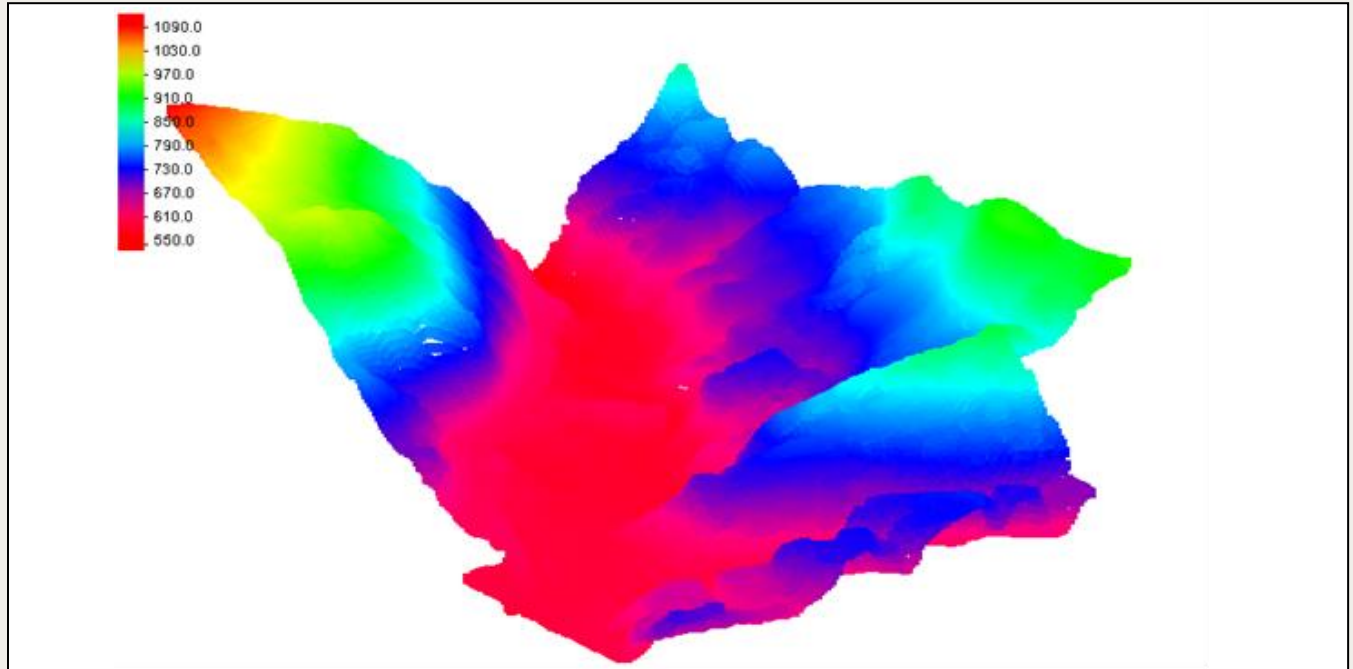




SMS 14.0 Tutorial

Working with Rasters

Importing and editing raster data in SMS



Objectives

Learn how to import a raster, view elevations at individual points, change display options for multiple views of the data, show the 2D profile plots, and interpolate data to a mesh.

Prerequisite Tutorials

- Overview

Required Components

- SMS Core

Time

- 20–30 minutes

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1 Introduction

A raster consists of a matrix of pixels or cells stored and displayed in a grid formation (rows and columns). Each cell contains a value representing a type of information such as elevation or land use.

In this example, the raster is a surface map containing elevation data. However, rasters can also be used as base maps (usually scanned maps and images, or satellite imagery) and thematic maps (usually containing information such as land use or vegetation).

2 Importing the Raster

Start with importing a Digital Elevation Model (DEM) file into SMS. SMS creates a raster object in the GIS module to represent this DEM.

To open a raster in SMS:

1. Start by launching SMS. If it is already launched, press *Ctrl+N* to reset to the default settings. Click **Don't Save** if asked to save changes
2. Select *File | Open...* to bring up the *Open* dialog.
3. Select "TIFF Image Files (*.tif;*.tiff)" from the *Files of type* drop-down.
4. Browse to the *SMS_Rasters\Data Files* folder and select "GunnersBrook.tif".
5. Click **Open** to import the raster and exit the *Open* dialog.

The project should appear similar to Figure 1.

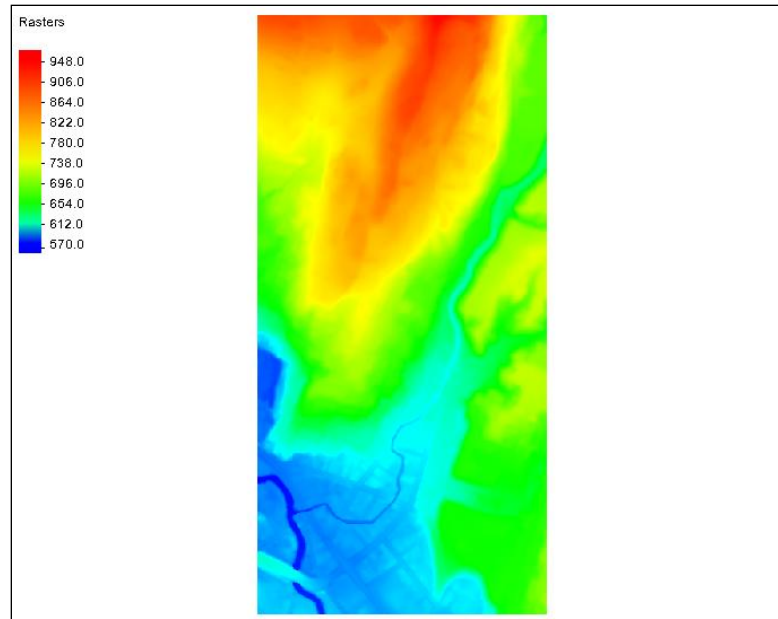


Figure 1 Imported raster

3 Setting the Projection

Like all objects in SMS, rasters should be referenced to a projection to locate the data in the physical world. The projection may come from the raster file or from an associated file. In this tutorial, the imported GeoTIFF file contains the projection within the file and has been set to State Plane Coordinates, with the zone set to Vermont. The units are set to feet.

To verify this:

1. Select *Display* | **Display Projection...** to bring up the *Display Projection* dialog.
2. In the *Horizontal* section, in the field below *Global projection*, notice that it contains the following:
 - Projection name: NAD83 / Vermont
3. In the *Vertical* section, notice that the *Units* drop-down has "Feet (U.S. Survey)" selected.
4. Click **OK** to close the *Display Projection* dialog.

4 Changing the Display

SMS offers two methods for displaying the data contained within the raster (elevations, in this case). These include an image of the shaded surface (this is a 2D display visible only in plan view) and a display of a sampling of the points that make up the surface. The default is a 2D image as shown in Figure 1.

The shading method employed to generate the image can be controlled by the user. SMS allows the user to choose between atlas, color ramp, global and HSV shaders. To change the shader:

1. In the Project Explorer, right-click on "GunnersBrook.tif" and select **Display Options...** to bring up the *Raster Display Options* dialog.
2. Click on the **Contour Options...** button to open the *Raster Contour Options* dialog.

3. Click on the **Color Ramp...** button to open the *Choose color ramp* dialog.
4. Select the “Color Ramp Shader” option from the list.
5. Click **OK** to close the *Choose color ramp* dialog.
6. Click **OK** to close the *Raster Contour Options* dialog.
7. Click **OK** to close the *Raster Display Options* dialog.

SMS updates the display of the image to use a different set of colors (Figure 2).

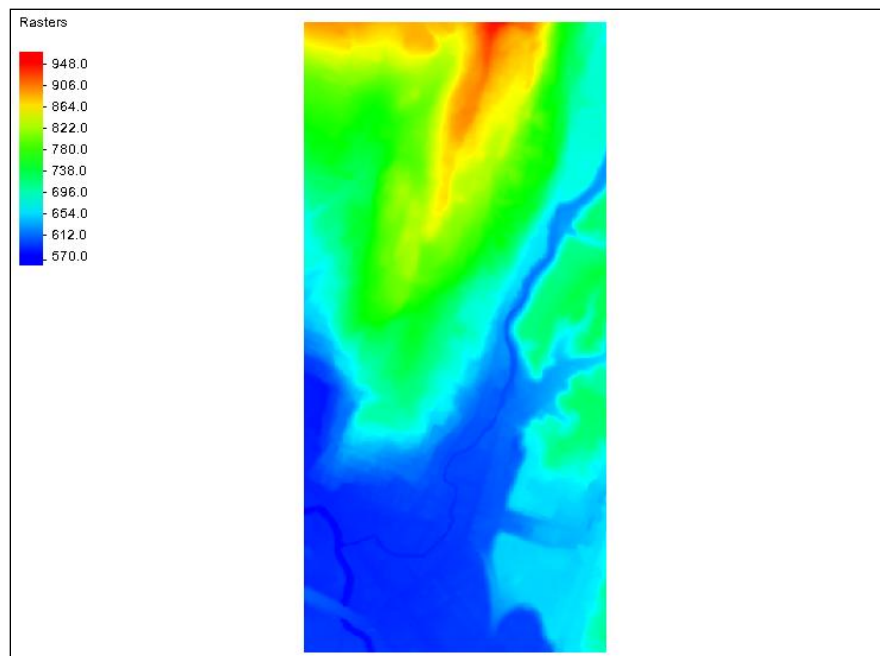


Figure 2 Using the Color Ramp Shader

The 2D image display of the raster is only visible in plan view. In order to view the data in three dimensions and display the raster data as point cloud, do the following:

8. In the Project Explorer, right-click on “ GunnersBrook.tif” and select **Display Options...** to bring up the *Raster Display Options* dialog.
9. In the *All Rasters* section, select *Display as 3D points*.
10. Click **OK** to close the *Raster Display Options* dialog.
11. Click **Display Options** to bring up the *Display Options* dialog.
12. Select “General” from the list on the left.
13. In the *Drawing options* section, turn off *Auto z-mag* and enter “10.0” as the *Z magnification*.
14. Click **OK** to close the *Display Options* dialog.
15. Using the **Rotate** tool, click and drag in the Graphics Window. Notice how the elevation can now be seen (Figure 3).

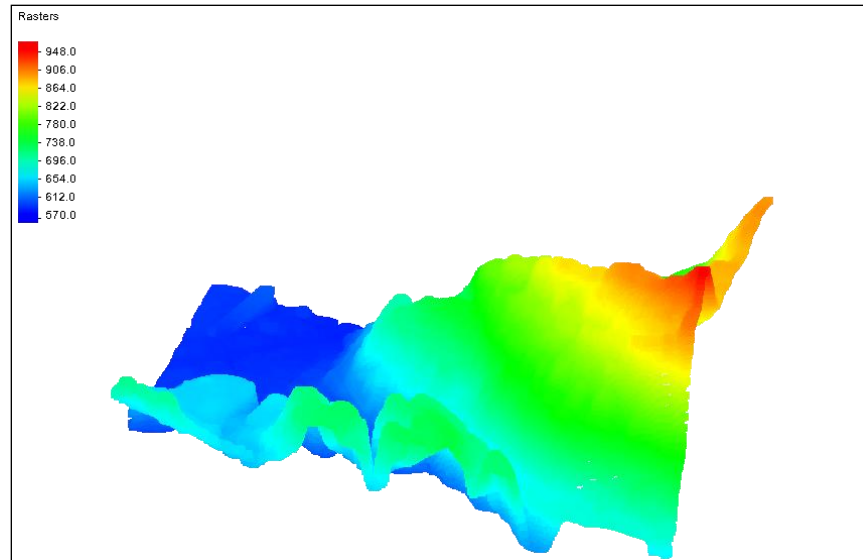


Figure 3 Rotated view with 3D points

The rest of the tutorial uses the 2D plan view of the raster. Change back to that view by doing the following:

16. Click **Plan View**  to return to the original view.
17. In the Project Explorer, right-click on  "GunnersBrook.tif" and select **Display Options...** to bring up the *Raster Display Options* dialog.
18. In the *All Rasters* section, select *Display as 2D image*.
19. Click on the **Contour Options...** button to open the *Raster Contour Options* dialog.
20. Click on the **Color Ramp...** button to open the *Choose color ramp* dialog.
21. Select the "HSV Shader" option from the list.
22. Click **OK** to close the *Choose color ramp* dialog.
23. Click **OK** to close the *Raster Contour Options* dialog.
24. Click **OK** to close the *Raster Display Options* dialog.

5 2D Profile Plot

SMS can show 2D profile plots using an observation coverage. This is done by doing the following:

1. Right-click on  "Map Data" and select **New Coverage** to open the *New Coverage* dialog.
2. In the *Coverage Type* section, select *Generic | Observation*.
3. Enter "Observation" as the *Coverage Name*.
4. Click **OK** to create the new coverage and close the *New Coverage* dialog.
5. Select  "Observation" to make it active.

6. Using the **Create Feature Arc**  tool, create two arcs from left to right across the channel as if facing downstream as shown in Figure 4. Feel free to **Zoom**  in if needed.

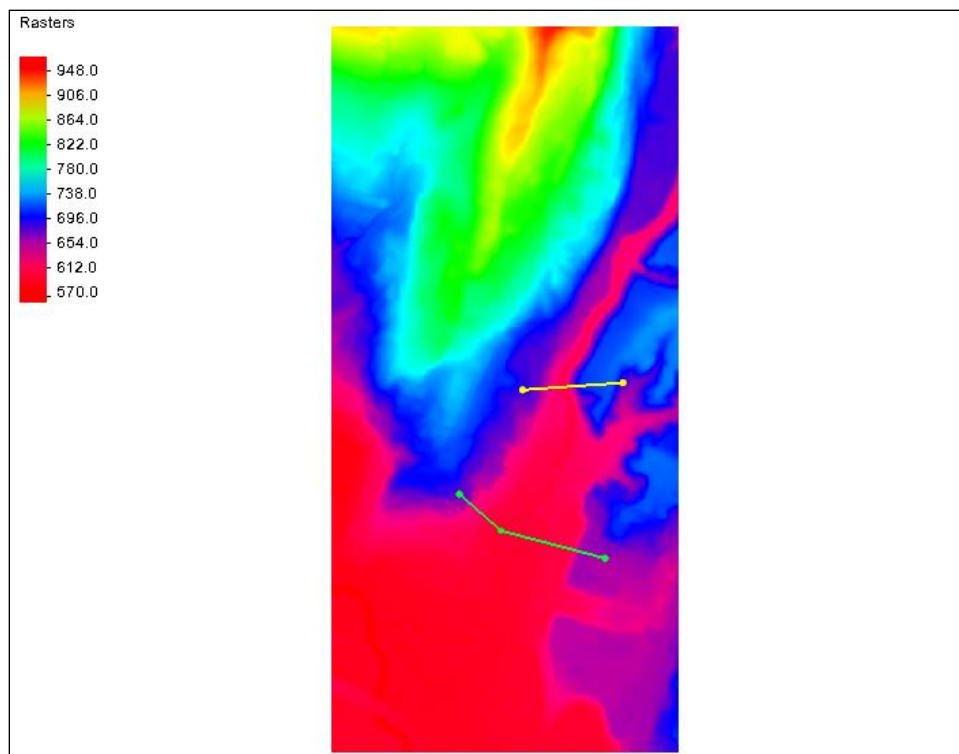


Figure 4 Observation arcs

7. Select **Display | Plot Wizard...** to bring up the *Step 1 of 2* page of the *Plot Wizard* dialog.
8. In the *Plot Type* section, select "Observation Profile" from the list on the left.
9. Click **Next >** to go to the *Step 2 of 2* page of the *Plot Wizard* dialog.
10. In the *Coverage* section, check both boxes in the *Show* column of the first spreadsheet.
11. In the *Dataset(s)* section, select *Specified*.
12. Turn on  GunnersBrook.tif" from the tree list.
13. Leave the *Plot tolerance* at "0.0" m.

The plot tolerance allows for points to become clearer in the plot as it puts a tolerance on how many points can be displayed.

14. Click **Finish** to close the *Plot Wizard* dialog and display the profile plots in the *Plot 1* dialog.

Notice that each observation arc has a different plot (Figure 5).

15. Leave the *Plot 1* dialog open and move it to the side so the Graphics Window is visible.

16. In the Graphics Window, use the **Select Feature Point**  tool to select one of the nodes of either arc and drag it to a new location.

Notice that the plot changes once the node has been moved.

17. Right-click in the plot window and select **Plot Data...** from the menu to open the *Step 2 of 2* tab of the *Data Options* dialog.
18. In the *Dataset(s)* section, enter “1.0” m as the *Plot tolerance*.
19. Click **OK** to close the *Data Options* dialog.

Notice how the points displayed on the plots are now coarser (spaced further apart) because the tolerance was increased.

20. Close the *Plot 1* window by clicking on the  button in the top-right corner.
21. **Frame**  the project.

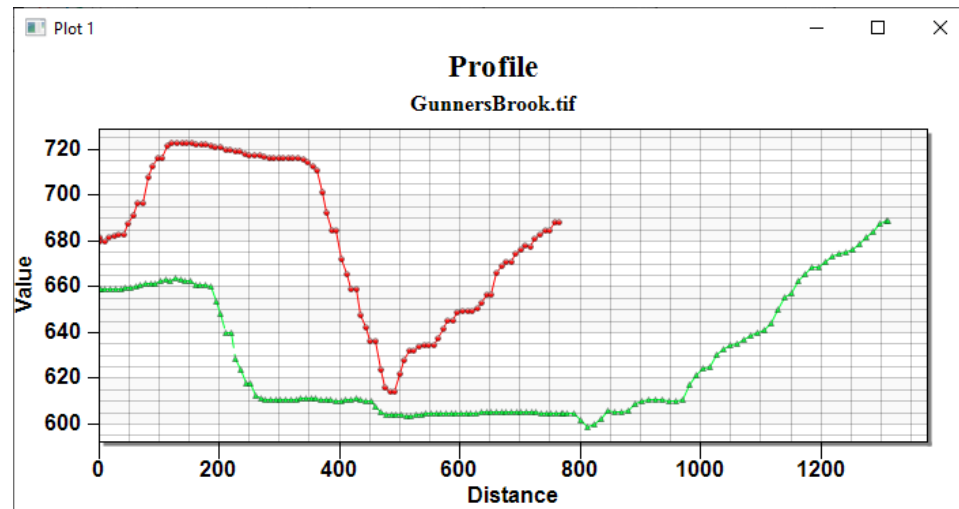


Figure 5 Profile plot for observation arcs

6 Raster to Mesh Interpolation

The raster data can also be interpolated to other geometric objects in a SMS project such as a mesh.

6.1 Reading a Mesh

Refer to other tutorials to create a mesh. For this tutorial, to import a previously created mesh:

1. Select *File* | **Open...** to bring up the *Open* dialog.
2. Select “GunnarsBrook_mesh.h5” and click **Open** to import the file and exit the *Open* dialog.

The project should appear similar to Figure 6.

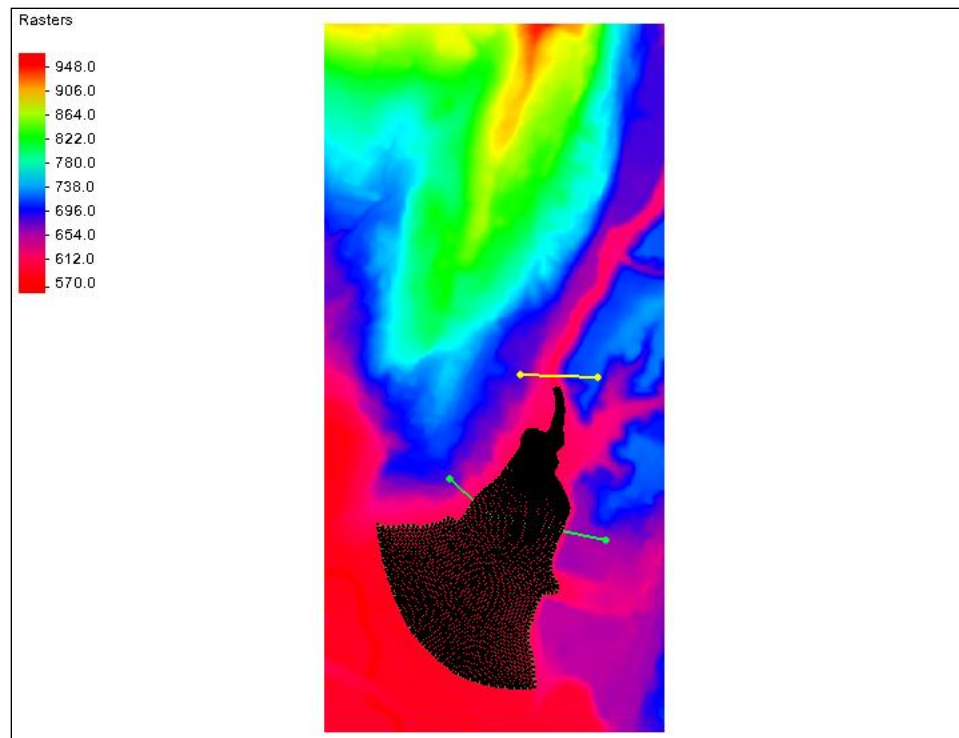


Figure 6 Mesh over the raster

3. Select “ GunnersBrook” under “ Mesh Data” to make it active.
4. **Zoom** in on any area of the mesh.
5. Using the **Select Mesh Node** tool, select any node in the mesh.

Notice that the elevation (Z) for the node is “0.0”.

6. Select several other mesh nodes one at a time.

Note that the elevation is “0.0” for all the nodes in the mesh.

6.2 Interpolating Raster Elevations to Mesh

Now that a mesh is in the project, interpolate elevations to that mesh using the elevations stored as raster data.

1. Right-click on “ GunnersBrook.tif” under “ GIS Data” and select *Interpolate to | 2D Mesh*.

A new dataset, “ GunnersBrook.tif”, has been created under the “ GunnersBrook” mesh item.

2. Select “ GunnersBrook” to make it active.
3. Select *Data | Map Elevation...* to bring up the *Select Dataset* dialog.
4. In the *Select section*, select “GunnersBrook.tif” and click **Select** to close the *Select Dataset* dialog.
5. If asked to replace existing Z values, click **OK**.

The raster elevations have now been assigned to the mesh. There are multiple ways to view the elevation in the mesh. Two of those ways are illustrated below.

- **Select Mesh Node**  tool:
 - Using the **Select Mesh Node**  tool, select individual nodes to see the assigned elevation.
- Adjust the display options and use the **Rotate**  tool:
 1. Click **Display Options**  to bring up the *Display Options* dialog.
 2. Select “2D Mesh” from the list on the left.
 3. On the *2D Mesh* tab, turn on *Contours*.
 4. On the *Contours* tab, in the *Contour method* section, select “Color Fill” from the first drop-down.
 5. Click **OK** to close the *Display Options* dialog.
 6. Use the **Rotate**  tool to view how the elevations were mapped to the mesh.

7 Operating on a Raster

SMS contains options to perform other operations using a raster object. To experiment with these options, begin by doing the following:

1. Turn off “ Mesh Data” in the Project Explorer.
2. Switch to **Plan View** .

7.1 Trimming a Raster

The available raster may be larger than what is needed for a project. Such is the case in this exercise. Trimming a raster results in a smaller region to work with and can improve efficiency.

To trim the raster, do the following:

1. Select “ Area Property” to make it active.
2. Using the **Create Feature Arc**  tool, click out a simple polygon similar to the one in Figure 7. Make certain the polygon stays within the bounds of the raster.

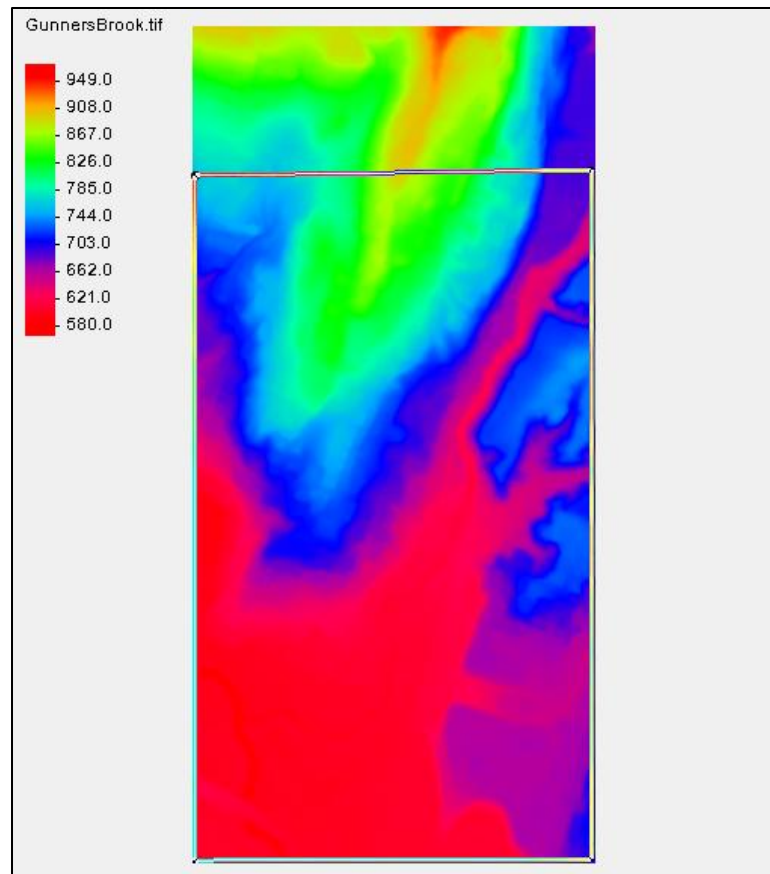


Figure 7 Simple polygon for trimming a raster

3. Select **Feature Objects | Build Polygons**.
 4. Right-click on "GunnersBrook.tif" and select **Convert To | Trimmed Raster** to bring up the *Trim Raster* dialog.
 5. For the *Input raster*, make certain the "GunnerBrooks.tif" raster is selected.
 6. For the *Coverage with polygons*, select "Map Data/Area Property".
 7. For the *Output raster*, enter "GunnersBrook_trim".
 8. Click **OK** to exit run the tool.
 9. When the tool finishes running, click **OK** to exit the *Trim Raster* dialog.
 10. Turn off "Area Property" and "GunnersBrook.tif" in the Project Explorer.
- The trimmed raster should be visible in the Main Graphics Window (Figure 8).

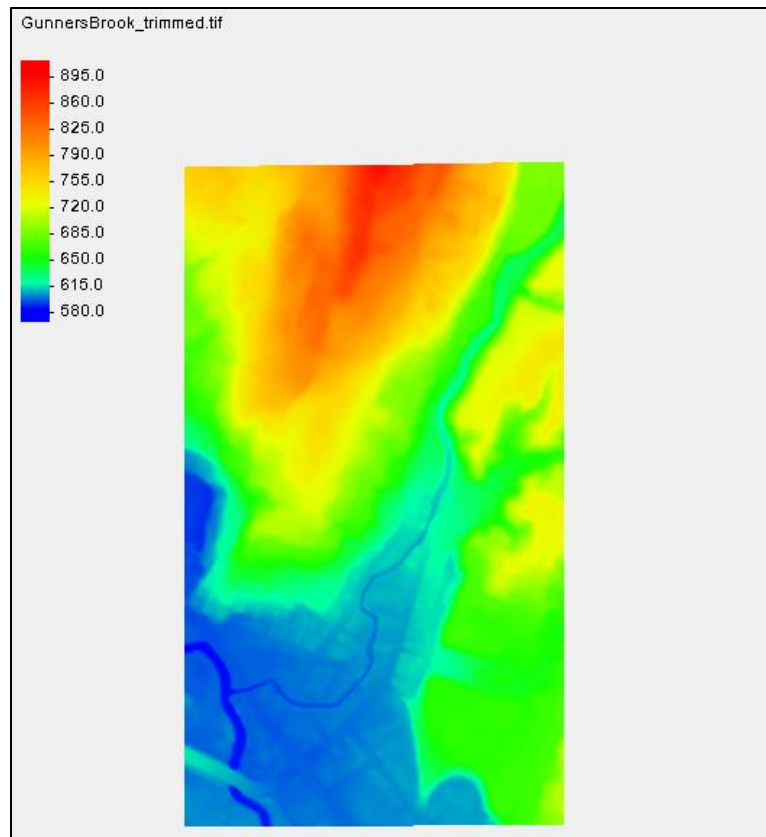


Figure 8 Trimmed raster

7.2 Merging Rasters

SMS allows merging rasters together. Do this by doing the following:

1. Select **File | Open...** to bring up the *Open* dialog.
2. Select "TIFF Image Files (*.tif;*.tiff)" from the *Files of type* drop-down.
3. Select "StevensBranch.tif" and click **Open** to import the TIFF and exit the *Open* dialog.
4. **Frame**  the project.
5. Select  "GunnersBrook_trim.tif" to make it active, then press the *Ctrl* key and select  "StevensBranch.tif".
6. Right-click on either selected item and select **Convert To | Merged Raster** to bring up the *Save As* dialog.
7. Select "GeoTIFF Files (*.tif)" from the *Save as type* drop-down.
8. Enter "Barre.tif" as the *File name* and click **Save** to export the new TIFF and close the *Save As* dialog.
9. Turn off all items under  "GIS Data" except for  "Barre.tif".

The merged raster should appear similar to Figure 9.

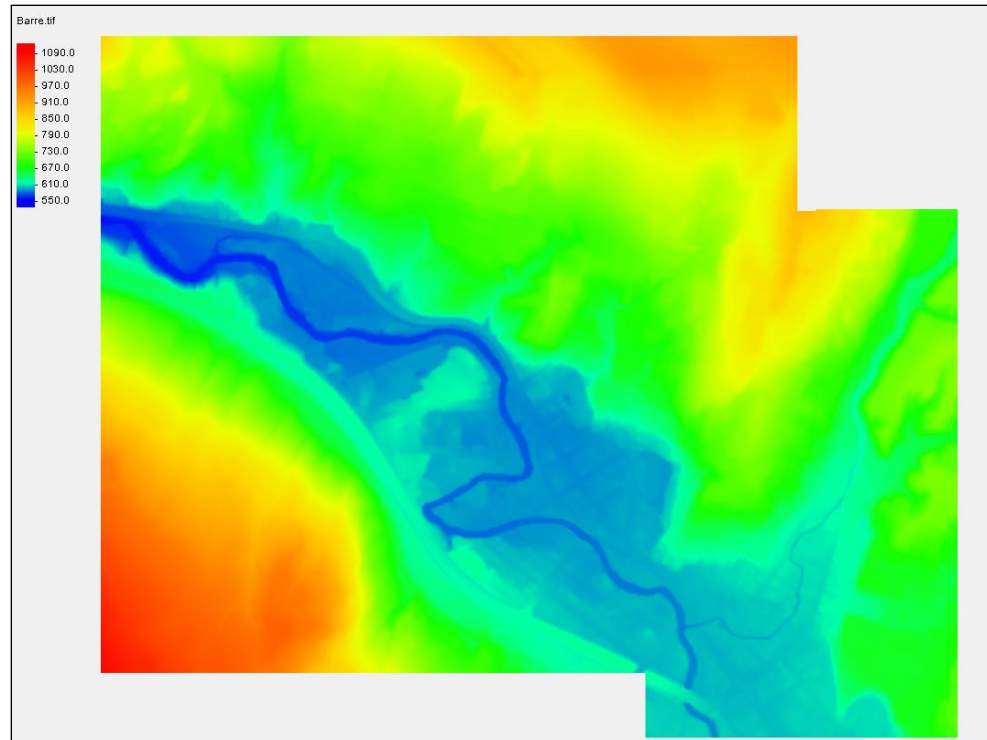


Figure 9 After merging the TIFFs

7.3 Converting a Raster to Feature Contours

There are two options for converting raster contours to feature arcs. For this tutorial, use the option to create an arc at a specified contour value (elevation).

To do so, do the following:

1. Right-click on “ Barre.tif” and select **Convert To | Feature Contours at Elevation** to bring up the *Contours from Single Raster Value* dialog.
2. For the *Input surface raster file* select “GIS Data/Barre.tif”.
3. For the *Output contour coverage*, enter “Barre_contours”.
4. For the *Base contour height*, enter “615.0”.
5. Click **OK** to close the *Contours from Single Raster Value* dialog.

A new map coverage, “ Barre_contours”, will appear in the Project Explorer, and a set of arcs will appear along the 615 foot contour elevation (Figure 10).

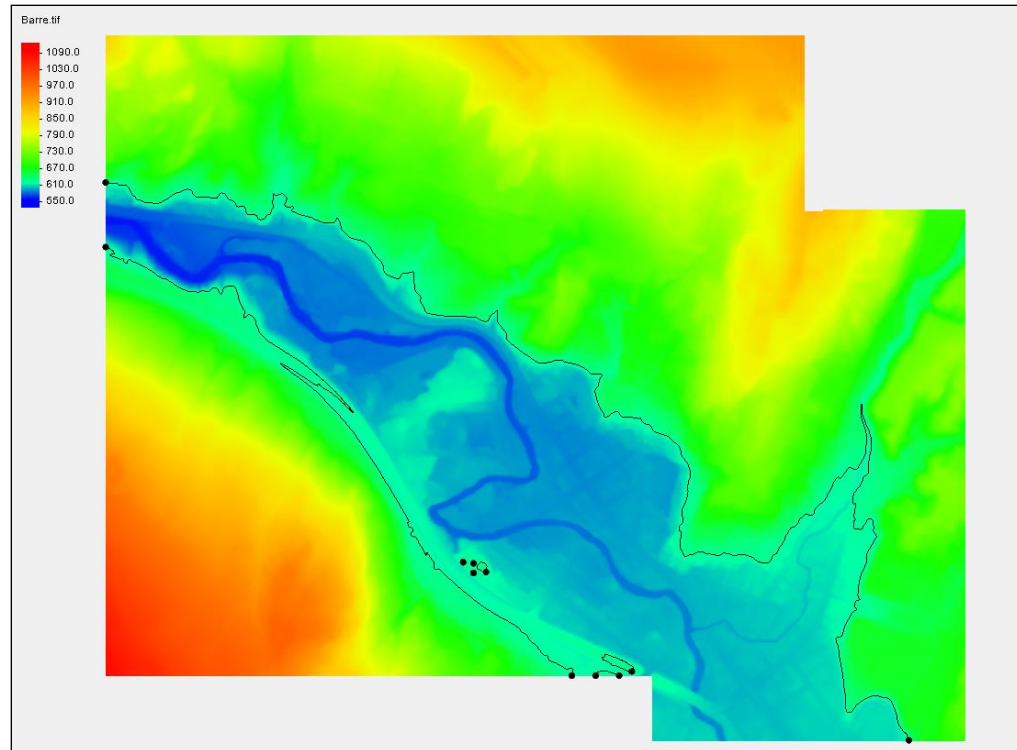


Figure 10 Contours generated from a raster

8 Conclusion

This concludes the “Working with Rasters” tutorial. Feel free to continue to experiment with additional features in SMS, or exit the program.