B9.0 Post Production

9.1 Calculating Channel Infilling

The results of the CMS calculated morphology change can be visualized several ways, from three dimensional or planar view of the bathymetry, planar view of the volumetric erosion and accretion, and with 1-D cross-sections of the time series. All vector and scalar information can be extracted from points and arcs (and polygons) in SMS. This section will cover the methodology used to post process time series morphology change data.

To plot channel infilling in SMS in a graphical format, the results in the solution file need to be changed from depths (the depth below the datum in which CMS calculates) to elevations.

- Change Depth to Elevation

    1. Load the SMS file in the Section B9 folder (and solution file, if it does not load automatically) located in the directory.

    2. Rt-click on the *Time Series* window on the left and select "Time Settings", and change the time reference from *Relative* to *Absolute*.

    3. In the Cartesian Grid Module, click *Data*, *Data Calculator*, and the Data Calculator should be selected in the Tools section as shown in Figure 9.1.1.

    4. Select the *Bathymetry* scalar (123) dataset, under *Time Steps* check the *Use all time steps* on, and double-click the *Bathymetry* (highlighted in Figure 9.1.1).

    2. The line under Calculator will display e:all, add the multiplication symbol (*) and negative 1 (-1) as shown in Figure 9.1.1.

    3. Change the *Output data set name* similarly to Figure 9.1.1 so as to distinguish this dataset from the original *Bathymetry* output, click *Compute*, and after the scalar set appears in the SMS window (Figure 9.1.2), click *Done*. (Note: values for the contours may need to be adjusted to view elevation range.)

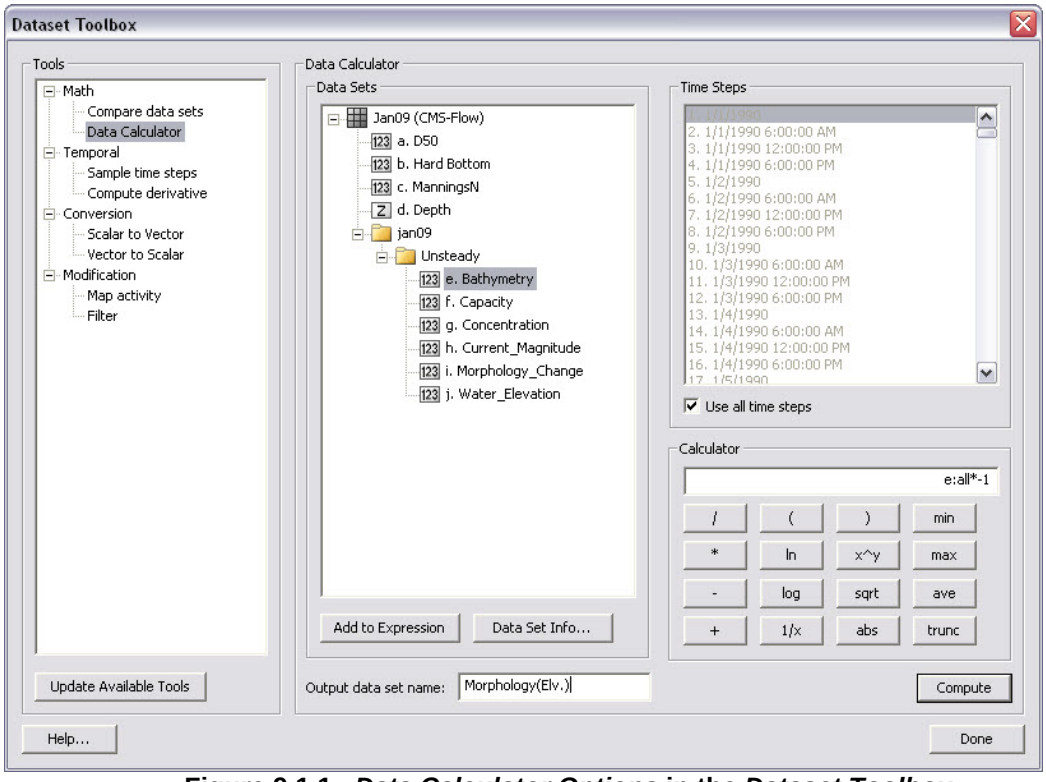

Figure 9.1.1. *Data Calculator Options* in the *Dataset Toolbox*.

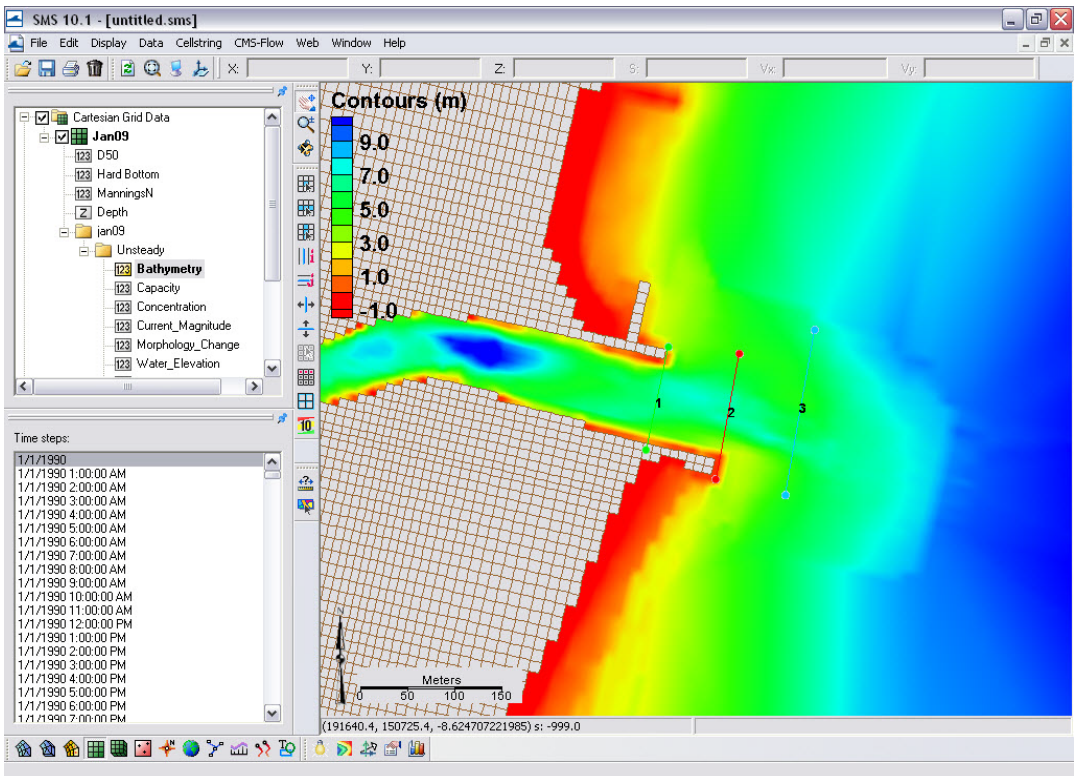

Figure 9.1.2. Display of calculated bathymetry now converted to elevations. Note the legend has been modified to display the new contours.

The next step is to generate the cross sections, or arcs, in SMS to extract data with.

- Create Feature Arcs

1. Click the *Map Module* button  , or Map Data 

.

2. Rt-click on *default coverage*, and under *Type*, *Generic*, *Observation*.

3. Click the *Create a Feature Arc* button  to generate the arcs that cross sections will be extracted from, and click on one side of the channel and double-click on the other side to close the arc.

4. Click the *Select a Feature Arc*  button and select the generated arc (Note that there is a direction associated with the arc, which determines the sideview of the cross section).

5. Rt-click and click on *Attributes*, and set the color and name(s) of each arc which are listed together in the *Observation Coverage* options (Figure 9.1.3), click *OK*.

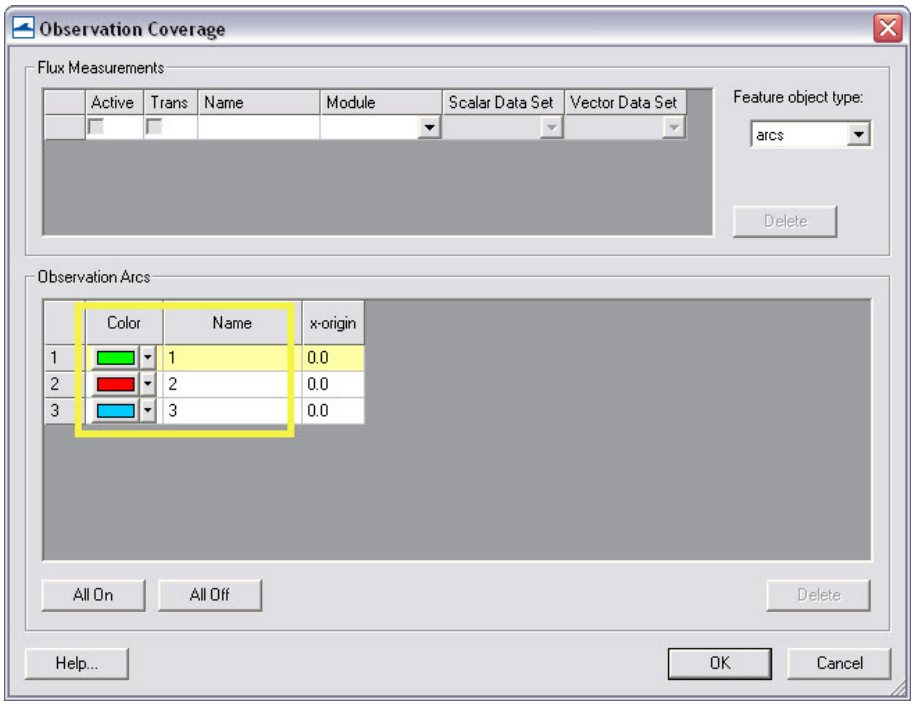

Figure 9.1.3. *Observation Coverage* options.

The following step is the final step for generating the graph in SMS. This is also the present method to extract and export this information in text format for use in other plotting software.

- Plotting Time Series Morphology Change in SMS

1. Click *Display*, *Plot Wizard*, and click Observation Profile (which should have the display in Figure 9.1.4 and *Next* should be available if the arcs were generated in the *Observation Type Coverage* in the above *Create an Arc* section), click *Next*.

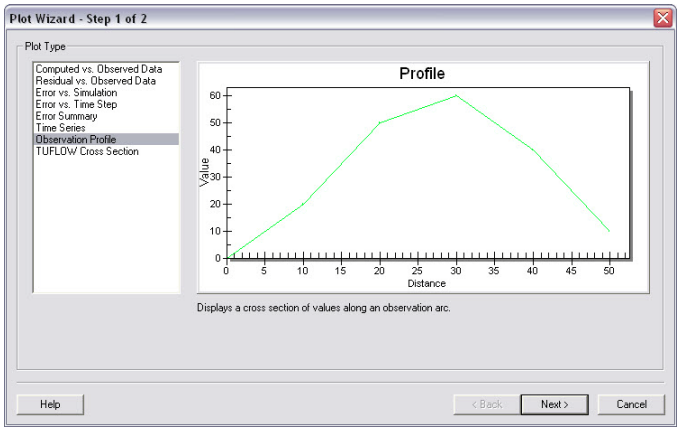

Figure 9.1.4. *Plot Wizard* Step 1.

2. Following Figure 9.1.5, under *Coverage* check one arc (though multiple can be plotted), under *Data set* select *Specified data set(s)* and select the generated *Morphology (Elev.)* set only, and under *Time step* select *Specified time step(s)* and check on several times spaced apart by at least several days to months, click *Finish*.

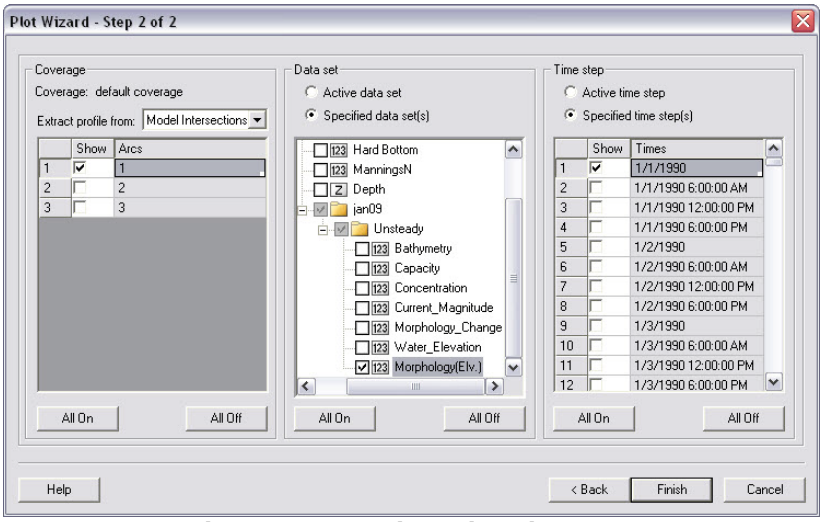

Figure 9.1.5. *Plot Wizard* Step 2.

3. To add more profiles or time-series, rt-click on the plot, and select *Plot data*.. to bring up the original options from Figure 9.1.5.

- Extracting Time Series Morphology Change

    1. Rt-click on the plot (Figure 9.1.6) and select *view values..*, and a table will appear with all the plotted distance and elevations given in the graph, (Note this ascii table can be copied and pasted into excel).

    2. To export the data in different formats, rt-click on the plot, and select Export/Print for several options to export the graph or data from the graph (Figure 9.1.7).

    3. In the *Exporting Time Series* window, select *Export|Text/Data*, *Export Destination|File* (and specify a location), and select *Export*.

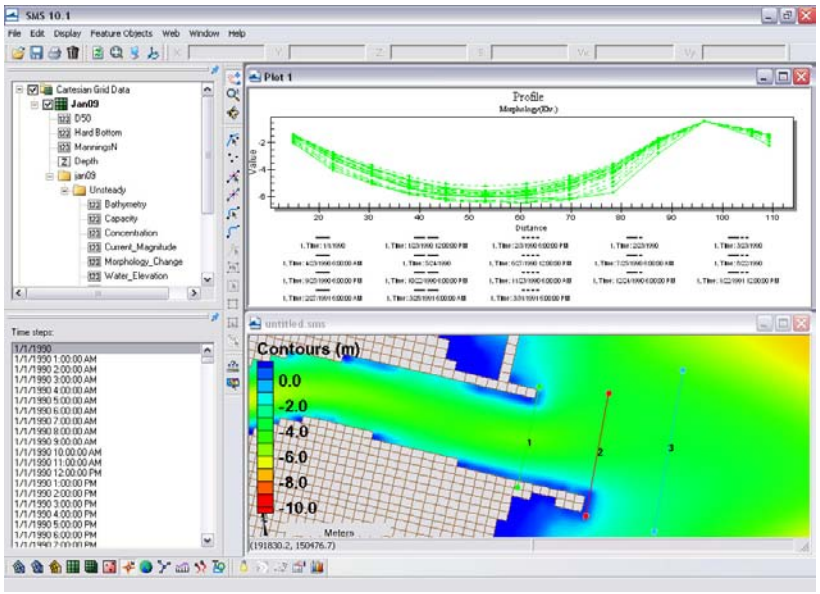

Figure 9.1.6. Plotted cross-section.

    4. Change the *Export Style* to *Table* and *Row vs. Column* to *Points/Subsets* (Figure 9.1.7). Export. This will generate a text file where the rows are based on the time illustrated in the *Time steps* window.

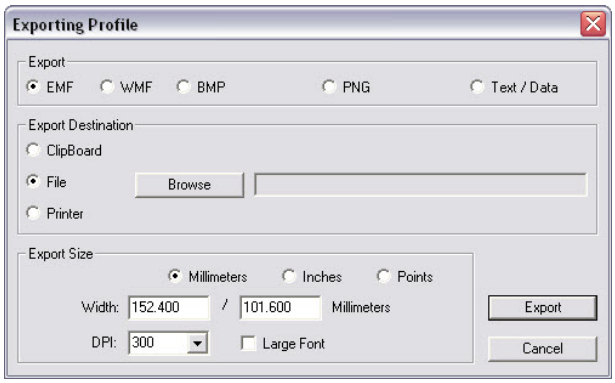

Figure 9.1.7. *Data Export* options.

9.2 Adding Channel Configuration

Some GIS data can be read into the SMS such as shapefiles or raster images. Presently, CAD and Microstation drawing files cannot be imported; however a drawing that is converted to a shapefile can be brought into the SMS.

- Adding Channel Lines

    1. Drag and drop in all three shapefiles (.shp) provided in the Section B9 folder over to the SMS window.

    2. These will be displayed in State Plane New Jersey in feet and must be reprojected to meters, rt-click on each file and *Reproject* each from feet to meters (Figure 9.2.1), uncheck all but the Channel.shp, and use the  button to highlight the shapefile.

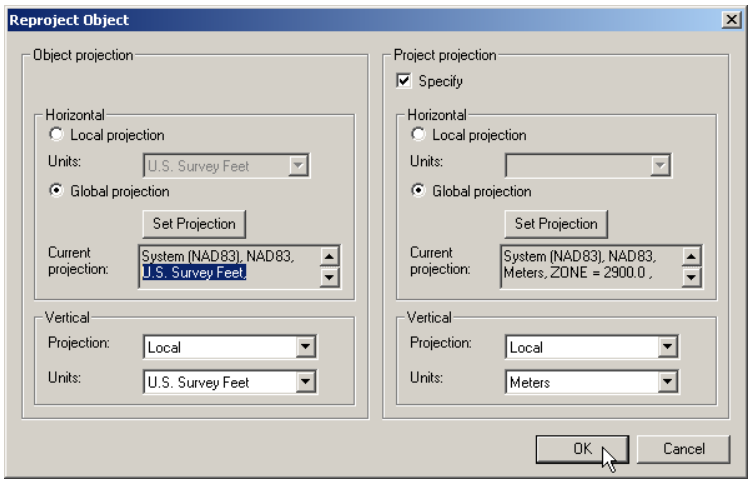

Figure 9.2.1. Reprojection from feet to meters.

    3. Convert this into map features by clicking on *Mapping*, *Shapes to Feature Objects*, and if a popup prompts that the shapefiles are not highlighted and whether or not to "Use all shapes in all visible shapefiles for mapping?" (make sure these are all turned on), click no and go back and select only one shapefile at a time, otherwise click through the prompt to convert to Feature objects.

    4. Click on *Map Data* on the left or the *Map Module* button  , and select the *Create Feature Arc* tool  , and connect the missing arc features of the channel outline, *Select all arcs*  , and click on *Feature Objects*, and *Create Arc Group*, and the polygon will be fixed

5. A new tool should now be available, the *Select Feature Arc Group* , select the arc and go to *Feature Objects*, and click i, and click *OK*, and again go to *Feature Objects*, and click *Build Polygons*.

6. Another new tool should now be available, the *Select Feature Polygon* , use this to highlight the polygon inside the arcs, and click *Attributes* (Figure 9.2.2), and select either *Land* or *Ocean*.

7. Open *Display Options* , and under the map tab check the *Polygon* box, here colors can be assigned to the label *Land* or *Ocean*, *OK*.

8. Selecting the polygon arcs with the button, the *Z* can be modified for the arcs to allow viewing the polygon as a plane within the 3-D visualization (Figure 9.2.2).

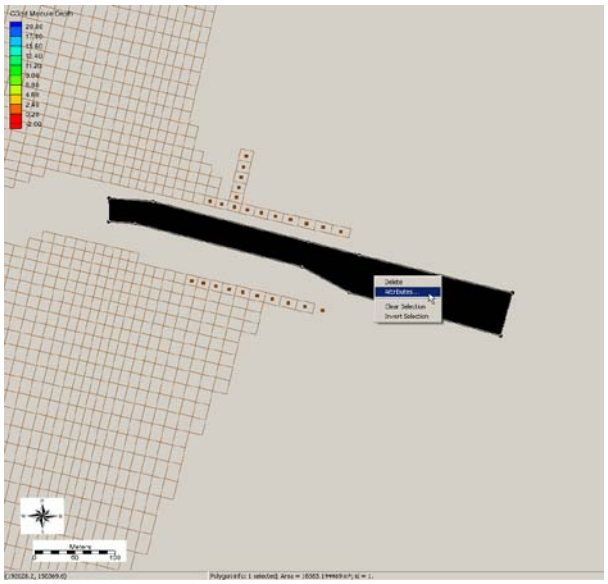

Figure 9.2.2. Selecting a polygon and clicking on Attributes.

9.3 Visualizing in a 3D View

- Visualizing in 3-D: Z-Magnification and The Functional Surface

1. 3-Dimensional viewing of grid and scatter data in SMS can turned on by setting the Z-magnification to a number greater than 1.0. Open the Display Options, and under the General tab, change the Z-magnification to 15, select *OK*.

2. In the main SMS viewing tools, select the *Rotate* tool to pivot the orientation of the display. If the grid is in positive depths (for CMS), the three dimensions should display properly.

3. If the land elevations are not necessary for modeling beyond some height, spikes and higher elevations can be removed from the grid (which is only permanent when grid is saved). Under *Edit*, *Select by*, and *Data set value*, select *Less Than* and change the value to -2.0.

   Since the grids water depths are positive, elevations above zero are negative, and so -2 meters is chosen here to select all cells smaller than -2 meters. Change the z for all selected land cells to -2.0. Now all land cells are limited in height and the bathymetry is easier to see.

Figure 9.3.1 provides examples of 3-D views of the channel at Shark River Inlet. Note that the polygon channel (red) can be given an elevation and displayed as a slice in that elevation of the grid. The grid can also be made partially transparent.

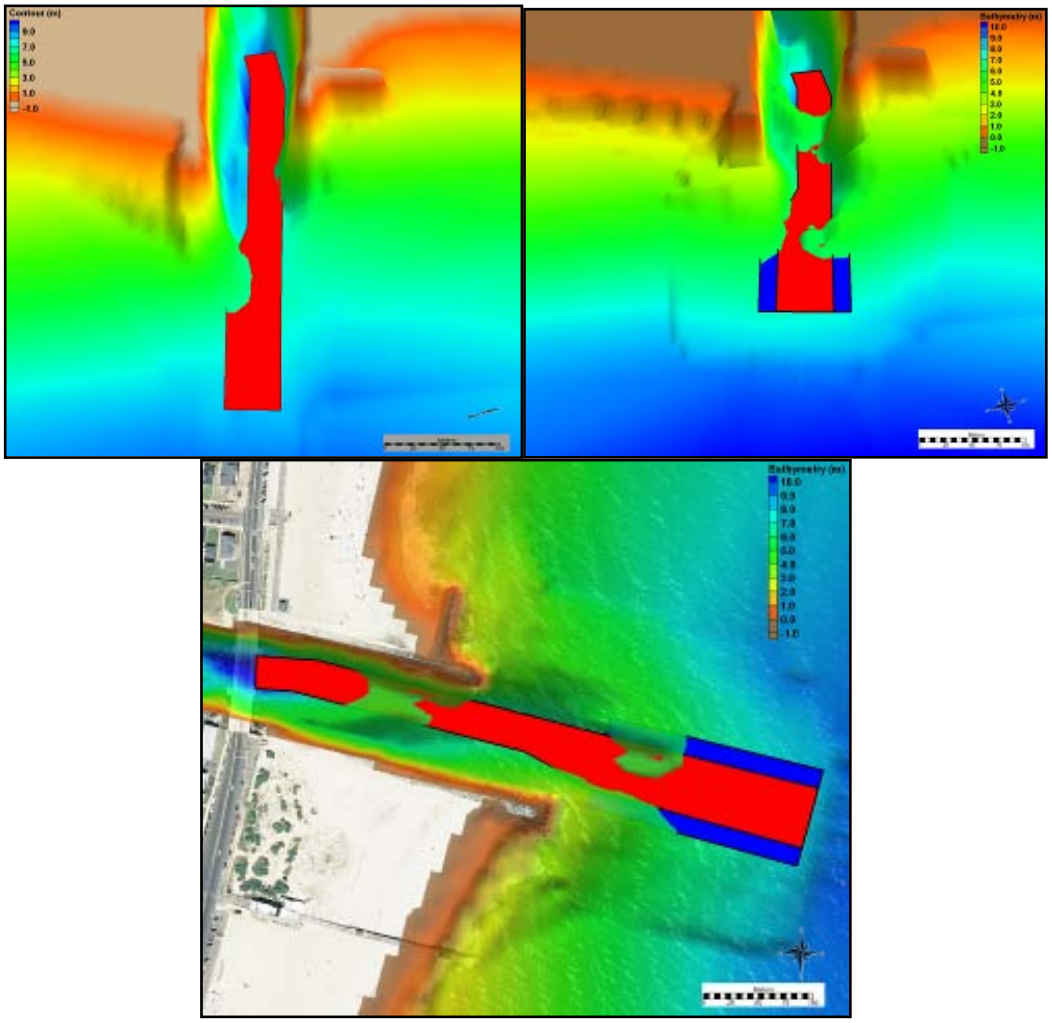

Figure 9.3.1. Examples of visualizing a polygon in 3-D.

The Functional Surface is another Z-magnification tool used for displaying time series data from a solution file. This tool can show 3-D imaging of scalar 2-D datasets (e.g. water level fluctuations) over 3-D bathymetry, and morphology and bathymetry change.

When this tool is turned on, animations can capture the 3-D changes over a specified time series.

- Visualizing in 3-D: The Functional Surface

    1. If the solution file is not already in SMS, bring the solution (.sol) from the section folder in to SMS. The Functional Surface option is located in the *Display Options* under the *Cartesian Grid* tab. Check the box for *Function Surface* and open the *Options* tab.

    2. Select the *User Defined* Dataset, and pick *Bathymetry* under the solution datatree (Figure 9.3.2). Set the *Override Global Value|Magnification value* to 15, turn the *Contour Surface* on and set the *Options* color scale similar to Figure 9.3.3.

       Note that both the general contour surface and the Function Surfaces are displayed now in SMS. Turn off the normal contours under the *Display Options* under the *Cartesian Grid* tab to view the Functional Surface only.

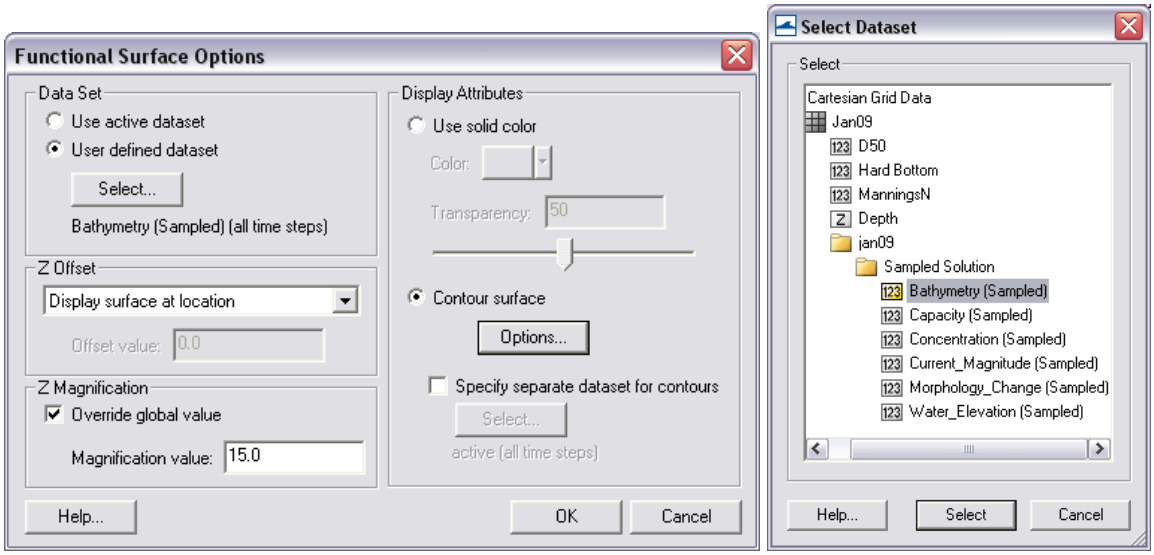

Figure 9.3.2. *Functional Surface Options* (left); Selecting the *User Defined Dataset*, *Bathymetry* (right).

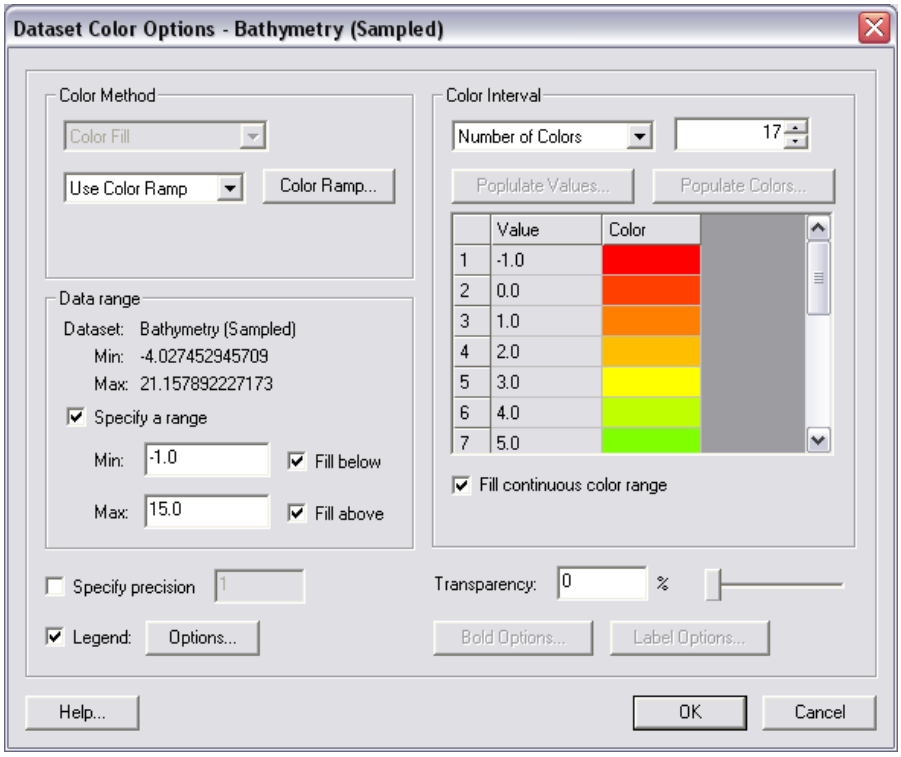

Figure 9.3.3. *Dataset Color Options* within the *Functional Surface Options*.

With the Functional Surface turned on, an Animation can be made of the time series 3-D display of bathymetry.

- Visualizing in 3-D: The Functional Surface

    1. To create and animation go to *Data* and select *Film Loop*. In the *Film Loop Setup – General Options*, select the location of the avi file and check *Transient Data Animation* (Figure 9.3.4), *Next*.

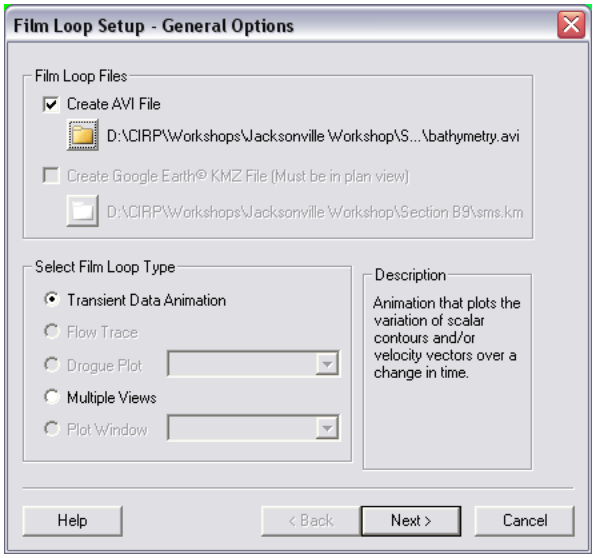

Figure 9.3.4. *Film Loop Options* for file location and film type.

2. Set the *Filmloop Time* to days (should automatically show 120 days), select *Specify Time Step Size* and set that to 1 day. The frame number above should automatically change to 121 frames based on the new time step (Figure 9.3.5). Select *Next*.

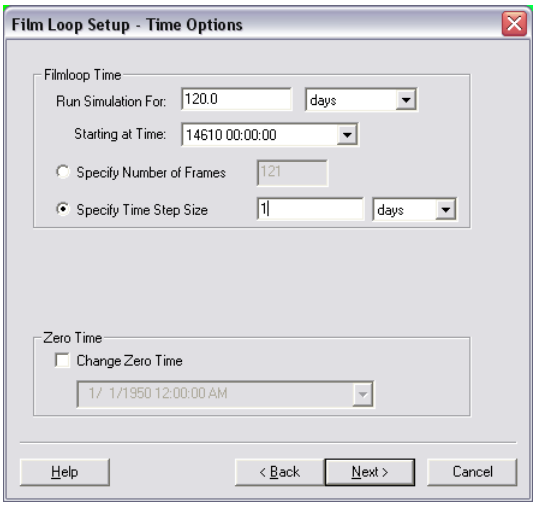

Figure 9.3.5. *Film Loop Options* for file location and film type.

3. Leave the default options on and click *Finish*. The clock position and display can also be changed here, as well as the quality and type of image (Figure 9.3.6). Note that a good quality film is typically set to 90, however, this produces a large file. Some trial and error is needed to adjust the Frames per Second and overall Quality of the film in relation to file size.

   The film loop will start generating after clicking finish (see bottom of SMS) and list which frame the generator is on. If the mouse moves or clicks during this process and the screen freezes, SMS is still generating the images in the film in the background. Though it is just not visible anymore, be assured that SMS will finish the film.

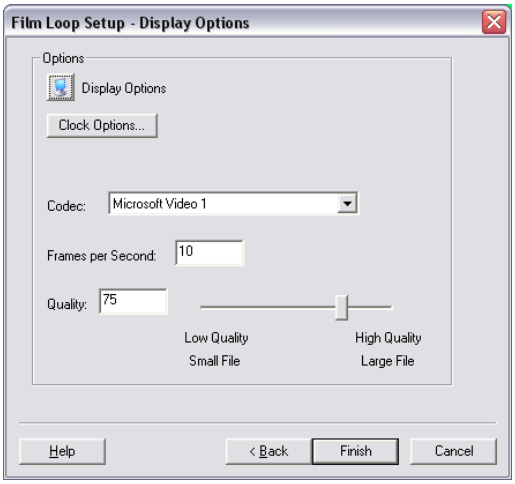

Figure 9.3.6. *Film Loop Options.* Note that the Clock Display options allow the user to turn a clock on displaying the time series date and time.