Chapter 6 - Lithology Patterns and the Lithology Mode

Introduction

The Horizontal XSection program can store 20 lithology patterns. These patterns are stored as bitmap files (*.bmp), which uses individual pixels to create an image. When you begin the program, it loads the default patterns (bitmap files) into memory. However, it is a simple process to load a custom set of lithology patterns, or to load and/or change individual patterns. The process, explained in "Chapter 3 - The File and Formatting Menus", for loading a file with pre-formatted attributes using the File->New menu item, will also load the files lithology patterns. Lithology mode allows you to draw horizontal, as well as dipping beds, add stringers and even put in faults.

Creating Custom Patterns with Microsoft Paint

A nice property of bitmap files is that they are simple to create. Microsoft Windows OS all come with a program called "Paint", which is a primitive, yet effective way to create lithology patterns, as well as log images (See chapter on log images).

To create a custom pattern, first open the "Paint" program by clicking on Start->All Programs->Accessories->Paint. The lithology patterns used in Horizontal XSection Log should be 32 pixels wide by 16 pixels in height. To create a 32 x 16 pixel canvas, click on Image->Attributes…, to open the attributes window, and enter 32 pixels and 16 pixels in the width and height text areas, respectively. An alternative method is to right-click a bitmap file and click "open with" and select the "Paint" program from the list of programs.
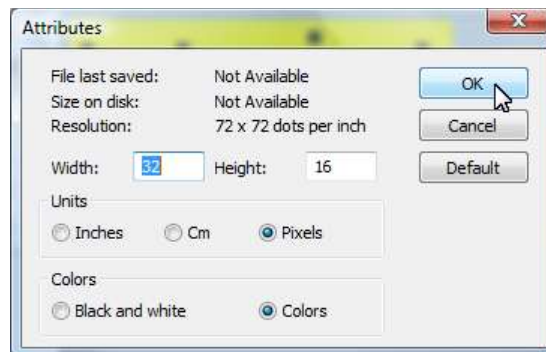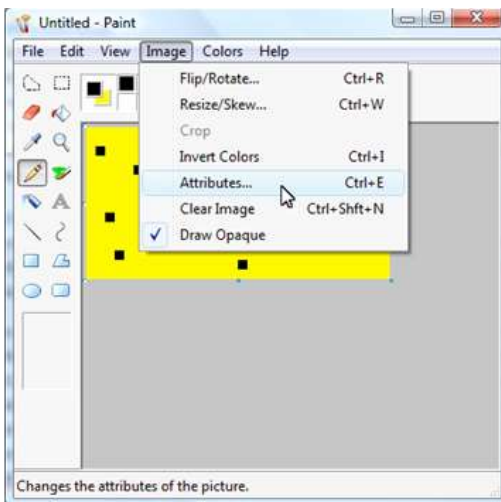

After closing the attributes window, click on View->Zoom->Custom->800% to enlarge the canvas area. This will make it easier to design your pattern. Create and save your custom pattern. It is recommended that you save patterns in the "Lithology Bitmaps" folder (this folder is found in the "XSection Utilities" folder located in "My Documents" or "Documents" folder).

Importing Lithology Patterns

To import or change the name of a lithology pattern, open the "Lithology Image and Name Selection Editor" window by clicking on the menu item Mode-> Lithology->Lithology Image Editor… (see below). Next, select the image from the right-hand side list of lithologies. Type in a new name for the selected lithology and click the "New Name" button, to change or edit the name. The new name will appear in the lithology list, the menu item Mode->Lithology-> "lithology list", and the log's Legend.

To import a new pattern, click the "Change Image" button for the selected lithology, and select the new bitmap file using the open file window.
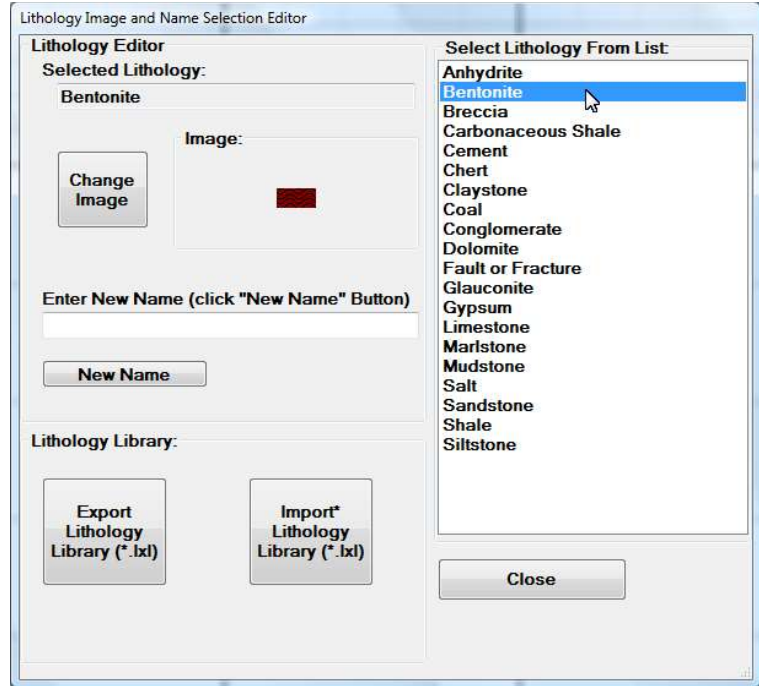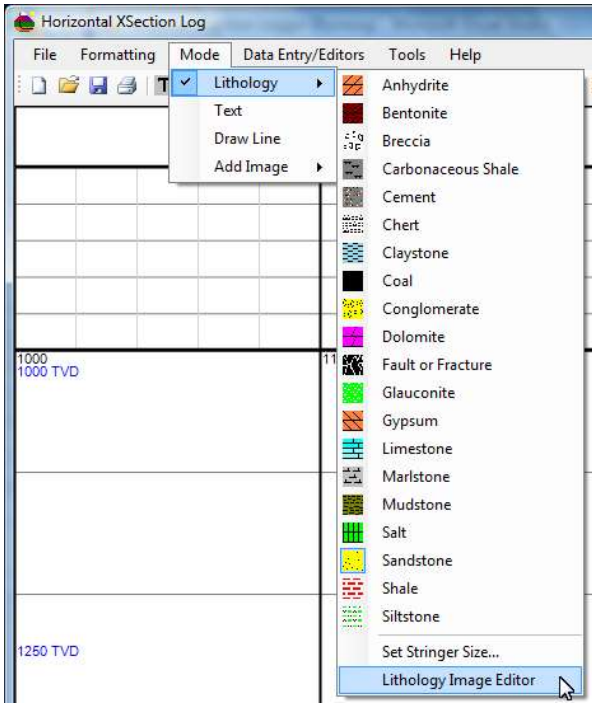

The Lithology Library

The lithology library import and export buttons are a simple way to import and export a complete library of custom patterns. Only import a lithology library at the beginning of a log session, before any lithology beds have been placed on the log, or sample percentages entered in the "Samples Track". When a lithology library is imported, all lithology beds in the "Cross-section Track" and samples in the "Samples Track" are deleted. A lithology library can be exported at any time. Personalized lithology patterns in a log are saved with the log. However, it is suggested that you use the export lithology library to backup your lithology patterns.
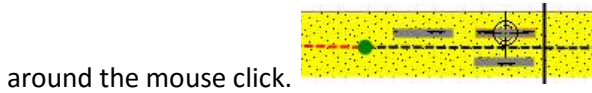
Lithology Mode

As mentioned in the Chapter 2 ("Getting Started"), there are five modes that allow annotation of the cross-section track. Lithology mode allows the placement of lithology beds. Lithology mode is automatically selected whenever a user selects a lithology pattern either through the Mode->Lithology->… menu or the toolbar. When in lithology mode, the mouse pointer will turn into a cross.
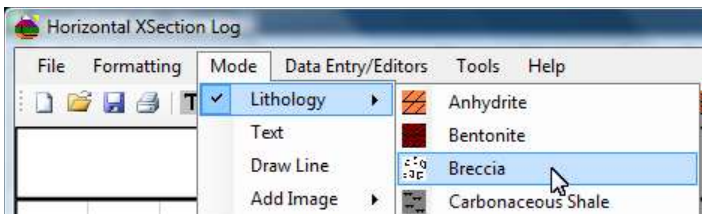
To draw a horizontal bed, simply click and hold the left-mouse button, and release when done.
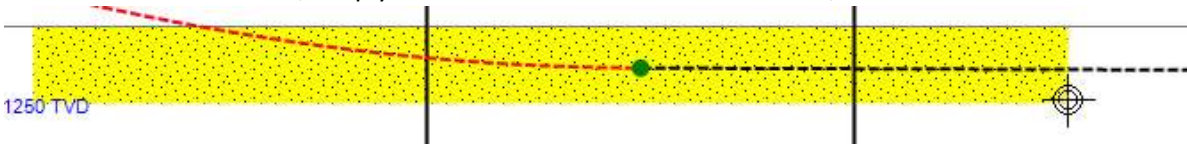
To put an interbedded stringer within a lithology bed, simply choose a different lithology pattern using the menu or the toolbar as shown above, and click once without moving the cursor. The program will draw a preset stringer centered

around the mouse click.

The stringer dimensions can be reset by the user. Open the "Set Stringer Size" window by clicking on Mode->Lithology->Set Stringer Size…,
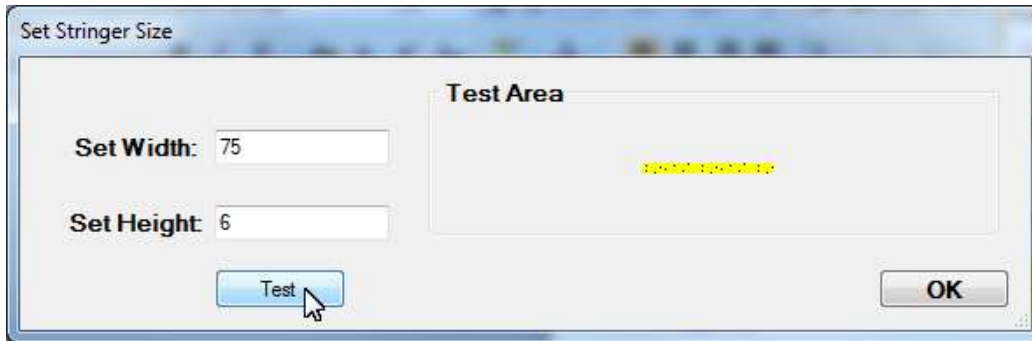

type in the new "Width" and "Height" dimensions in the appropriate text boxes, and use the "Test" button to view the new dimensions; click OK when you are satisfied with the new dimensions, and the new stringer size will be saved. When the file that you are working on is saved, the new stringer size is also saved and will be loaded when the file is reopened. If a new file is created using the File->New menu item , the stringer size will be reset to the default size of 4o pixels wide by 6 pixels in height.

## Delete, Move, Rotate and Resize Lithology Elements

To delete, move, rotate or resize a lithology element, the user must first be in "Lithology Mode". Then move the cursor over any lithology bed or stringer until an orange outline appears, then right click the mouse to open the popup menu.
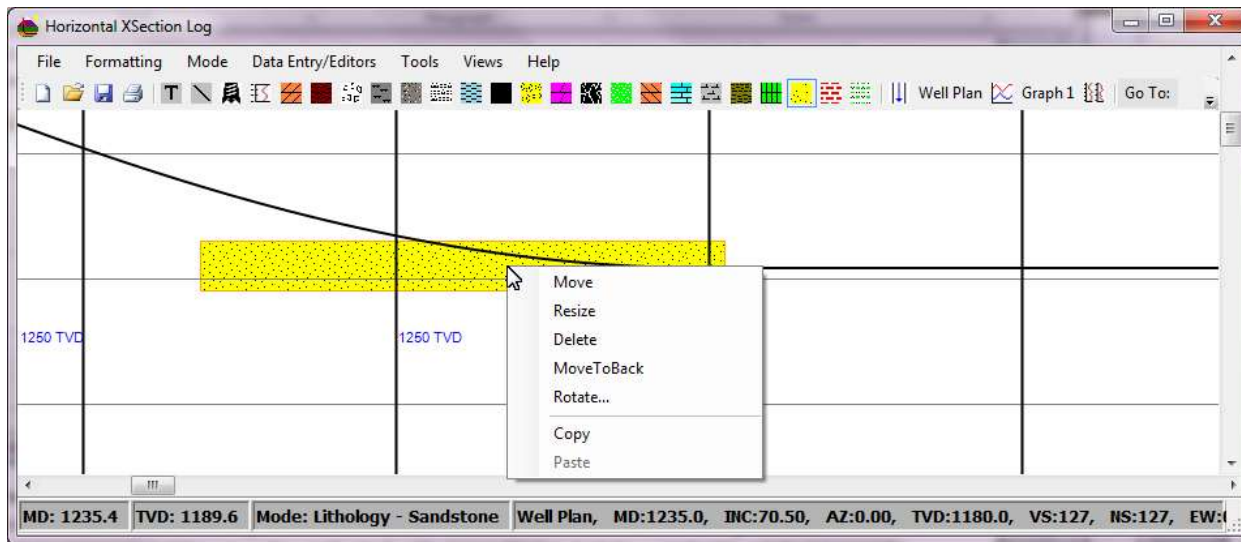
The "Move" and "Delete" items are self-explanatory. The "MoveToBack" feature will move the selected bed or stringer to the back, so that other lithology beds will be displayed over that bed. If this sounds confusing, first draw a few smaller beds (or stringers), and then cover the smaller beds with a larger lithology bed. Now use the MoveToBack item on the last larger bed that you drew covering the smaller beds, and the smaller thinner beds should reappear over the larger bed. Horizontal XSection draws lithology beds in the same order that they were created, and the "MoveToBack" feature reorders the drawing queue by moving the selected bed to the front of the queue. The "Resize" menu item can be used to lengthen or shorten the width (but not the height) of a lithology bed.

Rotate

The "Rotate" menu item will open up 'Set Angle' window. There are many different ways to rotate a lithology bed with this window. The simplest is to use the up/down arrow keys on the keyboard.
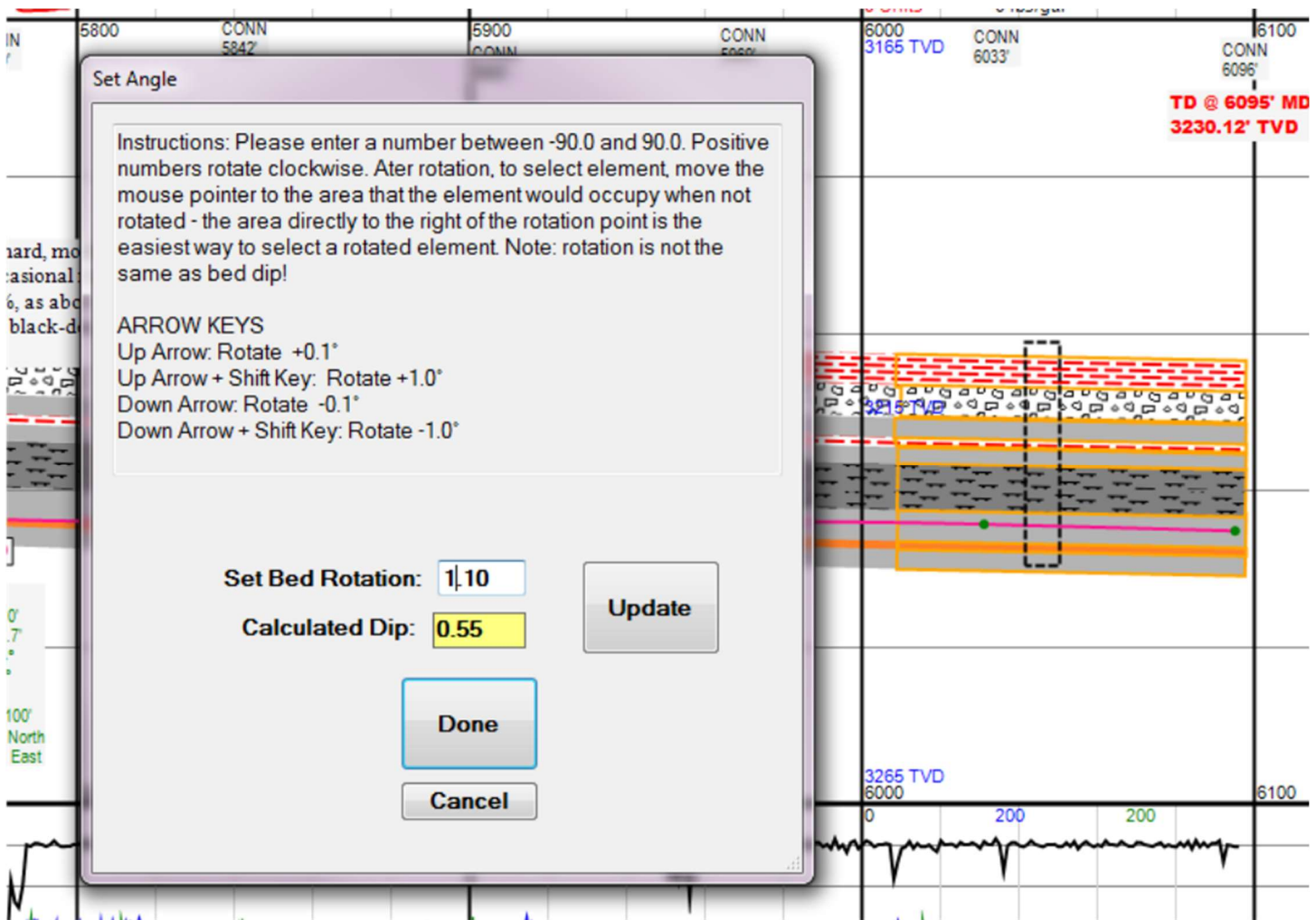

Each depress of the up or down arrow key will rotate the bed by ±0.1°. With the shift key depressed, the increment will increase to ±1.0°. Or, the user can enter a number between 90° and -90° and then depress the update button. Bed rotation refers to the degrees of rotation shown on the computer screen and is not analogous to the apparent dip of said rotation. The apparent dip depends on the TVD scale on the log where the bed is being rotated. However, the "Set Angle" window will calculate the apparent dip of the bed from the rotation angle. In the above example, a 1.10° angle calculates to a 0.55° dip. Positive dip values are below horizontal (below 90°), negative dip values are above horizontal (above 90°).

It is fine to enter fractions, for example 0.5 degrees or 2.3 degrees are perfectly valid values. Note, the software will automatically adjust the degrees of rotation if the height dimension of the cross-section is changed (see Chapter 3: Formatting and the File Menu), so that the rotated beds "fit" the new height. However, changing the TVD scale will not affect the rotated beds. Hence, make sure you that you are happy with your TVD scale prior to rotating beds. Also, note that rotating horizontal beds will slightly distort the "look" of your lithology patterns. This distortion will only occur on the computer screen, not on logs printed on paper, and has to do with the finite resolution and grid-type pixel-format of computer monitors.

> Note: the degree of rotation of a lithology bed is not the same as the apparent dip. Due to the vertical exaggeration of most logs, the degree of rotation will be greater that the apparent dip.

Selecting a Rotated Bed

A rotated bed can be selected, and hence, moved, deleted and rotated (again), just as a non-rotated bed. However, selecting a rotated bed can be tricky, especially if the bed is rotated to a high degree. To select a rotated bed, move the cursor to the position of the bed if it were not rotated.
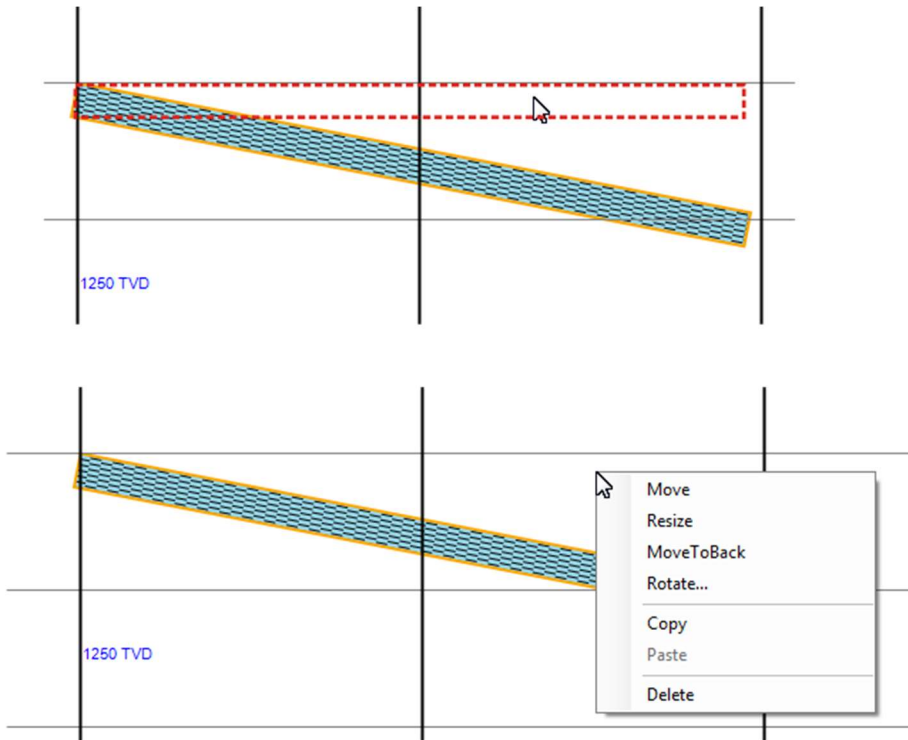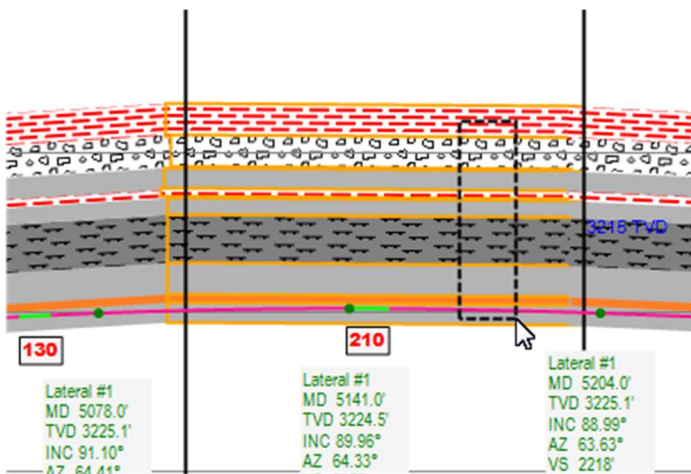

Copy and Paste

A lithology bed or beds (if grouped, see below) may be copied and pasted. One nice attribute of the copy and paste feature, is that rotated beds that are copied will be pasted with the same degree of rotation.

Group Lithology Beds

With the release of the Horizontal XSection Version 2.0+ there is now the ability to group lithology beds together for editing purposes. To group lithology beds together, hold down the shift key while moving the mouse cross-hairs (must be in "Lithology" mode) over the lithology beds of interest. The orange border that appears when a lithology bed is selected will remain selected even after the mouse has passed over the lithology edge as long as the shift key remains depressed. The program will draw a slotted rectangle, any bed within the rectangle will be grouped; then right-click the mouse key to select the desired action. Only 'MoveToBack' will not work on grouped lithology beds.


Following the steps shown in the figure above, it is now simple to select multiple lithology beds and either move, resize, rotate or copy and paste.

Creating a Fault

Displaying faults in the cross-section is simple. The first step is to draw your lithology beds showing the displacement of the lithology. The below example is an example of how to show displacement of a shale overlying a sandstone, wherein the borehole goes from drilling a sandstone (the pay zone) into drilling a shale at ~1682' MD.
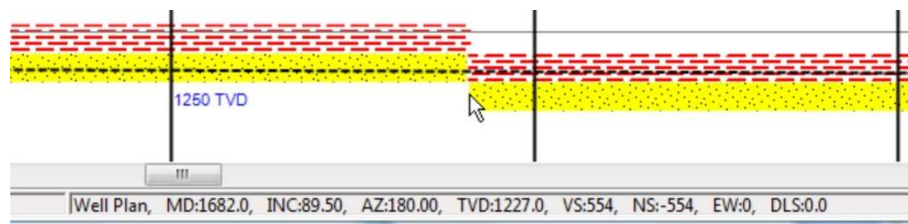
To show the fault, select the lithology pattern "Fault or Fracture" from the menu or tool bar, and draw a vertical strip

as shown below; then add a -5.0 degree rotation to the fault to give it a more realist display of a normal fault, and add an arrow using the draw line feature!