

Target 3D Geology Surfaces

The Target 3D Geology Surfaces (*Contact Surface from Geology Grids*) tool enables you to create subsurface topography grids, where the "Z" values correspond to the elevation of the top or bottom surfaces of specific lithologies, based on drilling data.

The subsurface topography grids are displayed in the 3D Viewer as 3D grids. Using the 3D functions, you can manipulate several characteristics of the displayed surfaces/3D grids, including colours, transparency, sample resolution, etc.

For more information on using Target capabilities, see the Target Application Help system.

Preparing Collar, Survey, and Lithology Data

To create subsurface topography grids, as well as lithology voxels, you require three Geosoft databases:

- A collar database
- A survey database
- A geology database that includes a From (depth) column, To (depth) column and a string column containing lithology information



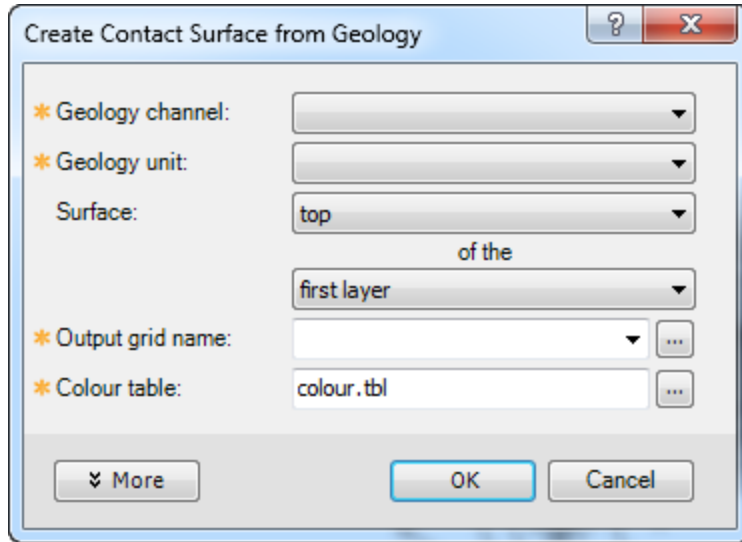
A string column (channel) contains plain text values, for example "LMSTN" for "limestone" or "SDSTN" for "sandstone".

Creating Contact Surface from Geology

You can create a relatively simple subsurface topography grid using the default settings of the Create Contact Surface from Geology option, or change the settings to make a more complex one. Remember that to create this grid, you must have an existing 3D view and open it using *3D|Open 3D Viewer* or create a new, blank 3D view by using *3D|Create a New 3D View*.

To Create a Subsurface Topography Grid:

1. With the Drillhole project open, from the *DH-Plot* menu, select **Create Contact Surface from Geology**. The *Create Contact Surface from Geology* dialog is displayed.

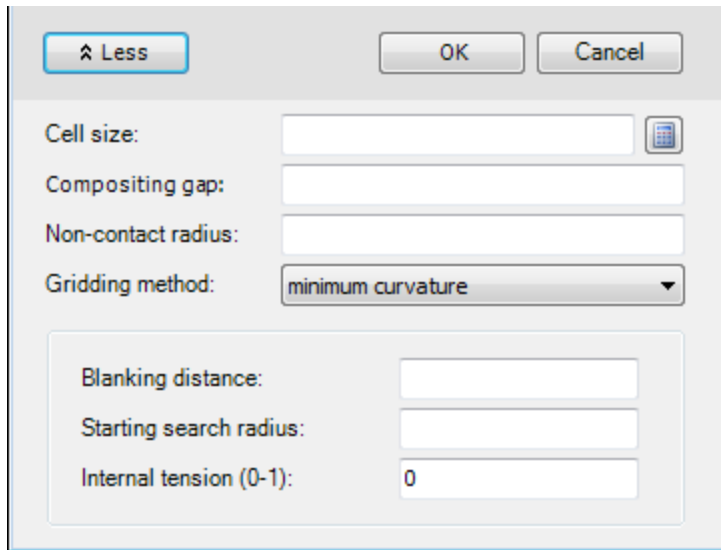


- From the *Geology channel* drop-down list, select a channel that stores lithology codes.



This drop-down list displays only string channels found in the lithology (“From – To”) database. If the channel you want to select does not appear on the list, verify the database type and format. Ensure that the data type of the required lithology channel is string. If it is not, you need to define the lithology channel’s type correctly while re-importing the data. (You define the channel type in the fourth dialog of Drill Hole Import Wizard).

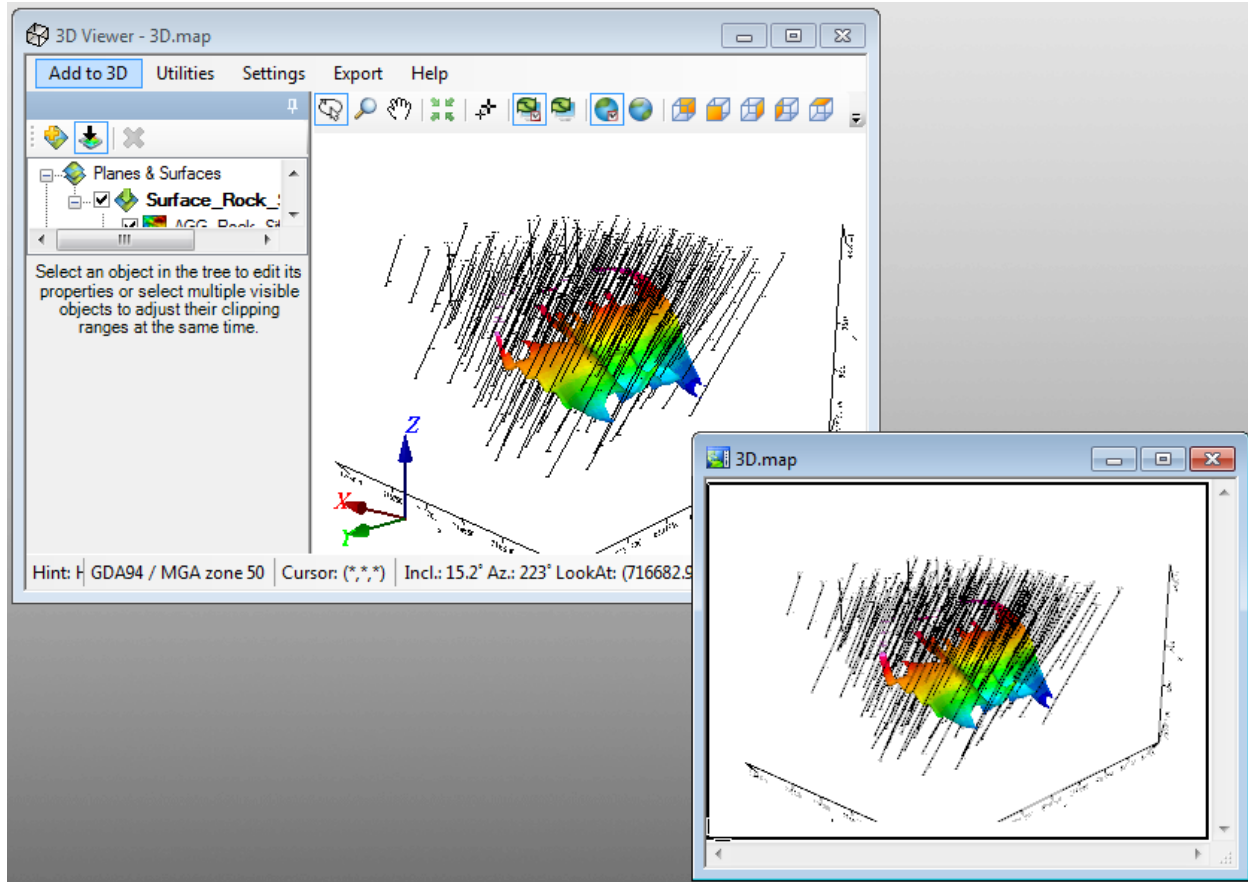
- From the *Geology unit* drop-down list, select the lithology (rock) type whose surface you want to create.
- From the *Surface* drop-down list, select **top** or **bottom**. “Top” refers to the upper surface of the specified lithology unit. “Bottom” refers to the lower surface of the specified lithology unit.
- From the *Of the* drop-down list, select **first layer**, **second layer**, or **last layer**. This parameter refers to the location of the lithology unit (counting from the top of the hole) in case a hole intersected a series of units of the same lithology.
- For the *Output grid name*, use the *Browse* button to specify the name and location of the Contact Surface grid file.
- For the *Colour table*, use the *Browse* button to select a colour table (.tbl) file, transform (.itr) file, or colour zone (.zon) file for the grid.
- Click **More** to display the advanced parameters for the *Create Contact Surface from Geology* dialog.



9. Fill out any of these advanced parameters for your grid to customize it further.
10. Click **OK**.

The grid is displayed in the 3D Viewer and a map containing the subsurface topography grid is also created and displayed in the current project.

The images on the 3D map and in the 3D Viewer are identical, as shown in the example below:



- Use the 3D Tools functionality to rotate, resize, re-colour, and otherwise enhance the graphical representation of the created subsurface topography grid. Click the *Help* menu on the 3D Viewer for more information on what you can do with 3D views.

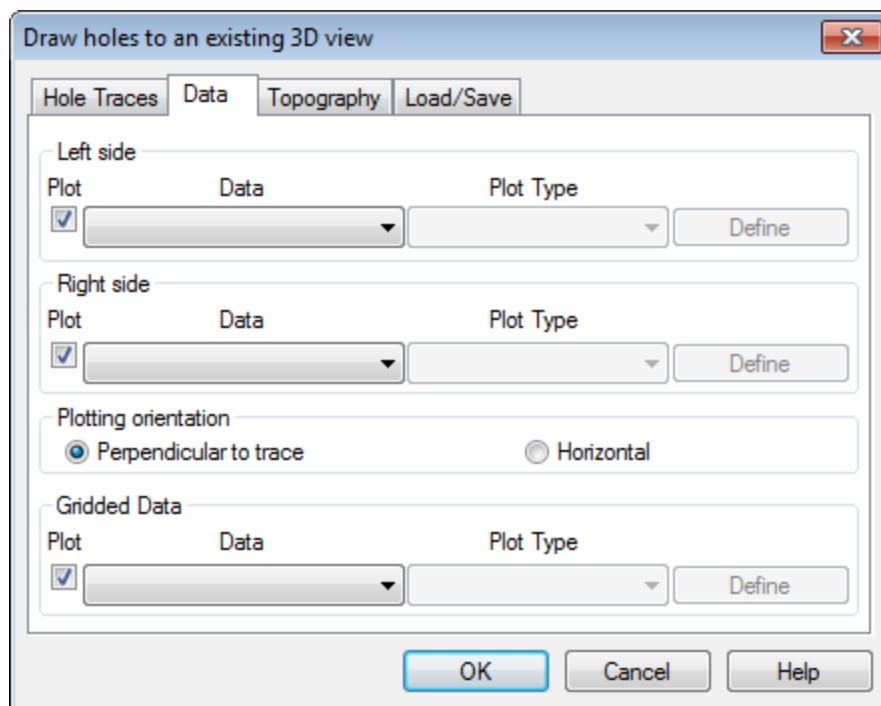
When you close the 3D Viewer the changes you have made are automatically reflected on the map.

Verifying Surface Correctness

A surface you have created and displayed might not correspond to your drillhole data with desired precision. With this procedure, you can check the new surface against the lithology data associated with individual drillholes.

To Verify Surface Correctness:

- Display your created surface in the 3D Viewer window (*3D|Open 3D Viewer*).
- From the *Add to 3D* menu in the 3D Viewer, select **Drillholes** .
The *Draw holes to an existing 3D view* dialog will appear.

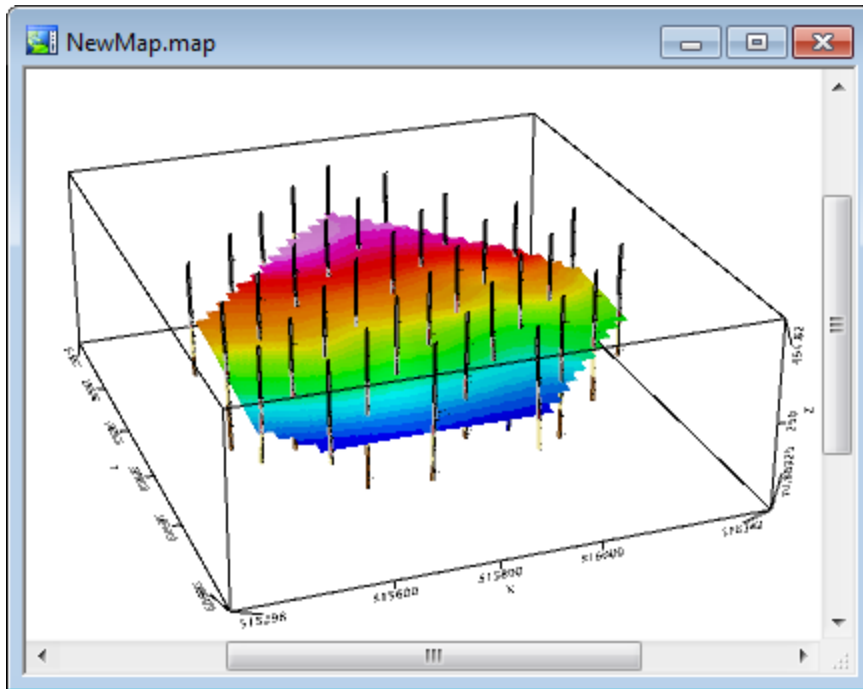


3. Click the **Data** tab. The *Data* page opens.
4. Under the *Left side* section, from the *Data* dropdown list, select a channel that contains the required data and using the *Plot Type* dropdown, select *Rock patterns*.
5. Click **Define**. The *Pattern Bands - Rock Codes* dialog opens.



For more information, click the **Help** button on the *Pattern Bands - Rock Codes* dialog.

7. Click **OK** to close the dialog and return to the *Drawn holes to an existing 3D view* dialog.
8. Under the *Right side* section, from the *Data* dropdown list, select a channel that contains the required data and using the *Plot Type* dropdown, select **Post Text**.
9. Click **Define** if you would like to define this plot type for your data, and click **OK**. The selected drillholes, along with the subsurface topography grid you created earlier, are displayed in a new map and in the 3D Viewer.





As you zoom into the resulting 3D map, you can see that sections of the displayed drillholes are coloured and text-labelled according to the selected table of rock type codes.

10. Use the 3D Tool panning, resizing, and rotation functions to examine intersections of your subsurface topography grid with the individual drillholes.

You might find that one or more intersections of the created surface does not correspond exactly with the geological boundary you have requested. You can achieve more precise results by adjusting the surface gridding parameters and choosing more specifically the holes to use.

Having adjusted a parameter's value, you will need to repeat the surface creation procedure and examine the results. Achieving satisfactory results may require several iterations.

 *It is recommended that you give each new version of the resulting grid a new name. If you need to keep the same grid name, you will need to first delete the original grid from the map and from the Planes & Surfaces section of the 3D Tool . Otherwise, the new grid will be displayed on the relief surface of the original grid, and the subsurface topography grid changes will not display.*

 *It is not recommended that you change multiple parameters in a single iteration. The results of several changes made simultaneously might be contradictory and difficult to analyse.*

Adjusting Surface Gridding Parameters

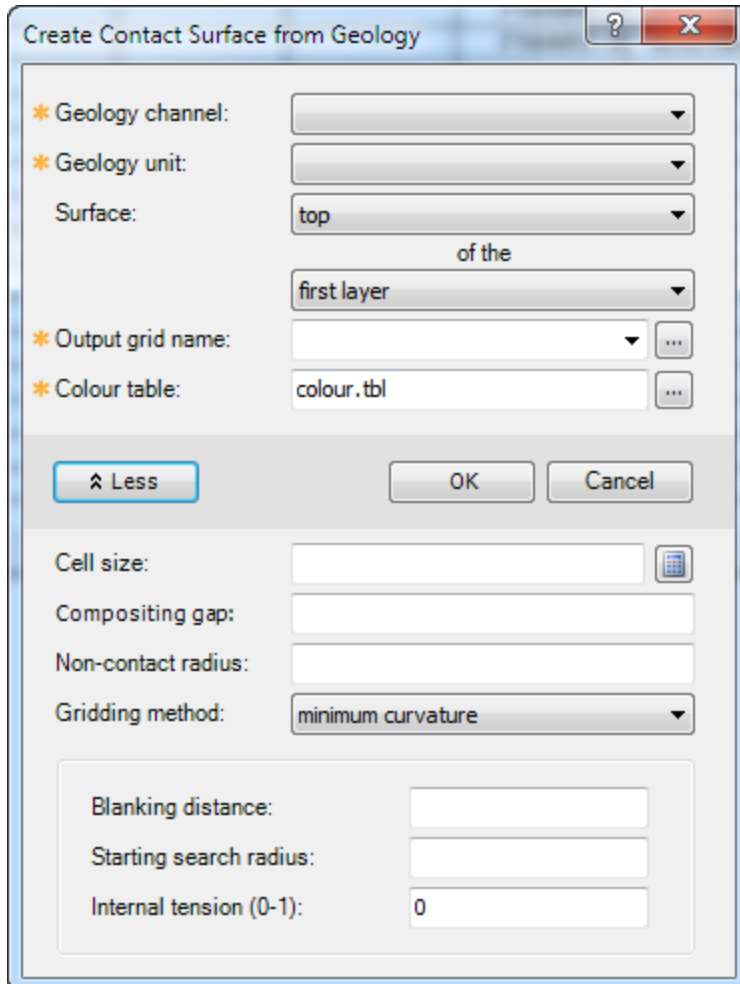
This section describes the meaning of the surface gridding parameters and the procedures used to adjust them..

A subsurface topography grid created with the default gridding parameters may not fit with some of the data in individual drillholes. A better fit between the hole data and the surface can be achieved by decreasing the surface cell size .

A smaller cell size will decrease the amount of interpolation made between the drillholes, creating a more constrained contact surface.


To Adjust Cell Size:

1. Make sure your map is open and selected in the 3D Viewer.
2. In the 3D Viewer, select *Utilities* and then select **Create Contact Surface from Geology**. The *Create Contact Surface from Geology* dialog will appear.
3. Specify the surface creation parameters as required for your project.
4. Click the **More** button. The dialog expands to display additional parameter fields.



5. Click the **Calculator** (🧮) button next to the *Cell size* field. The system calculates the default grid cell size and displays it in the *Cell size* field.
6. Change the value of the *Cell size* field to a smaller integer.


7. Click **OK**. The system creates the requested surface using the specified cell size and displays it in the 3D viewer. .
8. Compare the new surface (grid) with the original by toggling these grids on and off in the 3D viewer.

 *You can further improve the hole/surface agreement by setting the value of the Internal tension parameter closer to "1". The Internal tension field is located in the bottom section of the Create Contact Surface from Geology dialog, which is displayed by clicking the down arrow button next to the Gridding method field.*

Compositing Gap

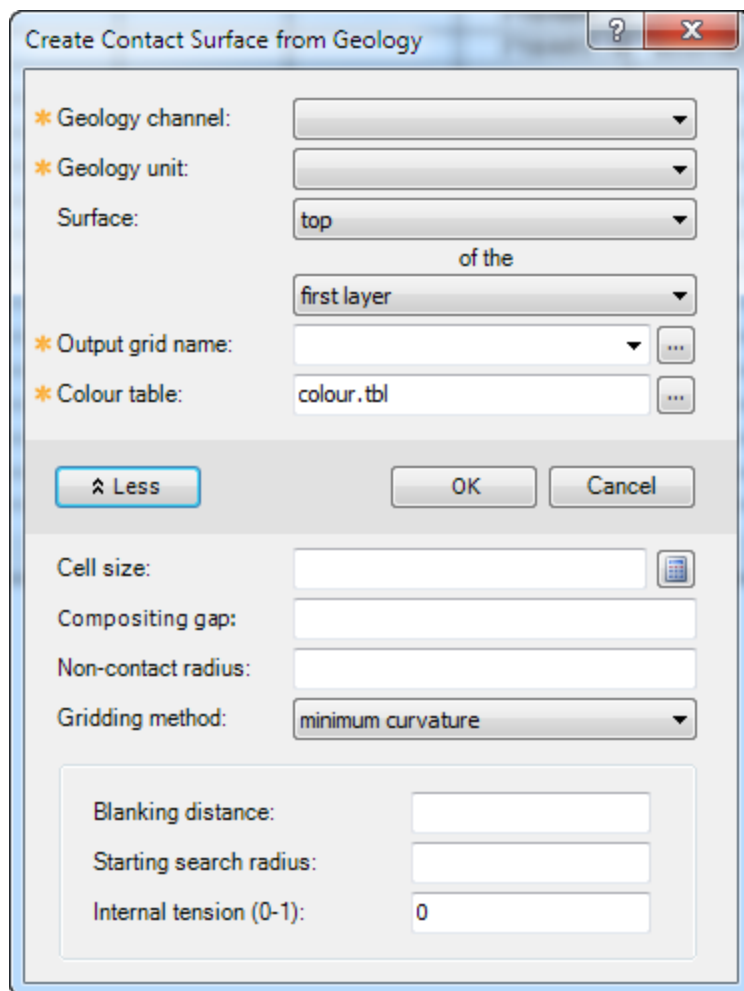
The compositing gap parameter allows for minor un-logged intervals in the data, where it can be assumed that the lithology has not changed much in the space of a gap.

Any gap between two lithology intervals of the same type that is less than or equal to the value in the Compositing gap field is "interpolated"; in other words, it is assumed that the gap contains the same lithology. If this field is left blank, all gaps are treated as real (no interpolation is performed).

 *Compositing only considers missing data – places where the lithology channel is blank. Thin layers of known lithology are not composited over, even if the compositing gap value is greater than the layer thickness.*

To Adjust Compositing Gap:

1. Open the 3D Viewer and from the *Utilities* menu, select **Create Contact Surface from Geology**. The *Create Contact Surface from Geology* dialog will appear.
2. Click the **More** button.



3. Change the default grid name in the *Output grid name* field.
4. In the *Compositing gap* field, specify **1** as an initial compositing gap.
5. Click **OK** .
The updated subsurface topography grid is displayed on the map and in the 3D Viewer .
6. Compare the second surface (grid) with the original by toggling these grids on and off in the 3D Viewer.

Blanking Distance

The blanking distance parameter may be used to improve the grid accuracy. All grid cells farther from a valid point than the value of the Blanking distance field are blanked out in the output grid.

The default value of the Blanking distance field is the nominal sample interval, i.e., $2 \times (\text{sqrt}(\text{grid area} / \#\text{data points}))$. This field value should be just greater than the maximum sampling interval through which interpolation is desired. If there are too many holes in the resulting grid, you increase the blanking distance appropriately.

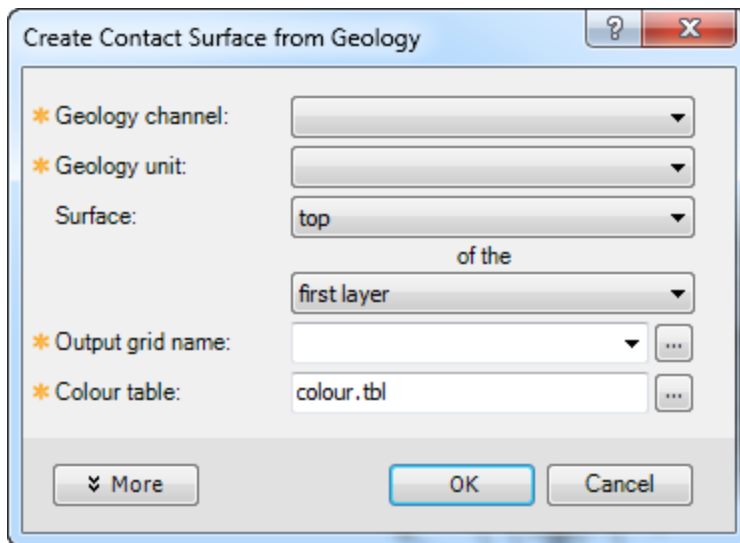
Blanking distance is important in datasets where drillholes are spaced irregularly, and where large gaps exist between some but not other drillholes. Under such circumstances, you need to decide what is more important across the larger gaps: interpolation of any kind or better confidence in the resulting grid.

Adjust Blanking Distance

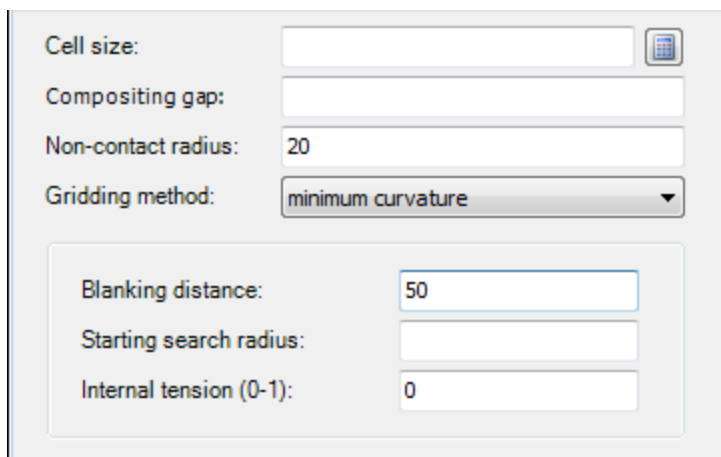
The Blanking distance parameter can be used to improve the grid accuracy. All grid cells farther from a valid point, than the value of the Blanking distance, are blanked out in the output grid.

To Adjust the Blanking Distance

1. Open the 3D Viewer and from the *Utilities* menu, select **Create Contact Surface from Geology**. The *Create Contact Surface from Geology* dialog will appear.



2. In the *Output grid name* field, change the name of the required output grid so you don't overwrite an existing one.
3. Click the **More** button to expand the dialog.

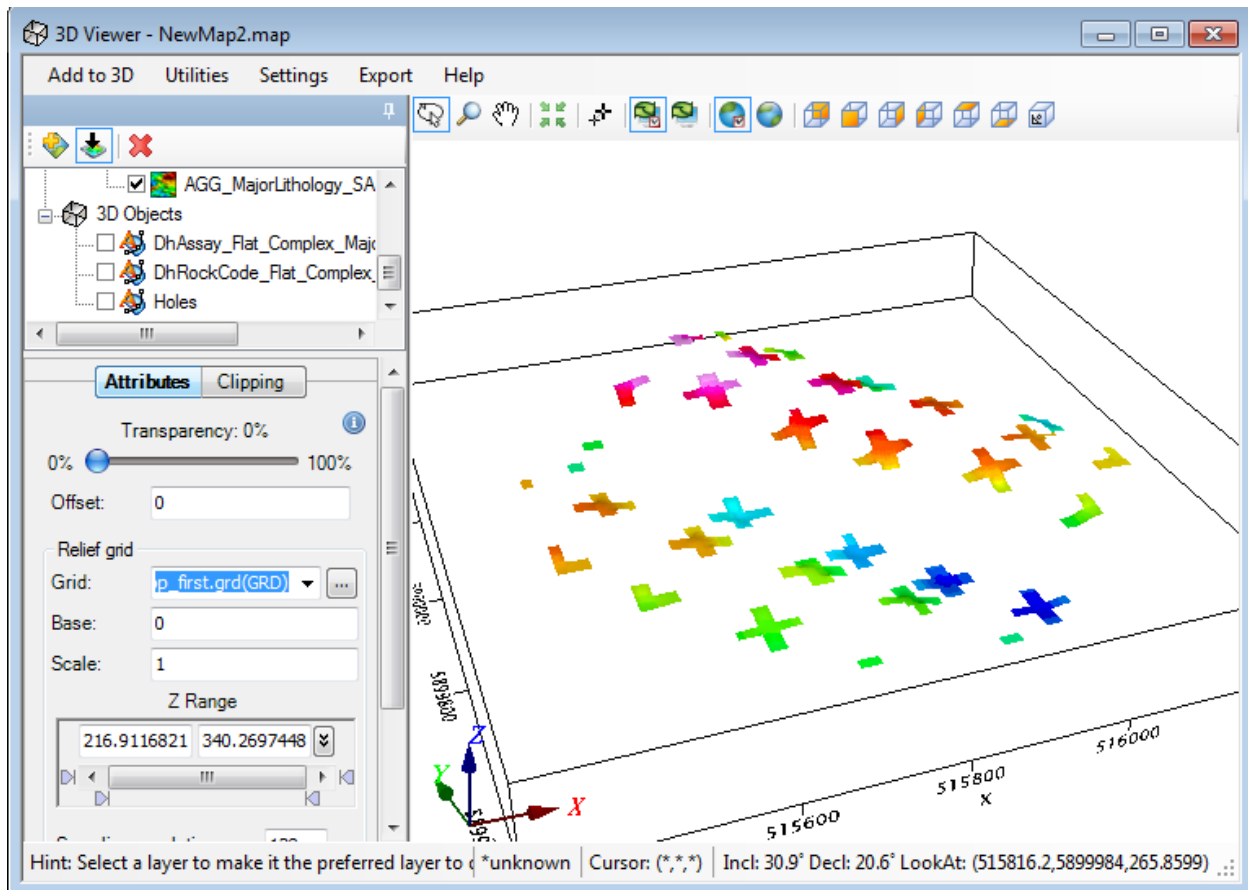


4. In the bottom section of the expanded dialog, select **minimum curvature** as the *Gridding method*.
5. In the *Blanking distance* field, type your blanking distance number. Note that the value is given in ground units.



If you are experimenting, try typing a very small number to explore an extreme case.

6. Click **OK**. The created surface displays on the current map and in the 3D Viewer.



Other Parameters

You can change three more parameters while refining your subsurface topography grids:

- Gridding method
- Starting search radius
- Internal tension

For descriptions of these parameters and the potential results of changing their values, click the **Help** button on the *Create Contact Surface from Geology* dialog.

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