3. Input Data Editing

There are few editing steps that must be completed before a 3D geological model is created. The steps include:

1. Creating Reservoir Boundary
2. Creating 3D Surfaces
3. Editing the Created Surfaces - Removing Surface Peaks
4. Creating Fault Polygons - Projecting Fault Polygons on their Surfaces

3.1 Creating Reservoir Boundary

Creating a reservoir boundary is done in a 2D window by following the steps:

- Open a 2D window from the Window menu command by clicking the “New 2D Window” item,
- Display the Top Tarbert 3D Seismic Lines (located in the Interpretation folder), you may need to click the View All button in the 3D Buttons toolbar to get a good view,
- Activate the Make/Edit Polygons under the Utilities item in the Process Diagram tab. This will display two toolbars; the Polygons Tools and Polygons Actions; which will be docked on the right-hand side of the Petrel window.
- Click the Add New Points icon on the Polygons Tools toolbar as shown in Fig. 3.1.
- Digitize a polygon that completely surrounds the interpreted lines. Once you finish digitizing, close the polygon by clicking the Close Selected Polygon(s) button, see Fig. 3.2. The newly-created polygon will be inserted at the bottom of the Petrel Explorer Input tab. Rename the created polygons to Boundary as shown in Fig. 3.2.

Created polygons may be edited by moving its points. If you need to move one of the points of the created polygon, follow the step:

- Click on the “Set Select/Pick Mode [P]” icon on the Polygons Tools toolbar as shown in Fig. 3.1,
- Select the polygon to be edited,
- Click the “Select and Edit/Add points [E]” icon on the Polygons Tools toolbar as shown in Fig. 3.1. The mouse cursor changes to cross, which means that you are in the edit mode.
- Click and keep holding the left mouse button on the point to be moved. While holding the left mouse button, move the mouse inside the 2D window. The point will follow the mouse pointer.
- When finished, make sure to exit the edit mode by clicking on the “Set Select/Pick Mode [P]” or the “Viewing Mode [V]” icon.
Fig. 3.1: The Top Tarbert displayed in a 2D window while the Polygons Tools toolbar is shown

Fig. 3.2: Creating reservoir boundary around Top Tarbert
3.2 Creating 3D Surfaces

The next process in editing the input data is creating 3D surfaces out of the 3D seismic lines. This process is summarized by the following steps:

- Expand the Utilities item in the Process Diagram tab, and then double click on the Make/Edit Surface. The Make/Edit Surface dialog box appears.
- In the Project Explorer window, select the 3D seismic lines whose surface is to be created; in this case select Top Tarbert.
- Click the Main input blue arrow of the Make/Edit Surface dialog box.
- In the Project Explorer window, select the boundary that was just created in the previous step.
- Click the Boundary blue arrow of the Make/Edit Surface dialog box.
- Go to the Geometry tab, and select the Automatic radio button.
- Press Apply. A surface will be created and added to the Project Explorer window as shown in Fig. 3.3.
- Repeat the same process for the Top Etive and Top Ness.
- Click the Insert menu command and choose New Folder. A New folder will be added which will appear in the Project Explorer window as a tree view item. Rename the folder to Surfaces by right-clicking on the folder and selecting the Settings… from the dropdown menu. Move all surfaces to this folder.

Fig. 3.3: Creating 3D surfaces out of the 3D seismic lines
Now spend some time playing with the settings of each set of data. For example,
deselect the wells, well tops, and seismic data, and only select the Top Tarbert
surface. Then display its settings dialog as shown in Fig. 3.4.

![Fig. 3.4: The settings dialog box of the Top Tarbert surface](image)

### 3.3 Editing Created Surfaces - Removing Surface Peaks

Peaks or spikes on the 3D surfaces can be removed with a simple click as follows;
Display the surface that contains the peak to be removed; in this case Top Tarbert,
see Fig. 3.3 for the peak. Make sure that the Edit Surface Tools toolbar is shown.
Choose the Peak Remover button on the Edit Surface Tools toolbar and click on the
peak to be removed. The peak disappears as shown in Fig. 3.5.

![Fig. 3.5: The Top Tarbert surface after removing the peak](image)
3.4 Creating Fault Polygons

Fault polygons are normally generated in the seismic interpretation station or in a mapping application, and are commonly defined by the hanging wall line and the footwall line for a given surface. To create fault polygons on a certain surface, follow the steps:

- Display the surface whose fault polygons are to be created. In this case display the Top Tarbert surface.
- Activate the Make/Edit Polygons under Utilities in the Process Diagram window. The Polygons Actions toolbar displays as shown in Fig. 3.6. To start a new set of fault polygons, click the Start New Set of Polygons. To add a fault polygon on the active set, click the Start New Polygon on Active Set of Polygons.
- Click on the Start New Set of Polygons to start tracing a new set of fault polygons for the Top Tarbert surface.
- Start tracing the faults on the surface. Every time you start a new fault, you must click the Start New Polygon on Active Set of Polygons icon as shown in Fig. 3.6.
- Repeat the same process for Top Ness and Top Etive surfaces.
- For completeness, create a new folder, call it Faults, and place all faults under this folder.

Fig. 3.6: Creating fault polygons of the Top Tarbert surface
3.5 Projecting Fault Polygons on their Surfaces

Fault polygons are often interpreted in the XY plane only; hence their Z-values will be set to 0 as shown in Fig. 3.7. It is an easy process, however, to get all fault polygons down to their respective surfaces. This will give them their Z-values at the correct position. This process is summarized by the following steps:

- Open the settings for the Tarbert fault polygons and go to the Calculations tab as shown in Fig. 3.8.
- Select the Top Tarbert surface in the Project Explorer window, then click on the A= beside the blue arrow in the Settings dialog box.
- Press the Assign: Z=A button then press Apply and OK buttons, the fault polygons move down to their surface as shown in Fig. 3.9.
- Repeat the same process for the Top Ness and Top Etive.

![Fig. 3.7: Fault polygons with 0 Z-values](image)
Fig. 3.8: Settings for Tarbert fault polygons dialog box

Fig. 3.9: Top Tarbert fault polygons projected on their surface