FDOTConnect for OpenRoads Designer

Roadway Design 3-D Modeling COURSE GUIDE

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State of Florida Department of Transportation

FDOTConnect

OpenRoads Designer Roadway Design 3-D Modeling

Course Guide

2024

PRODUCTION SUPPORT / CADD OFFICE TALLAHASSEE, FLORIDA http://www.fdot.gov/cadd

FDOTConnect

for

OpenRoads Designer Roadway Design 3-D Modeling

Description

This is a 2-day training course to include fundamentals of 3D Modeling. Participants will continue to learn the Bentley OpenRoads Designer Connect Edition tools for design and modeling within the FDOTCONNECT WorkSpace. Several advanced concepts and technologies will be introduced including:

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

Objectives

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

<u>Audience</u>

• 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 concepts and a solid understanding of the engineering necessary to design a Roadway.

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

FDOT Roadway Design and 2-D Baiscs.

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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.

This training guide was developed with FDOTConnect10.12. Any reference to FDOTConnect within this document should indicate either FDOTConnect10.12 or the currently supported FDOTConnect version.

COURSE OBJECTIVES

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

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

EXPECTATIONS – WHAT THIS COURSE PROVIDES

This course provides a standard workflow for designing a project with Bentley Systems 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.

Workset: 22049555201 - $(\leftarrow$ Help New Help Contents **OpenRoads Designer Help Documentation** Open Save Bentley Institute Link to Bentley Institute Training Save As Save Settings -----OpenRoads Designer Community Link to OpenRoads Designer Community Send Mail A - - A -\chi Product Support Link to Bentley Product Support Tools Settings Check Product Updates Check for OpenRoads Designer Updates Properties **RSS Reader** Open RSS Reader Print Import à ReadMe Display Product Requirements, Installation Guide and Legal Notice Export **Civil Tools** About OpenRoads Designer Display information about the installed version of OpenRoads Designer Publish iModel Help Feedback

FILE>HELP

DOCUMENT STYLE

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

Item	Convention	Example
Menu names, Commands, and Ribbon Navigation	Bold (Names separated	 General form is Workflow > Tab > Group > Tool File > Open
	with > symbol)	File > Settings > User > Preferences
		 OpenBridge Modeler > FDOT > Actions > Create File
Dialog actions	Bold	Click the Apply button.
		Click the Graphic Select button to the right of the <i>Horizontal Alignment Include</i> box.
Dialog field names	Italic	• 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.
Key-ins	Bold	• Key in Hemfield Road in the <i>Alignment Name</i> field.
File names	Italic	Open the file <i>Working Graphics.dgn</i> in the C:\Bentley Training\GEOPAK 101\Project Setup\ Practice\ folder.
File paths	Not Italic or Bold	Open the file <i>Working Graphics.dgn</i> in the C:\Bentley Training\GEOPAK 101\Project Setup\ Practice\ folder.

FILE TYPES

The Bentley Systems OpenRoads Technology road design process 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 some file types which can be imported or exported (i/o) with OpenRoads Technology.

File Type Description:

- <u>Surface.tin</u> (*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.xml (i/o)** A text based file, LandXML format, which stores civil data such as surfaces, breaklines, or horizontal and vertical alignments
- **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.
- <u>**Template Library.itl** (i)</u> 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: <u>https://learn.bentley.com</u>

Bentley Product OpenRoads:

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

YouTube:

Bentley OpenRoads Videos are available on a variety of topics: <u>http://www.youtube.com/user/</u> 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: <u>http://www.fdot.gov/cadd/</u>

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

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

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

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

COURSE SUPPORTING FILES

The exercises for each chapter are independent of one another and can be used without having to complete the exercises in previous modules. A Training_Files folder is provided in each of the discipline folders of the dataset which contain completed files for each chapter. All files used in this course are located also at this link:

https://www.fdot.gov/cadd/downloads/documentation/fdotconnecttraining/fdotord/fdotconnect-roadwaydesign-3d-modeling

INTRODUCING A NEW WORKSPACE

FDOTCONNECT PREDEFINED SETTINGS



DESIGN FILE SETTINGS:

🛃 Design File Settings			×
Category Active Angle	Station Settings		^ ^
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Angle Readout	Format Delimiter	+	
Axis	Precision	0.12	
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Color Fence	Radius Settings		*
Grid	Degree Of Curve Method	Arc	
Isometric	Degree Of Curve Length	100.00'	
Locks	Radius Toggle Char	d	
Snaps Stream	Spiral Settings		*
Views	Spiral Type	Clothoid	
Working Units	Profile Settings		*
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	Slope Format	Percentage	
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	Focus Item Description		
	Select category to view.		
		<u>0</u> K	Cancel

FDOTCONNECT WORKSPACE PREFERENCES:

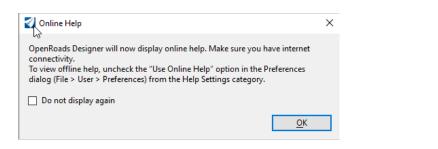
Category Database	Name for Preferences: Default Preferences	
Descartes		
Help Settings	Subsurface Utilities	* ^
Input Language	Manipulator Settings	*
Look and Feel	Manipulator Size 25.0000	
Mouse Wheel	Normal Color [0,0,255]	
Operation	Read-Only Color [255.0.0]	
Position Mapping	Selected In Property Pane Color [128,255,255]	
Raster Manager	Selected Color [0,192,0]	
Reference	Manipulator Font Arial	
Render	Manipulator Font Scale 1.3000	
	Manipulator Transparency 30.0000	
Ribbon	Use Shaded Manipulators True	
Spelling		
Tags	Survey Decorators	*
Text		
Update Settings	Aquaplaning Settings	*
View Options	Currentlevetien Cettines	
View Options - Civil	Superelevation Settings	*
	Survey Locator	* *
	Focus Item Description:	
	For more options, click on the category list at left.	

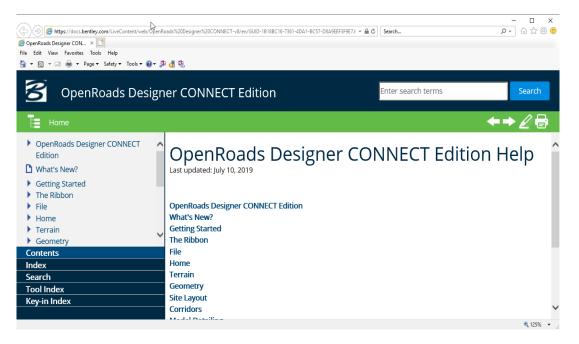
FDOTCONNECT FUNCTION KEYS

	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.

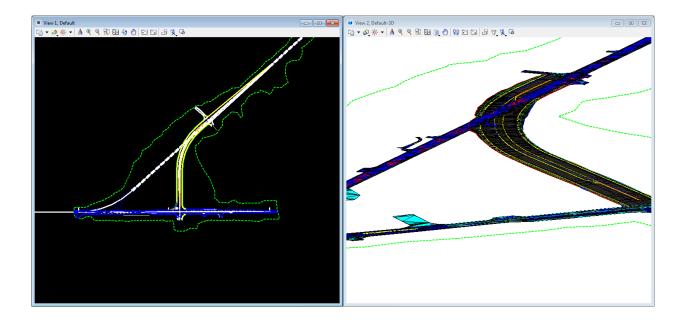
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- 2 0)	
Function Keys	;	
	□ <u>A</u> lt □ <u>S</u> hift F1 ▼	
Key: F1		
Action: he	elp	
Кеу	Action	^
F1	help	
F2	vba run [ViewSet] Module1.TwoView3D	
F3	view on 3; view off 4; window arrange	
F4	vba run [ViewSet] Module1.FourView	
F5	vba run [ViewSet] Module1.SetActiveModelToDrawLast	
F6	choose none	
F7	vba run [ViewSet] Module1.ToggleViewConstructions;	
F8	vba run [AccuDraw] Toggle.ToggleOnOff	
F9	dialog reference toggle	
F10	leveldisplay dialog toggle	
F11	dialog explorer toggle	
F12	corridor templatelibrary open	~
<		>
	Save Can	ncel

Function Key F1 - Civil Help

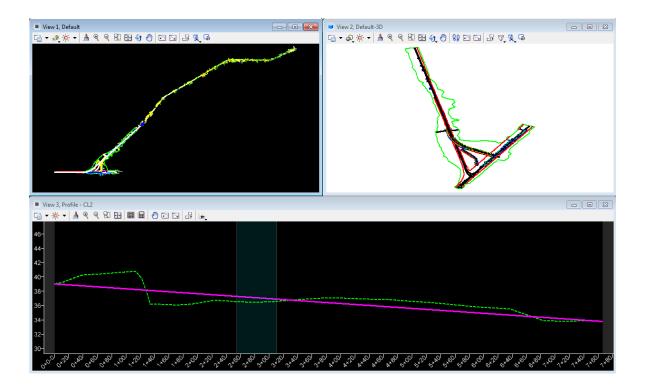




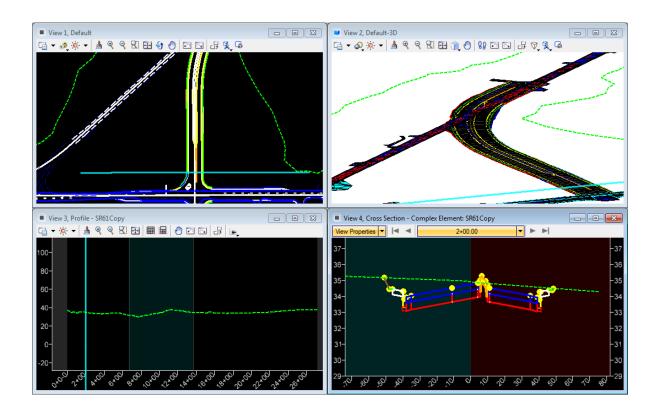
Function Key F2 - Open and Fits Two Views Setup; View 1- 2D Plan, View 2-Isometric.



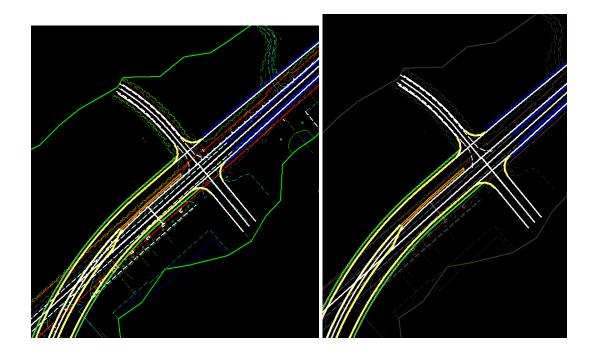
Function Key F3 – Opens View 3; Closes View 4 and Arranges Views.



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



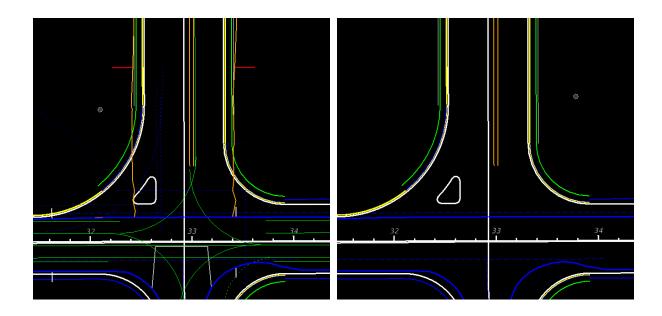
Function Key F5 - Toggle Dim References.



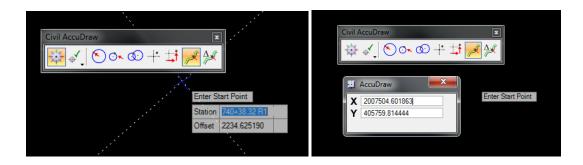
Function Key F6 – Resets Out of Any Ongoing Commands.



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



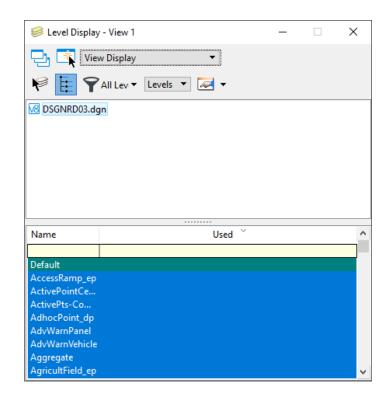
Function Key F8 – Toggles Between MicroStation AccuDraw and Civil AccuDraw.



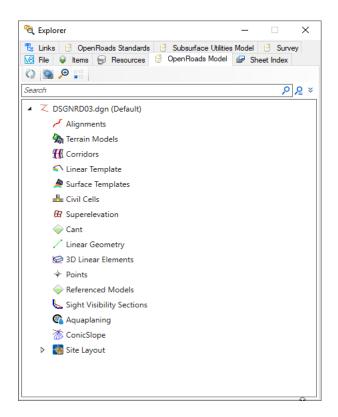
Function Key F9 - Toggles References Dialog Open\Close.

References (0 of 0 unique, 0 displayed)	_	□ ×
Tools Properties		
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Nesting Depth: Display Overrides: New Level Display:		
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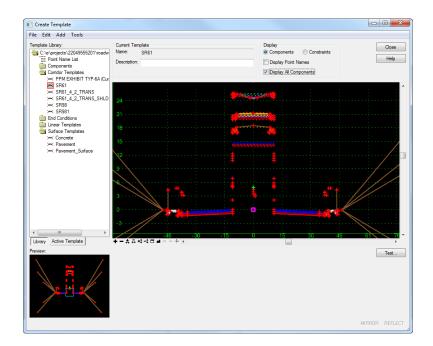
Function Key F10 - Toggles Level Display Dialog Open\Close.



Function Key F11- Toggles Explorer Dialog Open/Close.



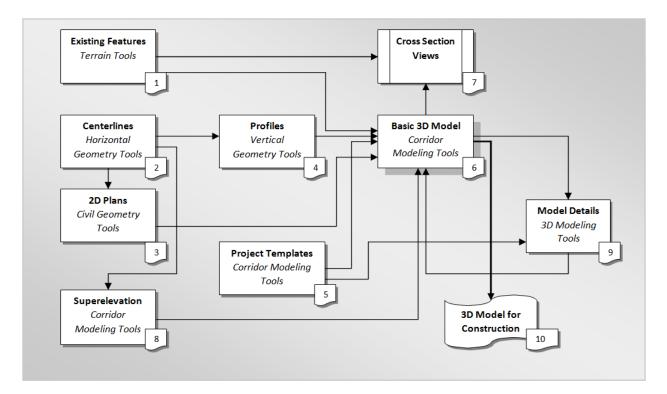
Function Key F12- Corridor Modeling, Opens Create Template Dialog.



FDOTCONNECT USER CONFIGURATION VARIABLES

gory	∧ Search			×
	Variable Name	Description	Level Flags	^
			-	
5	DWGRDL_DIR	DWG Redline Location	Undefined	<u>N</u> ew.
iles	MS_ADDINPATH	Addins	WorkSpace	
ase	MS_ADDIN_DEPENDENCYPATH	AddIn Dependencies	WorkSpace	
n Applications	MS_DEF	Design Files	System	Edit.
n History	MS_DGNLIBLIST	DGN Library List	WorkSpace	Edit
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	MS_DGNLIBLIST_LINKS	DGN Library List for Link Set files.	System	
Recorder	MS_DGNLIBLIST_PRINTING	DGN Library List for Print Styles.	WorkSpace	
qu	MS_DGNLIBLIST_RENDER	DGN Library List for Rendering tasks.		
	MS_DGNLIBLIST_TEXTFAVORITES	Process the DGNLIBs for available Te		
tion	MS_DGNLIBLIST_TEXTSTYLES	Process the DGNLIBs for available Te	· · · · ·	
Cloud	MS_ECFRAMEWORK_SCHEMAS	ECSchema Search Path	System	
ry Search Paths	MS_FILTER_LIB_DIR	Filter Library Path	System	
ng	MS_GUIDGNLIBLIST	User Interface DGN Library List	WorkSpace	
tion	MS_ICONBATH	Icon Library List	System	~
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ence	C:\FDOTConnect\WorkSpaces\FDO	[\Standards\Dgnlib*.dgnlib ^		e used to find Levels, Line Styles,
ering/Images	C:\Worksets\FDOT\44143355201\Sta	ndards\Dgnlib*.dgnlib		Aultiline Styles, Element Template
ts	C:\FDOTConnect\Organization-Civi	\FDOT\Dgnlib\Featu\FDOT_SUE*.dgnlib		port Definitions, Drawing Seeds,
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11 LIIV	v <			

FDOTCONNECT DESIGN AND 3D MODELING OVERVIEW



GENERAL WORKFLOW AND CHAPTER OUTLINE

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

RECOMMENDED MICROSTATION SETTINGS

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

LAUNCHING FDOTCONNECT FOR OPENROADS DESIGNER

FDOTConnect can be launched from the icons located in the FDOTConnect folder on your desktop. The first time it is launched, it is important to select the Custom Configuration and the FDOT WorkSpace from the WorkSpace dropdown.

1. Find the FDOTConnect launch icons on your desktop or locate the FDOTConnect folder on your desktop.



 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.



3. In the Configuration section, select *Custom Configuration*, then in the *WorkSpace* drop down menu, select *FDOT*.

Configuration :: Seamples Configuration :: Configuration to tentity Samples :: Custom Configuration Manage Configuration Recent WorkSets	OpenRoads Designer CE Workser No WorkSpace No WorkSet Front Custom Configuration Root Foot Foot
You haven't opened any files from a WorkSet recently. Browsk for files, create a new file, or select another WorkSet from the drop- down menus. The WorkSpace No WorkSet	No WorkSpace Center WorkSpace Configuration Assistant Wid WorkSet Wizard

4. From here, you can now create a new WorkSet, this is done by selecting the *WorkSet* drop down menu, and select **Create WorkSet**.

Configuration	OpenRoads Designer CE
:: SEXAMPLES Configuration Configuration for Bentley Example	WorkSpace WorkSet
:: 🤰 Custom Configuration	Recent Fi Search D
Manage Configuration	0_WORKSET_TEMPLATE You haven't start by clicking on Browse.
Recent WorkSets You haven't opened any files from a WorkSet recently.	Brows
Browse for files, create a new file, or select another WorkSpace or WorkSet from the drop- down menus.	
No WorkSpace No WorkSet	+ Create WorkSet.

5. Give the new *WorkSet* a *Name* and *Description* and be sure to select the **0_WORKSET_TEMPLATE** as the WorkSet Template. Click "**OK**" after filling in the *Create Workset* dialog.

Name:	NEW_TEST_WORKSET	
Description:	New Test WorkSet for Training Example	
Template:	0_WORKSET_TEMPLATE	ders Only
Add a Custom Property 🔹		
Folder locations		
Root Folder:		
Design Files:		
Standard Files:		
Standards Subfolders:		
ProjectWise Projects		
(click Browse to attach a Projec		Browse

6. 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 **FDOT Create File** tool.

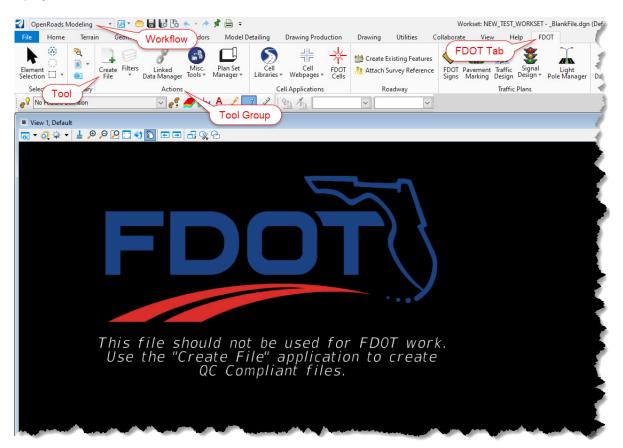
7. From the OpenRoads Designer file *Open* dialog, select **Browse** to browse the contents of your new WorkSet.

OpenR	Roads Designer CE
WorkSpace FDOT *	WorkSet NEW_TEST_WORKSET
Recent F	iles
You haven't	t opened any files recently. To browse for a file, start by clicking on Browse
Brow	se New File

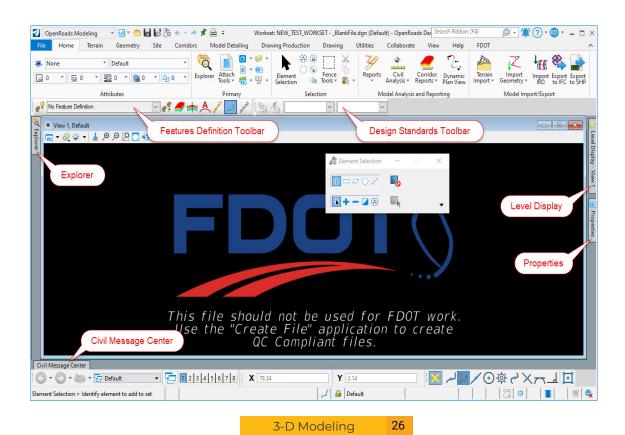
8. Locate _*Blankfile.dgn* at the root of your WorkSet folder structure. Select this file and then select **OPEN** to open it.

🕼 Open			×
$\leftarrow \rightarrow \checkmark \uparrow$ (C:)	> Worksets > FDOT > NEW_TEST_WORKSET >	✓ Ö Search NE	W_TEST_WORKSET
Organize 👻 New folder			EE - 🔟 🕜
Vorksets	Name	Date modified	Туре
V FDOT	Structures	6/17/2024 11:27 AM	File folder
> 0_WORKSET_TEMPLATE	Survey	6/17/2024 11:27 AM	File folder
V NEW_TEST_WORKSET	Symbology	6/17/2024 11:27 AM	File folder
Meta_Info	TrafficOperations	6/17/2024 11:27 AM	File folder
3DDeliverables	Utilities	6/17/2024 11:27 AM	File folder
Administrative	SlankFile.dgn	6/17/2024 11:27 AM	Bentley MicroStati
Administrative	v <		>
File	▼ Directory ▼		
File name:		✓ CAD Files	s (*.dgn;*.dwg;*.dxf)
		Options Open	Cancel
		options	- Cancer

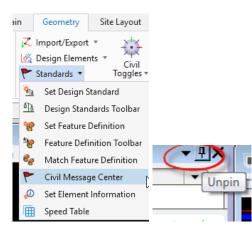
9. When the file opens, you can locate the FDOT ribbon by selecting the OpenRoads Modeling workflow from the drop-down menu at the top left of the screen. The FDOT tab is located at the far right of tab row. Select Create File to launch the Create File tool from the Actions tool group for creating FDOT 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.



 Verify that the *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.

OpenRoads Modeling DenRoads Modeling DenRoads Modeling DenRoads Modeling DenRoads Modeling DenRoads	Corridors Model Detailing	
	Explorer Attach Tools * 🚳 * 🛄 *	
Attributes Group	Primary	Unpin

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



5. Many of the dialog settings are stored in user preferences defined in xml data files located in the users data folders i.e. C:\Users\rd964vd\AppData\Local\Bentley\OpenRoadsDesigner\10.0.0\prefs.

TEMPLATE DESIGN

<u>OVERVIEW</u>

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

TEMPLATE BASICS

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

APPLYING TEMPLATES

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

CREATE TEMPLATE DIALOG

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

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

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

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

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

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

CURRENT TEMPLATE WINDOW

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

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

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

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

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

TEMPLATE PREVIEW WINDOW

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

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

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

DYNAMIC SETTINGS

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

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

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

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

XY = key-in absolute coordinates

- <u>**DL</u>** = key-in delta coordinates from last point placed (defaults to the dynamic origin if it is the first point of a component)</u>
- **<u>HS</u>** = key-in horizontal delta distance and slope from last point placed
- VS = key-in vertical delta distance and slope from last point placed
- OL = key-in delta coordinates from dynamic origin
- **OS** = key-in horizontal delta distance and slope from dynamic origin

<u>COMPONENTS</u>

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

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

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

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

MERGING COMPONENTS

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

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

EXERCISE OVERVIEW

Exercise 1.1	Create Template	31
Exercise 1.2	Creating a Blank Template Library (optional)	
Exercise 1.3	Create Default Template Library	
Exercise 1.4	Using the Template Library Organizer	35
Exercise 1.5	Naming Project Templates	
Exercise 1.6	Creating a Resurfacing Template	40
Exercise 1.7	Editing Templates	47
Exercise 1.8	Add a Component Switch to the RRR98 Template (optional)	60

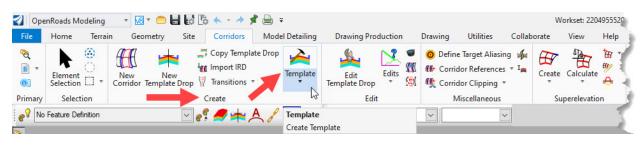
EXERCISE 1.1 Create Template

This exercise opens the proposed roadway 3D Model file, *MODLRDMainline61.dgn*, with Open Roads Technology and using the FDOTConnect WorkSpace and WorkSet configuration. The *Create Template* dialog displays and a new Template Library file created for the WorkSet in the WorkSet Roadway folder. This new project Template Library is the container for all the components and templates used to develop the design model for the project design.

- 1. Open the _BlankFile.dgn file of the C:\Worksets\FDOT\22049555201 folder of the WorkSet.
- 2. Go to the FDOT ribbon and choose Create File.
- 3. Create a new *MODLRDMainline61.dgn* file. Select **Wakulla** County. Choose **Create/Open File.** If the file already exists, select **OK** to overwrite the existing file. (*See following page.*)

orkset:	C:\Worksets\FDOT\22049555201 ~				\sim	
iscipline:	ROADWAY					
le Group:	Roadway De	esign Files			~	
le Type:						
Ba	se Filename	Descrip	otion			^
AE	RIAL	Aerial A	tachment Flle			1
ALC	GNRD	Alignme	nt Geometry			
BK	SWRD	Back-of	-Sidewalk Profile			
DS	GNRD	2D Plan	(Proposed)			
	DRD	Intersec	tion-Interchange Deta	ils		
	GRD		n Areas			
	DLRD		eling File (Existing/Pro	posed)		
	DSRD	-	Profile Layout			
	DSRD	-	Quantity Computation Shapes-Calculations Right of Way Details for Roadway			
	/DTRD DSRD	-				
ICI	JSKU	Tempor	ary Traffic Control Des	ign		Y
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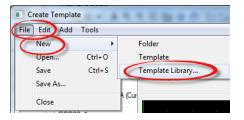
4. Navigate to the *Corridors* Tab of the Ribbon (in the *OpenRoads Modeling* workflow), then using the *Create* tool group select the **Create Template** icon to launch the **Create Template** tool.



Hint: Use the F12 function key to access the Create Template Dialog.

EXERCISE 1.2 Creating a Blank Template Library (optional)

1. From the *Create Template* dialog select **File > New > Template Library**.



2. Navigate to the WorkSet Roadway folder, C:\Worksets\FDOT\22049555201\Roadway.

→ * ↑ → Th	is PC → OSDisk (C:) → Worksets → FDC	DT > 22049555201_CE >			√ Ö	Search 22049555201_CE	۶
	Name	Date modified	Туре	Size			
Quick access	meta_info	5/28/2020 3:35 PM	File folder				
Desktop 🖈	Administrative	5/28/2020 3:05 PM	File folder				
- Downloads 🛛 🖈	Architecture	5/28/2020 3:05 PM	File folder				
Documents 🛛 🖈	BIM	5/28/2020 3:05 PM	File folder				
📰 Pictures 🛛 🖈	BridgeInspection	5/28/2020 3:05 PM	File folder				
03 FDOT Connect O	calculations	5/28/2020 3:05 PM	File folder				
GUI	cell	5/28/2020 3:05 PM	File folder				
roadway	concepts	5/28/2020 3:05 PM	File folder				
survey	Construction	5/28/2020 3:05 PM	File folder				
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Pictures	Landscape	5/28/2020 3:05 PM	File folder				
Videos	lighting	5/28/2020 3:05 PM	File folder				
🔒 OSDisk (C:)		5/28/2020 3:05 PM	File folder				
Network	Materials	5/28/2020 3:05 PM	File folder				
TVELWOIK	out	5/28/2020 3:05 PM	File folder				
	permits	5/28/2020 3:05 PM	File folder				
	Planning	5/28/2020 3:05 PM	File folder				
	Pre-estimates	5/28/2020 3:05 PM	File folder				
	Data created: 5/28/2020 3	5/28/2020 3:49 PM	File folder				

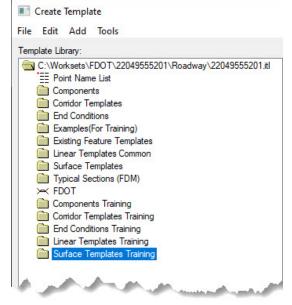
3. Enter the new Template Library File Name, 22049555201. and click Save.

Save Template Lib	rary As	ALCO/ DOM:	×
Save in:	👔 roadway 👻	G 🤌 📂 🛄 -	
(Ang	Name	Date modified	Туре
	\mu aerials	11/6/2014 6:01 AM	File folder
Recent Places	📔 eng_data	5/12/2014 4:43 PM	File folder
	\mu projdbs	11/6/2014 6:01 AM	File folder
	22049555201.itl	11/7/2014 1:17 PM	ITL File
Desktop			
Libraries			
Computer			
	• III		+
	File name: 22049555201.itl	-	Save
Network			
	Save as type: Template Libraries (*.itl)	▼	Cancel
			Help

4. Create new folders in the Project Template Library.

. c	reate Templat	te a a	1.	4.4	
File	Edit Add	Tools			
	New	۱.	Folder	Display	Close
	Open	Ctrl+O	Template	Components O Constraints	
	Save	Ctrl+S	Template Library	Display Point Names	Help
	Save As	L		Display All Components	
	Close				

- 5. Create and re-name five folders. Select the root folder and repeat steps to include all the following folders:
 - Components Training
 - Corridor Templates Training
 - End Conditions Training
 - Linear Templates Training
 - Surface Templates Training



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

EXERCISE 1.3 Create De

Create Default Template Library

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

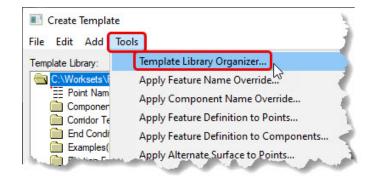
The Components, End Condition, Linear Templates, Surface Templates folders contain parts of the full Templates and is obtained from the FDOTConnect Template Library.

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

- From the Create Template dialog, select File > Open and navigate to the FDOTConnect WorkSpace folder C:\FDOTConnect10.12\Organization-Civil\FDOT\Template Library directory and choose the EmptyProject.itl Template Library.
- 2. From the *Create Template* dialog, select **File > Save As.** If Exercise 1.2 was performed, overwrite the blank 22049555201.it/ Template Library created earlier.

EXERCISE 1.4 Using the Template Library Organizer

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



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

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

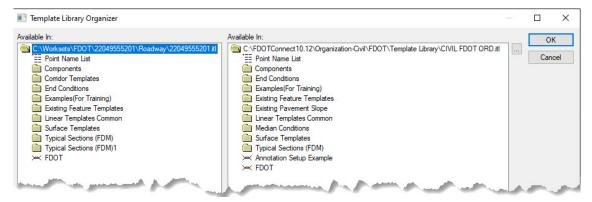
Template Library Organizer		9 <u>—</u> 19		×
Available In: C:\Worksets\FDOT\22049555201\Roadway\22049555201.itl	Available In:	-	Can	
a source and a source of the	marine marine and and a		الم ا	

3. From Open Template Library, navigate to the CIVIL FDOT ORD.itl

This is located in the FDOTConnect WorkSpace in the following folder location C:\FDOTConnect10.12\ Organization-Civil\FDOT\Template Library folder *CIVIL FDOT ORD.itl*. Click **Open**.

🔸 🕇 📙 « FDOTConn	ect10.12	> Organization-Civil > FDOT > Te	emplate Library > v さ	Search Templat	e Library 🛛 🔎
Organize 👻 New folder					== - 💷 🤇
Seed	^	Name	Date modified	Туре	Size
Sight Visibility		help	6/13/2024 8:26 AM	File folder	
StandardsData		CIVIL FDOT ORD.itl	11/15/2023 6:37 AM	ITL File	6,643 KB
Superelevation		EmptyProject.itl	8/24/2023 3:49 PM	ITL File	3,463 KB
Template Library					
help					
VBA	~				
File	-	Director	y · ▼		
File name: C	IVIL FDC)T ORD.itl	~	.itl	~
				Open	Cancel

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

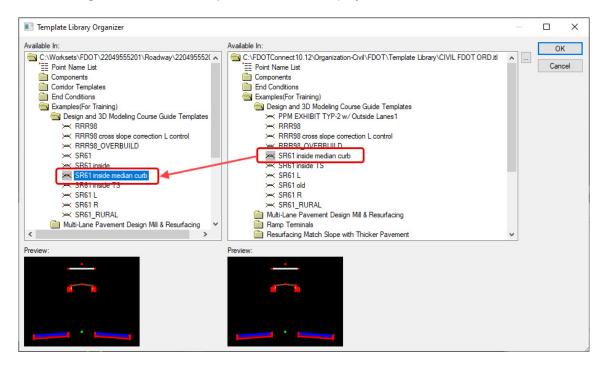


- 5. From the *Template Library Organizer*, navigate to the Examples (For Training) folder. Open the folder by double clicking on it, select the **SR61 inside median curb** template.
- 6. By selecting the template a preview will show in the *Preview* window below the directory view.

C:\FDOTConnect10.12\Organization-Civil\FDOT\Template Library\CIVIL FDOT ORD.itl	~
Test Point Name List	
Components	
End Conditions	
Examples(For Training)	
💼 Design and 3D Modeling Course Guide Templates	
→ PPM EXHIBIT TYP-2 w/ Outside Lanes1	
× RRR98	
→ RRR98 cross slope correction L control	
→ RRR98_OVERBUILD	
SR61 inside median curb	
🖂 SR61 inside TS 🛛 🗟	
🛏 SR61 L	
🛏 SR61 old	
🛏 SR61 R	
🛏 SR61_RURAL	
🚞 Multi-Lane Pavement Design Mill & Resurfacing	
Ramp Terminals	
Resurfacing Match Slope with Thicker Pavement	~



7. Drag the **Template** from the right side to the left side onto the **Examples(For Training) > Design and 3D Modeling Course Guide Templates** folder for the project.



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

CIVIL FDOT ORD Template Location	Project Folder Location
Examples (For Training)/ Design and 3D Modeling Course Guide Templates	Entire folder to Examples (For Training)/Design and 3D Modeling Course Guide Templates
End Conditions/Parts	Entire Parts folder to End Conditions
Component/Pavement/Resurfacing (Mill- ing, Overbuild and Overlay)	Entire Resurfacing (Milling, Overbuild and Overlay) folder to Components
Component/Curb & Gutter	<i>Curb Type E Inside</i> to Linear Templates Com- mon
Linear Templates Common	Outside Lane w/ Paved Shoulder to Linear Tem- plates Common
Linear Templates Common	Outside Lane w/ Type F Curb to Linear Tem- plates Common
Surface Templates	Pavement Asphalt to Surface Templates

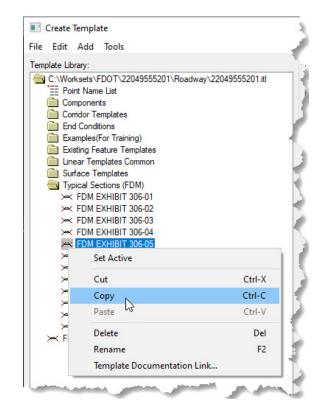
If template exists still add it and see that it will increment the template that you are adding (the program will add a 1 to the end of the template added.)

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

EXERCISE 1.5 Naming Project Templates

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

- NOTE A consistent project template naming convention is valuable as the design progresses. As more are added to the template design, create a backup copy and add a suffix to the name "_1, _2, _3, etc.
- 1. In the Typical Sections (FDM) folder, right click on the **FDM EXHIBIT 306-05** template and select **Copy**.



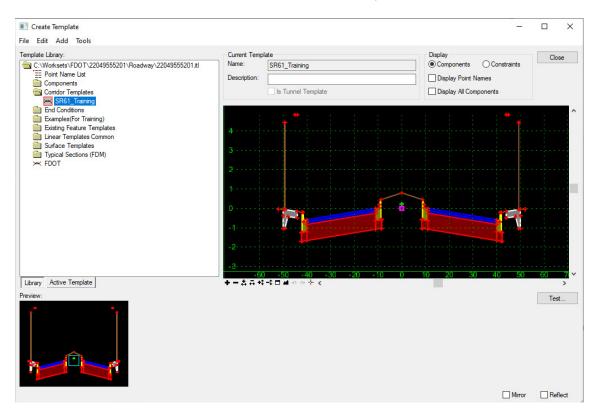
2. Right click on the *Corridor Templates* folder and select **Paste**. Right click on the copied **FDM EXHIBIT 306-5** Template and select **Rename**.

mplate Libra	iy:	
	ets\FDOT\22049555201\Road	way\22049555201.itl
	Name List	
Comp	onents lor Templates	
	DM EXHIBIT 306-05	
📄 End	Set Active	
📄 Exar		
Exist	Cut	Ctrl-X
Line Surfa	Сору	Ctrl-C
🛅 Турі	Paste	Ctrl-V
	Delete	Del
×1	Rename	F2
	Template Documentati	on Link
	DM EXHIBIT 306-06	
> ≍ F	DM EXHIBIT 306-07	
>=< F	DM EXHIBIT 306-08	

3-D Modeling

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3. Change the *Name* of the Template to **SR61_Training**. Right click on the **SR61_Training** Template and select **Set Active**. A small red box will indicate the Active Template.



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

EXERCISE 1.6 Creating a Resurfacing Template

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

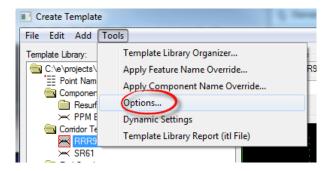
1. Right click on the *Corridor Templates* folder and select **New > Template**.

Edit Ad	dd Tools		
late Library	r: -		
C:\Workse	ts\FDOT\22049	555201\Roadwa	y\22049555201.itl
E Point N			
Compo			
	r Templates		Folder
	New	2	1010111
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Exis	Сору	Ctrl-C	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Line Sur	Paste	Ctrl-V	
Тур	Delete	Del	
× FD(Rename	F2	

- 2. Right click on the New Template1 and select **Rename**. Change the Name to RRR98_Training and Select **Enter** to store the name.
- 3. Right click again on the RRR98_Training and select **Set Active**.

emplate Library:		
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= Point N	s\FDOT\22049555201\Roa	idway \22049555201.iti
Compor		
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	Rename	F2
	Template Documentat	tion Link

- Before Adding Components, Open Preference File to Add a Prefix to the Point Names.
- 1. Select the Tools > Options from the Create Template dialog to launch the Template Options dialog.



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

Template Options	×	
Naming Options Component Seed Name: O From Feature Definition	OK Cancel Preferences	×
✓ Apply Affixes Left: LT	Name: Default FDOT	Close Load Save
Step Options X: 0.10 Y: 0.10 Slope: 0.000%		Save As Delete Rename

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

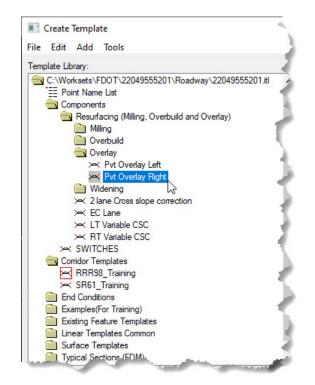
NOTE The X and Y Step value 0.1000 functions similar to a grid lock in MicroStation when placing the components.

- a. Change the Feature Definition to Linear > Roadway Design > Template Points > TemplateMisc_ pm.
- b. Uncheck Apply Affixes.

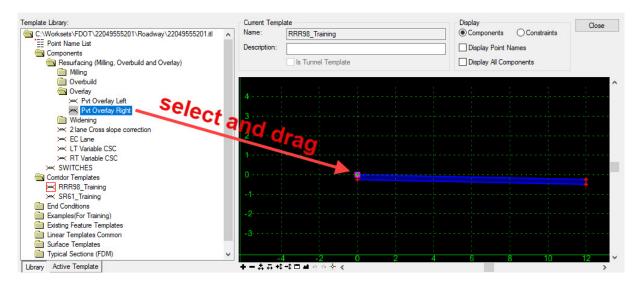
Dynamic Settings			×
X: 0.0000	Step:	0.1000	
Y: 0.0000	Step:	0.1000	
Point Name:			~
Feature Definition:	t∕ sign\	Template Points\TemplateMi	isc_pm
Apply Affixes	Linear	Roadway Design\Templat	e Points\TemplateMisc_pm
hs=	~		
	Set Dynam	iic Origin	

Add Components

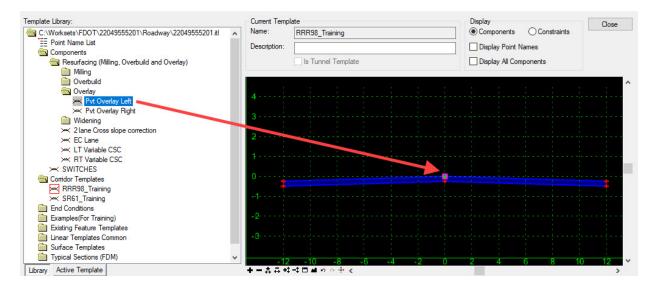
 Navigate to Components > Resurfacing (Milling, Overbuild and Overlay) > Overlay and select the Pvt Overlay Right Component.



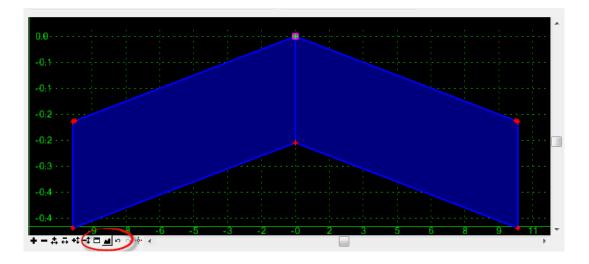
2. Using the Preview window drag the Component to the small magenta square in large view.



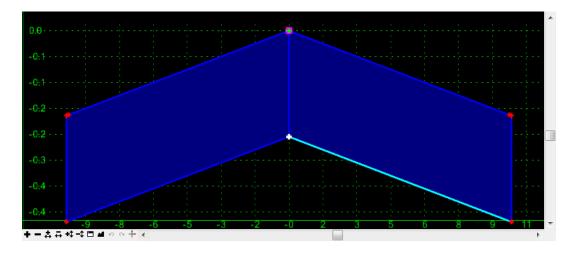
3. Repeat this step to place the **Pvt Overlay Left** Component on the small magenta square.



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

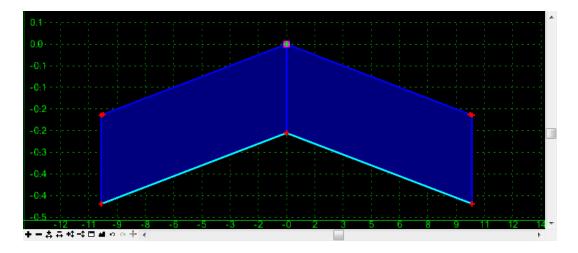


 Drag and drop the Components > Resurfacing (Milling, Overbuild and Overlay) > Milling > Pvt Milling Right Component and connect it to the bottom side of the overlay component in the template. The cursor will turn white when it is locked on the location.

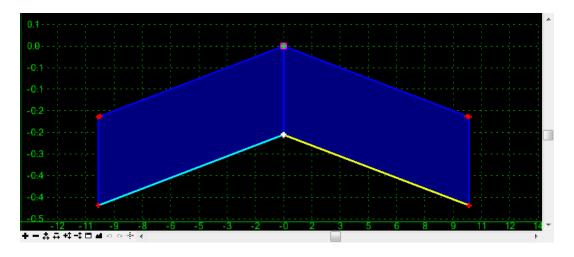


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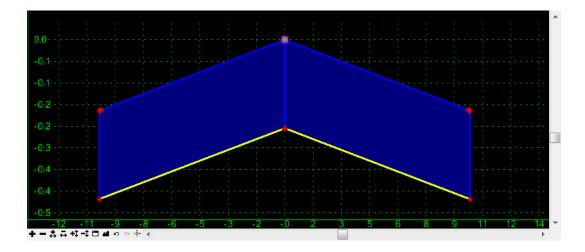
6. Repeat this step for the Left Milling Component.



Drag and drop the Components > Resurfacing (Milling, Overbuild and Overlay) > Overbuild >
 Pvt Overbuild Right Component and connect it to the bottom side of the Overlay Component in the
 template. The cursor will turn white when it is locked on the location.



8. Repeat this step for the Left Overbuild Component.



9. Check Apply Affixes on the Dynamic Settings dialog.

X:	0.0000	Step:	0.1000	
Y:	0.0000	Step:	0.1000	
Point N	lame:			~
Feature	e Definition:	 ✓ sign 	Template Points\Ten	nplateMisc_pm
	ly Affixes			

10. Drag and drop the **Linear Templates Common > Outside Lane w/ Paved Shoulder** component and connect it to the top side of the milling template. While dragging, right click and turn **On** *Mirror*.

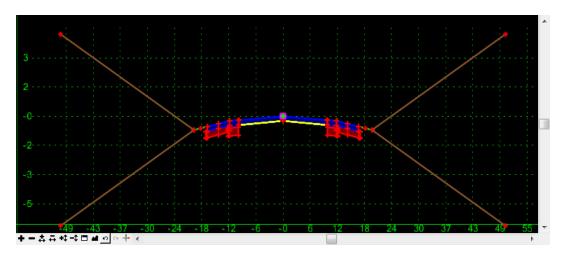
(Mirror	Ctrl-M
	Reflect	Ctrl-R
	Cancel	ESC
	Set Dynamic Origin	Ctrl-D

			PV	T_EOP_IN		
		LT_PVT_OLAY_OU		T_OLAY_BOT_IN	RT_PVT_OLAY_OUT	
-0:4	LT_RT_PVT_EOP_OUT	LI_PVT_OLAY_BOT	r_out		RT_PVT_OLAY_BOT_OUT	RT_RT_PVT_EOP_OUT
-0:8	LESHLDBSRUKOVER_BUT TP-C	T_RT_PVT_ADJ1_ UT	BOT_OUT		RT_RT_PVT_ADJ1_BOT_OU	
	TPSHLDTROLLOVER_BOT_OUT R_ROLLOVER_OUT					RT_RT_RT_RT_RT_UPSHLDR
-1:2 ·····	T_RT_ENT_BASE_SALDHT_PB_8					RT_RT_PVT_WSE_SALDR_YP_O
-1:4	₽₽₽ <u>₽₽₩₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽</u>					
-1.8		LT_RT_PVT_ADJ1_	BASE_BOT_OUT		RT_RT_PVT_ADJ1_BASE_BC	τ_Out
	20 15	-10 -	5 0	5	Dynamic Settings X: 12.000000 Step:	

- 11. Modify the widening lane Width and Slope,
 - a. Edit the Point RT_PVT_EOP_OUT, double click on the Point to open the Point Properties dialog.
 - b. Change the Constraint 1 Horizontal Value to 1.00 and Constraint 2 Slope Value to -2.000%.

Point Properties		×	
Name:	RT_PVT_EOP_OUT 🗸 🔶		
Use Feature Name Override:	PVT_EOP_OUT	Close	
Feature Definition:	<pre> plate Points\PavementAsphalt_pm </pre> <pre></pre>		
Superelevation Flag			
Alternate Surface:	× [Next >	
Constraints Type: Parent 1: RT_PVT_OLAY	Slope	∨ UT ∨ <u>+</u>	
Value: Label: Horizontal Feature Constrain Range:	= -2.000% EOP_SlopeOut		

- 12. Repeat for the left side widening pavement, **LT_PVT_EOP_OUT**, use *Constraint 1 Horizontal Value* to -1.00 and *Constraint 2 Slope Value* to 2.000%.
- Add End Conditions to the SR61 and RRR98 templates
- 1. Drag and drop the End Conditions > Parts > 6:1 Cut and 6:1 FILL TO 5' Components to both sides.
- 2. Select **File > Save** to save the Template changes.



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

EXERCISE 1.7 Editing Templates

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

Create Template						
File Edit Add Tools						
Template Library: C:\e\projects\22049555201\symb\ " ☐ Point Name List Components Comidor Templates RRR98	Current Tem Name: Description:	plate RRR98			play Components Display Point N Display All Com	

Change End Condition Point Properties

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

	Point Properties	
4	Name: RT_6:1Cut	
	Use Feature Name Override: RT_CUT Close	
4	Feature Definition: Cut_pm	
2	Atemate Surface:	
3	End Condition Properties Help	
2	Check for Interception Member of: Trace Point at Interception RT_1:6 CUT	
	End Condition is Infinite	
2	Do Not Construct	
	Constraints	
	Constraint 1 Constraint 2 Type: Slope	
1	Parent 1: RT_LT_UPSHLDR_OUT + RT_LT_UPSHLDR_OUT +	
	Parent 2: Rollover Values	
BOT IN RT MYRT GWAY LOUT	Value: 16.67% a 30.000000 a	
RT-BYTTER Sector Sector	Label:	
RT_PYREAM FRANCE	Horizontal Feature Constraint:	
9 12 15 18	Range: 0.000000	<u> </u>
+=☆☆☆☆□≝◇◇☆∢		

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

		1
5	Point Properties	
4	Name: RT_61Cut + Appy	
	Use Feature Name Overde: RT_CUT Close	
4	Festure Definition:	
	Superelevation Flag	
3	Attemate Surface:	
	Check for Interception Member of:	
	Place Point at Interception RT_1.6 CUT	
2	V EndCondion is Infinite	
	Do Not Construct	
*	Constraint 2 Constraint 1 Constraint 2	
	Type: Slope	
	Parent 1: RT_LT_UPSHLDR_OUT + RT_LT_UPSHLDR_OUT +	
N 0	Parent 2: Rollover Values Value: 16.67% = 5.00000 =	
BOT_INRT_RVAT_QVAY_QOPTOUT BT_RVAT_QVAY_QOPTOUT		
	Horizontal Feature Constraint:	
RT_PYATEMATEMATIC	Range: 0.000000	
9 12 15 18 += ☆☆☆☆☆☆☆☆☆☆	46 49 52 55 58 61 64 67 70	
		<u> </u>

- 3. Repeat these changes for the remaining End Conditions; RT 6:1Fill, LT 6:1Cut, RT 6:1Fill.
- NOTE Use -5 for left side points. To edit consecutive points, click the pick icon next to the point name and select the next point.

Point Properties		x
Name:	RT_6:1Cut	+ Apply
☑ Use Feature Name Override:	RT_CUT	Close
Facture Defentions	r	

4. Select **Fit View** to zoom to the entire active template and review the changes.

	T_6:1Cul				RT_6:TCM
			PVT_OLAY_BOT_IN	RT PUL OVAL OBT	
				RT_LT_PSHLDR_ROLL	DVER_OUT
-0:5 · · · · · ·	LT_LT_PSHL	LI PVI BOT IN		RT_PVT_OLAY BOT OUT RT_PVT_OLAY BOT OUT RT_LT_PSHLDR_PVT_BOT TP- RT_PVT_BOT IN RT_PVT BOT IN RT_PVT BOT IN RT_PVT_BOT SUBJECTSON	0UT R_PVT_TOP_OUT
-0:6		LRC SHLDR FRUT GYER BOT OUT		RT_SHLDR_PVT_BASE TP IN	
-0:8	L.F_L+T_PSPILL	PREASE BOT OUT OUT OUT		RT_LT_PVT_BASE_SHLDR_TP	₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽₽
		LT_PSHLDR_RQLADY58_BASE_RQT_OUT		RT_PVT_BASE_BOTLTNPSHLDR_ROLL RTIPVIBASEBOTLQUBOT_OL	VER_BASE_BOT_OUT
	L + T PSPILE	RRBBEERT-BUT_OUT		<mark>_</mark> ₽₹∓ <u></u> ₽₽\$₩₽	BREBREEERTRUBOT_OUT
-1:4					\
-1:0	24 -21 -18 -15	-12 -9 -6 -3		0 12 15 19	¥T_6:1F1I
+-444	ചിനേവം∲∢	*12 *3 *0 *3		<u> </u>	

5. Right click on the each Fill components and choose *Edit Component*. Change the *Priority* value to 2.

Component Properties	×
Name:	+ Apply
Use Name Ovenide: LT_FILL	Close
Description:	< Previous
Feature Definition: Slopes	
Parent Component:	
Display Rules:	Edit Help
Exclude From Top/Bottom Mesh	
End Condition Properties	
Target Type: Terrain Model 🔹	Priority: 2
Terrain Model: <active></active> 	Benching Count: 0
	No Datum
Horizontal Vertical Offsets: -0.000000 0.000000	Rounding Length 0.000000

6. Turn OFF the Horizontal Feature Constraint on the middle point, PVT_EOP_IN Point.

	:	Point Properties		×
		Name:	PVT_EOP_IN	+ Apply
	G r-	Use Feature Name Override:	PVT_EOP_IN	Close
		Feature Definition:	PavementAsphalt_pm	Previous
	HVT_	Superelevation Flag Alternate Surface:		Next > Help
			Member of:	Пер
COUT			LT_PvtOverlay RT_PvtOverlay	
_BOT_OUT		Constraints		
		Constraint Type: None		Constraint 2
₩ <u>₽</u> ▲₿₽Ĵ₽£\$₽₩ĨŢŢØ₽ĬOUŢ _BASE_SHLDR_TP_OUŢ		Type: None	▼ None	•
_BASE_BOT_OUT				
		Horizon al Feature Constrain	t:	-
		Range:	0.000000	

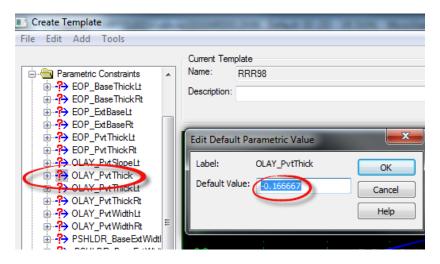
7. Select **File > Save** to save the Template changes.

Change the Overlay Depth Properties

1. Change the bottom tab on the left side of the *Create Template* dialog to Active Template.

Create Template	
File Edit Add Tools	
Points Components Find Condition Branches Display Rules Prime Parametric Constraints Atemate Surfaces Point Feature Definitions Component Feature Definitions	
Item Value	
Library Active Template	

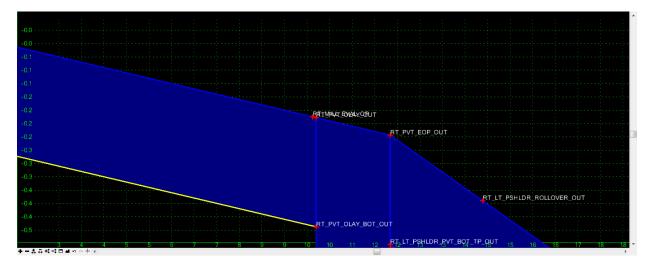
2. Open the *Parametric Constraints* folder, double click on the **OLAY_PvtThick** *Label* and change the *Default Value* from **-.25** to **-2/12**. Click **OK**.



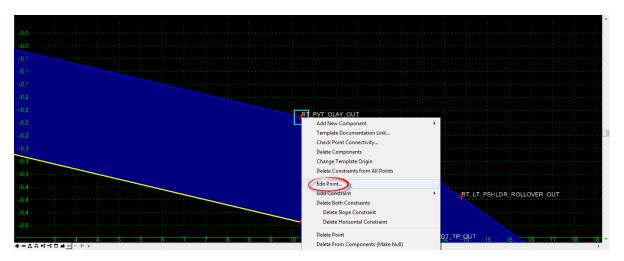
3. Repeat these steps for the OLAY_PvtThickLt and OLAY_PvtThickRt Labels.

Change the Milling Point Properties

1. Zoom in the Active Template View to the Right Widening side.



2. Right click on the RT_PVT_OLAY_OUT and select Edit Point.



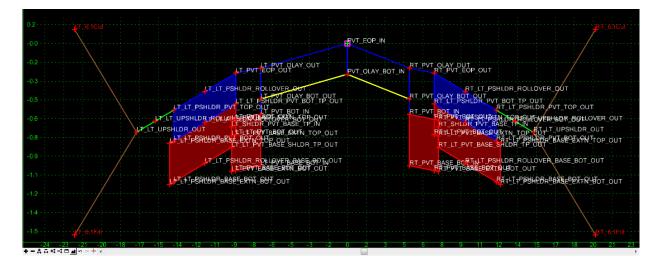
- a. Change the Constraint 1, Horizontal Value from 12 to 5 feet.
- b. Change Constraint 2, from Slope to Project to Surface.
- c. Set the Constraint 2 Value to Active.
- d. Click Apply and then Close.

Point Properties	
Name:	RT_PVT_OLAY_OUT - + Apply
Use Feature Name Override:	RT_PVT_OLAY_OUT Close
Feature Definition:	Pavement Milling_pm
Superelevation Flag	
Alternate Surface:	Next >
	Member of:
	RT_PvtOut RT_PvtOverlay
Constraints	
Constraint Type: Horizontal	1 Constraint 2
Parent 1: PVT_EOP_IN	the surface of t
Value: 5.00000 Label: OLAY_PvtWidth	
Range:	50.000000

e. Repeat these steps for the LT_PVT_OLAY_OUT, change the *Horizontal Value* from -12 to -7 and *Slope* to *Project to Surface.*

Point Properties		— X
Name:	LT_PVT_OLAY_OUT - +	Apply
Use Feature Name Override:	LT_PVT_OLAY_OUT	Close
Feature Definition:	Pavement Milling_pm 🔹	< Previous
Superelevation Flag		Next >
Alternate Surface:	-	
	Member of:	Help
	LT_PvtOut LT_PvtOverlay	
Constraints Constraint	1 Constra	int 2
Type: Horizontal	Project To Surface	
Parent 1: PVT_EOP_IN		•
Value: -7.00000		•
Label: OLAY_PvtWidth		
Horizontal Feature Constrain	r avonorici ming(inc)	•
Range:	-50.000000	

3. Zoom out of the Active Template to view the results.



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

Change the Widening Point Properties

1. Double click on the **RT_PVT_EOP_OUT** to edit the *Point Properties*.

			Point Properties		n a la la
-0:0 -0:1				PVT_EOP_OUT PVT_EOP_OUT Close ementAsphat_pm	
-0:2	PVT_OLAY_BOT_IN	RT_PVT_OLAY_OUT	Superelevation Flag Alternate Surface:	Member of:	
-0:3				RT_LT_ShidrPvtOut RT_PvtWiden	/
-0:4		RT_PVT_OLAY_BOT_OUT RT_LT_PSHLDR	Type: Slope	Constraint 2	
-0:6		RT PVT_BOT_IN RT _E RTVPAROBASI RT_SHLDR_P	Parent 2: Rollover Value Value: -2.00%		_out
-0:7		⋸⋸⋪√⋢ <u>⋎</u> ⋕ _⊥ тнятя	Range: 5		OUT
┿╼╬╬╬╪╝╗╘╺	0 2 3 ∝∲•∢	6 _RT_LT_PVT_E		14 13 17	18 20 2 ·

2. Change the *Constraint 1, Horizontal Value* from **1** to**.01 feet** and *Horizontal Feature Constraint Range* from **50** to **100 feet**. Click **Apply** and then **Close**.

Point Properti	es				×
Name:		RT_PVT_E	OP_OU	r ~ +	Apply
Use Feature	Name Override:	RT_PVT_E	OP_OU	Г	Close
Feature Definition	on:	✓ plate Po	ints\Pa	vementAsphalt_pm	< Previous
Superelevat	ion Flag				Next >
Alternate Surfac	ce:			~	Next >
		Memb	er of:		
	RT_PvtOut RT_ShldrPvtOut				
Constraints	Constrai	nt 1		Constraint	2
Туре:	Horizontal	~		Slope	\sim
Parent 1:	RT_PVT_OLAY	_out ~	+	RT_PVT_OLAY_0	DUT ~ <u>+</u>
				Rollover V	alues
Value:	0.01		=	-2.000%	=
Label:	EOP_WidthOut	~]	EOP_SlopeOut	~
Horizontal Feature Constraint V) Lines\Pavement\Pavement Asphalt EOPA		halt EOPA			
	Range:	100.00)		

3. Repeat these steps for the LT_PVT_EOP_OUT, change the *Horizontal Value* from -1 to -.01 and *Horizontal Feature Constraint Range* from -50 to -100 feet. Click Apply and then Close.

Point Properties		×	
Name:	LT_PVT_EOP_OUT	~ + Apply	
Use Feature Name Override	LT_PVT_EOP_OUT	Close	
Feature Definition:	✓ plate Points\Paveme		
Superelevation Flag			
Alternate Surface:		Next >	
	Member of:		
	LT_PvtOut LT_ShidrPvtOut		
Constraints	aint 1	Constraint 2	
Type: Horizontal	∽ Slo	ope 🗸 🗸	
Parent 1: LT_PVT_OLA	r_out v <u>+</u> Lt	_PVT_OLAY_OUT ~ +	
Value: -0.01	= 2.0		
Label: -EOP_WidthOu	t ∽ -E0	DP_SlopeOut ~	
Horizontal Feature Constraint V) Lines\Pavement\Pavement Asphalt EOPA			
Range: -100.00			

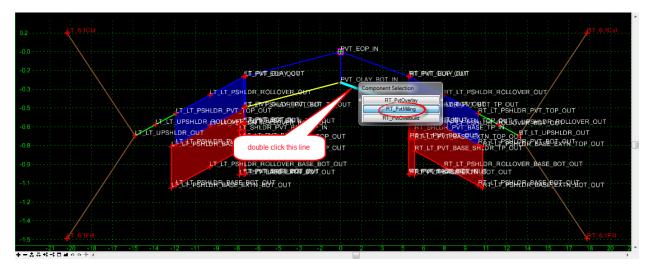
4. Fit View the Active Template to view the results.

	4T 6:1Cut		RT 61Cut
-0:0 · · · ·	$\overline{\}$	effvt_eof	P_IN
-0:2 · · · ·			NT_PVT_BORYOUUT
-0:3		LT LT PSHLDR ROLLOVER_OUT	RY_BOT_IN RT LT PSHLDR ROLLOVER OUT
-0:5		LT_LT_PSHLDR_PVT_OP_OUT	RT_EVIPSHAD HE OVICEDIT TP OUT RT_LT_PSHLDR_PVT_TOP_OUT
-0:6 • • • •		LT_LT_UPSHLDR_ROLLOVER_BANKSRETURNTS.TOP.GUT LT_SHLDR_PVT_BASE_TP_IN T_UPSHLDR_OUTLT_LTEPYTERSE_SHTN_TOP_OUT	
-0:8 · · · ·		LITH PERLERBERGE EXTON BASE_BAIN_10P_001	RT_LT_PVTBBASEUENT TOP OUT
-0:9		LT_LT_PSHLDR_ROLLOVER_BASE_BOT_OUT	RT_LT_PSHLDR_ROLLOVER_BASE_BOT_OUT
-1:1		₩ŢĹŦŢ₽₿ŔĽ₩Ŗ₽ġŔŝĔĘŖŔĨ_ĠŮŦ_OUT	RATLIPEURBREASEREXTRUTOUT
-1:2			
-1:5	4T_6:1Fill		AT 61Fill
+-44*	21 -20 -18 -17 -15 ‡-‡⊟∎o⇔∳∢	-14 12 11 -9 -8 -6 -5 -3 -2 0 2	3 5 6 8 9 11 12 14 15 17 18 20 2

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

Check the Milling Component Properties

1. Double click on the bottom line of the **RT_PvtOverlay** to open the *Component Selection* dialog and select the **RT_PvtMilling** option to edit the *Component Properties*.



2. Change the Overlay/Stripping Properties / Bottom option from Follow Surface to Follow Component. Click Apply and then Close.

NOTE	This is the appropriate setting for constant depth milling to match existing pavemen	It
	slope between two points.	

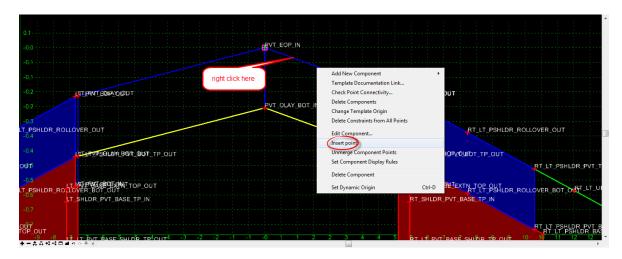
Component Propertie	S	2	×
Name:	RT_PvtMilling	+ Apply	
Use Name Override:	RT_PvtMilling	Close	
Description:		< Previous	F
Feature Definition:	✓ Mesh\XS	\Pavement Milling	
Display Rules:		Edit	
Parent Component:		~ +	
Exclude From Top/B	ottom Mesh		
Overlay/Stripping Prop	erties		
Top option:	Follow Surface \sim	Alternate Bottom Surface:	
Bottom option:	Follow Component \sim	~	
Component Depth:	0.00	Label: V	
Surface:	<active> ~</active>	Stripping Component	
Surface Depth:	0.00	Label: Pvt MillingDepth V	

3. Repeat these steps for the LT_PvtMilling Component, change the Overlay/Stripping Properties / Bottom option from Follow Surface to Follow Component. Click Apply and then Close.

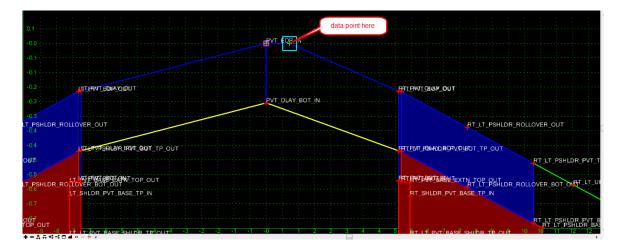
Component Properties X					
Name:	LT_PvtMilling	+ Apply			
Use Name Override:	LT_PvtMilling	Close			
Description:		< Previous			
Feature Definition:	✓ Mesh\XS\	Pavement Milling			
Display Rules:		Edit			
Parent Component:		~ +			
Exclude From Top/Bo	ottom Mesh				
Overlay/Stripping Prop	erties				
Top option:	Follow Surface \sim	Alternate Bottom Surface:			
Bottom option:	Follow Component \sim	×			
Component Depth:	0.00	Label:			
Surface:	<active> ~</active>	Stripping Component			
Surface Depth:	0.00	Label: PvtMillingDepth ~			

4. Select File Save to save the Template changes.

- Insert a Milling Slope Break Template Point
- 1. Right click on the **RT_PvtOverlay** *Component* and select **Insert Point**.



2. Data point in the Active Template View to store a point. Right click and select Finish.



3. Double click on the new *Point* to edit the **Point Properties**. Change the **Point Constraints** as shown.

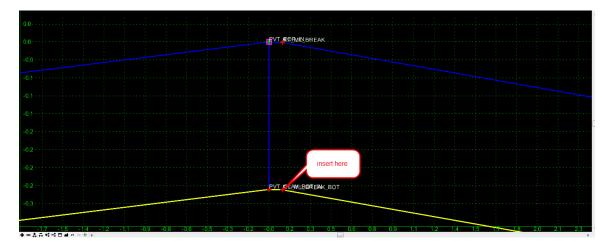
Point Properties		×
Name:	RT_ML_BREAK	~ + Apply
Use Feature Name Override:	RT_	Close
Feature Definition:	∽ nplate Points\Paveme	ntCrown_pm < Previous
Superelevation Flag		Next >
Alternate Surface:		
	Member of:	
	RT_PvtOverlay	
Constraints		
Constrai	nt 1	Constraint 2
Type: Horizontal	V V Proj	ect To Surface 🛛 🗸 🗸
Parent 1: PVT_EOP_IN	V 🕂 Any	Direction ~
Value: 0.10	= 🔁 <ac< td=""><td>tive> ~</td></ac<>	tive> ~
Label:	~	~
Horizontal Feature Constrain	 Crossover - Tempor 	ary\Crossover Temporary
Range:	0.00	
	3-D Modeling	57

4. Click Apply and then Close.



5. Repeat the steps above to insert *Points* on the bottom of the **PvtOverlay**, **PvtMilling**, and **PvtOverbuild** *Components*.





6. Set the *Point Properties* as shown.

Point Properties		×
Name:	RT_ML_BREAK_BOT	+ Apply
Use Feature Name Override:	RT_	Close
Feature Definition:	✓ esign∖Template Points\Botto	om_pm < Previous
Superelevation Flag		
Alternate Surface:		✓ Next >
	Member of:	
Constraints Constra	RT_PvtOverlay	onstraint 2
Type: Horizontal	 Vertical 	~
Parent 1: RT_ML_BREA	< ~ + RT_ML_E	REAK v 🕂
Value: 0.00	-0.17	=
Label:	V OLAY_Pv	ThickRt 🗸
Horizontal Feature Constrain	t 🗸 Crossover - Temporary\Cr	ossover Temporary
Range:	0.00	

NOTE When inserting the point on the PvtMilling and PvtOverbuild components, data point on the RT_ML_BREAK_BOT point to save from setting any other Point Properties edit steps.



7. Merge the three points into one final point.

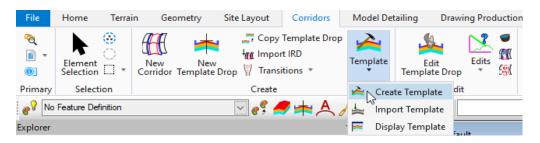


8. Select **File > Save** to save the Template changes and then close the *Create Template* dialog.



This exercise adds a Component Switch to the RRR98 template to be used across the limits of the intersection. This switch is implemented using a Parametric Constraint on the BL98 corridor to turn off all the outside components for the corridor through the intersection, in Chapter 4.

1. Use the Corridors > Create > Template > Create Template tool.



2. Right click on the *RRR*98 Template and select **Set Active**.

Create Template					
File Edit Add	t Tools				
Point Na	ents Templates	Current Tem Name: Description:	plate RRR98		
	Cat A stings				
inear T	Cut		Ctrl-X Ctrl-C Ctrl-V		
	Delete Rename Template Docu	umentation Li	Del F2 nk		

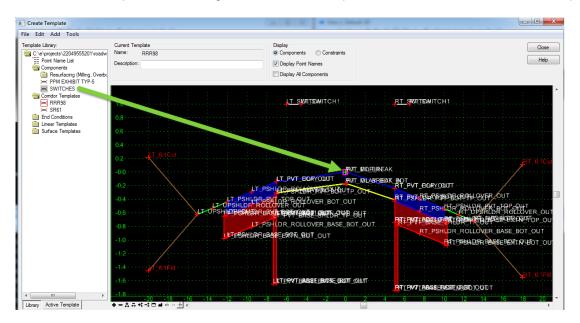
3. Using the *Template Library Organizer*, locate the **SWITCHES** template in the *Civil FDOT ORD.itl* file.

Template Library Organizer	🔳 Template Library Organizer 🦳 🗆 🕹					
Available In:	Available In:			ЭК		
(Worksets)FDOT\22049555201_CEIroadway\22049555201_CE.id	CPDOTConnectOrganization-Civil/FDOT\Template Library(CIVIL FDOT ORD.it FPPoint Name List Components Barriers & Retaining Walls Barriers & Retaining Walls Bridge Examples Universes Curb & Guter Curb &	^		incel		
< >	Traffic Separators	~				
Preview:	Preview:					

4. Drag the SWITCHES template to the project Components folder.

Template Library Organizer				×
Available In:	Available In:		C	ЭК
Point Name List Components Barriers & Retaining Walls Berm Bridge Examples Buffer Curb & Gutter Driveways Guardrail Handrail Median Slopes NULL Shoulder Stokwalk Subsoil Traffic Separators Utility Strip Corridor Templates Preview:	C\FDOTConnect\Organization-Civil\FDOT\Template Library\CIVIL FDOT ORD.it Point Name List Components Barriers & Retaining Walls Berm Bidge Examples Buffer Curb & Gutter Driches Drainage Driveways Guardrail Handrail Median Slopes WIL × PGL Divided Sidewalk Subsoil Traffic Separators Preview:	 		ncel

- 5. Choose OK and choose Yes to Save the data to the project template library, 22049555201.itl.
- 6. With the RRR98 template active, drag the SWITCHES template onto the center of the RRR98 template.

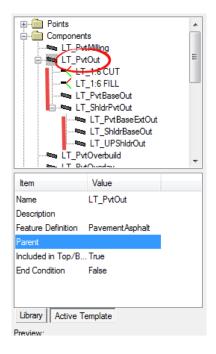


NOTE The switch template consists of two simple components left and right of the centerline. A label has been assigned to the horizontal constraint value. Also, display rules have been created for when the value is 1,2,3,4, or 5. By assigning one of the rules to a component, the display of that component and all related components can be controlled based on the value of the switch.

- Create a Parent /Child relationship of all the Left side components.
- 1. Open the Component Properties dialog for the Left Cut Component.
 - a. Set the *Parent Component* by using the pick icon \clubsuit , select the **LT_PvtOut**.
- **NOTE** Use the wheel to zoom into the Left Widening LT_PvtOut component or select it from the list.

Component Properties			 X
Name: LT_1:6 CUT	+		Apply
☑ Use Name Override: LT_CUT		ĺ	Close
Description:		(< Previous
Feature Definition: Slopes	•	l	
Parent Component:	+	l	Next >
Display Rules:		Edit	Help
Exclude From Top/Bottom Mesh			
End Condition Properties			
Target Type: Terrain Model 🔹	Priority:	1	
Terrain Model:	Benching Count:	0	
	No Datum		
Horizontal Vertical Offsets: -0.000000 0.000000	Rounding Length	0.000000	

- b. Choose Apply and Close the Component Properties dialog.
- c. Repeat this procedure for the Left Fill, and Left Shoulder components. The Unpaved Shoulder and Base components should already have a parent relationship which can be used.
- 2. Use the Active Template Tab to view the Component Relationships to the LT_PvtOut.



- 3. In the *Active Template* Component List, right click on the **LT_PvtOut** Component and uncheck the **Display** option,
- 4. All of the left side components should turn off, right click on the LT_PvtOut Component and toggle the Display back on.



- 5. In the Active Template Component List, right click on the LT_PvtOut Component and choose Edit.
- 6. From the Component Properties dialog, Select Edit on the Display Rules: field

Component Properties		×
Name:	LT_PvtOut +	Apply
Use Name Override:	LT_PvtOut	Close
Description:		< Previous
Feature Definition:	PavementAsphalt 🗸	
Parent Component:	+	Next >
Display Rules:	Edit	Help
Exclude From Top/Bo		

- a. Select the *Template Display Rule* LT_SWITCH1 rule from the list.
- b. Build the *Conditional Expression* **NOT LT_SWITCH1** by clicking the **NOT** button and then **Selected Rule** button.

Component Display C	Conditional Expression	
Conditional Expression for NOT LT_SWITCH1	IDT ()	Selected Rule
Template Display Rules		
Name	Туре	Expression
LT_SWITCH1	Horizontal	LT_SWITCH1 - LT_SWITCH
LT CM/ITCUD	I lasta a stal	LT CMUTCHELT CMUTCH

c. Choose OK, then Apply, then Close to save the display rule to the component.

NOTE Adding the rule NOT SWITCH1 is telling the template left side "Not To Display If The Horizontal Distance Of The Switch Is The Value 1"

7. Choose Close and Yes to save change to exit the Create Template dialog.

2

BASIC CORRIDORS MODELS

CORRIDOR MODELING OVERVIEW

As defined in the Bentley Civil Help:

"The Corridor Modeling toolset is a group of highly interactive commands to create new design surfaces that represent a new roadway or other type of surface. Tools for creation, modification, management, and report functions are supported.

Corridor Modeling tools aggregates a variety of civil data. The geometry is created with the Horizontal and Vertical Geometry tools, while the existing ground is defined by a MicroStation mesh or Civil Terrain Model. Plan view elements, such as edges of pavement, shoulders, curbs, etc. can be 2D or 3D. Superelevation information is defined within a design file using standards or imported data. Templates are utilized from one or more template libraries.

Reference files can be used extensively with Corridor Modeling. On a simple project, the data may be all in one file; larger projects may have geometry in one file, plan view graphics in a second, terrain in another, superelevation in a fourth and the actual model in a fifth. All files can reference the others, to present a complete picture of the project.

When working with Corridor Modeling, you can draw in 2D or 3D. When using 2D (such as for plan-view graphics), a 3D view is automatically created and maintained. For example, when a vertical geometry element is initially defined for a horizontal geometry element, the Default-3D model is created, if there isn't one already. The 3D baseline (combination of horizontal and vertical element) is drawn into the 3D model. As template drops are added, and progressed, they are added to the 3D model automatically.

When starting to create a corridor, basic information can be used. A single template can be used, along with preliminary geometry and a high level terrain model. As the design progresses, more detail can be added. Instead of a single template drop, perhaps more templates better define the roadway. Transitions can be added to smoothly move from one template to another. There may be multiple roadways all interconnected using the target aliasing tools. All the while, as changes are made, the corridor model is updating, so you see up-to-the minute results. Simple projects may not require all the tools, and a basic corridor model may be sufficient. But all the tools are available to handle basic to complex, small-scale to large-scale projects."

The following are minimum requirements to use Corridor Modeling.

- Civil horizontal element
- Civil vertical element
- · Template stored in a template library

A terrain model is not required for corridor modeling. If the template includes end conditions and no terrain model is defined, the software generates as much of the model as possible but will not complete the end condition that ties to ground and no error message is given.

Corridor models are built at an interval, which determines the level of detail of the model. OpenRoads essentially takes the typical section stored in the template and places it every 25' (or whatever the interval is set to) along the alignment in order to build the 3D model. The FDOT CADD manual section 8.4.7 sets forth the maximum required intervals for a corridor, depending on the Context Classification of the roadway. Corridors can certainly be built at a more frequent interval, but this is at the expense of more computing power (RAM, disk space, and CPU). To optimize the model, the interval spacing should only be made tighter than the maximum when needed.

For this project, the Context Classification is C3C. An excerpt from the table in the CADD manual is shown below, showing the corridor interval requirement for C3C. The interval can be set to the tangent requirement as long as the design stage used decreases the interval spacing on curves.

Maximum Corridor Frequency Interval Spacing (Feet)					
Context Classification Tangent Curve Intersection					
C3C	20	10	5		

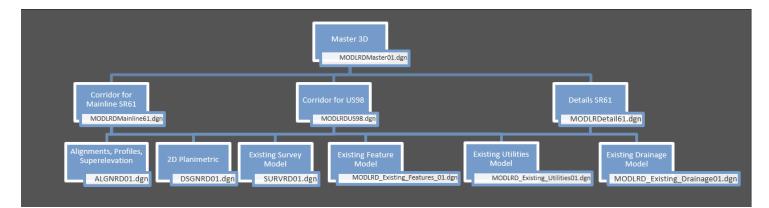
CORRIDOR MODELING PLANNING

It is recommended to plan out the 3D modeling approach on a project. Some have referred to this a Model Management Plan. This plan will attempt to outline the following:

- Determine how to break up the project into logical independent corridors.
- Determine which sections of the project are needed for detail modeling and surface modeling.
- Determine the files and filenames to be used for corridors and details.

NOTE The project 3D Model may be in separate files or all combined into one file.: The FDOT file defined to be used for Corridor and Detail Models is MODLRD(xx)## with an optional descriptor in the parentheses.

Below is the Model Management Plan for this project dataset. In this chapter we will be creating the three proposed model files.



EXERCISE OVERVIEW – BASIC CORRIDOR MODELING

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Exercise 21

Prepare to Create Corridor Model for SR61

- 1. Open the *MODLRDMainline61.dgn* file of the C:\Worksets\FDOT\22049555201\Roadway folder of the WorkSet.
- 2. Reference the GDTMRD01, ALGNRD01 and DSGNRD01 files.
- 3. Use the Terrain > Edit > Active > Set Active tool.

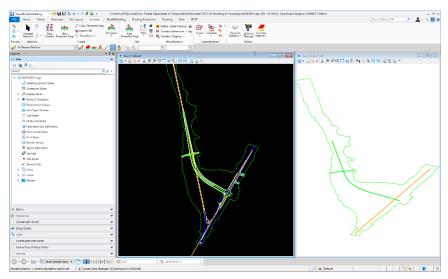


4. At the cursor prompt, select the **Terrain Boundary** green dashed line from the attached *SURVRD01* reference file. This will set the terrain model as active.

5. Move the cursor over the SR61 Centerline Feature and verify an Active Profile is set..



6. To set up the Views for viewing the 2D Plan and 3D Model simultaneously in the FDOTCONNECT WorkSpace, Select the F2 Function Key on the keyboard. This will open an Isometric View of the project.

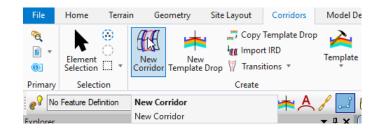


7. Save Settings.

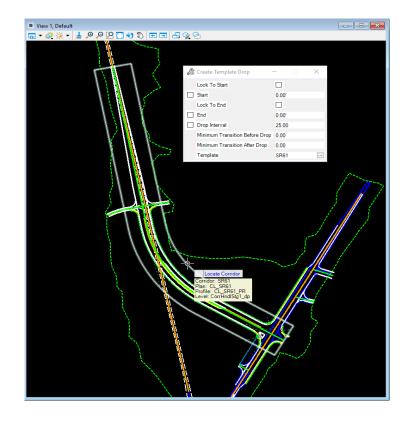


Create Corridor

1. Use the **Corridors > Create > New Corridor** tool.



- 2. Select the SR61 Centerline in the Plan View when the "Locate Corridor Baseline" prompt comes up.
- 3. Reset to accept the Active Profile. This profile resides with the SR61 Civil Feature Centerline.
- 4. Enter the *Feature Name*, **SR61**, in the *Create Corridor* dialog.
- 5. Data point to accept the Name of the Corridor, **SR61**. The corridor is created AND the integrated *Create Template Drop* diaog launches.

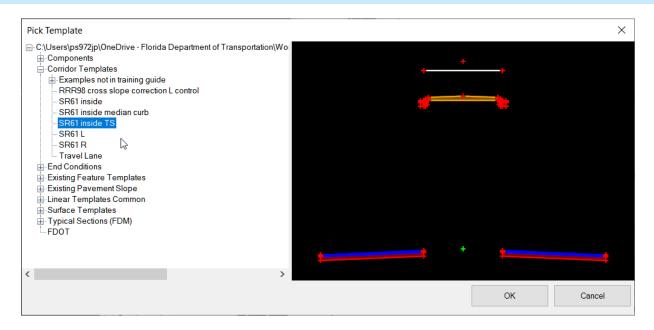


NOTE Once a Corridor is created, a shape boundary is placed in the Plan View representing its outline. This shape is initially placed on the CorrHndlStg1_dp level. It has several properties which can be seen by clicking on the shape and choosing first icon. One of the properties is the Feature Definition (Design Stage).

6. Once the *Create Template Drop* dialog is opened, first select the corridor *Template* to be placed on the corridor. Either use the **Ellipsis** icon on the dialog <OR> select **ALT down arrow** to pick a Template.

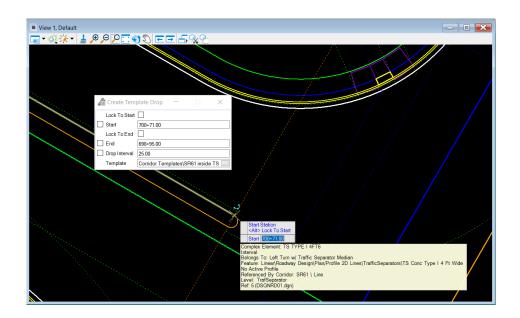
View 1, Default		
🐷 - 🐼 🔆 - 📑 🖉 🔎 💭 🖾 🖘 🔊		
	Create Template Drop	×
	Lock To Start	
	Start	698+95.00
	Lock To End	
	End	698+95.00
	Drop Interval	25.00
	Minimum Transition Before Drop	0.00
	Minimum Transition After Drop	0.00
	Template	SR61
		Select Template - cAls Templates Template [EC3]

- 7. Find the **SR61 inside TS** template in the *Corridor Templates* folder of the active Project Template Library. Select it and click **OK**.
- NOTE OpenRoads appears to have an issue applying superelevation properly when a template has multiple end condition search functions, so we have split the corridor into three template drops, one for the two traffic separator sections and one for the median section.

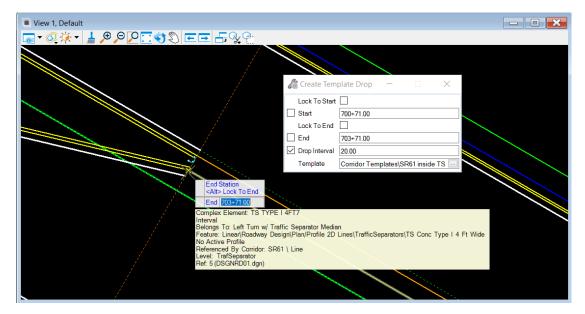


NOTE Verify that the correct .itl Template Library is loaded at the top left of the Pick Template dialog. If it is not, the correct template can be loaded by opening the Create Template dialog and opening a different .itl file prior to using the tool. Refer to the previous chapter.

- 8. Data point to accept the *Template* and move to the next setting.
- 9. Continue to define the *Create Template Drop* dialog information entering and accepting the following for the SR61 Corridor:
 - a. *Start* Use keypoint or intersect snap click to the traffic separator nose near the intersection with US 98, *Station* **700+71.00** as shown below.



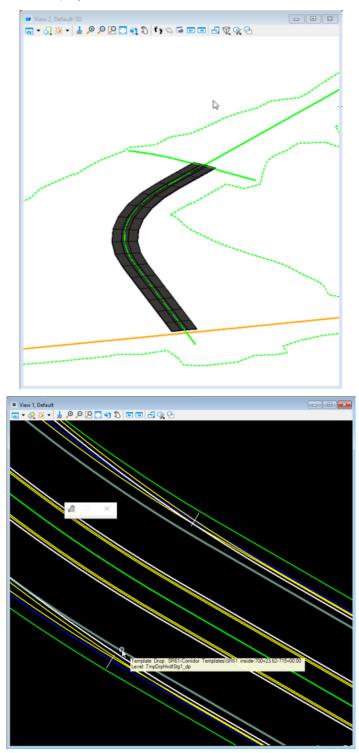
- b. End snap to the end of the traffic separator at Station 703+71.00 as shown below.
- c. Set the *Drop Interval* to **20**.



- 10. Repeat Steps 6-8, selecting the SR61 inside median curb in the Pick Template dialog.
 - a. Snap the **start station** to the end of the previously inserted template at the beginning of the curbed median section, Sta. **703+71.00**.
 - b. Snap the end station to the end of the curbed median section, Sta. 711+88.90.
 - c. Ensure the drop interval is set the same as above.
- 11. Repeat Steps 6-8 to insert another template drop for the next traffic separator section.
 - a. Snap the **start station** to the end of the previously inserted template at the end of the curbed median section, Sta. **711+88.90**.
 - b. Snap the **end station** to the beginning of the radius return for the side street shortly after the end of the traffic separator, Sta. **714+23.96**.
 - c. Ensure the drop interval is set the same as above.



12. Upon completion of the *Corridor Processing* bar in the lower right hand side of the OpenRoads status bar, the 3D model will be displayed in View 2.



NOTE Once a Template Drop is created, a shape boundary is placed in the Plan View represent its outline. This shape is initially placed on the TmpDrpHndlStg1_dp level. It has several properties which can be seen by clicking on the shape and choosing first icon. Properties include the Template Drop Interval and the Template Name.

▶ Turn 3D Reference File Display Off in the Plan View

At times the line work in the Plan View can become confusing with 3D lines over top of the 2D lines. This View can be simplified by turning the 3D Model Reference file display Off.

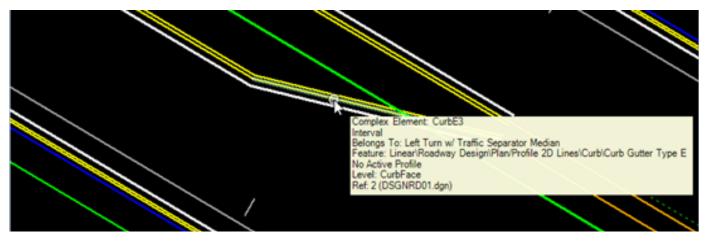
- 1. Data Point somewhere in View 1 to make it active.
- 2. On the OpenRoads Level Display dialog, navigate to the Ref. MODLRDMainline61.dgn, Default-3D file.
- 3. Right click on the file name and un-check the **Display** option.

🥯 Level Display - View 1	_	×
🔁 🙀 View Display 🔻]	
🌾 🗄 🌱 All Lev 🕶 Levels 💌 📈	•	
 □- MODLRD01.dgn, Default - M TOPO,\Survey\SURVRD01.dgn - D SGNRD01.dgn, Default - M GDTM,\Survey\SURVRD01.dgn - M UTEX,\Survey\SURVRD01.dgn - M DREX,\Survey\SURVRD01.dgn - ALGNRD01.dgn, Default - M Ref, DSGNRD01.dgn, Default-3D - M Ref-1, MODLRD01.dgn, Default-3D 	<u>O</u> pen Dialog	
- 🐼 Ref-2, ALGNRD01.dgn, Default-3D - 🐼 Aerials, Aerials.dgn - 🐼 ROW, RWDTRD01.dgn, Default - 🐼 GDTM-1,\survey\SURVRD01.dgn	<u>A</u> ttach <u>D</u> etach ✓ Distay ✓ Snap ✓ Locate	
Name DTM_ex CorrHndlStg TmpDrpHndlS ConstLines XSMisc_px ShldrUnpavBr	Update Levels Select <u>All</u> Select <u>None</u> Invert Selection Cu <u>t</u> Copy Paste	
Curb_pm SubGrade_pm	<u>P</u> roperties	
Bottom_pm CurbBase_pm CurbFlowLin Cut_pm Fill_pm PavtAsphalt_pm	•	
Sidewalk_pm PavtBreak_pm	•	~

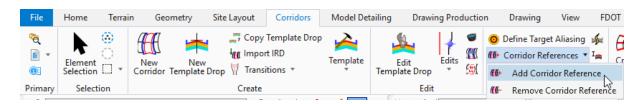
Exercise 23 Add Corridor References, SR61

Corridor References are related to the template points having a Horizontal Feature Constraint to control the location of the point on the corridor. They are 2D graphical Civil Features that need to be added to a corridor. For the SR61 corridor a selection of median Civil Features are used for template external references.

1. The SR61 template is designed to target Curb Gutter Type E lines in the median. Hover the cursor over one of the median lines to verify that it has the Feature Definition of Curb Gutter Type E.



- 2. Create a selection set of the following 12 features in the plan view:
 - 2 Pavement Asphalt EOPA lines in the median
 - 4 Pavement Asphalt EOPA taper lines in the median
 - 4 Pavement Asphalt EOPA lines on the outside edge of pavement
 - 2 Curb Gutter Type E lines in the median
 - 2 Curb Gutter Type E taper lines in the median
 - 4 TS Conc Type I 4 ft Wide lines in the median
- Modeling the TrafSeparator level, do not add the Nose Radius Element to the Selection Set. This will be modeled in Chapter 9 with a 3D Civil Cell.
- 3. Use the Corridors > Miscellaneous > Corridor References > Add Corridor Reference tool.



4. At the *Locate Corridor* prompt, select the corridor handle and then data point to add the selected lines as listed above to the corridor.

5. Once the Reference Lines have been added, the Corridor will automatically process to include the new Horizontal Feature Constraints. The median features will come in several feet above the pavement, as intended on the template. This will be resolved in the next exercise.



Exercise 24 Change Corridor Feature Definition, SR61

The FDOTConnect WorkSpace includes several Corridor Feature Definitions to help with various tasks for Design and 3D Modeling. Depending on the active Feature Definition, processing the Corridor will take longer.

To optimize model performance, it is recommended that designers wait to change the Feature Definition until later in the design process, as each definition is set up with multipliers that decrease the corridor interval spacing.

For example, the Design stage might be utilized for a 60% submittal, while the Final stage might be utilized for the 90% and final submittals.

1. Open the *Explorer* pane from the *Home* tab or with the **F11** *Function Key*.



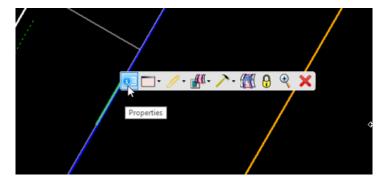
- 2. Select to expand the **OpenRoads Standards** section and expand the **Standards** option list.
- 3. Expand **Corridor** under **Libraries > Feature Definitions > Feature Definition** (*FDOT_Stanrdards_ Features.dgnlib* (*Default*)). These Feature Definitions are set up for various Design Stages.

Explorer 🔻 👎	×
M File	*
🖗 Items	*
🗑 Resources	*
J OpenRoads Model	*
Sheet Index	*
E Links	*
OpenRoads Standards	<u> </u>
	~
Search P P	×
 Standards 	
▲ W Libraries	
Feature Definitions	
 Feature Definition (FDOT_Standards_Features.dgnlib (Default)) 	
Alignment	
> 🦓 Terrain	
🔺 🎛 Corridor	
🔶 1 PRELIM	
→ 3 FINAL	
4 FINAL - Top Mesh Only	
5 FINAL - Bottom Mesh Only	
Superelevation	
> <u>∮Ta</u> Linear Template	
▷ <u> </u>	
> D Linear	
▷	
> 🚜 Mesh	
Trace Slope	
Aquaplaning	
Sight Visibility	
▷ X Survey	
Keature Definition (FDOT_SUE_Drainage.dgnlib (Default))	
	*
Subsurface Utilities Model	•
	-
U Survey	*

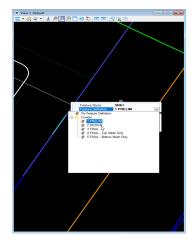
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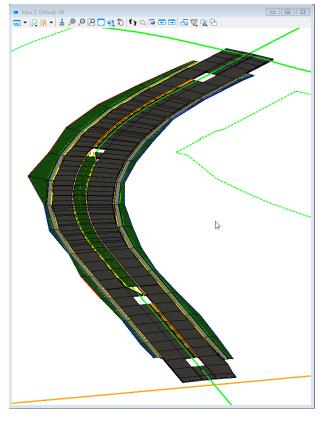
4. Select the Handle of the SR 61 Corridor and locate the Properties icon when the menu displays.



5. Select the Properties icon and change the Feature Definition from 1 PRELIM to 3 FINAL.



6. The Corridor will re-process and the 3D Model will re-draw with a tighter interval. Notice that the outside corridors remain unchanged.



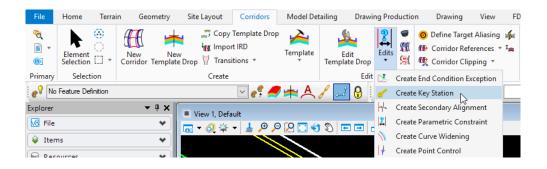
3-D Modeling

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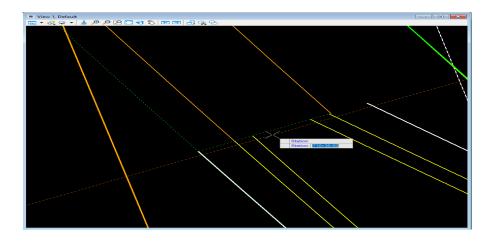
Exercise 2.5 Add Key Stations, SR61

Create Key Station tool is useful to add stations that are not coincident with the template interval. When the median conditions change abruptly, it is desirable to include the station for processing. Otherwise the model may have holes or overlaps, which is not desirable when it is used to generate 3D Deliverables for Automated Machine Guidance.

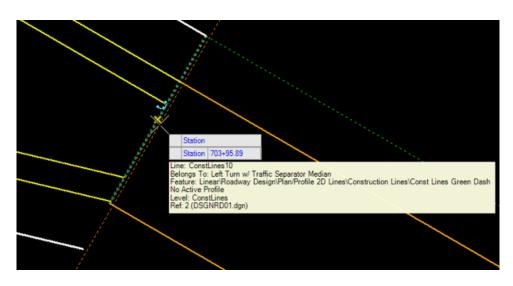
1. Use the **Bold Corridors > Edits > Create Key Station** tool.



- 2. Identify the Corridor Boundary handle of the SR61 Corridor.
- 3. Use **AccuSnap** to locate the Plan View **CurbMedian** / **Traffic Separator** *division line*. Snap to a point on this line.



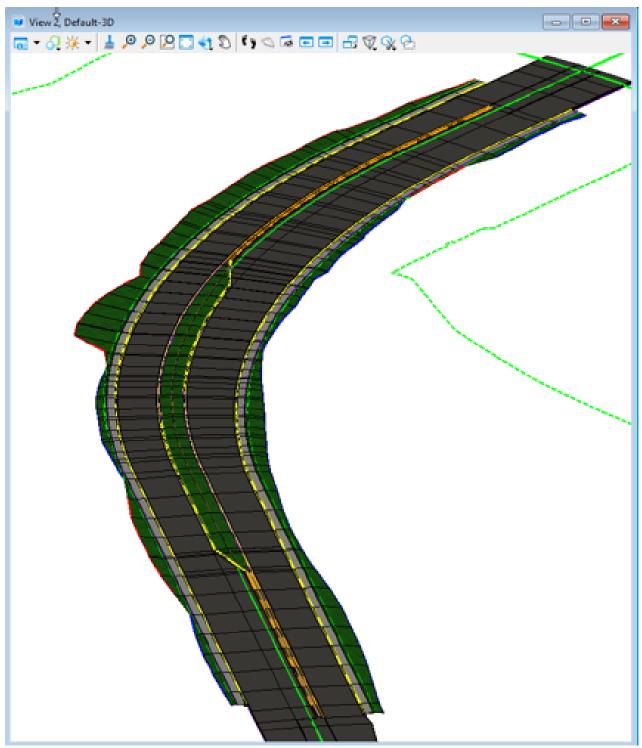
4. Repeat these steps for both Traffic Separator locations in the Plan View.



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- 5. Add Key Stations at other transition areas, including where the left turn lane transition begins. If snapping directly on the transition point does not work, sometimes a key station is needed immediately before and/or after the transition point in order to minimize the size of the hole.
- 6. (Optional) Rotate the 3D View to a Top-down orientation, as it is sometimes easier to see where to snap to in the 3D view.



Exercise 2.6 Review Corridor Objects, SR61

The *Corridor Objects* dialog is a summary of all Corridor Modeling objects and provides an excellent method of managing data.

1. Use the **Bold Corridors > Corridor Objects** tool.

File	Home	Terrain	Geome	try Site	Layout	Corridors	Model De	tailing	Drawing Pro	ductio	n Drawing	g View	FDC
° ∂ ∎ - ®:	Element Selection	© ○ □ • ।	New Corridor Ten	New	4 ₀₀ Impo	Template Drop rt IRD itions *	Template	Edit Template	Edits Drop		 Define Ta Corridor Corridor 		
Primary	Selecti	ion			Create				Edit		Misc	ellaneous	
e No Explorer	Image: Property of the second seco												

2. Identify the Corridor Boundary handle to open the Corridor Objects dialog.

🜍 Corridor Objects - SR61								-		\times
Template Drop	i 🗋 :	🗙 🚡 🖷 🐩 😣					•	Key	Station	*
Secondary Alignment		Station						Station		710+
Key Station	•	710+30.89 703+96.00		N						
Parametric Constraint		703+36.00		ß						
Point Control		709+81.58								
Curve Widening		710+10.01								
End Condition Exception										
External Reference										
Clipping Reference										
	Row:	4 4 1	of 5 🕨 🕨	M		 				
									Cl	ose

3. Review the various objects on the corridor. If too many key stations were added in the previous step, they can be deleted or modified in this dialog.

Exercise 2.7 Parametric Constraints, SR61

The *FDOTConnect.itl* file contains some FPM Exhibit Templates which are delivered with variable medians included. The median can vary with the following conditions or component sets:

- Curb Median with or without Left Turns
- Crossovers at Intersections
- Traffic Separators with Left Turns

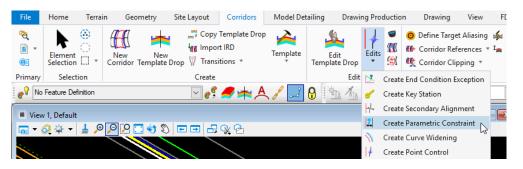
To properly operate the median condition templates, consider the following:

- The various median component sets have a parent end condition search lines that targets plan features; e.g. Curb Gutter Type E, Pavement Asphalt EOPA.
- Each of the median components sets are displayed ONLY if the target is found. This is by the Parent/Child relationship of the Template components.
- The LT and RT PGL Handles, or the LT and RT PGL in points, control the overall width of the median and can be modified to fit any project.
- Many of the median components have Horizontal Feature Constraints (HFC) defined to locate the 2D civil features and the horizontal range will need to be modified to fit the project.

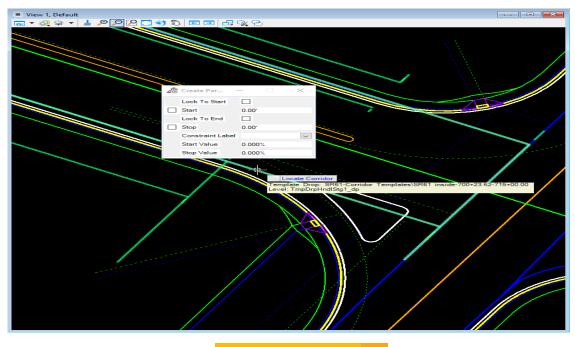
Add Parametric Constraint for Variable Median, SR61 Template

The templates used have variable median conditions built within that needs to be set in place for the corridor.

1. Use the Corridors > Edit > Edits > Create Parametric Constraint > Create Parametric Constraint tool.



2. Identify the **Corridor Boundary** *handle*. Continue to define the **Create Parametric Constraint** dialog information.



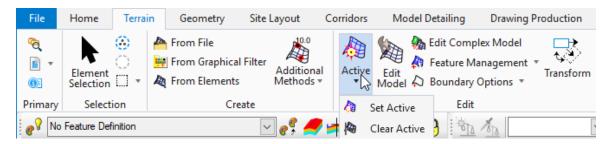
- 3. Enter and accept the following for the SR61 Corridor:
 - Start Station Alt for Begin
 - Stop Station
 Alt for End
 - Constraint Label V_Offset
 - Start Value 0.0
 - Stop Value 0.0

Sõ	Create Par	_		×
	Lock To Start	\checkmark		
\checkmark	Start	698+95	5.00	
	Lock To End	\checkmark		
\checkmark	Stop	726+47	7.00	
	Constraint Label	V_OFF	SET	\sim
	Start Value	0.00		
	Stop Value	0.00		

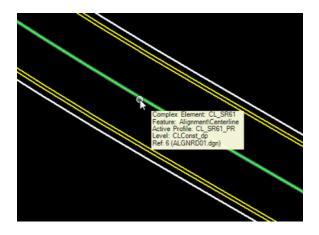
4. The variable median conditions are placed at the correct location vertically. This will ensure the median is at the correct elevation for the next exercise.

Exercise 2.8 Prepare to create Corridor Model, SR61 End Conditions

- 1. Go to the FDOT ribbon and Choose Create File.
- 2. Create a new *MODLRDDetail61.dgn* file. Select *Wakulla County*. Choose **Create/Open File**. If the file already exists, select **OK** to overwrite the existing file.
- 3. Reference the MODLRDMainline61 file. Set Live Nesting Depth to 1.
- 4. Use the Terrain > Active > Set Active tool.



- 5. At the cursor prompt, select the **Terrain Boundary** green dashed line from the attached *SURVRD01* reference file. This will set the *terrain model* as **Active**.
- 6. Move the cursor over the SR61 Centerline Feature and verify an Active Profile.

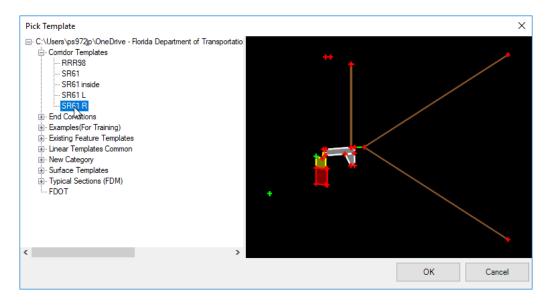


- 7. To set up the *Views* for viewing the **2D Plan** and 3D Model simultaneously in the FDOTConnect WorkSpace, Select the **F2** *Function Key* on the keyboard. This will open an *Isometric View* of the project.
- 8. Save Settings.



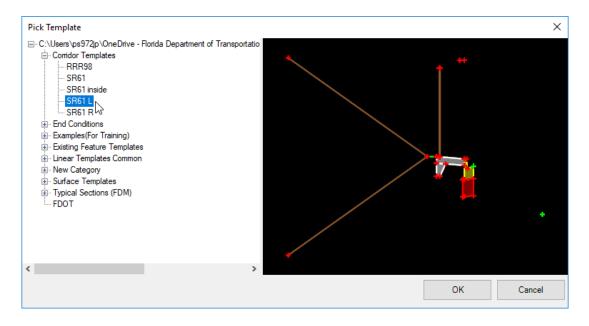
Splitting the template allows more flexibility when adding driveways and side streets, as the end condition (outside) template can change at those locations without affecting the mainline. The template for the previous exercise only extended to the edge of pavement and did not include curb. In this exercise we will add the curb and the end conditions.

- 1. Use the **Corridors > New Corridor** tool.
- 2. Select the SR61 Centerline in the Plan View when the "Locate Corridor Baseline" prompt comes up.
- 3. Reset to accept the Active Profile. This profile resides with the SR61 Civil Feature Centerline.
- 4. Enter the Corridor Name, SR61 R, in the Create Corridor dialog.
- 5. OpenRoads will continue on to the **Create Template Drop** command. Either use the **icon** on the dialog <OR> select **ALT down arrow** to pick a template.



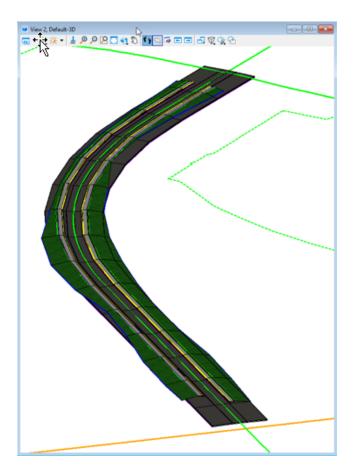
- 6. Pick the SR61 R template in the Corridor Templates folder of the active Project Template Library.
- 7. Continue to define the *Create Template Drop* dialog information entering and accepting the following for the **SR61** *Corridor*:
 - *a.* Start Snap to the beginning of the curb radius return on the right side of SR 61 at the T intersection, Station **700+40.00**.
 - *b.* End Snap to the beginning of the curb radius return on the right side of SR 61 at the intersection, *Station* **713+68.58**, as shown on the right.
 - c. Set the *Drop Interval* to **20** and accept the remaining prompts.

- 8. Repeat Steps 1-7 for the left side.
 - a. Name the Corridor SR 61 L and pick the SR 61 L Template.



b. Select the start and end points of the template drop based on the curb radius return points on the left side of the roadway. The stationing is listed below:

Start – Station **701+34.00** *End* – Station **714+29.06**



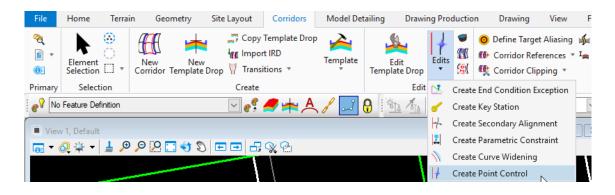
9. The corridor models will display in the 3D View but will be on top of the previously placed pavement model. This will be addressed in the next Exercise.



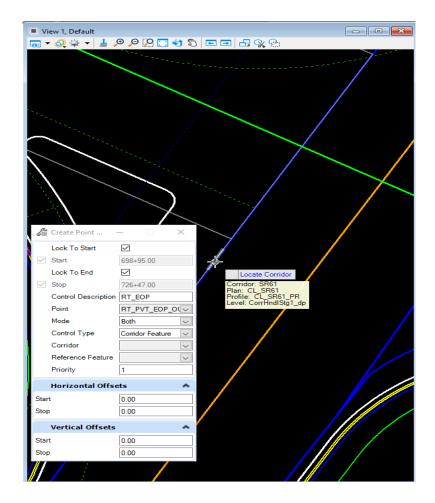


Add Corridor Point Control, SR 61 End Conditions

1. Use the Corridors > Edit > Edits > Create Point Control tool.



2. Identify the Corridor Boundary handle for the SR 61 R corridor.



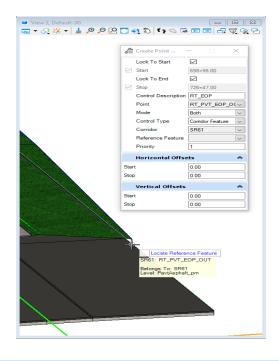
3. For the Start station, snap to the end of the radius return at Station 701+00.00.



- 4. Continue to define the *Create Point Control* dialog information. Enter and accept the following for the **SR61 R** Corridor:
 - End Station
 - Control Description
 - Point
 - Mode
 - Control Type

EOP RT__PVT_EOP_OUT Both Corridor Feature

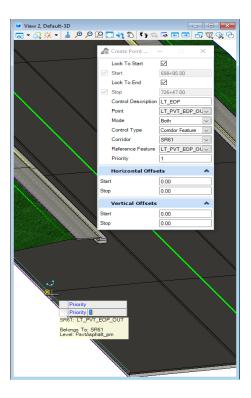
Lock to End



NOTE Do not select either the Point or the Reference Feature with the drop-down menu as ORD currently appears to have a defect where that will cause the point control to not display correctly. They must be selected in the 3D view.

- 5. For the Corridor, select a handle on **SR 61** corridor developed for the inside (from *MODLRDMainline61. dgn*).
- For the Reference Feature, select the RT__PVT_EOP_OUT line on the SR 61 corridor (inside) in the 3D view, as shown on the right.

7. Accept the defaults for the remaining items. The 3D view will update to move the curb and sidewalk to match the edge of pavement of the **SR 61** corridor model.



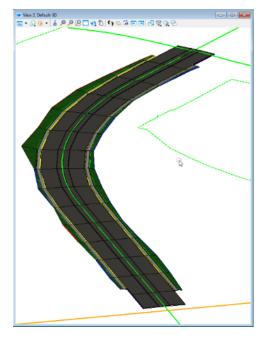
- 8. Repeat Steps 1 through 7 to set a point control for the **SR 61 L** corridor, with the following differences in the dialog:
 - Start Station:

Point:

•

701+34.00 EOP

- Control Description:
 - LT_PVT_EOP_OUT
- 9. For the Reference Feature: select the LT__PVT_EOP_OUT line on the SR 61 corridor (inside) in the 3D view, as shown on the right.



10. Repeat Step 6 to complete the point control. The model should look as shown on the left in the 3D view.

Exercise 2.11 Change Corridor Feature Definition, SR61 End Conditions

1. Open the **Explorer** pane from the Home tab or with the **F11** *Function Key.*



2. Expand the **OpenRoads Model** section of the **Explorer** window.

Explorer 🔻 👎 🗙
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😝 Items 🔹
🕞 Resources 🔹 👻
🖯 OpenRoads Model 🔥
🔇 💽 🗩 📰
Search P P ×
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Alignments
Ma Terrain Models
 Image: Corridors
🔺 🧼 1 PRELIM
SR61 L
▷ ∰ SR61 R
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🖍 Linear Template
👰 Surface Templates
🛗 Civil Cells
Superelevation
🖊 Linear Geometry
😥 3D Linear Elements
Points
Referenced Models
Sight Visibility Sections
Aquaplaning
TonicSlope
Site Layout
🕼 Sheet Index 🔹 👻
📽 Links 🔹
🤮 OpenRoads Standards 🔹 😽
🔋 Subsurface Utilities Model 🔹 🔹
🖯 Survey 🔹

- 3. Expand MODLRDDetail61.dgn (Default).
- 4. Expand 1 PRELIM under Corridors.
- 5. Right click on **SR61 L** and select *Properties*.
- 6. Hold down **Shift** or **Ctrl** and select **SR61 R**. The Properties window changes to show both Corridors selected.
- 7. Change the *Feature Definition* from **1 PRELIM** to **3 FINAL** as shown below. The 3D models for the outside corridors should redraw with a tighter interval.

Properties (OpenRoads I	Model) —	\times
 Selection (2) 		
📆 SR61 L		
📆 SR61 R		
General		*
Element Description Level Color Line Style Weight Class Template Transparency	**Varies** CorrHndlStg1_dp ByLevel (0) ByLevel (0) ByLevel (1) Construction (None) 30	
Priority	0	
Feature		*
Feature Definition	2 DESIGN	
Profile Name	CL_SR61_PR	

Exercise 2.12 Prepare to Create Corridor Model, US98

- 1. Go to the FDOT ribbon and Choose Create File.
- 2. Create a new MODLRDUS98.dgn file. Select Wakulla County. Choose Create/Open File.
- 3. Reference the SURVRD01, ALGNRD01, and DSGNRD01 files.
- 4. Use the **Terrain > Edit > Set Active** tool.



- 5. At the cursor prompt, select the **Terrain Boundary** green dashed line from the attached *SURVRD01 reference* file. This will set the *terrain model* as **Active**.
- 6. Move the cursor over the US98 Baseline Feature and verify an Active Profile.
- To set up the *Views* for viewing the 2D Plan and 3D Model simultaneously in the FDOTConnect WorkSpace, Select the F2 Function Key on the keyboard. This will open an Isometric View of the project.
- 8. Open the Level Display Browser.
- 9. With the 3D view active, turn off all levels in the *SURVRD01.dgn* reference, then turn on the **DTM_ ex** level.
- 10. In the 2D view, right click and select **Turn Level Off By Element** to turn off the following levels in the *SURVRD01.dgn* reference by selecting the relevant elements:
 - All existing utility levels
 - Survey control points
- 11. Turn off all DTM levels in the SURVRD01.dgn reference except DTM_ex.
- 12. Save Settings.

Exercise 2.13 Create Corridor, US98

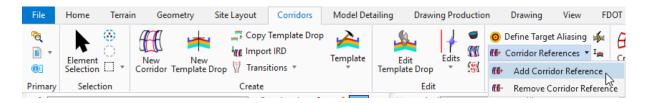
- 1. Use the Corridors, New Corridor tool.
- 2. Select the US98 Baseline in the Plan View when the Locate Corridor Baseline prompt comes up.
- 3. Reset to accept the Active Profile. This profile resides with the US98 Civil Feature Baseline.
- 4. Enter the Corridor Name, RRR98, in the Create Corridor dialog.
- 5. OpenRoads will continue on to the **Create Template Drop** command. Either use the **icon** on the dialog <OR> select **ALT down arrow** to pick a template.
- 6. Pick the **RRR98 cross slope correction L control** *template* in the *Corridor Templates* folder of the active Project Template Library.
- 7. Snap the start and end stations to the milling limits shown in the DSGNRD01.dgn file.
- 8. Set the Drop Interval to 20 and accept the remaining prompts.

Exercise 2.14 Add Corridor References, US98

- 1. Create a selection set of the following lines from the DSGNRD01.dgn file:
 - All Milling lines
 - All Paved Shoulder lines
 - All Edge of Pavement lines
- a. Open Level Display Manager.
- b. Turn off all levels but the Corridor handles in this file, and all but the needed levels in the *DSGNRD01. dgn* file.
- c. Use the box selection tool to select everything shown.
- d. Use the "-" selection tool to remove the corridor handles from the selection set.

NOTE "Select all on level by element" does not work with references in ORD.

2. Use the Corridors>Add Corridor References tool.



3. Data point to add selection set as a corridor reference.

Exercise 2.15 Additional Template Edits, SR61 (on your own)

- 1. Add the sidewalk front and back lines as corridor references to the respective outside corridors.
- 2. Change the sidewalk buffer from **3 feet** to **0 feet** on both roadways.
- 3. Add the outside Edge of Pavement lines as a corridor reference line to the SR61 mainline corridor.

3 SUPERELEVATION

OVERVIEW

Superelevation rotates the pavement cross slopes through a curve so that vehicles can maintain stability and speed while on a turning roadway. Elevation banking is applied to help offset centrifugal force. Superelevation standards also define the transition length required to rotate from a normal crown to a fully banked curve and back again.

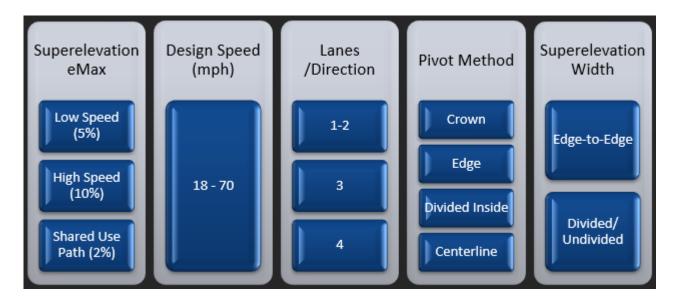
Superelevation can be calculated in two ways:

- Rules-based using a set of preferences the station and associated cross slopes of the transitions are based on design speed, curvature, and other design parameters. As the design progresses and parameters change (i.e., design speed exceptions) superelevation can be reprocessed to the revised parameter(s).
- Import using a comma separate values (CSV) file to import the station and associated cross slope of each transition. In this option, the rules are not utilized; the data is simply applied to the superelevation lanes.

The result of superelevation is a DGN file of graphic superelevation lanes with cross slope attributes. This file can be referenced to a corridor model and associated, so the superelevation transitions are incorporated into the corridor model. The superelevation data should be stored in the ALGNRD DGN file, in the Superelevation model.

DATA NEEDED FOR SUPERELEVATION

The following should be determined before beginning the superelevation process on any project since OpenRoads will need the data input. For this training dataset, the correct inputs will be provided.



EXERCISE OVERVIEW - SUPERELEVATION

In these exercises, the SR61 Centerline has a single curve to define superelevation. Once the required superelevation is determined from a predefined FDOT rule file, it will be assigned to the SR61 corridor. The results will be reviewed in the Cross Section View and in the table editor. Reports will be generated as other methods to review data.

As an alternative to calculating supers with rules, we'll also import a dataset from a FDOT Curve Table (csv file generated from Excel).

The general workflow for superelevation is listed below.

- Set up Superelevation Flags in Template Library
- Create Superelevation Sections and Lanes
- Calculate Superelevation Based on FDOT Tables
- Project Explorer Edits, Graphical Edits
- Superelevation Diagram and Reports
- Reference the Superelevation model of the ALGNRD File to the MODLRD file
- Assign Superelevation to Corridor, Associate Points
- Review superelevation in Cross Section View

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Exercise 3.1 Verify Template Superelevation Flags

- 1. Open the ALGRD01.dgn file in the C:\Worksets\FDOT\22049555201\Roadway folder of the WorkSet.
- 2. Use the **Corridors > Create Template** tool.
- 3. Set active the SR61 inside TS Template.
- Switch to Active Template view and select the Superelevation Points folder to highlight the points in the template that will be affected by superelevation. Verify that all four **Pavement Edge** *Points* and the CL_ null *Point* are highlighted.

Create Template e Edit Add Tools			- 0	
Points Components Contition Branches Colopiay Rules Pranewic Constaints	Current Template Name: SR61 inside Descriptor: Is Tunnel Template	Display Conponents Conponents Display All Components Display All Components		Close
Milemate Surfaces Moint Feature Definitions Component Feature Definitions Source Superelevation Points	e 1			
-+ CL null -+ LT_PGL -+ LT_PVT_EOP_IN1 -+ LT_PVT_EOP_OUT	C 10	📷 l. nell		
+ RT_PGL + RT_PVT_EOP_OUT	-0.5	na 1 krove stevnik skyle krale a krijeva i soli 1 krove soli soli na 1 krove stevnik skyle krale krale krale krale soli soli soli soli soli soli soli soli		
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view				Test
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, <u>[]</u> ,,			MIRROR F	

5. Open any of the points *Properties* and verify the *Superelevation Flag* option is checked **ON**.

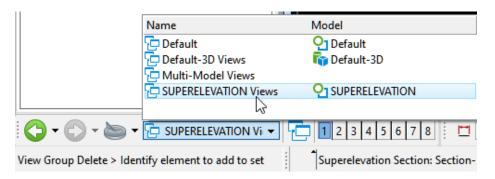
Point Properties	×
Name:	CL null ~ Apply
Use Feature Name Override:	CL null Close
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Constraints	aint 1 Constraint 2
Type: None	✓ None ✓
Horizontal Feature Constraint	> :\Crossover - Temporary\Crossover Temporary
Range:	0.00

- 6. Repeat Steps 3-5 for the SR61 Inside median curb Template.
- 7. Close the Create Template dialog.

NOTE Any changes needed to the points or Superelevation Flags must be saved to the .itl file and synchronized with the template in the appropriate MODLRD file.

Exercise 3.2 Prepare Alignment File for Superelevation

1. Locate the *View Group* toggle on the bottom left of the MicroStation window and change the *View Group/Model* to **Superelevation Views**.



2. On the MicroStation **References** tool, attach the Default models of the *DSGNRD01*, *MODLRDMainline61*, and *ALGNRD01* files.

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uick access	Training_Files		6/13/2024 9:13 AM	Fil		
	ALGNRD01.dgn		3/12/2024 1:02 PM	Be	The state	
	SGNRD01.dgn		3/12/2024 3:42 PM	Be		
Desktop	GNNTRD01.dgn		3/5/2024 3:34 PM	Be	A MARINE	
_	KEYSRD01.dgn		3/5/2024 3:36 PM	Be		
F	MODLRD_ExistinDrainage0	1.dgn	1/16/2024 7:31 AM	Be	1	
ibraries	MODLRD_ExistingFeatures	01.dgn	2/15/2024 2:12 PM	Be		
	MODLRD_ExistingUtilities0	1.dgn	1/16/2024 7:31 AM	Be		
	MODLRD_Master01.dgn		3/12/2024 4:02 PM	Be	Attachment Method	
This PC	MODLRDDetail61.dgn		6/14/2024 10:27 AM	Be	Interactive	
	MODLRDMainline61.dgn		6/13/2024 12:51 PM	Be		
5	MODLRDUS98.dgn		6/6/2024 9:47 AM	Be		
	VIANRD_LABELING_01.dgr	1	3/7/2024 2:09 PM	Be		
CLIVOIR .	VLANRD01.dgn		3/7/2024 2:20 PM	Be		
	VLPRRD01.dgn		3/7/2024 1:40 PM	Be		
	PROFRD_LABELING_01.dgr		3/5/2024 4:00 PM	Be		
	PROFRD01.dgn		3/5/2024 4:04 PM	Be		
	QTDSRD01.dgn		6/12/2024 10:27 AM	Be		
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	File name: "MODLRDMa	inline61.dan" "ALGN	RD01.dan" V	Open N		
				Grand	}	
	Files of type: CAD Files (*.dg	gn;".dwg;".dxf)	~	Cancel		



1. Use Corridors > Superelevation > Create > Create Superelevation Sections tool.

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🕐 No	🔊 No Feature Definition 🔍 💞 🥖 🚧 🗛 🦯 🗾 😡 🦄 📶 🔽							宙	Create Supe	erelevati	on Lanes	13					
Explorer	Explorer							Ħ	Create Supe	erelevati	on Lanes by F	load Temp	late				

- 2. Enter Name: SR61 and data point.
- 3. Select the CL_SR61 corridor.

NOTE Selecting the CL_SR61 centerline also works, but selecting a corridor automates much of the remaining process, and eliminates the need for exercises 3.4 and 3.5.

- 4. Select the *FDOT_Superelevation.xml* rules file.
- 5. Set all values as shown before accepting the Minimum Tangent Length value.

Create Superelevatio	n Sections — 🗆 🗙	
Name	SR61	
Rules File Name	C:\FDOTConnect\Organization-Civil\FDOT\Superelevation\FDC	
e Selection	emax 5% Low Speed	~
L Selection	FDOT Low Speed	~
Design Speed	45	~
Pivot Method	Inside Edge	~
Minimum Tangent Length	0.00	
Feature	43	•
Feature Definition	Superelevation	~
Name	SE	

6. Enter 80 for the EdgeWidth Runtime Variable.

Runtime Vari	ables		Х
EdgeWidth	8þ		
	2		
	ОК	Cancel	

NOTE The EdgeWidth Runtime Variable is the width used to determine the superelevation transition and varies depending on the type of roadway being superelevated. For any Low Speed roadways or High Speed undivided roadways, this width ("W" in the Standard Plans) will be left pavement edge to right pavement edge including any median, since the median width is included. For High Speed divided roadways, this width (W) will be the outside pavement edge to inside pavement edge of one side.

The section is drawn and the superelevation lanes automatically placed with the calculations.

7. Skip to Exercise 3.6.

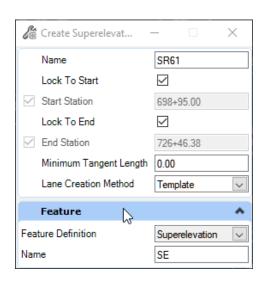
Exercise 3.4 Create Superelevation Sections (optional)

NOTE Only needed if selecting the centerline instead of the corridor.

- 1. On the Create Superelevation Sections dialog, enter remaining values as shown below:
 - Start Station Alt to lock to Begin
 - End Station Alt to lock to End

0

- Minimum Tangent •
- Lane Creation Method Template •
- Feature:
- Feature Definition Superelevation SE
- Name •



1. The Superelevation Sections are drawn and the Create Superelevation Lanes dialog is launched.

View 1, SUPERELEVATION	
🙆 Element Selection —	×//
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	8
	Superelevation Section: SR61-1 Level: CorrSuper_dp

NOTE Use the Function Key F5 to dim the references.

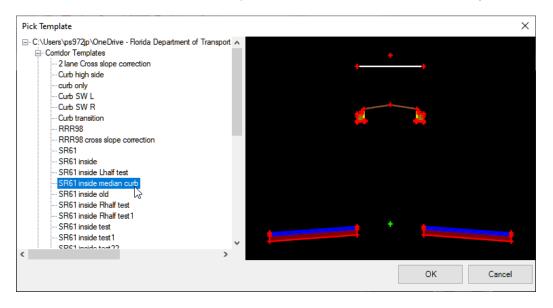
Exercise 3.5 Create Superelevation Lanes (optional)

NOTE Only needed if selecting the centerline instead of the corridor in Exercise 3.3.

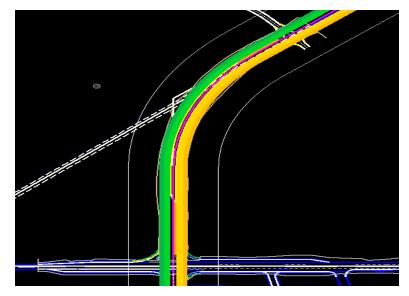
1. (Optional, only needed if canceling out of previous command.) Use the **Corridors > Create Superelevation Lanes by Road Template** tool.

File	Home Terrai	n Geometry Site Layout	Corridors Model De	tailing Drawing Production	on Drawing View Fl	тос		
° ∂ ∎ ▼ ®:	Element Selection	New New Corridor Template Drop V Transi			 Define Target Aliasing Corridor References * In Corridor Clipping * 	Creat	e Calculate	Dynamic 3D Drive Corridor Sections *
Primary	Selection	Create		Edit	Miscellaneous	B	Create Superelevati	on Sections
e 💡 No	📢 No Feature Definition 🔍 🧬 🛹 🙏 🦯 🗾 🖁 🖄 🕼 🔽							on Lanes
Explorer	View 1, SUPERELEVATION						Create Superelevati	on Lanes by Road Template

- 2. Select the **Superelevation Section** and reset to complete.
- 3. Select the SR61 Inside Median Curb Template as shown and click "OK" and Accept.



4. The Superelevation Lanes are drawn.



Exercise 3.6 Graphical Edits

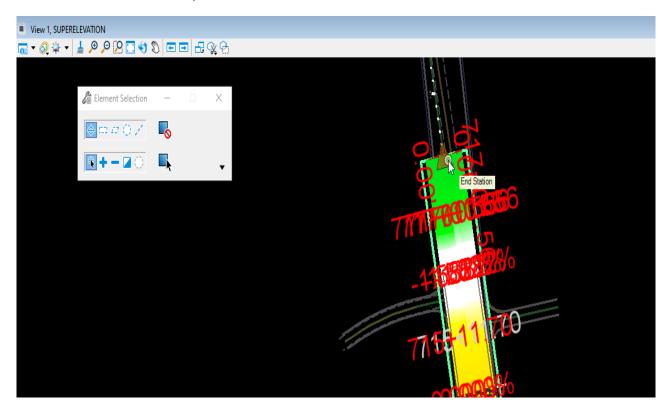
Superelevation Sections

1. Use the MicroStation **Element Selection** tool and select the **Superelevation Section**. The *graphic handlers* now display.



NOTE Press the Tab key if necessary to select the superelevation section instead of referenced linework.

2. Zoom in on the end of the Superelevation Section, select the *End Station* manipulator, and drag to extend the Superelevation Section to near Station 717+00. The Section as well as the lanes will extend, and the calculation will update as shown below.



Exercise 3.7 Add Superelevation Lane for Curb

NOTE Curb slope needs to follow the high side of the roadway superelevation per Standard Plans 000-511. This can be accomplished through a point control, or it can be done with superelevation.

1. Use the Corridors > Superelevation > Create > Create Superelevation Lanes Tool.

File	Home Ter	rain Ge	ometry Si	te Layout	Corridors	Model De	tailing Draw	ing Producti	on Drawing	View F	DOT				
° ≷ ∎ ▼ ®:	Element C	New Corridor	New Template Dro	4 Impo	Template Drop rt IRD itions *	Template	Edit Template Drop	Edits	 Define Target Corridor Refe Corridor Clip 	erences 🔻 I _m		Calculate	Dynamic Sections *		Corr Repc
Primary	Selection			Create			Edit		Miscellar	neous	ß	Create Supereleva	tion Sections		
e No	💦 No Feature Definition 🔍 🧬 🛹 🙏 🦯 🗾 🚱 🖄 🦾 🖂								齨	Create Supereleva	tion Lanes				
View	View 1 SUPEREI EVATION								Ħ	Create Supereleva	tion Lanes by	Road Temp	olate		

2. Select the Superelevation corridor and input the following values in the dialog:

Name	Gutter
Туре	Primary
Side of Centerline	Left
Inside Edge Offset	40.00
Width	1.50
Normal Cross Slope	9.375%

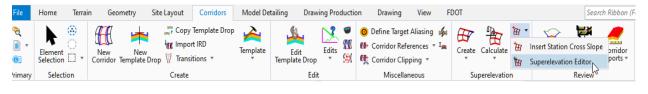
Create S	- 🗆 X
Name	Gutter
Туре	Primary 🗸
Side Of Centerline	Left 🗸
Inside Edge Offset	40.00
Width	1.50
Normal Cross Slope	9.375%

NOTE Normal Cross Slope should be calculated from the Standard Plans for the Edge of Pavement to Flowline based on curb type used. Curb and Gutter Type F is 9.375%.



Superelevation Editor

1. Select Corridors > Superelevation > Superelevation Editor.





- The Superelevation Editor opens. Note that the right side does not transition back correctly, because 2. the end transition was initially cut off before the end of the superelevation section.
- 3. Hold down the *Shift* key and select the last row. Click the Red X to delete all superelevation rows.

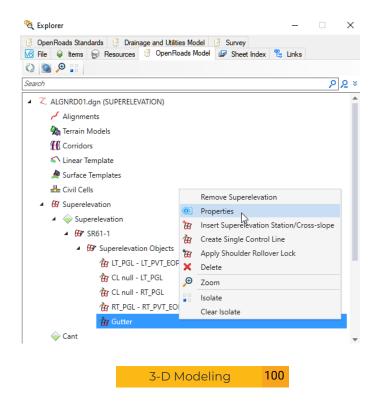
	1.1.1.1				1				· · · ·			
			-									
		~~~~~										
	700+50	702+23	703+87	705+	51 70	7+15 70	3+79	710+43 712	+07 7	/13+71	715+35	716
+‡ -‡ 🗖	<b>M</b> 0 0											
	🗙 🐂 🖷 🐒 😽	r 💷 🔒 🚖 🇞										_
	Superelevation	Name	Station	Curve Set	Cross Slope	Transition Type	Pivot Edge	Non Linear Curve	Point Type	Ignore	Distance Constr	. 1
	CL null - RT_PGL	CL null - RT_PGL	712+23.70	0	2.400%	Parabolic	Right Edge	75.0000	Full Super	False	Distance Offset	L
	CL null - RT_PGL	CL null - RT_PGL	. 712+71.70	0	2.000%	Parabolic	Right Edge	75.0000	Normal Crown	False	Distance Offset	
	CL null - RT_PGL	CL null - RT_PGL	717+01.56		-1.582%	Parabolic	Right Edge	75.0000	End Point	False	None	
	RT_PGL - RT_P	RT_PGL - RT_P	700+71.00	0	2.000%	Parabolic	Right Edge	75.0000	Normal Crown	False	None	
	RT_PGL - RT_P	RT_PGL - RT_P	706+32.70	0	2.000%	Parabolic	Right Edge	75.0000	Normal Crown	False	Vector Slope	L
	RT_PGL - RT_P	RT_PGL - RT_P	706+80.70	0	2.400%	Parabolic	Right Edge	75.0000	Full Super	False	Distance Offset	Ľ
	RT_PGL - RT_P	RT_PGL - RT_P	712+23.70	0	2.400%	Parabolic	Right Edge	75.0000	Full Super	False	Distance Offset	
	RT PGL-RT P	RT_PGL - RT_P	712+71.70	0	2.000%	Parabolic	Right Edge	75.0000	Normal Crown	False	Distance Offset	L
	ing as ing a	RT_PGL - RT_P	717+01.56			Parabolic	Right Edge	75.0000	End Point	False	None	
Þ	RT_PGL - RT_P	million and million										

4. Close the Superelevation Editor.



# Exercise 3.9 Project Explorer Edits

- 1. Open Explorer, Select F11 and select the OpenRoads Model tab.
- 2. Expand the ALGNRD01.dgn (SUPERELEVATION) data tree and navigate to Superelevation > SR61-1 > Superelevation Objects > Gutter. Right click and select Properties.



3. In the *Properties* dialog, review the **Superelevation Lane Properties**.

Properties (OpenRoad	s Model) —	$\times$
Selection (1)		
🕅 Gutter		
General		*
Element Description	Superelevation: Gutter	
Level	Default	
Color	[129,129,129]	
Line Style	····· ( <not found="">)</not>	
Weight	Varies Across	
Class	Primary	
Template	(None)	
Transparency	0	
Priority	0	
Extended		*
Superelevation		*
Name	Gutter	
Side Of Centerline	Left	
Inside Edge Offset	40.00'	
Width	1.50'	
Normal Cross Slope	-9.375%	
Туре	Primary	

4. Change the *Gutter* Lane Normal Cross Slope to -9.375%.



Calculate Superelevation

1. Use the Corridors > Superelevation > Calculate > Calculate Superelevation tool.

File	Home Terrai	n Geometry Site	Layout Corridors	Model De	tailing Drawing Produc	tion Drawing	View Fl	DOT				
°∂ ∎ ▼ 0]	Element Selection		☐ Copy Template Drop Import IRD Import IRD Iransitions ▼	Template	Edit Template Drop	O Define Target	erences 🔻 I _m	Create		™ * ♥/	Dynamic Sections *	3D D Throu
Primary	Selection		Create		Edit	Miscella	neous	Su	🏪 Ca	lculate Si	uperelevatior	n. 1
e No	e? No Feature Definition 🖸 est and the A of 💷 🚱 🐁 The Section Rule File										File	
View	View 1, SUPERELEVATION											
									orridor			

- 2. Select the Superelevation section.
- 3. Select the Superelevation rule file FDOT_Superelevation.xml.
- 4. Enter the necessary dialog information as shown at the prompt and data point to accept data:

e Selection	e _{max} 5% Low Speed
L Selection	FDOT Low Speed
Design Speed	45
Pivot Method	Inside Edge
Open Editor	No, unchecked

http://www.calculateSu	perelevation – 🗆 X
Rules File Name	C:\FDOTConnect\Organization-Civil\FDOT\Superelevation\FDC
e Selection	emax 5% Low Speed
L Selection	FDOT Low Speed
Design Speed	45 🗸
Pivot Method	Inside Edge
Open Editor	

5. Enter **80** for the **EdgeWidth** Runtime Variable.

Runtime Varia	ables		Х
Edge/Width	8þ		
	ß		
	ОК	Cancel	

- 6. The Superelevation Lanes are now applied with Superelevation.
- NOTE Bentley OpenRoads Connect Edition computes superelevation differently for each lane, using the offset to determine a different radius. As such, the only accurate calculations according to the FDOT method will be the center lanes, which both have the same calculated superelevation. Some edits in Excel will be required to copy the transitions and e rates from the center lane to the other lanes.

# **Exercise 3.11** Superelevation Reports

- Create a Superelevation Report
- 1. Use the Corridor > Superelevation > Superelevation Report tool.



#### 2. Select the SR61-1 Superelevation Section and right click to Accept. The Report Browser opens.

✓ Bentley Civil Report Browser - C:\Users\ps972jp\AppData\ File Tools Help	Local\Temp\RPTv4l	ssyb4.xml		- 0	×	
C:\Program Files\Bentley\OpenRoads Designer CONNEC		Superelevat	ion Data Rej	port	0	
Cant     Civil Terrain     CivilGeometry	R	23, 2020				
CivilSurvey     CorridorModeling     Evaluation	File Nan					
Geotech <ul> <li>Images</li> </ul>	Input Grid Note: All units in this report are in feet unless specifie Factor: otherwise					
LegalDescription     MapCheck     Milling     Schemas     Stakeout     StationOffset     Superelevation     FDOT_SuperelevationToCSV.xsl     SuperelevationCalculation.xsl	Section Name:	SR61-1			Z)	
	Base Horizontal Name:	CL_SR61				
	Standards C:\FDOTConnect\Organization- Filename: Civil\FDOT\Superelevation\FDOT Superelevation.xml					
SuperelevationCrossSlope.xsl SuperelevationData.xsl SuperelevationDesign.xsl	Design Speed:	45				
SuperelevationDesign.xsl SuperelevationToCSV.xsl	Pivot Method:	Inside Edge				
<ul> <li>TemplateLibrary</li> <li>Turnouts</li> <li>Themes</li> </ul>	E Selection:	emax 5% Low Spee	ed			
raw-xml.xsl ShowAll.xsl	L Selection:	FDOT Low Speed				
		Superelevation:	Gutter			
	Station	Cross Slope	Point Type	Transition Type		
K	700+71.00	-4.332%	Start Point			
	705+90.80	0.000%	Level Crown	Parabolic Curve		
	708+52.40	2.180%	Full Super	Parabolic Curve		
K	710+52.00	2.180%	Full Super	Parabolic Curve		
	713+13.60	0.000%	Level Crown	Parabolic Curve		
1	718+18.47	-4.207%	End Point	Parabolic Curve	$\sim$	

3. To adjust the formatting of the reports, go to *Tools*, **Format Options**. Set the Format Options as shown below:

	Mode		Precisio	on	Format		Clos
							Help
Northing/Easting/Ele	vation:		0.123	v			
Angular:	Degrees	Š	0.123	v	ddd.ddd ~		
Slope:			0.123	v	50% ~	]	
Use Alternate Slope in	f Slope Exceeds:		10.00%				
Alternate Slope:			0.123	~ C	d 0.5 ~		
Linear:			0.1234	v			
Station:			0.12	v	SS+SS.SS ~	Delimiter:	+
Acres/Hectares:			0.123	v			
Area Units:			0.123	v			
Cubic Units:			0.123	v	Convert to	Cubic Yard	
Direction:	Bearings	~	0.123	v	ddd.ddd ~		
Face:	Right Face	~					
Vertical Observation:	Zenith	~					

Slope Precision	0.123
Slope Format	50%
Alternate Slope	0.10 (10%)
Linear Precision	0.1234
Station Precision	0.12
Station Format	ss+ss.ss

4. In the Civil Report Browser, change the report format stylesheet to SuperelevationCalculation.xsl Scroll through the report and note the different radius measurements used for each lane. This will need to be corrected to meet FDOT criteria.

File Tools Help							
C:\Program Files\Bentley\OpenRoads Designer CONNEC	Section Name:	SR61-1					×^
▷ Cant ▷ Civil Terrain	Base Horizontal Name:	CL_SR61					
<ul> <li>▷ CivilGeometry</li> <li>▷ CivilSurvey</li> </ul>	Standards Filename:	C:\FDOTConnect\Organization-Civil\FI	DOT\Superelevation\FD	OT_Superelevation.xml			Ő.
CorridorModeling     Evaluation	Design Speed:	45					
Geotech	Pivot Method:	Inside Edge					
Images     LegalDescription	E Selection:	emax 5% Low Speed					
MapCheck	L Selection:	FDOT Low Speed					
<ul> <li>Milling</li> <li>Schemas</li> <li>Stakeout</li> </ul>	Calculation Units:	US survey foot					X
StationOffset     Superelevation     FDOT_SuperelevationToCSV.xsl	Start Station: 700+71.00	End Station: 718+18.47					
SuperelevationCalculation.xsl SuperelevationCrossSlope.xsl	Lane Set:		$\overline{X}\overline{X}\overline{X}$			$\overline{\mathbf{X}}$	ð.
SuperelevationData.xsl	Left Offset:	-41.50					
SuperelevationDesign.xsl SuperelevationStations.xsl	Right Offset:	-40.00					
SuperelevationToCSV.xsl	Curve Set: 1	Outside Lane: Gutter	XXXX				
<ul> <li>TemplateLibrary</li> <li>Turnouts</li> </ul>		Global Variables:					
▷ _Themes raw-xmLxsl		NRotatedLanes	0.5000				
ShowAll.xsl		PivotType	1 (Inside Edge)				
		WidthLane	1.5000				
		InitialCrossSlope	-0.0938				
		UseSpiralLength	false				
		PercentOnTangent	0.8000				
		LengthsAreTotalTransition	true				
K		UseRunoutLength	false				
		Radius	921.0000				
		Speed	45.0000				
		Maximum cross slope cale	culations	$\times \times \times \times \times \times$	X X X X		$\geq$
/		Max E Value:	2.180%				
1		Result from:	From Interpolated Ta	ble emax 5% Low Speed			
		Transition length calculati	ions	$\times \times \times \times \times \times$		$\propto$	$\geq$
		Transition Length:	1386.6000				
		Result from:	FDOT Low Speed				
		Equation:	max(TransitionLengt	h, MinTransitionLength )			
		Variables:	Name	Value	Equation		
K			EdgeWidth	80.0000	80		$\sim$
	<		MaxE	0.0218		$\sim$	<u> </u>



# **NOTE** Calculations can be confirmed using this report as well, if needed to verify which lane uses the correct radius, a current OpenRoads defect.

5. In the Civil Report Browser, change the report format stylesheet to FDOT_SuperelevationToCSV.xsl. Verify that Station and precision are showing properly.

Bentley Civil Report Browser - C:\Users\ps972jp\AppData\Local	l\Temp\RPTv4lssyb4.xml — □	×
ile Tools Help		
C:\Program Files\Bentley\OpenRoads Designer CONNEC	Gutter,700+71.00,-0.0433,RS,SP,PC,75	
Cant	Gutter, 705+90.80, 0.0000, RS, LC, PC, 75	
Civil Terrain	Galdel, 103150.00,0.0000,R3,10,10,10	
CivilGeometry     CivilGeometry	Gutter, 708+52.40, 0.0218, RS, FS, PC, 75	
CivilSurvey		
CorridorModeling     Evaluation	Gutter,710+52.00,0.0218,RS,FS,PC,75	
Geotech		
▷ Images	Gutter,713+13.60,0.0000,RS,LC,PC,75	
LegalDescription		
MapCheck	Gutter,718+18.47,-0.0421,RS,EP,PC,75	
▷ Milling		
Schemas		
Stakeout	LT_PGL - LT_PVT_EOP_OUT,700+71.00,-0.0200,RS,NC,P	C,75
StationOffset		
<ul> <li>Superelevation</li> </ul>	LT_PGL - LT_PVT_EOP_OUT,701+58.40,-0.0200,RS,NC,P	C,75
FDOT_SuperelevationToCSV.xsl		
SuperelevationCalculation.xsl	LT_PGL - LT_PVT_EOP_OUT,703+98.40,0.0000,RS,LC,PC	, /5
SuperelevationCrossSlope.xsl	LT PGL - LT PVT EOP OUT,706+38.40,0.0200,RS,RC,PC	75
SuperelevationData.xsl	LI_FGL = LI_FVI_EOF_001,700+50.40,0.0200,R3,RC,FC	, 15
SuperelevationDesign.xsl	LT_PGL - LT_PVT_EOP_OUT,706+79.20,0.0234,RS,FS,PC	. 75
SuperelevationStations.xsl		
SuperelevationToCSV.xsl	LT PGL - LT PVT EOP OUT,712+25.20,0.0234,RS,FS,PC	,75
TemplateLibrary     Turnouts		
Furnouts Themes	LT PGL - LT PVT EOP OUT,712+66.00,0.0200,RS,RC,PC	,75
raw-xml.xsl		
ShowAll.xsl	LT_PGL - LT_PVT_EOP_OUT,715+06.00,0.0000,RS,LC,PC	,75
SHOWAII.X3I		>

**NOTE** Cross Slope in this table uses the linear precision, as it cannot have a % symbol when importing back in to the editor.

- NOTE Any modified values of curve length (the last column), will not export properly due to OpenRoads limitations. The default value is exported in the FDOT_SuperelevationToCSV report.
- 6. In the Civil Report Browser, select File > Save As.
- 7. Change the *path folder* to C:\Worksets\FDOT\22049555201\Roadway and the *File Name* to **SR61_ SE.csv** use the *Save as type* **Text File (*.txt).**

Save As							$\times$
← → ~ ↑ <mark> </mark>	« FDOT	» 2204955520	)1_CE → roadv	vay > 〜 ご	Search roadway		Q,
Organize 👻 New	v folder						?
> Signatures	^ N	Jame	Status	Date modified	Туре	Size	
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> 🗊 3D Objects		me.txt	0	3/18/2020 11:15 AM	Text Document		9 KB
> Desktop	~ <						>
File name:	SR61_SE.c	sv]					~
Save as type:	Text File (*	.txt)					$\sim$
∧ Hide Folders					Save	Cancel	

8. Choose Save and Exit the Civil Report browser.

# Exercise 3.12 Editing Superelevation .csv Report

- 1. Open the .csv file in Excel to make edits.
- Copy all values (columns B-G) from the CL null LT_PGL lane to the LT_PGL LT_PVT_EOP_ OUT lane.

Auto	Save 💽 🕅 🖫	り・»		SR61_SE.cs	v <del>-</del>		р Б	-		×
File	Home Insert	Page Layout	Formulas	Data Re	eview Vie	ew Help	BLUEBEAM	Team	ß	P
() P(	OSSIBLE DATA LOSS	Some features workbook in th To preserve the format.	he comma-de	limited (.cs ave it in an l	/) format.	Don	't show again	Save A	5	3
	·	, √ Jx	B	с С	D	F	F	G	н	
8	А		D	U	U	E	F	0		
9	LT PGL-LT P		700+71.00	-0.02	RS	NC	PC	75		
10	LT PGL - LT PV		701+52.70	-0.02		NC	PC	75		
11	LT PGL-LT PV		703+92.70		RS	LC	PC	75		
12	LT_PGL - LT_P\		706+32.70	0.02	RS	RC	PC	75		
13	LT_PGL - LT_P\	T_EOP_OUT	706+80.70	0.024	RS	FS	PC	75		
4	LT_PGL - LT_P\	T_EOP_OUT	712+23.70	0.024	RS	FS	PC	75		
15	LT_PGL - LT_P\	/T_EOP_OUT	712+71.70	0.02	RS	RC	PC	75		
16	LT_PGL - LT_P\	/T_EOP_OUT	715+11.70	0	RS	LC	PC	75		
17	LT_PGL - LT_P\	/T_EOP_OUT	717+51.70	-0.02	RS	NC	PC	75		
18	LT_PGL - LT_P\	/T_EOP_OUT	718+18.47	-0.02	RS	NC	PC	<b>75</b>		
19								12		
20	CL null - LT_PG		700+71.00	-0.02		NC	PC	75		
21	CL null - LT_PG		701+52.70	-0.02		NC	PC	75		_
22	CL null - LT_PG		703+92.70	-	RS	LC	PC	75		_
23	CL null - LT_PG		706+32.70	0.02		RC	PC	75		_
24	CL null - LT_PG		706+80.70	0.024		FS	PC	75		_
25	CL null - LT_PG		712+23.70	0.024		FS	PC	75		_
26	CL null - LT_PG		712+71.70	0.02		RC	PC	75		_
27	CL null - LT_PG		715+11.70	-	RS	LC	PC	75		_
28 29	CL null - LT_PG		717+51.70	-0.02		NC NC	PC PC	75 75		_
29	CL null - LT_PG	IL	718+18.47	-0.02	<u>кэ</u>	NC	PC	/5		_
-	> SR61_SE	(+)				•				Þ
Select di		Average: 37.5004	Count: 60	Sum: 750.0	08 🆽		巴		- + 1	00%

3. Modify Gutter Lane values to match the table below. This can be done with a combination of copy and paste as well as adding new rows.

	RS	NC	L	75
	RS	NC	L	75
0	RS	LC	L	75
	RS	FS	L	75
	RS	FS	L	75
0	RS	LC	L	75
	RS	NC	L	75
	RS	NC	L	75
		RS 0 RS RS 0 RS RS RS	RS       NC         0       RS       LC         RS       FS         RS       FS         0       RS       LC         RS       S         0       RS       LC         RS       NC	RS       NC       L         0       RS       LC       L         RS       FS       L         RS       FS       L         0       RS       LC       L         RS       FS       L         0       RS       LC       L         RS       NC       L

#### NOTE Station for the second and second-to-last NC (Normal Crown) can vary as desired to adjust the distance the gutter transitions from full depth to match the lane at the Level Crown station.

4. Verify that all values appear correct, and close and save the .csv file.





1. Repeat Exercise 3.8, steps 1-3 to clear out the calculated superelevation. Leave the Superelevation Editor open.

🚮 Superel	evation Editor	- 🗆	×
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+-44*	705+56 708+84 712+ C+t ⊟ ≰ ∽ ∝	12 715+4	• ~
SR61-1			
	Superelevation Name		Stat ^
	LT_PGL - LT_PVT Import Superelevation Tran	nsitions DP_OUT	700+
	LT_PGL - LT_PVT_EOP_OUT LT_PGL - LT_	_PVT_EOP_OUT	703+
	<		>
	Row: 🛛 🔍 1 of 40 🕨 📲		
	1		

- 2. Select "Import Superelevation Transitions."
- 3. Locate the csv file in the Roadway directory and import the Superelevation.

# **Exercise** 3.14 Superelevation Diagram

1. Select Corridors > Superelevation > Open Superelevation View.

到 Ор	enRoads Modeling	- 🚍 🖬 🗟 🗞 🔹 🖈	📌 🚔 🖛				C:\Users\ps972jp\C
File	Home Terrai	in Geometry Site Layout	Corridors Model D	etailing Drawing Production	n Drawing View FDO	Т	
© ∎ ▼ 0	Element Selection	New New Imp	y Template Drop ort IRD nsitions *	te Edit Template Drop	<ul> <li>Define Target Aliasing in</li> <li>Corridor References * In</li> <li>Corridor Clipping *</li> </ul>	Create Calculate	Dynamic Sections *
Primary	Selection	Create	2	Edit	Miscellaneous	Superelevation	Review
e? No	Feature Definition	e	! 🥖 📥 🙏 🛛	J 🔒 🐁 🐁	· ,		Superelevation View

- 2. Select the Superelevation Section.
- 3. Open View 2 and select in the window. The Superelevation Diagram is placed in this view.

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	406	
	-0.06	
	4.07	
	-0.06	
	-0.00	
4		15-00 3495-00

4. Save Settings.

**Exercise 3.15** Attach Superelevation to Model File

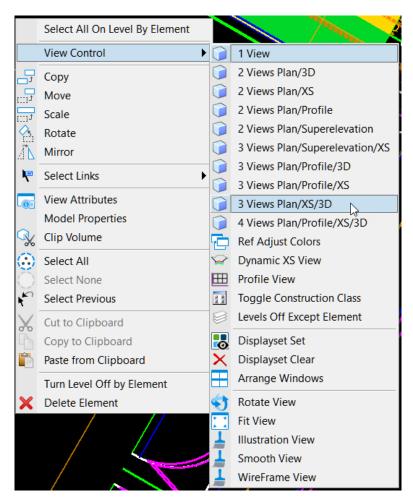
- 1. Open the *MODLRDMainline61* file. Make sure the 2D view is active.
- 2. Attach the **Superelevation Model** from the *ALGNRD01*-file as a *Reference* file.

Reference Att	tachmer	It Properties for	ALGNR	D01.dgn			$\times$
File Name:	ALGN	RD01.dgn					
- Full Path:		ksets\FDOT\220	495552	01_CE\roadwa	ıy∖AL	LGNRD01.dgn	
Model:	Defaul	t				-	
Logical Name:	Name				D	Description	
Description:	Default				N	Aaster Model	
0.1	Default						
Orientation:		ELEVATION					
View	SUPER	LEVATION-5D					
Coincident	L						
Coincident -				Origin aligned			
Geographic						x error 3.968e-07 '	
Geographic		ecteu	Reproje	ect reference o	lata	to Master GCS	
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				<u>_</u>	<u>0</u> K	Cancel	

Exercise 3.16 Set up Cross Section View

#### Open a Cross Section View

1. Right click and hold in one of the views and select View Control > 3 Views Plan/XS/3D.



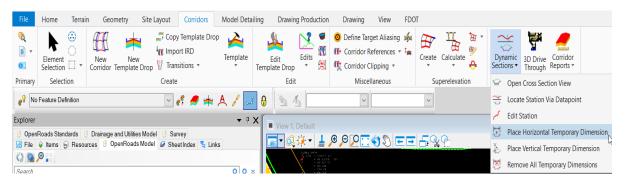
2. Select **OK** to create a dynamic cross section view.

Open a Dynamic Cross Section View	×
Select OK to Create a Dynamic XS View	
Cancel	

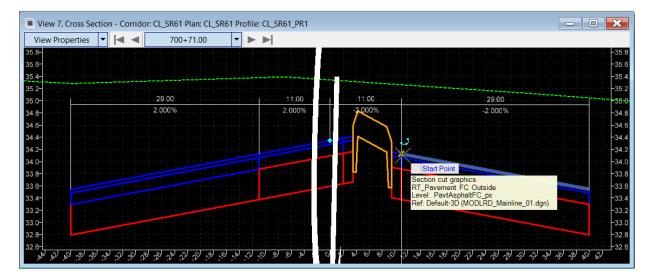
- 3. Select the SR61 mainline corridor and click in View 7 The cross section view should open in this view.
- **NOTE** For this and some other tools, you will need to select the short corridor handle that recurs along the length of the corridor. The long template drop handles at the beginning and end of each template drop is not valid for this tool.

#### Add Dimension Lines

4. Use the Corridors > Review > Dynamic Sections > Place Horizontal Temporary Dimension tool.



5. Select **View 7** and dimension each Superelevation lane as shown below (Left Lane, Left Median, Right Median, Right Lane), making sure to select the *Blue Diamond* centerline point for the two median lanes.

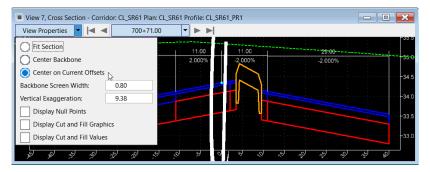


NOTE Make sure to select the point on top of the friction course on both sides. Zoom in as needed to see better. Ctrl+zoom with the mouse wheel will add vertical exaggeration if needed.

6. Adjust zoom as desired.

#### Change Station

7. Select View 7 View Properties > Center on Current Offsets as shown below.



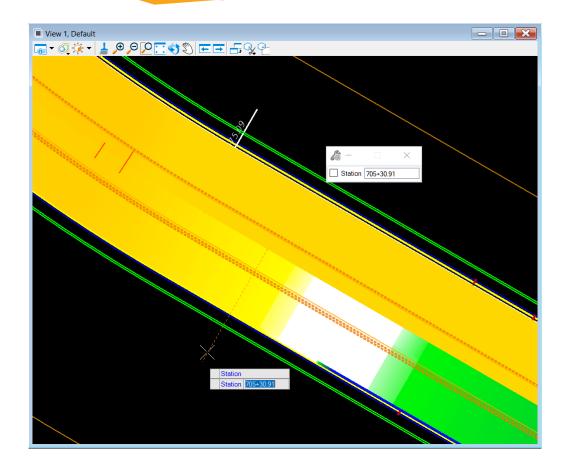
8. Right click and hold in View 7 and select Locate Station Via Datapoint as shown on the right.

	Select All On Level By Element						
	View Control						
t_	Сору						
t	Move						
t	Scale						
	Rotate						
<u> 1</u>	Mirror						
٣	Select Links						
	Place Horizontal Temporary Dimension						
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	Remove All Temporary Dimensions						
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$\odot$	Select All						
Ô	Select None						
5	Select Previous						
$\mathbf{X}$	Cut to Clipboard						
	Copy to Clipboard						
Ê	Paste from Clipboard						
	Turn Level Off by Element						
×	Delete Element						

9. Select View 1.

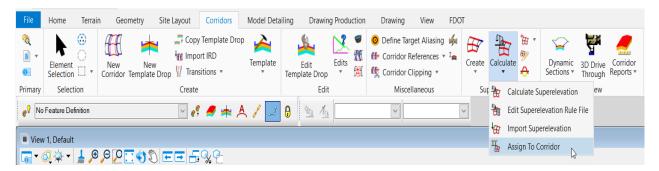
10. Select a station in the Superelevated area near the Superelevation Transition as shown below.

**NOTE** The cross slope is still 2% since the Superelevation has not yet been assigned.



# **Exercise 3.17** Assign Superelevation to Corridor

1. Use Corridors > Superelevation > Calculate > Assign to Corridor tool.



- a. Select the Superelevation section and Reset to accept.
- b. Select the SR61 corridor.
- c. Verify that the **Superelevation** and **Pivot Points** are correct. For the Gutter Lane, choose any point for Superelevation and Pivot Point.

	Superelevation Lane		Superelevation Point		Pivot Point		Start Station	Stop Station	Priority
ø	Gutter	$\sim$	CL null	Ř	LT_PVT_EOP_OUT	$\sim$	698+95.00	726+46.38	1
	LT_PGL-LT_PVT_EOP_OUT	$\sim$	LT_PVT_EOP_OUT	3	LT_PGL	$\sim$	698+95.00	726+46.38	1
	CL null - LT_PGL	$\sim$	LT_PGL	$\sim$	CL null	$\sim$	698+95.00	726+46.38	1
	CL null - RT_PGL	$\sim$	CL null	$\sim$	RT_PGL	$\sim$	698+95.00	726+46.38	1
	RT_PGL-RT_PVT_EOP_OUT	$\sim$	RT_PGL	$\sim$	RT_PVT_EOP_0	$\sim$	698+95.00	726+46.38	1
*		$\sim$		$\sim$		$\sim$			

#### NOTE Since the curve is to the right and we rotate about the inside edge, the Pivot Point should be the Template Point on the right while the Superelevation Point should be the Template Point on the left.

- d. Click **OK** on the *Associate Superelevation* Dialog, and then click **OK** on the error regarding Recursive Superelevation.
- NOTE This error occurs because the Gutter Lane is not actually in the mainline template, and would not occur if we had the gutter in the same template as the mainline. Superelevation will not process correctly due to this error, but it is easy to resolve by manually deleting the extra point control, though.
- 2. The Corridor will begin to process and display the new model.

Exercise 3.18 Review Superelevation Point Controls

1. Use the Corridors > Edit > Corridor Objects tool.



2. Identify the Corridor Boundary handle to open the Corridor Objects dialog.

3. Select **Point Control**, and find the Superelevation control labeled SR61-1:Gutter. Select it.

Corridor Objects - CL_S	R61							_			×
Template Drop	:	<b>X</b> 🖥 I	1	÷ 🖯		•	•	PointControl			^
Secondary Alignment		Enable	d	Control Des	Mode	Control Type		Enabled	$\checkmark$		
Key Station	•	True	$\sim$		Vertical	Superelevation		Control Description			
Parametric Constraint		True			Vertical	Superelevation		Mode	Vertical		$\sim$
Point Control		True			Vertical	Superelevation		Control Type Cant	Superel	evation	
Curve Widening		True			Vertical	Superelevation		Point	CL null		
End Condition Exception		True			Vertical	Superelevation		Superelevation	SR61-1:	Gutter	
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Clipping Reference								Priority	1		
								Station Rang	je		^
	<			_		_	>	Start Station	700+71.0	00	
	Row	: I4 - 4	1	of 5				End Station	723+76.3	38	
										Clo	ose

- 4. Click the red X to delete. The superelevation reprocesses.
- 5. Close the Corridor Objects dialog.
- 6. Verify in the cross section view that the superelevation has been applied correctly. Move to the previous or next cross section using the arrows as shown below, or use the **Locate Station Via Datapoint** tool.

View 7, Cross Section - Corrid	or: CL_SR61 Plan: CL_SR6	1 Profile: CL_S 💶 💷 🔀
View Properties 🔻 🖊 ┥	705+60.00	
34.5		Next Station
34.0-		-34.0
33.5-29.00		-33.5
33.0-	11.00	29.00 -33.0
32.5	-1.211% -2.000%	-2.000%
32.0-		-32.0
31.0-		-31.0
30.5-		-30.5
30.0-		-30.0
SC 32 25 26 26 28	10 10 0 0	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$



Assign Gutter Superelevation, SR61 L

#### Turn on Display of Superelevation model

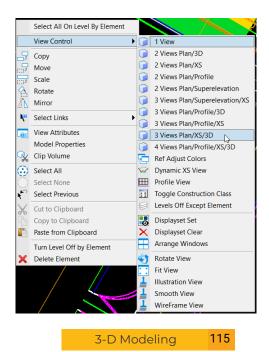
- 1. Open the MODLRDDetail61.dgn file.
- 2. Open the References dialog.
- 3. Set the 2D view active.
- 4. Use Show Hierarchy, select MODLRDMainline61.dgn.

References (7 of 7 unique, 3 displayed)	- 🗆 X
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Nesting Depth: 1 Display Overrides: Never Vew Leve	Display: Config Variable 🔻
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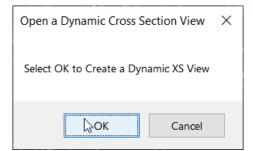
5. Turn on display of the ALGNRD01.dgn file, SUPERELEVATION model.

#### Set up Cross Section View

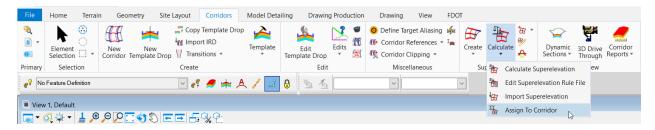
6. Right click and hold in one of the views and select View Control > 3 Views Plan/XS/3D.



7. Select OK to create a dynamic cross section view.



- 8. Select the SR61 L corridor and click in View 7. The cross section view should open in this view.
- Assign Superelevation to Corridor
- 9. Use Corridors > Superelevation > Assign to Corridor tool.



- Select the Superelevation section and reset to accept.
- b. Select the SR61 L corridor.
- c. Verify that the **Superelevation** and **Pivot Points** are correct for the Gutter Lane. For the remaining lanes, choose any point for Superelevation and Pivot Point.
- d. Set Priority for Gutter to 1 and the others consecutively as shown.

	Superelevation Lane		Superelevation Point		Pivot Point		Start Station	Stop Station	Priori
	Gutter	$\sim$	LT_CURB_FL_OUT	$\sim$	LT_PVT_EOP_OUT	$\sim$	698+95.00	726+41.66	1
	LT_PGL - LT_PVT_EOP_OUT	$\sim$	LT_CURB_FL_OUT	$\sim$	LT_PVT_EOP_OUT	$\sim$	698+95.00	726+41.66	2
	CL null - LT_PGL	$\sim$	LT_PVT_EOP_OUT	$\sim$	CL null	$\sim$	698+95.00	726+41.66	3
	CL null - RT_PGL	$\sim$	LT_CURB_FL_OUT	$\sim$	CL null	$\sim$	698+95.00	726+41.66	4
	RT_PGL - RT_PVT_EOP_OUT	$\sim$	LT_PVT_EOP_OUT	$\sim$	CL null	$\sim$	698+95.00	726+41.66	5
k		$\sim$		$\sim$		$\sim$			

# NOTE Since the curve is to the right and we rotate about the inside edge, the Pivot Point should be the Template Point on the right while the Superelevation Point should be the Template Point on the left.

e. Click **OK** on the Associate Superelevation Dialog.

10. The Corridor will begin to process and display the new model.

13% 📩		

#### Review Superelevation Point Controls

11. Use the Corridors > Edit > Corridor Objects tool.

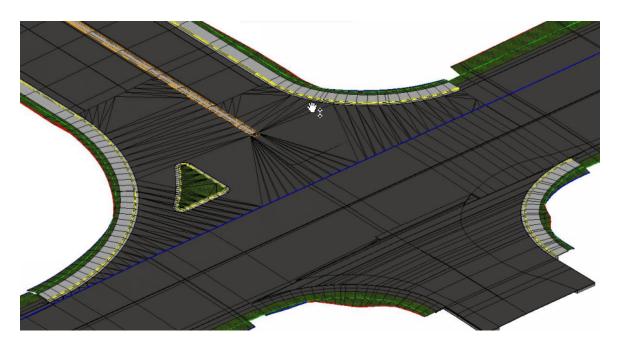
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Primary	Select	ion			Create				Edit			Miscella	neous	
en No	No Feature Definition     Image:													

- 12. Identify the Corridor Boundary handle to open the Corridor Objects dialog.
- 13. Select **Point Control**, and find the Superelevation control labeled *SR61-1:Gutter*. Select all the other Superelevation Point Controls.

Template Drop	1	X 🖻 🖷 🕯	R 🔒						•	PointControl		1
Secondary Alignment		Enabled	Control D	Mode	Control Type	Use as S	Priority	Start Stat	End Stati	Enabled	$\checkmark$	
ey Station		Tr_Delete	EOP	Both	Corridor Feature		10	701+34.00	726+41.66	Control Description		
,		True		Vertical	Superelevation		1	700+71.00	718+90.23	Mode	Vertical	
Parametric Constraint		True		Vertical	Superelevation			700+71.00	718+90.23	Control Type	Superelevation	
Point Control		True		Vertical	Superelevation		3	700+71.00	718+90.23	Cant		
urve Widening		True		Vertical	Superelevation		4	700+71.00	718+90.23	Point	LT_CURB_FL_OUT	
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xternal Reference										Reference Point	CL null	[
lipping Reference										Priority	4	
										Station Range		
										Start Station	700+71.00	
										End Station	718+90.23	
	Rov	v: 🚺 🖣 6	of 6							J		

- 14. Click the red **X** to delete. The superelevation reprocesses.
- 15. Close the Corridor Objects dialog.
- 16. Verify in the cross section view that the superelevation has been applied correctly, and that the gutter follows the outside lane slope when it reaches a positive superelevation. Move to the previous or next cross section using the arrows as shown below, or use the **Locate Station Via Datapoint** tool.
- 17. Turn off display of the ALGNRD01.dgn file, SUPERELEVATION model and close the Reference dialog.
- 18. Save Settings.

# 4 DETAIL MODELING



# SR61 CORRIDOR DESIGN DETAILS EXERCISES

Curb Radii

- Add profiles for Edge of Pavement
- Add Point Control for End Conditions

Intersection Design

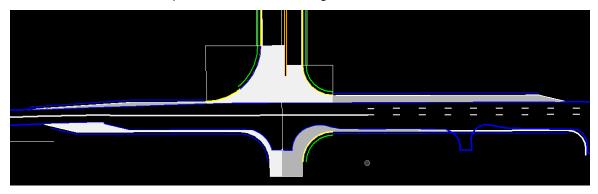
- Build Intersection Terrain at SR 61 and US 98
- ncluding TS Nose and Turn Island

#### **OTHER DESIGN DETAILS**

- Build Intersection Terrain at School Entrance
- Transition Template for the End of the Project
- Build Intersections for Friendship Road
- Add 3D Urban Driveway
- Add 3D Sidewalk Ramps
- Add 3D Rural Turn Out
- Superelevation Vector Offsets for the Median Widening and Curb Gutter Points
- Superelevation Vector Offsets for the Traffic Separator Widening

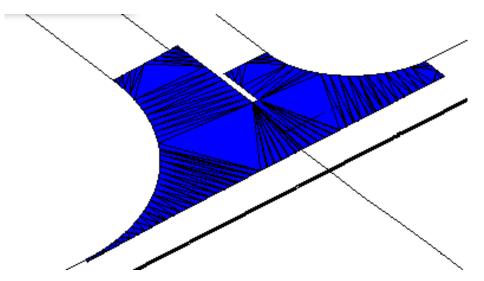
# **INTERSECTION DESIGN**

The intersection can be built in parts as shown in the diagram:



The following exercises provide instructions on how to model these with Civil Tools other than the Normal Corridor Templates. The steps to design the SR61 intersection have been detailed in the exercises in this chapter. Once completed follow the same methodology to add further design details for the remainder of the project.

## PLAN TO BUILD INTERSECTION TERRAIN AT BL98



The general methodology for building intersection design come from the concept of creating new 3D model boundary lines from profiles on the corridor surfaces and 3D lines. Transition profiles are easily produced with the civil tools for the radii.

These are the general steps to follow:

- 1. Develop a seam line between corridors through the intersection.
- 2. Create a switch or trigger line on the crossing corridor templates.
- 3. Remove outside corridor component elements through the limits of the intersection.
- 4. Construct 2D elements around the perimeter of the intersection.
- 5. Develop/design the profiles for each of the perimeter line.
- 6. Build an intersection terrain boundary using the 3D perimeter elements.
- 7. Add break lines to the intersection terrain.
- 8. Add surface templates to the intersection terrain.
- 9. Use linear templates along the perimeter edge lines to help transition corridors.
- 10. Use corridor clipping tool to clean overlaps between corridor and linear templates.

3-D Modeling 119

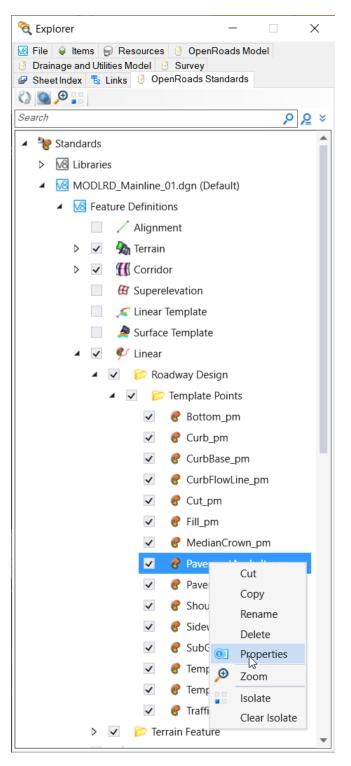
# **EXERCISE OVERVIEW**

Exercise 4.1	Create Template Geometry, RRR98	121
Exercise 4.2	Create Template Geometry, SR61	123
Exercise 4.3	Construct 3D Radius Lines	124
Exercise 4.4	Construct 3D Intersection Limit Lines	129
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Exercise 4.7	Build the Intersection Terrain from 3D Elements	139
Exercise 4.8	Clip Terrain for Right Turn Island	141
Exercise 4.9	Create an Intersection Pavement Surface	144
Exercise 4.10	Traffic Separator Nose	146
Exercise 4.11	Right Turn Island	147
Exercise 4.12	RRR98 Corridor-Build Intersection Terrain at School Entrance (On Your Own)	149
Exercise 4.13	SR61 Corridor-Build Intersection Terrain at Friendship Road (On Your Own)	150



This exercise turns on the profiles needed to build profiles tied to the corridor model. We have implemented 2D Lines from the 3D model. In Explorer change the PavementAsphalt_pm feature property to True as shown below. Then re-process each corridor to see the resulting construction lines. These lines have profiles and can be used in lieu of the steps outlined in the exercise.

- 1. Open the *MODLRDUS98.dgn* file.
- Go to Explorer, right click on Feature Definitions > Linear > Roadway Design > Template Points > PavementAsphalt_pm and select Properties as shown on the left.



**3-D Modeling** 

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3. Change **Create Template Geometry** to "**True**" as shown below.

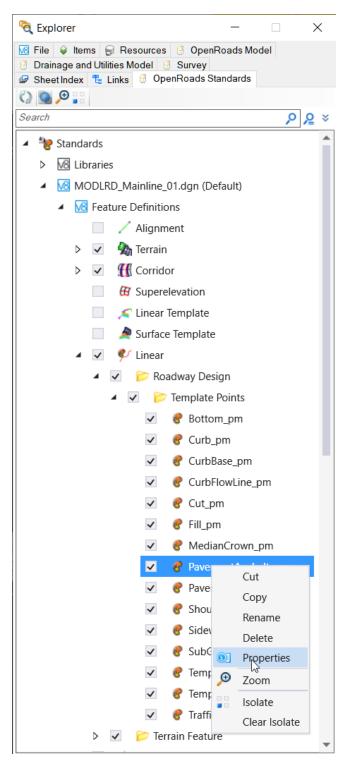
Properties (Open	Roads S —	$\times$							
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🗸 🦿 Pave	ementAsphalt_pm								
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- 4. Reprocess the corridor. Note the additional purple lines that show up in the 2D view.
- 5. Add Key Stations at the radius return points on either side of the SR61 intersection.



This exercise turns on the profiles needed to build profiles tied to the corridor model. We have implemented 2D Lines from the 3D model. In Explorer change the PavementAsphalt_pm feature property to True as shown below. Then re-process each corridor to see the resulting construction lines. These lines have profiles and can be used in lieu of the steps outlined in the exercise.

- 1. Open the MODLRDMainline61.dgn file.
- Go to Explorer, right click on Feature Definitions > Linear > Roadway Design > Template Points > PavementAsphalt_pm and select Properties as shown below.



**3-D Modeling** 

123

3. Change Create Template Geometry to True as shown below.

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4. Reprocess the corridor. Note the additional purple lines that show up in the 2D view.

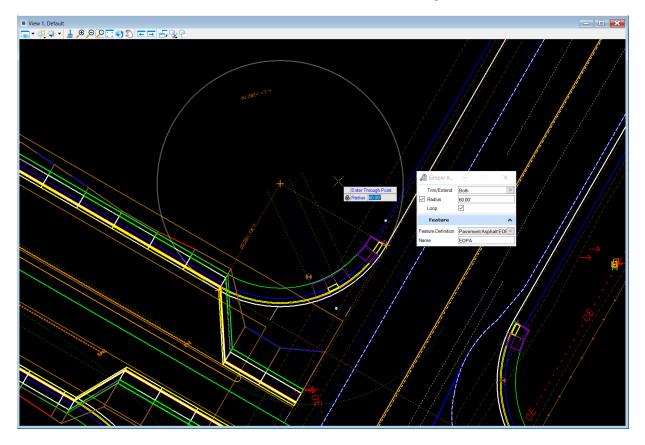


**Construct 3D Radius Lines** 

- 1. Open the MODLRDDetail61.dgn file and zoom in to the intersection of SR61 and US 98.
- 2. From *Geometry*, *Horizontal*, *Arcs* > *Arc Between Elements*, use the **Simple Arc** tool to create new **PavementAsphaltEOPA** features between the two *PavementAsphaltEOPA* edges on both corners.

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3. Use **110'** and **60'** for the radii to match the radius returns in the design file, as show below.

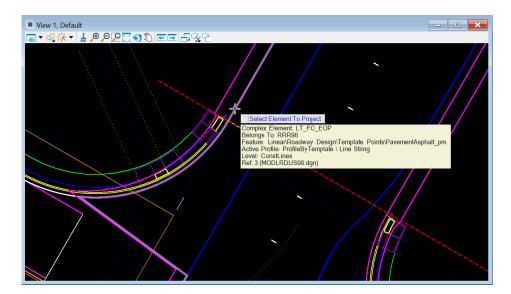


**NOTE** These will be used to help create automatic profiles for the 3D lines on the Radii.

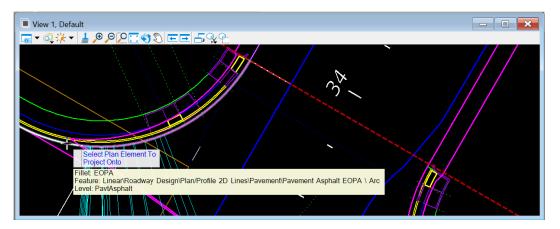
- 4. Open a Profile Model for the 60' radius on the right side.
- 5. Use *Geometry*, *Profile Creation* > **Project Profile Range to Element** tool.

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© ■ ▼ 0	Element Selection	↓Z Import/Export	1.1	Reports	Lines	O Arcs		<ul> <li>➡ Offsets and Tapers</li> <li>➡ Reverse Curves</li> <li>➡ Spirals</li> </ul>	✓ Modify	ومسو Complex Geometry •	<u>8</u>	Dpen Profile Mode Set Active Profile Profile Creation ▼	Lines	Curves	Element Profiles *	∎ Modify	Complex Geometry *
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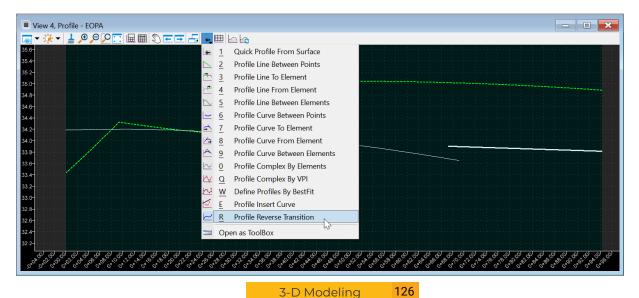
6. Select the **PavementAshpalt_pm** line to project as shown below.



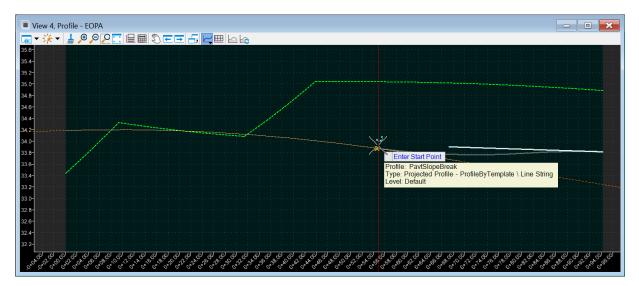
7. Select the Pavement Asphalt EOPA arc plan element to project onto.



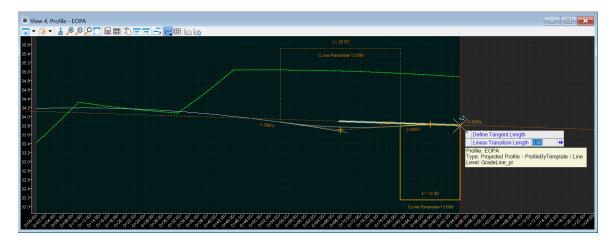
- 8. Set the range to match the length of the overlap of the two arcs, 0+00.00 to 0+69.11.
- 9. Repeat the command to project the **PavementAsphalt_pm** from the edge of the SR61 corridor onto the other end of the same arc. Snap from the beginning of the line, 0+67.23 to the end of the arc where it intersects the line, 0+94.25.
- 10. In the profile view, Vertical Geometry Tools, select Profile Reverse Transition.



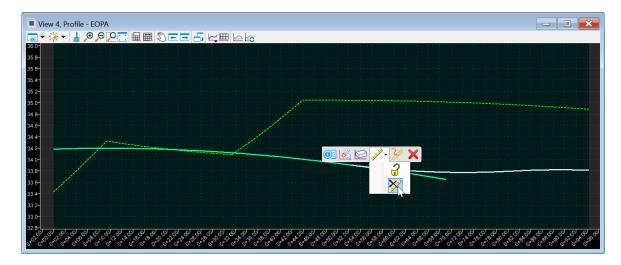
11. Select the two projected profiles as the two elements, and set back and ahead offsets to 0. Set the Start Point such that it creates a low point in the vicinity of Station 0+68.



12. Snap the end point to the end of the profile as shown below.



- 13. Set Trim/Extend option to Both.
- 14. Remove the rule from the transition projected from the US98 corridor.

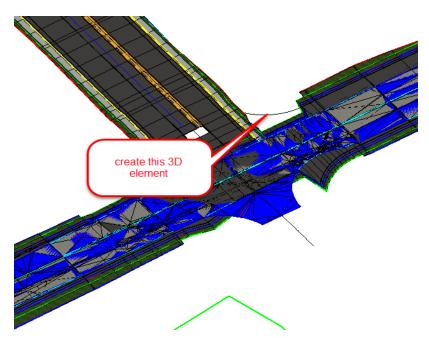


NOTE We will be removing the portion of the RRR98 corridor that the profile is built from later, so removing the rule here first will allow this change without breaking the profile for the radius return.

- 15. Use the **Drawing > Modify >Trim to Element** tool to trim the projected profile to the reverse transition.
- 16. Use the **Geometry > Vertical > Complex Geometry > Profile Complex By Elements** command to complex the pieces into one profile.

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17. Select the new **Profile Line.** Select the **Set Active Profile** from the Context Menu and the *3D Line* will display.



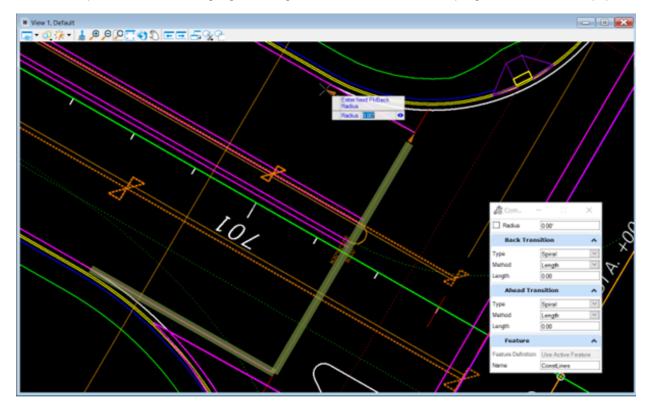
18. Repeat steps 4-17 for the 110' radius on the other side of the intersection.

# Exercise 4.4 Construct 3D Intersection Limit Lines

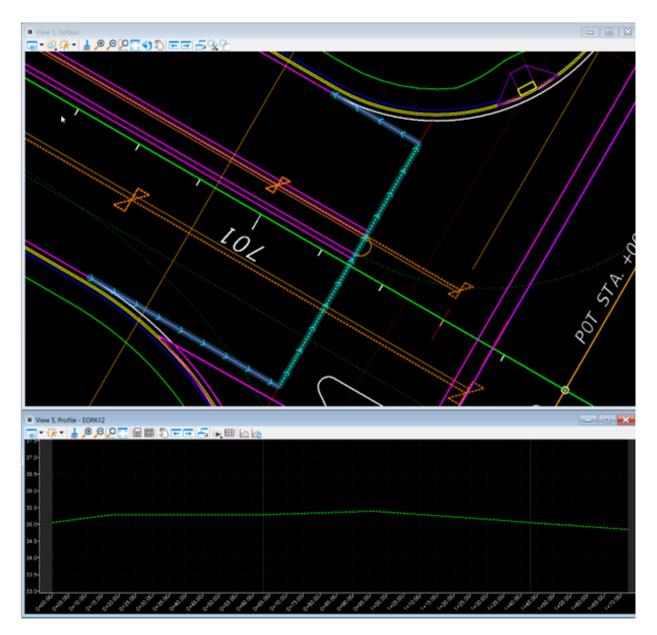
1. Use Geometry > Horizontal > Complex Geometry > Complex By PI tool.

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- a. Use the Feature Definition PavtSlopeBreak.
- b. Construct a complex line first along the left side of the mainline corridor from the EOP radius return to the beginning of the corridor (trace the PavementAshpalt_pm feature lines), then perpendicular to the Traffic Separator lines across the end of the corridor to the right side of the SR61 mainline corridor, then trace the PavementAshpalt_pm feature line to the EOP radius return point on the right side. In the picture below the first two segments of the complex element are highlighted in green, while the third is in progress near the snap point.



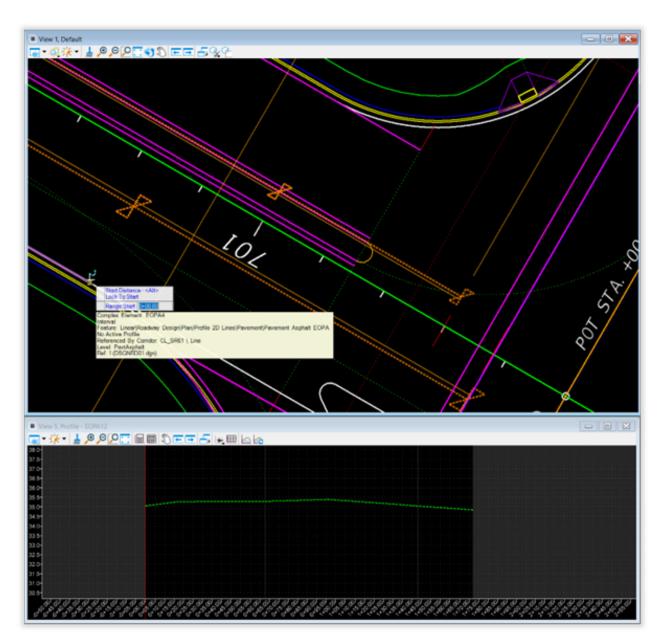
NOTE Turn off Level Display of the corridor elements from the mainline corridor, CorrPointControl_ dp and TmpDrpHndlStg3_dp to make it easier to select the correct lines. Also, turn off display of DSGNRD01.dgn if necessary. 2. Use the **Geometry > Vertical > Open Profile Model** tool and select the newly constructed Complex line.



3. Use the **Geometry > Vertical > Profile Creation > Project Profile Range to Element** tool.

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					2	Profile Intersection R	oint			

4. Select the *PavementAsphalt_pm* feature line on the left side and project it onto the ConstLines Green Dash complex element. Start the range at the EOP radius return and end at the beginning of the feature line and mainline corridor.



- 5. Repeat Steps 3-4 for the right side PavementAsphalt_pm feature line, starting the range at the beginning of the feature line/corridor and ending at the radius return.
- 6. Use **Geometry > Vertical > Profile Creation > Profile Intersection Point** tool to add intersection points for the 4 PavementAsphalt_pm feature lines around the traffic separator.

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7. Use the Geometry > Vertical > Complex Geometry > Profile Complex By PI command.

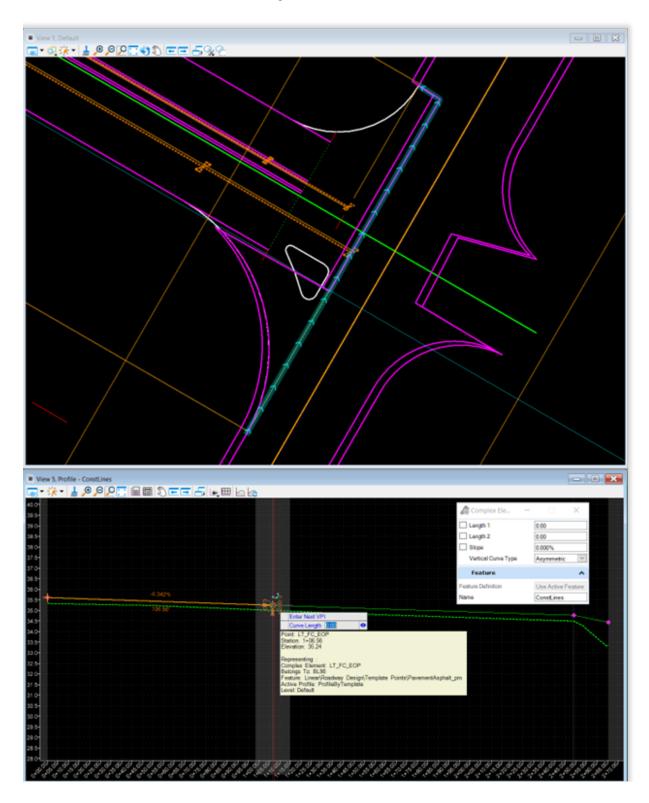


8. Start on the left and snap to all the lines and points shown in the profile.

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		7.00	lie: CovelLines1 e: Projected Profile - ProfileBy1e el Defaut	mplete ), Line	

9. Use Geometry > Set Active Profile to set the newly created profile as active.

10. Repeat these steps to draw a complex element with a profile on the US 98 side of the intersection area. Use Project Profile Range to Element where lines with profiles overlap the lines, and Profile Intersection Point where lines cross or end. See image below for reference.

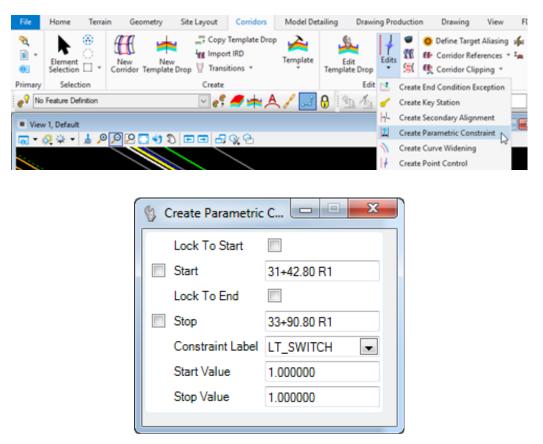


11. To create a profile for sections with neither an intersection nor overlapping profile from a template, use the **Geometry > Vertical > Element Profiles > Profile by 3D Element** tool. Select the element in this file to profile in the 2D view, and select the 3D element from the corridor model in the 3D view (ie LT_FC_IN on the RRR98 profile).

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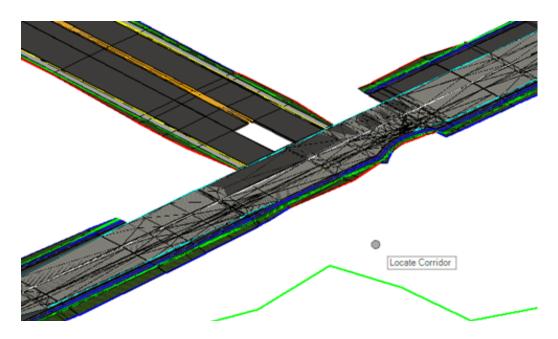
# **Exercise** 4.5 Add Parametric Constraint to RRR98 Template

- 1. Open the MODLRDUS98.dgn file.
- 2. Use the **Bold Corridor > Edit > Edits > Create Parametric Constraint** tool.

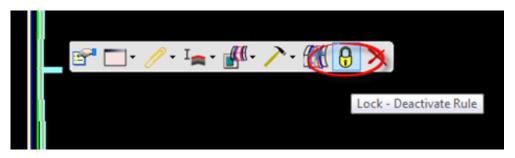


- a. At the prompt, select the **BL98 Corridor boundary**.
- b. Snap to the SW Radius for the Start Station.
- c. Snap to the NW Radius for the End Station.
- d. Pick the LT_SWITCH Constraint Label from the list.
- e. Enter 1 for the Start Value.
- f. Enter **1** for the Stop Value.
- g. The corridor will re-process with the updated RRR98 Template.

3. The left outside components of the BL98 corridor are now turned off though the limits of the intersection.

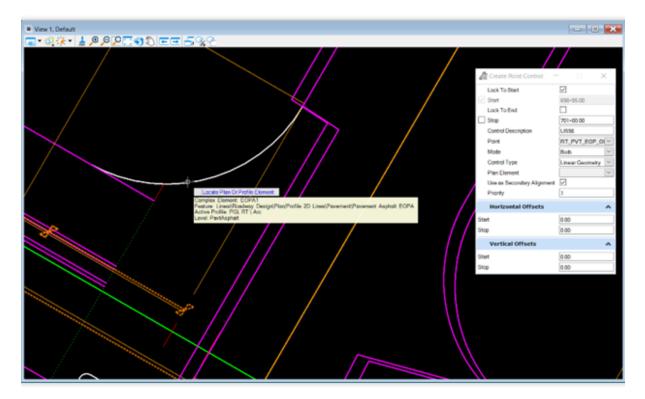


- ► Turn OFF the Automatic Corridor processing of US98.
- 1. Select the **US98 Corridor** handle to display the Context Menu and select **Lock Deactivate Rule**.



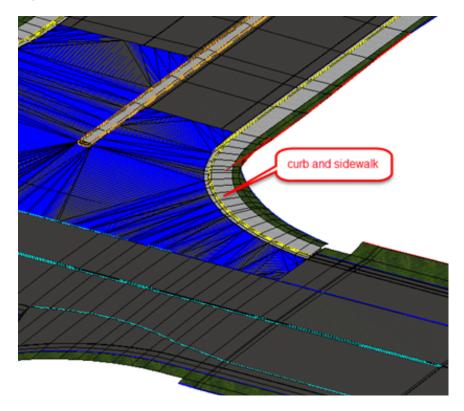
#### Exercise 4.6 Model Curb and Sidewalk Around Radii

- 1. Use the Corridors > Edit > Edits > Create Point Control tool.
- 2. Identify the Corridor Boundary handle for the SR 61 R corridor. Continue to define the *Create Point Control* dialog information.



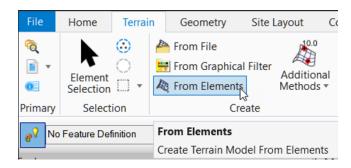
- a. Lock to Start.
- b. Snap End station to the end of the radius return, where the other point control begins.
- c. Set Control Description to US98.
- d. Select the RT_PVT_EOP_OUT in the 3D View.
- e. Set Mode to Both.
- f. Set Control Type to Linear Geometry.
- g. Select the Pavement Asphalt EOPA radius return with the active profile.
- h. Set Use as Secondary Alignment.
- NOTE Corridor intervals are normally drawn perpendicular to the alignment the corridor follows. Since the corridor was drawn along the roadway centerline, the sidewalk and curb intervals would not normally be perpendicular to the radius return pavement edge as it needs to be. Use as Secondary Alignment instructs the template drop to place the interval perpendicular to the element being used for a point control.
  - i. Accept remaining values as shown above.

3. Repeat the steps above for the SR 61 L Corridor.

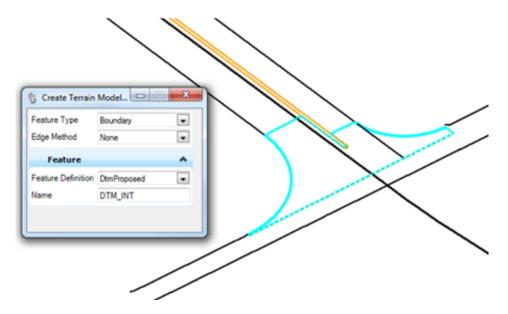


# **Exercise 4.7** Build the Intersection Terrain from 3D Elements

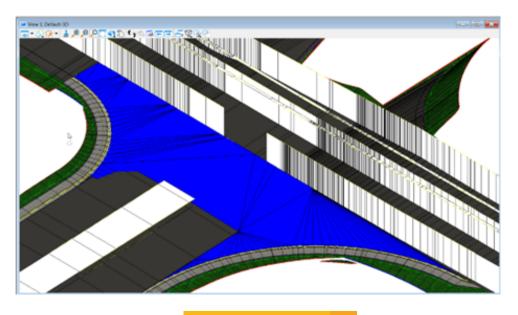
1. Use Terrain > Create > From Elements tool.



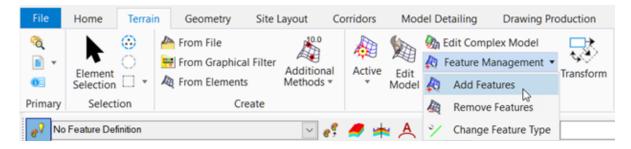
2. Select the boundary elements for the intersection.



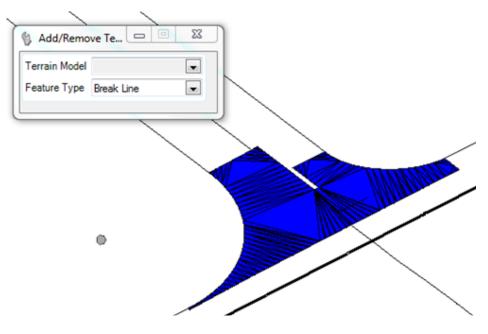
- 3. Set the Feature Definition to DtmClipping.
- 4. Data point to accept. Press F7 to turn on Constructions in the 3D view if necessary to see the newly created terrain model.



- 5. Verify that the boundary is correct by turning off reference displays and Mesh items in **Explorer > OpenRoads**.
- Add a breakline in the vicinity of the SR61 centerline connecting the traffic separator to US 98.
- 6. Construct a line using the horizontal geometry tools with an appropriate feature definition, such as PavtCrown. Use the vertical geometry tools, such as Profile Intersection Point, to create a profile for the horizontal line and set it active.
- 7. Use the Terrain > Edit > Add Feature tool.



- 8. Select the newly created terrain model.
- 9. Set Feature Type to Break Line and select a break line with an active profile.



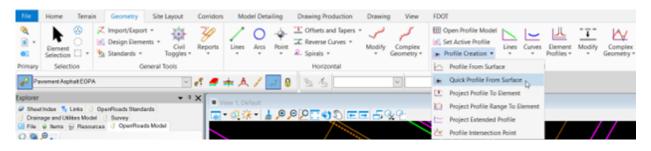
#### **NOTE** To turn off the Blue triangles, toggle off Construction elements.

10. Adjust stroking definition of the breakline in the Properties dialog to fine tune the surface as desired.

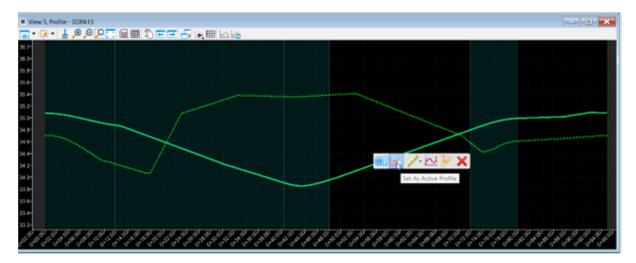
### Exercise 4.8 Clip Terrain for Right Turn Island

- 1. Create a selection set of EOP lines for the Right Turn Island and copy from the *DSGNRD01.dgn* reference into the *MODLRDDetail61* file.
- 2. Use **Geometry > Horizontal > Complex Geometry > Complex by Element** tool to complex all lines together into one complex element using the PavementAsphaltEOPA feature definition.

- 3. Open a Profile model for the complex element.
- Use the Geometry > Vertical > Quick Profile from Surface tool and select the intersection terrain and the complex element in the plan view.

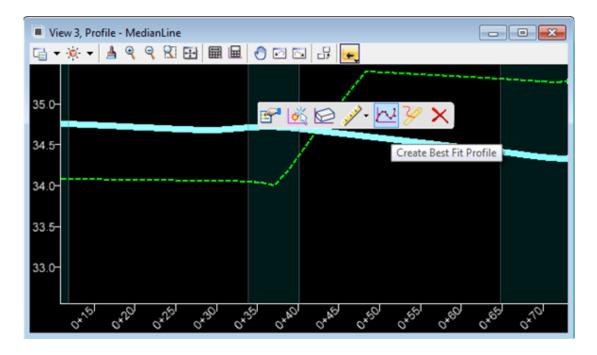


5. Set the newly created profile as Active.



NOTE The Automatic method is easier, but either way works. If using the Manual method, click on the first half of each line to ensure that the Complex Geometry elements are all going in the same direction. Note the arrow on the end of each element that appears as you select it, indicating direction.

6. <Optional> Select the Profile and select Create Best Fit Profile.



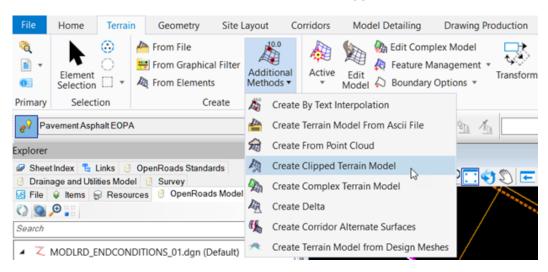
a. Enter the BestFitParameters as shown.

🚯 Best Fit Profile	
Best Fit	Make Complex Element
Best Fit Parameters	^
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Feature	~
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Element Template	Profiles(2D)\Proposed_pr\GradeLine

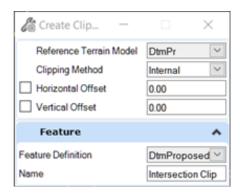
- b. Create the Best Fit Profile, select the new Profile and select Set As Active.
- c. The Island Boundary is created in the 3D Model.

#### Clip Terrain

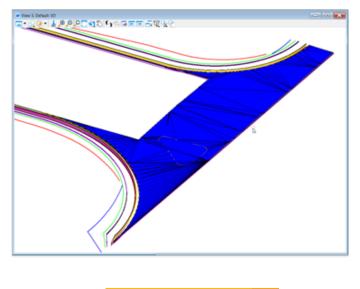
1. Use the Terrain > Create > Additional Methods > Create Clipped Terrain Model tool.



- a. Select the intersection terrain in the 3D view.
- b. Select the right turn island complex element and reset.
- c. Set Clipping Method to Internal.
- d. Name the terrain Intersection Clip.
- e. Accept settings as shown on the right.



f. Clipped terrain will overlap with existing terrain but triangles should indicate that the new one stops at the right turn island.

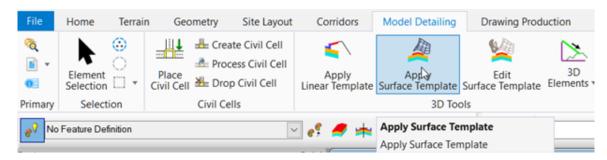


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**Exercise 4.9** Create an Intersection Pavement Surface

1. Use Model Detailing, Apply Surface Template.



- a. Select Pavement Asphalt Surface Template from the Template Library.
- b. Select the Intersection Clip terrain to create pavement.

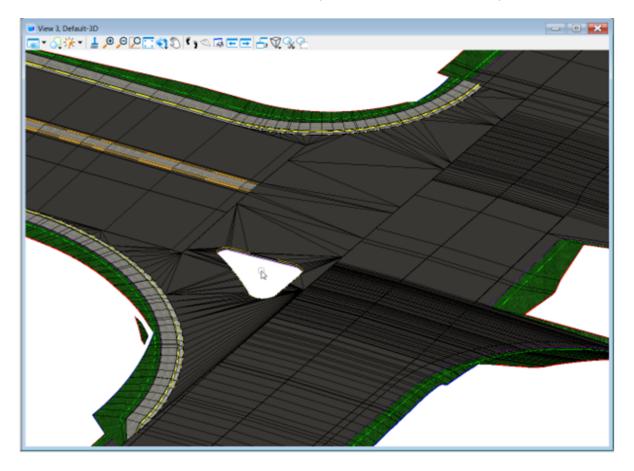
Hint Select one of the triangles in the 3D view that does not go through the right turn island.

c. Set *Feature Definition* to **Enable Linear Features**.

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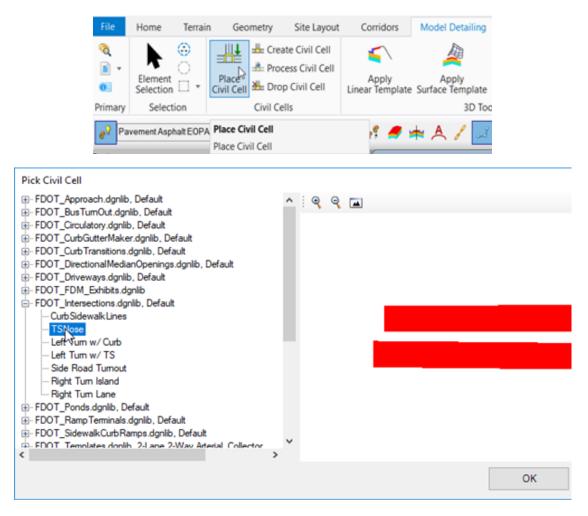
**NOTE** Using Enable Linear Features creates break lines that can be used to create the top and bottom surfaces in Chapter 5.

2. Turn off Construction lines to see the surface template without the terrain overlap.

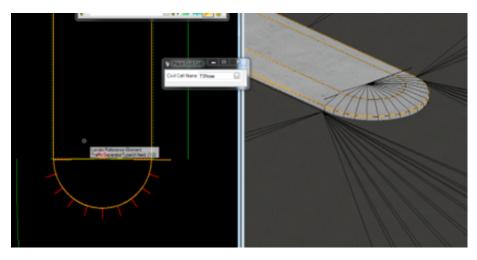


# Exercise 4.10 Traffic Separator Nose

- 1. To add the Traffic Separator Nose use the Model Detailing > Place Civil Cell Tool.
- 2. Select the **TSNose** Civil Cell.



- 3. Select the **PavementAsphalt_pm** line on the Right Side of the Traffic Separator in the Plan View, then select the line on the Left Side of the Traffic Separator.
- 4. While hovering over each of the Reference lines, change the Reference Line direction arrow(triangle) on both elements until it fits on the lines.

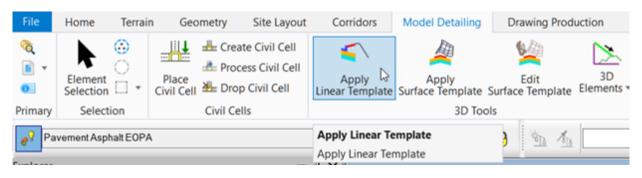


5. Data point to accept.

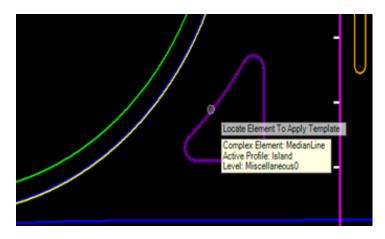


# Exercise 4.11 Right Turn Island

1. Use Model Detailing > 3D Tools > Apply Linear Template tool.



a. At the prompt select the Island Line in the Plan View.

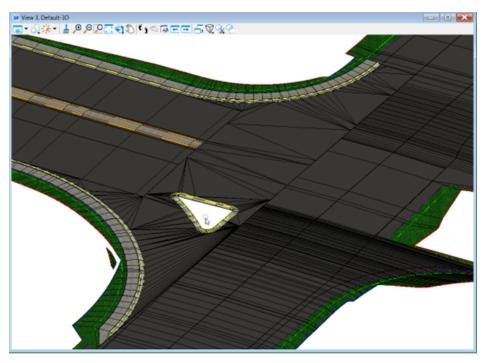


b. Select Alt down arrow to select the Template > Components > Curb & Gutter > Curb Type E Inside. Data point to accept the Template.



- c. Select Alt to lock the Start Station and data point to accept.
- d. Select **Alt** to lock the End Station and data point to accept.

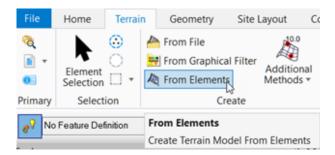
- e. Data point to accept the Reflect Orientation on the inside of the island.
- f. Data point to accept the Exterior Corner Sweep Angle.



- 2. Create Template Geometry for the back of curb line.
  - a. Go to Explorer, right click on Feature Definitions > Linear > Roadway Design > Template Points > Curb_pm and select Properties.

Item Type		
Item Type	No Item Type	
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Profile Feature S	wm True	

- b. Change Create Template Geometry to True as shown below.
- c. Reprocess the linear template.
- 3. To create the sod within the Traffic Island, create a Terrain from the 3D Top Back Curb line.
  - a. Use Terrain > Create > From Elements tool.

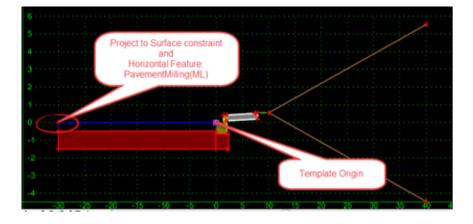


b. Set Feature Definition to DtmProposedSlopes.

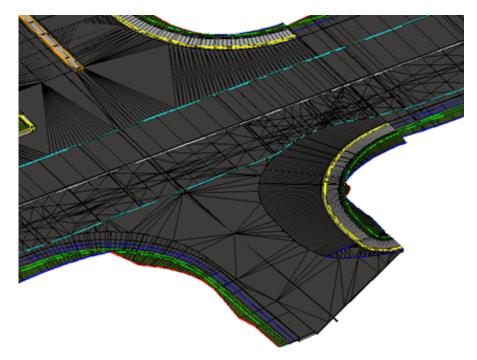


# **Exercise** 4.12 RRR98 Corridor-Build Intersection Terrain at School Entrance (On Your Own)

- 1. Create a shape boundary of the perimeter of the School Driveway pavement to be resurfaced.
- 2. Use the Create Clipped Terrain Model tool to model the existing pavement.
- 3. Add a surface template to the Terrain in step 2.
- 4. Use the RT_Switch parametric constraint along the RRR98 corridor to remove the overlap components between radius points.
- 5. Add Key Station to near the radius points to create complete components.
- 6. Use Linear Template around the Radii to construct the curb, sidewalk, shoulder, etc.
  - a. Set the Template Origin and Pavement Point as shown.



b. Add the *PavementMilling(ML)* lines as a reference to the linear templates to complete the widening.



# **Exercise** 4,13 SR61 Corridor-Build Intersection Terrain at Friendship Road (On Your Own)

- 1. Drop the Complex Chain that makes up the EOP Lines and Radius.
- 2. Create a Corridor Model of the Friendship Road.
- 3. Edit the Template Drop and delete all Components outside of widening.
- 4. Project Profile to Element on the Curve EOP lines <OR> Quick Profile from Surface.
- 5. Construct a Profile from the Projected Surface Lines for the Curve Radii.
- 6. Use Linear Template around the Radii.
- 7. Create a Terrain from the 3D elements.

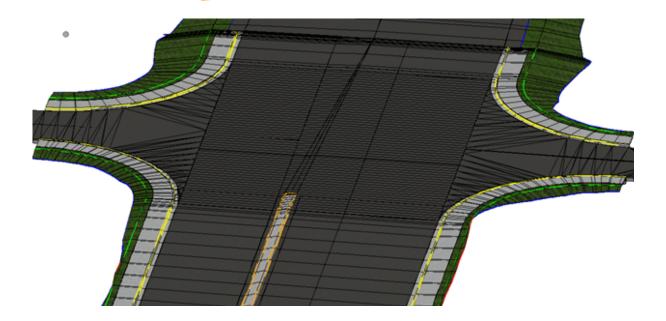
# NOTE For the Traffic Separator to Pavement Crown Cross over median, set the LT_XOVER_CTL, RT_XOVER_CTL, and PVT_CROWN Properties as shown:

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📃 Use Featur	re Name Override:	T_XOVER_CTI		Close
Feature Definit	tion:			< Previous
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		Member of		Help
Constraints	Constraint 1	LT_XOver	Co	instraint 2
Type:	Horizontal	•	Slope	•
Parent 1:	LT_PGL_IN	• +		ver Values
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Label:		•		-
Horizonta	I Feature Constraint:	PavementSlo	peBreak	-
	Range:	18.000000		

Point Properties		×
Name:	RT_XOVER_CTL	+ Apply
Use Feature Name Override:	RT_XOVER_CTL	Close
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Superelevation Flag		
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RT_XOVER_CTL +	Help
LT_XOVER_CTL +	
Multiplier: 1	



# **5** CREATING 3D DELIVERABLE FILES

## **INTRODUCTION**

This chapter will provide detailed instructions for producing the specific output files used by contractors for Automated Machine Guidance (AMG). Specifically:

- Controlling Geometry Files
- 2D CADD files
- Proposed 3D Breakline CADD files
- Existing, Proposed and Subgrade/Earthwork surface XML files

Chapter 8 of the CADD Manual for FDOTConnect outlines the required 3D Deliverables. .

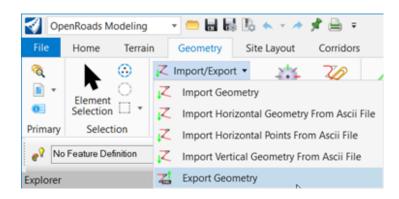
# **EXERCISE OVERVIEW**

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You can export Alignments and Profiles directly from the elements in the DGN file.

- 1. Open the ALGNRDD01.dgn file.
- 2. Switch to the Default Model view.
- 3. Use the Geometry > General Tools > Import/Export > Geometry tool.



- 4. Set *Export Type* to LandXML.
- 5. Select the CL_SR61 centerline alignment.
- 6. Set the Version to 1.2 and check the box or select Yes to export Only Active Profiles.

🔏 Exp −		$\times$
Export Type	LandXML	$\sim$
LandXML		^
Version Only Active Profiles	1.2	~

- 7. The Export to LandXML dialog opens.
  - a. Navigate to the 3DDeliverables directory.
  - b. Enter the File name: AMG-ALGNSR61.xml
  - c. Ensure that LandXML File (.xml) is the **Save as** type.
  - d. Click Save.
  - e. Repeat steps 3-7 for the US98 Baseline to create AMG-ALGNBL98.xml.

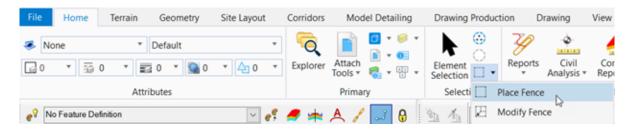
**NOTE** This will save both the Horizontal and Vertical (Profile) Geometry.

## Exercise 5.2 Creating 2D Proposed Planimetrics File for AMG

Use the MicroStation **Save As** command to save copies of the Proposed Design files into the 3DDeliverables directory with AMG-2 names in DGN and DWG formats.

For example: AMG-2DSGNRDxx.dgn, AMG-2DSGNRDxx.dwg.

- Simplify MicroStation Elements
- 1. Open the DSGNRD01.dgn file.
- 2. Select the Plan View to make active. Select Function Key CTRL F1 to open a Plan View.
- 3. In the View Attributes, turn Off Construction elements<OR> Select Function Key F7.
- 4. Turn Off reference file display.
- 5. Turn Off levels for Baseline, CLConstr., and Scratch.
- 6. Place a Fence around all the Elements. Home > Selection > Fence Tools > Place Fence.



7. Save the fence contents to a file, in 3DDeliverables*AMG-2DSGNRD01.dgn*. **Home > Selection > Fence Tools > Save Fence to File** 

File	Home	Terrain	Geometry	Site Layout	Corridors	Mod	lel Detailing	Drawing	Produ	ction	Drawing	View
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8. If converting to DWG, check the Switch to generated file box.

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Output File:	AMG-2DSGN	RD01.dgn		]
Processing Mode:	Сору	*		
Fence Mode:	Overlap	*		
	Switch to	generated file	D	

9. Data point to accept and verify the file is in the 3DDeliverables directory.



- Save as DWG(Optional)
- 1. If not already open, open the ..\3DDeliverables\AMG-2DSGNRD01 design file.
- 2. Select File > Save As from the MicroStation menu.
- 3. Select Autodesk(R) DWG as the Save as type.

#### NOTE There is no need to set Options on the Save As dialog.

- 4. Verify or Enter the File Name, *AMG-2DSGNRD01* and click **Save**.
- 5. Select the Units Survey Feet and click OK.

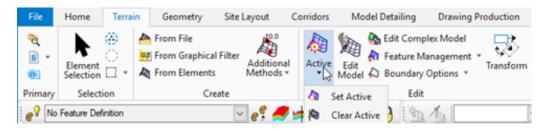
WG/DXF Units	×
OpenRoads Designer requires that the file units be accurately specified in order for "True" scaling to be calculat working with cells and reference files. It is not possible to infer the units for the DWG or DXF file: "C:\Users\ps972 Florida Department of Transportation\Worksets\FDOT\22049555201_CE\3DDeliverables\AMG-3DSGNRD01.dwg reason: The "Design Center Units" option has been selected, but Design Center units are not specified in this file.	2jp\OneDrive -
Units: Survey Feet  Do not display again (Use this setting for all DWG/DXF files of this type)	
	<u>O</u> K

# **NOTE** The file will open in DWG Work Mode, see the blue cross hairs icon in the bottom right of the MicroStation window.



### Exercise 5.3 Create Master Model File

- 1. If not already done, set the *Corridor Feature Definition* to Final for all the corridors and linear templates.
- 2. Go to the FDOT ribbon and choose Create File.
- 3. Create a new MODLRDMaster01.dgn file. Select Wakulla County. Choose Create/Open File.
- 4. Reference the MODLRDDetail61, MODLRDMainline61, MODLRDUS98, MODLRD_EXISTING_ FEATURES01, MODLRD_EXISTING_DRAINAGE01, MODLRD_EXISTING_UTILITIES01, RWDTRD01, PDPLRD01, GDTMRD01, SURVRD01, ALGNRD01, and DSGNRD01 files.
- 5. Use the Terrain > Edit > Active > Set Active tool.



- 6. At the cursor prompt, select the Terrain Boundary green dashed line from the attached *SURVRD01* reference file. This will set the terrain model as Active.
- 7. Display 2D and 3D Views and Select Function Key F2.
- 8. Save Settings.

# Exercise 5.4 Export iModel

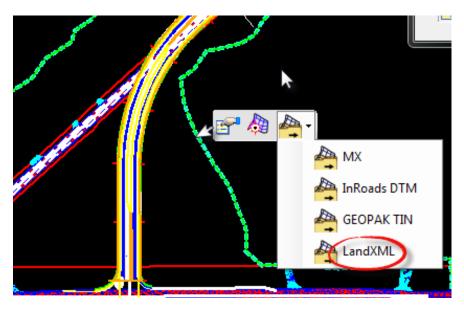
- 1. Go to File > Publish iModel as shown on the right.
- 2. Check the box to Create a Single Package.
- 3. In the *Package* name field, input *AMG-MODLRD01.i.dgn*. Click the **3 dots** beside the Package name and navigate to the 3DDeliverables folder.
- 4. Review remaining settings and select **Publish**.

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	Package: Embed Documents: Protection: Rights:	Create a single package AMG-MODLRD01  CVew View Export Edit Edit Expires: 3/24/2021 Remove intermediate files Create an iModel version Publish iModel to ProjectW	i.dgn 2.0 V ise Share
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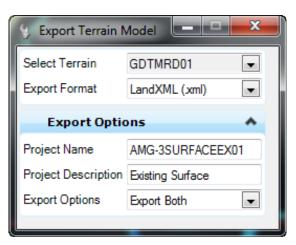
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Feedback		
Exit		

# Exercise 5.5 Creating 3D Existing Surface File for AMG

- 1. Turn ON the Reference file display for *GDTMRD02* or *SURVRD01*.
- 2. Hover over the Existing Surface and then select **Export Terrain Model > LandXML**.



- 3. Select the Terrain.
- 4. Select the Export Format: LandXML
- 5. Enter the Project Name: AMG-3SURFACEEX01
- 6. Enter the Project Description: Existing Surface
- 7. Select the Export Options: Export Both



8. Save the AMG-3SURFACEEX01.xml file to the 3DDeleverables directory.

## **Exercise** 5.6 Creating 3D Proposed Top Breaklines Files for AMG

This exercise outlines the steps to create the proposed surface of the project for use by contractors for automated machine guidance as follows:

Prepare the View for Exporting

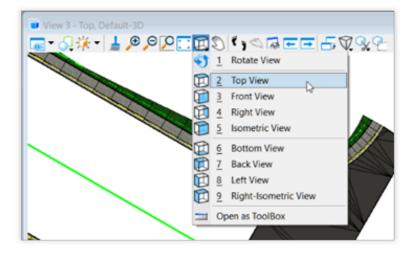
Exporting 3D Break Lines

Creating Proposed Surface Files for AMG

Delete extraneous triangles

#### Prepare View for Exporting

- 1. In the 3D view, turn OFF the Reference File display for:
  - MODLRD_Existing_Features_01.dgn
  - GDTMRD01.dgn
  - or SURVRD01.dgn
  - ALGNRD01.dgn
- 2. Maximize the View 2 Default-3D.
- 3. Change the View Rotation to a Top view as shown below.



- 4. Use the Function Key F7 to turn OFF all Construction elements in the 3D View.
- 5. Open Level Display. Ensure the 3D View is active.

6. Hold down Shift and select the *MODLRDMainline61.dgn*, *MODLRDDetail61.dgn*, *PDPLRD01.dgn*, and *MODLRDUS98.dgn* reference files. Turn off the following levels in the Default 3D View:

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-M Ref, DSGNRD01.dgn		
-MR Ref-1, MODLRD_MainLine_0	1.dgn, Default-	3D
-Ref-2, ALGNRD01.dgn		
-M Ref-3, ALGNRD01.dgn		
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-Ref-5, .\survey\GDTMRD01.	dgn 🗟	
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ShidrPaved_px	•	
ShidrPavBreak_pm	•	
ShidrBase.px	•	
ShidrBase_pm	•	
PondSlopeBreak.pm		
PondPeak_pm		
PondControl.pm		
PondBottom_pm PavtOverbuild_px	:	
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PavtMilling px		
PavtMilling_pm	•	
PavtBreak pm		
PavtBase_px	•	
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PavtAsphaltSC_px	•	
PavtAsphaltFC_px	•	_
PavtAsphalt_pm		
MedianCrown_pm Fill_pm		
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Earthwork2 px		
DTMTopMesh		
DTMBotMesh	•	
DitchBot_px	•	
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CurbBase_pm		
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ConstLines_pm ClipDrawingBound_dp	:	
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Berm_pm	•	
		*

- a. any proposed sub-surface features and other non-proposed surface features.
  - i.e. Bottom_pm, Subgrade_pm CurbBase_pm, PavtBase_pm, ShldrBase_pm, TemplateMisc_pm, TemplateNullPoint_pm.

- b. Any used _px levels (meshes).
- c. Remaining levels not needed for the 3D Proposed breakline surface. i.e. Default level, Scratch_dp, Miscellaneous, ConstLines.
- Exporting 3D Break Lines.
- 1. Place a Fence around all the Elements in the default-3D View. **Home > Selection > Fence Tools > Place Fence**

File Home	Terrain	Geometry	Site Layout	Corridors	Mod	lel Detailing	Drawing	Produc	ction D	Drawing	View
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	3		$\sim$	di j				63	Save Fence	to File	
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2. Save the fence contents to a file, in 3DDeliverables*AMG-3DSGNRD01.dgn*. **Home > Selection > Fence Tools > Save Fence to File** 

File	Home	Terrain	Geometry	Site Layout	Corridors	Mod	del Detailing	Drawing	Produ	ction [	Drawing	View
🥪 🖪 🖬 0	None	v 0 v 1	Default	• • 4 0 •	Explorer	Attach Tools *	<ul> <li>□ • ≥ •</li> <li>■ • 00</li> <li>≪ • 01 •</li> </ul>	Element Selection	0 0 0	Reports	-∳- Civil Analysis ▼	Cor
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					// /		$\sum$			Save Fence Named Bo		6

3. If converting to DWG (below), check the Switch to generated file box.

Copy Fence Contents to New File -						
Output File:	AMG-3DSGN	RD01.dgn			]	
Processing Mode:	Processing Mode: Copy					
Fence Mode:	Overlap	*				
	Switch to	generated file				

4. Data point to accept and verify the file is in the 3DDeliverables directory.

#### Save as DWG (Optional)

- 1. If not already open, open the 3DDeliverables\AMG-3DSGNRD01 design file.
- 2. Select File > Save As from the MicroStation Menu.
- 3. Select Autodesk(R) DWG as the Save as type.

#### **NOTE** There is no need to set Options on the Save As dialog.

- 4. Verify or Enter the File Name, *AMG-3DSGNRD01.dwg* and click **Save**.
- 5. Select the Units Survey Feet and click OK.

2 DWG/DXF Un	its		×
working with cel Florida Departm reason:	IIs and reference files.It is not po nent of Transportation\Worksets\	be accurately specified in order for "True" scaling t assible to infer the units for the DWG or DXF file: "C FDOT\22049555201_CE\3DDeliverables\AMG-3DS	:\Users\ps972jp\OneDrive - GNRD01.dwg" for the following
The bengh en	Units Survey Feet	-	
	Do not display	ay again (Use this setting for all DWG/DXF files of the	his type)

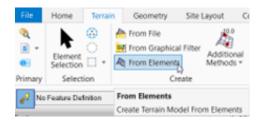
# **NOTE** The file will open in DWG Work Mode, see the blue cross hairs icon in the bottom right of the MicroStation window.



6. Trim extraneous elements as necessary. **Save** changes to the .dwg file, then **Save As** to overwrite the .dgn file.

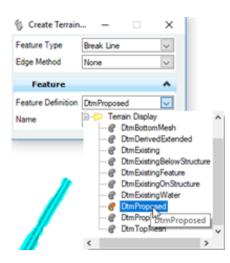
# Exercise 5.7 Creating 3D Proposed Surface Files for AMG

- 1. In FDOTCONNECT, Select File > Open to the AMG-3DSGN01..dgn file. Click Open File and click OK.
- 2. Create a Selection Set of all Elements.
- 3. Use Terrain > Create > From Elements tool.

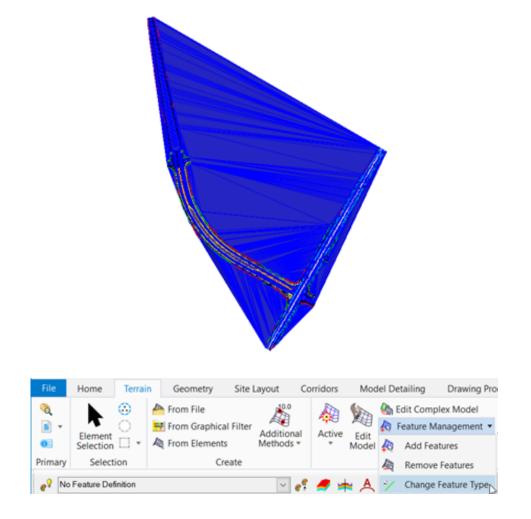


4. Define the following in the Create Terrain Model dialog:

Feature Type: Edge Method: Feature Definition: Name: Break Line None DTMProposed AMG-3SURFACEPR01



- 5. Data point through prompts to accept settings. A Surface is created. Use *Function Key* **F2** to turn **ON**/ **OF**F the construction elements.
- 6. Notice the External Triangles must be trimmed.
- 7. Turn Off the Level DTM_px .
- 8. Create a Selection Set of all the Cut_pm and Fill_pm Lines defining the slope construction limits.
- 9. Use Civil Tools Terrain > Edit > Change Feature Type tool.



- 10. Set the Feature Type to Boundary.
- 11. When prompted left click twice to change all the selected lines to boundary elements for the External Limits of the Surface.
- 12. Turn **ON** the *DTM_px* level to see the results.

#### ► To delete extraneous triangles

1. Select and hover over the Surface Terrain edge and then select **Rules > Remove Rule**.

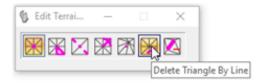


NOTE This will break the relationship to the 3D elements! Alternatively, build a 3D boundary connecting the gaps in the Cut_PM and Fill_PM lines and add the feature to the surface as a boundary, or use them to clip the terraian.

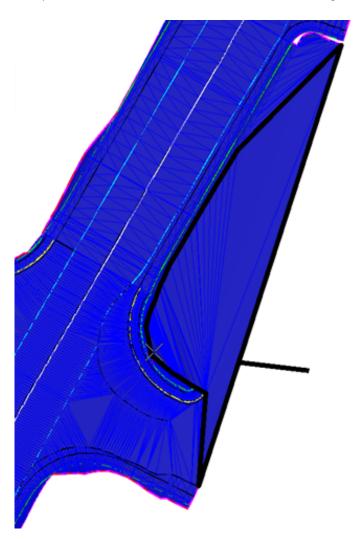
2. Use Terrain > Edit > Edit Model tool.



3. From the tool settings menu, select **Delete Triangle By Line**.



4. Draw a line (two left clicks) from outside the terrain across the erroneous triangle, then repeat as necessary.

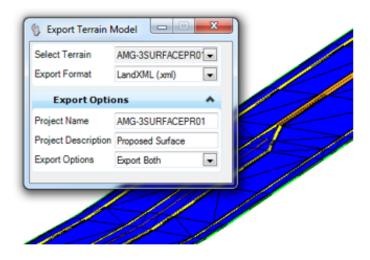


#### Save Terrain to Land XML file

1. Select and hover over the Surface and then select Export Terrain Model > LandXML.



- 2. Select the Terrain.
- 3. Select the Export Format: LandXML
- 4. Enter the Project Name: AMG-3SURFACEPR01
- 5. Enter the Project Description: Proposed Surface
- 6. Select the Export Options: Export Both



7. Save the file to the 3DDeleverables directory with the filename AMG-3SURFACEPR01.xml.

## Exercise 5.8 Creating 3D Subgrade/Earthwork Breaklines for AMG

This exercise outlines the steps to create the proposed surface of the project for use by contractors for automated machine guidance as follows:

Prepare the Templates for Subgrade Point definitions and Alternate Surfaces

Prepare the View for Exporting

Exporting 3D Break Lines

Creating Proposed Surface Files for AMG

Delete extraneous triangles

The 3D proposed finished subgrade surface to be exported as LandXML format from the \Roadway\ MODLRD file. This file can be used to generate surface to surface earthwork volumes

The subgrade surface can be created from the 3D feature lines provided that they have been defined properly in the point definitions on all project corridor, linear and surface templates.

#### Prepare the Templates for Subgrade Point definitions and Alternate Surfaces

In the *Create Template* dialog, edit each of the points defining the finished subgrade. Set the *Feature Definition* and *Alternate Surface* fields to SubGrade_pm and SUBGRADE, respectively.

When creating surface terrains from 3D lines, there are two important TIN principles for consideration:

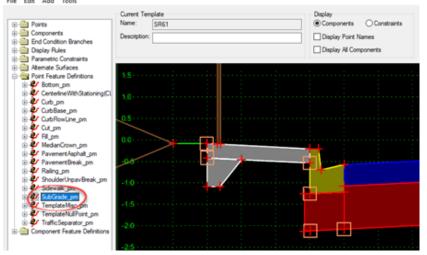
- a. Vertical Faces all lines must have different xy values. They cannot be stacked in the z plane. Therefore, set the horizontal offset value no less than .01 feet on vertical component points in the project templates
- b. Caves/Cliffs all lines must continue in the same direction. The TIN triangles will not reverse direction across a surface. Therefore, consider which points to use for the subgrade surface. I.E. base, base extensions, wall footers, etc. Additional template points may be needed to intercept the top surface in these areas. As a rule, it is better to include the base, base extensions, wall footers, etc for excavation and not to include base, base extensions, wall footers.

# **NOTE** These template accommodations are necessary to consider for ALL Corridor, Linear and Surface Templates used on the project.

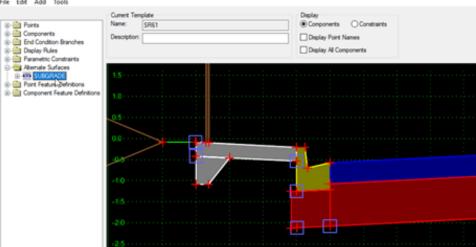
The following images are examples of the *Point Properties* dialog, highlighted Subgrade_pm Point Feature Definition, and the highlighted SUBGRADE Alternate surface. In this example the base extension is not included in the subgrade surface definition.

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Name:		T_PVT_BAS	SE_BOT	001 🗸 🛨 🚺	Apply
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Type: Parent 1: Value: Label:	Horizontal LT_PVT_BOT_OU	▼ T ▼]	• [ • ]	Vertical LT_PVT_BOT_OUT	× •

#### Create Template File Edit Add Tools







3-D Modeling 169

#### Prepare the View for Exporting

- 1. Open the MODLRD_Master01.dgn file. To Display 2D and 3D Views, select Function Key F2.
- 2. Turn OFF the Reference File display for:
  - MODLRD_Existing_Features01.dgn
  - MODLRD_Existing_Drainage01.dgn
  - MODLRD_Existing_Utilities01.dgn
  - RWDTRD01.dgn
  - GDTMRD01.dgn
  - SURVRD01.dgn
  - ALGNRD01.dgn
  - PDPLRD01.dgn
- 3. Maximize the View 2 Default-3D.
- 4. Change the View Rotation to a Top view.



- 5. Use the *Function Key* F7 to turn OFF all Construction elements in the 3D View.
- 6. Open Level Display. Ensure the 3D View is active.
- 7. Turn off display of Default level and PavementAsphalt_pm.
- 8. Hold down Shift or Shift Ctrl and select the *MODLRDMainline61.dgn*, *MODLRDDetail61.dgn*, *PDPLRD01.dgn*, *and MODLRDUS98.dgn* reference files.

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-Ref-2, ALGNRD01.dgn			
Ref-3, ALGNRD01.dgn			
- Ref-4, .\drainage\PDPLRD0	1.dgn, Defa	sult-3D	
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XSMisc.px		:	
TrafSeparator_px			
TrafSeparator pm			
SubGrade_pm		•	
SlopesBreak pm		•	
Slopes_px ShidrUnpaved_px		:	
ShidrUnpavBreak.pm			- 1
ShidrPaved_px			_
ShidrPavBreak.pm			
ShidrBase px		. D	
ShidrBase_pm			_
PondSlopeBreak.pm			
PondPeak.pm			
PondControl.pm			-
PondBottom_pm PavtOverbuild_px		:	
PavtOverbuild.pm			
PavtMilling px			
PavtMilling.pm		•	
PavtBreak pm		•	
PavtBase_px		•	
PavtBase.pm		•	
PavtAsphaltSC.px PavtAsphaltIC.px		:	
PavtAsphalt.pm		:	
MedianCrown pm		•	
		•	
Fill pm Earthwork4 px		•	
Earthwork2_px		•	
DTMTopMesh		•	
DTMBotMesh DitchBot are		:	
DitchBot.px Ditch.px			
Cut am			
CurbFlowLine.pm		•	
CurbBase_pm		•	
Curb.pm		•	
ConstLines.pm		•	
ClipOrawingBound_dp		•	
CandGBase_px CandG_px		:	
		:	
Bottom pm Berm pm			
			÷

- a. Turn on only proposed subgrade feature levels:
  - i.e. Cut_pm, Fill_pm, MedianCrown_pm, ShoulderUnpavBreak_pm, Subgrade_pm,
- b. Turn off any used _px levels (meshes)
- c. Turn off remaining levels not needed for the 3D Proposed breakline surface. i.e. Default level, Scratch_dp, Miscellaneous, ConstLines, and any levels not ending in _pm.remaining levels not needed for the 3D Proposed breakline surface. i.e. Default level, Scratch_dp, Miscellaneous, ConstLines, etc.

- **Exporting 3D Break Lines.**
- Place a Fence around all the Elements in the default-3D View. Home > Selection > Fence Tools > Place Fence



Save the fence contents to a file, in 3DDeliverables\AMG-3DSGNRDEW01.dgn. Home > Selection > Fence Tools > Save Fence to File.

File	Hon	e Terrain	Geometry	Site Layout	Corridors	Mod	lel Detailing	Drawing	Produc	tion [	Drawing	View
s (	None	• 50 •	Default	• • 4 0 •	Explorer	Attach Tools *	<ul> <li>▼ </li> <li>♥ </li></ul>	Element Selection		Reports	-∳- Civil Analysis ▼	Cor Repo
		Att	tributes			Prima	ry	Select		Place Fenc	e	
•?	No Featu	e Definition		e	<i>s</i>	A	² 🎿 🔒	勤為	83	Modify Fe	nce	
_									0	Manipulat	e Fence Cont	tents
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	0.0	र 🛓 🙂	⊎ ⊠ 🖸 য						85	Drop Fenc	e Contents	
		1 3/1					$\sum$		3	Save Fence	e to File	>
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3. If converting to DWG (next page), check the Switch to generated file box.

Copy Fence Con	tents to New F	ile	-	×
Output File:	AMG-3DSGN	RD01.dgn		]
Processing Mode:	Сору	*		
Fence Mode:	Overlap	*		
	Switch to	generated file		

4. Data point to accept and verify the file is in the 3DDeliverables directory.

#### Save as DWG(Optional)

- 1. Open the 3DDeliverables\ AMG-3DSGNRDEW01.dgn design file.
- 2. Select **File > Save As** from the MicroStation Menu.
- 3. Select Autodesk(R) DWG as the Save as type.

NOTE There is no need to set Options on the Save As dialog.

- 4. Verify or Enter the File Name, AMG-3DSGNRDEW01 and click Save.
- 5. Select the Units Survey Feet and click OK.

WG/DXF Units	×
OpenRoads Designer requires that the file units be accurately specified in order for "True" scaling to be calculate working with cells and reference files. It is not possible to infer the units for the DWG or DXF file: "C:\Users\ps972; Florida Department of Transportation\Worksets\FDOT\22049555201_CE\3DDeliverables\AMG-3DSGNRD01.dwg reason: The "Design Center Units" option has been selected, but Design Center units are not specified in this file.	jp\OneDrive -
Units Survey Feet  Do not display again (Use this setting for all DWG/DXF files of this type)	
	<u>O</u> K

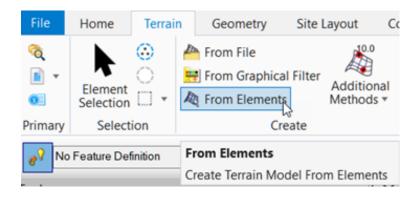
**NOTE** The file will open in DWG Work Mode, see the blue cross hairs icon in the bottom right of the MicroStation window.



6. Trim extraneous elements as necessary. Save changes to the .dwg file, then "Save As" to overwrite the .dgn file.

## **Exercise 5.9** Creating 3D Proposed Subgrade/Earthwork Surface Files for AMG

- In FDOTCONNECT, Select File > Open to the AMG-3DSGNRDEW01.dgn file. Click Open File and click OK.
- 2. Create a Selection Set of all Elements.
- 3. Use Terrain > Create > From Elements tool.



- 4. Define the following in the Create Terrain Model dialog:
  - Feature Type:
  - Edge Method:
  - Feature Definition:
  - Name:
- **Break Line** None **DTMProposed** AMG-3SURFACEEW01 Create Terrain... × Feature Type Break Line v Edge Method v None Feature ٠ Feature Definition DtmProposed Terrain Display Name @ DtmBottomMesh Ø DtmDerivedExtended Ø DtmExisting DtmExistingBelowStructure Ø DtmExistingFeature DtmExistingOnStructure
- 5. Data point through prompts to accept settings. A Surface is created. Use *Function Key* **F2** to turn **ON**/ **OFF** the construction elements.

CtmProp
DtmProp

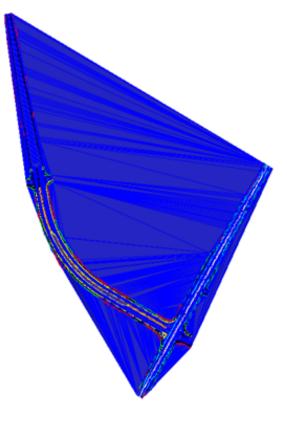
Ø DtmExistingWater

@ DtmTophes

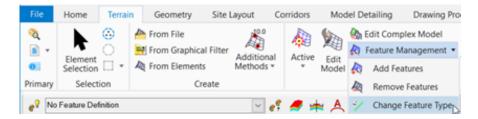
mProposed

>

6. Notice the External Triangles must be trimmed.

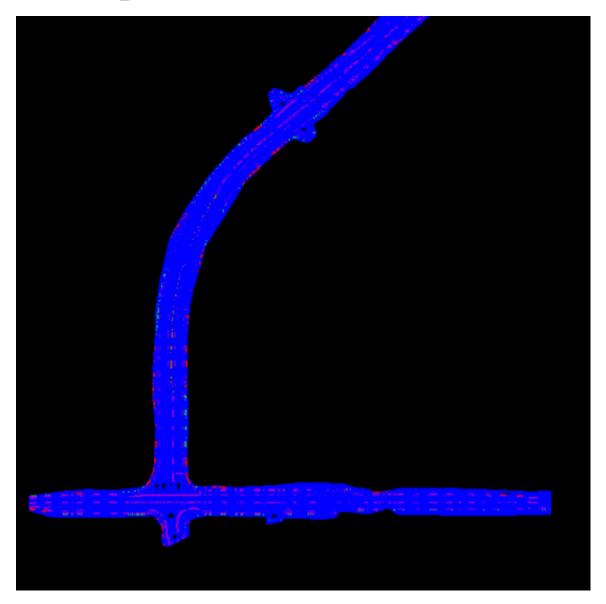


- 7. Turn Off the Level DTM_px.
- 8. Use Civil Tools Terrain > Edit > Change Feature Type tool.



- 9. Set the *Feature Type* to **Boundary**.
- 10. Select each of all the Cut_pm and Fill_pm Lines individually defining the slope construction limits. Right click to finish when all the selected lines to boundary elements for the External Limits of the Surface.
- **NOTE** A Selection Set for Cut/Fill Lines does not produce the desired results for the creation of the Subgrade surface Terrain.

11. Turn ON the DTM_px level to see the results.



- Save Terrain to Land XML file
- 1. Select and hover over the Surface and then select **Export Terrain Model > LandXML**.



- 2. Select the Terrain.
- 3. Select the Export Format: LandXML
- 4. Enter the Project Name: AMG-3SURFACEEW01.xml
- 5. Enter the Project Description: Proposed Bottom Surface
- 6. Select the Export Options: Export Both

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Exp	ort Options 🗛	110 - Marine	
Project N	ame AMG-3SURFACEEW01.xml		
Project D	escription Poposed Surface		
Export O	ptions Export Both		
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	Enter Export Value		
		Name AMG-3SURFACEEW01xm	
	Terrain Model: DTMPr Triangles	]	
11 11	Elevation 31.313444 Slope 2.05		
1-11	Aspect 17.49 Level: DTM_px		
		_	

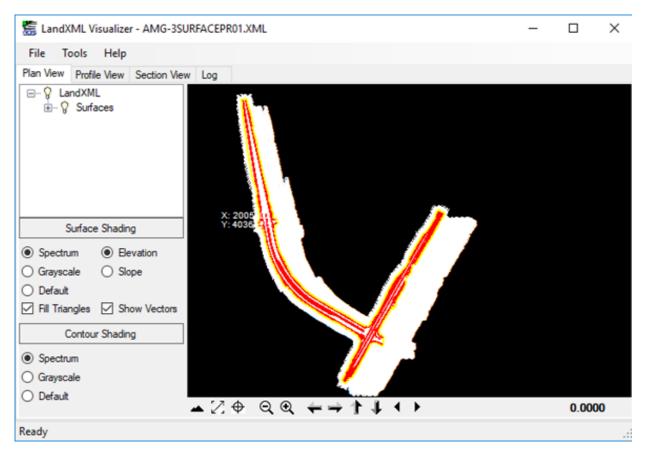
7. Save the file to the 3DDeleverables directory with filename AMG-3SURFACEEW01.xml.

**Exercise** 5.10 Use Land XML Visualizer to Validate Land XML File

1. From the desktop locate and open the FDOTConnect product folder..

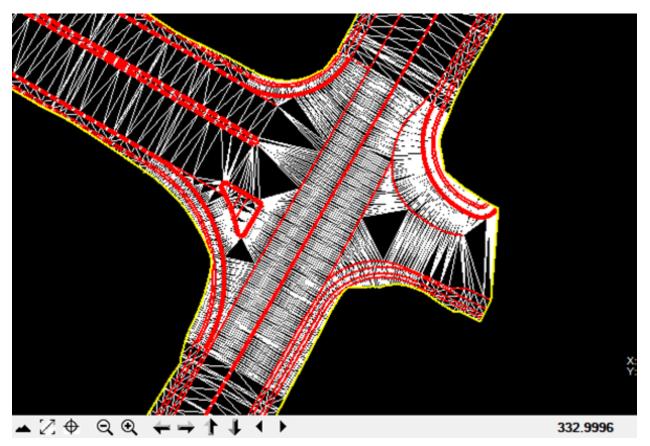


- 2. Open the Land XML Visualizer tool.
- 3. On the LandXML Visualizer tool, select File Open. Choose the AMG-3SURFACEPR01.xml file.



4. Change the *Plan View* Setting to Default, No Fill, No Vectors and No shading as shown below. Also, right click on the *Pnts* definition and choose **Hide**.

🔚 Lan	dXML V	isualize	r - AMG-3SUR	FACE		
File	Tools	Help				
Plan Vie	w Profil	e View	Section View	Log		
□- ♀ LandXML □- ♀ Surfaces □- ♀ AMG-3SURFACEPR01 □- ♀ Definition □- ♀ F. Hide □- ♀ SourceData □- ♀ Breaklines □- ♀ Boundaries						
	Surf	face Sh	ading			
O Spec						
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<ul> <li>Spec</li> <li>Gray</li> <li>Defa</li> </ul>	scale					



# 6 EARTHWORK

# **INTRODUCTION**

In OpenRoads Designer, quantities are generally calculated from the 3D model. While most of the effort is covered in other training documents, there are some steps of earthwork calculation that tie in closely with the modeling process and will be covered in this chapter. Historically, earthwork quantities in roadway design have been calculated using the average end area method, calculating the volume as a prism with the ends being two cross sections. This has certain limitations to accuracy, particularly depending on the cross section interval. It assumes no changes happen between the cross sections. If the roadway is a bit asymmetrical about the centerline on a curve or the earthwork changes significantly between cross sections, the accuracy drops quickly. In contrast, with triangulated terrain models and modern computing power, it is easy to calculate the volume using the surface-to-surface comparison method. This calculates the actual volume between two surfaces by using all the points of each of the terrains, in a compute intensive method that would be impossibly time consuming to duplicate by hand. Sometimes the surface-to-surface comparison method is also used to create a third surface that is the difference between the other two surfaces. In this comparison surface, any elevation values less than zero would be cut while positive values would be fill.

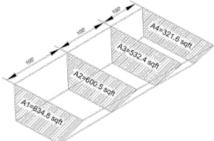


Figure 1. Average End Area.

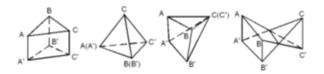


Figure 2. Surface-to-surface comparison.

The above figures illustrate the key differences in the volume calculations between average end area and surface-to-surface methods. Both are essentially calculating volumes of prisms, but the surface-to-surface prisms are enclosed by triangles based on the survey points and the triangles generated from the corridor components. The factors affecting volume accuracy are the detail level of the survey Digital Terrain Model and the interval spacing of the corridor model or the stroking definition of lines used for linear templates or surfaces. We can calculate much more accurate volumes from the 3D model by simply decreasing the interval spacing (i.e., on curves) and/or adding key stations in more complex areas such as intersections with radius returns in a way that seeks to maximize the tradeoff of performance vs accuracy. This is reflected in the requirements of the CADD manual table discussed in Chapter 2.

The average end area earthwork volumes can be calculated manually by scaling from plans, calculating the areas of cut and fill shapes in one cross section, then performing the same calculation on the next cross section and summing them up. The surface-to-surface comparison method, by contrast, is too computationally intensive to calculate by hand.

For engineers wanting to independently verify the quantity calculations, there are still a few options. One would be to import the surfaces into construction software such as Trimble and run the surface-to-surface comparison method in the other piece of software. This allows a different algorithm to independently check the calculations performed by OpenRoads Designer. Another might be to have OpenRoads calculate the volumes using the average end area as well, while recognizing that this figure will always differ to some degree due to its lower accuracy.

For the FDOT workflow we need to create the cut and fill volumes in the model files, and we cannot perform a surface to surface volume comparison until the proposed bottom surface is created. This chapter will focus on those two steps. Both are using the same approach to calculate the volumes, but one creates 3D shapes from the corridors and detail modeling, and the other calculates directly from two Digital Terrain Models.



## EXERCISE OVERVIEW

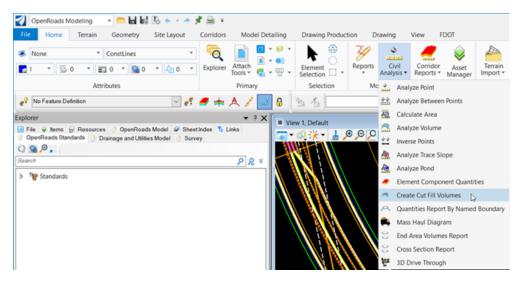
For any projects with multiple alignments, the cut/fill 3D shapes need to be created in separate files for each alignment. This allows our quantity calculations to be tied to an alignment. Any file that is referenced in is included in the earthwork volume calculation, even if the display is off. Consequently, for these projects, care needs to be taken to not even clip one corridor to a corridor on another alignment. In the case of this dataset, earthwork volumes for each alignment will be created in the *MODLRDMainline61.dgn* and *MODLRDUS98.dgn* files respectively. *MODLRDMainline61.dgn* will need to reference *MODLRDDetail61.dgn*, but it does not need to reference *MODLRDUS98.dgn*, even though the detail file references it out of necessity. For intersections between different alignments, having a separate file for detailmodeling may be the bestmodel management plan.

Exercise 6.1	Create Cut and Fill Volumes	181
Exercise 6.2	Analyze Volume	

# Exercise 6.1 Create Cut and Fill Volumes

#### Prepare File for Cut and Fill Volumes

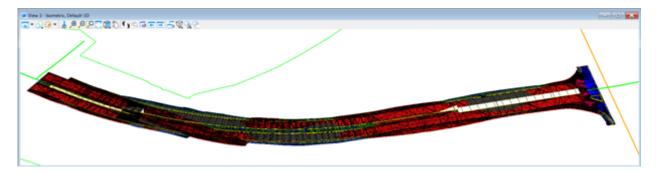
- 1. Open the C:\Worksets\FDOT\22049555201\Roadway\MODLRDDetail61.dgn file of the WorkSet
- 2. With the 2D view active, attach the MODLRDMainline61.dgn file.
- 3. If not already open, open a 2D and a 3D view.
- Create Cut and Fill Volumes, SR61
- 4. Use the Home > Model Analysis and Reporting > Civil Analysis > Create Cut Fill Volumes command.



5. Accept the default options in the dialog.

🕼 Crea —	
Cut Feature Definition	Volumes_Cut 🖂
Fill Feature Definition	Volumes_Fill 🕥
Compute Unsuitable	
Compute Custom	
Compute Substrata	

6. To see the cut and Fill Volumes, turn on Constructions in the 3D view.

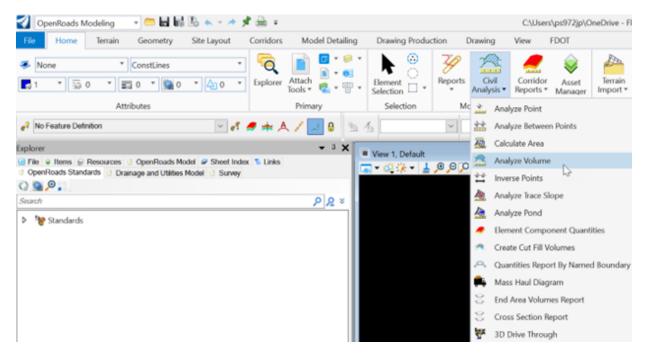


- NOTE Cut Volumes are in red and Fill Volumes are in blue. There should be two components, even if the cut and fill areas are not contiguous. These components do not show up in the OpenRoads Model, but can be toggled on and off in the OpenRoads Standards under Feature Definitions > Mesh > Volumes.
- Create Cut and Fill Volumes, US98
- 7. Open the C:\|Worksets\FDOT\22049555201_CE\Roadway\MODLRDUS98.dgn file of the WorkSet.
- 8. Repeat Steps 3-6 to create Cut and Fill Volumes for the US98 corridor.

NOTE Ensure that the neither the MODLRDMainline61 nor the MODLRDDetail61 files are attached.

# Exercise 6.2 Analyze Volume

- 1. Open the MODLRDMaster01.dgn file.
- 2. Make the 2D View active.
- 3. Attach the AMG-3DSGN01.dgn and the AMG-3DSGNRDEW01.dgn files as references. Turn off display of all but DTM levels.
- 4. Use the Home > Model Analysis and Reporting > Civil Analysis > Analyze Volume tool.



- 5. Use the Terrain Model to Terrain Model Volume Method.
- 6. Set Existing Ground as the From Terrain Model as shown below.

halyze Volume Terrain Mo – 🗌 🗙				
Volume Method	Terrain Model To Terrain Model Volume	$\sim$		
From Terrain Model	Existing Ground	$\sim$		
To Terrain Model		K		
Cut Factor	1.00	-h3		
Fill Factor	1.00			
Cut	0.00			
Fill	0.00			
Balance	0.00			
Save Result	$\checkmark$			

- 7. Set To Terrain Model to the proposed subgrade surface AMG-3SURFACEEW01.
- 8. <Optional> Check the box to *Save Result* to insert the calculated volume as a text object in the dgn file.
- 9. Accept settings and view the volumes in the Civil Message Center.

#### **NOTE** Volumes calculated are in the file units, so should be cubic feet, not cubic yards.

10. If Save Result was checked, insert the volume at desired location in the 2D View.

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# **7** VISUALIZATION

# **INTRODUCTION**

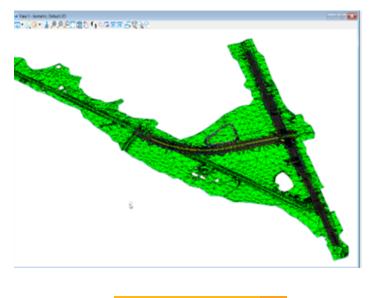
This section will cover several options for visualizing the model. These will help reviews performed in the CAD software, in LumenRT on a computer, or in LumenRT using a VR headset such as Oculus Rift.

# EXERCISE OVERVIEW

Exercise 7.1	Visualize Existing Ground	184
Exercise 7.2	Create a 3D Drive-Through Animation	187
Exercise 7.3	Export to LumenRT	188

# Exercise 7.1 Visualize Existing Ground

- ► Clip the Existing Ground Terrain
- 1. Open the MODLRDMaster01.dgn file.
- 2. In the 3D view, turn Constructions on in order to see the terrains used to create surface templates.
- 3. Use the Terrain > Create > Additional Methods > Create Clipped Terrain Model tool.
  - a. Select the Existing Ground for the Reference Terrain Model.
  - b. Select all the corridor handles:
    - SR 61 L
    - SR 61 R
    - SR 61 Inside
    - US 98
  - c. Select the DtmPr Terrain.
  - d. Accept clipping features.
  - e. Set Feature Definition to DCDrape. The triangles of the Existing Ground should now display without overlapping the proposed model.



#### ► Drape Aerials on Existing Ground

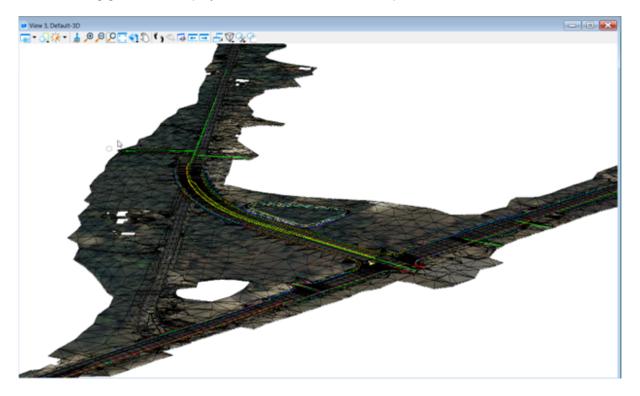
- 1. Ensure that the 3D View is active.
- 2. Use the **Primary > Attach Tools > Raster Manager** tool.

Visualization 🔹 🚍 🖥	🖪 🔦 + 🔺 📌 🚔 =		
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Attributes	Pr 🧔 Point Clouds	Selection	
€ No Feature Definition	🖂 ef 🥖	🤣 Reality Mesh	± <u>*</u>

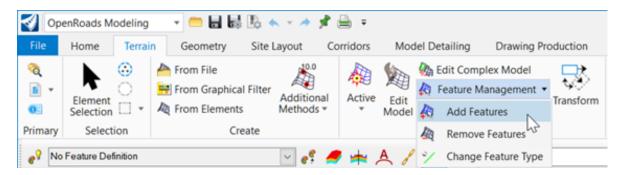
- 3. Attach the three *5136L-06.sdw*, *5136L-07.sdw*, and *5136L-08.sdw*f iles in C:\Worksets\ FDOT\22049555201\Roadway\aerials\sid.
- 4. Set *Draping* to **Yes** as shown below and click **Attach**.

Raster Attachment Options	- 🗆 🗙
	partment of Transportation/Worksets\FDOT\22049555201_CE\roadway\aerials\sid\5136L-06 partment of Transportation/Worksets\FDOT\22049555201_CE\roadway\aerials\sid\5136L-07 >
Action	^
Place Interactively	No
General	^
Level	Default
Color	ByLevel
Line Style	ByLevel
Weight	ByLevel
Class	Primary
Image	^
Description	
Geometry	^
Geo Priority	Attachment
Inherit GeoCS from Model	Not Inherited
Color	^
Tint	[255,255,255]
Contrast	0
Brightness	0
Invert	Do Not Invert Display
Transparency	Hide
Display Print	^
Views	1-2-3-4-5-6-7-8
Plane	Background
Print	Printable
Print Gamma	1.00000
Display Gamma	1.00000
Clip	Show V
Draping	
Extended	No Yes
Snappable	Snappable
Locked	Unlocked
	Attach Cancel

5. The existing ground will display on the terrain with the DCDrape Feature Definition.



6. Use **Terrain > Edit > Add Feature** to add the lines used to create the intersection surface in Chapter 4 to the new DCDrape terrain.



7. Set Feature Type to Hole.

NOTE Often the Hole Feature Type works, although because the profiles of those lines are not on the existing ground, it likely will not. Drape Void will work better as it essentially drapes the profiles to the existing ground before using them to clip the surface.

8. Use **Terrain > Edit > Change Feature Type** to change the feature type of the lines to Drape Void until they are successfully removed from the terrain.

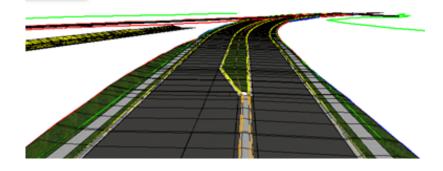
*Hint* Turn off display of reference file levels except for the Pavt Break and EOP from MODLRDDetail61.dgn in order to make it easier to select the lines for both these steps.

9. If needed, edit the model to manually delete triangles overlapping with the proposed model.

# Exercise 7.2 Create a 3D Drive-Through Animation

Creating a drive through along the project requires a 3D view and a 3D path to follow. This exercise explains how to use the Drive Through tool in FDOTConnect along the proposed SR61 3D Model.

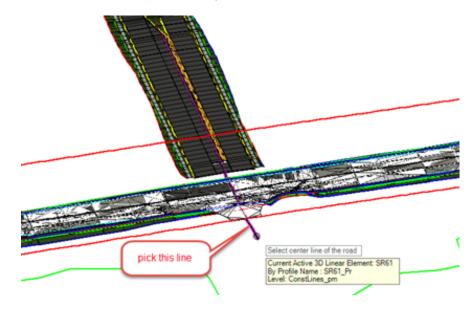
#### To Setup the Animation Drive Through



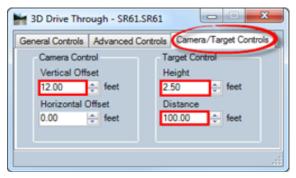
- 1. Open the MODLRDMaster01.dgn file.
- 2. Maximize View 2 Default-3D model to set it as the Active View.
- 3. Turn **OFF** the ConstLines and XSMisc_px levels.
- 4. Use Corridors > Review > 3D Drive Through tool.



- 5. At the prompt, Select a 3D view, left click inside View 2.
  - a. At the prompt, Select the center line of the road, pick the 3D line in the view shown below.



b. On the 3D Drive Through dialog, change to the tab Camera/Target Controls and enter the values as shown below.



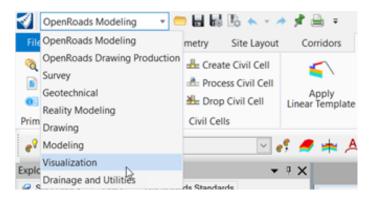
c. Change the tab back to the General Controls and Select the Play Button as shown below

🚔 3D Drive Thro	ough - SR61.SR61	
General Controls	Advanced Controls 0	Camera/Target Controls
		₩ ₩
Sp St St	press here	feet feet
		.:i



NOTE Ensure the system meets LumenRT requirements. CADD or District training laptops may not be able to process and may crash.

- 1. Make the 3D View active.
- 2. Change the Active Workflow to Visualization.



- 3. Turn off Existing Ground lines:
  - a. Turn off display of *GDTMRDO1.dgn*.
  - b. Turn off all levels in *MODLRDMaster01.dgn* except for DTM_ex and DTMTriangles_ep.



4. Use the **Home > LumenRT** tool.

Visualization					C\Users1p1972jpI;OneDrive - Florida	Department of Transportation/(Worksets/)	DOT_22049555201_CEyroadway/MODU
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5. LumenRT will open and the export will process.



Contact

www.fdot.gov/cadd

Address

605 Suwannee St Tallahassee, FL. 32399

**Roadway Design 3-D Modeling**