CONNECT

# DDE GUIDE

CONNECTICUT DEPARTMENT OF TRANSPORTATION

# DIGITAL DESIGN ENVIRONMENT GUIDE

*CONNECT EDITION*

# Volume 3.3 – OpenRoads Designer Corridor Modeling

Volume 3.2 - OpenRoads Designer Roadway Modeling

# Course Overview

This module will instruct users on how to create and edit roadway templates & Corridors.

## Skills Taught

Learn how to:

- attach Existing Terrain and Geometry Reference Files
- define 2D & 3D Model Views
- create a Corridor and Template Drops
- modify Corridor in various ways
- create and calculate superelevation
- create and review the superelevation diagram and reports
- assign superelevation to a corridor
- apply Linear and Surface Templates

## Introduction

Corridor Modeling allows the user to create a dynamic, intelligent and powerful 3D model of their design. The 3D model is then used to create cross sections, terrain models and generate corridor quantities. A corridor is created first in 2D by assigning a horizontal and vertical alignment to the corridor and then assigning a template to the corridor at a defined interval along the horizontal alignment. Once the template is assigned to the corridor a 3D model is created.

A template represents the transverse geometry or typical section along the corridor. Templates are made up of points and components and are stored in a template library. When a corridor is processed the template points create 3D linear features (edge of pavement, shoulder, curb, sidewalk, cut/fill lines etc.) along the corridor and the template components create the 3D material meshes (i.e. pavement, shoulder, curb & gutter, sidewalk, side slope grading etc.) along the corridor.

The Corridor Modeling toolset is a group of commands used to create 3D designs that represent a new roadway or other types of surfaces. Designers work primarily in 2D files and OpenRoads tools automatically generate the 3D model. Tools for the design, creation, modification, management, and report functions are provided. The tools are accessed by choosing the Corridors tab as shown below.

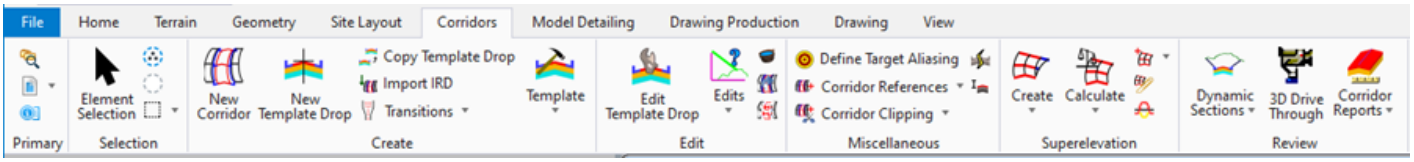


*Figure 1 Corridors Tab*

The 3D model will be generated from the 2D base model design file for CTDOT projects. It is recommended that users take a federated approach to store each corridor model in its own design file for large projects that have several alignments and sites. Small projects may have the data in a few files while larger projects will use multiple files for the geometry, terrain, superelevation, and the 3D model. All these files can reference one another to present a complete model of the project.

Each road within the project is used to define a 3D corridor model representing the proposed design. A corridor consists of an alignment, profile, and a template defining the initial roadway typical section. Multiple templates may be applied within a corridor to better define the roadway. Additionally, transitions and other modifications to the template can be defined using various modification tools. As changes are made, the 3D corridor model is automatically updated.

***Corridor Model 3D Graphics***

When a corridor is processed, the 3D model is generated in a separate MicroStation model named "Default-3D". The corridor graphics consist of 3D line strings and 3D surfaces for each design component. The example below shows a portion of the pavement for a corridor with the individual pavement layers that were generated for the 3D model as well as a portion of the side slope.

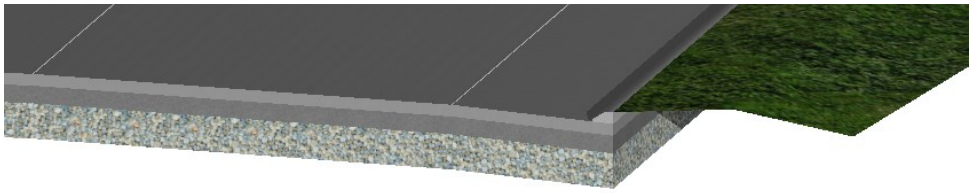

*Figure 2 3D Graphics*

When the template is processed, the template points are connected between template "drop" locations to form the longitudinal break lines that are used to create the proposed surface. An example of the longitudinal break lines plotted from a 3-dimensional design surface is shown below.

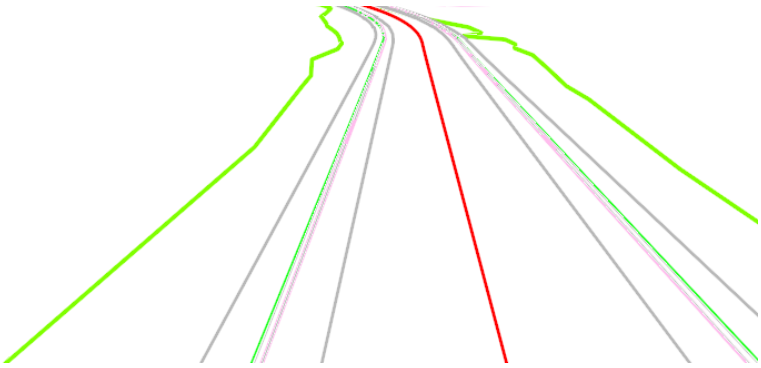

*Figure 3 Template Points longitudinal break lines*

Only the top template points are used to create the proposed surface mesh. Points below the surface are excluded from the proposed design surface.

The sub-surfaces can be included in the proposed cross sections as “components” or alternate surfaces. These components can be used for volume calculations. Corridor 2D Graphics In addition to the 3D graphics, the corridor modeling process draws 2D plan view graphics. These graphics can be used to generate the plan sheets for the project. An example of the 2D plan-view graphics drawn as part of the corridor modeling process for the curbing, shoulders, snow shelves, and fill limits is shown below.

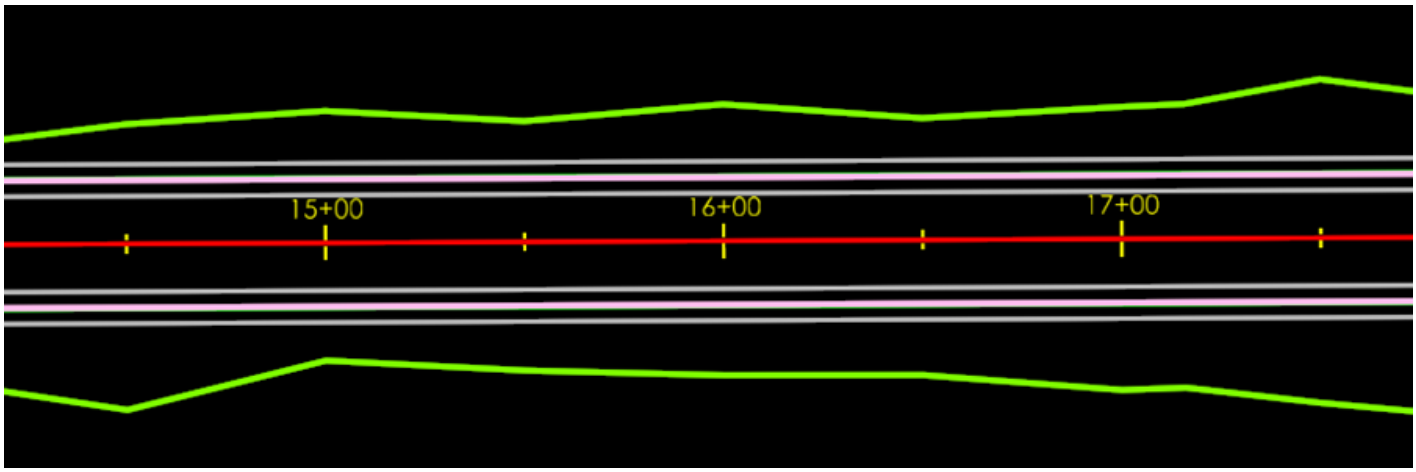


*Figure 4 Corridor 2D Graphics*

***Corridor Modeling Workflow***

The workflow for corridor modeling is summarized below.

1. Create Civil horizontal and vertical geometry element(s).
2. Define templates for the project.
3. Set the active terrain (existing ground).
4. Create a corridor based on the horizontal and vertical elements.
5. Add template drop(s).
6. Add horizontal and/or vertical controls for template points (optional).
7. Define any transitions and connections.
8. Associate superelevation information.
9. Review the results and adjust as necessary using additional controls, such as end condition exceptions, secondary alignments, parametric constraints, or target aliasing.
10. Continue the process/review/modify until results are what you want

# Exercise 1 – Base Model Creation

This section instructs users how to create a corridor base model design file for a project. Base model files will reside within the project folder structure the …\Highways\Base_Models folder. Depending on the complexity of the project one or more base model files can be created. References files such as alignments, survey and terrain files are attached without nesting.

## 1.1 Startup

Before attempting to open or create DGN files users should make sure the following is in place:

1. CTDOT users should have the CTDOT CONNECT DDE synced through SharePoint with the COMPASS Project Synced along with the CAD Configuration.
2. Consultants should have CTDOT DDE properly installed or be syncing to the CTDOT DDE SharePoint/COMPASS system.
3. Make note of the **Coordinate System** you will be working in. If you have existing survey data, you will need to find out what system is being used **(NAD 83/NAVD 88 or NAD 27/NAVD 29).**
4. Log on to the CONNECTION Client. Bentley Connect licensing requires users to log into their Bentley account to secure a software license. CTDOT users should log in using your CTDOT email address and Bentley password.If you do not see the dialog box, select the ∧ icon on the bottom Windows Screen. Click on the Connection Client Icon and select **Open.**

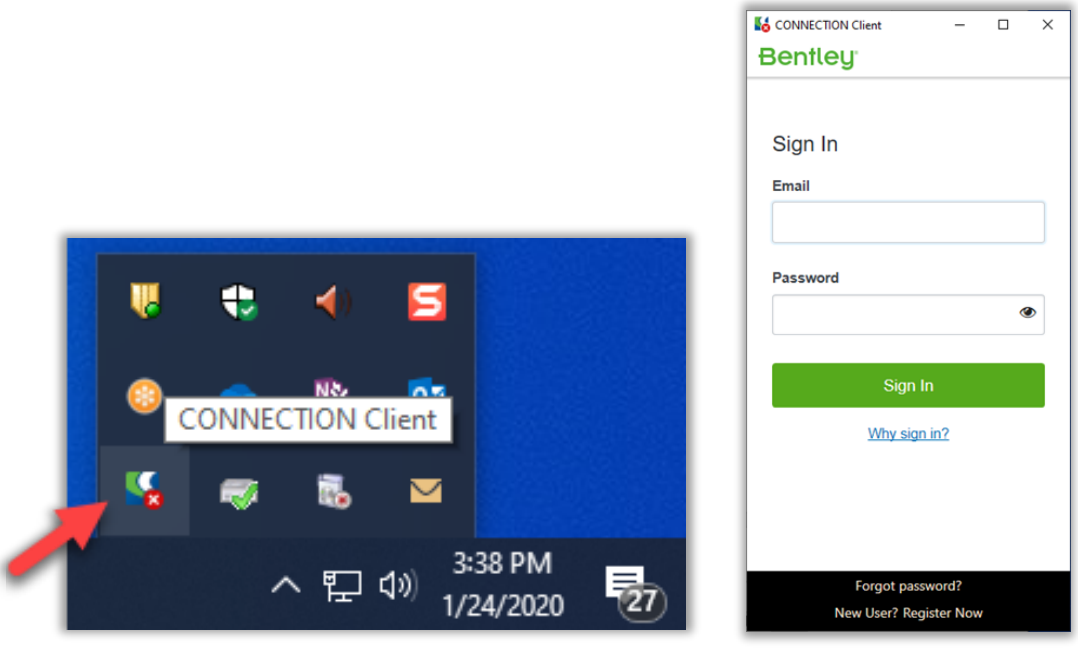


*Figure 5 CONNECTION Client System tray*

5. Launch the Application.
   - **CTDOT employees**
     On your desktop double click on the **CAD Accounting** icon.
   - **Consultants**
     Start the software via an appropriate **CTDOT DDE** icon
6. On the CT DOT Accounting Menu there will be select ***Compass OpenRoads CE***
   In the ***Run Program*** field select the needed program, the ***Available Account*** (funding source) and ***Resource Type***. Click on the **Start** button to load the program.

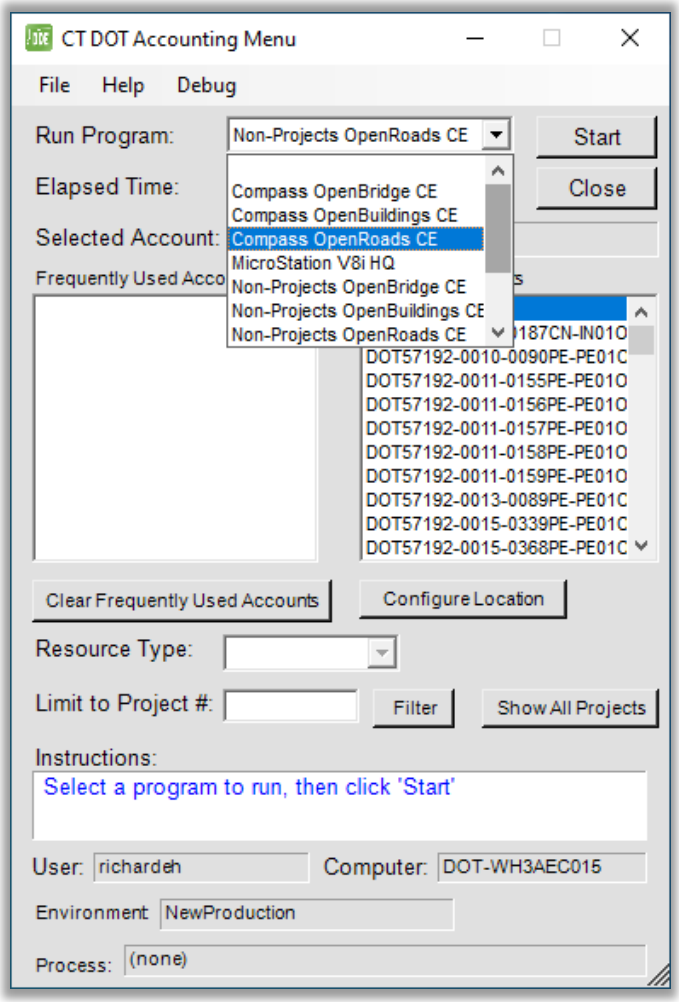


*Figure 6 CAD Accounting dialog box*

7. After launching the program, a Welcome Screen for ***OpenRoads Designer*** will appear.
8. Select **Custom Configuration**, using the small drop-down arrows select the Workspace **CT_Workspace**, the needed **WorkSet** and **Role**.

   ***Note:*** *For CTDOT Synced Projects - If you do not see the Project Number listed, please request a Compass/CAD Setup using this link* [*New CAD Project Request*]

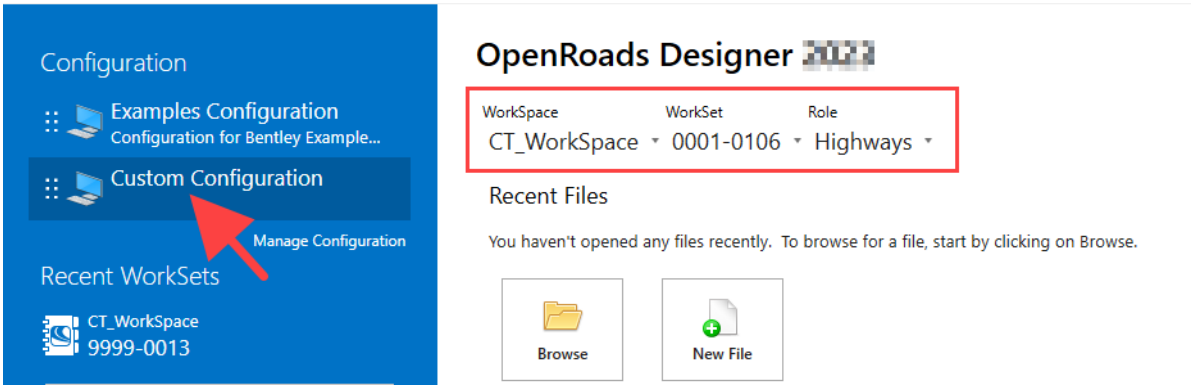


*Figure 7 OpenRaods Welcome Screen*

## 1.2 Creating a New File

1. Select the **New File** icon or open the file from Volume 3.2. Create a DGN file from the civil 2D seed and save it to the Base_Models folder. Use the file-naming conventions as described in Volume 16.

   Example: ***HW_1234_1234_CorridorRoute123.dgn***

   > **Warning:** Do not copy DGN files created with V8i SELECTseries or InRoads SS2, SS3, SS4, or SS10 to the new CTDOT CONNECT Project/WorkSet folders.

2. On the New dialog box click the **Browse** button to select to select the proper seed file. ***...CT_Configuration\Organization\Seed\Road***

   If the survey was done in an old Datum, use the corresponding 2D Seed File in this folder: ***...CT_Configuration\Organization\Seed\GCS***

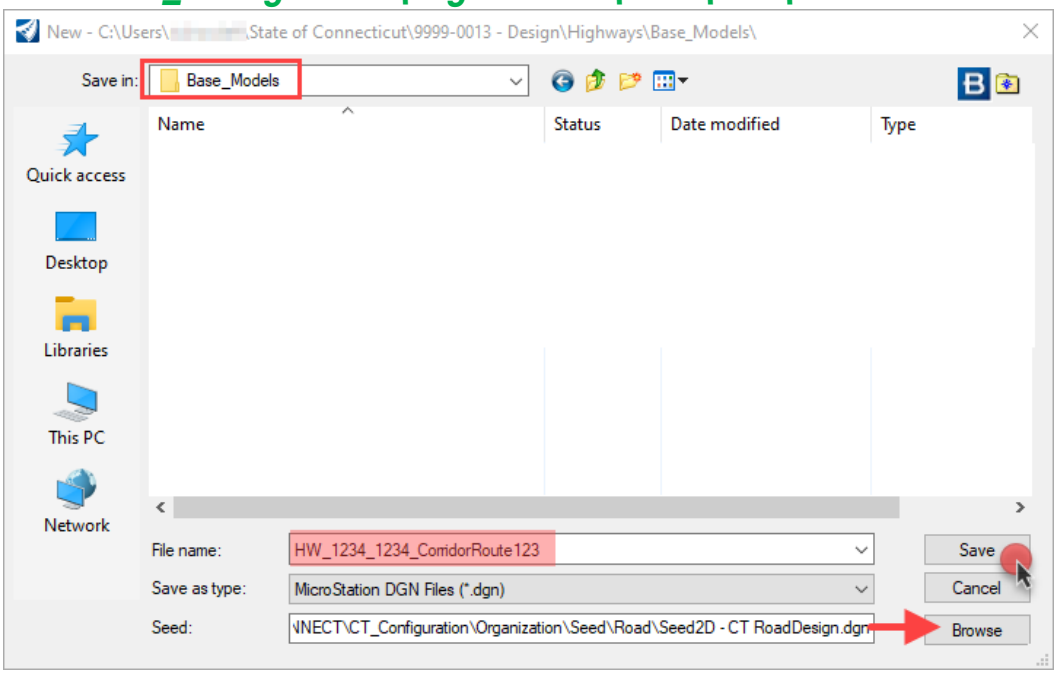


*Figure 8 New File*

3. After the DGN file is created open File Explorer and browse to the file, **right click hold** and select **View online**.

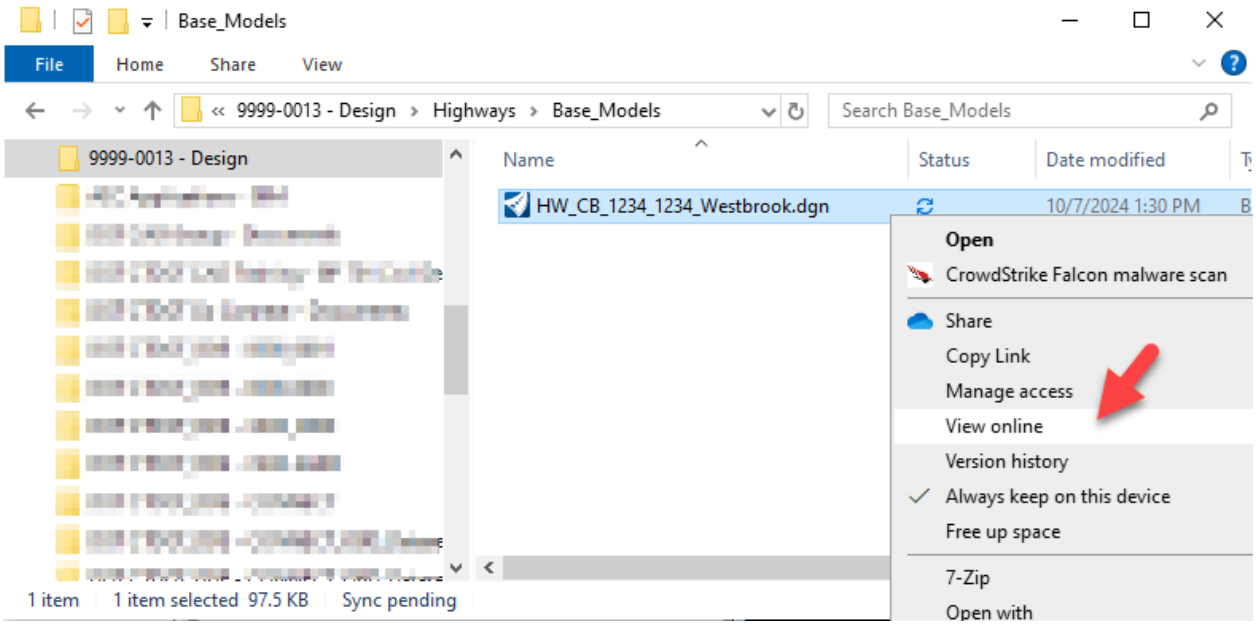


*Figure 9 File Explorer View online tool*

4. The Projects SharePoint site will open, sort by **Date**, click on the **three dots**, select ***More › Check Out.***

   ***Note:*** *When you are done working on the DGN file, exit the program and go back to the SharePoint Site and* ***Check In*** *the file.*

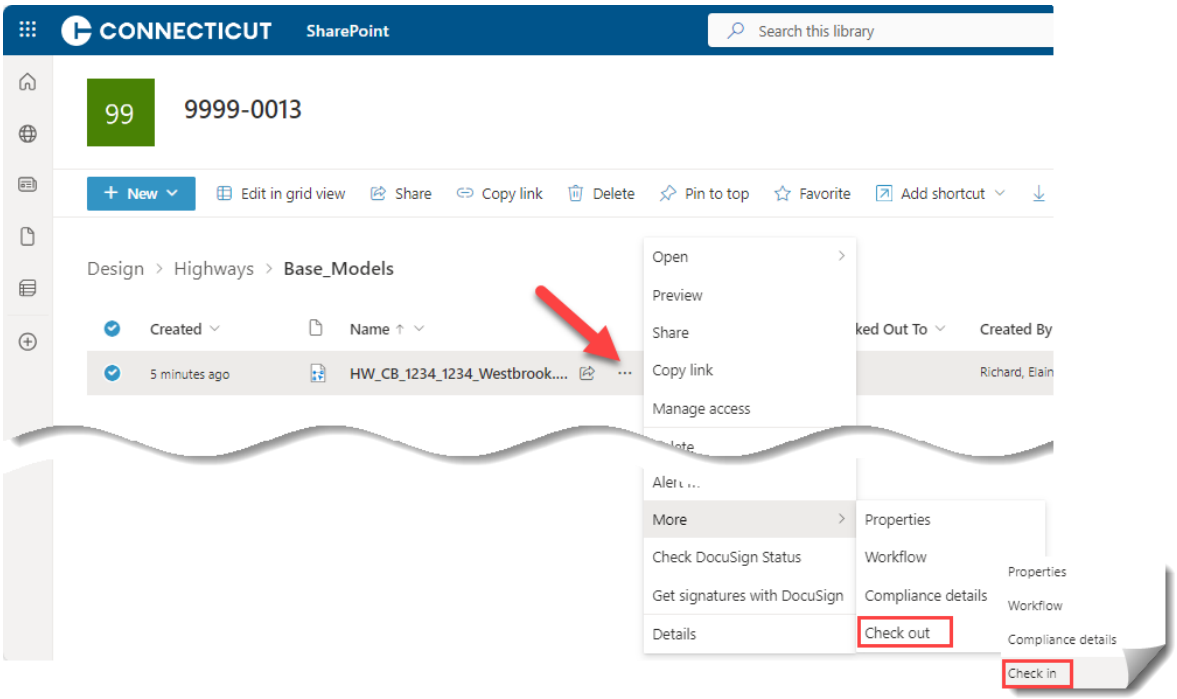


*Figure 10 SharePoint Check out*

## 1.3 Referencing

Reference in the survey, terrain, alignment(s), and corridor files using **no nesting**. Turn off levels as needed. Review Volume 2 for details on referencing Survey files.

***Note for old survey files:***

- *The **Ground** Topo design file previously created using V8i. Sometimes you will have several ground files and on very old files the extensions maybe **.grn**.*
- *The ORD **Terrain** survey file, this file was created by importing an old V8i InRoads DTM*

1. Select the Reference tool. Browse to attach all references
   Orientation: ***Coincident***
   Nested Attachments: ***No Nesting***
2. Click **Fit View** in the view window. Double-check that the survey ground file came in at the correct location. **Zoom** to a ***coordinate grid cross*** and **snap** to it, the **XY-axis**,
3. Check to see if the coordinates match up. To align the a file out of place, select it in the References dialog box change ***True Scale to off*** and the scale to ***1 to 1***.
4. **Fit** the view and re-check the coordinates, they should now line up.

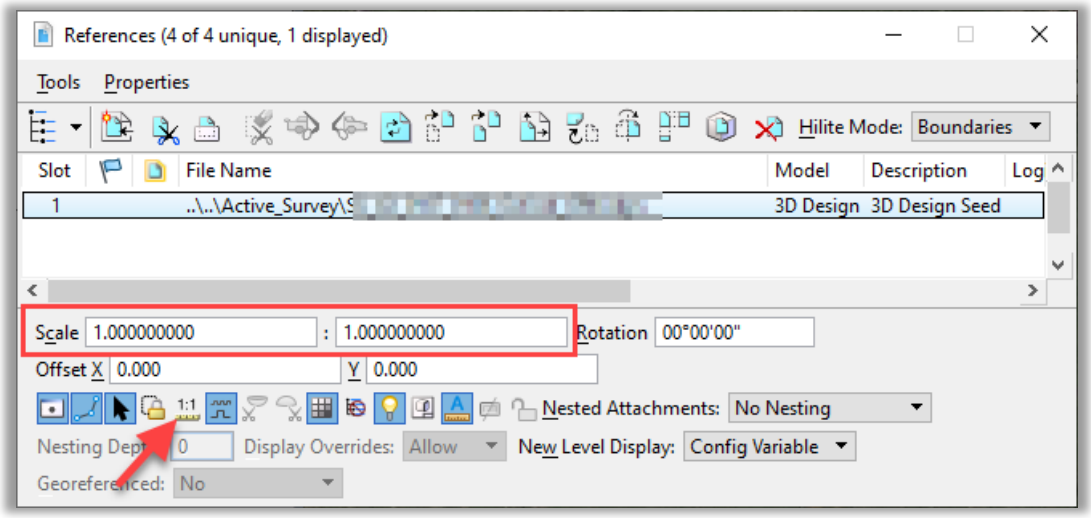


*Figure 11 Reference file Settings*

5. Click **Fit View** in the view window. Double-check that the survey ground file came in at the correct location. **Zoom** to a ***coordinate grid cross*** and **snap** to it, the **XY-axis**, the MicroStation command window should display the same numbers as the northing and easting of the coordinate grid cross.
6. Review the file and **Save Settings**

7. **Activate the terrain** by clicking on the terrain boundary, hover over the boundary and from the pop-up menu **select/click** the ***Set Terrain Active*** tool.

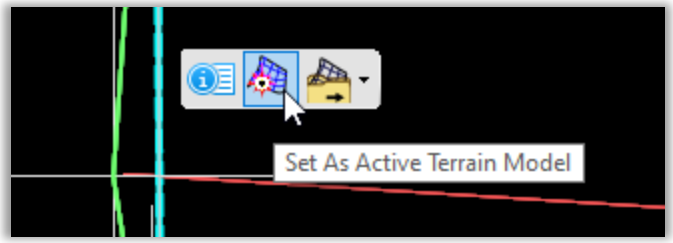


*Figure 12 Set Terrain Active tool*

8. Now the Default 3D view is available. You can also open view(s) for the profile(s) of the horizontal alignment(s). **Save settings** when the displays are completed as needed. ***Review*** the file then ***Save*** the file.

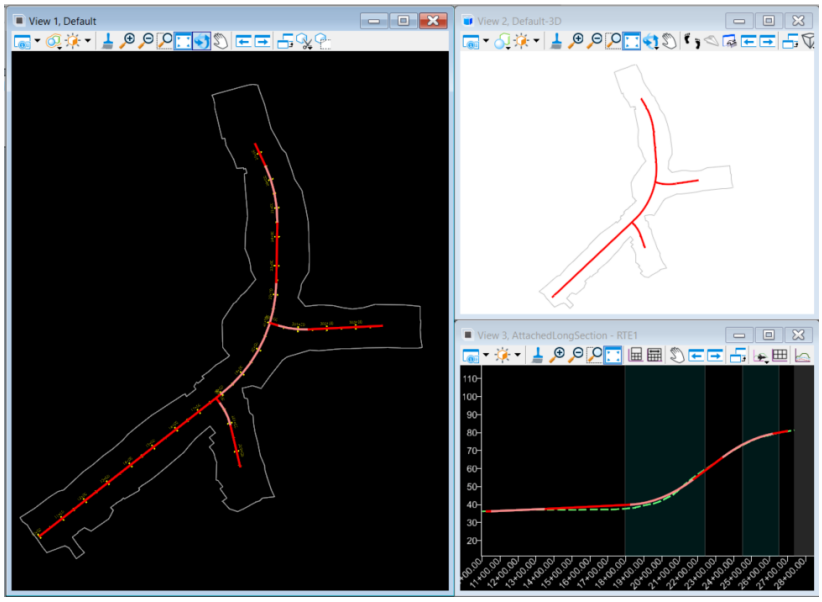


*Figure 13 Multi-Model View*

# Exercise 2 – Creating a Corridor Model

## 2.1 Corridor Creation

A corridor model is created by applying a template to selected horizontal and vertical geometry.

Corridor models are created by choosing the **New Corridor** command from the **Corridors** tab, or by selecting an alignment and choosing the Create Corridor command from the pop-up menu. When the command is selected, the software will step you through a series of prompts. These prompts appear on the cursor and can also be defined using the **Tool Settings** dialog.

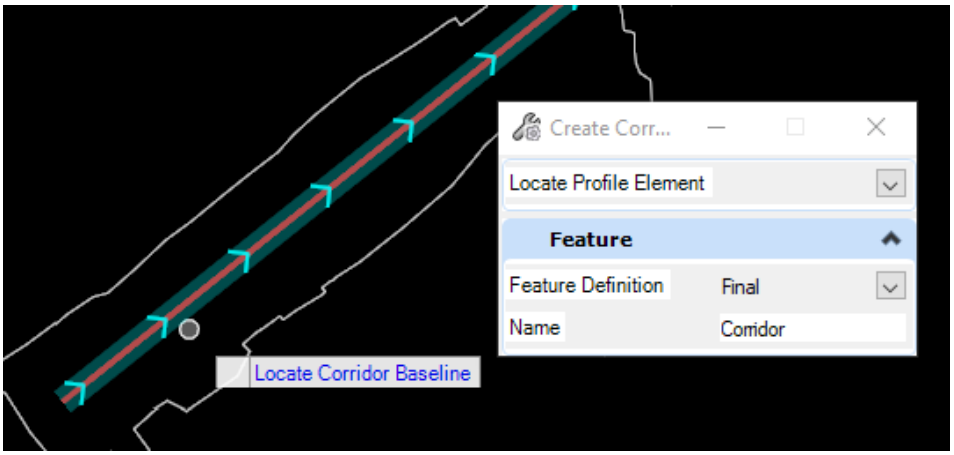


*Figure 14 New Corridor Creation*

You are prompted to define the following parameters:

**Locate Profile –** Reset For Active Profile - Select the profile name from the drop-down list or issue a reset button to accept the Active Profile that is defined for the Horizontal Alignment.

**Corridor Name -** Define the name for the corridor. It is recommended that you use same name as the horizontal alignment.

**Design Stage -** Design stages are used to define a variety of parameters to control the template drop interval as well as which elements are drawn in the 3D model (3D line strings, 3D components, surface meshes, etc). The design stages are defined in CV_Highway_Features_Levels_ElemTemp.dgnlib which is attached by a configuration variable.

The design stages can be reviewed in the Civil Standards tab of the Project Explorer dialog as shown below.

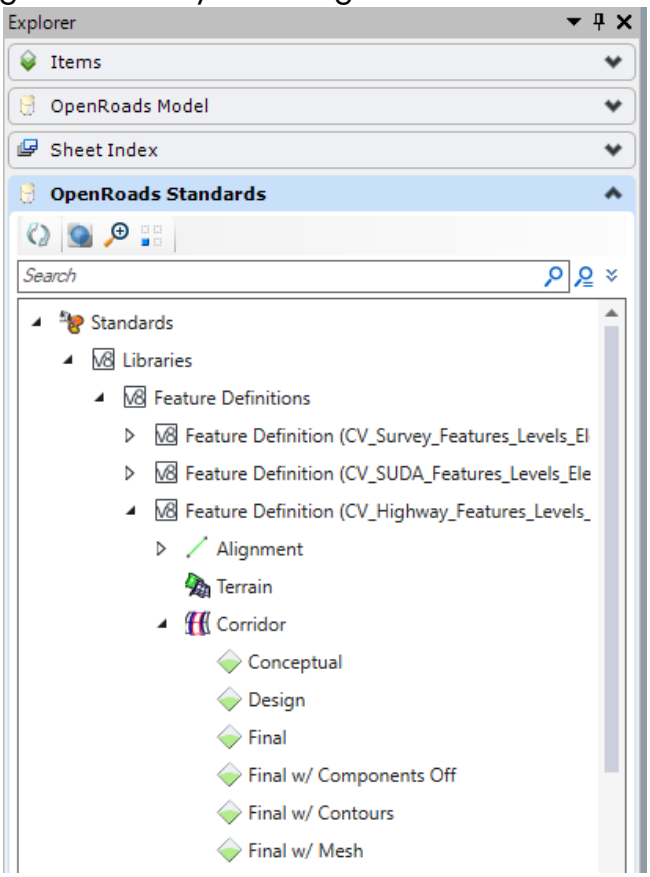


*Figure 15 Design stages in Project Explorer*

The design stage can be changed at any time throughout the corridor modeling process.

Each design stage is defined to provide more detailed information as you work from conceptual design for the final design. The settings for each design stage are defined in the CTHDOT standards and vary for each design stage.

**Template Drop Interval Multiplier –** When templates are applied to the horizontal and vertical geometry, the user is prompted to enter a template drop interval. CTDOT recommends an interval of 5. The Template Drop Interval Multiplier parameter is used to specify a multiplier, which is applied to the initial template drop interval, to determine the actual interval of each template drop location according to the selected design stage. This is useful to speed up processing for early design stages where less detailed information is required. The CTDOT design stages have been defined with the multiplier values shown in the table below.

| Design Stage | Template Drop Interval Multiplier |
|---|---|
| **Conceptual** | 5 |
| **Design** | 2 |
| **Final** | 1 |

After defining the **Profile, Corridor Name, and Design Stage**, you are prompted to define the Template Drop information as shown below.

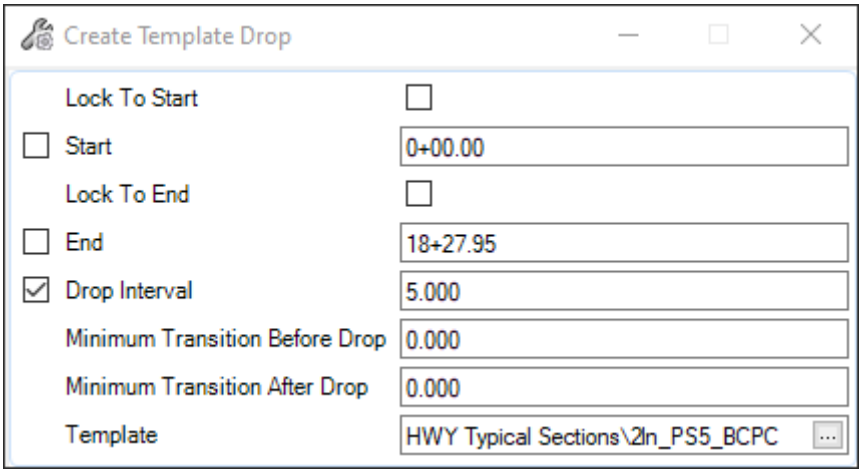


*Figure 16 Template Drop Information Dialog Box*

The parameters can be defined in the **Create Template Drop** window, as shown at above, or by dialogs floating on the cursor that will step you through the parameters.

Each parameter is defined below:

**Lock to Start –** Toggle this option on to lock the start of the corridor to the start of the horizontal alignment.

**Start –** Define the Start station for the corridor.

**Lock to End –**Toggle this option on to lock the end of the corridor to the end of the horizontal alignment.

**End –** Define the end station for the Corridor.

**Drop Interval –** This parameter is used to define the interval that the template will be applied to the corridor. We recommend a Drop Interval of 5 for CTDOT projects.

**Minimum Transition Before Drop / Minimum Transition After Drop –** If they are non-zero, then a transition drop is created at the beginning/end of the template drop with a length greater than or equal to the value entered. The actual length is determined by how far it is between the new drop and the drop before/after the new drop. If there isn't enough space to meet the minimum, then the previous/next drop is shortened to accommodate the transition. If there is no previous/next drop, then no transition drop is created.

**Template –** Define the template from the library to be applied to the alignment and profile. The … button to the right of the template name is used to browse the template library to choose the desired template.

After defining the Create Template Drop parameters, the template is applied to the selected horizontal and vertical alignments to create the corridor. A 3-Dimensional model

named Design-3D is automatically created in the active design file and referenced to the active model.

**Note:** The referenced graphics are not always desirable and can be turned off using the MicroStation Reference Attachment tools.

Different views can be displayed by holding down the right-mouse button in the MicroStation view until the pop-up menu appears, and then choose *the desired layout.*

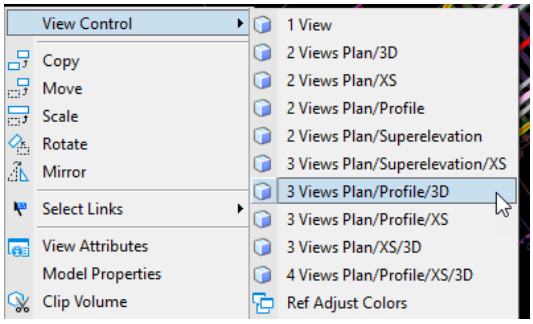


*Figure 17 Setting up the Muli-Model View*

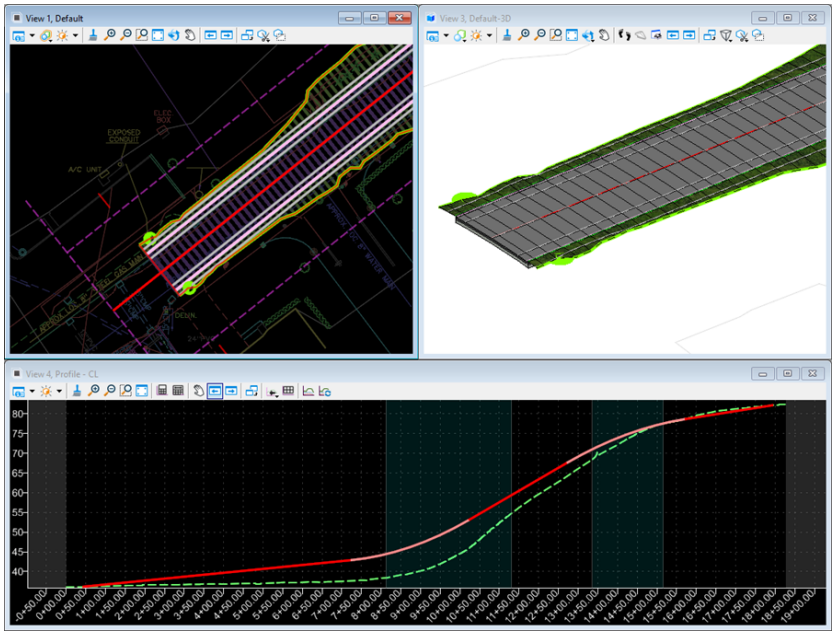

*Figure 18 Setting up the Muli-Model View Windows*

In addition to the 3d graphics, 2d graphics are drawn in the active model as described below:

- 2-Dimensional graphics are drawn in the active model as defined by the features assigned to the individual points in the template. The CTDOT feature definitions that are assigned to points on the surface of the template, such as the edge of pavement, shoulder, or ditches, are the only template features that draw these 2D plan graphics.
- Graphics representing the length of the corridor model and the template drop range are created in the active model. This graphic includes several "handles" at intervals along the length of the corridor that can be easily selected to identify the corridor model as shown below.

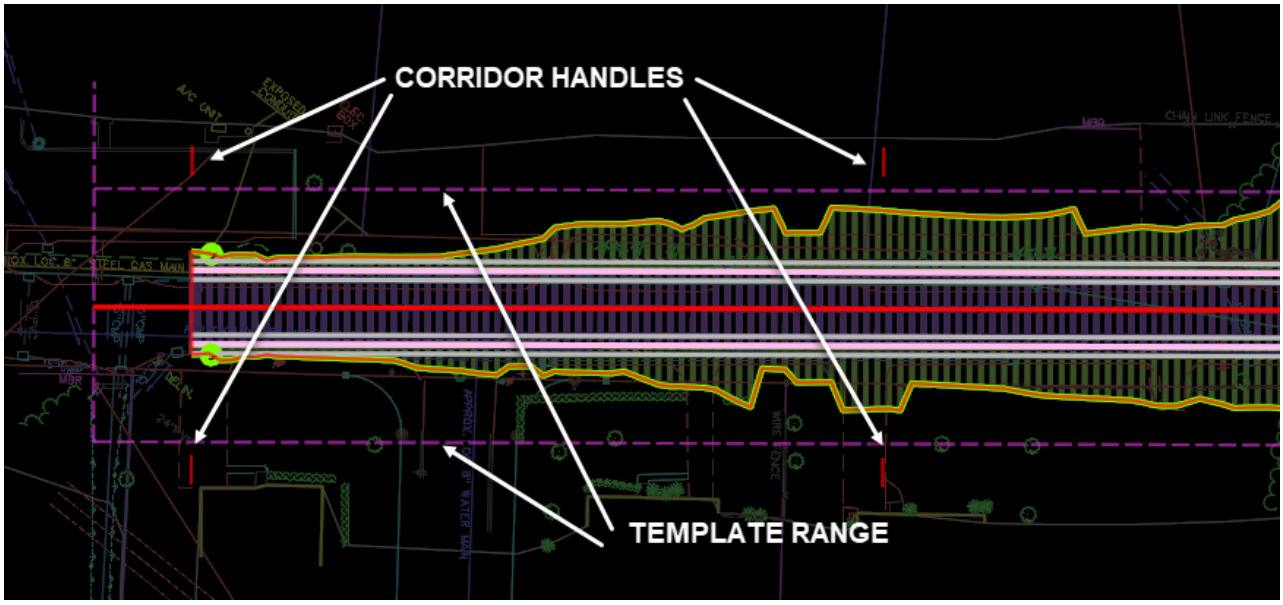


*Figure 19 Corridor Handles and Template Ranges*

- The corridor is added to the **OpenRoads Model**, which can be reviewed in the *Project Explorer* dialog.

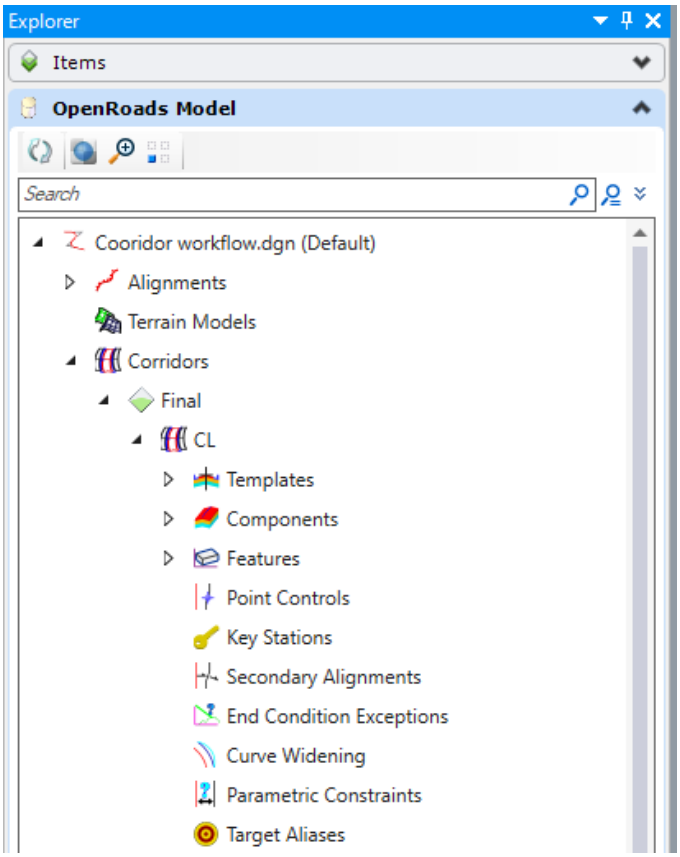


*Figure 20 OpenRoads Model Check in Project Explorer*

## 2.2 Corridor Editing

### 2.2.1 Corridor Editing Tools

Select one of the corridor handles, as shown below, to access a menu of common corridor commands.

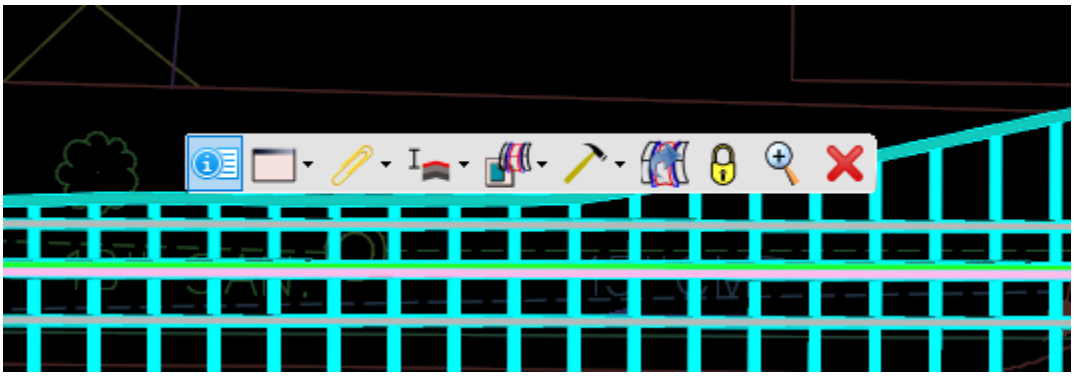

*Figure 21 Corridor Editing Tools*

The commands in the menu are grouped as follows:

- Properties
- Corridor Views
- Reports
- Corridor Overlay
- Corridor References
- Corridor Creation Tools
- Lock – Deactivate Rule
- Zoom To
- Delete

### 2.2.1.1 Corridor Properties

The corridor parameters can also be edited in the **Properties** dialog when a corridor is selected.

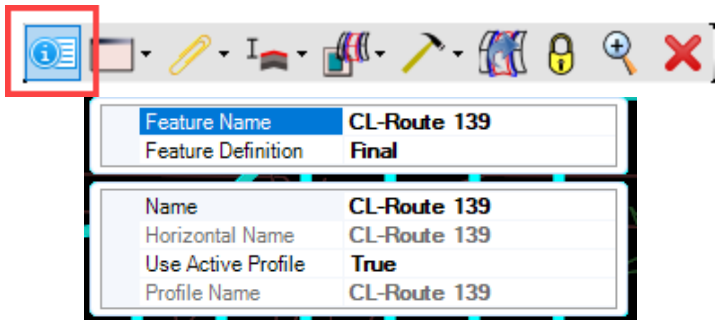


*Figure 22 Properties dialog*

### 2.2.1.2 Corridor Views

The **Corridor Views** icon has two commands, **Open Profile Model** and **Open Cross Section Model**. The **Open Cross Section Model** command is used to create a dynamic cross section view to review the model by scrolling through cross sections.

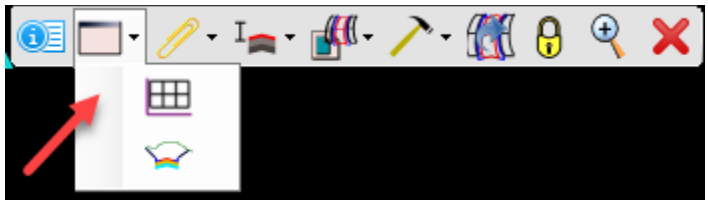

*Figure 23 Open Profile Model and Open Cross Section Model Tools*

When selected, you are prompted to **Open or Select View** for the cross-section display. In the example below, View 2 was selected to display the dynamic cross sections.

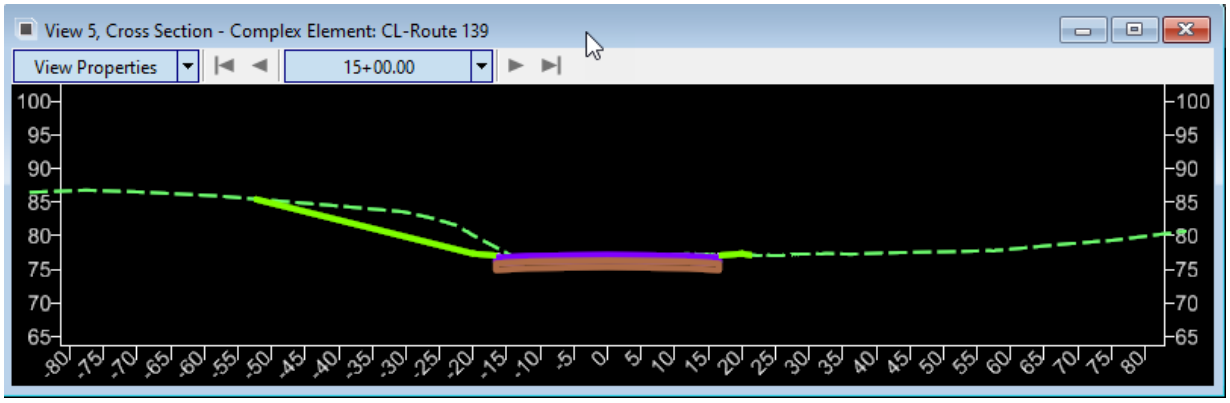


*Figure 24 Cross Section View*

This dynamic view is a temporary display of the cross sections. The sections are not written to the design file using this command.

The **View Properties** contains parameters for adjusting the cross section display, as shown at below.

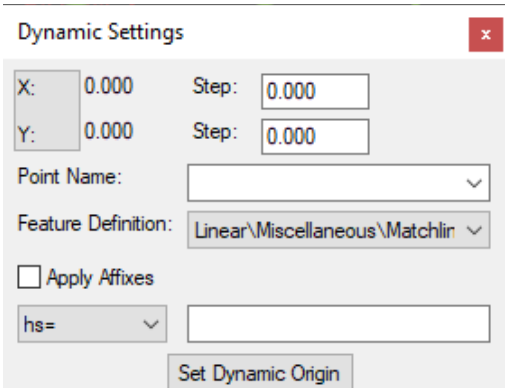


*Figure 25 Dynamic Settings*

Hold down the right mouse button in the cross section view to access the pop-up menu shown at right. Five additional commands relevant to cross sections are available. See the online help for additional information.

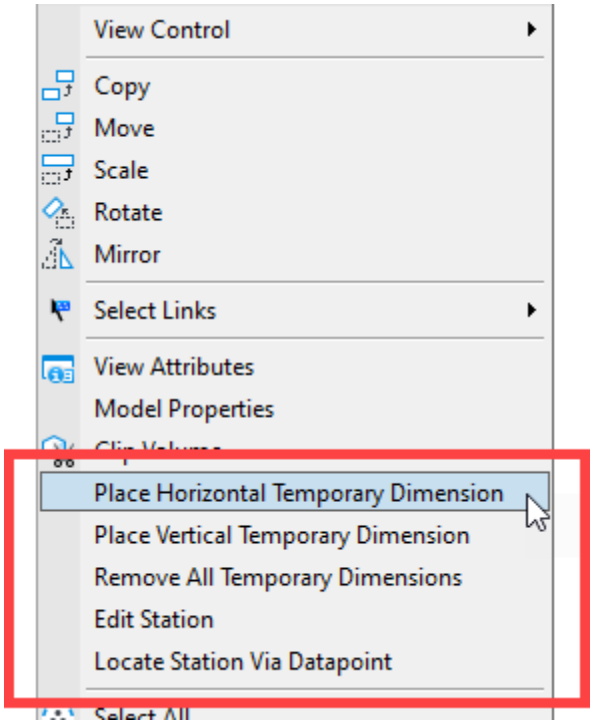


*Figure 26 Place Horizontal Temporary Dimension*

### 2.2.1.3 Reports

The Reports icon provides access to the following four reports:

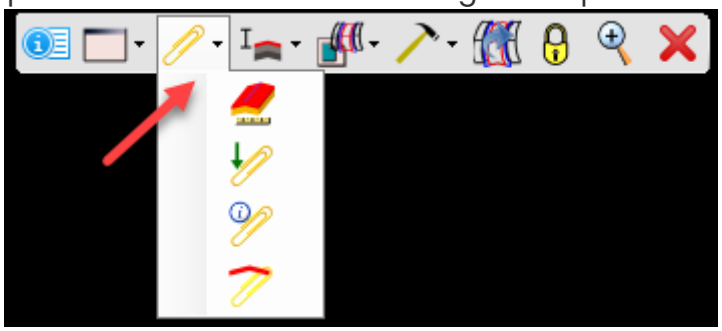

*Figure 27 Report Tool*

- Corridor Component Quantities
- Design Input Report
- Results Report
- Milling Report

The **Corridor Component Quantities** report is used to generate a quick cost estimate for the selected corridor by assigning a unit cost for each component in the corridor templates.

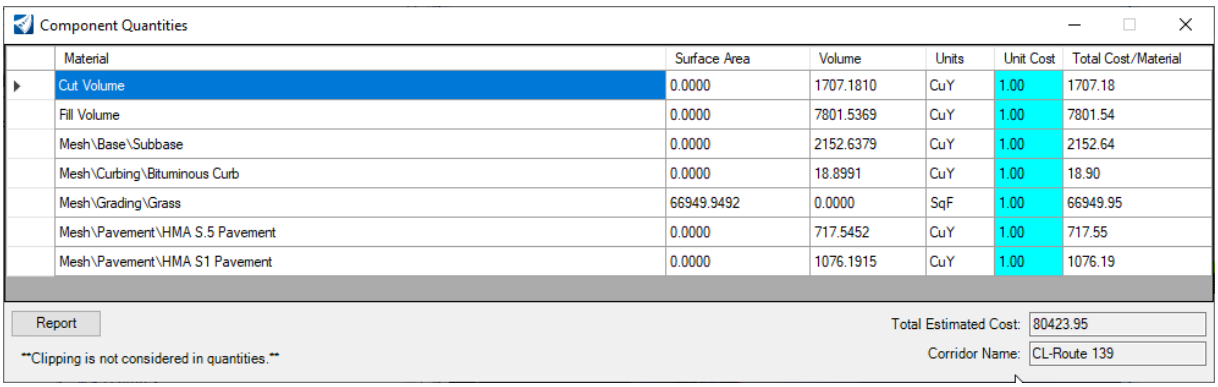


*Figure 28 Corridor Component Quantities*

#### 2.2.1.4 Corridor Overlay

The **Corridor Overlay Vertical Adjustment** command determines the ideal PGL point based on the input criteria and the distance from the top of the template to the existing ground. See the online help for additional information.

*Figure 29 Corridor Overlay Vertical Adjustment*

#### 2.2.1.5 Corridor References

The following four **Corridor References** commands are available:

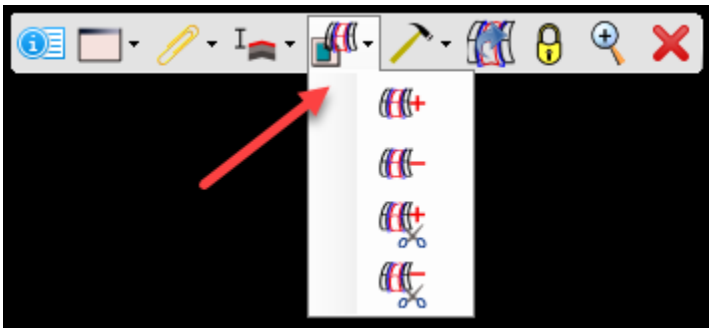

*Figure 30 Corridor References*

**Add Corridor Reference –** This tool is used to add graphical elements to the corridor processing. This must be done when a Feature is targeted in the template definition. This enables the software to process only the identified elements which speeds up processing. For example, if the template targets a right-of-way line, the right-of-way lines must be included as a Corridor Reference for the template to find the lines.

**Remove Corridor Reference –** This tool is used to remove graphical elements from the corridor processing.

**Add Clipping Reference –** This command is used to remove areas of overlap when working with multiple corridors. For example, in a corridor intersected by a crossing roadway, clipping is used to remove overlapping features within the intersection.

**Remove Clipping Reference –** This tool is used to remove any clipping references defied for a corridor.

### 2.2.1.6 Corridor Creation Tools

The Corridor Creation Tools menu contains commonly used corridor commands.

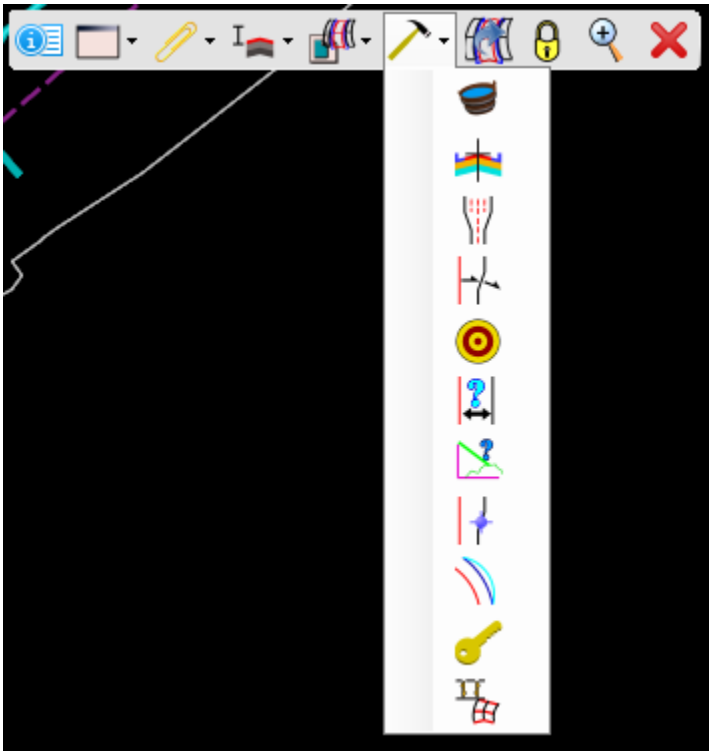

*Figure 31 Corridor Commands Tools*

**Corridor Objects –** This option is a one-stop shop to view, create, and edit corridor objects. Most of the options contained in the Corridor Creation Tools can be accessed from this dialog as shown below.

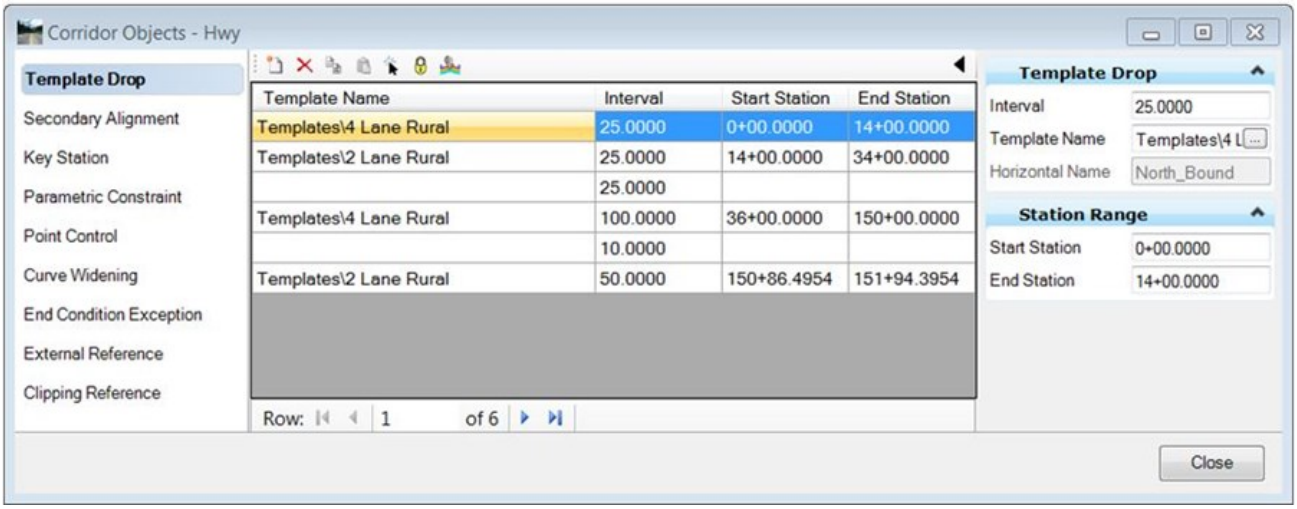


*Figure 32 Corridor Objects*

**Create Template Drop -** This tool is used to create a new template drop location on the corridor.

**Create Transition -** A transition is created between templates of different names, as templates generally don't instantaneously change from one template to another. This tool creates the transition by selecting the two templates drops which are adjacent to it. Once the transition location is created, it is up the user to define how the transition is applied. See the online help for more information.

**Create Secondary Alignment -** Secondary alignments are used to modify the direction of cross section processing. By default, at any given station, the cross section is created orthogonal to the main alignment. If a secondary alignment exists, then that portion of the cross section which lies outside the secondary alignment will be orthogonal to the secondary alignment instead of the main alignment. See the online help for more information.

**Define Target Aliasing -** Target aliasing allows you to target other corridor surfaces or features or to set up a prioritized target list for end condition solutions on surfaces, features and alignments. See the online help for more information.

**Create Parametric Constraint -** Parametric constraints can be used to change one or more labeled constraint values of a template while the template is being processed in the corridor modeler. See the online help for more information.

**Create End Condition Exception -** End Condition Exceptions are used to modify the behavior of an end condition solution without requiring the use of additional template drops. When an end condition exception is added, it must be edited to change its behavior. End condition exceptions come in two classes:

- **Overrides** allow you to replace or override the template drop end conditions on the left or right of the backbone. When you choose this option, you must edit the override to set up the new end condition. When the override exception is edited, the Create Template dialog is displayed allowing you to edit the end-condition.
- End condition **Transitions** are used where the end condition may change suddenly due to changes in the existing surface or other reasons, and you want the transition to be smooth over a specified station range rather than a sudden change over a short length.

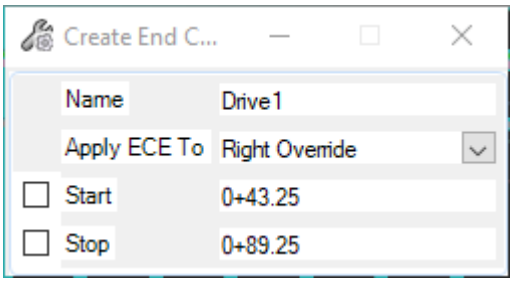


*Figure 33 Transitions*

**Create Point Control –** Point controls are used to override the normal locations of one or more points and or components in a cross section. Examples of this include lane widening, staying within the right-of-way, or maintaining a slope for a ditch.

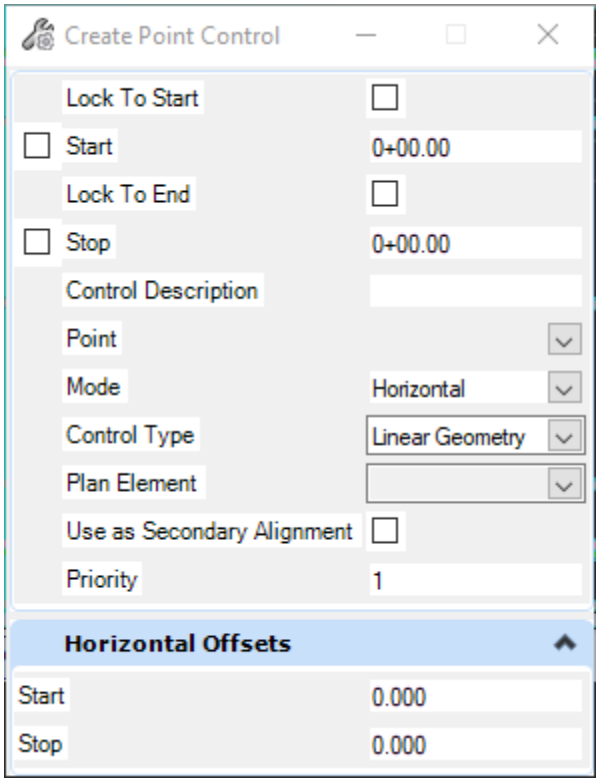


*Figure 34 Create Point Control*

**Create Curve Widening –** Curve widening is used to automatically create and apply horizontal controls to widen lane and/or edge of pavement lines around curves, moving them further away from the centerline at each curve of the controlling alignment. The tool is used in conjunction with an ASCII file (*.wid) which contains parameters to definethe widening. CTDOT does not provide curve widening tables currently. Use point controls to manually assign the station ranges and offsets for curve widening.

**Key Station –** This command is used to add stations that are not coincident to the template interval to the corridor processing. For example, a key station can be added at a drive or culvert location to ensure the template is processed at that station.

**Assign Superelevation to Corridor –** Superelevation is covered in another section of this training.

The last four tools on the bar are described below:

*Figure 35 Corridor Editing Tools*

**Process Corridor -** Select this icon to reprocess the corridor.

**Lock - Deactivate Rule -** This command can be used to temporarily deactivate processing rules on the corridor. This is useful when making edits so that the corridor does not automatically update as the edits are made. Once the edits have been completed, the rules can be turned back on, and the corridor reprocessed.

**Zoom To -** Select the command to zoom to the full extents of the corridor.

**Delete -** Select this command to delete the corridor.

#### *2.2.1.7 Processing Order for Point Overrides*

There are several ways in the corridor processing to override the template definition for various constraints using Parametric Constraints, Point Controls, and Horizontal Feature Constraints.

This is generally the order in which OpenRoads solves the location of points and components at each template drop:

1. Template is dropped, and points are placed according to the point constraints stored in the template.
2. Parametric constraints are applied as defined in the template, and in the corridor.
3. Horizontal Feature constraints are applied to move points if the feature is found in the specified range.
4. Point controls are applied to the assigned points, overriding the corresponding constraint, and all points that are constrained back to the point-controlled point will be recalculated.
5. Component display rules are solved based on the current position of all points.
6. End conditions are solved by extending designated segments along the specified slope to seek their targets.

# 2.3 Template Drops

## 2.3.1 Create Template Drop

The Create Template Drop tool is used to define what the cross sections of the roadway look like for that portion of the road based on user-defined station range.

You can access this tool from the following: **Ribbon: Corridors > Create > New Template Drop**

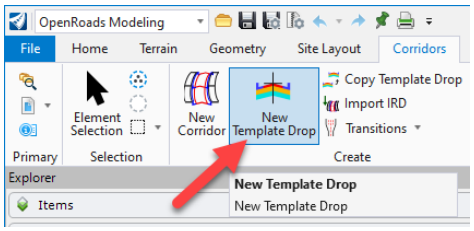


*Figure 36 Create Template Drop*

The Create Template Drop tool defines what the cross sections of the roadway look like for that portion of the road based on user-defined station range. A project may comprise a single template drop or multiple template drops. Often, transitions are used between two template drops, rather than an abrupt change from one template to another.

Before selecting the New Template Drop tool make sure the desired Template Library is connected, browse to select the needed library if it is not opened and close the Create Template Dialog box.

After selecting the New Template Tool, follow the prompts to select the wanted Corridor. The Select Template pop-up will appear, follow the prompts to select the needed roadway template.


*Figure 37 Selected Template Name*

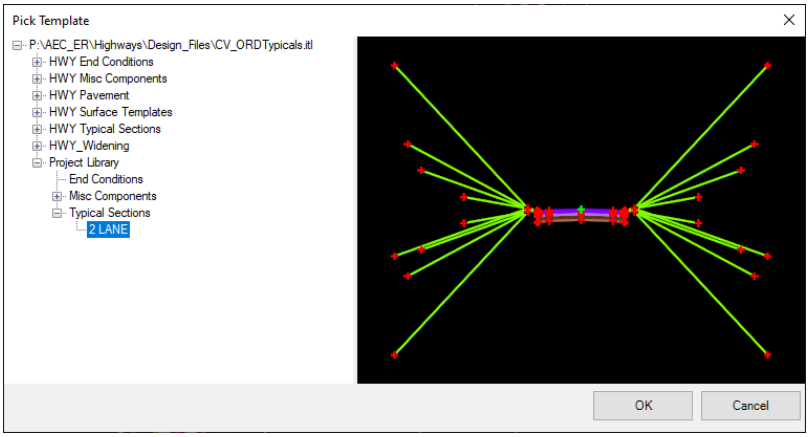


*Figure 38 Pick Template*

Careful consideration should be given for the Drop Interval used for a corridor, although it can be changed at any time. It specifies the distance between each processing of the template (in master units). Generally, this value is equal to or less than (but still a multiple) of the desired interval for the final cross sections, since cross section stations should be coincident with processing stations. It is not necessary to set the interval so small that it encompasses all desired cross section stations, as stations with particular project interest can be added to the model with the use of the Key Station tool. If the model is to be used in construction, the smaller the interval, the more detailed the model, but will require more processing time.

Minimum Transition Before Drop and Minimum Transition After Drop are inputs in the Create Template Drop tool. If they are non-zero, then a transition drop is created at the beginning/end of the template drop with a length greater than or equal to the value entered. The actual length is determined by how far it is between the new drop and the drop before/after the new drop. If there isn't enough space to meet the minimum, then the previous/next drop is shortened to accommodate the transition. If there is no previous/next drop, then no transition drop is created.

After completing the prompts, the corridor is automatically processed and can be viewed in both 2D and 3D views. The corridor can be rendered, if desired.

### 2.3.2 Edit the Template Range

When the template range graphic is selected, the range can be edited by accessing rule that defines the template drop location.

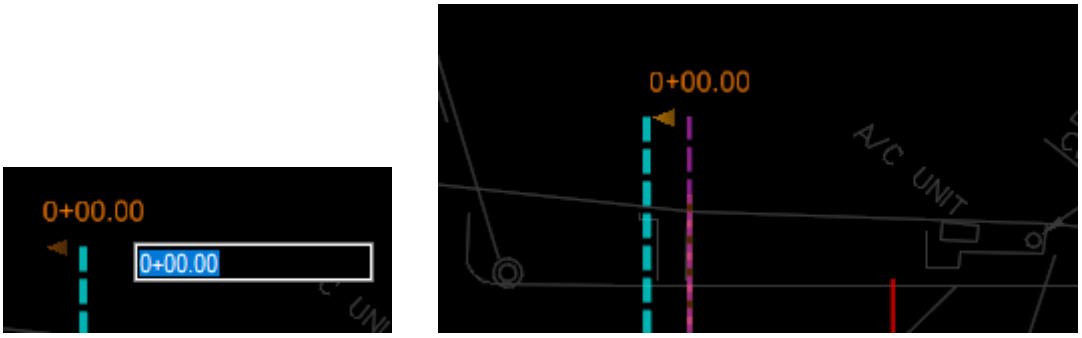


*Figure 39 Edit the Template Range*

The template range can be edited by selecting the station and editing the value of by selecting the arrow icon to dynamically mode the start (or end) of the template range.

### 2.3.3 Template Drop Context Menu

Select the template range graphic and let the cursor rest on the element to access the pop-up menu shown below.

*Figure 40 Template Drop Context Menu*

The following commands are available:

- Properties
- Edit Template Drop
- Copy Template Drop
- Synchronize with Library
- Delete

#### 2.3.3.1 Properties

Pop-up display includes access to modify the Interval, Template Name, Description and Station range.

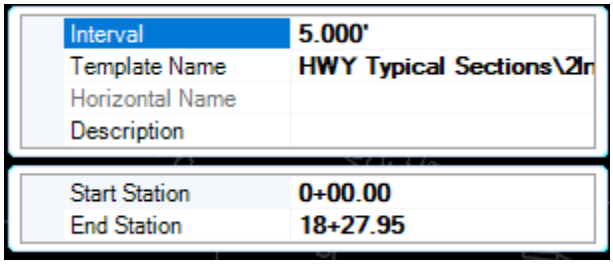


*Figure 41 Properties*

#### 2.3.3.2 Edit Template Drop

When a template is applied to generate the corridor, the template definition is copied into the design file. The template definition can be edited in the design file, independent of the definition that is stored in the template library .itl file. Use this command to edit the template definition as applied to the corridor, not the template as defined in the library.

> ***Note:*** *When the command is selected, the* Editing Roadway Designer Template Drop *dialog is opened. This tool is useful when you wish to make local changes to the corridor without editing the template library definition. For consistency, CTDOT recommends making all changes to the template library and then using the* ***Synchronize with Library*** *command to apply the changes made in the library to the corridor model.*

#### 2.3.3.3 Copy Template Drop

This tool is used to copy a template drop to a new station range along the alignment by defining the beginning and ending station for the new template drop range.

#### 2.3.3.4 Synchronize with Library

Select this tool to synchronize the local copy of the template that has been applied to the corridor with any changes that have been made to the template in the library .itl file.

> ***Note:*** *Synchronizing the template with the library will override and changes that may have been made to the corridor's template definition by using the* ***Edit Template Drop*** *command. For consistency, CTDOT recommends making changes to the template library and using the Synchronize with Library command to apply template changes to the corridor.*

#### 2.3.3.5 Delete

Deletes the template drop.

### 2.3.4 Create Corridor and Apply Template Drop

**Corridors** represents one or more Templates being dropped along 3D Baseline to create a 3D Model. This module will instruct to Creating Corridor and Applying Template Drops.

If not already open, Open the previously created project Corridor Model file,

HW_CB_1234_1234_RoadwayModel.dgn and Load the Template Library for the project.

Activate the **OpenRoads Modeling** workflow from the pick list next to Quick access toolbar in the upper left corner if it is not already active. The ribbon menu will reflect the **OpenRoads Modeling** tools.

1. From the ribbon, select **Corridors** Tab.
2. From the **Create** Group Select **New Corridor**.

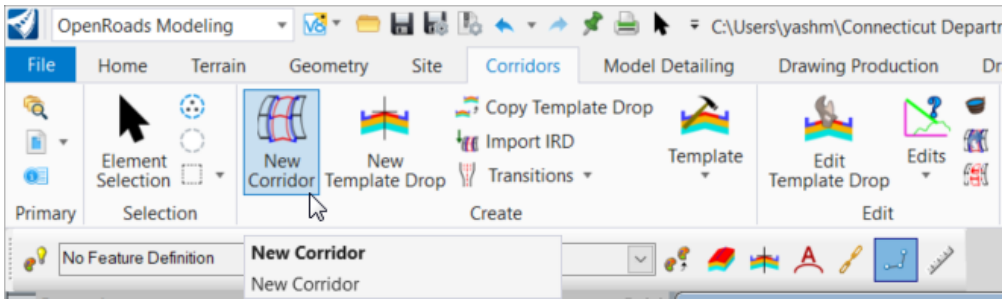


*Figure 42 New Corridor*

3. Create Corridor dialog will open.
   a. Select **Feature Definition > Final** (user can choose desired featured definition from the list)

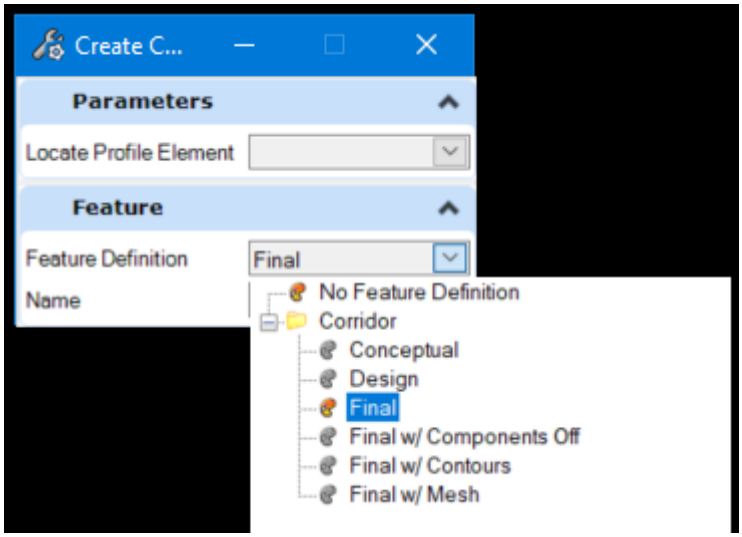


*Figure 43 Corridor Feature Definition*

   b. Follow the prompts:
   c. ***Locate Corridor Baseline***, select the **Horizontal Alignment** (The program will automatically generate or pick up the name of the selected alignment i.e. ***RTE1***)

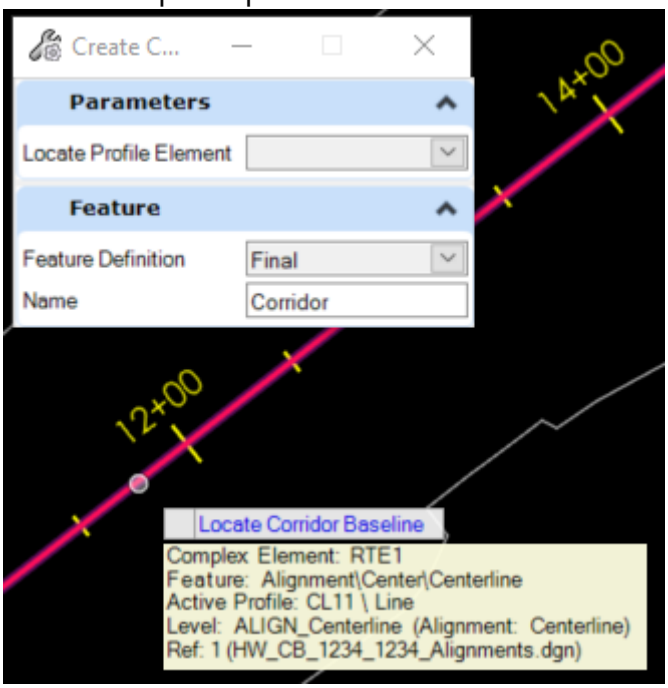


*Figure 44 Locate Corridor Baseline*

d. ***Locate Profile-Reset For Active Profile***, **right-click** to accept the Active profile associated with the Horizontal Alignment.

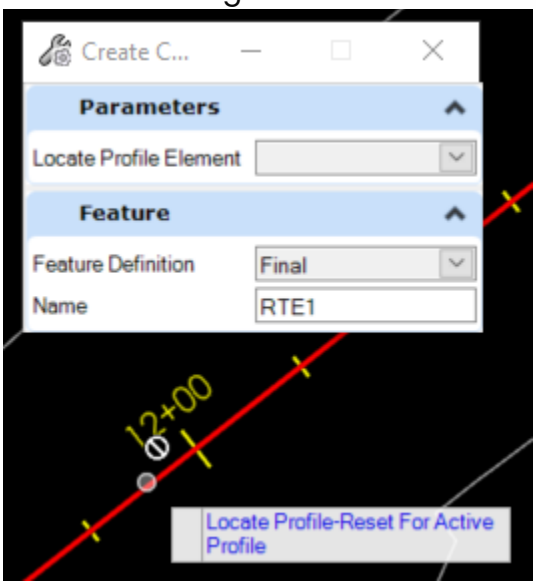


*Figure 45 Locate Profile-Reset For Active Profile*

e. ***Corridor Name> Feature: Name,*** **left-click** to accept the Active name ***RTE1*** or rename as desired then accept to create Corridor.

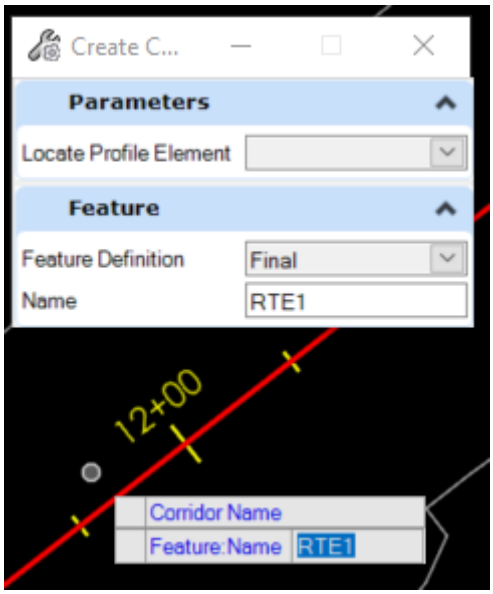


*Figure 46 Corridor Feature: Name*

f. Closed shape called **Corridor Object** is drawn along the alignment in 2D view.

g. Create Template Drop dialog will appear (skip to ***next Step***)

- If the Create Template Drop do not appear, it denotes that user have exited from the command and the plan will be like below.

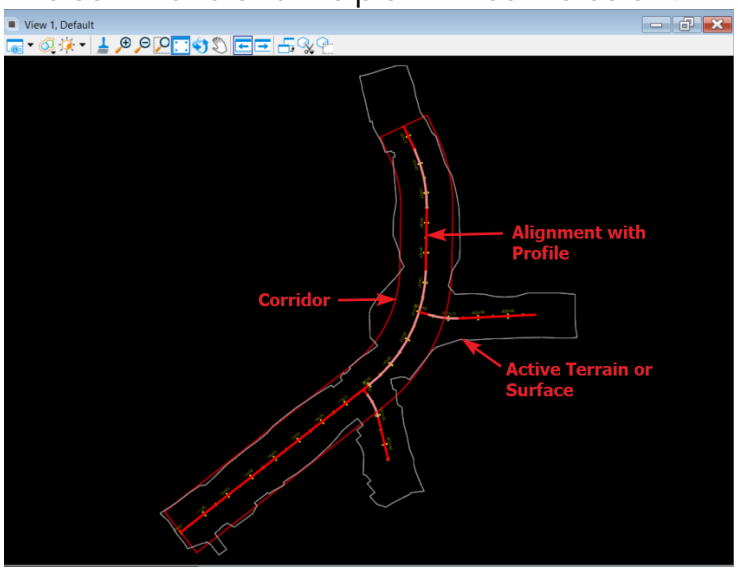


*Figure 47 No Template Drop Created*

- Corridor is created but there is no template applied to it. In order to apply the template(s) to the newly created corridor at a defined interval along the alignment, From **Corridors** Tab Ribbon then From the **Create** Group Select **New Template Drop**.

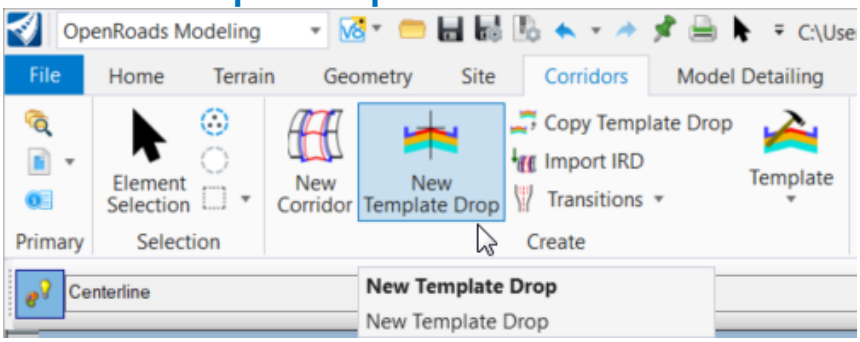


*Figure 48 New Template Drop*

- On ***Locate Corridor*** prompt, select the newly created corridor then follow the next steps below.

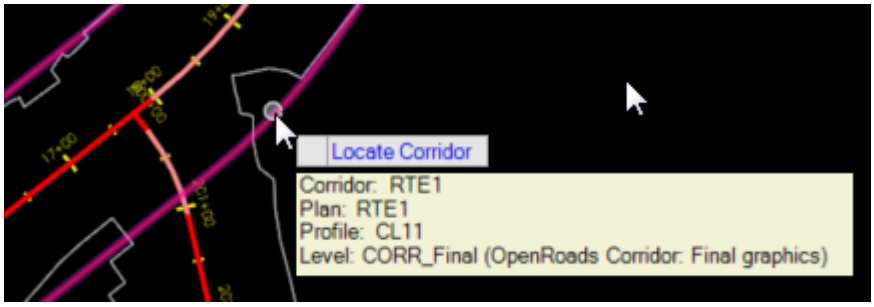


*Figure 49 Locate Corridor*

4. Follow prompts after **Create Template Drop** dialog opens.

a. Click the **browse** button next to Template label to open Template library or **click** the **Alt** and **Down** to open Template library.

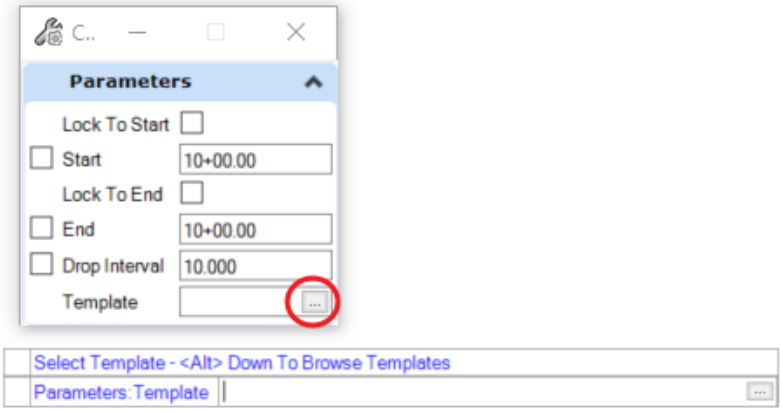


*Figure 50 Select Template*

b. This opens the Pick Template dialog. Select the desired template prepared for the project and review. For this example, choose ***HWY Typical Sections > 2ln_HMA_BCPC*** and click **OK**.

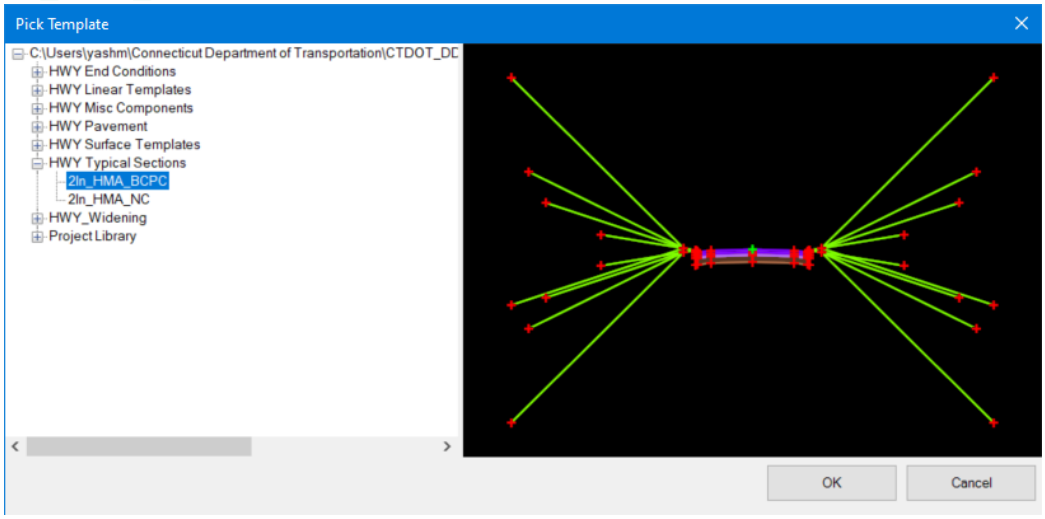


*Figure 51 Pick Template*

- **Template -** ***HWY Typical Sections > 2ln_HMA_BCPC***, **left-click** to accept the ***2ln_HMA_BCPC.***
- **Parameters: Start -** ***10+00*** (**Click** Alt to Lock to Start or type specific Station), **left-click** to accept .
- **Parameters: End -** ***27+36.69*** (**Click** Alt to Lock to End or type specific Station), **left-click** to accept.
- **Parameters: Drop Interval -** ***10*** (as desired), **left-click** to accept.
- **right-click** to exit command. New corridor with template drops associated with it is created.

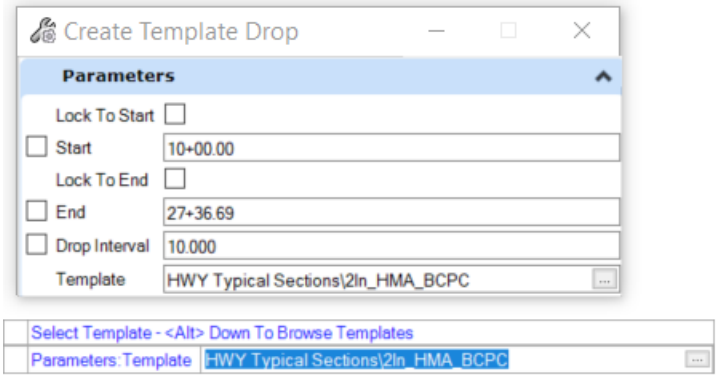


*Figure 52*

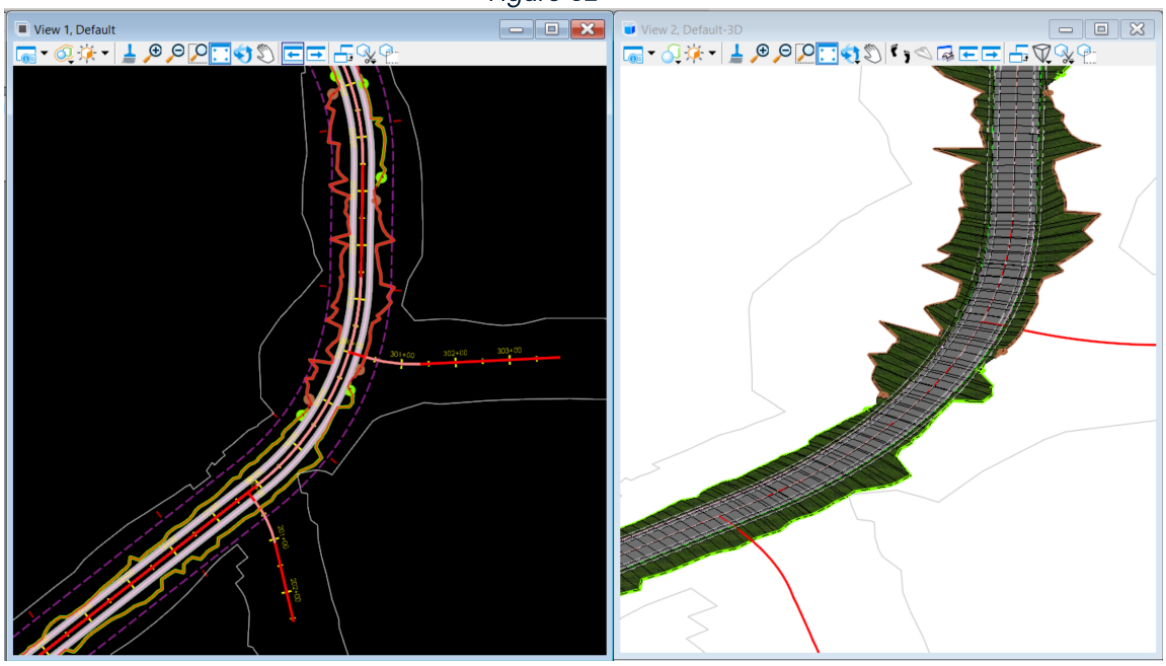


*Figure 53 2D and 3D Views*

9. Additional corridors can be created for the side roads following the steps described above.

## 2.3.5 Display Dynamic Cross Sections

Once Corridor is created, the cross sections can be created directly from the 3D Model and can be viewed with Dynamic Cross Sections tool. The interval of cross sections is based on the template drop interval. Dynamic Cross Sections are always created perpendicular to the alignment of the Corridor used.

1. Activate the **OpenRoads Modeling** workflow from the pick list next to Quick access toolbar in the upper left corner if it is not already active. From the ribbon, select **Corridors** Tab.

   From the **Review** Group Select ***Dynamic Sections*** **> Open Cross Section View.**

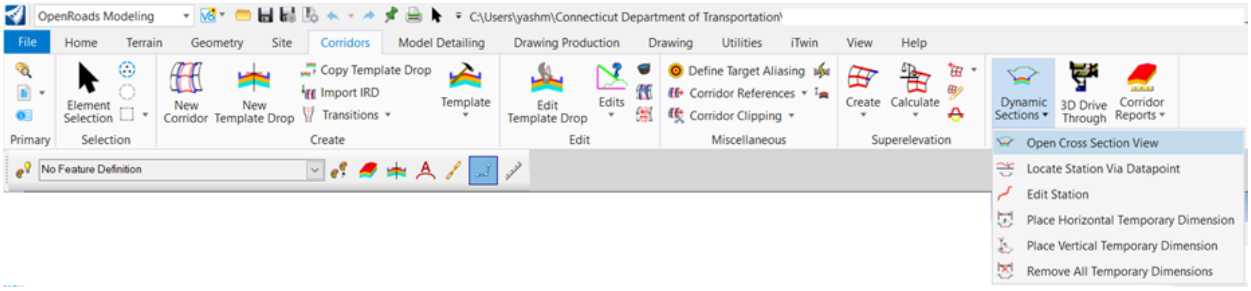


*Figure 54 Corridors Tab*

2. Follow the prompts.
   a. **Locate Corridor or Alignment:** Select ***RTE1*** Corridor.
   b. **Select or Open view:** **Open View 4** by selecting the view 4 button from the bottom of the screen.
   c. Click inside **View 4** window, a cross section will appear.

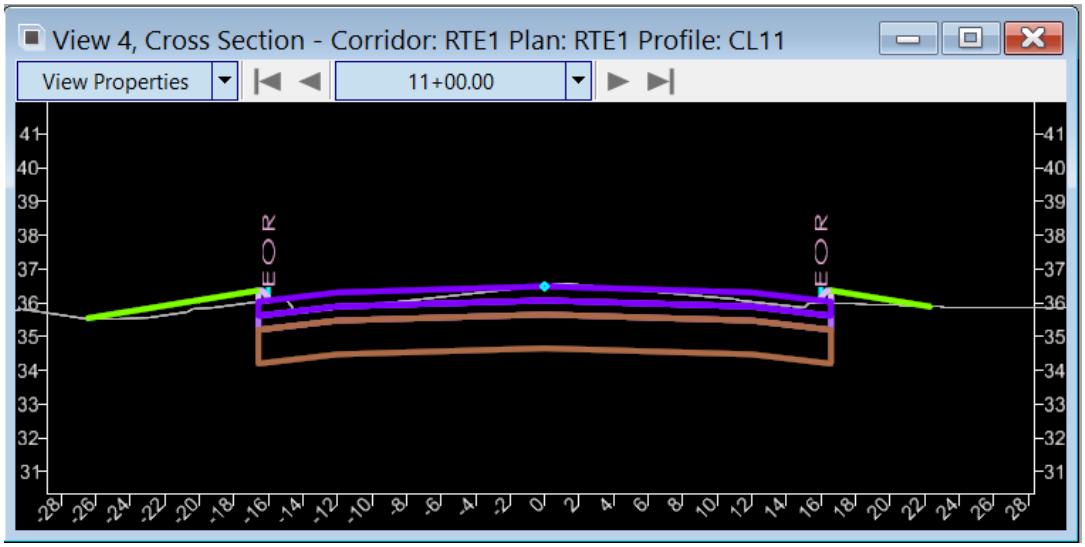


*Figure 55 Cross Section Viewer*

d. In the upper left portion of window, select the drop-down arrow next to ***View Properties.*** Here the view properties of the Cross Section view can be changed as needed.

e. User can press single left or right arrow to move to the previous or next cross section, respectively.

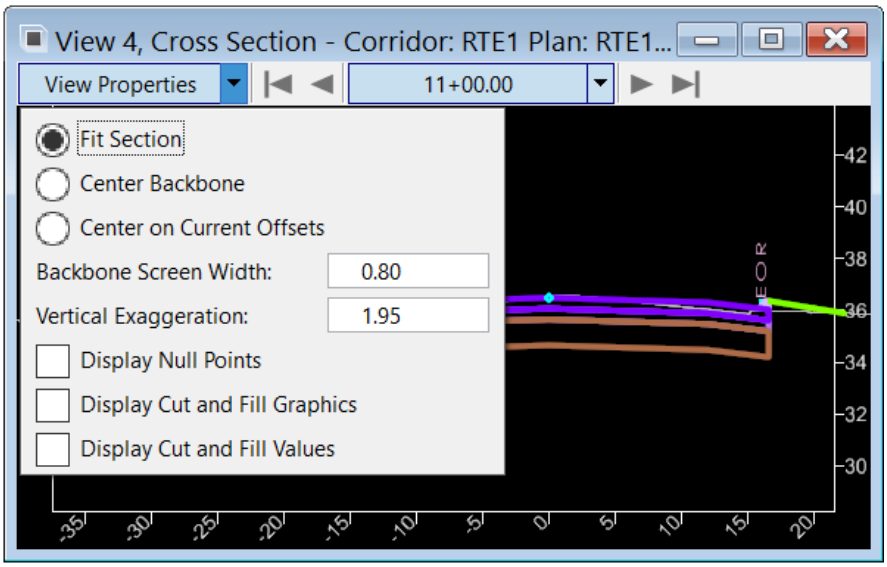


*Figure 56 Cross Section Viewer Set View Properties*

## 2.3.6 Modify Corridor

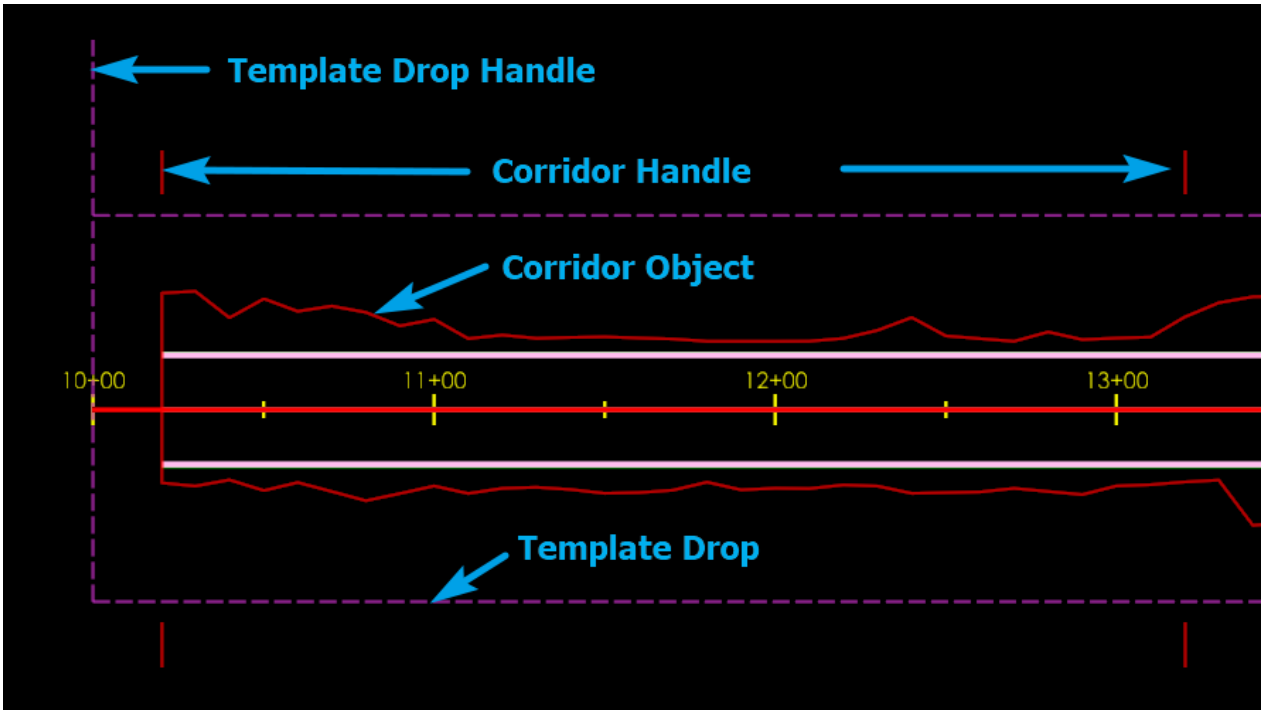


*Figure 57 Corridor Handles and Objects*

## 2.3.7 Copy and Replace Template Drop

This module instructs users how to copy and edit or replace existing Template in design file.

1. Load **Corridor (Roadway Model) file** and Load the **Template Library** for the project.
2. Activate the **OpenRoads Modeling** workflow from the pick list next to Quick access toolbar in the upper left corner if it is not already active. The ribbon menu will reflect the OpenRoads Modeling tools.
3. The Corridor file contains corridor ***RTE1*** with template drop ***2ln_HMA_BCPC*** from Sta. 10+00 to Sta. 16+00. When the Template Drop Range of ***Template Drop*** graphic is selected, range can be edited as needed. The range can also be edited form the properties window by changing ***Start*** and ***End Station***.
4. Copy ***Template Drop***. Select ***2ln_HMA_BCPC*** Template Drop and let the cursor ***rest*** on the element to access the context sensitive pop-up menu. Select **Copy Template Drop**.

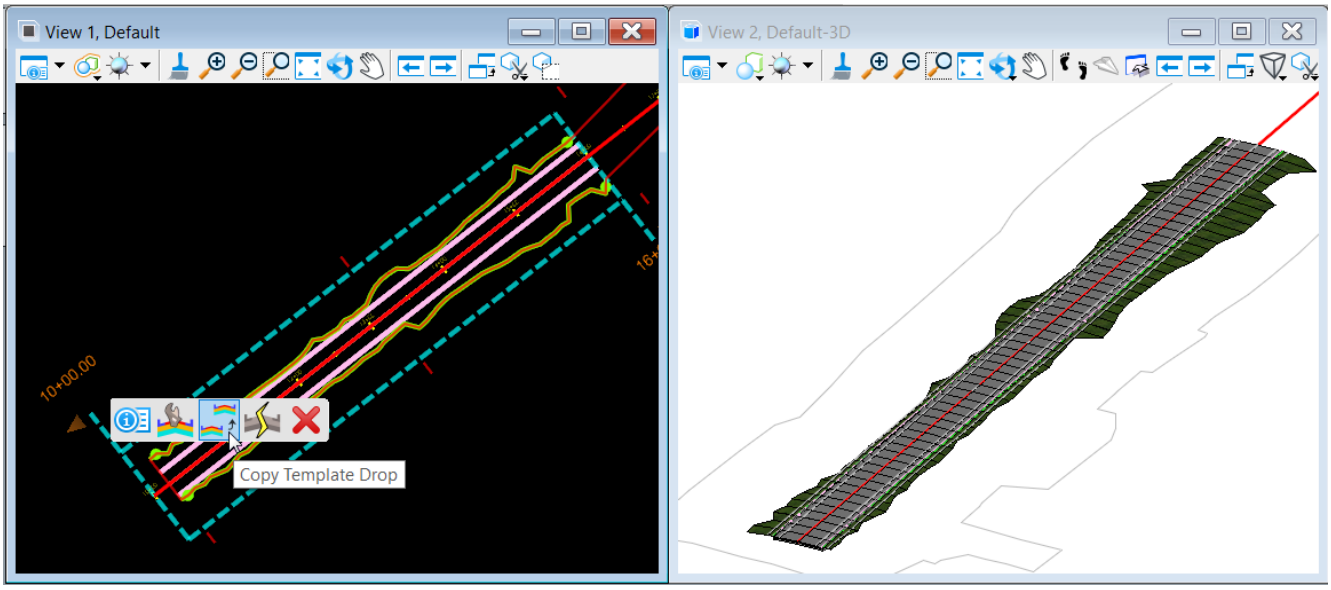


*Figure 58 Copy and Replace Template Drop*

Follow the prompts.m***Locate Corridor:*** Select ***RTE1*** Corridor.

- **Start Station:** ***13+00***, **left-click** to accept.
- **End Station:** ***16+00*** (**Click** Alt to Lock to End or type specific Station), **left-click** to accept.
- Corridor processes with new Template Drop.

5. Change or swap newly copied Template Drop. Replace template ***2ln_HMA_BCPC*** with template ***2ln_PS5_Curb_SW_Both.***
   a. Select ***2ln_HMA_BCPC*** Template Drop and let the cursor ***rest*** on the element to access the context sensitive pop-up menu. Select **Properties**.

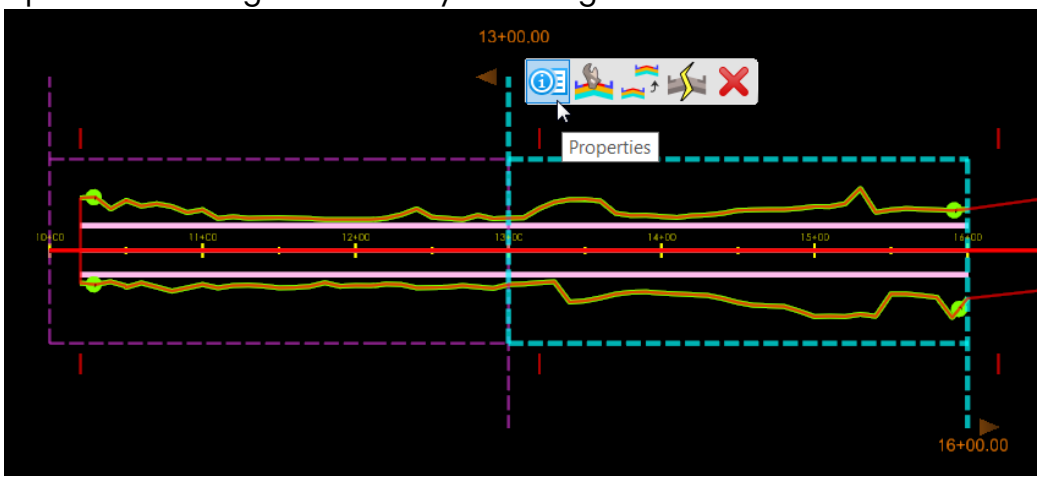


*Figure 59 Properites*

b. Click the **Browse** button in the right side of the ***Template Name*** label. This opens the Pick Template dialog.

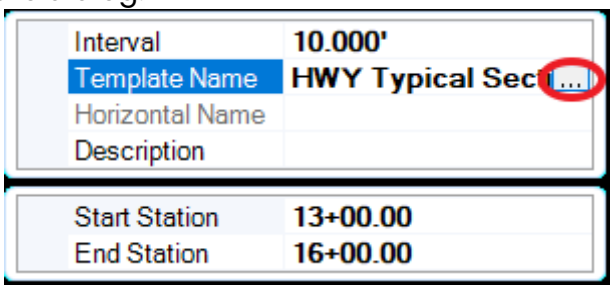


*Figure 60 Browse to Select Template*

c. Select the desired template prepared for the project and review. For this example, choose ***2ln_PS5_Curb_SW_Both*** (roadway with curb and sidewalk at both sides) and Click **OK**.

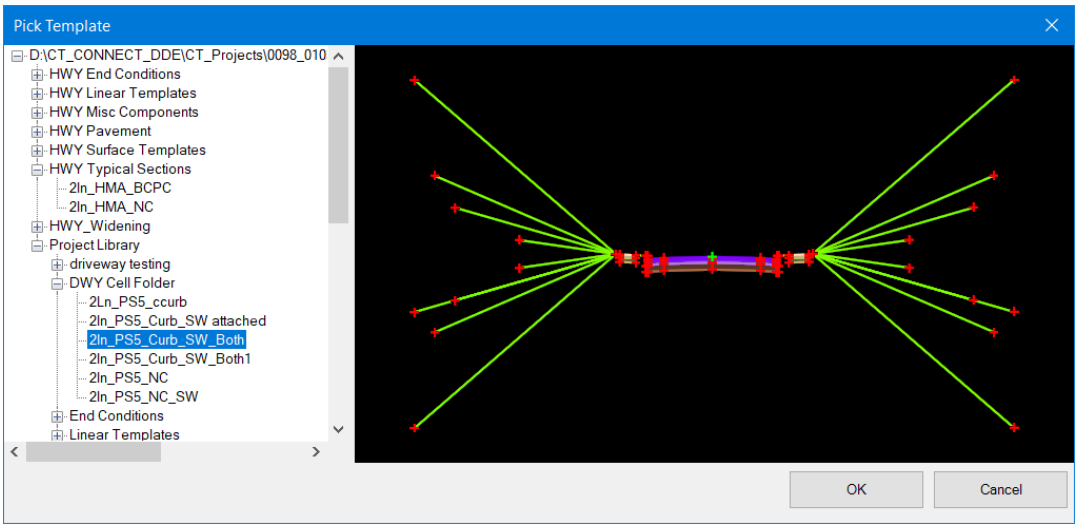


*Figure 61 Select Template*

d. The Corridor processes with new Template Drop. Notice the change in 3D view.

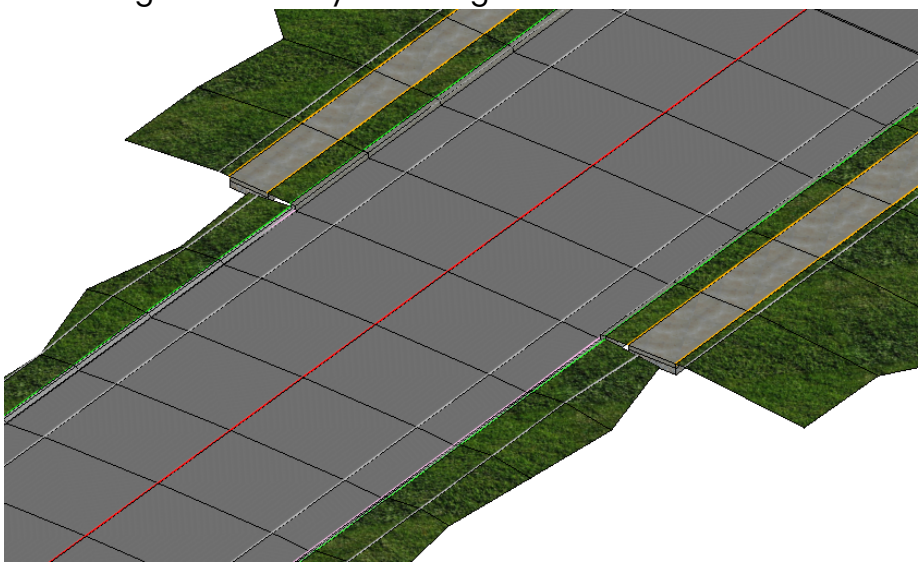

*Figure 62 3D Model*

### 2.3.8 Add Corridor Objects

Corridor Objects dialog is a summary of all corridor modeling objects and used to manage data. Clicking on the various categories located on the left side of the dialog displays the appropriate data in the center section. These data may be edited as needed, either from center section or from right side of the dialog.

1. Select **Corridor Handles** of ***RTE1*** Corridor and let the cursor ***rest*** on the element to access the context sensitive pop-up menu. Select **Corridor Creation Tools > Corridor Objects**.

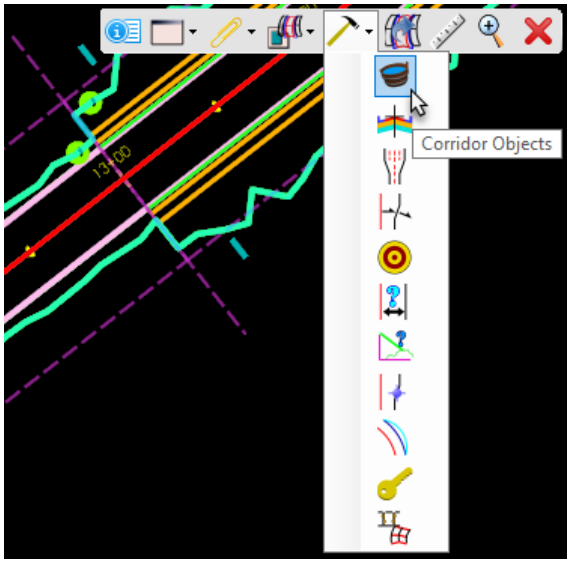


*Figure 63 Corridor Objects Tools*

2. Corridor Objects Window opens. In this window user can define or edit various categories. Select **Template Drop**, notice two Template Drop is applied to the ***RTE1*** Corridor. Here Template Drop can be replaced or the station can be edited easily.

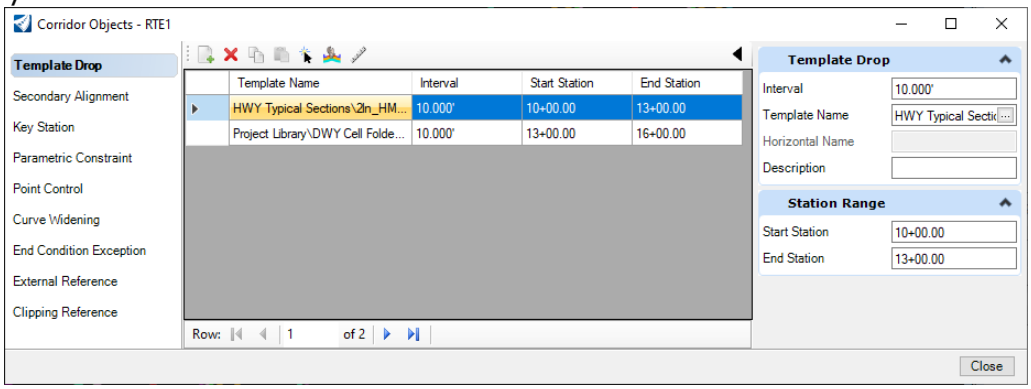


*Figure 64 Corridor Objects Dialog Box*

## 2.3.9 Create Parametric Constraint

Create Parametric Constraints tool allow user to override template point constraint values. The Create Parametric Constraints tool gives users the ability to vary pavement thickness, curb height, ditch widths, slopes, etc between any station range along a corridor. This module will show to override the subgrade depth of roadway structure from 1 foot to 6 inches using Create Parametric Constraints tool

1. Modify subgrade depth in a ***Template Drop*** named ***2ln_HMA_BCPC***
   a. The constraint labels are created and assigned to template point(s). Looking into ***2ln_HMA_BCPC*** Template Drop, Bottom of the subgrade layer has ***Constraint Label*** named as **Subgrade_Depth** under ***Vertical Type Constraint***. Here points BOC_sg, EOR_sg, SHDR_sg and CL_sg are all assigned **Subgrade_Depth** label.

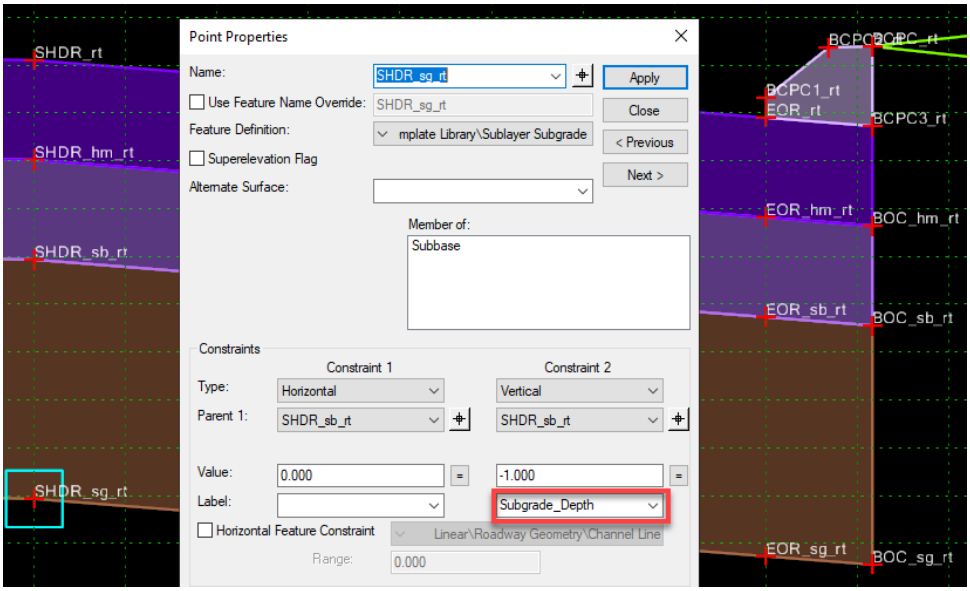


*Figure 65 Point Properties Dialog Box*

b. Select **Corridor Handles** of ***RTE1*** Corridor and let the cursor ***rest*** on the element to access the context sensitive pop-up menu. Select **Corridor Creation Tools > Create Parametric Constraint**.

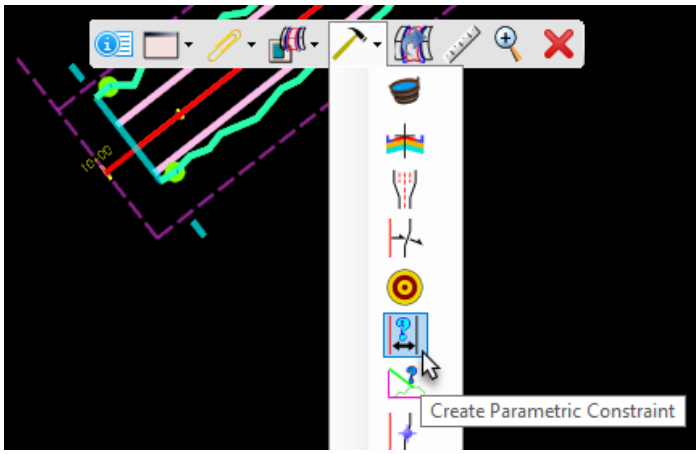


*Figure 66 Create Parametric Constraint*

c. **Create Parametric Constraint** window will appear. Follow the prompts.

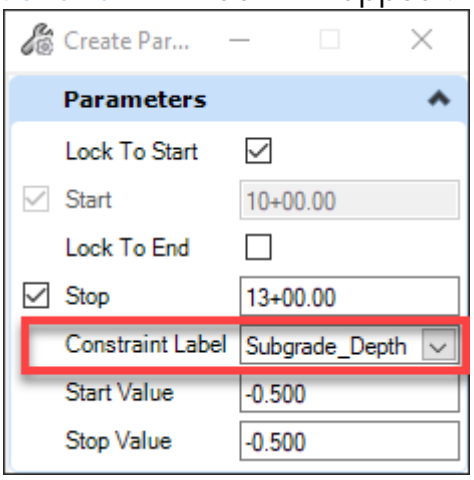


*Figure 67 Create Parametric Constraint Parameters*

- **Start Station: 10+00**, (**Click** Alt to Lock to Start or type specific Station), **left-click** to accept.
- **End Station: 13+00** (**Click** Alt to Lock to End or type specific Station), **left-click** to accept.
- **Constraint Label:** In the **Create Parametric Constraints** dialog, press the **down arrow** to display the list of available ***Constraint Labels*** that you can adjust and select **Subgrade_Depth.** Default value for **Subgrade_Depth** is currently set to **-1.000**, **left-click** to accept
- **Start Value: *-0.500,*** , **left-click** to accept.
- **End Value: *-0.500,*** , **left-click** to accept.
- The ***Corridor*** processes with new ***value***. Notice the change in 3D view.

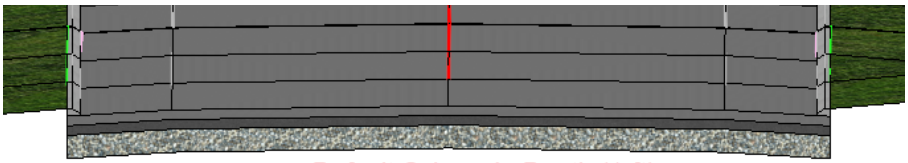


*Figure 68 Original Depth 1 foot*

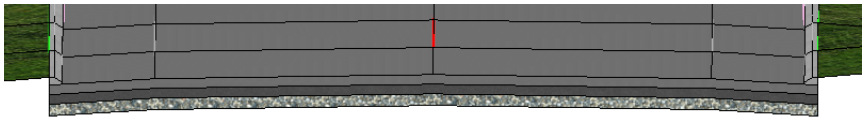


*Figure 69 Updated Depth 6 inches*

d. Review the dynamic cross section there are green boxes that appear along the bottom of the section. The green boxes indicate the locations where the ***Subgrade_Depth*** was adjusted.

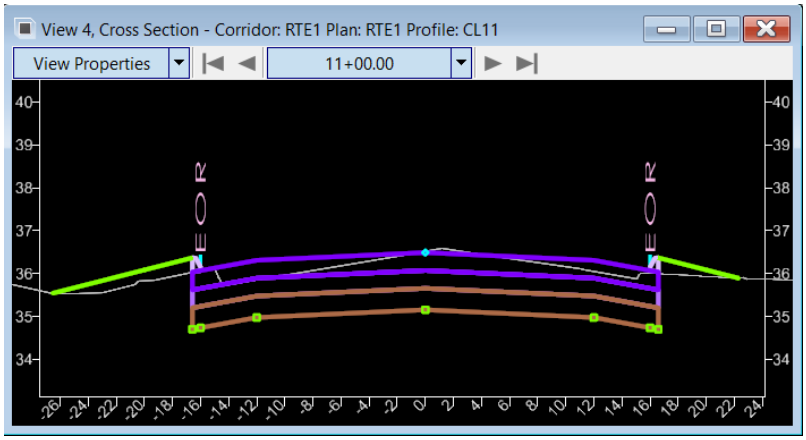


*Figure 70 Cross Section Viewer Updated Depth*

e. Review the ***Parametric Constraint*** with ***Corridor Objects*** tool.

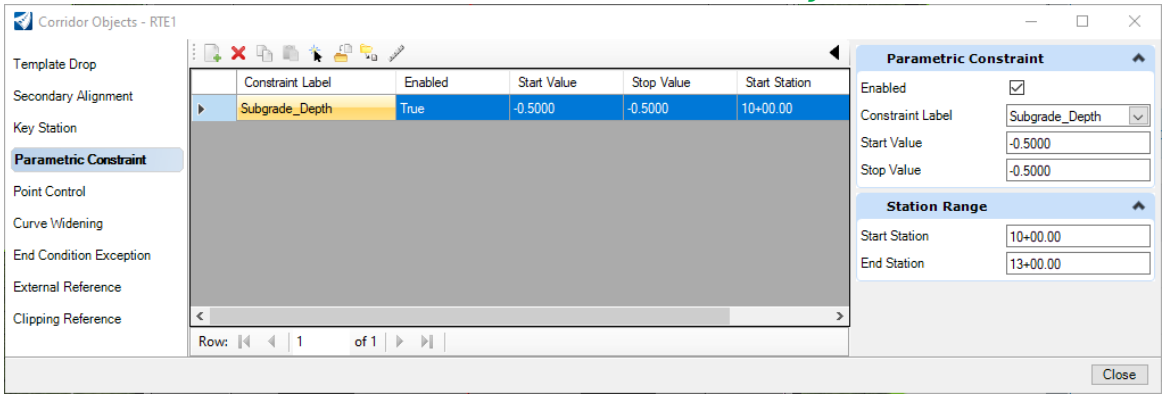


*Figure 71 Parametric Constraint Dialog Box*

If at any time user need to modify the values user can do it here.

## 2.3.10 Create Point Control

Create Point Control tool allow user to assign Point Control to Corridor which forces the cross-section template point to follow other information than what is set in the template. Point controls override the default location of template points. In this module user will create point controls for the right edge of road point: EOR_rt in 2ln_HMA_BCPC Template drop. Using Create Point Control tool shoulder will be tapered from 1 foot to 4 feet.

1. The Corridor file contains corridor ***RTE1*** with template drop ***2ln_HMA_BCPC*** from Sta 11+00 to Sta. 15+00.
2. ***New EOR_rt*** geometric element is drawn from Sta. 11+00 to Sta. 11+50 making shoulder width 1 foot and 4 feet, respectively.

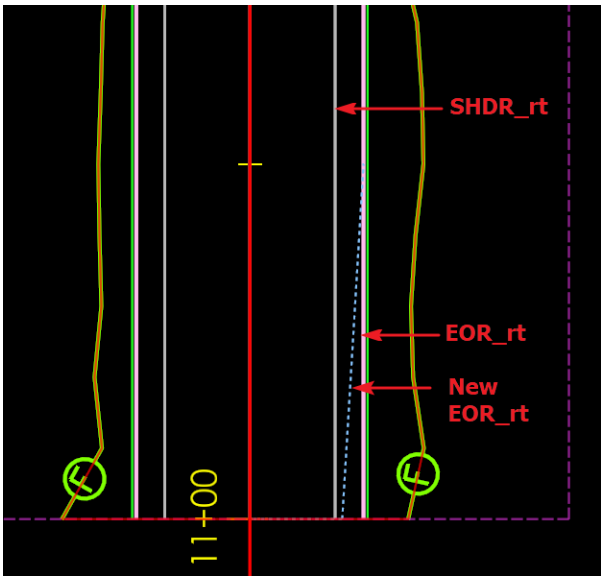


*Figure 72 2D View Liner Feature Names*

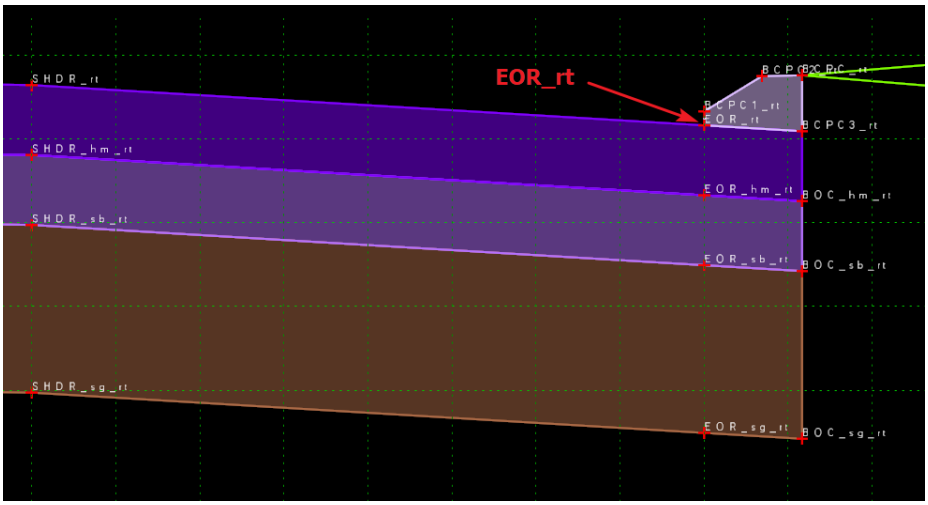


*Figure 73 Cross Section Point Feature Names*

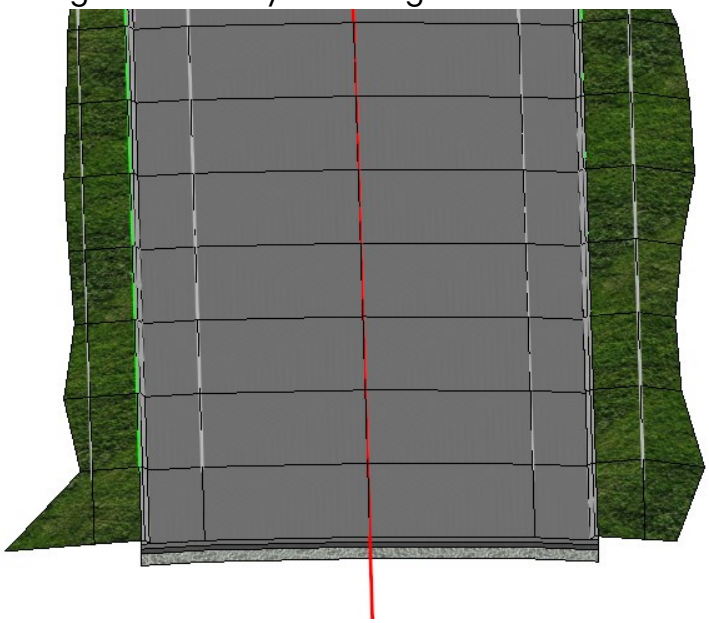

*Figure 74 3D View*

3. Create point control for point ***EOR_rt*** to follow the ***New EOR_rt*** geometric element
    1. Select **Corridor Handles** of ***RTE1*** Corridor and let the cursor ***rest*** on the element to access the context sensitive pop-up menu. Select **Corridor Creation Tools > Create Point Control**.

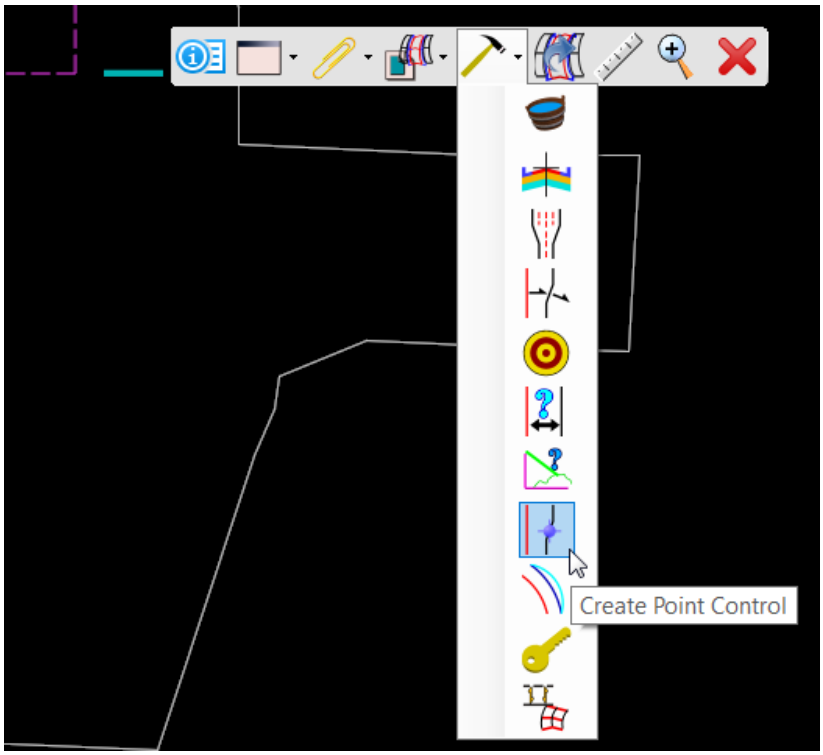


*Figure 75 Create Point Control*

b. Create Point Control window will appear. Follow the prompts (after each prompt, **left-click** to accept values and move to next prompt):

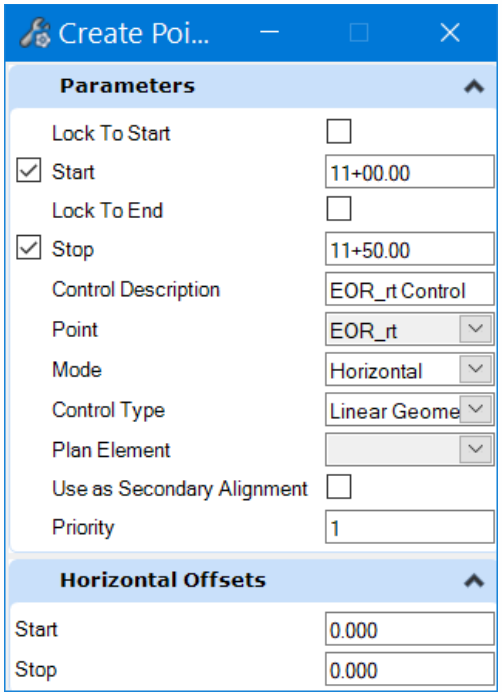


*Figure 76 Create Point Control*

- **Start Station:** ***11+00***
- **End Station:** ***11+50***
- **Control Description:** ***EOR_rt Control*** (name as needed)
- **Locate Point:** ***EOR_rt*** (Select EOR_rt element in View 1 or from cross section view)
- **Mode:** ***Horizontal***
- **Control Type:** ***Linear Geometry***
- **Locate Plan or Profile Element:** ***Select New EOR_rt*** geometric element (dashed blue line)
- **Use as Secondary Alignment:** ***Yes***
- **Priority:** ***1***
- **Start Offset:** ***0.000***
- **Stop Offset:** ***0.000***
- The *Corridor* processes and updates as per the point control.

c. Review point control in plan view, cross section view and 3D view.

- In plan view notice that ***EOR_rt*** linear feature now follows the New EOR_rt geometric element (blue cyan line).

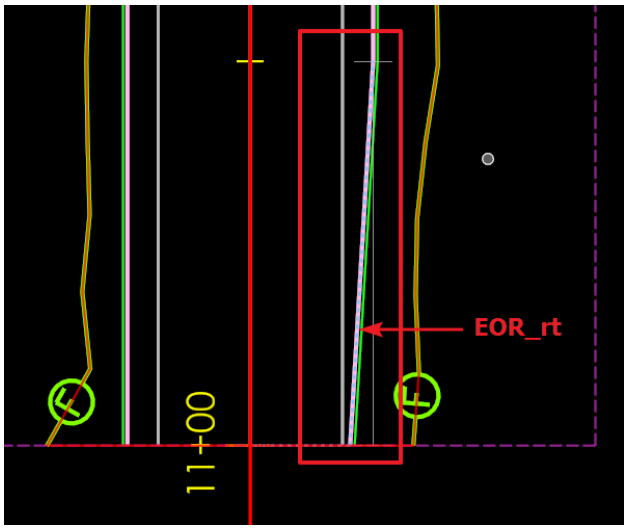


*Figure 77 2D View Right Edge of Road*

- In cross section view notice there is magenta box at ***EOR_rt*** point. This indicates that there is a point control to this point.

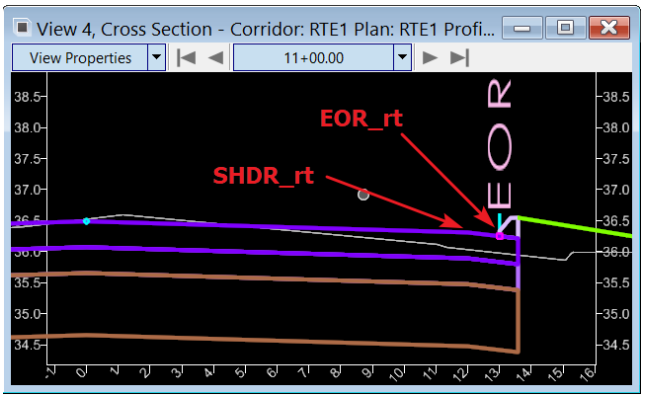


*Figure 78 Cross Section View Point names*

- Review 3D view, Right Edge of Road is tapered.

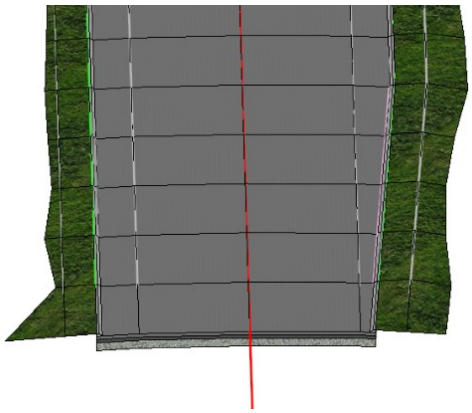

*Figure 79 3D View*

d. Review the **Point Control** with the **Corridor Objects** tool.

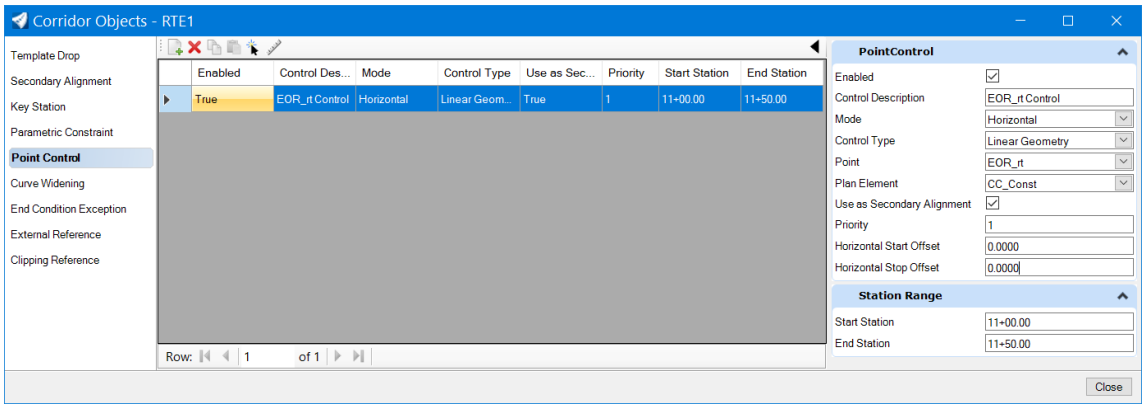


*Figure 80 Corridor Objects Dialog Box*

# Exercise 3 – Applying Superelevation

The Superelevation tools calculate the amount of cross slope or "bank" that should be provided on a horizontal curve to counterbalance, in combination with side friction, the centrifugal force of a vehicle traversing the curve. These tools also compute the superelevation transition length which is the distance required to transition the roadway from a normal crown section to full superelevation. The superelevation transition length is the sum of the tangent runout (TR) and superelevation runoff (L) distances.

Pavement slopes are initially defined in the template.Superelevation is created and applied after the corridor is defined and the template drops have been assigned. This section will detail how superelevation is computed with OpenRoads as well as how to accurately model the shoulder break for the high side of Superelevation.

Superelevation calculations should be applied as defined in Chapter 8 of the [Connecticut Department of Transportation Highway Design Manual].

The Superelevation tools are located in the Corridors tab, as shown below.

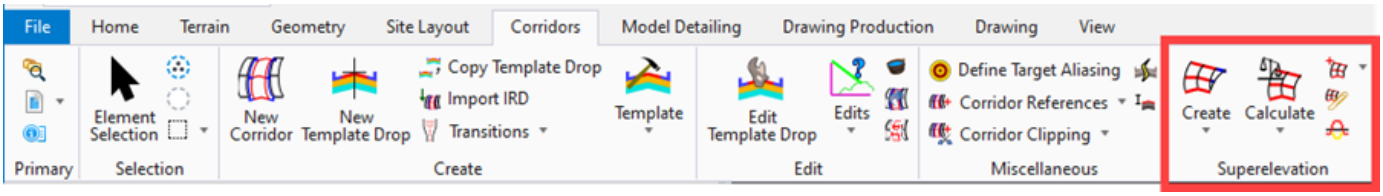


*Figure 81 Superelevation Tools*

The following tools are available:

- Create Superelevation Sections
- Create Superelevation Lanes
- Create Superelevation Lanes by Road Template
- Calculate Superelevation
- Edit Superelevation rule File
- Import Superelevation
- Assign to Corridor
- Insert Station Cross-Slope
- Superelevation Editor
- Superelevation Report
- Open Superelevation View

# 3.1 Applying a Superelevation to a Corridor

## 3.1.1 Create Superelevation Sections

Superelevation Sections for each alignment are normally placed in a separate design file with the Centerlines referenced in. The Create Superelevation tool creates a superelevation section for the specified station range on the centerline to demarcate a stretch of roadway for superelevation calculations.

In this tool the Civil horizontal geometry element is identified, and station limits of the superelevation are defined. Station limits are useful if the horizontal alignment is substantially longer than the project limits. The section is drawn using the selected Feature Definition.

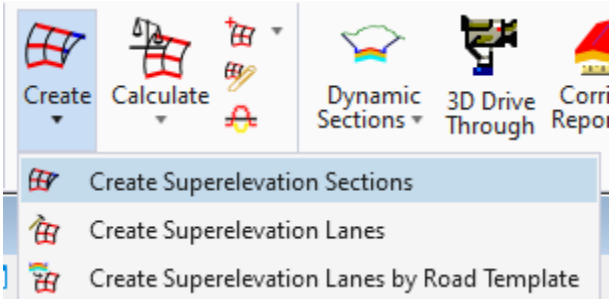


*Figure 82 Create Superelevation Sections*

The CTDOT XML-formatted rules file containing the superelevation standards/parameters is located in the following location:

***...|State of Connecticut|DOT CTDOT_DDE - CONNECT|CT_Configuration|Organization-Civil|_CT_Civil Standards - Imperial|Superelevation***

### 3.1.2 Assign Superelevation to Corridor

After the superelevation values have been computed, the next step in the process is to assign the superelevation sections to a corridor.

Before assigning the superelevation to the corridor, it is necessary to do the following:

- Attach the reference file containing the superelevation sections to the corridor model.
- Verify that the template being used in the corridor has the Superelevation Flag set for all pavement points used as candidate superelevation points. This flag is used for automatically setting the point controls.

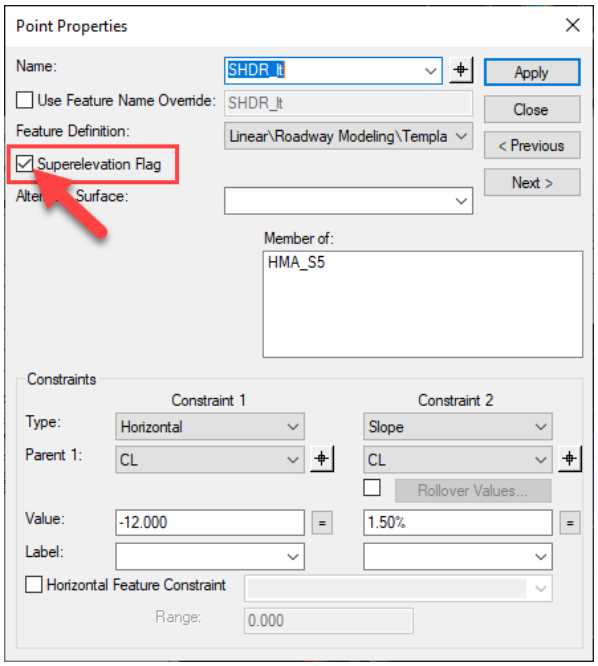


*Figure 83 Superelevation Flag set for on template Points*

The Assign Superelevation to Corridor tool applies the cross slopes defined on superelevation lanes to the corridor so the superelevated pavement is reflected in the corridor model.

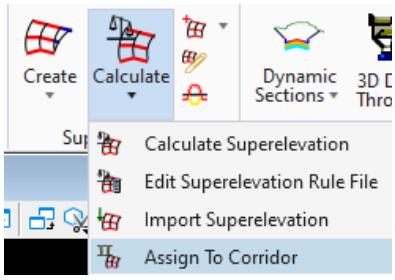


*Figure 84 Assign Superelevation to Corridor*

## 3.2 Adding Additional Lanes

Additional lanes can be added to an existing superelevation section by use of the **Create Superelevation Lanes** command.

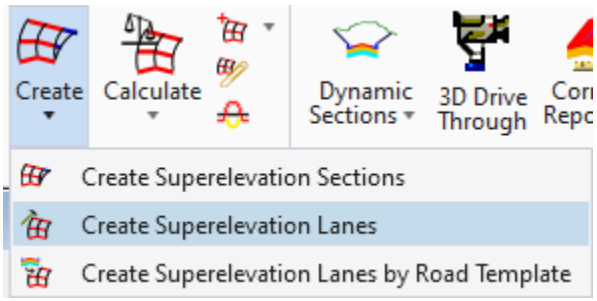


*Figure 85 Create Superelevation Lanes*

# Exercise 4 – Placing Linear Templates

***Templates*** represent typical cross-sectional geometry. Templates consist of points and components. Templates can be placed along any 3D line string using the **Apply Linear Template** tool. For example, a slope treatment template can be placed along a road corridor hinge point. A Template consisting of pavement lane, curb and side treatment can be placed along a pavement sawcut line. Applying a ***Linear Template*** is quick and easy, but it has its limitations during adjustments. Applying and editing ***Linear Template*** is less powerful compared to Placing and editing ***Corridors***.

### *LINEAR TEMPLATES*

Linear Templates can be placed along a civil geometry element without a defined corridor. The "Apply Linear Template" tool will apply a template to a selected civil geometry element that has a profile associated with it. Most templates can be treated as linear templates like shoulder, curb, etc. and don't need a defined corridor to be placed. Once you have the profiled linear element (3D geometry), templates can be placed. After placing the template, a corridor for the linear template will be automatically generated. This corridor and linear template can be edited as needed.

The **Apply Linear Template** tool can be found on the OpenRoads Modeling workflow Ribbon:

**Model Detailing** Tab > **3D Tools** Group > **Apply Linear Template**

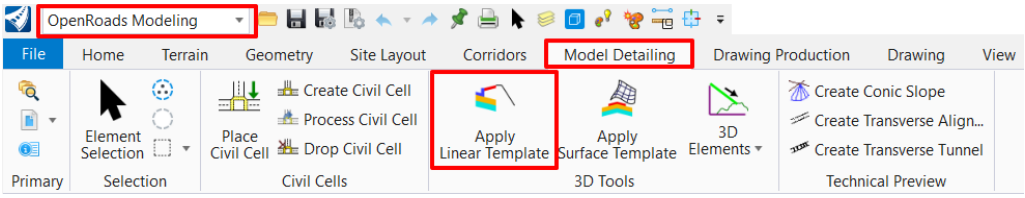


*Figure 86 Apply Linear Template*

**Apply Linear Template** will activate the Pick Template dialog then inserts the chosen template into the drawing relative to the selected linear element.

The Connecticut DOT has provided range of Linear Templates within its workspace. See figure below.

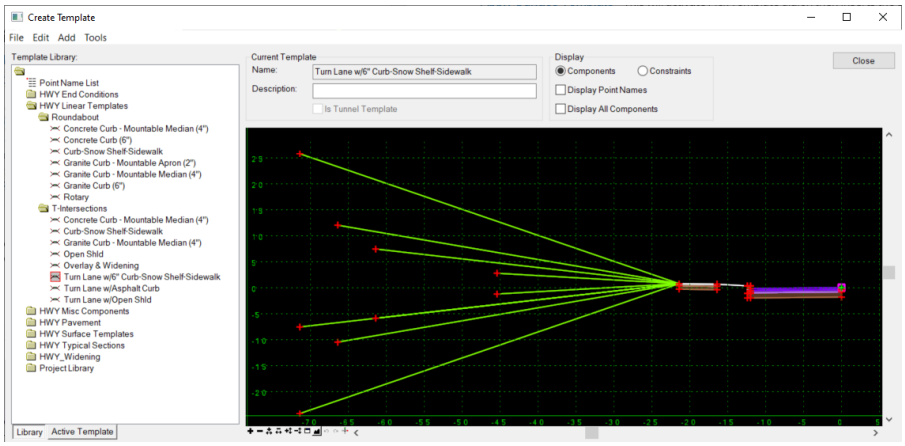


*Figure 87 Available Linear Templates*

## 4.1 Apply Linear Templates

This module instructs users how to place a linear template in a design file for a project. When placing linear templates, a corridor is not needed, linear templates can be applied to 3D elements.

1. Load **Corridor (Roadway Model) file** and Load the **Template Library** for the project.
2. Activate the **OpenRoads Modeling** workflow from the pick list next to Quick access toolbar in the upper left corner if it is not already active. The ribbon menu will reflect the OpenRoads Modeling tools.
3. The Corridor file contains corridor RTE1 with template drop 2Ln_HMA. The template drop applied only has two lane roadway surfaces without slope treatment.

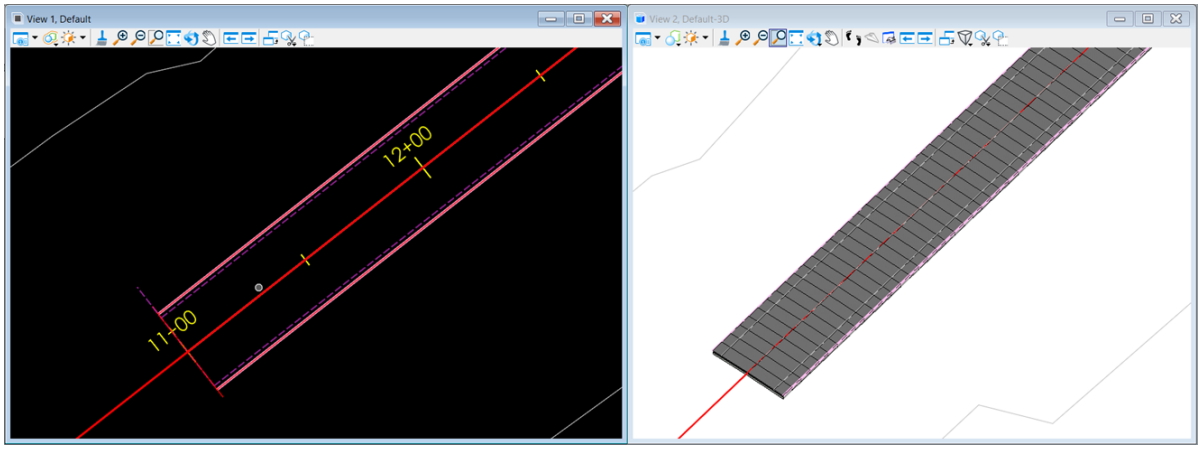


*Figure 88 Apply Linear Templates*

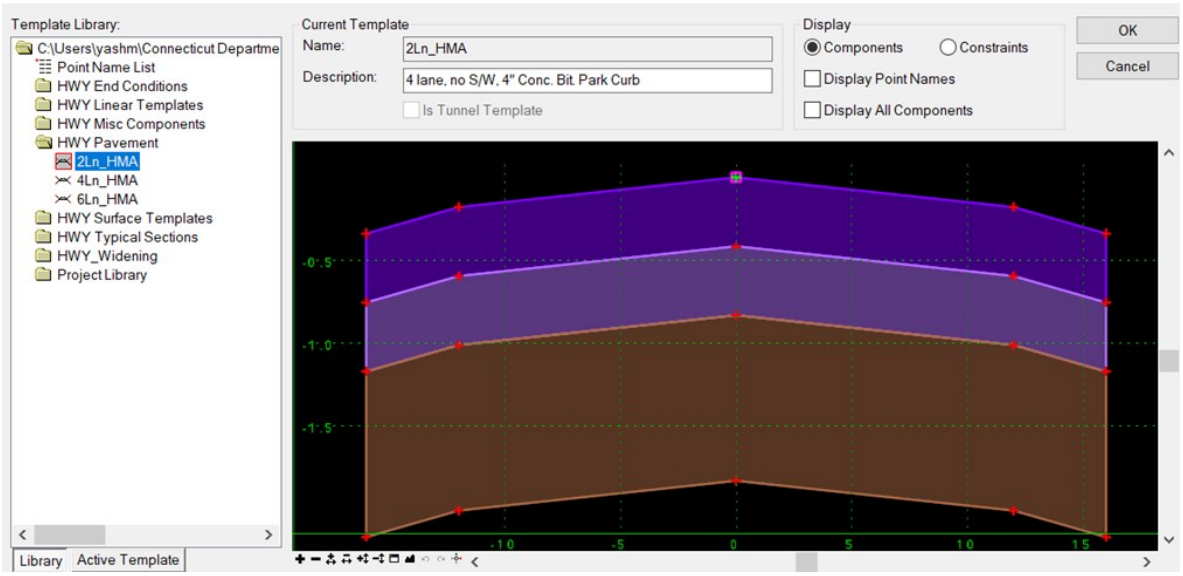


*Figure 89 Template Library*

4. Slope Treatment ***Linear Template*** can be applied to the edge of the road (***EOR_lt and EOR_rt***) as it is a 3D element with active profile.

5. Constructions option can be turned **ON** or **OFF** in the **View Attributes** window.

6. From **Model Detailing** tab within the **3D Tools** Group select: **Apply Linear Template.**

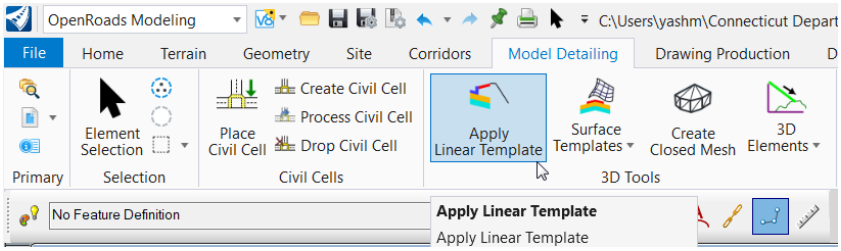


*Figure 90 Apply Linear Template Tool*

7. Apply Linear Template dialog will open. Fill as below and then follow the prompts.

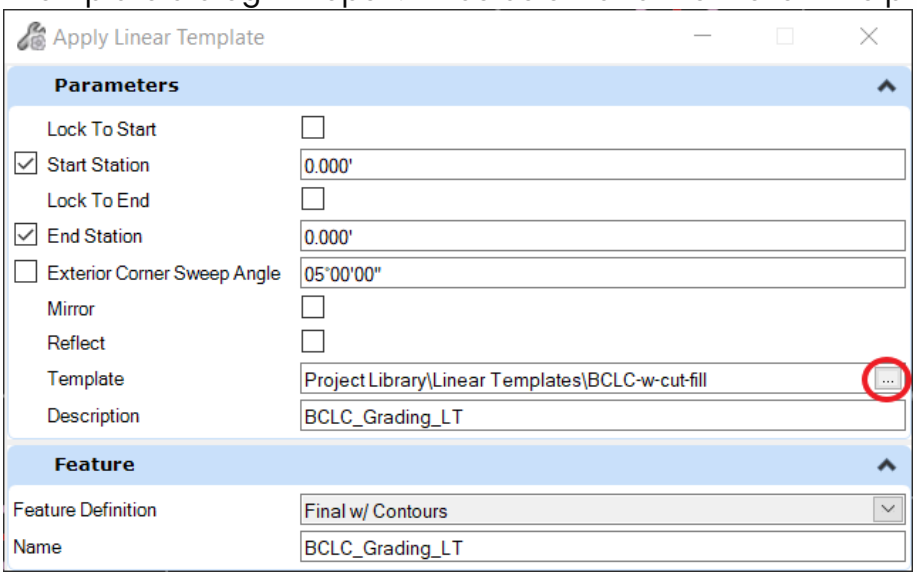


*Figure 91 Browse to Select Template*

a. **Locate Element To Apply Template**, click on the Left Edge of Roadway (***EOR_lt)***

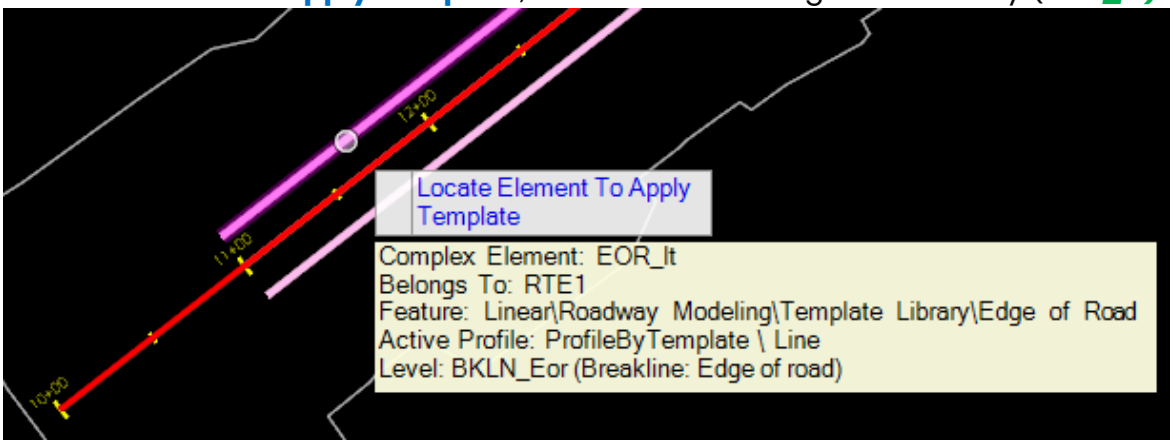


*Figure 92 Locate Element To Apply Template*

b. Click the **browse** button next to Template label to open Template library or **click** the **Alt** and **Down** to open Template library.

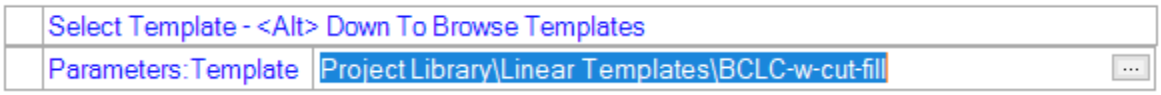


*Figure 93 Selected Template*

c. This opens the Pick Template dialog. Select the desired template prepared for the project and review. For this example, choose ***Project Library>Linear Templates>BCLC-w-cut-fill*** and click **OK**.

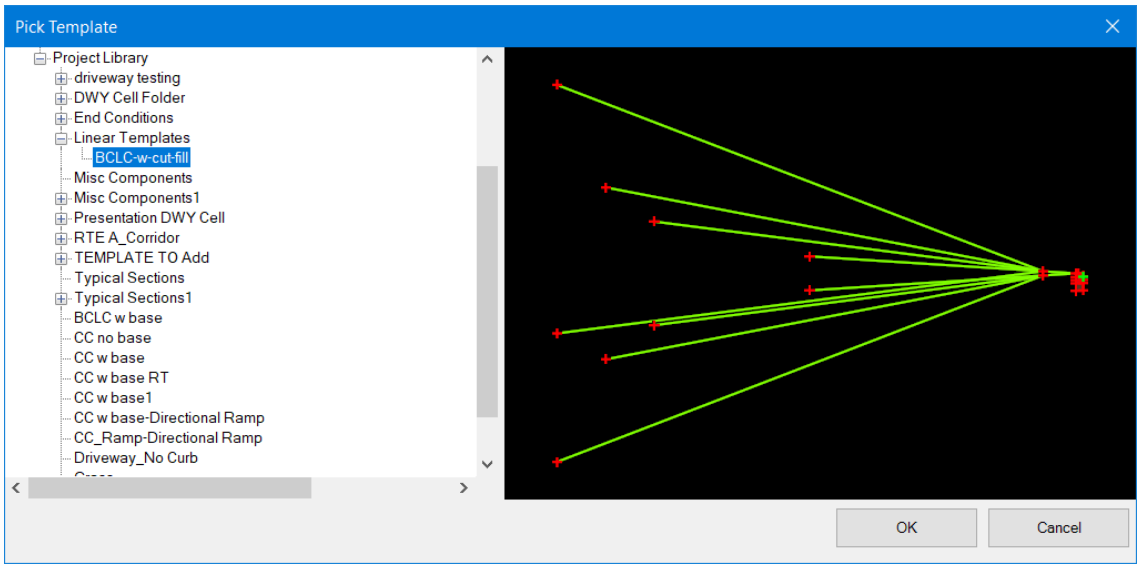


*Figure 94 Pick Template*

- **Template -** ***Project Library > Linear Template s> BCLC-w-cut-fill***, **left-click** to accept the BCLC-w-cut-fill
- **Start -** **0+00** (Click Alt to Lock to Start or type specific Station), **left-click** to accept. (This is same as **11+00** of ***RTE1*** Baseline)
- **End -** **3+00** (Click Alt to Lock to End or type specific Station), **left-click** to accept. (This is same as **14+00** of ***RTE1*** Baseline)

  ***NOTE***: *Station entered here is the station related to EOR not the Base Line Station.*
- ***Select Side-Reflect Option Mirror-<Alt> Down To Select***, **hover** mouse right side of EOR_lt or as needed, **left-click** to accept.

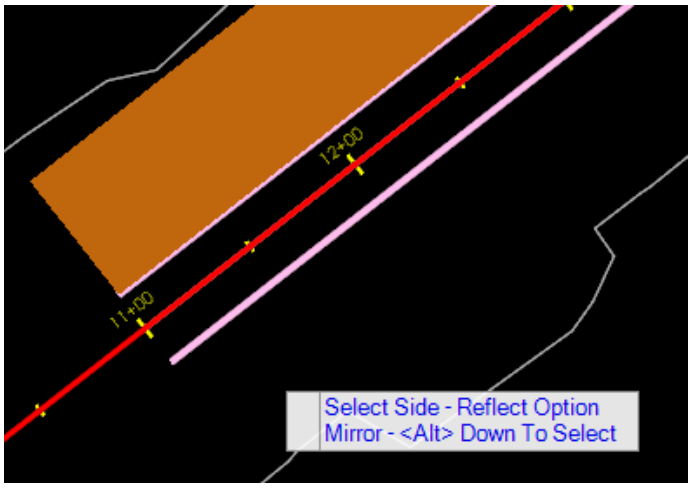


*Figure 95 Select Side-Reflect Option Mirror-<Alt> Down To Select*

- **Exterior Corner Sweep Angle** - ***05° 00'00"*** (Default value, change as needed), **left-click** to accept.
- **Description -** ***BCLC_Grading_LT***, **left-click** to accept.
- **Right-click** to exit command. Curb and Slope Treatment is generated at the Left Edge or Road. Corridor for the applied Linear template is automatically generated by the software.

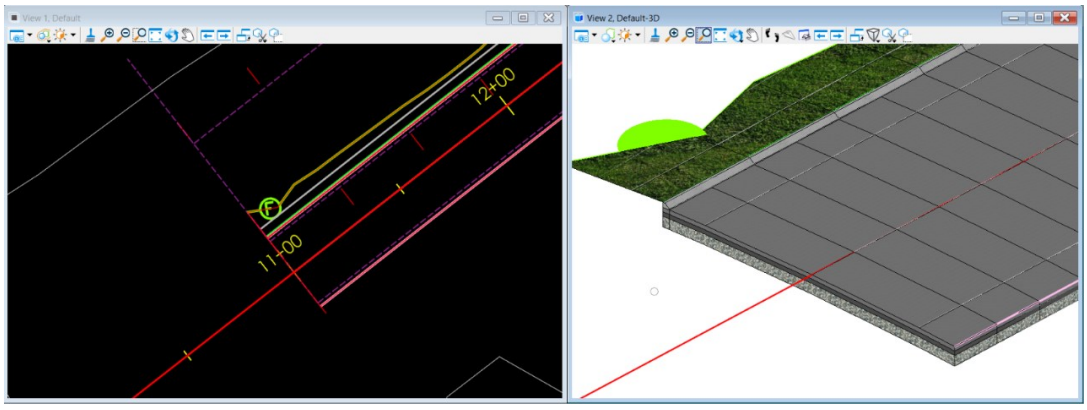


*Figure 96 2D and 3D View of Liner Template*

d. The newly applied Linear Template can be reviewed from ***Explorer Window > OpenRoads Model***.

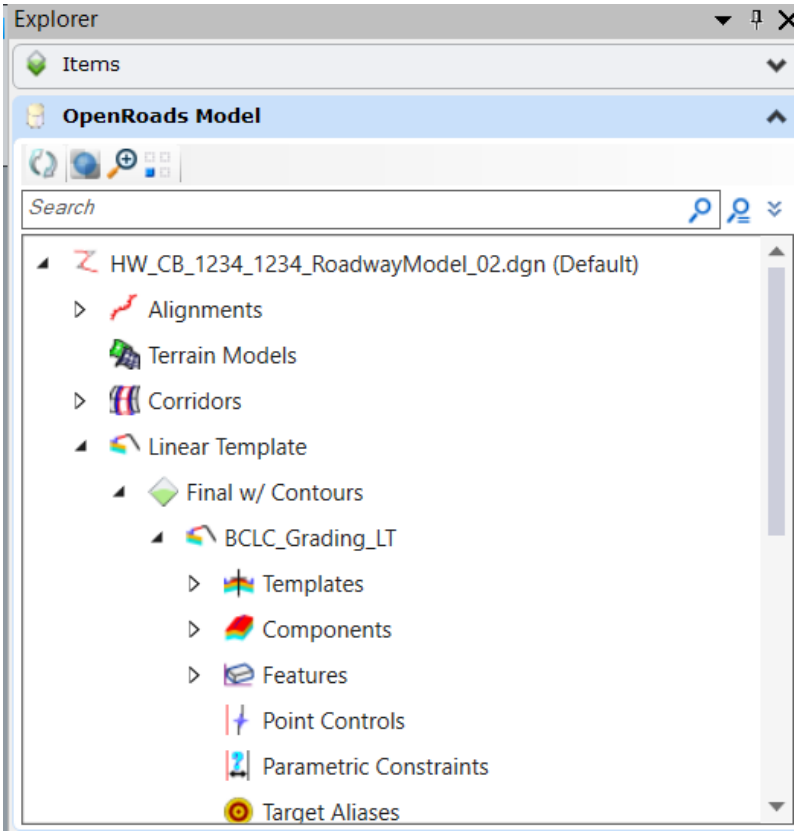


*Figure 97 Explorer Window*

8. Follow the same steps and **Apply Linear Template** at the Right Edge of Road.

## 4.2 Edit Linear Templates

Linear Templates can be edited as normal Templates, but it has its limitations. All the Corridor Parameter that can be edited for the Linear Template is less than that of Corridor. This module instructs users how to edit or replace an existing Linear Template in the design file. When placing a linear template, a corridor is not needed, it can be applied to a 3D element.

1. We are using a **Corridor (Roadway Model)** file that is used in above module.
2. An applied Linear Template cannot be copied, so it needs to be reapplied as needed. To show contrast, in the current file the
   - ***Linear Templates>BCLC-w-cut-fill*** (curb with slope treatment is applied at ***RTE1*** Sta. 10+00 to Sta. 14+00)
   - ***Linear Templates>BCLC-w base*** (only curb is applied at ***RTE1*** Sta. 14+00 to Sta. 27+00) are applied at the left side of the Edge of Road.

   When the template range of the ***Linear Template*** graphic is selected, the range can be edited as needed. The range can also be edited from the properties window by changing ***Start*** and ***End Station***.

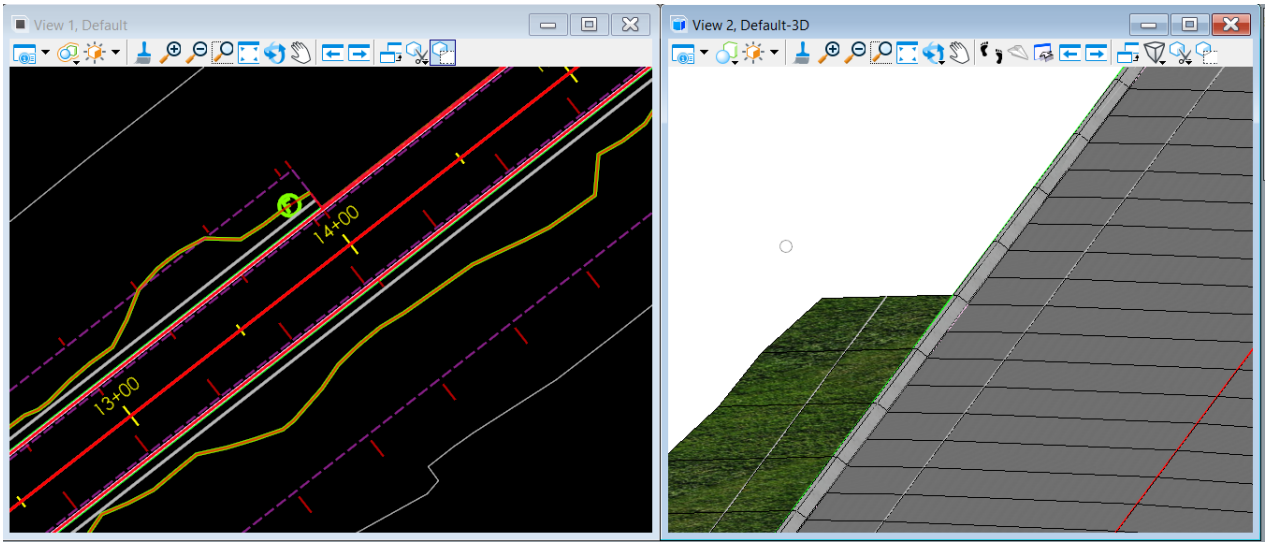


*Figure 98 Edit Linear Templates*

3. Change or swap the type of Linear Template, the ***BCLC-w-cut-fill*** to the ***cut-fill*** template.

    a. Select: ***BCLC-w-cut-fill*** template and let the cursor ***rest*** on the element to access the context sensitive pop-up menu. Select **Properties**.

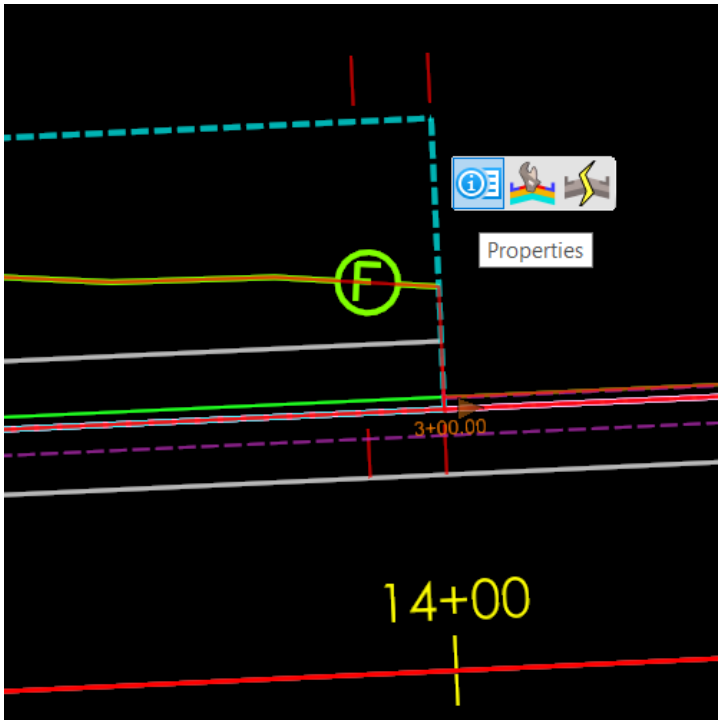


*Figure 99 Properties*

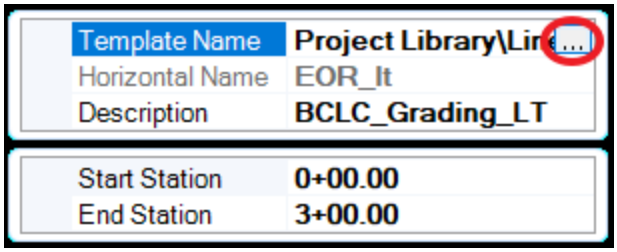


*Figure 100 Browse to select Template*

    a. Click the **Browse** button in the right side of the Template Name label. This opens the Pick Template dialog.

b. Select the desired template prepared for the project and review. For this example, choose ***Linear Templates>cut-fill*** (grading only no curb) and Click **OK**.

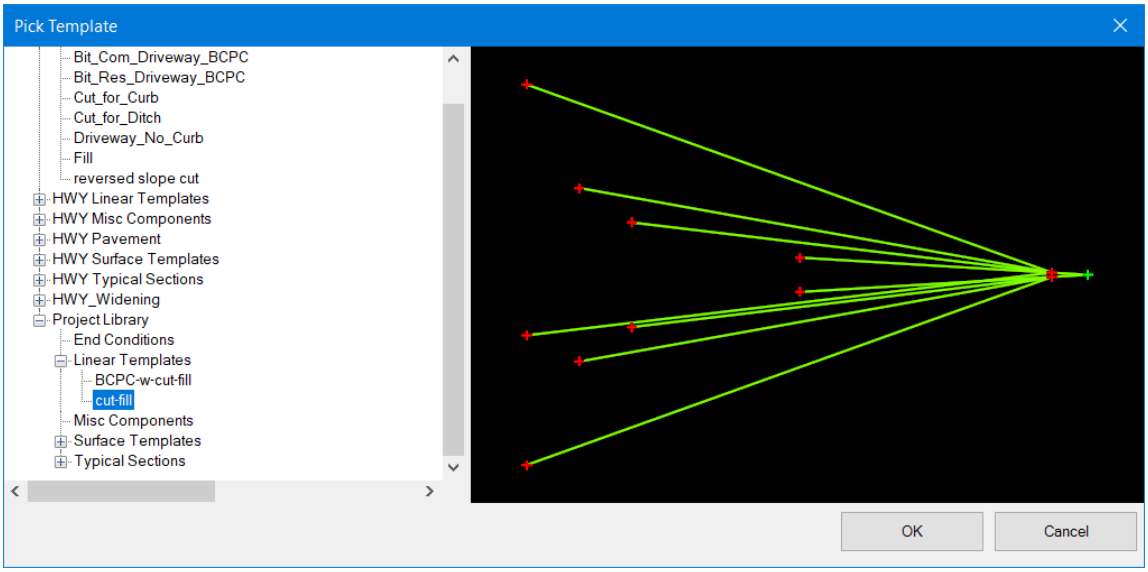


*Figure 101 Select Tempale*

c. The linear template processes with the new template. Notice the change in 3D view.

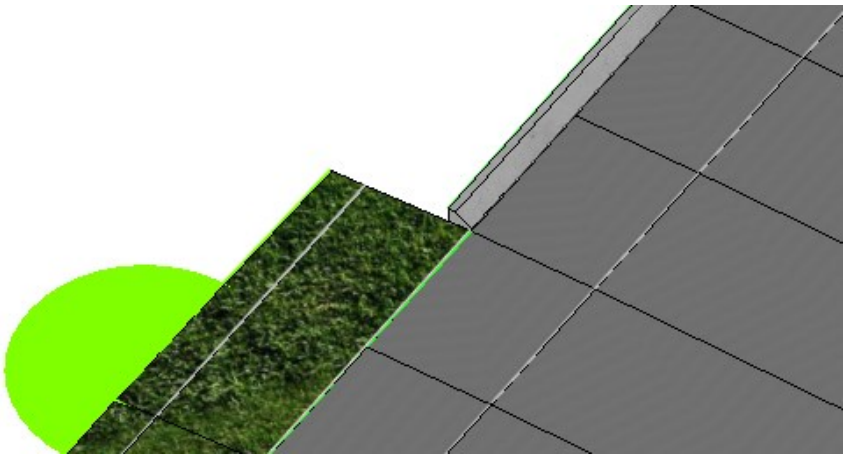

*Figure 102 3D View*

6. Edit linear template elements or parameters.
    a. Select: ***cut-fill*** template and let the cursor ***rest*** on the element to access the context sensitive pop-up menu. Select **Edit Template Drop**.

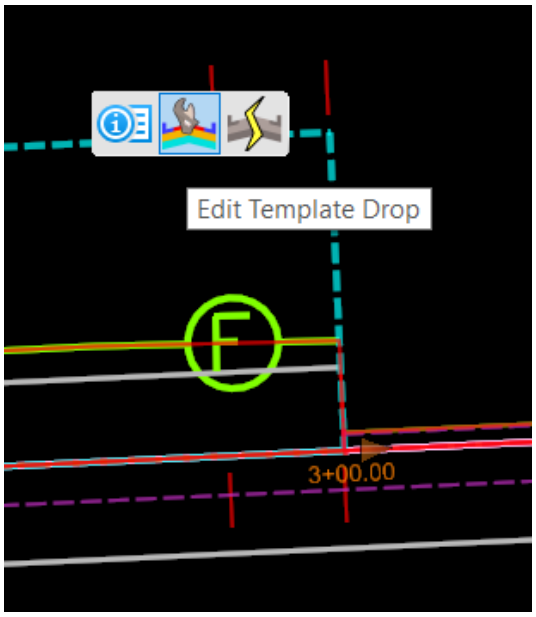


*Figure 103 Edit Template Drop*

    b. Editing Roadway Designer Template Drop Window appears along with the existing template used at the template window i.e. ***Linear Template>cut-fill***

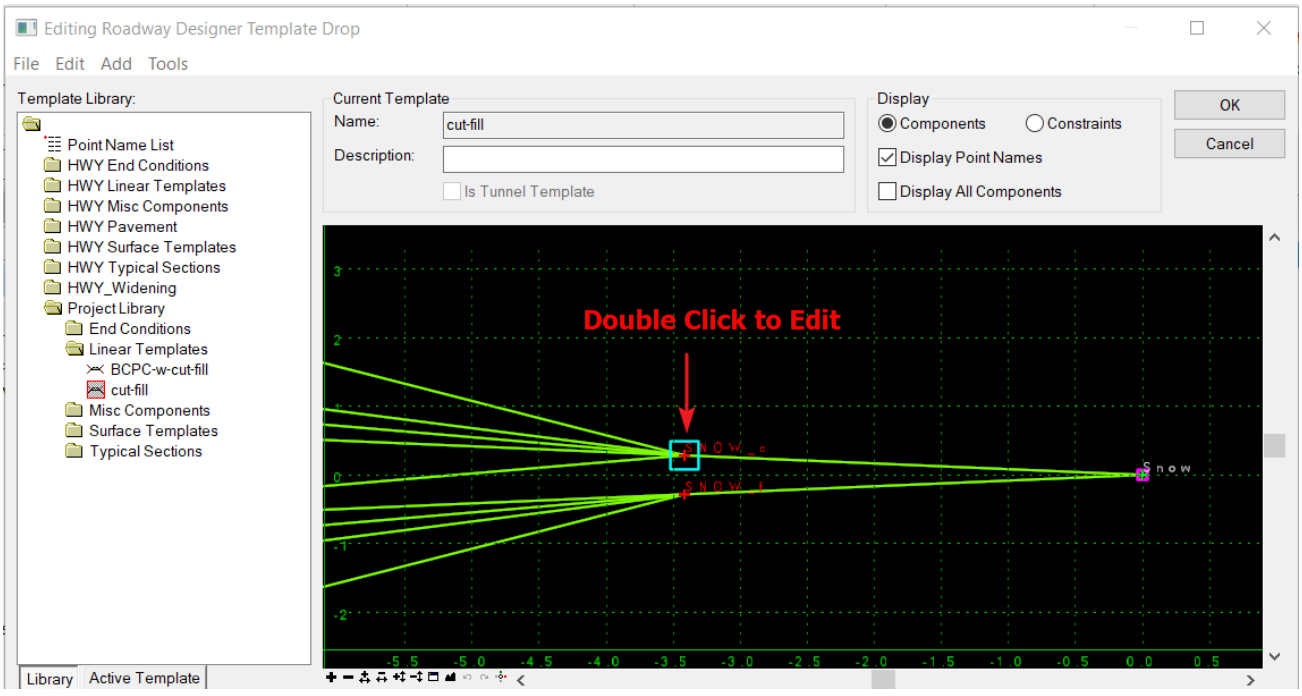


*Figure 104 Editing Roadway Designer Template Drop Window*

c. The Template can be edited in various ways and reviewed. For this example, Slope and Horizontal Distance of Snow shelf can be changed.

d. Double click on ***SNOW_c*** point.

e. In the Point Properties dialog, change Slope Value as desired under Constraint 1 and change Horizontal Value as desired under Constraint 2 and click **Apply**, and **Close**.

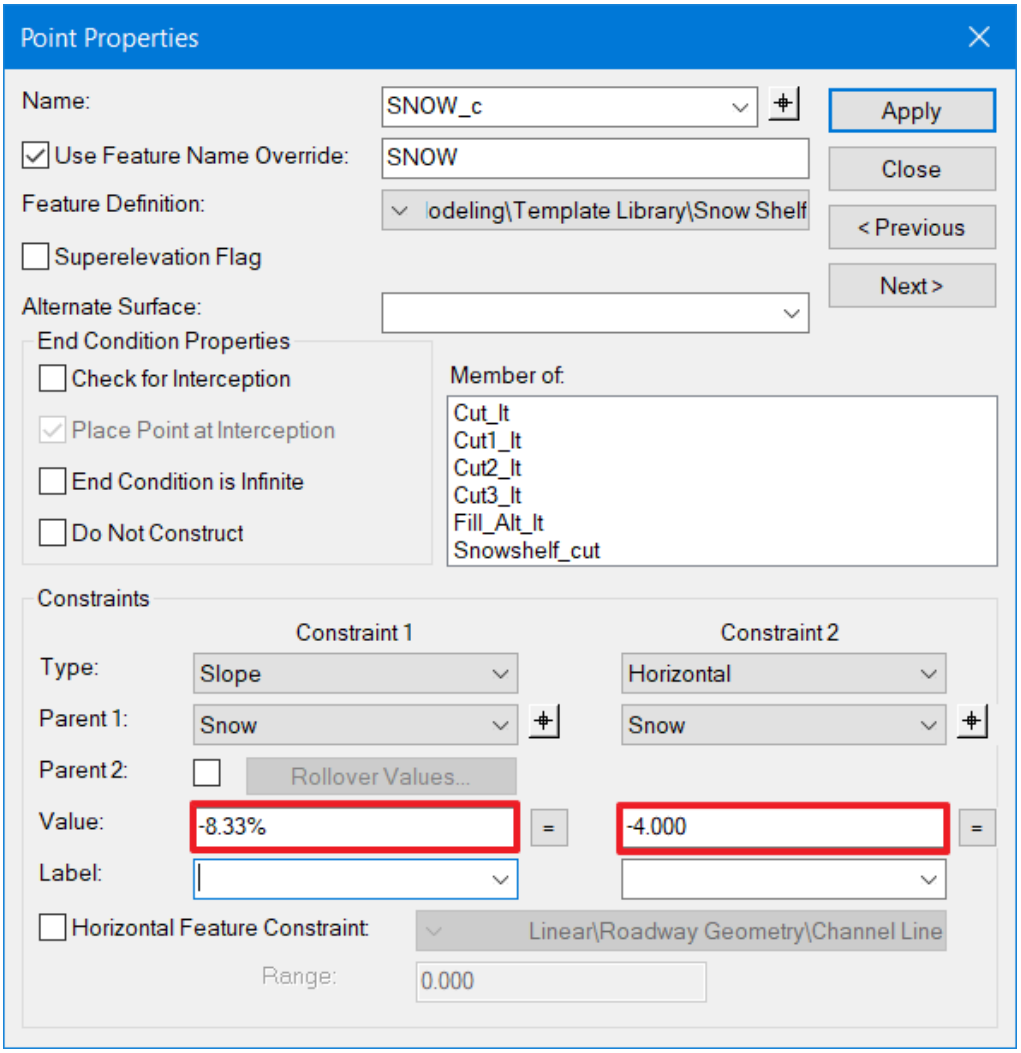


*Figure 105 Point Properties*

f. Click **OK** to close the Editing Roadway Designer Template Drop dialog. The linear template processes with the new value. Notice the change in slope and width of the snow shelf.

g. Other points or parameters of the ***Linear Template*** can be edited.

7. Edit the Corridor of a Linear Template. Select the Corridor Handles of the ***cut-fill*** template and let the cursor ***rest*** on the element to access the context sensitive pop-up menu. Select the **Corridor Creation Tools > Corridor Objects**.

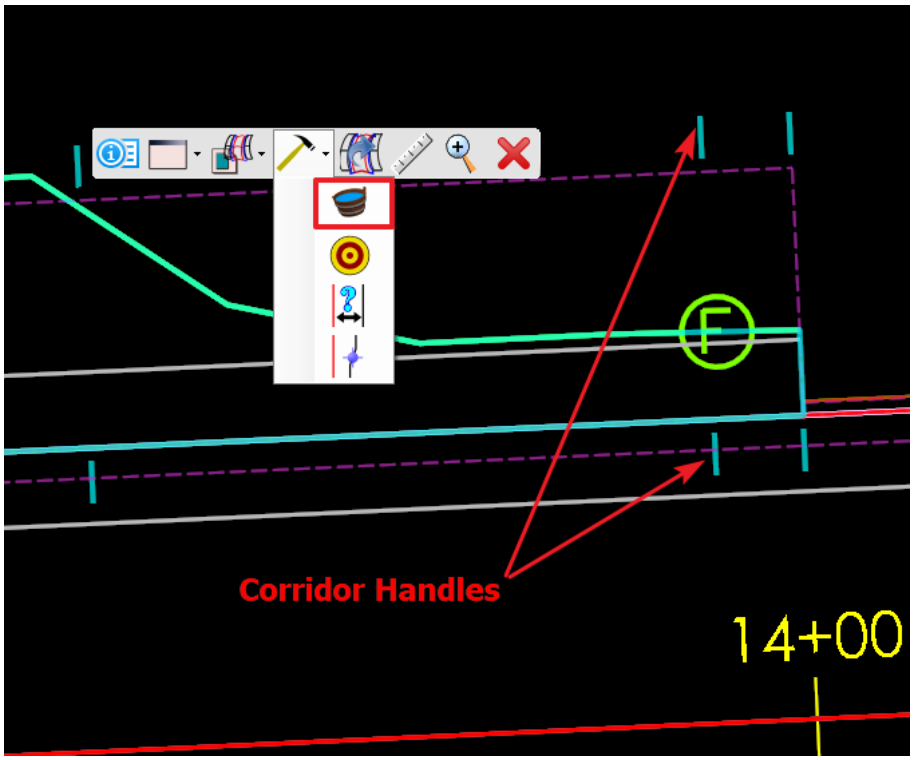


*Figure 106 Corridor Handles*

a. Corridor Objects Window will open. In this window the user can define four parameters as **Parametric Constraint, Point Control, External Reference, and Clipping Reference.**

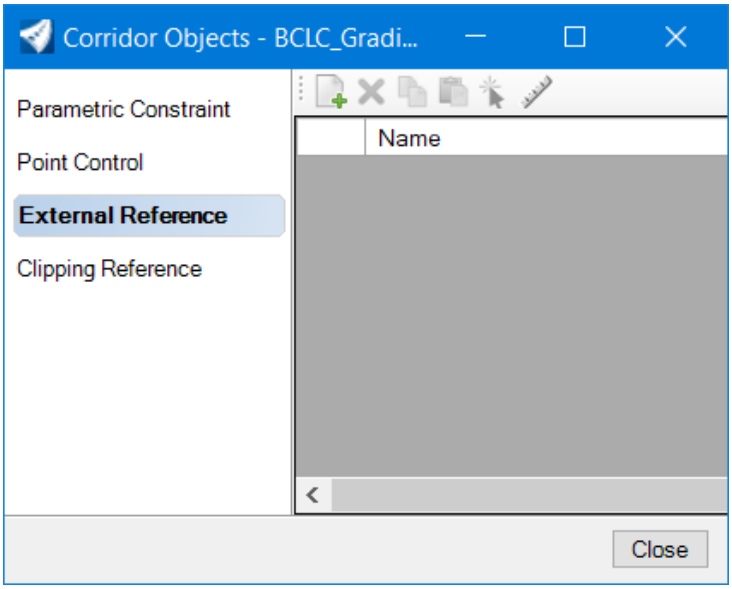


*Figure 107 Corridor Objects Window*

b. Corridor edits for ***Linear Templates*** is less powerful compared to Placing and editing ***Corridors*** (shown below).

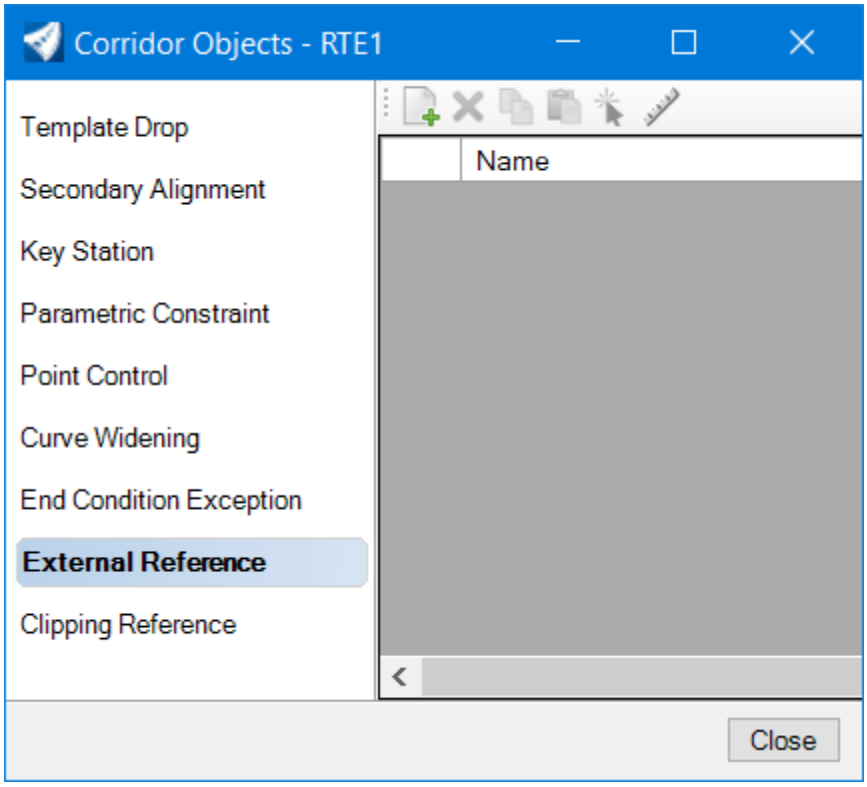


*Figure 108 Corridor Objects External Reference*

# Exercise 5 – Placing Surface Templates

Terrain Models either existing or proposed do not have depth or material associated with them. A Surface Template is made up of various components and each component can be of various depth and is applied to a terrain model. Components for a surface template are closed shapes such as asphalt layer, aggregate layer, grass layer etc. The "Apply Surface Template" tool will apply a selected surface template from the template library to a terrain.

The **Apply Surface Template** tool can be found on the OpenRoads Modeling workflow Ribbon:

**Model Detailing** Tab > **3D Tools** Group > **Apply Surface Template**

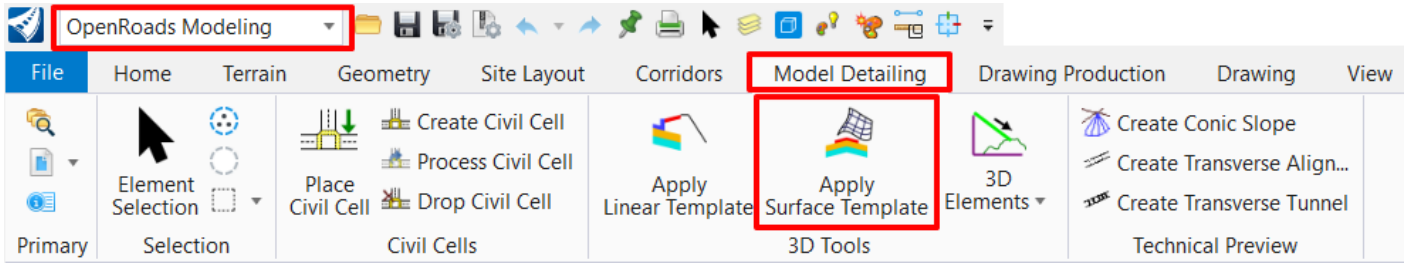


*Figure 109 Apply Surface Template*

**Apply Surface Template** will activate Pick Template dialog, then insert the chosen surface template into the drawing relative to a terrain model.

The Connecticut DOT has provided range of Surface Templates within its workspace. See figure below.

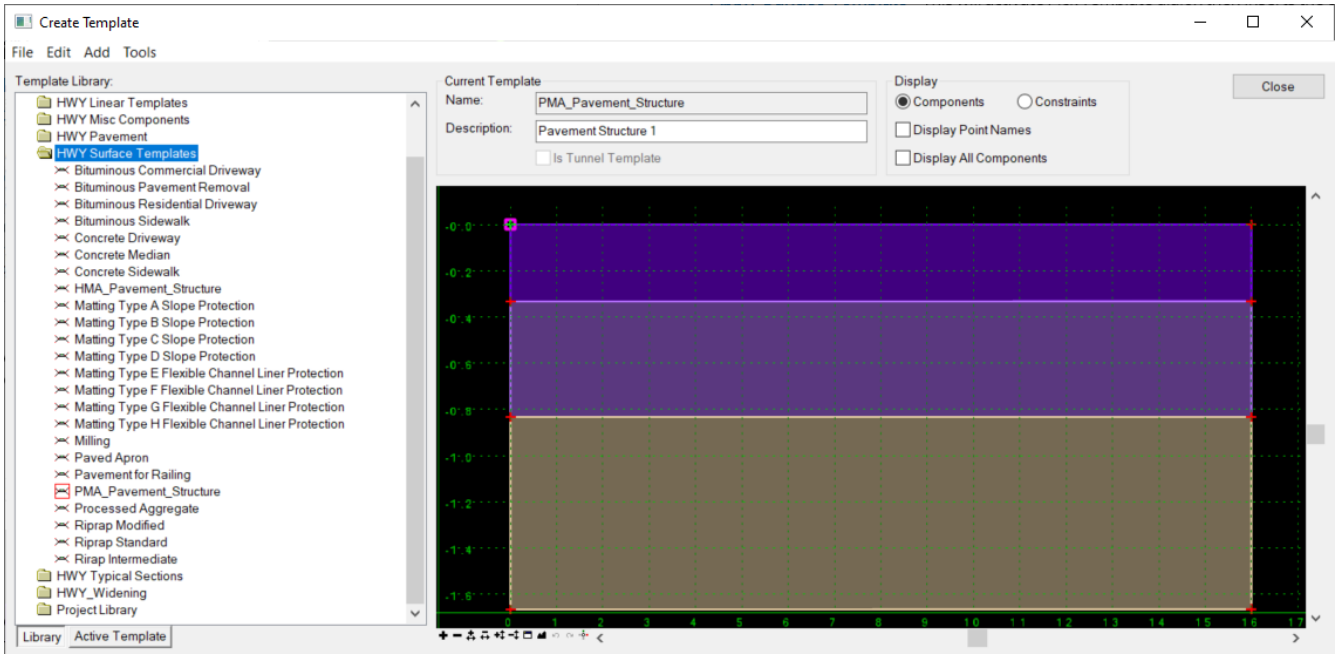


*Figure 110 CTDOT Surface Templates*

## 5.1 Apply Surface Templates

*Surface Templates* is a closed shaped component of a *Template.* A *Surface Templates* can be applied to a terrain using the Apply Surface Template tool. Surface Templates are used to apply material thickness to the terrain surface. A Surface Template can be of a single component or composed of different components.

This module instructs users how to place a surface template in a design file for a project. For placing surface template, a terrain is needed.

1. Open the **Corridor (Roadway Model) file** and the **Template Library** for the project.
2. Activate the **OpenRoads Modeling** workflow from the pick list next to Quick access toolbar in the upper left corner if it is not already active. The ribbon menu will reflect the **OpenRoads Modeling** tools.
3. The Corridor file contains Roadway corridor ***RTE1*** with a roadway template drop. Around ***Sta. 15+85***, a driveway is designed. We need to create a ***Terrain*** and apply a ***Surface Template*** to the Driveway in order to make it complete.

   ***NOTE***: *Driveway Civil Cells can be placed and edited as needed at this location*

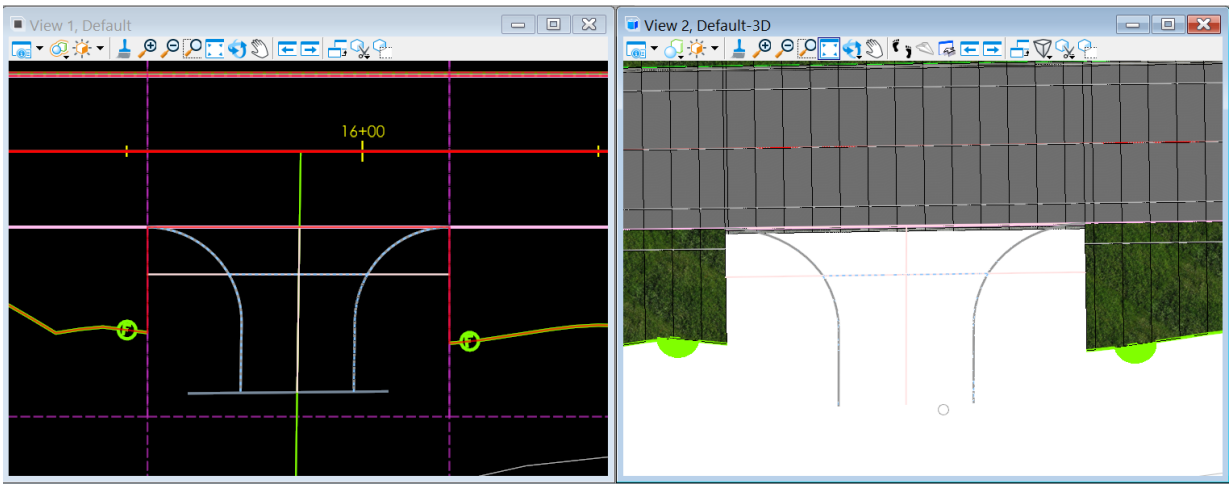


*Figure 111 2D and 3D View*

4. Create a Terrain out of the driveway components. Make sure that all the Driveway components have active profiles.
   a. From the Terrain Tab Ribbon and within the **Create** Group, select **From Elements.**

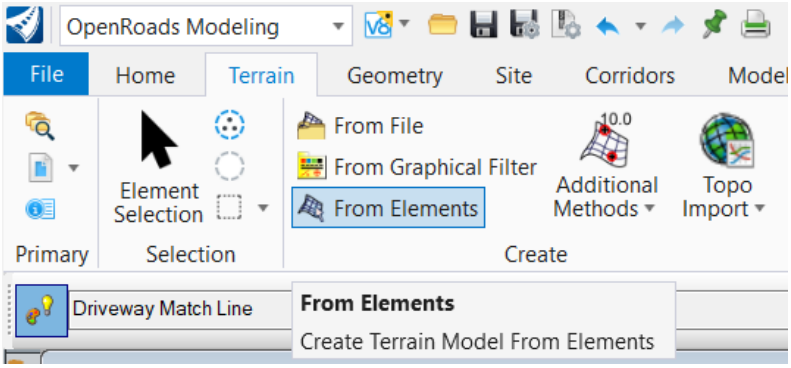


*Figure 112 Create Terrain From Elements*

   b. The **Create Terrain** dialog will open and then follow the prompts.
   c. Set the following on the dialog box:
      - **Feature Definition: *Design Top*** (User can change as required)
      - **Name: *P_DRV*** (or as required)

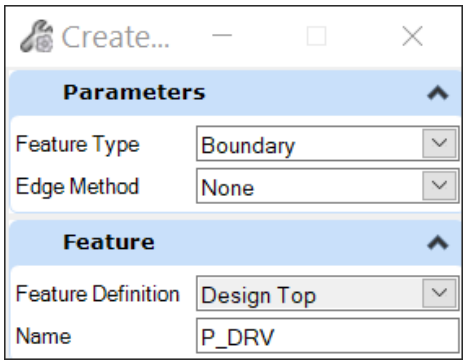


*Figure 113 Create Terrain Dialog*

   d. Follow the prompts.

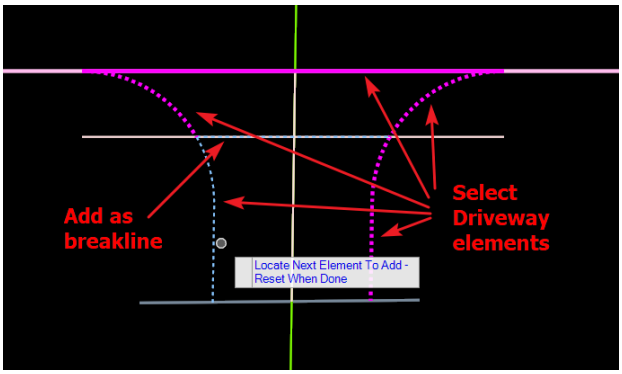


*Figure 114 From Element graphical Features*

- **Locate Element to Add:** Select all the sides of the ***Driveway*** (Front and sides of Driveway).
- **Locate Next Element to Add:** **Right-click** or reset.
- **Feature Type:** ***Boundary***
- **Edge Method:** ***None***
- **Left-click** to complete

e. The Add/Remove Terrain Model Features dialog will open. Follow prompts. Right-click to rest if there are no features to add or remove.

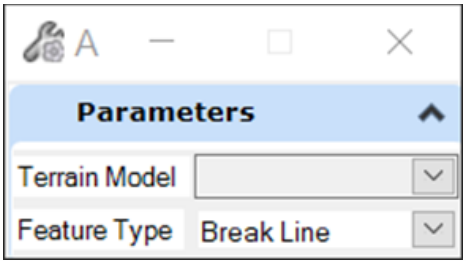


*Figure 115 Parameters*

- **Locate Element to Add:** Select **Driveway Shelf**
- **Locate Next Element to Add:** **Right-click** or reset
- **Feature Type:** ***Break Line***
- **Locate Element to Add:** **Right-click** or reset
- **Right-click** again to complete.

The ***P_DRV*** Terrain is created as shown in 3D view.

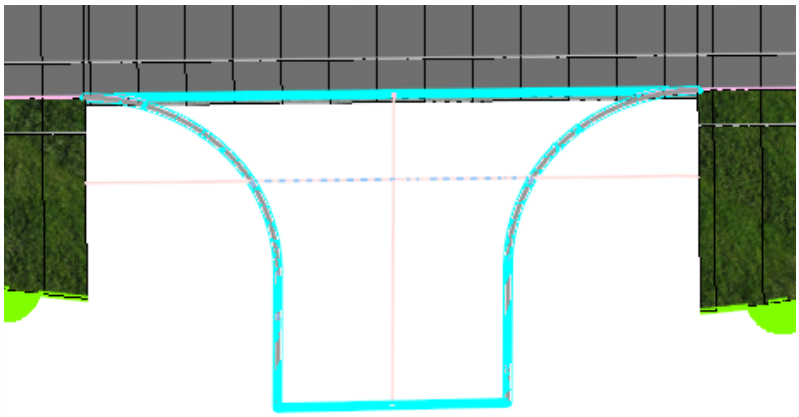

*Figure 116 3D View*

6. Apply the driveway surface template to ***P_DRV*** terrain
   a. From the Model Detailing Tab Ribbon and within the **3D Tools** Group select: **Surface Templates > Apply Surface Template.**

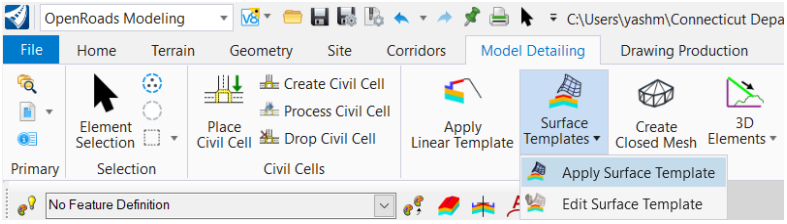


*Figure 117 Apply Surface Template*

   b. The **Apply Surface Template** dialog will open, follow the prompts.

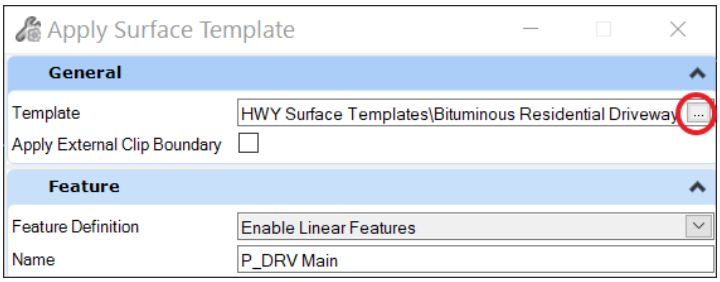


*Figure 118 Browse to select Surface Template*

   c. Set the following on the dialog box:

      **Feature Definition:** ***Enable Linear Features***

      **Name:** ***P_DRV Main*** (or as required)

   d. Follow the prompts.

      **Locate a Terrain Model:** Select ***P_DRV*** terrain (It is easier to select in 3D view)

      **Apply External Clip Boundary:** ***No***

      **Select Template:** click the **browse** button next to Template label

      The **Pick Template dialog box** will open, select ***HWY Surface Templates\|Bituminous Residential Driveway***

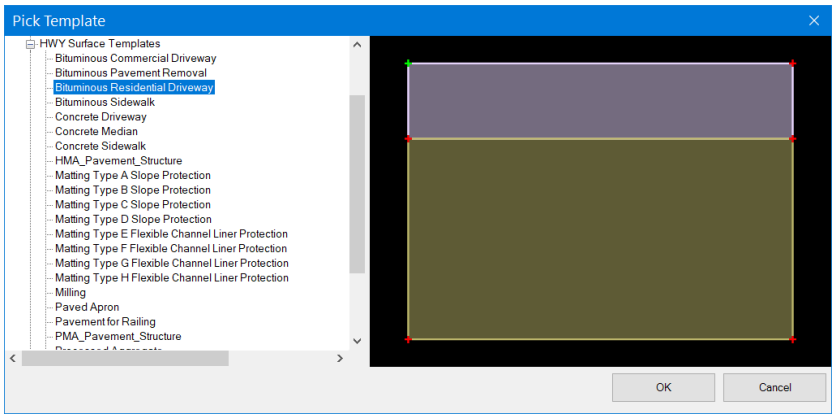


*Figure 119 Select Surface Template*

Click **OK** to close Pick Template dialog.

**Left-click** to complete selection.

**Data Point to accept selection: Left-click** to complete

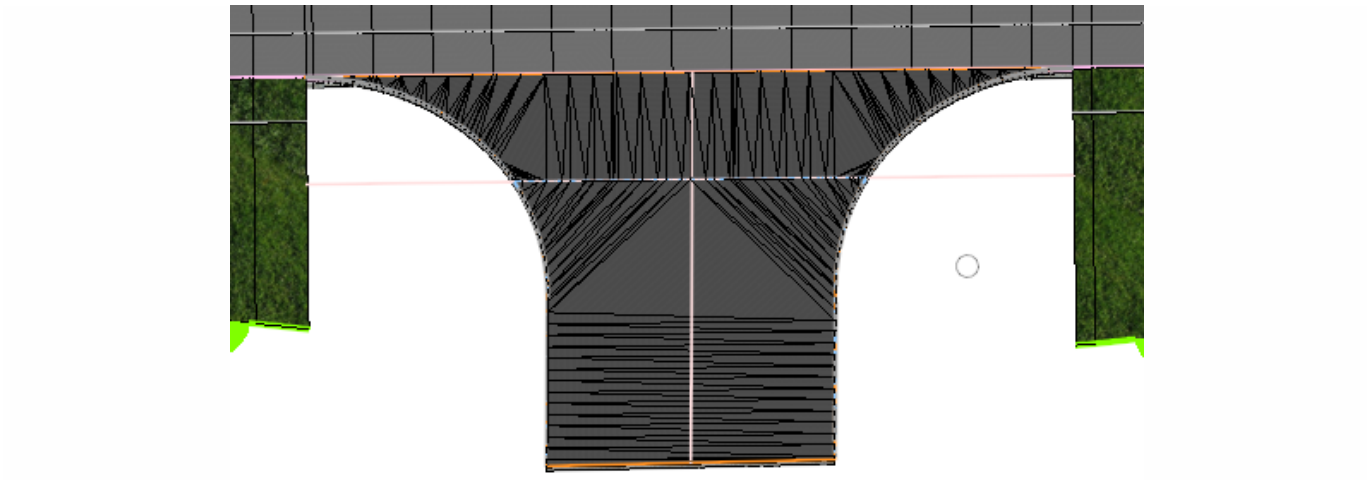

*Figure 120 P_DRV Main surface template is created as shown in 3D view*

7. Designers can create separate Terrains and apply Surface Templates to Driveway Shelf and Driveway Main separately. This is up to the Designers.

## 5.2 Edit Surface Templates

***Surface Templates*** can be swapped or edited as per the project requirement. This module instructs users how to edit the ***Surface Template*** applied in a design file for a project.

1. Open the **Corridor (Roadway Model) file** and the **Template Library** for the project. In this file a Commercial Driveway Civil Cell is placed, and we will be editing the Surface Template applied to the Driveway. The Driveway consists of two separate Terrains (Driveway Shelf and Driveway Main) and the Bituminous Commercial Driveway Template is applied to both Terrains.
2. Click and select a ***Driveway Main Surface Template (1-P_DRV Main Surface Template)*** in the 3D View.

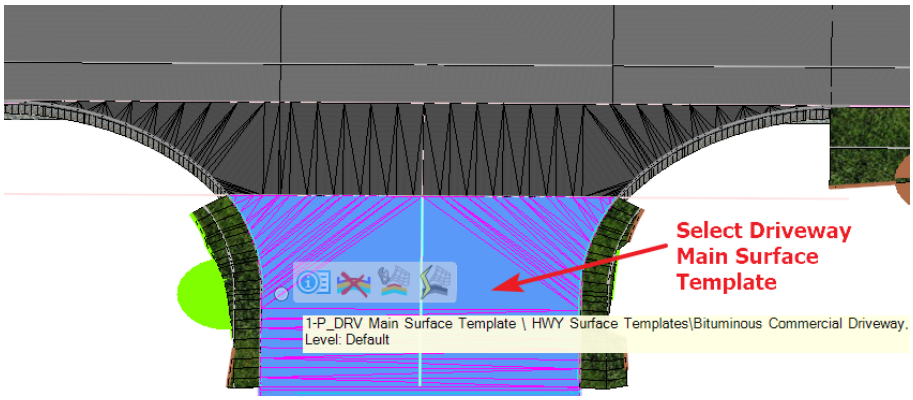


*Figure 121 select Surface Template*

a. Open the ***Properties*** dialog and expand the ***Mesh Template*** group. The current template is ***HWY Surface Templates> Bituminous Commercial Driveway.***

b. Click the **Browse** button at right side of the Template Name label. This opens the Pick Template dialog.

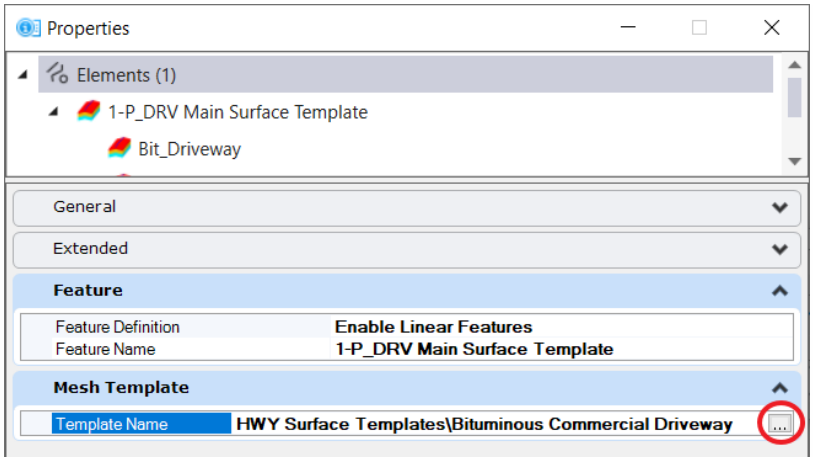


*Figure 122 Browse to Select Surface Template*

Alternatively, Select **Driveway Main Surface Template (1-P_DRV Main Surface Template)** in the 3D View and let the cursor rest on the surface to access the context sensitive pop-up menu.

Select **Properties**. **Quick Properties** opens, Click **Browse** button at right side of the Template Name label. This opens the Pick Template dialog.

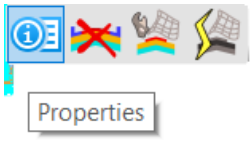


*Figure 123 Properties*

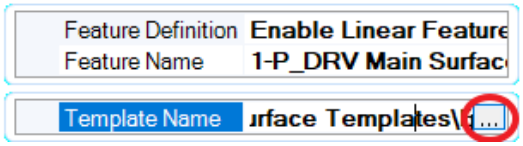


*Figure 124 Browse to Select*

c. Select the desired template prepared for the project and review. For this example, choose ***HWY Surface Templates> HMA_Pavement_Structure,*** Click **OK**.

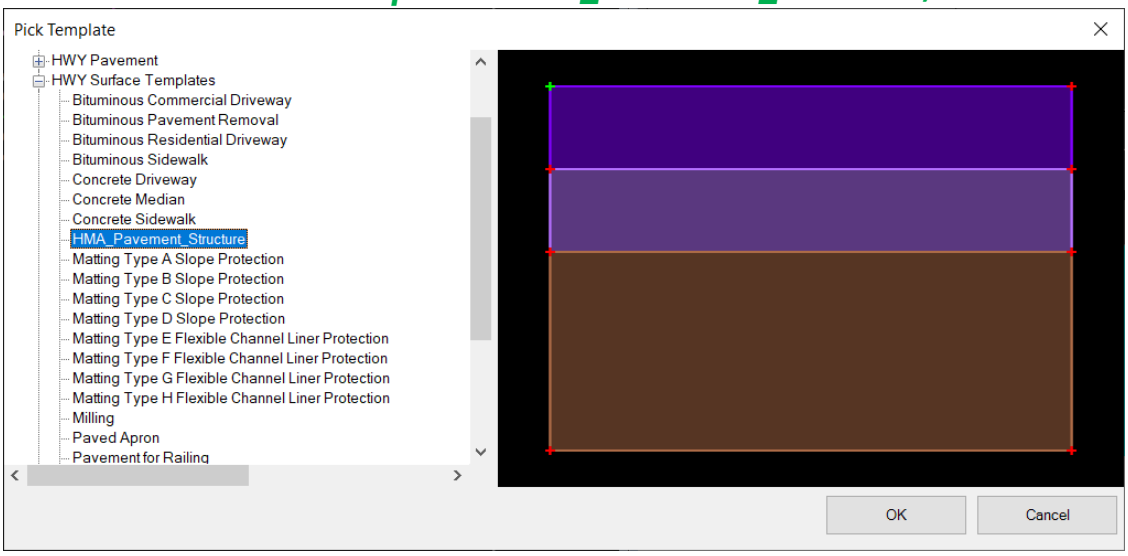


*Figure 125 Select Template*

The surface template processes with the new Template. Notice the change in the 3D view. The surface updated from 2 layers to 3 layers of pavement.

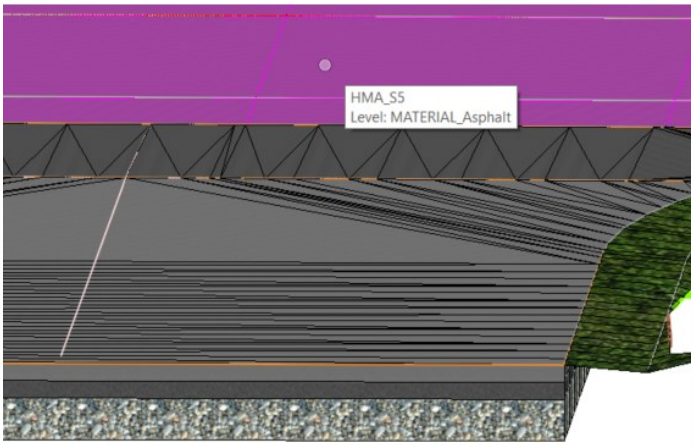


*Figure 126*

3. The User can edit the pavement thickness. Click and **rest cursor (hover)** over the ***Driveway Main Surface Template (1-P_DRV Main Surface Template)*** in the 3D View. From the Context Tool Bar, select **Edit An Applied Surface Template**.

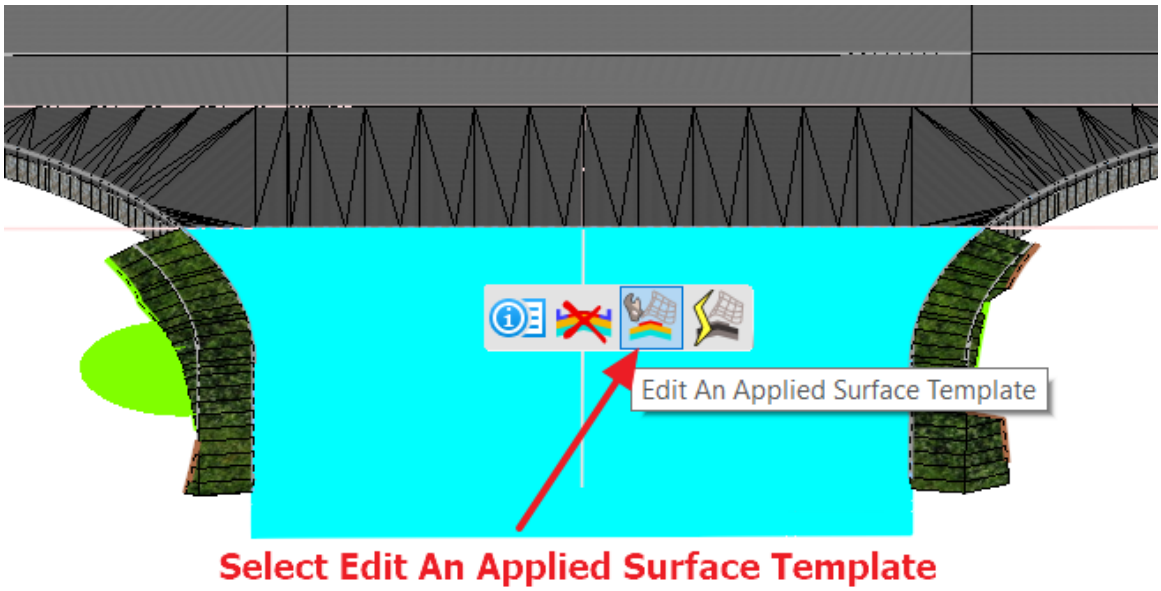


*Figure 127 Select Edit on an Applied Template*

a. In the Editing Roadway Designer Template Drop dialog, the pavement thickness can be edited. For this example, *EOR_sg_lt* and *EOR_sg_rt* points depth will be changed from 1' to 1.33'. Double click on **EOR_sg_lt** point.

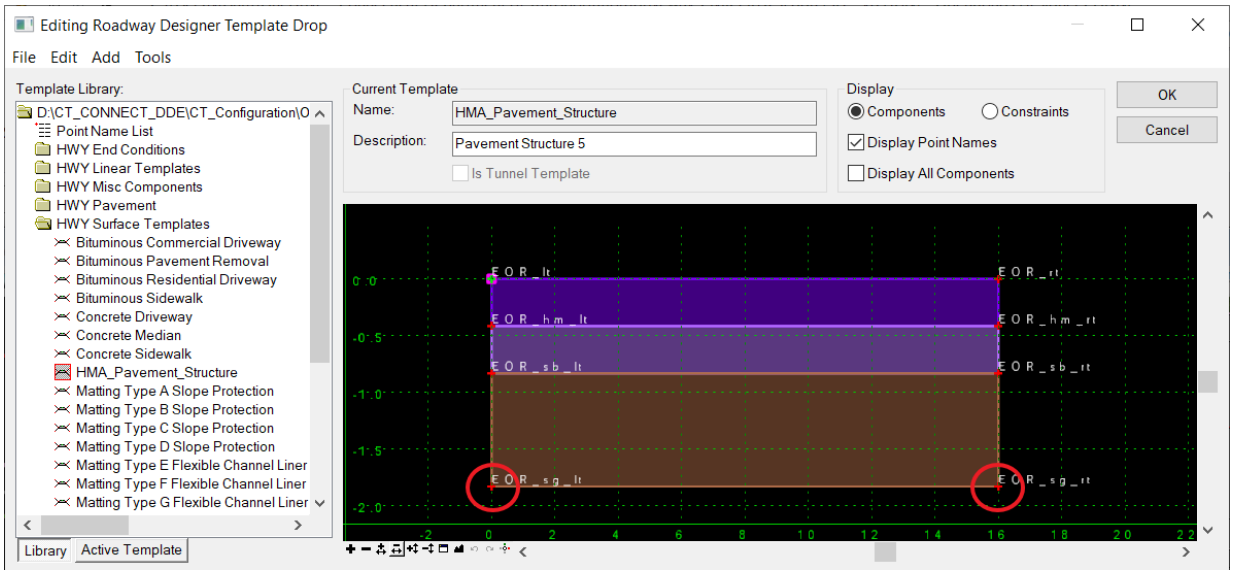


*Figure 128 Edite Template Drop*

b. In the Point Properties dialog, change Vertical Value from ***-1 to -1.333*** under Constraint 2 and click **Apply** then click **Close**.

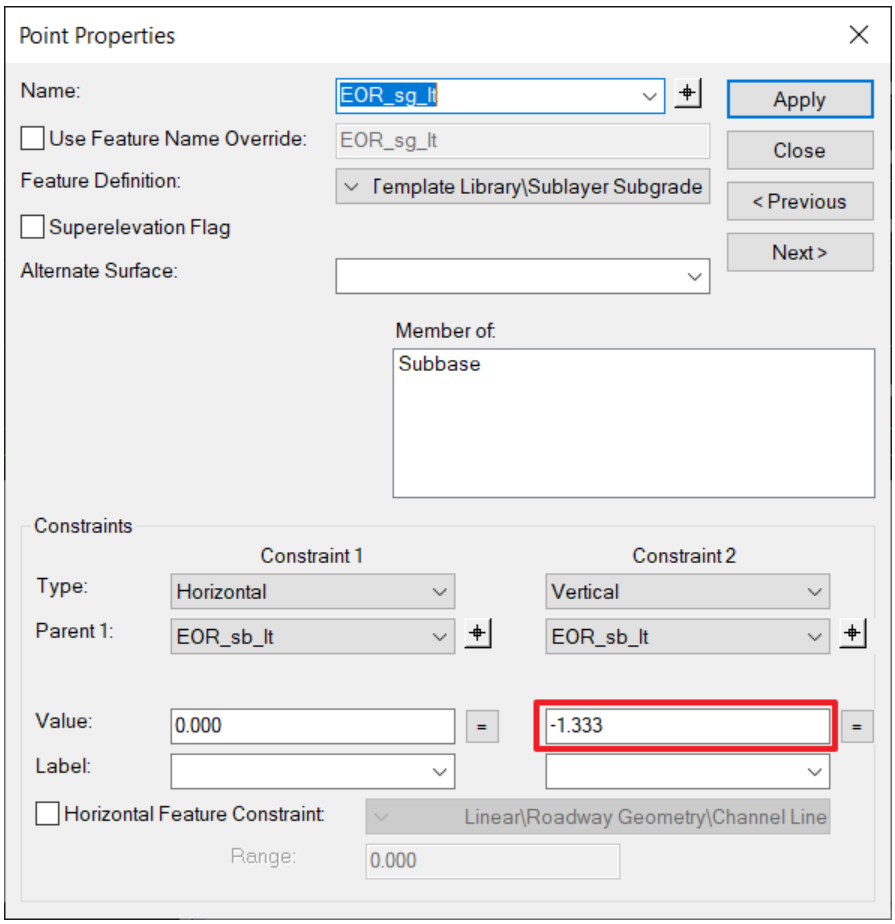


*Figure 129 Point Properties*

c. Double click on ***EOR_sg_rt*** point. In the Point Properties dialog, change Vertical Value from ***-1 to -1.333*** under Constraint 2 and click **Apply** then click **Close**.

d. Click **OK** to close the Editing Roadway Designer Template Drop dialog. The Depth of the bottom layer of the surface template is updated to the new value. You can see the change in the 3D view.

# Revisions