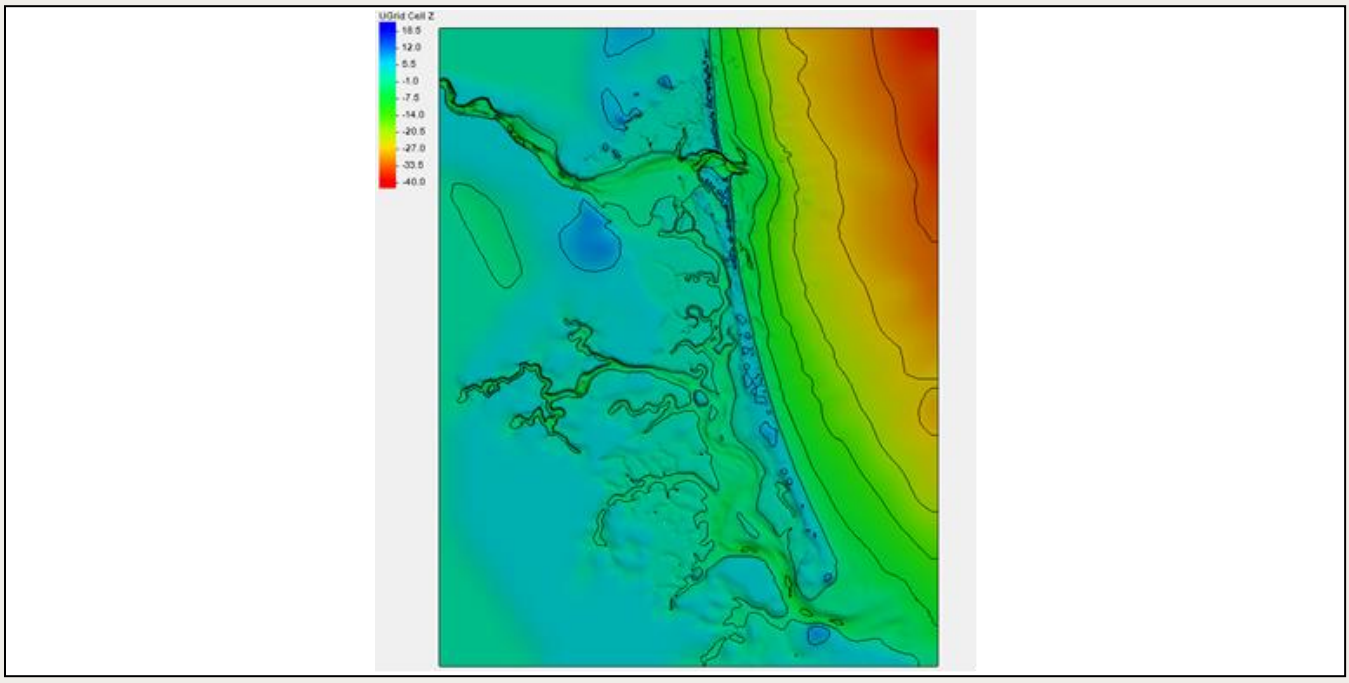
*SMS 14.0 Tutorial*

# *Sediment Volume Management*

Sediment Volume Management Tool in SMS




## Objectives

This tutorial demonstrates how to use the Sediment Volume Management tool.

## Prerequisite Tutorials

- Overview
- Map Module

## Required Components

- SMS Core

## Time

- 15–20 minutes

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# 1 Introduction

This tutorial demonstrates how to use the Sediment Volume Management tool. The Sediment Volume Management tool allows calculating cut and fill for sediment volume.

This tutorial makes use of a location near Newburyport, Massachusetts. The project begins with an unstructured grid (UGrid) that represents the terrain and bathymetry around Newburyport. It also includes two map coverages. The "Beach" coverage contains feature objects for areas along the shoreline for beach nourishment. The other coverage, "Shoal", contains feature objects that define a potential site of material.

# 2 Getting Started

Start by importing a project file containing an existing mesh:

1. Launch the SMS application.
2. Select *File* | **Open…** to bring up the *Open* dialog.
3. Select "Project Files (*.sms)" from the *Files of type* drop-down.
4. Browse to the *data_files* folder for this tutorial and select "SedimentVolumeManagement.sms".
5. Click **Open** to import the project and exit the *Open* dialog.

The project should appear similar to Figure 1. The project contains an UGrid called "FlowGrid-v6", and the "Beach" and "Shoal" coverages.

 

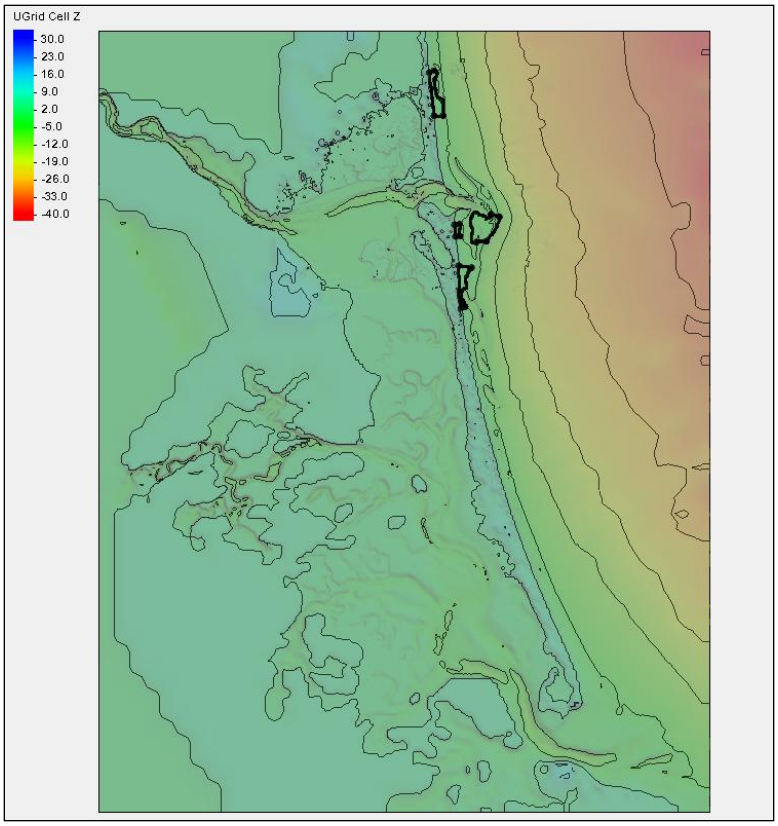


*Figure 1 Initial project*

# 3 Setup the Sediment Volume Management Coverage

The Sediment Volume Management tool requires having a Sediment Volume Management map coverage. On this coverage, the polygons are used to hold the sediment volume attributes.

## 3.1 Create the Sediment Volume Management Coverage

To create the Sediment Volume Management coverage, do the following:

1. Right-click on the "Map Data" tree node and select **New Coverage** to open the *New Coverage* dialog.
2. For the *Coverage Type,* under *Models,* expand *Engineering with Nature* and select *Sediment Volume Management*.
3. For the *Coverage Name*, enter "Nourishment".
4. Click **OK** to close the *New Coverage* dialog.

A new map coverage called "Nourishment" will appear in the Project Explorer.

## 3.2 Copying Feature Objects

Feature objects from the existing coverages now need to be copied over to the new coverage. To do this:

 

1. Select the "Beach" coverage to make it active.
2. Using the **Select Feature Polygon** tool, right-click in an empty spot in the Graphics Window and select the **Select All** command.
3. Right-click and select the **Copy to Coverage…** command to bring up the *Select Coverage* dialog.
4. Select the "Nourishment" coverage.
5. Click **OK** to close the *Select Coverage* dialog.
6. Select the "Shoal" coverage to make it active.
7. Repeat steps 2–5.
8. In the Project Explorer, turn off the "Beach" and "Shoal" coverages.
9. Select the "Nourishment" coverage to make it active.
10. Click the **Build Polygons** macro.

The beach and shoal polygons have now been added to the "Nourishment" coverage.

## 3.3 Assign Sediment Volume Management Attributes

With the polygons added to the Sediment Volume Management coverage, attributes can now be assigned. To do this:

1. Using the **Select Feature Polygon** tool, select the northern beach polygon for Salisbury Beach (Figure 2).
2. Right-click and select **Sediment Properties…** to bring up the *Sediment Volume Management* dialog.
3. For the *Name* enter "Salisbury Beach".
4. Change the *Type* to "Specified fill region".
5. Change the *Cut/fill* option to "Relative thickness" and enter a *Value* of "1".
6. Click **OK** to close the *Sediment Volume Management* dialog.
7. Repeat steps 1–6 for the other polygons, assigning them attributes as listed in the table below:

| Location | Name | Type | Cut/fill option | Value |
|---|---|---|---|---|
| Northern beach | Salisbury Beach | Specified fill region | Relative thickness | 1 |
| Central beach | Newburyport Beach | Specified fill region | Relative thickness | 1 |
| Southern beach | Newbury Beach | Specified fill region | Relative thickness | 1 |
| Ebb shoal | Ebb Shoal | Available cut region | Constant elevation | -5 |

The attributes for the sediment volume management have now been assigned to the beach and shoal areas. For the beaches, the value of 1 is the desired fill level. For the ebb shoal, the value of -5 is the initial limit of how deep the dredging operation is allowed.

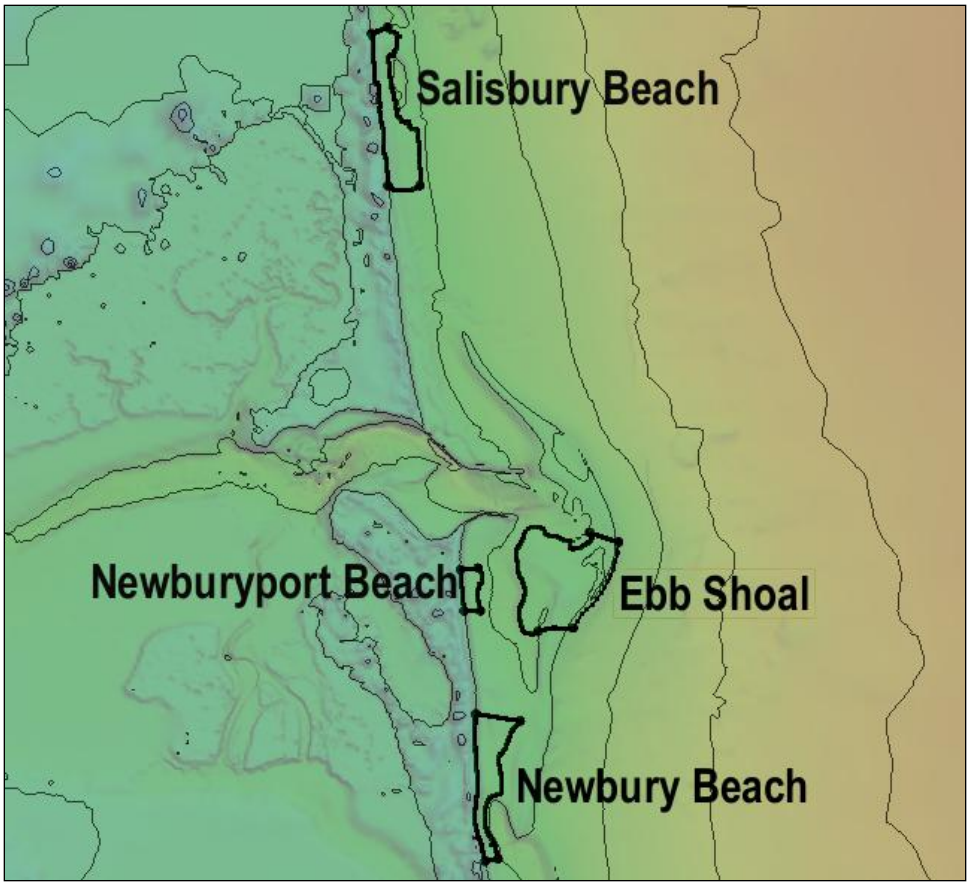


*Figure 2 Beaches and shoal*

# 4 Using the Sediment Volume Management Tool

With the attributes set, the Sediment Management tool can be used.

1. Right-click the "Nourishment" coverage, and select the **Sediment Volume Management** command to open the *Sediment Volume Management* dialog.

The *Sediment Volume Management* dialog allows defining the input for the sediment volume computations. The table in the center of the dialog shows the sediment properties that were entered in the last section. Changes to these attributes can be made here.

Before running the computations, set the computation parameters by doing the following:

2. Next to *Source geometry*, click the **Select** button to open the *Select EWN Geometry* dialog.
3. Select the "FlowGrid-v6" UGrid and click **OK** to close the *Select EWN Geometry* dialog.
4. Set the *Maximum slope* to "5".

This will set the slope to be five units of horizontal distance for each unit of depth. A small number will mean a steeper slope.

5. Click **Compute** to run the *Sediment Volume Management* tool.
6. Review the values in the *Computation* table (scroll to the right if needed).

 

That *Sediment Volume Management* gives the following results:

- *Total Volume Based on Slope*: amount of material that could be dredged/placed if the specified depth/elevation values were ignored.
- *Required Volume*: Volume for specified cuts/fills
- *Available Volume*: Volume for available cuts/fills
- *Cut Volume*: actual amount cut from this polygon
- *Fill Volume*: actual amount placed into this polygon

# 5 Adjusting the Computation

In this example, with a max of -5 meters, there is not enough volume (244824.86) to fill all the beaches. The *Net of fill* is the amount that would be required from another source to complete this operation

At this point the cut value can be decreased to fill the beaches. To do this:

1. In the *Computation* table on the *Ebb Shoal* row, change the *Value* for the *Cut/Fill Type* to be "-5.8".
2. Click **Compute** to run the *Sediment Volume Management* tool.

Notice the *Cut Volume* has increased to 384768.0; enough to fill all the beaches.

# 6 Creating a New Geometry

The new sediment volume can be used to generate a new UGrid. To do this:

1. In the *Output options* section, turn on the *Generate new geometry on OK* option.
2. For the *New geometry name*, enter "Beach nourishment".
3. Click **OK** to close the *Sediment Volume Management* dialog and create the new UGrid.

A new UGrid, "Beach nourishment", will appear in the Project Explorer.

4. In the Project Explorer, turn off the "FlowGrid-v6" UGrid to see the "Beach nourishment" UGrid.

The "Beach nourishment" UGrid should appear similar to Figure 3.

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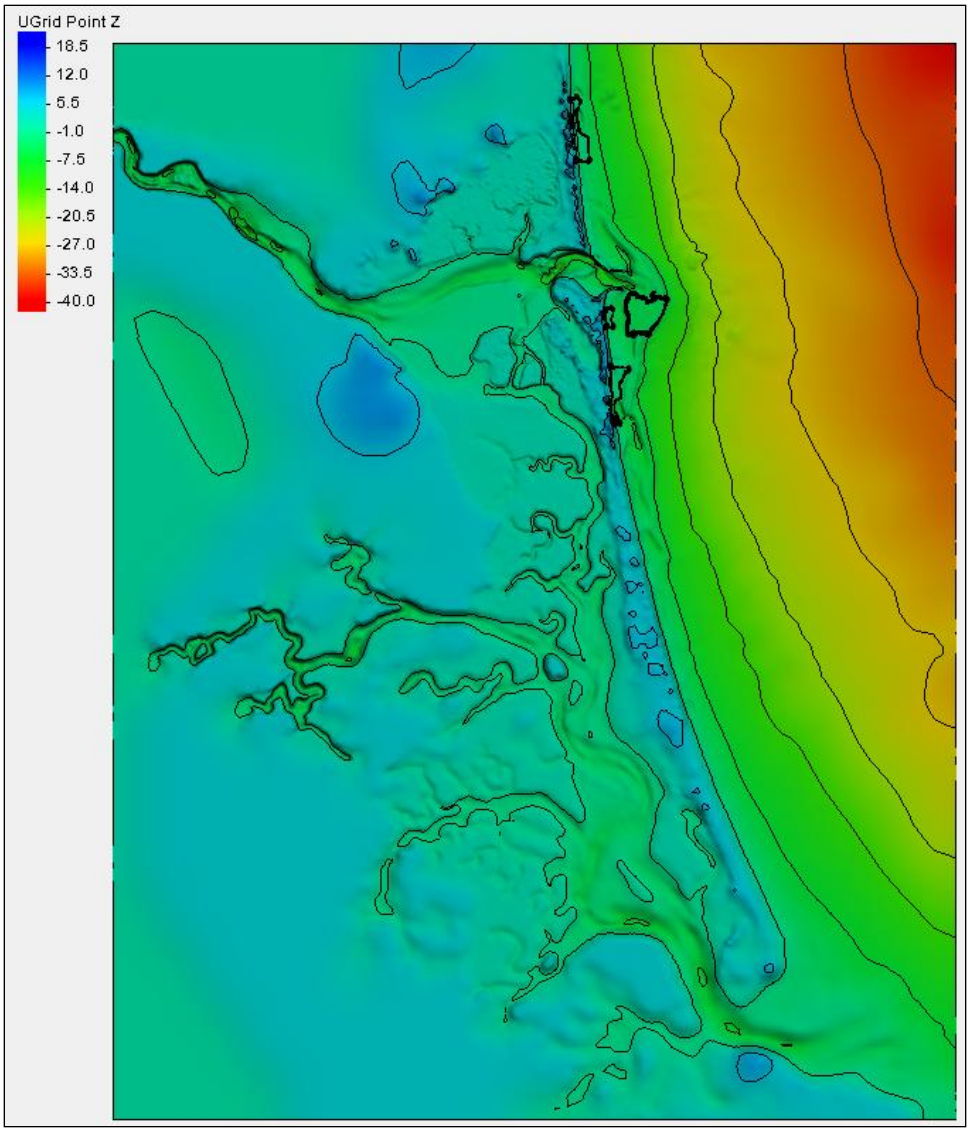


*Figure 3 Beach nourishment UGrid*

# 7 Reviewing the Geometry

Now review the generated UGrid and compare it to the existing UGrid by doing the following:

1. **Zoom** in on the dredge area (Figure 4).
2. Switch between hiding and showing the "FlowGrid-v6" UGrid and the "Beach nourishment" UGrid to see the differences.

Note the difference in the dredge from the shoal and the buildup on the beaches.

 

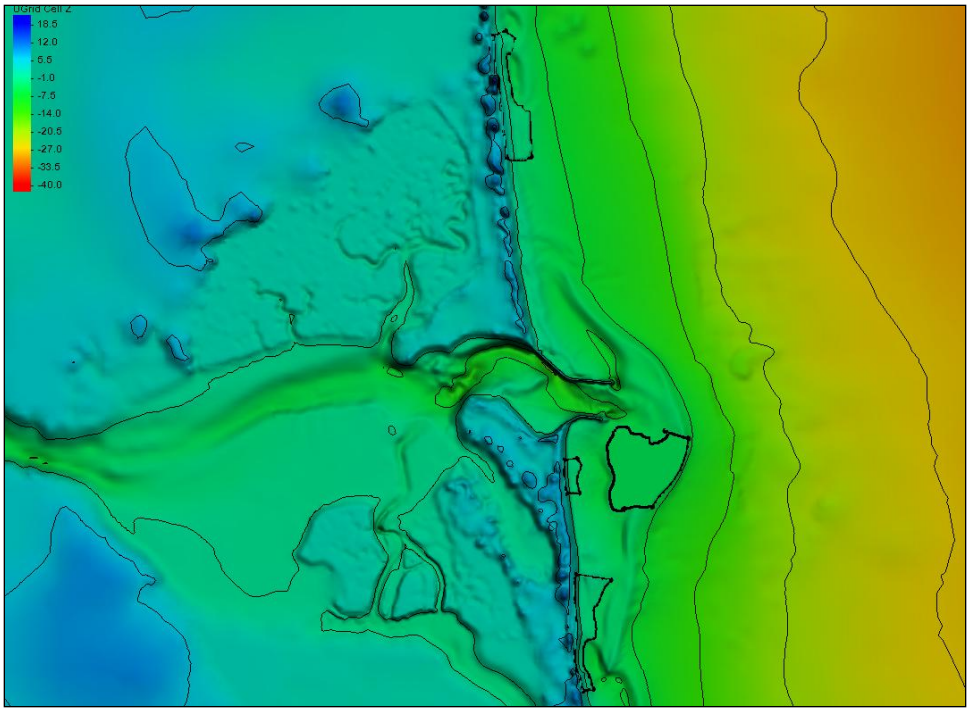


*Figure 4 Dredge area*

Now to create a new dataset that compares the two UGrids.

3. Select *Data* | **Data Set Toolbox** to open the *Dataset Toolbox* dialog.
4. In the *Tools* section, select *Compare datasets*.
5. For the *Base* dataset, select "Point Z" under "Beach nourishment".
6. For the *Alternate* dataset, select "Point Z" under "FlowGrid-v6".
7. For the *Output dataset name*, enter "PointZ-Comparison".
8. Click **Compute**.
9. Click **Done** to close the *Dataset Toolbox* dialog.
10. Select "PointZ-Comparison" to make it active.

The comparison dataset should appear similar to Figure 5.

 

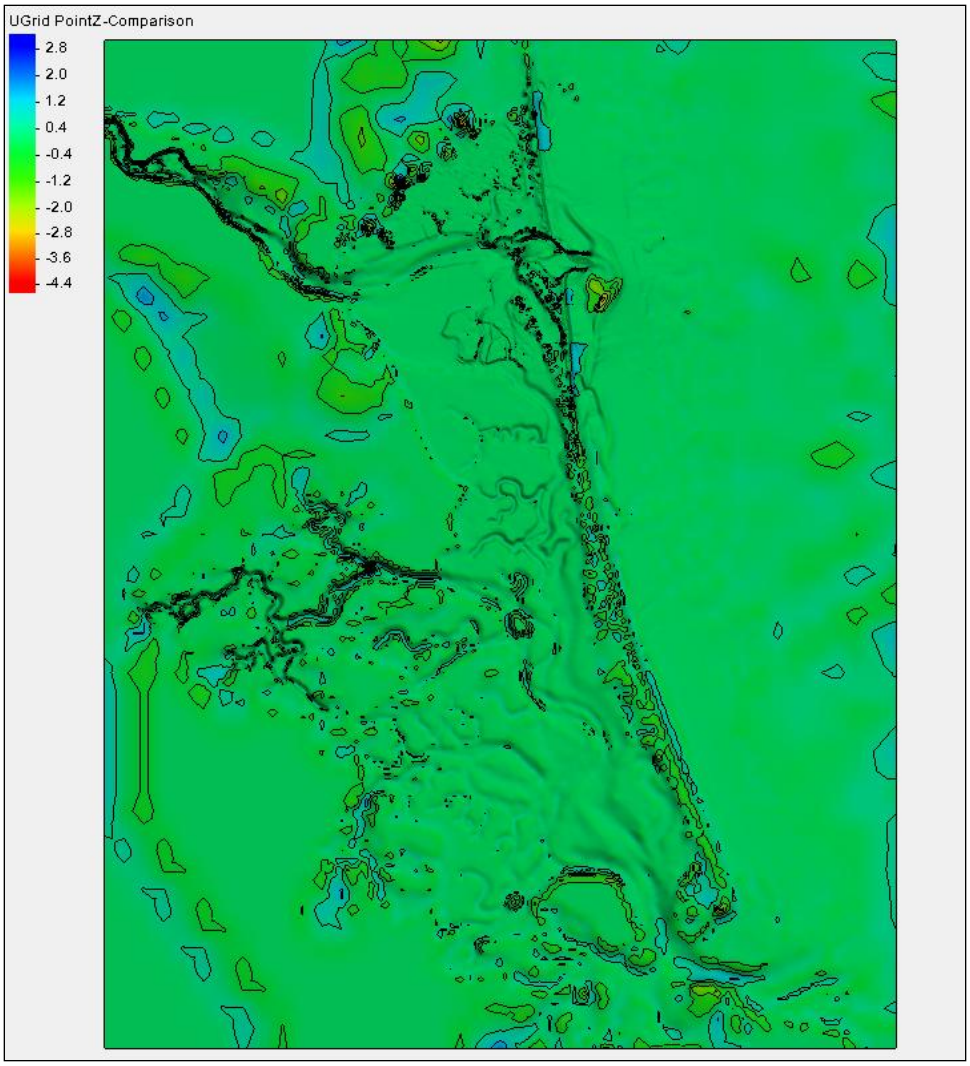


*Figure 5 Point Z comparison*

# 8 Conclusion

This concludes the “Sediment Volume Management” tutorial. Feel free to continue experimenting with the *Sediment Volume Management* tool or exit the program.