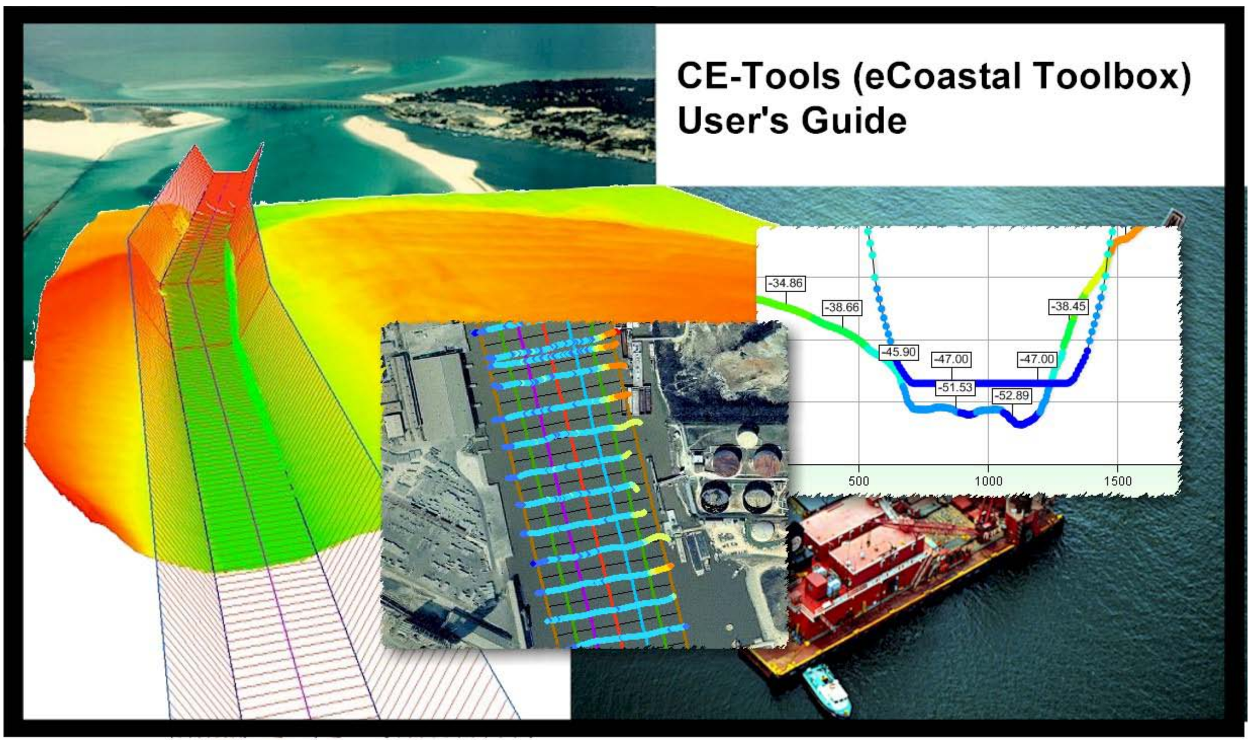
Mobile District
spatial data

US Army Corps of Engineers
Mobile District

CE-Tools (eCoastal Toolbox) User's Guide

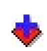


1. Introduction

The Mobile District's Spatial Data Branch has developed the eCoastal Toolbox and it was created as a comprehensive set of applications that enable stakeholders in management decisions to explore the broad spatial and temporal impacts of potential management actions. In the USACE, these tools have emerged as necessary components for effective planning and prediction of regional and local coastal processes. A GIS with specialized applications was developed to provide baseline information for regions including hydrographic and topographic data, shoreline position, aerial and oblique photography, georeferenced imagery, dredging records, nautical charts, and other data regarding regional utilities, infrastructure, and land use. Customized GIS applications were developed to retrieve pertinent hydrologic information, to extract dredging information from district databases via reporting tools, and to create bathymetric profiles and volume changes.

The eCoastal ArcMap toolbars support eCoastal desktop applications, and these individual toolbars collectively form the eCoastal Toolbox. The eCoastal Toolbox is distributed as part of the eGIS program of USACE, Mobile District Spatial Data Branch. The eCoastal Toolbox is designed to assist all GIS users in data analysis and access to the geodatabase through user-friendly tools and forms available in the ArcGIS ArcMap application.

2. Standard Data Viewer Toolbar Functions

	**Toolbar: eCoastal DataViewer** **Tool: Database Connections** Function: This form allows a user to select a connection to the GIS Management Database. Additionally, references for spatial and non-spatial servers are established here. A working "scratch" location must also be set here to allow for a working directory on a user's local computer.		**Toolbar: eCoastal DataViewer** **Tool: Data Picker** Function: Data indexed in the GIS Management Database can be easily accessed using the Data Picker tool. This GUI interface allows users of all user levels the ability to quickly search available layers and directly add items to the Table of Contents in ArcMap without prior knowledge of the Spatial Data Standards to browse the geodatabase with little introduction to the system architecture.
	**Toolbar: eCoastal DataViewer** **Tool: Zoom To Layer** Function: Allows a user to quickly zoom to the extents of the layer in the table of contents selected by the user. The Zoom to Layer tool on the eGIS Data Viewer toolbar is different than the standard 'Zoom to Layer' function as it honors the spatial extent of the definition query used in the Layer file.		**Toolbar: eCoastal DataViewer** **Tool: Create Map Layout** Function: Allows a user to quickly and efficiently create a map layout suitable for printing and or plotting. This tool simplifies map printing by providing a user the option to select a printing device and then select a paper size. Pre-defined map scales are also available for choosing. Each change updates the map layout.

Toolbar: eCoastal DataViewer **Tool: Find By Attribute** Function: Allows a user to search attributes contained in a vector feature layer by selecting from a list of distinct attribute values queried from the selected layer. Double-clicking on a value from the search list locates to the first feature by that value.	**Toolbar: eCoastal DataViewer** **Tool: Sort Layers** Function: Allows a user to sort all the layers in the table of contents alphabetically. The tool will honor grouped layers of any level.
Toolbar: eCoastal DataViewer **Tool: Move Layers Up** Function: Allows a user to move any selected layers to the top of the table of contents.	**Toolbar: eCoastal DataViewer** **Tool: Move Layers Down** Function: Allows a user to move any selected layers to the bottom of the table of contents.
Toolbar: eCoastal DataViewer **Tool: Delete Multiple Fields** Function: Allows a user to select a shape file on their computer. Once selected, a list of attribute fields is created from the shape file for final selection. All selected fields in the shape file are then deleted.	**Toolbar: eCoastal DataViewer** **Tool: Add X,Y Coordinates** Function: Automatically creates and populates an X and Y value column(s) in the attribute table of a selected vector layer using the coordinate system of the Data Frame properties. The Add XY tool is useful if a vector point layer was created using a "heads-up digitizing" technique or if a point data layer was acquired with no XY coordinates defined in the attribute table.
Toolbar: eCoastal DataViewer **Tool: Import Excel as Points** Function: This tool imports from a selected Excel spreadsheet a worksheet that contains columns of data that can be queried as X and Y point data. The tool imports the data and creates a point feature layer into the map. Additional columns of data in the spreadsheet may be selected and will be included in the feature layer as attribute data.	**Toolbar: eCoastal DataViewer** **Tool: Export to Text File** Function: Allows users to easily export the feature attributes of a feature map layer to an ASCII comma-delimited text file. The tool can also be used to export the XY vertices of a polygon or polyline feature class to a text file. Additionally if the feature class is 3D, the Z value of the geometry is also included.
Toolbar: eCoastal DataViewer **Tool: Polygon Area Tool** Function: Allows users to calculate the area, perimeter, and centroid of features in a polygon feature layer. The tool will also work with data that is in a geographic coordinate system.	**Toolbar: eCoastal DataViewer** **Tool: Graphics to Features** Function: This tool allows users to convert graphic elements (polygon, polyline, or point types) in the map to permanent feature classes of the same type of geometry.

	Toolbar: eCoastal DataViewer **Tool: Bounding Polygon Tool** Function: Bounding polygons are used to define the extent of surfaces to be calculated with the Spatial Analyst extension. This tool allows the user to create a boundary based on a feature point selection, and it creates a polygon graphic that surrounds the feature selection. The bounding polygon is a convex hull polygon.		**Toolbar: eCoastal DataViewer** **Tool: Compare Tool** Function: The main function of this tool, although not the only function, is to search the specified feature class for duplicate geometry. Any duplicate features are marked as duplicate with a Duplicate column that is added to the feature attribute table.
	Toolbar: eCoastal DataViewer **Tool: Make PointZ Shape** Function: Allows a user to select an ASCII comma-delimited text file that contains as minimum X, Y, and Z values that typically represent a location and an elevation. The resultant point shape file is z-aware, meaning it has 3D geometry.		**Toolbar: eCoastal DataViewer** **Tool: Make PolylineZ Shape** Function: Allows a user to select an ASCII comma-delimited text file that contains as minimum X, Y, and Z values that typically represent a location and an elevation. The X and Y values are used to create the polyline vertices. The resultant shape file is z-aware, meaning it has 3D geometry.
	Toolbar: eCoastal DataViewer **Tool: Polyline Tools** Function: The polyline tools are a collection of tools that modify polylines in a shape file or create new features from existing features.		**Toolbar: eCoastal DataViewer** **Tool: Shape to Multipoint Shape** Function: Combines one or more point shape files into a single multipoint shape file.
	Toolbar: eCoastal DataViewer **Tool: Nearest Neighbor Tool** Function: This tool is used to calculate the nearest point to every point contained in a point feature layer and provide the resulting average distance between points as a final result.		**Toolbar: eCoastal DataViewer** **Tool: Pixels 2 ASCII File Tool** Function: This tool permits you to select a raster dataset and export the raster pixel values to a formatted ASCII text file
	Toolbar: eCoastal DataViewer **Tool: Polygon to Polyline Tool** Function: This tool converts the selected polygon feature to a polyline feature.		**Toolbar: eCoastal DataViewer** **Tool: Polyline to Polygon Tool** Function: This tool converts the selected polyline feature to a polygon shape file.

Table 1 - Standard Toolbar Functions

3. DataViewer Tools

The Data Viewer tools have been created to assist GIS users in data analysis and access to the geodatabase through the ArcGIS ArcMap interface. The ArcGIS Desktop applications are developed using ArcObjects. When you use an application, such as ArcMap, most of the time you are simply looking at or working with ArcObjects. The graphical user interface in each custom eCoastal application is developed using the same objects, such that in each application you will find the interface contains toolbars, menus, commands, and tools that have the same look and feel. The eCoastal Toolbox is distributed as an install package for the ArcGIS environment. Created in a modular design, users can choose which tools to load in their toolbar. In general, the tools provide a simple interface to common GIS tasks; such as locating data stored in the geodatabase, building attribute queries or designing a map layout.

3.1 DataViewer Toolbar

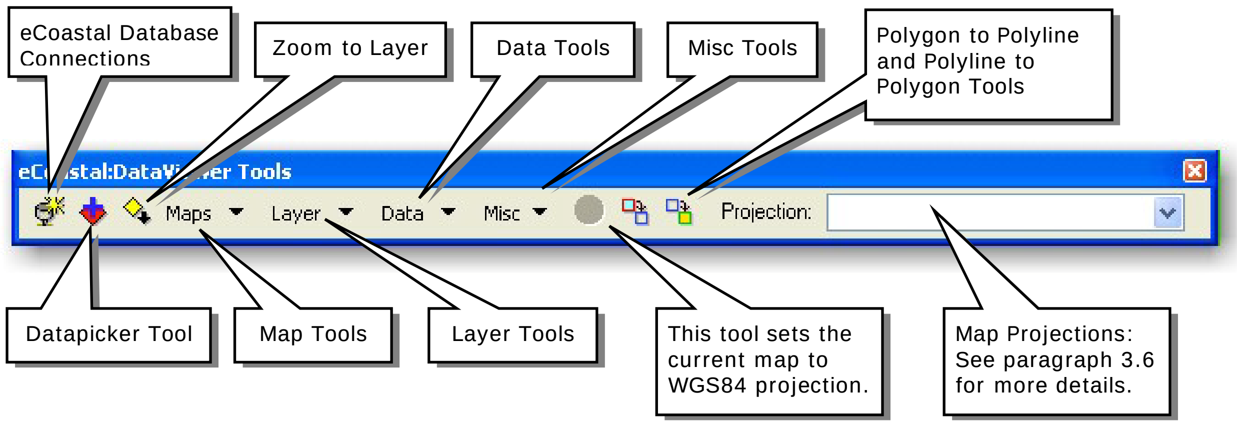


Figure 1 - DataViewer Toolbar

3.2 Database Configuration

In order to effectively utilize the eCoastal tools the proper database connection must be established, and also, other working network and local paths must be established. This is illustrated in Figure 2 - eCoastal Connections.

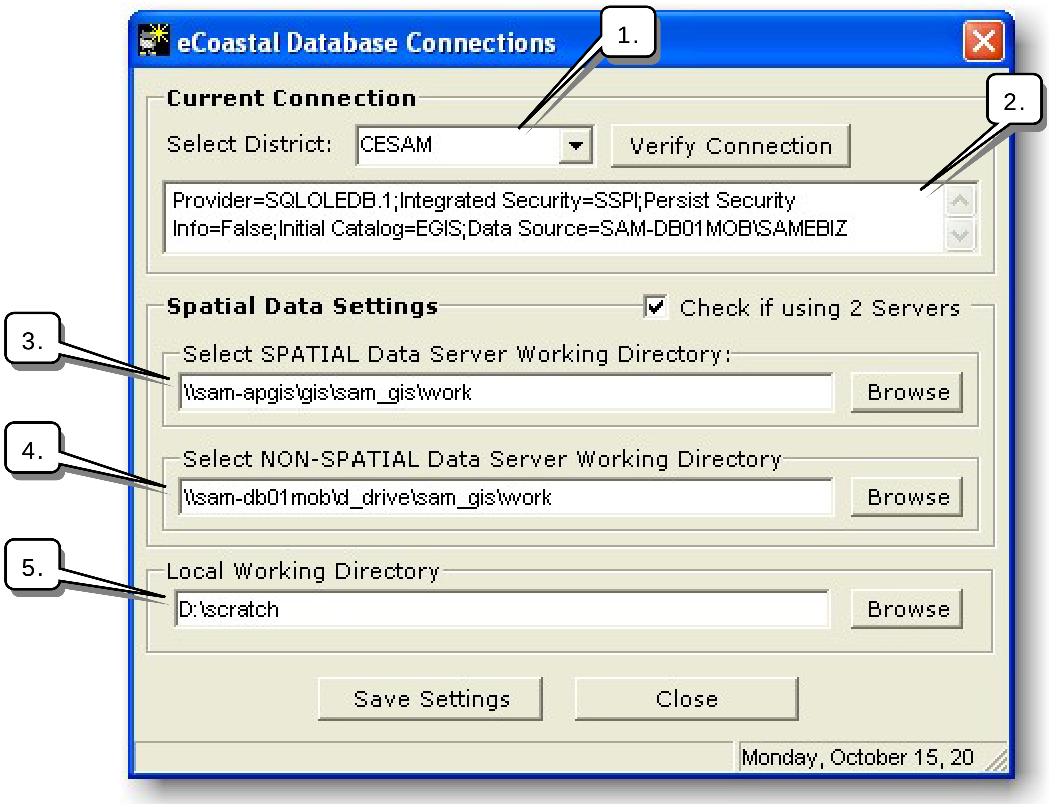


Figure 2 - eCoastal Connections

1. This dropdown list is used to select the working district and when selected will populate the remaining items on the form with the exception of the local working directory.

2. This box indicates the working database connection string that is used by the toolbox for database connectivity.

3. This UNC reference path is used to build a location for accessing project layer files. Layer files are a special ESRI file format that contains specific data about where the layer's data source is and how the data is symbolized when it is loaded in the map, and is a key part the eCoastal architecture.

4. This UNC reference path is used to build a location for accessing non-spatial data sources.

5. The local working directory is an area where scratch work is done. Typically this is data that is created in an ad-hoc fashion by the eCoastal tools and often times retrieved for later use.

3.3 Zoom to Definition Query

Click this button to zoom to the extents of a layer's definition query. In ArcMap, a request that examines feature or tabular attributes based on user-selected criteria and displays only those features or records that satisfy the criteria is a definition query. Typically, but not always, the visible features defined by a definition query have smaller visible extents then the same layer without a definition query. This tool will honor the visible extents of the definition query.

3.4 Polygon to Polyline Tool

Click this button to use the polygon to polyline tool. To use this tool, click on a polygon feature in a polygon layer. This polygon feature will be converted to a polyline shape file. The new polyline shape file is then added to your map. The new polyline shape file has a default file name prefix. You may substitute your own shape file prefix name by using the dialog shown in Figure 3. If the "Use selected features" box is checked, first click on any feature in the desired layer. All of the selected features in that layer will be converted and added to a new polyline shape file. If the polygon layer is z-aware (3d) you can flatten the features that are converted to the new polyline shape file by checking the "Flatten 3D geometry" checkbox. This makes the new layer a 2D layer.

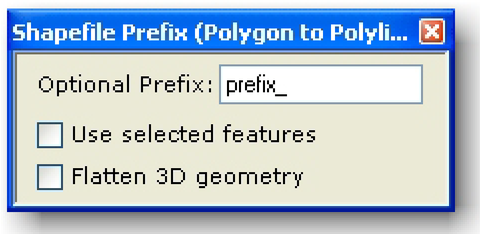


Figure 3 – Polygon to Polyline Tool

3.5 Polyline to Polygon Tool

Click this button to use the polyline to polygon tool. To use this tool, click on a polyline feature in a polyline layer. This polyline feature will be converted to a polygon shape file. The new polygon shape file is then added to your map. The new polygon shape file has a default file name prefix. You may substitute your own shape file prefix name by using the dialog shown in Figure 4. If the "Use selected features" box is checked, first click on any feature in the desired layer. All of the selected features in that layer will be converted and added to a new polygon shape file. If the polyline layer is z-aware (3d) you can flatten the features that are converted to the new polygon shape file by checking the "Flatten 3D geometry" checkbox. This makes the new layer a 2D layer.

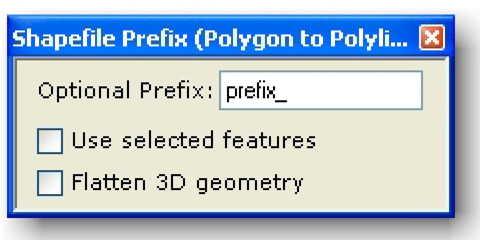


Figure 4 - Polyline to Polygon Tool

3.6 Map Projections

This list is a customized list of map projections that you can add to or remove from. Items added to this list will appear on the map projections list seen on Figure 1 - DataViewer Toolbar. To add to this list select <Customize this list…> from the dropdown list to open the dialog seen in Figure 5. Selecting a projection from the list on the DataViewer toolbar shown in Figure 1 will set the active map's coordinate projection to this value. The data written to your projections list is saved in a file called "myprojections.xml". This file is stored in the eCoastal-Toolbox installation folder on your hard drive.

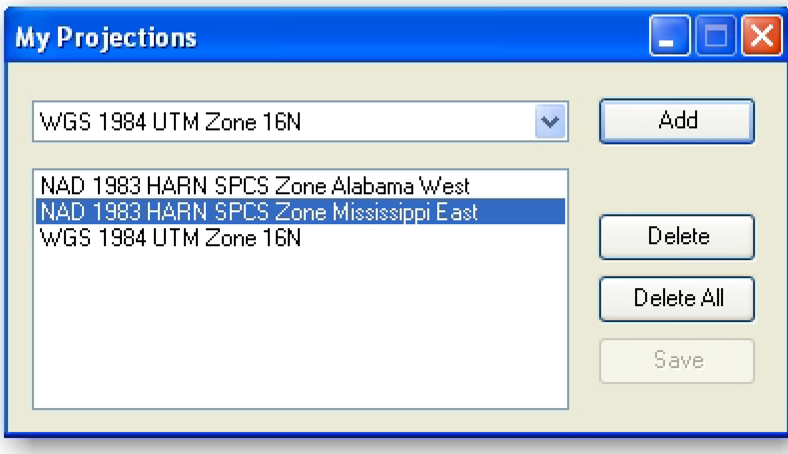


Figure 5 - My Projections

3.7 Datapicker Tool

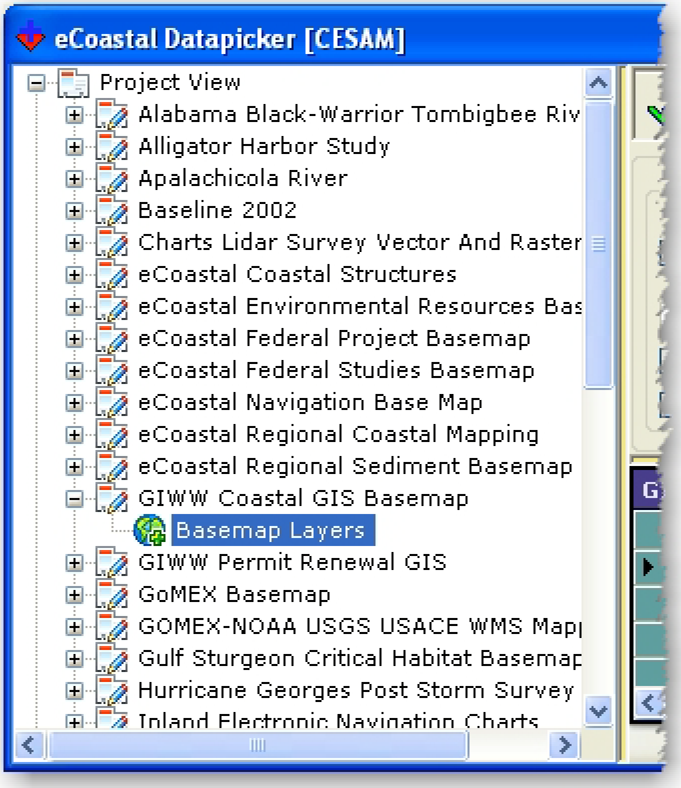


Figure 7 - Datapicker Project View

The Datapicker tool is a database driven tool that provides for easy loading of GIS data into your map. Information about each data layer is stored in the database. This information provides a pointer to a layer file, a special ESRI file format that contains specific data about where the layer's data source is and how the data is symbolized when it is loaded in the map. The Datapicker tool, shown here split into two pieces for clarity, provides several ways of accessing the indexed data references. Figure 7 - Datapicker Project View shows a "tree" view of the projects stored in the database. Every project seen under the Project View node will have two sub nodes. They are the ***Project*** node and the ***Basemap Layers*** node. When the Basemap Layers node is selected all of the project's base map layers are loaded into the grid display seen in Figure 6 - Datapicker Control Panel. All base map layers, when loaded in the grid display, are checked by default. If the Project node is selected all layers are loaded into the grid display but are initially unchecked.

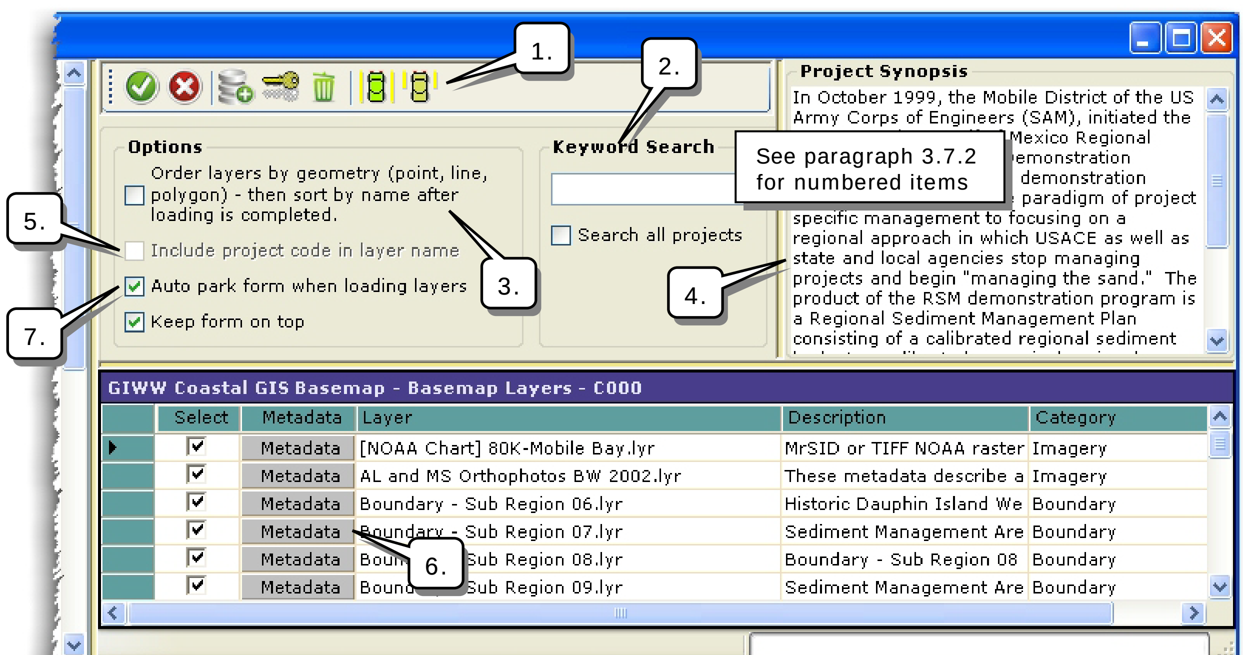
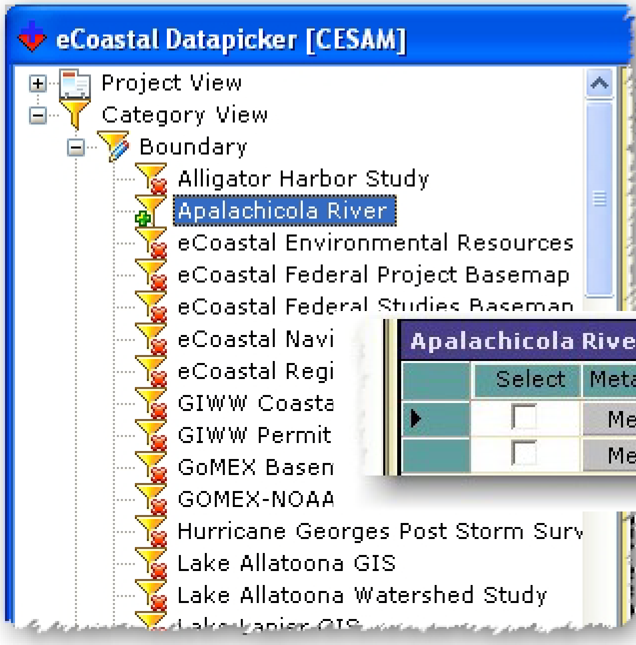


Figure 6 - Datapicker Control Panel

An alternative way to browse for data layers with the Datapicker tool would be to use the Category View seen in Figure 8 – Datapicker Category View. Under the ***Category View*** node are a number of categories, beneath which, are projects that would need to have at least one layer of a particular category in order to be seen under that category. The list of available categories is defined in Table 2. In this example we have selected the Boundary category and then the Apalachicola River project. We can see that this project has two layers that are defined as being in the boundary category. When the project node is selected the available layers are loaded into the grid display. At this point it is a matter of selecting the layer (applying the checkbox) and then loading the layers into your map.



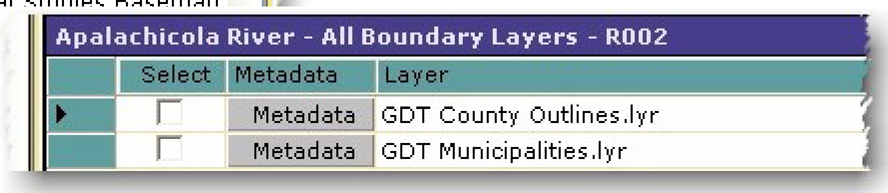


Figure 8 – Datapicker Category View

One useful way of using the category view is to select the Imagery node. This immediately provides a way of determining what projects have imagery that is available for loading.

Buildings	Ecology	Future Projects	Land Status	Soil
Cadastral	Environmental Hazards	General	Landform	Transportation
Climate	Erosion	Geodetic	Landmarks	Unassigned
Cultural	Fauna	Geology	Machinery	Utilities
Demographics	Flood Control	Hydrography	Navigation	Waterways Engineering
Dredging	Flora	Imagery	Outdoor Recreation	Wetland Area

Table 2 – Datapicker Categories

3.7.1 Administrative Functions

It is very important that the layer files that are built and placed on the server are the files that actually perform the loading and symbolizing of GIS data in ArcMap. The eCoastal database contains the indexes to these layer files, and as such, the contents of the database and the layer files referred to by the database must remain synchronized. This process of synchronization should be a matter of standard operating procedure. This operating procedure can be effectively implemented by the use the administrative tools provided under the node as shown in Figure 9 - Datapicker Administrative Node. Perhaps the most useful functions are the inventory commands that are accessible with a right mouse click. The ***Inventory Orphaned Layerfiles*** command when executed determines how many layer files are on the server and compares this to the number of layer files that have been indexed in the database. A partial result of the output of this is seen in Figure 10 – Orphaned Layer Display. Immediately following an inventory action an ***Inventory Report*** is available for printing. The results of the Inventory Orphaned Layerfiles command will tell you how many layer files you must enter into the database.

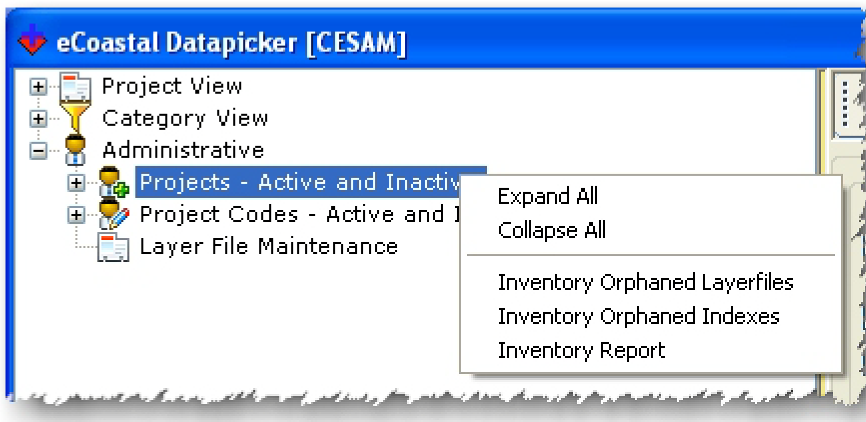


Figure 9 - Datapicker Administrative Node

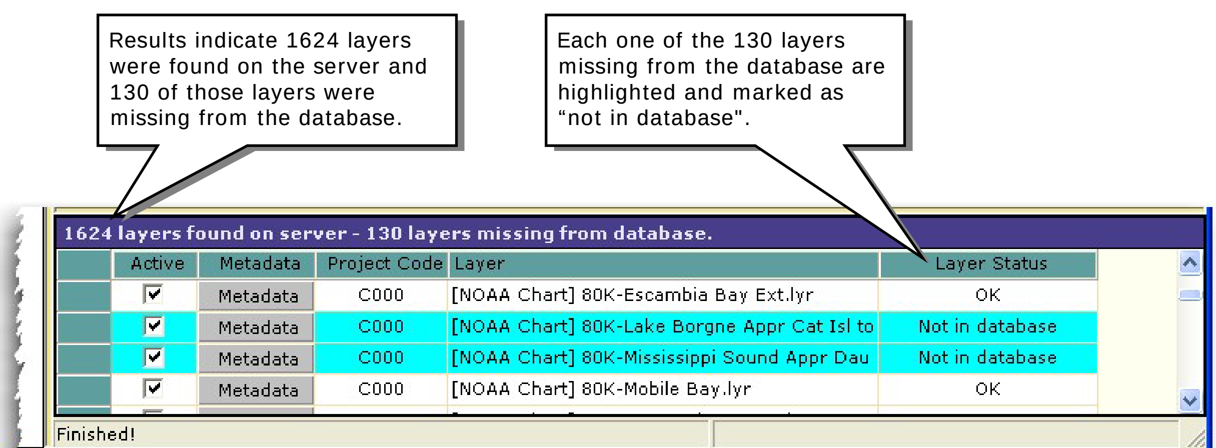
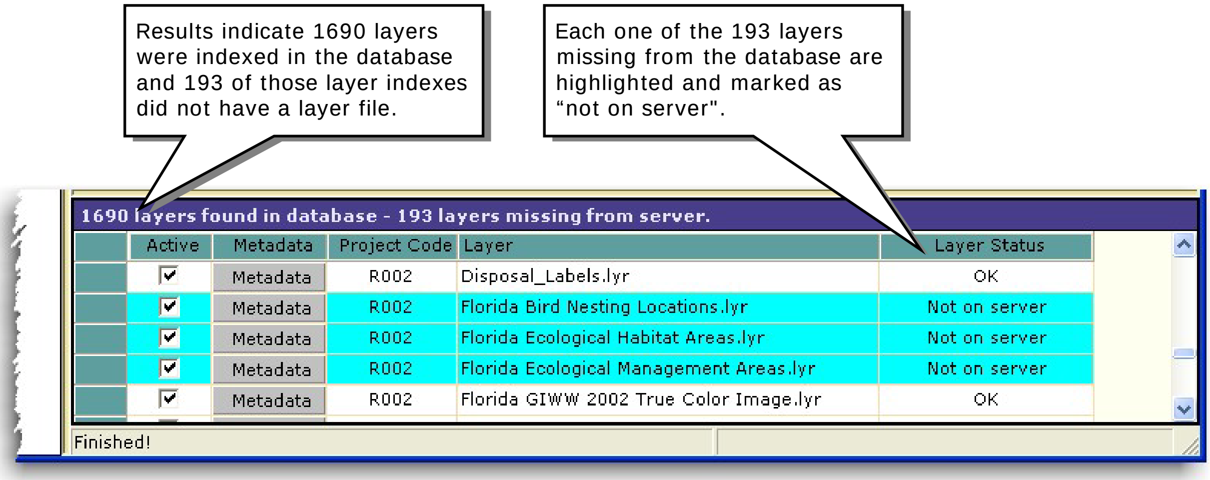


Figure 10 – Orphaned Layer Display

Similar to the Inventory Layer Layerfiles, the Inventory Layer Indexes command when executed determines how many layer indexes in the database do not have an accompanying



Active	Metadata	Project Code	Layer	Layer Status
☑	Metadata	R002	Disposal_Labels.lyr	OK
☑	Metadata	R002	Florida Bird Nesting Locations.lyr	Not on server
☑	Metadata	R002	Florida Ecological Habitat Areas.lyr	Not on server
☑	Metadata	R002	Florida Ecological Management Areas.lyr	Not on server
☑	Metadata	R002	Florida GIWW 2002 True Color Image.lyr	OK

Figure 11 – Orphaned Layer Indexes

layer file on the server. A partial result of the output of this is seen in Figure 11 – Orphaned Layer Indexes. Immediately following an inventory action an ***Inventory Report*** is available for printing. The results of the Inventory Orphaned Layerfiles command will tell you how many layer files you must build and place on the server.

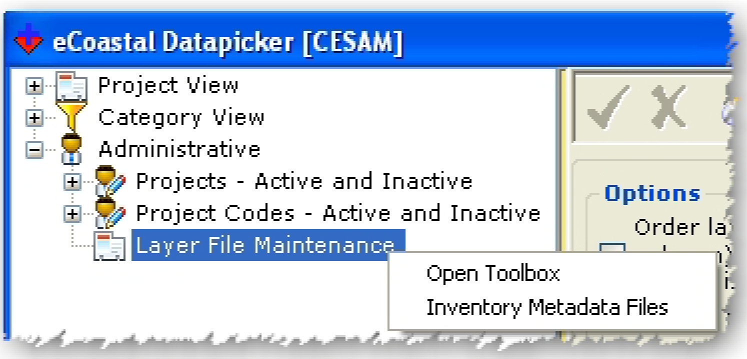
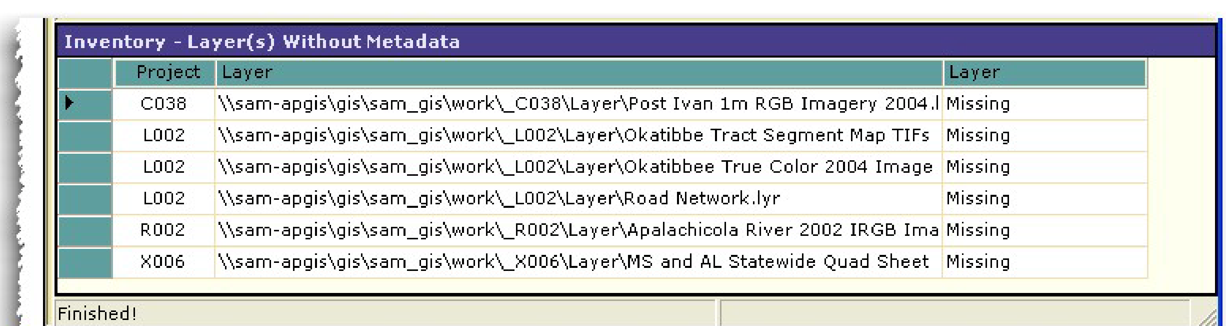


Figure 12 - Layer File Maintenance

In addition to maintaining synchronization between layer files and the database indexes the ***Inventory Metadata Files*** command determines which layer files do not have a matching metadata document. In the eCoastal schema the layer filename and the metadata document filename have the same name with only the extensions being different; i.e *.lyr vs. *.xml. Upon completing the metadata inventory any layer not having a matching metadata document is displayed as shown in Figure 13.



Project	Layer	Layer
C038	\\sam-apgis\gis\sam_gis\work_C038\Layer\Post Ivan 1m RGB Imagery 2004.l	Missing
L002	\\sam-apgis\gis\sam_gis\work_L002\Layer\Okatibbe Tract Segment Map TIFs	Missing
L002	\\sam-apgis\gis\sam_gis\work_L002\Layer\Okatibbee True Color 2004 Image	Missing
L002	\\sam-apgis\gis\sam_gis\work_L002\Layer\Road Network.lyr	Missing
R002	\\sam-apgis\gis\sam_gis\work_R002\Layer\Apalachicola River 2002 IRGB Ima	Missing
X006	\\sam-apgis\gis\sam_gis\work_X006\Layer\MS and AL Statewide Quad Sheet	Missing

Figure 13 - Layers without Metadata

The Open Toolbox menu item, when clicked, opens the Modify Layer files dialog. The layer file is a file that contains all the information required to find and load a GIS layer. The data source referenced in a layer file can be a file based data source, such as a shape file, or a feature layer stored in a geodatabase (SDE layer). If the data source is an SDE layer, the layer file also contains a set of properties, called connection properties, which are required for a database connection. This tool allows for these properties to be modified internally inside the layer file.

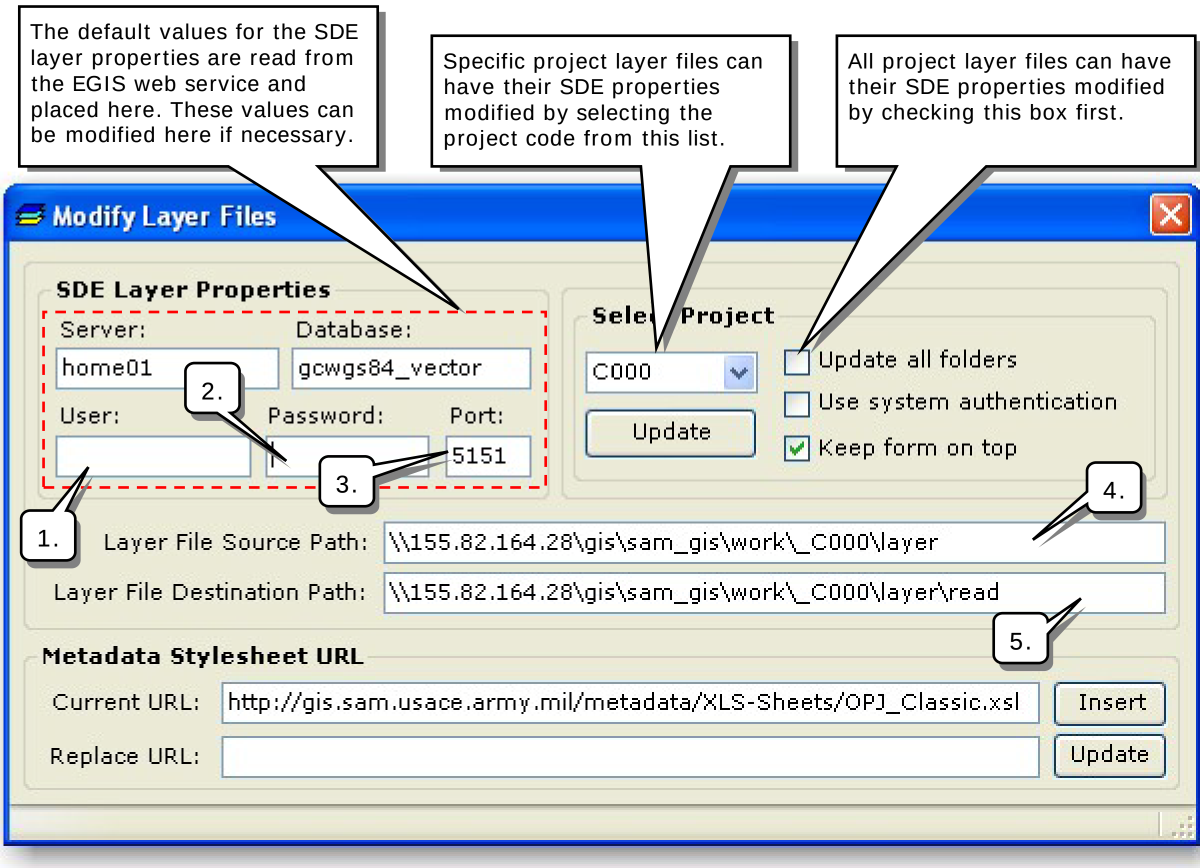


Figure 14 - Layer File Toolbox

1. This textbox holds the local database user account that is to be written into the modified layer files.

2. This textbox holds the local database user account password that is to be written into the modified layer files.

3. This textbox holds the SDE instance number that is written into the layer files.

4. This textbox holds the file path to the source layer files that are used to build the new replacement layer files holding the updated parameters. The default parameters that are used to initially populate this text box are read from the web.config file from the EGIS web service.

5. This textbox holds the destination file path for the new replacement layer files holding the updated parameters. The default parameters that are used to initially populate this text box are read from the web.config file from the EGIS web service.

6. Alternatively, the layer files can be modified to allow operating system authentication as the preferred method for connecting to an SDE database. Checking this box will build layer files that pass a user's network credentials into the SDE database.

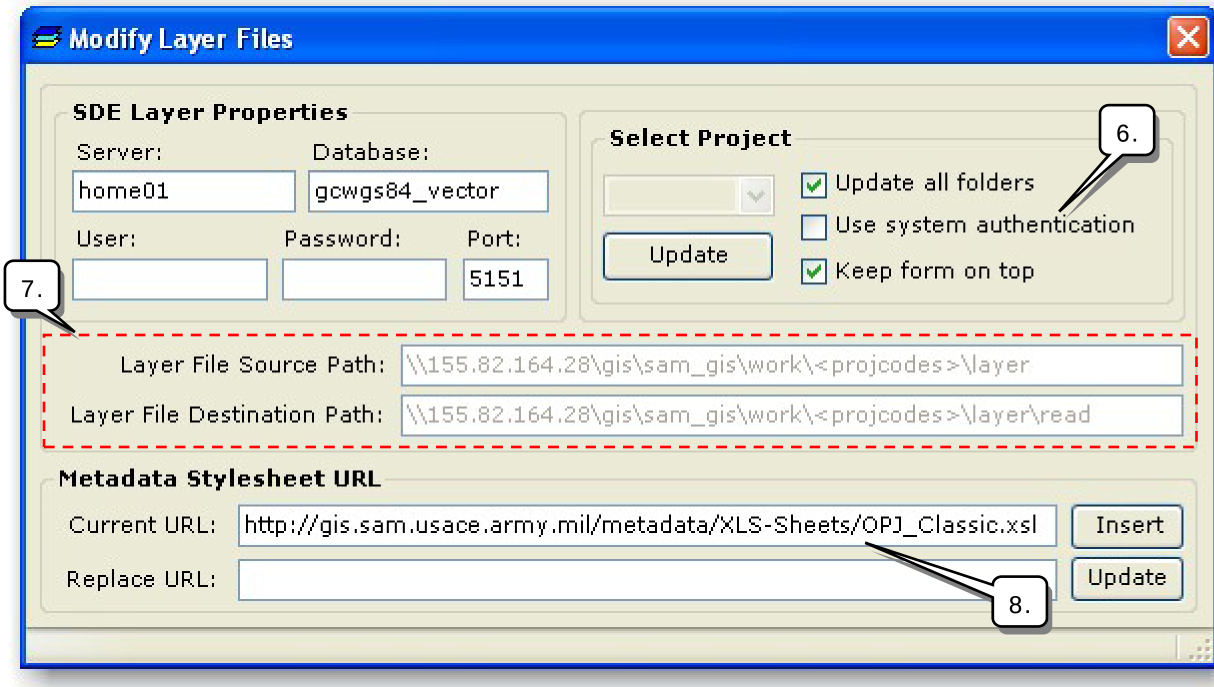


Figure 15 - Layer Toolbox

7. When the update all folders box is checked the layer file source path and layer file destination path properties are shown in their respective textboxes as seen in Figure 15.

8. The tool also provides the capability to insert a new style sheet URL or replace an existing style sheet URL with a new one in the metadata XML documents associated with each layer file. To insert a style sheet URL into metadata XML documents that haven't any, enter a value into the Current URL textbox as seen in Figure 15 - Layer Toolbox and click the Insert button. To update an existing style sheet URL already in your metadata XML documents enter the current URL being searched for in the Current URL textbox. Enter the replacement URL into the Replace URL textbox then click the Update button.

   The current style sheet URL and metadata document file locations are read from the web.config file from the EGIS web service.

3.7.2 Datapicker Control Panel Features

There are several key areas of the control panel and these are numbered in Figure 6 - Datapicker Control Panel.

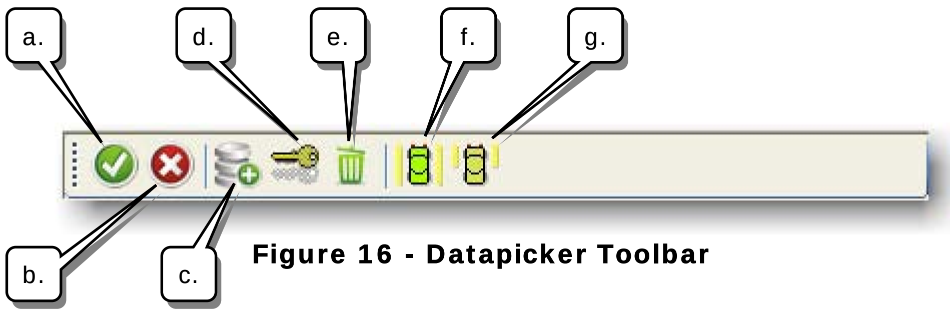


Figure 16 - Datapicker Toolbar

1. Datapicker Toolbar:

    a. Click this button to check all of the layers displayed in the layer grid.

    b. Click this button to uncheck all of the layers displayed in the layer grid.

    c. Click this button to load any checked layers into your map.

    d. Click this button to perform a keyword search. You may also just hit your enter key after typing in a keyword.

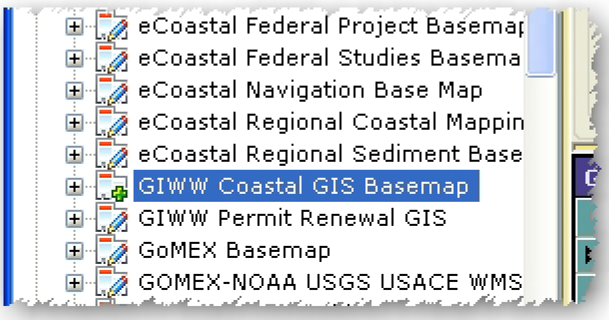
    e. Click this button to remove all layers from your table of contents in your active map.

    f. Click this button to park your Datapicker form. This resizes and parks the form in the upper left corner of your screen.

    g. Click this button to un-park your Datapicker form. This restores and repositions the form to its default size.

2. Keyword Search: A keyword search can be used to quickly find data layers. Although not seen by the user, a keyword column in the database holds one or more keywords that are searched using the keyword specified by the user. The results of a search are displayed in the layer grid as indicated. By default only the selected project is searched. If a search of all projects is desired the “Search All Projects”

Figure 17 - Keyword Search All Projects



checkbox must be checked. The result of searching all projects is seen in Figure 17. Layers are displayed in alphabetical order. The result of searching only the selected project is seen in Figure 18.

3. Layer Loading Order: Layers are loaded and sorted into the ArcMap table of contents in a couple of different ways. A base map layer load is designed to be

Figure 18 - Keyword Search Single Project

loaded with point layers at the top, followed by line layers, followed by polygons layers, then raster layers at the bottom. Within each geometry type the layer names are sorted alphanumerically. If all of the layers loaded, they are loaded in the order they are displayed in the grid. The order of loading, as previously described for base map layer loading, can be altered by checking the order layers checkbox marked by item 3 in Figure 6 - Datapicker Control Panel.

4. Project Synopsis: When a project is selected from the project view the project synopsis can be seen. This is a somewhat short description of the projects purpose.

5. Project Codes: Project codes are an internal system for categorizing and identifying projects in the Spatial Data Branch. They are a key part of OP-J data management practices, and as such, are an integral part of the Datapicker application. Typically this option is exercised by OP-J personnel and as such may be inconsequential to the average user.

Standard Project Code Categories			
C – Coastal	R – Riverine	G – Regulatory	N – Navigation
D – Dredging/Disposal	E – Real Estate	P – Permitting	T – Training
F – Flood Control	S – Study	I – Inlet	V – Environmental
L – Lake	M – Military	H – Harbor	X – Miscellaneous
Y – Emergency Mgt	U – Natural Resources	A – Applications	W – Technical Writing

Table 3 - Standard Project Code Categories

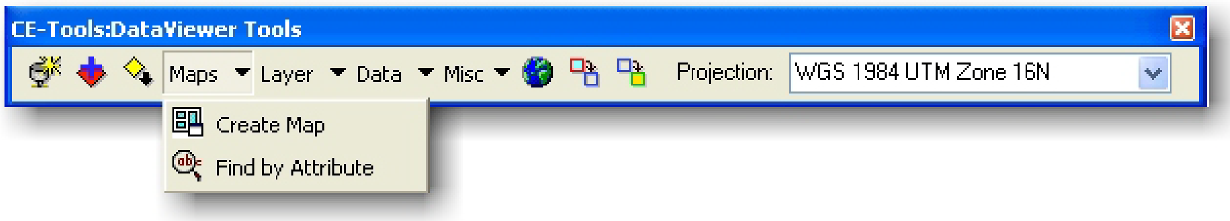
6. Metadata: Each layer displayed in the Datapicker grid has a metadata button, that when clicked, normally opens the FGDC compliant metadata record for that data layer. The metadata document is displayed in your web browser.

7. Check this box to “auto-park” the Datapicker form when loading data. This will minimize the footprint of the Datapicker by reducing its size, as shown Figure 19 - Parked Datapicker, and then will move the reduced form to the top left corner of your screen.

Figure 19 - Parked Datapicker

3.8 Map Tools

The map tools section of the Data Viewer toolbar has two dialogs the Create Map and the find by Attribute by Attribute dialogs.



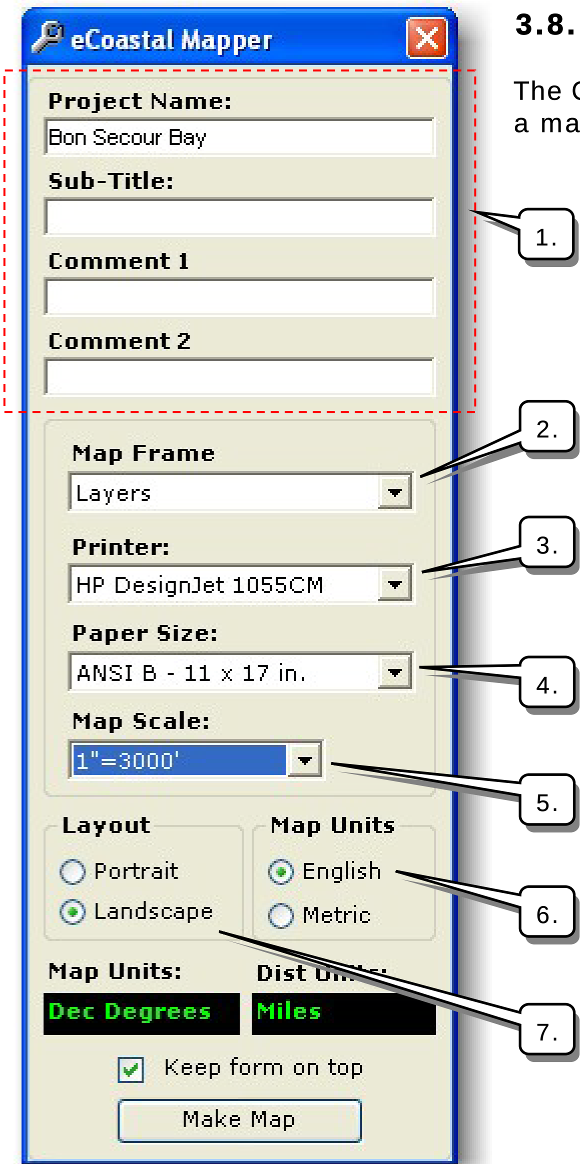


Figure 20 - eCoastal Mapper

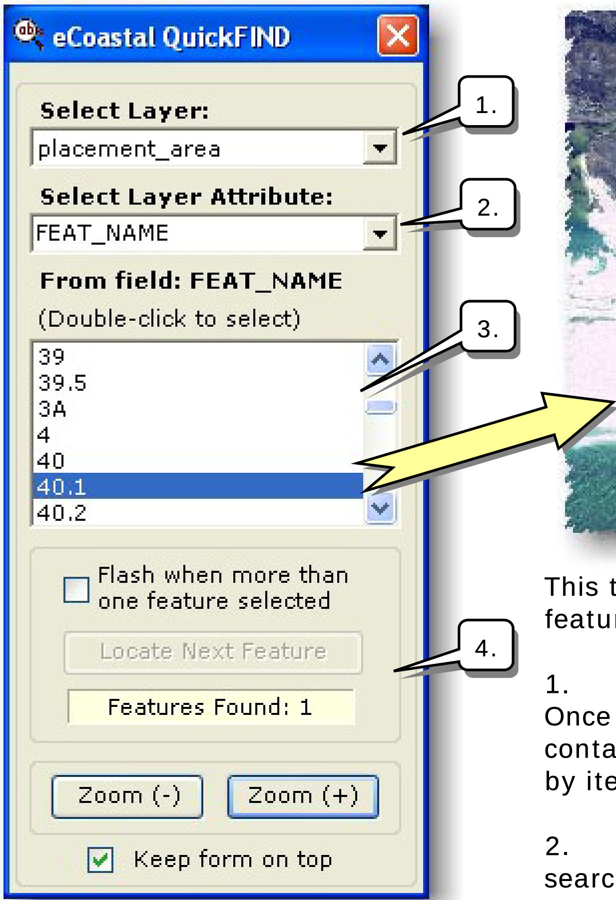
3.8.1 Create Map

The Create Map tool simplifies the process of building a map layout that is suitable for printing or plotting.

1. These four boxes are used to place information onto the title block area of the auto-generated map layout.
2. Select from this list the active map.
3. Select from this list the printer or plotter to be used.
4. Select from this list the paper size. Available paper sizes are dependent on the type of printer or plotter selected.
5. Select from this list the map scale for the map. The available map scales are dependent on the selected map units.
6. The linear map units. This determines what pre-determined map scales are available when changed.
7. The layout of the map.

Once the map layout is generated the map scale, map layout, and paper size can be changed while in the layout view from this dialog directly. This will dynamically update the layout.

3.8.2 Find by Attribute



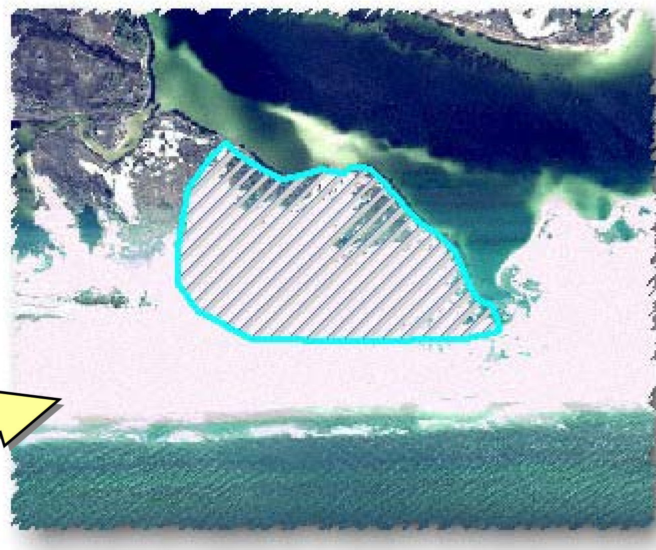


Figure 21 - Quick Find Tool

This tool simplifies the process of finding a map feature by using an attribute value.

1. Select from this list the layer to search with. Once a layer is selected, all of the field names contained that layer are written to the list marked by item 2.

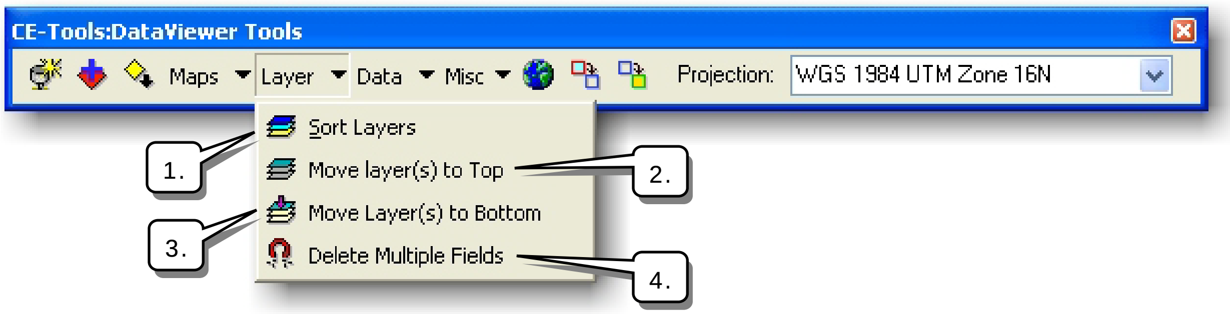
2. Select from this list the field name to be searched. When the field name is selected, the list box marked by item 3 is populated with all the values contained in this field.

3. Double click on any item in this list to locate to the features in your map with this value. As seen in the accompanying figure the feature is located in the map and then selected. If multiple items are found, the map will zoom to the extents of the selected features and select them.

4. Where more than one feature is found based on the selected value, the total number of features found is shown in the textbox shown here. To cycle through these features click the Locate Next Feature button shown here. To flash selected features check the checkbox shown here.

3.9 Layer Tools

This is a set of tools to manipulate layers in your table of contents.



1. Sort Layers: Select this to sort all layers alphanumerically.

2. Move Layer(s) to Top: Select any number of layers from your table of contents then click on this command. Those layers will be moved to the top.

3. Move Layer(s) to Bottom: Select any number of layers from your table of contents then click on this command. Those layers will be moved to the bottom.

4. Delete Multiple Fields: Click on this command to open the dialog box seen in Figure 22. Select a layer from the layer list and then select one or more fields as shown then click the delete button. If the selected layer is an SDE layer the user must have the required permission to delete the fields. Users not having the required level of access will not be able to delete the selected fields.

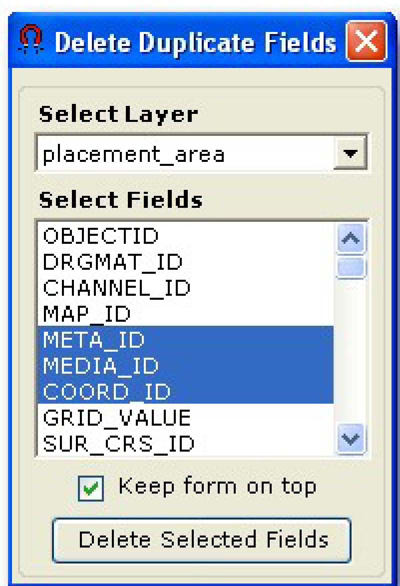
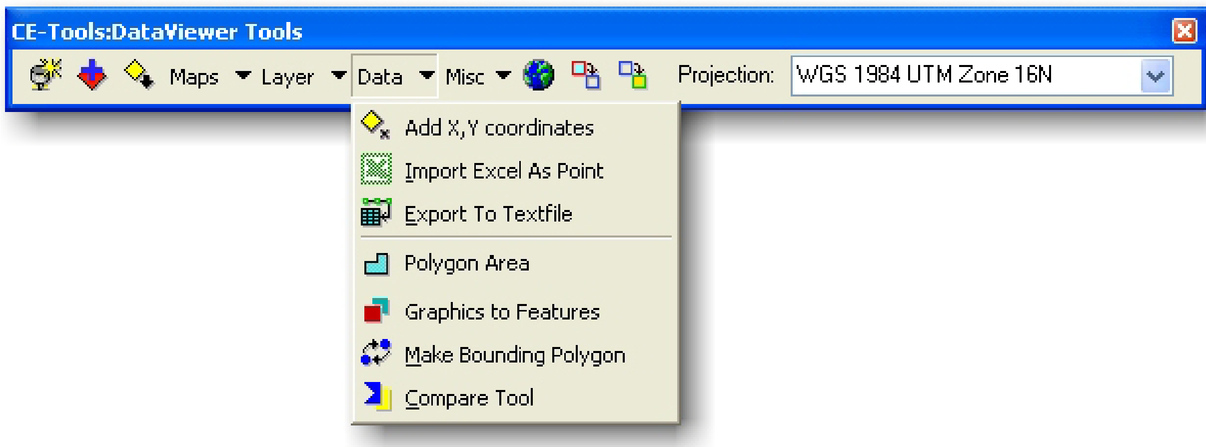


Figure 22 - Delete Duplicate Fields

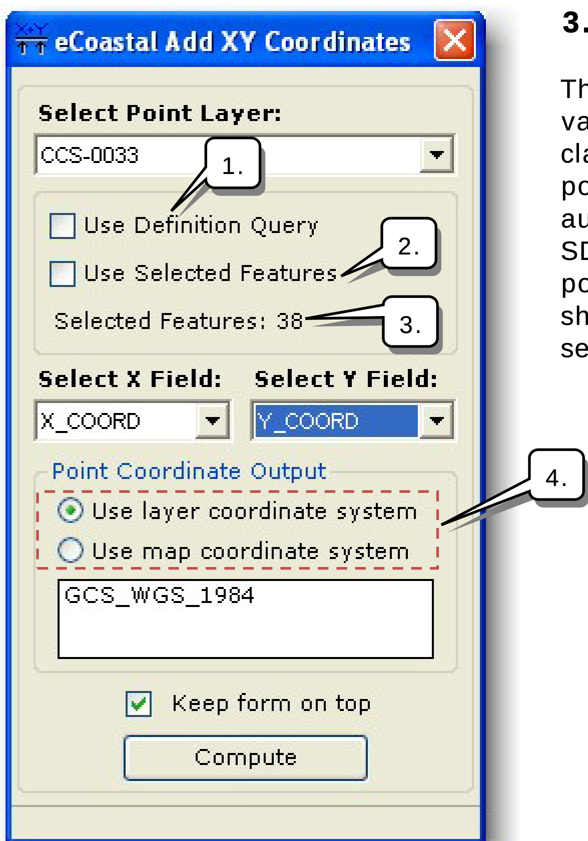
3.10 Data Tools

The data tools are a collection of applications that create or modify data, typically on features that already exists in your map.



3.10.1 Add XY Coordinates

This application will add the x and y coordinate values to the attribute table of a point feature class. The point layer list will contain a list of all point feature layers in the active map. Only users authorized to modify SDE feature layers will see SDE feature layers in this list. Otherwise only point shape files will be listed. In the example shown in the accompanying figure we have selected a layer that has both a defined definition



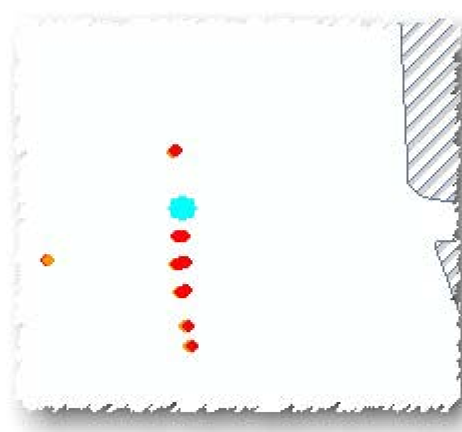


Figure 23 - Add XY Coordinates

query and selected features. If the boxes marked by item 1 and 2 are checked the application will calculate x and y values for these points only.

1. Check this box to honor the definition query of the selected layer. If the selected layer has not definition query this checkbox will be disabled.

2. Check this box to honor any selected features from the selected layer.

3. Select from these two lists the x and y fields that you wish to use to hold the x and y coordinate values. If they are left blank the application will add two fields, X_COORD and Y_COORD, and then use these fields to hold the x and y values.

4. Select from here the coordinate system you wish to use to calculate the x and y values. These two coordinate systems need not be the same. The textbox below the option buttons in Figure 23 will be the coordinate system of the option button clicked.

3.10.2 Imports Excel as Points

Open this application to import data from an Excel spreadsheet into ArcMap as a point shape file.

1. Click this button to open a spreadsheet.

2. Select from this list a worksheet from the spreadsheet.

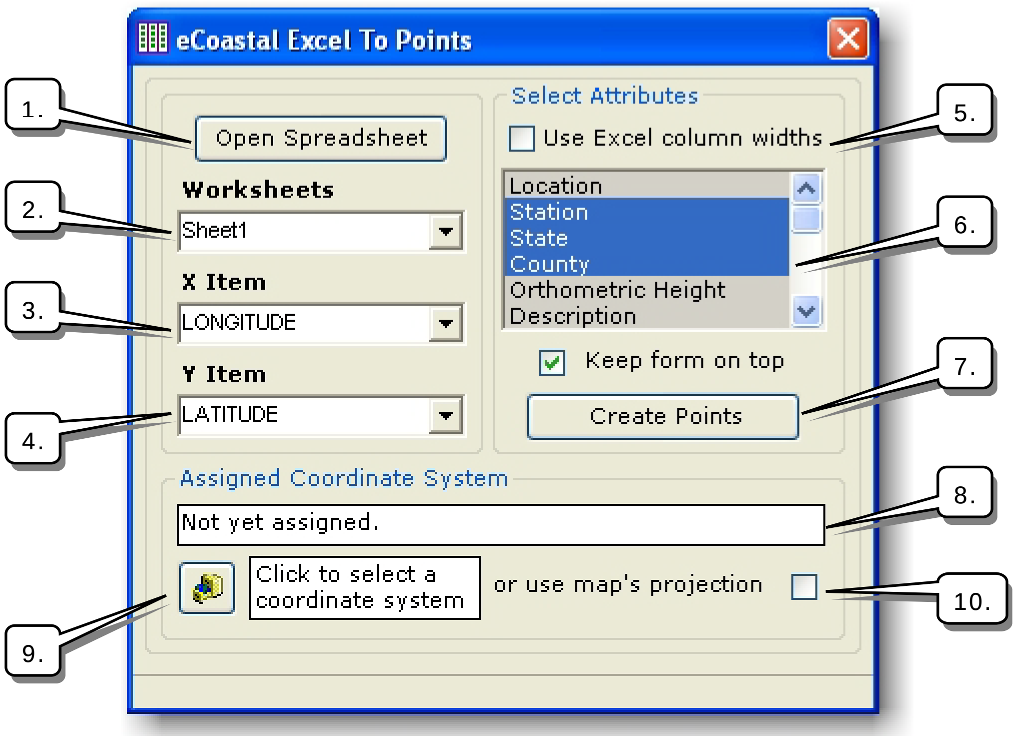


Figure 24 – Import Excel as Points

3. Select from this list a column from the worksheet that represents the x coordinate of the point.

4. Select from this list a column from the worksheet that represents the y coordinate of the point.

5. Check this box to use the worksheet column widths for the width of string fields in the shape file you are importing into. If left unchecked columns interpreted as string values will have a width of 50 characters in the shape file.

6. Select from this list Excel columns that you want to include in the attribute table of the shape file.

7. Click this button to create the shape file.

8. This textbox indicates the coordinate system that will be assigned to the shape file.

9. Click this button to open the Select Coordinate System dialog. The coordinate system selected will be the coordinate system used to build the shape file. This button will be disabled if the box marked in item 10 is checked.

10. Check this box to use the map's current coordinate system to build the shape file.

3.10.3 Export to Text File

This application will allow you to export points from different feature classes to a text file. Table 4 explains what is exported directly from the feature's geometry to the text file. In addition to these coordinates, additional attribute values can be exported at the same time. To do these select any of the attributes from the list marked by item 2 in Figure 26 - Options View.

Geometry	Output
Point	Exports the x and y coordinates of each point feature
Multipoint	Exports the x and y coordinates of each point feature
Polyline	Exports the x and y coordinate of each vertex for each polyline feature
Polygon	Exports the x and y coordinate of each vertex for each polygon feature

Table 4 - Export to Text File

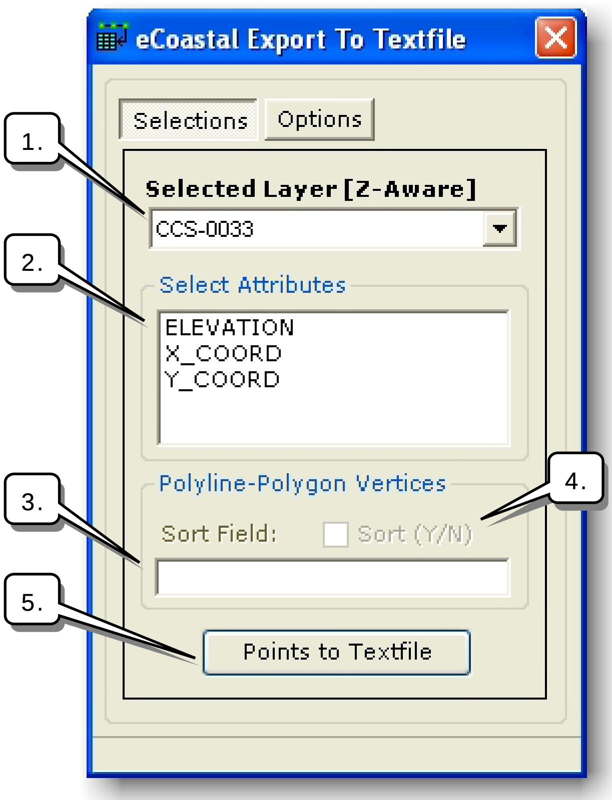


Figure 25 - Selections View

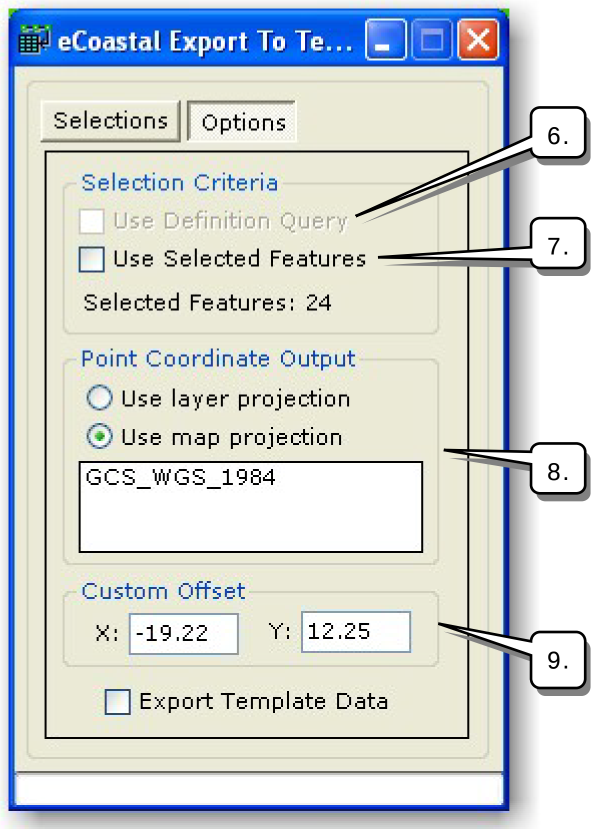


Figure 26 - Options View

1. Select from this list the feature class to export. If the feature class is z-aware the label above the list will say that and this is illustrated in Figure 25.

2. Select from this list box any additional attributes to export with the text file. If NO additional attributes are selected, the text file will contain what is specified in Table 4 - Export to Text File. For polygon or polyline feature layers, when additional attributes as selected from the list box, it may be desirable to sort these coordinates by a sort field. To select a sort field you must first select one or more items from the

list box. With your mouse cursor over any one of the selected items, right click and select Set Sort Field. This will place the field name in the textbox marked by item 3.

3. This is the optional sort field that is used when exporting points from a polyline or polygon feature class.

4. If this box is checked then the points will be sorted by the sort field you have selected.

5. If the selected feature layer is a point layer then this button will say Points to Text file.

6. Check this box to honor the definition query of the selected layer. If the selected layer has not definition query this checkbox will be disabled.

7. Check this box to honor any selected features from the selected layer.

8. Select from here the coordinate system you wish to use for the coordinates that are exported. These two coordinate systems may not be the same. The textbox below the option buttons in Figure 26 will be the coordinate system of the option button clicked.

9. For a feature layer with a projected coordinate system, you can adjust each exported x and y value by a fixed amount by specifying values here. The offset values are then added to each x and y point as they are exported.

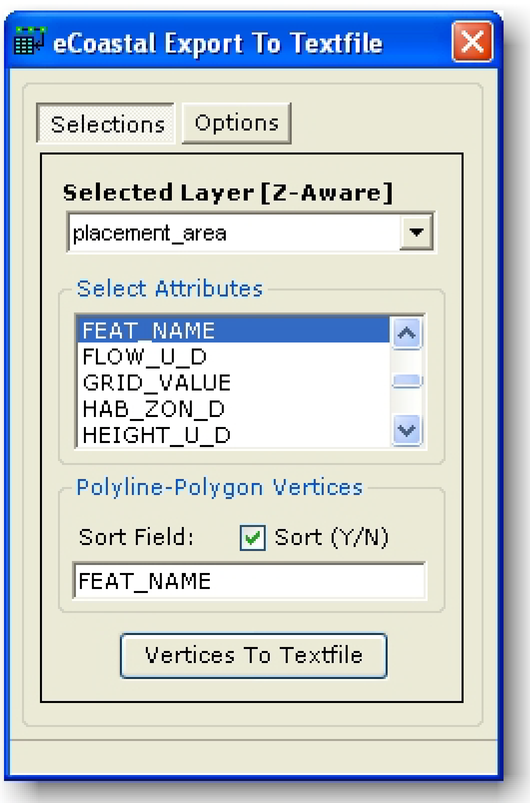
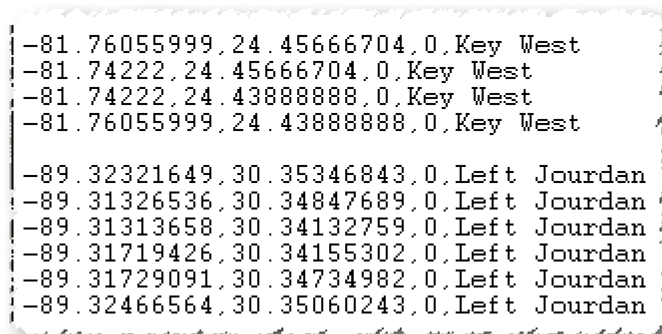


Figure 27 - Sorted Polygon Export to Text File



```
-81.76055999,24.45666704,0,Key West
-81.74222,24.45666704,0,Key West
-81.74222,24.43888888,0,Key West
-81.76055999,24.43888888,0,Key West

-89.32321649,30.35346843,0,Left Jourdan
-89.31326536,30.34847689,0,Left Jourdan
-89.31313658,30.34132759,0,Left Jourdan
-89.31719426,30.34155302,0,Left Jourdan
-89.31729091,30.34734982,0,Left Jourdan
-89.32466564,30.35060243,0,Left Jourdan
```

Figure 27 shows the export of vertices from a polygon feature layer. The additional attribute FEAT_NAME has been selected and designated as a sort field. A partial result of the exporting of this to a text file is seen in the accompanying figure. Each set of vertices for each individual polygon feature is group and sorted by the use of the sort option.

3.10.4 Polygon Area Tool

The polygon area tool computes area, perimeter, and centroid values of a polygon feature class. The tool is also capable of computing the values in the output units specified for a geographic projection. This is accomplished by determining what UTM zone a geographic feature is in and then projecting to that UTM zone to calculate the area and perimeter values. If the required fields do not exist in the attribute table they will be added. The area field will be as selected from the list marked by item 3 in Figure 28. The perimeter field will be PERIMETER, the x centroid will be X-CENTROID, and the y centroid will be Y-CENTROID. For an SDE feature layer a user would need the required permissions to both add the fields and also populate the values.

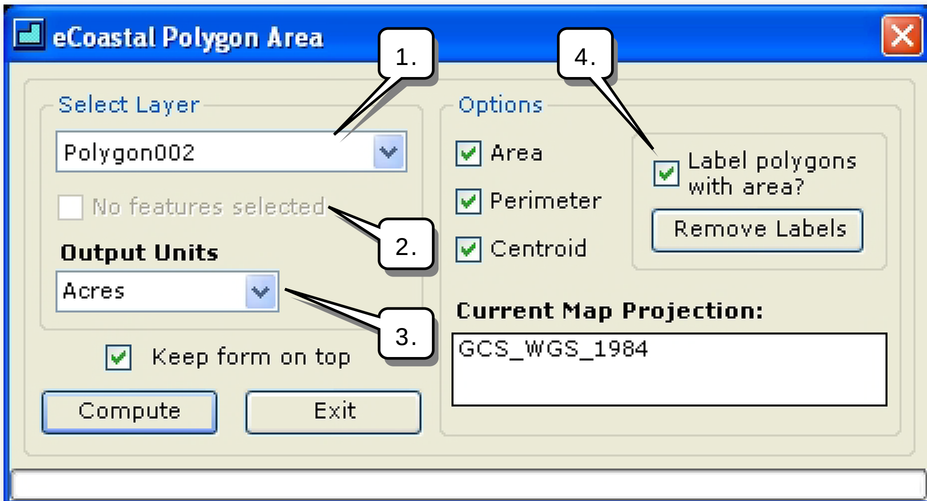
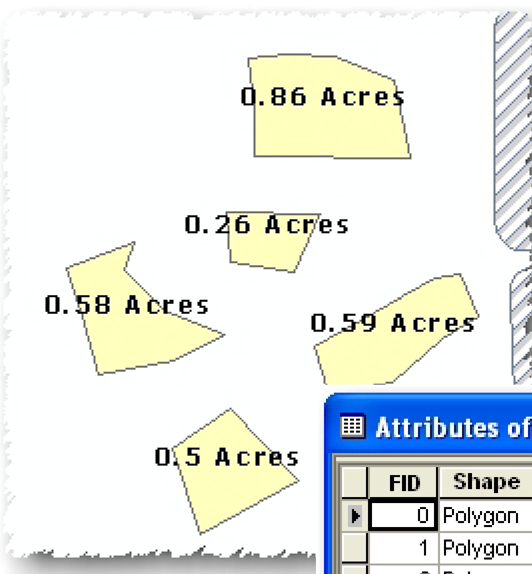


Figure 28 - Polygon Area Tool

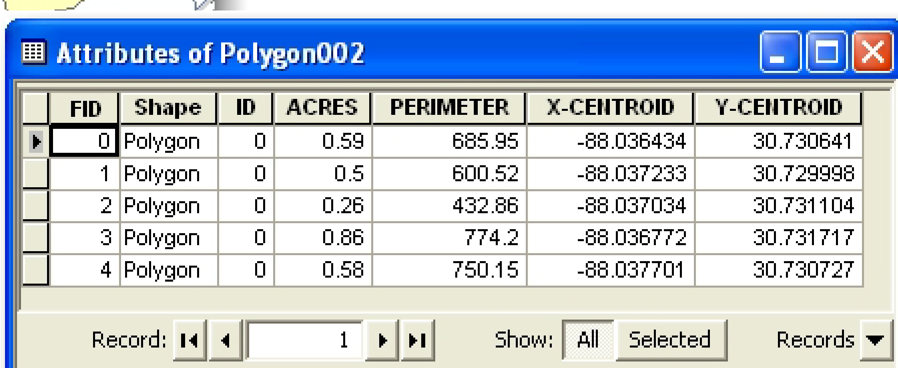


1. Select from this list the polygon feature layer.

2. Check this box to process selected features only.

3. Select from this list the output units for area.

4. Check this box to label each polygon with the area value. Labels are graphic text. Click the Remove Labels button to remove the graphic text at any time.



Attributes of Polygon002

FID	Shape	ID	ACRES	PERIMETER	X-CENTROID	Y-CENTROID
0	Polygon	0	0.59	685.95	-88.036434	30.730641
1	Polygon	0	0.5	600.52	-88.037233	30.729998
2	Polygon	0	0.26	432.86	-88.037034	30.731104
3	Polygon	0	0.86	774.2	-88.036772	30.731717
4	Polygon	0	0.58	750.15	-88.037701	30.730727

Record: 1 Show: All Selected Records

Figure 29 - Polygon Area Tool Attributes

3.10.5 Graphics to Shape File

This tool converts graphics into a shape file. Graphic polygons are converted to a polygon shape file, graphic polylines are converted to a polyline shape file, and graphics points are converted to a point shape file.

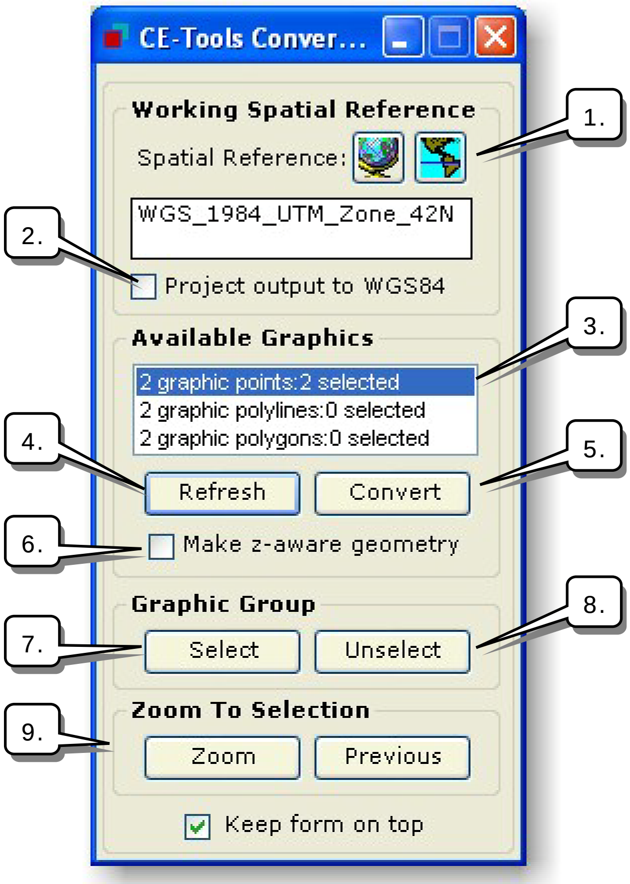
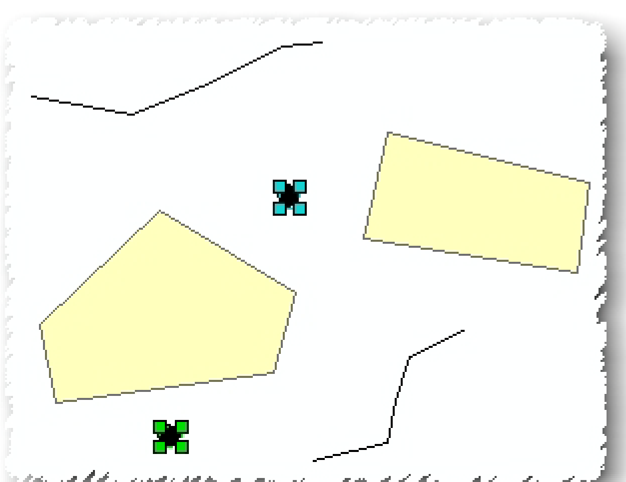


Figure 30 - Graphics to Shape File Tool



1. Set the working spatial reference for the shape file. Click the button on the left to choose a spatial coordinate system. Click the button on the right to select the current map coordinate system.

2. Check this box to project your shape file to WGS84 geographic coordinate system. Typically this is checked when you are working in a projected coordinate system and wish to create a WGS84 projection for the shape file.

3. This list provides a count of the total graphics in the active map and how many of those graphics are currently selected.

4. Click this button to refresh the graphics list.

5. Click this button to convert the selected graphic group to a shape file.

6. Check this box to covert the graphic to a z-aware (3D) shape file. The z-values are assigned an elevation of 0 by default.

7. Click this button to select a group of graphics in the map. You must first select a graphic group from the list of available graphics then click this button.

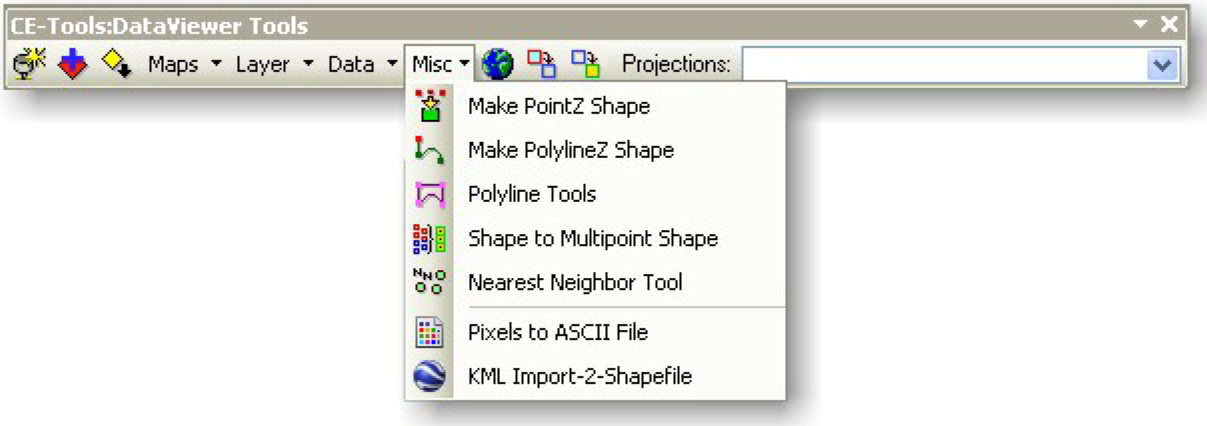
8. Click this button to unselect a group of graphics in the map. You must first select a graphic group from the list of available graphics.

9. Click these buttons to zoom to a selected group of graphics.

As shown in Figure 30 and the accompanying figure the two graphic points are selected. You may at your discretion add to or remove from the selected graphics with the ArcMap select tool.

3.11 Miscellaneous Tools

The miscellaneous tools are a collection of applications that create or modify data, typically on features that already exist in the map. The function of each tool is explained in detail hereinafter.



3.11.1 Make PointZ Shape File

This tool reads and then converts an ASCII text file into a z-aware point shape file. A z-aware shape file is a 3D feature class.

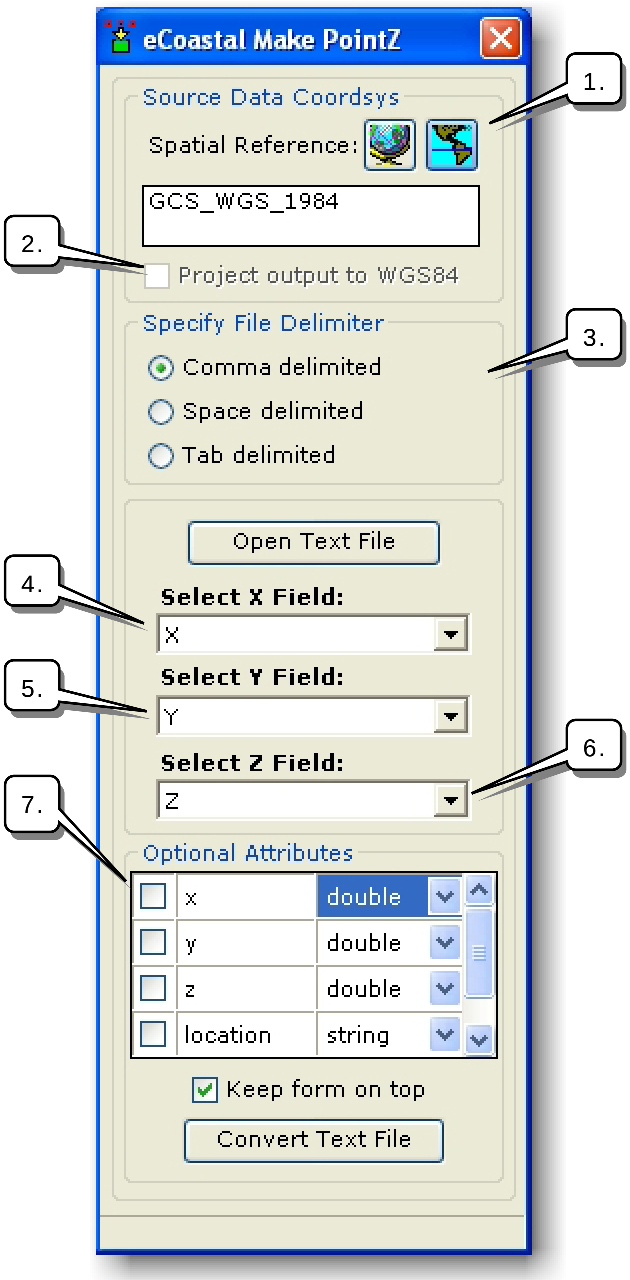


Figure 31 - Make PointZ Shape File

1. Set the working spatial reference for the shape file. Click the button on the left to choose a spatial coordinate system. Click the button on the right to select the active map's coordinate system.

2. Check this box to project your shape file to WGS84 geographic coordinate system. Typically this is checked when you are working in a map with a projected coordinate system, such as state plane feet, and wish to create the shape file with a WGS84 (lat/long) projection assigned to it.

3. Select from one of the option buttons the type of file delimiter that separates the values in the ASCII text file used to build the shape file.

4. Select from this list the item that represents the X coordinate value.

5. Select from this list the item that represents the Y coordinate value.

6. Select from this list the item that represents the Z coordinate value.

7. Select from this list any additional columns to include in the attribute table of the shape file.

3.11.2 Make PolylineZ Shape File

This tool reads and then converts an ASCII text file into a z-aware polyline shape file. A z-aware shape file is a 3D feature class. The polyline when built, will have its' vertices ordered in the same order the x and y values are read from the ASCII text file.

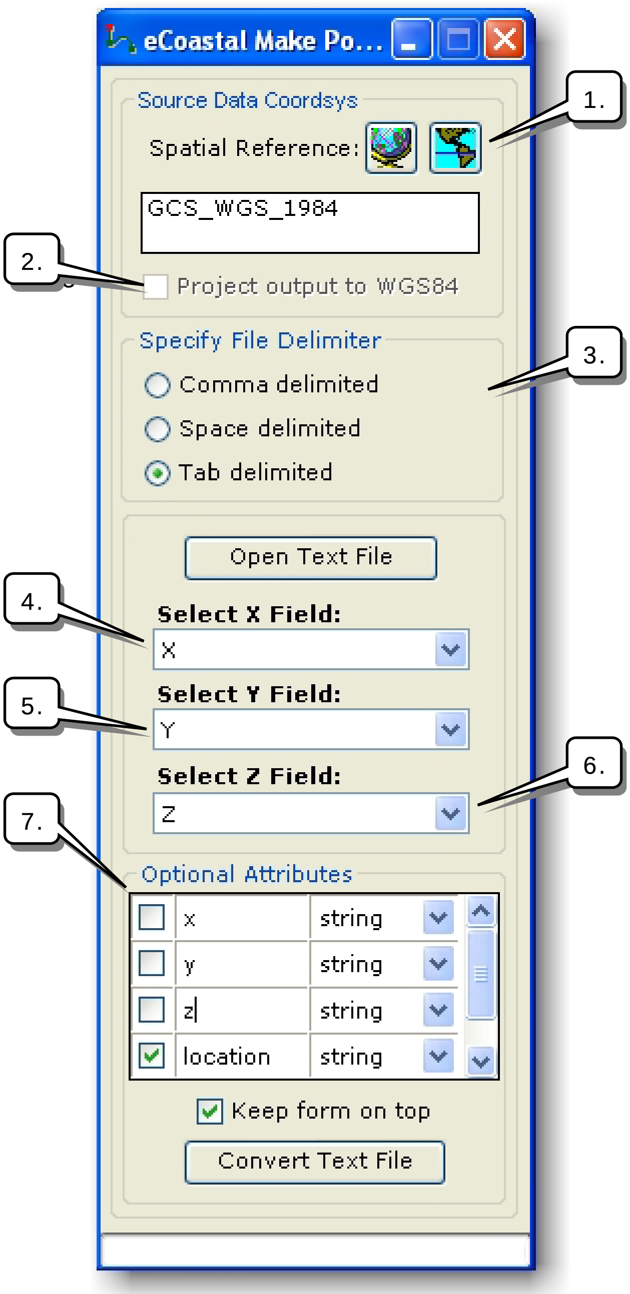


Figure 32 - Make PolylineZ Shape File

1. Set the working spatial reference for the shape file. Click the button on the left to choose a spatial coordinate system. Click the button on the right to select the active map's coordinate system.

2. Check this box to project your shape file WGS84 geographic coordinate system. Typically this is checked when you are working in a map with a projected coordinate system, such as state plane feet, and wish to create the shape file with a WGS84 (lat/long) projection assigned to it.

3. Select from one of the option buttons the type of file delimiter that separates the values in the ASCII text file used to build the shape file.

4. Select from this list the item that represents the X coordinate value.

5. Select from this list the item that represents the Y coordinate value.

6. Select from this list the item that represents the Z coordinate value.

7. Select from this list any additional columns to include in the attribute table of the shape file.

3.11.3 Polyline Tools

The polyline tools are a collection of tools that modify polylines in a shape file or create new features from existing features.

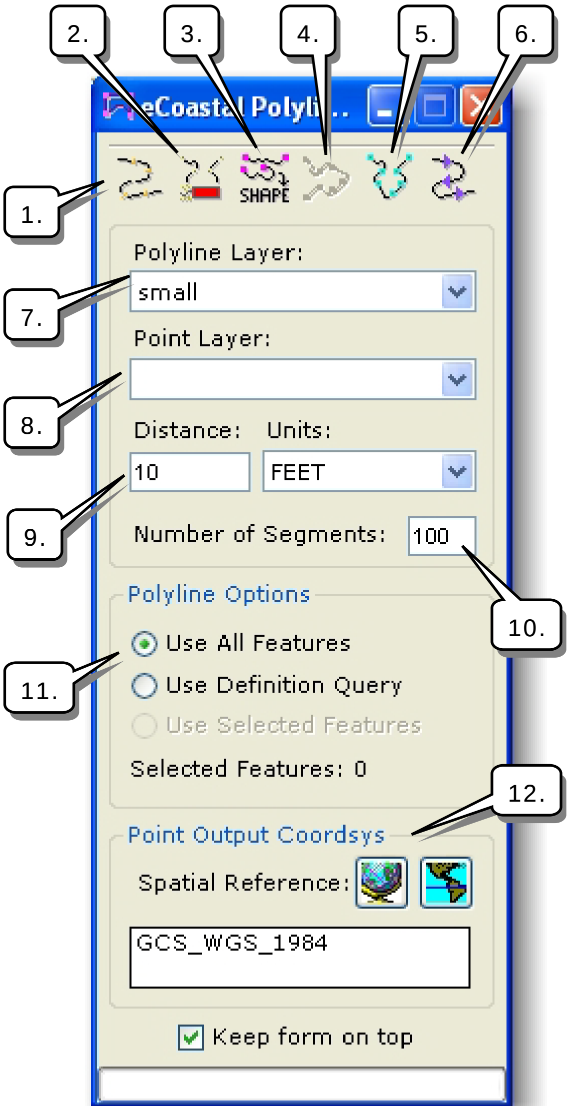


Figure 33 - Polyline Tools

1. Click this button to divide a polyline into equally sized segments.

2. Click this button to “explode” a polyline into its smallest individual pieces. This is done at the vertices of each polyline in the selected shape file. Potentially a time-consuming operation given the number of vertices often involved in this operation.

3. Click this button to export all endpoint coordinates of all polylines in a shape file to a new point shape file.

4. Click this tool to split all polylines in the selected shape file into smaller segments by using a point shape file.

5. Click this tool to create a new point shape file by using a polyline shape file. Points are created along each polyline at a user-specified distance.

6. Click this button to show the “flow” direction of all segments of all polylines in the selected polyline shape file.

7. Select from this list the polyline shape file for any required operation.

8. Select from this list the point shape file required for any operation.

9. Enter here the required spacing when creating points along a polyline. Select from the adjacent list the linear units required for the spacing.

10. Enter here the number of segments needed when dividing a polyline into equally sized segments.

11. Use these options when selecting the polylines to process with any of the tools.

12. Set the working spatial reference for the shape file. Click the button on the left to choose a spatial coordinate system. Click the button on the right to select the active map’s coordinate system.

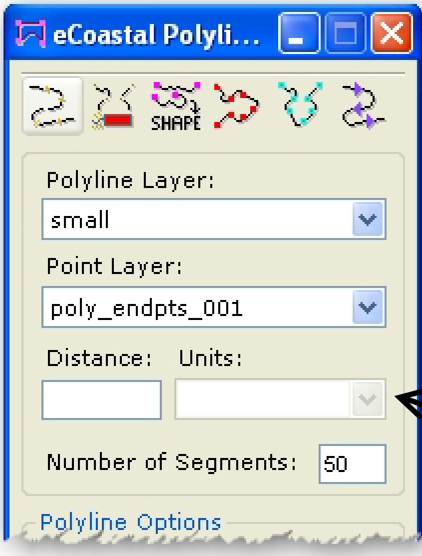
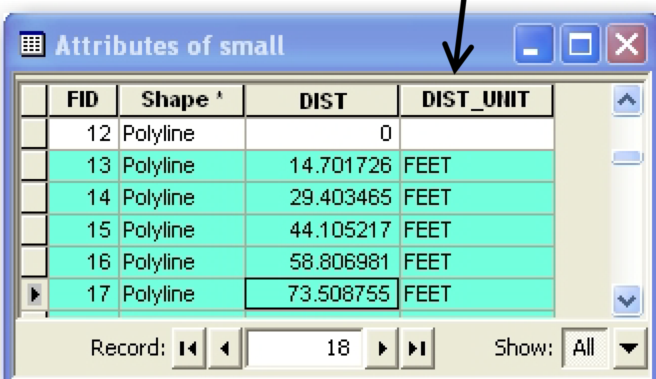


Figure 34 - Divide to Segments

3.11.3.1 Divide Polyline to Segments

Use this tool to divide a polyline into equally sized segments. In this example we have selected a polyline from the feature class and have elected to segment only the selected feature seen below. Specify the number of desired segments as shown in Figure 34. We have chosen to divide this polyline into 50 equally sized segments. The result of this operation is the addition of 50 new polyline features added to the shape file. As seen in Figure 35 the operation has added a "DIST" and "DIST_UNIT" column to the attribute table. The distance unit is set from the Units list seen in Figure 34 and the distance values shown in the DIST column are calculated in these units. It should be noted that the new polylines are appended to the bottom of the attribute table.



FID	Shape *	DIST	DIST_UNIT
12	Polyline	0	
13	Polyline	14.701726	FEET
14	Polyline	29.403465	FEET
15	Polyline	44.105217	FEET
16	Polyline	58.806981	FEET
17	Polyline	73.508755	FEET

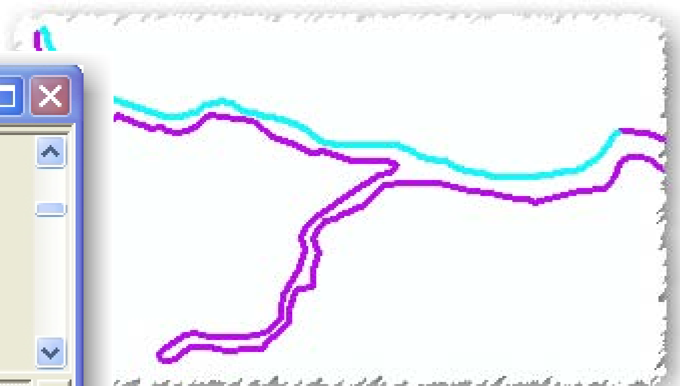
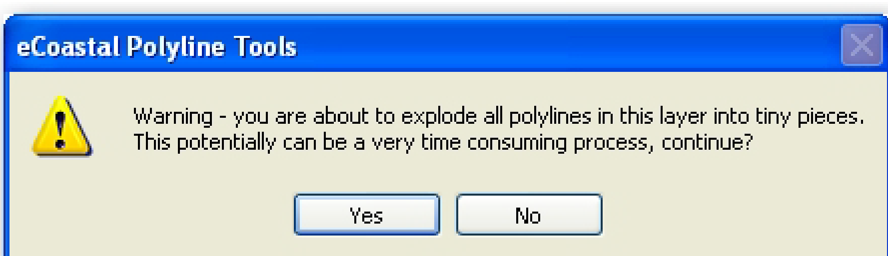


Figure 35 - Attribute Table Segments

3.11.3.2 Explode Polyline

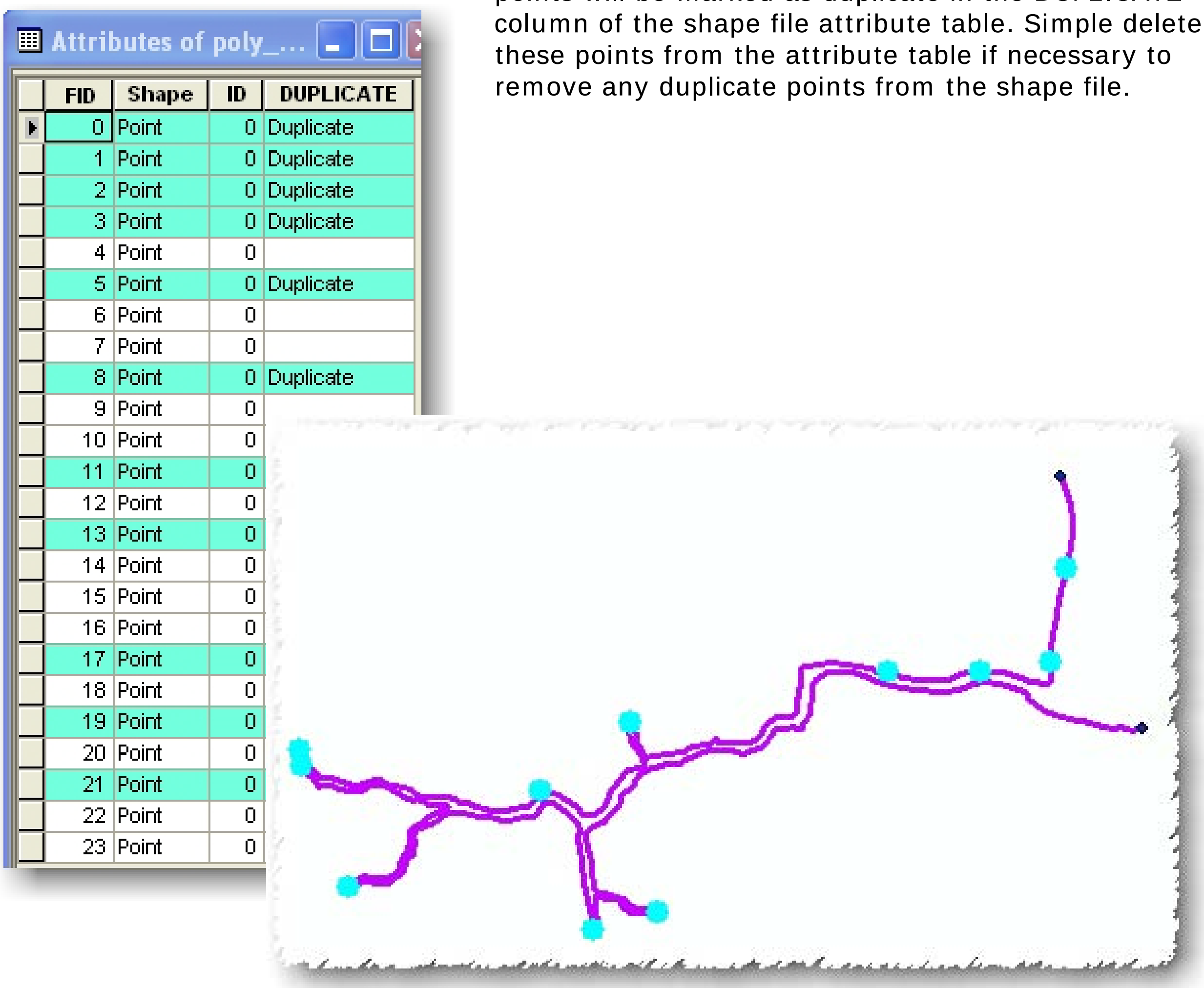
Click this button to explode the selected polyline layer into its smallest constituent pieces.



This is done by breaking each polyline at each vertex in the polyline. This tool honors any of the polyline options discussed in paragraph 3.11.3 Polyline Tools.

3.11.3.3 Polyline Endpoints to Shape File

When creating a point shape file from the polyline endpoints each polyline segment is examined for its starting and ending points. Given the fact that these segments are connected many duplicate points are naturally created. As seen in Figure 36 duplicate points will be marked as duplicate in the DUPLICATE column of the shape file attribute table. Simple delete these points from the attribute table if necessary to remove any duplicate points from the shape file.



FID	Shape	ID	DUPLICATE
0	Point	0	Duplicate
1	Point	0	Duplicate
2	Point	0	Duplicate
3	Point	0	Duplicate
4	Point	0	
5	Point	0	Duplicate
6	Point	0	
7	Point	0	
8	Point	0	Duplicate
9	Point	0	
10	Point	0	
11	Point	0	
12	Point	0	
13	Point	0	
14	Point	0	
15	Point	0	
16	Point	0	
17	Point	0	
18	Point	0	
19	Point	0	
20	Point	0	
21	Point	0	
22	Point	0	
23	Point	0	

Figure 36 - Polyline Endpoint Attributes

3.11.3.4 Split Polyline by Points

This tool uses a point shape file to split the polylines of a polyline shape file. To use simply select the required polyline and point layer and click the required button on the toolbar. Upon completion of the operation the eCoastal Messenger will inform you of the number of new polylines that are created. All existing attributes of the polyline being split are copied to all the new polylines.

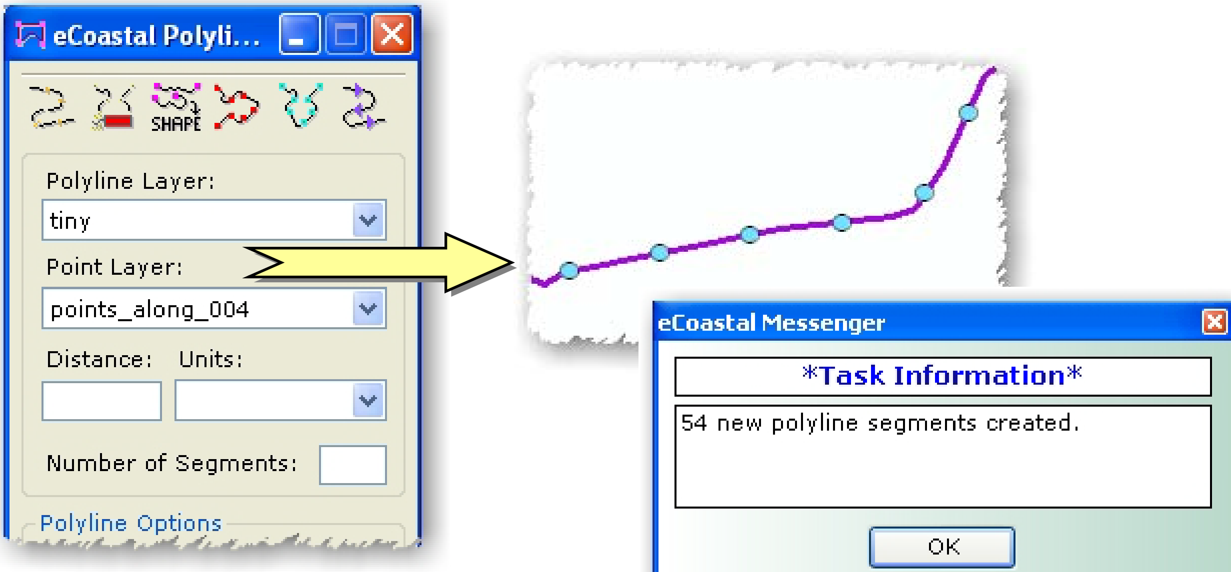
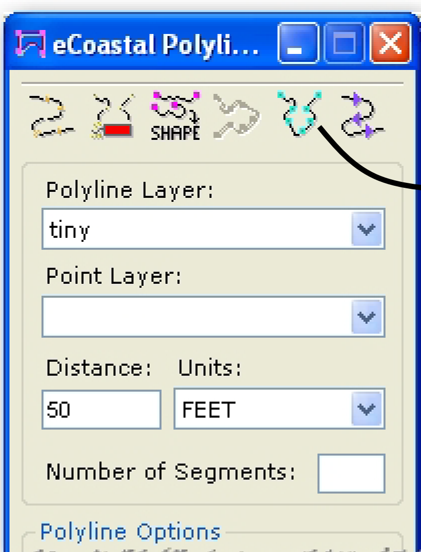
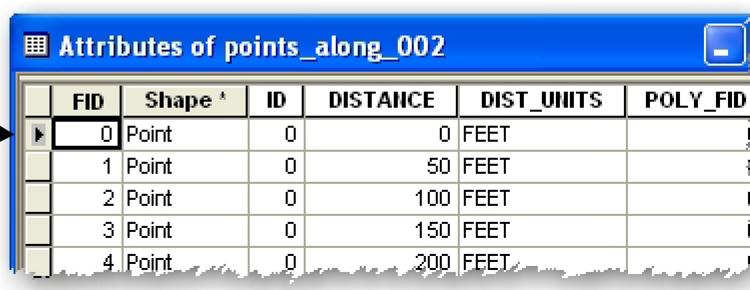


Figure 37 - Split by Points

3.11.3.5 Create Points along Polyline

This tool creates a new point shape file along a polyline shape file using a distance. To use simply select a polyline shape file from the list, specify the distance between the points and the distance units then click the required button on the toolbar. As seen in Figure 38 a DISTANCE and DIST_UNITS column are added to the "points_along" attribute table. The columns are populated based on the specified criteria




Attributes of points_along_002

FID	Shape *	ID	DISTANCE	DIST_UNITS	POLY_FID
0	Point	0	0	FEET	
1	Point	0	50	FEET	
2	Point	0	100	FEET	
3	Point	0	150	FEET	
4	Point	0	200	FEET	

Figure 38 - Points along Attributes

seen in the adjacent dialog box. All points are equidistant in spacing with the possible exception of the last point which can be less than required spacing.

3.11.4 Shape to Multipoint Shape Tool

Features that are composed of more than one point are called multipoint features and are often used to manage arrays of very large point collections such as LiDAR point clusters which can contain literally billions of points. Using a single row for such point geometry is not feasible. Clustering these into multipoint rows makes these datasets more manageable.

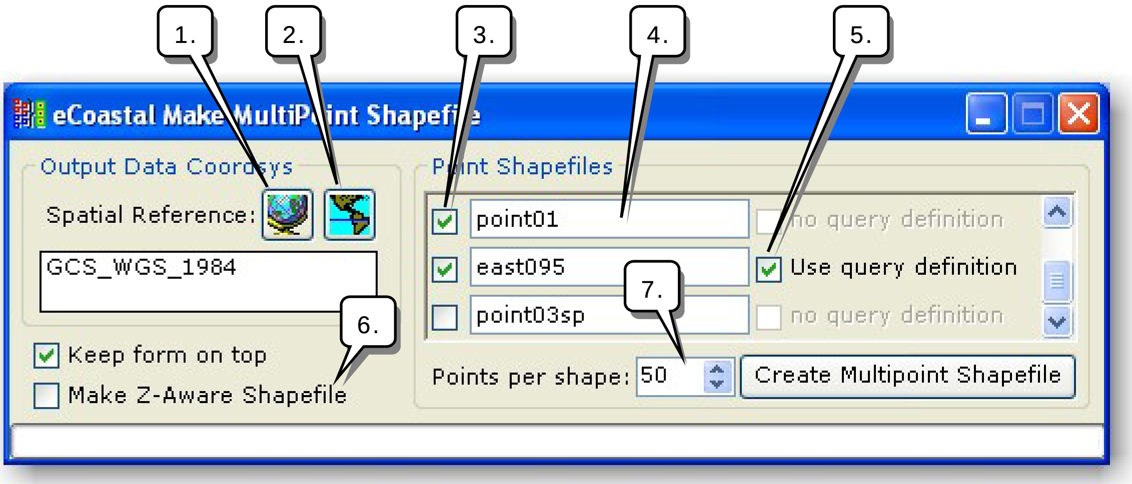


Figure 39 – Shape to Multipoint Shape Dialog

This tool is designed to take a number of point or z-aware point shape files and combine them together into a single multipoint shape file. The resulting multipoint shape file can be either a point or z-aware point shape file depending on how the processing was done.

1. Click this button to open the ArcGIS New Spatial Reference dialog. This will allow you to assign a projection to the multipoint shape file that is to be built.

2. Click this button to use the spatial projection that is currently assigned to the active map when building the multipoint shape file.

3. Click any checkbox to select a point shape file for processing. With the mouse cursor over any checkbox, right-clicking the mouse button will show a context menu that will allow you to select all layers or unselect all layers.

4. This textbox shows the name of the layer.

5. If any layer has an existing query definition, selecting this checkbox will honor the layer's query definition when processing the points in the layer.

6. Check this box to make the resulting multipoint shape file z-aware. This requires that all selected layers are also pointZ layers (z-aware). When this box is checked, any layer already selected as denoted by the green check as seen in Figure 39, will be unchecked and disabled if it is not z-aware.

7. Set the number of points per row when the multipoint shape file is built. The counter increments at the rate of 5 points per click up to a maximum of 5000 points per row.

3.11.5 Nearest Neighbor Tool

The nearest neighbor tool is used to calculate the nearest point to every point contained in a point feature layer and provide the resulting average distance between points as a final result.

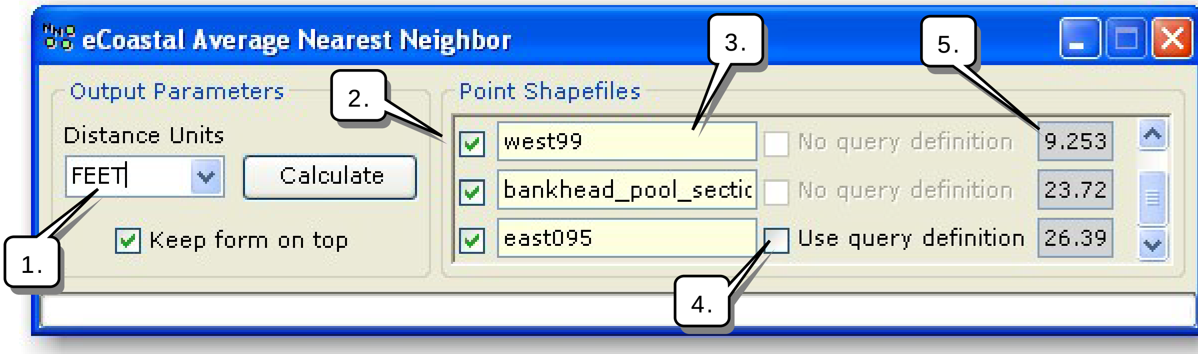


Figure 41 - Nearest Neighbor Tool Dialog

1. Select from this list the distance units that will be applied when the nearest neighbor statistics are calculated.

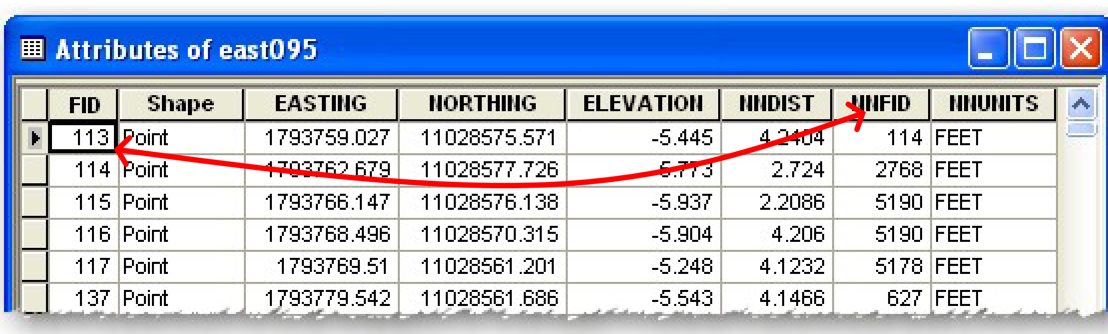
2. Check any checkbox to select a point shape file for processing. With the mouse cursor over any checkbox, right-clicking the mouse button will show a context menu that will allow you to select all layers or unselect all layers.

3. This textbox shows the name of the layer.

4. If any layer has an existing query definition, selecting this checkbox will honor the layer's query definition when processing the points in the layer.

5. This textbox shows the average point spacing in the units selected from the Distance Units list.

The nearest neighbor tool when applied against a selected point feature layer adds fields to the attribute table as shown by the three right most columns in Figure 40. Column NNDIST is the distance between a point and its nearest neighbor. Column NNFID is the FID of the points nearest neighbor. Column NNUNITS is the distance unit of measurement selected at processing time. As shown in Figure 40 the point with a FID of 113 nearest neighbor is the point with the FID of 114 and this point are 4.24 feet away.



Attributes of east095

FID	Shape	EASTING	NORTHING	ELEVATION	NNDIST	NNFID	NNUNITS
113	Point	1793759.027	11028575.571	-5.445	4.2404	114	FEET
114	Point	1793762.679	11028577.726	-5.773	2.724	2768	FEET
115	Point	1793766.147	11028576.138	-5.937	2.2086	5190	FEET
116	Point	1793768.496	11028570.315	-5.904	4.206	5190	FEET
117	Point	1793769.51	11028561.201	-5.248	4.1232	5178	FEET
137	Point	1793779.542	11028561.686	-5.543	4.1466	627	FEET

Figure 40 - Nearest Neighbor Attributes

3.11.6 Pixels to ASCII File Tool

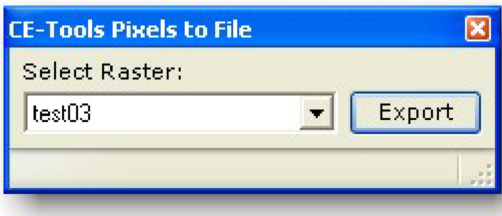


Figure 42 - Pixels to ASCII Dialog

The pixels to ASCII file tool permits you to select a raster dataset and export the raster pixel values to a formatted ASCII text file. The tool supports single and multi-band raster datasets. The format of the ASCII file is seen in Figure 43. Some important concepts to be aware of with regard to the output are enumerated below.

1. Band: Represents a raster band stored in the raster dataset.

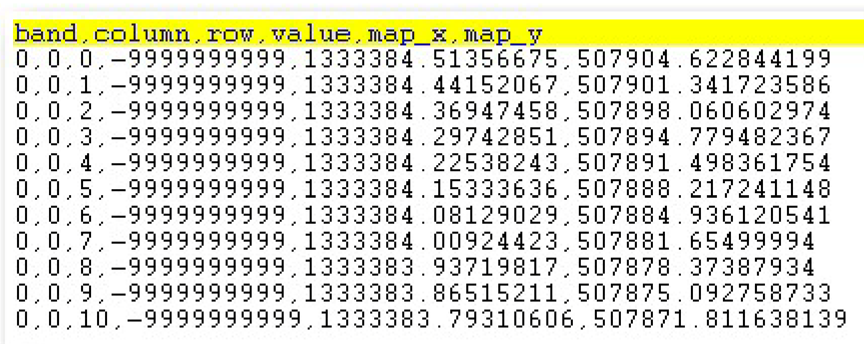
2. Column: The pixel column location.

3. Row: The pixel row location.

4. Value: The pixel value for the associated row, column location.

5. Map_X: The x-coordinate for the associated row, column location.

6. Map_Y: The y-coordinate for the associated row, column location.



```
band,column,row,value,map_x,map_y
0,0,0,-9999999999,1333384.51356675,507904.622844199
0,0,1,-9999999999,1333384.44152067,507901.341723586
0,0,2,-9999999999,1333384.36947458,507898.060602974
0,0,3,-9999999999,1333384.29742851,507894.779482367
0,0,4,-9999999999,1333384.22538243,507891.498361754
0,0,5,-9999999999,1333384.15333636,507888.217241148
0,0,6,-9999999999,1333384.08129029,507884.936120541
0,0,7,-9999999999,1333384.00924423,507881.65499994
0,0,8,-9999999999,1333383.93719817,507878.37387934
0,0,9,-9999999999,1333383.86515211,507875.092758733
0,0,10,-9999999999,1333383.79310606,507871.811638139
```

Figure 43 - Pixels to ASCII File Format

The columns and rows begin counting at the lower-left corner of the raster extents and continue up then over. Values indicating a value of -9999999999 are pixels that contain no data (null values). The pixel coordinate values are in the coordinate system of the map projection the raster dataset has been loaded into. The raster datasets may have a coordinate system that is different than that of the map. The output ASCII file is in a format that will allow you to create an event theme in ArcMap then convert the event theme to a point shape file. Optionally you could also use the Make PointZ Shape File Tool described in paragraph 3.11.1 Make PointZ Shape File to build a 3D point shape file. The result of this can be seen in Figure 44. The raster no data area is over laid with the pink points. The points are located in the center of the pixel.

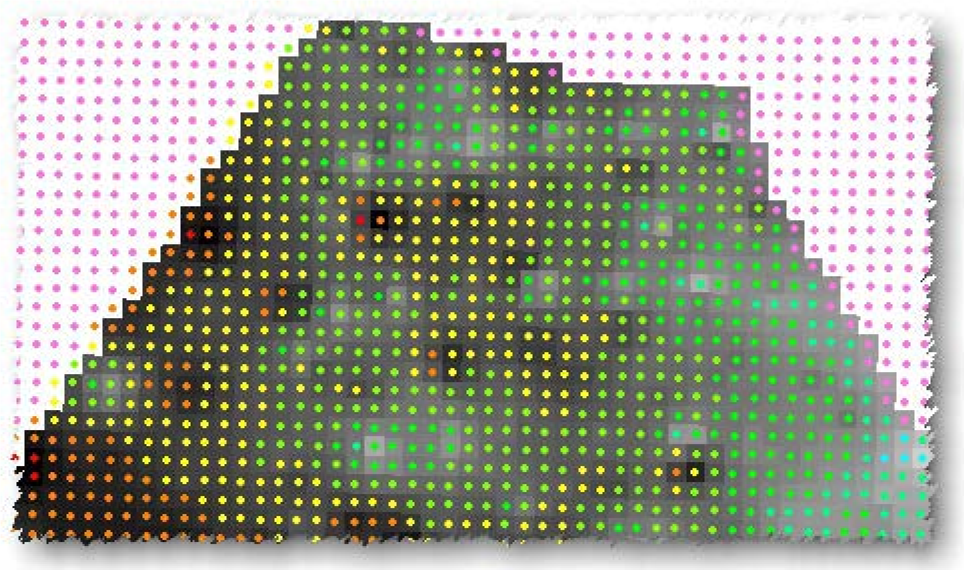


Figure 44 - Pixel Value Point Shape File

3.11.7 KML Import-2-Shape Tool

The KML import tool will read a KML file and build shape files, one for each set of point, polyline, and polygon data that is contained in the KML file. Select the all geometry option to build shape files for all point, polyline, and polygon data or select one of the geometry options to build a shape file only for that geometry type.

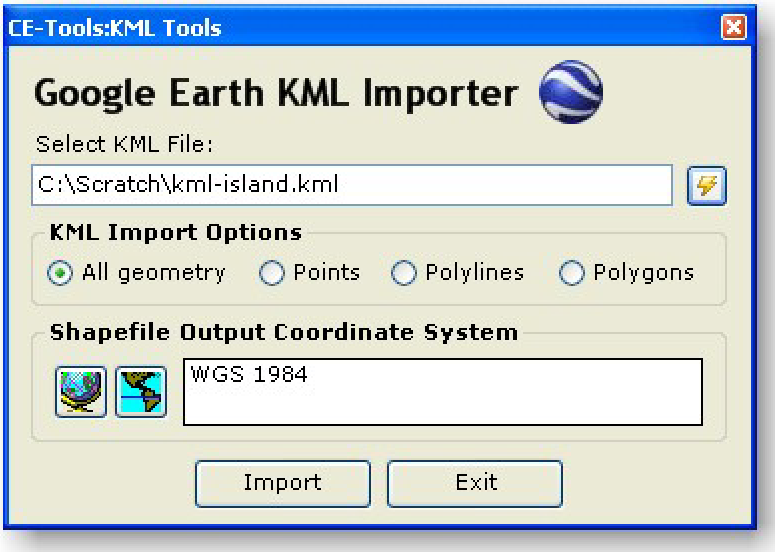


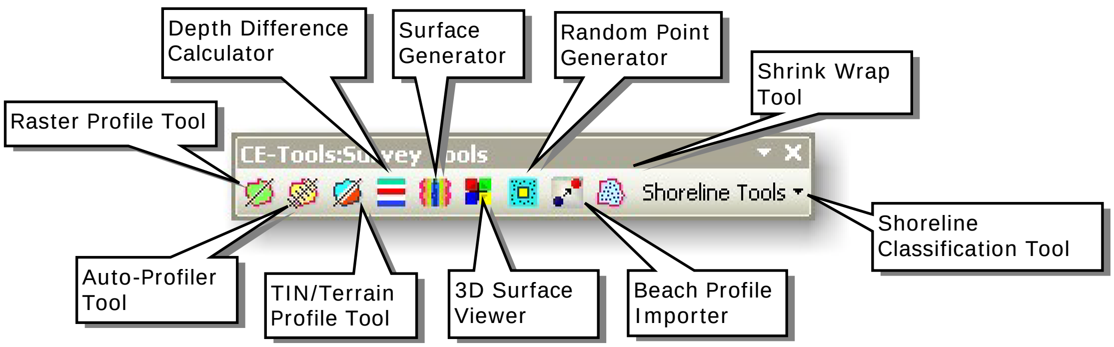
Figure 45 - KML Import Tool

4. Standard Survey Toolbar Functions

	Toolbar: eCoastal Survey Tools **Tool: Raster Profile Generator** Function: The raster profile generator allows you to cut profiles through one or more raster surfaces. This operation will result in one or more profile point shape files, one for each surface, that represent elevation values calculated along the transect line.		**Toolbar: eCoastal Survey Tools** **Tool: TIN/Terrain Profile Generator** Function: The TIN/Terrain profile generator allows you to cut profiles through one or more TIN or Terrain surfaces. This operation will result in one or more profile point shape files, one for each surface, that represent elevation values calculated along the transect line.
	Toolbar: eCoastal Survey Tools **Tool: Auto-Profiler Generator** Function: The auto-profiler generator allows you to create profiles through one or more raster surfaces using a centerline and stationing. The operation will result with one or more profile point shape files, one profile per station per surface that represents elevation values.		**Toolbar: eCoastal Survey Tools** **Tool: Depth Difference Calculator** Function: The depth difference calculator is a tool that provides you the ability to subtract one raster grid surface from another. The result of this operation is a new raster grid surface that represents the resultant difference in terms of the elevation units of the grid cells.
	Toolbar: eCoastal Survey Tools **Tool: Surface Generator** Function: The surface generator is a tool that provides the ability to generate a raster grid surface or a TIN surface from an input point feature layer. The Spatial and 3D Analyst extensions are required in order to use this tool.		**Toolbar: eCoastal Survey Tools** **Tool: 3D Surface Viewer** Function: Provides a viewer for inspecting 3D surface features.
	Toolbar: eCoastal Survey Tools **Tool: Beach Profile Importer** Function: This application is designed to read the Florida Department of Environmental Protection (FLDEP) profile format and create the beach profile as a shape file. Beach profile data is available for downloading from the FLDEP.		**Toolbar: eCoastal Survey Tools** **Tool: Random Point Generator** Function: The random point generator is a tool that provides the capability to create random points within specified criteria. The resulting random points created are used to automatically build a point shape file.
	Toolbar: eCoastal Survey Tools **Tool: Shrink Wrap Tool** Function: The shrink wrap tool is an application that synthesizes a data boundary from points that can be used to enforce a proper interpolation zone in the surface for other tools requiring an analysis mask.		**Toolbar: eCoastal Survey Tools** **Tool: Shoreline Classification Tool** Function: The shoreline classification tool is designed to attribute a shoreline shape file in accordance with the National Geodetic Survey's attribution scheme Coastal Cartographic Object Attribute Source Table (C-COAST).

5. Survey Tools

The survey tools are a collection of tools that allow for the design and analysis of raster grids, TIN surfaces, and the loading and analysis of hydrographic survey data. The tools require the use of the 3D Analyst and Spatial Analyst extensions for ArcMap.



5.1 Raster Profile Tool

The raster profile generator allows you to cut profiles through raster surfaces. This operation will result in one or more profile point shape files being built and added to your map. Allowable raster formats are ESRI GRID, TIFF, FGDBR, SDR, and IMAGINE IMAGE. Each point in the shape file represents a depth (or elevation) that was dynamically

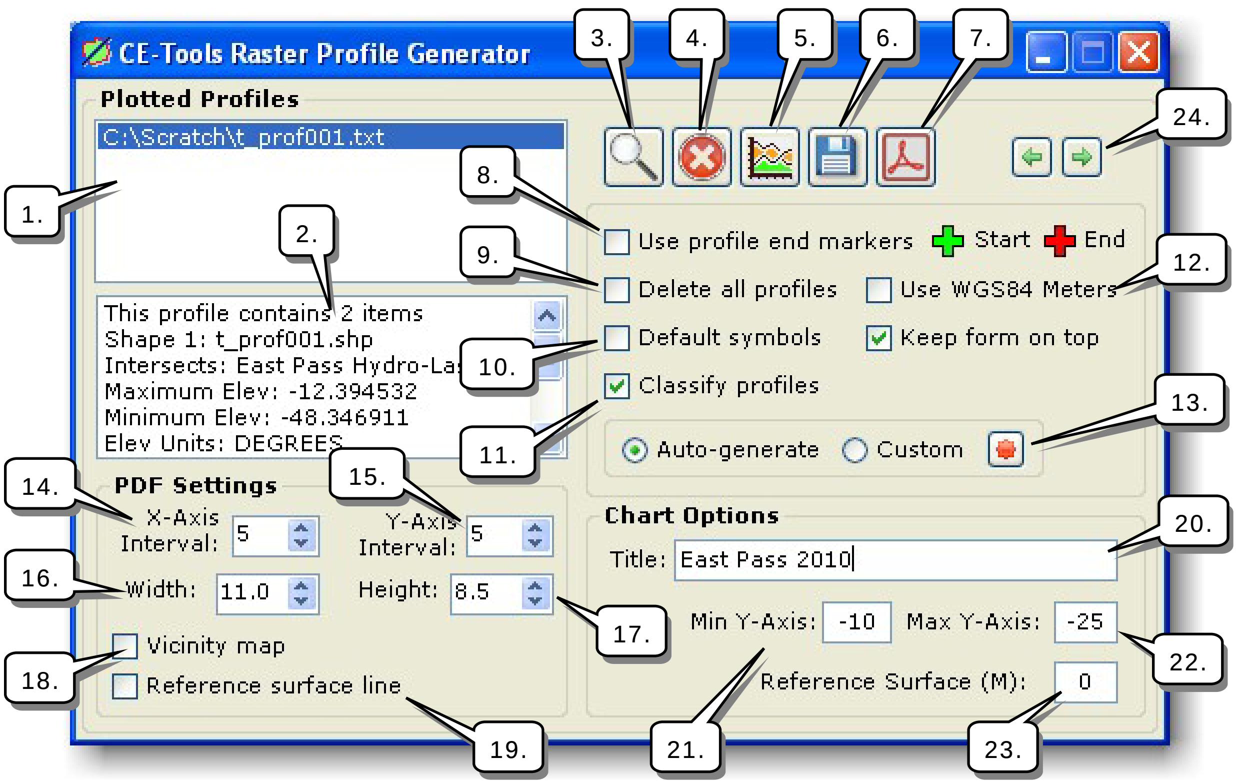


Figure 46 - eCoastal Profile Generator

extracted from each raster cell that was intersected by the profile line. The resulting points may then be viewed in a 2-D graph or the data represented in the point shape file may be exported to a comma-delimited ASCII text file. The profile shown in Figure 47 is a point shape file with several hundred points (the points are not that discernable in this figure) with the graduated color symbology applied.

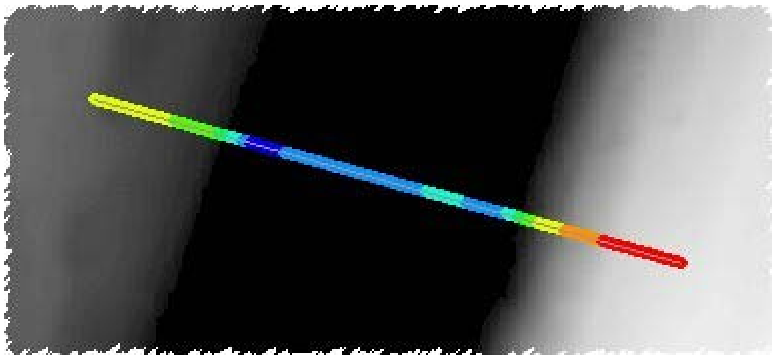


Figure 47 - Classified Profile

1. This list box contains a listing of all the profile master files. Each master file contains information about the profile shape files, intersected raster surfaces, map units, and other relevant information. There is only one master file for each transect line placed on the map.

2. This list box shows a listing of the profiles generated by the transect line and the raster surfaces intersected. When a master file is selected from the list box on the left the items in this list box are automatically populated.

3. Click this button to locate a master profile in the map.

4. Click this button to delete the master profile selected in the master profile list box. If the “Delete all profiles” checkbox is checked, then all master profiles and their associated files are deleted from your hard drive.

5. Click this button to graph the selected profile.

6. Click this button to export the selected profiles to a comma-delimited ASCII text file.

7. Click this button to generate a profile map book in PDF format.

8. When placing a profile transect line you can include a starting and ending marker at each end of the line for reference by checking this checkbox. This box must be checked prior to drawing the transect line. The markers are graphic symbols and can be manually deleted from the map at any time if necessary.

9. In the case where you may have many profiles in your map and you wish to delete all of them check the “Delete all profiles” checkbox prior to clicking the delete profile button. This will remove all profile shape files from your map and also delete all associated transect lines. IMPORTANT – it will also delete all of the profile point shape files from your hard drive.

10. Check this box to use default symbology for your profiles. Default symbology is settings that you can create and save. When this box is checked all profiles plotted

on a chart will use your custom settings. See paragraph 5.4 Charting Options for further detail on this item.

11. Check this box to classify the profile point shape files on the depth (or elevation field) values. As indicated in Figure 46 there are two options associated with using the classify option. You can allow the application to calculate the interval values for you or you can apply your own predefined intervals to all subsequent profile point shape files that are built. This will let you keep the color ramp and value classes the same for each surface. This may be desirable when comparing profiles cut through multiple surfaces. The classification dialog is accessible by clicking the small button to the right of the custom option button. As shown in Figure 48 - Profile Classification Dialog there are 9 intervals to define a break value for, or you can click the layer button at the top to retrieve the natural breaks from an active profile point shape file (once built). Click the Save button to retain your values in your working folder.

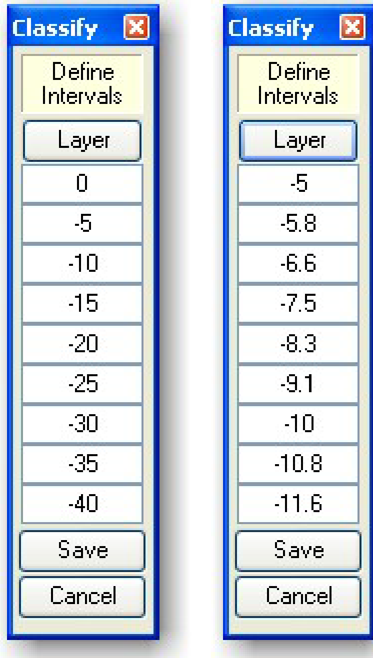


Figure 48 - Profile Classification Dialog

12. Check this box if your depth (or elevation) values in a raster surface represent meters. A raster surface built from geographic coordinates may include values that can be in units of meters. If checked the values for the y-axis of a profile plot are labeled as meters. This is at the discretion of the user.

13. Opens the Profile Classification dialog seen in Figure 48.

14. When converting a chart to PDF format set the x-axis major interval value here.

15. When converting a chart to PDF format set the y-axis major interval value here.

16. Set the desired paper width for the PDF file here.

17. Set the desired paper height for the PDF file here.

18. Check this box to include a vicinity map on the first page of a PDF map book. The map is a snapshot of the active map.

19. Check this box to include the reference surface elevation line in your chart.

20. Enter into this textbox a project description that is used in the PDF map book.

21. If desired a minimum value for the vertical elevation (Y) axis can be entered here.

22. If desired a maximum value for the vertical elevation (Y) axis can be entered here.

23. Enter into this textbox a value for a reference surface elevation in units of feet or meters. This value is used to place a reference surface line into the profile graph. It is also used as the reference when calculating cross section area above or below a profile plot line. This is illustrated in Figure 51 - Profile Plot.

24. Click the left button to shrink the form and the right button to restore the form.

When placing a transect line with the profile tool, it is perfectly fine to simultaneously intersect more than one raster surface. As seen in Figure 49 - Overlaid Grid Surfaces a

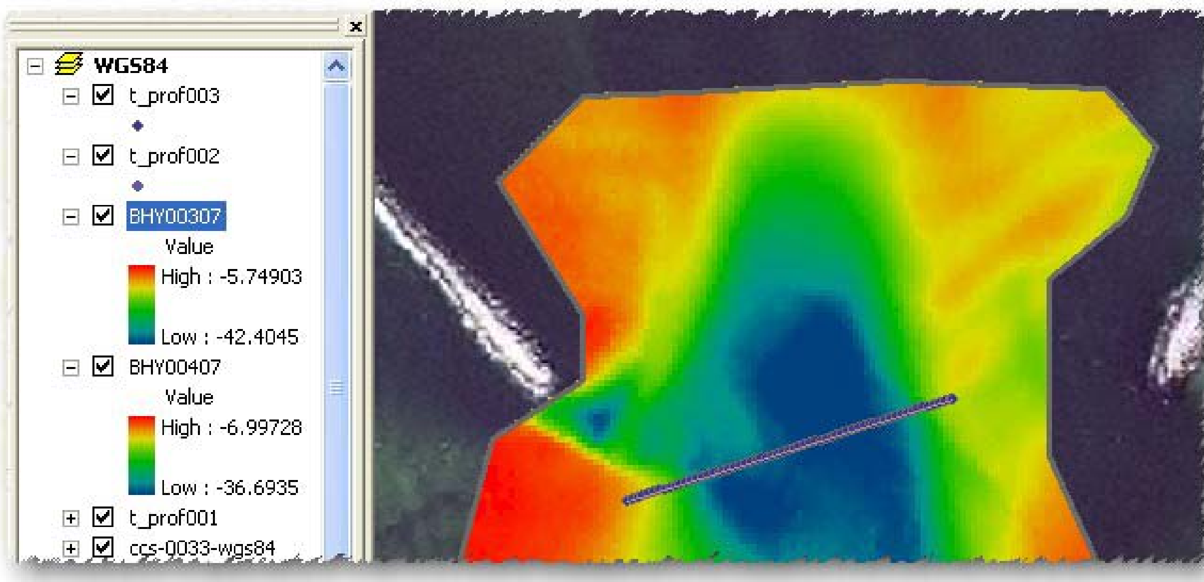


Figure 49 - Overlaid Grid Surfaces

transect line has cut two overlying grid surfaces and has generated two profile shape files. The resulting shape files are also overlaid in this figure. All of the metadata generated when cutting through one or more grid surfaces is stored in an ASCII text file as indicated by Figure 50 - Multiple Profiles. In the case where two grid surfaces were cut you can see that the selected master text shows two profiles. This provides a convenient mechanism to reload any profile data into your map if that particular set of profile data has been removed from you map. Clicking on any master text file in the list box on the left will reload all of the profile shape files referenced in the master text file back into your map.

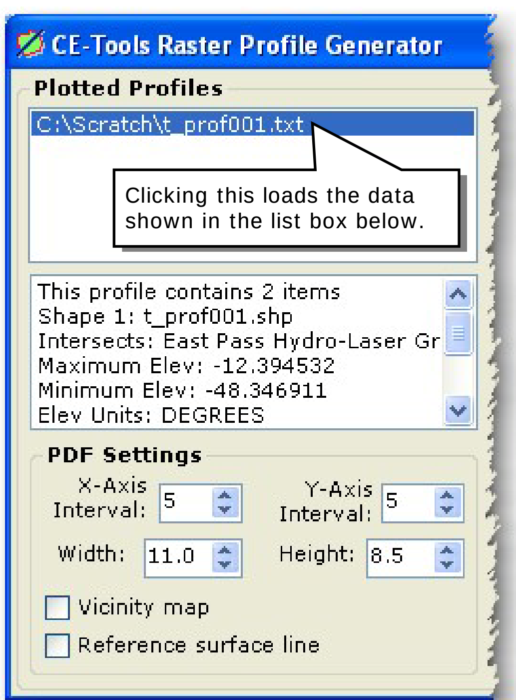


Figure 50 - Multiple Profiles

5.1.1 Profile Graphing

One of more profiles can be plotted into a 2D graph for further analysis and viewing. Select an item from the master text file list box shown on the left side of eCoastal Profile Generator dialog box and then click the plot profile button as previously described hereinbefore. The selected profiles are then plotted as seen in Figure 51 - Profile Plot. There are several features associated with this form as seen across the bottom of Figure 51. The large toolbar seen on the bottom right contains controls that allow to you modify the look and feel of the chart. Functions include zooming in and zooming out, export to image, printing dialog, and other additional features. The profiles plotted in Figure 51 are symbolized with graduated colors. As described previously, this is done by checking the classify profile points by elevation checkbox prior to plotting the graph. Refer to paragraph 5.4 Charting Options for a detailed explanation of the charting options seen below the graph in Figure 51.

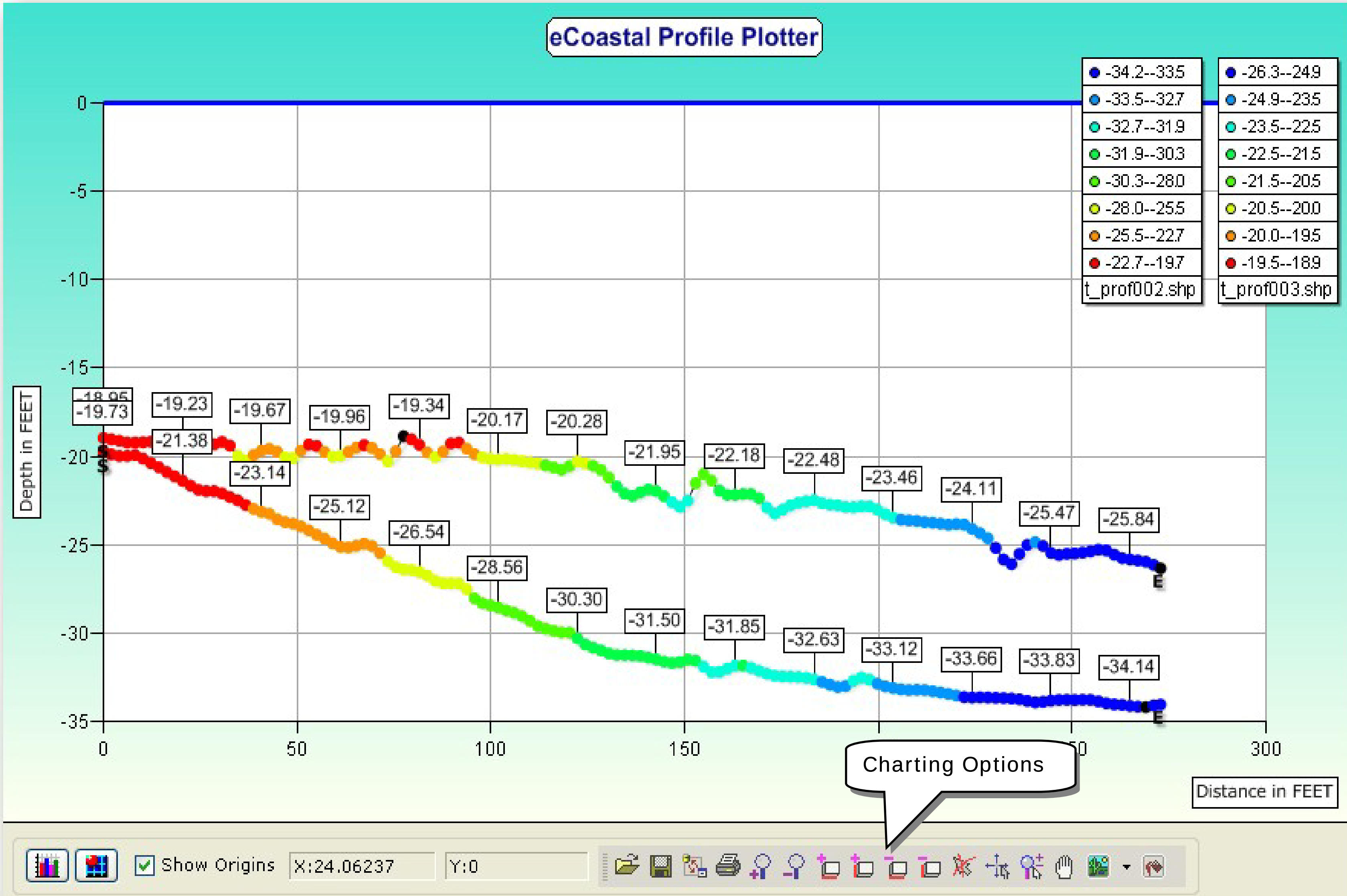


Figure 51 - Profile Plot

5.2 Auto-Profiler Tool

The auto-profiler allows you to layout a centerline and then place station lines along the centerline at a specified spacing and width. The stations are then used to generate a profile shape file that contains at least one profile for each station along the centerline. The stationing must overlay at least one raster surface. The tool can simultaneously generate multiple profile shape files by intersecting one or more raster surfaces with a single set of stationing. The raster surface is typically a surface that represents an elevation value. Allowable raster formats are ESRI GRID, TIFF, FGDBR, SDR, and IMAGINE IMAGE. Each point in a profile shape file represents a depth (or elevation) that was dynamically extracted from a raster cell intersected by a station line. These profile points can then be viewed in a

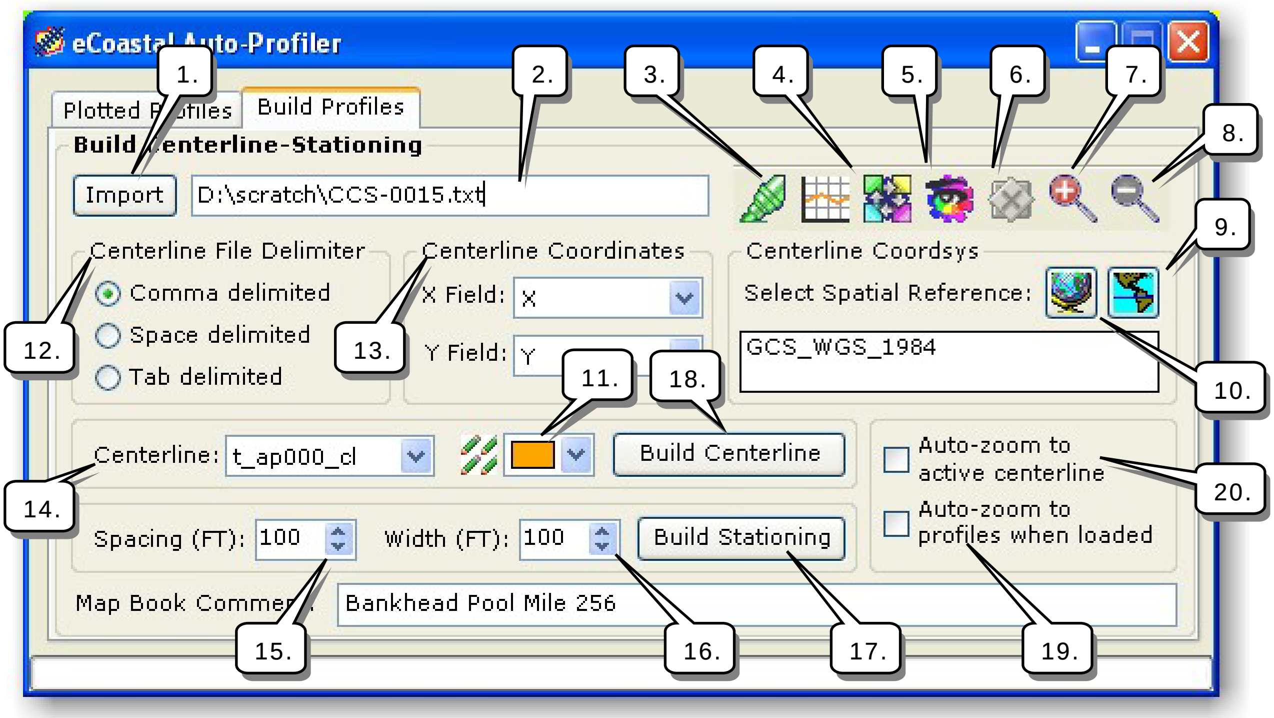


Figure 52 - Auto-Profiler Build Profiles Tab

2-D graph or the points can be exported to a comma-delimited ASCII text file. Additionally a profile map book in PDF format can be generated with one page for each profile.

5.2.1 Build Profiles Tab

The build profiles tab is where the centerline is built and the station lines generated. Once the centerline and stationing are constructed the profiles are built from here. The most important item on this tab is the centerline and the centerline coordinate system. A centerline coordinate system must first be established prior to building a new centerline. Please refer to items 9 and 10 below when selecting a centerline coordinate system. Once a centerline is built it can be used to generate a preview of the stationing layout and also can be repeatedly used to generate stationing profiles.

1. Click this button to select and import an ASCII text file that contains coordinates from which a centerline shape file can be constructed. Please note that before this

button can be used, a centerline coordinate system must be specified must be established as described hereinafter.

2. The imported centerline ASCII text file is indicated in this textbox.

3. Click this tool button to sketch a random centerline. The sketched line is converted

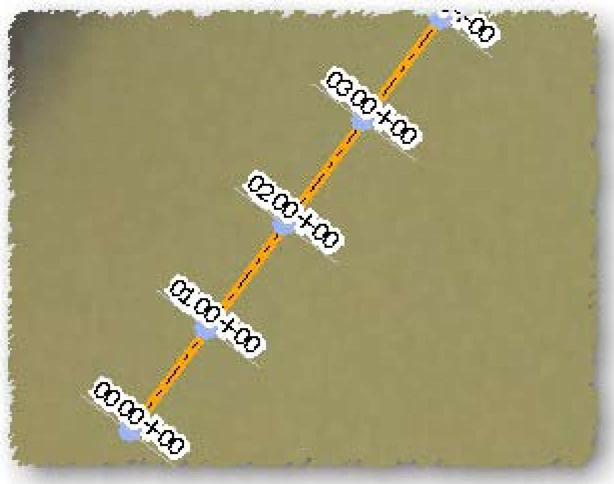


Figure 53 – Auto-Profiler Stationing Preview

into a centerline shape file. Double-click to terminate the sketch tool and convert the centerline sketch to a centerline shape file.

4. Clicking this button will generate a centerline profile shape file along the centerline. A centerline must first be selected from the centerline combo box.

5. Click this button to export the coordinates of the selected centerline shape file to a comma-delimited ASCII text file. A centerline must first be selected from the centerline combo box.

6. Click this button to preview the layout of the stationing and station text. A set of graphic elements are placed into the map display as shown in Figure 53. A centerline must first be selected from the centerline combo box.

7. Click this button to remove the preview graphic elements generated by the preview tool. Please note that these graphic elements can be manually deleted without clicking this button.

8. The last 2 buttons on the far right of the toolbar are a zoom in and zoom out command.

9. Click this button to use the map's current coordinate system prior to building a new centerline.

10. Click this button to select a specific coordinate system prior to building a new centerline.

11. A pre-selected color can be picked from the color list prior to generating the centerline. The centerline will be rendered in this color.

12. Select from these options the required file delimiter when importing the ASCII centerline text file.

13. Select from these combo boxes the item that represents the X and Y coordinates contained in the centerline ASCII text file that you have imported.

14. Once a centerline shape file has been built it will appear on this list. Only centerline shape files that are loaded in your map will appear on this list. Selecting an item from this list will also enable all the buttons on the toolbar.

15. This will be the maximum distance between the station lines. There will be a station line wherever there is a change in direction along the centerline regardless of the station spacing specified.

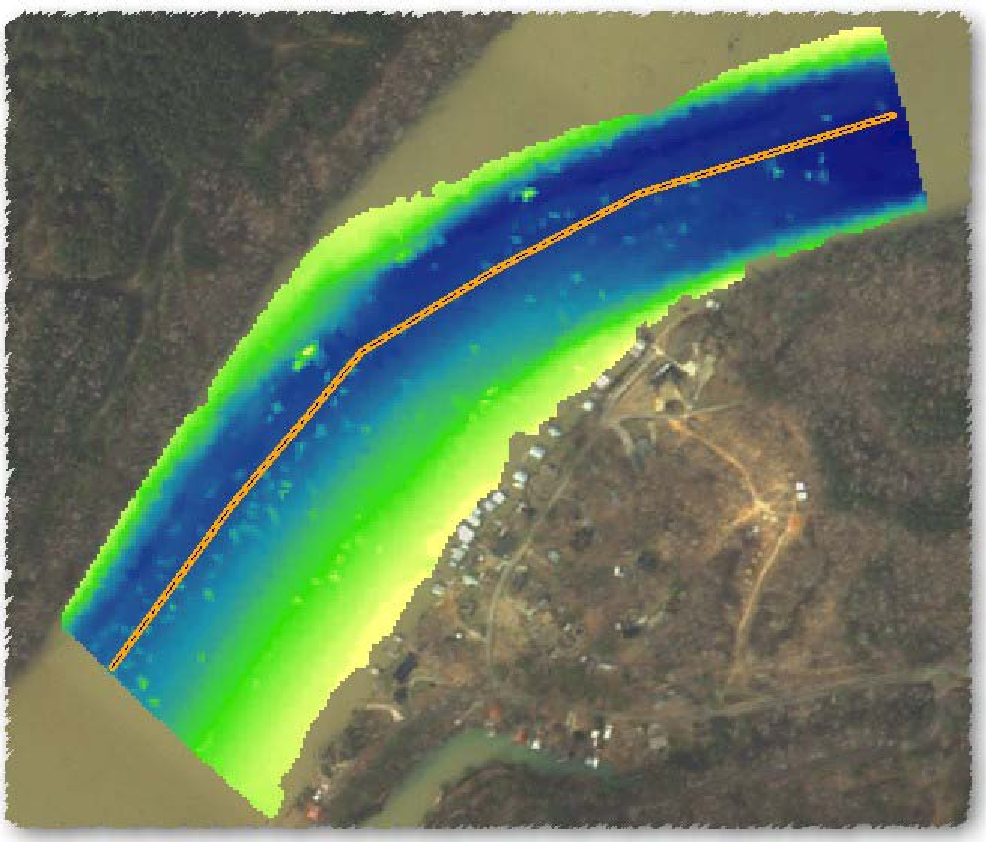


Figure 54 - Centerline

16. This is the width that is used to build each station line and represents the end to end width.

17. Once a centerline has been built or selected, clicking this button will build the permanent station profiles.

18. If a centerline coordinate file is imported as described hereinbefore, clicking this button will build the centerline shape file. An example of a centerline shape file is seen in Figure 54 - Centerline.

19. Any comment entered here will be printed in the on each page of the PDF map book.

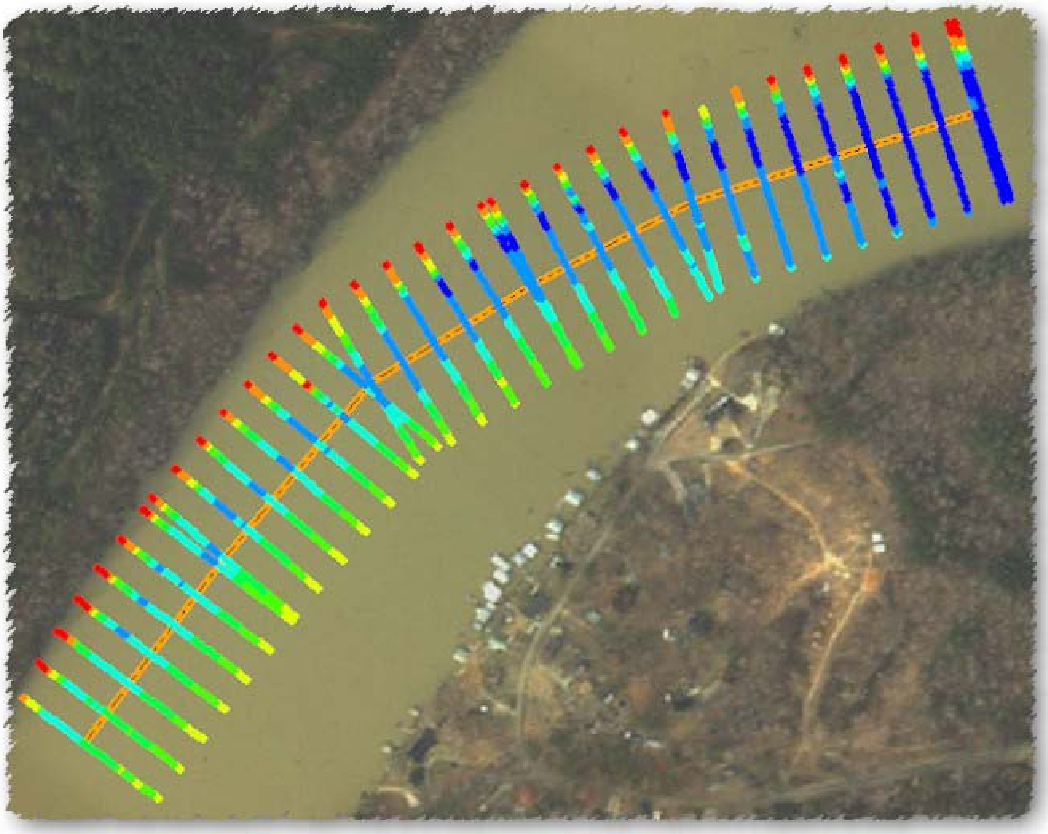


Figure 55 - Station Profiles

When the build stationing button is pressed, permanent stationing is built and labeled in accordance with the spacing specified, and as stated previously, a profile shape file is generated, one for each raster surface intersected. An example is shown in Figure 55 - Station Profiles. In Figure 55 the profile points have been classified using the elevation value field in the profile shape file attribute table. All of the profiles seen in Figure 55 are in a single profile shape file. Each profile normally has the same number of points but that is not always the case. Profile points are only generated where the station line overlays a raster surface. It is entirely possible that the station width may extend beyond the edge of a raster surface. In this case profile points are generated along the station up to the raster edge, but no farther.

5.2.2 Plotted Profiles Tab

Once a centerline is built and a set of profiles generated the information related to these items is place into the plotted profiles tab. From this location several functions related to plotting and printing can be performed.

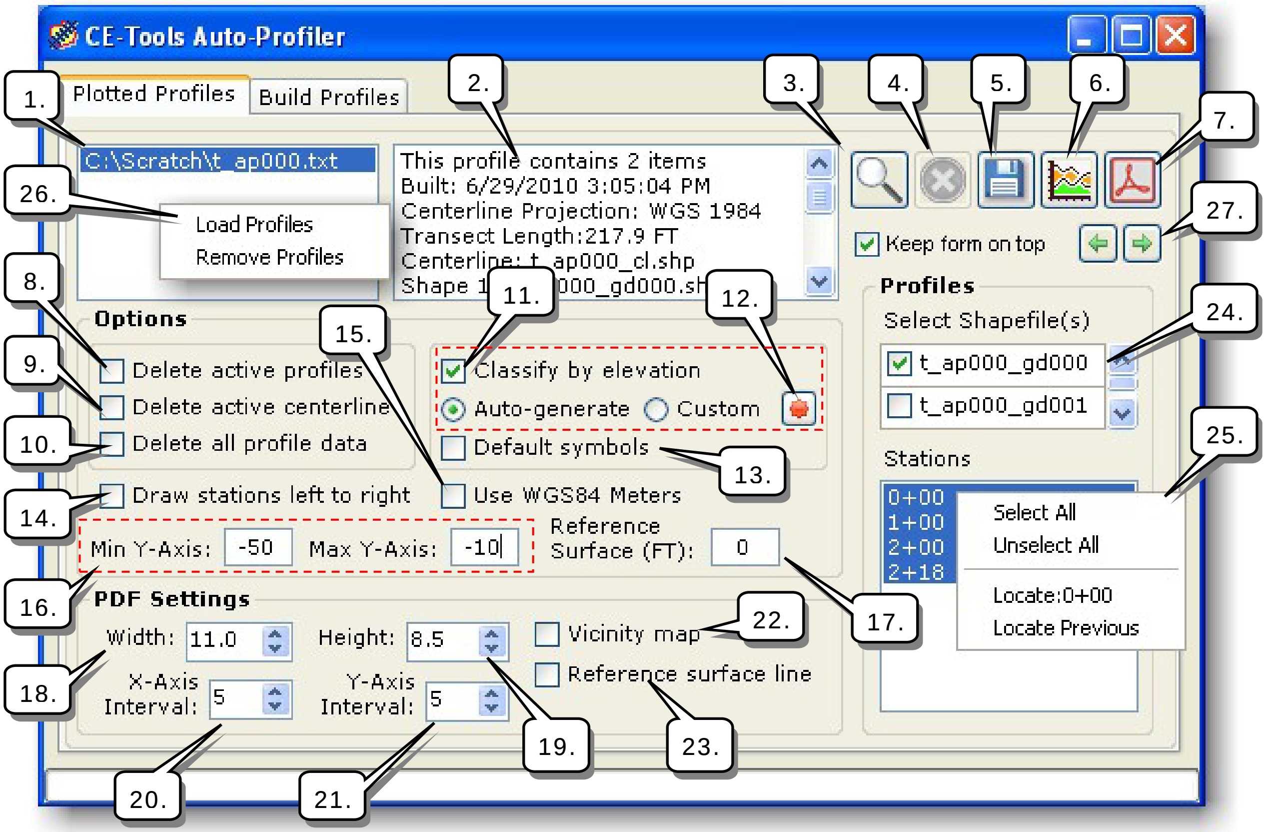


Figure 56 - Plotted Profiles Tab

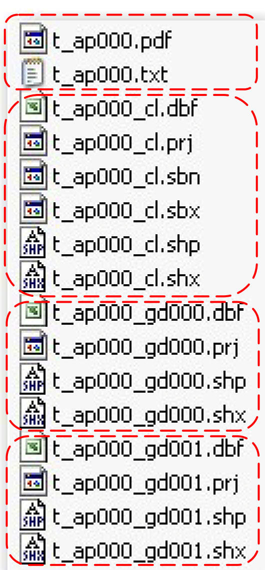


Figure 57 – File Structure

1. This list box contains a listing of all the master profile files. Each master profile file contains information about the centerline, profile shape files, intersected raster surfaces, map units, and other relevant information. There is only one master file for each centerline shape file built.

2. This list box shows a listing of the centerline and the profiles generated with the centerline and the raster surfaces intersected. When a master file is selected from the list box marked by item 1 the items in this list box are automatically populated. All of the files generated by this tool are automatically prefixed with the master profile name as illustrated in Figure 57 on the left. The 2 files in the first group are the profile PDF map book file and the profile master file. The files shown in the second group are the centerline shape file. The files in the third group are the first profile made by intersecting the first raster surface. The files in the fourth group are the second profile made by intersecting a second raster surface.

3. Click this button to locate a master profile in the map.
4. Click this button to delete profile data in accordance with the optional checkboxes described hereinafter.
5. Click this button to export the station profiles that are selected in the station list box to a comma-delimited ASCII text file.
6. Click this button to graph the station profiles that are selected in the station list box.
7. Click this button to generate a profile map book in PDF format. The map book will contain one graph for each station selected in the stations list box.
8. Check this box to only delete the selected profile shape files when the delete button is clicked.
9. Check this box to only delete the selected centerline shape file when the delete button is clicked.
10. Check this box to delete all data files for every profile from your working folder.
11. Check this box to classify the profile point shape files on the depth (or elevation field) values. As indicated in Figure 46 there are two options associated with using the classify option. You can allow the application to calculate the interval values for you or you can apply your own predefined intervals to all subsequent profile point shape files that are built. This will let you keep the color ramp and value classes the same for each surface. This may be desirable when comparing profiles cut through multiple surfaces.
12. Click this button to open the classification dialog. As shown in Figure 48 - Profile Classification Dialog there are 9 intervals to define a break value for, or you can click the layer button at the top to retrieve the natural breaks from an active profile point shape file (once built). Click the Save button to retain your values in your working folder.
13. Check this box to use default symbology for your profiles. Default symbology is settings that you can create and save. When this box is checked all profiles plotted on a chart will use your custom settings. See paragraph 5.4 Charting Options for further detail on this item.
14. By default a station line is built right to left. Check this box to force the station lines to be built left to right.
15. Check this box if your depth (or elevation) values in a raster surface represent meters. A raster surface built from geographic coordinates may include values that can be in units of meters. If checked the values for the y-axis of a profile plot are labeled as meters. This is at the discretion of the user.
16. A user-defined minimum and maximum value for the vertical elevation axis can be entered here.

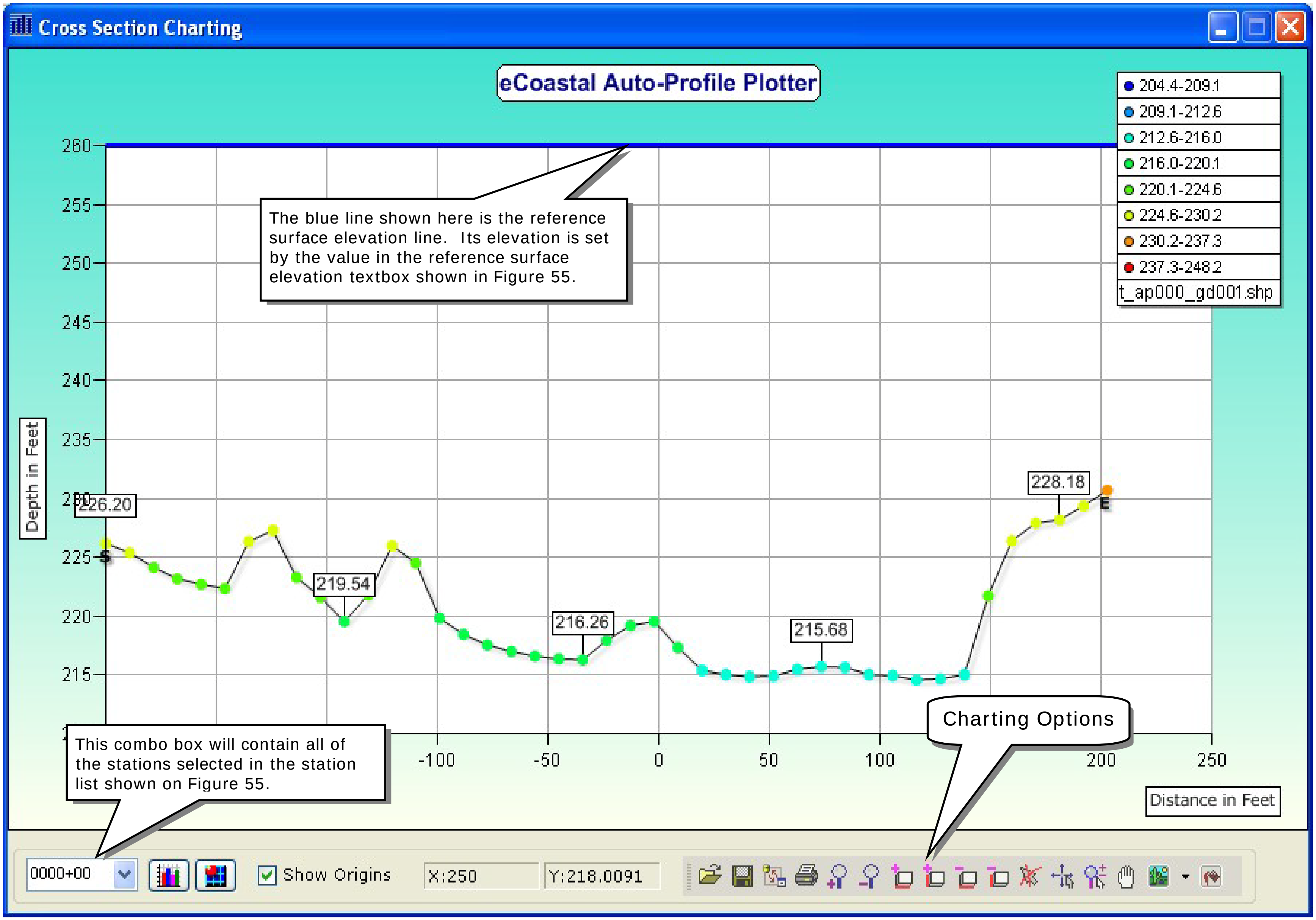


Figure 58 - Station Profile Plot

17. Enter into this textbox a value for a reference surface elevation if required. This value is used to place a reference surface line into any profile that is graphed. It is also used as the reference when calculating cross section area above or below a profile plot line. This is illustrated in Figure 58 - Station Profile Plot.

18. When converting a chart to PDF format set the x-axis major interval value here.

19. When converting a chart to PDF format set the y-axis major interval value here.

20. Set the desired paper width for the PDF file here.

21. Set the desired paper height for the PDF file here.

22. Check this box to include a vicinity map on the first page of a PDF map book. The map is a snapshot of the active map.

23. Check this box to include the reference surface elevation line in your chart.

24. This is a listing of the profile shape files made when the build stationing button was clicked. When the profiles for a master file are loaded this list box is also populated. When at least one of the shape files in this list is checked a listing of the profile stations is shown in the list box seen below. In order to graph profiles, print profiles to the PDF map book, or export profiles to an ASCII text file station at least one station from the station list must be selected.

25. This list box is populated with all the stations used to generate the station profiles. It is only populated when one or more of the profile shape files are checked as described previously. When the stations list box is populated with stations and is enabled, right clicking with the mouse pointer over the list box will show the context menu seen in Figure 56.

26. When the master profile list box is populated, right clicking with the mouse pointer over an item in this list box will show this context menu. The following actions will occur:

    a. Load Profiles: Select this to load station profiles and profile centerline shape files into your map.

    b. Remove Profiles: Select this to unload station profiles and profile centerline shape files from your map.

27. Click the left button to shrink the form and the right button to restore the form.

Refer to paragraph 5.4 Charting Options for a detailed explanation of the charting options seen below the graph in Figure 51. In this example we have generate a set of profiles by simultaneously intersecting 2 raster surfaces. Note that the profile points have not been classified with the elevation value.

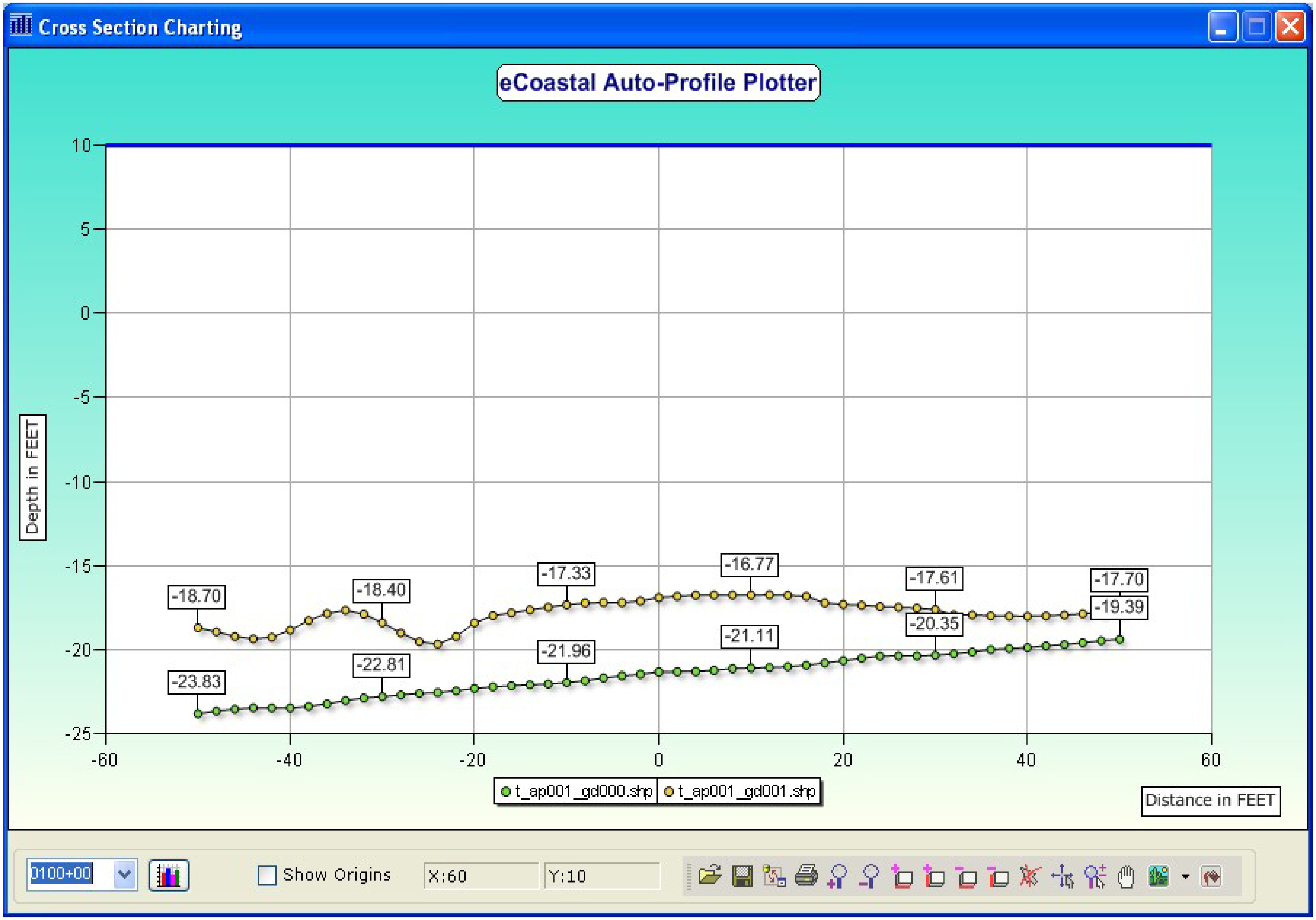


Figure 59 - Station Profile Plot (2 Surfaces)

5.2.3 Auto-Profiler PDF Map Book

The PDF map book function will generate one page for station selected in the stations list box as discussed previously. In the example seen in Figure 60 this page represents the profile at station 0000+00. The page header at the top will have one line for each raster surface intersected by the station line. Up to 4 raster surfaces can be intersected by a station line.

1. This is the profile shape file made where the first surface was intersected by the station line.
2. The blue line is the MSL value in feet specified in the MSL textbox.
3. This is the cross section area between the MSL line and the profile plot. The MSL line can be below or above the profile plot depending on the elevation values specified.
4. This is the raster surface intersected by the station line.
5. This is the maximum elevation value contained in the profile points at this station.
6. This is the minimum elevation value contained in the profile points at this station.
7. This is the profile plot of the first surface at the station line. Note the number 1 at the profile end points.
8. This is the profile plot of the second surface at the station line. Note the number 2 at the profile end points.
9. This is file path to the master profile text file.
10. This is the map book comment shown on item 19 in Figure 52 - Auto-Profiler Build Profiles Tab.
11. This is the station label.
12. This is the reference surface elevation value specified.

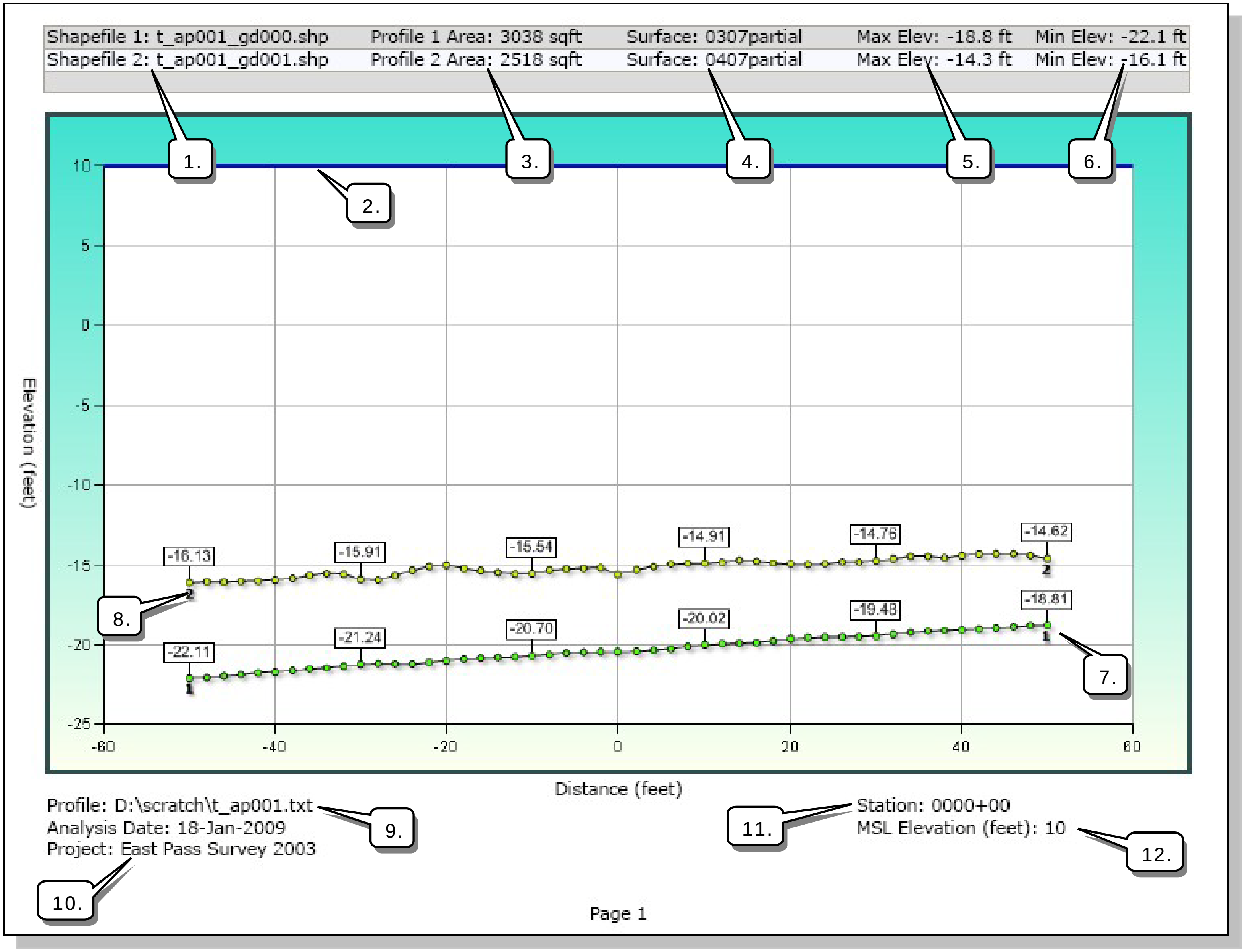


Figure 60 - Auto-Profiler PDF Map Page

5.3 TIN/Terrain Profile Tool

The TIN/Terrain profile tool allows you to cut profiles through a TIN or a Terrain feature surface. This operation will result in one or more profile point shape files being built and added to your map.

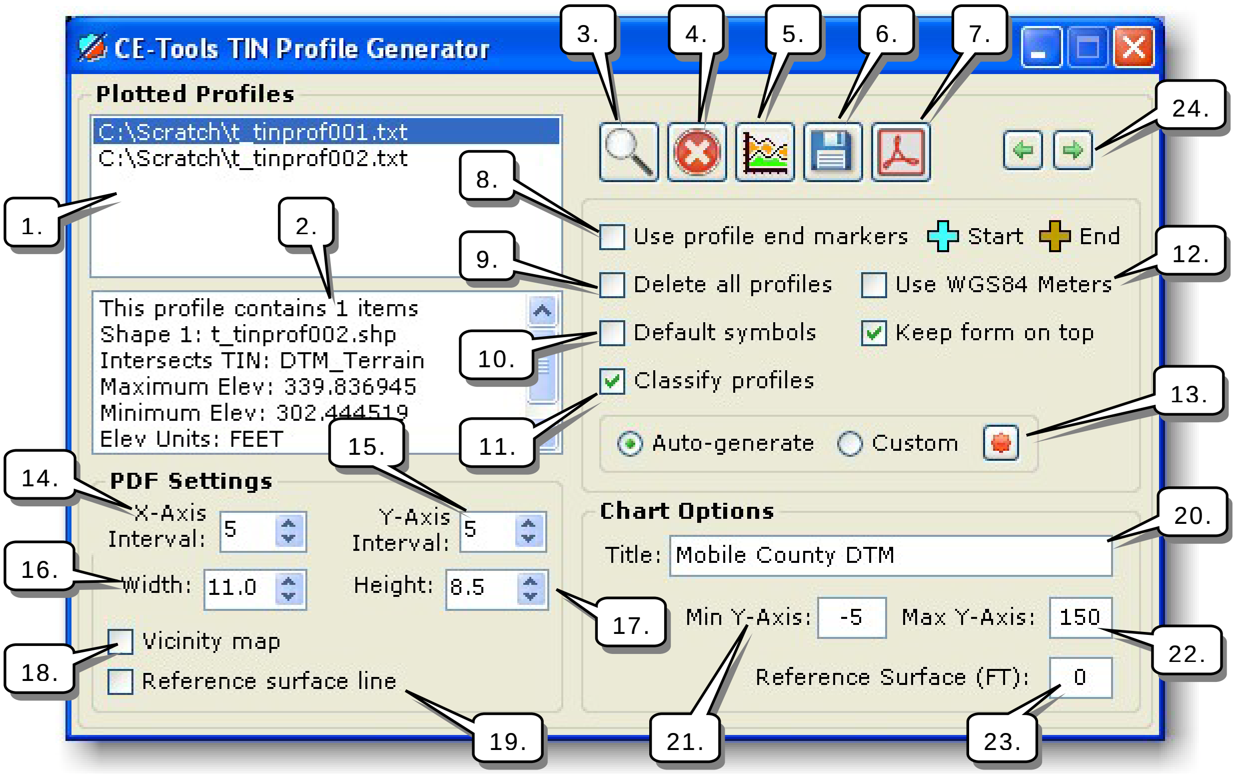


Figure 61 - TIN/Terrain Profile Tool

1. This list box contains a listing of all the profile master files. Each master file contains information about the profile shape files, intersected raster surfaces, map units, and other relevant information. There is only one master file for each transect line placed on the map.

2. This list box shows a listing of the profiles generated by the transect line and the raster surfaces intersected. When a master file is selected from the list box on the left the items in this list box are automatically populated.

3. Click this button to locate a master profile in the map.

4. Click this button to delete the master profile selected in the master profile list box. If the “Delete all profiles” checkbox is checked, then all master profiles and their associated files are deleted from your hard drive.

5. Click this button to graph the selected profile.

6. Click this button to export the selected profiles to a comma-delimited ASCII text file.

7. Click this button to generate a profile map book in PDF format.

8. When placing a profile transect line you can include a starting and ending marker at each end of the line for reference by checking this checkbox. This box must be checked prior to drawing the transect line. The markers are graphic symbols and can be manually deleted from the map at any time if necessary.

9. In the case where you may have many profiles in your map and you wish to delete all of them check the “Delete all profiles” checkbox prior to clicking the delete profile button. This will remove all profile shape files from your map and also delete all associated transect lines. IMPORTANT – it will also delete all of the profile point shape files from your hard drive.

10. Check this box to use default symbology for your profiles. Default symbology is settings that you can create and save. When this box is checked all profiles plotted on a chart will use your custom settings. See paragraph 5.4 Charting Options for further detail on this item.

11. Check this box to classify the profile point shape files on the depth (or elevation field) values. As indicated in Figure 46 there are two options associated with using the classify option. You can allow the application to calculate the interval values for you or you can apply your own predefined intervals to all subsequent profile point shape files that are built. This will let you keep the color ramp and value classes the same for each surface. This may be desirable when comparing profiles cut through multiple surfaces. The classification dialog is accessible by clicking the small button to the right of the custom option button. As shown in Figure 48 - Profile Classification Dialog there are 9 intervals to define a break value for, or you can click the layer button at the top to retrieve the natural breaks from an active profile point shape file (once built). Click the Save button to retain your values in your working folder.

12. Check this box if your depth (or elevation) values in a raster surface represent meters. A raster surface built from geographic coordinates may include values that can be in units of meters. If checked the values for the y-axis of a profile plot are labeled as meters. This is at the discretion of the user.

13. Opens the Profile Classification dialog seen in Figure 48.

14. When converting a chart to PDF format set the x-axis major interval value here.

15. When converting a chart to PDF format set the y-axis major interval value here.

16. Set the desired paper width for the PDF file here.

17. Set the desired paper height for the PDF file here.

18. Check this box to include a vicinity map on the first page of a PDF map book. The map is a snapshot of the active map.

19. Check this box to include the reference surface elevation line in your chart.

20. Enter into this textbox a project description that is used in the PDF map book.

21. If desired a minimum value for the vertical elevation (Y) axis can be entered here.

22. If desired a maximum value for the vertical elevation (Y) axis can be entered here.

23. Enter into this textbox a value for a reference surface elevation in units of feet or meters. This value is used to place a reference surface line into the profile graph. It is also used as the reference when calculating cross section area above or below a profile plot line. This is illustrated in Figure 51 - Profile Plot.

24. Click the left button to shrink the form and the right button to restore the form.

5.4 Charting Options

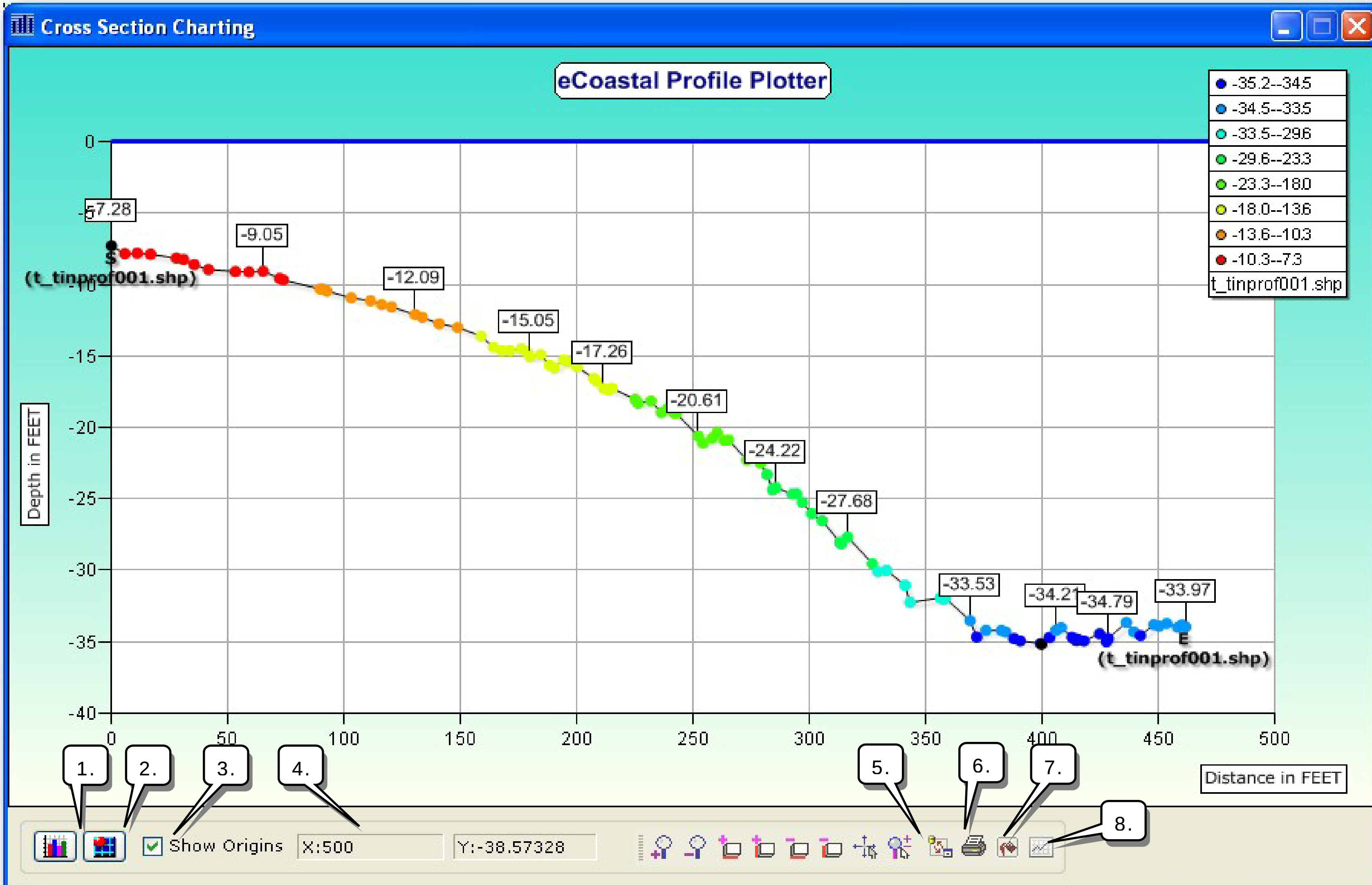


Figure 62 - Charting Options

1. Clicking this button opens the profile charting options dialog as indicated in Figure 63 - Profile Charting Options Dialog. This dialog gives you the ability to alter the formatting of the appearance of items in the profile graph.

2. Clicking this button opens the legend options dialog as indicated in Figure 64 - Profile Legend Options Dialog. This dialog gives you the ability to later the formatting of the appearance of items for a profile graph legend.

3. Check this box to show the start and end of each profile on the graph. The letter “S” indicates the starting point and the letter “E” indicates the ending point of a profile transect line.

4. The X and Y coordinate of the graph mouse cursor is dynamically indicated here.

5. Click this button to open the Image Export Dialog seen in Figure 66.

6. Click this button to open the Print Chart Dialog seen in Figure 67.

7. Click this button to open the Fill Effect Editor dialog seen in Figure 68. This dialog allows you to change the look and feel of the chart background area. This is not the chart background but the area surrounding the chart.

8. Click this button to open the Change Axis Text dialog seen in Figure 65. This dialog allows you to alter the formatting of both the vertical and horizontal axis text.

As stated previously in item 1 the charting options dialogs can be used to define the look and feel of the profiles. Depending on the options selected, profiles when graphed will have certain appearances.

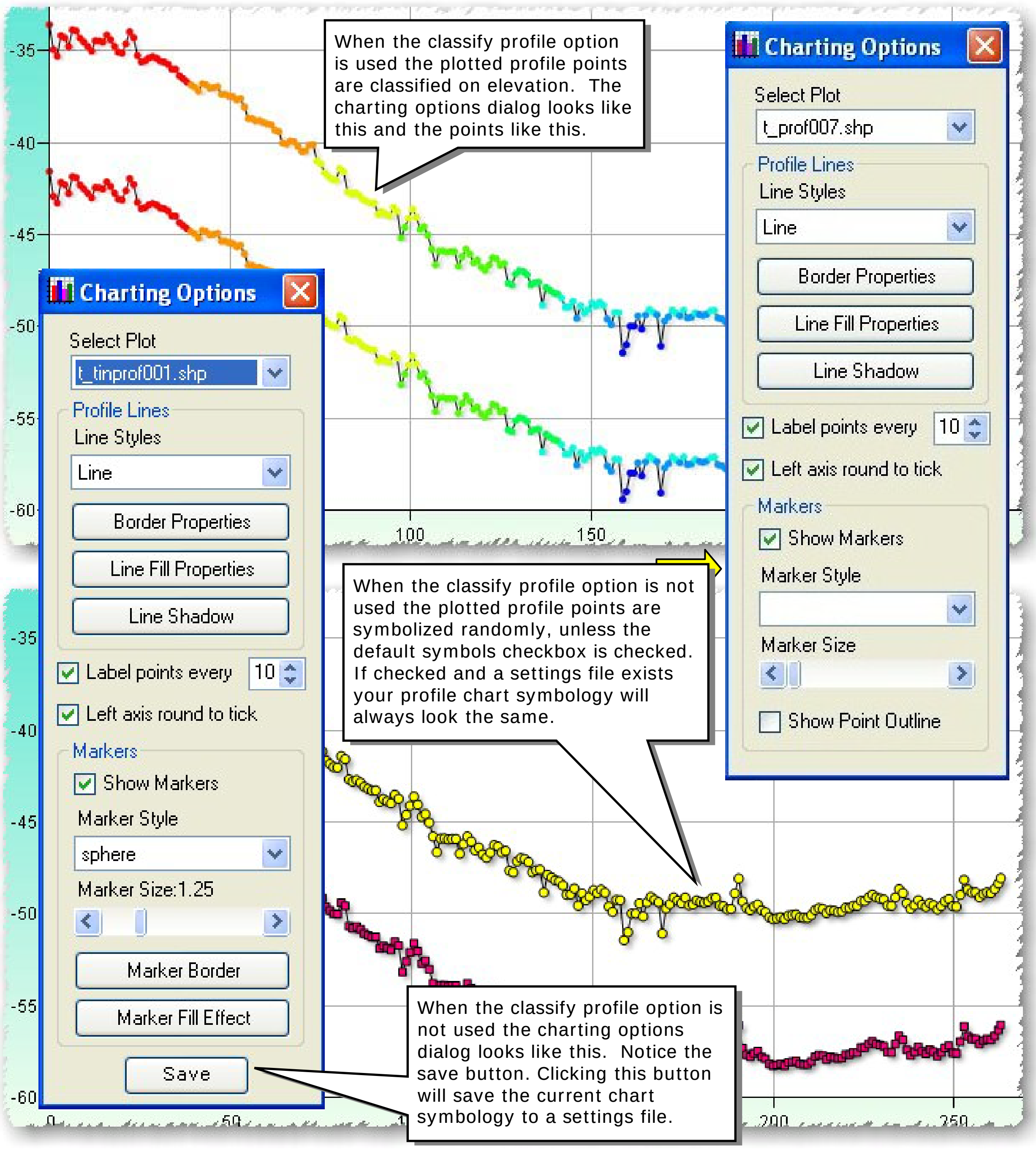
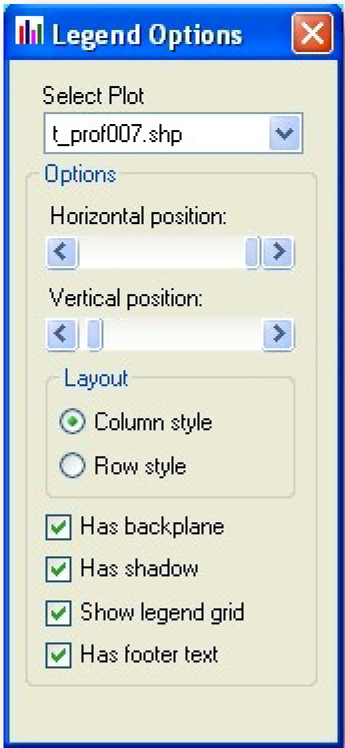


Figure 63 - Profile Charting Options Dialogs

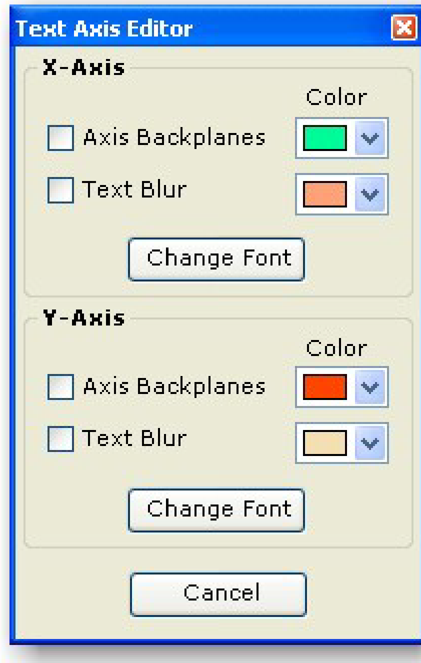


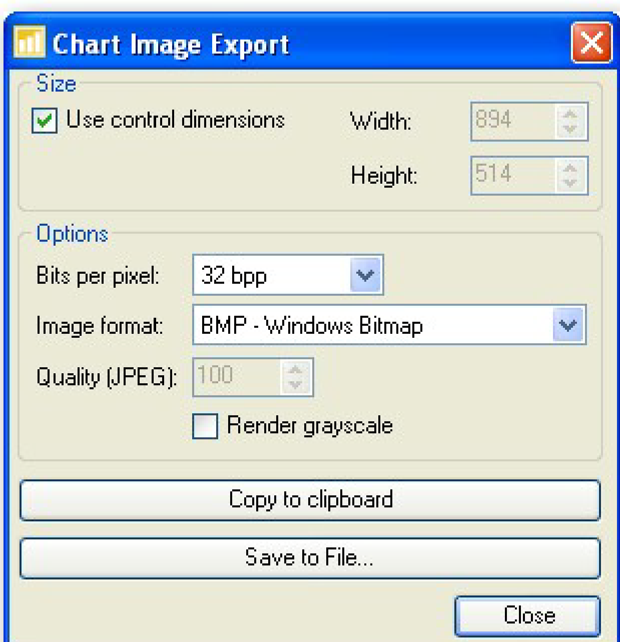
← This dialog supports the formatting and layout of graph legends.

Figure 64 - Profile Legend Options Dialog

This dialog allows modifications to the chart axis text. Apply text background fill effects and also change the default fonts for axis text. →

Figure 65 - Chart Axis Editor Dialog





This dialog supports the export of the graph to various image formats.

Figure 66 - Image Export Dialog

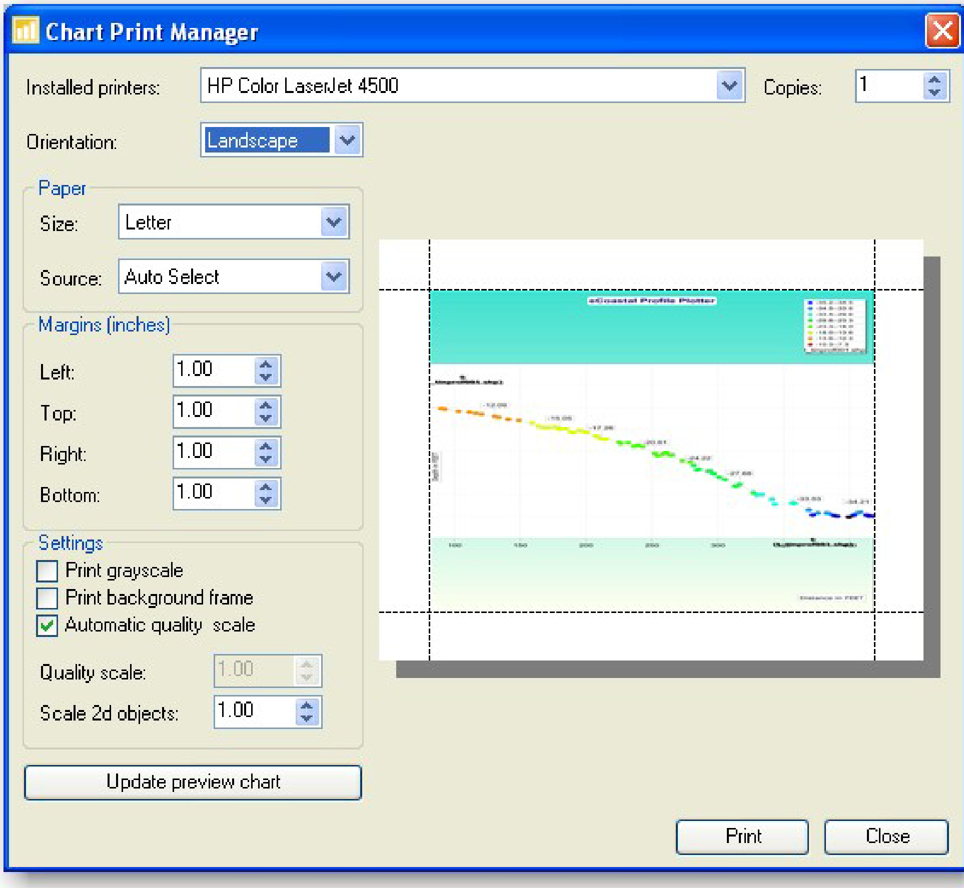


Figure 67 - Chart Print Manager Dialog

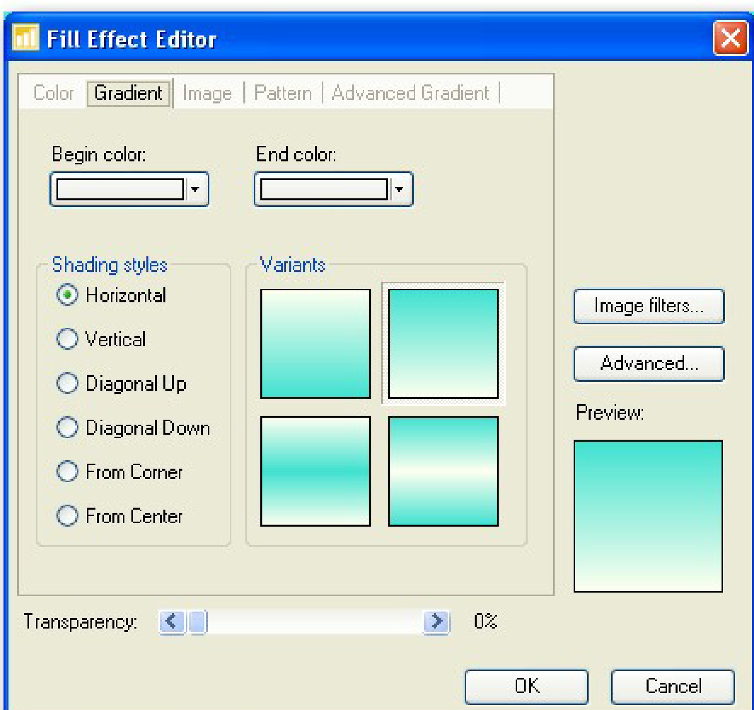


Figure 68 - Chart Fill Effect Editor

5.5 Depth Difference Calculator

The depth difference calculator is a tool that provides you the ability to subtract one raster grid surface from another. Supported raster formats are ESRI GRID, TIFF, FGDBR, SDR, and IMAGINE IMAGE. The result of this operation is a new raster grid surface that represents the resultant difference in terms of the elevation units of the grid cells. **The before surface is subtracted from the after surface**. Refer to paragraph 5.5.1 for a brief discussion on this topic. The grid is symbolized to indicate where surface material has either accreted or eroded. Additionally a cut and fill operation is also provided and a sample output is shown in Figure 72 - Cut/Fill Output Report.

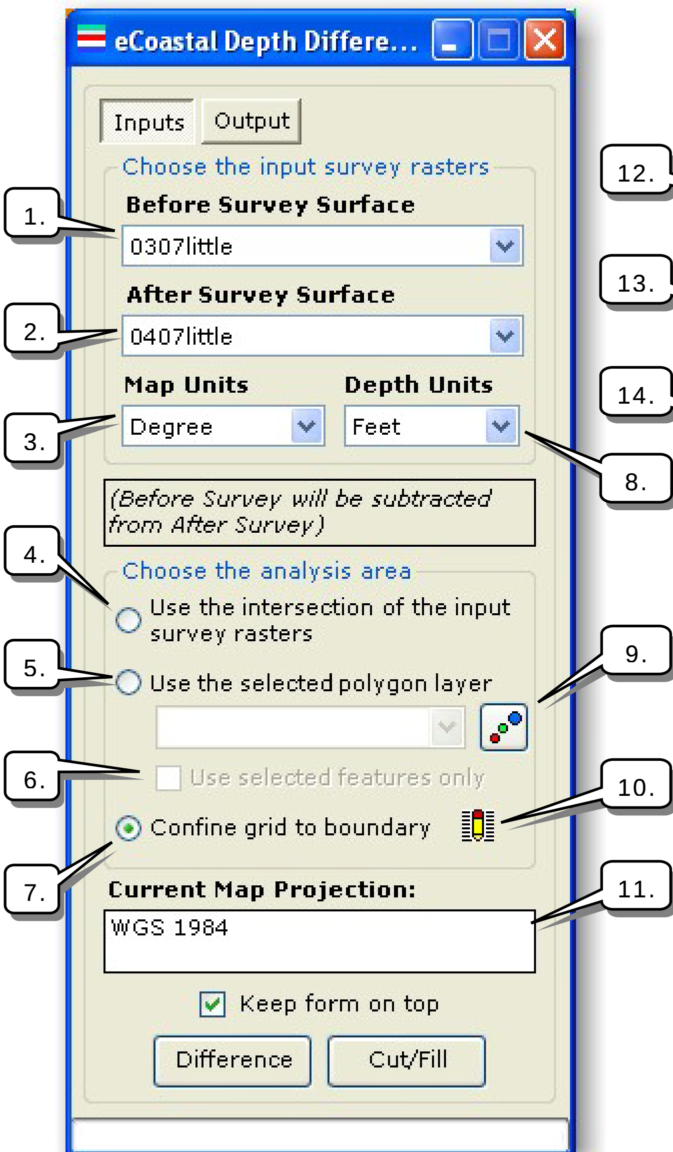


Figure 69 - eCoastal Depth Difference Calculator

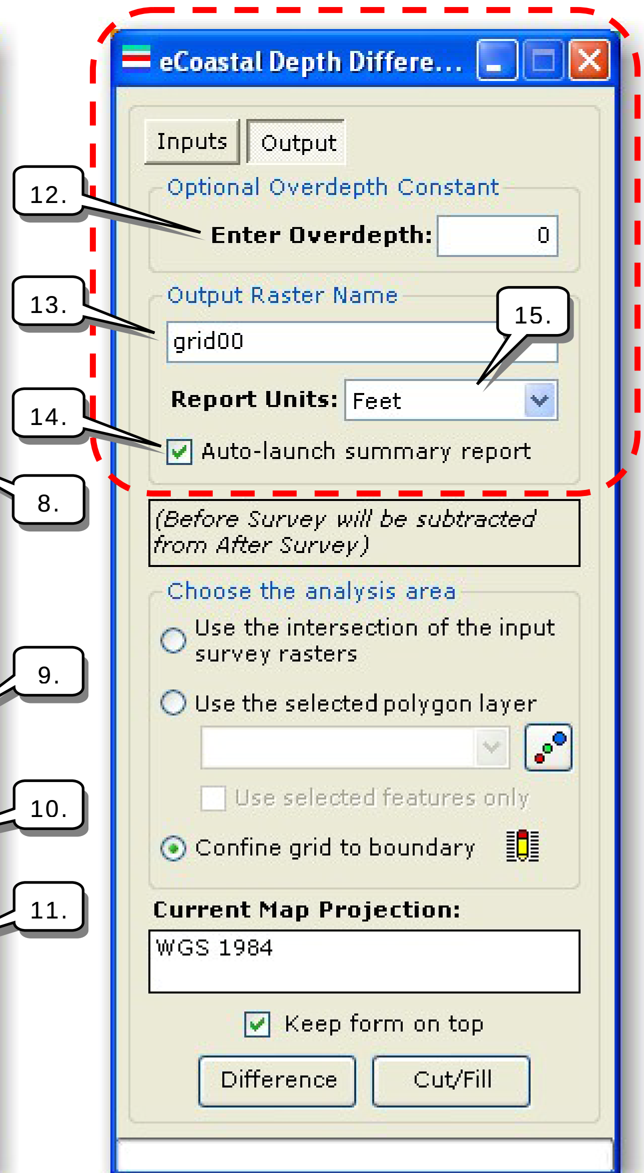


Figure 70 - eCoastal Depth Difference Output

1. Select from this list the base raster grid surface layer that represents the before condition.

2. Select from this list a raster grid surface that represents the after condition.

3. Select from this list the units that represent your maps' linear unit of measurement. This parameter is used in conjunction with the report unit dropdown list. Together they are used to set a grid surface cell size that is used in the calculation of volume differences. These volumetric numbers are contained in the automated output report.

4. Choose this option to produce a resulting grid surface that represents the intersecting area of the overlying surfaces.

5. Choose from this list an existing polygon layer from your map that is used as an analysis mask (an item that confines the resulting grid surface in size).

6. Check this if the polygon layer you are using has a selected feature and you want to use that selection only for an analysis mask.

7. Choose this option to sketch a polygon graphic in your map. This graphic is used as an analysis mask. To initiate the sketch tool the button sketch tool button seen in Figure 70 must be depressed.

8. Select from this list the depth units.

9. If a polygon layer is selected from the list clicking this button will zoom the map to the extents of the polygon layer.

10. Clicking this button will initiate the sketch function if the "Confine grid to boundary" option is depressed.

11. Indicates the current map coordinate system.

12. An optional amount of depth can be subtracted from the after surface by entering the value here.

13. An output raster name is required and is limited to 13 characters.

14. Upon completion of the calculation having this box checked will launch an output report as shown in Figure 71 - Depth Difference Output Report.

15. Defines the units of measurement used for all output data contained in the report. This parameter is used in conjunction with the x, y units selected in map units dropdown list. Together they are used to set a grid surface cell size that is used in the calculation of volume differences. These volumetric numbers are contained in the automated output report.

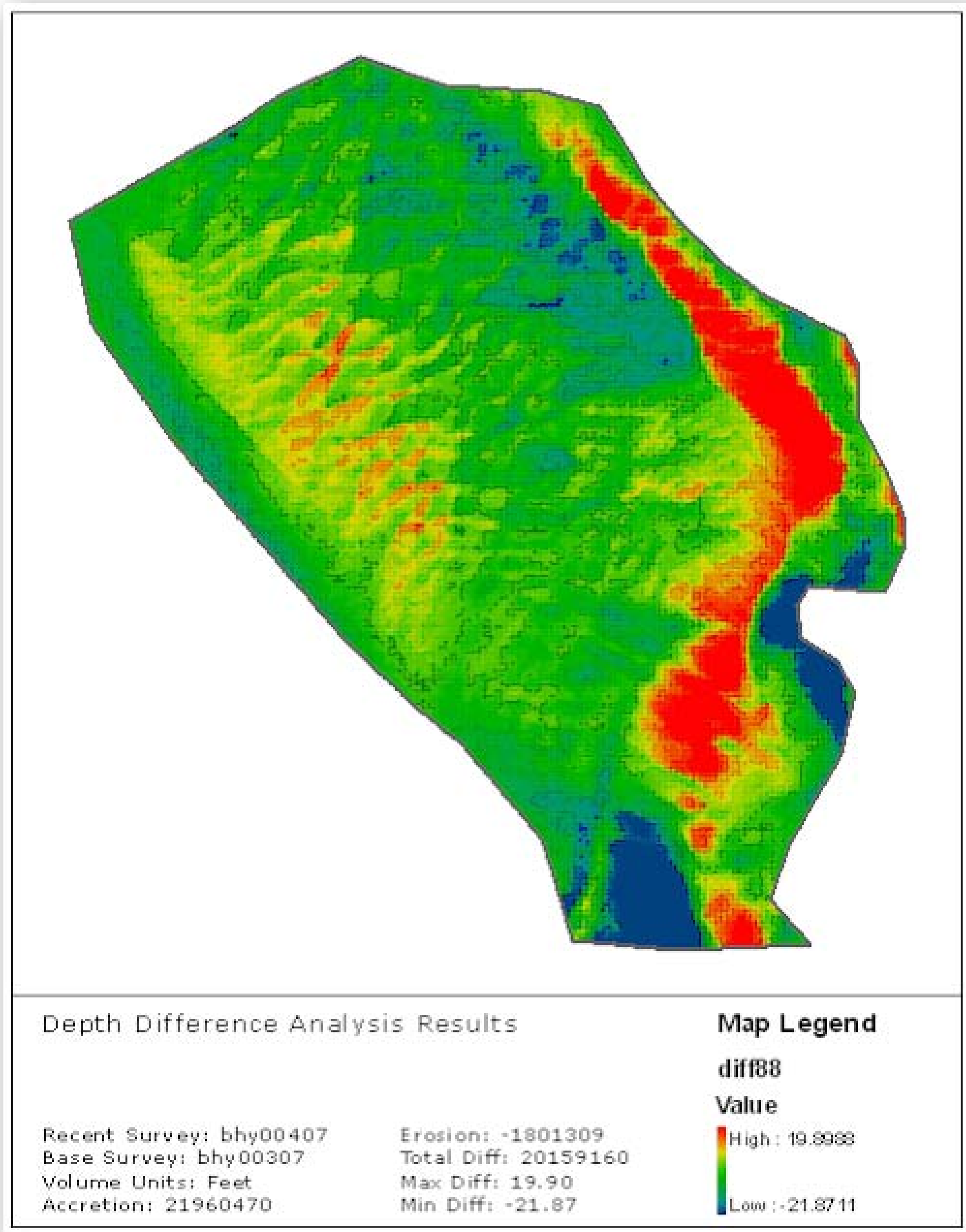


Figure 71 - Depth Difference Output Report

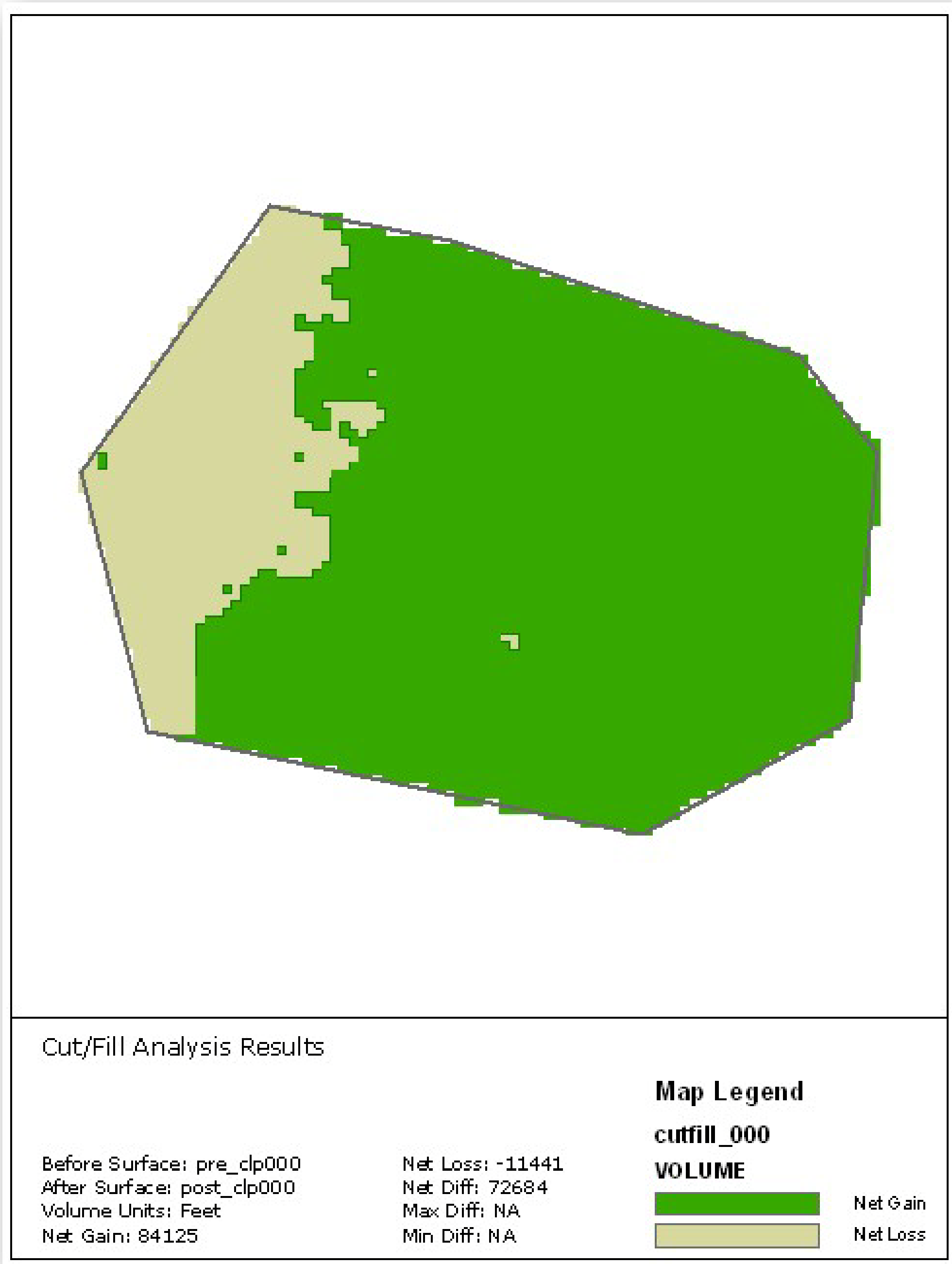


Figure 72 - Cut/Fill Output Report

The usage of the bounding polygon graphic (analysis mask) is illustrated in Figure 73 - Analysis Mask Usage. The grid surface shown on the right represents the difference between the 2 input surfaces.

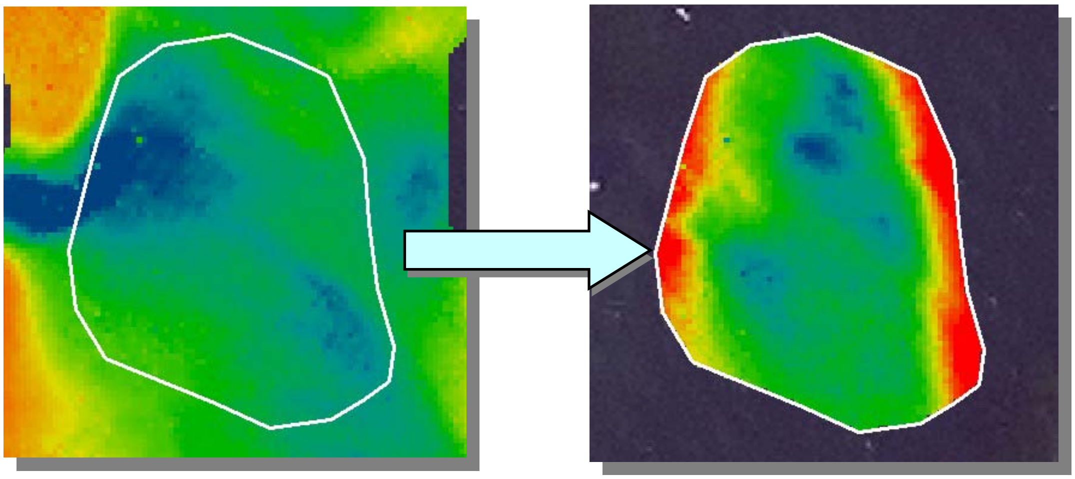


Figure 73 - Analysis Mask Usage

5.5.1 Before / After Surface Discussion

As previously stated the before surface is subtracted from the after surface. Another way of saying this is the older surface is subtracted from the newer surface. The logic to this could be described as follows. Let's say we have a surface of a river bottom from 1980 and a surface of the same river bottom from 2000. The question to pose is "How has the bottom changed as time progressed from 1990 to 2000"? To answer this you logically would take the 2000 surface (newer) and remove from it (subtract) the known condition that existed in the 1980 (older) surface. This represents the sum total (accretion + erosion) of change to the river bottom in this span of time.

5.6 Random Point Generator

The random point generator is a tool that provides the capability to create random points within specified criteria. The resulting random points created are used to automatically build a point shape file.

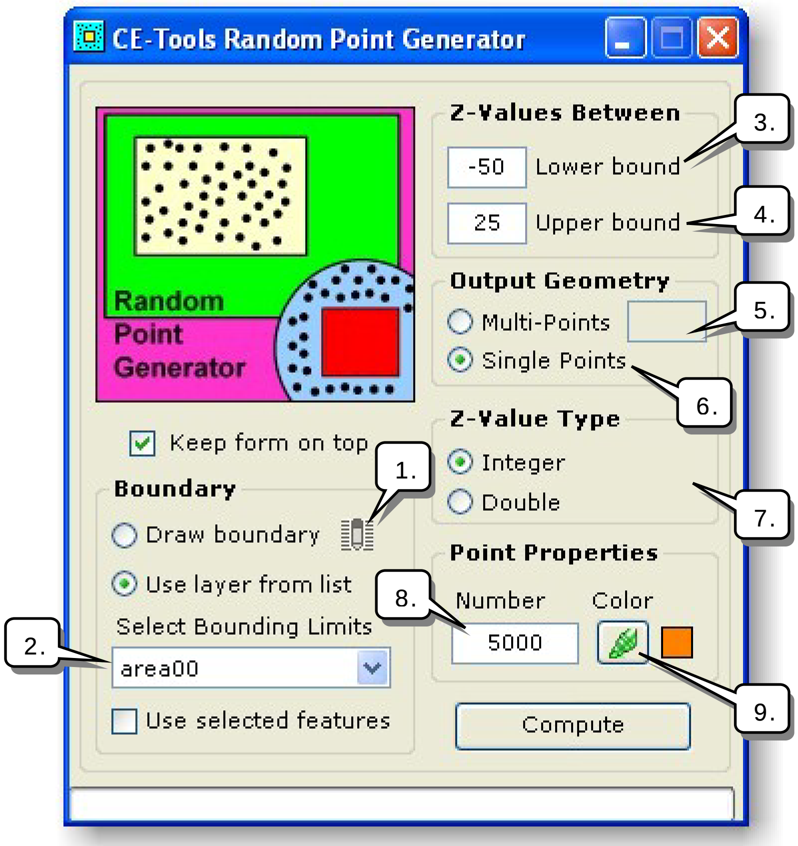


Figure 74 - Random Point Generator

1. Click this button to draw a user-defined polygon graphic on your map. The boundary of this polygon graphic is used to confine the random points.

2. Select from this list a polygon shape file that can be used to confine the random points. Check the box below if your polygon shape file has a selected record you wish to use.

3. This parameter defines the lower z value for the random number generator.

4. This parameter defines the upper z value for the random number generator.

5. Enter into this box the number of points per row in the attribute table for the multi-point option

6. Use this option for single points, one per row in the attribute table.

7. This setting defines the number type for the z values that are created in the output shape file attribute table.

8. Enter here the total number of points to be generated.

9. Click this button to open a select color dialog. This color will be used to define the color of the points in the output shape file.

5.8 Surface Generator

The surface generator is a tool that provides the ability to generate a raster grid surface or a TIN surface from an input point feature layer. The Spatial and 3D Analyst extensions are required in order to use this tool.

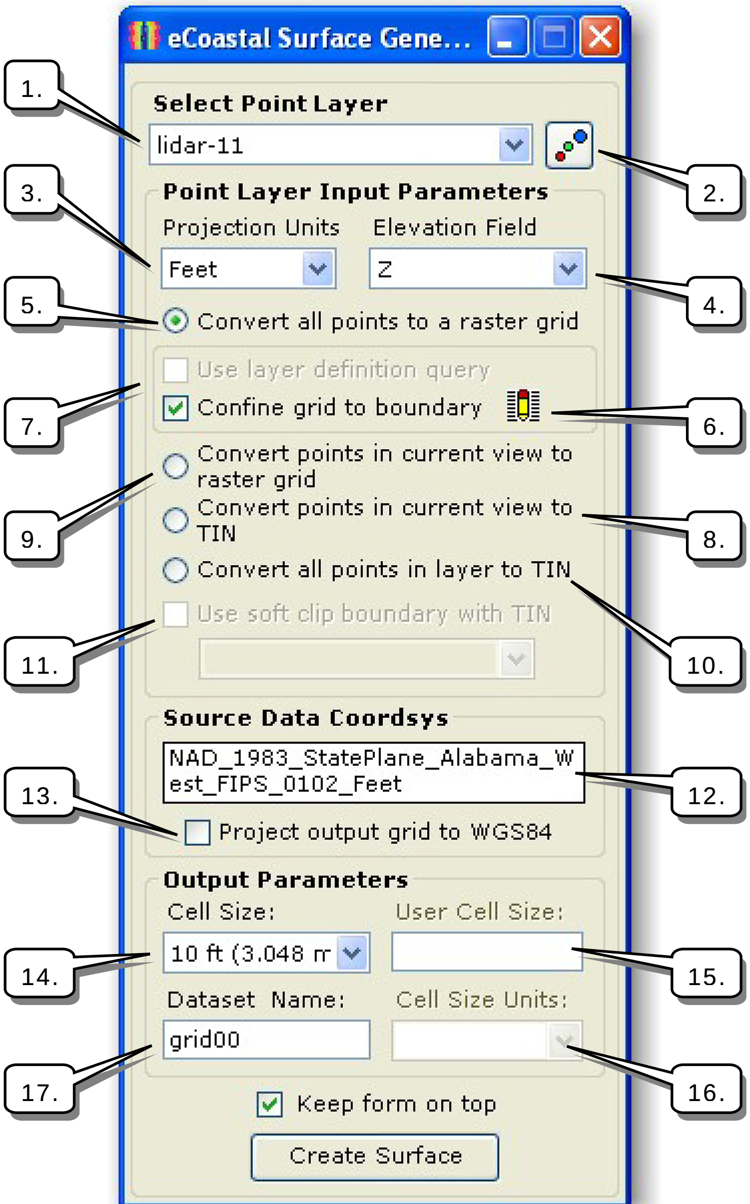


Figure 75 - eCoastal Surface Generator

1. Select from this list the point feature layer used to build the GRID surface.

2. Click this button to locate to the extents of the selected point feature layer. This zoom function honors any established query definition the layer may have.

3. Select from this list the linear unit of measure of the projection system of the selected point layer.

4. Select from this list the field that represents the elevation or depth values for the selected layer.

5. Choose this option to produce a GRID surface that is built from all points in the selected feature class.

6. Check this box to sketch a bounding polygon graphic in your map. This graphic is used as an analysis mask i.e. the grid surface will only be built inside the polygon. To initiate the sketch tool the sketch button must be depressed. The sketch tool button will automatically turn itself off after 20 seconds.

7. Check this box to use the query definition (assuming there is one) for the selected layer. Please note that if the selected layer has a query definition, the definition query checkbox and the sketch analysis mask checkbox both cannot be checked at the same time.

8. Choose this option to produce a TIN surface that is only built from the points seen in your current map view.

9. Choose this option to produce a GRID surface that is only built from the points seen in your current map view.

10. Choose this option to produce a TIN surface that is built from all points in the selected layer.

11. Choose this option to select a polygon boundary layer that can be used to clip the resulting TIN surface. An example of this is shown in Figure 76 - Clipped TIN Surface.

12. Indicates the current map coordinate system.

13. Check this box to build your surface in a WGS84 coordinate projection. This option is useful if you are working with points in a projected coordinates such as a state plane coordinate system and wish to output the surface in geographic coordinates.

14. Select from this list a predefined cell size for GRID surfaces. In addition to the predefined cell sizes, you may select from this list a user-defined size, and if selected, a user defined cell size must be input into the textbox identified by item 15.

15. Enter a cell size if the user defined option is selected from the cell size list.

16. If the user defined cell size option is selected the cell size unit of measure must be selected from this list.

17. An output name is required and is limited to 13 characters.

Figure 76 - Clipped TIN Surface illustrates the outcome of clipping a TIN with a bounding polygon feature class.

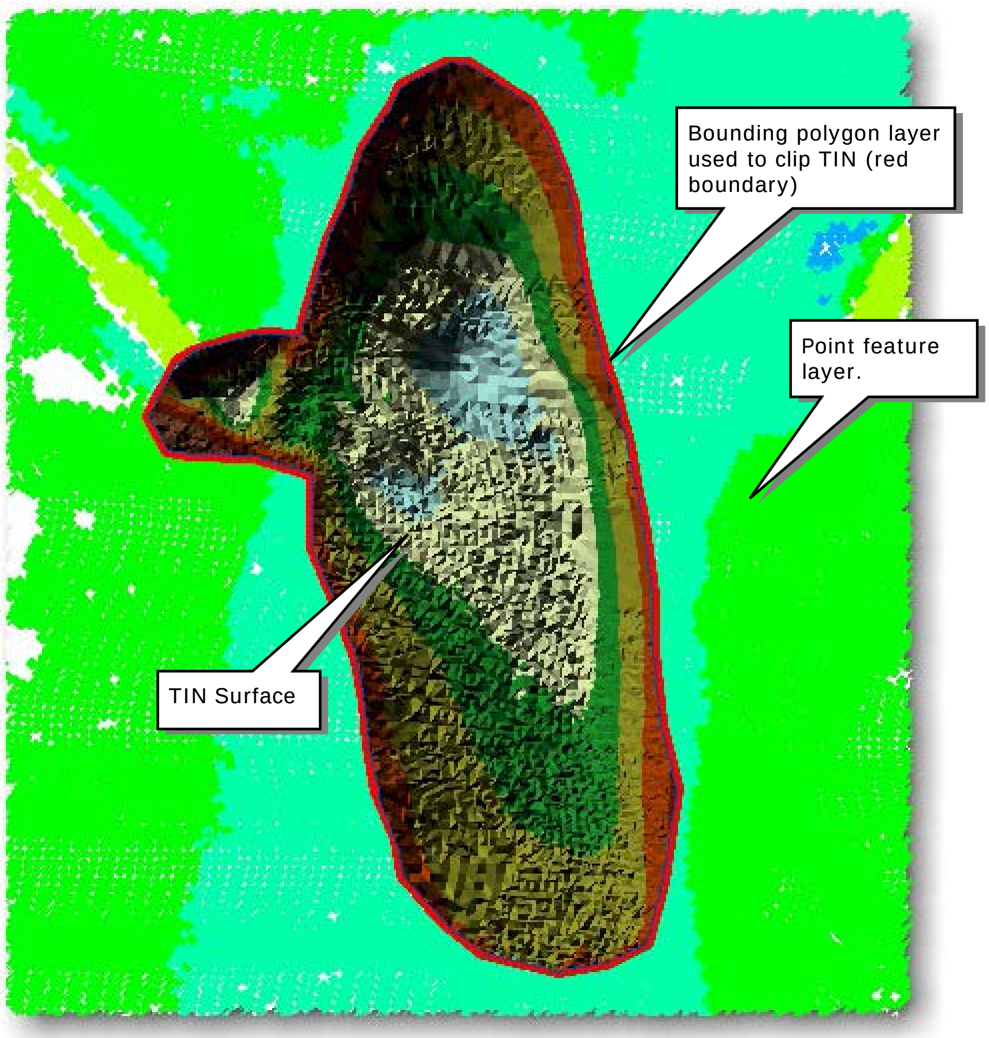


Figure 76 - Clipped TIN Surface

5.9 Beach Profile Importer

The Florida Department of Environmental Protection maintains a historic shoreline database that contains many directories of related types of information about beach changes in Florida over the past 150 or so years. The main focus of the database is historic mean high water (MHW) locations from digitized maps and field profile surveys. Beach profile data is available for downloading from the FLDEP. This application is designed to read the FLDEP profile format and create beach profiles as shape files.

5.9.1 File Menu

To utilize the FLDEP profile data you must first open a raw ASCII data file which can be obtained from their website. To do this select File>Open>Raw and select the text file. The application reads the text file and populates a beach profile monument tree which is seen in Figure 79 (beneath the tree context menu). Once opened, the data file establishes itself as the most recently opened item as seen in Figure 77. Once the beach profile monument tree

Figure 77 - File Open Menu

Figure 78 - File Build Menu

is populated, individual beach profile shape files may be built by accessing the context menu seen in Figure 79. To do this select a monument and right click with your mouse to show the context menu. In lieu of building individual profile shape files you may elect to place all profiles into a single master shape file. To do this select the master shape menu item from the Build menu seen in Figure 78.

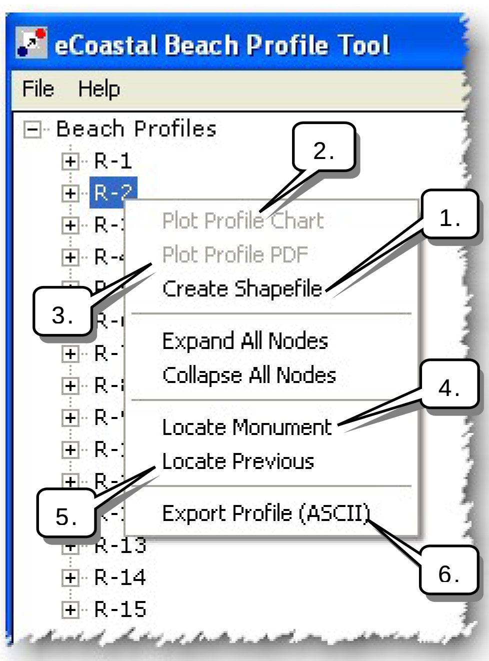


Figure 79 - Beach Profile Tool Tree

1. Select this item to build the selected beach profile shape file.

2. Select this item to plot the profile data on a chart. The shape file must exist and must be loaded into your active data frame.

3. Select this item to plot the profile data on a chart and build a PDF file of the chart.

4. Select this item to locate the profile monument in your map.

5. Select this to return to your previous location after locating a monument.

6. Select this to export the active profile points to an ASCII xyz file.

5.9.2 Beach Profile Tool Dialog

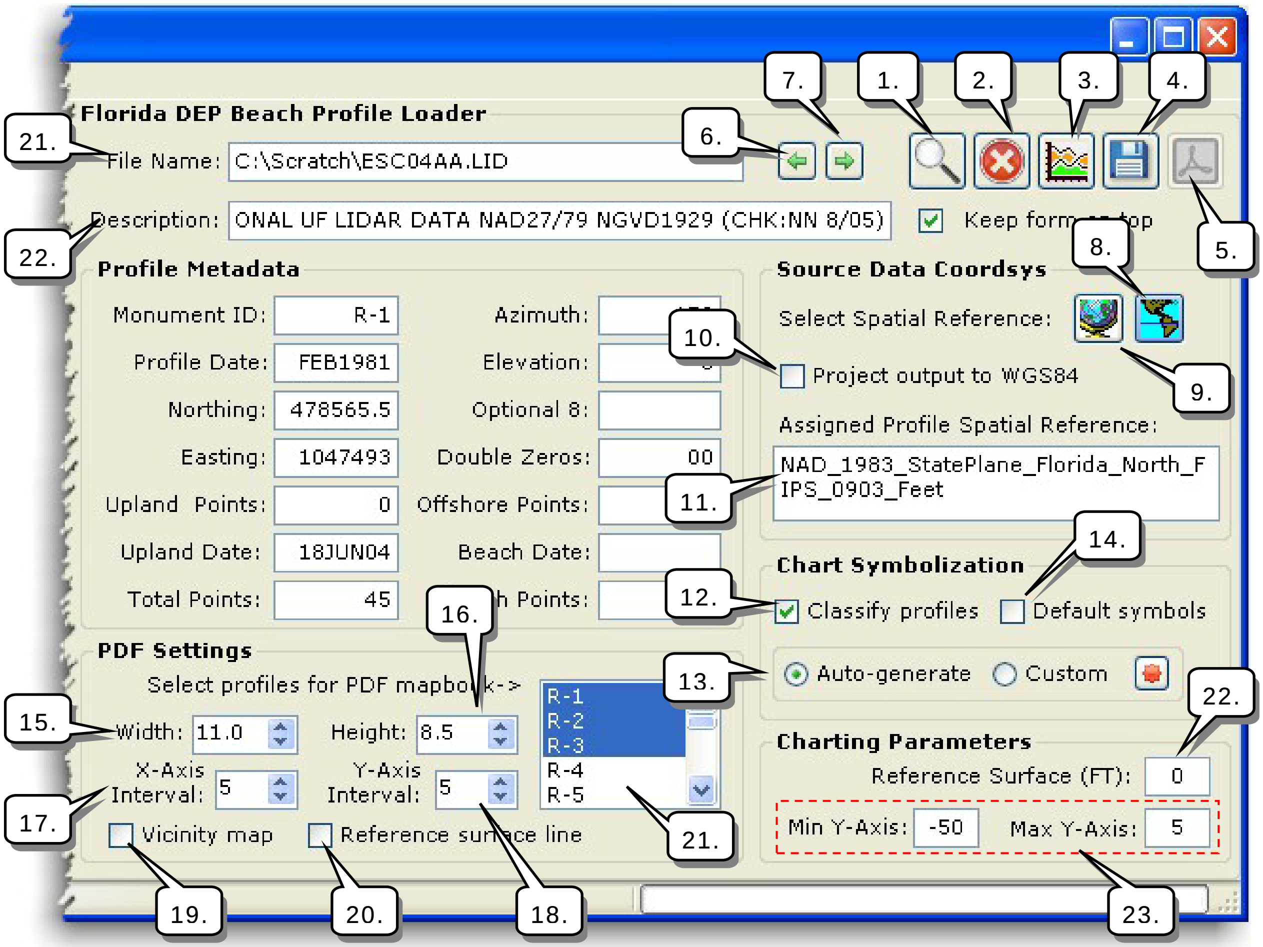


Figure 80 – Beach Profile Tool Dialog

1. Click this button to locate to the profile monument marker.
2. Click this button to delete the active profile shape file.
3. Click this button to plot the active profile data to a chart. The shape file must exist and must be loaded into your active data frame.
4. Click this button to export the active profile points to an ASCII xyz file.
5. Click this button to plot the selected profiles to a PDF map book. The profiles are selected from the list box identified by item 20.
6. Click this button to shrink the footprint of the dialog.
7. Click this button to restore the dialog to its normal footprint.
8. Click this button to set the working spatial reference to be the same as the map.

9. Click this button to select a working spatial reference.

10. Choose this option to build the profile shape file with a WGS84 coordinate projection. This option is useful if you are working with profile point data in projected coordinates such as a state plane coordinate system and geographic coordinate are desired. All FLDEP beach profiles are in state plane coordinates.

11. This is the working spatial reference that is assigned when building profile shape files. Profiles cannot be built until the correct coordinate system has been selected.

12. Check this box to classify the profile point shape files on the depth (or elevation field) values. As indicated in Figure 80 there are two options associated with using the classify option. You can allow the application to calculate the interval values or you can apply your own predefined intervals to all subsequent profile point shape files that are built. This will let you keep the color ramp and value classes the same for each profile. The classification dialog is accessible by clicking the small button to the right of the custom option button marked by item 18 in Figure 80. As shown in Figure 48 - Profile Classification Dialog there are 9 intervals to define a break value for, or you can click the layer button at the top to retrieve the natural breaks from an active profile point shape file (once built). Click the Save button to retain your values in your working folder.

13. If the classify profiles checkbox is checked, select auto-generate to allow the tool to automatically calculate the elevation break points. If the classify profiles checkbox is checked, select custom to allow manual selection of the elevation break points. Click the small button to open the Profile Classification dialog seen in Figure 48.

14. Check this box to use default symbology for your profiles. Default symbology is settings that you can create and save. When this box is checked all profiles plotted on a chart will use your custom settings. See paragraph 5.4 Charting Options for further detail on this item.

15. When converting a chart to PDF format set the x-axis major interval value here.

16. When converting a chart to PDF format set the y-axis major interval value here.

17. Set the desired paper width for the PDF file here.

18. Set the desired paper height for the PDF file here.

19. Check this box to include a vicinity map on the first page of a PDF map book. The map is a snapshot of the active map.

20. Check this box to include the reference surface elevation line in your chart.

21. Select from this list box the beach profiles to be plotted, each on an individual chart, and exported to a PDF map book, one profile per page. When the master profile shape file is built all of the monument ids in the master shape file are loaded into this list. Right click with the mouse cursor over the list box to open a selection context menu.

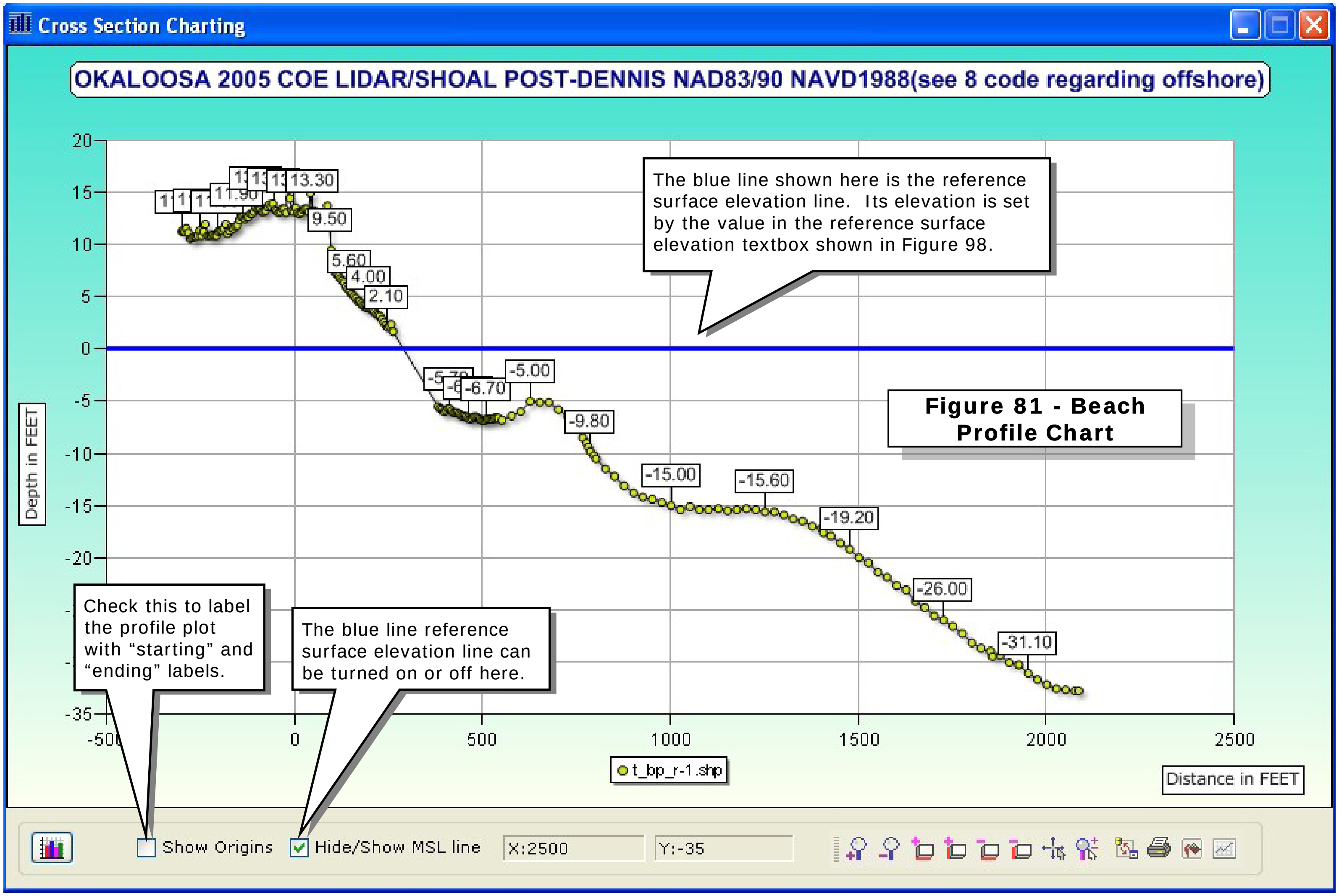
22. Enter into this textbox a value for a reference surface elevation in units of feet or meters. This value is used to place a reference surface line into the profile graph. It

is also used as the reference when calculating cross section area above or below a profile plot line. This is illustrated in Figure 51 - Profile Plot.

23. A user-defined minimum and maximum value for the vertical elevation (Y) axis can be entered here.

5.9.3 Beach Profile Chart

More information about chart functions and options is available as specified hereinbefore. See paragraph 5.4 Charting Options for more information on charting options and features.



5.10 Shrink Wrap Tool

If a surface is made without declaring the data area up front (in other words, by including a clip polygon when defining a terrain dataset, TIN, or raster), some of what are actually voids around the perimeter are treated as data areas. Analytic results in these areas are unreliable because height estimates are based on samples that can be far away. You know areas outside the data collection extent should be excluded from the surface. The problem is coming up with the polygon that provides an accurate representation of this extent. The solution is to synthesize a data boundary from the points that can be used to enforce a proper interpolation zone in the surface.[1] The Surface Generator and Depth Difference tools allow for the use of graphic polygon elements as analysis masks when interpolating surfaces. These graphic boundaries can be manually sketched in a fairly rapid manner. For more complex situations where time is a factor this tool provides capability to export out a result to one or more of these graphic bounding elements.

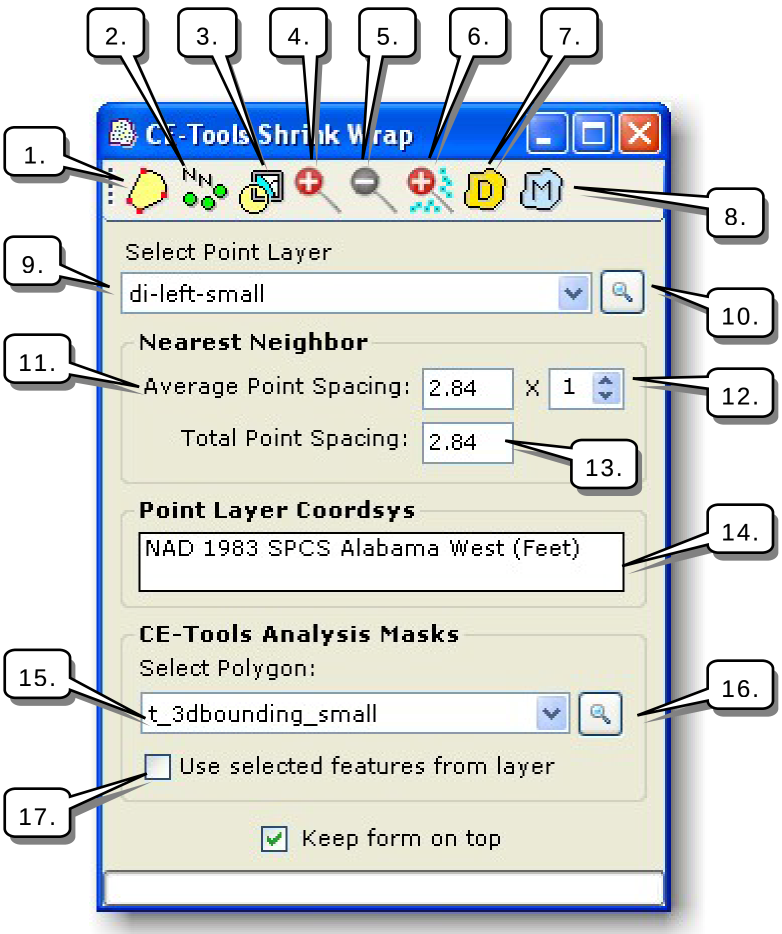


Figure 82 - Shrink Wrap Tool

1. Click this button to initiate the shrink wrap process. A point layer and point spacing must first be specified.

[1] ArcGIS 10 help topic – “Data area delineation from lidar points.”

2. Click this button to perform an average nearest neighbor (AVGNN) calculation on the selected point layer. The AVGNN calculation will honor any selection set on the point layer.

3. Click this button to use the select by circle tool.

4. Click this button to zoom in by 50%.

5. Click this button to zoom out by 50%.

6. Click this button to zoom to the extents of a layer's selection set.

7. Click this button to create a polygon graphic element from the selected polygon layer. This graphic element is assigned the name "DepthDiffPolygon" and then can be used as an analysis mask by the Depth Difference tool as described in 5.5 Depth Difference Calculator.

8. Click this button to create a polygon graphic element from the selected polygon layer. This graphic element is assigned the name "MakeSurfacePolygon" and then can be used as an analysis mask by the Surface Generator tool as described in 5.8 Surface Generator.

9. Select from this list the required point feature layer.

10. Click this button to zoom to the extents of the selected point layer.

11. The results of an AVGNN calculation are placed here. You may enter your own number if necessary.

12. Click this to increase (or decrease) the total point spacing.

13. This number represents the total point spacing used to initiate the shrink wrap process.

14. This represents the current coordinate system of the selected point layer.

15. Select from this list a polygon feature layer to be used in creating a graphic analysis mask as described hereinbefore.

16. Click this button to zoom to the extents of the selected polygon layer.

17. Check this box to export the selected feature in the selected polygon feature layer to a graphic analysis mask.

5.10.1 Basic Process

The shrink wrap process is a workflow that uses several of the geo-processing commands found in the Toolbox in addition to other customizations that give the desired result. The fundamental workflow is seen in **Error! Reference source not found.** hereinafter. As a general rule the output polygon is achieved fairly rapidly, rapidly enough that several iterations may be run in order to fine-tune the final output.

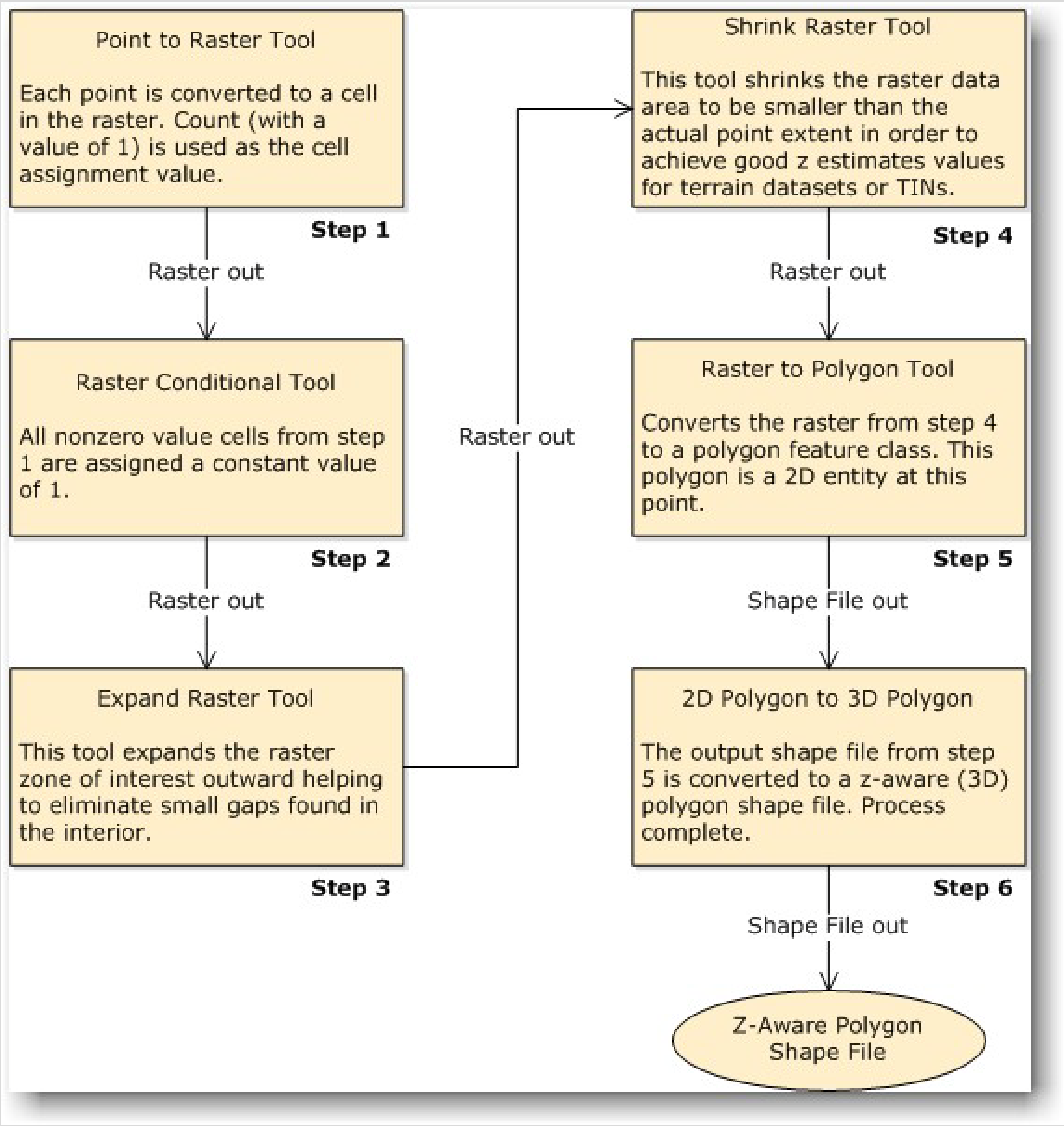


Figure 83- Shrink Wrap Process

5.10.2 Interpreting Average Nearest Neighbor (AVGNN) Results

The only input parameter (excluding the selection of the input point layer) is the point spacing parameter which directly affects the rasterization of the points to the initial raster. This tool works best when the input points are considered to scattered across a broad area. Another way of stating this is data that is not highly-clustered. Lidar data is an example of data that is randomly dispersed across a wide area while a navigation channel cross section survey done on 200-foot intervals is an example of data that is highly clustered. The AVGNN tool will calculate a set of statistical numbers, one of which, gives an indication of how clustered your input point dataset may be. This number is referred to as the z-score. If the z-score is less than 1 then your data is statistically more clustered. This could lead to less than desirable results when calculating the boundary but not always as we shall see.

In the example shown in Figure 84 – Shrink Wrap Pass 1 we have run the AVGNN tool and calculated an average point spacing of 11.67 feet. The points in this point layer are highly clustered as the z-score of -126.89 indicates in Figure 88. The shrink wrap process was then run and the output polygon is actually very small and is obscured by the points themselves and cannot even be seen here.

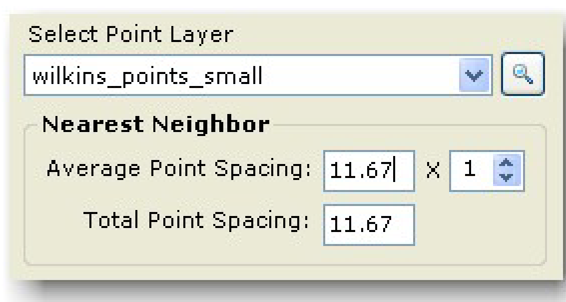


Figure 84 – Shrink Wrap Pass 1

In the next example seen in Figure 85 we have increased the total point spacing by a factor of 4 which increases the raster cell size and has the effect of filling in more of the empty space between the

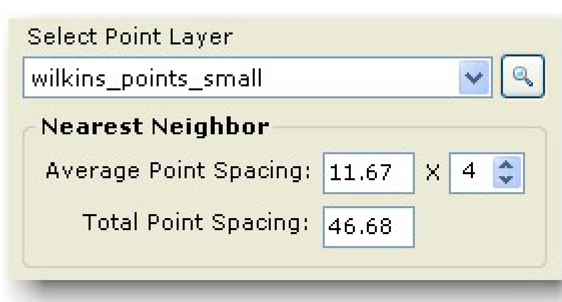
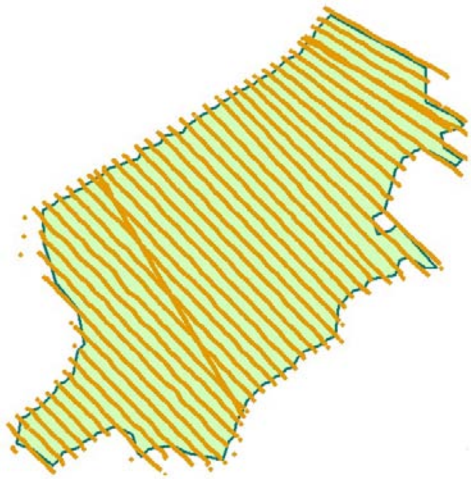


Figure 85 – Shrink Wrap Pass 2

points. The shrink wrap process was run and the output polygon is now much larger and filling in more of the empty space between the points.

In the final example in Figure 87 we have increased the total point spacing to a factor of 5 which further increases the raster cell size and has the effect of filling in enough of the empty space between the points to fully shrink wrap most of the points. As seen in the figure some of the points are outside the polygon boundary and this is a consequence of specifying a large cell size in order to minimally enclose the points. The less clustered the point data is the less of a problem this becomes.



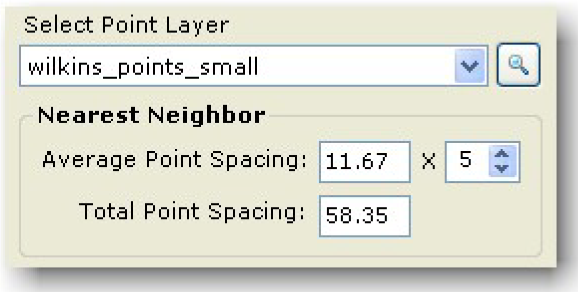


Figure 86 – Shrink Wrap Pass 3

In this last example we have a highly non-clustered set of points, in this case a set of lidar points with an average point spacing of 2.84 feet. The z-score for this point set is 1030.39 which indicate a significantly dispersed pattern. This allows for a very small cell size in the rasterization process which ultimately produces a very well defined polygon boundary.

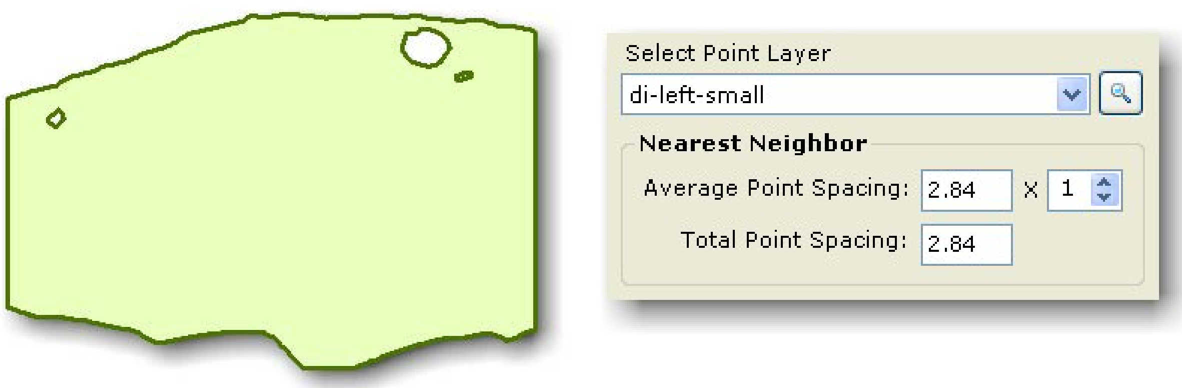
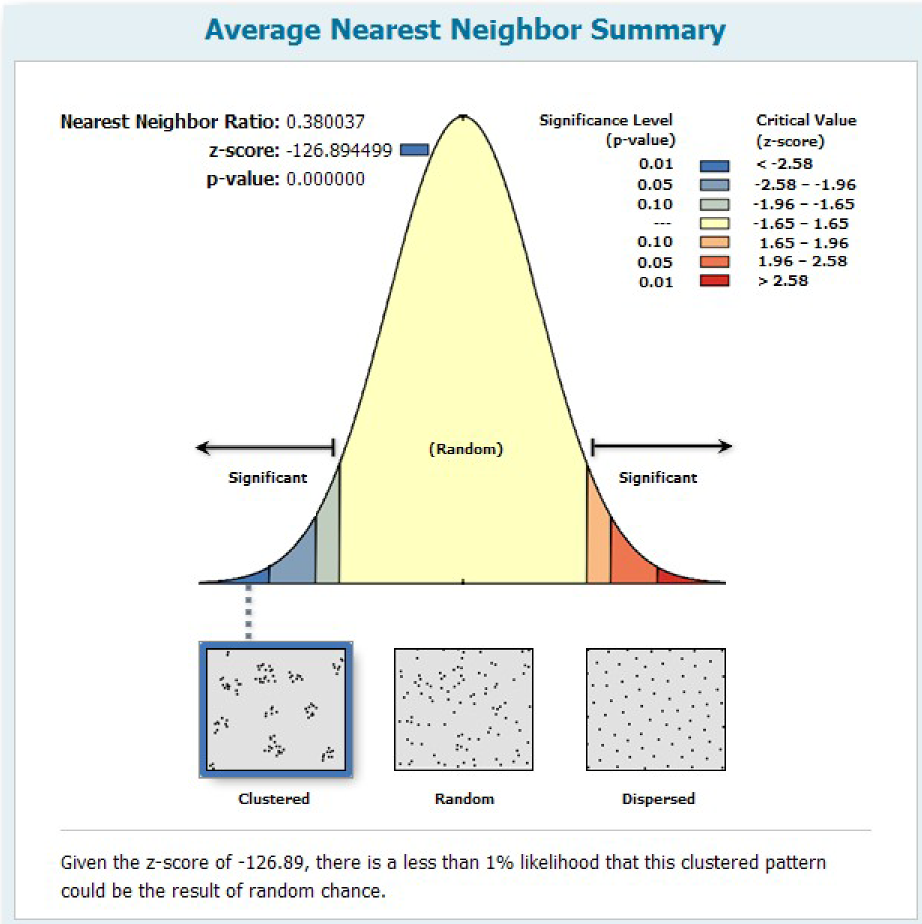


Figure 87 - Shrink Wrap Non-Clustered

5.10.3 AVGNN Report on Clustered Data

When the nearest neighbor tool is run for a set of points and if the z-score is less than zero



Average Nearest Neighbor Summary

Observed Mean Distance:	11.670296
Expected Mean Distance:	30.708351
Nearest Neighbor Ratio:	0.380037
z-score:	-126.894499
p-value:	0.000000

Dataset Information

Input Feature Class:	wilkins_points_small
Distance Method:	EUCLIDEAN
Study Area:	43178212.609387

Figure 88 - Nearest Neighbor Summary

then the data is considered clustered (statistically) and this report is displayed for you with a warning message stating such. The z-score seen in Figure 88 is the measure of this clustering.

6. Shoreline Classification Tool

The shoreline classification is a tool that is designed to attribute a shoreline shape file in accordance with the National Geodetic Survey's attribution scheme 'Coastal Cartographic Object Attribute Source Table (C-COAST). CCOAST was developed to bring attribution of various National Geodetic Survey sources of shoreline data into one attribution catalog. C-COAST is not a recognized standard but was influenced by the International Hydrographic Organization's S-57 Object-Attribute standard so that the data would be more accurately translated into S-57.

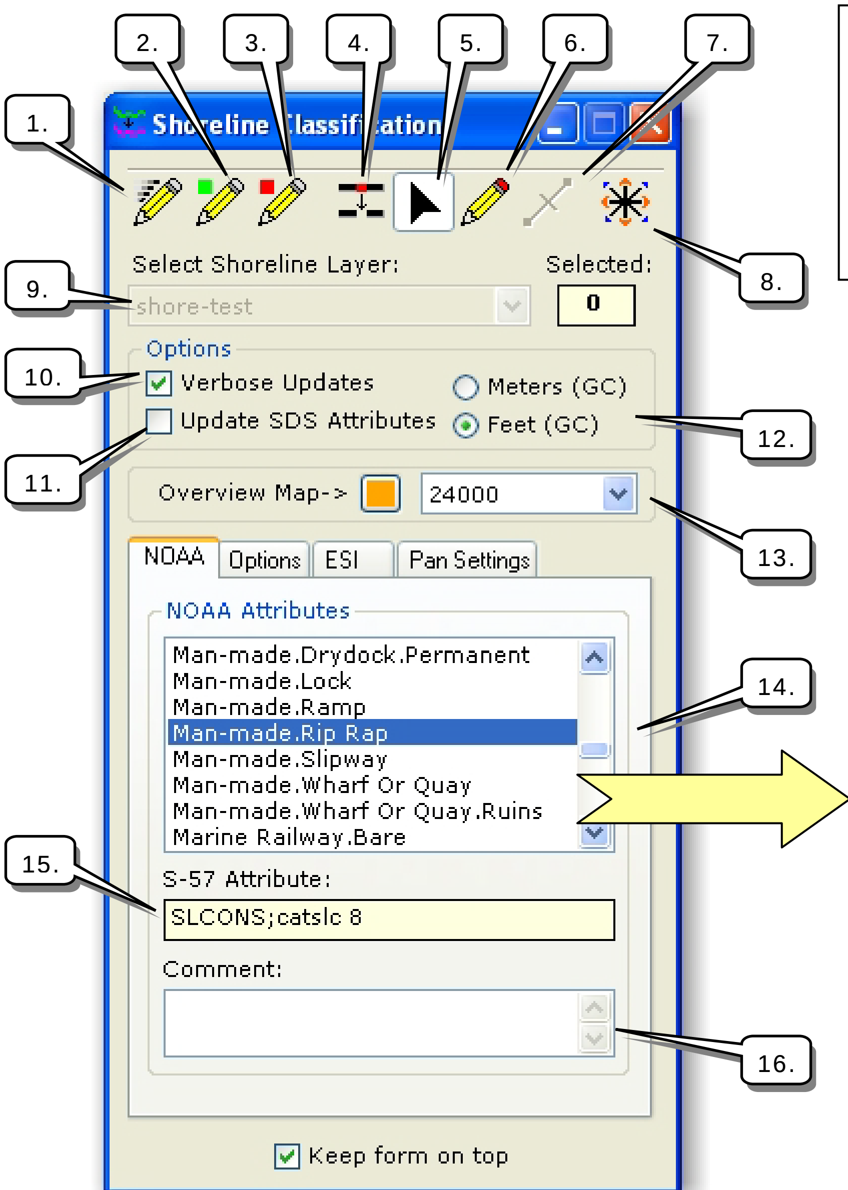


Figure 90 - Shoreline Classification Tool

The context menu seen in Figure 88 - Context Menu is accessible by right clicking on the attribute list box marked by item 14 in Figure 89.

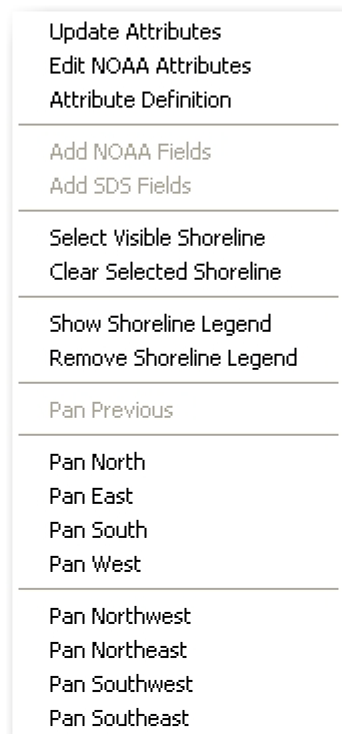


Figure 89 - Context Menu

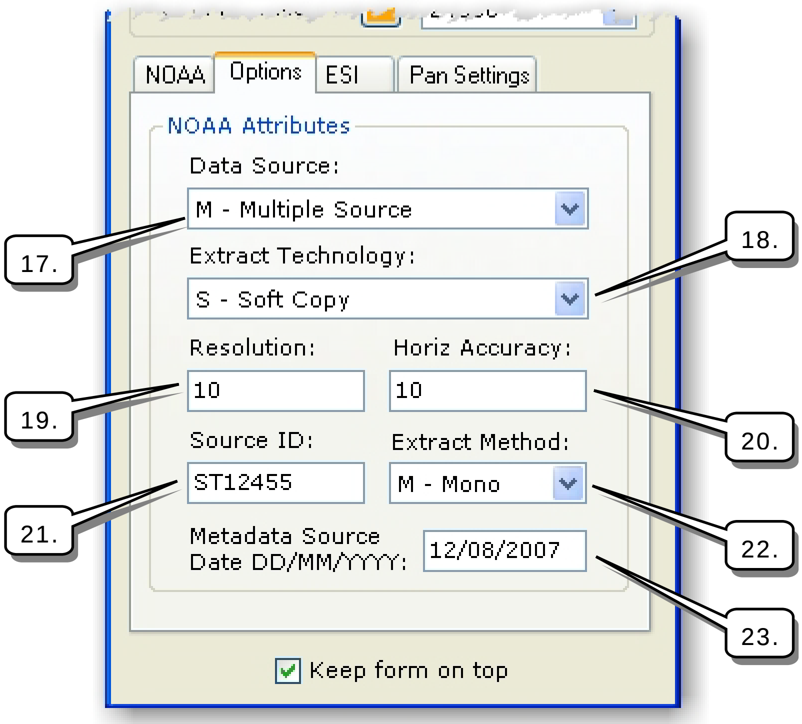


Figure 91 - Classification Options

More specifically, this tool populates required attribute fields in the shape file with information provided by the user and also extracted automatically from the polyline shape file. Information extracted from the polylines is shown in Table 5 - Extracted Attributes.

Attribute	Description
CONTOUR	Holds the elevation of the polyline segment if segment is a polylineZ. If the starting and elevations of a polyline segment are different then this value defaults to -999999.
LENGTH	Holds the length value of the shoreline segment.
LENGTH_U_D	Holds the unit of linear measurement for shoreline segment length.

Table 5 - Extracted Attributes

Features of the tool dialog box are enumerated as follows.

1. Click this button to start an edit session.

2. Click this button to save any edits during the edit session.

3. Click this button to stop the edit session.

4. Click this button to open the snapping environment window while in edit mode.

5. Click this button to use the select tool. Use this tool to select one or more polylines for editing or attribute updating.

6. Click this button to use the sketch tool. The sketch tool allows you to draw a new polyline in the shoreline layer being edited.

7. Click this button to use the split polyline tool. The split tool allows you to split a shoreline polyline anywhere you require.

8. Click this button to pan the map in the direction specified on the pan settings tab.

9. Select from this list the shoreline layer to classify.

10. Check this box to enable verbose updates when updating shoreline attributes.

11. Check this box to update SDS attributes concurrent to updating NOAA attributes.

12. When working in a map with geographic coordinates while editing a shoreline shape file choose either meters or feet for your linear units. When updating the attributes of a shoreline shape file the length of the polyline segment being edited is automatically extracted and its length is either meters or feet as determined by this setting. It can be changed at any time. For a map with a projected coordinate system, the linear units of the projection are used to calculate segment length.

13. Click the orange button to open an overview map window. Once opened, the view scale of the overview map can be changed by selecting a scale from this list.

14. Select from this list the attribute value to update. This list box has a mouse context menu that can be accessed with a right mouse click and it explained in detail in the next paragraph.

15. This is the equivalent S-57 attribute that is displayed when an attribute is selected from the list.

16. Enter an optional comment that is added to the edited attribute record.

17. Select from this list the data sources of the shoreline data.

18. Select from this list the extract technology used to extract the shoreline from the lidar survey.

19. Enter into this textbox the resolution of the shoreline vector data.

20. Enter into this textbox the horizontal accuracy of the shoreline vector data.

21. Enter into this textbox the source ID of the shoreline vector data.

22. Select from this list the extract methodology used with lidar survey.

23. Enter a date here to add to each attribute record when updating occurs. This is typically the date found with the shoreline metadata file.

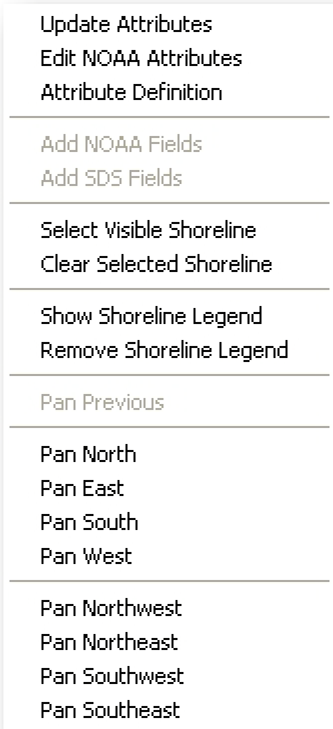


Figure 92 - Context Menu

6.1 Attribute List Context Menu

The required attribute fields can be added to the shape file from the context menu by selecting “Add NOAA Fields”. In addition to these fields the “Add SDS Fields” item can be selected to add fields that are compliant with Spatial Data Standards. These two commands cannot be used when in an explicit editing session.

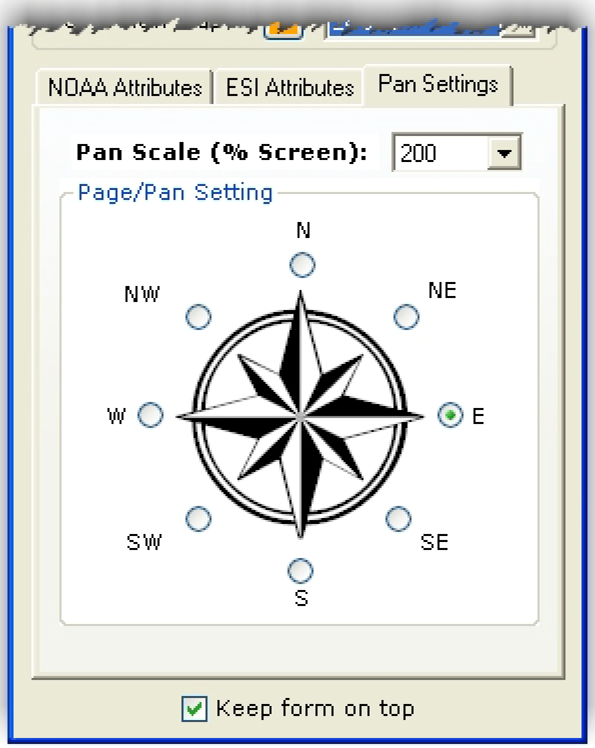
To update attributes of a selected shoreline segment, select the “Update Attributes” menu item from the context menu. The attributes seen in the attribute list box are read from an ASCII text file stored in the application folder. To access this file select the “Edit NOAA Attributes” menu item from the context menu. This will open the text file in notepad for you. You will have to restart the tool dialog box to see any changes made to this text file.

To access a “definition” of any attribute, first select the attribute, and then select “Attribute Definition” from the context menu. This will display a definition of the selected attribute. The definitions are stored in the same text file that is accessed from the “Edit NOAA Attributes” menu item.

Pick “Select Visible Shoreline” from the context menu to select all shoreline visible in the current view. Please note that shoreline selected in this way may extend beyond the current view extents. Pick “Clear Selected Shoreline” to clear the selected shoreline.

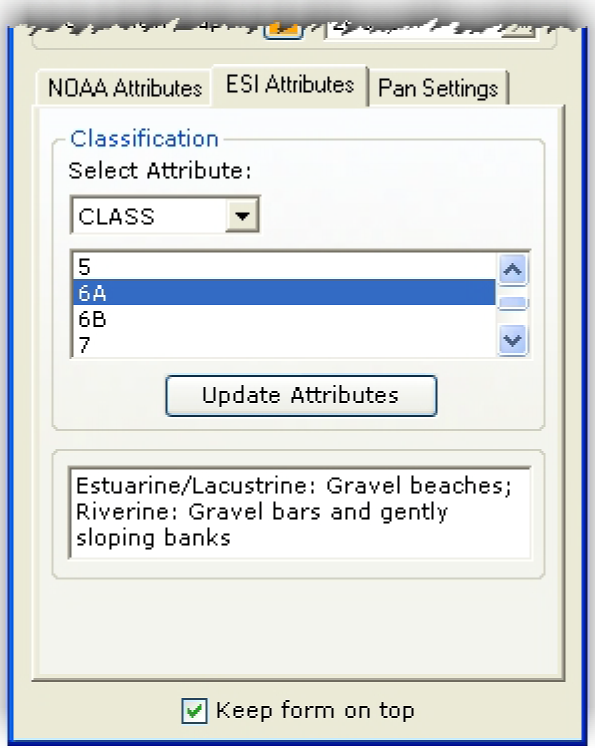
Select “Show Shoreline Legend” to classify the selected shoreline shape file with a value map renderer. This is useful to see what shoreline segments have been classified as you work. To set the shoreline back to a single simple line symbol pick the “Remove Shoreline Legend” item from the menu.

Custom user defined legends for shoreline layers are available by doing the following. For each shoreline layer being edited create a layer file from ArcMap. The layer file must have the same name as the layer being edited (with the required “lyr” extension). Save this layer file to the “c:\program files\ecoastal-toolbox” folder. When the “Show Shoreline Legend” command is selected this application folder is checked to see if this layer file exists, and if so, the line symbology that is stored in the layer file is used to render the layer in your map.



Pan commands to navigate the map are available from the context menu. The amount of pan movement is based on the percentage value selected from the list seen in Figure 93 - Shoreline Tool Pan Settings. The compass rose seen in this figure has no relationship to the pan commands on the context menu. This compass setting is used in conjunction with the Pan button located on the main toolbar only.

Figure 93 - Shoreline Tool Pan Settings



The ESI Attributes section at this time is designated for future use and does not currently provide and attribution functions. ESI, NOAA's Environmental Sensitivity Index (ESI) "systematically compiles information in standard formats for coastal shoreline sensitivity, biological resources, and human-use resources."

Figure 94 - Shoreline Tool ESI Attributes

Appendix A History of Modifications

1. Added paragraph 3.11.4 Shape to Multipoint Shape Tool on 23 Oct 2008.
2. Added paragraph 3.11.5 Nearest Neighbor Tool on 23 Oct 2008.
3. Modified description of Layer File Toolbox as described in paragraph 3.7.1 Administrative Functions on 23 Oct 2008.
4. Modified Figure 75 - eCoastal Surface Generator interface on 27 Oct 2008. Changed point layer input parameters section.
5. Modified paragraph 5.1 Raster Profile Tool on 26th Jan 2009. Tool interface has been updated.
6. Added paragraph 5.2 Auto-Profiler Tool on 26th Jan 2009.
7. Added CELRB to district list on DB Connections form on 8th Feb 2009.
8. Fixed alpha-numeric sorting of my projections select list on 4th Mar 2009.
9. Added CESPN to district list on DB Connections form on 4th Mar 2009.
10. Added cut/fill to Depth difference tool and Figure 72 - Cut/Fill Output Report on 5th Mar 2009.
11. Fixed generate centerline profile function in Auto-Profiler Tool on 6th Mar 2009.
12. Added custom vertical axis to charting for Auto-Profiler and Raster Profile tools on 7th Apr 2009.
13. Profiler, Auto-Profiler, and Depth Difference tools have been updated to work with SDE, file geodatabase, and personal geodatabase raster layers on 7th Apr 2009.
14. Polyline2Polygon and Polygon2Poyline tools now allow custom shape file user-defined prefixes on the filenames on 7th Apr 2009.
15. Polyline2Polygon and Polygon2Polyline tools honor layer selection sets on 2nd Nov 2009.
16. Modified Auto-Profiler Tool to allow standard classification schemes on depth (or elevation) values. Added delete options. Modified dialog layout all on 2nd Nov 2009.
17. Renamed tool from “Profiler Tool” to “Raster Profile Tool”. Modified Raster Profile Tool to allow standard classification schemes on depth (or elevation) values. Added delete options. Modified dialog layout all on 2nd Nov 2009.
18. Added TIN/Terrain Profile Tool on 2nd Nov 2009.
19. Added ability to save default chart symbology for raster, tin, and auto-profiler profile tools to settings file(s) on 5th Dev 2009.

20. Modified and improved FLDEP Beach Profile Import Tool on 26th Jan 2010. Incorporated charting features and options associated with other profile tools describe hereinbefore.

21. Added the Pixels to ASCII File Tool on 10th Feb 2010.

22. Modified Profiler, Auto-Profiler, and TIN-Terrain Profiler Tools to allow better user defined parameters for building PDF map books on 30th June 2010.

23. Modified Polyline to Polygon and Polygon to Polyline tool dialog box to include flatten 3D geometry option on 25th Sept 2010.

24. Add the Shrink Wrap Tool on 15th Mar 2011.

25. Integrated existing shoreline classification tool with survey toolbar on 15th Mar 2011.