# 3D Model Submittal Preparation – Power GEOPAK SS3

General Information

This document is intended to provide guidance in preparing the proposed 3D model data from Power GEOPAK SS3 for submittal and is only applicable to the MDOT_02 workspace. Specific template point names are not critical or mandated however, top surface and bottom surface feature styles must be delivered as indicated in the design submittal requirements *3D Model Surface Feature List SS3* and the *Standard Naming Conventions*. See below for an example of top and bottom surface point locations. A working knowledge of CADD, GEOPAK, template creation and roadway modeling are necessary to complete this process.
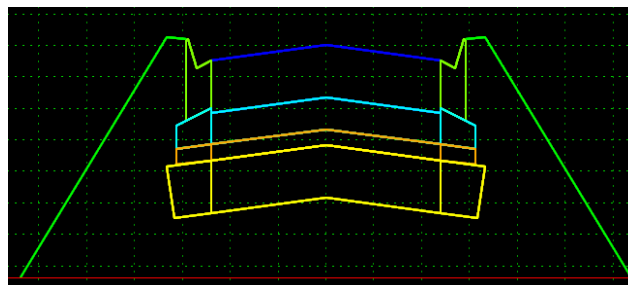
O   Typical Top Surface Points

▽   Typical Bottom Surface Points
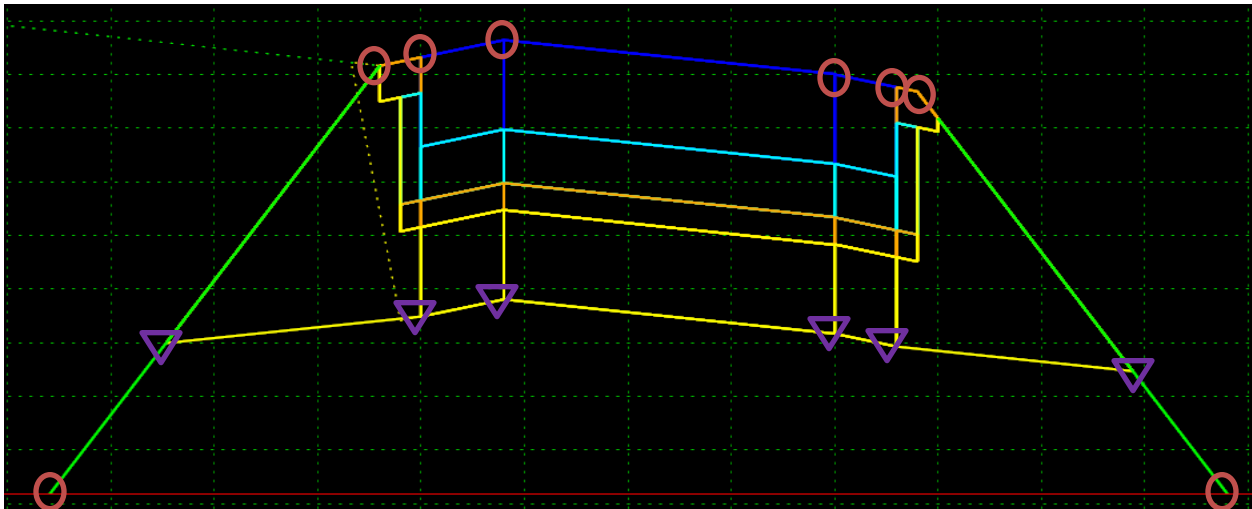
In addition to top and bottom surface feature styles, the other layers of the template must be set to specific styles to simplify sorting of the 3D line strings for submittal.

Using the template below as an example in which the layers shown indicate concrete pavement, OGDC, aggregate base, and subbase the surface feature styles would need to be set as shown in the following figures.

Top Surface Feature Styles

P_Slope_HingePt
P_CnG_XX_Bk*
P_CnG_All_Fc~

Slope Components
style: P_Slope

Curb Components
style: P_CnG_Conc

Concrete Components
style: P_Trvl_Conc

P_Trvl_CrownJoint

P_Trvl_Conc_Prdctn_Edge

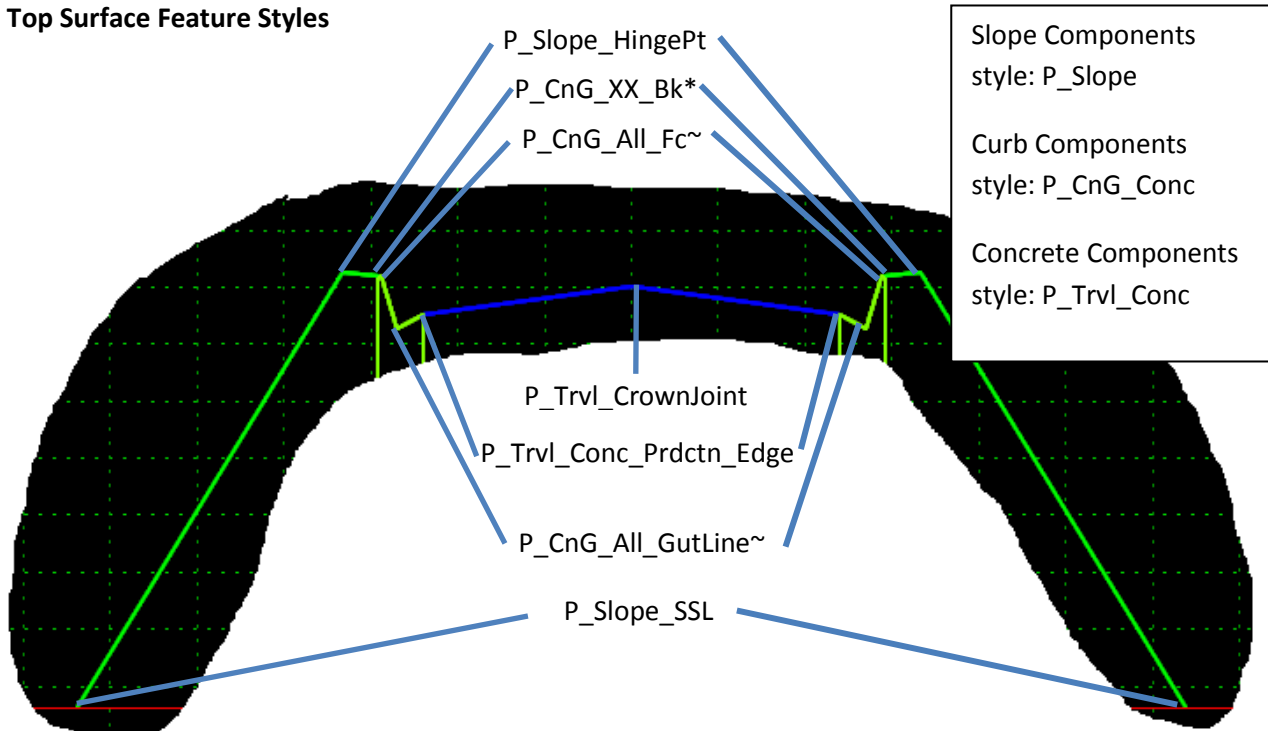P_CnG_All_GutLine~

P_Slope_SSL

Figure 1

*If several different Curb and Gutter types are used on a project the feature name override on all back of curb points must be set to P_CnG_ALL_Bk_(R or L) for curb along the edge of the travel way.

NOTE: In the case of HMA pavement, all HMA points except the very top and very bottom layers should have the feature style P_Trvl_HMA_Prdctn_Bot~ and the component style P_Trvl_HMA_(layer name). Additional top surface feature styles can be found in the document *3D Model Surface Feature List SS3*.
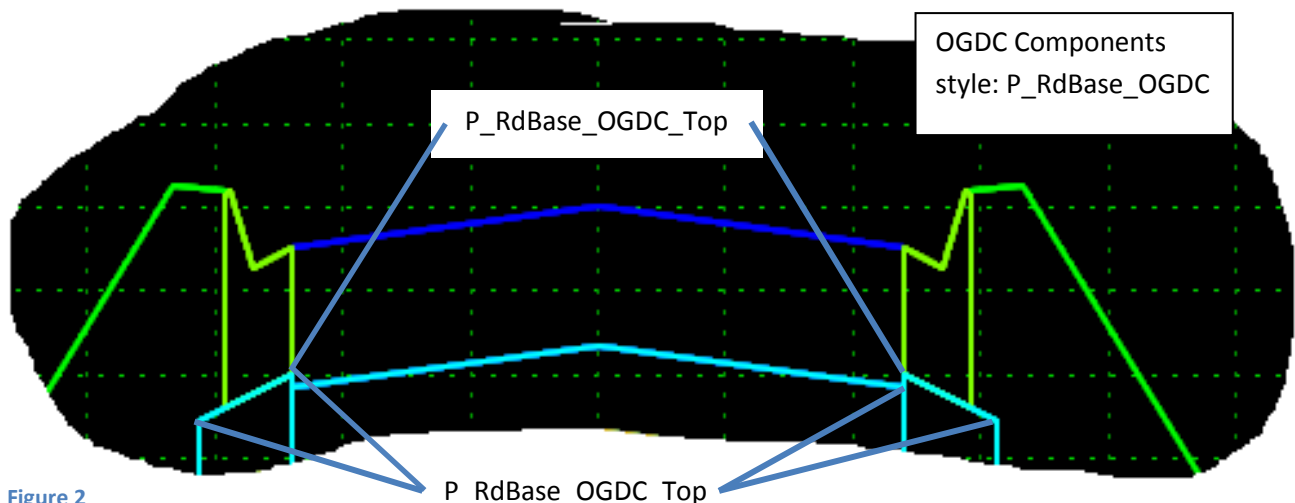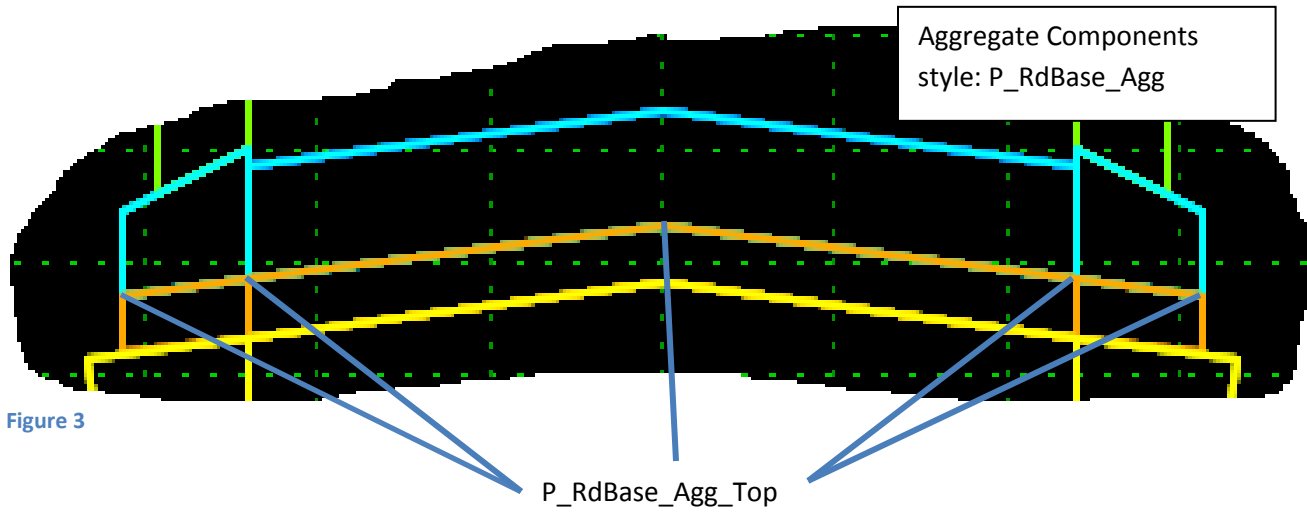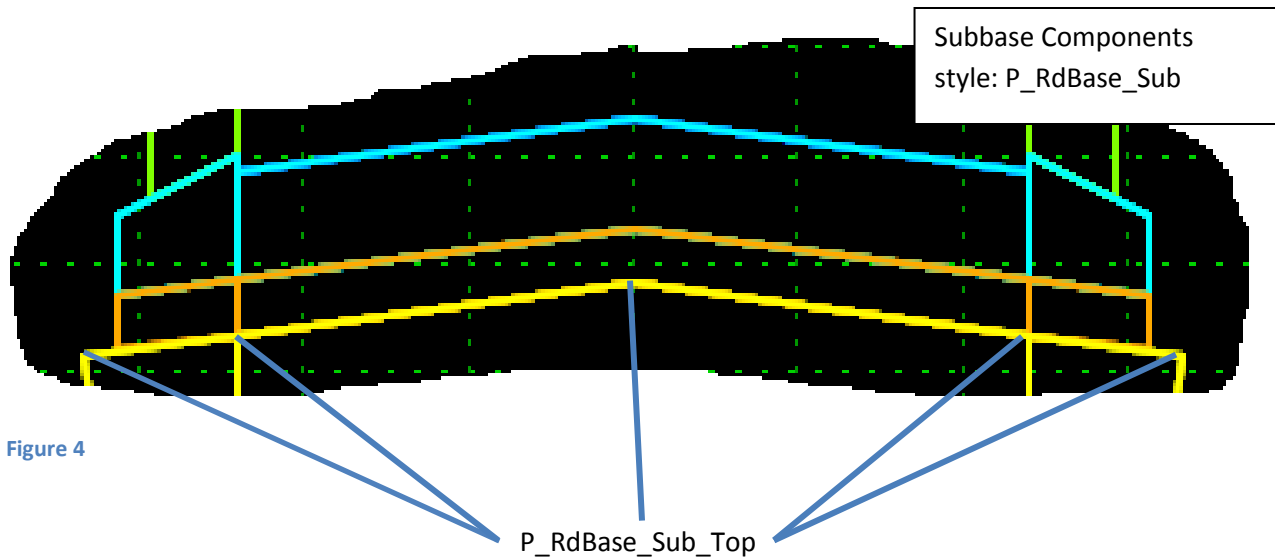
OGDC Layer Feature Style

OGDC Components
style: P_RdBase_OGDC

P_RdBase_OGDC_Top

P_RdBase_OGDC_Top

Figure 2

Aggregate Base Layer Feature Style

Aggregate Components
style: P_RdBase_Agg

P_RdBase_Agg_Top

Figure 3

Subbase Layer Feature Style

Subbase Components
style: P_RdBase_Sub

P_RdBase_Sub_Top

Figure 4

NOTE: Each of the bottom feature styles indicated in Figure 2 through Figure 4 must be manually changed. The default feature style of two points merged during placement will retain the original feature style of the first component placed. So it is necessary to change the feature style of each bottom layer point to the features styles indicted in the figures above.
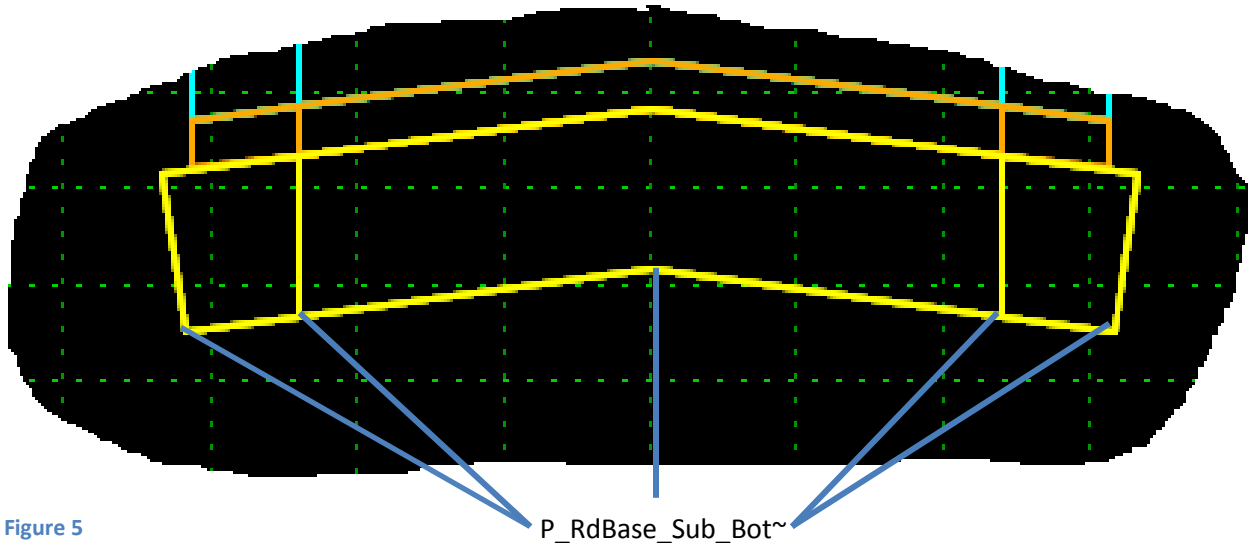
Bottom Surface Layer Feature Style

Figure 5   P_RdBase_Sub_Bot~

NOTE: The same bottom surface layer feature style should be applied to any point on the template that would need to be included in the clay grade or bottom of the proposed pavement cross section. This would include any day lighting points (locations as shown on Page 1). This concept can also be applied to a wedging layer or a milling surface on rehab projects. The example in Figure 5 shows the subbase layer, however in practice any feature style would work so long as it was used consistently on all the bottom of the section points.

In addition to the surface feature style, an alternate surface name can be included in the point properties for any surface layer (other than the top surface) that needs to be isolated as shown below. The sub surface name should be logical and easily identifiable.
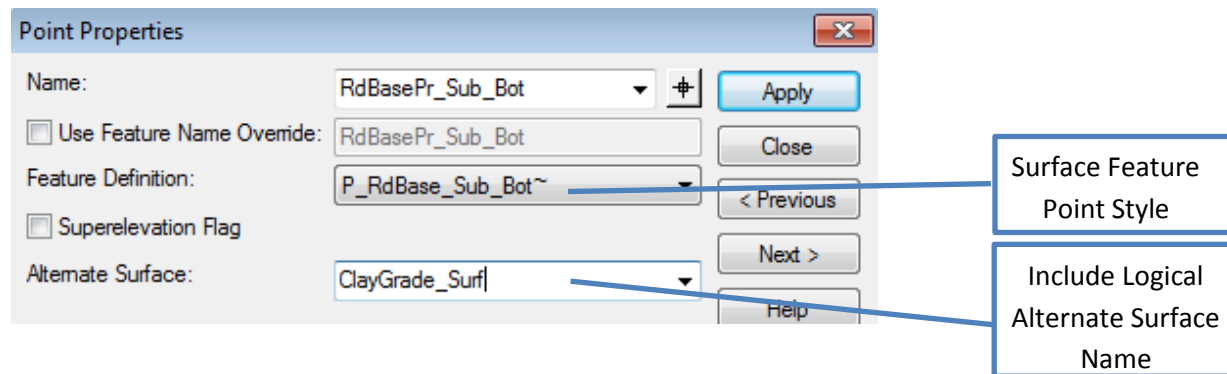
General Overview

The proposed surfaces and 3D line string files required for the RID submittal are generated as part of the design process. It will be necessary to create a separate corridor model for every roadway over 200' in length. Any roadway under 200' in length and created from a civil cell and can be included with the associated mainline roadway.

3D Model Submittal Preparation – MDOT_02 Workspace

RID Creation

Step1: Create the 3D DGN Data Required for the Overall Project

NOTE: This step is required for every RID Submittal. Prior to completing this step, create the following 3D DGN files named per the *Standard Naming Conventions*:

- one for the top surface 3D line strings
- one for the top surface 3D triangles
- one for the bottom surface 3D line strings

Step 1.1: Verify the template drop interval is 5'. Change all corridors to the Design Stage: Review (1x) and reprocess the corridors.

Step 1.2: Create the proposed 3D line strings file of the entire project by opening the top surface 3D line strings DGN file and referencing all project Corridor and 3D Model files using the Default-3D Model and No Nesting setting as shown. Be sure to include any associated Civil Cell DGN files for the project.

Step 1.3: Turn off all levels in the referenced files that contain and of the following in the level name, "XS", "Terrain", "RdBase", "GdRail", "Bot~", and "Corridor" or any other level not desired in the Proposed Terrain Surface.

Step 1.4: Turn on the View Attribute: Level Overrides

Milestone Submittals: "Save Settings" on the DGN.

Final RID Submittal: Merge all the visible data into the Top Surface 3D Line String DGN file.

Step 1.5: Select all the line strings and select "Create from Elements" from the Terrain Model task menu shown below. Follow the prompts. Add all the selected features as "Break Line", Edge Method: Remove Silvers, Feature Definition: P_Boundary, and name the surface specifically and uniquely.
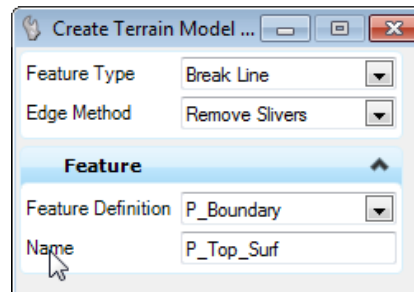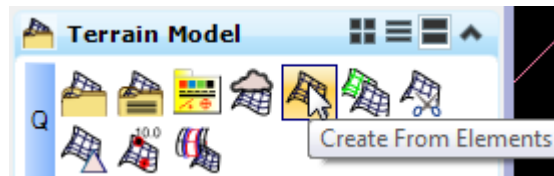
NOTE: It is also possible to create the proposed terrain using the "Create Terrain by Graphical Filter using the Pr – Breaks – 1 Surface filter located on the same tool bar.

Step 1.6: Select the resulting terrain boundary and select "Export Terrain Model" from the context menu. Export the terrain as a GEOPAK TIN. Be sure to name the TIN the same as the Terrain for consistancy of the data for review.
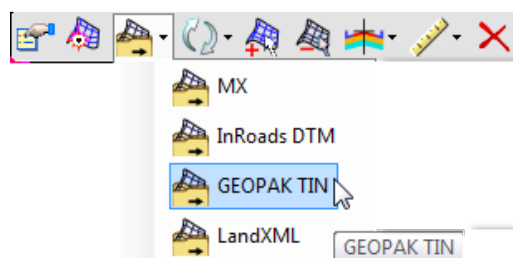
NOTE: The "Export to File" option can also be found on the Terrain Model Task Menu on the "R" Line.

Step 1.7: Use the GEOPAK DTM tools\Edit:Edit Triangles to clean up the unnecessary triangles from the TIN. Once cleanup is complete, save the revised TIN.

NOTE: See the section, **Editing the Proposed Triangles** for more information on how to edit the proposed triangles.

Step 1.8: Open the triangle 3D DGN file for the project and display the 3D triangles and Hull for the revised proposed surface TIN in the file.

NOTE: See the section, **Displaying the Proposed Triangles**, for more information on how to display the proposed triangles.

Step 1.9: Open the bottom surface 3D DGN file for the project and repeat **Step 1.2**.

Step 1.10: Turn off all levels in the referenced files except the level\feature assigned to the bottom of the proposed surface or pavement cross section.

Step 1.11: Repeat **Step 1.4** through **Step 1.7**. Except name the bottom surface accordingly.

NOTE: The overall proposed surface names are not mandated, but should be specific enough to easily identify the project and the associated surface. All terrain feature names included in the RID submittal 3D DGN files must comply with the *3D Model Surface Feature List SS3*.

Step 2: Create the 3D DGN Data Required Per Roadway

NOTE: This step is only required for the <u>Final RID submittal</u>. Prior to completing this step create a separate 3D DGN file for each of the following for every roadway over 200' in length per the *Standard Naming Conventions*.

- top surface
- bottom surface

Step 2.1: Open the corresponding road top surface 3D DGN file.

Step 2.2: Reference the corresponding road Corridor using the Default-3D Model and No Nesting setting as shown in **Step 1.2**. Be sure to include any associated Civil Cell DGN files for the roadway.

Step 2.3: Turn off all levels in the referenced file that contain any of the following in the level name, "XS", "Terrain", "RdBase", "GdRail", "Bot~", and "Corridor" or any other level not desired in the Proposed Roadway Terrain Surface.

Step 2.4: Turn on the View Attribute: Level Override and merge all the visible data into the Top Surface 3D Line String DGN file.

Step 2.5: Open the corresponding road bottom surface 3D DGN file.

Step 2.6: Repeat **Step 2.2**.

Step 2.7: Turn off all levels in the referenced file except the level\feature assigned to the bottom most layer of the proposed surface or typical cross section.

Step 2.8: Turn on the View Attribute: Level Overrides and merge all the visible data into the Bottom Surface 3D Line String DGN file.

Repeat **Step 2** for each roadway over 200' in length. Side roads of less than 200' in length, independent ditches or walls should have the 3D line sting features included with the associated mainline roadway.

NOTE: The individual proposed roadway names are not mandated, but should be specific enough to easily identify the project and the associated surface. All terrain feature names included in the RID submittal 3D DGN files must comply with the *3D Model Surface Feature List SS3*.

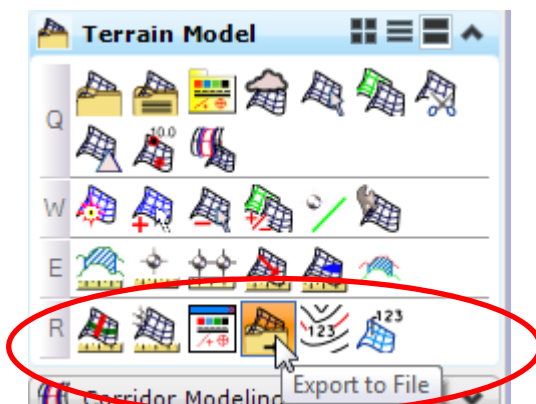**Step 3: Create the Proposed Terrain LandXML files**

NOTE: This process is only required for the Final RID Submittal and should only be completed after the all the 3D line string and triangle files have been created.

Step 3.1: Open the Terrain Model task menu and select the "Export to File" option on tool bar "R".

NOTE: The "Export to File" tool can also be accessed by selecting a terrain boundary and using the context sensitive menu. The export process can only be completed on a terrain located either in the active DGN or referenced to the active DGN.

Step 3.2: Create the LandXML file for each Terrain Model as per the _Standard Naming Conventions_.
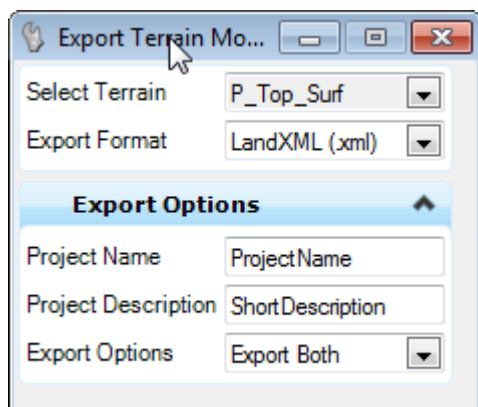
NOTE: Terrain Models and other names shown do not reflect actual file name requirements but are intended to indicate the general type of information and naming convention required. All surface names should be specific enough to identify the location and roadway in the project.

Repeat the **Step 3** for each Terrain Model created with **Steps 1** and **2** for the project.

NOTE: Do not create standalone LandXML files for independent ditches, walls, or roadways less than 200' in length.

Additional Information

Any template points included in various display rules or hidden features will need to have the same feature style as the mainline material layer as well as a consistent feature and component name override name, throughout the template, to build connected 3D line strings for a project. 3D triangles and cross sections when displayed often look fine and the continuity issues are not apparent until the line strings are displayed without the associated components.

At times the plotted cross sections will not draw components; this is also a symptom of not having all the 3D elements referenced and displayed in the "Default -3D Views" of the cross section DGN file. Any 3D element whether it's the existing Terrain Model, created with Power GEOPAK SS3 through a Corridor, other modeling methods or are Microstation 3D elements which are displayed in 3D Model View of the DGN will appear in the cross sections.
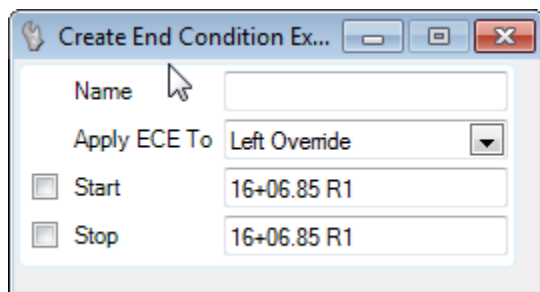
Point names and override names are especially important when transitioning between templates. The program will not know how to connect the points across the transition unless the override names match or an end condition exception with a transition is set for the template transition and the points are connected together appropriately.

For more information on template transitions see the MDOT Power GEOPAK Training Video – Roadway Designer Series: Part 5 – Template Transitions.

NOTE: The video mention above was created for Power GEOPAK SS2, but the principles discussed relating to feature and component override names are still valid for Power GEOPAK SS3.

Alternate surface names can be added to any layer of the template if any additional surfaces are requested. It is important that any template point to be included in an alternate surface have the same alternate surface name defined.

Several training videos are available for editing and displaying the proposed triangles. The videos are part of the Advanced MDOT Power GEOPAK SS3 – Road Modeling Course and can be found either on the MDOT GEOPAK FTP site, the Design Services Website or in ProjectWise. Please contact MDOT-PowerGEOPAKSupport@michigan.gov for assistance in locating the videos.
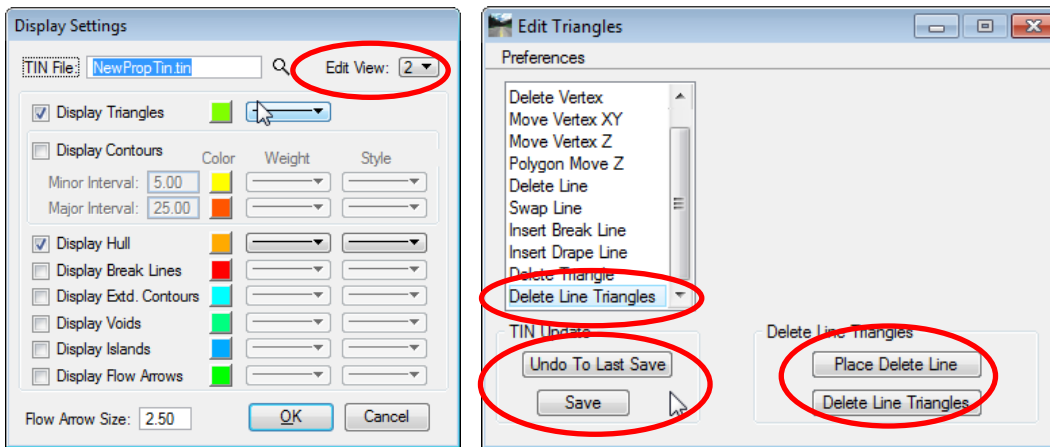
Editing the Proposed Triangles

Step A: Open the triangle 3D DGN file named according to the _Standard Naming Conventions_, and then open the DTM Tools Menu.
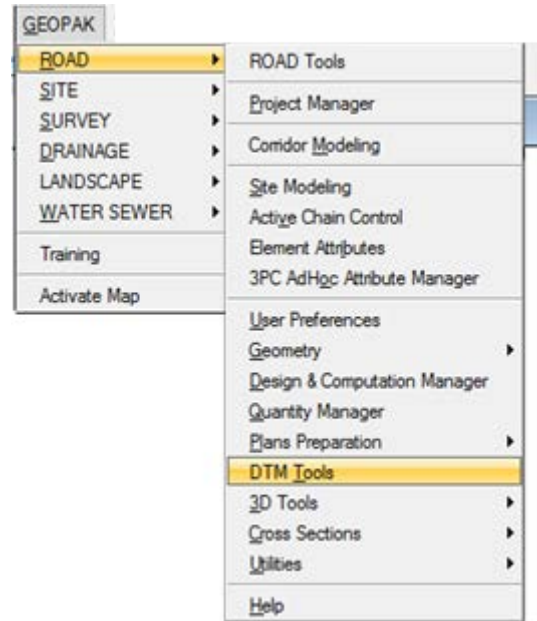
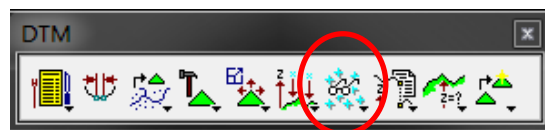**Step B:** Select the Edit: Edit Triangles option.

Step C: Select the TIN of the proposed surface created from the 3D line strings and set the toggles on the dialog as shown below. Be sure to set the Edit View to a view other than 1 for best results.

Step D: Delete the long and unnecessary triangles using the "Delete Line Triangles" option. Be sure to save often.

Step E: Open the 3D line String file. Display the Hull on the level Slope_BreakLine_Pr_SlopeStakeLine using the Load DTM Feature option.

NOTE: The Hull can also be displayed in a 2D DGN file and used as the project Slope Stake Line.

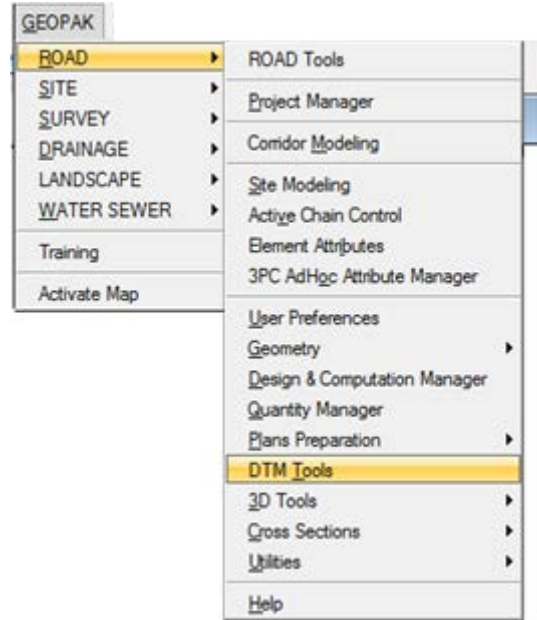**Step F:** Select the Proposed Terrain and add the revised triangle boundary as Feature Type: Boundary.
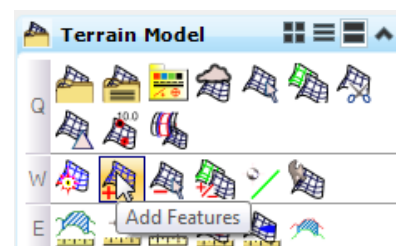
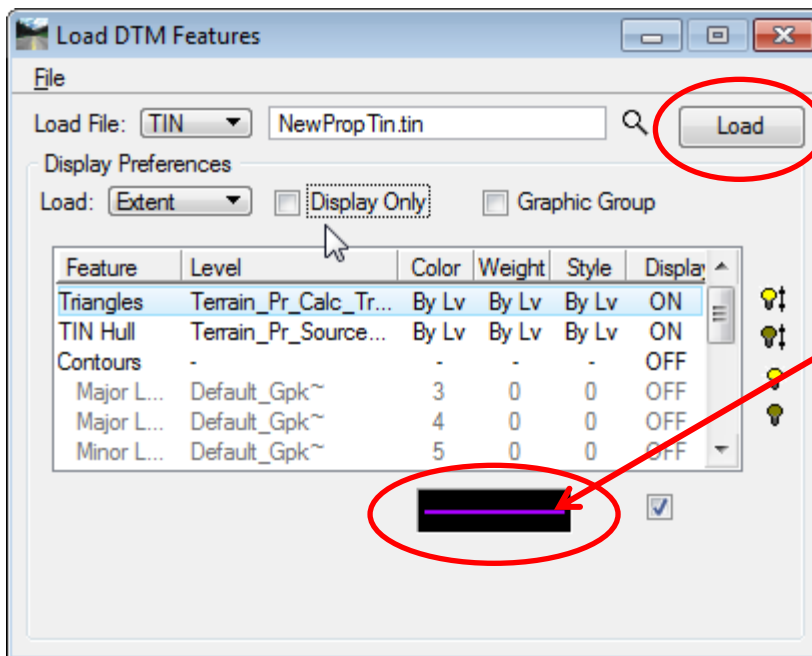**Displaying the Proposed Triangles**

Step A: Open the triangle 3D DGN file named according to the *Standard Naming Conventions*, open the DTM Tools Menu.
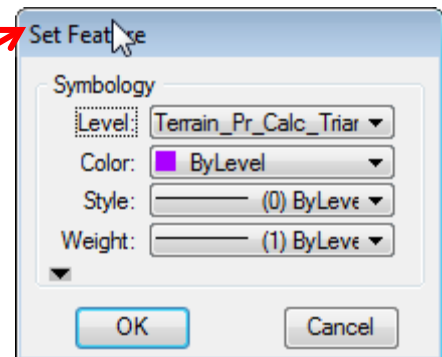
Step B: Select the Load DTM Feature option.

Step C: Select the TIN of the proposed surface and set the toggles on the dialog as shown below. Be sure to set the feature symbology as shown.

Step D: Display the 3D triangles in the 3D DGN file named according to the *Standard Naming Conventions* by "Clicking" the Load button.

Trouble Shooting the 3D line Strings

If the line strings are broken lines, meaning they have unnecessary gaps or breaks in the line strings other than where civil cell have been placed, it will be necessary to use the "Feature Name Override" in the point properties dialog and the "Use Name Override" in the component properties dialog as shown below for components at points that need to be connected in the complete model.
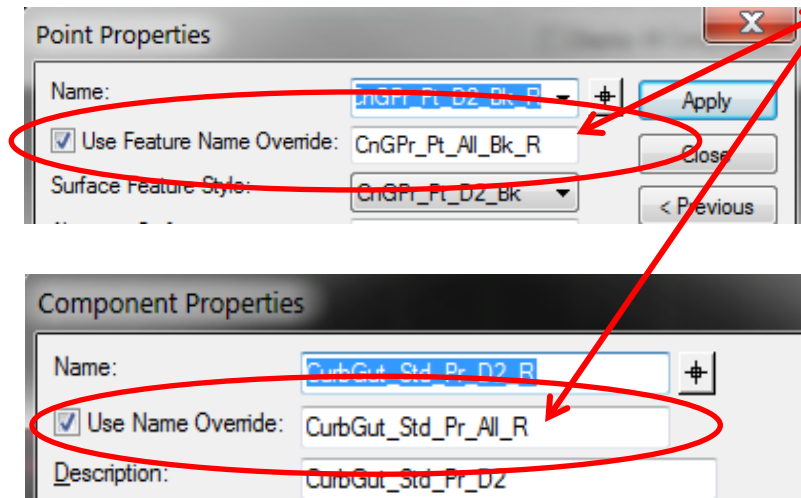
These toggles should be set for like points and components when using multiple templates or display rules. See the See the MDOT Power GEOPAK Training Webinar: The Proposed Template Series: Part 6 - Parametric Constraints for more information.

NOTE: The video mention above was created for Power GEOPAK SS2, but the principles discussed relating to feature and component override names are still valid for Power GEOPAK SS3.

Technical Support

Please email any questions, issues or problems associated with this document to:

MDOT-PowerGEOPAKSupport@michigan.gov

This is also accessible through Microstation or Power GEOPAK while in the MDOT_02 workspace through the "MDOT Tools\Help\MDOT Support Contacts" menu.