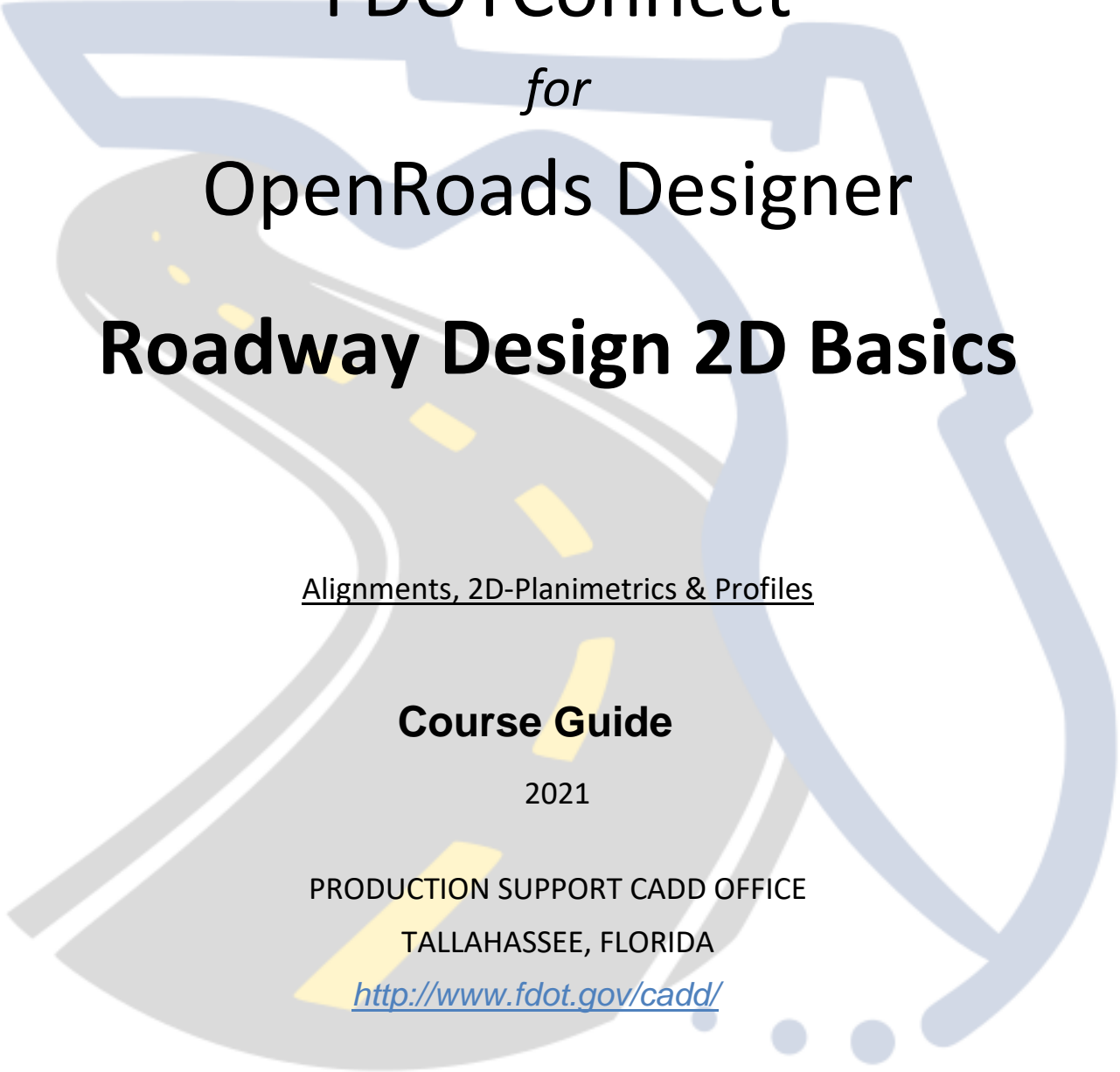


State of Florida
Department of Transportation



FDOTConnect
for
OpenRoads Designer
Roadway Design 2D Basics

Alignments, 2D-Planimetrics & Profiles

Course Guide

2021

PRODUCTION SUPPORT CADD OFFICE

TALLAHASSEE, FLORIDA

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

FDOTConnect for ***OpenRoads Designer***

Roadway Design ***Basic 2D Rule Based Design***

Description

This is a 2-day training course to that will go over the fundamentals of 2D design Alignments, 2D-Planimetrics & Profiles. Participants will be introduced to Bentley OpenRoads Designer CONNECT Edition - OpenRoads Technology tools for design and modeling; specifically for Florida Department of Transportation (FDOT) projects using the FDOTCONNECT 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
- Ribbon Tabs 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 FDOTCONNECT 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 OpenRoads Designer CONNECT Edition - OpenRoads Technology tools and a solid understanding of the engineering necessary to design a Roadway.

Duration: 12 Hours

Professional Credit Hours: 12 PDHs

Note PDH Credit will only be available with Instructor lead or Computer Based Training (CBT) thru Learning Curve.

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INTRODUCTION

This course was developed to introduce OpenRoads Designer CONNECT Edition - OpenRoads Technology tools for design and modeling on Florida Department of Transportation (FDOT) projects. The curriculum was developed within the FDOTCONNECT Workspace to provide sample exercises for most of the new Civil Tools on a sample project data set.

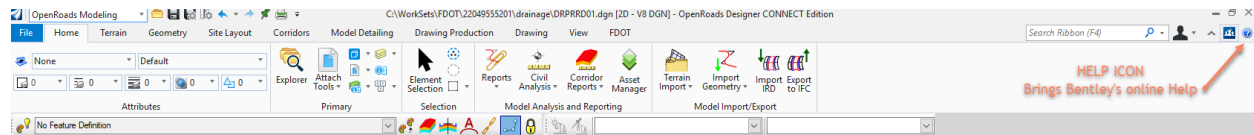
COURSE OBJECTIVES

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:

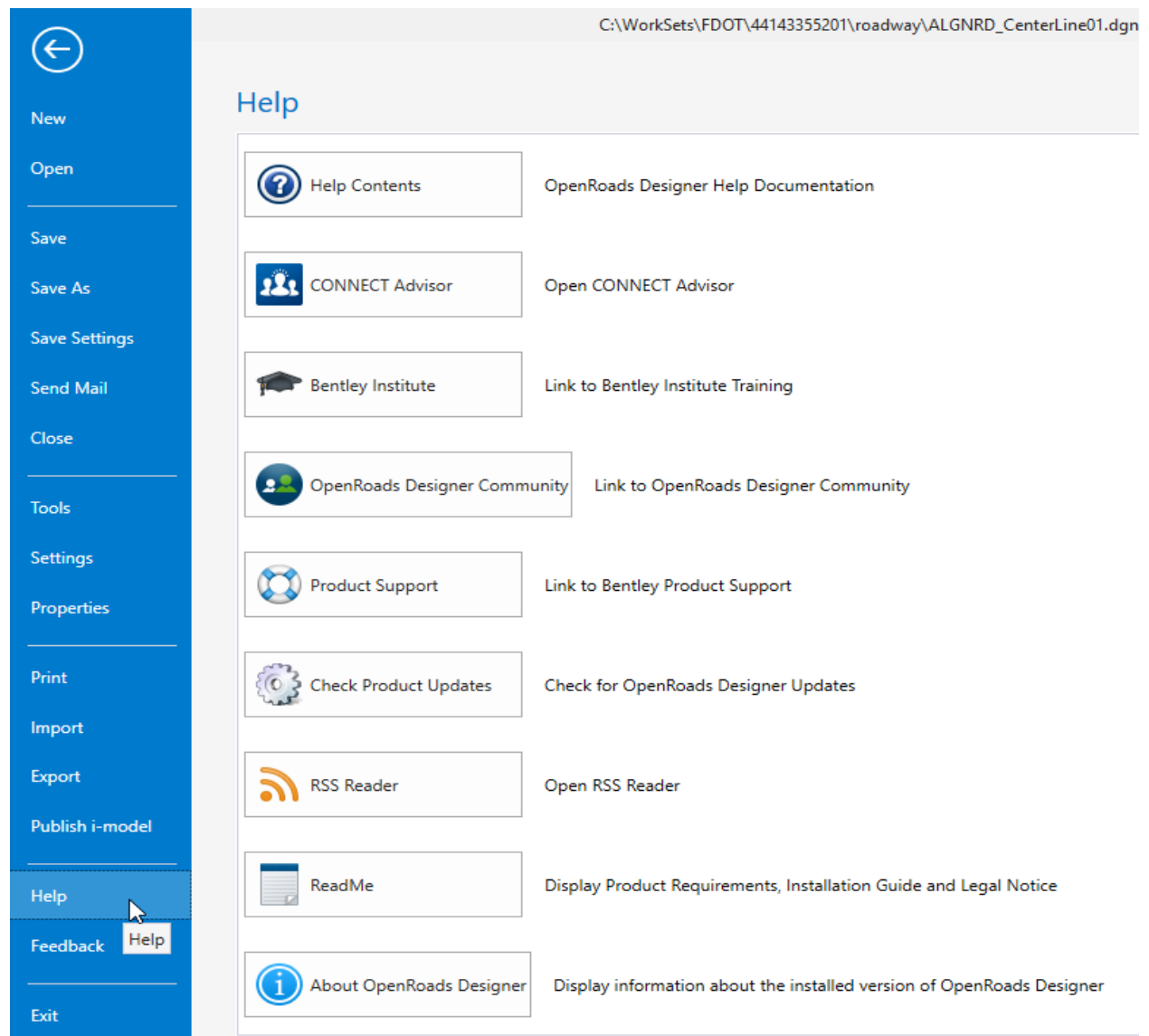
- Use Civil Geometry Elements in the design file to calculate and define a proposed centerline of construction and while using the built in Design Standards Criteria checking.
- Use Civil Geometry Elements in the design file to define the roadway features of the proposed design.
- Apply Civil Cells delivered within the FDOTCONNECT Civil Cell DGN library.
- Use Civil Geometry Elements in the design file to define the vertical profiles of a proposed centerline.

EXPECTATIONS – WHAT THIS COURSE PROVIDES

This course provides a standard workflow for designing a project with Bentley Systems OpenRoads Designer CONNECT Edition - OpenRoads Technology within the FDOTCONNECT Workspace. Although the majority of tools are used throughout, this course does not provide a description of every Bentley Systems OpenRoads Designer CONNECT Edition - OpenRoads Technology Civil Tool. Integrated help for each of the tools can be found by selecting FILE then going to the backstage and selecting Help to bring up Bentley’s ONLINE HELP or from the Ribbon pick the HELP icon.



FILE>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)	<ul style="list-style-type: none"> • File > Open • File > ComSelect > Design
Dialog box Actions	Bold	<ul style="list-style-type: none"> • Click the Apply button. • Click the Graphic Select button to the right of the <i>Horizontal Alignment Include</i> box. • In the <i>Segment Type</i> list, click Lines.
Dialog box Field Names	Italic	<ul style="list-style-type: none"> • Key in Hemfield Road in the <i>Alignment Name</i> field. • Click the Graphic Select button to the right of the <i>Horizontal Alignment Include</i> field. • In the <i>Segment Type</i> list, click Lines.
Key-ins	Bold	<ul style="list-style-type: none"> • Key in Hemfield Road in the <i>Alignment Name</i> field.
File Names	Italic	<ul style="list-style-type: none"> • Open the file <i>ALGNRD01.dgn</i> in the C:\WorkSets\FDOT\22049555201\Roadway.
File Paths	Non italic	<ul style="list-style-type: none"> • Open the file <i>_Blank.dgn</i> in the C:\WorkSets\FDOT\22049555201
New Terms or Emphasis	Italic	<ul style="list-style-type: none"> • The Template Library contains <i>templates</i>, which represent typical sections of the proposed roadway.

We would like to introduce the user to a new workflow terminology using the Ribbon if you see a direction like this *OPENROADS MODELING>GEOMETRY>HORIZONTAL>Lines>Line From Element>Simple Line From Element*

This means we are in the **WorkFlow** of **OpenRoads Modeling** which has a **Tab** named **Geometry** and has tools that are located in the **Horizontal Group**. Now that we are in the right workflow, Tab and Group we may need to click on a tool that has more than one option.

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.
- *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.

LEARNING RESOURCES

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

- Bentley Communities:
https://communities.bentley.com/products/road_site_design/w/road_and_site_design_wiki/33435/openroads-designer
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/UCqbY8kqZuXp1pyYV6IIQw_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 completed Selected zip files for each chapter. All files used in this course are located also at this link:

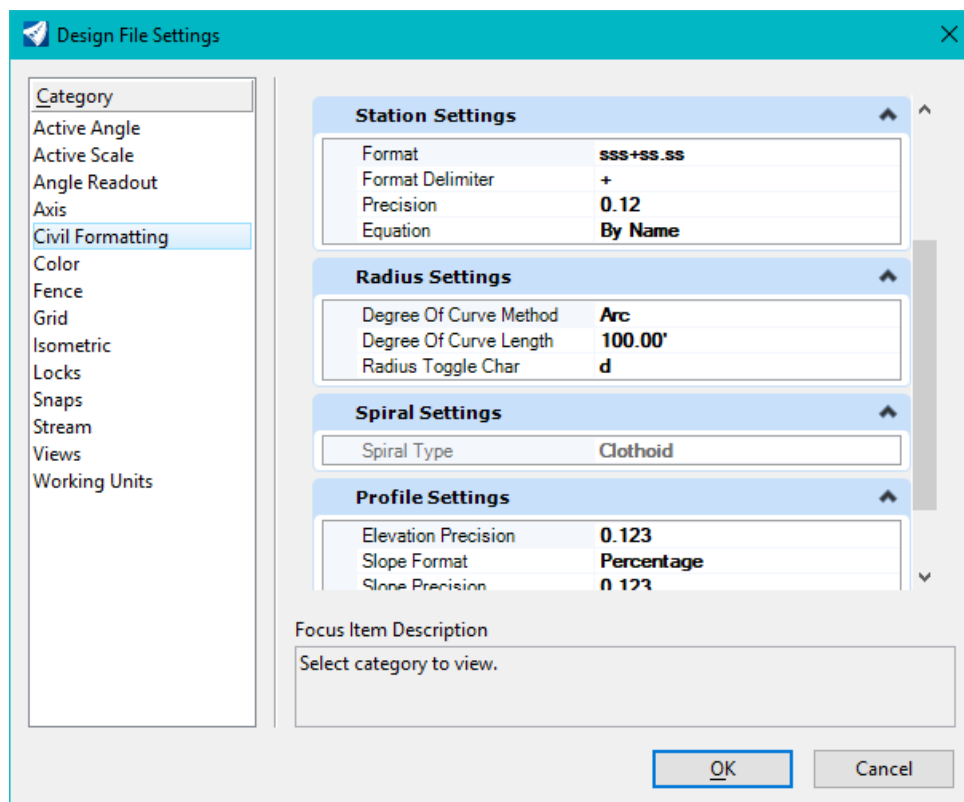
<http://www.fdot.gov/cadd/downloads/documentation/FDOTRDAnd3DM/FDOTRDAnd3DM.shtm>

INTRODUCING A NEW WORKSPACE

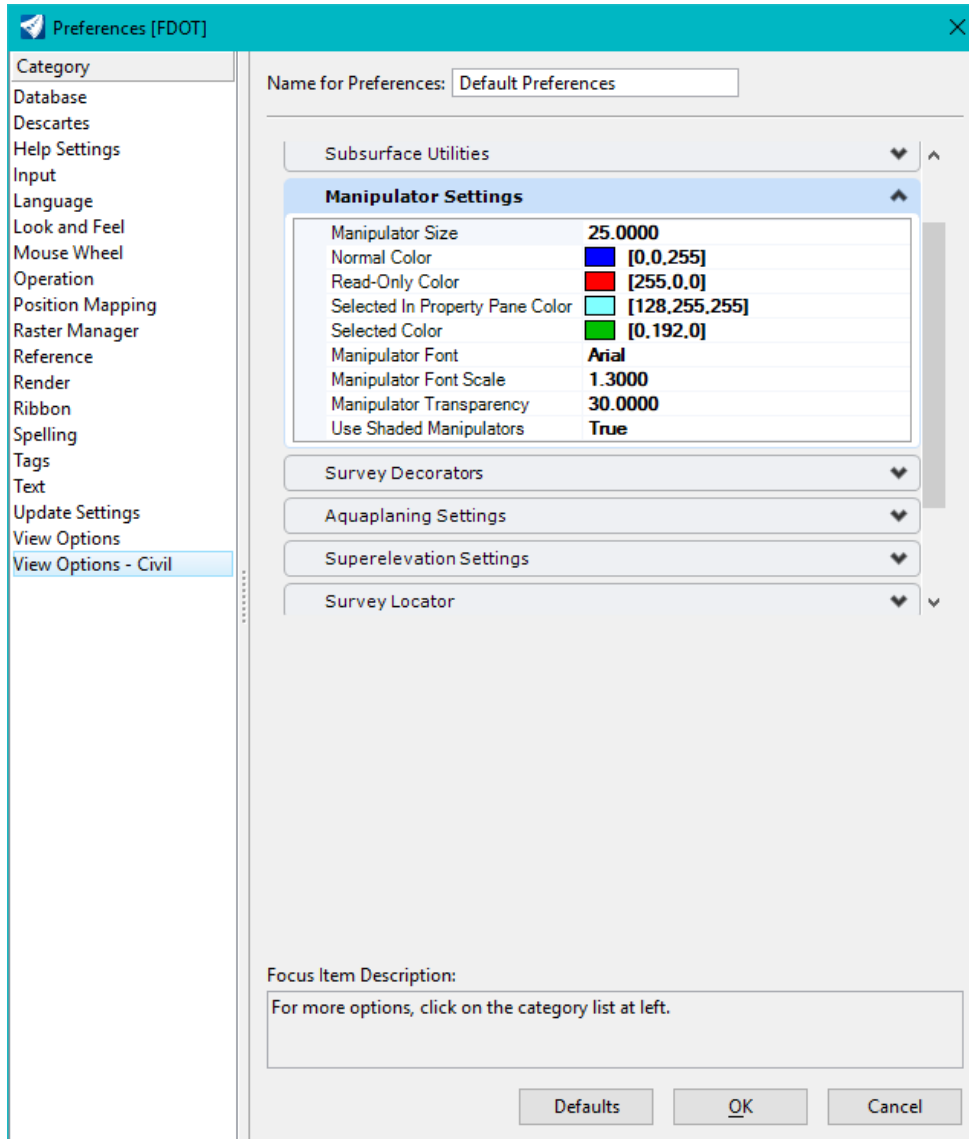
FDOTCONNECT PREDEFINED SETTINGS



DESIGN FILE SETTINGS:

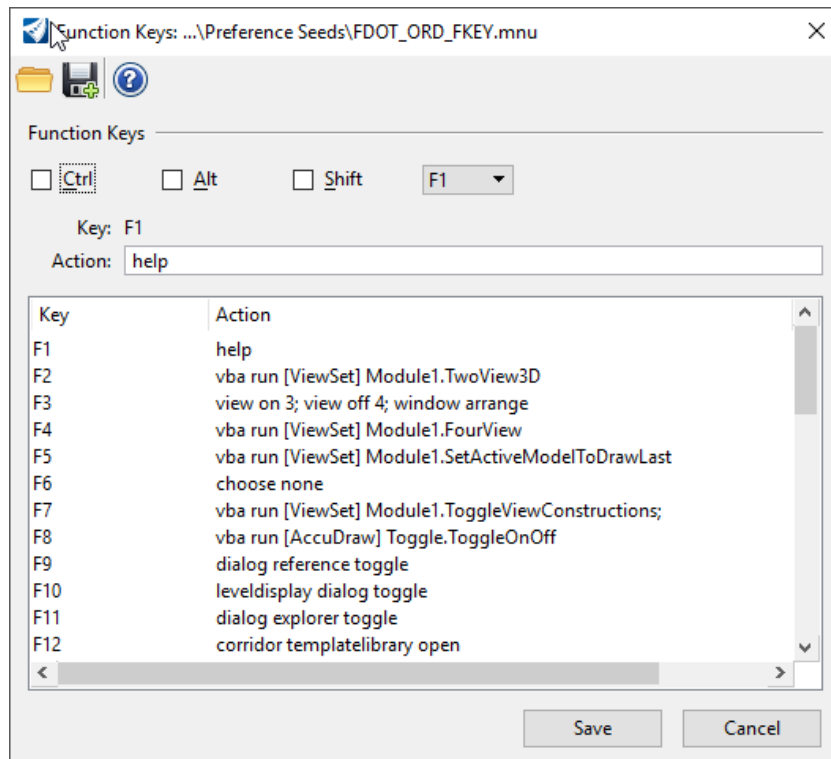


FDOTCONNECT WORKSPACE PREFERENCES:

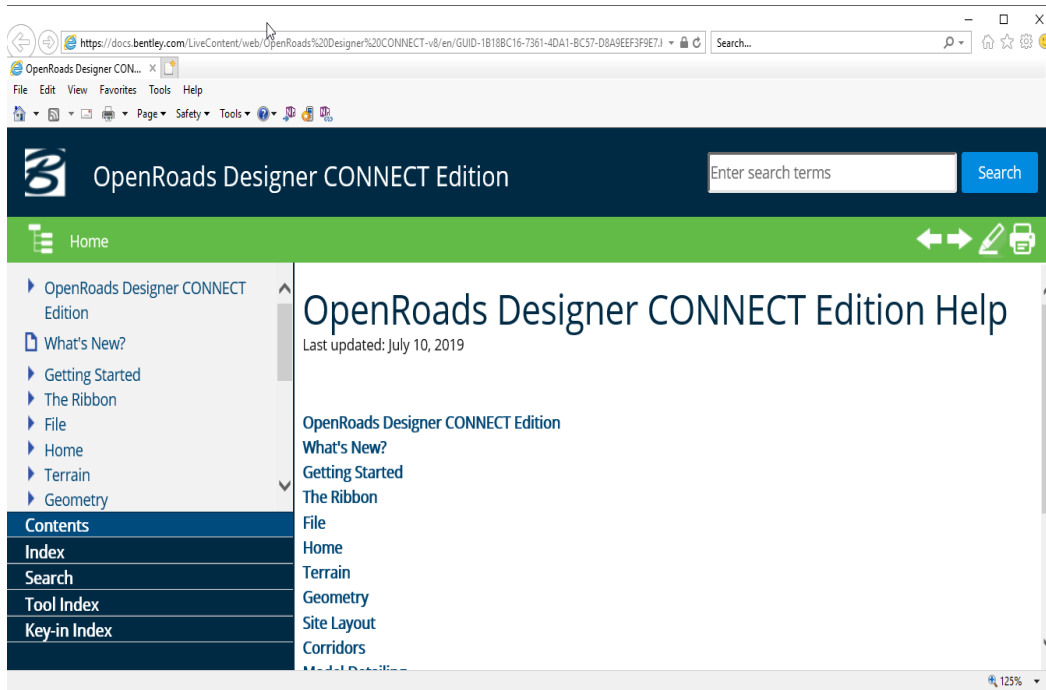
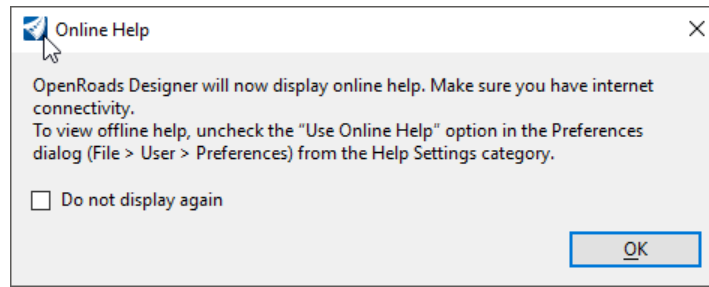


FDOTCONNECT FUNCTION KEYS

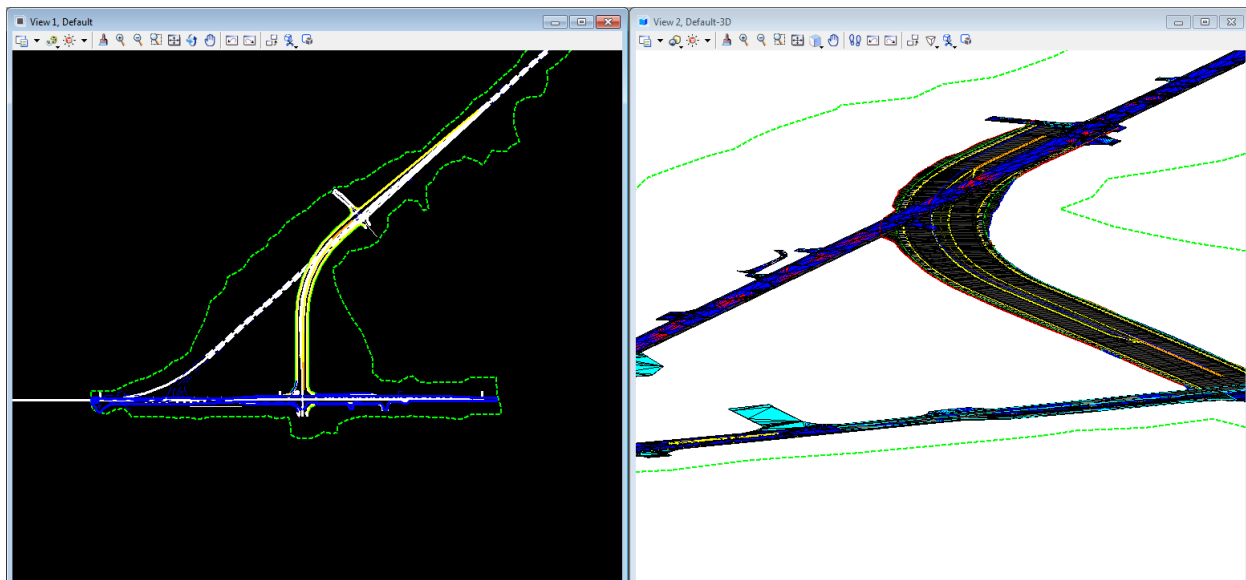
FDOTCONNECT Function Key Assignments	
F1	Opens the OpenRoads Designer OnLine Help. Ctrl+F1 Closes all Views except View 1.
F2	Open View 1 (2D Plan) and View 2 (3D Isometric) and fits both views.
F3	Opens View 3 (2D Plan), closes all View 4, and arranges all Views.
F4	Open View 1 (2D Plan) , View 2 (3D 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 ON/OFF.
F8	Toggles between MicroStation AccuDraw and Civil AccuDraw.
F9	Toggles (opens or closes) the Reference dialog.
F10	Toggles (opens or closes) the Level Display dialog.
F11	Toggles (opens or closes) the Project Explorer dialog.
F12	Opens the Create Template dialog.



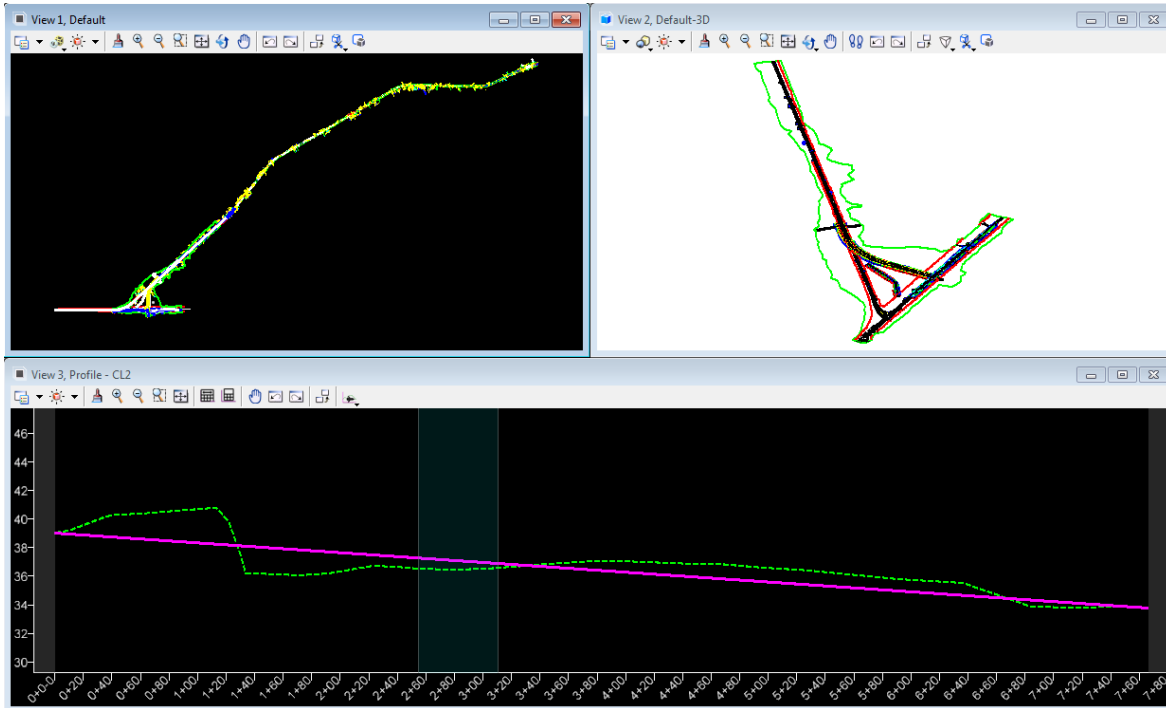
- Function Key **F1** – Civil Help



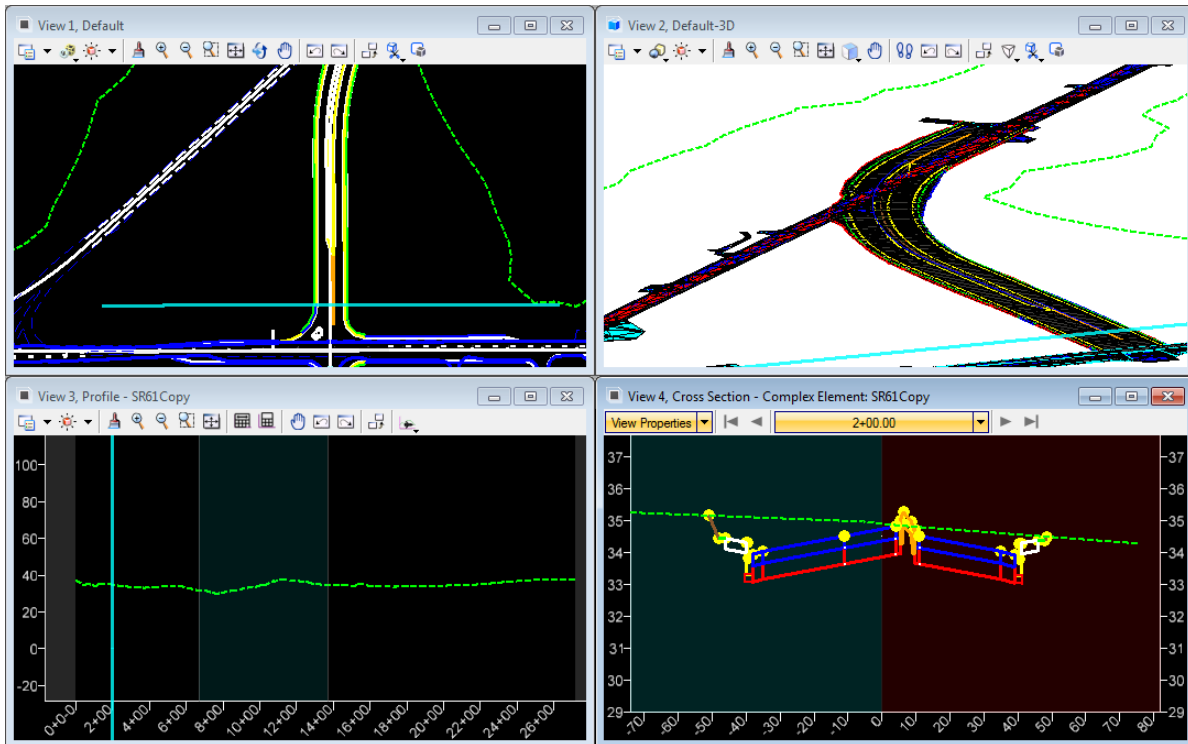
- Function Key **F2** – Open and Fits Two Views Setup; View 1- 2D Plan, View 2-Isometric.



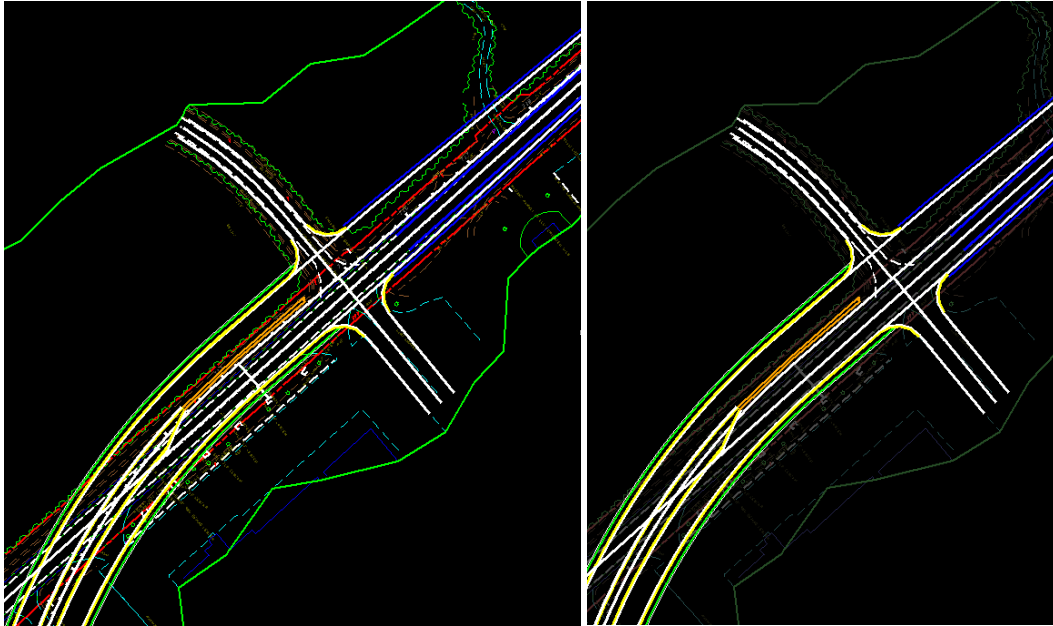
- Function Key F3 – Opens View 3; Closes View 4 and Arranges Views.



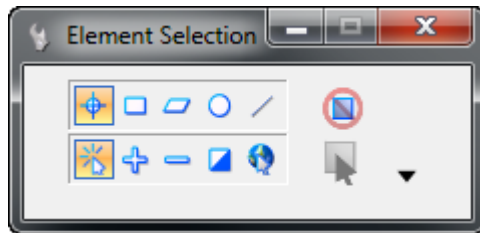
- Function Key F4 – Opens and fits Four View Setup; View 1- 2D Plan, View 2-Isometric, View 3,4 – custom.



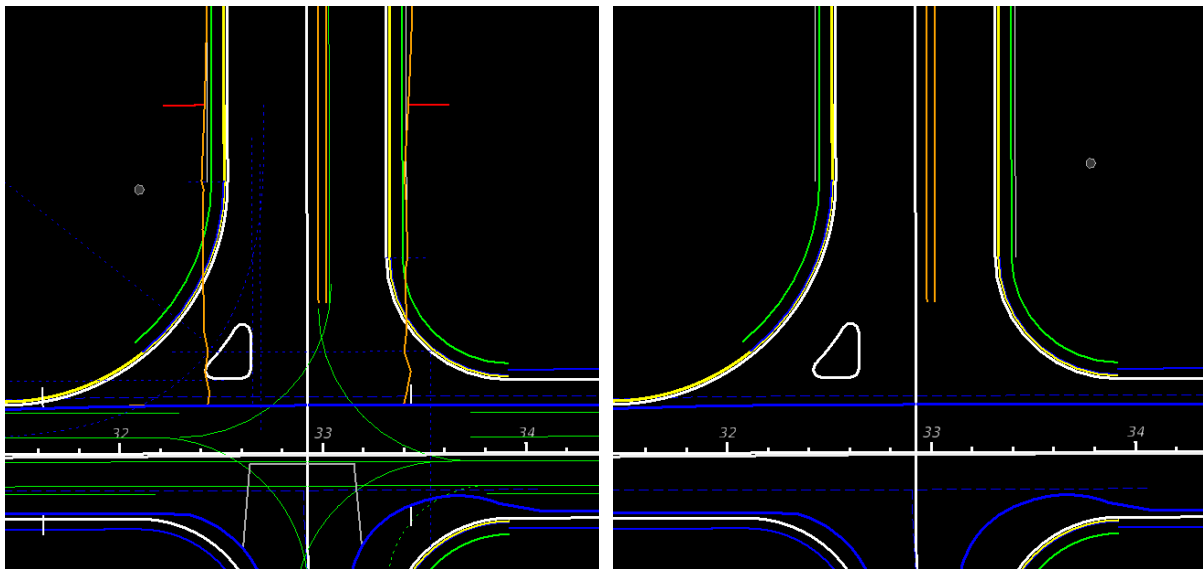
- Function Key **F5** – Toggle Dim References.



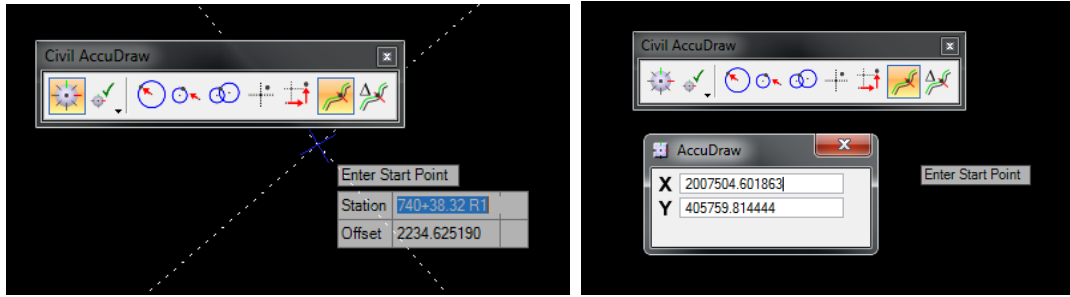
- Function Key **F6** – Resets Out of Any Ongoing Commands.



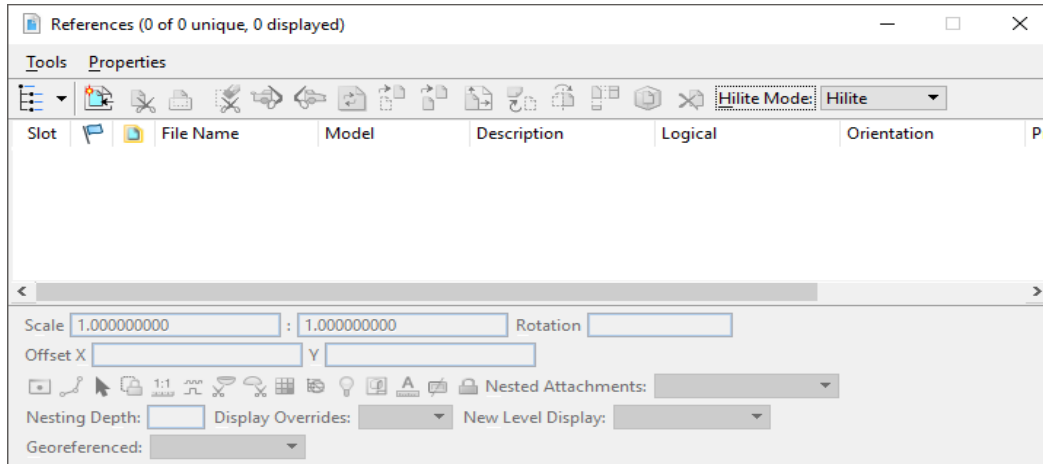
- Function Key **F7** – Toggles On/Off Construction View Attributes.



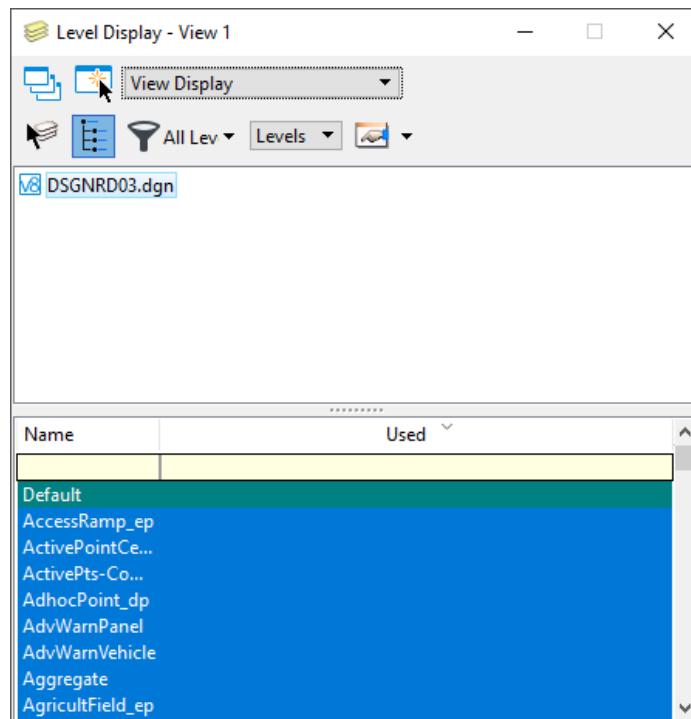
- Function Key **F8** – Toggles Between MicroStation AccuDraw and Civil AccuDraw.



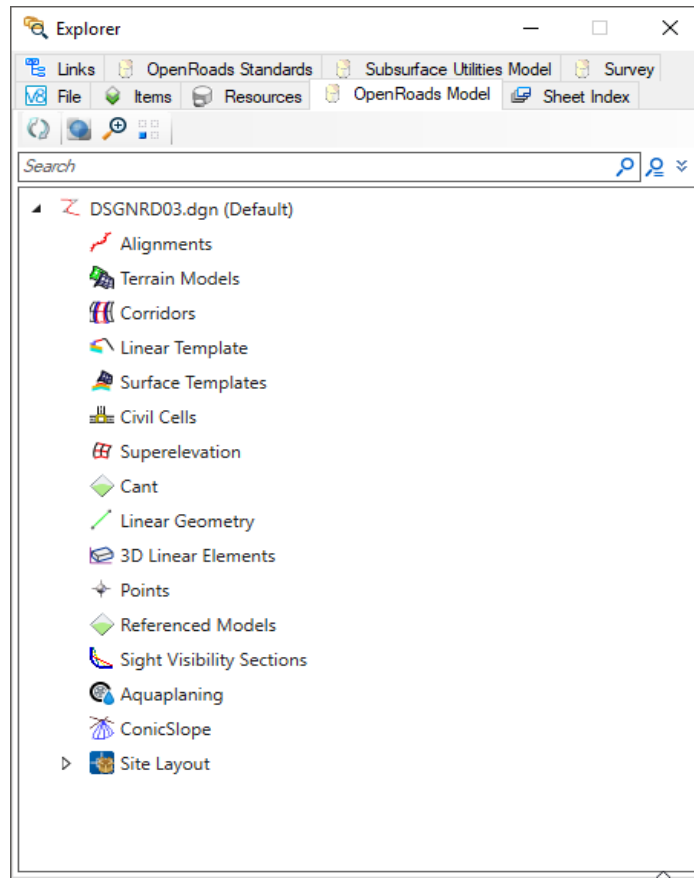
- Function Key **F9** – Toggles Reference Dialog Open\Close.



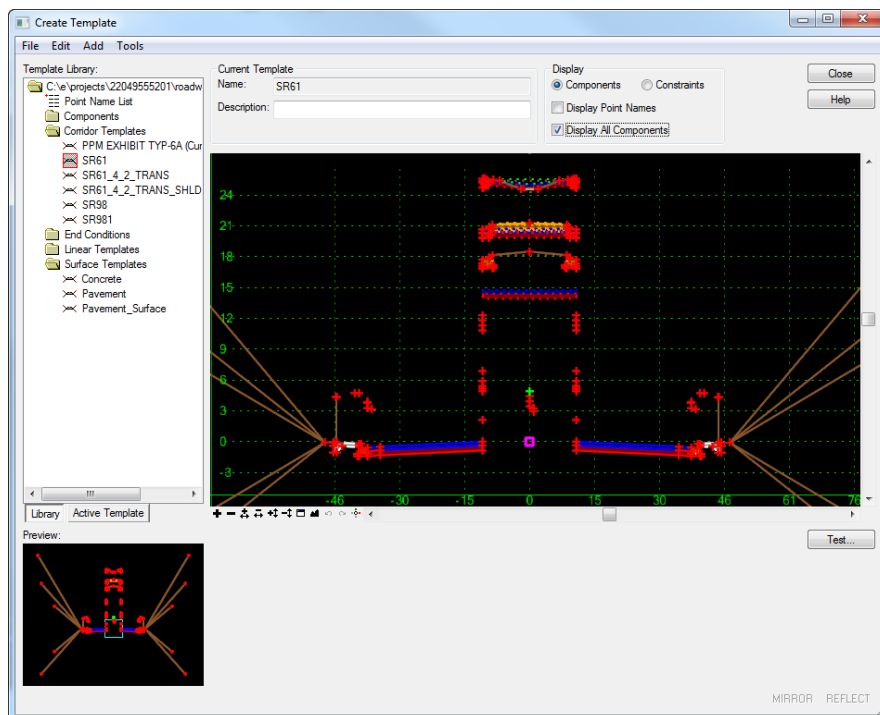
- Function Key **F10** – Toggles Level Display Dialog Open\Close.



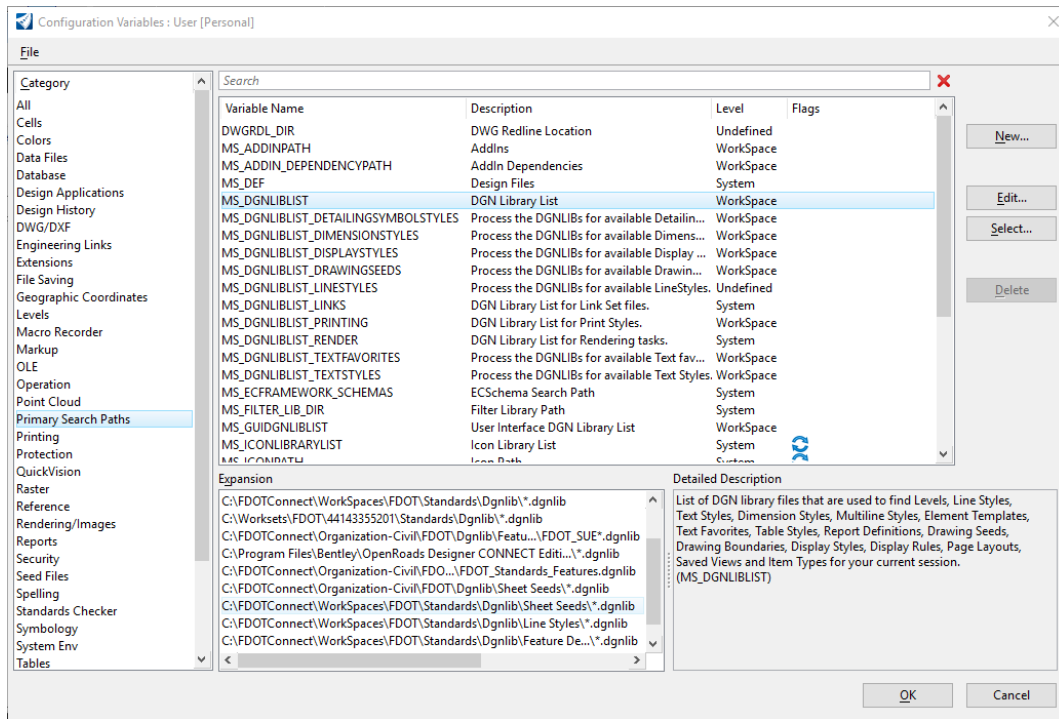
- Function Key **F11** Toggles Project Explorer Dialog Open/Close.



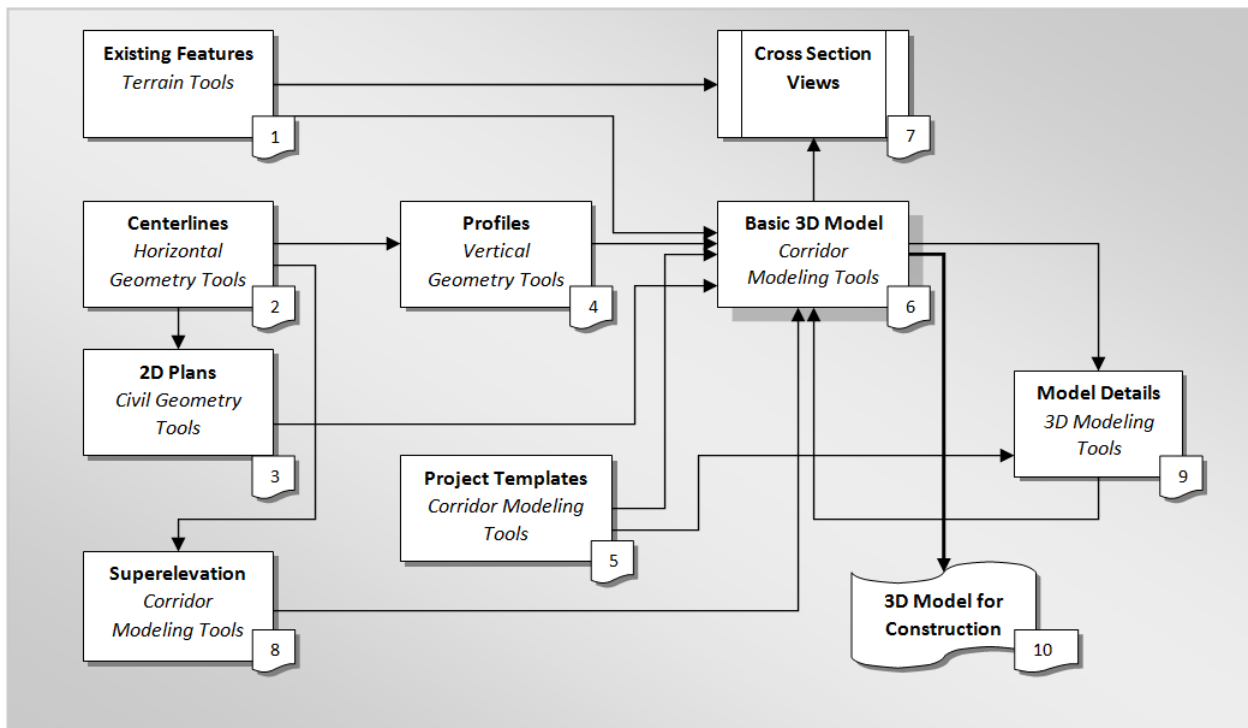
- Function Key **F12** Corridor Modeling, Opens Create Template Dialog.



FDOTCONNECT USER CONFIGURATION VARIABLES



FDOTCONNECT DESIGN AND 3D MODELING OVERVIEW



GENERAL WORKFLOW AND CHAPTER OUTLINE

1. Design Centerlines Alignments
2. Prepare 2D Plan Layout
3. Design Profiles
4. .

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

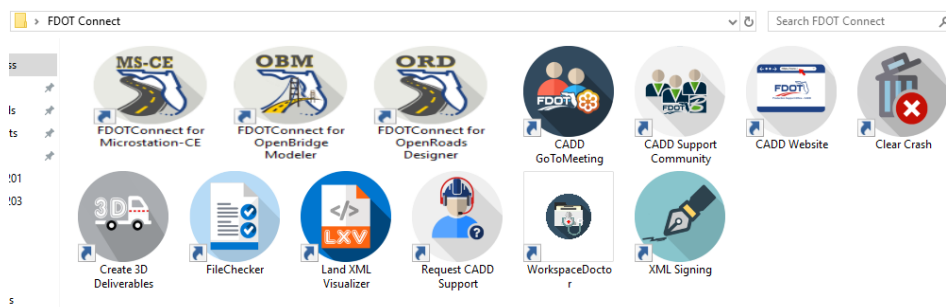
LAUNCHING FDOTCONNECT FOR OPENROADS DESIGNER

FDOT Connect can be launched from the FDOT – Roadway and FDOT – ROW icons located in the FDOTConnect folder on your desktop. The first time it is launched, it is important to select the FDOT workspace from the workspace dropdown.

1. Find the FDOT Connect launch icons on your desktop or locate the “FDOTConnect” folder on your desktop.

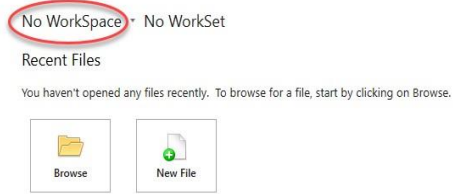


2. Launch FDOTConnect for OpenRoads Designer by double-clicking one of the FDOT icons. Note that your FDOTConnect launch icons will vary depending on which Bentley Connect Edition platforms you have installed. FDOTConnect will create an icon for OpenRoads Designer, an icon for Microstation Connect Edition (MSCE), and an icon for OpenBridge Modeler (OBM) depending on which of these applications is present on your machine during installation of the Workstation or Client. (This release of FDOT Connect is the “Alpha test” version for OpenBridge Modeler).



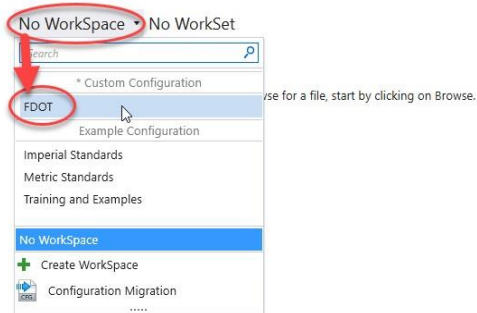
1. In the Workspace/Workset selection screen of OpenRoads Designer, select the Workspace selection drop-down menu by clicking on “No Workspace.”

OpenRoads Designer CONNECT Edition



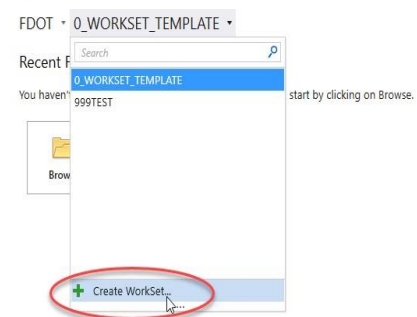
2. Select “FDOT” from the drop-down menu to select the FDOTConnect workspace.

OpenRoads Designer CONNECT Edition

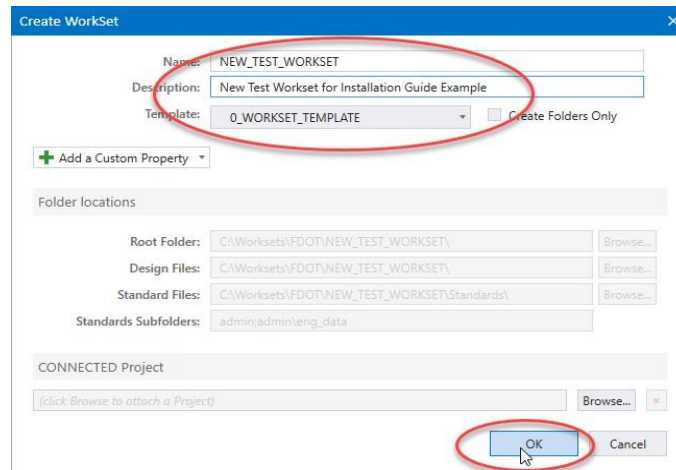


3. From here, you can now create a new WorkSet,,this is done by selecting the drop-down menu, being sure to select the FDOT’s “0_WORKSET_TEMPLATE” as the workset template.

OpenRoads Designer CONNECT Edition

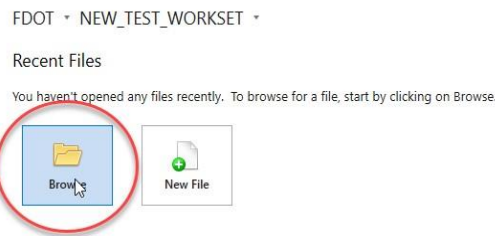


4. Click “OK” after filling in the Create Workset dialog.

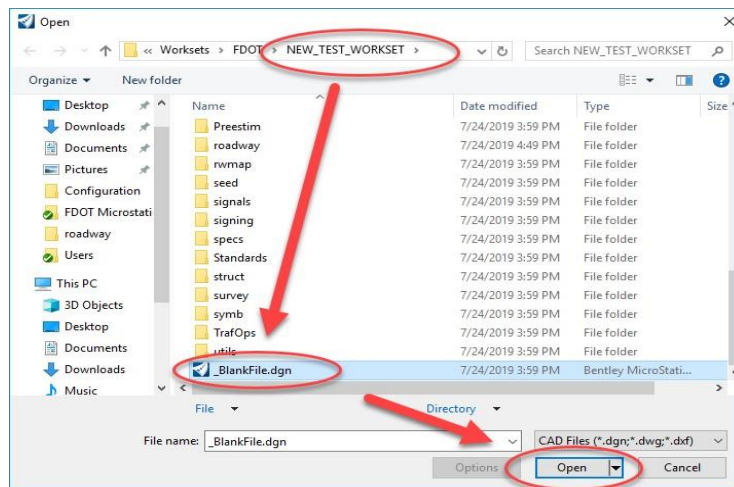


5. After creating a new project using the FDOT Workset Template, you can create new files using the FDOT Create File tool. This tool is launched from within the FDOTConnect workspace, so you must first open a file. The FDOT Workset template includes a blank starting file from which to launch the Create File tool.
6. From the OpenRoads Designer file open dialog, select “Browse” to browse the contents of your new workset.

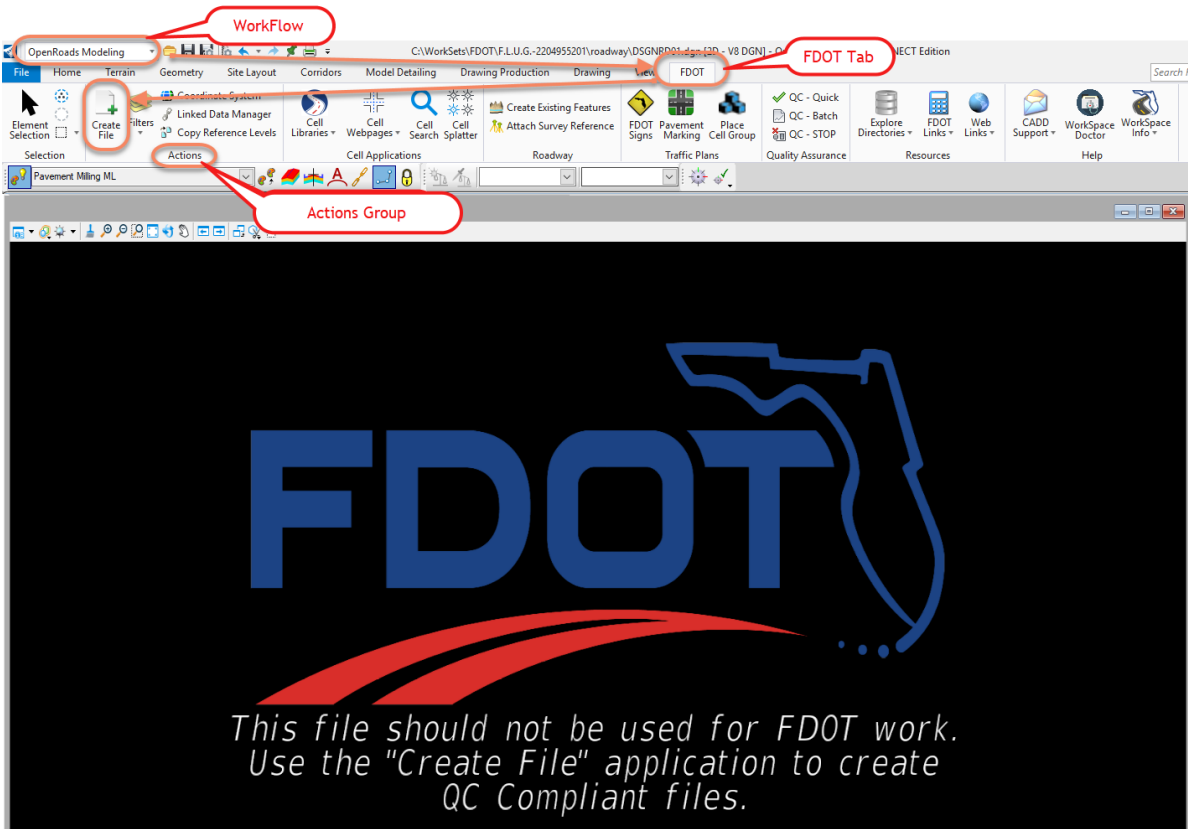
OpenRoads Designer CONNECT Edition



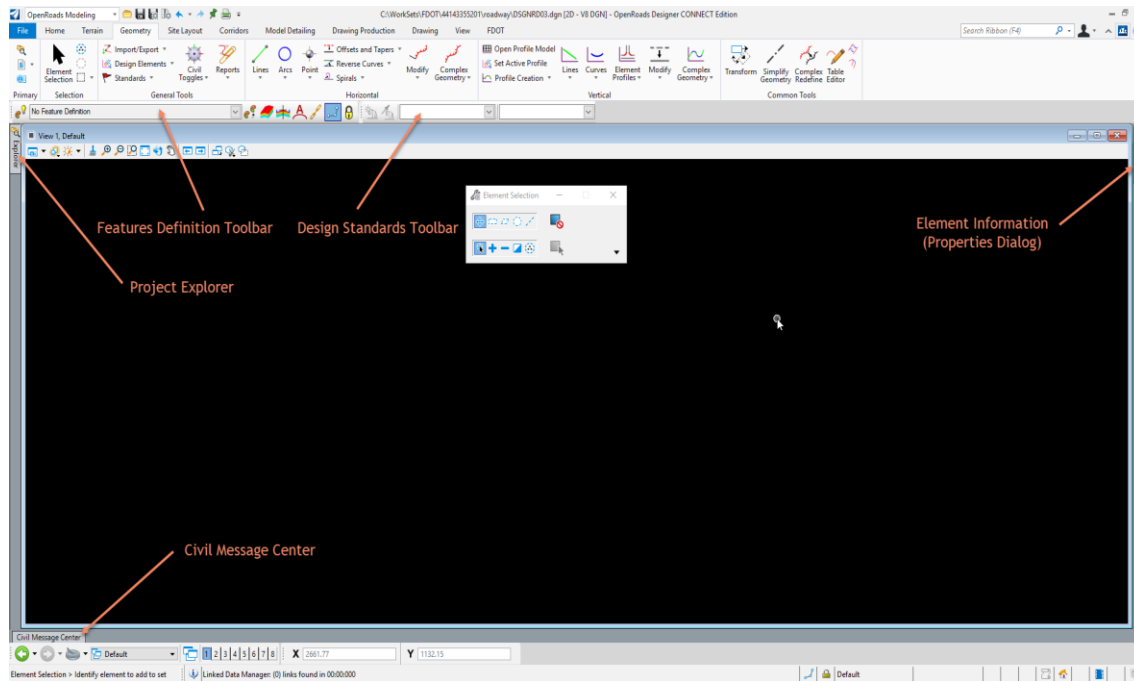
7. Locate “_Blankfile.dgn” at the root of your workset folder structure. Select this file and then select “OPEN” to open it.



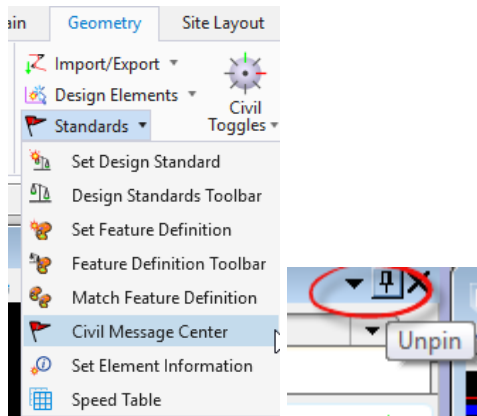
- 8. When the FDOTConnect Workspace opens, you can locate the FDOT ribbon by selecting the “OpenRoads Modeling” workflow from the menu at the top left of the screen. The FDOT tab is located at the far right of this ribbon. Select “Create File” to launch the Create File tool for creating FDOT project files.



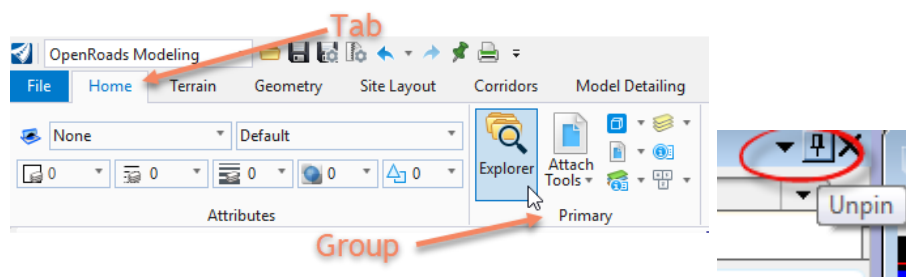
MENU DOCKING



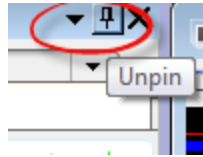
1. Verify that the *Civil Message Center* tool is already docked on the bottom; if not, select it from the *General Geometry Task* group, dock and unpin.



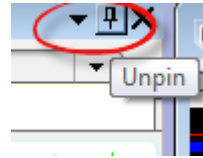
2. Verify that the *Project Explorer* is docked on the left side; if not, from the Ribbon select the Home tab then in the group named primary click on the explorer icon...Or use the F11 function key to toggle ON/OFF the dialog.



3. Verify that the *Level Display* is docked on the right side; if not, from the FDOT-Function Keys press F10, dock and unpin.



4. Verify that the *Element Information* is docked on the right side; if not, this can be brought up by selecting Ctrl+I , dock and unpin.



- 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\rd964\vd\AppData\Local\Bentley\OpenRoadsDesigner\10.0.0\prefs.

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1 2D DESIGN GEOMETRICS ALIGNMENTS

INTRODUCTION

This chapter will introduce four (4) important OpenRoads Technologies for creating geometry/line work while designing in FDOTCONNECT. They are:

- Feature Definitions
- Civil Geometry Design Intent
- Design Standards
- Annotation Groups

We would like to introduce the user to a new workflow terminology using the Ribbon if you see a direction like this

OPENROADS MODELING>GEOMETRY>HORIZONTAL>Lines>Line From Element>Simple Line From Element

This means we are in the **WorkFlow** of **OpenRoads Modeling** which has a **Tab** named **Geometry** and has tools that are located in the **Horizontal Group**. Now that we are in the right workflow, Tab and Group we may need to click on a tool that has more than one option.

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 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 *FDOT_Standards_Features.dgnlib* has been developed for the FDOTCONNECT 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 an 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-based elements are created intelligently as the tools are used and elements are constructed. The FDOTCONNECT 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 FDOT_DesignGeometricsCriteria.dgnlib has been developed for the FDOTCONNECT 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 (*LandXML*) 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 FDM 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	FDOT Design Manual (FDM), Part 2 Chapter 210
Design Speed	45 MPH
Facility	Low Speed Desired Length
Maximum Tangent Deflection w/out curve	1 Degree Section 210.8.1
Minimum Horizontal Radius	694 feet Table 210.9.2
Minimum Length of Curve	675 feet Table 210.8.1
Context Class	C3 Max Grade Table 210.10.1

- Low Speed Minimum Length – This will give a minimum Radius at Max Super ($e_{max} = .05$)
- Low Speed Desired Length – This will give a desired length of curve at Normal Crown.

Note Refer to the FDM for Tables

- 1.1 Import Baseline
- 1.2 Design New SR61 Centerline
- 1.3 Import Side Roads
- 1.4 Baseline Side Road Design from BL98
- 1.5 Using Annotation Groups to Label your Alignment Features

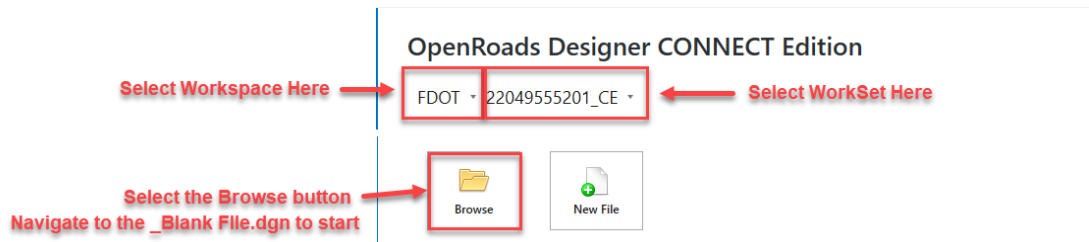
Exercise 1.1 *Import Baseline*

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

1. From the desktop FDOTCONNECT folder, double-click on the **FDOTConnect for OpenRoads Designer** icon.



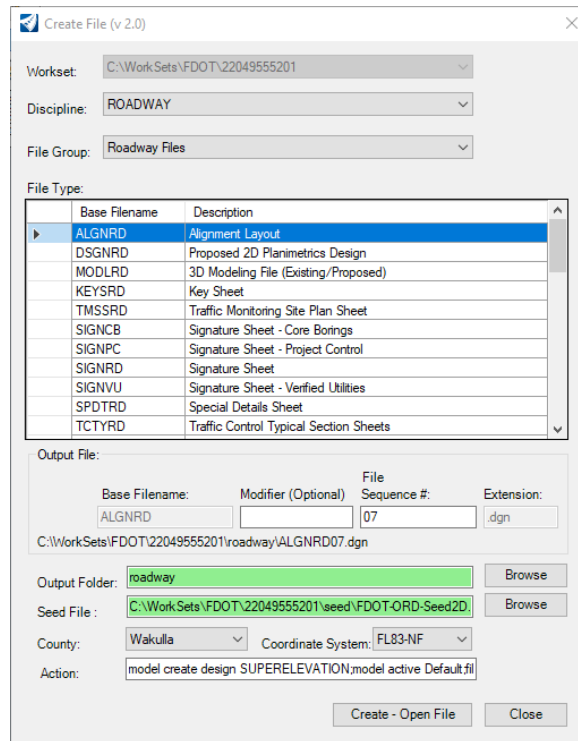
2. Set the workspace to FDOT and set the Workset to 22049555201_CE. Navigate to the root of the folder of 22049555201_CE and find the _Blank File.dgn



3. Once the file opens navigate to FDOT Ribbon Tab of the OpenRoads Modeling WorkFlow looking for the Actions Group click on the create file.

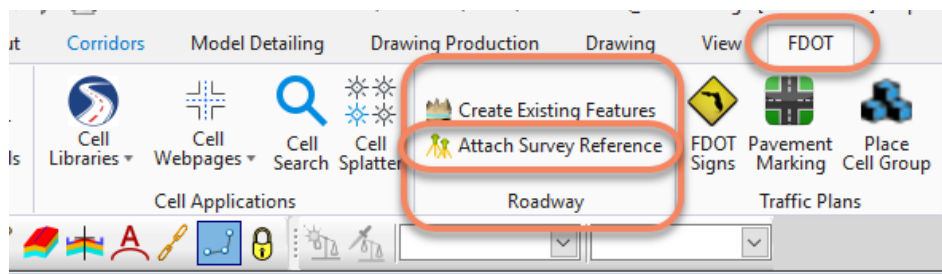
OPENROADS MODELING>FDOT>ACTIONS

4. Create a *ALGNRD01.dgn* file with the dialog as shown below.

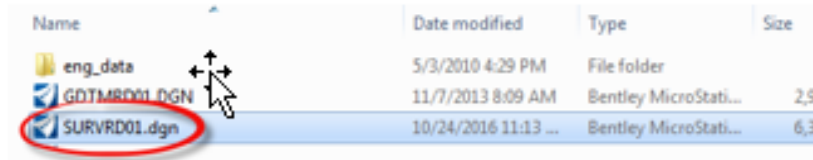


- From the Create File Dialog box pick the Base Filename of **ALGNRD**.
 - Select your County, by selecting this the correct coordinate system will be selected.
 - Click **Create - Open File** to create the file, *ALGNRD01.dgn*.
 - You are now in the *ALGNRD01.dgn* Click **Close**.
 - Navigate to the models Dialog, you will notice that during the creation of the ALGNRD a new model of SUPERELEVATION was created.
5. If the SURVRD file exists use the **Attach Survey Reference** tool which is located on the FDOT Tab, with in the Roadway Group. These Tabs and Groups can be found within the OpenRoads Modeling WorkFlow. Otherwise, skip to step 7.

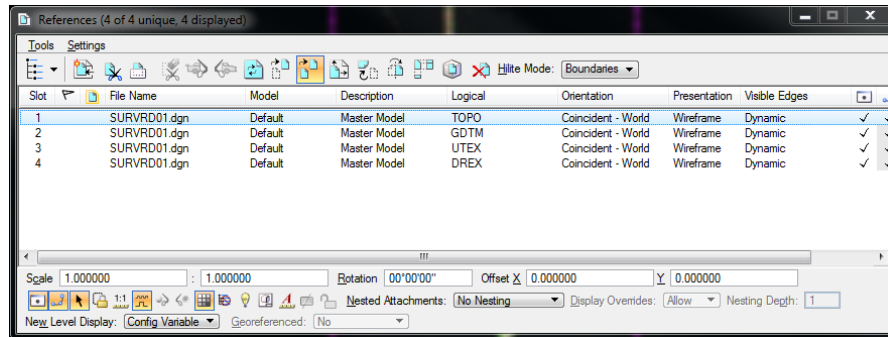
OPENROADS MODELING>FDOT>ROADWAY



- Select the *SURVRD01.dgn* file.



7. From the Function key F9 (toggles on the Reference Dialog) to view the attached files:



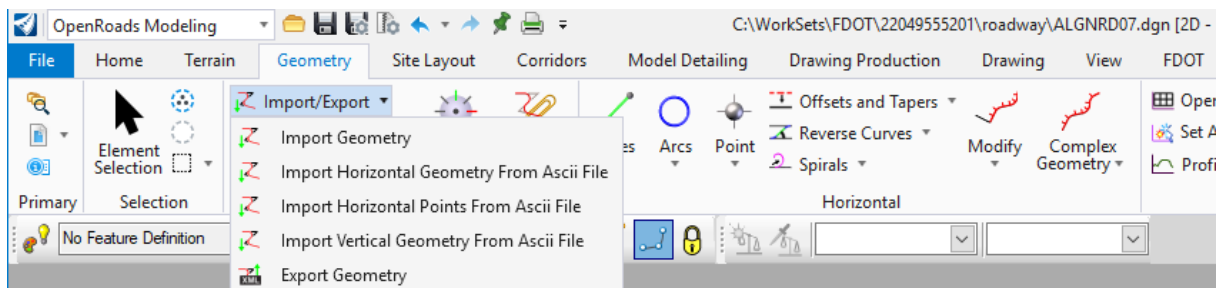
8. From the Function key F9 (toggles on the Reference Dialog) and attach the following files:

- C:/Workset/FDOT/22049555201_CE/Survey/TOPORD01.dgn (*disregard if SURVRD exists*)
- C:/Workset/FDOT/22049555201_CE/ROWMap/RWDTRD01.dgn
Set the Logical Name to RWDTRD
- C:/Workset/FDOT/22049555201_CE/Roadway/AERIALS.dgn
Set the Logical Name to AERIALS

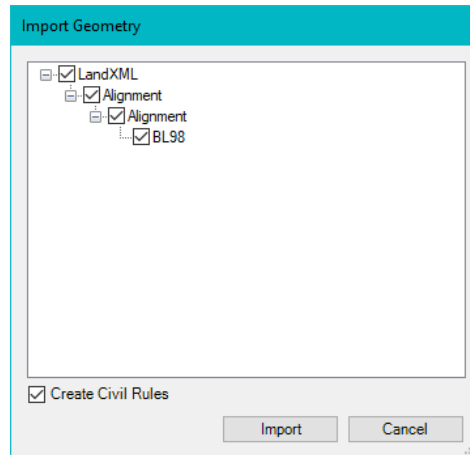
9. Fit View and Save Settings, select Ctrl F.

10. Use the *OpenRoads Modeling* workflow to locate the *Geometry* Tab, then in the *General Tools* Group is where you will find import tools, **Import/Export** tool – import Geometry and select the Landxml file in the *Roadway* folder to import alignments. We are looking for the file name BL98.xml.

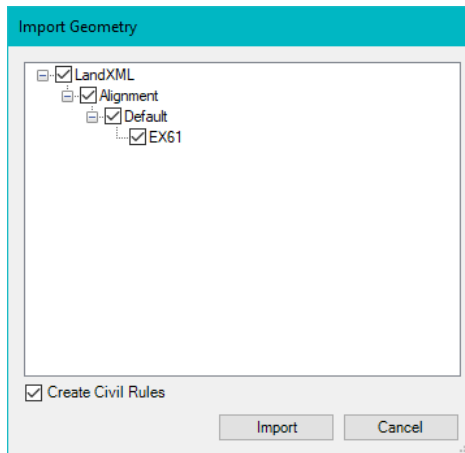
OPENROADS MODELING>GEOMETRY>GENERAL TOOLS>Import/Export>Import Geometry



- Navigate to the **Alignment > Alignment>BL98** folder.
- Click in the box to select **BL98**.



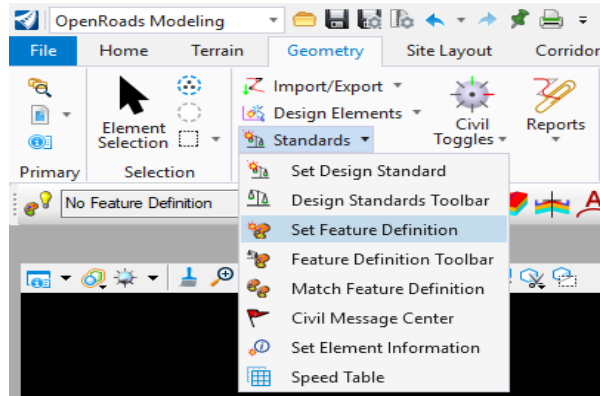
- c. Click **Import**.
- d. Repeat this process to import the existing baseline for SR61. The file name of this LandXML is EX61.xml.



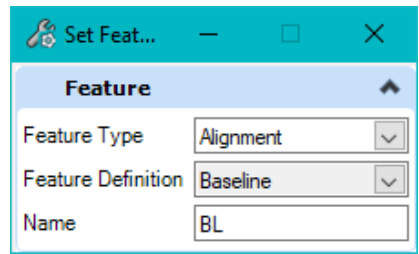
11. Zoom to the intersection of EX-SR61 and US98, hover over the baseline to verify the alignment imported in the previous step. You will notice that the Baseline for US98 already has a Feature Definition assigned to it.



12. Use *Geometry Tab*, and the *General Tools Group*, and then click on the Standards icon bring up the dropdown list that for the Set Feature Definition Tool.
 OPENROADS MODELING>GEOMETRY>GENERAL TOOLS>Standards>Set Feature Definition



- a. Set the *Feature Type* to *Alignments*.
- b. Set the *Feature Definition* to **Baseline**.

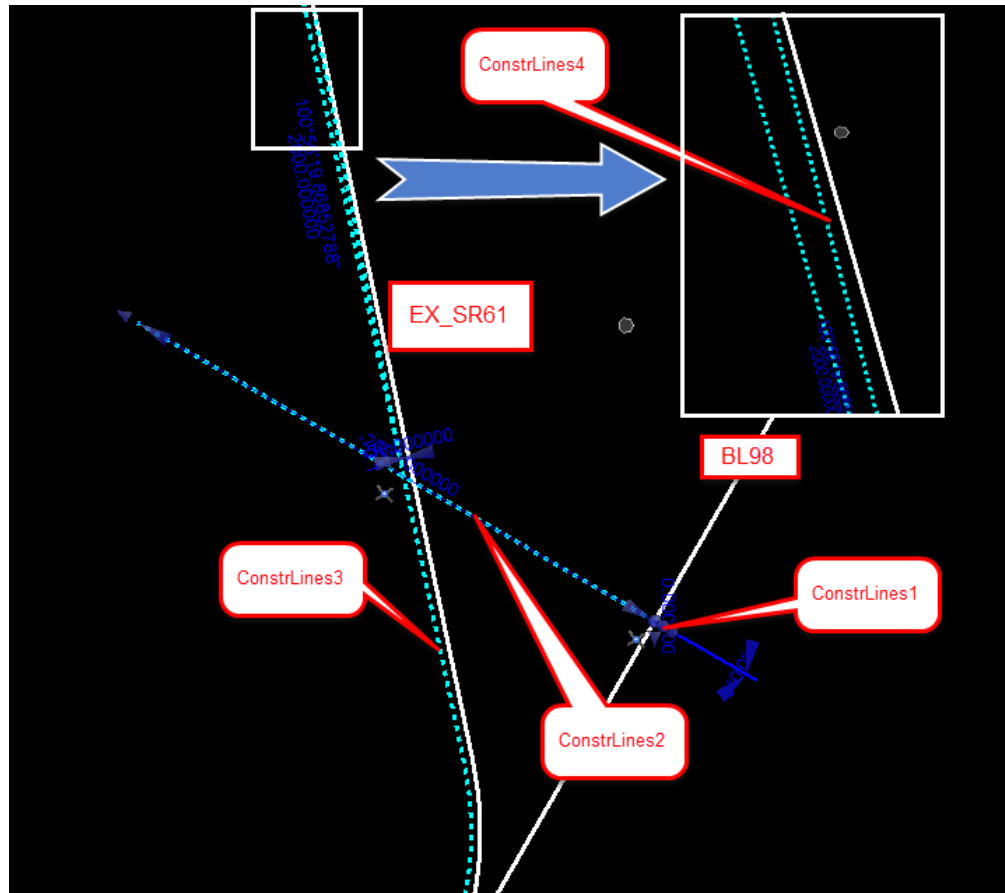


- c. Select the **EX-SR61**, then click **Reset** to set the **Baseline** feature on the line.

13. Select the **Element Selection** to exit the command, you can also do this by the function Key F6.

Exercise 1.2 *Design New SR61 Centerline*

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

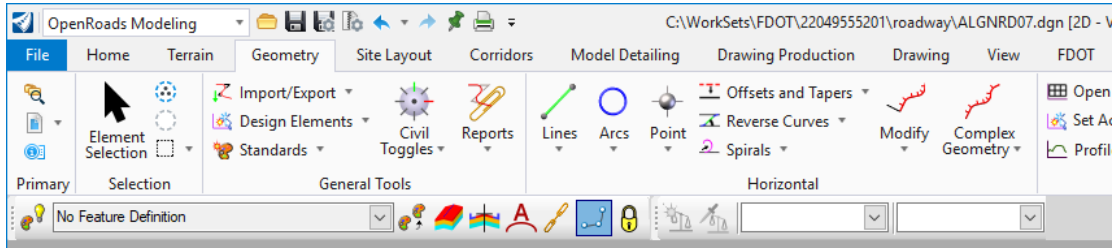


➤ **ConstLines1**

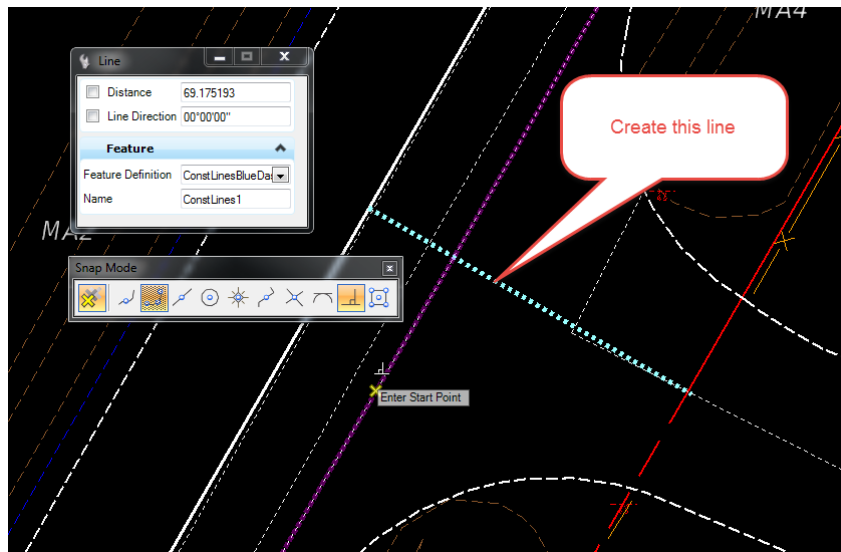
1. Locate the **Driveway** into the school off US98 between the baseball field and the parking lot.



2. Now that the new intersection is located, turn the *display OFF* for the *Aerial Reference file*.
3. Use the *Geometry Tab and the Horizontal Group*, to select the **Line Between Points** tool.
OPENROADS MODELING>GEOMETRY>HORIZONTAL>Lines>Line Between Points



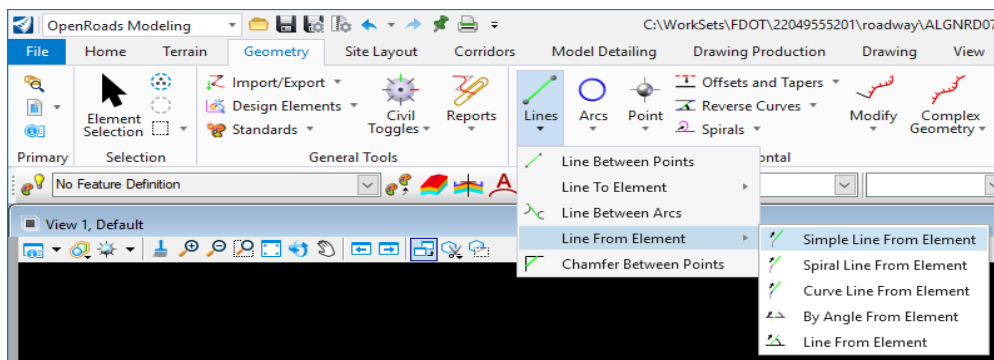
- a. Use *Feature Definition Const Lines Blue Dash* and a *Name of ConstLines1*. You will have to add the 1 to the name.
- b. Start a line perpendicular to *BL98* and ending at in the middle of the *Driveway*. Be careful not to snap to anything on the second point.



➤ **ConstrLines2**

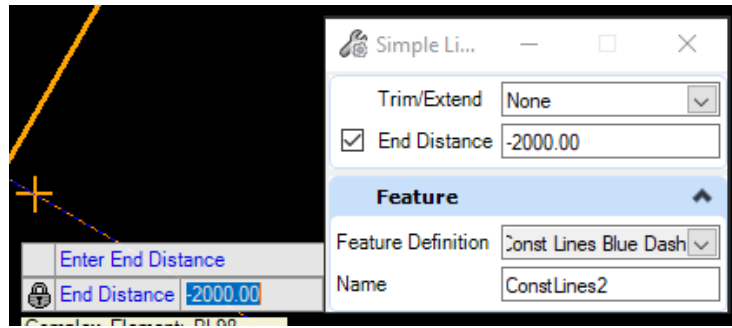
1. Use the *Geometry Tab and the Horizontal Group*, to select the **Simple Line From Element** tool.

OPENROADS MODELING>GEOMETRY>HORIZONTAL>Lines>Line From Element>Simple Line From Element



2. Use *Feature Definition Const Lines Blue Dash* and *Name ConstLines2*

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



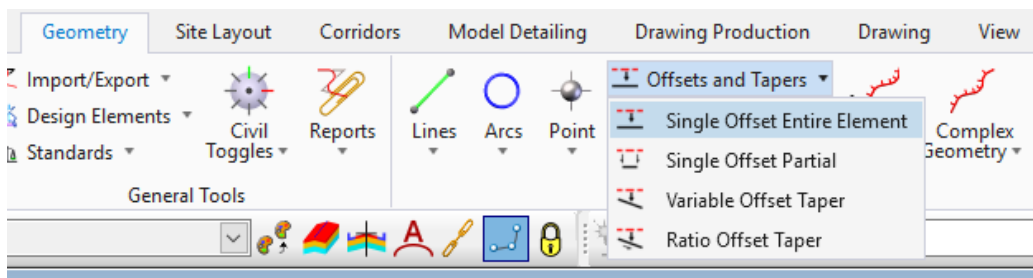
4. Enter a *Distance* of **-2000 feet**. **Data point** in the View to accept the *Distance*.
5. **Data point** to accept Trim None.



➤ **ConstrLines3**

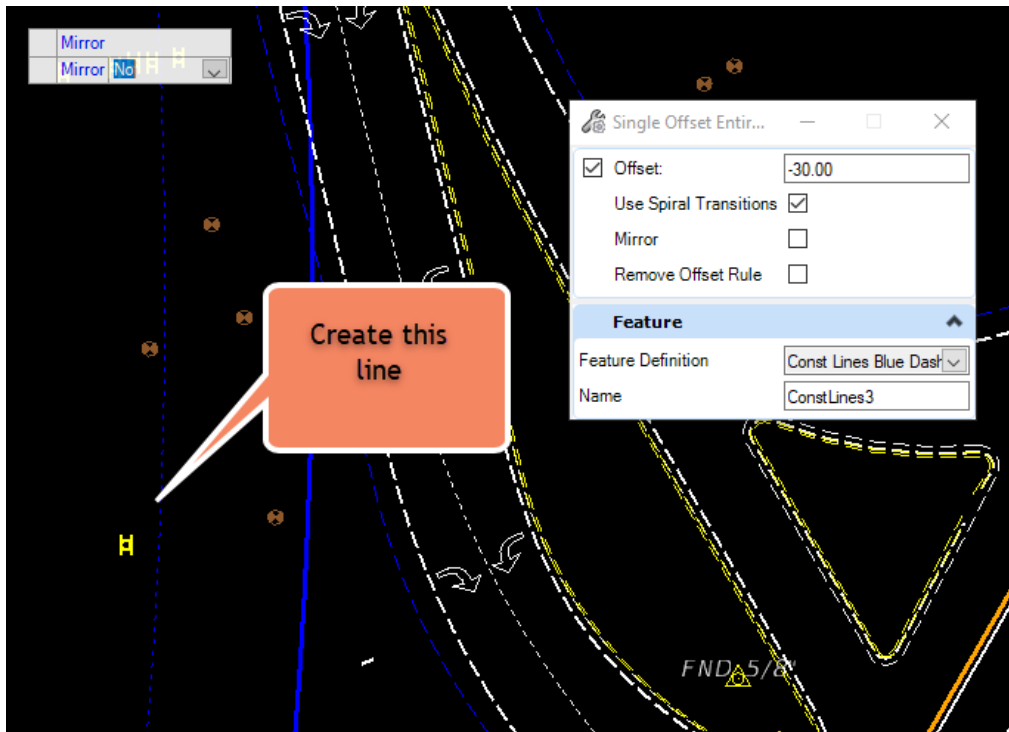
1. Use the *Geometry Tab and Horizontal Group*, to select the **Single Offset Entire Element** tool.

OPENROADS MODELING>GEOMETRY>HORIZONTAL>Offsets and Tapers>Single Offset Entire Element

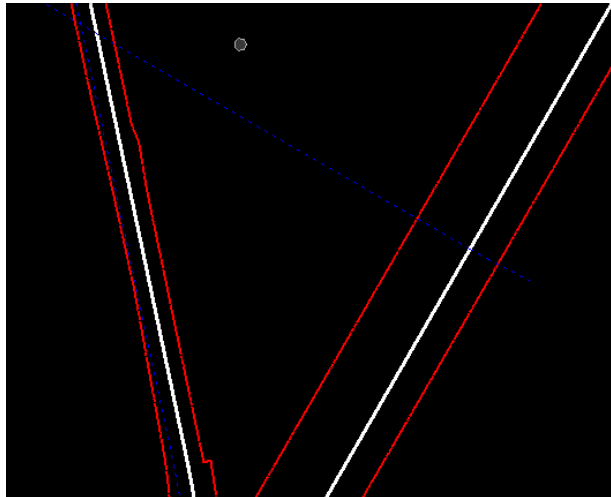


2. Use *Feature Definition Const Lines Blue Dash* and *Name ConstLines3*.

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**.



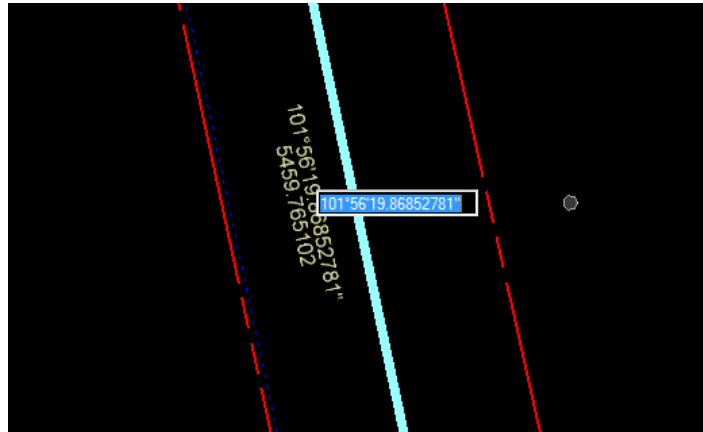
5. Once the new line is created, turn the *Display* **OFF** for the SURVRD with Logical Name TOPO in the *Reference dialog*.



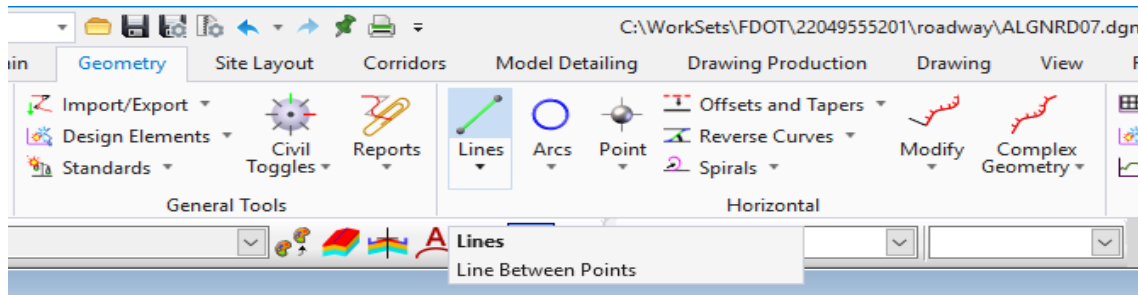
➤ **ConstrLines4**

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

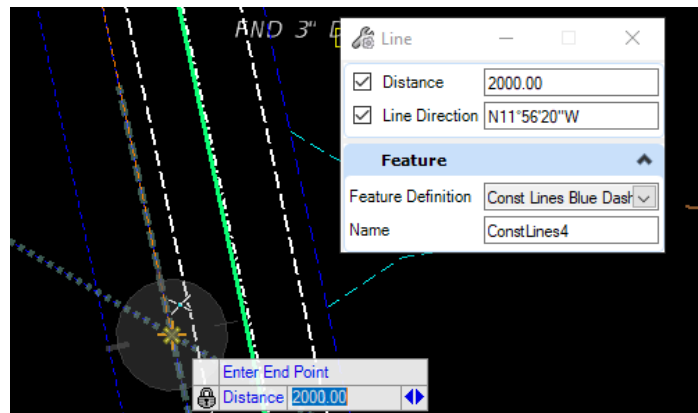
1. Find the Bearing Angle of **EX-61**, select the element and click the Context Menu **Description**. Copy the *Bearing value* into the buffer space selecting **Ctrl C** <OR> right-click **Copy**. Note: You may have to right click on the element to make the bearing value active in order to copy from it.



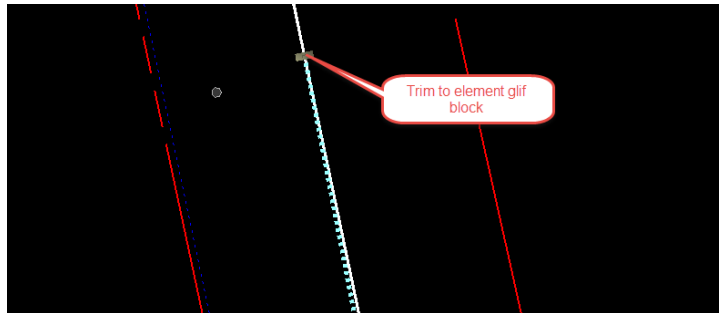
2. Use the *Geometry Tab and Horizontal Group*, to select the **Line Between Points** tool. *OPENROADS MODELING>GEOMETRY>HORIZONTAL>Lines>Line Between Points*



3. Use *Feature Definition Const Lines Blue Dash* and Name **ConstLines4**.
4. Start a line at the *intersection of ConstLine2 and ConstLine3* (this can be done by selecting the intersection snap) then enter a value of **2000 feet** for the *Length* and use the **Bearing** in the buffer as the *Line Direction minus 1 degree*.

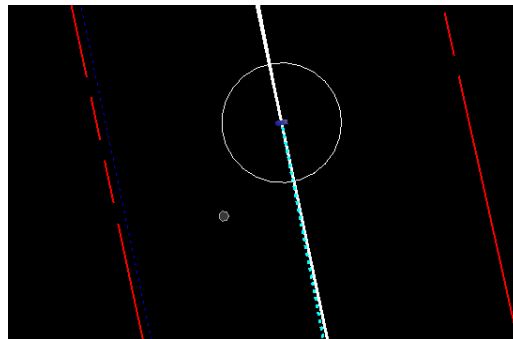


- Use MicroStation **Trim to Element** and to Trim **ConstLines4** line to intersect **EX-61**. This step will create an interval element with a new Name of **ConstLines5**.

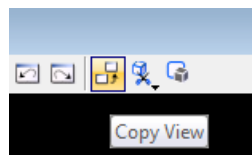


➤ **Verify the Construction Lines Maintain Design Intent**

- Change the Active Level to **Scratch1_dp**. Use MicroStation Drawing to Place Circle with MicroStation with a center at the end of **ConstLines5**

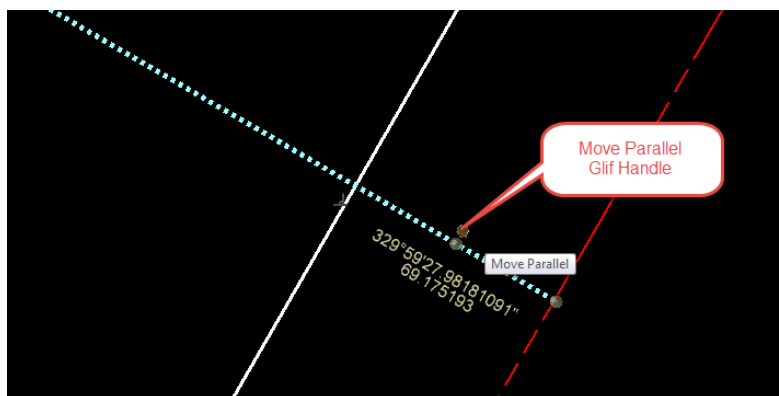


- Open View 4 and use Copy View from View 1. Zoom into the School Entrance in View 4

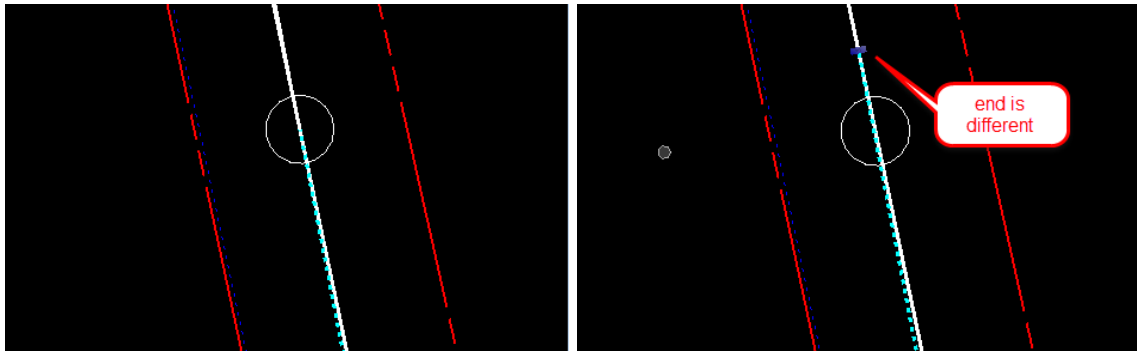


- Move the location of the **ConstLines1** and check the end of **ConstLines5** to see if the location has been corrected.

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

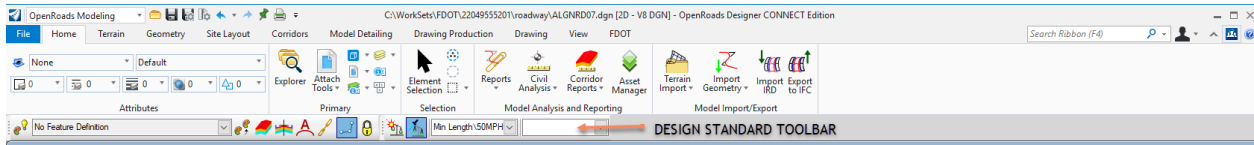


- 2: Select ConstLines5, Use MicroStation Undo/ Redo to see the end change location.

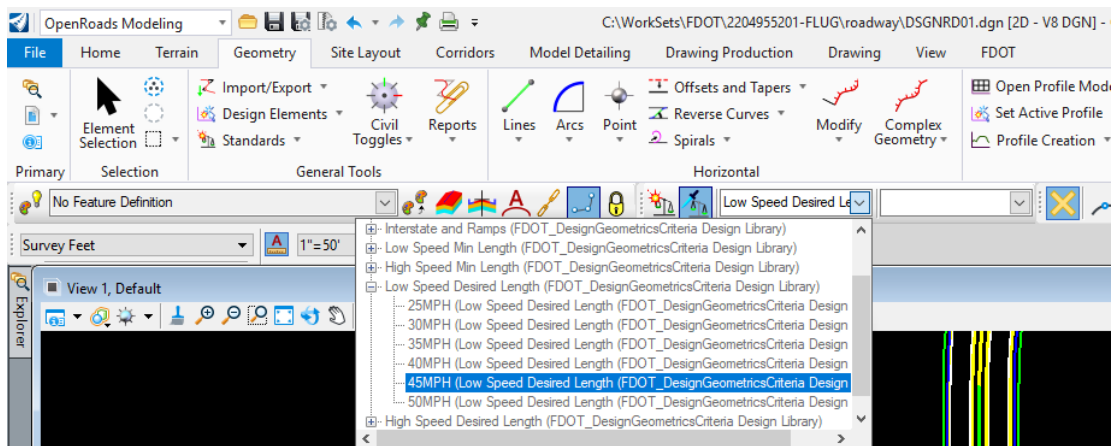


4. Select **Ctrl Z** to undo change.
 5. (Extra Exercise) Change the *Offset Distance* of **ConstrLines3** from **-30** to **-40** to verify that the end of **ConstrLines4** will change.
 6. Select **Ctrl Z** to undo change.
- **Construct a Horizontal Curve between ConstLines2 and ConstLines5 to Meet Geometric Standards.**

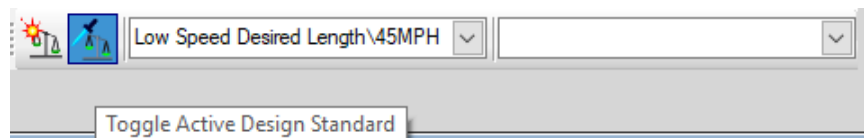
1. Use the **Design Standards Toolbar** that is already docked at the top of the screen.



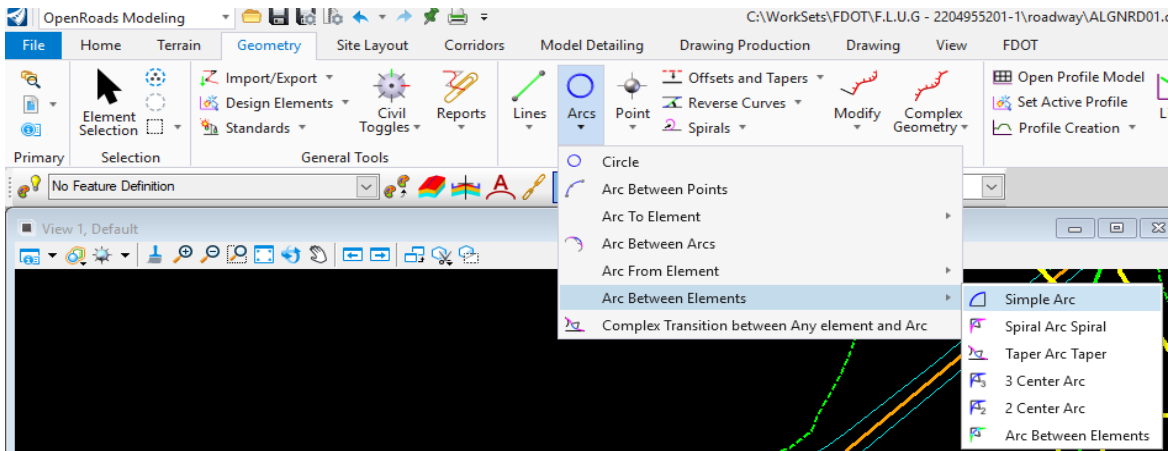
2. Set Active the Design Facility Standard to: Low Speed Desired Length, 45 MPH.



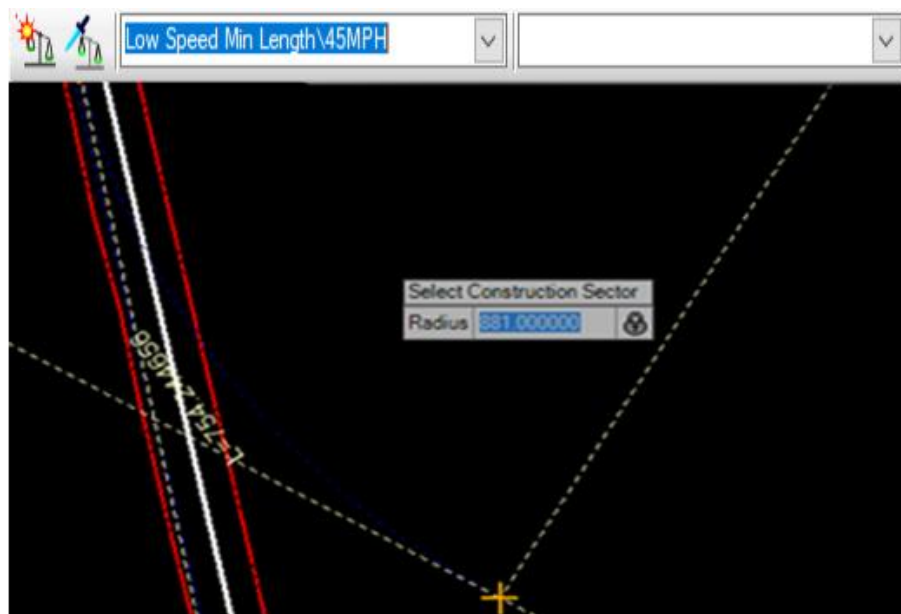
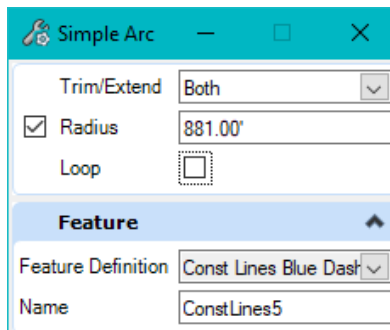
3. Activate the Toggle Active Design Standard icon.



- Use the *Geometry Tab and the Horizontal Group* to select the **Simple Arc** tool. This tool can be found using the Arcs button then selecting Arcs between Elements Simple Arc. *OPENROADS MODELING>GEOMETRY>Arcs>Arcs Between Elements>Simple Arc*

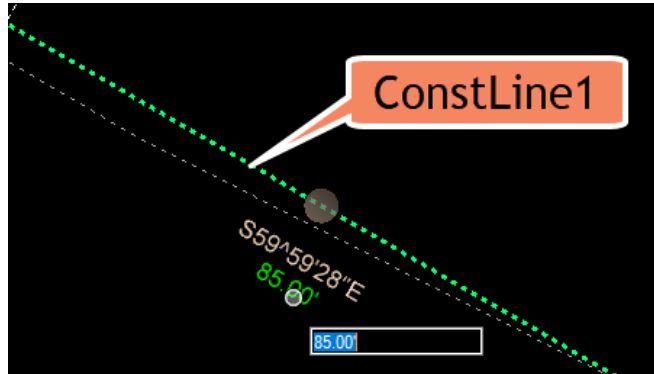


- Use *Feature Definition Const Lines Blue Dash* and *Name ConstLines6*.
- Create a *Radius* between **ConstLine2** and **ConstLine5** you will notice that setting the Design Standard has set a default value of 2083.00' for the Radius, be sure to change this to 881.00'. Set *Trim/Extend* to **Both**.

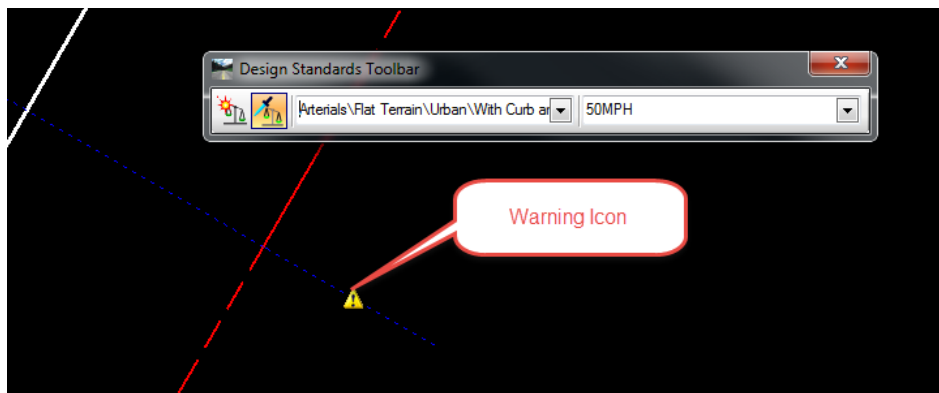


➤ **Make a Longer Driveway into the School.**

1. Select ConstLine1 using the element selection tool.
2. Select the manipulator for length, click it and change the length from 85 to 105



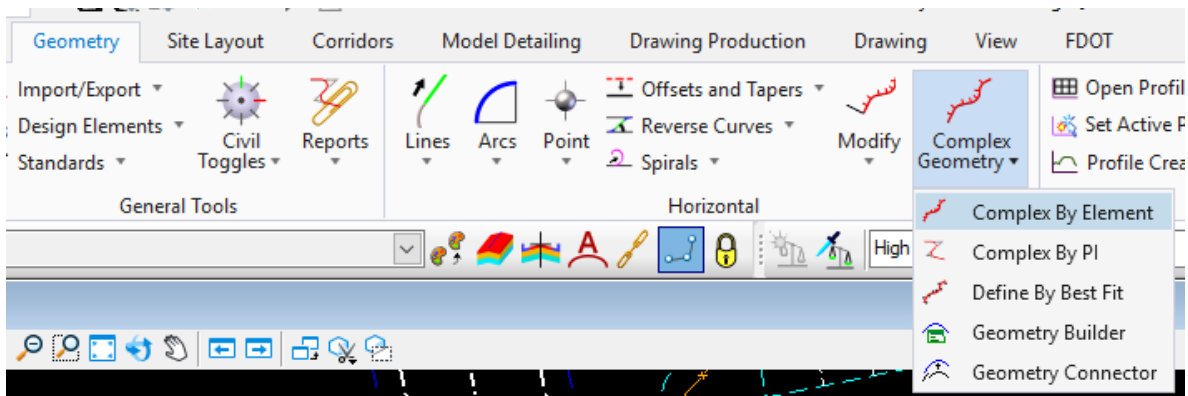
Note After the line is constructed a *Warning* icon may appear on the line because the *Active Design Standard* icon is being toggled **ON** and the *tangent length* may be less than the *minimum 100 feet*.



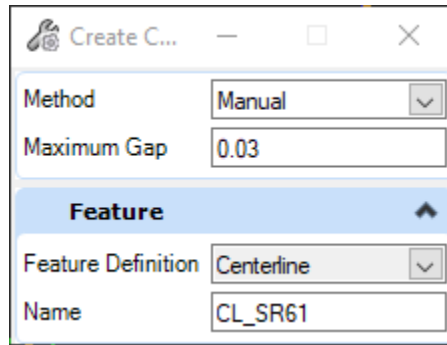
➤ **Next, Create a Centerline of All the ConstrLines.**

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

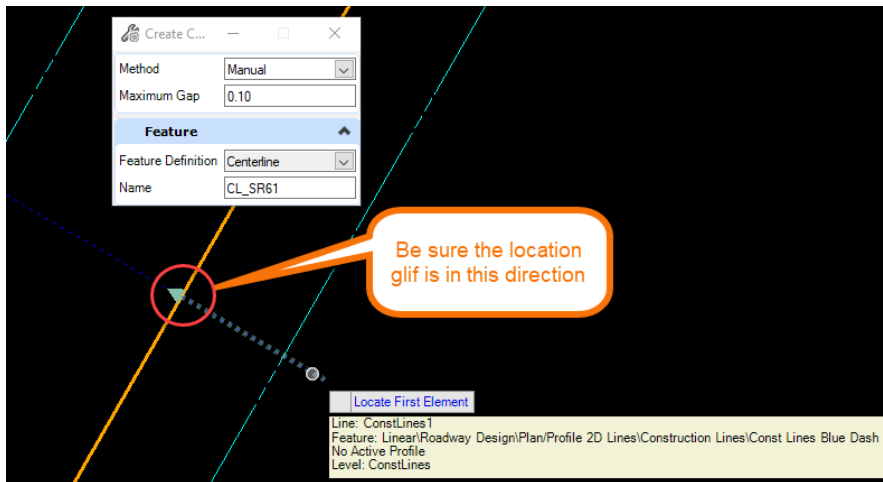
OPENRAODS MODELING>GEOMETRY>HORIZONTAL>Complex Geometry>Complex By Element



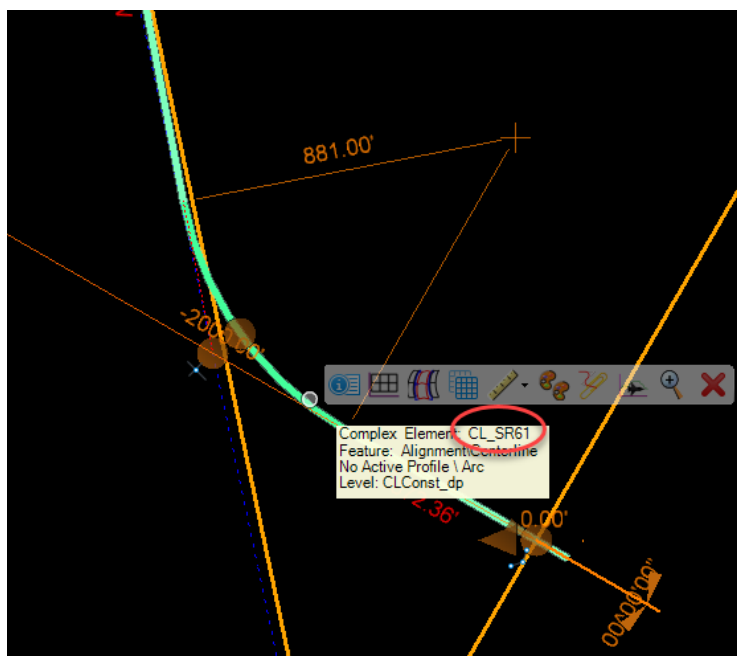
2. Create the new *Alignment* by connecting the elements. Use *Feature Definition Centerline* and Name **CL_SR61**, with no spaces. Use the **Manual Method**.



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

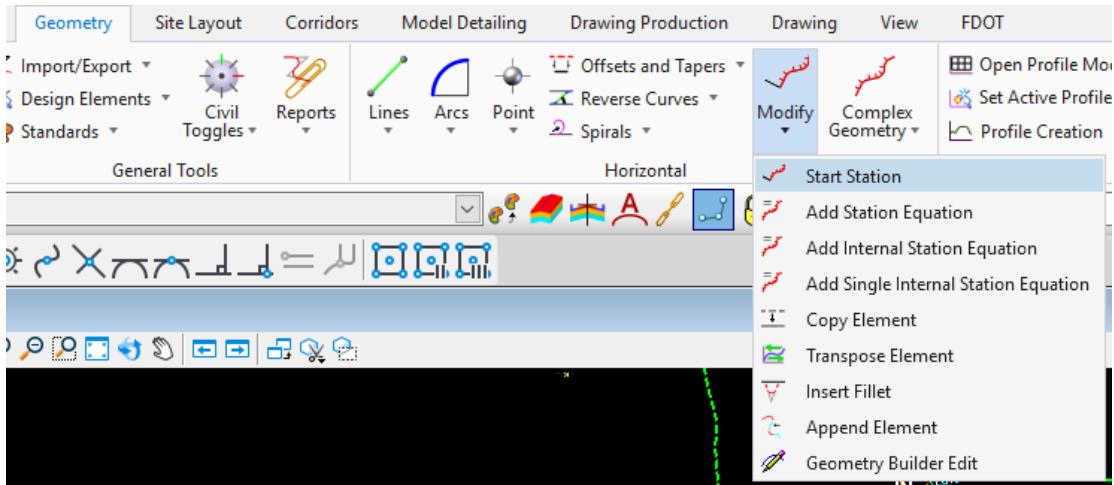


4. Continue until New Centerline is constructed as shown below.

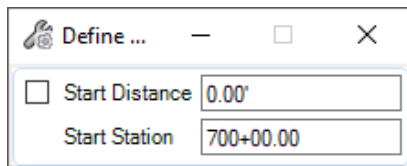


➤ **Set a Begin Station Value at the Intersection of BL98**

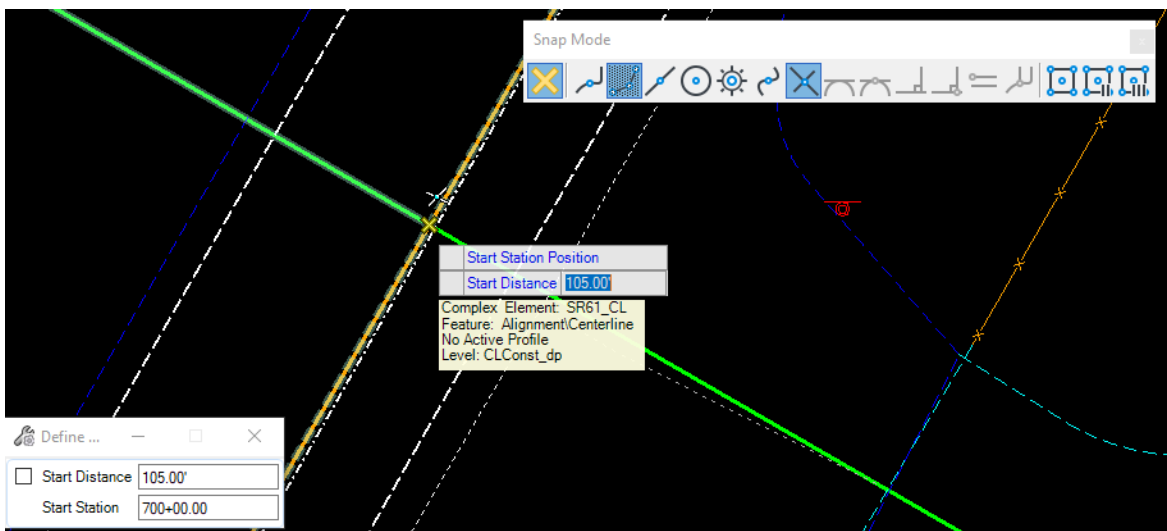
1. Use the Geometry Tab and Horizontal Group, Start Station tool under the Modify icon.
OPENROADS MODELING>GEOMETRY>HORIZONTAL>Modify>Start Station



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



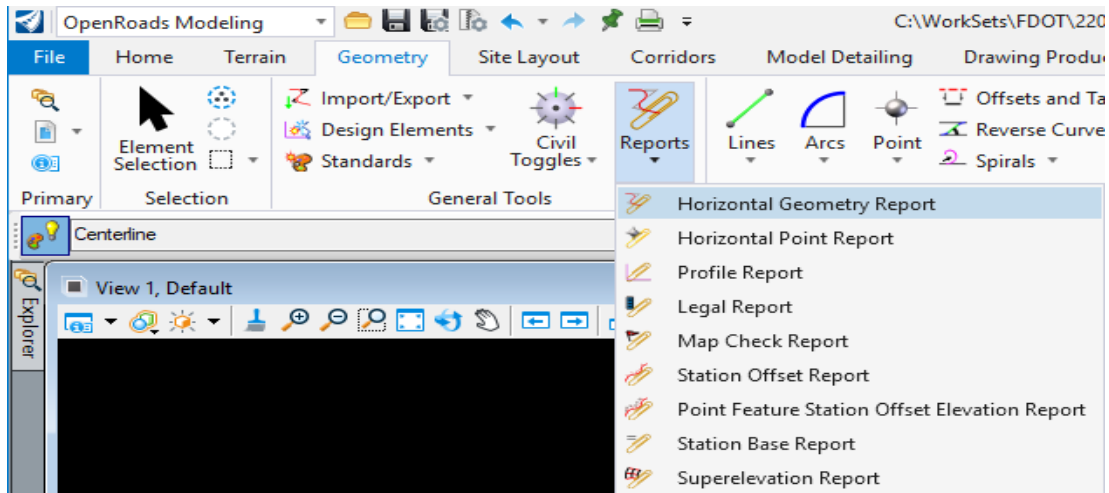
3. Select the new **SR61 Centerline(CL)**.
4. Use **AccuSnap** to locate the *Intersection* with **BL98** and **data point** to accept.
5. Enter **70000** and select **Enter <OR> data point** to accept.



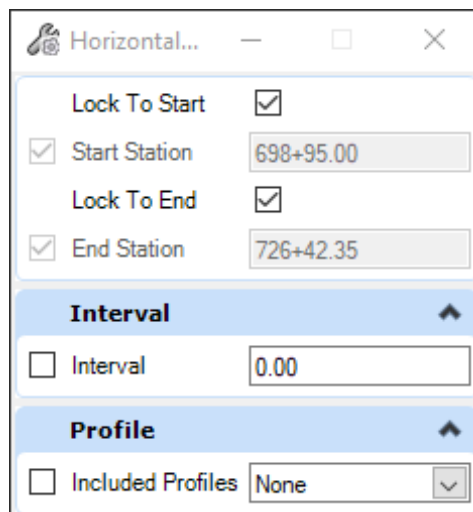
➤ **Describe the New Centerline Geometry**

1. Use the *Geometry Tab and General Tools Group*, **Horizontal Geometry Report** tool under the Reports icon.

OPENROADS MODELING>*GEOMETRY*>*HORIZONTAL*>*Reports*>**Horizontal Geometry Report**



2. Select the **SR61_CL Centerline**. Use the settings below at the prompt to generate the report shown.



Horizontal Alignment Review Report

Report Created: Tuesday, August 13, 2019
Time: 3:18:06 PM

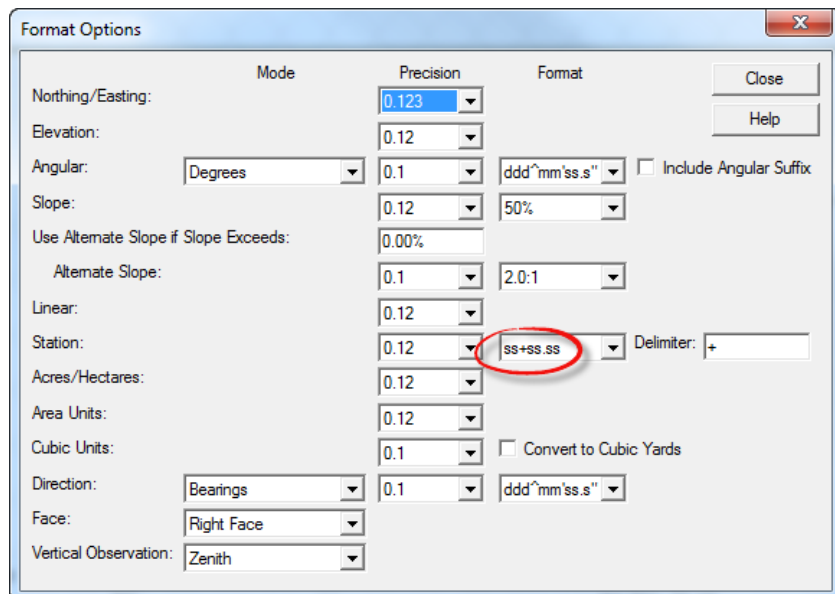
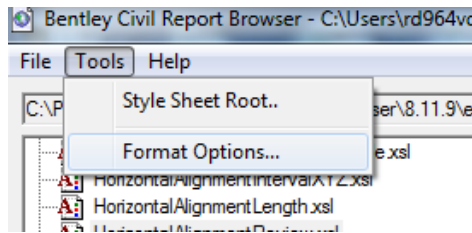
Project: Default
Description:
File Name: C:\WorkSets\FDOT\22049555201\roadway\ALGNRD08.dgn
Last Revised: 8/13/2019 15:13:46

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

Alignment Name: SR61_CL
Alignment Description:
Alignment Style: Alignment/Centerline

			Station	Northing	Easting
Element: Linear	START	()	700+00.000	402643.279	2006833.823
	HPI	()	698+95.000	402590.765	2006924.748
	Tangential Direction:		S59.991°E		
	Tangential Length:		105.000		
Element: Linear	HPI	()	700+00.000	402643.279	2006833.823
	PC	()	705+71.067	402928.889	2006339.309
	Tangential Direction:		N59.991°W		
	Tangential Length:		571.067		
Element: Circular	PC	()	713+25.311	403524.609	2005914.935

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

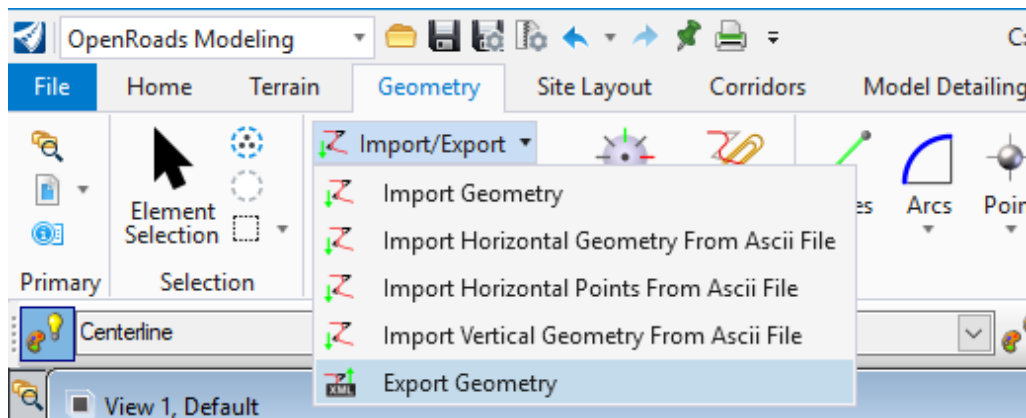


➤ **Save the SR61 Centerline to a Landxml for a back up.**

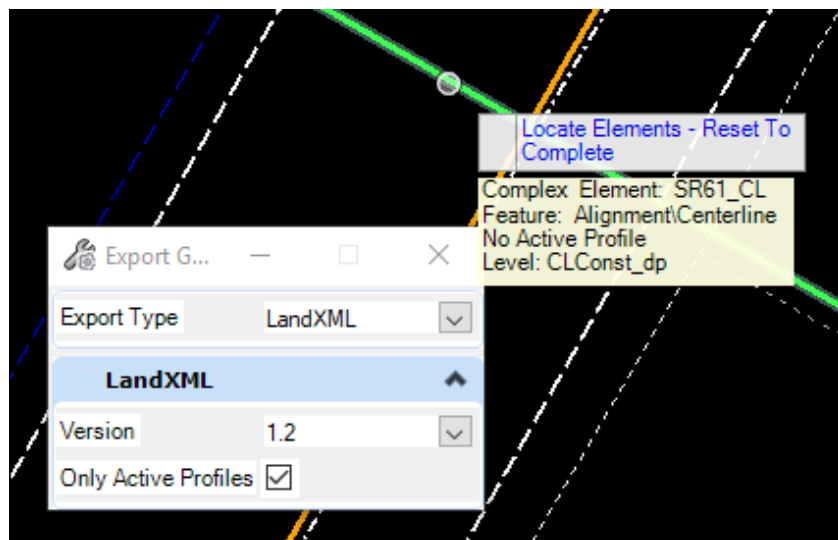
1. Use the *Geometry Tab and the General Tools Group*, to select the **Export to Native** tool and save the **SR61_CL** Centerline to a *Landxml* file.

OPENROADS MODELING>GEOMETRY>GENERAL TOOLS>Import/Export>Export Geometry

2. This will bring the Export Dialog up which gives you the option to export as a LANDXML

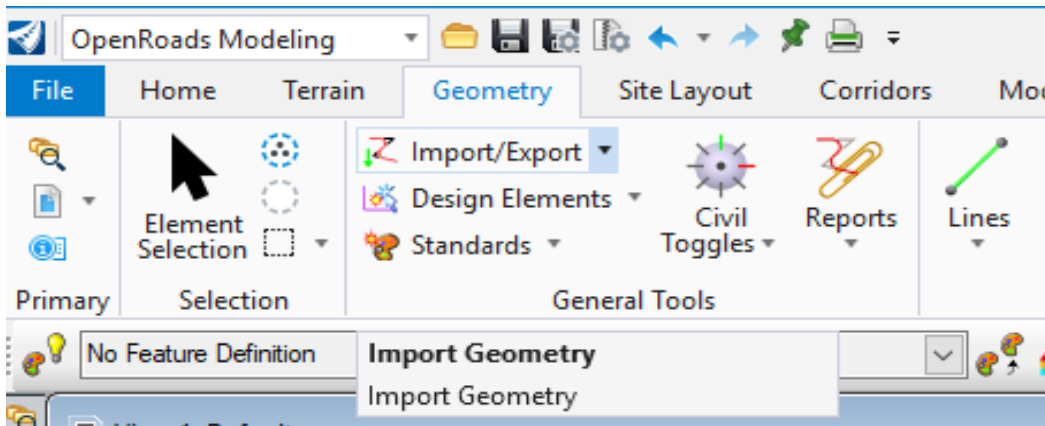


3. Select the Alignment you wish to export, select Version 1.2 for export, when prompted save as SR61_CL.xml.

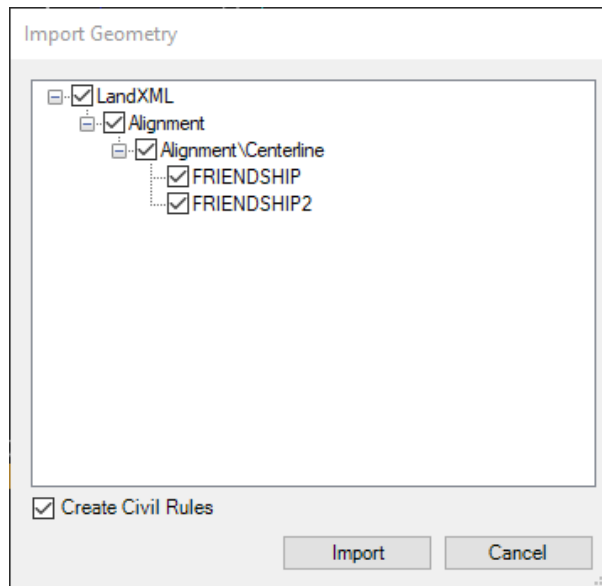


Exercise 1.3 Import Side Roads

1. Use the *Geometry Tab* under the *General Tools Group*, to select the **Import Geometry** tool.
OPENROADS MODELING>GEOMETRY>HORIZONTAL>GENERAL TOOLS>Import/Export>Import Geometry



2. Select the following *LandXML(FRIENDSHIP.xml)* file: **Friendship, Friendship2**. click the **Import** button.

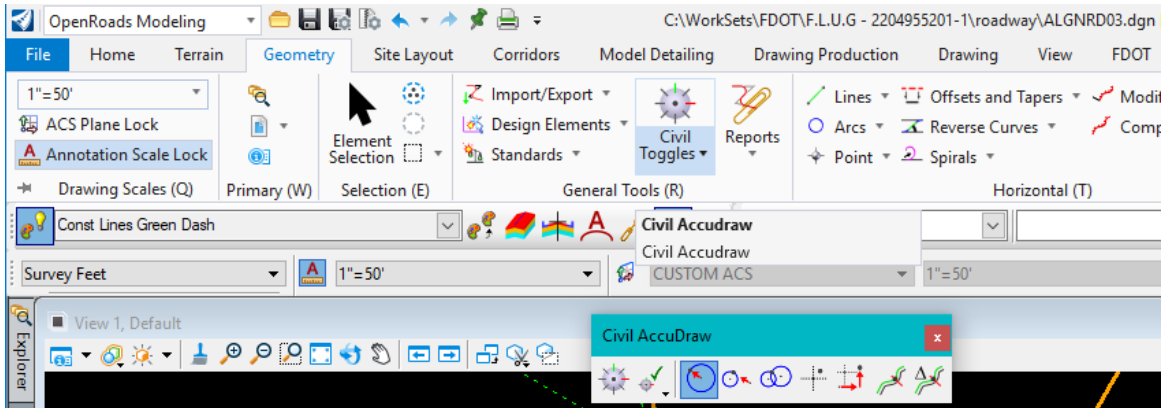


3. Notice from the LandXML a Feature Definition for CenterLine is defined for each alignment.

Exercise 1.4 Baseline Side Road Design from US98

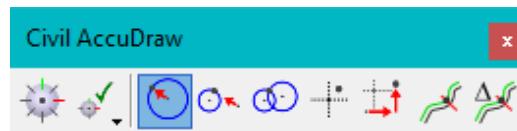
In this exercise Civil AccuDraw is used to help construct a side road centerline on BL98.

1. OpenRoads 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 OpenRoads AccuDraw.

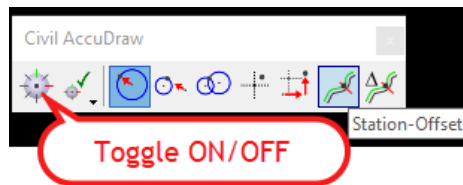


2. Use *Geometry Tab and the General Tools Group*, to select the **Civil Toggles icon** to call Civil AccuDraw tool to activate the Civil AccuDraw toolbar.

OPENROADS MODELING>GEOMETRY>GENERAL TOOLS>Civil Toggles>Civil AccuDraw

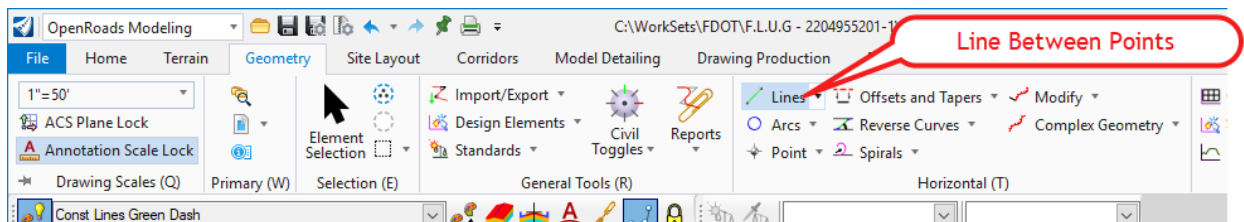


3. Click on the *Mode Station-Offset* to toggle **ON**.

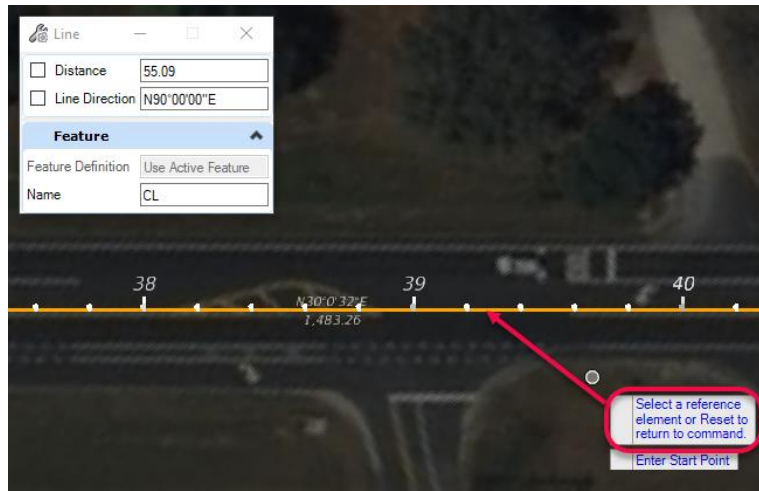
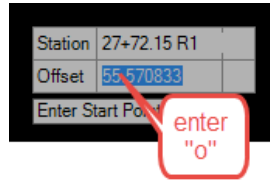


4. Use the *Geometry Tab and Horizontal Group*, to select the **Line Between Points** tool to create a **Centerline** perpendicular to the *BL98* at *Station 39+00* for a *Length of 80 feet* used as a side road centerline. Here are the steps to use Civil AccuDraw with the *Station Offset* option:

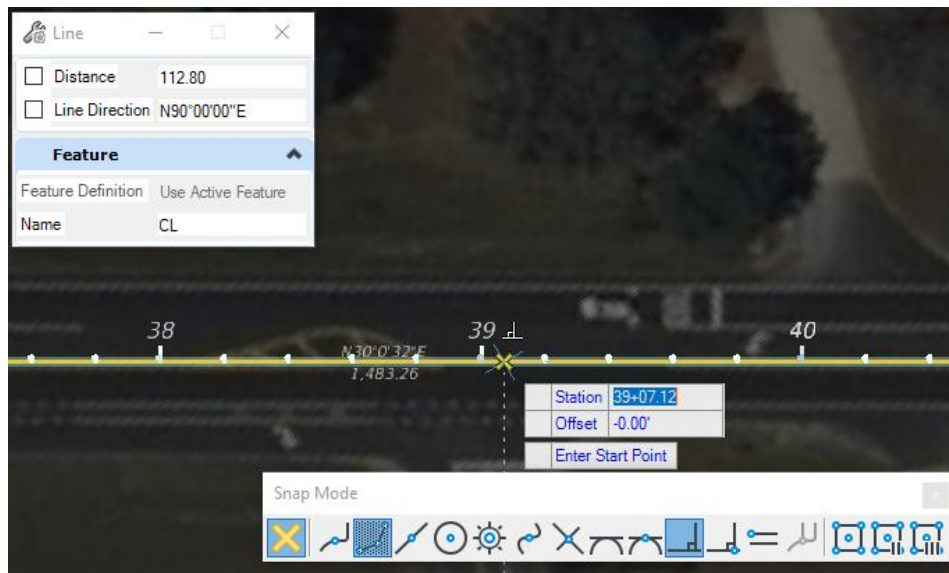
OPENROADS MODELING>GEOMETRY>HORIZONTAL>Lines>Line Between Points



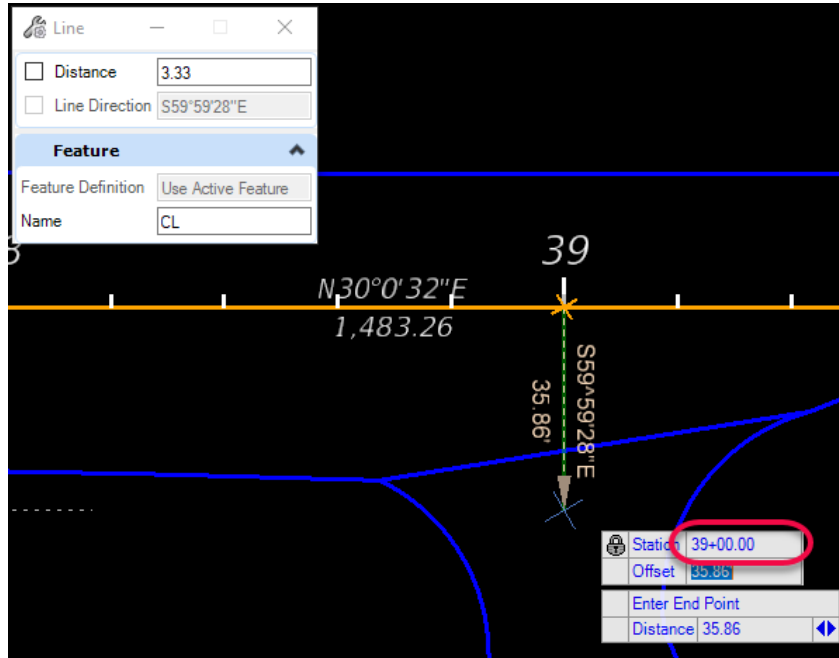
- On the cursor prompt, tab to the offset field and use the Shortcut Key-in **o**, and select the reference line **BL98**. The cursor will now track the station and offset.



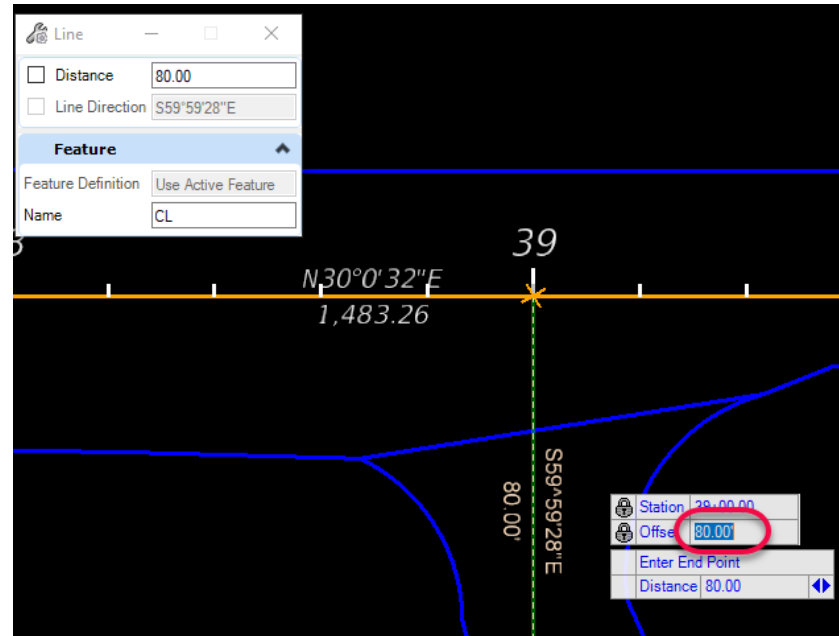
- For the first data point, set the *Snap Locator* button to **Perpendicular**, and select on the **BL98**.



- 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.

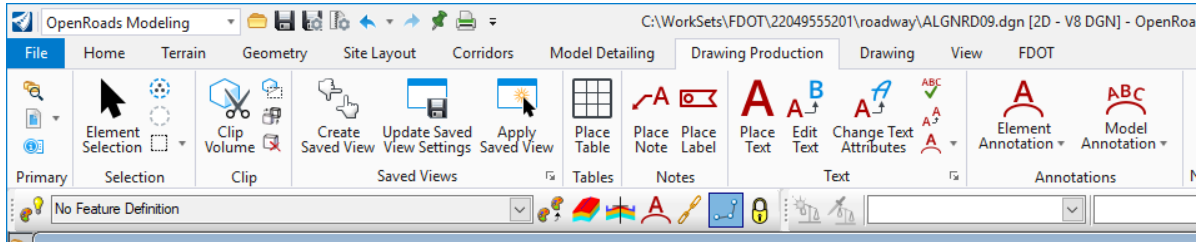


- d. **Data point in View** to place the point. Repeat these steps for the Centerline at Station 36+40.0

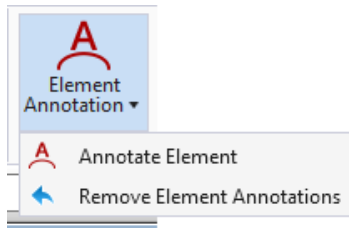
Exercise 1.5 Using Annotation Groups to Label Your Alignment Features

1. Open the ALGNRD file that has been created in the previous exercises. From the **OpenRoads Modeling WORKFLOW** navigate to the DRAWING PRODUCTION TAB and the Annotations Group. There are two icon buttons for Annotating.

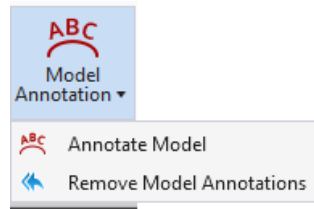
OPENROADS MODELING>DRAWING PRODUCTION>ANNOTATIONS



- a. Element Annotation – This will annotate the element and remove the element Annotation Group.

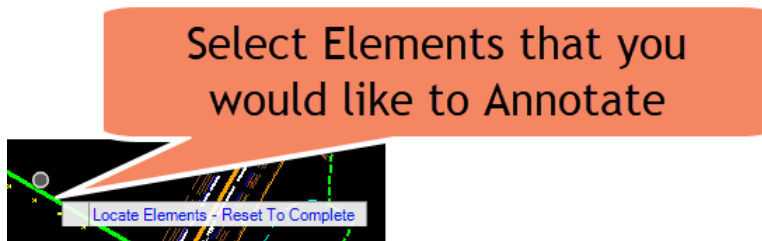


- b. Model Annotation – This will annotate all the elements in the model and remove the element Annotation Group.

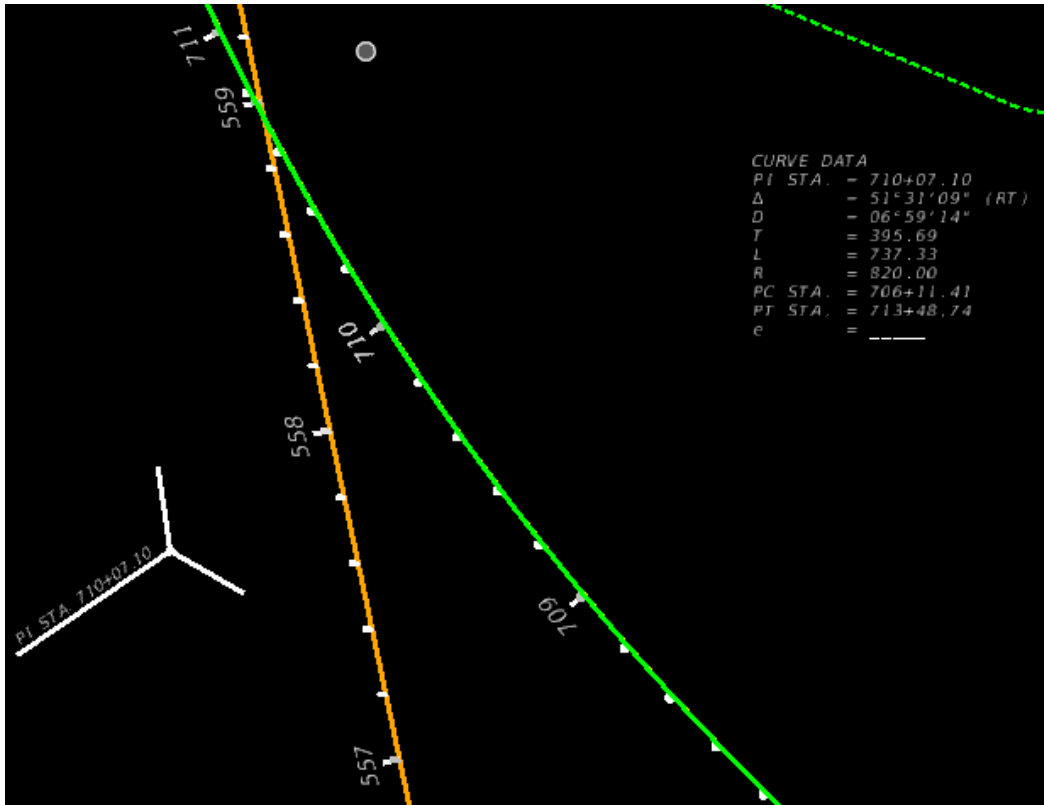


2. From the Drawing Production Tab and the Annotations Group, Select the Annotate Element button then following the prompts by the cursor. Select SR61 Centerline (optional you may select multiple alignments if you like) The n reset the tool by right click.

OPENROADS MODELING>DRAWING PRODUCTION>ANNOTATIONS>Annotate Element

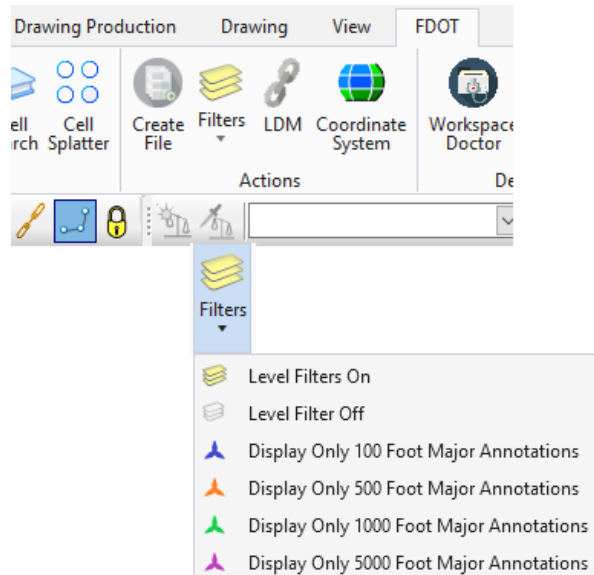


3. You have now just Annotated your Alignments.



- a. If you Navigate to the FDOT Tab on the Ribbon, in the Actions Group will be the Filters Icon Button with a Drop Down list.

OPENROADS MODELING>FDOT>ACTIONS>Filters



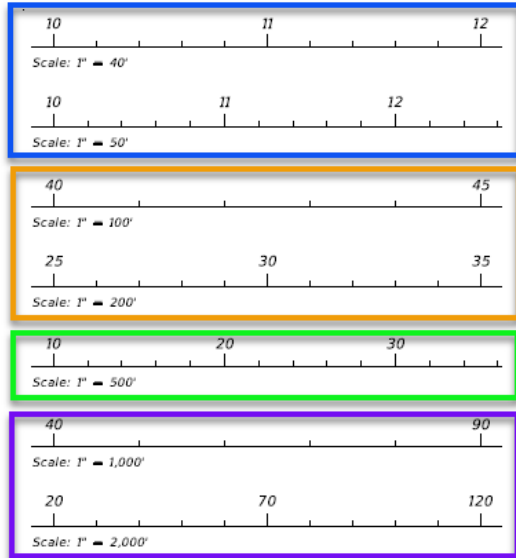
- b. From this list you will now be able to control what levels will be displayed for the Annotation Group.

- c. When you first Annotate the alignments in the level display all levels will be turned on. When using the Level Filters for annotation group be sure to change the Drawing Scale to match the applicable scale.

Topic #825-000-002
 FDOT Design Manual

January 1, 2019

Figure 312.2.1 Centerline Station Numbering and Tick Marks

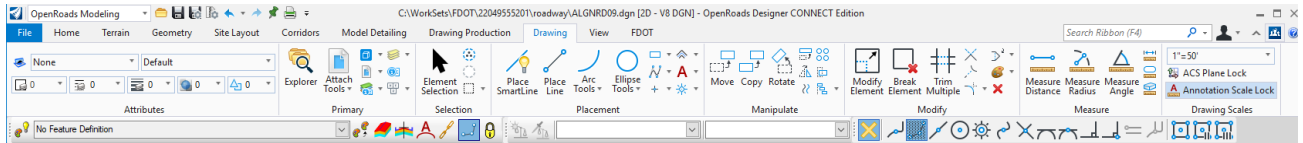


Display Only 100 Foot Majors Annotations

Display Only 500 Foot Majors Annotations

Display Only 1000 Foot Majors Annotations

Display Only 5000 Foot Majors Annotations



Example: For drawing scales from 1"=10' to 1"=60' use the Level Filter for Display Only 100 Foot Major Annotations

2 2D PLANIMETRICS

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 FDOTCONNECT. 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.

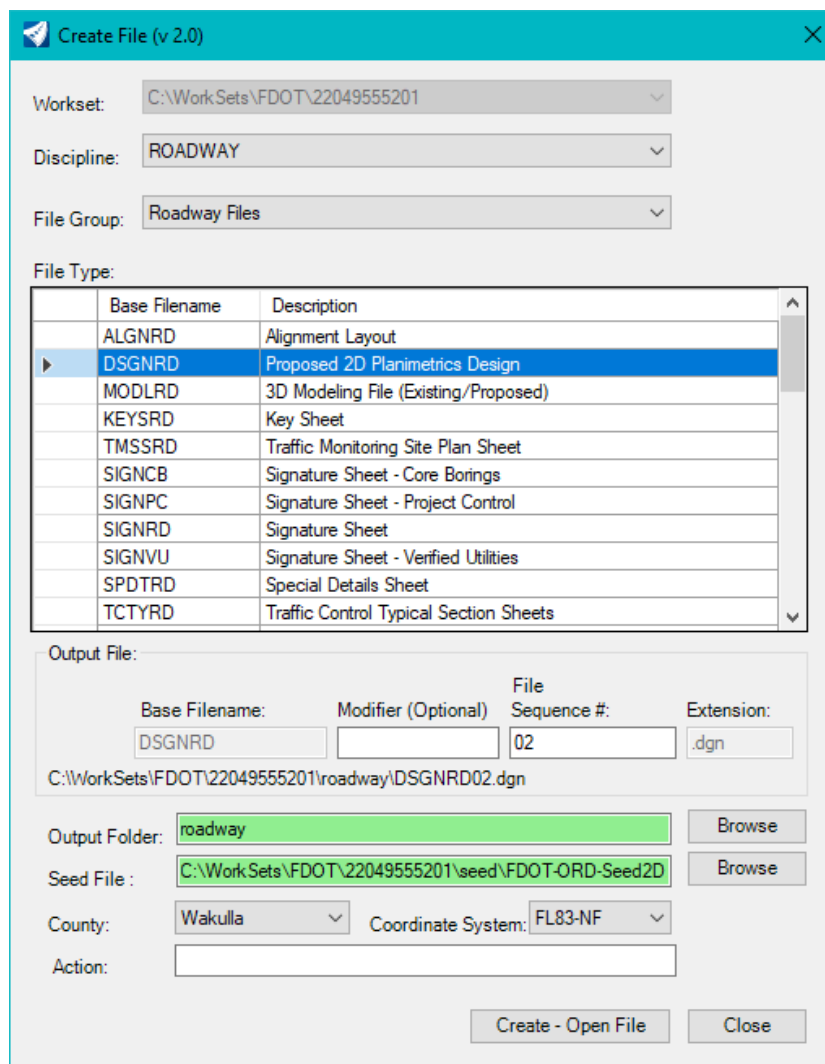
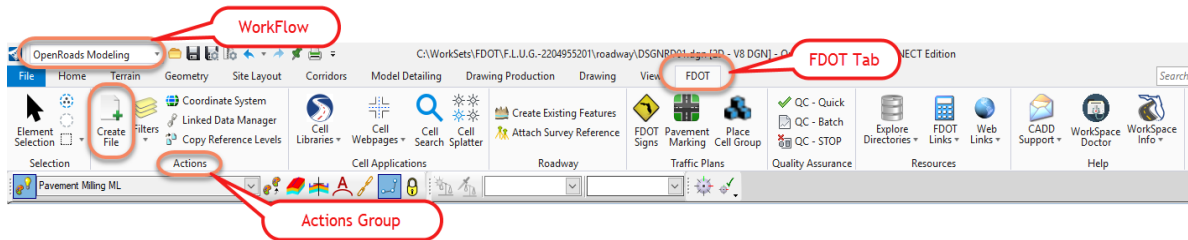
EXERCISE OVERVIEW

- 2.1 Preparation for 2D Plans
- 2.2 BL98 Milling Limits
- 2.3 BL98 Side Street
- 2.4 BL98 Widening
- 2.5 BL98 Widening Taper Line
- 2.6 For SR61 New Construction Template Lines
- 2.7 Add Right Turn lane on BL98
- 2.8 Add the School Entrance Right Turn Lane off BL98 Intersection
- 2.9 Create/Edit the Intersection Curve Radii
- 2.10 Trim Back Sidewalk and Curb Lines to the Curve Radii
- 2.11 Use Civil Cell Technology to Place Curb and Sidewalk Around the Radii
- 2.12 Create a Custom Civil Cell for Other Radii
- 2.13 Place Left Turn with Traffic Separator
- 2.14 Place Right Turn Island
- 2.15 For BL98 Intersection Crosswalks Lines
- 2.16 Create BL98 Turnouts
- 2.17 For BL98 Intersection Shoulders
- 2.18 For Friendship Intersection

Exercise 2.1 Preparation for 2D Plans

1. File Tool: This tool is always the starting point to create QC compliant design files for your workset/project.

OPENROADS MODELING > FDOT > ACTIONS > Create File

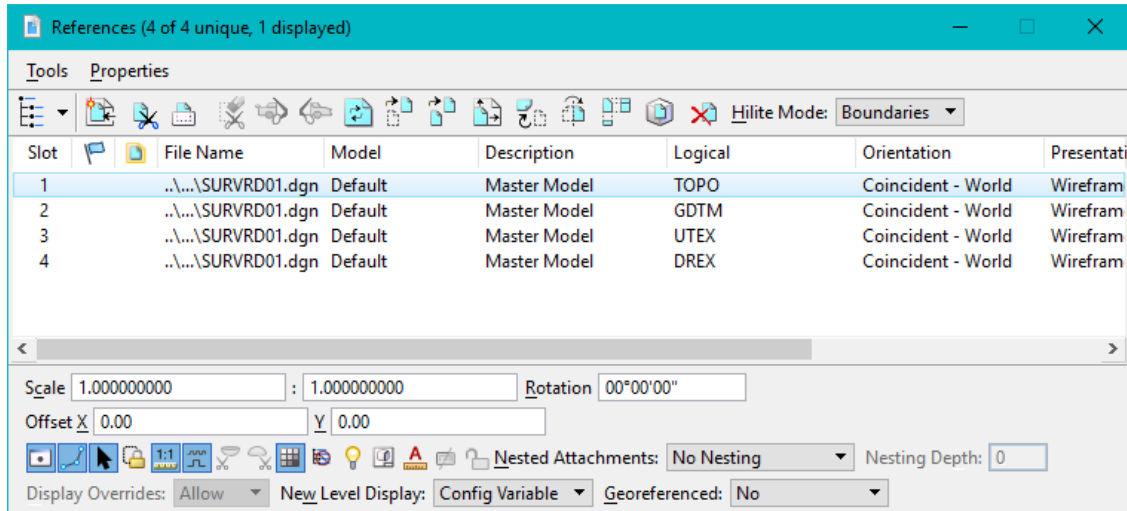


Exercise 2.2 *BL98 Milling Limits*

In this exercise the existing pavement edge lines from the TOPORD or SURVRD file are copied to be used as the Milling Lines for the proposed improvements. If the SURVRD does not exist and you only have a TOPORD skip to step 5.

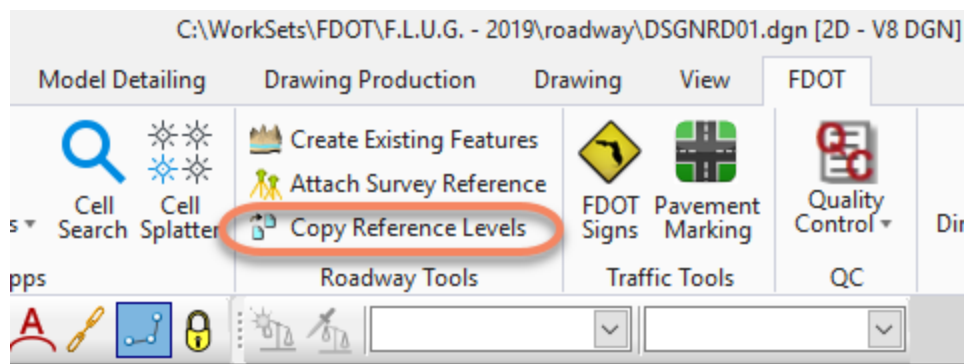
1. Use the **Attach Survey Reference** from the FDOT Tab within the Roadway Tools Group. (This tool will attach a SURVRD file 4 times with different Logical names of **TOPO**, **GDTM**, **UTEX**, **DREX** which apply to different level filters.)

OPENROADS MODELING>FDOT>ROADWAY>Attach Survey Reference




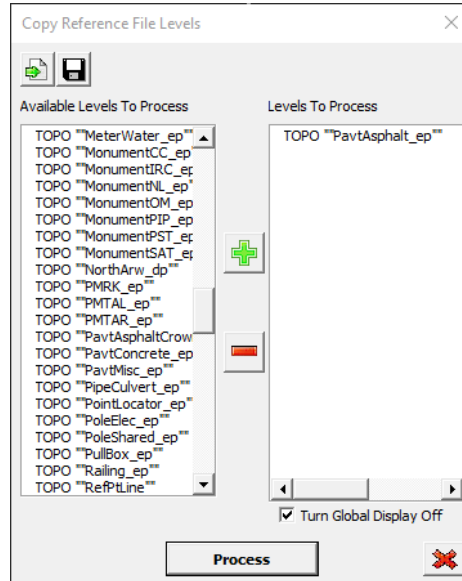
2. Once the SURVRD is attached, open your Reference Dialog (Function Key F9) and Detach the reference files with logical names of GDTM, UTEX, DREX. This will only leave the TOPO.
3. Now we need to copy or merge the elements that are on the PavtAsphalt_ep level. This can be done by using the **Copy Reference Levels** tool from the FDOT Tab within the Roadway Tools Group

OPENROADS MODELING>FDOT>ACTIONS>Copy Reference Levels

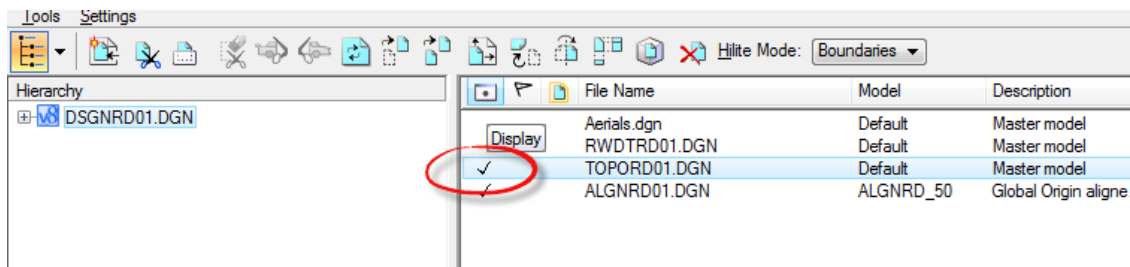


- This will open a dialog for the Copy Reference File Levels tool. On the left side of the

dialog choose PavtAsphalt_ep level. Then click on the plus  to add the level to the right side of the dialog. Click the process button to merge/copy the elements with this level into the file.



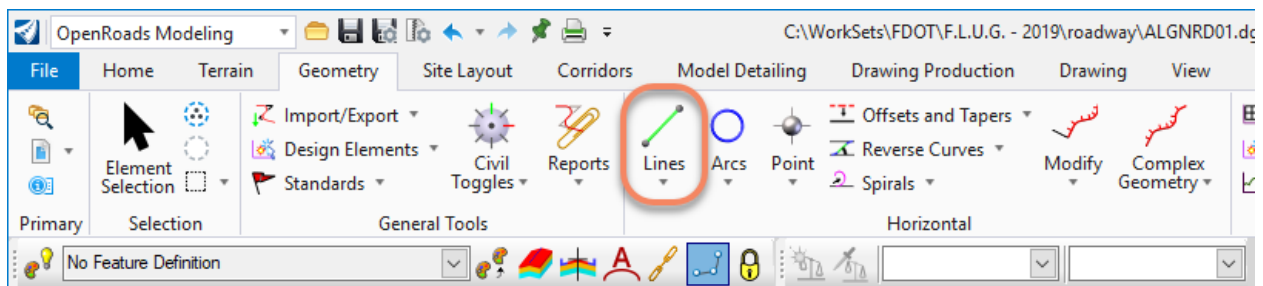
- This step if no SURVD Exists Use OpenRoads **References (Function Key F9)** to attach and display the *TOPORD01* and *RWDTRD01* Reference files.



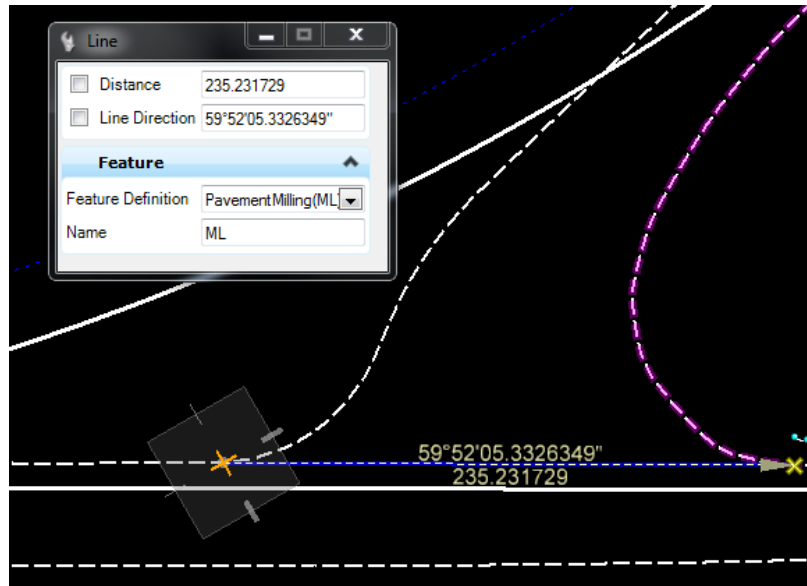
- Use OpenRoads **Level Display** to turn **OFF** all the *TOPORD01* Levels except the **PavtAsphalt_ep**.

- Use the *Geometry Tab* and the *Horizontal Group*, **Line Between Points** tool.

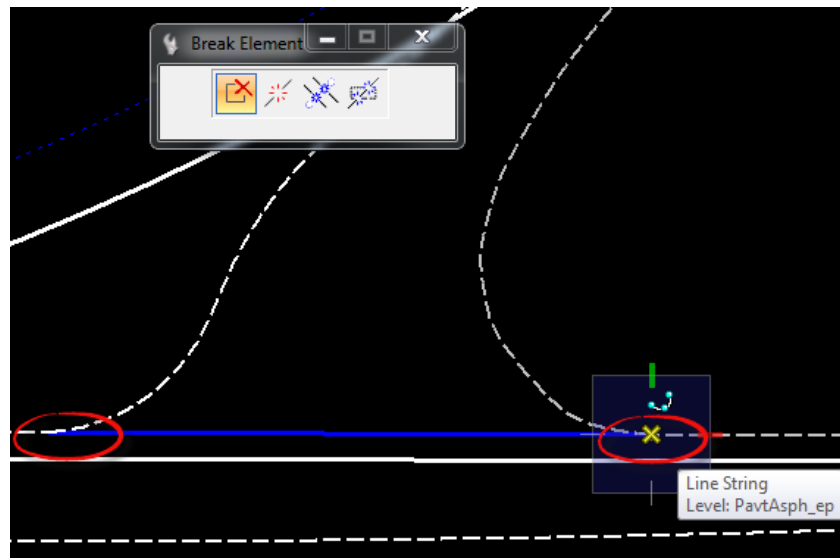
OPENROADS MODELING>GEOMETRY>HORIZONTAL>Lines>Line Between Points



8. Create a **PavementMilling ML** line across the *existing intersection* of **SR61** and **BL98**.

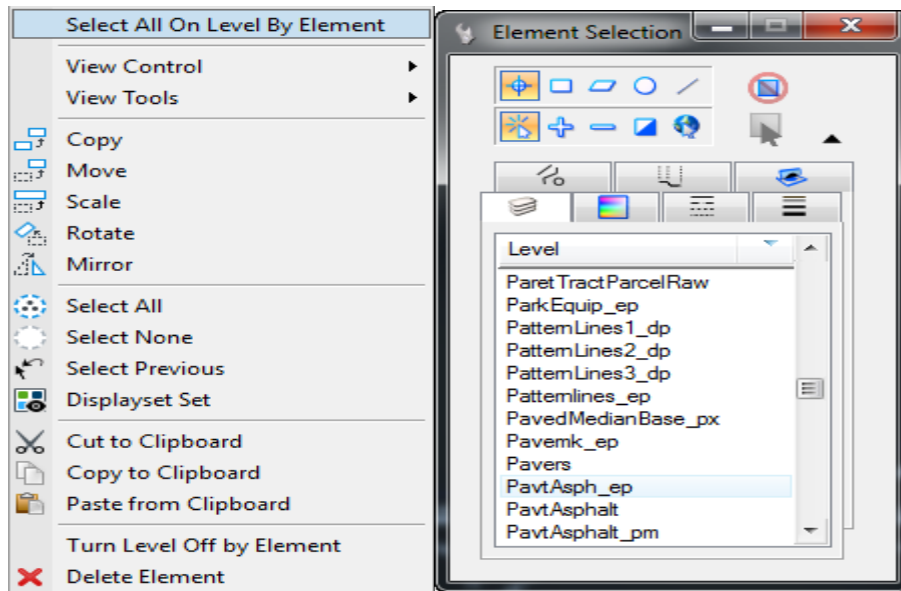


9. Use OpenRoads **Break Element** on the **PavtAsphalt_ep** line string elements where the new **PavementMilling(ML)** line intersects.

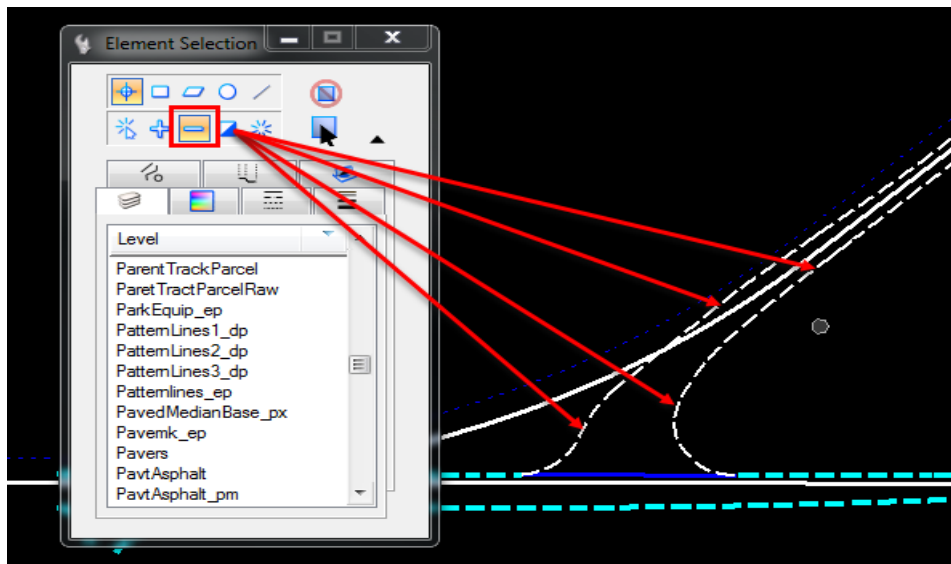


10. Repeat these steps for the other **side roads** along **BL98**.

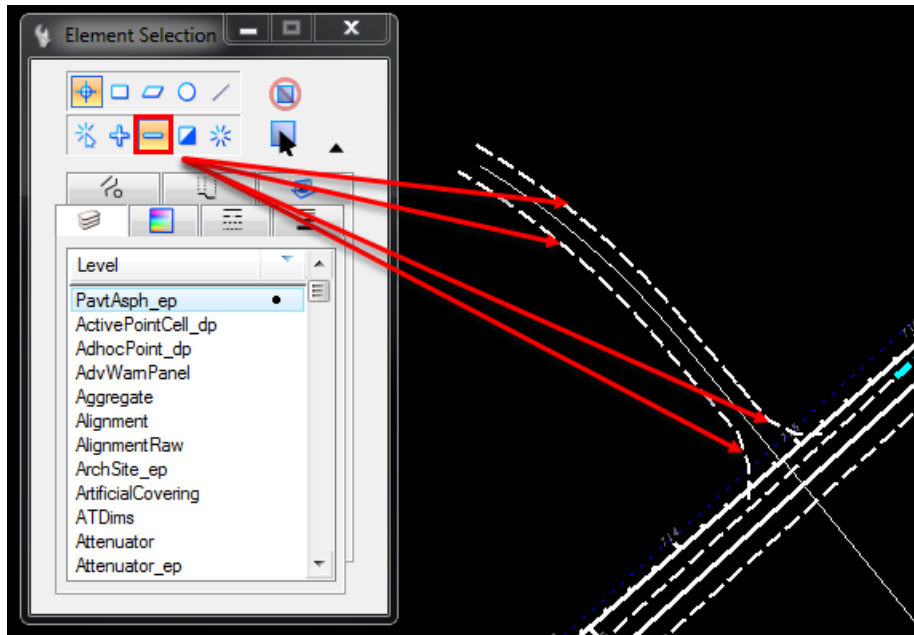
11. Create a *Selection Set* of the **PavtAsphalt_ep** by level. This can be done with the right click function of the mouse, by holding down and Selecting All On Level By Element. Then selecting an element.



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

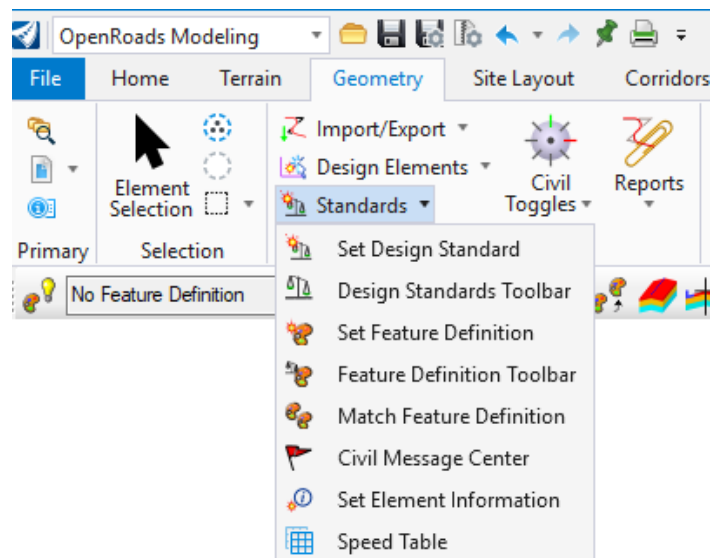


- b. Also subtract out of the *Selection Set* the **Intersection lines at Friendship Road.**

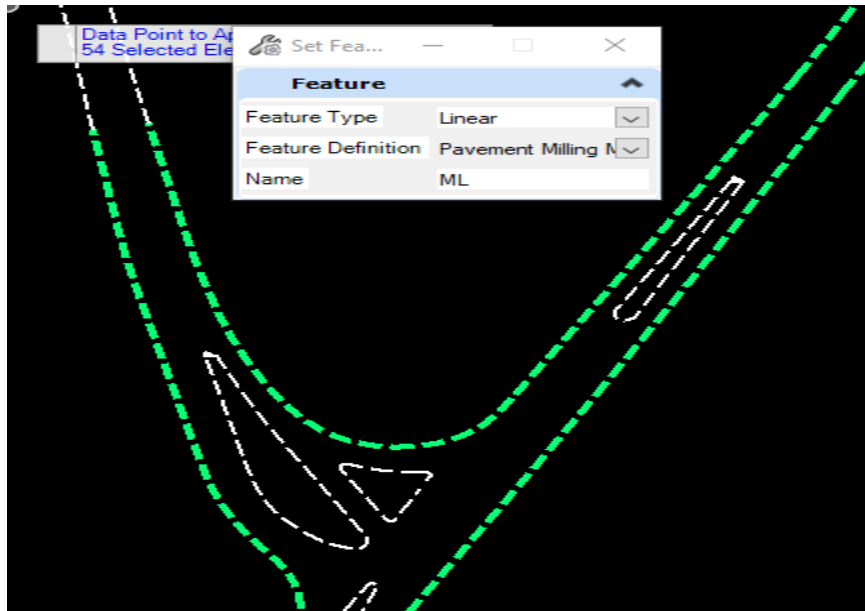


12. Use the Geometry Tab and the General Tools Group, click on the Standards button to bring up a drop down that has the Set Feature Definition tool.

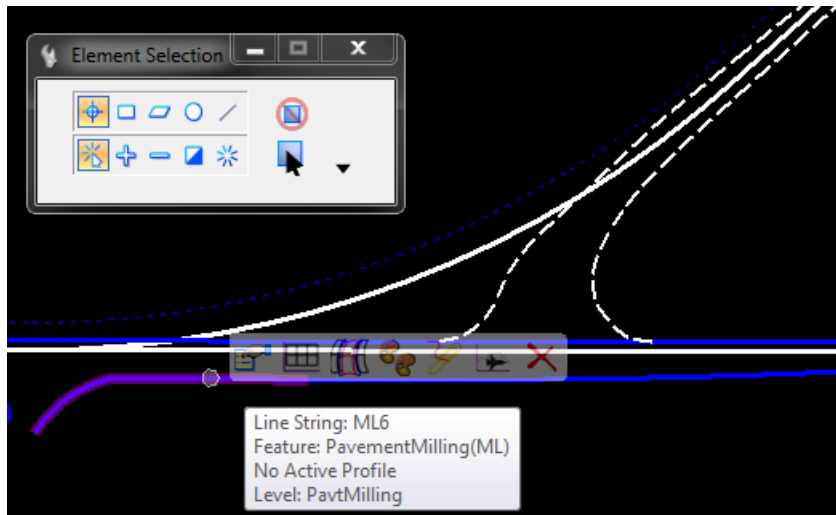
OPENROADS MODELING > GEOMETRY > GENERAL TOOLS > Standards > Set Feature Definition



13. **Data point** to change the elements to the *Feature Definition, Pavement Milling ML*.



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

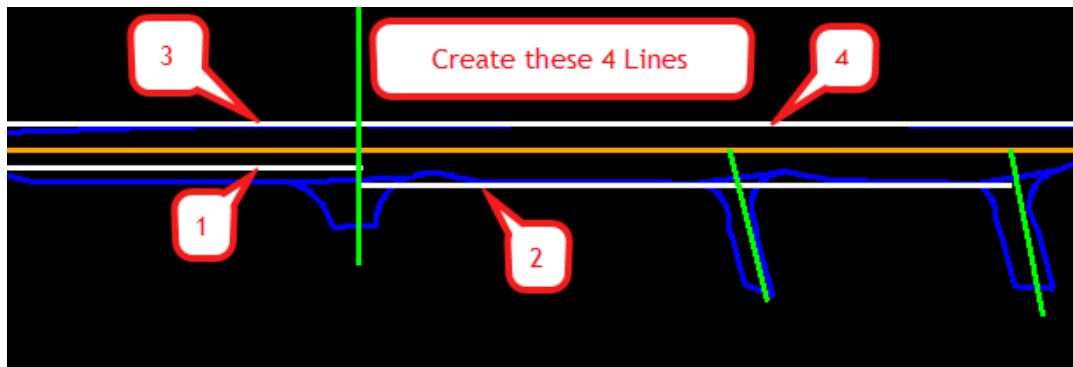


Exercise 2.3 *BL98 Widening*

Before we start, the ALGNRD will need to be attached as a reference into the DSGNRD file. Making sure when you attach the ALGNRD it is the Default Model. With a Detail scale of 1"=50'.

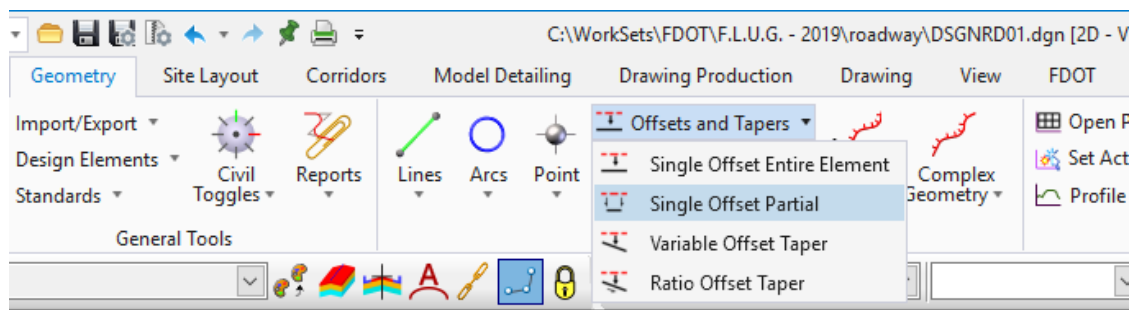
In this exercise, the proposed Pavement Lines used for widening on BL98 are created at the following locations:

	START STATION	OFFSET	LENGTH	FEATURE NAME
1	28+00	16 feet	500 feet	SW_EOPA
2	33+00	32 feet	600 feet	SE_EOPA
3	30+00	-24 feet	300 feet	NW_EOPA
4	33+00	-24 feet	1000 feet	NE_EOPA



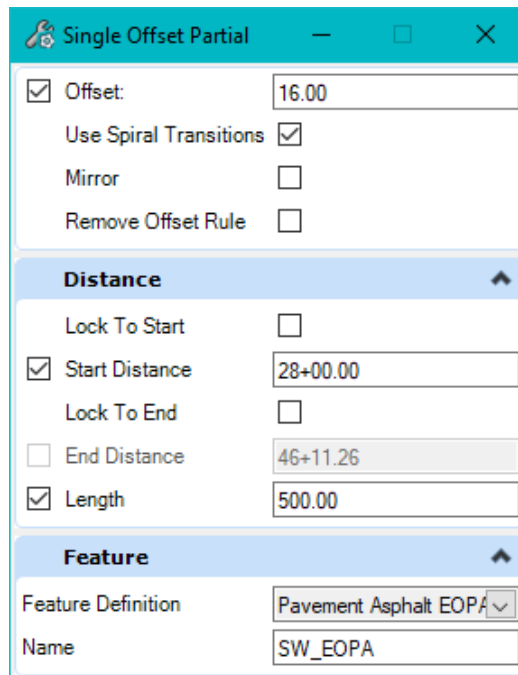
1. Use the *Geometry Tab and the Horizontal Group*, to select **Single Offset Partial** tool located in the Offsets and Tapers button.

OPENROADS MODELING>GEOMETRY>HORIZONTAL>Offsets and Tapers>Single Offset Partial

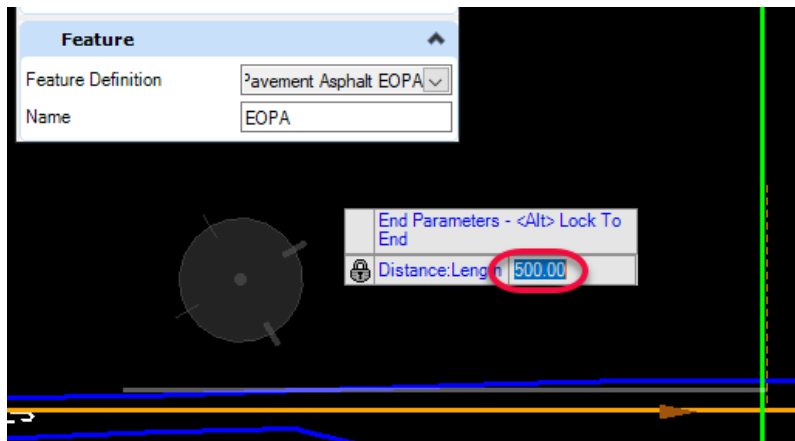


- a. Select the **BL98** line at the prompt to **Locate Element**.

- 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*.



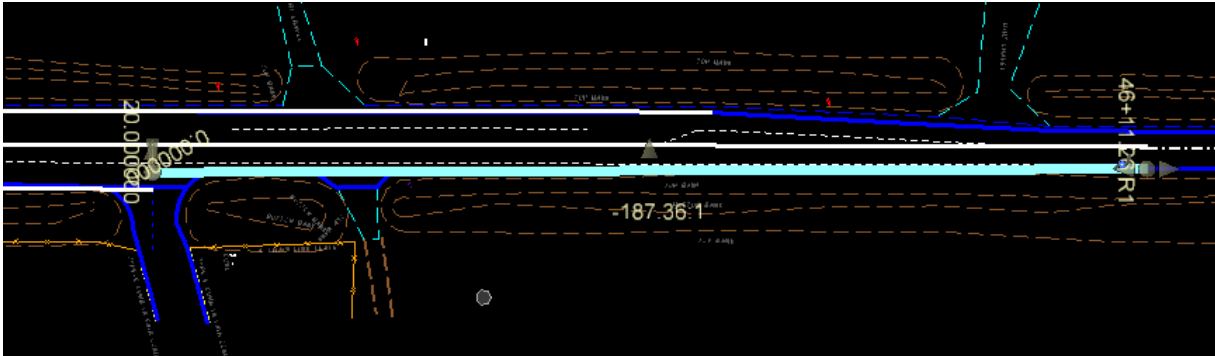
- e. **Data Point** in the **View** to accept **No** at the *Mirror* option prompt.
2. Repeat this procedure for each of the **Pavement Asphalt EOPA** widening lines diagram and table above.

Exercise 2.4 *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	FEATURE NAME
39+00	20 feet	Alt to end Station Lock	Snap Nearest	EOPA_TAPER



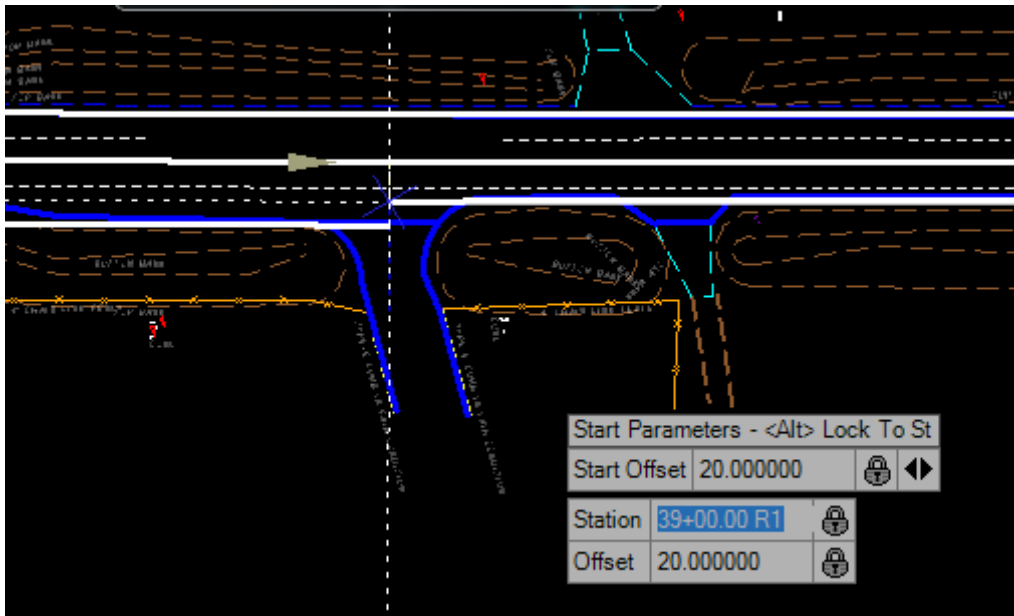
- Toggle On the Civil AccuDraw.

1. Use the *Geometry Tab and the Horizontal Group*, to select **Variable Offset Taper** tool located in the Offsets and Tapers button.

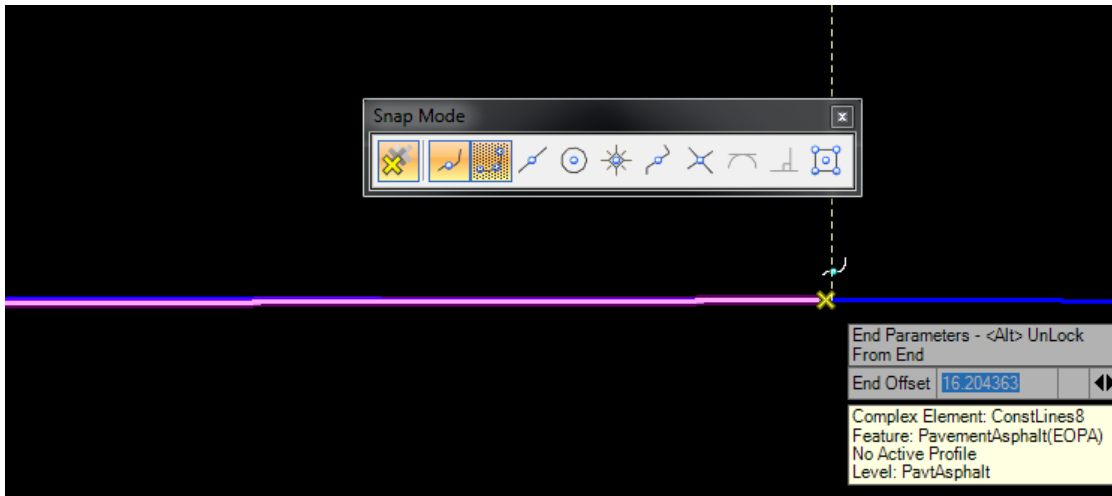
OPENROADS MODELING > GENERAL > HORIZONTAL > Offsets and Tapers > Variable Offset Taper

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 **Pavment Milling ML** until the *Snap Mode* displays.

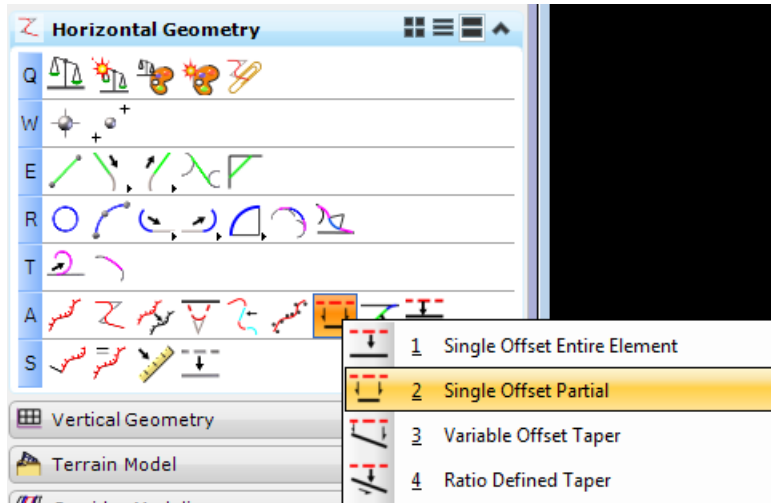


8. **Data Point** to place the second point and complete the command.

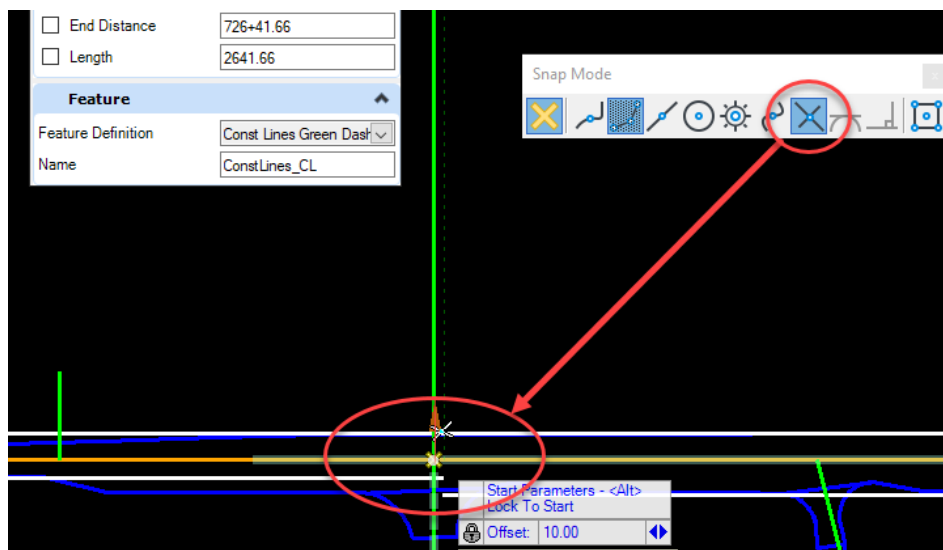
Exercise 2.5 For SR61 New Construction Template Lines

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

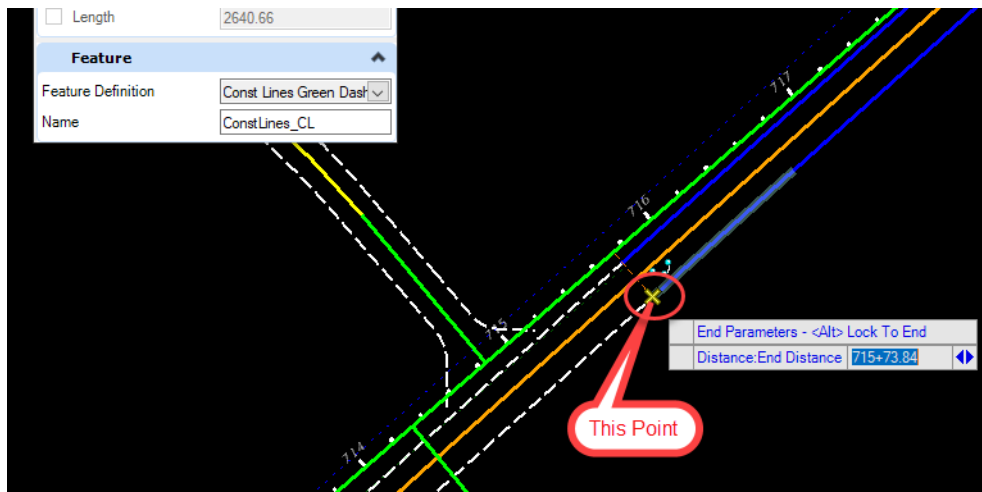
1. Use the *Geometry Tab and the Horizontal Group*, to select the **Single Offset Partial** tool. *OPENROADS MODELING>GEOMETRY>HORIZONTAL>Offsets and Tapers>Single Offset Partial*



2. Create a *Feature line, Const Lines Green*.
 - a. Select the SR61 Centerline CL.
 - b. Set the Offset to 10.00.
 - c. Set the Name to ConstLines_CL
 - d. For the first point, set AccuSnap to Intersection and select the intersection of SR61 and BL98.



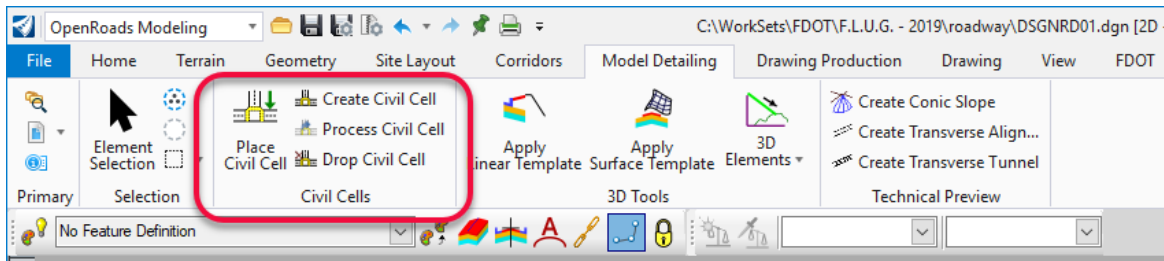
- e. For the second point, zoom out to the first *intersection* after the end of the *SR61* curve and snap to the right **Pavement Milling ML** of existing SR61 <OR> Key in *Station 716+50*.



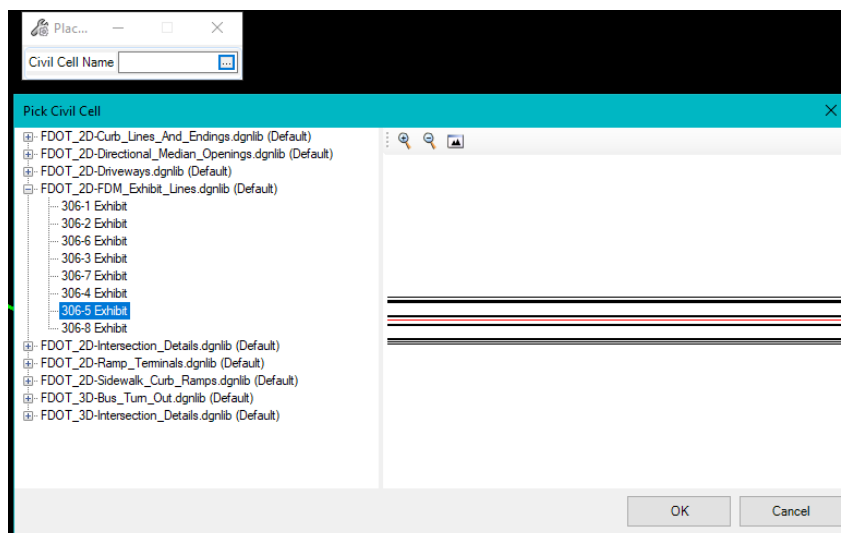
- Use Intersect Snap and to place first point and Key Point snap for the second point.

3. Use the Model Detailing Tab and the *Civil Cells Group*, to find the **Place Civil Cell** tool.

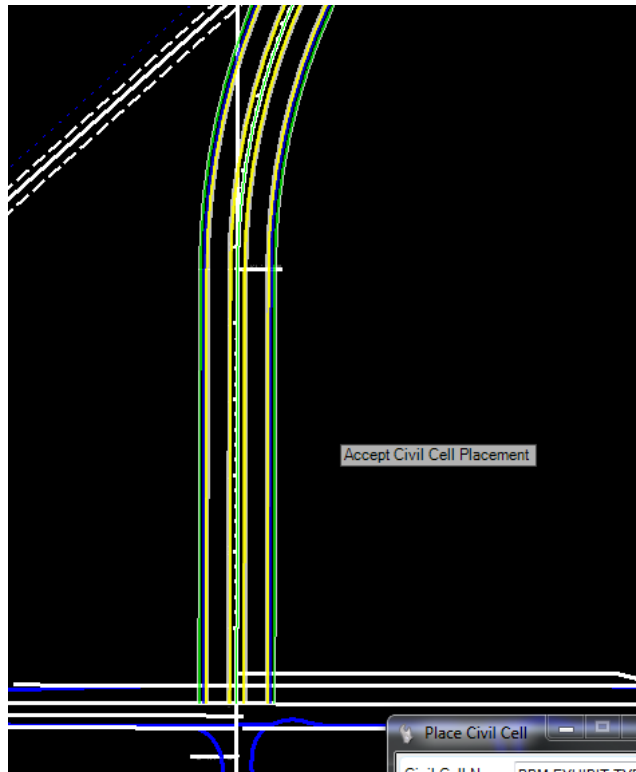
OPENROADS MODELING>MODEL DETAILING>CIVIL CELLS>Place Civil Cell



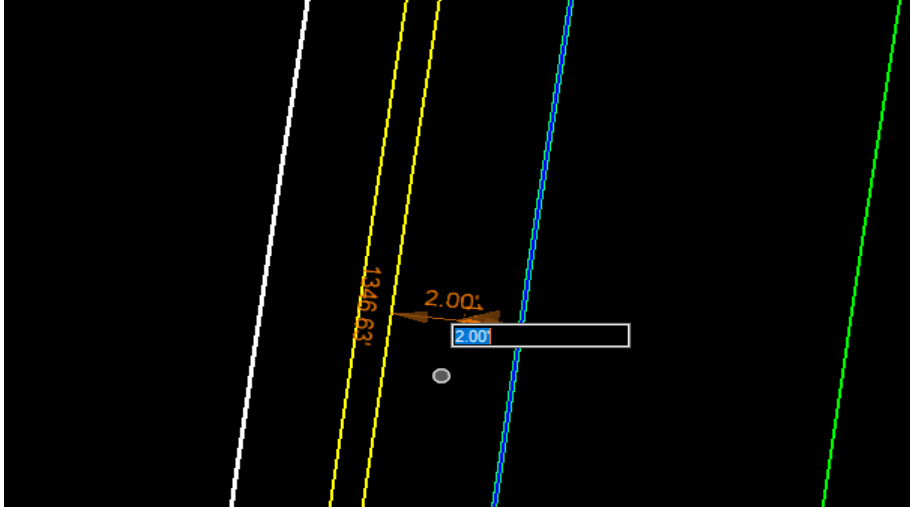
4. Navigate to the *FDOT_2D-FDM_Exhibit_Lines.dgnlib* and select 306-5 Exhibit civil cell to place.



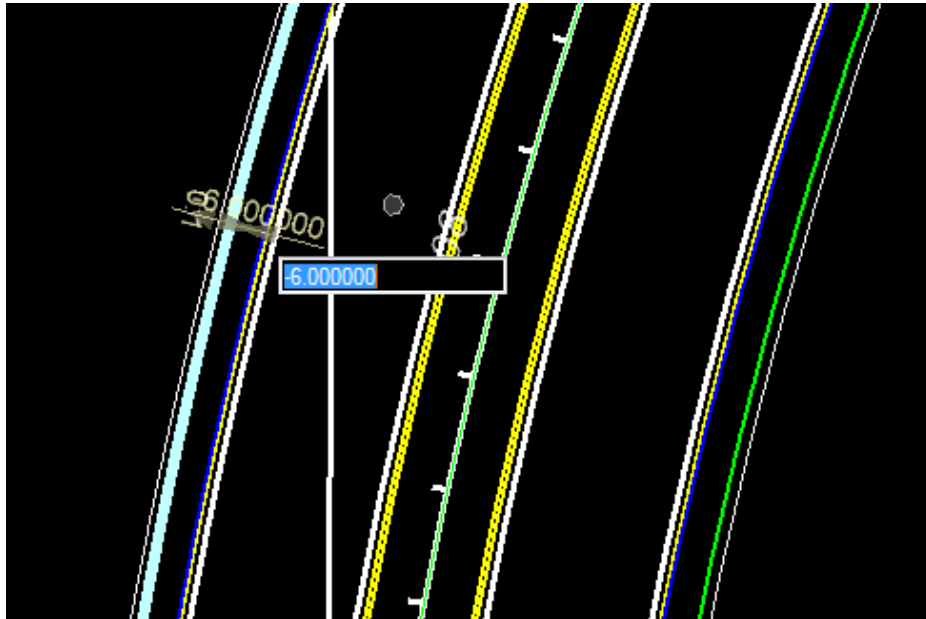
- a. Click **OK** and follow the prompts to complete the *Place Civil Cell* command.
- b. Locate *Reference Element*, select the **Green Const Line**.
- Use the tab key to after clicking on an element to get to the last place Green Const Line.
- c. **Reset** to Skip View Alternates.
- d. Data point to accept **Civil Cell Placement**.



5. Change the Front Sidewalk Utility Strip Width to **2 ft** and set the Sidewalk Width to **5ft**.
 - a. Select the **Sidewalk Front FSW Feature** and zoom to find the Context Menu near the middle of the element.



- b. Change the *SidewalkFront offset Dimension* from 6 to 5.
- c. Verify that the *SidewalkBack* is set to 5.
- d. Repeat this for *both sides* of the roadway.

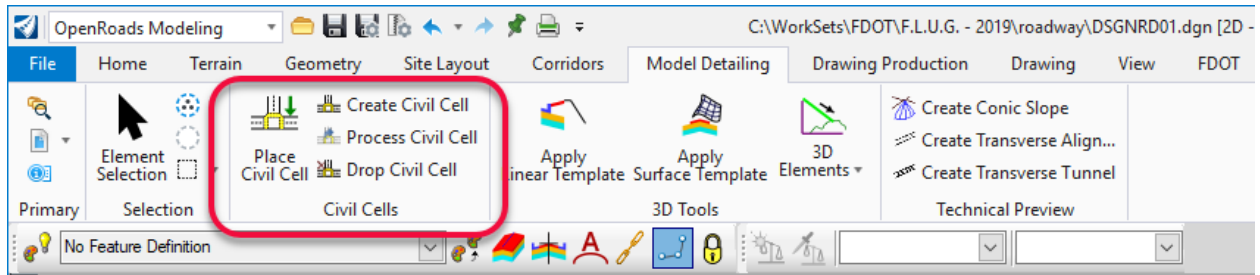


Exercise 2.6 Add Right Turn Lane on BL98

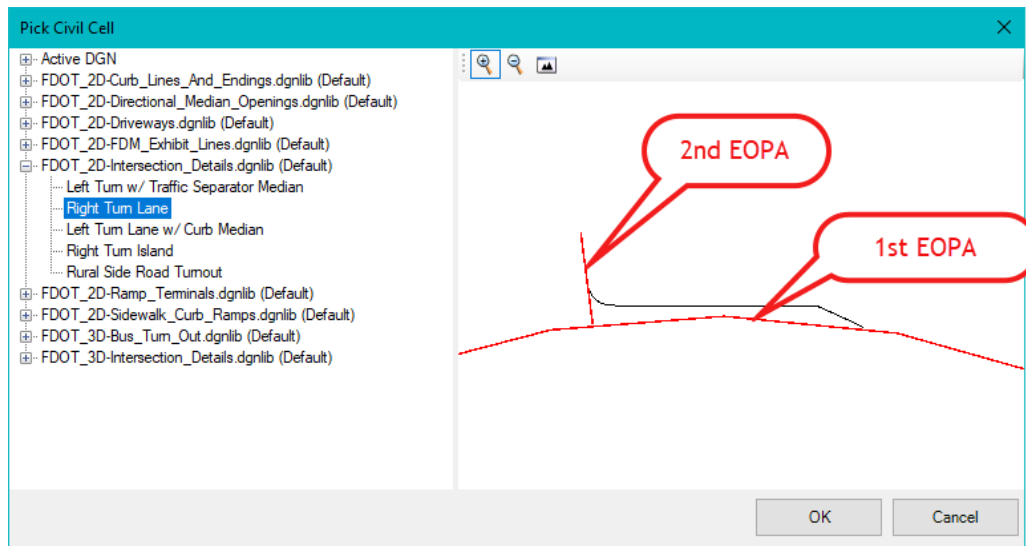
This exercise uses Civil Cells to add a right turn lane to the BL98.

1. Use Model Detailing Tab and the Civil Cells Group, **Place Civil Cell** tool.

OPENROADS MODELING>MODEL DETAILING>CIVIL CELLS>Place Civil Cell

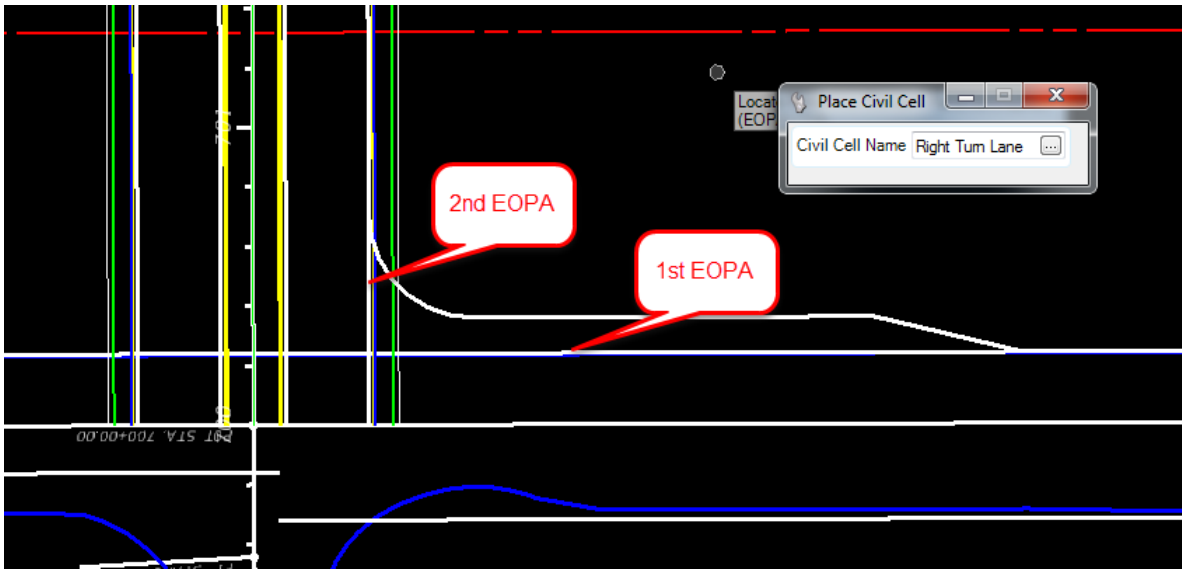


2. From the Place Civil Cell dialog, navigate to the *FDOT_2D-Intersection_Details.dgnlib* and select **Right Turn Lane**.

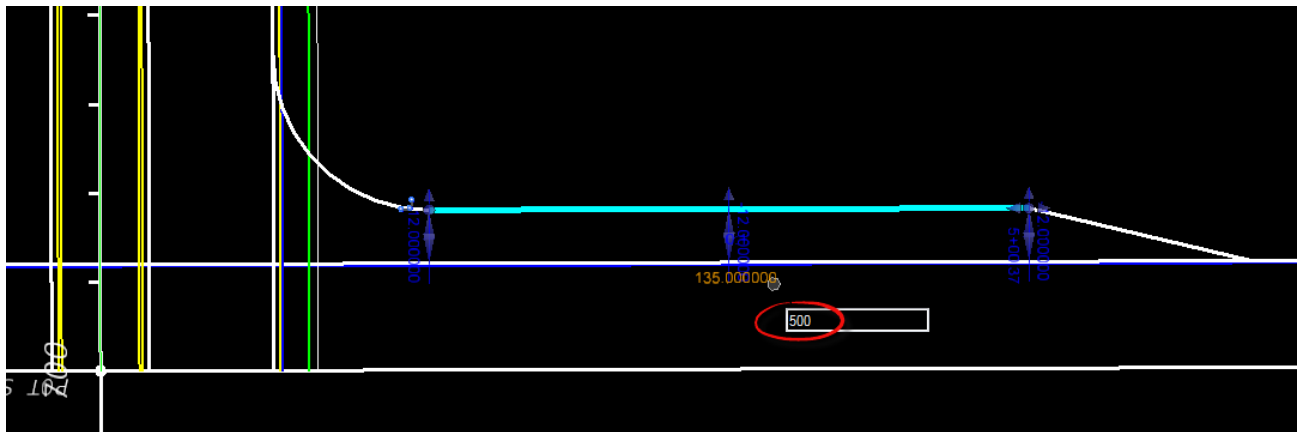


3. At the prompt, for the first *Reference*, select the **widening Pavement Asphalt EOPA** line.
4. For the second *Reference*, select the **SR61 Right EOP Out Pavement Asphalt EOPA**.
5. Reset to Skip Elements to View Alternatives.

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 **200** to **500** feet.

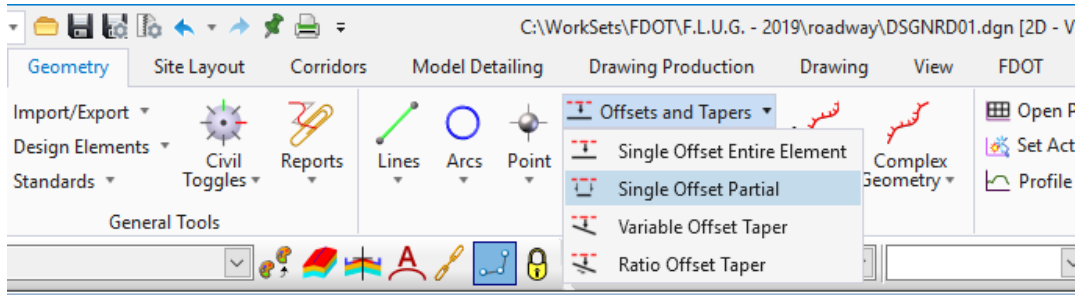


8. Use OpenRoads *Trim to Intersection* to correct the Pavement Asphalt EOPA lines.

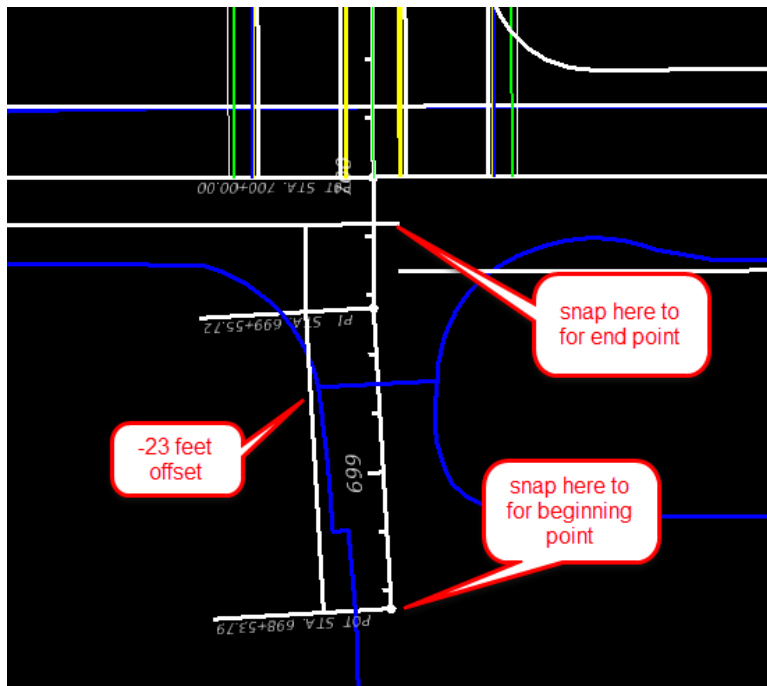
Exercise 2.7 Add the School Entrance Right Turn Lane off BL98 Intersection

1. Use the *Geometry Tab and the Horizontal Group*, to select **Single Offset Partial** tool located in the Offsets and Tapers button.

OPENROADS MODELING>GEOMETRY>HORIZONTAL>Offsets and Tapers>Single Offset Partial



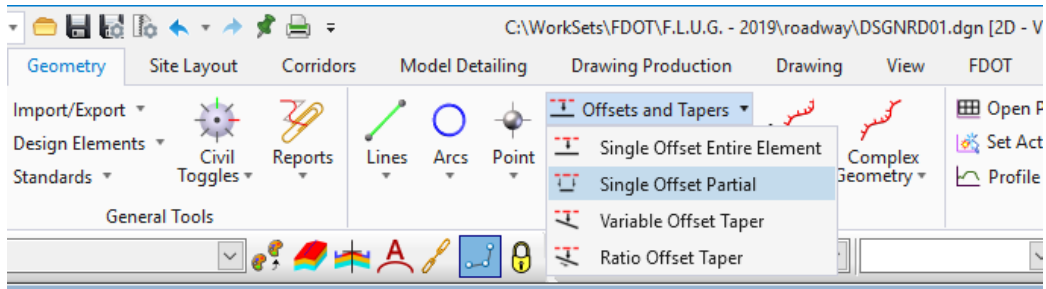
2. Create the side road **Pavement Asphalt EOPA** opposite *SR61* left *offset -23 feet*.
 - a. For the *beginning*, snap to beginning of **SR61**.
 - b. For the *end*, snap to the BL98 widening line end point at **SR61**.
 - c. Uncheck *Mirror* to set to **No**.



H

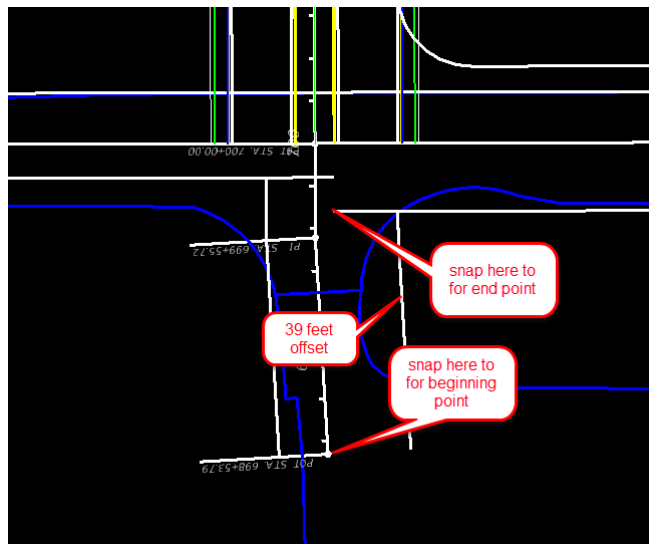
3. For the opposite side, use the *Geometry Tab and the Horizontal Group*, to select **Single Offset Partial** tool located in the Offsets and Tapers button.

OPENROADS MODELING>GEOMETRY>HORIZONTAL>Offsets and Tapers>Single Offset Partial

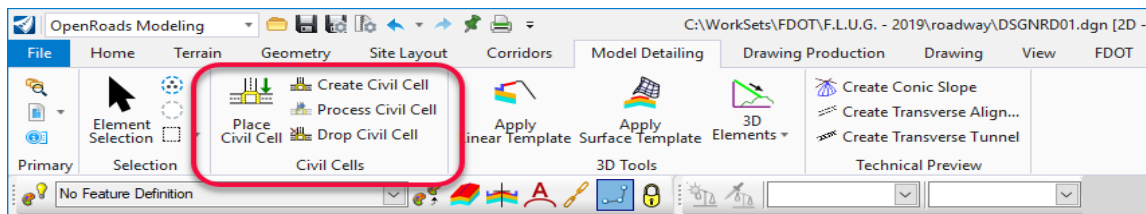


4. Create the side road **Pavement Asphalt EOPA** opposite *SR61 Left Offset 39 feet*.
 - a. For the *beginning*, snap to beginning of **SR61**.
 - b. For the *end*, snap to the BL98 widening line end point at SR61.
 - c. Uncheck *Mirror* to set to **No**.

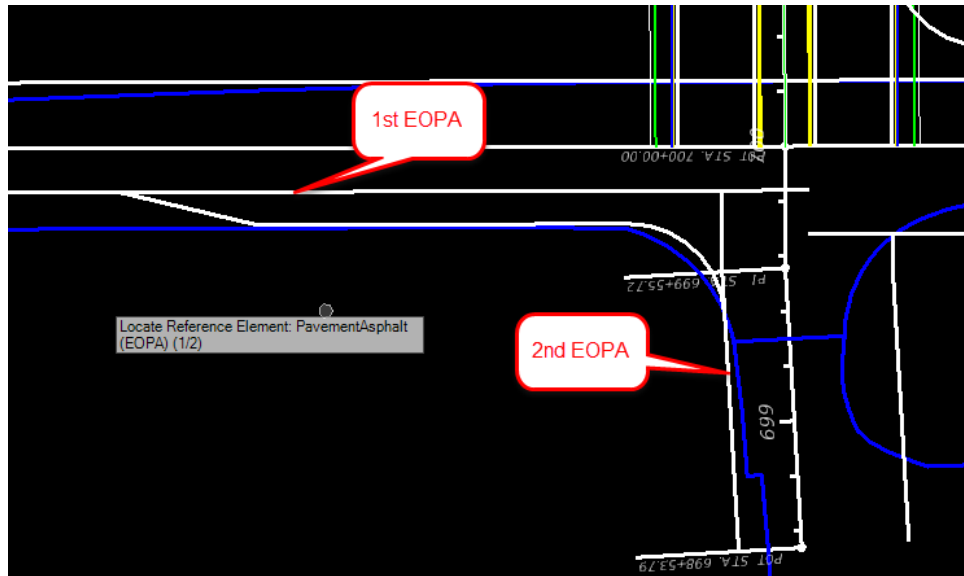
- If necessary, Let the tool place the line on the opposite side and edit it after it is placed.



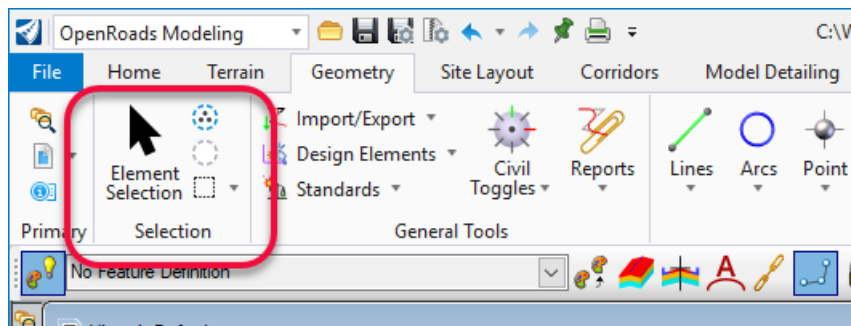
5. Add another **Right Turn Lane Civil Cell** on the opposite side of the intersection.



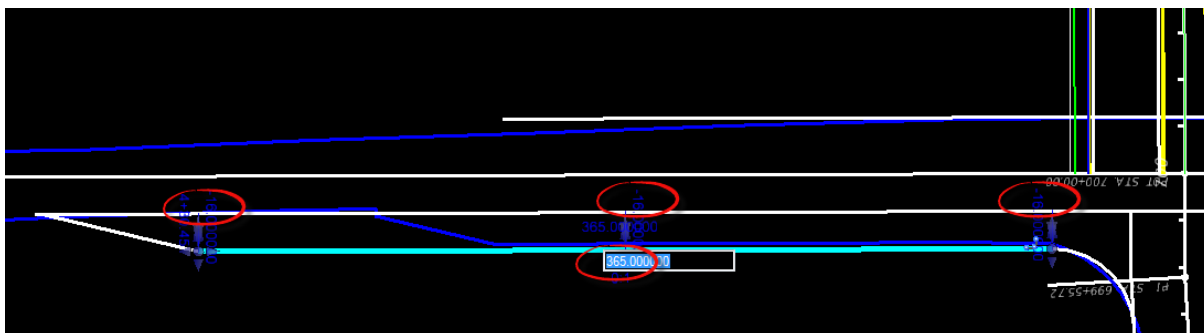
- a. At the prompt, for the first *Reference*, select the **widening Pavement Asphalt EOPA** line.
- b. For the second *Reference*, select the **intersection Pavement Asphalt EOPA** line.



- 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.

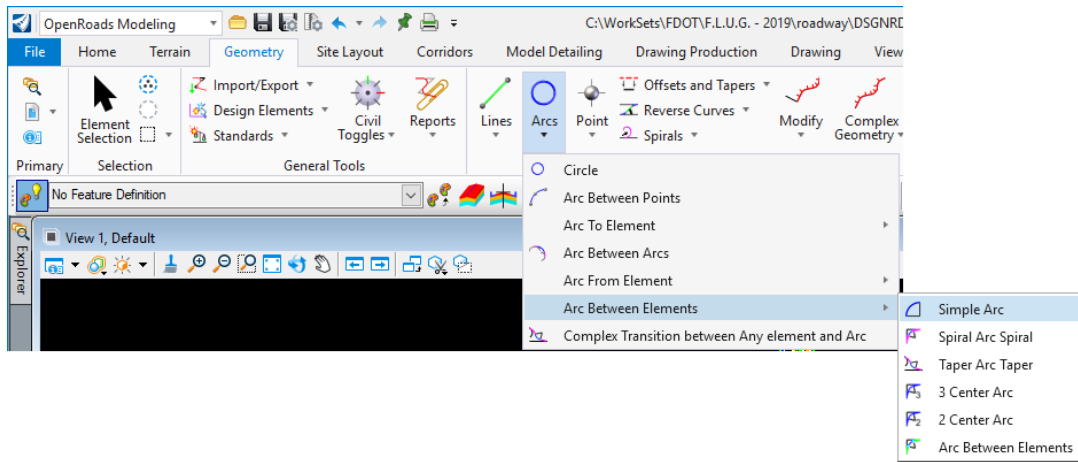


7. Edit the storage length for the second Right Turn Lane placed, select the tangent line and change the Length from 200 to 365 feet. Verify the Change the lane width is -16 feet.



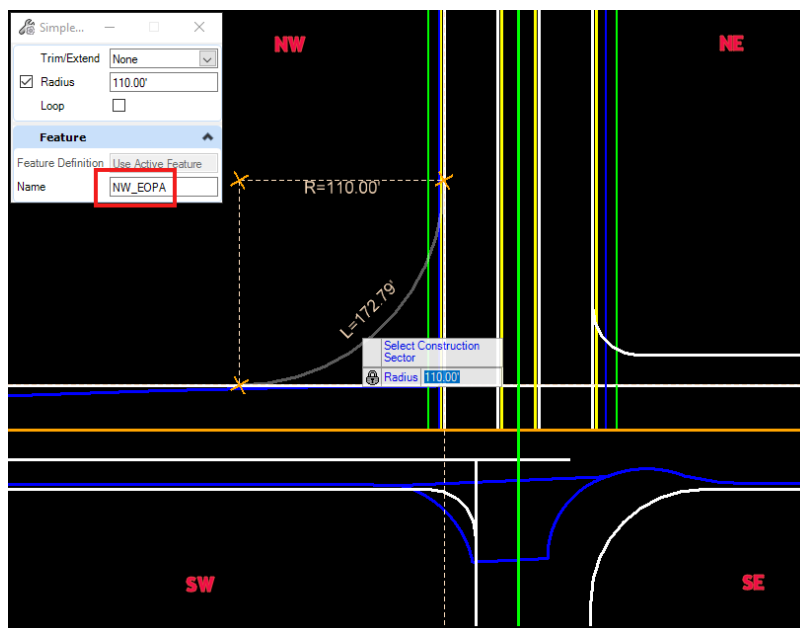
Exercise 2.8 Create/Edit the Intersection Curve Radii

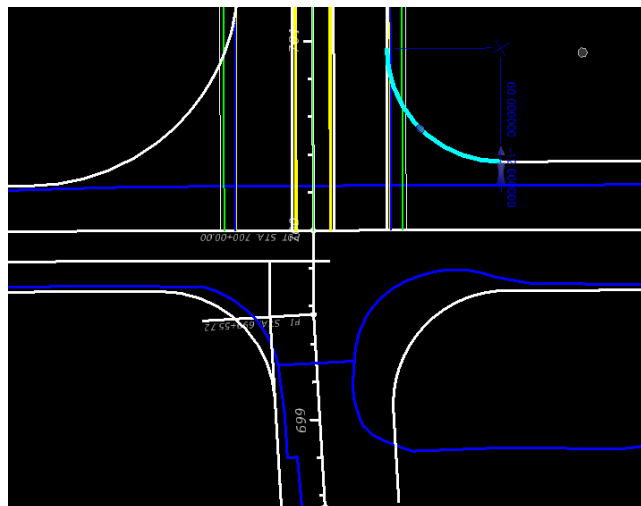
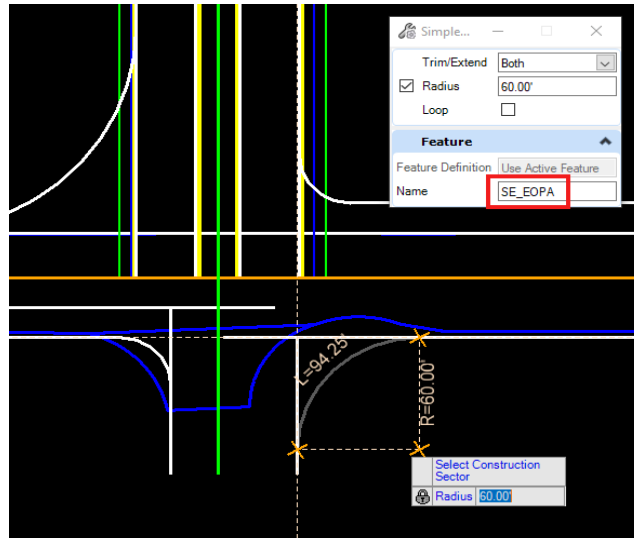
1. Use the *Geometry Tab and the Horizontal Group*, to select the **Simple Arc** tool located in the ARCS button then the drop down of Arc Between Elements.



2. Create/Edit the **Curve** returns.
3. Select *Feature Definition, Pavement Asphalt EOPA* to place remaining curve radii.
4. Follow the cursor prompt to select the two Roadway **Pavement Asphalt EOPA** *reference lines*.

- Rotating the view along the BL98 Baseline will set the Top of the screen as North giving a quadrant as shown below.
- Select the two Pavement Asphalt EOPA in each quadrant. Use the value shown and trim both for each of the following quadrants:
 - NorthWest 110 feet,
 - NorthEast 60 feet,
 - SouthWest 60 feet,
 - SouthEast 60 feet

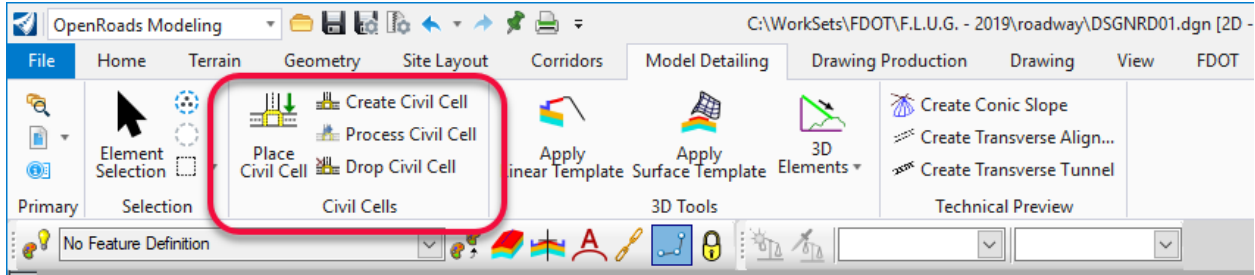




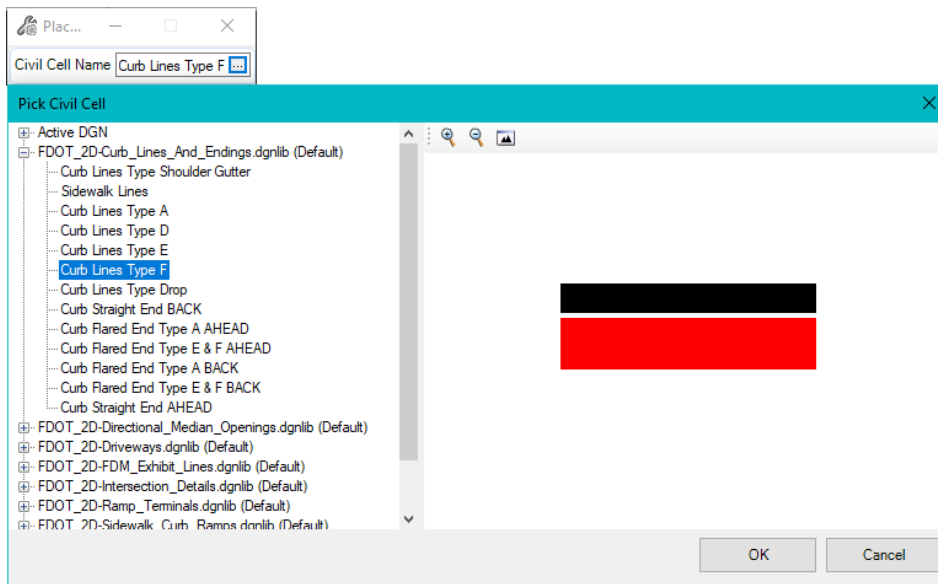
Exercise 2.9 Use Civil Cell Technology to Place Curb and Sidewalk Around the Radii

1. Use Model Detailing Tab and the Civil Cells Group, to select the **Place Civil Cell** tool.

OPENROADS MODELING>MODELING DETAILING>Place Civil Cell



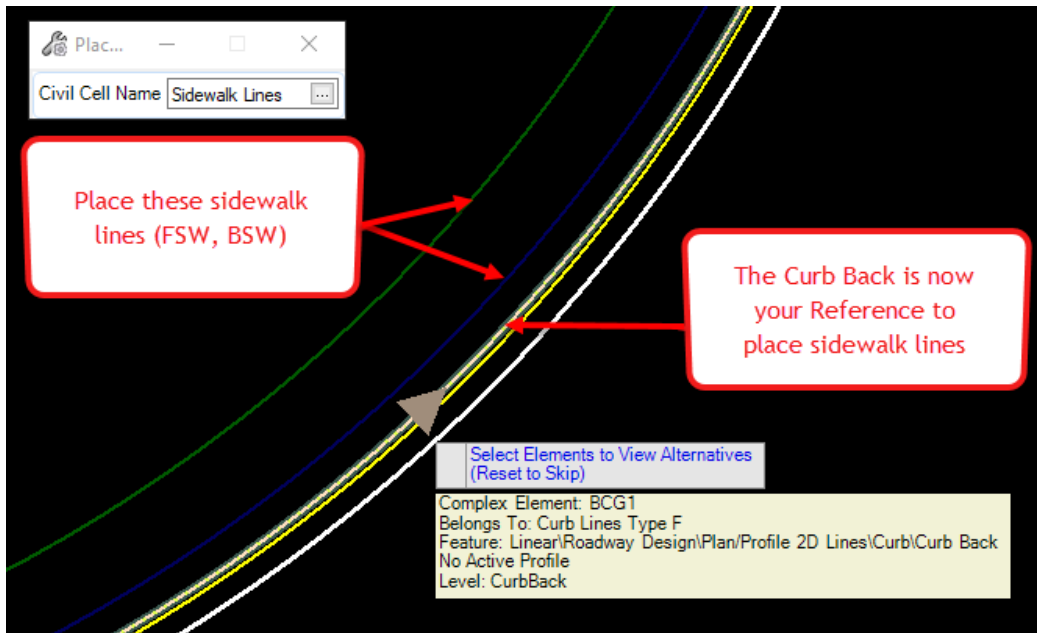
2. Navigate to the *FDOT_2D-Curb_Lines_And_Endings.dgnlib* and select the **Curb Lines Type F civil cell**.



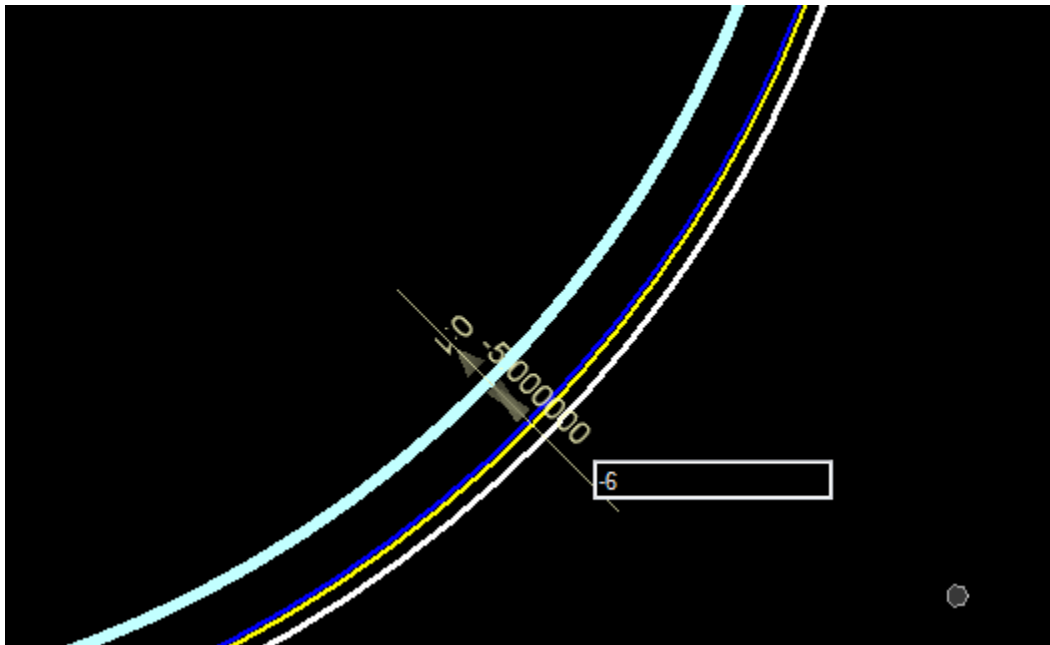
3. At the prompt, select the *NW_EOPA radius line*, reset to **View Alternates** and then data point to accept the **Civil Cell Placement**.



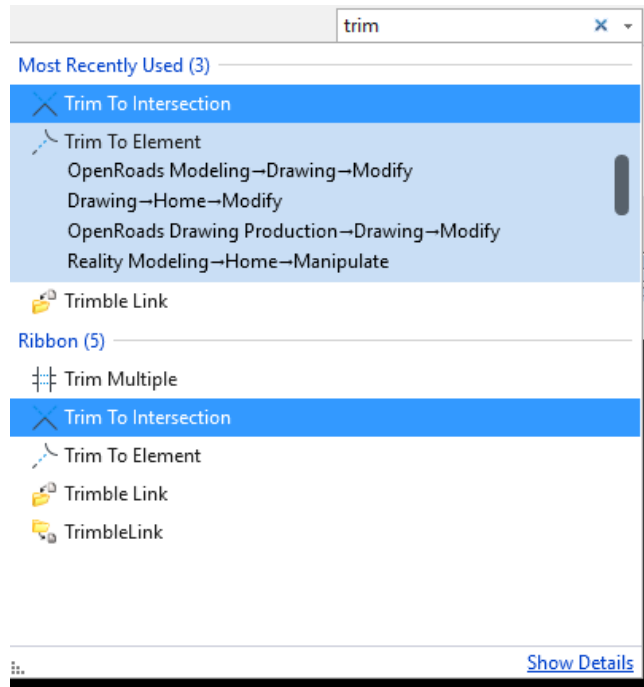
4. Navigate back to the Place Civil cell dialog select the SideWalk Civil cell from the *FDOT_2D-Curb_Lines_And_Endings.dgnlib*. Place this civil cell off the back of curb line that you just placed in the previous step.



5. Edit the *SidewalkBack* line from -5 to -6 feet from the **SidewalkFront** line of the element. Also, the *SidewalkFront* needs to be set from -4 to 0 feet.



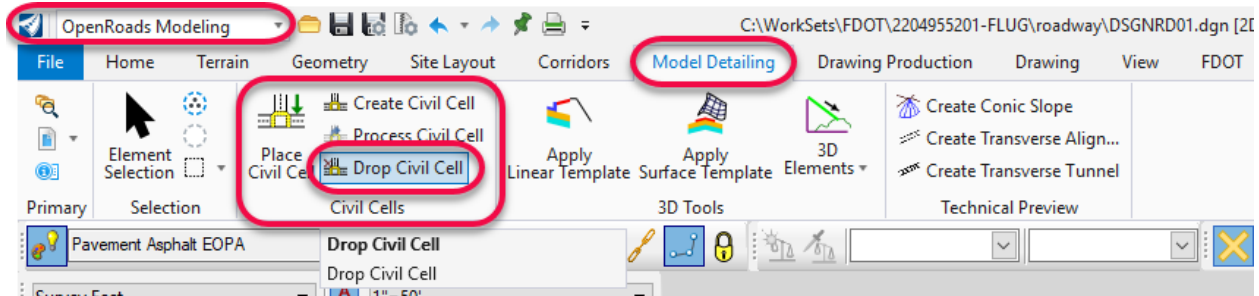
Use OpenRoads **Trim to Intersection** tool. A quick way to find a tool is to use the search ribbon.



Exercise 2.10 Create a Custom Civil Cell for Other Radii

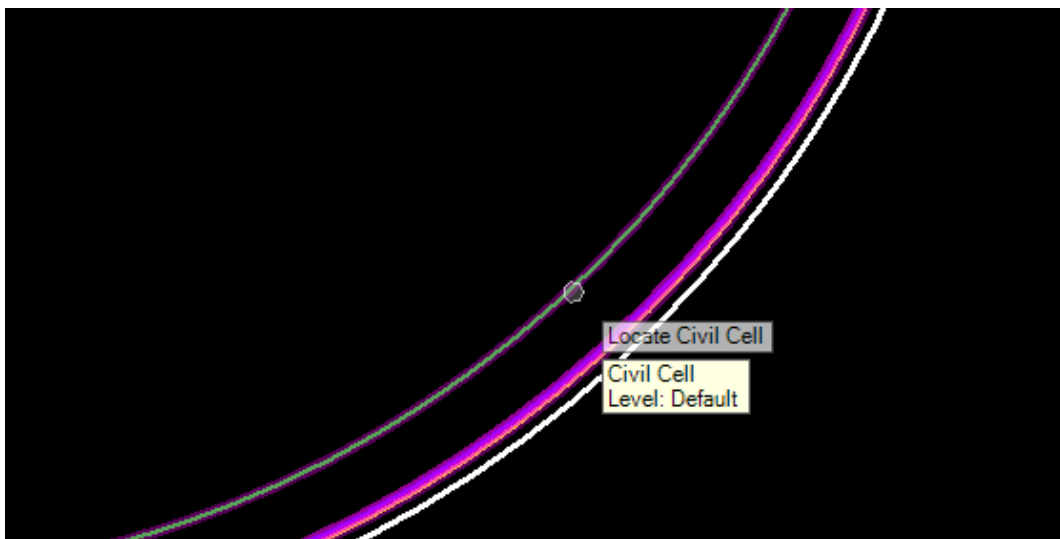
1. From the Model Detailing Tab and the Civil Cells Group, select the **Drop Civil Cell** tool.

OPENROADS MODELING>MODEL DETAILING>CIVIL CELLS>Drop Civil Cell



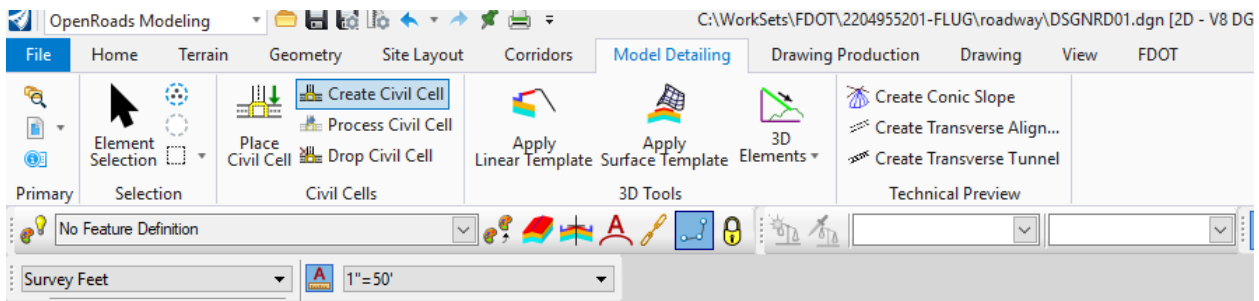
2. Select the SidewalkLines *Civil Cell* in the View and data point to drop the Civil Cell. Repeat this for the Curb Civil Cell.

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

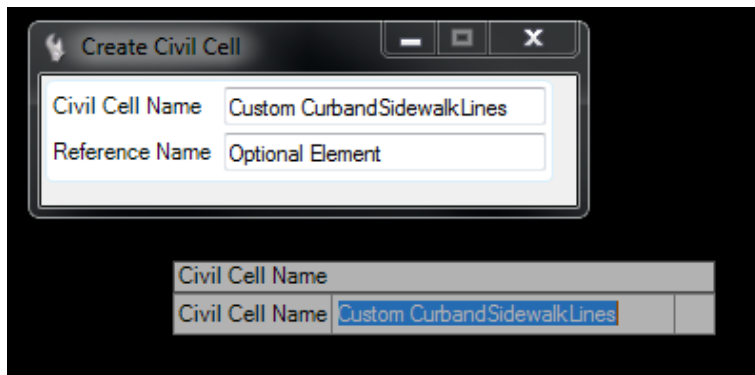


3. Use *Civil Cells*, **Create Civil Cell** tool. This can be found in the Model Detailing Tab and the Civil Cells Group of the Ribbon.

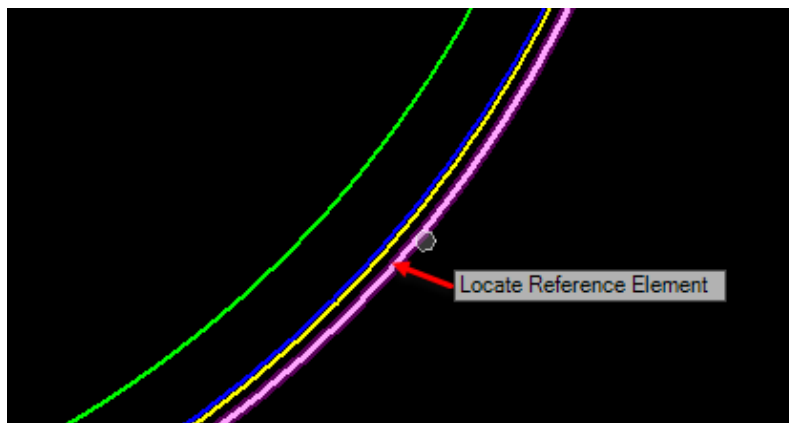
OPENROADS MODELING>MODEL DETAILING>CIVIL CELLS>Create Civil Cell



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

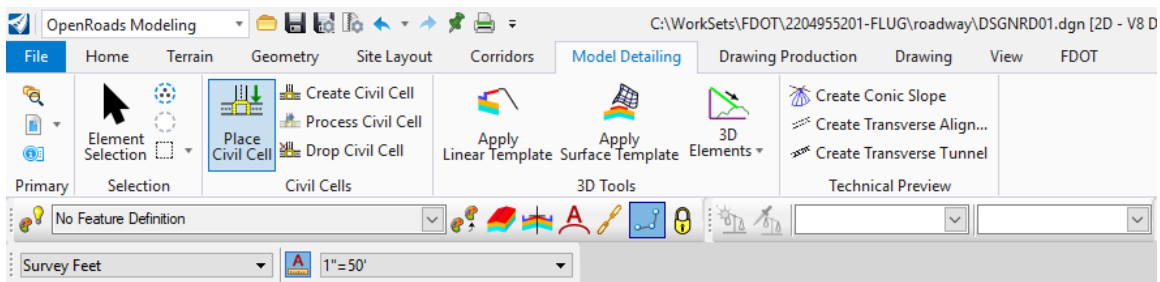


- b. Data point to accept the new *Name*.
- c. At the prompt, locate *Reference Element* and select the NW_EOPA line.

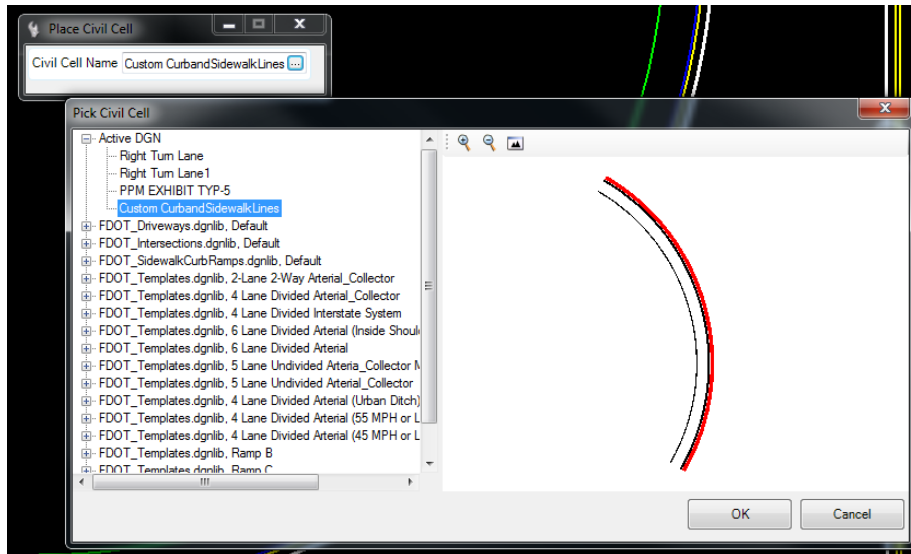


- d. Reset to Locate Reference Element.
 - e. Reset to Optional Reference.
 - f. Data Point to accept **Civil Cell**.
4. Use the new *Civil Cell* to place for the other *Radii*; use *Place Civil Cell*. This can be found in the Model Detailing Tab and the Civil Cells Group of the Ribbon.

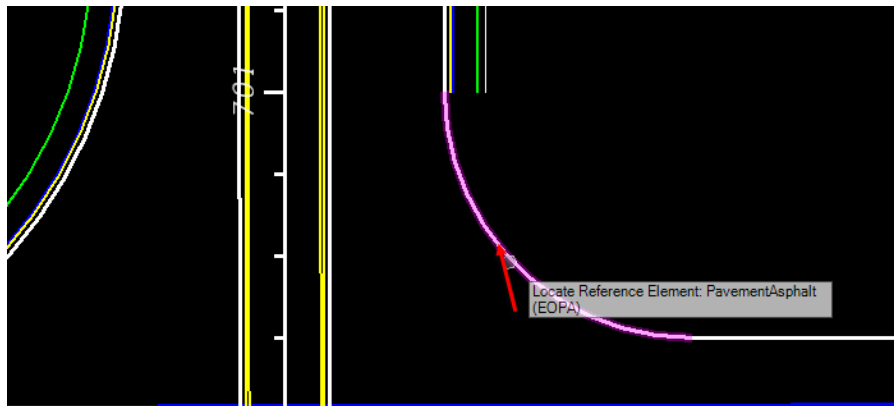
OPENROADS MODELING>MODEL DETAILING>CIVIL CELLS>Place Civil Cell.



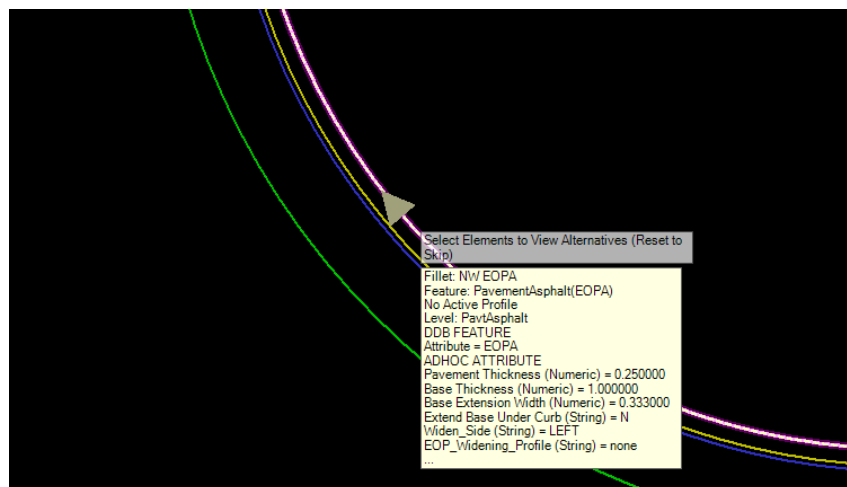
- a. If the **Custom CurbandSidewalkLines** is not active, navigate to the *Active DGN* and select it from the list. Click **OK**.



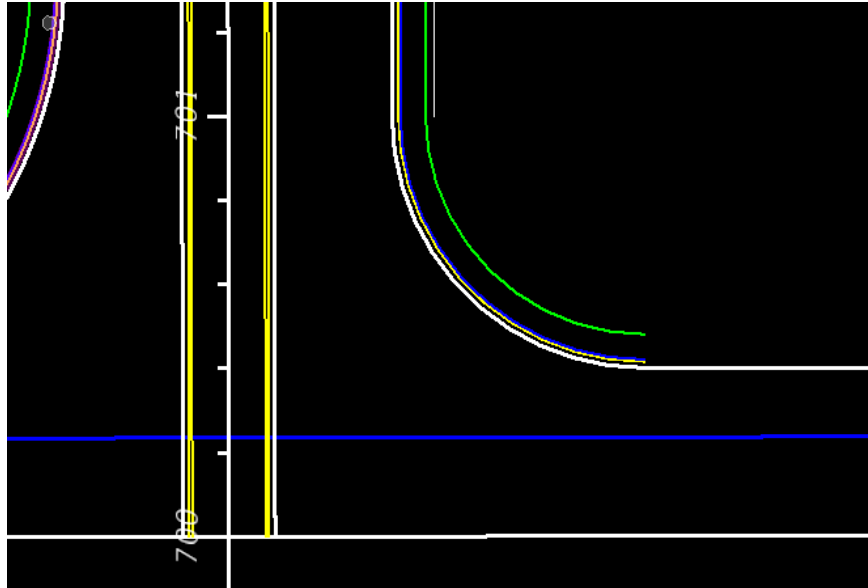
- b. At the prompt, select the **NE_EOPA Radius line**.



- c. At the prompt, select **Element to View Alternatives**, move the cursor over the *EOPA 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**.

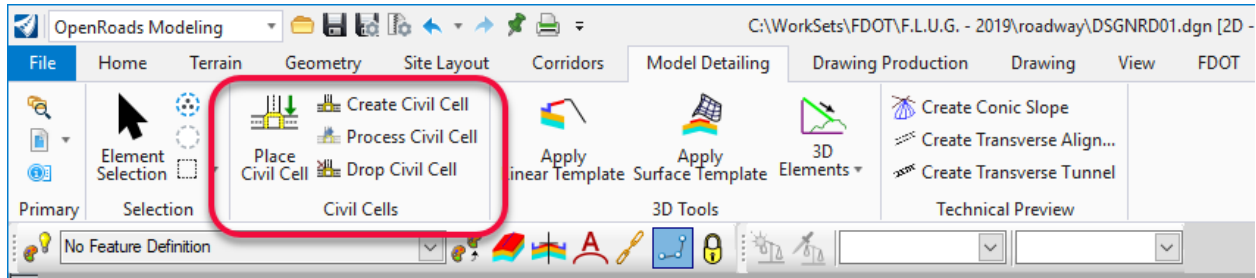


- 6. Leave the **SE Radius** without curb and sidewalk.

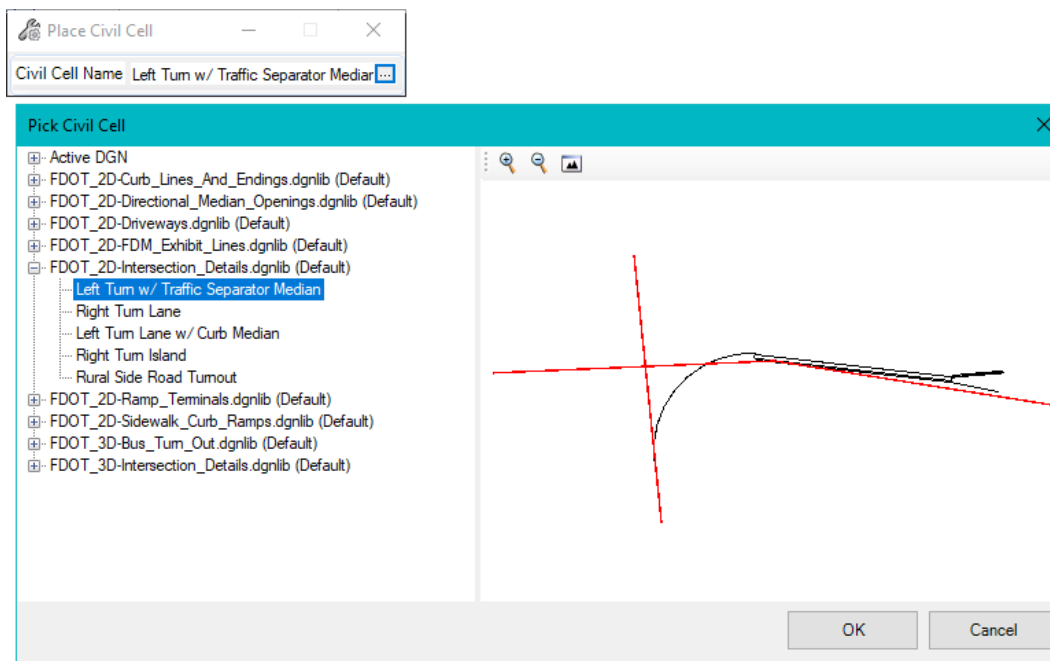
Exercise 2.11 Place Left Turn with Traffic Separator

1. Use Model Detailing Tab and the Civil Cells Group, to select the **Place Civil Cell** tool.
NOTE: After the placement of any Civil Cell be sure to verify the Feature Definition on elements in order to add as a Corridor Reference.

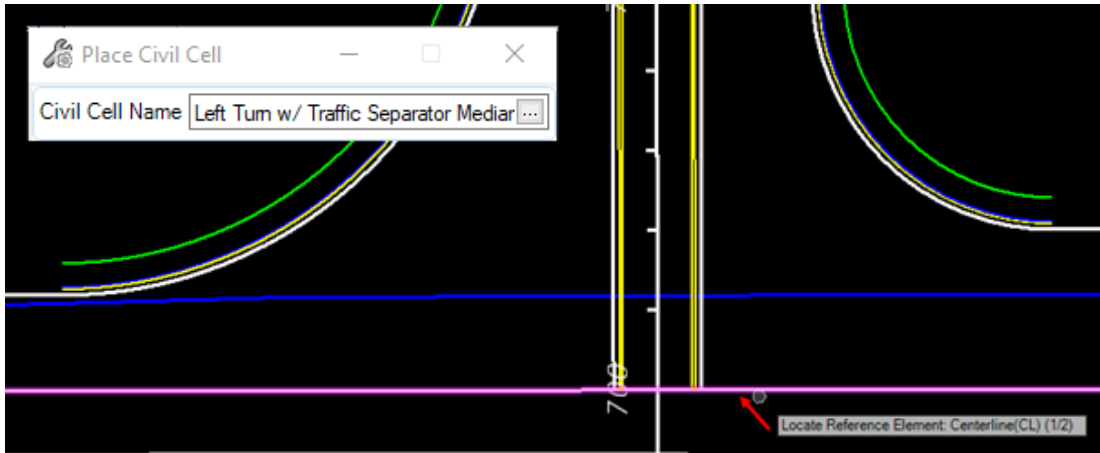
OPENROADS MODELING>MODEL DETAILING>CIVIL CELLS>Place Civil Cell



- a. Navigate to the *FDOT_Intersections.dgnlib* and select **Left Turn with TS civil cell**.

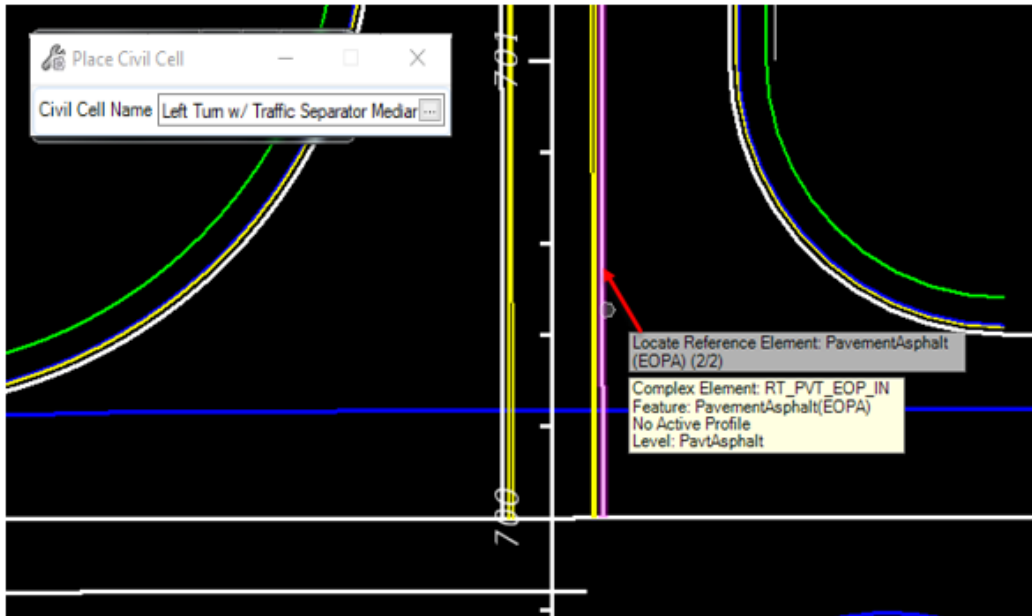


- b. At the *Locate Reference Element Centerline*, select the **BL98** line in the View.

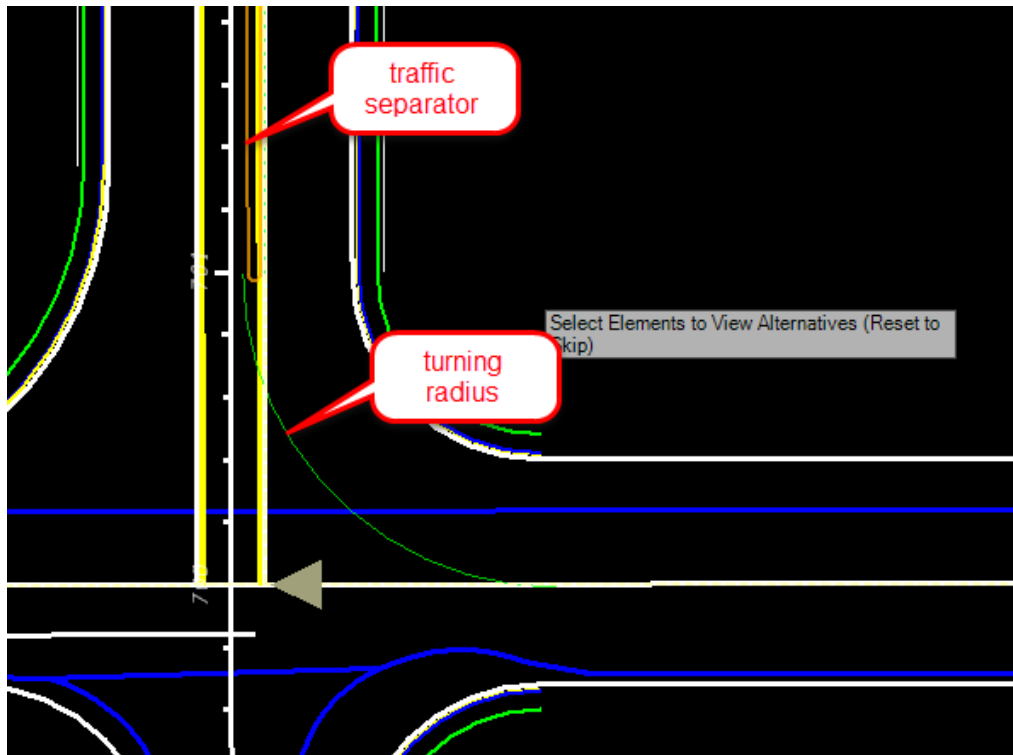


- c. At the *Locate Reference Element Pavement Asphalt EOPA*, select the **RT_PVT_EOP_IN** line in the View.

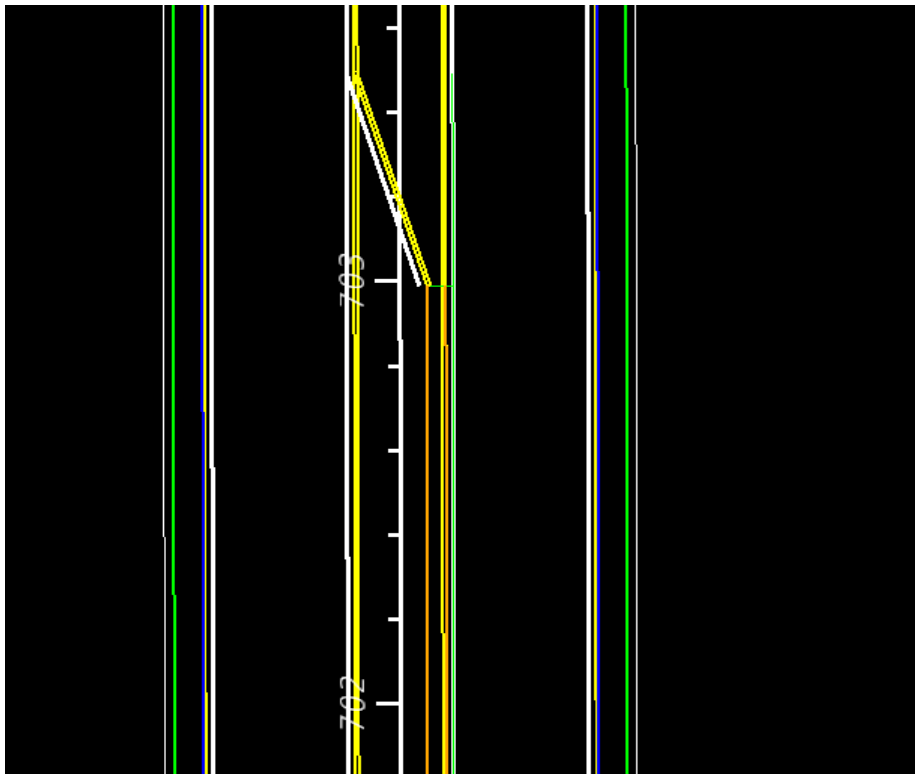
NOTE: For the direction of travel I, this is always the left median EOP line.



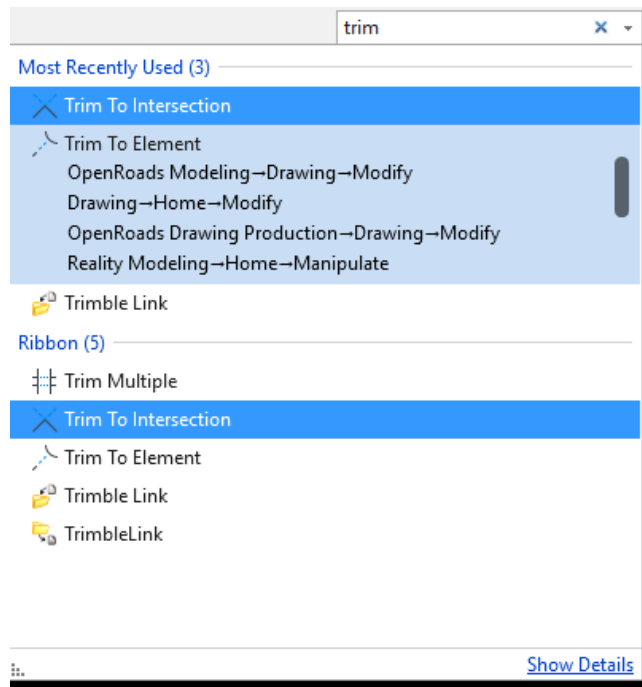
- d. Click on the **Arrow** of both *Reference Elements* to **View Alternates**, when the *Green Turning Radius* and *Traffic Separator* are both in the correct place, **Reset** to skip.



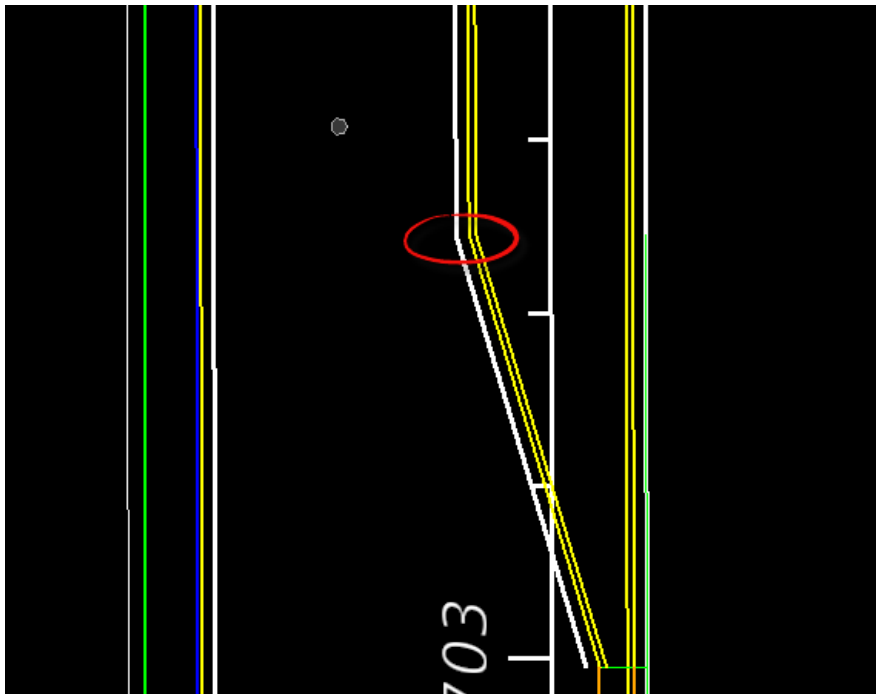
- e. Data point to accept the **Civil Cell Placement** and view the left turn lane on **SR61** at **BL98 Intersection**.



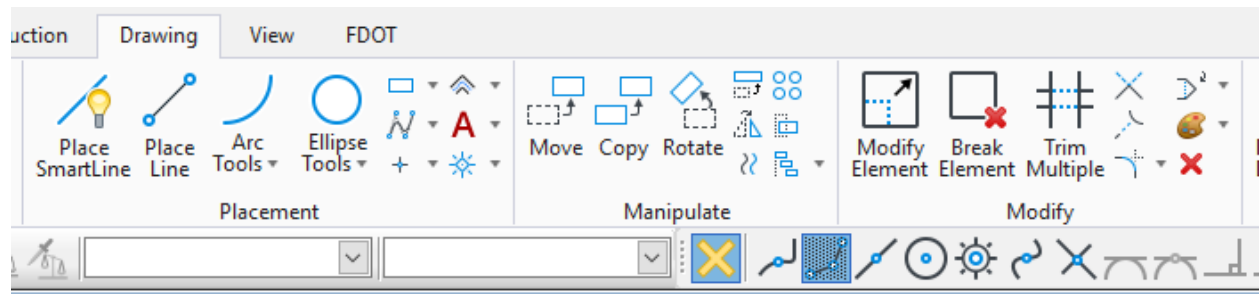
2. Use OpenRoads **Trim to Intersection** tool. A quick way to find a tool is to use the search ribbon.



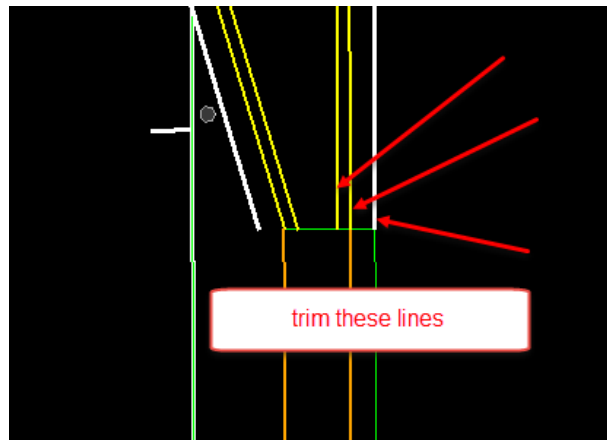
- Trim the *curb median elements* at the **begin taper** as shown.



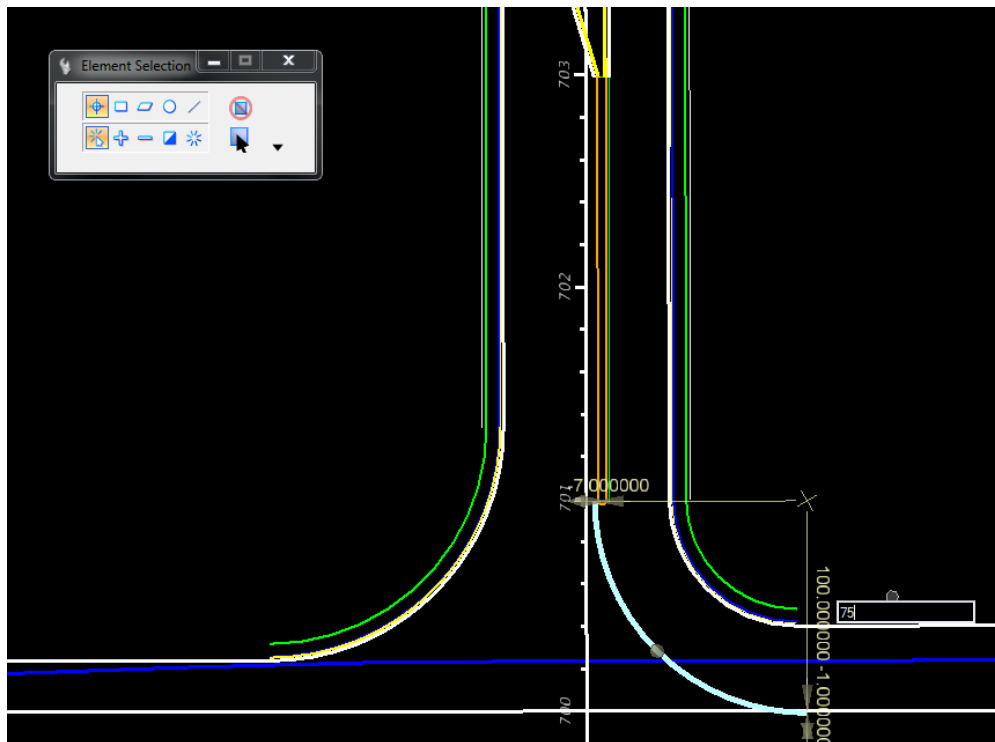
- Use OpenRoads **Trim to Element** tool. Which can found in the Drawing Tab, and the Modify Group



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

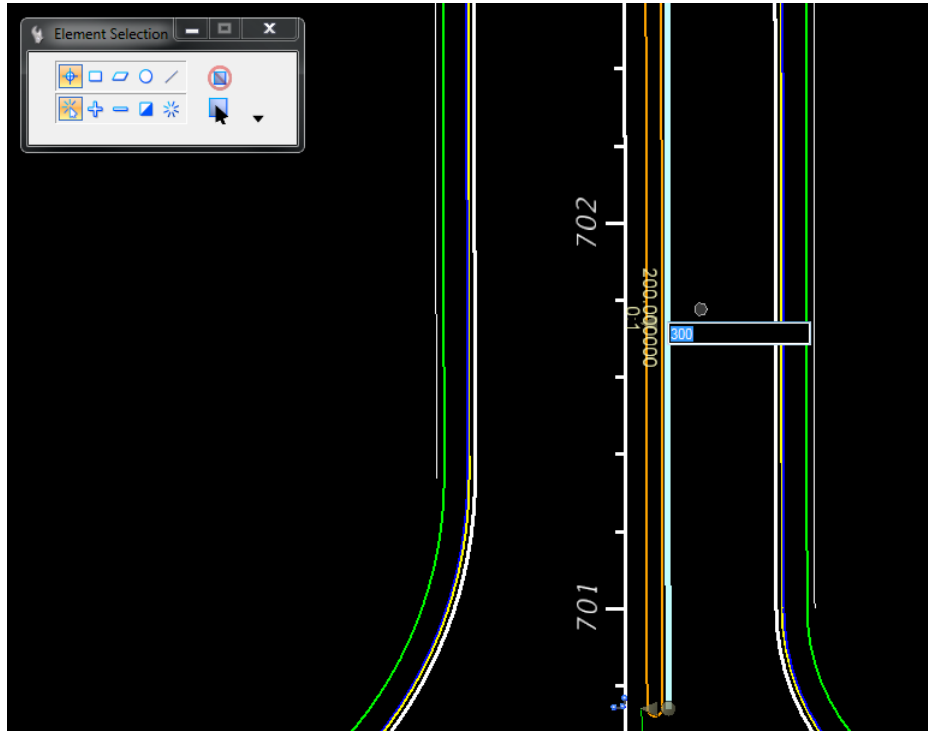


- View the placed left turn, change the *Turning Radius* from **100 feet** to **75 feet**.

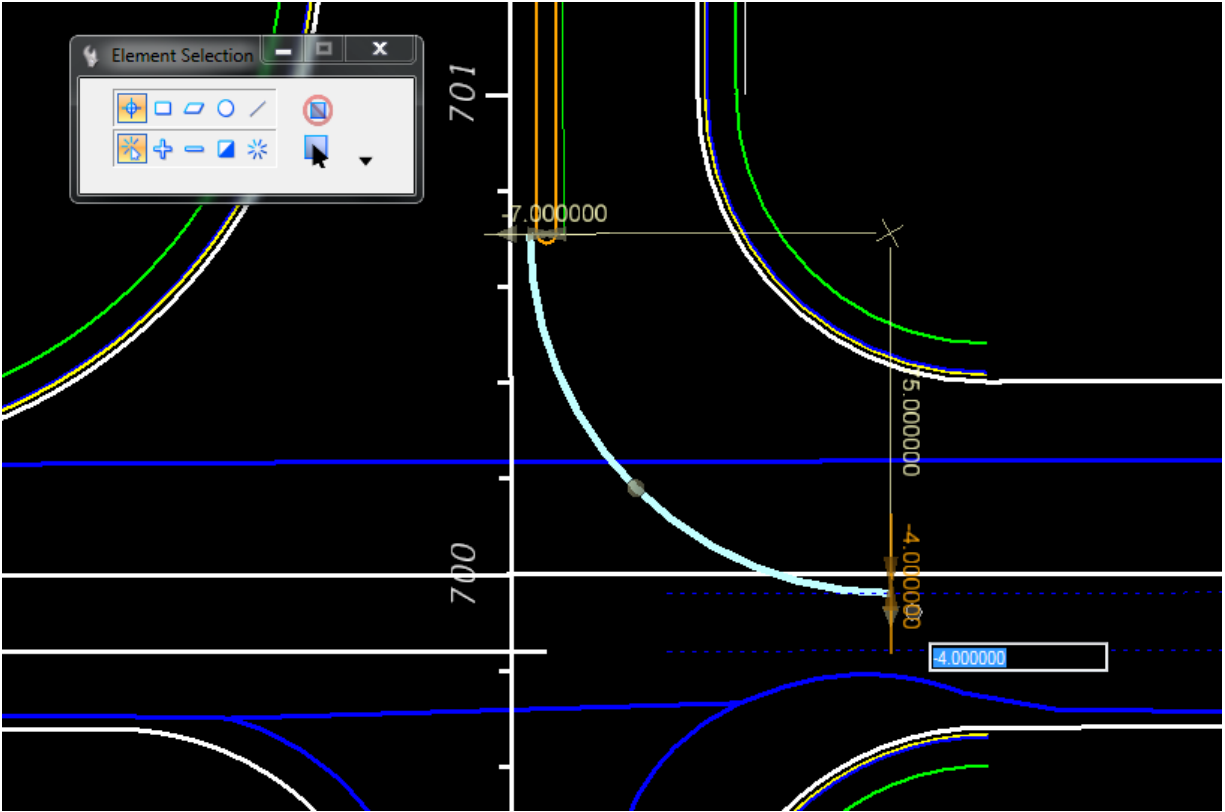


- View the placed left turn, change the *Storage Length* from **200 feet** to **300 feet**.

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



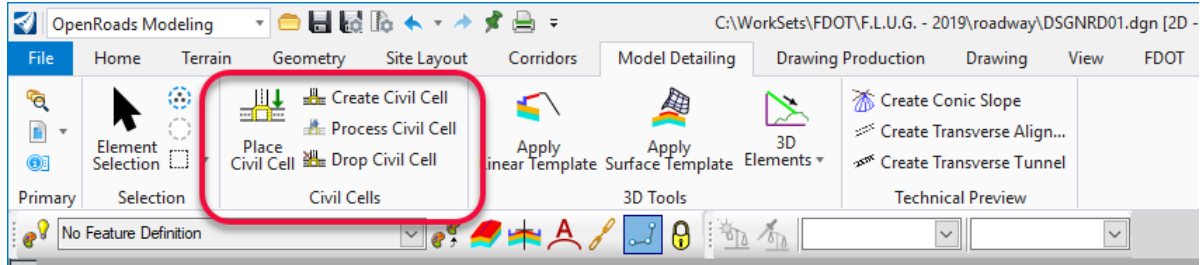
8. Zoom to the *Turning Radius Offset Dimension*, change the *value* from -1 **feet** to -4 **feet**.



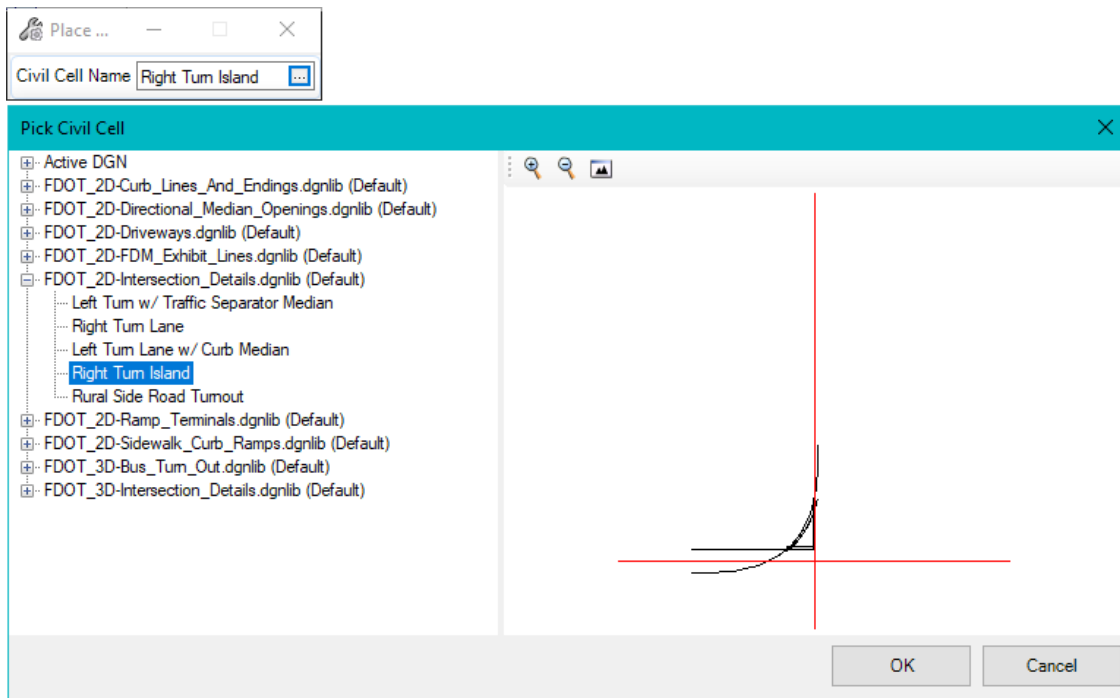
Exercise 2.12 Place Right Turn Island

1. Use Model Detailing Tab and the Civil Cells Group, to select the **Place Civil Cell** tool.

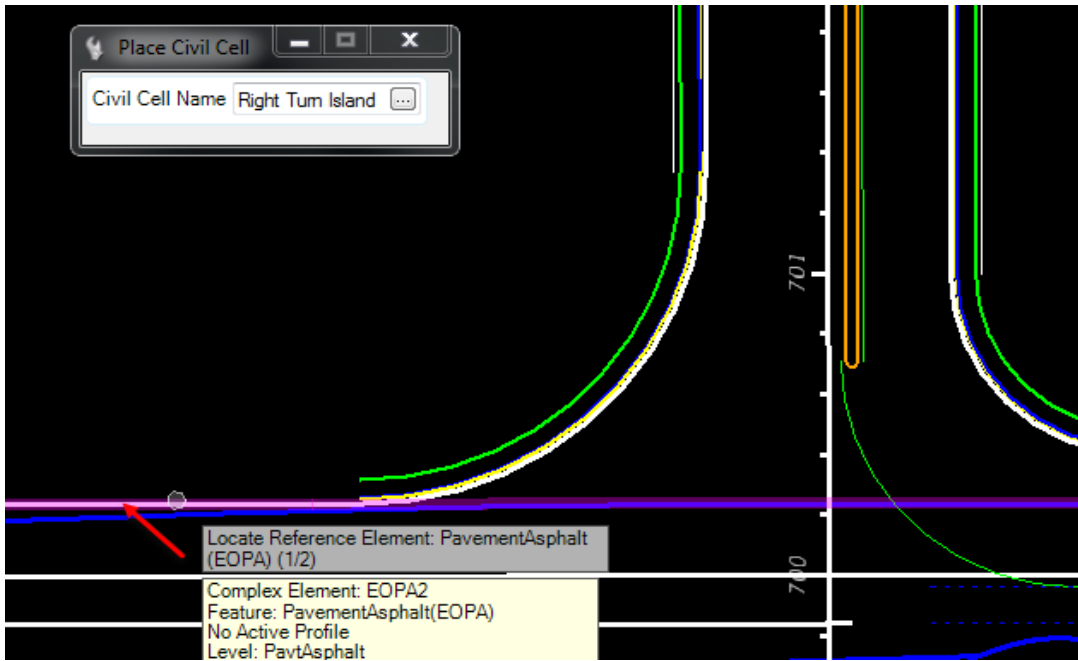
OPENROADS MODELING>MODEL DETAILING>CIVIL CELLS>Place Civil Cell



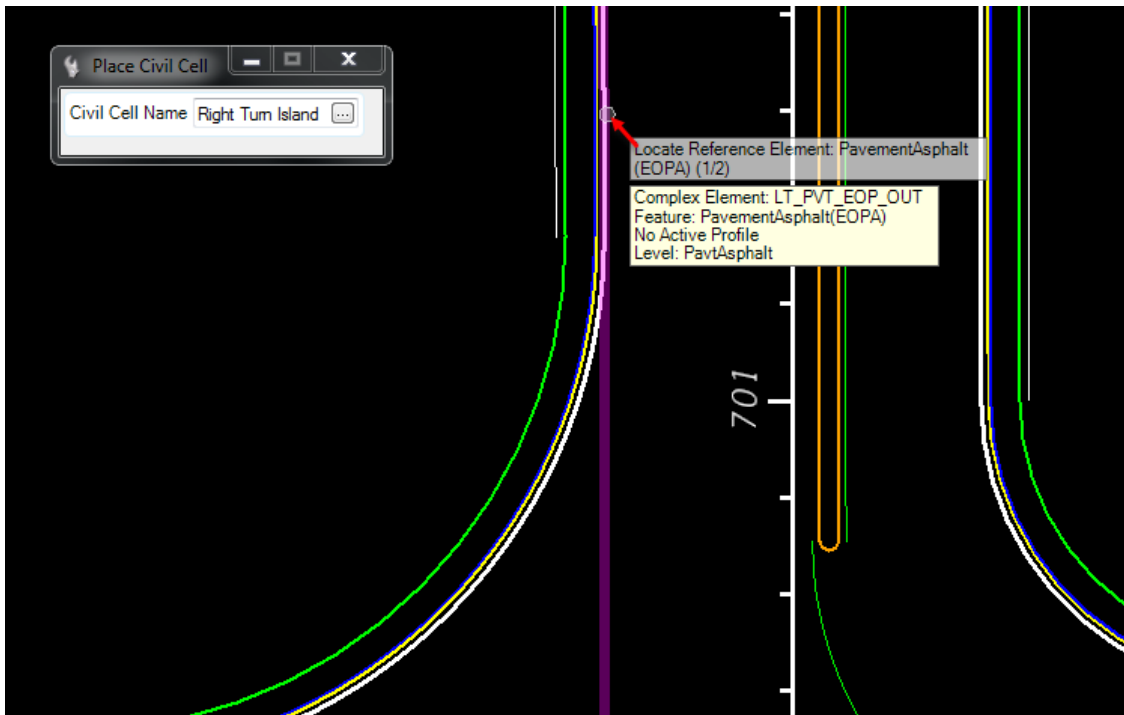
2. Navigate to the *FDOT_2D-Intersection_Details.dgnlib*, select **Right Turn Island**. Click **OK**.



3. Select the first **Pavement Asphalt EOPA** lines.

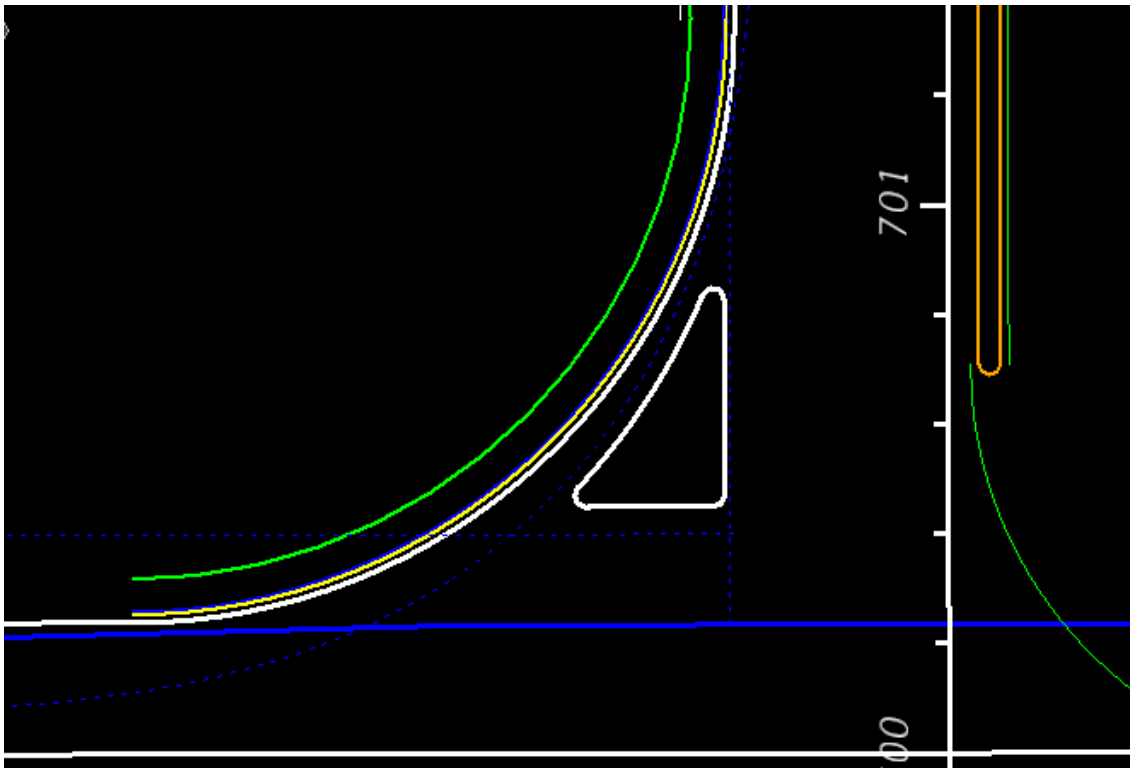


4. Select the second **Pavement Asphalt EOPA** line.



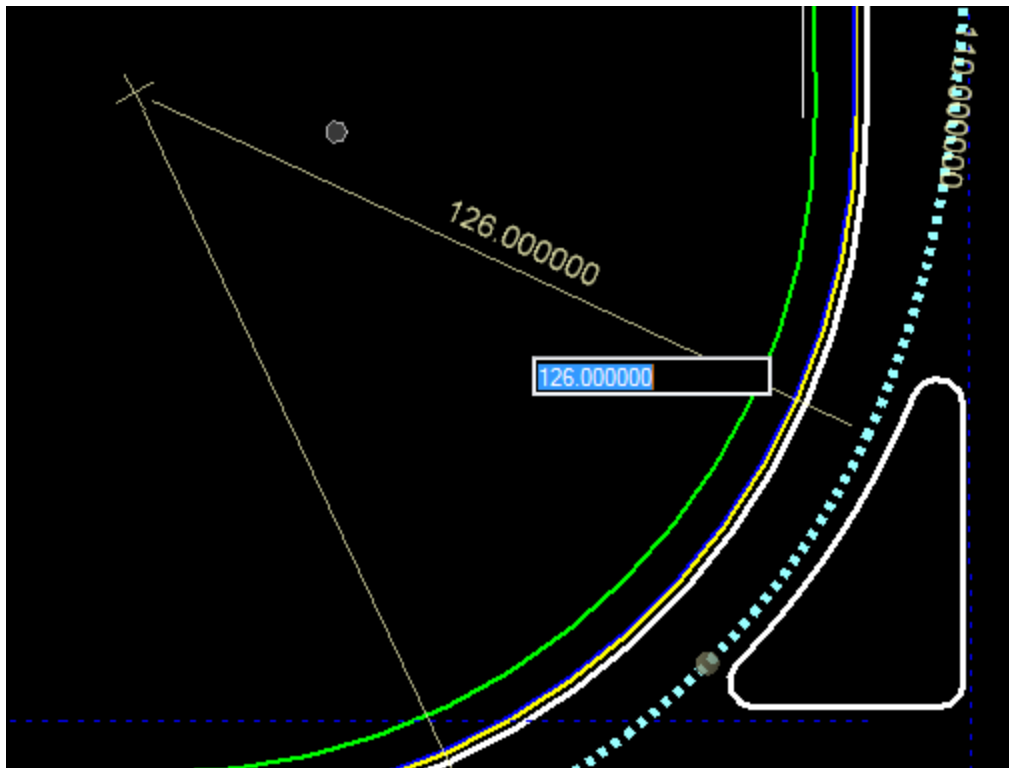
5. Reset to Skip Alternates.

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

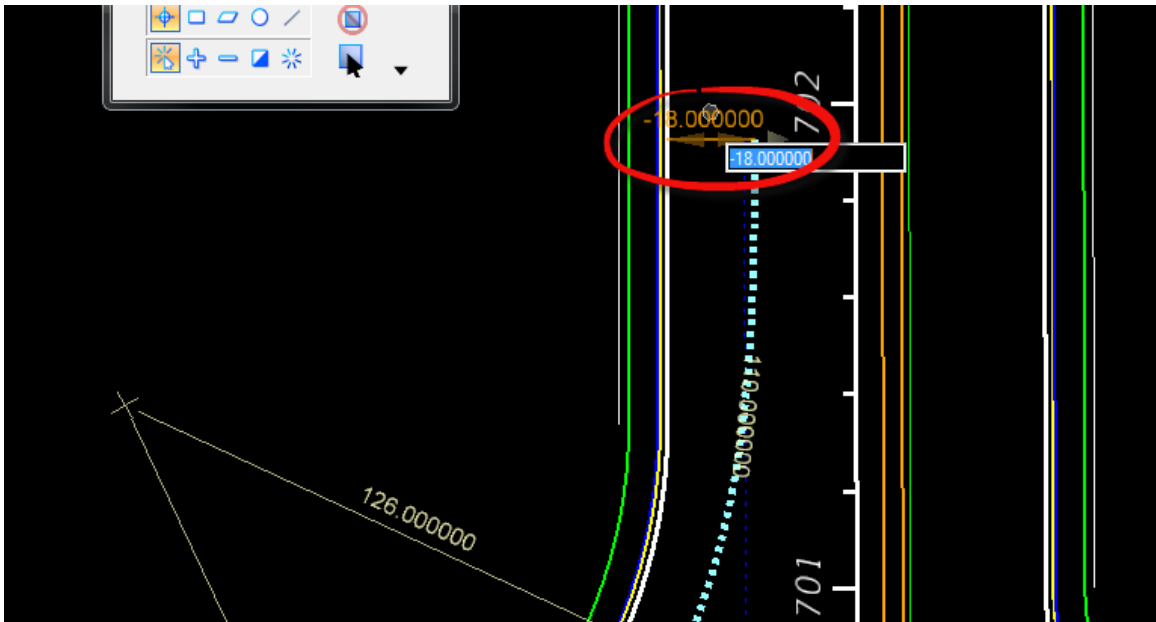


➤ **Change the Right Turn Island Parameters**

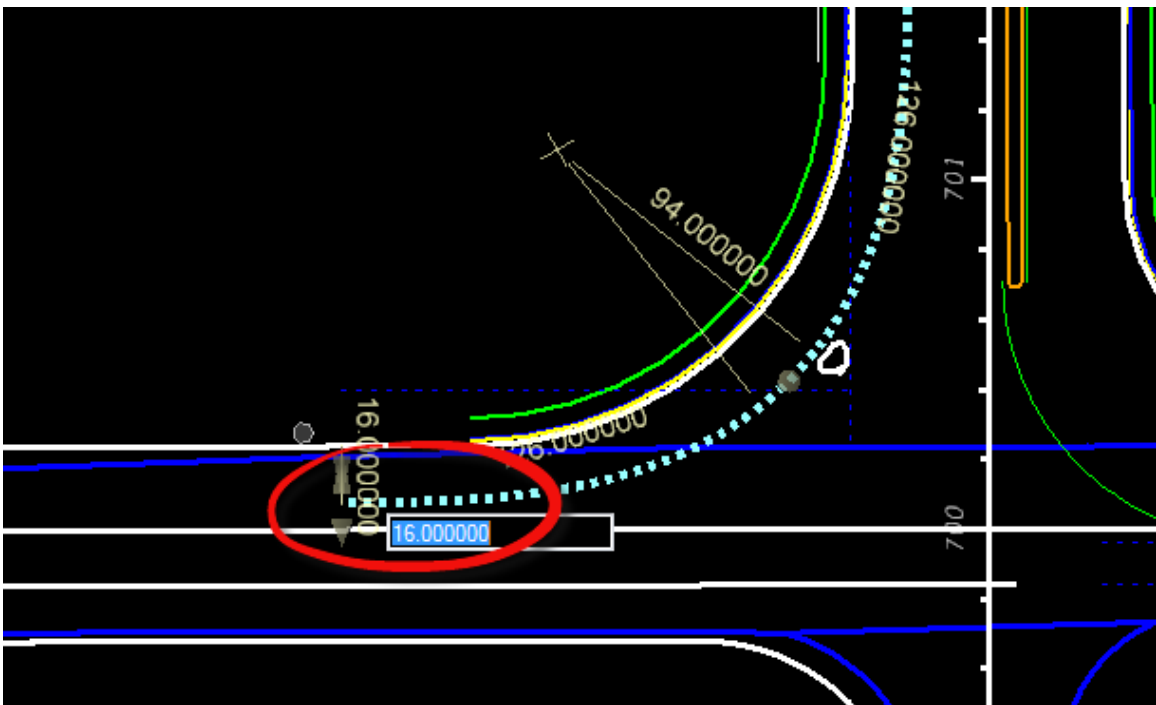
1. Change *Const Lines Blue Dashed Arc Radius* from **110 feet** to **126 feet**.



2. Check Const Lines Blue Dashed Begin Arc Offset is **-18 feet**.



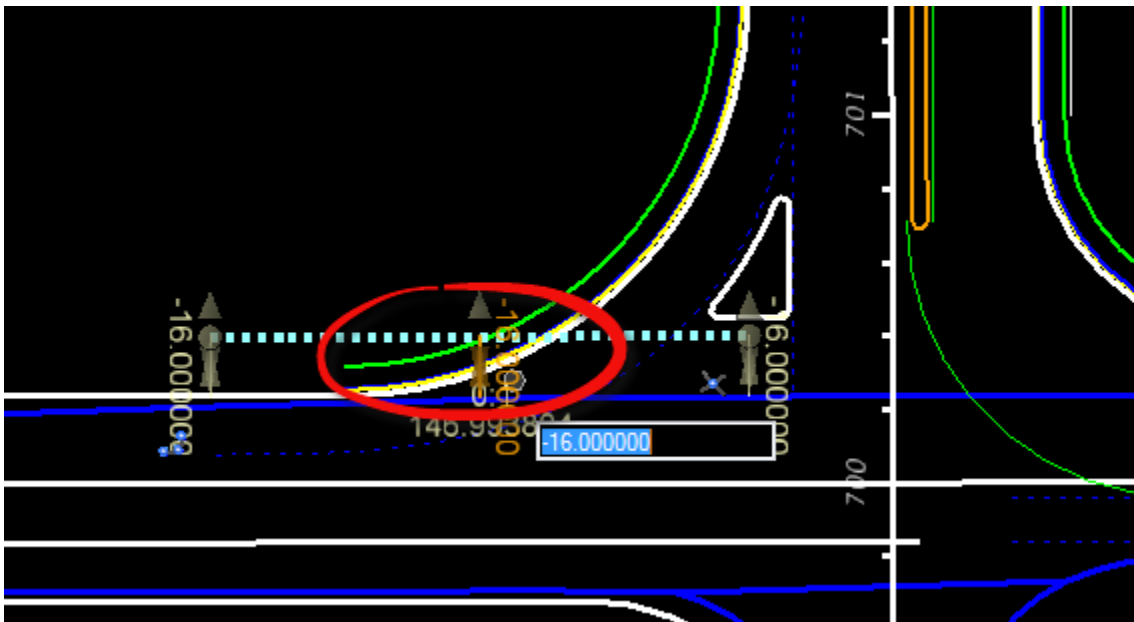
3. Check Const Lines Blue Dashed End Arc Offset is **-16 feet**.



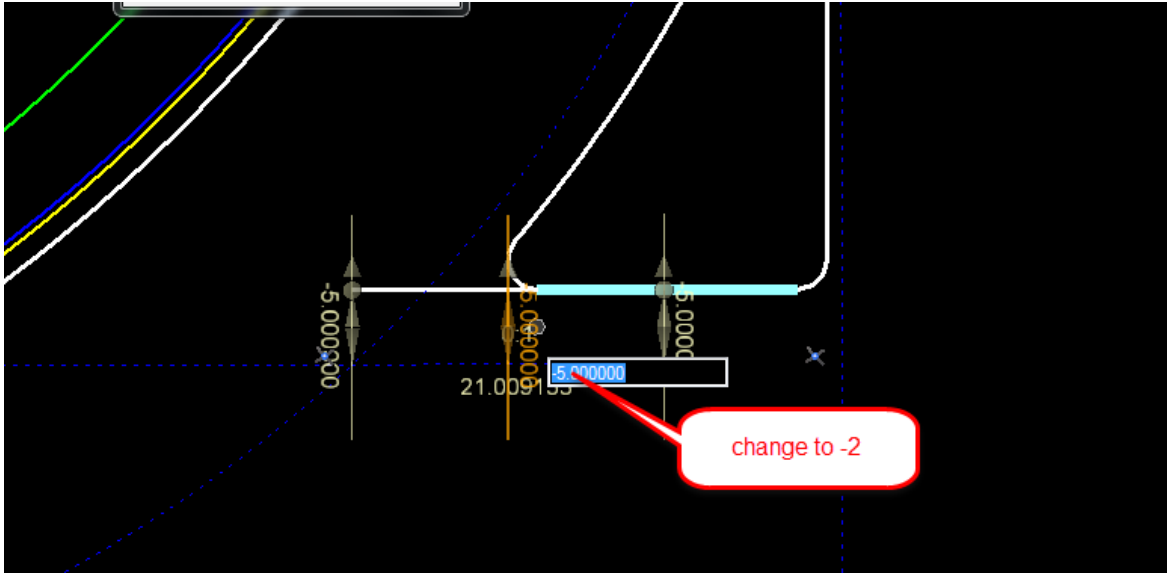
- 4. Change the straight *Const Lines Blue Dashed SR61 EOP Offset* from **1 foot** to **-16 feet**.



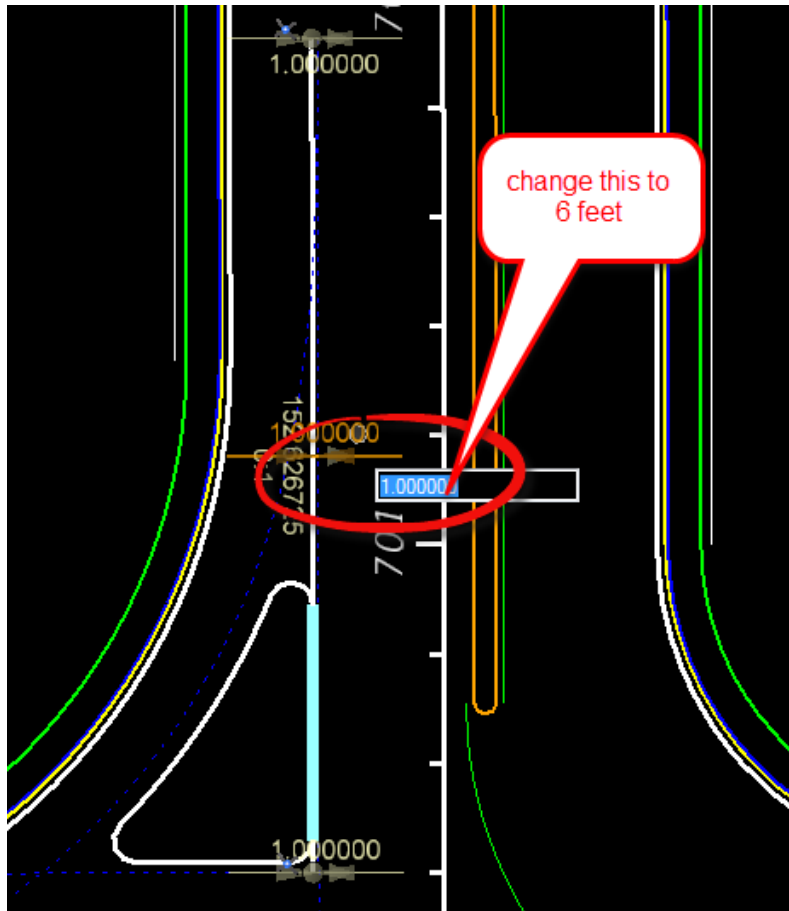
- 5. Check *Const Lines Blue Dashed BL98 EOP Offset* is **-16 feet**.



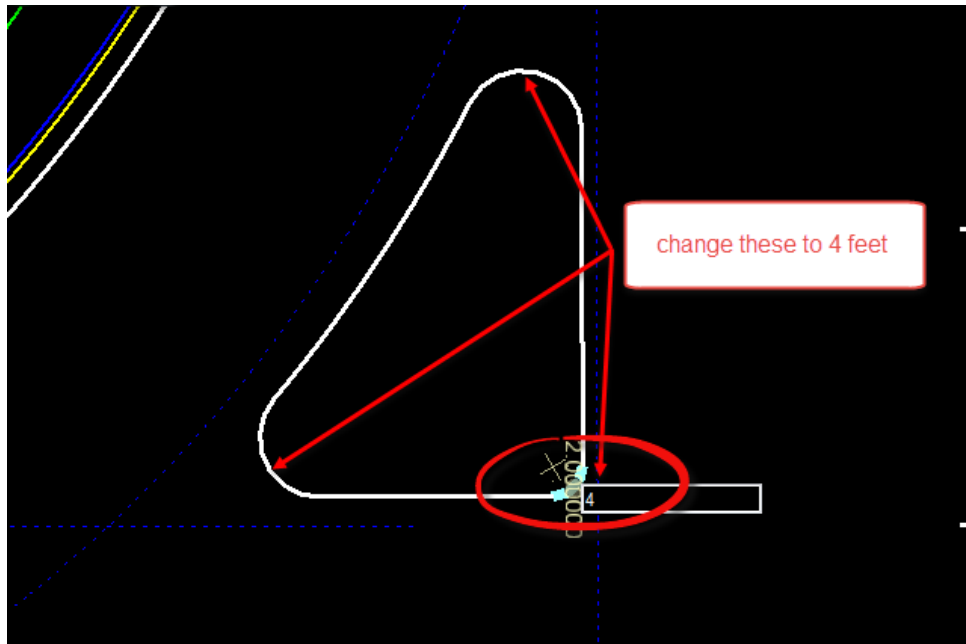
- 6. Change *Island EOPA Offset* from the Const Lines Blue Dashed BL98 from **-5 feet** to **-2 feet**.



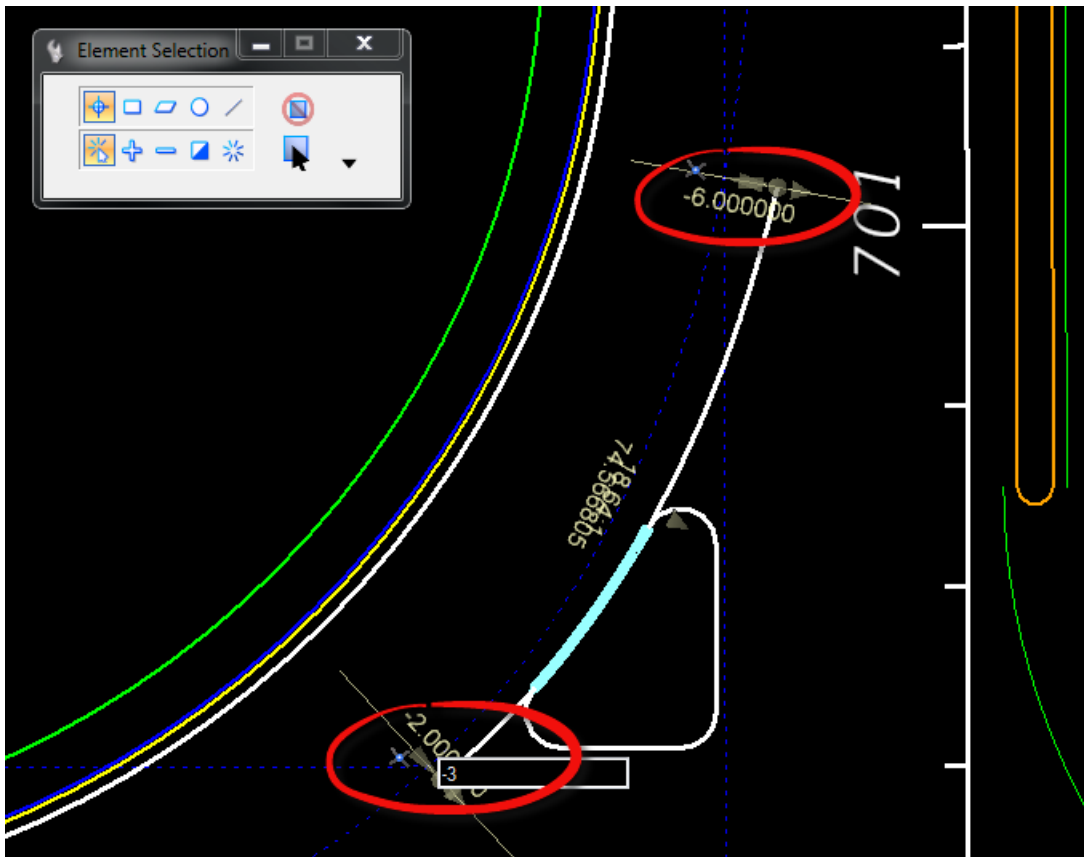
- 7. Change *Island EOPA Offset* from the Const Lines Blue Dashed SR61 from **1 foot** to **6 feet**.



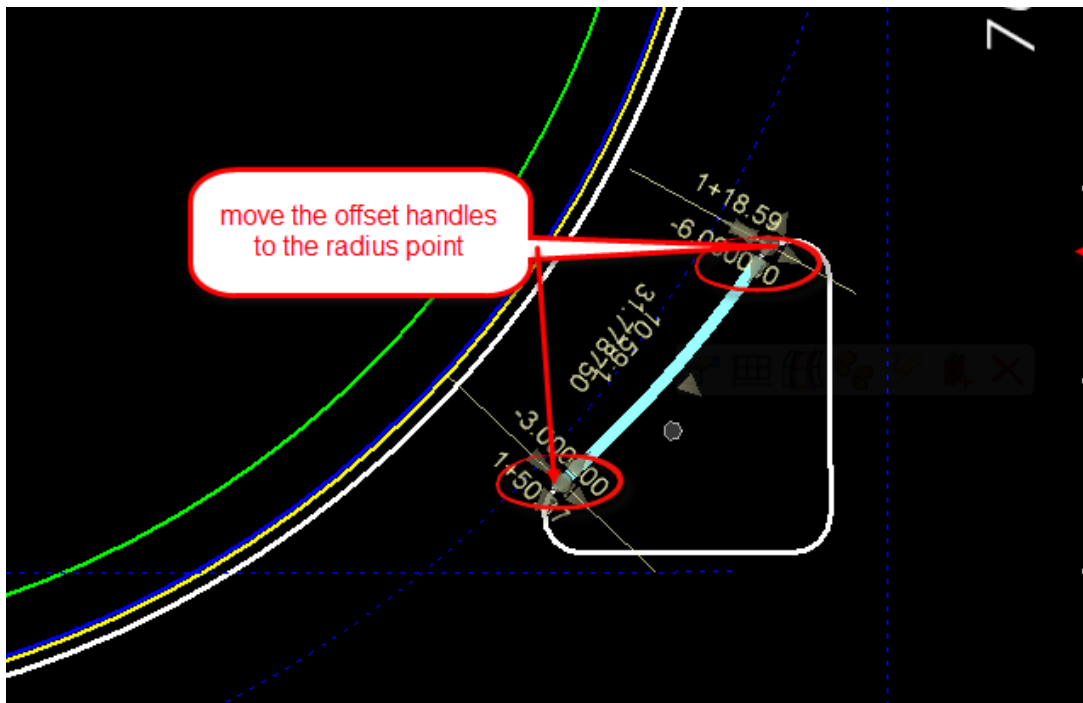
- 8. Change *Island Radii* to **4 feet**.



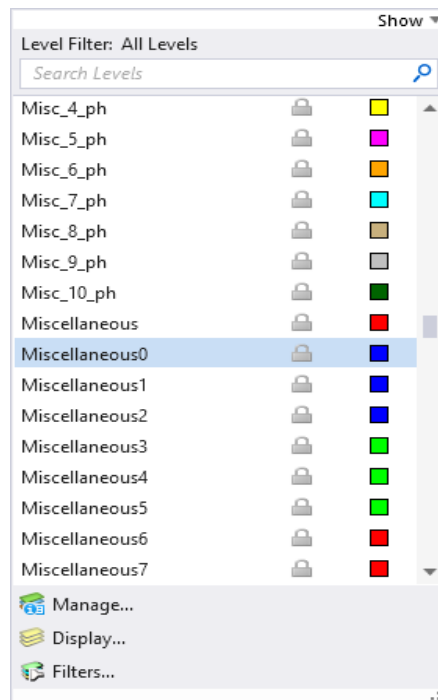
- 9. Change the Island ingress Offset **-4 feet** and Island Egress Offset **-3 feet**.



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



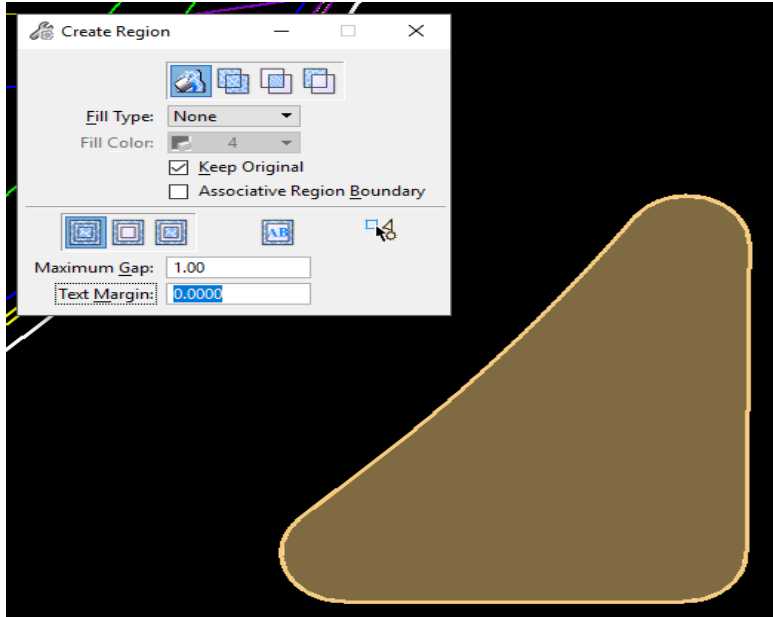
11. Change the *Active Level* to **Miscellaneous0**.



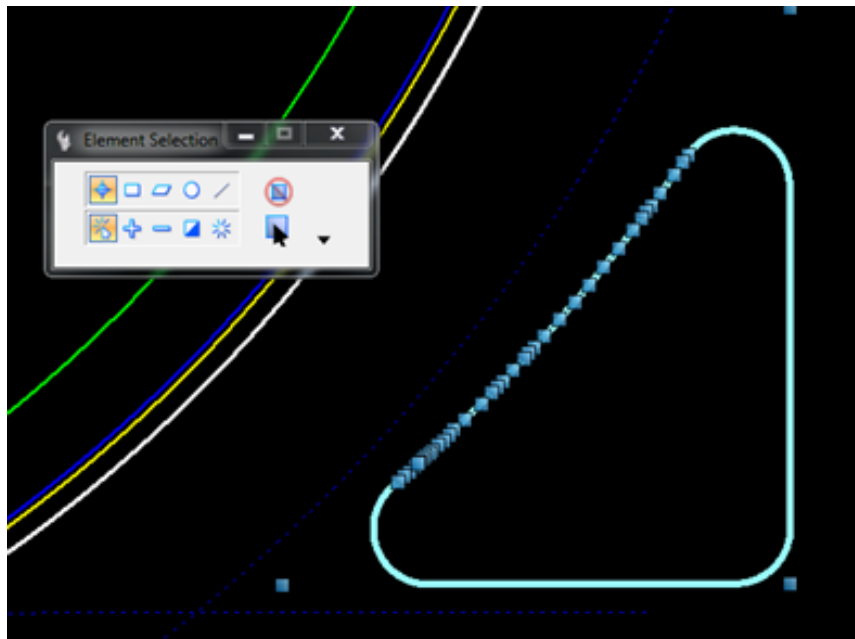
12. Use the OpenRoads **Create Region Flood** tool, this tool can be found by switching to the Drawing Workflow and then the Home Tab and with in the Groups Group will be the Create Region.

DRAWING>HOME>GROUP>Create Region

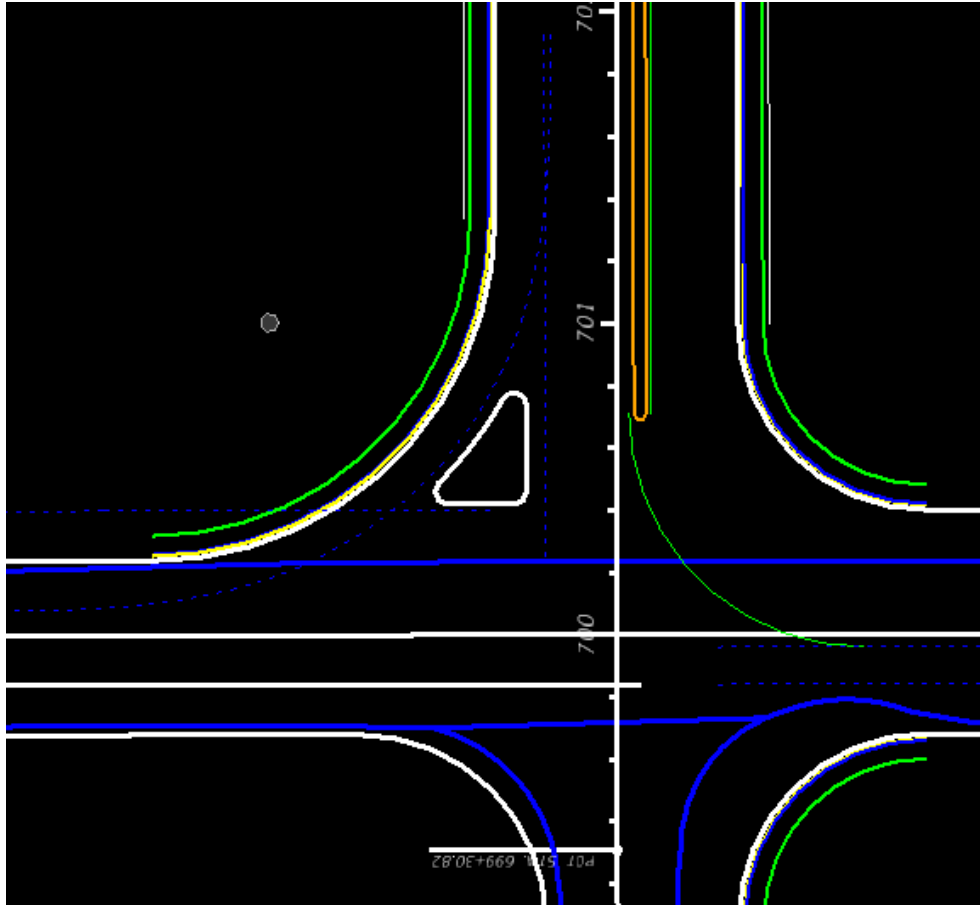
13. Select the Center of the Island, and then data point to accept the closed element.



14. Use the OpenRoads Select tool to view the properties of the new island. Record the Area.



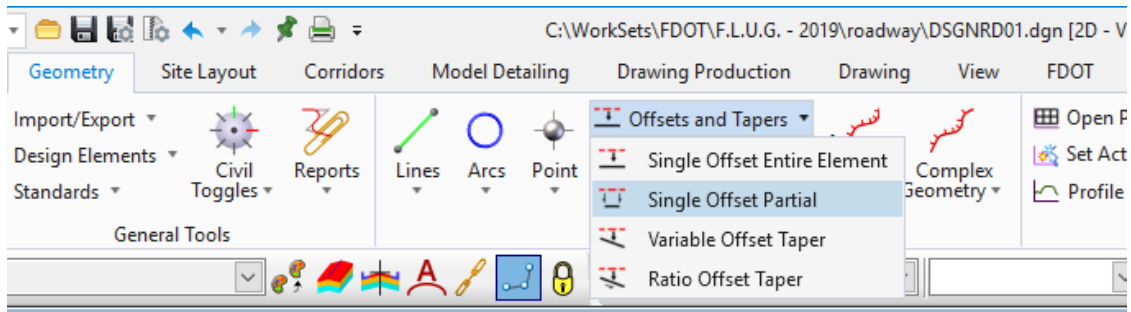
15. View the modified **Right Turn Island**.



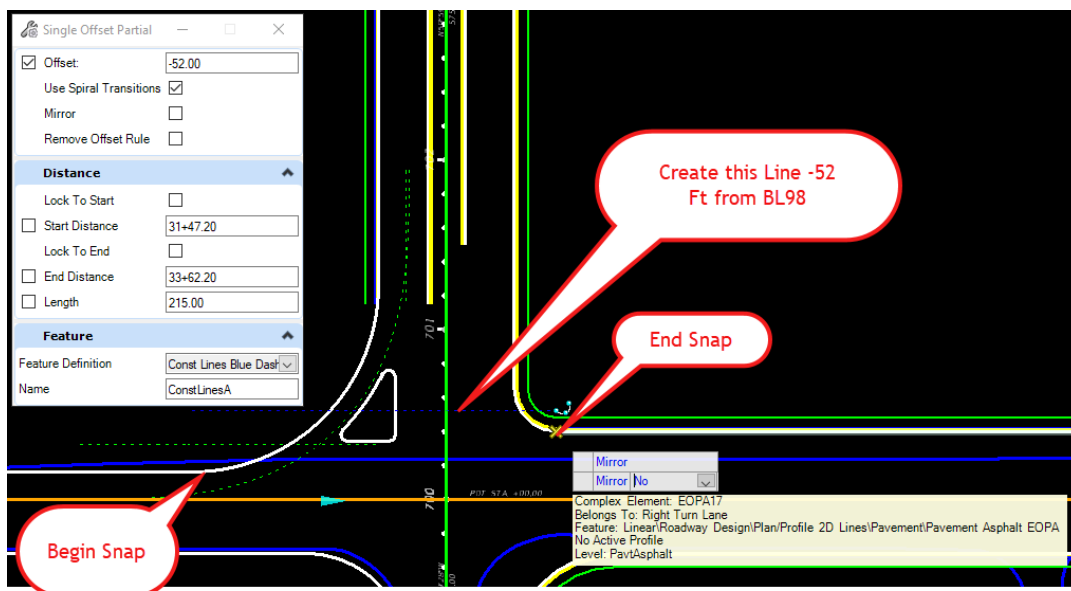
Exercise 2.13 For BL98 Intersection Crosswalks Lines

1. Use the *Geometry Tab and the Horizontal Group*, to select **Single Offset Partial** tool located in the Offsets and Tapers button.

OPENROADS MODELING>GEOMETRY>HORIZONTAL>Offsets and Tapers>Single Offset Partial

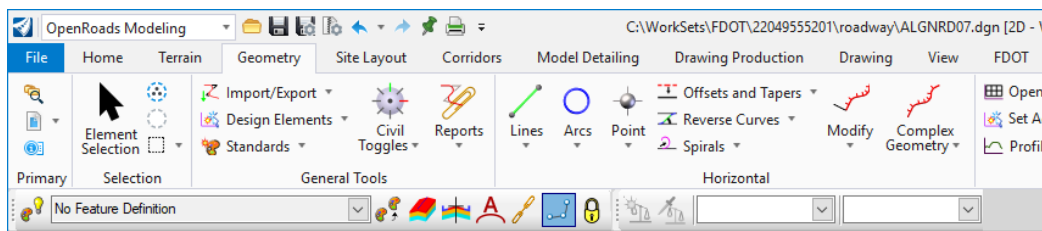


2. Create a **Partial Offset** line from *BL98 -52 feet* across the intersection. Use *Feature Definition Const Lines Blue Dash* and *Name ConstLinesA*.

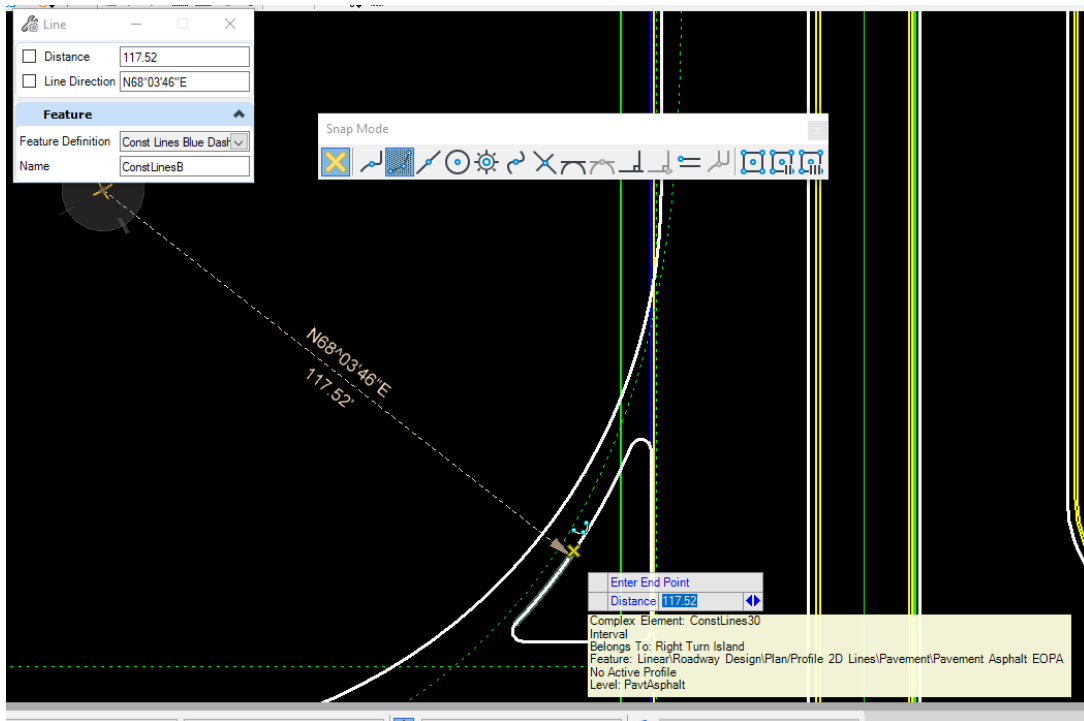


3. Use *Geometry Tab and the Horizontal Group*, to select the **Line Between Points** tool.

OPENROADS MODELING>GEOMETRY>HORIZONTAL>Lines>Line Between Points

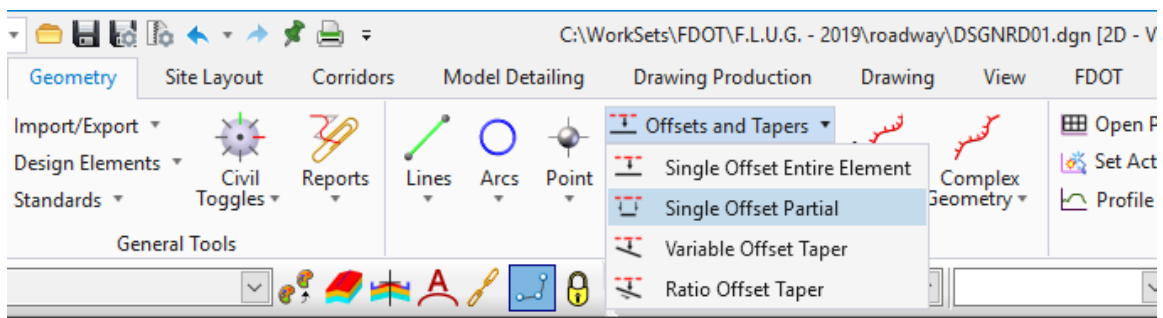


4. Create a line from the curve center to the midpoint of the *Island Radius EOP*. Use *Feature Definition Const Lines Blue Dash* and Name **Line B**.



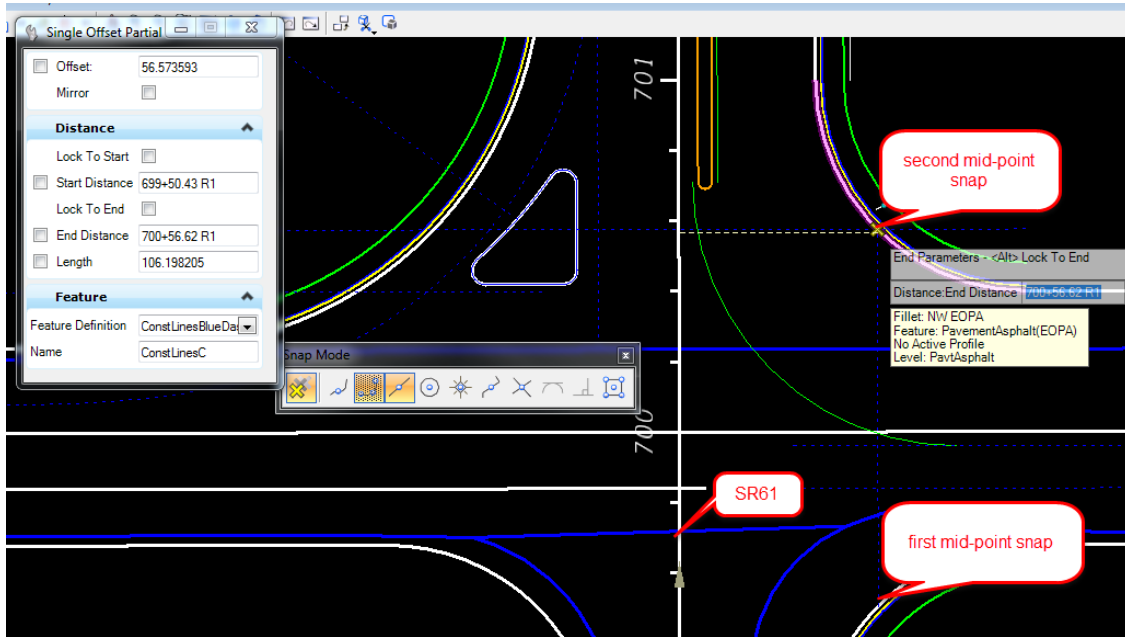
5. Use the *Geometry Tab* and the *Horizontal Group*, to select **Single Offset Partial** tool located in the *Offsets and Tapers* button.

OPENROADS MODELING>GEOMETRY>HORIZONTAL>Offsets and Tapers>Single Offset Partial



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

- Snap to the mid-point of the radii.



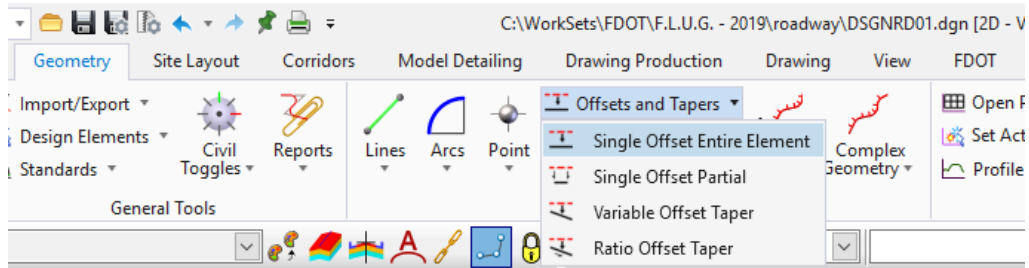
Note Use these lines in later exercises to place *3D Sidewalk Ramp Civil Cells*.

Exercise 2.14 Create BL98 Turnouts

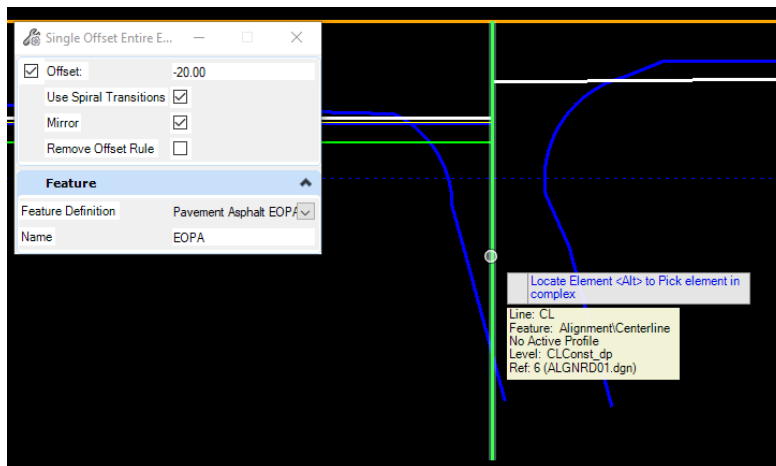
In this exercise the additional rural turnouts can be added to BL98.

1. Use the *Geometry Tab and the Horizontal Group*, to select **Single Offset Entire Element** tool located in the Offsets and Tapers button.

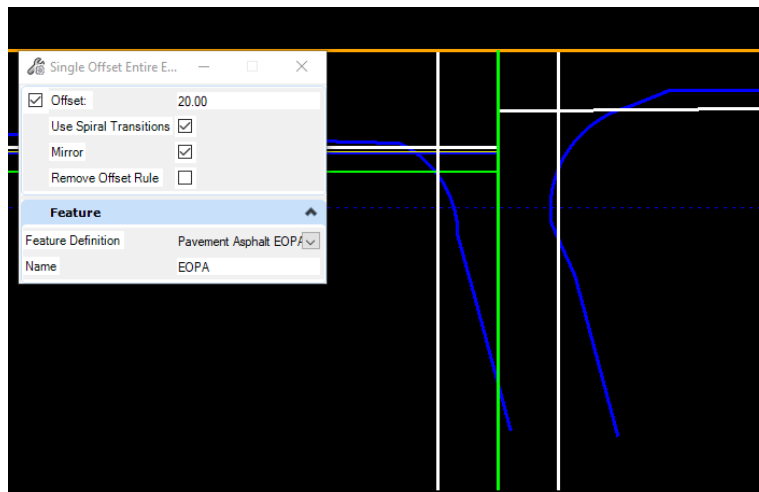
OPENROADS MODELING>GEOMETRY>HORIZONTAL>Offsets and Tapers>Single Offset Entire Element



- a. Select the **CenterLine** of the second *Turnout*. (This Turnout is at Sta. 39+00.00 of BL98)

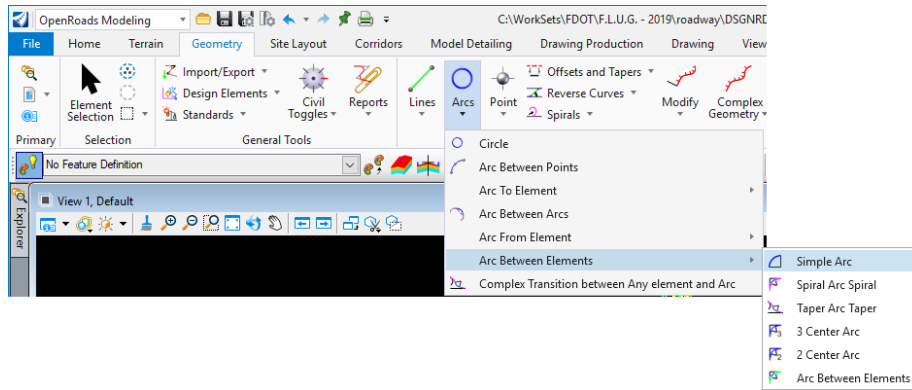


- b. Accept the **-20 feet Offset** and *Mirror*.

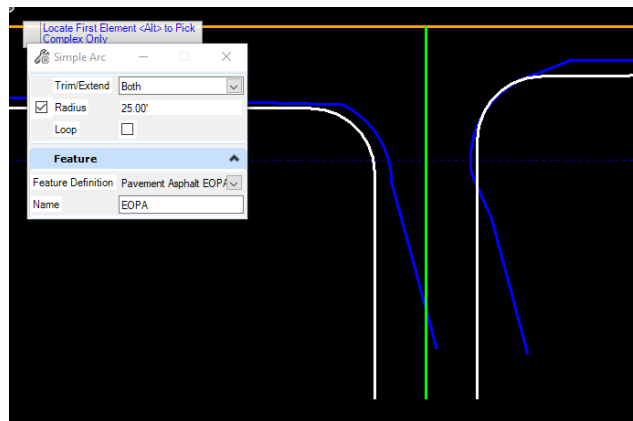


2. Use the *Geometry Tab and the Horizontal Group*, to select the **Simple Arc** tool located in the ARCS button then the drop down of Arc Between Elements.

OPENROADS MODELING>GEOMETRY>HORIZONTAL>Arcs>Arc Between Elements>Simple Arc

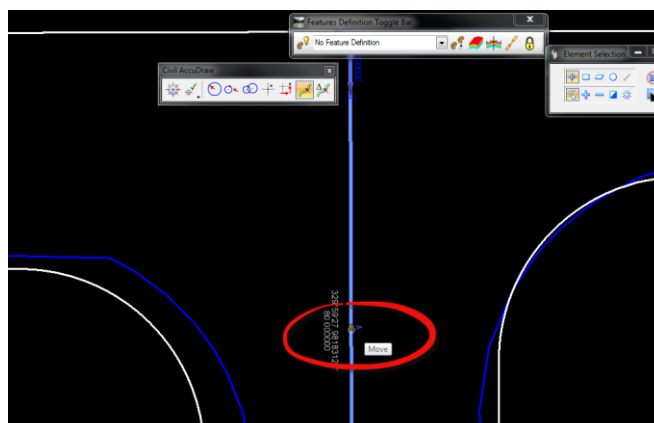


- a. In the Simple Arc tool set *Trim/Extend* to **Both**, then set the Radius to **25.0'**. Be sure to set a Feature Definition of Pavement Asphalt EOPA. Then place the *Radius* on both sides.

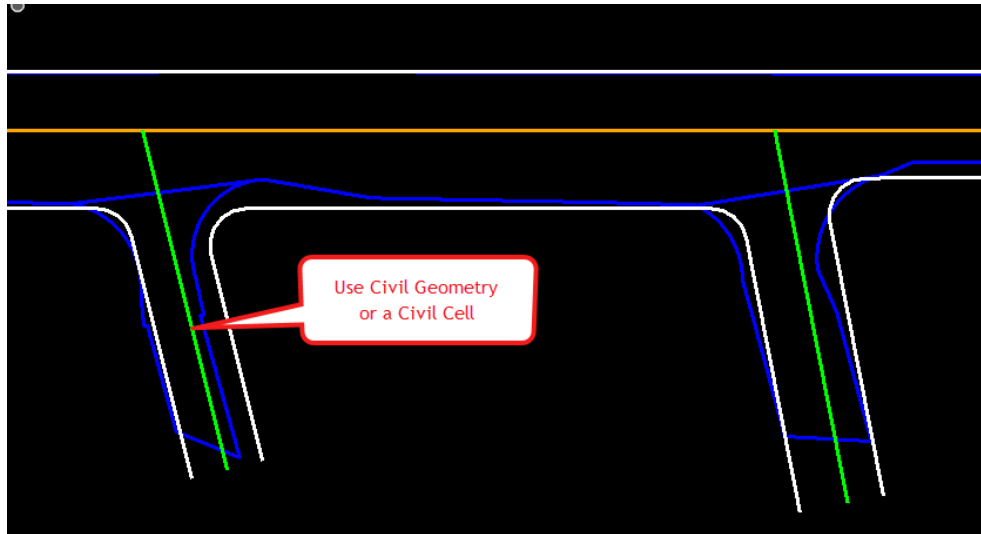


- b. Change the *Geometry* to fit the existing driveway.

- Use the centerline snap and dimensions to modify the location, length and angle. Use the Offset Pavement Asphalt 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_2D-Intersection_Details.dgnlib, and Side Road Turnout.
4. First place the Side Road Centerline make sure to go back into the ALGNRD file to adjust the centerline feature.

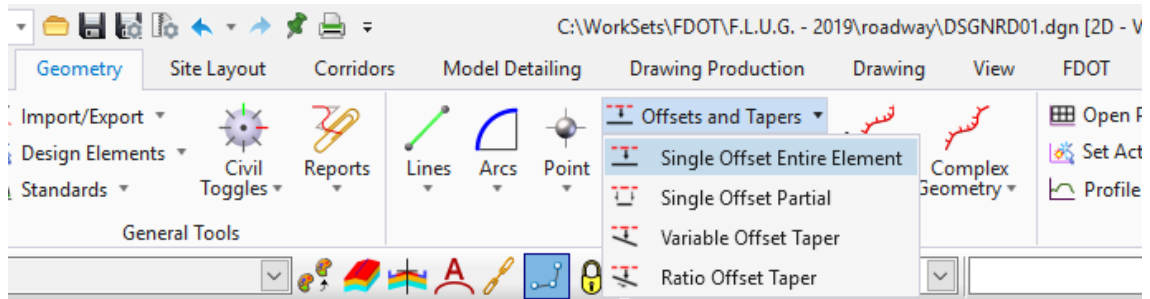


Exercise 2.15 For BL98 Intersection Shoulders

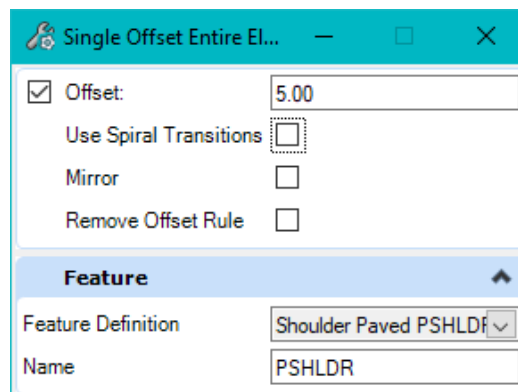
This exercise uses the Pavement Asphalt EOPA to create the **5 feet Shoulder Paved PSHLDR** Offset lines.

1. Use the *Geometry Tab and the Horizontal Group*, to select **Single Offset Entire Element** tool located in the Offsets and Tapers button.

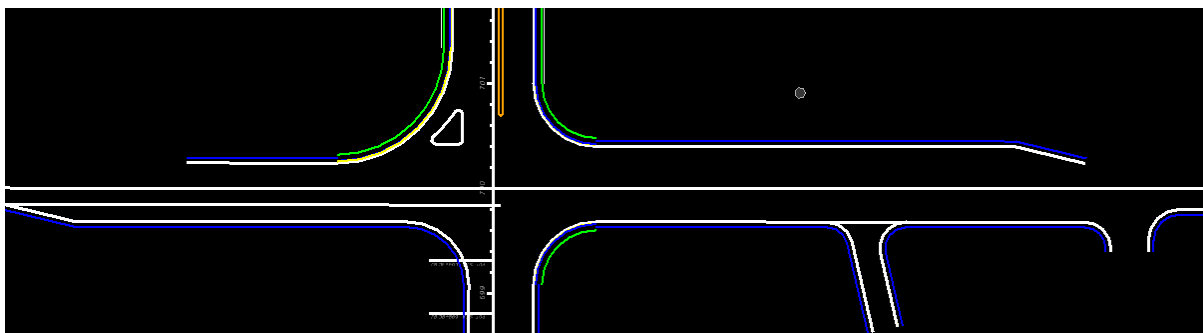
OPENROADS MODELING>GEOMETRY>HORIZONTAL>Offsets and Tapers>Single Offset Entire Element



2. Set the *Offset* to **5 feet** and the *Feature Definition* to **Shoulder Paved PSHLDR**.



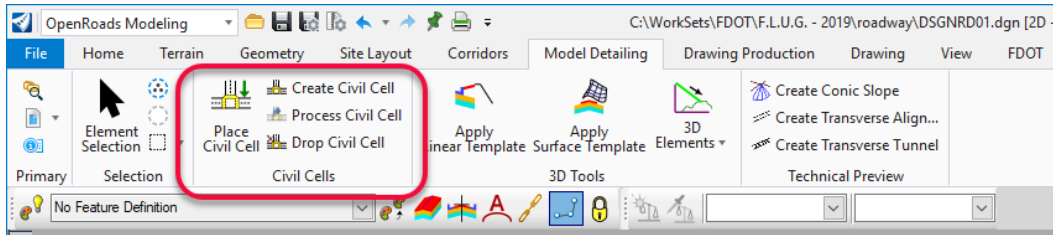
3. Select the **Pavement Asphalt EOPA** lines from the previous steps.
4. Repeat these steps to add the remaining *Shoulder lines* for the widening along BL98.
5. View the intersection below for complete details.



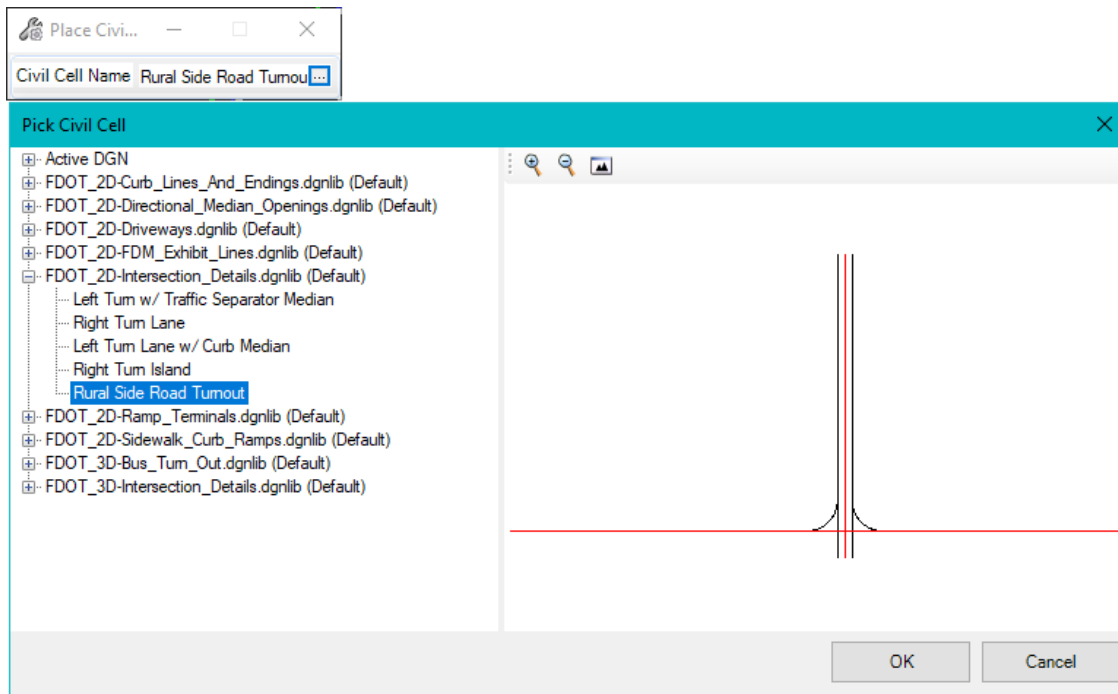
Exercise 2.16 For Friendship Intersection

1. Use Model Detailing Tab and the Civil Cells Group, to select the **Place Civil Cell** tool.

OPENROADS MODELING>MODEL DETAILING>CIVIL CELLS>Place Civil Cell



- a. From the Place Civil Cell dialog, navigate to the *FDOT_2D-Intersection_Details.dgnlib* and select **Rural Side Road Turnout**.

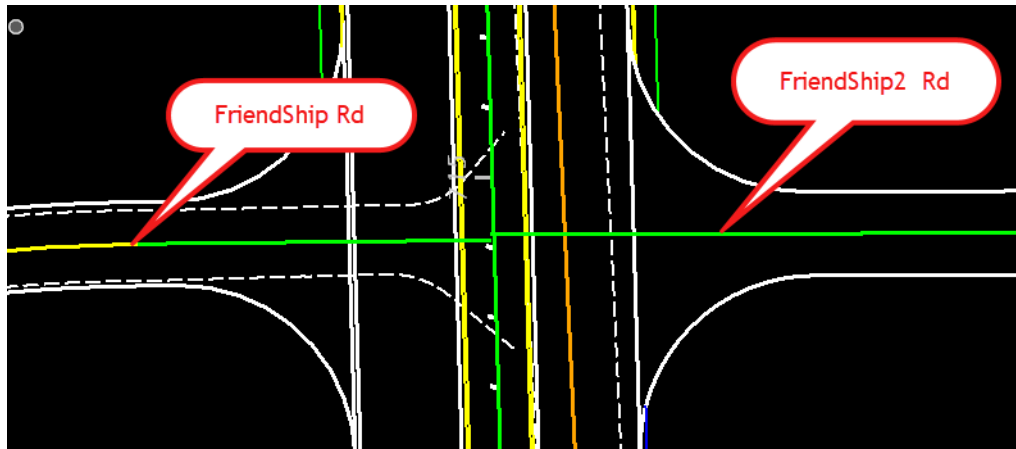


- b. Add **Rural Side Road Turn Out** civil cell to both sides of the Intersection with *Friendship* and *Friendship 2 Centerlines*.
- c. Use the trim commands located in the Drawing Tab and the Modify Group, to clean the extra curb line and sidewalk lines across the intersection.

OPENROADS MODELING>DRAWING>MODIFY>Trim to Element

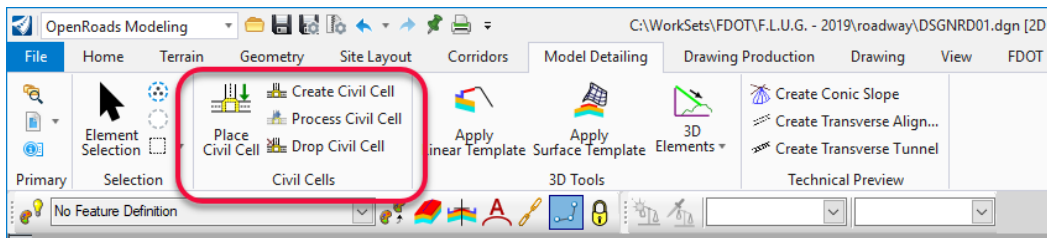
- d. Change all Radii to **35 feet**.
- e. Change Friendship2 Side Road Offsets to **20 feet**.

- f. Change *Centerline Length* to **100 feet**. This step will need to be done in the ALGNRD File.

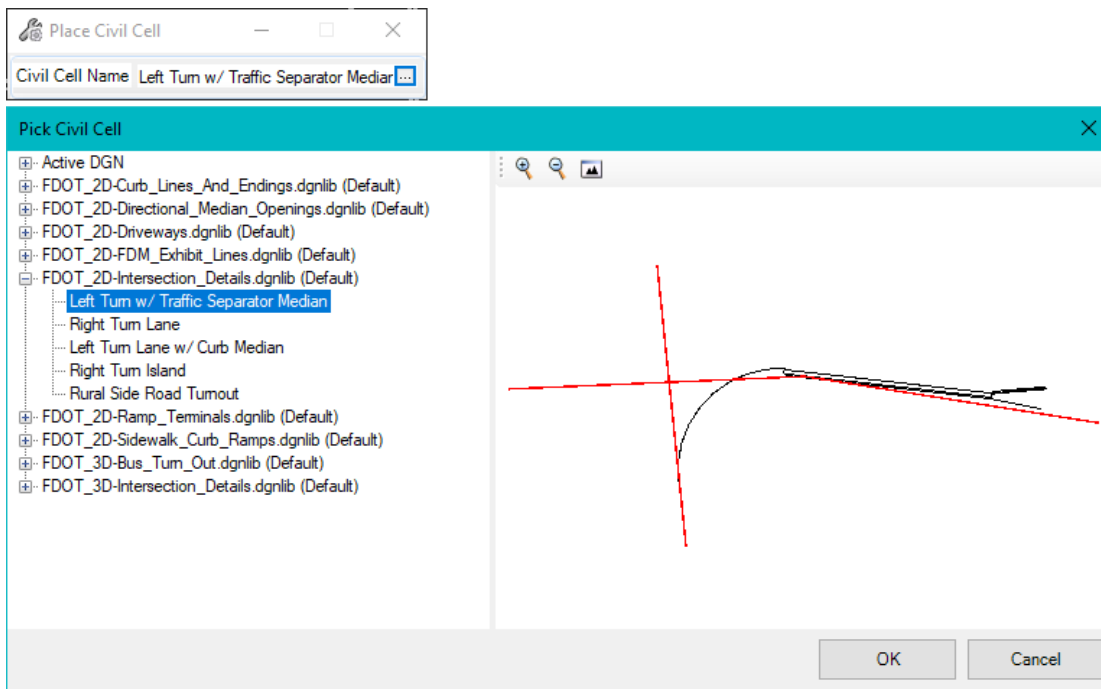


- 2. Use Model Detailing Tab and the Civil Cells Group, to select the **Place Civil Cell** tool.

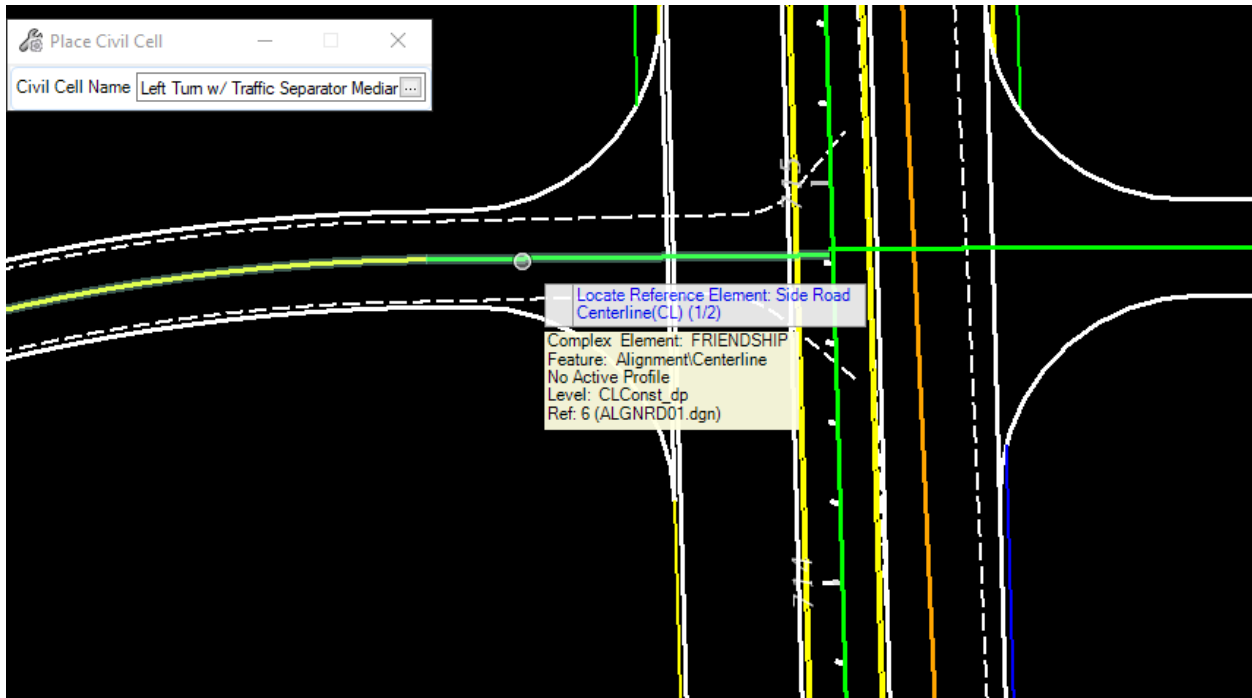
OPENROADS MODELING > MODEL DETAILING > CIVIL CELLS > Place Civil Cell



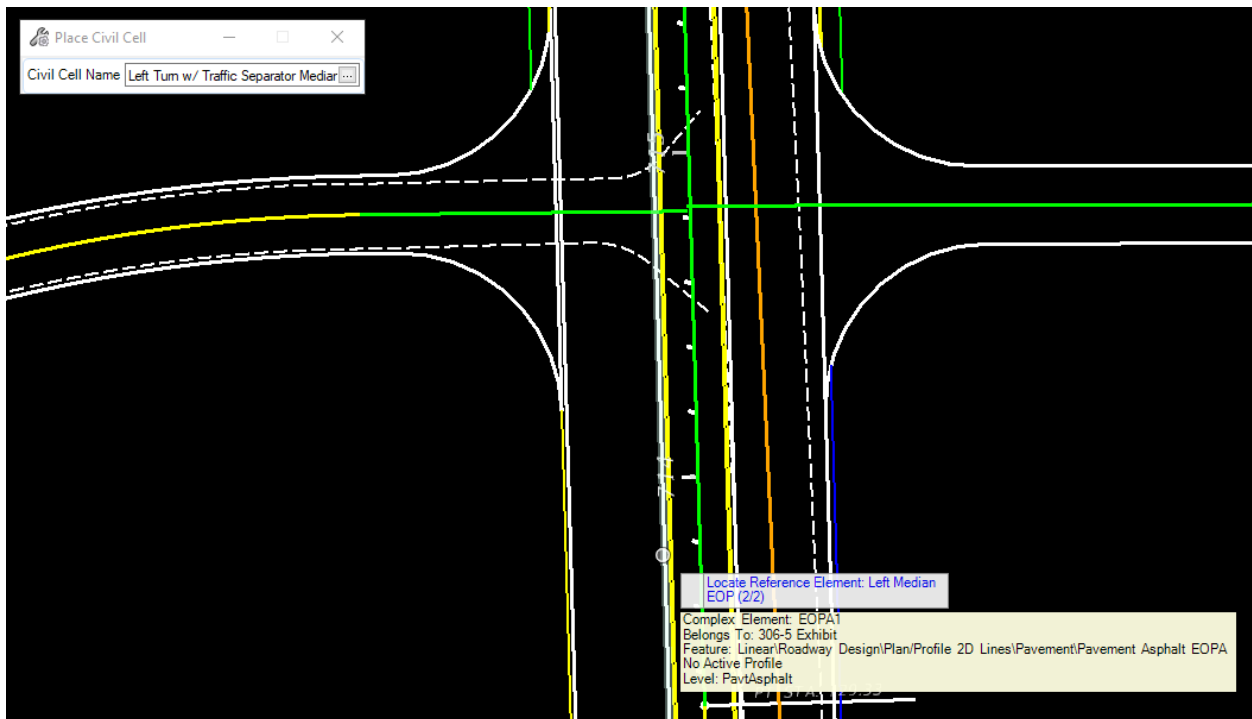
- a. From the Place Civil Cell dialog, navigate to the *FDOT_2D-Intersection_Details.dgnlib* and select **Left Turn w/ Traffic Separator Median**.



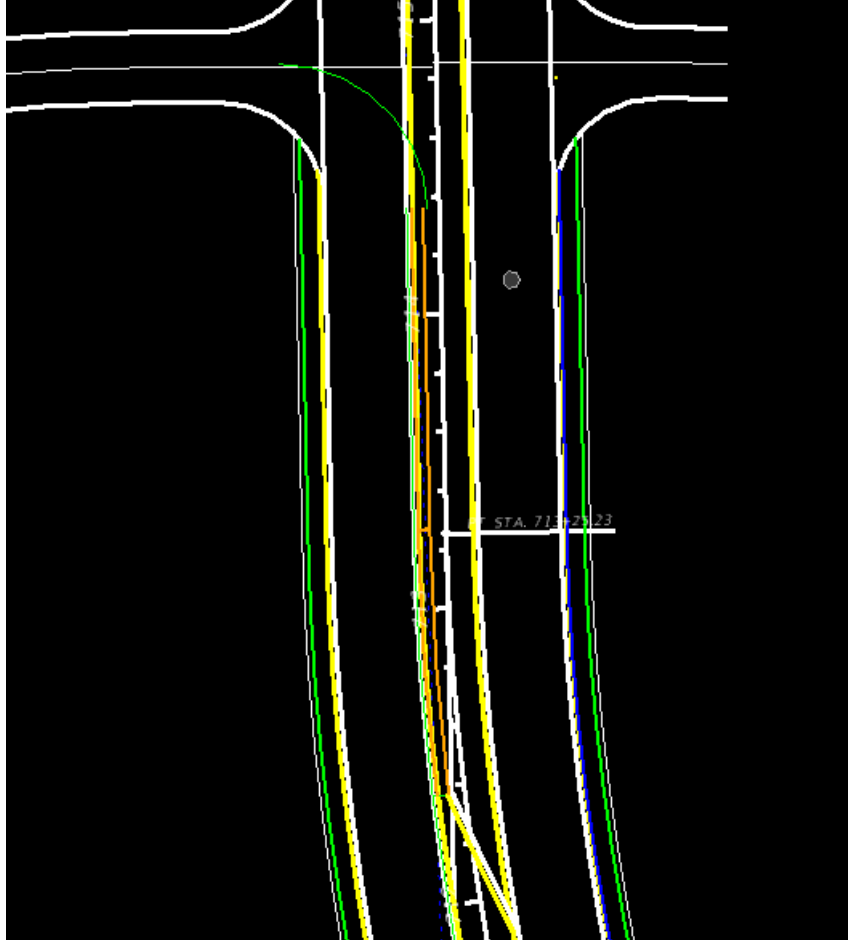
b. For the first *Reference* element, select the **Friendship Rd Centerline**.



c. For the second *Reference* element, select the *left median* **Pavement Asphalt EOPA** line.

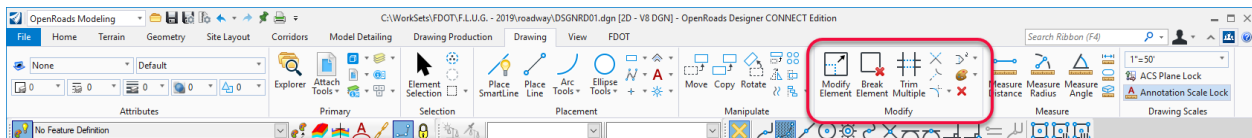


- d. Reset to Skip Alternates and data point to accept Civil Cell Placement.
- e. Change the turning *Radius* to **50 feet**.
- f. Change the turning lane storage length to 300 feet.



3. Use OpenRoads **Trim to Element** tool. This can be found using the **Drawing Tab** and the **Modify Group**. You can also use the Search on the Ribbon.

OPENROADS MODELING>DRAWING>MODIFY>Trim to Element



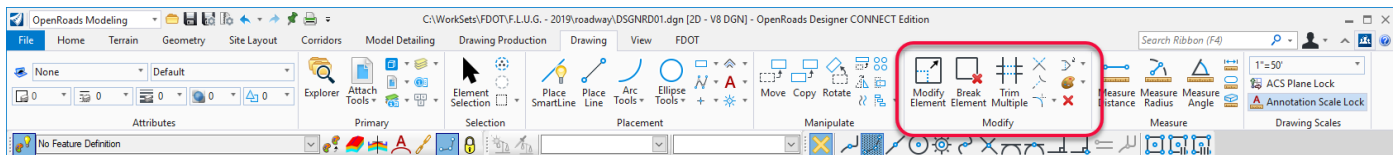
4. Move the **LT_PVT_EOP_IN** to the beginning of the *Traffic Separator*.

- Use the **Const Lines Green** as the cut element.

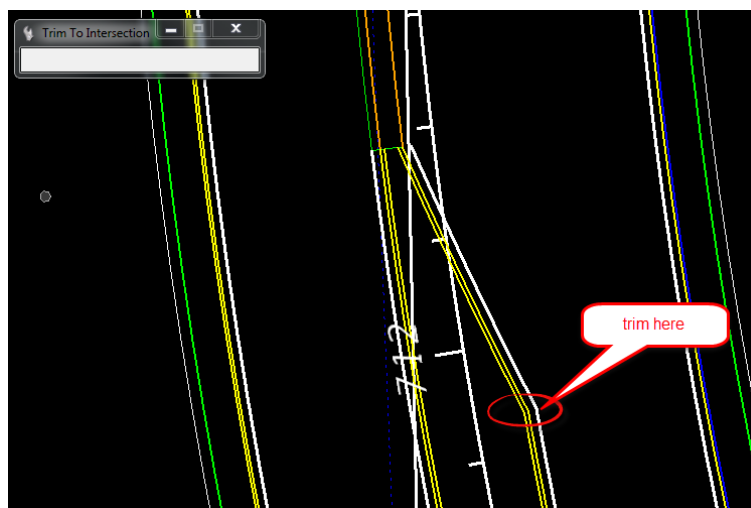


5. Use OpenRoads **Trim to Element** tool. This can be found using the **Drawing Tab** and the **Modify Group**. You can also use the Search on the Ribbon.

OPENROADS MODELING>DRAWING>MODIFY>Trim to Element

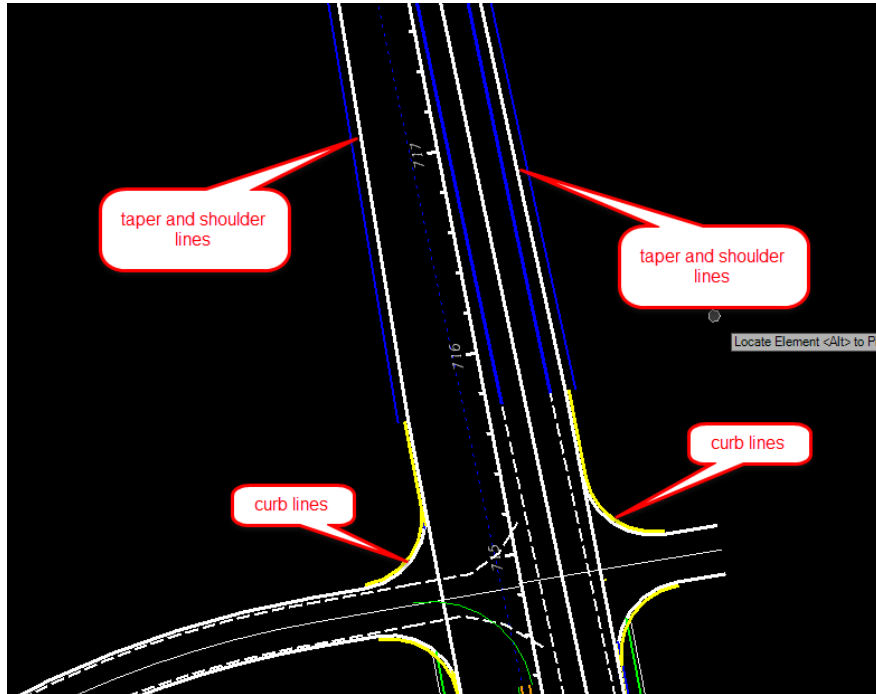


6. Trim the **Curb** and **EOP** lines to the beginning of the *median Taper* line.



NOTE: After the placement of any Civil Cell be sure to verify the Feature Definition on elements in order to add as a Corridor Reference.

7. (EXTRA Exercises) Complete the *Intersection* with *Civil Geometry* tools as shown below:
- Add **Curb lines** for each of the *Radius*.
 - Trim **Sidewalk lines** into the *Radius Curb* lines. There is no sidewalk along SR61 north of Friendship Road.
 - Add **Pavement Asphalt EOPA Taper lines** from the Intersection Radii at Friendship to the End Station of SR61 11 left.
 - Add **Shoulder Paved PSHLDR** lines to both sides along the *Taper*.



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3 PROFILES

INTRODUCTION

This chapter will continue to use the OpenRoads Technology Civil Tools, Vertical Geometry. 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 evaluated throughout the development process.

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

OPEN PROFILE MODEL

The Open Profile Model generates an OpenRoads 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

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

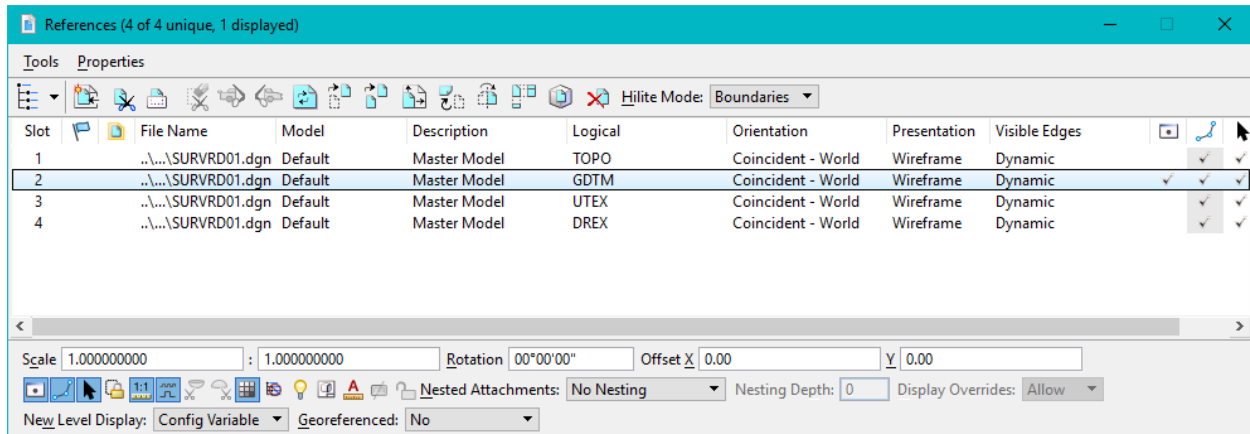
Design Geometrics and Criteria	FDOT Design Manual (FDM), Part 2 Chapter 210
Design Speed	45 MPH
Facility	Low Speed Desired Length
Maximum Tangent Deflection w/out curve	1 Degree Section 210.8.1
Minimum Horizontal Radius	694 feet Table 210.9.2
Minimum Length of Curve	675 feet Table 210.8.1
Context Class	C3 Max Grade Table 210.10.1

- Low Speed Minimum Length – This will give a minimum Radius at Max Super ($e_{max} = .05$).
- Low Speed Desired Length – This will give a desired length of curve at Normal Crown.

Note Refer to the FDM for Tables.

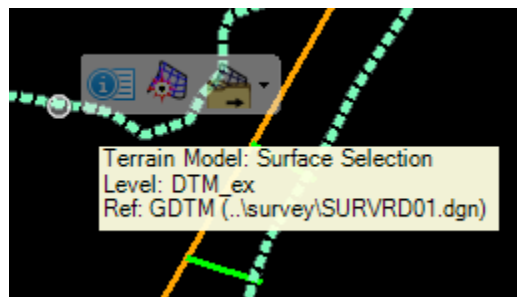
Exercise 3.1 Preparation for SR61 Profile

1. Open the ALGNRD01.dgn that was created in Exercise 2.1.
C:\WorkSets\FDOT\22049555201\roadway.
2. Use Function key F9 (toggles on the Reference Dialog) to view the attached files: Turn the display off on all the reference files except the SURVRD file with a logical name of GDTM. This file will be used to create Profiles of the Existing Ground.



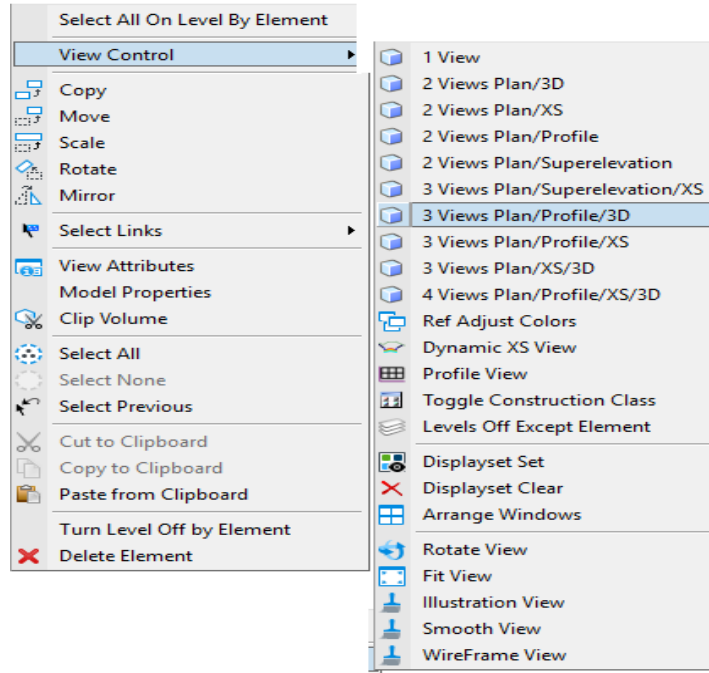
Note If the SURVRD file exist, the SURVRD01 -GTMRD logical can be used.

3. Once you have the turned off the SURVRD files, we now need to set the terrain Active. To do this select the boundary to bring up the context menu and select the second icon in the menu.

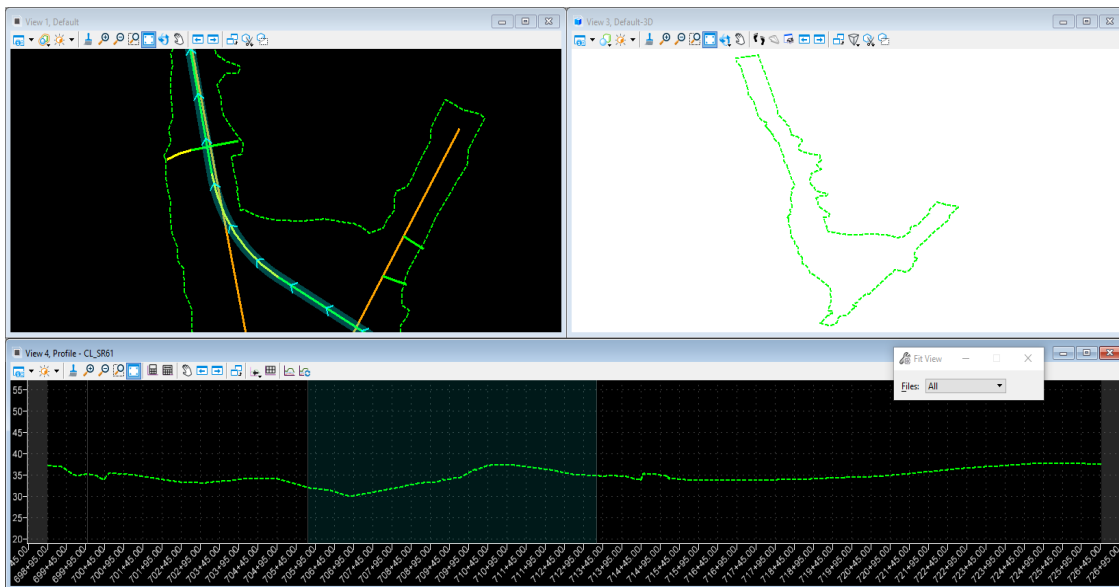


Note Setting the terrain to Active will create a new Model that is 3D we will use this Model to view our Profiles.

4. To set up the correct views to design profiles we will use the View Controls located with the right click and hold function of the Right mouse. Right Click and Hold on the mouse and navigate to the View Control then arrow over to bring up a second dialog to find different view control functions select on the (3 Views Plan/Profile/3D) then follow the prompts by the cursor to complete.



- At the cursor prompt, select the OK then it will ask you to select a plan element this will be the SR61 Centerline. Once you are done your view windows should look like this.

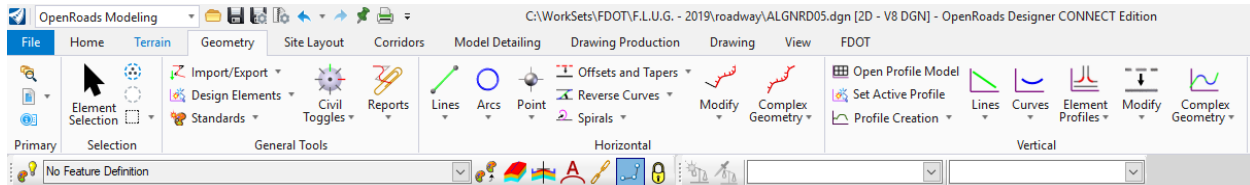


Exercise 3.2 Create SR61 Profile

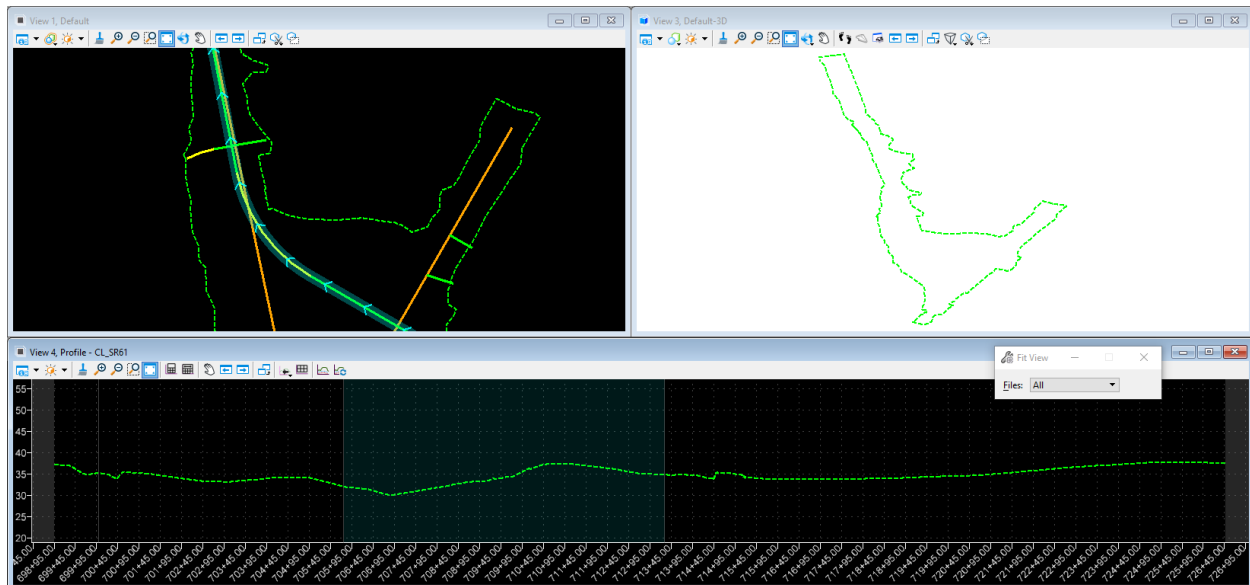
In this exercise, several Vertical Geometry tools are used to create a proposed profile for SR61.

1. Use the *Geometry Tab and the Vertical Group* of the OpenRoads Modeling Workflow.

OPENROADS MODELING>GEOMETRY>VERTICAL

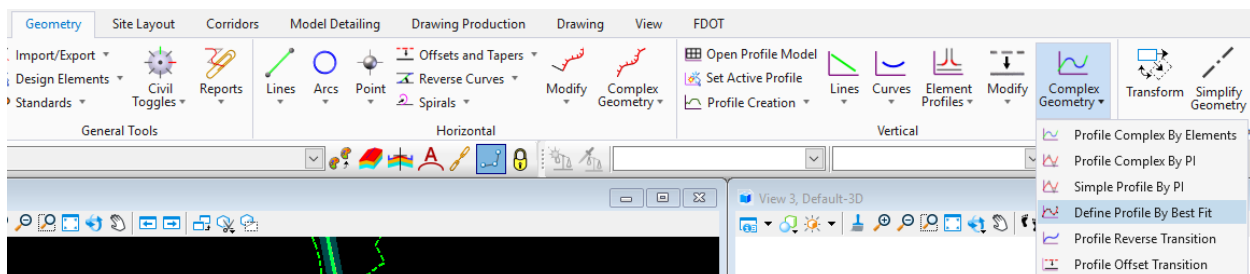


2. From the previous exercise select View 4 to make the Profile window active.

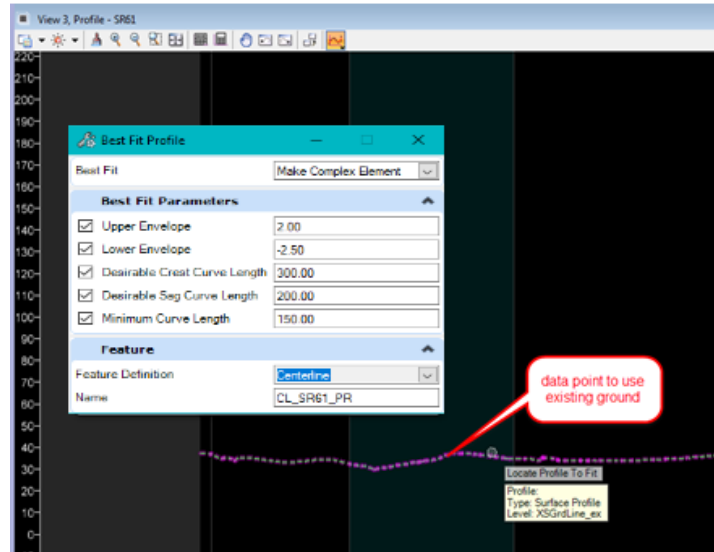


3. Use the *Geometry Tab and the Vertical Group*, to select the **Define Profiles by Best Fit** tool that is located within the Complex Geometry pull down.

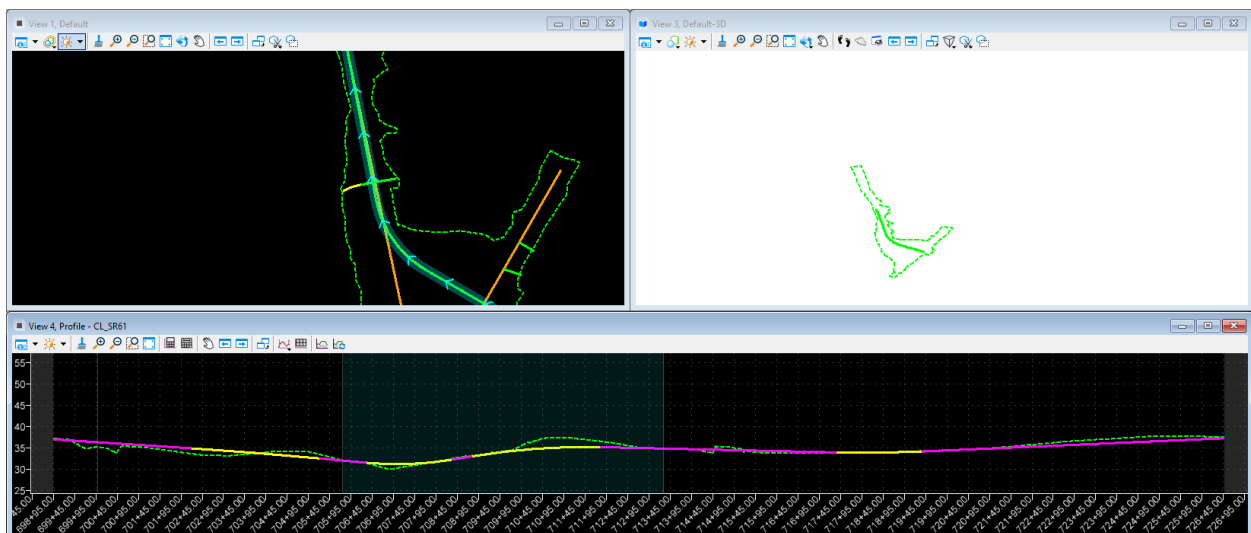
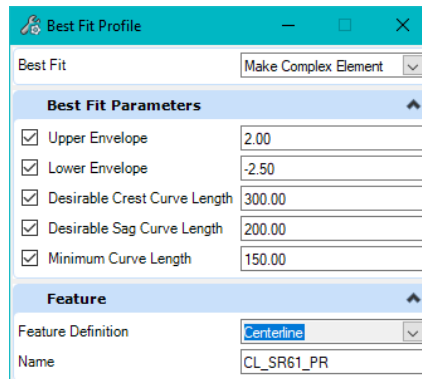
OPENROADS MODELING>GEOMETRY>VERTICAL>Complex Geometry>Define Profile By Best Fit



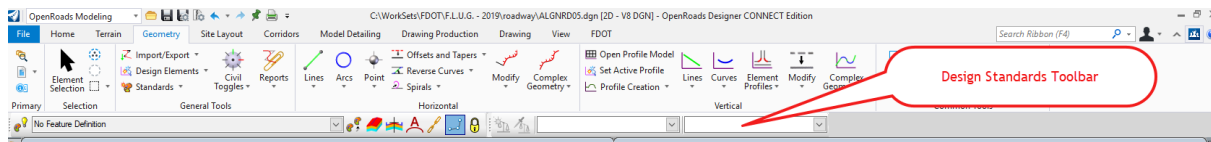
- a. At the cursor prompt, data point to **Make Complex Element** option. Enter the *Profile Name*, SR61-PR, and then data point on the green line in the profile.



- b. Follow the prompts to enter the **Best Fit Parameters** as shown. Make sure to pick the Feature Definition of CenterLine.

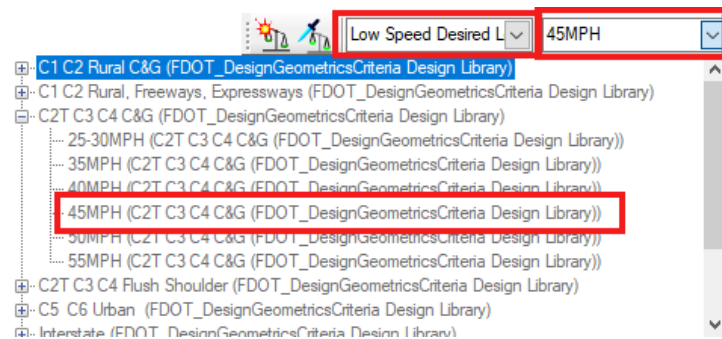


4. Using the **Design Standards Toolbar** that is already docked at the top of the screen.

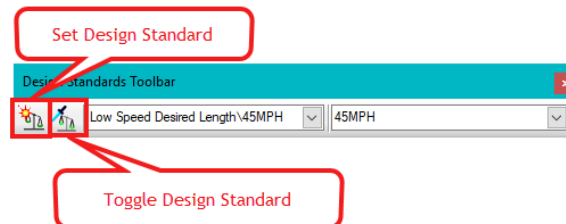


5. On the Design Standards Toolbar, using the second drop down list navigate to the C2T C3 C4 C&G (FDOT_DesignGeometrics Criteria Design Library and select **45 MPH**. Toggle **On** the Active Design Standard.)

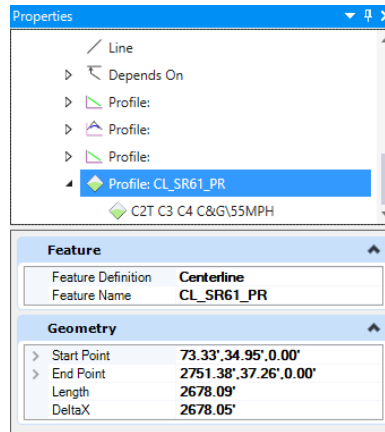
- Be sure to set the left field (Horizontal Design Standard) in order to set the right field (Vertical Design Standard) to 45 MPH.



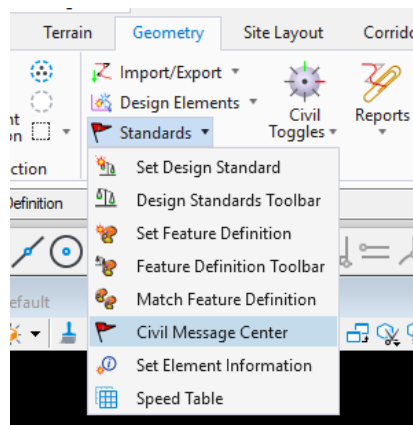
6. Use the Design Standards Toolbar, to select the **Set Design Standard** tool.



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

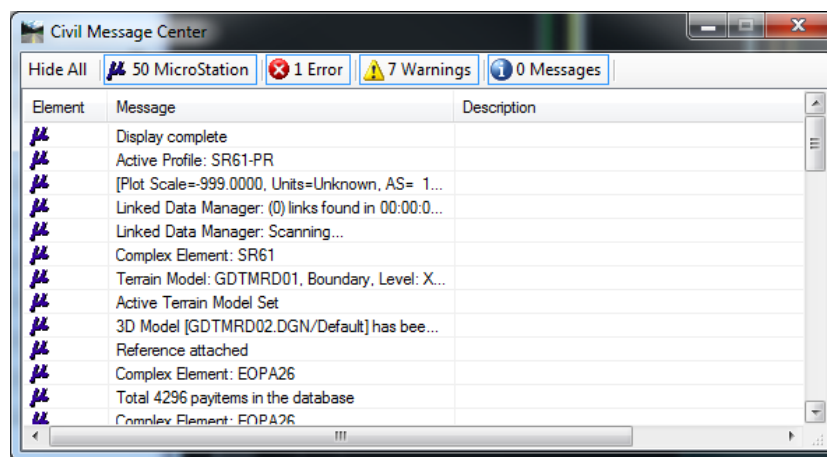


7. Use the **Civil Message Center** tool that is located on the Geometry Tab and General Tools Group in the Standards drop down menu.



- a. The Civil Message Center dialog displays the results.

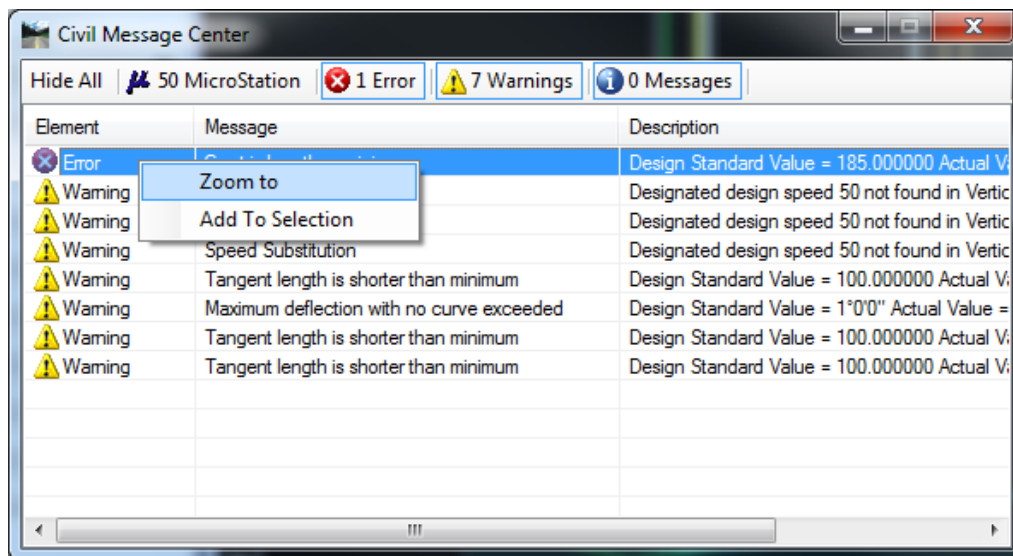
Note It may be docked at the bottom of the screen, click on the Tab.



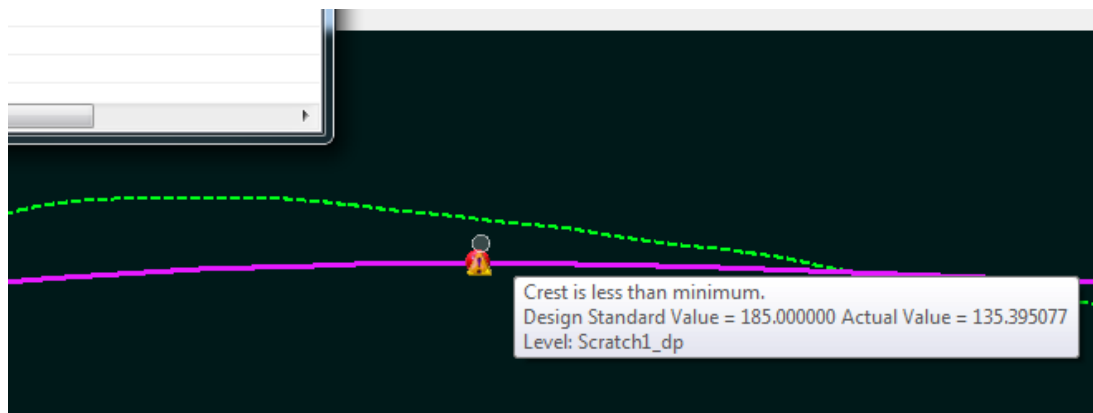
- b. In the Civil Message Center dialog, select on the **MicroStation** tab. This will toggle **Off** all the general messages for MicroStation and leave only *Error messages* and *Warnings* in the list.

Element	Message	Description
Error	Crest is less than minimum	Design Standard Value = 185.000000 Actual Value = 135.395077
Warning	Speed Substitution	Designated design speed 50 not found in Vertical Curve
Warning	Speed Substitution	Designated design speed 50 not found in Vertical Curve
Warning	Speed Substitution	Designated design speed 50 not found in Vertical Curve
Warning	Tangent length is shorter than minimum	Design Standard Value = 100.000000 Actual Value = 100.000000
Warning	Maximum deflection with no curve exceeded	Design Standard Value = 1'0"0" Actual Value = 1'0"0"
Warning	Tangent length is shorter than minimum	Design Standard Value = 100.000000 Actual Value = 100.000000
Warning	Tangent length is shorter than minimum	Design Standard Value = 100.000000 Actual Value = 100.000000

- 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.

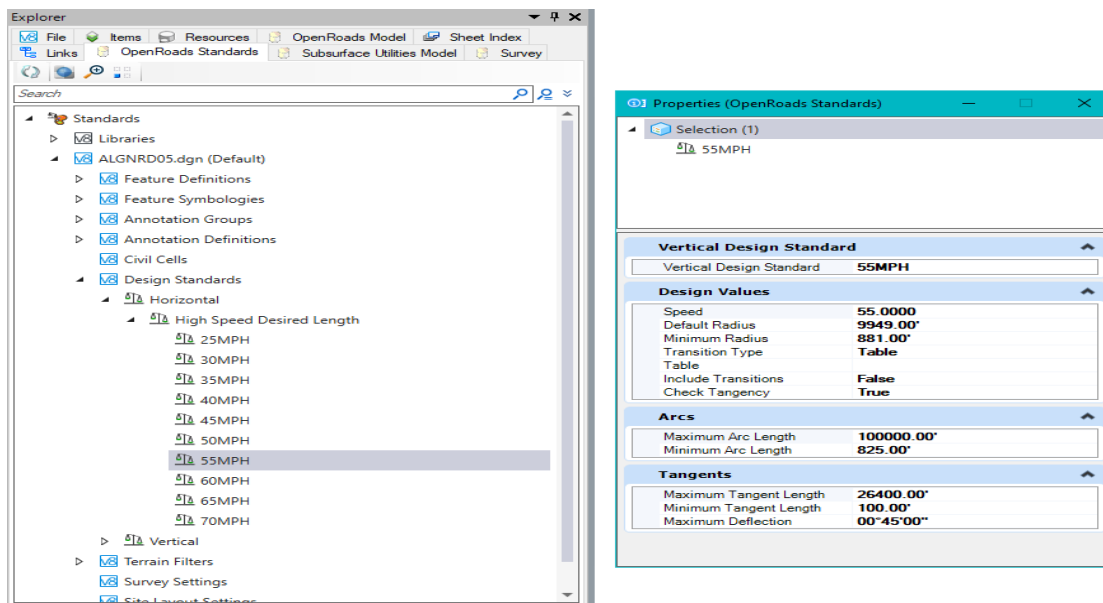


- e. Notice the *Error* is now centered in the profile view. Hover the cursor over the *Error* icon to display the *Error Message* description.

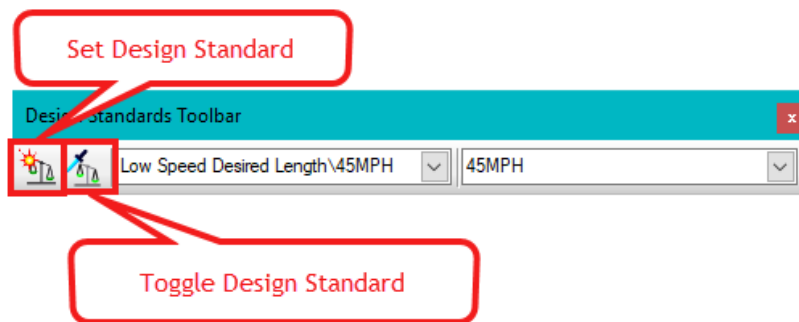


Note The values are given in whole stations, i.e. 3.5 station equals 350 feet.

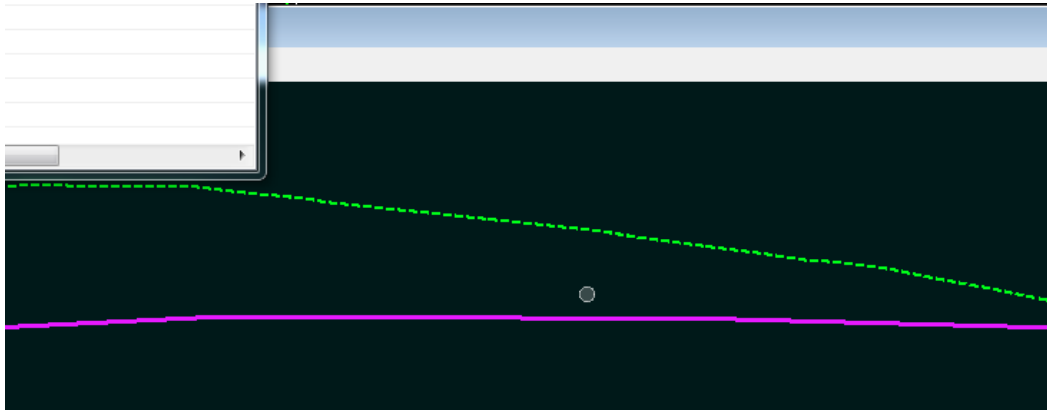
8. Since there can be a number of different situations for both the horizontal and vertical curve depending on Context classification and Design Speed we will now set the vertical in the Explorer Dialog.
 - a. Using the Explorer Dialog (Function Key F11) if you do not have it docked. Navigate to the **OpenRoads Standards Tab** then click on Standards to open the current file you are in to see the Design Standards Category to view the Design Standard applied the Alignments in the file.
 - b. Select the Horizontal Design Section to see which design standard is applied to the Alignment, next select the desired speed. Now using the Ctrl+I key to bring up the properties dialog lets link a vertical design speed to the horizontal.



9. Use the Design Standards Toolbar that is docked to toggle on the Set Design Standards.

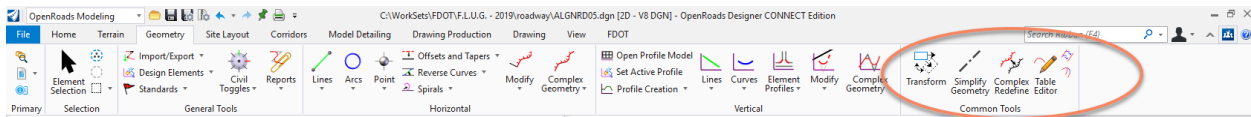


10. At the prompt, select the **Best Fit Profile** created in the previous steps. Notice the *Error* icons are no longer displayed.



Note A new tool to OpenRoads Designer is the Table Editor Tool. This tool can be found on the Geometry Tab and the Common Tools Group. With this tool a selection of the alignment (Horizontal or Vertical) will bring up a table for easy editing.

OPENROADS MODELING>GEOMETRY>COMMON TOOLS>Table Editor



Profile Table Editor: CL_sr61_pr1

	Back Tangent Length	Back Slope	Station	Elevation	Curve Length	K Value	Ahead Slope	Ahead Tangent Length
		<input type="checkbox"/>	698+95.00	37.25			<input type="checkbox"/> 1.000%	16.12
	16.12	<input type="checkbox"/> 1.000%	699+36.12	37.66	50.00	5.31	<input type="checkbox"/> -8.413%	7.21
	7.21	<input type="checkbox"/> -8.413%	699+68.33	34.95	0.00	0.00	<input type="checkbox"/> -0.300%	12.98
	12.98	<input type="checkbox"/> -0.300%	699+81.31	34.91	0.00	0.00	<input type="checkbox"/> 1.872%	17.89
	17.89	<input type="checkbox"/> 1.872%	699+99.19	35.24	0.00	0.00	<input type="checkbox"/> -1.723%	24.42
	24.42	<input type="checkbox"/> -1.723%	700+23.62	34.82	0.00	0.00	<input type="checkbox"/> 1.974%	31.33
	31.33	<input type="checkbox"/> 1.974%	700+54.95	35.44	0.00	0.00	<input type="checkbox"/> -0.487%	316.00
	316.00	<input type="checkbox"/> -0.487%	703+70.95	33.90	0.00	0.00	<input type="checkbox"/> -0.925%	212.38
	212.38	<input type="checkbox"/> -0.925%	705+83.32	31.94	0.00	0.00	<input type="checkbox"/> 0.482%	627.65
	627.65	<input type="checkbox"/> 0.482%	712+10.97	34.96	0.00	0.00	<input type="checkbox"/> -0.300%	525.43
	525.43	<input type="checkbox"/> -0.300%	717+36.40	33.39	0.00	0.00	<input type="checkbox"/> 0.300%	200.00
	200.00	<input type="checkbox"/> 0.300%	719+36.40	33.99	0.00	0.00	<input type="checkbox"/> 0.461%	709.97
	709.97	<input type="checkbox"/> 0.461%	726+46.38	27.26				

Report Apply

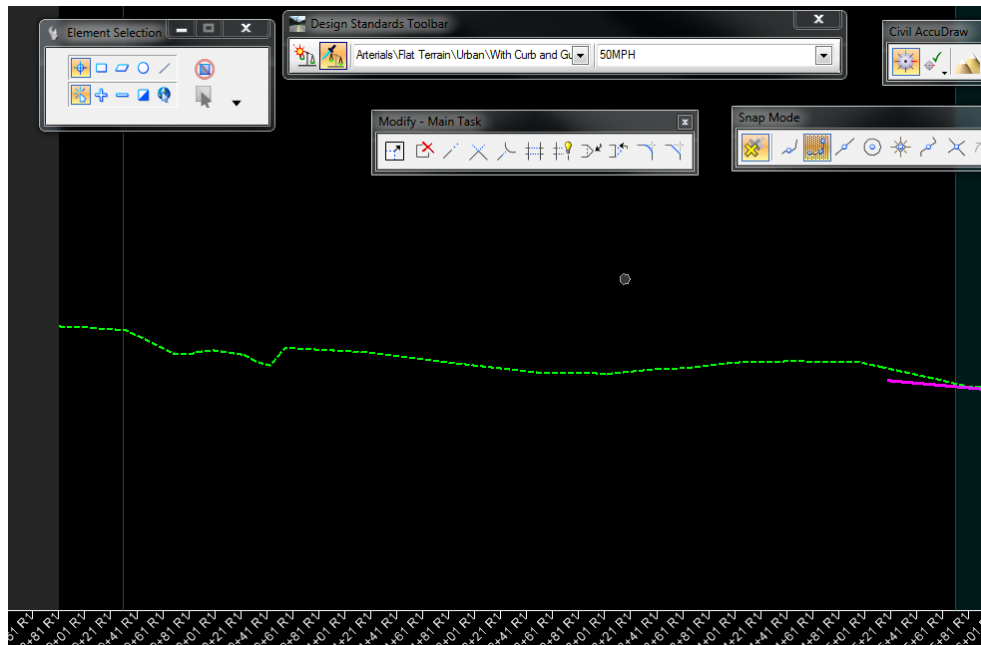
Exercise 3.3 Edit SR61 Profile

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.

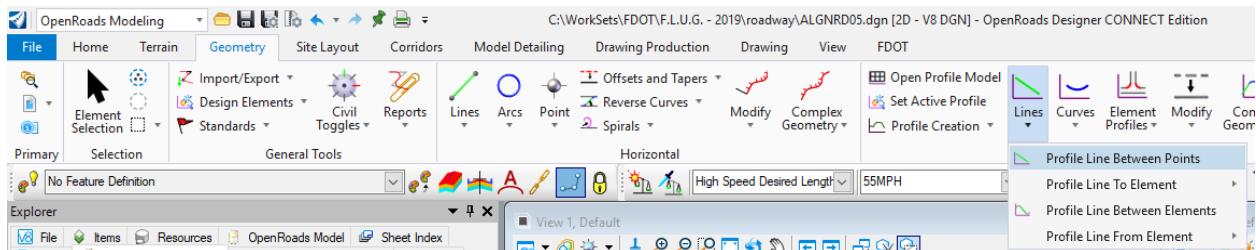


➤ **Create Profile with Place Vertical Line**

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

1. Use *Geometry Tab and the Vertical Group*, to select the **Profile Line Between Points** tool located in the Lines Tools.

OPENROADS MODELING>GEOMETRY>VERTICAL>Lines>Profile Line Between Points

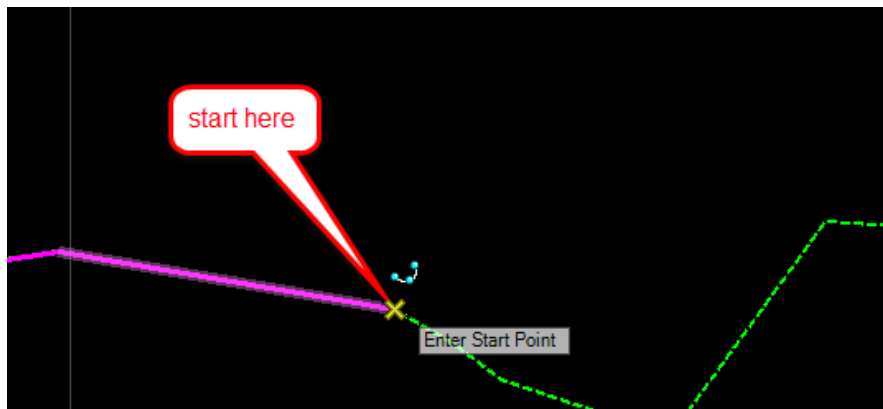


2. Place **Line Elements** on the *Existing Ground* points to trace the Profile across BL98.

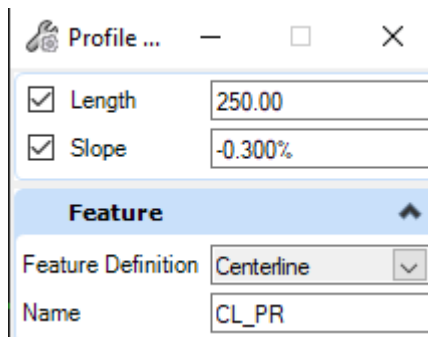
Note This is not exact, simply trace a few lines.

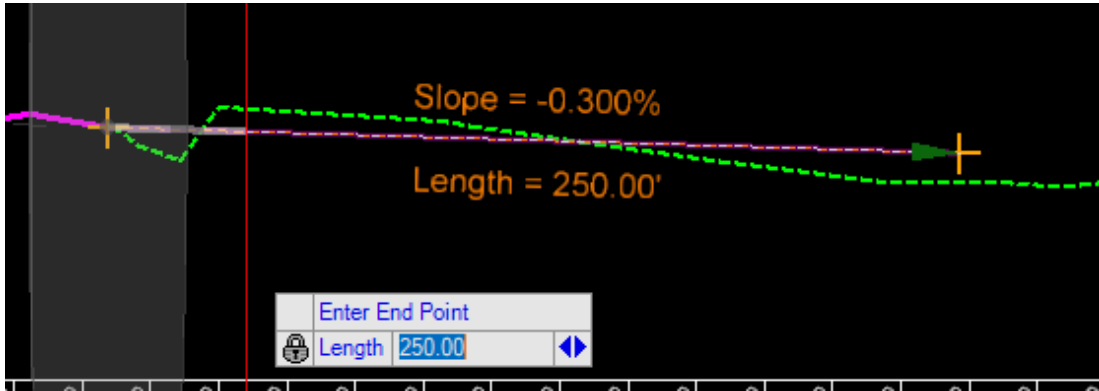


3. Continue using the Profile Line Between Points tool.
 - a. Begin at the edge of the existing pavement or connect to the proposed profile line from the step above.



- b. In the Profile Line Between Points dialog, check the *length* and *slope*, *length* of **250 feet** and *slope* of **-0.3%**. Click a data point in the view to create the line as defined in the dialog.

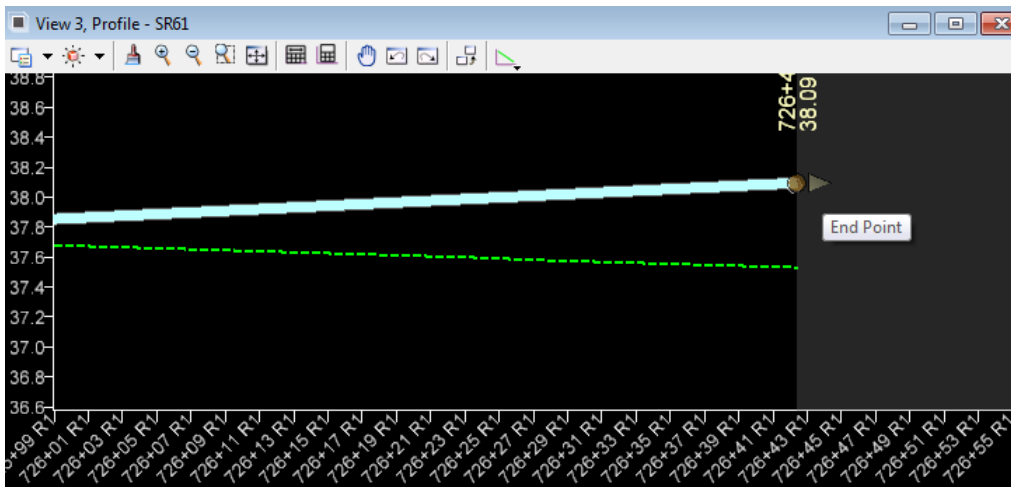




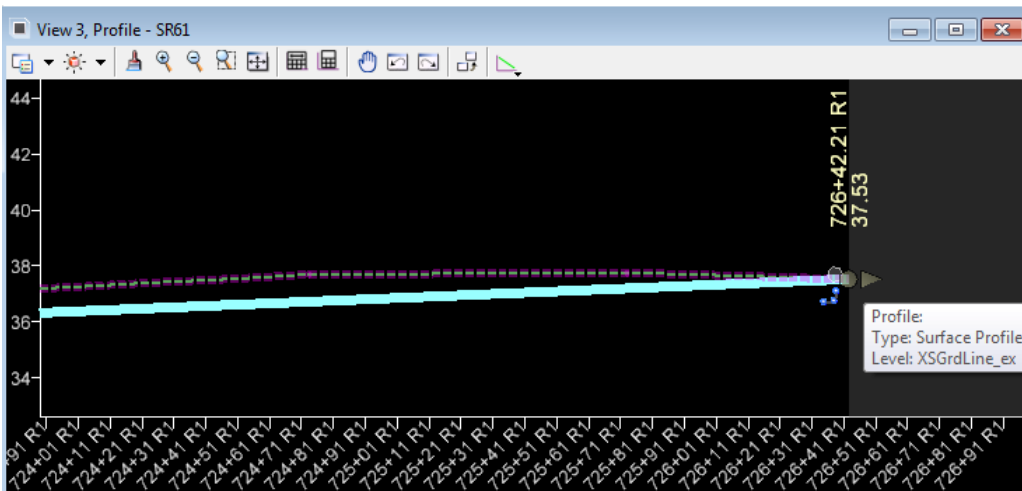
- c. Using *Line Between Points* to join the two profiles, place another **Profile line** between the “250 at .3%” line and the *Best Fit Profile*.



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



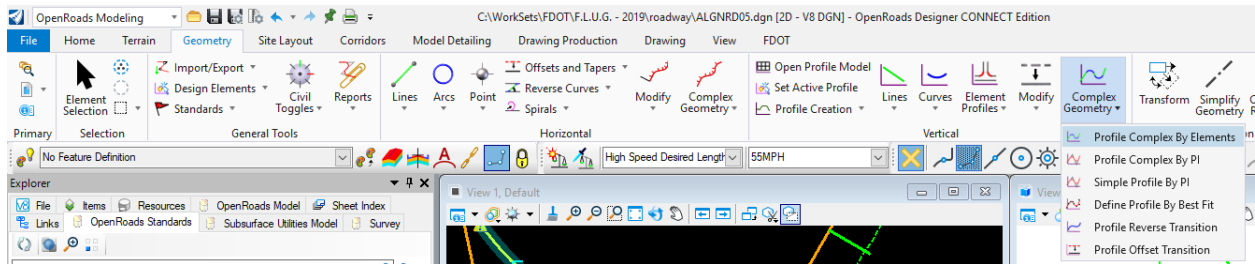
- Click on the solid ball manipulator at the end of the line to move it in both directions.



➤ Complex Profile Elements

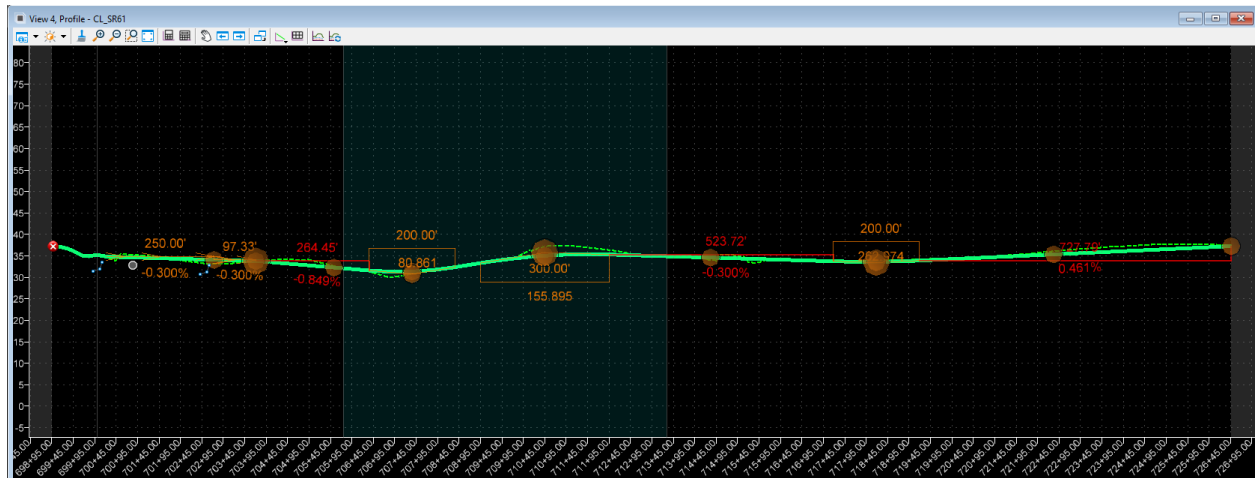
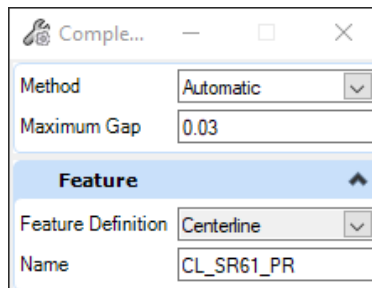
1. Use *Geometry Tab and the Vertical Group*, to select the **Profile Complex by Elements** tool located within the Complex Geometry tool Group.

*OPENROADS MODELING>GEOMETRY>VERTICAL>Complex Geometry>Profile
Complex By Elements*



2. Key-in the name CL_SR61_PR on the dialog and Start at the Beginning Profile line and create a new **Connected Profile**.

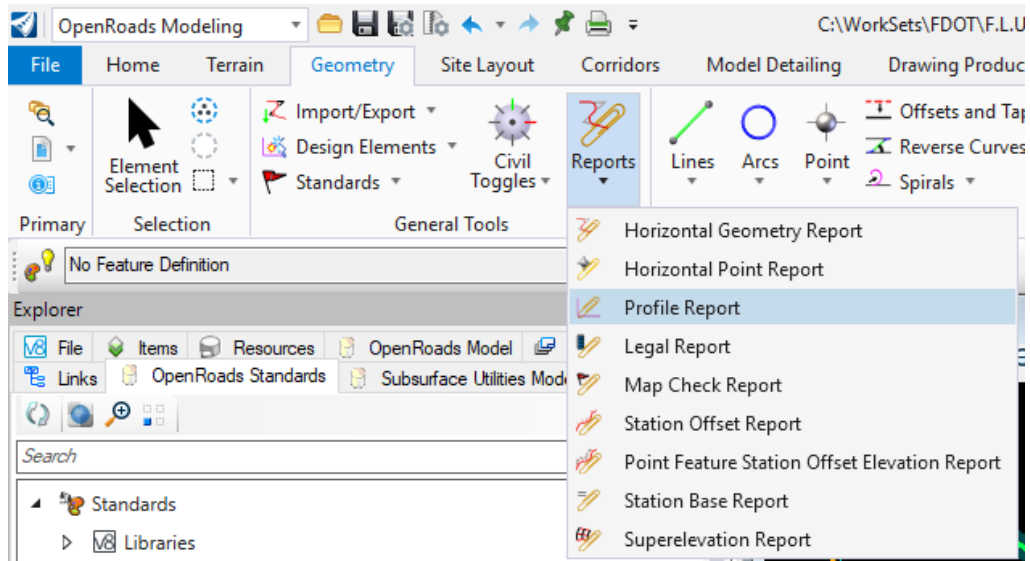
- On the Profile Complex by Element tool setting, enter the **Feature Name**. This is the *Profile Name* assigned to the Profile. Switching the method should run the entire element if all elements are within the tolerance of Maximum Gap.



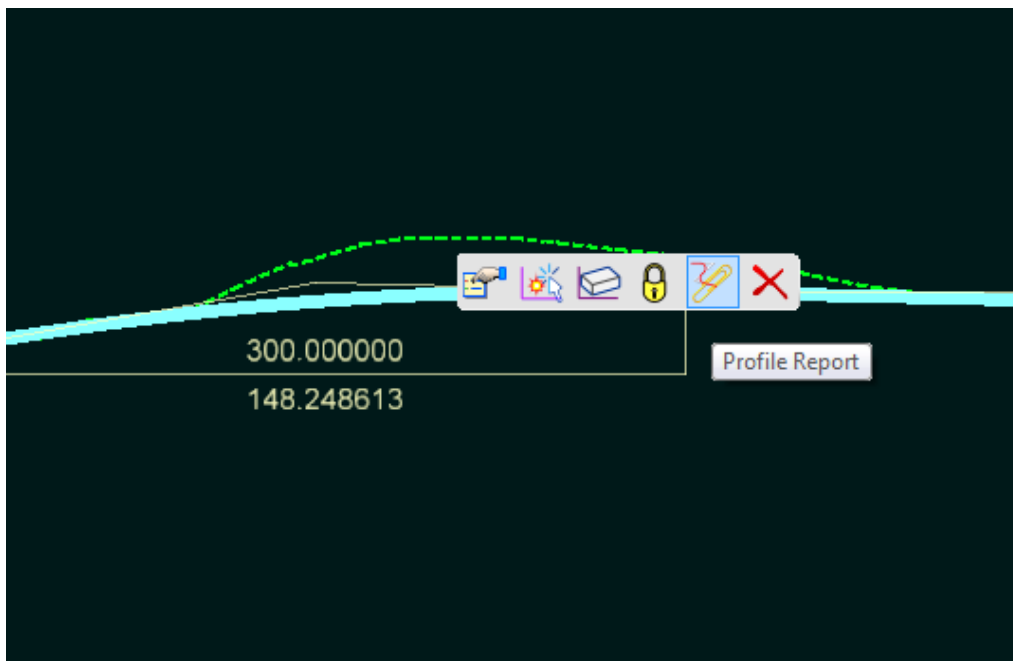
➤ **Profile Report**

1. Use the *Geometry Tab and the General Tolls Group*, to select the **Profile Report** tool located within the Reports tool Group.

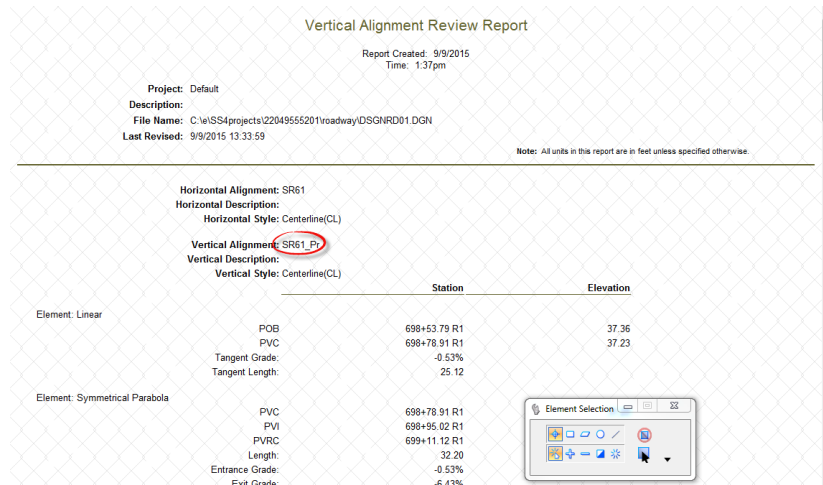
OPENROADS MODELING>GEOMETRY>GENERAL TOOLS>Reports>Profile Report



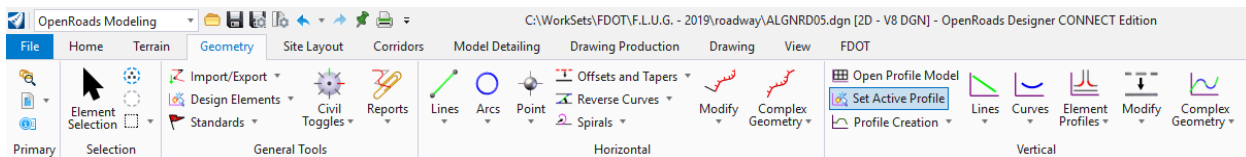
<OR> With the *Profile* selected, hover over the element to display the Context Menu and select the **Profile Report**.



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



- 3. Use *Geometry Tab* and the *Vertical Group*, to select the **Set Active Profile** tool.



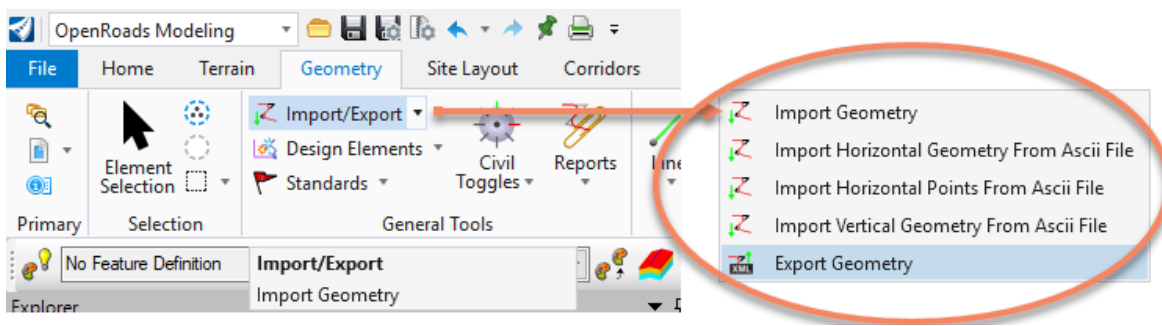
<OR> With the **Profile** selected, hover over the element to display the Context Menu and select **Set Active Profile**.

Note The ALGNRD file is your single source for both your Horizontal and Vertical Geometry. This file is now more important than ever in your design. This file will be referenced in to your DSGNRD and MODLRD files to control the 2D Planimetrics (DSGNRDxx.dgn) and your Corridor (MODLRDXX.dgn).

➤ **Optional Export Profile**

- 1. Use the *Geometry Tab* and the *General Tools Group*, to select the **Export Geometry** tool located within the Import/Export tool Group.

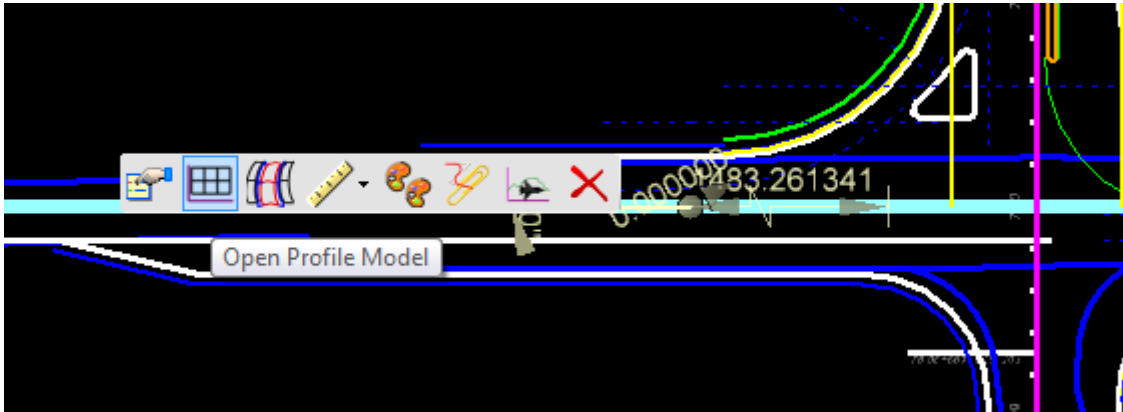
OPENROADS MODELING>*GEOMETRY*>*GENERAL TOOLS*>*Import/Export*>**Export Geometry**



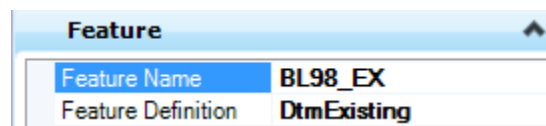
- Always check that the profile has a **Feature Name** before saving to the LandXML file.
- 2. Select the **SR61 Horizontal Alignment** and save as SR61_Alignment.xml for a backup.

Exercise 3.4 *BL98 Profile*

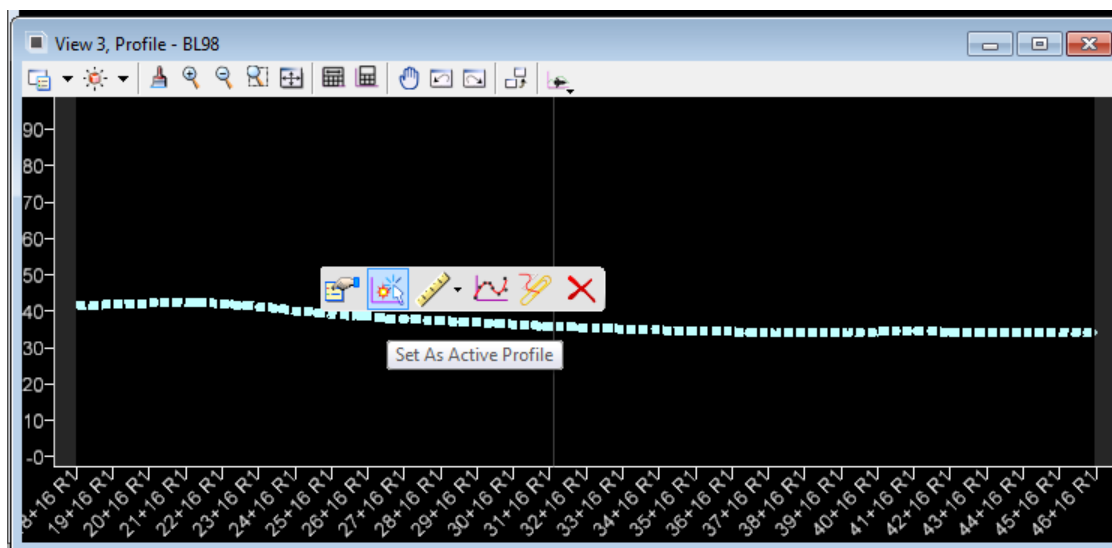
1. With the **BL98** alignment selected in the *Plan View*, hover over the element to display the Context Menu and select the **Open Profile Model**. (Optional Method - Using the Right Click Menu under View Control navigate and pick **2 Views Plan\Profile** then follow the prompts to setup a Plan and Profile views.)
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**.

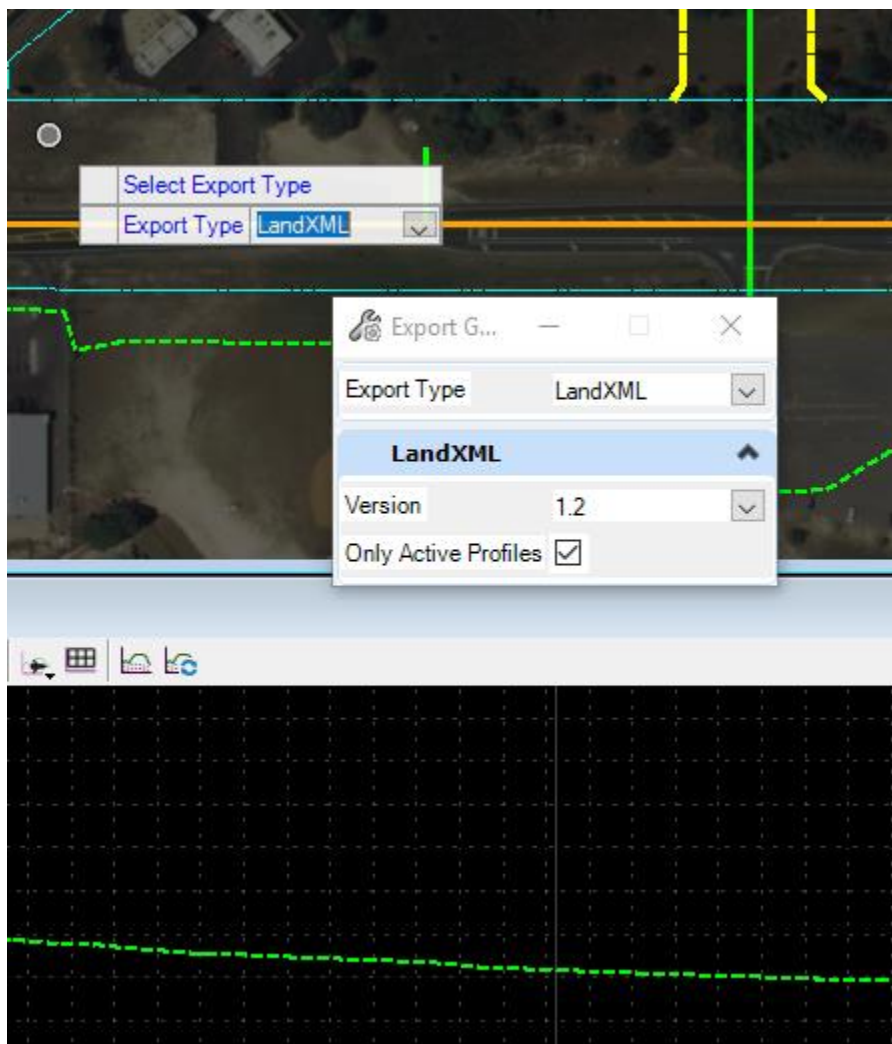
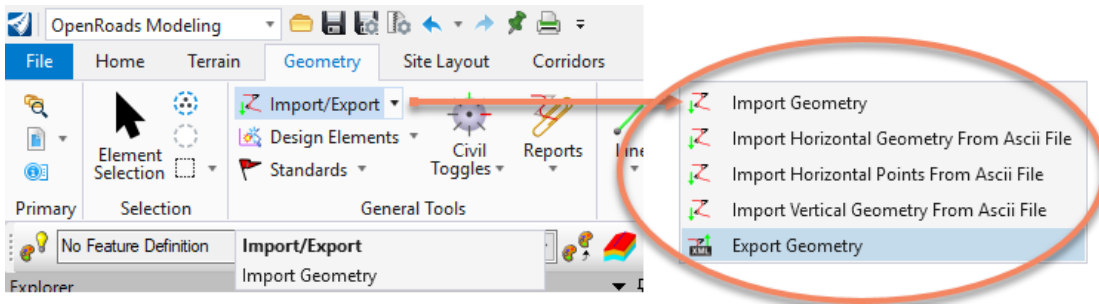


5. With the **Profile** selected, hover over the element to display the Context Menu and select **Set As Active Profile**.



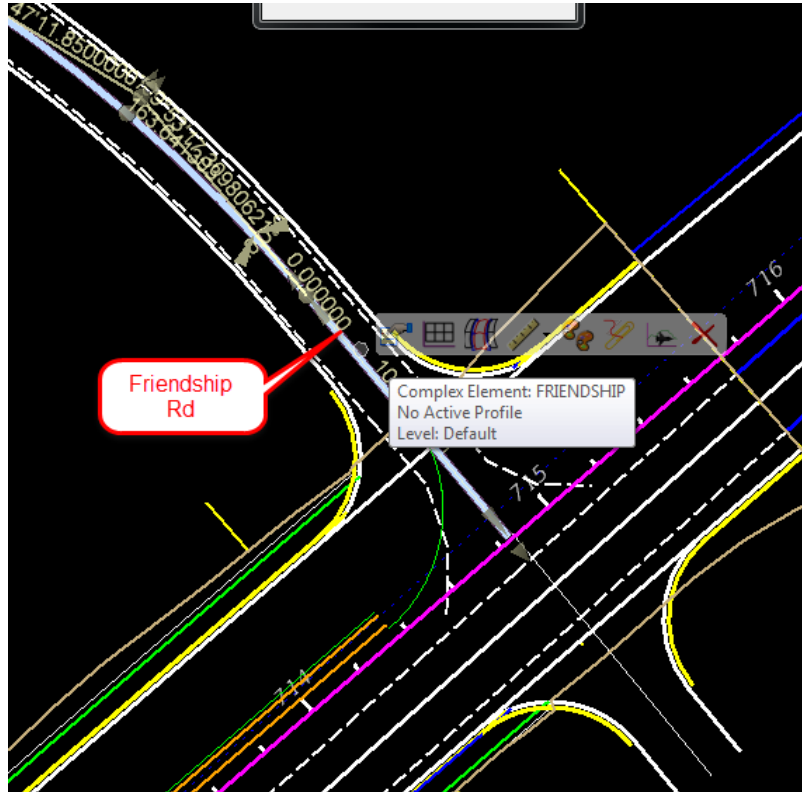
6. Use the *Geometry Tab and the General Tools Group*, to select the **Export Geometry** tool, select the **BL98_EX** plan element and save as a LandXML file. (Ex. BL98_EX.xml).

OPENROADS MODELING>GEOMETRY>GENERAL TOOLS>Import/Export>Export Geometry



Exercise 3.5 Friendship Profile

1. With the **Friendship alignment** selected in the *Plan View*, hover over the element to display the Context Menu and select the **Open Profile Model**. (Optional Method - Using the Right Click Menu under View Control navigate and pick **2 Views Plan\Profile** then follow the prompts to setup a Plan and Profile views.)



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

