## Geo-Horizons - Tops, Faults and other 2-dimesional Surfaces
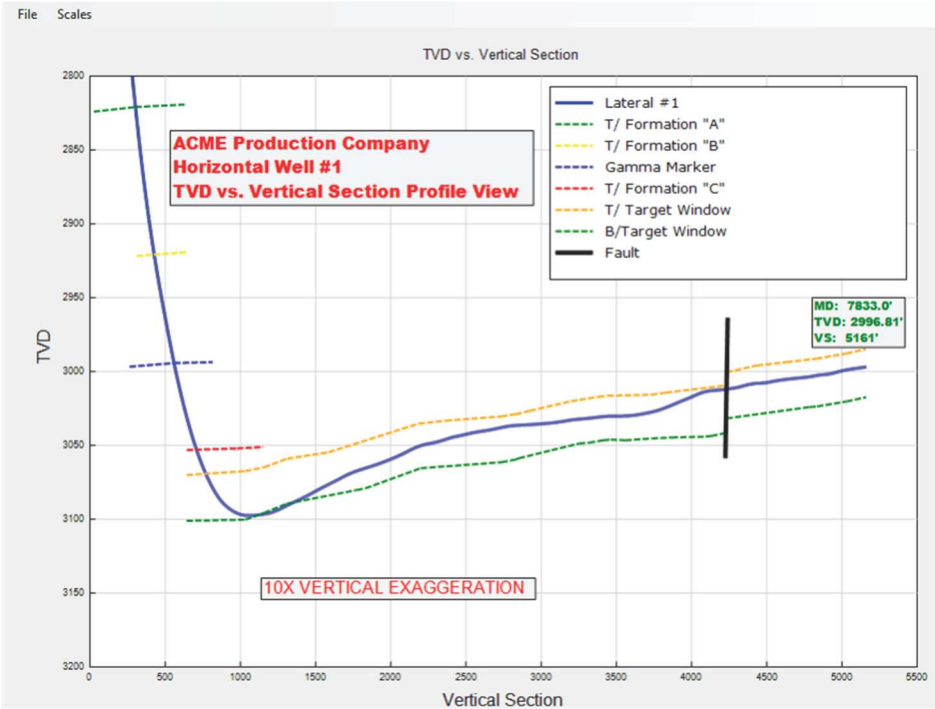


Geo-horizons allow the program to delineate planes of importance that can be projected on to the **TVD vs Vertical Section** view. In the example at left, the formation tops (and bottoms) and the fault are all projected from the mudlog to the TVD vs. Vertical Section using the geo-horizon feature. Any two-dimensional feature can be added, like porosity zones, oil/water contact, member tops, faults and or fractures.

## Geo-horizon Editor

The first step in creating Geohorizons is to open the geo-horizon editor from the "Geologic Tops / Horizons" sub-menu. This will open up the geo-horizon editor.
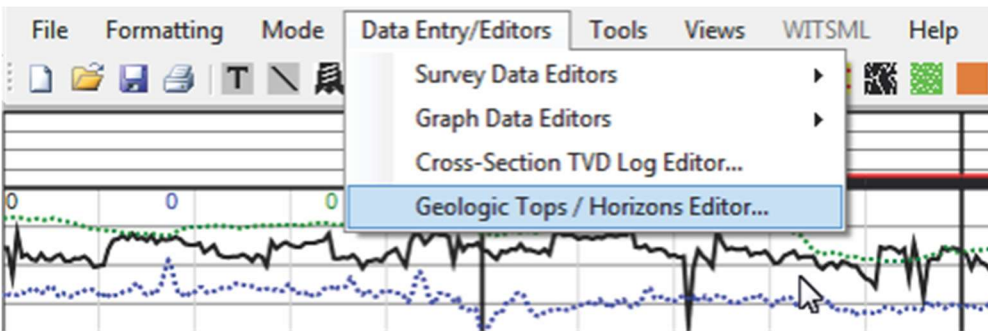


Use the "Add" button to create a new Geo-horizon, then use the "Change Top / Horizon Name" to give the new Geo-horizon a name. The "Line Attributes" allows the user to edit the Geo-horizon for 'Line Style',' Line Width' and 'Line Color, much as in previous editors for the graphs and survey data. The visibility check box allows the user to toggle (visible or not visible) whether the Geo-horizon is displayed on the mudlog cross-section track. The Geo-horizon is always displayed on the "TVD vs. Vertical Section" view.

### Geo-horizon Data

Geo-horizon data consists of a list of Measured Depth (MD) and true vertical depth (TVD) values. Though the easiest way to enter a Geo-horizon is on the mudlog directly (see below), Geo-horizon data can be entered using the "Edit" feature.

### *Projecting Geo-horizon Data onto the "TVD vs. Vertical Section" View*

To display a Geo-horizon onto the "TVD vs. Vertical Section" view, the program must project the geo-horizon data from the mudlog cross-section track to the "TVD vs Vertical Section" View. This is done my converting the measured depth
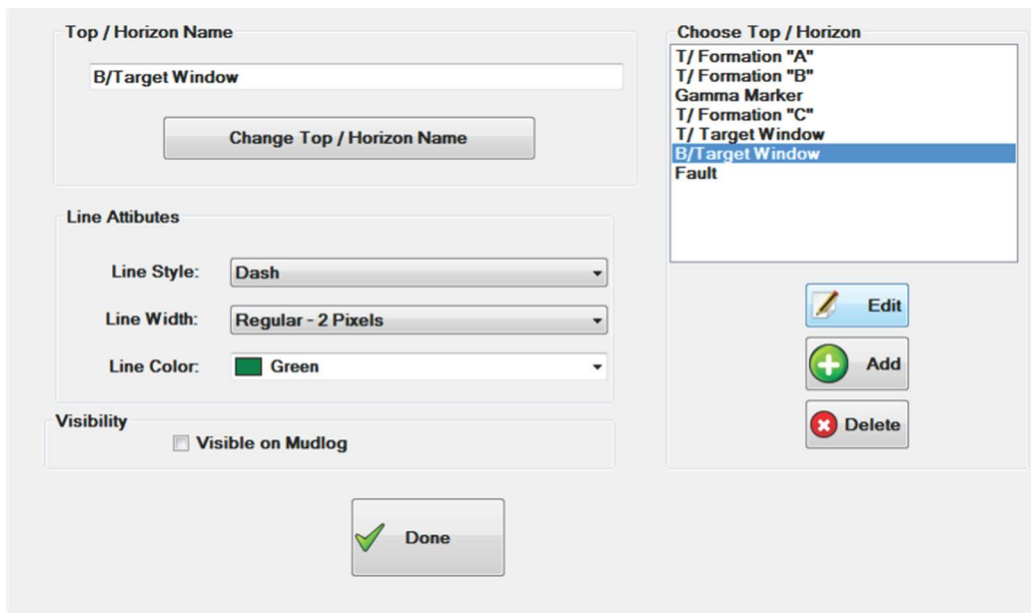
values in the Geo-horizon data to a corresponding VS values by culling the survey data and converting each MD value to a corresponding Vertical Section (VS) value. This can only be done if there is a corresponding VS value for every MD value of a Geo-horizon. If there is no corresponding VS value, the Geo-horizon will not draw that particular point on the TVD vs. Vertical Section view. For this reason, Geo-horizon points that fall outside the survey data (whether it be a well plan, lateral or sidetrack) will not be drawn. Often times, if you have multiple survey data curves on your log, for example a well plan and a lateral, there may be more than one VS value for a corresponding MD value. In this case the program will use whichever VS value comes last in the list. If your first survey curves are a well plan a lateral #1 and a lateral #2, the projection for a particular MD value will first look at the well plan survey data, then the lateral #1 survey data and finally the lateral 2 survey data. If they all have data for a particular MD, the lateral #2 survey data will be used by the software.

## Adding Geo-horizon Data to the Mudlog

The first step to adding Geo-horizon data is to switch to "Geo-Horizon" mode using the Mode menu.
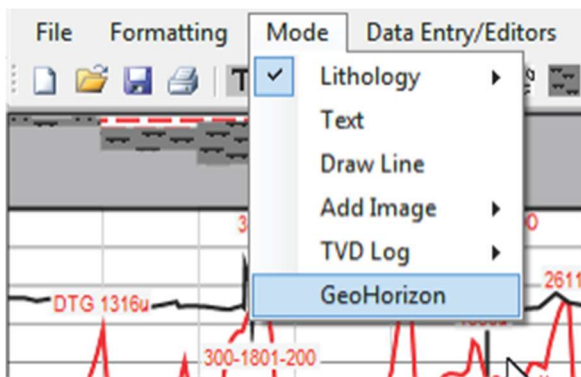


This will open a list of Geohorizons that the user has created using the Geo-horizon editor. Select the appropriate Geo-horizon and then click done. The cursor will appear as a cross-hair. Move the cursor to where you want the next Geo-horizon point to be a left-click the mouse. This will draw the Geo-horizon from the last point to the new point. Use the Escape (Esc) key to delete the last point.
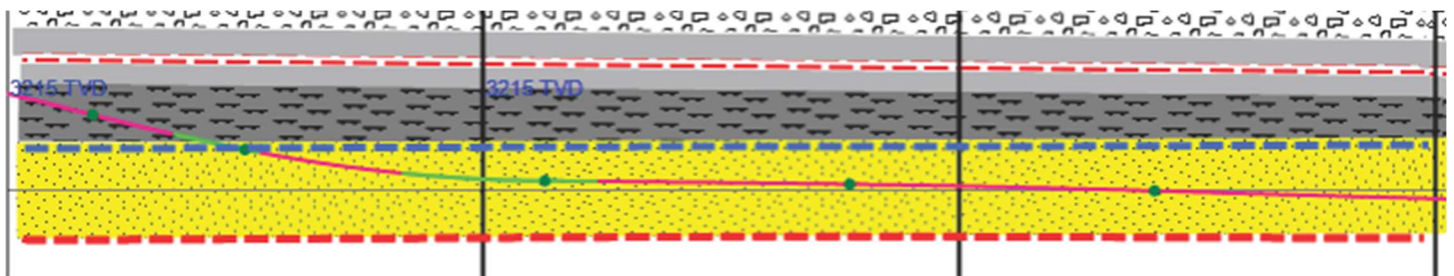


In the above example, the sandstone 'target zone' is delineated by a dashed blue Geo-horizon layer (top) and a dashed red Geo-horizon layer (bottom). The figure below shows how these layers will be projected onto the "TVD vs. Vertical Section" view.
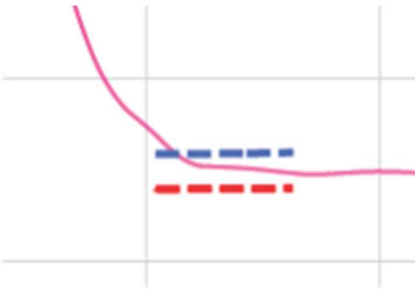
The Geo-horizon layer must be drawn in a forward, down-hole or increasing measured depth direction. Each new point must have a higher measured depth value than the previous Geo-horizon point. A Geo-horizon point that has a lower measured depth value will not be recorded by the program. This means that faults must be drilled at a slight angle as shown in the example below with the fist point at a lower MD than the second point.



Fault
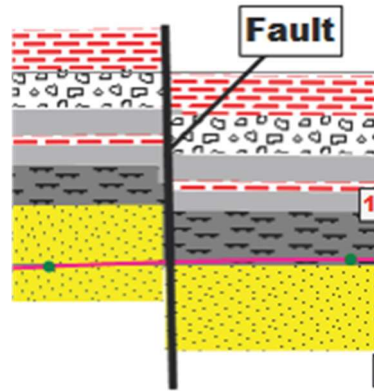
## Edit Feature

| MD | TVD |
|---|---|
| 3304 | 3070 |
| 3699.5835 | 3067.29175 |
| 3825.8335 | 3064.79175 |
| 3978.3335 | 3058.95825 |
| 4254.583 | 3054.58325 |
| 4442.5 | 3050.83325 |
| 4855 | 3035.16675 |
| 5035.667 | 3033.16675 |
| 5404.333 | 3030.33325 |
| 5498.667 | 3028.83325 |
| 5593.667 | 3026.5 |
| 5869 | 3020 |
| 6049.1665 | 3017.08325 |
| 6110.8335 | 3016.25 |
| 6225.8335 | 3016.04175 |
| 6402.0835 | 3015.625 |
| 6500.4165 | 3014.16675 |
| 6597.5 | 3013.75 |
| 6900.8335 | 3009.375 |
| 6903.75 | 3000.41675 |
| 7104.5835 | 2995.83325 |
| 7301.25 | 2993.54175 |
| 7499.1665 | 2991.25 |
| 7699.5835 | 2987.70825 |
| 7828.3335 | 2984.79175 |
| * | |

Datum Column = T/ Target Window

**Add/Delete Data**

Insert Row

Datum Value: 0

Delete Row

**MD Column**

Check Sorting

**Datum Column**

Delete Rows

With 0     Value

Replace

0     With 0

All Done

Data can be edited by opening the "Edit" window in the Geo-horizon editor. This is done by selecting the Geo-horizon in question and clicking the 'Edit' Button. The Geo-horizon data editor is similar to the editor for the graph curves, and consists of two columns, one for the MD value and one for the TVD value.