

# CONNECT DOCUMENTATION

[Connect Edition Introduction](#)

[MicroStation Connect Documentation](#)

[OpenRoads Designer Documentation \(Survey\)](#)

[OpenRoads Designer Documentation \(Design\)](#)

[Appendices](#)

## OpenRoads Designer

### Contents

OpenRoads Design – Geometry.....	3
P-4-1: Horizontal Geometry .....	3
P-4-2: Vertical Geometry.....	3
P-4-3: Geometry from SS4 OpenRoads.....	4
OpenRoads Designer - Corridors .....	7
P-5-1: Creating Corridors .....	7
P-5-2: Templates .....	12
P-5-3: Parametric Constraints – Control the Design .....	18
P-5-4: Superelevation .....	21
P-5-5: Parametric Constraints – Control the Slope Transitions.....	25
P-5-6: GuardRail Platforms .....	27
P-5-7: Drives and Side Roads.....	30
P-5-8: Importing Corridors from SS4 InRoads .....	31



NHDOT CAD/D Connect Documentation

OpenRoads Designer - Creating Cut Sheets.....	34
P-6-1: Creating Cross Section Sheets – Named Boundaries.....	34
P-6-1A: Create Features of ENV and ROW Elements .....	40
P-6-1B: XS Detail Tick Features for Section Annotation .....	42
P-6-1C: Cross Section Earthwork Features .....	46
P-6-1D: Rock Excavation Quantities.....	48
P-6-1E: Skewed Drive Sections (and Profiles).....	49
P-6-1F: Controlling Displayed information on the Cross Sections.....	52
P-6-2: Plan Cut Sheets .....	54
P-6-3: Profile Cut Sheets .....	60
P-6-6: Creating Drainage Profiles for Plotting .....	65
P-6-7: Contour Creation (CTR and PCN) for plans from Terrain.....	68
Creating Proposed Terrain Models.....	71
P-7-1: Creating Proposed Terrain Models from Mesh Elements.....	71
P-7-2: Creating Proposed Terrain from Graphic Filter .....	73
P-7-3: Terrain Tasks - Create Terrain Model from Design Meshes.....	74
Drainage and Utilities .....	76
P-8-1: Creating Proposed Drainage - Node and Link Features.....	76
P-8-2: Existing and Proposed Utility Poles.....	81
Label Cross Section Slope.....	89
Rotate Cells – Envision CADD.....	90
Quantity Computations .....	91
P-9-1: NHDOT Suggested Practices.....	91



## OpenRoads Design – Geometry

### P-4-1: Horizontal Geometry

[Return to Index](#)

#### Training

SIG - Fundamentals of Horizontal Design <https://event.on24.com/wcc/r/2186799/CA4FC23886823D081C512BF456AC8A41>

OpenRoads Designer Help [Let's Begin with OpenRoads Designer \(bentley.com\)](#)

#### Short Version [Geometry \(bentley.com\)](#)

Open the 12345-Geometry.dgn, Default model, attach references and modify the View as needed. May need to save settings and reopen the dgn if the terrain's Default-3D model is not displaying in the *Default* window.

Set *Feature Definition* from the Feature definition toggle bar and set to use active.

Use the OpenRoads **Modeling** Workflow **Geometry** tab **Horizontal** tools. Place individual lines and arcs for element design and then complex them together or use the *Complex Geometry by PI* to place a linked Alignment.

To display the Alignment curve data, ticks, and stations, use the Annotate element tool from the OpenRoads Modeling > **Plan Production** tab

### P-4-2: Vertical Geometry

After the Horizontal Geometry is designed create the Vertical Geometry. First ensure that you have an active terrain model. Use the view control tools to open multiple views. Select the horizontal geometry and use the context sensitive menu to open a Profile view. If the view does not contain the existing ground select the terrain and set it active.

Use the OpenRoads **Modeling** Workflow **Geometry** tab **Vertical** tools. Place individual lines and arcs for element design and then complex them together or use the *Complex Geometry by PI* to place a linked Alignment. The existing ground can be set as the active profile if desired to just use the existing elevations. This is not recommended for design.



NHDOT CAD/D Connect Documentation

## P-4-3: Geometry from SS4 OpenRoads

[Return to Index](#)

### Before You Begin

This process is assuming you have OpenRoads SS4 Horizontal and Vertical geometry alignments that need to be brought forward into ORD to use in design.

### Create LandXML files of the SS4 Alignments

Start *InRoads*, opening your project's *Geometry.dgn* file to the Default model. Use *Element Selector* and select the alignment. In *Element Information* update/define the feature name. With the alignment still highlighted hover on it to get the popup menu and select **Open Profile Model** and click in a view to contain the profile.

In the Profile view select the profile. In *Element Information* update/define the profile name and set it active if not already. Only the active profile will transfer with the horizontal in the xml file.

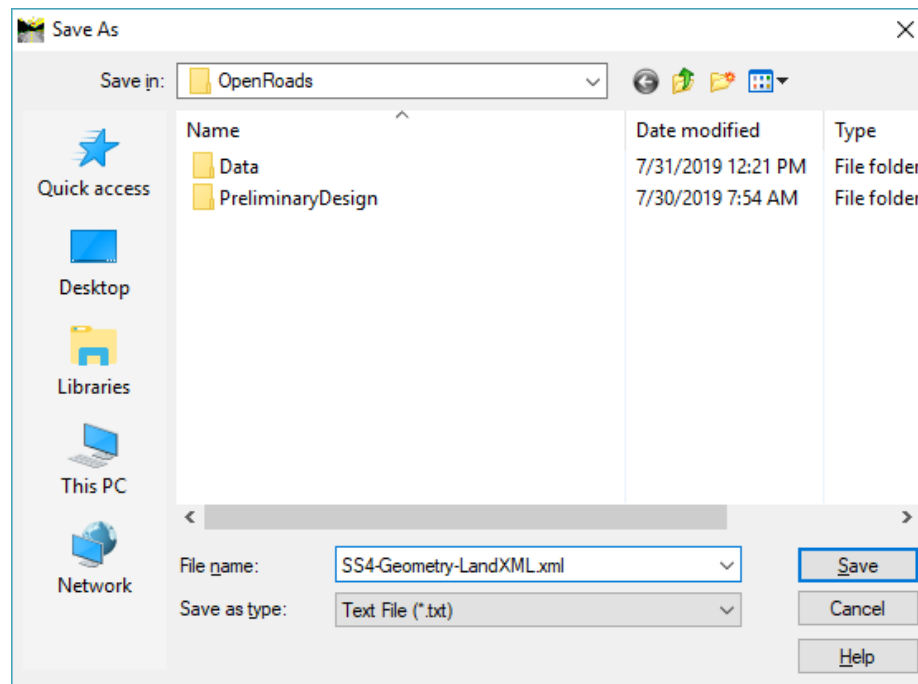


## NHDOT CAD/D Connect Documentation

Set the **Default** view active again and select the horizontal alignment, hover, and select the *Horizontal Geometry Report* icon. Alternately go to the Analysis and Reporting tasks and select *Horizontal Geometry Report* and then select the alignment.

When the report appears, select the **AlignmentsToLandXML.xsl** style sheet report at the top of the list. Use *File > Save As* to save the file as *Type Text File (\*.txt)* but when naming the file add **.xml** to the end. Browse to the folder (in your CONNECT project directory) you want to save it in and click *Save*.

Repeat these steps for Each alignment.





## NHDOT CAD/D Connect Documentation

### Open ORD and Import the LandXML Alignment Files

Start ORD and select your ORD Project and the *Geometry.dgn*'s **Default** model.

Set the *Workflow* to OpenRoads > *Geometry* tab and select the General tool *Import Geometry*. Select the .xml file that you saved in the previous exercise and click Open.

Check the LandXML box and select the Import button. This will import the horizontal and vertical geometry into the dgn.

### Update the Feature Definition

Use *Element Selector* to select the imported geometry and update the *Feature Definition* to **Alignment Mainline** (or other appropriate feature). The geometry will update to the correct symbology but the stations will not be shown.

To display the Stations and Curve data you must use the *Element Annotation* tool from the Drawing Production tab. With the element selected click on the tool and *data point* on the screen to *accept*. The stations, ticks, pc/pt's, bearings and curve data will all be added to the drawing.

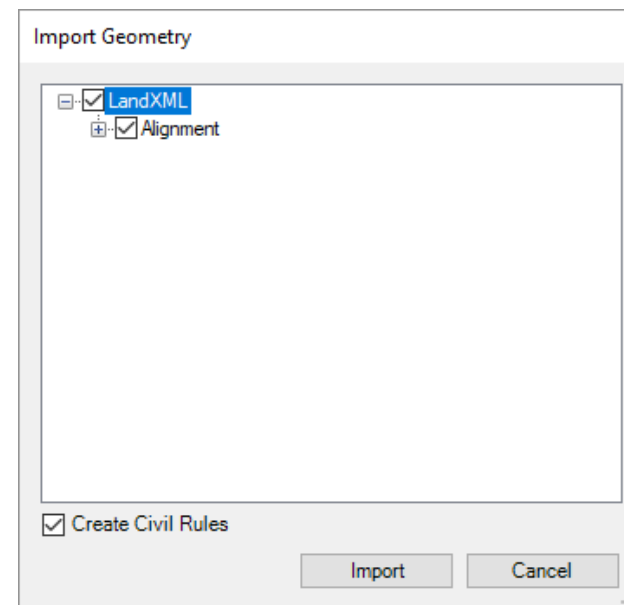
Set the Existing Terrain as active prior to opening the profile.

The active profile should already exist but its feature definition is not defined. Go to the Geometry tab, and **select Open Profile Model** from the Vertical section or select the Alignment hover and select it from the popup menu. An easy way to bring up a profile if you only have the default model in view 1 is to use the *Right Click* hold menu > *View Control* > *Views plan/profile*. Next select the horizontal alignment and then the view for it to go in.

Use *Element Selector* to select the profile and change its feature definition to match it's horizontal feature definition. Set it active if not already.

### Your alignment is good to go!

Repeat for each alignment.





## OpenRoads Designer - Corridors

### P-5-1: Creating Corridors

[Return to Index](#)

#### Before You Begin

OpenRoads Designer works using the Civil Tools to perform all the roadway design steps. A corridor is the main civil object used for modeling a roadway. The corridor civil object acts as a container for all the elements and design constraints that make up your design.

Note that references to "12345" in file names refer to the project's five digit Project Number.

Use the *Create Template* tool to check to see if an active template file is set. If no templates are displayed in the box use the file open command to open one or go to section [P-5-2: Templates](#) to see how to copy one to the correct location and rename it so it can be found.

Review the engineering base plan, engineering report, as well as the pavement recommendation prior to creating the corridor. It is a good idea to create the Typical Section before creating a corridor to ensure the design follows intent. Review the intended template before use and edit to match the standard widths, slopes, and depths indicated in these resources. The no component template can be used first to work on the corridor design prior to switching to a template containing all the components when the pavement recommendation comes in.

Corridor training can be found in *How to Deliver - From Survey to Plan Production - Session 3* <https://www.bentley.com/en/Global-Events/Accelerator-Series/2019/OpenRoads-Virtual>

---

#### Short Version

1. Open the Drawing, reference attach the Terrain and Geometry drawings. Set the Terrain active.
2. Use the OpenRoads Modeling workflow > Corridors tab *Create* > *New Corridor* tool, select the alignment, answer and accept through the prompts. (Ensure you are hitting on the 2D alignment geometry feature.)
3. Select the Template to be applied and set the start and ending stations. Reset to complete.



## NHDOT CAD/D Connect Documentation

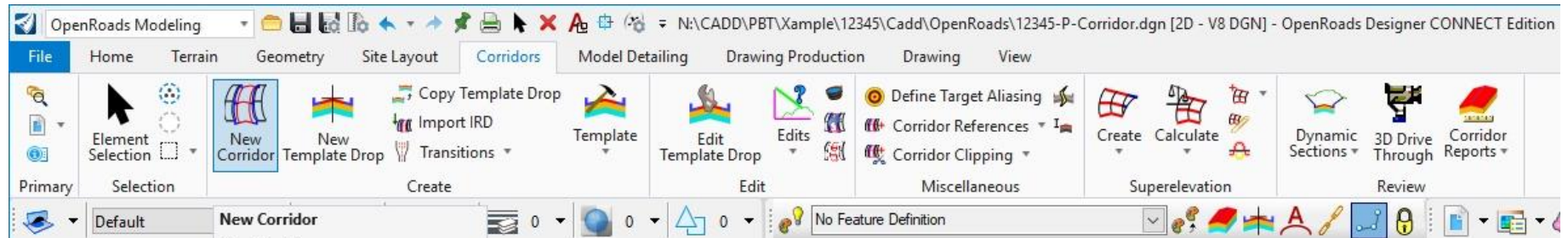
### Create the Corridor

Each Corridor should be in its own DGN for larger projects. For smaller projects a single DGN can be used with multiple corridors. If DGN files have not yet been created, see the [Create Project Drawings](#).

Open 12345-P-Corridor.dgn. Open the *Default* model and attach the Combined.dgn's Default model with Live Nesting = 1, if not already attached.

Using Level Display, expand the dgn's Default-3D entry. Expand the Combined DGN's Default-3D's attachments. Shut off the display of all referenced Default-3D models in any attached reference except the Terrain's.

Select the terrain element and use the context popup menu to set the terrain as active. (may need to make the Default-3D model snapable)



Use Element Selector with the *Individual* and *New* toggles active. Select the Alignment that you want to create a corridor with. Hover on the alignment and the Context Menu popup will appear. (Element Selector needs to be set to Individual and New buttons active).

Select **Create Corridor** or go to the **OpenRoads Modeling Workflow Corridors Tab Create - New Corridor** tool and hit on the alignment.

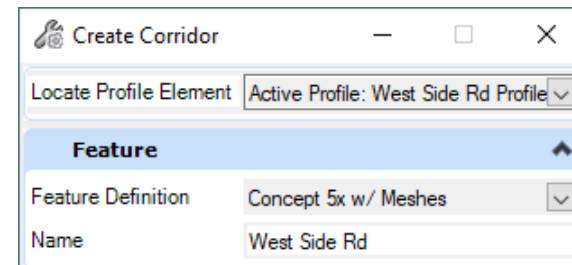




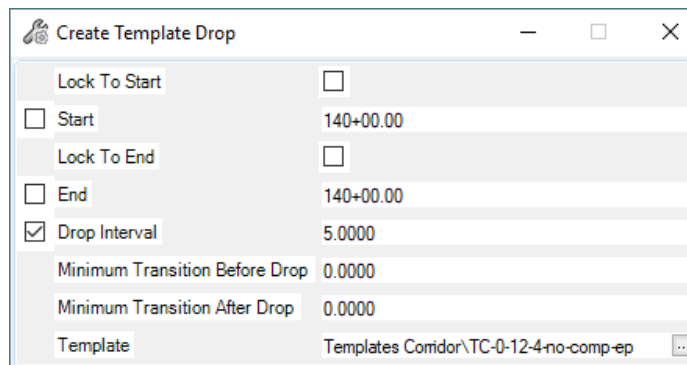


## NHDOT CAD/D Connect Documentation

Reset to use the active profile of the alignment chosen or choose another from the drop-down as needed. Set the <https://nhgov.sharepoint.com/sites/DOT-ProjectCentral-Home/SitePages/OpenRoads-Corridor-Design-Stages.aspx> in the tool box then type a Name for the corridor into the on screen tooltip and left click to accept.



After the corridor is created the *Create Template Drop* toolbox becomes active. The first prompt is for the [template](#) (name). Use the Alt key + down arrow to bring up the *Pick Template* box. Select the Template and hit **OK**. Left click on the screen to accept the template, then define the start and end points. You can type in the Start and End stations of the Proposed profile or use the alt key to set the Start and End stations to the beginning and end of the alignment. Set the template *Drop Interval* = 5, and set the *Transitions* to 0. Templates are only placed/created where the selected profile exists.

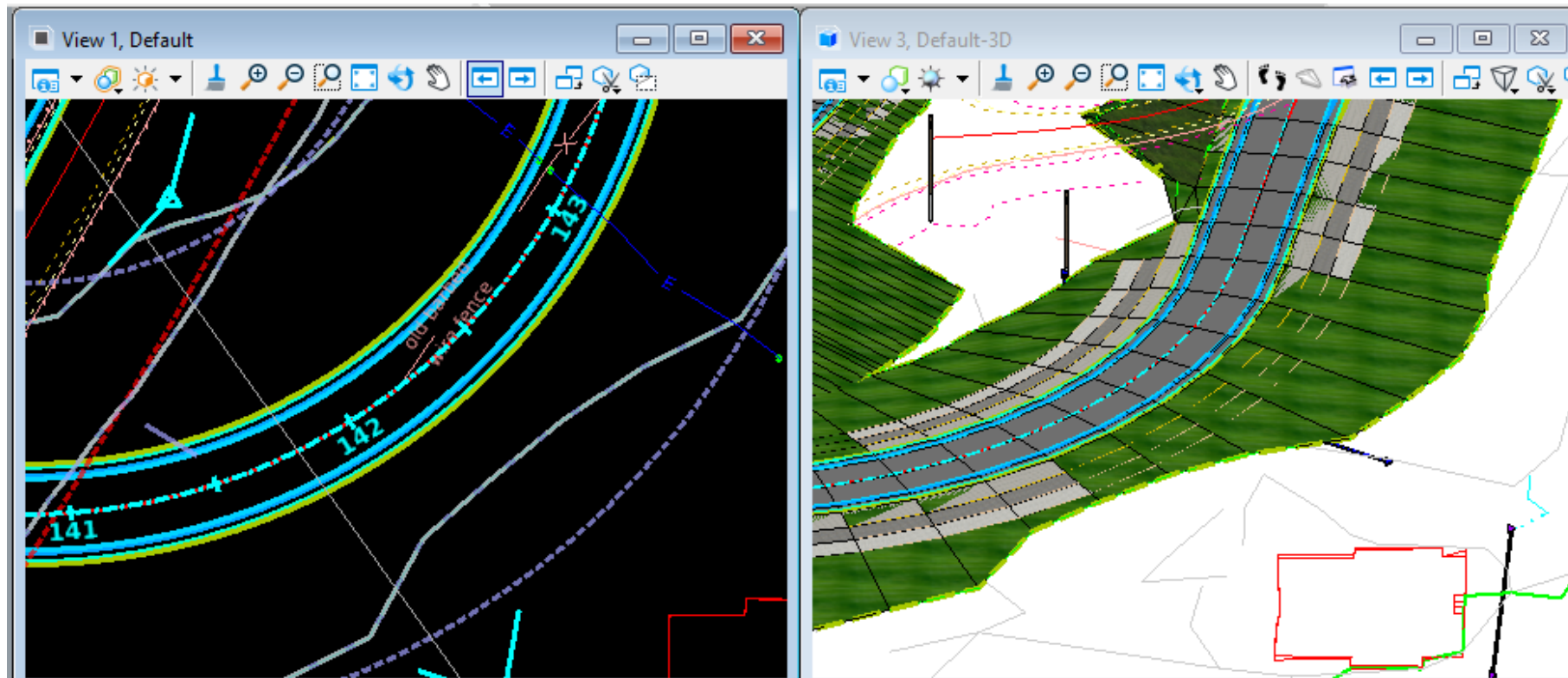


After the template drop is placed you can create additional template drops with different stations by selecting another template and following the prompts again. Reset to finish placing templates. After each drop is defined the template is applied to the stations indicated and added to the corridor.

Your corridor has now been created and can be refined using the other corridor creation tools. Many tools work by hitting on the feature's 2D lines that were created. Shut off the display of all the 3D design components by opening the level display, expand the tree under your Default-3D model, highlight only the *Default-3D* model, then right click in the levels pane and select **All Off**.



## NHDOT CAD/D Connect Documentation



Save Settings and Save. Review your Design by viewing [Dynamic Sections](#).

### NOTE:

If you cancel out of the command before selecting a template an empty corridor outline could still be created... Delete it before creating a new one.

Use Project Explorer - Civil Model Tab to review all the corridors in a DGN.

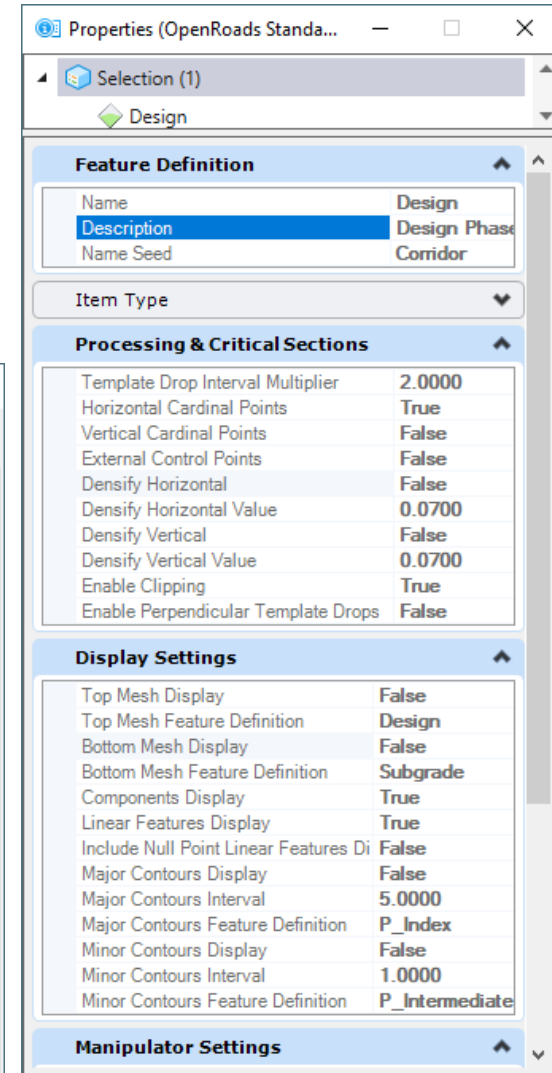
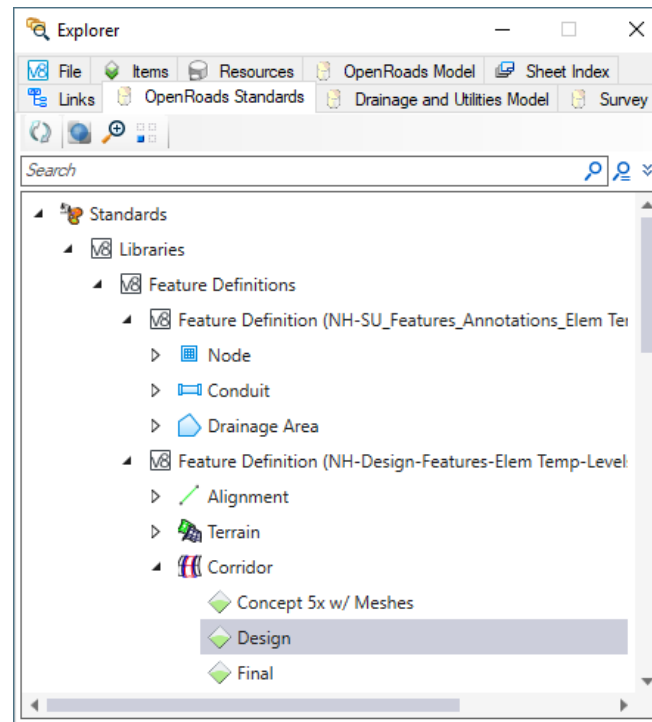
For projects with Bridges create separate corridors with overlaps for clipping the approach, the bridge, and the departure. [Video](#)



## NHDOT CAD/D Connect Documentation

### Design Stage

The corridor design stage and the template drop increment determine the frequency of the placed templates. NHDOT has determined that the Final Template drop increment should be 5' therefore the template drop increment should be 5. When working on a conceptual 5, design 2 or final design 1, the design stage uses a template drop multiplier to determine the actual increment of drops translating to 25', 10' and 5' respectively. To see additional information about the design stages properties, use the Home tab's Primary tool **Explorer**. Expand the OpenRoads Standards tab of the Explorer, expand Feature Definitions > Corridor > and select and review the settings of the different design stages in the properties box. Also refer to the Help.





## P-5-2: Templates

[Return to Index](#)

### Before you Begin

Templates are used to create corridors. Each template is basically a typical section that contains the features and components that are extruded along an ORD alignment.

Since each project is unique and will likely need modification to any standard template, a “seed” template file has been created — *ApprovedCE-NHDOT-Templates.itl* — which contains templates developed by the NHDOT. When working in a new project, this file should be copied into the project’s ... \Cadd\Standards\Template Library\ directory and rename it with your project number (such as *12345CE-NHDOT-Templates.itl*) for it to be found by OpenRoads.

If your template file is not found when you open the *Create Template* panel check the project number in the CFG file name and make sure it matches the 12345 in the itl\cfg file name.

Templates are continuously being updated as new ones are created and old ones revised, it will become necessary to update your ITL file or even replace it. Notice will be posted when significant changes take place. For additional information on Templates the [ORD Help](#) can be viewed as well a search on Connect Advisor for Templates. They can be accessed from [File > Help](#).

New Design Manual templates have been created and are prefaced with DM\_ rather than the previous DM-. these templates should be used as they have updated components allowing for widened and steeper ditches to be developed without the components looping.



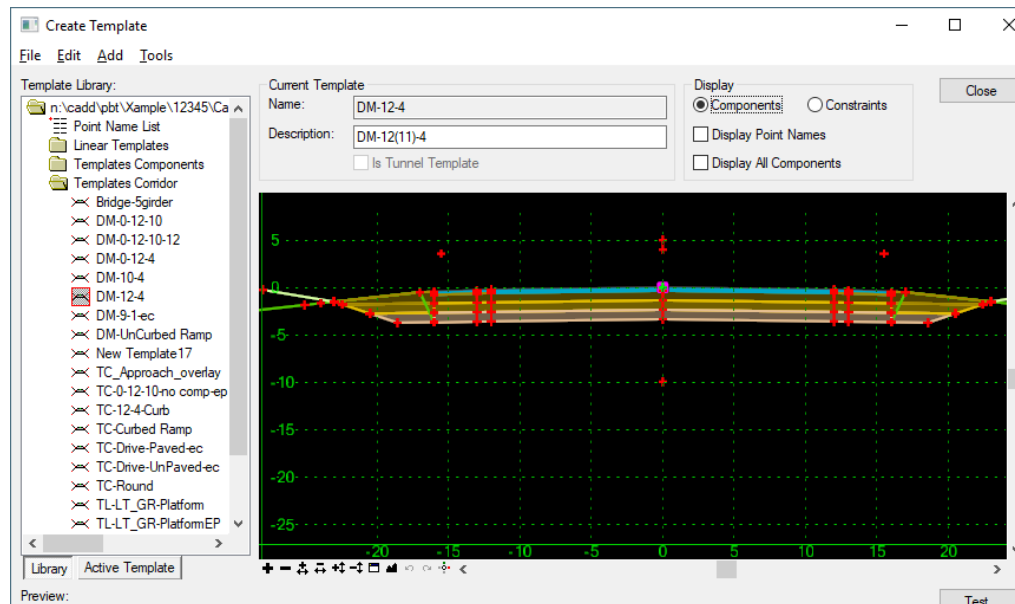
## NHDOT CAD/D Connect Documentation

### Create Template - Tool

The Create Template tool is used to create and modify templates. It can be accessed from the *OpenRoads Modeling* workflow > *Corridors* tab > *Create* tools - **Template**. The main templates are designated with **DM** (Design Manual) prefix and match what is shown in the Design Manual typical sections. A curbed template **TC-12-4-Curb** also exists. The naming convention helps to indicate the intent of the template. Prefixes - TC = Corridor Templates, TL = Linear Templates, TS = Surface Templates.

Components to create templates are in the Template Components folder. Creation of Templates is covered in the Help files as well as on the Bentley learn server and may be documented here in the future.

Common practice should be to create a new 12345 folder in your template file and copy/rename any templates you want to use in your project into the new folder. You can then edit the templates without corrupting the original.



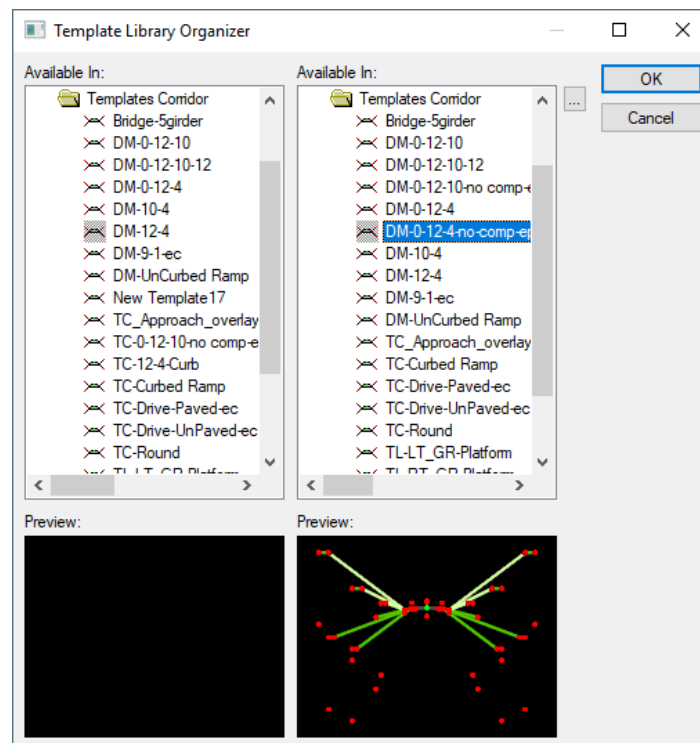


## NHDOT CAD/D Connect Documentation

### Copy Templates from other ITL files

The template library organizer is used to copy templates from one ITL file to another. Delete any similarly named folder prior to opening the Organizer. It is not an especially user friendly interface.

1. Select *OpenRoads Modeling* workflow > *Corridors* tab > *Create tools - Template* to open the Create Template panel.
2. *Tools > Template Library Organizer..* opens the current ITL file into the organizer panel.
3. Click on the folder to expand the ITL's contents. To the right of the second pane select the ... to pick the ITL to copy from.
4. If copying a folder of templates, drag it from the right pane up to the top ITL name of the left pane to copy it.
5. Individual templates can be copied by dragging and dropping also but must be dropped onto a folder.
6. Close the Organizer to save the changes.



### Preliminary Design “No Components” Templates

Latest design practice would be to use the *DM-12-4-no-components* to start your design. The Horizontal and vertical alignments, lane and shoulder widening's, superelevations, slope break modifications for guardrail would all take place using this stripped down template file. This greatly improves processing speeds as well as just the speed of opening a dgn. Once the majority of the top line design is complete, a set of cross sections would then be cut and used to review the side slopes and write parametric constraints that set the side slopes, slope transitions and rounding's throughout the whole project. The template would then be changed to the *DM-12-4* template that has material components. All parametric constraints are the same for the two templates so the top line design would reflect what was designed using the no-components template. The select materials issues/conflicts would then be looked at and resolved.

The reasons for this approach are because the DM templates do not contain fill height criteria with multiple end conditions, this reduces the complexity of dealing with multiple components and multiple end condition conflicts.

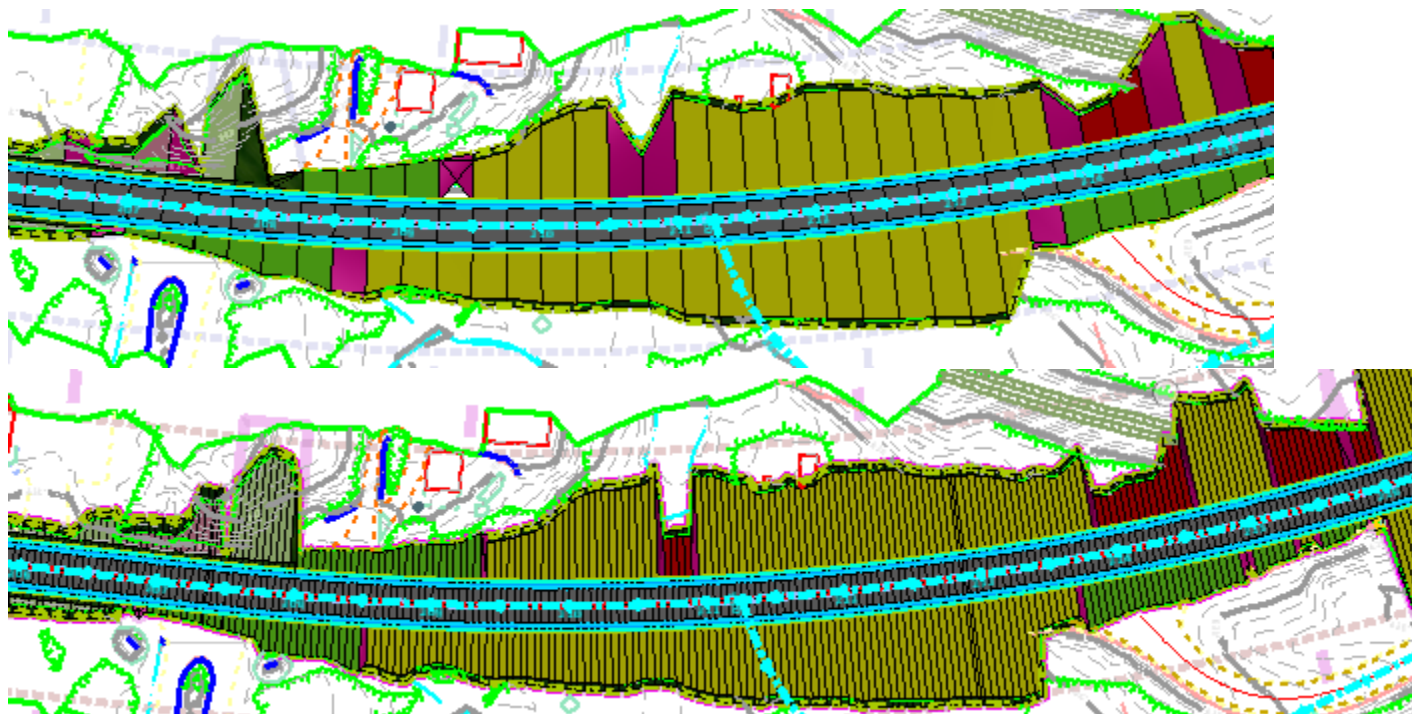




## NHDOT CAD/D Connect Documentation

### DM-0-12-4-NC-Color with Color Coded Slopes

A new *DM-0-12-4-NC-Color* template file has colored cut and fill height components that show what the slopes are and help visualize where the Parametric Constraint slope transitions need to be. When ready to work on the slope transitions, the Corridor's template can be changed from the *DM-12-4-no-components* to the *DM-0-12-4-NC-Color* template. To clearly see the slope, change the *Default's* View attributes to *Illustration*. Fill slope colors are 6:1 Green 55, 4:1 Yellow 84, 2:1 Red 80, cut slope colors are 4:1 light green 102, 3:1 Fuchsia 191, 2:1 Orange 7. Transition slopes are hot pink 252.



Using this we can clearly see where the slope transitions need to occur. Changing the corridor Feature Definition from *Concept 5x w/ Meshes* to *Final w/ Meshes* which uses a template from modifier of 1 vs the 5 may help, though the pink transition slopes don't seem to display in some instances.

Create *Parametric Constraints* to control the slope transitions over 50-foot intervals. Steeper slopes and some of the yellow slopes may change as the actual end condition is forced to a steeper slope.



## NHDOT CAD/D Connect Documentation

### Template Parts

Templates are made up of points and components. A point's constraint value can be controlled and modified through Parametric Constraints which are defined as the label. These labels are variables which can be used with the *Create Parametric Constraint* tool in the *Corridor* to modify their values.

Components are made up of the points which define them and have other properties such as *Display Rules* and *Parent Components*. The Component's Display rules allow components to be turned on and off based on criteria controlled by PCs. If a Parent component is turned off, then all of its children will also turn off. Other display rules work automatically to display the appropriate cut or fill select material and can be very tricky to define.

**Point Properties**

Name:

Use Feature Name Override:

Feature Definition:

Superelevation Flag

Alternate Surface:

Member of:

- XC - Wearing Course Shldr L
- XC - Wearing Course TW

Constraints

Type:	Constraint 1	Constraint 2
Parent 1:	<input type="text" value="CL"/>	<input type="text" value="CL"/>
Value:	<input type="text" value="-12.0000"/> =	<input type="text" value="2.00%"/> =
Label:	<input type="text" value="LT_TW_width"/>	<input type="text" value="S_LT_TW_slope"/>
<input checked="" type="checkbox"/> Horizontal Feature Constraint	<input type="text" value="ear\Design Features\Road\Road Trav Way"/>	
Range:	<input type="text" value="-15.0000"/>	

**Component Properties**

Name:

Use Name Override:

Description:

Feature Definition:

Display Rules:

Parent Component:

Exclude From Top/Bottom Mesh  Closed Shape

Vertex Fillet Tangent Lengths

Select points to apply fillet tangent length to:

Name	Tangent Length
R_DWEAR_TW	0.0000
P_TW_R	0.0000
CL	0.0000

Fillet Tangent Length:





## NHDOT CAD/D Connect Documentation

### End Conditions

End Conditions are Components that seek an intersection with the active terrain. They have properties similar to display rules in that end conditions are displayed if certain conditions are met within defined parameters. i.e. a 6:1 slope end condition will typically have height of fill criteria defined for it. Meaning it will solve and display if it finds an intersection point within 6 vertical feet of the slope break. Cut slope end conditions are checked before fill slope conditions and are controlled through the end condition's priorities. The *SFill SubEC X* end condition is priority 1 for many templates but its width is set to 0 so it will not solve unless its width is widened through a parametric constraint. Setting the *LT\_Fill\_Sub\_EC\_width* allows the end condition to look for an intersection with the existing ground along the subgrade from the EP out. This results in a variable slope from the Slope Break but can be helpful if you are trying not to chase slope work.

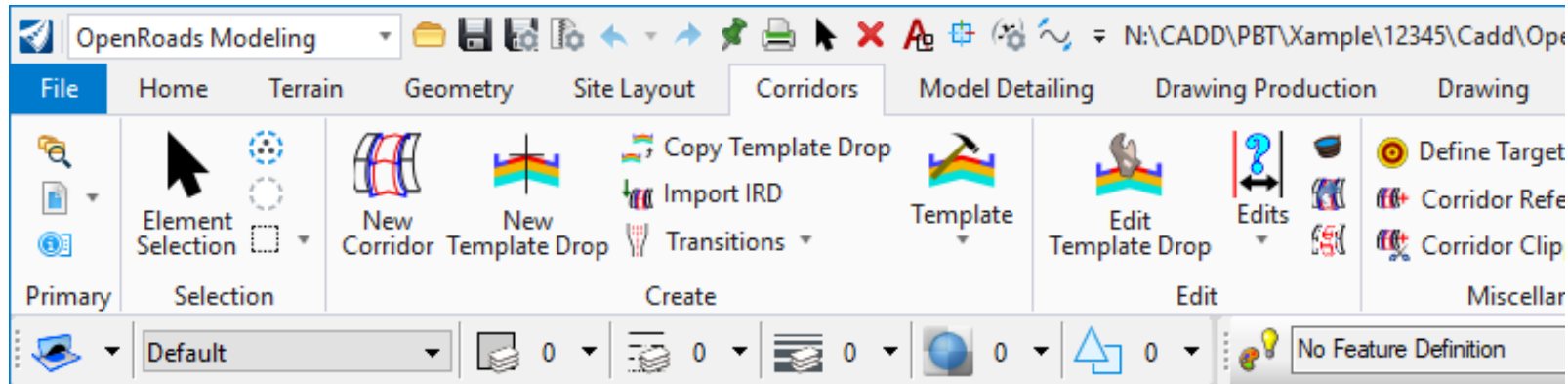


NHDOT CAD/D Connect Documentation

## P-5-3: Parametric Constraints – Control the Design

[Return to Index](#)

The *Create Parametric Constraint* and the *Corridor Objects* tools are found on the *OpenRoads Modeling Workflow* in the *Corridors* Tab under the *Edit* tools. Use either tool to create a Constraint.



*Parametric Constraints* or PC's have been defined to control almost every aspect of the NHDOT Templates. Material depths, travel way, shoulder, cut and fill, widths and slopes as well as guardrail display and offset. These constraints are used to refine/define

Constraint Label	Enabled	Start Value	Stop Value	Start Station	End Station
Add New	slope	True		220+55.00	221+25.00
RT_Fill_slope	True			221+25.00	221+75.00
RT_Fill_slope	True			221+75.00	222+25.00
RT_Fill_slope	True			222+25.00	222+75.00
RT_Fill_slope	True			232+75.00	233+25.00
RT_Fill_slope	True			233+25.00	238+00.00
RT_Fill_slope	True			238+00.00	238+50.00
RT_Fill_slope	True			240+50.00	241+00.00
RT_Fill_slope	True			241+00.00	243+50.00
RT_Shldr_width	True	4.0000	10.0000	208+80.00	210+00.00
RT_Shldr_width	True	10.0000	10.0000	210+00.00	212+00.00
RT_Shldr_width	True	10.0000	4.0000	212+00.00	213+20.00

Row: 40 of 49

**Create Par...**

Lock To Start

Start 197+25.00

Lock To End

Stop 212+00.00

Constraint Label RT\_Shldr\_width

Start Value 10.0000


Stop Value 10.0000



## NHDOT CAD/D Connect Documentation

your design. You will use the constraints to transition your slopes from 6:1 - 4:1 - 2:1 as well as transition the rounding's from 5 feet to 0 feet when going from a 4:1 fill to a 6:1 fill. Slope transitions should generally occur over 50 feet.

Some constraints like the *LT & RT\_EL\_width* can be set to 0, others which are used to extend and break slopes in superelevated areas like the *LT* and *RT\_Shldr\_Break\_width* points should be set to a minimum offset of 0.005 so that the points slope property is still usable to create subsequent points.

When editing or creating multiple constraints using the Corridor Objects tool it is sometimes beneficial to use the *Unlock - Activate Rule* button . This allows you to create and edit constraints without each change or addition being processed. Reactivate the lock when done adding constraints, Close the tool then reprocess the corridor to have all the changes processed.

## Import\Export Parametric Constraints

Constraints can be exported to a text file which can be edited and re-imported to create the constraints as shown here by copying the *RT\_Shldr\_width* constraints and editing them for the *LT\_Shldr\_width*.

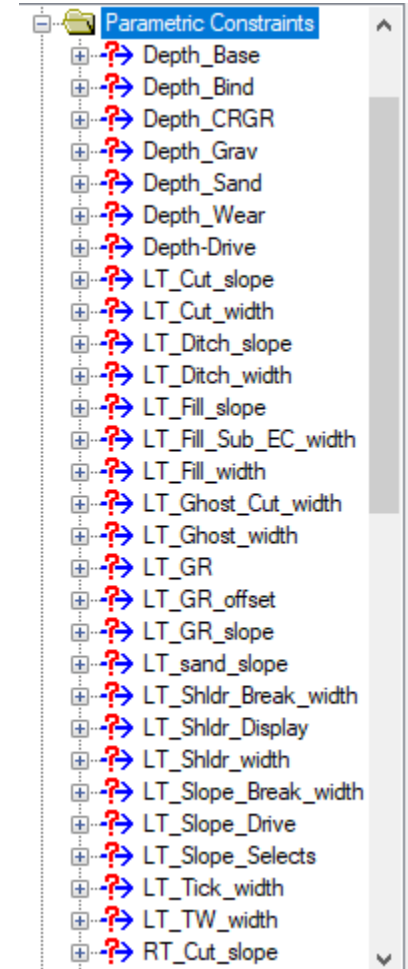
1	*label	type	start value	stop value	start station	stop station	enabled
2	*						
3	RT_Shldr_width	Distance	4	10	208+80.00	210+00.00	X
4	RT_Shldr_width	Distance	10	10	210+00.00	212+00.00	X
5	RT_Shldr_width	Distance	10	4	212+00.00	213+20.00	X
6							

Replace

Find   Replace   Find in Files   Mark

Find what:    Find Next

Replace with:    Replace



## Display Switches

Some constraints control the display of template components like a switch through display rules. The default value for *RT\_GR* is -0.5, which has the Guardrail hidden. When the parametric constraint for *RT\_GR* is set to positive (+) it turns on the display of the guardrail. *LT\_GR* needs to be set to negative to turn it's display on.



## NHDOT CAD/D Connect Documentation

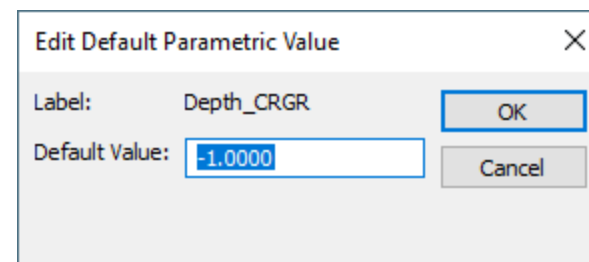
When rounding's, represented by a tick mark offset from the toe (LT & RT\_Tick\_width) are set to a negative number their display is shut off.

The display of the shoulders and slopes for many templates can be controlled with the LT and RT\_Shoulder\_Display PC, when XT\_Shldr\_Display is set to an offset other than 0 they are hidden.

If the Depth\_Base is set to 0 it shuts off its display so it will not be shown in the corridors quantities.

### Modify all values of a Parametric Constraint in a Template

Mass editing of the material depths (or any constraint) can be achieved by opening the *Active Template* tab, expand the *Parametric Constraints* entry and double click on the desired depth. This will bring up a box showing the default value which can be changed. i.e. if the *Depth\_CRGR* is set to -0.66666 or 8" it can be set to -1, (tab to fill the value in the box) then OK to change all points in the template to the new value.





## P-5-4: Superelevation

[Return to Index](#)

### Before you Begin

Create or open a 13245-SuperElevation.dgn and reference in the Geometry drawings. It is sometimes helpful to also reference the Corridor.dgn files as well to see the limits of the design.

Superelevations can be created using the Superelevation tools on the Corridors tab of the OpenRoads Modeling workflow. Supers can be imported as parametric constraints generated from the Excel worksheet that was used in SS4 or as point control lines from the same Excel sheet.

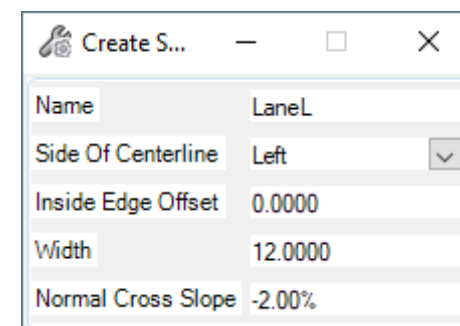
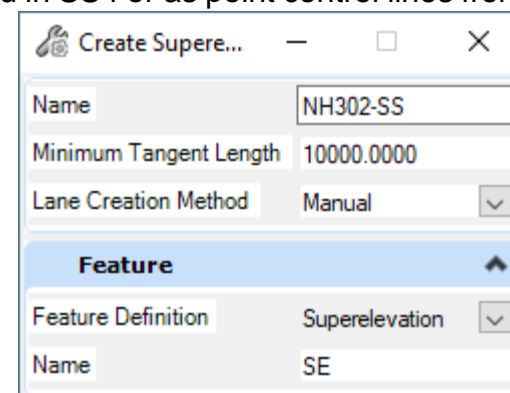
### ORD Superelevation

Open the Default model and adjust the display as necessary to be able to select the 2D geometry feature of the roadway.

Open the *OpenRoads Modeling* workflow > *Corridors* Tab > Superelevation tool **Create Superelevation Sections**. Supply a name and set the Minimum Tangent Length to a large number. Set the Feature Definition and accept through the prompts to create the Super Section.

After creating the Super Section the next tool should automatically start.... Define the superelevation lanes by defining the name (use the templates TW's point name P\_TW\_L or R), side, width, and normal crown slope for both the left and right lanes accepting through after verifying each entry.

After Create Superelevation Lanes the next tool should automatically start... the Calculate Superelevation tool allows you to define the AASHTO Rules file, the e max rate, the Length





## NHDOT CAD/D Connect Documentation

calculation type, design speed and the pivot method. When this tool is completed with the Open Editor box checked the Superelevation Editor will be displayed.

Use the ***AASHTO\_2018\_NH.xml*** when working on NHDOT projects. The delivered xml files have not been corrected for AASHTO's Errata which corrected some entries in the tables. The Relative Gradient's calculations have also been changed to match how NH calculates it in the Highway Design Spread Sheet previously used.

Calculate Superelevation	
Rules File Name	N:\CADD\CADD\Connect-Workspace\Workspaces\NHDOT\Standards\Supere...
e Selection	4%
L Selection	AASHTO Relative Gradient
Design Speed	30
Pivot Method	Crown
Open Editor	<input checked="" type="checkbox"/>



## NHDOT CAD/D Connect Documentation

### Superelevation Editor

For information on how to use the Superelevation editor see the Help, Learn server or connect advisor. The Editor allows you to view and modify the calculated Superelevation by editing the Black text in the Station and Cross Slope columns.

Superelevation	Name	Station	Curve Set	Cross Slope	Transition Type	Pivot
LaneR	Lane R - 140+00	140+00.00	0	1.71%	Linear	Left E
LaneR	Lane R - 140+06	140+05.00	0	2.00%	Linear	Left E
LaneR	Lane R - 140+39	140+40.00	0	2.00%	Linear	Left E
LaneR	Lane R - 143+51	143+50.00	0	2.00%	Linear	Left E
LaneR	Lane R - 143+51_1	143+50.00	0	2.00%	Linear	Left E
LaneR	Lane R - 144+03	144+02.50	0	0.00%	Linear	Left E

Row: 1 of 49

When you have finished modifying the Superelevation you can create and save the reports. The next step is to assign the superelevation to a corridor. Save dgn and open the corridor dgn. With the *Default* model active, reference attach the Superelevation dgn's *Default* model. Use the *Assign to Corridor* tool to apply the Superelevation to the corridor by first selecting the super section and then the corridor to apply it to.

Associate Superelevation

Superelevation Lane	Superelevation Point	Pivot Point	Start Station	Stop Station	Priority
P_TW_L	P_TW_L	CL	100+00.00	313+97.05	1
P_TW_R	P_TW_R	CL	100+00.00	313+97.05	1
*					

OK Cancel



NHDOT CAD/D Connect Documentation

## Corridor Modeling – By Constraints – non-preferred method in ORD

Using Template Constraints for Superelevation - Video

Found under Corridor Modeling Tasks the Corridor Objects - Parametric Constraints tools allow for importing of txt files containing constraints.

An Excel spread sheet has been created for Super Elevation design and is located in *ss4\_superelevations\_2\_4.xlsm*. It should be copied into each project prior to use. The sheet will create parametric constraints to import into the corridor for superelevation transitions. Fill in all appropriate boxes for each curve, then open the Parametric Constraints worksheet tab.

Click the "Add Output All" or "Add Output Shoulders Only" to define which entries are to be exported. Click the "Export to TXT" button to create the file in the project directory.

**\*\*\* This information should be checked carefully for errors such as overlapping curve transitions \*\*\***

**\*\*\* YOU ARE RESPONSIBLE FOR YOUR DESIGN \*\*\***

\*\*\*The latest sheet is good for 18 curves - if you need more use a second sheet and increment the files by adding - Part 1 Part 2... to the ROAD NAME\*\*\*

Open the *Corridor Objects* panel by selecting the tool on the *Corridor Modeling* task menu. Then select *Parametric Constraints* on the left side of that panel.

The *Import Parametric Constraint* tool from the *Corridor Objects - Parametric Constraint* view is used to import the text file of the correct format. Constraints can also be exported from a corridor, edited with a text editor and re-imported.

Super elevation control lines can be created using the appropriate tabs, but it is recommended to take advantage of using the *Parametric Constraint* tab of the spread sheet in that it also creates the constraints for the shoulder roll over and is more easily reviewed together.



When editing or creating multiple constraints using the *Corridor Objects* tool, it is sometimes beneficial to use the *Unlock - Activate Rule* button. This allows you to create and edit constraints without each change or addition being processed. Reactivate the lock when done adding constraints. Close the tool then reprocess the corridor to have all the changes processed.






## P-5-5: Parametric Constraints – Control the Slope Transitions

[Return to Index](#)

The *Create Parametric Constraint*  and the *Corridor Objects*  tool are found on the *Corridor Modeling* task menu. Use either tool to create a Slope Constraint. Constraints for slopes include L(R)\_Fill\_slope and L(R)\_Cut\_slope. These constraints will override the default slopes from the fill height criteria used in the no-comp(onents) templates as well as those in the 2 slope templates such as the DM-12-4 and DM-12-10.

### Create Slope Parametric Constraints

The design should be worked through in order... basically the same order that the Corridor Design documentation is in. Constraints to transition your slopes from 2:1 - 4:1 - 6:1 as well as transitioning the roundings from 5 feet to 0 feet when going from a 4:1 fill to a 6:1 fill should be next after the Guardrail Design. The Video shows the process of using the results of a no component template that uses the Typical section's fill height criteria to determine the base slope solutions. These slopes are shown and annotated on a set of cross sections and then hand recorded into an <https://nhgov.sharepoint.com/:x:/r/sites/DOT-ProjectCentral-Home/CADD%20Document%20Library/report-slopes-ticks.xlsx?d=wba11871a8661417b944804d91080c8e9&csf=1&web=1&e=ELAhVs>. The spread sheet helps to determine where the parametric slope constraints are needed to set the slopes and transitions between different slopes. Slope transitions should generally occur over 50 feet. The section of the spread sheet to the right can be used to help write the parametric constraints (copy into text file) but it may be easier to just have the recorded slopes displayed while you add the constraints by hand into the *Corridor Objects > Parametric Constraints* section. - [Video](#)

When editing or creating multiple constraints using the **Corridor Objects** tool it is sometimes beneficial to use the *Unlock - Activate Rule* button . This allows you to create and edit constraints without each change or addition being processed. Reactivate the lock when done adding constraints, Close the tool then reprocess the corridor to have all the changes processed. - [Video](#)

### Create Slope Rounding (Tick Width) Parametric Constraints

Slope roundings are not shown on the cross sections as there is no real way to transition their lengths or reliably match them into the existing slopes. Slope roundings are represented by a tick mark on the cross section at the appropriate distance from the slope intersection point. Parametric constraints need to be created to set the tick marks at the correct distance from the toe of slope. Each Template has default slopes and a default Tick width. These can be reviewed and modified by hand (adding individual constraints) using the Excel spread sheet created in the previous section. An alternate method is to create and edit a report of the



## NHDOT CAD/D Connect Documentation

cut and fill slope parametric constraints. The report is edited to have the Tick width replace the slope for all variations of the cut and fill slopes parametric constraints then the constraint name is updated to reflect the Tick width constraint. - [Video](#)

```

N:\CADD\PBT\Xample2\65432\Cadd\OpenRoads\65432-All-constraints-1-22-18.txt
RT_Fill_slope|Slope      |-0.25      |-0.166667   |241+75.00   |242+25.00   |X
RT_Fill_slope|Slope      |-0.25      |-0.25       |241+00.00   |241+75.00   |X
RT_Fill_slope|Slope      |-0.5       |-0.25       |240+50.00   |241+00.00   |X
RT_Fill_slope|Slope      |-0.5       |-0.5        |237+50.00   |240+50.00   |X
RT_Fill_slope|Slope      |-0.25      |-0.5        |237+00.00   |237+50.00   |X
RT_Fill_slope|Slope      |-0.166667  |-0.25       |236+50.00   |237+00.00   |X
RT_Fl_width|Distance  16         16          |214+00.00   |223+50.00   |X

N:\CADD\PBT\Xample2\65432\Cadd\OpenRoads\Data\constraints-for-ticks.txt
*label      |type      |start value  |stop value  |start station |stop station |enabled
*-----*-----*-----*-----*-----*-----*-----
LT_Tick_width|Distance  |-5          |-5          |227+00.00   |228+50.00   |X

RT_Tick_width|Distance  |0          |0          |242+25.00   |244+50.00   |X
RT_Tick_width|Distance  |5          |0          |241+75.00   |242+25.00   |X
RT_Tick_width|Distance  |5          |5          |241+00.00   |241+75.00   |X
RT_Tick_width|Distance  |5          |5          |240+50.00   |241+00.00   |X
RT_Tick_width|Distance  |5          |5          |237+50.00   |240+50.00   |X
RT_Tick_width|Distance  |5          |5          |237+00.00   |237+50.00   |X
RT_Tick_width|Distance  |0          |5          |236+50.00   |237+00.00   |X

```

When roundings (LT & RT\_Tick\_width) are set to a negative number they are shut off in newer templates. This allows you to have slopes shown without the cut or fill linestyle being placed such as at intersections were proposed side road slopes match into the mainline slopes.

Review [Displaying Dynamic Cross Sections](#)



## P-5-6: GuardRail Platforms

[Return to Index](#)

### Before you Begin

Create or open a **12345-P-GuardRail-Platforms.dgn** and reference in the **Combined**, and the corridor dgnos that require guardrail.

Guardrail platforms can be created within the corridor or created separately by creating a corridor for each in their own dgn. By creating a separate corridor for each platform, the quantities for the platform can be excluded from the corridor as the specifications indicate. The GuardRail Platform's offsets and slopes are created from imported parametric constraints generated from an Excel worksheet. Constraints to turn on the GR display and widen the slope break to 2.5' between the platforms are also generated in the Excel file and need to be imported into the corridor dgn.

### GuardRail Note and Calc Sheet

The [guardrail field notes-calc sheets-openroads constraints.xlsx](#) is used to design guardrail and to create the parametric constraints for the platform widening, grading and turning on the display of the guardrail. There are 3 tabs in the file, *GR Field Review Sheet*, the *GR Worksheet* and the *OpenRoads Constraints* sheet. Design information from the *GR Worksheet* is used in the *OpenRoads Constraints* sheet by populating the drop down selections in green and entering the stationing in fuchsia.

GR Note:	GR-1	Side of Roadway:	RT	Face of GR offset from EP:	0.00 ft
Stationing Information					
Lower Station Guardrail Limit:	106+50.00				
Upper Station Guardrail Limit:	113+00.00				
Lower Station Platform Type:	TL-3				
Is Platform Preferred or Alternate?	Preferred				
Distance of Guardrail from EP:	< 2.50' from EP				
Upper Station Platform Type:	TL-3				
Is Platform Preferred or Alternate?	Preferred				
Distance of Guardrail from EP:	< 2.50' from EP				

There are 3 sections of constraints generated for each GR run. Each section should be highlighted, copied and pasted into notepad, PFE or Notepad++ and saved as text files. The middle 2 lines are for the actual roadway corridor and the Approach and Departure sections for the GR Platform corridor(s). Name the test files appropriately with GR-# followed by the approximate station values found above each section

RT_Slope_Break_width	Distance	1	9	106+18.00	106+50.00	X
RT_Slope_Break_width	Distance	9	9	106+50.00	106+50.00	X
RT_Slope_Break_width	Distance	9	5	106+50.00	106+75.00	X
RT_Slope_Break_width	Distance	5	4	106+75.00	107+00.00	X
RT_Slope_Break_width	Distance	4	2.5	107+00.00	107+12.50	X
S_RT_Slope_Break_slope	Slope	-0.05	-0.1	106+18.00	106+23.00	X
S_RT_Slope_Break_slope	Slope	-0.1	-0.1	106+23.00	107+00.00	X
S_RT_Slope_Break_slope	Slope	-0.1	-0.05	107+00.00	107+12.50	X
RT_GR_offset	Distance	2.5	0	106+50.00	107+12.50	X
RT_GR	Distance	0.5	0.5	106+50.00	107+12.50	X



## NHDOT CAD/D Connect Documentation

and then LT or RT. i.e. **GR-1-App-10618-10712-RT.txt**, and **GR-1-Cor-10712-11237-RT.txt**, and **GR-1-Dep-11237-11332-RT.txt**. Alternately, have both the approach and departure sections in the same .txt file.

## Create Guardrail Corridors

With the **12345-P-Guardrail-Platforms.dgn** open, and referenced corridor attached, select the Mainline Geometry, hover and select *Create Corridor* from the Pop-up list. Make sure you are selecting the 2D geometry reference. If needed, shut off the display of the 3D corridor and geometry reference models. Right click to use active profile and name the corridor with the corresponding GR-# that you are working on. Use the *Alt+Down arrow* to select the template, **Templates Corridor\TC-RT\_GR-Platform**, *Left click* to accept. Next, key in the start and end stations of the platform shown in the Excel file above the constraint section. Use a 5-foot template drop. When finished placing the template drop you can place another one for the departure platform using the start and end stations above that section. *Right Click* to end.

## Create Point Controls and import Constraints

The Template that was used has points corresponding to the points on the roadway corridor. Select the corridor, hover and select *Corridor Creation Tools > Corridor Objects* from the Pop-up Menu. Select *Point Controls* from the *Corridor Objects* tool box, and select *Create Point Control*. Three point controls need to be created. They should be created from the Start of the Geometry to the End so they will already be defined when/if you add additional template drops.

### Description

- 1 Description-EP/ Both /Linear Geometry/**Corridor EP\_R** /Plan Element/ hit on the Roadway corridor's *P\_EP\_R* feature.
- 2 Description-SB/ Both /Linear Geometry/**Corridor Slope Break\_R** /Plan Element/ hit on the Roadway Corridor's *P\_SLP\_B\_R*.
- 3 Description-Toe/ Both /Linear Geometry/**Corridor Toe** /Plan Element/ hit on the Roadway Corridor's toe *P\_TOE\_R*.

This should align the platform corridor on to the roadway corridor. In the Dynamic section view the platform should appear as a thin fill over the roadway slopes.

Widen the platform and turn on the 2D and 3D guardrail by importing the txt files created earlier. In the *Corridor Objects Box* switch to the *Parametric Constraints* section. Click on the *Import Parametric Constraints* tool and import the App and Dep files created earlier.

If the 2D guardrail line is not showing up, use *OpenRoads Modeling workflow > Model Detailing tab > 3D tools pane > Plan By 3D Element* from the dropdown menu and click on the 3D guardrail.



NHDOT CAD/D Connect Documentation

## Open the Roadway Corridor and Import the Parametric Constraints

The corridor .txt file can be imported directly into the roadway corridor's constraint section. Open the **P-Corridor.dgn** and Select the corridor, hover and select *Corridor Creation Tools > Corridor Objects* from the Pop-up Menu. In the *Corridor Objects Box* switch to the *Parametric Constraints* section. Click on the *Import Parametric Constraints* tool and import the Cor file created earlier.

If the 2D guardrail line is not showing up, use *OpenRoads Modeling workflow > Model Detailing tab > 3D tools pane > Plan By 3D Element* from the dropdown menu and click on the 3D guardrail.



## P-5-7: Drives and Side Roads

[Return to Index](#)

### Introduction

Drives and Side Road civil cells have been developed for the designer's use. Standard driveways should always match into the edge of pavement of the main corridor. Side roads can also match into the edge of pavement or into the travel way so the shoulder is continuous from the main road into the side road. Alignments for either should generally be designed perpendicular from the mainline out to at least the EP before skewing or curving.

Side Roads and driveways are designed after the Mainline corridor has been completed. The horizontal and vertical geometries will match into the Mainline. All alignments that are intended to be stationed and shown on the plans should be created in the project's Geometry.dgn. All other Drive alignments, Civil cells and corridors can be created in the **P-Drive.dgn** and side roads can either be in the mainline corridor or in their own corridor.dgn file if the work is extensive.

### Create the Drive Alignment

Open or create the **xxxxx-P-Drives.dgn** file, *Default* model and attach the existing reference files, geometry and the corridors the drives will match into.





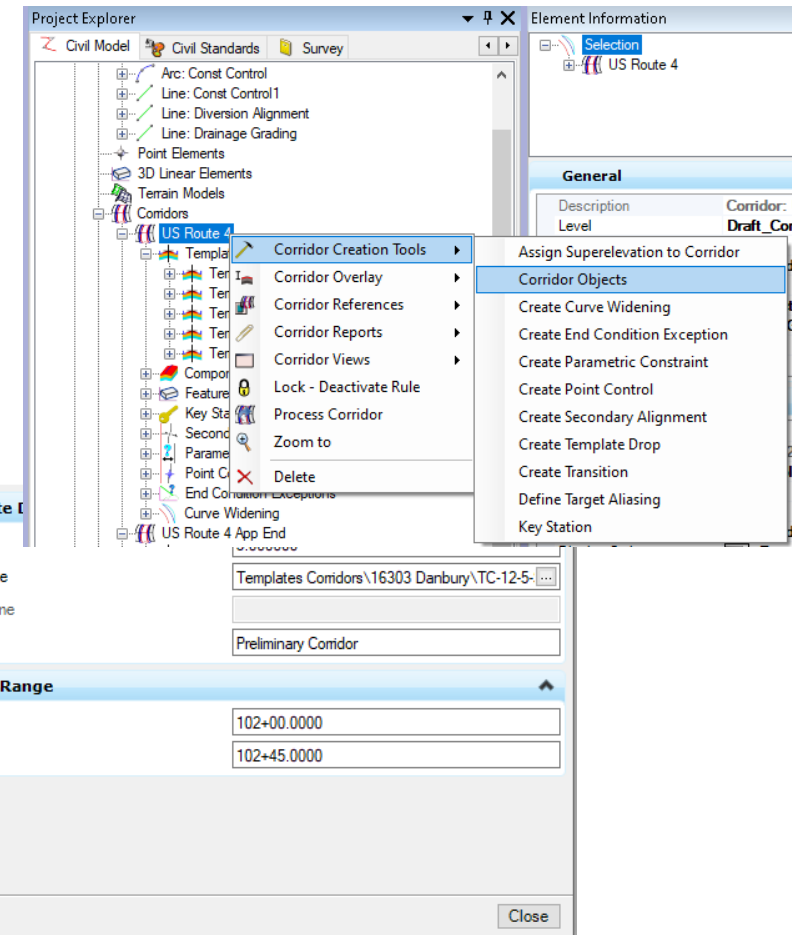
NHDOT CAD/D Connect Documentation

## P-5-8: Importing Corridors from SS4 InRoads

### Create Corridor Object Reports

Using InRoads, open each SS4 corridor dgn in the old –ss4 project. Now that the project has been renamed you may need to update the Project Defaults to point to the correct file locations. Open Project Explorer to the Civil Model Tab. Expand the dgn dropdown > Expand the *Corridors* entry. Each corridor listed should be examined and determined whether it needs to be exported. Right click on the corridor and use *Zoom To* to find it (may or may not work).

Select the corridor and make note of the Horizontal Name and Profile Name that the corridor was created from as they need to be recreated using Section [P-4-2: Geometry from SS4..](#) Next, *right click* on the corridor expanding the Corridor Creation Tools and select *Corridor Objects*. The box will appear containing the parts of the corridor.

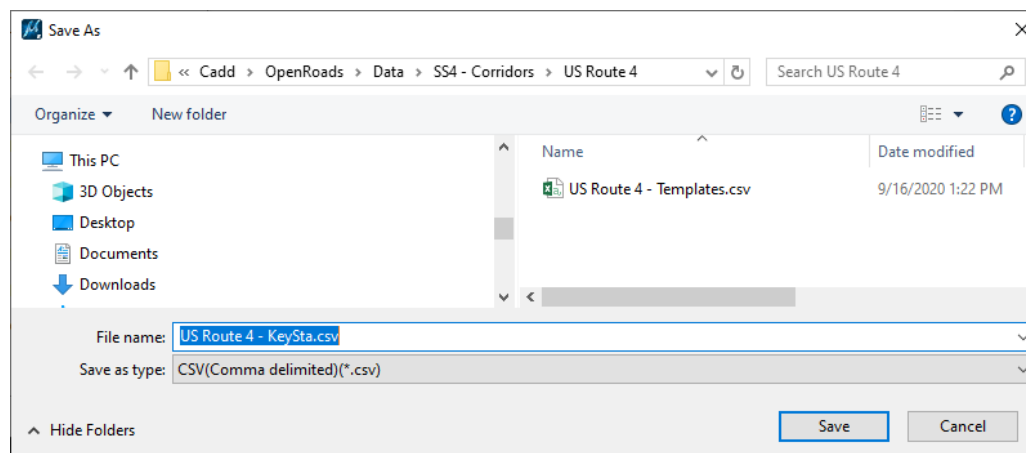


Click on each category in the left pane and if information is present, *Right Click* in the gray area and select *Export*.



## NHDOT CAD/D Connect Documentation

Create a Folder(s) in the Connect project OpenRoads\Data\SS4-Corridors\RoadName\ and save each export there with corresponding name and description for each corridor. The Parametric Constraints are really the only part of the corridor that can be imported into the ORD corridor but the rest of the Exported files provide information on what was and needs to be done.



## Template Reports

With both InRoads and ORD open, review each template and, if necessary, make modifications to standard ORD templates mimicking any changes that were done to the SS4 templates used in the corridor. SS4 templates can be imported into ORD but there are more changes that would need to be done than its worth. When editing ORD templates, check for any new functionality (like shoulder shutoff display rules) that work to make things easier before just making modifications (like deleting the shoulder and creating additional template drops).

## Parametric Constraint Reports

Edit the exported *ParametricConstraint.csv* file and remove any super elevation slope constraints as supers are done with the Superelevation tools in Connect and the shoulder Rollovers are controlled in the template. Dimension Height constraints can also be deleted as they are not used in ORD.

Most PC's are named the same as those defined in SS4 but some have been upgraded. Review the constraints and use Find/Replace to update any constraint names to those used in the ORD template selected. Import this edited file into your ORD corridor.





## NHDOT CAD/D Connect Documentation

### Point Control Reports

These cannot be imported. Use the report to see what other control lines may need to be recreated in ORD, whether other alignments or other corridors possibly in different corridor dgn files. The list will help you determine those dependencies but cannot be created until those pieces are created. *Superelevation Point Controls* will be created when the SuperElevation tool *Assign to Corridor* is used.

### External Reference and Clipping Reference Reports

Neither of these categories can be imported as they will need to point to things newly created in ORD. They will help you to understand what may need to be created and referenced in order to recreate the SS4 corridor design in ORD.

Continue creating the reports until all corridors are completed or determined to be unnecessary.

Follow the steps in [OpenRoads Designer - Corridors](#) for importing the Parametric Constraints file after creating the template drops.

The SS4 Corridor dgn file's *Default-3D* model can be attached to an ORD Corridor's *Default-3D* model in order to compare the 3D Models by viewing the Dynamic Sections. The regular way of attaching the *Default* to the *Default* model and the 3D being automatically attached will not work as connect does not recognize the SS4 files as being civil files.



NHDOT CAD/D Connect Documentation

## OpenRoads Designer - Creating Cut Sheets

### P-6-1: Creating Cross Section Sheets – Named Boundaries

[Return to Index](#)

#### Before you begin – [Creating ORD Cross Section Cut Sheets - Video](#)

Additional tasks: P-6-1A – E, create existing features, e-row, env, create corridors, p-row, p-utilities, p-drainage, xs detail, End Area Volumes.

#### Attach Reference Files – Display Information to be Sectioned

Open ORD to the NHDOT Workspace and the project's WorkSet. Open/create the 12345-XSections.dgn.

With the *Default* model active, Reference file attach the Combined.dgn with *live nesting* set to 1. Next, attach all other dgn files that you want to section over. E-Terrain or E-MX-Survey-Terrain, E-MX-Survey-Linear, E-Drainage, E-ENV, E-ROW-Lines, E-Terrain-Rock, E-Utility, Geometry, P-Cor, P-Drainage, P-Utilities, P-Drives, Earthwork, P-Guardrail-Platforms, P-ROW all with *live nesting* set to 0. As you accept through each drawings attachment make sure you see the message that the *Default-3D* models are automatically being attached. Do not include point feature drawings such as the E-MX-Survey-Points as those features are represented in the XS Detail drawings.

View both the *Default* and *Default-3D* models by *Right Clicking* and holding to get the popup menu and select *View Control > Views Plan/3D*. Set the **Default-3D** view active by clicking on the top of the view. The content of the cross sections is determined by what is displayed in this View/Model. Shut off Communication Nodes, Electrical Nodes, Gas and Water nodes. Update the view, *Save Settings* and *Save* the dgn. This will be the Cross Section seed file.

#### Copy the XS Seed and Attach the appropriate XS Detail

Copy/Rename the seed to *12345-XSect-RoadName.dgn*. Add the *RoadName*. With the *Default* view active, attach the appropriate *12345-XS-Detail-RoadName.dgn*. *Save Settings* and *Save* the file, repeat for each road as needed.



## NHDOT CAD/D Connect Documentation

### Create named Boundaries

The cross sections are generated through *Named Boundaries*. The cross section boundaries are 3D elements. Ensure you have 2 views open, a view of the *Default* (2D model) and the *Default-3D* model. With View 1 active, use the *OpenRoads Modeling Workflow's Drawing Production* tab and select the *Place Named Boundary* tool. Select the cross section image in the top of the tool. Set the drawing seed from the dropdown, this should fill in many of the properties in the tool box. If a previous Group of sections were created, you can add to the group by selecting it from the group dropdown. Otherwise, you are being prompted to Identify a Path Element to create boundaries along. The Name will take on the name of the Feature that you select. The offsets, interval, clearance(s), can be changed but are set for NHDOT standards.

Check the *Create Drawing* and *Show Dialog* boxes then accept through the on cursor prompts to create the Named Boundaries. The Boundaries will be placed in both 2D and 3D views and the create drawing box will display.

### Create the Drawings

The *Create Drawing* box is filled in per NHDOT standard setup. Decide whether to have the drawings added to the sheet index or not and hit *OK* to create the Cross Section drawing and sheet model! The progress bar in the lower right will display your progress. Be Patient. The last Cross Section sheet will be displayed when finished.



## NHDOT CAD/D Connect Documentation

### Review and add Additional Annotation

In the previous step the **NH XS Preferences** Annotation Group was used to annotate the drawings, and much was annotated. From existing features to the ROW and ENV feature to the proposed offset and elevations of the roadway features and the cross slopes. Additional annotation groups label the **NH XS Detail features**, **NH XS Barrier** as well as **XS EAV Anno** for Earthwork material if that information has been generated.

### Re-Annotating Sections After Changes

When changes are made to Corridors and other dgnos that are referenced to the cross sections or other reference files attached their 3D models will be updated when the sections are opened. The annotation will not be.

Using the *OpenRoads Modeling Workflow > Drawing Production tab > Annotations* pane select the *Model Annotation* dropdown and select *Remove Model Annotation*. Check the box for all drawing models and accept. This will remove all annotation from the sections. You will have to then re-annotate the sections using each Annotation Group. Start with the **NH XS Preferences**, then **NH XS Detail**, **NH XS Barrier** if any is present and finally the **XS EAV Anno** if that has been done. Alternately a group called **NH All** can be used that will annotate all the features, but it takes quite a bit of time to run. The annotate **NH All** does not include the EAV box.

After you select a group and accept the command, a box showing the *Annotate Progress Form* will appear. Move your cursor into the box to keep it on top so you can see the progress. If it gets hidden and you start the next command, it may crash or not finish annotating the sections.

### Editing Annotation Groups - Changing Top Frame Annotations

The cross sections are set up to annotate a list of features contained in the annotation groups. To edit the list, make the *Default View* active. Open the Explorer's *OpenRoads Standards Tab*, Expand *Standards* and then select the drawing name. Right click on it, then select *Update Standards From dgnlib*. This will update the *Annotation Group* entries to the latest definitions.

Next open the Annotation group used to modify the point annotation list. Expand the *> Drawing Name > Annotation Groups > Cross Sections > Drawing > NH XS Preferences (or NH All)*. Right Click and select *Manage*. Alternately select the annotation group and in the *Properties* pane select the *Annotation List* and click on the ... button. This will bring up the annotation Group for editing. The entry for *XS Top Frame* controls the list of points that are annotated with offset and elevation across the top of the section. Select *XS Top Frame*. This will display Row list and Row Properties which shows the Location list of points to be annotated. Click on the Add filter button above the Expression to alter the list.



## NHDOT CAD/D Connect Documentation

The screenshot displays the NHDOT CAD/D Connect software interface. The main window shows a list of annotation groups on the left, including 'NH XS Preferences'. The 'Annotation Filter' dialog box is open, showing a list of feature definitions to be included in the annotation. The list includes:

- point\_feature\_definition = "Linear\Design Features\Road\Road Trav Way"
- point\_feature\_definition = "Linear\Design Features\Shoulders\Shldr Edge of Pave"
- point\_feature\_definition = "Linear\Design Features\Shoulders\Shldr Break"
- point\_feature\_definition = "Linear\Design Features\Slopes\Slope Break"
- point\_feature\_definition = "Linear\Design Features\Slopes\Toe"

The 'Annotation Filter' dialog also shows a table of logical operators:

Math Operators	Logical Operators	Properties
AND	AND	offset
OR	OR	elevation
NOT	NOT	on too

The 'Row List' panel shows the following table:

Show	Type	Title	Definition
<input checked="" type="checkbox"/>	Annotation	Offset	
<input checked="" type="checkbox"/>	Annotation	Z	

The 'Properties (OpenRoads Standards)' panel shows the 'NH XS Preferences' group selected, with the 'Annotation List' set to 'Varies'.

Highlight an entry and then click on *Remove* to remove it from the list or Scroll to the Bottom of the list and click in the blank box to add a new entry. The old list was an exclusion list meaning it Added all points on the Top line and the entries told it what not to annotate. This new list is an inclusion list meaning whatever is in the list will be annotated. Entries should use the OR setting. As a minimum the *Road Trav Way*, *Shldr Edge of Pave*, *Slope Ditch Front* and *Toe* features should be labeled. All others can be removed. When done, click *Apply Expression Changes* to save the list then the *X* to close the box. After editing the *Offset* Row the *Z* or elevation list should be edited to match the same point list entries.

The *Annotation Group Entries* are used in more than one group. If you update the *NH All* group point list the *NH XS Preferences* will be updated also as it has the same entries for the *XS Top Frame*.



## NHDOT CAD/D Connect Documentation

### Editing Annotation Groups – Changing Slope Annotation Segments

As above, to edit the annotation group in Explorer, Expand the > Drawing Name > Annotation Groups > Cross Sections > Drawing > NH XS Preferences (or NH All). Right Click and select *Manage*. There are 2 entries for Slope annotation, *XS Left (& Right) Slope Annotation*. Select one of them and then click in the Location box and then the ... button that appears. The 3 expressions control the selection of points confining them to top line points on the left or right side of the CL. These should not need to be modified. At the top is a dropdown set to > Create list of Segments, the list of segments is at the bottom of the box and can be changed by clicking on the box to the right *Select Segments from Template*.

At the top of the Select Segments box - use the dropdown to select a template. This will fill in the list of available points. Entries in the bottom left can be selected and then using the arrow will copy them to the list of segments. Alternately the Point 1 and Point 2 can be selected from the dropdown lists and the green + will add the segment to the list.

Different Templates can be used to seed the point list so the segment list can be created for a variety of Templates.

The screenshot shows two overlapping dialog boxes. The 'Annotation Filter' dialog is in the foreground, and the 'Select Segments' dialog is behind it.

**Annotation Filter Dialog:**

- Segments to be Filtered: Create list of segment: [dropdown]
- Apply Expression Changes: [checked]
- Current Filter:  $(\text{point1\_on\_top AND point2\_on\_top}) \text{ AND } (\text{point1\_offset} \leq 0.01 \text{ AND } \text{point2\_offset} \leq 0.01) \text{ AND } (\text{NOT point1\_elevation} - \text{point2\_elevation} = 0)$
- Use expressions to build your filter:
- Table of expressions:

Expression	AND/OR	
point1_on_top AND point2_on_top	AND	Remove
point1_offset <= 0.01 AND point2_offset <= 0.01	AND	Remove
NOT point1_elevation - point2_elevation = 0	AND	Remove
	AND	Add

Double click or drag to add to expression

Math Operators	Logical Operators	Properties	Point1 Properties	Point2 Properties
+	AND	width	point1_offset	point2_offset

Filtered segments list

Create a list of segments to be filtered by the filter. If the list is empty, then all of the segments of the cross section will be filtered by the filter. If criteria is left blank, all of the segments in the list will be annotated

Example Criteria: [SegmentBegin - SegmentEnd], [SegmentBegin - SegmentEnd]

[P\_SLP\_B\_L - P\_EP\_L], [P\_TOE\_L - P\_DITCH\_F\_L], [P\_TOE\_L - P ...] Select segments from template

**Select Segments Dialog:**

99999\DM-12-4

Select two points to form a new segment.

Point 1 [dropdown] [↔] Point 2 [dropdown] [green +]

P_SLP_B_R	P_EP_R
P_SLP_B_L	P_EP_L
P_SLP_B_R	P_DITCH_F_R
P_SLP_B_R	RT_Ghost_Fill
RT_Ghost_Fill	P_TOE_R
P_SLP_B_L	P_DITCH_F_L
P_SLP_B_L	LT_Ghost_Fill

Start End

P_DITCH_B_L	P_TOE_L	Remove
P_DITCH_F_L	P_SLP_B_L	Remove
P_SLP_B_L	P_SWK_BK_L	Remove
P_SWK_BK_L	P_SWK_F_L	Remove
L_DCRGR_TW	L_DCRGR_EL	Remove

Close the *Select Segments* box when done and then *Apply Expression Changes* and close the filter to save it.

Remember to open a section Drawing model, Remove the model annotation and then Reannotate all the sections to see the changes you made to the Group.



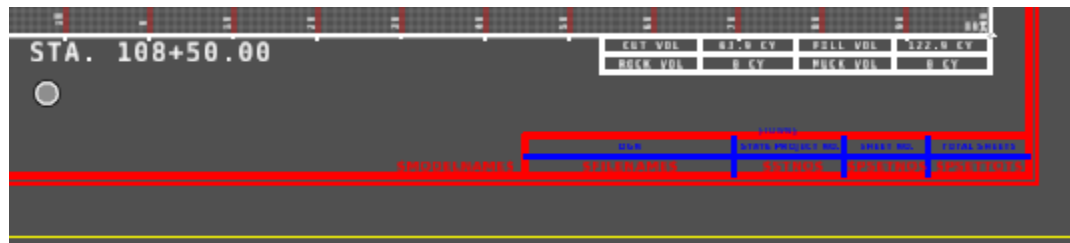
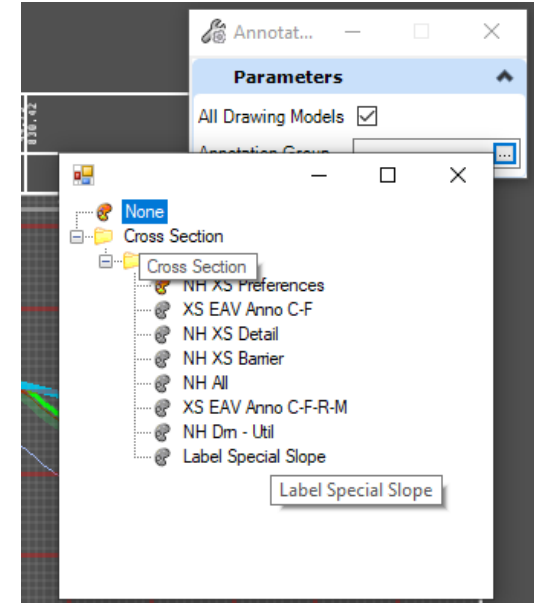


## NHDOT CAD/D Connect Documentation

### End Area Volumes

Cut and fill volumes are created in the Cross Section dgn. Workflow *OpenRoads Modeling* > Home tab *Model Analysis and Reporting* pane > select *Civil Analysis* dropdown **Create Cut and Fill Volumes**. Next Use the **Create End Area Volumes report** tool from the dropdown. The Volumes report can be saved for quantity calculations. The EAV boxes are added by selecting **Model Annotation** from the Drawing production tab and selecting the **XS EAV Anno C-F** group. A different group, **XS EAV Anno C-F-R-M** can be used if Muck and or Rock is present on the sections. Check the *All Drawing Models* box.

Entries for Rock or Muck removal can be found in the Volumes Report. They are not automatically filled into the annotation box and must be edited by hand.



108+50.00					
Strata - Exist Pave (removed):	6.48	12.12	1.00	12.12	No
Total Strata - Exist Pave:	6.48	12.12	1.00	12.12	
Strata - Rock (removed):	41.70	38.61	0.00	0.00	No
Total Strata - Rock:	1041.44	1847.90	1.00	1847.90	
Volumes_Cut:	45.39	63.85	1.00	63.85	Yes
Volumes_Fill:	60.09	122.86	1.00	122.86	Yes
Strata - Unsuitable:	81.86	149.80	1.00	149.80	No
XC - 641_ - Loam:	0.69	1.28	1.00	1.28	No
XC - 403_11 - HBP Wearing:	0.00	0.00	1.00	0.00	No
XC - 403_11 - HBP Binder:	0.13	0.23	1.00	0.23	No
XC - 606_ - Barrier:	0.20	0.37	1.00	0.37	No



## P-6-1A: Create Features of ENV and ROW Elements

[Return to Index](#)

### Before you begin

This process can take place once you have an existing terrain model as well as delineated wetlands or existing row lines drawn. The intent of this process is to featurize and assign elevations to elements that need to be labeled on the cross sections.

### Attach Reference Files

Open/Create the drawing to be worked on, the 12345-E-ENV, E-ROW-Lines or P-ROW.

View both the *Default* and *Default-3D* models by *Right Clicking* and holding to get the popup menu and select *View Control > Views Plan/3D*. Set the **Default** view active by clicking on the top of the view. Reference file attach the Combined.dgn with Live Nesting set to 1. Fit View.

Next Reference File Attach the drawing containing the MicroStation elements to be featurized. Live nesting should be set to 0 when attaching the env, erl, or prw files from the Prj directory. In Level Display, turn off all levels in the reference file. Next Turn on only levels that need to be annotated on the Cross sections. In the Reference file Dialog box select the reference file. Use **Tools > Merge into Master** and then click in the view to copy all the elements displayed into the dgn and automatically detach the dgn file.

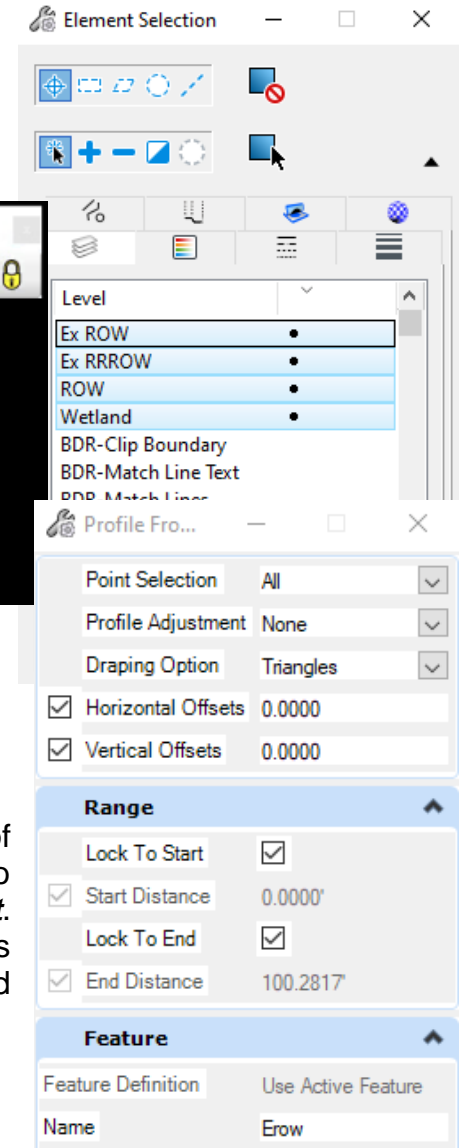
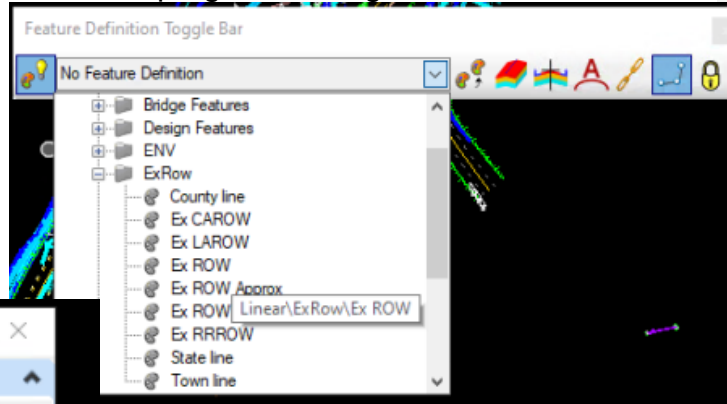
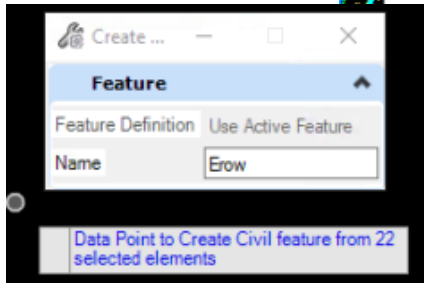
*Save Settings* and *Save* the dgn. Use *File > Open* to re-open the dgn. This will make some of the 3D elements from the attached reference files visible in the *Default* view that were previously not displayed.



NHDOT CAD/D Connect Documentation

**Create Features from Elements**

1. Use element selector and select all elements in the drawing by clicking on Select All. Expand the extended settings by clicking on the triangle at the right if not already expanded, use the level tab to display levels with elements in them. Next unselect all but one level. Start with isolating the top level first and progress through each in turn.
2. In the Feature Definition toggle bar Set the use active feature button on the left and select the linear feature definition for the elements selected. Use the **Create Civil Rule Feature** tool from OpenRoads Modeling workflow, Geometry tab's, General Tools, Design Elements, drop down menu.
3. Data point in the view to create the features.



4. With the features still selected use the **Profile From Surface** tool in the Vertical group of the Geometry tools to attach elevations to the new features. Data point on the screen to Profile the selected elements, next **Select the Existing terrain model by clicking on it.** (do not right click to use active terrain model as this can cause problems when the features are imported and no terrain is active). Accept through the rest of the prompts as displayed to the right to attach elevations to the features.

Repeat steps 1 – 4 on each level containing elements.



## NHDOT CAD/D Connect Documentation

### P-6-1B: XS Detail Tick Features for Section Annotation

Cross section detail tick features are created from point features that are deemed relevant to appear on the cross sections. They include trees, poles, hydrants and such. A point feature station offset elevation report is run on the 12345-E-MX-Survey-Topo.dgn's point features as well as an alignment xyz report to get the information for a macro which draws tick mark elements at the 50 foot stations. These tick marks are featurized and profiled over the terrain model to assign elevations. A separate dgn should be created for each Alignment for the tick features to be included in the XS drawing for that Alignment.

Note: in newer project the E-Detail.dgn contains cells, not point features – use the Survey-Topo.dgn for the report.

#### DGN setup

Open the *12345-XS-Detail.dgn's Default* model. Check that the Combined.dgn is attached with live nesting 1 to see the project's existing detail drawings. Reference File Attach the *12345-Geometry.dgn* file (no nesting) as well as the *....\OpenRoads\Survey\12345-E-MX-Survey-Topo.dgn* that contains the point features. Save settings, Save the dgn and reopen it. Set the existing terrain model Active.

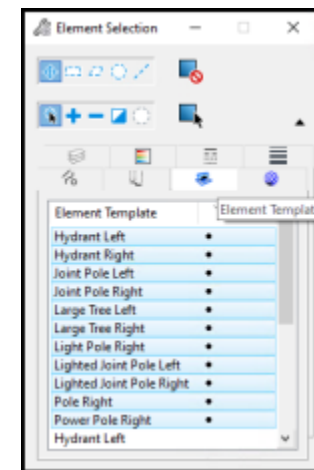
Using only the *Default* model view, shut off all reference files that don't have point features, except the *12345-Geometry.dgn's Default* Model. Also shut off the *Default-3D* model reference. The view should now only show the *Geometry* and the *E-MX-Survey-Topo Default* models. Save Settings and Save the dgn. This file will be the Seed detail file. Continue by Copying/Save As this file as *12345-XS-Detail-RoadName.dgn*

#### Create Alignment Report

If a 50' interval alignment report in .XLS format already exists, skip this section and continue to create the detail station & offset report. Select the *Horizontal Geometry Report* button that is found on either the *Analysis & Reporting* or the *Horizontal Geometry Task* menus.

Follow the Heads-Up prompt and select the alignment (in the *Default View*) associated with the cross sections you wish to annotate. Click the Right Mouse (Reset) button to complete the selection process.

Confirm that the boxes on the *Horizontal Geometry Reports* panel for Lock to Start, Lock to End and Interval are all checked. Set the Interval value to 50.





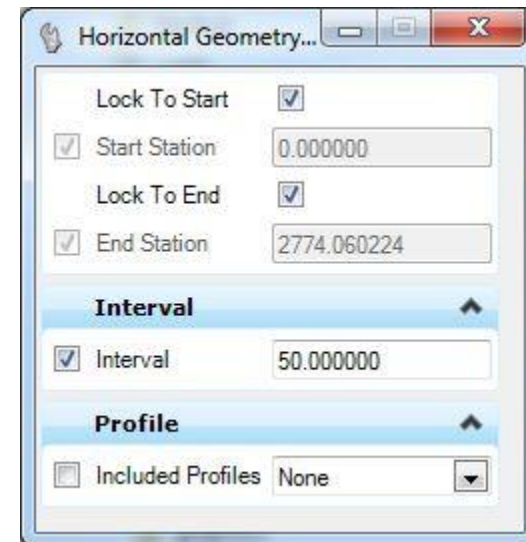
## NHDOT CAD/D Connect Documentation

If your alignment does not start at an even 50 value, uncheck the Lock to Start box and enter a start station that is at an even 50 foot value.

The last prompt looks for Profile information. This report does not need to have vertical information, so any response for this prompt will suffice. If there is interest in other reports beyond the scope of this procedure, then specify Active Profile so that the vertical component is included.

OpenRoads will open the Bentley Civil Report Browser and display the default horizontal report. This browser offers many predefined report options on the left side of the panel. The right side of this panel displays the output of the selected report option. From the left side of the report window, select the **HorizontalAlignmentIntervalXYZ.xsl** report.

The report must have the correct station format before saving. *Tools > Format options > Stations* should be set to **SS+SS.SS** Direction should be **ddd^mm^ss**. When the report is displayed, select *Save As...* from the *File* menu and select the Microsoft Excel option. Provide a File name.



## Create Station/Offset Detail Report

Use Element selector and drag a box around all the point features to be reported in the project area selecting them. Note that only features which typically appear on cross sections will be processed.

Once the point features are selected, choose the Point Feature Station Offset Elevation Report tool from the OpenRoads Modeling Workflow - Model Analysis & Reporting tab - Reports Dropdown. You will be prompted to click on the alignment (select it in the Default view) and then data point to accept the selected detail features. When the default report appears, change the report to **StationOffsetNorthingEastingElevationFeature.xsl**. Use the *Save As* option on the *File* menu of the report window to save this report as an Excel (\*.xlsx) file. Open the report to check its contents.

## Create Cross-Section Detail Features

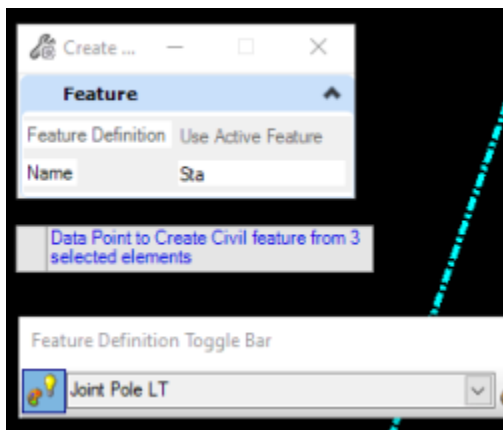
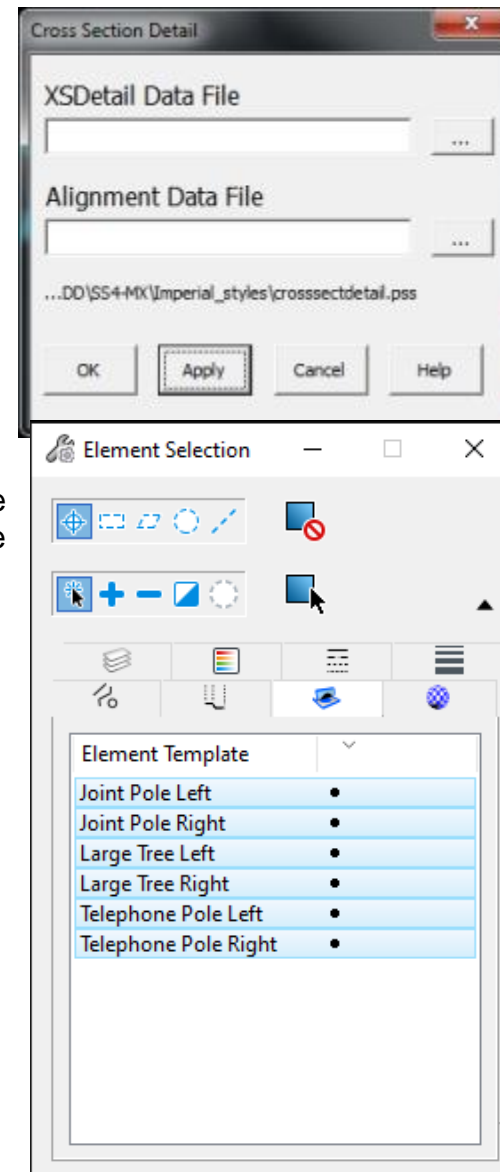
Once the reports are created, the next step is to create a series of lines at the even 50' station which is nearest to each detail feature. If not already, Open the *12345-XS-Detail-roadname.dgn*, *Default* model that was created to contain these detail lines. Creating separate drawings for each alignment's detail ticks (by using the **File > Save As** command).



## NHDOT CAD/D Connect Documentation

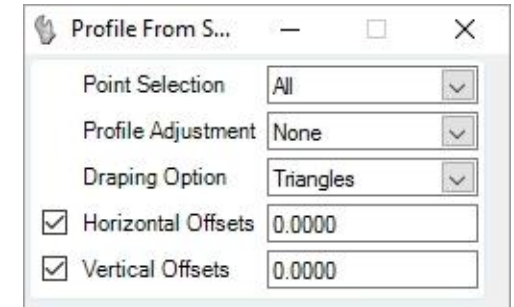
To create cross section detail features in OpenRoads Designer, set the workflow to *Drawing* > *Utilities* tab > *Macros* pane select *XSDetail* macro from the drop down menu then click Play. Select the detail and alignment xlsx files created in the previous steps. Click *Apply* if you plan to do another alignment after or *OK* if this will be the only one processed. The macro creates short line segments offset at each 50-foot station.

1. Use Element Selector to select everything in the drawing. Switch to the *Element Templates* tab of the element selector. Click (or click and drag) on each to deselect all templates except one, leaving only it selected.
2. Next use the *Feature Definition Toggle* bar drop down list, expand **Linear** > **XS Detail** > and set the feature to match the selection and turn on the **Use Active Feature** toggle button.
3. Use the **Create Civil Rule Feature** tool from the **Geometry** tab's **General Tools** pane > **Design Elements** dropdown list to set the feature definition and Accept. The selected lines should now be features of the type that is active.



NHDOT CAD/D Connect Documentation

- The features are in the *Default* model. In order for them to show up on the cross sections, they will need elevations. Use the Geometry tab's Vertical pane's Profile Creation dropdown tool Profile from Surface to attach elevations to the features. Make sure the feature definition is still defined and the elements still selected from the previous step. Accept through the prompts and Right click to use the active Terrain model when asked.



The names of the features can be annotated on the cross sections. Attach the *12345etxt.dgn* for tree sizes and descriptions. The *Point Feature Station Offset Elevation Report* created earlier will provide the + station of the features.

Use *Element Selector* to select each tick and edit the name in Element Information to include the + station value for all features. Pole numbers, tree sizes and descriptions are not required on the sections.

Point	Station	Offset	Northing	Easting	Elevation	Feature
14						
15	UP-9	100+08.09	21.63	370795.8356	931299.0942	Node\ElectricalNode\E_Joint Pole
16	PANC-10	100+12.29	39.66	370793.8595	931317.4983	Node\GenericNodeAsset\Guy Wire Anchor
17	EPTDS5	101+24.22	-27.32	370921.6036	931291.1177	Node\GenericNodeAsset\Decid Tree
18	EPTDS6	101+75.75	-25.01	370969.4945	931310.271	Node\GenericNodeAsset\Decid Tree



NHDOT CAD/D Connect Documentation

## P-6-1C: Cross Section Earthwork Features

### Creating Cross Section Earthwork Features

Cross Section Earthwork features include Topsoil, Pavement Removal, Unsuitable Materials as well as Limited Reuse Soils which are delimited with a 2D outline that is used to create clipped terrain models. The depths will be created with surface templates. Muck and Rock will also fall into this category but are dealt with somewhat differently.

This information will be stored in the *12345-Earthwork.dgn*. Note that references to "12345" in file names refer to the project's five-digit Project Number.

### Create Earthwork Feature Boundaries

First, the area to be computed needs to be delineated as a closed 2D shape. Set the level to the feature you are going to delineate. The level names are **Strata** - followed by the type.

Use the Fill Area Boundary created previously and any other elements to create closed areas/shapes for the features needed. For example, use Element Selector and select the Fill boundary, drive edges and the existing edge of pavement.

Use the Create Region tool to delineate Topsoil removal areas. Set the fill type to Flood (the left most icon at the top of the panel) and check the box to Keep Original.

To define areas of pavement to be removed, a color plan or the hearing plan can be attached as a reference. The Fill area boundary and the edge of pavement features can be used to determine the area of pavement to be removed.

After all the shapes are defined, use the Terrain Modeling task Create Clipped Terrain Model to create a separate clipped terrain model for each area. Use the **NH\_Prop\_Earthwork Feature Definition** under the *Terrain Display* features and set the *Feature Name* to reflect the area and location as shown below.





NHDOT CAD/D Connect Documentation

**Apply Surface Template**

A Surface Template needs to be applied to each clipped terrain to define the material and depth. See the chart below. If a different depth of material is needed Open the template editor, Copy the desired template, rename it and re-specify the depths below the origin.

Topsoil removal depth and any unsuitable material should be defined in the geotechnical report. Existing pavement depths may be found in the pavement recommendation or from the borings or straight-line diagrams. Areas of differing depths should be defined separately and a different depth template assigned. Drives usually only have 2 or 3 inches of pavement vs. the roadway possibly having 5 or more.

Earthwork Summary Sheet Description

Terrain Name \*

Template Name

2A Bituminous Pavement in Fill Sections	Earth - Pavement	x" Exist Pave
8 Topsoil Removed Beneath Fill Sections	Earth - Topsoil	x" Topsoil
9 Unsuitable Material Removed Beneath Fill Sections	Earth - Unsuitable	x" Unsuitable
Limited Reuse Soils LRS	Earth - LRS Unsuitable	18" LRS Unsuitable

\* A description can be added to clarify areas. For example,

Earth - Pavement - LT Sta 21+00 - 22+25





## P-6-1D: Rock Excavation Quantities

### Introduction

A set of 25' sections is created and sent to Materials & Research for Rock line interpolation. Sheets are returned to design and scanned. Lines are drawn in plan view at each section location and the profile displayed. The scanned files are referenced into each Profile View of the section location traced and set active. Create a terrain model from all sections. Then apply a surface template.

### Create Sections for Materials & Research

#### Create Rock Terrain

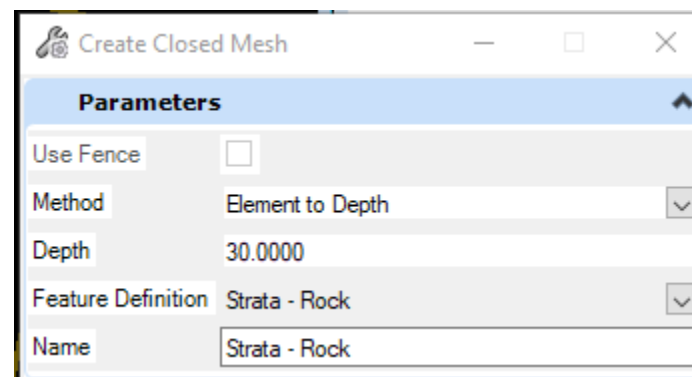
#### Create/Apply Earthwork Surface Template

After the Rock terrain model has been created, review the Dynamic sections to determine the greatest depth of rock removal. Create a new Surface template with the components vertical depth that is greater than the largest rock removal depth. Set the Feature definition to *Mesh\XS Components\Strata – Rock*. This Feature definition should have the *Volume Option* set to *Substrata*.

In the Earthwork.dgn file's *Default* model reference in the Rock Terrain.dgn. Open the *Default-3D* model.

OpenRoads Modeling workflow > *Model Detailing* Tab > Create Closed Mesh tool to create a mesh for rock calculations to be done on.

In the XSections.dgn file attach the Earthwork dgn file as well as the Rock Terrain.dgn file. The Civil analysis tool Compute cut and fill volumes is used. When it finishes, use the Create End Area Volume Report. The report will show the total Rock which can be ignored.... As well as the Strata-Rock (Removed) which is what you want to annotate onto the sections EAV table cell.





## P-6-1E: Skewed Drive Sections (and Profiles)

### Introduction

Creating skewed drive sections is a process that includes creating horizontal and vertical geometry, adding extra named boundaries to create sections as well as displaying and referencing the skewed drive profiles into those sections. The process can be done by adding the additional sections into the main group or by creating a new group of just the drives.

Open the Drives.dgn's *Default* model and reference the Combined.dgn with live nesting 1, the Geometry and Corridor dgns with no nesting. Adjust Level Display so that no *Default-3D* Levels or Models are displayed other than the Terrain's.

### Create the Drive's Horizontal Geometry

Skewed Drives should be created by elements with a tangent perpendicular from the Mainline alignment out to the P\_EP and then skewing along the drive.

Use the *OpenRoads Modeling Workflow* Geometry Tab Horizontal > Geometry Pane > **Place Line Between Points** command. Use Feature Definition *Alignment Elements*. Select 2 points along the CL of the drive in the skewed area. Use the *Trim to Element* command to extend this line back to the Corridor's EP. **Place Line Between Points** and set the snap mode to *Perpendicular*. Select the Mainline alignment and slide the tangent back and forth ensuring it's perpendicular and then snap to the skewed line's endpoint on the EP.

In the feature definition Toggle bar set Alignment Drive and use the Create Complex tool to join the pieces and create the connected drive geometry. If the drive is in a cut section a reference line (Feature = Construction Control) 7' over at the slope of the shoulder from the EP can be created using the Single Offset partial command and then the *Profile by Slope from Element*. Rename the created drive feature adding the approximate station and side for identification purposes.

### Create the Drive's Vertical Geometry

Right Click in the default view and hold until the pop-up menu displays. Move into the View Control menu and select *Views Plan/Profile/3D*. OK. When asked, hit on the Drive alignment in the *Default* view then the bottom view to display the profile in it. In View Attributes the view's Exaggeration can be modified from the Default 10 to 1 so the profile looks more like a section for easier viewing.

In the Profile View, Select **Create 3D Cut. Full** and click in the profile view to display the cut of the 3D model. Snaps will be turned off in the referenced Cut graphics. In Level Display Select and right click on the referenced Drive's *Default-3D* model and turn



## NHDOT CAD/D Connect Documentation

Snaps on by checking it. From the *Profile Creation* menu select the **Profile Intersection Point** command. Select the Drive and then the Edge of Pavement element and a point should appear on the profile at the location of the feature showing the location of the drive's intersection elevation point.

Set the *Feature Definition* to **Elements Alignment** again and create the drive profile from elements starting with Lines. The drive profile should start at the EP of the corridor using a Origin Point snap on the intersection point. Back in the profile view select the *Line* command again and you should be able to snap to Corridor's EP. If the drive is in a cut, define the second point using an *Origin Snap* selecting the Construction Control cell that was placed or set the length and slope to the next point. Adjacent Drive Slopes should not exceed a 10% algebraic difference in grades of lengths not less than 10' generally. Place the next line from the previous one with a *Key Point* snap at its end and set the length and slope of the next tangent. Use the Right arrow key to switch between them and lock the entries by hitting the Enter key. Continue until the profile matches in, the last tangent section can be Trimmed to Element to meet the existing ground. Change the *Feature Definition* to **Alignment Drive** and use *Complex Geometry by Elements* to link the pieces together. Select the connected profile and set it active. The drive should now be displayed in the 3D view.



## NHDOT CAD/D Connect Documentation

### Create Drive Profile Drawing for Xsection Reference

Review the cross section that was cut at the Drive location and determine the height of the section as well as the Top Clearance used.

With the drive's profile view active, use OpenRoads Modeling workflow > tab Drawing Production, then Select the *Place Named Boundary* tool.

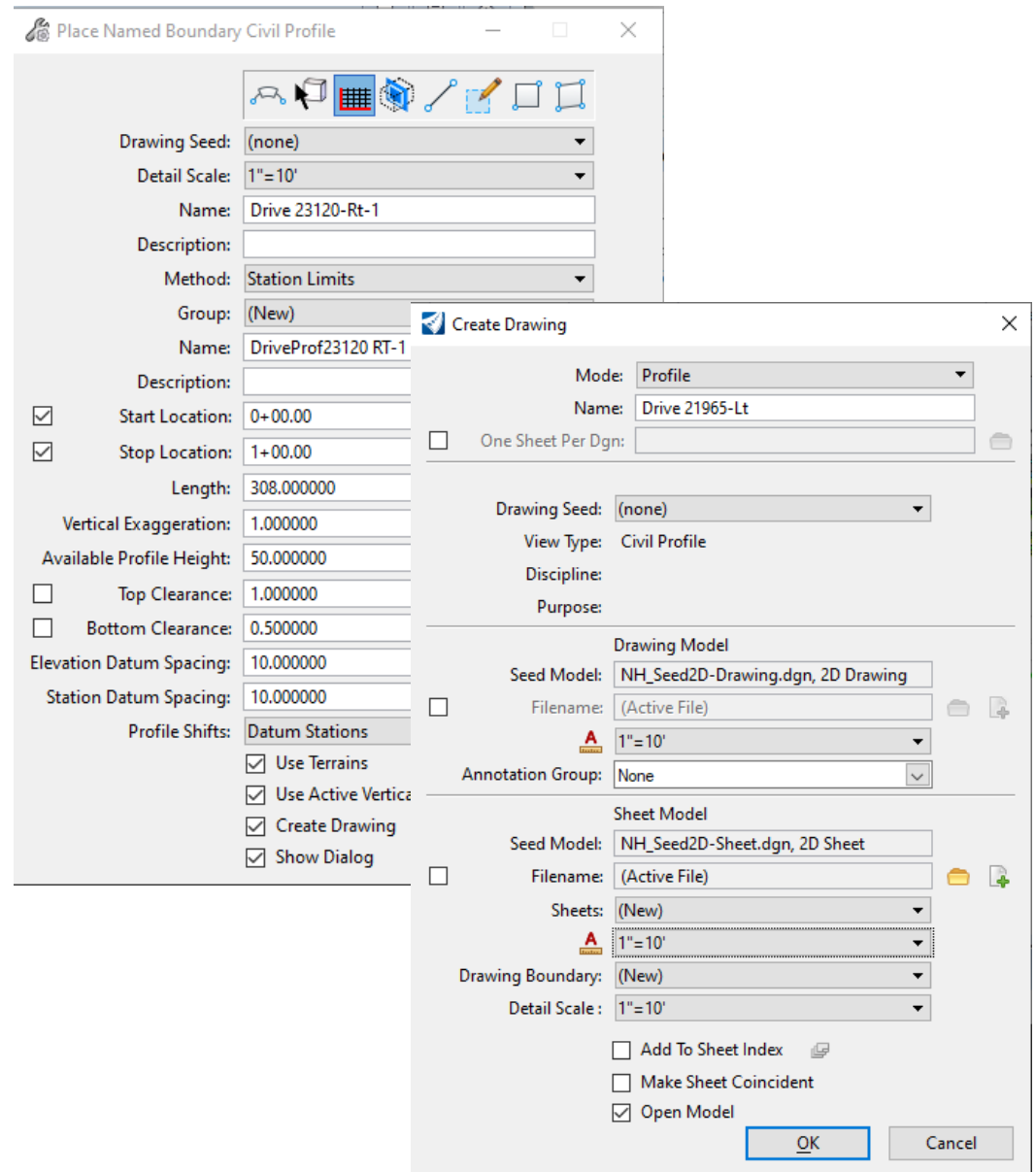
- Drawing seed (none), Detail Scale 1"=10'
- the profile should be named for its mainline station value and side.
- Start station set to 0.
- Stop location set to 1+00 for 10 scale sections set vertical.
- Vertical Exaggeration to 1
- Top Clearance to match the sections (typically 14).
- *Available Profile Height* can be limited to 40'.

Accept through the prompts to create the named boundary and bring up the create drawing box.

Fill in the *Create Drawing* box as shown. Click *OK* when done to create the drawing.

Save Settings and Save.

Open the Drawing model just created and shut off all the levels in the active model leaving the levels from the reference file turned on. Plot a skewed drive cell.





NHDOT CAD/D Connect Documentation

## Place a Drive Civil Cell and Manipulate It

After placing the drive civil cell, click on *Create 3D Cut* to display the driveways select materials in the profile view.

## Create a Station Offset Report from the Mainline Alignment to each Drive

Set the workflow to *OpenRoads Modeling > Home tab > Model Analysis* pane, select *Reports > Station Offset Report*. Select the roadway alignment and then click on each driveway alignment *Reset* to complete and have the report show up. Save this report. Each drive's profile can also be reported on and saved.

## Open Cross Sections drawing model and reference in the Drive Profile

Open the Cross Section dgn file and then open the drawing model associated to the drive section. Reference file Attach the drive profile with live nesting 99. Proposed and existing levels can be turned off for the actual section which may not follow the drives skew. This information can be clipped out of the sections drawing models reference file. Also shut off the drives profile elevations.

# P-6-1F: Controlling Displayed information on the Cross Sections

## Introduction

The various reference files contain the base information that is displayed on the sections and the cross section annotation groups control what is annotated on the sections. Other information from reference files is used to generate the End Area Volumes and the Volumes report for quantities but is not needed to be displayed on the finished cross section plots for the contractor. It may be beneficial to Create a Saved View of the display status so it can be used when annotation needs to be updated as well as one to globally shut the levels back off.

## Global Display

Global display is used to turn off levels that you don't want displayed on the cross sections. Simply turning off the display of levels in the Default-3D model is not sufficient to turn them off in the actual sections. The Global Display of levels can be achieved thru the Level Manager or thru the Level Display tools.



NHDOT CAD/D Connect Documentation

## Construction Plan Check List – for Cross Sections

Review the Construction Plan check list for a list of what should be displayed on the sections. Right click on the screen to open the View Control menu and select 2 *Views Plan/3D*. This will display both Default and Default-3D models. Make the Default-3D active. Using the Level Display change the Type from View Display to Global Display. Next shut off levels that don't need to be displayed.

Corridor and drive dgn files can have their base courses shut off so only the Top and Bottom meshes are displayed. The EarthWork.dgn can have all of its levels shut off. All survey point features can be turned off. In the XSections.dgn all of the Volumes- levels can be turned off.

When done updating the levels state, save Settings and then Save the dgn. Create a Saved View for future use to recall the Global display settings if the annotation was redone and levels were turned back on. To ensure that the changes make it to all the sheets it is suggested that the dgn is closed and reopened before printing.



## P-6-2: Plan Cut Sheets

[Return to Index](#)

### Introduction – [Creating ORD Plan Cut Sheets Video](#)

Working with ORD to create the cut sheets is a bit different than only using MicroStation as in the past. In ORD, reference files are attached both as 2D and 3D drawings. Knowing the content of each drawing will help to ensure that the correct information is being shown on the plans produced. For many drawings 2D information will be shown on the plan sheet. Cells representing the symbology of Utility and Drainage features need to be referenced from their 2D models. Corridor and Drive dgn's should have their 3D models displayed as the 3D model is the only model information that gets clipped out of the design when placing civil cells along the corridor or at Bridge locations.

The Cut Sheet Seed dgn will be set up and copied to create subsequent cut sheet sets. The default model of a cut sheet dgn is used to turn levels and reference files on and off in each sheet set, very similar to the Master dgn's view definition in SS4.

\*\*\*\* Note that for plan and profile cut sheets, the Sheet model has the Drawing model attached with *Display Overrides* set to **Never** and the Drawing model has the *Default* model attached with *Display Overrides* set to **Never!** This means that if you want to turn a level or reference file on or off you need to open the *Default* model, modify the view and save setting and save the dgn to save the Reference and Level state. You may have to reopen the dgn to see the changes propagated through to the sheet models!

### Create Cut Sheet Seed dgn - Attach Reference Files

Create new drawing *12345-Cut-Sheet-Seed.dgn* either in the CutSheet folder of the prj directory or create a new \CutSheet folder in the OpenRoads folder. Use the ORD seed file - ...NHDOT\Standards\Seed\NH\_SeedORD\_Design.dgn

With the new drawing open and its *Default* model active, attach the project's reference files. Use *Reference File Attach* and attach the Combined.dgn with live nesting set to 1. If using a Proposed Container file, also attach that with live nesting set to 1. All other proposed files such as the Corridor, Drainage, Drive, and Utility files should be attached with live nesting set to 0. MicroStation's files can be attach using the *Drawing* workflow > *Utilities* tab select the **NHREF** Macro > **PLAY**. The nhref macro may attach some of the civil drawings like the Geometry drawings so review the attachments carefully.

The *Open Ref Lev* macro can be used to turn levels and reference file display off / on for a particular plan set. It will only work if the Reference file's logical names were defined during the attachment process. The *Default-3D* model attachment's logical name will not be defined and must be assigned by hand. See the Drawing name list for Logical names of Civil drawings.





## NHDOT CAD/D Connect Documentation

Use Level Display to turn levels on and off for the plan set. Remember to look at both the *Default 2D* model's levels as well as the *Default-3D* attached model levels. Can turn some levels *Off* that you know will be off in any cut sheet such as the Corridor outlines, Template Drop outlines. The Right click menu can be accessed and Off by element used to shut off displayed levels.

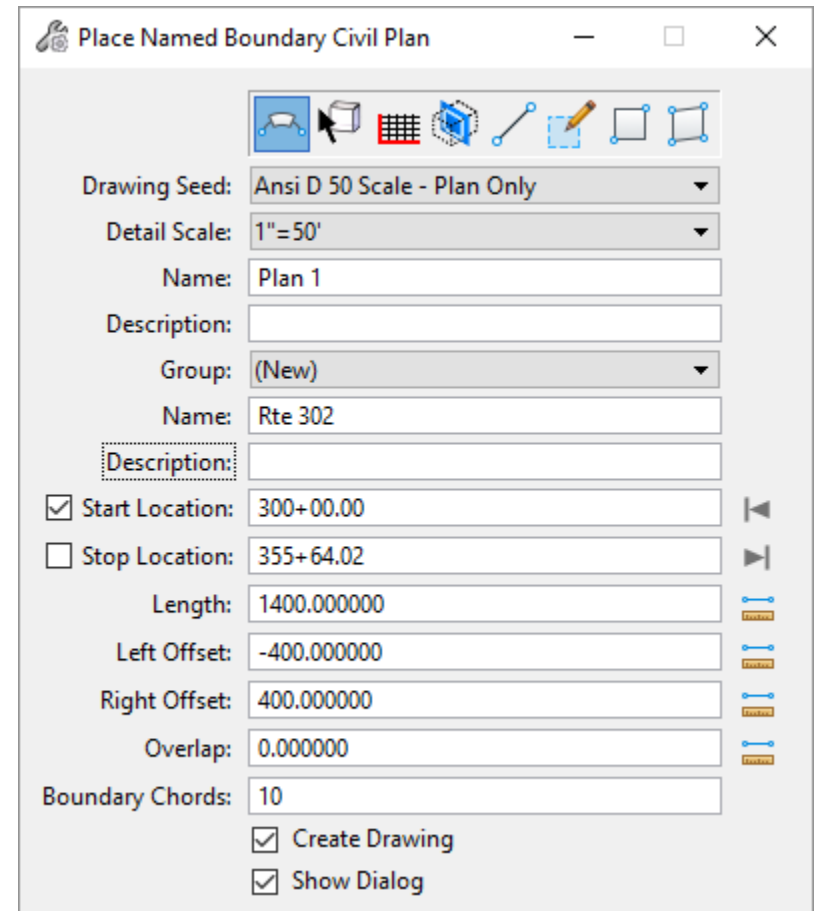
Save Settings and save the dgn.

## Create Named Boundaries

*Named Boundaries* are the clipping elements for the cutsheets. The *Place Named Boundary* tool is used to create the named boundaries of the various types of plans, from plan, profiles to cross sections and details.

Set the workflow to *OpenRoads Modeling > Drawing Production > Named Boundary* tool

Select the Drawing seed in the top and then select the Alignment in the *Default* model *View 1*. Ensure the correct geometry and name is selected by viewing the popup information on your cursor. Set the start station of the first cut sheet and then move to the location of the end of project and select the stop location.



**Place Named Boundary Civil Plan**

Drawing Seed: *Ansi D 50 Scale - Plan Only*

Detail Scale: *1"=50'*

Name: *Plan 1*

Description:

Group: *(New)*

Name: *Rte 302*

Description:

Start Location: *300+00.00*

Stop Location: *355+64.02*

Length: *1400.000000*

Left Offset: *-400.000000*

Right Offset: *400.000000*

Overlap: *0.000000*

Boundary Chords: *10*

Create Drawing

Show Dialog



## NHDOT CAD/D Connect Documentation

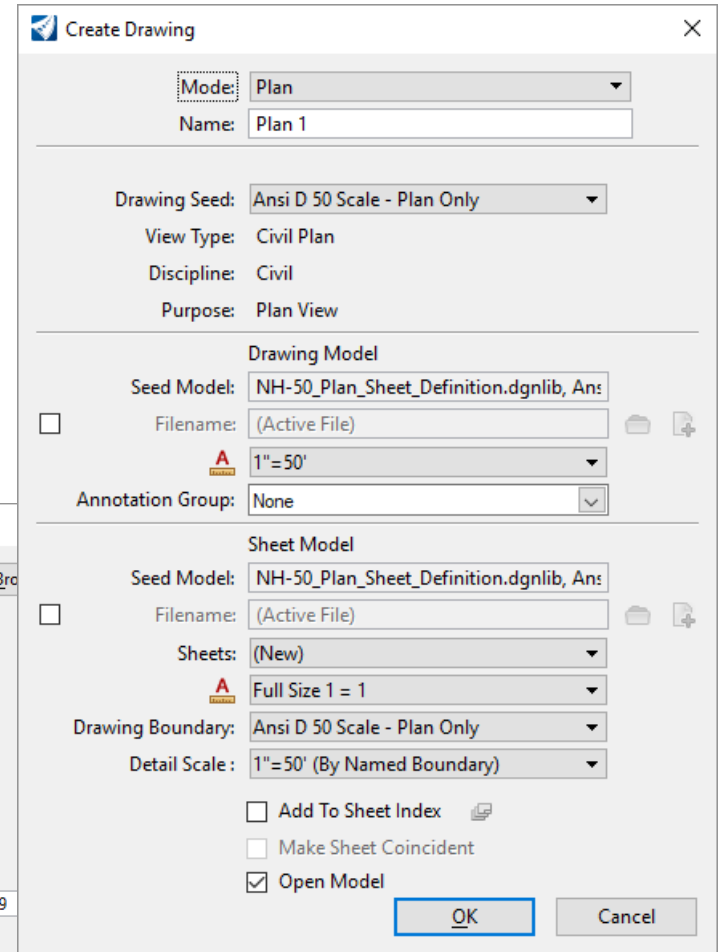
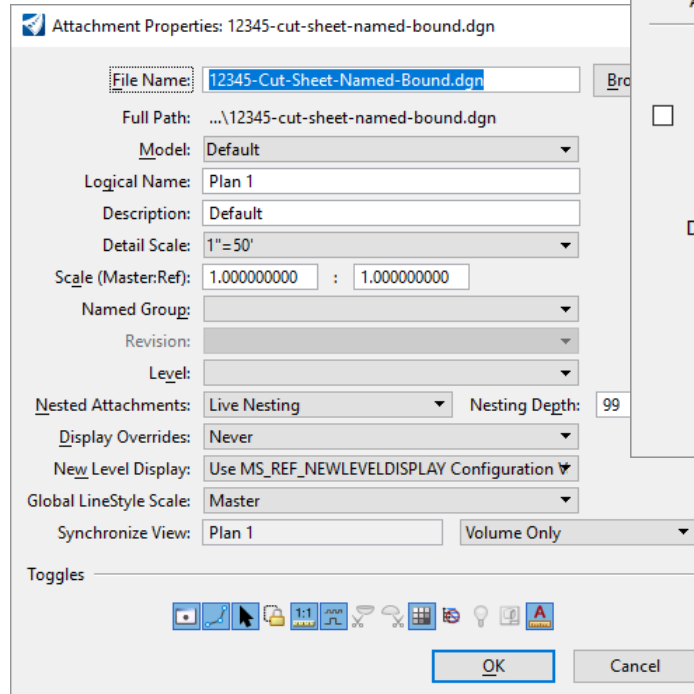
### Create the Drawings (from checking the Box)

Sheets of equal length will be created. Sheets can be placed one at a time of varying lengths. Select any sheet Boundary and you can move vertices to change the shape of the clipped area. With the *Create Drawing* box checked, the cut sheet Drawing models and the Sheet models will be created. It is suggested that you actually uncheck the *Create Drawing* box and verify that the sheets are where you want them. Modify the *Named Boundaries* then use the *Named Boundaries* Tool Box to create the drawings.

Accept through the prompts.

The *Create Drawing* box is as shown. Use the default *Annotation Group* (Plan Annotation). Change the Logical name to the plan type you are creating. i.e. DRN PLAN 1, or GEN PLAN 1. Click OK

This image shows the Drawing Model's properties. Note the *Display Overrides* are set to *Never*, and the model is synchronized to Plan 1 Saved view.





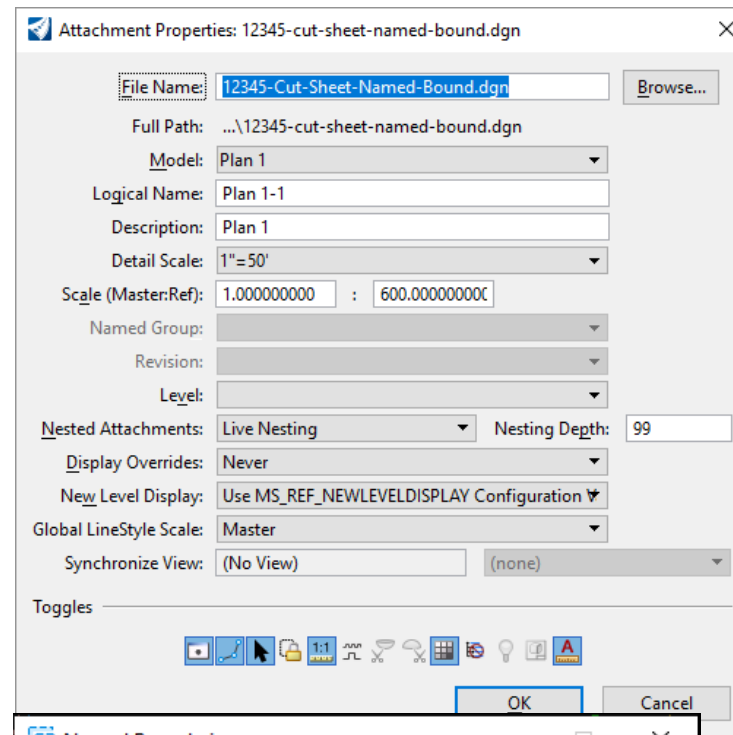
## NHDOT CAD/D Connect Documentation

This is the Sheet Model's Reference Attachment settings of the Drawing Model. Note that the Display Overrides are set to Never.

After reviewing the Drawing and Sheet models return to the Default model in View 1, Save Settings and Save the DGN.

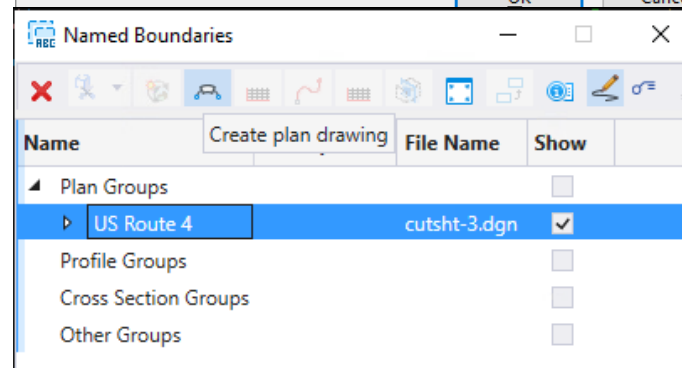
To create the first set of cut sheets use the *File > Save As* command and choose the folder and drawing name. 12345-Gen-Plans.

The Drawing will open. Note that if you view the *Default* model you will see that the view's level state is the same as the sheet model's.



### Create Drawings from the Named Boundaries Toolbox

Below and to the right of the Named Boundary tool click on the down arrow. This will open the Named Boundaries box. After creating all the boundaries and modifying them the drawings can be created by selecting the plan group name and clicking on Create Plan Drawing. If the Show Create drawing dialog toggle is set the create drawing box will appear. Click Ok to create the drawing and sheet models.





## NHDOT CAD/D Connect Documentation



Open the *Default* model view. Use Level Display to shut off any levels not appropriate to the Plan Type. Corridor dgns should display their 3D levels so that any clipped areas will not display, DU dgns should display their 2D model's levels as that is where the 2D annotation cells are. The Guardrail levels are an exception. The corridor's *Default* model should have the Guardrail turned on and have it turned off in the *Default-3D* model.

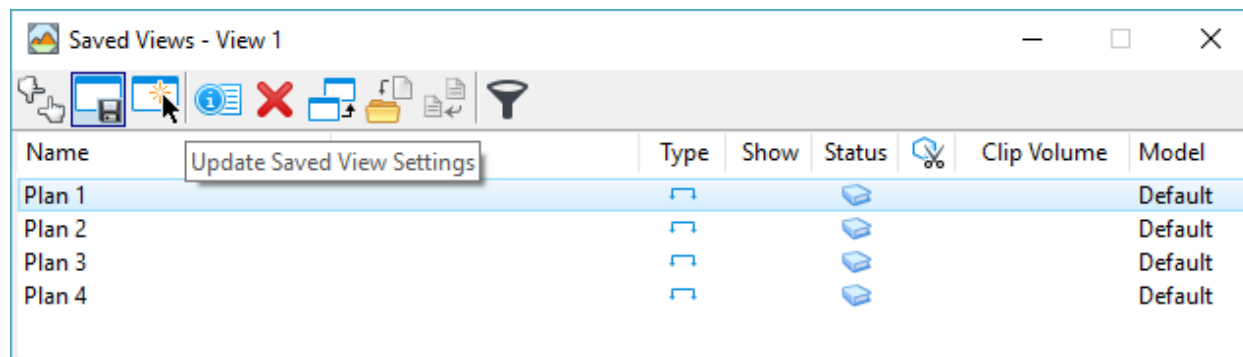
When the *Default* view setup is finished *Save Settings*, Save the DGN. Reopen the dgn and all sheet models should be synched with the drawing models which is synched to the *Default* model. When changes to the level state or additional reference files need to be attached do it in the *Default* model, Save settings, save the dgn and reopen the file to see the changes propagated through to the sheet models.



## NHDOT CAD/D Connect Documentation

### If the sheets become out of synch with the Default model (should not need to be done!)

Go to the OpenRoads Modeling workflow, then Saved views. With the *Default* model displayed in view 1 select the first *Saved View*, Plan 1 and use the *Update Saved View Settings* tool and click in the view. Repeat for each defined Saved View. *Save Settings*, Save the DGN then **CLOSE** it.



Reopen the DGN and open a Sheet model. The Sheet model’s level settings should reflect what was saved in the *Default* model.

Saved views also save the views extents. So, when the views are updated from view 1 the drawings model’s “clip extents” are lost. The first time this process is done the Sheet model’s clip needs to be re-established. Open each Sheet model, used the Reference Files dialog box to highlight the referenced drawing model and then use the Clip Boundary tool and hit on the named Boundary to re-clip the reference file.

Open each drawing and sheet model and make sure the reference files *Display Overrides* are set to **Never**.

Additional levels can be turned on or off. When finished Save Settings, Save the DGN and then **CLOSE** and Reopen it to see the changes.



## P-6-3: Profile Cut Sheets

[Return to Index](#)

### Introduction – [Creating ORD Profile Cut Sheets Video](#)

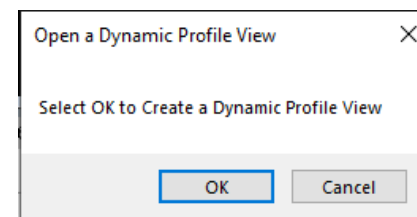
Profile cutsheets are generated similar to plans in that a profile view seeds the create drawing models which in turn are referenced into sheet models. They are generated in ORD using established procedures. The seed profile view can contain a live cut through the attached reference file's 3D models as well as displaying reference profiles of Drainage and Utility profile runs. After creating the profiles the SuperElevation information can be annotated at the bottom of the profile using a special annotation group.

### Create the Profile CutSheet Drawing and Attach Reference Files

Open ORD and use the file New command to create *12345-Prof-Seed.dgn* in the \cutsheet directory. Open the *Default* model and Reference file attach only civil drawing to this dgn including all drawings that have information to be drawn and annotated on the profiles. This should include the E-Terrain, E-Drainage, E-Utilities, Geometry, and proposed corridors, as well as the P-Drainage, P-Utilities and the SuperElevation dgnos. Set the existing terrain model active. Save settings and Save the dgn. Either copy the dgn and rename it or use a *File > Save As*, to create *12345-Prof-Roadname.dgn*. The seed file can be copied to create drawings for other roads.

### Open Profile View

Right click and hold on the screen and select - **3 Views Plan/Profile/3D** from the *View Control* menu. This will open 3 views with the two on top being the *Default* and *Default-3D* models. Click **OK** in the pop-up box to create a Dynamic Profile view. In View 1, as prompted Select the Alignment that you want to create the profile for and then click in the bottom View 4 to create the profile.



If the command ends without placing the profile you may have hit on the alignment's 3D geometry rather than the 2D alignment. Select the alignment in the *Default* model, reset or tentative snap as needed to ensure you hit on the 2D alignment, then hover on it and from the pop-up menu select the **Open Profile Model** and click in the bottom view to create it. If having trouble turn off the display of the referenced *Default-3D* model and anything else under the alignment to be able to select it. **Save Settings** and **Save** the dgn.



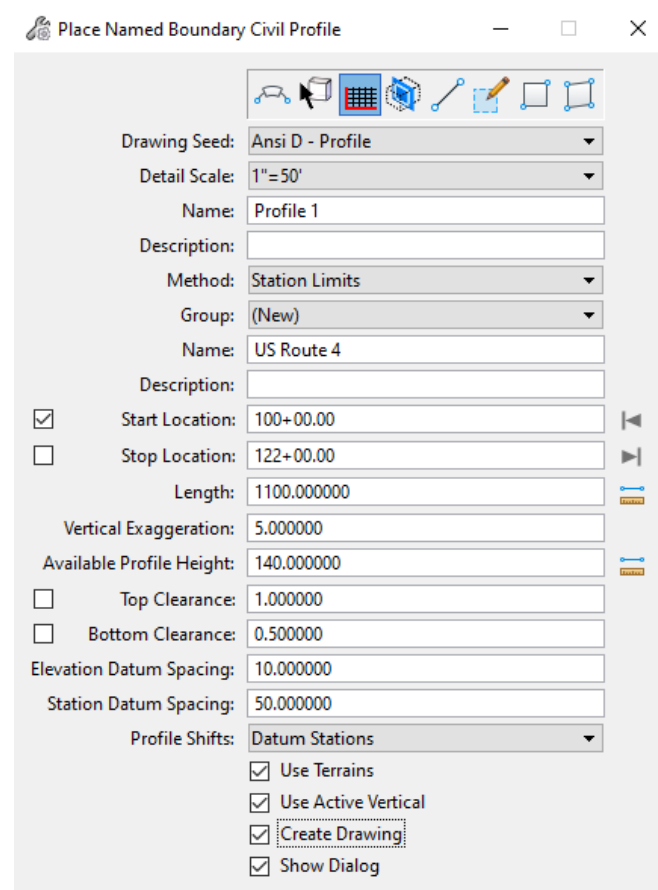


## NHDOT CAD/D Connect Documentation

### Create Profile Named Boundaries

Set the workflow to *OpenRoads Modeling, Drawing Production > Named Boundary* to open the *Place Named Boundary* tool. Select the *Civil Profile* icon and set the *Drawing Seed*. Next, click inside the profile view to start the command. This sets the *Name* and associates the stationing to the Start and Stop locations so they can be set. Profile sheets should be 50 scale even if the plan scale is 20.

The start location can be set in the view as the station value follows the cursor. It is suggested that you key-in the start. If you use the *Lock to Start* button at the right, it will lock to the start of the active profile not the start of where you may want a couple 100 feet before the proposed. After setting the start station move the cursor to the right along the profile and boundaries will be displayed of the length indicated. Change the length until the last sheet has about the same length as the rest displayed within its boundary. The Default height is set to 160'. If you intend to display superelevation information under the profile set it to 140'. The *Create Drawing* box can be checked so the *Create Drawing and Sheet Model* box is displayed automatically. Accept through the prompts to finish creating the Boundaries.



Place Named Boundary Civil Profile

Drawing Seed:

Detail Scale:

Name:

Description:

Method:

Group:

Name:

Description:

Start Location:

Stop Location:

Length:

Vertical Exaggeration:

Available Profile Height:

Top Clearance:

Bottom Clearance:

Elevation Datum Spacing:

Station Datum Spacing:

Profile Shifts:

Use Terrains

Use Active Vertical

Create Drawing

Show Dialog





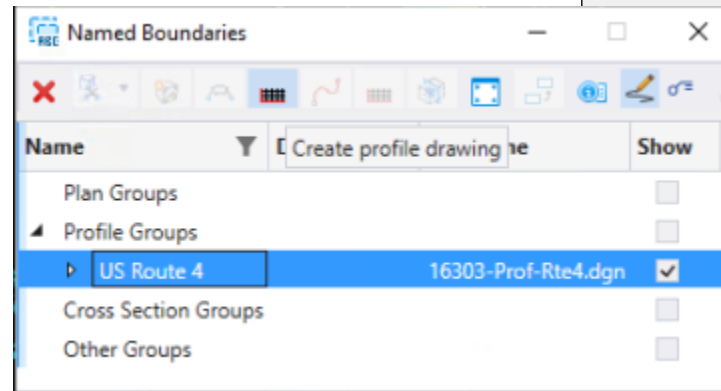
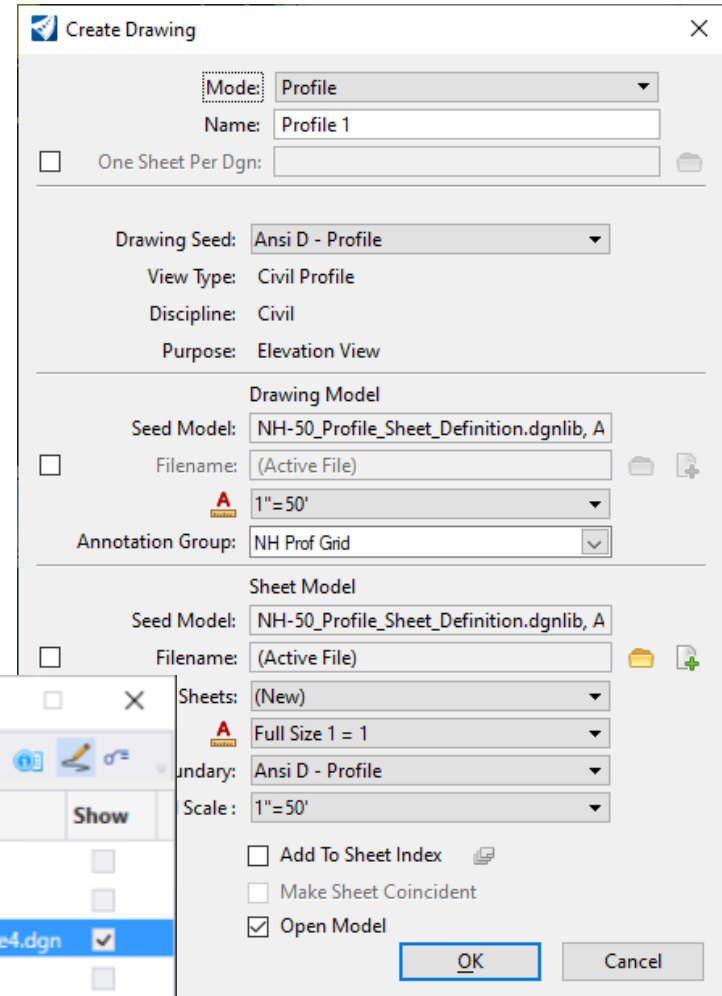
## NHDOT CAD/D Connect Documentation

### Create Profile Drawings

The *Create Drawing* box should be filled in by default and no changes are needed. If you want the drawing to automatically be added to the *Sheet Index*, check the box and then select the folder icon to the right to select the folder for the sheets to be added to. Hit **OK** and the sheets will be created.

If the *Create Drawing* box was not checked when creating the boundaries, the sheets can be created using the *Named Boundaries* tool box.

Below and to the right of the *Named Boundary* tool, click on the down arrow. This will open the *Named Boundaries* box. The drawings can be created by selecting the profile group name and clicking on *Create Plan Drawing*. If the *Show Create* drawing dialog toggle is set, the create drawing box will appear. Click **OK** to create the drawing and sheet models.





## NHDOT CAD/D Connect Documentation

### Add 3D Cut to Profile

Open the profile view again from the View Groups menu selecting MultiModel Views. This should return you to the 3 View setup with the profile at the bottom in view 4. Use the *View Tool* and select *Create 3D Cut*. The modes are *Full Profile* or *Corners*, use *Corners as there seems to be a bug with full*. Place from top left to bottom right around the profile. This will cut through all displayed features in the *Default-3D* model and show them on the profile. The Drawing models and sheet model will automatically also display this information. If there is a reference file you don't want to display shut off its display in View 3. *Save Settings* and *Save* the dgn, and refresh the 3D cut.

NOTE: The 3D cut will display all levels in a reference file. Levels can be turned off individually in the profile view, but you have to use *Level Display* and Expand the referenced *Default-3D* model's levels to do it. You cannot use *Off by Element*.

For a list of things that should be in the cut see the Profile construction plan check lists.



## NHDOT CAD/D Connect Documentation

### Profile Annotation

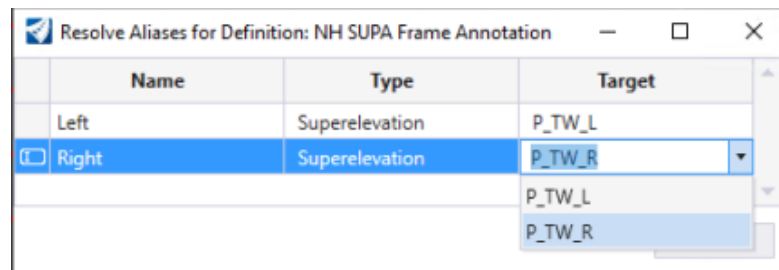
When profiles are created, they are annotated from the *Annotation Group NH Prof Grid* as selected in the *Create Drawing Box*. The alignments are also annotated by their assigned annotation group. If the proposed vertical alignment changes, cutsheets don't have to be regenerated unless you need them to be different length or have a sheet added. The annotation just needs to be updated.

Open one of the Drawing models. A drawing model is where the annotation is created. If you needed something moved, edited or added, this is where you need to work, in the Drawing model. To update an alignment's Annotation, the annotation first needs to be removed from the drawing. Set the workflow to *OpenRoads Modeling > Drawing Production Tab > Annotations* pane click on the bottom of the *Model Annotation* tool to show the dropdown menu and select *Remove Model Annotation*. Check the *All Drawing Models* box and click on the screen. To re-annotate the drawing select the dropdown again and select *Annotate Model*. Check the box for *All Models* and use the dropdown menu to select *NH Prof Grid*. Accept. If the SuperElevations were annotated previously they will need to be re-annotated also.

### Adding SuperElevation Information

If Roadway Superelevation sections have been created, they can be used to create the superelevation schematic below the profile. The Superelevation drawing must be attached to the *Default* model for them to be present to annotate. Select the *Model Annotation* tool, Check the *All Models* box, and use the dropdown to select the *NH SuperElevations* annotation group. Click on the screen to accept.

The *Resolve Aliases* box will appear. Superelevation lanes need to be attached to the Left and Right profile schematic lines by selecting the Targets in the Target boxes. The names are from the SuperElevation control lines that were created and attached. After defining the second target it is important to click in another box to ensure the second target is actually defined. Click on the screen to Accept and create the schematics.



Note: Only a left and right are defined. Development will need to be done to annotate more than 2 lines.



## P-6-6: Creating Drainage Profiles for Plotting

[Return to Index](#)

### Introduction – [Create Drainage Profile - Video](#)

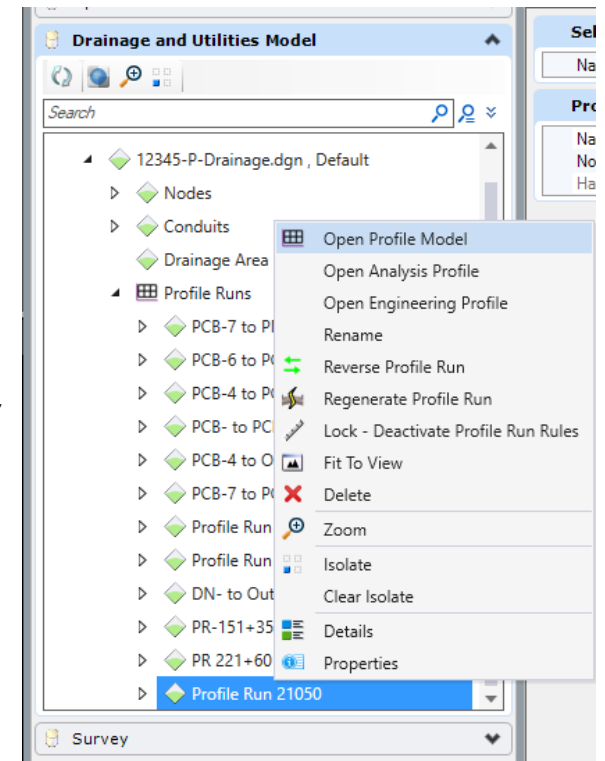
Drainage profiles are needed for complex drainage runs that cross other underground pipes and utilities. They can be used to determine limits of excavation as well as to review depth of cover. Not all drainage runs need to have profiles included in the contract.

Drainage profiles should be created by following the Section on P-8-1 - Creating Proposed Drainage Features – Drainage Profile View. The Actual Drainage profile needs to be created within the dgn that contains the Drainage and Utility Database. The Drawing and Sheet models can be located in a different dgn. These drawings can become rather large very quickly. It is recommended that different areas of the project get modeled separately to keep the files smaller and working well.

With the appropriate Proposed drainage drawing open use the Right click menu - *View Plan/Profile* then Cancel. Open Explorer from the home tab and then open the Drainage and Utilities Model view in the explorer. Expand the entries to get to the Profile Runs list. Select the profile run, then right click and select *Open Profile Model*. Click in the bottom view to open the profile.

From the *View Attributes* tool change the Exaggeration to 1 and zoom into the profile. Use the *Annotate Elements* tool at the end of the view tools to annotation all elements in the profile. (May need to zoom out or in to see the annotation).

From the View tools select the *Create 3D Cut* tool and set to *Corners* accept and then drag a box around the profile to place it. This will display all the elements from the *Default-3D* model into the Profile.





## NHDOT CAD/D Connect Documentation

Change to the Drawing Production Tab and select *Create Named Boundary*. Drawing seed = **Ansi D – Drn Prof 10**, Detail Scale **1"=10'**, Vertical Exaggeration = **1**, and then click inside the profile view. Next update the start station Setting it to -10, left click to accept (a box should then be shown), set the Profile Height = **50**, and update the length as needed to encompass the profile. The Length should not exceed 300 as that is what fits on a landscape border. The height and the top clearance can be adjusted to get the profile centered in the Box. Update the name of the detail to include the station to station (or crossing station) value of the drainage run.

Left click inside the view to accept each entry and bring up the Create Drawing Box.

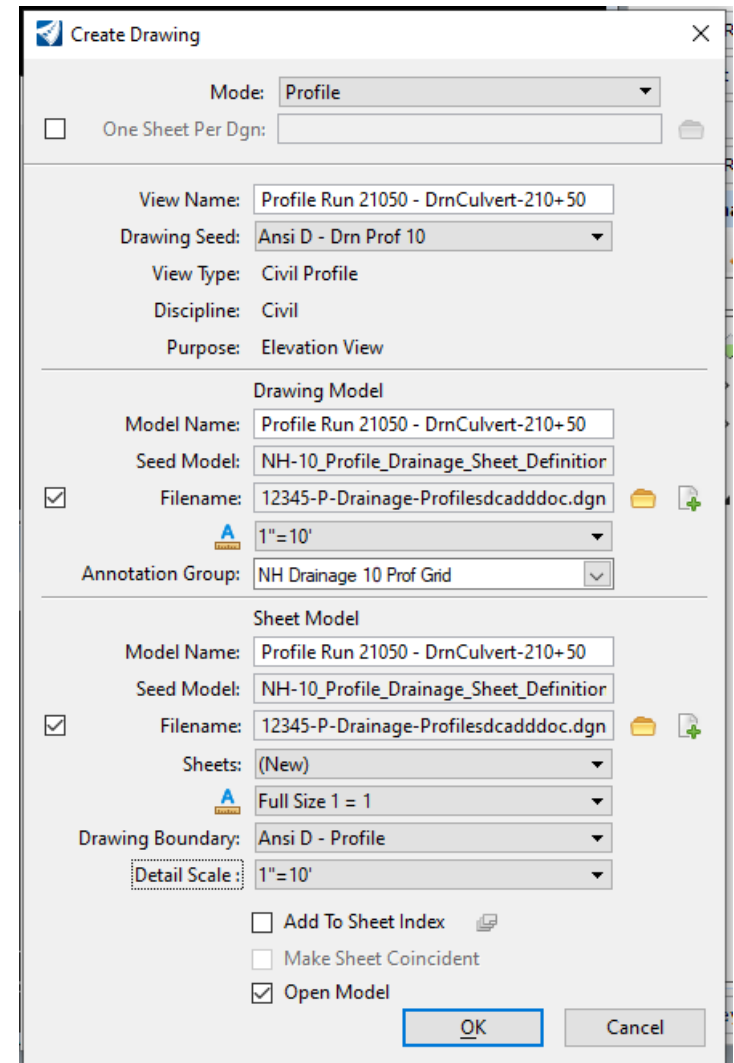


## NHDOT CAD/D Connect Documentation

The drainage profile models can be created in the same dgn or in a separate dgn. Check the boxes next to the Filename and in the Drawing model use the green + to create a new drawing or the folder to select a previously created drainage profile drawing. In the sheet model section use the folder to select the just create drawing to contain the profiles. Set the annotation group to NH Drainage 10 Prof Grid and set the detail scale at bottom to 1"=10'. Click OK.

The profile drawing and sheet models will be created in the designated drawing. Text and labels can be added in the Drawing model and in the Sheet model, the reference file can be moved to the desired location.

If adding an additional profile to an existing sheet the Sheets: toggle can be changed from (New) to the actual sheet name already created



**Create Drawing**

Mode: Profile

One Sheet Per Dgn:

View Name: Profile Run 21050 - DrnCulvert-210+50

Drawing Seed: Ansi D - Drn Prof 10

View Type: Civil Profile

Discipline: Civil

Purpose: Elevation View

---

**Drawing Model**

Model Name: Profile Run 21050 - DrnCulvert-210+50

Seed Model: NH-10\_Profile\_Drainage\_Sheet\_Definitior

Filename: 12345-P-Drainage-Profilesdcaaddoc.dgn

Annotation Group: NH Drainage 10 Prof Grid

---

**Sheet Model**

Model Name: Profile Run 21050 - DrnCulvert-210+50

Seed Model: NH-10\_Profile\_Drainage\_Sheet\_Definitior

Filename: 12345-P-Drainage-Profilesdcaaddoc.dgn

Sheets: (New)

Drawing Boundary: Ansi D - Profile

Detail Scale: 1"=10'

Add To Sheet Index

Make Sheet Coincident

Open Model

OK Cancel



NHDOT CAD/D Connect Documentation

## P-6-7: Contour Creation (CTR and PCN) for plans from Terrain

[Return to Index](#)

### Introduction

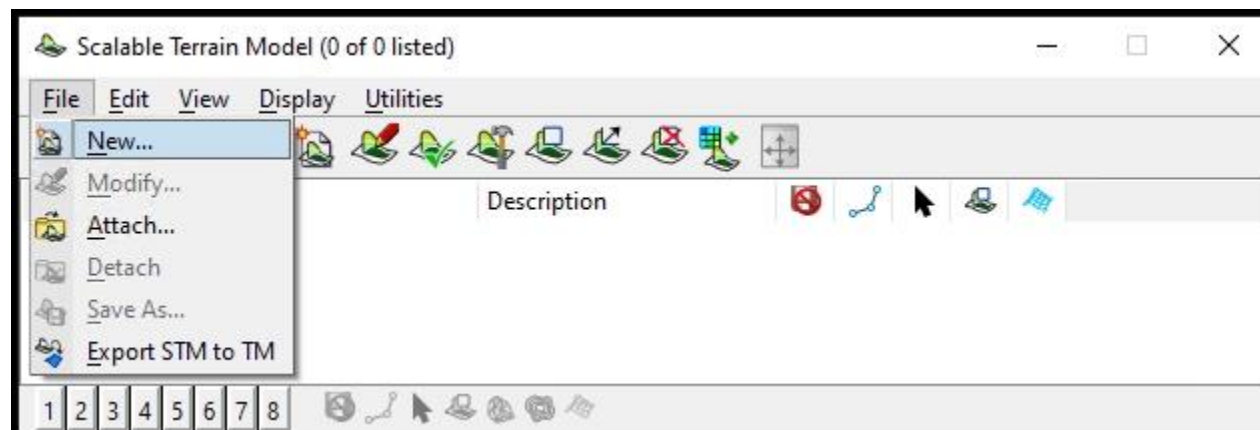
Contours can be extracted from a STM (Scalable Terrain Model) or a TM (Terrain Model). A STM can also be used to create HEC—RAS sections. The STM can be created from several different sources including files, points, breaklines or ORD Terrain Models. These combined STM can be exported to a TM, Contours Extracted or saved for future use.

[https://communities.bentley.com/products/3d\\_imaging\\_and\\_point\\_cloud\\_software/w/wiki/10678/extract-contours](https://communities.bentley.com/products/3d_imaging_and_point_cloud_software/w/wiki/10678/extract-contours)

<https://nhgov.sharepoint.com/:v:/r/sites/DOT-ProjectCentral-Home/CADD%20Document%20Library/nh-ord-microstation-contour-from-terrain.mp4?csf=1&web=1&e=AbbZ6d>

### Create A Scalable Terrain Model including an ORD Terrain Model

Create \ Re-Crete a new *12345ctr* or *pcn* dgn using a 3D MicroStation seed file to contain the Contours in the \PRJ directory. The drawing should be opened into its *Default-3D* model. Switch the workflow to **Reality Modeling** > **Attach** tab and select the **Scalable Terrain Model** tool in the bottom right of the *Scalable Terrain Model* pane.



Select **File** > **New...** and name the STM with the name. **12345-E(P)-STM.stm**





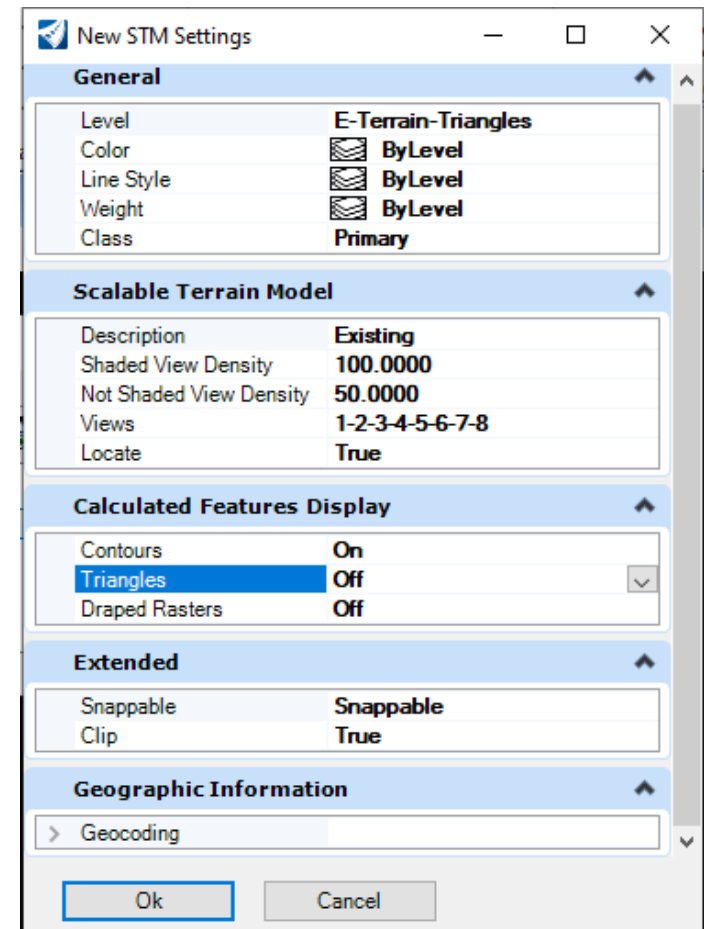
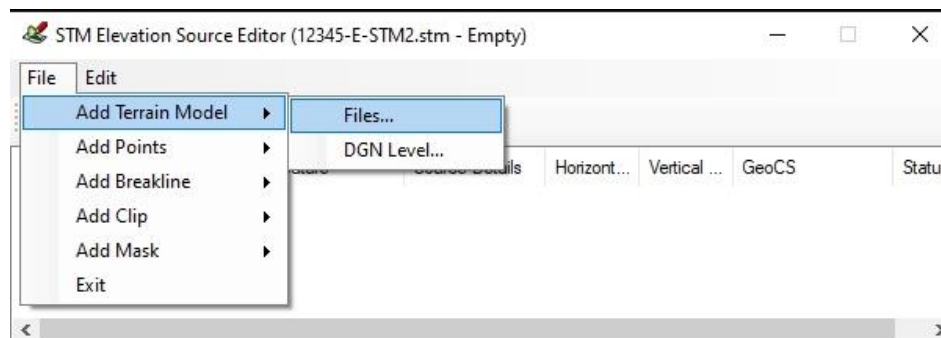
## NHDOT CAD/D Connect Documentation

The *New STM Settings* box will be displayed. Set the Level, add a Description, contours-on, triangles-off and set the geographic coordinate system. Click **OK**. This will create the STM.

Next the Terrain model needs to be attached to the STM. Use *File > Modify* to Open the *STM Elevation Source Editor*. In the Editor use **File > Add Terrain Model > DGN Level...** Select the attached Terrain and the **E-Terrain** level then click **Select**. The Terrain will be added to the STM but not visible. This allows you to add additional terrains or other features to the STM if needed.

Use **Edit > Generate** or click the **Generate** icon to display the generated STM.

Close the *STM Elevation Source Editor*.

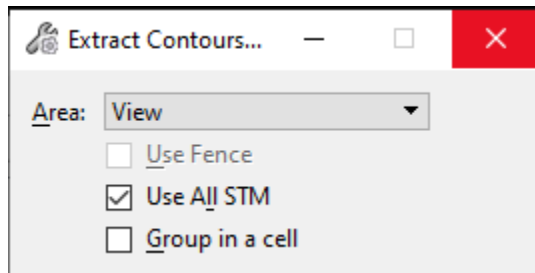


NHDOT CAD/D Connect Documentation

## Create the Contours and Update the Symbology

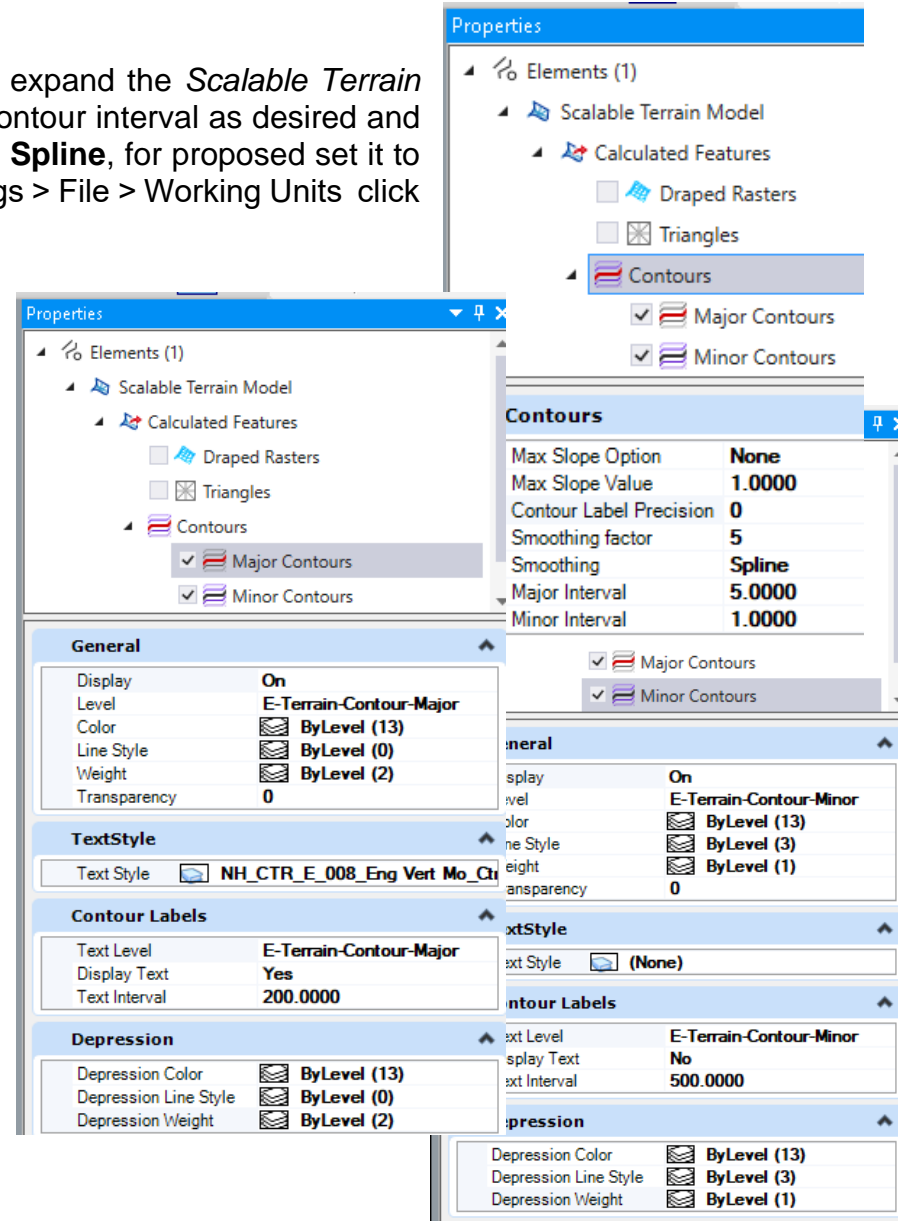
Use *Element Selector* to select the STM. In the *Properties* box expand the *Scalable Terrain Model's* Calculated Features and select *Contours*. Change the contour interval as desired and set the precision to **0**. For existing contours set the smoothing to **Spline**, for proposed set it to **none**. To remove the ' symbol from the contours use File > Settings > File > Working Units click Custom to delete the Labels.

Expand the Contours dropdown and set the properties of the Major and Minor Contours as shown. (P- for proposed) In the *Scalable Terrain Model* box, select **Edit > Extract Contours**. The *Extract Contour* tool will display. Use the Area drop down to select the mode of the contour boundary for Extraction. Uncheck the *Group in a cell* box. Define the Boundary to extract the contours and accept the extraction.



Using the *Scalable Terrain* tool, the STM can be saved and detached from the drawing leaving the contours. The text justification of the labels may need to be changed. Use element selector and select all text in the drawing and use *Change Text* attributes to change the justification only to Top Right.

Save and Exit the dgn.





## Creating Proposed Terrain Models

[Return to Index](#)

### Introduction

Proposed terrain can be created from Elements using a graphic filter or by selecting the elements desired. On long slopes this method can result in some slope waffling as the triangles try to connect to the nearest points of each feature rather than going from the top of slope straight to the bottom. It is for this reason the preferred method is to build Proposed Terrain Models from the corridor meshes.

The process is to reference all the meshes into the dgn, review them and copy any that need to be edited into the dgn. They can be moved into different levels so they can be displayed independently and edited easily using the Edit Mesh tools. Large meshes can be split into smaller pieces. These referenced and edited meshes are then used to create a Terrain from Elements.

If the referenced corridors or drives are updated in the future the terrain model can be updated by selecting it and updating from source. Previously copied mesh elements can be removed from the terrain model, the updated ones copied back into the drawing, edited and then added back into the Terrain.

A third method is to reference the design files and use the **Create Terrain Model from Design Meshes**. The meshes don't need to be displayed as part of the corridor feature definition, it will find and create the Top or Bottom Terrain from all the design mesh elements in the dgn's that are referenced. The drawback is that the Terrain may need to be edited which is harder than editing copied meshes.

### P-7-1: Creating Proposed Terrain Models from Mesh Elements

#### Copy and Edit the Meshes

The Corridor's Feature definitions on your project need be set to either Concept 5X w/ Meshes or Final w/ Meshes so that the P-Mesh-Top and -Bottom meshes are created. This can be done on a Corridor by Corridor basis or the Explorer - OpenRoads Model tab can be used. For linear Templates set them to Final w/ Meshes. Surface templates have components for Top and Bottom Mesh elements.

Open the *P-Terrain.dgn*. Attach all files that are to be included in creating the Terrain such as the corridor and drive files as well as any other special plan files needed.

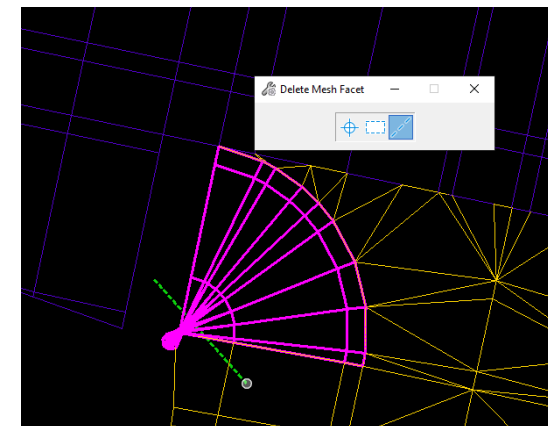


## NHDOT CAD/D Connect Documentation

Open the Default-3D model. In level display select all the reference files and turn off all levels and then turn on the *P-Mesh-Top*. Create a new level called **1-mesh**, set the color, and then make active. Review the mesh elements, copy any that need to be edited into the dgn. Change their Level and color so they can be identified separately from others.

Shut off the display of all the referenced files in the *Default\_3D* display. Create a new level called **2-mesh**, set the color, set Active. Use *Change Element Attributes* to modify the display of alternating Mesh pieces. Continue until no adjoining meshes are the same.

WF > *Drawing* > *Mesh Tab* > *Modify Meshes* pane. Select the *Delete Mesh Facet* tool. Set the *Type* on the tool to **Line**. Select the mesh to edit such as a drive radii mesh and draw a line across the overlapping slopes at the toe. **Accept!** This will remove the overlapping mesh elements.

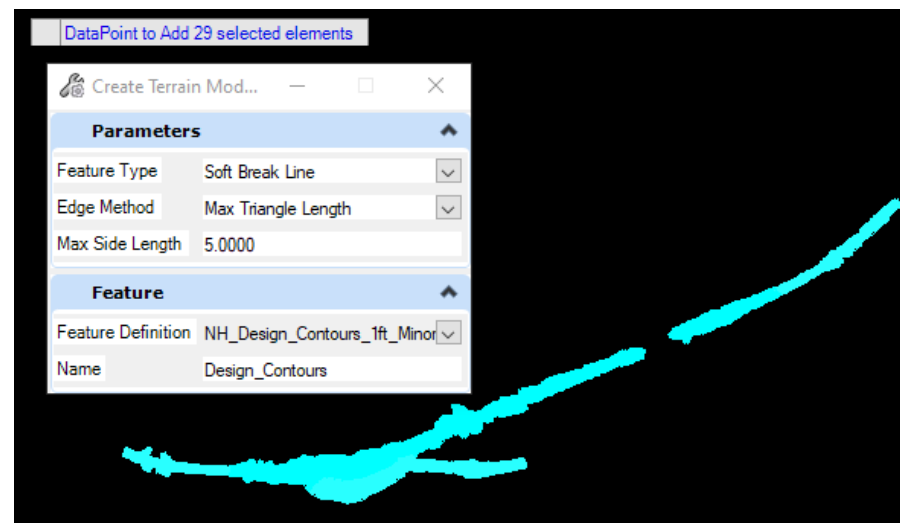


Continue Zooming and rotating your view, identifying all areas of overlapping mesh elements and deleting the overlaps from the appropriate mesh. Use any other mesh editing tools needed to update the models. The *Split Mesh* tools can be used to separate mesh elements that cross a bridge area so that terrain for each side can be edited\created independently. The *Mesh Utilities* tab has the *Cleanup Mesh* tool that removes many facets of a terrain simplifying it.

To view the results of your manipulations you can create a terrain model from elements and turn on the contours or flow arrows to view an area. Delete the terrain when done and keep moving to other areas that need attention.

When finished editing the meshes, turn on the display of any Reference files that contain mesh elements that did not need to be edited. Fit view. Select all the meshes needed for the terrain. Use WF > *OpenRoads Modeling* > *Terrain Tab* > *Create from Elements* tool. Feature type - **Soft Break Lines**, max triangles **20'** Feature **NH\_Design\_Contours\_1'\_Minor**, Accept.

Shut off the all the mesh levels. Review the terrain. If any meshes were missed add them in. The referenced Design files linear features can be displayed to help review the terrain. Right click and open 3 Views. Use the *Default* view to select the main corridor and Display Dynamic sections. Move through the sections comparing the surfaces.





## NHDOT CAD/D Connect Documentation

### Editing Terrain Created from Meshes

When Corridors or drives are updated the associated meshes are updated but the copied and edited meshes and the terrains created from them are not. In some cases, it may be beneficial to just recreate from scratch depending on the amount of changes that have occurred since the Terrain was created. If there are specific areas that need to be updated that can be easily accomplished.

Open the DGN's Default 3D model. Select the terrain model and **Update from Source** to refresh the referenced mesh elements. Turn on the display of the reference files and compare the numbered mesh levels that it was created from. Delete any outdated mesh elements. Select the updated mesh elements from the referenced files. Copy them into the view. Edit the copied terrains if needed. Use the *Add Features* tool to add them to the Terrain model.

### P-7-2: Creating Proposed Terrain from Graphic Filter

Design and Subgrade terrain model surfaces need to be created for the cross sections. These will also be exported in LandXML format for turnover to construction. The Design terrain model and the existing terrain will also be combined to create a Composite terrain model for use with Drainage & Utility tools to design Proposed Drainage.

When included with cross sections, the design and subgrade will be displayed with line weight **4** that the proposed sections should be drawn with.

When a design is created by using one of the corridor templates, feature definitions are assigned to the elements being created (edge of pavement, top of slope, toe of slope, etc). The process which is described here is dependent on the drawing containing those features. Graphical filters select the features that would be used for a specific surface definition. For example, the NHDOT *Subgrade By Features* filter selects features defining the bottom of the subgrade and toe of slope.

- Open the **12345-P-Terrain.dgn**, Open the **Default-3D** model. Turn on the display of all proposed corridors created during the design process including drives.
- Set the active level to **Terrain\_Coutour\_Imported**, color=**9**, linestyle **0** and line weight **3**.
- From the *Terrain Model* Task menu, select *Create Terrain by Graphical Filter*. See the sample form below while following the next few steps.
- Select the ... button next to *Graphical Filter Group* and pick the filter group to use, **NHDOT Design by Features**. Hit *Preview* to view selected features. Under *Triangulation Options*, set the *Edge Method* to **None** or Max Triangle Length = **15**. The *Edge Method* can be modified through element properties after the process is complete if the desired result isn't achieved on the first try. More details below.
- Select feature definition - **NH\_Design\_Triangles** under the *Terrain Display* category. Accept through the prompts.



## NHDOT CAD/D Connect Documentation

### Other Proposed Graphic Filters

Repeat the above steps using the settings shown in the table below to create the Subgrade terrain model. Filters have also been created for creating surfaces representing the bottom of pavement and toe of slope boundary.

Filter	Feature	Edge Method
NHDOT Design by Features	NH_Design_Triangles	Max triangle Length = 15
NHDOT Subgrade By Features	NH_Subgrade_Traingles	Max Triangle Length = 15
NHDOT Bottom Pavement	NH_SubPavement_Triangles	Max triangle Length = 15
NHDOT Toe Boundary	NH_SubPavement_Triangles	None

The *Maximum Triangle Length* should be changed until the you have all triangles displayed... but so you do not have large slivers. The *Maximum Triangle Length* can be changed from the *Edge Method* section of the Element Information panel.

The *NHDOT Toe Boundary* filter creates a terrain that only follows the *Toe* features. Use the *Extract Boundary* tool to Extract Graphic which creates a Line String boundary from the terrain model. It will put it in the active level and element attributes. Use the Add Feature task to add the line string to design and subgrade terrains as a Boundary to more effectively clip out unwanted triangles.

When the project is finalized and going to Construction, select the Design terrain model and right-click to display the Context Sensitive menu. Choose the Export to LandXML option. Fill in the prompts. Repeat the *Export* for the *Subgrade Terrain* model.

### P-7-3: Terrian Tasks - Create Terrain Model from Design Meshes

Reference the design files and use the **Create Terrain Model from Design Meshes**. The meshes don't need to be displayed as part of the corridor feature definition, it will find and create the Top or Bottom Terrain from all the design mesh elements in the dgn's that are referenced. The drawback is that the Terrain includes all mesh element even from components that are set to not be part of the top and bottom mesh line like the roundings. Editing terrain is much harder than editing copied meshes. To edit the terrain you need to drop the rules. This still does not really allow you to use the Edit Mesh tools with any dependency. The resultant Terrain can be dropped. This will reduce it to a mesh element which can be edited with the mesh editing tools making it



## NHDOT CAD/D Connect Documentation

much easier to trim down but deleting the roundings can take time along the whole project. Prior to creating the terrain, all roundings could be set to 0 in the corridors so they are not part of the terrain but that would take a lot of time.

The resultant terrain cannot be updated from source if the design is changed, they would need to be deleted and recreated. This is a fast way to create the Terrain's but may not be the best.





## Drainage and Utilities

### P-8-1: Creating Proposed Drainage - Node and Link Features

[Return to Index](#)

#### Introduction

Drainage and Utilities features are created for underground elements that need to be designed and shown on the cross sections. Drainage and Utilities features use both 2D and 3D cells (models) to represent their graphics. The *Default* model of the drawings should be referenced into plan sheets and the *Default-3D* model referenced into the Cross Sections and Drainage Profiles.

Bentley's OpenRoads Designer offers a Product Add-in for design and analysis of Drainage and Subsurface Utilities. At the NHDOT we are not using the design and analysis functionality of this software at this time.

This documentation will cover plotting proposed drainage and utility features, creating Drainage profiles and creating reports of these elements.

#### Drainage and Utilities

Nodes can be placed onto a surface (or other elements) to get the grate elevation. Follow the documentation for creating the Proposed Terrain model as well as creating a Composite Terrain model to be used by D&U.

Open the *12345-P-Drainage.dgn*, open the *Default* model. *Reference Attach* the *Combined.dgn* with live nesting = 1 if not already attached. *Reference Attach* the *12345-Composite-Terrain.dgn* with no nesting. Attach the Geometry, E-Terrain and any other drawings needed for the Design. Use level display to set up your view as you want it and set the composite terrain model as the active surface. Shut off the display of the existing terrain model so it is not accidentally selected when trying to hit on the composite terrain model.



## NHDOT CAD/D Connect Documentation

### **Project Properties**

The first order of business is to create the D&U database for the dgn by selecting from the *Drainage and Utilities WorkFlow > Tools > Project tools > Project > Project Properties*. If this is the first time using D&U in the drawing, it will create the Utility model. Accept. Fill in the Project Properties, then click OK.

### **Proposed Drainage - Analyze Surface**

In Terrain Modeling task use the *Analyze Trace Slope* command (both Up and Down) to see where water is flowing. The results should coincide with the displayed Catchment centroids from MX. Turning on the High and Low points as well as the flow arrows from the composite terrain model will also help you determine the location of proposed structures. It is suggested that you work in 3 Views when laying out nodes and pipes.



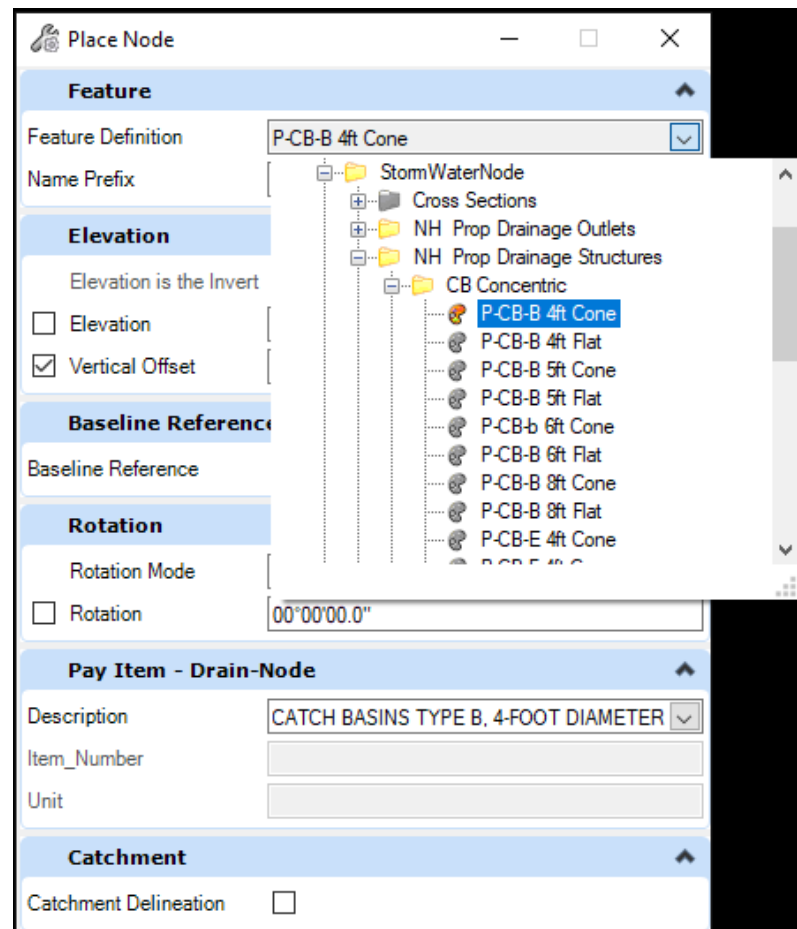
## NHDOT CAD/D Connect Documentation

### Place Nodes

Open the *Drainage and Utilities WorkFlow Layout Tab > Place Node* command to place the first node. Select the appropriate proposed node such as **P - CB 4ft Cone** and follow the prompt to select a reference element for elevation by selecting the Composite Terrain model. Accept the Placement Type, *By Minimum Depth*. You can now use a data point on the screen to place the node, or activate Civil Accudraw, Station-Offset, tab to highlight the Offset, then type an **O** (origin) and hit on the alignment as the reference element and then use the station and offset fields to type in a location to place the node. Move the cursor around to define the nodes rotation and accept. When using Civil Accudraw's Station/Offset to place a node, the node will have manipulators for the station and offset to easily move it in the future.

The command will continue to allow you to place additional nodes. Just select the next feature definition you want to place and continue placing. Reset when done placing nodes. Nodes should be placed for all structures including headwalls and end sections. For links to be placed you must have a node for each pipe end. In order for outlet ditch links to be placed, use the *Conduit Drainage Node* or *Conduit Drainage Node Outfall* to locate the end of the ditch or channel.

For basins in pavement, the Vertical offset can be set to -0.08333 to achieve an accurate elevation. Recall also that basins on pavement or in ditches are set 1' inside the edge of pavement or CL of ditch respectively. When placing Headwalls and End Sections use the -Pipe Diameter for the vertical offset.



### Nodes – Name and Base Reference

A node is named from its Feature definition name base. This is incremented for each one placed. After placing all the nodes they should be *Baseline Referenced* to an alignment. In the Drainage and Utilities Model section of the Explorer – expand the Nodes. select all nodes placed along a particular alignment. In the properties box expand the *Utility* pane and click in the *Baseline Reference* box and then select the alignment to associate. The *Station* and *Offset* boxes should populate. Next select each node,



## NHDOT CAD/D Connect Documentation

one node at a time and update the node name from an incremented value to the station value. (PCB-1... to PCB-207+50). This will help identify nodes when creating reports as well as Profile Runs that are generated.

### Place Conduit

Use the *Place Conduit* command to place the pipes or ditches. Select the feature definition (type of pipe) and then the size. Each node has a connection area so when hitting on the node pay attention to where you are hitting on the outside of basins so they connect to the edge of the outside wall closest to the next node. Place a pipe from the upstream node to the downstream node. Continue placing Conduit until all nodes are connected.

Selecting a pipe will allow you to bring up the hydraulic properties by clicking on *Open Utility Properties*. The Drainage properties for links contain all the hydraulic information about the link including the physical as well as the results after analysis/design has been performed. A true/false switch is also available to tell the software if it is a culvert.

Default settings for Proposed pipes have the *Set Invert to Start* and *Set Invert to Stop* set to *True*. This means that when placing a pipe, its inverts will take on the invert of the node they are attaching to which could result in pipe not flowing down hill. This setting can be changed (set to False) on a pipe by pipe basis or it can be changed in the Prototypes for all proposed pipes within the dgn.

After placing pipes, select it and bring up the profile and change the inverts as necessary to get it to flow correctly. A profile of the entire run can be generated from the Layout tab of the Drainage and Utilities workflow. Either from the outlet or by nodes or links. The Drainage Profile run will be shown in the Explorer's Drainage and Utilities Model tab. Right click on it to select it and then Open Profile model. The nodes and pipes should be selectable and editable within the profile view.

Drainage ditches are Conduit links and can be placed from the last outlet structure to a *Pipe End Drainage Node* placed on the surface of the terrain. Bring up the profile and modify as needed. With the pipe selected the Trench can be turned on to create a corridor. Selecting this and drilling down into it allows you to see the Template it is using and change it to what you need. There are several Ditch templates that can be used. Selecting the corridor object tools then the corridor allows you to control all aspects of the ditch. The V ditch shapes level **P-Util-Drainage-Conduits-Ditch-3D** can be turned off in the Default-3D model leaving only the trench corridor displayed.

### Drainage Profile View

A profile of the entire run can be generated from the Layout tab of the Drainage and Utilities workflow. Either from the outlet or by nodes or links. Set the Feature definition to **Geometry Pipe Run**. The Drainage Profile run will be shown in the Explorer's *Drainage and Utilities Model* tab. Right click on it to select it and then Open Profile model. The nodes and pipes should be



## NHDOT CAD/D Connect Documentation

selectable and editable within the profile view. The pipe run should be renamed to the Start and End Station node values so it is easily identifiable. Update the scale and create a 3D cut to see the referenced 3D model information along the profile. The annotation button (all elements) can be used to show the Pipe and Link annotation. You may need to turn on *Annotation Scale* and set the scale to see it.

Cover or subsidiary excavation depth can be checked from the profile view by either the measure distance command or by the *Profile Creation* tool – Profile from surface. The vertical offset from the Existing Ground terrain can be used to create a profile line 4 feet below for cover as well as a second line 9 feet below to check for excavation areas. The line styles and other symbology can be updated for clarity of those lines.

Selecting the Profile run in Explorer allows you to update the *Node Draw Type* to slice if you have it set to something less desirable. Drainage profiles should show the Proposed ground the existing ground as well as all subsurface features from the project. What is globally displayed in the *Default-3D* model is what is displayed in the profiles' 3D cut. (may need to be updated though). To shut off the display of say the corridors select materials, open the Level Manager, (If needed Turn on the column for Global Display by Right clicking in the top line of the level view and checking next to Global Display.) In the Tree, select the drawings 3D entry to display the levels in that corridors drawing and Turn off the levels for XC-CRGR , XC-Gravel, and XC-Sand by unchecking them. Save Settings, Save the dgn and it may require reopening the dgn as well as refreshing the 3D profile cut for the view to sync.

See the Cut Sheet documentation to learn about creating sheets of the profiles.



NHDOT CAD/D Connect Documentation

## P-8-2: Existing and Proposed Utility Poles

[Return to Index](#)

### Introduction

Item Type information can be attached to the Existing poles in the *12345-E-Detail.dgn* as well as the proposed poles to help with annotation as well as with Reporting. Upon Receipt of the Utility pole relocation sheets this can be started. Proposed poles should be plotted in the *12345-P-Utility.dgn* using Civil Accudraw to ensure the station and offsets are correct as well as to have them as manipulators if they need to move in the future.

### Existing Utility Poles – Add Item Type Utility Pole Location

Open the *E-Detail.dgn's Default-3D* model and use *Element Selector* to select all Annotation Cells and then switch to level and unselect everything that is not a utility pole. Use the *Attach Item* tool and add the *Utility Pole Location Item* to all the poles.

Follow the XS-Detail procedures to create tick marks for the existing detail.

Open the *E-Detail.dgn - Default-3D* model

Shut off all detail - turn on only poles *E-Utility-* levels

Select and add item type data - pole location

report the pole locations and save to an Excel file. open the Excel file on the side.

attach the corridor, and or the P-Terrain geometry drives and such

Terrain > Edit > Boundary options > create boundary > Extract Graphic > select the terrain.

Fence from element



## NHDOT CAD/D Connect Documentation

In the *Default* view shut off all except the poles, alignment and the corridor.... can use just the alignment vs the corridor for dynamic sections.

Open 3 views - place dynamic section in the lower view. Alternately, you could add Event points to the geometry and use that to cut section at the pole locations.

Locate station via data point - select the first pole.

In the section view, go to the pole offset and scale the cut or fill amount and fill in on the Excel table.

Repeat for each pole location.

When done, set the *Default 3D* view active - shut off all but the poles and then select each one and add the cut / fill height to the Pole Location item.

If in *Top View* you could also attach the ETXT dgn and add pole numbers to the item info

When done create a new report.

The report can be used in the Geometry dgn to create an event point list of all the poles so a set of sections can be cut showing the cut & fill amounts for utility sections use.

If the XS-Detail has been created, the even station sections could be used.

Give the report to the utilities engineer with pdf sections for pole L/R determination format in Excel

When you receive the pole relocation sheets, open the *Default-3D* model select each pole and add the L/R information to them.



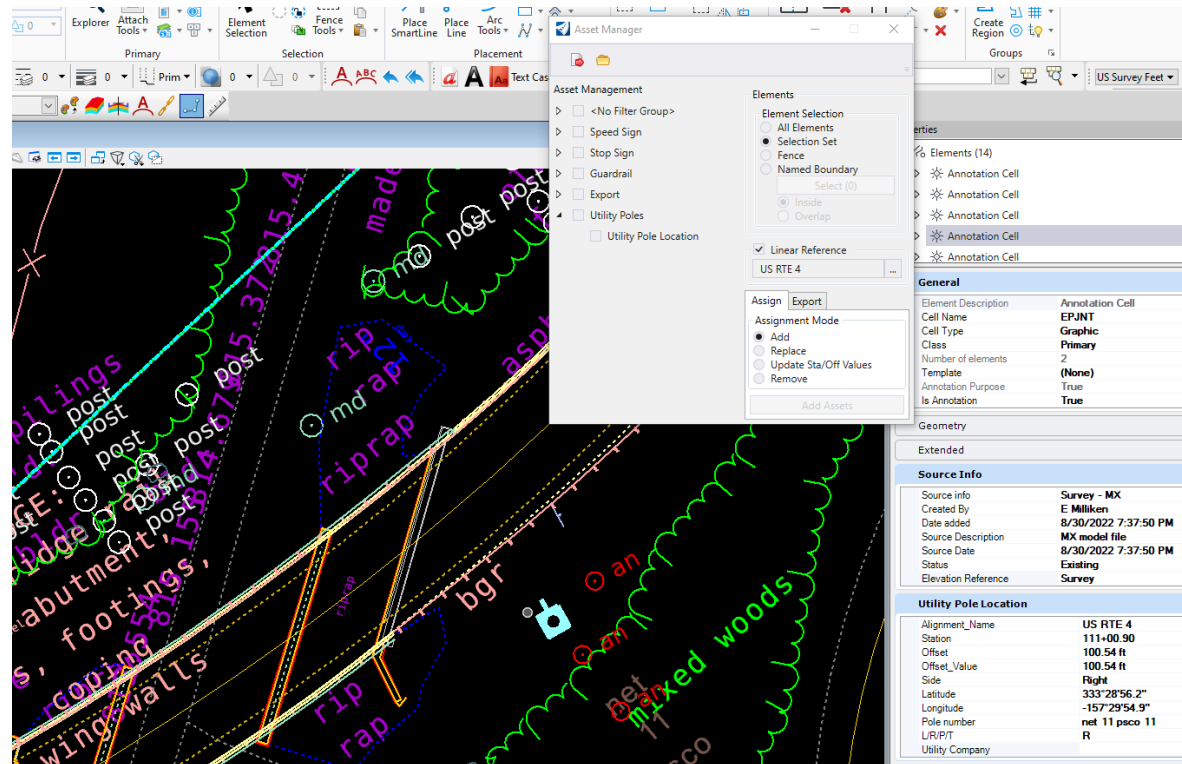


## NHDOT CAD/D Connect Documentation

Reselect poles that are not on a particular alignment and then use *Asset Manager* to attach a Linear Reference. Repeat for each Road that has poles on it.

Reselect all the poles and use the Utility Pole Relocation sheet and the Properties Box to move thru the list of poles and Assign a **L/R/P/T** - Leave or Remove label to each. These designations are also used to Label the poles in the *P-Utilities.dgn*. With the *ETXT.dgn* attached, the Pole number can be added as Item Type information as you move down the list. Right click on the Annotation Cell and Zoom to each particular pole in top view to see the pole numbers.

View dynamic sections to review the Grade Change information and add to the Item Type entry and verify on the Relocation sheets. Use the View Station Via Data point and hit on each pole with an Origin Hit code to view the section.





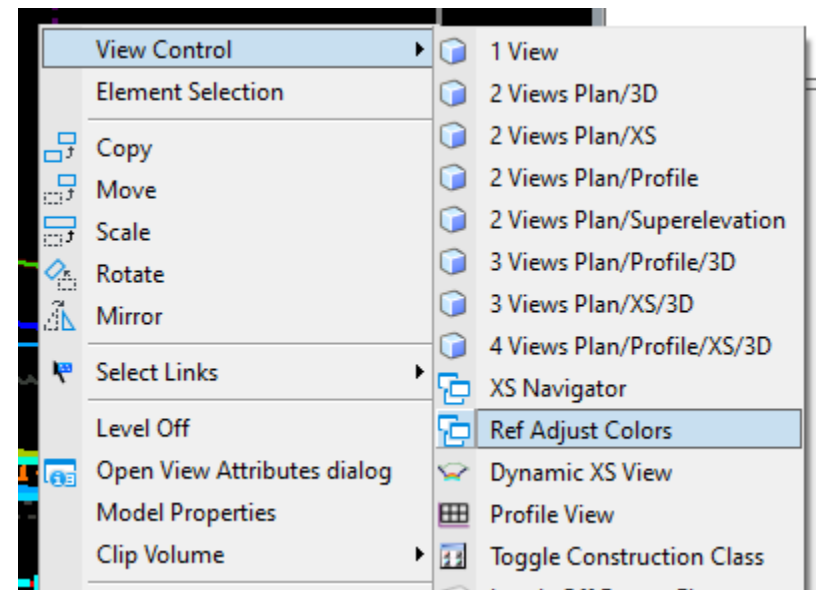
## NHDOT CAD/D Connect Documentation

### Plotting Proposed Utility Poles

Open the *Drainage and Utilities WorkFlow Layout Tab > Place Node* command to place the first node. Select the appropriate proposed node such as Electric Nodes > **P\_Joint Pole** and follow the prompt to select a reference element for elevation by selecting the Composite Terrain model. Accept the Placement Type, *By Minimum Depth*. You can now use a data point on the screen to place the node, or activate Civil Accudraw, Station-Offset, tab to highlight the Offset, then type an **O** (origin) and hit on the alignment as the reference element and then use the station and offset fields to type in a location to place the node. Accept or change the Rotation Mode, then move the cursor around to define the nodes rotation and accept. When using Civil Accudraw's Station/Offset to place a node, the node will have manipulators for the station and offset to easily move it in the future.

The command will continue to allow you to place additional nodes. Just select the next feature definition you want to place and continue placing. Reset when done placing nodes.

When working on poles it is sometimes hard to differentiate between existing and proposed. Use the right click menu and select *View Control > Ref Adjust Colors* to tone down all the reference files and more easily see the proposed poles.





## NHDOT CAD/D Connect Documentation

can open the geometry.dgn and add all proposed pole stations from the Pole Relocation sheets to a proposed pole event point list

Open P-Utilities.dgn

Attach alignment corridors and existing terrain  
default view.

D&U place node

use civil accudraw and place poles

attach station and offset - Node item type or pole location item type.

Dynamic sections could be viewed to determine cut/fill height at the proposed locations

create a PFSONEE report of the proposed pole vs the alignment

open the xs - detail dgn and create all the ticks for all detail or just for the proposed poles

create sections of the proposed and existing pole locations could leave the named boundaries in the p-util and save the sections to a different dgn

remember that pole tick marks are at the even station not at the pole station.

Attach the Gen Plans Cut sheet drawing for Sheet Named Boundary locations. rotate to the first sheet.

Use the PUT task list to label each existing and proposed pole location.

For existing poles... manipulate levels... then "highlight" reference file



## NHDOT CAD/D Connect Documentation

For proposed.... asks for identify element.... tentative on the alignment then accept to highlight it.... then use origin code on the proposed pole.

Rotate to each sheet.

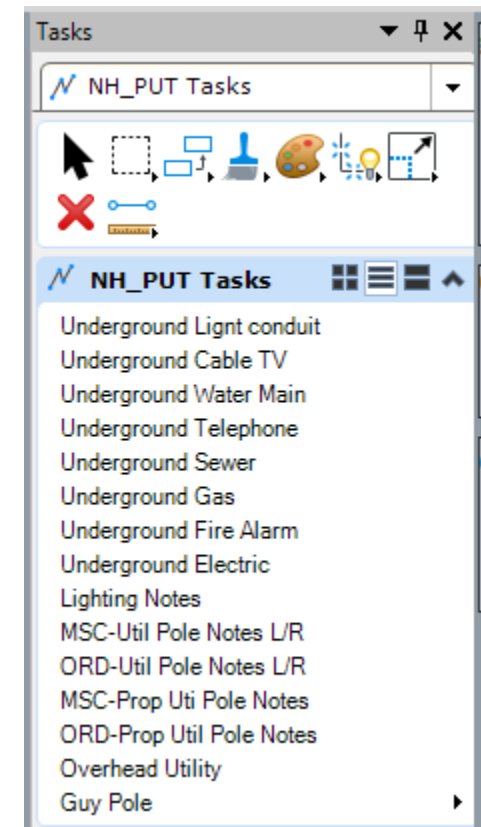
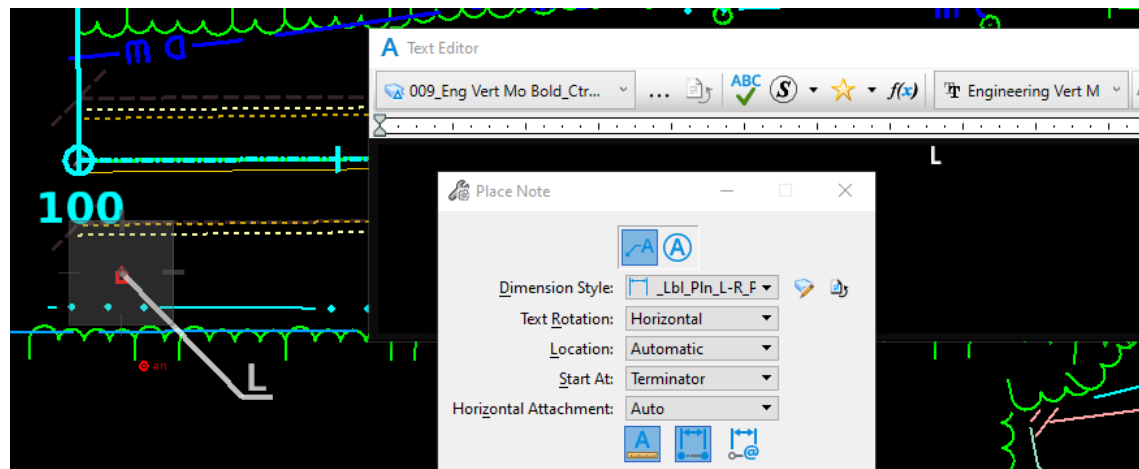
## Place Utility Pole Notes

Reference the Default model of the cut sheet drawing that the pole notes will be plotted on into the Default model. Use the Named Boundaries to rotate the view to each cut sheet prior to adding the notes for that sheet. Open or use the NH\_PUT Tasks. There are 2 sets of tools to label Existing and Proposed Poles one for MSC and the other for ORD.

The MSC tools use Place Note for the L/R, and the Station/Offset macro for the Proposed poles.

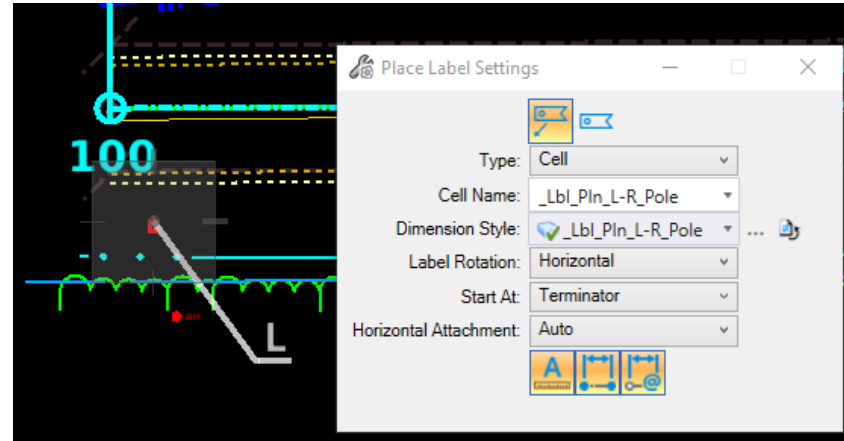
The ORD tools use the Place Label command and pull the information from the node or Item Type properties attached to the nodes or cells.

For L/R notes Select the Tool then Origin hit on the Existing Pole. For MSC type an L or R in the text editor and then click where to place the Text. For ORD after selecting the pole just place the text.



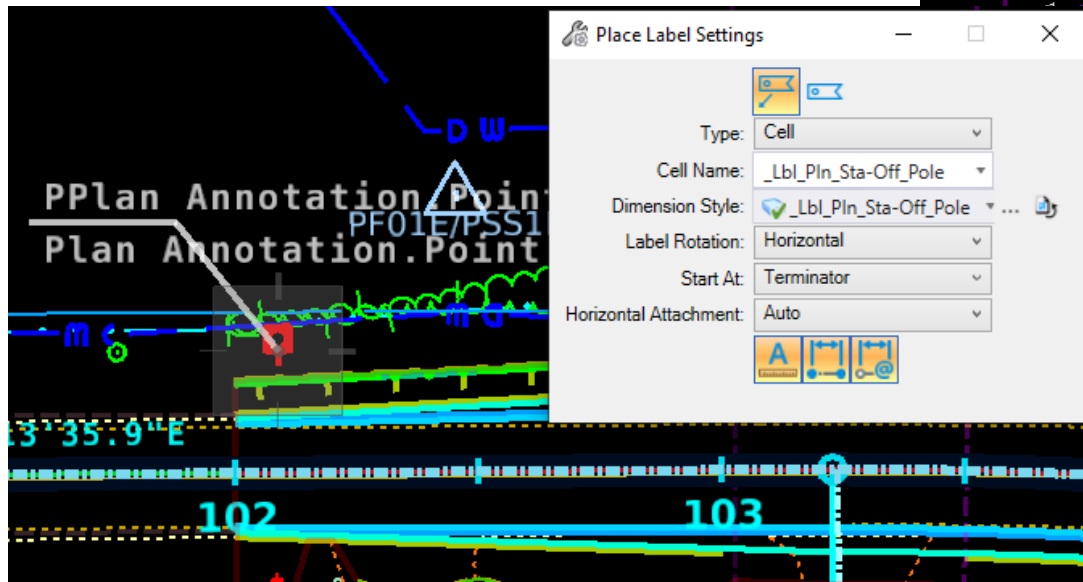
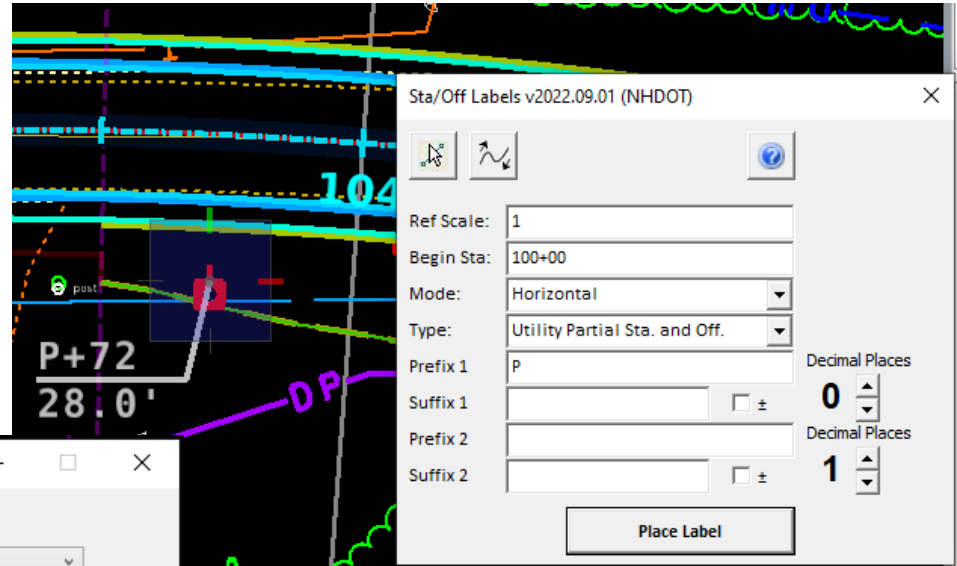


# NHDOT CAD/D Connect Documentation



## NHDOT CAD/D Connect Documentation

For the *MSC Proposed Utility Pole Notes* the tool will Open the [Station/Offset Macro](#). Use the Select Center Line Element and select the alignment, and accept. Update the *Begin Station* and change the *Type* to **Utility Partial Sta. and Off.** Click Place Label and use an *Origin* hit on the pole and then place the label. Repeat for each Proposed Pole. Remember to rotate to each cut sheet as you proceed.



For the *ORD Proposed Utility Pole Notes* the tool will Open the Place Label tool. In the bottom left it will prompt you to **Identify Element** or Data Point. *Tentative Snap* to the alignment to highlight it then *Left Click* to select it and again to accept it. Next use an *Origin* hit on the pole and then place the label. Repeat for each Proposed Pole. Remember to rotate to each cut sheet as you proceed.

When finished Save Settings, and Save the DGN.



## Label Cross Section Slope

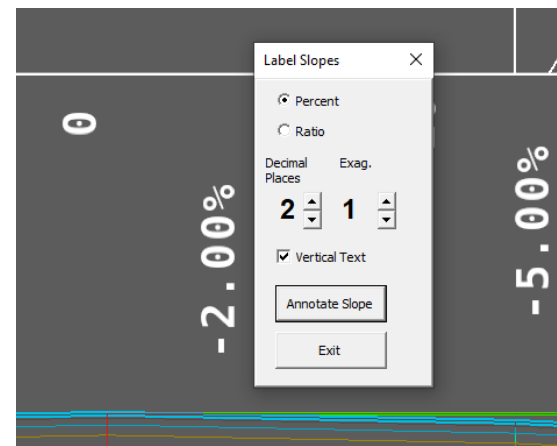
### Macros

It is suggested to match element attributes as well as text attributes to another slope label prior to using the macro.

To Label a slope on a Cross Section that did not get labeled. WF > Drawing > Utilities Tab > Macros Pane > SlopeSet <PLAY>

Update the settings as desired.

Command text will show in the message center indicating *Select First Point*, *Select Second Point*, then *Select Text Location*.







## Rotate Cells – Envision CADD

### Introduction – [EnvisionCadd – Rotate Text and Cells - Video](#)

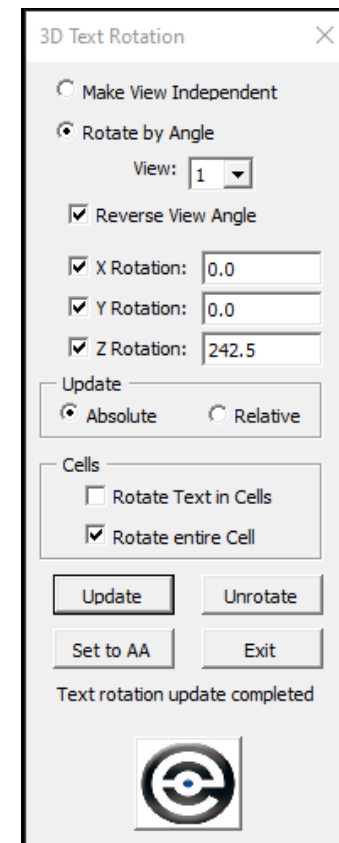
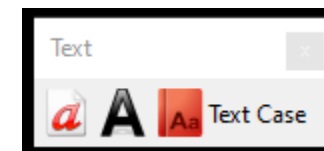
The Envision CADD software has been added to the NHDOT Workspace. If using the default setup a Text ToolBox with 3 tools will be available, *Label Areas*, *Rotate Text* and *Change Case*.

There is also anEnvisionCAD workflow to get these and other utilities.

**EnvisionCad** - [https://nhgov.sharepoint.com/:b:/r/sites/DOT-ProjectCentral-Home/CADD%20Document%20Library/envision\\_text-rotation.pdf?csf=1&web=1&e=QEERut](https://nhgov.sharepoint.com/:b:/r/sites/DOT-ProjectCentral-Home/CADD%20Document%20Library/envision_text-rotation.pdf?csf=1&web=1&e=QEERut)

This tool is intended to rotate Text (**Cells**) to the View Angle. So first rotate the view along the roadway. In a 3D model rotate by 3 points. Hit all points in space so they get the same elevation, the first 2 define the rotation, the last point hit above the other two. Return to Top rotation and re-rotate if you hit on an element and tilted the plane.

Use *Element Selector* to drag box around cells or text you want to rotate. Click on the **A Rotate Text** tool and use the following Settings - *Rotate by Angle*, *Reverse View Angle* - uncheck/check to update view angle, *Absolute*, check **Rotate entire Cell**, click *UPDATE* to Rotate them. Note that poles on the bottom side of the roadway will need to be selected again. In the Tool add **180** to the *Z Rotation* value and then Update.





## Quantity Computations

### P-9-1: NHDOT Suggested Practices

[Return to Index](#)

#### Introduction

With good 3D modeling comes good quantities! That is not to say that errors won't occur and we do describe a bug below. Create Quantity dgn files for your work. If you already have Cross section dgn's, make copies of them for quantities so the main project's dgn files are not disturbed.

For Select materials and such use, Corridor Component quantities. Any clipped areas will need to be adjusted by hand.

#### Earthwork Quantities from the Cross Sections

Quantities from Cross Sections is the historical method of computing the earthwork. But, in order to compute complex areas around bridge pay limits and side roads with match lines, a separate set of sections should be created just for Quantity Calculation purposes. These special sections can be cut with additional half width areas to accommodate Back and Ahead areas to more accurately compute the volumes. Alternately, Plan name boundaries can be created 50 feet long and half to the left and another group to the right. The shapes can be modified and the resultant cut and fills computed. QML lines drawn along the edges in the plans will show on the cross sections.

#### Earthwork Quantities from Named Boundaries

Quantities from plan named boundaries allow for computing odd shapes around bridges and sideroads. They can also include the drive components. By creating them at a 50-foot interval as well as on the left and right of the CL allows them to be easily modified to ensure coverage of the whole project.



NHDOT CAD/D Connect Documentation

**BUG – Select Materials – Sand, Gravel, and Crushed Gravel**

ORD 2021 Release 2 has a bug when computing quantities that have component name override locks active. The intent of the name override is to fill in the gaps between component drops making the quantities more accurate. But this is giving incorrect results from End Area Volume Reports from the cross sections as well as the Plan Named Boundaries.

From XSections AverageEndAreas

<b>Totals:</b>		
XC - 403_11 - HBP Base:	888.89	888.89
Total XC - 403_11 - HBP Base:	888.89	888.89
XC - 403_11 - HBP Binder:	617.28	617.28
Total XC - 403_11 - HBP Binder:	617.28	617.28
XC - 304_3 - CRGR:	3741.67	3741.67
Total XC - 304_3 - CRGR:	3741.67	3741.67
XC - 304_2 - Gravel:	3504.99	3504.99
Total XC - 304_2 - Gravel:	3504.99	3504.99
XC - 403_11 - HBP Wearing:	370.37	370.37
Total XC - 403_11 - HBP Wearing:	370.37	370.37
Volumes_Cut:	34187.40	34187.40
Total Volumes_Cut:	34187.40	34187.40
Volumes_Fill:	20758.89	20758.89
Total Volumes_Fill:	20758.89	20758.89
XC - 304_1 - Sand:	3291.31	3291.31
Total XC - 304_1 - Sand:	3291.31	3291.31

From plan Named Boundaries

<b>Totals:</b>		
Total XC - 641_ - Loam:	0.00	0.00
XC - 403_11 - HBP Binder:	615.24	615.24
Total XC - 403_11 - HBP Binder:	615.24	615.24
XC - 403_11 - HBP Base:	886.82	886.82
Total XC - 403_11 - HBP Base:	886.82	886.82
XC - 304_3 - CRGR:	4353.53	4353.53
Total XC - 304_3 - CRGR:	4353.53	4353.53
XC - 403_11 - HBP Wearing:	368.35	368.35
Total XC - 403_11 - HBP Wearing:	368.35	368.35
XC - 304_2 - Gravel:	4423.45	4423.45
Total XC - 304_2 - Gravel:	4423.45	4423.45
Total XC - Rounding:	0.00	0.00
Total Design:	0.00	0.00
Total XC - 641_ - Loam Cut:	0.00	0.00
XC - 304_1 - Sand:	4546.75	4546.75
Total XC - 304_1 - Sand:	4546.75	4546.75
Total Subgrade:	0.00	0.00
Volumes_Cut:	34178.76	34178.76
Total Volumes_Cut:	34178.76	34178.76

From Component Quantities

<b>Totals:</b>			
Cut Volume:	34195.77	34195.77	
Total Cut Volume:	34195.77	34195.77	
Fill Volume:	20773.89	20773.89	
Total Fill Volume:	20773.89	20773.89	
MeshXS ComponentsXC - 304_1 - Sand:	4712.62	4712.62	
Total MeshXS ComponentsXC - 304_1 - Sand:	4712.62	4712.62	
MeshXS ComponentsXC - 304_2 - Gravel:	4521.78	4521.78	
Total MeshXS ComponentsXC - 304_2 - Gravel:	4521.78	4521.78	
MeshXS ComponentsXC - 304_3 - CRGR:	4401.73	4401.73	
Total MeshXS ComponentsXC - 304_3 - CRGR:	4401.73	4401.73	
MeshXS ComponentsXC - 403_11 - HBP Base:	888.89	888.89	
Total MeshXS ComponentsXC - 403_11 - HBP Base:	888.89	888.89	
MeshXS ComponentsXC - 403_11 - HBP Binder:	617.28	617.28	
Total MeshXS ComponentsXC - 403_11 - HBP Binder:	617.28	617.28	
MeshXS ComponentsXC - 403_11 - HBP Wearing:	370.37	370.37	
Total MeshXS ComponentsXC - 403_11 - HBP Wearing:	370.37	370.37	

The errors seem to be contained to components that have display rules for multiple component decision making. Meaning Transition components for Sand, Gravel, and Crushed Gravel. While Component Quantities seem to be the most accurate "Clipping is not Considered in Quantities", and adjustments have to be made by hand to any clipped areas. Corridor Component



## NHDOT CAD/D Connect Documentation

Quantities should only be created in the same dgn as the Corridor. Incorrect results are returned when reporting on a referenced corridor. This seems to be caused if the terrain is not set active.

After using *Create EarthWork Volumes* then the Cut and Fill volumes from the XSections Average End Areas are correct and can be used. For areas with side roads and drives that may need a Quantity Match the *Plan Named Boundaries* can be placed and modified. The resulting volumes for cut and fill from the plan *Named Boundary* can be used/incorporated into the *Average End Area* report to compute the final numbers.