
Chapter 15

Proposed Cross Sections & Typical Section Generator

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15.1 Objectives

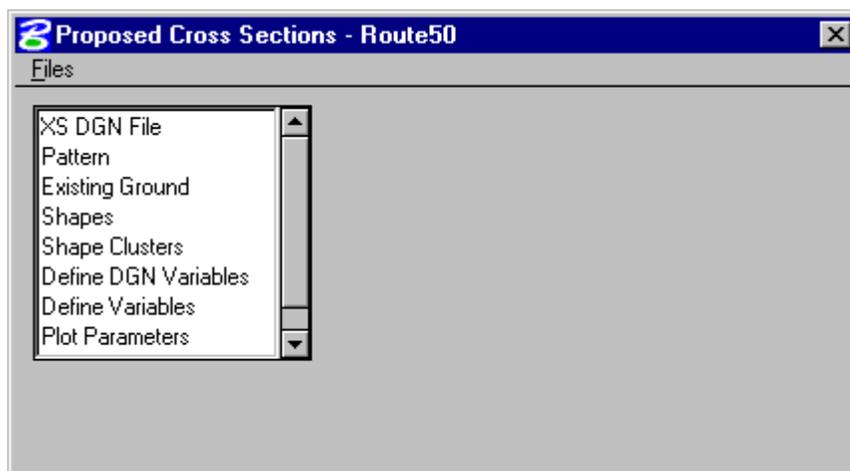
- Use Project Manager to create proposed cross-sections using the Typical Section Generator Tool.
- Understand what criteria files are and how Geopak Typical Section Generator uses them to define side slope conditions for proposed cross-sections
- Become familiar with MoDOT's Typical Section Generator.

15.2 Accessing

Proposed cross-sections can be accessed from **Project Manager >> Proposed Cross Sections**.
IMPORTANT NOTE: If the default MoDOT run is older than 06/08/2004 it needs to be replaced

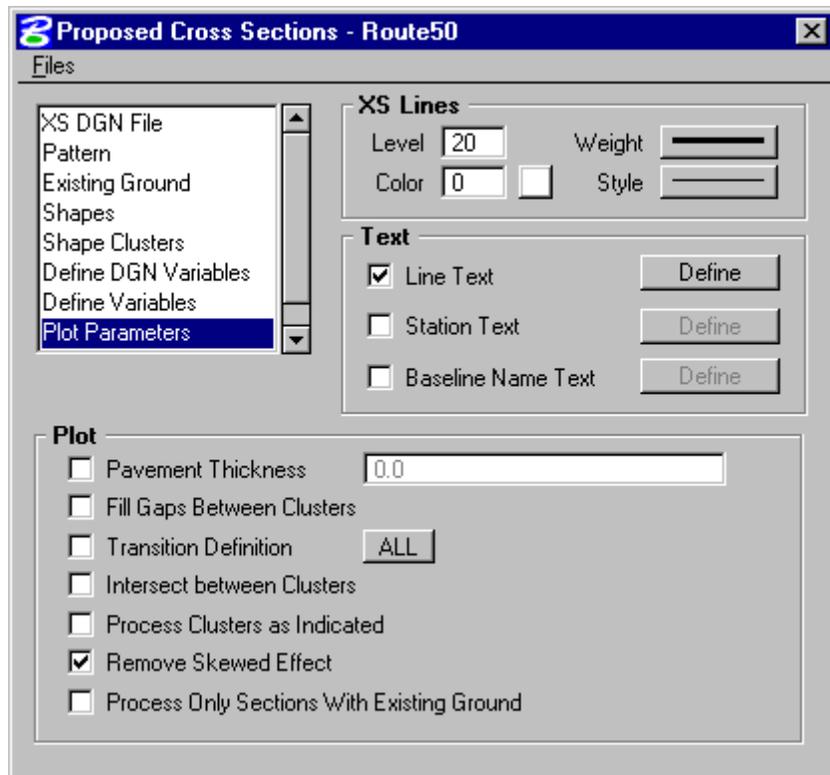
15.3 Dialog

When the **Proposed Cross Sections** button in the Road Project Manager is pressed, the Select Run dialog is displayed. An existing run may be selected or new run may be started. When complete, press the **OK** button, which will close the Select Run dialog and open the proposed cross sections dialog as depicted below.



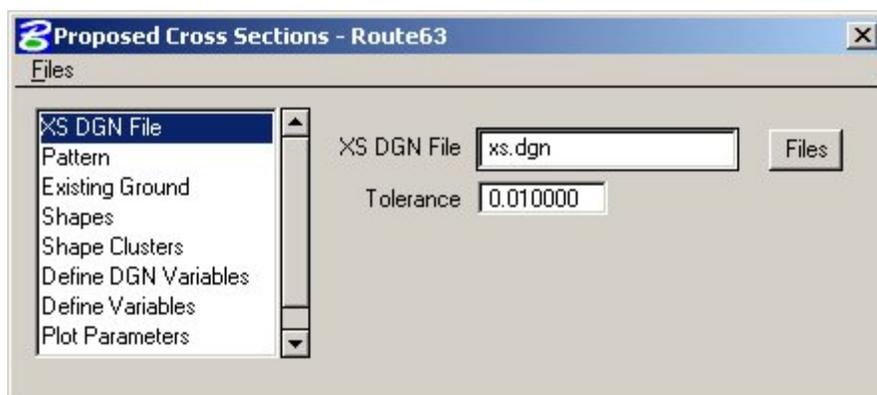
The left side of the dialog contains the list of parameters required to process proposed cross sections. When each parameter is selected, the dialog changes to reflect the requirement of each parameter. For example, when **Plot Parameters** is selected, the dialog changes to reflect the various plot parameters and text as depicted on the next page.

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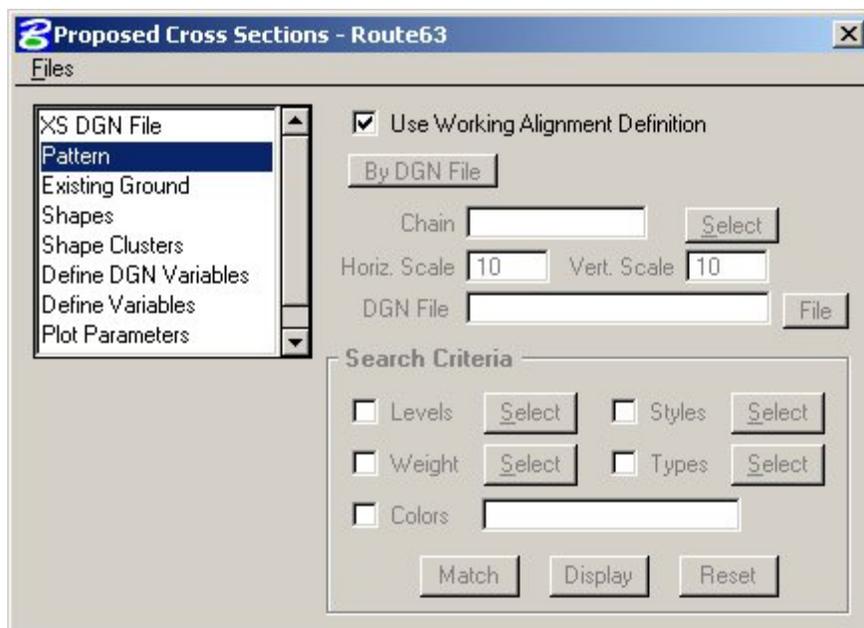
15.3.1 XS DGN File

XS DGN File controls the Microstation file in which the original ground cross-sections are located. The proposed cross section elements will be placed into this file.



15.3.2 Pattern

When **Pattern** is selected, the dialog changes to the illustration below. This section contains information on how to find the pattern lines used to create the original ground cross-sections.

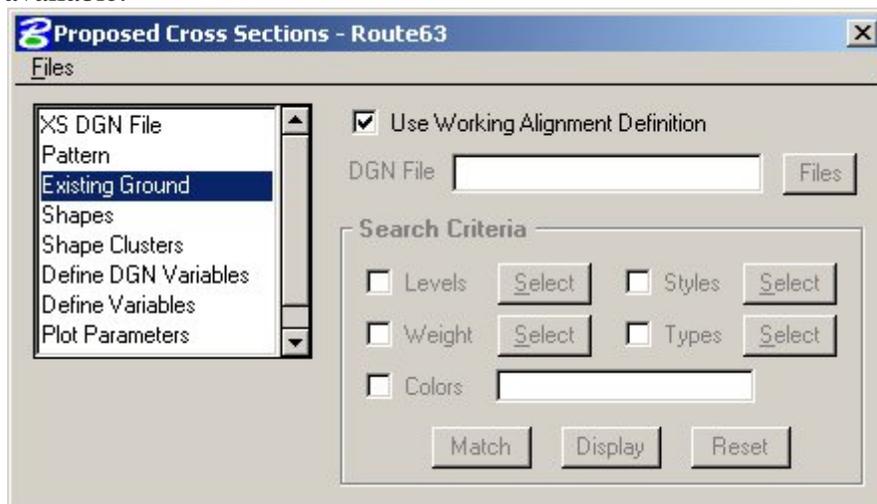


Three dialogs (Pattern, Existing Ground, and Shapes) support a toggle to **Use Working Alignment Definition**. For example, in the Pattern dialog above, the toggle is not active; therefore the user must supply all pattern information. However, if the toggle is active when one of these three dialogs is invoked, the data information part of the dialog is ghosted and the required information is utilized from the current working alignment. If the toggle is activated, and the required information is not stored within the current working alignment, an Alert message is displayed. It is recommended to use the working alignment definition when this toggle is available.

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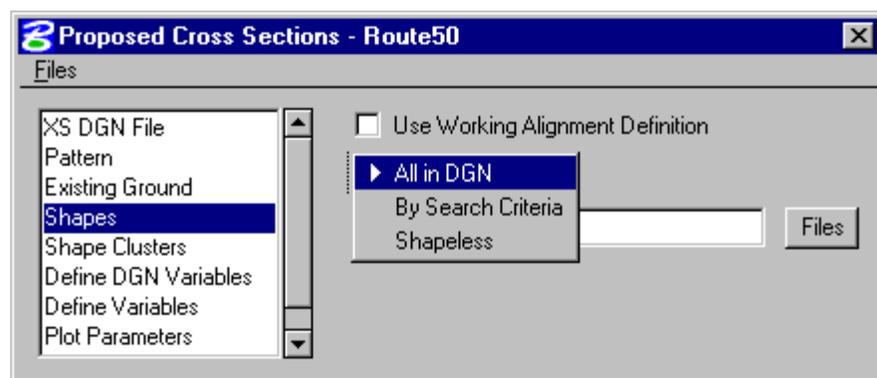
15.3.3 Existing Ground

Existing Ground section contains information to identify the symbology of the existing ground cross-sections. The user toggles on the **Search Criteria** options needed to identify the existing ground, then selects the values for those options. The **Use Working Alignment Definition** toggle is also available.



15.3.4 Shapes

When the **Shapes** parameter is selected, the dialog is displayed as depicted below.



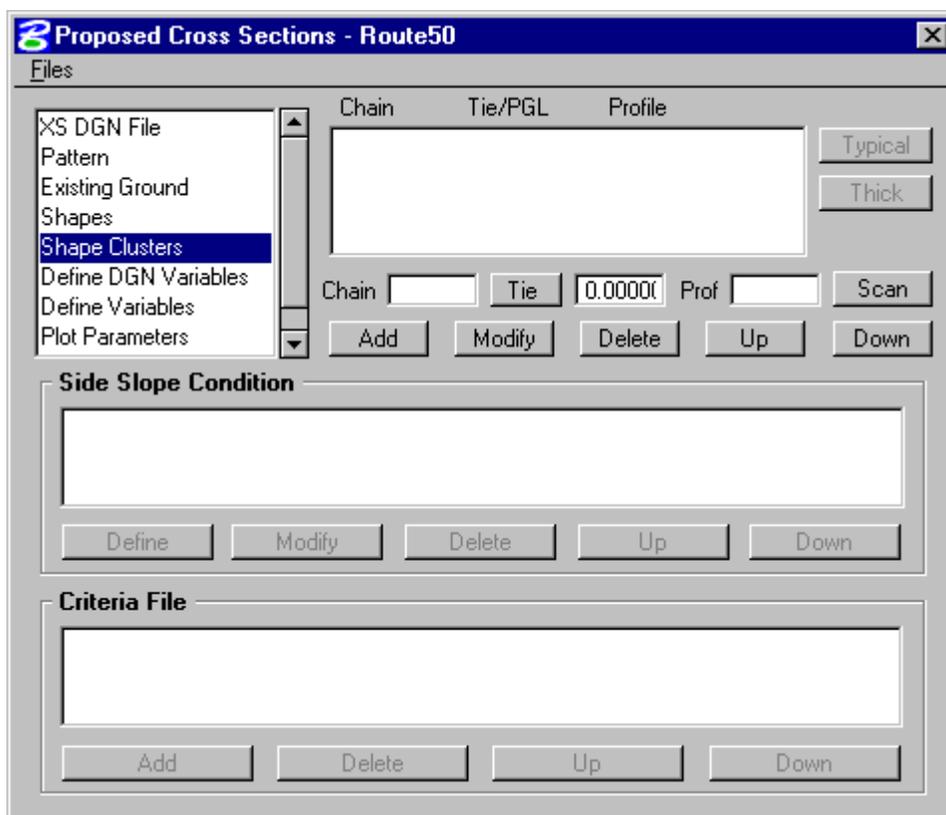
Three options are supported as depicted in the exploded view:

- **All in DGN** - All shapes within the specified file are utilized.
- **By Search Criteria** - Only those shapes that match the specified search parameters are utilized.
- **Shapeless** - No shapes are utilized. In this option, there is no field for a shapes file name or files button.

The **Use Working Alignment** toggle is also available.

15.3.5 Shape Clusters

When the **Shape Clusters** parameter is selected, the dialog dynamically changes as depicted below.



The user may **Add**, **Delete**, or **Modify** any specified shape clusters. When the **Scan** button is pressed, Geopak scans the design file and uses the search criteria specified in the **Shapes** dialog to lists all matching shape clusters. In the case of shapeless criteria, the user must define the cluster by typing in the Chain, Tie/PGL and Prof, then pressing the **Add** button.

15.3.5.1 SIDE SLOPE CONDITIONS

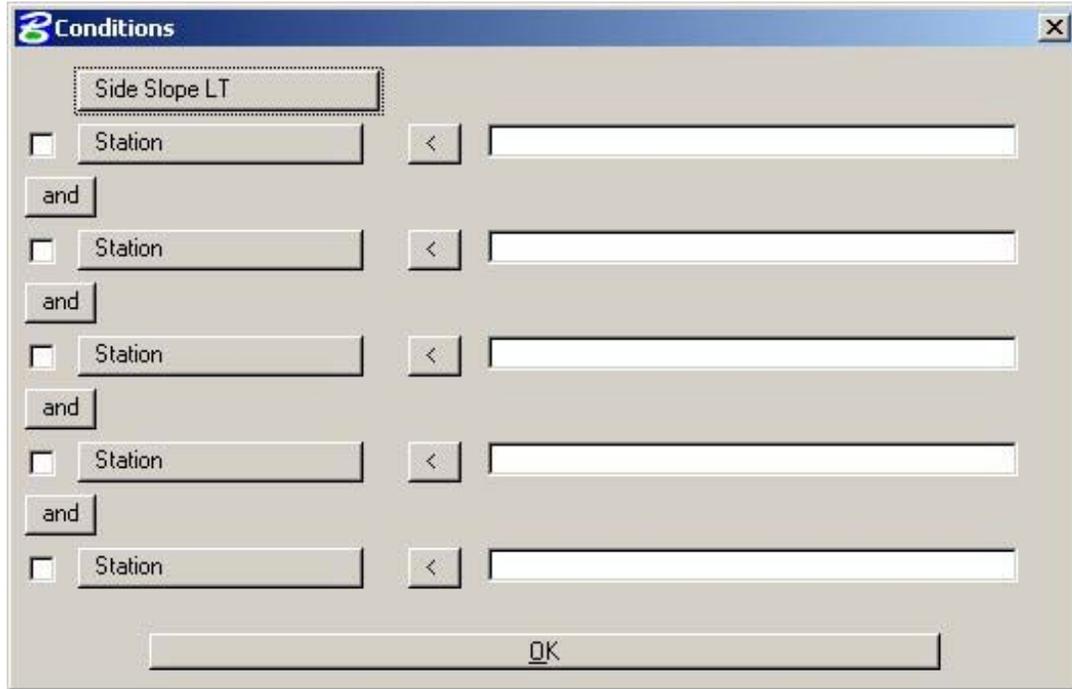
The **Side Slope Conditions** define what happens for each side of the shape cluster, and/or within a specified station range on the specified side of the shape cluster. The side slope conditions can be defined either by Conventional Side Slope Definition or by using the **Typical Section Generator** tool.

15.3.5.2 CONVENTIONAL SIDE SLOPE DEFINITION

To set up the side slopes conditions by conventional methods, the user needs to choose the **Define** button from the shape clusters dialog box. The define button is available once a shape cluster is added.

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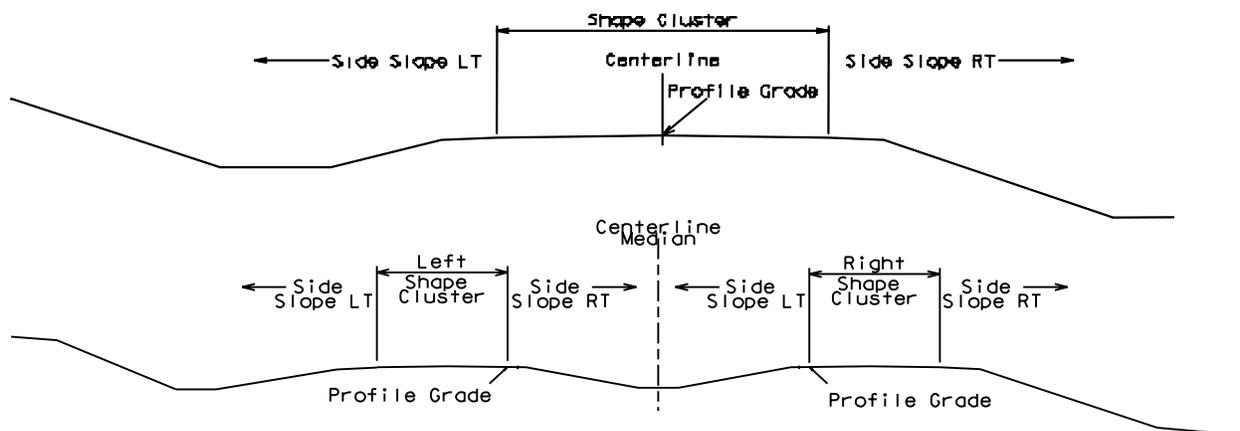
When choosing the Define button the following dialog box is displayed



The user can choose **Side Slope LT**, **Side Slope RT**, or **Offset Minus/Plus Side Slope LT/RT**.

Certain conditions such as $\text{Station} > 5+000$, or $\text{Median Width} \leq 7.2$ can be set up to apply the side slope information if those conditions are met. For example, the side slope condition *Side Slope LT where Station $\geq 15+00$ and Station $\leq 23+00$* would apply the specified criteria files (criteria files are discussed later) to the left side of the shape cluster only between and including stations 15+00 and 23+00.

It is important to remember that the side slope conditions pertain to the left or right side of the shape cluster, not the left or right side of the baseline.



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15.3.5.3 CRITERIA FILE

For each **Side Slope Condition** criteria files are added based upon the type of features to be drawn in the cross-sections. Criteria files will be covered in Section 15.4.

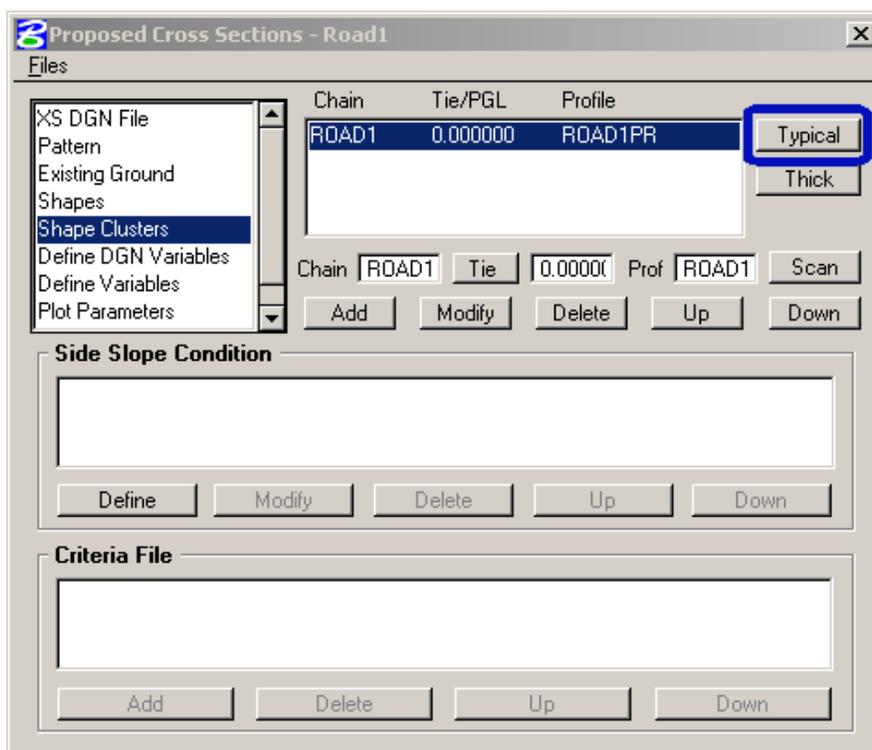
15.3.5.4 TYPICAL SECTION GENERATOR

The Typical Section Generator (TSG) tool allows the user to select a picture representing the project typical section to set up the side slope conditions and appropriate criteria files. This tool is designed for accommodating 90% of project cases.

The TSG is a powerful and versatile tool. It can be used for both rural sections, urban sections or a combination of the two. Similarly, this tool can be used for both bituminous and rigid pavement as well as a combination of the two within the same project. The tool allows the user to select a particular typical section for one or multiple station ranges.

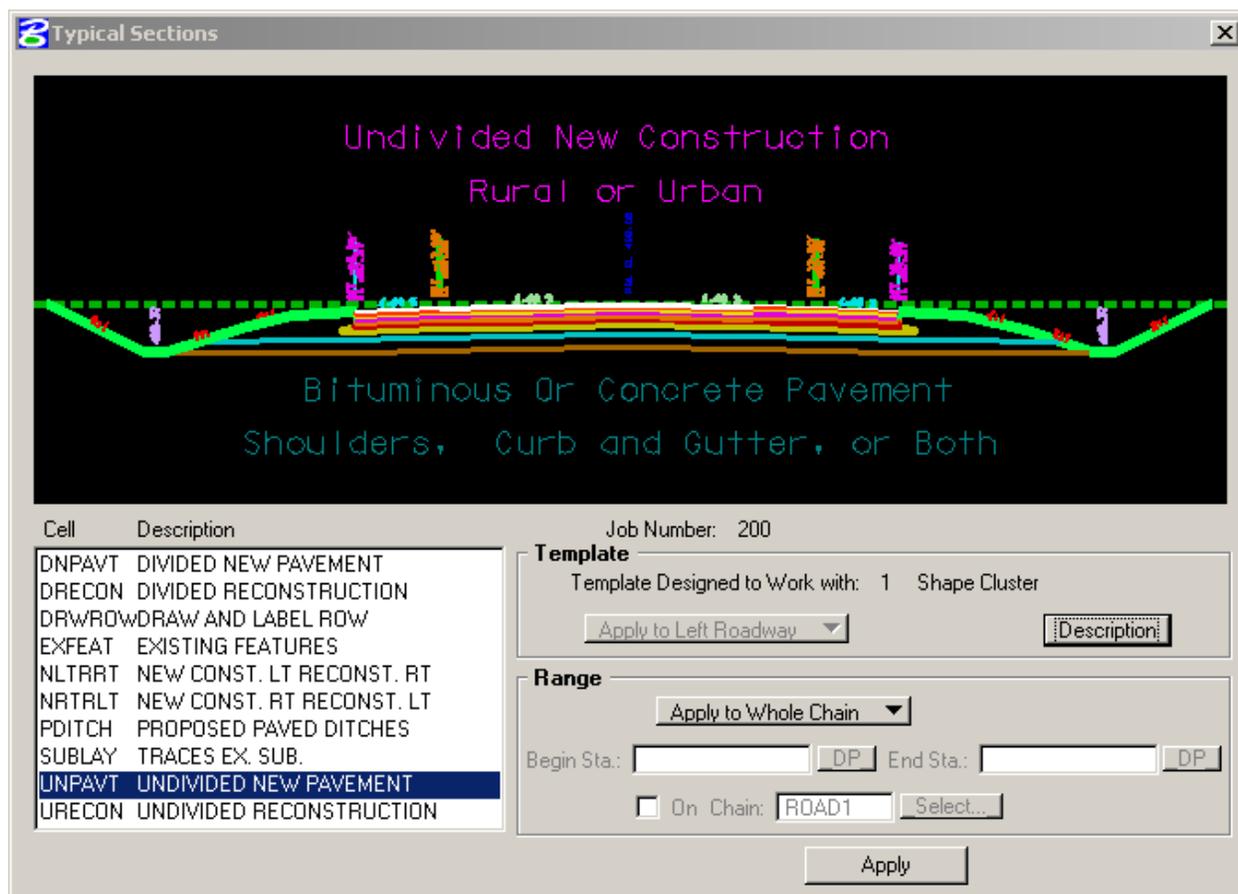
The TSG works by searching for plan view elements and then it draws the proposed cross section elements based on the typical section selected and the plan view elements found. Therefore, it is required placing **ALL plan view elements** using the **Design and Computation Manager (D&C Manager)**. Each typical section has a **Help File**, which specifies the D&C Manager path to all available plan view elements. These help files can be accessed through the CADD Support internal web page.

To access the Typical Section Generator, select the **Typical** button in the dialog box below.



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The Typical Section dialog box opens and it is displayed below



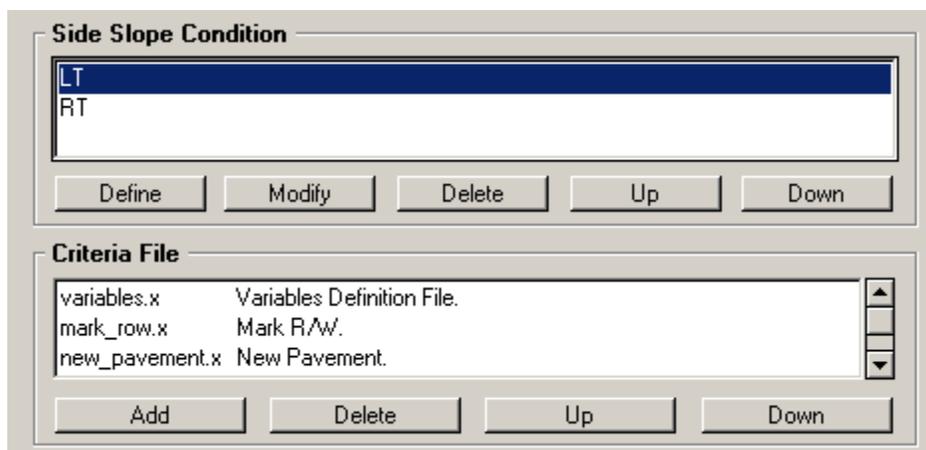
The user has a list of ten (10) different typical sections from which to choose. Each typical section has a picture and a description, which can be accessed by clicking on the **Description** button. The description shows in great detail what plan view elements are required in order for the typical section generator to work. In addition, it explains all the define and redefinable variables. **Define Variables** and **Redefinable Variables** are explained in **Section 15.3.7** & **Section 15.3.8** respectively.

The dialog offers information such as the job number and how many shape clusters are required for using the individual template. When the template requires two (2) shape clusters, the user will be required to apply the typical section to both sides of the roadway. It is *imperative* that the roadway template is applied to the left of the roadway first.

In addition, the user has the option to apply the selected typical section to either the whole chain or a particular station range. The user will also have the option to choose a particular chain. Note that if using working alignment definition, choosing a chain will not be necessary.

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When the apply button is selected in the TSG, the side slope conditions are automatically populated with the appropriate criteria files.

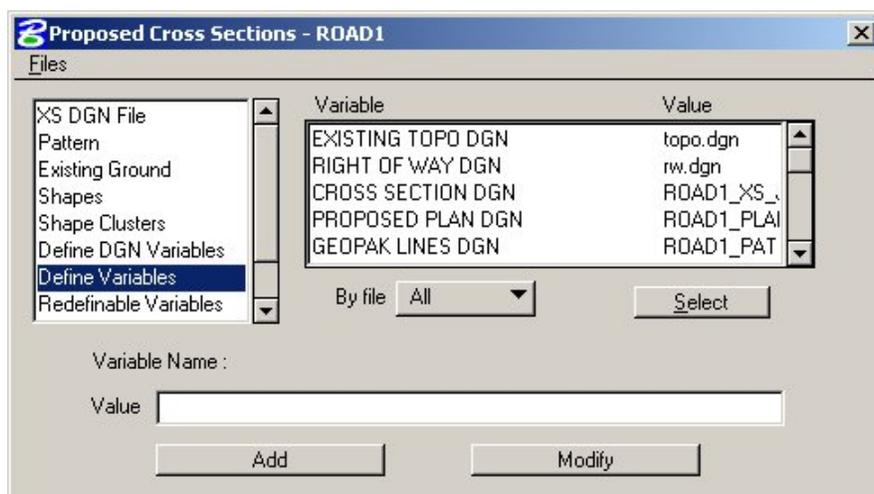


15.3.6 Define DGN Variables

The **Define DGN Variables** option allows the user to define how to locate Microstation elements used by the criteria files. **Define DGN Variables** can be determined from the element symbology, or from the symbology and attributes assigned in the D&C Manager database. MoDOT users do not need to define the DGN Variables. These are defined within the criteria files.

15.3.7 Define Variables

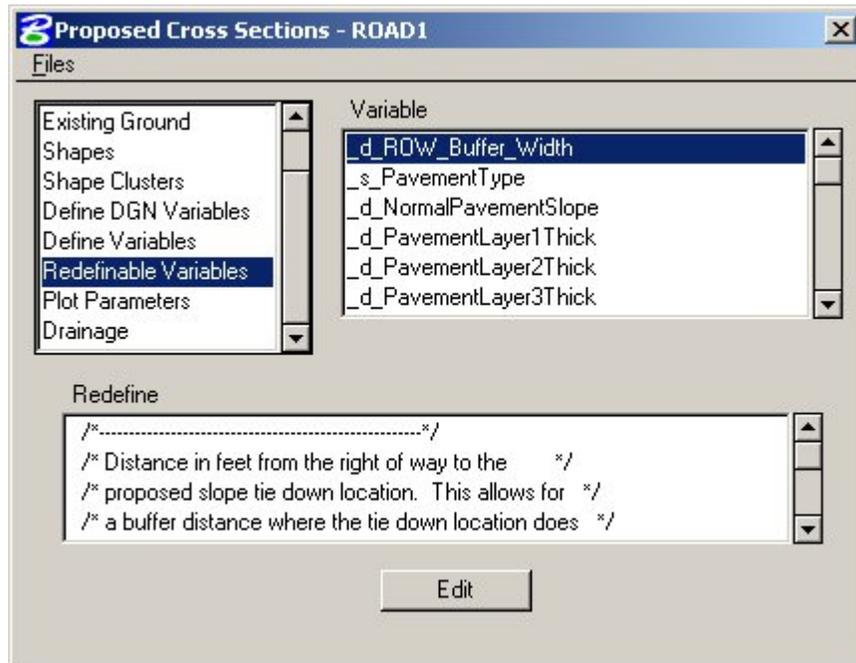
Define Variables are variables that allow the user to enter certain information regarding plan view elements, special chains and profiles, and Microstation files to be used as well as the appropriate scale used for text and symbol size. The user can select the variable from the list, then enter the value and select the **Modify** button.



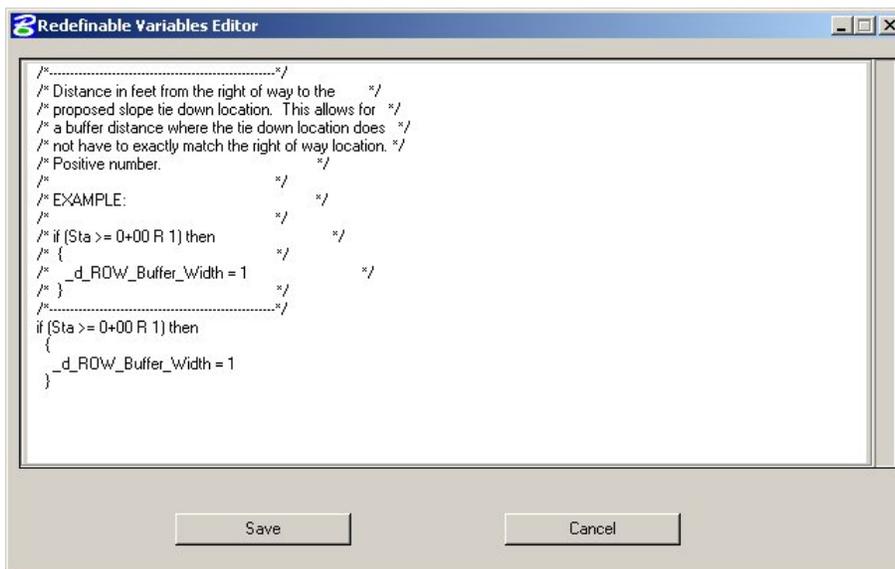
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15.3.8 Redefinable Variables

Redefinable Variables are variables that allow the user to enter job specific values for certain items to be drawn with the typical section generator. Some of these items include, but are not limited to type of pavement, pavement thickness, type and thickness of shoulders, ditch width, side slopes, etc. These variables can be “redefined” for various station ranges. The variable displayed will depend on the typical section selected.

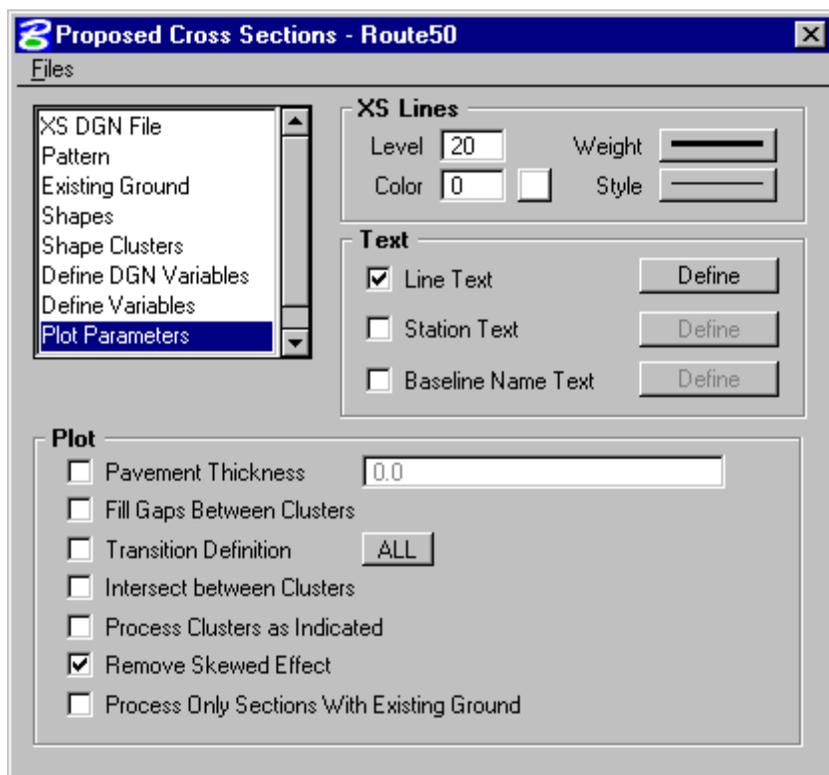


Each redefinable variable is set to a default value. The user selects the variable from the list and click on the **Edit** button to input the appropriate value for the specific project. The editor opens and the user can edit the value.



15.3.9 Plot Parameters

Plot Parameters allow the user to determine how the data from the superelevation shapes are going to appear. **XS Lines** determine the symbology of the pavement surface. **Text** plots various pieces of text relating to the cross-section. **Plot** allows the user to control different aspects relating to the cross-sections and criteria files. The **Plot Parameters** dialog box is displayed on the next page.



Pavement Thickness will plot a depth of pavement below the pavement surface. MoDOT users should leave this value at 0.0. The `pvmt_layers.x` criteria file should be used to draw the depth of pavement.

Fill Gaps Between Clusters will draw a line between two shape clusters if the criteria does not fill between them.

Transition Definition defines the use of superelevation parabolic transitions. MoDOT users should use the ALL option.

Intersect Between Clusters will extend or trim elements in a median to create a finished, clean appearance.

Process Clusters as Indicated will force the criteria to process the clusters as they are listed in the **Shape Clusters** dialog. If this option is turned off, the clusters will be processed left to right.

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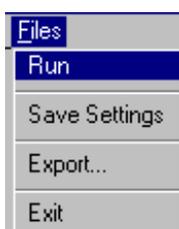
Remove Skew Effect will force Geopak to correct itself back to the pattern line if a skewed element is encountered in the processing of the criteria files.

Process Only Sections With Existing Ground will process the proposed cross sections for only those cross section cells that have existing ground drawn.

15.3.10 Drainage

The **Drainage** section allows the user to draw the drainage components into the cross sections. The drainage .dgn file, and the drainage project database must be specified.

15.3.11 File Menu

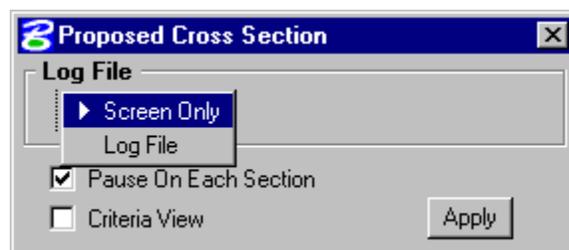


Under **Files**, the options are **Run**, **Save Settings**, **Export...** and **Exit**. To process the cross-sections, press the **Run** button, which invokes the Process Cross Section dialog. **Save Settings** simply saves the current settings to the run, and can be recalled at a later time. When the **File > Export** option is selected, the user may save the dialog information in an ASCII input file for subsequent processing. The **File > Exit** option enables the user to exit the **Proposed Cross Sections** dialog box. The software also prompts the user with an **Alert** box if the settings should be saved before exiting. Pressing the **Yes** button will save the current dialog settings, **No** will not save the settings, but both buttons will exit to the **Project Manager**.

15.3.12 Process Cross Sections

When **File >> Run** is chosen, the dialog to the right appears.

The output can be displayed on the screen only, or written to a log file and displayed to the screen. The **Pause On Each Section** option allows the user to view each section as it is drawn. **Criteria View** displays each step in the criteria file. This is primarily for debugging purposes.



15.4 Criteria Files

One of the most powerful and flexible features of GEOPAK is the use of criteria in generating proposed cross-sections. Within criteria, design conditions can be evaluated and complicated design decisions executed in response to these design conditions. The flexibility of criteria allows the designer to make the design as basic or as complex as the project requires. Numerous baselines can interrelate as ditches and medians are drawn between roadways and ramps. Sophisticated drainage details can also be drawn with criteria. The list is endless.

Cross-section criteria are used to draw cross-section features outside of the mosaic of superelevation shapes typically representing pavement. Operationally, the software constructs

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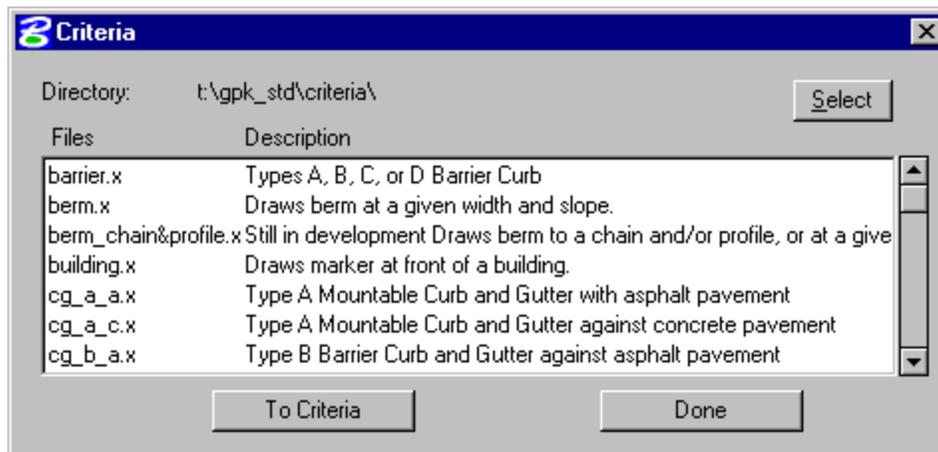
the cross-section features derived from the mosaic of shapes first. Then, the software constructs the remaining portions of the cross-section through the application of criteria emanating out from the outer edges of the mosaic of shapes.

MoDOT users do not need to know how to write criteria. A criteria library has been established. As users encounter situations that require a new criteria file, they should contact the CADD Support Center to have that criteria file written.

Note: Criteria files written or modified outside of the CADD Support Center, and criteria writing **WILL NOT BE SUPPORTED**.

15.4.1 MoDOT's Traditional Criteria Library

MoDOT's criteria library is located in the directory t:\gpk_std\criteria. Within the **Shape Clusters** section of the **Proposed Cross Section** dialog, the user can choose the **Add** button in the **Criteria File** portion of the dialog box. The following dialog will appear.



The user simply selects the criteria file to be included, and then clicks the **To Criteria** button. The criteria files must be listed in the order they are to be processed. Once they are selected, they can be re-arranged within the **Proposed Cross Sections** dialog box.

With each run, the **Setup.x** criteria file must be chosen as the first criteria file in each side slope condition. This file allows the user to choose the plotting scale and the files that are being used for the plan, shape, and cross-section information. This data is required for other criteria files.

The criteria files will have a short description to help identify what they will do. The criteria file name will also give a basic idea of what the criteria file is. For example, cg_b_c.x will draw a type B curb and gutter and cap the edge of pavement as concrete (vertical line). The file cg_b_a.x will draw a type B curb and gutter and cap the edge of pavement as asphalt. Help documents are available on the intranet for further information on the criteria library.

15.4.2 MoDOT's TSG Criteria Library

MoDOT's typical section criteria library is located in the directory t:\gpk_std\typicals.

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15.5 Example: Big Horn Dr.

In Proposed Cross Sections, create a new default MoDOT run by deleting the MoDOT run for user **ClsUser** and copy the MoDOT run from user **AltRun**, leaving the name the same. Copy the new default MoDOT run and call it **BigHorn**.

In the Shape Clusters section, add the BigHorn shape cluster information. Highlight the shape cluster and click on the **Typical** button. Select the **Undivided New Pavement** typical and click on **Apply**. This will create the side slope conditions and add the criteria files to each side slope.

Switch to the **Define Variables** section and change the following variable vales:

CROSS SECTION DGN	BH_xs_j5p0100.dgn
PROPOSED PLAN DGN	BH_plan_j5p0100.dgn
GEOPAK LINES DGN	BH_pattern_shape_j5p0100.dgn
XS SCALE	10

Based on the Typical Sections for Big Horn Drive, switch to the Redefinable Variables and change the following variables, leaving the station information the same:

_d_NormalPavementSlope	-3.125
_d_PavementLayer2Thick	8.25/12
_d_NormalOutsideShoulderSlope	-3.125
_d_ShoulderLayer1Thick	1.75/12
_d_ShoulderLayer2Thick	4/12
_d_ShoulderLayer3Thick	4/12
_d_CurbSearchDistance	4
_d_BermSlope_Left	3
_d_BermSlope_Right	3
_d_DitchForeSlope2_Left	4:-1
_d_DitchForeSlope2_Right	4:-1
_d_DitchBackSlope_Left	2:1
_d_DitchBackSlope_Right	2:1
_d_FillSlope1_Left	4:-1
_d_FillSlope1_Right	4:-1

Change the following Redefinable Variables to include the indicated station ranges.

	<u>Sta >= 0+00 R 1</u>	<u>Sta >= 17+31.61 R 1</u>
_d_StandardDitchDepth_Left	0	2
_d_StandardDitchDepth_Right	0	2
_d_DitchWidth_Left	0	8
_d_DitchWidth_Right	0	8
_d_FillSlope1Width_Left	0	8
_d_FillSlope1Width_Right	0	8
_d_FillSlope2_Left	2:-1	4:-1
_d_FillSlope2_Right	2:-1	4:-1

Run the proposed cross sections, pausing on each section.