

Creating a Contour Map using surfer

A contour map is a plot of three values. The first two dimensions are the X, Y coordinates, and the third (Z) is represented by lines of equal value (the contour lines on the map) across the map extents. The shape of the surface is shown by the contour lines.

What are contour maps used for?

Contour maps are used for a variety of applications. You can contour any Z value of data. If you have multiple Z values for your X, Y values, you could create multiple contour maps. For example, you could create a contour map for X, Y, Z (elevation) to show the topography of your study area. You could then create a contour map for X, Y, Z (concentration) to show the concentration values across your study area. The Z value could be temperature, concentration, frequency, or any other numeric column of data. The Map | New | Contour Map command creates a contour map based on a grid file.

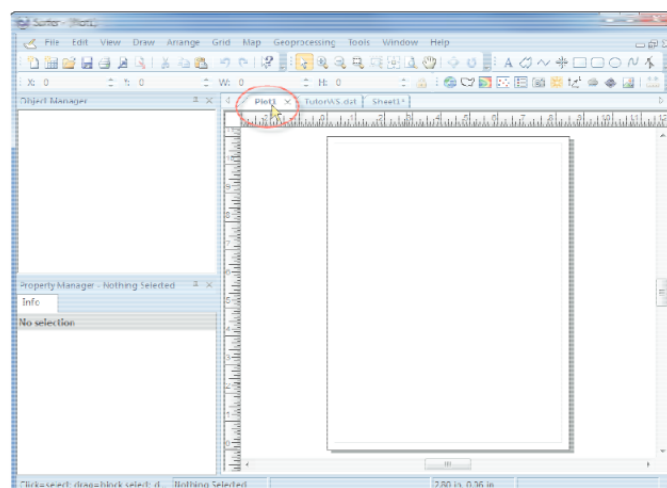
Creating a Grid File

Grid files are required to produce a grid-based map. Grid-based maps include contour maps, image maps, shaded relief maps, 1-grid vector maps, 2-grid vector maps, 3D wireframes, and 3D surfaces.

How are grid files produced? Grid files are created using the Grid | Data command. The Grid | Data command requires data in three columns: one column containing X data, one column containing Y data, and one column containing Z data how to produce a grid file.

Creating a Grid File

1. If you have the worksheet window open, click on the Window menu and choose Plot1, or click on the Plot1 tab. Alternatively, you can create a new plot window with the File | New | Plot command.



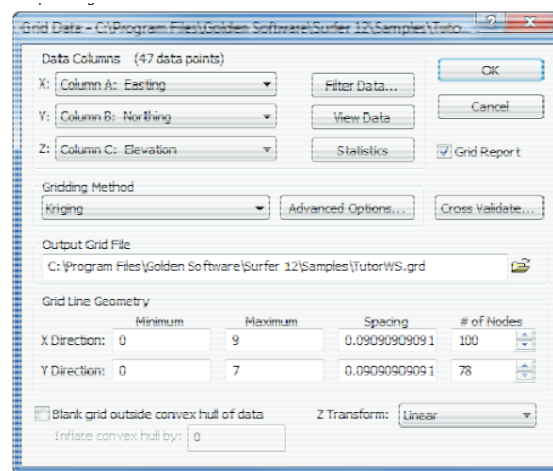
Click on the Plot1 tab to return to the plot window.

2. In the plot window, click the Grid | Data command, or click the button in the grid toolbar. The Open Data dialog is displayed.

3. In the Open Data dialog, click the file TutorWS.dat file located in the Samples folder. If you are not in the Samples folder, browse to it. By default, the Samples folder is located in c:\Program Files\Golden Software\Surfer 12\Samples. You can select the file in the file list section or in the Open worksheets section of the dialog by clicking once on the file name. The name appears in the File name box below the list of data files.

4. Click Open. Alternatively, double-click on the data file name.

5. The Grid Data dialog is displayed. The Grid Data dialog allows you to control the gridding parameters. Take a moment to look over the various options in the dialog. Do not make changes at this time, as the default parameters create an acceptable grid file.



Use the **Grid Data** dialog to set gridding preferences and create a grid file.

The Data Columns section is used to specify the columns containing the X and Y coordinates, and the Z values in the data file.

- The Filter Data button is used to filter your data set.
- The View Data button is used to see a worksheet preview of your data.
- The Statistics button is used to open a statistics report for your data.
- The Grid Report option is used to specify whether to create a statistical report for the data.
- The Gridding Method option is used to specify the interpolation gridding method.
- The Advanced Options button is used to specify advanced settings for the selected Gridding Method.
- The Cross Validate button is used to assess the quality of the gridding method The Output Grid File displays the path and file name for the grid file.
- The Grid Line Geometry section is used to specify the XY grid limits, grid spacing, and number of grid nodes (also referred to as rows and columns) in the grid file.

- The Blank grid outside convex hull of data automatically blanks any locations that are outside the data area. When checked, the Inflate convex hull by option is available. This allows the area to be gridded to be expanded or contracted beyond the data locations by the value specified.

- The Z Transform controls whether the actual Z value or the log (base 10) of the Z value is gridded and how the Z value is stored in the grid file.

6. Click OK. In the status bar at the bottom of the window, a display indicates the progress of the gridding procedure. By accepting the defaults, the grid file uses the same path and file name as the data file, but the grid file has a .GRD extension.



7. By default, a Surfer dialog appears after gridding the data with the full path and file name of the grid file that was created. Click OK in the Surfer dialog.

8. If Grid Report was checked in the Grid Data dialog, a report is displayed. You can minimize or close this report. This report contains detailed information about the gridding process.

Creating a Contour Map

1. Click the Map | New | Contour Map command, or click the button in the map toolbar.

2. The Open Grid dialog is displayed. Select the WS.grd file created earlier- Creating a Grid File by clicking once on its name. The file name is entered in the File name box.

3. Click Open and the map is created using the default contour map properties.

4. If you want the contour map to fill the window, click the View | Fit to Window command, click the button, or press CTRL+D on the keyboard. Alternatively, if you have a wheel mouse, roll the wheel forward to zoom in on the contour map. The zoom is changed so that the cursor location remains on the screen. Click and hold the wheel button straight down while you move the mouse to pan around the screen.

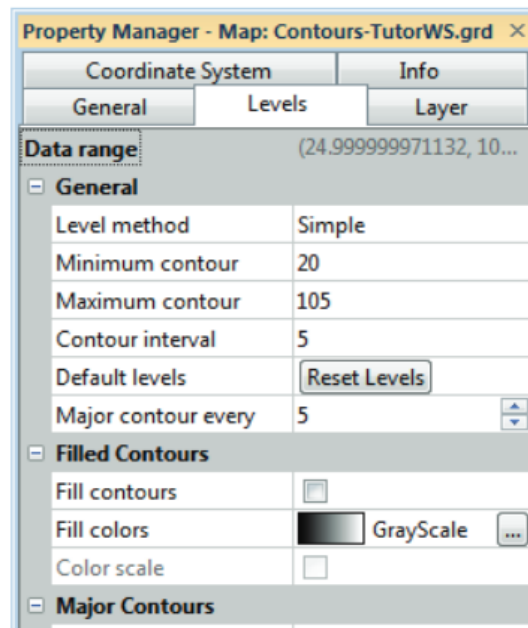
Changing Contour Levels

After you create a contour map, you can easily modify any of the map features. For example, you might want to change the contour levels displayed on the map. To change the contour levels:

1. Place the cursor inside the limits of the contour map and click once. Or, click on the Contours-TutorWS.grd object in the Object Manager. When the contour layer is selected, the contour properties are displayed in the Property Manager.

2. In the Property Manager, click the Levels tab to display the contour levels and contour line properties for the map. In this example, the contour levels begin at $Z = 20$. This is displayed next to Minimum contour. The Maximum contour level is $Z = 105$. Go to the Levels page to display the contour level properties.

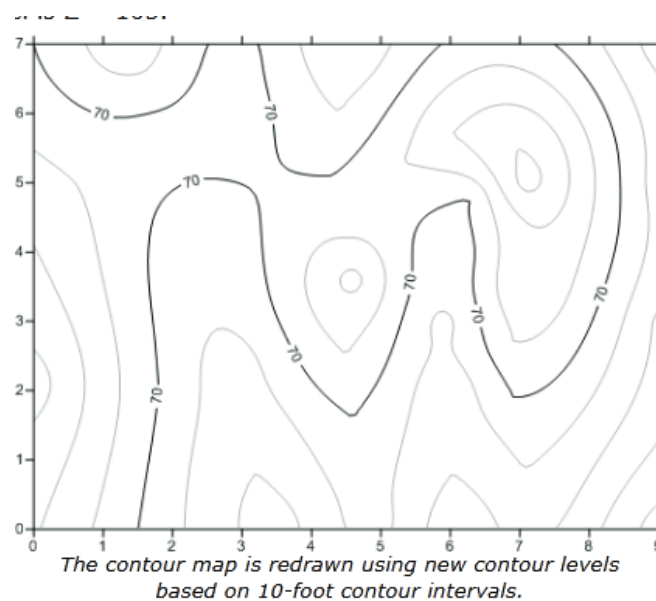
3. To change the contour range, click in the box next to Minimum contour or Maximum contour. Highlight the existing value and type a new value. The Data range of the grid file is displayed at the top of the Levels page, making selecting



an appropriate range easier. For best results, select values for Minimum contour and Maximum contour that are in or near this Data range.

4. The Contour interval, or the frequency of contour lines, is five. This means that a contour line will be displayed every five Z units. We should see contour lines at 20, 25, 30, 35, etc. up to 105. Click in the Contour interval box, highlight the value 5, and type the value 10.

5. Press ENTER on the keyboard. The map automatically updates to show contour lines every 10 Z units. The minimum contour level is $Z = 20$, and the largest contour level is $Z = 105$.



Changing Contour Line Properties

You can set any of the options in the list on the Levels page to customize the contour map. The Major contour every value allows the setting of two different line styles, the major and minor contour lines, for the contour map. By default, the major contour lines are black and labeled and the minor contour lines are gray and unlabeled. The number of minor contour lines and the line properties for both the major and minor contours can be changed.

Setting the Major Contour Value

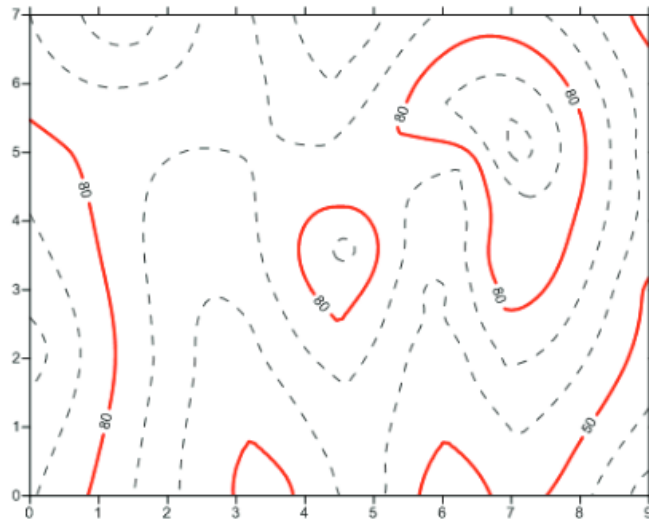
1. Highlight the number in the box next to Major contour every and type in a new value of 3.
2. Press ENTER on the keyboard and every third line is a major contour line

Changing the Major Contour Line Properties

1. Click the next to Major Contours, if it is not already open.
2. Click the next to Line Properties in the Major Contours section. The major line properties appear.
3. Click the Black color box next to Color. Select another color, such as Red, from the list. The map automatically updates.
4. Click the next to Width and change the value to 0.030 inches. Thick red lines now appear at the major contours.

Changing the Minor Contour Line Properties

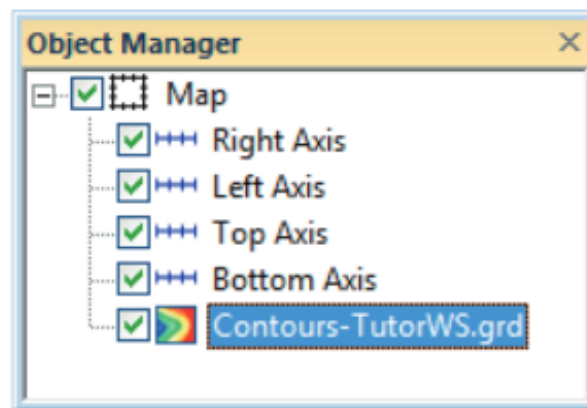
1. Click the next to Minor Contours, if it is not already open.
2. Click the next to Line Properties in the Minor Contours section. The minor line properties appear.
3. Click the 30% Black color box next to Color. Select another color, such as 80% Black, from the list.
4. Click in the box next to Style and select a dashed line from the list. Dashed gray lines now appear at the minor contours.



The contour map should look similar to this example after changing the major and minor line properties.

Exporting 3D Contours

When you have completed a contour map in the plot window, you can export the contour lines with associated Z values to an AutoCAD DXF file, 2D SHP, 3D SHP, or to a Text Format TXT file. To export contour lines to 3D DXF, 2D SHP, 3D SHP, or TXT File: 1. Select the contour map layer by clicking on the map layer in the plot window or by clicking on the word Contours-TutorWS.grd in the Object Manager.



*Select the contour map by clicking on the Contours-TutorWS.grd object in the **Object Manager** or by clicking on the map in the plot window.*

.Click the Map | Export Contours command. 3. In the Save As dialog, type TutorWS in the File name box. 4. Specify AutoCAD DXF File (*.dxf), 2D ESRI Shapefile (*.shp), 3D ESRI Shapefile (*.shp), or Text format (*.txt) in the Save as type box. 5. Click Save and the file is exported to the current directory. This creates a file titled TutorWS.dxf, TutorWS.shp, or TutorWS.txt depending on what file type you selected. Additional files may also be created that accompany the DXF, SHP, or TXT file.