STATE OF FLORIDA

DEPARTMENT OF TRANSPORTATION

FDOT CORRIDOR MODELING

CE-11-0135

Course Guide

February 2014

ENGINEERING / CADD SYSTEMS OFFICE

TALLAHASSEE, FLORIDA

http://www.dot.state.fl.us/ecso/

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CE-11-0135

Description

This course is an introduction to GEOPAK Road Corridor Modeling and builds on the basic and advanced Florida Department of Transportation (FDOT) GEOPAK for Roadway Designers course skills by teaching users Corridor Modeling features and working with FDOT components and templates.

Topics Covered

This course includes, but is not limited to the following:

- FDOT Template Library overview
- Point Name and Component Name Conventions
- Point Constraints
- Template creation and editing tools
- Roadway Designer
- Station Ranges
- Parametric Value Settings
- Alignment and Point Controls on Templates
- End Condition exceptions
- Superelevation Proposed Cross Section
- Cross Section Labeling
- Earthwork
- Cross Section Reports
- Cross Section Sheets
- Displaying Surface Model
- Drive Thru.

Prerequisites

To get the most from this course the user should have a basic understanding of Computer Aided Design and Drafting (CADD) using MicroStation, a basic understanding of GEOPAK concepts and a solid understanding of the engineering necessary to design a roadway.

This course does not teach CAD drafting or engineering design. GEOPAK is simply a tool to facilitate the engineering design process. The following courses and some manual drafting or related CADD product experience is recommended:

- MicroStation
  - FDOT MicroStation Essentials Part I CE-11-0114
  - FDOT MicroStation Essentials Part II CE-11-0115
- GEOPAK
  - FDOT Basic GEOPAK for Roadway Designers CE-11-0099
  - FDOT Advanced for GEOPAK Roadway Designers CE-11-0101
- Engineering / Design
  - Solid understanding of road design process
- Review Topics
  - DTM Tools
  - Draw Profile Tool
  - Proposed Profile and Active chain control Profiles
  - Drawing and Computation (D&C) Manager

Duration: 24 Hours

Professional Credit Hours: 24 PDHs

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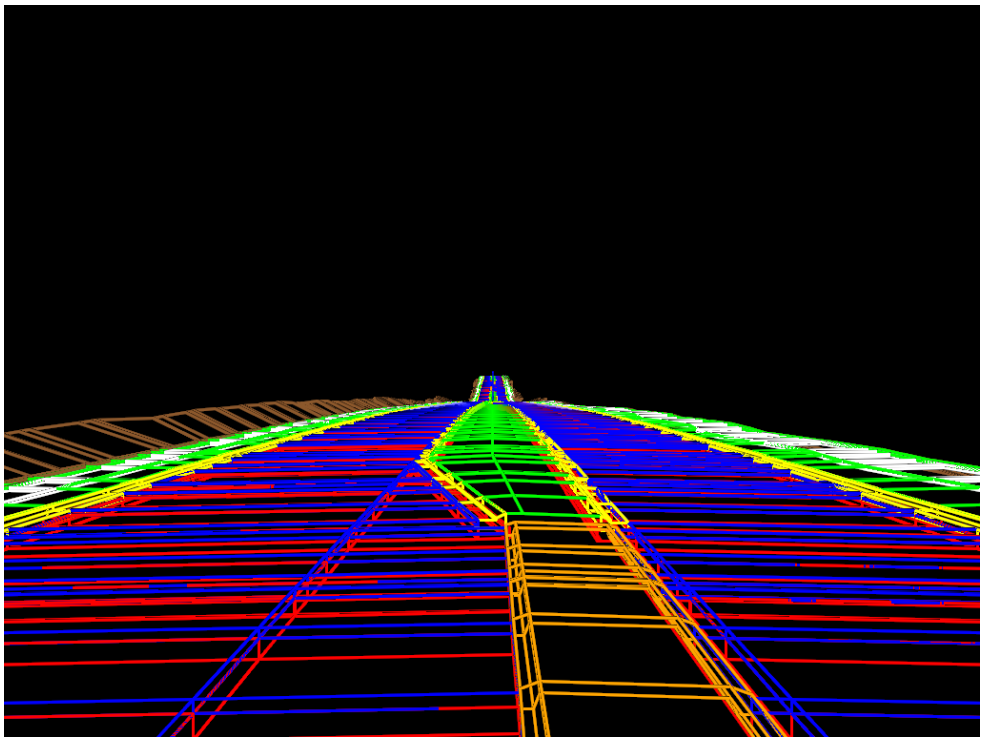

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1 INTRODUCTION

This course was developed to introduce GEOPAK and MicroStation users to the V8i SELECTseries2 Corridor Modeling tools for design and development on Florida Department of Transportation (FDOT) projects. The curriculum includes the following: software overview, general workflow, FDOT Template Library overview, Create Template dialog, Point Name and Component Name Conventions, Point Constraints, Roadway Designer dialog, Station Ranges, Parametric Value Settings, Alignment and Point Controls on Templates, End Condition exceptions, Superelevation design commands, Overlay/Stripping components, Proposed Cross Sections, Cross Section Labeling, three dimensional (3D) Corridor design models, and Drive Roadway commands.

COURSE OBJECTIVES

Students will expand their knowledge of basic and advanced GEOPAK skills by introducing them to GEOPAK Road, Corridor Modeling. At successful completion they will have learned how …

- To use the Corridor Modeling tools to design a roadway utilizing the FDOT delivered Template Library of standard components and templates
- To incorporate 2 dimensional (2D) design graphics in Corridor Modeling by importing the elements for use as design model control lines
- To 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.
- To apply the Superelevation wizard along a corridor.
- To provide 'real-time" cross section view updates, and design checks along the project before cross sections are created in MicroStation.
- To create and display 3D models for better designing and visualization
- To use the milling overbuild and overlay components on a project corridor.
- To apply vertical adjustments along existing alignments on resurfacing projects. Including vertical alignment generator based on user defined overbuild, milling and overlay, standards.
- Corridor Modeling techniques are used for developing driveways and intersection, etc.

This course has 24 Professional Development Hours (PDHs) associated with it.

EXPECTATIONS

WHAT THIS COURSE PROVIDES

This course provides an introduction to template and component creation, template constraints, applying template on corridors and several point controls methods. This course provides a standard workflow for designing a project with the Corridor Modeling tools.

This course does not provide a description of every GEOPAK command. However, the online GEOPAK command reference help is referenced throughout the document. Instruction for advanced template design and constraints are not specifically covered. However, the more advanced design exercises in chapters 6-11 provide ample instructions to advanced template techniques.

DOCUMENT STYLE

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

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

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FILE TYPES

The GEOPAK road design process uses several different file types. All GEOPAK data is stored in external files. The CAD file is used to view a graphical representation of the design data, but the graphic files do not store the GEOPAK data. Deleting the CAD graphics does not affect the GEOPAK data. For example, if the graphics that represent existing ground surface contours are deleted, the GEOPAK existing ground surface file is not modified.

Below is a brief description of the major file types used in GEOPAK.

File Type		Description
Project Manager	.prj	A binary file created to store project information when a new project is created.
Surface	.tin	A binary file, also known as a digital terrain model (DTM), that stores features made up of random points, breaklines, and boundary data along with triangulated surface model. The features and the triangles together represent an existing ground surface.
Surface DAT	.dat	A binary (or ASCII) file containing string and point information, that is used for digital terrain model construction.
Geometry Project	.gpk	A binary file (job###.gpk) created when starting a coordinate geometry (COGO) session for the first time or created through Project Manager, that stores geometric data including points, lines, curves, spirals, parcels, chains, and profiles. The file may be appended to during the design process. Multiple users can access this file at the same time. Only one file should be created for each project. The "###" is the only variable in this filename. It represents a job number (1 to 3 alphanumeric characters) unique to a project and is user defined upon creation.
Template Library	.itl	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.
Roadway Designer	.ird	Stores information defining the parameters of a roadway design. These roadway design parameters are defined using a tool called the Roadway Designer. The Roadway Designer is used for corridor management, assigning template drops, creating Superelevation, reviewing the design, defining template transitioning, and creating design surfaces. Only one Roadway Design file may be open for editing at a given time.
Corridor Modeling	.rdp	Stores the Roadway Design Preferences from the settings in the main Corridor Modeling dialog.
Corridor Modeling Surface	.dtm	Store the digital terrain model (DTM) made up of random points, breaklines, boundary and subsurface features along with triangulated surface model.

ADDITIONAL INFORMATION

The FDOT CADD Software Suite provides help files to explain how the GEOPAK Corridor Modeling tools can be used in conjunction with the FDOT workspace.

Webinar training recordings are available on many of the subjects covered in this manual on the Engineering\CADD Systems Office (ECSO) website at:

http://www.dot.state.fl.us/ecso/downloads/clips/default.shtm

COURSE SUPPORTING FILES

The exercises for each module are independent of one another and can be used without having to complete the exercises in previous modules. Most exercises use Project Manager. When the project file is loaded, all other supporting files such as surfaces, geometry databases, etc. are loaded. All files used in this course are located in the C:\FDOT Training Material\FDOT Corridor Modeling\ folder. The exercise files are organized into separate compressed zip files for each module..

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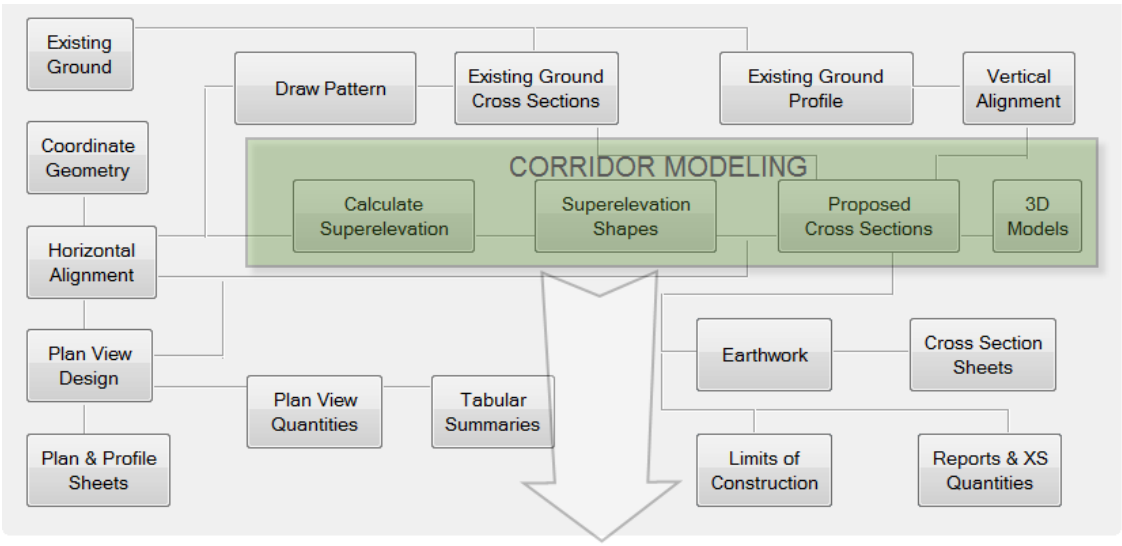
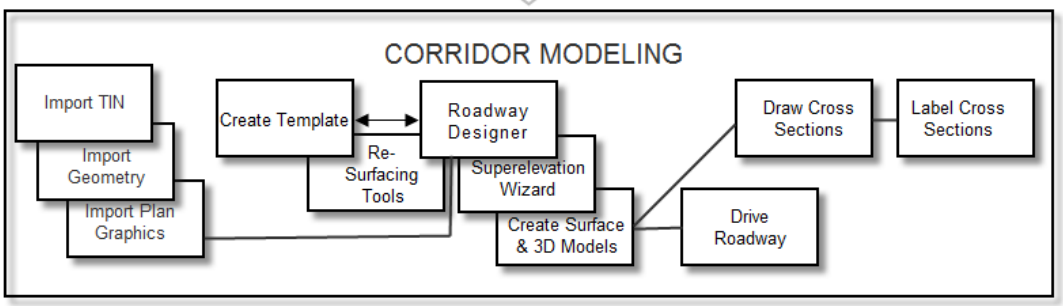
2 OVERVIEW

WORKFLOW

Before the Corridor Modeling tools can be discuss in any great detail, it is best to understand how they fit in the overall GEOPAK Road Project Manager workflow. The diagram below gives a general idea of where Corridor Modeling fits. The workflow outlined in green shaded area is basically replicated with the Corridor Modeling application. Corridor Modeling is not intended to replace the entire process, only provide another alternative set of tools to design the proposed roadway. The Corridor Modeling diagram outlined below the Traditional Project Manager diagram shows the various dialogs and processes within the application environment. All of the processes are covered in detail within the various chapter exercises to follow. Corridor Modeling files and results will directly integrate with all the other outside processes shown in the Project Manager diagram and vice versa.

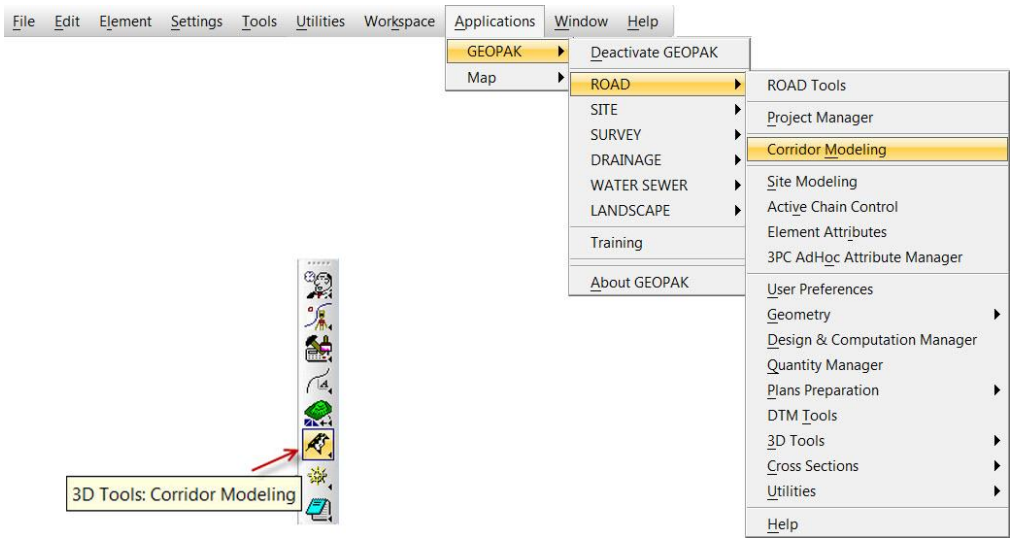


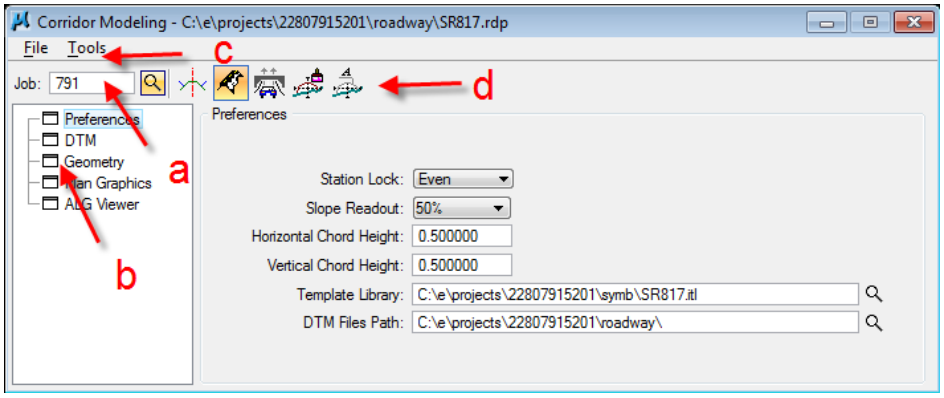


ACCESSING CORRIDOR MODELING

The Corridor Modeling tools delivered with GEOPAK are located under the MicroStation menu option: **Applications** > **GEOPAK** > **ROAD** > **Corridor Modeling**. <OR>

Access Corridor Modeling by clicking the *Corridor Modeling* icon on the GEOPAK ROAD tools pallet.





The Corridor Modeling dialog is the interface environment for several functions.

a) Project Identifier

b) Tree View Setting Window

c) Menu Options

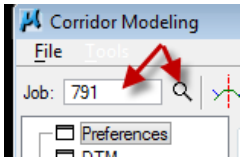
d) Tool Buttons

When the Corridor Modeling dialog is loaded for the first time, a sub folder named **rddbs** is created within the active project directory structure. This folder contains files that will be used by Roadway Designer. ***This sub folder should NOT be deleted.*** The **rddbs** folder is created in the working directory of the active DGN file. Three files are located in this folder:

- *cmjob791.alg* - created and re-created every time geometry or plan graphics are imported
- *cmjob791.xml* - created when geometry from the .gpk is imported from to the Corridor Modeling dialog
- *plangraphics.txt* - created when exiting Corridor Modeling dialog after plan graphics have been imported.

PROJECT IDENTIFIER

The Project Identifier selects the GEOPAK coordinate geometry Job file by entering a Job number or clicking the magnifying glass to access available (.gpk) files.

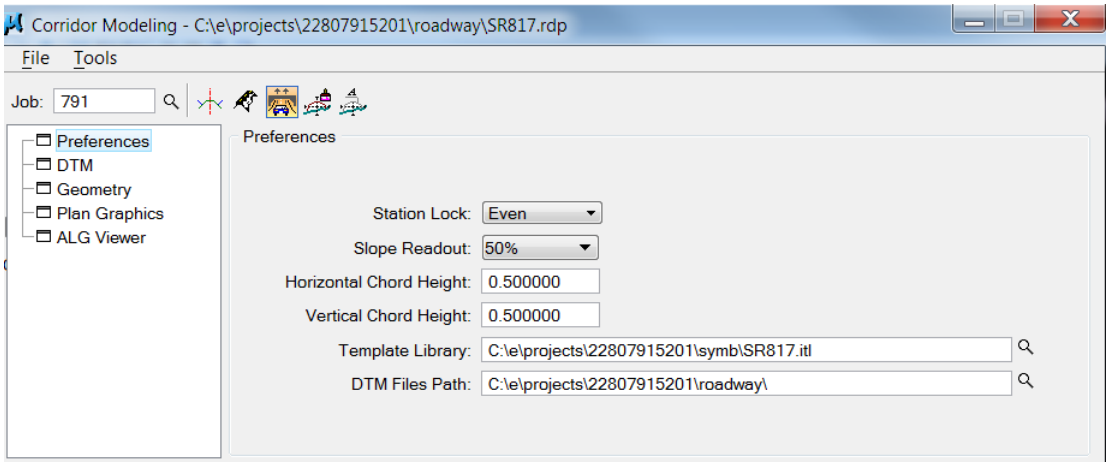


TREE VIEW SETTING WINDOW

These options are where the Project specific settings are defined and Project information can be imported. The dialog will change based on the selected option in the tree list to reveal parameters and preferences to be defined for the project and saved. The preferences and imported information can then be saved in a preference (.rdp) file and recalled for future use.

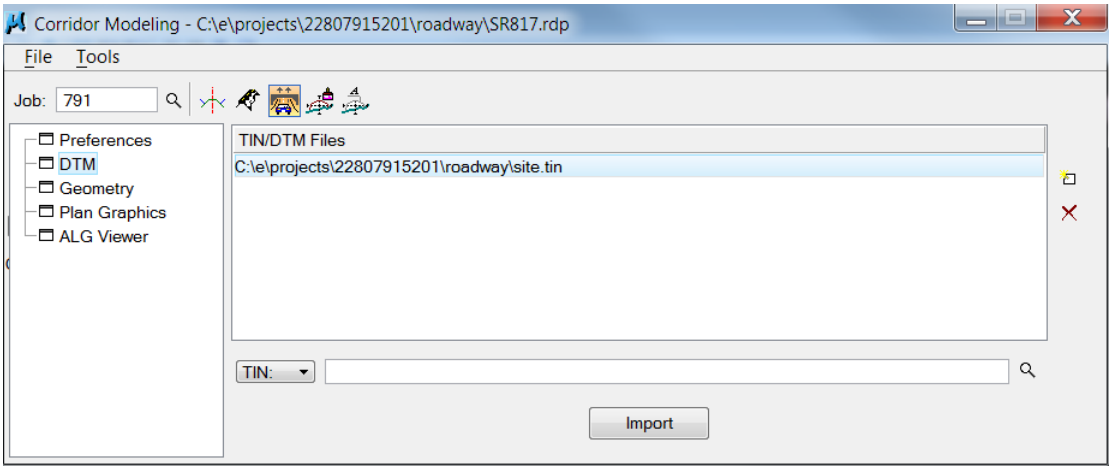
PREFERENCES

- *Station Lock* - Applicable only when the first station specified on the horizontal alignment is an odd-numbered station (for example, 2+38). When **Increment** is selected, and the first station is odd-numbered, the software performs the command action at odd-numbered stations only (for example, 2+38, 2+88, 3+38). When **Even** is selected, the software performs the command action to the first station and then forces all subsequent actions to even-numbered stations. For example, if the first station is 2+38 and the station interval is defined as 50, the software performs the command action at stations 2+38, 2+50, 3+00, etc.
- *Slope Readout* - Designates a particular format for expressing slope from the Slope combo box.
- *Horizontal/Vertical Chord Height* - Process of automatically adding shots to the DTM input (*.dat*) file by interpolating new shots from the linear and curved sections of the data.
- *Template Library* - Specifies the *.itl* file for the project. Select a file or use one of the automatically selected files. This field is populated by the configuration variable (*GPK_RD_Template_Library*), if set. If it is not set, this field is populated by the *./bin/default.itl*.
- *DTM files Path*: - Specifies the save location for surfaces, *.dtm* files, created and imported for the project. This field is populated by selecting the magnifier and choosing the directory path for the preference variable. Note: Roadway designer may not work properly if this is not set to the project roadway folder.



DTM

Imports selected DTM or TIN file(s). If you import a TIN file, it is converted to a .dtm file. Used to select and import the existing surface(s) (DTM/TIN) and/or other target surfaces.



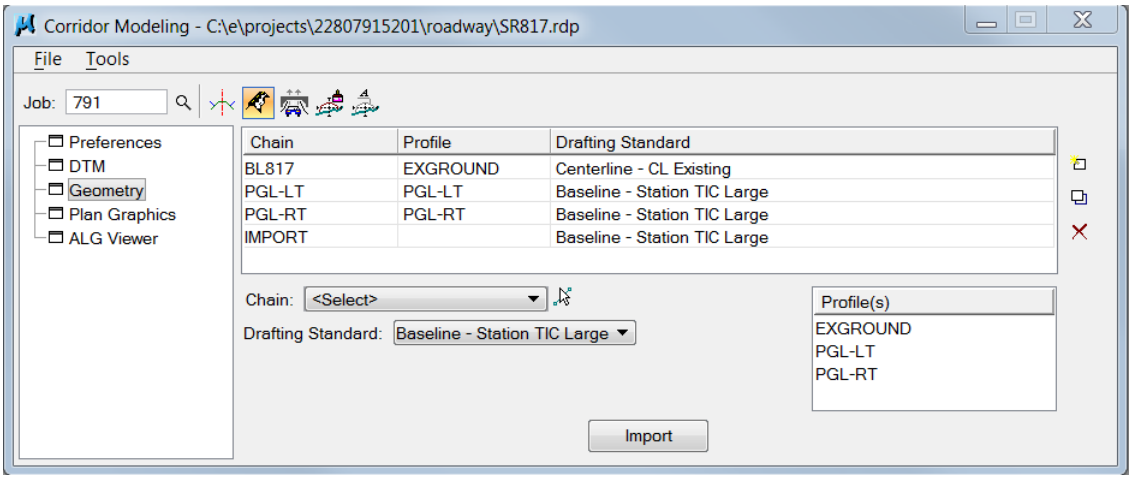
GEOMETRY

The Geometry imports various types of Geometry data (Chains, Profiles, etc.) from the selected *.gpk* file and generates an *.alg* file based on the information you provide.

When you select a row in the list box and click Import, the geometry is updated in the *.alg* file with the selected Chain, Profile, and Drafting Standard information. The *.alg* file is put in the rddbs sub-directory.

If a list box entry is red, that indicates the entry has been deleted since the last update.

If a list box entry is blue, that indicates the entry has been changed since the last update.



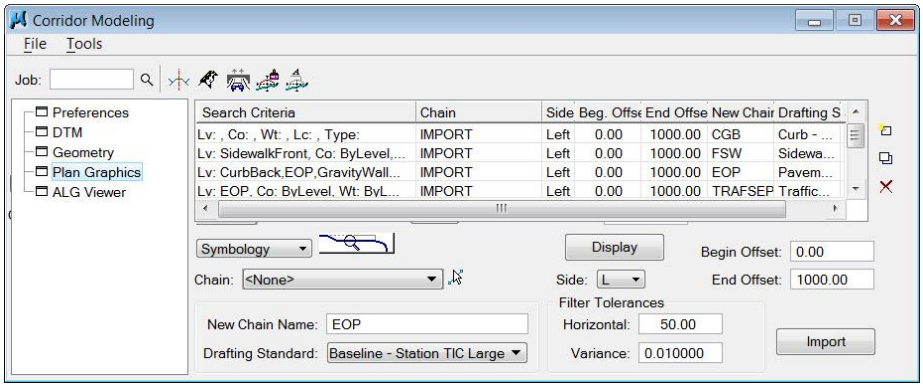
PLAN GRAPHICS

The Plan Graphics option on the Corridor Modeling dialog is used to store plan view graphical elements in the Roadway Designer alignment file (*.alg*). Roadway Designer does not work with plan view graphics directly The elements must be imported as alignments in the Roadway Designer alignment file (*.alg*). The alignments can then be used by Roadway Designer to handle pavement transitions, widening, etc.

DIALOG OPTIONS

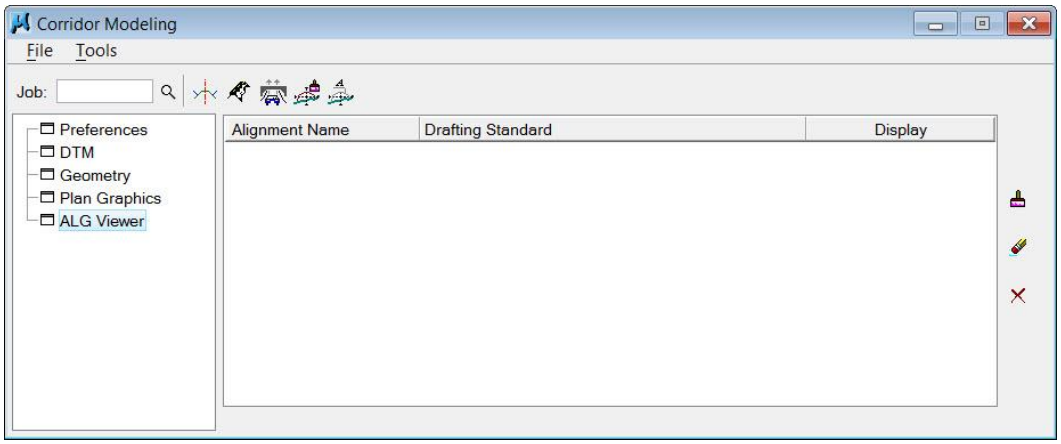
- *Search Criteria* - There are three options to choose from that can be selected to search for plan graphics.
  - *Symbology* – by MicroStation Level, color, style, weight, etc..
  - *Feature* – by Design & Computation Manager feature.
  - *Selection Set* – MicroStation Selection Set.
- *Chain* - An existing chain stored in the *Coordinate Geometry* file (*.gpk*) that will be used to search for the plan graphics that will be stored as alignments in the Roadway Designer alignment file (.alg).
- *Side* - Select either "L" or "R" to instruct the software as to which side of the selected chain you would like to use in the search.
- *Begin and End Offsets* - A search distance from the selected chain used to search for plan elements.
- *Display* - Once the search criteria has been specified and added to the collection box, this option is used to display the plan elements that will be stored.
- *New Chain Name* - Specifies the new chain name to be stored in the Roadway Designer alignment file (.alg). (NOTE: these chains are NOT converted/stored in the (.gpk))
- *Drafting Standard* - Symbology that will be assigned to the new chain.
- *Import* - Stores the new chain or any added graphical elements into the Roadway Designer alignment file (.alg) and makes Roadway Designer aware of the new chain/ element(s).
- *Add Search Criteria to List* - Adds specified search criteria to the collection box.
- *Modify Search Criteria of Selected Row* - Modifies the selected row of search criteria in the collection box.
- *Delete Search Criteria of Selected Row* - Deletes the selected row of search criteria in the collection box.

> ***Note*** The Drafting Standards labeled "XS_*" should not be used when importing Plan Graphics from the design file and to display imported Alignments from the *.alg* file.

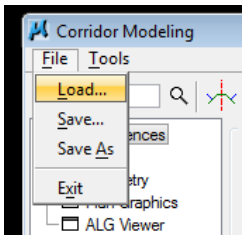


ALG VIEWER

Used to display, un-display and delete the imported geometry and plan graphics alignments.

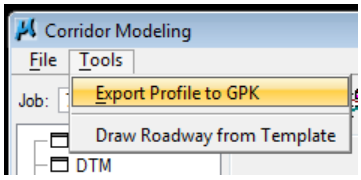


MENU BAR



FILE MENU

- *Load, Save, Save As or Exit* - After the Corridor Modeling dialog is populated according to the specific project information and the information is imported, it is recommended to save the Corridor Modeling preferences to the active design file working directory. The file will be saved with a (.rdp) extension.

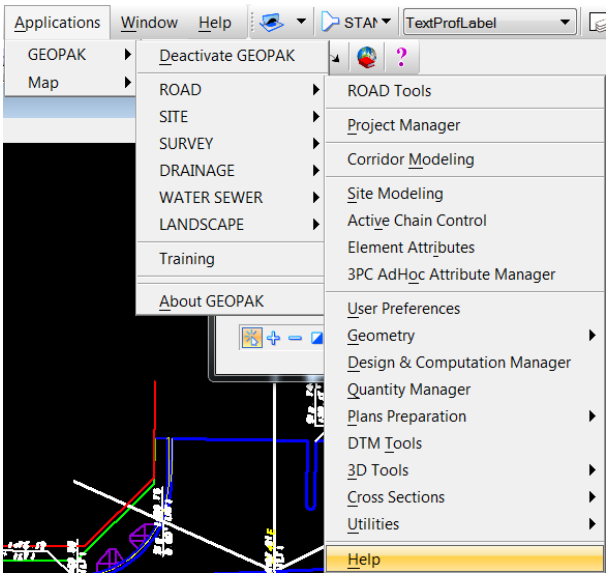


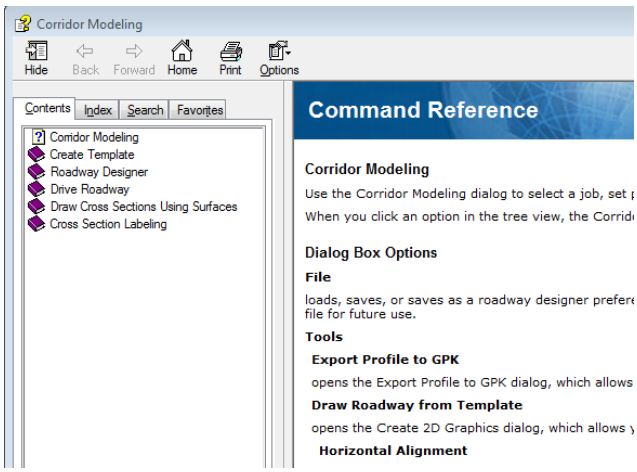
TOOLS MENU

- *Export Profile to GPK* - Opens the Export Profile to GPK dialog, which allows the designer to save/export vertical adjustment profiles created from the OverLay Tools in Roadway Designer out of an ALG file to a gpk file.
- *Draw Roadway from Template* - Opens the Create 2D Graphics dialog, which allows the designer to create 2D graphics from a specified template in a Template Library file.

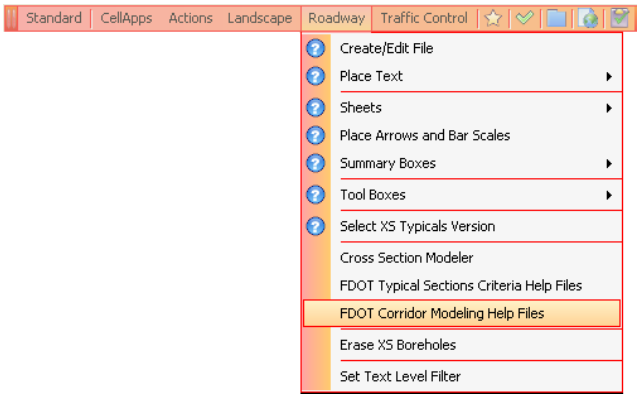
COMMAND REFERENCE & HELP

All of the Dialog Parameter fields are described in the Help files. To view this information, select **Applications** > **GEOPAK** > **ROAD** > **Help** and then select the Command Reference folder and then Corridor Modeling. The F1 keyboard button does not work for the Help files in GEOPAK Corridor Modeling.

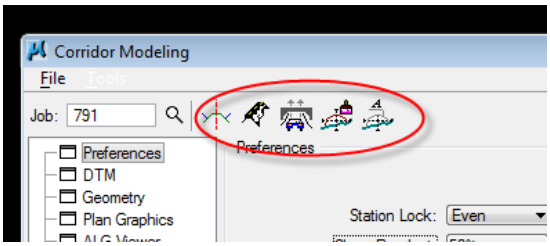




<OR> Access help from the FDOT Menu Option: **Roadway** > **FDOT Corridor Modeling Help files**.



TOOL BUTTONS



OPEN CREATE TEMPLATE:

Open Create Template opens the Create Template dialog. After the specific project information has been imported, a model of the proposed roadway design is generated by assembling project components/templates and applying them to a corridor using the Roadway Designer.

Components, Templates and End Conditions are created, edited and stored in the Template Library File which has an *.itl extension.

The Standard Road or Project Specific Template Library can be shared, however, the Template Library is recommended to be read-only when shared. It's recommended to create a project specific Template Library by copying the Standard Road Template Library to the project directory symb folder which allows the designer to modify the Template Library to meet the specific needs of the project.

Templates can be copied from a Standard Template Library to a Project Specific Template Library using Tools > Template Library Organizer in the Create Template Tool.

OPEN ROADWAY DESIGNER:

Open Roadway Designer opens the Roadway Designer dialog. Templates are designed and subsequently utilized to create a proposed model of the roadway. This is accomplished using the Roadway Designer tool. In the Roadway Designer, templates are assigned to specific station ranges along a selected corridor.

The Roadway Designer, via the Edit Transition tool, connects the points of the template drops, forming a model of the roadway, which is made into a surface model. The connected template points form longitudinal break line features in the surface model.

The Roadway Designer is where Superelevation is created and/or applied to the design. The Roadway Designer tool requires the following preferences be set up prior to accessing the tool:

GPK file select (job number)
DDB
DTM
Geometry
Plan Graphics

The Roadway Designer data is saved in the Roadway Design file which has an (.ird) extension.

The Roadway Designer tool has three window viewing areas. They represent the plan, profile, and cross section views of the design.

DRIVE ROADWAY:

Drive Roadway opens the Drive Roadway dialog. The Drive Roadway tool allows the designer to view the path a driver would take along a roadway. It also generates a 3D line string along the path which might be used to control camera position along the roadway.

DRAW CROSS SECTION FROM SURFACES:

Draw Cross Section from Surfaces opens the Draw Cross Sections dialog. Designers will recognize this as the tool used for cutting existing ground cross sections from a TIN file. The Draw Cross Sections from Surfaces tool is used to draw both the existing ground surface and proposed Roadway surfaces on the cross sections.

Support for a DTM created by Roadway Designer is a new feature of the tool. All template components are included in the proposed cross sections created from a Roadway Designer DTM.

CROSS SECTION LABELING:

Cross Section Labeling opens the Cross Section Labeler dialog. The Cross Section Labeler tool is provided for batch labeling the different components of the cross sections in a corridor set. The Cross Section Labeler has several label types that can be saved in a label preference file .xlp. Labels can be defined for Slopes, Elev/Off, Station, Text Notes or a Dimension or text between two points. Each of the labels can have customized attributes styles which can also be saved in an xml file.

3 NEW CORRIDOR MODELING PROJECTS

This chapter provides the user with an introduction and exercises on the Corridor Modeling dialog. When starting a new project in Corridor Modeling, there are a few simple procedures to do first in order to get your Corridor Modeling design going.

LOADING ACTIVE GEOPAK PROJECT FILES

The Roadway Designer part of Corridor Modeling uses GEOPAK chains to define the direction and path of the roadway. These chains or alignments will need to be established in a GEOPAK project before a Corridor Modeling design can begin. The (*.gpk)* file(s) can then be associated and saved with the Corridor Modeling project.

Note	There are NO alignment tools, either horizontal, or vertical in the Corridor Modeling dialogs.

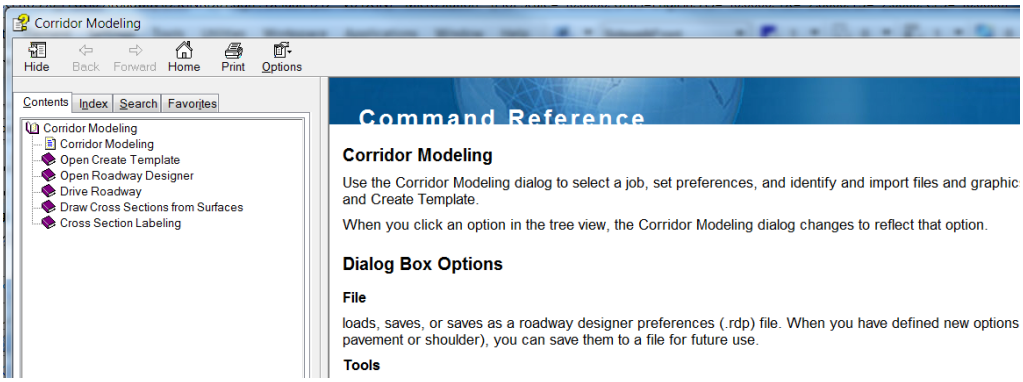
PROJECT PREFERENCE SETTINGS

Corridor Modeling is a front end dialog that will allow the user to set up project specific preferences. Symbology features, geometry information, and the existing surface will also be imported from the tool that Roadway Designer will utilize when creating a roadway design model. The preferences and imported information can then be saved in a preference (.rdp) file.

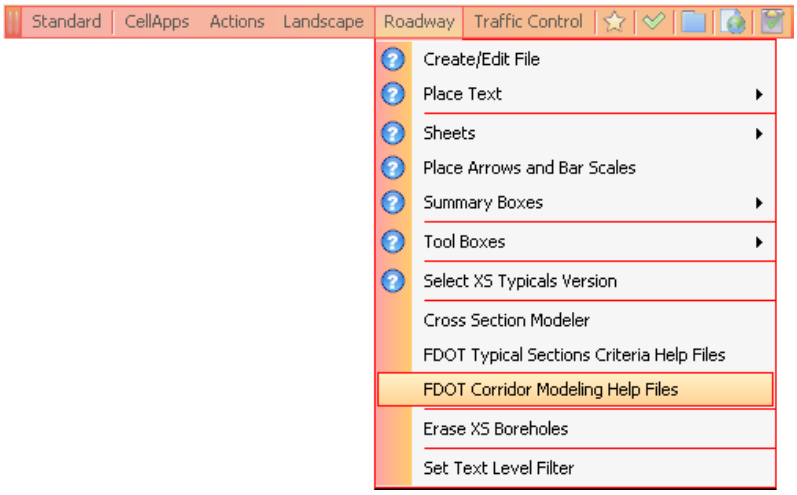
The preferences are project specific dialog settings that can be stored with a Corridor Modeling project. These settings are stored in a (*.rdp*) file for the Corridor Modeling project at the working directory.

- *Station Lock* - Applicable only when the first station specified on the horizontal alignment is an odd-numbered station (for example, 2+38). When Increment is selected, and the first station is odd-numbered, the software performs the command action at odd-numbered stations only (for example, 2+38, 2+88, 3+38). When Even is selected, the software performs the command action to the first station and then forces all subsequent actions to even-numbered stations. For example, if the first station is 2+38 and the station interval is defined as 50, the software performs the command action at stations 2+38, 2+50, 3+00, etc.
- *Slope Readout* - Designates a particular format for expressing slope from the Slope combo box.
- *Horizontal/Vertical Chord Height* - Process of automatically adding shots to the DTM input (*.dat*) file by interpolating new shots from the linear and curved sections of the data.
- *Template Library* - Specifies the *.itl* file for the project. You can select a file or use one of the automatically selected files. This field is populated by the configuration variable (*GPK_RD_Template_Library*) if set. If it is not set, this field is populated by the *./bin/default.itl*.

There are detailed descriptions for each of the fields represented in the GEOPAK Corridor Modeling Command References.



Note Also, from FDOTSS2 Menu select Roadway then FDOTSS2 Corridor Modeling Help Files to get further information links on project preferences for Corridor Modeling.



EXISTING TIN MODELS

In a Corridor Modeling project, the design model is generated and tied to the existing ground. The existing ground needs to be represented in a digital terrain model format. The Corridor Modeling dialog will allow for both file formats: GEOPAK TIN or DTM. The Corridor Modeling dialog also allows multiple TIN/DTM files to be associated with a project and saved in the (*.rdp*). This would be useful if a project survey was stored in several different files.

GEOMETRY

Imports various types of geometry data from the selected *.gpk* file and generates an *.alg* file based on the information you provide. When you select a row in the list box and click Import, the geometry is updated in the *.alg* file with the selected Chain, Profile, and Drafting Standard information. The *.alg* file is put in the *rddbs* sub-directory.

- If a list box entry is red, that indicates the entry has been deleted since the last update.
- If a list box entry is blue, that indicates the entry has been changed since the last update.

EXERCISE OVERVIEW

3.1 Load Active GEOPAK Project .prj &.gpk Files

3.2 Change the Project Preference Settings

3.3 Import an Existing TIN Model

3.4 Add / Import GEOPAK Chains to Alignments

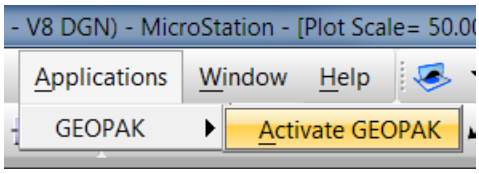
Note For Importing MicroStation Elements See Chapter 4, Importing Plan Graphics to Alignments

Exercise 3.1 Load Active GEOPAK Project .prj & .gpk files.

In this exercise the proposed roadway design file, *DSGNRD01.dgn*, will be opened with GEOPAK using the FDOT workspace and Project configuration. The design file has the proposed design drawn in MicroStation for the project according to FDOT Engineering CADD standards. Other project reference files are attached to the file and not displayed for the existing topo, utilities and right of way.

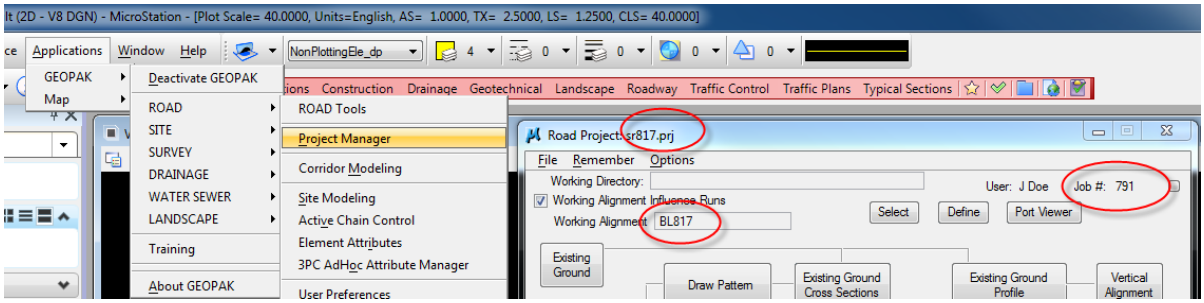
Before beginning this Chapters exercises remove or rename the c:\e\projects\22807915201 folder if it exists, and then extract the *22807915201(3).zip* file to C:\e\projects.

1. Open the FDOT folder on the desktop and click on the FDOT icon.
2. Select the *DSGNRD01.dgn* file in the c:\e\projects\22807915201\roadway\ folder in the FDOTSS2 workspace in MicroStation.
3. From the MicroStation pull down menu select **Applications** > **GEOPAK** > **Activate GEOPAK**

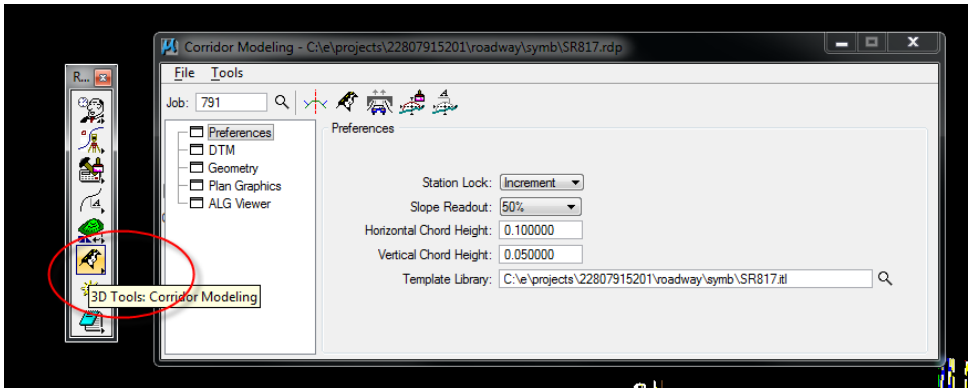


4. Open up GEOPAK Project Manager from the MicroStation menu option:

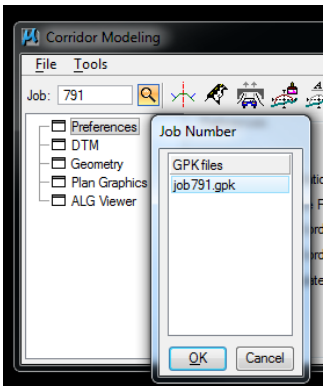
   Applications > **GEOPAK** > **Road** > **Project Manager** to insure the project *.prj* and *.gpk* files are loaded and active.



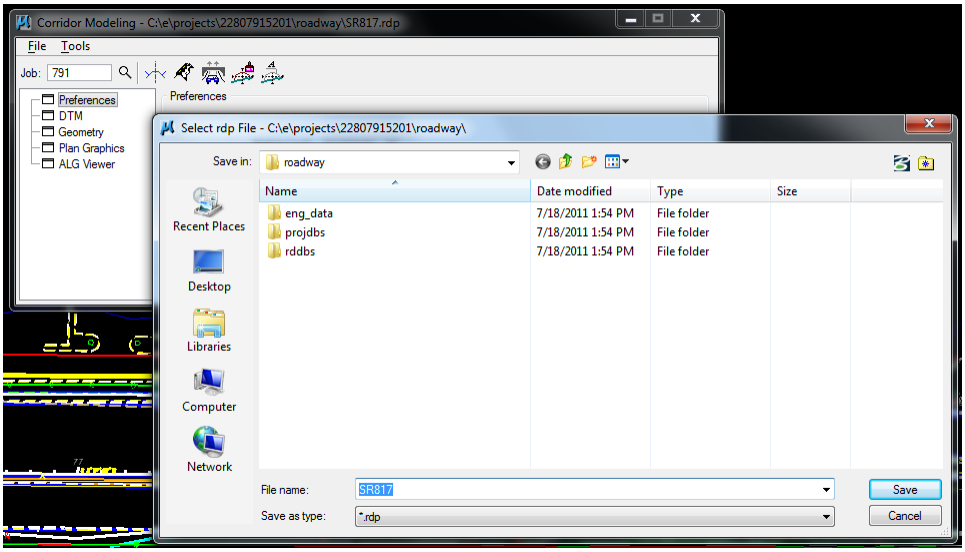
5. Collapse the Road Project dialog
6. From the GEOPAK Road Tools toolbox, open the Corridor Modeling dialog.



7. From Corridor Modeling, click the *Magnifier* icon next to the *Job:* field, confirm the Project Identifier *job791.gpk* file is selected and click **OK**.



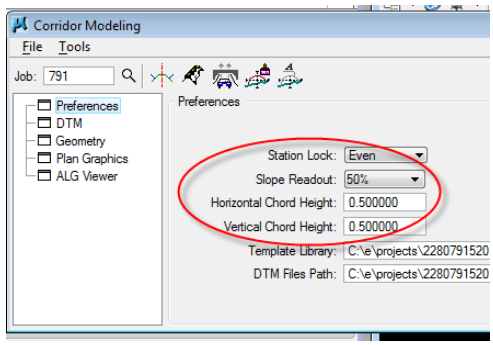
8. Select **File** > **Save As** to create a new project Corridor Modeling *Preference* file, **SR817.rdp**.



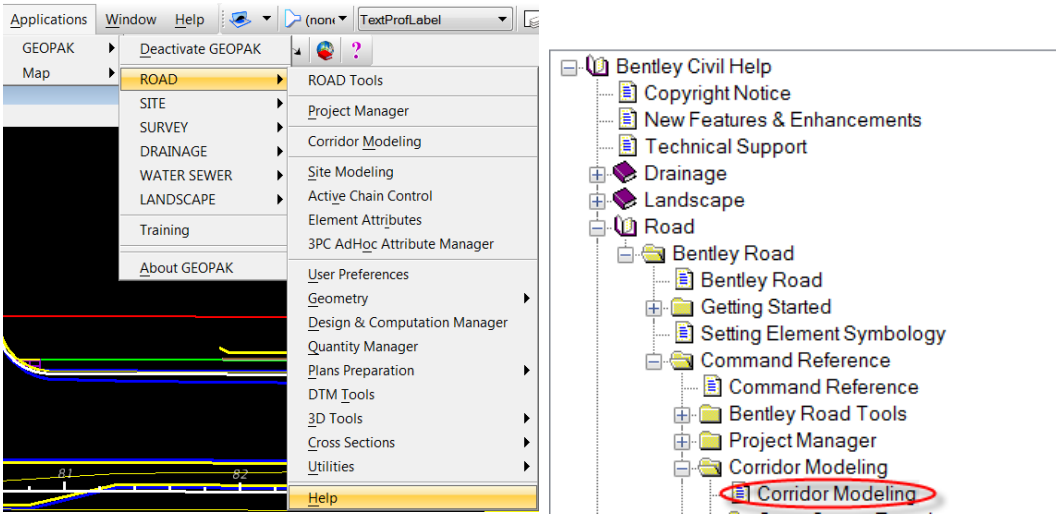
Exercise 3.2 Change the Project Preference Settings

The next step when starting a new Corridor Modeling project is to set the Project preferences and save them off to a file for future loading. In this exercise, the Corridor Modeling Preferences are set for the *Station Lock, Slope Readout, Horizontal and Vertical Chord Heights*. Once a new preference file is saved, the setting can be loaded together for future session from the **File** > **Load** menu option on the Corridor Modeling dialog.

1. From Corridor Modeling, select the **Preferences** item in the tree view list.
2. Set the *Station Lock, Slope Readout, Horizontal, Chord Height,* and *Vertical Cord Height* as shown below:

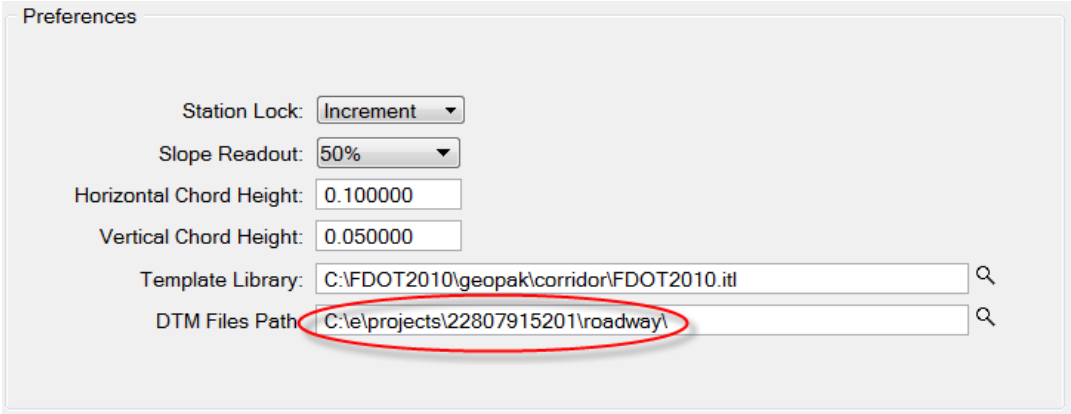


3. For help on these parameters preference settings see the Corridor Modeling **Help** files by selecting from the MicroStation menu option **Applications** > **GEOPAK** > **ROAD** > **Help** and then navigating to the folder **Road** > **Command Reference** > **Corridor Modeling**.



4. Read each of the Command References in the online help to answer the following questions:
   a. In the Section *Horizontal Chord Height*, what does the parameter affect?
   b. In the Section *Vertical Chord Height*, what does the parameter affect?
   c. In the *DDB* Section, where is the FDOTSS2 xin file? Note that the DDB item is not present in the tree view list.
   d. In the *ALG Viewer*, what types of elements are used to display alignments?
5. Close the online help.

6. Set the *DTM Files Path* as shown below.

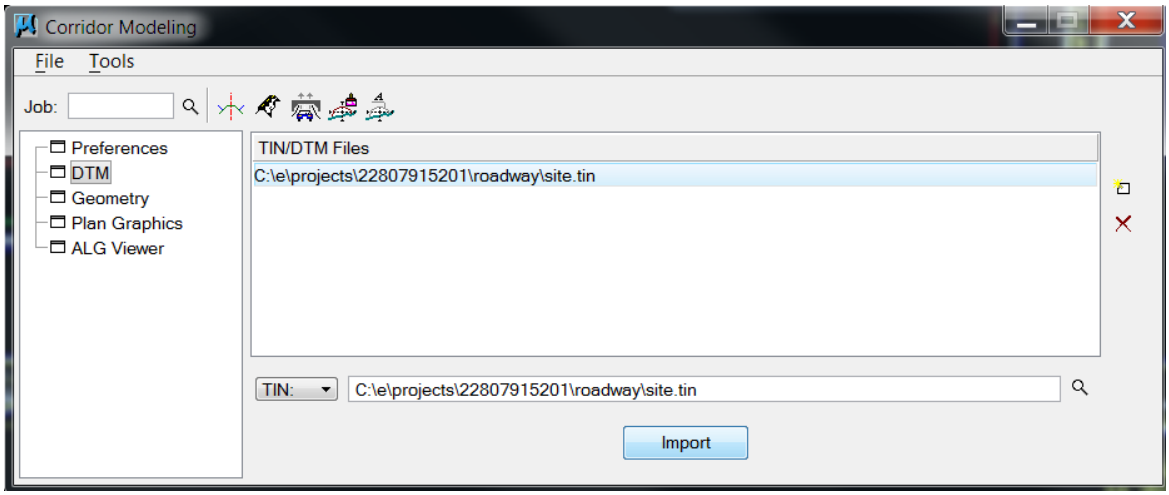


7. From the Corridor Modeling menu, select **File** > **Save** to save the project *Preference* file. Click **OK** on the Information dialog.

Exercise 3.3 Import an Existing TIN Model

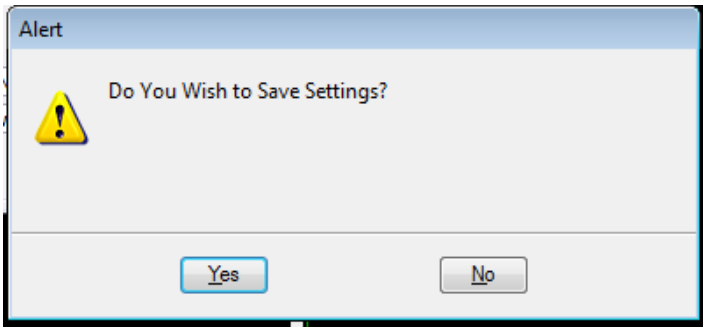
In this exercise the existing digital terrain model for the project is identified and then imported into the Corridor Modeling environment. The DTM can be in either TIN or DTM format, however if TIN it is converted to a DTM file. The existing project TIN file is used by Corridor Modeling as the base surface or target to tie the new project model. The name and location of this file is saved with preference file

1. From Corridor Modeling, select the category **DTM** in the tree listing (a) to set the existing **TIN** model.
2. Click the *Magnifier* icon next to the *TIN* field, navigate to the project roadway folder.
3. Select the *site.tin* file for the project and then click **Open**.
4. Click the *Add Tin* icon to list and display the path in the TIN/DTM files list.
5. Highlight the added *site.tin* file and click the **Import** button to import the file. Click OK on the Information Alert dialog.



6. Select **File** > **Save** the project Corridor Modeling preference file, **SR817.rdp**

> ***Note*** The *Corridor Modeling* dialog should remain open until finished with the design session. It will be accessed periodically by future commands in other steps. If it is inadvertently closed, it will take a several seconds to close and then the following Alert dialog will appear. If the preferences have already been saved, Click No to close the session.



> ***Note*** Closing the *Corridor Modeling* dialog will also close the *Create Template* dialog, if it is open, without prompting to save the changes to the Template library. However, the *Roadway Designer* dialog will remain open, if the *Corridor Modeling* dialog is closed.

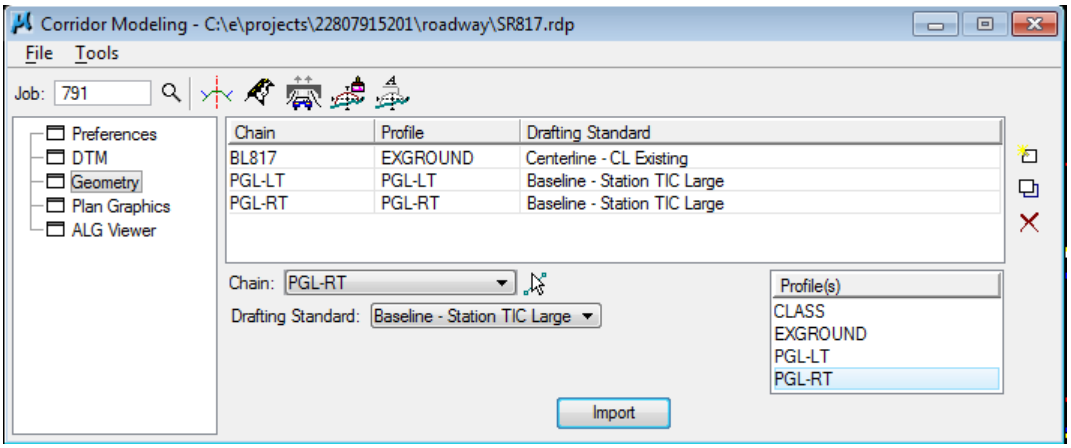
Exercise 3.4 Add / Import GEOPAK Chains to Alignments

In this exercise, several Coordinate Geometry chains and profiles from the project (*.gpk*) file are identified and imported to create an alignment file. This (*.alg*) file is created and put in the (*rddbs*) folder of the project roadway sub-folder. The alignments are the longitudinal features the templates follow in the Roadway Designer. The Corridor Modeling application is a legacy Inroads application that ran on (.alg) alignment files for horizontal and vertical control; thus the need to convert or import the (*.gpk*) chains and profiles to (*.alg*) format.

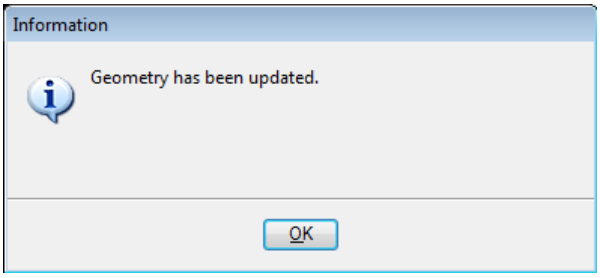
1. Open Corridor Modeling, if closed, and select the *Geometry* category in the tree view list.
2. Set *Chain:* by selecting **BL817** from the drop down list.
3. Set *Profile(s)* by selecting **EXGROUND** from the list window.
4. Set *Drafting Standard*: by selecting **Centerline – CL Existing** from the dropdown list.
5. Click the *Add* icon . Alignment will appear in the display window.
6. Repeat the procedure for the **PGL-LT** and **PGL-RT**.

CHAIN	PROFILE	DRAFTING STANDARD
BL817	EXGROUND	Centerline – CL Existing
PGL-LT	PGL-LT	Baseline Station TIC Large
PGL-RT	PGL-RT	Baseline Station TIC Large

7. The results should match the image below.



8. Click the **Import** button to import the geometry from the *.gpk* file to the *.alg* file. The following Information box will display to confirm import.



Note: Once the alignments have been associated with the Corridor Modeling project, there is a smart update feature that runs with the Corridor Modeling application that creates notification when changes have been made to the GEOPAK project file. When such alignment changes have been identified, they simply need to be re-imported to have an effect on the Corridor Modeling design.

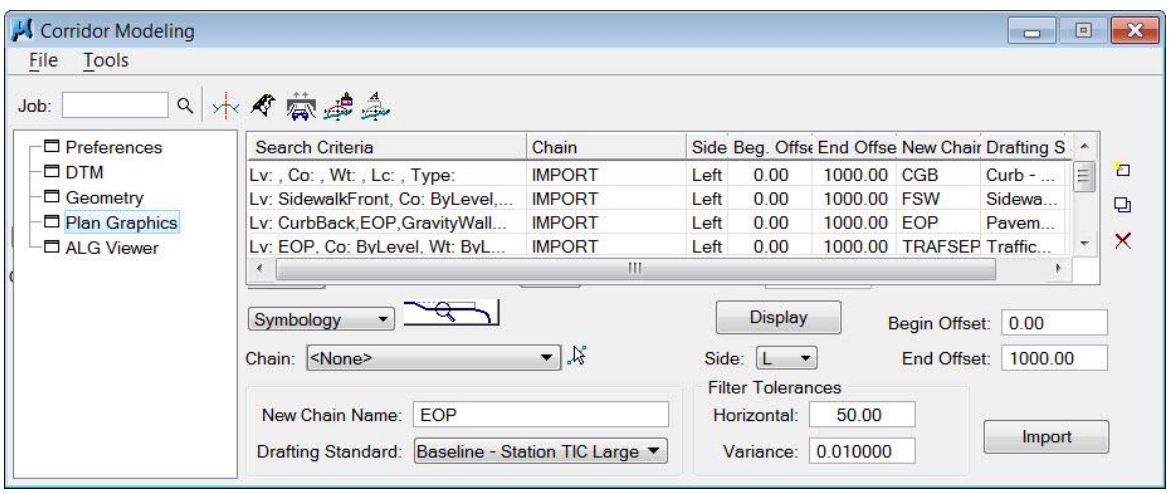
9. From the Corridor Modeling menu, select File > Save to save the project preference file.

4 IMPORTING PLAN GRAPHICS TO ALIGNMENTS

PLAN GRAPHICS

The Plan Graphics option on the Corridor Modeling dialog is used to store plan view graphical elements in the Roadway Designer alignment file (*.alg*). Roadway Designer does not work directly with plan view graphics like criteria elements. First these elements must be stored as alignments in the Roadway Designer alignment file (*.alg*). The alignments can then be used by Roadway Designer to handle pavement transitions, widening, etc. If the elements in the design file change, an Information dialog appears and the elements should be imported again.

DIALOG OPTIONS



- ***Search Criteria*** **-** There are three options to select from that can be selected to search for plan graphics.
  - *Symbology* - Searches for the Plan Graphic by Level, color, style, weight, etc. of the plan graphics.
  - *Feature* - Searches for the Plan Graphic using Design & Computation Manager feature.
  - *Selection Set* – Uses a MicroStation Selection Set to set the Plan Graphic.
- ***Chain*** **-** An existing chain stored in the Coordinate Geometry file (.gpk) that will be used to search for the plan graphics that will be stored as alignments in the Roadway Designer alignment file (.alg).
- ***New Chain Name*** **-** Specifies the new chain (alignment) name to be stored in the Roadway Designer alignment file (.alg).

- ***Drafting Standard*** **-** Symbology that will be assigned to the new chain (alignment) when displayed with the ALS Viewer. These have been imported from the DDB to match FDOT CADD Standards.
- ***Display*** **-** Once the search criteria has been specified and added to the list box, this option is used to highlight the plan elements that will be stored.
- ***Side*** **-** Select either "L" or "R" to instruct the software as to which side of the selected chain you would like to use in the search.
- ***Begin / End Offsets*** **-** A search distance from the selected chain used to search for plan elements.
- ***Filter Tolerances*** **–** Both horizontal and variance filter tolerances are considered together for each pair of graphical segments. The middle point is deleted if both segment lengths are less than the horizontal filter tolerance while the projected distance between the mid-point and the chord between the two end points is less than the variance tolerance. A value of 0 for both tolerances disables them.
- ***Import*** **–** Stores the new chain or any added graphical elements into the Roadway Designer alignment file (.alg) and makes Roadway Designer aware of the new chain/ element(s).
- ***Add Search Criteria to List*** **-** Adds the specified search criteria to the collection box.
- ***Modify Search Criteria of Selected Row*** **-** Modifies the selected row of search criteria in the collection box.
- ***Delete Search Criteria of Selected Row*** **-** Deletes the selected row of search criteria in the collection box.

EXERCISE OVERVIEW

4.1 Add / Import Plan Graphics to Alignments

4.2 ALG Viewer

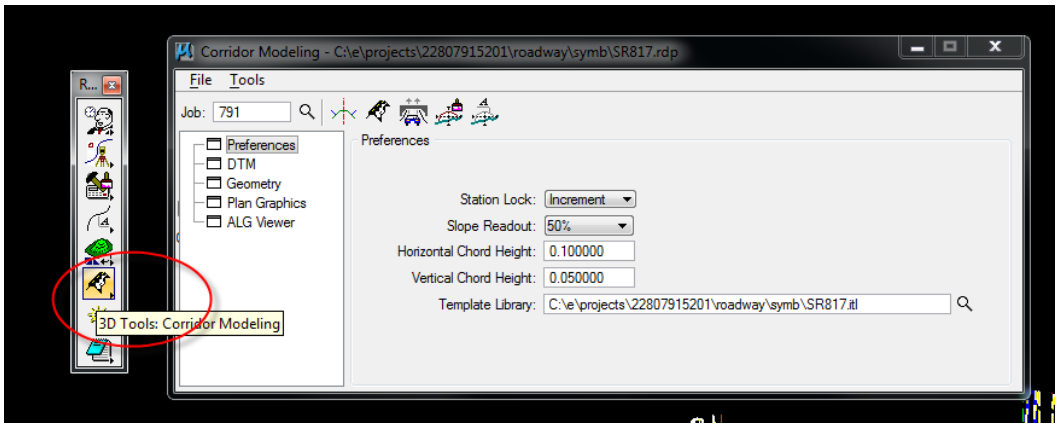
4.3 Understanding Smart Update

Exercise 4.1 Add / Import Plan Graphics to Alignments

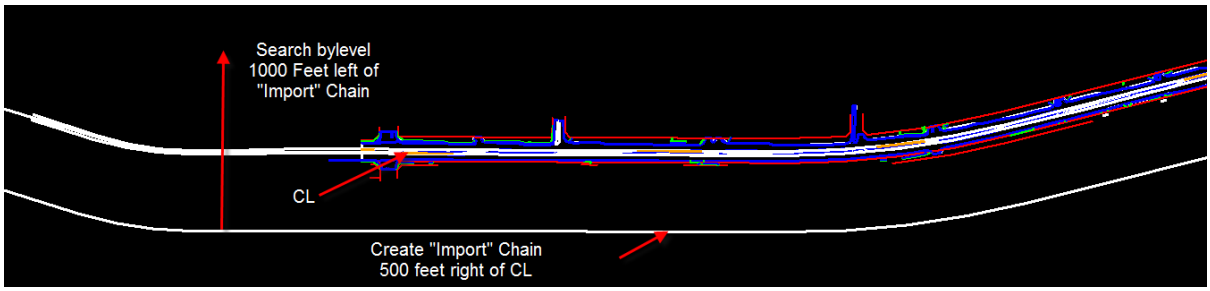
In this exercise 2D MicroStation elements drawn for the proposed roadway design will be selected and imported to create alignments. These alignments are imported from graphics and stored in the (*.alg*) file along with the imported Coordinate Geometry. The alignments are used for style constraints defined in the FDOT templates. Roadway Designer will follow the 2D proposed design (i.e. EOP, edge of pavement) to handle pavement transitions, adding lanes, traffic separator display, wall display, etc. and much more.

1. Optional, extract the *22807915201(4).zip* file in the c:\e\projects directory.
2. Open the *DSGNRD01.dgn* file of the c:\e\projects\22807915201\roadway\ folder in the FDOTSS2 workspace in MicroStation.
3. From the GEOPAK Road Tools toolbox, open the Corridor Modeling dialog, select the GPK job number **791**.

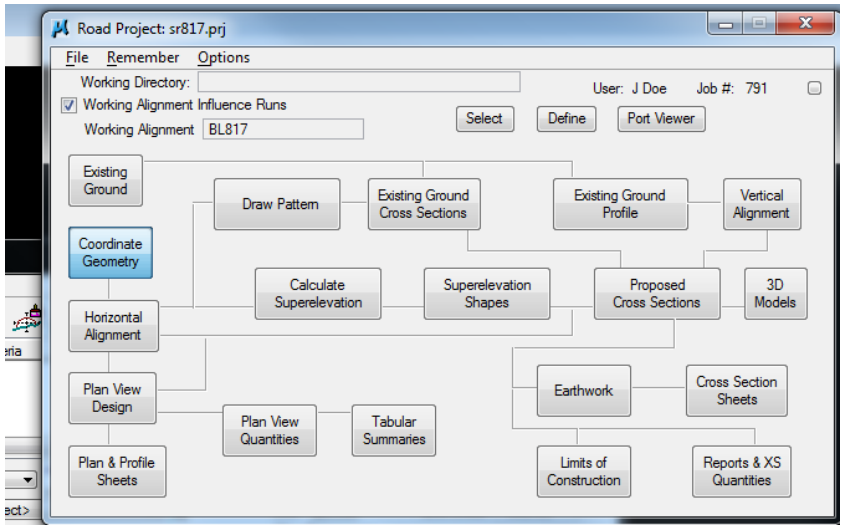
4. Select **File** > **Load** to load the project file **SR817.rdp**.



The search criteria for the Import Alignment command works off of a defined chain as stored in the COGO database. It has the ability to find graphical alignment features in the design file. However, this command can only be defined left or right from the defined chain. Therefore, it is necessary to create an offset chain to the defined centerline out a distance beyond the right or left side and search for elements twice the distance in the other direction. For example, create an offset chain 500 feet right and define the offset search 1000 feet left.

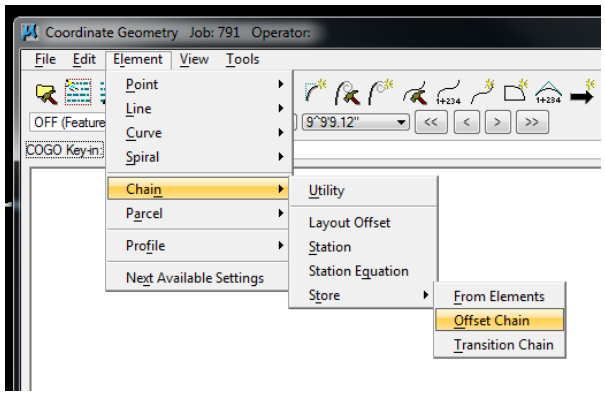


5. From the Road Project dialog, select *Coordinate Geometry* to create an offset alignment.

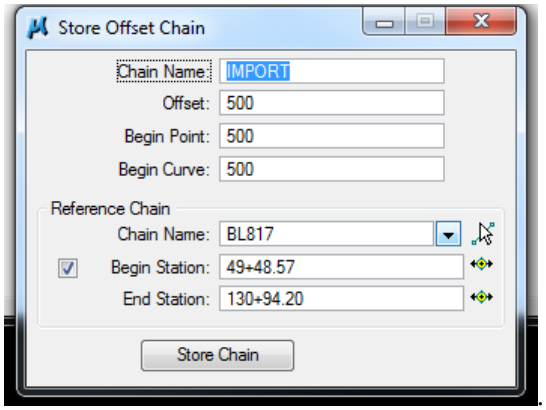


Note If necessary, Delete the Import Alignment and elements from GPK file, #500, 501 & 502 Points and #500 & 501 Curves.

6. From the Coordinate Geometry menu, select **Element** > **Chain** > **Store** > **Offset Chain.**

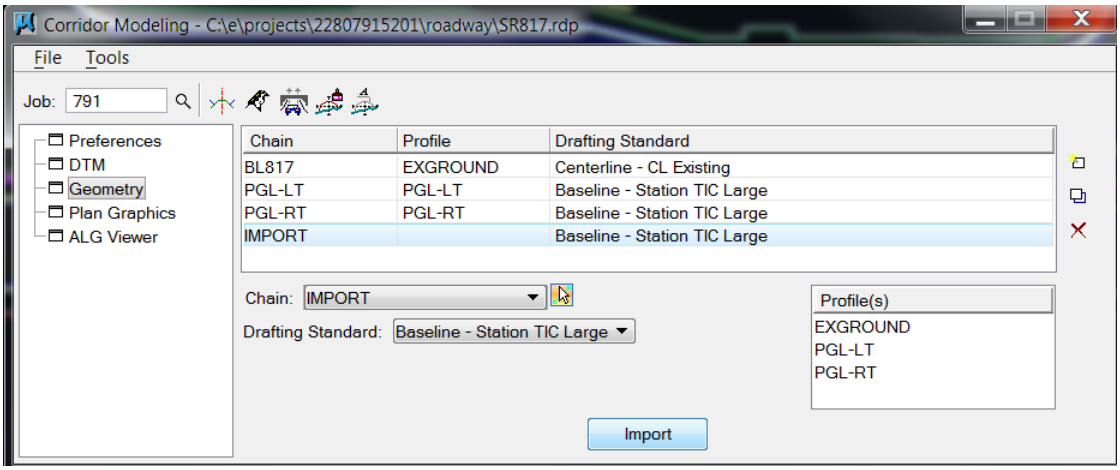


7. Using the settings shown below, store an offset chain, **IMPORT,** 500 feet right from the baseline of survey.



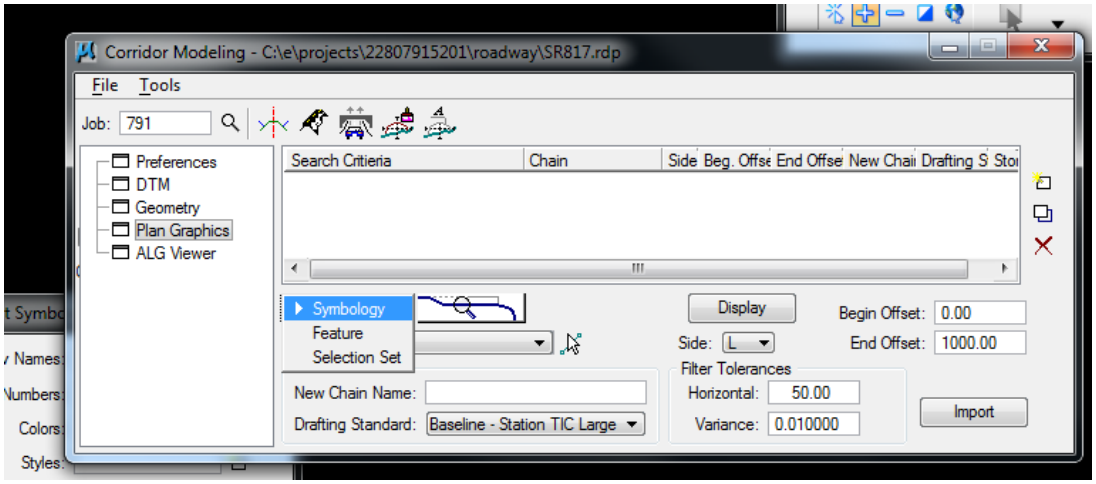
8. Select **Store Chain** button and then close the Store Offset Chain Dialog. Close the Coordinate Geometry dialog. Select No to save an input file.

9. From the Corridor Modeling dialog, select *Geometry*, and then **Add** and **Import** the offset chain utilizing the **Baseline – Station TIC Large** drafting standard.



10. Select **File** > **Save** to save the project preferences.

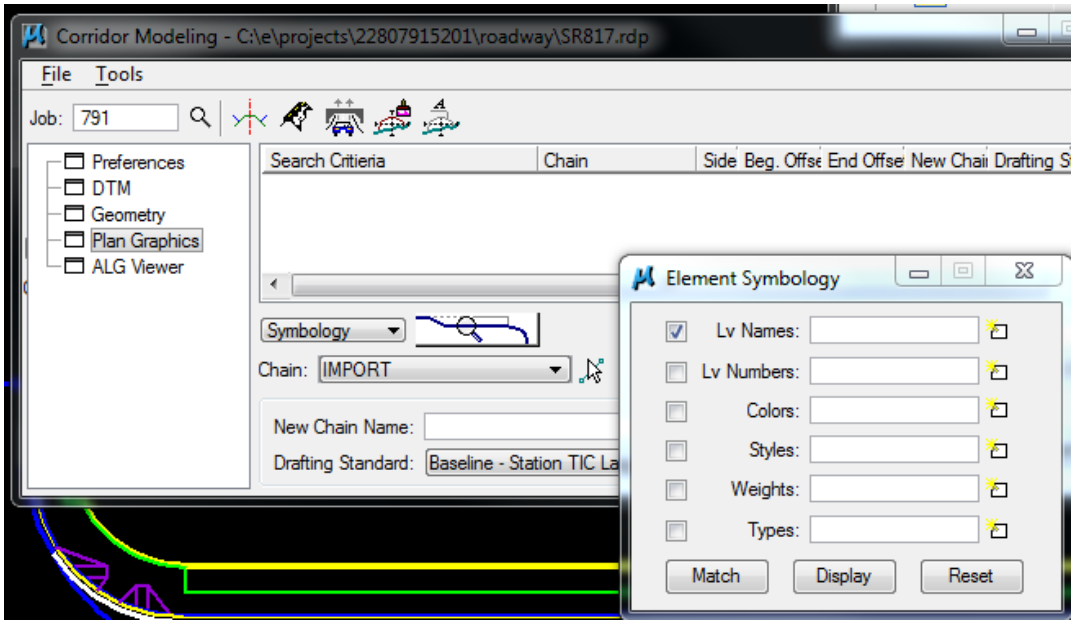
11. Select *Plan Graphics* to switch the dialog for importing of the necessary alignments for the Corridor Modeling project. Begin by adding the **edge of pavement** graphics. First set the *Search Criteria* to **Symbology**.



> ***Note*** There are 3 ways to import graphics in the Corridor Modeling dialog: by Symbology, by Feature and by Selection Set. The method described in the exercise is by Symbology. The symbology search window starts from a chain offset 500 feet right of centerline, "Import" chain and ends left 1000 feet of the "Import" chain. This method will find all features Bylevel one direction from a defined chain.

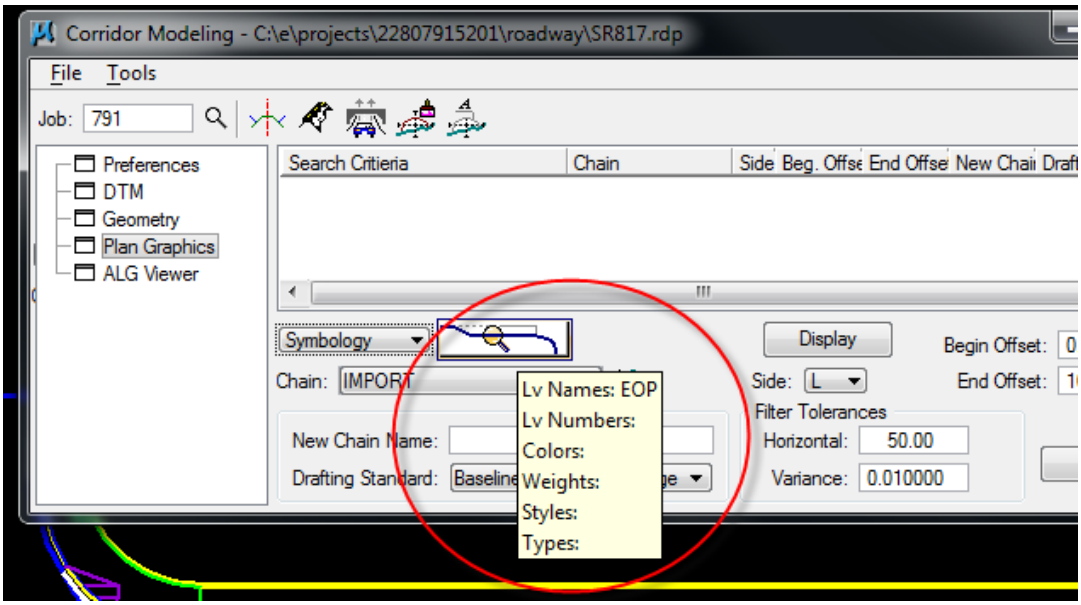
12. Click the icon to the right of the *Symbology* option to open the Element Symbology dialog. Check the **Lv Names** box, and uncheck each of the others.

> ***Note*** If necessary, hit the reset button to clear all of the fields and start over.

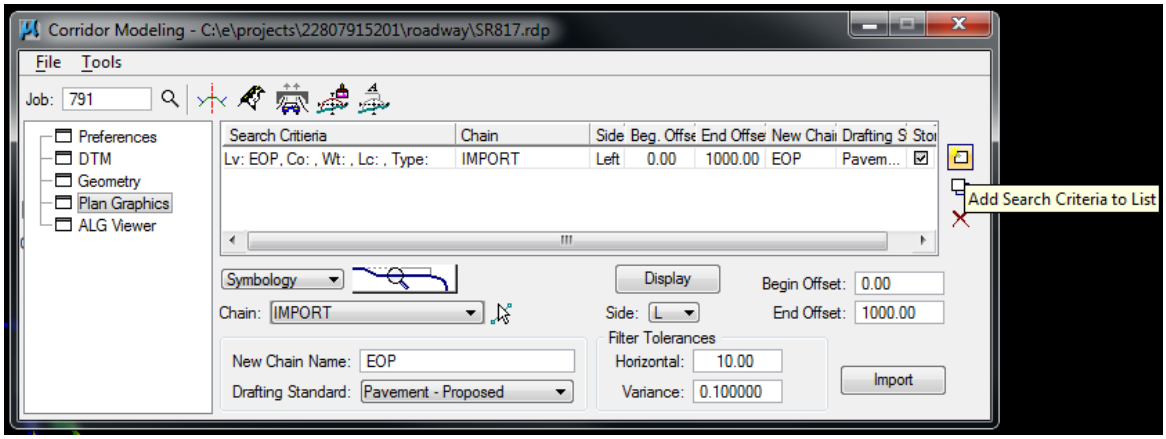


13. From Element Symbology, select **Match** and follow the MicroStation prompts at the bottom left corner to Identify an **EOP** element, click again to Accept/Reject the element. The **Lv Name EOP** should appear in the dialog.

14. Close Element Symbology by clicking on the **X** in the upper right corner. Move your cursor over the icon to verify the search symbology setting.



15. From Corridor Modeling, complete the dialog entry by following these steps:
    a. Select the offset *Chain:* **IMPORT** from the available chains in the dropdown list.
    b. Key-in a *New Chain Name*, **EOP**.
    c. Define the appropriate *Drafting Standard* from the list, **Pavement- Proposed.**
    d. Set the *Begin Offset:* to **0** and *End Offset:* to **1000**.
    e. Set the *Side* option **Side L** from the list.
    f. Set the *Filter Tolerances* for the *Horizontal* and *Variances* to **10** and **.1** respectfully.
    g. Click the *Add Search Criteria to the List* icon to enter the settings into the dialog



16. Repeat Steps 11-16 to include each of the following plan features:

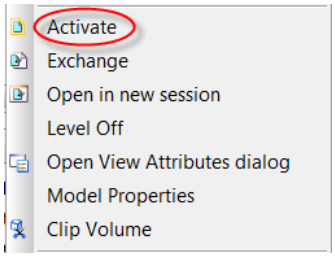
Lv Name	Chain	New Chain Name	Drafting Standard
SidewalkBack	IMPORT	SWB	Sidewalk -Back Proposed
SidewalkFront	IMPORT	SWF	Sidewalk -Front Proposed
CurbBack	IMPORT	CURBBACK	Curb - Back Proposed
EOP	IMPORT	EOP	Pavement Proposed
TrafSeparator	IMPORT	TS	Traffic Separator Proposed

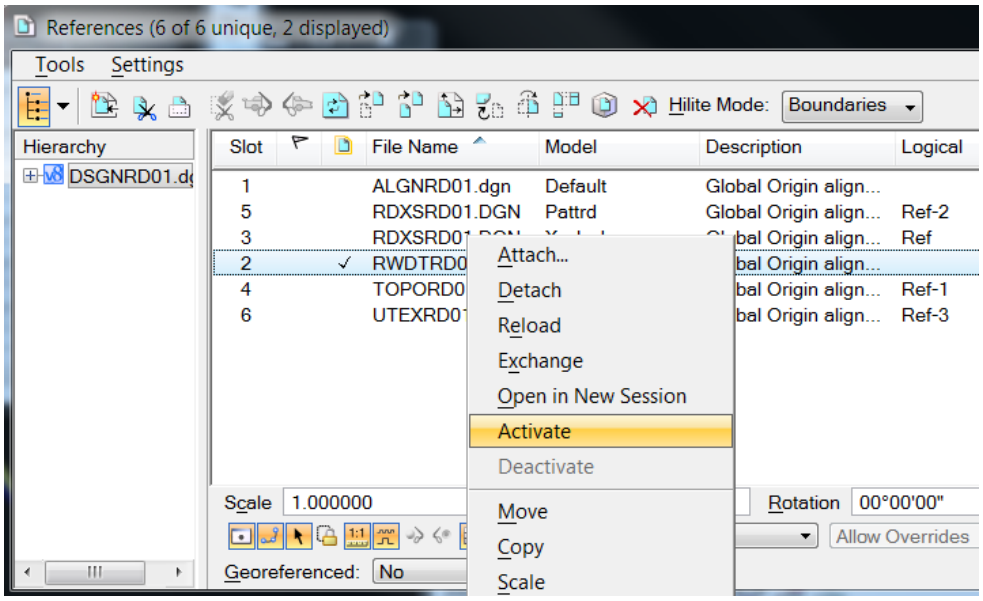
17. See Note below to continue…

*RWLine_ep	IMPORT	ROW_EX	ROW Existing

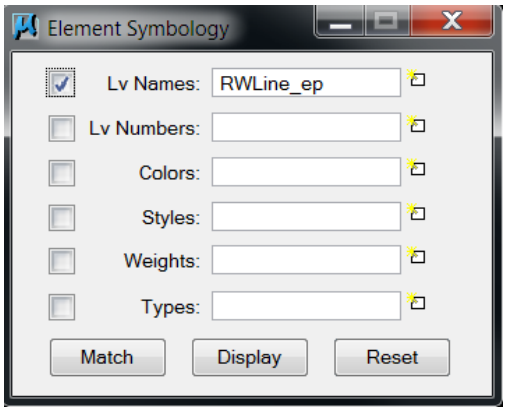
Note *The Existing Right of Way (ROW) lines are stored in the reference file *RWDTRD01.dgn* file in the project rwmap folder. The reference file should be "activated" prior to selecting the element with the Match button on the Element Symbology dialog. Continue with the following steps.

18. Hold a right click over a Right of Way line and click Activate. This will make the Reference file the active file. Or from the References dialog, right click on the RWDTRD01 file and click Activate.



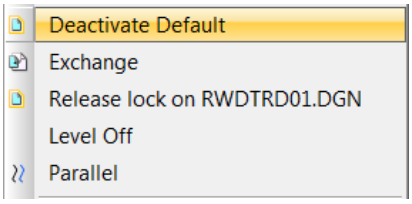


19. Click on the Match button and add the RWLine_ep to the search criteria list.

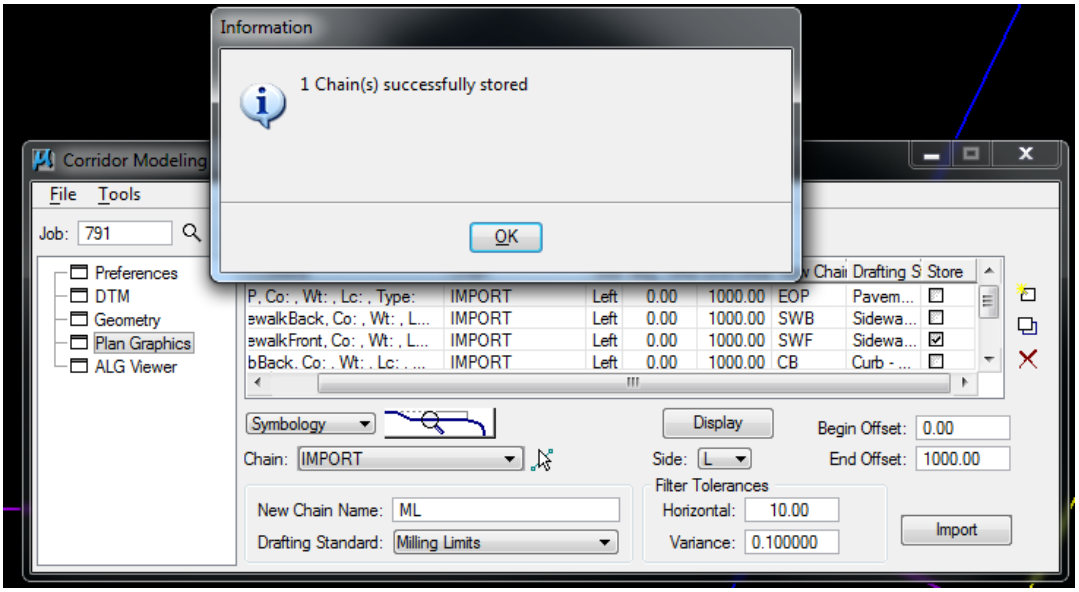


*RWLine_ep	IMPORT	ROW_EX	ROW Existing

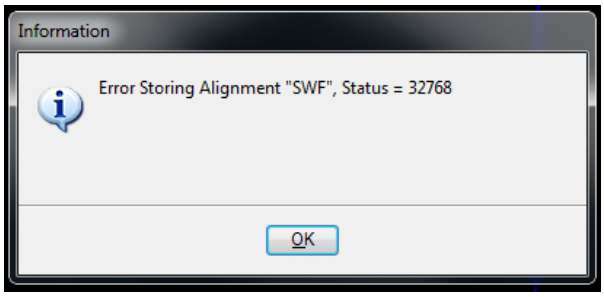
20. Click the *Add Search Criteria to the List* icon to enter the settings into the dialog. When finished right click again in the design file and click Deactivate Default to return to the original file.



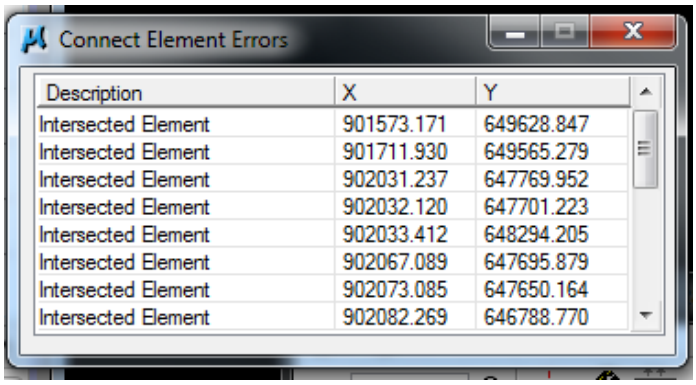
21. The new chains can be imported all at once or one at a time. From Corridor Modeling, select the chain(s) to be imported by simply checking the box in the *Store* column under the *Search Criteria* display, and then click the **Import** button. When you have succeeded, an Information window will display to confirm action. Click OK.



Note It is likely that an Information dialog similar to the one below will display, indicating drafting problems with the MicroStation elements.



Note If this dialog appears, click **OK** and a list of drafting problems will appear. These must be resolved with MicroStation edit element commands in order to store the alignments in the Corridor Modeling project.

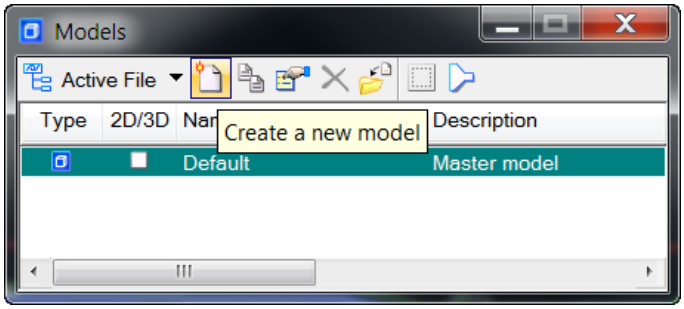


22. Select on each row and the error location will be centered to the view. Use MicroStation to resolve each of the list items and click the **Import** button again.
23. Select **File** >**Save** to save the Corridor Modeling project imported Plan Graphics.

Exercise 4.2 ALG Viewer

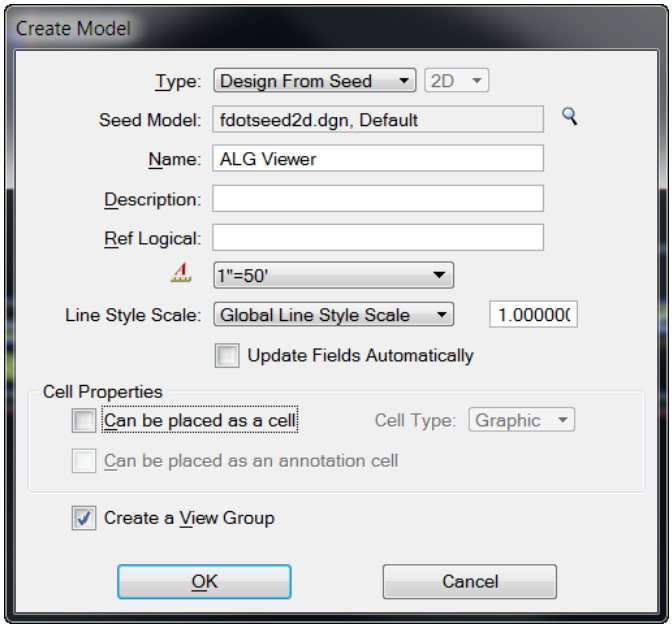
In this exercise using the Corridor Modeling dialog, the alignments created with Import Geometry and Import Plan Graphics exercise will be displayed in a new design file model. First a new model will be created from MicroStation. This exercise will help provide a basic understanding of the ALG Viewer dialog option and the alignment database that Corridor Modeling uses in the Create Template and Roadway Designer dialogs.

1. From the MicroStation menu, select **File** > **Models**. The Models dialog displays.



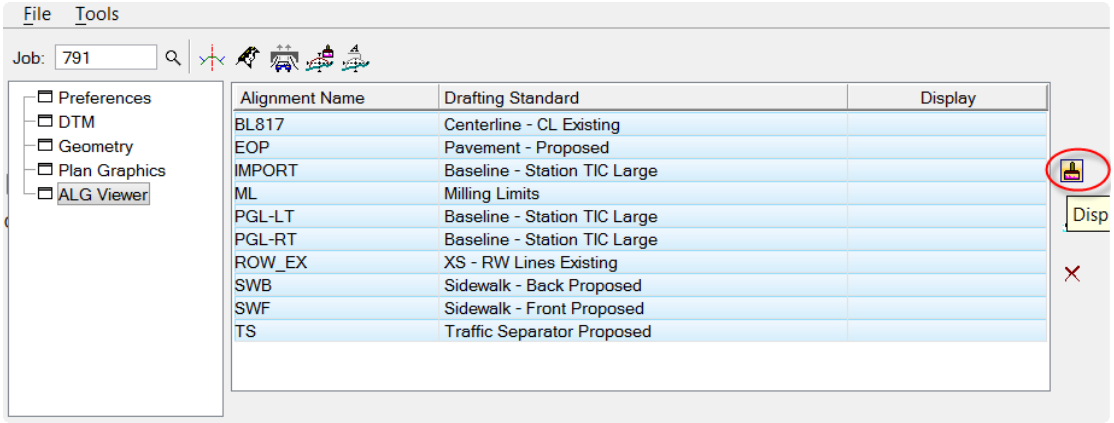
2. Select the *Create a new model* icon. The Create *Model dialog* displays.

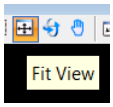
3. Select *Type*: **Design from Seed**. Leave *Seed Model*: **fdotseed2d.dgn, Default**. Key-in the *Name*: **ALG Viewer**. Uncheck the *Cell Properties*: **Can be placed as a cell**. Check the **Create a View Group** box. Click **OK**.



4. The *Active View Group* display in the lower left corner of the MicroStation dialog should change to the **ALG Viewer View Group**. Also, there should be an empty view. Close the Models dialog.

5. On the Corridor Modeling dialog, change the focus on the tree view to *ALG Viewer*. Select all of the entries and click the *Display Selected Rows* icon .



6. Click the Fit View icon on the MicroStation window. 

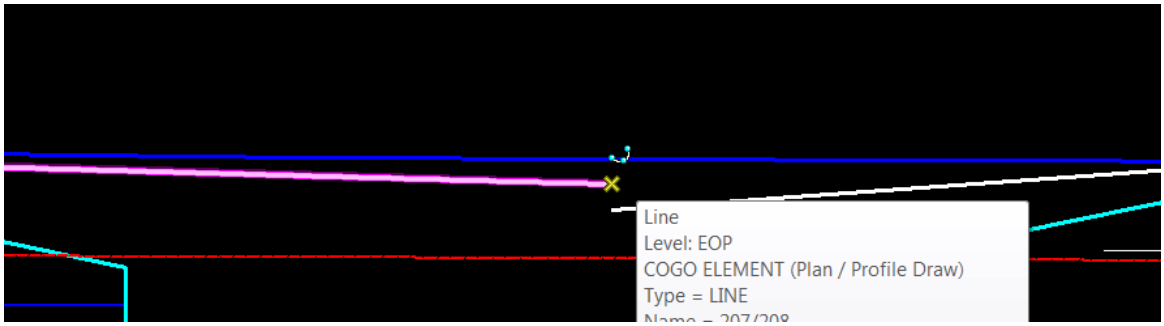
7. In the *Display* column of each row a check symbol should have appeared. Uncheck each of the rows to un-display each of the alignments. <OR> Use selection sets and choose the *Un-display Selected Rows* icon .

> ***Note*** The *delete selected rows* icon will remove the imported alignments from the ALG file. This is NOT required for this exercise.

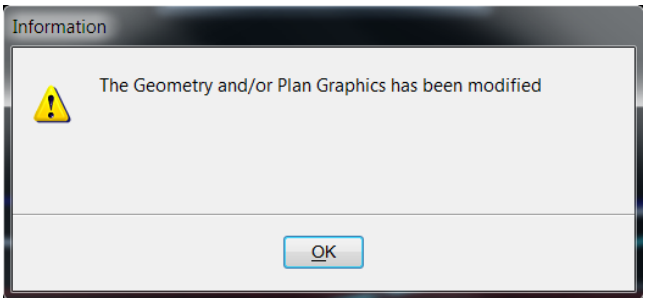
Exercise 4.3 Understanding Smart Update

In this exercise MicroStation elements are modified to indicate a change to the previously imported 2D design elements. This will make the ALG file out of sync with the elements. When you re-enter the Corridor Modeling environment, an Information dialog will display. This dialog is referred to as a S*mart Update* and the graphics or geometry should be re-imported.

1. Continue working in the *DSGNRD01.dgn* file. Change the view group back to the Default Views group. Change the viewing area to the portion of the BL817 between **Stations 76** and **78.**
2. Select the MicroStation command Modify Element.
3. Move the line **EOP** elements that intersect in the driveway.

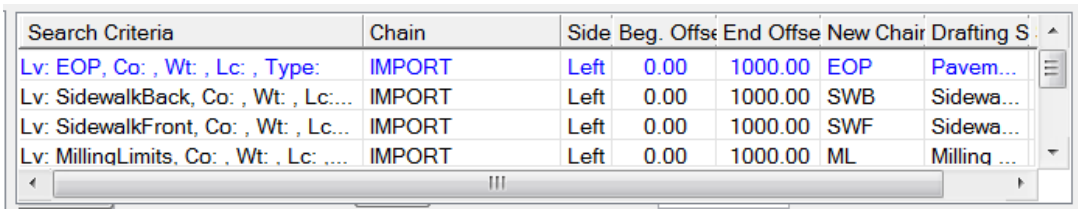


4. Close Corridor Modeling. Click **No** to save settings.
5. Reopen the Corridor Modeling dialog. The following Information dialog displays. Click **OK**.



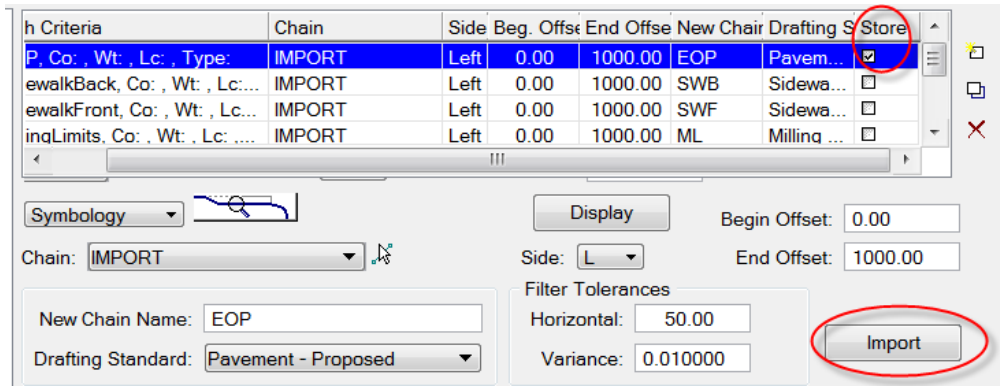
Note This is referred to as the Smart Update feature in Corridor Modeling. It is an alert to the user that the Geometry file or the MicroStation graphics have changed.

6. Select the *Plan Graphics* option on the tree view of the Corridor Modeling dialog. The **EOP** row in the import list is now the color blue.

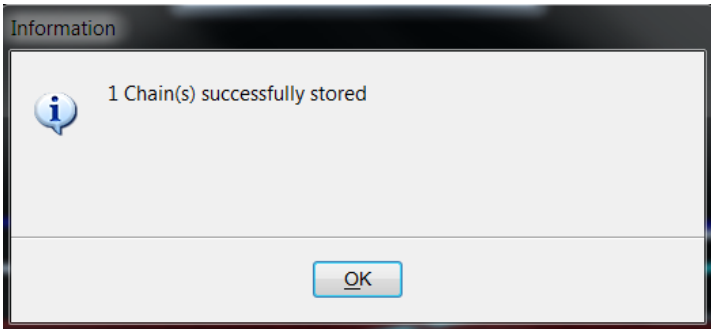


Search Criteria	Chain	Side	Beg. Offse	End Offse	New Chair	Drafting S
Lv: EOP, Co: , Wt: , Lc: , Type:	IMPORT	Left	0.00	1000.00	EOP	Pavem...
Lv: SidewalkBack, Co: , Wt: , Lc:...	IMPORT	Left	0.00	1000.00	SWB	Sidewa...
Lv: SidewalkFront, Co: , Wt: , Lc...	IMPORT	Left	0.00	1000.00	SWF	Sidewa...
Lv: MillingLimits, Co: , Wt: , Lc: ,...	IMPORT	Left	0.00	1000.00	ML	Milling ...

7. Slide the row display to the right to view the *Store* column and check only the box for the **EOP** on the import list. Click the **Import** button to re-import the plan graphics.



8. An Information dialog should display. Click **OK**.



9. Select File Save to save the SR817.rdp file.

5 CREATING NEW PROJECT TEMPLATES

TEMPLATES BASICS

- Templates are typical sections of the proposed roadway
- Templates are stored in the Template Library File (*.itl*)

After the proposed project plans have been created, a 3D model of the proposed roadway design is generated by assembling project plan graphics to cross sections along the proposed centerline of the alignment. Templates are the cross section views that are used to create the proposed 3D model.

Individual templates are created and stored in the Template Library file, which has the file extension.itl.

The Template Library can be shared by many people needing the template standards, but the Template Library must be read-only when it is being shared. Usually a project specific Template Library is created for each project and the appropriate templates are copied to that library so they can be modified to meet the specific needs of the project.

PROJECT TEMPLATE LIBRARIES

The first time a project is started in Corridor Modeling, a new project Template Library should be created. This (*.itl*) file will contain the templates used for the design of the corridor. These templates can be created, customized and saved specific to the project. This procedure provides a measure of Quality Assurance/Quality Control (QA/QC) on a project if the project (*.itl*) is managed properly. To begin with, the FDOT workspace is delivered with a plethora of standard components and templates which can be used to start off a project (i.e. FDOTSS2.itl). In the future, it may be deemed prudent to start with templates from previous projects. This can also be accommodated provided standard naming conventions and procedures are followed and documented when creating the templates.

APPLYING TEMPLATES

- Templates create a model of the proposed roadway
- Accomplished using the Roadway Designer
- Template points generate longitudinal break line features in the model

Templates are used to create a proposed model of the roadway. This is accomplished using the Roadway Designer tool. In the Roadway Designer, templates are assigned to specific stations along the mainline alignment at a specific interval, which are called template drops.

The Roadway Designer connects the points of the template drops, forming a model of the roadway, which is made into a surface model. The connected template points form longitudinal break line features in the surface model.

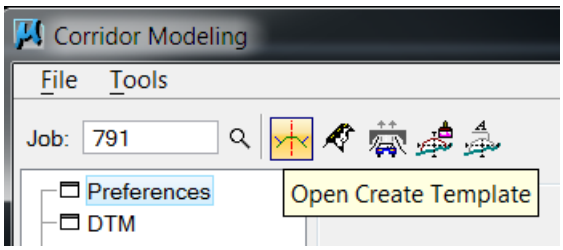
TEMPLATES – SURFACE MODELS

- Top template points create a triangulated surface.
- Points below the surface are "Exclude from Triangulation" points.
- All Subsurface Points lower than the triangulated surface are "Exclude from Triangulation" points in the proposed surface. The sub-surfaces will appear, if desired, in the proposed cross sections as "components." Components are used to generate the sub-surface line work on the GEOPAK cross sections, allowing proposed earthworks to be processed.

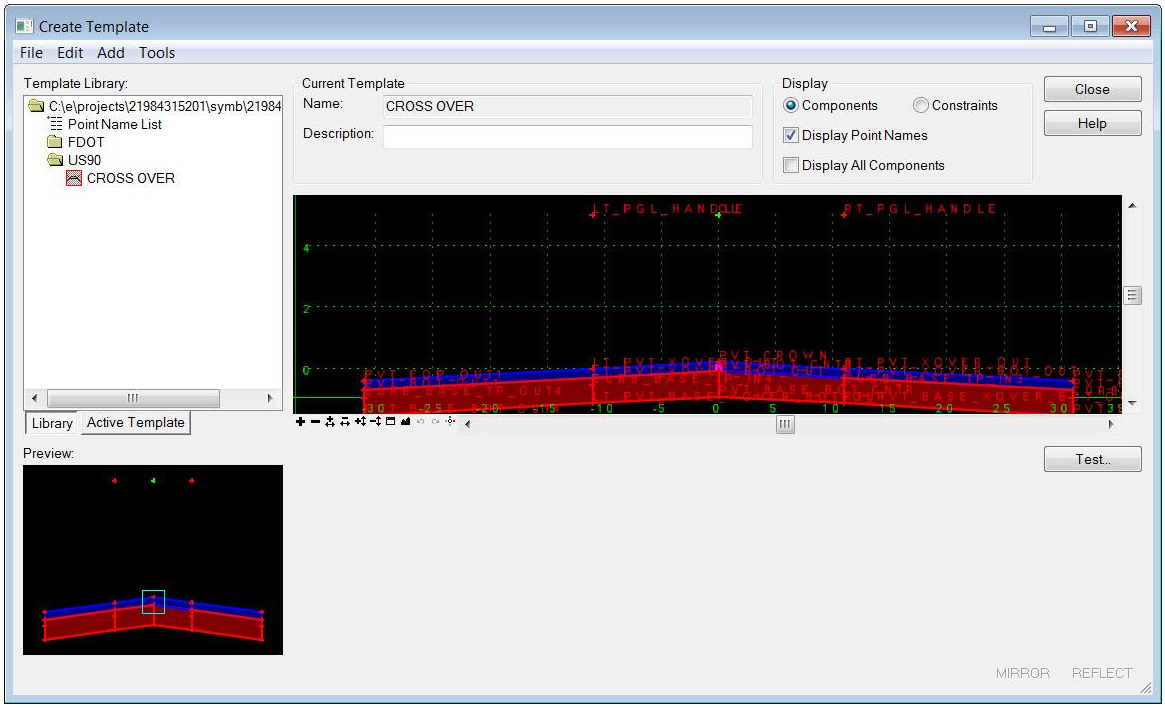
If required for a specialized workflow, individual template layers (including sub-surfaces) can be triangulated. This process is not a common workflow and is not discussed in this course.

CREATE TEMPLATE DIALOG

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



TEMPLATE LIBRARY

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

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

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

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

CURRENT TEMPLATE WINDOW

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

In the center of the Create Template dialog is the main graph for creating templates. The graph is called the Current Template window. The Current Template window uses its own graphics engine and is not a MicroStation View.

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

At the bottom of the graph there are numerous view commands, which are similar to MicroStation View commands. There are two buttons that look like the MicroStation View Previous and View Next commands, however, they are used to undo and redo template creation operations. If your mouse has a scroll wheel, it can be used to pan and zoom. The CTRL-Z keyboard hotkey 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= Key-in Delta Coordinates from Last Point Placed

The Dynamic Settings dialog is used for precision input of the template components and to assign point names and styles when creating components.

It also serves as a compass for the location of your cursor with respect to the dynamic origin. The dynamic origin can be moved using Set Dynamic Origin, located at the bottom of the Dynamic Settings dialog.

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

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

XY = key-in absolute coordinates

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

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

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

OL = key-in delta coordinates from dynamic origin

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

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COMPONENTS

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

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

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

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

MERGING COMPONENTS

- Right-click between the components to merge
- Select the Merge Components command

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

BASIC TEMPLATE CREATION WORKFLOW

1. ***Open Template*** - Open an existing Template Library by specifying the Template Library in the *Create Roadway* preferences.
2. ***Create New Template*** - Click the *Open Create Template* icon. This brings up the Create Template dialog.
3. ***"Drag and Drop" Template Components*** - Navigate to the appropriate folder where the components are stored in the Template Library folder structure and drag and drop the components to the *Current Template* window.
4. ***Name New Template*** - Navigate to the appropriate folder in the *Template Library* folder structure and select **File > New > Template**. Name the new template.
5. ***Merge Components*** - If necessary, right-click on the vertical segment between two components and click **Merge Components**.
6. ***Verify Point Names*** - Set the **Display Point Names** radio button in the *Display* area of the Create Template dialog. Review the point names. Editing the point names, if needed, by double-clicking on the points in the *Current Template* window.
7. ***Save the Template Library***

EXERCISE OVERVIEW

5.1 Creating a New Project Template Library

5.2 Creating Project Folders in Template Library

5.3 Using the Template Library Organizer

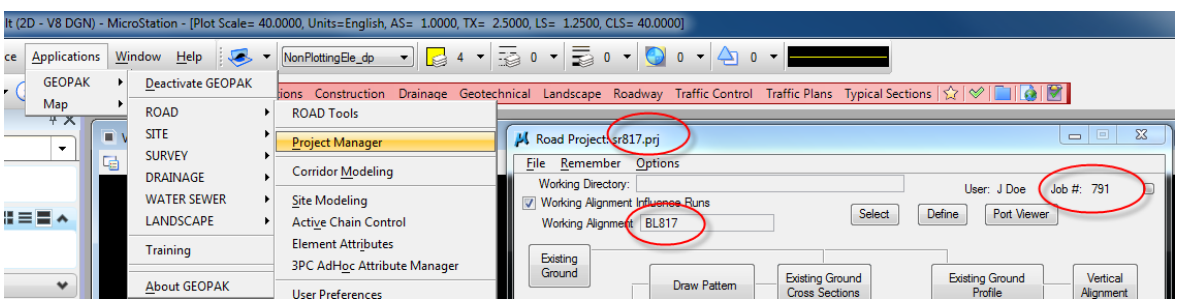
5.4 Naming Project Templates

5.5 Creating A Basic Template

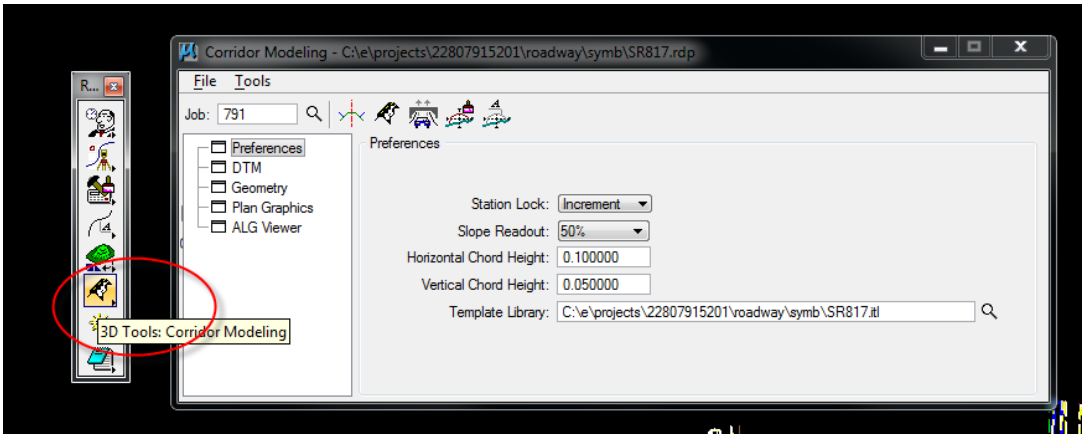
Exercise 5.1 Creating a New Project Template Library

In this exercise the proposed roadway design file, *DSGNRD01.dgn*, will be opened with GEOPAK using the FDOT workspace and Project configuration. The GEOPAK Project Manager is loaded for the project. The Corridor Modeling dialog is loaded and the project preferences are loaded from the previous exercises. The Create Template dialog is opened and a new Template Library file will be created for the project. The new Template Library for the project will be created in the project *symb* folder. This new project Template Library will be the container for all the components and templates used to develop the corridor design models for the project design. Once the new project Template Library is created, the Corridor Modeling Preferences will be updated and saved in the Roadway Designer preference file (*.rdp*).

1. Optional, extract the *22807915201(5).zip* file in the c:\e\projects folder.
2. Open the *DSGNRD01.dgn* file of the c:\e\projects\22807915201\roadway\ folder in the FDOTSS2 workspace in MicroStation.
3. Open up GEOPAK Project Manager to ensure the project ***.prj*** and ***.gpk*** files are loaded and active.

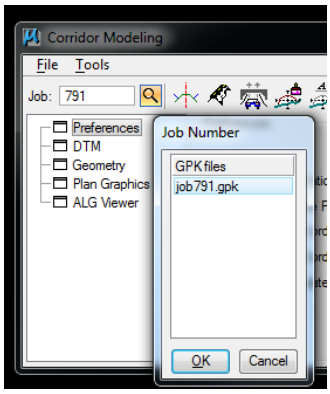


4. From the GEOPAK Road Tools toolbox, click the *Corridor Modeling* icon.

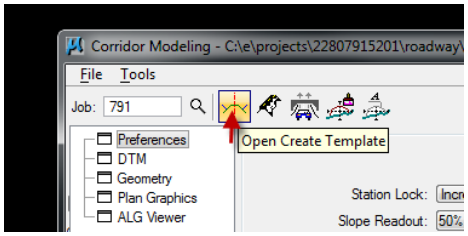


5. From the Corridor Modeling dialog, select **File** > **Load**, select *SR817.rdp* from the project preferen**ces** list and click **Open.**

6. **Click** the *Magnifier* icon next to the *Job:* field box and make sure the active **job791gpk** is located correctly.

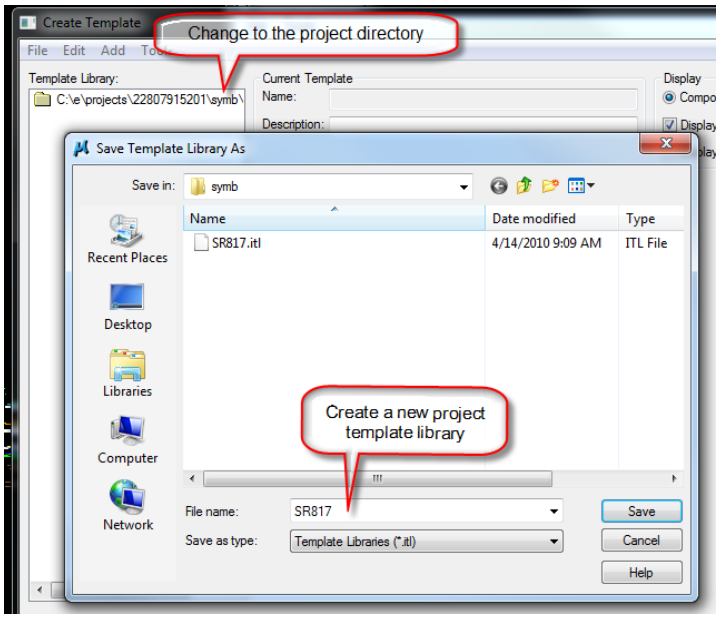


7. Click the *Open Create Template* icon to create a new project Template Library.



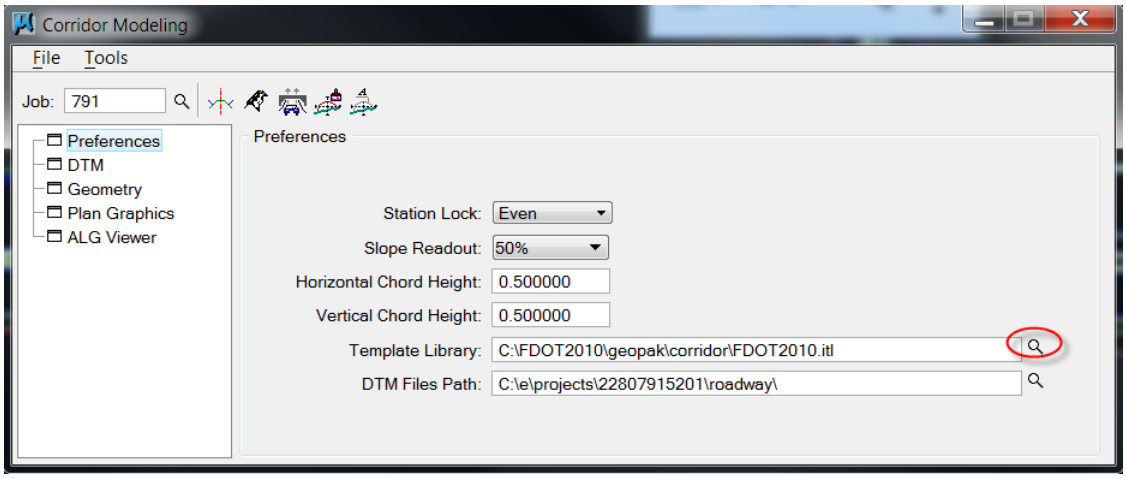
8. From the Create Template dialog, select **File** > **New** > **Template Library**. Navigate to the project *symb* folder, C:\e\projects**\2280795201\symb\.**

9. Key-in the new template library name, **SR817**. Select **Save**.

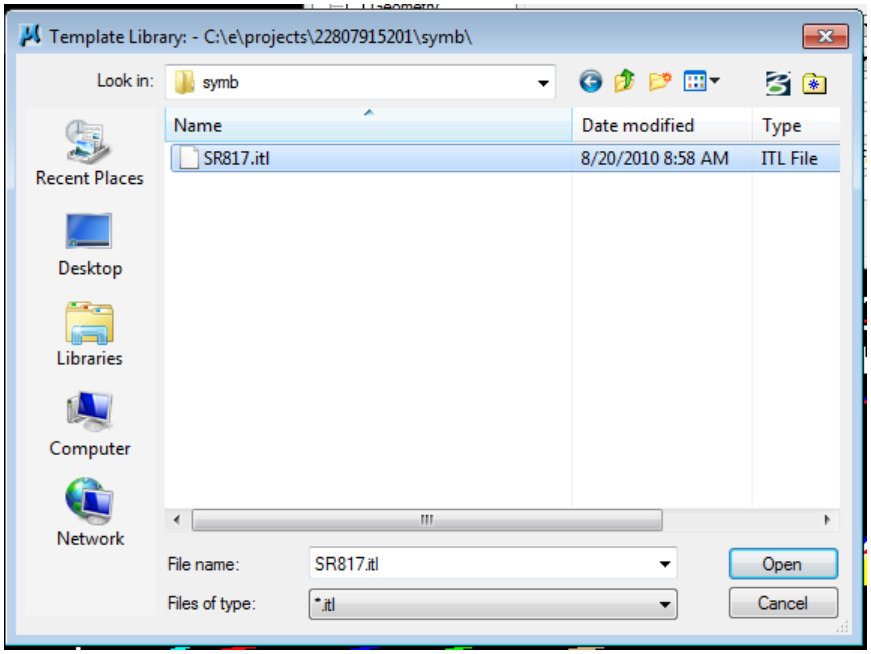


10. Close the Create Template dialog.

11. From the Corridor Modeling dialog, set the new project *Template Library* under the category *Preferences* in the tree listing.



12. Click the *Magnifier* icon next to the **Template Library** field, navigate to the project *symb* folder C:\e\projects\2280795201\symb\, select the newly created *SR817.itl* file for the project, and then click **Open**.

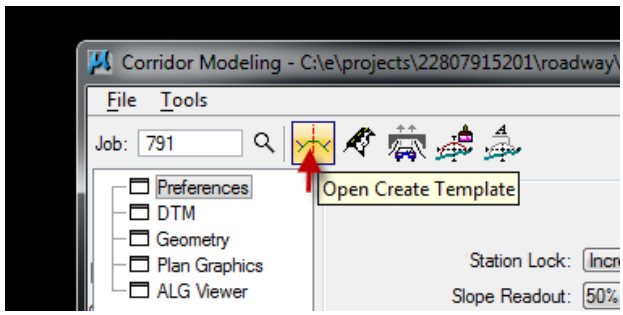


13. From Corridor Modeling, select **File** > **Save** the project Corridor Modeling preference file, *SR817.rdp*. Select **Yes** to replace the file or **OK** to dismiss the Information dialog.

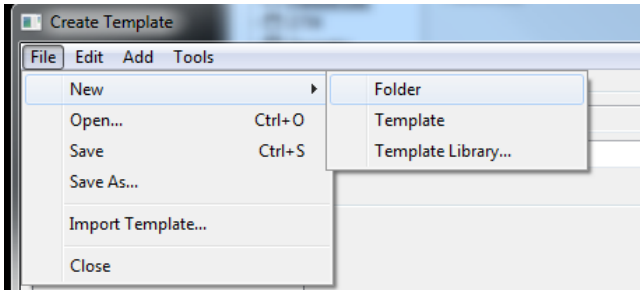
Exercise 5.2 Creating Project Folders in the Template Library

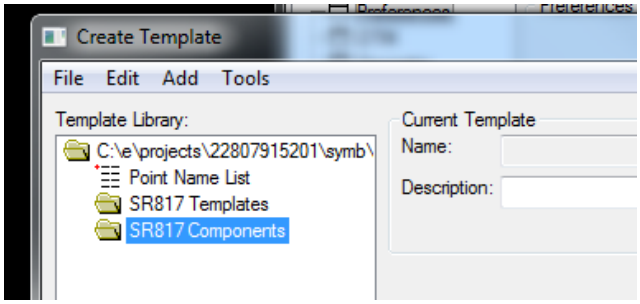
In this exercise 2 new folders will be created within the Template Library. One is for project template components and one is for full templates. The project components folder will contain parts of the full template and will be obtained from the FDOTSS2 Template Library. The project templates folder will contain the constructed templates for the corridor. The project templates in the exercises to follow will be named and saved in stages or phases in order to track the progress of the design. This method is also recommended to provide a backup and/or history for potential trouble shooting along the way.

1. Click the *Open Create Template* icon to open the Create Template dialog.

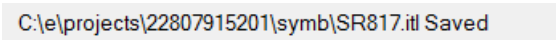


2. From the Create Template menu, select **File** > **New** > **Folder** to create a new folder in the project Template Library. Rename the folder **SR817 Templates**. Click on the root folder and repeat steps to create folder named **SR817 Components**.





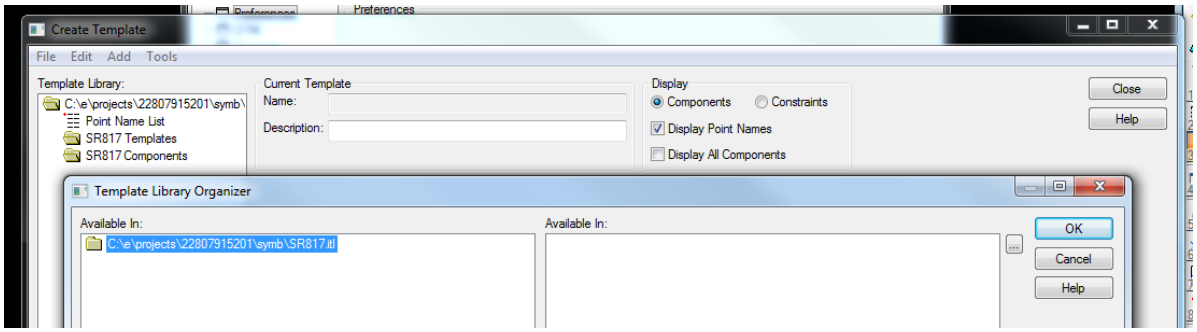
3. Select **File** > **Save** to save the project Template Library *.itl* file. To verify: look at the prompt location in the lower left corner of the Create Template dialog.



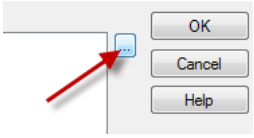
Exercise 5.3 Using the Template Library Organizer

In this exercise the Create Template dialog is used to open the Template Library Organizer from the **Tools** menu option. The Template Library Organizer is used to obtain various components and templates from other Template Libraries and Roadway Designer files. For the exercises to follow, the FDOTSS2 Template Library contains a basic Typical Section and all of the components that will be used for the project design.

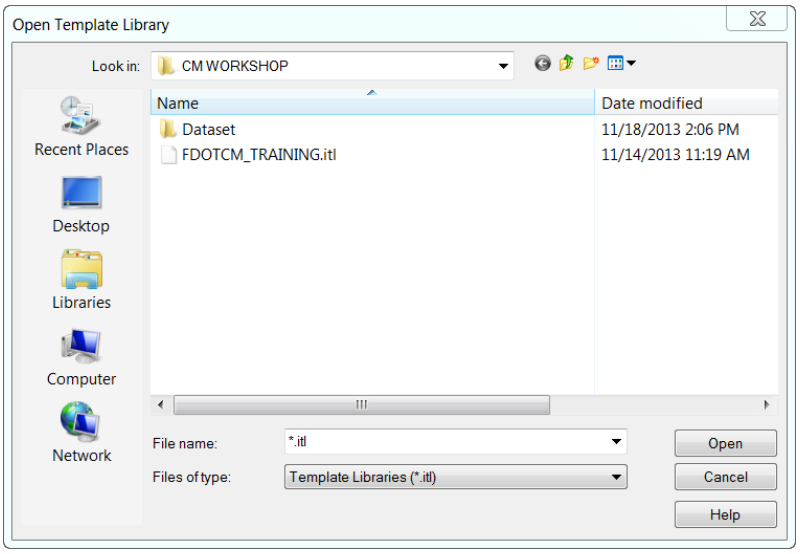
1. Select **Tools** > **Template Library Organizer**.



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



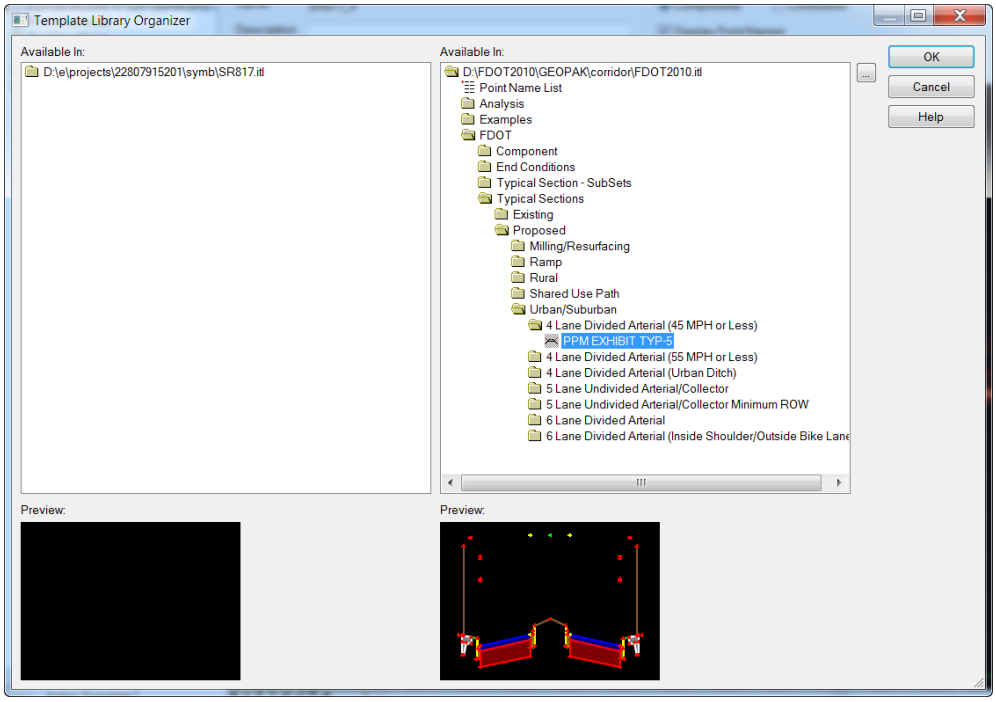
3. From Open Template Library, navigate to the CM WORKSHOP folder and select the FDOTCM_TRAINING.itl Template Library file.



> ***Note*** Templates can be obtained from Roadway Designer files also. For example, if an old project would be a good start for the current project or if a change was made to a template in Roadway Designer and should be saved to the current project library.

4. Set the *Files of type* list to **Template Libraries (*.itl)**, select the *FDOTCM_TRAINING.itl* file and then click **Open**. The Template Library Organizer dialog will display with the *.itl* file listed in the right *Available In*: window.

5. From the Template Library Organizer, navigate to the **FDOT** folder **Typical Sections\Proposed\Urban/SubUrban\4 Lane Divided Arterial(45 MPH or Less)** to find the standard Typical Section for the project. Select the **PPM EXHIBIT TYP-5** to preview the template in the Preview window below the directory view.

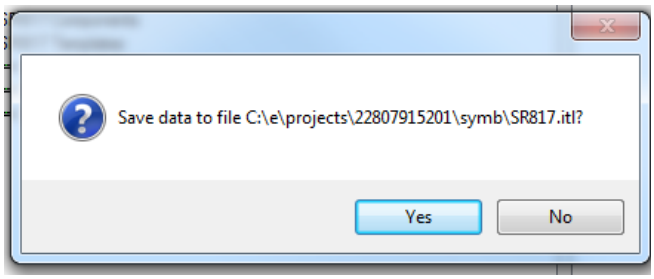


6. Drag and drop templates and components from the right side to the left side ONTO THE **SR817 Components** folder for the project.

7. Collect the following items from the FDOTSS2 Template Library and drag them to **the SR817 Components** folder.

FDOTSS2 Folder	Item Name
Component\Pavement\Travel Lanes	12’ Travel Lane Right
Component \Pavement\Travel Lanes\Base	Base 12’, 2% Right
Component \Pavement\Travel Lanes\Base Extension	Pavement Base Extension Outside Right
Component\Shoulder\Outside\Paved	5’Paved Shoulder
Component\Shoulder\Outside\Base	Shoulder Base Outside 6%
Component\Shoulder\Outside\Paved	Unpaved Shoulder
Components\Barriers & Retaining Walls	Gravity Wall
Component\Shoulder\Outside\Paved	5’Paved Shoulder
End condition\Cut & Fill	FDOT Standard Cut & Fill
End condition\Cut & Fill\Parts	6:1 FILL to 5’
End condition\Cut & Fill\Parts	6:1 CUT’

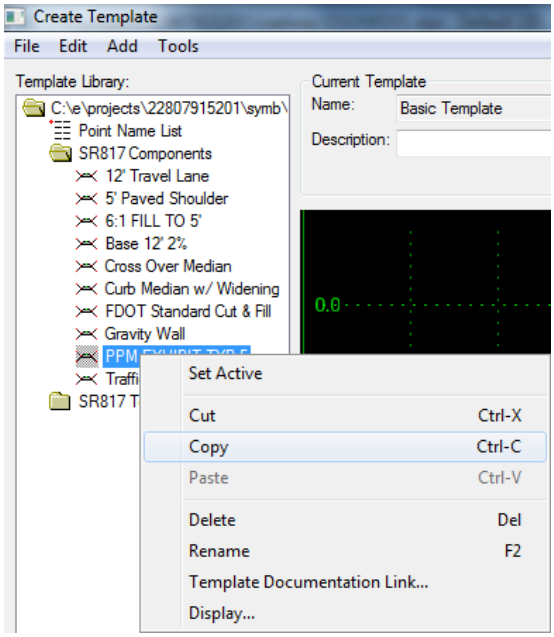
8. Click **OK** to return to the Create Template dialog and click **Yes** to the **"Save data to file…"**. The FDOT Standard Items are now saved in the project Template Library.



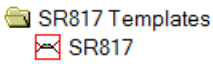
Exercise 5.4 Naming Project Templates

In this exercise using the Create Template dialog the Typical Section obtained from the FDOTSS2 Template Library is copied and renamed in the project Template Library template folder. The Create Template dialog has functionality similar to Window Explorer to help manage templates for each project. A consistent project template naming convention will be valuable as the template design progresses in the exercises and on a project. For the exercises to follow as the template changes it will be copied and renamed adding an "_1, _2, _3,…" to keep previous template versions saved in the project Template Library.

1. In the **SR817 Components** folder, Right click on the **EXHIBIT TYP - 5** template, and click **Copy**.



2. Right click on the **SR817 Templates** folder and click **Paste**.
3. Right click on the copied **EXHIBIT TYP – 5** template and click **Rename**. Change the name of the template to **SR817**.
4. Right click on the **SR817** template and click **Set Active**. A small red box will indicate the active template.

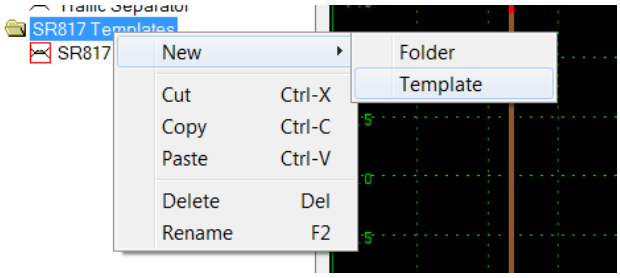


5. Select **File > Save** to save the project Template Library.

Exercise 5.5 Creating a Basic Template

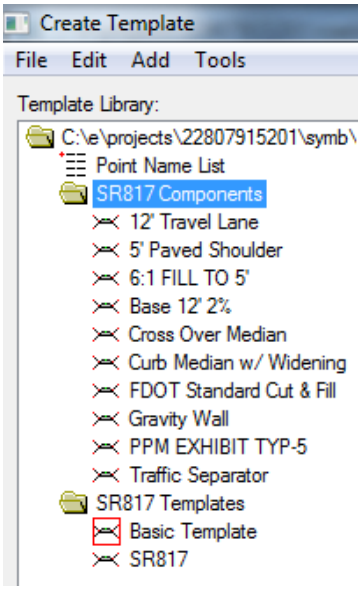
In this exercise using the Create Template dialog a Basic Template will be created within the project Template Library. This exercise will help provide a basic understanding of the basic template creation methods from the FDOTSS2 library components types, connection points, constraints, targets, etc.

1. Right click on the **SR817 Templates** folder and select **New Template**.

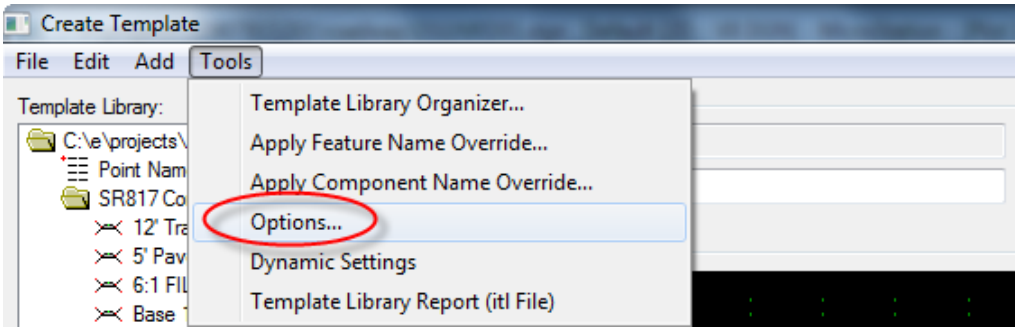


2. Right click on the *New Template1* and select **Rename.** Change the name to **Basic Template,** press enter to store the name

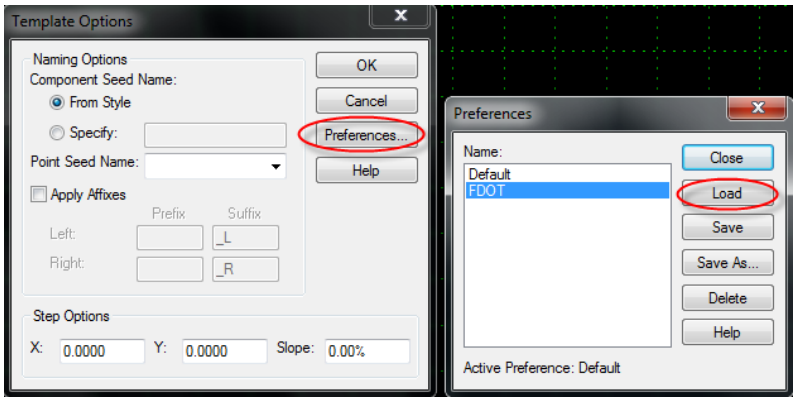
3. Right click again on the **Basic Template** and click **Set Active**



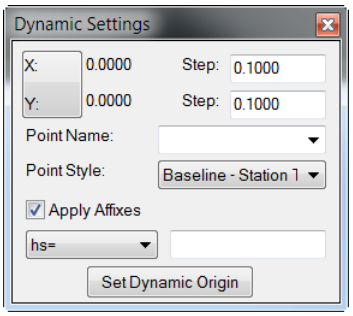
4. Before adding components, open a preference file that will add a prefix to the point names. Select the **Tools** > **Options** from the Create Template menu to launch the Template Options dialog.



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

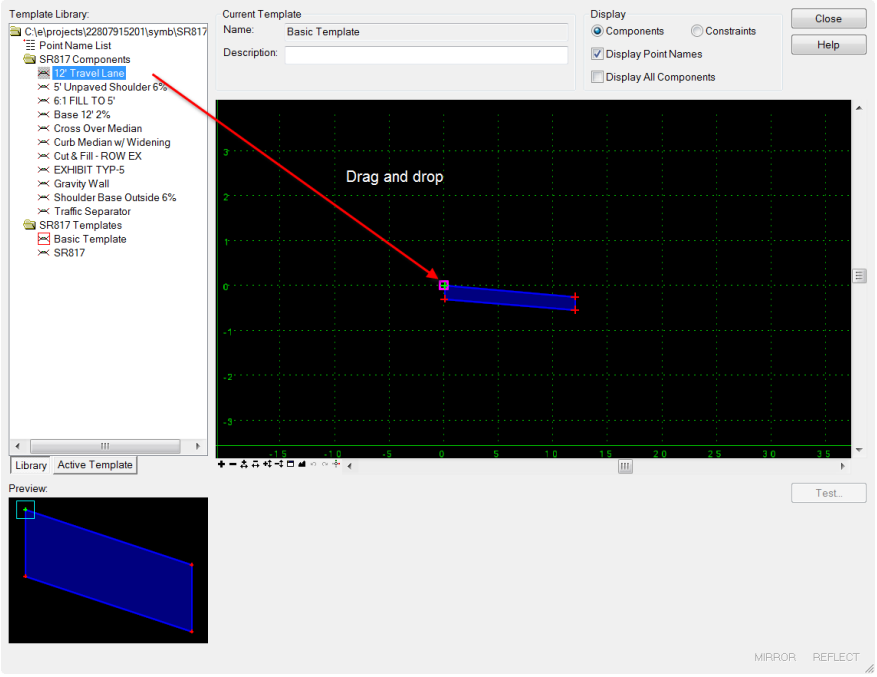


6. Select the **Tools** > **Dynamic Settings** from the Create Template menu. This provides a toolbox like dialog for placing components.

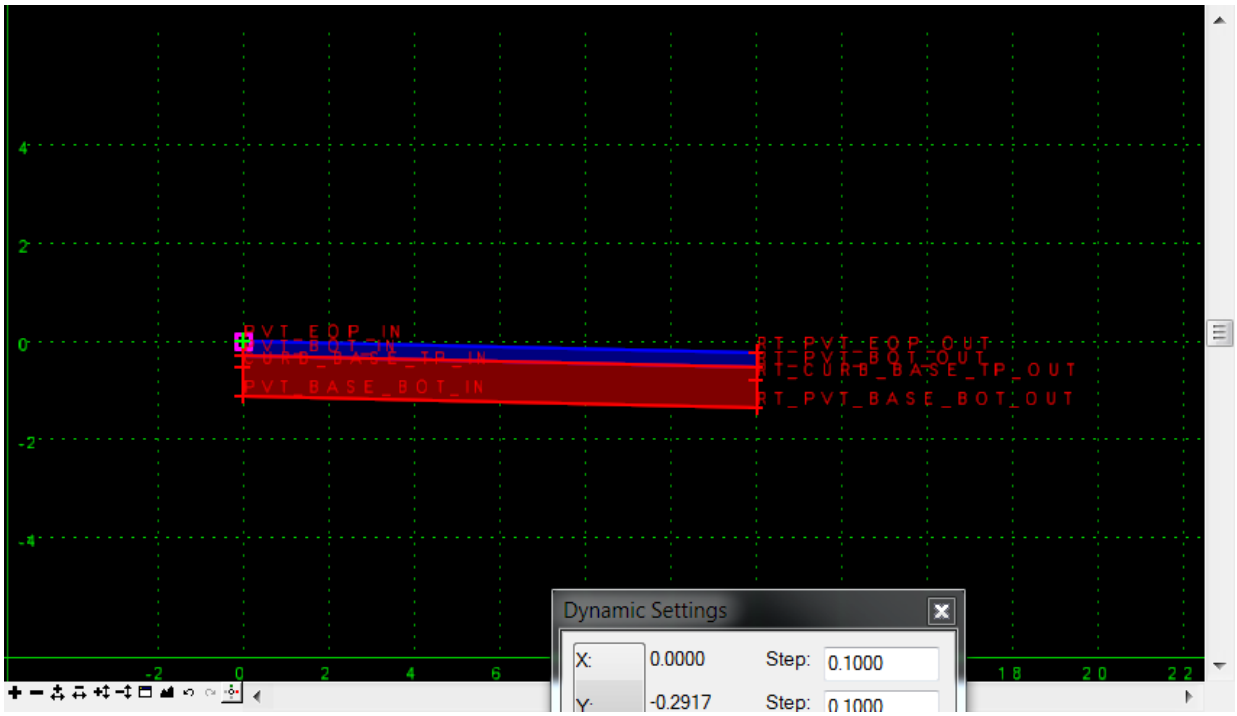


Note The X and Y Step value 0.1000 functions similar to a grid lock in MicroStation when placing the components

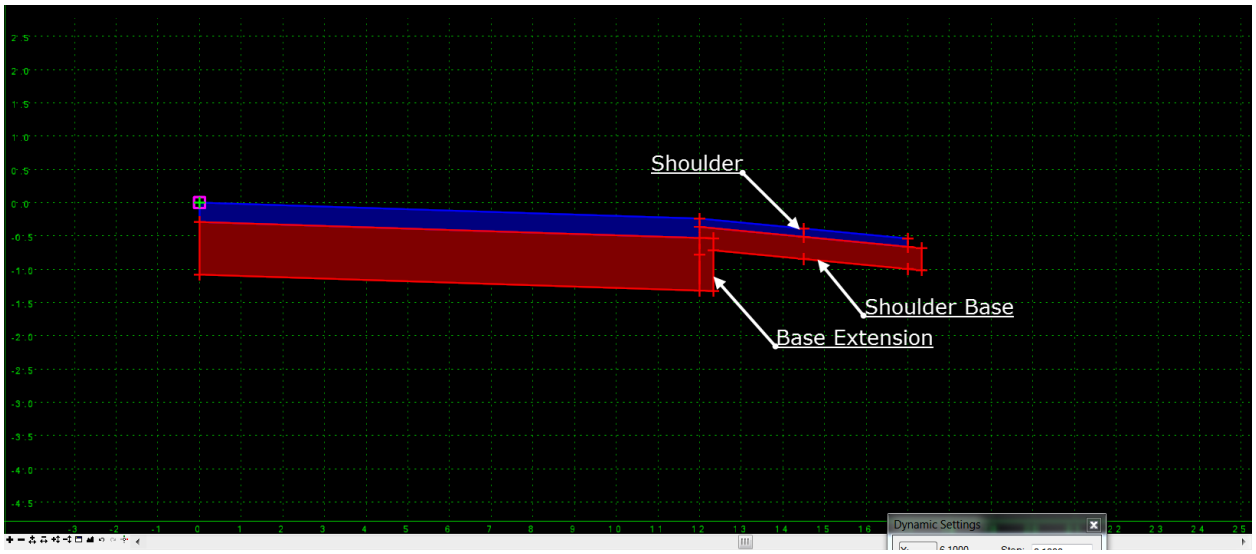
7. Drag the 12' Travel Lane component to the small magenta square in large view.



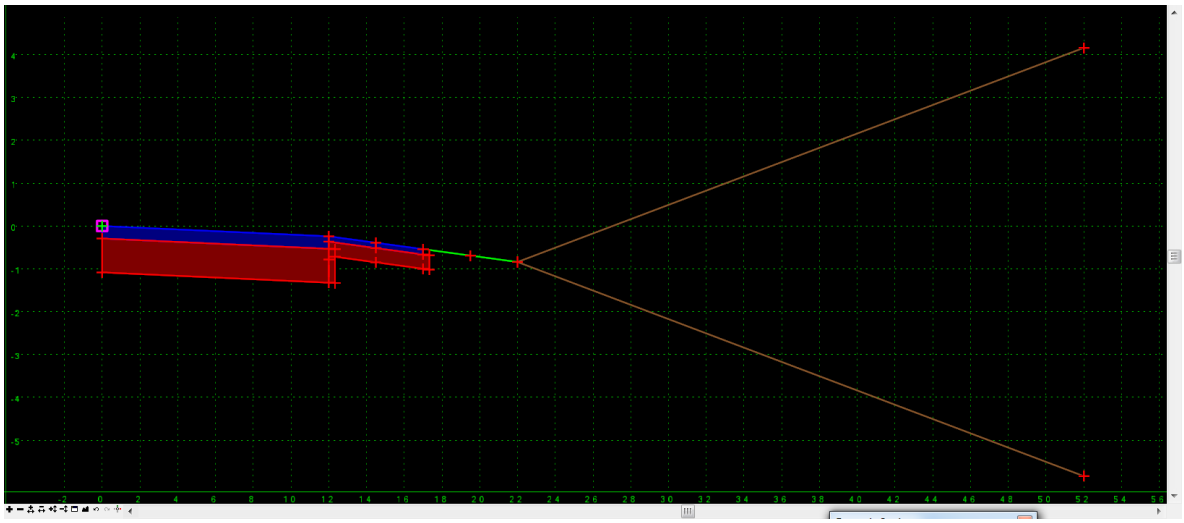
8. Drag and drop the **Base 12', 2%** component and connect it to the bottom side of the pavement component in the template. *The cursor will turn white when it is lock on the location.*



9. Add the shoulder components, **5'Paved Shoulder, Shoulder Base and Pavement Base Extension.**

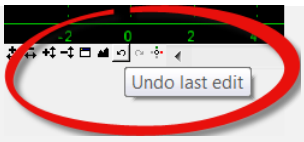


10. Add the **6:1 Cutand 6:1 FILL to 5 Components'**. Uncheck the **Display Point Names Option** and select the *Fit View* Icon.

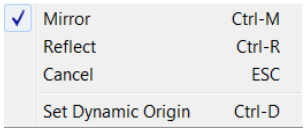


11. Click Edit Undo several times back to the start of the exercise (i.e. a blank template).

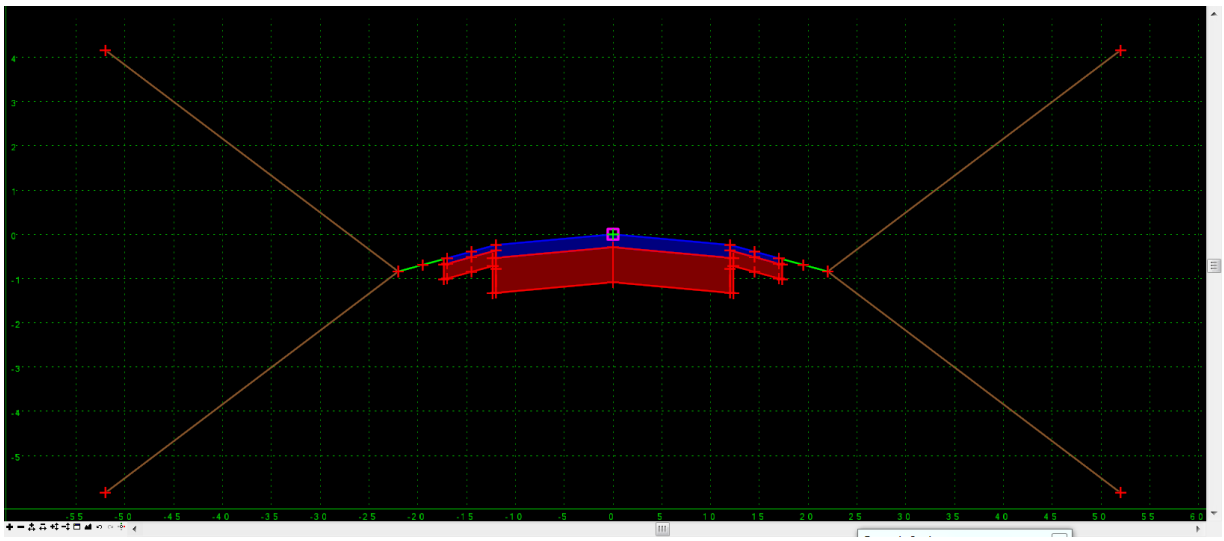
Note Use the icons at the bottom of the view:



12. Repeat the steps with the Mirror option checked when dragging components. Right Click while dragging to get the dialog.



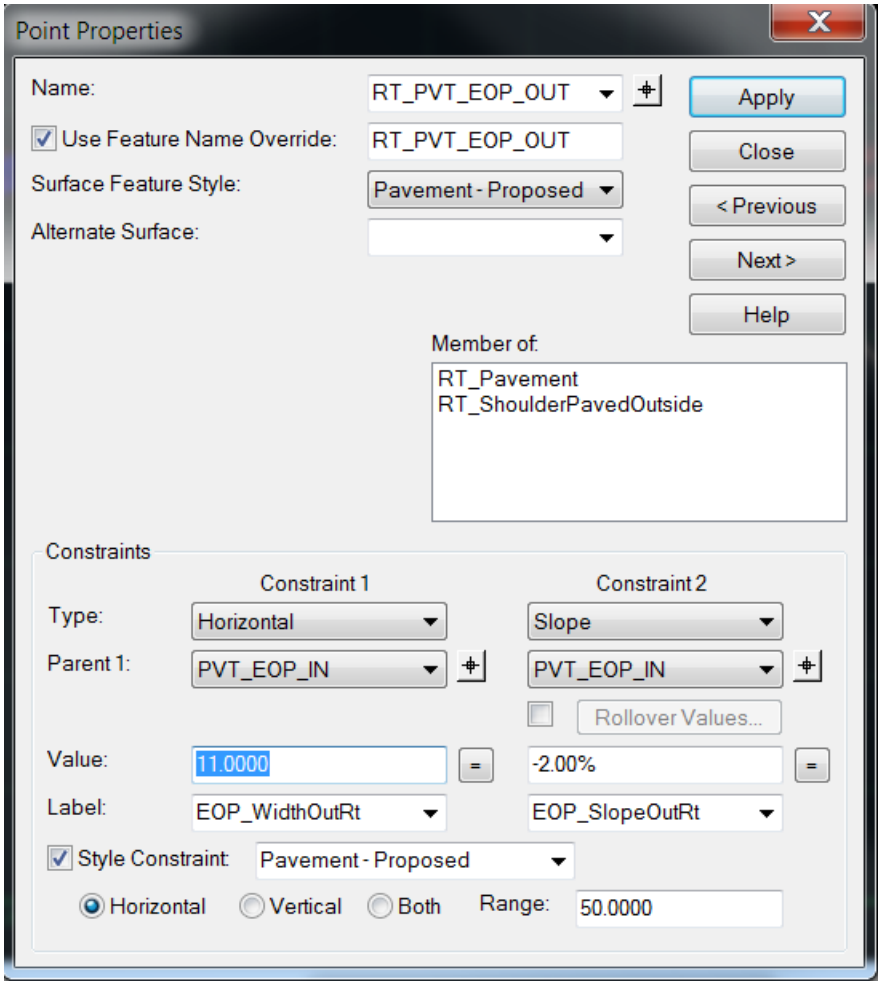
13. The completed template should look similar to the image below.



Note To change the default properties of the delivered components use the Point Properties Dialog

14. To Change the pavement width to 11 feet, double click on the right top edge of pavement and the Point Properties dialog will display. Change the **Constraint 1 Horizontal Value** to **11.0**.

Note Use the **Tab** Key to enter data, NOT the **Enter** key



15. Click **Apply** to see the new changes to the **Basic Template**. Close the Point Properties dialog.
16. Repeat this procedure to change the roadway pavement width on the left side.
17. Save the Template Library, select **File > Save** from the *Create Template* drop down menus.
18. **Close** the Create Template dialog.

6 FDOT STANDARD LIBRARY COMPONENTS

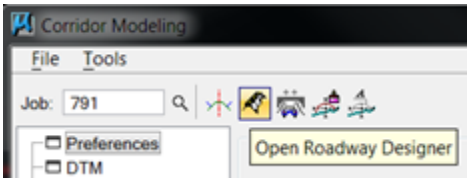
APPLYING FDOT STANDARD LIBRARY COMPONENTS

- Roadway Designer Basics
- Switches, Display Rules
- Parametric Constraint Values
- Assigning Style Constraint and Ranges to Points
- Assigning Point Controls to Alignments, (i.e. PGL, Special Ditch Profiles, etc.)
- End Conditions

ROADWAY DESIGNER BASICS

After the templates are created, they are applied using the Roadway Designer. The Roadway Designer combines alignments, surfaces, and templates to create a model of the proposed roadway. It is also where Superelevation is created and applied to the design.

The Roadway Designer tool is accessed from the Corridor Modeling dialog.



Roadway Designer requires certain preferences be set up prior to accessing the tool. These preferences (DDB, Plan Graphics, and Geometry, DTM) are stored in the *.rdp* file. (Roadway Designer Preferences). This file will be stored in the working directory and should not be deleted. To load the preference file select File > Load from the pull down menu on the Corridor Modeler dialog then select the appropriate preference file.

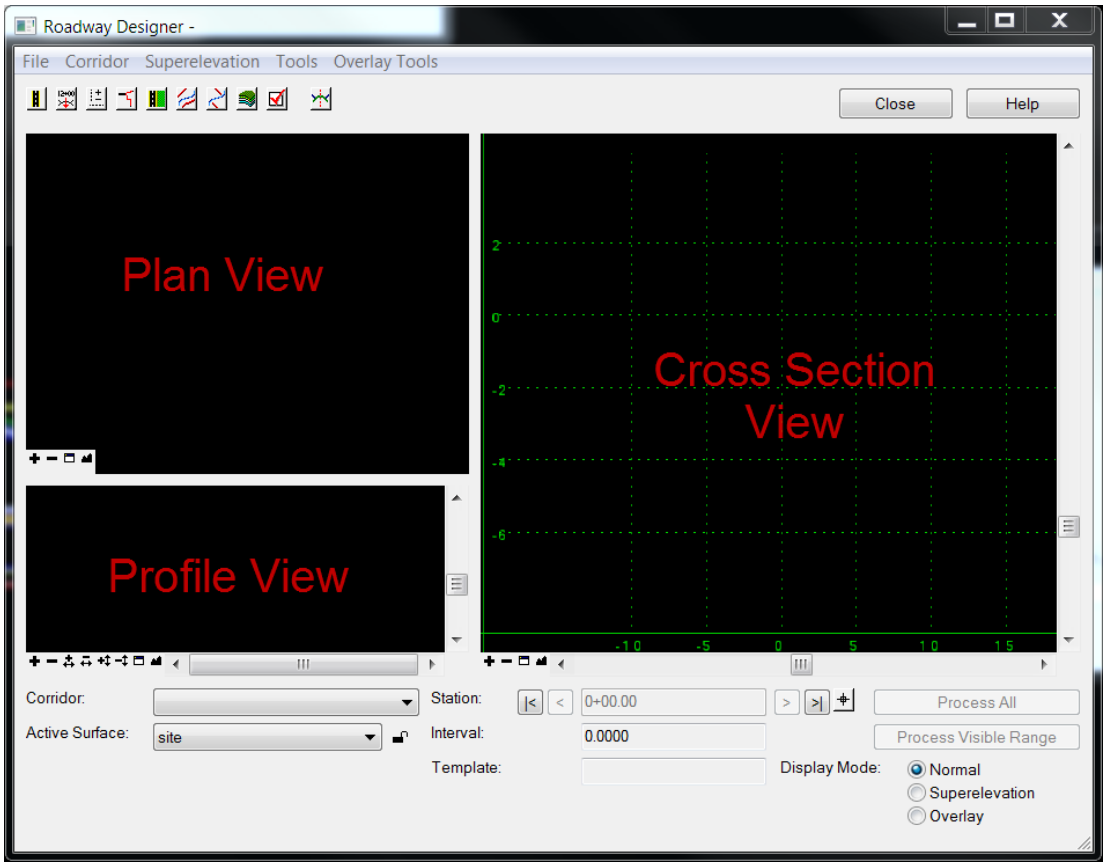
The data you input into Roadway Designer is saved in the Roadway Design file, which has the extension *.ird*.

ROADWAY DESIGNER DIALOG

The Roadway Designer dialog has three different window viewing areas in Normal Mode. They represent the plan, profile, and cross section views of the design.

These views use their own graphics engine, like the Create Template dialog, and are not MicroStation views. The views show only what is related to the design, not what is displayed in the MicroStation design file. The content of each window is controlled by the active Corridor selection and Active Surface settings.

The Roadway Designer dialog is resizable. Each window in the Roadway Designer can be resized.



PLAN VIEW WINDOW

- Shows template locations
- Shows Corridor's centerline alignment, cut-fill lines, and original ground surface perimeter
- Shows civil design data, not CAD graphics
- Links to data
- Shows station position
- Mouse over tips
- View controls

The Plan View window is located in the upper left corner of the Roadway Designer dialog. Although it looks like a MicroStation view, it does not display the graphics in the MicroStation design file. Not having the MicroStation graphics displayed allows you to focus on the design data only.

The location of the templates is displayed with respect to the corridor alignment and original ground surface, which are shown as short brown lines. The Plan window is linked to the other windows in Roadway Designer via station positioning of the design. The station position is shown as the longer yellow line.

Other graphics in this window include the corridor centerline, original ground surface perimeter, and cut-fill lines. Other graphic indicators appear in the window. *Mouse-over tips* are available and view controls are located on the bottom of all of the Roadway Designer's view windows.

PROFILE VIEW WINDOW

- Shows original surface and Corridor's vertical alignment
- Shows civil design data, not CAD graphics
- Links to data
- Mouse over tips
- Shows station position
- Dynamic scale

The Profile View window is located in the lower left hand corner of the Roadway Designer dialog. It does not show MicroStation graphics.

It displays the Original ground surface line and the corridor's vertical alignment. It is also linked to the station position of the design and that location is shown as a heavy vertical yellow line. The scale of the Profile View window is dynamic based on the zoom controls.

CROSS SECTION VIEW WINDOW

- Shows original ground surface and proposed design
- Shows civil design data, not CAD graphics
- Right-click functions
- Mouse over tips
- Links to data
- Dynamic Scale

The Cross Section View window is located on the right side of the Roadway Designer dialog. It does not show MicroStation graphics. It displays the Active Surface line, (typically, existing ground) and the templates as they are applied to the design. This window will be a primary area for reviewing the design.

Additional display settings can be applied by right-clicking on the window. The scale of the Cross Section View window is dynamic based on the zoom controls. Located directly below the Cross Section view window is an area that displays the current station being displayed and several buttons that allow you to step through the design, based on stationing.

ROADWAY DESIGNER FUNDAMENTALS

- Corridor Management command specifies horizontal and vertical alignments
- Template Drops command specifies template location and Template 0,0 point tracks on the Corridor's horizontal and vertical alignment
- Create Surface command creates a DTM of the proposed roadway design model and surface contains template components

CORRIDOR MANAGEMENT COMMAND

A Corridor is a design section of roadway defined by the station limits of the mainline horizontal and vertical alignment. A corridor is created by using **Corridor > Corridor Management**.

To create a Corridor, name the Corridor, select a horizontal and vertical alignment and optionally set the station limits of the project. A single roadway design file (.ird) can store all the corridors of a project. The .ird file is single user access only.

The next step is to assign templates to the corridor. This is accomplished using **Corridor > Template Drops**.

TEMPLATE DROP COMMAND

Template Drops are used to assign previously created templates to specific stations in the corridor. The XY = 0,0 point on the template tracks on the corridor's horizontal and vertical alignment to form the proposed roadway.

To create template drops, select the appropriate template from the Template Library, the station where the template is applied, and the modeling interval. The final result is a station and template list.

CREATE SURFACE COMMAND

Create Surface combines the corridor and template drops data to create a surface model of the proposed roadway design. This creates a surface consisting of the top surface of the roadway design and the sub-grade components, which are 'Exclude from Triangulation' points and children of the top surface. Components can be displayed in cross sections and used for volume calculations.

BASIC ROADWAY DESIGNER WORKFLOW

1. Open *Geometry*, original ground DTM, and preferences
2. Select Roadway Designer
3. Load Template Library
4. Create new roadway design
5. Create new corridor
6. Assign template drops
7. Create surfaces
8. Save roadway design results

EXERCISE OVERVIEW

6.1 Roadway Designer Basics

- Manage Corridors
- Template Drops
- Tools Options
- Component Quantities
- Create Surface

6.2 Switches, Display Rules

6.3 Parametric Constraint Values

6.4 Assign Style Constraints & Ranges to Points

6.5 End Conditions

6.6 PGL Handles and Test Point Controls in Create Template

6.7 Assign Point Controls to Alignments

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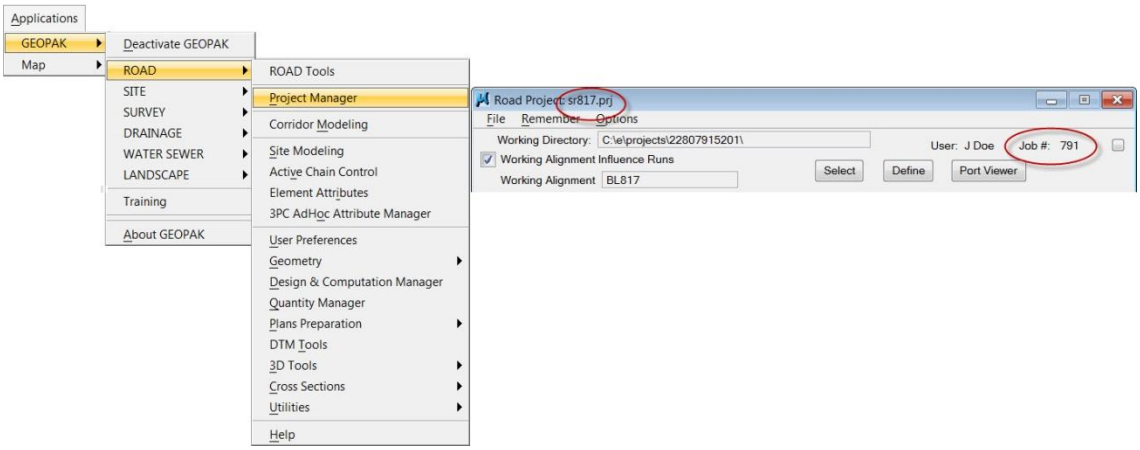
Exercise 6.1 Roadway Designer Basics

In this exercise the proposed roadway design file, *DSGNRD01.dgn*, will be opened with GEOPAK using the FDOT workspace and Project configuration. The GEOPAK Project Manager is loaded for the project. The Corridor Modeling dialog is loaded and the project preferences are loaded from the previous exercises. The following Roadway Designer tasks will be completed:

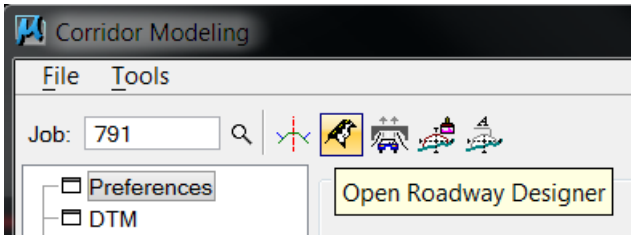
- A new corridor for the project is created using the Manage Corridors dialog.
- The Template Drops dialog is used to select a Template for the Corridor.
- Roadway Designer options dialog is used to set display options, report options and critical stations to included or exclude for processing.
- The Component Quantities dialog is opened to view corridor estimates on cost and materials.
- The Create Surface dialog is opened to create a proposed DTM and 3D MicroStation mesh model.

➢ *Manage Corridors*

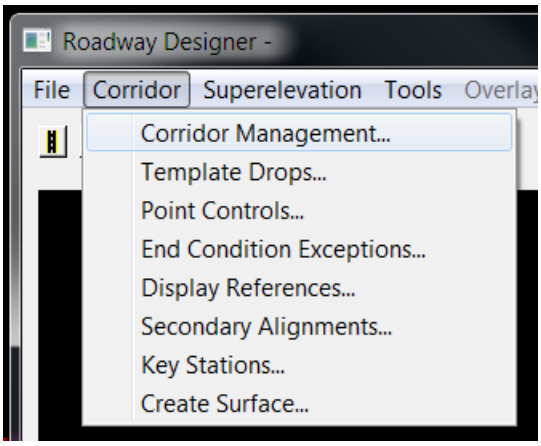
1. Optional, extract the *22807915201(6).zip* file in the c:\e\projects folder.
2. Open FDOTSS2 in the file c:\e\projects\22807915201\roadway*DSGNRD01.dgn*
3. Open up GEOPAK Project Manager to insure the project ***.prj*** and ***.gpk*** files are loaded and active.



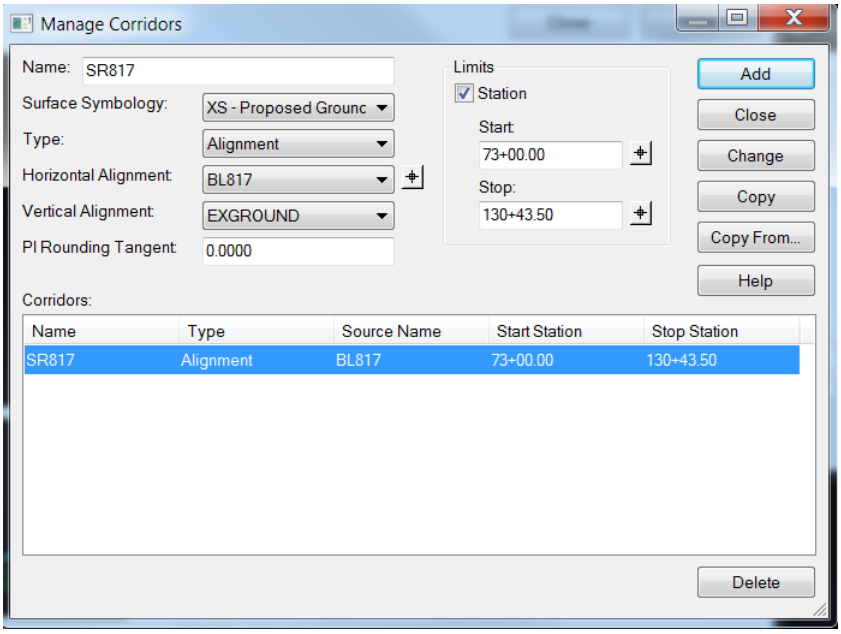
4. From the GEOPAK Road Tools toolbox, open the Corridor Modeling dialog.
5. From the Corridor Modeling dialog, Select **File** > **Load,** select **SR817.rdp** from the project preferences list and then click **Open**.
6. From the Corridor Modeling dialog, click on the *Open Roadway Designer* icon.



7. From the Roadway Designer dialog, select **Corridor** > **Corridor Management**.



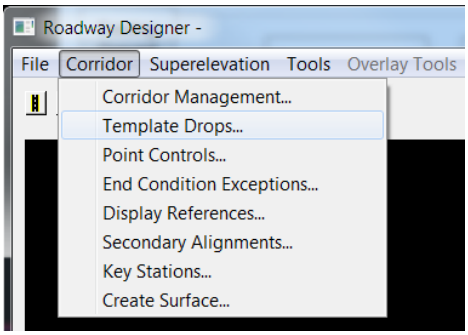
8. Name the corridor **SR817** and enter the dialog information with the following information.



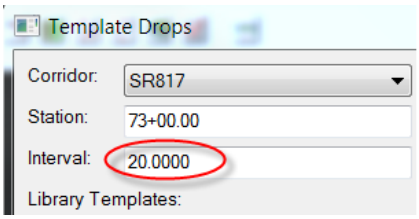
9. From the Manage Corridors dialog, click **Add** to add the corridor to the *Corridors:* list box, then **Close** Manage Corridors dialog.

➢ *Template Drops*

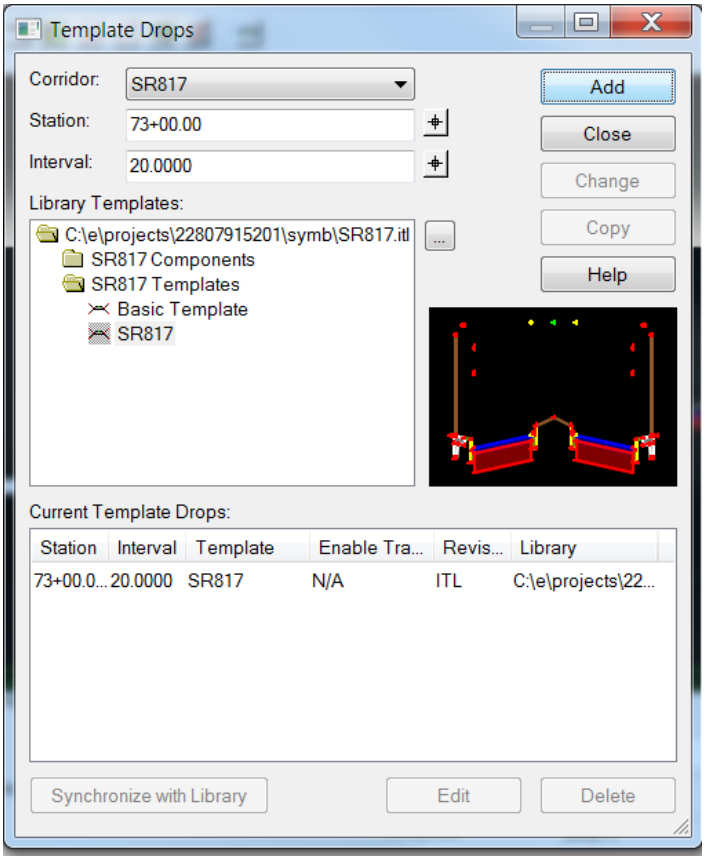
1. From the Roadway Designer dialog, select **Corridor** > **Template Drops** to open the Template Drops dialog.



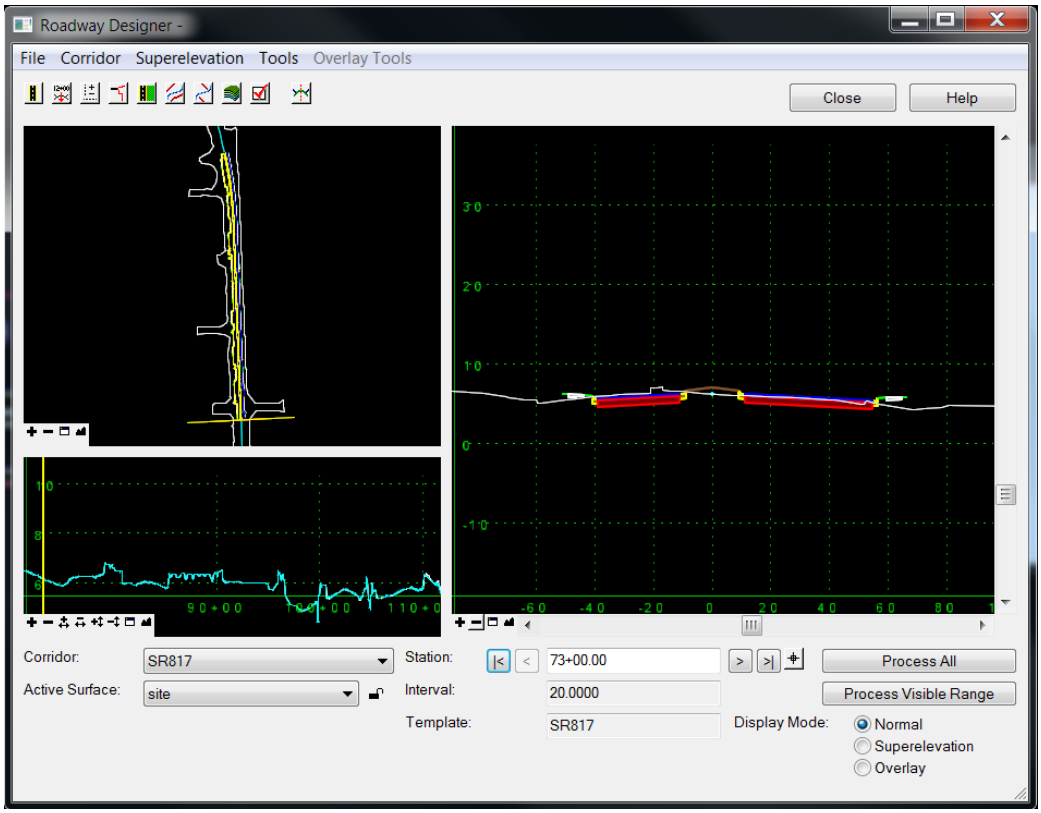
2. In the Template Drops dialog, change the **Interval to 20.**



3. In the Library Templates: area of the dialog, browse to the folder named **SR817 Templates** and select the template named **SR817**. Click **Add**

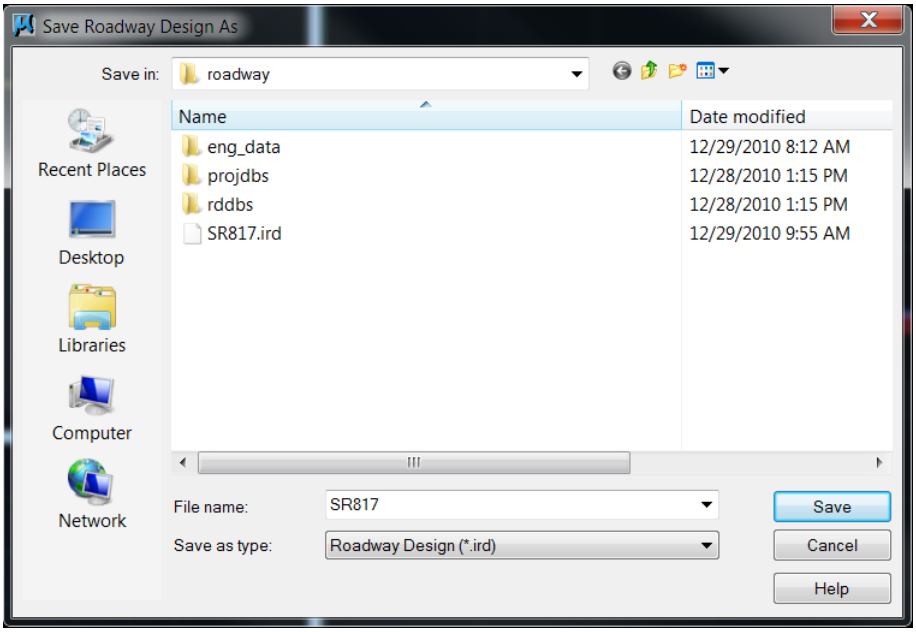


4. Close the Template Drops dialog. The Roadway Designer now displays graphics in the 3 views.



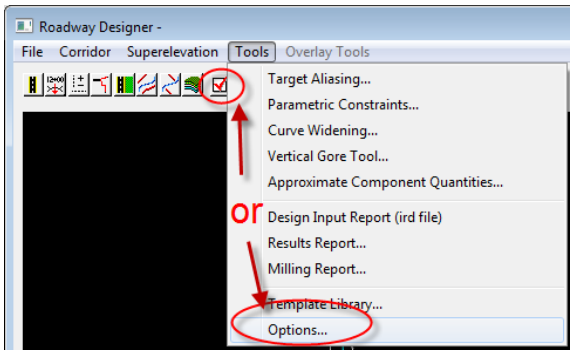
5. To view other sections along the corridor; Use the cross section navigation gadget tools <**or**> drag the yellow line in the plan or profile view.

6. From the Roadway Designer dialog, select **File** > **Save** . Enter SR817 in the File Name field. Choose Save.



➢ *Tools Options*

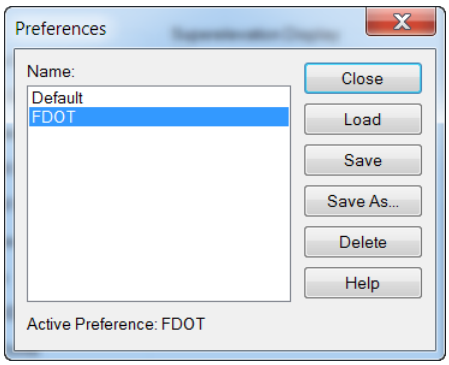
1. Select **Tools** > **Options** <OR> click the *Options* icon. The Roadway Designer Options dialog displays.



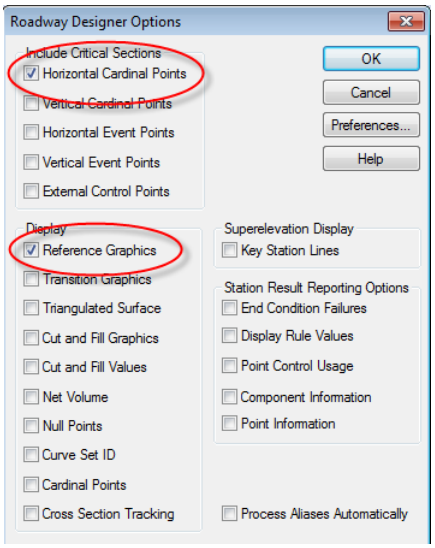
2. From the Roadway Designer Options dialog, check only the **Horizontal Cardinal Points** and **Reference Graphics** boxes and uncheck all others.

or

3. From the Roadway Designer Options dialog, click the **Preferences** button.



4. From the Preferences dialog, click the **FDOT** line and choose **Load**. **Close** the Preferences dialog.



SWITCHES, DISPLAY RULES

One of the more sophisticated features of template design in Corridor Modeling is the ability to add display rules on template components. Display rules are used to turn on or off components based on logical statements. If a rule or statement is TRUE the component is on. If the rule is FALSE the component is off. The rules are compared against physical attribute of template at each defined interval location along the corridor, (i.e. If the distance between two points is the value one, then a component will be displayed. If the distance is not one, then the component will not be displayed).

Display rules follow IF, THEN logic and can be joined by 'AND' and 'OR' to create multiple conditions for a rule to be TRUE. This allows designers the ability to create very flexible and accommodating templates. Using display rules on templates reduces the need to place several template drops along a corridor when a different template conditions are needed.

Switches are essentially point constraint values, labels, or parametric constraints, which make display rules TRUE or FALSE

The FDOT Template Library includes many provided switches on the delivered templates. These can be used at the discretion of the designer. They may be used as provided or as an example for other project specific conditions. By and large, display rules are project design specific and will be addressed in later chapter exercises.

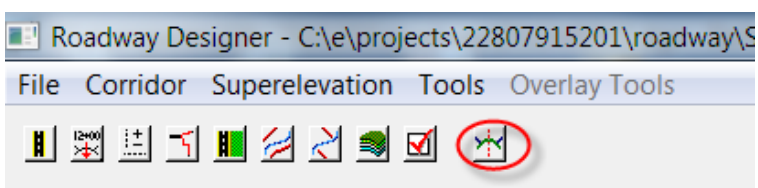
Some of the conditions where display rules and switches have been provided on the delivered templates include the following:

- Curb Types
- Curb Base
- Traffic Separator Types
- Median Types, Flat vs. Crowned
- Shoulder Gutter
- Ditch Pavement
- Guard Rail

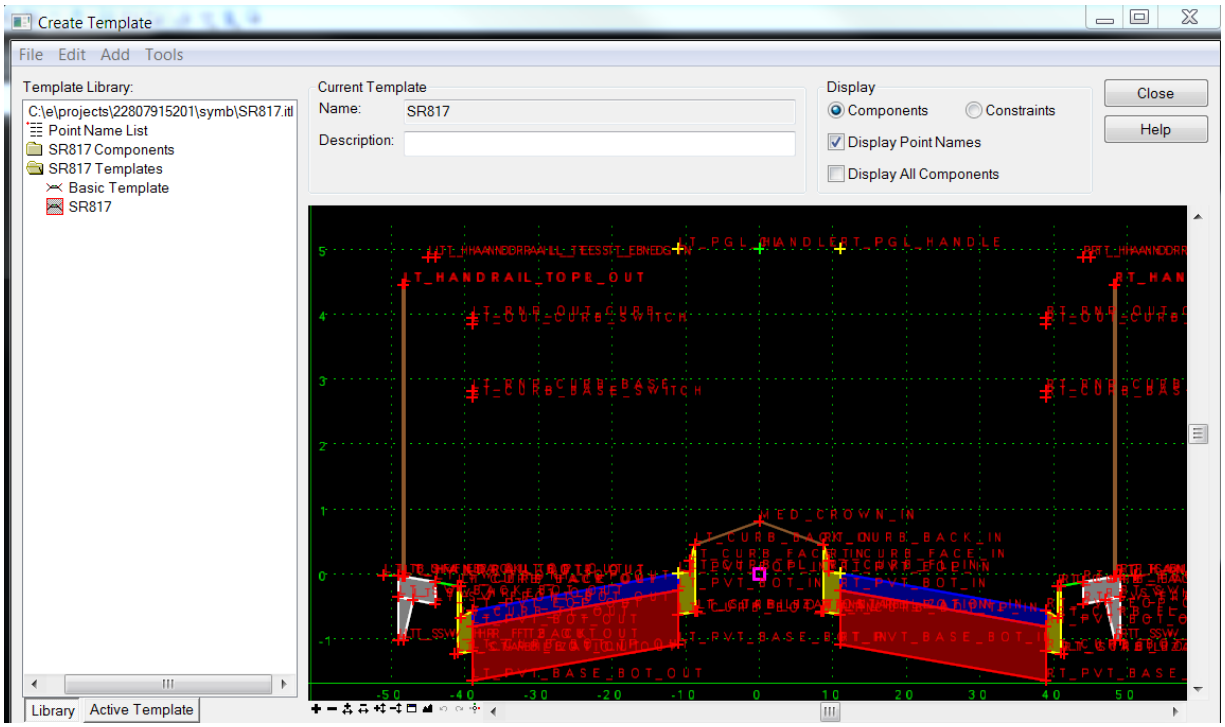
Exercise 6.2 Switches, Display Rules

In this exercise the Create Template dialog is used to edit point properties for Curb Base and Curb Type label values for the project template. Depending on the label value, different components on the template become active for display. Therefore, they act like "switches. Values for the switches are defined in the display rules for the template. In order to view which value is used to display which component, the Display Rules dialog is opened for review. The Typical Sections delivered in the FDOTSS2 Template Library were created to be very flexible and accommodating for a variety of situations and project requirements. Rather than use the delivered "switch" display conditions, the project specific template conditions are defined in this exercise.

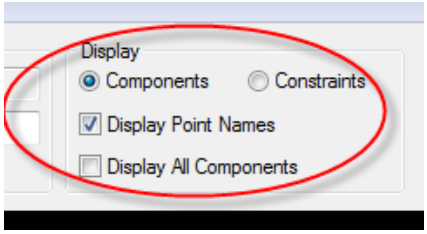
1. In Roadway Designer dialog, change to the Create Template dialog by clicking on the **Open Template Library** icon.



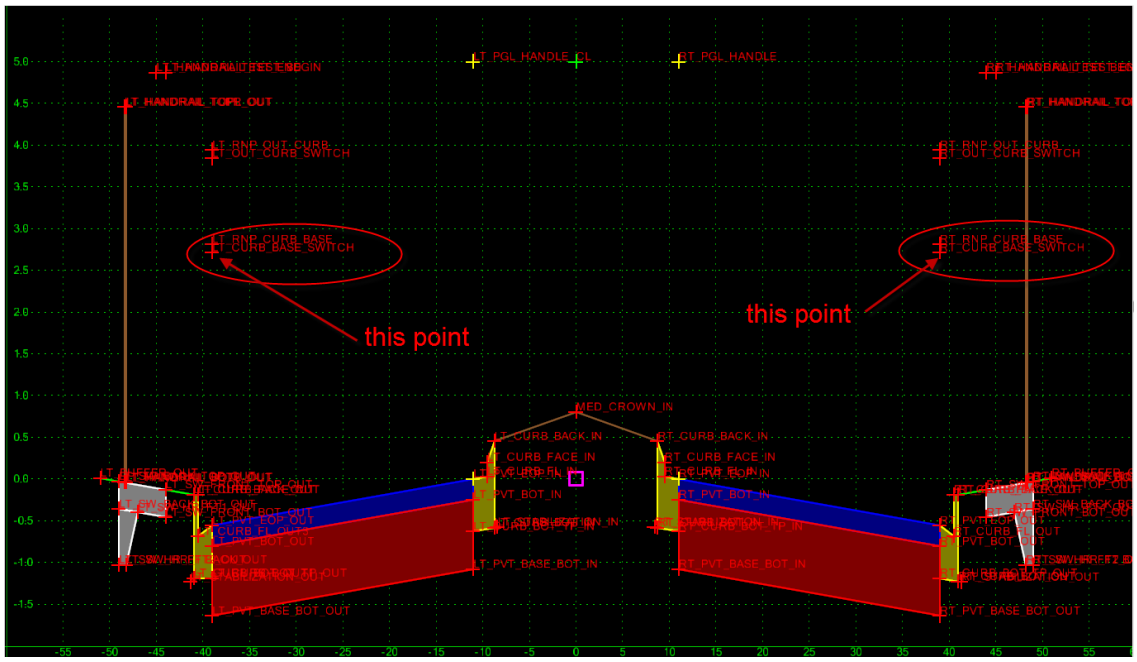
2. From the Create Template dialog,. Make the **SR817** Template active if it is not by double clicking on the name in the list.

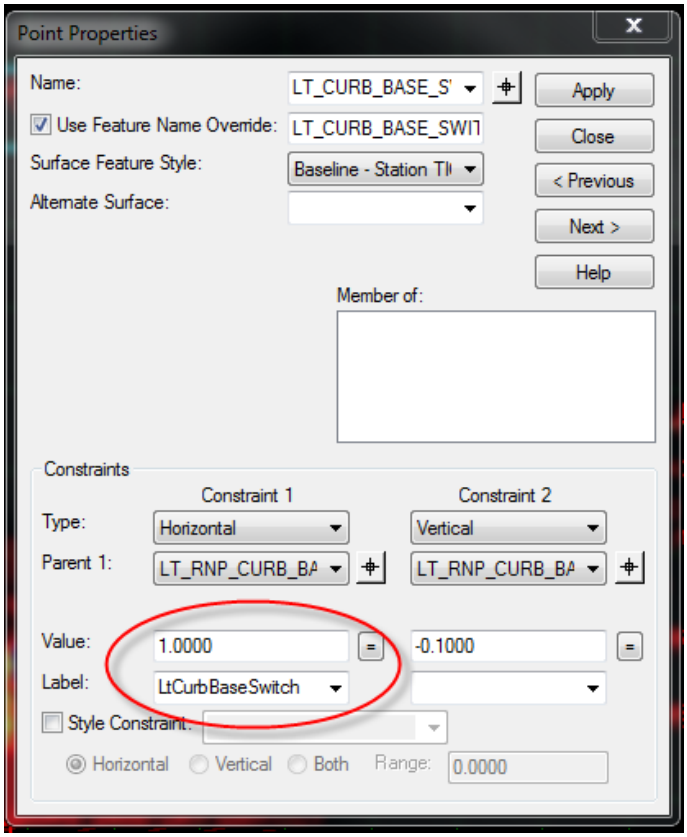


3. From the Create Template dialog, set the **Display** settings to **Components**, check **Display Point Names** and uncheck **Display all Components**.



4. To switch on the **curb base** for display, find the template points **LT_CURB_BASE _SWITCH** and **RT_CURB_BASE _SWITCH** with the Library tab active. Double click on each point and change the **Horizontal Constraint Value** to **1**.



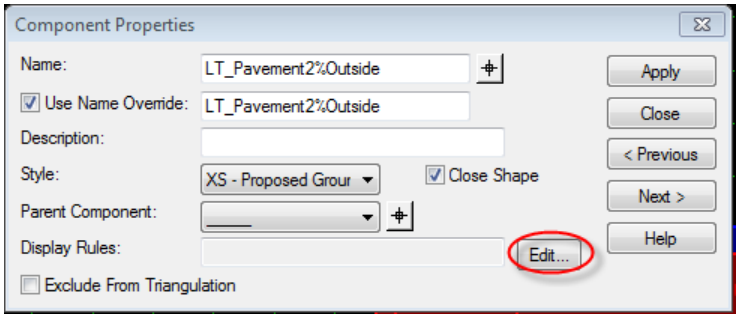


5. Click **Apply** and **Close**. Once the Value has been set for each point the Curb Base is now displayed in the Template.

6. To change the outside curb type, find the template points **LT_OUT_CURB_SWITCH** and **RT_OUT_CURB_SWITCH** with the **Library** tab active. Double click on the point and change the **Horizontal Constraint Value** to **1**.
7. Click **Apply** and **Close.** The curb will now display a Type E curb.
8. Click the undo Icon to return to the delivered Type F curb display.

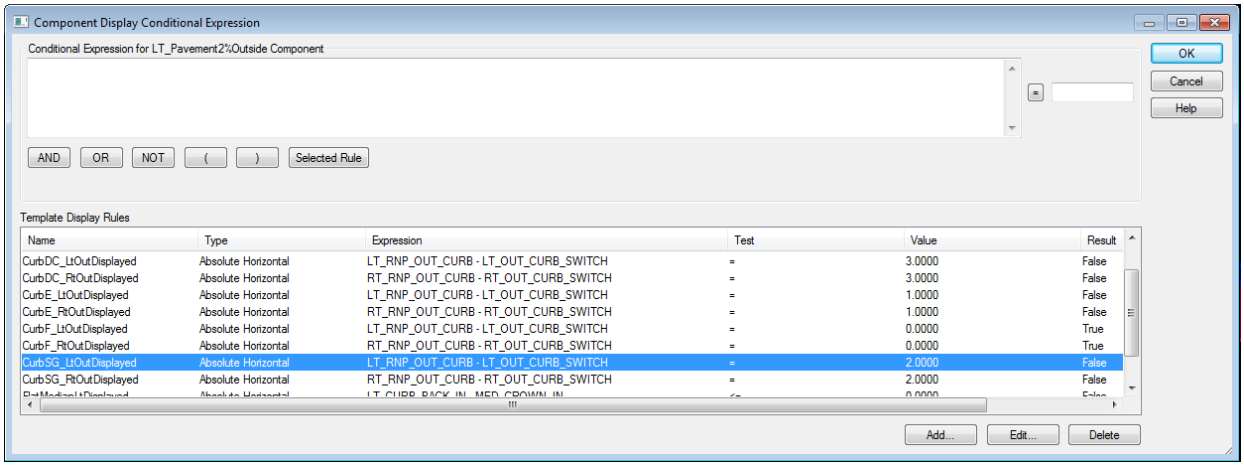
To pre-determine what switch settings will display

9. Open the Component Properties dialog, **double click** on the line of any **component** to OR **right click** on the line of any **component** and click the **Edit Component** option from the list.



10. On the Component Properties dialog, click the **Edit** button next to the **Display Rules** field. The Component Display Conditional Expression dialog will display. The bottom half of the dialog is a **Template Display Rules** listing all rules for the template.

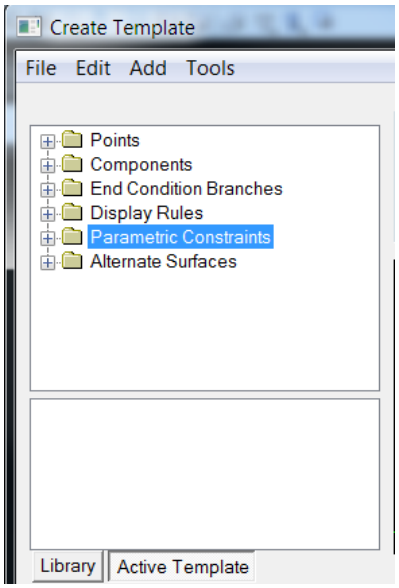
> ***Note*** The Value column indicates what the number is associated with each available component name, (i.e. 2 for Shoulder Gutter SG, 3 for Drop Curb, etc.). EDITING THE DISPLAY RULES IS AN ADVANCED TOPIC TO BE ADDRESSED IN ANOTHER CHAPTER.



11. Click **OK** to exit the dialog. **Close** the Component Properties dialog. Click **File Save** to save the work from this exercise.

> ***Note*** There is another way to view the display rules for the template which will be described in general in the next section regarding Parametric Constraints.

PARAMETRIC CONSTRAINT VALUES



- Used to override Constraint Values
- Named as Labels in the Point Properties dialog
- Override values set in the Tools > Parametric Constraints dialog
- Easily adjusts pavement thickness

Parametric Constraints are used to override constraint values. For example, a template created with a 2 inch layer of asphalt, but the design calls for 3 inches. The 2 inches is a vertical constraint value that can be overridden to 3 inches using parametric constraints. To create parametric constraints, first Edit the template points and key-in a name in the Labels field that you want to assign to a specific constraint value. For pavement thickness, it would be the vertical constraint of the bottom layer points. In the Roadway Designer dialog, use Tools > Parametric Constraints to assign overriding values to the labeled points OR set project specific values in the Create Template dialog to override the preset values delivered in the FDOT Template Library.

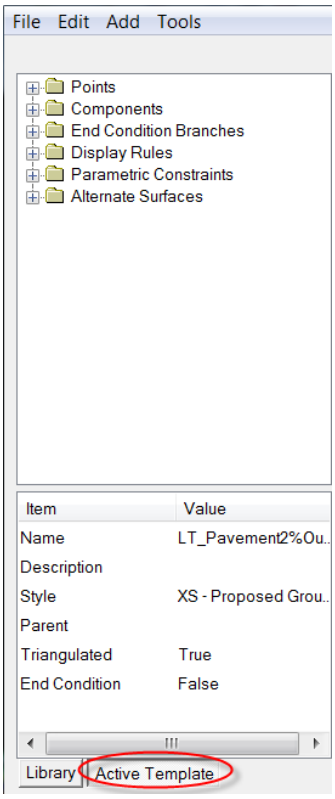
Exercise 6.3 Parametric Constraints Values

In this exercise the Create Template dialog is used to edit the default parametric value in the Parametric Constraints folder of the Active project template. The pavement and base thickness will be changed for both sides of the template. Changing the value in the dialog will change the vertical constraint distance for each point with that label assign to it. This is an efficient way to change multiple point constraint values in one step on a project template.

1. Continue working on the **SR817 Template** from the last exercise active.

2. Select the **Active Template** tab under the **Template Library** tree list to make it active. Collapse the tree list folder if necessary. The dialog should display as follows:

> ***Note*** This is also where the Display Rules for the template can be reviewed and edited in reference to the previous section.

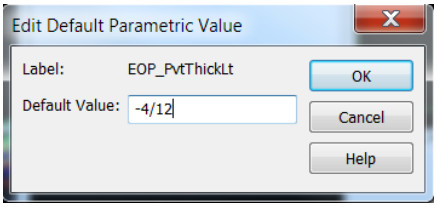


3. Open the Parametric Constraints folder to display the list for the active template.

> ***Note*** Notice at the bottom of the list the LtCurbBaseSwitch. This is one of the switches that were changed in the previous exercise. They could have been changed here as well.

4. To change the pavement thickness for the left roadway: Right click on the EOP_PvtThickLt item and click Edit.

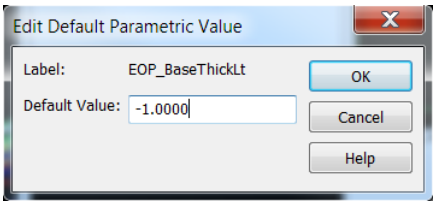
5. Change the **Default Value** from -0.25 feet to -4/12 feet, or from 3 inches to 4 inches. Use the Tab key to enter the information and Click **OK.**



6. Repeat for the right roadway.

7. To change the base thickness for the left roadway, Right click on the EOP_Base ThickLt item and click Edit.

8. Change the De**fault Value from** -0.833 feet to -1 feet or from 10 inches to 12 inches. Click **OK**.

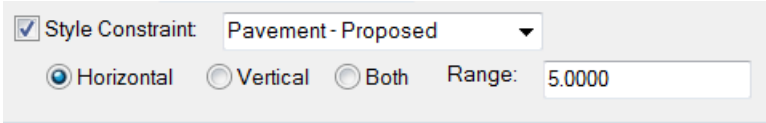


9. Repeat for the right roadway.

> ***Note*** Notice that the curb base thickness changes along with the pavement base. This is because of predefined relationships developed in the FDOT Template Library components.

10. Select the **Library Tab** again on the Create Template dialog and select **File** > **Save**. Select **File** > **Save** to exit the Create Template Dialog.

ASSIGNING STYLE CONSTRAINT & RANGES



- Template Point Controls
- Used to override the normal locations of Template Points
- Uses include lane widening, ramp and intersection design, and separate grade line control of a single corridor.

Template point controls are used to override the normal horizontal and vertical locations of template points during the modeling process. Design examples include lane widening, ramp and intersection design, Superelevation, and divided highways with separate grade lines. These overrides are accomplished by assigning template point names to alignments. The assigned template points will follow the alignments using horizontal and/or vertical controls within a specified station range. Surface features can also be used to control template points.

In the previous chapter Importing Plan Graphics the following MicroStation lines were imported as Corridor Modeling alignments which can be used for template points:

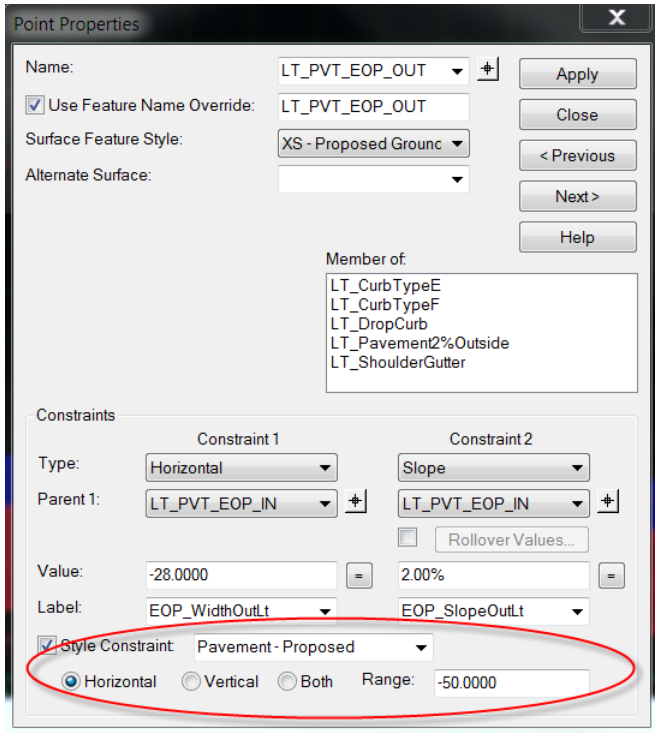
Lv Name	Chain	New Chain Name	Drafting Standard
Sidewalk Back	IMPORT	SWB	Sidewalk -Back Proposed
Sidewalk Front	IMPORT	SWF	Sidewalk -Front Proposed
EOP	IMPORT	EOP	Pavement Proposed
Traf Separator	IMPORT	TS	Traffic Separator Proposed

Exercise 6.4 Assign Style Constraint & Ranges to Points

In this exercise the Create Template dialog is used to edit point properties of specific points. A Style Constraint is selected and a Range value is assigned to the points in the project template that will need to follow the imported graphic alignments. This will cause the template to vary the segment lengths in Roadway Designer to reflect the project design requirements for the locations of the template points. The FDOTSS2 Template Library has been designed and delivered with default Style Constraint and Range value setting for several other template points, (i.e. edge of pavements, front and back of curbs, front and back of sidewalks and traffic separator, etc…). This exercise changes the inside and outside edge of pavement Style Constraint and Range values to follow the Milling Limits along the proposed project as defined in the 2D graphics.

1. Continue working with the **SR817 Template** from the last exercise active.
2. Select the **Library** tab under the **Template Library** tree list.

3. Right click on the top outside edge of pavement point of the left roadway, LT_PVT_EOP_OUT and select the **Edit Point** option from the list, <OR> double click on the point. The Point Properties dialog will display with the Style Constraint list field and check box located at the bottom.



4. Check the **Style Constraint** box and verify the list item is **Pavement Proposed**. Click **Apply** and **Close**

The Style Constraint applies an override from the current template location. Instead the template will look a range from 0 to 50 feet left of the defined template point location for the Milling Limits to set the horizontal location of the template point.

> ***Note*** When the template is processed in Roadway Designer, if the alignment style alignment, (i.e. Pavement Proposed) is **not** found, then the point location will default to the horizontal location defined in the template.

5. Right click on the top outside edge of pavement of the right roadway, RT_PVT_EOP_OUT and select the Edit Point option from the list, <OR> double click on the point. Verify the Style Constraint.

6. Select **File > Save** to save the changes to the Template library.

END CONDITIONS

End condition components are used to form the template transition slopes to the existing ground. End condition templates in the FDOT Template library have multiple end conditions components. All have standard slope condition tests developed to meet FDOT design standard criteria.

COMPONENT PROPERTIES

The component properties for End Conditions have an additional area for End Condition Properties. These properties list the Target Type and Priority for processing end condition components

TARGET TYPE

This property determines what the end condition will try to intercept. The Target Type affects the way the side slope is constructed. Feature XYZ, Alignment XYZ, and Style XYZ will override the slope constraint and use whatever slope is necessary to tie to the target location. All other Target Types observe the slope constraint to locate the point.

Additional drop down menus are displayed below the Target Type. These are used to list the target of the type specified in the Target Type. The information required for each Target Type is:

- *Surface* – Set to Active (which will tie to whatever surface is active) or to a specific surface. Surface is the most common Target Type and used by most FDOT standard side slopes.
- *Elevation* – Enter the target elevation in the Vertical Offset field. This can be useful for setting elevations of benches, for example.
- Feature XY, Feature Elevation, and Feature XYZ – Identify a surface (Active can be used) and the Feature Name that you want to seek. For example, you may need to tie into an existing curb or an existing ditch feature.
- *Alignment XY, Alignment Elevation, and Alignment XYZ* – All must have a horizontal alignment specified. Alignment Elevation and Alignment XYZ also need the Vertical Alignment identified. For example, Alignment Elevation can be used to tie a special ditch into the elevation of a vertical alignment.
- *Style XY, Style Elevation, and Style XYZ* – Specify a Style. These targets work just like the previous Feature and Alignment targets, except the side slope looks for a Style used in the active surface or geometry project instead of a specific feature or alignment listed by name. For example, if you want to tie into an existing curb, but the curb is made up of multiple features, you can tie into the style for the curb and the side slope finds the first occurrence at each template drop.

Note The most often used Target Type is Surface.

PRIORITY:

This property determines the order in which end condition components are processed. The processing order is from the lowest numbered priority to the highest. The flattest slopes are set to the lowest numbered priority so that they are processed first. If you do not set the priorities ahead of time, they can be set when the end conditions are tested.

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POINT PROPERTIES

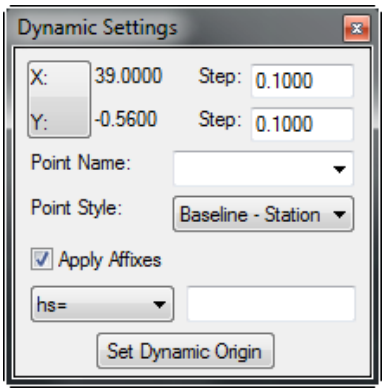
For points that are part of an end condition, four additional check boxes for End Condition Properties are added to the Point Properties.

- *Check for Interception* - If on, the point checks for an interception of the target between the previous point and this one. In general, turn this option on for the last point in a cut or fill definition. An example of where it would be turned off is for the fore slope of a ditch that has a flat bottom.
- *Place Point at Interception* - When on, the point will be constructed where it contacts the target. When off, the point is constructed as defined by its constraints. Turn on this option in most cases when Check for Interception is on.
- *End Condition is Infinite* – When on, the point will extend past its defined width in order to contact its target. When off the point must reach its target within its defined width in order to be constructed. This option is used for the steepest cut and fill slope defined in the template. Since it is off for shallower side slopes, they will not extend beyond their constrained horizontal distance.
- *Do Not Construct* – When on, the point will be solved for as normal, but will not be used when creating the component.

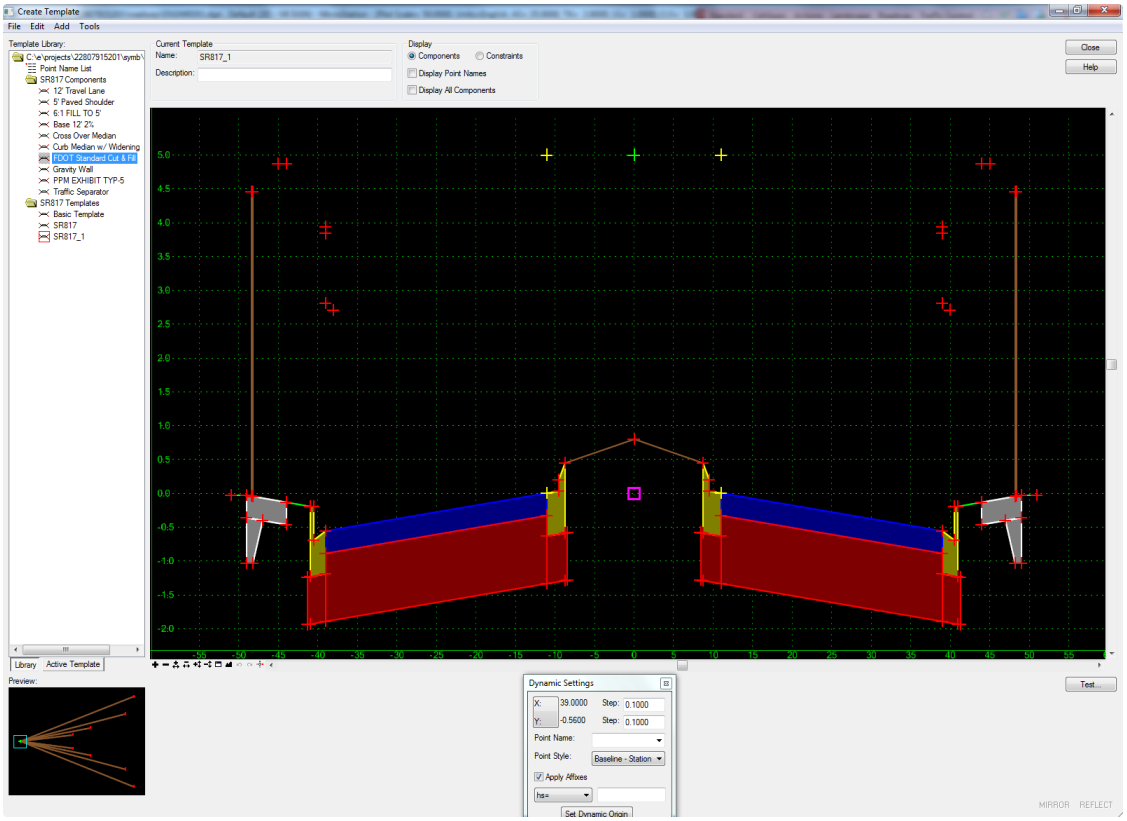
Exercise 6.5 End Conditions

In this exercise the Create Template dialog is used to add end condition components to the project template. The typical sections delivered in the FDOTSS2 Template Library were designed and delivered without end condition components. However, individual end condition component groups are available in the End Conditions folder. In order to tie the project template to the imported DTM existing surface the end condition component copied from the FDOTSS2 Template Library is added to the project template. Also in this exercise, the Test button on the Create Template dialog is used to open the Test End Conditions dialog.

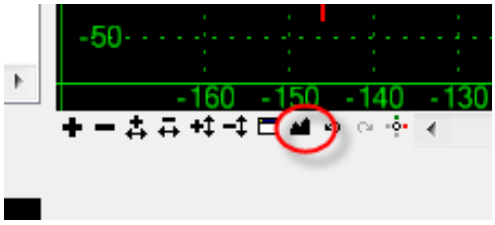
1. From the Create Template dialog: Uncheck the Display Point names
2. Right click the template **SR817** and click **Copy**. On the folder, **SR817 Templates**, click **Paste** and right click to **Rename** the template, **SR817_1**. Double click or right click and click **Set Active**.
3. From the *Tools* menu option on the Create Template dialog, click on the **Dynamic Settings** option. Check on the *Apply Affixes* box on the Dynamic Settings Toolbox.



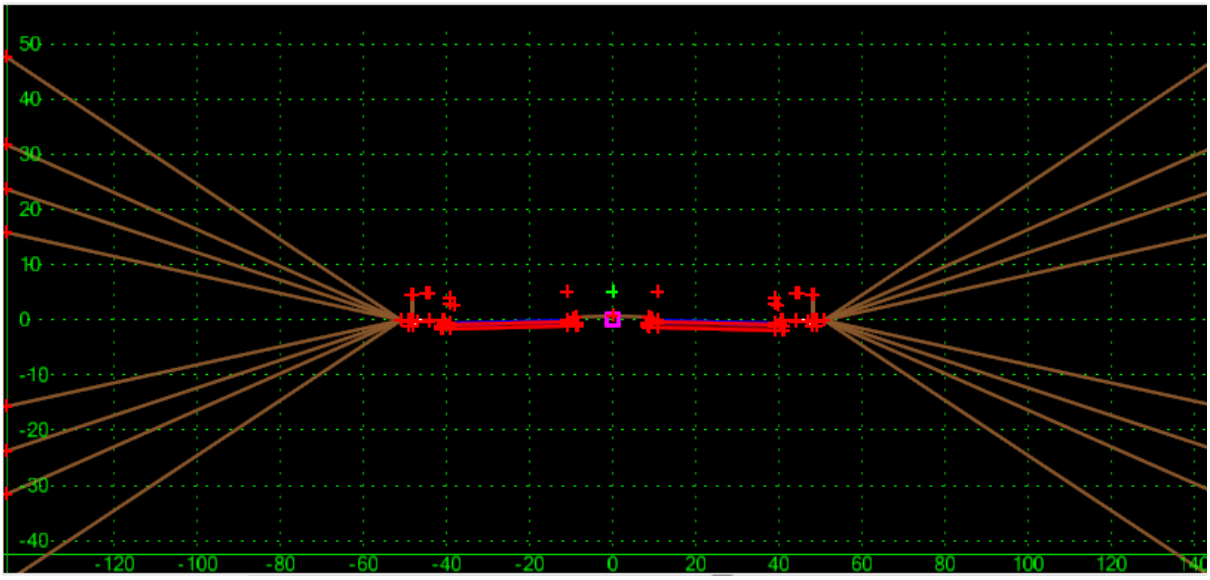
4. Open the SR817 Components folder and select the **FDOT Standard Cut & Fill** item in the list. Drag the end condition components near the right side of the template. While dragging, use the right mouse click and click **Mirror** before placing to apply to both sides of the template. When the joining points are near the template point will turn white. This is a template snap feature. Click on the last right point on the template.



5. Click the *Fit* icon.



6. When the drag operation is complete the template should look like the one below.

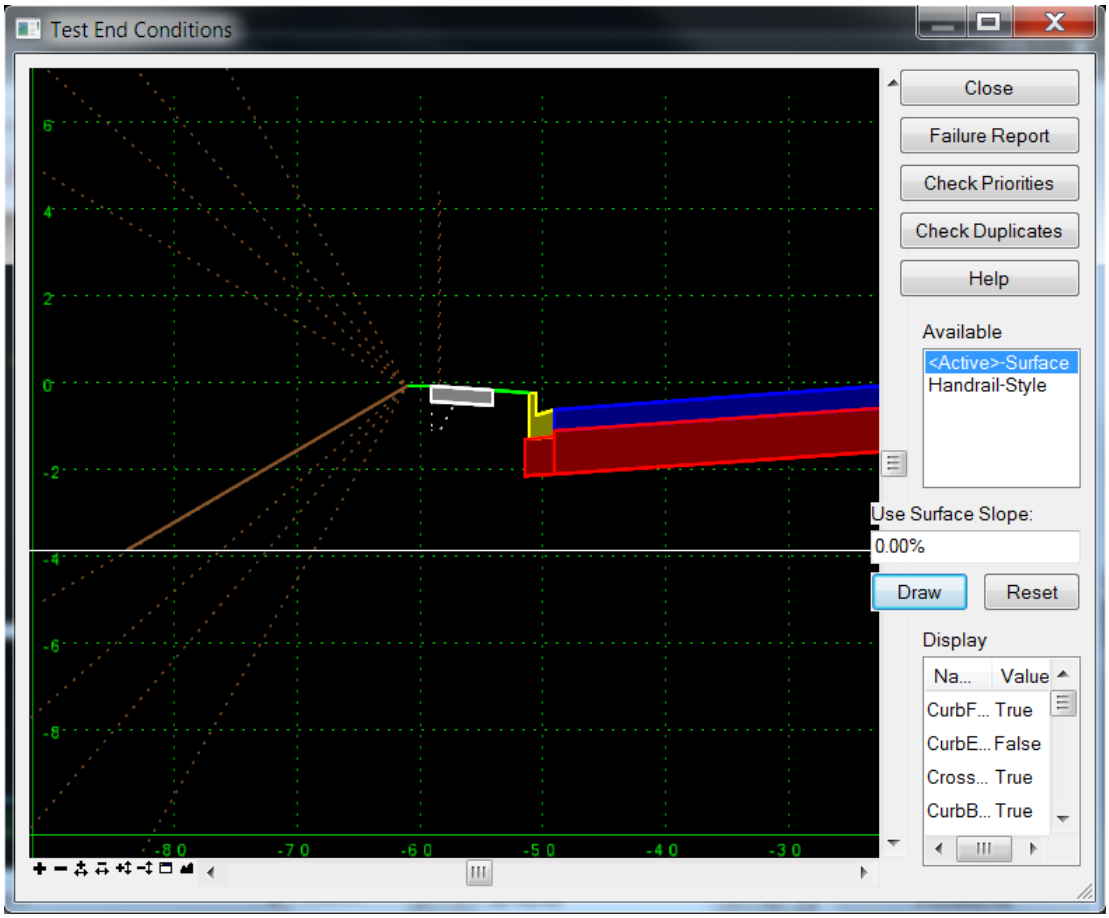


Note	To recover from a misplaced drag, use the *Undo* icon below the template window OR delete the template and start with a new copy of the previous edited template.

7. Select **File >Save** to save the changes to the **Template Library.**
8. Click the **Test** button in the Create Template dialog to open the Test End Conditions dialog.

9. Select the **<Active> Surface** in the **Available Targets** list and then click **Draw.** This will place a white line using the default surface slope in the dialog.

10. Move the mouse cursor up and down vertically to observe the End Condition Solutions based on the location of existing surface.



Note	For a complete Reference Command List, click the Help button to review the documented functionality.

11. Click **Close** to exit the Test End Conditions dialog.
12. Select **File > Save** to save the changes to the project template library, **SR817.itl**

Exercise 6.6 PGL Handles and Test Point Controls in Create Template

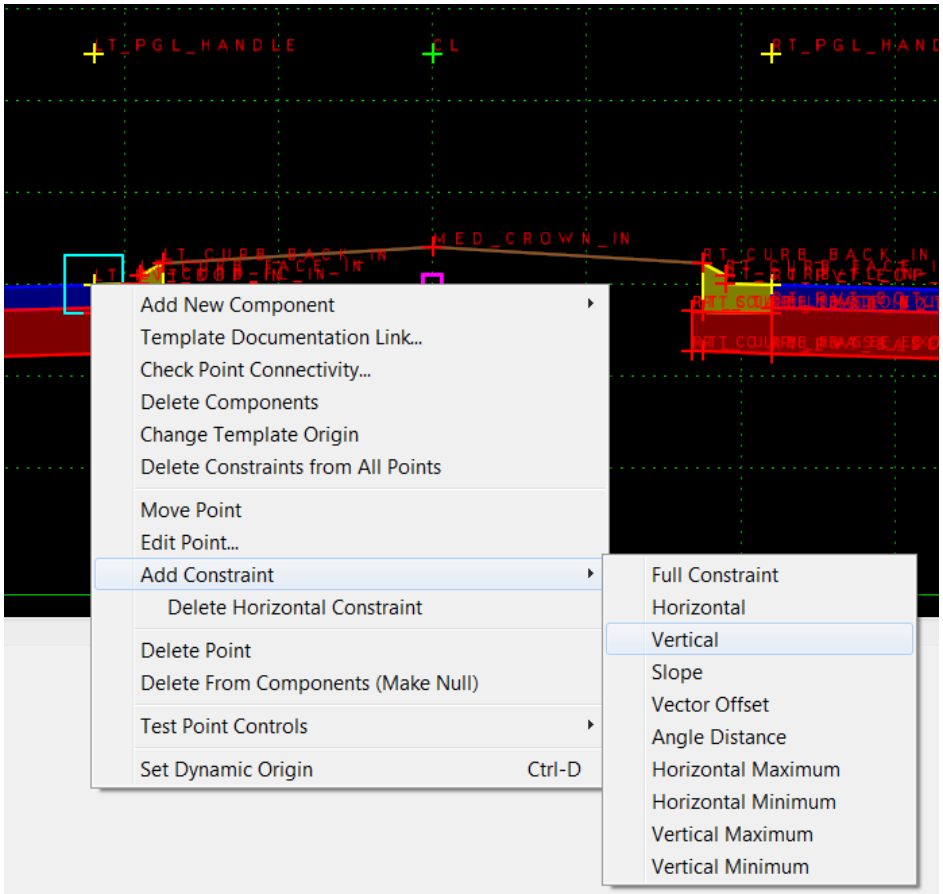
In this exercise the Create Template dialog is used to test components component relationships on the project template. The typical sections delivered in the FDOTSS2 Template Library were designed and delivered with null points labeled as PGL Handles.

Also in this exercise, the Test Point Controls command in the Create Template dialog is introduced to assist the designer in testing the component relationships as point controls move the template in roadway designer.

NULL POINT HANDLES

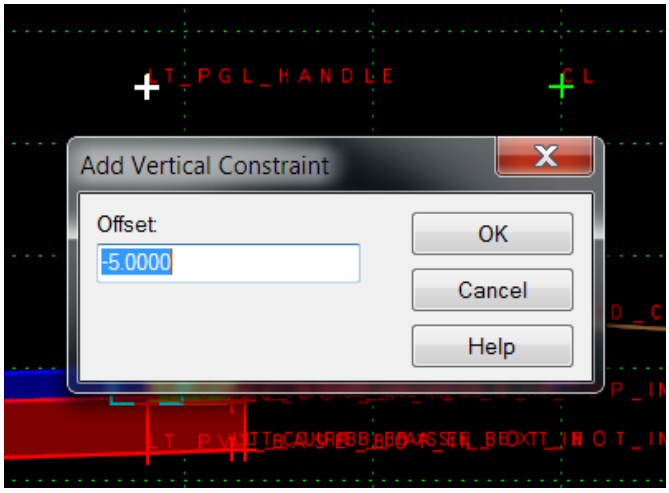
The FDOTSS2 templates have handle points built in to assist in the designer in areas that get full of details. By placing "NULL POINTS" outside of busy areas, other points can be constrained to the points to act as handles for testing purposes. To fully constrain the roadway to the null points, follow the procedure as follows below:

1. Zoom into the median area of the template.
2. Locate the null points above the left and right PGL points on the template. Turn on the point names briefly. They are labeled **LT_PGL_HANDLE** and **RT_PGL_HANDLE**.
3. Right click on the left roadway inside edge of pavement point BELOW the **LT_PGL_HANDLE** handle and select Add Constraint > Vertical.

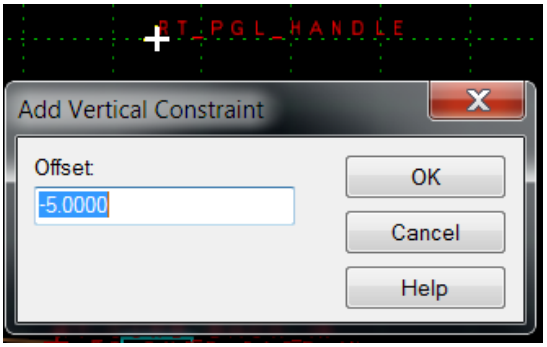


4. A prompt appears to select the parent point. The prompt is in the lower left corner of the Create Template dialog.

5. Select the **LT_PGL_HANDLE** point, the Add Vertical Constraint dialog opens to set the offset distance. Leave the Offset value -5.0000, Click **OK**. The pavement point will change from yellow to red.



6. Repeat for the procedure right roadway inside edge of pavement point and set the vertical constraint **RT_PGL_HANDLE**.



TEST POINT CONTROLS

In the Create Template dialog there are two ways to test movement of components in relationship to one another. The first way is with the **Move Point** command. The second is the **Test Pont Controls** command. Both of the commands can be found when right clicking over a template point. The **Move Point** command will only appear when a point is yellow or green (i.e. not fully constrained).

1. Right click on the **LT_PGL_HANDLE** and select **Delete Horizontal Constraint.**
2. Right click on the **LT_PGL_HANDLE** again and select the **Move Point** command
3. Move the cursor up and down to test template roadway movement when the PGL of the left roadway varies from the right roadway. Notice the median slopes will change from crowned to straight slope.
4. RIGHT CLICK AGAIN TO END/CANCEL. Select **Edit Undo** to add the **Horizontal Constraint** back to the **LT_PGL_HANDLE**.

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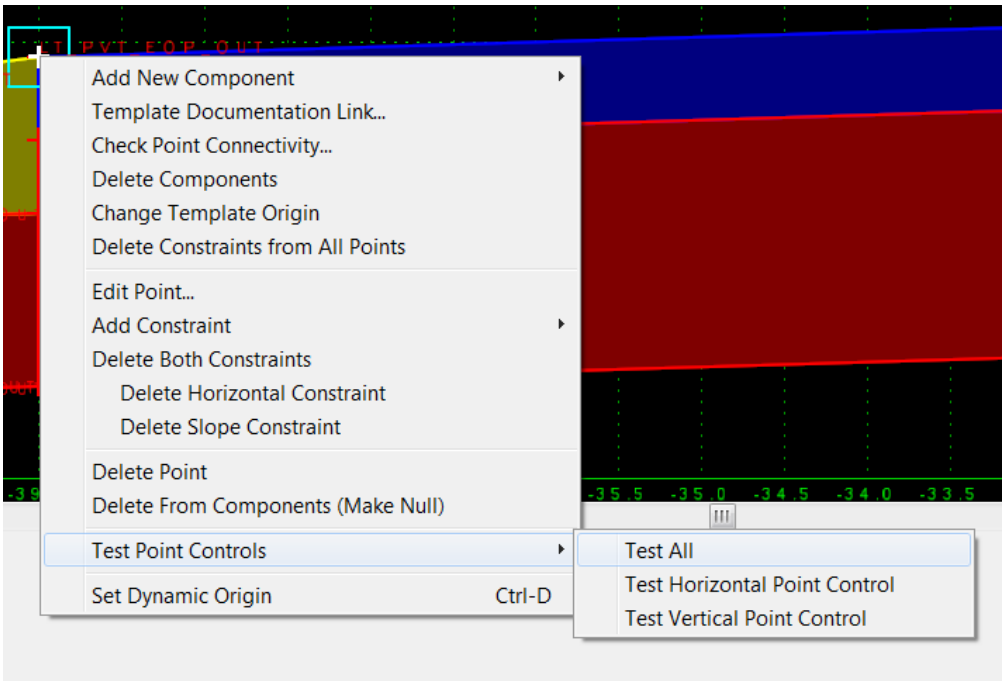
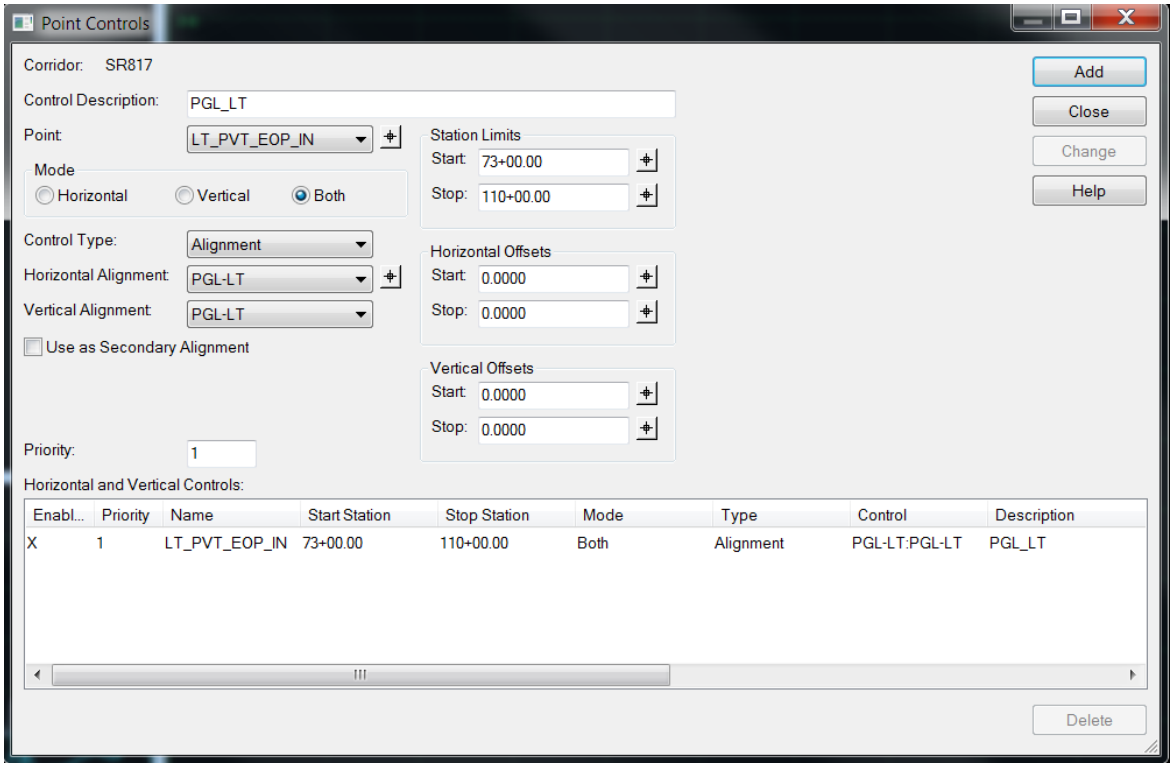
5. Right click on the outside edge of pavement point **LT_PVT_EOP_OUT**, select the **Test Point Controls** > **Test All** command.



6. Move the edge of pavement in all directions to test the template roadway movement, notice how each of the components change with movement both horizontally and vertically.
7. RIGHT CLICK AGAIN TO END/CANCEL
8. Close the Create Template dialog. Choose Yes to save your changes.

ASSIGNING POINT CONTROLS TO ALIGNMENTS

f



POINT CONTROL COMMAND

- Set horizontal and/or vertical controls
- Control template points based on horizontal and vertical alignments
- Automatically overrides existing template point constraints

BASIC WORKFLOW

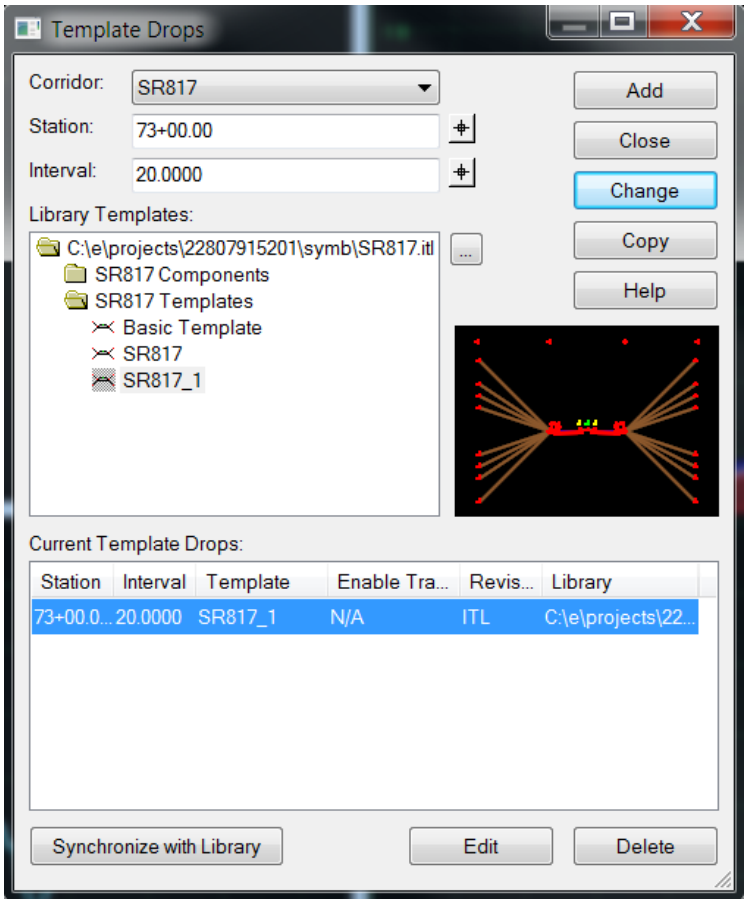
- Create alignments used for horizontal and/or vertical controls
- Assign template points to the control alignments
- Controlling stations based on corridor alignment stationing
- Click **Process All** and review the design

Point Controls are used to assign horizontal and/or vertical controls to any template point. Point controls are added to the design after the corridor is created and the template drops are assigned to the corridor. Point controls are specified by the corridor's alignment stationing, and not by the stationing on the controlling alignment. Point controls automatically override all template point constraints on the point being controlled. Constraints on all other points will be obeyed.

Exercise 6.7 Assign Point Controls to Alignments

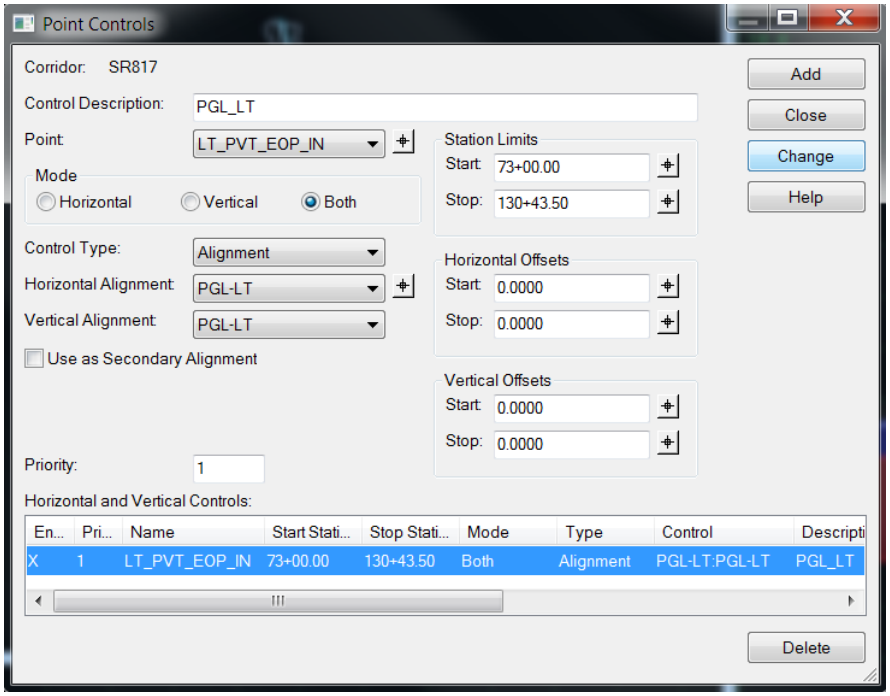
In this exercise the Roadway Designer dialog is used to add Point Controls to the template define on the corridor. Point controls will add more project design controls to the template points along the corridor alignment. For the project in the exercises, a left and right profile grade chain was designed with GEOPAK Coordinate Geometry and imported as alignments. The template points corresponding to these profile grade alignment controls are added and displayed in the Point Controls dialog. Roadway Designer will now re-construct the project template with the point controls alignment controls at the defined interval and critical points along the corridor. Also in this exercise a temporary dimension line, in Roadway Designer only, is placed to see how the left PGL and right PGL vary in elevation along the corridor.

1. From the Corridor Modeling dialog, open the Roadway Designer dialog.
2. From the Roadway Designer menu, select **File** > **Open** and then select the project **SR817.ird** file.
3. Select **Corridor** > **Template Drops** and select the **Current Template Drops** entry
4. Select the newest version of the template **SR817_1** and click on the **Change** button. Close the Template Drops dialog.

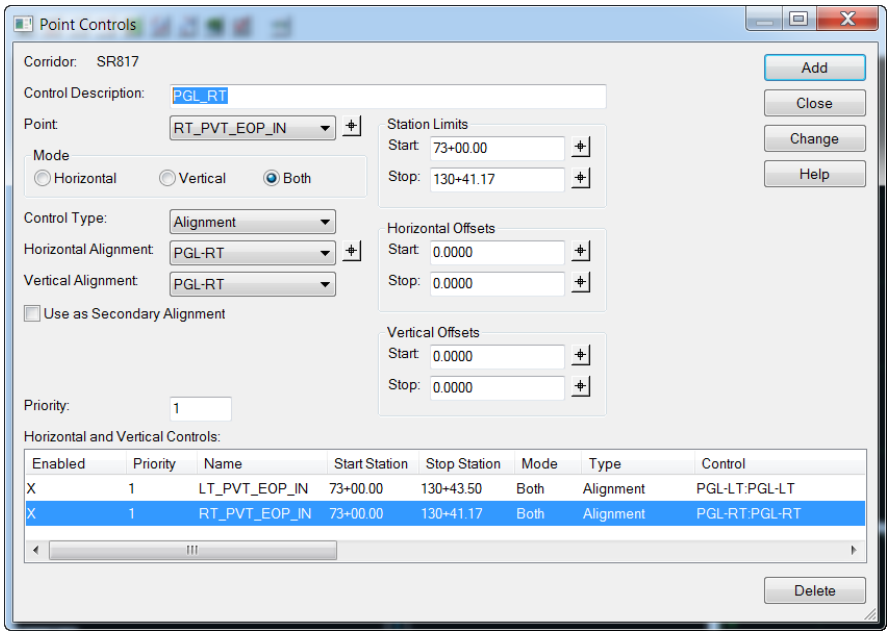


5. Change the Stations in the cross section view. Notice how the pavement widths change for each of the roadways. This is because they are now following the Style Milling from the imported graphics.
6. Select **Corridor** > **Point Controls**. The Point Controls dialog displays. See image below.
7. Enter PGL_LT for the Control Description
8. Select the **LT_PVT_EOP_IN** template point name to control.
9. Select the *Mode* option **Both** to control the point both horizontally and vertically.

10. Leave the *Control Type:* option on **Alignment.**
11. Select the **PGL-LT** for the *Horizontal Alignment* and **PGL-LT** for the *Vertical Alignment*
12. Leave the corridor's default *Station Limits* and *Offsets* values.
13. Click **Add** to store the new PGL_LT point control on the list.

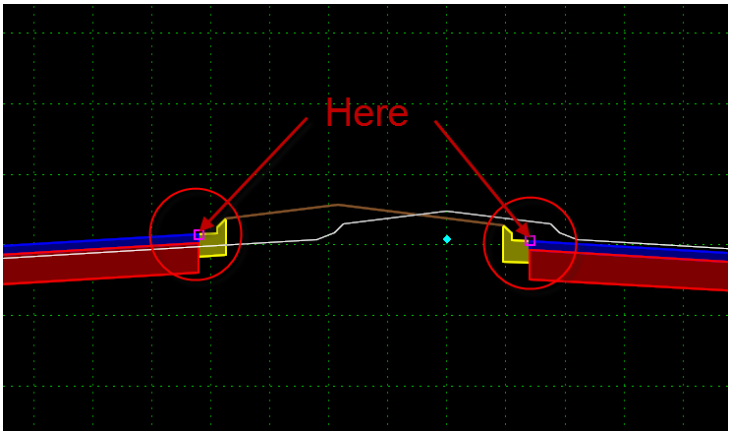


14. Repeat these steps to create another point control description PGL_RT for the **RT_PVT_EOP_IN** template point, using the **PGL-RT** for *Horizontal* and *Vertical Alignments* point control.
15. Click **Add** to store the new PGL_RT point control on the list.

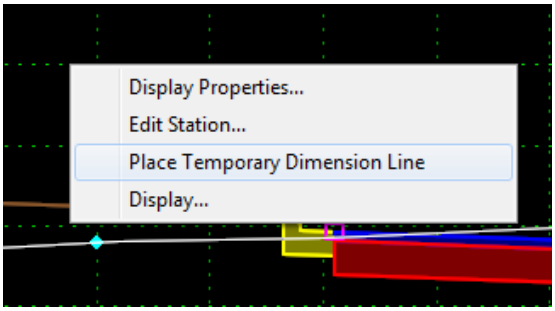


16. Close out of the Points Control dialog.

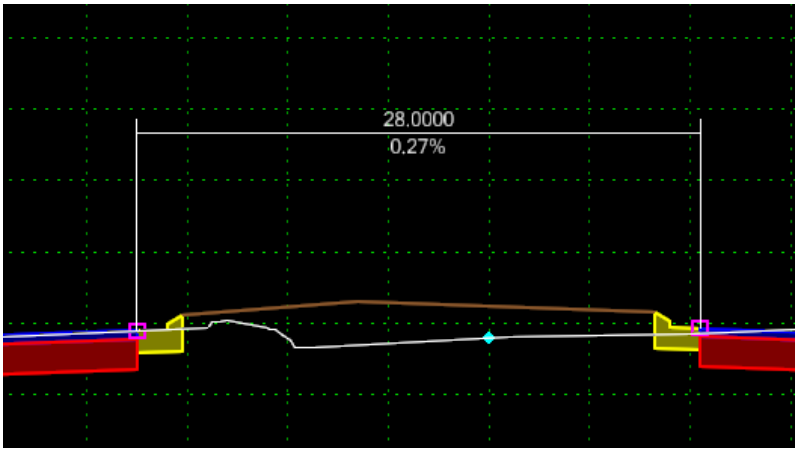
17. Notice in the Cross Section View there are new magenta squares added to the view where the point controls were added.
18. Use the *Station* control buttons to step through the cross section.



19. To validate the *Point* control changes, right click on the *Cross Section* window and click **Place Temporary Dimension Line**



20. At the prompt place a **Dimension Line** between the *PGL_LT* and *PGL_RT***.**

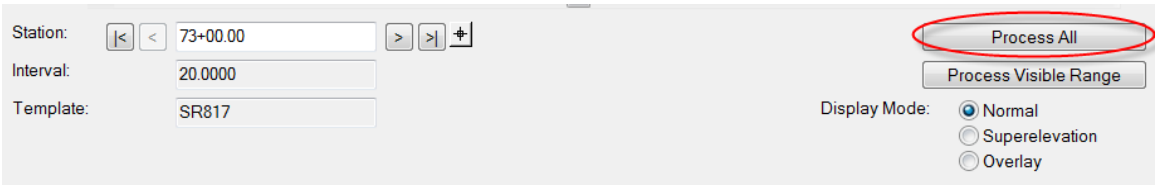


21. Change the *Stations* to see that the *slope* between the **PGL point** controls varies. This is because the profile grade lines are different for each side of the roadway.
22. Select **File > Save** to save the changes to the **SR817.ird.**

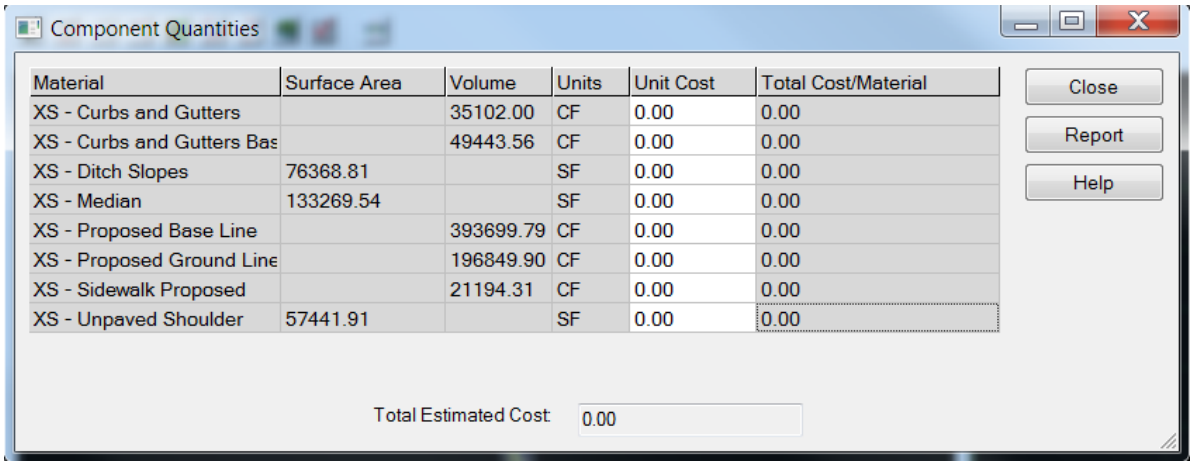
Note Depending on the station, the slope value will differ.

➢ *Component Quantities*

1. From the Roadway Designer dialog cross section view, use the **Station** toggle buttons at the bottom of the view to change the location of the template along the alignment. Notice the graphics displayed in the plan and profile windows. Click on the **Process All** button.

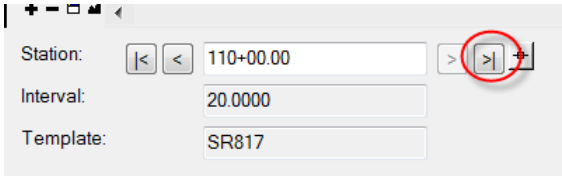


2. From the Roadway Designer dialog, select **Tools** > **Component Quantities** to display the dialog as shown below.



Material	Surface Area	Volume	Units	Unit Cost	Total Cost/Material
XS - Curbs and Gutters		35102.00	CF	0.00	0.00
XS - Curbs and Gutters Bas		49443.56	CF	0.00	0.00
XS - Ditch Slopes	76368.81		SF	0.00	0.00
XS - Median	133269.54		SF	0.00	0.00
XS - Proposed Base Line		393699.79	CF	0.00	0.00
XS - Proposed Ground Line		196849.90	CF	0.00	0.00
XS - Sidewalk Proposed		21194.31	CF	0.00	0.00
XS - Unpaved Shoulder	57441.91		SF	0.00	0.00

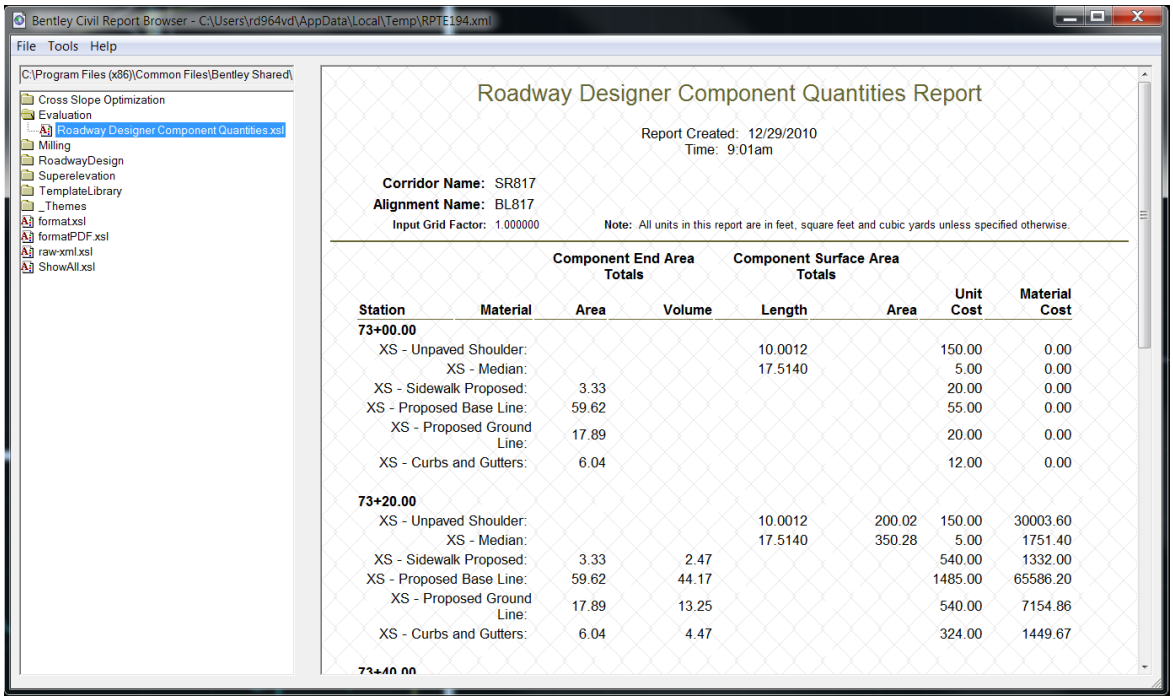
3. Click the Proceed to End button.



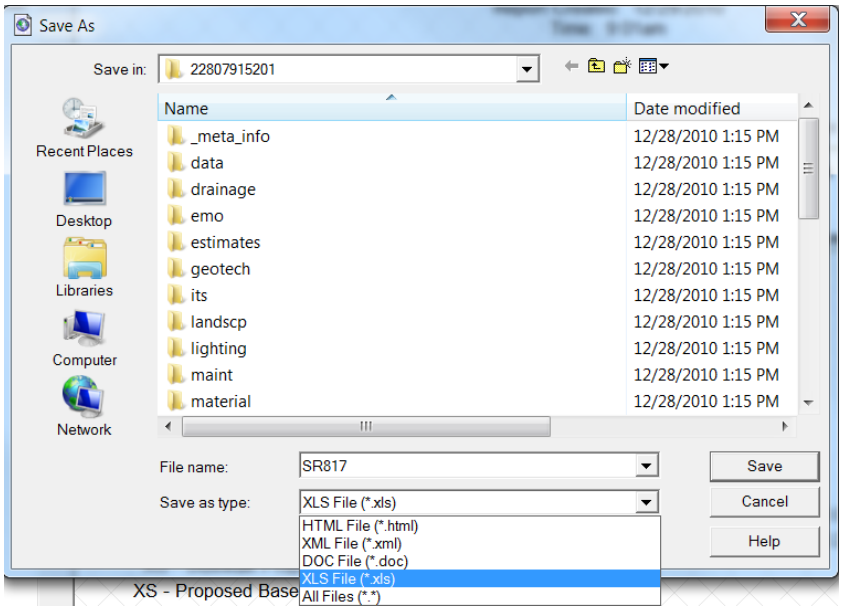
Note Notice how the component quantities update bases on the station along the corridor.

4. Select the **Report** button on the Component Quantities dialog. The Bentley Civil Report browser window displays.

5. Select the *Evaluation* folder and select the Roadway Designer Component Quantities *.xls*. The **Roadway Designer** *Component Quantities Report* displays in the window.



6. From the browser menu, select **File** > **Save As**. The *Save As* dialog opens.
7. Enter the *File Name* **SR817** and change the *Save as Type* to **XLS File (*.xls)**.

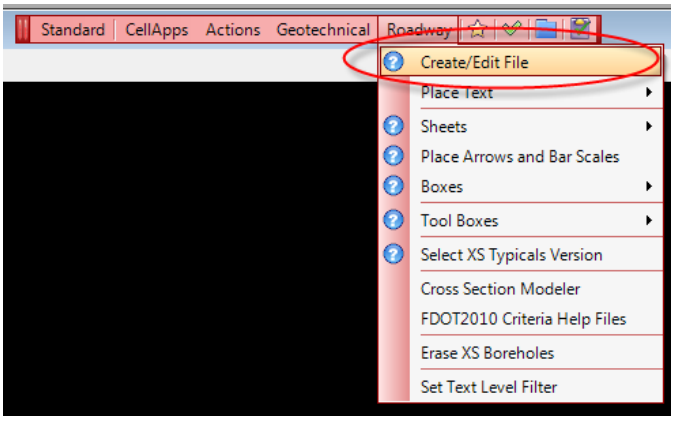


8. *Click the **Save** button to* create a Cost Estimate in Microsoft Excel format.
9. Close the Bentley Civil Report browser window.
10. Close the Component Quantities window.

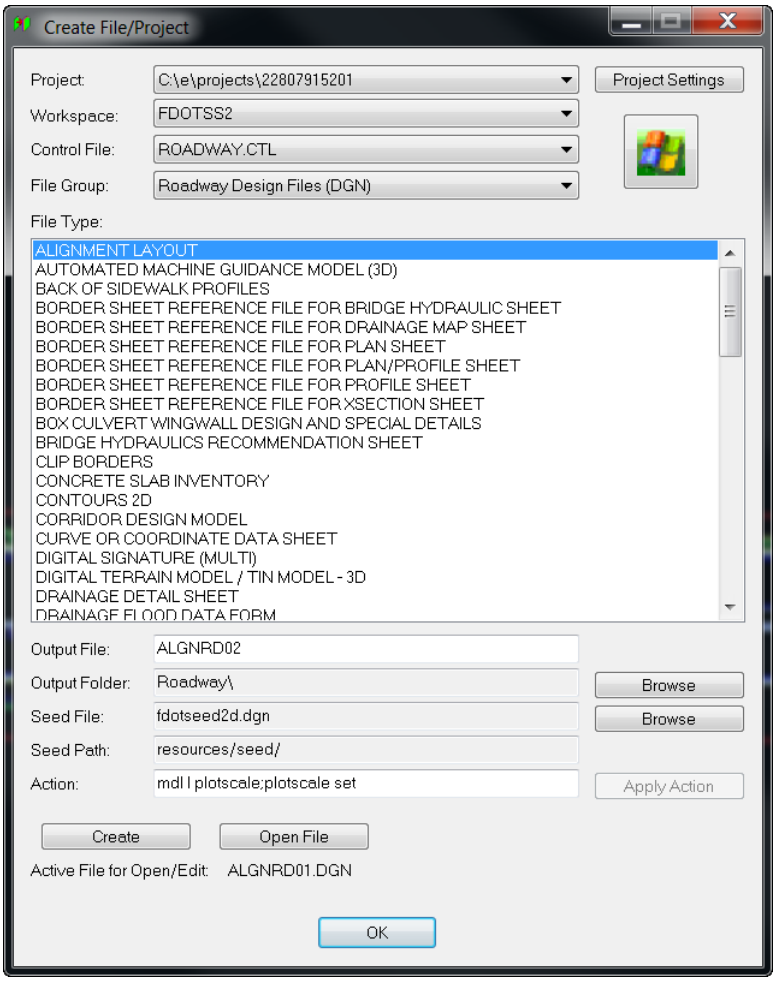
➢ *Create Surface*

In Roadway Designer, the Create Surface command will create a 3D Mesh Model. LEAVE Roadway Designer dialog open for this exercise. However, the dialog may need to be minimized.

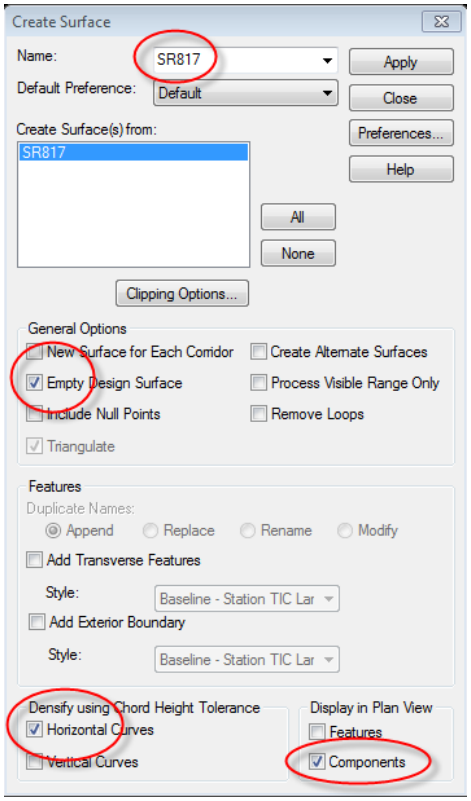
1. Select the FDOTSS2 menu option: **Actions** > **Create/Edit File** and to create a 3D MicroStation file *AMGMRD01.dgn* (Automated Machine Guidance Model (3D)).



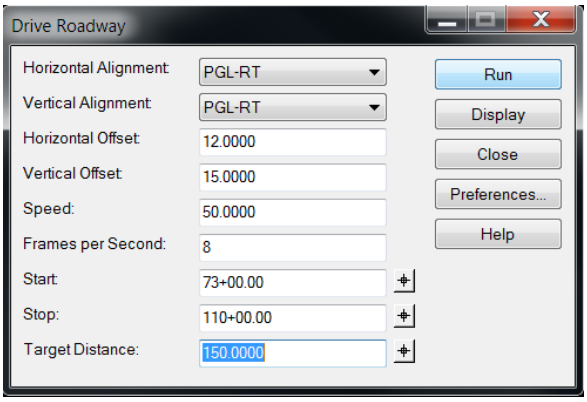
2. Complete the Create File/Project dialog as shown below. If the Project field is not set to the current exercise project, select the **Project Settings** button and click on the **Select Active Project** button.



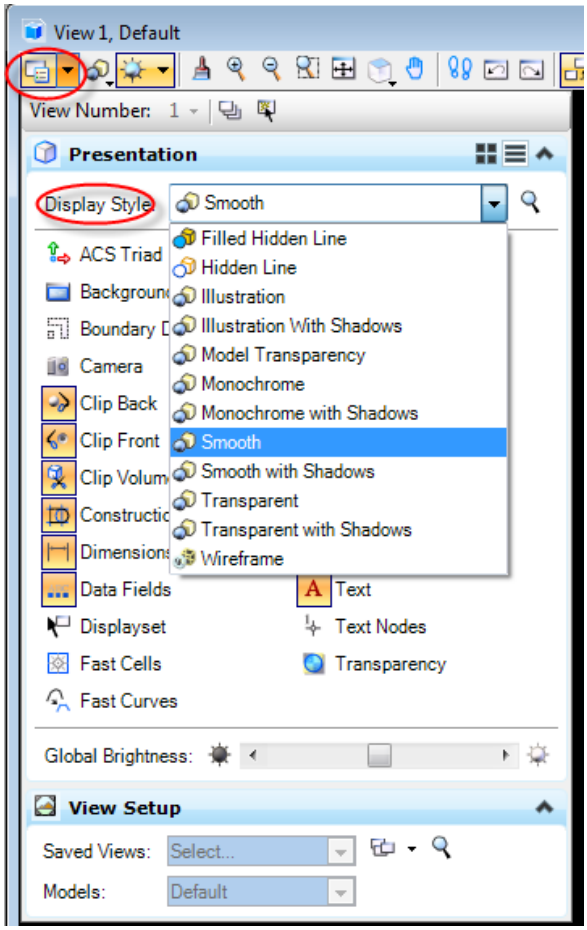
3. Click the **Create** button and then click **Open File**. The newly created MicroStation file will open.
4. Click **OK** to close the Create File/Project dialog.
5. Set *Plot Scale* to **50**. Click **OK.**
6. From the Roadway Designer menu, select **Corridor** > **Create Surface** <OR> click the icon, enter the *Name*: **SR817** and then complete the dialog as shown.



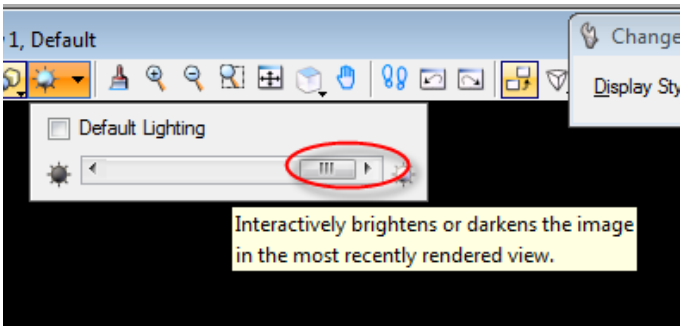
7. Click **Apply** to create the surface. Depending on the settings in the Tools Options dialog this process may take several seconds.
8. Close the Create Surface dialog and the mesh model elements are drawn into MicroStation file. **Fit View** to see the corridor results. It may be necessary to move the Roadway Designer and Corridor Modeling dialogs away from the view area.
9. From the Corridor Modeling dialog, click the **Drive Roadway tool** icon and set the Drive Roadway dialog options as shown below.



10. Select **Run**, click the **Escape** key to pause the *Drive Roadway* command.
11. When completed, change the MicroStation *View Display Style* from **Wireframe** to **Smooth**.

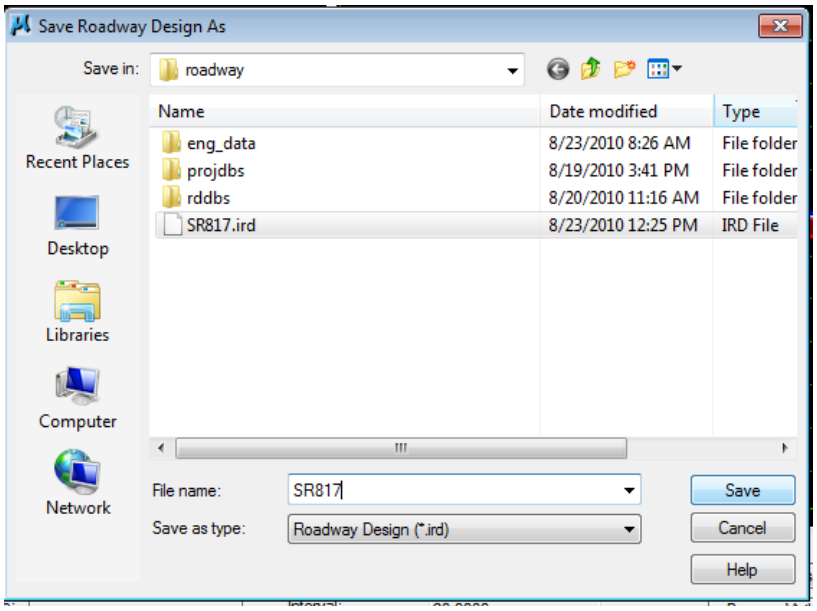


12. Change the **Light** setting to the bright**est**.



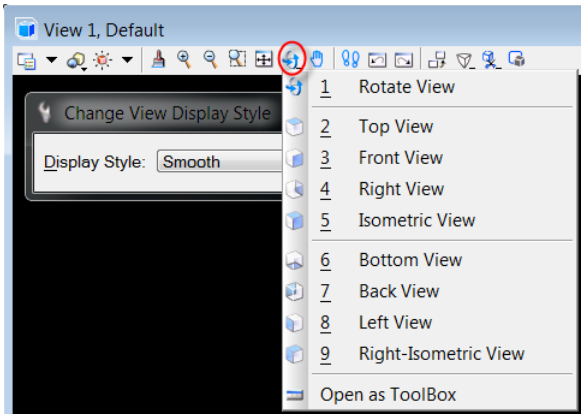
13. From the Drive Roadway dialog, click **Run**..
14. Repeat with other *View Display Style* changes, such as, **Frames per second** and or **Speed**.
15. Close the Drive Roadway dialog.

16. From the Roadway Designer dialog, select **File** > **Save**.



17. Close the Roadway Designer dialog.

> ***Note*** To return to a top view in MicroStation, click the *View Rotation* icon, click **Top**, and then **Fit View**.



18. Change the *View Display Style* back to **Wireframe** and select the MicroStation menu option **File** > **Save Settings** to save the current view.

> ***Note*** To create animations using the MicroStation animation tools refer to the white paper delivered in the **c:\FDOTSS2\GEOPAK\corridor\help** folder entitled, "**MS drive thru animation preview**". This is the preferred method for presenting more controllable "Drive Thru" conditions once the 3D design model has been finalized.

7 SUPERELEVATION

Superelevation rotates pavement cross slopes through a curve so that vehicles can maintain stability at the design speed. The Superelevation Commands compute the necessary Superelevation rate, determine how the road will transition from normal crown to full Superelevation and calculates the station locations of these transitions for each curve in the corridor. The Create Superelevation Wizard is used to establish Superelevation for the roadway. The Table option automates creating the initial Superelevation point controls and control lines based on the FDOT Design Standard criteria.

MENU OPTIONS

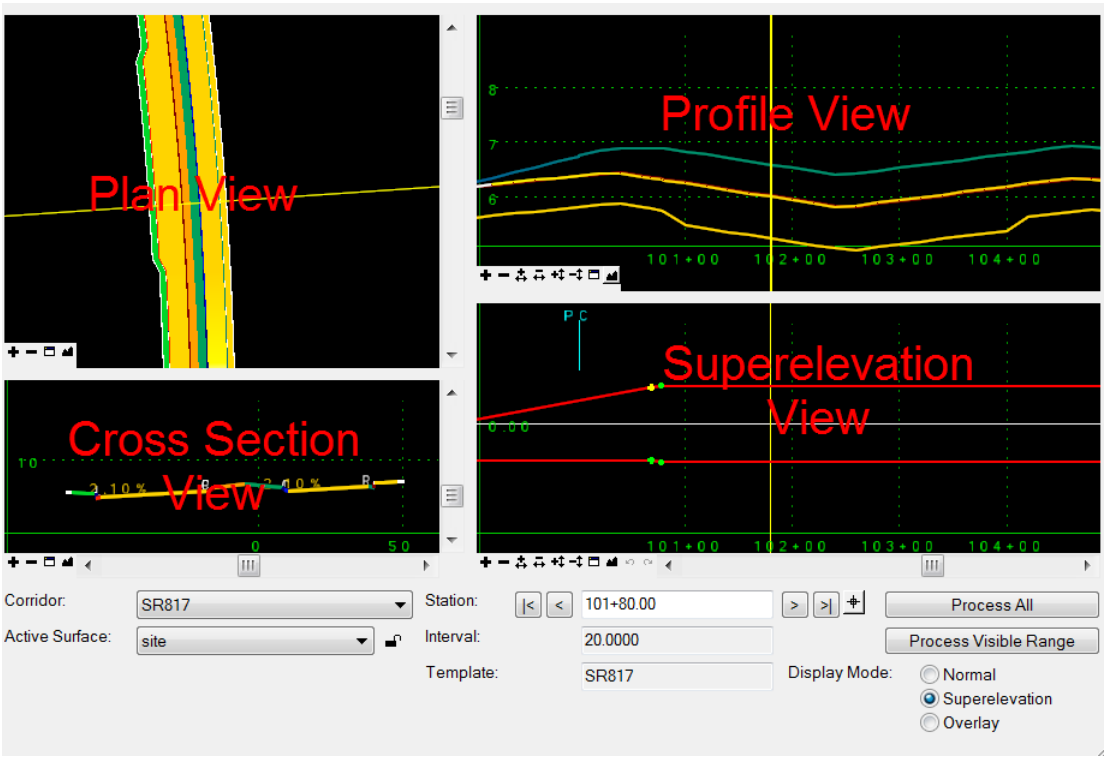
The Superelevation Menu is located on the Roadway Designer dialog and includes the following Commands:

- **Create Superelevation Wizard** - Used to step through the process of entering Superelevation criteria. There are three available methods to input the data: AASHTO, Fixed Length or Table. FDOT uses the Table method. After running the wizard, Superelevation control lines are automatically created and assigned to template points (through Point Controls) to determine how the points (edges, lanes, etc.) will rotate in Superelevation.
- **Create Single Control Line** - An alternate method of setting up Superelevation criteria by manually creating Superelevation control lines, which controls the cross slope of template points in Superelevation. This is also useful when the cross slope of the roadway is not truly in Superelevation, such as matching the vertical grade of the main roadway for an approach road (i.e. On ramp).
- **Apply Shoulder Rollover Lock** - Special Superelevation control lines and point controls are assigned to shoulder points, which determine how shoulders will rotate in Superelevation. FDOT uses multiple rollover locks on shoulders for 10% maximum Superelevation rates as defined in the Design Standards.
- **Import Superelevation from ASCII** - Allows you to import an ASCII Superelevation file (pipe delimited format) to create Superelevation control lines. This file is generated and saved from the Roadway Designer Superelevation Report.
- **Import Superelevation from INP File** - Allows you to import, from GEOPAK Shape Maker, Superelevation data from an alignment created in previous versions. This creates Superelevation control lines matching the previous super table.
- **Superelevation Report** - Generates an XML report of the superelevated points and/or their corresponding control lines.

SUPERELEVATION DISPLAY MODE

When Display Mode is changed to Superelevation, the Roadway Designer dialog is then updated with 4 new views:

- Plan View - this is color filled by slope values, the end condition slopes are omitted,
- Cross Section View – this is color coded by slope value and Superelevation points are labeled,
- Profile View – this displays a profile for each template point ,
- Superelevation View – this displays the Superelevation control lines in relation to the crown point, the zero line.



Note	The Superelevation Table Wizard (FDOT's preferred method of setting up Superelevation criteria) is explained below. For information on other methods or the concept of Superelevation in general, refer to Superelevation Overview in the Reference Information Help file.

TABLE WIZARD

The Superelevation Wizard steps through the process of entering Superelevation values. These values include selecting the appropriate FDOT Superelevation rate table.

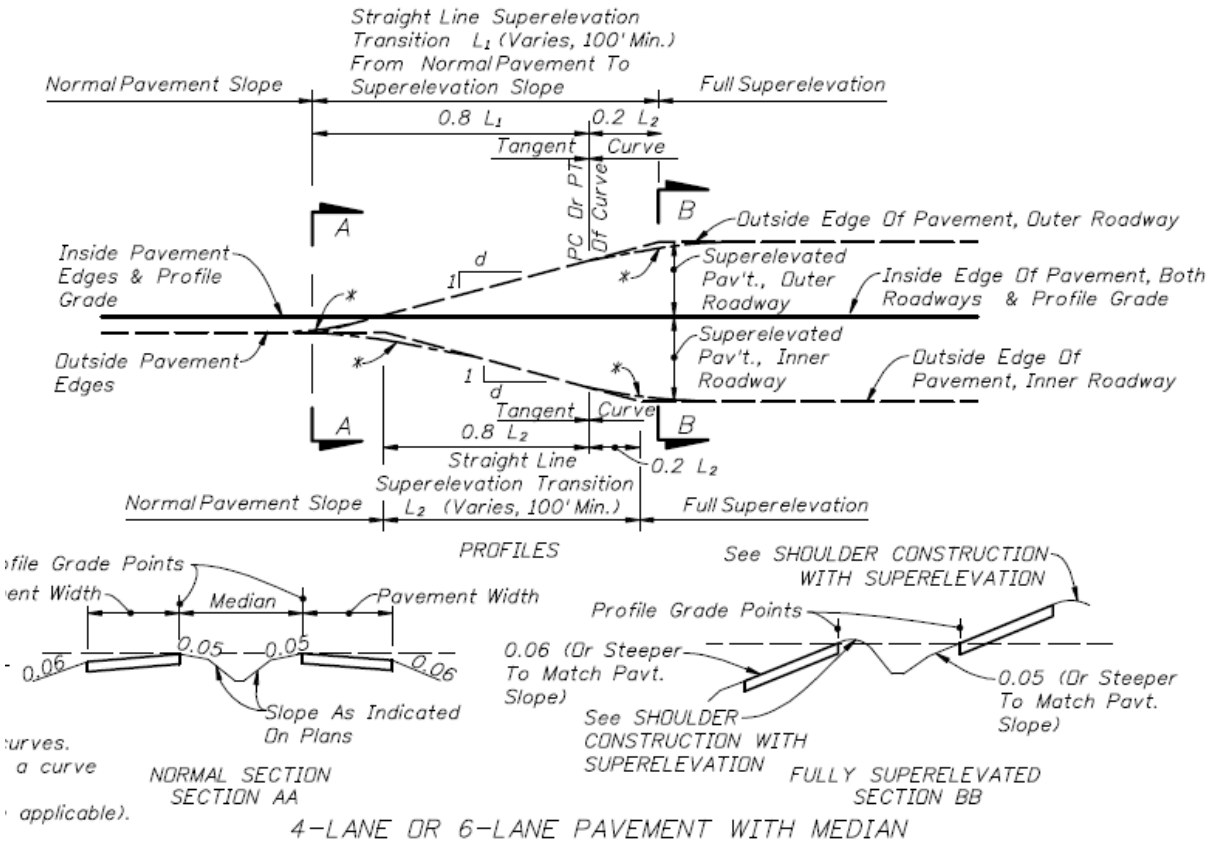
FDOT uses the Table method to calculate Superelevation rates. This method complies with AASHTO guidelines and incorporates FDOT's Superelevation standards by utilizing custom Superelevation tables located in the FDOT workspace. The FDOT Superelevation tables specify maximum Superelevation rates, along with spiral transition lengths, for a range of curve radii. The tables are text files, which can be opened in Notepad or any word processor. They are categorized by a maximum Superelevation rate and a design speed. For example, a table named 05_50.sup contains FDOT standard values for curves at a 5% maximum Superelevation rate at a 50 mph design speed.

For more information on Superelevation rate tables, see Superelevation Rate Table (.sup) Descriptions in the Online Reference Information Help.

Additional Superelevation criteria set via the Wizard includes:

- pivot point location (centerline, inside edge),
- range point locations (to designate the fully superelevated portion of the template),
- station range for different design criteria and
- the number of lanes to be superelevated.

The illustration below shows an example of pivot and range point locations for a template cross slope as it rotates through Superelevation. In this example, the template pivots about the crown points (the PGL lines) and the range points (left and right edge of pavement) define the range of points that will rotate to full super. The Wizard stores this information in Superelevation Sections. In addition to the pavement rotation, the shoulder appears to rotate along with pavement. The Sections are a set of super values applied to a station range along the corridor. If the design speed changes at any point along the corridor, end one section and start another.



SUPERELEVATION WIZARD RESULTS

The wizard automatically creates:

- Superelevation control lines for each point super elevated on the template
- Vertical point controls for these points.
- Color-coded plan display that varies by cross-slopes for the components within the template backbone.
- Color-coded view cross section display of the template backbone along with the cross slope annotations.

The profile display shows color-coded grade lines for all points on the template backbone. Right-click to control which template points are displayed (i.e. the left and right edges of roadway). The Superelevation diagram shows the control lines along the corridor.

The control lines in the Superelevation diagram view are the graphical representations of cross slope over a station range (stationing or length along the x-axis and cross slope on the y-axis). A horizontal line represents a constant cross slope along a station range, whereas a sloped line represents a linear change in cross slope along a station range. An infinite number of control lines can be assigned to an infinite number of points in a corridor. The control lines can be created to control any change in cross slope between two points in the template (i.e. sidewalk, gutters, etc.) The control lines are colored in the diagram for visual clarification only. Unlike the plan, profile and cross section views, the line colors do not correlate to any Superelevation values.

The Wizard automatically creates the vertical point controls that correspond to each Superelevation point control line. Open the Point Controls dialog to review the vertical point controls created by the Superelevation Wizard. The Wizard also calculates Superelevation rates for each curve on the horizontal alignment and stores these in the geometry project (ALG file). The Superelevation section definitions (the point controls and control line information) are stored in the IRD file.

EXERCISE OVERVIEW

7.1 Calculating the Initial Superelevation

7.2 Controlling Superelevation Displays

7.3 Editing Superelevation

7.4 Moving Superelevation Control Points

7.5 Editing Curve Set Stations

7.6 Superelevation Reports and Save to ASCII file

7.7 Removing Superelevation and Import Superelevation from ASCII

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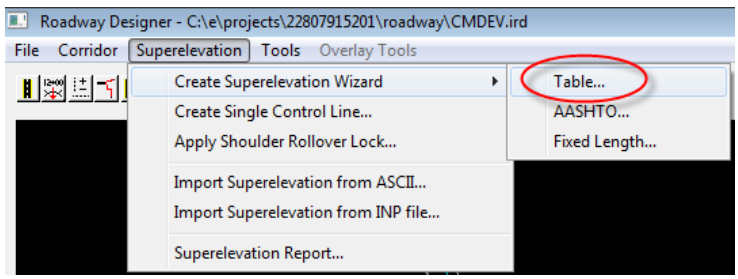
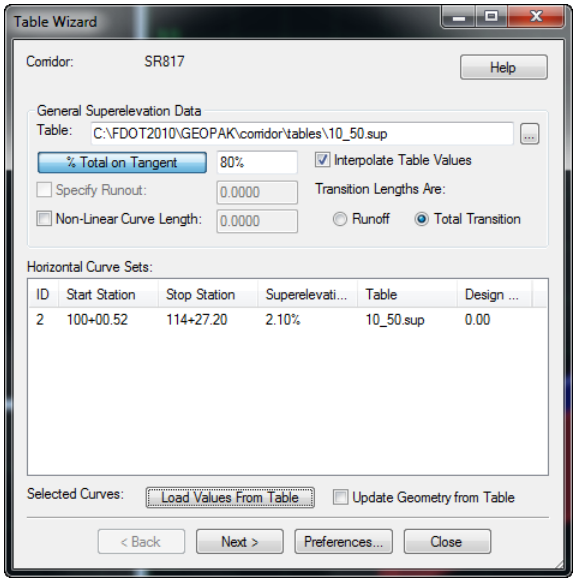
Exercise 7.1 Calculating the Initial Superelevation

In this exercise the proposed roadway design file, *DSGNRD01.dgn*, will be opened with GEOPAK using the FDOT workspace and Project configuration. The GEOPAK Project Manager is loaded for the project.. The Create Superelevation Table Wizard is opened from the Superelevation pull down menu on the Roadway Designer dialog. The project corridor has one curve along the alignment that requires Superelevation based on the design speed for the facility. The Superelevation wizard will calculate the required cross slopes and transition station locations based on the curve table chosen from the available FDOT Superelevation curve tables. The Point controls needed to rotate the pavement slopes for the corridor through the curve are also created.

1. Optional, extract the *22807915201(7).zip* file in the *c:\e\projects* folder.
2. In the Corridor Modeling dialog, load the project preferences **SR817.rdp** from the previous exercises.
3. Open Roadway Designer dialog and open the Roadway Designer project settings **(SR817.ird)** file.
4. From the Roadway Designer dialog, open the Table Wizard dialog by selecting **Superelevation** > **Create Superelevation Wizard** > **Table…**.



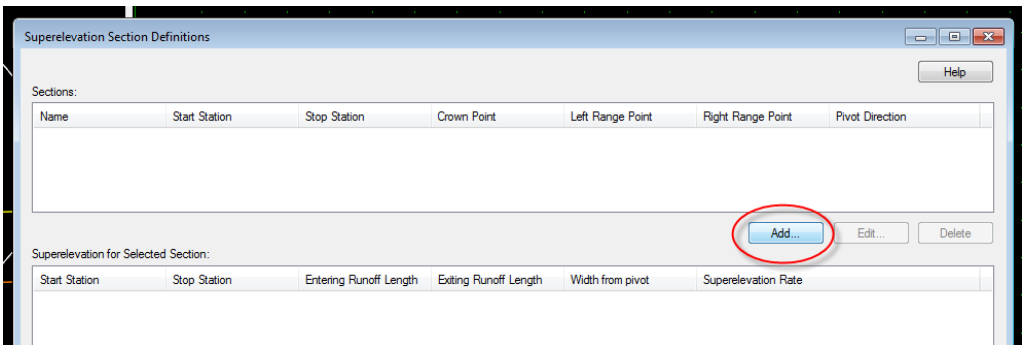
5. From the Table Wizard dialog, select the desired super Table, **10_50.sup** located in the *C:\FDOTSS2\GEOPAK\corridor\tables* folder. This file corresponds to the curve table for a HIGH SPEED RURAL Facility (10% E Max) with a design speed of 50 MPH.
6. Continue to enter information into the Table Wizard dialog as shown below.



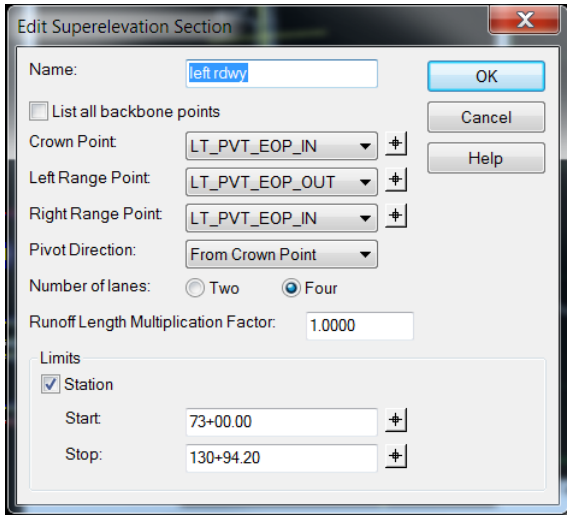
Note If the curves need different design speeds or maximum super rates (i.e. different tables), highlight the curves to load from this table.

7. Click **Load Values From Table.** The rate values are read from the table and updated for the horizontal curve set listed in the dialog box or highlighted.

8. Click **Next** and then click the **ADD** button on the Superelevation Section Definitions pane. This displays the Add Super Elevation Section dialog.



9. From the Add Superelevation Section dialog, select the **Crown Point, Left Range Point** and **Right Range Point**, using the drop down lists <OR> the Target buttons as shown below.



Note	The Range Points are the template points at edges of the template section to be rotated in the superelevated portion of the alignment. .

10. Select **Four** for the *Number of Lanes:*

11. Key-in **1** for *Runoff Length Multiplication Factor*.

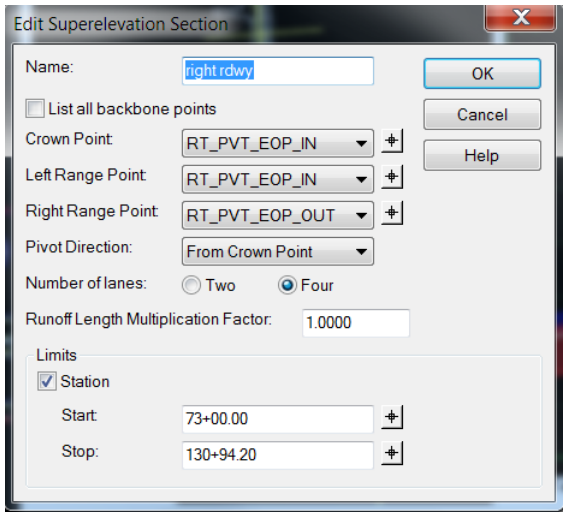
Note	This is typically used only when there are more than four lanes.

12. Set the *Begin Station* limit to **73+00**.

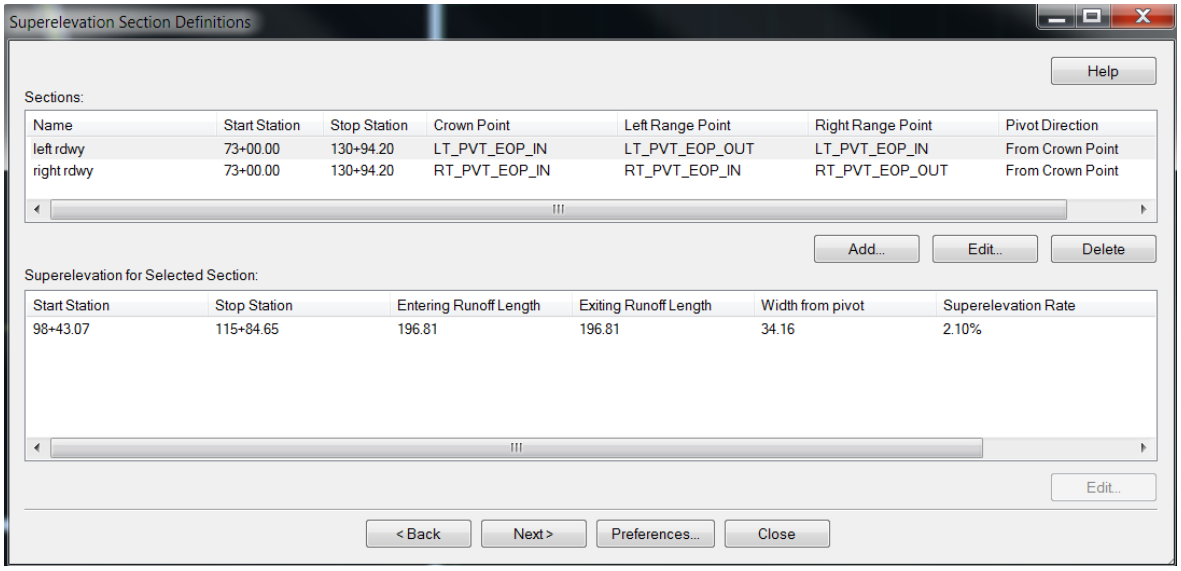
Note	Station limits are used to define Superelevation section criteria limits. If Superelevation design criteria changes (such as different pivot points, range points or different number of lanes), then create a new section to specify the different criteria. However, using multiple tables along the alignment does not require multiple sections.

13. Click **OK**.

14. Click **Add** to create another *Superelevation Section*, **right rdwy,** repeating steps 6 through 10 to add the **right rdwy** section.



15. The completed Superelevation Section Definitions dialog should look as follows:

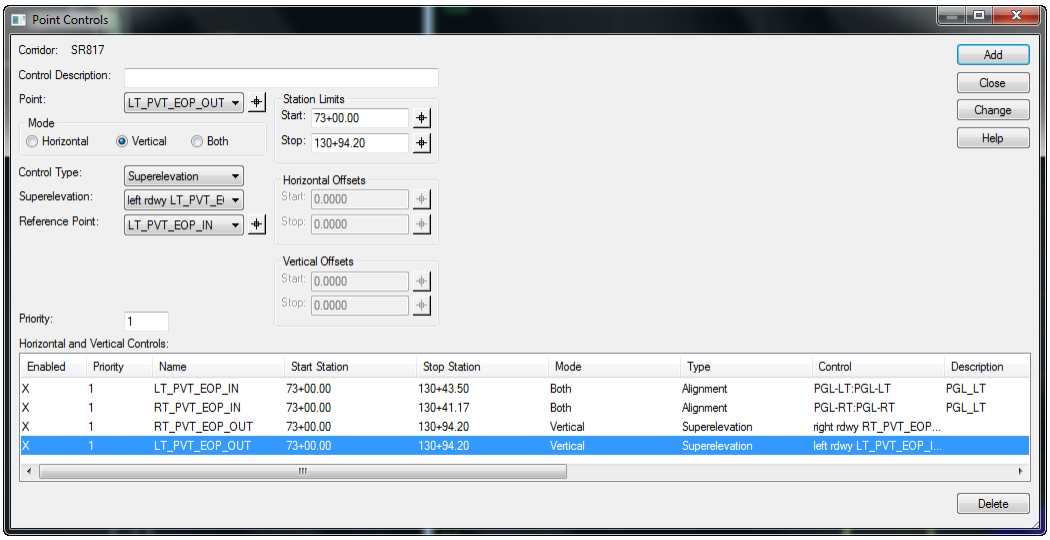


16. Click **Next** on Superelevation Section Definitions dialog to display the Superelevation Controls dialog.

> ***Note*** This box lists point controls that are created automatically by the Wizard. The point controls determine the vertical location (by defining a cross slope) of template points (those at and inside the range points) while rotating in Superelevation. Use the Edit button to make changes in the control lines as needed. Use the Delete button to remove unnecessary point controls.

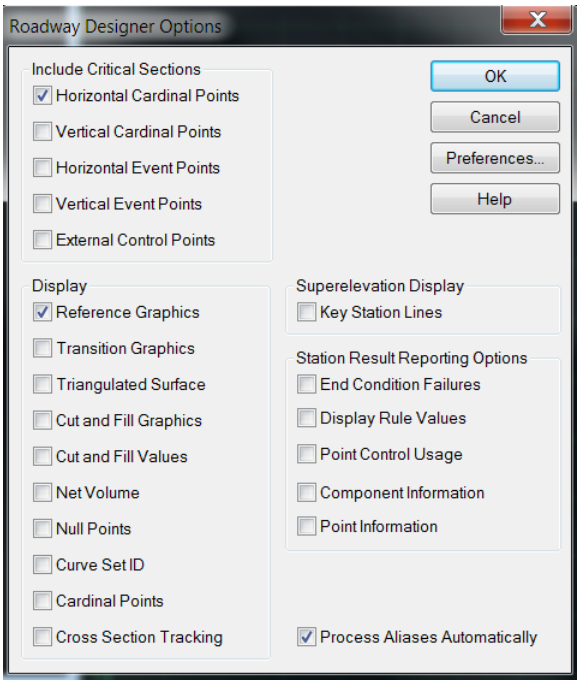
17. Click **Finish** to complete Superelevation Wizard. The Superelevation Wizard creates Superelevation control lines and uses point controls to assign them to the template points within the Superelevation range.

18. Open the Point controls dialog, click **Corridor** > **Point Controls** from the Roadway Designer Dialog menu.



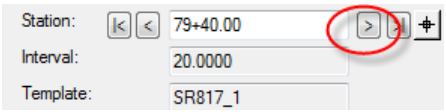
Note	Notice the new point controls corresponding to each control line on the Superelevation diagram. The Superelevation control lines are displayed on the Superelevation diagram view in Roadway Designer. The control lines represent the percent cross slope (vertical axis) at each station (horizontal axis) for each point that is superelevated in the super range.

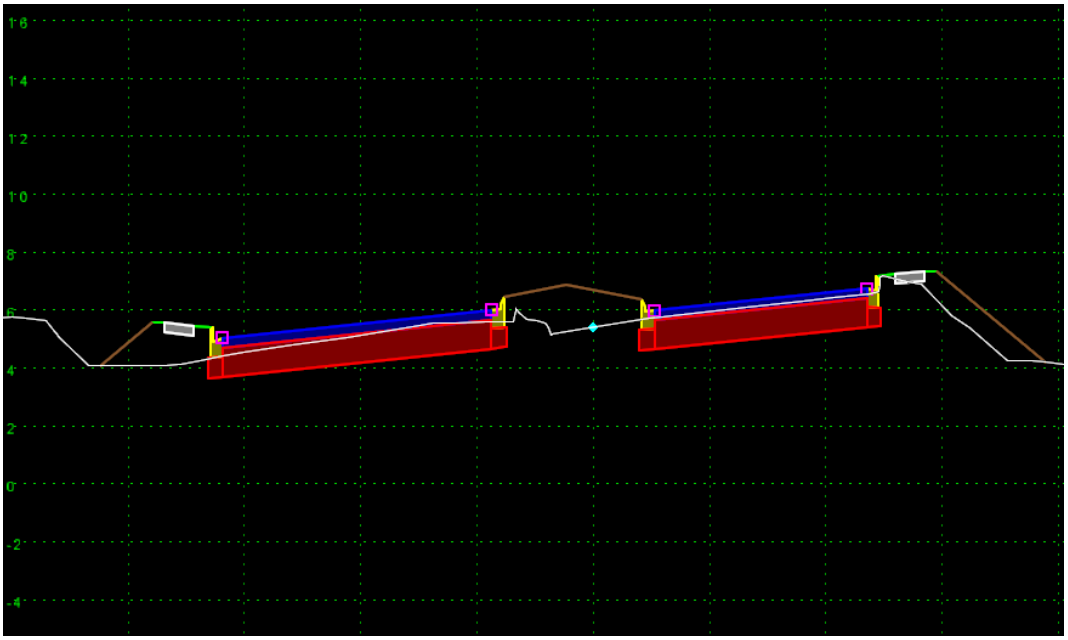
19. Select **Tools** options to be sure that only the *Horizontal Cardinal Points* are checked **on** and the close the Roadway Designer Options dialog.



20. Click **Process All.**

21. To see the *Superelevation* results, change the *cross section view* **Stations** through the curved part of the project.





22. Select **File** > **Save** from the Roadway Designer dialog. Superelevation control is saved in the .ird file for the project.

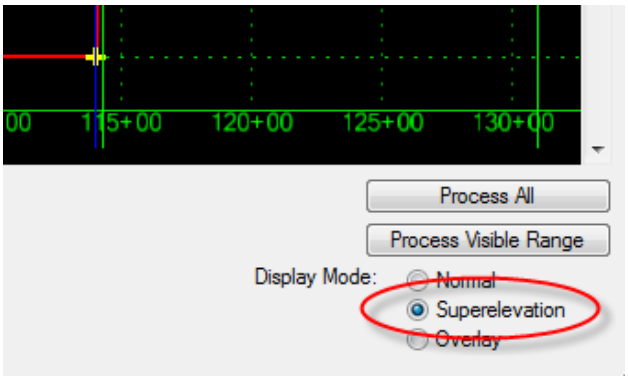
Exercise 7.2 Controlling Superelevation Displays

In this exercise the Roadway Designer dialog Display Mode is changed to Superelevation. The Roadway Designer dialog is then updated with 4 new views:

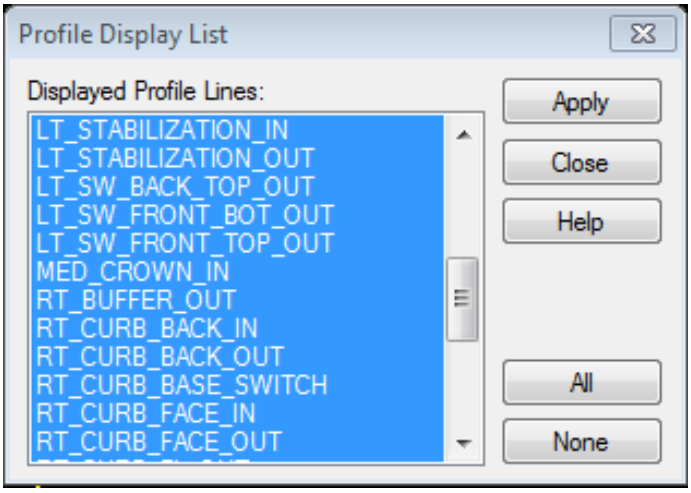
- A plan view - this is color filled by slope values, the end condition slopes are omitted,
- A cross section view – this is color coded by slope value and Superelevation points are labeled,
- A profile view and – this displays a profile for each template point ,
- A Superelevation view – this displays the Superelevation control lines in relation to the crown point, the zero line.

Also in this exercise, the profile display list will be changed to only include the 4 edge of pavement lines. This exercise is to review Superelevation design layout.

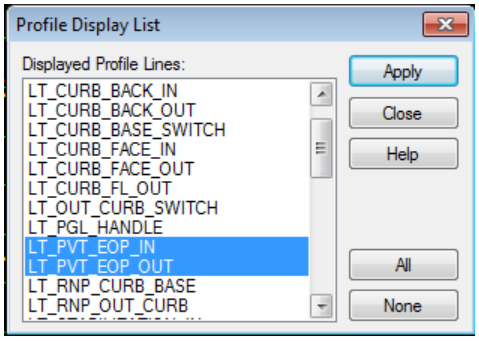
1. From the Roadway Designer dialog, select the **Display Mode: Superelevation** radio button to view the Superelevation diagram.



To set which profile lines are displayed in the Superelevation diagram, Right-click in the Superelevation profile view to open the Profile Display List dialog and click **Superelevation Display List**.

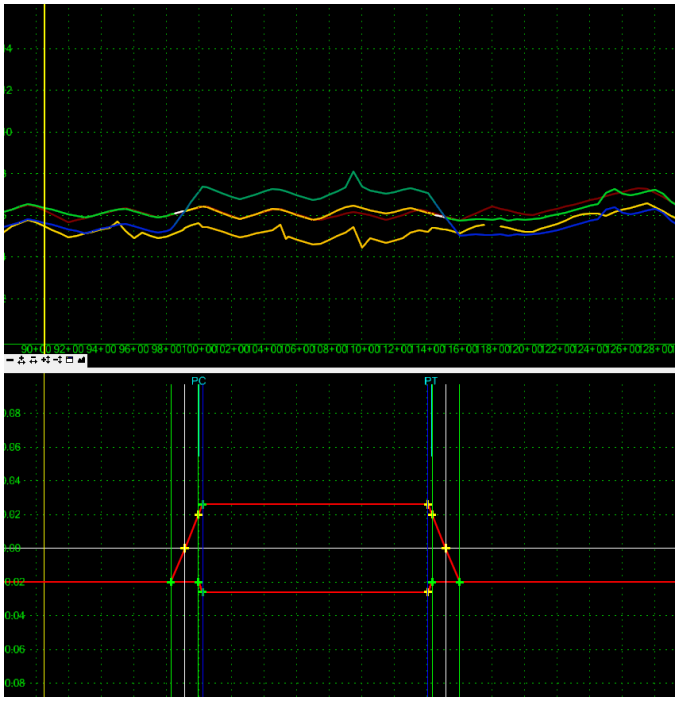


2. From the Displayed Profile List dialog, click **None** to clear and then select only the following control lines to be displayed:
   a. Left inside edge pavement, LT_PVT_EOP_IN
   b. Left outside edge of pavement, LT_PVT_EOP_OUT
   c. Right inside of pavement, RT_PVT_EOP_IN
   d. Right outside of pavement, RT_PVT_EOP_OUT



Note Press the Ctrl keys and select multiple profile lines to display.

3. Click **Apply**. The Superelevation profile diagram is updated with the only the selected control line displayed.



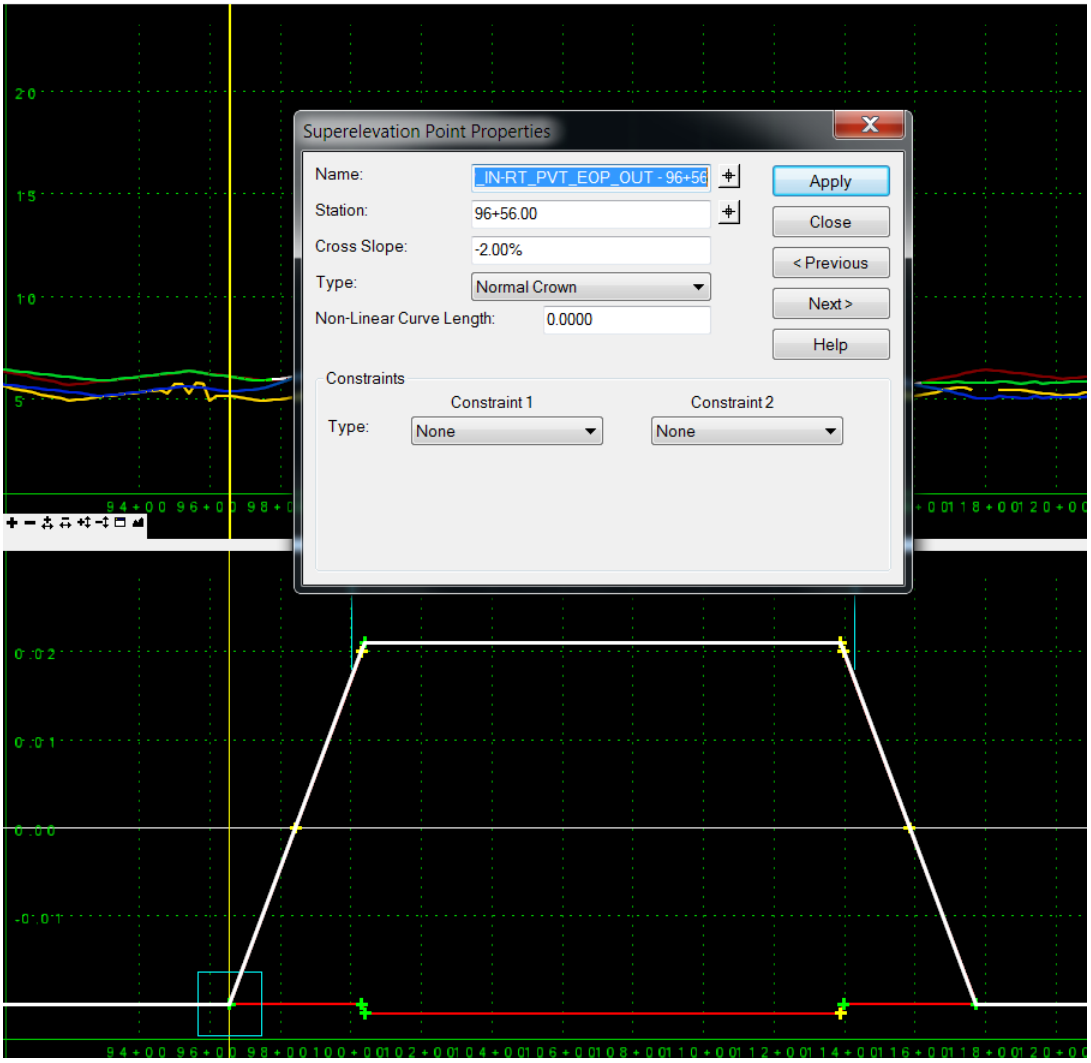
4. To edit the Superelevation Criteria, such as, a point's cross slope or max super rate, the normal crown, runoff or full super locations, etc., use one of the following methods:
   a. Edit Superelevation Point Properties (via dialog box settings).
   b. Graphically Move Superelevation Points (using dynamic settings).
   c. Edit Curve Set Stations (in table format).

Note Exercises 7.3 – 7.5 explore each of these methods.

Exercise 7.3 Editing Superelevation

In this exercise the Superelevation control line points will be edited using the Superelevation Point Properties dialog. The Station and Cross Slope can be changed in this dialog. If the Superelevation wizard calculations need to be overridden they can be calculated by another method and entered here in a manual mode.

1. From the Roadway Designer dialog, select the **Display Mode: Superelevation** radio button to view the Superelevation diagram.
2. Right click on the beginning point of the transition in the Superelevation diagram and then click **Edit Point.** The Superelevation Point Properties dialog displays.

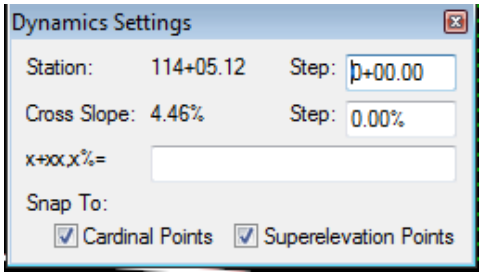


3. Change the *Station* value to an even station**, i.e. 96+56** and then click **Apply.**
4. Close the Superelevation Point Properties dialog**.**

Exercise 7.4 Moving Superelevation Control Points

In this exercise the Superelevation control line points will be moved using the Dynamic Settings dialog. The Station and Cross Slope can be changed in this dialog. If the Superelevation wizard calculations need to be overridden they can be calculated by another method and entered here in a manual mode.

1. From the Roadway Designer dialog, select the **Display Mode: Superelevation** radio button to view the Superelevation diagram.
2. Right-click on the next point on the superelevation transition control line and click **Move Point**. The Dynamics Settings dialog displays.
3. Move the cursor to dynamically change the location of the point. OR…



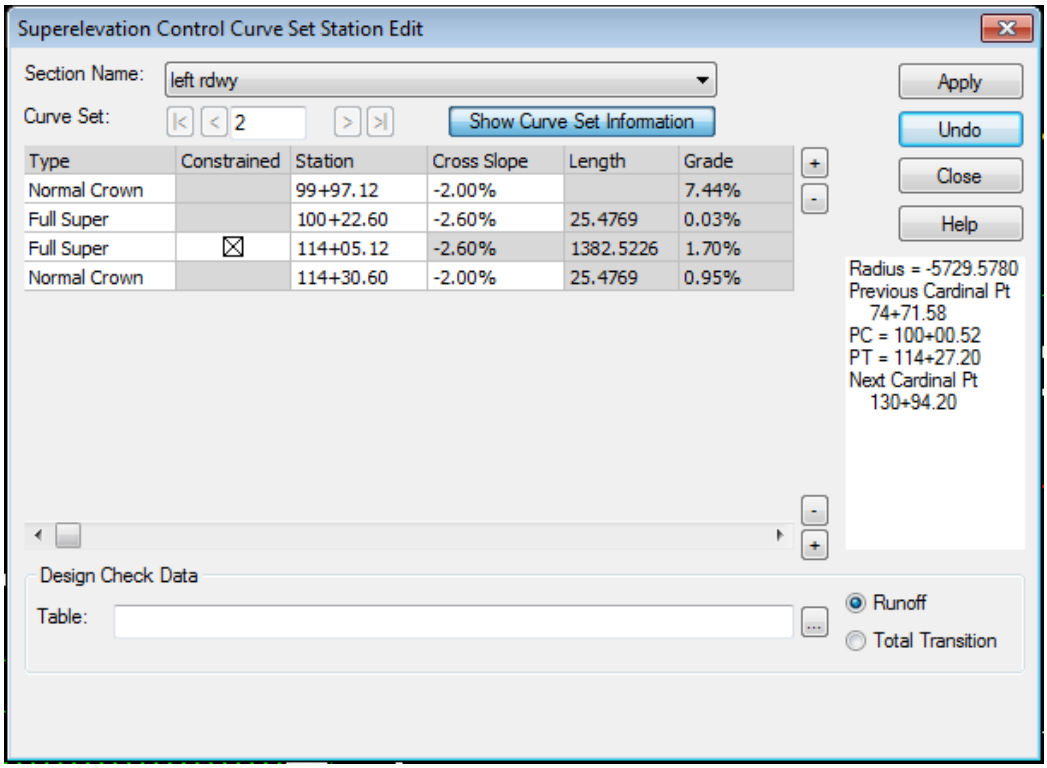
4. In the **x+xx,x%** field, enter the nearest whole or even station and cross slope to move the point.

> ***Note*** Use the syntax <Station, Cross Slope> when keying in the Dynamic Settings box. Express the cross slope as either a % or decimal (334+25,5% or 334+25,.05).

Exercise 7.5 Editing Curve Set Stations

In this exercise the Superelevation control line points will be edited using the Edit Curve Set Station dialog. The Station and Cross Slope information can be changed in this dialog. If the Superelevation wizard calculations need to be overridden they can be calculated by another method and entered here in a manual mode. This method would be used if there were curve sets that calculated overlapping Superelevation stations. This often happens on reverse curve alignments with little distance between curve points of successive curves.

1. From the Roadway Designer dialog, select **Display Mode: Superelevation** radio button to view the Superelevation diagram.
2. Right-click in the superelevation diagram control line view and then click **Edit Curve Set Stations**. The Superelevation Control Curve Set Station Edit dialog displays.



3. Use the *Curve Set* controls to select the desired curve and verify the desired *Section Name* is correct from the drop down menu.
4. Click **Show Curve Set Information** to display curve data in the lower right corner of the dialog box.
5. Add or Remove *Data* for other curves within the super section from the list by using the buttons to the right of the data area.
6. Modify **Stations** and **Cross Slopes** in white cells by changing the data entries.
7. Press the **Tab** key to move to the next editable field.
8. Edit **Reverse Crown** stations by toggling off the **Constrained** check box. If the *Constrained* check box is toggled back on, the station will revert back to its original value.

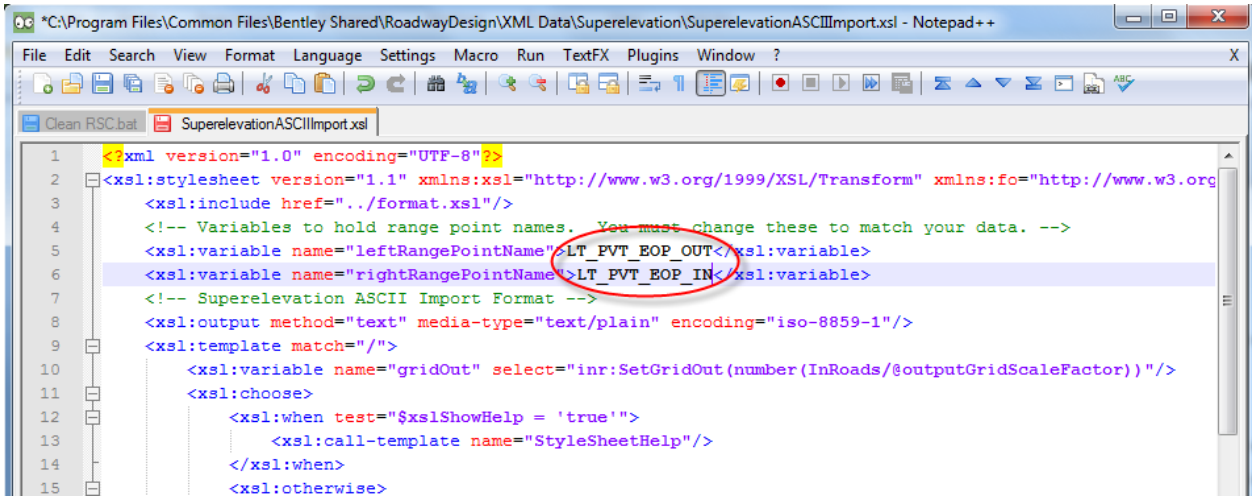
   Note Changing previously constrained stations may result in kinks in the control line.

9. Click **Apply** to accept the changes.
10. Click **Undo** to discard any changes, if desired.

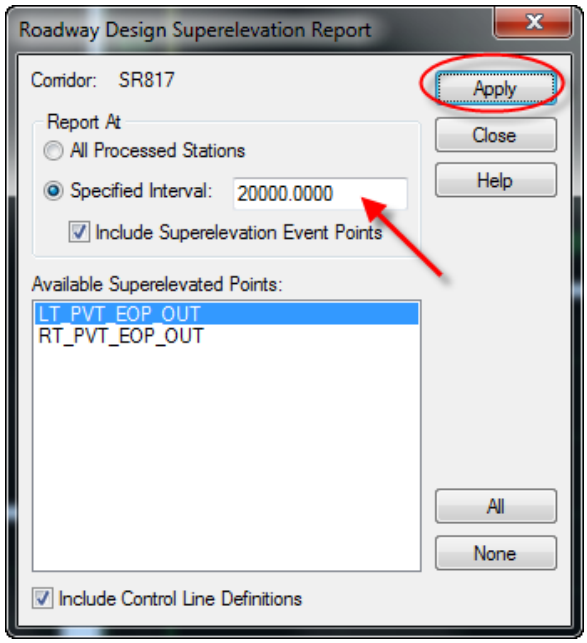
Exercise 7.6 Superelevation Reports and Save to ASCII

In this exercise the Superelevation control line points can be saved using the Roadway Designer Superelevation Report dialog. The Superelevation sections and ranges can be saved entirely along with the control points in the Point Controls dialog in an ASCII file. This file can then be edited and re-loaded if something changes on the template or if the method of Superelevation changes.

1. Open Windows Explorer and navigate to the C:\ProgramFiles\CommonFiles\Bentley Shared\RoadwayDesign\XMLData\Superelevation directory. To save the Superelevation for the left rdwy, edit the SuperelevationASCIIImport.xsl file and change the *leftRangePointName* to **LT_PVT_EOP_OUT**. Change the *rightRangePointName* to **LT_PVT_EOP_IN**.

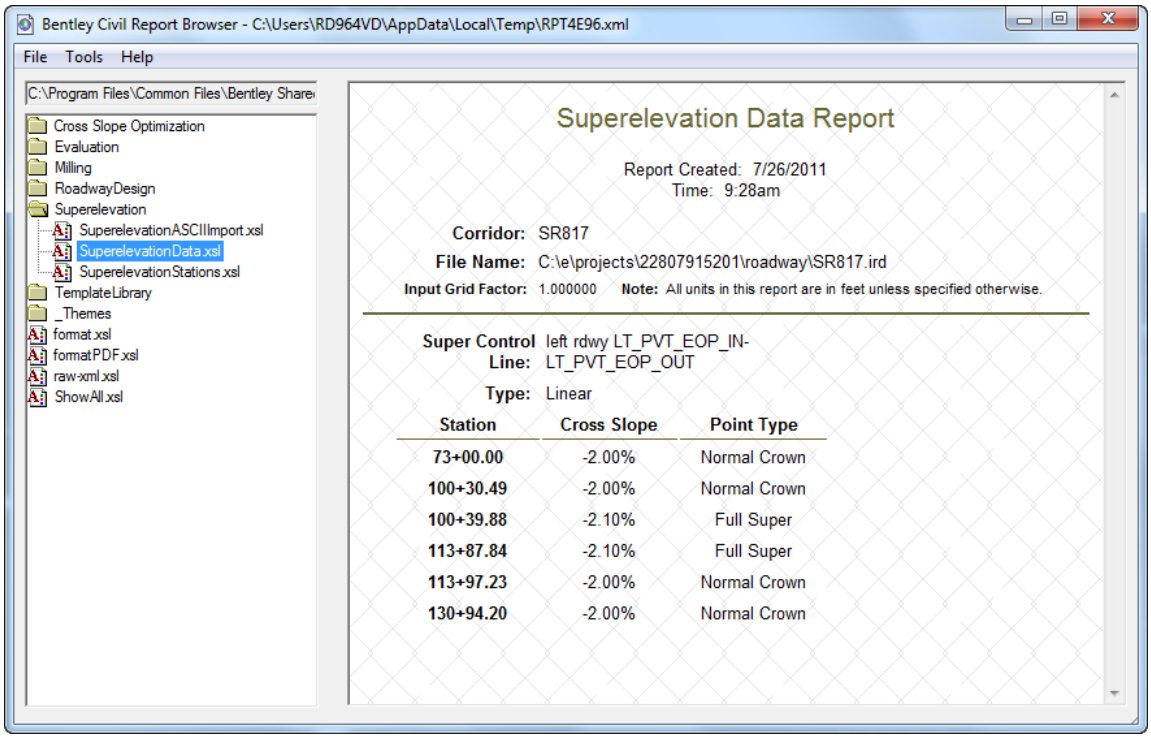


2. From the Roadway Designer menu click **Superelevation** > **Report**. The Roadway Designer Superelevation Report dialog will appear. Complete the Superelevation Report dialog as shown in order to save the superelevation data for the left roadway. Click Apply

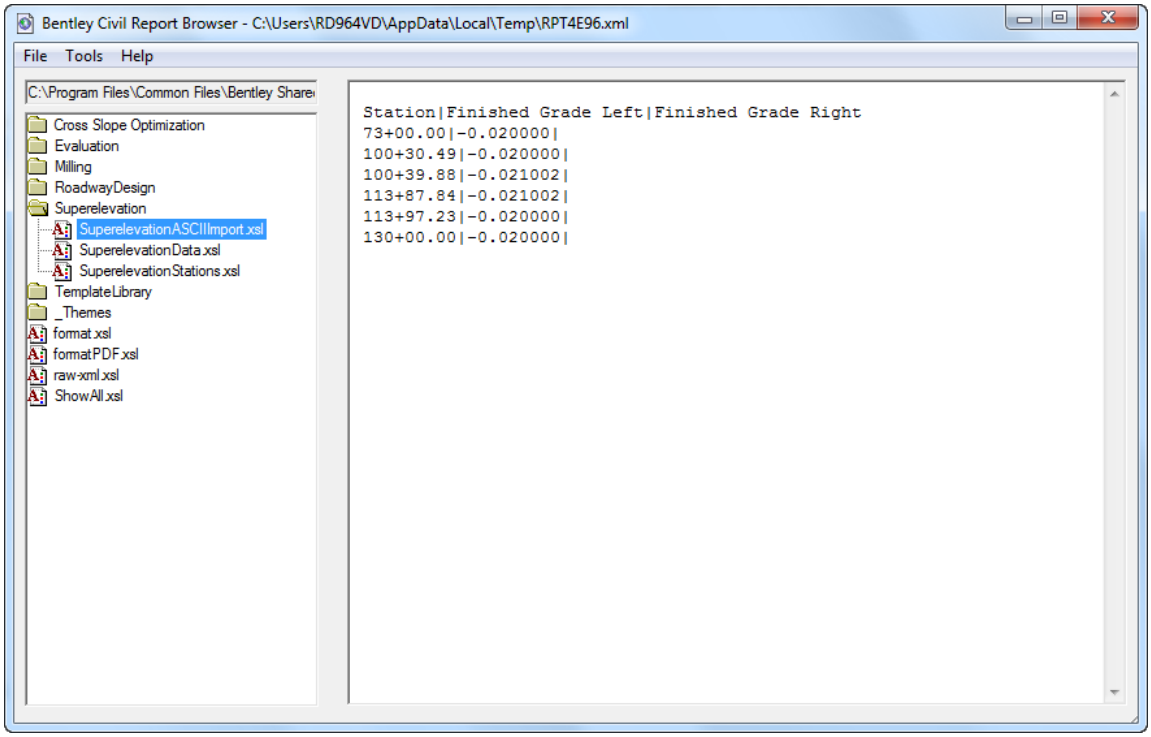


Note When the *Specified Interval* is greater than the corridor length, the ASCII Import report will only contain the Superelevation key stations.

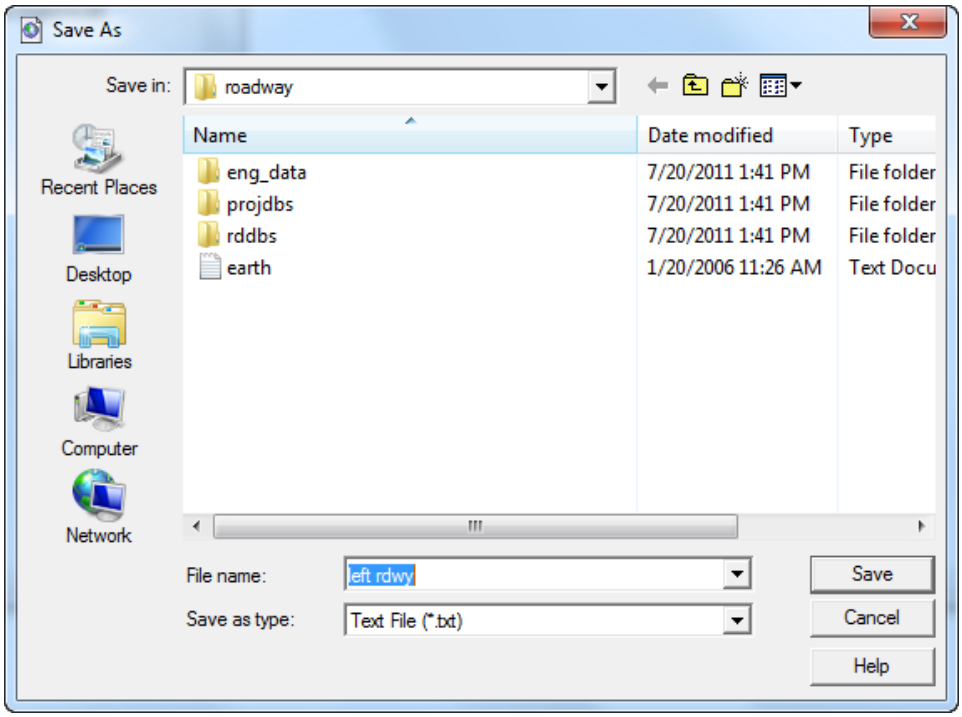
3. By default the **Superelevation Data Report** will be displayed in the Bentley Civil Report Browser dialog.



4. Select the **SuperelevationASCIIImport.xsl** file in the folder list on the left side of the dialog. The display window in the browser should update as shown.

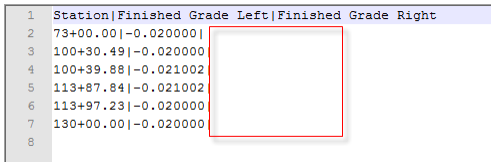


5. To save the Bentley Civil Report Browser data to a file, select **File** > **Save As** and key-in the *File name* : **left rdwy** as shown. Click **Save**.

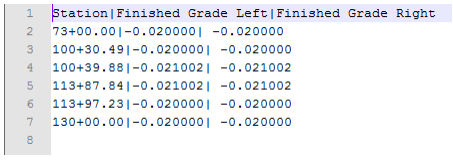


6. Repeat the steps as necessary in this exercise to save an ASCII file for the right roadway Superelevation control.

> ***Note*** When saving the text files for divided roadways, it is necessary to fill in the last column of data matching the second column.



```
Station|Finished Grade Left|Finished Grade Right
73+00.00|-0.020000|
100+30.49|-0.020000
100+39.88|-0.021002
113+87.84|-0.021002
113+97.23|-0.020000
130+00.00|-0.020000
```



```
Station|Finished Grade Left|Finished Grade Right
73+00.00|-0.020000| -0.020000
100+30.49|-0.020000| -0.020000
100+39.88|-0.021002| -0.021002
113+87.84|-0.021002| -0.021002
113+97.23|-0.020000| -0.020000
130+00.00|-0.020000| -0.020000
```

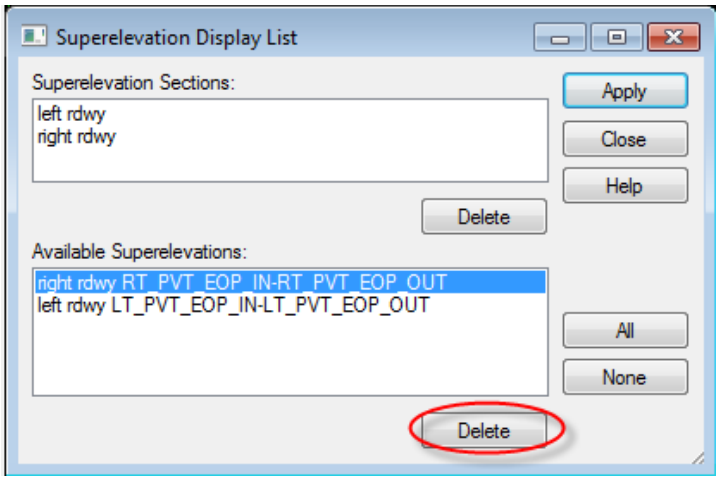
> ***Note*** The files can now be used by the Roadway Designer .> Superelevation .> Import Superelevation from ASCII command.

Exercise 7.7 Removing Superelevation

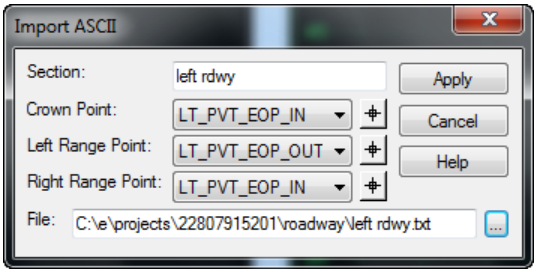
In this exercise the Superelevation control line points can be deleted using the Superelevation Display List dialog. The Superelevation sections and ranges can be deleted entirely along with the control points in the Point Controls dialog. This is the **method for removing Superelevation point control lines** if something changes on the template or if the method of Superelevation changes.

1. Right-click in the Superelevation diagram control line view and select **Superelevation Display List...**
2. To delete just one control line, select the associated point controls from the *Available Superelevations* list and then click **Delete**.

> ***Note*** You can press the **Ctrl** key and select multiple point controls to delete more than one control line.



3. To delete all control lines for a Superelevation section, select the section from the *Superelevation Section* list (all point controls should highlight) and then click **Delete. Click Apply and Close.**
4. Once both the *left rdwy* and *right rdwy* **Superelevation Sections** have been deleted, select from the Roadway Designer dialog **Superelevation** > **Import Superelevation from ASCII** to restore them.
5. Complete the Import ASCII dialog as shown and click **Apply**.



6. Complete the dialog again to import *right rdwy.txt* file. Click **Cancel** on the Import ASCII dialog. Save the .ird file. Select **File** > **Save** on the Roadway Designer dialog.

8 BUILDING VARIABLE CONDITIONS

INTRODUCTION

This chapter provides step by step details on how to apply the variable conditions with FDOT Standard Library Components along a project corridor. The course project has many design requirements of which are common on many projects.

Among them are:

- Left Turn Lanes Added in the Median
- Right Turn Added on Outside
- Intersection Crossover Pavements
- Grass Medians
- Traffic Separators
- Varying Sidewalks
- Retaining Walls

Traditionally the changing median conditions along the corridor would require multiple template drops and template changes to design the corridor. This method will allow for a single template to handle any median conditions that is encountered.

EXERCISE OVERVIEW

8.1 Using the Variable Median PPM Exhibit templates as delivered in the FDOTSS2 workspace

8.2 Applying Superelevation to inside widening

8.3 Varying Sidewalks

8.4 Walls and Checking for R/W

Exercise 8.1 Using the PPM Exhibit templates with Variable Median

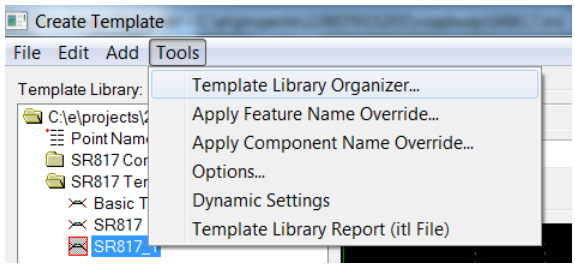
In this exercise the proposed roadway design file, *DSGNRD01.dgn*, will be opened with GEOPAK using the FDOT workspace and Project configuration. The GEOPAK Project Manager is loaded for the project. The Corridor Modeling dialog is loaded and the project preferences are loaded from the previous exercises. The Create Template dialog is opened to begin building a variable median into the project templates.

Note This FDOTSS2.itl file has PPM Exhibit Templates with variable medians included. The median can vary with the following conditions

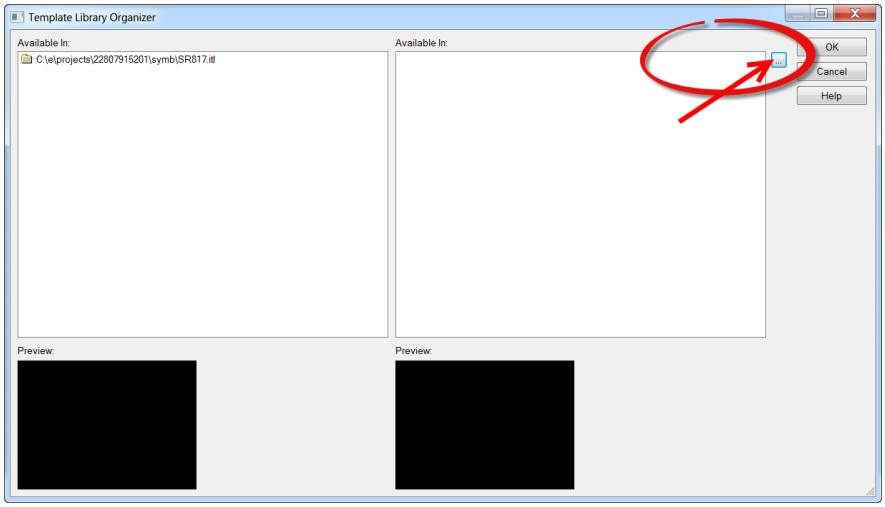
- Curb Median with or without Left Turns
- Shoulder Median with or without Left Turns
- Crossovers at intersections
- Traffic Separators with Left Turns

Note . The next few steps will describe the templates available and the how to make them work for this project.

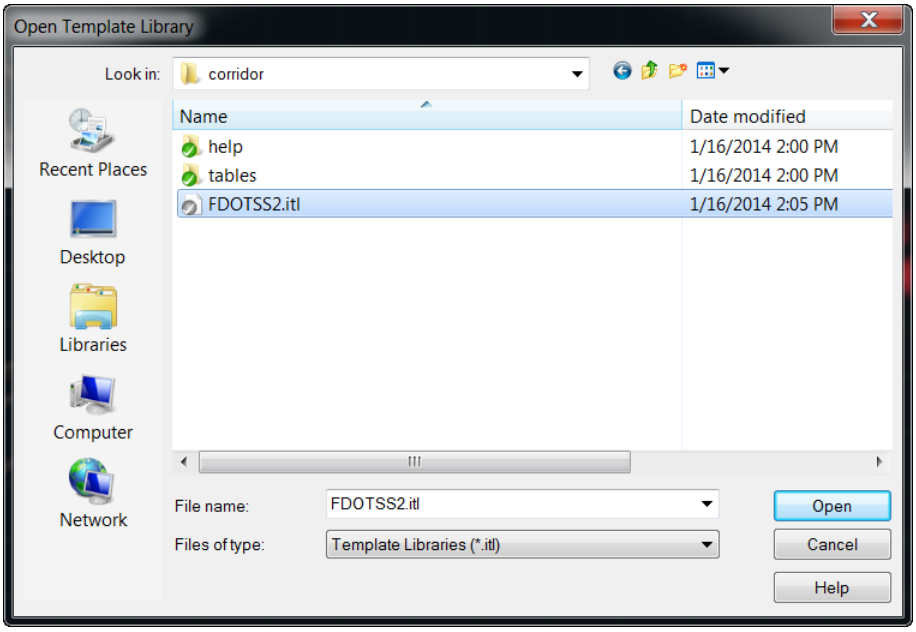
1. Optional, extract the *22807915201(8).zip* file in the *c:\e\projects directory*.
2. Open FDOTSS2 in a project design file, i.e. c:\e\projects*DSGNRD01.dgn***.** Load the GEOPAK Road Project Manager and collapse the dialog. Open Corridor Modeling and load the *SR817.rdp* file.
3. From the Corridor Modeling dialog, click the **Open Create Template** icon. The project Template Library will display in the Create Template dialog.
4. Select **Tools>Template Library Organizer**.



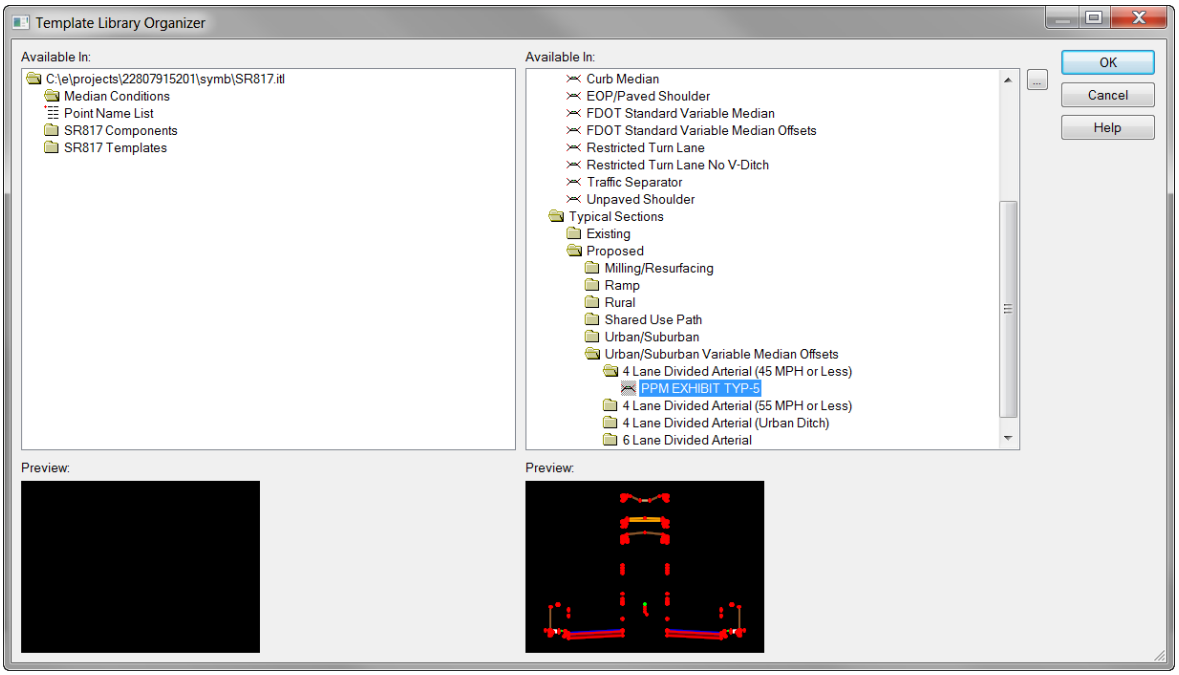
5. On the **Available In** side of the *Template Organizer dialog*, select the Browse Button.



6. Navigate to the FDOTSS2/GEOPAK/Corridor folder and select the FDOTSS2.itl file.

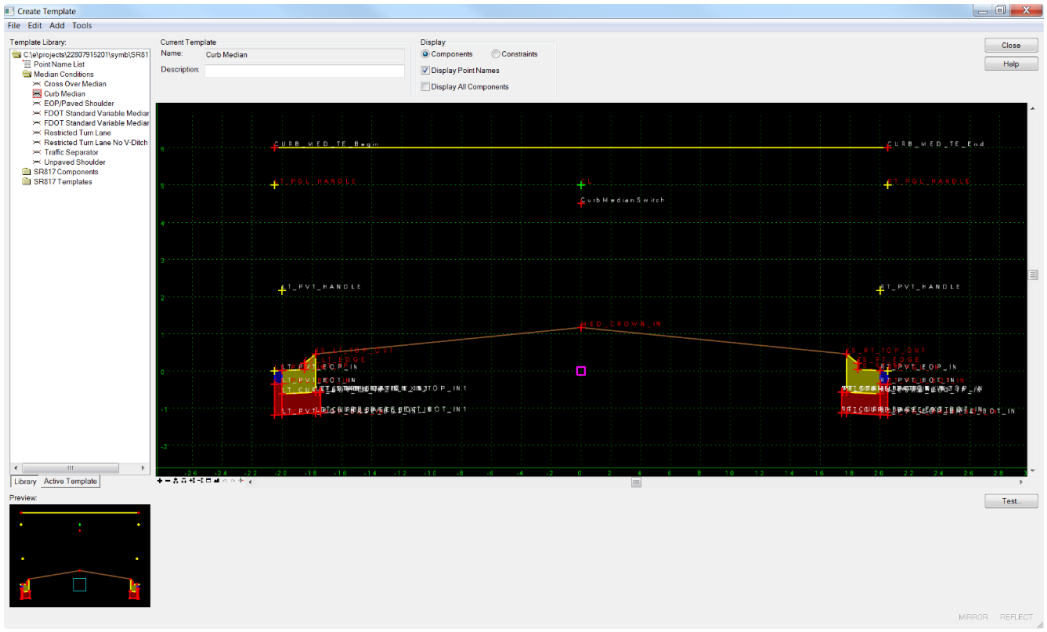


7. Copy the entire Median Conditions folder AND the Typical Sections/Urban/Suburban Variable Median Offsets/4 Lane Divided Arterial (45 MPH or Less) PPM EXHIBIT TYP-5 template to the SR817.itl template library



8. Choose **OK** to exit the Template Library Organizer dialog and choose **Yes** to save the changes the SR817.itl file.

9. Open Median Conditions folder and Set Active the Curb Median template



Note The five things to know about these median condition templates are as

a. The line at the top is an end condition search line that targets alignments that have been imported. I.E CurbBack

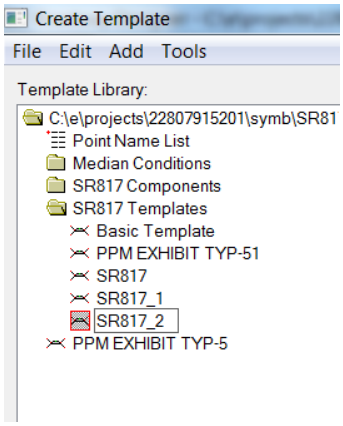
b. Each of the components are turned on ONLY if the target is found. This is by the Parent/Child relationship of the Template components

c. The LT and RT PGL Handles control the overall width of the median and can be modified to fit any project

d. The LT and RT PVT Handles control the amount of pavement inside widening from the PGL lines

e. Each of the Handles have style constraints to located the imported alignments and the horizontal range will need to be modified to fit the project

10. Copy the **PPM EXHIBIT TYP-5 template** to the **SR817 Templates** folder and rename it to *SR817_2*. This template was built to include each of the median conditions found on a typical divided roadway.



11. Right-click and click **Set Active** on the *SR817_2* template.

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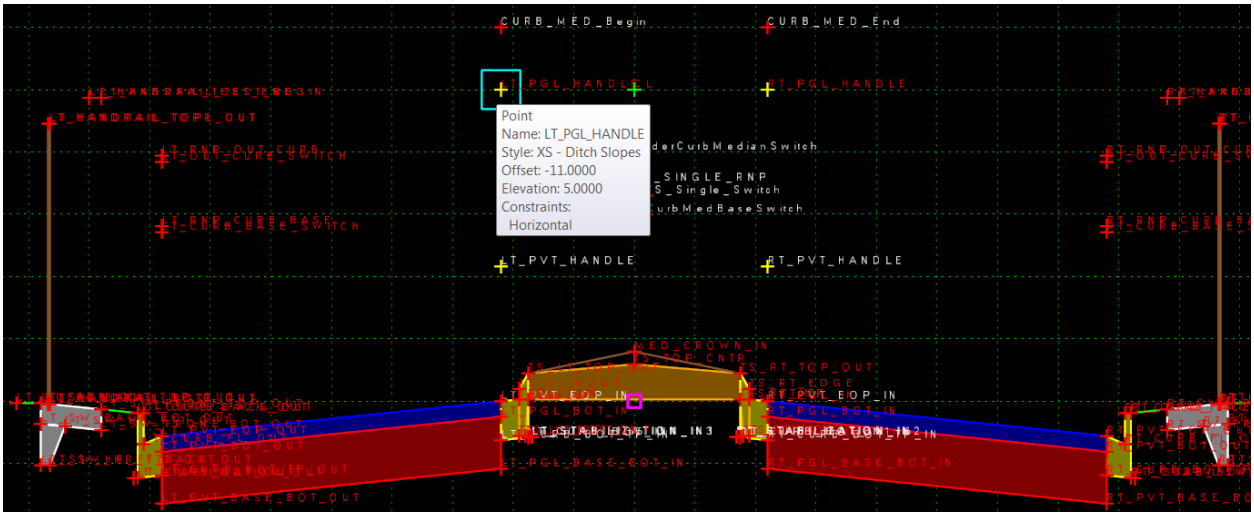
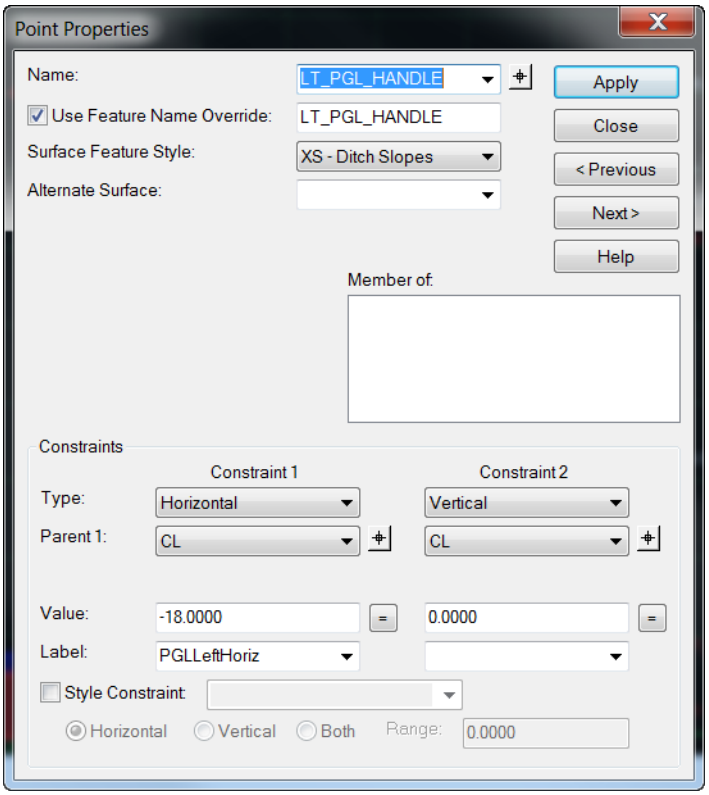
➢ *To modify the Template to match the project PGL Lines*

The left and right PGL lines on this project are -18 and 10 feet offset from the Baseline. Therefore, the template PGL Handles will be moved to accommodate the median width. Adding an additional 2 feet to the offset width will allow for the Back of Curb lines to match the imported graphics.

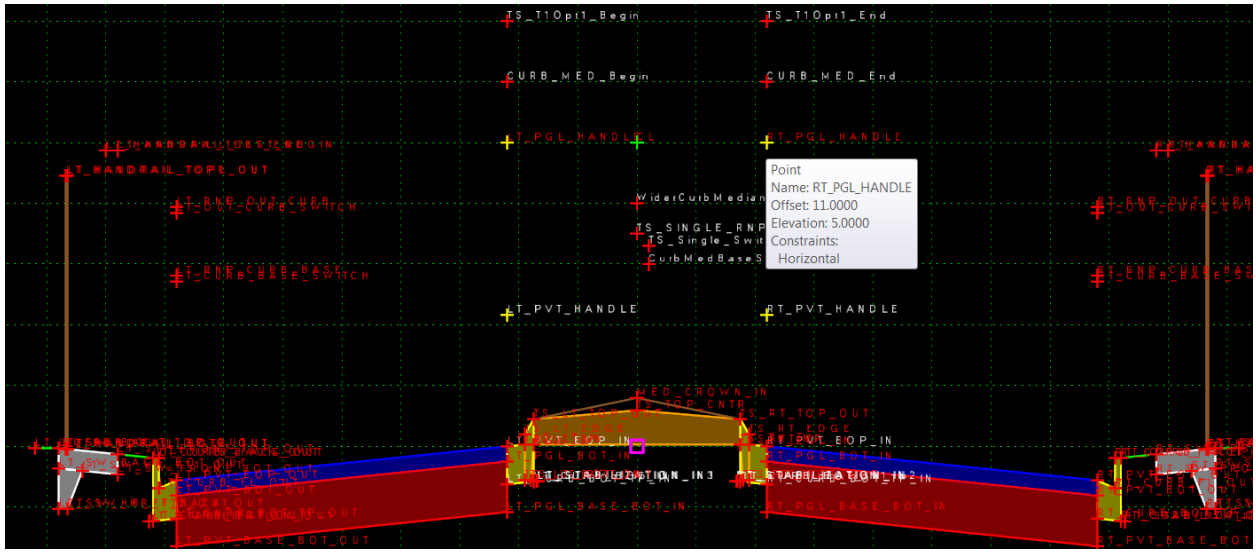
1. Right-click on the **LT_PGL_HANDLE** point and select **Edit Point**.



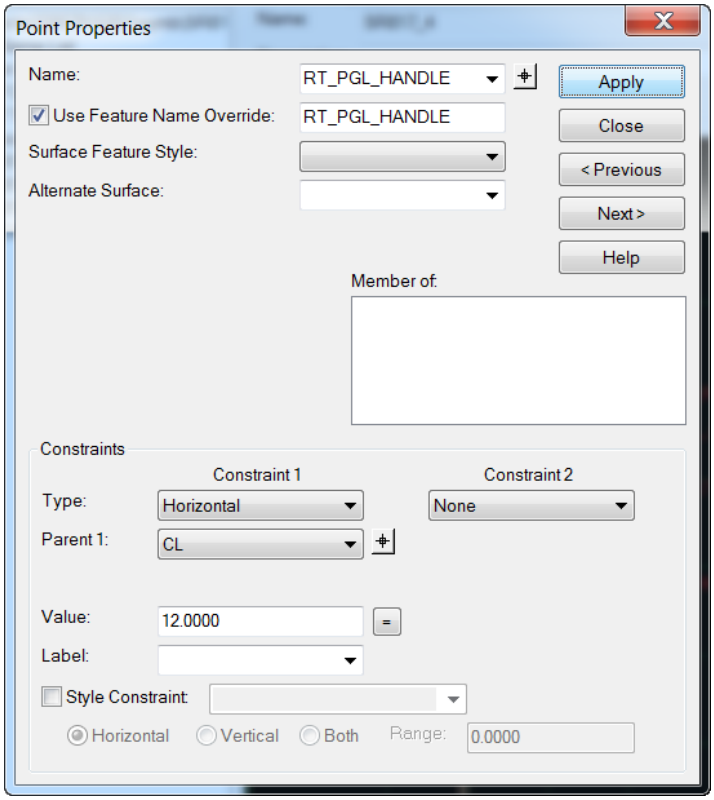
2. Change the *Horizontal Constraint Value* to **-20** on the Point Properties dialog. Also, uncheck the **Style Constraint.** Click **Apply** and **Close**.



3. Right-click on the **RT_PGL_HANDLE** point and select **Edit Point**.



4. Change the *Horizontal Constraint Value* to **12** on the Point Properties dialog. . Also, uncheck the **Style Constraint** Click **Apply** and **Close.**



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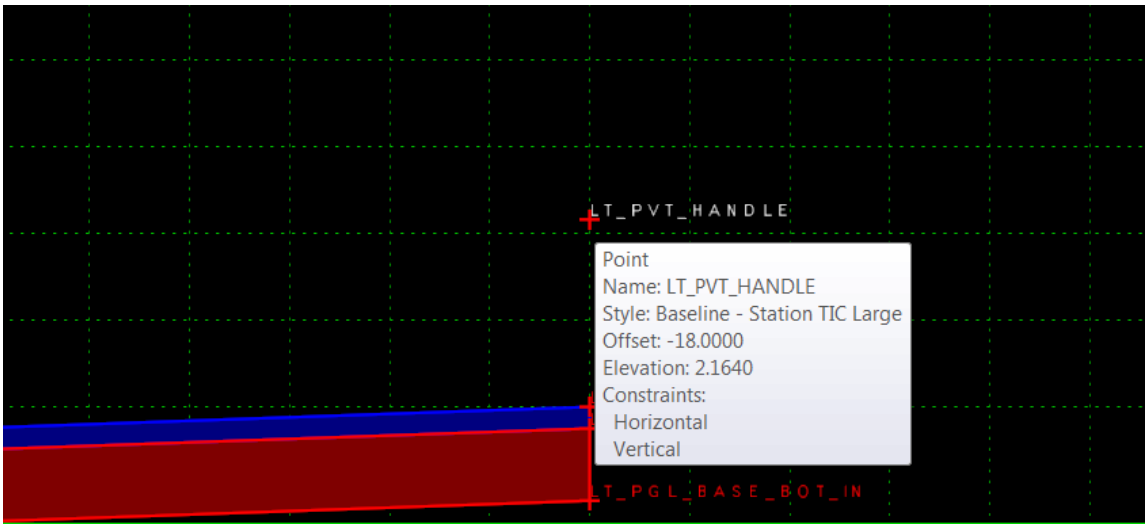
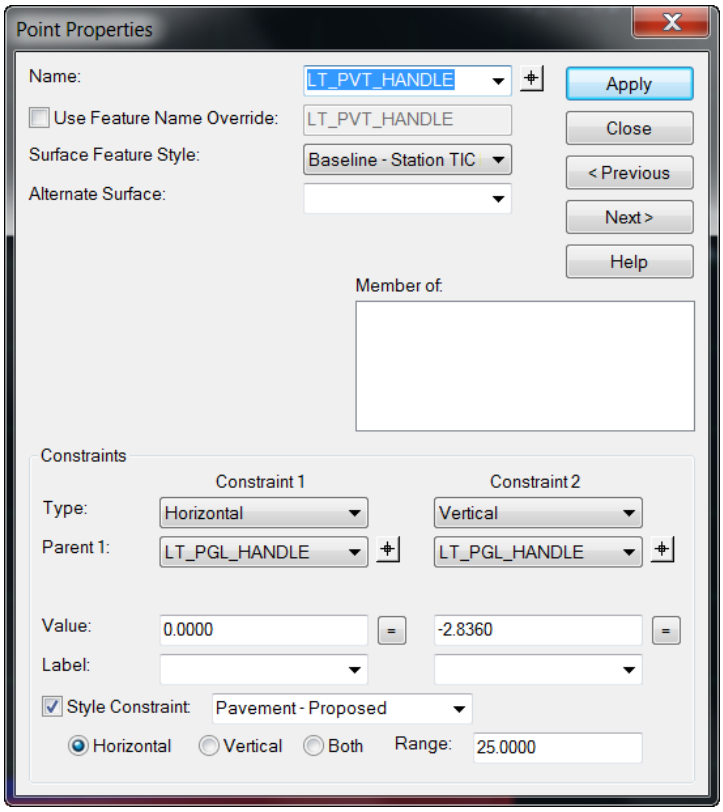
➢ *To redefine the Style Constraints ranges for the variable median Template*

The EOP, and Traffic Separator points on the templates need to follow the imported graphics for this project. Since, the overall median with is 6 feet wider than that in the PPM Exhibit the style constraint range will be modified on the LT and RT PVT_HANDLE points on the template.

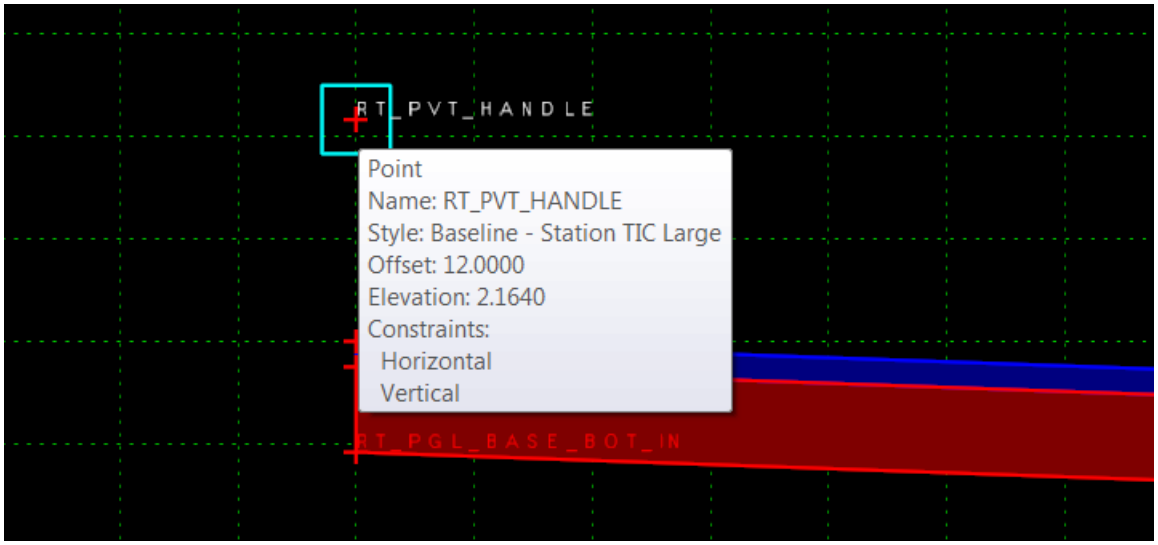
5. Right click on the LT_PVT_HANDLE point of the template and choose edit point.



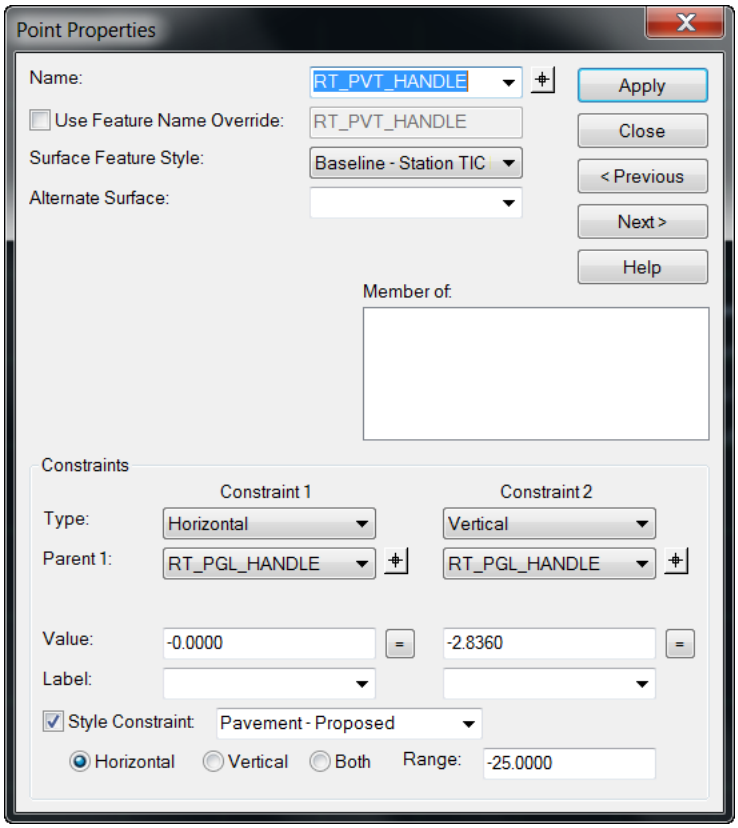
6. In the Point Properties dialog, Edit the style constraint value and change it from 18 to 25. This will allow for the left inside EOP to move across two lanes for the target style.



7. Right click on the RT_PVT_EOP_IN point of the template and choose edit point.



8. In the Point Properties dialog, Edit the style constraint value and change it from -18 to -25. This will allow for the right inside EOP to move across two lanes for the target style.



9. Save the changes to the SR817_4 template and close the Create Template Dialog.

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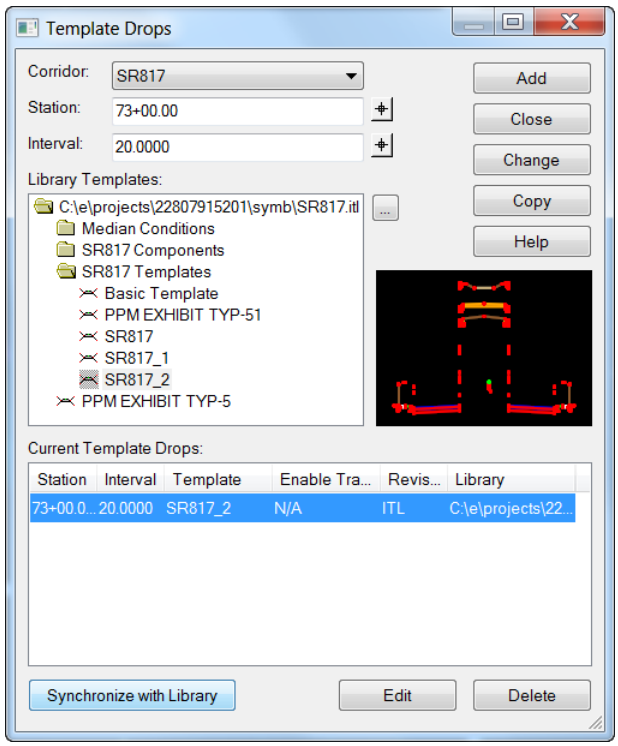
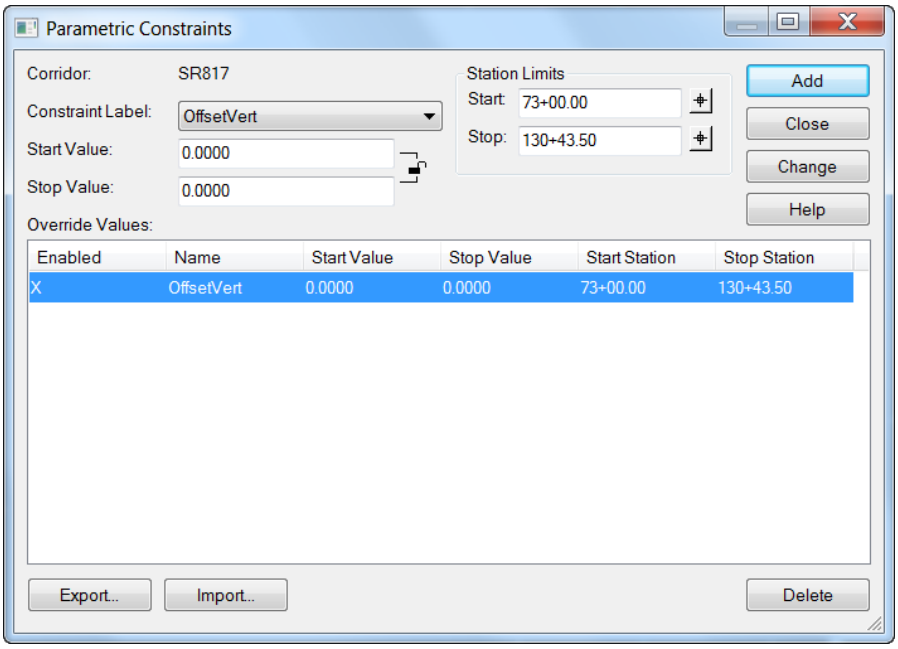
➢ ***To apply the variable median template to the previous SR817 corridor in Roadway Designer there are four steps: 1.) Change the template in the Template Drops dialog and 2.) Add the Parametric Constraint to connect all the median conditions. 3.) Modify the point controls in Point Controls dialog.***

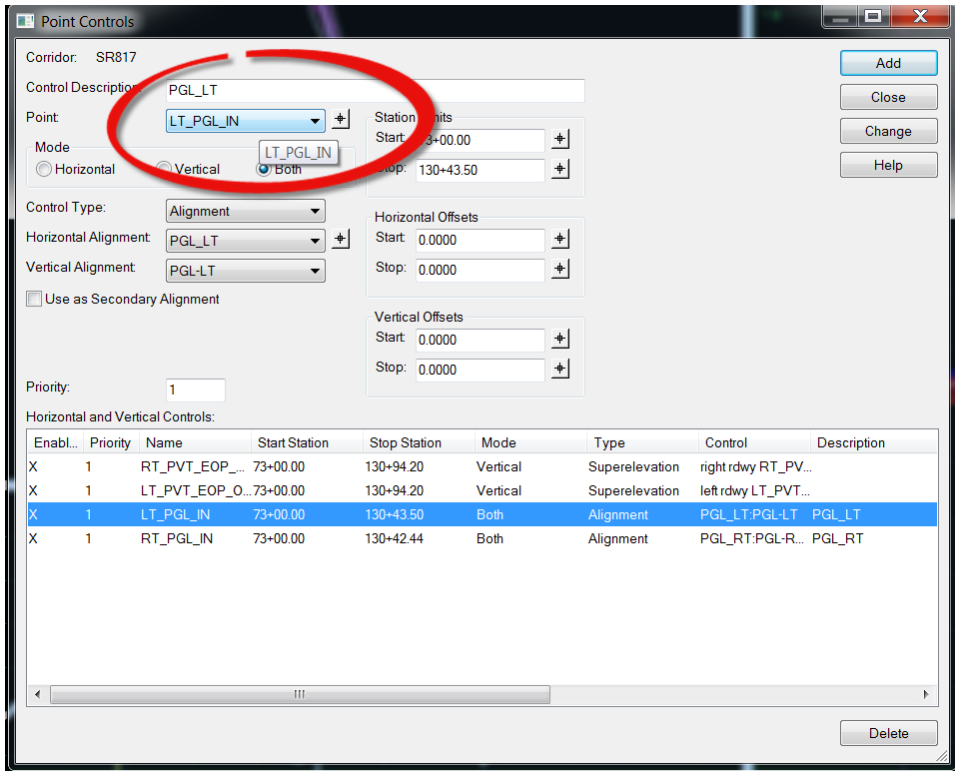
10. Open **Roadway Designer** and then choose **Corridor >Template Drops**. A. Select the Current Template Drops entry in the list, B. Select the *SR817_2* Template in the Library Templates List., and C. Select the **Change**. Button. Close the template Drops dialog.



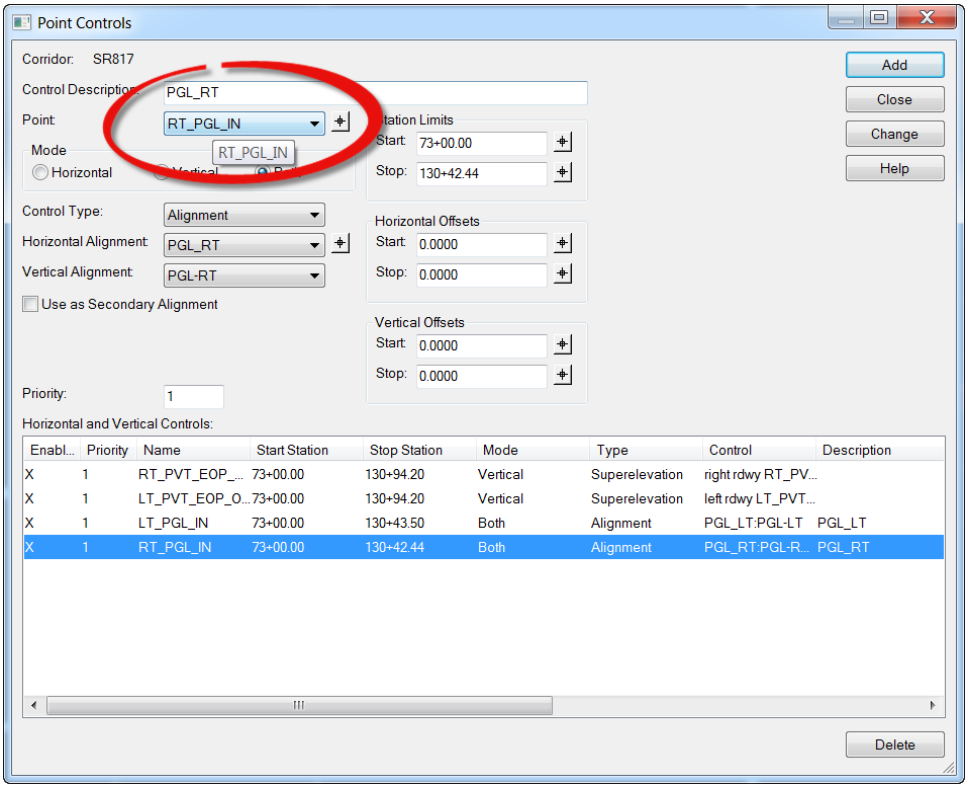
11. On the **Roadway Designer** dialog, choose **Tools Parametric Constraints**. Select the OffsetVert *Constraint Label* and set the values to **0**. Choose **Add** then **Close** the dialog



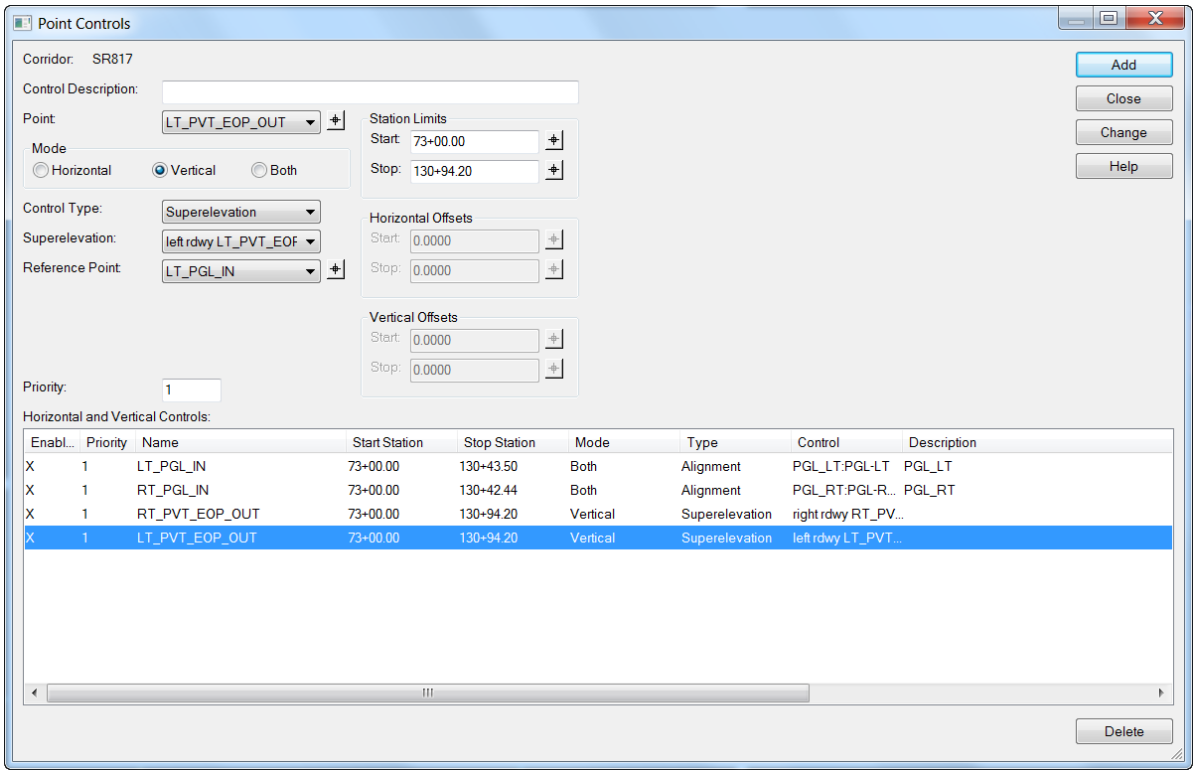
12. Continue in **Roadway Designer** and then choose **Corridor >Point Controls.** . Modify the Point Name of the PGL_LT from **LT_PVT_EOP_IN** to **LT_PGL_IN**.



13. Continue in Roadway Designer and then choose Corridor >Point Controls. . Modify the Point Name of the PGL_RT from RT_PVT_EOP_IN to RT_PGL_IN.



14. Continue in **Point Controls.** . Change the *Reference Point* of the Superelevation for **LT_PVT_EOP_OUT** to **LT_PGL_IN**. Choose **Change** to apply the modification.



15. Continue in **Point Controls.** . Change the *Reference Point* of the Superelevation for **RT_PVT_EOP_OUT** to **RT_PGL_IN**. Choose **Change** to apply the modification

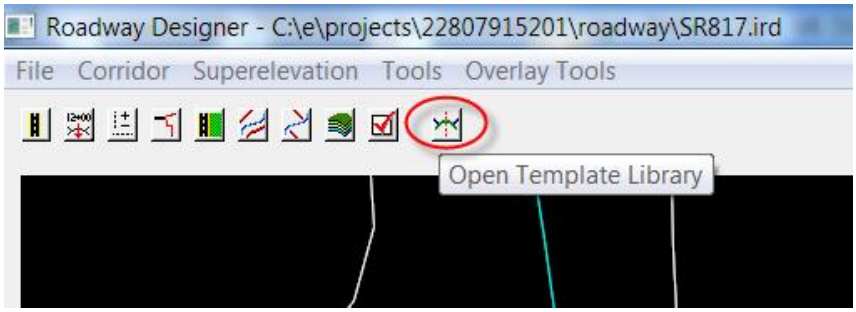
16. Close the dialog and choose **File Save** to update the SR817.ird file in **Roadway Designer**.

Exercise 8.2 Applying Superelevation to Inside Widening

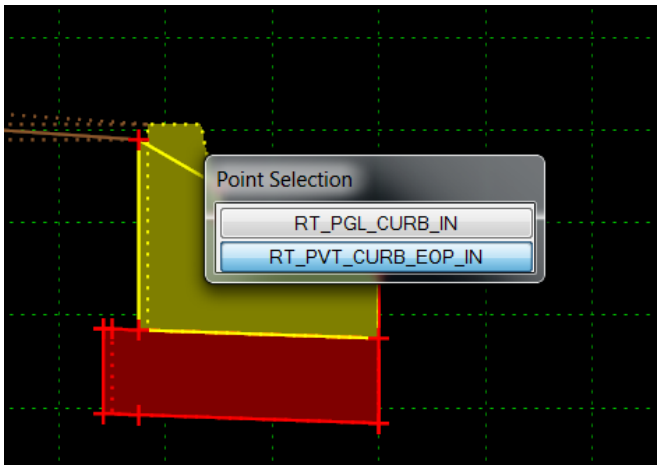
In this exercise the Create Template dialog is used to change the Constraint2 type from Slope to Vector Offset on the inside widening components. This will cause the inside widening pavement to maintain the same slope as the main roadway pavement; therefore in effect, applying Superelevation by a constrained relationship.

1. In the Roadway Designer dialog, change the *Station* value to **102+00**. Notice how the inside widening slope is not super elevated. This can be accomplished with vector offset constraints in the Template.

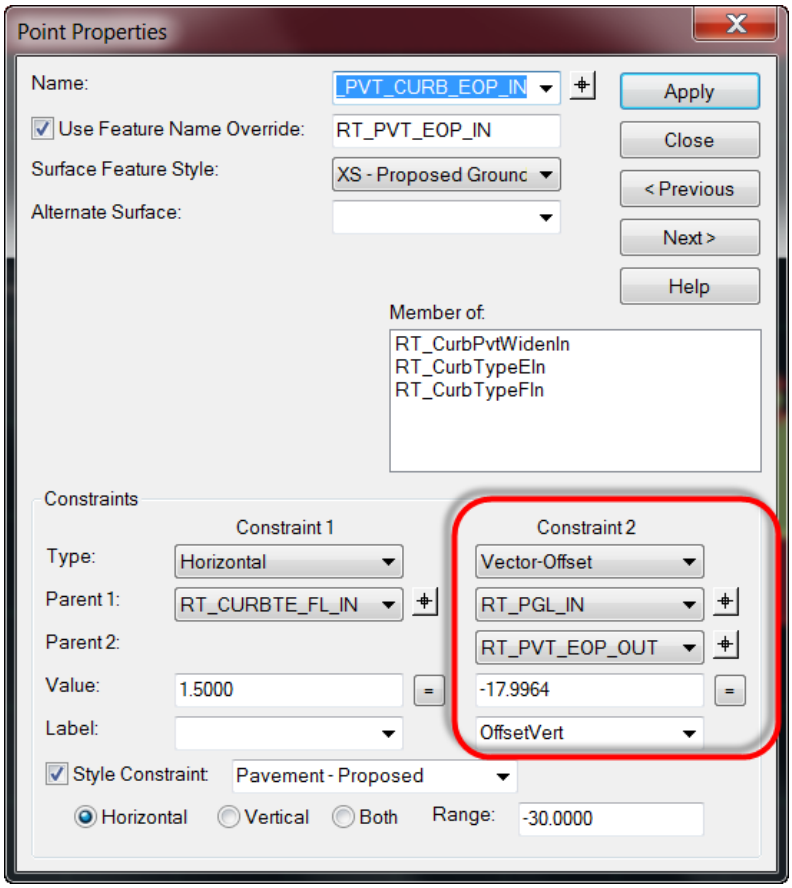
2. Click the **Open Template Library** icon on the Roadway Designer dialog.



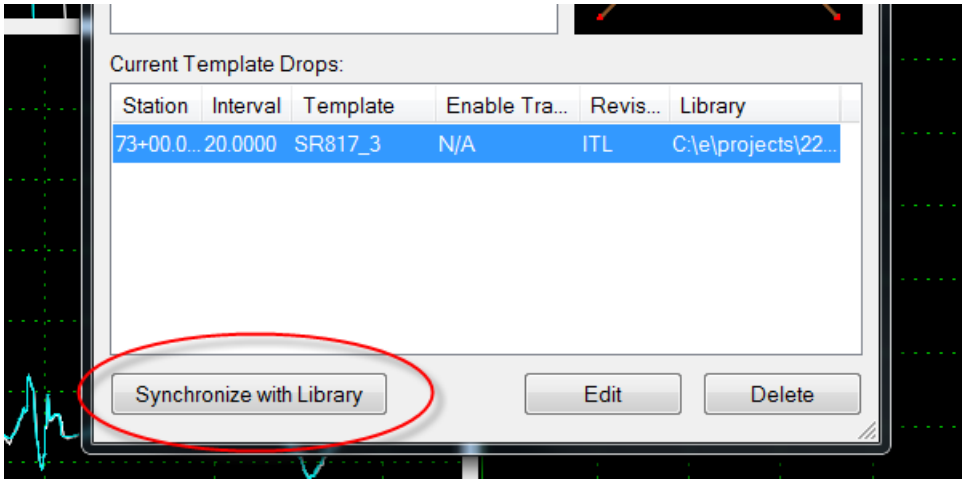
3. In the Create Template dialog, select the **Active Template** tab and choose the **RT_PVT_CURB_EOP_IN** point or the edge of pavement on the inside curb and choose **Edit Point**.



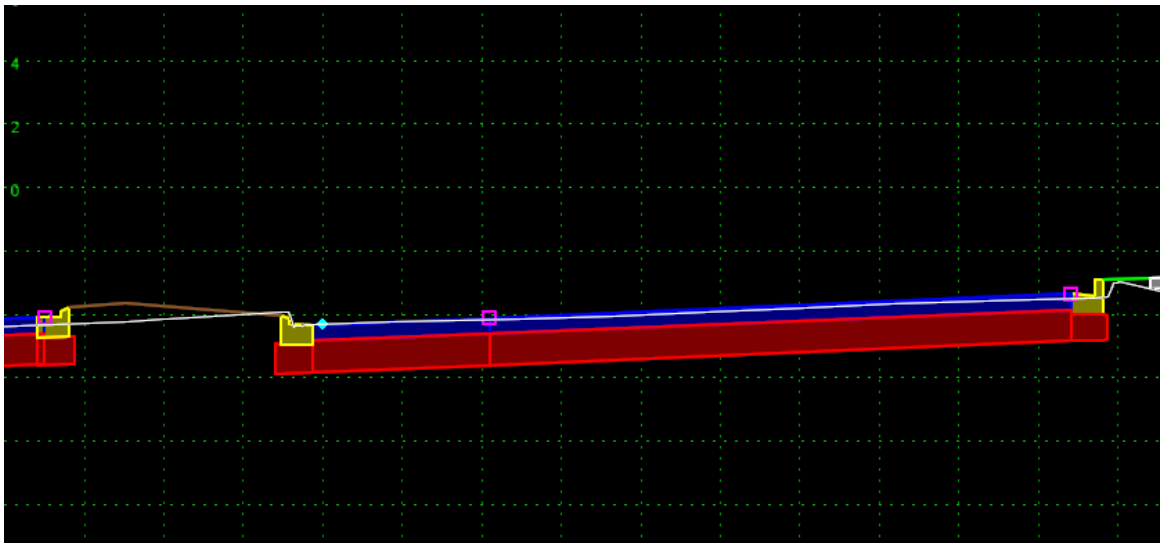
4. Change the *Constraint Type* from **Slope** to **Vector Offset** and modify the dialog to follow the pavement slope between the **PGL_IN** and **PVT_EOP_OUT.** Set the *Constraint Label* to **OffsetVert.** Click **Apply**



5. Repeat for the **RT_PVT_CURB_EOP_IN**, **TS_LT_TP**, and **TS_RT_TP** points.
6. Save and Close the **Template** Library.
7. Open the Template Drops dialog and select the **Current Templates Drops** entry, Choose the **Synchronize with Library** button.



8. Close the Template Drops dialog. The inside widening now is following the Superelevation slopes.

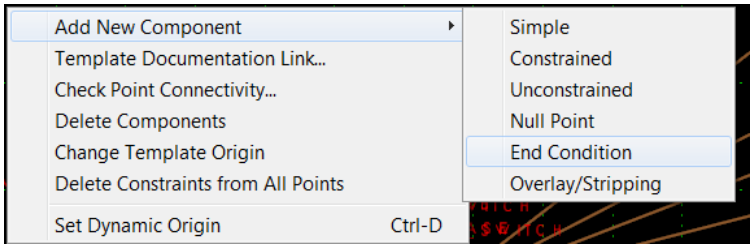


Exercise 8.3 Varying Sidewalks

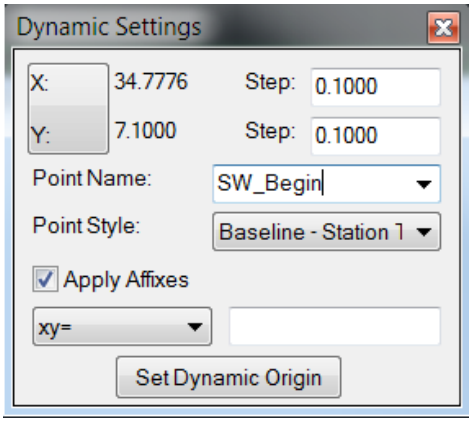
In this exercise the Create Template dialog is used to add end condition components to the project template to locate the back of sidewalk alignment. In this project design, the sidewalk will only be constructed in specific areas on the project, a **SW_Display** end condition is used as a parent component to the components outside the curb. Also, in this exercise a **Normal Fill** component will be added to the back of curb, similar to the force slope in criteria. A display rule is added to this component containing the "**NOT SW_Display**" definition. Therefore, the **Normal Fill** component will not display if the back of sidewalk alignment is present.

1. Open the Create Template dialog, right click and copy the *SR817_2* template to the **SR817 Templates** folder. **Set Active** the new template and rename the template *SR817_3*.

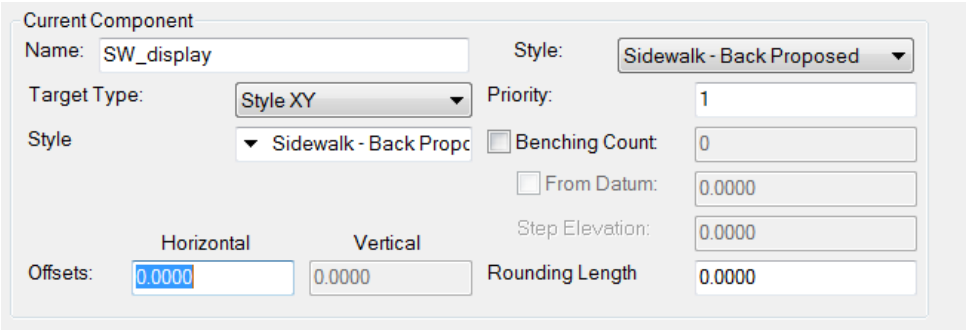
2. Right click in the template view and select **Add New Component > End Condition**



3. Select the **Toggle On/Off Dynamic Settings** icon and be sure that the **Apply Affixes** is on. Key-in the *Point Name* **SW_Begin**.

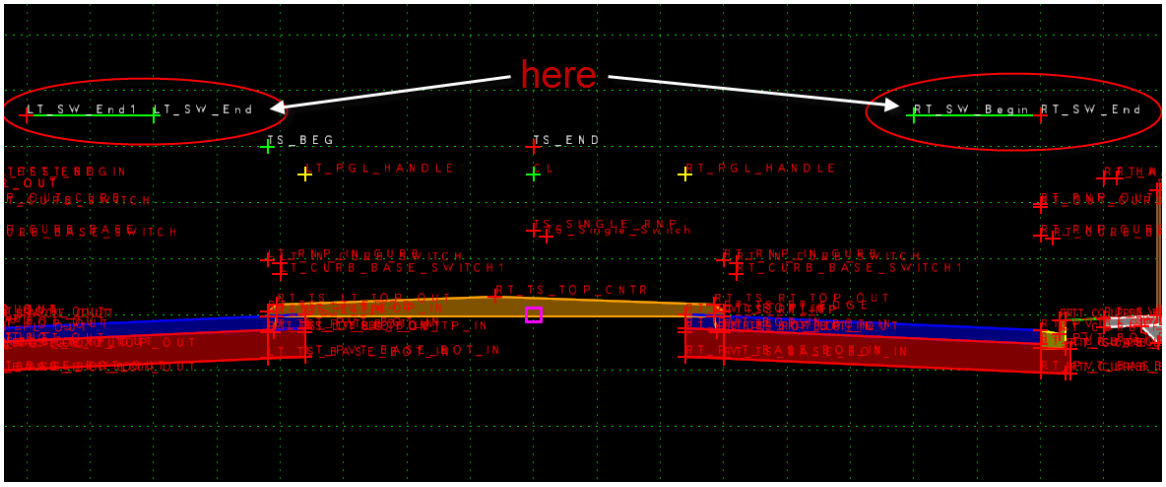


4. Key-in the *Component Name*, Select the *Target Type* and *Style*, Right click in the view and check on the **Mirror** option.



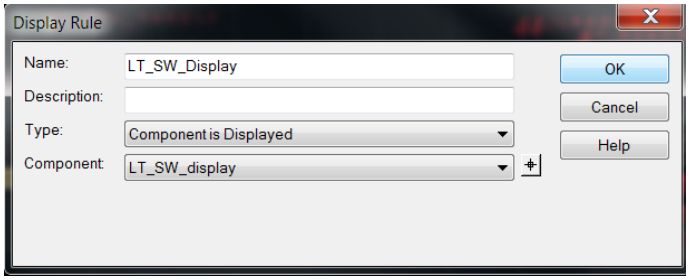
5. Enter a point at the **xy= 30, 7** location.
   a. Check the **End Condition is Infinite** box on the Dynamic Settings dialog.
   b. Change the point name to **SW_End** on the Dynamic Settings dialog
   c. Enter another point at the **xy= 40, 7** location.
   d. Right click and select **Finish**

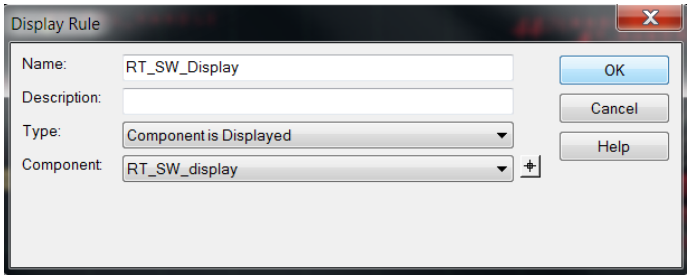
Note Two new End Conditions will appear on the template.



➢ *Next create two new Display **rules,** LT_SW_Display and RT_SW_Display.*

1. Right click on one of the new components and select **Edit Component**. Choose the **Edit** button on the Component Properties dialog.
2. Click **Add** button on the Component Display Conditional Expressions Dialog.
3. Create a new **Display Rule** as shown below. Repeat these steps for the other new component.

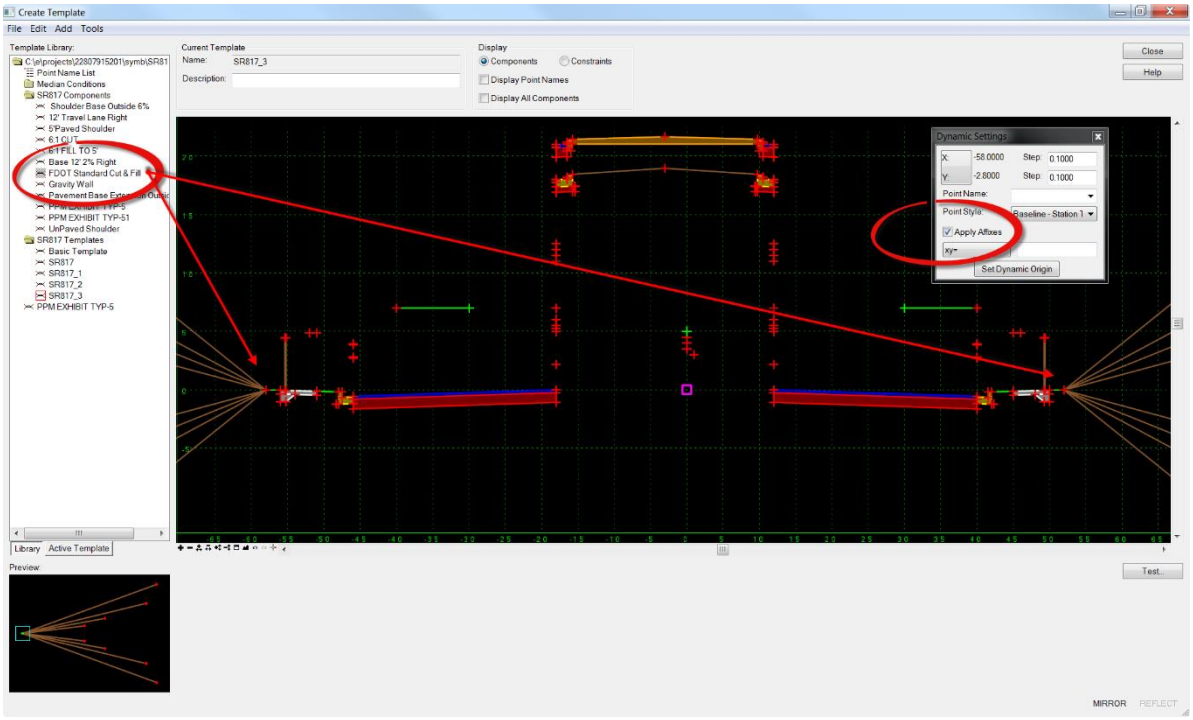




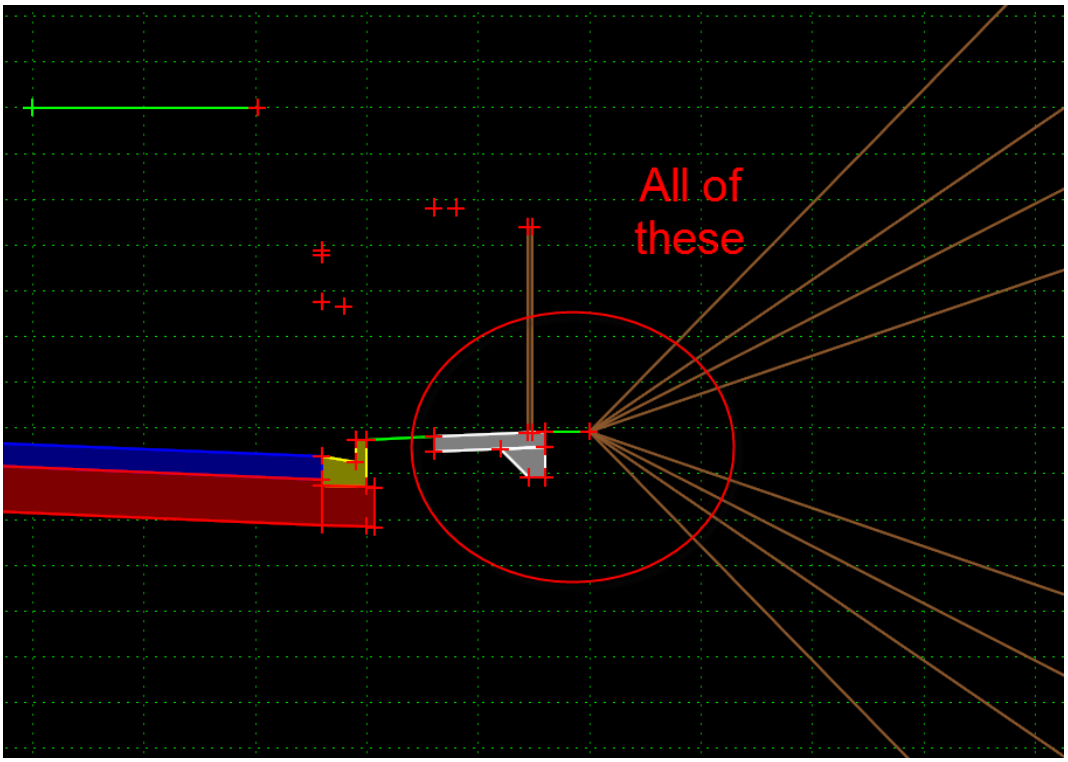
4. Click **OK** to add the new *Template Display Rule* to the list.
5. Click **OK** to close the Component Display Conditional Expressions dialog.
6. Click **Apply** and **Close** to close the Component Properties dialog

➢ ***Create a Parent relationship to the End condition SW_Display component on each component outside of the curb.***

1. Add the FDOT Standard Cut &Fill end conditions to each side of the SR817_3 template with Apply Affixes checked on in the Dynamic Settings Box.

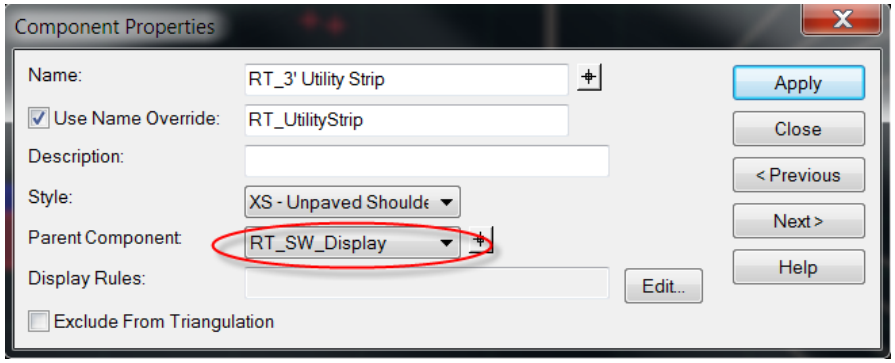


2. Right click on each of the components outside of the curb and select Edit Component.



3. Set the **Parent Component** relationship to the **SW_Display** End Condition Component for each component outside of the curb.

   <OR> … Create a chain relationship to one another with the first related to the **SW_Display** End Condition Component.



   <OR> … Another method is to change to the Active Template Tab and drag each of the components under the SW_Display component.

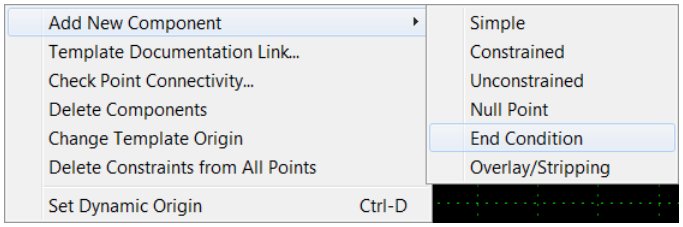
4. Edit the *Front of Sidewalk* point **RT_SW_FRONT_TOP_OUT** change the *Horizontal Constraint* to .1 and set the *Horizontal Range* **+25**. Repeat for the **LT_SW_FRONT_TOP_OUT** point, use **-25**.

5. Edit the *Back of Sidewalk* point **RT_SW_BACK_TOP_OUT,** set the *Horizontal Range* **+25**. Repeat for the **LT_SW_BACK_TOP_OUT** point, use **-25**.

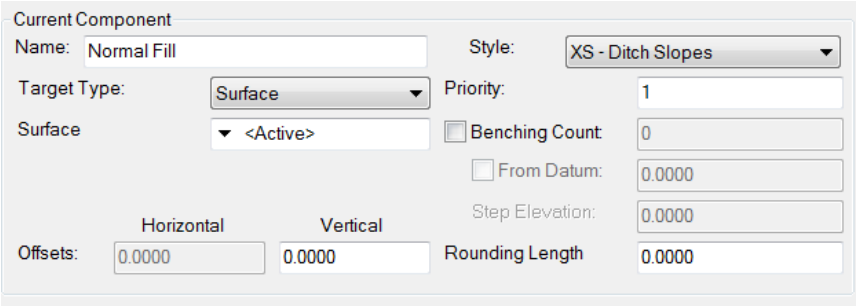
6. Click on each of new **SW_End** points to display the Point Properties dialog. Click on the **Do Not Construct** box.

➢ *To add a **Normal F**ill End Condition when the sidewalk is not present**:*

1. Right click in the view and select **Add New Component > End Condition**



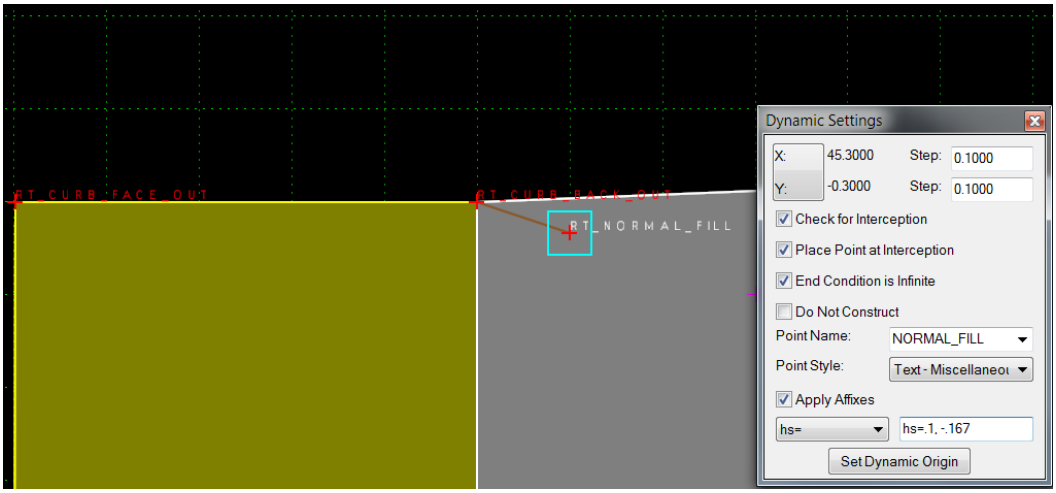
2. Enter **Normal Fill** for the Current Component dialog *Name*, set the *Target Type:* to **Surface**, set the *Style:* to **XS- Ditch Slopes**



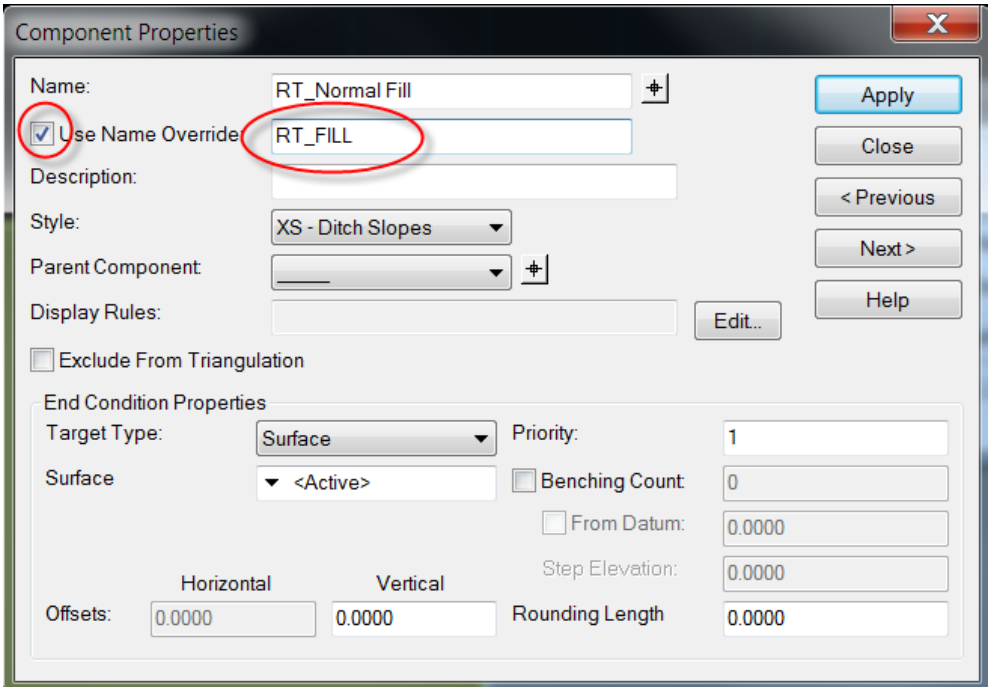
3. Start the new component on the right top back of curb point, **RT_CURB_BACK_OUT**, click on the first point.

HINT While in the command to create a component, use the Right Click again to check to see if the Mirror or Reflect setting is on. Use the escape key to leave as is.

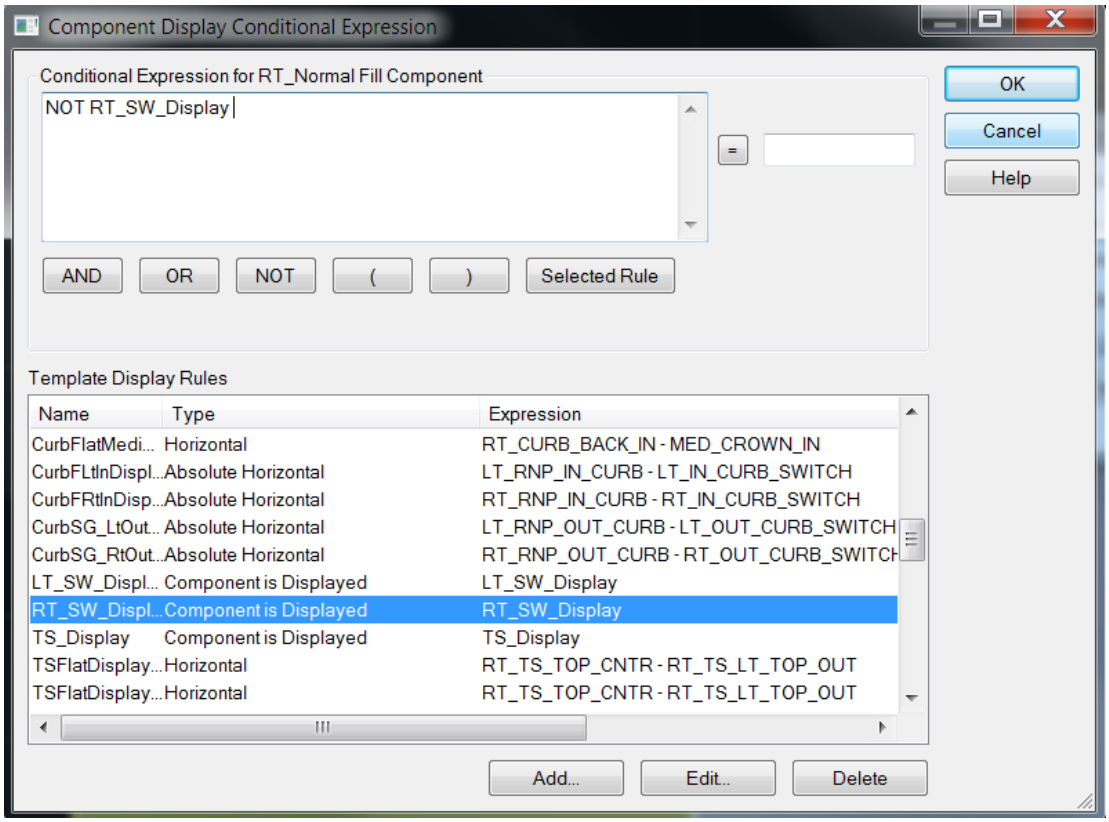
4. In the Dynamic Settings dialog,
   a. Check the **End Condition is Infinite** box
   b. Enter **NORMAL_FILL** for the *Point Name:*,
   c. Set the *Point Style* to **Text-Miscellaneous**,
   d. Check the **Apply Affixes**,
   e. Set the exact key-in field to **hs=.1,-.1667**.
   f. Click the **Enter** key while the cursor is in the key-in field to store the second point.
   g. Right click again and choose **Finish**.



5. Double click on the new component, the Edit Component dialog displays. Check the **Use Name Override** Box and key-in **RT_FILL,** click the **Apply** button**.** DO NOT close the dialog.



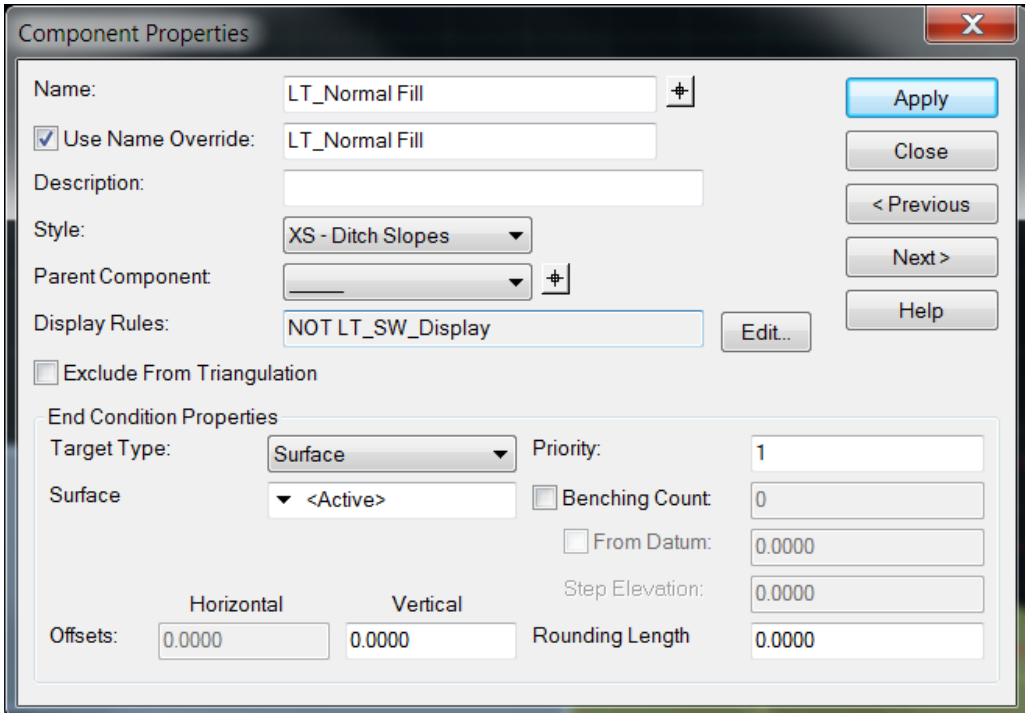
6. Click the **Edit** button next to the *Display Rules:* field, the Display Rule Conditional Expression dialog will display. From the list, select the **RT_SW_Display** rule. Click the **NOT** button and then the **Selected Rule** button

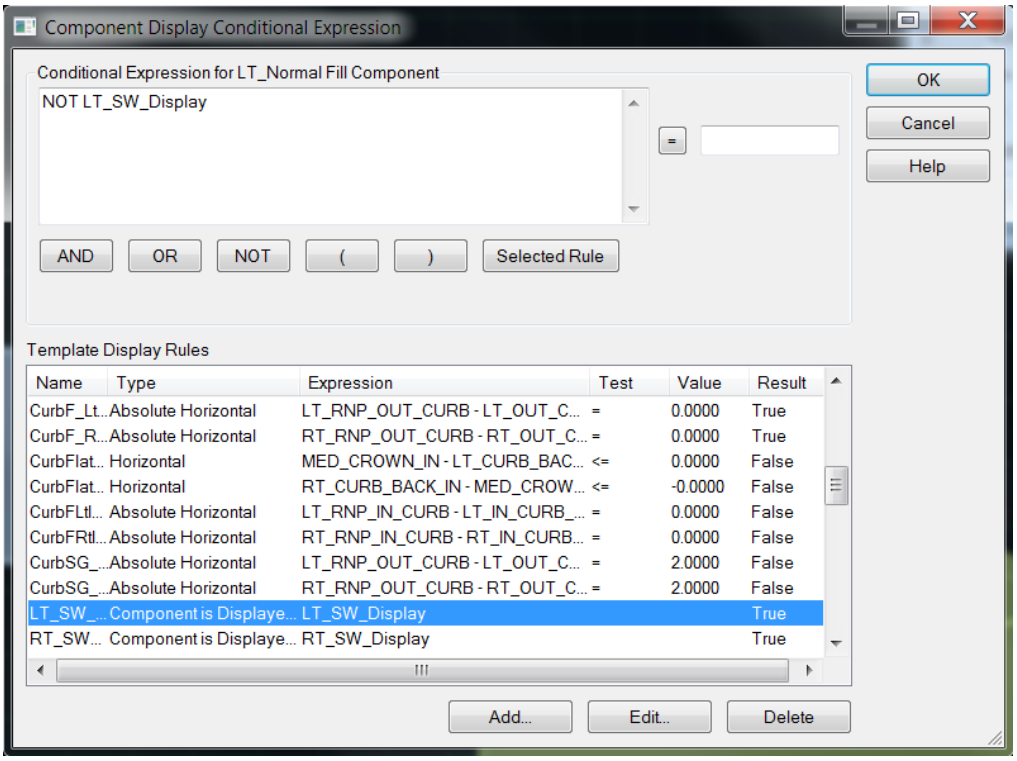


7. Click **OK** on the Display Rule Conditional Expression dialog. Click **Apply** and OK on the Component Properties dialog.

8. The component will not display unless the *Display All Components* box is check **ON** in the Create Template dialog.

9. Save the template and repeat these steps for the *Normal fill* on the Left side of the template.



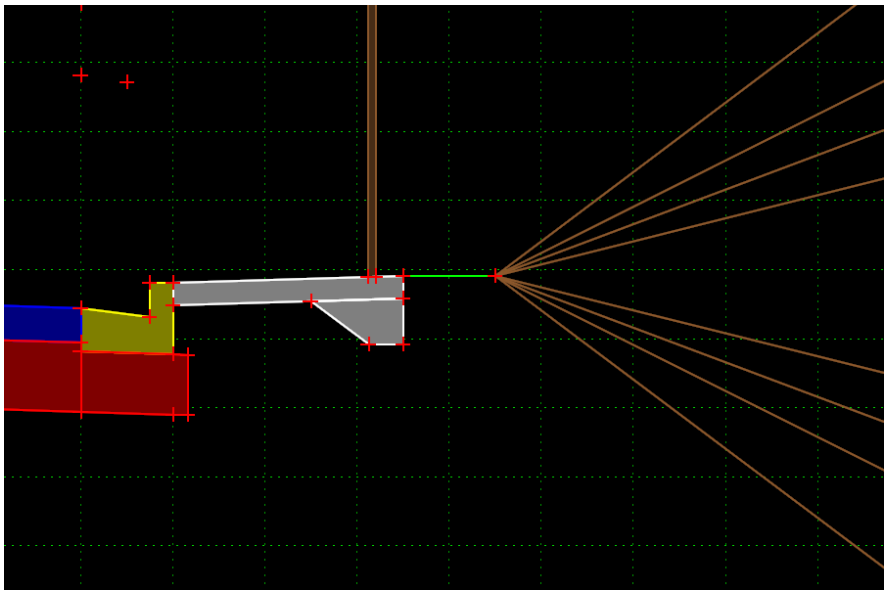


10. Save the changes to the **Template** library.

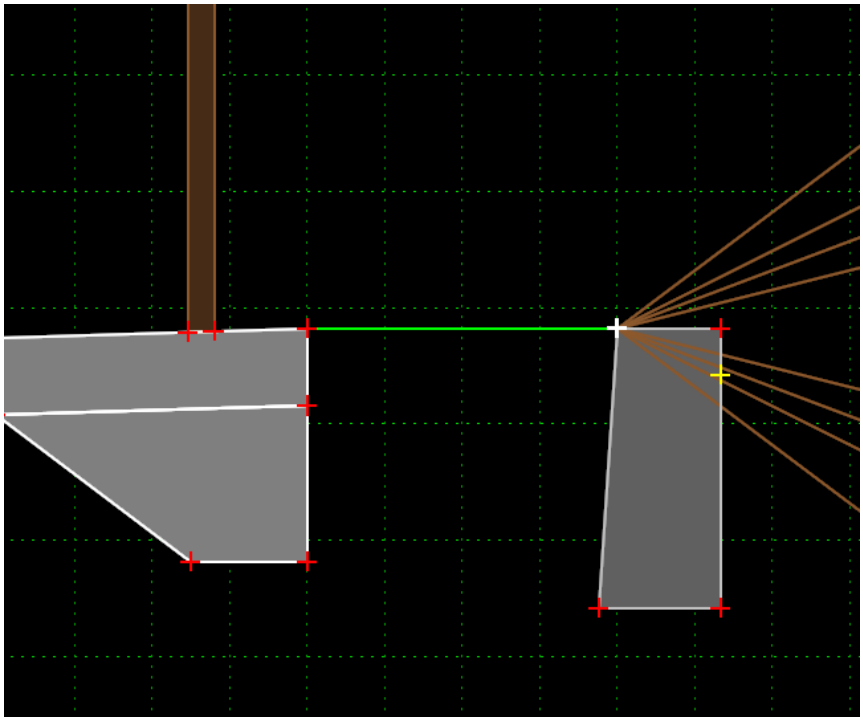
Exercise 8.4 Walls and Checking for R/W

In this exercise the Create Template dialog is used to add Gravity Wall components to the project template. In this project design, if the R/W is too close to construct a normal fill slope within the Right of Way, a wall will be included. In the FDOTSS2 Template Library there is a normal gravity wall component that will be added as an end condition to the template. The only change to the Gravity Wall end condition is the priority number.

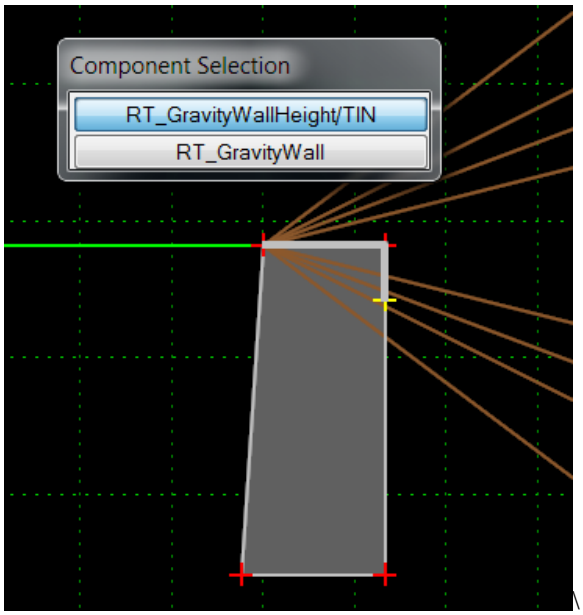
1. Zoom in to the *End Condition* area on the right side of the *SR817_3* template.



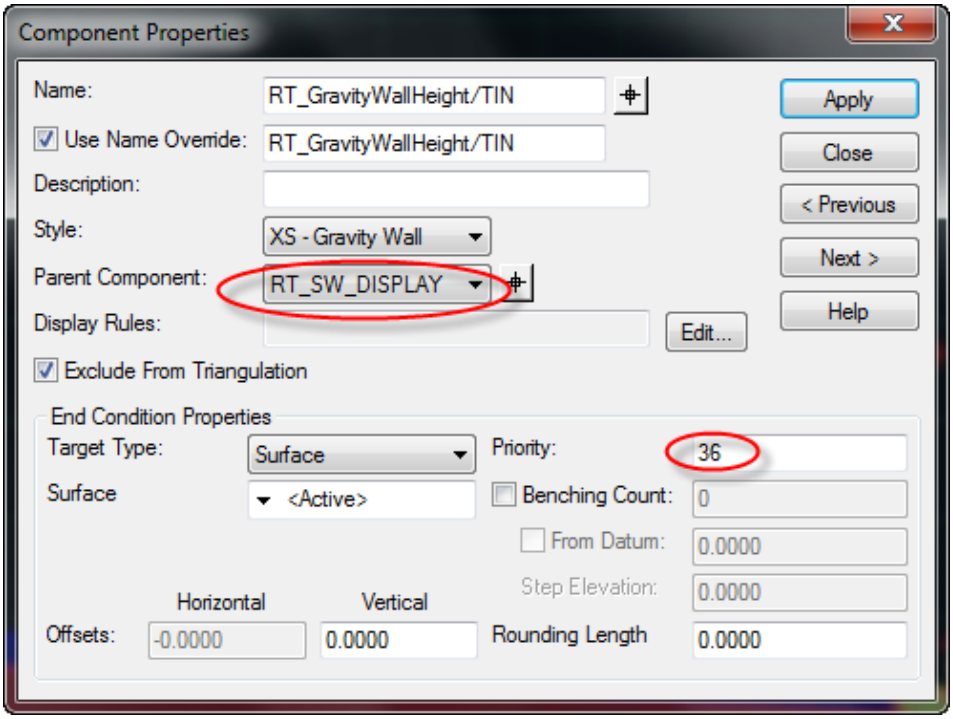
2. Open the *SR817 Components* folder and drag the **Gravity Wall** component over to the *Buffer Out point*, **RT_BUFFER_OUT**. While in dragging, right click and select the **Reflect** option to flip the components for the Right side of the template.



3. Right click on the top of the *Gravity Wall component* and select **Edit Component**. Select the **Wall Height/TIN component**.



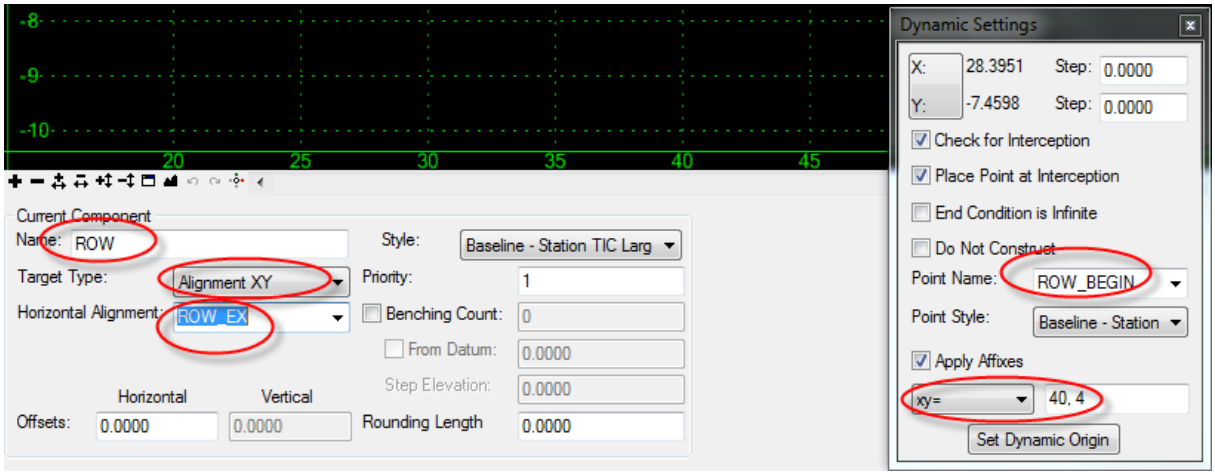
4. Change the *Priority* to **36** and Add the RT_SW_Display component as the *Parent Component*



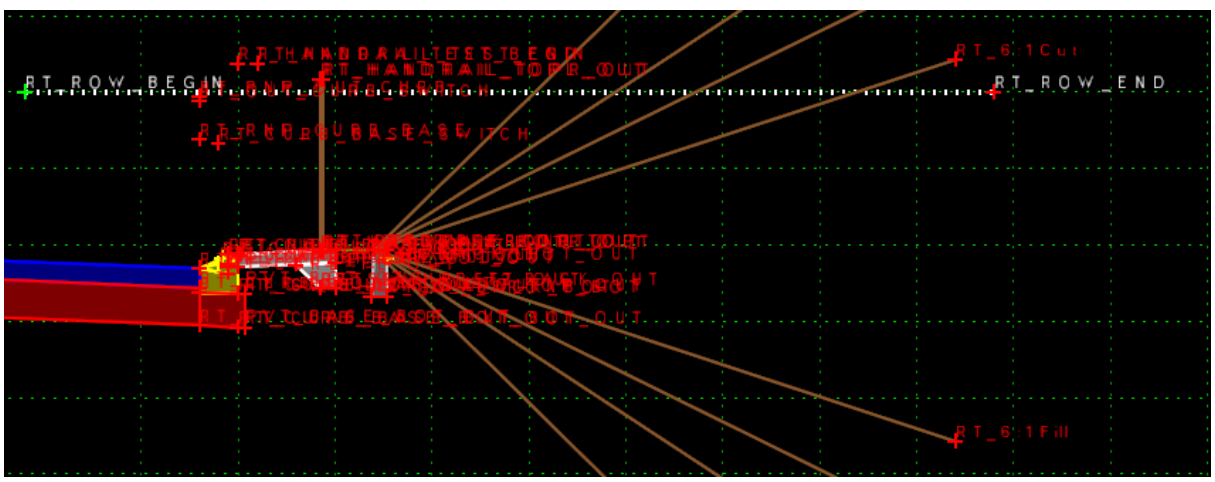
5. Click the **Apply** button.
6. Close the Component Properties dialog. Save the **Template**.

➢ *To check for the existing Right of Way distance*

1. Right click in the Template view and select **New Component** > **End Condition**. Open the Dynamic Setting dialog and check on the *Apply Affixes*.
2. Create an **End Condition** that targets the **AlignmentXY** for the **ROW_EX .** Place the first point, ROW_BEGIN at xy=40,4. **Press Enter.**

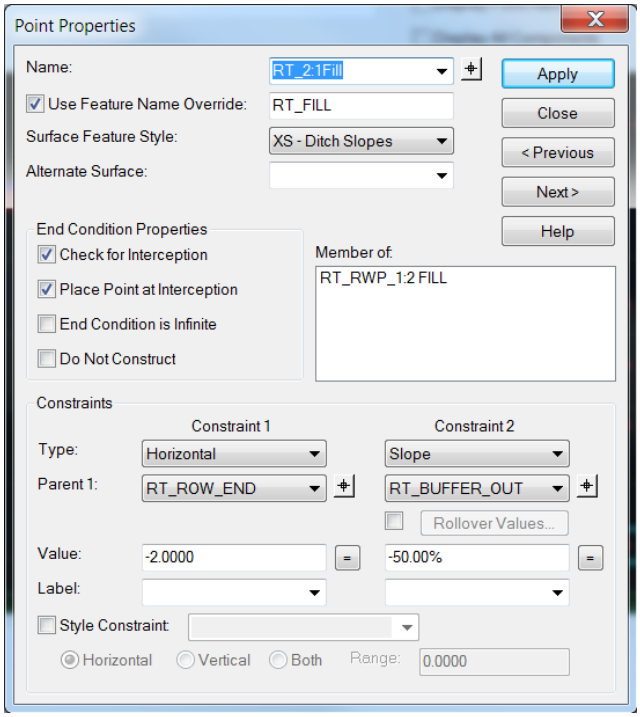


3. Place the second point, ROW_END at xy=100,4. **Press Enter.**

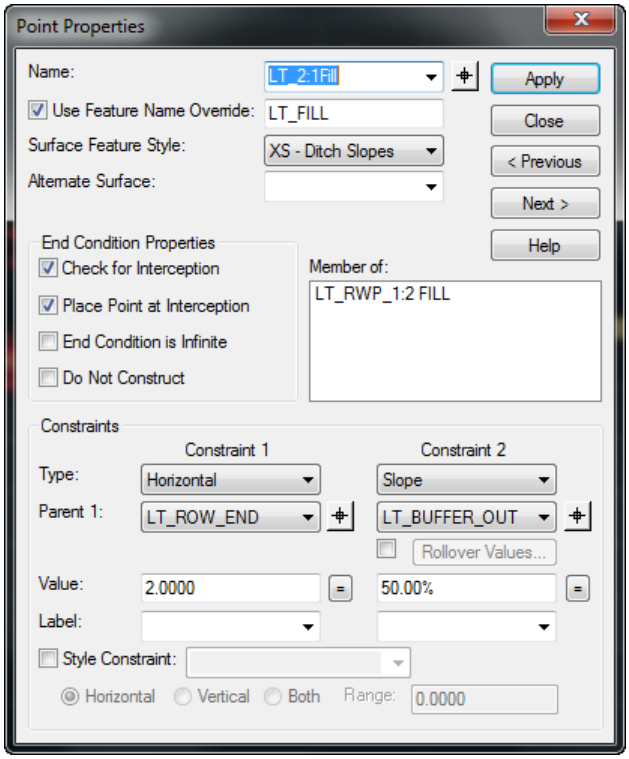


4. Edit each the right side Cut/Fill component end points, (8 Total) and change the *Horizontal Constraint* to the **ROW** condition ending point, **RT_ROW_END**. Use -2 for a 2 foot buffer distance.

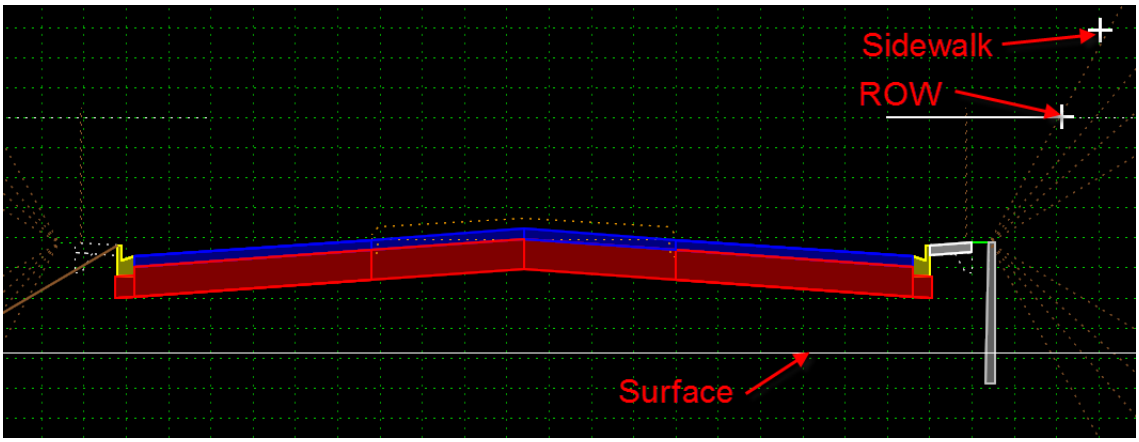
> ***Note*** Verify on the **2:1Fill and 2:1Cut Slope Components** that the "End Condition is Infinite" is NOT checked.



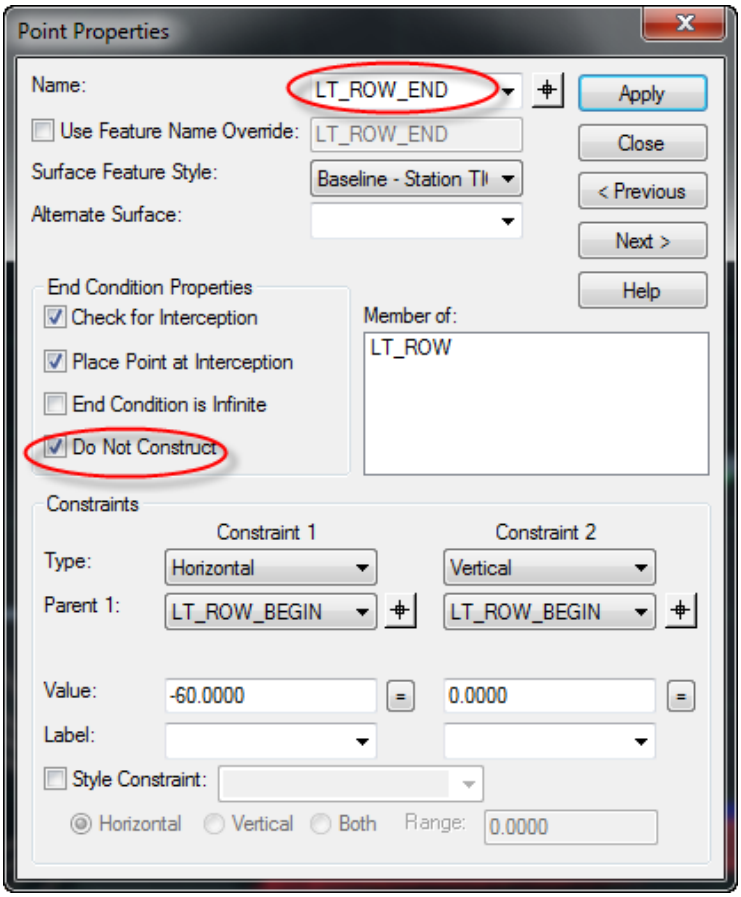
5. Edit each the left side Cut/Fill component end points, (8 Total) and change the *Horizontal Constraint* to the **ROW** condition ending point, **LT_ROW_END**. Use +2 for a 2 foot buffer distance.



6. Use the Test window to verify the results of the Right of Way condition check on the cut/fill end conditions.



7. Select and Edit the RT_ROW_END and LT_ROW_END points, check the *Do Not Construct* box. Click **Apply** and **Close**



8. **Save** the template.

9 WIDENING, MILLLING & RESURFACING

INTRODUCTIONS

Florida's Design Criteria for Resurfacing, Restoration and Rehabilitation (RRR) of Streets and Highways is outlined in the Plans Preparation Manual, Volume 1, and chapter 25. In general, some of the types of work for RRR projects are defined as follows:

- Mill and resurface only, EOP to EOP, no other improvements
- Resurface with trench widening (Roadway only)
- Resurface adding turn lanes (spot improvements)
- Resurface adding paved shoulders
- Combination of above
- Resurface with access management improvements
- Add paved shoulders only
- Intersection improvements
- Correct horizontal and/or vertical alignment
- ADA compliance
- Approaches to structures
- RRR with Right of Way acquisition

Improvements other than resurfacing, restoration or rehabilitation which can be considered include:

- Improve side slopes; slope flattening/stabilizing.
- Correct shoulder drop-off.
- Pave shoulders.
- Improve pavement cross slope.
- Improve pavement drainage.
- Provide or upgrade sidewalks, transit stops and bikeways.
- Provide or upgrade curb cuts, ramps and other disability access features.
- Reconstruct or close driveways to comply with Access Management standards.

The GEOPAK Corridor Modeling application has tools built in to assist in the design of RRR projects. Specifically, in the Create Template dialog, there are special components that can be added for milling, overbuild and resurfacing. Also, in Roadway Designer, there are cross slope correction and vertical alignment adjustment tools available to achieve the optimum rehabilitation design.

In this chapter exercise, the templates created from previous exercises will be modified to include the widening for turn lanes, radii, bus turn outs, etc. The template will also be changed to reflect the milling, overbuild and overlay for the existing pavement along the corridor. Simple vertical adjustment criteria will be applied to the project based on a maximum milling depth.

EXERCISE OVERVIEW

9.1 Modify Design Template with Inserted Points

9.2 Differentiate Widening from Resurfacing

9.3 Assign Parent Components & Delete Base Components

9.4 Adding Milling, Overbuild & Overlay Components

9.5 Apply Template to Corridor

9.6 Vertical Adjustments Settings

WIDENING, MILLING & RESURFACING

The project in this course manual is a typical RRR project. It includes several of types of work described above. Including:

- Mill and resurface only, EOP to EOP
- Adding/widening pavement for turn lanes (spot improvements)
- Intersection improvements (Radii improvements, new traffic separator)
- Improved pavement cross slope
- Provide or upgrade sidewalks, transit stops and bikeways

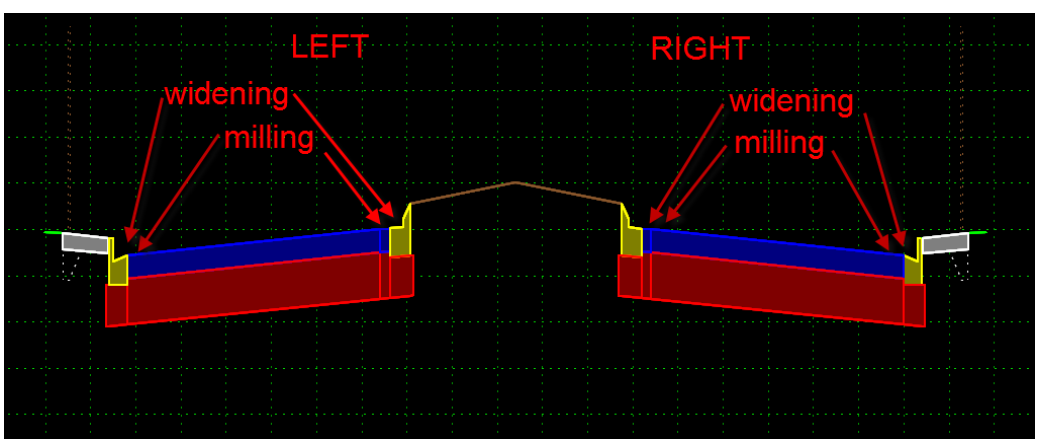
The design file has well defined line work designating the milling limits and widening limits along the project. These limits will be targeted on the template to automate the design and development of cross sections. The templates will be designed with widening, milling, overbuild, and resurfacing.

Exercise 9.1 Modify Design Template with Inserted Points

The first step will be to add the widening targets to the project SR817 template. The template will be modified to allow for simultaneous milling and widening targets as shown in the diagrams below.

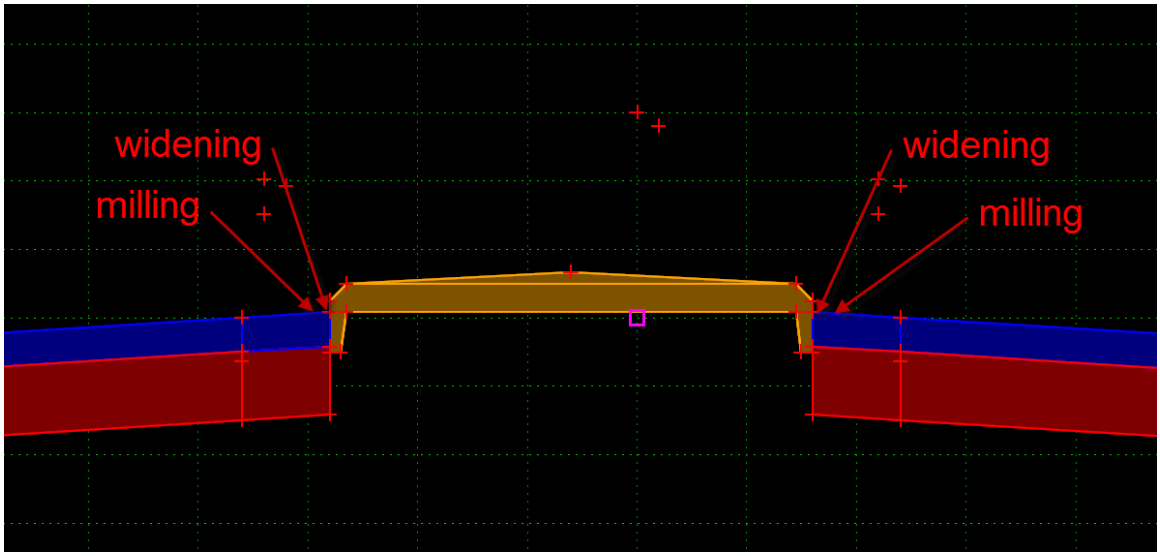
- To accommodate widening for the outside lanes and inside lanes in a Curb Median with Widening condition, there are three points to be inserted at 4 different locations:

LOCATION	Left Outside	Left Inside	Right Inside	Right Outside
Top	LT_ML_OUT	LT_ML_IN	RT_ML_IN	RT_ML_OUT
Middle	LT_ML_BOT_OUT	LT_ML_BOT_IN	RT_ML_BOT_IN	RT_ML_BOT_OUT
Bottom	LT_ML_BASE_BOT_OUT	LT_ML_BASE_BOT_IN	RT_ML_BASE_BOT_IN	RT_ML_BASE_BOT_OUT



- To accommodate widening for the inside lanes when a traffic separator is present, there are three points to be inserted at 2 different locations. They are:

LOCATION	Left Inside	Right Inside
Top	LT_ML_IN1	RT_ML_IN1
Middle	LT_ML_BOT_IN1	RT_ML_BOT_IN1
Bottom	LT_ML_BASE_BOT_IN1	RT_ML_BASE_BOT_IN1



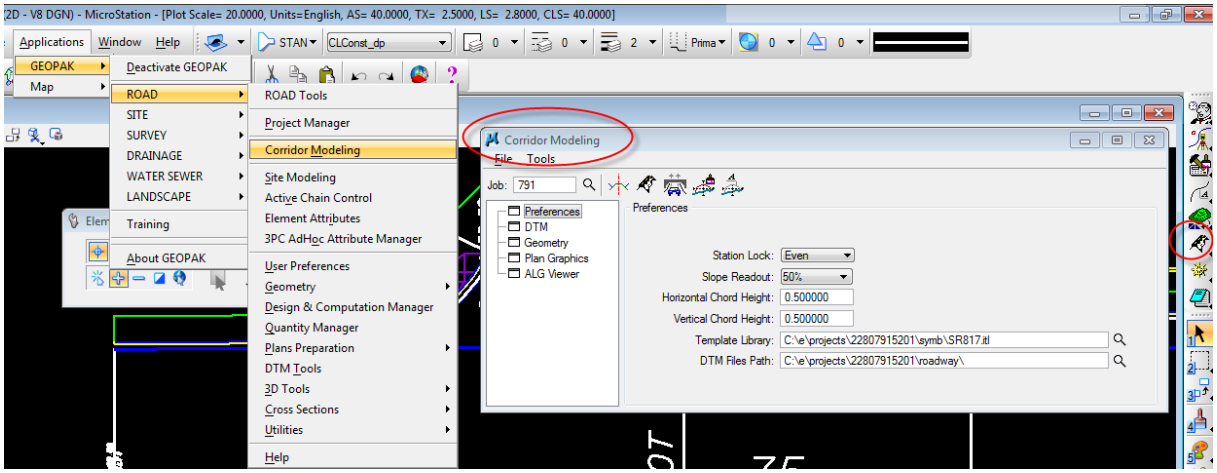
In this exercise the proposed roadway design file, *DSGNRD01.dgn*, will be opened with GEOPAK using the FDOT workspace and Project configuration. The GEOPAK Project Manager is loaded for the project. The Corridor Modeling dialog is loaded and the project preferences are loaded from the previous exercises. The Create Template dialog is opened and the completed template from chapter 8 is copied and renamed.

The template will have new points inserted on the components to accommodate widening on the inside and outside of the milling limits for each roadway. Also, the style constraints defined in the earlier chapters will be changed to target Pavement-Proposed alignments and the new points will target the Milling Limits. Since components cannot be inserted on templates, this step is included prior to creating new components.

1. Open the FDOTSS2 MicroStation workspace in the c:\e\projects\2280795201\roadway folder in the *DSGNRD01.dgn* file.

2. Click the **GEOPAK Project Manager** icon and select the **sr817.pr**j Road Project.

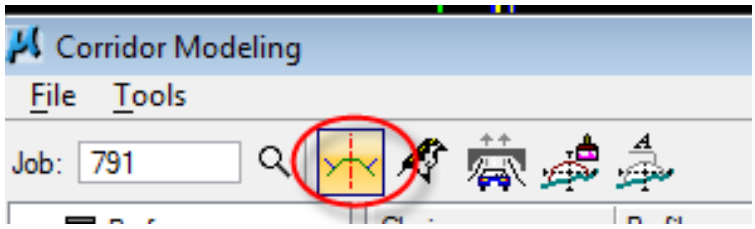
3. Open the Corridor Modeling dialog box by clicking on the icon <OR> from the MicroStation menu option: **Applications** > **GEOPAK** > **ROAD** > **Corridor Modeling**.



4. From the Corridor Modeling dialog, select **File** > **Load**. A browser window will appear in the current working design file directory.

5. Select the **SR817.rdp** preference file to load.

6. Open the Create Template dialog by clicking on the **Create Template** icon.



7. From the tree view right click on the **SR817_4_RD Template** and click **Copy**.

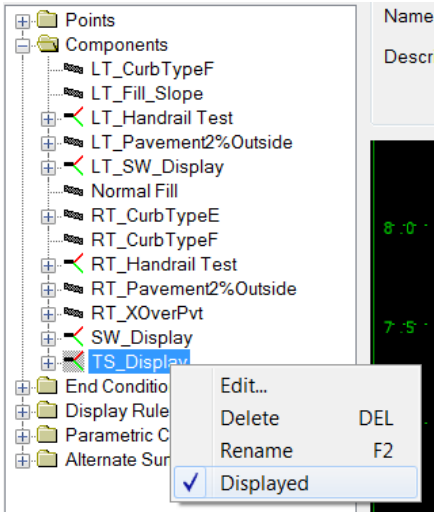
8. Right click on the folder, click **Paste** and then rename the template **SR817_5**.

9. Right click on the **SR817_5** template and select **Set Active**.

10. Click on the **Active Template** tab and uncheck the **Display All Components** box in the Display area of the Create Template dialog.

➢ ***To turn off the display of Components in the Active Template tab of the Create Template dialog***

1. Expand the *Components* folder, right click each of the **"TS_" components** in the list and click **Displayed**. This will toggle off the each of the Traffic Separator components displayed in the view.

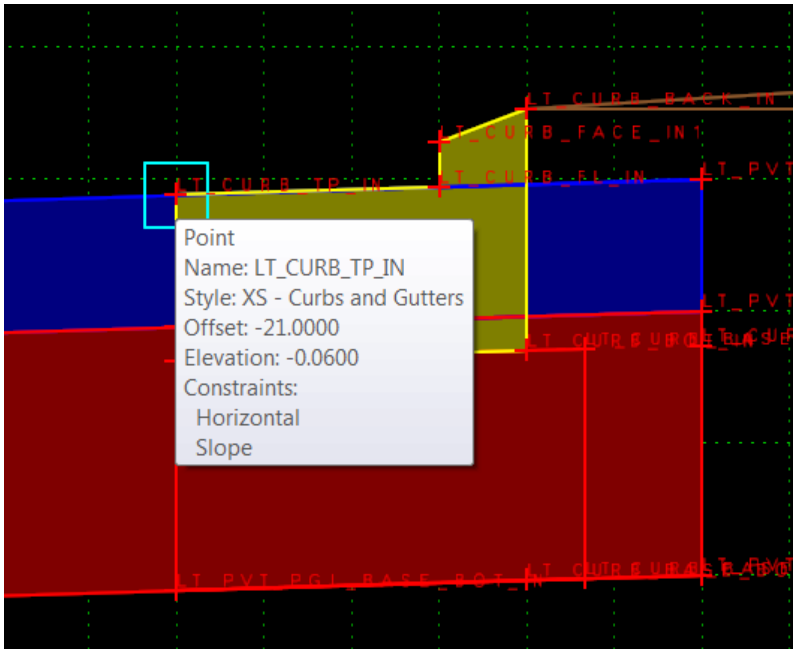


2. Also, right click on the **RT_XOverPvt** and toggle off the display of the Crossover Median. Since the **RT_XOverPvt** is the parent of the **LT_XOverPvt**, both sides toggle off together.

   <OR> right click on the **LT_XOverPvt** and toggle off the display of the Crossover Median on the left side.

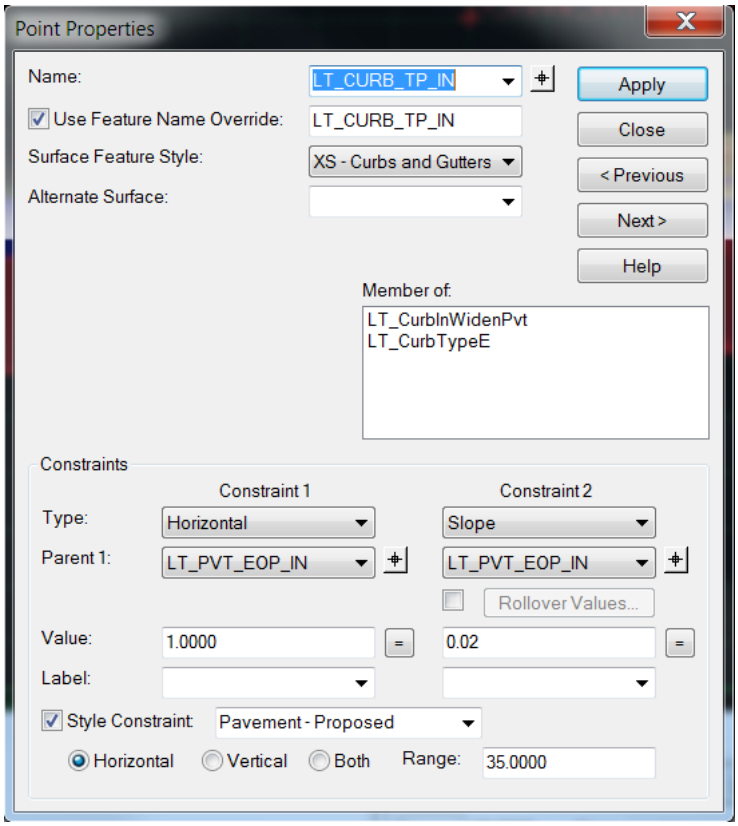
➢ ***To add the widening targets for the left inside roadway***

1. Zoom into the left side of the template and right click on the **LT_CURB_TP_IN point,** click **Edit**.



2. In the Point Properties dialog, change the *Parent 1: Horizontal Constraint* to be applied from the **Lt_PVT_EOP_IN** point and change the *Value* to **1.0**.

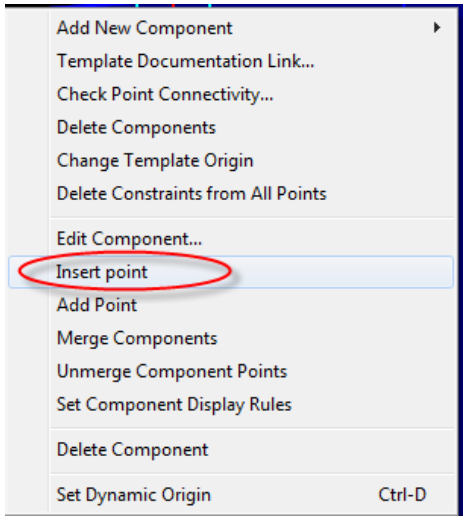
3. Also, change the *Style Constraint* feature list selection from **Milling Limits** to **Pavement – Proposed**, click **Apply** to save the changes and then **Close** the Point Properties dialog.



4. Select **File** > **Save** to save the changes to the **Template** Library.
5. Toggle on the Dynamic Settings dialog and check the **Apply Affixes** box.

➢ *Bookmark INSERT POINT*

1. Right click on the **LT_CurbInWidenPvt** component next to the *LT_CURB_TP_IN* point and click **Insert point**.



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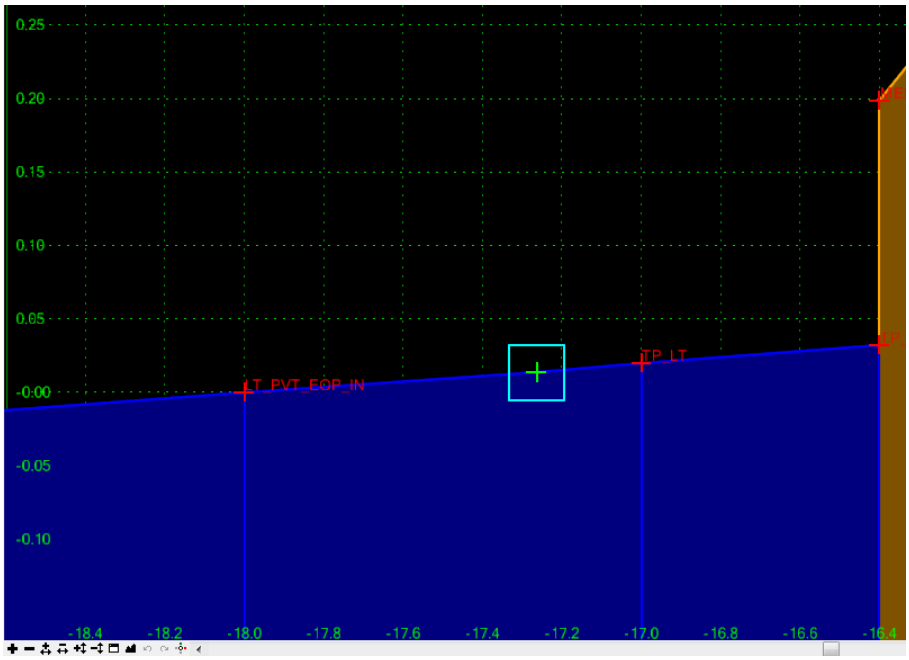
2. Float a point in between the **LT_PVT_EOP_IN** and the **LT_CURB_TP_IN** points. Use a *data point* to insert a point, right click and then right click again and select **Finish** to store the point.



Note There is a problem with the software that appears in the Active Template tab of the create template dialog; all the components re-display after an inserted point.

3. Right click on the new inserted point and click **Edit Point.**

4. From the Point Properties dialog, change the *name* to **LT_ML_IN** and set the following:

Point Name		LT_ML_IN	
Check	Use Feature Name Override	LT_ML_IN	
Constraint 1	Slope	LT_PVT_EOP_IN	2.0%
Constraint 2	Horizontal	LT_PVT_EOP_IN	0.90
Style Constraint		Milling Limits	
Label		*none*	
Range	Horizontal	35	

5. Right click on the **LT_CURB_TP_IN** point and click **Edit Point.** From the Point Properties dialog, change the *Constraint* to target the new **LT_ML_IN** point. The *values* should be:

Point Name		LT_CURB_TP_IN	
Check	Use Feature Name Override	LT_CURB_TP_IN	
Constraint 1	Slope	LT_PVT_EOP_IN	2.0%
Constraint 2	Horizontal	LT_ML_IN	0.10
Style Constraint		Pavement – Proposed	
Label		*none*	
Range	Horizontal	35	

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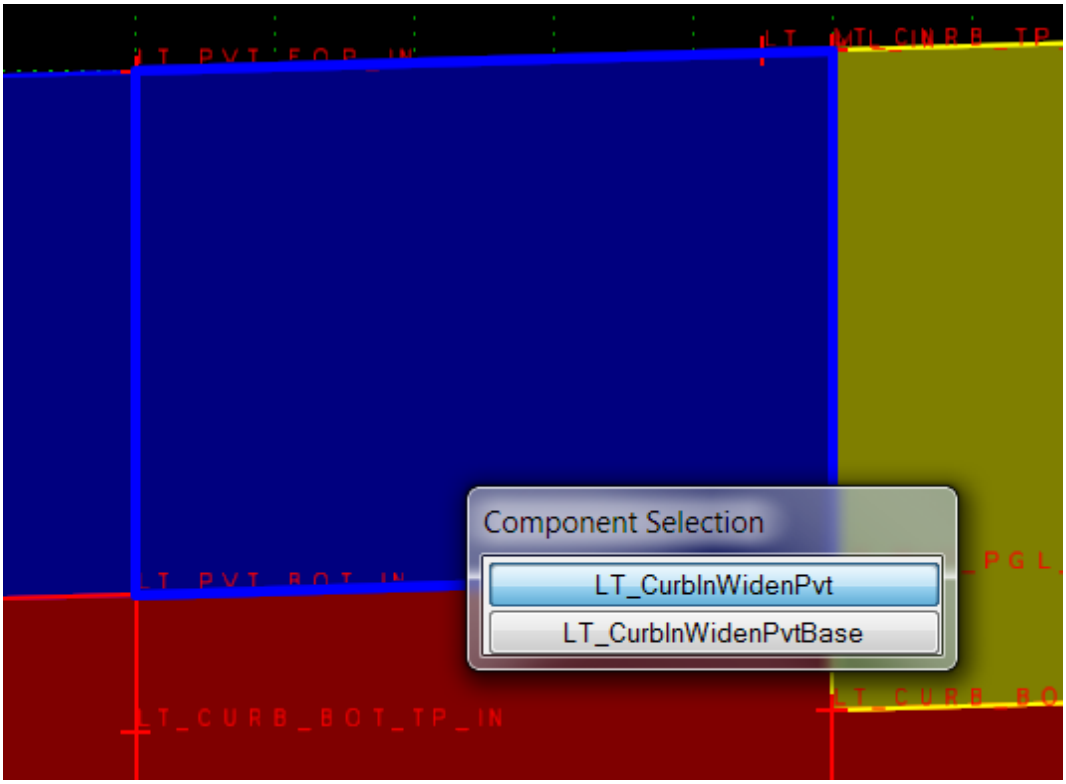
6. Click **Apply** and **Close** the Point Properties dialog. Save the **Template** Library.
7. Next insert another point directly below the inserted milling point, right click on the component and click **Insert point**. When the Component Selection dialog appears, click the **LT_CurbInWidenPvt.**

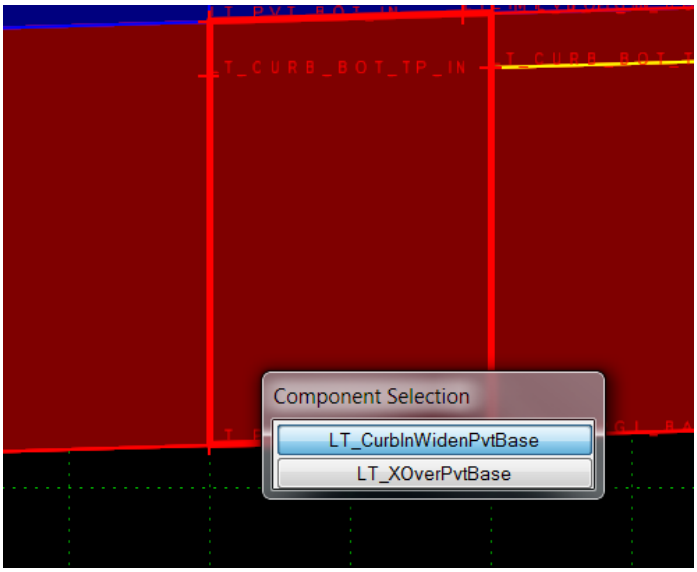


8. Place the point, right click and click **Finish**.
9. Right click on the point and click **Edit Point** to open the Point Properties dialog. Change the dialog as follows:

Point Name		LT_ML_BOT_IN	
Check	Use Feature Name Override	LT_ML_BOT_IN	
Constraint 1	Horizontal	LT_ML_IN	0.0
Constraint 2	Horizontal	LT_ML_IN	-0.5
Style Constraint			
Label		EOP_PVT ThickLt	

10. Click **Apply** and **Close** the dialog to save the changes. Save the **Template** Library

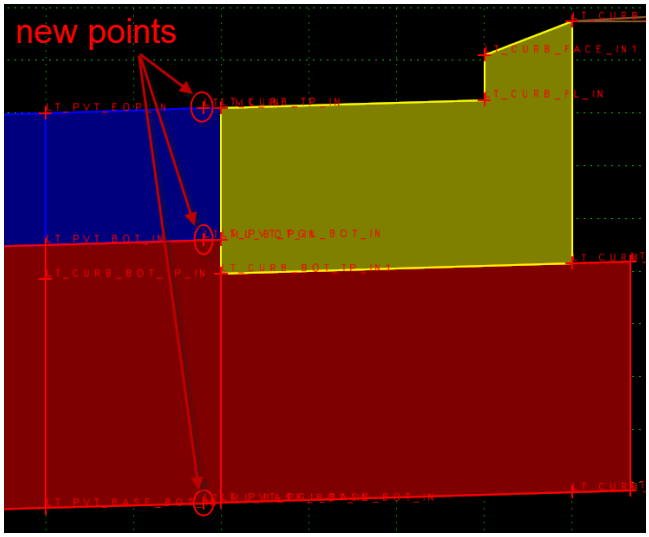
11. Next insert another point directly below the inserted **LT_ML_BOT_IN** point, right click on the component and click **Insert point**. When the Component Selection dialog displays, click the **LT_CurbInWidenPvtBase**.



12. Place the point, right click and click **Finish**.
13. Right click on the point and click **Edit Point** to open the Point Properties dialog. Change the dialog as follows:

Point Name		LT_ML_BASE_BOT_IN	
Check	Use Feature Name Override	LT_ML_BASE_BOT_IN	
Constraint 1	Horizontal	LT_ML_BOT_IN	0.0
Constraint 2	Horizontal	LT_ML_BOT_IN	-1.0
Style Constraint			
Label		EOP_Base ThickLt	

14. Click **Apply** and **Close** the dialog to save the changes. Save the Template Library.
15. The results should resemble the image below.



16. **REPEAT** this procedure for the *milling targets* on the left outside roadway, right inside roadway and the right outside roadway. Use the *Point Name Convention* from below and save the **Template** Library after each point is added. Follow the steps outlined above.

HINT Go back to the bookmark Insert Point.

Use the following guidelines:

a. Change each of the existing outside and inside points to target the widening **Style Constraint, Pavement-Proposed**.

b. Insert each point on the correct component nearest the curb or traffic separator location.

c. Construct each *new TOP point* to be a **Horizontal constraint** and **Vertical constraint** from the **PVT_EOP _IN (PGL control point)** and to target the **Milling Limits Style Constraint**. Use the same range value as the widening points.

d. Change each of the existing TOP outside and inside points to be a **Horizontal constraint** and **Vertical constraint** from the new *ML point*, *Horizontal* = **(+/-)0.10**, *slope* = **Vector Offset(inside), (+/-) 2.0%(outside).**

e. Include the *Label* for each of the **Middle** and **Bottom points.**

f. Save the **Template** Library after each point is added.

Location	Left Outside	Left Inside	Right Inside	Right Outside
Top	LT_ML_OUT	LT_ML_IN	RT_ML_IN	RT_ML_OUT
Middle	LT_ML_BOT_OUT	LT_ML_BOT_IN	RT_ML_BOT_IN	RT_ML_BOT_OUT
Bottom	LT_ML_BASE_BOT_OUT	LT_ML_BASE_BOT_IN	RT_ML_BASE_BOT_IN	RT_ML_BASE_BOT_OUT

17. For the new points at the Traffic Separator use the table below:

LOCATION	Left Inside	Right Inside
Top	LT_ML_IN1	RT_ML_IN1
Middle	LT_ML_BOT_IN1	RT_ML_BOT_IN1
Bottom	LT_ML_BASE_BOT_IN1	RT_ML_BASE_BOT_IN1

18. Save the **Template** Library.

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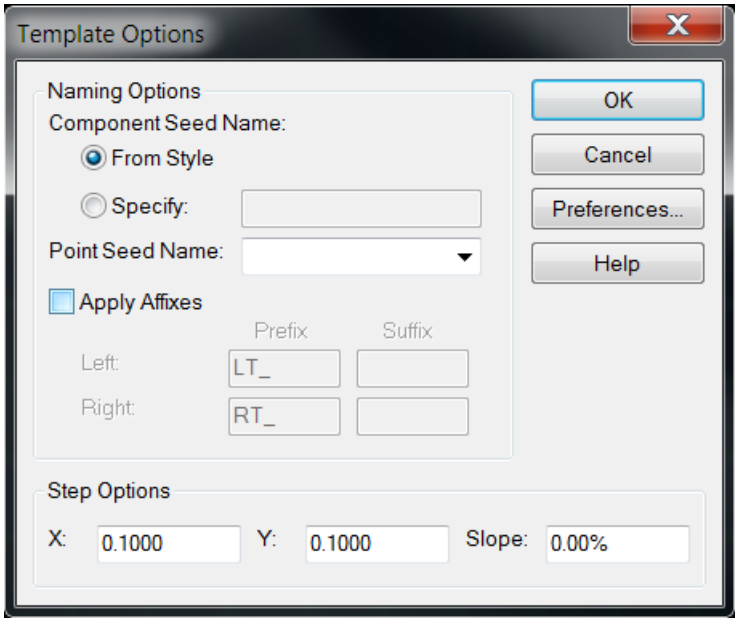
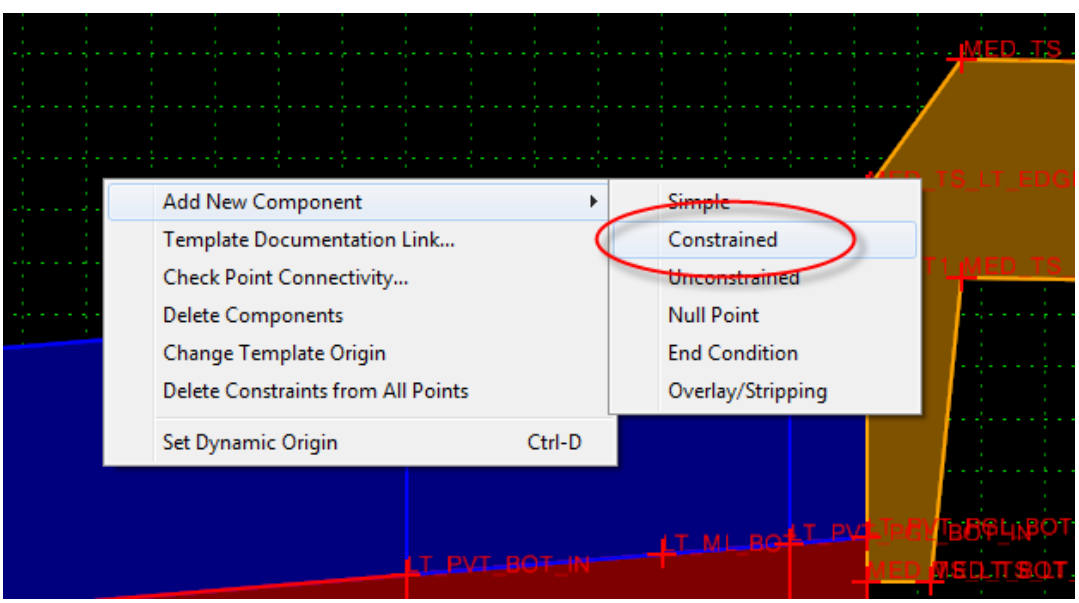
Exercise 9.2 Differentiate Widening from Resurfacing

In this exercise the template will have new components added and constrained to the points created in the prior exercise. The components will accommodate widening on the inside and outside of the milling limits for each roadway. Since components cannot be inserted on templates, this step is included prior to deleting the older components.

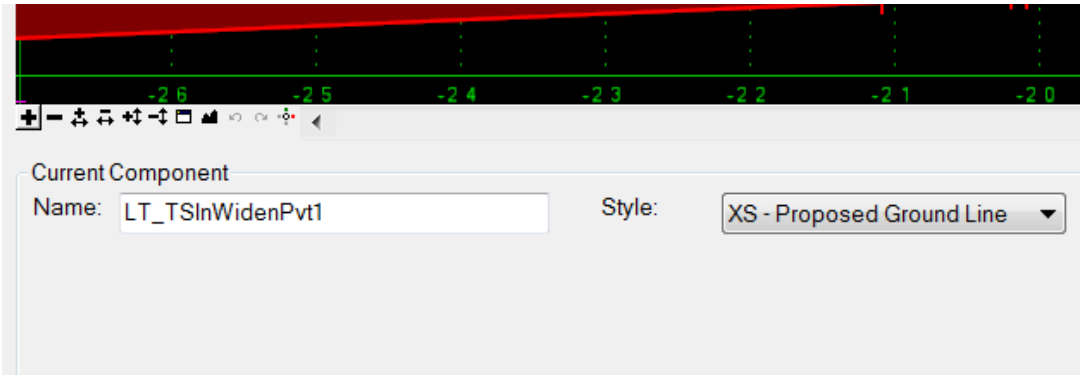
1. From the tree view, right click on the **SR817_5 Template** and click **Copy**.
2. Right click on the **SR817 Template** folder, click **Paste** and then rename the template **SR817_6**.
3. Right click on the **SR817_6** template and select **Set Active**.
4. From the Create Template dialog, select **Tools** > **Options** and set the Template Options dialog as shown in the image below. Click **OK** to close the dialog.



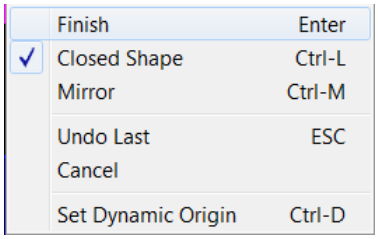
5. Zoom into the inside widening area of the left roadway.
6. Right click on the template window and select **ADD New Component** > **Constrained**.



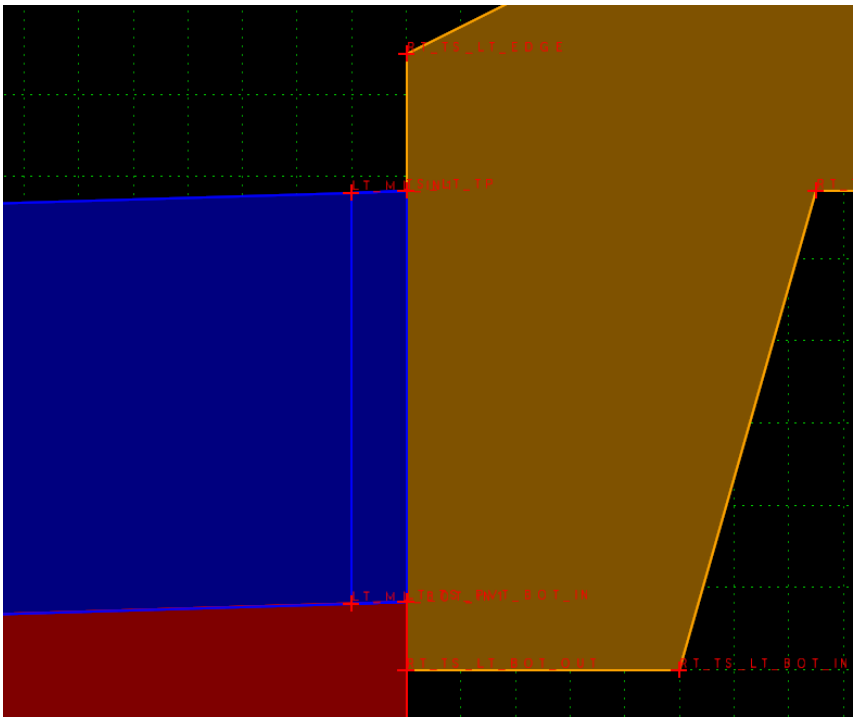
7. In the *Name:* field, key in **LT_TSInWidenPvt1** and from the *Style:* list, select **XS - Proposed Ground Line**,



8. Right click in the view and check **Closed Shape.** If already checked hit the **Escape (Esc)** Key.

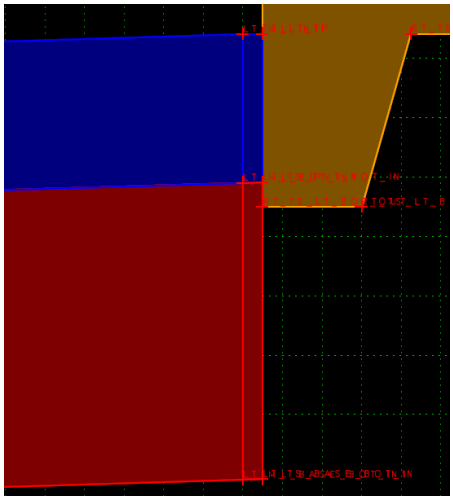


9. Select the four points shown below that define the widening pavement, right click and click **Finish.**



10. Right click on the template window and select **ADD New Component > Constrained**.
11. In the Name field key in **LT_TSInWidenBase1**
12. From the **Style** pull down list, select the **XS - Proposed Base Line**.

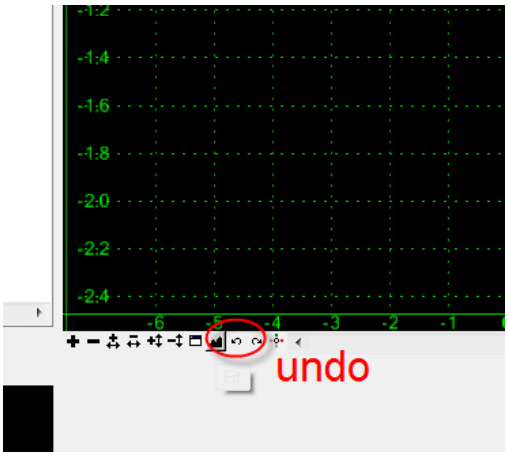
13. Select the four points shown below that define the widening base, right click and click **Finish**.



14. Save the Template Library.
15. Zoom into the outside widening area of the left roadway.
16. Save the Template Library.
17. Repeat the **ADD New Component** > **Constrained** procedure for the each of the components listed in the table below. Use the following naming convention for the new components:

	Left Outside	**Left Inside**	**Right Inside**	**Right Outside**
Outside Widening at Curb	LT_CurbOutWidenPvt LT_CurbOutWidenBase			RT_CurbOutWidenPvt RT_CurbOutWidenBase
Inside Widening at Curb		LT_CurbInWidenPvt1 LT_CurbInWidenBase1	RT_CurbInWidenPvt1 RT_CurbInWidenBase1	
Inside Widening at Traffic Separator		LT_TSInWidenPvt1 LT_TSInWidenBase1	RT_TSInWidenPvt1 RT_TSInWidenBase1	

Note Use the undo and *Redo* icons to make corrections while editing templates.

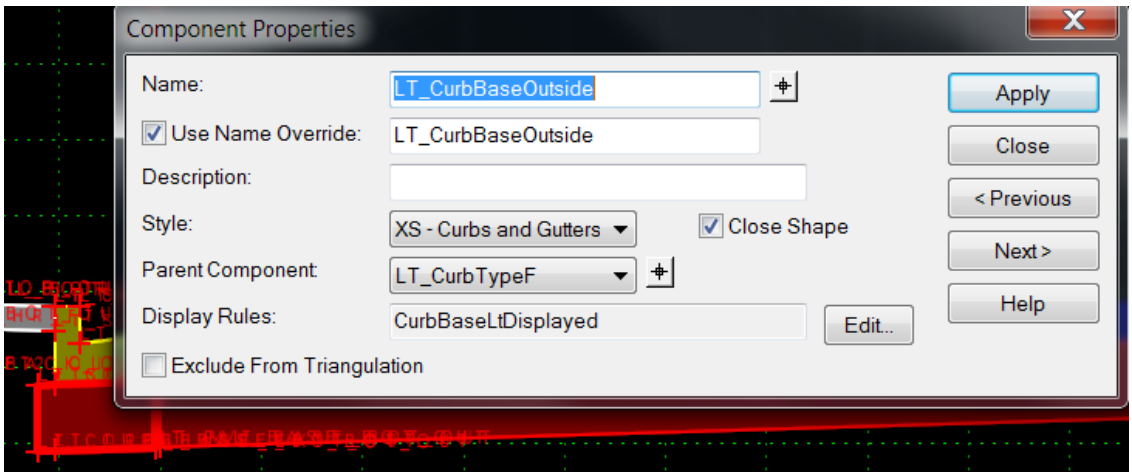


18. Save the Template Library.

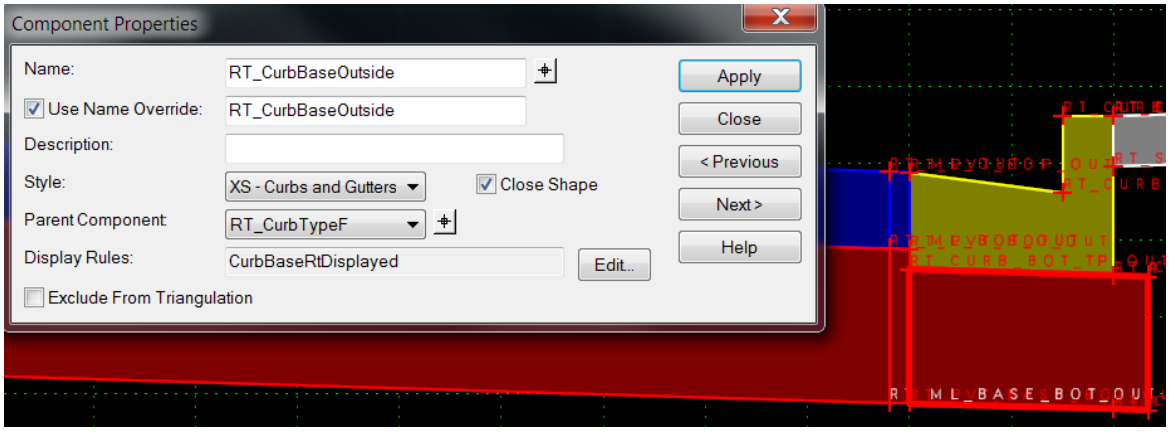
Exercise 9.3 Assign Parent Components, Delete Base Components

In this exercise the new widening template components will be associated with other template components using Parent Component Properties. This step is necessary for the new components to inherit the variable template display rules created in the previous chapter for this project. The un-needed base components will then be deleted for both roadways.

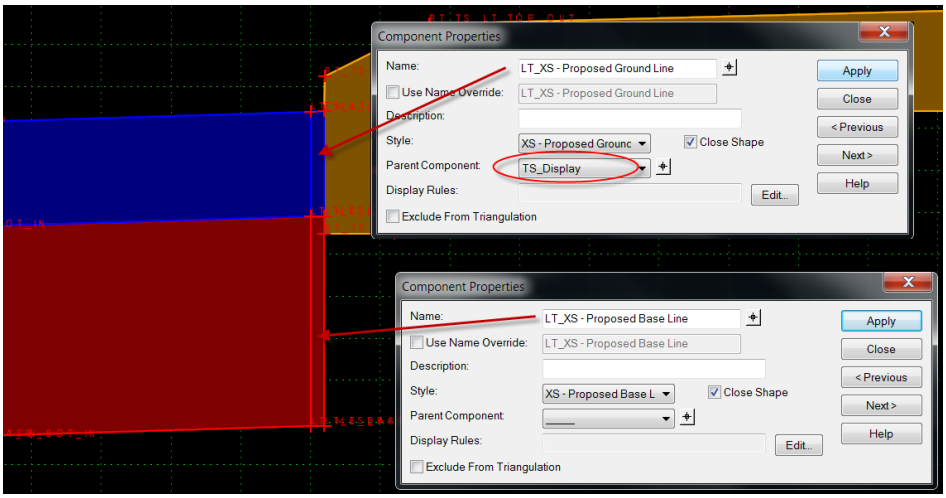
1. From the tree view right click on the **SR817_6 Template** and click **Copy**.
2. Right click on the *Template* folder, click **Paste** and then rename the template **SR817_7**.
3. Right click on the **SR817_7** template and select **Set Active.**
4. Right click on the **LT_CurbBaseOutside component**, select **Edit Component.** Change the Components Properties dialog to have the *Parent Component* as the **LT_CurbTypeF**.



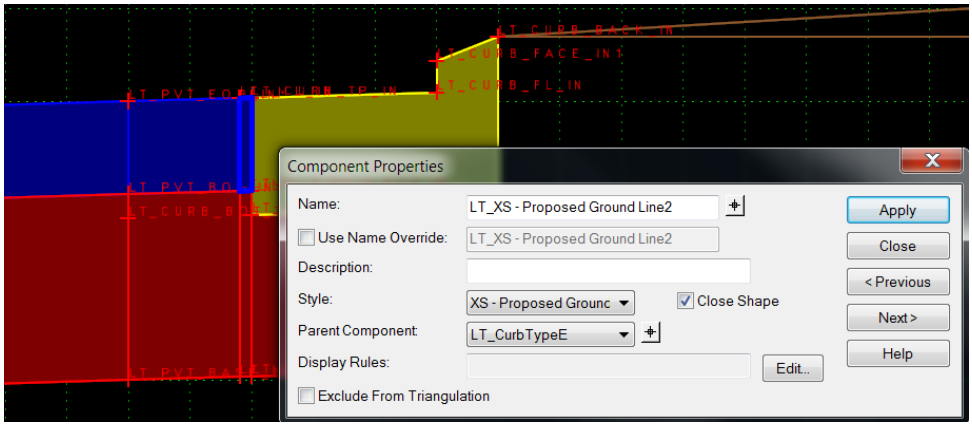
5. Right click on the **RT_CurbBaseOutside component,** select **Edit Component.** Change the Components Properties dialog to have the *Parent Component* as the **RT_CurbTypeF.**



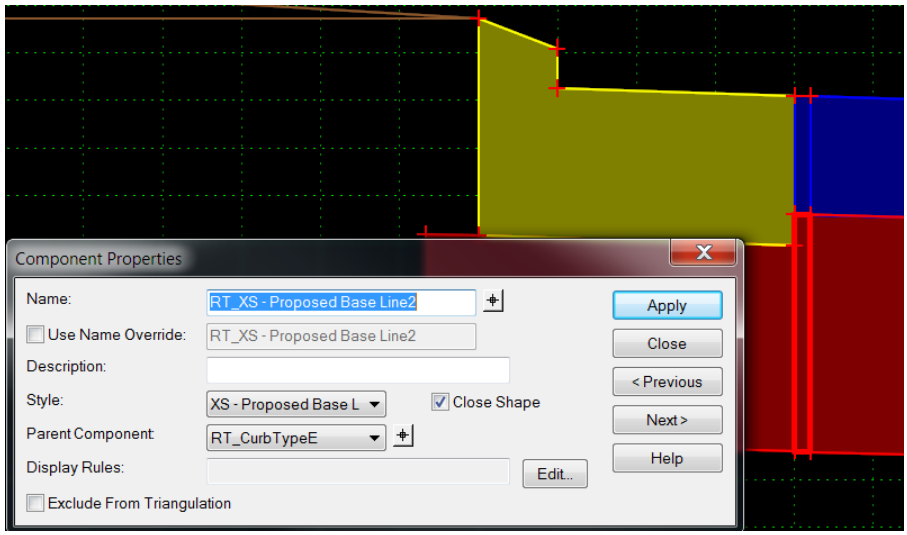
6. Assign the TS_Display as the *Parent Component* to the new widening Pavement and Base components for each side of the Traffic Separator.



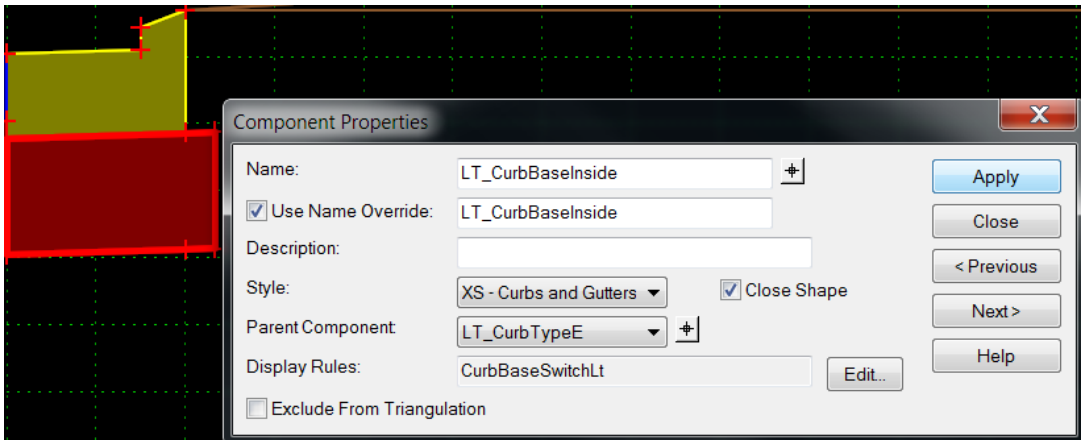
7. Assign the **LT_CurbTypeE1** as the *Parent Component* to the new left side widening Pavement and Base components.



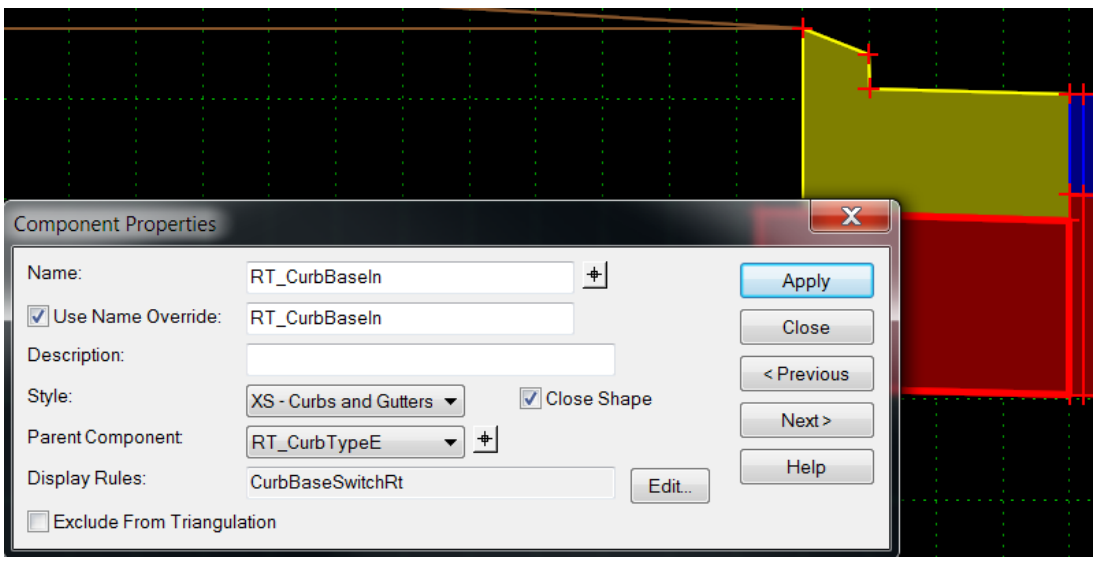
8. Assign the **RT_CurbTypeE1** as the *Parent Component* to the new right side widening Pavement and Base components



9. Reassign the **LT_CurbBaseInside** in the Component Properties dialog to have the *Parent Component* as the **LT_CurbTypeE1**.

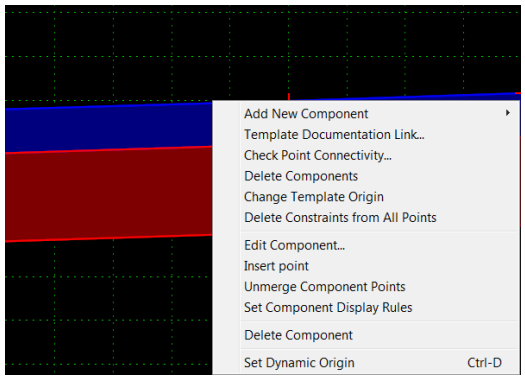


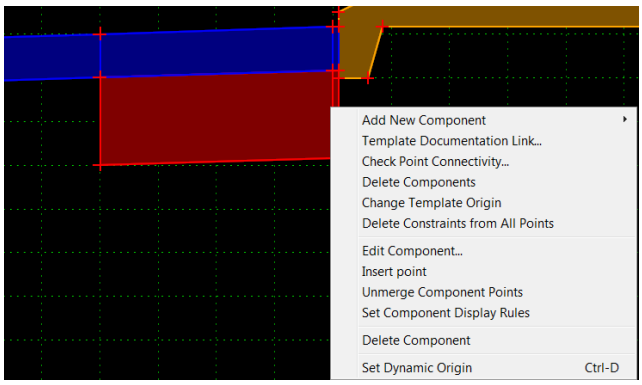
10. Reassign the **RT_CurbBaseIn** in the Component Properties dialog to have the *Parent Component* as the **RT_CurbTypeE1**.



➢ *Delete the Base Components*

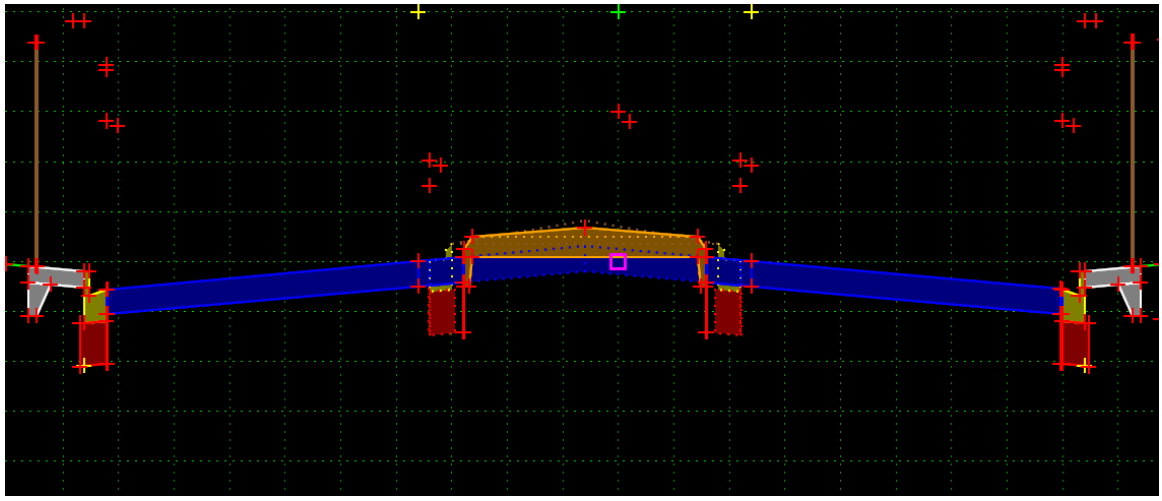
1. Zoom into the left roadway.
2. Right click on the base component**, LT_PavementBase2%Outside**, and select **Delete Component**.





3. Delete the base components for both the Curb Median and Traffic Separator inside widening on the left roadway: **LT_CurbInWidenPvtBase, LT_TSInWidenPvtBase**
4. Delete the main base component and the inside widening base components on the right roadway: **RT_PavementBase2%Outside, RT_CurbInWidenPvtBase, RT_TSInWidenPvtBase**
5. Delete the base components for the crossover median pavement: **LT_XOverPvtBase, RT_XOverPvtBase**

> ***Note*** When these step are completed, the only base components remaining will be for the curbs and the new pavement widening components.

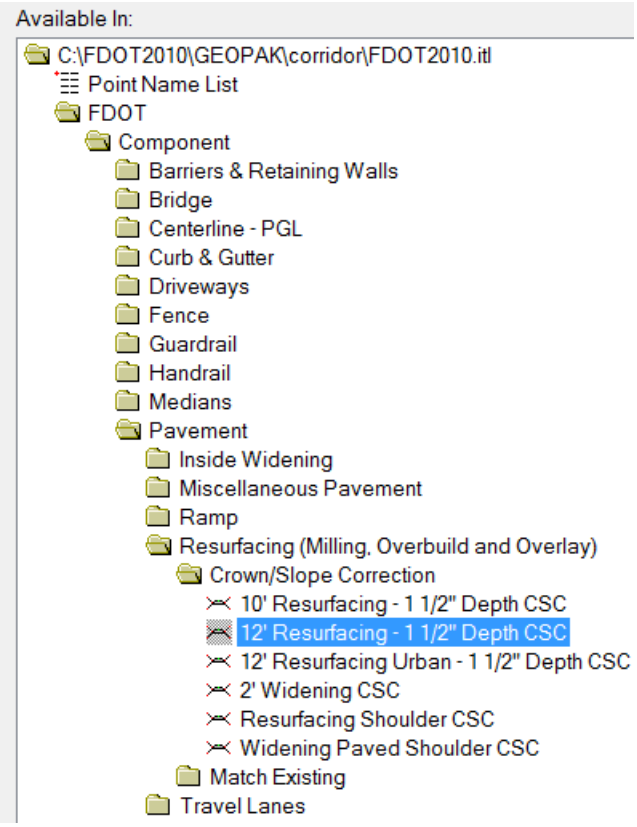


Exercise 9.4 Adding Milling, Overbuild and & Overlay Components

In this exercise the template will have new milling, overbuild and overlay components added. Standard resurfacing components are located in the FDOTSS2 template library. These components will be added in place of the pavement and base components and will accommodate milling and overbuild between the inside and outside of the milling limits for each roadway.

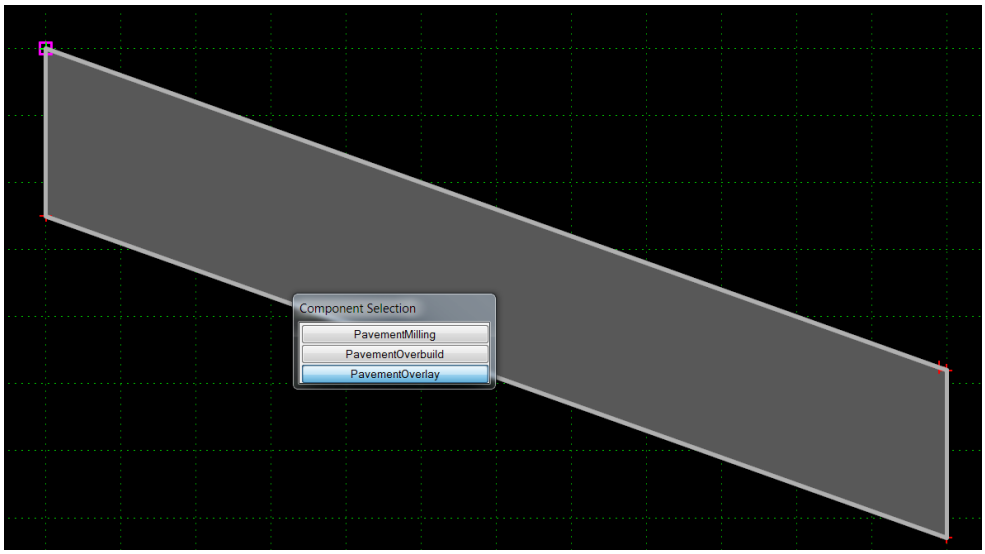
1. From the Create Template dialog select **Tools >Template Library Organizer**
2. For the *Available In:* folder on the right side, navigate to the

   C:\FDOTSS2\GEOPAK\corridor**FDOTSS2.itl** folder and click **Open.**
3. In the Template Library Organizer dialog , open the FDOT templates folder and navigate to the **Cross Slope Correction** folder shown below:



4. Drag the **12' Resurfacing 1 1/2" Depth CSC** template over to the project template library and place it in the **SR817 Components** folder.
5. Also drag the **Resurfacing Shoulder CSC** template over to the project template library and place it in the **SR817 Components** folder
6. Click **OK** to close the Template Library Organizer dialog. Click **Yes** to save the data.
7. Double click on the **12' Resurfacing- 1 1/2" Depth CSC** template to display it in the main view**.**

8. Right click on the bottom side of the shape and select **Edit Component**. The Component Selection dialog will open.



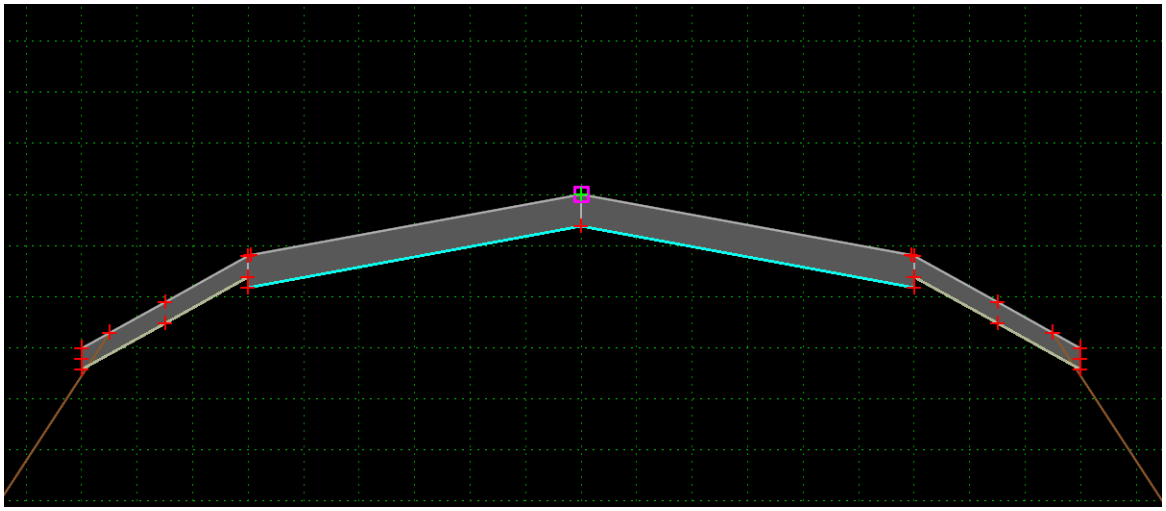
Note	This template is a composite of 3 required components for Resurfacing: Milling, Overbuild, and Overlay.

9. Press the **Esc** key to release the Component Selection dialog.

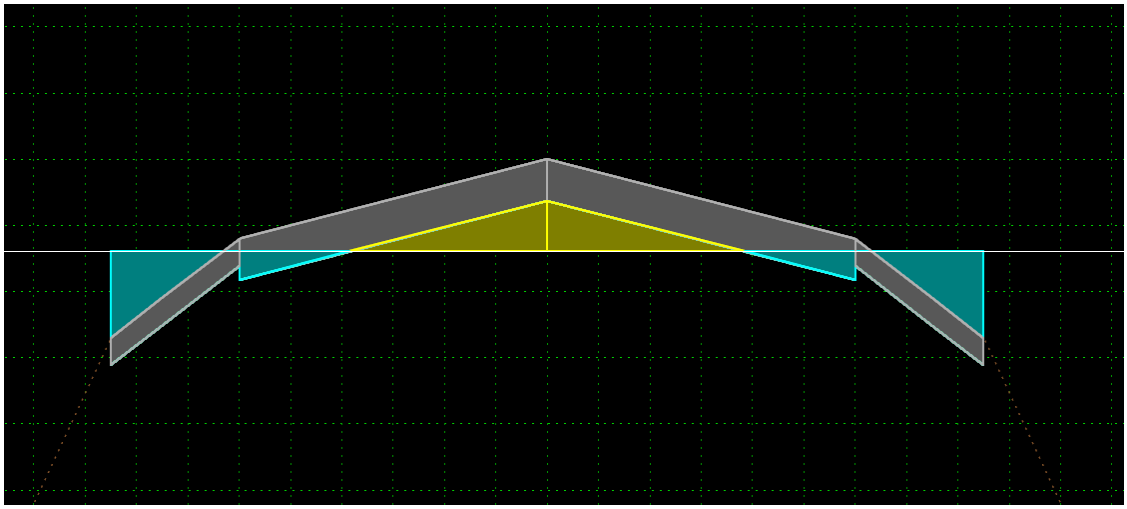
➢ ***To illustrate how these components work together:***

The Basic Template created in the previous exercise will be modified with the resurfacing components.

1. Make a copy of the **Basic Template** and rename the template **Cross Slope Correction**.
2. **Set Active** the **Cross Slope Correction** template
3. Drag the **12' Resurfacing- 1 1/2" Depth CSC** template with the Mirror option checked, onto the **Cross Slope Correction** template at the center point.
4. Drag the **Resurfacing Shoulder CSC** template with the **Mirror** option checked, onto the **Cross Slope Correction** template at the shoulder point.
5. Delete the pavement, base, and shoulder component copied from the Basic Template The **Cross Slope Correction** template should look as follows



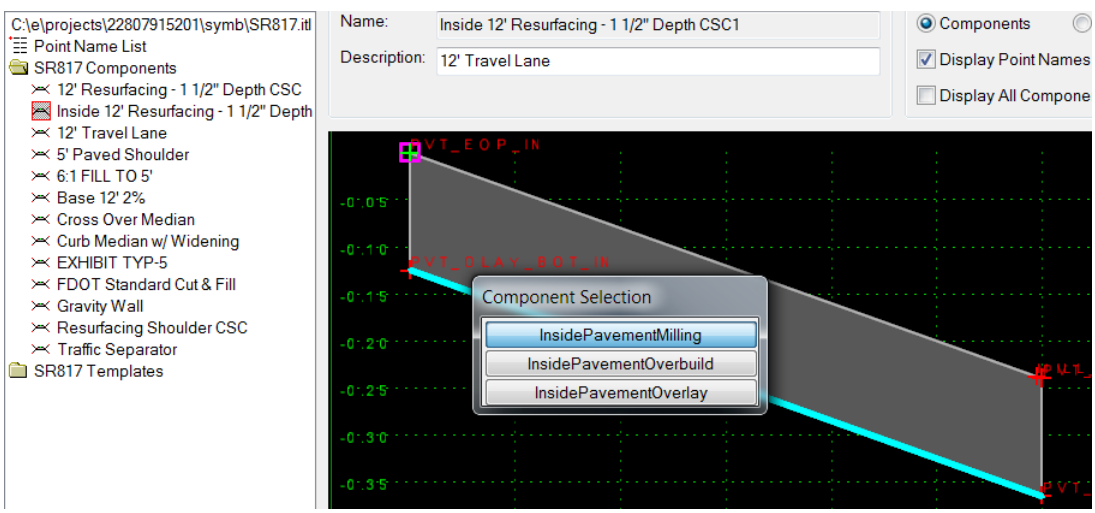
6. Click the **Test** button to open the Test End Conditions dialog.
7. Click on the **Draw** button in the Test End Conditions dialog to view how the resurfacing components are constructed based on where the exiting surface is located. The light blue is the required milling, yellow is the required overbuild and gray is the overlay. Some of the colors overlap.



8. Time permitted; repeat this exercise with the resurfacing components from the **Match Existing** folder.

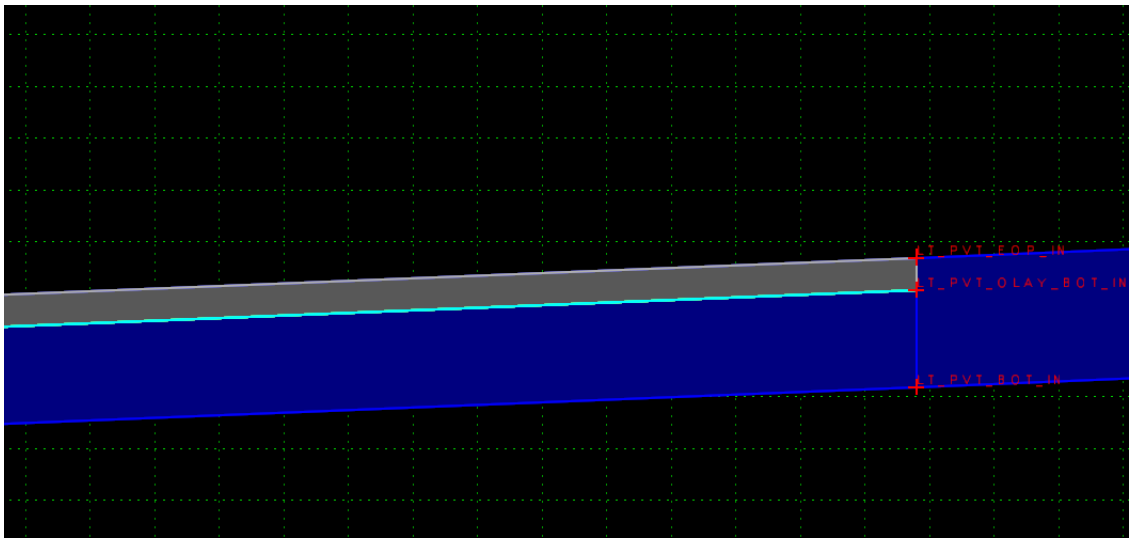
➢ ***To add the Resurfacing components to the SR817 Project Template***

1. Locate the **MILL_EVAL_CP** point, right click and select **Delete Point**.
2. Copy and Paste **12' Resurfacing- 1 1/2" Depth CSC** template to the **SR817 Components** folder. Rename the template with the prefix "**Inside** "and the individual components with the prefix "**InsidePavement**" instead of "**Pavement**".

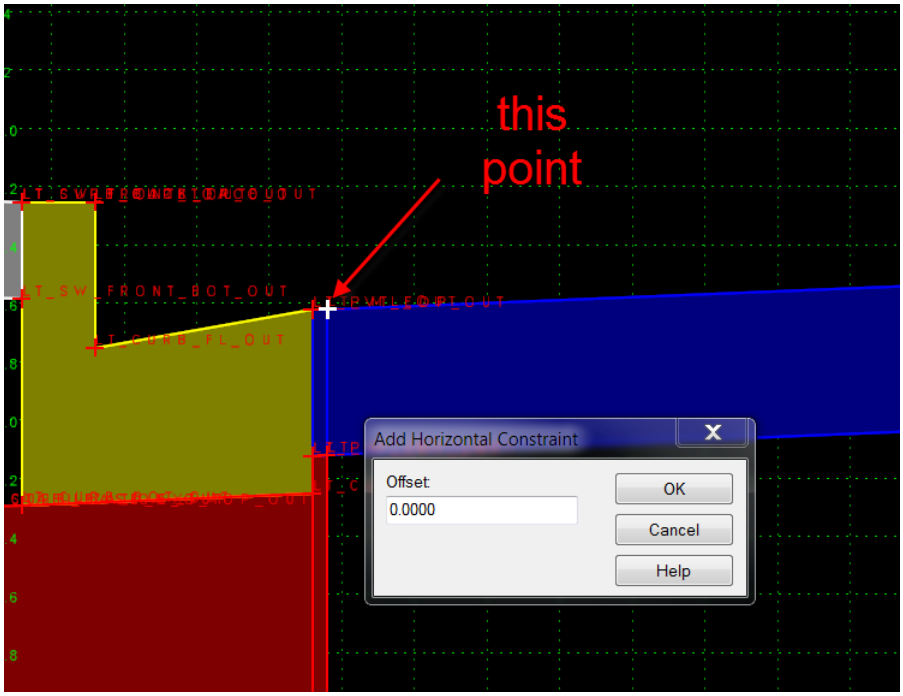


3. In the **SR817 Templates** folder, **Copy** and **Paste** the **SR817_6** to a new template and **Rename** the template **SR817_7**.
4. Right click on the **SR817_7** Template and click **Set Active**.

5. Toggle **On** the Dynamic Settings dialog, ***Apply Affixes*** should be checked.
6. Zoom into the left roadway, *Display Point Names* should be checked to view the **LT_PVT_EOP_IN** point.
7. Drag the **12' Resurfacing- 1 1/2" Depth CSC** template onto the view and Right click on the template window and select **Reflect.** Place the template on the **LT_PVT_EOP_IN** point**.**

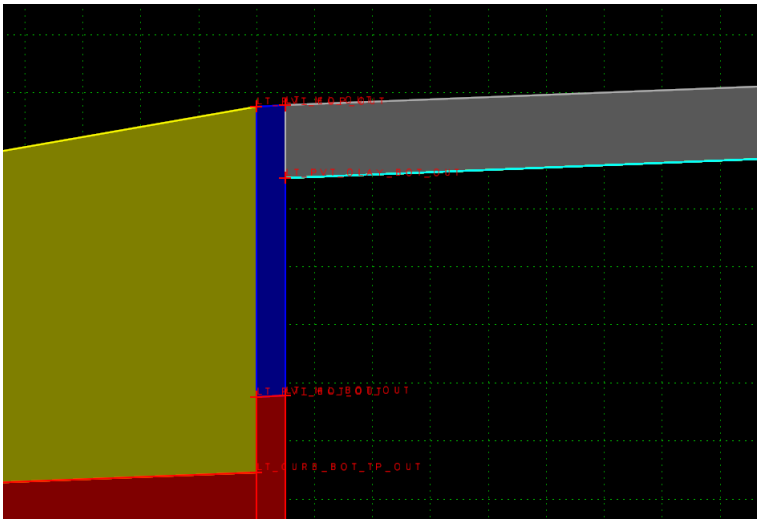


8. Zoom out enough to view the left side of the added components. Right click on the **LT_PVT_OLAY_OUT** point and select **Delete Horizontal Constraint.**
9. Right click on the **LT_PVT_OLAY_OUT** point again and select **Add Constraint > Horizontal.** At the prompt choose the **LT_ML_OUT** point of the template**.** Change the *Offset* on the Add Horizontal Constraint dialog to **0.00** and choose **OK.**

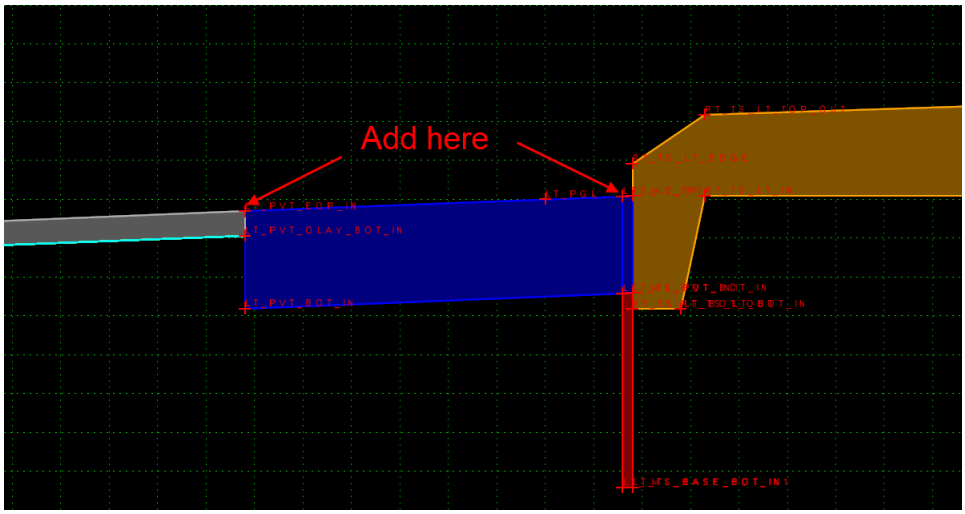


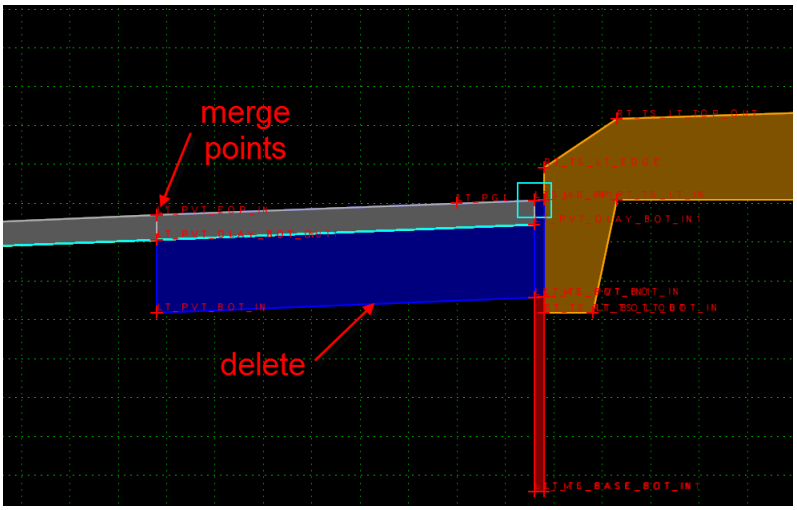
10. Right click on the **LT_ML_OUT** point and select **Merge Points**, Delete the **LT_PVT_OLAY_OUT** point.

11. Right click on the **LT_Pavement2%Outside** component and select **Delete Component**.

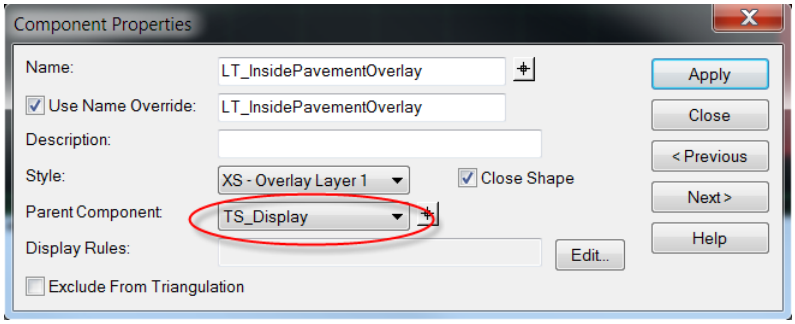


12. Repeat the procedure and add the **Resurfacing Components** on the left side widening. Use the **Inside Resurfacing- 1 1/2" Depth CSC** template.

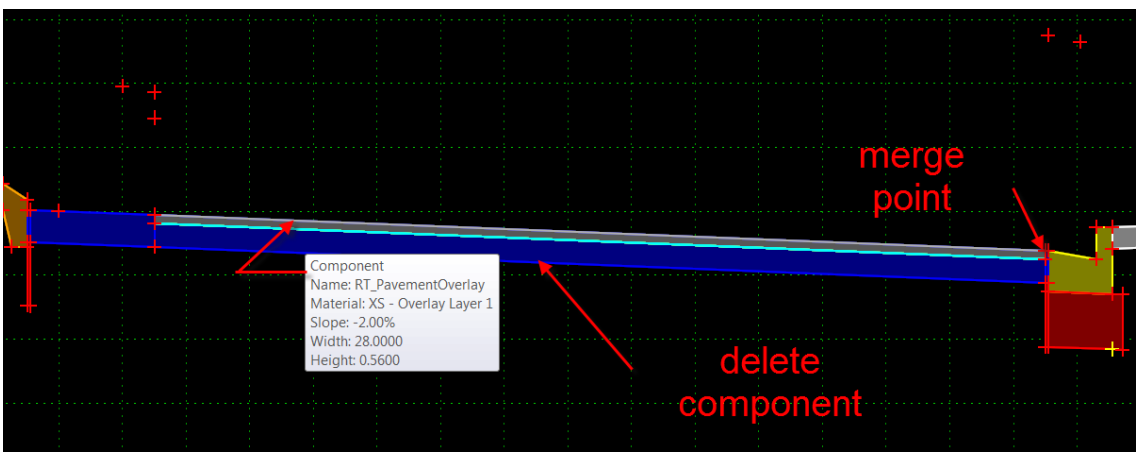




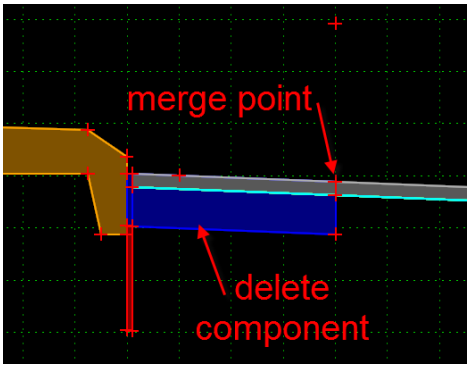
13. Edit the **Component Properties** for the 3 inside widening resurfacing components and add the **TS_Display** as the *Parent Component.* This step will associate the inside resurfacing with Traffic Separator display condition. The three components to edit are:
    a. LT_InsidePavementOverlay
    b. LT_InsidePavementOverbuild
    c. LT_InsidePavementMilling



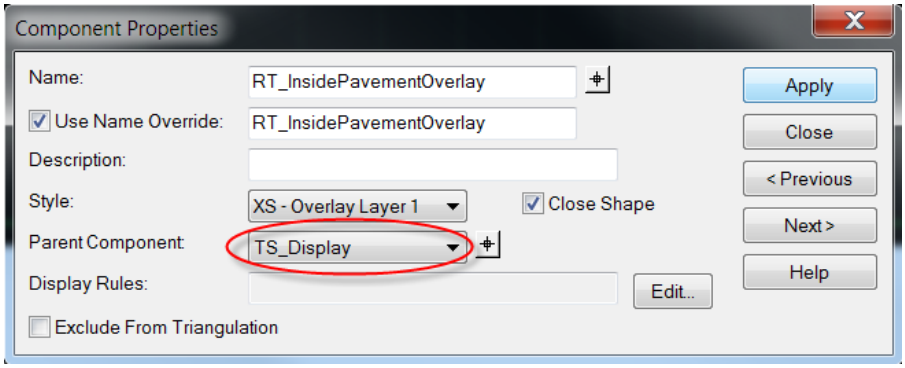
14. Repeat the procedure and add the **Resurfacing Components** on the *right roadway*. Use the **12' Resurfacing- 1 1/2" Depth CSC** template. Remember to **Merge Points** and **Delete Component**.



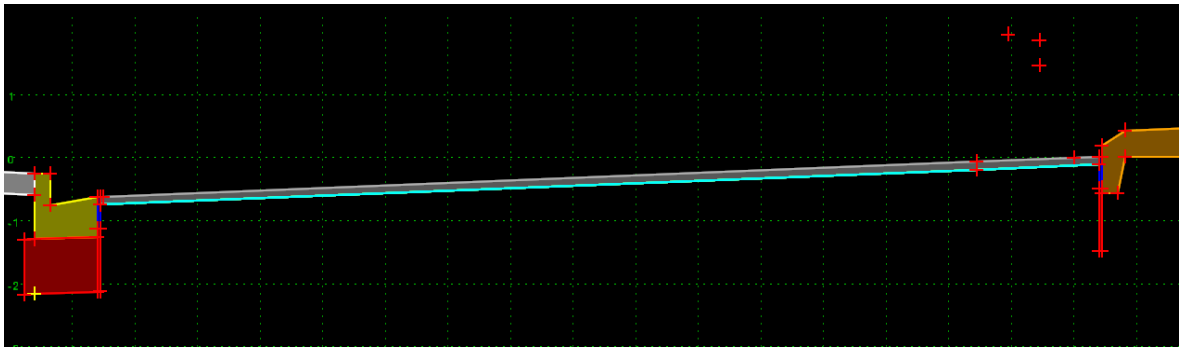
15. Repeat the procedure and add the **Resurfacing Components** on the *right side widening segment.* Use the **Inside 12' Resurfacing- 1 1/2" Depth CSC** template. Remember to **Merge Points** and **Delete Component**.

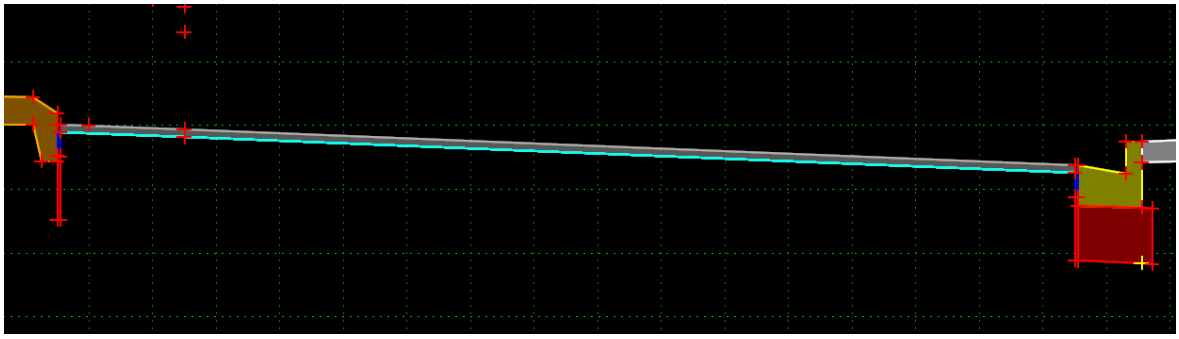


16. Edit the **Component Properties** for the 3 inside widening resurfacing components and add the **TS_Display** as the *Parent Component*. This step will associate the inside resurfacing with Traffic Separator display condition. The three components to edit are:
    a. RT_InsidePavementOverlay
    b. RT_InsidePavementOverbuild
    c. RT_InsidePavementMilling



Note The template should now look as shown below.

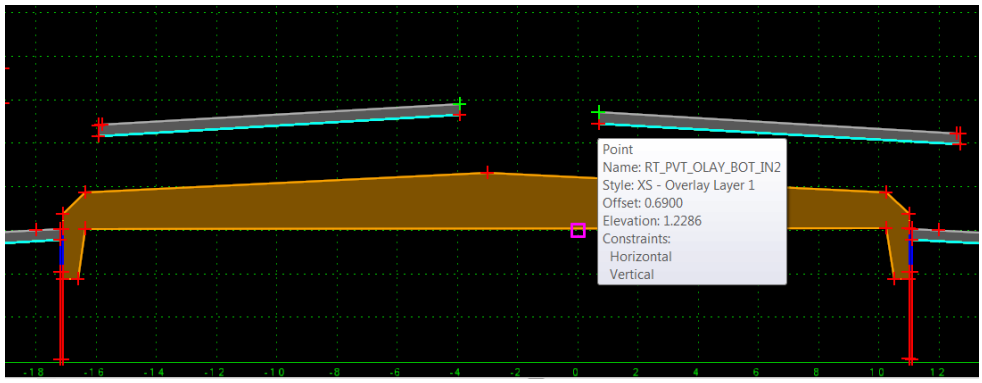




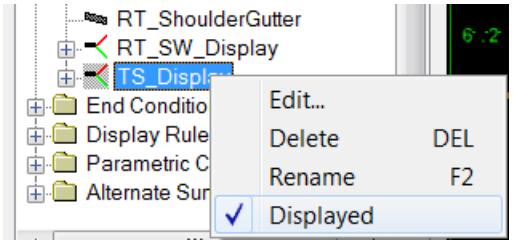
17. Repeat the procedure and add the **Resurfacing Components** on the *Crossover Median*.

Important! *Use the Inside 12' Resurfacing- 1 1/2" Depth CSC template.*

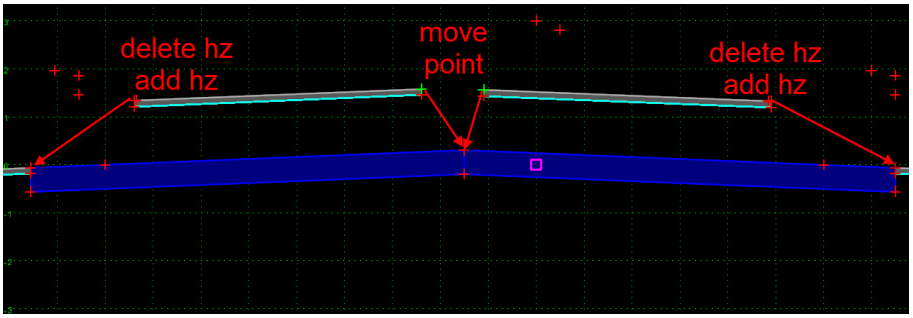
HINT Drag the new resurfacing components approximately 1 foot above the final Crossover Median and drop them first. Make sure to use care to drop the right side, right of the 0 line, to ensure the RT_ affixes are applied.



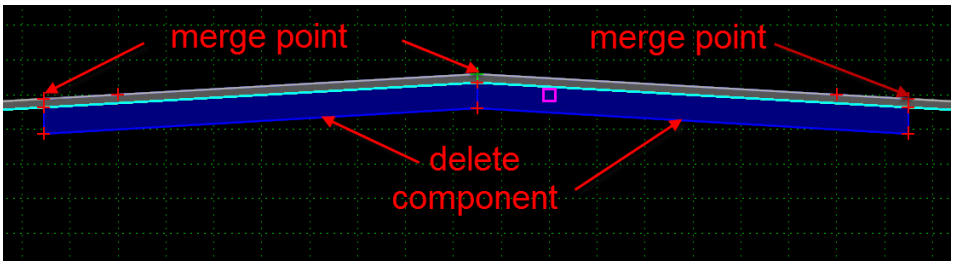
18. Use the *Active Template* tab to turn **off** components. Open the *Components* folder and right click on the *component name* in the list and uncheck the **Displayed**.



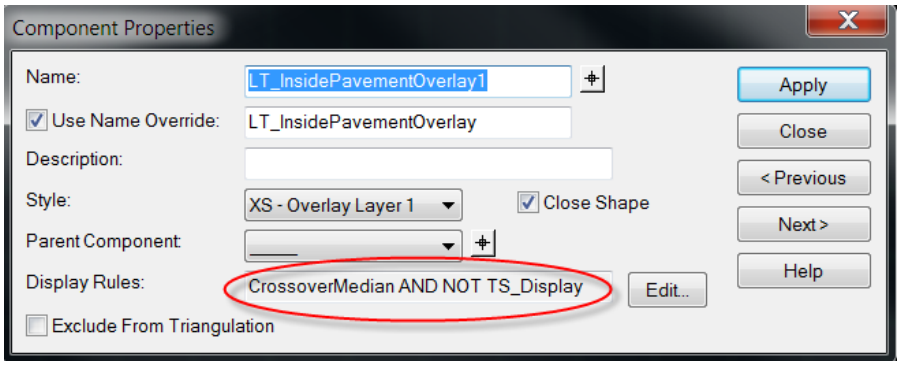
19. Uncheck all the **traffic separator** and **curb types**. Then move the components into place



20. Remember to **Merge Points** and **Delete Component**. Leave the **PVT-CROWN, LT_PVT_EOP_IN** and **RT_PVT_EOP_IN points**.



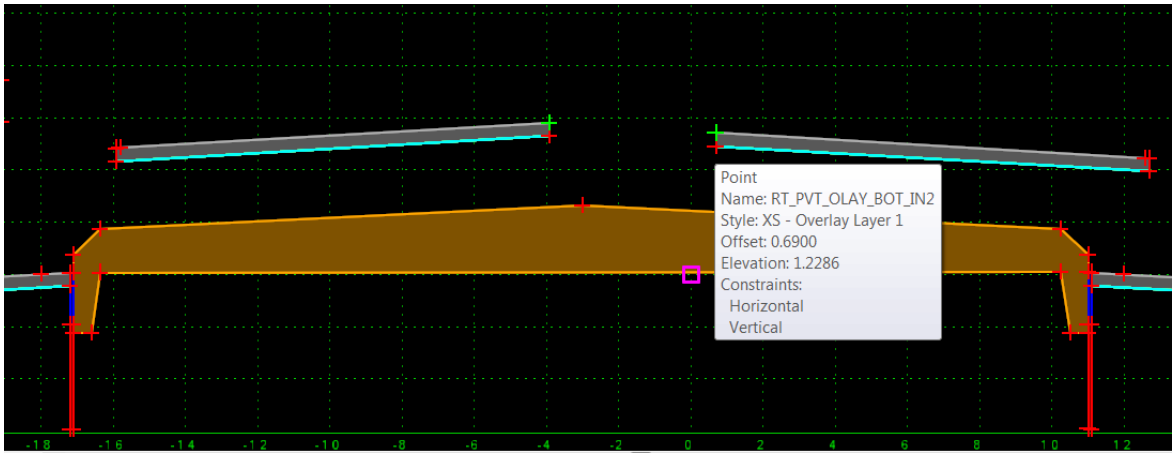
21. Edit the **Component Properties** for the *Milling Crossover segments* and add **CrossoverMedian AND NOT TS_Display** as the *Display Rule*. There are a total of 6 components that need this rule:
    a. LT_InsidePavementOverlay1
    b. LT_InsidePavementOverbuild1
    c. LT_InsidePavementMilling1
    d. RT_InsidePavementOverlay1
    e. RT_InsidePavementOverbuild1
    f. RT_InsidePavementMilling1



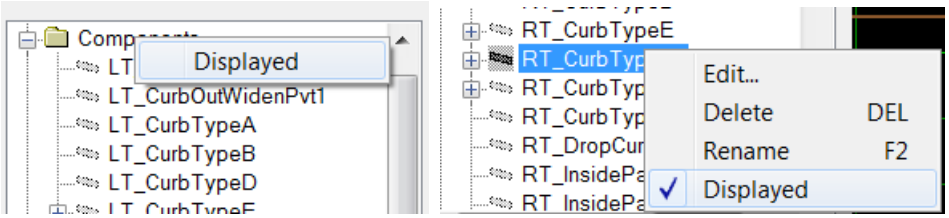
22. Save the template.
23. Repeat the procedure and add the **resurfacing components** for the *inside curb median widening components*. Use the **Inside 12' Resurfacing- 1 1/2" Depth CSC** template.

Important! *Use the Inside 12' Resurfacing- 1 1/2" Depth CSC template.*

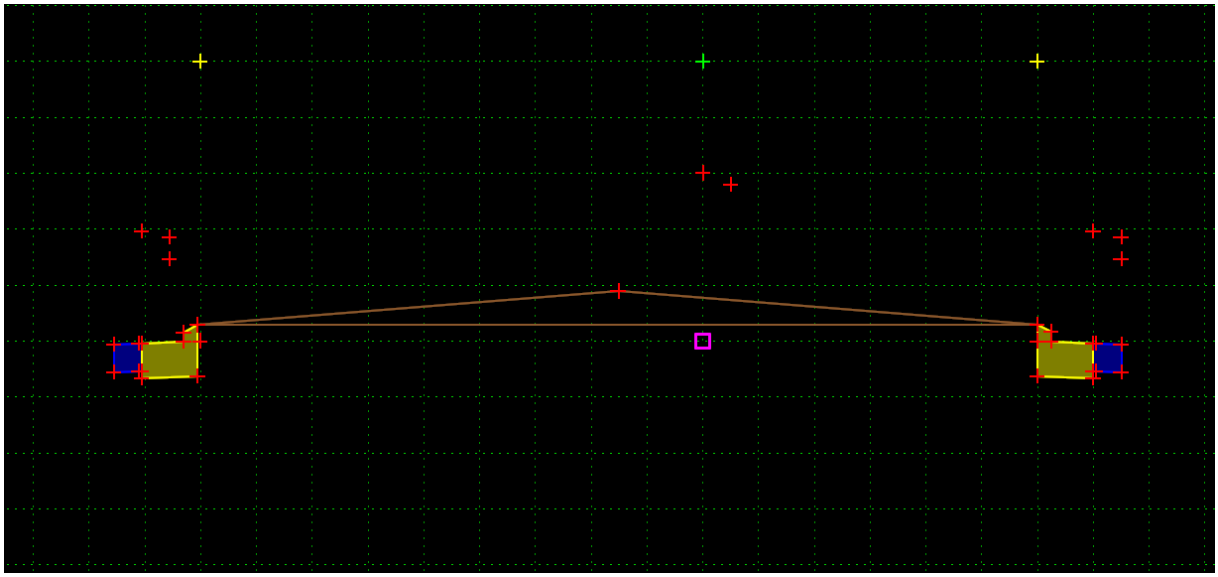
HINT Drag the new resurfacing components approximately 1 foot above the Inside Curb Median and drop them first. Make sure to use care to drop the right side, right of the 0 line, to ensure the RT_ affixes are applied.



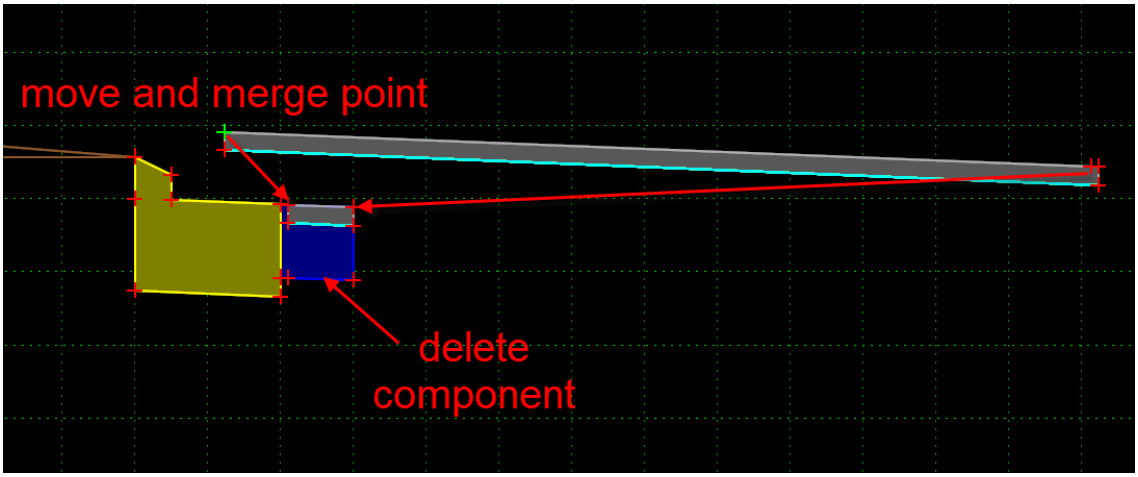
24. Use the *Active Template* tab to turn **off** components. Right click on the *Components* folder in the list and uncheck the **Displayed** check. Then Right click on the *RT_CurbTypeE* component in the list and check the **Displayed** check



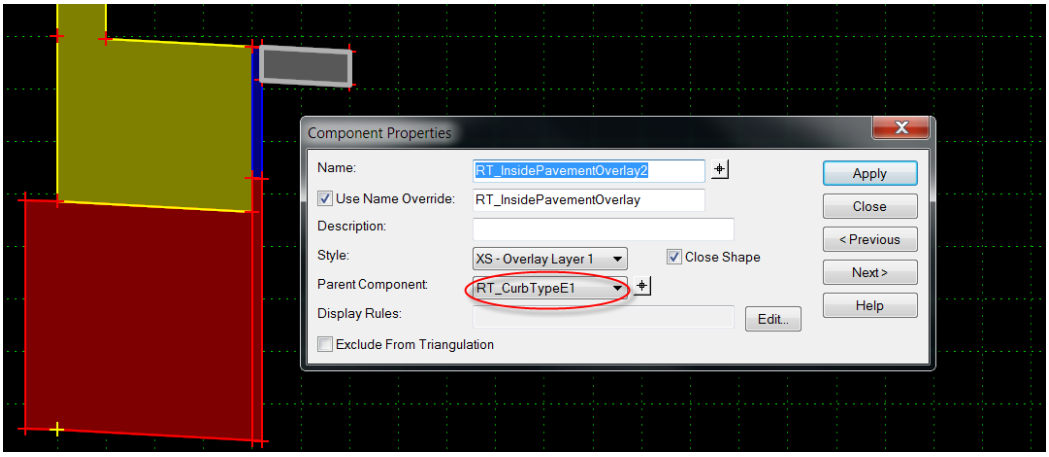
Note	This will display only the all Curb Median With Widening Components established from parent relationships in the previous exercises



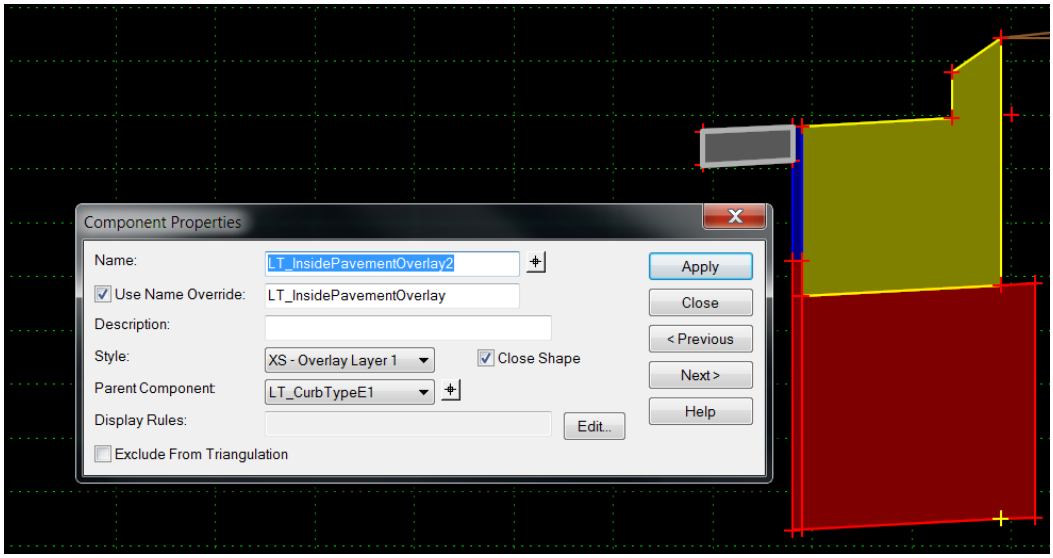
25. Right click on the top end points and move the components into place using the edit point properties.



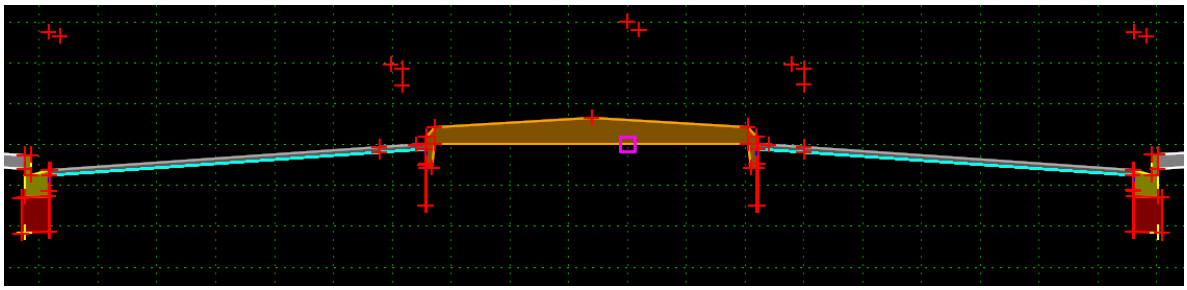
26. Add the **RT_CurbTypeE1** as the *Parent Component* for the right side resurfacing components.



27. Add the **LT_CurbTypeE1** as the *Parent Component* for the left side resurfacing components



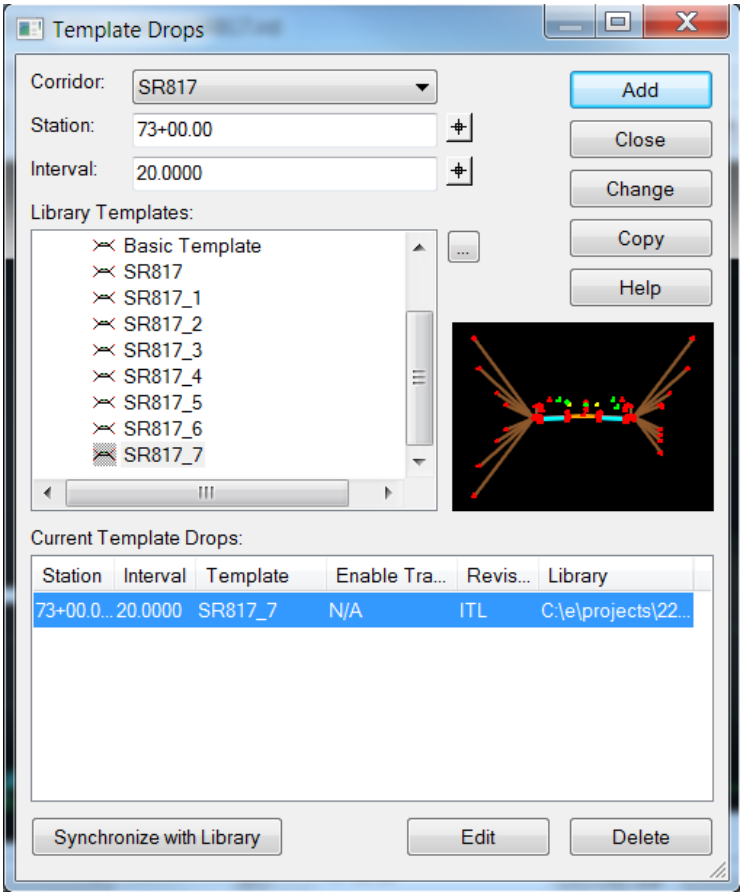
28. Toggle back to the *Library* tab and fit the template view. The template should look as follows.



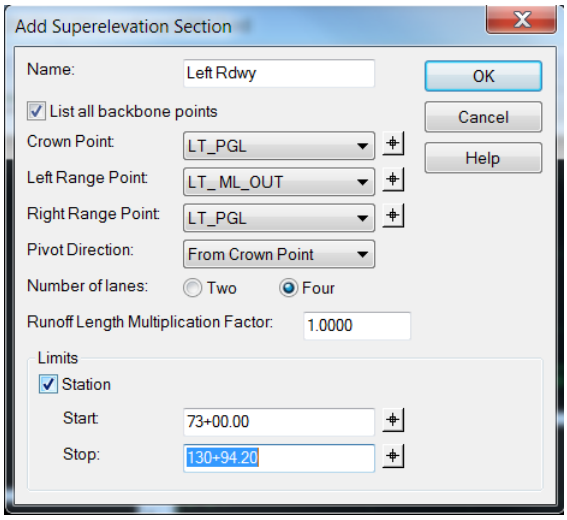
29. Save the **Template** Library
30. Use the **Test** button to check the *display conditions*.
31. Remember to move the move the **ML_IN and ML_IN1 points** back to **.05** inside of the *EOP_PVT_IN points*.

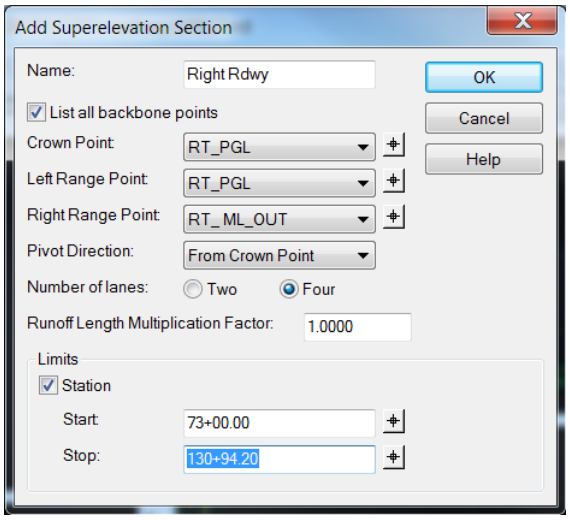
Exercise 9.5 Apply Template to Corridor

1. Open the Roadway Designer dialog and select **File** > **Open** the **SR817.ird** file to load the project Mainline Corridor design.
2. From the Corridor drop down list, select **SR817**.
3. Click the *Template Drops* icon to open Template Drops dialog.
4. Select the **Current Template Drops** entry and change the template entry to the **SR817_7 Template**, click **Change** to save the entry and then close the dialog.



5. DELETE **Super Section Ranges** and ADD NEW **Section Range Definitions** as shown in the diagrams below.

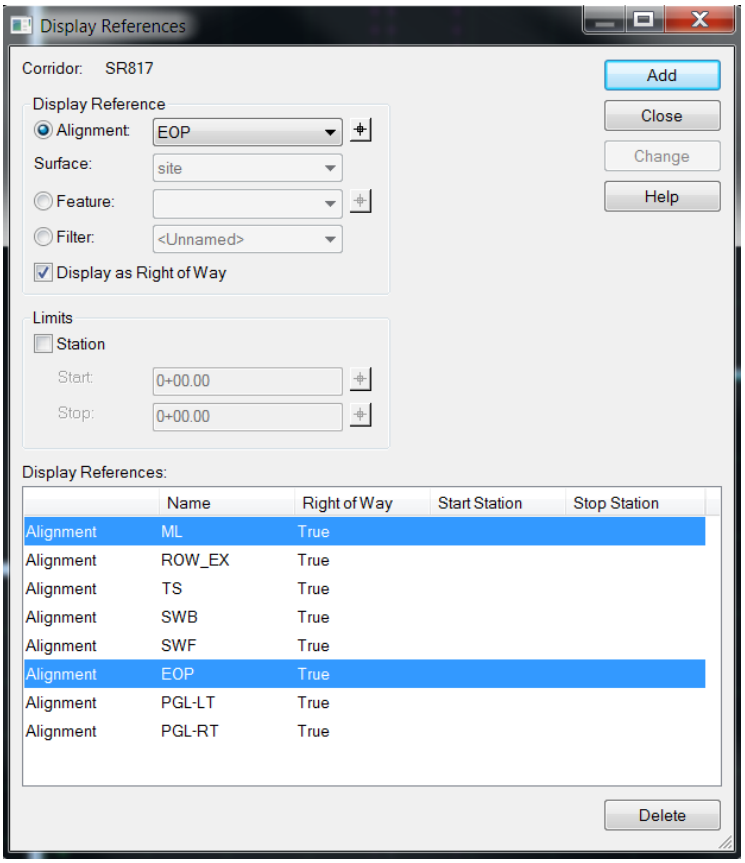




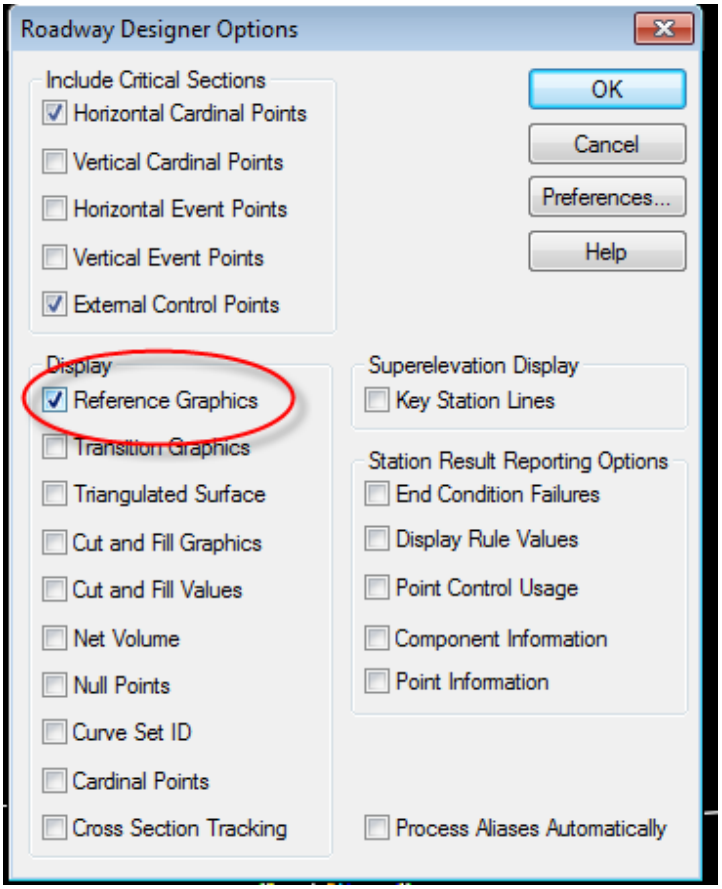
6. To validate or test the template widening along the corridor, from the Roadway Designer dialog, select **Corridor** > **Display References.** The Display References dialog displays.

7. From the *Alignment* list, select the **EOP** item, check on the **Display as Right of Way** box and then click the **Add** button.

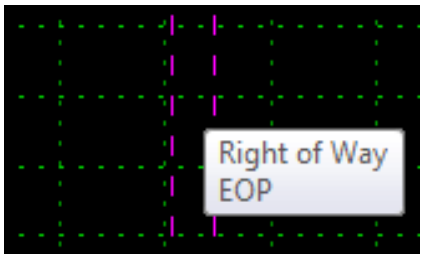
8. From the *Alignment* list, select the **ML** item, check on the **Display as Right of Way** box and then click the **Add** button. Close the dialog.



9. From the Roadway Designer Options dialog, click the *Options* icon , check on the **Reference Graphics** box in the *Display area* and then click **OK**.

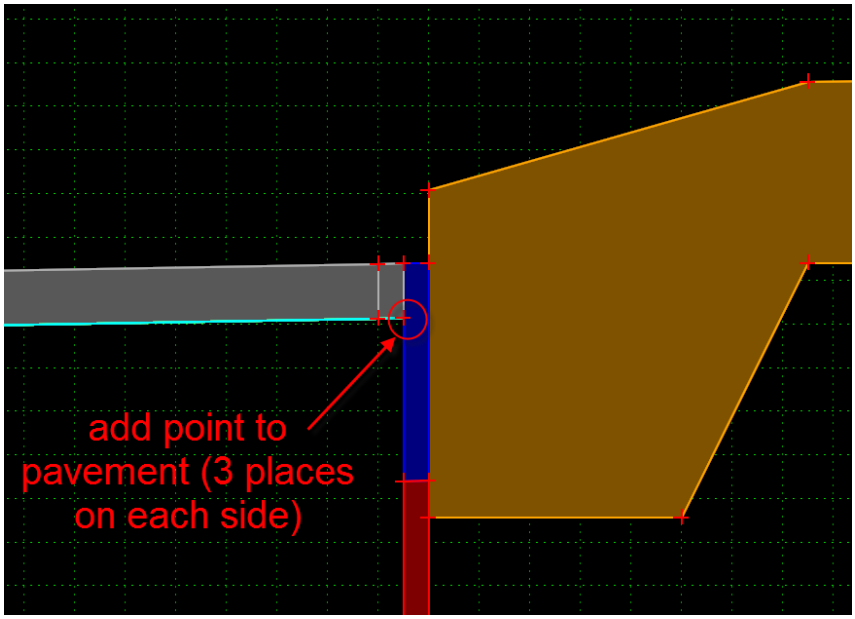


10. Use the *Cross Section* view to step through the stations on the corridor. Use the *mouse hover* tool to see the name of the **Reference Graphic** lines.



➢ ***If the template is not working properly:***

1. From the Roadway Designer dialog, click the shortcut icon, to open the Create Template dialog. Make changes to the template as necessary.
   a. The style constraint ranges may need to be changed when the curb and traffic median cross itself.
   b. Insert points on the widening pavement at the bottom of the overlay layer. Use Add Full Constraint and then Merge Points and Delete the inserted point. This will associate the bottom of the overlay with the widening pavement.
   c. Check the Component Properties dialog for all added components in this exercise for the same *Name* and *Name Override* .
   d. Check the Point Properties dialog for all added component points in this exercise for the same *Name* and *Name Override*.

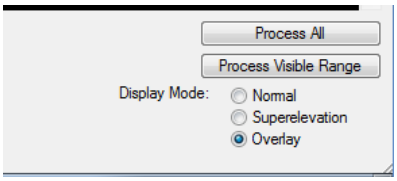


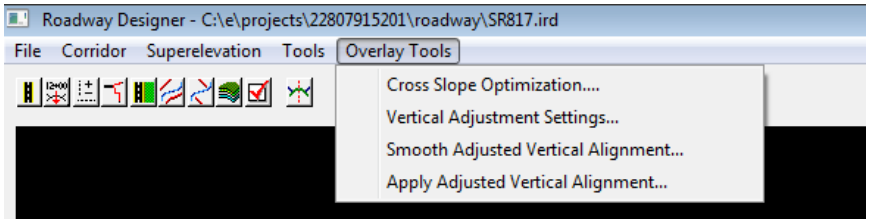
2. Click **OK** to save the changes, select **File** > **Save** to save the **Template** Library and then click **Close** to exit the Create Template dialog.
3. From the Roadway Designer dialog, open the Template Drops dialog and select the **Current Template Drops** entry. Notice the Template name is red which indicates that the Template Library version of the template has been changed.
4. Click the **Synchronize with Library** button and close the dialog.

VERTICAL ADJUSTMENTS

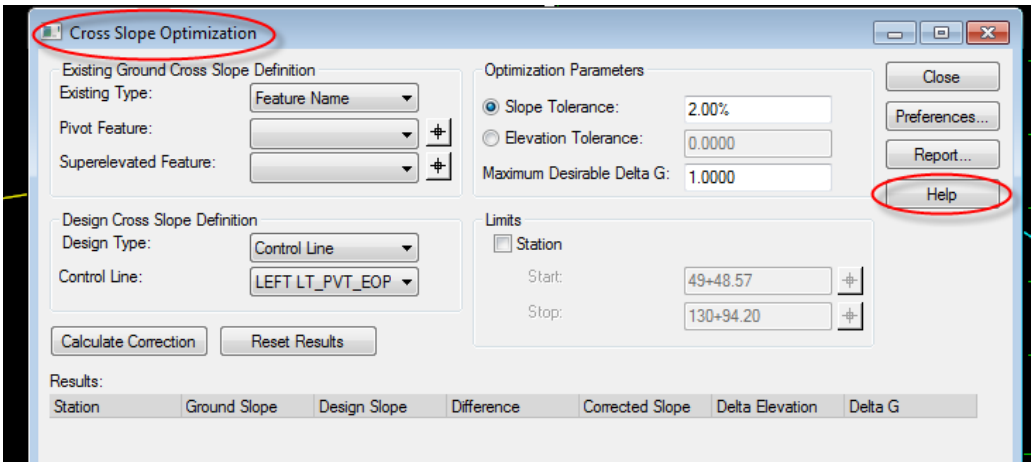
Exercise 9.6 Vertical Adjustments Settings

1. If Exercises 9.1-9.5 were skipped to learn the Vertical adjustments, extract the **22807915201(10).zip** file in the *c:\e\projects* folder
2. From the Roadway Designer dialog, change the *Display Mode* in the bottom right side to **Overlay**. An additional view will display similar to **Superelevation Display** Mode and the **Overlay Tools** pull down will be enabled.





Note Each of the dialogs listed in the **Overlay Tools** list has a **Help** button to link to the **Reference Information** for that dialog.



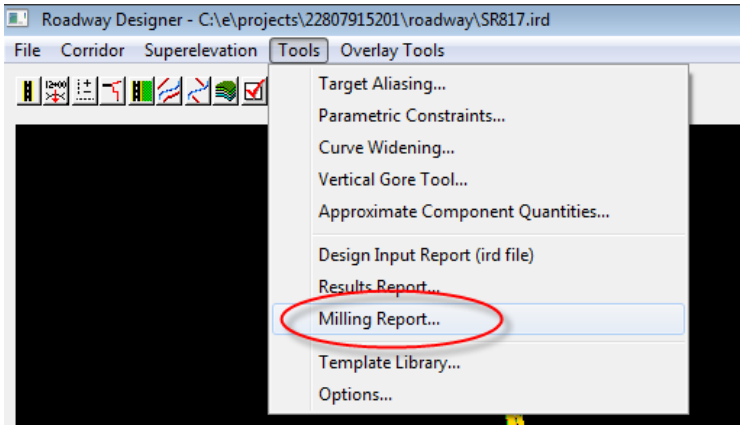
3. Open the Roadway Design Options dialog, check only the **Horizontal Cardinal Points** in the *Include Critical Sections area* and then click **OK.**

4. Click the **Process All** button.

> ***Note*** Allow this process to complete. It may take several minutes.

5. Prior to creating a *Vertical Adjustment*, review the cross sections to evaluate how the Milling and Overbuild have been applied to the project based on the current template settings and vertical alignment design.

6. From the Roadway Designer dialog, select the **Tools** > **Milling Report** option.



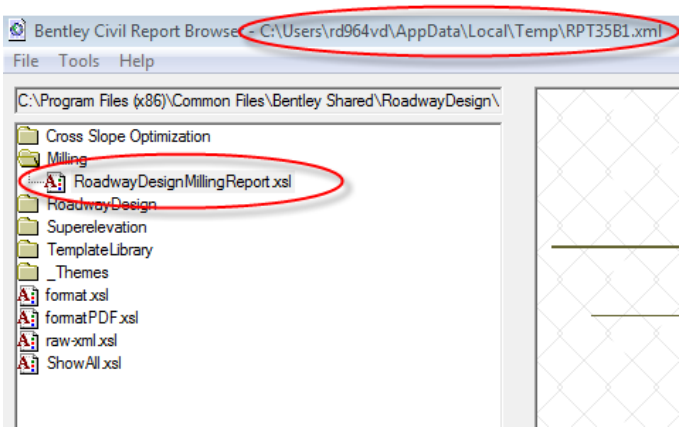
> ***Note*** In order to generate a report of the milling surface area, place a check in the Stripping Component box on each of the milling component in the template. Save the Template Library and Resynchronize the Template Library with the Template Drops list.

7. A *Milling Report by Station* will be generated. This an *xml* format file using the format file delivered with GEOPAK Corridor Modeling.

Roadway Design Milling Report

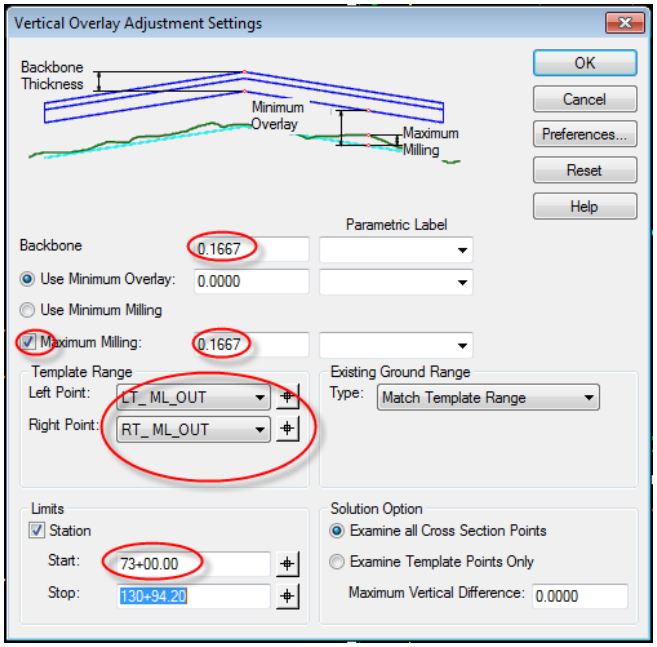
Report Created: 8/18/2010
Time: 8:31am

Station	Left Offset/ Elevation	Right Offset/ Elevation	Planar Area
73+00.00	-45.8991 5.6316	-20.9619 6.1303	
	-15.9519 6.4095	45.7294 5.1759	
			0.00
73+50.00	-54.0193 5.4250	-20.9377 6.0866	
	-15.9519 6.4219 10.0271 5.9023	-11.9205 6.3413 44.4324 5.2142	
	-21.0000 6.0854	-10.5090 6.2952	
			4215.70



8. Record the final Planar Area for this run.

9. From Roadway Designer dialog, select the **Overlay Tools > Vertical Adjustment Setting**.
10. Set the *Backbone* to **2/12** <OR> **.1667**.
11. Check the **Maximum Milling** box and set to **2/12** <OR> **.1667**.
12. Set the *Template Range* to *Left Point* to **LT_ML_OUT** and the *Right Point* to **RT_ML_OUT**.
13. Change the ***Station Range*** to begin at **73+00**.



14. Click **OK** and then click the **Process All** button.

15. Wait then review the cross section.
16. From the Roadway Designer dialog, select the T**ools** > **Milling Report** option again and compare the final area result.

-19.0000 6.0922	-9.7029 6.2781	
-9.7029 6.2781	7.0000 5.9441	6490.87
-53.3034 5.2196	-19.4665 5.8963	
-11.8592 6.3928	-11.4848 6.3853	
-19.0000 5.9056	-10.4223 6.0772	
		3873.59
	Total Planar Area:	200870.19

17. Select **Tools** > **Approximate Component Quantities** to get a report of the computed quantities.

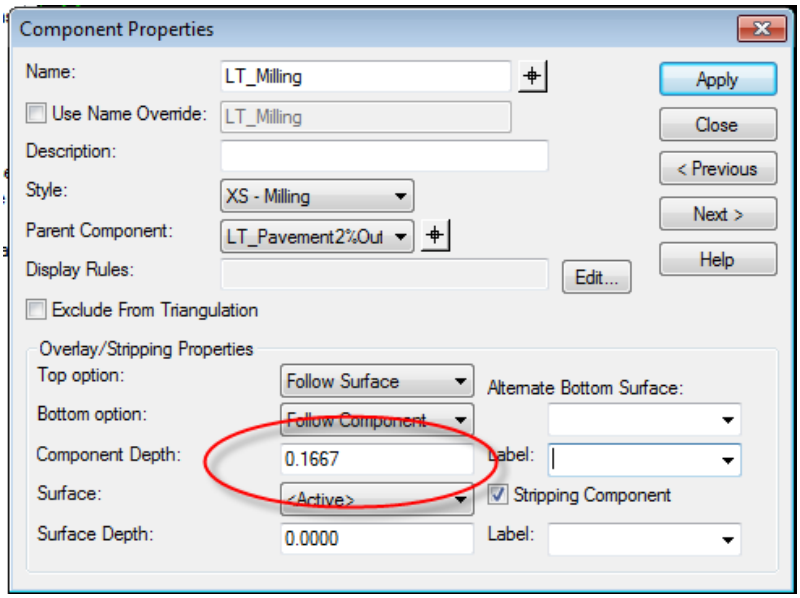
Approximate Component Quantities

Material	Surface Area	Volume	Units	Unit Cost	Total Cost/Material
Traffic Separator Proposed	2311.49		SF	0.00	0.00
XS - Curbs and Gutters		1732.47	CF	0.00	0.00
XS - Curbs and Gutters Base		914.67	CF	0.00	0.00
XS - Median	11588.50		SF	0.00	0.00
XS - Milling		1720.58	CF	0.00	0.00
XS - Overbuild		4906.96	CF	0.00	0.00
XS - Proposed Base Line		2901.58	CF	0.00	0.00
XS - Proposed Ground Line		7666.89	CF	0.00	0.00
XS - Sidewalk Proposed		1083.44	CF	0.00	0.00
XS - Traffic Separators Prop		4475.96	CF	0.00	0.00
XS - Unpaved Shoulder	3496.81		SF	0.00	0.00

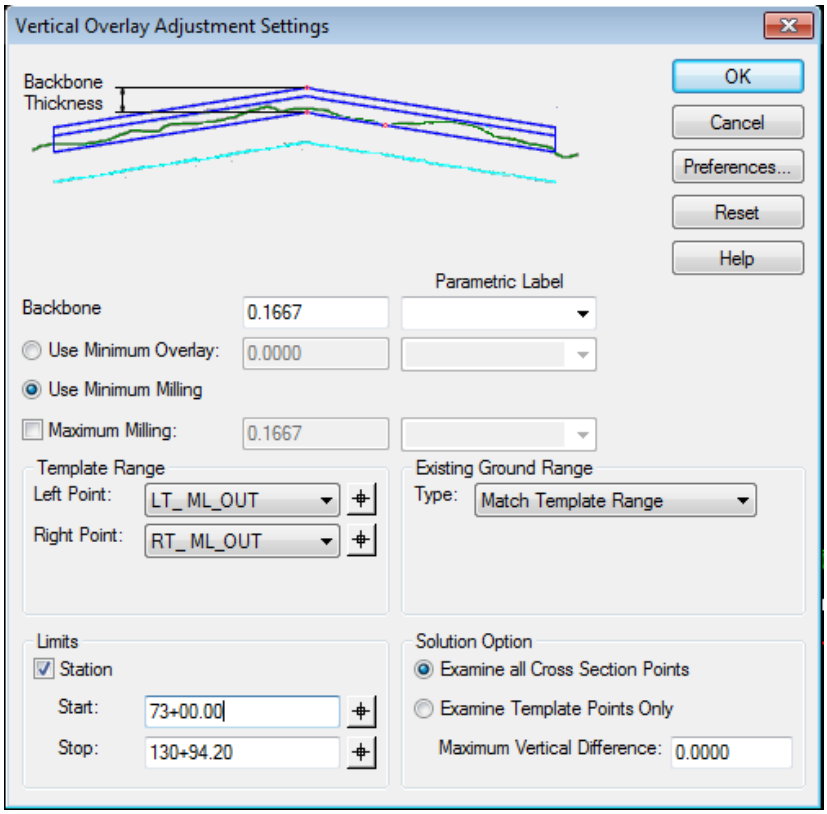
Close
Help

Total Estimated Cost: 0.00

18. From the Component Properties dialog, edit the Template again and change the *Milling Component depth* to **2/12** <OR> **.1667** for each of the *Milling Components* in the template.

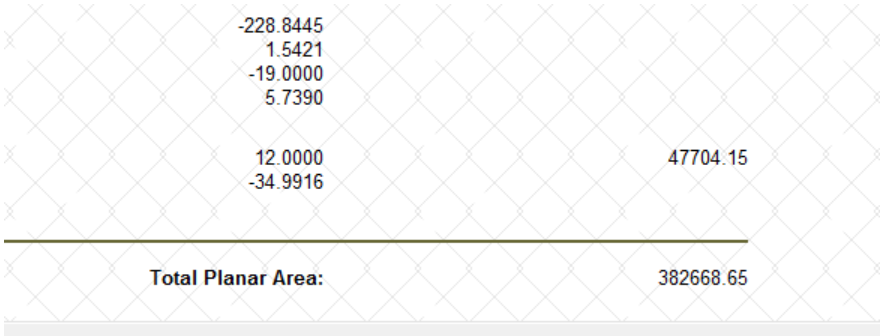


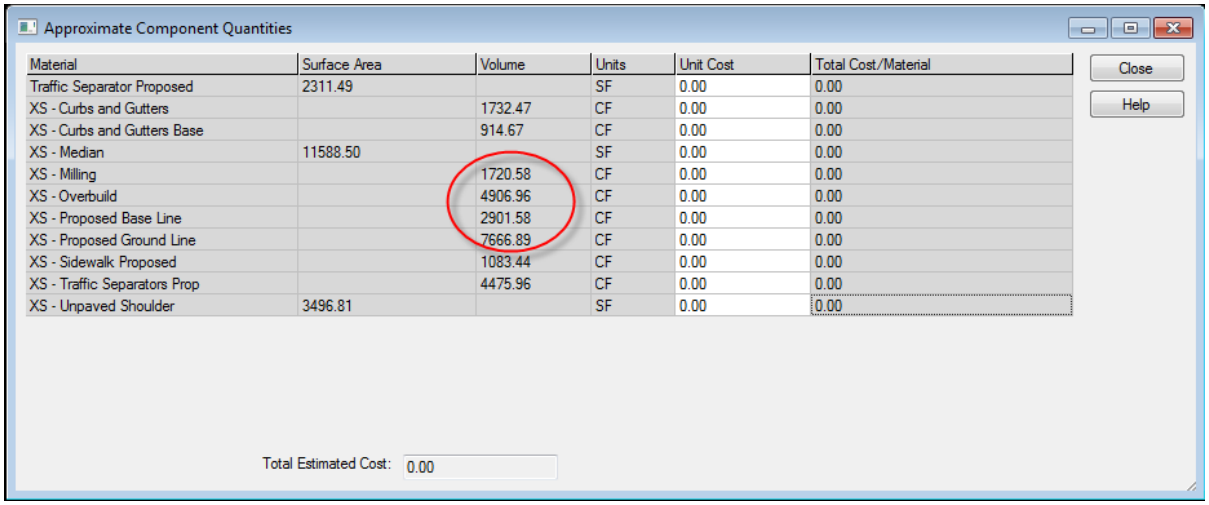
19. Click **Apply** and **Close**.
20. Save the **Template Library** and **Resynchronize** the Template Library with the Template Drops list.
21. In the Vertical Overlay Adjustment Setting dialog, select the **Use Minimum Milling** option and reset the *Start Station value* to **73+00**.



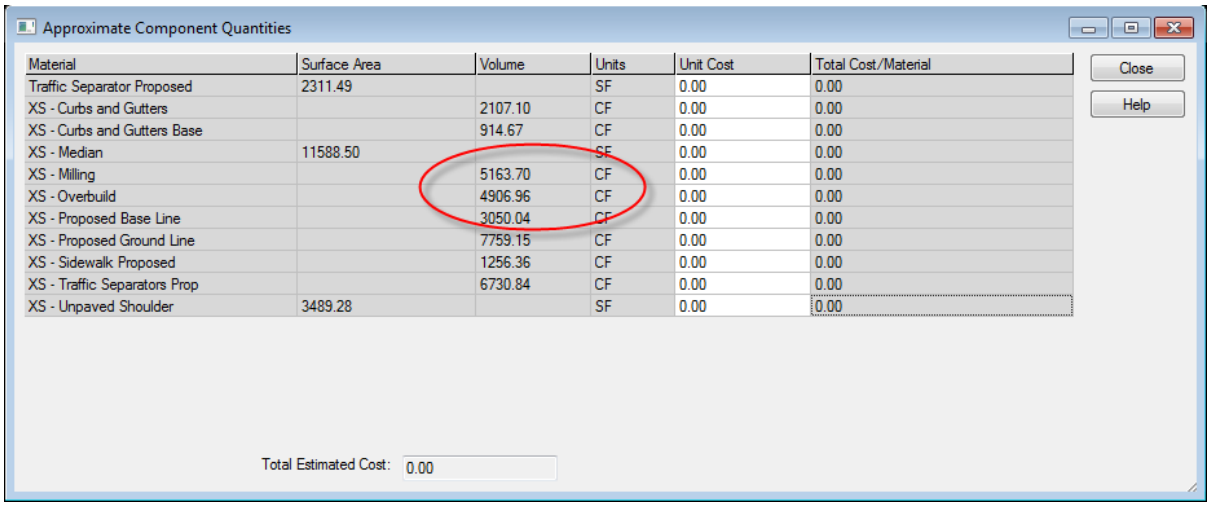
22. Click **OK** and then click **Process All**.

23. Wait and then review the cross section.
24. From the Roadway Designer dialog, select the **Tools** > **Milling Report** option again and compare the final results.





Material	Surface Area	Volume	Units	Unit Cost	Total Cost/Material
Traffic Separator Proposed	2311.49		SF	0.00	0.00
XS - Curbs and Gutters		1732.47	CF	0.00	0.00
XS - Curbs and Gutters Base		914.67	CF	0.00	0.00
XS - Median	11588.50		SF	0.00	0.00
XS - Milling		1720.58	CF	0.00	0.00
XS - Overbuild		4906.96	CF	0.00	0.00
XS - Proposed Base Line		2901.58	CF	0.00	0.00
XS - Proposed Ground Line		7666.89	CF	0.00	0.00
XS - Sidewalk Proposed		1083.44	CF	0.00	0.00
XS - Traffic Separators Prop		4475.96	CF	0.00	0.00
XS - Unpaved Shoulder	3496.81		SF	0.00	0.00



Material	Surface Area	Volume	Units	Unit Cost	Total Cost/Material
Traffic Separator Proposed	2311.49		SF	0.00	0.00
XS - Curbs and Gutters		2107.10	CF	0.00	0.00
XS - Curbs and Gutters Base		914.67	CF	0.00	0.00
XS - Median	11588.50		SF	0.00	0.00
XS - Milling		5163.70	CF	0.00	0.00
XS - Overbuild		4906.96	CF	0.00	0.00
XS - Proposed Base Line		3050.04	CF	0.00	0.00
XS - Proposed Ground Line		7759.15	CF	0.00	0.00
XS - Sidewalk Proposed		1256.36	CF	0.00	0.00
XS - Traffic Separators Prop		6730.84	CF	0.00	0.00
XS - Unpaved Shoulder	3489.28		SF	0.00	0.00

10 CROSS SECTIONS & LABELING

INTRODUCTION

Historically, proposed cross sections were created using criteria after the existing ground sections were cut from a TIN file utilizing the Draw Cross Sections from Surfaces tool. The Corridor Modeling method does not automatically draw the proposed cross sections into a MicroStation design file like the criteria method.

The Draw Cross Sections from Surfaces tool is used to draw both the existing ground surface and proposed cross sections into the MicroStation graphics file at the same time. This tool is an enhanced version of the tool included previously in GEOPAK.

A new feature of the tool is support for a DTM created by Roadway Designer. Proposed cross sections created from a Roadway Designer DTM include all template components (pavement layers, shoulders, sidewalk, tie slopes, etc.), thus eliminating the need to select by features from the FDOT ddb file.

ACCESSING THE DIALOG

The dialog is invoked via the GEOPAK Road Tools or menus as always but for convenience it can also be invoked by clicking the *Draw Cross Sections from Surfaces* icon on the Corridor Modeling dialog. The tool works exactly the same no matter where it is accessed from.

PREREQUISITES

The prerequisites to generate cross-sections utilizing digital terrain modeling are:

GEOPAK coordinate geometry database wherein the horizontal and vertical alignments are stored.

Binary GEOPAK TIN file or a DTM created with Roadway Designer.

Each surface to be drawn must be added to the list box. This is accomplished by using the **action / edit** buttons on the right side of the dialog. Each surface draws a cross section line or line string. When the list box is populated, clicking Draw in the upper right corner commences the processing.

The generation of existing ground cross sections must be invoked from within the MicroStation design file wherein the sections are to be drawn. GEOPAK does not create this MicroStation design file.

CROSS SECTION SYMBOLOGY

Existing ground symbology is controlled from “By Level Symbology” or “By Feature”.

Proposed cross section symbology is controlled by Roadway Designer. The same symbology that is used in Roadway Designer to display the design template will also be used to draw the proposed cross sections. Symbology must be set in the Draw Cross Sections from Surfaces dialog but that setting will be ignored when the cross sections are processed.

Cross Section point symbology is controlled by the active MicroStation settings when the cross sections are processed.

The Pattern Lines Even-Increment distance for cutting cross sections needs to match, or be evenly divisible by, the Corridor Interval that is set for the Template Drops in Roadway Designer. If these settings do not match then the cross sections that are cut will be an interpolation and could affect the earthwork.

EXERCISE OVERVIEW

10.1 Create Surface DTM & TIN

10.2 Review Pattern Lines & Existing Cross Sections

10.3 Review Pattern Lines

10.4 Reviewing Cross Sections

10.5 Draw Proposed Roadway Cross Sections

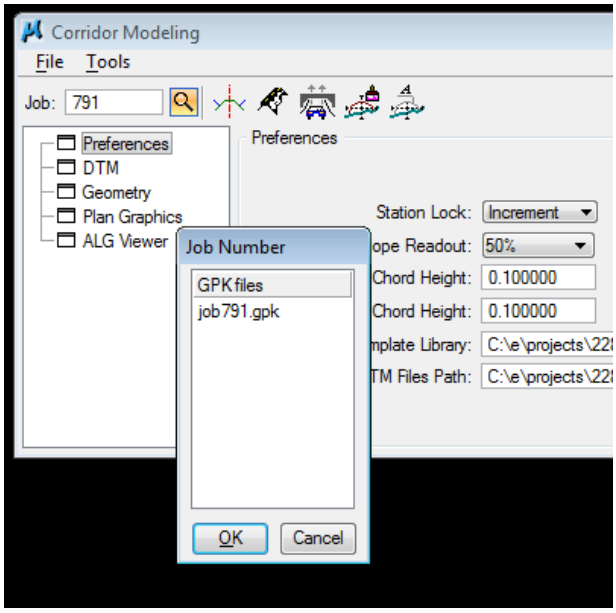
10.6 Label Cross Sections

10.7 Cross Section Sheet Layout with Earthwork

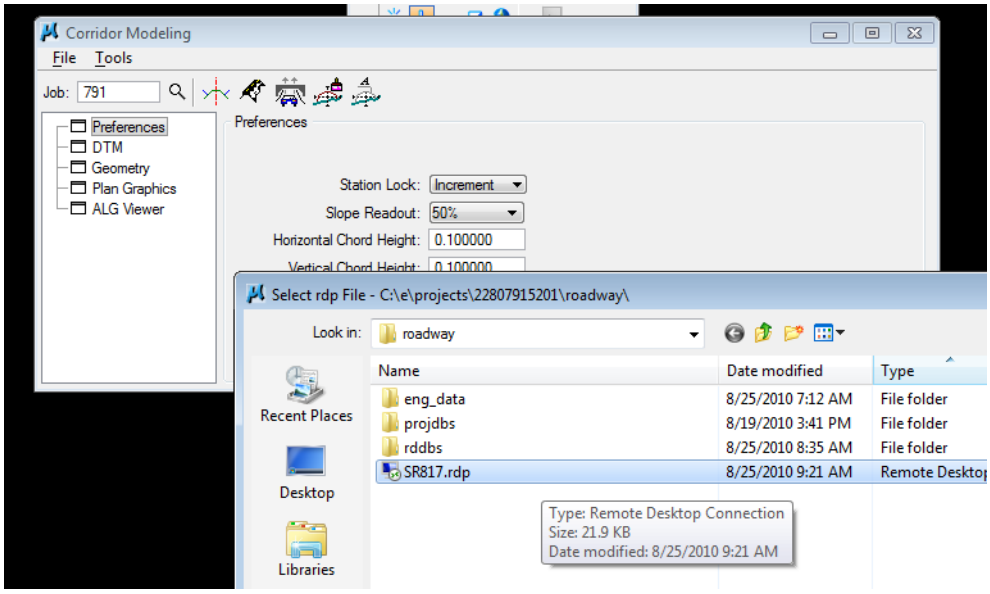
Exercise 10.1 Create Surface DTM & TIN

In this exercise the proposed roadway design file, *RDXSRD02.dgm*, will be opened with GEOPAK using the FDOT workspace and Project configuration. The GEOPAK Project Manager is loaded for the project. The Corridor Modeling dialog is loaded and the project preferences are loaded from the previous exercises. Roadway Designer is opened and the project designer (.ird) file is loaded. The Create Surface dialog is loaded and the proposed DTM is created.

1. Optional, extract the **22807915201(10).zip** file in the *c:\e\projects* folder.
2. Open the FDOTSS2 MicroStation workspace in the cross sections project design file c:\e\projects\22807915201\roadway\ *RDXSRD02.dgn*.
3. From the MicroStation menu, open the Corridor Modeling dialog by selecting **Applications** > **ROAD** > **3D Tools** > **Corridor Modeling**.
4. Select *Job Number* **job791.gpk**.

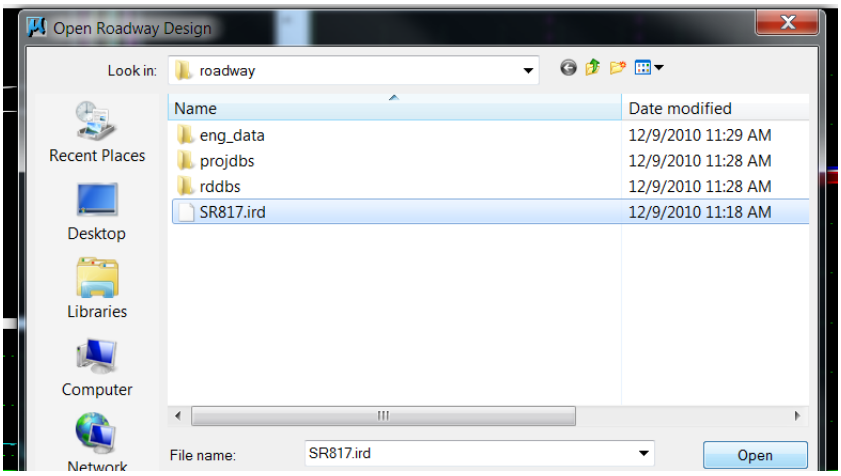


5. Load preference file **SR817.rdp.**

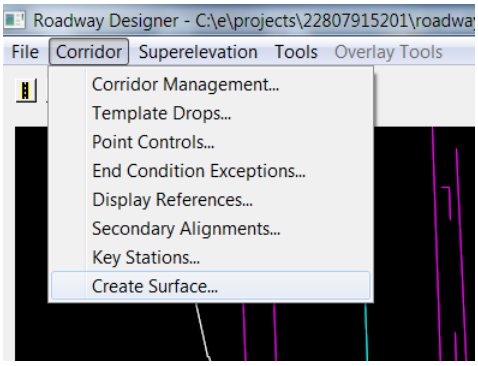


6. Click on the *Open Roadway Designer* icon to launch the Roadway Designer dialog.

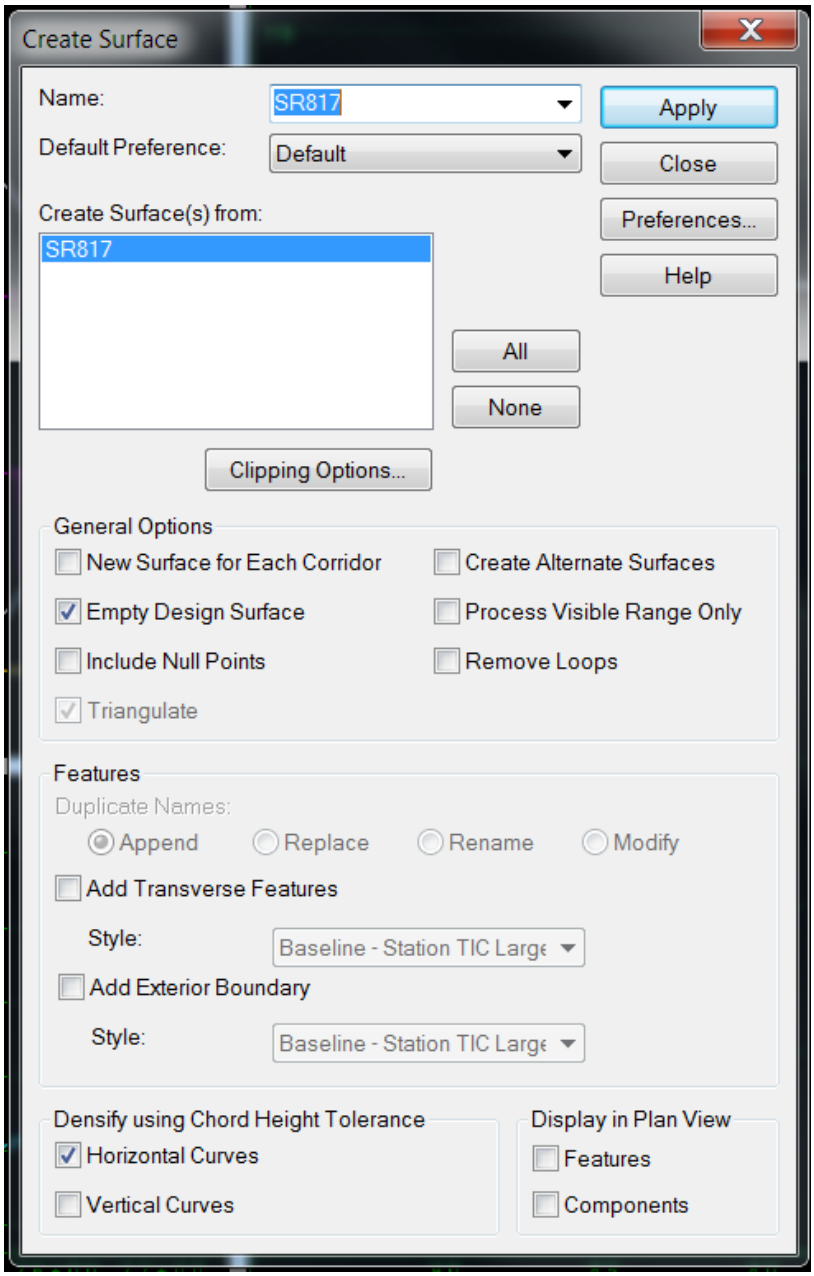
7. From the Roadway Designer dialog, select **File** > **Open** and select the **SR817.ird** file. Click the **Open** button.



8. From the Roadway Designer dialog, select **Corridor** > **Create Surface** and the Create Surface dialog will display.



9. In the Create Surface dialog, key-in **SR817** in the *Name:* field and ONLY check the **Empty Design Surface** and **Horizontal Curves** boxes.



10. Click the **Apply** button. This will execute the command to create a new *.tin* and *.dtm* file in the project *roadway* folder.
11. When the dialog finishes processing, close the Create Surface dialog. **Close** the Roadway Designer dialog.
12. Close the Corridor Modeling dialog and then click **No** to Save Setting.

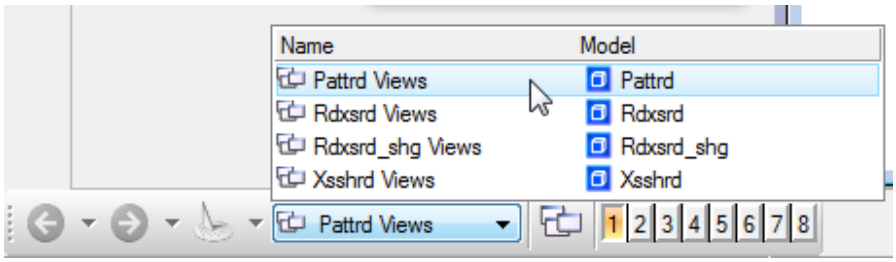
Exercise 10.2 Review Pattern Lines & Existing Cross Sections

➢ *Reviewing Pattern Lines*

In this exercise, the user will review the pattern lines locations for the cross sections.

1. In the design file c:\e\projects\22807915201\roadway*RDXSRD02.dgn*.

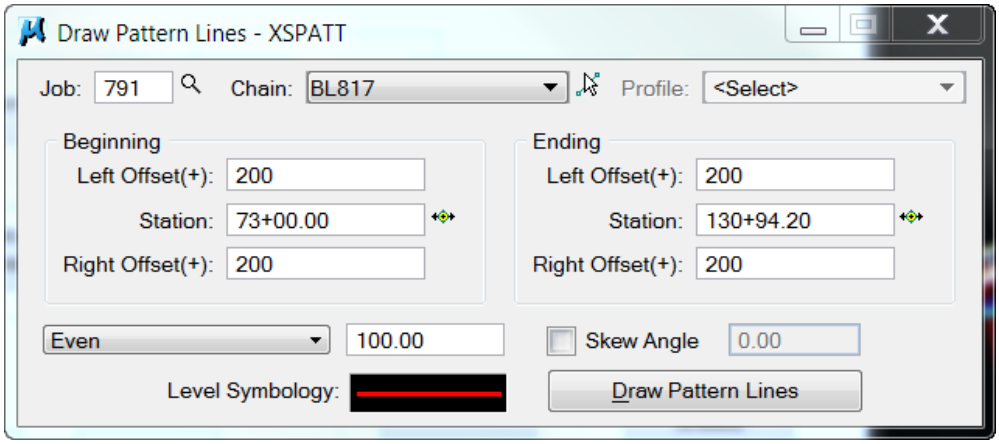
HINT Change the active model to Pattrd. Attach as reference files, *DSGNRD01.dgn* and *ALGNRD01.dgn* to the model.



2. Access Project Manager. The Road Project dialog should appear since we "remembered" the project and user in a previous exercise.
3. From Road Project, click the **Draw Pattern** button.

4. Select the **XSPATT** run and click **OK** in the Run dialog. The Draw Pattern Lines dialog displays.
5. Review the settings in the each of the fields.

HINT The Dialog information is populated automatically by the Working Alignment Definition.

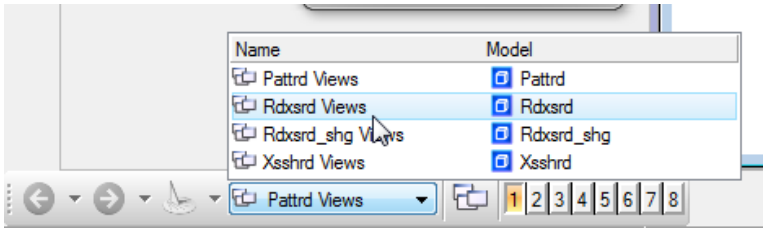


6. Close the Draw Pattern Lines dialog.
7. Click **Yes** when prompted to Save Settings.
8. Minimize the Road Project dialog and fit the contents of the view.

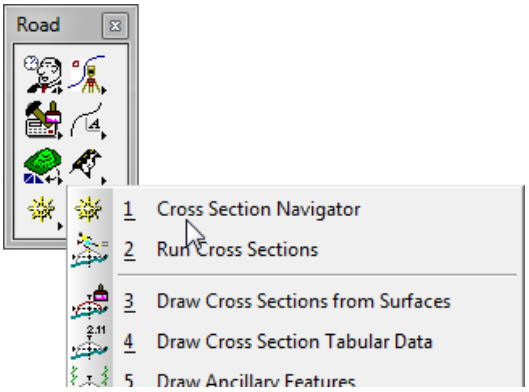
➢ *Reviewing Cross Sections*

In this exercise, the *Cross Section Navigator* tool will be used to review the existing cross sections.

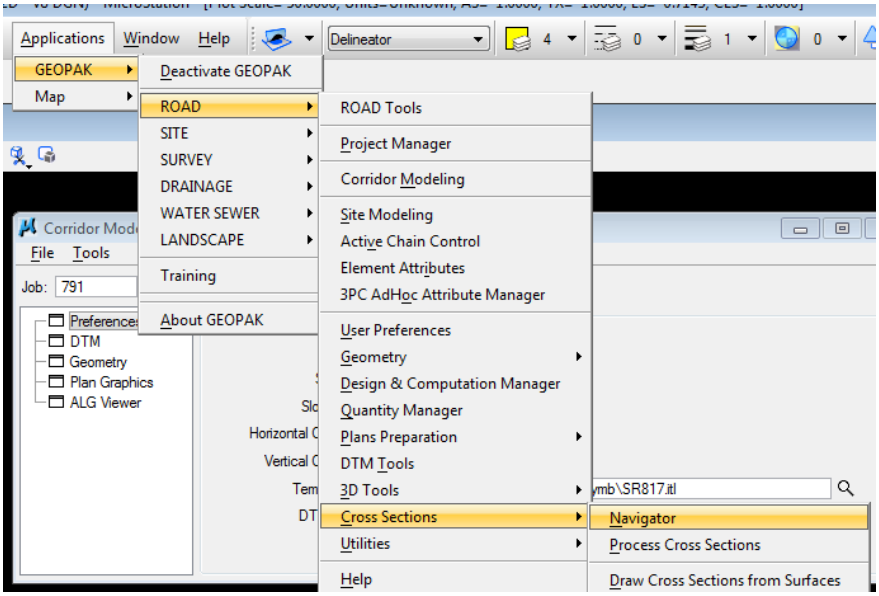
1. In the design file *RDXSRD02.dgn*, change the *Active Model* to **Rdxsrd**. Minimize the Road Project dialog.



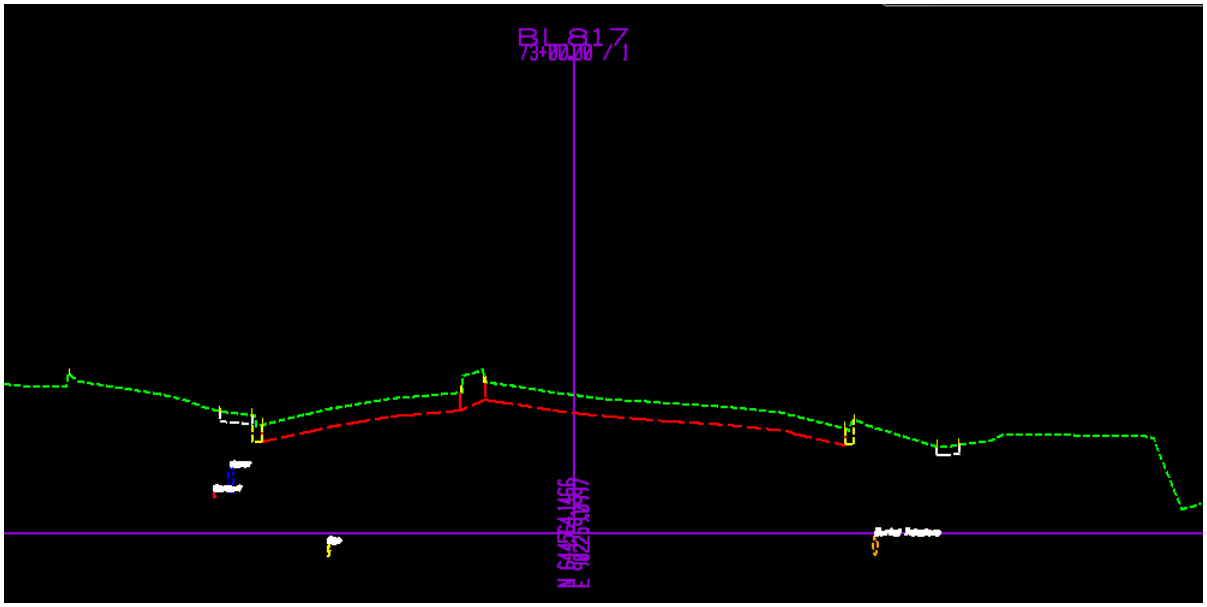
2. From the *Road* toolbox, click the **Cross Section Navigator** icon.



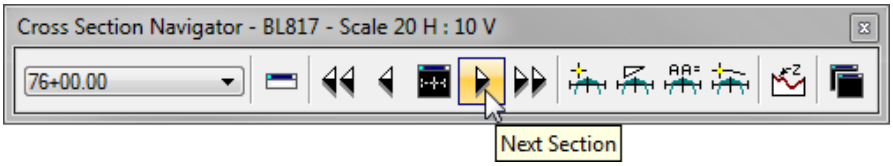
<Or> From the MicroStation menu, select **GEOPAK > ROAD > Cross sections > Navigator**



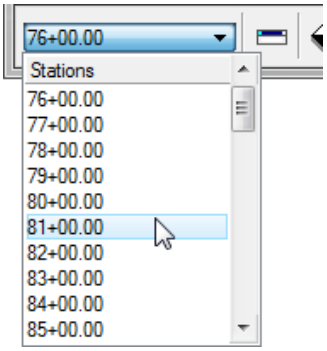
3. The Cross Section Navigator displays.



4. Use the navigation buttons to browse through the cross sections.



<OR> Use the *Station List* pull down to access any particular station.



5. Close Cross Section Navigator.

Exercise 10.3 Review Existing Utilities on Cross Sections

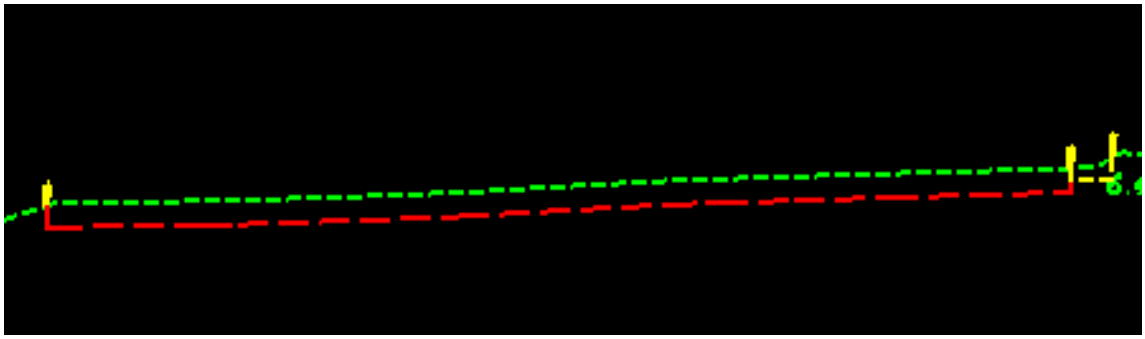
For this exercise, existing utilities have been pre-drawn onto the cross sections using the Draw Ancillary Features application. For instructions on drawing existing utilities on cross section, see the **FDOT Advanced GEOPAK for Roadway Designers Course Guide**, chapter 3.

1. Review the cross sections and utilities using Cross Section Navigator.

Exercise 10.4 Loading Existing Features on Cross Sections

For this exercise, existing cross section features have been pre-drawn onto the cross sections using the Typical Section Generator, a tool which allows users to automatically access and setup the appropriate criteria for our cross sections. For instructions on drawing existing features on cross section, see the **FDOT Advanced GEOPAK for Roadway Designers Course Guide**, chapter 6.

1. Review the cross sections and note the existing features drawn on the cross sections.

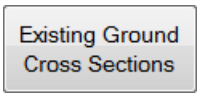


Exercise 10.5 Draw Proposed Roadway Cross Sections

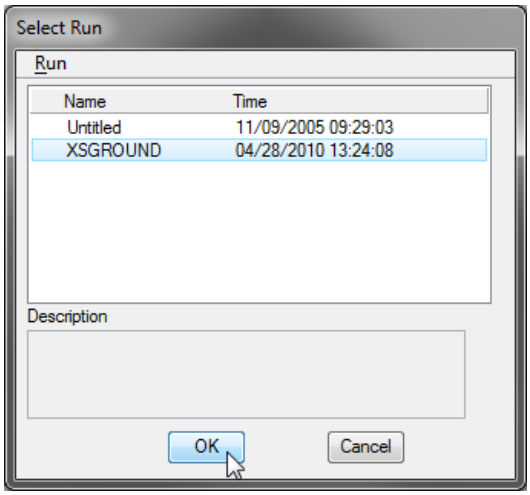
In this exercise, the proposed roadway cross sections can be generated by two methods.

1. *Method 1*:

   a. From Road Project dialog, select the **Existing Ground Cross Sections** button.



   b. Select **XSGROUND** in the Select Run dialog and click **OK**.



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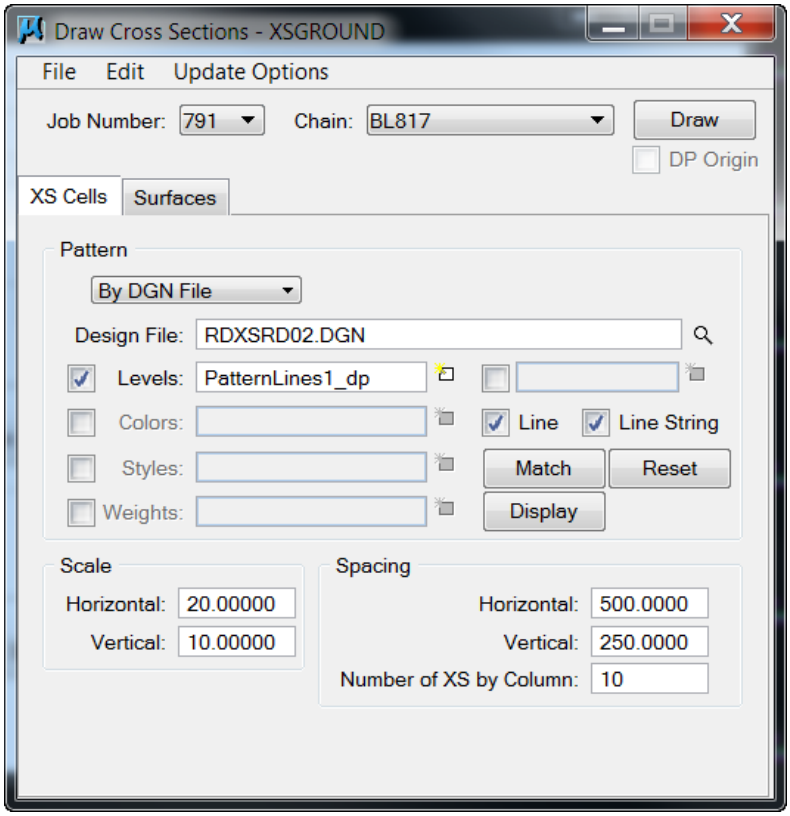
c. The Draw Cross Sections dialog displays.

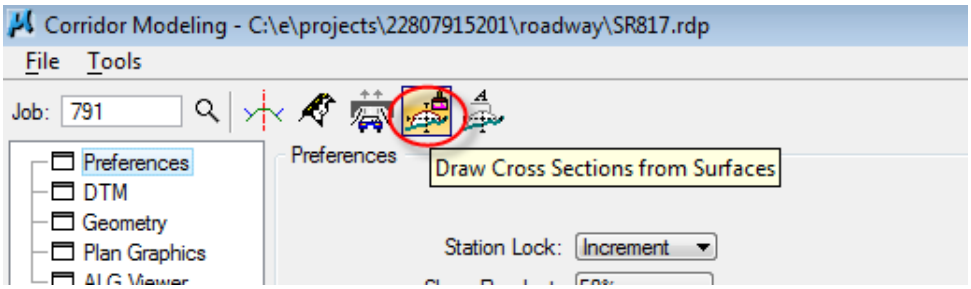


HINT The XS Cells tab portion of the dialog is already filled out by the Working Alignment Definition.

d. Continue to the **Both Methods** Label <OR>

2. *Method 2*:

a. Click the **Draw Cross Sections from Surfaces** icon on the Corridor Modeling dialog.



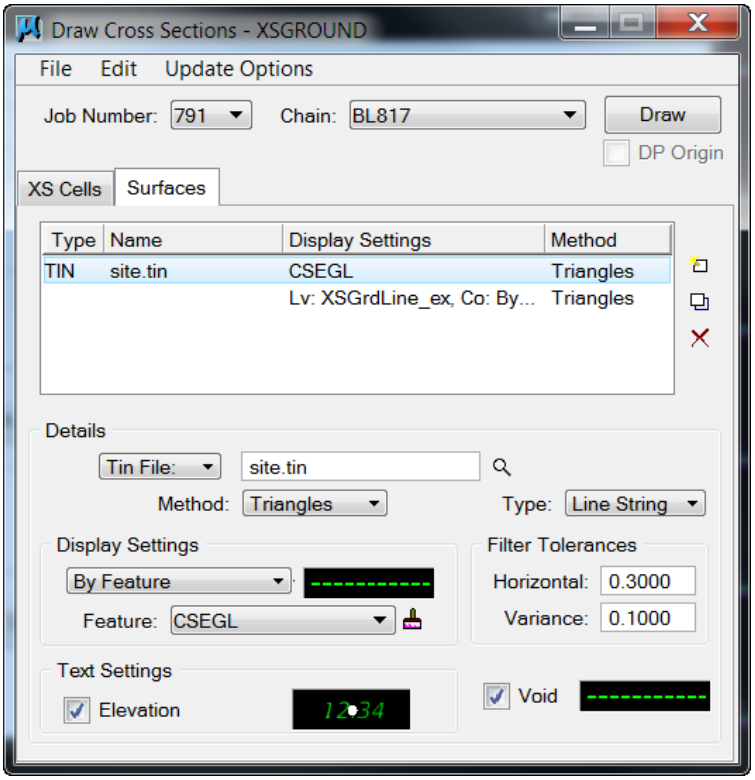
b. Select **XSGROUND** in the Select Run dialog and click OK.

HINT The XS Cells tab portion of the dialog is already filled out by the Working Alignment Definition.

3. ***Both Methods***

   a. Select the **Surfaces** tab

HINT The Surfaces tab portion of the dialog is already filled out for the Existing Ground Surface by the Working Alignment Definition.



➢ *Add Proposed Surface*

1. Under *Details Section:* Toggle the *Tin file:* button to **DTM File**. Click on the magnifier icon and select **SR817.dtm**.

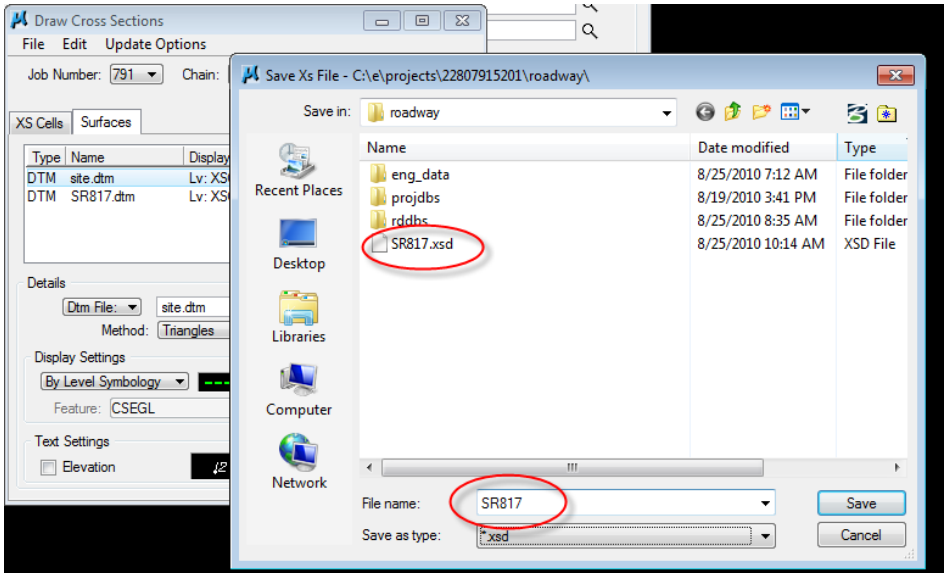
2. Under *Display Settings:* Set the list to **By Level Symbology**.

   Note The symbology for the proposed sections is controlled by the component styles defined in the XIN file.

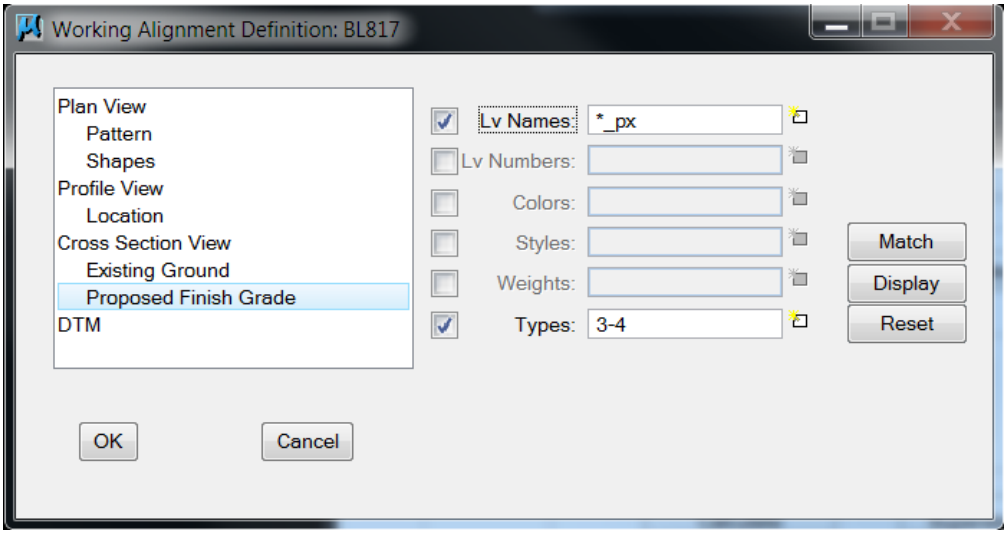
3. Click the **Add Surface** button.

   Note The template point names that are displayed in Roadway Designer will be plotted on each cross section. The symbology of these points is controlled by the active MicroStation settings.

4. Select **File** > **Save As** to save the *Draw Cross Sections Preferences*, name the file **SR817**.



5. To save the information to the *Working Alignment Definition*, from the Road Project dialog click the **Define** button and set the *Proposed Finish Grade* option in the tree view as follows and click **OK.**

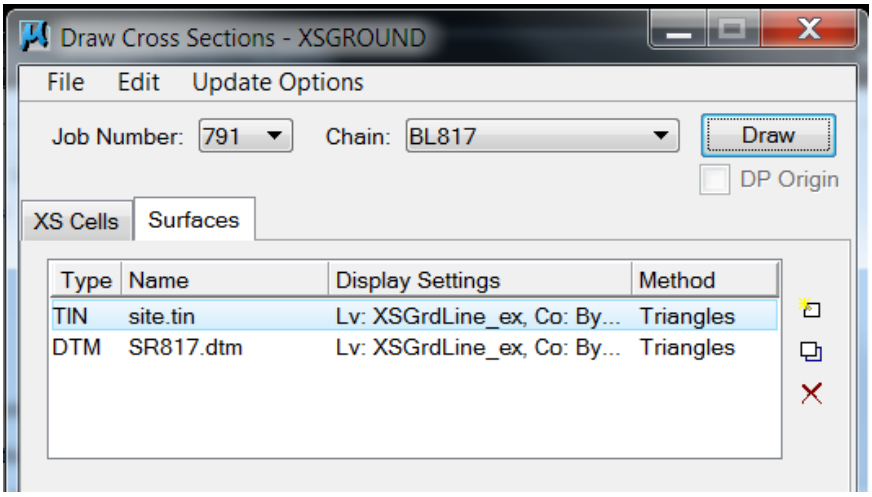


Note In order to control the size and level display of the component point name display

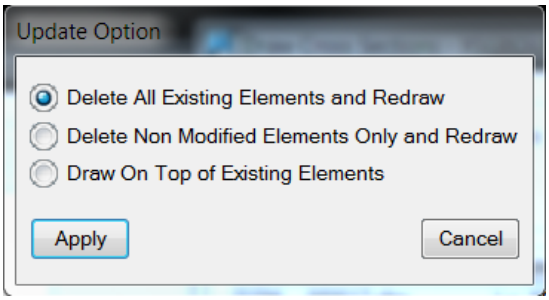
6. Set the *Active Level* to **Scratch1_dp**

7. Set the *Active Text size* to **.05**, from the MicroStation Key-in: **TX=.05**.

8. Set the *Active Text Scale* to **1**, from the MicroStation Key-in: **AS=1**.



9. To Process *Cross Sections*, click the **Draw** button on the Draw Cross Sections dialog.
10. Click the **Delete All Existing Elements and Redraw** on the Update Option dialog. Click **Apply**.



11. Close the Draw Cross Sections dialog and click **Yes** to save the Setting. .

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CROSS SECTION LABELING

- Slopes
- Elevations
- Offsets

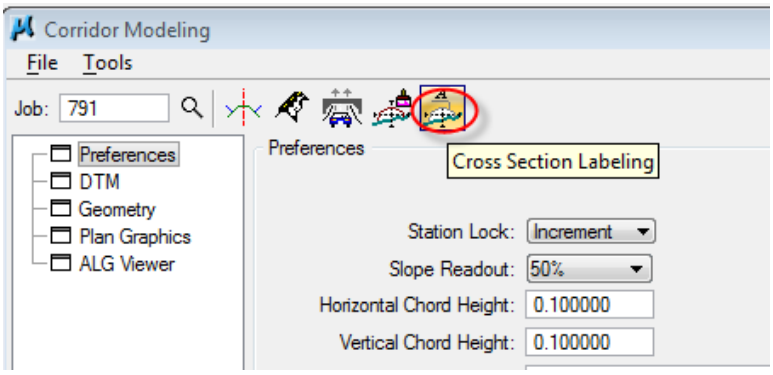
A cross section labeling tool is provided in Corridor Modeling for labeling the different components of the template. Historically, this was accomplished with criteria. The cross section point labels that are plotted from Roadway Designer when the cross sections are generated are used in the labeling process.

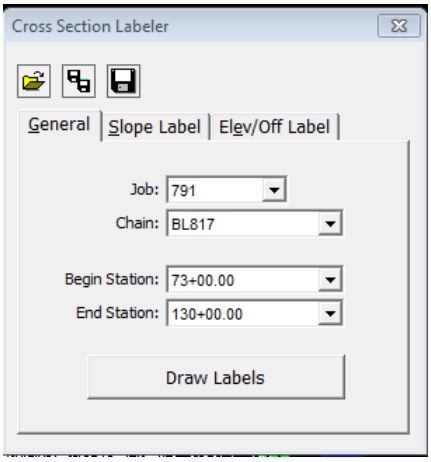
To label the slope of a component both end of the component must be identified. If a negative sign is desired in the label, identify the piece of text with the highest elevation first.

To label an elevation and/or offset, only one piece of text needs to be selected.

ACCESSING THE DIALOG

The dialog is invoked by clicking the *Cross Section Labeling* icon on the Corridor Modeling dialog.





- *General Tab* - This is where the Job Number, Chain Name, and Station range are entered. There is also a "Draw Labels" button that is used to draw the labels after the remainder of the dialog is populated with the desired labels.
- *Slope Label Tab* - A "Start Point" and "End Point" is selected by clicking the ID button next to the respective field then identifying the desired piece of text. Click the Symbology button and enter the desired symbology for the label. Also toggle on the required "Slope Text Format" (there are several formats available).

  Once the information is entered it must be added to the list box though the **Action / Edit** buttons on the right side of the dialog. Add as many slope labels to the list box as needed.

- *Elev/Off Label Tab* - To label an elevation and/or offset click the ID button next to the point field then select the respective text associated with the location desired for the label. Set the "Elevation" option and/or the "Offset" option. Click the Symbology button and enter the desired symbology for the label. The "Slope Text Format" option is unavailable.

  Once the information is entered it must be added to the list box. This is accomplished via the **Action / Edit** buttons on the right side of the dialog. Add as many elevation and/or offset labels to the list box as needed.

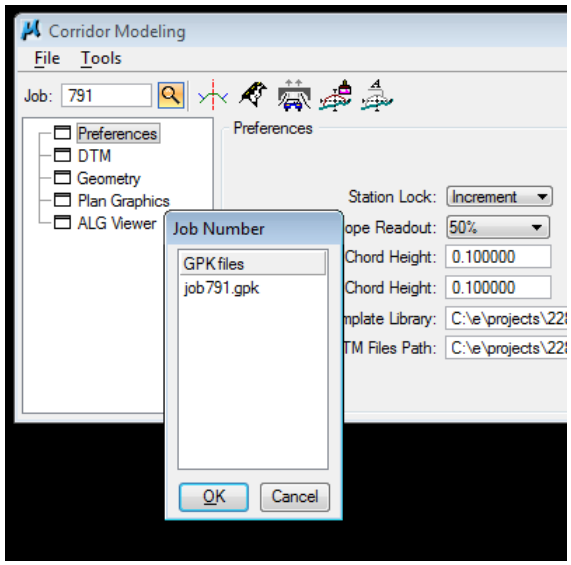
- *Draw Labels* - Once all the labels have been entered into the dialog, select the "General" tab then click the "Draw Labels" button. The labels are drawn on each cross section.

- *Preference File* - The dialog settings can be saved in a preference file (.xpl) that can be recalled for use on other cross section files.

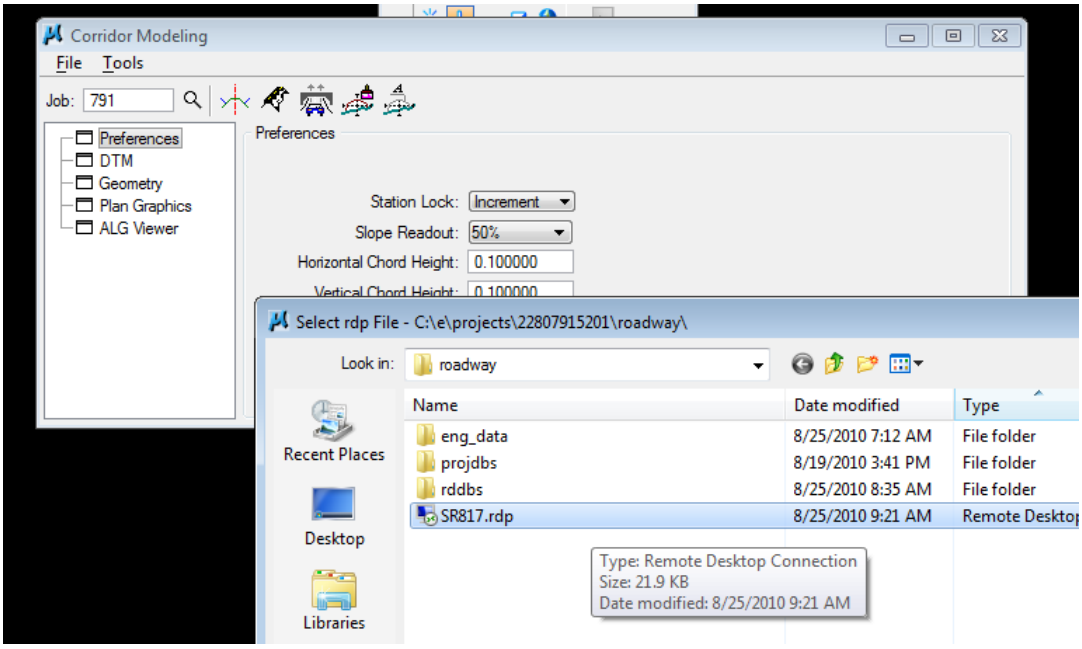
Exercise 10.6 Label Cross Sections

In this exercise the proposed roadway Cross Sections labels will be created and drawn on the Cross Sections in the design file, RDXSRD02. The Cross Section Labeling dialog is launched from the Corridor Modeling dialog. The labels are defined from the point names drawn on the proposed roadway elements and stored in a preference file for the project. The point names are plotted when the proposed cross sections are plotted. They are drawn on the active level with the active text and active scale settings.

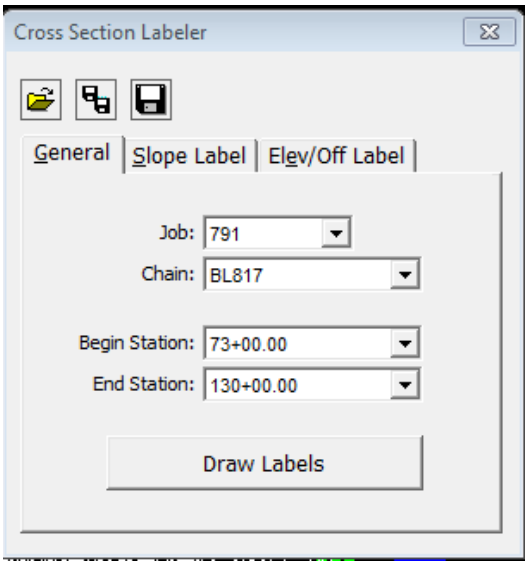
1. Open the FDOTSS2 MicroStation workspace in the cross sections project design file c:\e\projects\22807915201\roadway*RDXSRD02.dgn*.
2. From the MicroStation menu, open Corridor Modeling dialog by selecting **Applications** > **ROAD** > **3D Tools** > **Corridor Modeling**.
3. Select *Job Number* **job791.gpk.**



4. Load *preference* file **SR817.rdp**

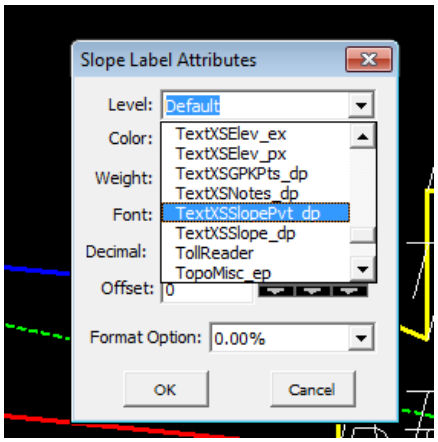


5. Click the **Cross Section Labeling** icon on the Corridor Modeling dialog.

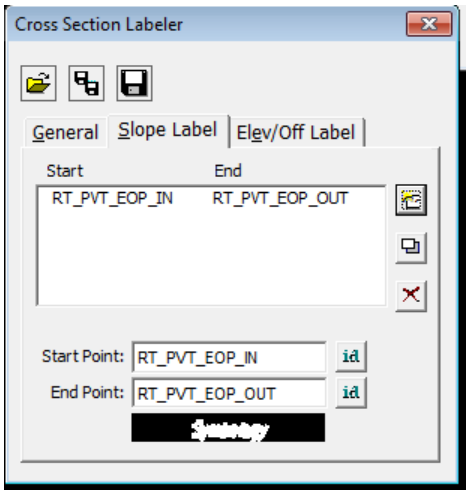


6. Set the **General** tab:
   a. Select *Job Number* **job791.gpk**.
   b. Select *Chain* **BL817**.
   c. Change the *Begin Station* to **73+00**.

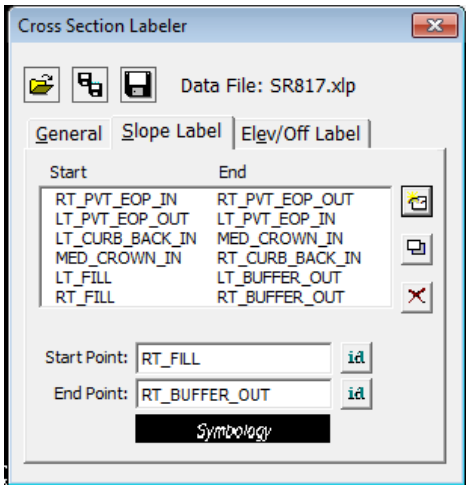
7. Set the **Slope Label** tab:
   a. Click the **ID** button for the *Start Point.*
   b. Select the right inside pavement point text labeled **RT_PVT_EOP_IN**
   c. Click the **ID** button for the *End Point.*
   d. Select the right outside pavement point text labeled **RT_PVT_EOP_OUT**.
   e. Select the **Symbology** button then enter the desired symbology.
   f. From the Slope Label Attributes dialog, set the *Level* to **TextXSSlopePvt_dp** and *Slope Text Format Option* to **0.00%**.



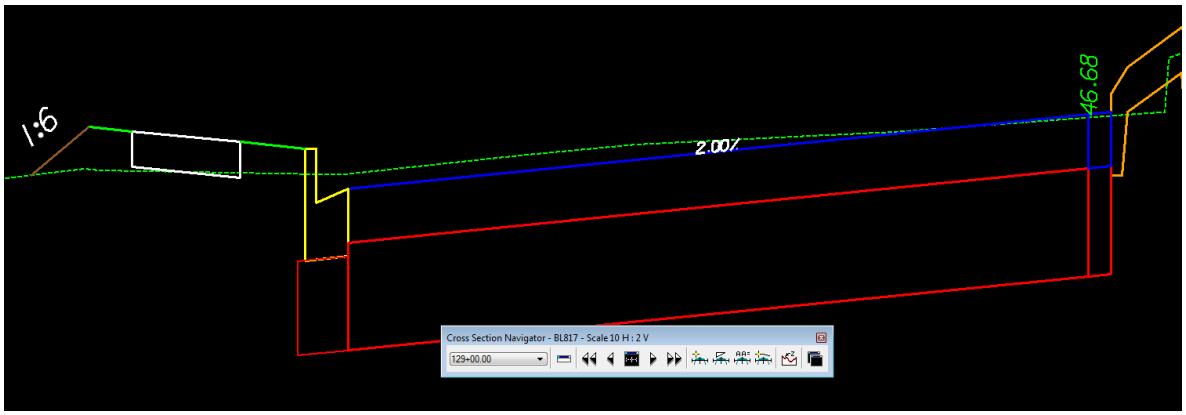
   g. Close the Slope Label Attributes dialog.
   h. Click the **Add** button.



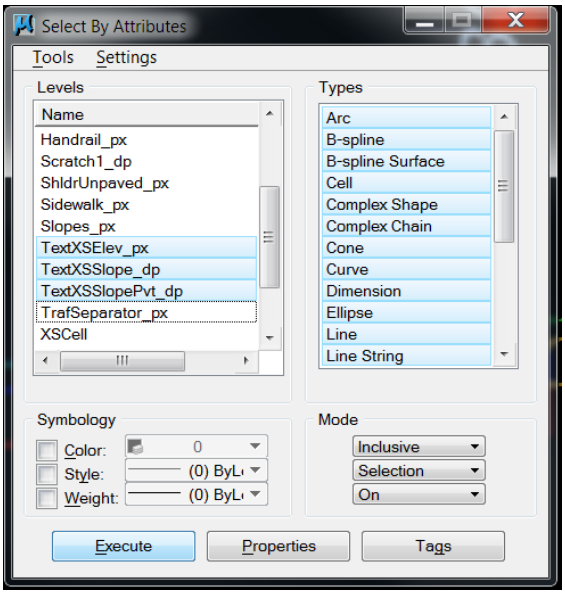
   i. Repeat for the *left pavement segments*.
   j. Repeat the slope label steps for the *cut/fill slopes* on both sides.
   k. Set the *Slope Text Format* option to **RUN:1**.
   l. Save to a new *preference* file **SR817.**



8. Set the **Elev/Off Label** tab:
   a. Set the **Elevation** check box.
   b. Use the *ID* button to identify the text that represents the *PGL of the right roadway*, **RT_PVT_EOP_IN**.
   c. Click the **Symbology** button then enter the desired symbology.
   d. Close the Label Attributes dialog.
   e. Click the **Add to List** button.
   f. Repeat steps 1 to 5 for the *cut/fill tide down points* on both sides of the roadway.
   g. Save the *preference file* **SR817.**
9. Select the **General** tab.
   a. Click the **Draw Labels** button.



   b. Review the labels.
   c. If there are additions or modifications to be made to the labels after the *Draw Labels* command is executed, use the MicroStation Select by Attribute dialog. Execute the levels for **TextXS*** and delete the elements.

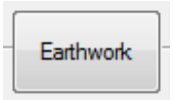


   d. Re-Draw Labels as necessary.

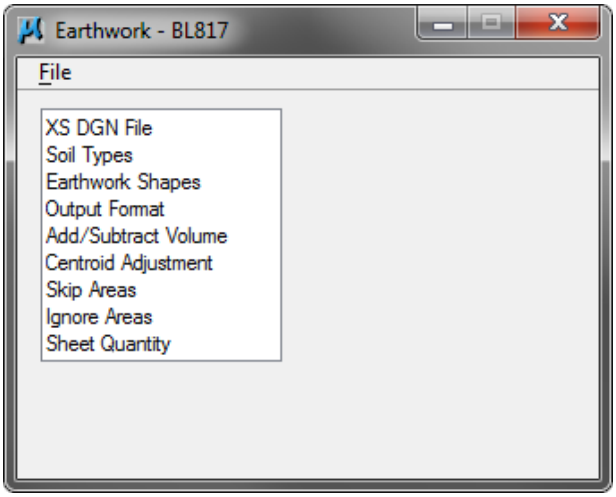
Exercise 10.7 Earthwork Quantities

In this exercise basic cut and fill earthwork will be processed for proposed cross sections.

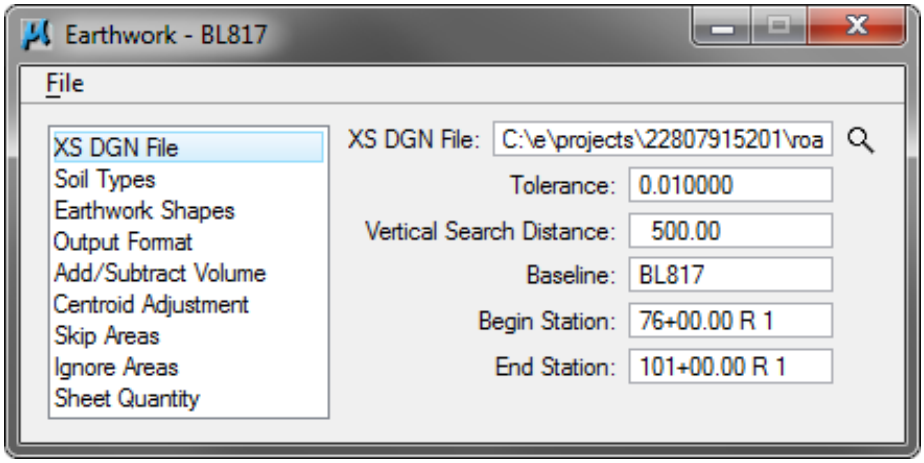
1. Open the design file c:\e\projects\228079115201\roadway*RDXSRD01.dgn***.**
2. Access Project Manager.
3. From Road Project, click the **Earthwork** button.



4. Create a new run **BL817**. Select the **BL817 run** and click the **OK** button. The Earthwork dia**log o**pens.



5. Selec**t XS DGN File**. All of the inf**or**mation is populated by the *Working Alignment*.



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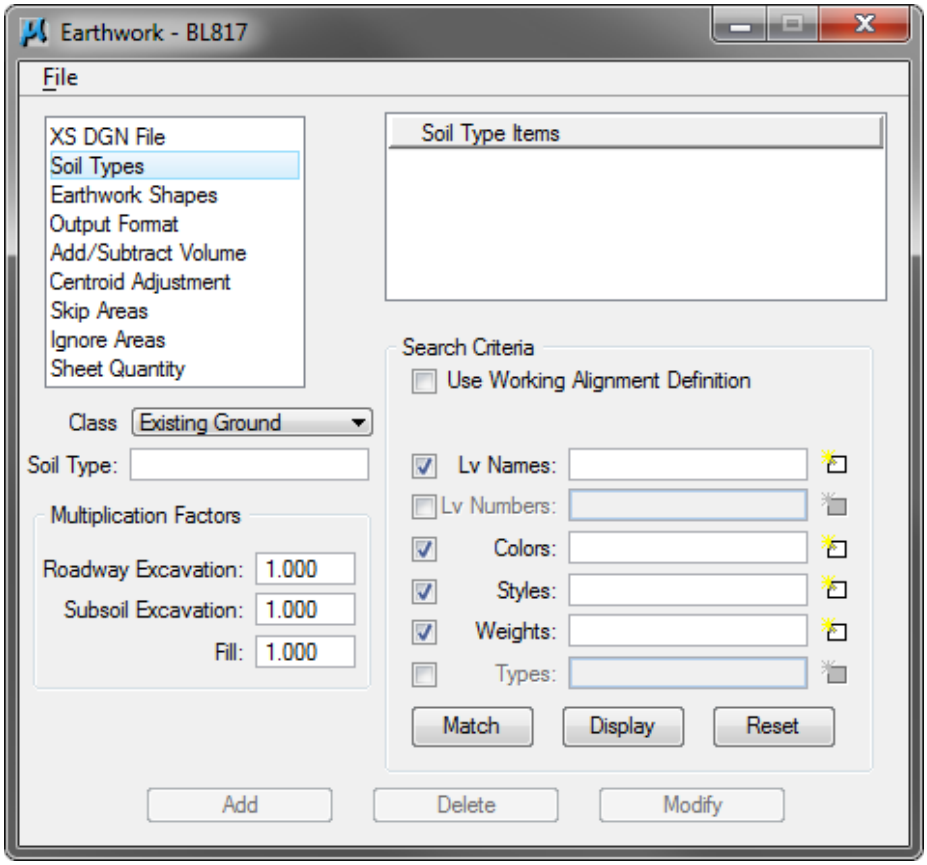
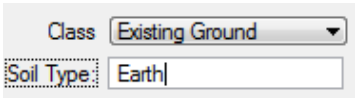
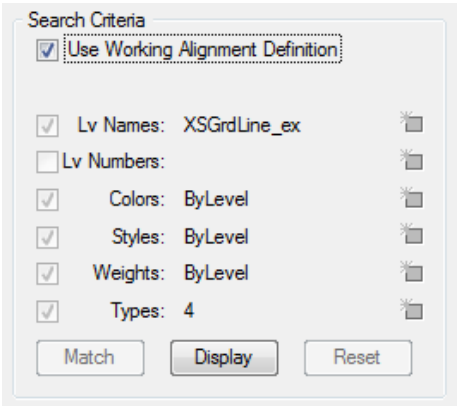
6. Select **Soil Types**.



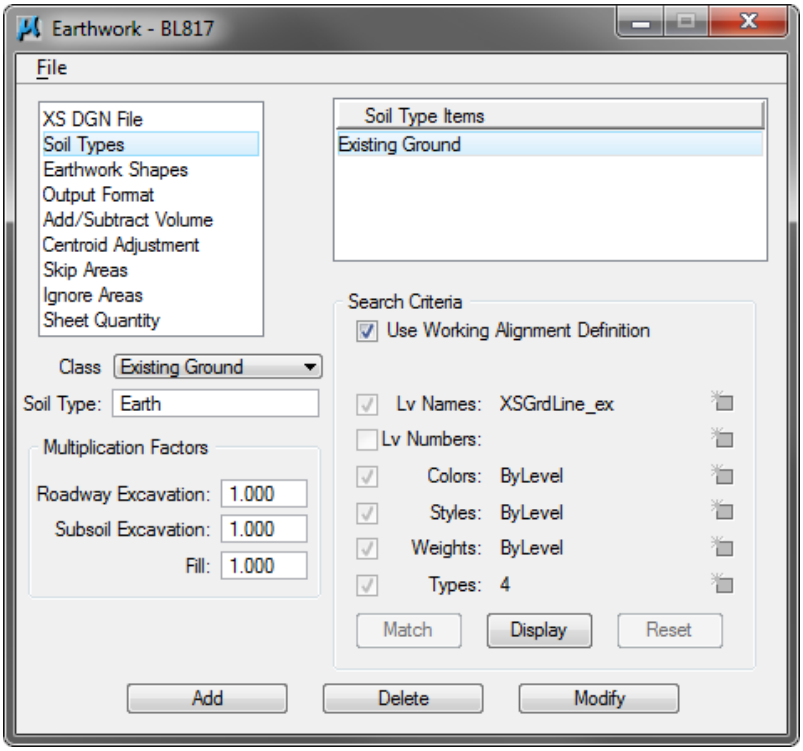
7. Leave the *Class* set to **Existing Ground**. Key in the name **Earth** for the *Soil Type*.



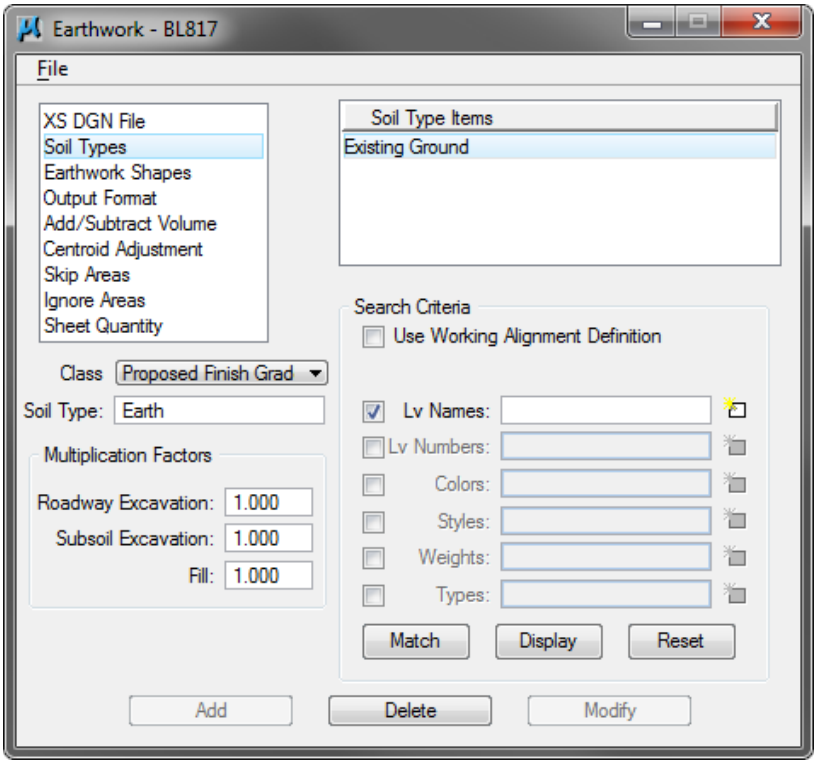
8. Enable the **Use Working Alignment** check box.



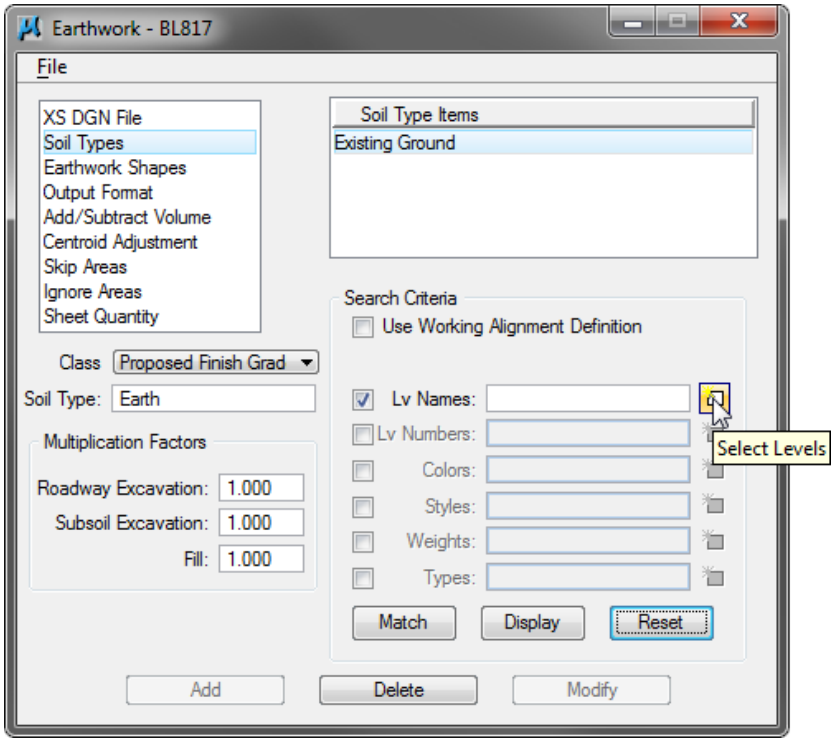
9. Click the **Add** button to add **Existing Ground** to the *Soil Type Items* list box as shown.



10. Change the *class* to **Proposed Finish Grade**, uncheck the **Use Working Alignment Definition** option, and check only the **Lv Names** option as shown.



11. Click the **Select Levels** button to the right of the **Lv Names** field.



12. In the Level Name Search Filter dialog that appears, select the following level names:

AsphaltMilling_px

Base_px

CandG_px

CandGBase_px

Driveway_px

DrivewayBase_px

Overlay1_px

Overbuild_px

ShldrUnpaved_px

Sidewalk_px

SidewalkBase_px

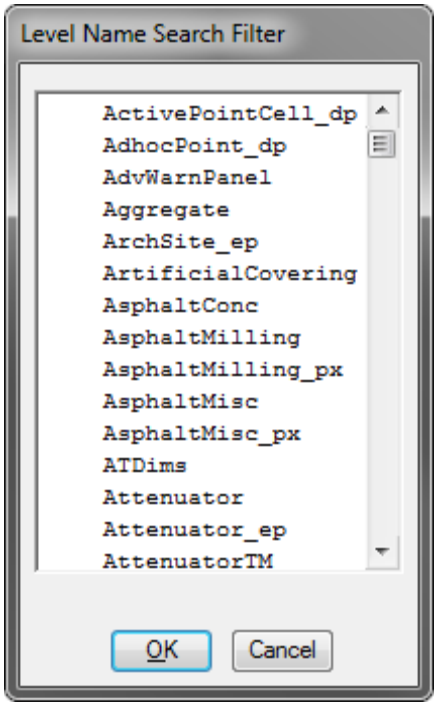
Slopes_px

TrafSeparator_px

TrafSeparatorBase_px

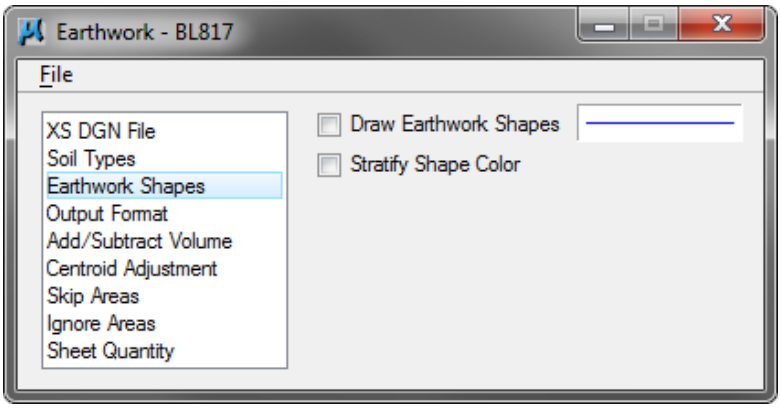
XSBaseTop_px

XSGrdLine_px



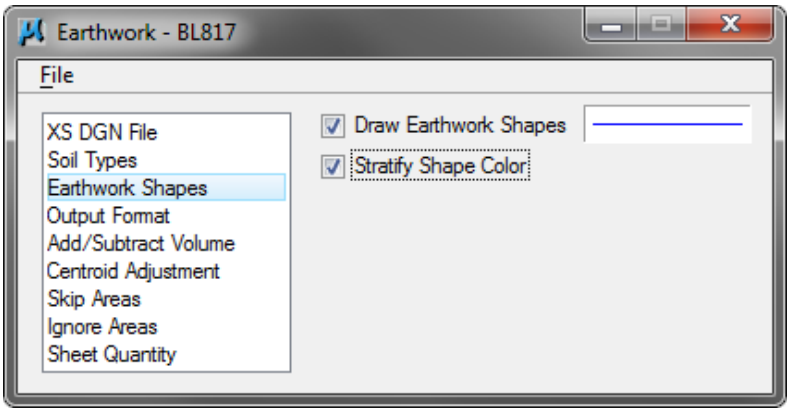
13. Click **OK**.

14. Click the **Add** button to add **Proposed Finish Grade** to the *Soil Type Items* list box.
15. Select **Earthwork Shapes**.

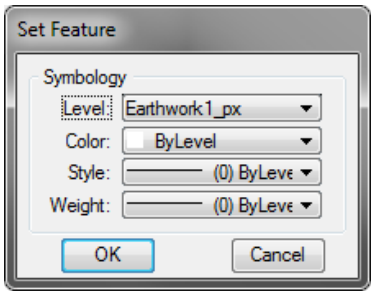


Note The use of Draw Earthwork Shapes is optional. If it is desired to see the shapes place a check mark appropriately. When creating the cross section sheets, the shapes come also, so fill will have to be turned off under View Attributes.

16. Enable the check box to **Draw Earthwork Shapes**.
17. Enable the check box to **Stratify Shape Color**.

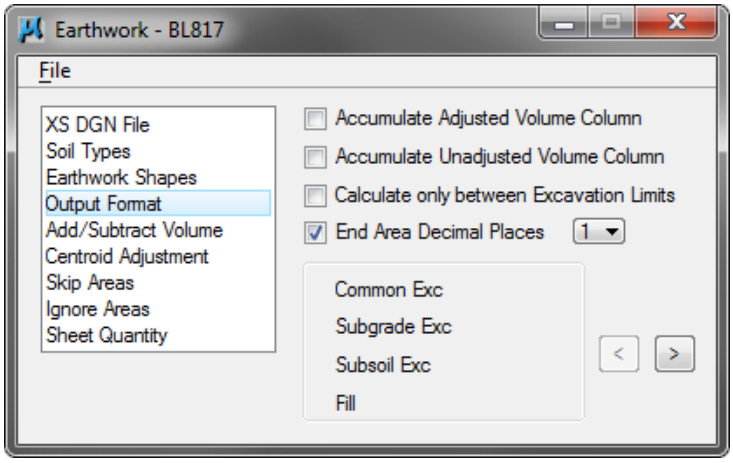


18. Access the Set Feature dialog and set the symbology for the *Earthwork Shapes* as shown in the following figure.

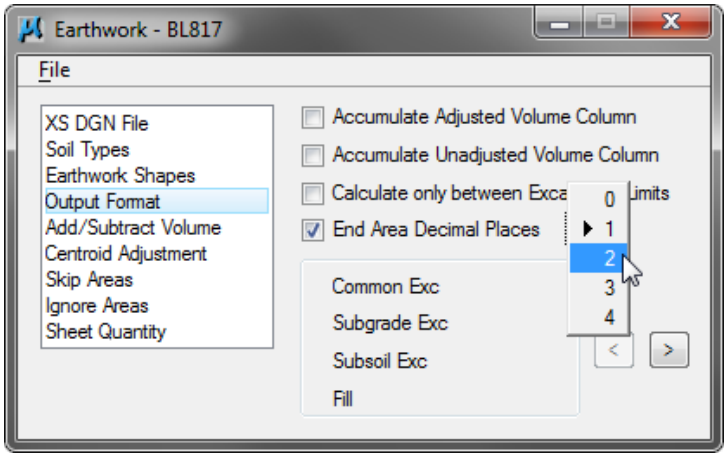


19. Click **OK** to close the Set Feature dialog.

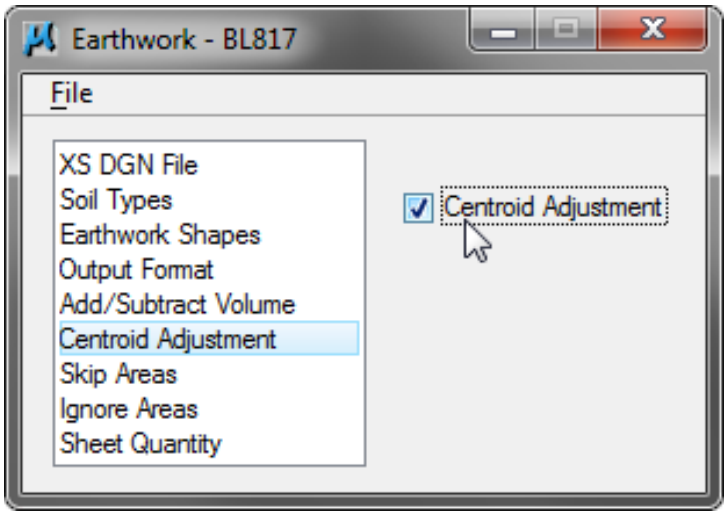
20. Select **Output Format**.



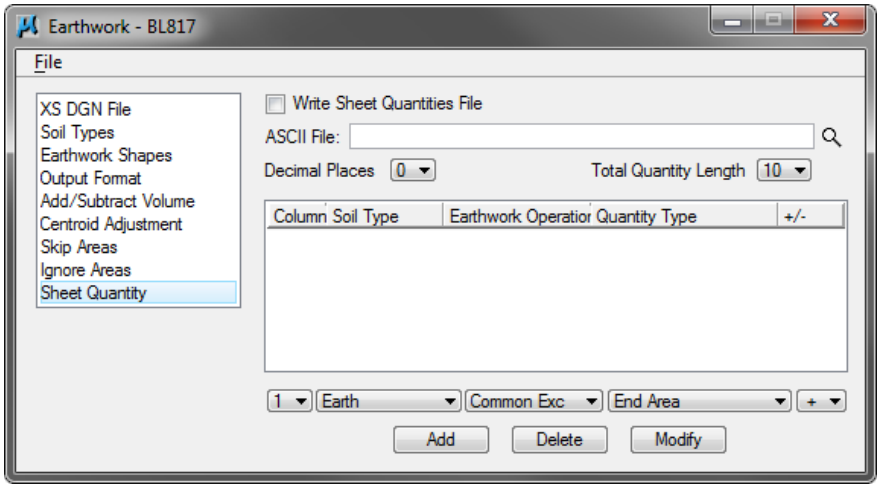
21. Set the *End Area Decimal Places* to **2**.



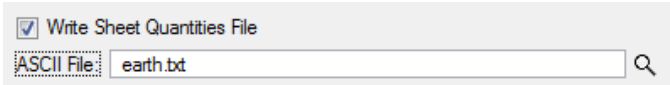
22. Select **Centroid Adjustment** and enable the check box.



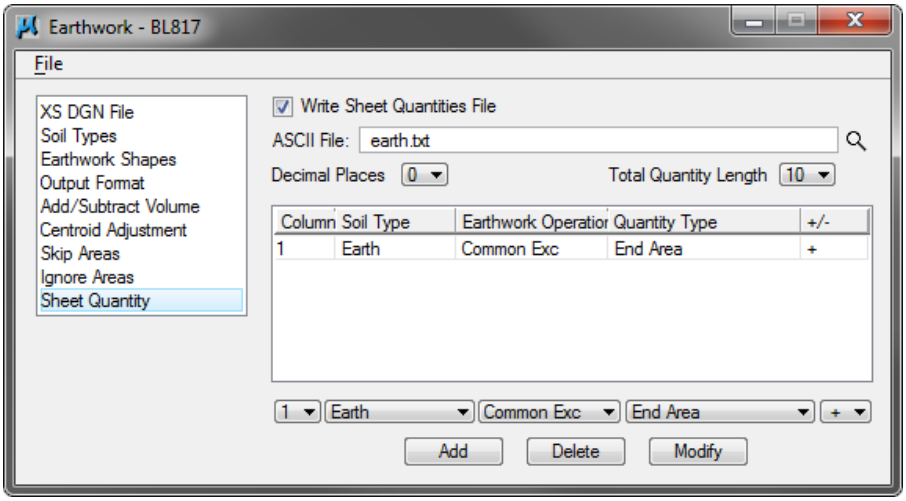
23. Select **Sheet Quantity**.



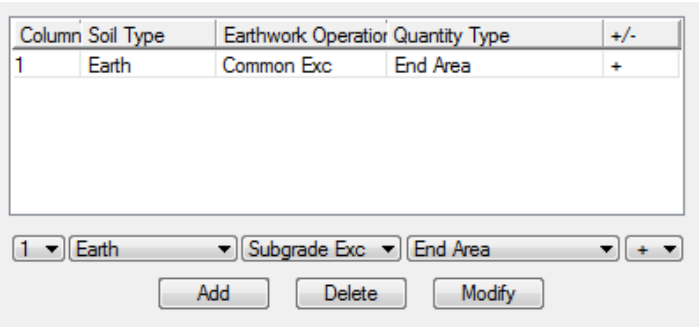
24. Enable the check box to **Write Sheet Quantities File**.
25. Key in **earth.txt** in the *ASCII File* field.



26. Click **Add** to add the Column 1 earthwork to the list box.



27. Leave the Column set to 1 but change the *EW Operation* to **Subgrade Exc**.



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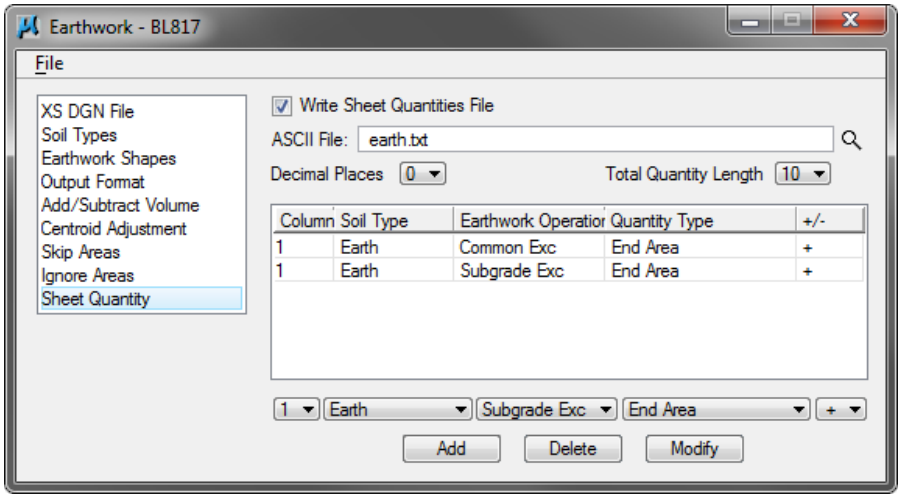
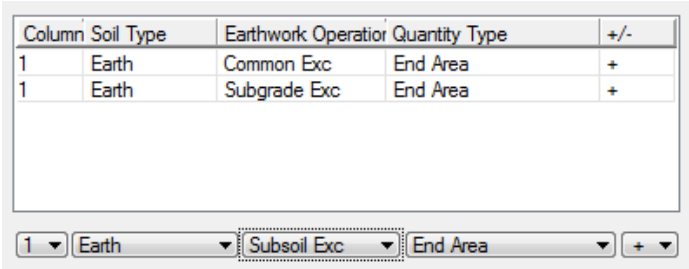
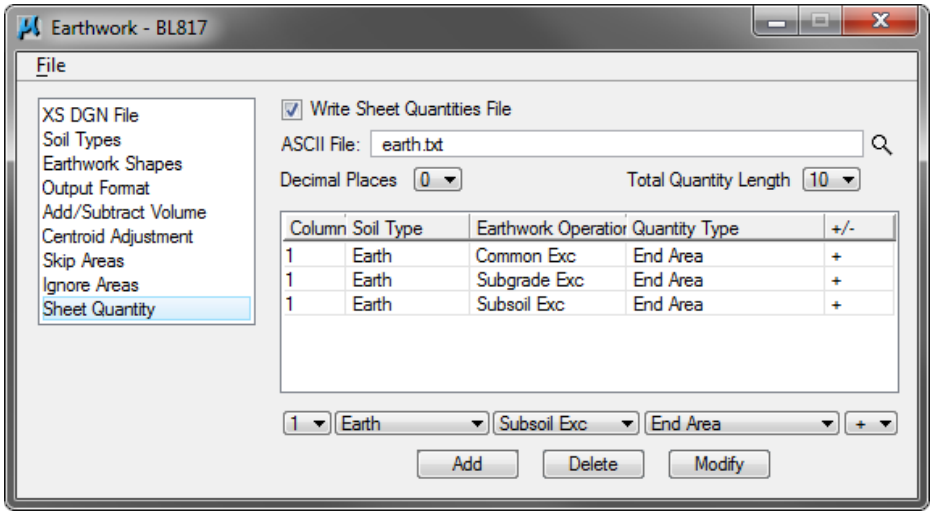
28. Click **Add** to add the **Subgrade Exc** to the existing *Column 1 earthwork*.



29. Change the *EW Operation* to **Subsoil Exc.**

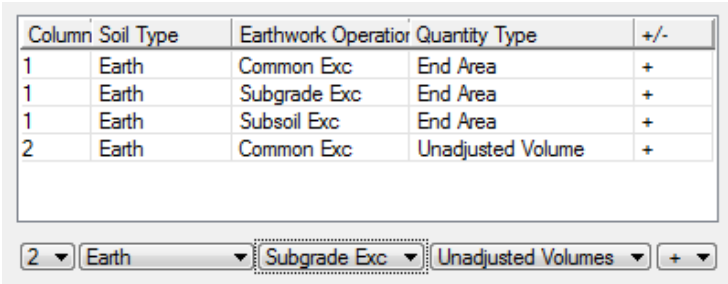


30. Click **Add** to add the **Subsoil Exc** to the existing *Column 1 earthwork*.

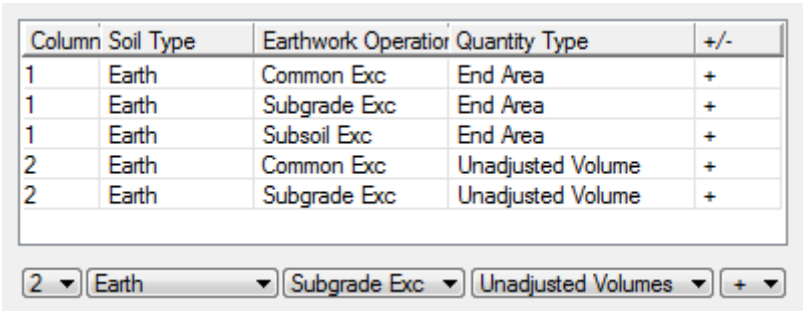


31. Change the *Column* to **2.**
32. Set the *Earthwork Operation* to **Common Exc**.
33. Set the *Quantity Type* to **Unadjusted Volumes**.

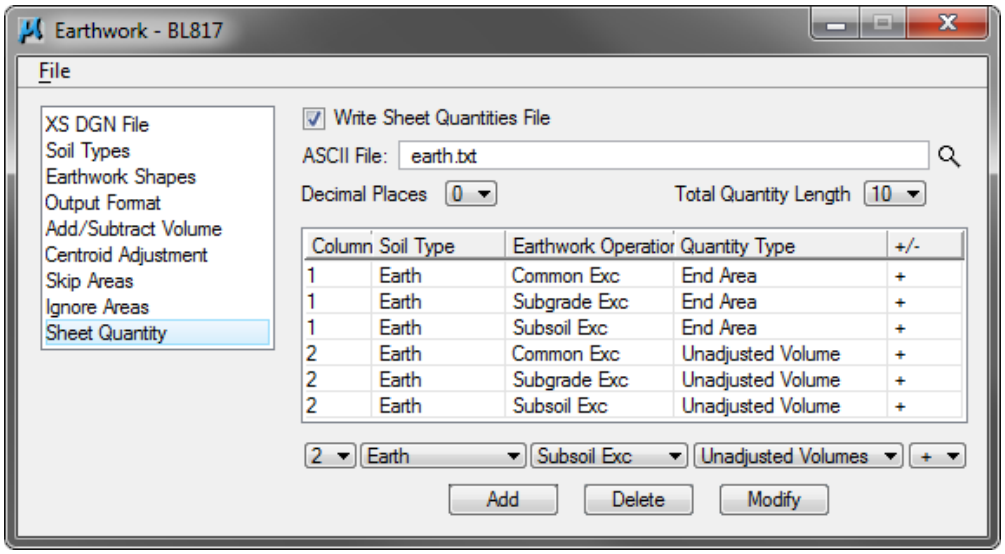
34. Click **Add** to add the *Column 2 earthwork* to the list box.



35. Leave the *Column* set to **2** and change the *Earthwork Operation* to **Subgrade Exc**.
36. Click **Add** to add the **Subgrade Exc** to the existing *Column 2 earthworks*.

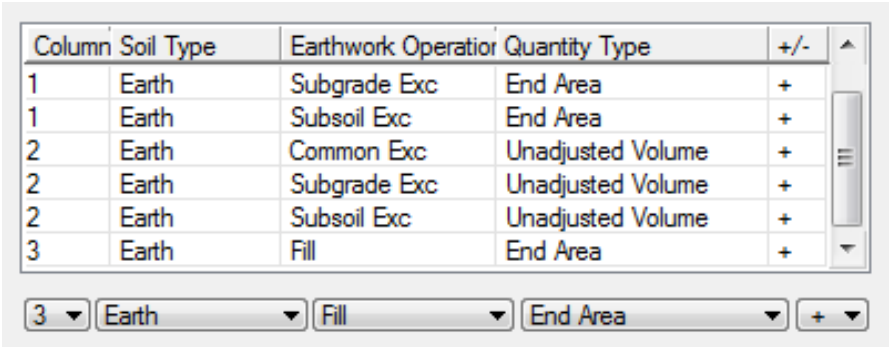


37. Leave the *Column* set to **2** and change the *Earthwork Operation* to **Subsoil Exc**.
38. Click **Add** to add the **Subsoil Exc** to the existing *Column 2 Earthworks*.

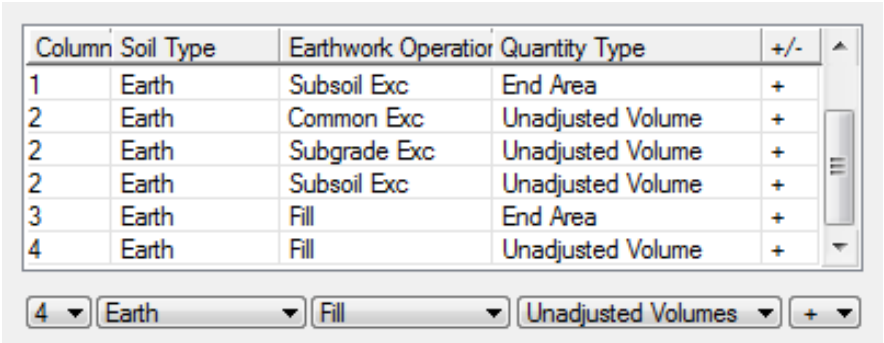


39. Change *Column* to **3**.
40. Change the *EW Operation* to **Fill**.

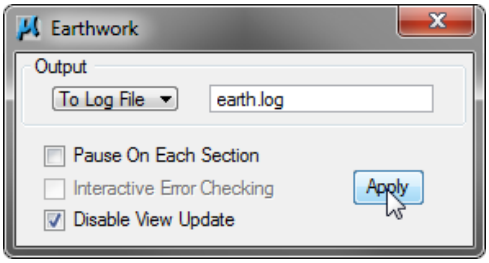
41. Click **Add** to add the **Column 3 earthwork** to the list box.



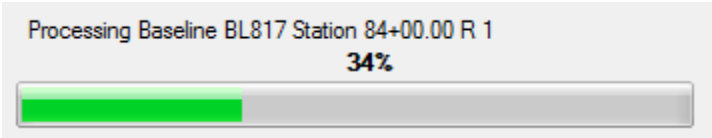
42. Change the *Column* to **4.**
43. Set the *EW Operation* to **Fill**.
44. Click **Add** to add the **Column 4 earthworks** to the list box.



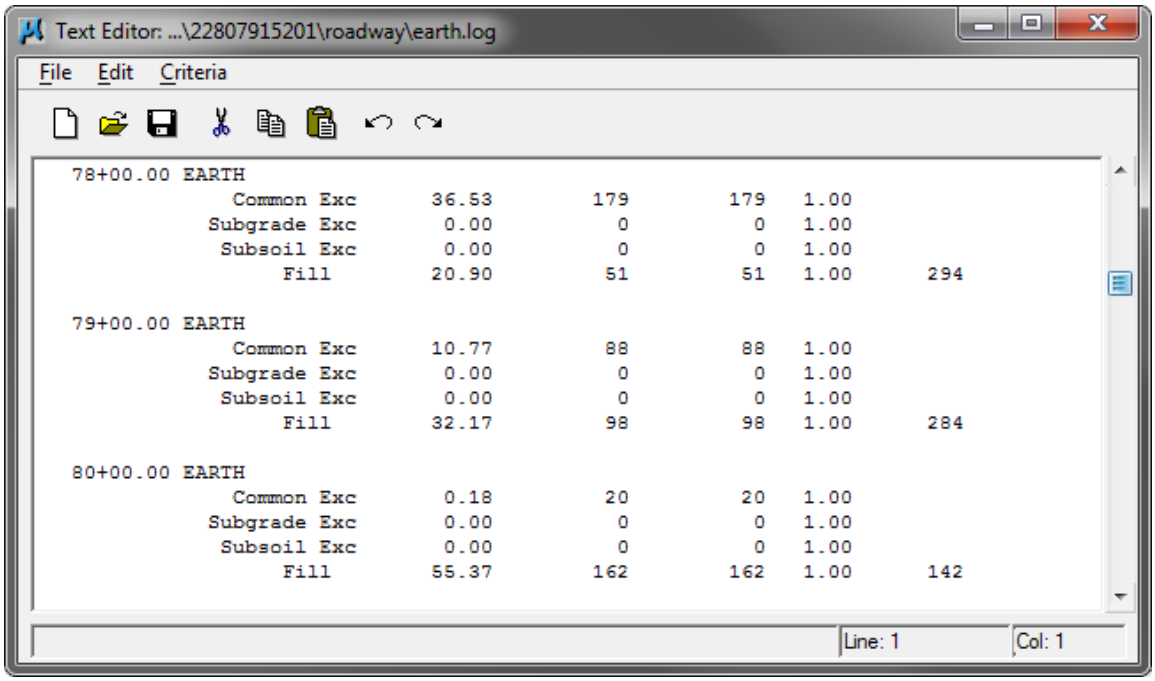
45. Select **Files > Save Settings**.
46. Select **Files > Run**.
47. Set the option To **Log File** and key in a log file name of **earth.log**.



48. Click **Apply** to process the earthwork.
49. When processing is complete, click **Exit**.



50. Close the Earthwork dialog. When prompted to **Save Settings** click **Yes**
51. From the */roadway* directory, review the file **earth.log**.

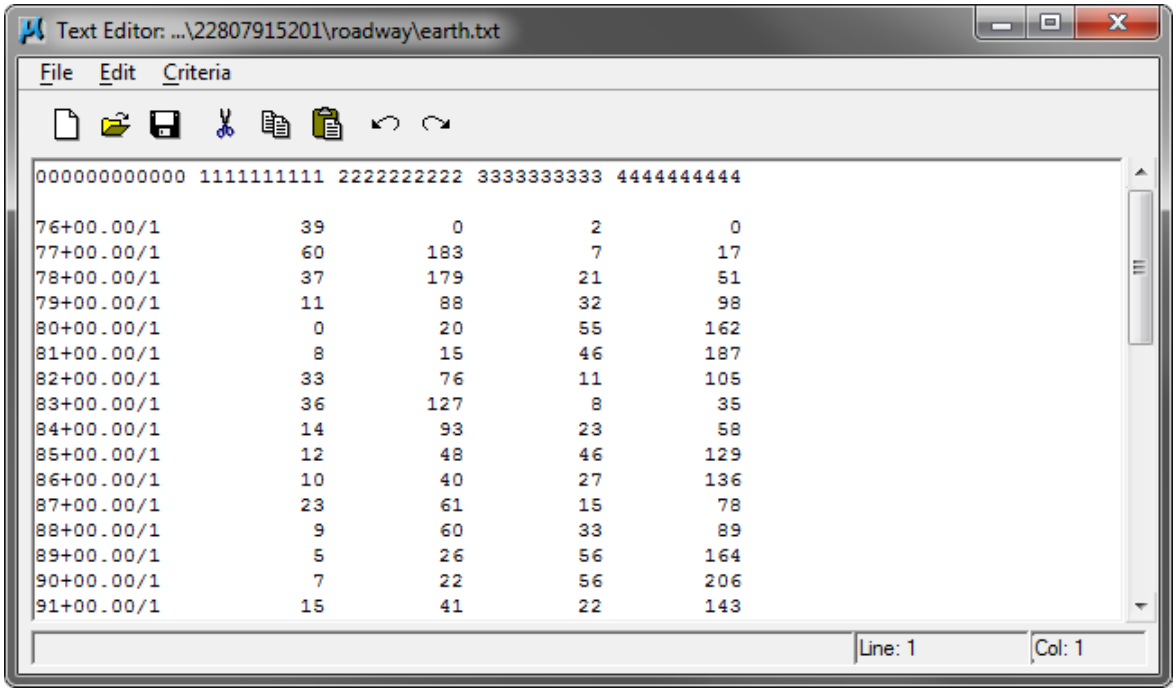



```
78+00.00 EARTH
              Common Exc      36.53        179        179   1.00
            Subgrade Exc       0.00          0          0   1.00
             Subsoil Exc       0.00          0          0   1.00
                  Fill        20.90         51         51   1.00       294

79+00.00 EARTH
              Common Exc      10.77         88         88   1.00
            Subgrade Exc       0.00          0          0   1.00
             Subsoil Exc       0.00          0          0   1.00
                  Fill        32.17         98         98   1.00       284

80+00.00 EARTH
              Common Exc       0.18         20         20   1.00
            Subgrade Exc       0.00          0          0   1.00
             Subsoil Exc       0.00          0          0   1.00
                  Fill        55.37        162        162   1.00       142
```

52. From the */roadway* directory, review **earth.txt**.



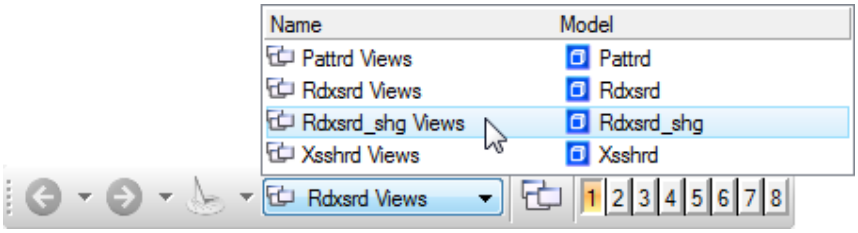

```
000000000000 1111111111 2222222222 3333333333 4444444444

76+00.00/1           39          0          2          0
77+00.00/1           60        183          7         17
78+00.00/1           37        179         21         51
79+00.00/1           11         88         32         98
80+00.00/1            0         20         55        162
81+00.00/1            8         15         46        187
82+00.00/1           33         76         11        105
83+00.00/1           36        127          8         35
84+00.00/1           14         93         23         58
85+00.00/1           12         48         46        129
86+00.00/1           10         40         27        136
87+00.00/1           23         61         15         78
88+00.00/1            9         60         33         89
89+00.00/1            5         26         56        164
90+00.00/1            7         22         56        206
91+00.00/1           15         41         22        143
```

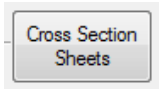
Exercise 10.8 Cross Section Sheet Layout with Earthwork

In this exercise, the cross sections are referenced onto sheets with the earthwork quantities.

1. Open the design file c:\e\projects\228079115201\roadway*RDXSRD01.dgn***.**
2. Change the *active model* to **Rdxsrd_shg**.

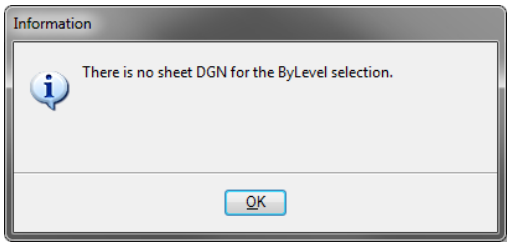


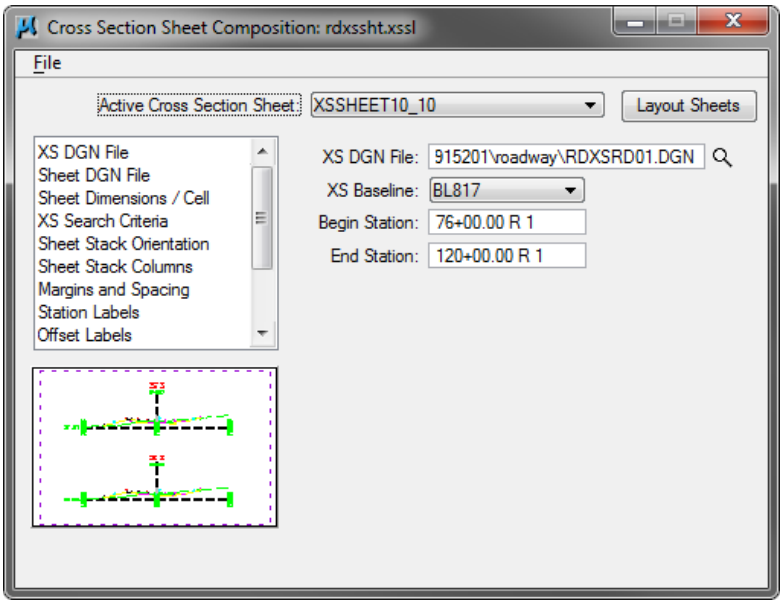
3. Access Project Manager.
4. From Road Project, click the **Cross Sections Sheets** button.



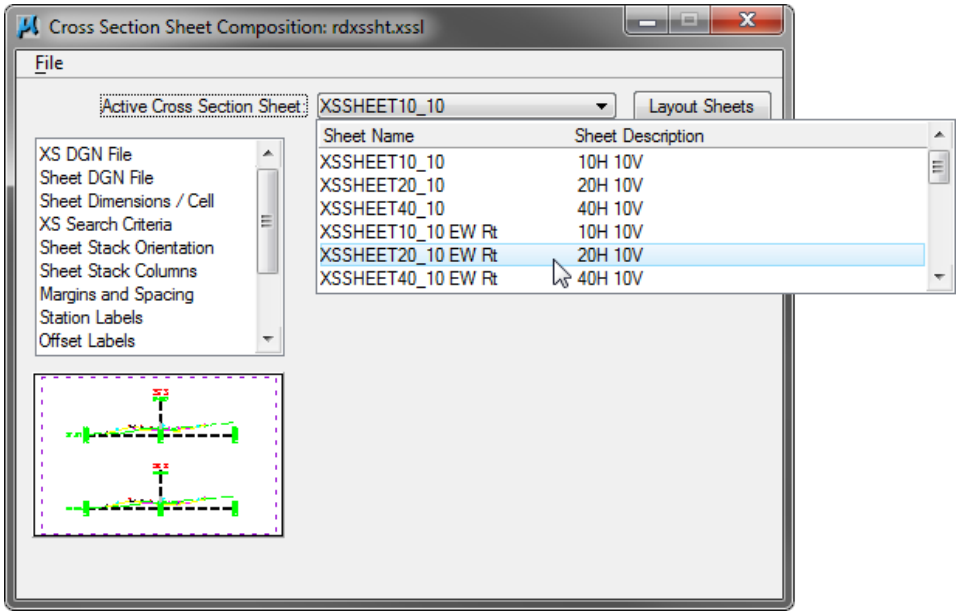
5. Create a *new run* named **BL817** and select the **BL817 run** and click **OK.**
6. The Cross Section Sheet Composition dialog.

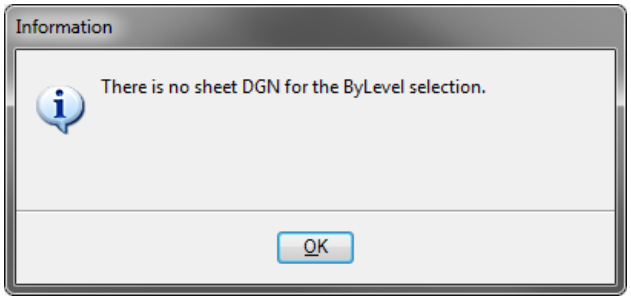
> ***Note*** When accessing the Cross Section Sheet Composition dialog for the first time and until a sheet DGN file is defined, the user will get the following Alert dialog. You will have to click OK 4 times to dismiss this dialog.

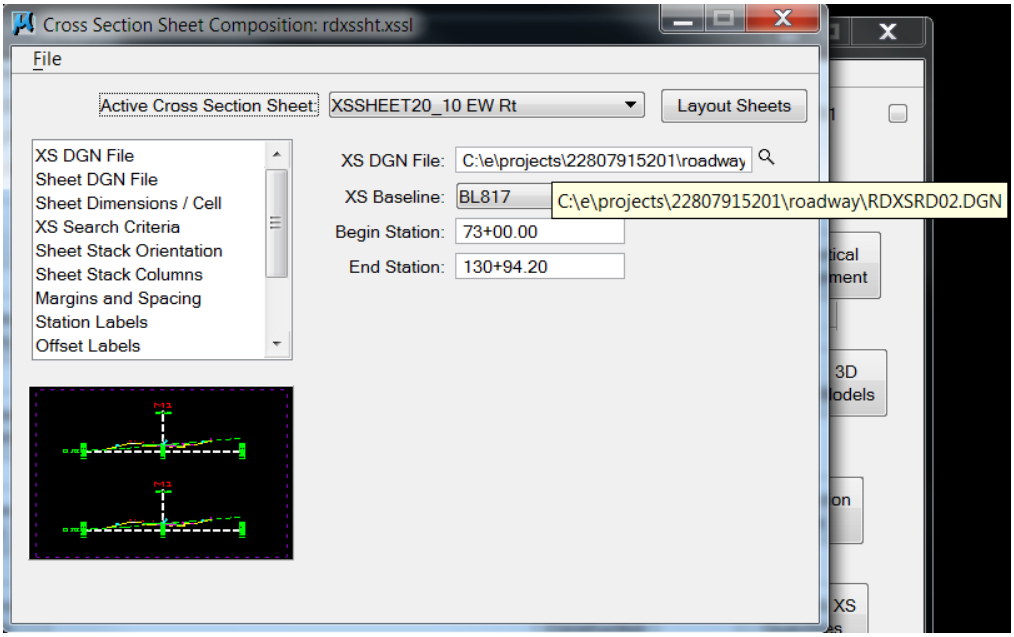




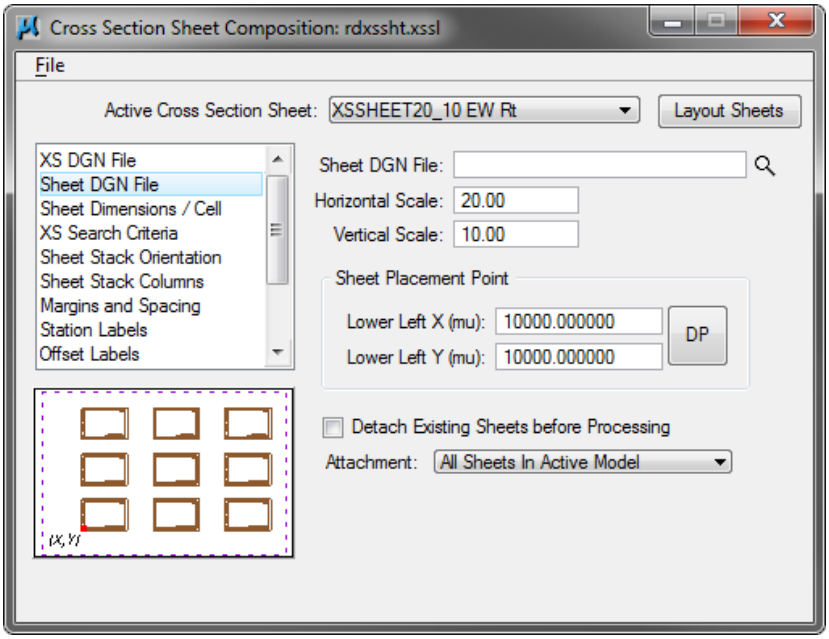
7. Select the sheet **XSSHEET20_10EW Rt**.



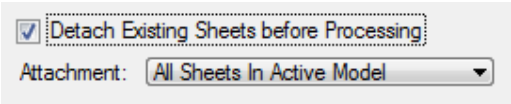




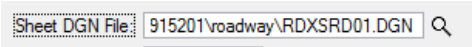
8. Select **Sheet DGN** file.



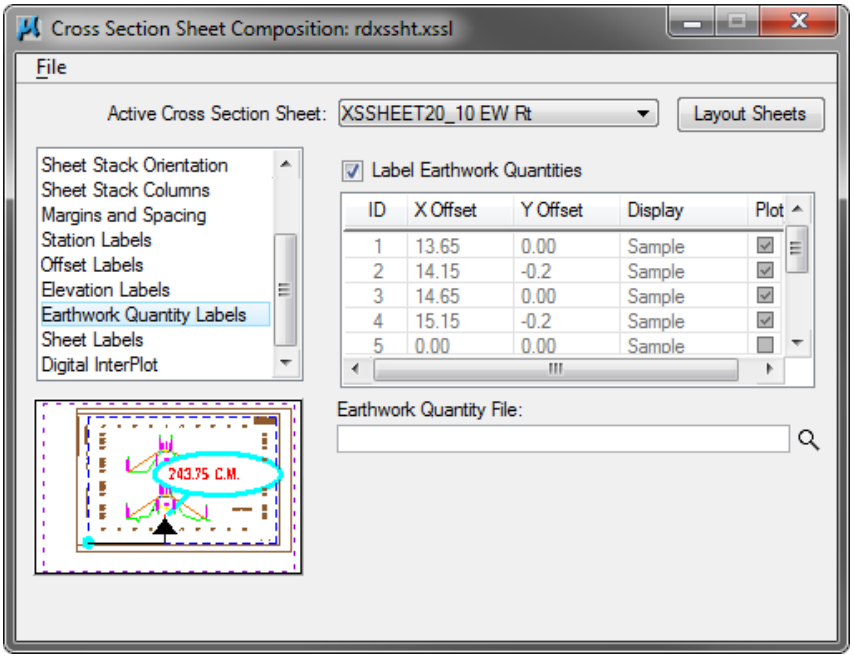
9. Enable the check box for **Detach Existing Sheets before Processing**.



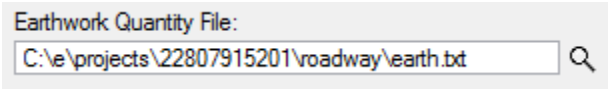
10. Select or key-in **RDXSRD02.*dgn*** as the *Sheet DGN file name.*



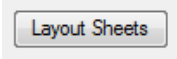
11. Select **Earthwork Quantity Labels.**

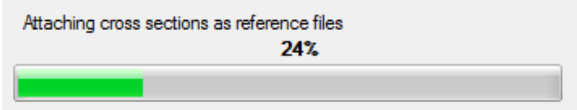


12. Select or key in the file name **earth.txt** for the ***Earthwork Quantity file***.



13. Select **File > Save Settings**.
14. Click the **Layout Sheets** button. The cross sections will attach as reference files and be drawn on the sheets.



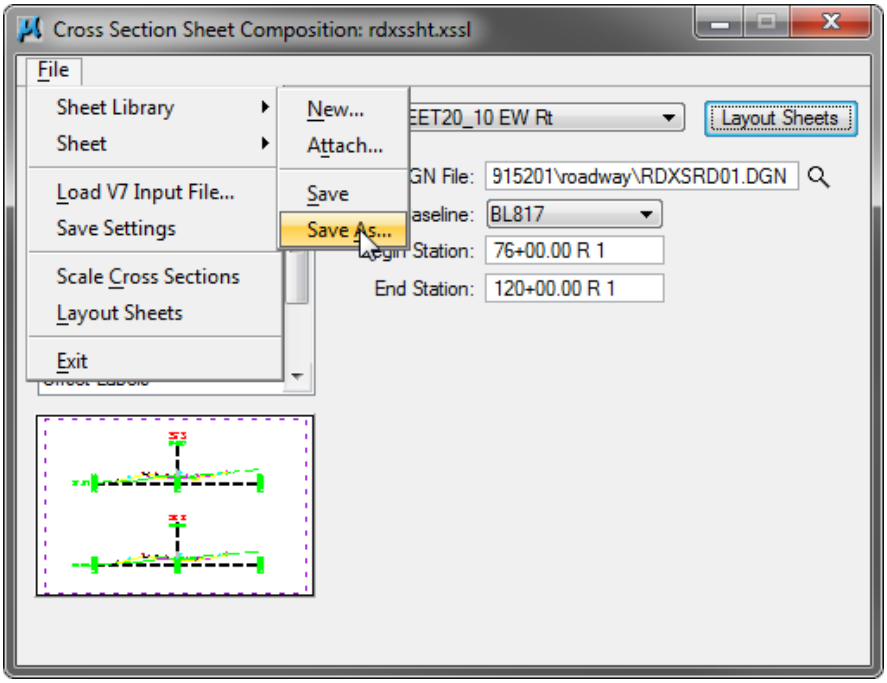


15. Close the Cross Section Sheet Composition dialog. When prompted to **Save Settings,** click **Yes**.
16. Review the sheets.

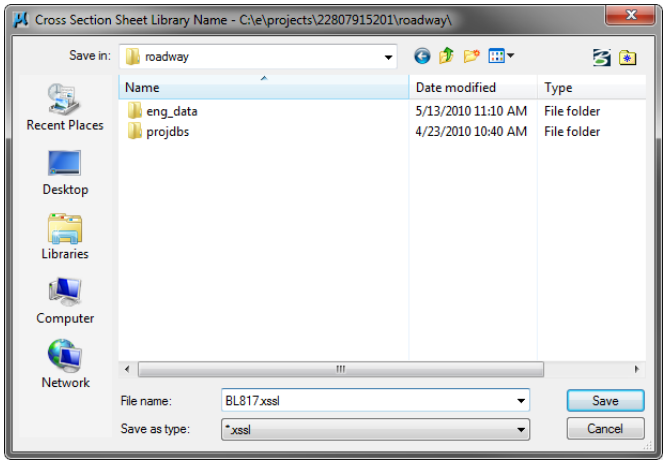
➢ *Modifying Cross Section Sheet Layout*

In this exercise, the user will save the Sheet Library to our project directory and then modify our sheet layout preferences.

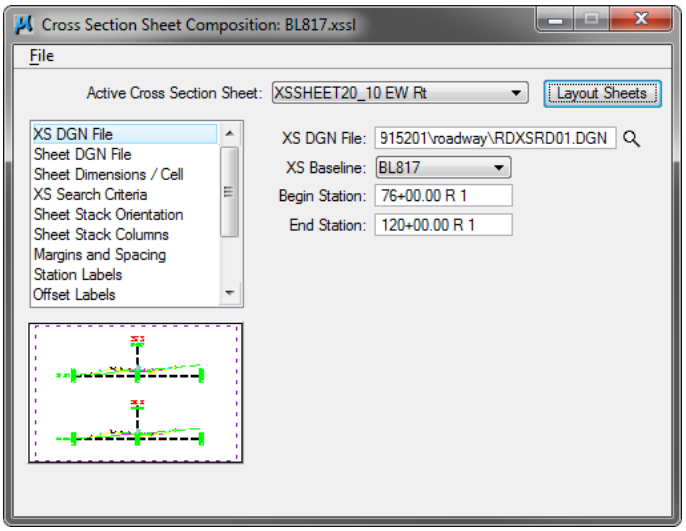
1. Access the previously created **Cross Section Sheet** run.
2. Select **File > Sheet Library > Save As**.



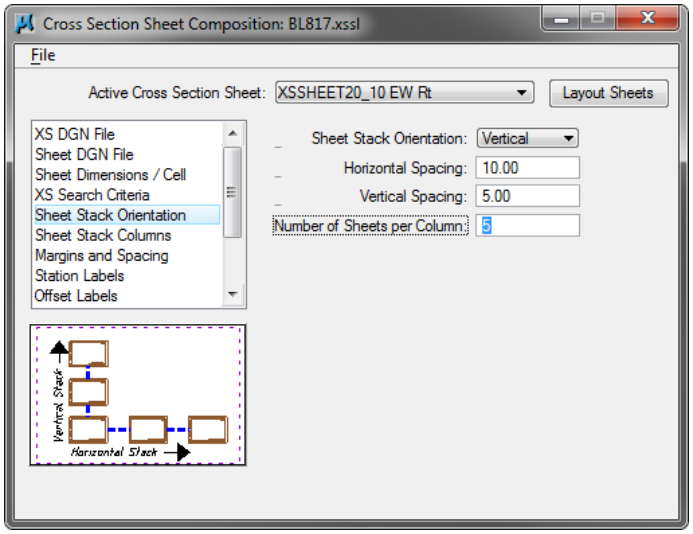
3. Save the file in your *\roadway* directory using the name **BL817.xssl** as shown.



4. The dialog will automatically update and begin to use the newly created **BL817.xssl** sheet library.



5. Select **Sheet Stack Orientation** and change the *Number of Sheets per Column* to **5**.



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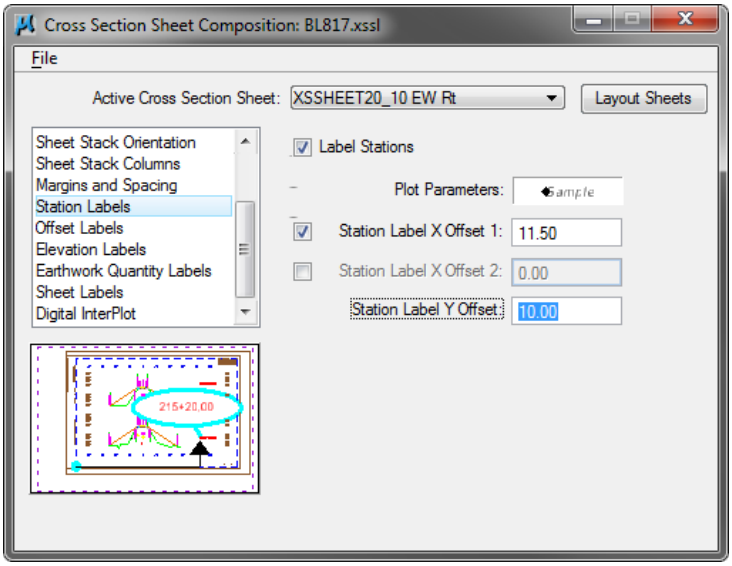
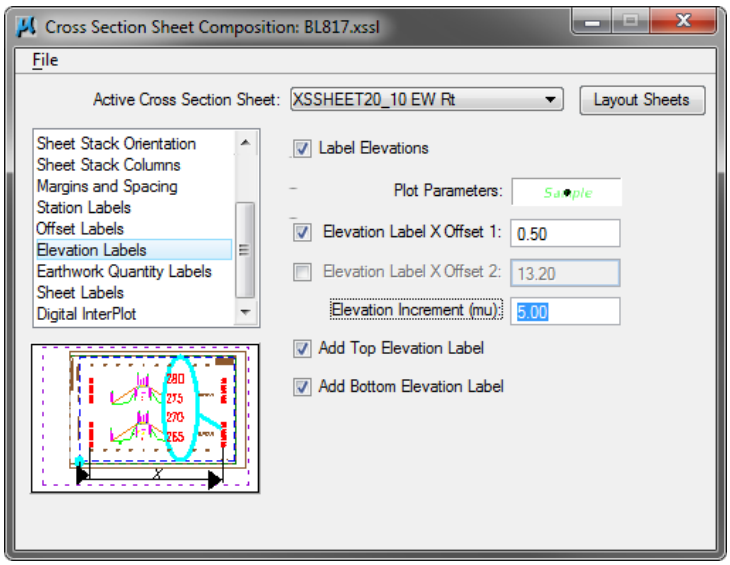
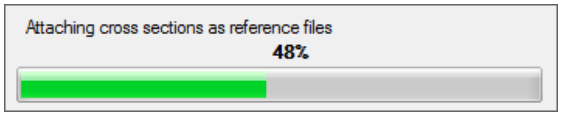
6. Select **Station Labels** and change the *Station Label Y Offset* to **10**.



7. Select **Elevation Labels** and change the *Elevation Increment (mu)* to **5**.



8. Select **File > Sheet > Update.**
9. Select **File > Sheet Library > Save.**
10. Click the **Layout Sheets** button. The cross sections will be laid out on the sheets.



11. Close the Cross Section Sheet Composition dialog. When prompted to **Save Settings,** click **Yes**.
12. Review the sheets.
13. Exit MicroStation.

11 INTERSECTION DESIGN STEPS

INTRODUCTION

GEOPAK Corridor Modeling can be used to model proposed at grade intersections along a project. This basic approach for intersection design, as documented, can be used on similar intersections with skew, orientation or number of lanes. Some of the types include three-leg (T or Y), four-leg, multi-leg or circular.

To begin, a mainline corridor for the project should be determined with consideration given to the cross roads intercepting or joining the mainline at or along the edge of pavement. The approach to the design is to first design the mainline corridor through the intersection from left edge of pavement to right edge of pavement. Next the crossroad baseline, profile and typical section design needs to have been defined. Below is a list of Corridor Modeling prerequisites to begin an intersection design

- The mainline chain stored in the gpk file and then imported an alignment in Corridor Modeling with its corresponding profile grade line(s)
- The mainline Corridor Modeling corridor design template and Roadway Designer files
- The crossroad chain stored in the gpk file and then imported as an alignment in Corridor Modeling with its corresponding profile grade line.
- The basic typical cross road section.

Note	Consideration should be given to whether the cross road profile in the intersections should match at the mainline profile grade line(s) or at the edge of pavement or some other location. For further information please refer to the Florida Intersection Design Guide located at:
Note	*http://www.dot.state.fl.us/officeofdesign/publications/*.

EXERCISE OVERVIEW

11.1 Create an Intersection Design Corridor

11.2 Create Quadrant Chain & Profile Alignments

11.3 Create Vertical Tangents

11.4 Importing Quadrant Chains & Profiles

11.5 Create the Quadrant Templates

11.6 Design Quadrant Alignments

11.7 Create the Intersection Model

INTERSECTION DESIGN MODELING

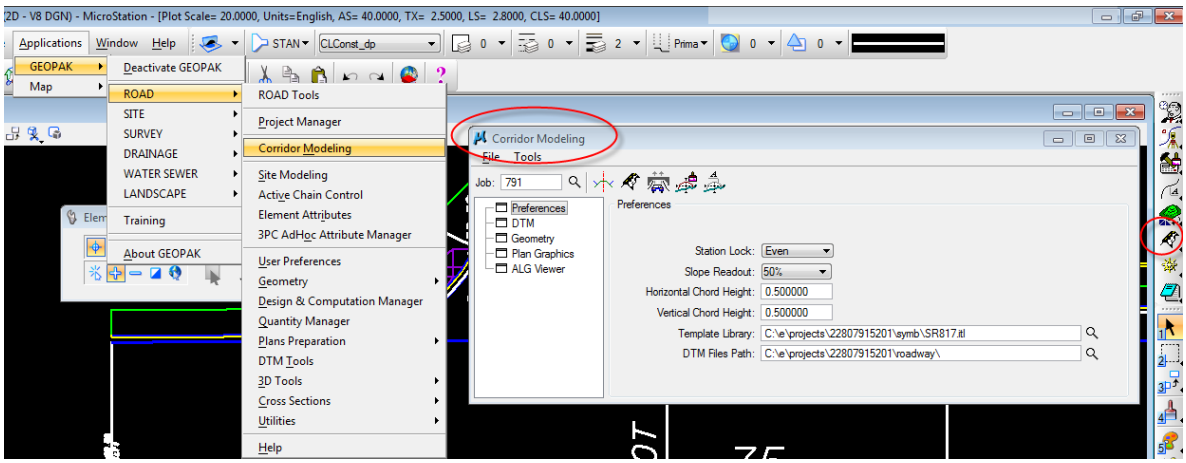
For the class exercise, an at grade 4 legged intersection will be designed with the Corridor Modeling tools. This intersection is located at the crossing of Peter Road and SR817, Baseline Station 74+71.

Exercise 11.1 Create an Intersection Design Corridor

In this exercise the proposed roadway design file, *DSGNRD01.dgn*, will be opened with GEOPAK using the FDOT workspace and Project configuration. The GEOPAK Project Manager is loaded for the project. The Corridor Modeling dialog is loaded and the project preferences are loaded from the previous exercises. The Cross Road chain and profile are added to the imported geometry as alignments. The Roadway Designer is opened and the project designer (.ird) file is loaded. The Manage Corridors dialog is used to create a new mainline corridor with Station limits of the intersection to be modeled. Open the FDOTSS2 MicroStation workspace in the project roadway folder in the *DSGNRD01.dgn* file.

1. Optional, extract the *22807915201(11).zip* file in the c:\e\projects folder.

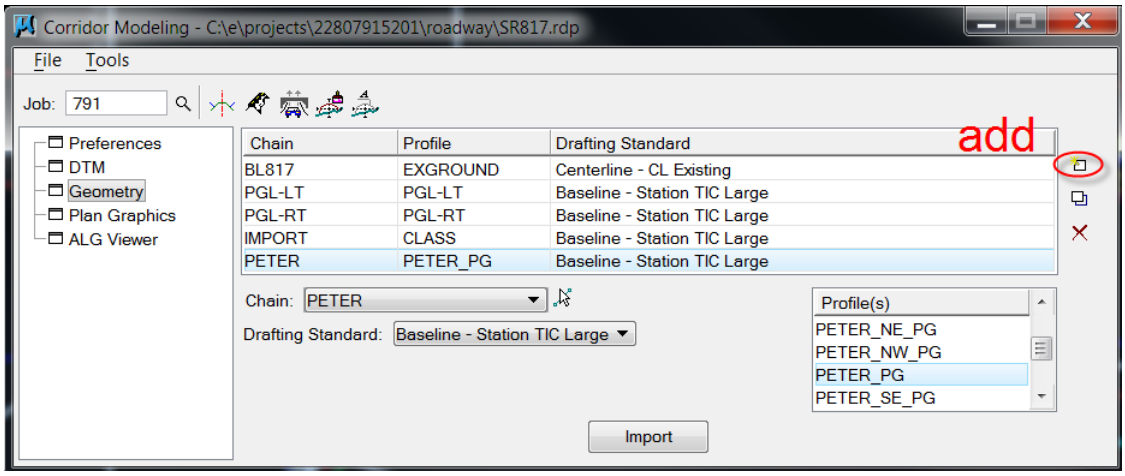
2. Open the Corridor Modeling dialog by clicking on the icon <OR> from the MicroStation menu, select **Applications** > **GEOPAK** > **ROAD** > **Corridor Modeling**.



3. From the Corridor Modeling dialog, select **File** > **Load**. A browser window will appear in the current working design file directory. Select the **SR817.rdp** preference file to load.

4. From the Corridor Modeling dialog, select **Geometry** from the tree list to display the **Chains and Profiles** that have been imported into the Corridor Modeling **Alignments .alg** file in the *rddbs* folder.

5. Select the *Chain* **Peter** and the *Profile* **Peter_PG** from the list and then click the **Add Chain to List** icon to include it with those shown in the dialog below.

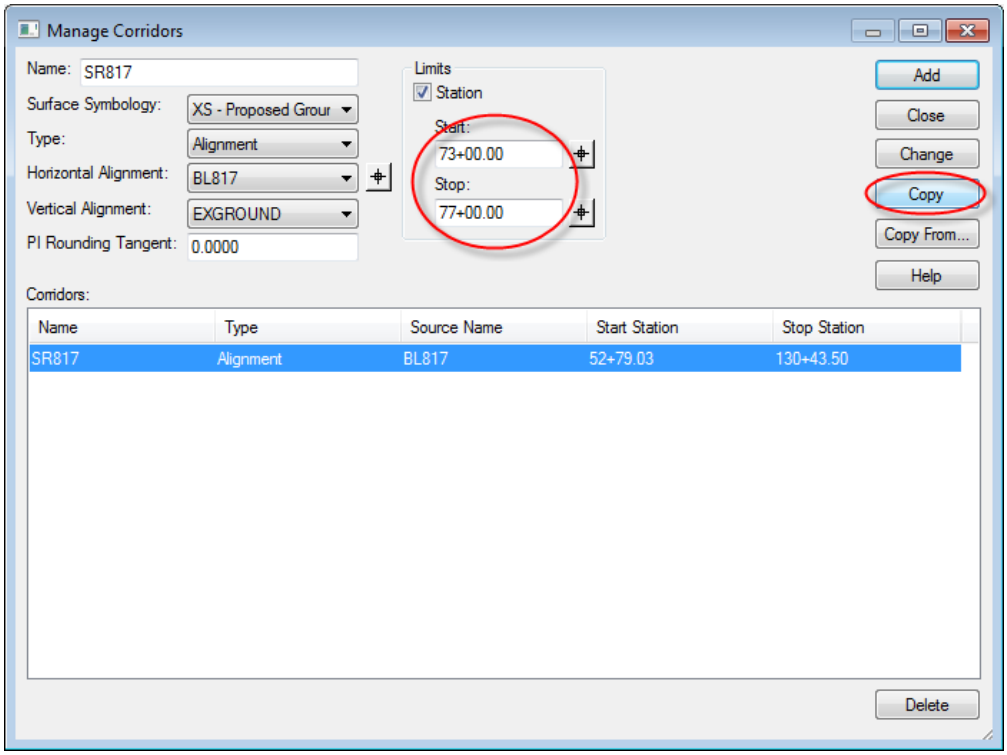


6. Click the **Import** button and select **File** > **Save** to save the changes to the **SR817.rdp** file.

7. Open the Roadway Designer dialog, select **File** > **Open**, and then select the **SR817.ird** file to load the project mainline corridor design.

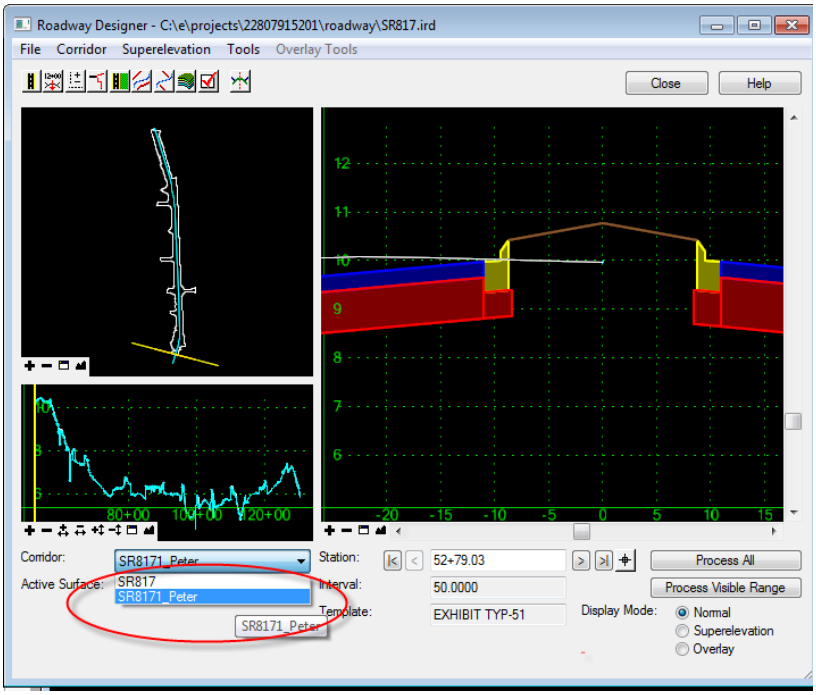
> ***Note*** Intersection designs are complex regions along a corridor and are best designed separate from the mainline. It is recommended to define the limits of the intersection and then design the intersection on separate mainline corridor. Once the intersection design is complete the corridors can be processed together.

8. In the Roadway Designer dialog, select **Corridor** > **Corridor Management** to open the Manage Corridors dialog <OR> click the first icon under the menu list.
9. Select the **Mainline Corridor** from the list and then check the **Station** box.
10. Enter the **intersection station limits** and click **Copy** as shown below.



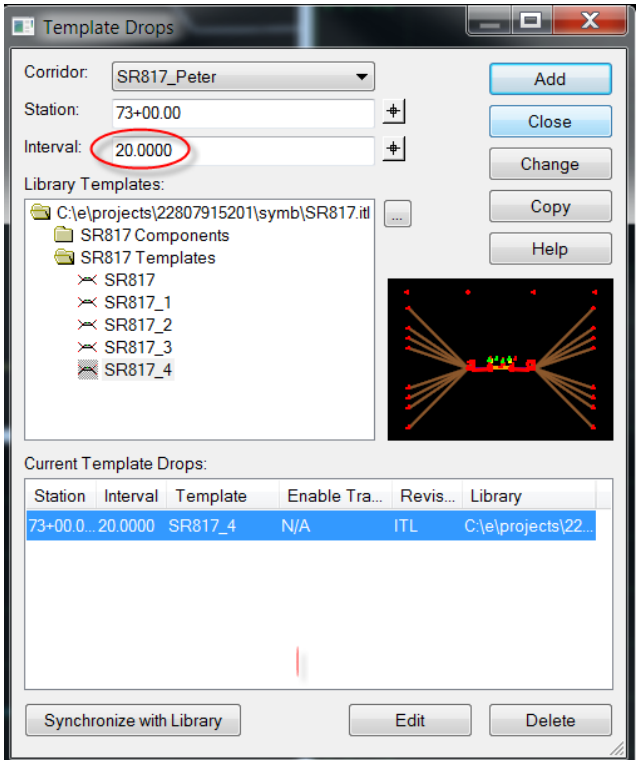
11. Enter the *New Name* for the corridor as **SR817_Peter,** and click **OK**. The point control alignments for the left and right PGL lines will be copied. The templates drops list will also be copied.
12. Close the Manage Corridors dialog.

13. Change the corridor drop down list to the new corridor for the intersection.



14. From the Roadway Designer dialog, select **Corridor** > **Template Drops** to open the Template Drops dialog and select the entry in the **Current Templates Drops**.

15. Change the *Interval* to **20 master units or feet**, and then click **Change**.



16. Close the Template Drops dialog.

17. Select **File** > **Save** to save the **SR817.ird** Roadway Designer file changes for the intersection project.

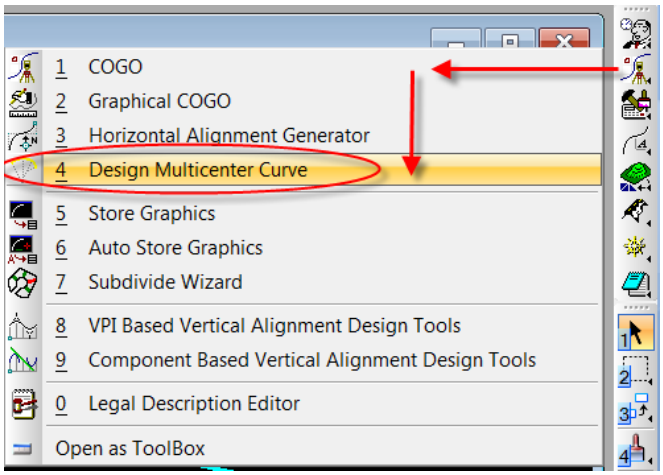
18. Close the Roadway Designer dialog.

QUADRANT CHAIN & PROFILE ALIGNMENTS

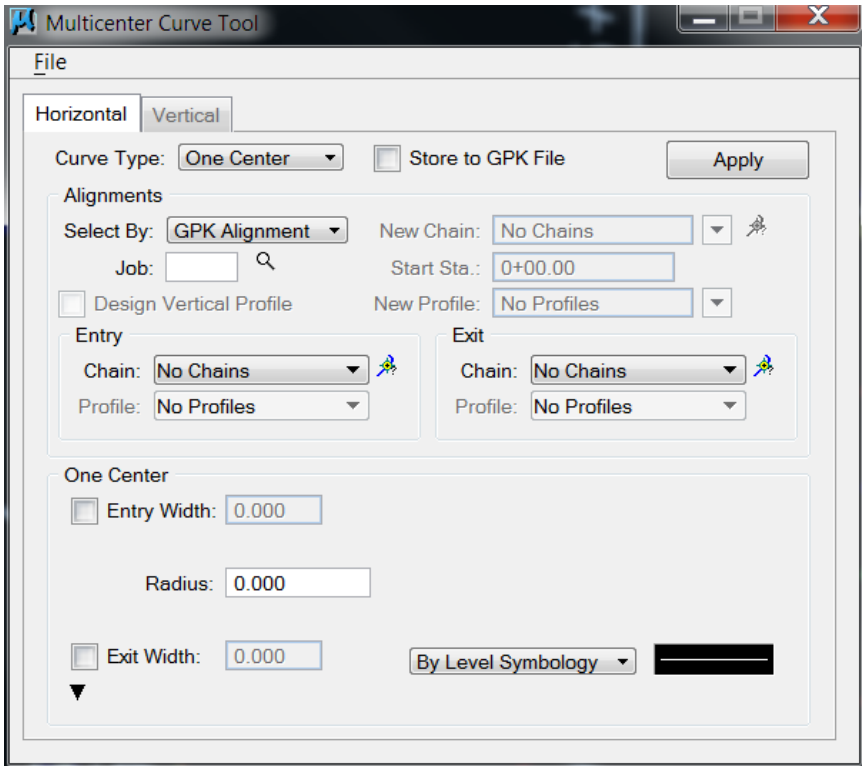
Exercise 11.2 Create Quadrant Chain & Profile Alignments

In this exercise quadrant alignments and profiles will be created or loaded along each of the corner radius curves.

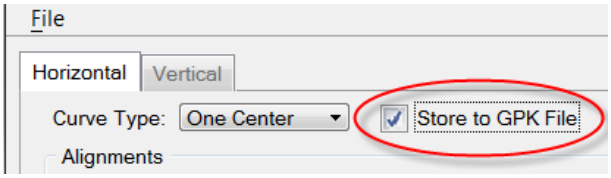
1. From the MicroStation menu, select **Applications** > **GEOPAK** > **ROAD** > **Geometry** > **Design Multicenter Curve** <OR> from the Road Palette COGO button pullout.



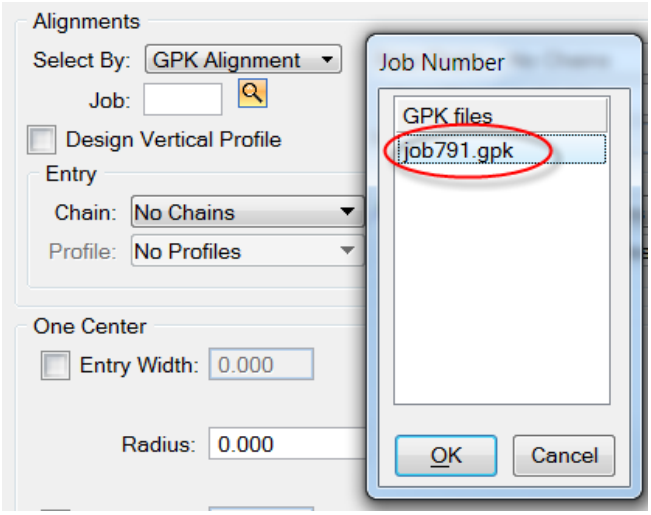
2. The Multicenter Curve Tool dialog will display.



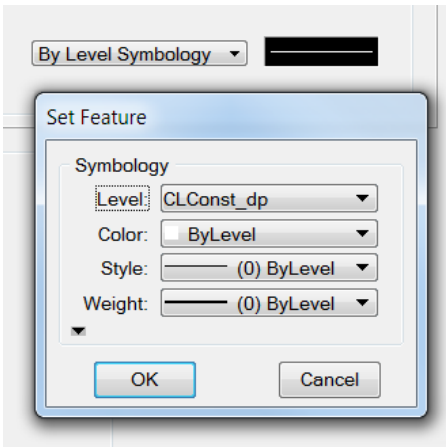
3. From the Multicenter Curve tool settings, click the box next to the **Store to GPK File label**.



4. In the *Alignment section* of the dialog, select the magnifier icon next to the **Job: label** and select the **job791.gpk** file when the Job Number dialog is launched.



5. Double click on the field next to the **By Level Symbology** label to launch the Set Feature dialog. Change the *Level* to **CLConst_dp**.



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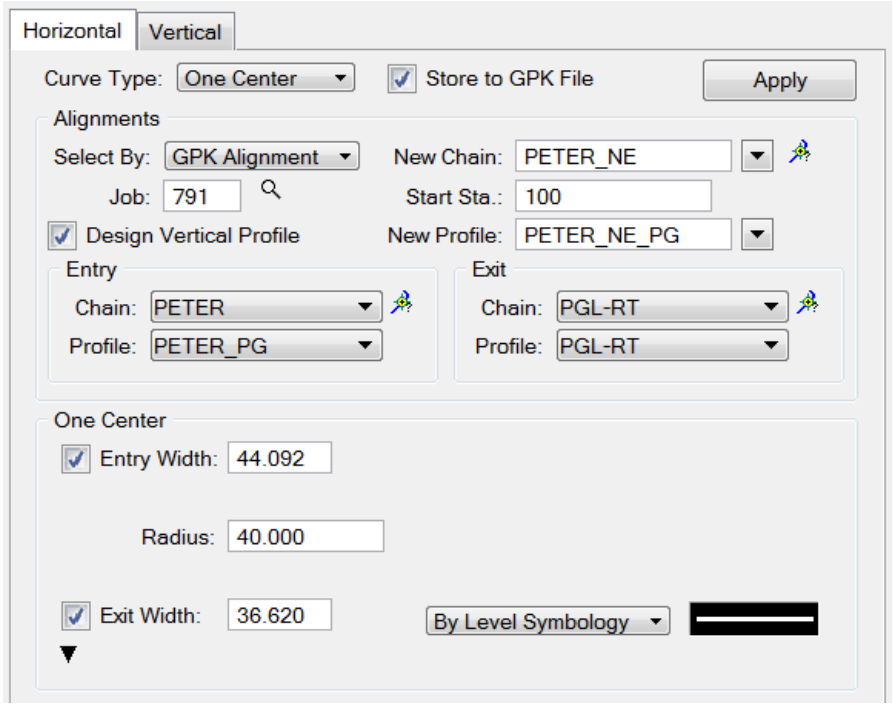
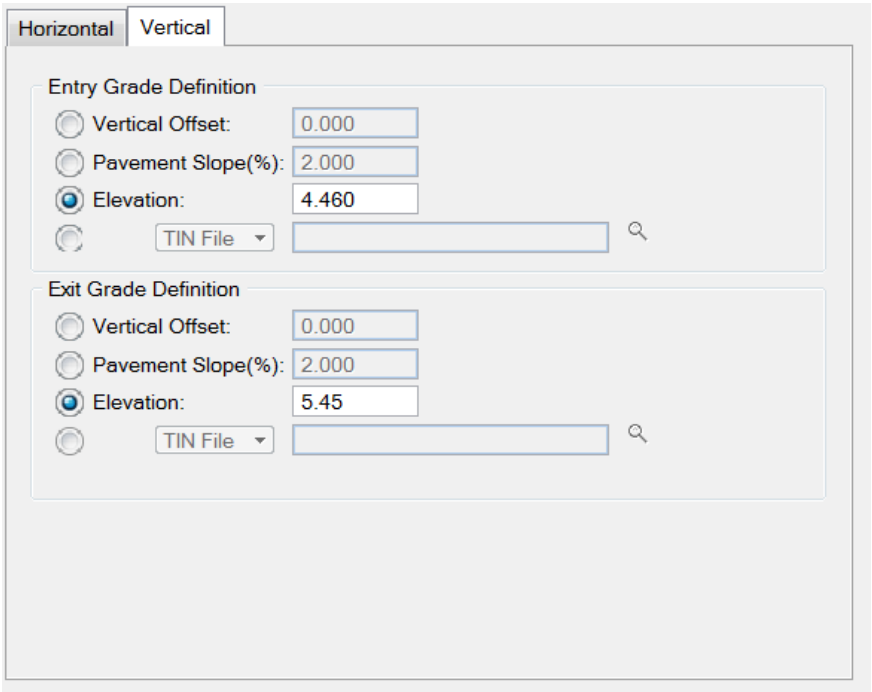
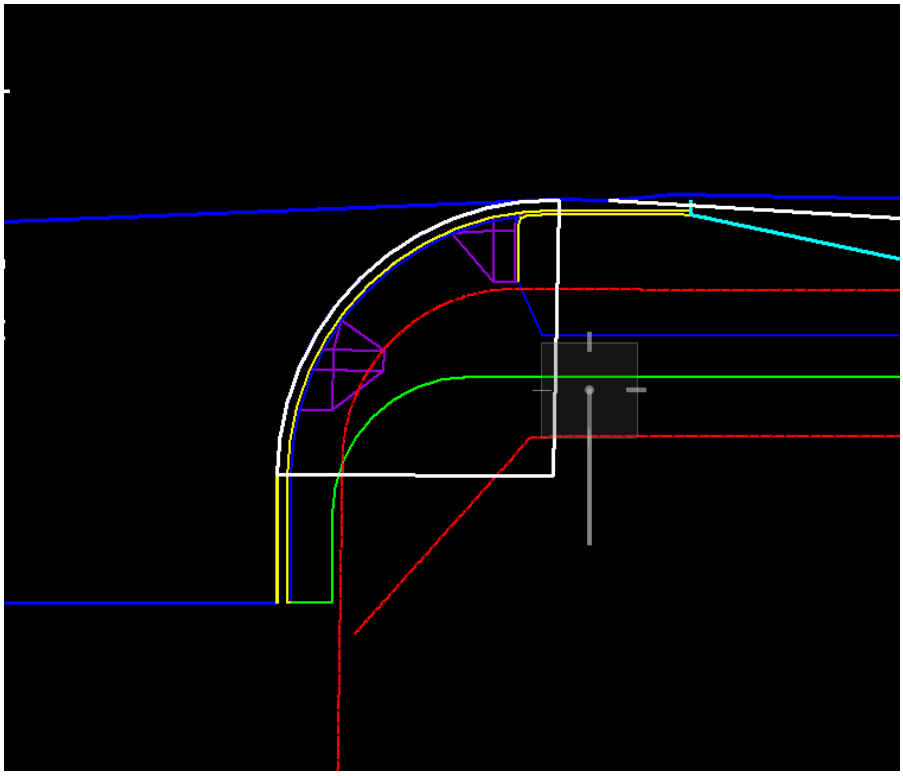
6. To create *radii chain* **PETER_NE** and *profile* **PETER_NE_PG** for the NE quadrants, complete the dialog with the information shown in the images to follow.

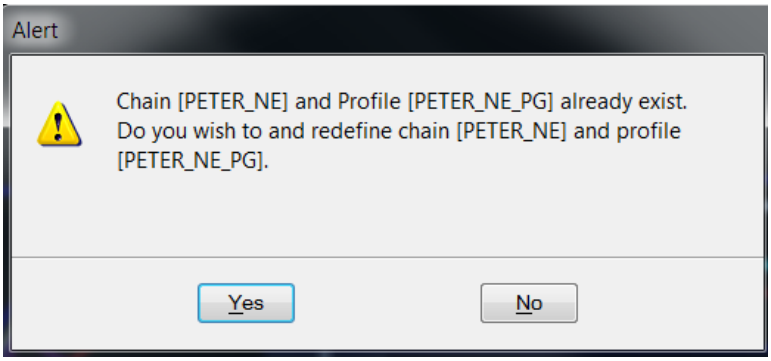




7. Click the **Apply** button and move the cursor to the **NE_quadrant** of the intersection. The radius for the quadrant is constructed as temporary viewing graphics. Click a **data point** in the view to accept and store the new alignment definitions.



8. When the Alert dialog opens. Click **Yes** to redefine the chain and profile.



9. Close the **Multicenter Curve** tool settings.

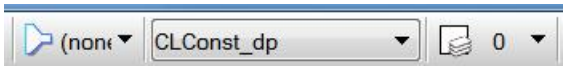
Note This table can be used with the Multicenter Curve Too to create each of the quadrant alignments for this intersection. The dialog will create one alignment at a time. On the Vertical Tab, Use Pavement slope (2%) FOR EACH THE ENTRY GRADE AND EXIT GRADE.

New Chain	Start Sta.	New Profile	Entry Chain Entry Profile	Exit Chain Exit Profile	Entry Width	Radius	Exit Width	Entry Grade Elev	Exit Grad Eleve
PETER_NE	1+00	PETER_NE_PG	PETER PETER_PG	PGL-RT PGL_RT	44.092	40	36.62	4.46	5.45
PETER_NW	1+00	PETER_NW_PG	PETER PETER_PG	PGL-LT PGL_LT	47.26	40	49.415	5.50	5.49
PETER_SW	1+00	PETER_SW_PG	PETER PETER_PG	PGL-LT PGL_LT	52.5	50	37.61	5.38	5.54
PETER_SE	1+00	PETER_SE_PG	PETER PETER_PG	PGL-RT PGL_RT	45.235	50	47.548	4.45	5.31

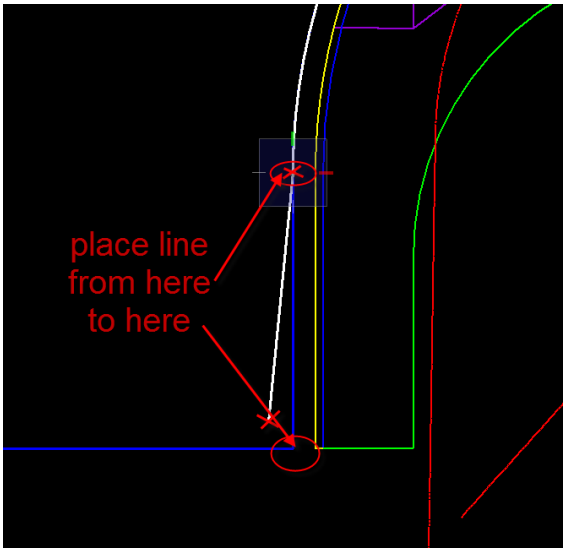
Note At some intersections the edge of pavement at the radius point will have a different station along the centerline on each side of the intersection cross road. It is important to begin the quadrant alignments at the same cross road centerline location on each leg the intersection. This can be done by adding begin tangents segments to the quadrant alignments with the GOPAK COGO store graphics command.

➢ *To Add /Create Tangent segments to the quadrant alignments*

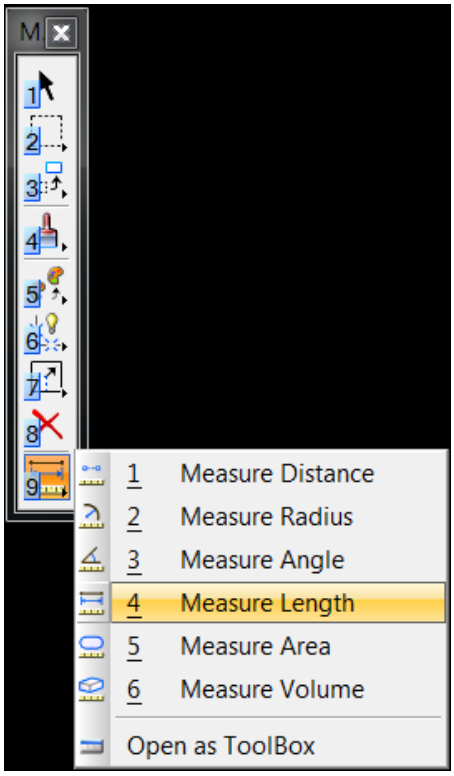
1. Using the MicroStation *Match Element* command select the **PETER_NE alignment** stored previously. The active ByLevel element should change to **CLConst_dp**.



2. Use *Place Line* to create a line from the alignment beginning to the intersection cross road limits.



3. When this line is added to the alignment, the **Begin Station** will be changed to reflect the length of the line. Select the MicroStation *Measure Length* command to determine the exact length of the line placed.

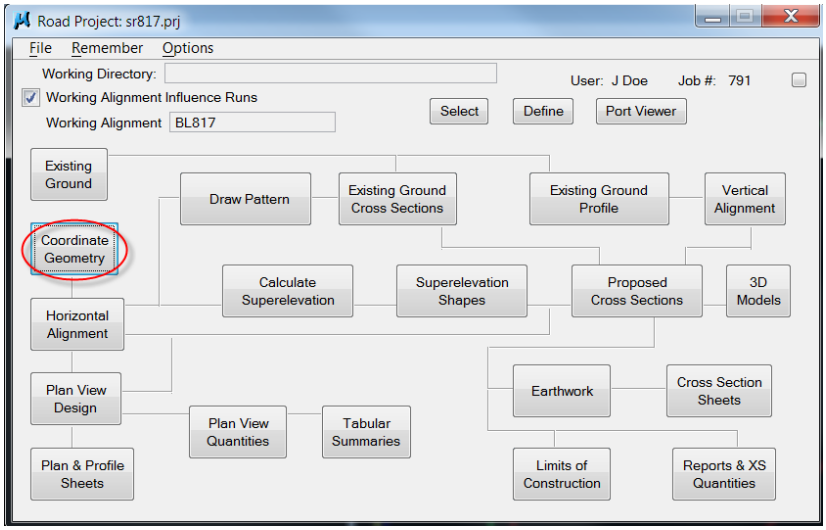


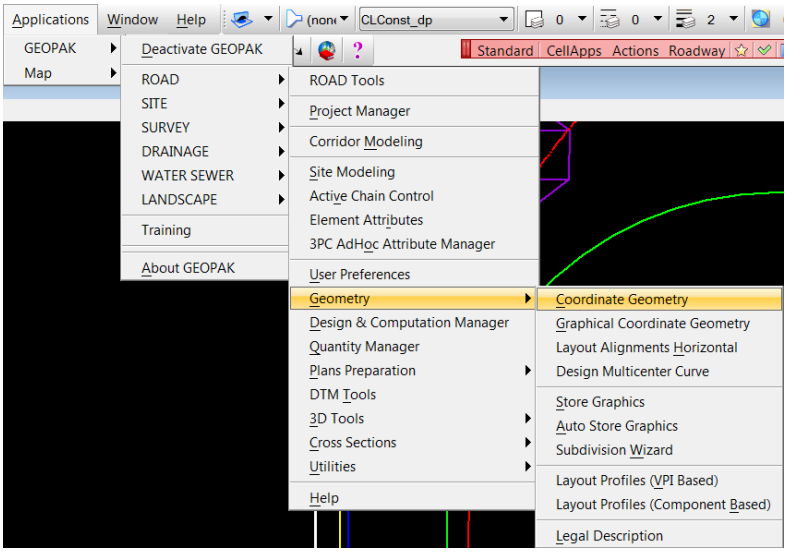
4. Subtract the *length* from **100**. This is the new **Begin Station** for the alignment. Use the table below to record the measured **Segment Length** and **Begin Station** calculations.

QUAD	Beginning POINT #	Segment Length	Begin Station
PETER NE	100	18.50	0+81.4971
PETER NW	200	21.86	0+78.17
PETER SW	300	21.97	0+78.03
PETER SE	400	1.025	0+98.98

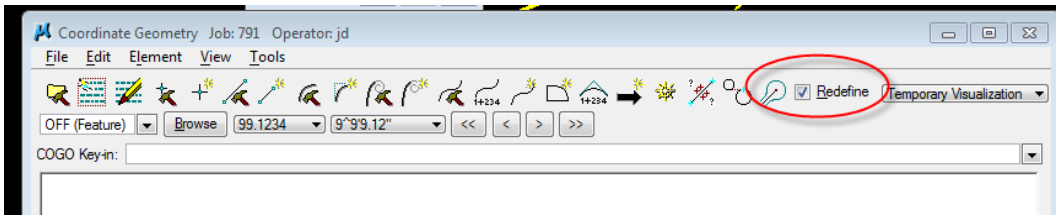
Note When using the Store Graphics command, turn off all the other elements levels near the elements to be stored. Be sure that the COGO Redefine button is checked in order to overwrite the alignment with the new segment added.

5. From the Road Project dialog click the **Coordinate Geometry** button to add the tangent segments to the quadrant alignment. <OR> Select **Applications** > **Road** > **Geometry** > **Coordinate Geometry**.

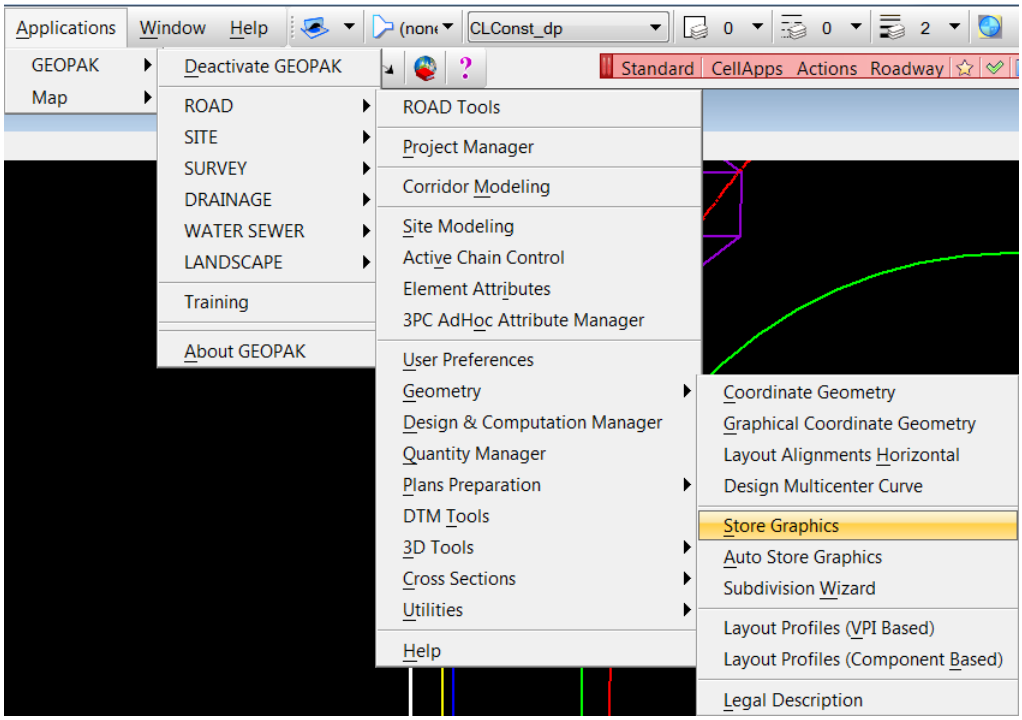




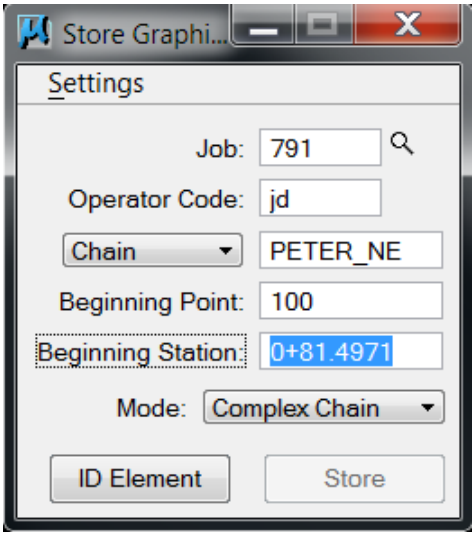
6. The Coordinate Geometry dialog opens, check **Redefine**. Close the Coordinate Geometry dialog. Minimize the Road Project dialog.



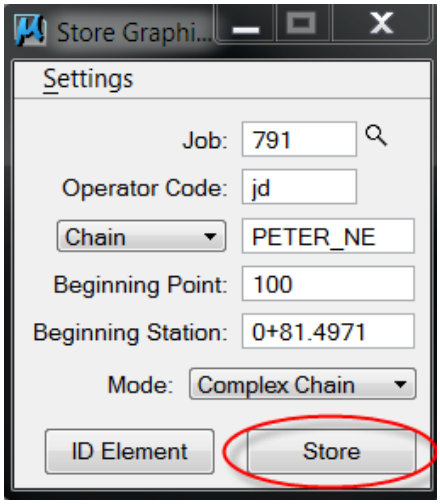
7. Select **Applications** > **Road** > **Geometry** > **Store Graphics**. The Store Graphics dialog opens.



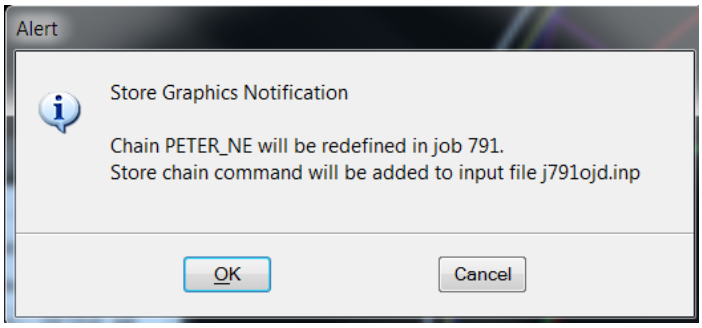
8. From the Store Graphics dialog, select the *Job file* **job791.gpk**. Complete the dialog as shown.



9. Click on the **ID Element** and select first the *tangent element* and then the *radius element*. Once they are both highlighted, **data point** away from the graphics to accept. The *Store* button will become active. Click the **Store** button.



10. An Alert dialog will open regarding the redefining of the *alignment* **PETER_NE**. Select **OK.**



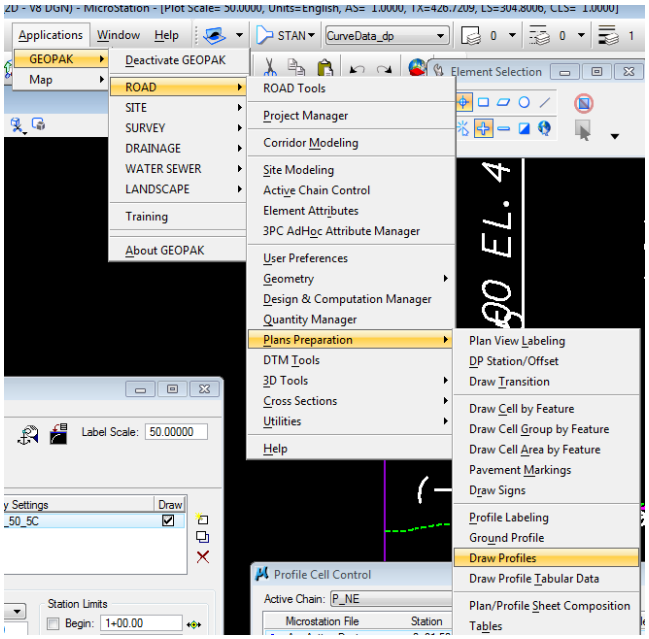
11. Close the Store Graphics dialog

Note	The **Multicenter Curve** tool will generate a profile for the radius portion of the quadrant alignments. However, another segment will need to be added to match the Existing Ground Line and to match the Begin Station of the tangent segment added. This is also necessary to verify the profile grade elevation of the curve at its tie into the mainline.

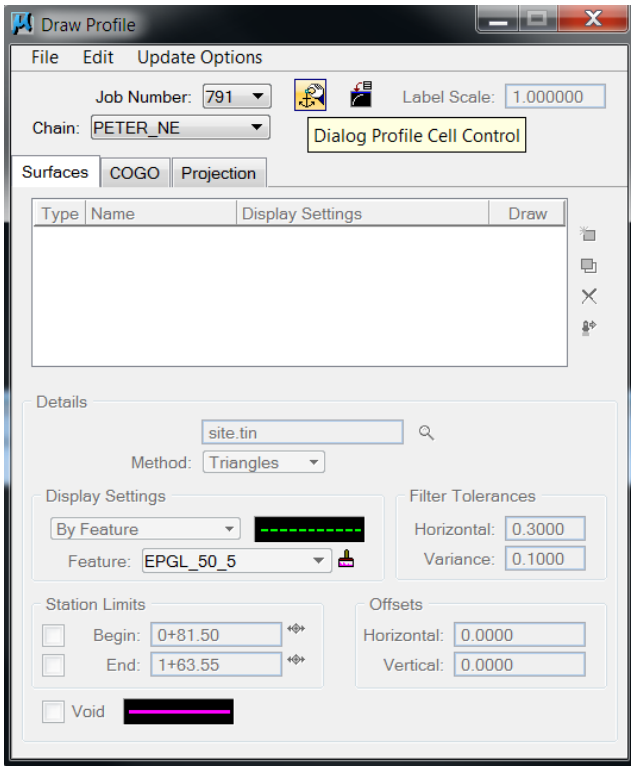
Exercise 11.3 Create Vertical Tangent

In this exercise a new Vertical Tangent will be added to the PETER_NE_PG profile created by the Multicenter curve Tool

1. From the MicroStation Menu, select **File** > **Open** and select the *DSPFRD01.dgn* file.
2. Select the **Applications** > **GEOPAK** > **ROAD** > **Plans Preparation** > **Draw Profiles** to display the quadrant profiles..



3. The Draw Profile dialog will display.



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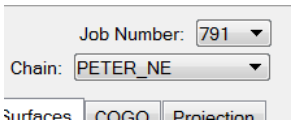
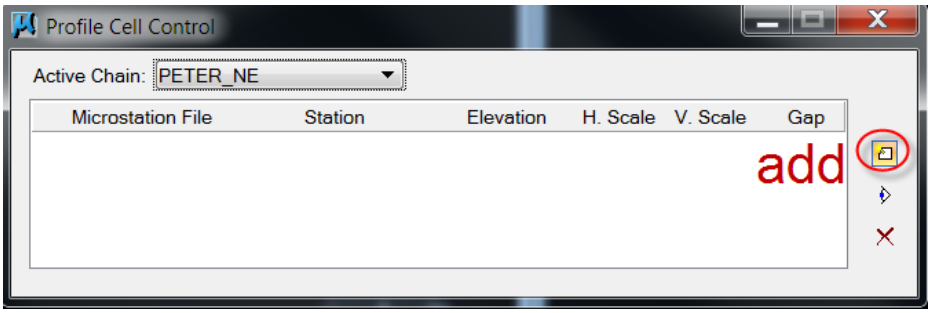
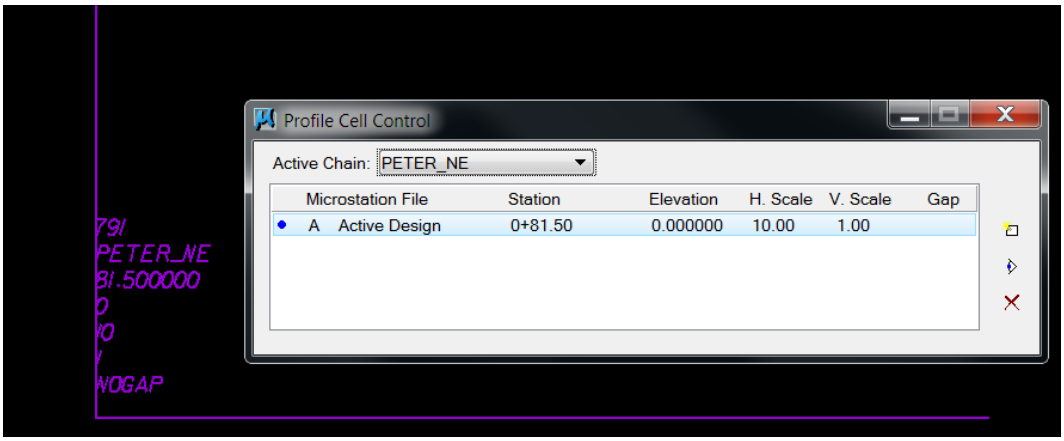
4. Select the **Surfaces** tab and follow the steps in the diagram below:
   a. From the *Chain* dropdown, select the **quadrant alignment**, i.e. **PETER_NE**.



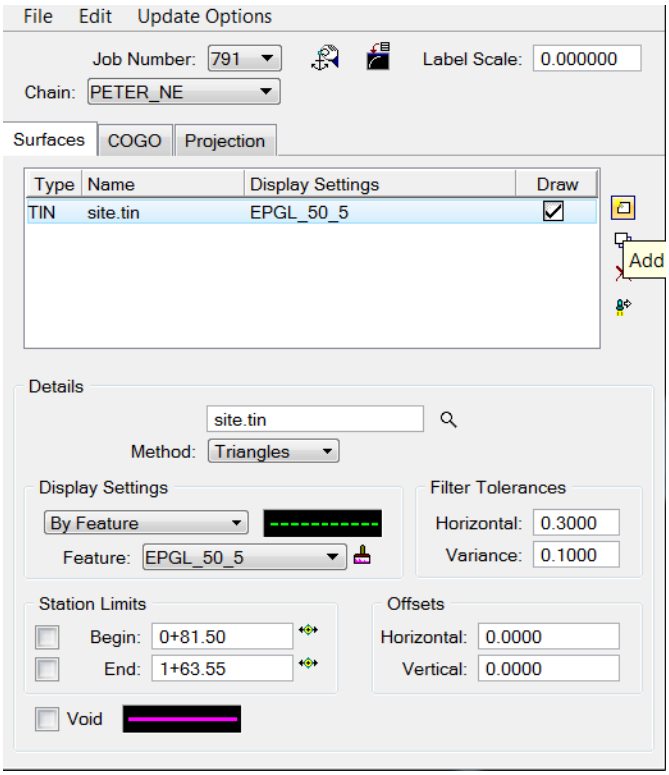
   b. Click the **Draw Profile Cell Control** icon. The Profile Cell Control dialog displays.
   c. Select the *Active Chain*, **PETER_NE,** and then click **Add**.



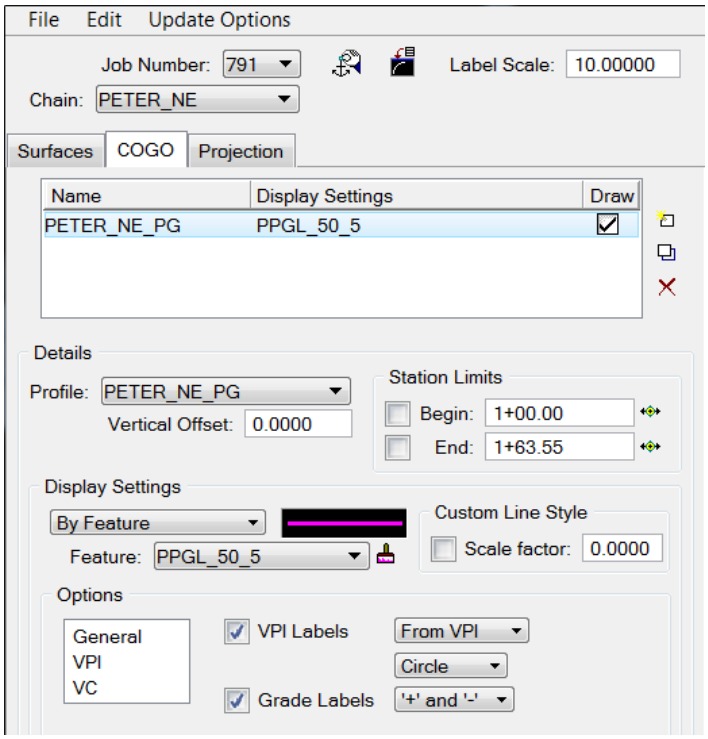
   d. Place a **data point** in the MicroStation file to add the **profile grid axes**.



5. From the Draw Profile dialog, select *Feature:* **EPGL_50_5**, browse for the ***site.tin,*** Method: **Triangles**, and then click the ***Add*** icon to add the proposed profile to the Profile Cell.

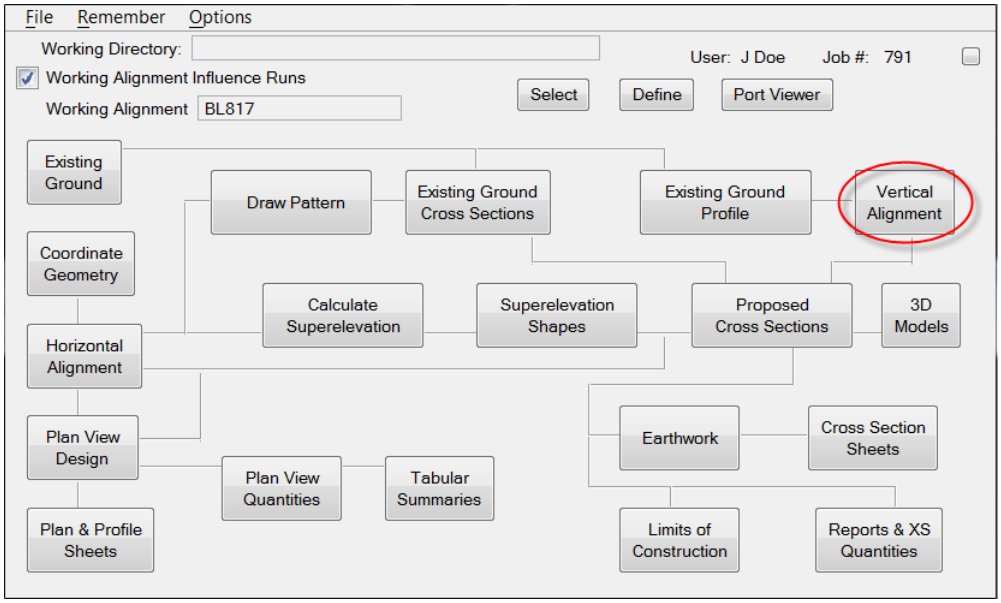


6. Toggle to the COGO tab, select the *Profile:* **PETER_NE_PG**, select *Feature:* **PPGL_50_5C** and then click the **Add** icon.

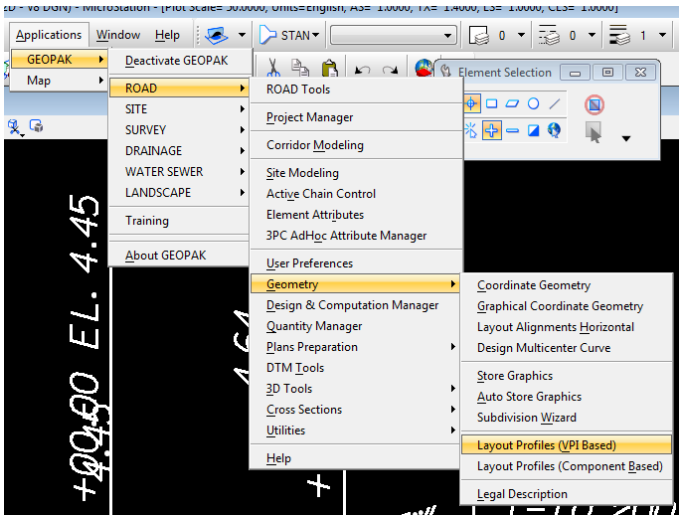


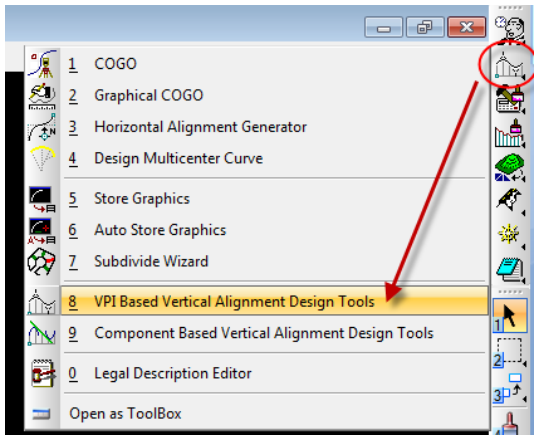
7. Close the Draw Profile and the Profile Cell Control dialogs.

8. From the Road Project dialog, select the **Vertical Alignment** button



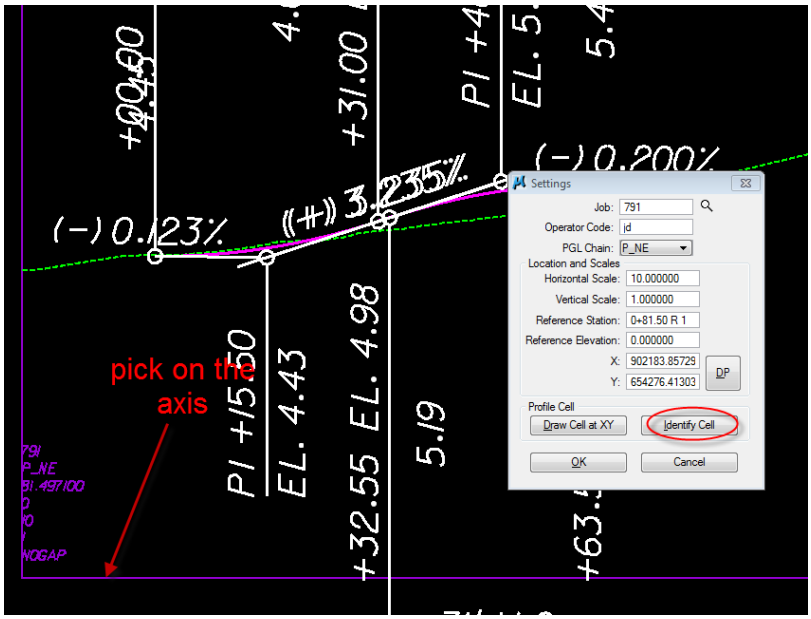
<OR> From the MicroStation menu, select **Applications** > **GEOPAK > ROAD > Geometry** > **Layout profiles (VPI Based)** <OR> select **option 8** from the *COGO* tool palette.





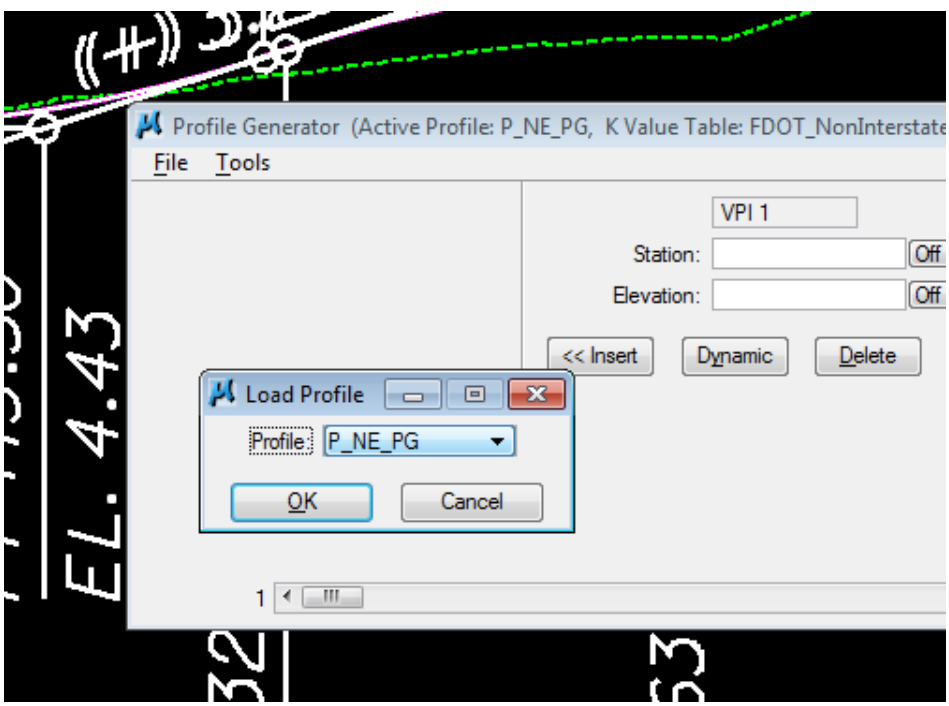
9. Select the **PETER_NE** *Chain*, click the **Identify Cell** button and select the axis of the profile cell. **Data point** again to accept the profile cell.

10. Key-in the **Operator Code jd**.

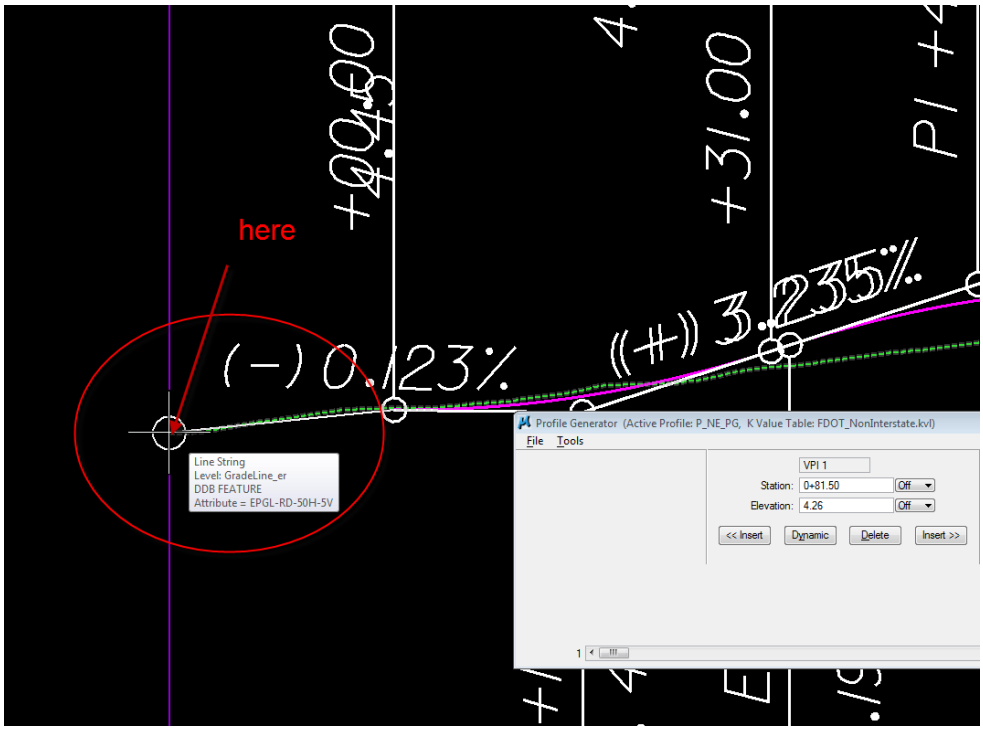


11. Click the **OK** button to open the Profile Generator dialog.

12. From the Profile Generator dialog, select **File** > **Load Profile**, select the *Profile* **PETER_NE_PG,** and then click **OK**. This is the profile created by the *Multicenter Curve* tool and stored in the **.gpk** file.



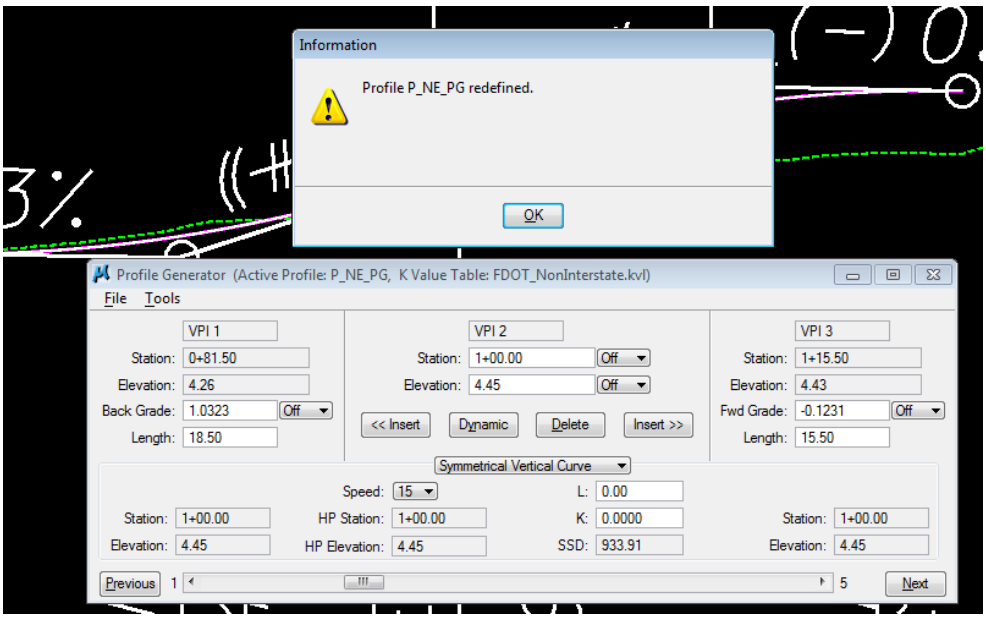
13. In the Profile Generator dialog locate the section for the **VPI 1**, click the **<<Insert** button to add a VPI to the beginning of the profile, click the **Dynamic** button, and then key-in the **beginning Station** of the *existing profile*.



14. Accept the snap to store the point to the profile. Click the **Next** button on the lower right corner of the dialog and change the *Speed Setting* to **15** and the *L Value* to **10.0**.

15. Click the **Next** button until the last *VPI information* can be viewed. Verify that the elevation is the same as the elevation calculated for the mainline PGL station and offset, in the exercise above.

16. Select **File > Save Profile**. The change to the profile has been saved to the **.gpk** file.

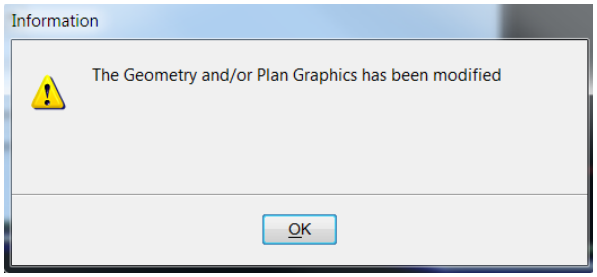


17. Close the Profile Generator dialog.

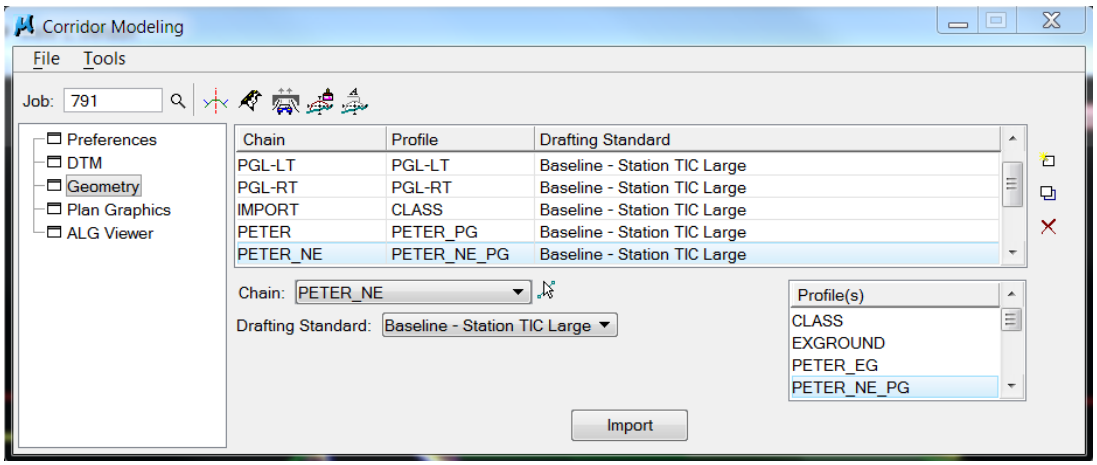
Exercise 11.4 Importing Quadrant Chains & Profiles

In the next Steps the Quadrant Chains and Profiles will be added Imported for Corridor Modeling

1. Open the *DSGNRD01.dgn* design file and open the Corridor Modeling dialog. The smart update feature will display the Information dialog.

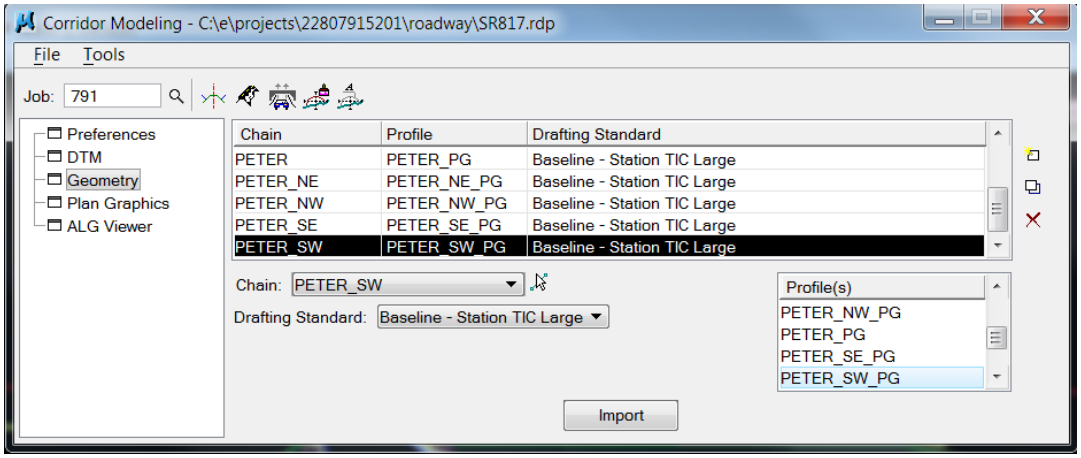


2. Select the **Geometry** option on the tree list. Select the **PETER_NE** *alignment* from the *Chain* dropdown list and the **PETER_NE_PG** *profile* on the *Profiles* list. Click the **Add** icon to add it to the list.



3. Click the **Import** button to include the quadrant alignment in the **.alg** file for the Corridor Modeling project.

4. Repeat this for each of the quadrant **Chains** and **Profiles**.



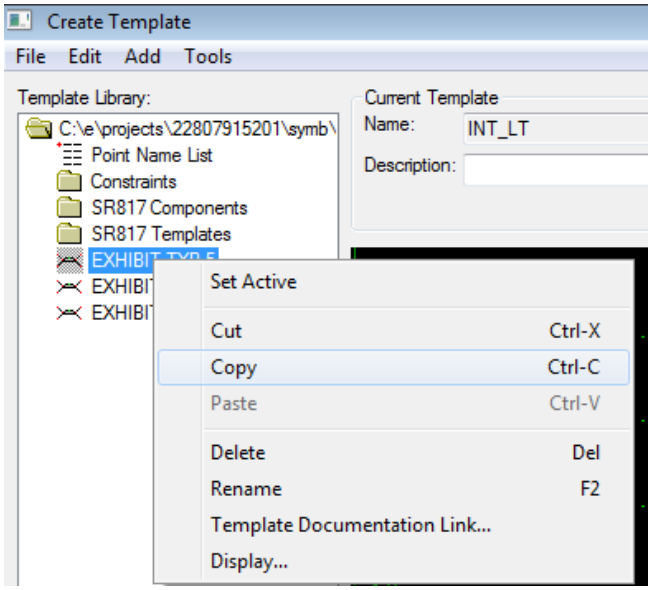
5. From the Corridor Modeling dialog, select **File** > **Save** to save the changes to the **.rdp** file.

QUADRANT TEMPLATES

Exercise 11.5 Create the Quadrant Templates

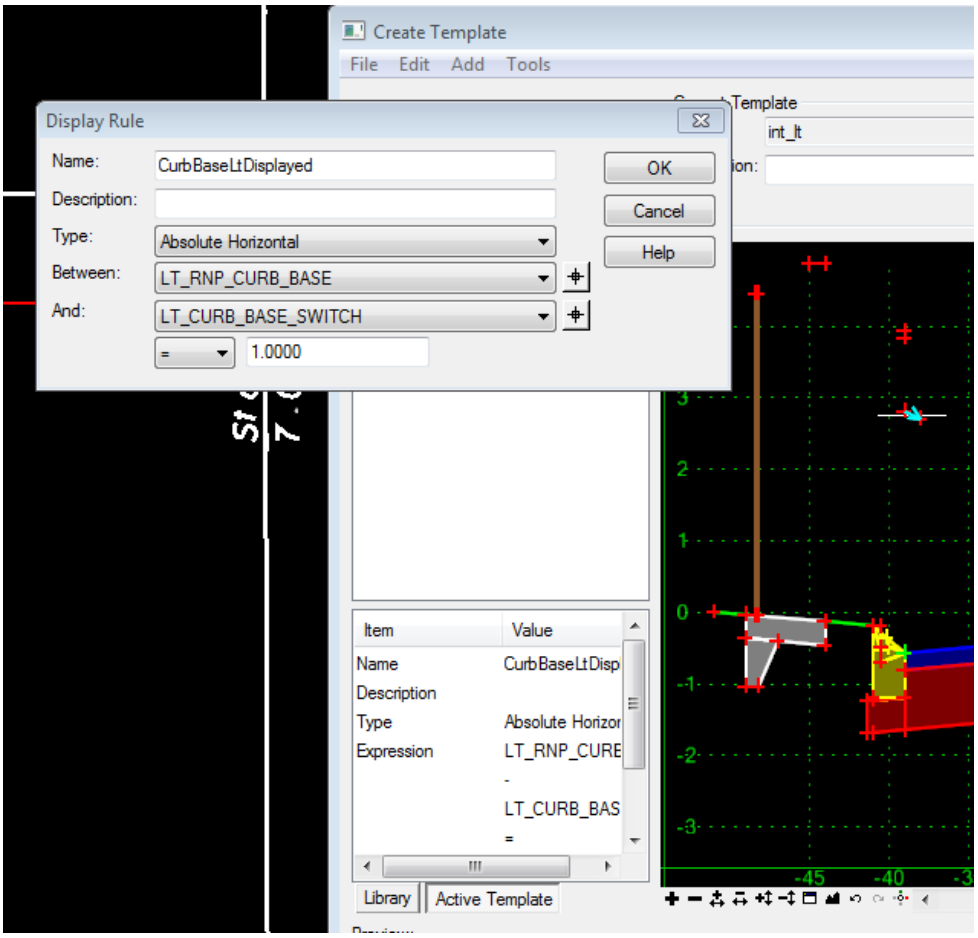
In this exercise the Create Template dialog will be used to create templates for the quadrant corridors. Using a copy of the project Typical Section template, components are deleted leaving only one half of the template on one side of the centerline. The remaining pavement segment is changed to a small segment. The template origin is then changed to the edge of pavement line. This will allow for the pavement to stretch or warp itself around the corridor connecting with the crossroad and mainline edge of pavement.

1. From the Corridor Modeling dialog, open the Create Templates dialog.

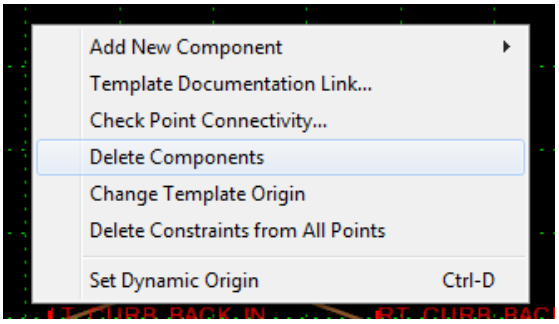


2. From the tree list right click on the **EXHIBIT TYP-5 Template** and click **Copy.**
3. Right click on the *SR817 Templates* folder and click **Paste**.
4. Open the folder and rename the template **INT_LT**.
5. Right click on the **INT_LT Template** and click **Set Active**.

6. Change the tab to **Active Template**, open the *Display Rule* folder, set the *CurbBaseLt Displayed Value* to **1.00** and then click **OK**.

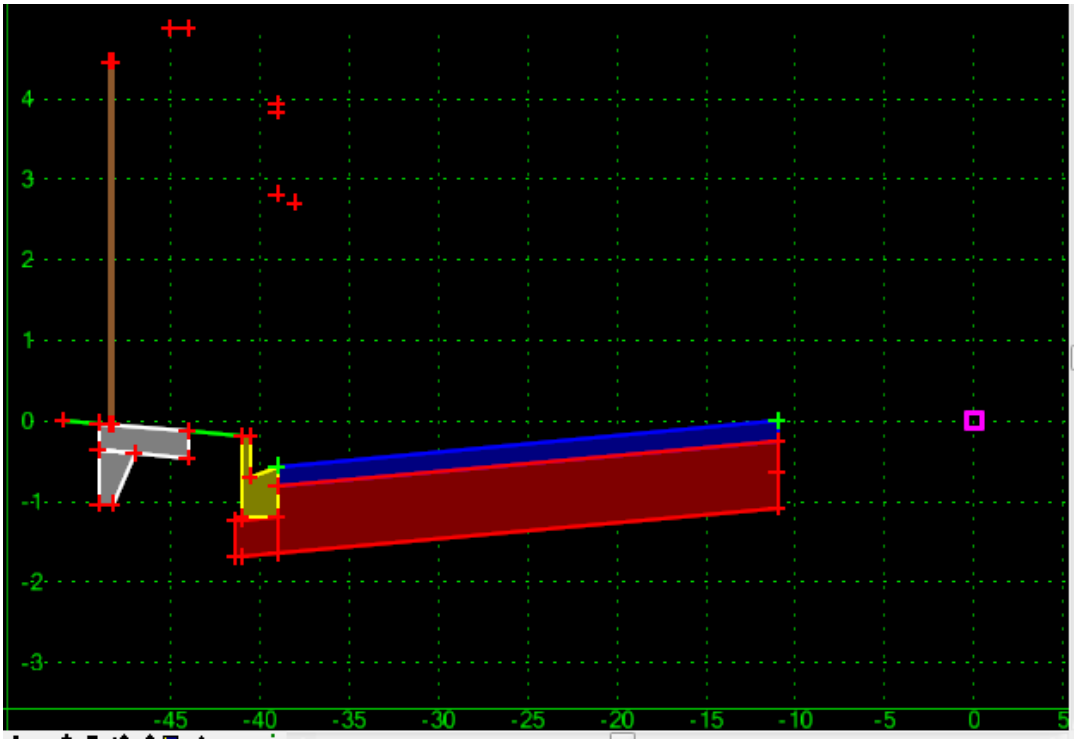


7. Change back to the **Library Tab**, right click in the *Grid View* and click **Delete Components.**

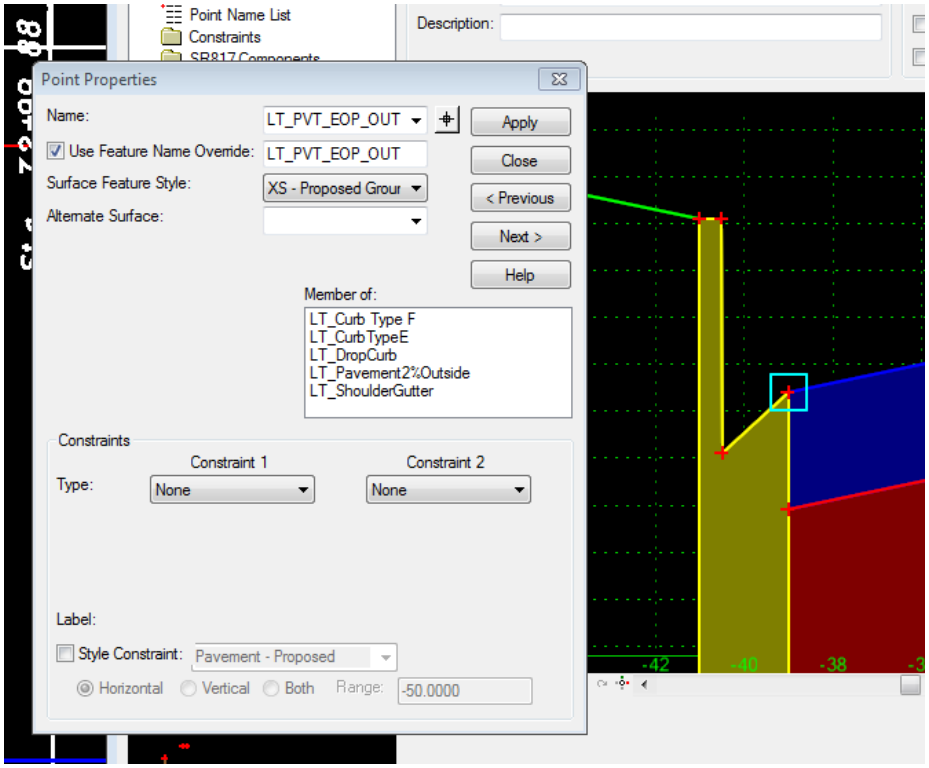


8. Drag the cursor across each of the components right of the *Left Pavement components*. There may be points to be deleted. Right click on each of the points and click **Delete Point**.

9. The remaining template will display as follows.



10. Right click on the *Outside Edge of Pavement Point* and click **Edit Point**, the Point Properties dialog displays. Change the *Type: Constraint 1* to **None** and *Constraint 2* to **None** and uncheck the **Style Constraint** box.

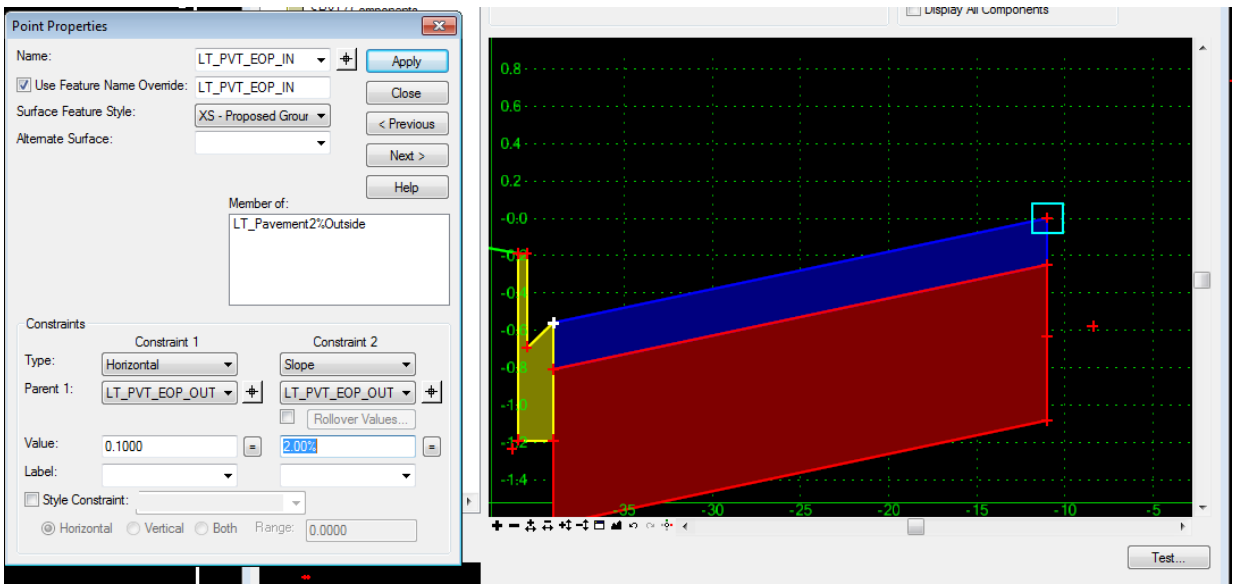


11. Click **Apply** and close the Point Properties dialog.

12. Right click on the *Inside Edge of Pavement Point* and click **Edit Point**. The Point Properties dialog will display. Change the following:

Constraint 1	**Horizontal**
Parent 1	LT PVT_EOP_OUT
Value	0.1

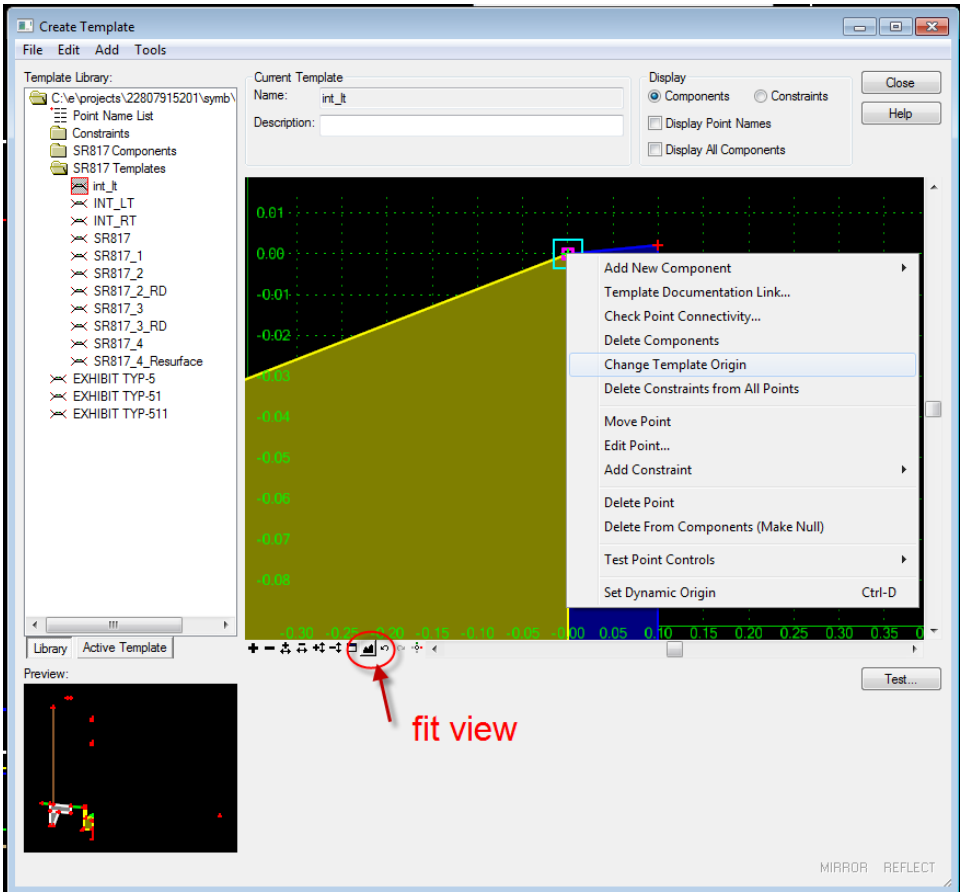
Constraint 2	**Slope**
Parent 1	LT PVT_EOP_OUT
Value	2.00%



13. Click **Apply** and close the Point Properties dialog.

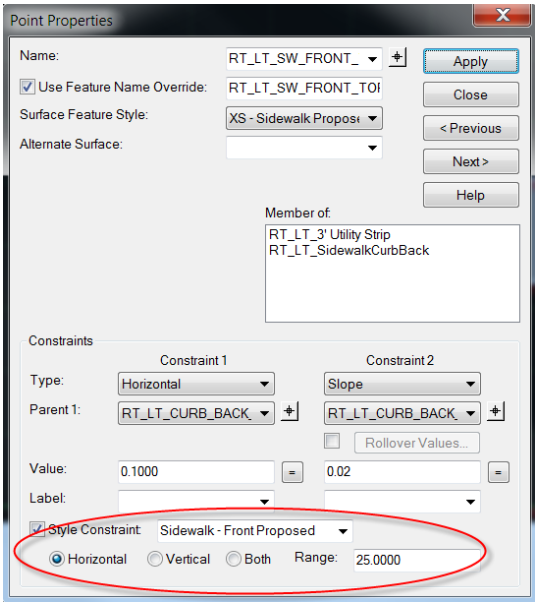
14. Zoom in **o**n the *Outside Edge of Pavement* in the Create Template dialog, right click on the *Outside Edge of Pavement Point* and then click **Change Template Origin**.

15. The template display will update outside of the limits. Click on the **Fit View** Icon.

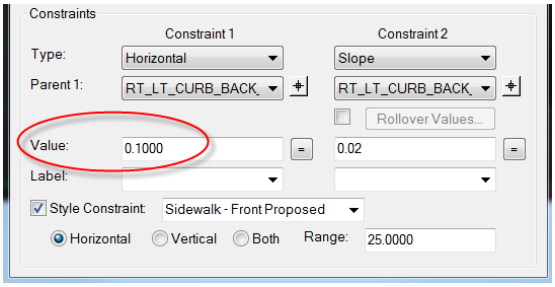


16. Edit the *point properties* for the **Sidewalk: SW_FRONT_TOP** and **SW_BACK_TOP**.

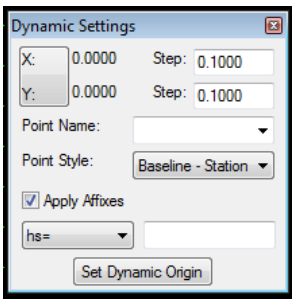
17. Verify that the **Horizontal Style Constraints** are checked and the *Horizontal Range Distance* is set to **+/- 25 feet**.



18. Change the *SW_FRONT_TOP Sidewalk Point Horizontal Distance* to **+/- 0.1 feet**.

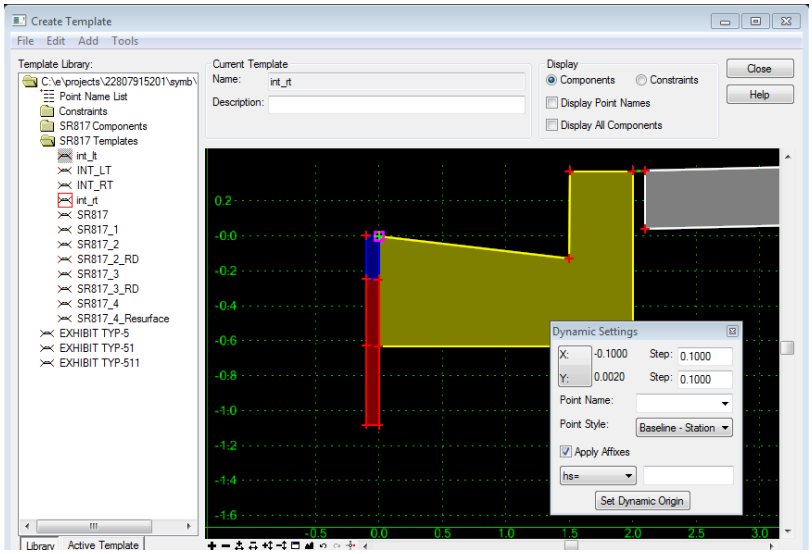


19. Select **File > Save** to save the template to the project Template Library.
20. Repeat the procedure for **INT_RT** <OR>
21. To create the right side template, select **File > New** in the Create Template dialog. Name the template **INT_RT**.
22. Right click on the **INT_RT Template** and click **Set Active**.
23. Select **Tools > Dynamic Settings** to open the Dynamic Settings dialog, set the *X and Y Step* to **0.1** and then check the **Apply Affixes** box.



24. Drag the **INT_LT Template** onto the window and right click and select **Reflect** to drop the template on the **0,0** origin point.

> ***Note*** The drag operation with **Apply Affixes** will copy the point names and component names from the original template AND append "RT_ " to the beginning of each. This results in RT_LT_ex_ex name format. To avoid this use the delete components method described above.



25. Select **File > Save** to save the project Template Library and close the Create Template dialog.

DESIGN THE QUADRANT ALIGNMENTS

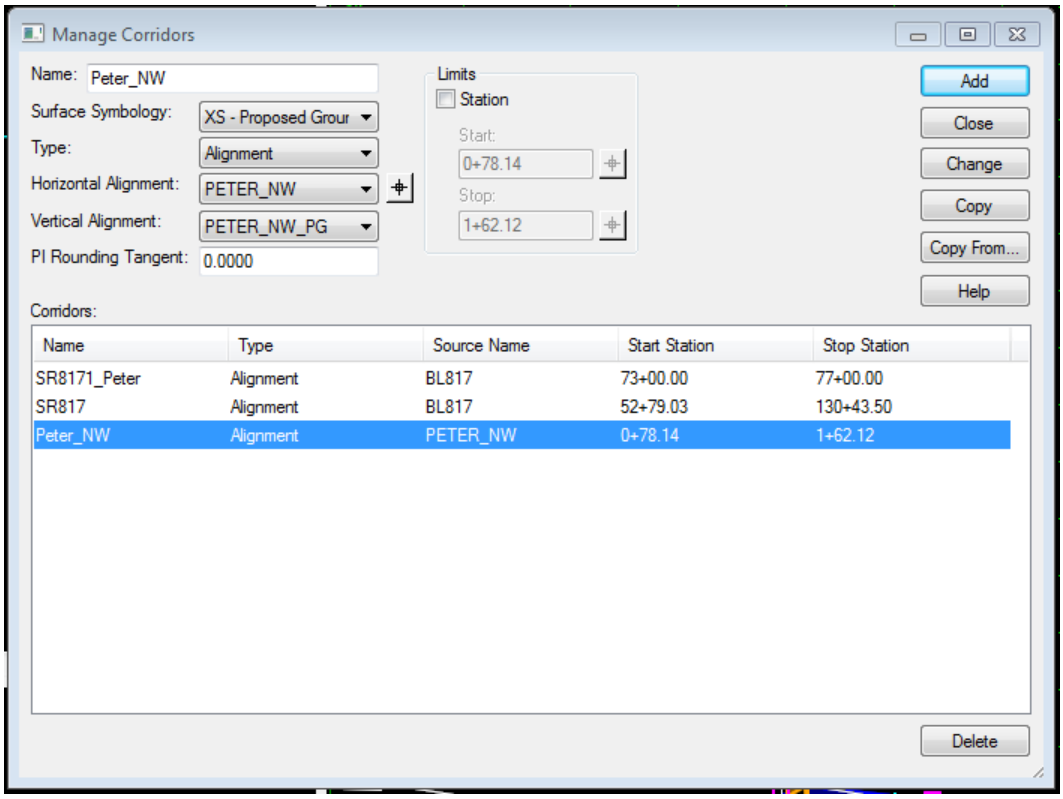
Exercise 11.6 Design the Quadrant Corridors

In this exercise the Roadway Designer dialog will be used to create the corridor names for each of the quadrant alignments. The Template Drops dialog opened in Roadway Template will be used to add templates definitions to each of the quadrant corridors. The Point Controls dialog.

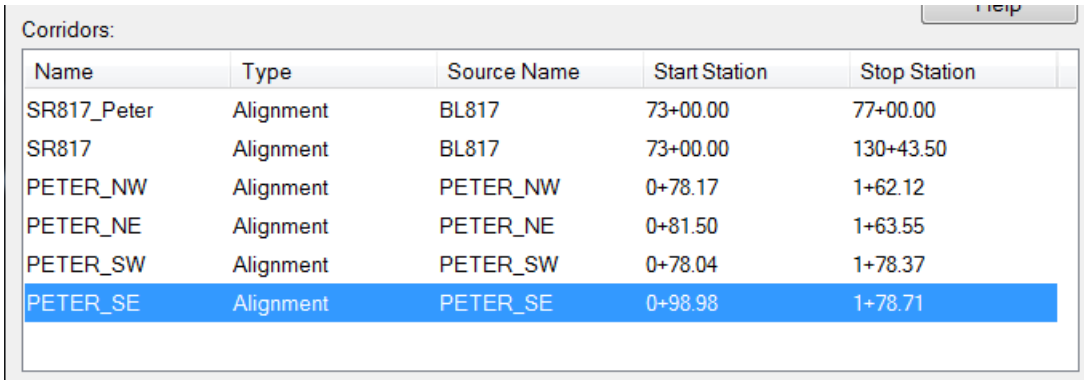
1. Open the Roadway Designer dialog, select **File** > **Open** and select **SR817.ird.**

2. Open the Manage Corridors dialog by clicking the icon <OR> select **Corridor** > **Corridor Management**.

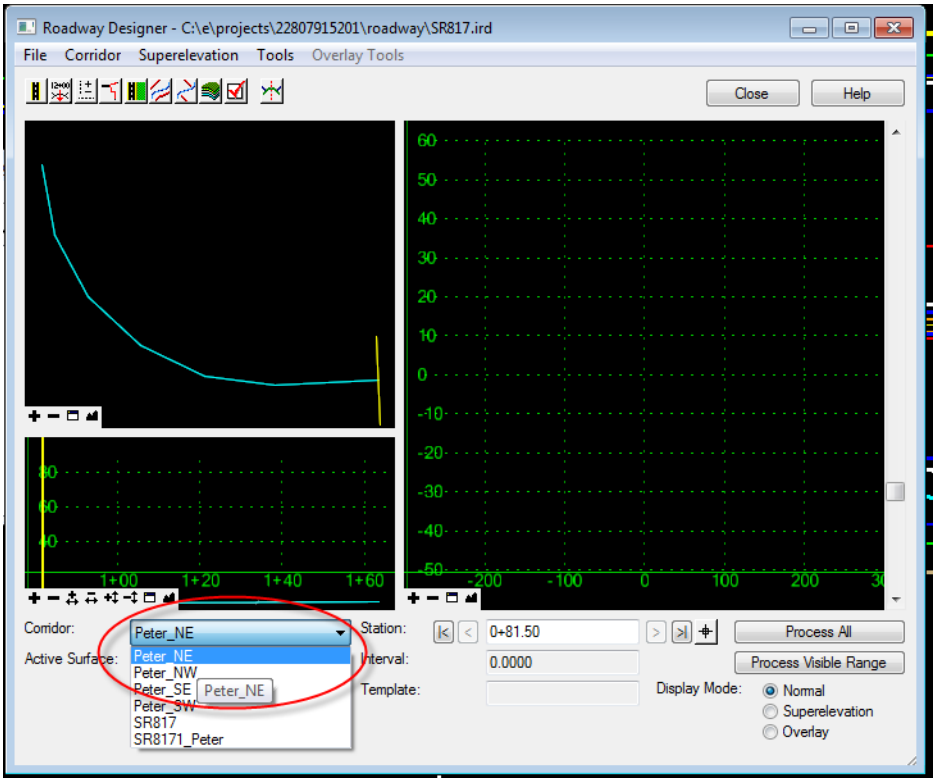
3. Key-in a *New Name* for the quadrant corridor, i.e. **Peter_NW**. Complete the dialog as shown below and click the **Add** button.



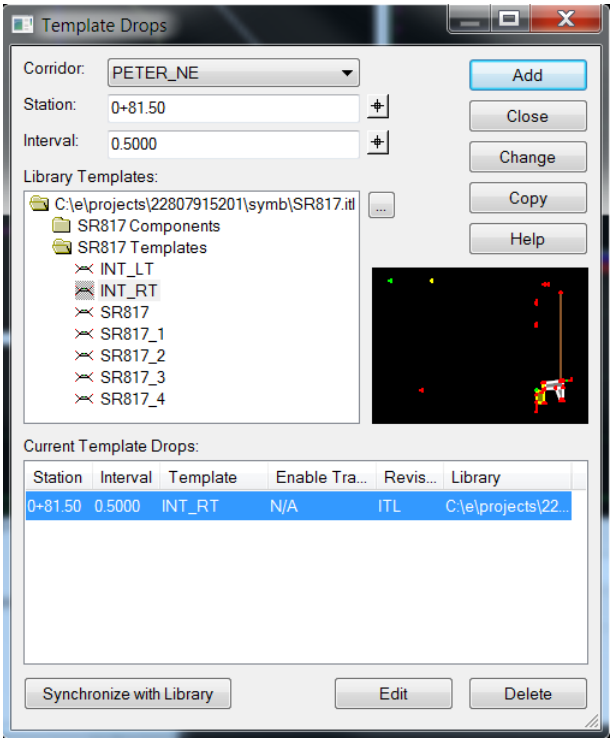
4. Repeat this procedure for each of the **Quadrant Alignments.**



5. Close the Manage Corridors dialog
6. In the Roadway Designer dialog, change the *Corridor* drop down list to a *Quadrant Corridor*, i.e. **Peter_NE**.

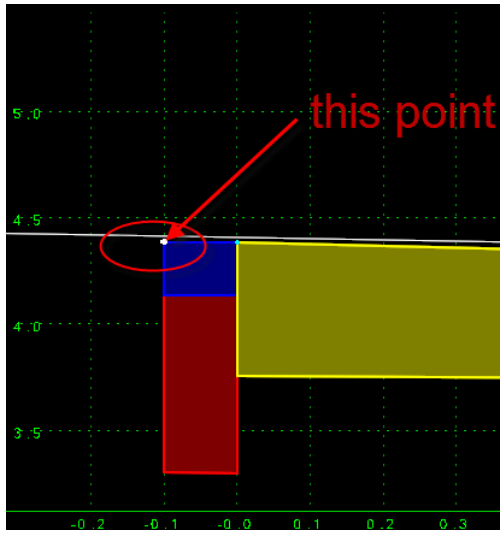


7. Open the Template Drops dialog and select the **INT_RT template**, change the *Interval setting* to **.5**, click **Add** and then close the Template Drops dialog.

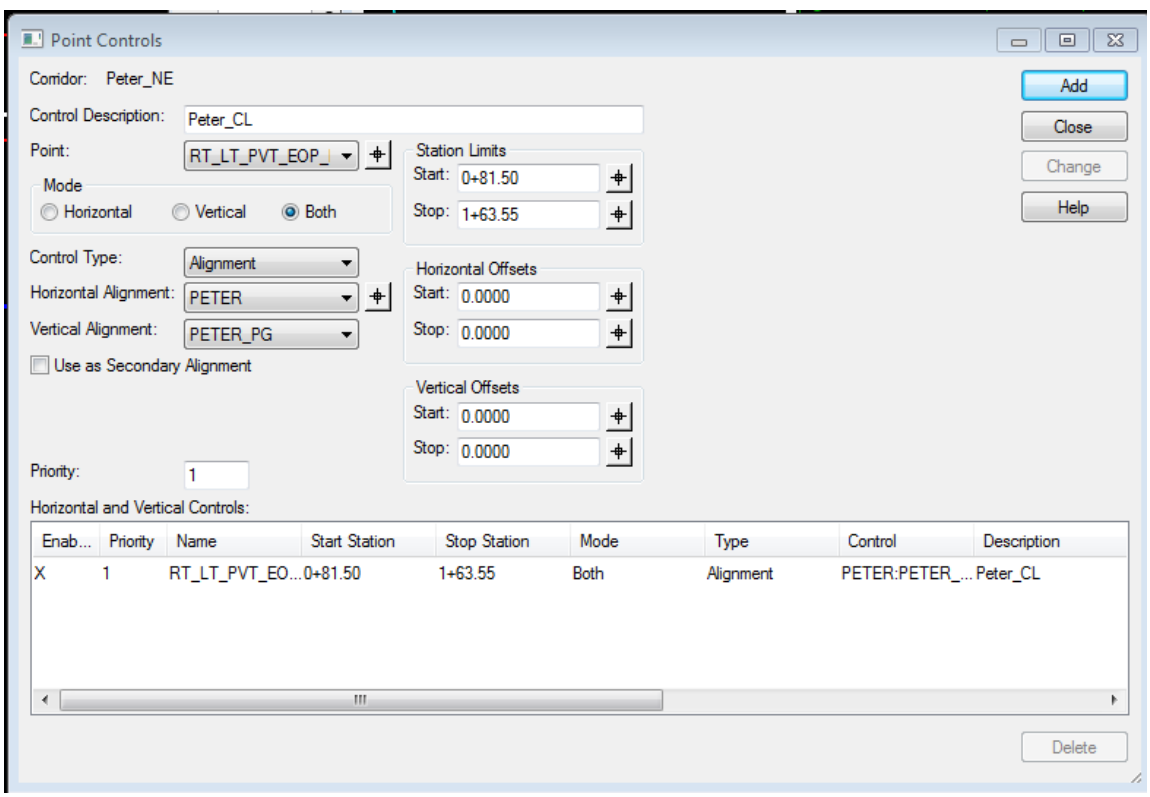


8. Click the **Point Controls** icon <OR> from the Roadway Designer dialog, select **Corridor** > **Point Controls**. The Point Controls dialog displays for the **Quadrant Alignment Corridor**.

9. From the *Point* drop down list, select the ***hanging top edge of pavement,*** ***LT_LT_PVT_EOP_IN** point depending on how the template was created previously.



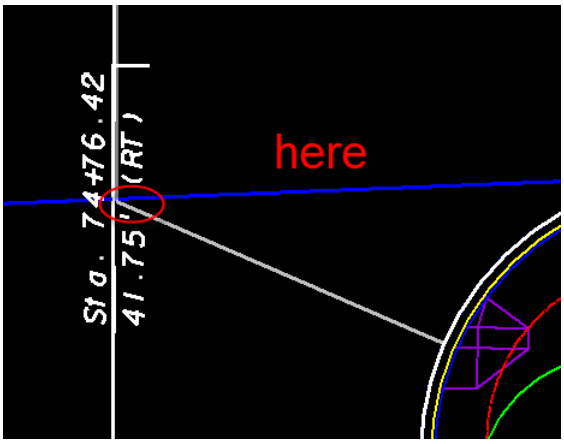
10. Complete the dialog as shown below and then click **Add.**



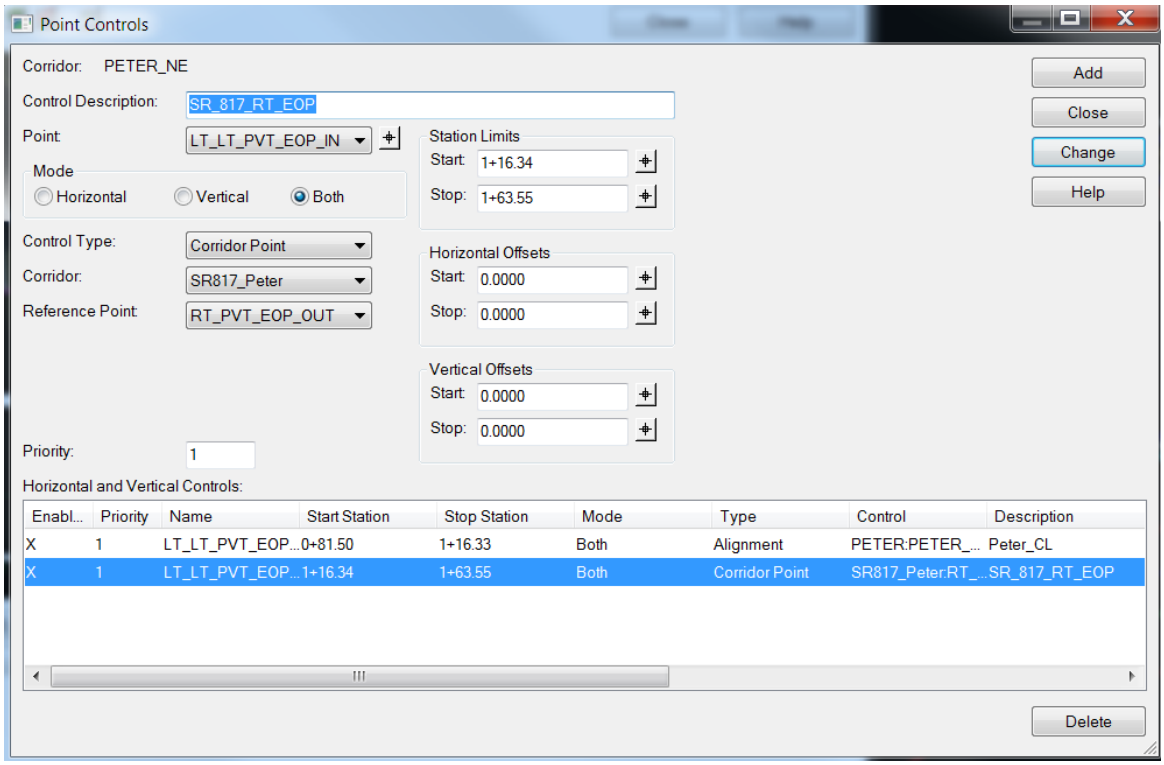
11. In order to complete the quadrant Corridor Modeling, the *Transition Point Control Stations* need to be determined. This can be accomplished with the Corridor Modeling smart target icons.

12. Hover over the **Stop field** of the *Station Limits* target icon.

13. A tool tip appears *"Hold down the CTRL key to select station from the drawing file*"
14. Follow the tip and pick the location in MicroStation where the *radius point line intersects* with the *mainline edge of pavement*. See the example below.



15. Change the *Control Type* to **Corridor Point** and complete the dialog as shown below to add the remaining control for the template on the corridor. Close the Point Controls dialog. Click **File** > **Save** the save to ***SR817.ird*** Roadway Designer project.



16. Select a different quadrant corridor and repeat this procedure for each quadrant. Use the tables below to complete the settings for each quadrant.

Corridor	Template Drop	Control Descr.	Point	H Align	V Align
Peter_NE	INT_RT	Peter_CL	LT_LT_PVT_EOP_IN	Peter	Peter_PG
Peter_NW	INT_LT	Peter_CL	LT_PVT_EOP_IN	Peter	Peter_PG
Peter_SW	INT_RT	Peter_CL	LT_LT_PVT_EOP_IN	Peter	Peter_PG
Peter_SE	INT_LT	Peter_CL	LT_PVT_EOP_IN	Peter	Peter_PG

Corridor	Control Descr	Start Sta	Point	Corridor	Corridor Point
Peter_NE	SR817_RT_EOP	1+16.33	LT_LT_PVT_EOP_IN	SR817_Peter	RT_PVT_EOP_OUT
Peter_NW	SR817_LT_EOP	1+18.71	LT_PVT_EOP_IN	SR817_Peter	LT_PVT_EOP_OUT
Peter_SW	SR817_LT_EOP	1+20.82	LT_LT_PVT_EOP_IN	SR817_Peter	LT_PVT_EOP_OUT
Peter_SE	SR817_RT_EOP	1+25.86	LT_PVT_EOP_IN	SR817_Peter	RT_PVT_EOP_OUT

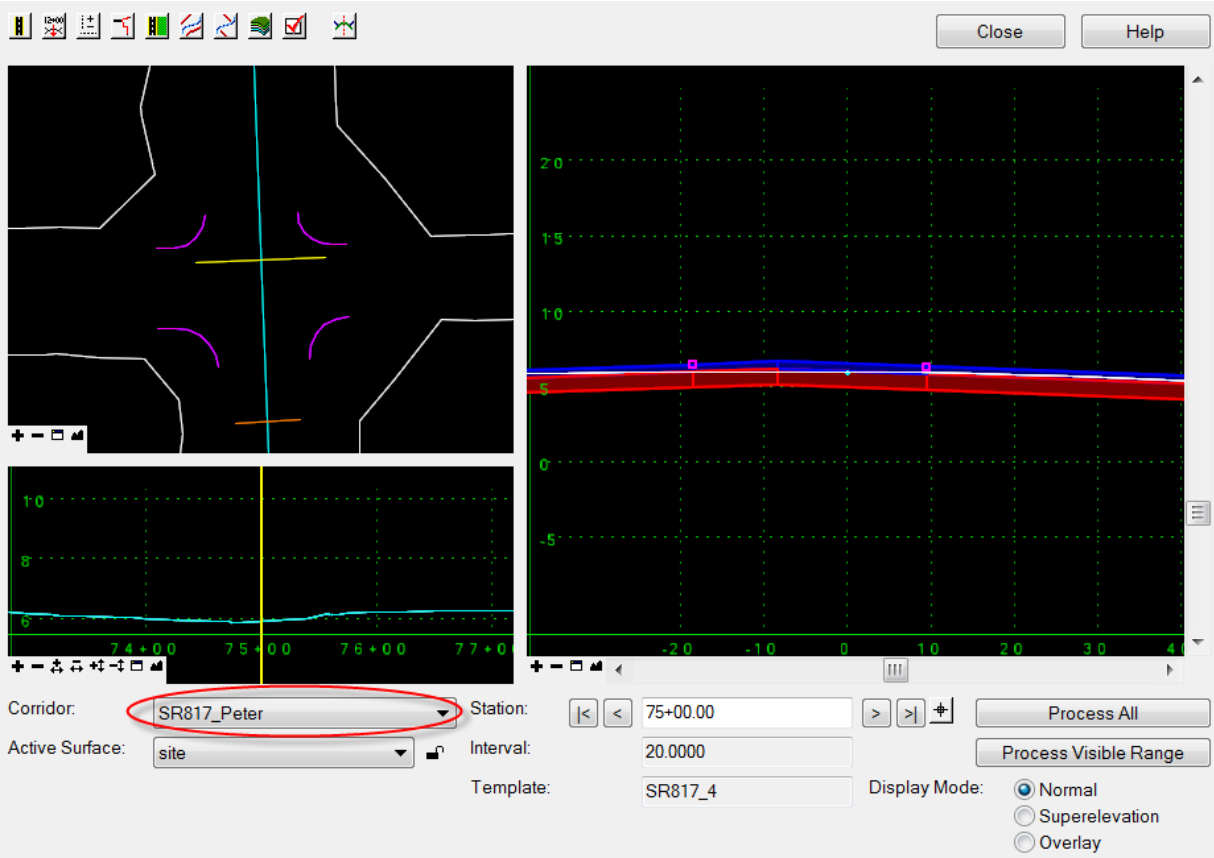
17. From the Roadway Designer dialog, select **File** > **Save** to save the **SR817.ird** Roadway Designer project.

INTERSECTION MODEL

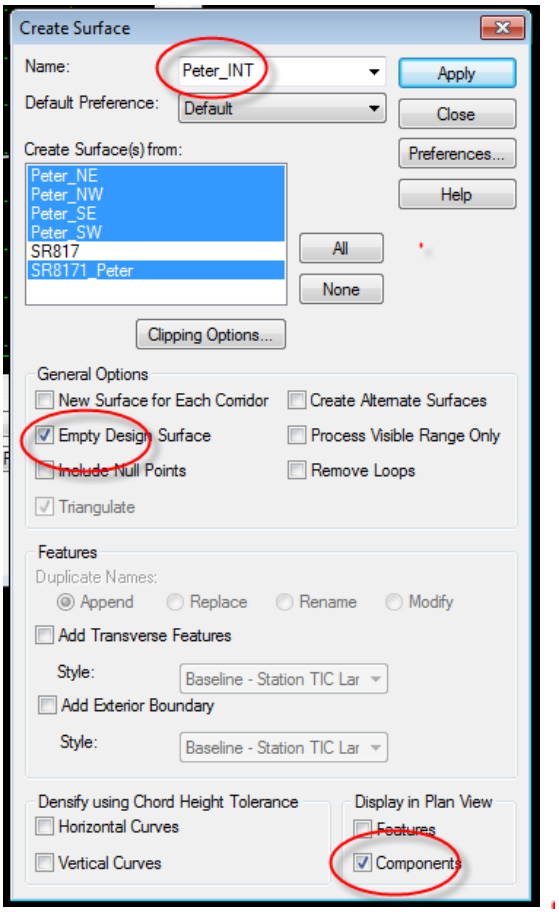
Exercise 11.7 Create the Intersection Model

In this exercise the intersection composite surface model will be created from the Create Surface dialog. A DTM and TIN file will be saved to the project Roadway folder or in the Path defined by the TIN/DTM files field on the Corridor Modeling dialog. Also, a 3D corridor mesh model will be drawn in the MicroStation file. The DTM file will be used to create Cross Sections for the intersection.

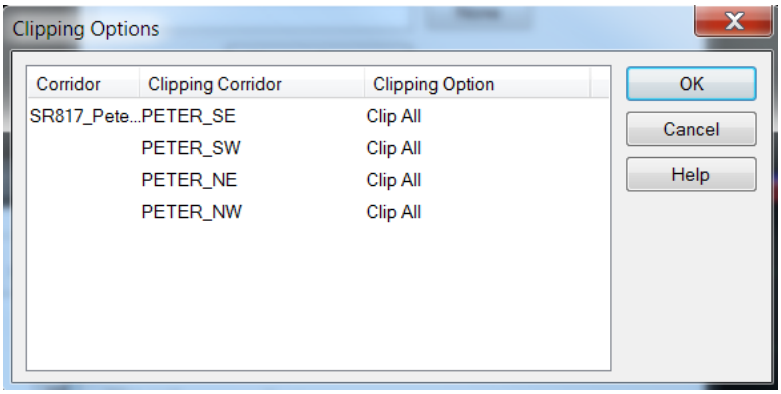
1. In MicroStation, open the 3D file, c:\e\projects\22807915201\roadway*AMGMRD01.dgn.*
2. Open the Roadway Designer dialog and select **File** > **Load** the **SR817.ird** file,
3. Change the *Corridor label* to **SR817_Peter.**



4. Click the **Create Surfaces** icon <OR> select **Corridor** > **Create Surfaces**. The Create Surface dialog displays. Enter the *Nam:;* **Peter_INT** and complete the dialog as shown below.



5. Click on the **Clipping** options and check to see that **Clip All** is the default in the clipping option. If not, double click on the line to change. Click on the **OK** to close the dialog.



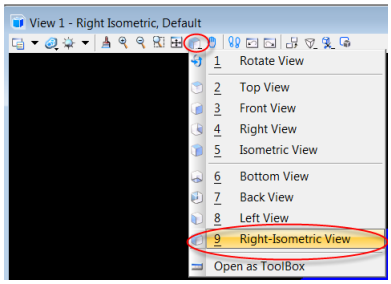
6. Click **Apply** to start the processing.

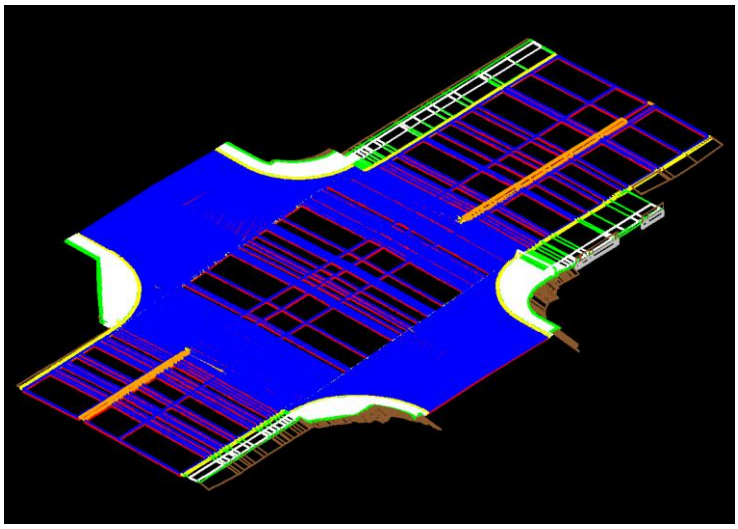
   Note ALERT ! THIS PROCESS MAY TAKE AWHILE.

7. When complete, click **Close** on the Create Surface dialog. Close the Roadway Designer dialog and click to **Save the changes** to the **SR817.ird** file.

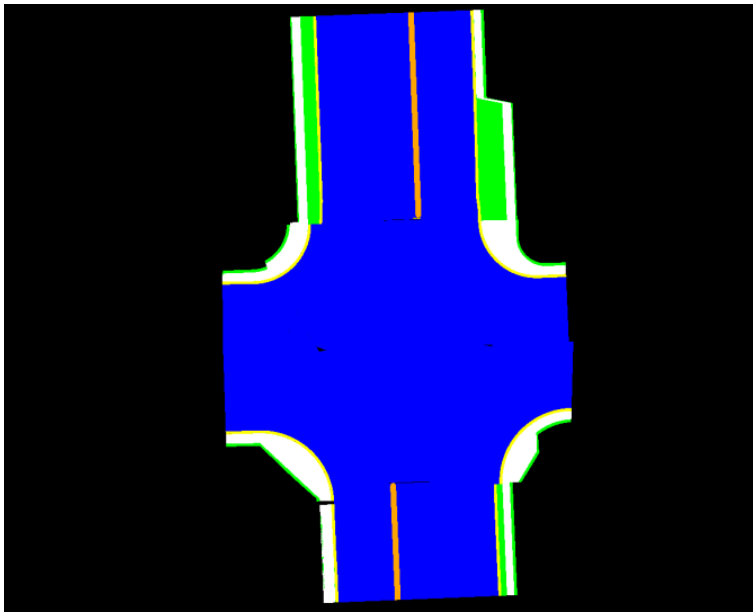
8. Use MicroStation **Fit View** to view the intersection model.

9. Change the *view rotation* to **Right Isometric**.





Mesh Model



Smooth Shaded