

Target Drillhole 3D Tools

The Drillhole 3D Tools developed for Geosoft's Target Surface and Drillhole Mapping applications enables you to display downhole and surface data types in an interactive three-dimensional environment. Drillholes are displayed in their "true" three-dimensional location. You can begin creating a 3D Drillhole Map view once all the appropriate project information has been imported into your drillhole database.

Grids and layers created in 2D views can be displayed directly into the 3D view, in their correct orientation, using Geosoft's "on-the-fly" technology. Other grids and images (including bitmaps and jpegs) can be opened and easily located in any specified orthogonal plane or draped over surfaces.

3D Voxel grids can also be displayed and modified in a 3D drillhole map. 3D Voxels can be created in Target using the *3D|3D Gridding* menu, or from the *Utilities|3D Gridding* menu in the 3D Viewer.

Using the 3D Tools you can interactively control the transparency of the individual planes (groups), enabling the data to be displayed with a cumulative (light-table) effect. The 3D viewer supports a number of imports such as MapInfo TAB or MIF files and DXF files.

Inside the 3D Viewer you can toggle on/off individual groups in the 3D view, enabling changes to the displayed data, without having to recreate your 3D maps.

All data in the Target environment is dynamically linked; from the database through cross-section and map through to the 3D environment.

About the 3D Viewer

The 3D Viewer has been redesigned to streamline your workflow and enhanced usability. The 3D Viewer provides all of your 3D-mapping tools, functions and settings in one integrated 3D environment. The Target 3D Viewer includes drillhole traces and attributes, voxels, grids, image files, Isosurfaces and map surrounds.

When you display a 3D view, either by using the *3D|Open 3D Viewer* menu option, or by selecting (doubing-clicking) a 3D view in the *View/Group Manager Tool*, or by simply double-clicking a 3D view in an open map file, the 3D view will be displayed in the 3D Viewer.

The 3D Viewer consists of an interactive dialog, with five main Menus: (*Add to 3D*, *Voxel*, *Wireframe*, *Tools & Settings*, *Export* and *Help*), a 3D Viewing window, a 3D Tools window and the bottom Status Bar.

What Menu options are available?

Add to 3D	Voxel		Wireframe	Tools & Settings	Export
Plane	3D Gridding>	Kriging	Start Wire-framing	Coordinate System	3D PDF
Relief Surfaces	Properties	Inverse Distance Weighted Gridding	Stop Wire-framing	Orient a Grid	AutoCAD DXF File
Grids >	Metadata		Geostring Metadata	Create snapshot	Geosoft 3DV File
Voxel	Math		Geosurface Metadata	Manage snapshot	
Vector Voxel	Create Lithology Voxel			Display Settings	
Isosurface>	Create Contact Surface from Geology			Rendering Settings	
Drillholes	Voxel Topography Clip				
Geostring	Window a Voxel				
Geosurface	Reproject a Voxel				
3D Symbols	Merge Voxels				
2D Map Tools >	Conversions>	GDB to Voxel			
Imports >		GOCAD to Voxel			
		UBC to Voxel			
		XYZ to Voxel			
		Datamine to Voxel			
		Voxel to GDB			
		Voxel to GOCAD			
		Voxel to UBC			
		Voxel to XYZ			
		Lithology to Numeric Voxel			
		Numeric to Lithology Voxel			

What can I do in the 3D Viewing Window?

The following interactive viewing buttons are provided on the toolbar directly above the 3D Viewing window.



What can I do with the 3D Viewer Tools?

The parameters available in the *3D Tools* window are dependent on the type of 3D group currently selected. Each group enables you modify different aspects of the 3D view within the 3D Viewer.

Each of the following 3D groups can be displayed in the 3D Viewer. See the Application help for more information.

- Planes and Surfaces
- Vector Objects
- Geosurfaces
- 3D Data Voxel
- Lithology Voxel
- Geostings
- Vector Voxels

What information is available on the Status Bar?

The status bar across the bottom of the 3D Viewer displays helpful navigation hints, along with the current 3D view's coordinate system, the shadow cursor location, the view's inclination, azimuth and look-at point (centre of rotation).

To modify or edit 3D views requires a licensed version of Target.

You can begin creating a 3D view once all the appropriate project information has been imported into your drillhole databases; collar, survey, assay, and any other data that you are using in your drillhole project.

Creating a 3D Drillhole Map

3D maps provide a new perspective to traditional drillhole data. You can now view borehole traces and gridded data from different angles—in 3 dimensions, making it easier to spot the relationship between surface and sub-surface features.

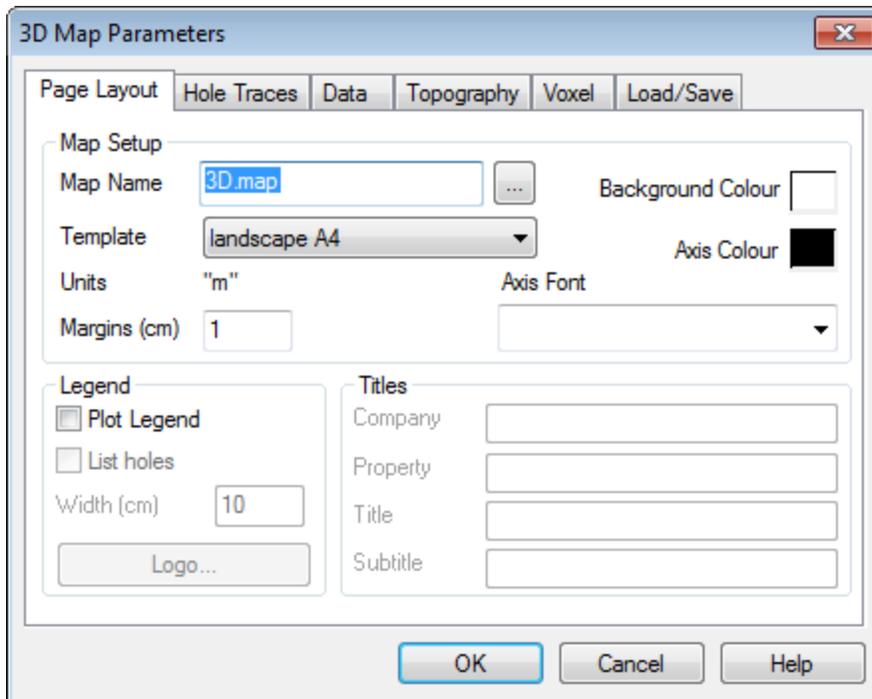
Before you can start creating your 3D map you first must select the drillholes *DH-Plot|Select Holes* you want to view in your map.

The 3D map options are provided in an easy-to-use tab dialog, enabling quick access to all the settings from a single dialog. The dialog includes sensible defaults; enabling easy creation of your 3D map.

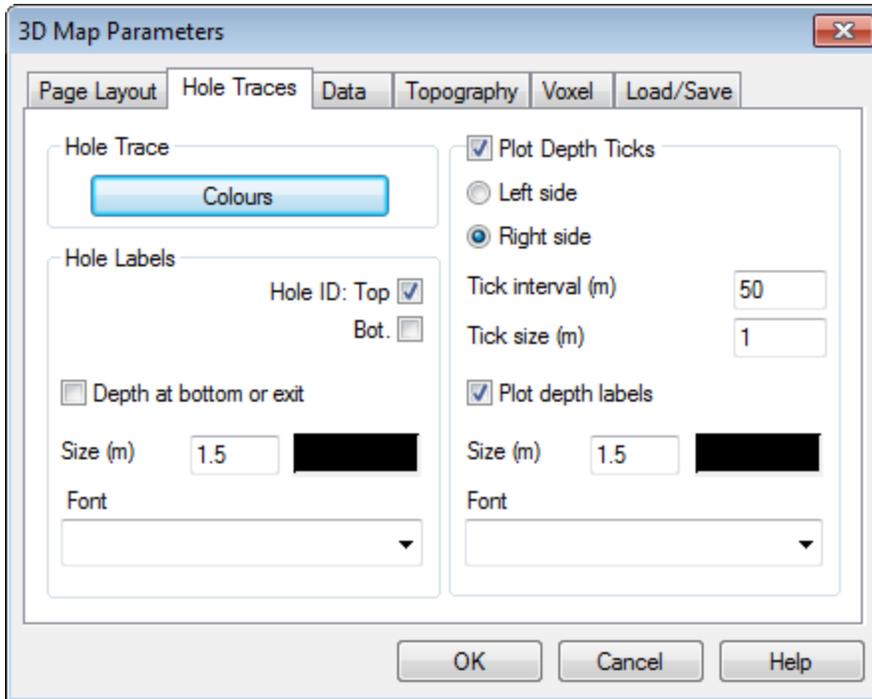
To Create a 3D Map

1. On the *DH-Plot* menu, select **3D map**.

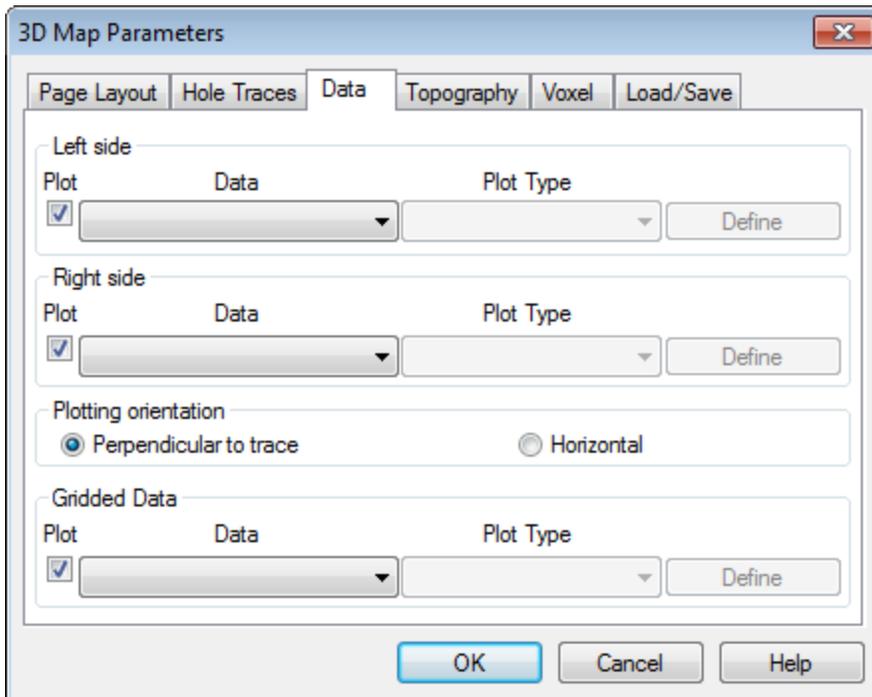
The *Page Layout* tab, on the *3D Map Parameters* dialog, is displayed by default.



- Control the following page layout parameters from this tab; the Background Colour of the 3D view, the Axis Colour and Font used for annotating the 3D view, selecting to Plot Legend (right side of map), including company Logo (image file) and specifying the map Titles.
- Select the *Hole Traces* tab. This tab dialog includes the following drillhole trace parameters; the Colour of the Hole Trace, the Hole Labels including location, annotations, text size, colour and font, and Depth Ticks (annotations etc.) along the hole trace.



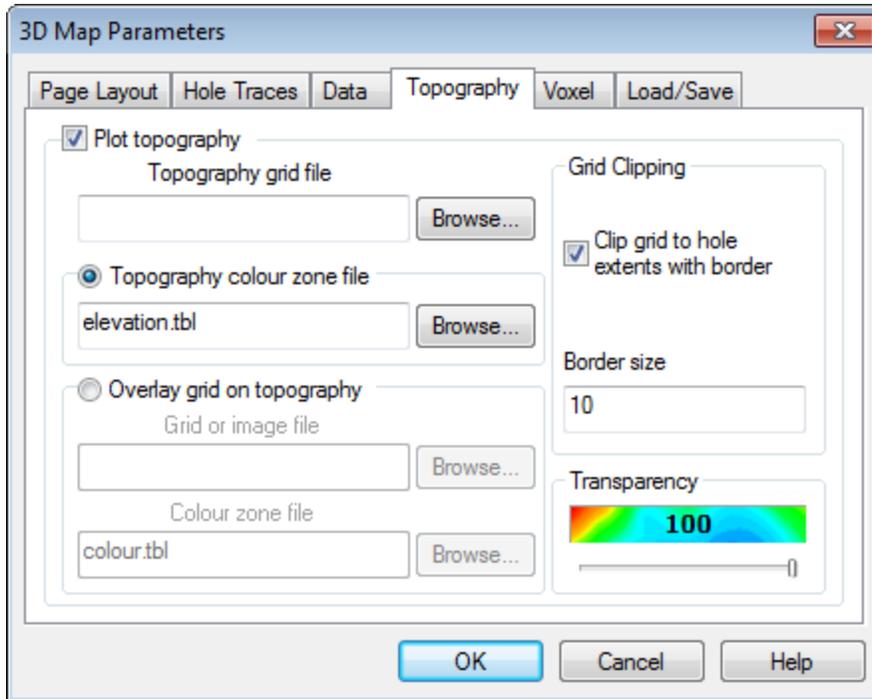
4. Select the *Data* tab. The Data and Plot Types are selected from dropdown lists, just as you would select data for your Plans or Sections to be plotted.



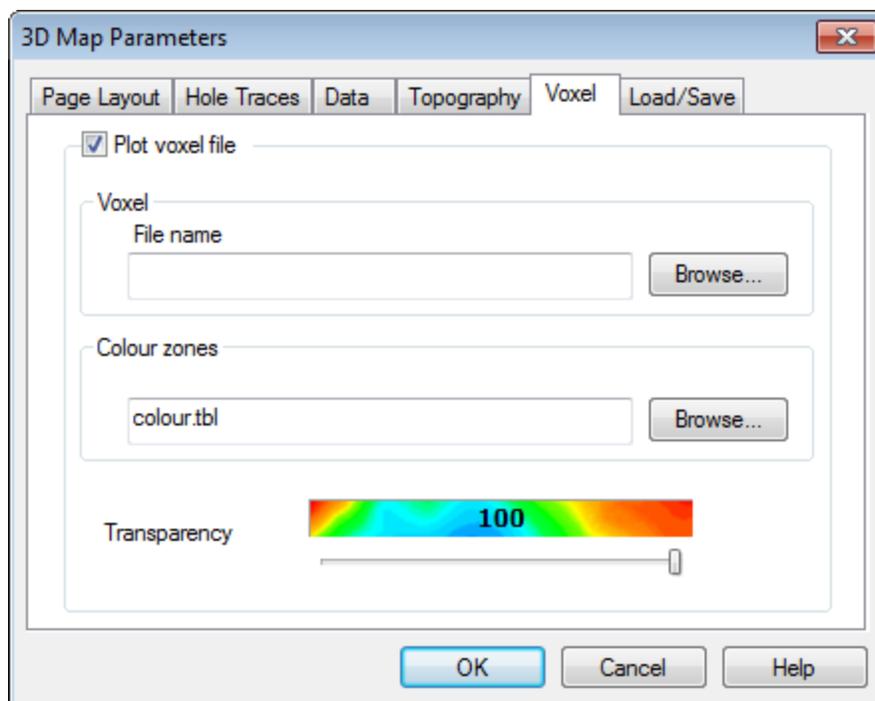


In Drillhole 3D two sets of data can be plotted down hole along the trace (Left side and Right side), at one time. When these data appear in the 3D Viewer, the point-of-view will always remain the same, no matter how the image is rotated, panned or zoomed.

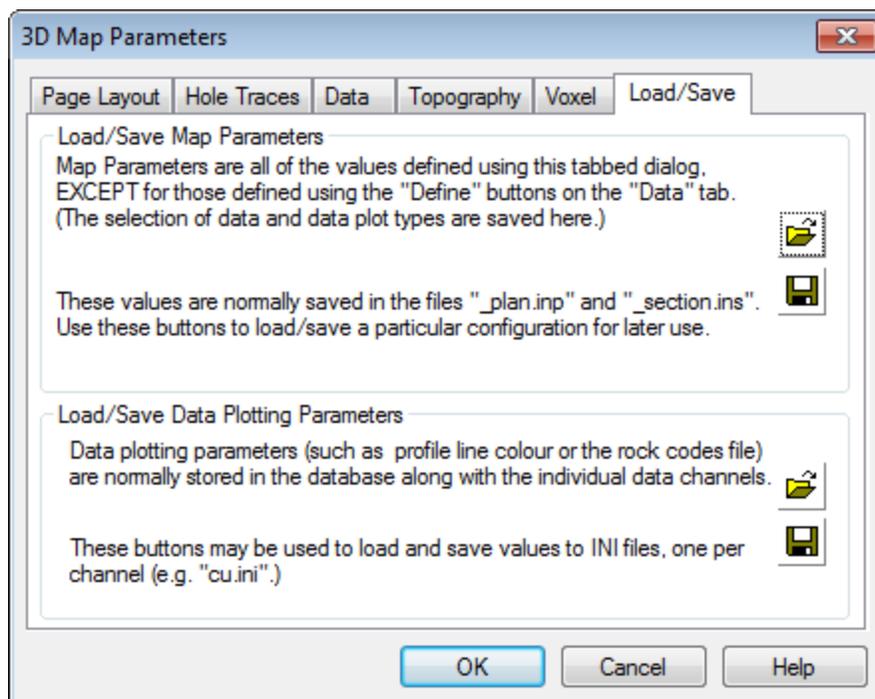
5. In the Plotting Orientation section, you can choose to plot your data as Perpendicular to trace or Horizontal to the hole trace.
6. Plan oriented gridded data can be created from this tab. The three available gridding methods are Minimum curvature, Kriging and a TIN based technique. To define the gridded data parameters, click the **Define** button. The specified *Gridding* dialog will be displayed.
7. The Data channel (column) to be gridded is displayed. You can add a File name tag to the grid; this is useful when distinguishing between grids created using different gridding parameters. The Cell size can be left to the "intelligent" default, which is one quarter the average data separation based on a statistical average.
8. The Colour zone file can also be left to the default file, or your own zone file (*.itr, *.tbl, *.zon) can be selected.
9. The Location section of the tab enables you to specify the Relative Level (elevation of grid) and the Averaging Interval (data within this elevation interval will be used to create the grid. Note that the data values are averaged for this thickness).
10. The Multiple Grids section enables you to specify the Number of grids to create and at what Increment. (For example, 3 grids with a Relative Level of 225 and an Increment of 50 downwards, you will create grids at 225RL, 275RL and 325RL).
11. To specify additional gridding parameters, such as Log options etc., click the **Advanced gridding options...** button. The "*Gridding*" – *Advanced Options* dialog is displayed. For detailed technical information, click the **Help** button. When you are satisfied with your selections, click the **OK** button on the *Advanced Options* dialog.
12. The final parameter on the "*Gridding*" parameters dialog is Transparency. Using the slider you can control the level of transparency of the gridded data in the 3D view. Click the **OK** button on the "*Gridding*" dialog to return to the *3D Map Parameters* dialog.
13. Select the *Topography* tab. If you have gridded topography data available you can check the Plot Topography tab and using the *Browse* buttons, locate the Topography grid file and the Overlay grid on topography file.



14. To enable the *Grid Clipping* check the appropriate box, and specify the Border size in ground units.
15. Select the **Voxel** tab. Check the Plot voxel file box to enable the voxel parameters and using the *Browse* button, locate the Voxel grid file. Using the *Browse* button, locate a Colour zone file. (Note that, the default Geosoft *.tbl files can be located in the '..\..\Oasis montaj\tbl' directory.) Then, using the Transparency slider set the transparency of the Voxel.



16. Select the **Load/Save** tab. This tab is used to save the map and data parameters to a file for either sharing with other users or so these particular map settings can be used at a later date.



17. Click the **OK** button and the 3D map will be created and display in your 3D Viewer.



To help in viewing all of the data, on the Voxel tab, set the Transparency slider to approximately 50%. You can also modify the X, Y, Z and Data sliders. Modifying the Data slider (moving the left side towards the right) is the same as windowing the lower values of your data, enabling easier viewing of all of your 3D data.

Create a 3D Voxel Grid

You can easily create a 3D Voxel grid (*3D | 3D Gridding*) or in the 3D Viewer *Utilities | 3D Gridding*), using the Kriging, Direct Gridding, or the Inverse Distance Weighted Gridding methods. Additional Voxel tools are provided enabling you to, report and modify Voxel information including, statistical and coordinate system information, create new Voxels based on mathematical expressions or clipped (windowed) areas, copy and convert Geosoft Voxels into a number of other data formats (and visa versa). Users are also provided with the tools to extract section grids, plan grids, and Isosurface (contours) from a Voxel and plot them to a Target 3D map.

To Create a Drillhole 3D Voxel Grid using either of the 2 methods:

1. Select the holes you would like included in your 3D Voxel grid using one of the *DH-Plot | Select holes* menu items.
2. Select (highlight) the project database containing the data you want to use to create the 3D Voxel.

3D Gridding Methods in Oasis montaj

A "Voxel" is short for "volume pixel", the smallest distinguishable box-shaped element of a three-dimensional image. A Voxel is the 3D conceptual counterpart of the 2D pixel.

You can create a Voxel using the *3D Gridding* submenu, located on the *3D* menu or in the *3D Viewer* from the *Voxel|3D Gridding* menu.

The *3D Gridding* submenu offers 2 different gridding algorithms, each with a different focus:

- ▶ The *Kriging* method best suits clustered data occurring in a region with otherwise sparse data distribution, such as geochemistry data.
- ▶ The *Inverse Distance Weighted Gridding* method is most suitable for gridding data collected along specific directions - such as borehole data.

The data to be gridded must have defined X, Y and Z coordinates. To define the coordinates use the menu, *Coordinates|Set Current X,Y,Z Coordinates*. The 3 dimensional coordinate system will locate the data in 3D space. The Z axis is interpreted as positive up. The **3D** workflow includes tools for creating, displaying and processing voxels. The *3D Viewer* enables visual inspection of voxels and comes with an extensive set of 3D viewing tools.

 When applying 3D gridding, halving the cell size increases both the file size and processing time by a factor of 8 (2^3).

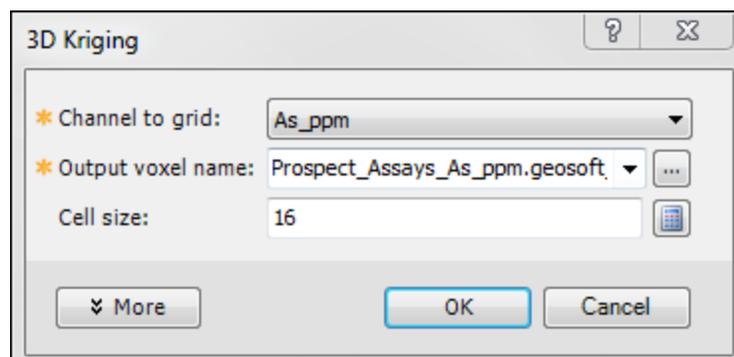
Creating a Voxel using the Kriging Gridding method

From the *3D Gridding* menu, select the **Kriging** option to perform a statistical-based 3D gridding. The input data must be supplied in a Geosoft database (GDB file). The output will be a voxel model within the confines of the data extent.

To Create a 3D Voxel model using Kriging:

1. Open a Geosoft database containing X, Y, Z and the data channel you would like to grid. If the coordinate system is not completely defined, a message will pop up and you will not be able to continue until the corrective action is taken.
2. In the *3D Viewer*, select *Voxel*, then select *3D Gridding* and then select **Kriging** (or on the main Target *3D* menu, select *3D Gridding* and then select *Kriging*).

The *3D Kriging* dialog appears.





If a database is not already open you will be prompted to open one.

- From the dropdown list, select the *Channel to grid*. The first time through the process, the default *Output voxel file* name will default to the provided channel name. The subsequent invocations of this tool will remember the user specified file name. You can rename the output voxel file or accept the default name.
- Specify the *Cell size*. If you do not have a preset cell size, click the **Calculator**  button to obtain a reasonable cell size based on the extents of your data. The cell size is calculated for a single cube, assuming the volume is divided into 10000 individual cubes. The value is then rounded down to give a more satisfactory value.



We recommend that your first attempt at gridding be using the defaults. After inspecting the outcome however you may decide to modify defaults such as the *Blanking Distance to fill in the gaps*, modify the *Z cell increment*, or generate the output on a logarithmic scale.

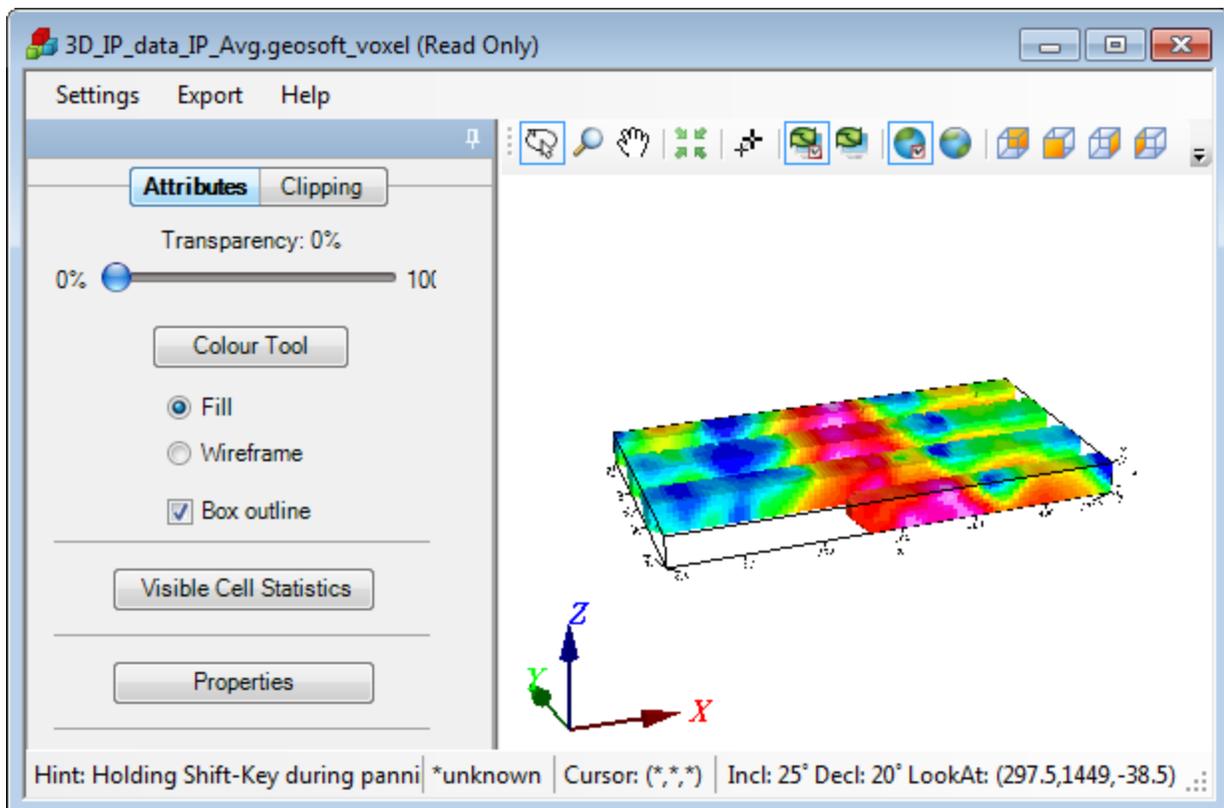


Additionally you can customize the *variogram to best suit your data*.



For more information, click the *Help* button on the *3D Kriging* dialog.

- When you are satisfied with your selections click **OK**. The Voxel is created and displayed in the *Voxel Viewer*. An example is shown below:

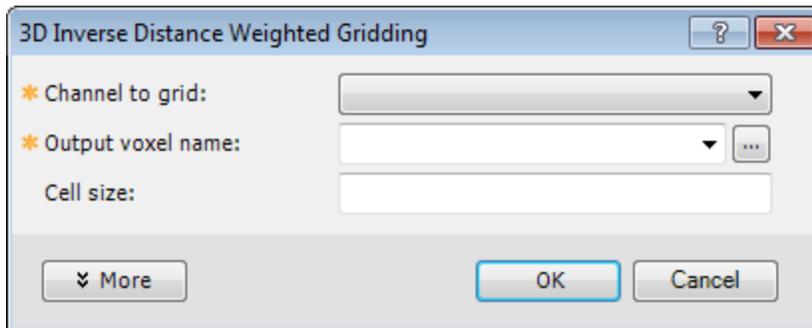


The *Voxel Viewer* provides additional viewing tools.

Creating a Voxel Model using the Inverse Distance Weighted (IDW) Gridding method

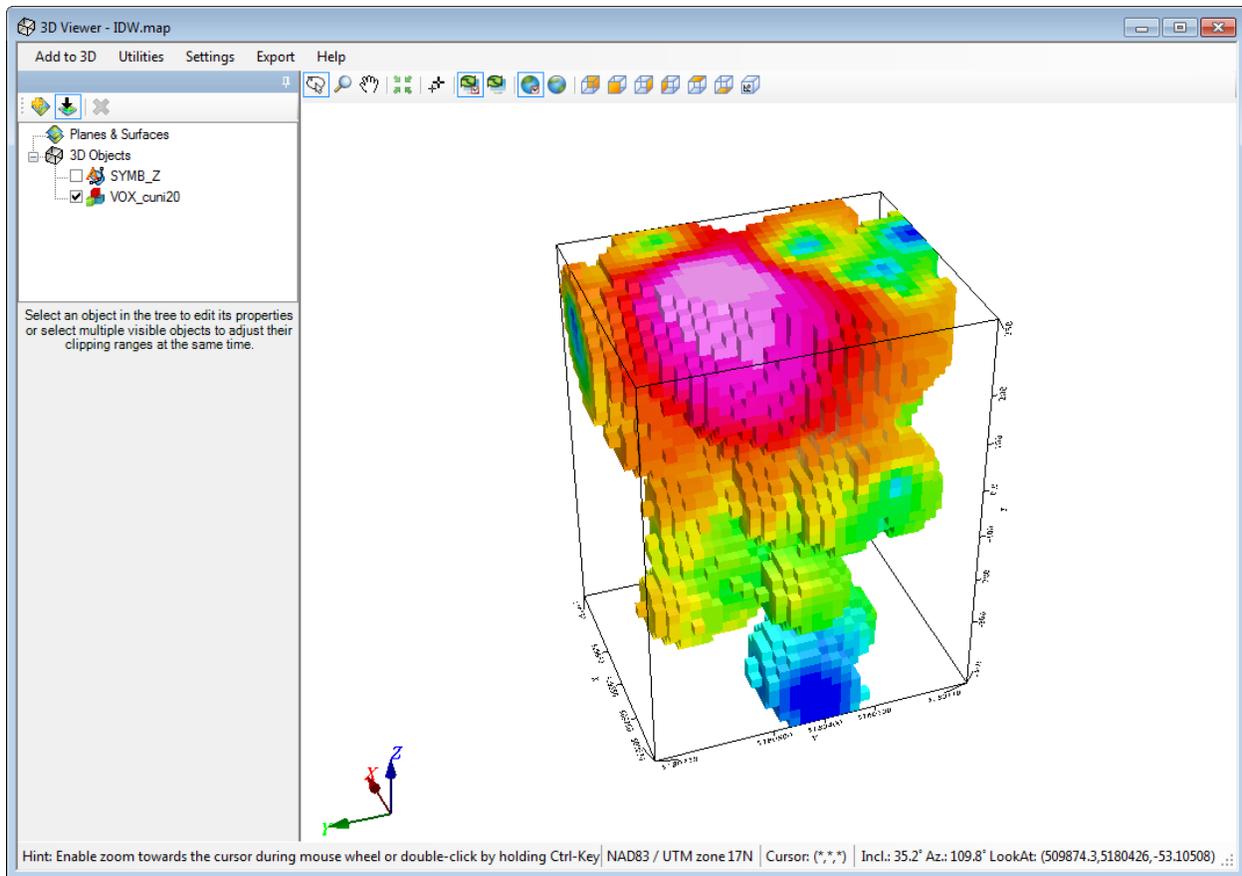
To Create a 3D Voxel model using Inverse Distance Weighted Gridding:

1. Open a Geosoft database containing X, Y, Z and the array data channel to grid. If the coordinate system is not completely defined, a message will pop up and you will not be able to continue.
2. In the 3D Viewer, select *Voxel*, then select *3D Gridding* and then select **Inverse Distance Weighted Gridding** (or on the main Target 3D menu, select *3D Gridding* and then select, *Inverse Distance Weighted Gridding*). The *3D Inverse Distance Weighted Gridding* dialog appears.



If a database is not already open you will be prompted to open one.

3. From the dropdown list, select the *Channel to grid*. The first time through the process, the default *Output voxel file* name will default to a combination of the current database and provided channel name. The subsequent invocations of this tool will remember the user specified file name. You can rename the output voxel file or accept the default name.
4. Specify the *Cell size*. If you do not have a preset cell size, click the **Calculator**  button, to obtain a reasonable cell size based on the extents of your data.
5. When you are satisfied with your selections click **OK**. The Voxel is created and displayed in the *Voxel Viewer*. An example is shown below.



Inverse Distance Weighted Gridding of Borehole data



We recommend that your first attempt at gridding be using the defaults. After inspecting the outcome however you may decide to modify defaults such as the Weighting power & slope to alter the degree of influence of contributing data points relative to their distance, or the Blanking Distance to fill in the gaps, or generate the output on logarithmic scale.

- Specify the *Cell size*. If you do not have a preset cell size, click the **Calculator**  button, to obtain a reasonable cell size based on the extents of your data. The cell size is calculated for a single cube, assuming the volume is divided into 10000 individual cubes. The value is then rounded down to give a more satisfactory value.



For more information, click the Help button on the 3D Inverse Distance Weighted Gridding Help topic.

How-To Guide Publication Date: 29/04/2014

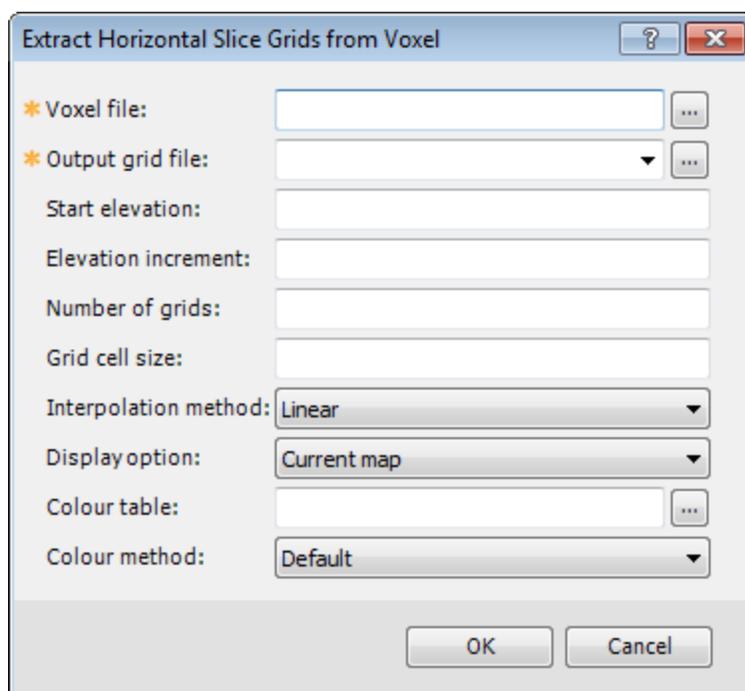
Copyright 2014 Geosoft Inc. All rights reserved.

Extract a Plan Grid (Horizontal Slice)

A “Plan Grid” (or horizontal slice) can be easily extracted from a Voxel using the *Add to 3D|Grids|Level Plan Grid(s) Extracted from Voxel* option. Users can select the start elevation, the elevation increment and the number of grids to extract.

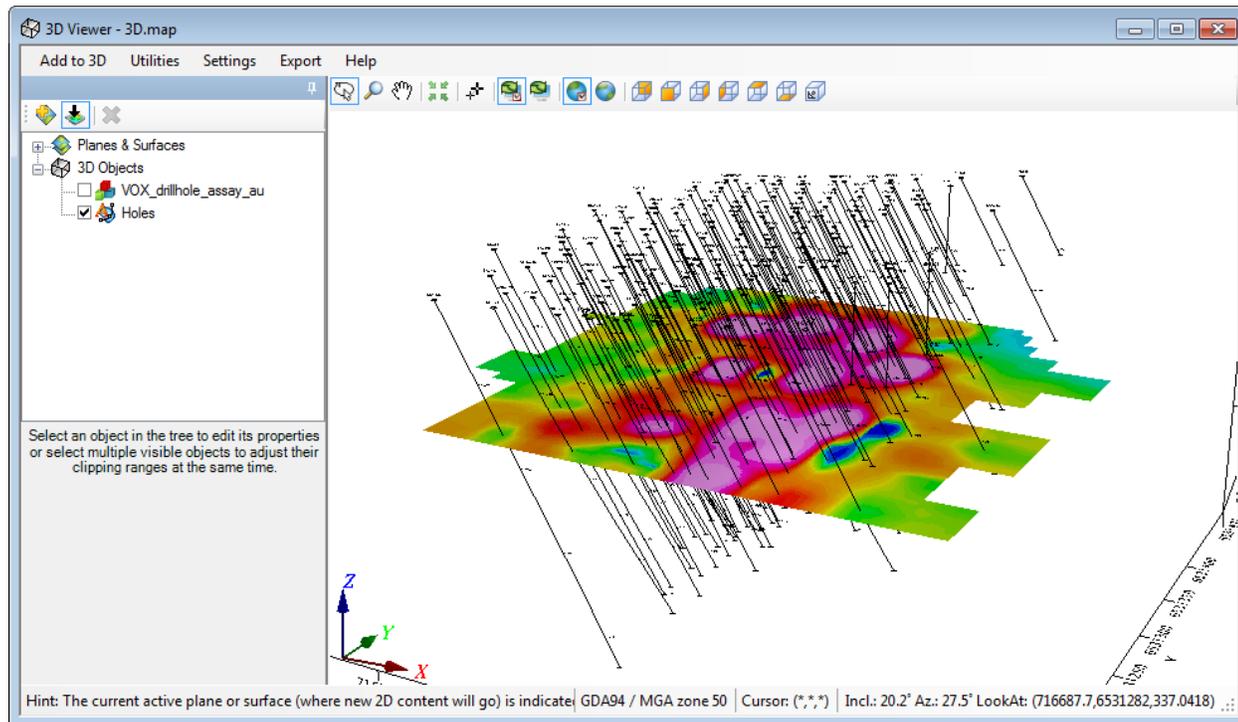
To Extract a Plan Grid

1. Open your 3D view in the *3D Viewer*.
2. On the *Add to 3D* menu, select *Grids* and then select **Level Plan Grid(s) Extracted from Voxel**. The *Extract Horizontal Slice Grids from Voxel* dialog appears.



3. Use the **Browse** button or dropdown list to locate the Voxel file in your current working directory.
4. Specify the start Elevation, leaving the remaining fields blank if you wish, and click the **OK** button.

The “Plan Grid” will be extracted from the voxel and displayed in the *3D Viewer*, as shown below.

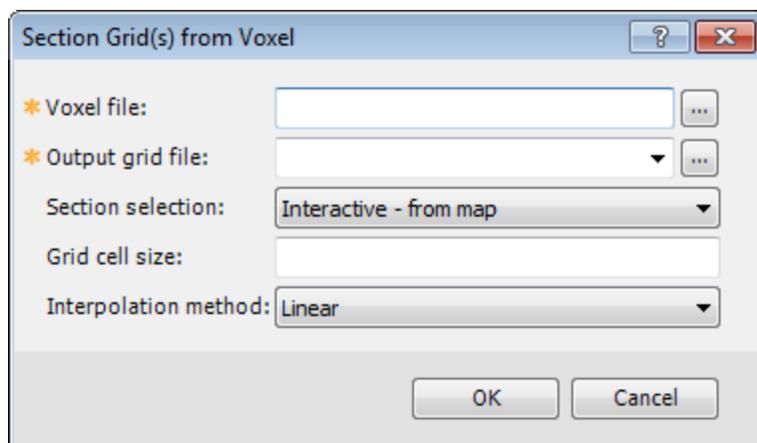


Extract a Section Grid (Vertical Slice)

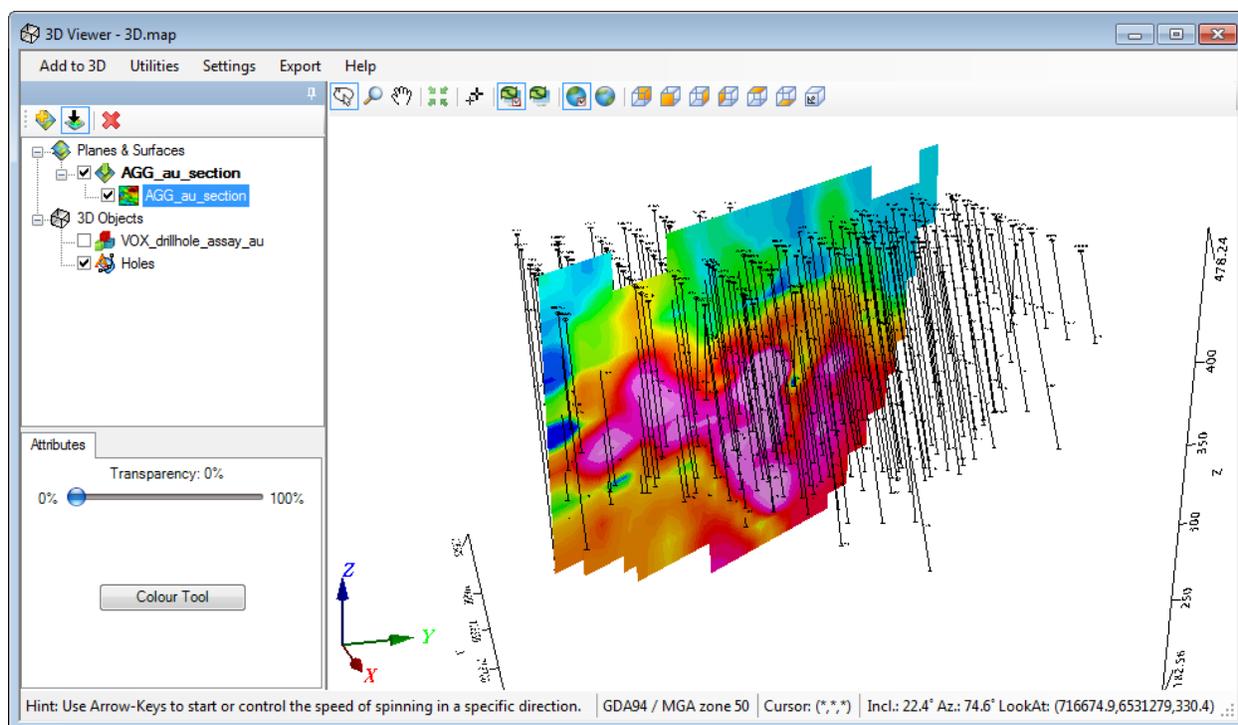
Target includes the ability to extract vertical slices of a voxel grid as “Section Grids”. A Section Grid (or vertical slice) can be easily extracted from a Voxel using the *Add to 3D|Grids|Section Grid(s) Extracted from Voxel* option. The Section grid can be extracted using the voxel database or interactively from a displayed map. To use the interactive map method, you should first have a “Plan Map” open in your project, you will be prompted to interactively draw a profile line from the open Plan map.

To Extract a Section Grid:

1. Open your 3D view in the *3D Viewer*.
2. On the *Add to 3D* menu, select *Grids* and then, select **Section Grid(s) Extracted from Voxel**.
The *Section Grids from Voxel* dialog appears.



3. Use the *Browse* button or dropdown list to locate the *Voxel file* in your current working directory. In the *Output grid file* box specify a name for your output grid.
4. Using the *Section selection* dropdown list, select the method you would like to use to choose your section. You can leave the *Grid cell size* to the default value.
5. Click the **OK** button. If using the interactive methods, you will be asked to define the section location on a map. The “Section Grid” will then be extracted from the voxel and displayed in the *3D Viewer*, as shown below:



You might need to hide (uncheck) some of the 3D groups displayed in the 3D Viewer to clearly see the extracted section grid.

*How-To Guide Publication Date: 29/04/2014
Copyright 2014 Geosoft Inc. All rights reserved.*