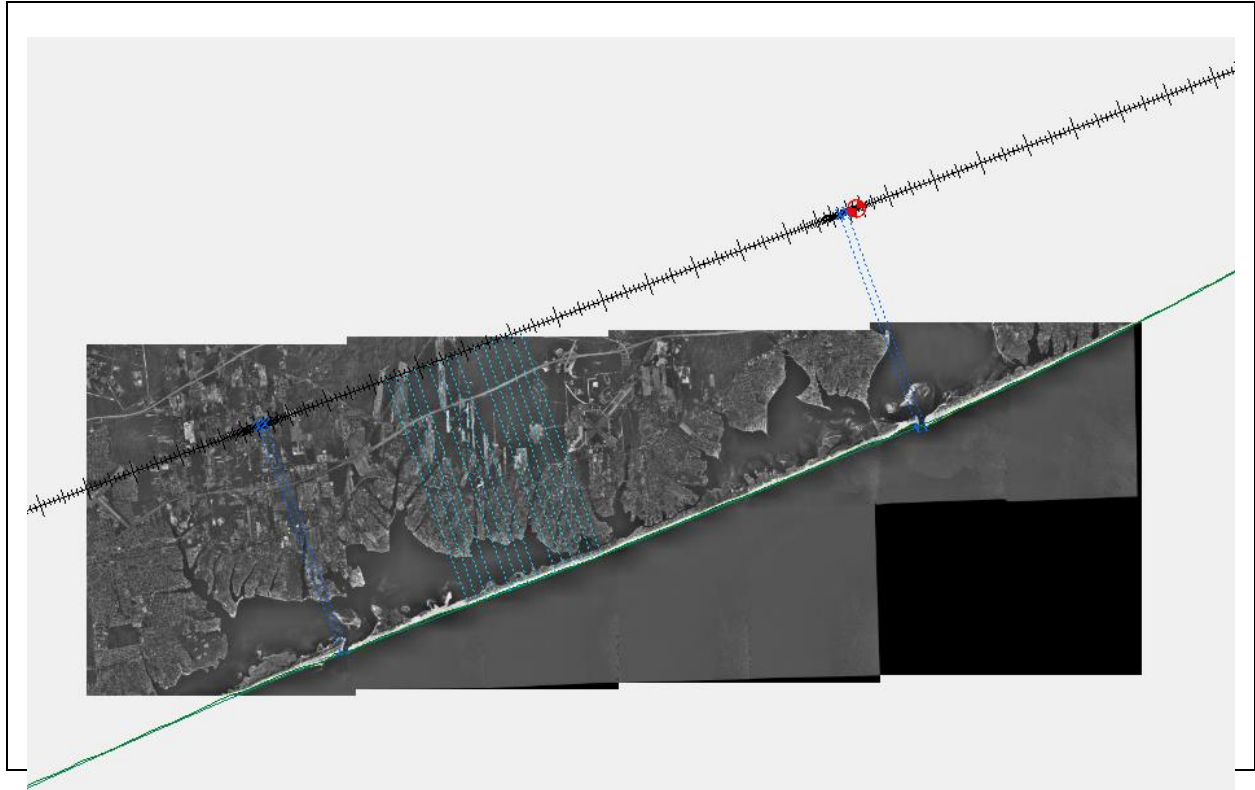


## SMS 12.3 Tutorial

### GenCade



### Objectives

This tutorial shows how to set up and run a GenCade model. The objective is to demonstrate the efficacy of GenCade in modeling the coastal sediment transport, morphology change, and sand bypassing at inlets and other coastal structures.

### Prerequisites

- None

### Requirements

- Map Module
- 1D Grid Module

### Time

- 60–90 minutes

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<b>1</b>	<b>Introduction .....</b>	<b>2</b>
<b>2</b>	<b>Getting Started.....</b>	<b>2</b>
2.1	Merge the Coverages.....	4
<b>3</b>	<b>Define the Projection .....</b>	<b>4</b>
<b>4</b>	<b>Grid Setup: Structures and Events .....</b>	<b>5</b>
4.1	Inlets and Dredging Events .....	5
4.1.1	Jones Inlet.....	5
4.1.2	Fire Island Inlet.....	6
4.1.3	Moriches Inlet.....	7
4.1.4	Shinnecock Inlet .....	8
4.2	Jetties.....	8
4.3	Groins .....	11
4.4	Seawall .....	12
4.5	Beach Fills.....	13
4.6	Breakwaters .....	16
<b>5</b>	<b>Grid Setup: Orientation, Cell Size, Variable Grid Resolution .....</b>	<b>17</b>
<b>6</b>	<b>Wave Data .....</b>	<b>20</b>
<b>7</b>	<b>Model Control.....</b>	<b>21</b>
7.1	Save the Project.....	22
<b>8</b>	<b>Run GenCade.....</b>	<b>22</b>
8.1	Gencade Output Files .....	23
<b>9</b>	<b>Visualizing the Results .....</b>	<b>23</b>
<b>10</b>	<b>Conclusion .....</b>	<b>24</b>

## 1 Introduction

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GenCade is a regional model for calculating coastal sediment transport, morphology change, and sand bypassing at inlets and engineered structures. This tutorial will apply the GenCade model to the south shore of Long Island, NY because of the availability of a long-term regional coastal database and because the site includes multiple inlets and barrier islands with coastal structures.

## 2 Getting Started

---

GenCade requires that an initial shoreline be imported into SMS. The file must be in CST format for the file to be imported correctly into the conceptual model. The CST format requires the  $x$  and  $y$  coordinates of every point along the shoreline. Multiple aerial JPG image files will be imported in order to help build the model. Then a regional contour for this project will be imported.

Open the images and the CST files by doing the following:

1. Select *File* / **Open...** to bring up the *Open* dialog.
2. Browse to the *Data Files\Aerials* folder for this tutorial.
3. Select “JPEG Image Files (\*.jpg;\*.jpeg)” from the *Files of type* drop-down.
4. While holding down the *Ctrl* key on the keyboard, select the following eight JPG files:
  - “m4007210.jpg”
  - “m4007211.jpg”

- “m4007212.jpg”
- “m4007213.jpg”
- “m4007322.jpg”
- “m4007327.jpg”
- “m4007328.jpg”
- “m4007330.jpg”

5. Click **Open** to exit the *Open* dialog and import the images into SMS.

The project should appear similar to Figure 1.

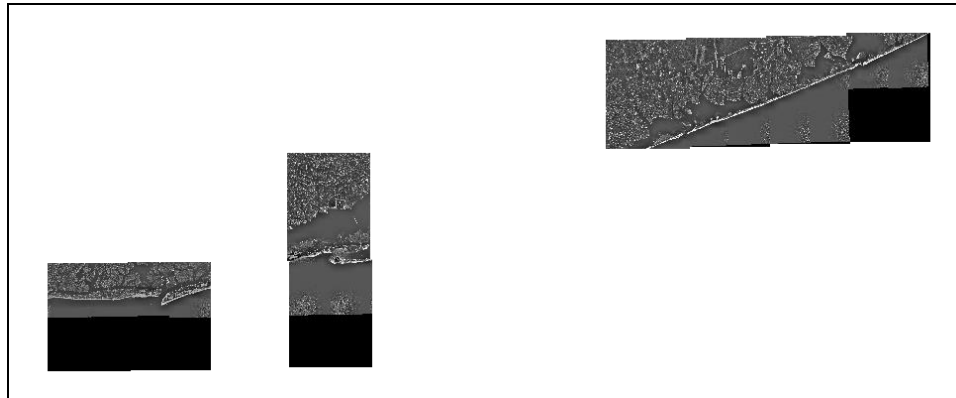




Figure 1 Initial project

To set the correct model type for this tutorial:




1. Right-click on “Area Property” and select *Type | Models | GenCade*.
2. Right-click on “Area Property” and select **Rename**.
3. Enter “GenCade” and press the *Enter* key when done.

To import the initial coastline and set its properties:

1. Click **Open**  to bring up the *Open* dialog.
2. Browse to the *Data Files* folder for this tutorial and select “initial.cst”.
3. Click **Open** to import the file and exit the *Open* dialog.
4. Using the **Select Feature Arc**  tool, double-click on the arc to bring up the *GenCade Arc Attributes* dialog.
5. In the *Arc Options* section, select “Initial Shoreline” from the drop-down list.
6. Click **OK** to close the *GenCade Arc Attributes* dialog.

To open the regional contour:

1. Right-click on “Map Data” in the Project Explorer and choose **New Coverage** to bring up the *New Coverage* dialog.
2. In the *Coverage Type* section, select *Models | GenCade* and enter “Regional Contour” as the *Coverage Name*.
3. Click **OK** to close the *New Coverage* dialog.



4. Select “ Regional Contour” coverage to make it active.
5. Click **Open**  to bring up the *Open* dialog.
6. Select “reg\_cont.cst” and click **Open** to import the file and exit the *Open* dialog.
7. Using the **Select Feature Arc**  tool, double-click on the arc to bring up the *GenCade Arc Attributes* dialog.
8. In the *Arc Options* section, select “Regional Contour” from the drop-down list.
9. Click **OK** to close the *GenCade Arc Attributes* dialog.


## 2.1 Merge the Coverages




---

After the initial shoreline and regional contour have been imported and defined in SMS, it is necessary to merge the two arcs into a single coverage. All structures, inlets, wave gages, and other features will be created in this single coverage.

Merge the coverages by doing the following:

1. While holding down the *Ctrl* key, select “ GenCade” and “ Regional Contour”. This highlights both of them.
2. Right-click and select **Merge Coverages**.
3. A dialog will open asking if the coverages used to make the merged coverage should be deleted. Click **No**.

This creates a new “ Merge coverage” while keeping the initial shoreline and regional contour coverages. It is a good idea to keep these coverages in the interface. If a problem occurs with the merged coverage, the initial shoreline and regional contour may be merged again.

4. Turn off “ GenCade” and “ Regional Contour”.
5. Select “ Merge coverage” to make it active.

## 3 Define the Projection

---

This project requires a global UTM coordinate system. Do the following to define the display projection:

1. Select *Display / Projection...* to bring up the *Display Projection* dialog.
2. Select *Global projection* and click **Set Projection...** to bring up the *Select Projection* dialog.
3. Select “UTM” from the *Projection* drop-down.
4. Select “18 (78°W - 72°W - Northern Hemisphere)” from the *Zone* drop-down.
5. Select “NAD83” from the *Datum* drop-down.
6. Select “METERS” from the *Planar Units* drop-down.
7. Click **OK** to close the *Select Projection* dialog.
8. In the *Vertical* section, select “Meters” from the *Units* drop-down.

9. Click **OK** to close the *Display Projection* dialog.

Define the object projection by doing the following:

10. Right-click on “Merge coverage” and select **Projection...** to bring up the *Object Projection* dialog.
11. Repeat steps 2–8, above.
12. Click **OK** to close the *Object Projection* dialog.

## 4 Grid Setup: Structures and Events

---

The features of this project must now be created and defined. These features include inlets, groins, and jetties.



### 4.1 Inlets and Dredging Events

---

This project contains four main inlets: Jones Inlet, Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet. The project contains two dredging events: one at Moriches and the other at Shinnecock.

#### 4.1.1 Jones Inlet

Define the inlet arc for Jones Inlet by doing the following:

1. **Frame**  the project and **Zoom**  in to the inlet in the image on the far left of the model. The inlet is shown in Figure 2:

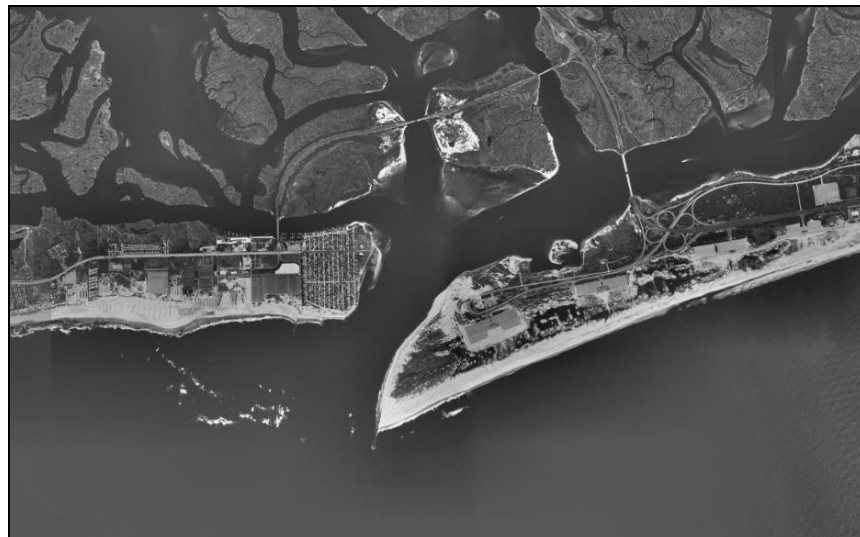



Figure 2 Jones Inlet, on the far left of the model

2. Digitize an inlet by using the **Create Feature Arc**  tool to draw an arc from one side of the inlet to the other. Be careful to not place it on top of either the initial coastline arc or the regional contours arc (see Figure 3).

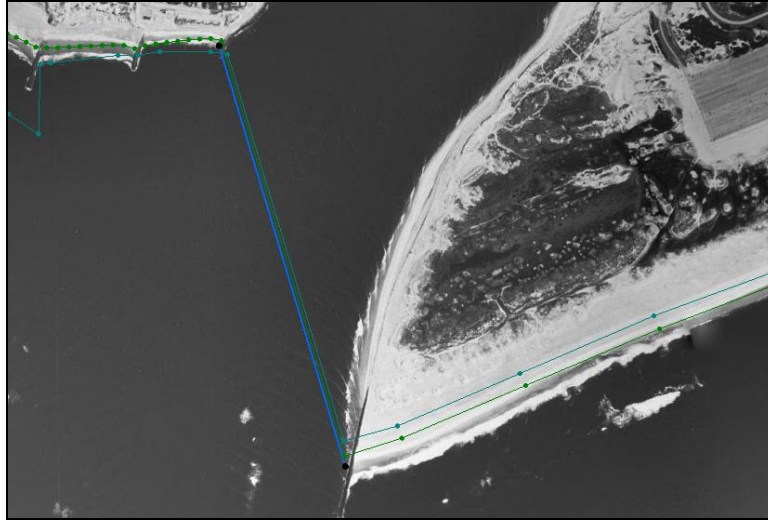





Figure 3 Jones Inlet, with the inlet arc in royal blue with black nodes

3. Using the **Select Feature Arc**  tool, double-click on the newly created arc to bring up the *GenCade Arc Attributes* dialog.
4. In the *Arc Options* section, select “Inlet” from the drop-down.
5. Click **Attributes...** to bring up the *Inlets (Reservoir Model and Jetties)* dialog.
6. Enter "Jones" in the *Name of Inlet* field.
7. Click on the **Volume** button in the ( $m^3$ ) column to bring up the *Inlet Shoal Volumes* dialog.
8. Outside of SMS, open the file “Inlets.xls” from the *Data Files* folder in a spreadsheet program.
9. Copy the values from the *Initial* column in the *Jones Inlet Volume* section of the “Inlets.xls” file to the *Initial* column in the *Inlet Shoal Volumes* dialog.
10. Copy the values from the *Equilibrium* column in the *Jones Inlet Volume* section of the “Inlets.xls” file to the *Equilibrium* column in the *Inlet Shoal Volumes* dialog.
11. Click **OK** to close the *Inlet Shoal Volumes* dialog.
12. Enter “0.8” in both the *Left Bypass Coef* and *Right Bypass Coef* columns.
13. Click **OK** to close the *Inlets (Reservoir Model and Jetties)* dialog.
14. Click **OK** to close the *GenCade Arc Attributes* dialog.

#### 4.1.2 Fire Island Inlet

Define the inlet arc for the Fire Island Inlet by doing the following:

1. **Frame**  the project and **Zoom**  to the inlet in the middle image (Figure 4).
2. Repeat steps 2–6 from the above Jones Inlet section, but enter "Fire Island" in the *Name of Inlet* field. See Figure 4 for the location of the arc.
3. Repeat steps 7–11 from the above Jones Inlet section, using the information from the *Fire Island Inlet Volume* section of the “Inlets.xls” file.



4. Set both the *Left Bypass Coef* and *Right Bypass Coef* to “1.0”.
5. Click **OK** to close the *Inlets (Reservoir Model and Jetties)* dialog.
6. Click **OK** to close the *GenCade Arc Attributes* dialog.



Figure 4 Fire Island Inlet, with the inlet arc in royal blue with black nodes

### 4.1.3 Moriches Inlet

Define the inlet arc and dredging events for Moriches Inlet by doing the following:

1. **Frame**  the project and **Zoom**  to the left most of the two inlets in the image on the right (Figure 5).
2. Repeat steps 2–6 from the above Jones Inlet section, but enter "Moriches" in the *Name of Inlet* field.
3. Repeat steps 7–10 from the above Jones Inlet section, using the information from the *Moriches Inlet Volume* section of the “Inlets.xls” file.
4. In the *Manage* column, click on the **Dredging...** button to bring up the *Dredging Events* dialog.
5. Copy the values from the *Begin Date* column in the *Moriches Dredging Events* section of the “Inlets.xls” file to the *Begin Date* column in the *Dredging Events* dialog.
6. Copy the values from the *End Date* column in the *Moriches Dredging Events* section of the “Inlets.xls” file to the *End Date* column in the *Dredging Events* dialog.
7. Copy the values from the *Shoal to Be Mined* column in the *Moriches Dredging Events* section of the “Inlets.xls” file to the *Shoal to Be Mined* column in the *Dredging Events* dialog.
8. Copy the values from the *Volume* column in the *Moriches Dredging Events* section of the “Inlets.xls” file to the *Volume (m<sup>3</sup>)* column in the *Dredging Events* dialog.
9. Click **OK** to close the *Dredging Events* dialog.
10. Set both the *Left Bypass Coef* and *Right Bypass Coef* to “0.8”.
11. Click **OK** to close the *Inlets (Reservoir Model and Jetties)* dialog.
12. Click **OK** to close the *GenCade Arc Attributes* dialog.

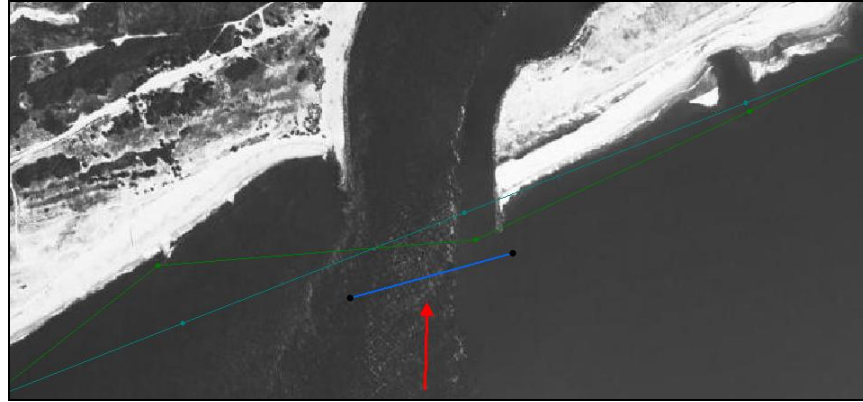




Figure 5 Moriches Inlet, with the inlet arc in royal blue with black nodes

#### 4.1.4 Shinnecock Inlet

Define the inlet arc and dredging events for Shinnecock Inlet by doing the following:

1. **Frame**  the project and **Zoom**  to the last inlet to the right of Moriches Inlet. This inlet is the one shown in Figure 6.
2. Repeat steps 2–6 from the above Jones Inlet section, but enter "Shinnecock" in the *Name of Inlet* field.
3. Repeat steps 6–10 from the above Jones Inlet section, using the information from the *Shinnecock Inlet Volume* section of the "Inlets.xls" file.
4. Repeat steps 4–9 from the above Moriches Inlet section, using the information from the *Shinnecock Dredging Events* section of the "Inlets.xls" file.
5. Set both the *Left Bypass Coef* and *Right Bypass Coef* to "1.0".
6. Click **OK** to close the *Inlets (Reservoir Model and Jetties)* dialog.
7. Click **OK** to close the *GenCade Arc Attributes* dialog.

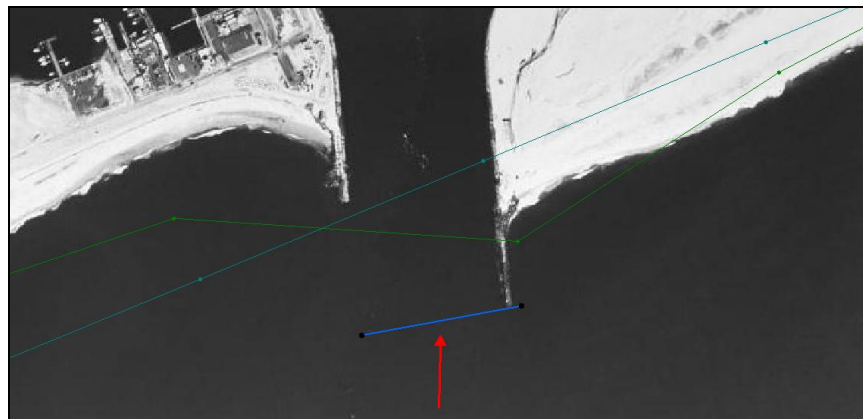


Figure 6 Shinnecock Inlet, with the inlet arc in royal blue with black nodes




## 4.2 Jetties

Jetties can be created to the left and right of the inlets. They can be given a length, permeability, and a seaward depth. Whether the jetty exists and is diffracting can also be



specified. In this tutorial, three sets of jetties will be created: for Jones Inlet, Moriches Inlet, and Shinnecock Inlet.

To create the jetties:

1. **Frame**  the project and **Zoom**  to the Jones Inlet.
2. Using the **Create Feature Arc**  tool, create an arc on each side of the inlet arc, as indicated by the red arrows in Figure 7. Be sure to not end or begin the arcs on any of the existing arcs, vertices, or nodes.

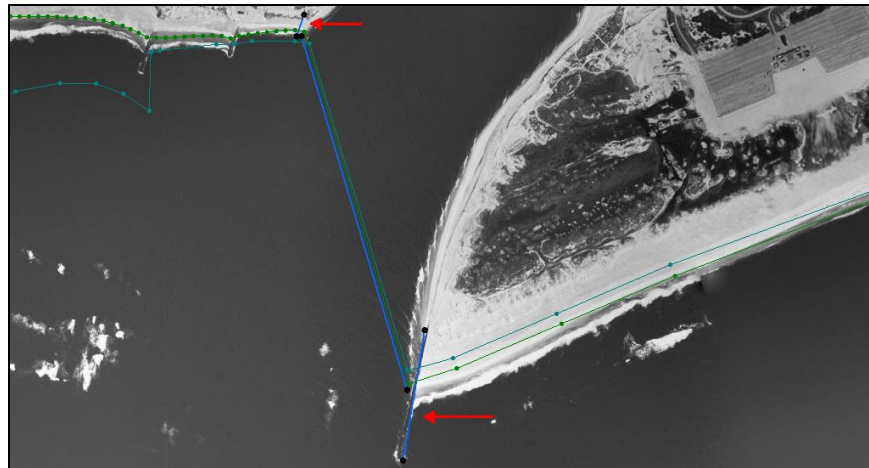



Figure 7 Jones Inlet with the two jetties indicated

3. Using the **Select Feature Arc**  tool, double-click on the jetty to the west (the one at the top of Figure 7) to bring up the *GenCade Arc Attributes* dialog.
4. Select “Right Jetty on Inlet” in the *Arc Options* section.

The “left” and “right” in the name of the jetty is always determined as if facing the ocean with the land behind.










5. Click the **Attributes** button to bring up the *Groins* dialog.
6. Enter “0.2” as the *Permeability*.
7. Turn on *Diffraction*.
8. Enter “7.0” as the *Seaward Depth*.
9. Click **OK** to close the *Groins* dialog.
10. Click **OK** to close the *GenCade Arc Attributes* dialog.
11. Using the **Select Feature Arc**  tool, double-click on the east jetty (the one at the bottom of Figure 7).
12. Repeat steps 4–10, except select “Left Jetty on Inlet” in the *Arc Options* section.
13. **Frame**  the project and **Zoom**  to the Moriches Inlet.
14. Using the **Create Feature Arc**  tool, create jetty arcs on both sides of the inlet arc, as indicated by the red arrows in Figure 8.



Figure 8 Moriches Inlet showing where arcs should be created

15. Using the **Select Feature Arc**  tool, double-click on the jetty to the west in Figure 8 to bring up the *GenCade Arc Attributes* dialog.
16. Repeat steps 4–10 using the following settings:
  - Enter “0.0” as the *Permeability*.
  - Turn on *Diffracting*.
  - Enter “5.0” as the *Seaward Depth*.
17. Using the **Select Feature Arc**  tool, double-click the east jetty to bring up the *GenCade Arc Attributes* dialog.
18. Repeat step 4–10, selecting “Left Jetty on Inlet” in step 4 and using the settings in step 16.
19. **Frame**  the project and **Zoom**  to the Shinnecock Inlet.
20. Using the **Create Feature Arc**  tool, create arcs on both sides of the inlet arcs as previously done with other inlets and as shown in Figure 9.

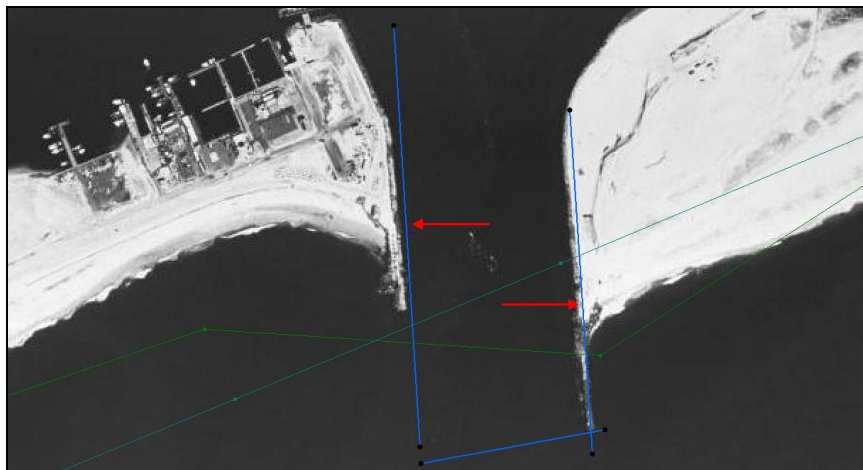







Figure 9 Shinnecock Inlet showing where to create the arcs

21. Follow steps 16–18 while referring to Figure 9, keeping in mind the point of view, and using the following settings:
  - Enter “0.0” as the *Permeability*.
  - Turn on *Diffracting*.
  - Enter “3.0” as the *Seaward Depth*.

### 4.3 Groins

Now set up groins in the model by placing groins along the coastlines in between the Moriches and Shinnecock Inlets, and to the left of the Jones Inlet. Parameters for characterizing groins include length, permeability, diffraction, and depth.

To define a groin, proceed with the following steps:

1. **Frame**  the project and **Zoom**  to the left of the Jones Inlet. There are 13 groins in this location: 11 to the far left and two just to the left of Jones Inlet.
2. Using the **Create Feature Arc**  tool, draw arcs along the shoreline as shown in Figure 10. Be careful to avoid placing arc nodes on the initial shoreline arc or the regional contour arc. **Zoom**  in if necessary.
3. Using the **Select Feature Arc**  tool, double-click on the groin to the far left to bring up the *GenCade Arc Attributes* dialog.
4. Select “Groin” from the drop-down list in the *Arc Options* section.
5. Click on the **Attributes** button to open the *Groins* dialog, and set the following:
  6. Enter “0.1” as the *Permeability*.
  7. Turn on *Diffracting*.
  8. Enter “3.0” as the *Seaward Depth*.
9. Click **OK** to close the *GenCade Arc Attributes* dialog.
10. Click **OK** to close the *Groins* dialog.
11. Repeat steps 3–7 for each of the other 12 groins.

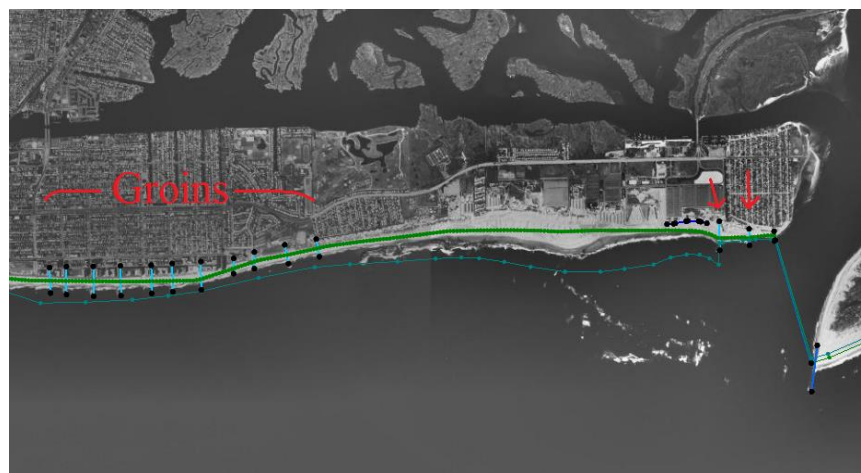






Figure 10 Location of groins at Jones Inlet

To create the groins in between the Moriches and Shinnecock Inlets, do the following:

1. **Frame**  the project and **Zoom**  to the area between the Moriches and Shinnecock Inlets. There are 14 groins total in this location.
2. Using the **Create Feature Arc**  tool, draw arcs along the shoreline as shown in Figure 11. Again, avoid placing arc nodes on the initial shoreline arc or the regional contour arc. **Zoom**  in if necessary.
3. Repeat steps 3–7 for each of the 14 groins.

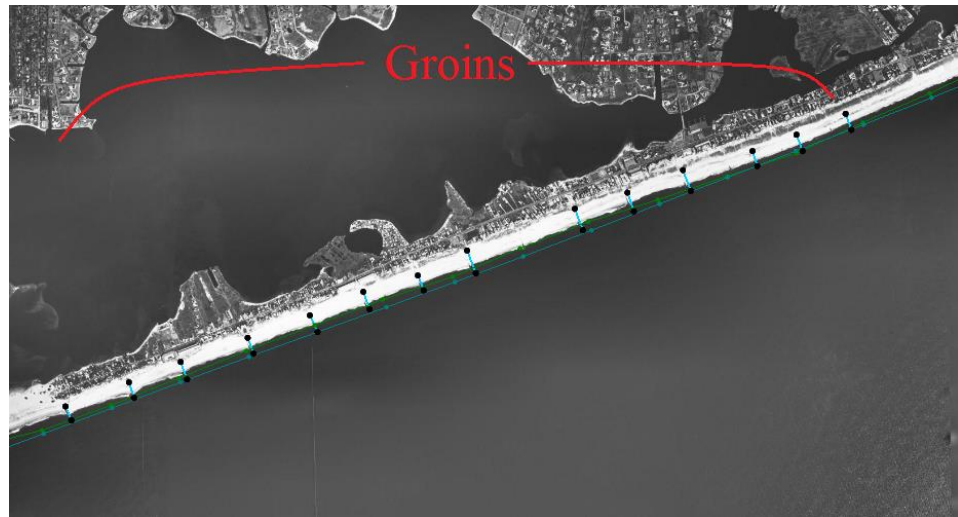


Figure 11 The locations of the 14 groins between Moriches and Shinnecock Inlets





#### 4.4 Seawall

A seawall will be created approximately 500 meters west of the Jones Inlet. Parameters for characterizing seawalls include start and end location. The seawall must be drawn landward of the shoreline. If the seawall is drawn directly on top of the initial shoreline, an error will occur.

Care should be taken when drawing the seawall so the shape of the seawall in the GenCade model resembles the actual seawall as closely as possible.

Additionally, since cell numbers are used in the GenCade model, the seawall shape may look different after converting from the conceptual model.

To define the seawall, do the following:

1. **Frame**  the project and **Zoom**  to the Jones Inlet.
2. Using the **Create Feature Arc**  tool, click out four arcs approximating the seawall arcs indicated in Figure 12.
3. Using the **Select Feature Arc**  tool, select all four arcs by clicking on each while holding down the *Shift* key.
4. Right-click and select **Attributes...** to bring up the *GenCade Arc Attributes* dialog.
5. Select “Seawall” from the drop-down in the *Arc Options* section.

- Click **OK** to close the *GenCade Arc Attributes* dialog.

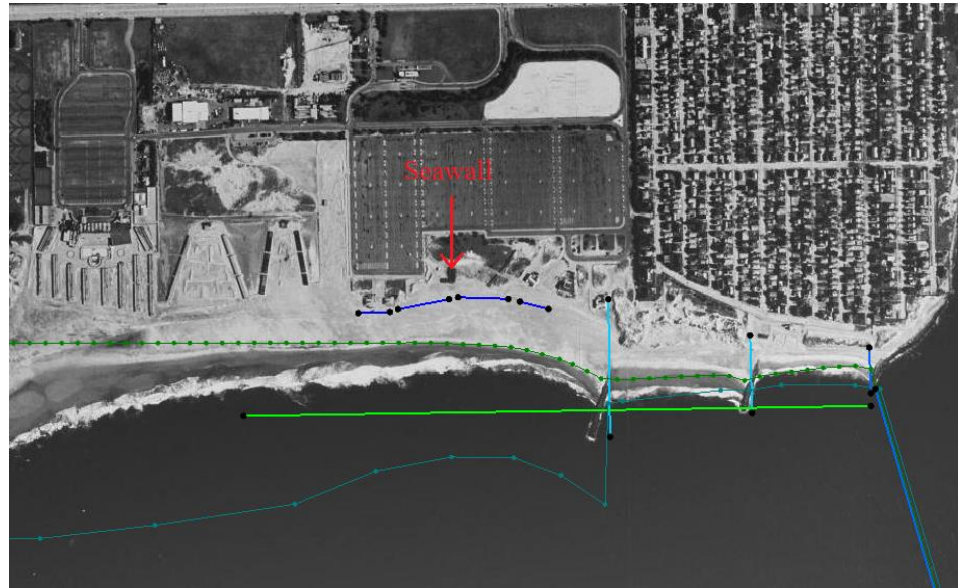






Figure 12 Location of the seawall arcs

When the model is converted to a 1D grid, an error message referring to the seawall may pop up. This message should be ignored as GenCade will modify the cells defined for the seawall. Review the seawall in the GenCade model. If the seawall does not resemble the actual seawall, the cell numbers and distances from the grid should be revised. A smaller cell size near the seawall may also be helpful.

## 4.5 Beach Fills

A total of four beach fills need to be created for this project. Parameters for characterizing beach fills include begin and end time, location, and width.

To define the beach fill for Jones Inlet, do the following:

- Frame**  the project and **Zoom**  to Jones Inlet
- Using the **Create Feature Arc**  tool, create an arc (the green arc in Figure 13).
- Using the **Select Feature Arc**  tool, select the arc and double-click on it to bring up the *GenCade Arc Attributes* dialog.
- Select “Beach Fill Event” from the drop-down in the *Arc Options* section.
- Click the **Attributes** button to bring up the *Beach Fill* dialog, and set:
  - Begin Date* to “01-Mar-1994”.
  - End Date* to “30-Apr-1994”.
  - Added Berm Width* to “10.0”.
- Click **OK** to close the *Beach Fill* dialog.
- Click **OK** to close the *GenCade Arc Attributes* dialog.

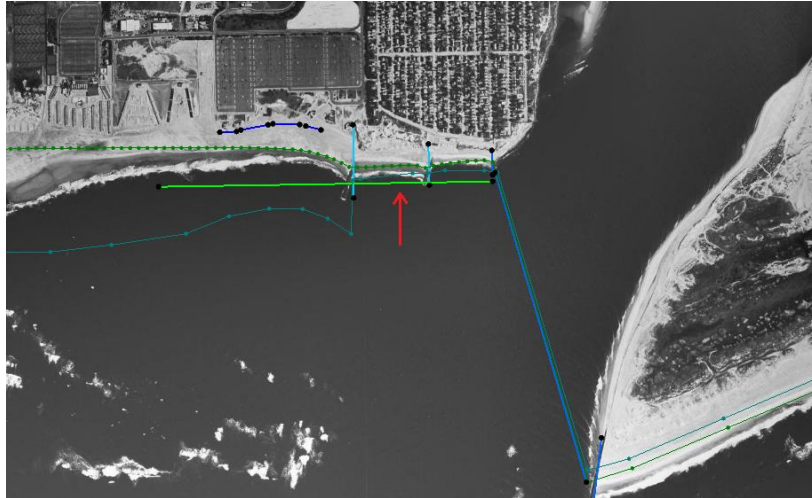






Figure 13 Jones Inlet, showing where to create the arc

To define the beach fill for Moriches Inlet, do the following:

1. **Frame**  the project and **Zoom**  to Moriches Inlet
2. Using the **Create Feature Arc**  tool, create an arc (the green arc in Figure 14).
3. Using the **Select Feature Arc**  tool, select the arc and double-click on it to bring up the *GenCade Arc Attributes* dialog.
4. Select “Beach Fill Event” from the drop-down in the *Arc Options* section.
5. Click the **Attributes** button to bring up the *Beach Fill* dialog, and set:
  - *Begin Date* to “01-Mar-1994”.
  - *End Date* to “30-Apr-1994”.
  - *Added Berm Width* to “200.0”
6. Click **OK** to close the *Beach Fill* dialog.
7. Click **OK** to close the *GenCade Arc Attributes* dialog.

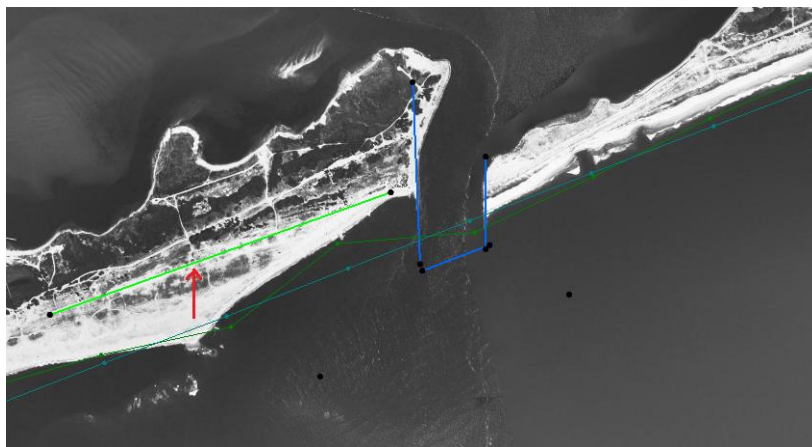






Figure 14 Moriches Inlet, showing where to create the arc

To define the first beach fill for Shinnecock Inlet, do the following:

1. **Frame**  the project and **Zoom**  to Shinnecock Inlet
2. Using the **Create Feature Arc**  tool, create an arc (the green arc in Figure 15).
3. Using the **Select Feature Arc**  tool, select the arc and double-click on it to bring up the *GenCade Arc Attributes* dialog.
4. Select “Beach Fill Event” from the drop-down in the *Arc Options* section.





This arc will have multiple beach fill events.

5. Click the **Attributes** button to bring up the *Beach Fill* dialog, and set:
  - The first *Begin Date* to “01-April-1994”.
  - The first *End Date* to “31-May-1994”.
  - The first *Added Berm Width* to “5.0”
  - The second *Begin Date* to “01-Apr-1990”.
  - The second *End Date* to “31-May-1990”.
  - The second *Added Berm Width* to “5.0”
  - The third *Begin Date* to “01-Mar-1993”.
  - The third *End Date* to “28-Dec-1993”.
  - The third *Added Berm Width* to “5.0”
6. Click **OK** to close the *Beach Fill* dialog.
7. Click **OK** to close the *GenCade Arc Attributes* dialog.



Figure 15 Shinnecock Inlet showing where to create the arc

To define the final beach fill, do the following:

1. **Frame**  the project and **Zoom**  to the coastline at the very top right of the project (there is no background map at this point, see Figure 16).
2. Using the **Create Feature Arc**  tool, create an arc (the green arc in Figure 16).
3. Using the **Select Feature Arc**  tool, select the arc and double-click on it to bring up the *GenCade Arc Attributes* dialog.
4. Select “Beach Fill Event” from the drop-down in the *Arc Options* section.
5. Click the **Attributes** button to bring up the *Beach Fill* dialog, and set:

- *Begin Date* to “01-Mar-1994”.
  - *End Date* to “31-May-1994”.
  - *Added Berm Width* to “20.0”
6. Click **OK** to close the *Beach Fill* dialog.
  7. Click **OK** to close the *GenCade Arc Attributes* dialog.

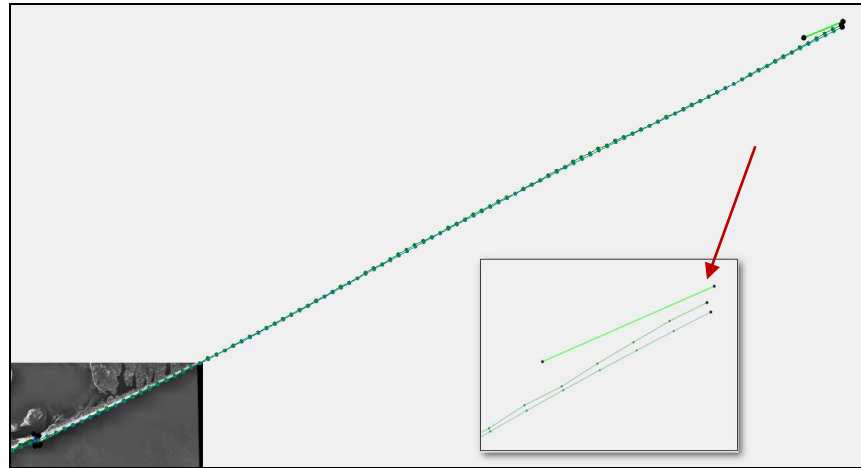






Figure 16 Shinnecock Inlet at bottom left, inset shows area from top right

## 4.6 Breakwaters

This project requires one breakwater be created. Parameters for defining breakwaters include start and end location, depth, and transmission coefficient.

To define the breakwater, proceed with the following steps:

1. **Frame**  the project and **Zoom**  to the coastline about 5800 m northeast of Shinnecock Inlet.
2. Using the **Create Feature Arc**  tool, create an arc similar to the orange arc in Figure 15.
3. Using the **Select Feature Arc**  tool, select the arc and double-click on it to bring up the *GenCade Arc Attributes* dialog.
4. Select “Breakwater” from the drop-down in the *Arc Options* section.
5. Click the **Attributes** button to bring up the *Detached Breakwaters* dialog, and set:
  - *Depth 1* to “3.0”.
  - *Depth 2* to “5.0”.
  - *Transmission* to “Constant”
6. Click **OK** to close the *Detached Breakwaters* dialog.
7. Click **OK** to close the *GenCade Arc Attributes* dialog.







## 5 Grid Setup: Orientation, Cell Size, Variable Grid Resolution

After defining the shorelines and any necessary structures, the grid should be set up.

The cell size can be constant or variable. For this tutorial, use a variable cell size. In order to do so, refine points must be created. Refine points tell the model where to have variable cell sizes on the 1D grid.

To create the refine points for the 1D grid frame near Jones Inlet, do the following:

1. **Frame**  the project and **Zoom**  to Jones Inlet as shown in Figure 17.
2. Using the **Create Feature Point**  tool, create eight nodes as indicated by the red arrows in Figure 17.
3. Using the **Select Feature Point**  tool, drag a box around all eight of the new nodes to select them.
4. Right-click and select **Node Attributes...** to bring up the *Refine Point* dialog.
5. Turn on *Refine grid in I direction*.
6. Set *Base cell size* to “60.0”.
7. Click **OK** to close the *Refine Point* dialog.

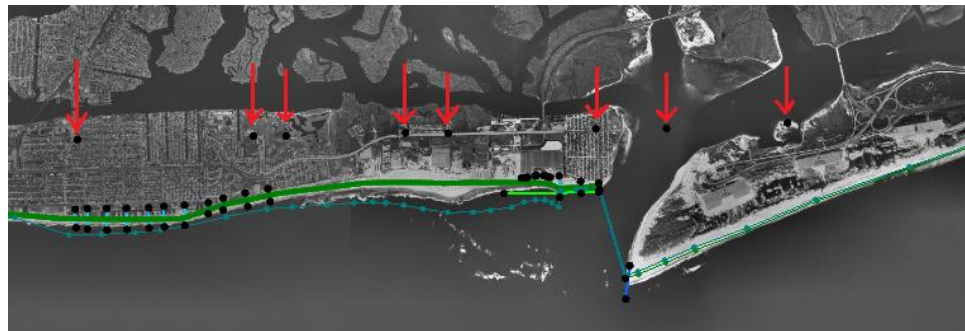






Figure 17 Location of the refine points near Jones Inlet

To create the refine points by Moriches Inlet, do the following:

1. **Frame**  the project and **Zoom**  to Moriches Inlet as shown in Figure 18.
2. Using the **Create Feature Point**  tool, create two nodes as indicated by the red arrows in Figure 18.
3. With the **Select Feature Point**  tool, select both by selecting one, holding down the *Shift* key, and then selecting the other.
4. Right-click and select **Node Attributes...** to bring up the *Refine Point* dialog.
5. Turn on *Refine grid in I direction*.
6. Set *Base cell size* to “50.0”.
7. Click **OK** to close the *Refine Point* dialog.

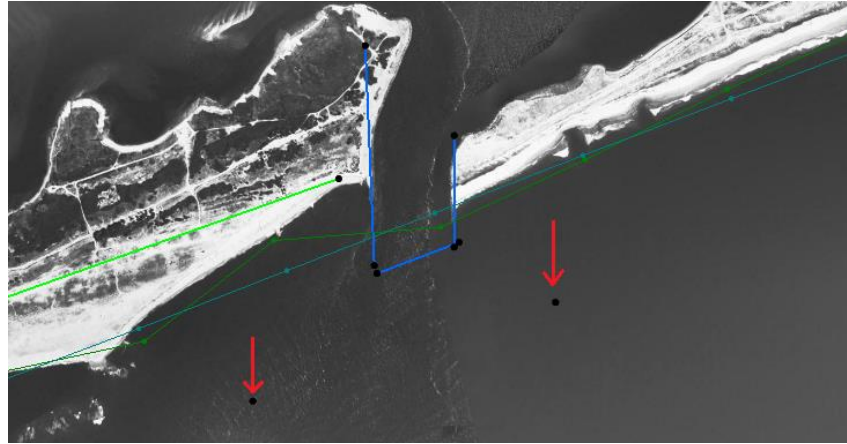






Figure 18 Location of the Moriches Inlet refine points

1. To create the refine point between Moriches and Shinnecock Inlets, do the following:
2. **Frame**  the project and **Zoom**  to the area between Moriches and Shinnecock Inlets (as in Figure 19).
3. Using the **Create Feature Point**  tool, create one node as indicated by the red arrow in Figure 19.
4. Using the **Select Feature Point**  tool, double-click the new node to bring up the *Refine Point* dialog.
5. Turn on *Refine grid in I direction*.
6. Set *Base cell size* to “500.0”.
7. Click **OK** to close the *Refine Point* dialog.

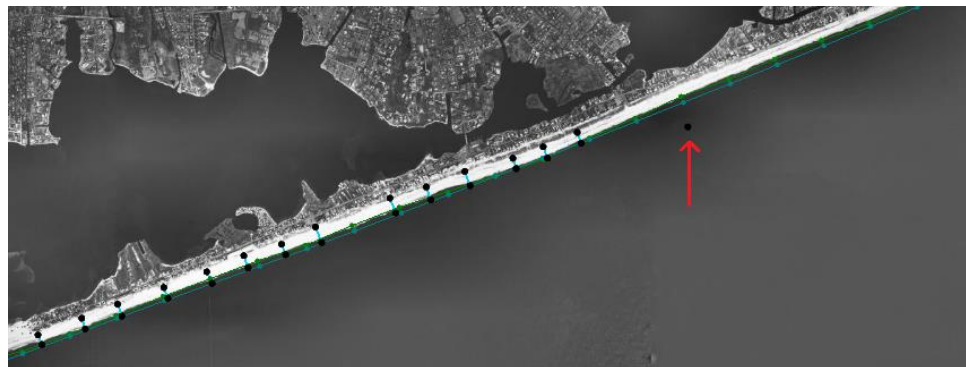






Figure 19 Location of the refine point between Moriches and Shinnecock Inlets

To create the refine points by Shinnecock Inlet, do the following:

1. **Frame**  the project and **Zoom**  to Shinnecock Inlet (as in Figure 20).
2. Using the **Create Feature Point**  tool, create two nodes as indicated by the red arrows in Figure 20.
3. Using the **Select Feature Point**  tool, select both by selecting one, holding down the *Shift* key, and then selecting the other.

4. Right-click and select **Node Attributes...** to bring up the *Refine Point* dialog.
5. Turn on *Refine grid in I direction*.
6. Set *Base cell size* to “50.0”.
7. Click **OK** to close the *Refine Point* dialog.

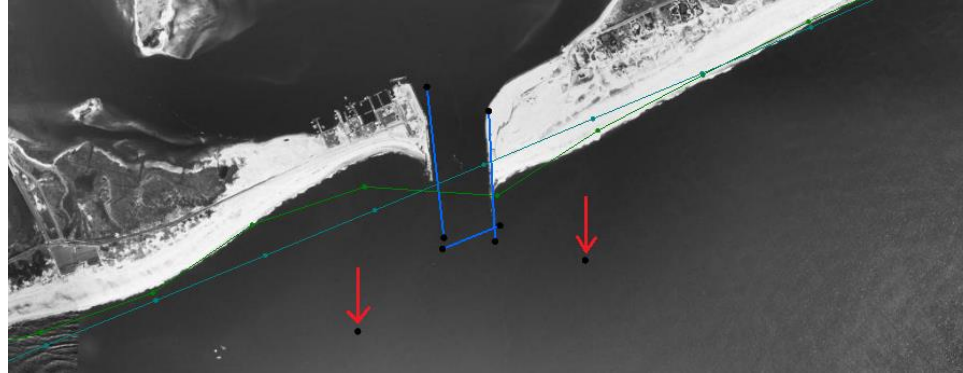




Figure 20 Location of Shinnecock Inlet refine points

The grid frame can now be created by following these steps:

1. **Frame**  the project and select the **Create 1-D Grid Frame**  tool.
2. Starting from just above the final beach fill event at the top right of the project coastline, click once to create a start point, go down to a point just left of the map image for Jones Inlet and click once to create the end point (see Figure 21).

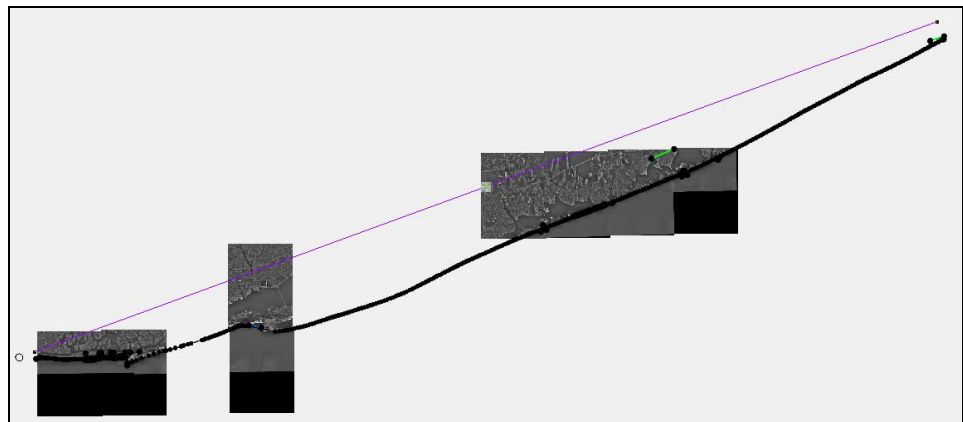



Figure 21 Location of 1D grid frame

3. Using the **Select 1-D Grid Frame**  tool, double-click on selection box of the newly created grid frame to bring up the *Grid Frame Properties* dialog.
4. Set the following:
  - *Origin X* to “754605”.
  - *Origin Y* to “4548955”.
  - *Angle* to “200”.
  - *I size* to be “158915”.
  - Turn on *Use refine points* and set:

- *Maximum cell size* to be “200”.
  - *Maximum bias* to be “1.08”.
  - Turn on *Use inner growth*.
5. Click **OK** to close the *Grid Frame Properties* dialog.
  6. Right-click on “Merge coverage” and select *Convert | Map → 1D Grid* to bring up the *Map → 1D Grid* dialog.
  7. Click **OK** to create the 1D grid.
  8. If a dialog appears stating degenerate seawall segments were ignored, click **OK**.

If the *Model Checker (Potential Issues Found)* dialog appears stating that groins need to be at least two cells apart, do the following:

9. Click **Cancel** to close the *Model Checker (Potential Issues Found)* dialog.
10. Select “GenCade Grid” in the Project Explorer to make it active.
11. Select *GenCade | Edit Groins* to bring up the *Groins* dialog.
12. In the *Cell Index* column, edit the numbers to make sure they are at least four cells apart.
13. Once done, click the **OK** button to close the *Groins* dialog.

The 1D grid should now be created (see Figure 22).

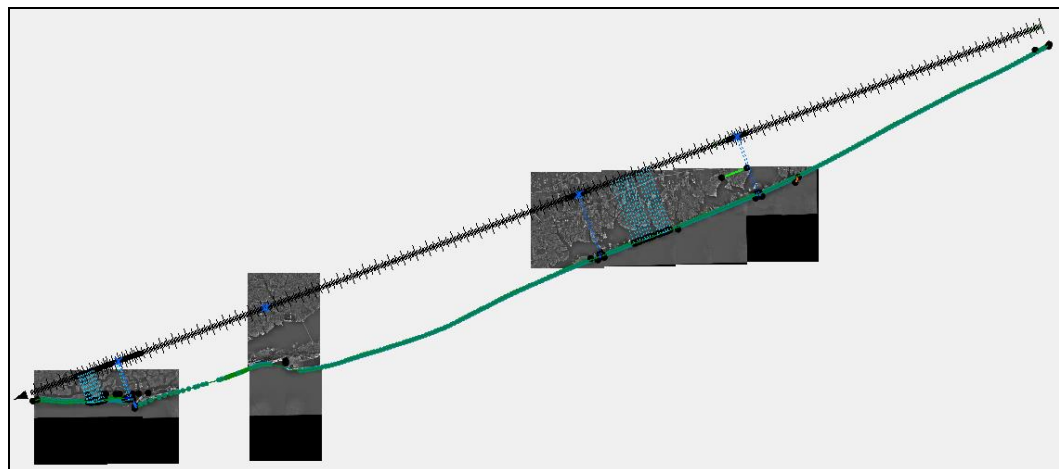


Figure 22 The 1D grid

## 6 Wave Data

Now that the 1D grid is created, the wave data can be loaded into the project by doing the following:

1. Select “GenCade Grid” in the Project Explorer to make it active.
2. Select *GenCade | Edit Wave Data...* to bring up the *Wave Gages* dialog.
3. In row 1, enter “1” in the *Cell* column and “36.0” in the *Depth* column.
4. Click **Data...** to open the *Wave Events* dialog.

5. Open the file “Wave\_Data\_Gage\_1.xls” in a spreadsheet program.
6. Copy the values from the *Date* column of the “Wave\_Data\_Gage\_1.xls” file to the *Date* column in the *Wave Events* dialog.
7. Copy the values from the *H0 (m)* column of the “Wave\_Data\_Gage\_1.xls” file to the *H0 (m)* column.
8. Copy the values from the *Period (sec)* column of the “Wave\_Data\_Gage\_1.xls” file to the *Period (sec)* column.
9. Copy the values from the *Direction (deg)* column of the “Wave\_Data\_Gage\_1.xls” file to the *Direction (deg)* column.
10. In the *Interpret Directions As* section, select “Shore Normal” from the *Convention* drop-down.
11. Click **OK** to close the *Wave Events* dialog.
12. In the second row of the *Wave Gages* dialog, enter “244” in the *Cell* column and “27.0” in the *Depth* column.
13. Click **Data...** to open the *Wave Events* dialog.
14. Repeat steps 5–11 using the file “Wave\_Data\_Gage\_2.xls”
15. In the third row of the *Wave Gages* dialog, enter “678” in the *Cell* column and “24.0” in the *Depth* column.
16. Click **Data...** to open the *Wave Events* dialog.
17. Repeat steps 5–11 using the file “Wave\_Data\_Gage\_3.xls”
18. Click **OK** to close the *Wave Gages* dialog.

The Main graphics window should now appear similar to Figure 23, below.

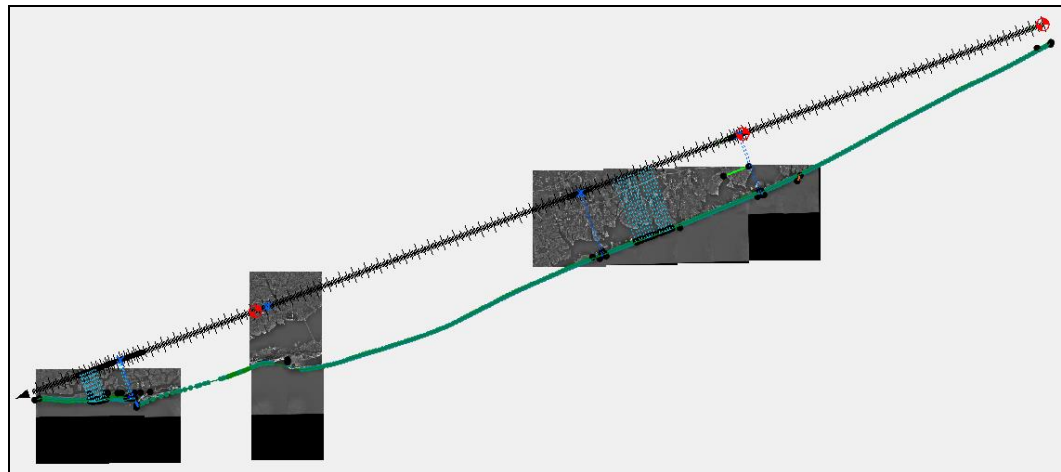


Figure 23 The red icons indicate wave data has been entered

## 7 Model Control

Before running GenCade, first set the parameters of the model in the model control by doing the following:

1. Select *GenCade* | **Model Control...** to bring up the *GenCade Model Control* dialog.
2. On the *Model Setup* tab in the *Computation Time* section, set:
  - *Start Date* to “01-Jan-1983 12:00 AM”.
  - *End Date* to “01-Jan-1995 12:00 AM”.
  - *Time Step* to “1.0”.
  - *Recording Time Step* to “168.0”.
3. On the *Beach Setup* tab, set:
  - *Effective Grain Size* to “0.3”.
  - *Average Berm Height* to “1.0”.
  - *Closure Depth* to “8.0”.
  - *K1* to “0.3”.
  - *K2* to “0.15”.
4. On the *Seaward BC* tab, set *Number of Cells in Offshore Contour Smoothing Window* to “11”.
5. On the *Lateral BC* tab, select “Pinned” in the *Type* drop-down in both the *Left Lateral BC* and the *Right Lateral BC* sections.
6. Click **OK** to close the *GenCade Model Control* dialog.

## 7.1 Save the Project

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Before running the model, save the project by doing the following:

1. Select to *File* | **Save as...** to bring up the *Save As* dialog.
2. Select “Project Files(\*.sms)” from the *Save as type* drop-down.
3. Enter “LongIsland.sms” as the *File name*.
4. Click **Save** to save the project under the new name and close the *Save As* dialog.

## 8 Run GenCade

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When running GenCade, a window opens that describes the simulation. This window will give a notice if an error occurs and advises of the progress each time a year is completed. The window gives an alert when the model is finished. GenCade generally runs quickly.

To run GenCade, do the following:

1. Select *GenCade* | **Run GenCade....** If any potential issues are identified by the Model Checker, the *Model Checker (Potential Issues Found)* dialog will appear. In this case, go to step 2. If it does not appear, skip to step 3.
2. Resolve any issues by following the directions in the *Fix* section of the *Model Checker (Potential Issues Found)* dialog.

If the problems are not cleared even after following the directions, the GenCade model can still be run, but it may encounter errors.

3. Click on the **Run Model** button to run GenCade.
4. Once it is finished, you can save the *GenCade Output* as a text file, or simply click **Exit**.

## 8.1 Gencade Output Files

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Following a GenCade simulation, at least seven output files will be created in the assigned directory.


- The print file (\*.prt) saves all of the information related to the simulation including wave heights, shorelines, and transport rates.
- The shoreline position output file (\*.slo) documents the shoreline position for each time step for every cell in the grid.
- The net transport rate file (\*.qtr) prints the net transport rate for each cell at every time step.
- The inlet shoal volume file (\*.irv) lists volumes for each inlet shoal for every time step. A separate inlet shoal volume file is created for each inlet represented in the simulation. If the grid does not include an inlet, the \*.irv file will not be created.
- The mean net annual transport files (\*.mqn [mean annual net transport], \*.mql [mean transport to the left], and \*.mqr [mean transport to the right]) list the transport for each cell for each time step.
- The offshore contour for each time step for each cell is included in the offshore contour file (\*.off).

All of the files except the print file may be opened and viewed in SMS. The aforementioned files contain the majority of the information needed to evaluate the results of a simulation.


## 9 Visualizing the Results

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As mentioned in the previous section, many of the output files may be opened in the SMS for visualization. The first of these files is the SLO file, or shoreline change file.

1. Click **Open**  to bring up the *Open* dialog.
2. Select “LongIsland.slo” and click **Open** to import the solution file and exit the *Open* dialog.

The *Time Steps* section will appear in the SMS window. An arc representing the calculated shoreline should appear in the grid window. The default color and size of the calculated shoreline may be difficult to view, so the display options should be adjusted.

3. Click **Display Options**  to bring up the *Display Options* dialog.
4. Select *ID Grid* from the list on the left.

5. Click on the wide button to the left of *Current shoreline* to bring up the *Line Attributes* dialog.
6. Enter “3.0” as the *Width*.
7. Click on the *Line color* button to bring up the *Color* dialog.
8. Select *Red* and click **OK** to close the *Color* dialog.
9. Click **OK** to close the *Line Attributes* dialog.
10. Click **OK** to close the *Display Options* dialog.

The calculated shoreline should now be more visible as a red arc (Figure 24). The size and color of the initial shoreline, regional contour, and structures can also be changed using these same steps.

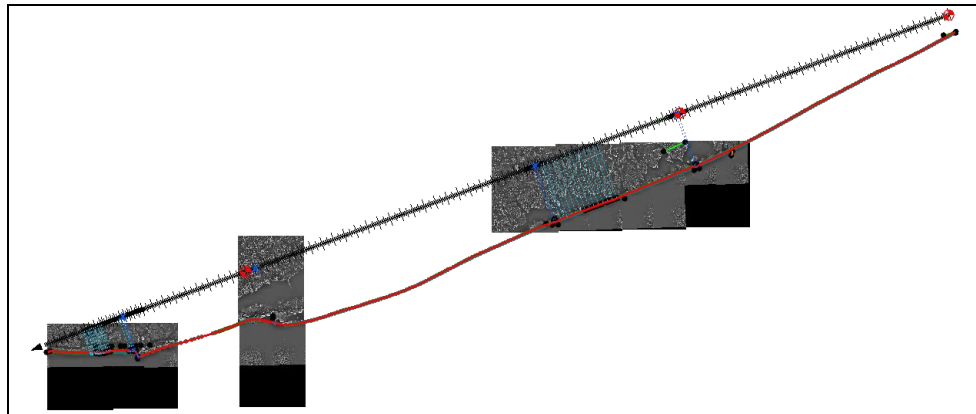


Figure 24 Calculated shoreline

The default time under *Time Steps* is “Relative Time”. To view the simulated dates:

11. Right-click on *Time Steps* in the SMS window and select **Time Settings** to bring up the *Time Settings* dialog.
12. Enter “1/1/1983 12:00:00 AM” as the *Zero time* to match the first date in the simulation.
13. In the *Time Display* section, select “Absolute Time/Date” from the Display as drop-down.
14. Click **OK** to close the *Time Settings* dialog.

View the current shoreline at any date during the simulation and compare it with the initial shoreline or other reference lines.

## 10 Conclusion

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This concludes the “GenCade” tutorial. Feel free to continue to experiment with GenCade in SMS, or exit the program.