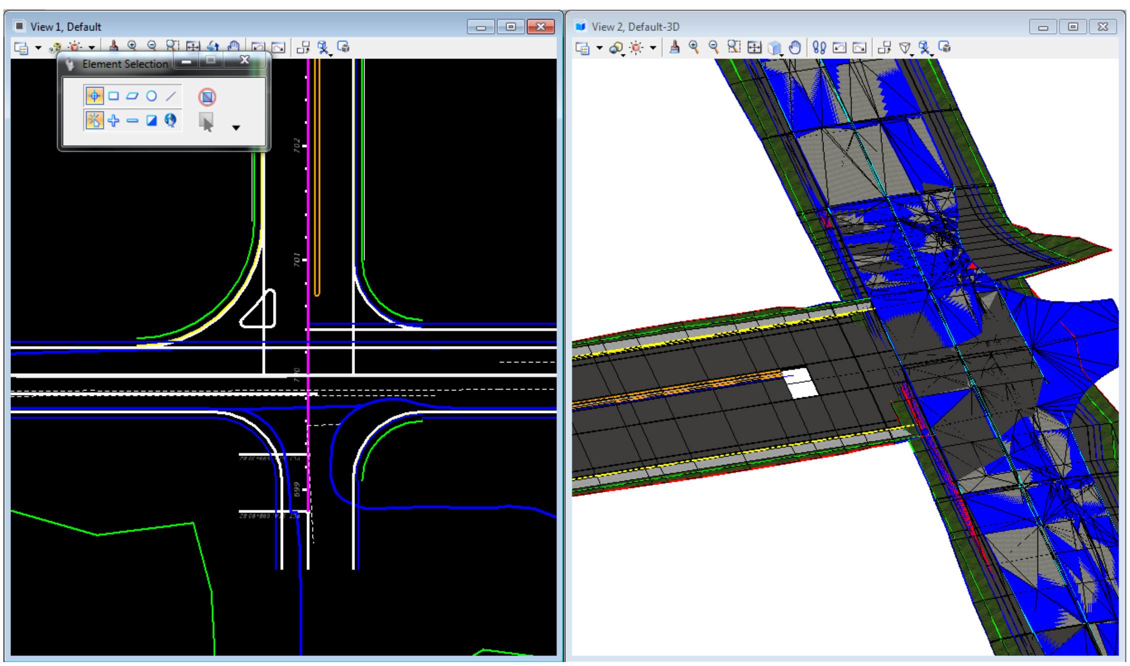
<OR> Create a MODLRD02.dgn file and create the intersection details in this file. Refer to Chapter 6 Corridor Modeling Planning.

➢ ***Turn OFF the Automatic Corridor processing of SR61.***

1. Select the **SR61 Corridor** *handle* to display the Context Menu and select **Lock - Deactivate Rule.**



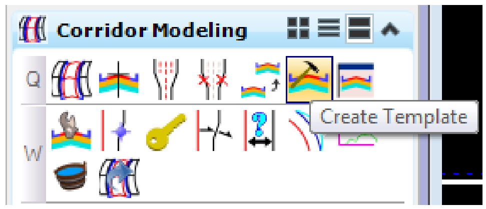
2. Select the *Function Key* **F2** to open the *Plan* and *Model Views* together. Zoom into the Intersection in both **Views 1** and **2.**



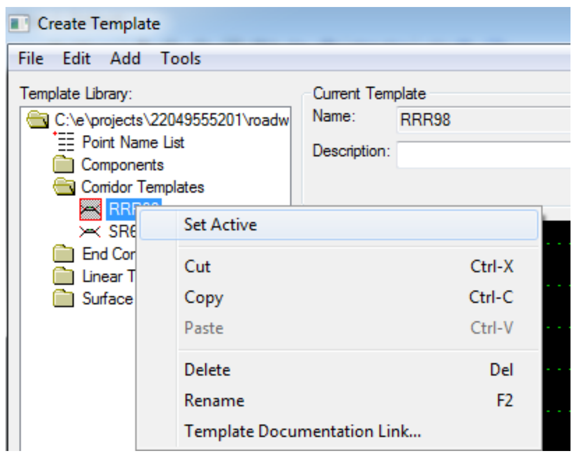
Exercise 9.2 Add a Component Switch to the RRR98 Template

This exercise adds a Component Switch to the RRR98 template to be used across the limits of the intersection. This switch is implemented using a Parametric Constraint on the BL98 corridor to turn off all the outside components for the corridor through the intersection.

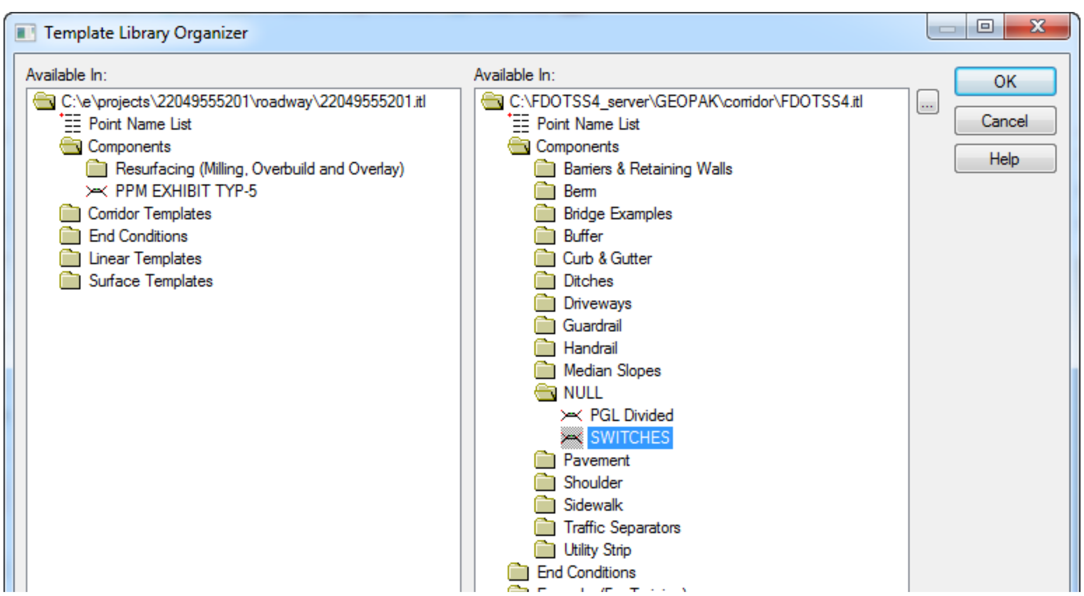
1. Use *Corridor Modeling*, **Create Template** tool.



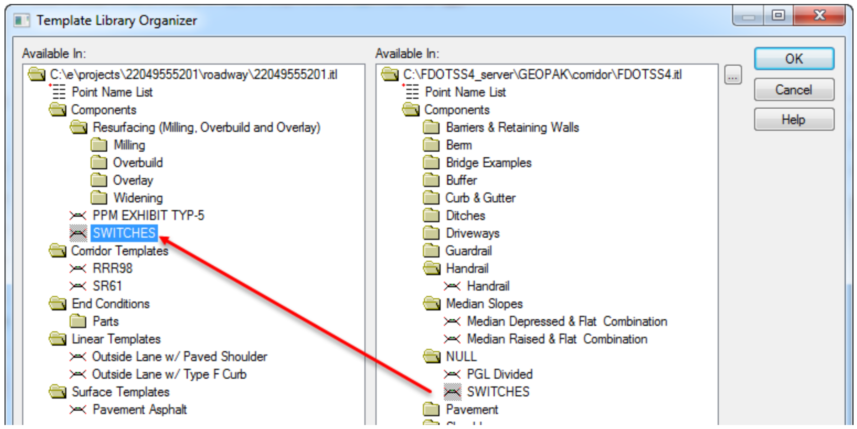
2. **Set Active** the *RRR98* template.



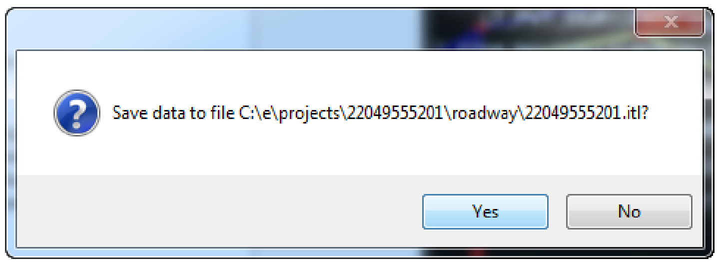
3. Using the Template Library Organizer, locate the **SWITCHES** template in the *FDOTSS4.itl* file



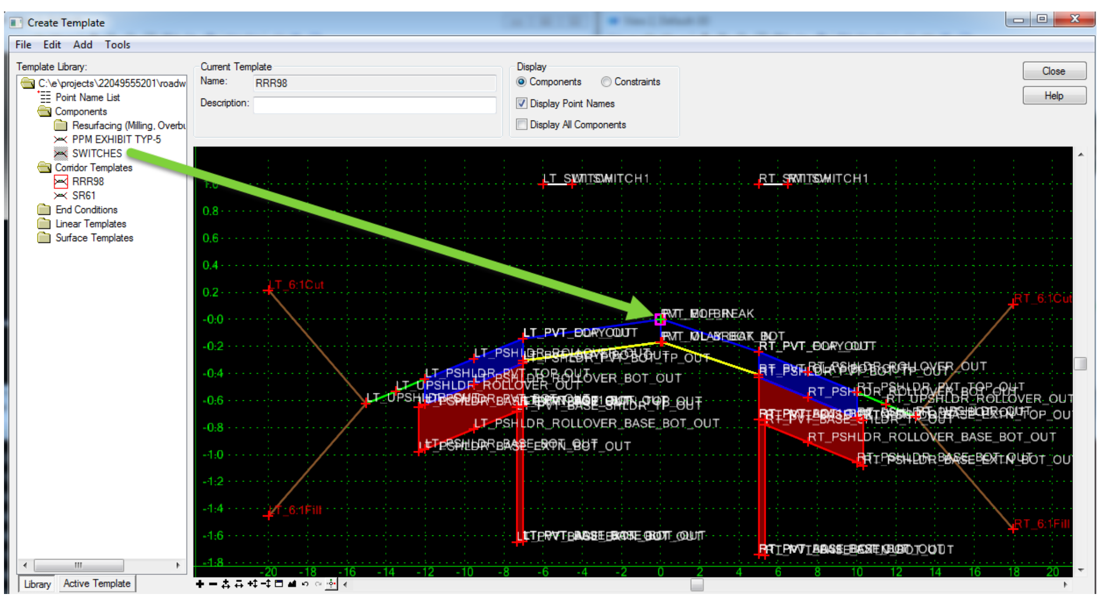
4. Drag the **SWITCHES** template to the project **Components** folder



5. Choose **OK** and choose **Yes** to Save the data to the project template library, *22049555201.itl***.**



6. With the *RRR98* template active, drag the **SWITCHES** template onto the center of the *RRR98* template



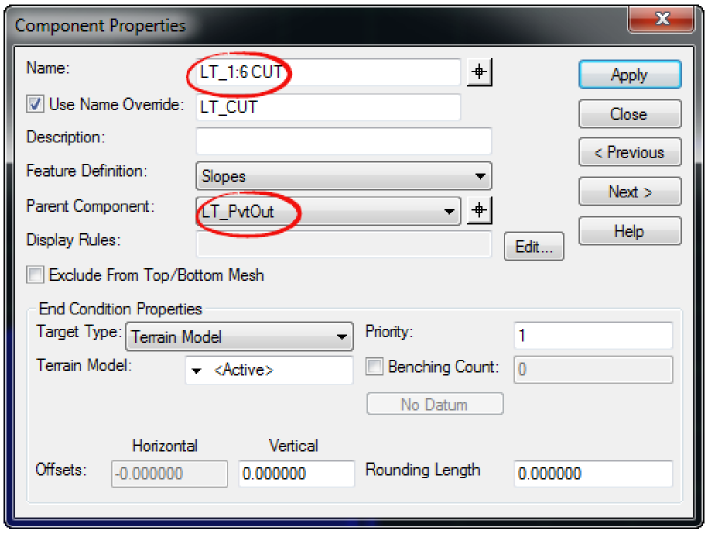
Note The switch template consists of two simple components left and right of the centerline. A label has been assign to the horizontal constraint value. Also, display rules have been created for when the value is 1,2,3,4, or 5. By assigning one of the rules to a component, the display of that component and all related components can be controlled based on the value of the switch.

➢ ***Create a Parent /Child relationship of all the Left side components.***

1. Open the Component Properties dialog for the **Left Cut Component**.

    a. Set the *Parent Component* by using the “pick icon” , select the **LT_PvtOut**.

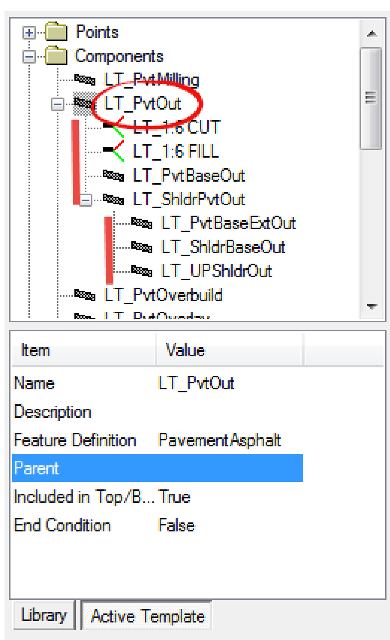
Note Use the wheel to zoom into the Left Widening **LT_PvtOut** component or select it from the list



    b. Choose **Apply** and **Close** the Component Properties dialog.

    c. Repeat this procedure for the Left Fill, and Left Shoulder components. The Unpaved Shoulder and Base components should already have a parent relationship which can be used.

2. Use the *Active Template* Tab to view the Component Relationships to the **LT_PvtOut.**

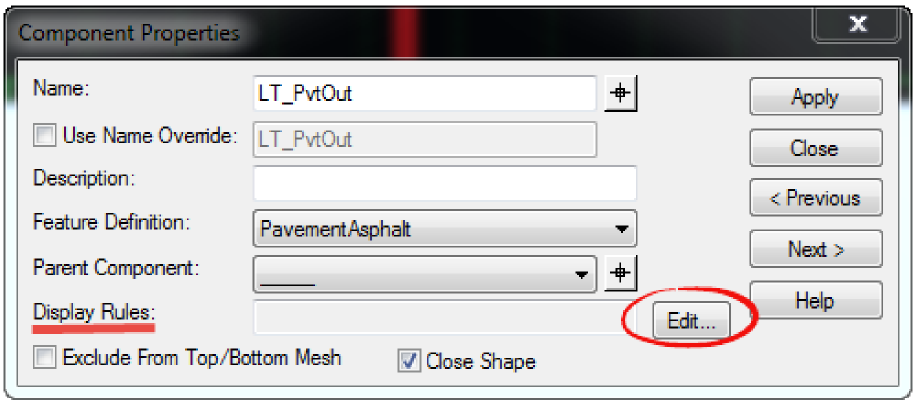


3. In the *Active Template* Component List, Right click on the **LT_PvtOut** Component and uncheck the **Display** option,

4. All of the left side components should turn off, Right click on the **LT_PvtOut** Component and toggle the **Display** back on.

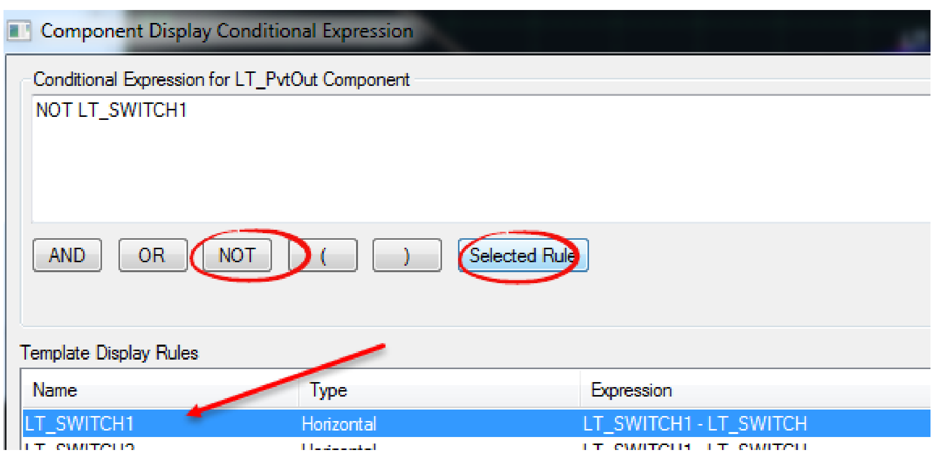
5. In the Active Template Component List, Right click on the **LT_PvtOut** Component and choose **Edit**.

6. From the Component Properties dialog, Select **Edit** on the Display Rules: field



   a. Select the *Template Display Rule* **LT_SWITCH1** rule from the list

   b. Build the *Conditional Expression* **NOT LT_SWITCH1** by clicking the **NOT** button and then **Selected Rule** button



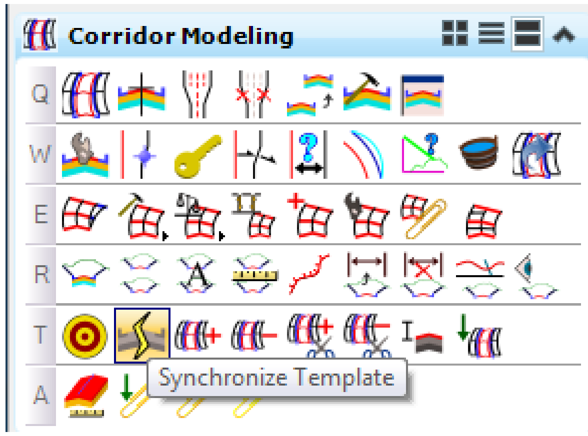
   c. Choose **OK**, then **Apply**, then **Close** to save the display rule to the component.

Note Adding the rule NOT SWITCH1 is telling the template left side "Not To Display If The Horizontal Distance Of The Switch Is The Value 1"

7. Choose **Close** and **Yes** to save change to exit the Create Template dialog.

➢ ***To update the Corridor with the Template changes.***

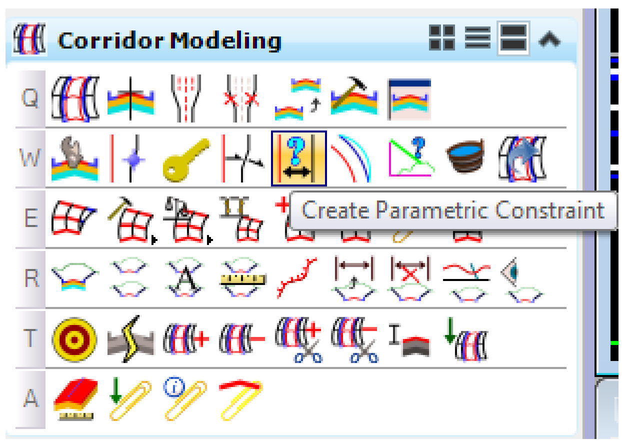
1. Use *Corridor Modeling*: **Synchronize Template** tool;



2. At the prompt, select the **BL98** *Template boundary*. The corridor will re-process with the updated RRR98 template.

➢ ***To implement the Switch, Add the Parametric Constraint***

1. Use *Corridor Modeling*, Create Parametric Constraint;



a. At the prompt, select the **BL98** *Corridor boundary*.

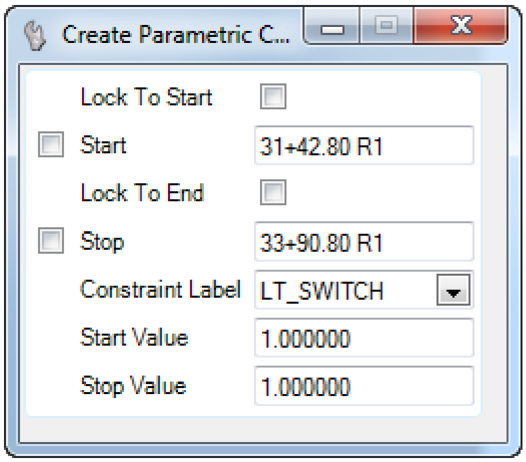
b. Snap to the **SW Radius** for the *Start Station*.

c. Snap to the **NW Radius** for the *End Station*.

d. Pick the **LT_SWITCH** *Constraint Label* from the list.

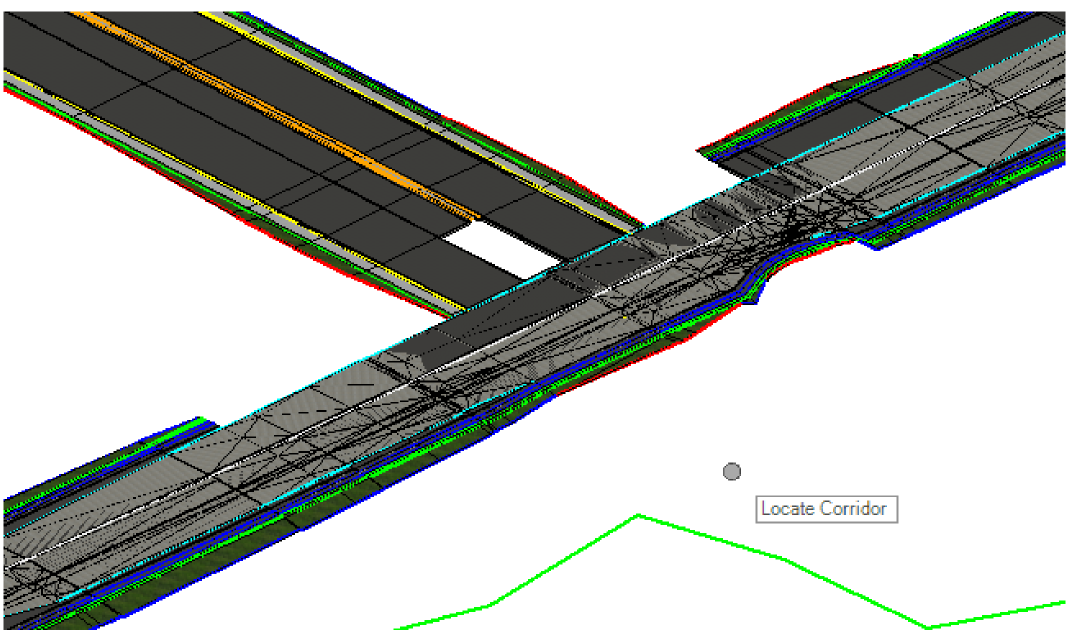
e. Enter **1** for the *Start Value*.

f. Enter **1** for the *Stop Value*.



g. The corridor will re-process with the updated RRR98 Template.

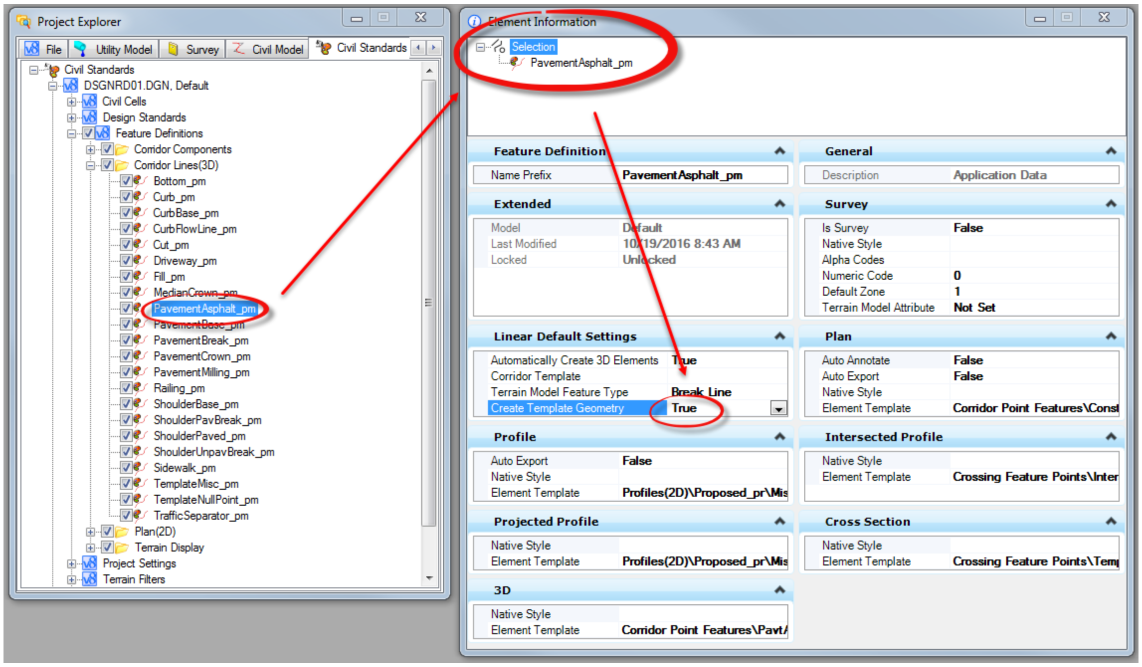
2. The left outside components of the *BL98* corridor are now turned off though the limits of the intersection.



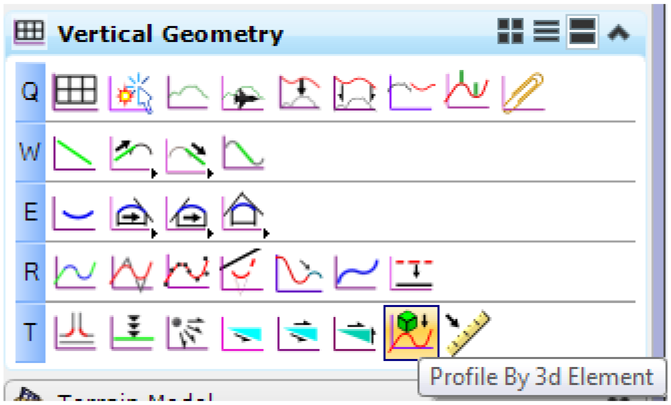
Exercise 9.3 Constructing Vertical Profiles from 3D Model Elements

This exercise calculates a Curb Profile between the two EOP Lines, from which it is constructed, in order to construct the Intersections Corners. However, first it's necessary to add the Model Line Profiles back onto the 2D elements.

Important! *FDOTSS4 – with the MR2 release, we have implement 2D Lines from the 3D model. In Project Explorer change the PavmentAsphalt_pm feature property to True as shown below. Then re-process each corridor to see the resulting construction lines. These lines have profiles and can be used in lieu of the steps outlined in the exercise.*

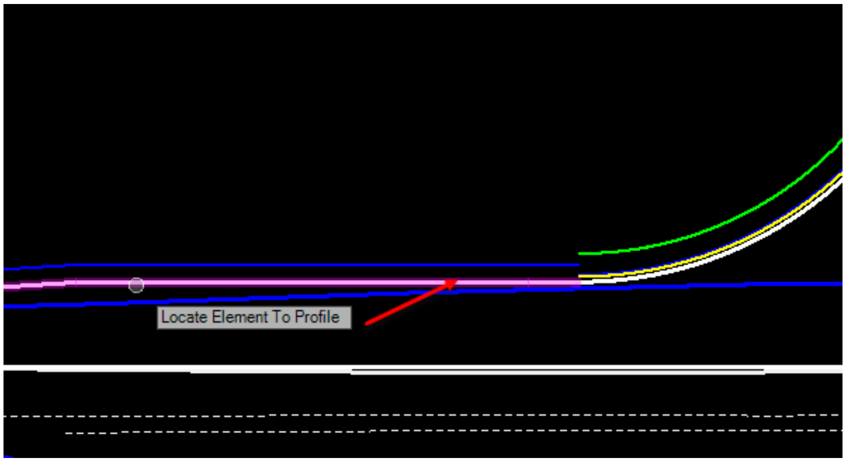


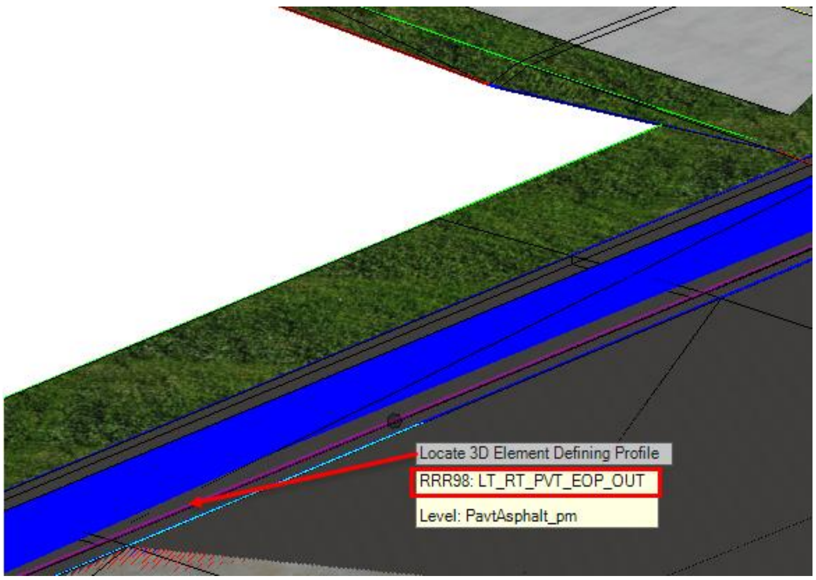
1. Use the *Vertical Geometry*, **Project Profile by 3D Element** tool.



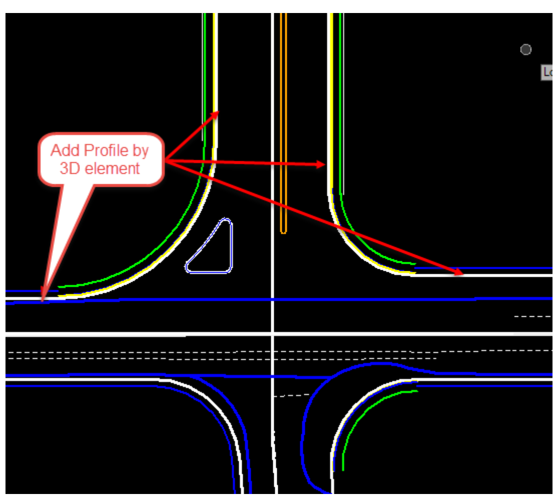
2. At the prompt select *plan Line* **PavementAsphalt(EOPA)**.

3. From the *Model*, select the **PavtAsphalt_pm** *Line* representing the outside *RRR98 EOP* in the Model.





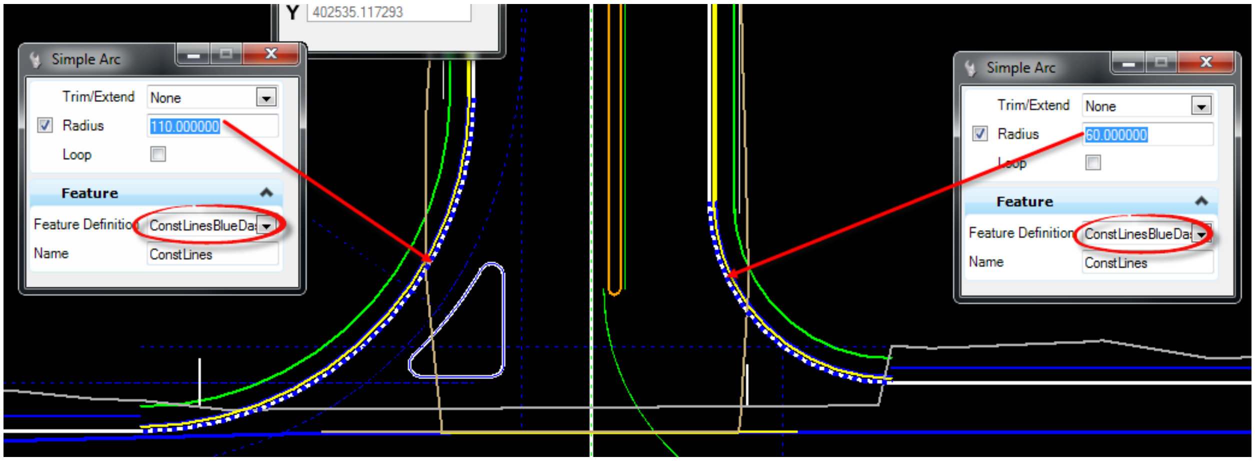
4. Repeat for all 4 lines shown below.



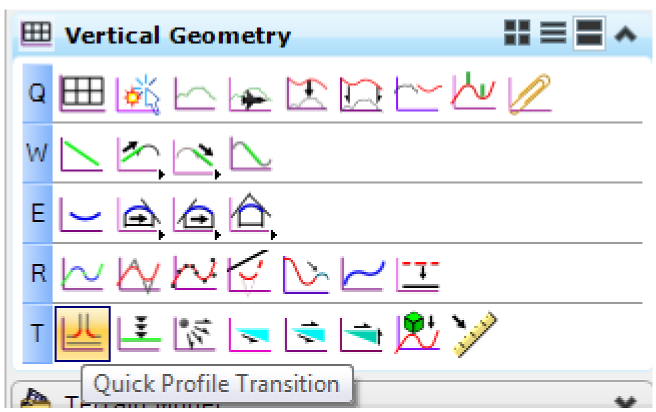
Exercise 9.4 *Construct 3D Radius Lines*

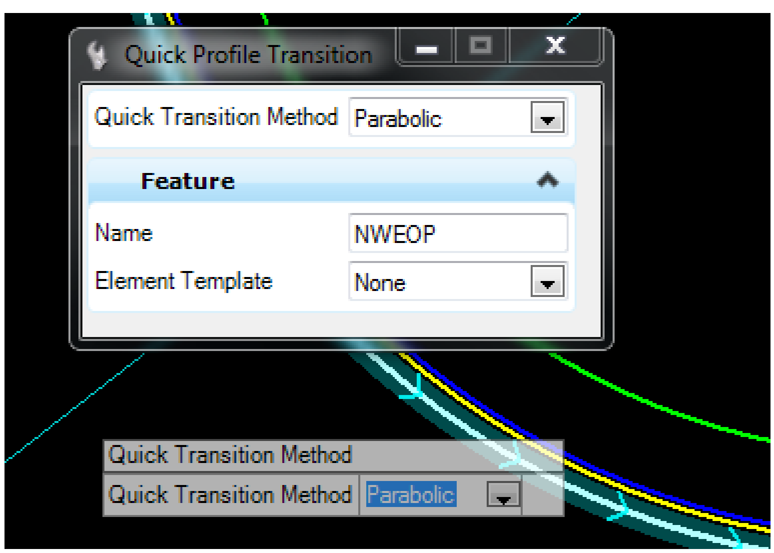
1. **First:** Use the **Horizontal Geometry Simple Arc** tool to create new **Construction Line Blue Dash** features between the two *PavementAsphalt EOP* edges on both corners. Use **110’** and **60**.

Note Note that these will be used to help create automatic profiles for the 3D lines on the Radii.

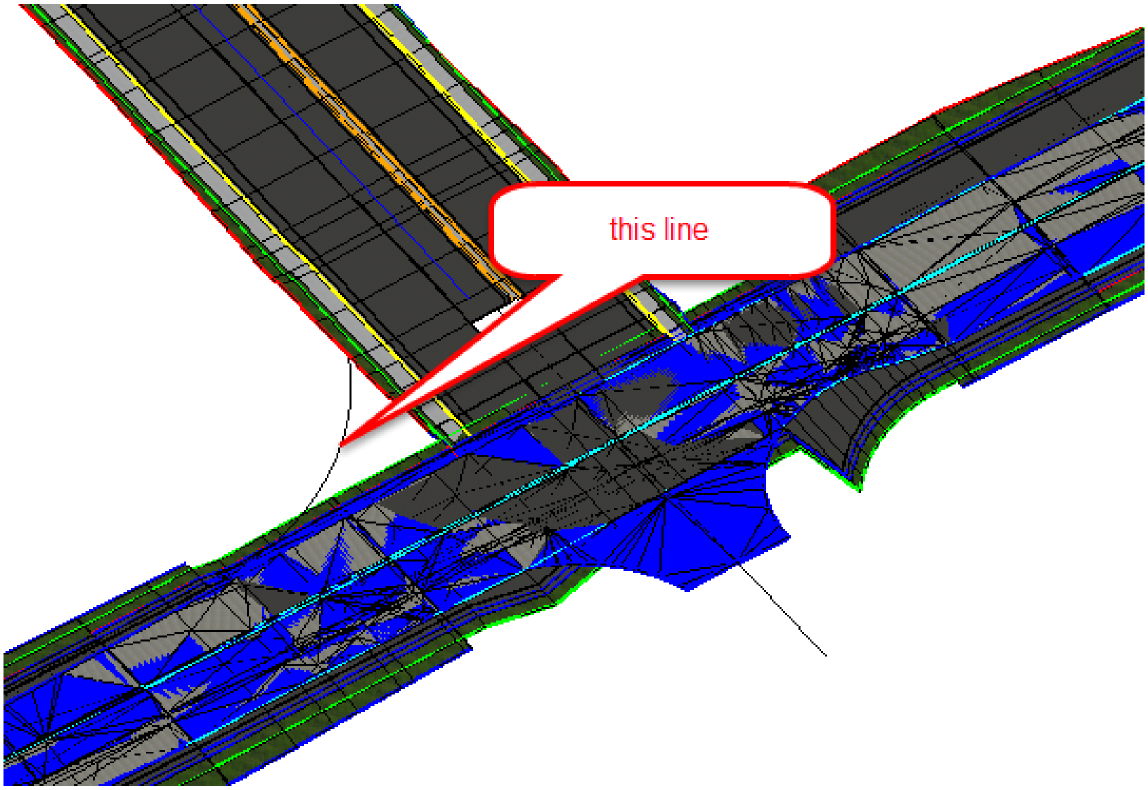


2. Use *Vertical Geometry*, **Quick Profile Transition** tool.

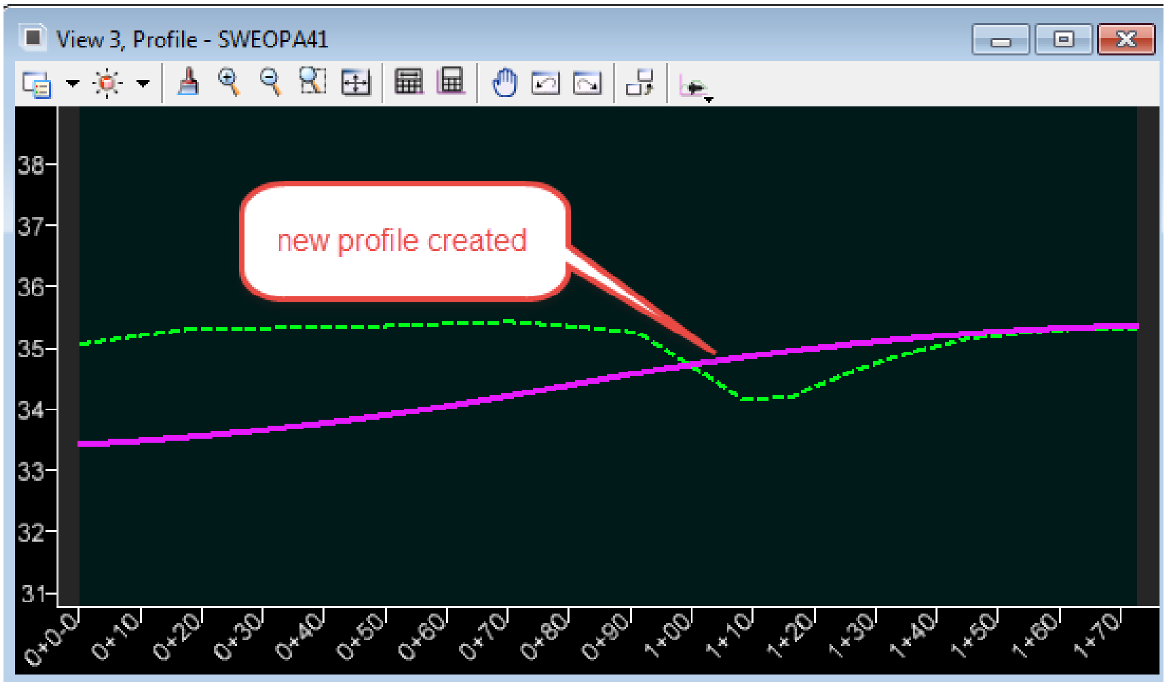




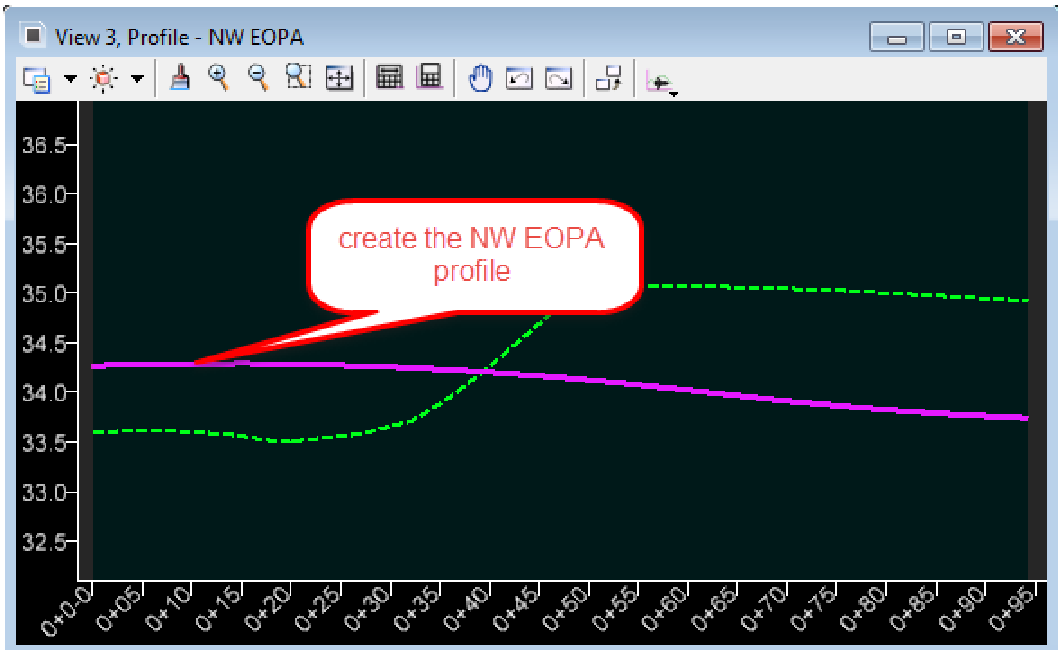
3. Accept the **Parabolic Quick Transition** *Method*, enter **SW_EOP-Pr** and select the *construction line* **Radius Line** create from above. A 3D element should display.

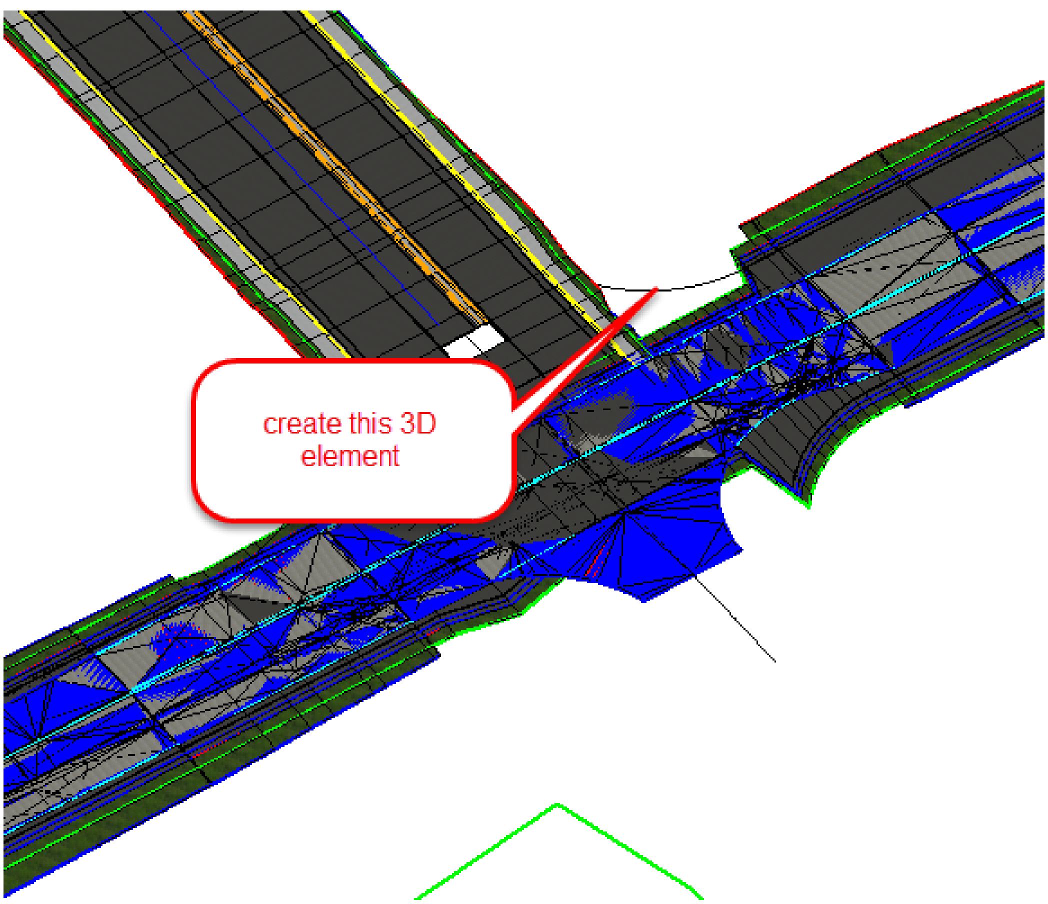


4. Open the *Profile View* for the **SW EOP Curve Radius**.



5. Repeat the same steps above to create a *Profile* for the **NW_EOP-Pr** *Line*.

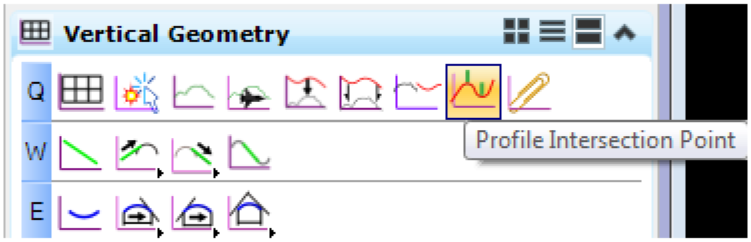




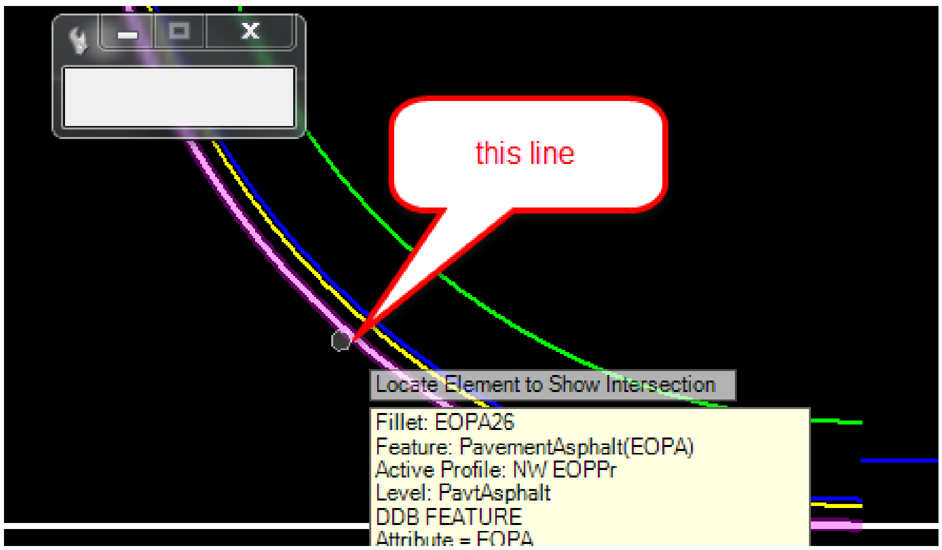
6. (Alternative to using the Parabolic Option) Follow the next steps.

   a. Open the Profile Model of the **Radius Element.**

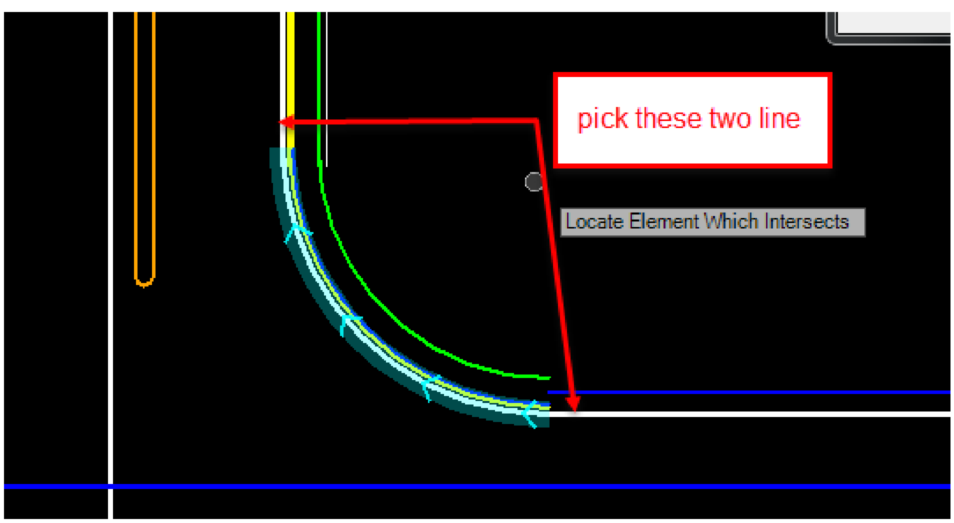
   b. Use *Vertical Geometry*, **Profile Intersection Point** tool.



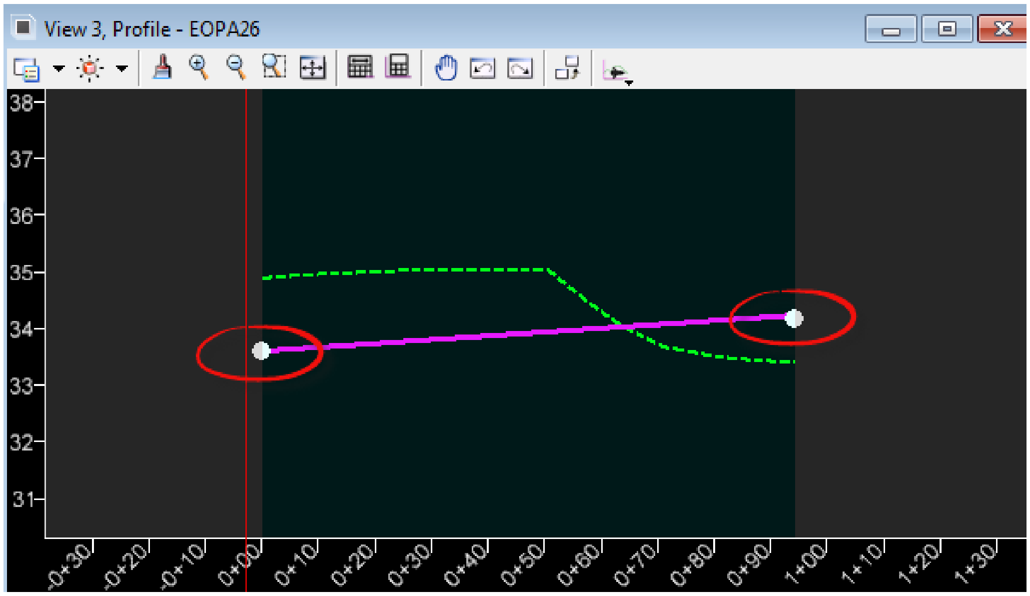
   c. Select the **NW PavementAsphalt(EOPA)** *Radius Line* as the *Element to Show Intersections.*



   d. Select the *Right SR61* **EOP** and *Right Turn Lane* **PavementAsphalt(EOPA)** *Lines* respectfully.

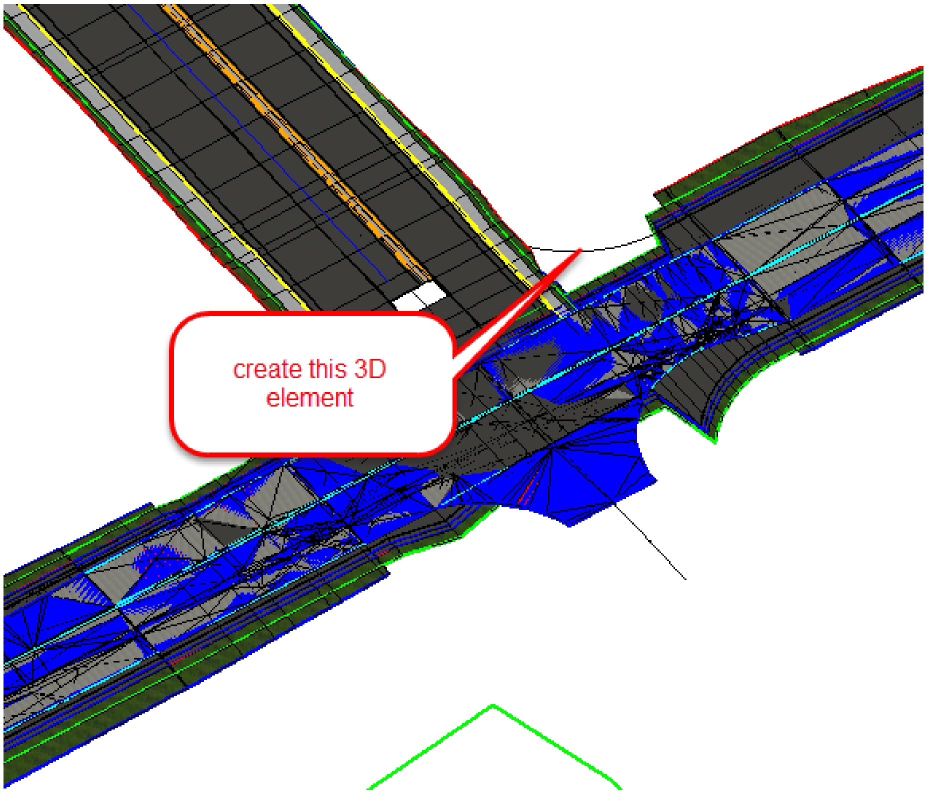


e. Two white location points will display on the Profile View.



f. Use *Vertical Geometry*, **Profile Line between Points** tool and snap to the two **Intersection Points** on the *NW Profile View*.

g. Select the new **Profile Line.** Select the **Set Active Profile** from the Context Menu and the *3D Line* will display.

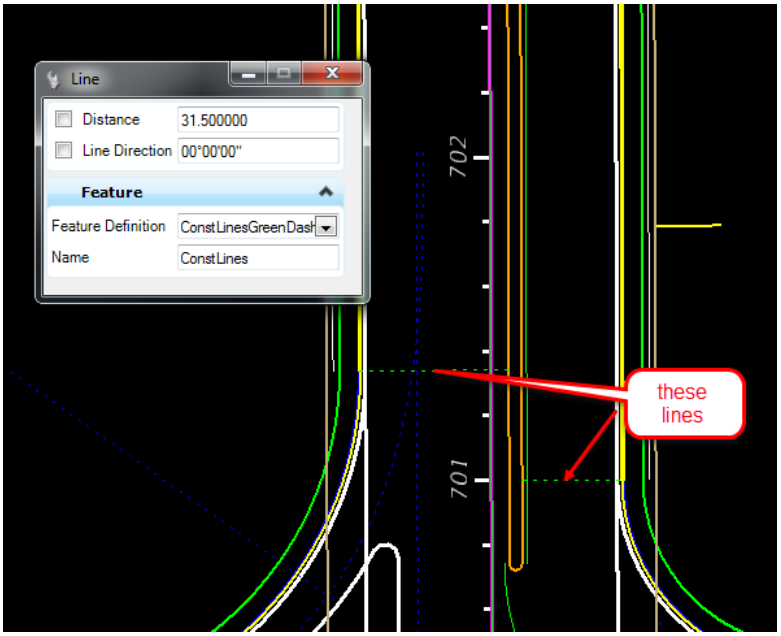


Exercise 9.5 Construct 3D Intersection Limit Lines

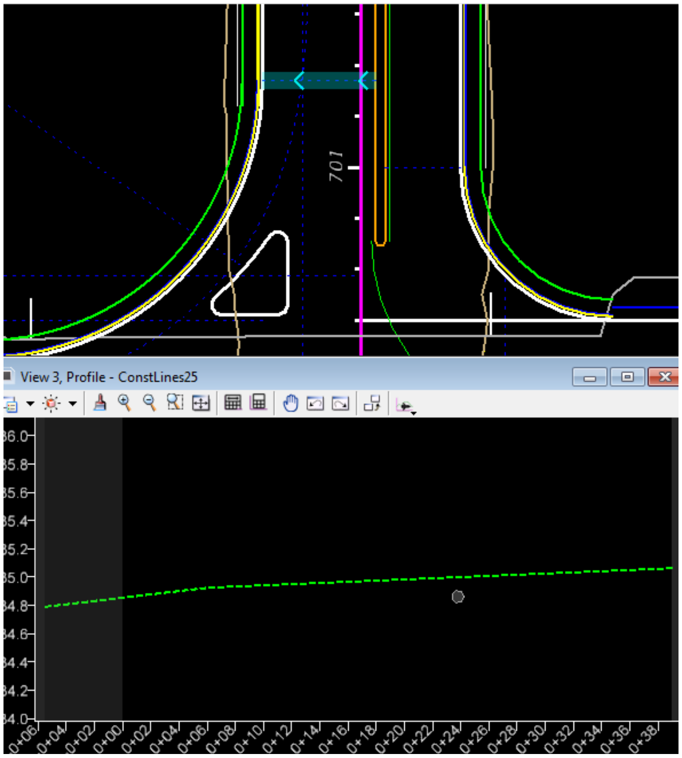
1. Use *Horizontal Geometry*, **Line between Points** tool.

    a. Use the *Feature Definition* **ConstLinesGreenDash.**

    b. Construct a line perpendicular to the *Traffic Separator lines* and ends at the *Radius EOP* across both Roadways *left* and *right*.

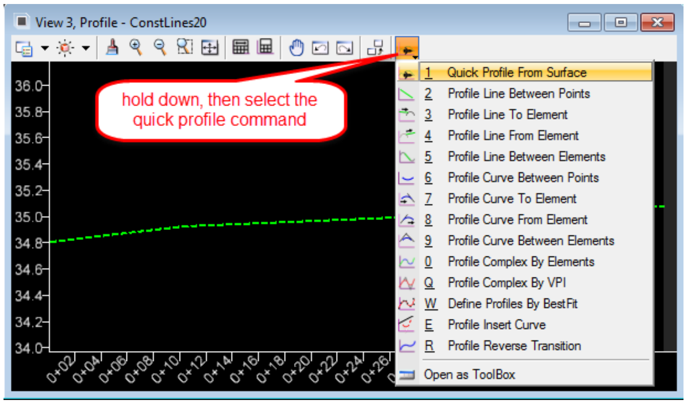


2. Use the *Vertical Geometry*, **Open Profile Model** and select the newly constructed line.

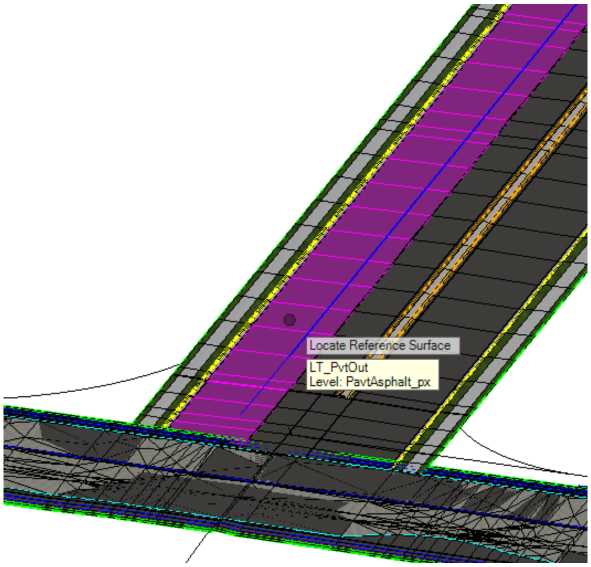


3. On the Profile window, hold down the last icon until a drop down menu displays.

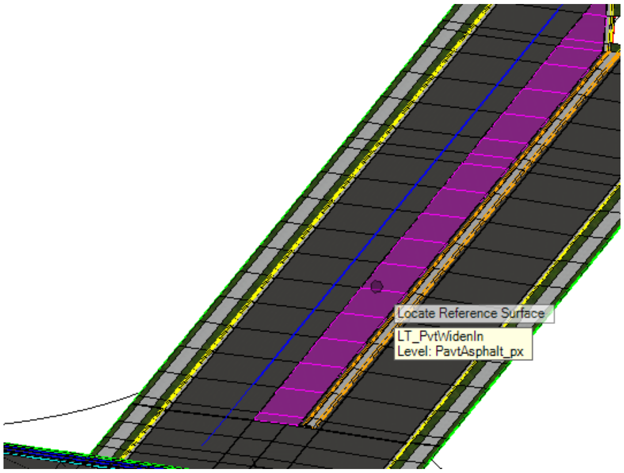
    a. Select the Quick Profile from Surface command.



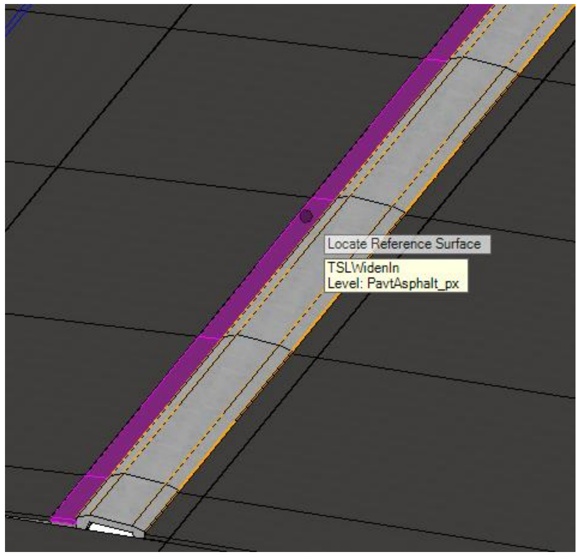
    b. At the prompt, first select the **LT_PvtOut** *Surface* in the *3D Model*.



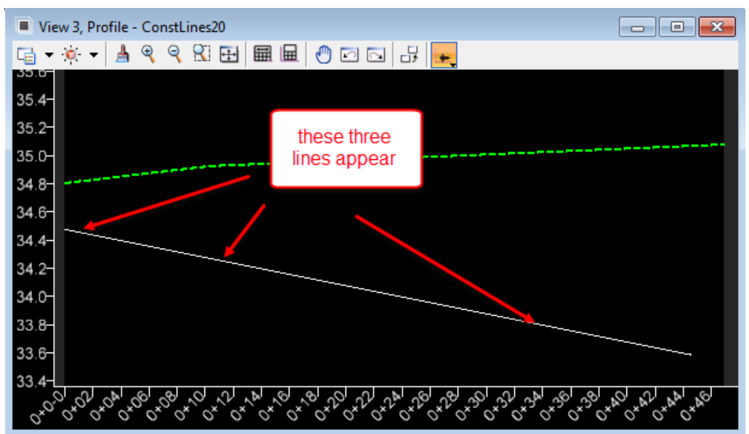
    c. Then select the **LT_PvtWideneIn** *Surface*.



d. Continue to add the **TSWidenIn** *Surface*.

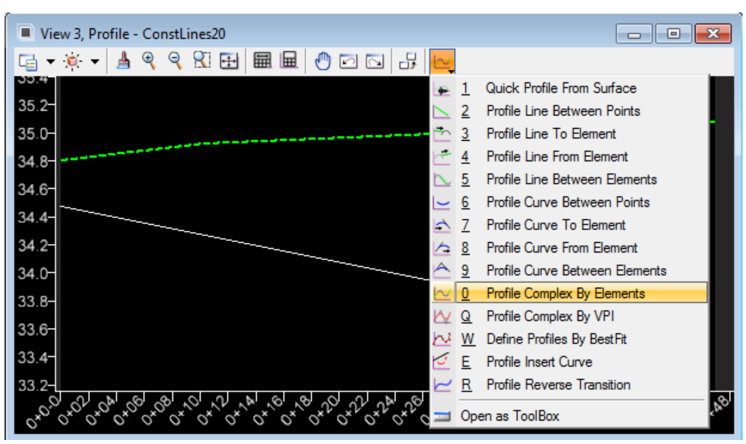


e. Data point to accept.

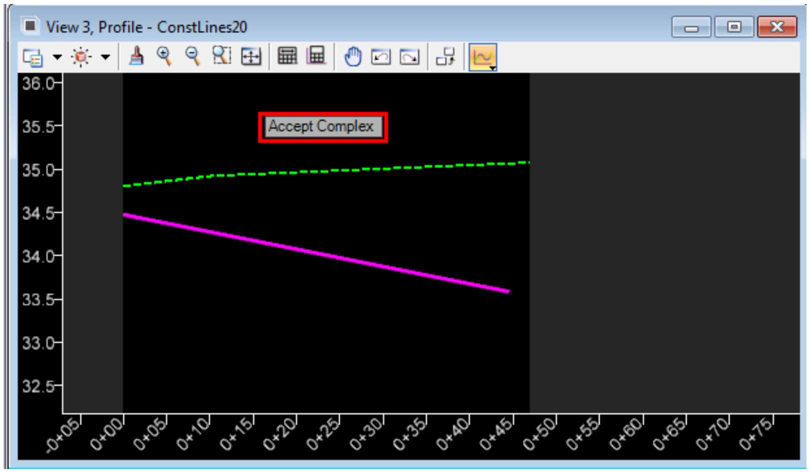


4. On the Profile window, hold down the last icon until a drop down menu displays.

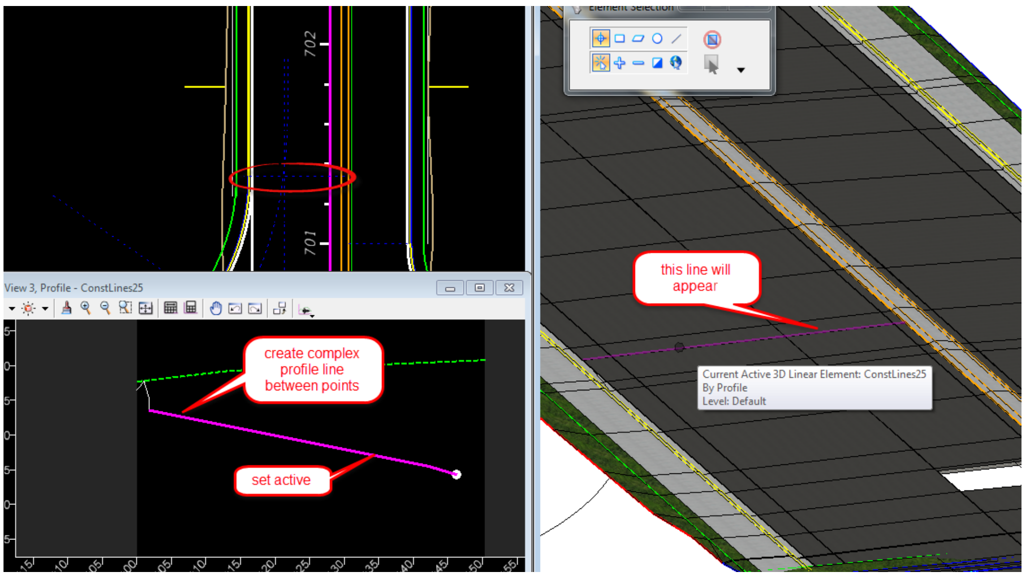
a. Select the Profile Complex By Elements command.



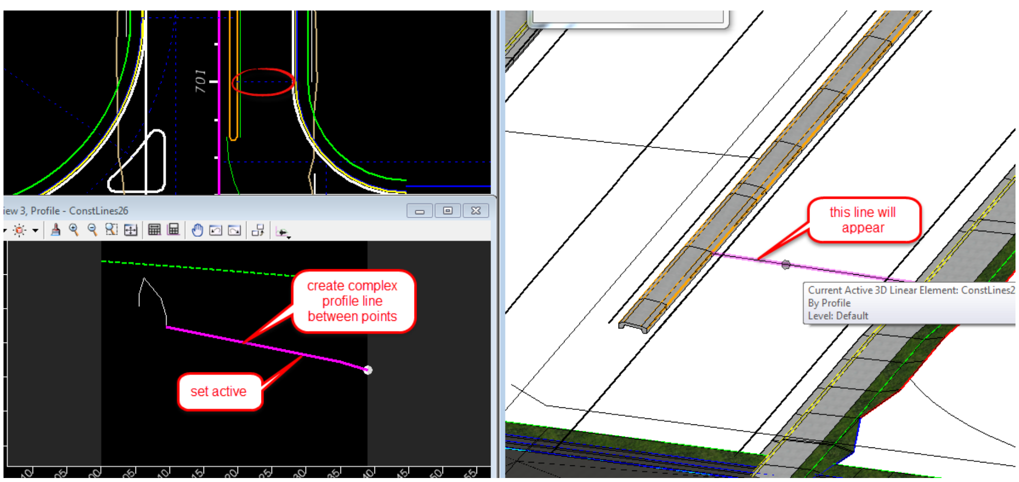
b. At the prompt, select the **first segment** and data point to accept Profile.



5. Use *Vertical Geometry*, **Set Active Profile**.



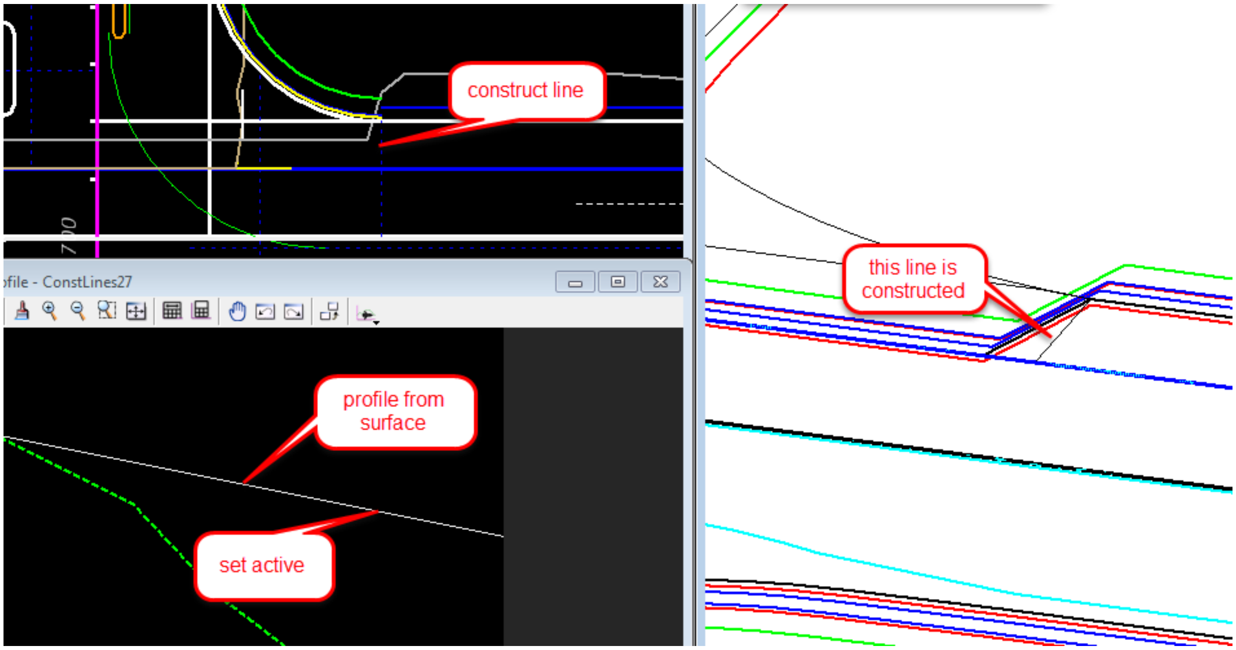
6. Repeat these steps for the other **Intersection Limit** *line*.



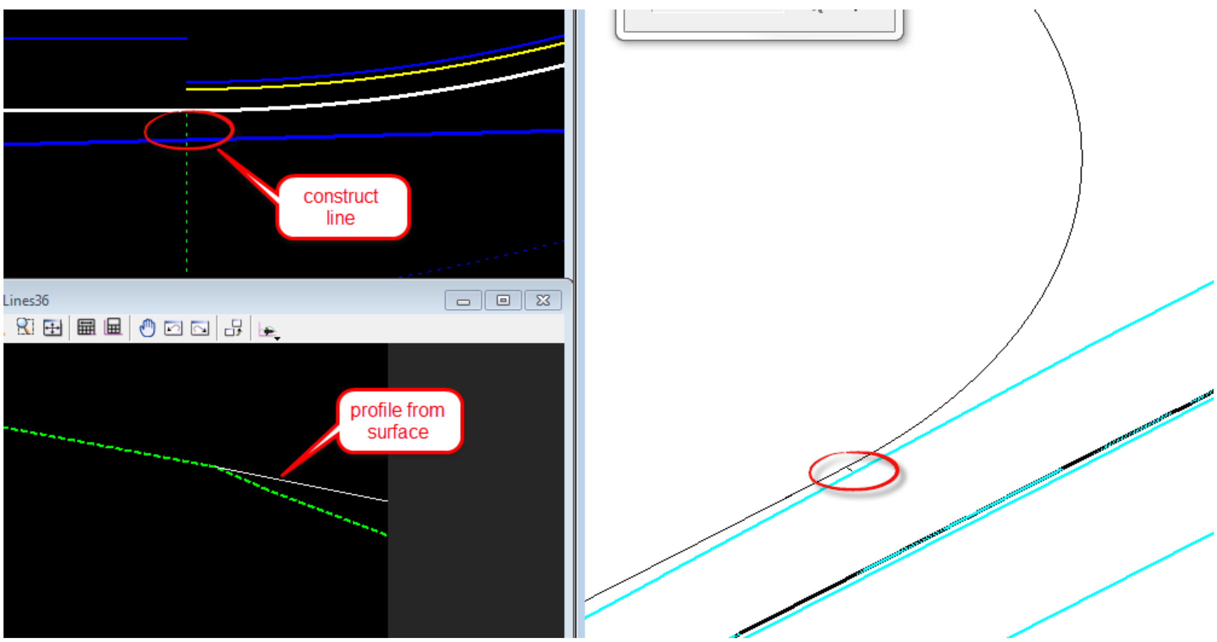
7. Construct an element across the *Right Turn Lane* from the **EOP** to the **ML** line at the *Radius Point* on the NW corner of the Intersection.

   a. Use *Vertical Geometry*, Profile from Surface tool and select the Right Turn Pavement Component.

   b. Use *Vertical Geometry*, **Set Active Profile**.



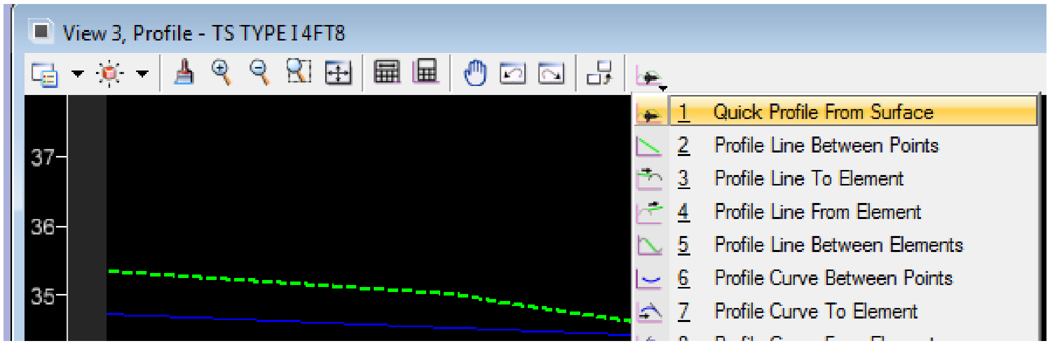
8. Repeat these steps to create the **3D line** on the opposite side.



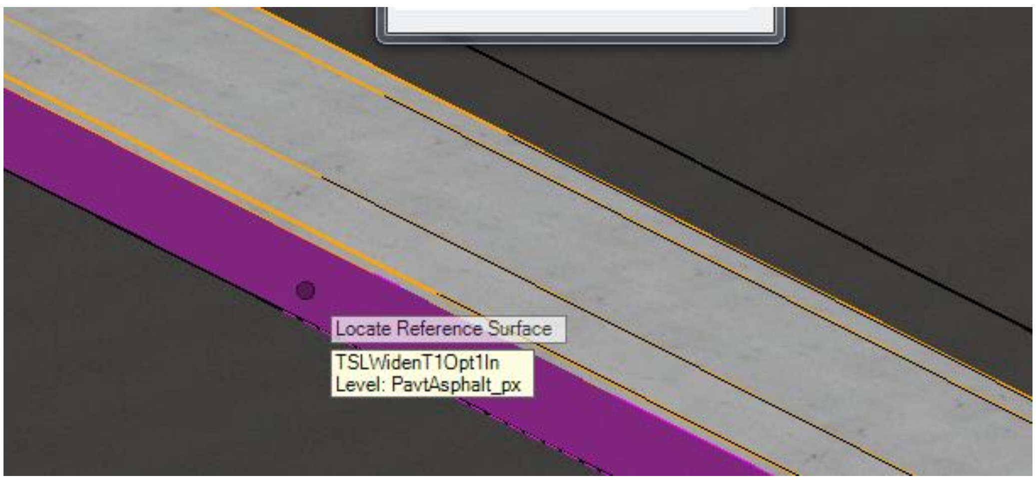
➢ *Add Profile to Traffic Separator Lines in Plan*

1. Open the *profile view* for the **Traffic Separator** line

2. From the *profile view*, select the *Vertical Geometry*, **Quick Profile from Surface** tool.



3. At the cursor prompt, select the *pavement surface*, **TSWidenT1Opt1In**, in the 3D model, *view 2*.

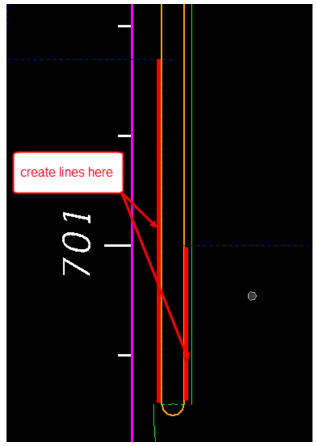


4. Repeat this for the opposite **Traffic Separator** *element*.

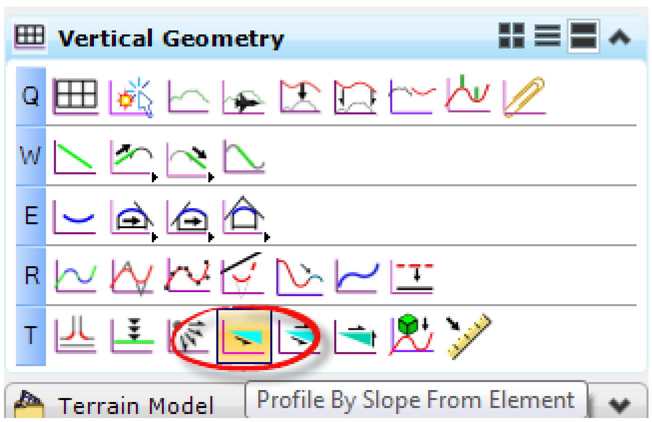
5. Construct lines using *Horizontal Geometry*, **Single Offset Partial** on either side of the *Traffic Separator*. Use **.08 feet** *Offset*, **1 inch**.

   a. *Start* the line at the end of the **Traffic Separator** and *Stop* at the **Intersection Limit Construction** line.

b. Repeat this for both sides.

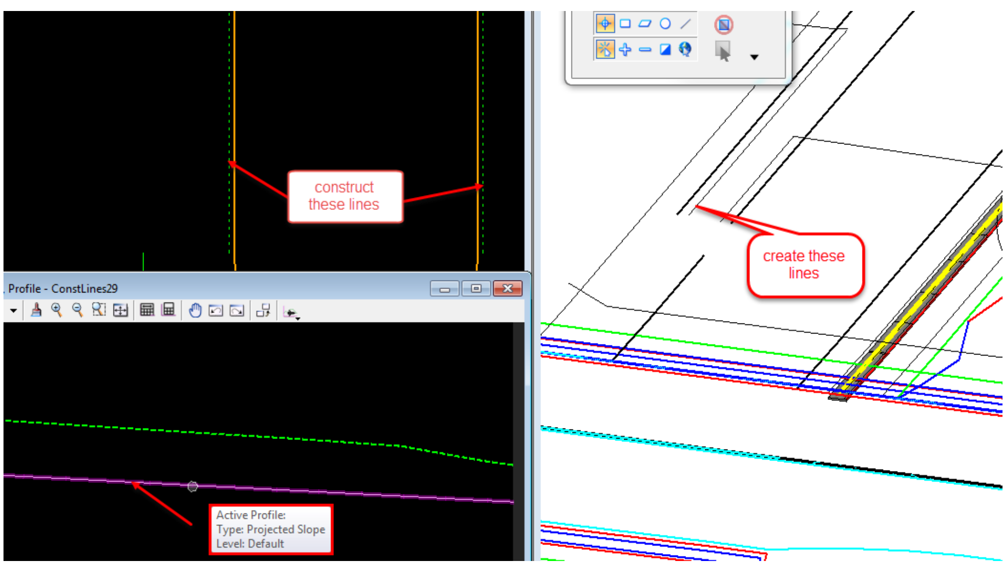


6. Use *Vertical Geometry*, **Project Slope from Element** tool.



a. Project a Profile on the lines from the **Traffic Separator Profile**. Use **0%** *Slope*.

b. Select the *line* and select **Set Active Profile** from the Context Menu.

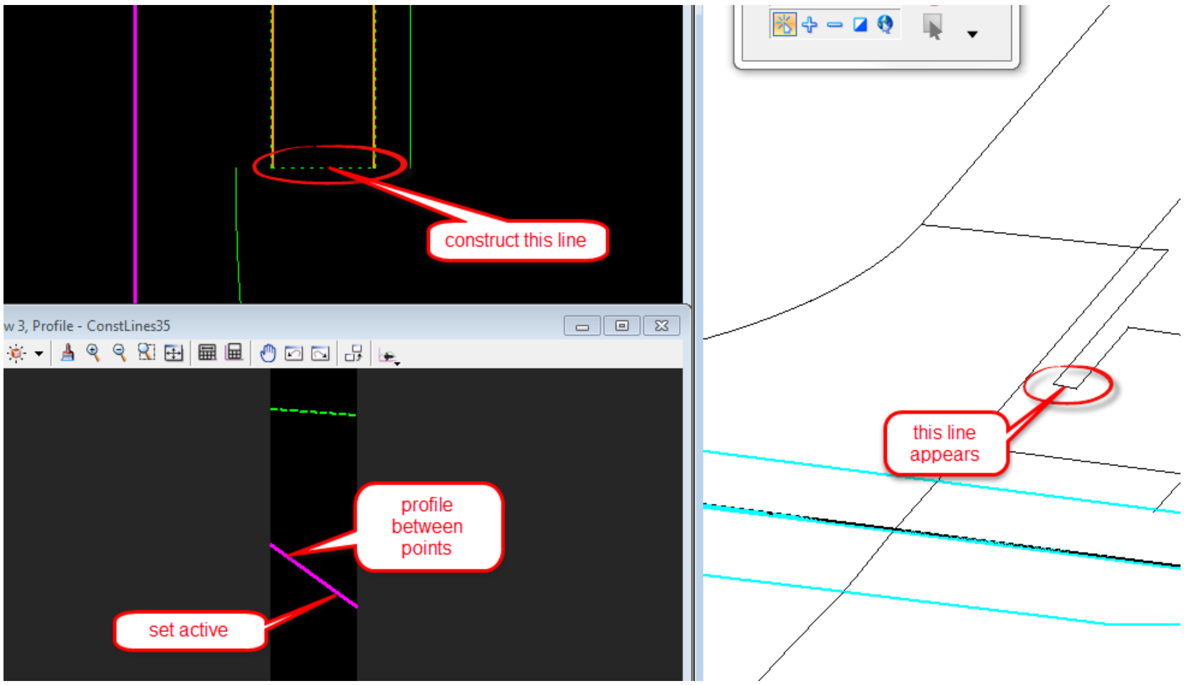


7. Delete the **Traffic Separator Nose** *Radius Line*. It will be created later with a Civil Cell.

Note It may need to be dropped from the Left Turn with TS Civil Cell.

8. Construct a **Line** across the *Traffic Separator Offset Ends*.

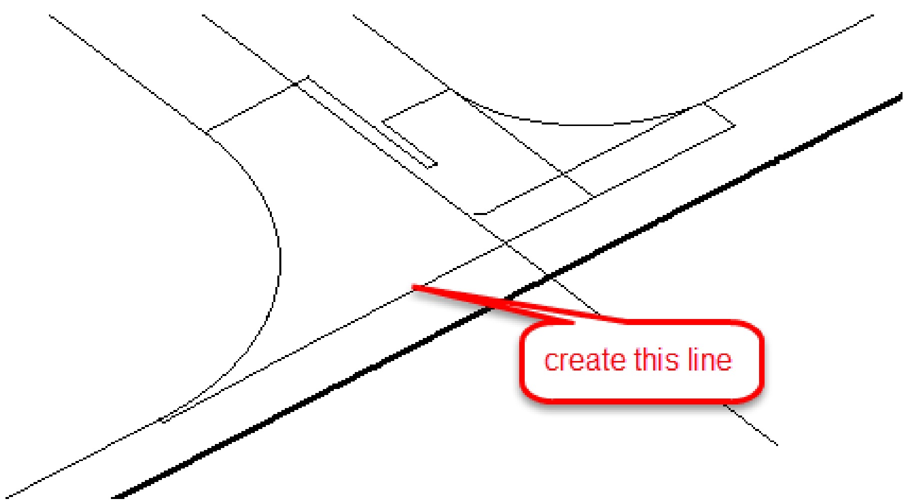
9. Create a **Profile** from the elements that intersect. Set the **Profile** as *active*.



10. Create a **3D Line** across the *Intersection from Radius to Radius*. This will close the Intersection boundary.

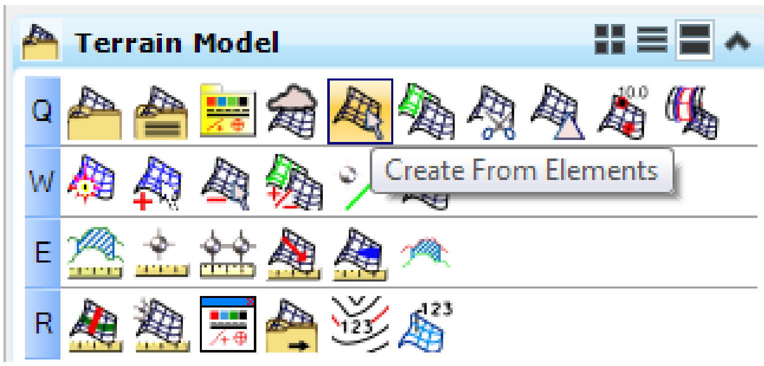
11. Construct the **Line** across the *Intersection*.

HINT Use Single Offset Partial for the Horizontal, and Profile from Element for the Vertical.

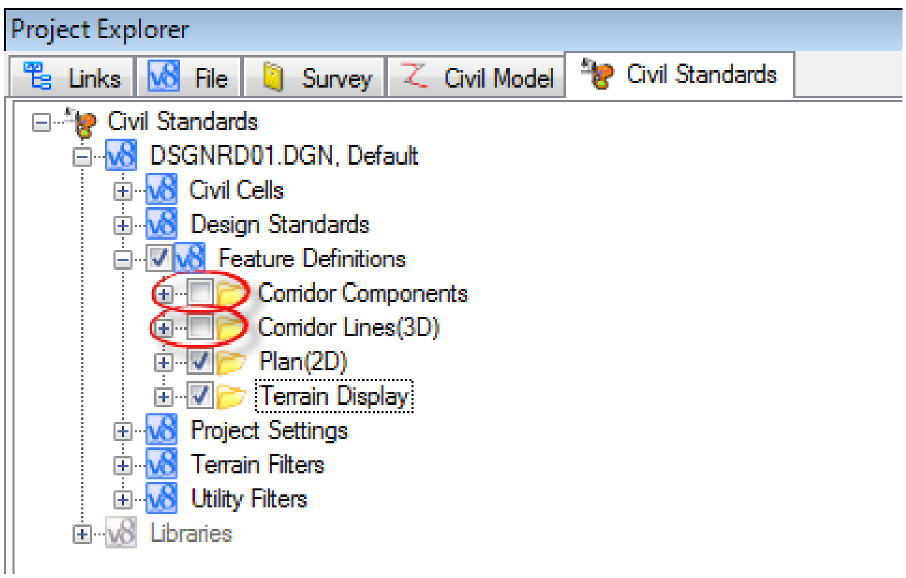


Exercise 9.6 Build the Intersection Terrain from 3D Elements

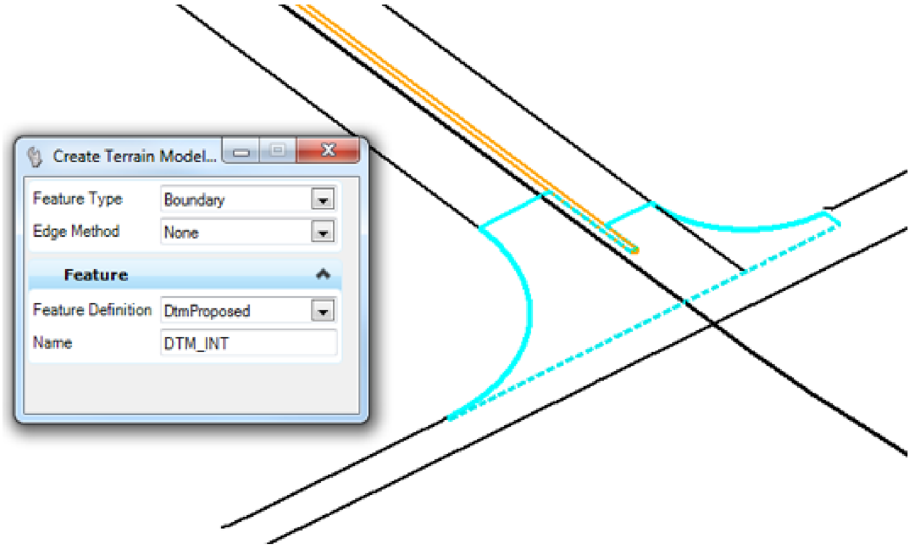
1. Use *Terrain Model*, **Create from Elements** tool.



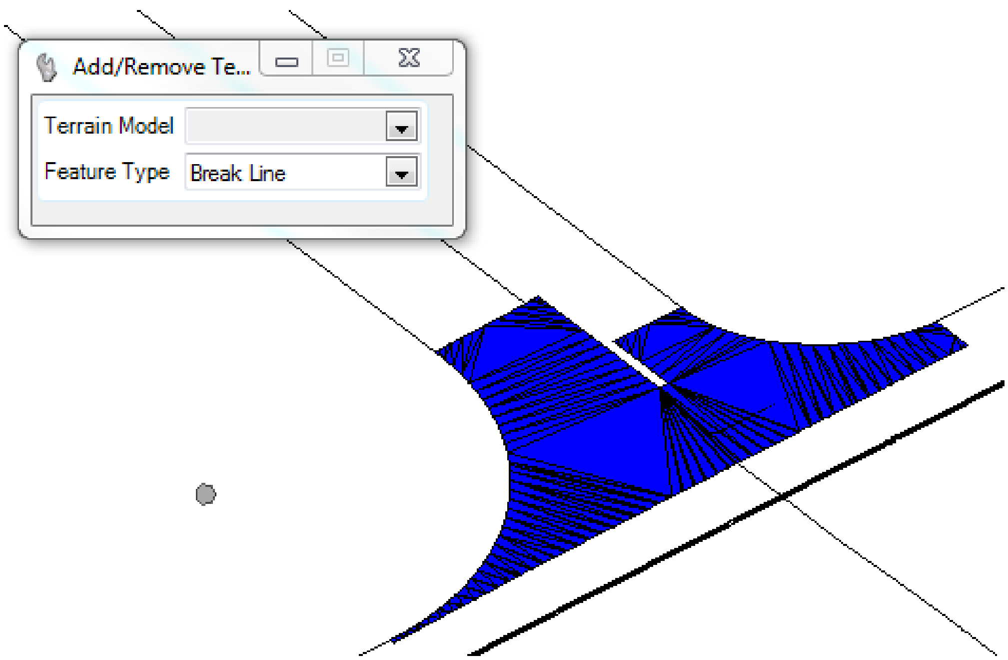
2. Select the **3D Model View** to set active and using the Project Explorer, **Civil Standards**: Turn **OFF** the **Corridor Components** and **Corridor Lines(3D)**



3. Select the boundary elements for the intersection.



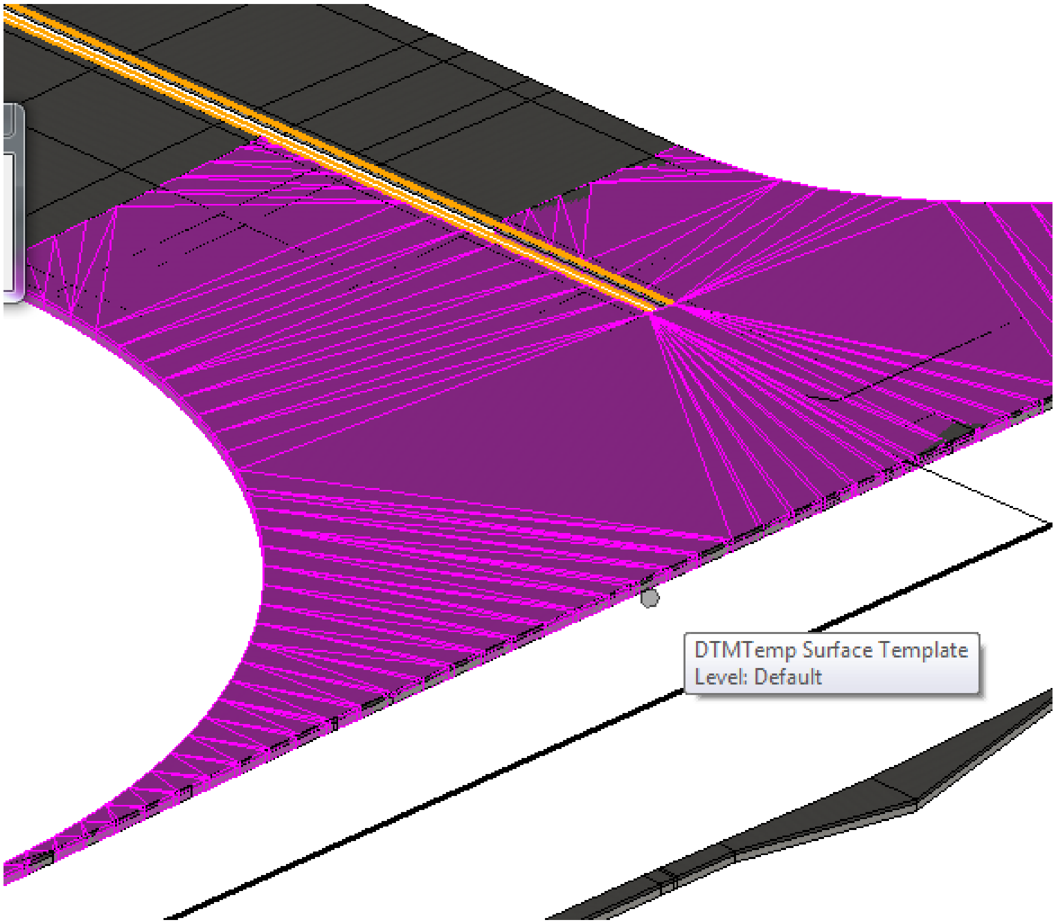
4. Data point to accept.



Exercise 9.7 Create an Intersection Pavement Surface

1. Use *3D Geometry*, Apply Surface Template.

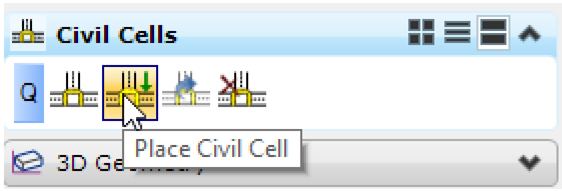
2. Select a **Pavement Surface** *Template* from the *Template Library* and select the **Intersection Terrain** to create pavement.



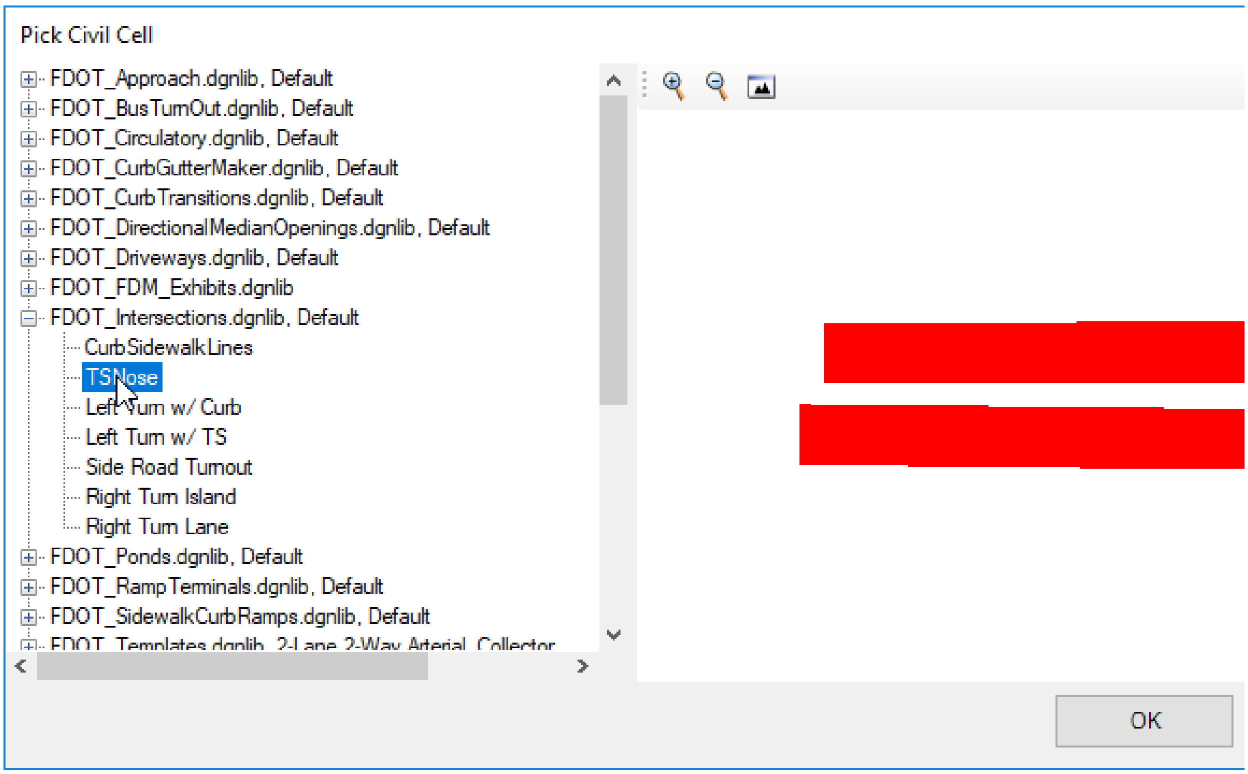
Exercise 9.8 Traffic Separator Nose

1. In Project Explorer change the Traffic Separator_pm feature property Linear Feature Properties to *True* as shown in Exercise 9.3. Then re-process each corridor to see the resulting construction lines. These lines have profiles and can be used for the steps outlined in this exercise.

2. To add the *Traffic Separator Nose* use the **Civil Cell Place Civil Cell Tool.**



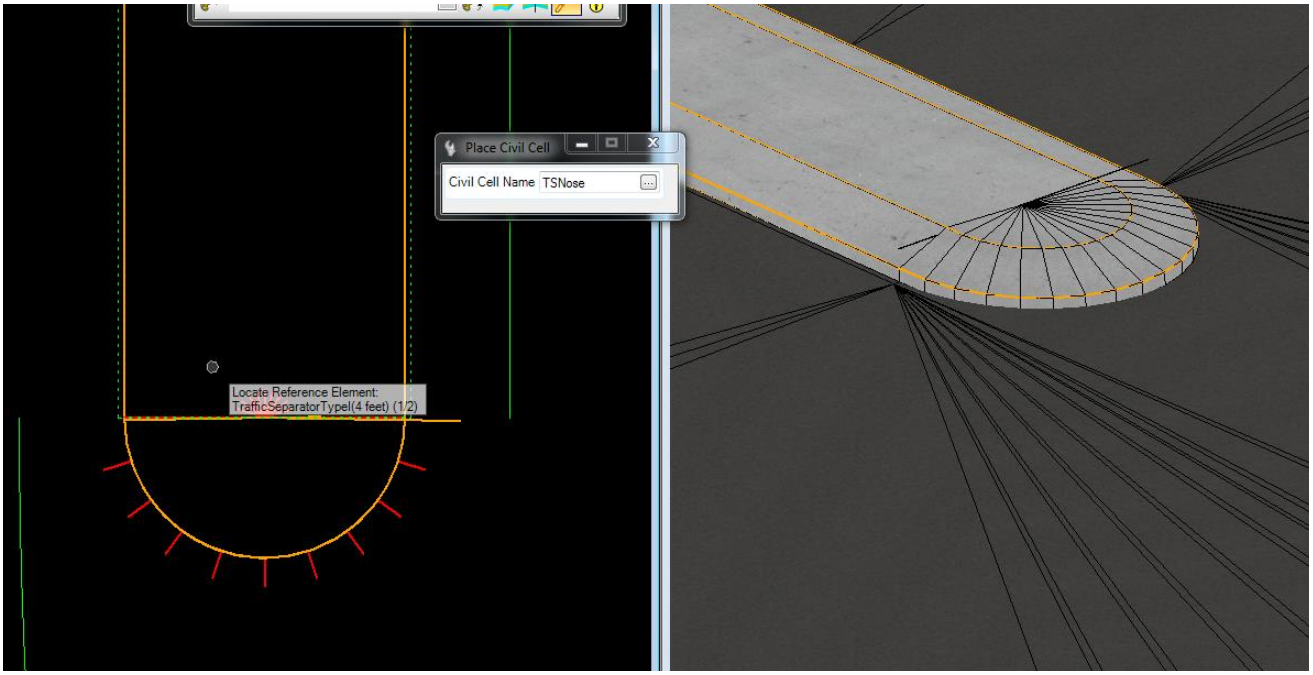
3. Select the **TSNose** *Civil Cell*.



4. Select the **Right Side** of the *Traffic Separator_pm* in the Plan View, then select the **Left Side** of the *Traffic Separato_pm*. These magenta line have profiles attached either from the model.

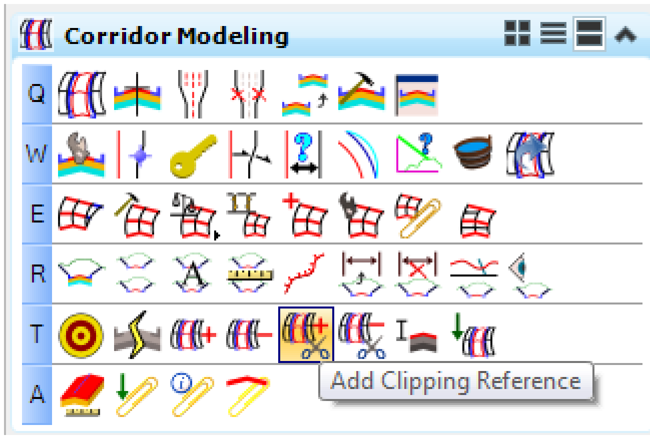
5. While hovering over each of the Reference lines, change the *Reference Line* **direction arrow(triangle)** on both elements until it fits on the lines.

6. Data point to accept.

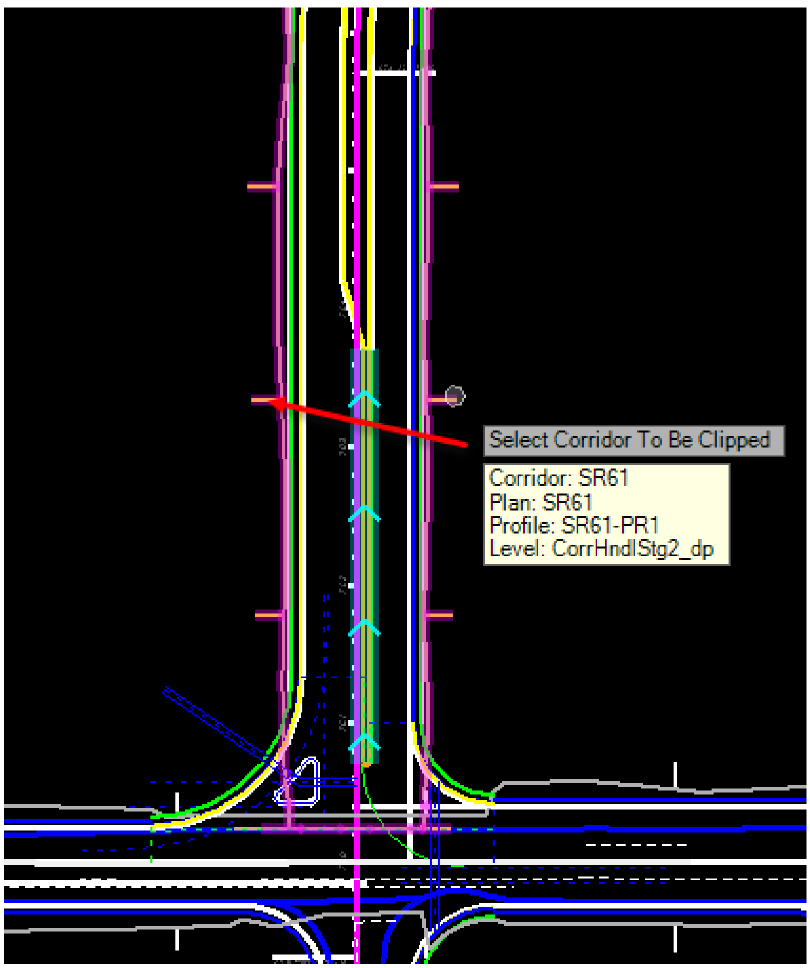


Exercise 9.9 ***SR61 Corridor Clipping References***

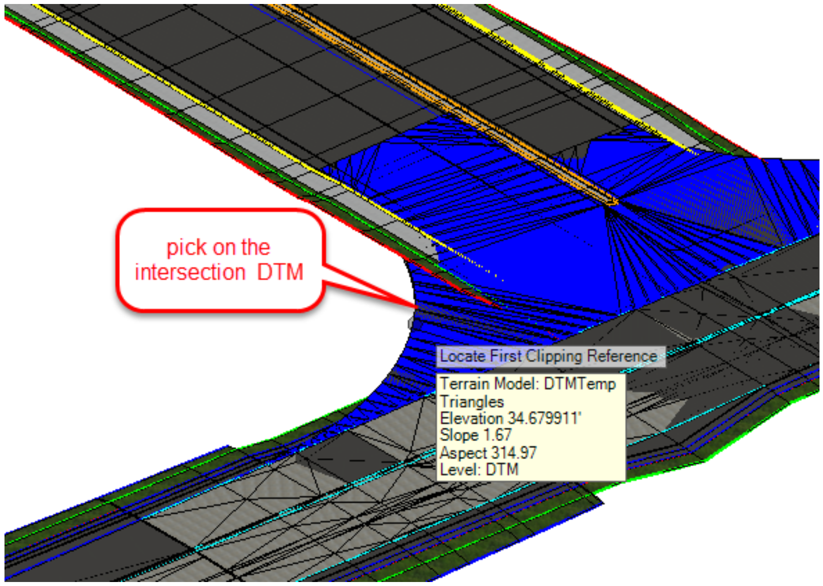
1. Use *Corridor Modeling*, **Add Clipping Reference** tool.



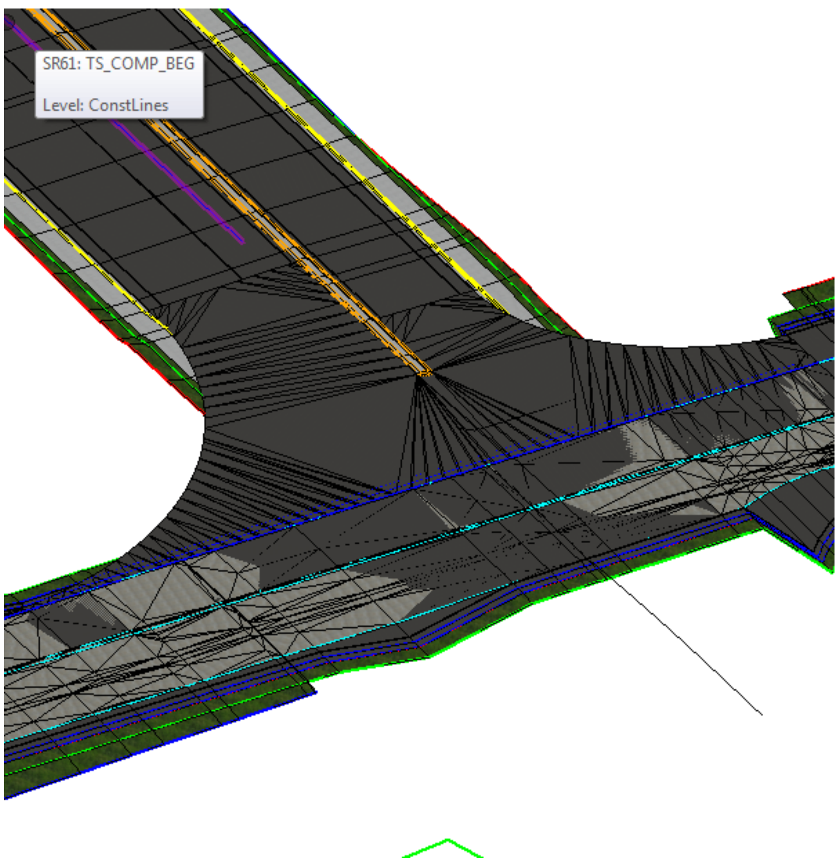
2. At the prompt, select the **SR61 Corridor** *handle.*



3. Select the Intersection Terrain Boundary.



4. Reset and the *SR61 Corridor* begins re-processing.

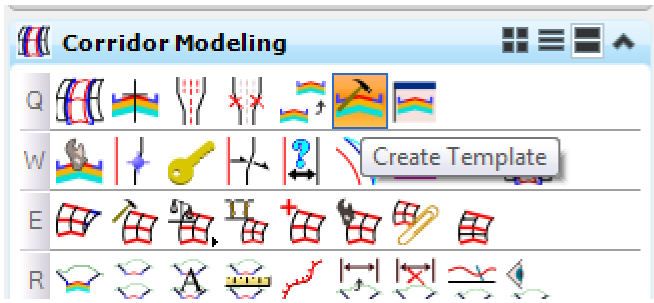


5. Repeat to add the **Intersection** as a *clipping reference* for RRR98 Corridor.

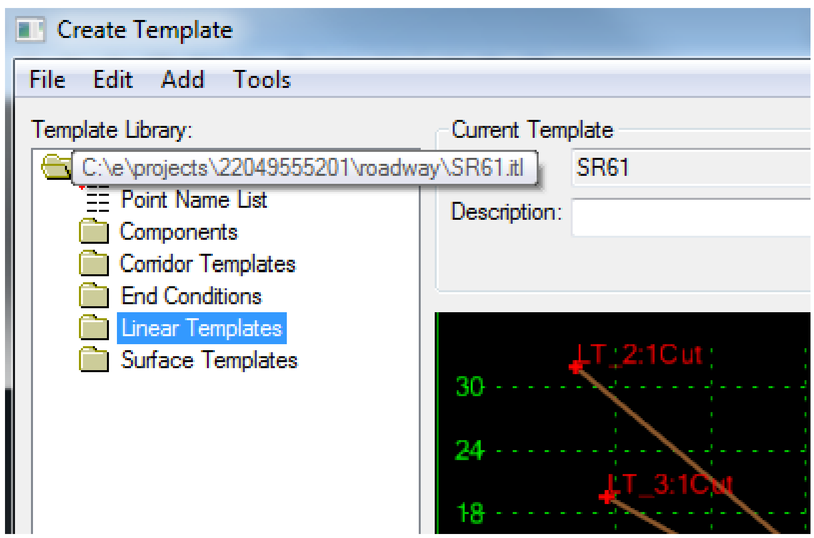
Note Later the shoulders and sidewalks will be clipped with the Linear Templates added around the radii.

Exercise 9.10 Model Curb and Sidewalk Around Radii

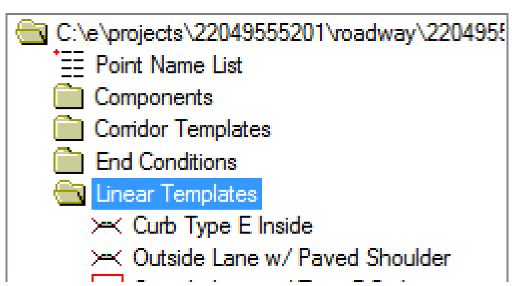
1. Use the *Corridor Modeling*, **Create Template** tool.



2. Open the **SR61** Template Library.



3. Navigate to the **Linear Templates** folder.



4. Double click on the **Outside Lane w/ Type F Cub** *Template* to make active.

5. Make the following edits:

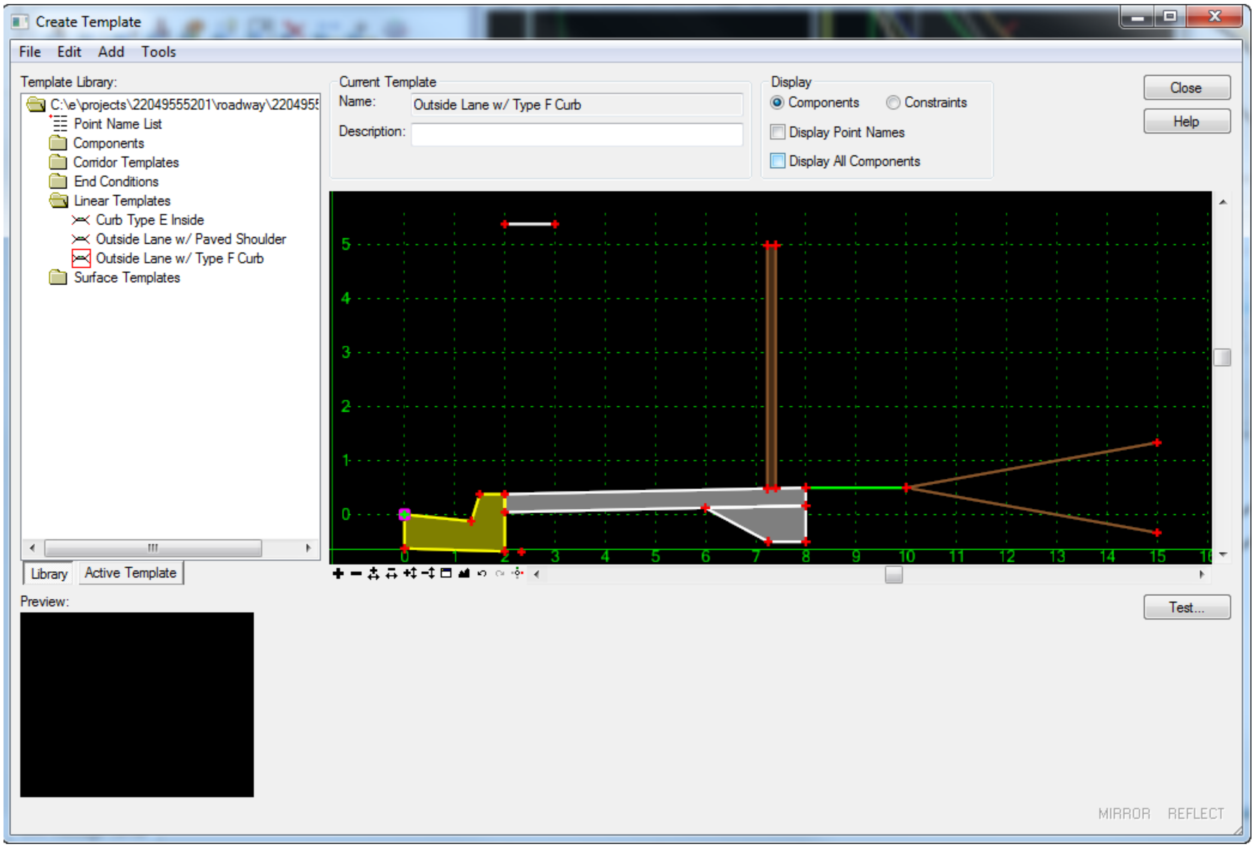
   a. Delete the **Pavement** and **Base**.

   b. Change the *Template Origin* to the **Curb PVT_EOP_OUT Point**.

   c. Change the Utility Strip Horizontal Value to **Zero**.

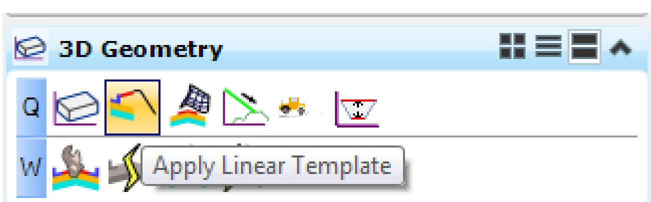
   d. Change the *Back of Sidewalk* to **6 feet**.

   e. Add the 6:1 *Fill* and *Cut End Conditions*, set the *End Points* to **Infinite**.

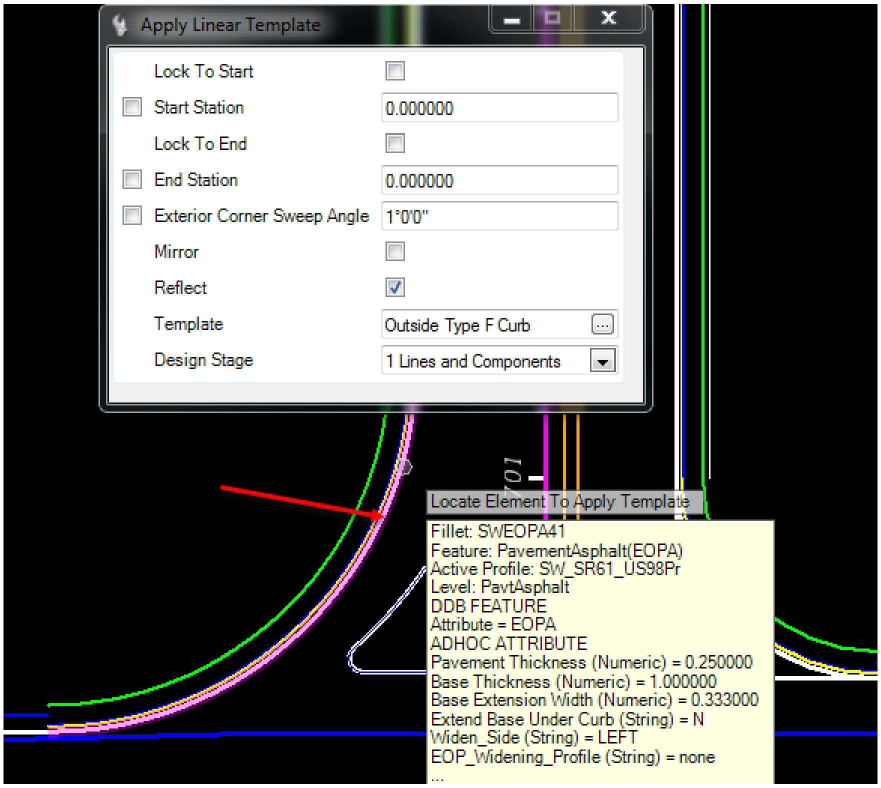


6. Close the Create Template dialog and click **Yes** to Save Changes.

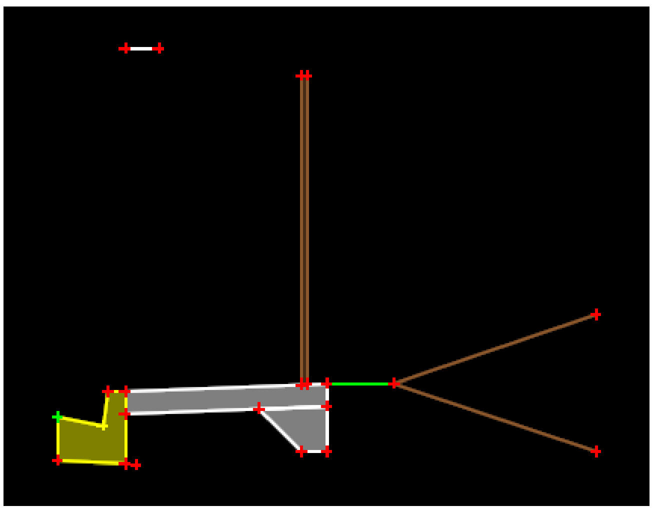
7. Use *3D Geometry*, **Apply Linear Template** tool.



a. At the prompt select the **SW_EOP** *Construction Radius Line* in the Plan View.



b. Select **Alt** *down arrow* to select the *Template*, **Outside Type F Curb**. Data Point to accept the Template.

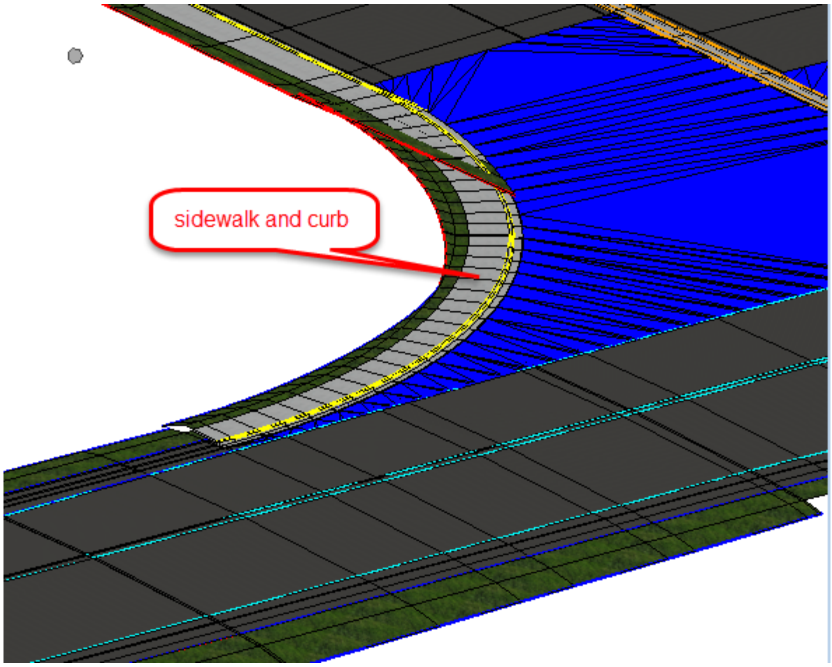


c. Select **Alt** to lock the *Start Station* and data point to accept.

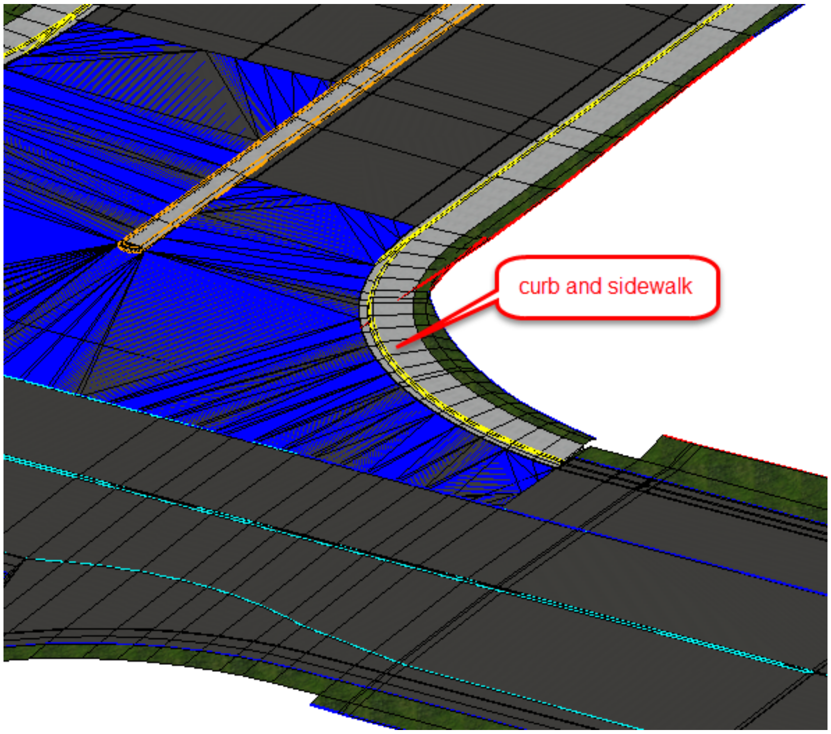
d. Select **Alt** to lock the *End Station* and data point to accept.

e. Data point to accept the **Reflect Orientation**.

f. Data point to accept the **Exterior Corner Sweep Angle**.

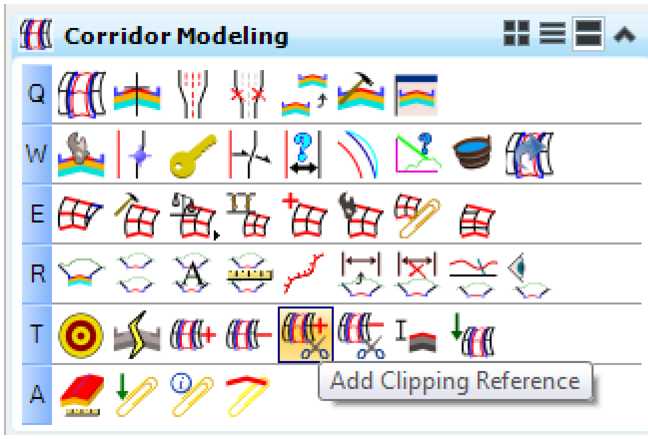


8. Repeat the steps above for the **NW EOP** *Construction Radius Plan Element*.

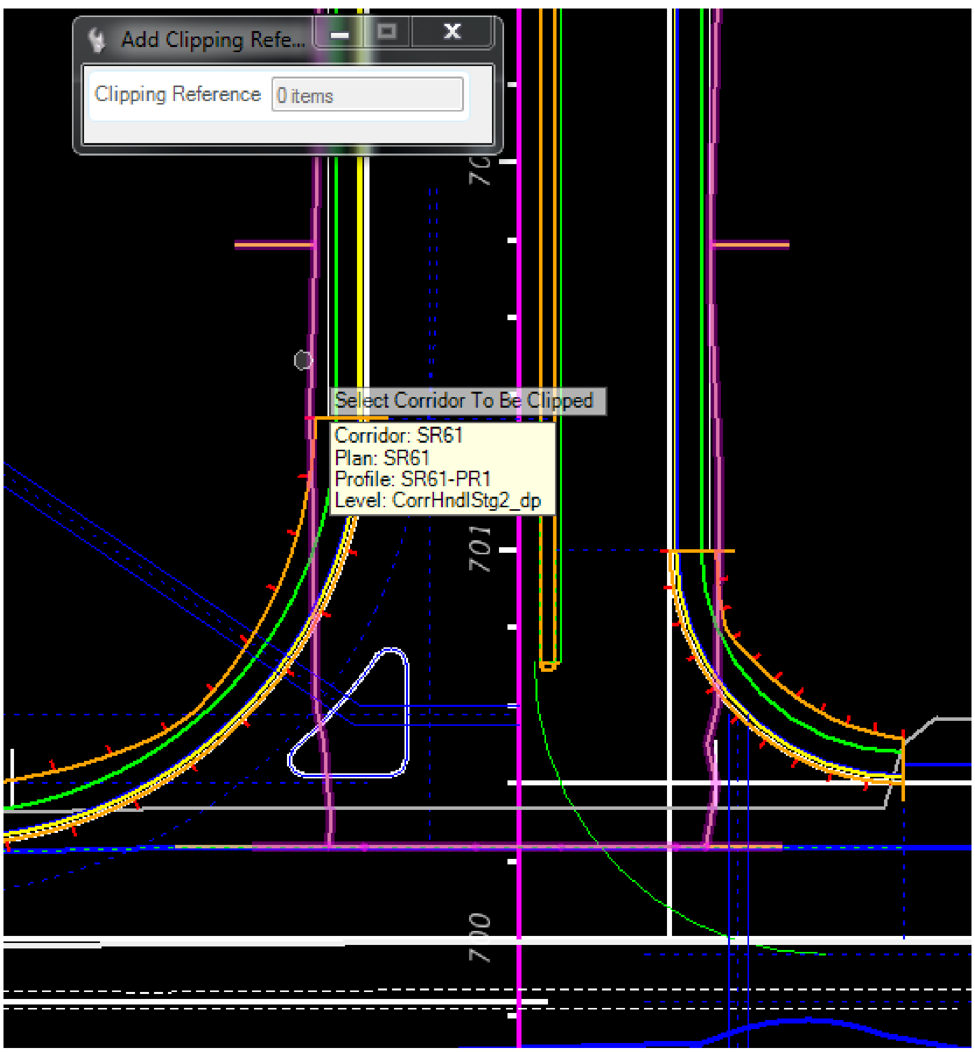


HINT To turn off the Blue triangles, toggle off the DTM and DTM Triangles.

9. Use *Corridor Modeling*, **Add Clipping Reference** tool.

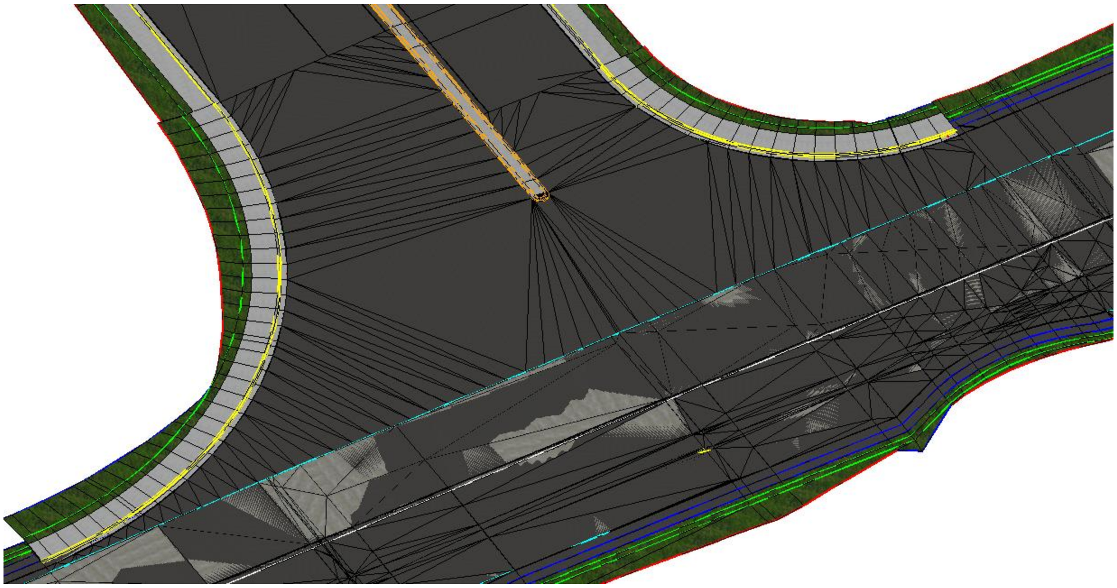


a. At the prompt, select the **SR61** *Corridor handle*.



b. Select the **2 Linear Template Boundaries** as *Clipping References*.

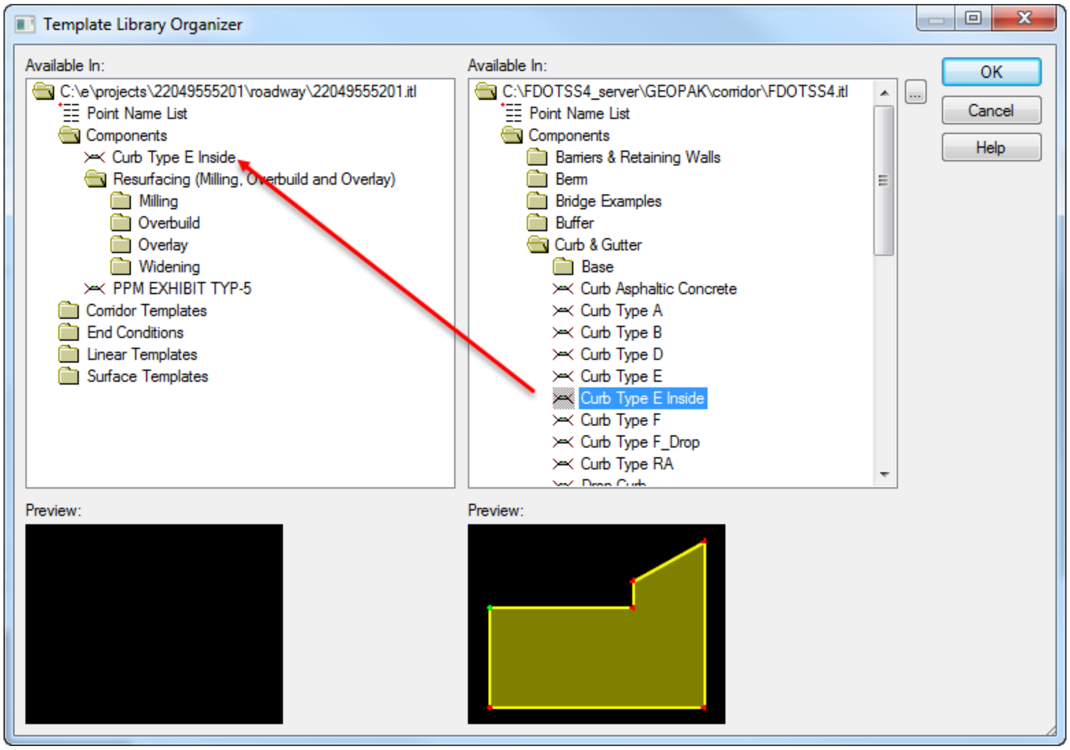
c. Data point to accept the **Corridor clipping**.



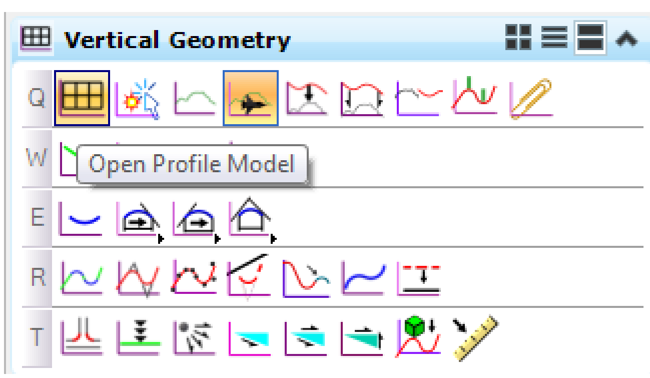
Exercise 9.11 Right Turn Island

1. For this exercise, an Island Curb will need to be retrieved from the FDOTSS4.itl file.

    a. Use the *Create Template*, **Template Library Organizer** to add the **Curb Type E Inside** to the project .itl file.



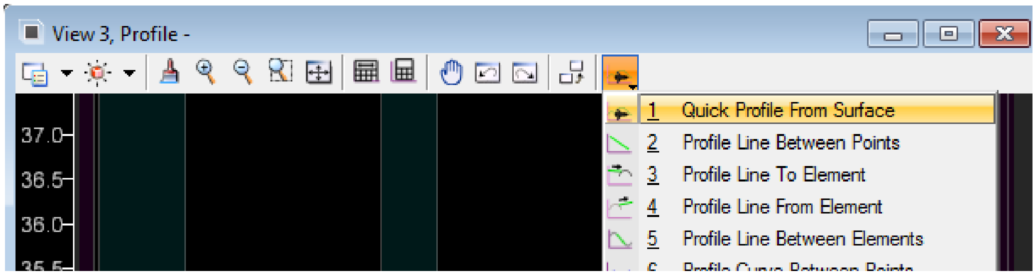
2. Use *Vertical Geometry*, **Open Profile Model** tool.



a. Select the **Turn Island** *shape* and select **View 3**.

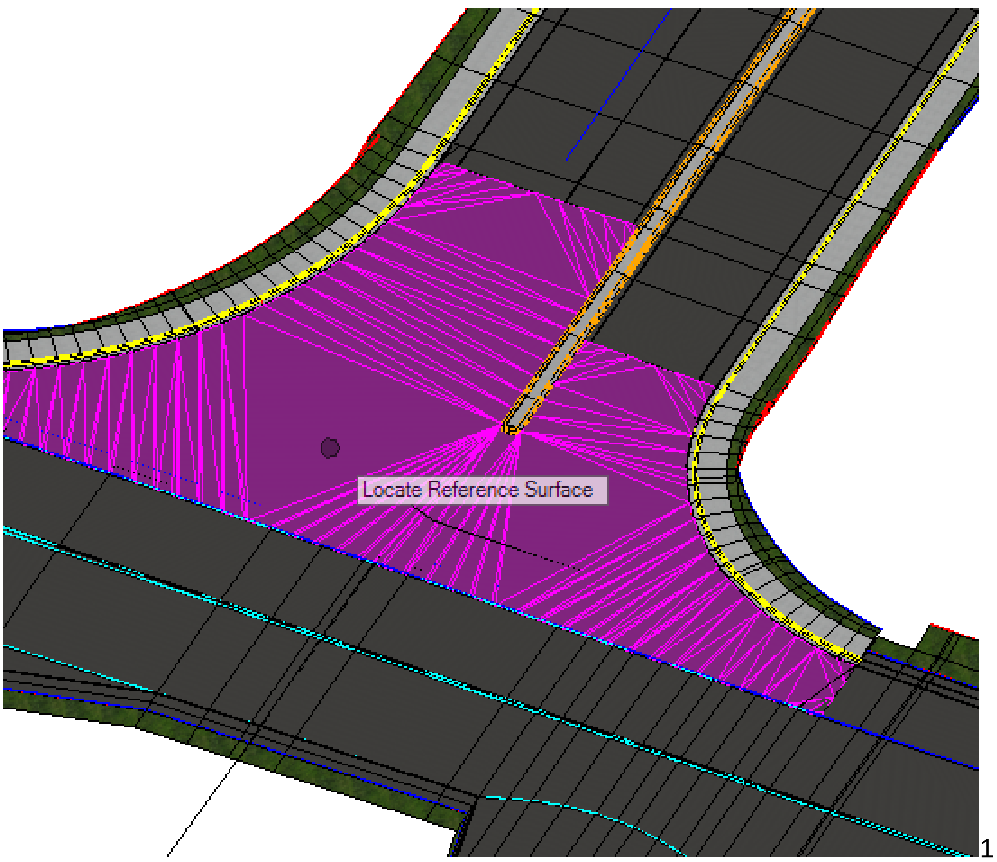
Hint First toggle off the PavtAsphalt(EOP) level

b. In the *Profile Model View 3*, select the **Quick Profile from Surface** command.

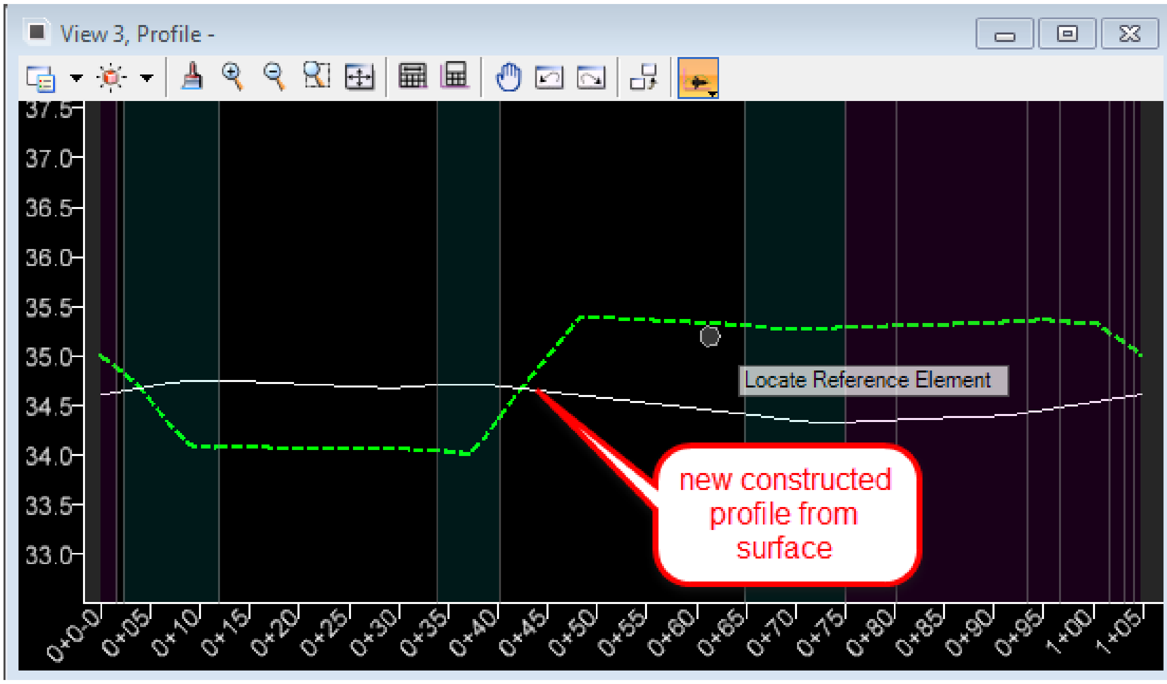


c. At the prompt, select the *Intersection Terrain Surface* **DTMPrInt** in the *3D Model View 2*.

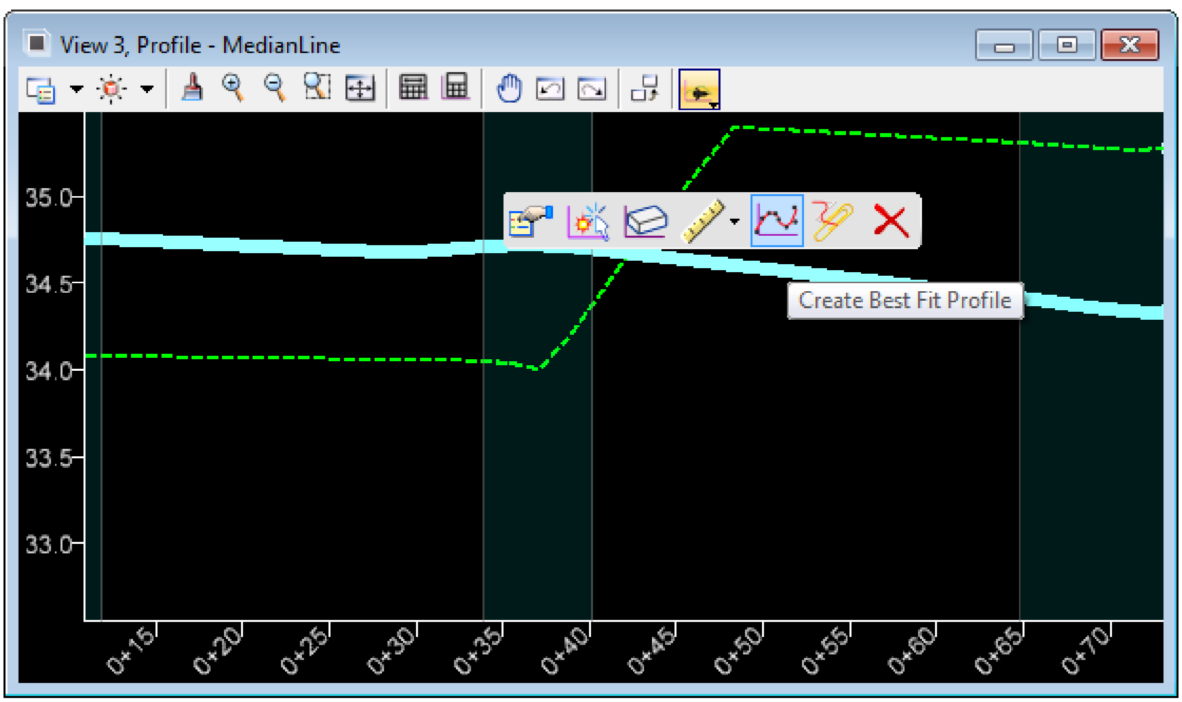
Note It may be necessary to tab over the surface features in intersection in order to select the terrain element.



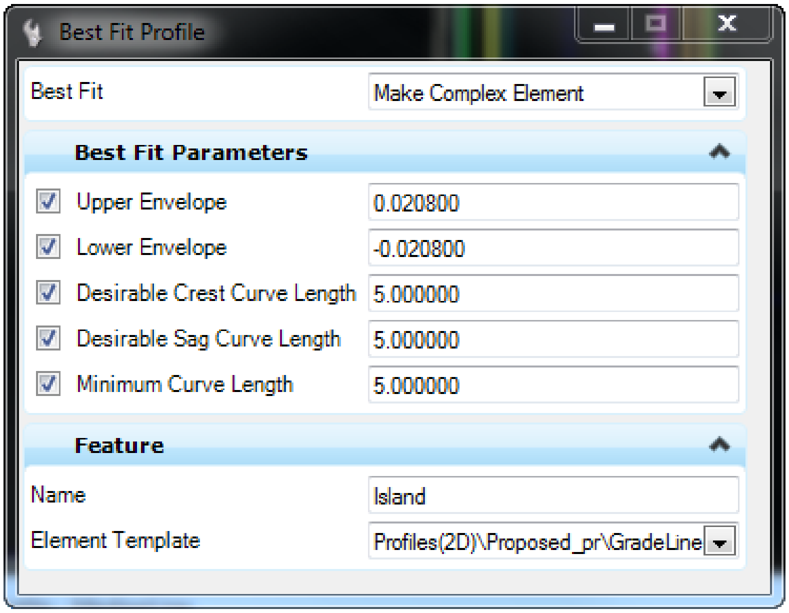
d. Data point to accept. A new *Profile* will display.



e. Select the Profile and select Create Best Fit Profile.

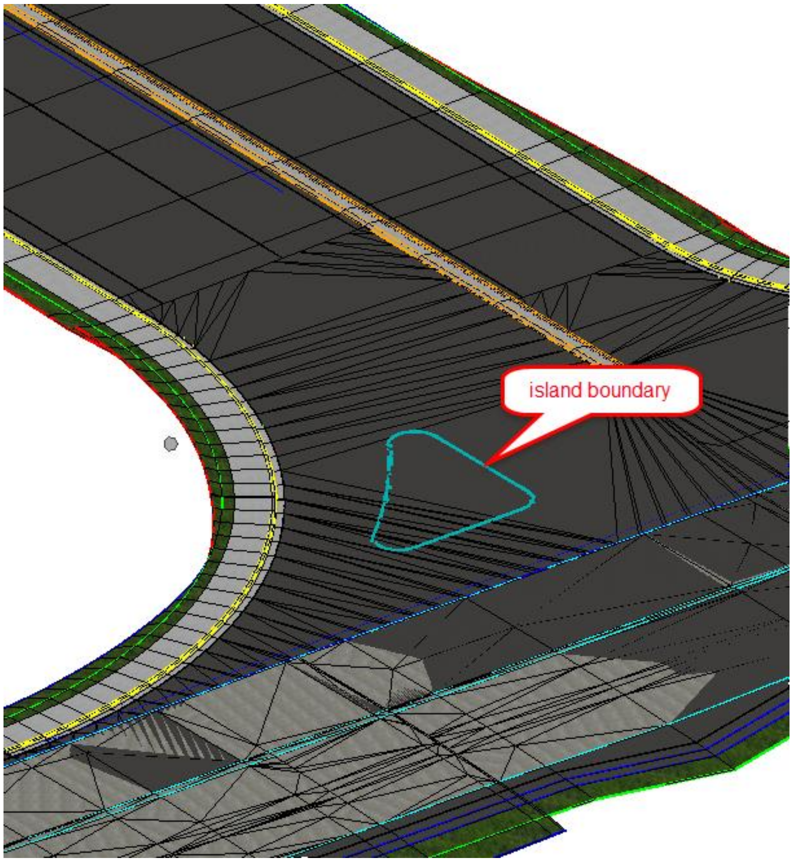


f. Enter the *Best fit Parameters* as shown.

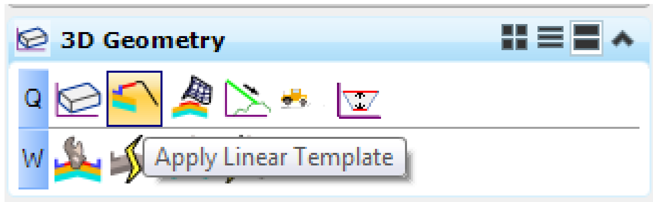


g. Create the **Best Fit Profile**, select the new **Profile** and select **Set As Active.**

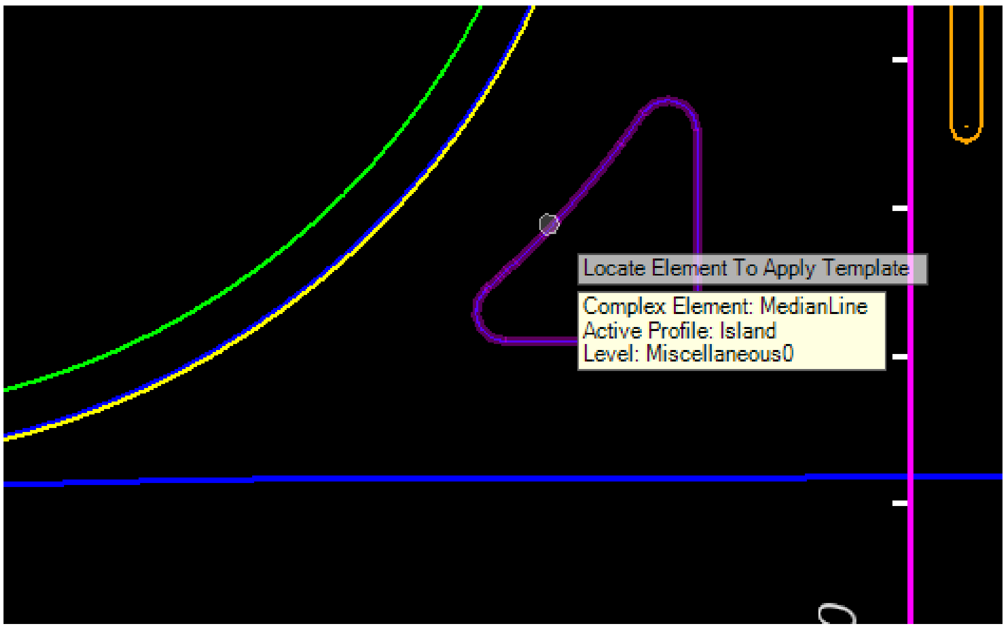
h. The *Island Boundary* is created in the 3D Model.



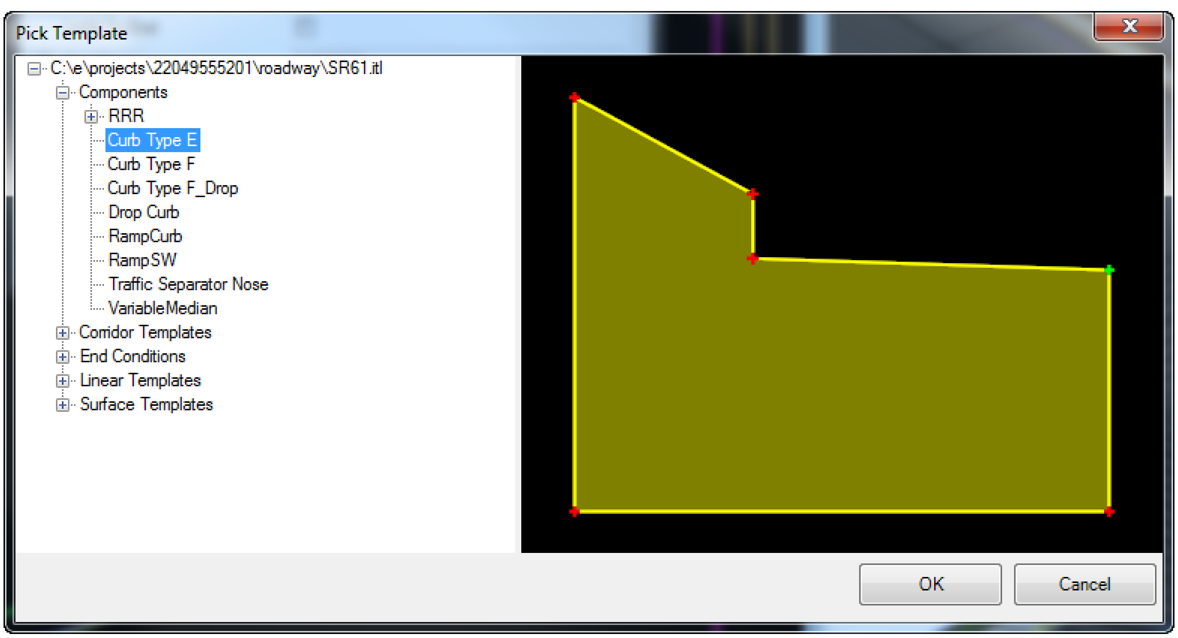
3. Use *3D Geometry*, **Apply Linear Template** tool.



a. At the prompt select the **Island Line** in the *Plan View*.



b. Select **Alt** *down arrow* to select the *Template*, **Curb Type E**. Data point to accept the Template.

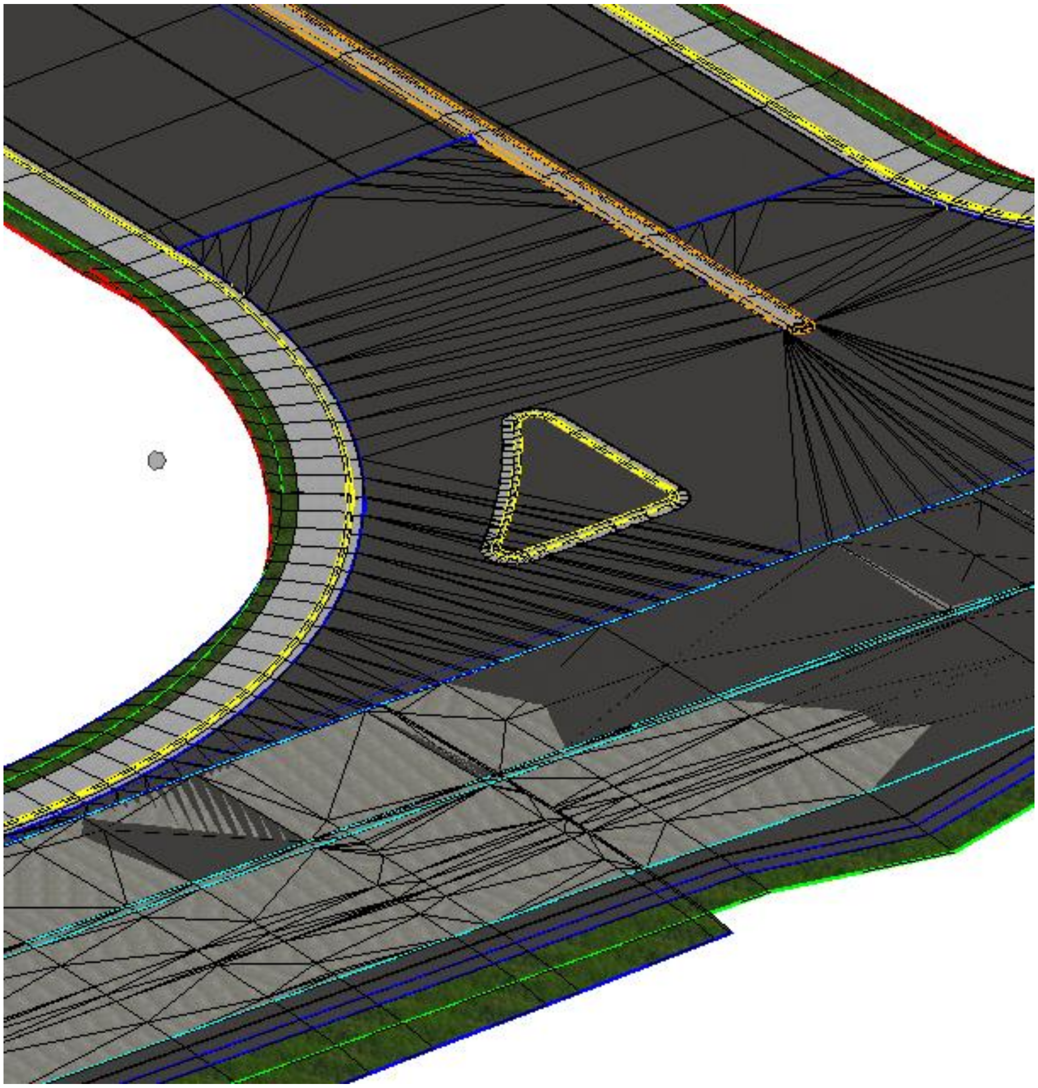


c. Select **Alt** to lock the *Start Station* and data point to accept.

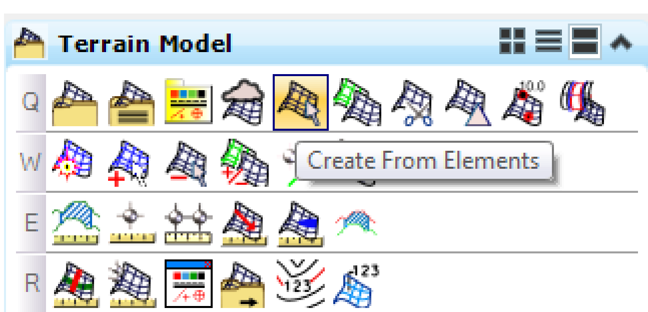
d. Select **Alt** to lock the *End Station* and data point to accept.

e. Data point to accept the **Reflect Orientation.**

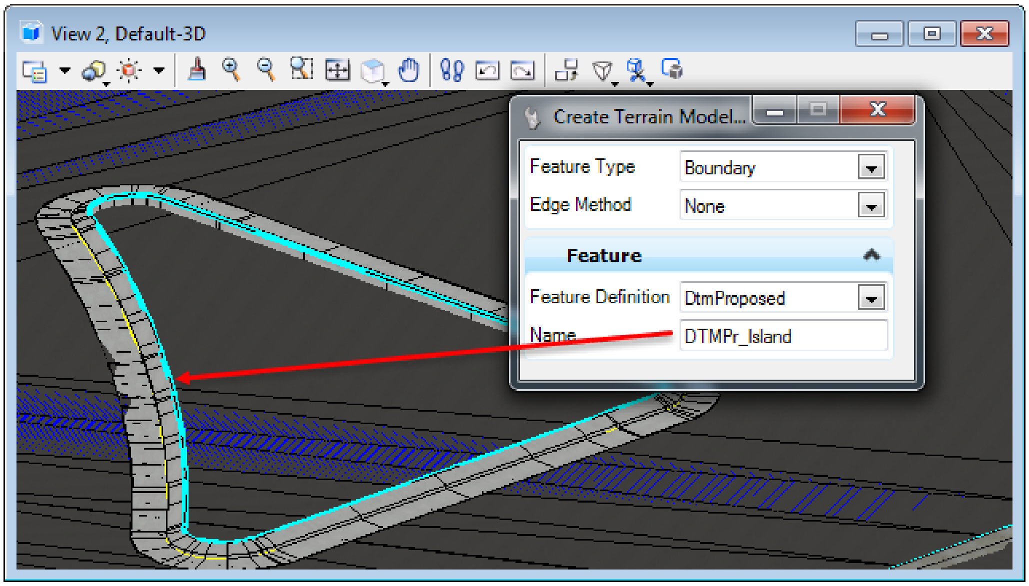
f. Data point to accept the Exterior Corner Sweep Angle.



g. To create the sod within the Traffic Island, Use Terrain Model, Create from Elements tool.



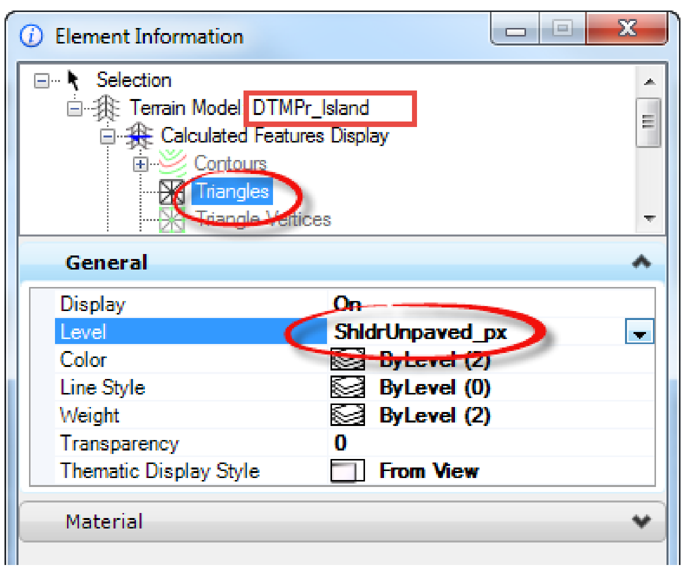
h. Create a **Terrain** from the *3D Top Back Curb* line.

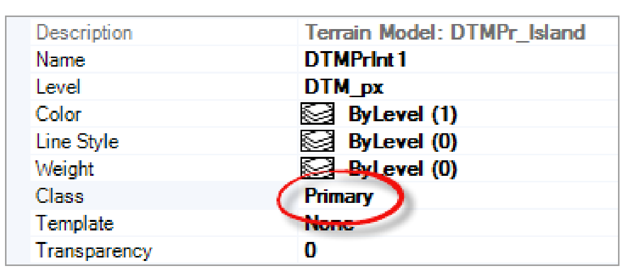


4. To change the *Terrain Triangles* display,

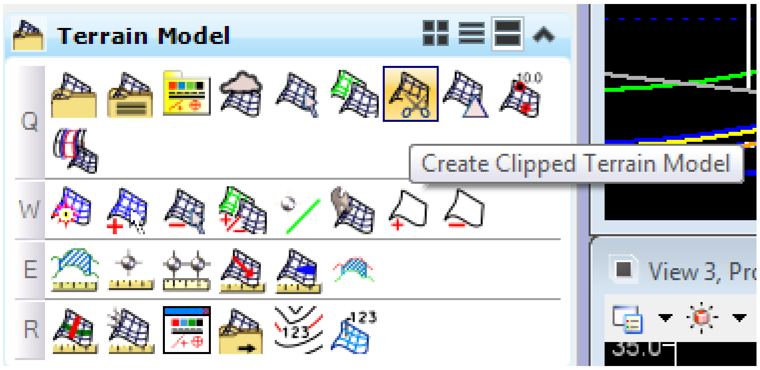
a. Select the new Terrain **DTMPr_Island** and open the properties, Element Information dialog.

b. Change the *level* for the *Calculated Features Display Triangles* to **ShldUnpaved_px and** change the *class* from **construction** to **primary.**

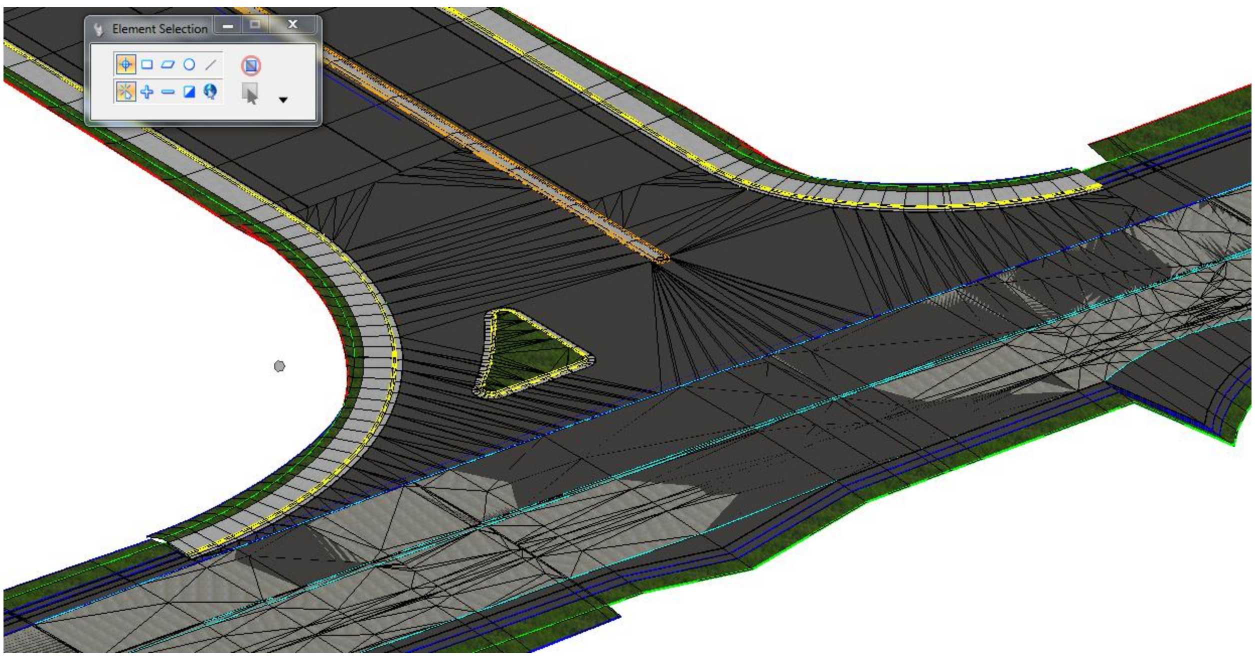




5. Use the *Terrain Model*, Create Clipped Terrain Model tool

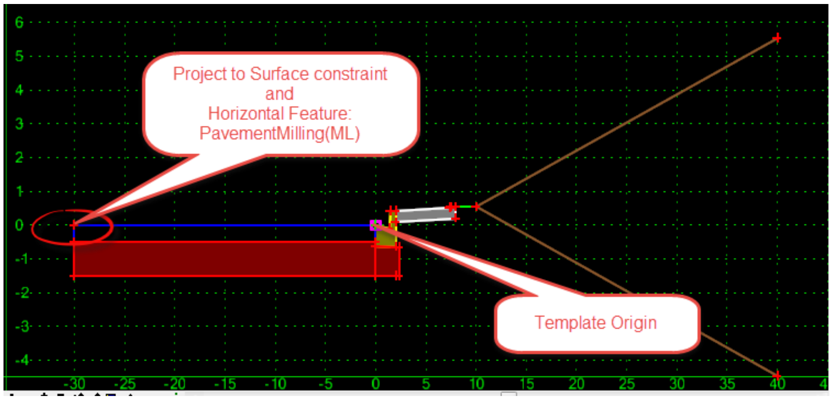


a. Select the Intersection terrain and then select the island boundary and choose Internal

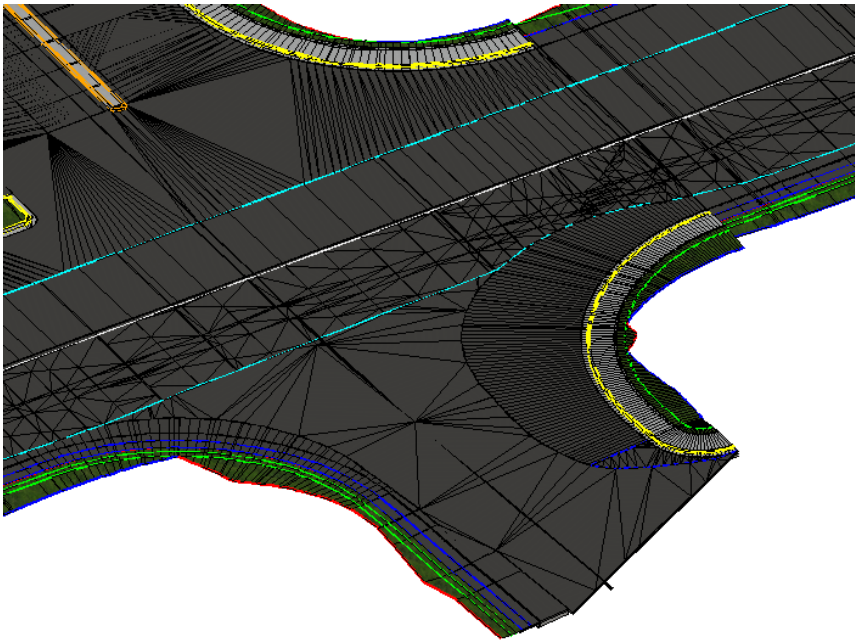


Exercise 9.12 *RRR98 Corridor-Build Intersection Terrain at School Entrance (On Your Own)*

1. Create a shape boundary of the perimeter of the School Driveway pavement to be resurfaced.
2. Use the Create Clipped Terrain Model tool to model the existing pavement.
3. Add a surface template to the Terrain in step 2.
4. Use the RT_Switch parametric constraint along the RRR98 corridor to remove the overlap components between radius points.
5. Add Key Station to near the radius points to create complete components
6. Use **Linear** *Template* around the *Radii* to construct the curb, sidewalk, shoulder, etc.
   a. Set the Template Origin and Pavement Point as shown



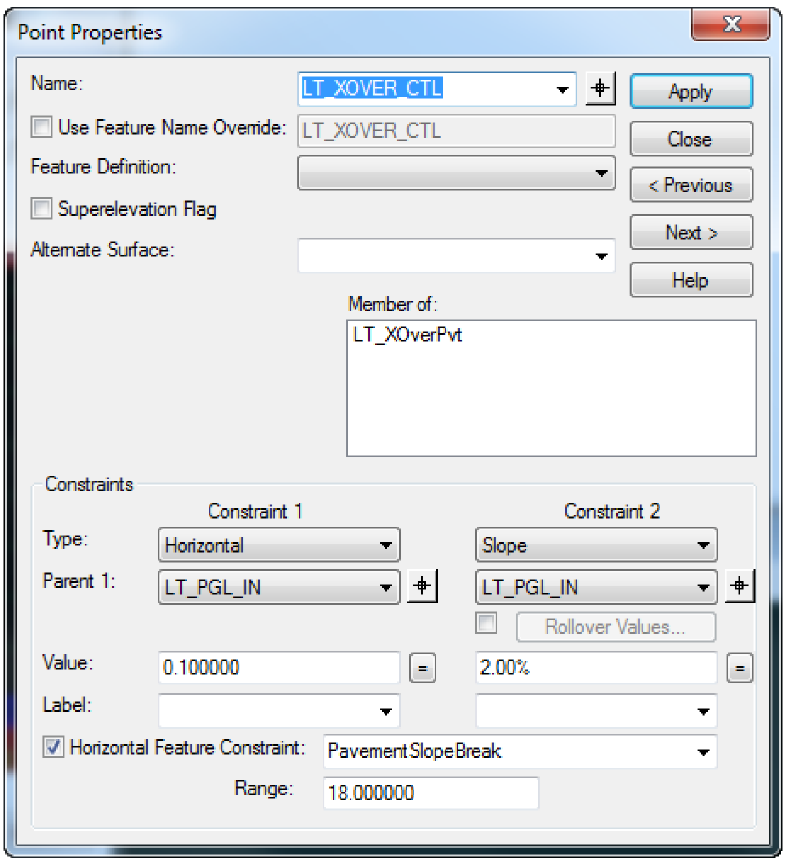
   b. Add the PavementMilling(ML) lines a reference to the linear templates to complete the widening.

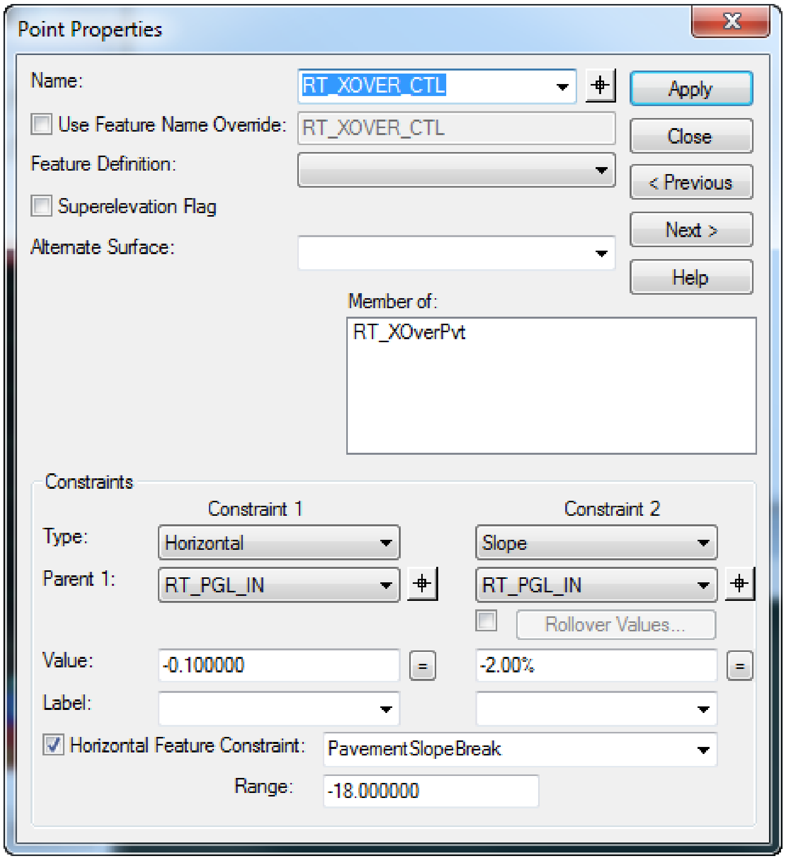


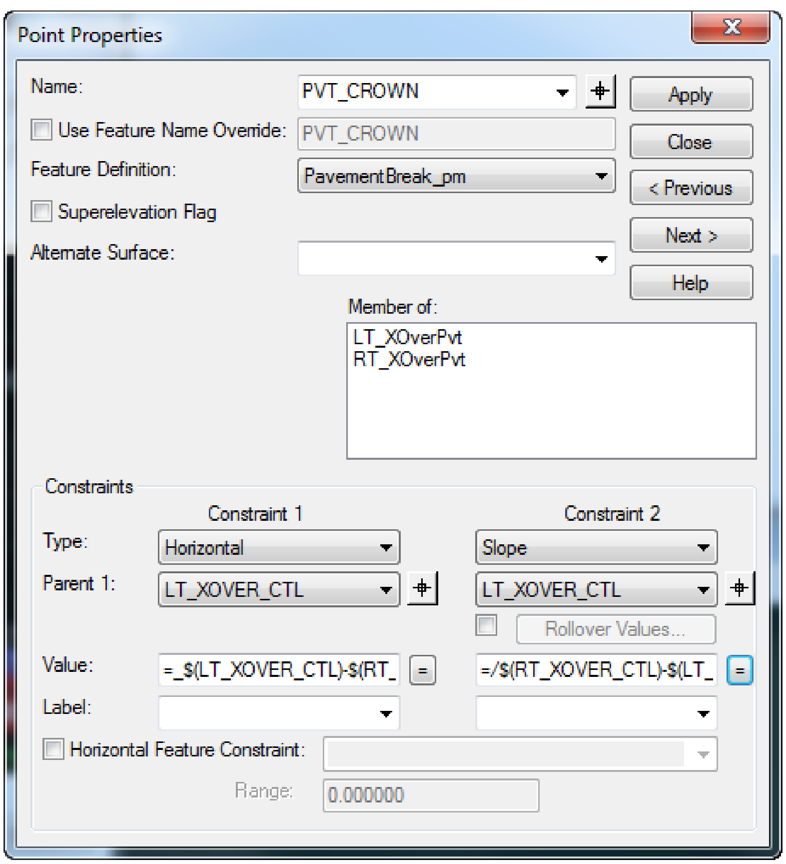
Exercise 9.13 ***SR61 Corridor-Build Intersection Terrain at Friendship Road*** *(On Your Own)*

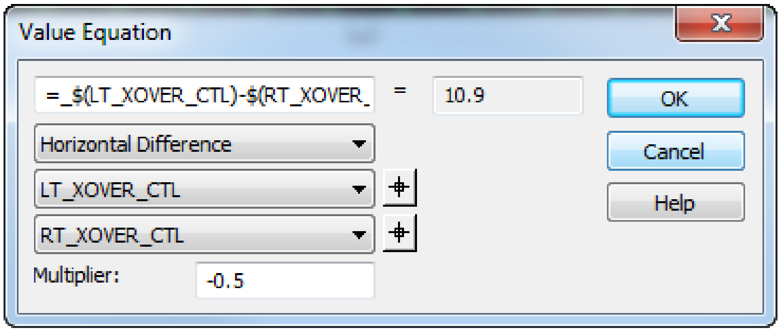
1. Drop the **Complex Chain** that makes up the *EOP Lines* and *Radius.*
2. Create a **Corridor Model** of the *Friendship Road*.
3. Edit the *Template Drop* and delete all **Components** outside of widening.
4. Project Profile to Element on the *Curve EOP lines* <OR> Quick Profile from Surface.
5. Construct a **Profile** from the *Projected Surface Lines* for the Curve Radii.
6. Use **Linear** *Template* around the *Radii.*
7. Create a **Terrain** from the *3D elements*.

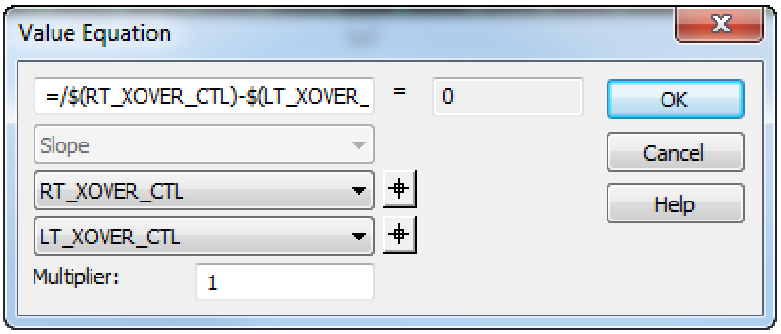
HINT For the Traffic Separator to Pavement Crown Cross over median, set the **LT_XOVER_CTL, RT_XOVER_CTL, and PVT_CROWN** Properties as shown:

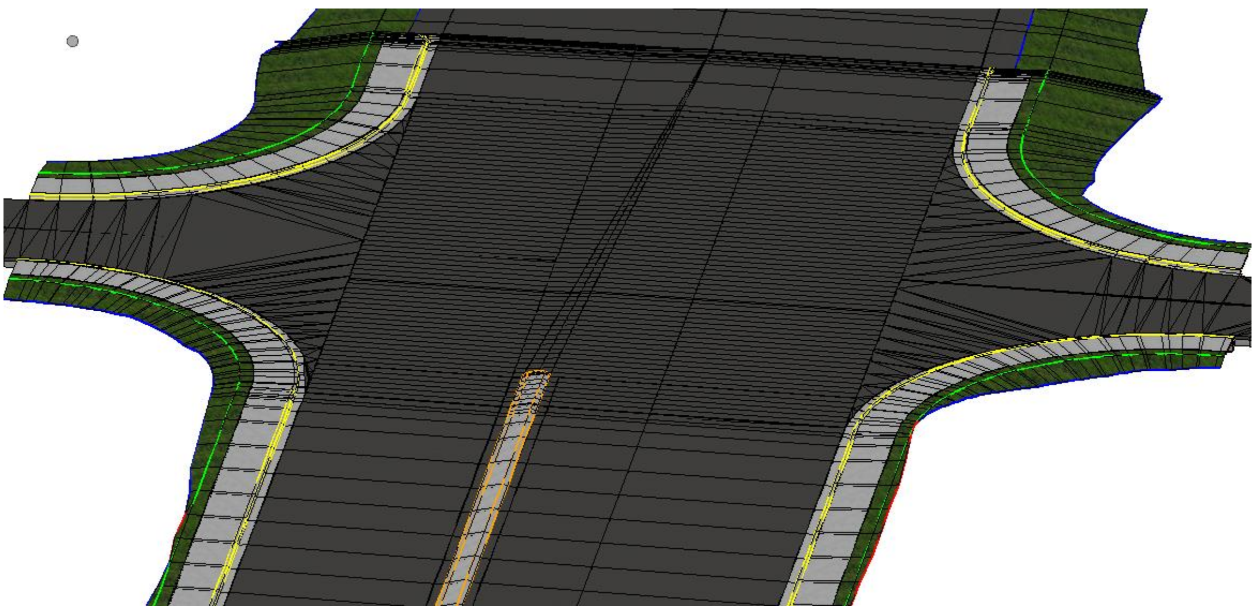



Point Properties
Name:
RT_XOVER_CTL
Apply
Use Feature Name Override:
RT_XOVER_CTL
Close
Feature Definition:
< Previous
Superelevation Flag
Next >
Alternate Surface:
Help
Member of:
RT_XOverPvt
Constraints
Constraint 1
Constraint 2
Type:
Horizontal
Slope
Parent 1:
RT_PGL_IN
RT_PGL_IN
Rollover Values...
Value:
-0.100000
-2.00%
Label:
Horizontal Feature Constraint:
PavementSlopeBreak
Range:
-18.000000


Point Properties
Name:
PVT_CROWN
Apply
Use Feature Name Override:
PVT_CROWN
Close
Feature Definition:
PavementBreak_pm
< Previous
Superelevation Flag
Next >
Alternate Surface:
Help
Member of:
LT_XOverPvt
RT_XOverPvt
Constraints
Constraint 1
Constraint 2
Type:
Horizontal
Slope
Parent 1:
LT_XOVER_CTL
LT_XOVER_CTL
Rollover Values...
Value:
=_$(LT_XOVER_CTL)-$(RT_
=/$(RT_XOVER_CTL)-$(LT_
Label:
Horizontal Feature Constraint:
Range:
0.000000


Value Equation
=_$(LT_XOVER_CTL)-$(RT_XOVER_
=
10.9
OK
Cancel
Help
Horizontal Difference
LT_XOVER_CTL
RT_XOVER_CTL
Multiplier:
-0.5


Value Equation
=/$(RT_XOVER_CTL)-$(LT_XOVER_
=
0
OK
Cancel
Help
Slope
RT_XOVER_CTL
LT_XOVER_CTL
Multiplier:
1



10 CREATING 3D DELIVERABLE FILES

INTRODUCTION

This chapter will provide detailed instructions for producing the specific output files used by contractors for Automated Machine Guidance (AMG). Specifically:

- Controlling Geometry Files
- 2D CADD files
- Proposed 3D Breakline CADD files
- Existing, Proposed and Subgrade/Earthwork surface XML files

3D DELIVERABLES SUPPORTING AMG for 3D PROJECTS *(Store in project folder: 3DDeliverables)*	
File Name	**Description**
Design Alignments and Profiles	
AMG-ALGN##.xml	All Alignments and Profiles exported from the \Roadway\ALGNRD, PROF or model files and \Roadway\DSGNRD or CORRRD files in LandXML format.
2D Proposed Planimetrics Design	
AMG-2DSGN##.dwg/dgn	2D proposed Roadway design exported from the \Roadway\DSGNRD file. (Production of this file for construction is at the designer's discretion.)
AMG-2DRPR##.dwg/dgn	2D proposed Drainage design exported from the \Roadway\DRPRRD file. (Production of this file for construction is at the designer's discretion.)
AMG-2PDPL##.dwg/dgn	2D proposed Pond design exported from the \Roadway\PDPLRD file. (Production of this file for construction is at the designer's discretion.)
2D Existing Survey (*Note: These are being considered to merge into a single survey Planimetrics file)*	
AMG-2TOPO##.dwg/dgn	2D proposed existing Topography exported from the \Survey\TOPORD file. (Production of this file for construction is at the designer's discretion.)
AMG-2DREX##.dwg/dgn	2D proposed existing Drainage exported from the \Survey\DREXRD file. (Production of this file for construction is at the designer's discretion.)
AMG-2UTEX##.dwg/dgn	2D proposed existing Utilities exported from the \Survey\UTEXRD file. (Production of this file for construction is at the designer's discretion.)
3D Existing Survey Surfaces	
AMG-3SURFACEEX##.xml	3D existing terrain surface to be exported from the \Survey\GDTMRD file as LandXML format. (Production of this file for construction is at the designer's discretion. This file will be produced if the 3D Existing Surface dwg/dgn file(s) are not produced.)
3D Proposed Surfaces	
AMG-3SURFACEPR##.xml	3D proposed finished (top) surface to be exported as LandXML format from the \Roadway\MODLRD file.
AMG-3SURFACEEW##.xml	3D proposed finished (bottom) surface to be exported as LandXML format from the \Roadway\MODLRD file. This file will be used to generate surface to surface earthwork volumes.
3D Proposed Break Lines	
AMG-3DSGN##.dwg/dgn	3D proposed Roadway design exported from the \Roadway\DSGNRD file. (Production of this file for construction is at the designer's discretion. This file will be produced if the 3D Proposed Surface(s) LandXML file(s) is not produced. Geometric elements should be in vector.)

EXERCISE OVERVIEW

10.1 Creating Alignment XML File for AMG

10.2 Creating 2D Proposed Lines File for AMG

10.3 Creating Existing Surface File for AMG

10.4 Creating 3D Breaklines and Proposed Surface Files for AMG

10.5 Creating 3D Breaklines and Proposed Subgrade/Earthwork Files for AMG

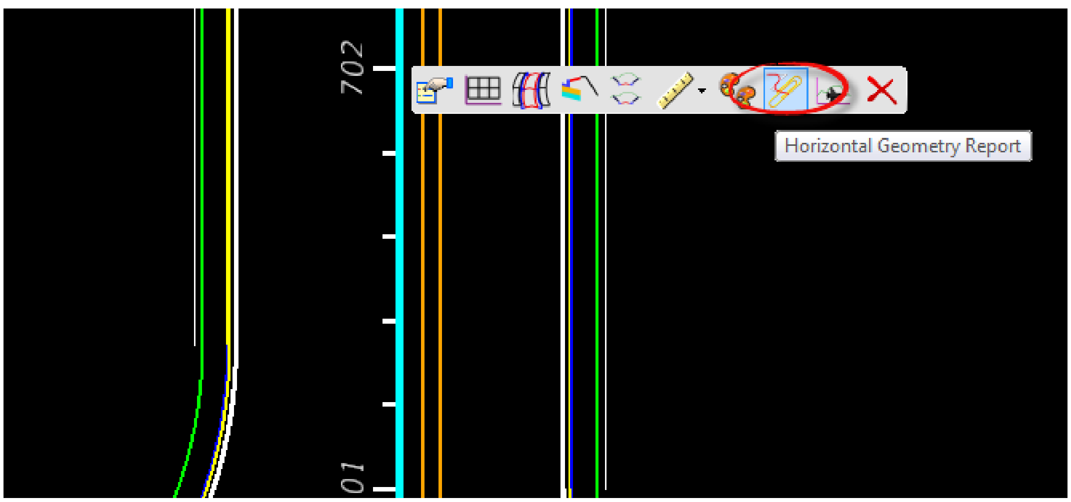
10.6 Use LandXML Visualizer to Validate Land XML File

Exercise 10.1 Creating Alignment XML File for AMG

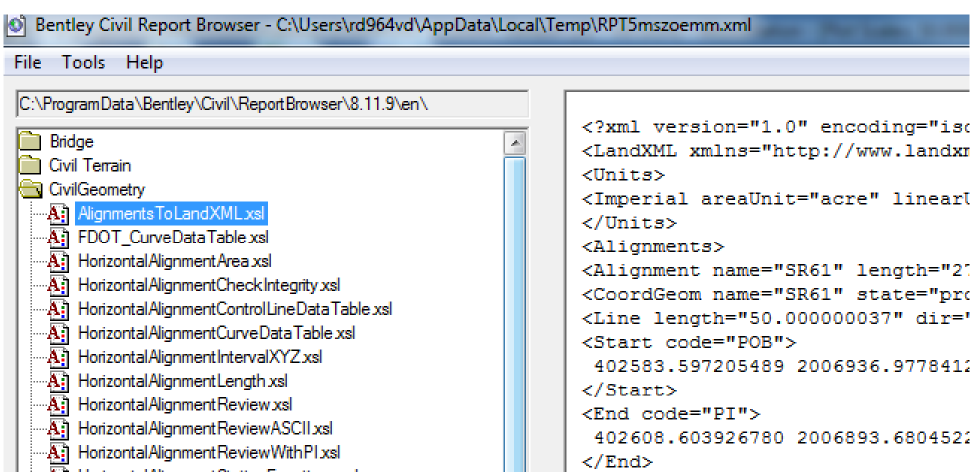
You can export Alignments and Profiles directly from the elements in the DGN file.

1. Open the DSGNRDxx.dgn.

2. Select and hover over an **Alignment**. Select **Horizontal Geometry Report** from the Context Menu.

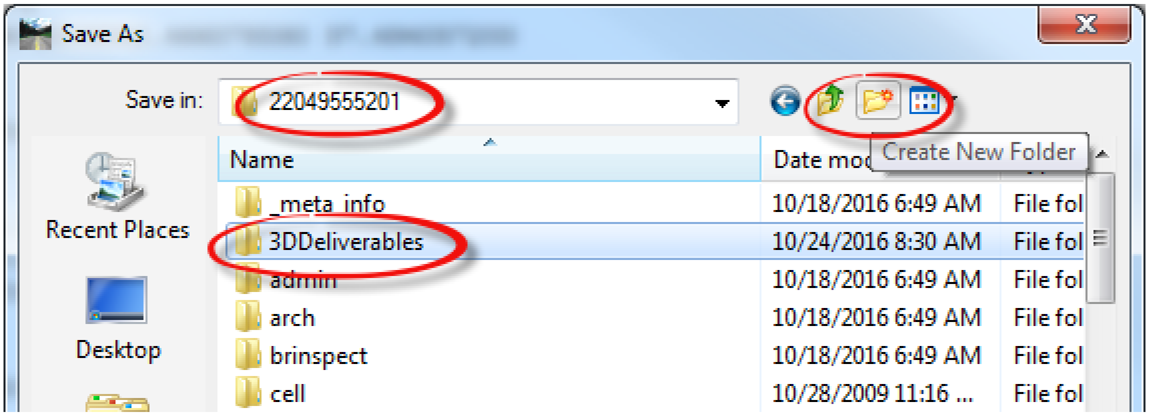


3. In the Bentley *Civil Report Browser* select the **Civil Geometry > AlignmentsToLandXML.xsl** report.



4. Select File > Save As

   a. Navigate to the **3DDeliverables** directory. If it doesn't exist, use create new folder.

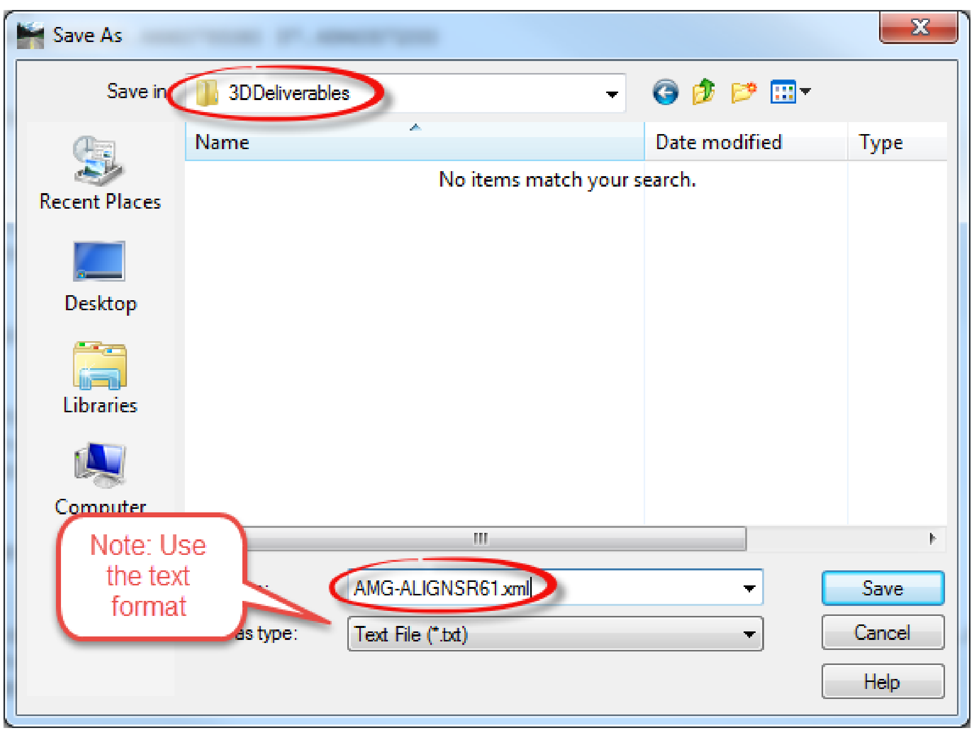


   b. Enter the *File name:* **AMG-ALGNSR61.xml**

   c. Select **Text File (.txt)** as the *Save as type*.

   d. Click Save.

5. Repeat for the AMG-ALGNBL98.xml



Note This will save both the Horizontal and Vertical (Profile) Geometry.

Exercise 10.2 Creating 2D Proposed Lines File for AMG

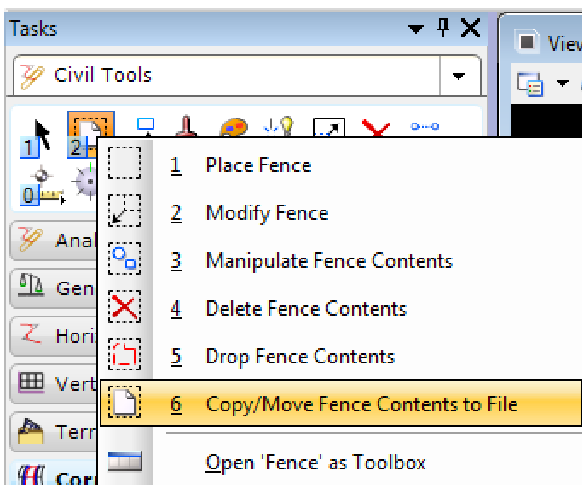
Use the MicroStation **Save As** command to save copies of the Proposed Design files into the *3DDeliverables* directory with **AMG-2** names in *DGN* and *DWG* formats.

For example: *AMG-2DSGNRDxx.DGN*, *AMG-2DSGNRDxx.DWG*.

➢ ***Simplify MicroStation Elements***

1. Open the DSGNRDxx.dgn.
2. Select the **Plan View** to make active. Select *Function Key* **CTRL F1** to open a Plan View.
3. In the *View Attributes*, turn **Off** Construction elements<OR> Select *Function Key* **F7.**
4. Turn Off reference file display
5. Turn Off levels for Baseline, CLConstr., and Scratch
6. Place a **Fence** around all **Elements** in the design file.
7. Enter ff= ..\3DDeliverables\AMG-2DSGNRD01.

   <Or> use the Copy Fence Contents dialog.



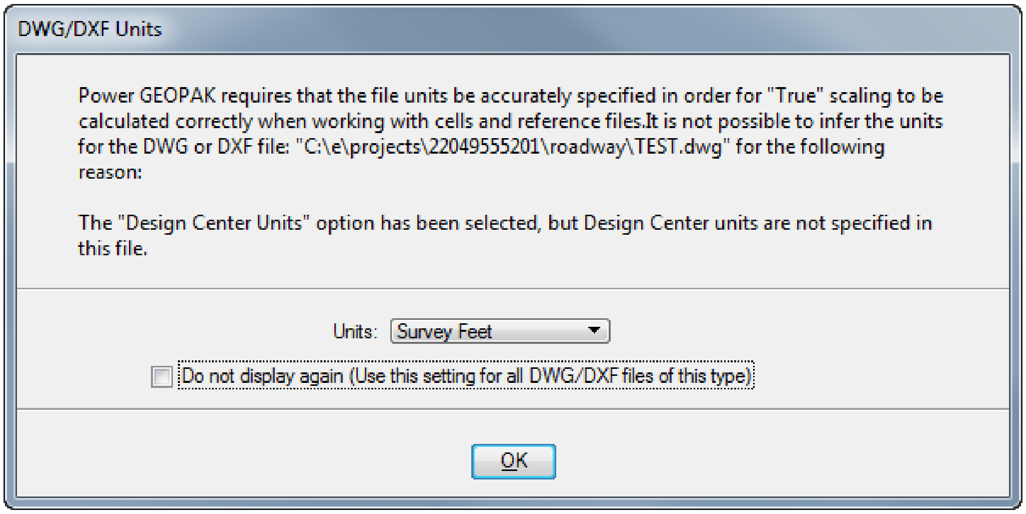
8. Data point to accept.
9. Verify the file is in the **3DDeliverables** directory.

➢ ***Save as DWG(Optional)***

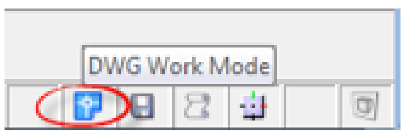
1. Open the .\3DDeliverables*AMG-2DSGNRD01* design file.
2. Select **File** > **Save As** from the MicroStation menu.
3. Select **Autodesk(R) DWG** as the *Save as type*.

Note There is no need to set **Options** on the **Save As** dialog

4. Verify or Enter the *File Name*, **AMG-2DSGNRDxx** and click **Save**.
5. Select the *Units* **Survey Feet** and click **OK**.



Note The file will open in DWG Work Mode, see the blue cross hairs icon in the bottom right of the MicroStation window

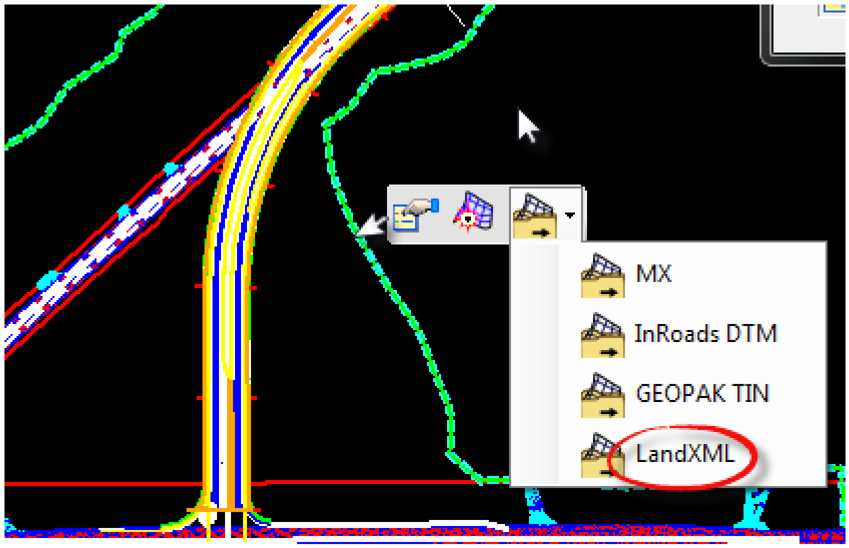


Exercise 10.3 Creating Existing Surface File for AMG

1. Open the *DSGNRD01.dgn* file. Display **2D** and **3D Views** and Select *Function Key* **F2**.

2. Turn **ON** the **Reference file** display for *GDTMRD02 or SURVRD01*.

3. Select and hover over the *Existing Surface* and then select **Export Terrain Model** > **LandXML.**



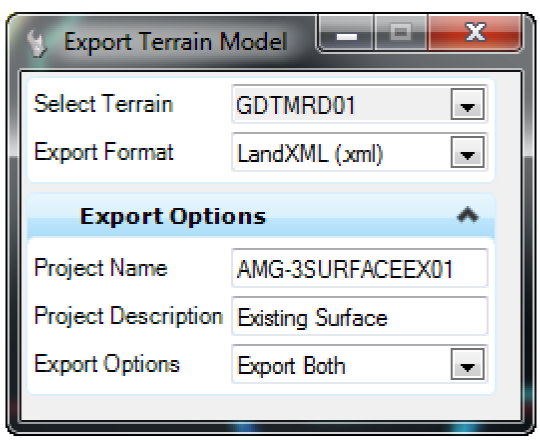
4. Select the **Terrain.**

5. Select the *Export Format:* **LandXML**

6. Enter the *Project Name:* **AMG-3SURFACEEX01**

7. Enter the *Project Description:* **Existing Surface**

8. Select the *Export Options*: **Export Both**



9. Save the **AMG-3SURFACEEX01.xml** file to the *3DDeleverables* directory**.**

Exercise 10.4 Creating 3D Breaklines and Proposed Surface Files for AMG

This exercise outlines the steps to create the proposed surface of the project for use by contractors for automated machine guidance as follows:

Prepare the View for Exporting

Exporting 3D Break Lines

Creating Proposed Surface Files for AMG

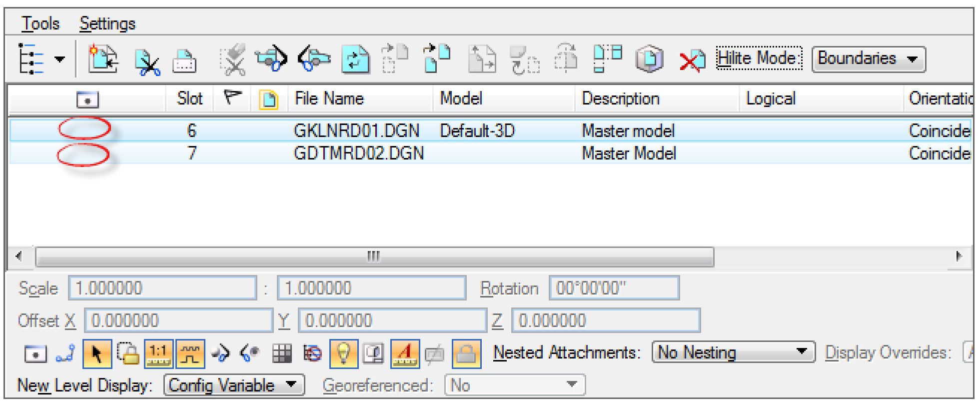
Delete extraneous triangles

➢ *Prepare View for Exporting*

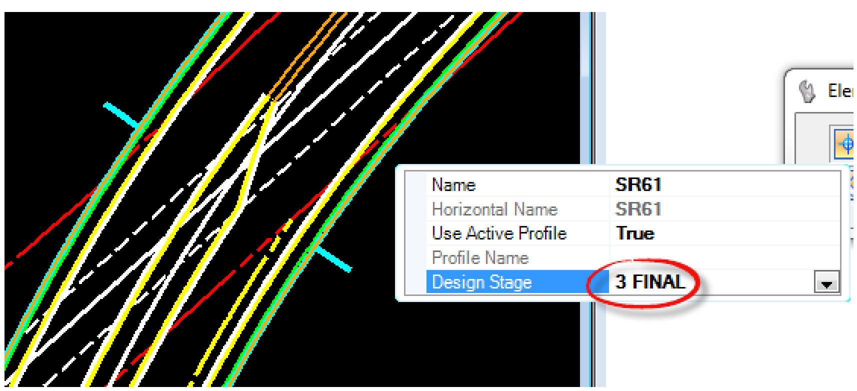
1. Open the *DSGNRDxx.dgn or MODLRDxx* file. To Display **2D** and **3D Views**, select *Function Key* **F2**.

2. Turn **OFF** the **Reference File** display for:

    - *GKLNRD01.DGN*
    - *GDTMRD02.DGN or SURVRD01.DGN*

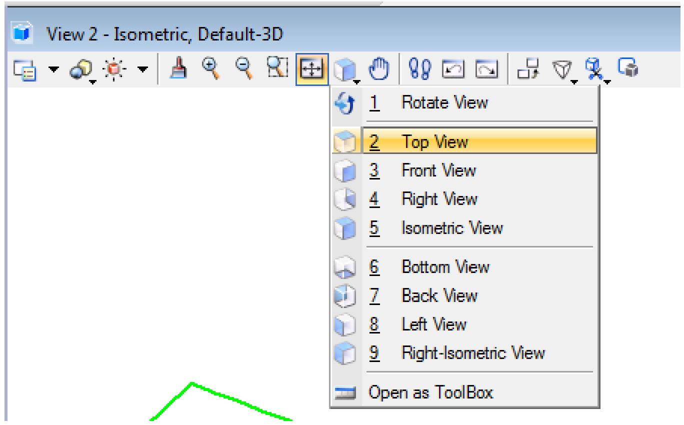


3. Set the Corridor Design Stage to **Final**.



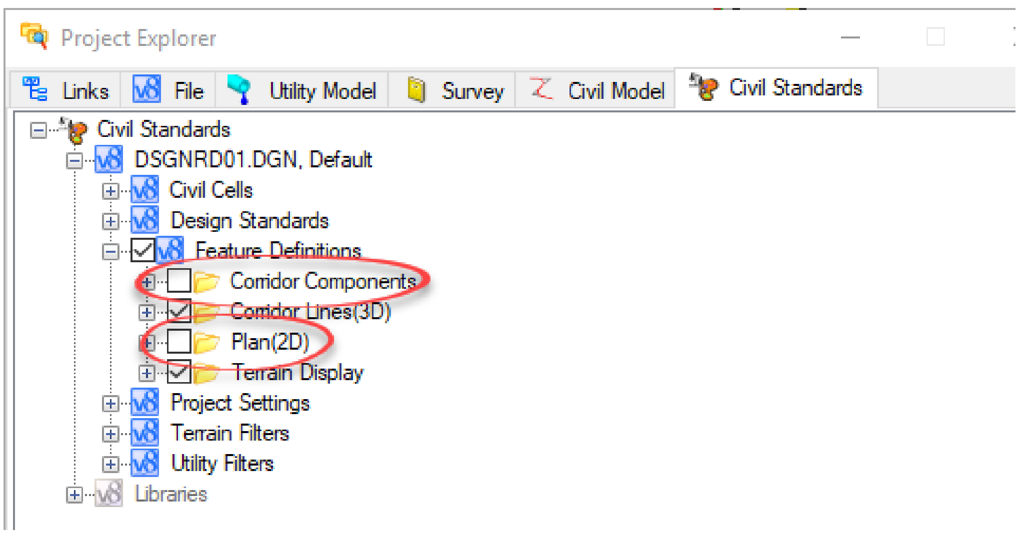
4. Maximize the View 2 – Default-3D.

5. Change the *View Rotation* to a **Top view**



6. Open Project Explorer Use the *Function Key* F11 . Navigate to Civil Standards > *Active file* >Feature Definitions. Uncheck Corridor Components *folder* to turn OFF Mesh Solid elements.

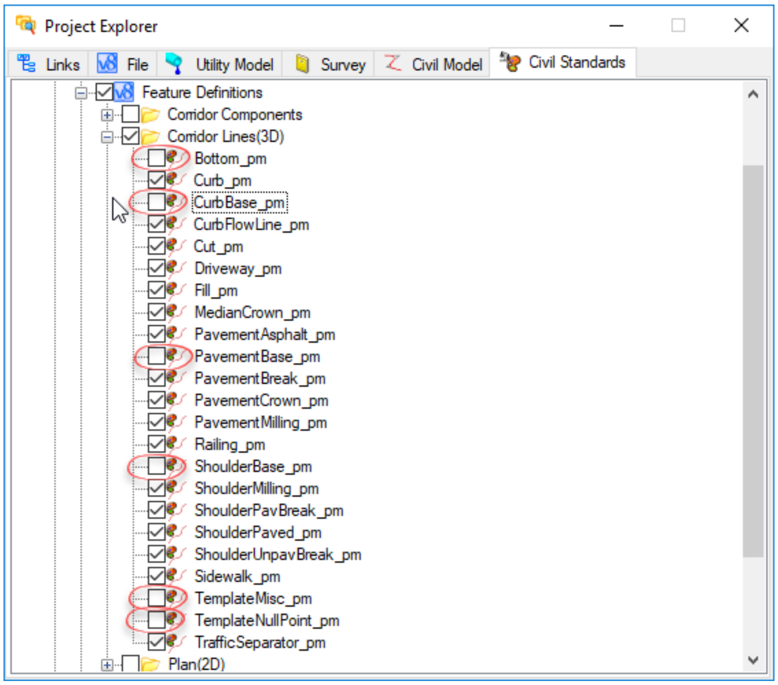
7. Use Project Explorer Civil Standards > *Active file* >Feature Definitions. Uncheck Plan(2D) *folder* to turn OFF Lines created from Active Profiles



8. Use the *Function Key* **F7** to turn **OFF** all *Construction* elements in the 3D View.

9. In **Project Explorer Civil Standards >** ***Active file*** **>Feature Definitions**. Open the **Corridor Lines(3D**) *folder* to uncheck any proposed sub-surface features and other non-proposed surface features.

   i.e. Bottom_pm,
   Subgrade_pm
   CurbBase_pm,
   PavementBase_pm,
   ShoulderBase,
   TemplateMisc_pm,
   TemplateNullPoint_pm.

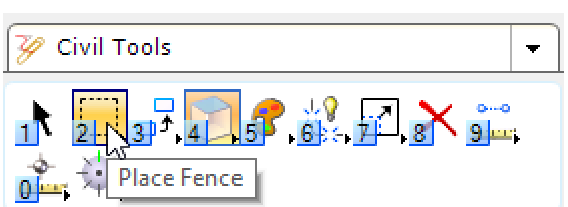


10. Use **Level Display** dialog to turn off the **default** level in the Default 3D view

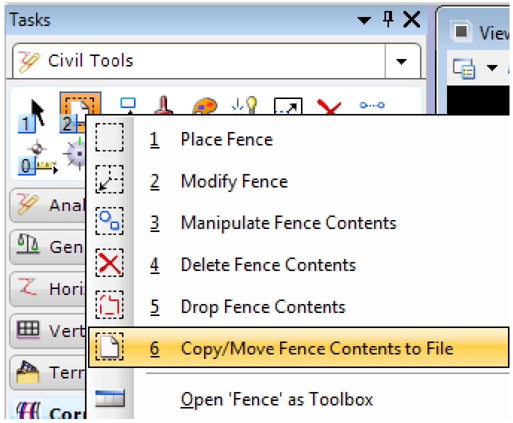
Note Use Level Display dialog to *turn off* remaining levels to use for the 3D Proposed breakline surface. i.e. Default level, Scratch_dp, Miscellaneous, ConstLines, etc

➢ ***Exporting 3D Break Lines.***

1. Place a Fence around all the **Elements** in the default-3D View.



2. Enter **ff= ..\3DDeliverables\AMG-3DSGNRD01**. Or use the copy fence contents dialog.



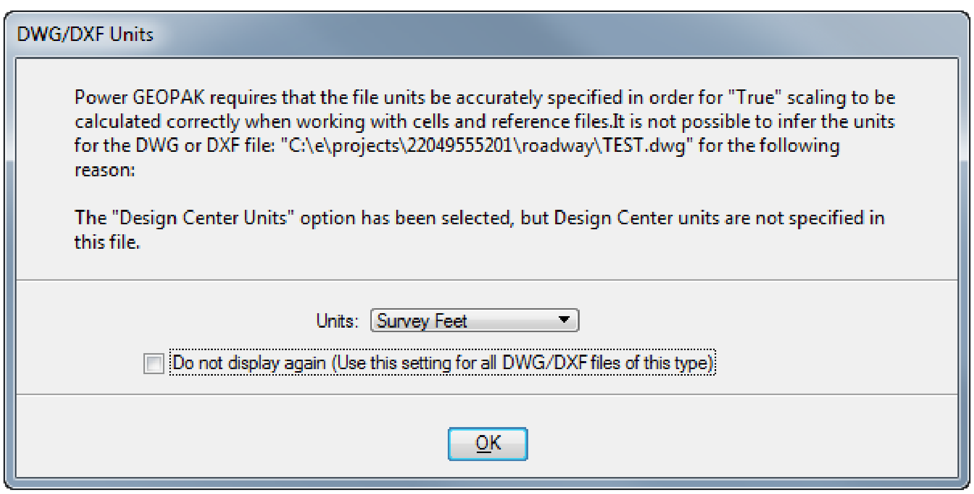
3. Data point to accept and verify the file is in the **3DDeliverables** directory.

➢ ***Save as DWG(Optional)***

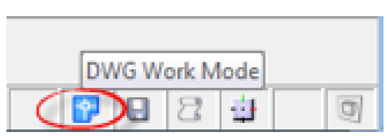
1. Open the 3DDeliverables*AMG-3DSGNRD01* design file.
2. Select **File** > **Save As** from the MicroStation Menu.
3. Select **Autodesk(R) DWG** as the *Save as type*.

Note There is no need to set **Options** on the **Save As** dialog

4. Verify or Enter the *File Name*, **AMG-3DSGNRD01** and click **Save**.
5. Select the *Units* **Survey Feet** and click **OK**.



Note The file will open in DWG Work Mode, see the blue cross hairs icon in the bottom right of the MicroStation window. Open the dwg file and trim extraneous elements as necessary

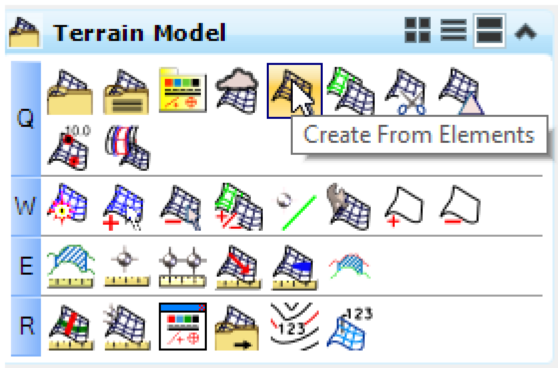


➢ ***Creating Proposed Surface Files for AMG***

1. In FDOTSS4, Select File >**Open** to the *AMG-3DSGN01.DGN* file. Click **Open File** and click **OK**.

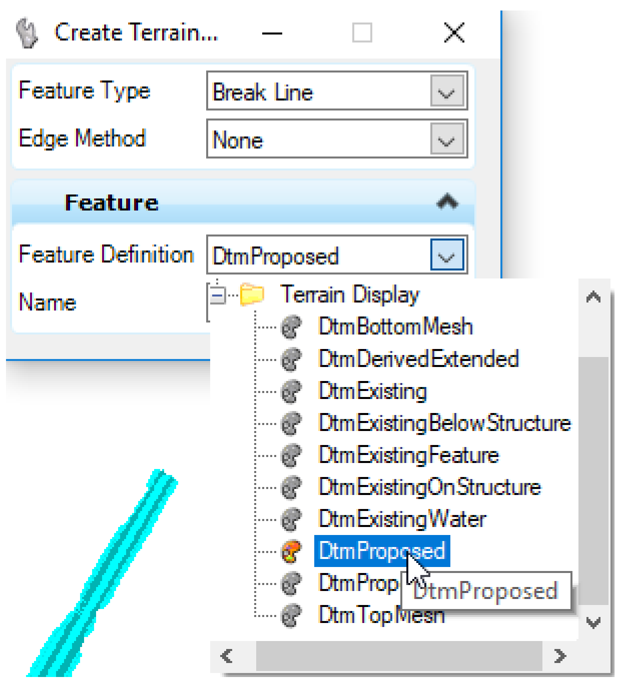
2. Create a Selection Set of all Elements.

3. Use *Civil Tools*, *Terrain Model*, **Create From Elements** tool.



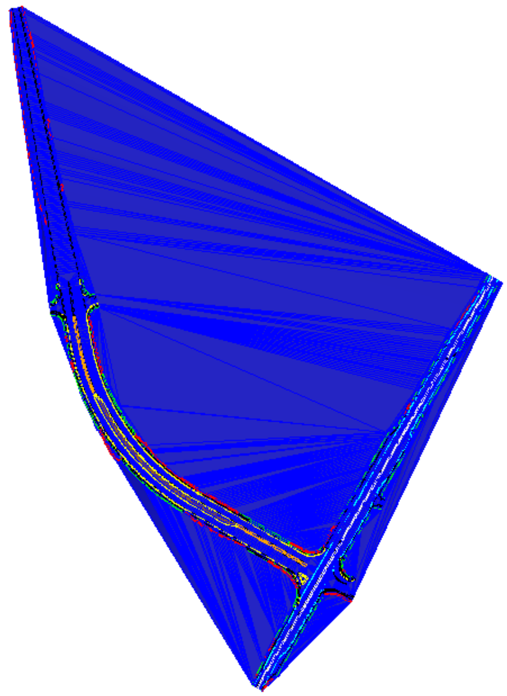
4. Define the following in the Create Terrain Model dialog:

   - *Feature Type:* **Break Line**
   - *Edge Method:* **None**
   - *Feature Definition:* **DTMProposed**
   - *Name:* **AMG-3SURFACEPR*01***



5. Data point through prompts to accept settings. A *Surface* is created. Use Function Key **F2** to turn ON/OFF the construction elements

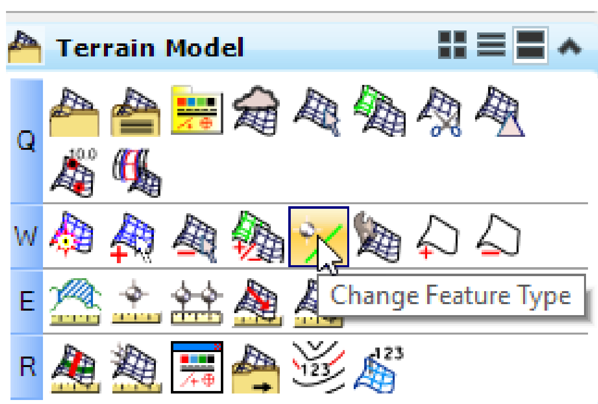
6. Notice the External Triangles must be trimmed.



7. Turn **Off** the Level **DTM_px** .

8. Create a Selection Set of all the **Cut_pm** and **Fill_pm** Lines defining the *slope construction limits*.

9. Use *Civil Tools*, *Terrain Model*, **Change Feature Type** tool.



10. Set the *Feature Type* to **Boundary**.

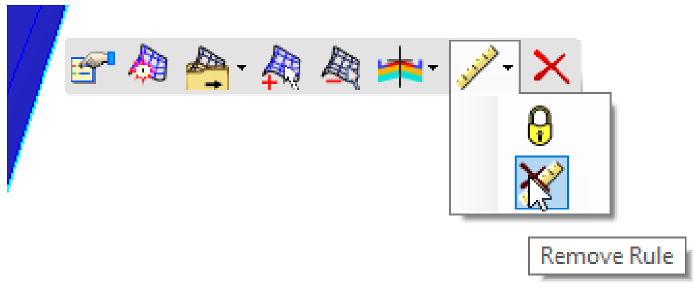
11. When prompted **left click twice** to change all the selected lines to *boundary elements for the External Limits of the Surface*.

12. Turn **ON** the **DTM_px** level to see the results.

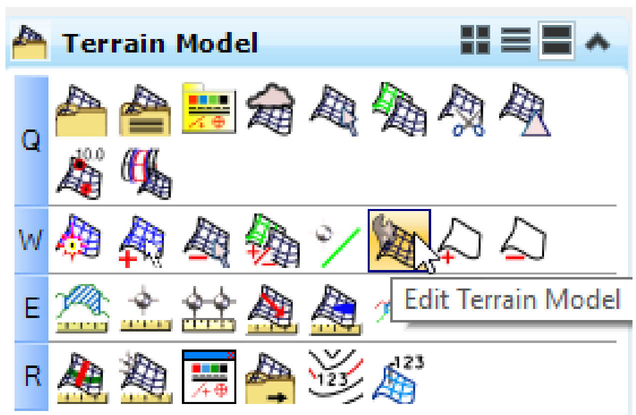
➢ *To delete extraneous triangles*

1. Select and hover over the Surface Terrain edge and then select **Rules>Remove Rule**.

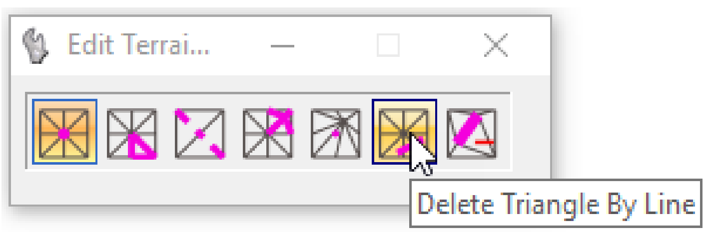
Note This will break the relationship to the 3D elements!



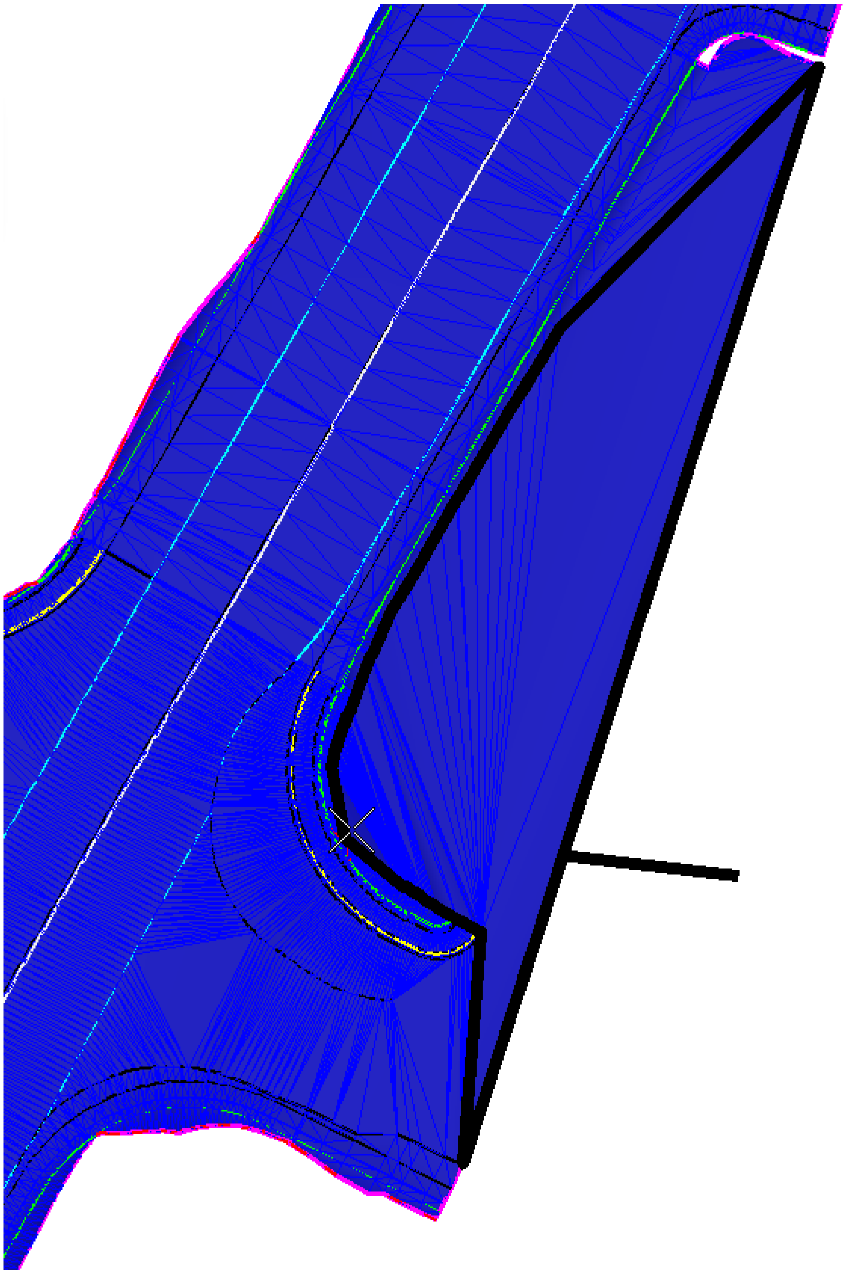
2. Use *Civil Tools, Terrain Model,* **Edit Terrain Model** tool



3. From the tool settings menu, select **Delete Triangle By Line**

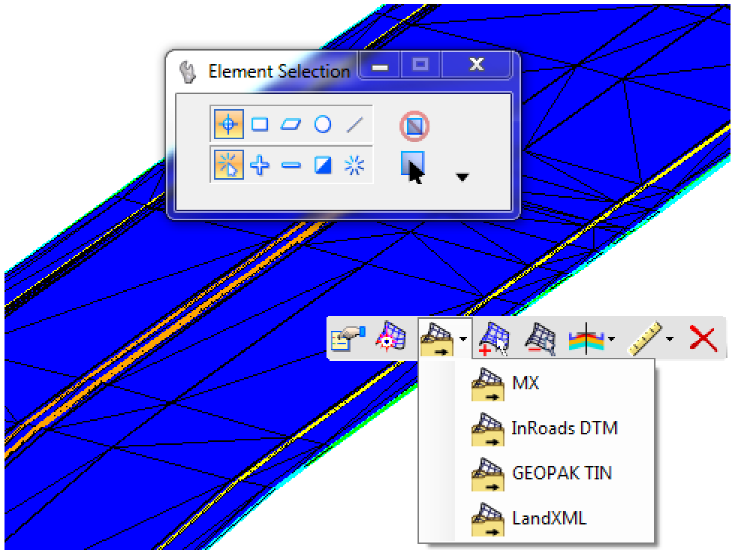


4. Draw a line (two left clicks) from outside the terrain across the erroneous triangle, then repeat as necessary.

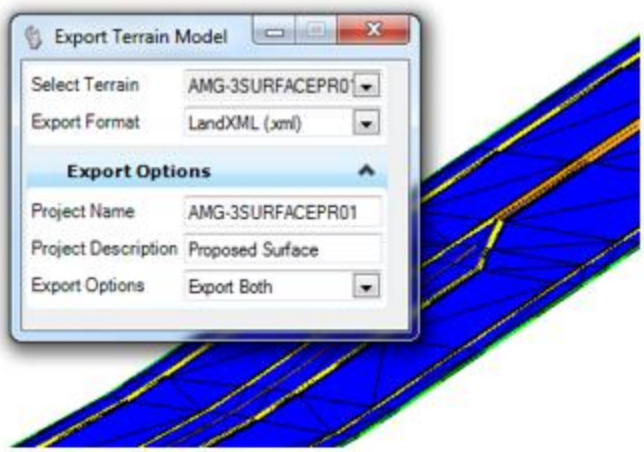


➢ *Save Terrain to Land XML file*

1. Select and hover over the *Surface* and then select **Export Terrain Model > LandXML**.



2. Select the **Terrain.**
3. Select the *Export Format:* **LandXML**
4. Enter the *Project Name:* **AMG-3SURFACEPR01.xml**
5. Enter the *Project Description:* **Proposed Surface**
6. Select the *Export Options*: **Export Both**



7. Save the file to the *3DDeleverables* directory**.**

Exercise 10.5 *Creating 3D Breaklines and Proposed Subgrade/Earthwork Files for AMG*

This exercise outlines the steps to create the proposed surface of the project for use by contractors for automated machine guidance as follows:

Prepare the Templates for Subgrade Point definitions and Alternate Surfaces

Prepare the View for Exporting

Exporting 3D Break Lines

Creating Proposed Surface Files for AMG

Delete extraneous triangles

The 3D proposed finished subgrade surface to be exported as LandXML format from the \Roadway\MODLRD file. This file can be used to generate surface to surface **earthwork** volumes

The subgrade surface can be created from the 3D feature lines provided that they have been defined properly in the point definitions on all project corridor, linear and surface templates.

➢ *Prepare the Templates for Subgrade Point definitions and Alternate Surfaces*

In the Create Template dialog, edit each of the points defining the finished subgrade. Set the **Feature Definition** and **Alternate Surface** fields to *SubGrade_pm* and *SUBGRADE*, respectfully.

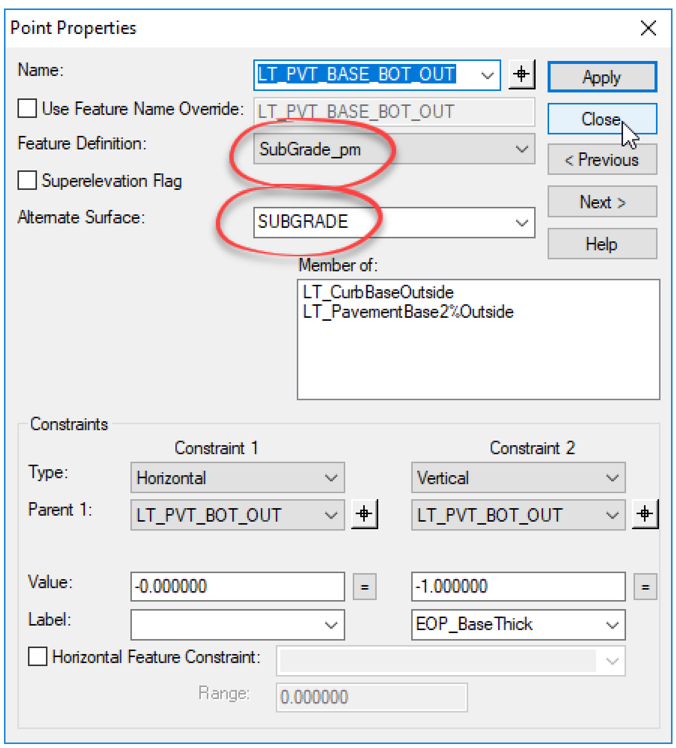
When creating surface terrains from 3D lines, there are two important TIN principles for consideration:

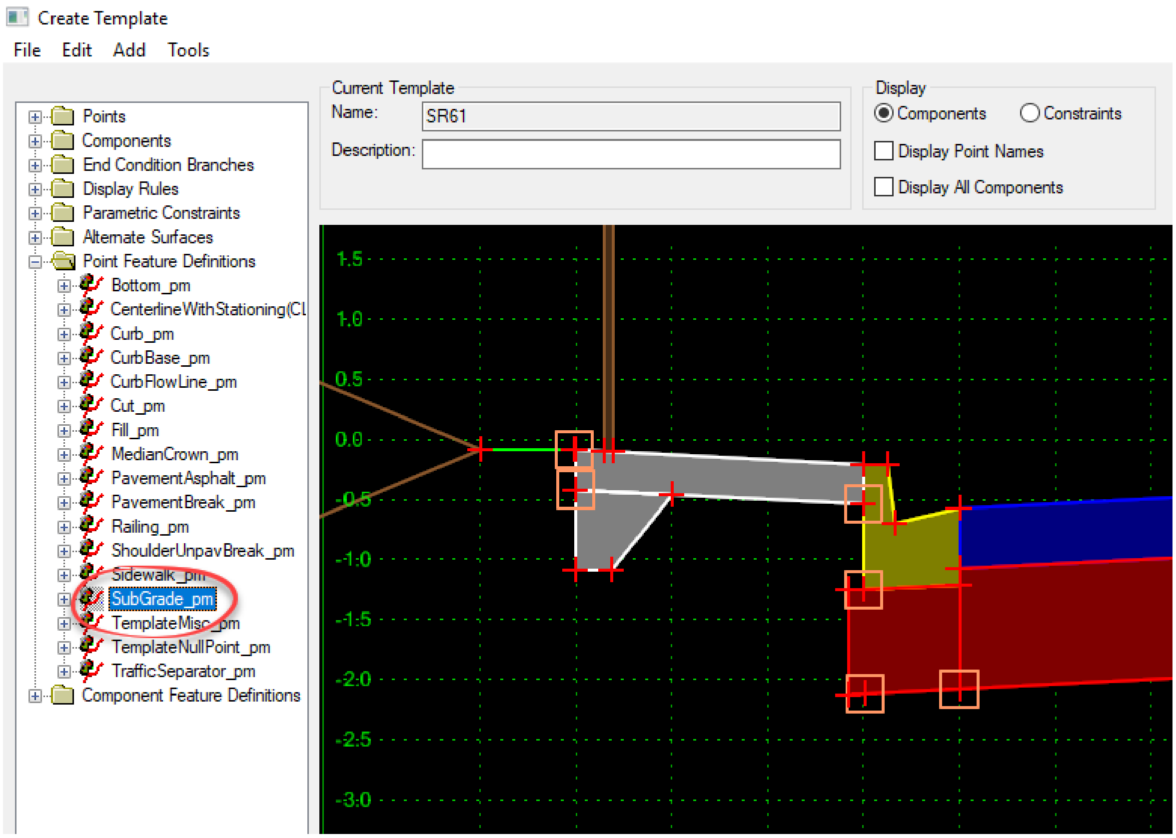
a. **Vertical Faces – all lines must have different xy values. They cannot be stacked in the z plane**. Therefore, set the horizontal offset value no less than .01 feet on vertical component points in the project templates

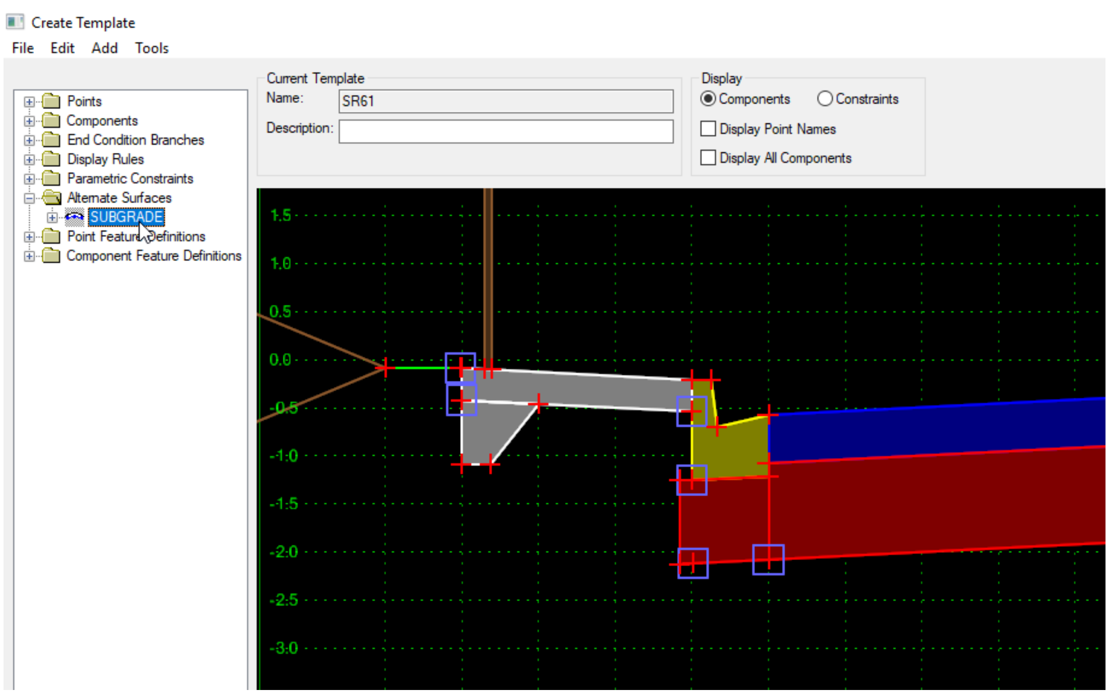
b. **Caves/Cliffs – all lines must continue in the same direction. The TIN triangles will not reverse direction across a surface**. Therefore, consider which points to use for the subgrade surface. I.E. base, base extensions, wall footers, etc. Additional template points may be needed to intercept the top surface in these areas. As a rule, it is better to include the base, base extensions, wall footers, etc for excavation and not to include base, base extensions, wall footers, etc for embankment.

Note These template accommodations are necessary to consider for ALL Corridor, Linear and Surface Templates used on the project.

The following images are examples of the point properties dialog, highlighted **Subgrade_pm** Point Feature Definition, and the highlighted **SUBGRADE** Alternate surface. In this example the base extension is not included in the subgrade surface definition.




Create Template
File Edit Add Tools
Points
Components
End Condition Branches
Display Rules
Parametric Constraints
Alternate Surfaces
Point Feature Definitions
Bottom_pm
CenterlineWithStationing(Cl
Curb_pm
CurbBase_pm
CurbFlowLine_pm
Cut_pm
Fill_pm
MedianCrown_pm
PavementAsphalt_pm
PavementBreak_pm
Railing_pm
ShoulderUnpavBreak_pm
Sidewalk_pm
SubGrade_pm
TemplateMisc_pm
TemplateNullPoint_pm
TrafficSeparator_pm
Component Feature Definitions
Current Template
Name: SR61
Description:
Display
Components
Constraints
Display Point Names
Display All Components
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0

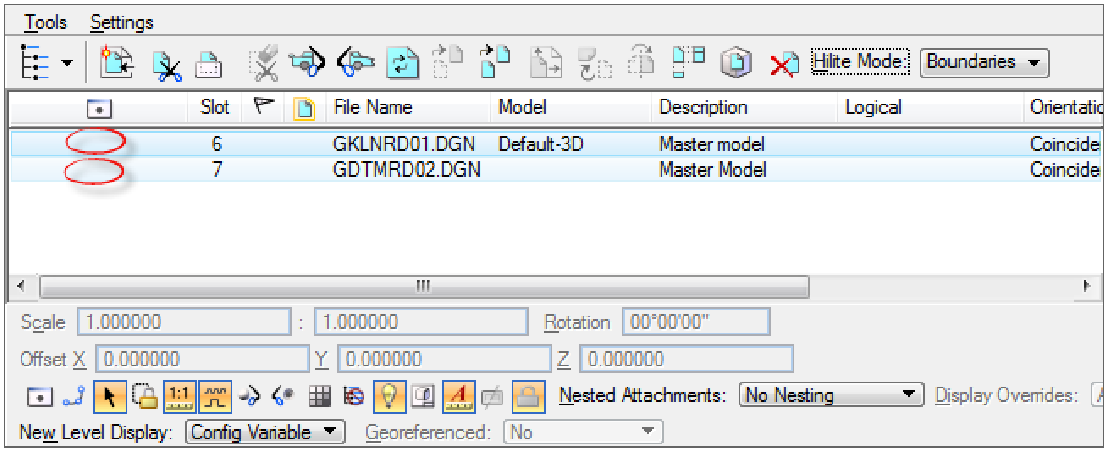

Create Template
File Edit Add Tools
Points
Components
End Condition Branches
Display Rules
Parametric Constraints
Alternate Surfaces
SUBGRADE
Point Feature Definitions
Component Feature Definitions
Current Template
Name: SR61
Description:
Display
Components
Constraints
Display Point Names
Display All Components
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0

➢ ***Prepare the View for Exporting***

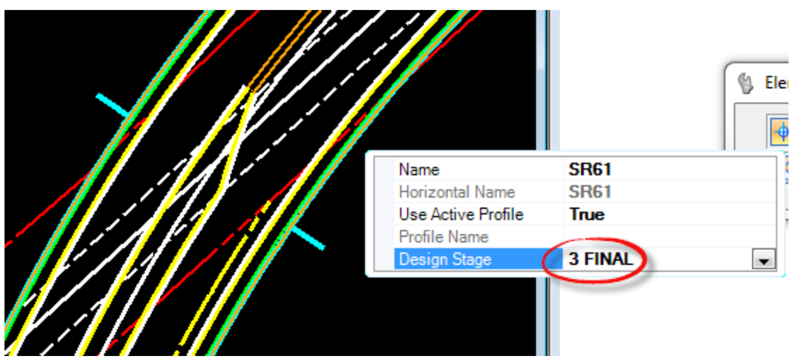
1. Open the *DSGNRDxx.dgn or MODLRDxx* file. To Display **2D** and **3D Views**, select *Function Key* **F2**.

2. Turn **OFF** the **Reference File** display for:

   GKLNRD01.DGN
   GDTMRD02.DGN or SURVRD01.DGN

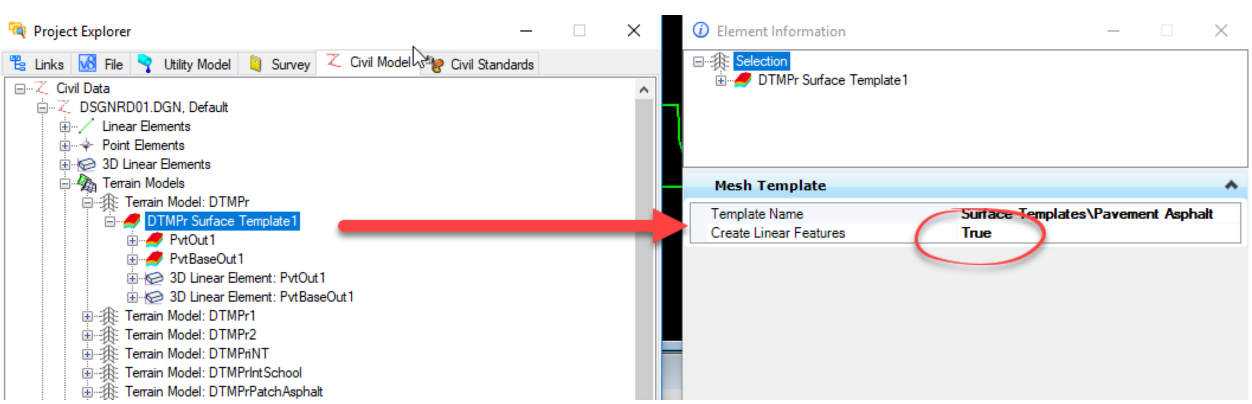


3. Set the *Corridor Design Stage* to **Final** for all the corridors and linear templates.



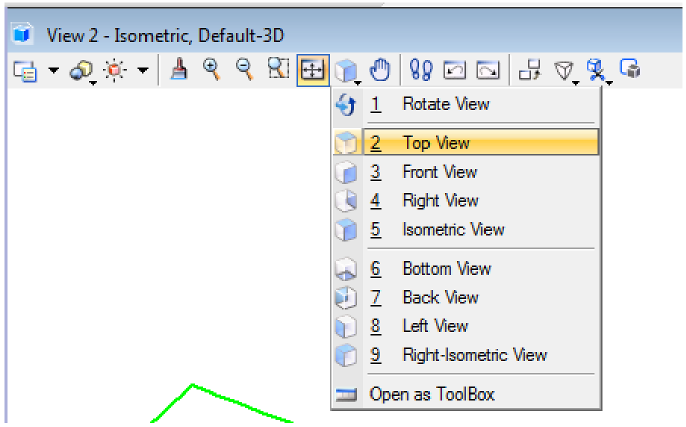
4. Open both the Project Explorer and Element Properties Dialogs, Navigate to the Civil Model>*Active Design file* > Terrain Models.

5. For EACH Terrain Model Surface Templates, Set the **Create Linear Features** option to *True*.



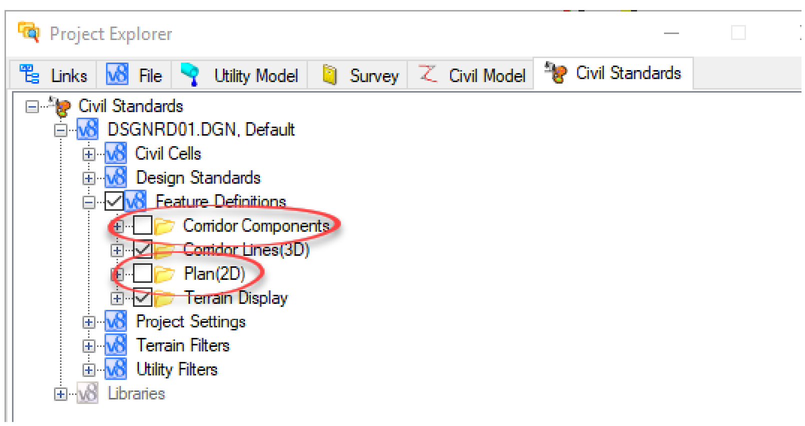
6. Maximize the View 2 – Default-3D.

7. Change the *View Rotation* to a **Top view**



8. In Project Explorer > Civil Standards > *Active file* >Feature Definitions. Uncheck Corridor Components *folder* to turn OFF Mesh Solid elements.

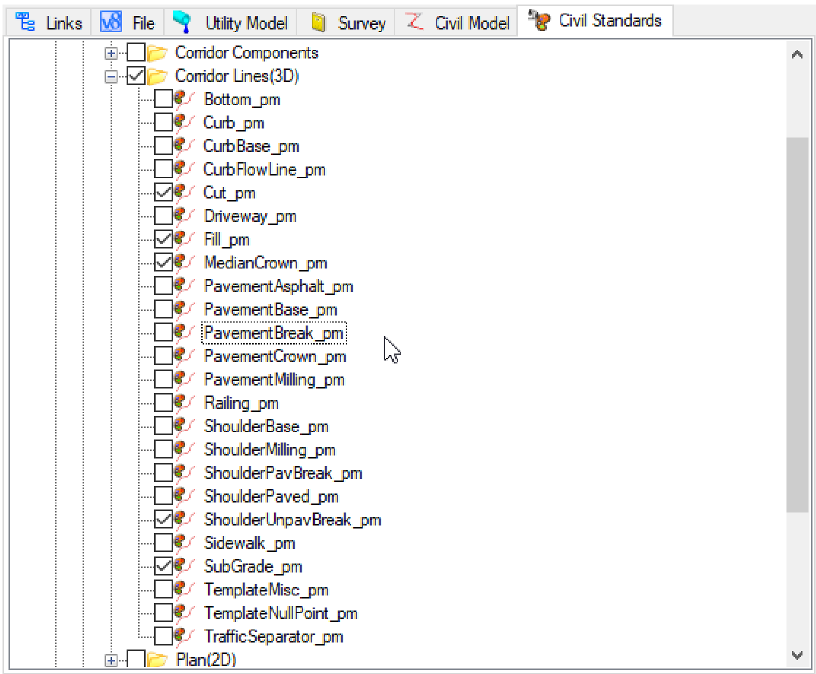
9. Use Project Explorer Civil Standards > *Active file* >Feature Definitions. Uncheck Plan(2D) *folder* to turn OFF Lines created from Active Profiles



10. Use the *Function Key* **F7** to turn **OFF** all *Construction* elements in the 3D model view.

11. In Project Explorer Civil Standards > *Active file* >Feature Definitions. Open the *Corridor Lines(3D)* folder to check only-proposed subgrade surface features.

    i.e. *Cut_pm,*
    Fill_pm,
    MedianCrown_pm,
    ShoulderUnpavBreak_pm,
    Subgrade_pm,

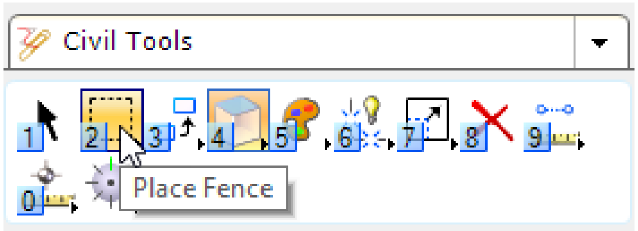


12. Use Level Display dialog to turn off the *default* level in the Default 3D view

Note Use Level Display dialog to *turn off* remaining levels to use for the 3D Proposed Subgrade breakline surface. i.e. Default level, Scratch_dp, Miscellaneous, ConstLines, etc.

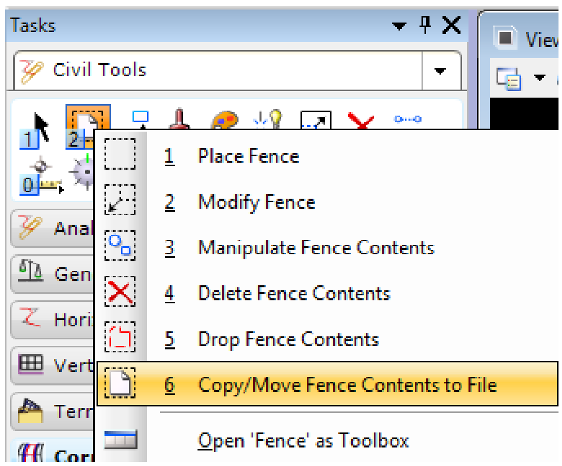
➢ ***Exporting 3D Break Lines.***

1. Place a Fence around all the **Elements** in the default-3D View.



2. Enter ff=..\3DDeliverables\ AMG-3DSGNRDEW01.dgn.

3. Or use the copy fence contents dialog.



4. Data point to accept.

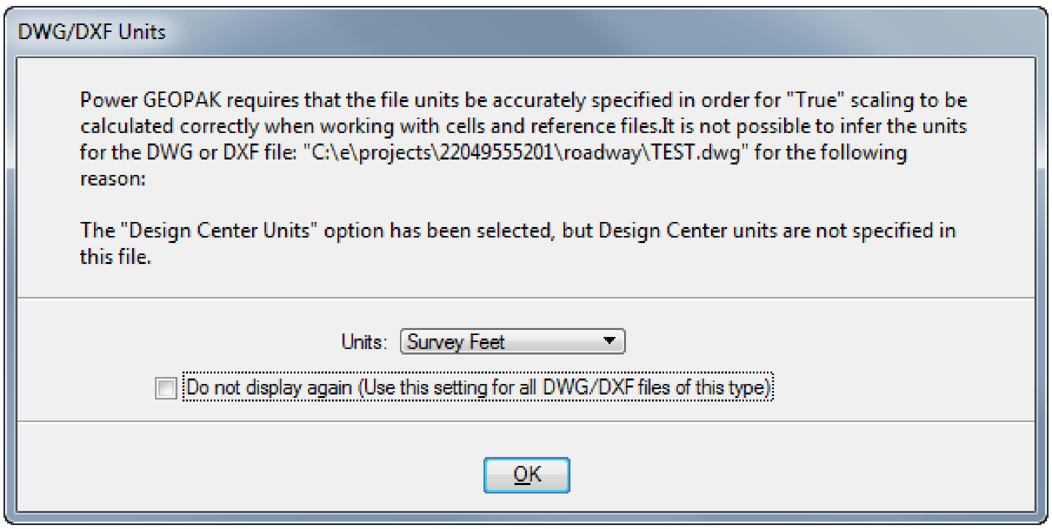
5. Verify the file is in the **3DDeliverables** directory.

➢ *Save as DWG(Optional)*

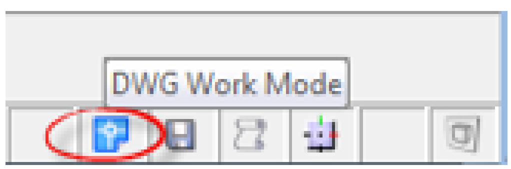
1. Open the 3DDeliverables\ *AMG-3DSGNRDEW01.dgn* design file.
2. Select **File** > **Save As** from the MicroStation Menu.
3. Select **Autodesk(R) DWG** as the *Save as type*.

Note There is no need to set **Options** on the **Save As** dialog

4. Verify or Enter the *File Name*, **AMG-3DSGNRDEW01** and click **Save**.
5. Select the *Units* **Survey Feet** and click **OK**.



Note The file will open in DWG Work Mode, see the blue cross hairs icon in the bottom right of the MicroStation window. Open the dwg file and trim extraneous elements as necessary

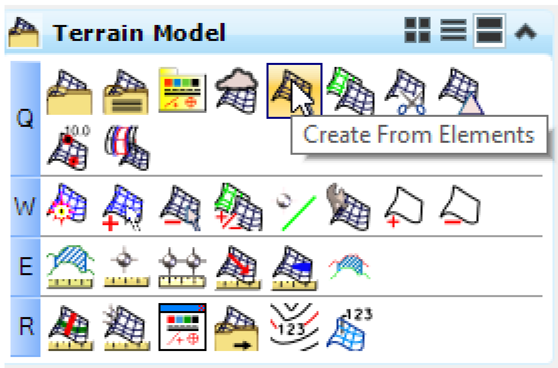


➢ *Creating Proposed Subgrade Surface Files for AMG*

1. In FDOTSS4, Select File >**Open** to the *AMG-3DSGNEW01.DGN* file. Click **Open File** and click **OK**.

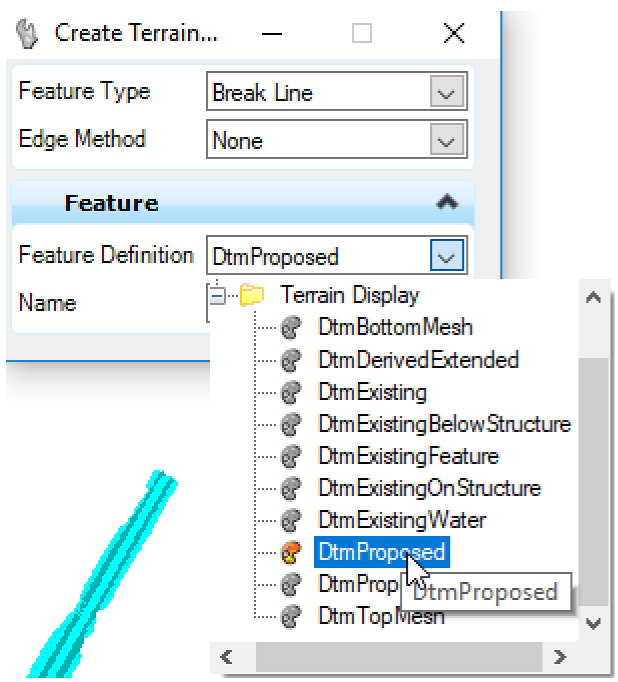
2. Create a Selection Set of all Elements.

3. Use *Civil Tools*, *Terrain Model*, **Create From Elements** tool.



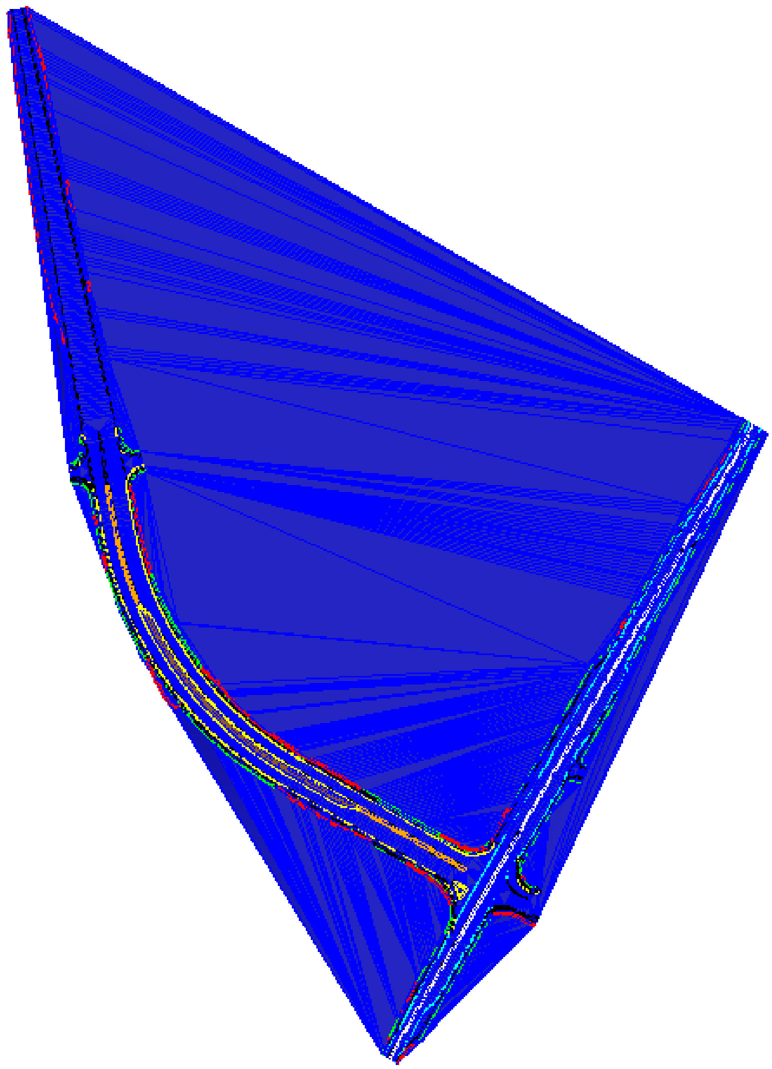
4. Define the following in the Create Terrain Model dialog:

   - *Feature Type:* **Break Line**
   - *Edge Method:* **None**
   - *Feature Definition:* **DTMProposed**
   - *Name:* **AMG-3SURFACEEW*01***



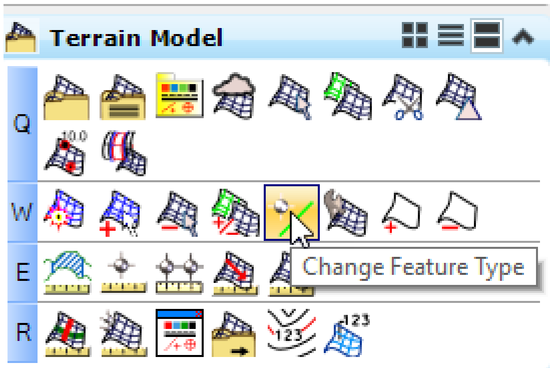
5. Data point through prompts to accept settings. A *Surface* is created. Use Function Key **F2** to turn ON/OFF the construction elements

6. Notice the External Triangles must be trimmed.



7. Turn **Off** the Level **DTM_px** .

8. Use *Civil Tools*, *Terrain Model*, **Change Feature Type** tool.

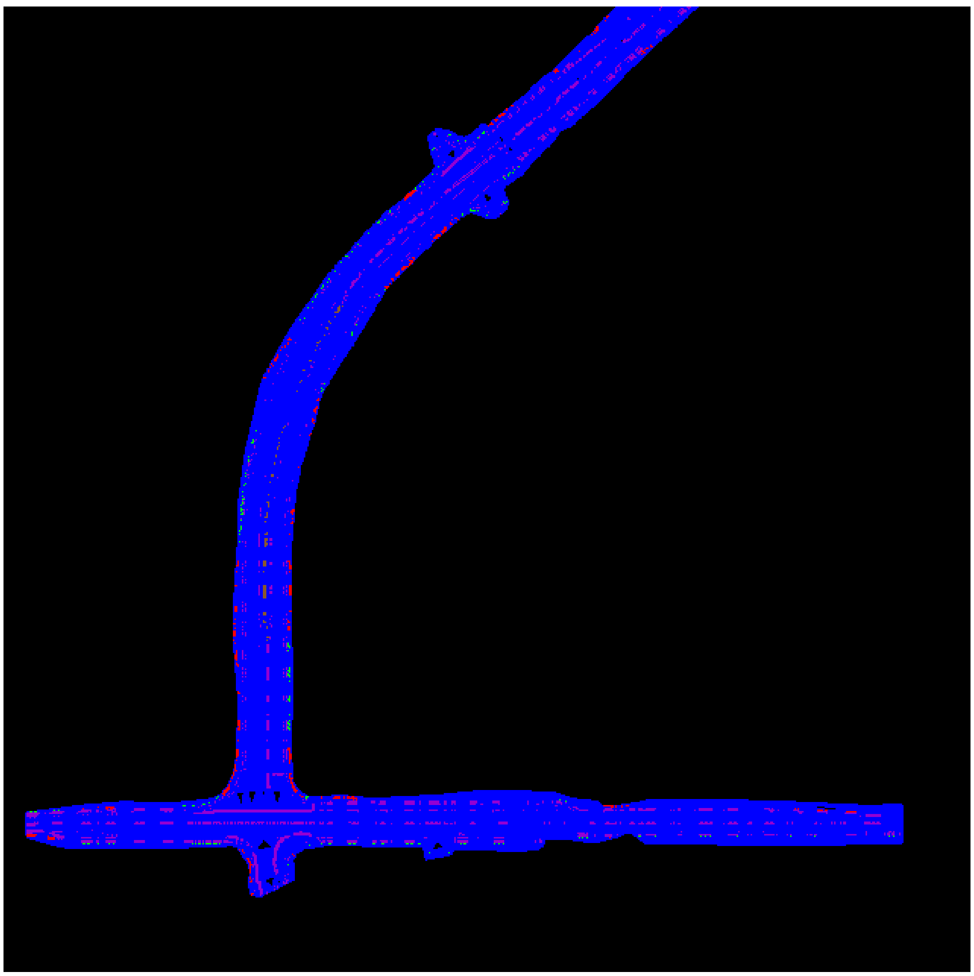


9. Set the *Feature Type* to **Boundary**.

10. Select each of all the **Cut_pm** and **Fill_pm** Lines individually defining the *slope construction limits*. Right click to finish when all the selected lines to *boundary elements for the External Limits of the Surface*.

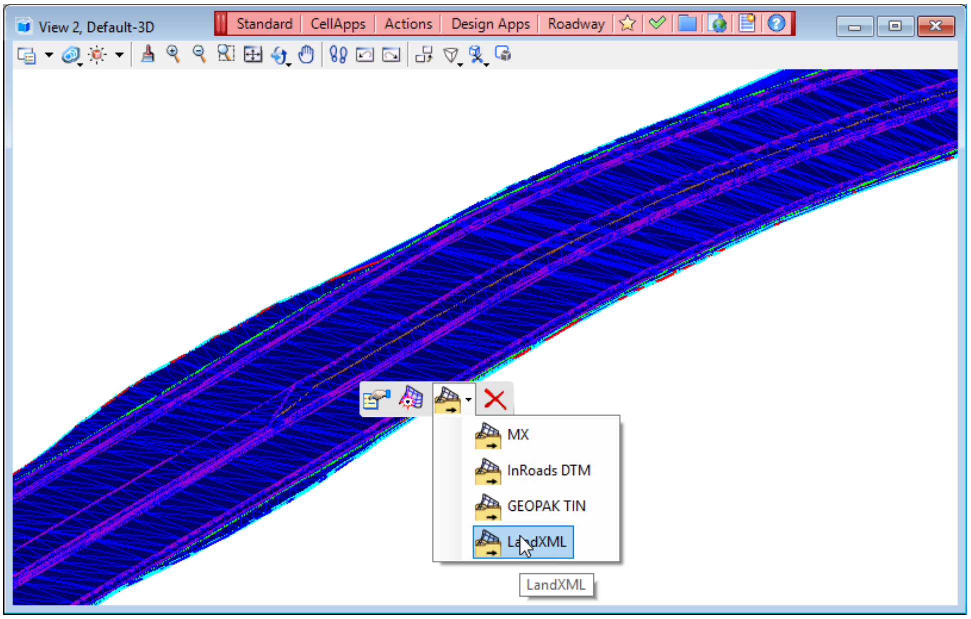
Note A Selection Set for Cut/Fill Lines does not produce the desired results for the creation of the Subgrade surface Terrain

11. Turn **ON** the **DTM_px** level to see the results.



➢ *Save Terrain to Land XML file*

1. Select and hover over the *Surface* and then select **Export Terrain Model > LandXML**.



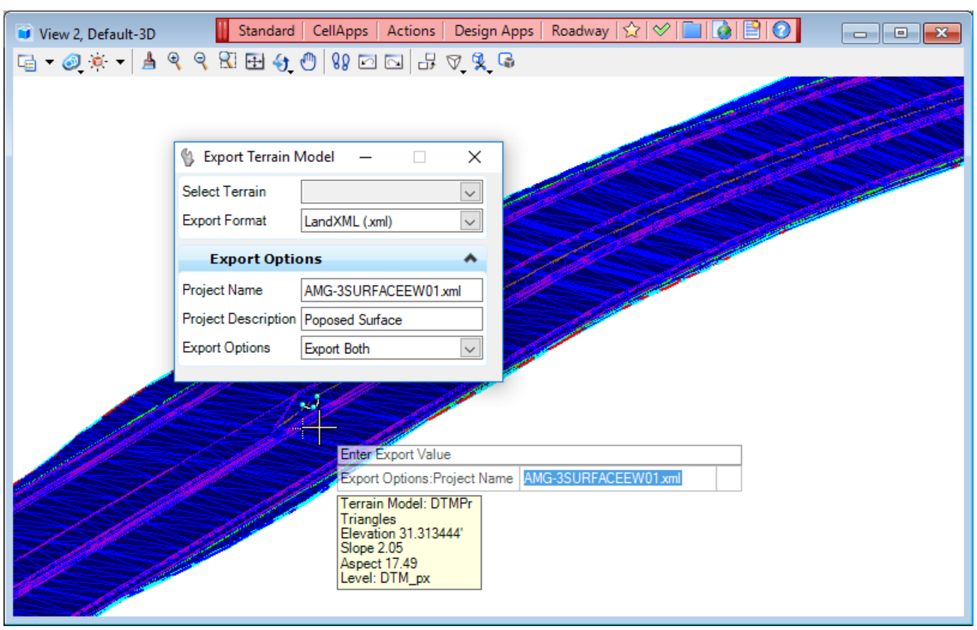
2. Select the **Terrain.**

3. Select the *Export Format:* **LandXML**

4. Enter the *Project Name:* **AMG-3SURFACEEW01.xml**

5. Enter the *Project Description:* **Proposed Surface**

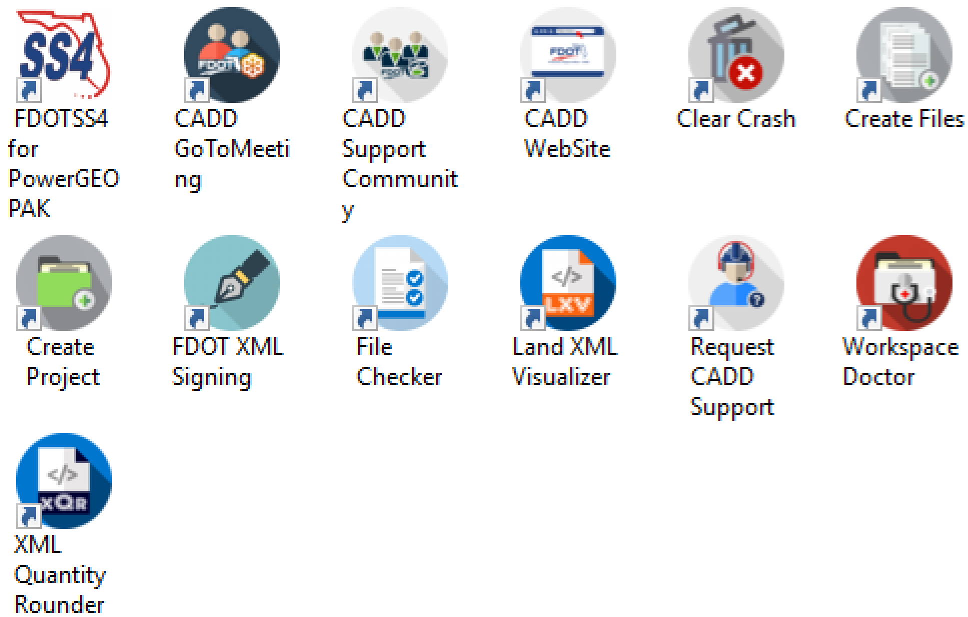
6. Select the *Export Options*: **Export Both**



7. Save the file to the 3DDeleverables directory.

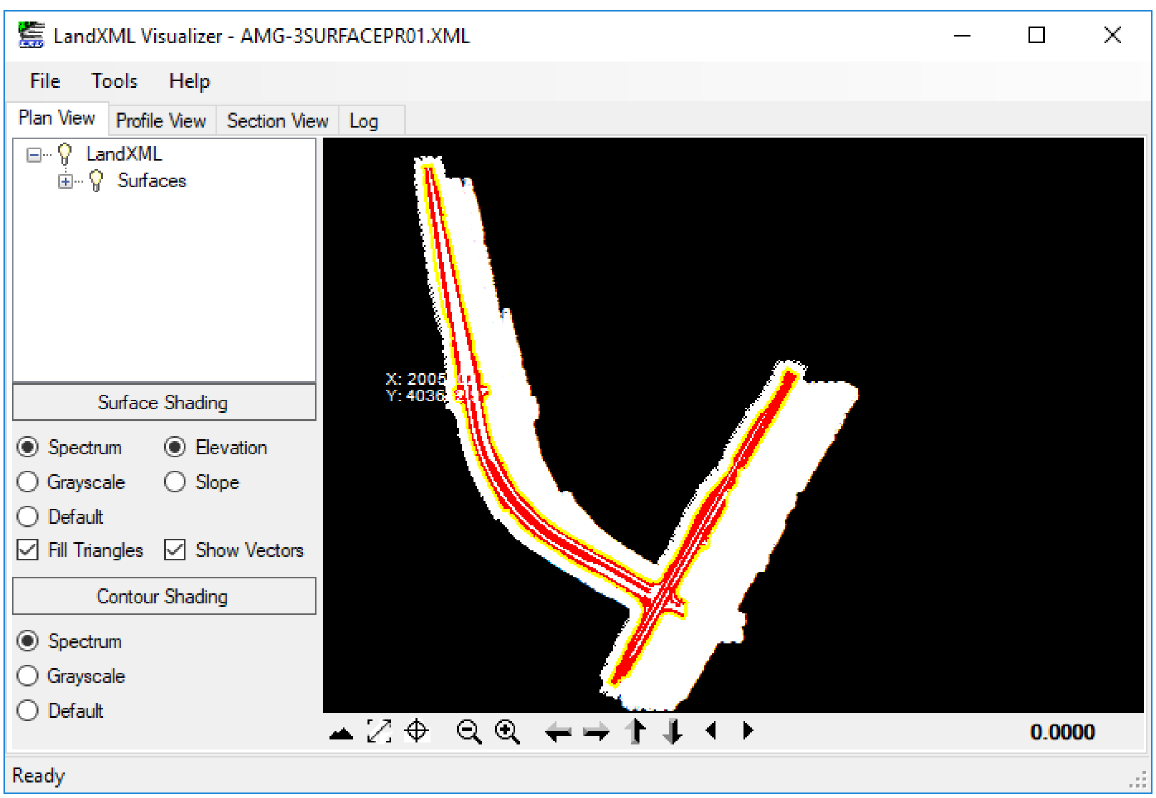
Exercise 10.6 Use Land XML Visualizer to Validate Land XML File

1. From the desktop locate and open the FDOTSS4 Product Folder



2. Open the Land XML Visualizer tool

3. On the **Land XML Visualizer** tool, select **File Open**. Choose the AMG-3SURFACEPR01.xml file



4. Change the **Plan View** Setting to **Default**, **No Fill**, **No Vectors** and **No shading** as shown below. Also, right click on the **Pnts** definition and choose **Hide**