



NHDOT CAD/D OpenRoads Designer Documentation

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OpenRoads Designer – Creating Cross Section Cut Sheets

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

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

Additional processes for creating, row, environmental, existing point detail features, muck and rock surfaces and End Area Volumes are also covered here. Information about the commands used can be found in *File > Help > Help Contents*. When working with Cross Sections the *Cross Section Navigator* can help navigate the drawing models.

Create Sheet Seed - 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, attach all the dgn files that need to be sectioned over. *Survey, E-Terrain, E-Drainage, E-ENV, E-ROW-Lines, E-Field-Check, 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**. For Bridge Projects also attach the *Brd-3D, P-Cor-Bridge, and P-Br-Grading* drawings. While accepting through each drawing's attachment make sure you see the message that the *Default-3D* models are automatically being attached. Shut off point features in the Survey file as those features are represented in the XS Detail drawings. (only display the *Survey.dgn* then select *By Element Cells* – then right click off by element to shut off the levels - then turn references back on).

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.

Create the XSection file by Copying the XS Seed

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* if generated. *Save Settings* and *Save* the file, repeat for each road as needed.



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Create named Boundaries

The cross sections are generated through *Named Boundaries*. The cross section boundaries are 3D elements but get created in the *Default* view. Ensure you have 2 views open, a view of the *Default* (2D model) and the *Default-3D* model. Set the active Level to be BDR-Named-Boundary. 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 selected. The offsets, interval and clearance(s), can be changed but are set for NHDOT standards.

Check the *Create Drawing* and *Show Dialog* boxes then accept through them on the 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. The Default Annotation group is **NH-Preferences**. Decide whether to have the drawings added to the sheet index or not and hit *OK* to create the Cross Section drawings and sheet models. The progress bar in the lower right will display your progress. Be Patient. The last Cross Section sheet will be displayed when finished.

The image shows two overlapping dialog boxes in the software interface. The background dialog is titled "Place Named Boundary Civil Cross Section" and contains the following fields and options:

- Drawing Seed:** XS 10 Portrait
- Detail Scale:** 1"=10'
- Group:** (New)
- Name:** US RTE 5
- Description:** (empty)
- Start Location:** 110+50.00
- Stop Location:** 122+00.00
- Left Offset:** -100.000000
- Right Offset:** 100.000000
- Interval:** 50.000000
- Vertical Exaggeration:** 1.000000
- Top Clearance:** 12.500000
- Bottom Clearance:** 10.000000
- Elevation Datum Spacing:** 10.000000
- Event Point List:** (None)
- Include Event Points Only
- Include Control Points
- Backward Facing
- Create Drawing
- Show Dialog

The foreground dialog is titled "Create Drawing" and contains the following fields and options:

- Mode:** Cross Section
- One Sheet Per Dgn:
- View Name:** US RTE 4 - 110+
- Drawing Seed:** XS 10 Portrait
- View Type:** Civil Cross Section
- Discipline:** Civil
- Purpose:** Section View
- Create Drawing
- Model Name:** US RTE 4 - 110+
- Seed Model:** NH-All-Sheet-
- Filename:** (Active File)
- Annotation Group:** NH-Preferences
- Sheet Model:**
 - Create Sheet
- Model Name:** US RTE 4 - 110+
- Seed Model:** NH-All-Sheet-
- Filename:** (Active File)
- Sheets:** (New)
- Full Size 1 = 1**
- Drawing Boundary:** XS 10 Scale
- Detail Scale:** 1"=10' (By Named Boundary)
- Add To Sheet Index
- Make Sheet Coincident
- Open Model

Buttons for "OK" and "Cancel" are visible at the bottom of the "Create Drawing" dialog.



P 6-2: Basic Cross Section Annotation

Introduction

Line Work on the sections comes from the referenced 3D models. Annotation on the sections is created in the cross section drawing models and comes from defined *Annotation Groups* which label the 3D elements referenced. The referenced 3D models are always displayed in their latest state. If changes were made to them, the Annotation for them needs to be updated. For elements newly created, the annotation group need to be used to annotate the elements. For elements that have been changed or updated, the annotation needs to be removed and the features reannotated.

When removing all annotation from the drawing models only annotation from the annotation groups is removed. If elements were labeled using other tools, that annotation will remain in the Drawing models. *Annotation Labels* that are copied into the drawing model are also not removed.

Annotation Groups - Updating Cross Section Annotation After Changes

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 *EXCEPT* that which you have copied in or has been annotated by hand. It will then be necessary to re-annotate the sections using the Annotation Groups.

Annotation Definitions were created for each feature displayed on the cross sections. These Definitions are organized into Groups to annotate like features. The default **NH-Preferences** annotation group contains the Grid Definition as well as Existing feature labels and proposed slope and point definitions for the design corridors. This is a great group to use through the design process. Annotating sections can be time consuming so the groups can be used to only annotate what specifically has been created or changed.

Other groups are more specific to annotating information from specific reference files such as the **NH E Detail** and **NH E Drn – Util**, **NH P Detail**, and **NH P Drn – Util** Groups that annotate information developed later in the design process and only need to be annotated after those drawing are populated.

Later in the plan development process some annotation can be copied into the Cross Section Drawing models so it does not get removed and need to be reannotated. **NH Anno Grid** which only annotates the Grid and station values can be used and then a Batch Process run to copy that annotation into the drawing models. The **NH P Pref** annotates proposed corridor points and crossing features. if any is present and finally the **XS EAV Anno** is for Cut and Fill quantities if they have been created.

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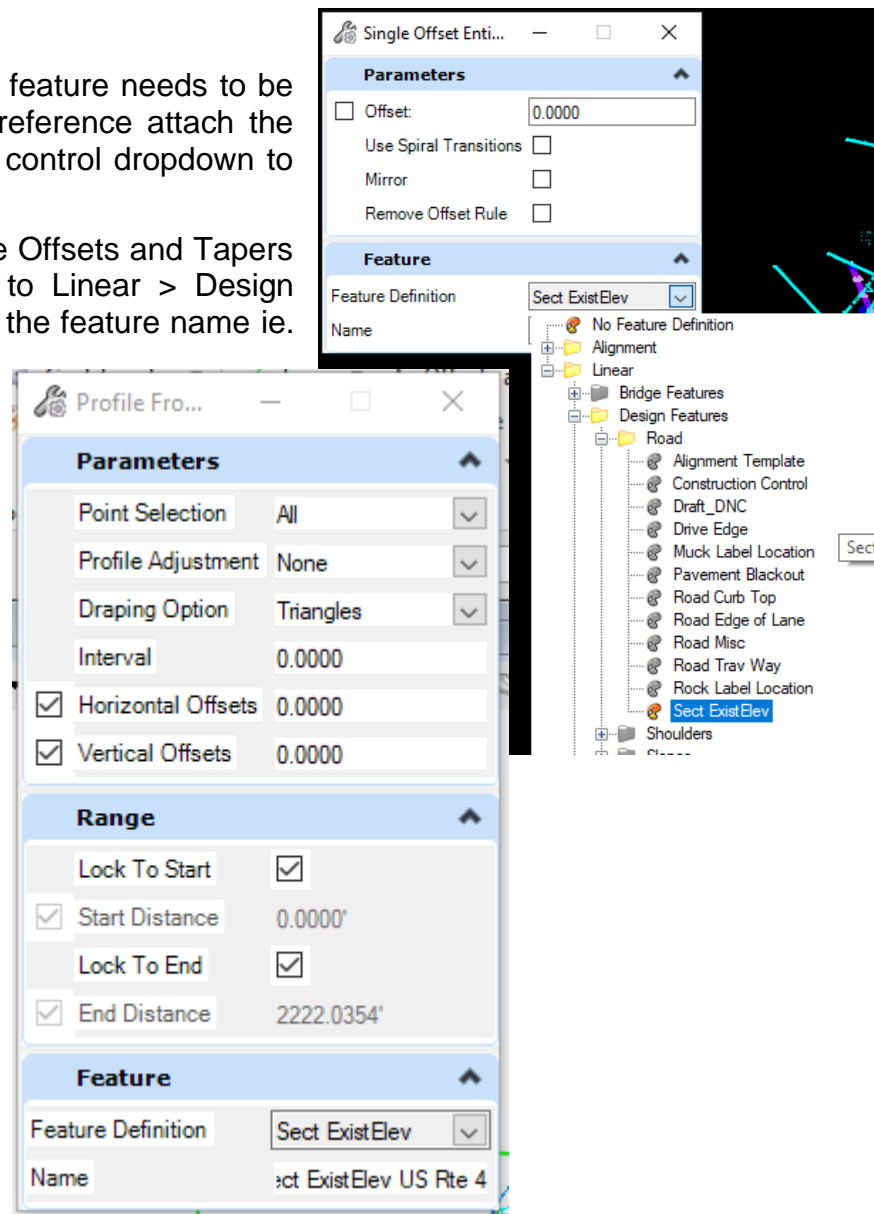
Cross Section Existing Elevation Feature

To annotate the existing elevations on the cross sections a linear feature needs to be created along the alignment. Open the Geometry.dgn file and reference attach the terrain.dgn if not already attached. Right click and use the View control dropdown to select 2 views Plan/3D.

OpenRoads Modeling workflow > Geometry Tab > Horizontal pane Offsets and Tapers > **Single Offset Entire Element** Set the Feature Definition to Linear > Design Features> Road > **Sect ExistElev** and then add the road name to the feature name ie. **Sect ExistElev US Rte 4** Lock the offset to 0 and select the geometry element to create the new feature.

Elevations need to be attached to the feature. Select it by using element selector and clicking on the geometry and then right clicking to cycle thru until the Sect ExistElev feature is selected. In the Geometry tab's Vertical pane select Profile Creation > **Profile from Surface**. in the box set the feature definition again as well as update the name. Lock the offsets and start and end range. Left click to *Apply DTM Profile* and then select the terrain model by clicking on it. Do not use the active terrain as you may lose the elevations if the terrain changes.

Open the cross section file and reannotate all the drawing models with **NH-Preferences** or **NH P Pref** for the elevations to display.





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P-6-3: Controlling Displayed 3D information on the Cross Sections

Introduction - [Video](#)

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.

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.



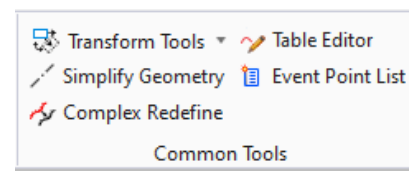
P-6-4: Cutting Additional Sections and Re-Sheeting

Introduction - [Video](#)

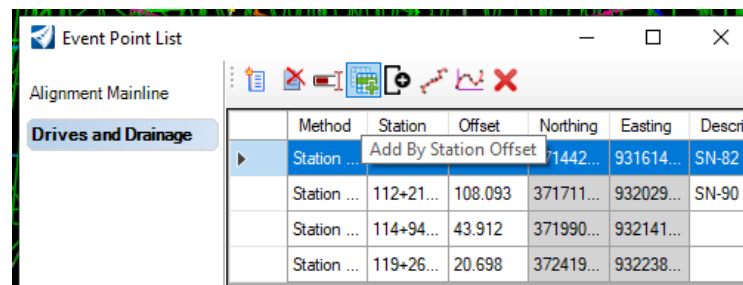
Cross sections can be added to the *Named Boundaries* group individually or through the use of *Event Point Lists* added to the Geometry Feature that the sections are cut from. When adding new sections, the sheet models generally need to be deleted so the new drawing models can be inserted sequentially within the sheets.

Create Event Point Lists to Create Additional Section Drawing Models

Open the Geometry.dgn's *Default* model and turn off the display of all reference files. Next turn on the display of the *Default* model of the file that you wish to create extra sections for such as the Drives. In the *OpenRoads Modeling* workflow *Geometry* Tab – *Common Tools* pane select the **Event Point List** tool and then select the alignment. Click the New list button and name the *Event Point List* to create it. Use help if you want to learn more about all the buttons on the list. Select the **Add By Station Offset Button**. Unlock the Station value and then hit on the drive alignment at the intersection with the geometry. This will add that station to the list. Continue adding all Drive Stations.



Create a new List for Existing Drainage. You can use origin hit codes on the basins to locate where you want sections generated for them.



Alternatively for proposed and existing drainage sections use a report to determine the station values needed rather than searching along the alignment and selecting the basins. In the *Default* models turn off the Drives reference drawing and turn on the 2D display of all the Existing and/or Proposed Drainage (attach the Drawings if needed). With the drainage displayed use *element selector* to select by Element Type – *Cells*. This should select all Node Features. In the *General Tools* Pane expand the *Reports* Dropdown and select *Point Feature Station Offset Elevation Report*. It will prompt you to select the alignment and then Accept to bring up the report. Format for Stationing *ss+ss.ss* if needed. The report can be saved as a Word or Excel document as preferred. Review the report and highlight locations that you want to add additional sections to be cut. Only odd station CB, DI's or Manhole locations that are within the cross sections offsets should be highlighted.

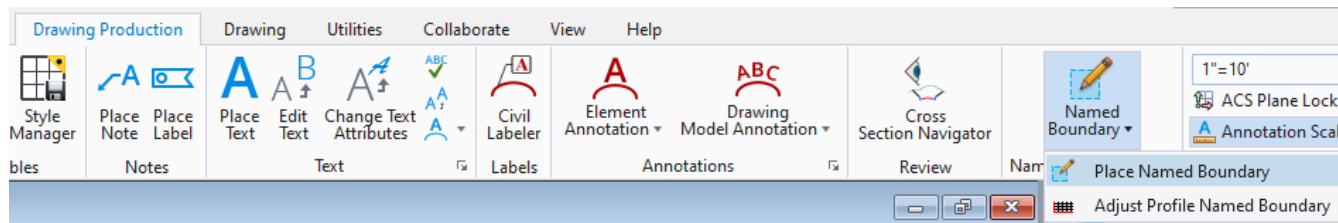
Create a new *Event Point List* and use the *Add By Station Offset* Button to bring up the tool again. Check the *Station* box and type in the station to be added from the highlighted report. Accept the station to add it to the list. Repeat for all additional locations needed. Repeat for Proposed Drainage locations if desired with a separate *Event Point List*.



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Create Named Boundaries for the Additional Sections

Open the Cross Section Drawing. Open two views, *Default* and *Default-3D*. Set the *BDR-Named-Boundary* level active in the *Default* model. In the *Drawing Production* tab open the *Named Boundary* tool.



Set the Drawing seed, Scale and Group to match the previous sections settings. **** NOTE IT IS IMPORTANT TO SELECT THE GROUP rather than *New*.** Sections can not be moved from group to group after they are created.

Identify the path element by selecting the alignment. The mouse will be tracking along the alignment, be careful to not click on the screen. At the bottom of the input boxes, select the *Event Point List* that you want to create additional sections for and then check the box to *Include Event Points Only*. Left Click on the screen to accept your selection and create the named boundaries.

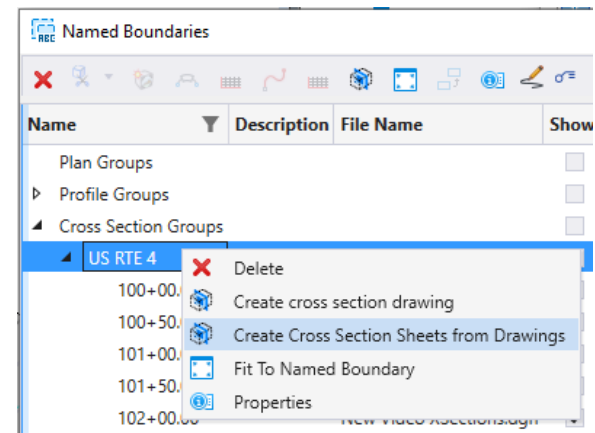
Next the *Create Drawing* box will open if *Create Drawing* was checked on in the *Place Named Boundary* tool. Un-Check the *Create Sheet Model* section so only Drawing models are created at this time. Set the *Annotation Group* to **NH Anno Grid** and Click **OK** to create the Drawing models. The drawing models could be created from the *Named Boundaries* tool box as well.

Delete old Sheet models and Re-Sheet the Sections

Open the *Models* Tool from the *Home* tab or hover over it if it is docked to get it to expand. Select the sheet models and delete them as they need to be recreated. (Shift Click to highlight multiple models) Do not delete the gray Drawing models.

Open the (Manage) *Named Boundaries* tool box. Expand the Cross Section Groups and review the group's stations make sure there are no duplicates. Select and delete if there are. If the drawing models were not created in the previous step, you would need to select only those boundaries in the list and then use the *Create Drawing* tool in the top to create them.

Back in the *Named Boundaries* tool – Right Click on the *Group name* and select *Create Cross Section Sheets from Drawings*.





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Modify Special Station Sections for Drainage

For cross sections cut with proposed drainage running longitudinally along the roadway

P-6-5: Create Features of ENV and ROW Elements

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Before you begin - [Video](#)

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. When the features are created and attached as a reference file to the cross sections they can then be annotated with the NH E Detail or NH-Preferences annotation groups.

Attach Reference Files

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

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. Next, Turn on all levels that are good and 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 reference file.

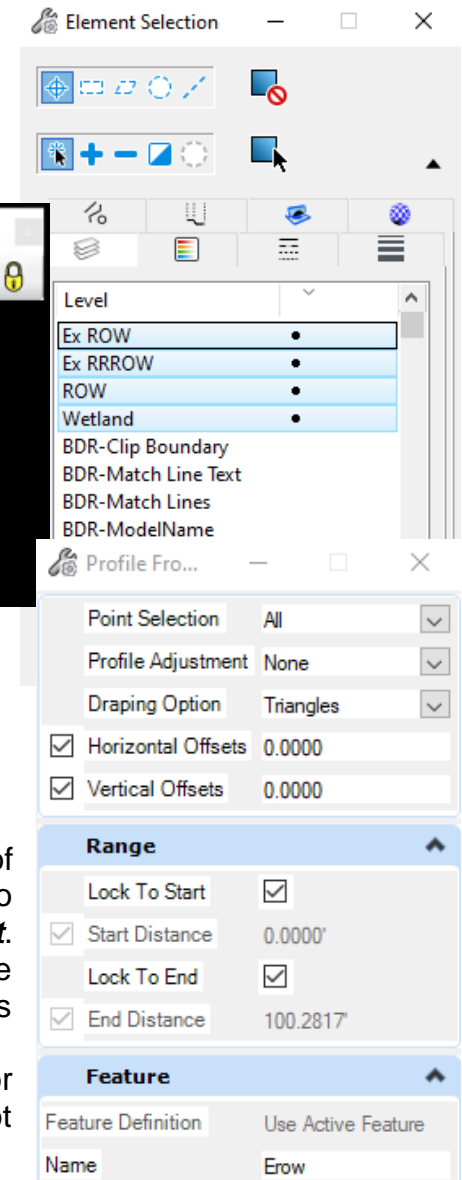
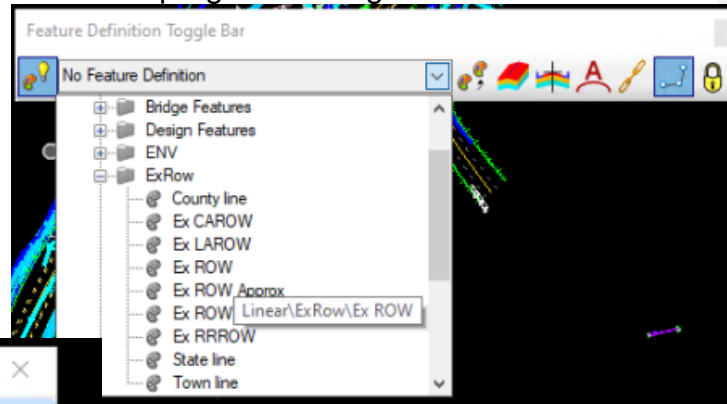
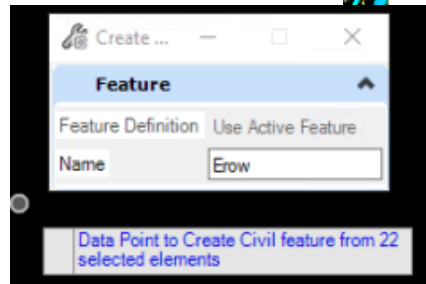
View both the *Default* and *Default-3D* models by *Right Clicking* and holding to get the popup menu and select *View Control > Views Plan/3D*. Set the **Default** view active by clicking on the top of the view. Reference file attach the Combined.dgn with Live Nesting set to 1. Fit View.

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. Make sure the terrain model is visible as it will need to be identified as the source of the profile elevations.

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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. If a feature definition cannot be found for selected elements that means it is not something that is normally show on the sections does not need to be featurized. Repeat for each ROW and ENV file.

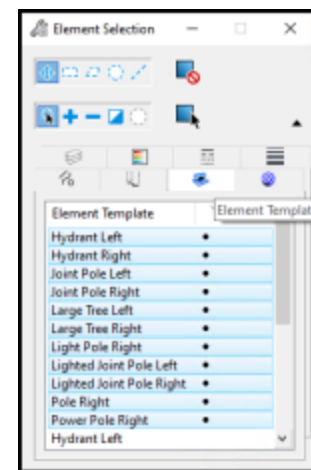
When finished Annotate All Drawing models using the **NH E Detail** or **NH-Preferences** groups.



P-6-6: XS Detail Tick Features for Section Annotation

Introduction – [Video Playlist](#)

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-Survey.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.



DGN setup - [Video](#)

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.

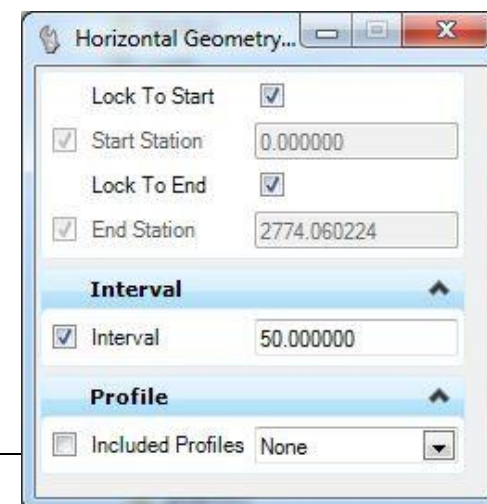
Using only the Default model view, shut off all reference files that don't have point features, except the 12345-Geometry.dgn's Default Model. Also shut off the Default-3D model reference. The view should now only show the Geometry and the E-MX-Survey-Topo Default models. Save Settings and Save the dgn. 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.





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If the alignment does not start at an even 50 foot 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

In the Default model turn off all reference files then turn on only the survey reference. Use Element selector and drag a box around all the survey features to be reported in the project area to select them. In the Properties box select the Cells entry and then right click **Select** to select only the cells. Note that only features which typically appear on cross sections will be processed.

Once the point features are selected, turn on the display of the geometry.dgn. then 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 *****IMPORTANT***** at the bottom of the reports list expand *Reports >* and select the **NHSurveyStationOffsetNorthingEastingElevationFeature.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. If you use the default Station Offset Northing Easting Elevation Feature Report from the StationOffset section the report file will not work with the macro.

Create Cross-Section Detail Features

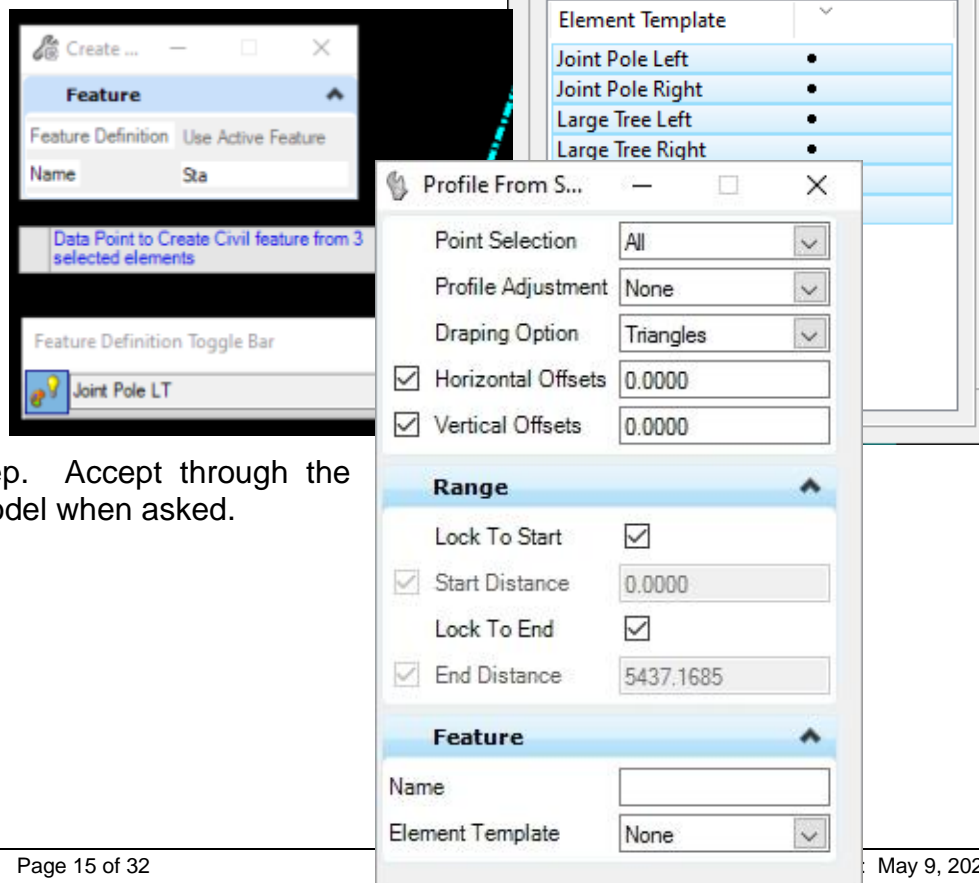
Once the reports are created, the next step is to create a series of lines at the even 50' station which is nearest to each detail feature. If not already, Open the *12345-XS-Detail-roadname.dgn*, *Default* model that was created to contain these detail lines. Creating separate drawings for each alignment's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



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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.
4. 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.





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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. [VIDEO](#)

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. For Poles, add a **L** or an **R** to the +station to indicate Leave and Removal. For proposed Poles, annotate **P +XX** or **T +xx**. If you have duplicate pole + stations add spaces to the end to make them different. Could add decimal.

Selecting the Feature in the *Default-3D* model or bringing up the profile of it allows the profile to be modified (vertical offset) moving it up or down based on the +sta of the feature. [Video](#)

Add the XS Detail Road name drawing as a reference file to the Xsections and Annotate the detail using the appropriate annotation group, NH E Detail or NH P Detail. If changes to the +sta name or profile elevation are made the annotation needs to be removed and then reannotated. [Video](#)

Point	Station	Offset	Northing	Easting	Elevation	Feature
14	Point					
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



P-6-7: Skewed Drive Sections (and Profiles)

Introduction – [Video Play List](#)

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 of 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



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turn 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 an 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.



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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.

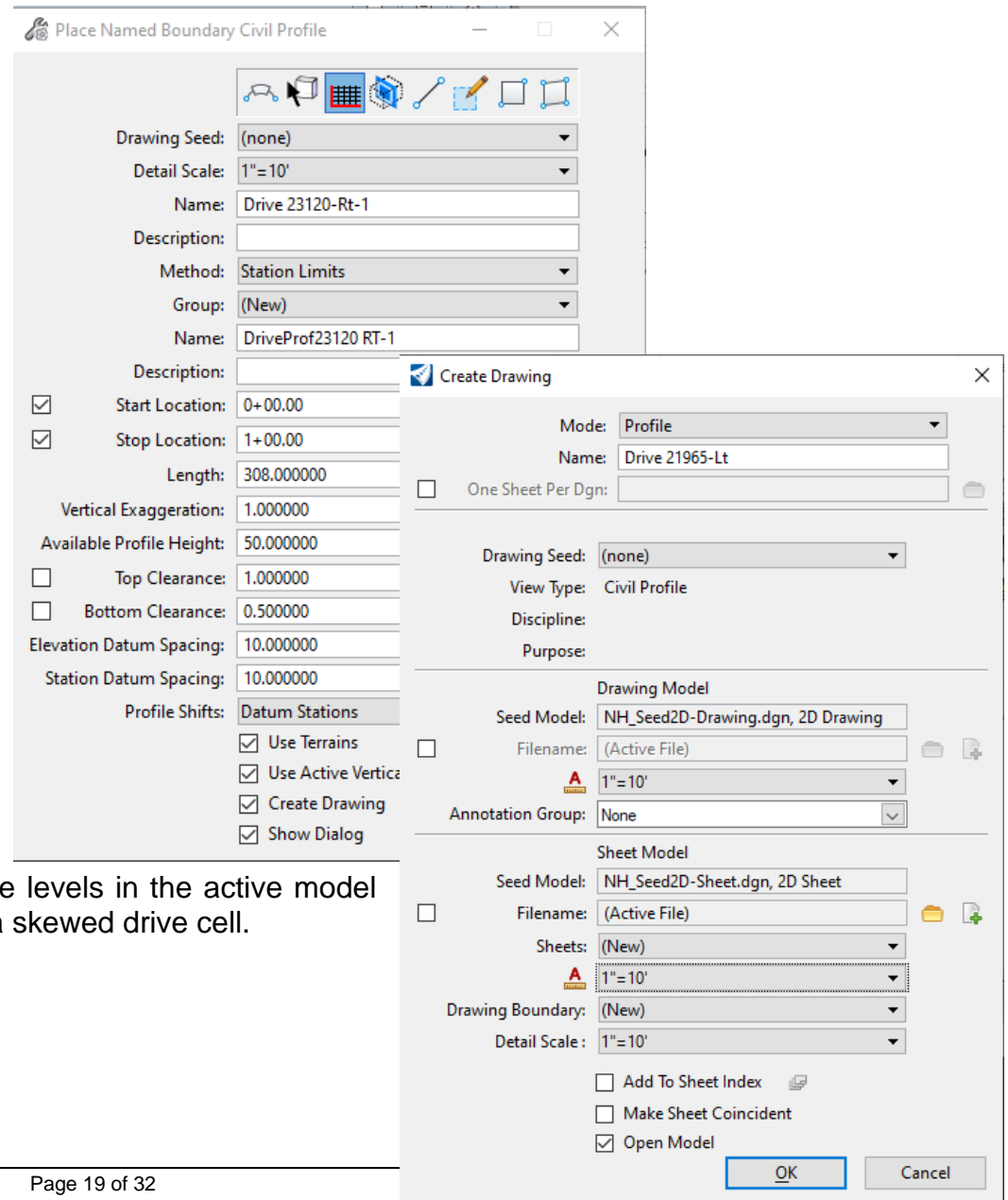
- Drawing seed (none), Detail Scale 1"=10'
- the profile should be named for its mainline station value and side.
- Start station set to 0.
- Stop location set to 1+00 for 10 scale sections set vertical.
- Vertical Exaggeration to 1
- Top Clearance to match the sections (typically 14).
- *Available Profile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





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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-6-8: 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.



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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

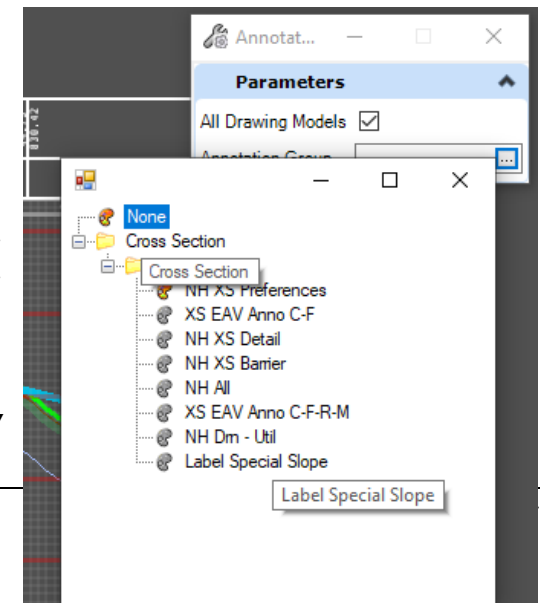
2A Bituminous Pavement in Fill Sections	Earth - Pavement	x" Exist Pave
8 Topsoil Removed Beneath Fill Sections	Earth - Topsoil	x" Topsoil
9 Unsuitable Material Removed Beneath Fill Sections	Earth - Unsuitable	x" Unsuitable
Limited Reuse Soils LRS	Earth - LRS Unsuitable	18" LRS Unsuitable

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

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

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**



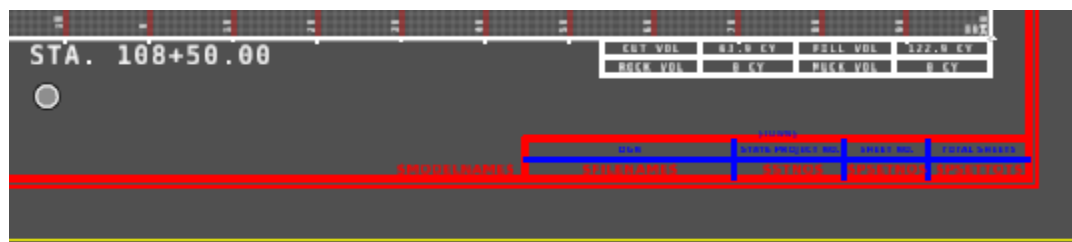


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Anno C-F-R-M can be used if Muck and or Rock is present on the sections. Check the *All Drawing Models* box.

To Remove just the End Area Volumes annotation a Batch Process can be run with command file **cmdfile-XS-anno-delete-EAV-levels.txt** to delete the XS-Volume-Annotation level from all the drawing models prior to reannotating.

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-6-9: 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

Coordinate with the Bureau of Materials and Research to determine station and offset limits needed. Follow the directions at the start of the create cross sections to create a set of sections in the ROCK area at 25-foot increments. May need to create Landscape sections with wider Left or Right offsets to accommodate the Rock Lines.

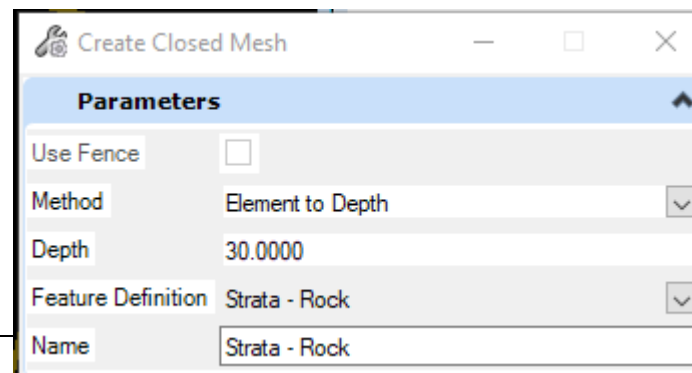
[Create Rock Terrain](#)

Create Event Point List and Create additional 25 foot Sections

From the Materials and Research sections determine where Rock may be impacted to determine where additional Sections are needed to cover the impacts. If it is early enough in the project and there is not much hand annotation on the sections just recut all the sections for the roadway with 50 foot increments before and after the area that 25 foot sections are needed. Add at least 2 additional 25 foot sections beyond the length of impacts. If the project has a lot of modified/hand annotated information create a new *Event Point List* on the Geometry Feature with only the +25 and +75 foot stations. Use the *Event Point List* to create the additional sections and annotate as needed. Either individually or by running the macro and batch routines described above.

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*





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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.

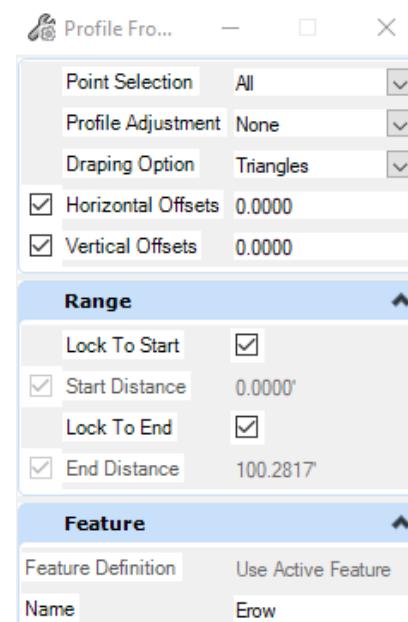
In the XSections.dgn file attach the Earthwork dgn and Rock Terrain.dgn files. The Civil analysis tool Compute cut and fill volumes is used. When it finishes, use the Create End Area Volume Report. The report will show the total Rock which can be ignored.... As well as the Strata-Rock (Removed) which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

Label Rock and Muck Lines

To annotate rock and muck lines on the sections features need to be created and draped on their terrain models. The lines can be created in the Rock or Muck terrain dgn files. In the Feature definition toggle bar set the feature definition (and check use active) to Rock or Muck Line Label. In the *Default* model reference the Geometry dgn file.

- Use geometry tasks Offsets and Tapers > Single Offset Entire Element and select the Road centerline. Offset the feature so that it will be over the terrain model where you want the labels to appear in the sections. The geometry can be tapered or at different offsets along the project if needed by creating as Complex Geometry by PI.
- Use **Profile From Surface** tool in the Vertical group of the Geometry tools to attach elevations to the new feature. Data point on the screen to Profile the selected elements, next **Select the Rock or Muck terrain model by clicking on it**. (do not right click to use active terrain model as this can cause problems if no terrain is active). Accept through the rest of the prompts as displayed to the right to attach elevations to the features.

The Rock and Muck annotation entries are part of the **NH E Drn – Util** Annotation Group. The levels can be deleted using a batch process with **cmdfile-XS-anno-delete-E-DrnN-Util-levels.txt** as the command file and then reannotated. Alternately a new Group can be created with just the 2 entries ***XS txt Rock Line*** and ***XS txt Muck Line***. Understand that the levels they use are the same for the other **NH E Drn – Util** items.





P-6-10: Advanced Annotation Techniques for Final Sections

Introduction

. So, for information such as the Grid and station values that will not change, copying them into the drawing model will speed up removing and reannotating time as they would not need to be reannotated in the future. Batch process routines and macros are being created to assist in removing and reannotating annotation groups other than the Grids that will specifically delete the annotation levels of specific Annotation Groups to minimize annotation time and rework to any modified annotations that are copied.

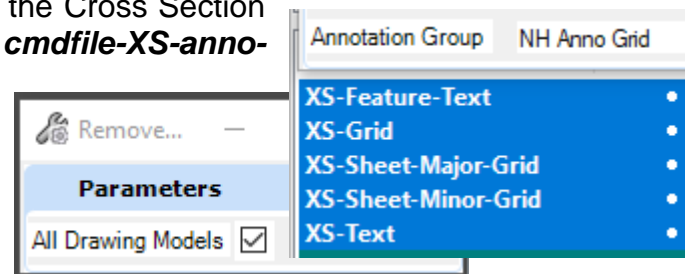
Alternately, a macros **Update_XS_Anno** will remove all annotations and reannotate all of the groups, but can take quite a bit of time to run.

After selecting a group and accepting 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.

Copy the Base Grid Annotation into Each Drawing Model

To Speed up future annotation processes, remove all annotation and then annotate all using the **NH Anno Grid Annotation Group** the drawings. Next copy all the information that was annotated from the group into the drawing models so it does not need to be reannotated in the future. Open the First Drawing model using **Element Selector > Select All** then **Copy** from and to the same point. Repeat for each drawing model.

This can be done with a **Batch process**. *File > Tools > Batch Process*. Add the Cross Section dgn to the Batch process tool and set to all models. Select the command file **cmdfile-XS-anno-Copy-E-Grid-levels.txt** and then process. This selects all the *NH Anno Grid* levels and copies them in each model. When finished open a drawing model and remove all annotation from all. The levels copied are shown in the graphic to the right. Another command file exists to delete the specific levels **cmdfile-XS-anno-Delete-E-Grid-levels.txt** if there are issues and they need to be recreated.

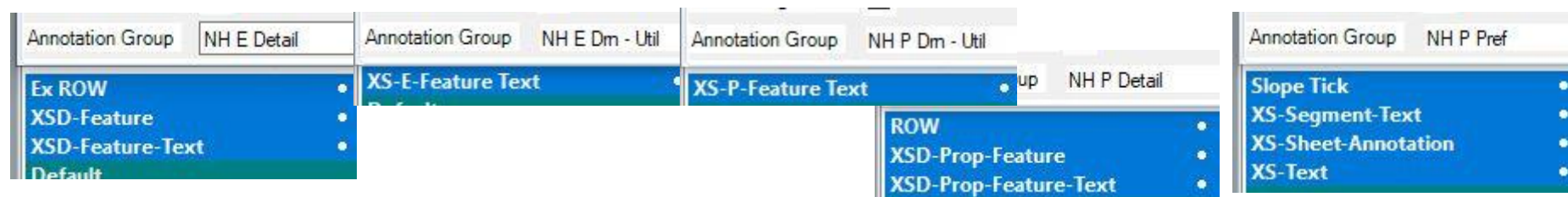




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Review and add Additional Annotation

In the previous steps the **NH Anno Grid** Annotation Group was used to annotate the drawings, and then copied into the drawing models. Additional annotation groups label the **NH E Detail**, **NH E Drn – Util**, **NH P Drn – Util**, and **NH P Detail**. These groups can be used as those types of features are generated. The macro **Update_XS_Anno** will remove all annotations and reannotate all of these at once.



If an annotation group is used and deemed to not need updating in the future such as the NH E Detail or NH E Drn – Util those levels could also be copied into the drawing model after they are annotated. They would then not need to be removed and reannotated so any changes to them would not be lost.

Batch command files exist for Copying or Deleting the levels associated to each annotation group. They actually take longer to process but once the groups levels are copied they would not need to be annotated again speeding up time in the future.

- cmdfile-XS-anno-Copy-All-level.txt
- cmdfile-XS-anno-Copy-E-Detail-levels.txt
- cmdfile-XS-anno-Copy-E-Grid-levels.txt
- cmdfile-XS-anno-Delete-EAV-levels.txt
- cmdfile-XS-anno-Delete-E-Grid-levels.txt
- cmdfile-XS-anno-Delete-E-Detail-levels
- cmdfile-XS-anno-Delete-E-DrnN-Util-levels.txt
- cmdfile-XS-anno-Delete-P-DrnN-Util-levels.txt
- cmdfile-XS-anno-Delete-P-Pref-levels.txt
- cmdfile-XS-anno-update.txt

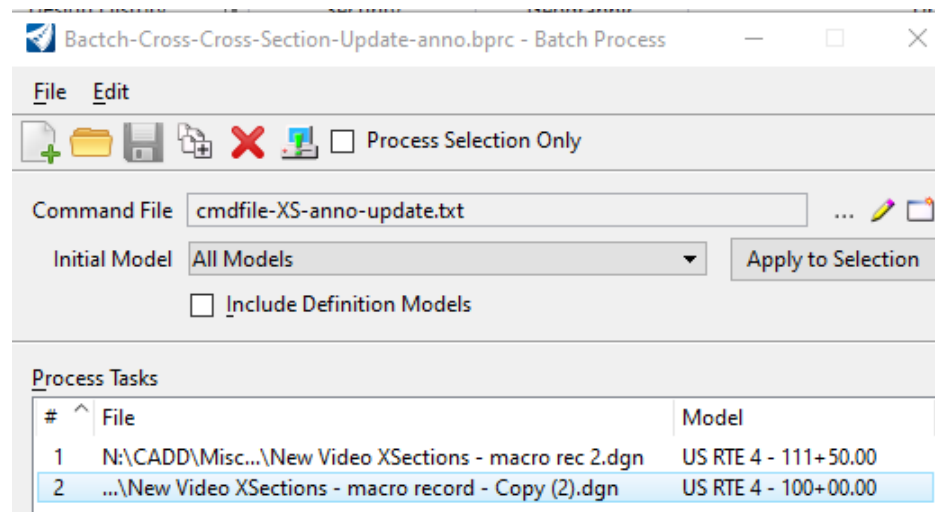


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Batch Process

For roadways with multiple section drawings, a batch process can be run to update all the drawings. *File > Tools > Batch Process*. Add the files to be processed. Select the command file **cmdfile-XS-anno-update.txt**. This file has the **macro play Update_XS_Anno** command in it.

In the Process Tasks area select each cross section file that you added and change the model to be processed to one of the cross section's **Drawing** models contained in the dgn. Save the Batch Process and then Process Batch Process Job. Move the Process box out of the way and click. **Process** The Batch process will open each dgn to the drawing model selected and then run the macro to reannotate all the drawing models.



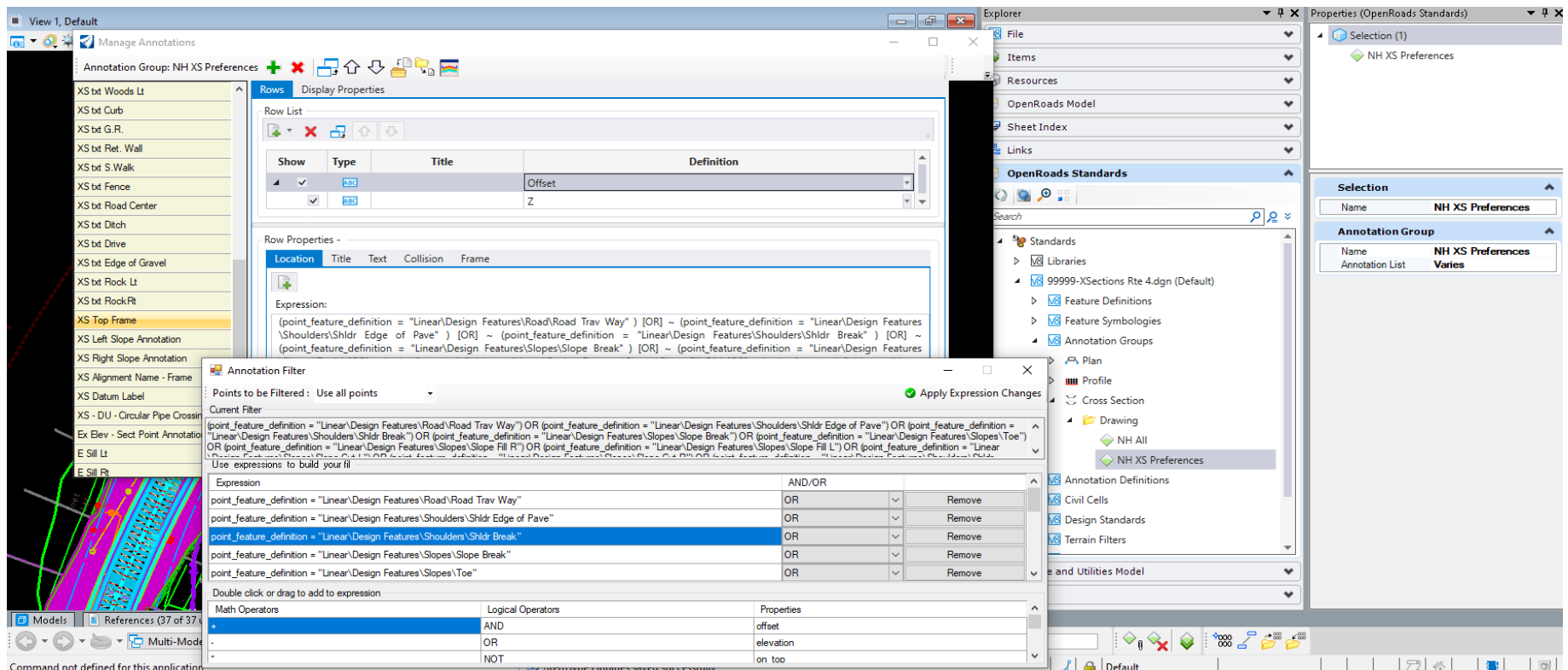


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Editing Annotation Groups - Changing Top Frame Annotations

The cross sections are set up to annotate a list of features contained in the annotation groups. When used, an annotation group and its entries are copied into the dgn. To edit the list or update to the latest settings, 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. (may not want to do this if you have already edited your group for your project as this will reset the standard named groups and entries to match the dgnlib)

Next, open the Annotation Group and modify the point annotation list. Expand the > *Drawing Name* > *Annotation Groups* > *Cross Sections* > *Drawing* > *NH P Pref*. 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.





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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. As a minimum the *Road Trav Way*, *Shldr Edge of Pave*, *Slope Ditch Front* and *Toe* features should be labeled. All others could be removed depending on the Template used. 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* can be used in more than one group. If you update the *XS Top Frame* point list in the *NH-Preferences* group it will be reflected in any other groups such as the *NH P Pref* group.

The *Row Properties* can be edited by clicking in the *Expression* area, highlight an entry and delete it. Repeat for both the *offset* and *Z* to keep them the same. Pay attention to the syntax if you do it this way. When Editing via the *Filter* expression make sure each entry it set to *OR....* or the entry won't annotate because it is not *X AND Y* its only one thing.



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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 P Pref** (or **NH-Preferences**). 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 followed by 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 and segments in the left. Entries in the bottom left can be selected and then using the arrow will copy them to the right list of segments to be annotated. 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.

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. A Batch Process with command file **cmdfile-XS-anno-delete-P-Pref-levels.txt** similar to the one above can be used to delete only the levels annotated with the **NH P Pref** Annotation Group. Then reannotate **NH P Pref**

The screenshot shows two overlapping dialog boxes. The top one is the 'Annotation Filter' dialog, and the bottom one is the 'Select Segments' dialog.

Annotation Filter Dialog:

- Segments to be Filtered: Create list of segment: [dropdown]
- Apply Expression Changes: [checked]
- Current Filter: (point1_on_top AND point2_on_top) AND (point1_offset <= 0.01 AND point2_offset <= 0.01) AND (NOT point1_elevation - point2_elevation = 0)
- Use expressions to build your filter:

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] [swap] Point 2 [dropdown] [add]

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

- [arrow]

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



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Trouble Shooting Segment Annotation

At times some segments may not annotate. This could be due to a variety of reasons. The *NH P Pref* annotation group was created using NHDOT Templates and Point names. The points in a template may be different than those used to set up the preference or may not have the same point feature override names as those used. Review your sections to figure out which segments are missing and review your template to see which points are on each end of the segment. Select the template used when editing the entry.

There may be different point names in the template that are not being used in the XS preference that labels the slopes. In the delivered templates *DM-0-12-4...* the toe has a feature name override... *P_TOE_L* or *R...* and the slope break is *P_SLP_B_L* or *R*. Ditch is *P_DITCH_F_L* or *R*. Review the template for these names. Point with overrides are shown in **Red** in the list.

One cause of the segment not annotating may be a 0 offset between adjacent points. When 2 points are at the same spot, the computer can get confused on which point to use when looking left to right to find the segments. Adding a 0.002 foot offset between points (in the template or with a constraint) may help the annotation find a solution.

The entries for *XS Left (& Right) Slope Annotation* can be copied. Open the ***XS Right Slope Annotation1*** (the copy) and remove all the segments then add only the ones having trouble. It's possible something is conflicting with another entry.... ***XS Right Slope Annotation 1*** Would look like this with just a few entries.

In the original *XS Left (& Right) Slope Annotation* remove any entries for the segments used in the copy so you don't have double annotations.

