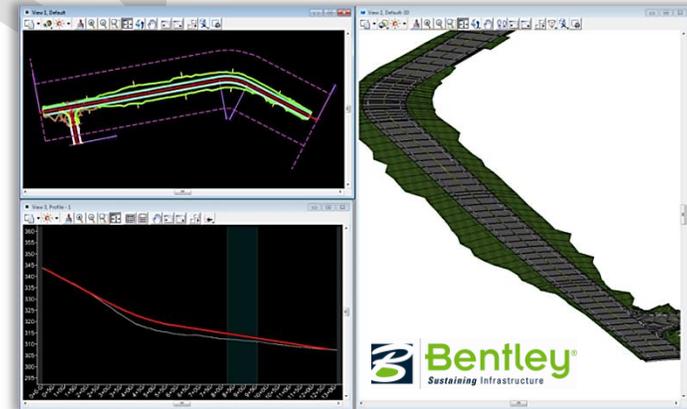




Office of Engineering
Division of Facilities & Transit

ARCHITECTURAL
AEC
ENGINEERING CONSTRUCTION
APPLICATIONS

Version 3
10/24/2016



CTDOT OPENROADS MANUAL FOR DESIGNERS

INTRODUCTION

The purpose of this manual is to introduce CTDOT users to the latest OpenRoads technology. AEC Applications provides an OpenRoads Managed Workspace through the use of ProjectWise. This workspace provides the standardization users will need to prepare their design. All OpenRoads projects will be done in the ProjectWise (PW) document management system environment and will use Managed Workspaces to implement the latest CTDOT CADD Standards.

Bentley ProjectWise (PW) is a collaborative environment which allows all parties involved in the project to use live data and to make real time decisions. It also allows CAD support to immediately update or edit any necessary Workspace resource. All CTDOT employees should have a ProjectWise account. If you do not, or if you experience difficulties logging in, please contact Julie Annino via email: Julie.Annino@ct.gov

When starting a new OpenRoads Project do not copy over or open any DGN files that were used on the X Drive, these files do not use the correct settings. You may reference them in as needed but using them and running OpenRoads will cause problems.

Selecting the Bentley Institute Icon throughout this manual will link users to training videos on the Bentley LEARNServer. These videos are part of the [OpenRoads Technology - Getting Started](#) Learn Path.

Before getting started AEC recommends viewing these first 2 videos to get acclimated with the application and the terms used throughout this guide.



Understanding
OpenRoads technology



Become Familiar with
the OpenRoads
Interface and Tools

Chapter 1 ProjectWise Set Up

The steps in this chapter will only have to be done at the initial startup and then if again if a user gets upgraded software, they receive a new computer, or their computer has to be reimaged. The Steps in Chapter 2 will need to be completed for every new project a user works on.

Step 1 Verify Software Installations

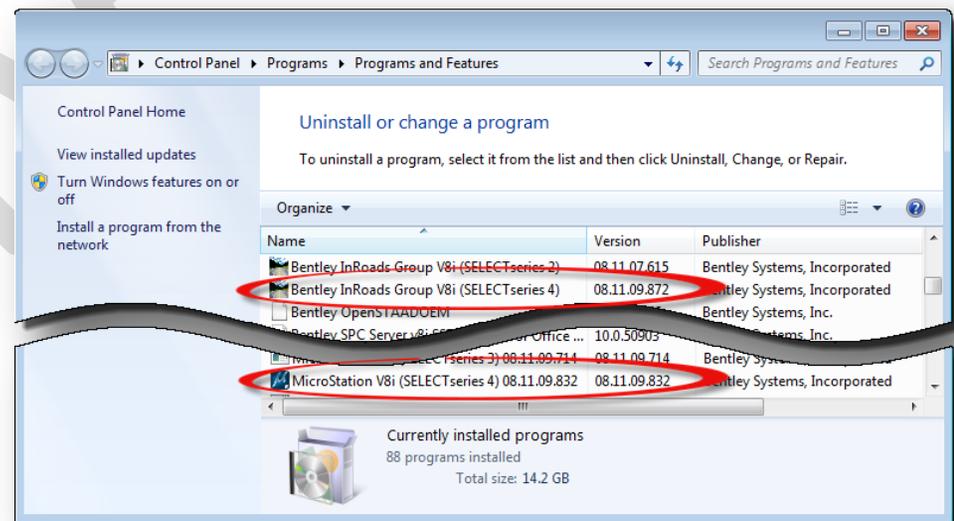
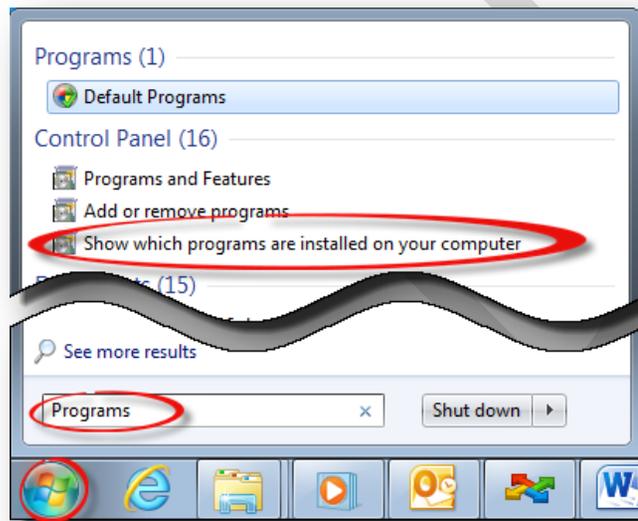
Verify that the required software versions have been installed on your computer by navigating to the Windows Start Menu and typing **Programs** into the search field. Select **Show which programs are installed on your computer** from the search results. This will open the Control Panel's Programs and Features which lists the names and versions of the installed programs.

The required versions are as follows:

ProjectWise Explorer V8i (SELECTseries 4) - Version 08.11.11.566

MicroStation V8i (SELECTseries 4) - Version 08.11.09.832

Bentley InRoads Suite V8i (SELECTseries 4) - Version 08.11.09.872



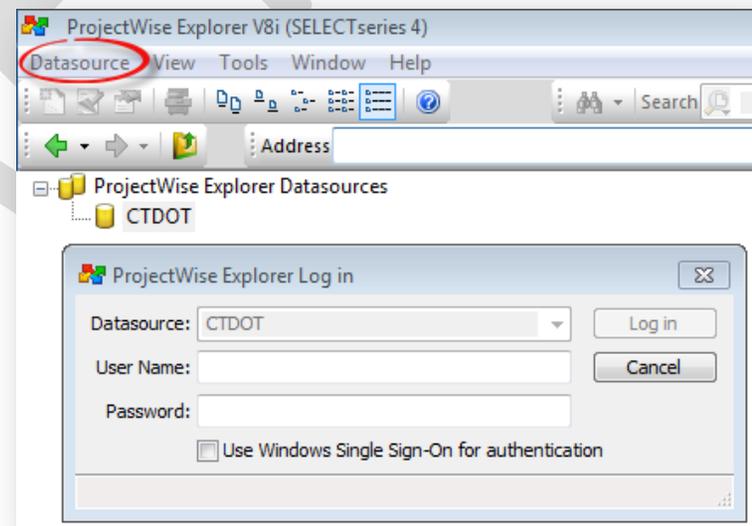
Step 2 Create a ProjectWise Desktop Shortcut

1. Select **All Programs > Bentley > ProjectWise V8i**.
2. Right click on ProjectWise Explorer and select **Send to > Desktop**.



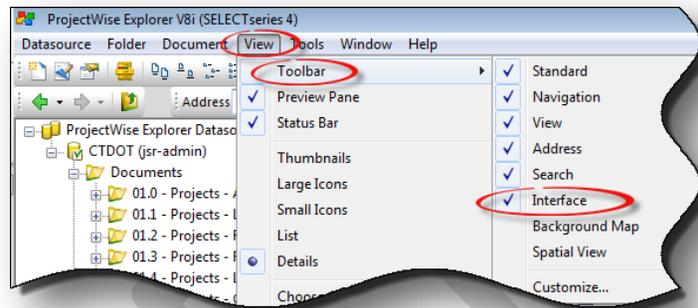
Step 3 Log in to ProjectWise

1. Double click on the newly created **ProjectWise Explorer** Icon as shown above.
2. From the ProjectWise Explorer main menu, select **Datasource > Log in...**
3. Enter your **User Name** and **Password** then select the **Log in** button.
4. Browse to locate your Project under **Documents\01.0 - Projects - Active**
5. Become familiar with the new project folder structure, it is quite different than how the X drive was structured. Two important folders will be the Highway and Survey folders.
330_Design_Data\Highways
500_Pre_Design\03_Central_Survey



Step 4 Adjust ProjectWise Explorer Settings

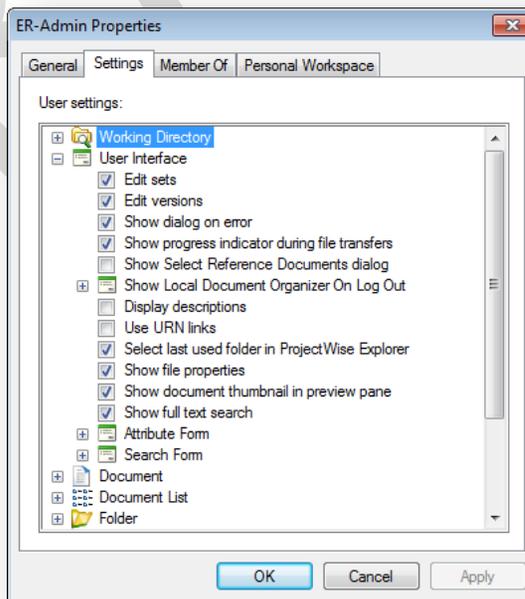
1. If the Interface and View are not displayed, navigate through the main menu select **View > Toolbar** and toggle them on.



2. ProjectWise Explorer has Interfaces and Views to display certain attributes. Ensure that:
Interface is set to **CTDOT_Doc_Code**
View is set to **Document**



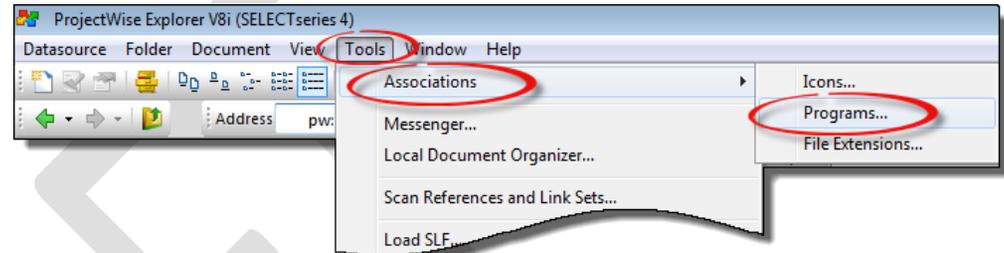
3. On the ProjectWise pull down menu select **Tools > Options**, Select the **Settings** tab and uncheck **Use URN Links**. Click **Apply** and **OK**.



Step 5 Configure ProjectWise Open With

User Program Associations must be removed in order for MicroStation platforms and user workspaces to function properly. [Note: There is presently a service ticket filed for this]

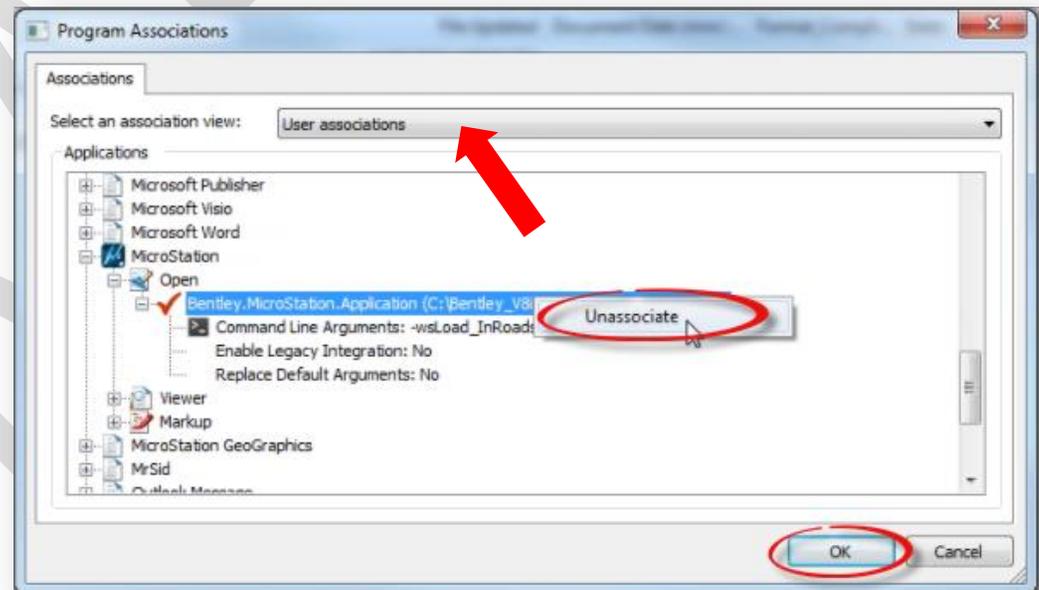
1. From the ProjectWise Explorer main menu, select **Tools > Associations > Programs**



2. From the Program Associations dialog box, change Select an association view to **User associations**. Scroll down to **MicroStation**.

Note: In this case, MicroStation has its own unique icon displayed. (This is not the case for other programs such as MrSid and Outlook Message.) This indicates that there are User associations activated which must be removed.

3. Expand the MicroStation tree to display **Open, Viewer, & Markup**. If the MicroStation icon is just a generic icon that looks like a notepad, skip the remaining part of this step.
4. Expand **MicroStation > Open** and right click on the line containing `\ustation.exe`. Choose **Unassociate** and **OK**.
5. Repeat for each `\ustation.exe` instance under **Open**. Disregard Viewer and Markup.

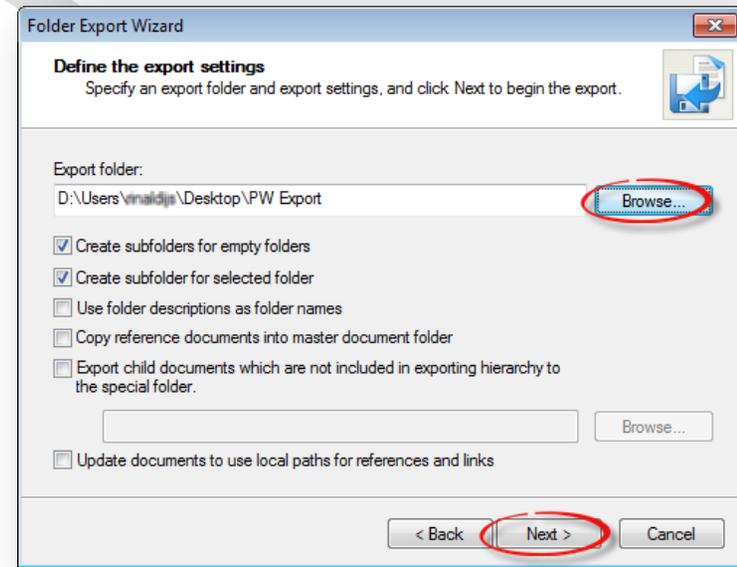


Step 6 Set up Your User Preferences

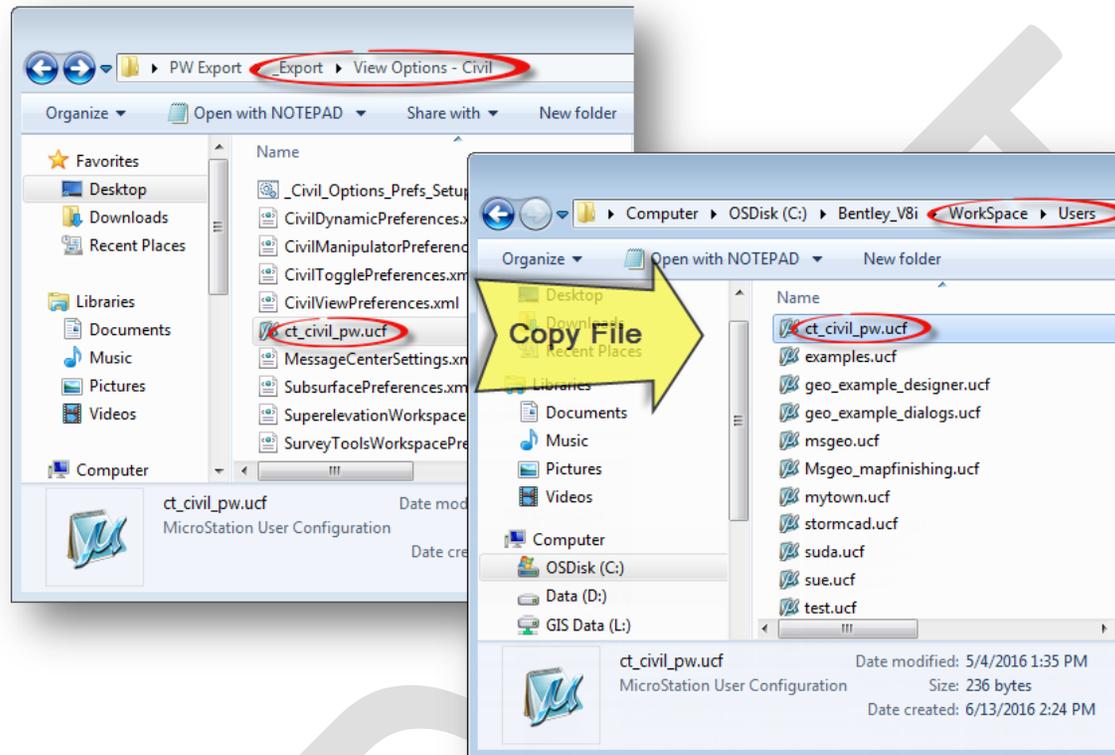
1. On your desktop create a folder named *PW Export*.
2. In ProjectWise browse to *05.0 - Workspace Resources\3_Workspace_V8i_Export*. Right click on the *_Export* folder and select *Export...*
3. Choose *Send to Folder* and select *Next>*.



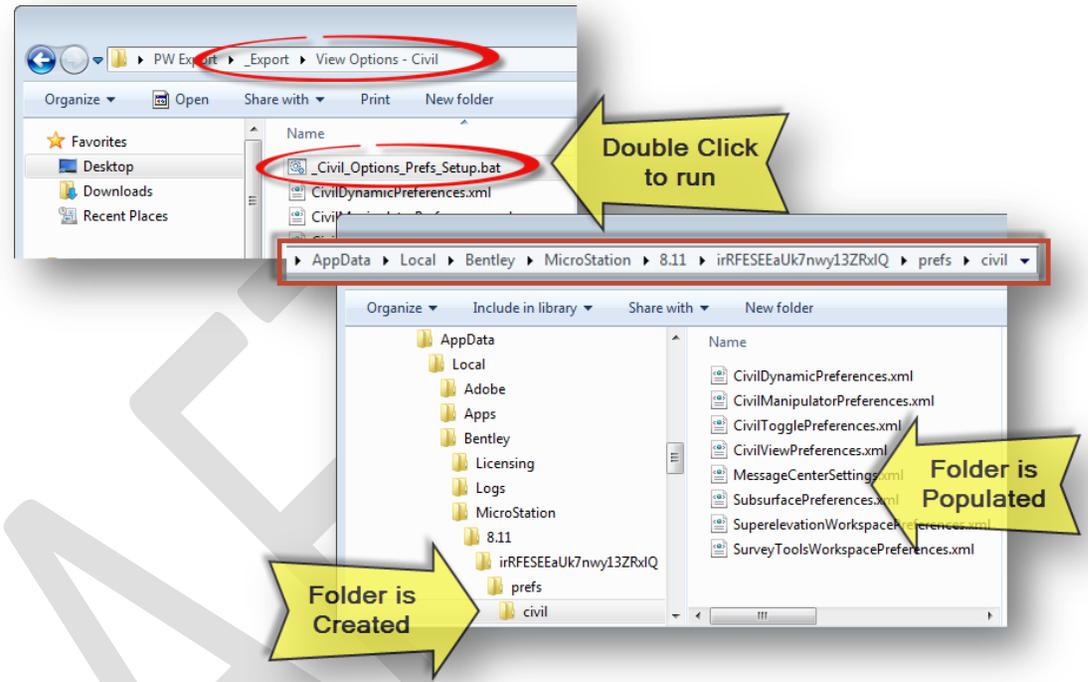
4. Browse to an export folder created in step 1 and accept to overwrite any outdated files if prompted, and *Finish*.



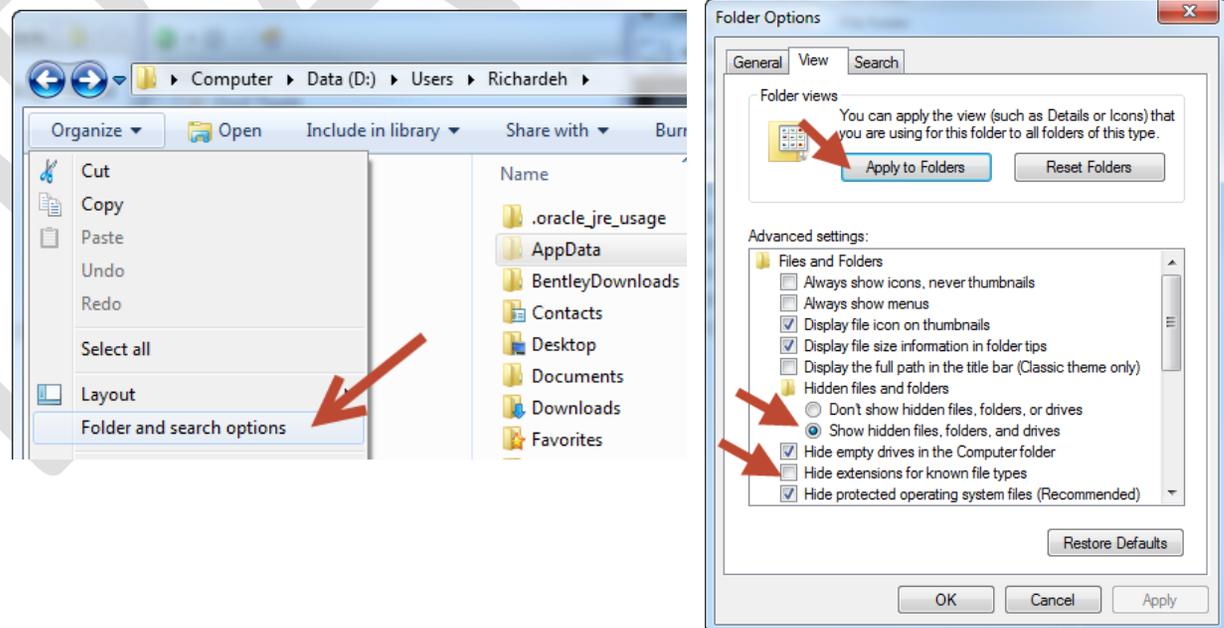
5. On your desk top open the folder *_Export folder|View Options - Civil* and copy *CT_Civil_pw.ucf* and *CT_MSTA_PW* to *C:\Bentley_V8i\Workspace\Users*.



6. Again go to the *_Export folder* on your desktop, double click on *_Civil_Options_Prefs_Setup.bat* to automatically populate the civil folder with default preferences for Civil Options.



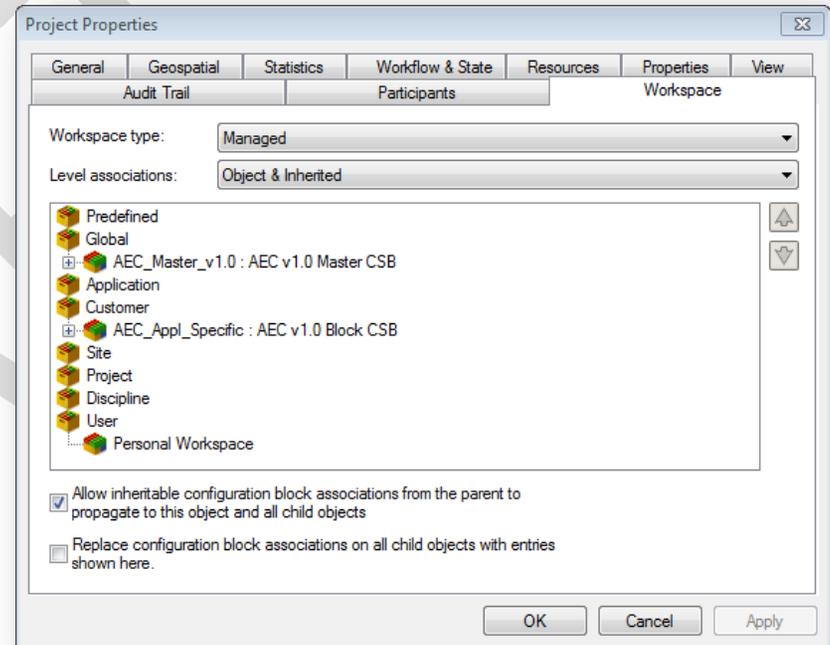
7. If you do not see Hidden Folder of File Extensions you will need to change your folder options in Windows Explorer.



Chapter 2 Project Start up

Step 1 Verify Correct Project Workspace

1. Locate the Workspace location. You will no longer be connected to the old workspace on the W drive, instead you will find the workspace at this location in ProjectWise, **Documents\05.0 - Workspace Resources\3_Workspace_V8i**
2. Check to make sure your project is configured to the correct workspace. In ProjectWise explorer right click on the project folder and choose **Properties**. All projects using OpenRoads SS4 should use the following Blocks shown in the image below. ProjectWise Configuration Settings Blocks (CSBs) are attached to projects so that CAD workspaces are read when a MicroStation design file is opened.
3. If you do not see the correct blocks please contact AEC applications and they will reset them. Users do not have access to do this.
4. Click **OK** to close the box.



Step 2 Copy Resource Files from the Workspace to your project

The ITL and XIN will need to be copied over from the workspace to your project discipline folder

1. Browse to

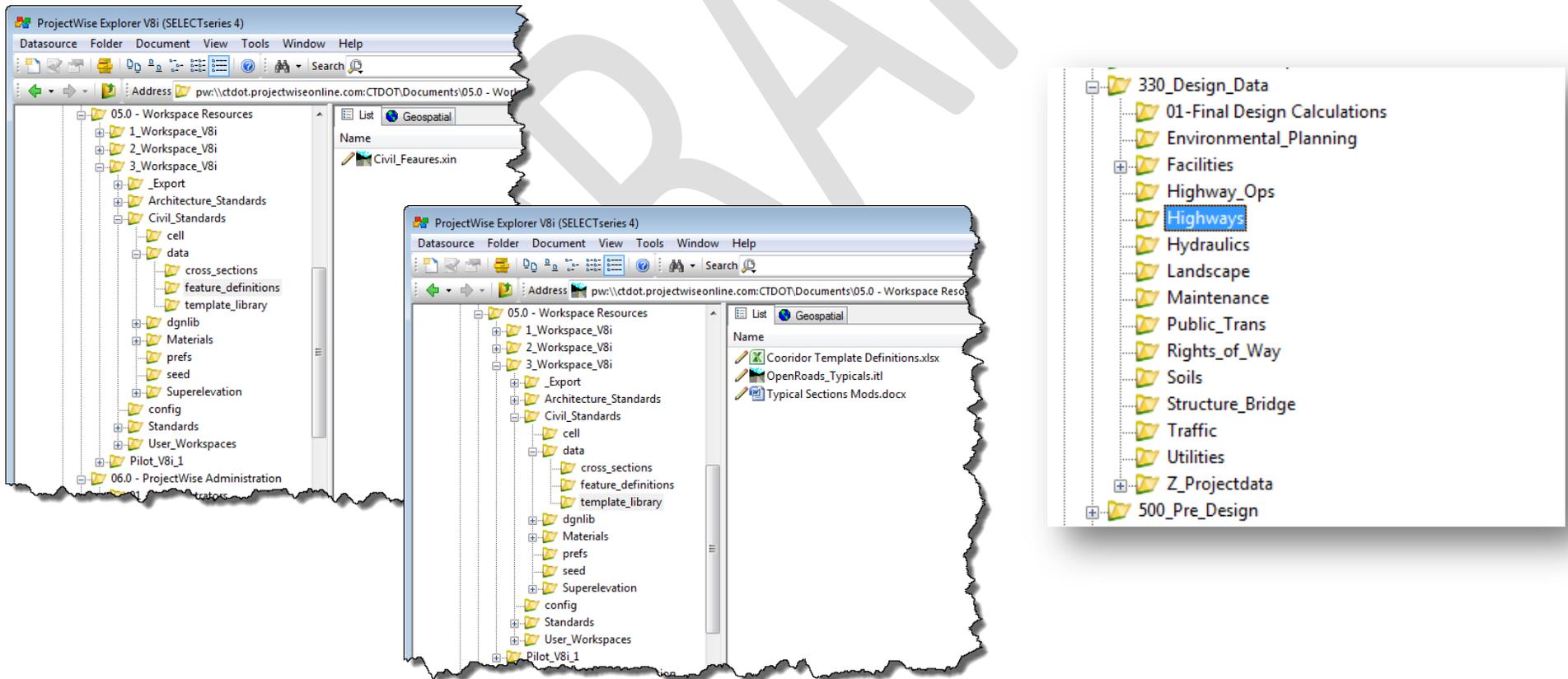
05.0 - Workspace Resources\3_Workspace_V8i\Civil_Standards\data\feature_definitions\Civil_Features.xin

Right Click and Select **Copy**. Browse to your projects discipline folder right click and select **Paste**. When the Document Wizard appears select **No Wizard** and click the **OK** button.

2. Browse to

05.0 - Workspace Resources\3_Workspace_V8i\Civil_Standards\data\template_library\OpenRoads_Typicals.itl

Right Click and Select **Copy**. Browse to your projects discipline folder right click and select **Paste**. When the Document Wizard appears select **No Wizard** and click the **OK** button.



Step 3 Create a Document (MicroStation DGN File)

-Seed File Usage-

- Use a 2D DGN seed file to start your Design Modeling (OpenRoads will automatically create a 3D model as your design progresses).
- Survey will use one of the 3d DGN seed file to house the Existing Terrain.
- DO NOT Drag and drop DGNs and Point Cloud files in from the network location. These files have different working units and will not scale properly if opened in the ProjectWise environment.
- Always start with new clean seed files.

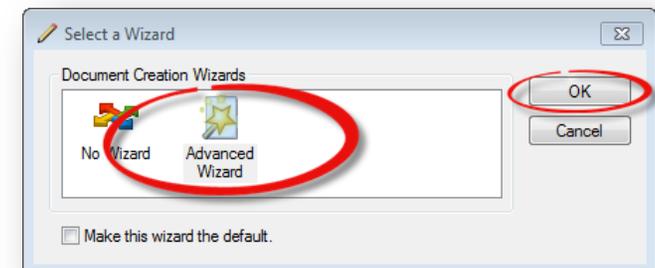
Geospatial OpenRoads seed files

```
\Documents\05.0 - Workspace Resources\3_Workspace_V8i\Civil_Standards\seed\  
2D_OpenRoads_DesignSeed_83.dgn  
2D_OpenRoads_DesignSeed_27.dgn  
3D_OpenRoads_DesignSeed_83.dgn  
3D_OpenRoads_DesignSeed_27.dgn
```

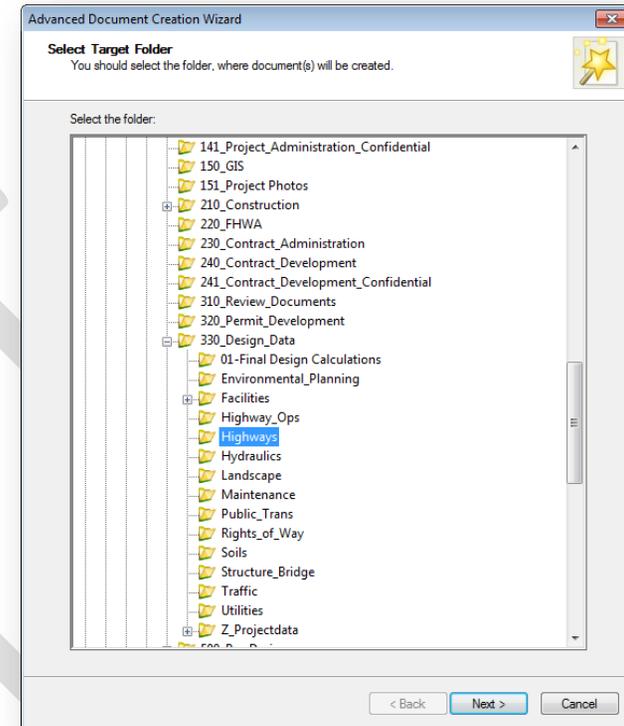
FAQs - NAD & NGVD

<http://www.ngs.noaa.gov/faq.shtml#WhatNAD>

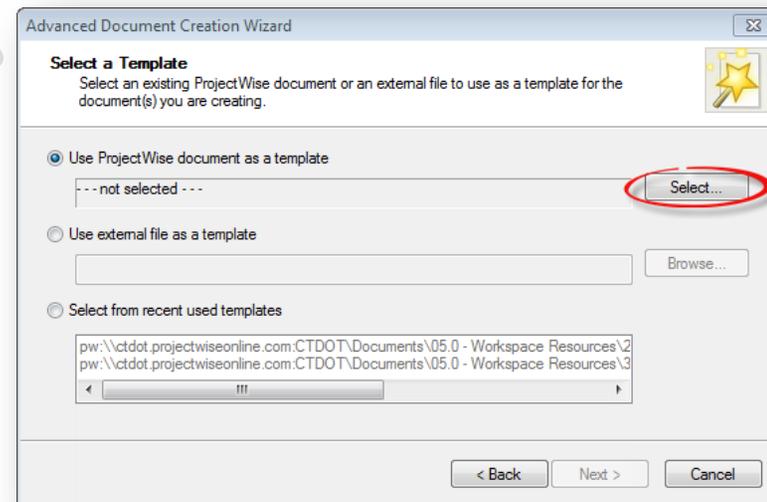
1. Select the project subfolder that you wish to work in.
Example: 01.0 - Projects - Active\1234-1234\300_Design_Data\Highway\
2. From the main menu, select **Document>New > Document...**
3. In the **Select a Wizard Dialog Box**, select **Advanced Wizard** then **OK**.
4. On the **Advanced Document Creation Wizard Welcome** dialog box Select **Next>**.



5. When prompted to Select Target Folder, verify that you are pointed to the correct folder and select **Next>**.



6. From the Select a Template options, toggle on **Use ProjectWise as a template** and click the **Select...** button. If this is not your first time creating a MicroStation file in ProjectWise, you may elect to toggle on **Select from recent used templates** and use a previously selected seed file stored in your file history and skip to the next step.



7. A Select Template Document dialog box will appear. Browse to the seed files location:
...05.0 - Workspace Resources\3_Workspace_V8i\Civil_Standards\seed\

Choose the 2D seed file that correspond to your survey NAD year 1983 or 1927.

2D_OpenRoads_DesignSeed_83.dgn

or

2D_OpenRoads_DesignSeed_27.dgn

Select the **Open** button. The template is now populated for Advanced Document Creation. Select **Next**.

8. Select the fields to Define Document Attributes as shown. Tab to accept each field. The document file name will be built from these fields. Be sure to enter a **Label** and **Description**. These fields will be displayed and used for searching rather than the file name. Select **Next**.
9. On the Document Properties Dialog Box select **Next>**.
10. On the Create a Document Dialog box select **Next >**.
11. Click **Finish** to **Close**. The new file will now appear in ProjectWise.
12. To Update the ProjectWise Explorer Document View **data point in the view** and then select **F5** on the keyboard. This will refresh Label and Description.

Advanced Document Creation Wizard

Define Document Attributes
You should define environment specific document attributes.

Discipline: HW
Discipline Description: Highways

Main Category: CAD
Sub-Category: Design
Sub-Category Description: CAD Design Models

Project Number(s): 1234_1234
Document Date (mm/dd/yyyy):

Label (User Defined): OpenRoads

Description: OpenRoads Modeling File

Bridge No(s):
Signal Intersections No(s):
Traffic_Structure_ID:
Sign Structures No(s):
Railroad Crossing Signal No(s):

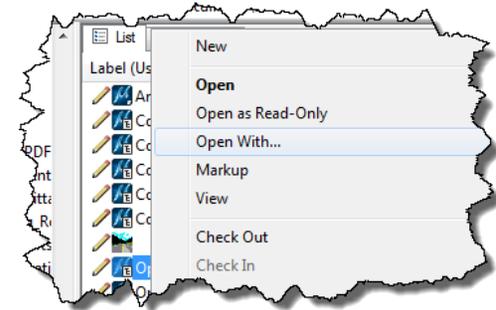
CTDOT Asset Tags

Building No(s):
State Route No(s):
Town Road ID(s):
Town No(s):

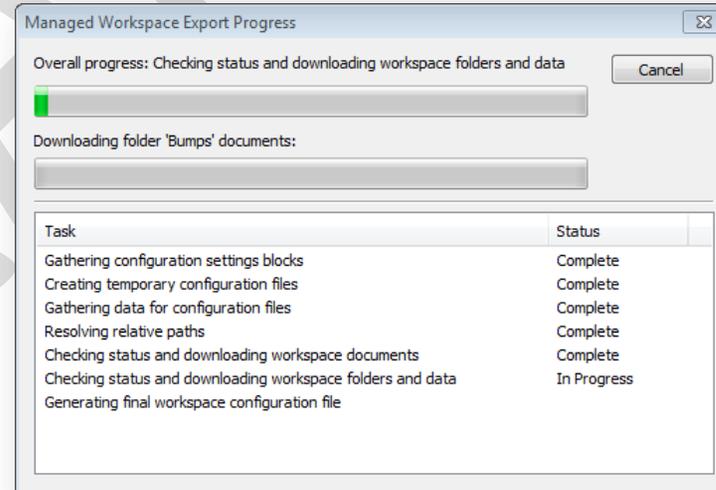
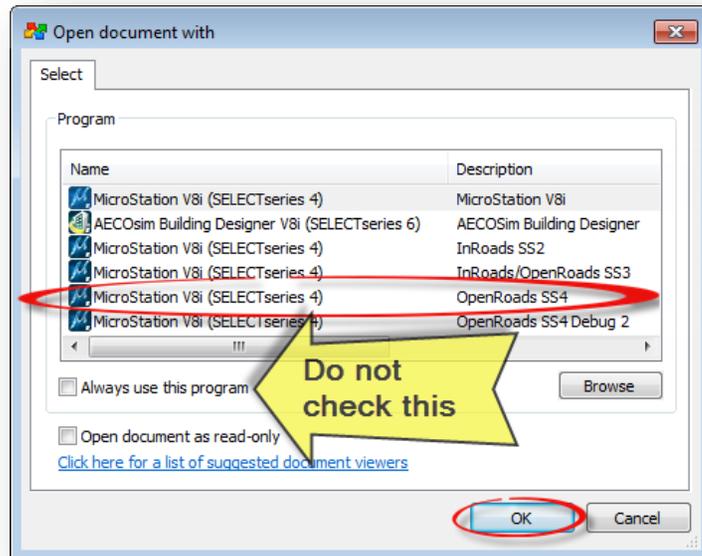
< Back Next > Cancel

Step 4 Open a MicroStation DGN file

1. In ProjectWise Explorer browse to your discipline folder and locate the DGN file you wish to open, right click on the DGN file and select **Open With**. By default MicroStation DGN files will open with MicroStation only (i.e. no InRoads nor OpenRoads) if double clicked on, so selecting open with is imperative if you want to run OpenRoads.

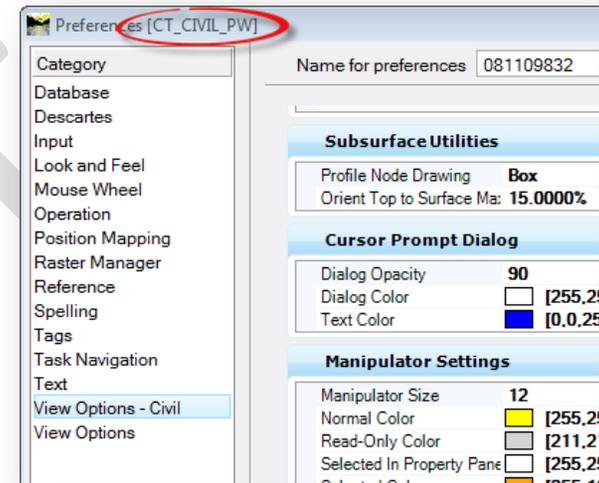


2. In the Open document with dialog box locate the Description column and select **OpenRoads SS4**. This will use OpenRoads SS4 if it is installed and also complete CTDOT configurations. The Managed Workspace will now begin to cache on your computer's hard Drive.

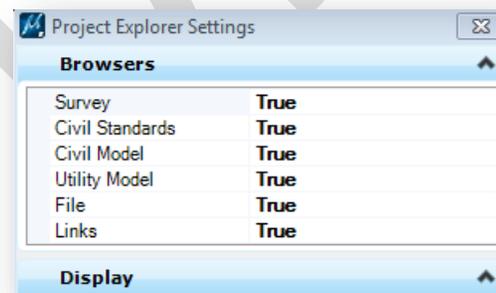
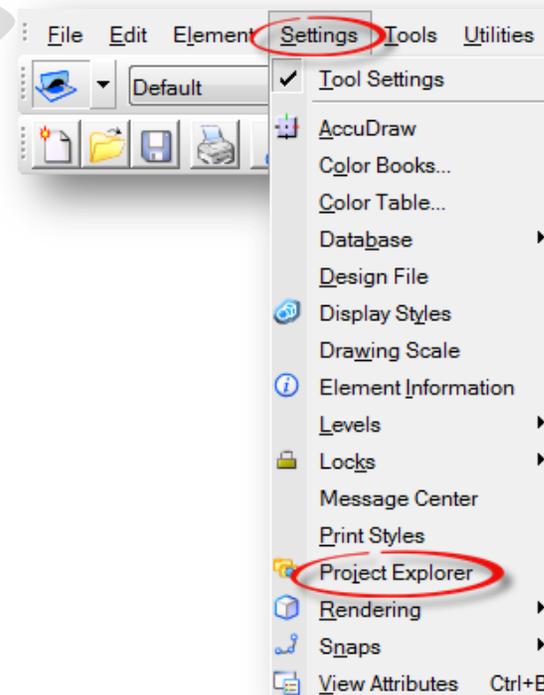


Step 5 Ensure your User Preferences are working properly

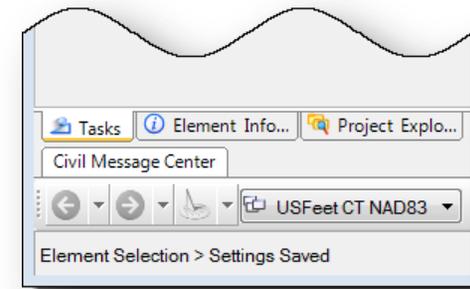
1. Now that your MicroStation File is opened you should check to make sure your User Preferences are properly set. On the MicroStation pull down menu select **Workspace>Preferences**. It should be named **CT_CIVIL_PW**



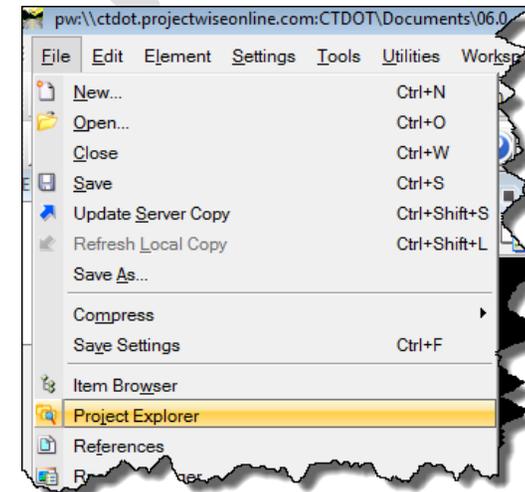
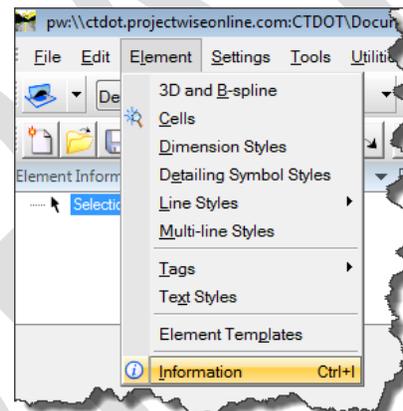
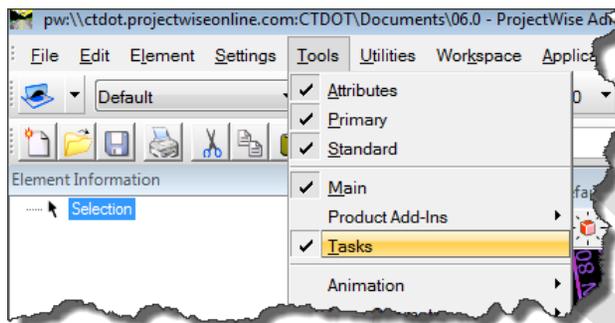
2. Ensure that all MicroStation Project Explorer settings for Browsers are set to **True** by selecting **Settings > Project Explorer** from the MicroStation menu.



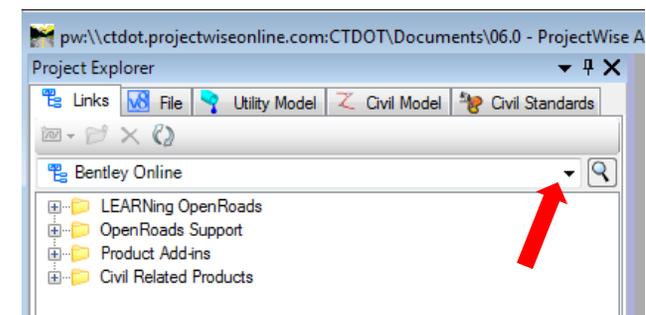
3. At the bottom of the Right side of you screen check for docking of the Tasks, Project Explorer and Element Information Tabs. You can move and doc them as desired.



4. If the these menu are not visible you can manually turn them on using the MicroStation pull down menu.
For the Tasks select **Tools > Tasks**.
For Element Information select **Element > Information**.
For the Project Explorer select **File > Project Explorer**.



5. Locate the Bentley Online Help Videos, On the Project Explorer there is a Tab named Links. Click on the down arrow and select **Bentley Online**. This will directly link you to Bentley's help and Training Videos.



Step 6 Set up Project Defaults

1. If the InRoads explorer dialog box is not visible you will need to open it. On the MicroStation pull down menu select **Applications > InRoads > Tools > Show/Hide**
2. On the InRoads Main menu select **File > Project Defaults**. Select the **New** button and type **PW** followed by the project number.
3. In the Preference (*.xin) field browse the XIN file that was copied to your discipline folder.
4. Copy that same path (not the file) in to the **Default Directory Path** for the Geometry Project (*.alg) and the Template Libraries (*.itl).
5. Click **Apply** and **Close**.
6. Open **Project Defaults** again and select **Highway** as your **Preferred Preference**.

The screenshot shows the 'Set Project Defaults' dialog box with the following details:

- Configuration Name:** PW_1234_1234
- Default Preferences:**
 - Preferences (*.xin): pw:\ctdot.projectwiseonline.com:CTDOT\Documents\01.0 - Proj...
 - Tumouts (*.xml):
 - Drainage Structures (*.dat):
 - Rainfall Data (*.idf):
 - Bridge Sections (*.bt):
 - Drafting Notes (*.dft):
 - Pay Items (*.mdb):
- Default Directory Paths:**
 - ProjectWise Directory:
 - Project Default Directory:
 - Report Directory:
 - Projects (*.rwk):
 - Surfaces (*.dtm):
 - Geometry Projects (*.alg): pw:\ctdot.projectwiseonline.com:CTDOT\Documents\01.0 - Projects - Active\1234_1234\
 - Template Libraries (*.itl): pw:\ctdot.projectwiseonline.com:CTDOT\Documents\01.0 - Projects - Active\1234_1234\
 - Roadway Design (*.ird):
 - Survey Data (*.fwd):
 - Drainage (*.sdb):
 - Style Sheet (*.xsl):
 - Quantity Manager (*.mdb):
- Default Grid Factor:** Grid Factor: 1.0000
- Export:** Active Only
- Preferred Preference:** Name: Highway

Chapter 3 Existing Terrain



Creating and Viewing Terrain (Part 1)



Creating and Viewing Terrain (Part 2)

Section 3.1 Obtain an Existing Terrain

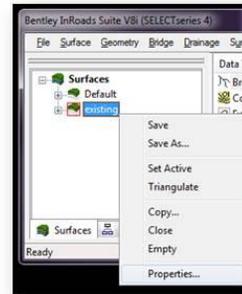
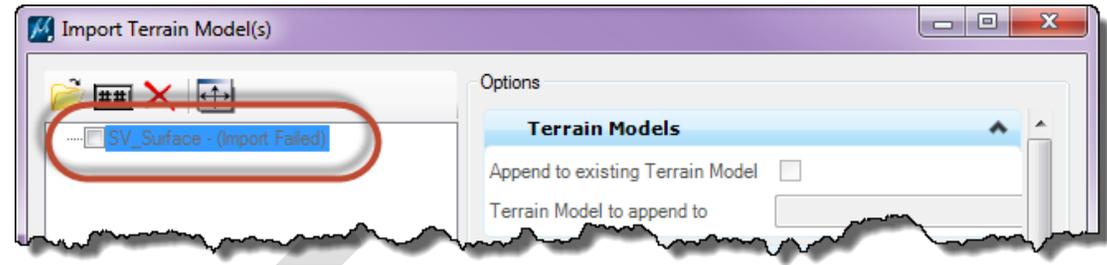
The concept of 2D and 3D files is very important when using OpenRoads. The existing terrain will be created using a seed file with a 3D model while the proposed design will be created using seed file with a 2D model. Keep in mind when using OpenRoads to design the MicroStation file with the 2D model will automatically create a 3D model, so you will be working with one file that had two models. Most of the work a designer does will be done in 2D. The 3D views are mostly used for checking the model and visualization. Below are three methods for creating an existing Terrain.

- Create from Fieldbook
- Create from File (DTM, LAS ...)
- Create from Point Cloud

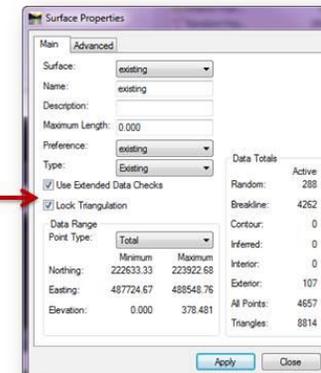
3.1.1 Create from Fieldbook

This will be done with new survey data where a DTM does not exist yet. The Survey Unit will use OpenRoads to process the fieldbook instead of InRoads SS2. Please see OpenRoads Survey Workflow for further information on this process.

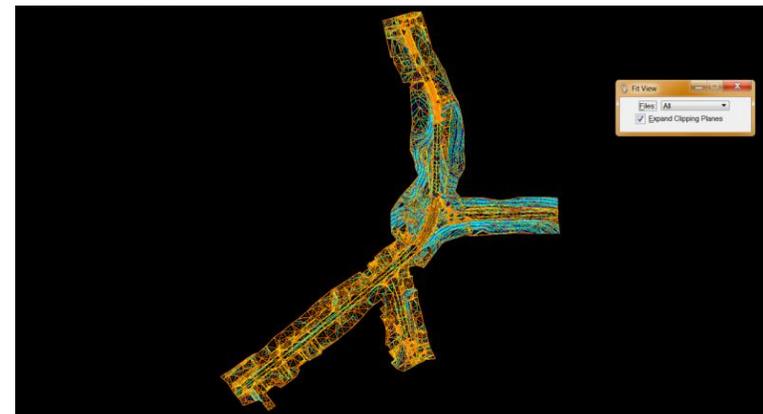
5. If an **Import Failed** error appears the following procedure must be done to the DTM.



1. In InRoads open the DTM. In the InRoads Dialog Box, right click on the DTM file and select **Properties**.
2. Toggle **ON** Use Extended Data Checks and Lock Triangulation, click **Apply** and **Close**.
3. Right click on the DTM file and select **Save**.
4. Right click on the DTM file and select **Properties** again
5. Toggle **OFF** Use Extended Data Checks and Lock Triangulation, click **Apply** and **Close**.
6. Right click on the DTM file and select **Save**.



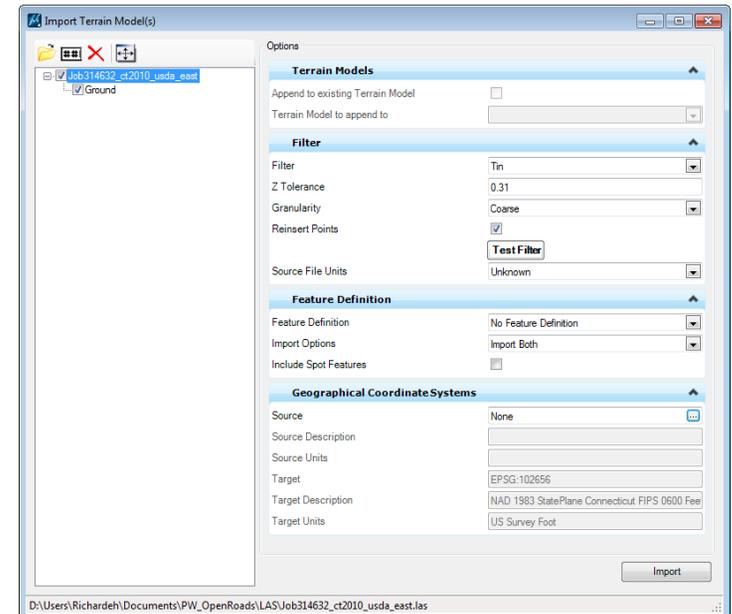
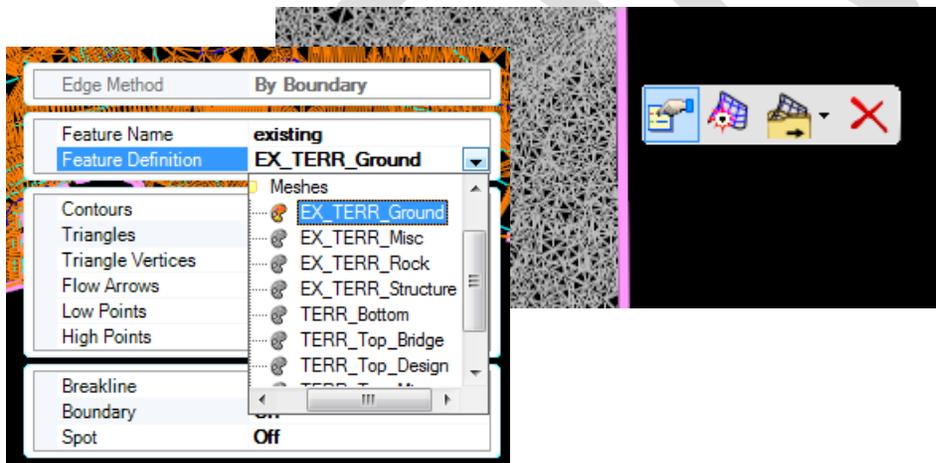
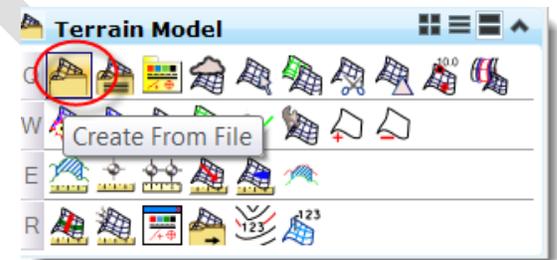
6. Go back and do #3 & 4. Select **Fit View** tool and the terrain should appear in the file.



3.1.3 Create From LAS File

This method will be used when importing LAS files. While OpenRoads can handle a larger amount of surface data than a traditional InRoads DTM it still has a breaking point. For example you will lock up if you try to import a LAS file that contains the entire State of Connecticut. The point cloud tools in the next section 2.1.4 can be used to filter out unneeded areas of the LAS file data before importing to a terrain. Size Examples: A 1000 KB file imported quickly while 100,000 KB (1.5 square miles) took some processing time. The view was slow to rotate and display.

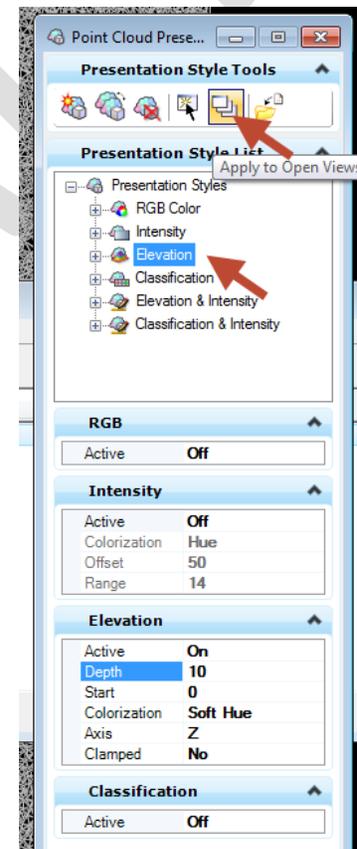
1. Complete Step 4 in Chapter 2 to create a new file. Use the seed file `Documents\05.0 - Workspace Resources\3_Workspace_V8i\Civil_Standards\seed\3D_OpenRoads_DesignSeed_83.dgn`. Open the file (Step 5, Chapter 2)
2. On the task menu select **Civil Tools\Terrain Model\ Create from File tool**
3. The Select Files to Import dialog will appear. Browse to the location of the **LAS** file to import, highlight it and click **OK**.
4. Another dialog box should appear. Fill out the fields as shown. Do not select a Feature Definition yet, this will be set after the import. Click **Import** and close the dialog box.
5. Fit the view and change the feature definition to **Meshes/EX_TERR_Ground**



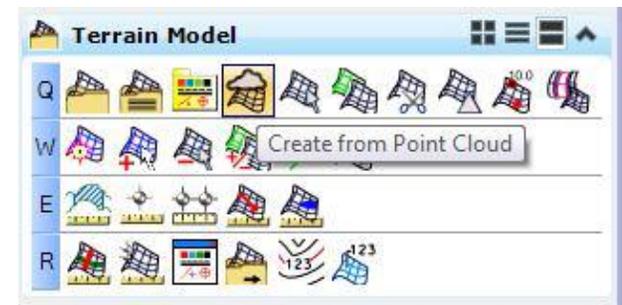
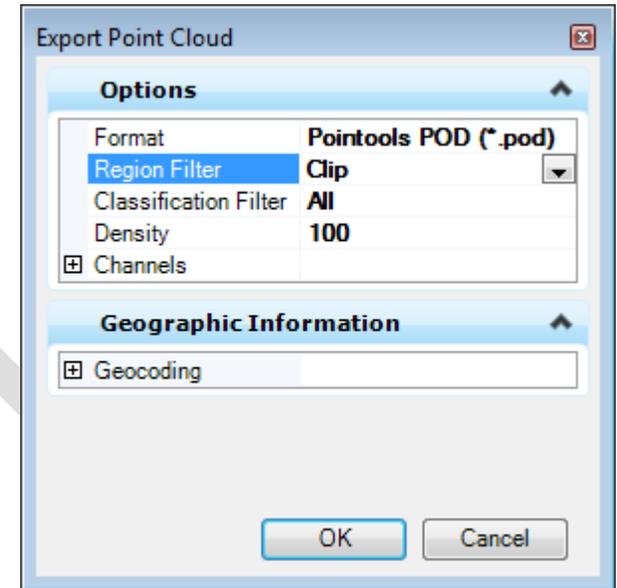
3.1.4 Create from the Point Cloud tools using a "LAS file"

This method will be used when importing a very large LAS file. While OpenRoads can handle a larger amount of surface data than a traditional InRoads DTM it still has a breaking point. The point cloud tools will be used to filter out unneeded areas of the LAS file data before importing to a terrain.

1. Complete Step 4 in Chapter 2 to create a new file. Use the seed file `Documents\05.0 - Workspace Resources\3_Workspace_V8i\Civil_Standards\seed\3D_OpenRoads_DesignSeed_83.dgn` and open the file (Step 5, Chapter 2)
2. On the MicroStation Primary Tool bar select the **Point Clouds** Icon. On the Point Cloud Dialog Box select the **Attach** Icon. Browse to and select the LAS file.
3. In the Bentley Point Clouds dialogue box select **Settings > Presentation**. Highlight the Elevation and set as needed. Click on the **Apply to Open Views** button to visualize the existing ground surface and close the Presentation dialogue box.



- In the Point clouds Dialog box use the **Clip** tool to clip out the unwanted area. Keep in mind this only clips what you see on the view display, the actual points are still in the cloud. To get rid of these points select **File > Convert**. Change the Region filter to **Clip** and click **OK**. Follow the prompts to create a new POD file.
- The Create from POD file tool in OpenRoads will bring in the entire POD regardless of what is clipped out of the view display. To only bring in the needed area attach the new smaller POD file and detach the original.
- After visualizing the existing surface with the POD file, the Terrain Model can be created. From the Terrain Models task pane select **Create from Point Cloud**.



7. Set as shown.

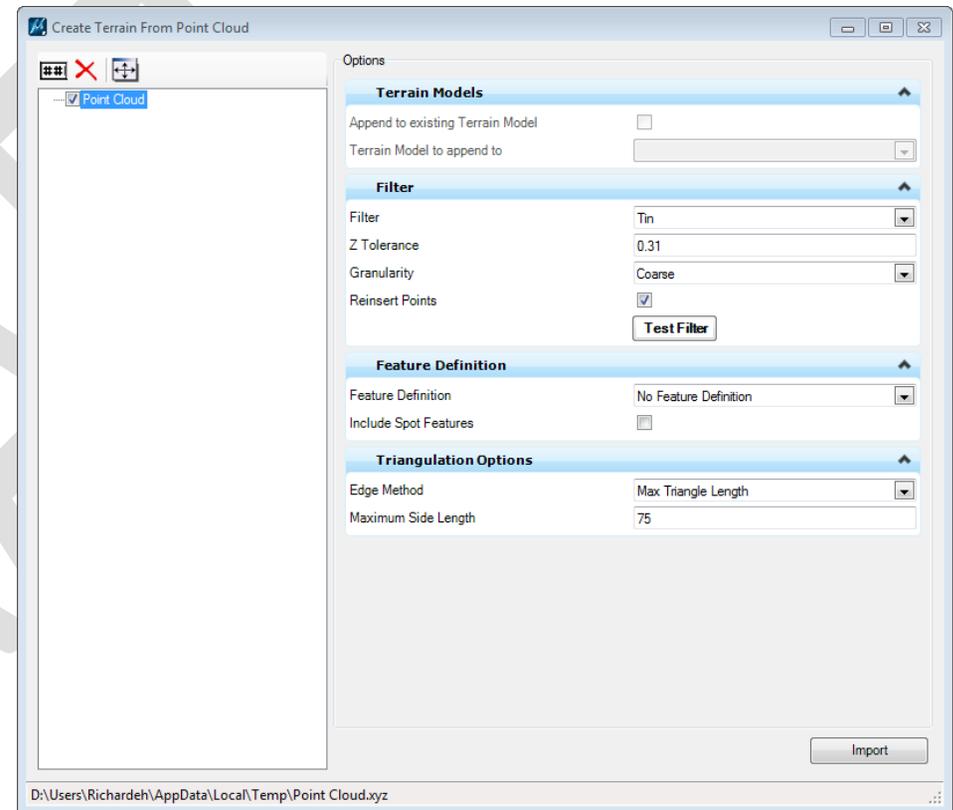
BENTLEY SUGGESTED SETTINGS FOR POD FILE IMPORT

In the Import Terrain Model From Point Cloud dialogue box

- Always use the "Tin Filter".
- Input the "Z" Tolerance.
- Always use the "Coarse" option.
- Always use "Reinsert Points" option.
- Do not select a Feature Definition until after the Terrain Model is created.

What is the "Z Tolerance"

- An unaltered TIN (no filtering) will produce a huge file that could be difficult to work with. The Z tolerance is the amount of error that you are willing to accept in order to produce a TIN that is not too large to use.
- Bentley reports that if you want to be absolutely sure that your final filtered TIN is within a certain accuracy of your original unfiltered TIN then Z tolerance should be $\frac{1}{2}$ of that acceptable error (vertical accuracy).
- The Survey Report should give you an idea of the vertical accuracy within a point cloud at a 95% confidence level.

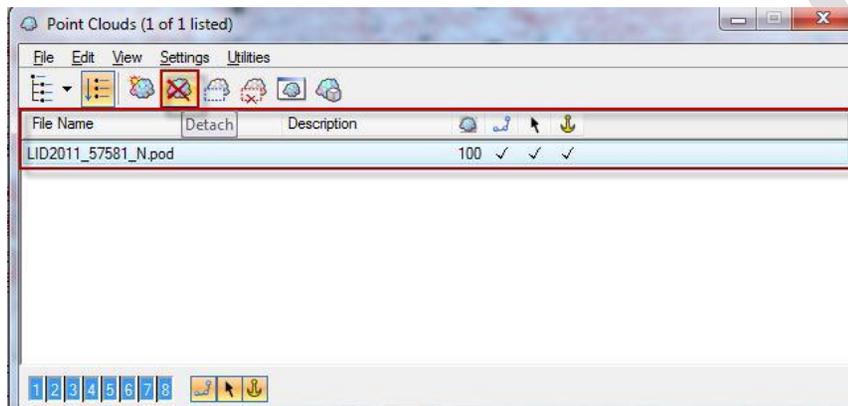


8. Select the **Test Filter** button

The "Test Filter" button allows you to test various settings before actually creating the Terrain Model. Default Triangulation Options can be changed here, before the Terrain Model is created.



9. After the Terrain Model has been created. The POD File is no longer needed and can be detached from the design file.

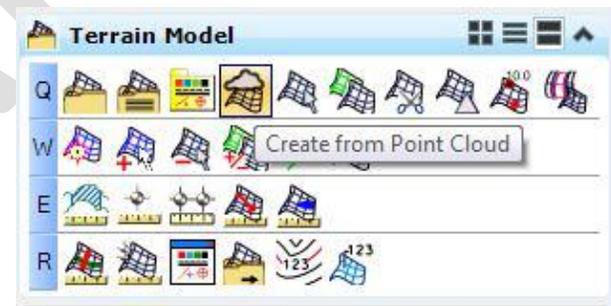
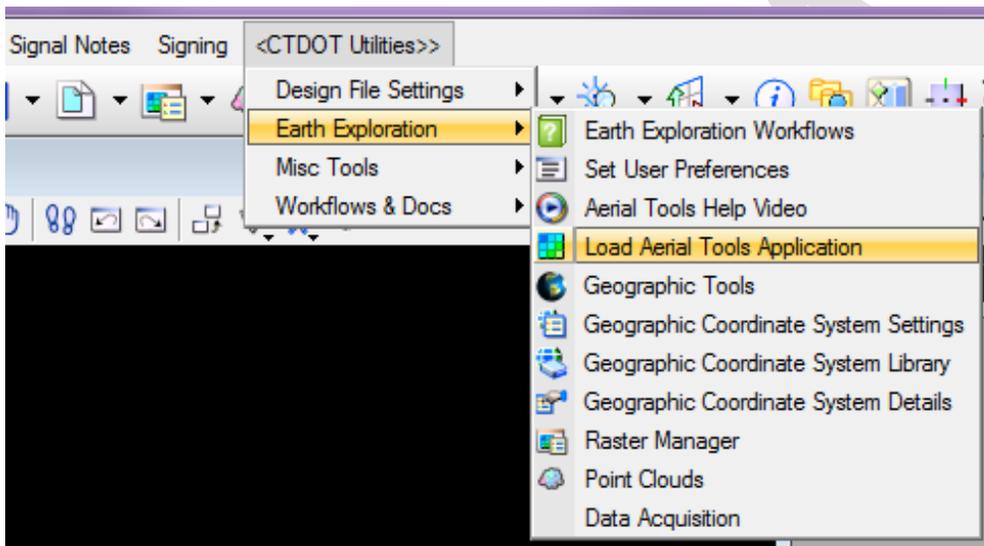


10. Fit the view and change the feature definition to **Meshes/EX_TERR_Ground**

3.1.5 Create from Point Cloud tools using Earth Exploration

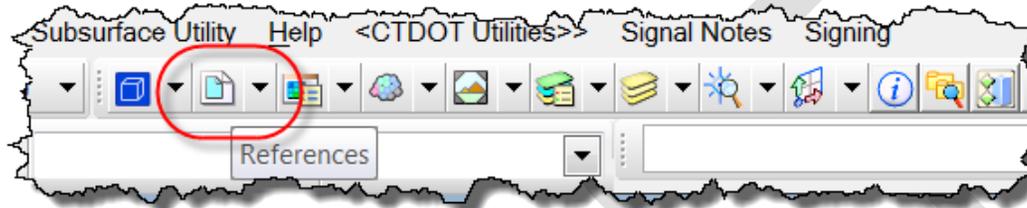
If you are in the preliminary stages and do not have an official survey yet you can use the Earth Exploration Tools provided with the workspace. These tools will aid you in loading aerial photography and Point Clouds in to a MicroStation file. The Point Clouds can then be imported in to OpenRoads to create an existing terrain.

1. Complete Step 4 in Chapter 2 to create a new file. Use the seed file [Documents\05.0 - Workspace Resources\3_Workspace_V8i\Civil_Standards\seed\3D_OpenRoads_DesignSeed_83.dgn](#) and open the file (Step 5, Chapter 2).
2. On the MicroStation Main Pull Down Menu select [CTDOT Utilities > Earth Exploration > Load Aerial Tools](#) and pull in the needed Point Clouds.
3. Use the tool [Create from Point Cloud](#) to create an existing terrain.

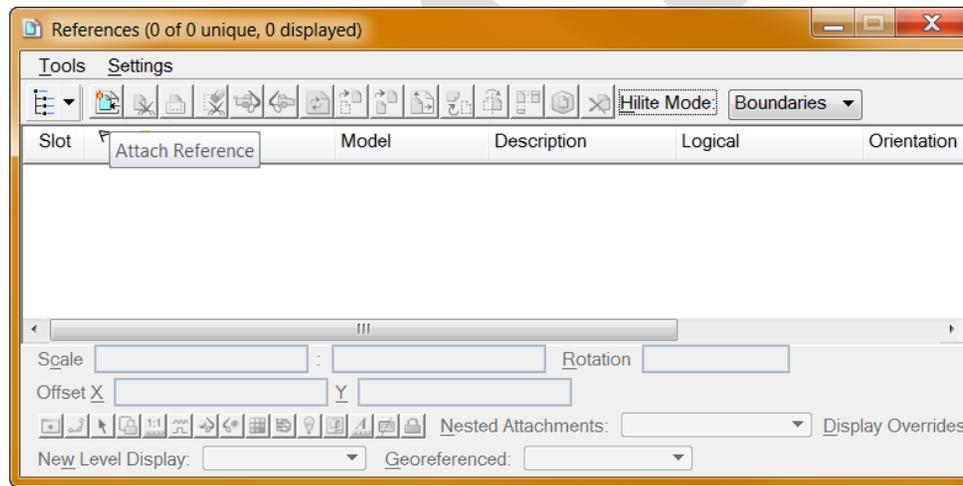


Section 3.2 Reference in the Existing Terrain

1. If you have not done so already create a 2D design file as shown in Chapter, 1 Steps 6 and right click and select **Open With**, select the **OpenRoads SS4** option.
2. Once in the file go to the **Reference** tool and open the references dialog box.



3. In the references dialog click the **Attach Reference** button.



4. In the Attach Reference dialog box browse to the needed DGN terrain file. If Survey created it, the file will be in the **500_Pre_Design\03_Central_Survey** folder. Highlight it and click **OK**.

5. In the Reference Attachment Settings Dialog Box give the file a logical name, set the options as shown. Be sure that the Nested Attachments is set to **No Nesting** and click **OK**.

Reference Attachment Settings for ...\terrain file_AEC_DESIGN_.dgn

File Name: PW_WORKDIR:d0200908\terrain file_AEC_DESIGN_.dgn
Full Path: ...sfs-admin\d0200908\terrain file_AEC_DESIGN_.dgn
Model: Default

Logical Name: ground terrain
Description: Master Model

Orientation:

View	Description
Coincident	Aligned with Master File
Coincident - World	Global Origin aligned with Master File
Standard Views	
Saved Views (none)	
Named Fences (none)	

Detail Scale: Full Size 1=1

Scale (Master:Ref): 1.000000 : 1.000000

Named Group:
Revision:
Level:
Nested Attachments: No Nesting Nesting Depth: 2
Display Overrides: Allow
New Level Display: Use MS_REF_NEWLEVELD
Global LineStyle Scale: Master
Synchronize View: Volume Only

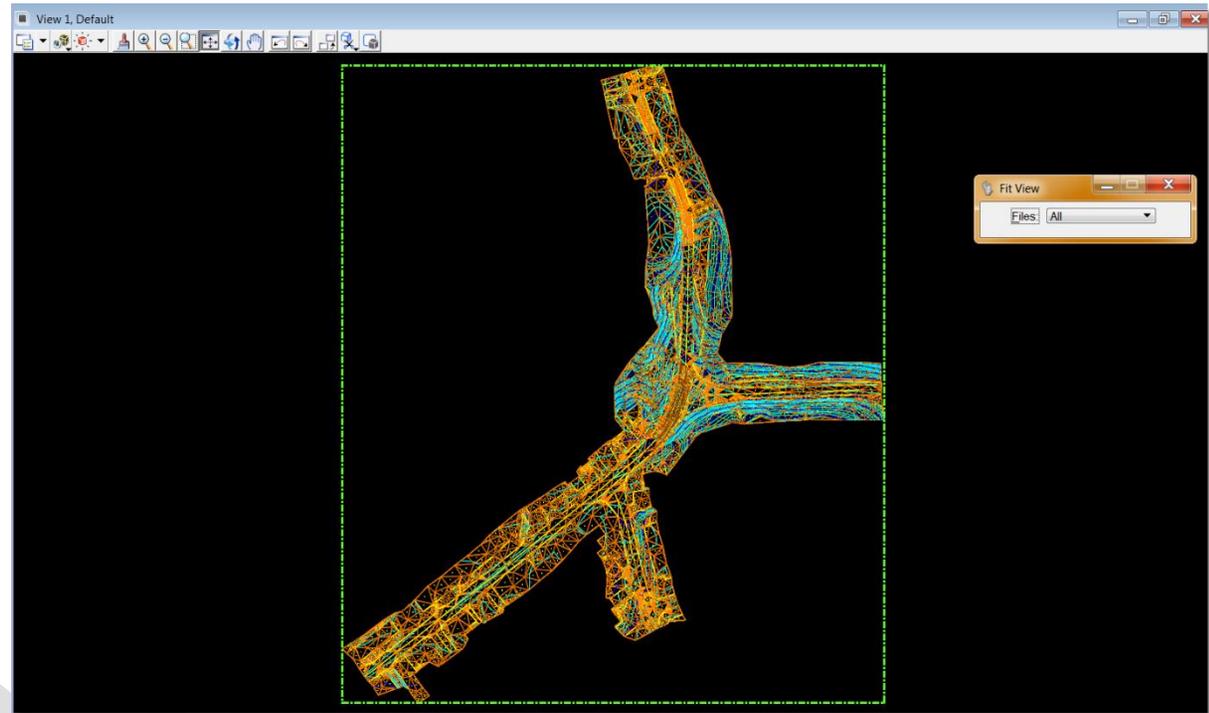
Toggles

Drawing Title

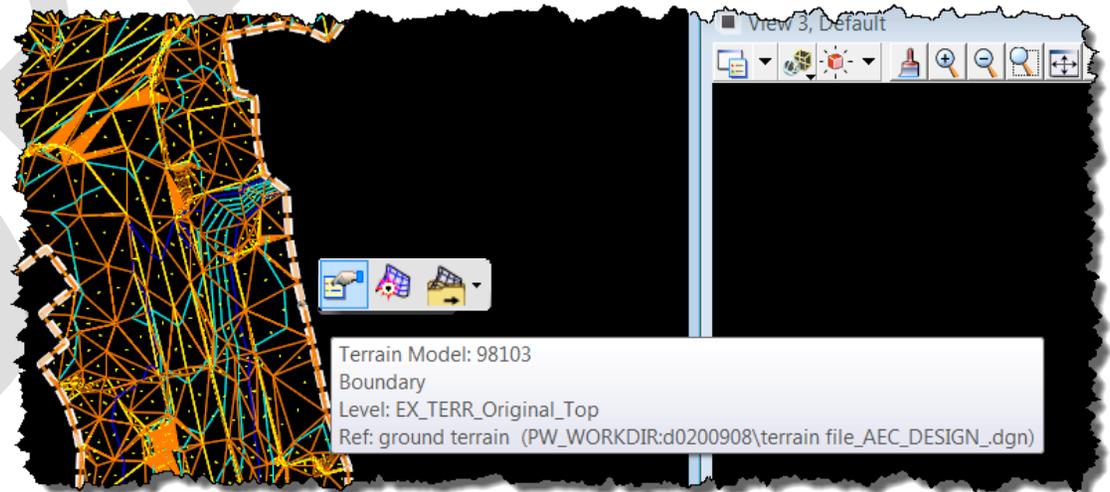
Create
Name: Drawing

OK Cancel

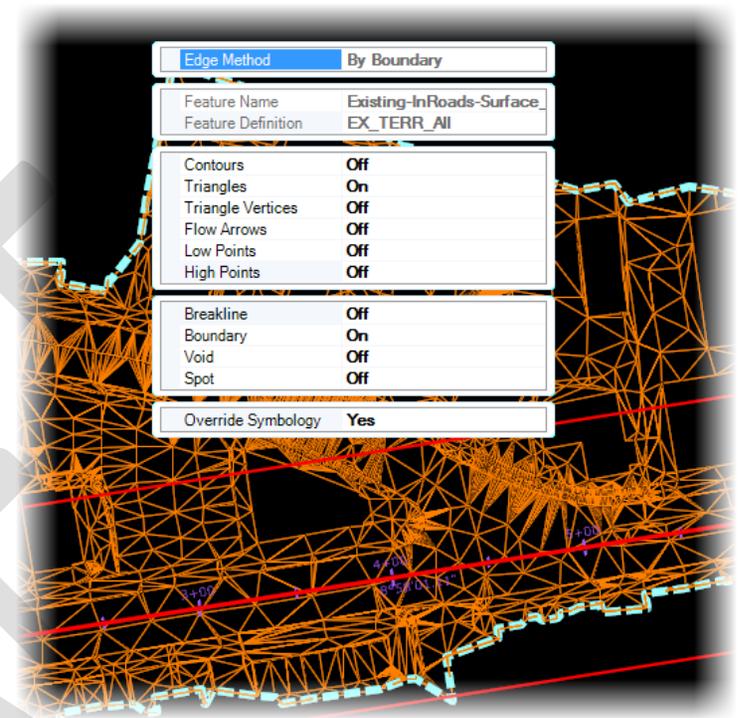
6. Go to your main view and click **Fit View**. The terrain should be displayed.



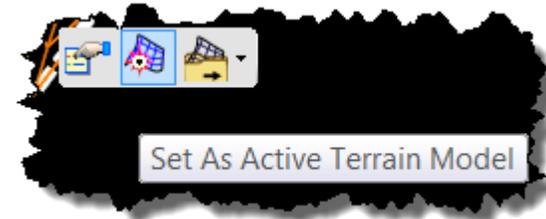
7. To change the display of the view select the **Element Selection Tool** and click and hover over the terrain border (edge) to get the context menu to appear. Click the **Properties** button.



8. In the Override **Symbology field** select **Yes** to be able to change the display of features in the terrain model.
9. Now select **Off** for all of the fields you would like to display off such as flow arrows, low points etc.
10. The terrain model should now display with symbology turned off or on depending on your selected settings.



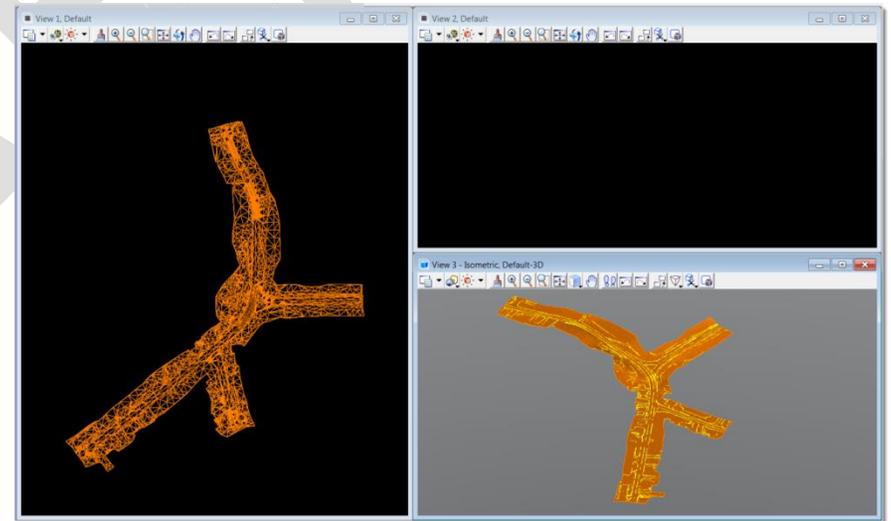
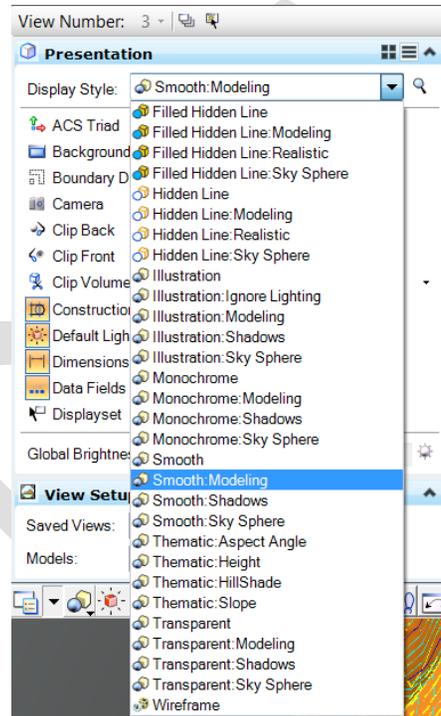
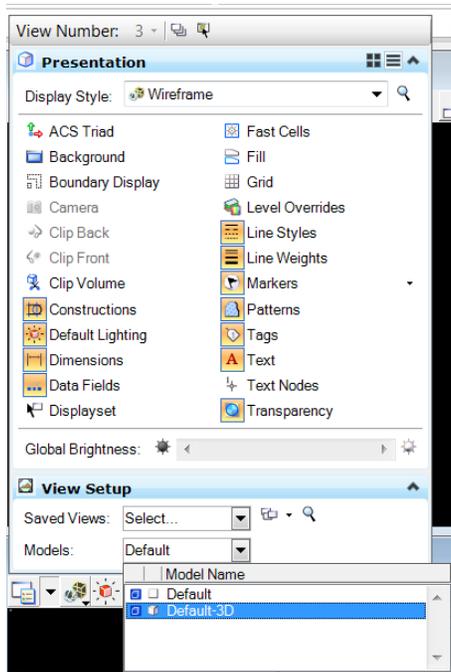
11. Now hover over the terrain model edge again to get the context menu to appear. Click the **Set As Active Terrain Model** button. If you have a file with the Ground features attach it as well. If you select **F10** your reference file colors will appear dithered out.



Section 3.3 View the 3D Features

The quickest way to do this is to select **F9** on your Key board, but it is important to understand how this all happens. Follow the instructions below to view your 2D features and 3D features in the same DGN file.

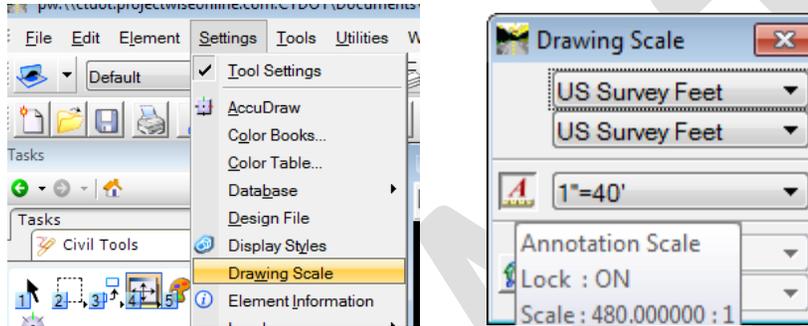
1. Open another view window. In this window open the **View Attributes** and select the **default-3D model** from the model field.
2. To make it a bit easier to see, in the display style field select **Smooth Modeling** from the dropdown list
3. Click the **Fit View** button in your view containing the default model and your view containing the default-3D model. Use the Rotate View command see your terrain in 3D. Most of the modeling will be completed in the 2D window, the 3D view is useful for evaluating changes to the design visually.



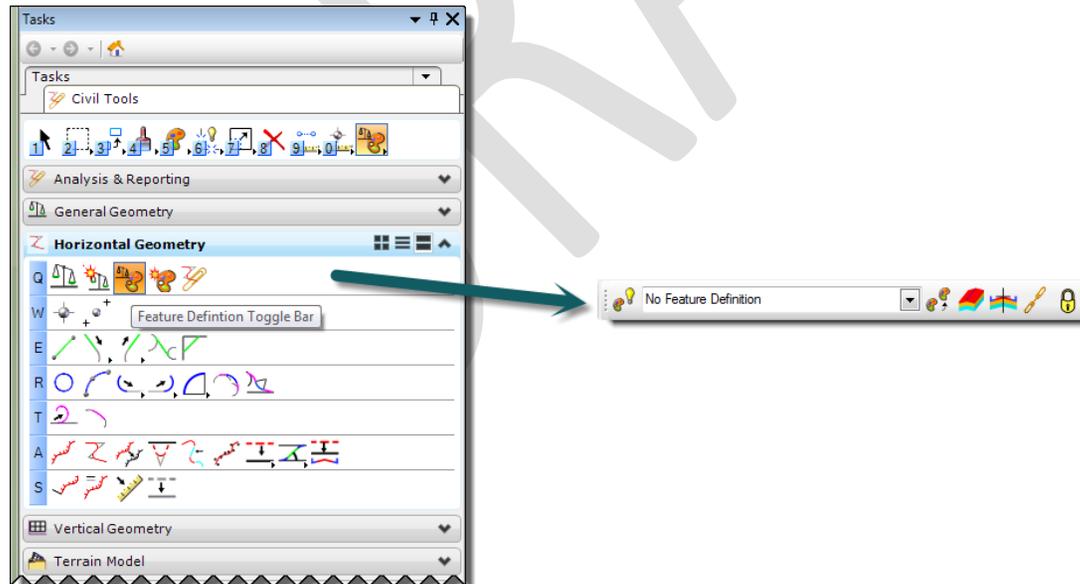
Chapter 4 Geometry

Section 4.1 Geometry Set Up

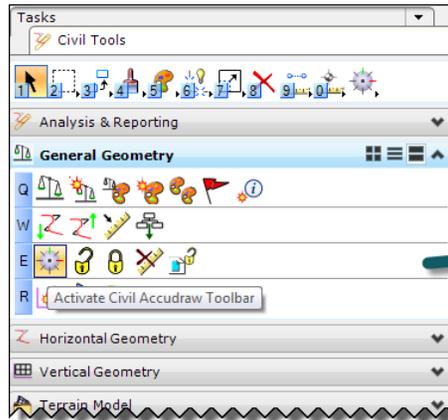
1. To set the Annotation Scale, go to **Settings>Drawing Scale**. Toggle **Annotation Scale** On and set it to **1" = 40'**.



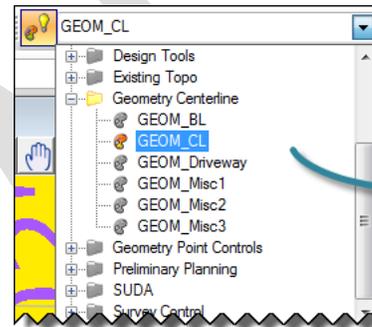
2. Go to **Tasks>Civil Tools> General Geometry** and turn on the **Feature Definition Toggle Bar** (if it is not already on).



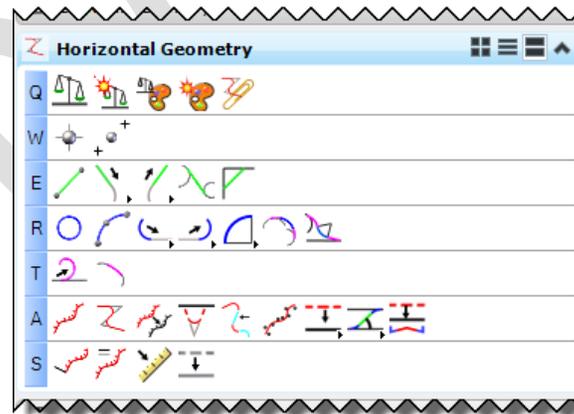
3. Go to **tasks>civil tools>general geometry** and turn on the **Civil Accudraw toggle bar** (but do not turn Civil Accudraw on yet).



4. Set the feature definition to **GEOM_CL** and make sure the **Use Active Feature Definition** button is on.



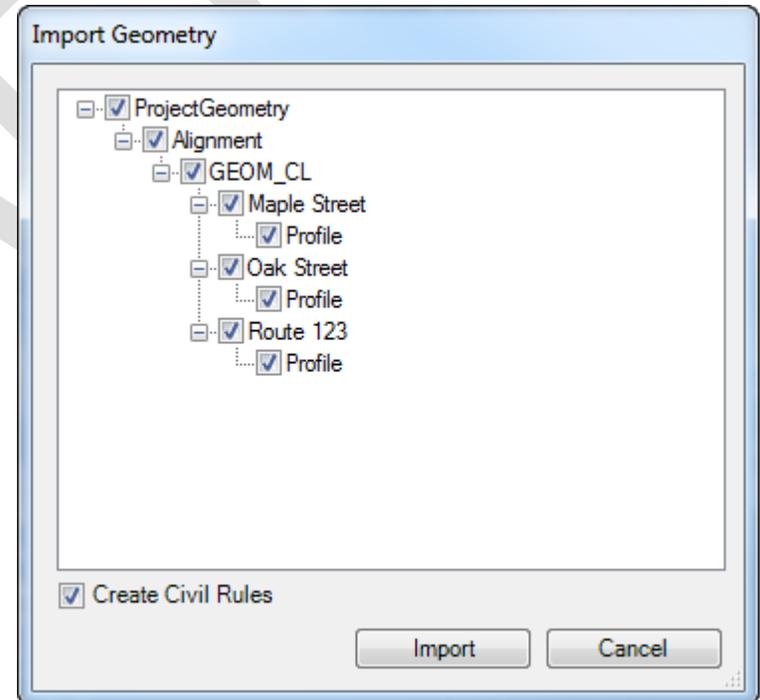
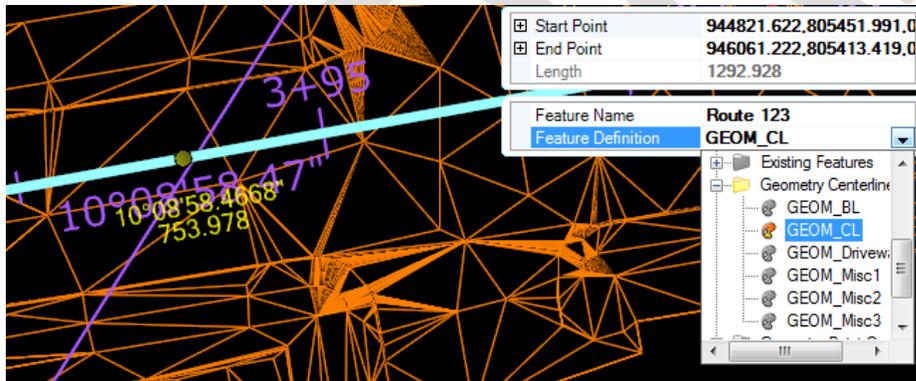
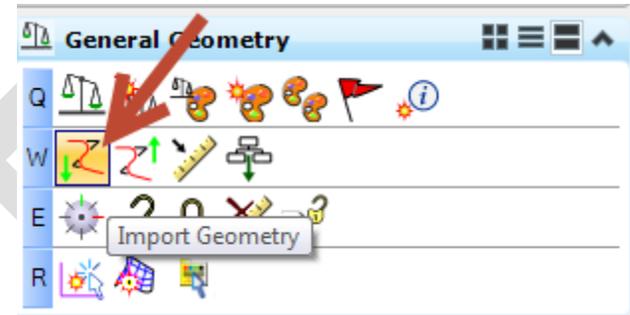
5. Review the horizontal alignment tools.



- General Geometry
- Geometry Point
- Geometry Line
- Geometry Arc
- Geometry Spiral
- Geometry Complex
- Geometry Modify

Section 4.2 Importing Geometry from an InRoads ALG file

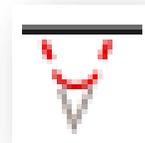
1. If you have multiple vertical alignments on one horizontal you will need to open the ALG before importing it into OpenRoads. Make the option that you would like to import is active for each horizontal with more than one option.
2. Select the Task on the General Geometry tools set and select the **Import Geometry Icon**.
3. Browse to the location of the ALG file. Click **Cancel** on the first dialog box if the file is located outside of ProjectWise.
4. The Alignment will come in default grey with no Feature Definition. Select each alignment and set the Feature Definition, for Roadway Centerlines they should be set to **Geometry Centerline/CEOM_CL**



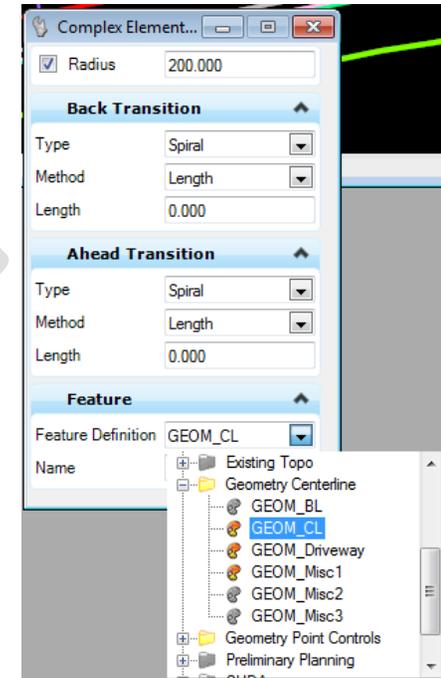
Section 4.3 Creating Horizontal Geometry from PI's



If you use the **Complex By PI** method the alignment will be one element rather than multiple pieces, use the Feature Style **Geometry Centerline/GEOM_CL**. This style will appear with stationing turned on.



To add PI's after laying out the initial alignment use the tool **Horizontal Insert Fillet**



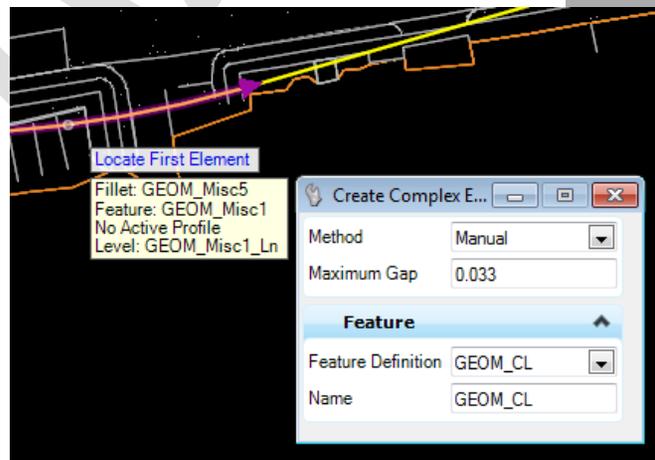
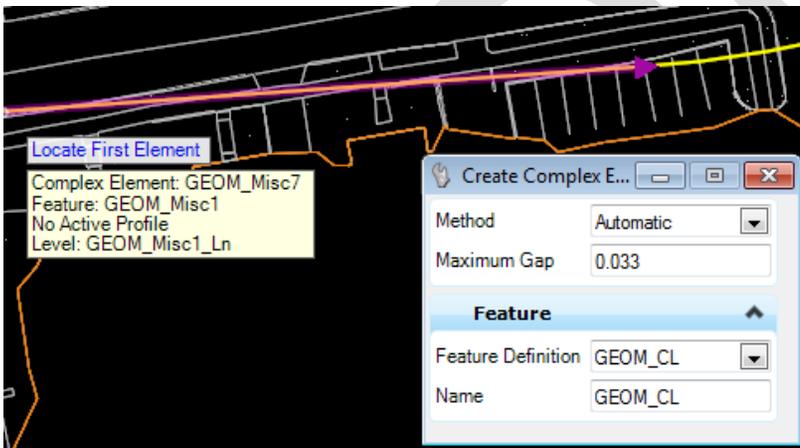
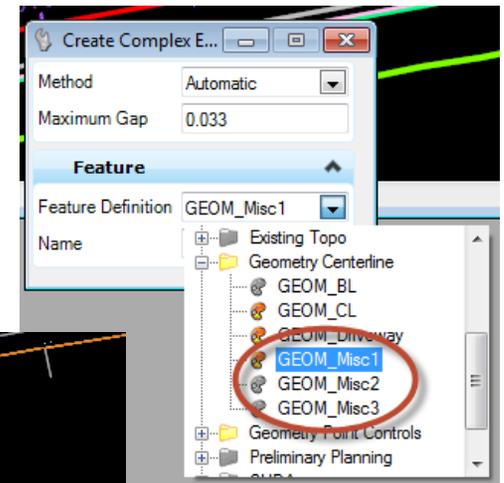
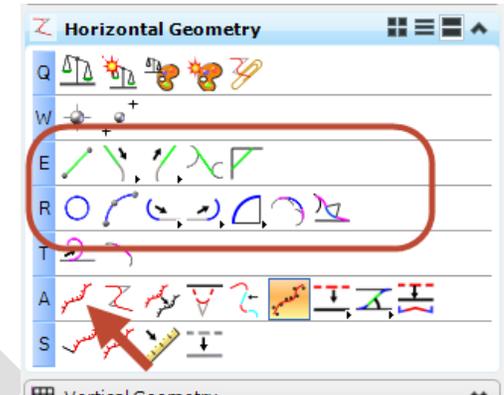
Section 4.4 Creating Horizontal Geometry from Elements



If you choose to use the Geometry from Elements tools you will need to use **Complex By Elements** after to create a single alignment. The issue with this method is if stationing is part of the feature definition annotation (as seen in *GEOM_CL*) the old stationing for the individual elements will display in addition to the new stationing for the complex element. To solve this issue the user can use a different feature definition for the initial layout and then set the *GEOM_CL* feature definition before using the Complex By Elements command.

If using the **Automatic** method select the first element in the alignment and indicate the direction see the **Pink Arrow** below, the rest of the alignment should select automatically. Click to accept the complex.

If using the **Manual** method, select each individual element in the alignment indicate the direction see the **Pink Arrow** (from start location to end). Right click to finish and accept the complex.



Section 4.5 Civil Accudraw



The Basics of Civil AccuDraw

Why You Need Civil AccuDraw

Using Civil AccuDraw to Communicate Design Intent

The process for laying out side road elements is similar to main alignments but for added functionality/intelligence to the elements the Civil Accudraw feature will be used. *Note: Make sure you turn off regular Accudraw when using Civil Accudraw.

When using Civil Accudraw keep in mind which snaps are used and which fields are locked when placing the geometry, both will determine how the second alignment interacts with the first when it is adjusted.

For the regular snaps here are a few examples:

Perpendicular snap will keep the alignment attached to the first at a right angle, if no station is entered in the process it will move around the alignment.

Key Point snap: this will make an element tied to the element that is selected, for example if I draw one line and key point snap my second alignment to this item, no matter where I move the first end point the start point of the line attached will follow.

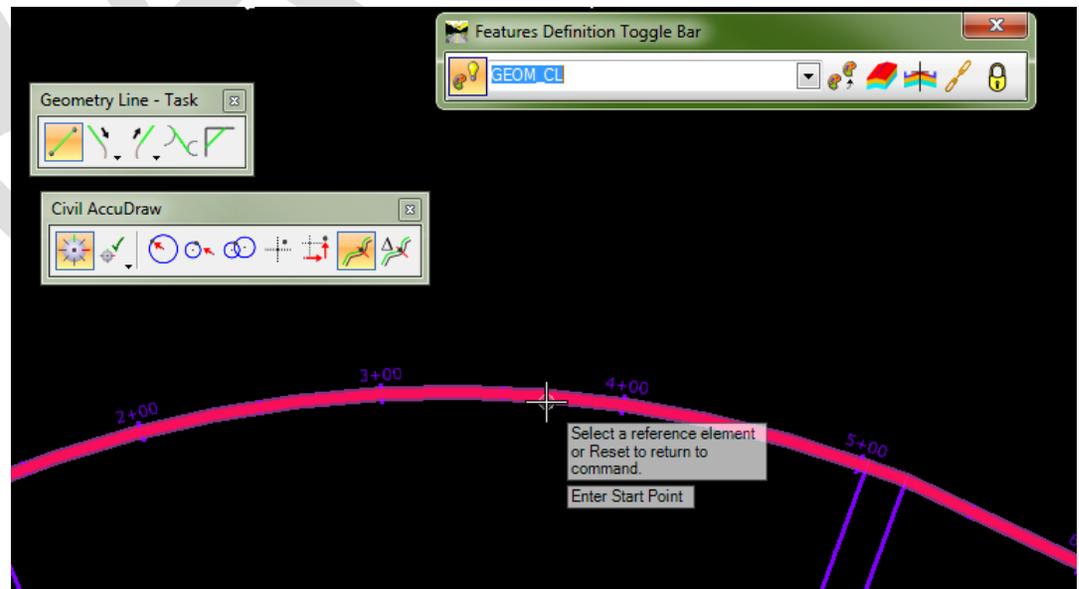
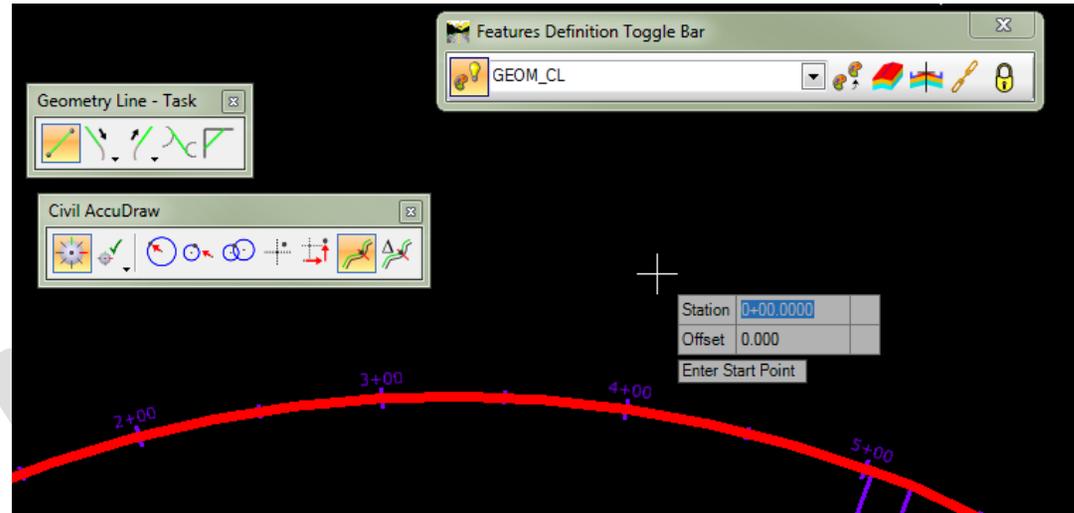
Civil Accudraw "snaps" explained :

- Distance-Direction: a feature end point is located based on a given distance and direction
- Distance Direction Unlinked:
- Distance- Distance: feature is dependent on two defined distances, usually from a specific feature.
- XY: feature is defined and tied to a specific XY location
- Delta XY: feature is defined and tied to a specific point given a X and or Y offset from the given point
- Station-Offset: feature is defined by a start specified by a station and offset from a given feature, and then has an end point defined by station offset or some other snap type depending on the requirement of the designer
- Delta Station Offset: feature is defined by an offset from a chosen Station-Offset as above.

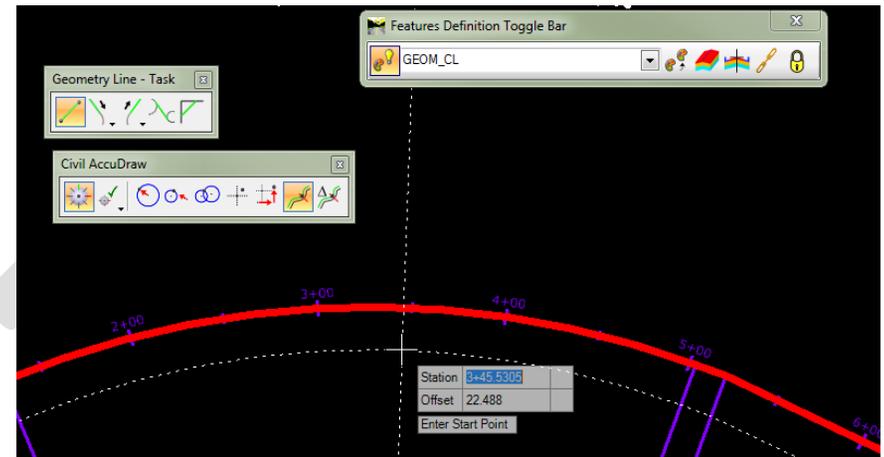
Section 4.6 Creating Side Road Alignments with Design Intent

Try the following method to lock the Secondary alignment to the Main alignment.

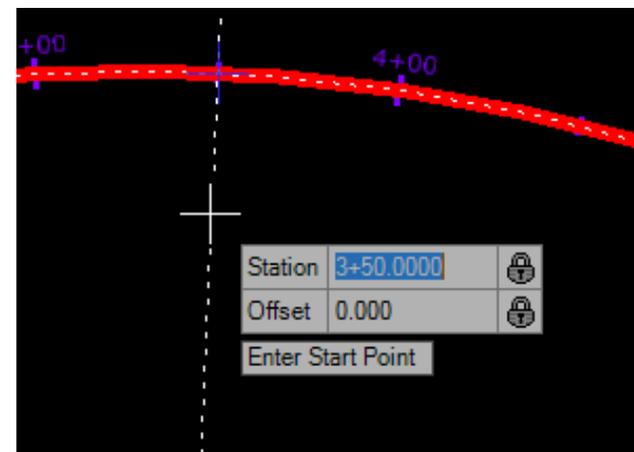
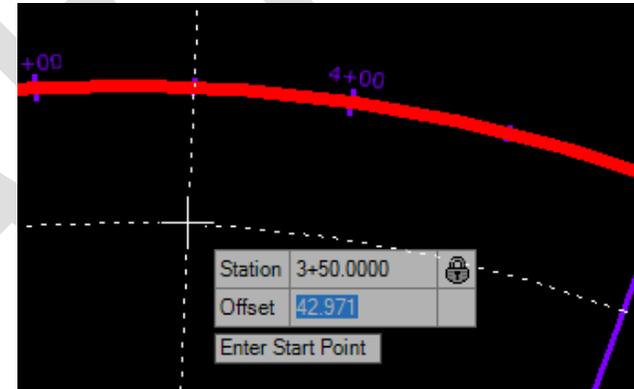
1. Toggle on **Civil Accudraw** and set the Civil Accudraw snap type to **Station-Offset**.
2. Select a geometry tool: **Line, Arc, Complex By PI**, etc. A heads up menu should appear when the cursor is on the screen, prompting for a station.
3. Key in the letter **O**. A prompt to select a reference element should appear. Left click the **Main alignment**.



4. The stationing in the heads up prompt will now be stationing specific to the reference element, i.e. if the stationing runs from 1+00 to 3+00 those will be available, or 500+00 to 600+00 if the stationing was set differently. Key in a **station** on the element and hit enter. A small lock icon should appear to the right of the station field.



5. The cursor should now be in the **offset** field. Key in **0** (zero) and hit **Enter**. The lock icon should appear to the right of this field as well. A small blue crosshair should now be at the intersection of the station chosen and offset distance. This ensures that the start of the secondary alignment will begin at the intersection of the main alignment. Left Click to accept the start point.



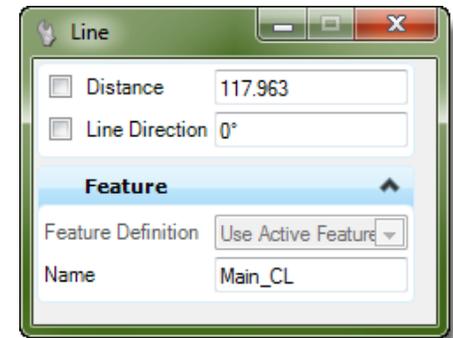
Section 4.7 Renaming Alignments

Geometry should be named when created; in the case of complex geometry the final complex element should be named. Individual components of a complex element can be named as well. Proper naming makes finding geometry in the Project Explorer much easier down the road.

There are multiple methods for naming elements.

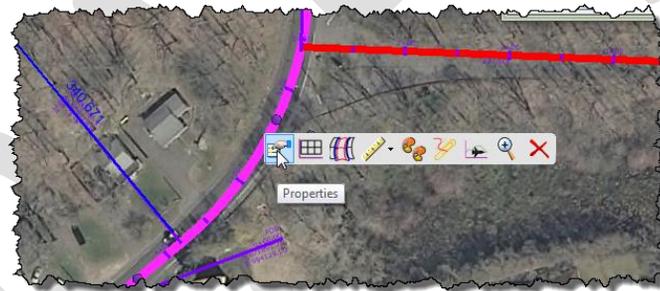
1. During element creation:

During element creation a dialog box will appear, a name can be entered into the *Name* field for each element created. This works for single elements and complex elements.



2. Heads up menu:

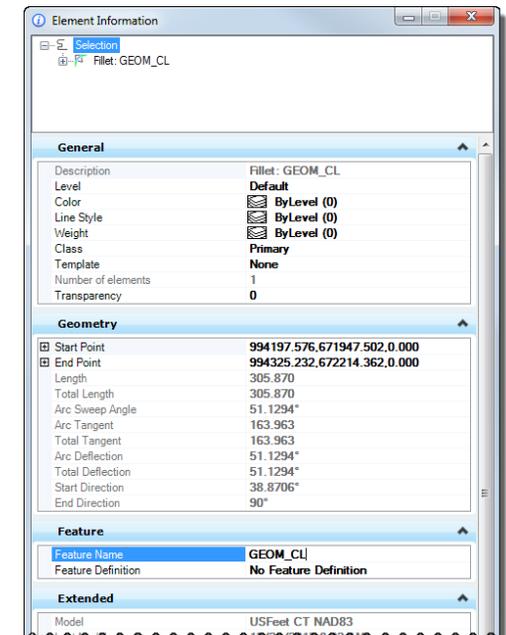
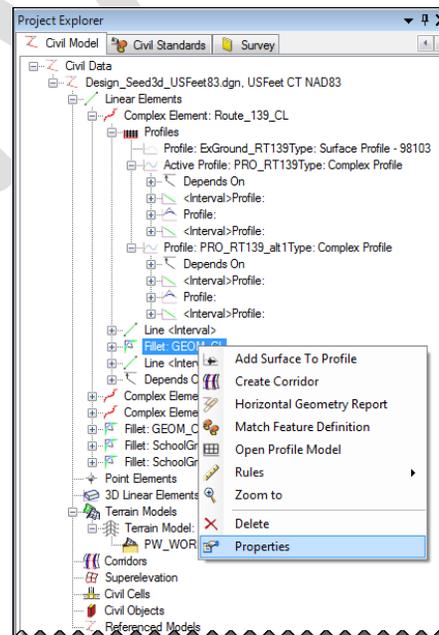
Left click the element and hover over it. A heads up menu should appear. Select the **Properties** command. A *properties table* will appear, change the name in the *Feature Name* field.



Start Point	993518.349,671400.011,0
End Point	994325.232,672568.735,0
Length	1532.651
Feature Name	Route_139_CL
Feature Definition	GEOM_CL
Curve Stroking	0.050
Profile Stroking	0.050
Stroking Step Method	Increment
Linear Stroking	10.000

3. Project Explorer:

Go to the *Project Explorer* > *Civil Model* tab and right click on the element name. Select *Properties* from the dropdown menu. A *properties table* will appear, change the name in the *Feature Name* field.



Section 4.8 Creating Vertical Geometry

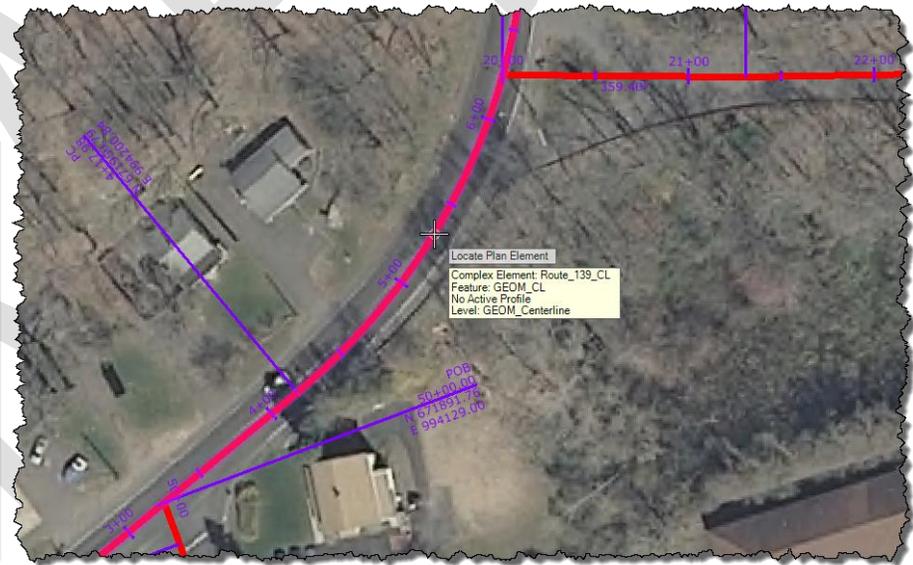
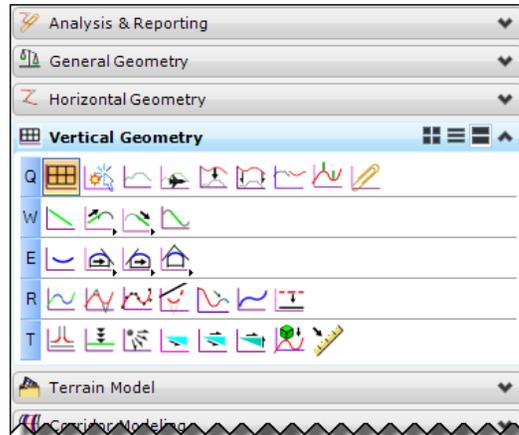


Creating Vertical Geometry from Elements

Creating Vertical Geometry from Known PI's

4.8.1 Displaying the Existing Ground

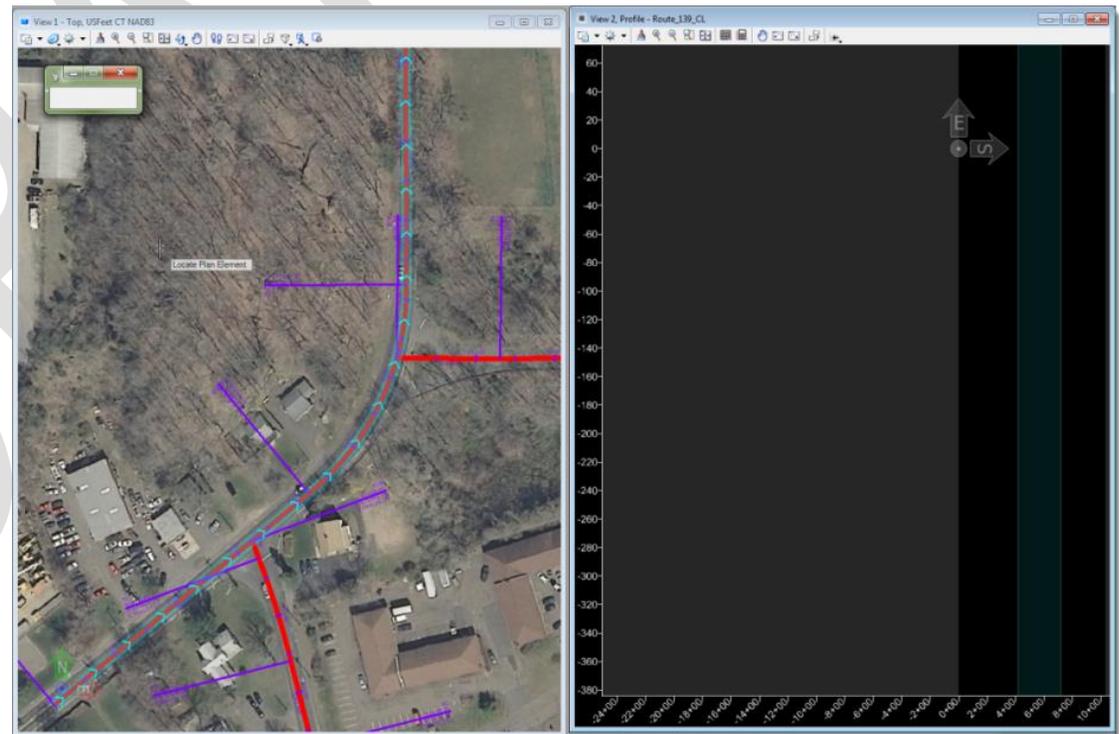
1. Open the profile view for the selected alignment. In **Tasks > Civil Tools > Vertical Geometry** select the **Open Profile Model** command. A prompt will then ask the user to **Locate Plan Element**, Left click to select the **Element**.



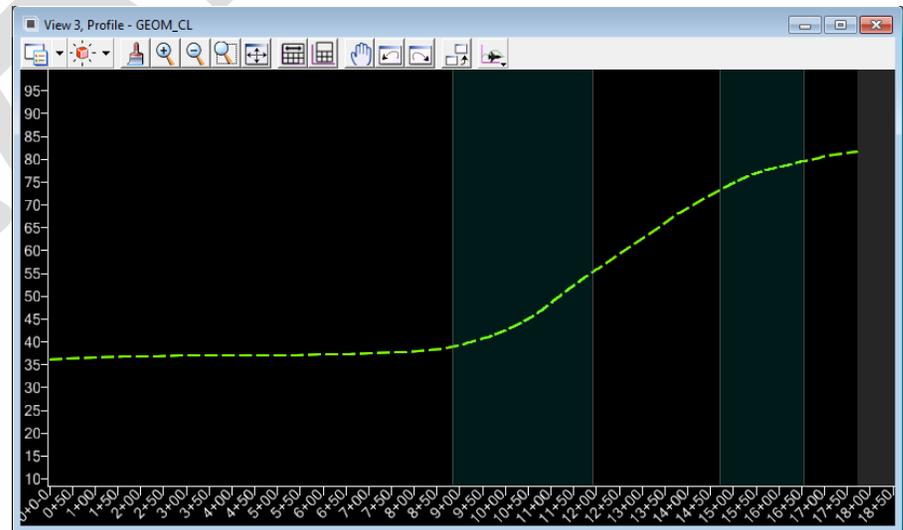
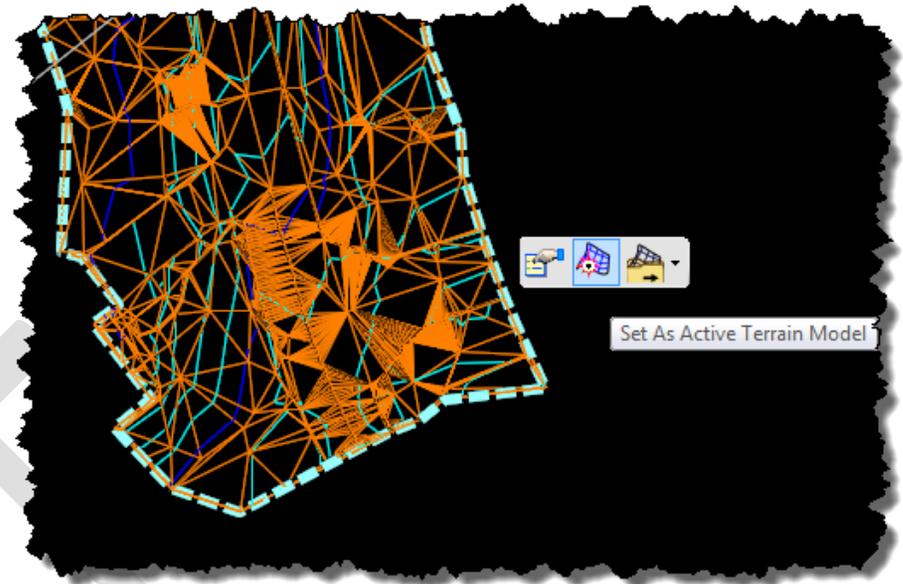
2. A prompt to **Select or Open View** will appear. Select an **unused view** from the view groups box.



3. Once the view opens, left click inside the view. An X and Y axis should appear in the profile view and the alignment will be highlighted blue with chevrons in the plan view. This indicates which alignment is in the active profile view.



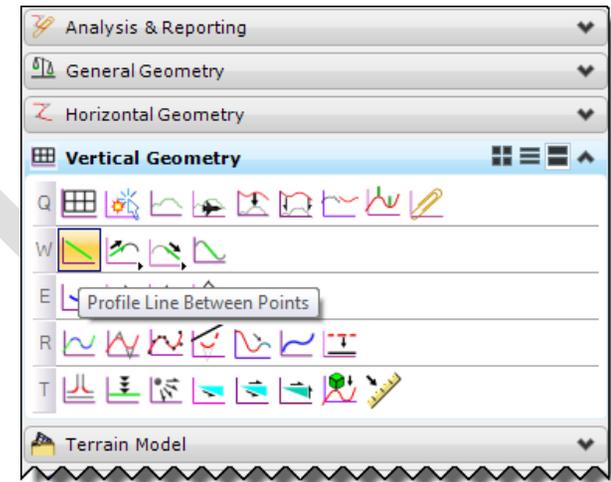
4. Display the existing surface on the profile model. Select the ground terrain model and hover to get the context menu to appear. Click the **Set Active Terrain model** command. The terrain profile should appear in the profile view.



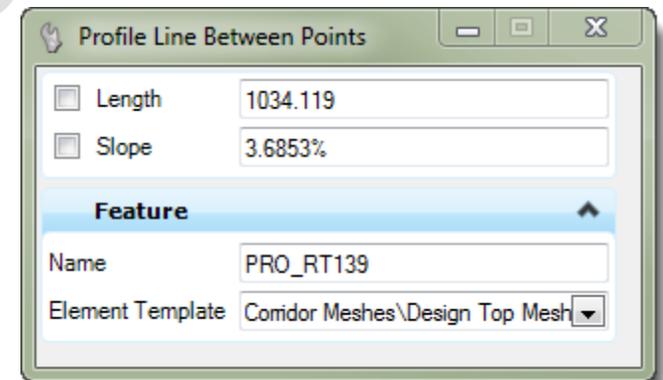
4.8.2 Creating a proposed Profile

This example will show how to create a very simple proposed profile. See the Bentley tutorials for more a detailed explanation of the vertical geometry tools.

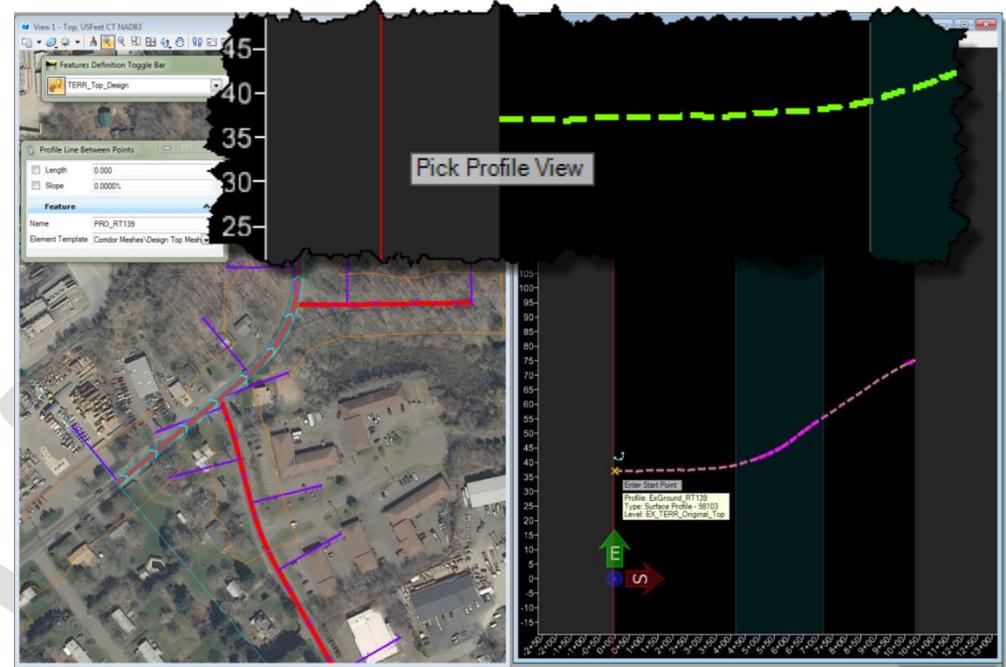
1. Go to **Tasks > Civil Tools > Vertical Geometry** and select the **Profile Line Between Points** command.



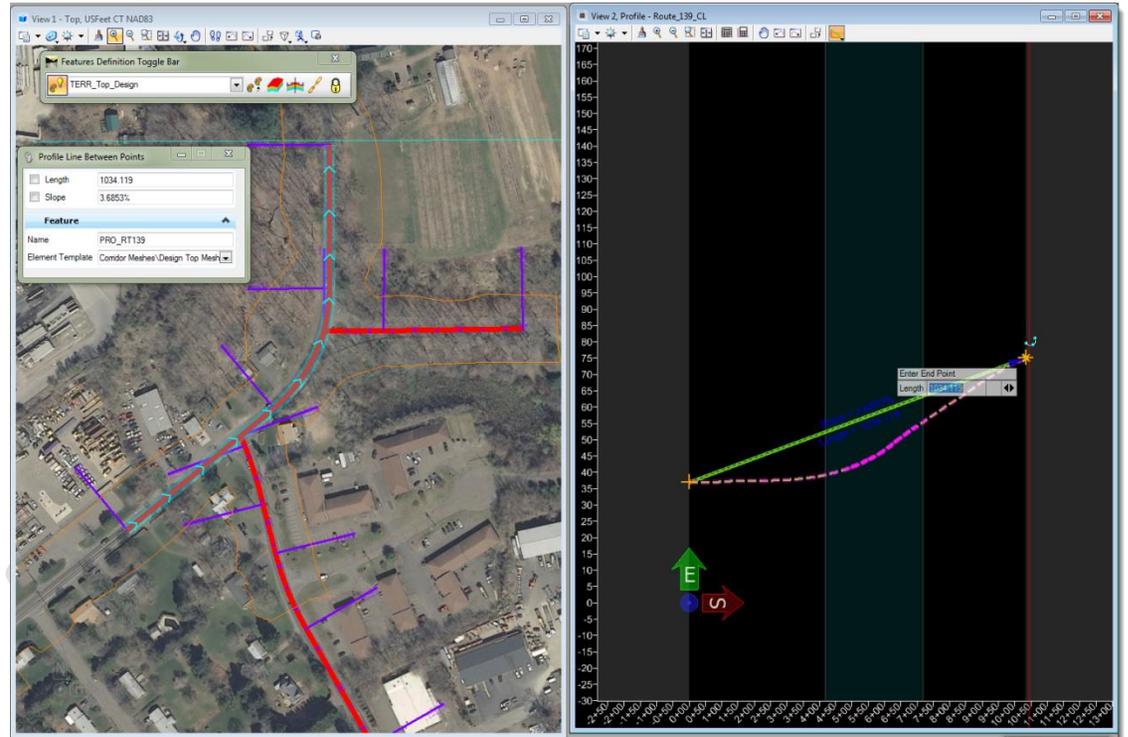
2. The Profile Line Between Points dialog box will appear. Fill in the **Name field** (something that will help identify the profile later).



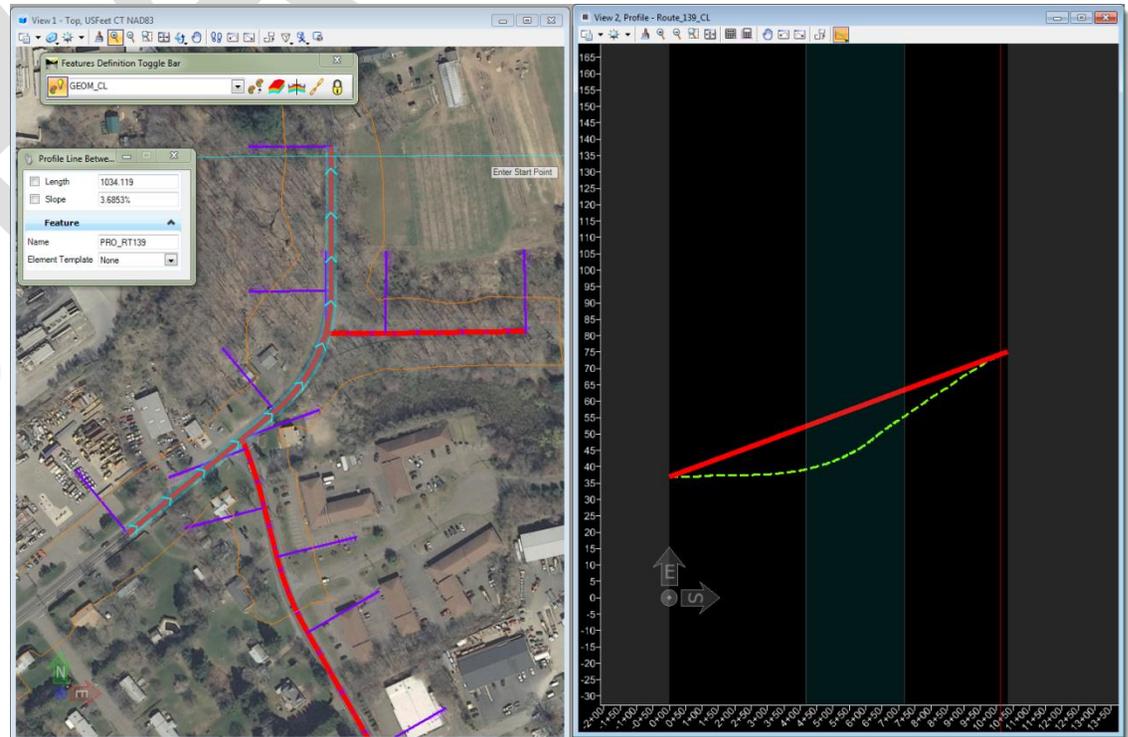
3. A prompt to **Pick Profile View** will appear, left click in the view window with the active profile (the one that has the existing ground displayed). Ther **Enter Start Point** prompt will appear. In the profile view select **your starting point**, a blue perpendicular line in the Plan view shows represents the location of the start point. (In this example the end point of the existing ground was selected to tie the proposed alignment in with the existing ground.)



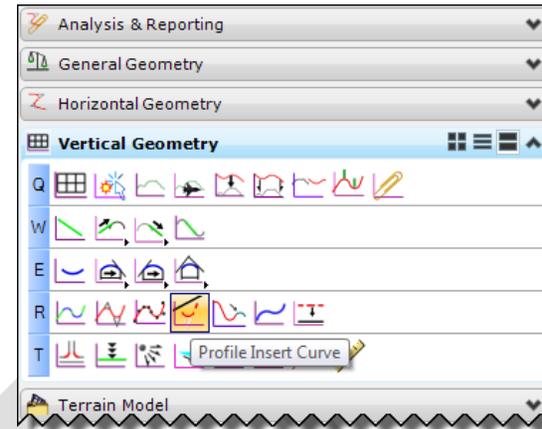
- The next prompt is **Enter End Point**. In profile view select the **end point**, it will also be displayed in plan view with a perpendicular line.



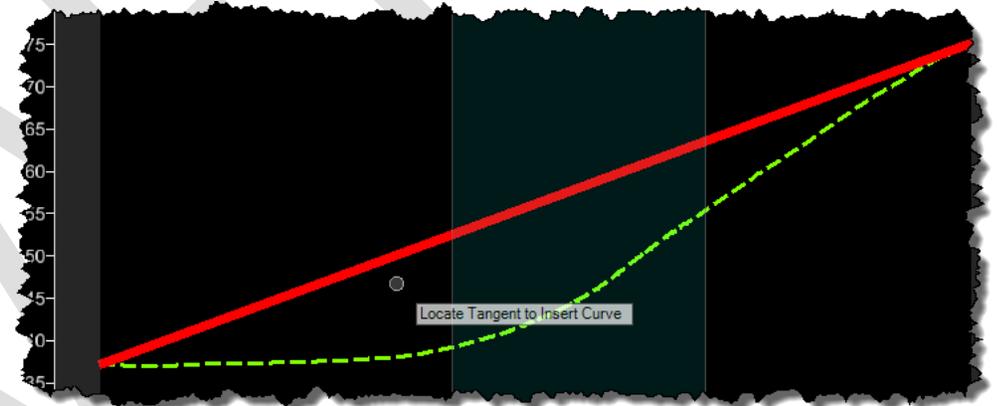
- The feature definition can be changed to make it easier to distinguish profile alternatives.



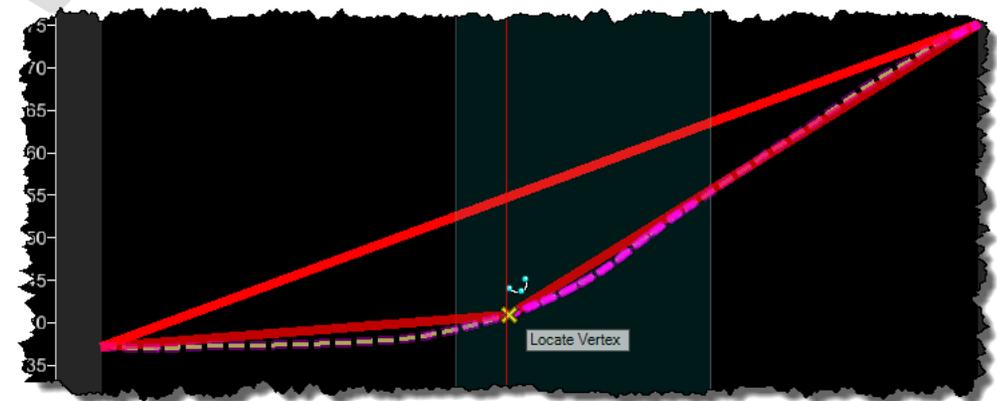
6. Add curves into the profile. Go to **Tasks > Civil Tools > Vertical Geometry** and select the **Profile Insert Curve** command.



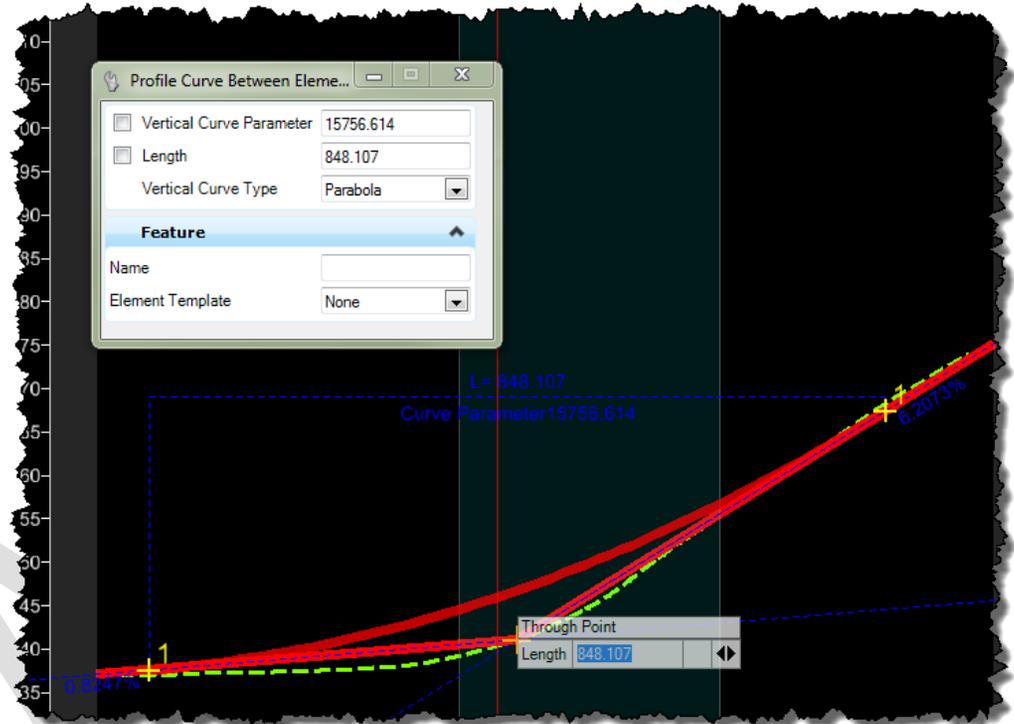
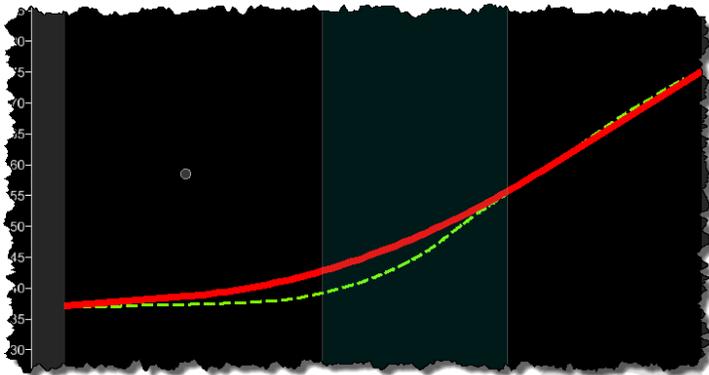
7. A **Locate Tangent to Insert Curve** prompt will appear. Left click to select the **profile line**.



8. The next prompt is **Locate Vertex**. Left click to select a **vertex point** for the curve.

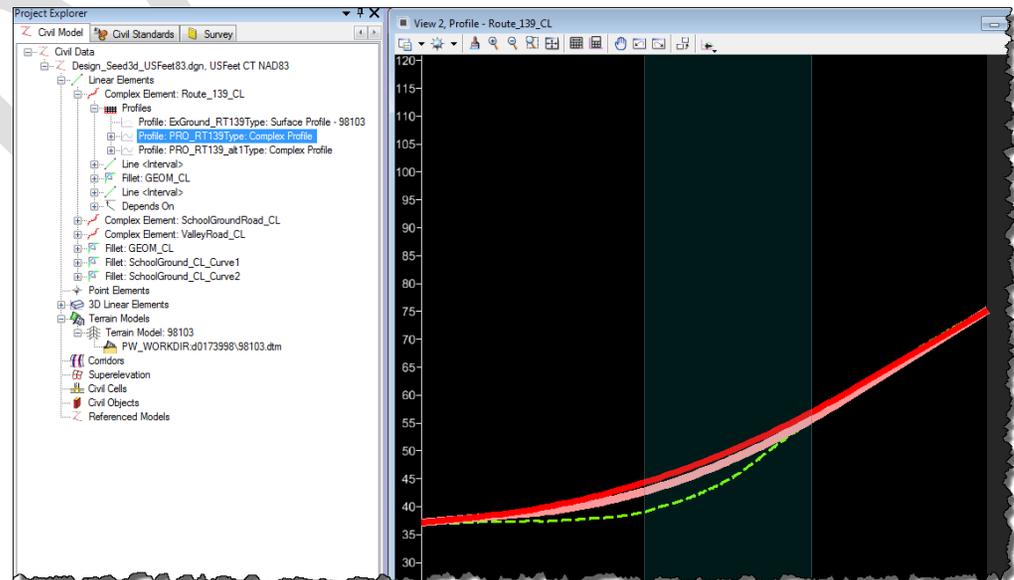


9. It will now prompt for a **Through Point**. Make sure the Vertical Curve Parameter box is unchecked. Select a **through point** on the profile screen or by entering in a **vertical curve parameter or length** and left clicking through the heads up fields to accept. The proposed profile should now be displayed.



4.8.3 Vertical Alignment Alternatives

Multiple profile alternatives can be created on the same plan element. In this example there are two proposed profiles. It is here that properly naming elements is especially important. When selecting alternatives or comparing alignments, properly named elements will be much easier to identify in the project explorer, as well as identifying element dependencies.



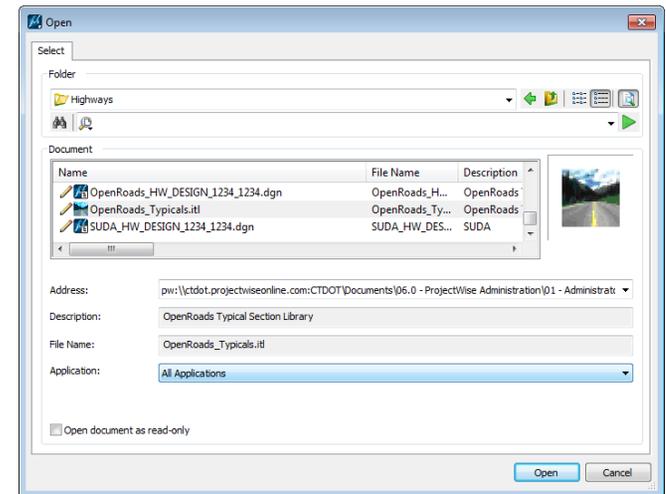
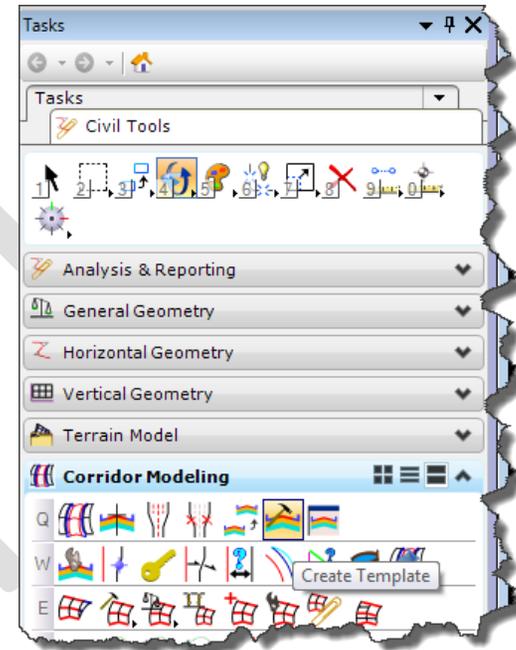
Chapter 5 Template Library



Understanding Component Display Rules

The Template Library will look very similar to what you were used to with InRoads SS2.

1. To open the Template library in the Workspace go to **Tasks > Civil Tools > Corridor Modeling > Create Template** or select **F12**. The Create Template Dialog Box will open and the Template Library file on the Workspace will be pointed to as read only.
2. If you would like to make modifications to the Templates select **File > Open** and open the Template Library file that you copied over in the getting started section on this manual. Click on the **ITL** and select **Open**.



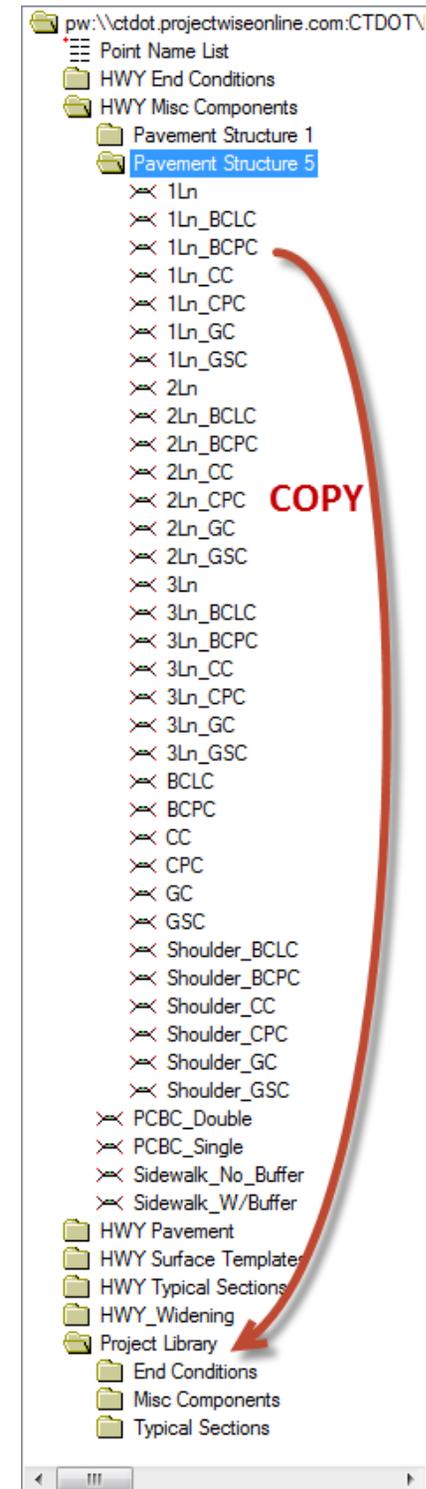
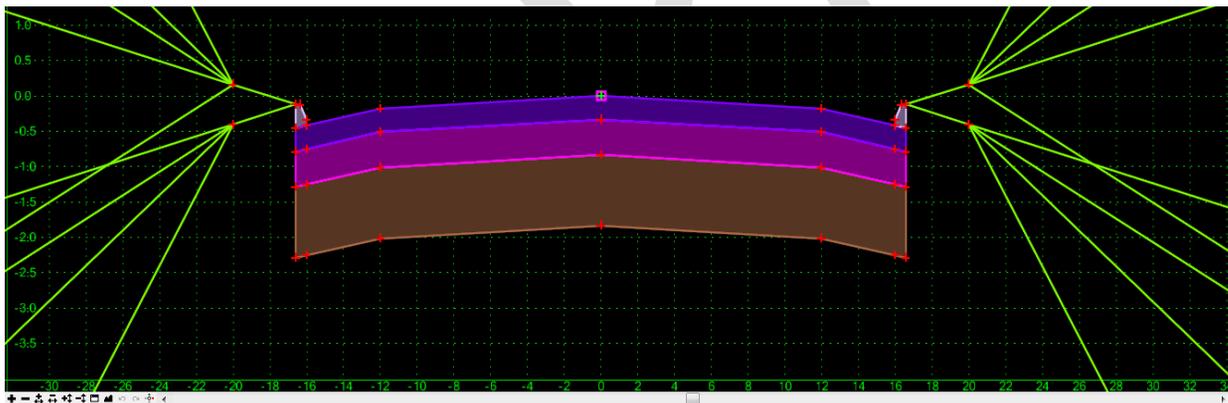
3. Use the Project Library Folders as your working area by copying the needed pre-designed templates down from the top folders. This way you always have a fresh copy to use as you build your specific project templates.

If you are going to build your own templates or modify the one supplied you will need to have a vast understanding of which feature styles to use and what settings are specific to different point and component types. Browse to the template **HWY Typical Section > 2Ln_PS5_BCPC**. Double click on the different points, closed shapes and end conditions.

Take note of the following settings.

- A. Feature Styles
- B. Feature Name Overrides
- C. Superelevation Flags (new for OpenRoads)

This template is a two lane road with bituminous concrete curbing using the pavement structure #5. Pavement Structures are found Appendix B of [The State of Connecticut MTG Pavement Design Catalog](#).

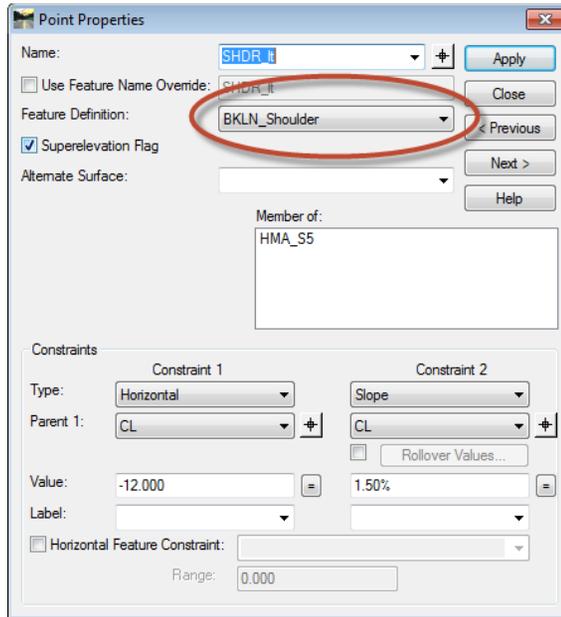


A. FEATURE STYLES

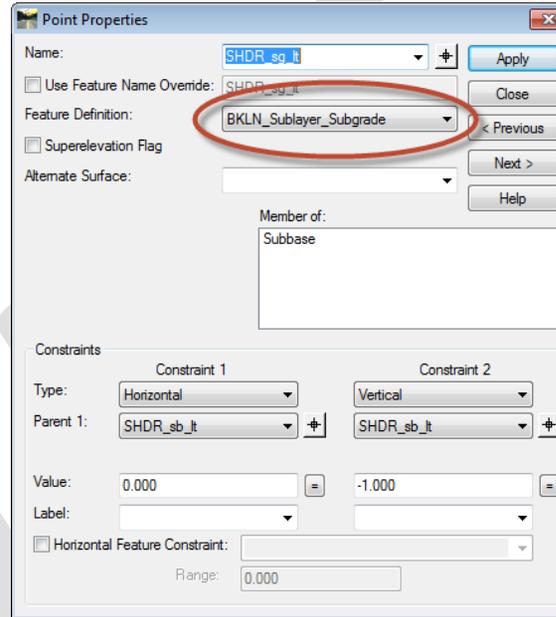
Point Feature Suffix...

On the top surface **BKLN_**

Below the top surface **BKLN_Sublayer**



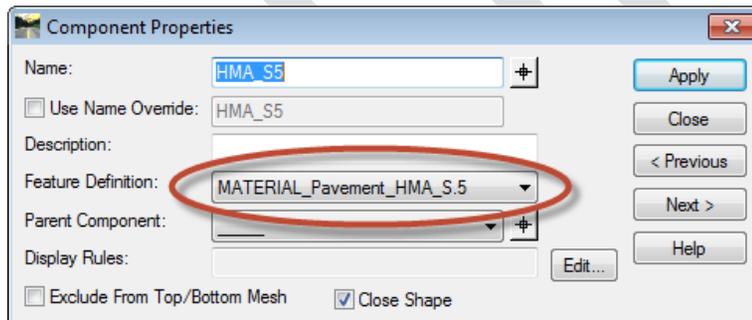
Point Properties dialog box showing configuration for a feature. The Name field is SHDR_It. The Feature Definition dropdown is BKLN_Shoulder (circled in red). The Superelevation Flag is checked. The Member of field is HMA_S5. Constraints are set to Horizontal (Parent 1: CL, Value: -12.000) and Slope (Parent 2: CL, Value: 1.50%).



Point Properties dialog box showing configuration for a feature. The Name field is SHDR_sg_It. The Feature Definition dropdown is BKLN_Sublayer_Subgrade (circled in red). The Superelevation Flag is unchecked. The Member of field is Subbase. Constraints are set to Horizontal (Parent 1: SHDR_sb_It, Value: 0.000) and Vertical (Parent 2: SHDR_sb_It, Value: -1.000).

Components Suffix...

Material_

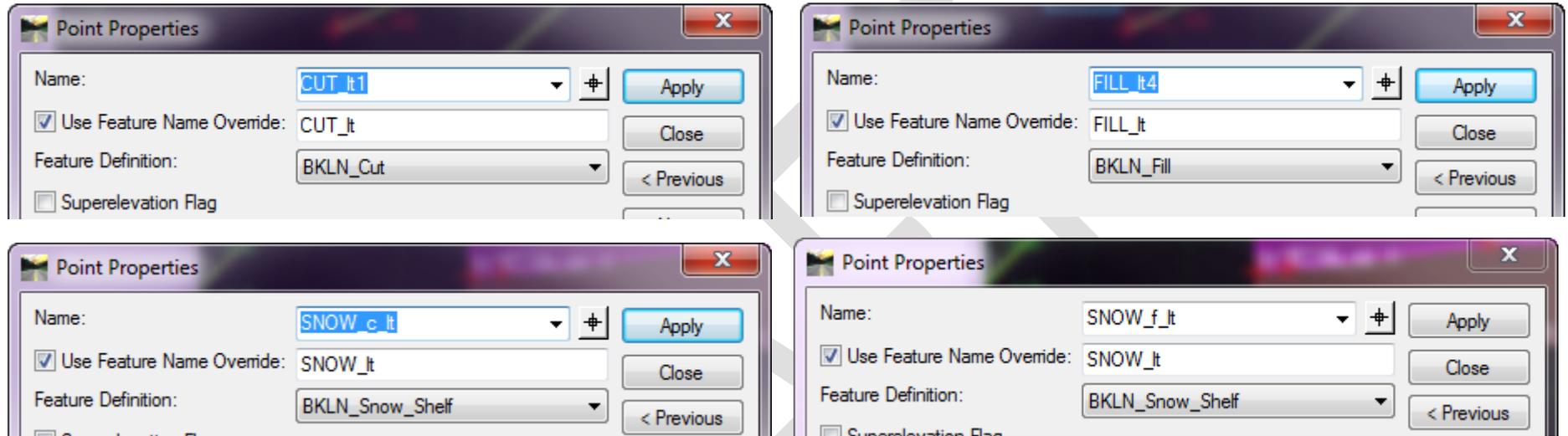


Component Properties dialog box showing configuration for a component. The Name field is HMA_S5. The Feature Definition dropdown is MATERIAL_Pavement_HMA_S.5 (circled in red). The Parent Component field is empty. The Close Shape checkbox is checked.

B. FEATURE NAME OVERRIDES

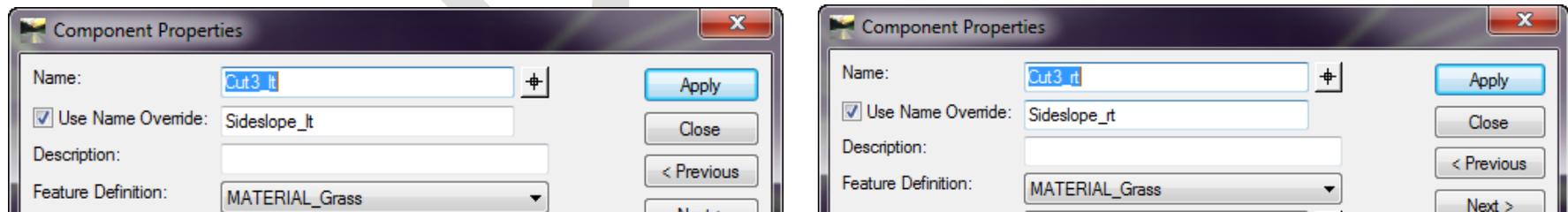
Points on end conditions

Make sure to Use Feature Name Overrides on Cuts, Fills and the Snow shelves.



End conditions components

In the end condition components, the "Use Name Override" needs to be set for like slopes. For example, you have 4 possible ditch backslopes where only one at a time can solve. Setting the feature name override in the component properties assures the model stitching using the same component name. This is similar to what you have done correctly in the point properties for the point feature override.



C. Superelevation Flags

Point Properties

Name: SHDR_It

Use Feature Name Override: SHDR_It

Feature Definition: BKLN_Shoulder

Superelevation Flag

Alternate Surface:

Member of:
HMA_S5

Constraints

Constraint 1	Constraint 2
Type: Horizontal	Type: Slope
Parent 1: CL	Parent 1: CL
Value: -12.000	Value: 1.50%
Label:	<input type="checkbox"/> Rollover Values...
<input type="checkbox"/> Horizontal Feature Constraint:	Range: 0.000

Point Properties

Name: EOR_It

Use Feature Name Override: EOR_It

Feature Definition: BKLN_EOR

Superelevation Flag

Alternate Surface:

Member of:
BCPC_It
HMA_S5

Constraints

Constraint 1	Constraint 2
Type: Horizontal	Type: Slope
Parent 1: SHDR_It	Parent 1: SHDR_It
Value: -4.000	Value: 0.00%
Label:	<input checked="" type="checkbox"/> Rollover Values...
<input type="checkbox"/> Horizontal Feature Constraint:	Range: 0.000

Rollover Point Properties

Difference: High Side 7.00% Low Side 0.00%

Reference Point: CL

High Side Difference

Low Side Difference

Parent Point

Reference Point

Chapter 6 Corridor Modeling

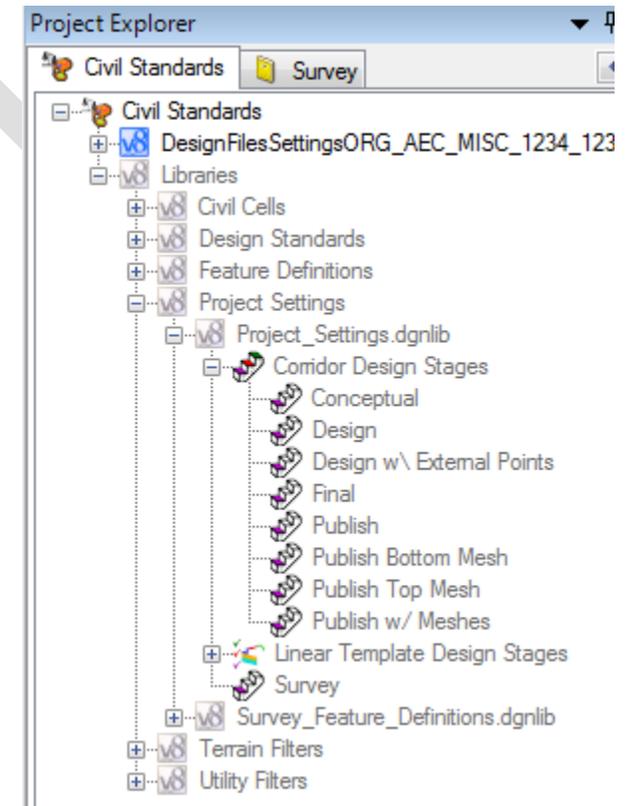


Model the Roadway Corridor

Section 6.1 Design Stages

Before creating a corridor it's important to understand the Project Settings for Design Stages. A design Stage is selected when first creating a corridor and it modified as the design progresses from conceptual to Final design. Design staging helps users to optimize their computers processing speeds by the managing corridor modeling details to only what is needed for the stage they are in.

Select the **Project Explorer, Civil Standard Tab**. Under Libraries select **Project_Settings.dgnlib\Coorodor Design Stages**. Study at the Properties presets for each stage.



6.1.1 Template Management

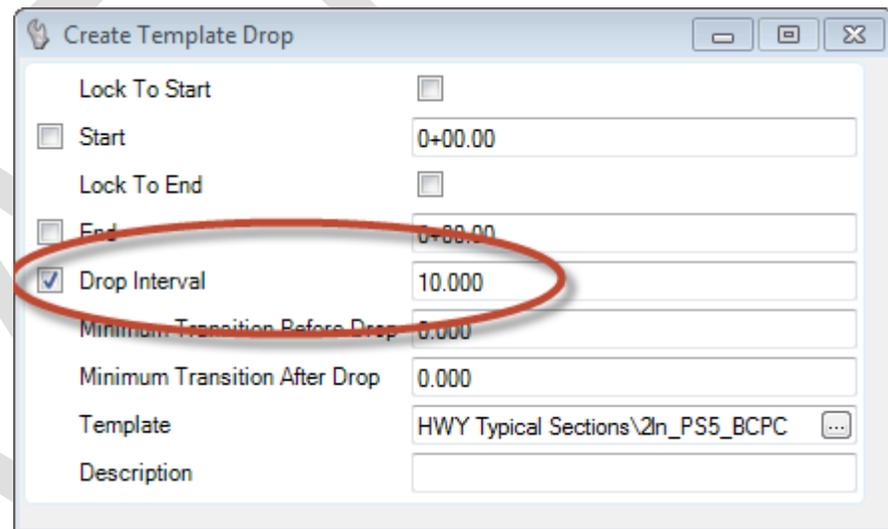
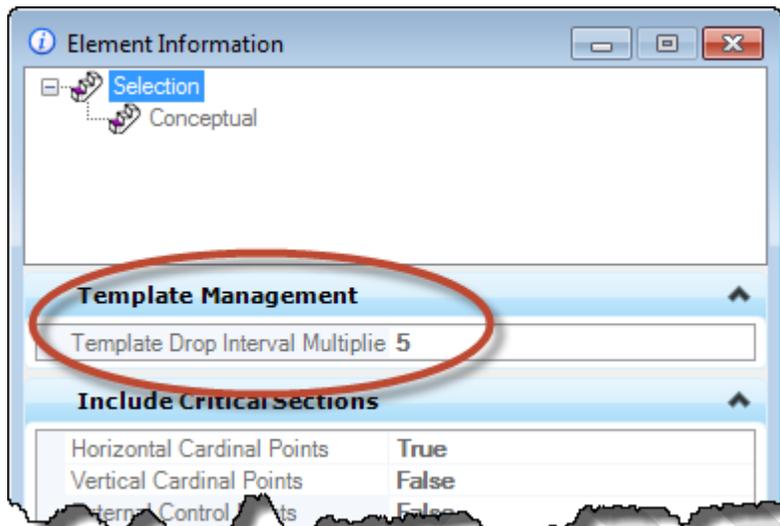
Manages the template drops on a straight piece of road.

(Template Drop Interval Multiplier) X (Drop Interval)
Design Stage Create Template Drop
Dialog Box

Conceptual Design Stage - 5 X 10 = Template drop created every 50'

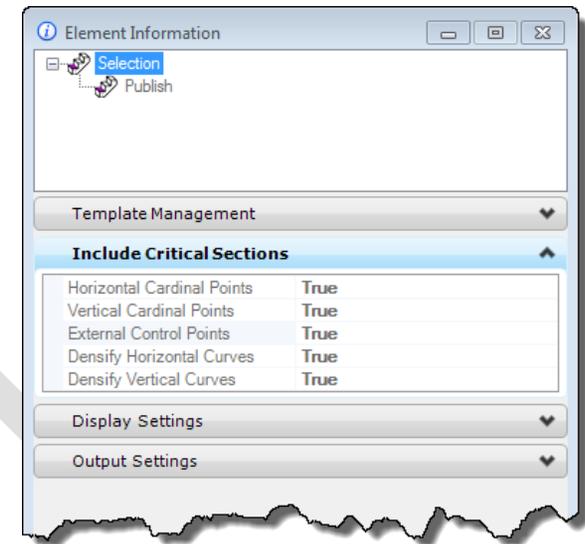
Design Design Stage- 2 X 10 = Template drop created every 20'

Final & Publish Design Stages - 1 X 10 = Template drop created every 10'



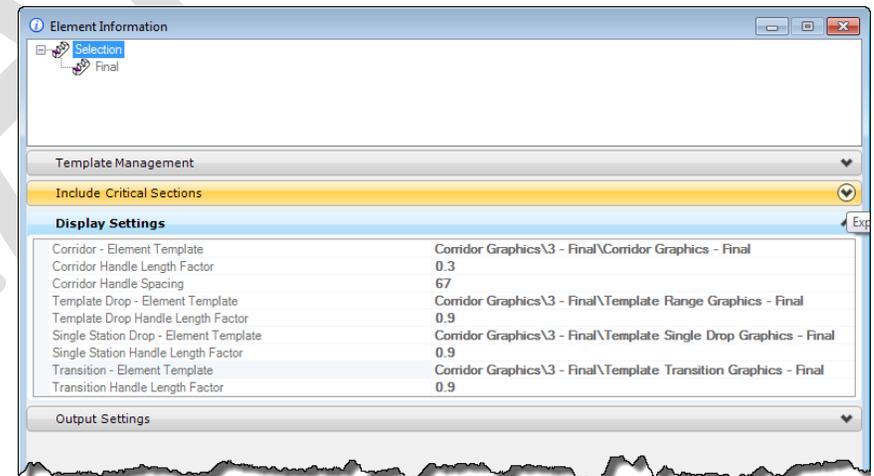
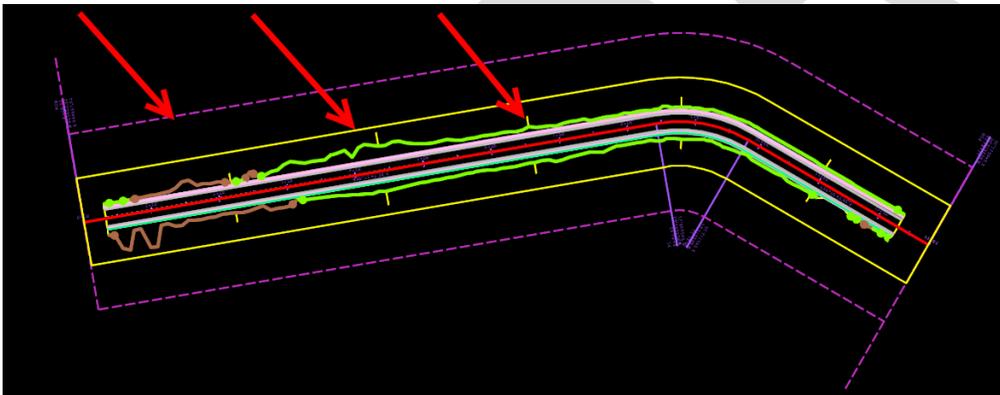
6.1.2 Include Critical Sections

Manages the template drops at critical sections. Publish is set to true for all fields, this level of accuracy will not be needed in Conceptual and Design Stages in turn some of these are set to false.



6.1.3 Display settings

Display Settings point to the look and feel of the graphical representation of the corridor, these are displayed as construction classes as they is not a real world features. Users can easily turn these off by deselecting Constructions in Veiw Attributes.



6.1.4 Output Settings

All the base Design Stages are set the same (Conceptual, Design, Final & Publish Design) for the Output Settings.

There are separate stages set up for the output of different Mesh surfaces if needed.

The screenshot displays the Bentley software interface with three main panels:

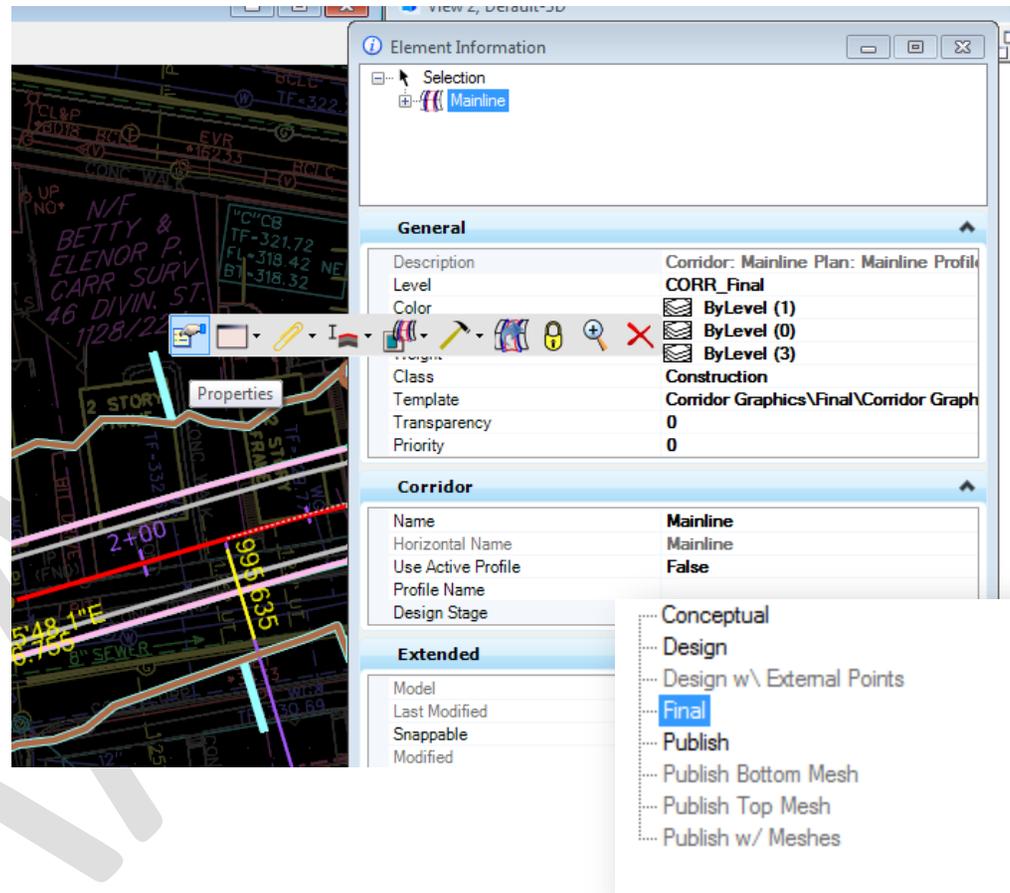
- Project Explorer:** Shows a tree view of project settings. Under 'Corridor Design Stages', the 'Publish w/ Meshes' stage is selected.
- Element Information:** Shows the selected element 'Publish w/ Meshes'.
- Output Settings:** A panel with a table of settings for the selected element.

Output Settings	
Create Top Mesh	False
Top Mesh Feature Definition	No Feature Definition
Create Bottom Mesh	False
Bottom Mesh Feature Definition	No Feature Definition
Create Linear Features	True
Create Component Meshes	True
Include Null Point Linear Features	False

Output Settings	
Create Top Mesh	True
Top Mesh Feature Definition	TERR_Top_Design
Create Bottom Mesh	True
Bottom Mesh Feature Definition	TERR_Bottom
Create Linear Features	True
Create Component Meshes	True
Include Null Point Linear Features	False

6.1.5 Updating the Design Stage

Click on the graphical notches and select Properties, change the Design Stage Field to the desired selection.



The screenshot displays a software interface for managing design stages. On the left, a design plan view shows a road layout with various lines and text annotations. A 'Properties' window is open over the plan view. On the right, the 'Element Information' panel is open, showing the 'Mainline' element selected. The 'Design Stage' field is highlighted, and a dropdown menu is open, showing options: Conceptual, Design, Design w\ External Points, Final, Publish, Publish Bottom Mesh, Publish Top Mesh, and Publish w/ Meshes.

General	
Description	Corridor: Mainline Plan: Mainline Profile
Level	CORR_Final
Color	ByLevel (1)
	ByLevel (0)
	ByLevel (3)
Class	Construction
Template	Corridor Graphics\Final\Corridor Graph
Transparency	0
Priority	0

Corridor	
Name	Mainline
Horizontal Name	Mainline
Use Active Profile	False
Profile Name	
Design Stage	

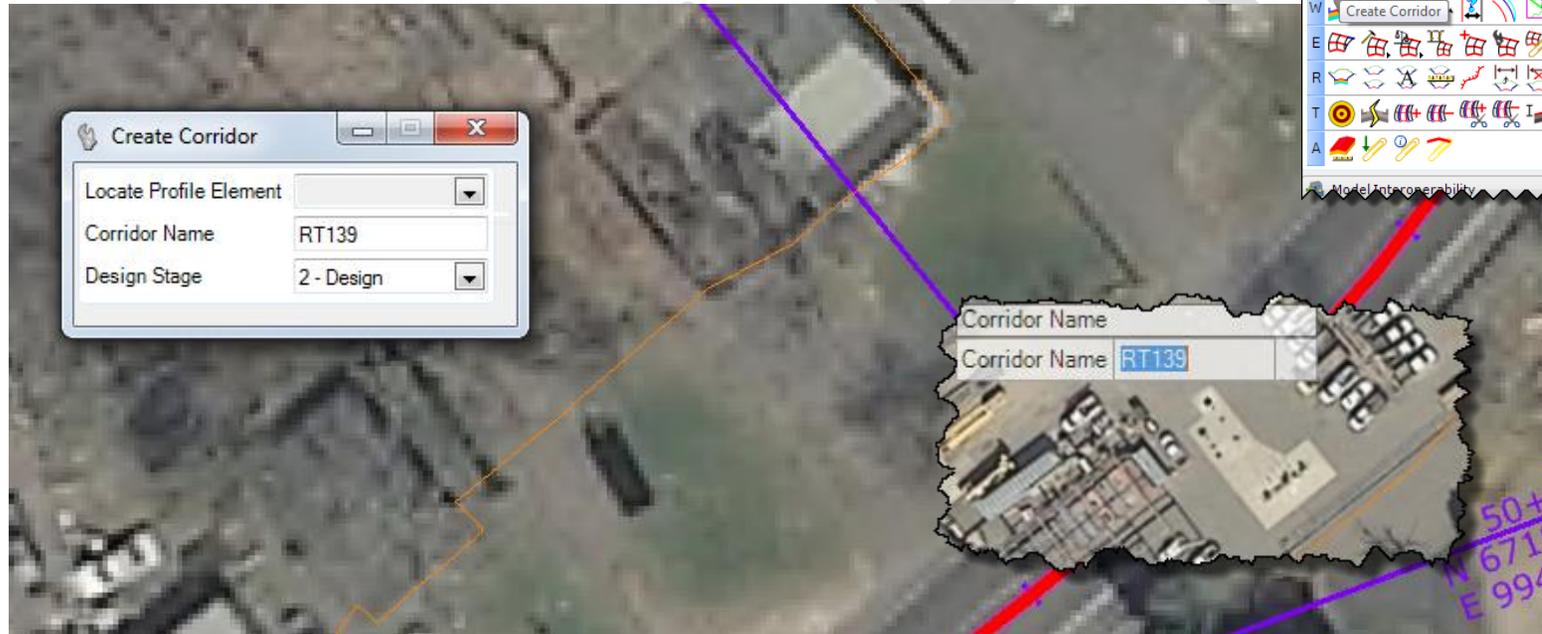
Extended	
Model	
Last Modified	
Snappable	
Modified	

- Conceptual
- Design
- Design w\ External Points
- Final
- Publish
- Publish Bottom Mesh
- Publish Top Mesh
- Publish w/ Meshes

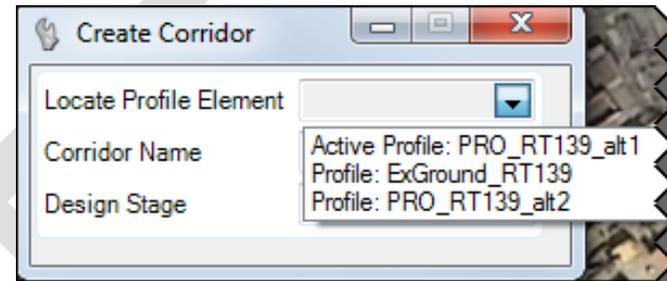
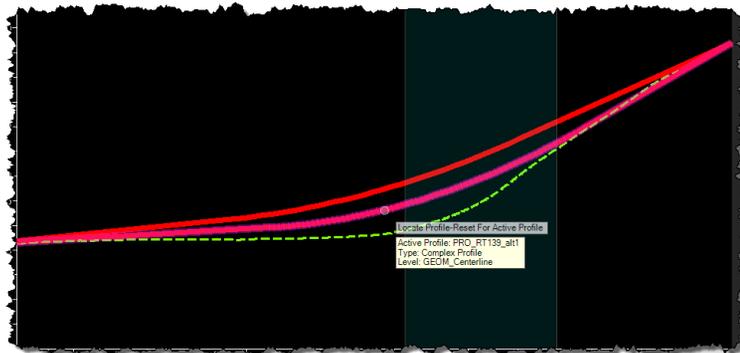
Section 6.2 Create a Corridor

Corridors and models are no longer created in the Roadway Designer; they are created directly in the MicroStation Screen.

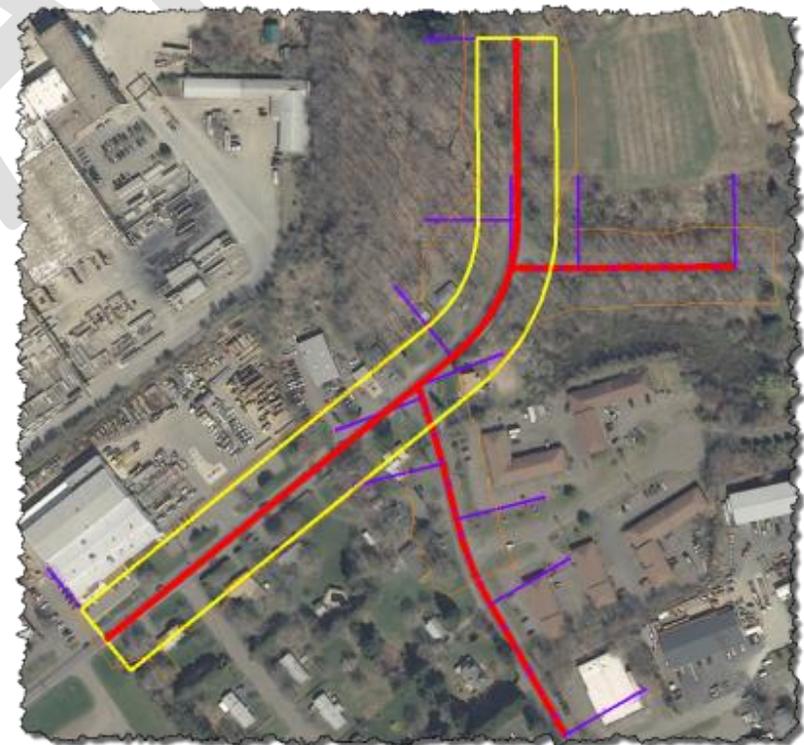
1. Go to **Tasks > Civil Tools > Corridor Modeling** and select the **Create Corridor** Command.
2. The Create Corridor dialog box will appear as well as a prompt to **Locate Corridor Baseline**. Enter in a name in the **Corridor Name** field, select a **Design Stage** and select the **plan element for the corridor**.



3. A prompt to **Locate Profile Element** will appear. Select the **alignment** in Profile view, select a **profile** from the dropdown menu in the dialog box, or right click to **select the active profile**. By selecting the Active Profile option the user can easily switch between profile alternatives and see how this affects the corridor model.

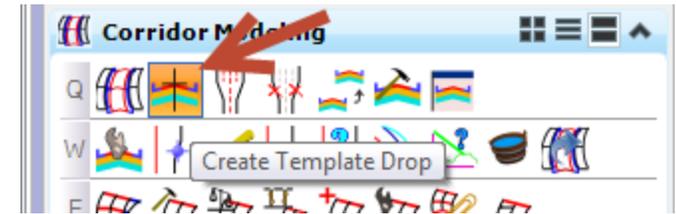


4. Enter a **Corridor Name** and **left click** to accept. A corridor feature should now be displayed around the alignment (the shape may be a different color depending on which design stage was selected when creating the corridor).

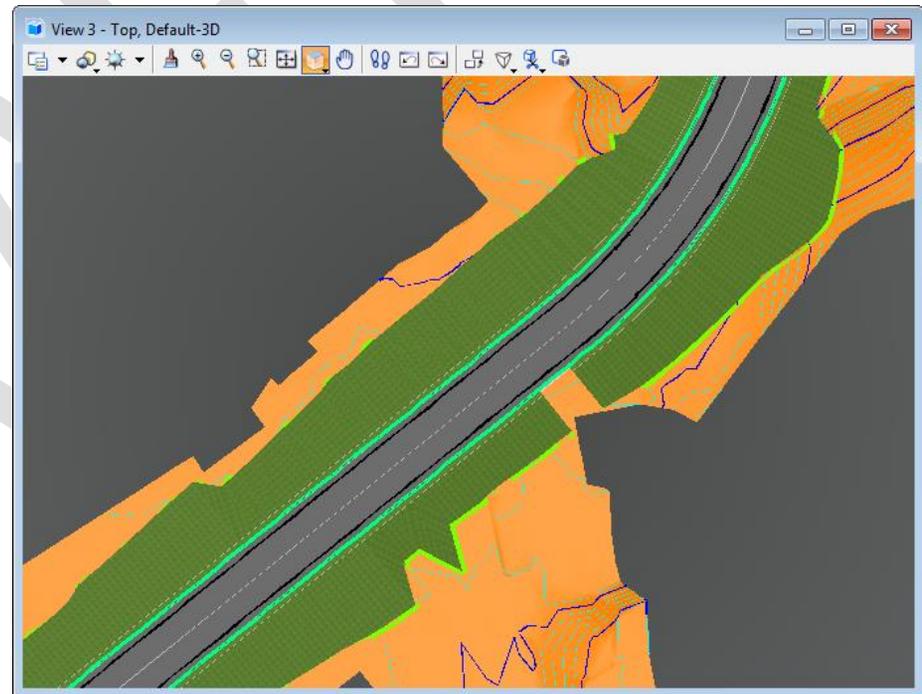
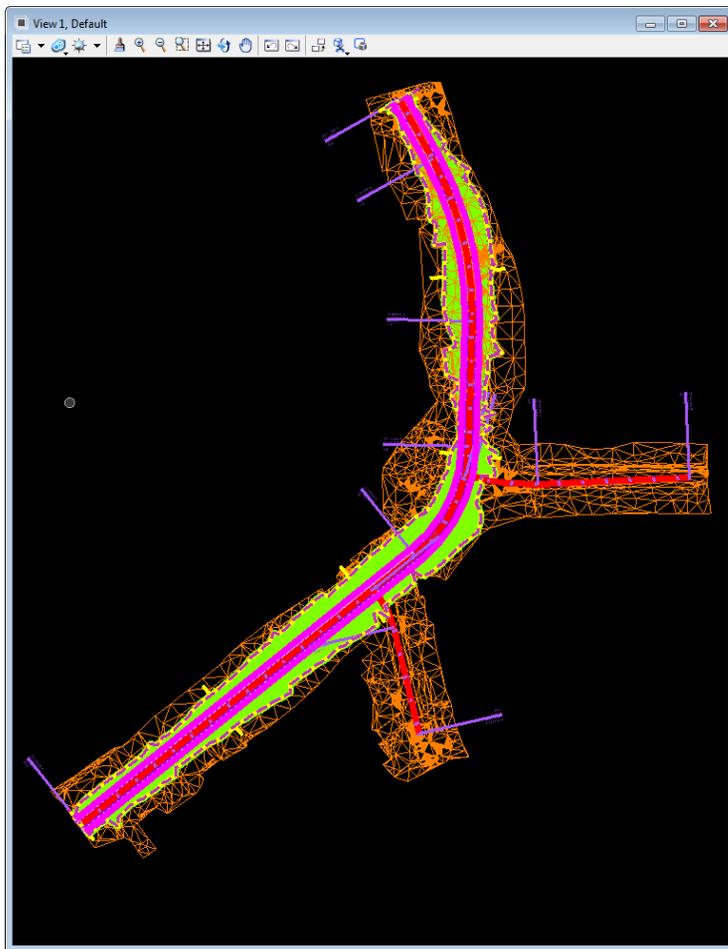


5. The **Select a Template** prompt will appear, click the **ellipses button** or **Alt+Down** to browse the templates. Select a **template** and Click **OK**.

Note: If you right clicked off to cancel the command after the corridor was created you will need to select the Create Template Drop Icon to continue. Follow the prompts to select a template.



6. Left click to **accept** and apply the template, follow the prompts for **Start Station, End Station, Drop Interval, Minimum Transition, Maximum Transition, Description**. The components of the model should be displayed in plan view as well as the 3D model if it is open.



Section 6.3 Superelevation

Superelevation is calculated and created differently in OpenRoads than InRoads, it uses SRL and SEP files instead of SUP files. Much of the application is done graphically using the heads up menus rather than the templates.

At this point the user should already have the following items:

- Terrain file (existing ground surface)
- Centerline geometry (horizontal alignment)
- Profile geometry
- Corridor
- Template drop(s)

Quick Step Preview:



STEP 1. Create Superelevation Sections



STEP 2. Create superelevation Lanes



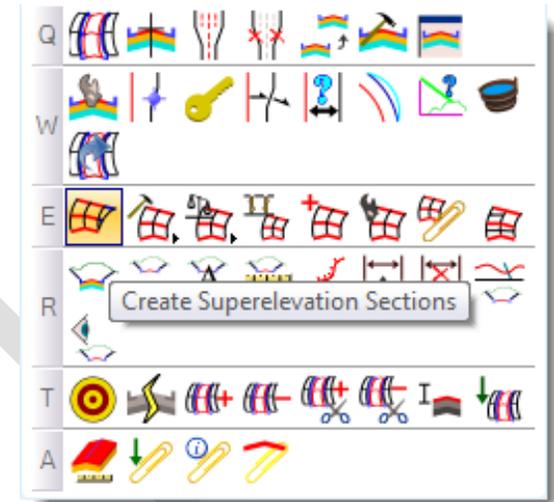
STEP 3. Calculate Superelevation



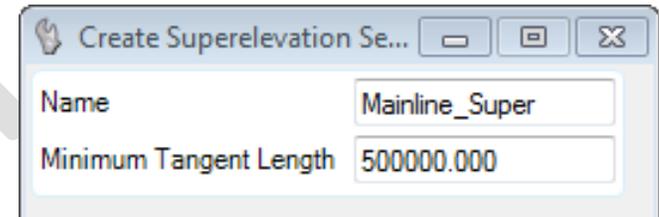
STEP 4. Assign Superelevation to Corridor

6.3.1 Step 1 - Create Superelevation Sections

1. Open the Level Manager and set the level **CORR_Superelevation** active.
2. The Superelevation tools are located under **Tasks > Civil Tools > Corridor Modeling**. Select **Create Superelevation Sections** and follow the prompts.

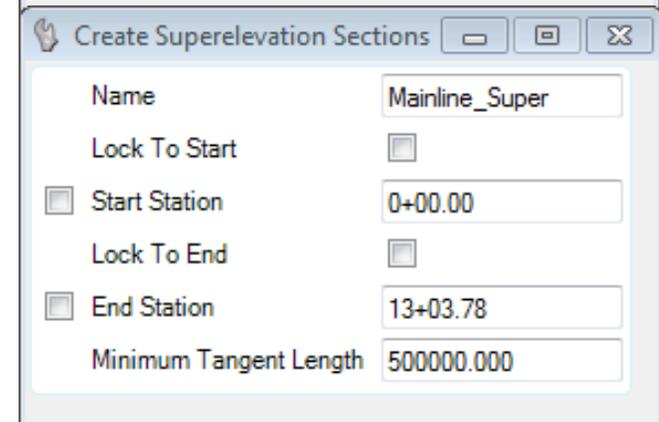


3. Give the Section a **Name** and specify the **Minimum Tangent Length**.



Note: If you do not want to have multiple superelevation sections created set the Minimum Tangent Length to a very large number. This will force the product to create only one superelevation section for your entire corridor. The only reason you may want multiple sections is if your design speed changes within the limits of your corridor.

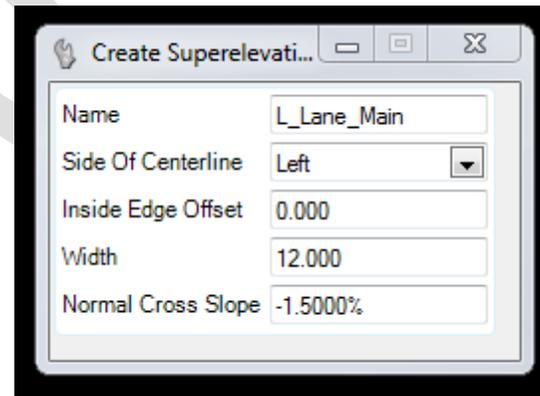
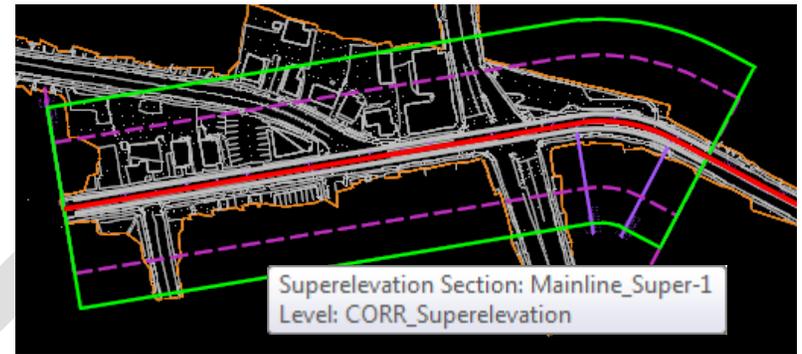
4. Data point the **centerline alignment** and left click to accept.
5. Another dialogue box should appear, select the **Start and End Stations** and click through to accept.



6. A green outline will appear around the Superelevation section that was just created

6.3.2 Step 2 - Create superelevation Lanes

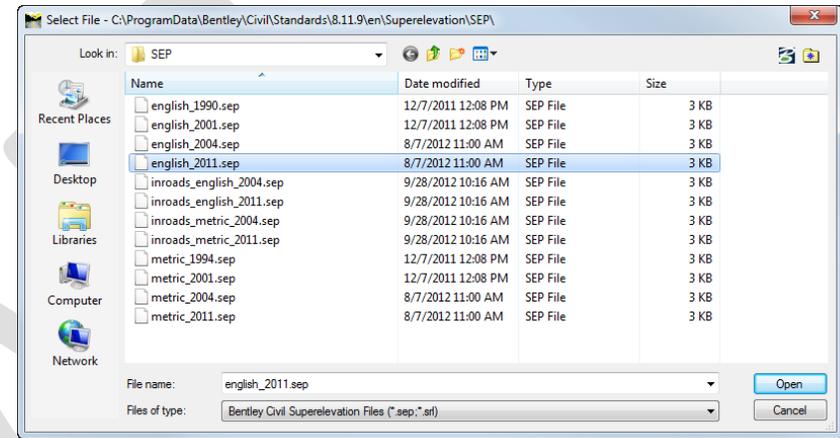
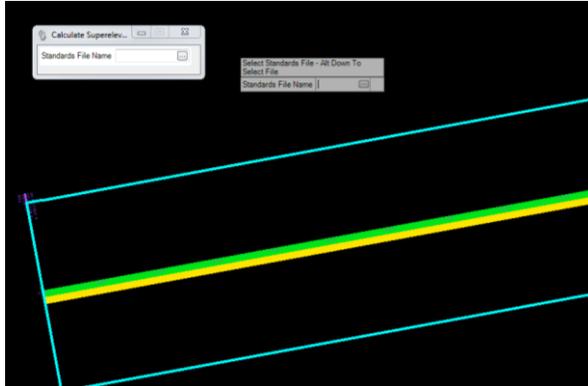
1. The next superelevation task will automatically start, **Create Superelevation Lanes**. This step needs to be done twice, once for the left lane and once for the right lane. For roads with more than two lanes additional super lanes will be required. In this example a two lane road is used.
2. Give a meaningful name to the lane.
3. Select which side of the centerline the lane is on.
4. Determine the inside edge offset (in the case of a two lane road each lane would have an offset of 0. For a multilane road the inside edge offset would be the width from the edge of the lane to the centerline).
5. In this example the normal cross slope is 1.5% because it is a two lane road, for a 4 lane road the outermost lanes would have a normal cross slope of 2%. See the HDM for more information on lane cross slopes.
6. Repeat process for each lane (in this example the **create super elevation lane** command was done twice, once for the left, once for the right)



6.3.3 Step 3 - Calculate Superelevation

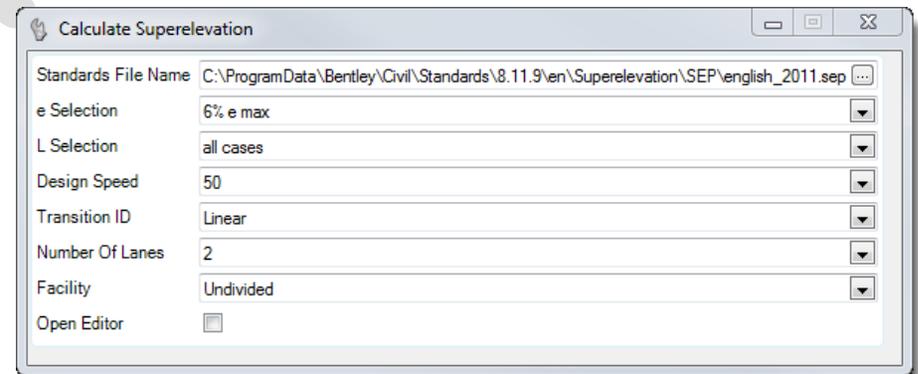
Once the lanes are created, right click to reset and move on to the next tool. The **calculate superelevation** dialogue should appear automatically.

1. Browse to the superelevation resource files and select **File of Type**. The SEP or SRL format can be used, each has multiple AASHTO years, select the most recent year.



2. The next dialogue box to appear will depend on which file type was selected for calculation. For the SEP file method, the dialogue box will ask for the following fields. Data point through the fields to accept the entries.

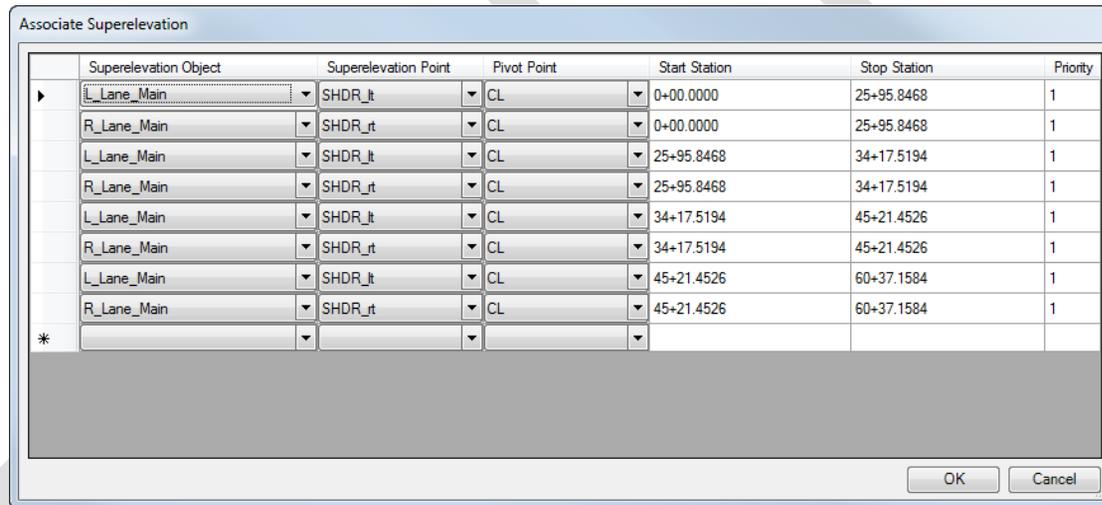
- a. E selection, CTDOT uses an e max of 6% for rural roads and 4% urban roads.
- b. L selection
- c. Design speed
- d. Transition ID
- e. Number of lanes
- f. facility



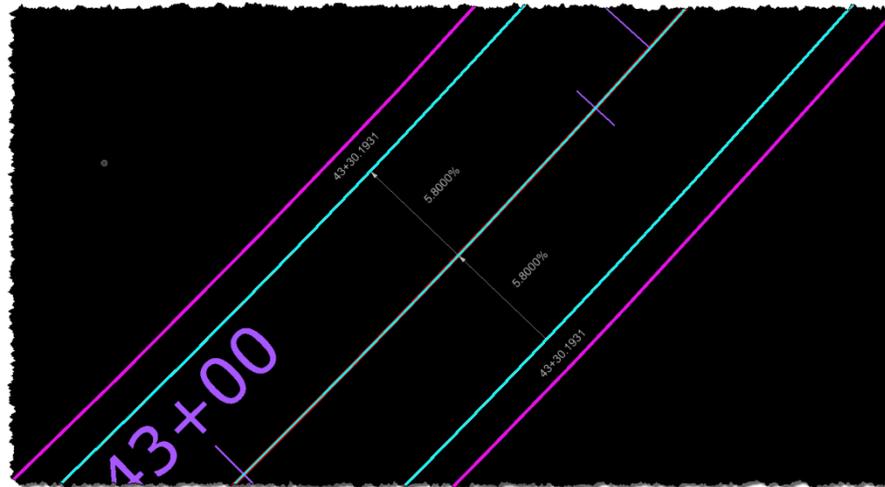
6.3.4 Step 4 - Assign Superelevation to Corridor

The next step is to assign the superelevation to the corridor.

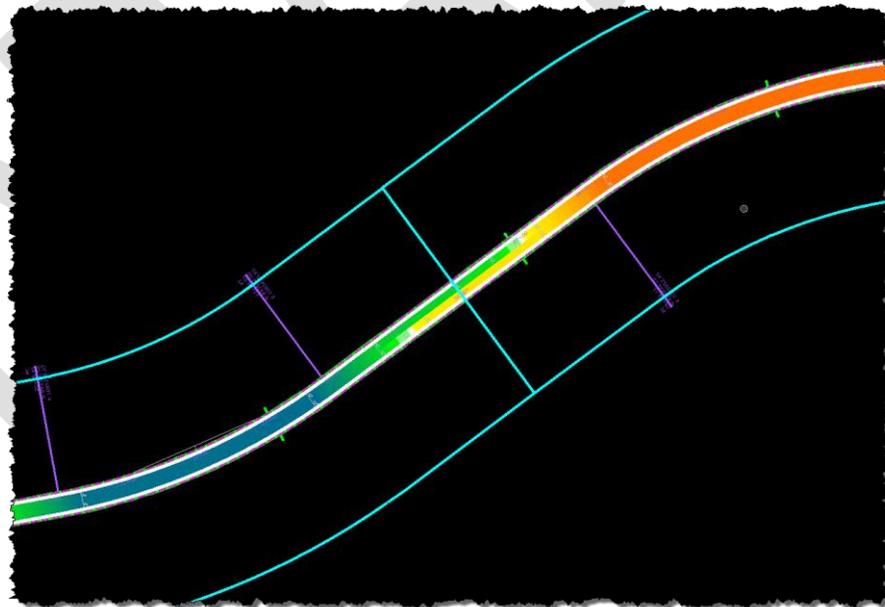
1. Click the **Assign Superelevation to Corridor** Command
2. When prompted, select the **super sections**.
3. When prompted, select the **corridor**.
4. The associate superelevation window should appear. Check over the points to make sure there are no errors and that the superelevation points and pivot points make sense, SHDR_lt with the left super lane and SHDR_rt with the right super lane.



5. Click **OK**, The Superelevation graphics should appear. The normal crown, reverse crown, and full super points should appear with labels as shown below.



To get a thematic visualization of the super grade changes toggle on the fill button in the view attributes window.

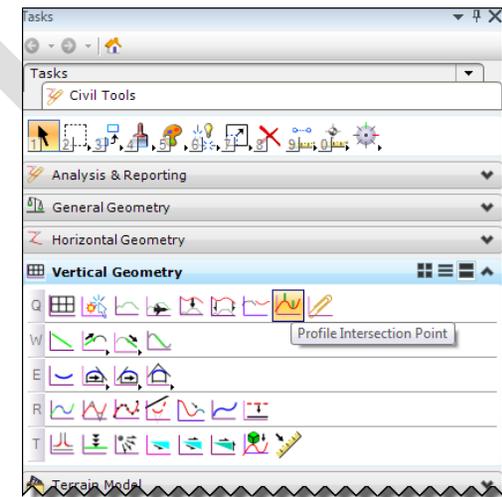


Section 6.4 Modeling Intersections

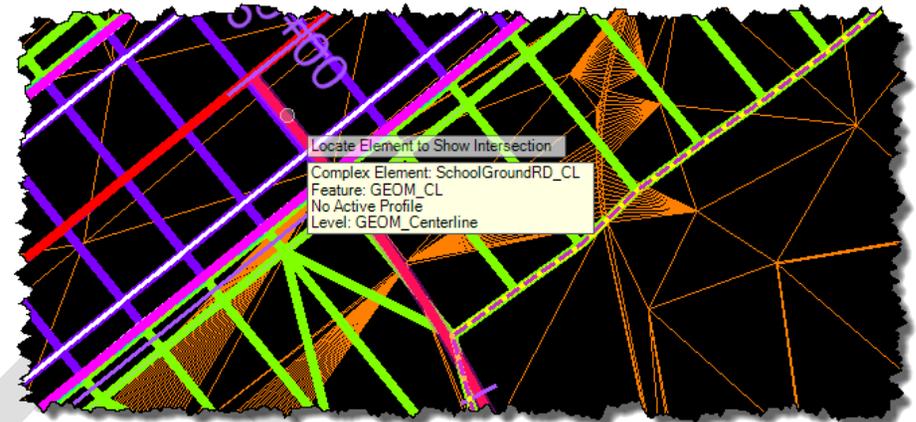
Side alignments are modeled a bit differently because the main line is constraining how the side road meets in. Alignments, models and corridors have to be adjusted to meet into the new proposed road. The alignment for a side road meets in at the alignment of the main line, because of this, the side alignment has to match the main line until it is off of the main line, or the two models have to be warped to accommodate each other.

6.4.1 Creating the Side Road Alignment

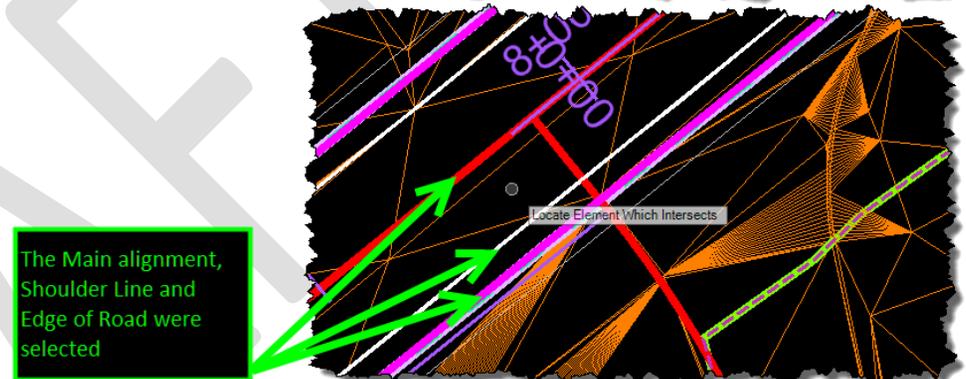
1. Follow the steps in section 3 to create the side road horizontal alignment and vertical profile window.
2. Display the points on the main line which cross the side road alignment. Go to **Tasks > Civil Tools > Vertical Geometry** and select the **Profile Intersection Point** command.



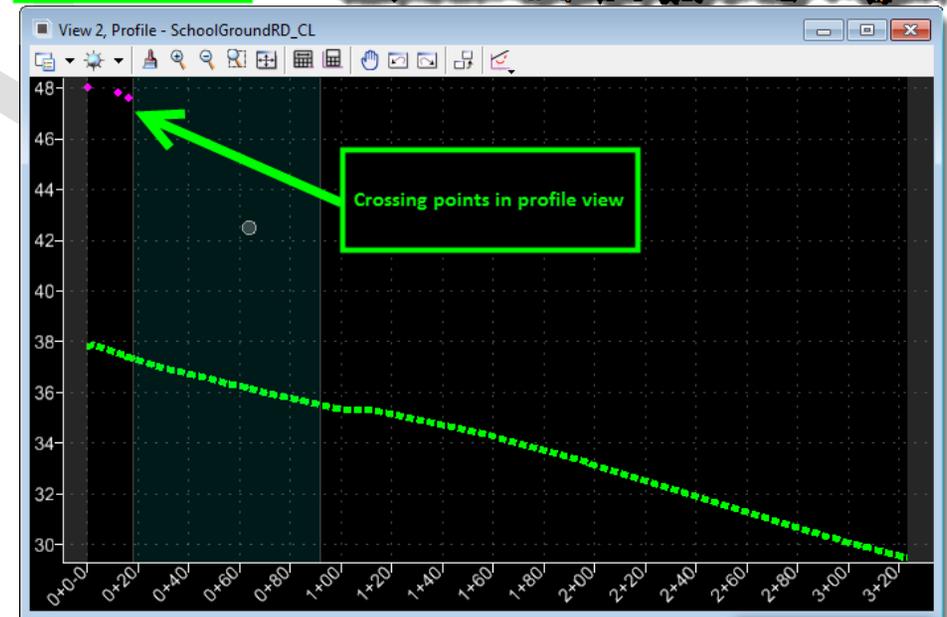
3. The prompt **Locate Element to Show Intersection** will appear. Select the **side road alignment**.



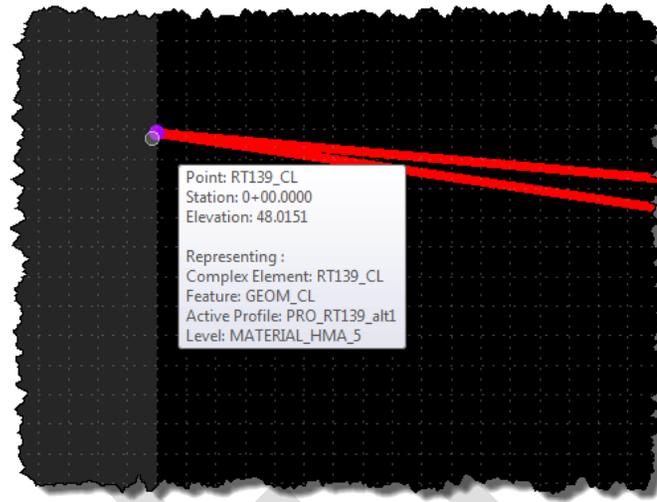
4. Another prompt will appear asking to **Locate Element Which Intersects**. This is asking which element crossing points the user wants to appear on the profile. In this example **the Main Road alignment, shoulder line, and edge of road elements** were selected. When finished selecting elements, **right click** to complete the selection.



5. The crossing points should now be displayed in the profile view. Fit view may be needed to locate the points, and the colors/ line weight may need to be changed to make them more visible.



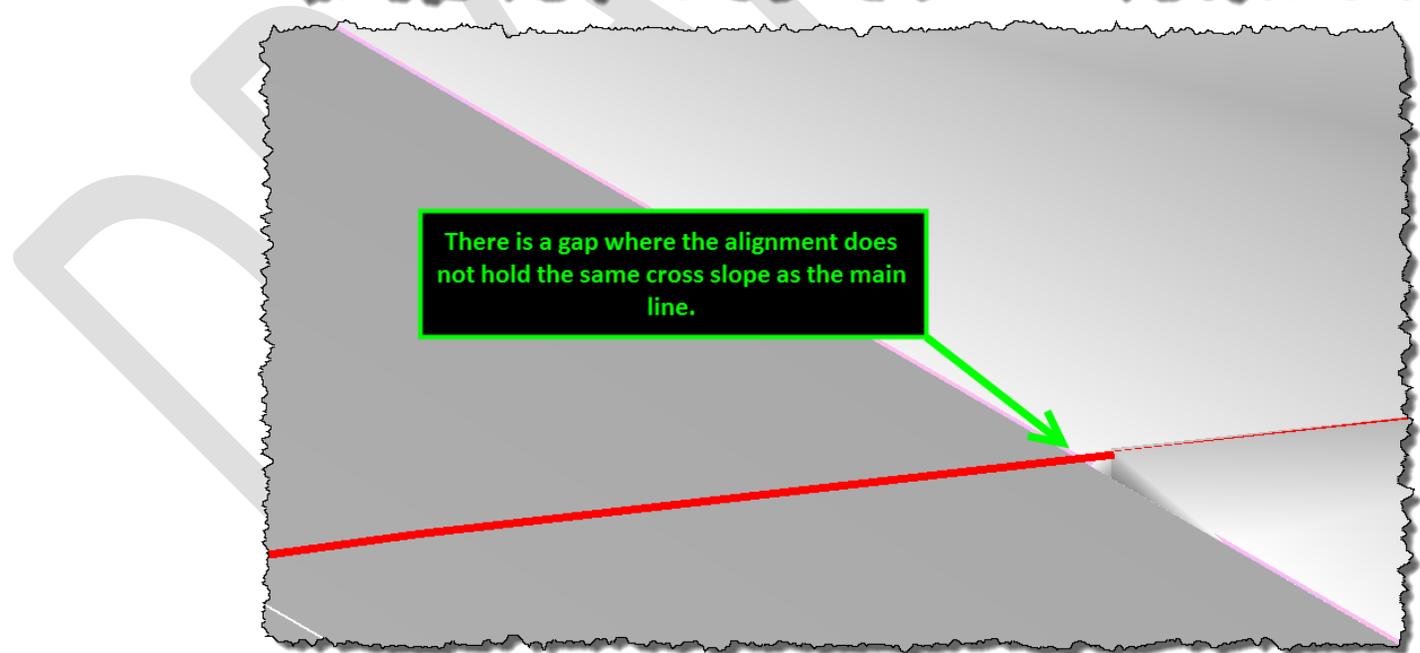
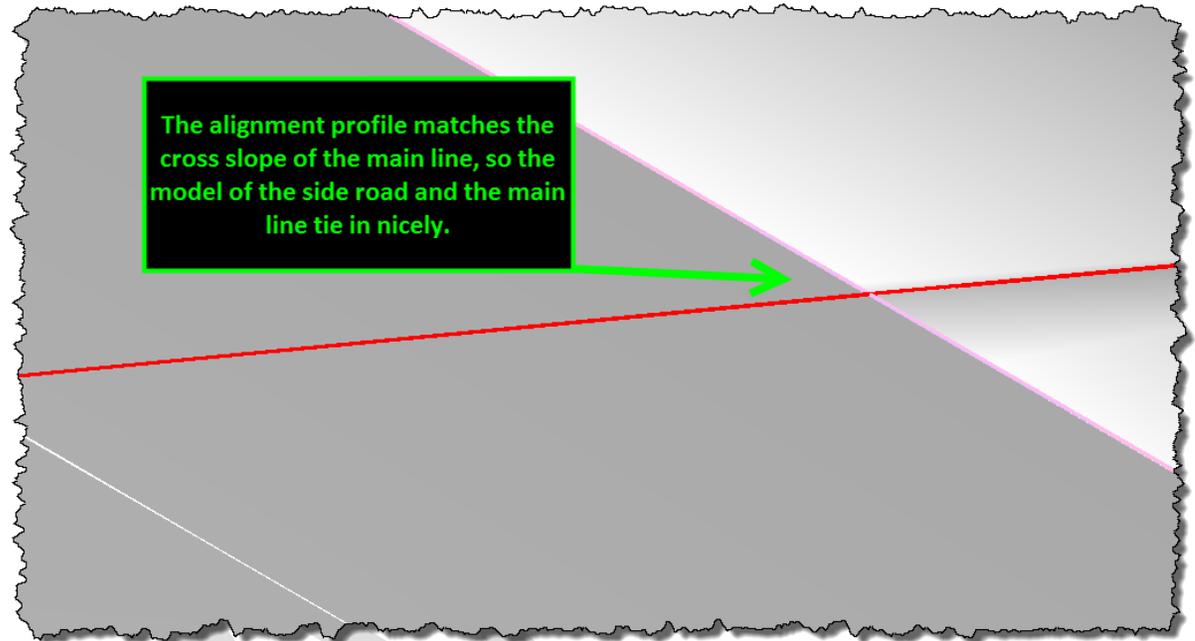
6. Hovering over a point in profile view will tell the designer what feature the point is representing as well as geometric information.



7. Create profile elements for the side road alignment. To maintain the side slope of the road, the side road alignment will need to match in to the main line. The points displayed earlier will help the designer achieve this. Select the **Profile Line Between Points** command and connect the crossing points. In the example shown the top vertical alignment is only connected to one crossing point. The lower alignment is connected to all three of the crossing points. The **Profile Complex By Elements** command can connect individual elements to create a single profile.
* Remember to use meaningful names when creating profiles.



8. This example shows the difference between the models using the top profile and the bottom profile.



6.4.2 Creating the Side Road Corridor

1. Create the Side Road Corridor. Now that the profile is complete, a corresponding corridor needs to be created. *Remember to name the corridor correctly to avoid confusion later.
2. Attach a template to the corridor. The designer can edit the corridor as needed and create alignment elements for the corridors and adjust the template drops as needed, or they can use a civil cell.

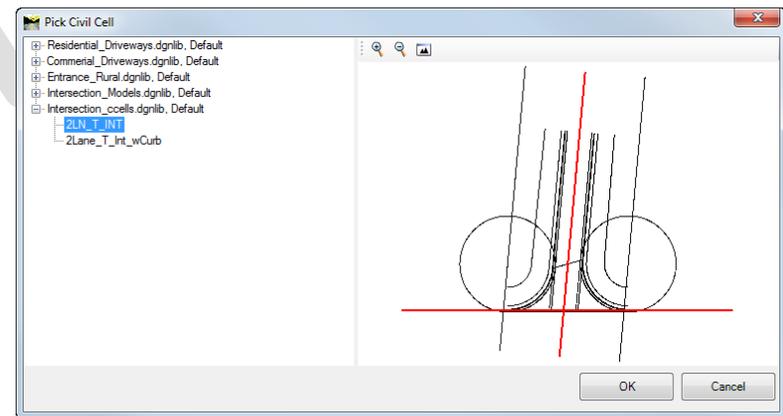
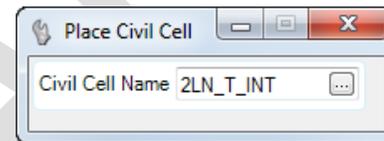
Section 6.5 Civil Cells



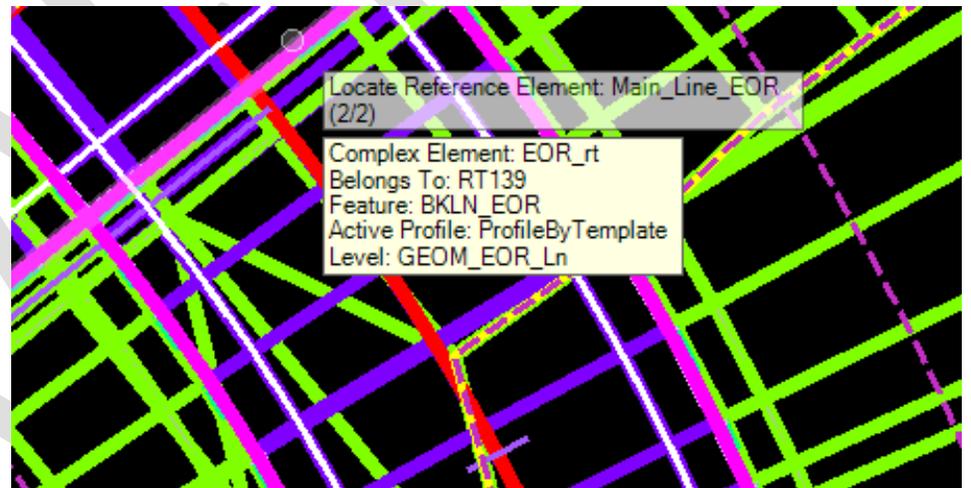
Model an Intersection with a Civil Cell

There are many different types of civil cells that help automate design tasks. Civil cells use reference elements for placement, meaning you can use the same civil cell in many locations and it will change based on the reference elements used to place it. Civil cells can be edited after placement as well as "dropped" to allow the designer to use pieces of a civil cell if necessary.

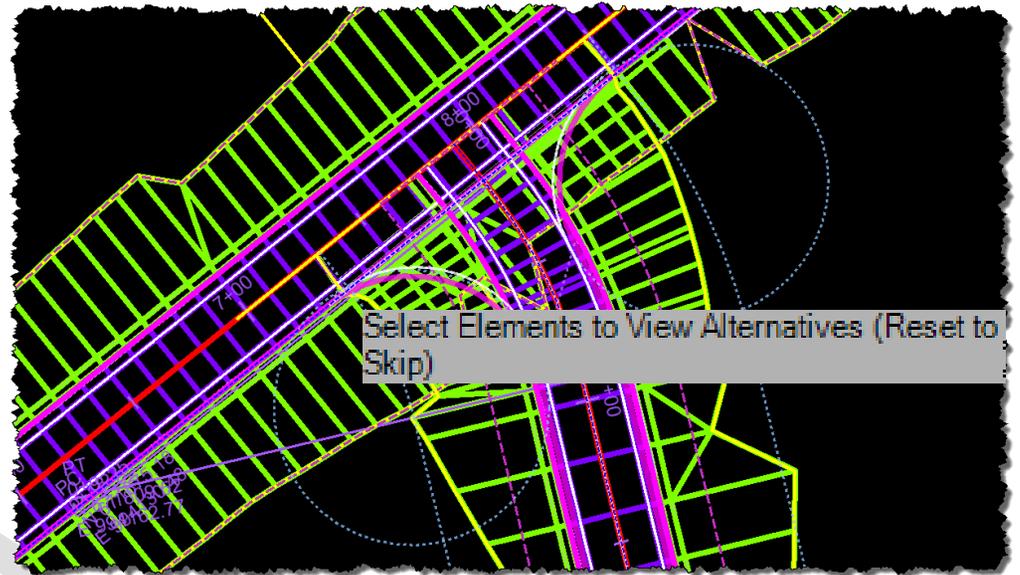
1. To place a civil cell go to **Tasks > Civil Tools > Civil Cells** and select the **Place Civil Cell** command.
2. The Place Civil Cell dialog box will appear, click the **ellipses** button to **browse available civil cells**. When selecting a civil cell preview will be shown to the right of the selection. Click **OK**.



3. The prompts that appear with each civil cell vary based on what type of civil cell is being placed or what the creator of the civil cell labeled the references as. The reference prompts are usually intuitive, so be sure to read the prompt. In the example the prompts indicate two reference elements are needed, one for the Side Road Center Line and one for the Main Line Edge of Road.



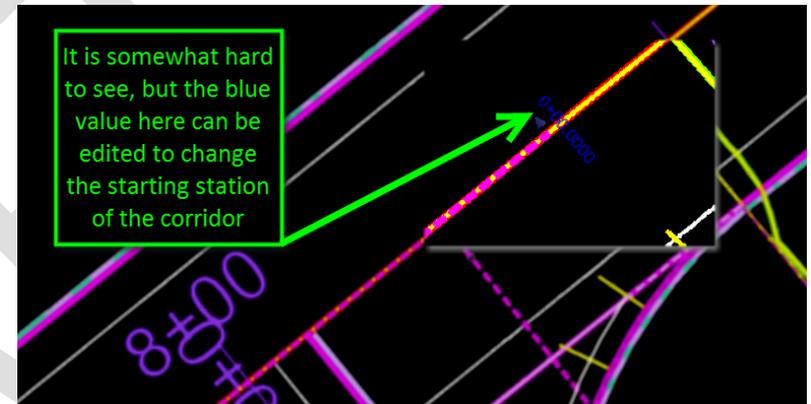
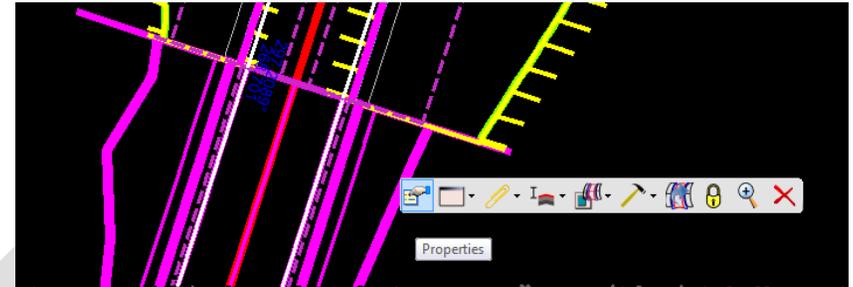
4. Elements of the civil cell should now appear on the screen, if there are alternative configurations you can view them at this point by selecting elements, or you can right click to move to the next step.



5. The next prompt will ask for the user to **Select Corridors To Be Clipped**. *note: this prompt will only appear if a clipping boundary was added to the civil cell when it was created. In this example the main line corridor and the side road corridors were selected. Right click to move on once the corridors (if any) have been selected.
6. Left click to accept civil cell placement. The corridor template graphics are visible on the main line. This will be edited in the next section.
7. Adjusting corridors. Corridors have an outline around them identifying the limits of the corridor; this is similar to the outline in the Roadway designer from SS2.

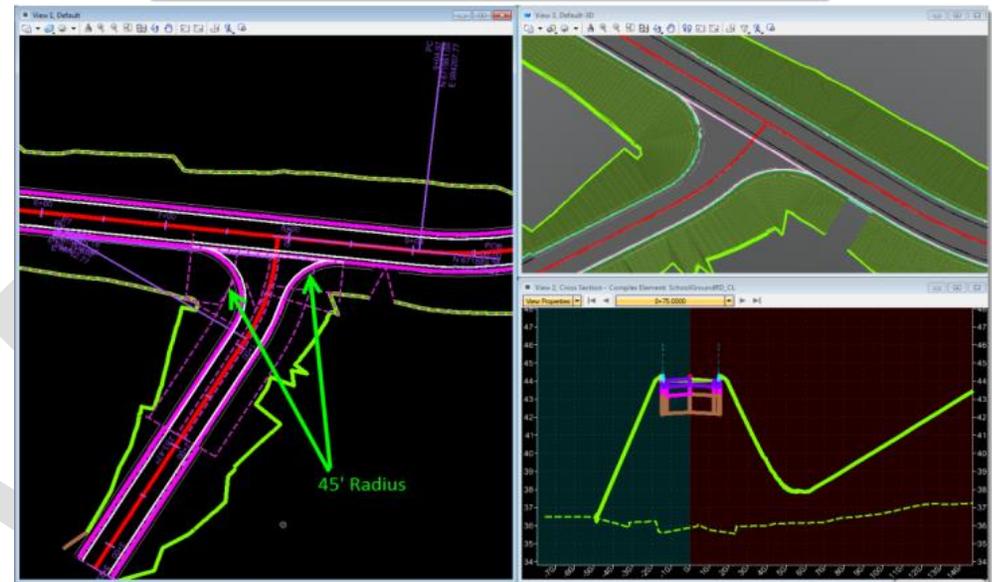


8. Adjusting a corridor using properties. The heads up menu will appear if the corridor element is clicked and hovered over. From the menu, the designer can open the properties and change the start/ end range of the corridor. The limits should change graphically.
9. Adjusting a corridor using handles. The designer can also adjust a corridor using handles. The lines perpendicular to the corridor graphic are the handles. When selecting a corridor graphic small blue numbers will appear at key points. Clicking on them will give you the ability to edit the number and adjust the value. There are also small blue arrows at some locations. These can be dragged to adjust the corridor dynamically instead, as well as snapped to certain locations if the element is snappable.
10. In this example, the side road corridor has been adjusted to the back of the civil cell corridor graphic. The side road surface is no longer breaking through the main line.
11. Editing geometric elements. Depending how an element is created, the designer can edit and adjust elements without disrupting and breaking apart the model. Many elements which selected will have blue handles appear as well as blue numbers. If there is a handle and number it means the element was created using design constraints. Many handles can be adjusted dynamically or the numbers can be entered manually. In some cases the changes may break an element but the undo command is useful when trying to edit elements.

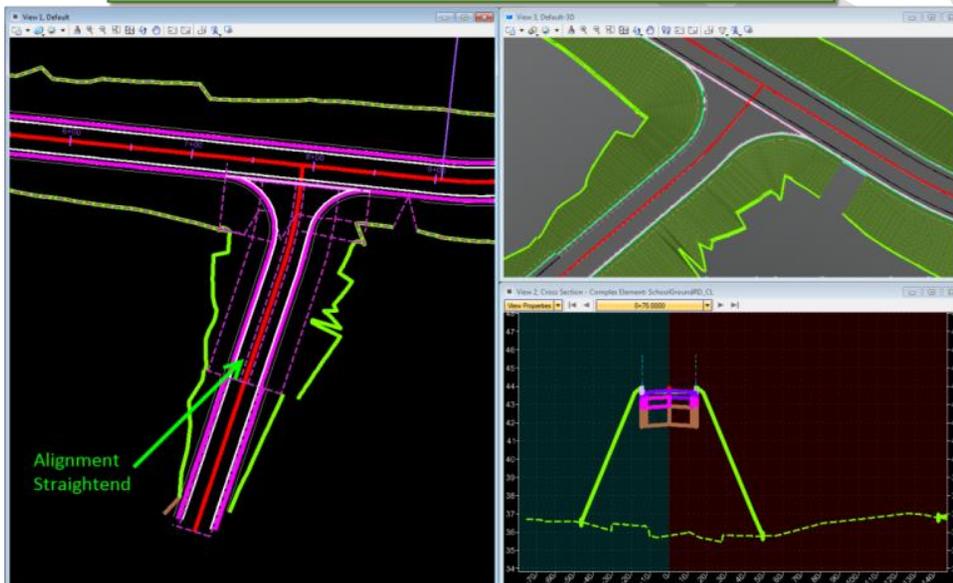


12. In this example there are three stages shown. The plan view, cross section view and 3D view are all visible. The first picture is the original model, the second had the alignment straightened and the third shows the radii of the intersection increased. Only elements in the 2D view were changed. The OpenRoads software automatically adjusts dependent 2D geometry, cross sections, profiles, and 3D models. This means less work for the designer as profiles, cross sections and 3D models do not need to be re-run each time a design change is made, all of these elements adjust automatically. *note: because of the changes the program needs to make to the model, when changing element values, allow the program to catch up and display the changes before moving on to the next edit.

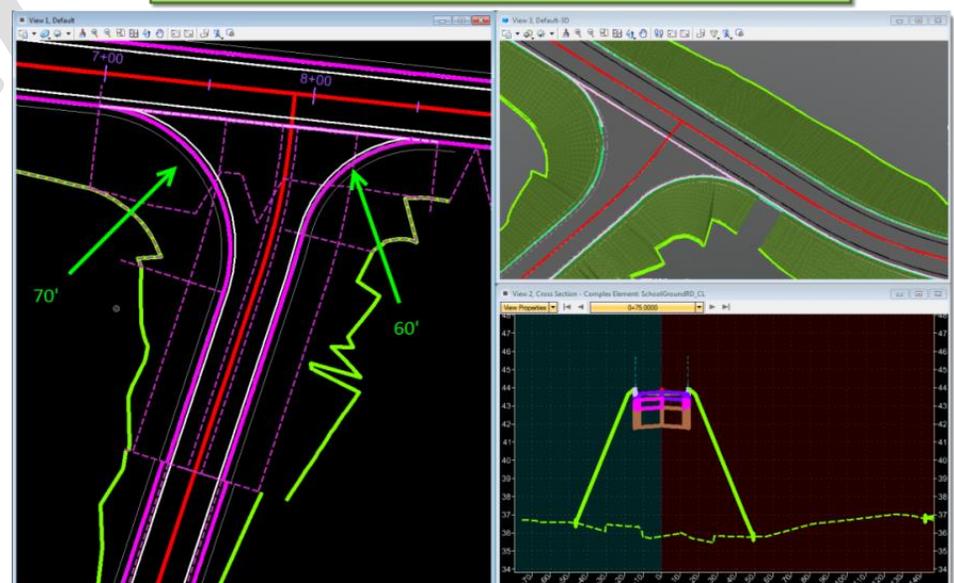
Original Model



Alignment Straightend



Curb Returns Changed from 45' to 60' and 70'



Section 6.6 Enhancing the Model



Review and Enhance the Complete Model

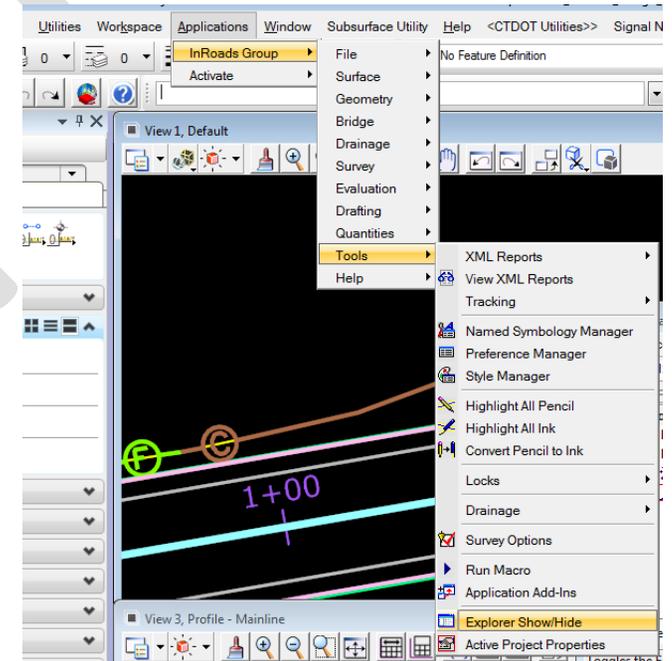
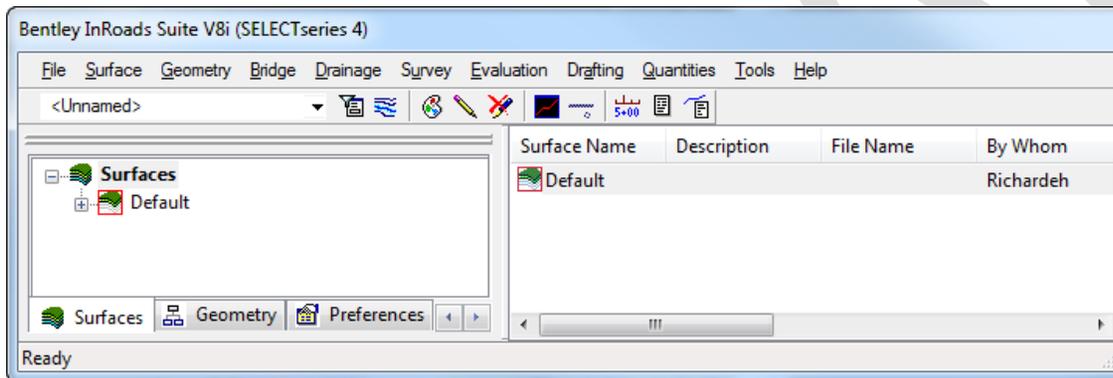
DRAFT

Chapter 7 Plans Production

Sheet production for OpenRoads has not been completed, this software development will not be finalized until the next Major Release in the CONNECT version. You will need to convert your geometry back to an ALG file type to be able to use the Plan and Profile Generator. You will also need to convert your top proposed surface back to a DTM. If you do not have an existing DTM this will need to be converted back as well.

If you chose to hide the InRoads dialog box you will need to open it again. On the MicroStation top menu bar go to

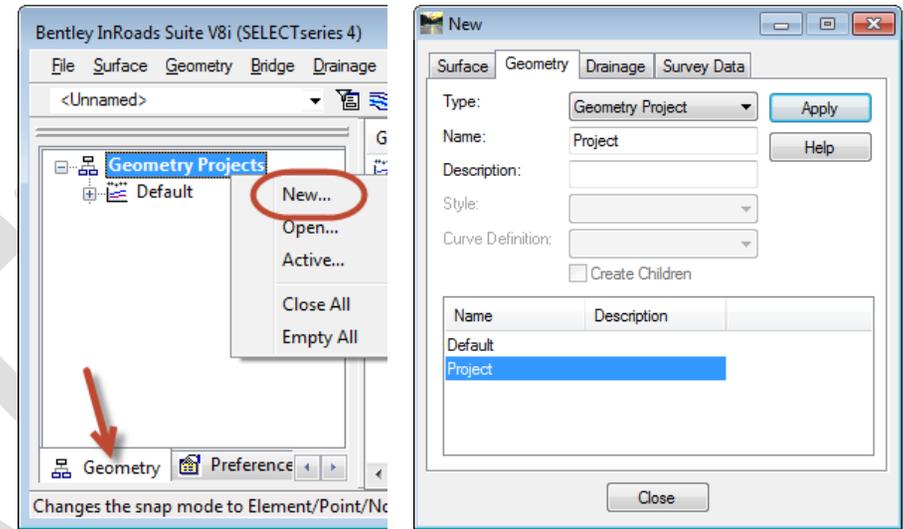
[Applications > InRoads Group > Tools > Explorer Show/Hide](#)



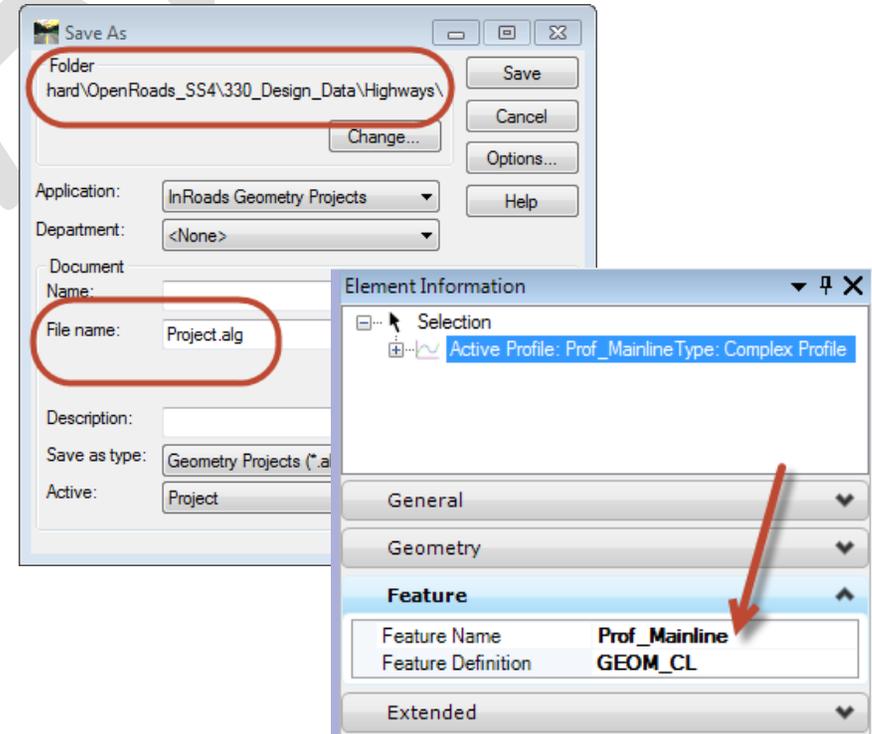
Section 7.1 Exporting Data

7.1.1 Export to an ALG

1. In InRoads Explorer select the **Geometry** tab, right click on **Geometry Project** and select **New**. Type in a name in the **Name** field and click **Apply** and **Close**.

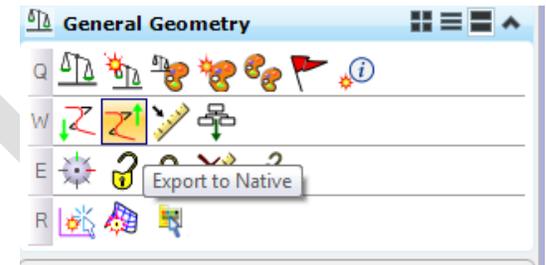


2. Right click on the new Geometry Project and select **Save As**. If you completed Step 11 in the Step by Step start up you will see your project path on the top portion of the Save As dialog box. The Internal name you gave will be filled in the File name field. Select **Save** and **Cancel**.



3. Before exporting to the new ALG file make sure all horizontal and vertical alignments have feature names.
 - A. Click on the horizontal alignment in check Element information locate the **Feature Name** field. If it is blank give it a name.
 - B. Click on the vertical alignment in check Element information locate the **Feature Name** field. If it is blank give it a name.

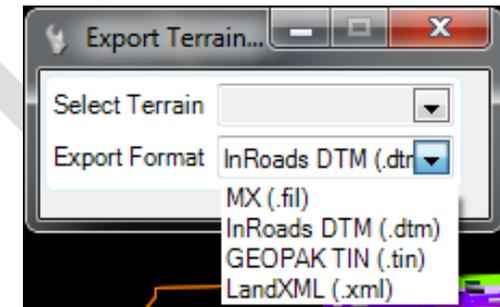
4. Now you are ready to complete the export on the Task menu. On the task menu select the **Export to Native** tool. Follow the prompts and select the Horizontal alignments you wish to export. It is not required to select the vertical alignment because they are children of the Horizontal and will automatically export with the Horizontal.
 - If you do try and select the verticals MicroStation will lock up and you will be kicked out of the application.
 - Check the InRoads Dialog box and confirm everything came over.
 - If you do not see a vertical appear in the alg it's because a Feature Name is missing (go back and do step 3)



7.1.2 Export to an Existing DTM

If there is not an existing DTM, designers will need to call Central Surveys and ask them to do the following in OpenRoads.

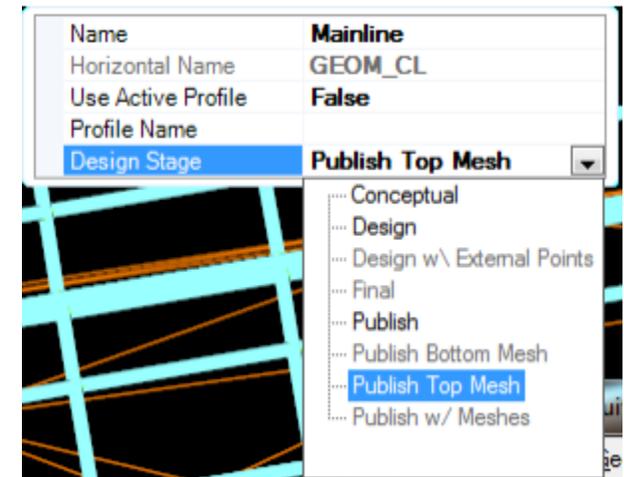
1. Select on Terrain Model on the task menu and select the **Export to File** icon. In the Export Terrain pick box select:
Select Terrain: **Existing**
Export Format: **InRoads DTM (.dtm)**
2. Place the DTM in the ProjectWise project folder under
\500_Pre_Design\03_Central_Survey



7.1.3 Export to a Proposed DTM

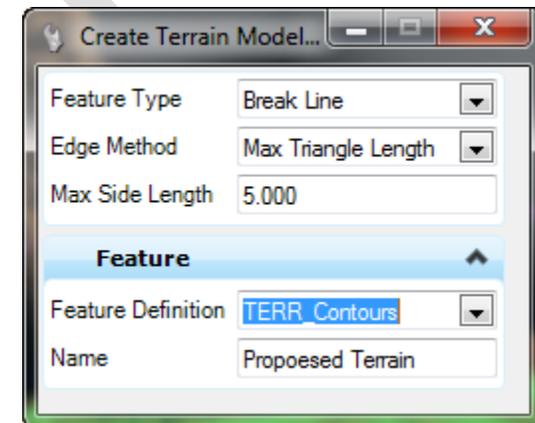
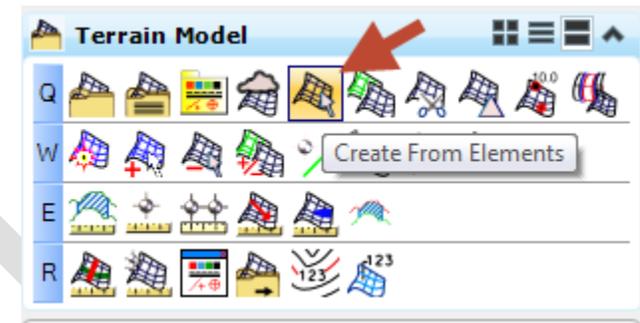
1. Open your main design File.
2. Change the corridor's **Design Stage** to display the top mesh.
 - a. In **View 1**, select the corridor. (Use the handles if necessary)
 - b. From the context menu, select **Properties**
 - c. Change the **Design Stage** to **Publish Top Mesh**.
 - d. The corridor model changes to display a mesh of the proposed top surface.

After creating the top mesh along the corridor, we will create a new dgn in which the proposed terrain model will be stored. The main corridor will be referenced into the new file to be utilized in terrain creation.



3. Create a new 3D dgn to store the proposed terrain from the corridor and open it.
4. Reference the Main Design File into the Proposed Terrain File. Set Live Nesting to 2.
5. Create a terrain model from the mesh.

- a. On the task menu, open the **Terrain Model** toolbox.
- b. Select the **Create from Elements** tool.
- c. First, on the **Create Terrain Model** dialog box...
 - Set the **Feature Definition** to **TERR_Contours**
 - Name the terrain **Proposed Terrain**.
- d. Then, following the prompts, locate the elements to add and select the mesh element.
- e. Click **Reset** when done.
- f. Set the feature type to **Break Line**.
- g. For the **Edge Option**, select **Max Triangle Length**
- h. Set the **Max Side Length** to 5. The terrain model is created.



- i. Turn off the display of the main file and review the terrain model. Do not detach the reference file.

NOTE: This terrain model is linked or "ruled" to the corridor model in the main file. The terrain model will update when modifications to the corridor are made. If the referenced corridor is detached, the link between the terrain and the corridor will be broken.

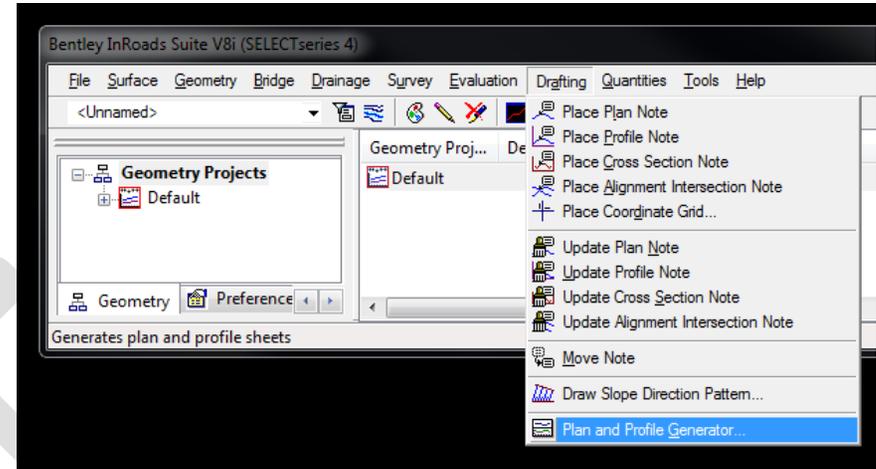
8. Export the Proposed Terrain Model to its native file format. The plan production tools rely on the native file format, therefore we will now export the proposed terrain model to its native file format.

- a. Select the **Proposed Terrain** element in the file.
- b. From the context menu, select the **Export Terrain Model** tool.
- c. Select the DTM file format.
- d. Click **Save**. The terrain is saved into the selected native file format.

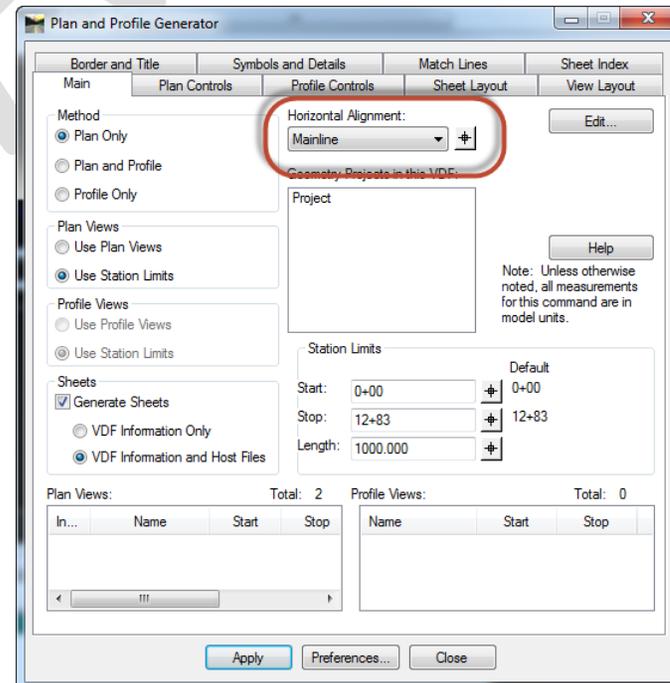


Section 7.2 Plan Sheets

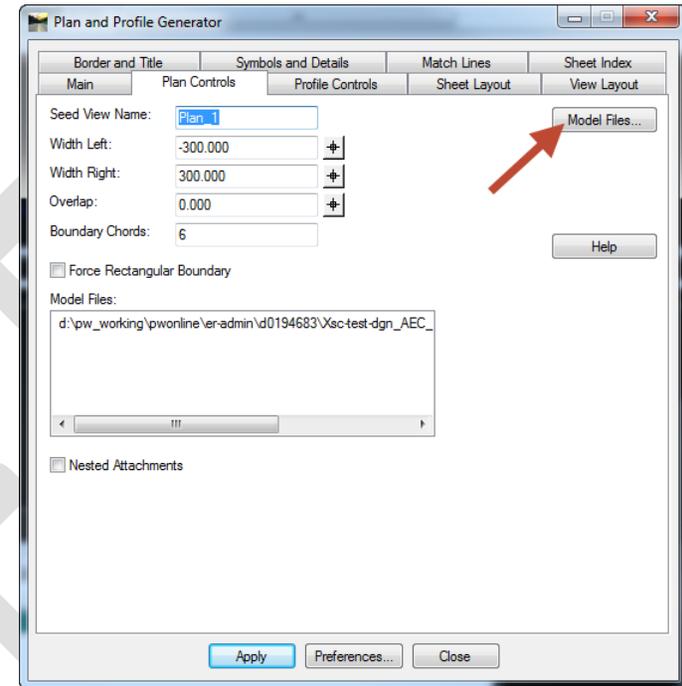
1. Open your main modeling DGN file.
2. Make sure the ALG and Proposed and Existing DTM's are opened.
3. To generate plan sheets select **Drafting > Plan and Profile Generator** on the InRoads Dialog Box.
4. Select the **Highway** Preference and select each tab to edit as necessary (AT THIS POINT DO NOT CLICK ON THE PROFILE CONTROLS TAB, this will mess up your settings "INROADS GLITCH")



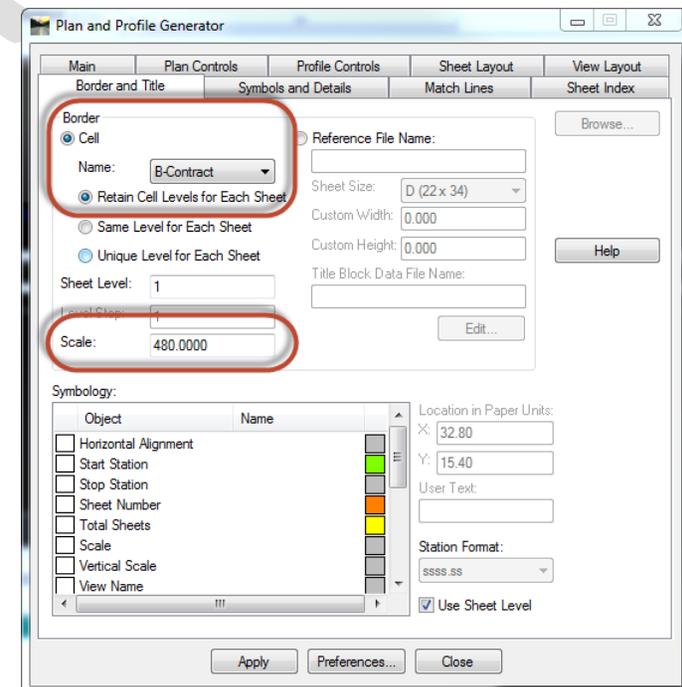
5. On the Main Tab select the **Horizontal Alignment**.



6. On the Plan Controls select and browse to the needed **Model Files...**

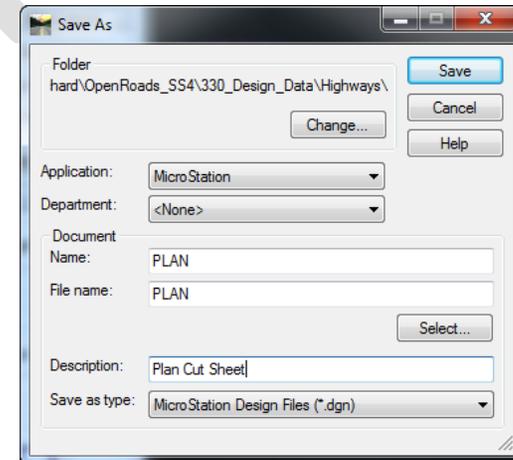
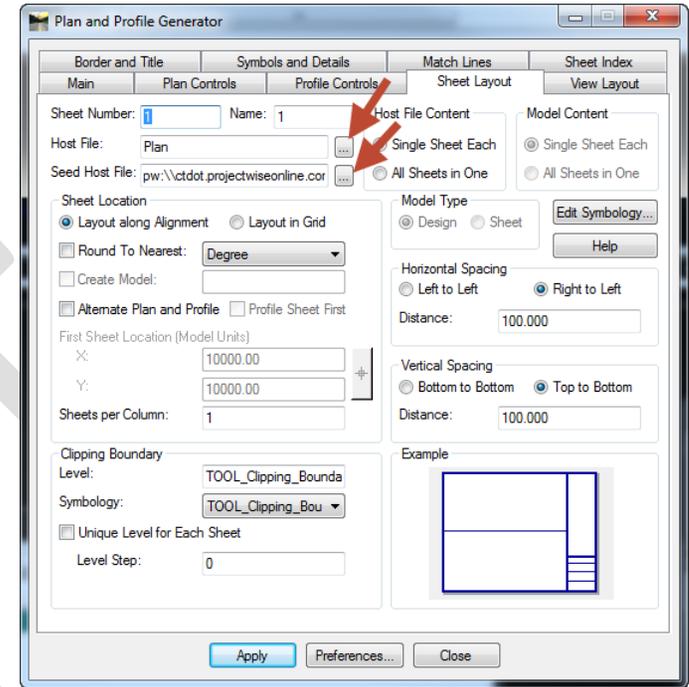


7. On the Borders and Titles Tab the following should be set. Cell toggled on and is set to **B-Contract**. Retain Cell Levels for Each Sheet is on and the Scale is set to **480**.



8. On the Sheet Layout Tab

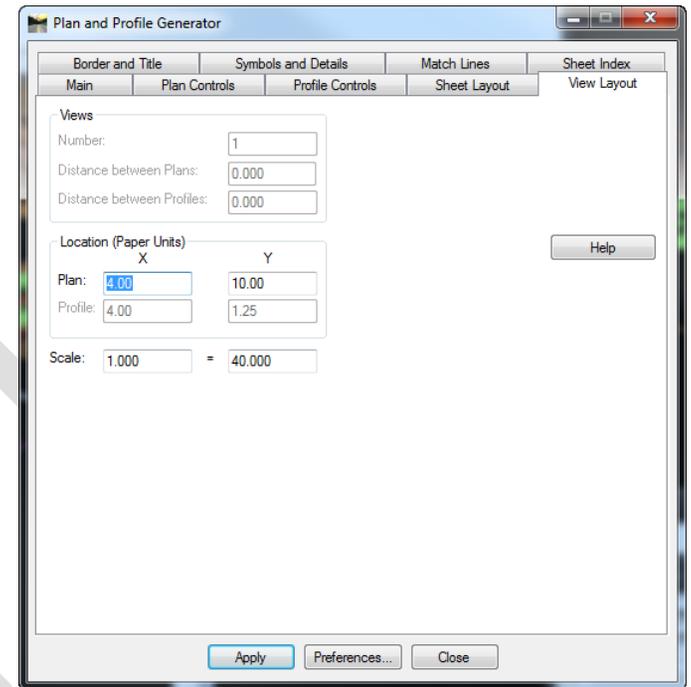
- a. Select to pick a **Host File**, this will be the name of the newly created Plan Sheet DGN files.
- b. In the Save As dialog box direct your files to be created in the correct ProjectWise folder by clicking on the **Change** button.
- c. Give your Document a Name, File Name and a description and click **Save**.



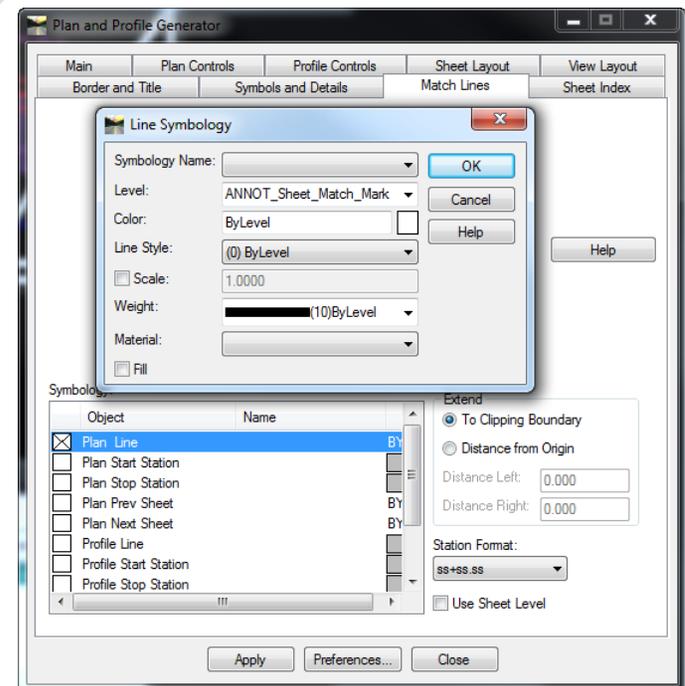
- d. Select to pick a **Seed File**.

Browse to **05.0 - Workspace Resources\3_Workspace_V8i\Standards\seed\Sheet_Seed2d.dgn**

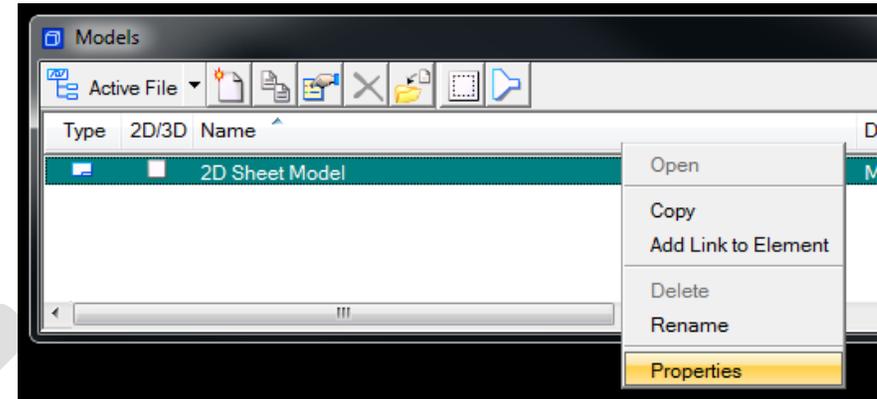
7 . On the View Layout Tab the Scale should be set to $1 = 40$.



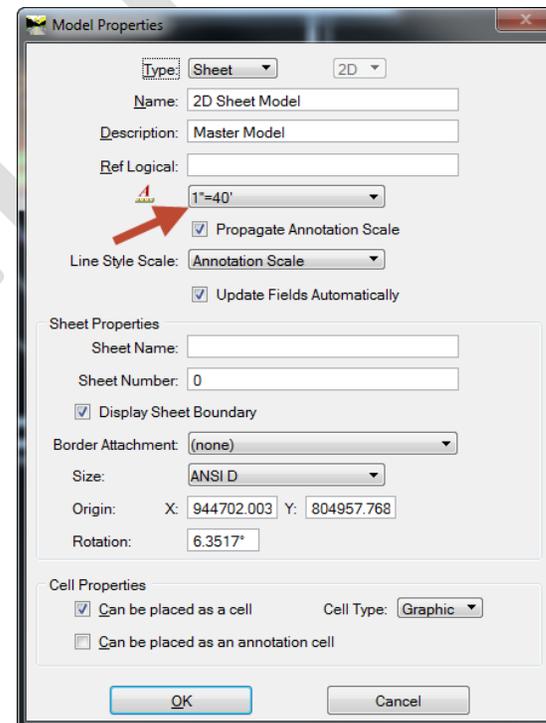
8 . Select the Match Line tab and assure that the Match lines are set to level ANNOT_Sheet_Match_Mark.



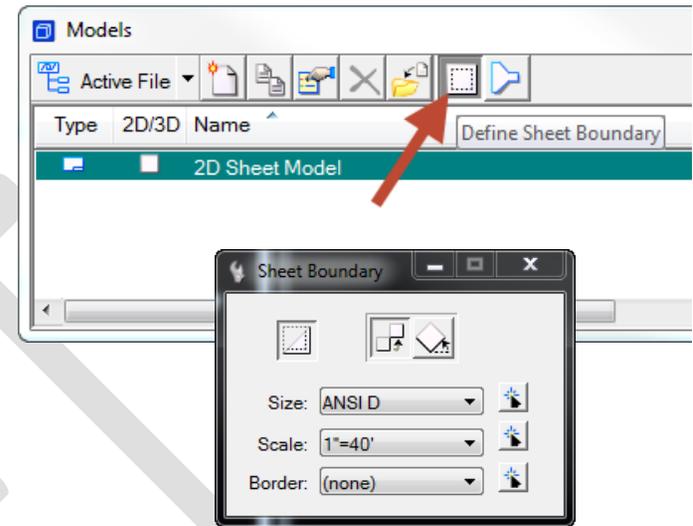
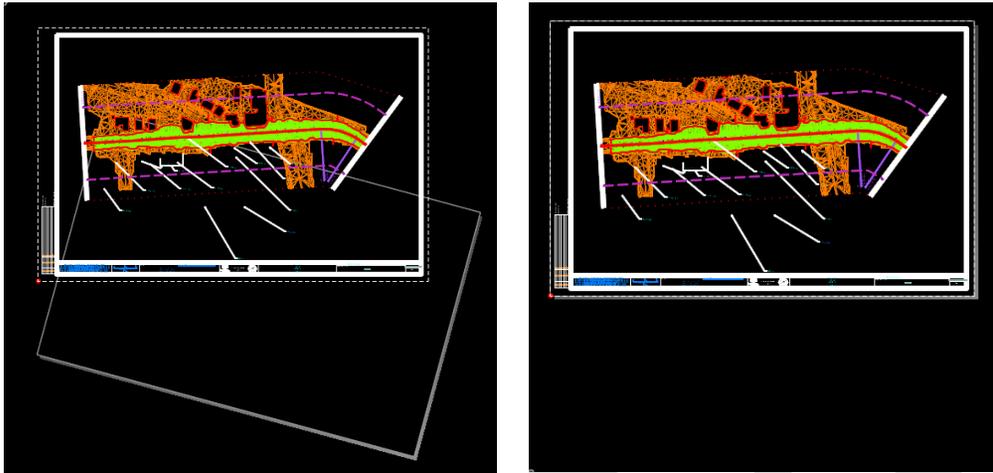
- Click **Apply** on the Plan and Profile Generator and plan cut sheets will be produced
- Open each file and modify the Model Properties. Open the Models Dialog box, right click on the Sheet Model and select **Properties**,



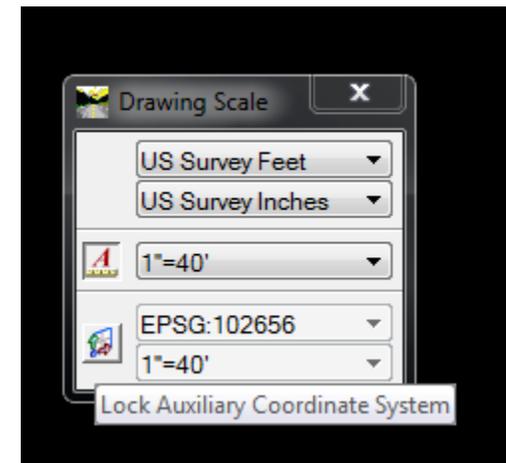
- In the Models Properties Dialog Box change annotation scale to **1"=40'**. Click the **OK** Button.



12. Back on the Models Dialog box select the Define Sheet Boundary Icon. Adjust the Models Sheet Boundary to line up with the Border. You will need to use both the rotate and move tools to accomplish this.

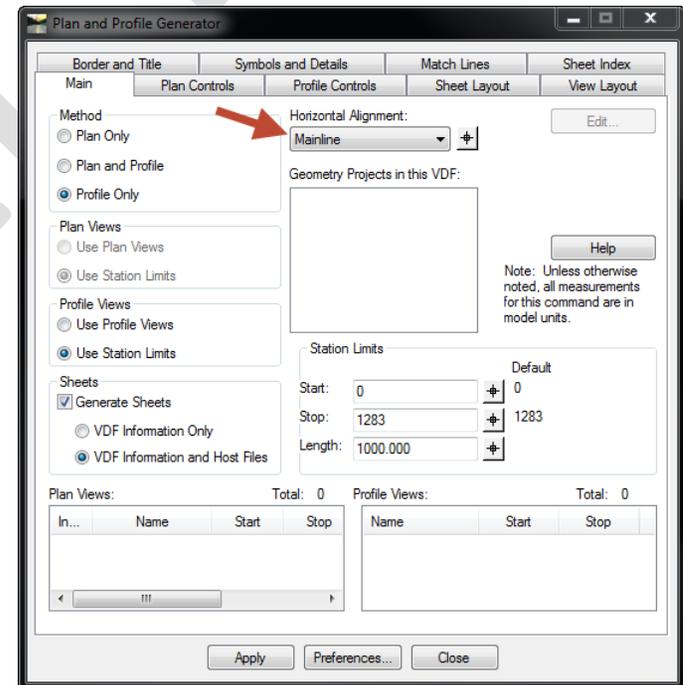
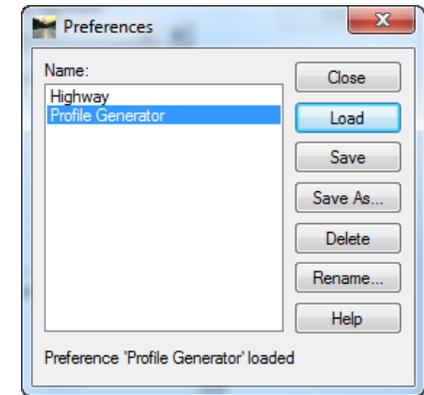


13. On the MicroStation top menu bar select **Settings > Drawing Scale** and assure the the Lock Auxiliary Coordinate System is NOT on.
14. On the MicroStation top menu bar select **File > Save Settings**.

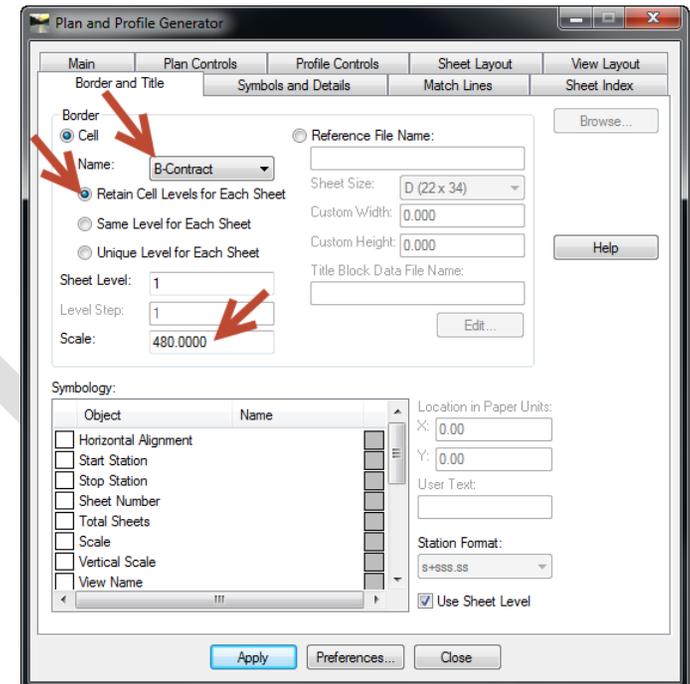


Section 7.3 Profile Sheets

- 1 . Create a 2D Design Model DGN File to house the Profile Grids. Make sure the ALG and Proposed and Existing DTM's are opened.
- 2 . To generate profile sheets Select **Drafting > Plan and Profile Generator** on the InRoads Dialog Box
3. Load the **Profile Generator** Format Preference. Select each tab to edit as necessary (**CLICK ON THE PROFILE CONTROLS TAB LAST. This needs to be done this way to work around an "INROADS GLITCH"**)
4. On the Main Tab select the **Horizontal Alignment**.



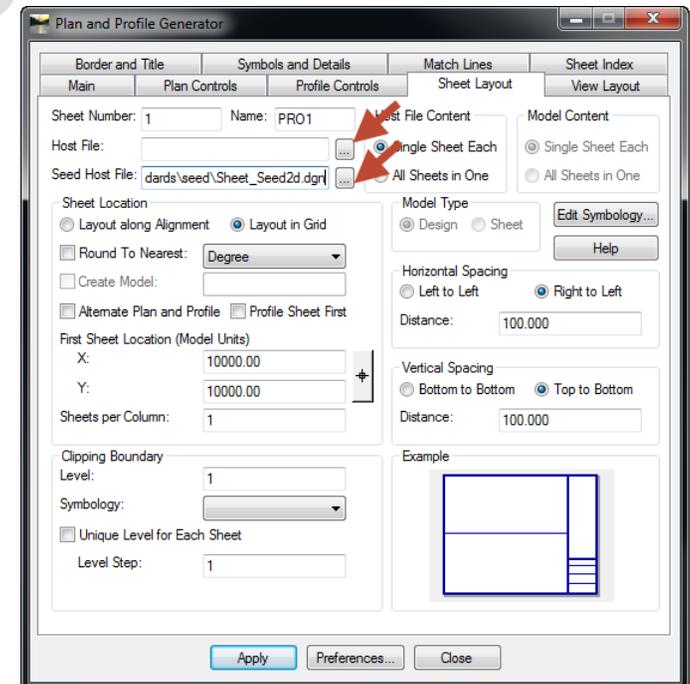
5. On the Borders and Titles Tab the following should be set. Cell toggled on and is set to **B-Contract**. Retain Cell Levels for Each Sheet is on and the Scale is set to **480**.



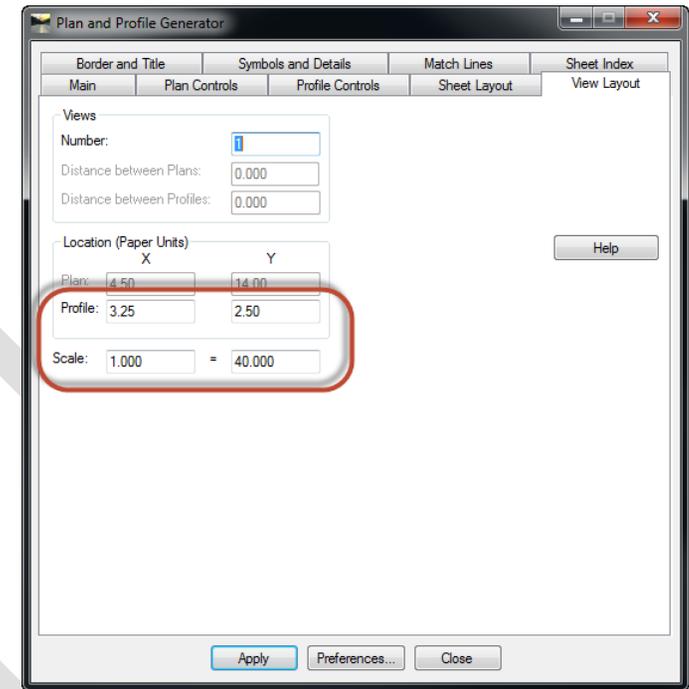
6. On the Sheet Layout Tab

- Select to pick a **Host File**, this will be the name of the newly created Profile Sheet DGN files.
- In the Save As dialog box direct your files to be created in the correct ProjectWise folder by clicking on the **Change** button.
- Give your Document a Name, File Name and a description and click **Save**.
- Select to pick a **Seed File**.

Browse to **05.0 - Workspace Resources\3_Workspace_V8i\Standards\seed\Sheet_Seed2d.dgn**



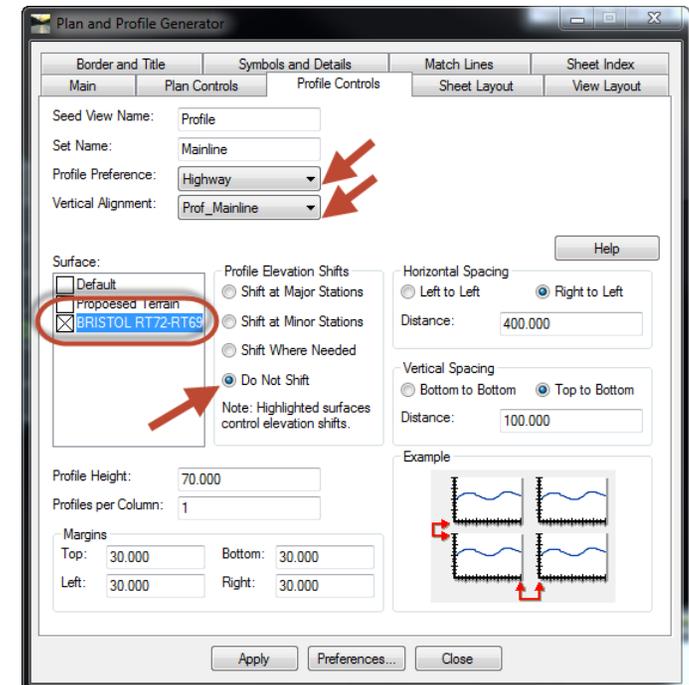
7 . On the View Layout Tab the Scale should be set to $1 = 40$.



8 . On the Profiles Controls tab

9 . Click **Apply** on the Plan and Profile Generator and data point in the DGN to select the starting point for the profile grids. This file will be automatically referenced into the profile cut sheets.

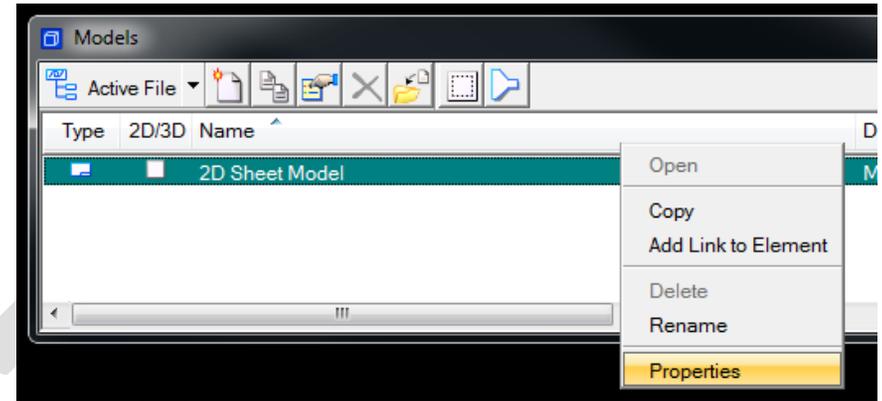
10 . Open the profile grid layout dgn. Using the InRoads dialog box view and annotate the vertical alignment.



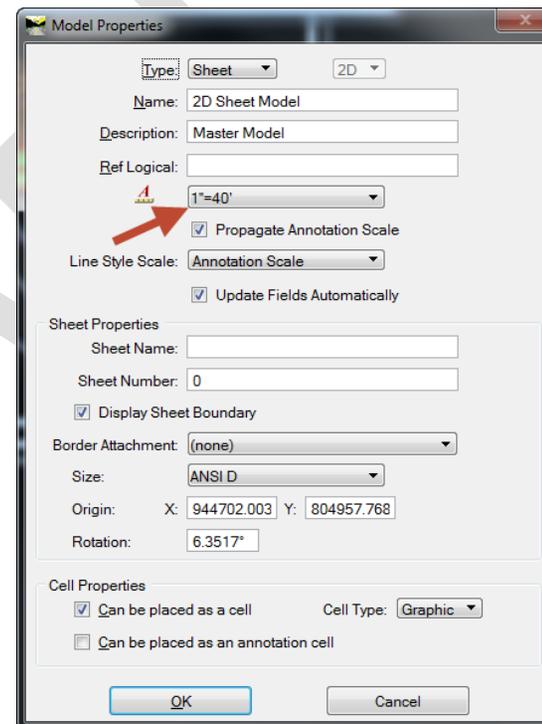
Geometry > View Geomentry > Active Vertical

Geometry > View Geomentry > Vertical Annotation

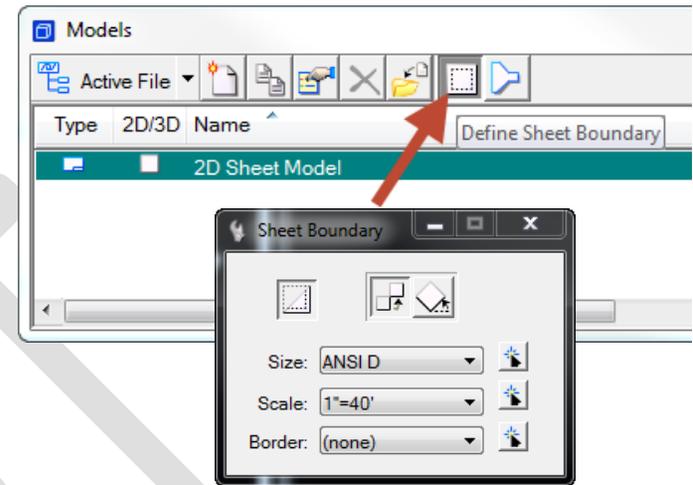
15. Open each file and modify the Model Properties.
Open the Models Dialog box, right click on the Sheet Model and select **Properties**,



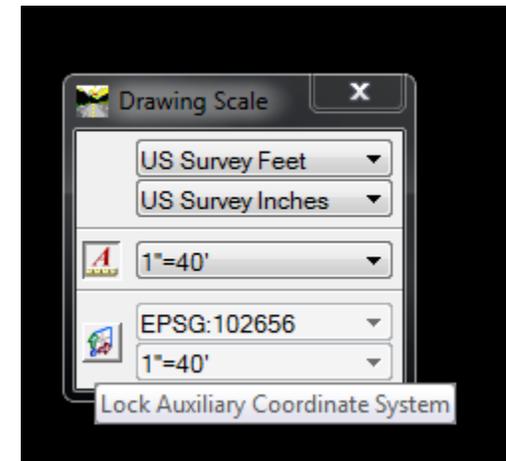
16. In the Models Properties Dialog Box change annotation scale to **1"=40'**. Click the **OK** Button.



17. Back on the Models Dialog box select the Define Sheet Boundary Icon. Adjust the Models Sheet Boundary to line up with the Border.



18. On the MicroStation top menu bar select **Settings > Drawing Scale** and assure the the Lock Auxiliary Coordinate System is NOT on.
19. On the MicroStation top menu bar select **File > Save Settings**.



Section 7.4 Cross Section

7.4.1 Create a Cross Section DGN and Reference the Design

Before moving on to create a new file for your cross sections you will need to verify a couple things in your main design files. The existing ground reference file's display must be tuned the 3D Model. All the proposed and existing levels, features and components you need displayed in the cross sections need to be on as well. To create cross sections you will need to use Nested Attachments - Live Nesting to attach the main design model to the blank cross section file.

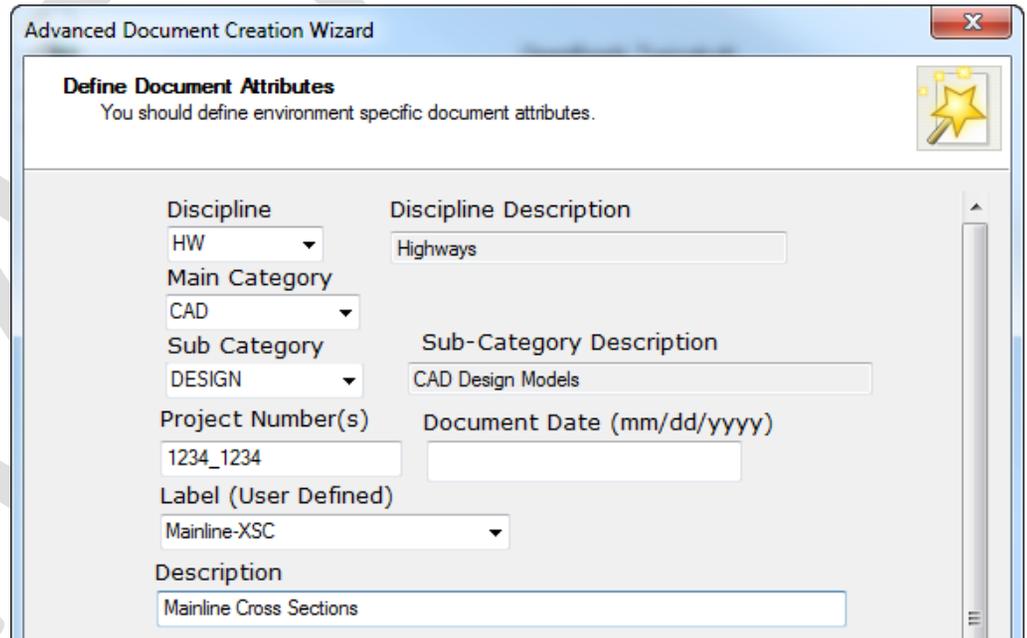
1. Create new file using a CTDOT 2d Seed file and attribute as shown.

\05.0 - Workspace
Resources\3_Workspace_V8i\Civil_Standards\seed
\2D_OpenRoads_DesignSeed_83.dgn

or

\05.0 - Workspace
Resources\3_Workspace_V8i\Civil_Standards\seed
\2D_OpenRoads_DesignSeed_83.dgn

2. In the MicroStation pull down menu choose **File > References**.
3. In the References dialog menu choose **Tools > Attach**. Select the file in your main modeling file.
4. Leave the Attachment Method set to **Interactive**.
5. Select **Open** to activate the Reference Attachment Settings dialog.



6. Populate the Reference Attachment Settings as shown.

Orientation **Coincident - World**
Nested Attachments **Live Nesting**
Nesting Depth **2**

Hint: Live nesting will automatically give access to the 3D model as well as the existing terrain dgn file.

7. Select **OK** to attach the reference file.

8. Fit View to review the project location.

Hint: Pressing the F8 Function Key will toggle black background to white and toggle on the level override symbology. This is setup as part of the Bentley-Civil workspace. Pressing F8 again will revert back to original settings.

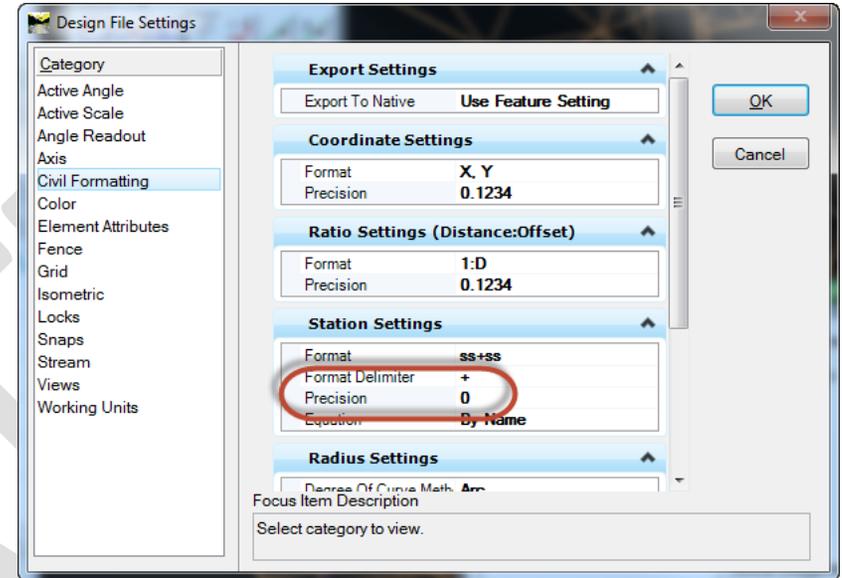
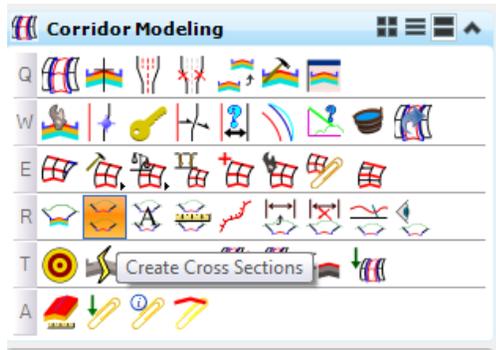
9. Open the Level Display Dialog, Enable the Target Tree, and verify all levels are enabled.

Hint: Turning off a level at this stage will also turn it off in the created cross section Design Model. For a component to be displayed in the proposed cross section Design Model, the level must be turned on in the 3D model before creating the sections.

*If any level settings are changed, select **File > Save Settings** so the changes will be remembered when cross sections are created.

7.4.2 Create the Proposed Cross Sections

1. Select **Settings > Design File**, Change Station Settings to a precision of 0.
2. Select the **Create Cross Sections** tool from the Corridor Modeling task menu.

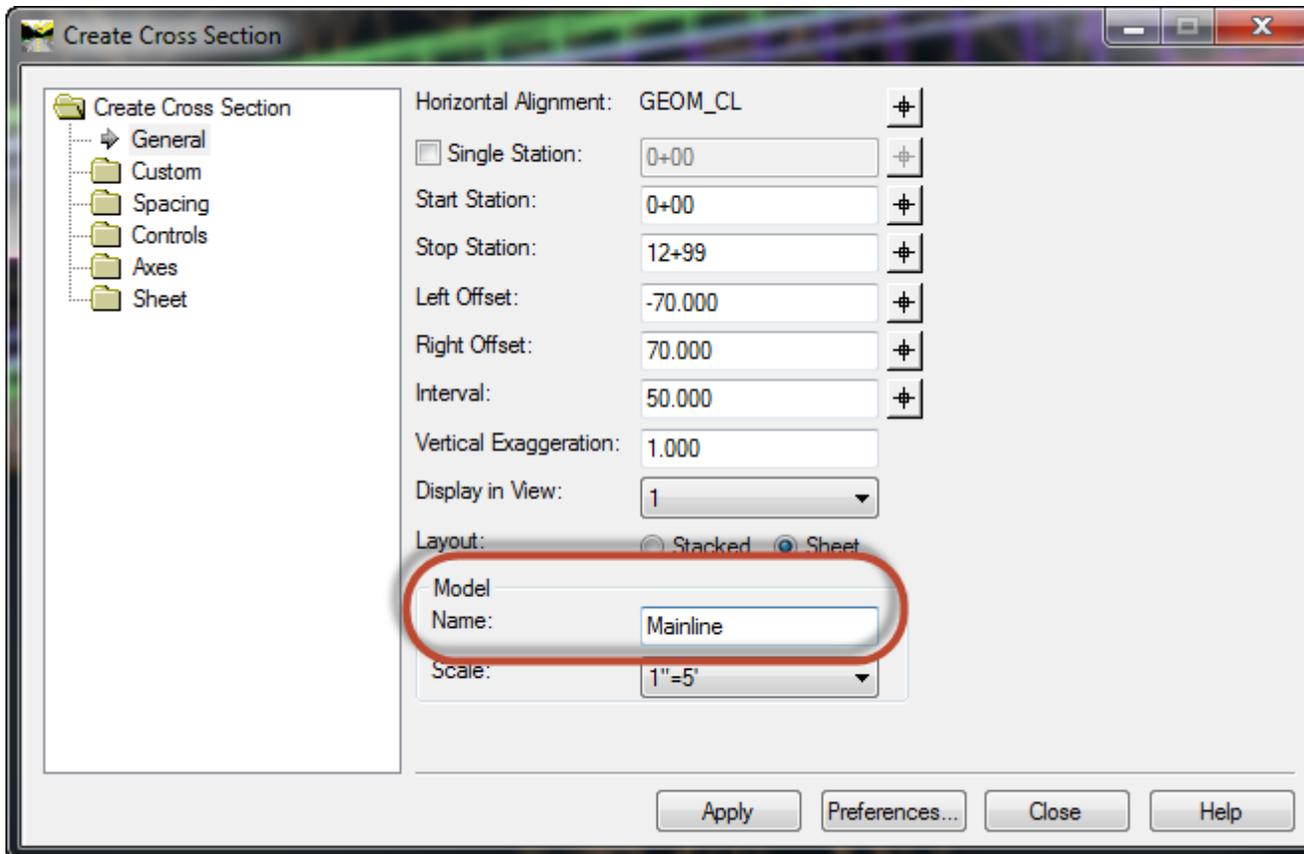


3. Following the heads-up prompt, locate the alignment by selecting the red centerline alignment.
4. Select Preferences button from the bottom of the Create Cross Section dialog.
5. In the **Preferences** dialog select the preference named **Highway**.
6. Select **Load**.

Preferences are predefined settings stored in the active XIN settings file for all three products (GEOPAK, InRoads, and MX). These preferences will be used for creating, annotating and computing end area volumes on proposed cross sections.

7. **Close** the Preferences dialog.

8. Under Model type in a name



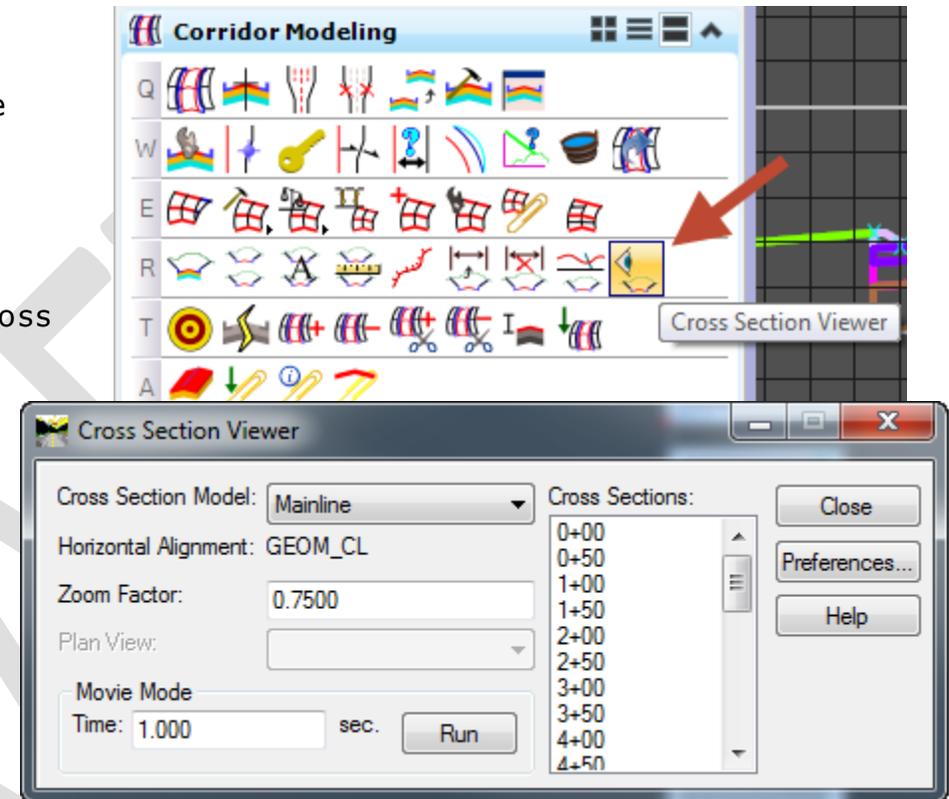
9. Select **Apply** to create the cross sections into a new DGN Drawing Model.

It will take a few moments for the cross sections to be created. A status bar appears in the lower right corner showing the progress.

10. Close the Create Cross Section dialog.

7.4.3 Viewing the Cross Sections

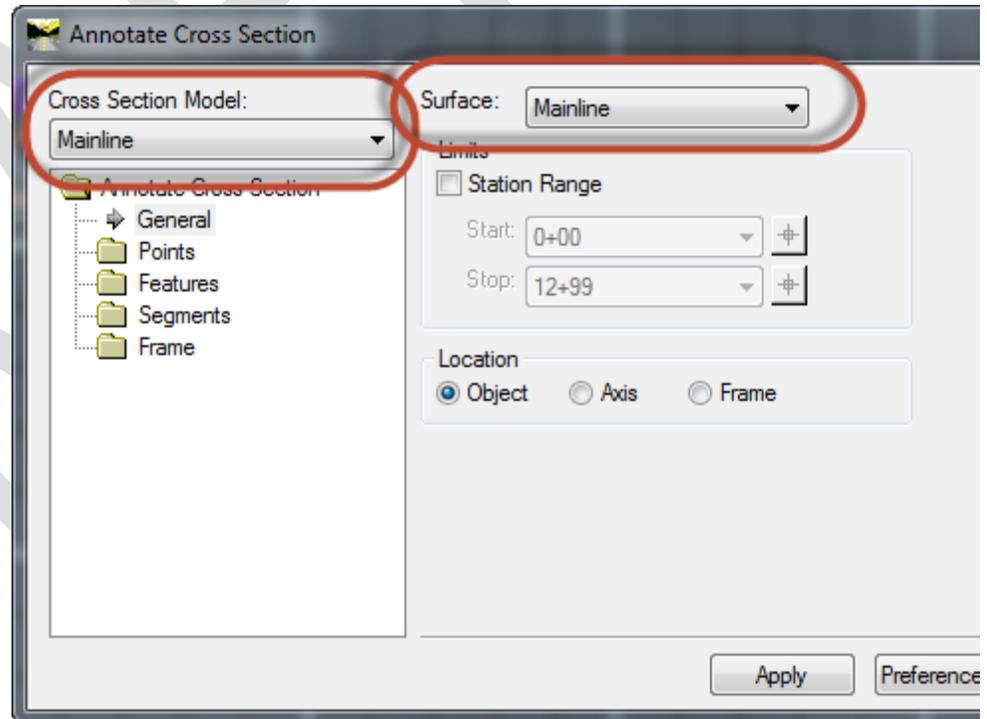
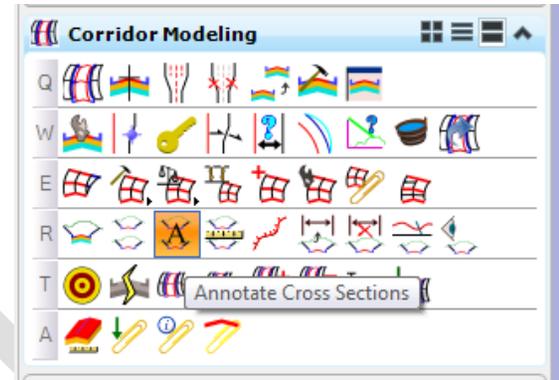
1. Select the **Cross Section Viewer** tool from the **Corridor Modeling** task menu.
2. Verify the Cross Section Model setting is set the correct Cross Section Model.
3. Set the **Zoom Factor** to **0.75**.
4. Set the **Movie Mode Time** to **1.0** sec.
5. Select **Run** to automatically scan through the cross sections.
6. Hit the **Esc** key on your keyboard to exit the movie mode.
7. Select a Cross Section station by clicking on it in the list and notice how the view updates to the selected cross section station value.
8. Press the **Up** and **Down** Arrow keys on your keyboard to step through the Cross sections in the list.
9. Close the Cross Section Viewer application.



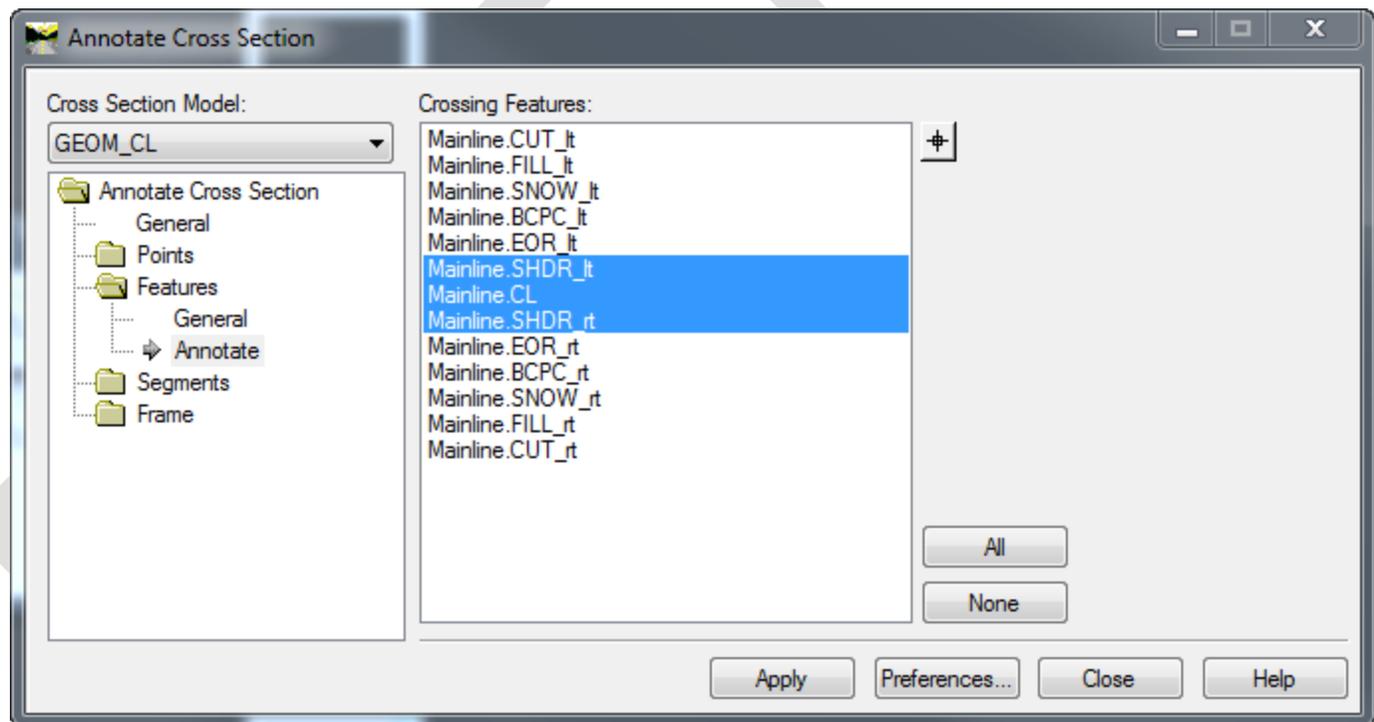
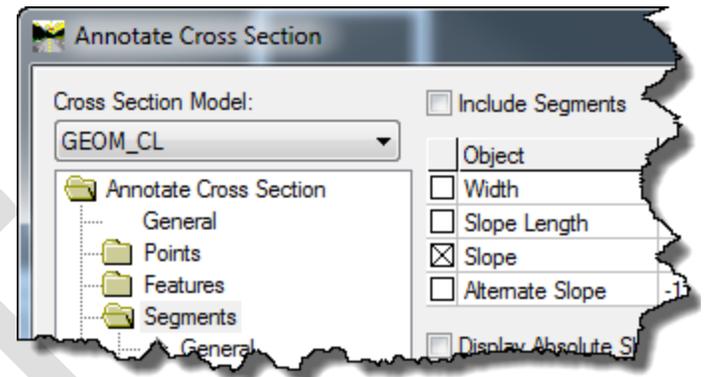
*Note that the Cross Sections are displaying an 'X' at each of the Crossing Features such as Centerline and Edge of Pavement. The Features must be displayed for them to be annotated, and are a construction class so they can easily be turn off in View Attributes.

7.4.4 Annotating the Proposed Cross Sections

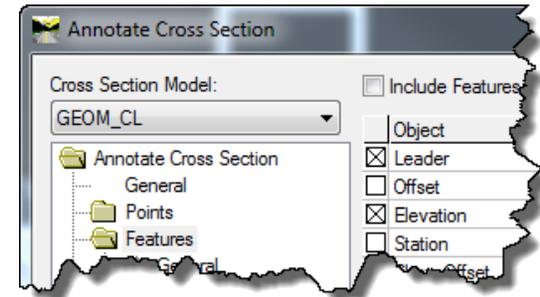
1. Select the **Cross Sections** tool from the **Corridor Modeling** task menu.
 2. Select **Preferences**.
 3. Select the preference entitled **Object - Off/Elev/Slope**.
 4. Select **Load**, to utilize the selected preferences in the previous step.
 5. Close the Preferences selection dialog.
- In the Annotate Cross Section dialog, set the General settings. Make sure the correct Cross Section Model and Surface you would like to annotate is active.
 - Select a **Cross Section Model**
 - Select a **Surface**
 - Ensure that the **Location** is set to **Object**.



- To annotate the point features. Select the Segments Folder and turn off Include Segments.
- Select the **Features > Annotate folder** and Highlight the Features you would light to annotate. Click **Apply**.

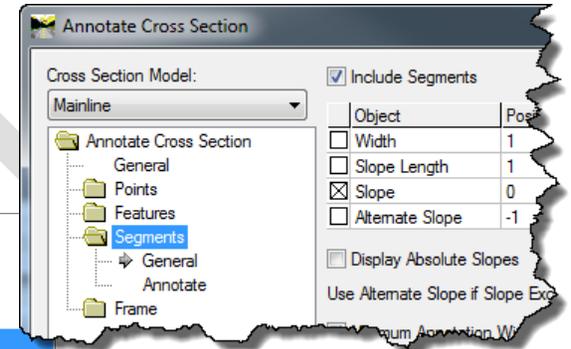


8. Select the Features Folder and turn off Include Features.



9. Select the Segments Folder and turn on Include Segments.

10. Select the **Segments > Annotate** folder and Highlight the Segment you would light to annotate. Click **Apply** for each segment.



Mainline.CUT_lt
Mainline.FILL_lt
Mainline.SNOW_lt
Mainline.BCPC_lt
Mainline.EOR_lt
Mainline.SHDR_lt
Mainline.CL
Mainline.SHDR_rt
Mainline.EOR_rt
Mainline.BCPC_rt
Mainline.SNOW_rt
Mainline.FILL_rt
Mainline.CUT_rt

Left Side Slope

Mainline.CUT_lt
Mainline.FILL_lt
Mainline.SNOW_lt
Mainline.BCPC_lt
Mainline.EOR_lt
Mainline.SHDR_lt
Mainline.CL
Mainline.SHDR_rt
Mainline.EOR_rt
Mainline.BCPC_rt
Mainline.SNOW_rt
Mainline.FILL_rt
Mainline.CUT_rt

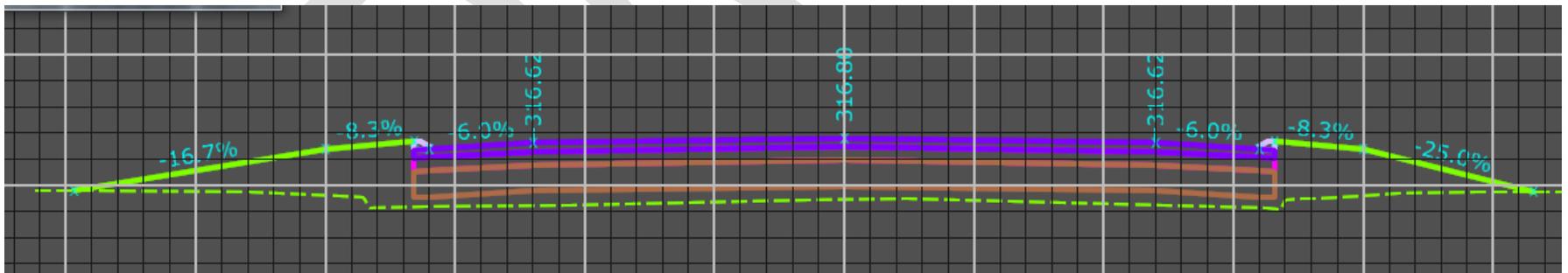
Left Shoulder

Mainline.CUT_lt
Mainline.FILL_lt
Mainline.SNOW_lt
Mainline.BCPC_lt
Mainline.EOR_lt
Mainline.SHDR_lt
Mainline.CL
Mainline.SHDR_rt
Mainline.EOR_rt
Mainline.BCPC_rt
Mainline.SNOW_rt
Mainline.FILL_rt
Mainline.CUT_rt

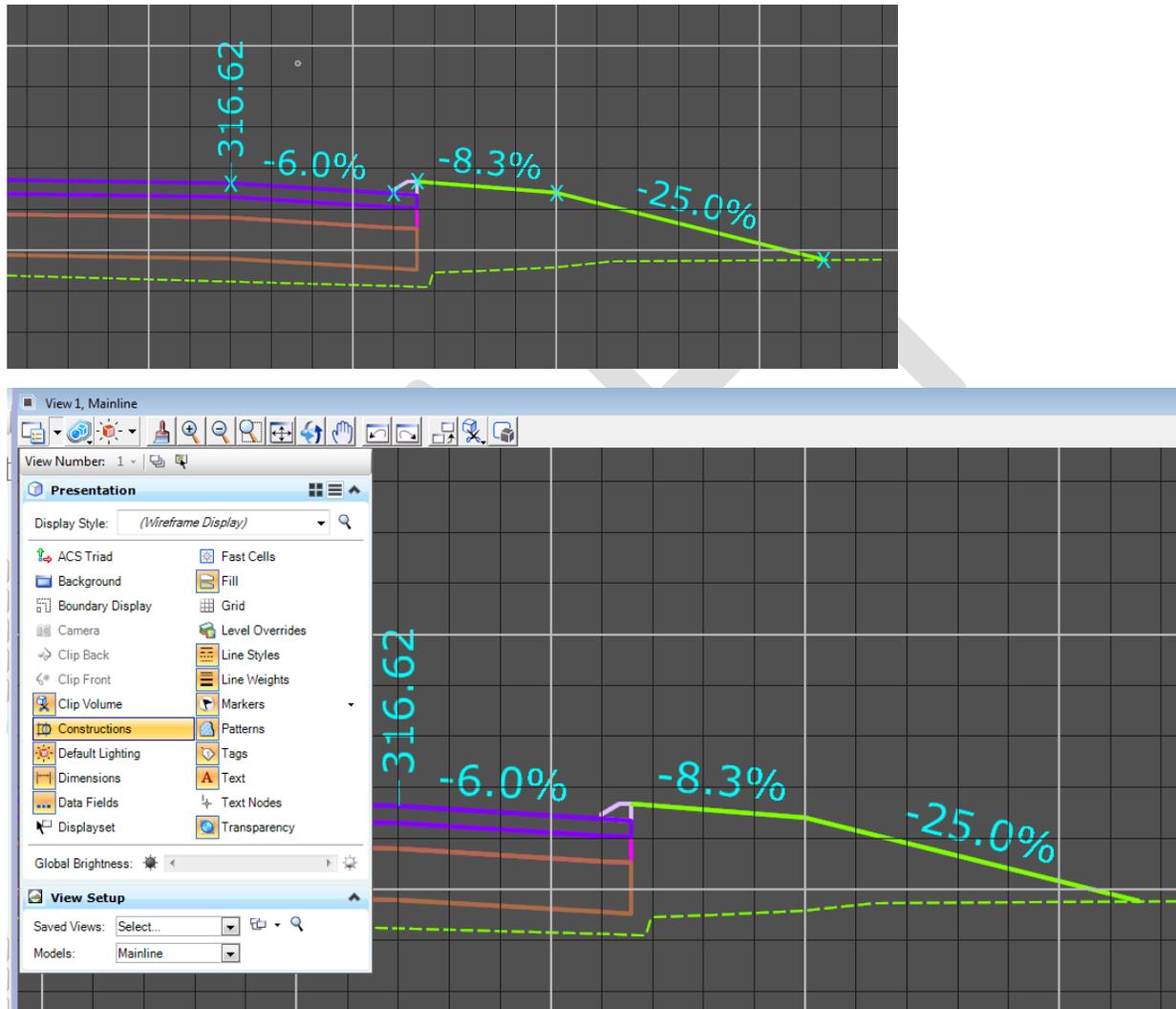
Right Side Slope

Mainline.CUT_lt
Mainline.FILL_lt
Mainline.SNOW_lt
Mainline.BCPC_lt
Mainline.EOR_lt
Mainline.SHDR_lt
Mainline.CL
Mainline.SHDR_rt
Mainline.EOR_rt
Mainline.BCPC_rt
Mainline.SNOW_rt
Mainline.FILL_rt
Mainline.CUT_rt

Right Shoulder



11. To turn off the X on the crossing Features select **View Attributes** and turn of **Constructions**.



7.4.5 ROW Lines Projected on Cross Sections

Coming Soon

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7.4.6 Computing End Area Volumes



End Area Volumes Overview



End Area Volumes Unsuitable Materials Exceptions Factors



End Are Volumes Classifications

Chapter 8 Best Practices

Through CTDOT Piloting and suggestions from Bentley the following best practices have been established.

1. When using AutoTrack create a new 2D MicroStation file and reference in your OpenRoads file. Do not use AutoTrack in your OpenRoads Modeling File.

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