Target Drillhole Gridding

Gridding refers to the process of interpolating data onto an equally spaced "grid" of values in a specified coordinate system, such as X-Y. In the Surface Mapping component of Target, both the Minimum Curvature and Kriging gridding methods are available. The Drillhole component of Target includes TIN gridding as an additional gridding option.

This How-to Guide will demonstrate two of the Target drillhole gridding methods, Minimum Curvature and Kriging. See below for a short description of all the gridding methods available to Target users.

Minimum Curvature Gridding

Minimum curvature gridding is a gridding method that fits a smoothest possible surface to the data points. It is best used when data is randomly distributed, sampled along arbitrary lines or if you want to include tie lines.

Kriging

Kriging is a geostatistical gridding technique for random data, non-parallel line data or orthogonal line data.Use the kriging method if the data is variable between sample locations, known to be statistical in nature, poorly sampled or clustered. Kriging is ideally suited to geochemical or other geological sample-based data; it is rarely used with geophysical data, which tends to follow a natural smooth surface.

Tinning

The TIN gridding method requires one data point for each (X, Y) data location in the database. Tinning provides the ability to sum or average duplicate samples - data that have multiple Z values at single point locations.Geosoft Tinning provides a number of ways of visualizing the TIN, including the ability to plot the TIN Nodes, the TIN Mesh (or Delaunay triangulation), the Convex Hull, the Voronoi cells of your data and as grids.

💡 *For more detailed information on TIN Gridding, read the Tinning: Triangular Irregular Network GriddingTechnical Note found on the www.geosoft.com web site.*

The following are newer methods of gridding also available to Target users via the *Grid and Image|Gridding* menu.

Gridding using Inverse Distance Weighting Algorithm

This new method creates a grid from point data using an Inverse Distance Weighting algorithm, and is used primarily to interpolate geochemistry data.

Direct Gridding

You can create a grid from highly sampled data without using any interpolation. This method is intended for use with over-sampled datasets such as LiDAR; it provides a quick gridded view of the datasets.

Sample Density Gridding

You can create a grid of the density of sample locations, rather than the value recorded at each location. This method is useful for determining the spatial distribution of highly sampled data and enables you to easily identify areas which are undersampled. Accessed via the *Direct Gridding* dialog.

Anisotropic Kriging

You can create a grid enhanced in a preferred direction using the strike direction and a weighting factor. This method enables you to incorporate the dominant geologic strike and define a preferential weighting in the strike direction, enhancing geological trends in your dataset.Accessed via the *Kriging - Advanced Options* dialog.

For immediate assistance on using any of these gridding routines, click the **Help** button on the dialog of interest.

Kriging Overview

The statistical gridding method (KRIGRID GX) uses the method of Kriging to determine a value at each grid node based on the XYZ data. Kriging is a geostatistical gridding technique for random data, non-parallel line data or orthogonal line data. Use the Kriging method if the data is variable between sample locations, known to be statistical in nature, or poorly sampled or clustered. Kriging is ideally suited to geochemical or other geological sample-based data; it is rarely used with geophysical data, which tends to follow a natural smooth surface.

Kriging first calculates a variogram of the data showing the correlation of the data as a function of distance. The greater the distance between data points, the greater the variation between the points. Based on the variogram, you can select a model that best defines the variance of the data.

The technique of Kriging uses this model to estimate the data values at the nodes of the grid. A significant by-product of Kriging is the ability to estimate the error of the data at each grid node.

Geosoft supports ordinary Kriging as well as universal Kriging. Universal Kriging differs from ordinary Kriging in that it allows the data to contain a regional trend. For a more in-depth understanding of geostatistical analysis and Kriging, refer to Mining Geostatistics written by A.G. Journel and C.J. Huijbregts, 1978.

Kriginghas the following capabilities:

- Applies de-aliasing filter.
- Applies linear and logarithmic gridding options.
- Blanks un-sampled areas.
- Calculates a variogram from the input data channel.
- Output grids up to any size.
- Processes unlimited number of input observation points.
- Supports linear, power, spherical, Gaussian, exponential and user defined models.

⚠️ *The actual maximum size of the grid that you can use depends upon the available free disk space of your computer.*

You will now use the Kriging method. You will first compute the variogram, adjust the advanced options and then create the grid.

Drillhole Gridding Using Kriging

The Kriging option is ideal for clustered data and provides better control in anomalous or poorly sampled areas.

To Grid Drillhole Data using the Kriging Method

1. Make sure your Drillhole project is opened.
2. On the *DH-Plot* menu, select **Section**. The *Section Parameters* dialog will appear.
3. Click the **Data** tab. The *Data* page opens.
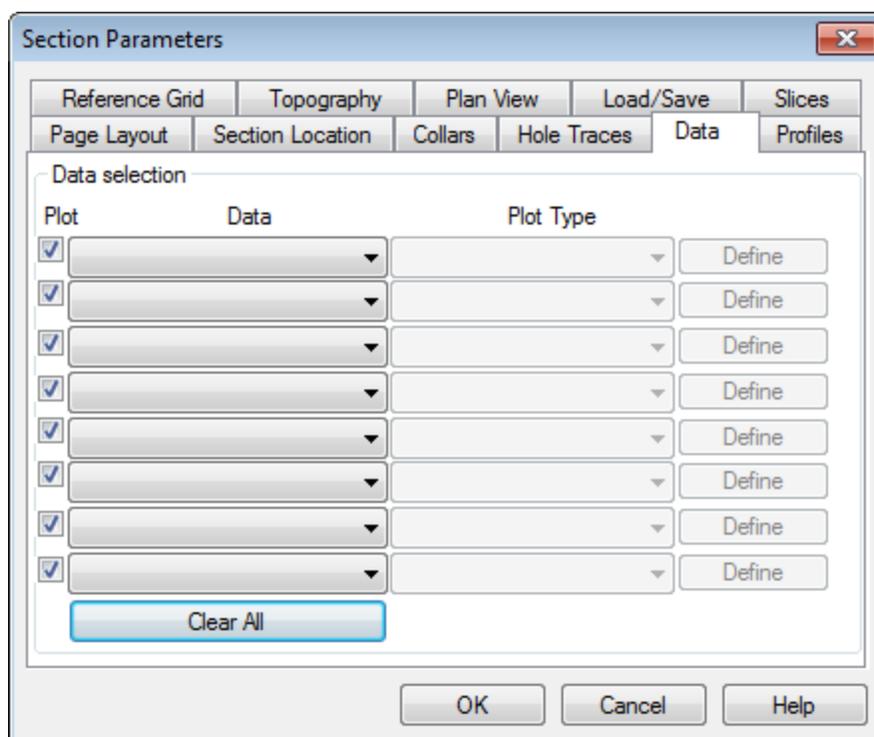
4. Using the *Data* dropdown list, select the channel (column) to grid. Select *Grid: Kriging* from the *Plot Type* dropdown list, and click the **Define** button to the right. The *Grid data* dialog will appear.
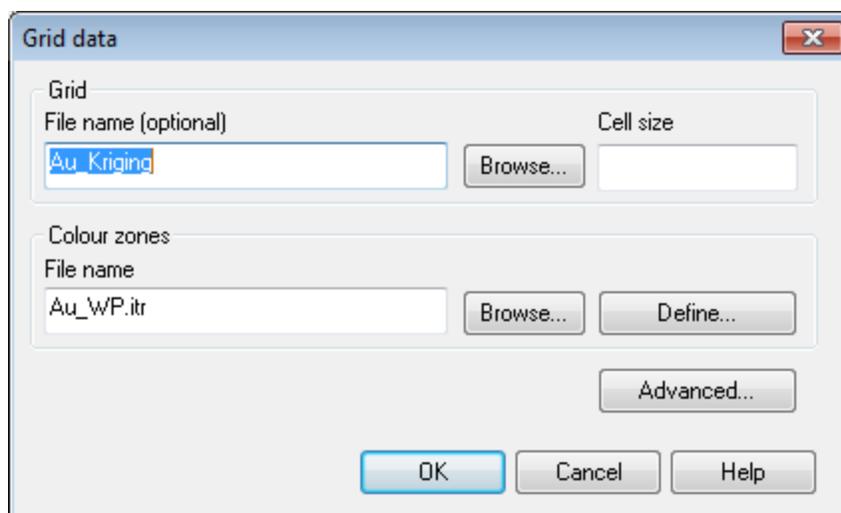
5. In the *Grid* section of the dialog specify the *File name*, or accept the default name.

6. Specify the grid cell size. This should normally be ½ to ¼ the nominal sample interval. If not specified, the data points are assumed to be evenly distributed and the default cell size will be. ¼* (sqrt (grid area / #data points)).

7. Click the **Advanced>** button to specify a name of output for the variogram file and other advanced parameters.

💡 *For more information on the **Advanced**gridding parameters, click the **Help** button.*

9. Click the **OK** button and to return to the *Grid Data* dialog and click the **OK** button again to return to the *Section Parameters* dialog.

10. Click the **OK** button and the system processes the data and displays the grid in a "map" window and adds it under **Grids** in the *Project Explorer* window.
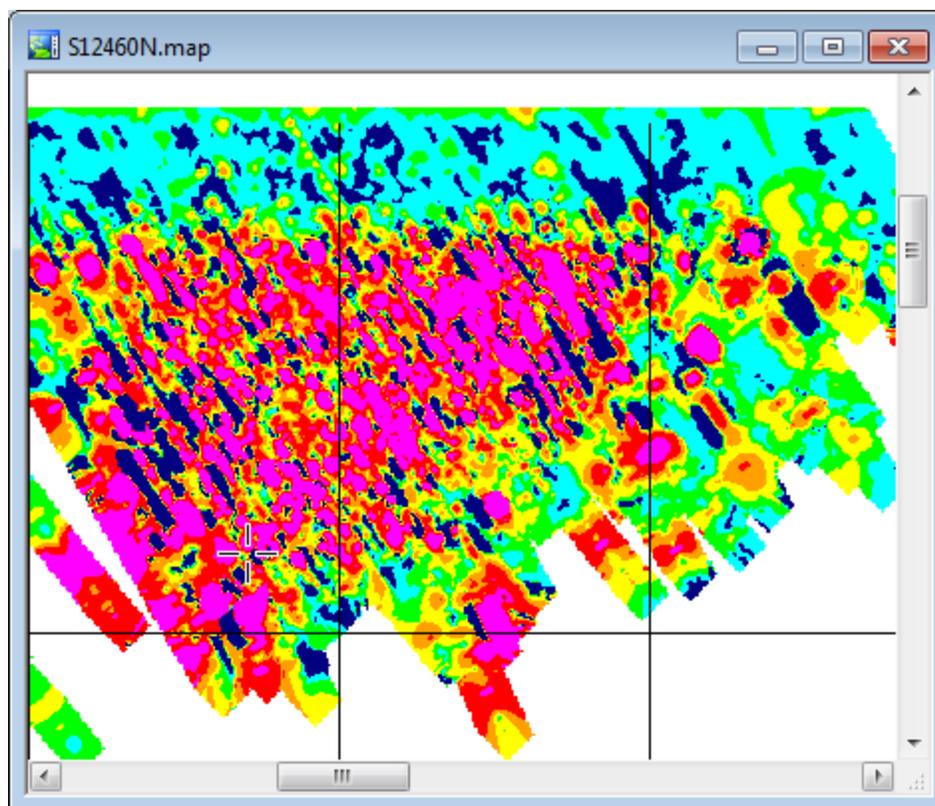
Minimum Curvature Gridding Overview

The random gridding method (RANGRID GX) fits a minimum curvature surface to the data points using a method similar to that described by Swain (1976) and Briggs (1974). A minimum curvature surface is the smoothest possible surface that will fit the given data values.

Minimum Curvature gridding first estimates grid values at the nodes of a coarse grid (usually 8 times the final grid cell size). This estimate is based upon the inverse distance average of the actual data within a specified search radius. If there is no data within that radius, the average of all data points in the grid is used. An iterative method is then employed to adjust the grid to fit the actual data points nearest the coarse grid nodes.

After an acceptable fit is achieved, the coarse cell size is divided by 2. The same process is then repeated using the coarse grid as the starting surface. This is iteratively repeated until the minimum curvature surface is fit at the final grid cell size.

A very important parameter in the Minimum Curvature gridding process is the number of iterations used to fit the surface at each step. The greater the number of iterations, the closer the final surface will be to a true minimum curvature surface. However, the processing time is proportional to the number of iterations.

Minimum Curvature stops iterating when:

❯ It reaches a specified maximum number of iterations, or

❯ A certain percentage of the observed points are within a limiting tolerance of the surface

By default these limits are 100 iterations and 99% of points within 1% of the data range.

Minimum Curvature gridding has the following capabilities:

❯ Accessing unlimited number of input observation points.

❯ Adjustable internal tension.

❯ Applying de-aliasing filter.

❯ Applying linear and logarithmic gridding.

❯ Applying projections.

❯ Blanking un-sampled areas.

❯ Outputing grids up to any size.

⚠ *The actual maximum size of the grid that you can use depends upon the available free disk space of your computer.*

## Drillhole Gridding using Minimum Curvature

The Minimum Curvature gridding option is best used when data is randomly distributed, sampled along arbitrary lines or if you want to include tie lines.

To Grid Drillhole Data using the Minimum Curvature Method

1. Make sure your drillhole project is open.

2. On the *DH-Plot* menu, select **Section**.
The *Section Parameters* dialog will appear.

3. Click the **Data** tab.
The *Data* page opens.
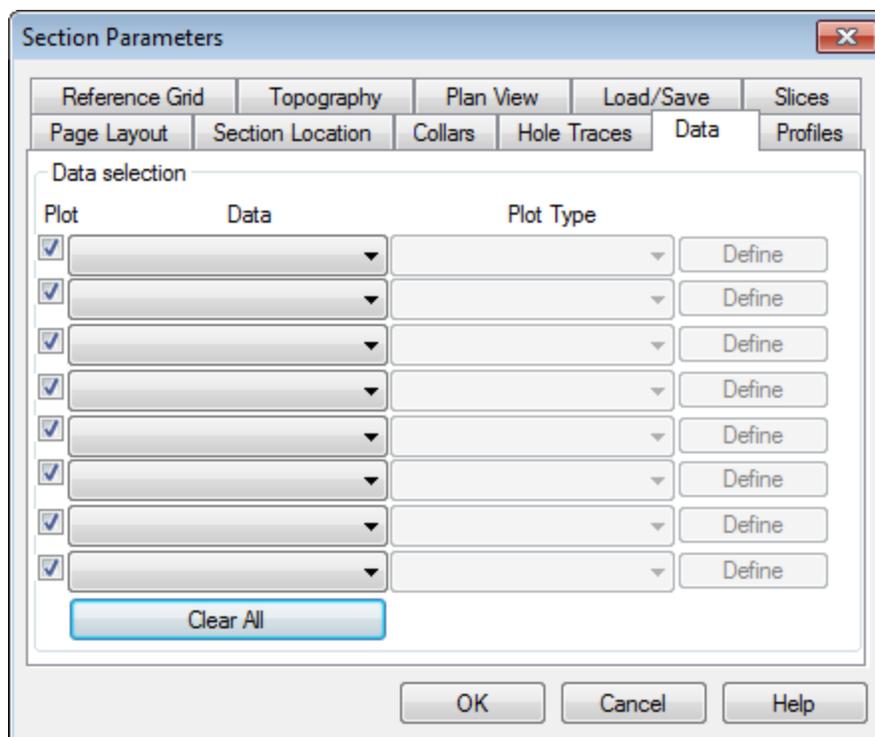
4. Using the *Data* dropdown list, select the channel (column) to grid. Select **Grid: Min. curve** from the *Plot Type* dropdown list, and click the **Define** button to the right.
   The *Minimum Curvature Gridding* dialog will appear.
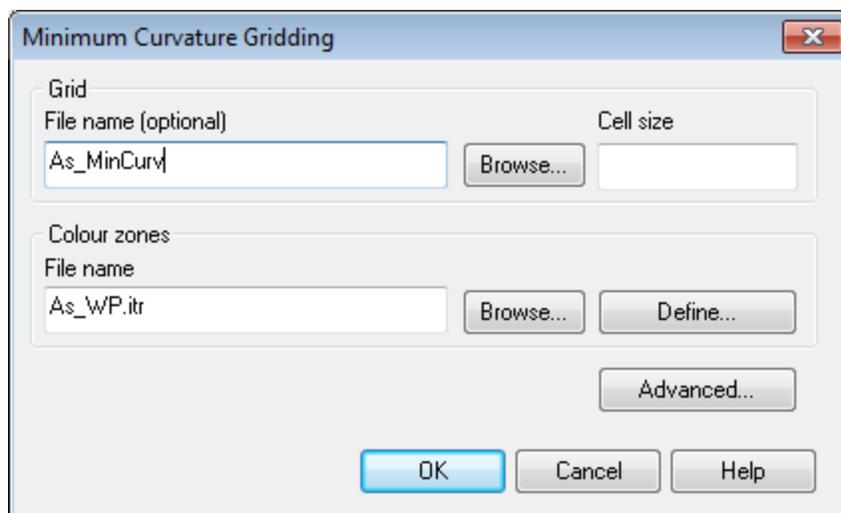
5. Specify the *Name of new grid file*.

6. Specify the *Grid cell size*. This should normally be ¼ to ½ the nominal data sample interval. If not specified, the data points are assumed to be evenly distributed and the default cell size will be. ¼* (sqrt (grid area / #data points)).

7. Click the **Advanced** button. The *Minimum Curvature - Advanced Options* dialog appears.

8. You can use this dialog to set a number of advanced minimum curvature gridding options. Set your advanced options as required.

💡 *For more information on the Advanced gridding parameters, click the* **Help** *button.*

9. Click the **OK** button to return to the *Minimum Curvature Gridding* dialog .

10. Click the **OK** button to return to the *Section Parameters* dialog.

11. Click the **OK** button and the system processes the data and displays the grid in a "map" window and adds it under **Grids** in the *Project Explorer* window.
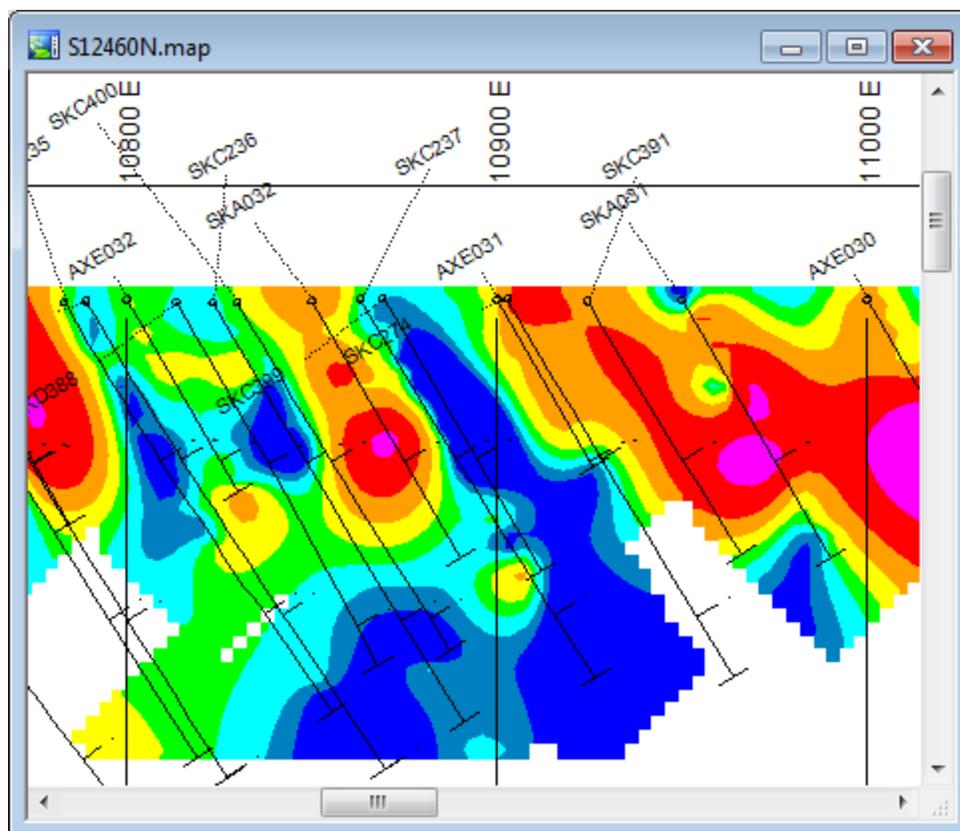
Displaying a Grid in a Plan Map

The ability to quickly and easily integrate multi-disciplinary data into your maps (surficial, plan, section and 3D maps) is one of the advanced visualization capabilities of the Drillhole system. For example, you may have a magnetic grid supplied by a Geophysicist, or a topography grid that you want to place on your plan view for comparison with your drillholes.

To Display a Single Grid on a Plan Map

1. Select the Plan map you want to work with.

2. On the *DH-Plot* menu, click **Plan Map**.
   The *Plan Map Parameters* dialog appears.
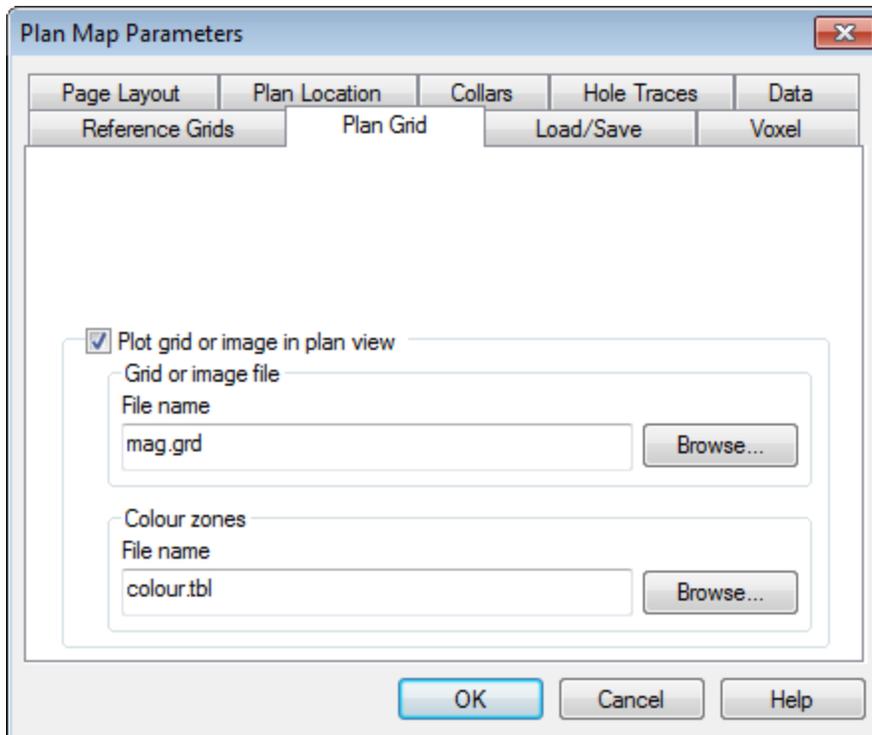
3. Make sure you are on the *Plan Grid* tab and select (check) the *Plot grid or image in plan view* box. The *Grid or image file* parameters will be enabled.

4. Using the **Browse** button, select the *Grid or image file* from your working directory.

5. You may leave the *Colour zones* as the default and click the **OK** button. The grid is displayed on the Plan map.
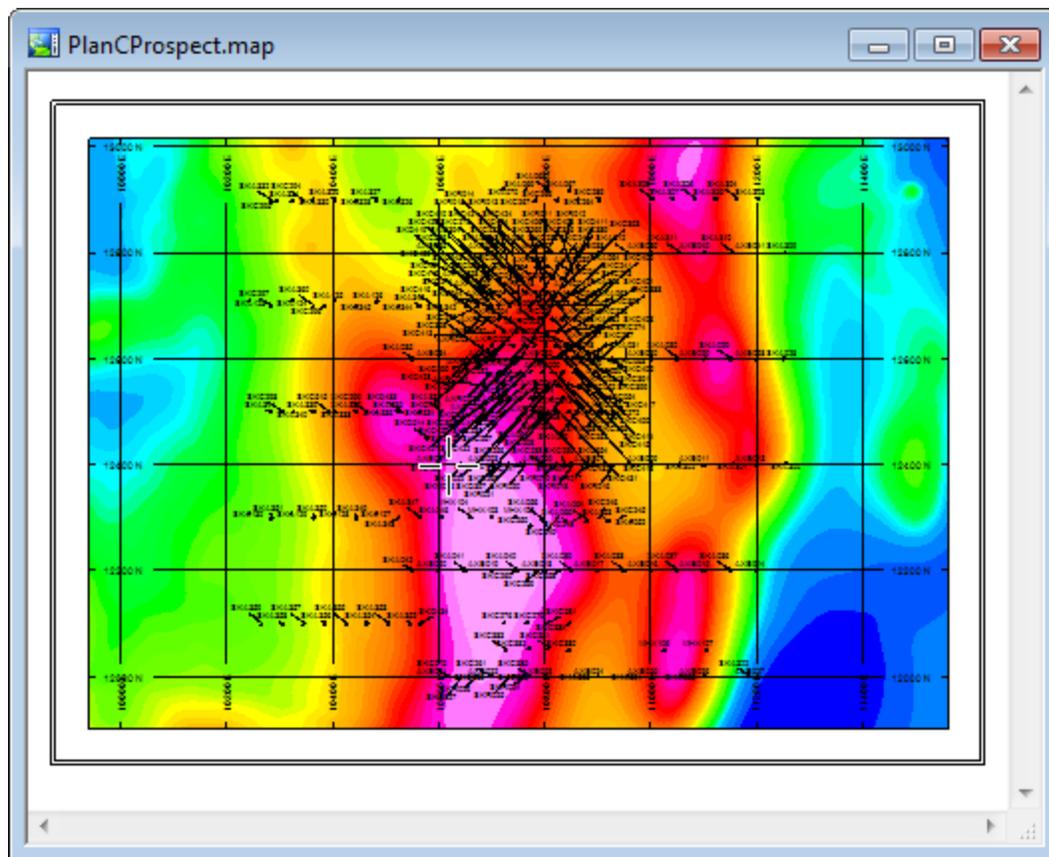
⚠️   *For more information on the grid display parameters, click the **Help** button on the Plan Grid tab.*

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