SMS User Manual 11.2, Volume 4

Appendix and File Support

Contents

Articles

7. Appendix

FHWA:2010 Webinars

Federal Highways Administration and Aquaveo have partnered to present a series of webinars on using SMS/WMS. This page contains links to past webinars that you can watch.

January: Introduction to WMS: How to Build a Model using the Hydrologic Modeling Wizard

Slide Presentation [1] (50 minutes)

Software Demonstration [2] (20 minutes – please note that the sound for this recording will take a few seconds to come up so don't worry if you don't hear anything initially)

February: Introduction to SMS models FESWMS and TUFLOW

Watch (45 minutes) [3]

March: Using coordinate systems in SMS and WMS

Watch (50 minutes) [4]

April: Data Collection in SMS

Watch (53 minutes) [5]

May: Data Collection in WMS

Watch (1 hr 8 min) [6]

June: Editing Scattered Data in SMS

Watch (47 min) [7]

July: Using the Hydrologic Modeling Wizard in WMS

Watch (55 min) [8]

August: Flow Modeling using SMS and TUFLOW

Watch (1 hr 27 min) [9]

September: HEC-RAS Conceptual Modeling in WMS

Watch (1 hr) [10]

October: Setting up FESWMS Models in SMS

Watch (1 hr) [11]

November: Mapping Floodplains in WMS

Watch (1 hr) [12]

December: FESWMS(and TUFLOW), Modeling structures in 1D and 2D

Watch [13]

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[1] http://fhwa.na3.acrobat.com/p23061878/
[2] http://fhwa.na3.acrobat.com/p11298550/
[3] http://fhwa.na3.acrobat.com/p22046632/
[4] http://fhwa.na3.acrobat.com/p27781810/
[5] http://fhwa.na3.acrobat.com/p94892485/
[6] http://fhwa.na3.acrobat.com/p27287621/
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[8] http://fhwa.na3.acrobat.com/p63062182/
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[12] http://fhwa.na3.acrobat.com/p82094152/
[13] http://fhwa.adobeconnect.com/p62228745/

SMS 11.2 Dialog Help

This is a special page that relates SMS dialogs to wiki pages. SMS reads this page when a user hits the **Help** button in a SMS dialog, and opens the wiki at the page indicated below.

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692. SMS:Materials_Data | QDlgMaterialProperties
693. SMS:SRH_Model_Control | DynSrhModelControl
694. SMS:SRH_Boundary_Conditions | DynSrhNdstrBc

References

[1] http://www.xmsdevwiki.com/dev/SMS:FATE_Coverage
[2] http://www.xmsdevwiki.com/dev/SMS:Dredge_Source_Model
[3] http://www.xmsdevwiki.com/dev/SMS:MKPlacement
[4] http://www.xmsdevwiki.com/dev/SMS:Dredging_Coverage2
[5] http://www.xmsdevwiki.com/dev/SMS:Dredging_Sediment_Characteristics
[6] http://www.xmsdevwiki.com/dev/SMS:STFATE_Clouds_to_PTM_Sources
[7] http://www.xmsdevwiki.com/dev/SMS:Dredging_Scheduling2
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7.1. Dynamic Model Interface

Dynamic Model Interface Schema

The dynamic model interface is available in SMS version 11.2 and later. It is primarily a tool for developers. The dynamic model interface provides a way to quickly generate an interface for a numeric model.

Dynamic dialogs are a quick way to generate dialogs without having to compile code. To add or delete a widget on a dynamic dialog, the user simply modifies the XML document. When the modified document is loaded, the new/modified dialog exists. The XML document defines the layout, behavior and the different dialog controls.

The dialog is divided into 2 sections, the tree and the widget view. The tree is on the left side of the dialog and it contains groups and items that represent data. Clicking on a group or item will result with the widget view being updated to match the selected tree or group item.

- Order of the tree items and groups will match the order defined in the XML file.
- Clicking on group will display all children items in the widget view.
- Clicking on a single item will display associated widgets in widget view.
- Tree item will also display the values in a non-editable field.
- Unique_name use format: file::unique_name#value
- Widgets or groups of widgets can be loaded from an outside file by using <link_to_xml>.
- Multiple widgets when displayed on right side can be expanded/collapsed – TO BE DETERMINED
- Can have nested groups
- Keywords are words SMS has reserved in the schema and can not be used as unique names. All keywords will start with a "#". Here is a list of available keywords:
  - #card_name
  - #geom_name – name of geometry as it shows up in the project explorer
  - #project_name
  - #value
  - #units
  - #xmdf_path – path inside the XMDF file
  - #file_name
  - #file_path
  - #sms_path – path in sms project explorer once inside a geometric item
  - #count (used for a widget in a table for counting the rows/columns)
  - #geom_guid

    Projection keyword:

  - #horizontal_datum: NAD83 |NAD27|LOCAL
  - #horizontal_system: UTM|STATE_PLANE|GEOGRAPHIC|LOCAL
  - #horizontal_units: FEET|METERS|DEGREES
  - #horizontal_zone: 3104 etc
  - #vertical_datum
  - #vertical_units

    Additional keywords are defined with the various custom control widgets.

Note: In changing from version 1 to version 2, all tags that were <custom_control_XXXX> were changed to <control_XXXX>.

Element *<alignH>*

Info	Align text horizontally in a text box. Keywords are LEFT, RIGHT, CENTER, and JUSTIFIED
Versions	1, 2
Attributes	none
Children	none
Used by	text_box

Example	`<text_box>`
	`  <unique_name>edtD50Units</unique_name>`
	`  <alignH>CENTER</alignH>`
	`  <text>mm</text>`
	`</text_box>`

Element *<alignV>*

Info	Align text horizontally in a text box. Keywords are BOTTOM, TOP, and CENTER
Versions	1, 2
Attributes	none
Children	none
Used by	text_box

Example	`<text_box>`
	`  <unique_name>edtD50Units</unique_name>`
	`  <alignV>TOP</alignV>`
	`  <text>mm</text>`
	`</text_box>`

Element *<arc_att>*

Info	Used to specify what attributes should be used for the arcs of a coverage.
Versions	2
Attributes	none
Children	menu_item
Used by	coverage
Example	

Element *<blue>*

Info	The blue element of a color. Ranges from 0 to 255. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	none
Used by	color

Example	This would change the text to a bright red color.
	`<text_style>`
	`  <color>`
	`  <red>255</red>`
	`  <green>0</green>`
	`  <blue>0</blue>`
	`  </color>`
	`<text_style>`

Element *<bold>*

Info	Sets the text to be bolded. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	none
Used by	text_style

Example	This would bold the text when the value in the edit_box is less than 0.0.
	`<edit_box>`
	`  <unique_name>edtA</unique_name>`
	`  <default>1.0</default>`
	`  <text_style>`
	`  <bold></bold>`
	`  <condition>edtA LESS_THAN 0.0</condition>`
	`  <text_style>`
	`</edit_box>`

Element *<card>*

Info	Determines the card name and format when the item is exported. For more examples see <export_format>.
Versions	1, 2
Attributes	none
Children	card_name, export_format, export_location, dependency, anything beginning with “process_each_”, export_group, export_optional
Used by	file_def

Example	`<item>`
	`  <text>Formulation</text>`
	`  <card>`
	`  <card_name>FORMULATION</card_name>`
	`  <export_format>card "formulationUnits"</export_format>`
	`  </card>`

Element *<card_name>*

Info	The name of the card which is used in the card file.
Versions	1, 2
Attributes	none
Children	none
Used by	card
Example	

Element *<check_box>*

Info	Widget that displays text that is checked/unchecked.
Versions	1, 2
Attributes	none
Children	text, default, unique_name, dependency, export_text_checked, export_text_unchecked, text_style
Used by	item

Example	`<check_box>`
	`  <text>Calculate Sediment Transport</text>`
	`  <default>checked</default>`
	`  <unique_name>togCalcSedimentTransport</unique_name>`
	`  <export_text_checked>ON</export_text_checked>`
	`  <export_text_unchecked>OFF</export_text_unchecked>`
	`  <dependency>...</dependency>...`
	`</ check_box >`

Element *<color>*

Info	The color of an item, expressed in red, green and blue values ranging from 0 to 255. All 0 values for red, green and blue is black. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	red, green, blue
Used by	text_style

Example	This would change the text to a bright red color.
	`<text_style>`
	`  <color>`
	`  <red>255</red>`
	`  <green>0</green>`
	`  <blue>0</blue>`
	`  </color>`
	`<text_style>`

Element *<column>*

Info	Definition of the column in the table. A widget defined in a column will be the widget used for each cell in the column.
Versions	1, 2
Attributes	none
Children	text, read_only, optional, dependency, text_box, combo_box, edit_box, all elements starting with “custom_control”, check_box
Used by	table

Example	Column1 is read only, Column 2 isn't read only and is also optional. This means the column can have empty fields and a warning message won't be displayed.
	`< table >`
	`  …`
	`  <column>`
	`  <text>Column1</text>`
	`  <read_only></read_only>`
	`  </ column >`
	`  < column >`
	`  <text>Column2</text>`
	`  <optional></optional>`
	`  </ column >`
	`</ table >`

Element *<combo_box>*

Info	Widget that displays list of options. Only 1 can be selected. If no default is specified and the optional tag is present, then an empty option will be added to the combo box. If there is no default tag, and no optional tag, then the first item will be default. In version 2, if a combo box has display_options_arc, and is part of a dialog that is used as an arc attribute, then a limited set of display options will appear for the options of the combo box. The display option for each option of the combo box will only be line thickness and color. The display option is NOT saved at any point and will be reset every time SMS is opened.
Versions	1, 2
Attributes	none
Children	option, unique_name, optional, dependency, text_style, display_options_arc
Used by	item, row, column

Example	Creates a combo box with hours, minutes and seconds. Hours is the default item.
	`<combo_box>`
	`  <unique_name>cbxTransportUnits</unique_name>`
	`  <option>`
	`  <text>hours</text>`
	`  <default></default>`
	`  </option>`
	`  <option>`
	`  <text>minutes</text>`
	`  </option>`
	`  <option>`
	`  <text>seconds</text>`
	`  </option>`
	`  <dependency>...</dependency>...`
	`</ combo_box >`

Element *<command_args>*

Info	Defines the command line arguments to run a particular executable.
Versions	2
Attributes	none
Children	none
Used by	input_file, anything starting with process_
Example	See executable example.

Element *<comment>*

Info	Defines a character or sequence of characters that defines the start of a comment on a line. Comments are always terminated by an end of line.
Versions	2
Attributes	none
Children	none
Used by	file_def

Example	The following example has a file where the exclamation point starts the comment.
	`<file_def>`
	`...`
	`  <comment>!</comment>`
	`...`
	`</file_def>`

Element *<condition>*

Info	Evaluates two or more objects using GREATER_THAN, GREATER_THAN_EQUALS, LESS_THAN, LESS_THAN_EQUALS, EQUALS, AND, OR, and NOT. If condition is not met, then message is displayed (if model_check) or widget is hidden/dimmed (if dependency). String literals, such as an entry in a combo-box, must be enclosed in double-quotes (ex. “Combo box entry”).
Versions	1, 2
Attributes	none
Children	none
Used by	model_check, dependency, text_style

Example	`< table >`
	`  <column>`
	`  <text>A</text>`
	`  <edit_box>`
	`  <unique_name>colA</unique_name>`
	`  </edit_box>`
	`  </column>`
	`...// other columns also defined`
	
	`  <model_check>`
	`  <condition>( (colA EQUALS 0.0 OR colB LESS_THAN 0.0)`
	`  AND NOT(colD NOT EQUALS EMPTY OR colE NOT EQUALS`
	`  “Some value”))</condition>`
	`  <message>Column D or E is required</message>`
	`  </model_check>`
	`</ table >`

Element *<contains>*

Info	Holds all the groups and items of a group.
Versions	2
Attributes	none
Children	group, item
Used by	group
Example	

Element *<control_curve>*

Info	Displays an curve push button. When pushed the xy curve values can be updated and a curve is displayed.
Versions	2
Attributes	none
Children	max_rows, flags, x_column, y_column, unique_name, dependency
Used by	item, row, column

Example	This example creates a curve limited to 10 rows.
	`<item>`
	`  <control_curve>`
	`  <unique_name>myCurve1</unique_name>`
	`  <max_rows>10</max_rows>`
	`  <flags>XY_USEDATE</flags>`
	`  <x_column>`
	`  <text>Time</time>`
	`  </x_column>`
	`  <y_column>`
	`  <text>Velocity</text>`
	`  </y_column>`
	`  </control_curve>`
	`  …`

Element *<control_dataset>*

Info	Displays an edit box, and push buttons for select, delete and create. Once selected, the dataset string is placed into the edit box. <dataset_type> can be scalar or vector. Possible keyword outputs are file_name (which is the name of the dataset without path), geom_name, and file_path (full path c:\somewhere) and sms_path.
Versions	1 (<custom_control_XXXX>), 2
Attributes	none
Children	push_button, dataset_type, unique_name, dependency, default, dataset_name, text_style, use_parameter
Used by	item, row, column

Example	This example creates the custom control with only the select and delete buttons.
	`<item>`
	`  <control_dataset>`
	`  <push_button>select<push_button>`
	`  <push_button>delete</push_button>`
	`  <dataset_type>scalar</dataset_type>`
	`  </control_dataset>`

Element *<control_date>*

Info	Displays date and time selector, where a date can be selected. Possible output is value, which will be the date formatted as specified in SMS preferences. Possible outputs are year, month, day, hour, minute, second. Keywords: • #DAY_DIGIT • #DAY_DIGIT_ZERO • #DAYS_IN_YEAR • #DAY_SHORT_NAME • #DAY_LONG_NAME • #MONTH_DIGIT • #MONTH_DIGIT_ZERO • #MONTH_SHORT_NAME • #MONTH_LONG_NAME • #YEAR_2 • #YEAR_4 • #HOUR • #HOUR_ZERO • #HOUR_24 • #HOUR_24_ZERO • #MINUTE • #MINUTE_ZERO • #SECOND • #SECOND_ZERO • #AM_PM • #AM_PM_CAPS
Versions	1 (<custom_control_XXXX>), 2
Attributes	none
Children	unique_name, dependency, default, text_style
Used by	item, row, column

Example	<item>
	  <text>Start date</text>
	  <control_date>
	  <unique_name>edtDate</unique_name>
	  </control_date>
	  <card>
	  <card_name>DATE</card_name>
	  <export_format>"%s Day:%s Month:%s Year:%s Hour:%s Minute%s
	  Second:%s\n", #card_name, edtDate#DAY_DIGIT,
	  edtDate#MONTH_LONG_NAME, edtDate#YEAR_4, edtDate#HOUR_24,
	  edtDate#MINUTE_ZERO, edtDate#SECOND_ZERO</export_format>
	  </card>
	</item>

Element *<control_density>*

Info	Displays an edit box and combo box. Combo box can contain kg/m^3, gr/cm^3, lb/ft^3. Possible outputs are value and units. Keywords: • #MPV_MG_PER_L • #MPV_G_PER_L • #MPV_KG_PER_CU_M • #MPV_G_PER_CU_CM • #MPV_LB_PER_CU_FT
Versions	1 (<custom_control_XXXX>), 2
Attributes	none
Children	option, unique_name, dependency, range, default, text_style
Used by	item, row, column
Example	Displays kg/m^3 and lb/ft^3 in combo box. If kg/m^3 selected and exported, returns the text “kg m”. <item> <text>Density </text> <control_density> <option> <text>kg/m^3</text> <export_text>kg m</export_text> <unit_keyword>#MPV_KG_PER_CU_M</unit_keyword> </option> <option> <text>lb_ft^3</text> <export_text>lbs ft</export_text> <unit_keyword>#MPV_LB_PER_CU_FT</unit_keyword> </option> </control_density> …

Element *<control_duration>*

Info	Displays an edit box and combo box. Combo box contains days, hours, minutes, seconds. Possible outputs are value and units. Keywords: • #TIME_SECONDS • #TIME_MINUTES • #TIME_HOURS • #TIME_DAYS • #TIME_WEEKS • #TIME_YEARS
Versions	1 (<custom_control_XXXX>), 2
Attributes	none
Children	option, unique_name, dependency, range, default, text_style
Used by	item, row, column
Example	Displays only minutes and hours in combo box. If hours selected and exported, returns the text “hrs”.

```
<item>
   <text>Transport Time Step</text>
   <control_duration>
       <option>
          <text>minutes</text>
          <export_text>min</export_text>
          <unit_keyword>#TIME_MINUTES</unit_keyword>
       </option>
       <option>
          <text>hours</text>
          <export_text>hrs</export_text>
          <unit_keyword>#TIME_HOURS</unit_keyword>
          <default></default>
       </option>
   </control_duration>
 …
```

Element *<control_file_opener>*

Info	Push button that opens a file open dialog to select files. Possible outputs are file_path.
Versions	1 (<custom_control_XXXX>), 2
Attributes	none
Children	filter, create_file, unique_name, dependency, default, text_style
Used by	item, row, column
Example	Opens a file dialog, filtering on files with *.h5 and *.cmcards extensions

```
<item>
   <text>File:</text>
   <control_file_opener>
          <filter>Cmcards file (.cmcards)</filter>
    </control_file_opener>
…
```

Element *<control_length>*

Info	Displays an edit box and combo box. Combo box can contain meters, cm, mm, um, ft, in. Possible outputs are value and units. Keywords: • #LEN_MM • #LEN_CM • #LEN_M • #LEN_KM • #LEN_INCH • #LEN_FT • #LEN_YD • #LEN_MILE • #LEN_UM
Versions	1 (<custom_control_XXXX>), 2
Attributes	none
Children	option, unique_name, dependency, range, default, text_style
Used by	item, row, column
Example	Displays only cm, and mm in combo box. If cm selected and exported, returns the text “centimeter”.

```
<item>
   <text>Length</text>
   <control_length>
       <option>
          <text>cm</text>
          <export_text>centimeter</export_text>
          <unit_keyword>#LEN_CM</unit_keyword>
       </option>
       <option>
          <text>mm</text>
          <export_text>mm</export_text>
          <unit_keyword>#LEN_MM</unit_keyword>
          <default></default>
        </option>
    </control_length>
```

Element *<control_velocity>*

Info	Displays an edit box and combo box. Combo box can contain m/sec, m/min, m/hours, etc.... Also could be m/sec, cm/sec, ft/sec, etc... The option tag specifies which options are displayed. The edit box will display doubles, within the given range, if provided. Possible outputs are value and units. Keywords: • #VEL_M_PER_S • #VEL_KM_PER_H • #VEL_FT_PER_S • #VEL_MPH • #VEL_KNOTS • #VEL_CM_PER_S • #VEL_MM_PER_S
Versions	1 (<custom_control_XXXX>), 2
Attributes	none
Children	option, unique_name, dependency, range, default, text_style
Used by	item, row, column

Example	Displays m/sec and cm/sec in combo box. If m/sec selected and exported, returns the text “m sec”.

```
<item>
   <text>Velocity </text>
   <control_velocity>
       <unique_name>ccVelocity</unique_name>
       <range>0-100</range>
       <option>
          <text>m/sec</text>
          <export_text>m sec</export_text>
          <unit_keyword>#VEL_M_PER_S</unit_keyword>
       </option>
       <option>
          <text>cm/sec</text>
          <export_text>cm sec</export_text>
          <unit_keyword>#VEL_CM_PER_S</unit_keyword>
        </option>
    </control_velocity>
 …
```

Element *<control_volume_flow>*

Info	Displays an edit box and combo box. Combo box can contain m^3/sec, m^3/min, m^3/hours, etc.... Also could be m^3/sec, cm^3/sec, ft^3/sec, etc... The option tag specifies which options are displayed. The edit box will display doubles, within the given range, if provided. Possible outputs are value and units.
Versions	2
Attributes	none
Children	option, unique_name, dependency, range, default, text_style
Used by	item, row, column
Example	Displays m^3/sec and cm^3/sec in combo box. If m^3/sec selected and exported, returns the text “m^3 sec”.

```
<item>
   <text>Volume flow</text>
   <control_volume_flow>
       <unique_name>ccVolumeFlow</unique_name>
       <range>0-100</range>
       <option>
          <text>m^3/sec</text>
          <export_text>m^3 sec</export_text>
          <unit_keyword>#VFLOW_CU_M_PER_SEC</unit_keyword>
       </option>
       <option>
          <text>cm^3/sec</text>
          <export_text>cm^3 sec</export_text>
          <unit_keyword>#VFLOW_CU_CM_PER_SEC</unit_keyword>
        </option>
    </control_volume_flow>
 …
```

Element <*coverage*>

Info	Defines a coverage type for the model.
Versions	2
Attributes	z_is_elev
Children	coverage_type, point_att, arc_att, polygon_att, material_att, menu_item
Used by	model

Example	This defines a coverage that can be created.
	`<coverage z_is_elev = “true”>`
	` <coverage_type>MyModel</coverage_type>`
	` <point_att>`
	`  <menu_item>`
	`  <text>Assign BC...</text>`
	`  <link_to>NodeAtt</link_to>`
	`  </menu_item>`
	` </point_att>`
	` <arc_att>`
	`  <menu_item>`
	`  <text>Assign BC...</text>`
	`  <link_to>NodestringBC</link_to>`
	`  </menu_item>`
	` </arc_att>`
	` <material_att>`
	`  <link_to>MaterialProp</link_to>`
	` </material_att>`
	`</coverage>`

Element <*coverage_type*>

Info	Gives the name to be used for a type of coverage.
Versions	2
Attributes	none
Children	none
Used by	coverage, take_coverage
Example	See the coverage example and the takes example.

Element <*dataset_name*>

Info	Determines the name of the dataset to be created. Uses the standard printf and sprintf format (www.cplusplus.com/reference/clibrary/cstdio/printf/ [1]). The keywords #row_number, #column_number, #row_name, and #column_name are used when the dataset is in a table.
Versions	1, 2
Attributes	none
Children	none
Used by	control_dataset

Example	`<control_dataset>`
	`  <dataset_name>”Five percent Layer %d”, #row_number</dataset_name>`
	`  …`
	`</control_dataset>`

Element *<dataset_type>*

Info	Determines if the dataset is scalar or vector.
Versions	1, 2
Attributes	none
Children	none
Used by	control_dataset

Example	`<control_dataset>`
	`  <dataset_type>scalar</dataset_type>`
	`  …`
	`</control_dataset>`

Element *<default>*

Info	Sets the initial default value of a widget. Can also be used to state the default combo-box option.
Versions	1, 2
Attributes	none
Children	none
Used by	edit_box, check_box, option, any element that begins with “custom_control”

Example 1	`<edit_box>`
	`  <default>1.5</default>`
	`</edit_box >`

Example 2	Check box is checked
	`<check_box>`
	`  <default>checked</default>`
	`</check_box >`

Example 3	Check box isn’t checked
	`<check_box>`
	`  <default>unchecked</default>`
	`</check_box >`

Example 4	Combo box hours is default
	<combo_box> <option> <text>minutes</text> </option> <option> <text>hours</text> <default></default> </option>
Example 5	Custom control date always has a date formatted as “day-month-year hour:minute:second”.
	<control_date> <default>16-7-2010 14:45:32</default> </control_date>

Element *<dependency>*

Info	Dependencies allow widgets to be hidden, dimmed (grayed out), or shown based on the state/value of another widget. The <dependency> tag can be placed in any widget, combo-box option, item, or group. You need to specify the condition that this object is dependent upon and what the value(s) need(s) to be in order for the object to be shown/not dimmed. If the condition is false, by default the control is hidden. To have the control dimmed, use the <dim> tag.
Versions	1, 2
Attributes	none
Children	condition, dim
Used by	card, check_box, text_box, combo_box, table, any element that begins with “custom_control”, edit_box, item, group
Example 1	We only want our edit_box displayed if the check_box is checked (true). If check_box is not checked, we want to dim(show but is grayed out) the edit_box.
	<check_box> <unique_name>MyBox</unique_name> … <edit_box> <dependency> <condition>MyBox EQUALS CHECKED</condition> <dim></dim> </dependency>
Example 2	We want our text_box displayed if the edit_box has a value between 0-3 or if the combo box has the value minutes or days.

	<edit_box>
	  <unique_name>MyEdit_box</unique_name>
	…
	<combo_box>
	  <unique_name>MyComboBox</unique_name>
	  <option><text>hours</text></option>
	  <option><text>minutes</text></option>
	  …
	
	<text_box>
	  <dependency>
	  <condition>(MyEdit_box GREATER_THAN_EQUALS 0 AND MyEdit_box
	  LESS_THAN_EQUALS 3) OR (MyComboBox EQUALS “minutes” OR
	  MyComboBox EQUALS “days”)</condition>
	  </dependency>
	</text_box>

Element *<dialog>*

Info	Used to define a dialog.
Versions	2
Attributes	none
Children	dialog_name, page
Used by	dialogs
Example	

Element *<dialog_name>*

Info	Specifies the name of a dialog. This is required. This name is used by link_to.
Versions	2
Attributes	none
Children	none
Used by	dialog
Example	

Element *<dialogs>*

Info	Contains all the dialogs used in a model.
Versions	2
Attributes	none
Children	dialog
Used by	model
Example	

Element *<display_options_arc>*

Info	Specifies that the options in the combo box are to be used as arc/nodestring boundary condition display options. This element should only be used once in the schema.
Versions	2
Attributes	none
Children	none
Used by	combo_box
Example	

Element *<dim>*

Info	Specifies that when the dependency is false, the widget should be dimmed, not hidden.
Versions	1, 2
Attributes	none
Children	none
Used by	dependency
Example	See dependency example.

Element *<edit_box>*

Info	Widget that displays text or numbers. If <type> not specified, default to double.
Versions	1, 2
Attributes	none
Children	type, default, unique_name, range, optional, dependency, text_style
Used by	item, row, column

Example	`<edit_box>`
	`  <type>double</type>`
	`  <range>0, 2.2</range>`
	`  <default>1.0 </default>`
	`  <unique_name>edtBox5</unique_name>`
	`  <optional></optional>`
	`  <dependency>...</dependency>...`
	`</ edit_box`

Element *<executable>*

Info	Represents a single executable used by the model.
Versions	2
Attributes	none
Children	executable_name, input_file, output_file, executable_order
Used by	simulation

Example 1	`<executable>`
	`  <executable_name>SRH 2D</executable_name>`
	`  <input_file>`
	`  <file_ref>caseFile</file_ref>`
	`  <export_location>"%s", #project_name</export_location>`
	`  <command_args>"-%s", #file_name</command_args>`
	`  <execute>"%s", #executable_name</execute>`
	`  </input_file>`
	`  <executable_order>1</executable_order>`
	`</executable>`

Example 2	In the following example, one instance of the numeric model is executed per coverage. A file will be exported per coverage and no command line arguments are used when launching the model.
	`<executable>`
	`<executable_name>SRH 2D</executable_name>`
	`<input_file>`
	`<process_each_coverage>`
	`<file_ref>caseFile</file_ref>`
	`<export_location>"%s/%s", #geom_name, #project_name</export_location>`
	`<execute>"%s - %s", #executable_name, #geom_name</execute>`
	`</process_each_coverage>`
	`</input_file>`
	`<executable_order>1</executable_order>`
	`</executable>`

Example 3	In the following example, only one instance of the numeric model is executed. A file will be exported per coverage and no command line arguments are used when launching the model.
	`<executable>`
	`<executable_name>SRH 2D</executable_name>`
	`<input_file>`
	`<file_ref>caseFile</file_ref>`
	`<process_each_coverage>`
	`<export_location>"%s/%s", #geom_name, #project_name</export_location>`
	`</process_each_coverage>`
	`<execute>"%s", #executable_name</execute>`
	`</input_file>`
	`<executable_order>1</executable_order>`
	`</executable>`

Element *<executable name>*

Info	Defines the name for the executable in the preferences window.
Versions	2
Attributes	none
Children	none
Used by	executable
Example	See executable example

Element *<executable order>*

Info	Defines the order in which this executable should run relative to other executables in the same simulation.
Versions	2
Attributes	none
Children	none
Used by	executable

Example	In this example, the executable for “My Model Preprocess” will run before “My Model Main” is allowed to start.

```
<executable>
  <executable_name>My Model Main</executable_name>
  <execuatble_order>1</executable_order>
   ...
</executable>

<executable>
  <executable_name>My Model Preprocess</executable_name>
  <execuatble_order>0</executable_order>
   ...
</executable>
```

Element *<execute>*

Info	Defines when to run an executable. The text of this element is the text that will be displayed as the process name when running the model.
Versions	2
Attributes	none
Children	none
Used by	input_file, anything starting with process_
Example	See executable example.

Element *<export_format>*

Info	Placed inside the <card> to determine how the card format will be displayed when exporting to a text file. Uses the standard printf and sprintf format (www.cplusplus.com/reference/clibrary/cstdio/printf/). “#card_name” should be used when displaying the card. When using an element that starts with “custom_control”, you can use the # character to get to the value or units.
Versions	1, 2
Attributes	ignore_on_read
Children	none
Used by	card

Example 1	`<edit_box>`
	`  <unique_name>MyEditBox</unique_name>`
	`</edit_box>`
	…
	`<card>`
	`  <card_name>FIFTH_GRAIN</card_name>`
	`  <export_format>”%s %lf\n", #card_name, MyEditBox</export_format>`
	`</card>`

Example 2	If the edit_box has the value of 15, this would print out: FIFTH_GRAIN 15
Example 3	If export_format was changed to this: <export_format>”%s \”%lf\” // comment\n", #card_name, MyEditBox </export_format> FIFTH_GRAIN “15” // comment

Example 4	<control_length>
	  <unique_name>MyLength</unique_name>
	  ...
	</control_length>
	...
	<card>
	  <card_name>ADAPTATION_LENGTH_TOTAL</card_name>
	  <export_format>"%s %lf, %s\n", #card_name, MyLength#value,
	  MyLength#units</export_format>
	</card>
	
	ADAPTATION_LENGTH_TOTAL 25 cm

Element *<export_group>*

Info	A way of grouping optional exports.
Versions	2
Attributes	ignore_on_read
Children	Any element beginning with "process_" and required.
Used by	Any element beginning with "process_".
Example	

Element *<export_location>*

Info	Relative or absolute path of the export file (CMCARDS). Can be used multiple times if exporting to more than 1 file location. Keywords can be #PROJECT_NAME and #GEOMETRY.
Versions	1, 2
Attributes	none
Children	none
Used by	group, card, input_file, output_file. If it used just within group or link_to (version 1), then everything within the element will use the same export location unless specified in the child group or item card.
Example 1	<export_location>\\Ideal__Inlet.cmcards</export_location>
Example 2	<export_location>\\#PROJECT_NAME_#GEOMETRY.cmcards</export_location> <export_location>"\\%s__%s.cmcards", #PROJECT_NAME, #GEOMETRY</export_location>

Element *<export_optional>*

Info	Indicator of text that might be included. If it has default as a child, then SMS will write out the text included in this element.
Versions	2
Attributes	ignore_on_read
Children	Any element beginning with “process_”, export_format, default, separator.
Used by	Any element beginning with “process_”.
Example	

Element *<export_text>*

Info	Used to write out a different name to the export file than the “text” displayed to the user.
Versions	1, 2
Attributes	none
Children	none
Used by	option

Example	We have a combo box and one of the options is Equilibrium which is selected. If the file is exported and the <export_text> card is omitted we would write out:
	`FORMULATION Equilibrium`
	However, if we wanted to write out EQ instead, we would use the <export_text> tag. The exported line would look like: FORMULATION EQ
	`<combo_box>`
	`  <unique_name>formulationUnits</unique_name>`
	`  <option>`
	`  <text>Equilibrium</text>`
	`  <export_text>EQ</export_text>`
	`  </option>`
	`…`
	`  <card>`
	`  <card_name>FORMULATION</card_name>`
	`  <export_format>"%s %s\n, #card_name, formulationUnits`
	`  </card>`
	`</combo_box>`

Element *<file_def>*

Info	file_def
Versions	2
Attributes	control_def
Children	file_ref, file_type, export_location, card
Used by	model
Example	

Element *<file_type>*

Info	The file format. Keywords include SEQUENTIAL_ASCII, CARD_ASCII
Versions	2
Attributes	none
Children	none
Used by	file_def
Example	

Element *<filter>*

Info	When selecting a file, used to filter the available files by the extension type. The filter tag contains two parts. The first part is the text describing the filter that gets displayed to the user. The second part is a pair of parentheses that contains the actual filter.
Versions	1, 2
Attributes	none
Children	none
Used by	control_file_opener

Example 1	Displays all files with *.cmcards extension
	`<item>`
	`  <text>Select Some File:</text>`
	`  <control_file_opener>`
	`  <filter>Cmcards file (*.cmcards)</filter>`
	`  </control_date>`

Example 2	Displays all files `<filter>All Files (*.*)</filter>`

Element *<flags>*

Info	Flags are optional, and are used to modify the behavior/appearance of the control_curve. Only 1 flag is currently defined: XY_USEDATE. When this flag is set, the x column becomes a date/time calendar.
Versions	2
Attributes	none
Children	none
Used by	control_curve

Example	This example creates a curve button with the date/time flag.
	`<item>`
	`  <control_curve>`
	`  <unique_name>myCurve1</unique_name>`
	`  <flags>XY_USEDATE</flags>`
	`  <x_column>`
	`  <text>Time</time>`
	`  </x_column>`
	`  <y_column>`
	`  <text>Velocity</text>`
	`  </y_column>`
	`  </control_curve>`
	`  …`

Element *<green>*

Info	The green element of a color. Ranges from 0 to 255. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	none
Used by	color

Example	This would change the text to a bright red color.
	`<text_style>`
	`  <color>`
	`  <red>255</red>`
	`  <green>0</green>`
	`  <blue>0</blue>`
	`  </color>`
	`</text_style>`

Element *<group>*

Info	Tree group item that contains one or more items or groups.
Versions	1, 2
Attributes	none
Children	text, dependency, text_style, contains
Used by	page_def, contains

Example	`<group>`
	`  <text> Timing </text>`
	`  <item>`
	`  ... tree item stuff`
	`  </item>`
	`</group>`

Element *<help_button_url>*

Info	Provides online help when the help button is clicked. Loads the specified url in a web browser.
Versions	2
Attributes	none
Children	none
Used by	dialog

Example	`<dialog>`
	`  <dialog_name>Model Control</dialog_name>`
	`  <help_button_url>www.aquaveo.com</help_button_url>`
	`  ...`
	`</dialog>`

Element *<help_button_wiki>*

Info	Displays a wiki help page when the help button is clicked. Loads either a local or online wiki page based on the user settings in the preferences dialog. Must provide the correct key from the wiki dialogs page.
Versions	2
Attributes	none
Children	none
Used by	dialog

Example	`<dialog>`
	`  <dialog_name>Model Control</dialog_name>`
	`  <help_button_wiki>DynSrhModelControl</help_button_wiki`
	`  ...`
	`</dialog>`

Element *<input_file>*

Info	Defines a file to be used for input for an executable.
Versions	2
Attributes	none
Children	file_ref, export_location, execute, command_args, process_each_row, process_each_coverage, process_each_material
Used by	executable
Example	See executable example.

Element *<italic>*

Info	Sets the text to be italicized. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	none
Used by	text_style

Example	This would italicize the text when the value in the edit_box is less than 0.0.
	`<edit_box>`
	`  <unique_name>edtA</unique_name>`
	`  <default>1.0</default>`
	`  <text_style>`
	`  <italic></italic>`
	`  <condition>edtA LESS_THAN 0.0</condition>`
	`  <text_style>`
	`</edit_box>`

Element *<item>*

Info	Tree item contains one or more widgets (combo_box, text_box, edit_box, etc). A tree item can contain multiple cards (version 1), but those cards must be mutually exclusive.
Versions	1, 2
Attributes	none
Children	text, card, dependency, text_box, edit_box, check_box, combo_box, table, any element starting with “custom_control”, text_style
Used by	group

Example	`<item>`
	`  <text>Transport Time Step</text>`
	`  <edit_box>…. </edit_box>`
	`  <card>…</card>`

Element *<link_to>*

Info	Determines which dialog definition we are linking to.
Versions	2
Attributes	none
Children	none
Used by	menu_item, material_att

Example	`<simulation>`
	`  <menu_item>`
	`  <text>Model Control...</text>`
	`  <link_to>SRHModelControl</link_to>`
	`  </menu_item>`
	`</simulation>`
	
	`<page_def>`
	`  <page>SRHModelControl</page>`
	`  <group>`
	`  <contains>`
	`  …<item>...</item>`
	`  </contains>`
	`  </group>`
	`</page_def>`

Element *<material_att>*

Info	Used to specify what attributes should be used for materials of a coverage.
Versions	2
Attributes	none
Children	link_to
Used by	coverage
Example	See coverage example.

Element *<max_rows>*

Info	Optional element used to limit the number of rows the user can specify in a SMS:Dynamic Model Interface Schema#Element <control_curve>control_curve. If this element is not used, the max_rows is unlimited.
Versions	2
Attributes	none
Children	none
Used by	control_curve

Example	This example creates a curve button with the date/time flag.
	`<item>`
	`  <control_curve>`
	`  <unique_name>myCurve1</unique_name>`
	`  <max_rows>10</max_rows>`
	`  <x_column>`
	`  <text>Time</time>`
	`  </x_column>`
	`  <y_column>`
	`  <text>Velocity</text>`
	`  </y_column>`
	`  </control_curve>`
	`  …`

Element *<menu_item>*

Info	Item to be placed in a menu. The text is the text displayed in the menu, link_to describes the dialog to be launched, dependency describes what needs to be true in order for the menu item to appear. The double_click attribute (if true) indicates that this is the menu item to be launched on a double-click event. For example, if a menu_item is in an arc_att, and has double_click = “true”, then when an arc is double clicked, the dialog specified by the menu item is launched.
Versions	2
Attributes	double_click
Children	text, link_to, dependency
Used by	simulation, coverage, point_att, arc_att, polygon_att, material_att
Example	See the model example.

Element *<message>*

Info	Used to display text to the user when a model check condition has failed.
Versions	1, 2
Attributes	none
Children	none
Used by	model_check

Example	`< table >`
	`  <column>`
	`  <text>A</text>`
	`  <edit_box>`
	`  <unique_name>colA</unique_name>`
	`  </edit_box>`
	`  </column>`
	`...// other columns also defined`
	
	`  <model_check>`
	`  <condition>( (colA OR colB) AND NOT(colD OR colE))</condition>`
	`  <message>Column D or E is required</message>`
	`  </model_check>`
	`</ table >`

Element *<minimum_height>*

Info	Used to set the minimum height of a widget in pixels. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	none
Used by	table

Example	`< table >`
	`  <minimum_height>500</minimum_height>`
	`</ table >`

Element *<model>*

Info	Defines the model interface that is being created.
Versions	2
Attributes	none
Children	model_name, simulation, coverage, dialogs, file_def
Used by	dynamic_model

Example	A simple model that has one coverage type, one dialog, and one file definition. This interfaces with version 4 of “MyModel”.

```
<dynamic_model filetype=”dynamic model”>
 <version>2</version>
  <model>
    <model_name>MyModel</model_name>
    <model_version>4</model_version>
    <simulation>
      …
    </simulation>

    <coverage>
      <coverage_type>My Model</coverage_type>
      ...
    </coverage>

    <dialogs>
      …
    </dialogs>

    <file_def>
      …
    </file_def>
  </model>
</dynamic_model>
```

Element *<model_check>*

Info	Used to validate data of multiple combinations when the **OK** button is clicked. Displays an error message if the logic in the <condition> is false. Can use AND, OR, LESS_THAN, GREATER_THAN, EQUALS and NOT.
Versions	1, 2
Attributes	none
Children	condition, message
Used by	model_checks
Example	

```
< table >
   <column>
      <text>A</text>
      <edit_box>
         <unique_name>colA</unique_name>
      </edit_box>
    </column>
…// other columns also defined
< /table >

 <model_check>
     <condition>( (colA EQUALS 0.0 OR colB EQUALS 0.0) AND NOT
      (colD EQUALS 0.0 OR colE EQUALS 0.0))</condition>
     <message>Column D or E is required</message>
 </model_check>
```

Element *<model_checks>*

Info	Contains all model checks
Versions	2
Attributes	none
Children	model_check
Used by	
Example	<dialogs> <dialog> ... < table > <column> <text>A</text> <edit_box> <unique_name>colA</unique_name> </edit_box> </column> ...// other columns also defined < /table > ... <dialog> <dialogs> <model_checks> <model_check> <condition>((colA EQUALS 0.0 OR colB EQUALS 0.0) AND NOT (colD EQUALS 0.0 OR colE EQUALS 0.0))</condition> <message>Column D or E is required</message> </model_check> <model_checks>

Element *<model_name>*

Info	The name of the model whose interface is being defined.
Versions	2
Attributes	none
Children	none
Used by	model
Example	See the model example.

Element *<model_version>*

Info	The version of the numeric model this interfaces with.
Versions	2
Attributes	none
Children	none
Used by	model
Example	See the model example.

Element *<new_line>*

Info	Creates a new line before adding the next widget in a tree item.
Versions	1, 2
Attributes	none
Children	none
Used by	item

Example	In the dialog there would be:
	`Breaking Efficency: [edit box] (new_line called)`
	`Friction Efficency:`
	
	`<item>`
	`<text>Non-cohesive bedload entrainment</text>`
	`<text_box>`
	`<text>Breaking Efficency:</text>`
	`</text_box>`
	`<edit_box>`
	`<unique_name>edtBreakingEff</unique_name>`
	`</edit_box>`
	`<new_line></new_line>`
	`<text_box>`
	`<text>Friction Efficency:</text>`
	`</text_box>`

Element *<option>*

Info	Widget that displays list of options. Only 1 can be selected.
Versions	1, 2
Attributes	none
Children	text, export_text, default, dependency, unit_keyword, text_style
Used by	combo_box, any element that starts with “custom_control” and has units

Example	Creates a combo box with hours, minutes and seconds. Minutes is the default item.

```
<combo_box>
    <unique_name>cbxTransportUnits</unique_name>

       <option>
           <text>hours</text>
        </option>
        <option>
           <text>minutes</text>
            <default></default>
         </option>
         <option>
             <text>seconds</text>
         </option>
    <dependency>...</dependency>...
</ combo_box >
```

Element *<optional>*

Info	Placed inside widgets to suppress a warning message from being displayed if the widgets data is empty. By default, data associated with a widget is required. If the <optional> tag is included and the widget's data is empty, a warning message won't be displayed.
Versions	1, 2
Attributes	none
Children	none
Used by	text_box, combo_box, edit_box, table, any element that starts with "custom_control", check_box
Example	`<optional></optional>`

Element *<output_file>*

Info	Defines a file to be created by the executable.
Versions	1, 2
Attributes	none
Children	file_ref, export_location, execute, export_table, export_each_coverage, export_each_material
Used by	executable
Example	See executable example.

Element *<page>*

Info	This is the name of the page or tab to which everything inside the link_to(version 1) or page_def(version 2) tag belongs. No spaces or punctuation are allowed in the name.
Versions	1, 2
Attributes	none
Children	none
Used by	page_def
Example	`<page>CMSSedimentTransportPage</page>`

Element *<page_def>*

Info	This defines the page or tab of a dialog. If there is only one page_def in a dialog, then no tabs will appear.
Versions	2
Attributes	none
Children	page, page_display, contains
Used by	dialog
Example	

Element *<page_display>*

Info	This is used to describe how the dialog should display. There are 3 options that can be given: FLEX, FULL, and NO_NAV. FLEX is the default. In this mode, there is a tree on the left hand side of the dialog. Clicking on an item in the tree will display that portion of the tree along with any child items below the clicked item. Other items will be hidden on the right hand side. FULL will show a tree on the left hand side of the dialog. Clicking on an item in the tree will move the scroll bars on the right hand side to make the item visible. All items that are not disabled due to dependencies are shown on the right hand side of the dialog in this mode. NO_NAV will have no left hand side tree. Instead, all items that are not disabled due to dependencies are shown in this mode. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	none
Used by	page_def
Example	`<page_display>FULL</page_display>`

Element *<point_att>*

Info	Used to specify what attributes should be used for the points of a coverage.
Versions	2
Attributes	none
Children	menu_item
Used by	coverage
Example	

Element *<polygon_att>*

Info	Used to specify what attributes should be used for the polygon of a coverage.
Versions	2
Attributes	none
Children	menu_item
Used by	coverage
Example	

Element *<process_each_arc>*

Info	Indicator to loop through each arc in the given context.
Versions	2
Attributes	ignore_on_read
Children	card_name, export_format, separator, process_each_point, end_card, use_parameter, declare_parameter
Used by	card, process_each_coverage, process_each_polygon
Example	

Element *<process_each_coverage>*

Info	Indicator to loop through each coverage in the given context.
Versions	2
Attributes	ignore_on_read
Children	card_name, export_format, separator, process_each_point, process_each_polygon, process_each_arc, end_card, use_parameter, declare_parameter
Used by	card
Example	

Element *<process_each_material>*

Info	Indicator to loop through each material in the given context.
Versions	2
Attributes	ignore_on_read
Children	card_name, export_format, separator, end_card, use_parameter, declare_parameter, process_each_polygon
Used by	card, process_each_coverage, process_each_polygon
Example	

Element *<process_each_point>*

Info	Indicator to loop through each point in the given context.
Versions	2
Attributes	ignore_on_read
Children	card_name, export_format, separator, end_card, use_parameter, declare_parameter
Used by	card, process_each_coverage, process_each_polygon, process_each_arc
Example	

Element *<process_each_polygon>*

Info	Indicator to loop through each polygon in the given context.
Versions	2
Attributes	ignore_on_read
Children	card_name, export_format, separator, process_each_point, process_each_arc, end_card, use_parameter, declare_parameter
Used by	card, process_each_coverage
Example	

Element *<process_each_row>*

Info	Indicator to loop through each row in a table. Has the widget attribute that must be used. The widget attribute needs to be set to the name of a widget which belongs to the table to be iterated through. To iterate through the rows of a curve widget, use the name of the curve widget and a keyword, such as “#x”.
Versions	2
Attributes	ignore_on_read, widget
Children	process_column, card_name, export_format, separator
Used by	process_column, card, process_each_coverage, process_each_polygon, process_each_arc, process_each_point
Example	`<process_each_row widget = “someColumnWidget”>`

Element *<process_on_condition>*

Info	Indicator to perform a certain action only if the condition is satisfied.
Versions	2
Attributes	ignore_on_read
Children	process_column, card, process_each_coverage, process_each_polygon, process_each_arc, process_each_point, card_name, export_format, separator
Used by	process_column, card, process_each_coverage, process_each_polygon, process_each_arc, process_each_point
Example	

Element *<process_on_count>*

Info	Indicator to perform a certain action only on certain iterations of a loop.
Versions	2
Attributes	ignore_on_read
Children	process_column, card, process_each_coverage, process_each_polygon, process_each_arc, process_each_point, card_name, export_format, separator
Used by	process_column, card, process_each_coverage, process_each_polygon, process_each_arc, process_each_point
Example	

Element *<push_button>*

Info	The button to be used for a control_dataset. Can be SELECT, CREATE, or DELETE.
Versions	1, 2
Attributes	none
Children	none
Used by	control_dataset
Example	See control_dataset example.

Element *<range>*

Info	Determines the range of acceptable values in an edit_box. Can use the keywords GREATER_THAN, GREATER_THAN_EQUALS, LESS_THAN and LESS_THAN_EQUALS. Numbers assumed inclusive unless otherwise specified.
Versions	1, 2
Attributes	none
Children	none
Used by	edit_box, any element that starts with “control” except control_file_opener, control_dataset and control_date

Example 1	`<edit_box>`
	`  <range>0-1</range>`
	`</ edit_box >`

Example 2	`<range>0 – 5.6546</range>`
Example 3	`<range>GREATER_THAN 0</range>`

Example 4	`<range>GREATER_THAN 0.0 - LESS_THAN 5.0</range>`

Example 5	Both examples are equivalent
	`<range>0.0 - LESS_THAN 5.0</range>`
	`<range>GREATER_THAN_EQUALS 0.0 - LESS_THAN 5.0</range>`

Element *<red>*

Info	The red element of a color. Ranges from 0 to 255. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	none
Used by	color

Example	This would change the text to a bright red color.
	`<text_style>`
	`  <color>`
	`  <red>255</red>`
	`  <green>0</green>`
	`  <blue>0</blue>`
	`  </color>`
	`<text_style>`

Element *<required>*

Info	Used to indicate that something from the exported group must be used.
Versions	2
Attributes	none
Children	none
Used by	export_group
Example	

Element *<row>*

Info	Typically you would only use row if you had a fixed table and wanted to display row text or to specify specific rows as read only. Row tags are placed inside a < table >.
Versions	1, 2
Attributes	none
Children	text, read_only, optional, dependency, text_box, combo_box, edit_box, all elements starting with “custom_control”, check_box, text_style
Used by	table

Example	Row 1 is read only, row 2 isn't

```
< table >
      …
    <row>
       <text>Row1</text>
       <read_only></read_only>
    </row>
    <row>
       <text>Row2</text>
    </row>
</ table >
```

Element *<separator>*

Info	Determines how to separate text that is being exported into a text file.
Versions	1, 2
Attributes	none
Children	none
Used by	export_each_row
Example	See <export_table>

Element *<strike_through>*

Info	Sets the text to have a line through the middle. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	none
Used by	text_style
Example	This would put a line through the text when the value in the edit_box is less than 0.0.

```
<edit_box>
  <unique_name>edtA</unique_name>
  <default>1.0</default>
  <text_style>
      <strike_through></strike_through>
      <condition>edtA LESS_THAN 0.0</condition>
  <text_style>
</edit_box>
```

Element *< table >*

Info	Table widget with columns and rows. Will most likely have multiple column and row tags.
Versions	1, 2
Attributes	none
Children	read_only, column, row, dependency, unique_name, text_style
Used by	item

Example	Read only table with 2 columns and 3 rows. The number of rows are fixed.
	`< table >`
	`  <unique_name>myTable </unique_name>`
	`  <read_only></read_only>`
	`  <fixed_row_count>3</fixed_row_count>`
	`  <column>`
	`  <text>hours</text>`
	`  </column>`
	`  <column>`
	`  <text>minutes</text>`
	`  </column>`
	`</ table >`

Element *<take_coverage>*

Info	Represents a coverage that can be taken in the project explorer.
Versions	2
Attributes	limit
Children	declare_parameter, condition, coverage_type
Used by	simulation
Example	See <takes> example.

Element *<take_mesh2d>*

Info	Represents a coverage that can be taken in the project explorer.
Versions	2
Attributes	limit, linear
Children	declare_parameter, condition
Used by	simulation
Example	See <takes> example.

Element *<takes>*

Info	Represents what can be dragged under another object in the project explorer.
Versions	2
Attributes	none
Children	declare_parameter, take_coverage, take_mesh2d
Used by	simulation

Example 1	This example shows a simulation that can take a coverage and a 2D mesh which uses linear elements.
	`<takes>`
	`  <take_coverage limit = "1">`
	`  <coverage_type>My Model Type</coverage_type>`
	`  <condition>""</condition>`
	`  </take_coverage>`
	`  <take_mesh2d limit = "1" linear = "true">`
	`  <condition>""</condition>`
	`  </take_mesh2d>`
	`  <declare_parameter>meshCov</declare_parameter>`
	`</takes>`

Example 2	This example shows taking one type of coverage OR another type of coverage.
	`<takes>`
	`  <take_coverage limit = "1">`
	`  <coverage_type>My Model Type</coverage_type>`
	`  <coverage_type>My Other Model Type</coverage_type>`
	`  <condition>""</condition>`
	`  </take_coverage>`
	`  <declare_parameter>monitorCov</declare_parameter>`
	`</takes>`

Element *<text>*

Info	Text that is displayed in the SMS user interface.
Versions	1, 2
Attributes	none
Children	none
Used by	group, item, text_box, check_box, options, x_column, y_column
Example	

Element *<text_box>*

Info	Widget that displays text that is not editable.
Versions	1, 2
Attributes	none
Children	text, dependency, unique_name, alignH, alignV, text_style
Used by	item, row, column

Example	`<text_box>`
	`  <text>Time Step:</text>`
	`  <unique_name>Transport_TS</unique_name>`
	`  <alignH>LEFT</alignH>`
	`  <dependency>...</dependency>...`
	`</text_box>`

Element *<text_size>*

Info	Sets the point size of the text. Ranges from 8 to 20. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	none
Used by	text_style

Example	This would set the size of the text to 20pt. when the value in the edit_box is less than 0.0.
	`<edit_box>`
	`  <unique_name>edtA</unique_name>`
	`  <default>1.0</default>`
	`  <text_style>`
	`  <text_size>20</text_size>`
	`  <condition>edtA LESS_THAN 0.0</condition>`
	`  <text_style>`
	`</edit_box>`

Element *<text_style>*

Info	Holds the style options for the text. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	none
Used by	group, item, text_box, combo_box, edit_box, all elements starting with “custom_control”, check_box, options

Example	This would bold the text when the value in the edit_box is less than 0.0.
	`<edit_box>`
	`  <unique_name>edtA</unique_name>`
	`  <default>1.0</default>`
	`  <text_style>`
	`  <bold></bold>`
	`  <condition>edtA LESS_THAN 0.0</condition>`
	`  <text_style>`
	`</edit_box>`

Element *<type>*

Info	Determines if the edit_box is displaying text, an integer or a double.
Versions	1, 2
Attributes	none
Children	none
Used by	edit_box

Example 1	`<edit_box>`
	`  <type>double</type>`
	`  …`
	`</ edit_box >`

Example 2	`<type>integer</type>`
Example 3	`<type>text</type>`

Element *<underline>*

Info	Sets the text to be underlined. Added in SMS 11.2.
Versions	1, 2
Attributes	none
Children	none
Used by	text_style

Example	This would underline the text when the value in the edit_box is less than 0.0.
	`<edit_box>`
	`  <unique_name>edtA</unique_name>`
	`  <default>1.0</default>`
	`  <text_style>`
	`  <underline></underline>`
	`  <condition>edtA LESS_THAN 0.0</condition>`
	`  <text_style>`
	`</edit_box>`

Element *<unique_link_name>*

Info	A unique name given to a link when using link_to_xml. This is needed to identify the unique_name elements from the file, especially when a linked to XML file is used multiple times. Hence, when using link_to_xml, this tag is required. No spaces or punctuation are allowed in the name.
Versions	1, 2
Attributes	none
Children	none
Used by	link_to_xml
Example	See link_to_xml example.

Element *<unique_name>*

Info	A unique name given to an widget, which determines how to reference the widget. This is needed if the widget is being used as a dependency (parent), or if the widget value is being exported. When a unique_name is being referenced it should be by the file (nothing if current file), then unique_name. No spaces or punctuation (except _) are allowed in the name. The name must contain at least 1 non-numeric letter. The name must be unique. Names are not case sensitive, hence “aaa” is the same as “AAA”.
Versions	1, 2
Attributes	none
Children	none
Used by	card, text_box, combo_box, edit_box, table, all elements starting with “custom_control”, check_box, link_to_xml
Example	

Element *<unit_keyword>*

Info	The units of a widget that begins with “control_” (where applicable). This provides a mapping for SMS to know the unit type.
Versions	1, 2
Attributes	none
Children	none
Used by	option

Example	`<control_duration>`
	`  <option>`
	`  <unit_keyword>#TIME_SECONDS</unit_keyword>`
	`  <text>seconds</text>`
	`  </option>`
	`  <option>`
	`  <unit_keyword>#TIME_MINUTES</unit_keyword>`
	`  <text>minutes</text>`
	`  </option>`
	`</control_duration>`
	
	See also dependency example.

Definitions	Length: • LEN_KM (kilometers) • LEN_M (meters) • LEN_FT (feet) • LEN_CM (cm) • LEN_MM (mm) • LEN_INCH (inch) • LEN_YD (yd) • LEN_MILE (mile) • LEN_UM (um) Time: • TIME_SECONDS • TIME_HOURS • TIME_MINUTES • TIME_DAYS • TIME_WEEKS Volume: • VFLOW_CU_FT_PER_SEC • VFLOW_CU_M_PER_SEC

Element *<version>*

Info	Stores the SMS .xml version number. Initial version is 1
Versions	1, 2
Attributes	none
Children	none
Used by	none, should be placed near the top of the XML file
Example	`<version>1</version>`

Element *<x_column>*

Info	Used to define the attributes in the column such as text (heading).
Versions	2
Attributes	none
Children	text
Used by	control_curve

Example	This example creates a curve button with the date/time flag.
	`<item>`
	`  <control_curve>`
	`  <unique_name>myCurve1</unique_name>`
	`  <flags>XY_USEDATE</flags>`
	`  <x_column>`
	`  <text>Time</time>`
	`  </x_column>`
	`  <y_column>`
	`  <text>Velocity</text>`
	`  </y_column>`
	`  </control_curve>`
	`  …`

Element *<y_column>*

Info	Used to define the attributes in the column such as text (heading).
Versions	2
Attributes	none
Children	text
Used by	control_curve

Example	This example creates a curve button with the date/time flag.

```
<item>
    <control_curve>
        <unique_name>myCurve1</unique_name>
        <flags>XY_USEDATE</flags>
        <x_column>
           <text>Time</time>
        </x_column>
        <y_column>
           <text>Velocity</text>
        </y_column>
    </control_curve>
  ...
```

References

[1] http://www.cplusplus.com/reference/clibrary/cstdio/printf/

7.2. File Support

XMDF

Description

XMDF is a C and Fortran language library providing a standard format for the geometry data storage of river cross-sections, 2D/3D structured grids, 2D/3D unstructured meshes, geometric paths through space, and associated time data. XMDF uses HDF5 for cross-platform data storage and compression.

Version 2.1

- Online Documentation [1]
- XMDF library code [2] (5.9 MB) No XMDF Unix add-on available - Last Revised July 30, 2012
- Change Log [3]

Previous Versions

2.0

- Online Documentation [4]
- XMDF library code [5] (14.6 MB) No XMDF Unix add-on available - Last Revised April 30, 2012

1.9

- Online Documentation [6]
- XMDF library code [7] (6.68 MB) No XMDF Unix add-on available - Last Revised July 12, 2011

1.8

- Online Documentation [8]
- XMDF library code [9] (14.9 MB) No XMDF Unix add-on available - Last Revised April 6, 2011

1.7

- Online Documentation [10]
- XMDF library code [11] (6.52 MB) No XMDF Unix add-on available - Last Revised Jan 19, 2010

1.6

- Online Documentation [12]
- XMDF library code [13] (5.5 MB) No XMDF Unix add-on available - Last Revised Mar 13, 2009

1.4

- Online Documentation [14]
- XMDF library code [15] (5.2 MB) No XMDF Unix add-on available - Last Revised Feb 19, 2008

1.3

- Online Documentation [16]
- XMDF library code [17] (7.8 MB) XMDF Unix add-on [18] (8.4 MB) - Last Revised Oct 4, 2006

1.2

- Online Documentation [19]
- XMDF library code [20] (5.5 MB)

1.1

- Online Documentation [21]
- XMDF library code [22] (2.5 MB)

1.0

- XMDF library code [23] (2.7 MB)

HDF5 File Browsers and Editors

- HDF Explorer [24]
- NCSA HDFView [25]

Back to XMS

References

[1] http://xmdf.aquaveo.com/doc2.1/html/index.html
[2] http://xmdf.aquaveo.com/xmdf_2.1.zip
[3] http://xmdf.aquaveo.com/changes.txt
[4] http://xmdf.aquaveo.com/doc2.0/html/index.html
[5] http://xmdf.aquaveo.com/xmdf_2.0.zip
[6] http://xmdf.aquaveo.com/doc1.9/index.html
[7] http://xmdf.aquaveo.com/xmdf_1.9.zip
[8] http://xmdf.aquaveo.com/doc1.8/index.html
[9] http://xmdf.aquaveo.com/xmdf_1.8.zip
[10] http://xmdf.aquaveo.com/doc1.7/index.html
[11] http://xmdf.aquaveo.com/xmdf_1.7.zip
[12] http://xmdf.aquaveo.com/doc1.6/index.html
[13] http://xmdf.aquaveo.com/xmdf_1.6.zip
[14] http://xmdf.aquaveo.com/doc1.4/index.html
[15] http://xmdf.aquaveo.com/xmdf-1.4.zip
[16] http://xmdf.aquaveo.com/doc1.3/index.html
[17] http://xmdf.aquaveo.com/xmdf-1.3.zip
[18] http://xmdf.aquaveo.com/xmdf-1.3_unix.zip
[19] http://xmdf.aquaveo.com/doc1.2/XMDF.htm
[20] http://xmdf.aquaveo.com/xmdf-lib_1.2.zip
[21] http://xmdf.aquaveo.com/doc1.1/XMDF.htm
[22] http://xmdf.aquaveo.com/xmdf-lib_1.1.zip
[23] http://xmdf.aquaveo.com/xmdf-lib_1.0.zip
[24] http://www.space-research.org/explorer/explorer.htm
[25] http://www.hdf-group.org/hdf-java-html/hdfview/index.html

7.2.a. File Formats

File Formats

Files used in SMS can be grouped into the following categories:

- **Native SMS Files –** Non-model specific files SMS can read and write
- **Non-native SMS Files –** Non-model specific files SMS can read, but must convert and save to a different format
- **Model Input and Output Files –** Files created by numerical models SMS can read.

Related Topics

- File Extensions
- Importing Non-native SMS Files

2D Mesh Files *.2dm

A finite element mesh can be saved in a generic format defined by SMS, called the 2dm format. In addition, the Generic Model interface in the Mesh module uses this format to save a template definition, in addition to model parameter, material property, and boundary condition assignments for a specific simulation. When a *.2dm file is opened, the Current Numerical Model changes to the Generic Mesh Interface. To save a numerical model definition as a template file, you should first set up the template and save a *.2dm file before any nodes are created.

Mesh Cards

Card Type	**MESH2D**
Description	Identifies the file as a 2d mesh file. Must be the first line of the file.
Required	YES

Card Type	**NUM_MATERIALS_PER_ELEM**		
Description	Defines Number of Materials per Element		
Required	YES		
Format	MATERIALS Quantity		
Sample	NUM_MATERIALS_PER_ELEM 2		
Field	**Variable**	**Value**	**Description**
1	Quantity	+ integer	Number of Materials

Nodes

Card Type	ND		
Description	Defines the ID and location for each node of the mesh.		
Required	NO		
Format	ND id x y z		
Sample	ND 1 7.75e+005 1.10e+005 5.00e-001		
Field	**Variable**	**Value**	**Description**
1	id	+ integer	The ID of the node.
2-4	x,y,z	± real number	The x, y, and z coordinates of the point.

Linear Elements

Card Type	E2L		
Description	Identifies a 2-noded linear element.		
Required	NO		
Format	E2L id n_1 n_2 matid		
Sample	E2L 1 1 2 1		
Field	**Variable**	**Value**	**Description**
1	id	+ integer	The ID of the element.
2 - 3	n_1 - n_2	+ integer	The ID's of nodes in the element.
4	matid	+ integer	The ID of the material assigned to the element.

Card Type	E3L		
Description	Identifies a 3-noded linear element.		
Required	NO		
Format	E3L id n_1 n_2 n_3 matid		
Sample	E3L 1 1 2 3 1		
Field	**Variable**	**Value**	**Description**
1	id	+ integer	The ID of the element.
2 - 4	n_1 - n_3	+ integer	The ID's of nodes in the element.
5	matid	+ integer	The ID of the material assigned to the element.

Triangular Elements

Card Type	E3T		
Description	Identifies a 3-noded triangular element.		
Required	NO		
Format	E3T id n_1 n_2 n_3 matid		
Sample	E3T 1 1 2 3 1		
Field	**Variable**	**Value**	**Description**
1	id	+ integer	The ID of the element.
2 - 4	n_1 - n_3	+ integer	The ID's of nodes in the element.
5	matid	+ integer	The ID of the material assigned to the element.

Card Type	E6T		
Description	Identifies a 6-noded triangular element.		
Required	NO		
Format	E6T id n_1 n_2 n_3 n_4 n_5 n_6 matid		
Sample	E6T 1 1 2 3 1		
Field	**Variable**	**Value**	**Description**
1	id	+ integer	The ID of the element.
2 - 7	n_1 - n_6	+ integer	The ID's of nodes in the element.
8	matid	+ integer	The ID of the material assigned to the element.

Quadrilateral Elements

Card Type	E4Q		
Description	Identifies a 4-noded quadrilateral element.		
Required	NO		
Format	E4Q id n_1 n_2 n_3 n_4 matid		
Sample	E4Q 1 1 2 3 4 1		
Field	**Variable**	**Value**	**Description**
1	id	+ integer	The ID of the element.
2 - 5	n_1 - n_4	+ integer	The ID's of nodes in the element.
6	matid	+ integer	The ID of the material assigned to the element.

Card Type	E8Q		
Description	Identifies an 8-noded quadrilateral element.		
Required	NO		
Format	E8Q id n_1 n_2 n_3 n_4 n_5 n_6 n_7 n_8 matid		
Sample	E8Q 1 1 2 3 4 5 6 7 8 1		
Field	**Variable**	**Value**	**Description**
1	id	+ integer	The ID of the element.
2 - 9	n_1 - n_8	+ integer	The ID's of nodes in the element.
10	matid	+ integer	The ID of the material assigned to the element.

Card Type	E9Q		
Description	Identifies an 9-noded quadrilateral element.		
Required	NO		
Format	E9Q id n_1 n_2 n_3 n_4 n_5 n_6 n_7 n_8 n_9 matid		
Sample	E9Q 1 1 2 3 4 5 6 7 8 9 1		
Field	**Variable**	**Value**	**Description**
1	id	+ integer	The ID of the element.
2 - 10	n_1 - n_9	+ integer	The ID's of nodes in the element.
11	matid	+ integer	The ID of the material assigned to the element.

Nodestrings

Card Type	NS		
Description	Identifies a nodestring.		
Required	NO		
Format	NS n_1 n_2 n_3 ... - n_n (number of nodes in nodestring)		

Sample	`NS 1 3 10 15 6 -2`
	`NS 126 127 128 129 173 -194`
	`NS 1006 988 987 989 968 948 931 930 929 906`
	`NS -904`
	`NS 720 701 699 686 680 664 649 648 647 640`
	`NS -621`		

Field	**Variable**	**Value**	**Description**
n_1 - n_n (number of nodes in nodestring)	n_x	+ integer	The ID's of the nodes in the nodestring. The last node id is written as a negative number, thus signaling the nodestring's end. Multiple NS cards can be used on consecutive lines for a single nodestring.

Model Parameter Definition Cards

The model control parameters, boundary conditions and material options available for a specific model are defined in the generic model parameter definition section of the 2D mesh file. The generic model parameter definition section is begun by specifying the **BEGPARAMDEF** card and ended with the **ENDPARAMDEF** card.

Starting with SMS version 11.0, all of the parameter cards follow a similar pattern and the available options for several of the types of parameters were increased. The pattern is similar for Global Parameters, **GP**, Bondary Conditions **BC**, and Materials **MAT**. More information can be found in each individual card.

Global Parameters	Boundary Conditions	Materials	Description
GP	BC	MAT	Name,Id
GP_DEF	BC_DEF	MAT_DEF	definitions
GP_OPTS	BC_OPTS	MAT_OPTS	options
GP_VAL	BC_VAL	MAT_VAL	values
(parent, so it has no dependencies)	BC_DEP	MAT_DEP	dependencies

Card Type	**BEGPARAMDEF**
Description	Identifies the beginning of the model parameter definition section of the 2D Mesh File.
Required	Required if model parameters are to be defined.

Card Type	**ENDPARAMDEF**
Description	Identifies the end of the model parameter definition section of the 2D Mesh File.
Required	Required if model parameters are to be defined.

Global Parameters

Card Type	**GM**		
Description	Identifies the model name.		
Required	NO		
Format	GM name		
Sample	GM "Gen2DM"		
Field	**Variable**	**Value**	**Description**
1	name	string	Model name.

Card Type	SI		
Description	Identifies the model units.		
Required	NO		
Format	SI val		
Sample	SI 0		
Field	**Variable**	**Value**	**Description**
1	val	boolean	Enter 1 for Meters, or 0 for U.S. Survey Feet or International Feet.

Card Type	DY		
Description	Identifies whether the model is dynamic or steady state.		
Required	NO		
Format	DY val		
Sample	DY 1		
Field	**Variable**	**Value**	**Description**
1	val	boolean	• Enter 0 for steady state. • Enter 1 for dynamic.

Card Type	TU		
Description	Identifies the model time units.		
Required	NO		
Format	TU val		
Sample	TU seconds		
Field	**Variable**	**Value**	**Description**
1	val	string	A string value describing the model units (days, hours, minutes, seconds, etc.).

Card Type	TD		
Description	Identifies the model time step and total simulation time.		
Required	NO		
Format	TD time_step total_time		
Sample	TD 20 1000		
Field	**Variable**	**Value**	**Description**
1	time_step	+ real number	Time step (for dynamic simulations).
1	total_time	+ real number	Total simulation run time (for dynamic simulations).

Card Type	KEY		
Description	Identifies the key to unlock and edit the model definition inside of the SMS interface.		
Required	NO		
Format	KEY key		
Sample	KEY "sms-gen2dm"		
Field	**Variable**	**Value**	**Description**
1	key	string	Case sensitive key to unlock and edit the model definition.

Card Type	• **DISP_OPTS entity** • **DISP_OPTS inactive** • **DISP_OPTS multiple**		
Description	How a specific display option to the user.. colors, line thickness, etc. • **entity –** the main attribute (will either be the node, element, or nodestring display option) • **inactive –** display option for inactive or unassigned • **multiple –** display option for multiple assigned		
Required	NO		
Format	DISP_OPTS EntityId Red Green Blue Display Pattern Width Style		
Sample	DISP_OPTS entity 1 0 0 0 1 0 1 0		
Sample	DISP_OPTS multiple 1 0 0 0 1 0 1 0		
Field	**Variable**	**Value**	**Description**
1	EnitityId	integer (0-2) • 0 = node • 1 = nodestring • 2 = element	id of the group it belongs too.
2	Red	integer (0-255)	red pixels
3	Green	integer (0-255)	green pixels
4	Blue	integer (0-255)	blue pixels
5	Display	boolean (0,1)	turned on = 1, turned off = 0
6	Pattern	integer	display pattern
7	Width	integer	width
8	Style	integer	style pattern

Global Parameter Assignment Cards

Card Type	GP		
Description	Defines a Global Parameter Group		
Required	NO		
Format	GP Id Name Active		
Sample	GP 1 "Hydro" 1		
Field	**Variable**	**Value**	**Description**
1	+ integer	id	
2	name	string	name
3	active	boolean	• 0 = inactive • 1 = active

Card Type	GP_DEF		
Description	Global Parameter Defaults		
Required	NO		
Format	The format will depend up the type (field 4). Fields 5, 6, and 7 will be impacted by the choice of field 4. Note that the min and max information is only applicable to integer and double types. bool, integer, double, text, or options : GP_DEF GroupId ParamId Name Type Default Min Max curve: GP_DEF GroupId ParamId Name Type x_axis_title y_axis_title Float/Curve: GP_DEF GroupId ParamId Name Type Float_Default Float_Min Float_Max DefaultFloatOrCurve x_axis_title y_axis_titleGP param_name val		
Sample	Values depend upon type (see format). bool, integer, double, text or options : GP_DEF 1 1 "manning n" 1 0 0 10 curve: GP_DEF 1 1 "manning n" 5 "x-axis" "y-axis" Float/Curve: GP_DEF 1 1 "manning n" 6 0.2 0.0 1.0 CURVE "x-axis" "y-axis"		
Field	**Variable**	**Value**	**Description**
1	group Id	+ integer	id of the Global Parameter Group that it belongs too
2	param Id	string	its id
3	name	string	its name
4	type	int	0-Bool, 1-Integer, 2-Double, 3-Text, 4-Options, 5-Curve, 6-Float/Curve
5	• default • or x_axis_title (curve)	• type specific () • string	• default value • x-axis title when bringing up curve editor
6	• min or • y_axis_title (curve)	• type specific (min) • string	• minimum value • y-axis title when bringing up curve editor
7	max	type specific (max)	max value
8 (only float/curve)	DefaultFloatOrCurve	string either • "FLOAT" • "CURVE"	The default version float or integer that is seen by the user
9 (only float/curve)	x_axis_title	string	x-axis title when bringing up curve editor

10 (only float/curve)	y_axis_title	string	y-axis title when bringing up curve editor

Card Type	**GP_VAL**		
Description	Global Parameters values		
Required	NO		
Format	GP_VAL GroupId ParamId (CURVE or FLOAT only if type is float/curve) Value		
Sample	GP_VAL 1 1 30.23		
Sample	GP_VAL 1 2 "Manning"		
Field	**Variable**	**Value**	**Description**
1	Group Id	+ integer	id of the Global Parameter Group that it belongs too
2	Param Id	+ integer	its id
3	Value	varies depending on type	value

Card Type	**GP_DEP**		
Description	Global Parameters dependencies		
Required	NO		
Format	GP_DEP GroupId ParamId Type Parent ParentActive Opts OptsValue		
Sample	GP_DEP 1 7 "PARENT_SELF" "Friction type" 0 "Manning" 0 "Chezy" 1		
Field	**Variable**	**Value**	**Description**
1	Group Id	+ integer	id of the Global Parameter Group that it belongs too
2	Param Id	+ integer	its id
3	Type	string valid values are: • PARENT_UNASSGINED • PARENT_NONE • PARENT_LOCAL • PARENT_GLOBAL • PARENT_SELF	• parent not assigned • no parent • parent is in the same group id • parent is from global group or GP • parent
4	Parent	+ integer	parent name
5	Parent Active	boolean	• 0 = inactive • 1 = active
6	Opts	string	name of the option
7	OptsValue	boolean	whether this option is turned on/off

Boundary Condition Definition Cards

Card Type	BCPGC		
Description	Defines whether or not to allow boundary condition / parameter group correlation.		
Required	NO		
Format	BCPGC val		
Sample	BCPGC 1		
Field	Variable	Value	Description
1	val	boolean	• 0 = Do not allow boundary condition / parameter group correlation. • 1 = Allow boundary condition / parameter group correlation.

Card Type	BEDISP		
Description	Defines inactive boundary condition display options and boundary condition label options.		
Required	NO		
Format	BEDISP entity_ID font_red font_green font_blue label_on label_vals_on inactive_size inactive_style inactive_red inactive_green inactive_blue inactive_on		
Sample	BEDISP 0 2 0 0 0 1 1 1 255 128 255 1		
Field	Variable	Value	Description
1	entity_ID	integer	• 0 = node • 1 = nodestring • 2 = element
2	font_red	integer	0 - 255, Red component of RGB triplet defining boundary condition font color.
3	font_green	integer	0 - 255, Green component of RGB triplet defining boundary condition font color.
4	font_blue	integer	0 - 255, Blue component of RGB triplet defining boundary condition font color.
5	label_on	boolean	• 0 = Do not display boundary condition labels. • 1 = Display boundary condition labels.
6	label_vals_on	boolean	• 0 = Do not display boundary condition values in boundary condition labels. • 1 = Display boundary condition values in boundary condition labels.
7	inactive_size	integer	• 1 - 63, Default size for inactive boundary condition node symbols. • 1 - 50, Default size for inactive boundary condition element or nodestring symbols.

8	inactive_style	integer	• Default style for inactive boundary condition symbols.
			• For nodes
			  • 1 = Filled square
			  • 2 = Hollow square
			  • 3 = Filled circle
			  • 4 = Hollow circle
			  • 5 = Filled triangle
			  • 6 = Hollow triangle
			  • 7 = Filled diamond
			  • 8 = Hollow diamond
			  • 9 = Cross
			  • 10 = X
			  • 11 = Survey marker
			• For elements or nodestrings:
			  • 0 = solid line
			  • 1 = dashed line

9	inactive_red	integer	0 - 255, Red component of RGB triplet defining inactive boundary condition font color.
10	inactive_green	integer	0 - 255, Green component of RGB triplet defining inactive boundary condition font color.
11	inactive_blue	integer	0 - 255, Blue component of RGB triplet defining inactive boundary condition font color.
12	inactive_on	boolean	• 0 = Do not display inactive boundary conditions. • 1 = Display inactive boundary conditions.

Card Type	**BEFONT**	Single integer method.	
Description	Defines boundary condition label font attributes.		
Required	NO		
Format	BEFONT entity_id font_size		
Sample	BEFONT 1 1		
Field	**Variable**	**Value**	**Description**
1	entity_ID	integer	• 0 = node • 1 = nodestring • 2 = element
2	font_size	integer	• 1 = Large font size. • 2 = Small font size.

Card Type	**BEFONT**	Multiple value method.	
Description	Defines boundary condition label font attributes.		
Required	NO		
Format	BEFONT entity_id height width escapement orientation weight italic underline strikeout charSet precision clipPrecision quality pitchAndFamily faceName		
Sample	BEFONT 1 1		
Field	**Variable**	**Value**	**Description**
1	entity_ID	integer	• 0 = node • 1 = nodestring • 2 = element
2	height	integer	Font height.

3	width	integer	Font width.
4	escapement	integer	Font escapement.
5	orientation	integer	Font orientation.
6	weight	integer	Font weight.
7	italic	integer	Font italic.
8	underline	integer	Font underline.
9	strikeout	integer	Font strikeout.
10	charSet	integer	Font character set.
11	precision	integer	Font precision.
12	clipPrecision	integer	Font clip precision.
13	quality	integer	Font quality.
14	pitchAndFamily	integer	Font pitch and family.
15	faceName	string	Font face name.

Card Type	**BC_DISP_OPTS**		
Description	Boundary Condition display options (how the boundary conditions are going to be displayed to the user)		
Required	NO		
Format	BC_DISP_OPTS GroupId Red Green Blue Display Pattern Width Style		
Sample	BC_DISP_OPTS 1 0 0 0 0 0 0 0 0		
Field	**Variable**	**Value**	**Description**
1	Group Id	integer	• 0 = node • 1 = nodestring • 2 = element
2	Red	integer (0-255)	red pixels
3	Green	integer (0-255)	green pixels
4	Blue	integer (0-255)	blue pixels
5	Display	boolean (0,1)	turned on = 1, turned off = 0
6	Pattern	integer	displayed pattern
7	Width	integer	width
8	Style	integer	style pattern

Card Type	**BEG2DMBC**
Description	Identifies the beginning of the boundary condition assignment section of the 2D Mesh File.
Required	Required if boundary conditions are assigned.

Card Type	END2DMBC
Description	Identifies the end of the boundary condition assignment section of the 2D Mesh File.
Required	Required if boundary conditions are assigned.

Boundary Condition Assignment Cards

The following cards are used to assign values to the boundary conditions defined in using **Boundary Condition Definition Cards**:

Card Type	BC		
Description	Defines input values required for a boundary condition.		
Required	NO		
Format	BC EntityId Name Id 0 LegalOnInterior ParamGroupCorrelation		
Sample	• BC 1 "Flow rate (cfs)" 1 0 1 "(none)" • BC 1 "Water temperature (F)" 2 0 "Hydrodynamic" • BC 1 "Flow rate(cfs)" 3 0 1 "(none)"		
Field	**Variable**	**Value**	**Description**
1	entity id	integer	Entity id that the bc belongs to (NODE = 0, NDSTR =1, ELEM = 2
2	name	string	Name of value to be specified.
3	id	integer	The boundary conditions id.
4	filler	0	Always 0
5	legalOnInterior	boolean	• 0 = boundary condition is not legal on the interior of the mesh. • 1 = boundary condition is legal on the interior of the mesh.
6	paramGroupCorrelation	string	Name of the parameter group (defined using the GP card) with which the boundary condition is correlated. If the boundary condition is not correlated with a parameter group, "none" should be specified.

Card Type	BC_DEF		
Description	Boundary Condition Parameter Defaults		
Required	NO		
Format	The format will depend up the type (field 4). Fields 5, 6, and 7 will be impacted by the choice of field 4. Note that the min and max information is only applicable to integer and double types. bool, integer, double, text, or options : BC_DEF GroupId ParamId Name Type Default Min Max curve: BC_DEF GroupId ParamId Name Type x_axis_title y_axis_title Float/Curve: BC_DEF GroupId ParamId Name Type Float_Default Float_Min Float_Max DefaultFloatOrCurve x_axis_title y_axis_title		
Sample	Values depend upon type (see format). bool, integer, double, text or options : BC_DEF 1 1 "manning n" 1 0 0 10 curve: BC_DEF 1 1 "manning n" 5 "x-axis" "y-axis" Float/Curve: BC_DEF 1 1 "manning n" 6 0.2 0.0 1.0 CURVE "x-axis" "y-axis"		
Field	**Variable**	**Value**	**Description**
1	group Id	+ integer	id of the boundary condition group that it belongs too
2	param Id	string	its id

3	name	string	its name
4	type	int	0-Bool, 1-Integer, 2-Double, 3-Text, 4-Options, 5-Curve, 6-Float/Curve
5	default or x_axis_title (curve)	type specific string	default value x-axis title when bringing up curve editor
6	min or y_axis_title (curve)	type specific (min) string	minimum value y-axis title when bringing up curve editor
7	max	type specific (max)	max value
8 (only float/curve)	DefaultFloatOrCurve	string either • "FLOAT" • "CURVE"	The default version float or integer that is seen by the user
9 (only float/curve	x_axis_title	string	x-axis title when bringing up curve editor
10 (only float/curve)	y_axis_title	string	y-axis title when bringing up curve editor

Card Type	**BC_OPTS**		
Description	Boundary Condition options		
Required	NO		
Format	BC_OPTS GroupId, ParamId, Values		
Sample	BC_OPTS 1 5 "a" "b" "c"		
Field	**Variable**	**Value**	**Description**
1	group Id	+ integer	id of the boundary condition group that it belongs too
2	param Id	string	its id
3	values	string	

Card Type	**BC_VAL**		
Description	Boundary Condition values		
Required	NO		
Format	BC_VAL N, E, S (Node, Elem or nodeString) Node or Elem Id, GroupId, ParamId, (CURVE or FLOAT only if type is float/curve) Value		
Sample	BC_VAL S 1 1 2 2		
Sample	BC_VAL S 1 1 2 CURVE 2		
Sample	BC_VAL S 1 1 2 FLOAT 7.675		
Field	**Variable**	**Value**	**Description**
1	N, E or S	+ integer	Node, Elem or Nodestring
2	Node, Elem, or Nodestring Id	+ integer	id of the node/element
3	group Id	+ integer	id of the group it belongs too
4	param Id	+ integer	id of the parameter it belongs too
5	value	varies depending on type	value

Card Type	BC_DEP		
Description	Boundary Condition dependencies		
Required	NO		
Format	BC_DEP GroupId ParamId Type Parent ParentActive Opts OptsValue		
Sample	BC_DEP 1 7 "PARENT_SELF" "Friction type" 0 "Manning" 0 "Chezy" 1		
Field	**Variable**	**Value**	**Description**
1	Group Id	+ integer	id of the Global Parameter Group that it belongs too
2	Param Id	+ integer	its id
3	Type	string valid values are: • PARENT_UNASSGINED • PARENT_NONE • PARENT_LOCAL • PARENT_GLOBAL • PARENT_SELF	• parent not assigned • no parent • parent is in the same group id • parent is from global group or GP • parent
4	Parent	+ integer	parent name
5	Parent Active	boolean	• 0 = inactive • 1 = active
6	Opts	string	name of the option
7	OptsValue	boolean	whether this option is turned on/off

Material Properties Cards

Card Type	MAT_MULTI		
Description	Is Material Assignment Multiple		
Required	NO		
Format	MAT_MULTI Assigned		
Sample	MAT_MULTI 1		
Sample	MAT_MULTI 0		
Field	**Variable**	**Value**	**Description**
1	assigned	boolean	0- Single, 1 - Multiple

Card Type	MAT_PARAMS		
Description	Material Parameters Assigned		
Required	NOT NEEDED IF MAT_MULTI 0		
Format	MAT_PARAMS MaterialId, GroupId (1 or More)		
Sample	MAT_PARAMS 1 2 3 5		
Sample	MAT_PARAMS 1 1		
Field	**Variable**	**Value**	**Description**
1	Material Id	+ integer	id of the material
2	Group id	+ integer	id of the assigned group

Material Properties Assignment Cards

Card Type	MAT		
Description	Defines the assigned material properties.		
Required	NO		
Format	MAT ID "name"		
Sample	MAT 1 "Clay"		
Field	**Variable**	**Value**	**Description**
1	mat_ID	+ integer	Material id (sequentially numbered, starting at 1). The disabled material is always id 0 and does not need to be specified in the 2dm file.
2	name	string	The name of the material. Should be unique.

Card Type	MAT_DEF		
Description	Material Parameters defaults		
Required	NO		
Format	The format will depend up the type (field 4). Fields 5, 6, and 7 will be impacted by the choice of field 4. Note that the min and max information is only applicable to integer and double types. bool, integer, double, text, or options : MAT_DEF GroupId ParamId Name Type Default Min Max curve: MAT_DEF GroupId ParamId Name Type x_axis_title y_axis_title Float/Curve: MAT_DEF GroupId ParamId Name Type Float_Default Float_Min Float_Max DefaultFloatOrCurve x_axis_title y_axis_title		
Sample	Values depend upon type (see format). bool, integer, double, text or options : MAT_DEF 1 1 "manning n" 1 0 0 10 curve: MAT_DEF 1 1 "manning n" 5 "x-axis" "y-axis" Float/Curve: MAT_DEF 1 1 "manning n" 6 0.2 0.0 1.0 CURVE "x-axis" "y-axis"		
Field	**Variable**	**Value**	**Description**
1	group id	+ integer	id of the Material Group that it belongs too.
2	param id	string	its id
3	name	string	its name
4	type	int	0-Bool, 1-Integer, 2-Double, 3-Text, 4-Options, 5-Curve, 6-Float/Curve
5	default or x-axis_title (curve)	type specific string	default value x-axis title when bringing up curve editor
6	min or y-axis_title (curve)	type specific (min) string	minimum value y-axis title when bringing up curve editor
7	max	type specific (max)	max value
8 (only float/curve)	DefaultFloatOrCurve	string either • "FLOAT" • "CURVE"	The default version float or integer that is seen by the user
9 (only float/curve)	x_axis_title	string	x-axis title when bringing up curve editor
10 (only float/curve)	y_axis_title	string	y-axis title when bringing up curve editor

Card Type	MAT_OPTS		
Description	Material options		
Required	NO		
Format	MAT_OPTS GroupId, ParamId, Values		
Sample	MAT_OPTS 1 5 "a" "b" "c"		
Field	**Variable**	**Value**	**Description**
1	group id	+ integer	id of the Boundary Condition Group that it belongs too
2	param id	+ integer	its id
3	values	string	

Card Type	MAT_VALS		
Description	Material values		
Required	NO		
Format	MAT_VAL MaterialId, GroupId, ParamId, (CURVE or FLOAT only if type is float/curve) Value		
Sample	MAT_VAL S 1 1 2 2		
Sample	MAT_VAL 2 1 8 VALUE 8.8888		
Sample	MAT_VAL 2 1 8 CURVE 1		
Field	**Variable**	**Value**	**Description**
1	material id	+ integer	id of the material
2	group id	+ integer	id of the group it belongs too
3	param id	string	id of the parameter it belongs too
4	VALUE or CURVE	string	Only if type is float/curve
5	value	varies depending on type	value

Card Type	MAT_DEP		
Description	Material dependencies		
Required	NO		
Format	MAT_DEP GroupId ParamId Type Parent ParentActive Opts OptsValue		
Sample	MAT_DEP 1 7 "PARENT_SELF" "Friction type" 0 "Manning" 0 "Chezy" 1		
Field	**Variable**	**Value**	**Description**
1	GroupId	+ integer	id of the Global Parameter Group that it belongs too
2	ParamId	+ integer	its id
3	Type	string valid values are: • PARENT_UNASSGINED • PARENT_NONE • PARENT_LOCAL • PARENT_GLOBAL • PARENT_SELF	• parent not assigned • no parent • parent is in the same group id • parent is from global group or GP • parent
4	Parent	+ integer	parent name
5	ParentActive	boolean	• 0 = inactive • 1 = active

6	Opts	string	name of the option
7	OptsValue	boolean	whether this option is turned on/off

Time Series Data Cards

Card Type	BEGCURVE Version: version		
Description	Identifies the beginning of the time series data section of the 2D Mesh File.		
Required	NO		
Format	BEGCURVE		
Sample	BCE 2 2 300		
Field	**Variable**	**Value**	**Description**
1	version	+ integer	Used to version file format for the curve portion of the file.
Note: Version 1 writes the time series data using the XY Series File, XYS Format within the 2D Mesh File. See XY Series Files (*.xys) for a description of the cards used to define the time series data.			

Card Type	ENDCURVE
Description	Identifies the end of the time series data section of the 2D Mesh File.
Required	NO

Obsolete Cards

The following cards are no longer used in SMS:

PG, PD, PO, GG, GP, BD, BV, MD, MV, BCE, BCN, BCS, TIME, BEDISP

Changes from 10.1 to 11.0

New Cards:

- NUM_MATERIALS_PER_ELEM
- GP replaces PG
- GP_DEF replaces PD
- GP_VAL
- GP_DEP
- BC replaces BD
- BC_DEF replaces BV card
- BC_OPTS replaces PO card
- BC_VAL replaces BC card
- BC_DEP
- BC_DISP_OPTS replaces bedisp
- MAT_MULTI
- MAT_PARAMS
- MAT_DEF replaces MV card
- MAT_OPTS
- MAT_VAL

- MAT_DEP
- DISP_OPTS entity
- DISP_OPTS inactive
- DISP_OPTS multiple

Sample File 1

```
BEGCURVE Version: 1
XYS 1 29 "new_series"
0.0 3000.0
1.5 3000.0
2.5 3050.0
3.0 3150.0
3.5 3300.0
4.0 3500.0
4.5 3700.0
5.0 3950.0
5.5 4150.0
6.0 4350.0
6.5 4550.0
7.0 4700.0
7.45 4825.0
8.0 4925.0
8.5 4975.0
9.0 5000.0
9.5 4975.0
10.0 4800.0
10.5 4500.0
11.0 4250.0
11.5 4000.0
12.0 3750.0
13.0 3500.0
14.0 3350.0
15.5 3200.0
17.5 3100.0
19.5 3050.0
22.0 3000.0
25.0 3000.0
XYS 3 29 "new_series"
0.0 3000.0
1.5 3000.0
2.5 3050.0
3.0 3150.0
3.5 3300.0
4.0 3500.0
4.5 3700.0
5.0 3950.0
```

```
5.5 4150.0
6.0 4350.0
6.5 4550.0
7.0 4700.0
7.45 4825.0
8.0 4925.0
8.5 4975.0
9.0 5000.0
9.5 4975.0
10.0 4800.0
10.5 4500.0
11.0 4250.0
11.5 4000.0
12.0 3750.0
13.0 3500.0
14.0 3350.0
15.5 3200.0
17.5 3100.0
19.5 3050.0
22.0 3000.0
25.0 3000.0
XYS 5 29 "new_series"
0.0 3000.0
1.5 3000.0
2.5 3050.0
3.0 3150.0
3.5 3300.0
4.0 3500.0
4.5 3700.0
5.0 3950.0
5.5 4150.0
6.0 4350.0
6.5 4550.0
7.0 4700.0
7.45 4825.0
8.0 4925.0
8.5 4975.0
9.0 5000.0
9.5 4975.0
10.0 4800.0
10.5 4500.0
11.0 4250.0
11.5 4000.0
12.0 3750.0
13.0 3500.0
14.0 3350.0
15.5 3200.0
```

```
17.5 3100.0
19.5 3050.0
22.0 3000.0
25.0 3000.0
XYS 7 29 "new_series"
0.0 3000.0
1.5 3000.0
2.5 3050.0
3.0 3150.0
3.5 3300.0
4.0 3500.0
4.5 3700.0
5.0 3950.0
5.5 4150.0
6.0 4350.0
6.5 4550.0
7.0 4700.0
7.45 4825.0
8.0 4925.0
8.5 4975.0
9.0 5000.0
9.5 4975.0
10.0 4800.0
10.5 4500.0
11.0 4250.0
11.5 4000.0
12.0 3750.0
13.0 3500.0
14.0 3350.0
15.5 3200.0
17.5 3100.0
19.5 3050.0
22.0 3000.0
25.0 3000.0
XYS 9 29 "new_series"
0.0 3000.0
1.5 3000.0
2.5 3050.0
3.0 3150.0
3.5 3300.0
4.0 3500.0
4.5 3700.0
5.0 3950.0
5.5 4150.0
6.0 4350.0
6.5 4550.0
7.0 4700.0
```

```
7.45 4825.0
8.0 4925.0
8.5 4975.0
9.0 5000.0
9.5 4975.0
10.0 4800.0
10.5 4500.0
11.0 4250.0
11.5 4000.0
12.0 3750.0
13.0 3500.0
14.0 3350.0
15.5 3200.0
17.5 3100.0
19.5 3050.0
22.0 3000.0
25.0 3000.0
XYS 11 29 "new_series"
0.0 3000.0
1.5 3000.0
2.5 3050.0
3.0 3150.0
3.5 3300.0
4.0 3500.0
4.5 3700.0
5.0 3950.0
5.5 4150.0
6.0 4350.0
6.5 4550.0
7.0 4700.0
7.45 4825.0
8.0 4925.0
8.5 4975.0
9.0 5000.0
9.5 4975.0
10.0 4800.0
10.5 4500.0
11.0 4250.0
11.5 4000.0
12.0 3750.0
13.0 3500.0
14.0 3350.0
15.5 3200.0
17.5 3100.0
19.5 3050.0
22.0 3000.0
25.0 3000.0
```

```
XYS 13 8 "new_series"
0.0 237.35
24.0 137.9
48.0 1347.4
72.0 351.05
96.0 1465.25
120.0 1247.1
144.0 847.35
168.0 731.75
XYS 14 8 "Curve"
0.0 1600.7
24.0 700.85
48.0 1353.7
72.0 712.25
96.0 866.6
120.0 1626.35
144.0 567.6
168.0 980.55
XYS 15 8 "Curve"
0.0 1240.7
24.0 772.25
48.0 741.3
72.0 908.45
96.0 599.45
120.0 522.8
144.0 946.8
168.0 170.4
XYS 16 8 "Curve"
0.0 1252.55
24.0 1467.95
48.0 876.25
72.0 250.2
96.0 479.95
120.0 981.65
144.0 1432.4
168.0 1382.8
XYS 17 8 "Curve"
0.0 1507.65
24.0 202.6
48.0 905.3
72.0 1051.45
96.0 434.95
120.0 267.5
144.0 547.95
168.0 349.2
ENDCURVE
```

Sample File 2

Sample files are available in the SMS tutorials in the Generic Mesh Model tutorial under the models section.

```
MESH2D
E3T      1      4      1      3      2
E3T      2      2      5      6      2
E4Q      3      7      8      5      2      2
.
.
.
E4Q   1543    205   1226   1225   1221      2
E4Q   1544    191   1222   1226    189      1
E3T   1545    205    189   1226      2
ND      1 -7.62907961e+001 4.00243909e+001 8.41808447e+001
ND      2 -7.62907174e+001 4.00219296e+001 8.36614138e+001
ND      3 -7.62907700e+001 4.00238340e+001 7.32122342e+001
.
.
.
ND   1222 -7.62811008e+001 4.00272795e+001 7.28898113e+001
ND   1225 -7.62814608e+001 4.00273631e+001 7.29479847e+001
ND   1226 -7.62812859e+001 4.00271526e+001 7.41231480e+001
NS       1      3     10     15      6     -2
NS     126    127    128    129    173   -194
NS    1006    988    987    989    968    948    931    930    929
906
NS    -904
NS     720    701    699    686    680    664    649    648    647
640
NS    -621
BEGPARAMDEF
GM  "Gen2DM"
SI  0
DY  1
TU  "minutes"
TD  20  1000
KEY  "sms-gen2dm"
PG  "Hydrodynamic" 1
PD  "Time interval" 1 20 0 2147483647
PD  "Velocity max (ft/sec)" 2 75 0 100
PD  "H min" 2 0.25 0 1.79769e+308
PD  "A min" 2 1 1e-015 1.79769e+308
PD  "Check for dry elements" 0 1
PD  "Element style" 3 "quadratic"
PD  "Critical scour velocity" 4 "2.0 ft/sec"
PO  "0.8 ft/sec" "2.0 ft/sec" "2.6 ft/sec"
PG  "Sediment transport" 0
```

```
PD  "Time interval" 1 10 0 2147483647
PD  "Source X postion" 2 0 -1.79769e+308 1.79769e+308
PD  "Source Y position" 2 0 -1.79769e+308 1.79769e+308
PD  "Source elevation" 2 0 -1.79769e+308 1.79769e+308
PD  "Parcel mass (slug)" 2 0.5 0.0001 1.79769e+308
PD  "Particle mass (slug)" 2 0.003 0.0001 1.79769e+308
PD  "Particle size (in)" 2 0.05 0 1.79769e+308
PD  "Deviation" 2 0 -1.79769e+308 1.79769e+308
PD  "Average density (slug/ft^3)" 2 3 1.5 6
NUME  3
BCPGC  1
BEDISP  0 2 0 0 0 1 1 1 255 128 255 1
BEFONT  0 1
BD  0 "Water sink/source" 2 3 "Flow rate (cfs)" "Water temperature (F)"
 "Flow rate(cfs)" 1 "(none)"
BV  "Flow rate (cfs)" 0 -1.79769e+308 1.79769e+308
BV  "Water temperature (F)" 65 32.5 100
BV  "Flow rate(cfs)" 0 0 1.79769e+308
BCDISP  0 2 10 1 0 255 255 1
BD  0 "Ceiling (pressure flow)" 1 1 "Ceiling (ft above sea level)" 0
"(none)"
BV  "Ceiling (ft above sea level)" 0 -1.79769e+308 1.79769e+308
BCDISP  0 1 3 1 128 128 255 1
BD  0 "Water surface observation gauge" 3 0 1 "(none)"
BCDISP  0 3 3 1 255 128 128 1
BEDISP  1 0 0 255 1 1 1 0 255 128 0 1
BEFONT  1 1
BD  1 "Water surface" 1 3 "Elevation" "Essential/Natural factor" "Vary
along nodestring factor" 0 "(none)"
BV  "Elevation" 0 -1.79769e+308 1.79769e+308
BV  "Essential/Natural factor" 0 0 1
BV  "Vary along nodestring factor" 1 0 10
BCDISP  1 1 5 0 255 0 0 1
BD  1 "Flow" 2 1 "Flow rate (cfs)" 0 "(none)"
BV  "Flow rate (cfs)" 0 0 1.79769e+308
BCDISP  1 2 5 0 128 255 0 1
BD  1 "Supercritical" 3 0 0 "(none)"
BCDISP  1 3 1 0 0 0 0 1
BD  1 "1D weir segment" 4 4 "Discharge coefficient" "Weir width (ft)"
"Crest level (m above sea level)" "Equation (0 = water level / 1 =
energy head)" 1 "(none)"
BV  "Discharge coefficient" 1 0 1.79769e+308
BV  "Weir width (ft)" 1 0 1.79769e+308
BV  "Crest level (m above sea level)" 0 -1.79769e+308 1.79769e+308
BV  "Equation (0 = water level / 1 = energy head)" 0 0 1
BCDISP  1 4 1 0 0 0 0 0
BD  1 "Sediment trap" 5 0 1 "Sediment transport"
```

```
BCDISP  1 5 1 0 0 0 0 1
BEDISP  2 2 0 0 0 1 1 0 0 0 0 1
BEFONT  2 1
BD  2 "2D weir" 1 3 "Discharge coefficient" "Crest level (ft above sea
level)" "Equation (0 = water level / 1 = energy head)" 1 "(none)"
BV  "Discharge coefficient" 1 0 1.79769e+308
BV  "Crest level (ft above sea level)" 0 -1.79769e+308 1.79769e+308
BV  "Equation (0 = water level / 1 = energy head)" 0 0 1
BCDISP  2 1 1 0 0 0 0 1
MD  2 "Manning" "Kinematic eddy viscosity"
MV  "Manning" 0.035 0.01 0.18
MV  "Kinematic eddy viscosity" 0 -1.79769e+308 1.79769e+308
ENDPARAMDEF
BEG2DMBC
MAT  1 0.03 20
MAT  2 0.045 20
GG "Hydrodynamic"
GP "Time interval" 20
GP "Velocity max (ft/sec)" 75
GP "H min" 0.25
GP "A min" 1
GP "Check for dry elements" 1
GP "Element style" "quadratic"
GP "Critical scour velocity" "2.0 ft/sec"
GG "Sediment transport"
GP "Time interval" 10
GP "Source X postion" 0
GP "Source Y position" 0
GP "Source elevation" 0
GP "Parcel mass (slug)" 0.5
GP "Particle mass (slug)" 0.003
GP "Particle size (in)" 0.05
GP "Deviation" 0
GP "Average density (slug/ft^3)" 3
BCN  772 3
BCN  774 3
BCN  776 3
.
.
.
BCS  4 5
BCS  1 1 80 0 1
BCE  1293 1 1 0 0
TIME 20
BCS  2 2 380
TIME 40
BCS  2 2 400
```

```
TIME 60
BCS  2 2 380
TIME 80
BCS  2 2 300
TIME 100
BCS  2 2 300
TIME 120
BCS  2 2 300
TIME 140
BCS  2 2 300
TIME 160
BCS  2 2 300
TIME 180
BCS  2 2 300
TIME 200
BCS  2 2 300
TIME 220
BCS  2 2 300
TIME 240
BCS  2 2 300
TIME 260
BCS  2 2 300
TIME 280
BCS  2 2 300
TIME 300
BCS  2 2 300
TIME 320
BCS  2 2 300
TIME 340
BCS  2 2 300
TIME 360
BCS  2 2 300
TIME 380
BCS  2 2 300
TIME 400
BCS  2 2 300
TIME 420
BCS  2 2 300
TIME 440
BCS  2 2 300
TIME 460
BCS  2 2 300
TIME 480
BCS  2 2 300
TIME 500
BCS  2 2 300
TIME 520
```

```
BCS  2 2 300
TIME 540
BCS  2 2 300
TIME 560
BCS  2 2 300
TIME 580
BCS  2 2 300
TIME 600
BCS  2 2 300
TIME 620
BCS  2 2 300
TIME 640
BCS  2 2 300
TIME 660
BCS  2 2 300
TIME 680
BCS  2 2 300
TIME 700
BCS  2 2 300
TIME 720
BCS  2 2 300
TIME 740
BCS  2 2 300
TIME 760
BCS  2 2 300
TIME 780
BCS  2 2 300
TIME 800
BCS  2 2 300
TIME 820
BCS  2 2 300
TIME 840
BCS  2 2 300
TIME 860
BCS  2 2 300
TIME 880
BCS  2 2 300
TIME 900
BCS  2 2 300
TIME 920
BCS  2 2 300
TIME 940
BCS  2 2 300
TIME 960
BCS  2 2 300
TIME 980
BCS  2 2 300
```

```
TIME 1000
BCS  2 2 300
END2DMBC
```

Related Topics

- File Formats
- Generic Model Files
- HYDRO AS-2D
- SRH-W

2D Scatter Point Files

2D Scatter Point Files (*.xy)

Two-dimensional scatter point sets are stored in 2D scatter point files. The file includes the scatter point locations and requires that functional information be defined in a separate dataset file. However, multiple scatter point sets can be stored in a single file. An XY coordinate pair defines each point in a scatter point set. The format allows time variant datasets to be associated with scattered data points as well as to organize datasets by allowing the user to assign an ID to the scattered dataset. Scatter files are opened through *File* | **Open** and are saved from *File* | **Save Scatter** from the Scatter module. When scatter point files are saved, a super file is saved. The super file saves and references the scatter and dataset files.

File Format

SCAT2D	/* File type identifier */
BEGSET	/* Beginning of cards for scatter point set */
NAME "name"	/* Name of scatter point set */
ID id	/* ID of scatter point set */
DELEV elev1	/* Default elevation */
IXY np	/* Number of points in set, begin point listing */
id1 x1 y1	/* Point id and coordinatess, one per line */
id2 x2 y2	
.	
.	
idnpxnpynp	
ENDSET	/* End of cards for scatter point set */
	/* Repeat point set cards as many times as necessary */

Sample File

```
SCAT2D
BEGSET
NAME "lakes"
ID 8493
DELEV 0.00000000000e+00
IXY 25
1 1.47000000000e+02 3.90000000000e+02
2 8.82000000000e+02 9.49000000000e+02
.
.
24 1.73000000000e+02 7.01000000000e+02
25 5.39000000000e+02 8.98000000000e+02
ENDSET
```

Cards

Card Type	**BEGSET**
Description	Identifies the beginning of a scatter point set. No fields.
Required	NO

Card Type	**NAME**		
Description	Defines the name for the following scatter point set.		
Required	NO		
Format	NAME "name"		
Sample	NAME "st mary"		
Field	*Variable*	*Value*	*Description*
1	name	str	The name for the following scatter points. Remains as default until new NAME card is encountered.

Card Type	**ID**		
Description	Defines the ID for the scatter point set.		
Required	YES		
Format	ID id		
Sample	ID 43098		
Field	*Variable*	*Value*	*Description*
1	id	+	The ID for the following scatter point set.

Card Type	**IXY**		
Description	Defines a scatter point set.		
Required	YES		
Format			
	IXY np		
	id1 x1 y1		
	id2 x2 y2		
	.		
	.		
	idnp xnp ynp		
Sample			
	IXY 4		
	1 12.3 34.5		
	2 52.2 23.5		
	3 63.2 27.4		
	4 91.1 29.3		
Field	*Variable*	*Value*	*Description*
1	np	+	The number of scatter points in the scatter point set.
2	id	+	The ids of the points.
3-4	x,y	±	The coordinates of the points.
Repeat fields 2 - 4 np times			

Card Type	**ENDSET**
Description	Identifies the end of a scatter point set. No fields.
Required	NO

Related Topics

File Formats

2D Grid Files

Two-dimensional grids are stored in 2D grid files. The grids can be either cell-centered or mesh-centered. If the grid is mesh-centered, a set of material IDs may be included in the file. The 2D grid file format is shown in Figure 1, and a sample file in Figure 2.

GRID2D	/* File type */
TYPE i	/* Type of grid. Mesh or Cell centered. */
IJ ±idir ±jdir	/* Card for defining rows, columns. */
DIM nx ny	/* # of cell boundaries in each direction. */
x1	/* X coord. of cell boundaries. */
x2	
.	
.	
x_{nx}	
y1	/* Y coord. of cell boundaries. */
y2	
.	
.	
y_{ny}	
DELEV el	/* Default elevation for grid. */

Figure 1. 2D Grid File Format.

GRID2D
ID 5758
TYPE 1
DELEV 0.000000000000000e+00
IJ -y +x
DIM 4 4
0.000000000000000e+00
3.333333333333334e+01
6.666666666666667e+01
1.000000000000000e+02
0.000000000000000e+00
3.333333333333334e+01
6.666666666666667e+01
1.000000000000000e+02

Figure 2. Sample 2D Grid File.

2D Grid Files Card Types

The card types used in the 2D grid file format are as follows:

Card Type	GRID2D
Description	File type identifier. Must be on first line of file. No fields.
Required	YES

Card Type	TYPE		
Description	Defines the type of grid as either cell- or mesh-centered.		
Required	YES		
Format	TYPE i		
Sample	TYPE 0		
Field	**Variable**	**Value**	**Description**
1	i	0,1	The type code: • i = 0 for mesh-centered • i = 1 for cell-centered

Card Type	IJ		
Description	Defines the orientation of the i,j indices.		
Required	YES		
Format	IJ ±idir ±jdir		
Sample	IJ +x -y		
Field	**Variable**	**Value**	**Description**
1	±idir	±x,±y	The direction corresponding to an increasing i index.
2	±jdir	±x,±y	The direction corresponding to an increasing j index.

Card Type	DIM
Description	Defines the dimensions of the grid.
Required	YES
Format	DIM nx ny x1 x2 . . xnx y1 y2 . . yny

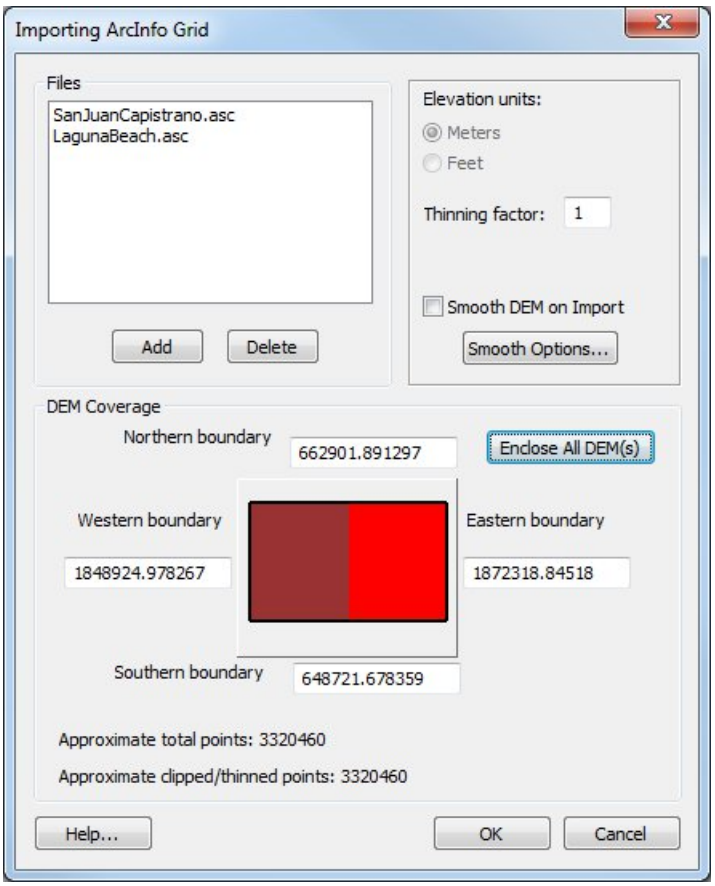
Sample	DIM 4 6 0.0 1.0 2.0 4.0 10.0 12.0 14.0 16.0 18.0 20.0		
Field	**Variable**	**Value**	**Description**
1	nx	+	The number of cell boundaries in the x direction.
2	ny	+	The number of cell boundaries in the y direction.
3 to (nx+2)	x1-xnx	±	The coordinates of the x boundaries.
(nx+3) to (nx+ny+2)	y1-yny	±	The coordinates of the y boundaries.

Card Type	**DELEV**		
Description	Defines a default elevation for the grid.		
Required	NO		
Format	DELEV el		
Sample	DELEV 100.0		
Field	**Variable**	**Value**	**Description**
1	el	±	The default elevation.

Back to XMS

ARC/INFO® ASCII Grid Files *.arc

SMS can import ARC/INFO® ASCII grid. Since it is a simple file format, other digital elevation data can be formatted in the same way and then imported into SMS using the **Open** command in the *File* menu. This will bring up the *Importing ArcInfo Grid* dialog.



Importing ArcInfo Grid dialog

The CASC2D model may also import and used ARC/INFO® grid files when defining map parameters. The file format is shown in Figure 1 and an example file in Figure 2.

ncols ncol	/* Number of columns in the grid */
nrows nrow	/* Number of rows in the grid */
xllcorner x	/* Lower left x coordinate of grid */
yllcorner y	/* Lower left x coordinate of grid */
cellsize size	/* Grid cell size */
NODATRA_value NODATA	/* value of an empty grid cell */
z_{11} z_{12} z_{13} ... z_{1ncols}	/* values of row 1 */
z_{21} z_{22} z_{23} ... z_{2ncols}	/* values of row 2 */
.	
.	
.	
z_{nrows1} z_{nrows2} z_{nrows3} ... $z_{nrowsncols}$	/* values of last row*/

Figure 1. ARC/INFO® ASCII Grid File Format.

ncols 128
nrows 136
xllcorner 422415
yllcorner 4515405
cellsize 30
NODATA_value -9999
1287 1286 1286 1288 ...
1288 1288 -9999 1289 ...
.
.
1282 -9999 1283 1284 ...

Figure 2. Sample ARC/INFO® ASCII Grid File.

The card types used in the ARC/INFO® grid file format are self explanatory.

ASCII Dataset Files *.dat

Datasets can be stored in either ASCII or binary files. Multiple datasets can be stored in a single file and both scalar and vector datasets can be saved to the same file. For scalar dataset files, one value is listed per vertex, cell, node, or scatter point. For vector dataset files, one set of XY vector components is listed per vertex, cell, node, or scatter point. If necessary, a set of status flags can be included in the file. If the status flag is false (0), the corresponding item (node, cell, etc.) is inactive. If status flags are not included in the file, it is assumed that all items are active. Dataset files are opened through *File* | **Open** and are saved when other files are saved such as 2D Scatter Point Files or through the Export Dataset Dialog.

File Format

```
DATASET               /* File type identifier */
OBJTYPE type          /* Type of object data set is associated with */
BEGSCL                /* Beginning of scalar data set */
OBJID id              /* Object id */
ND numdata            /* Number of data values */
NC numcells           /* Number of cells or elements */
NAME "name"           /* Data set name */
RT_JULIAN             /* The reference time as a Julian number. */
TIMEUNITS             /* The time units. */
TS istat time         /* Time step of the following data. */
stat1                 /* Status or activity flags */
stat2
.
.
statnumcells
val1                  /* Scalar data values */
val2
```

```
.
.
valnumdata
/* Repeat TS card for each time step */
ENDDS                /* End of data set */
BEGVEC               /* Beginning of vector dataset */
VECTYPE type         /* Vector at node/gridnode or element/cell */
OBJID id             /* Object id */
ND numdata           /* Number of data values */
NC numcells          /* Number of cells or elements */
NAME "name"          /* Data set name */
TS istat time        /* Time step of the following data. */
stat1                /* Status or activity flags */
stat2
.
.
statnumcells
vx1 vy1
vx2 vy2
.
.
vnumdata vnumdata vnumdata
/* Repeat TS card for each time step */
ENDDS                /* End of data set */
/* Repeat BEGSCL and BEGVEC sequences for each data set */
```

Sample File

Note: This sample file is using an activity array, so there are 16 values per TS. The first 8 values are activity flags for each of the 8 nodes. Values 9-16 are the scalar values for the 8 nodes.

```
DATASET
OBJTYPE "grid2d"
BEGSCL
ND 8
NC 8
NAME "sediment transport"
RT_JULIAN 2453867.068720
TIMEUNITS seconds
TS 1 1.00000000e+00
0
0
0
1
1
1
1
0
```

```
0.00000000e+00
0.00000000e+00
0.00000000e+00
3.24000000e+00
4.39000000e+00
2.96000000e+00
7.48000000e+00
0.00000000e+00
ENDDS
BEGVEC
VECTYPE 0
ND 8
NC 8
NAME "velocity"
TS 1 5.00000000e+00
0
0
0
1
1
1
1
0
1.60000000e+01 1.60000000e+01
6.40000000e+01 6.40000000e+01
1.44000000e+02 1.44000000e+02
1.96000000e+02 1.96000000e+02
2.25000000e+02 2.25000000e+02
9.21600000e+03 9.21600000e+03
9.60400000e+03 9.60400000e+03
9.80100000e+03 9.80100000e+03
ENDDS
```

Cards

Card Type	**DATASET**
Description	File type identifier. Must be on first line of file. No fields.
Required	YES

Card Type	**OBJTYPE**		
Description	Identifies the type of objects that the datasets in the file are associated with.		
Required	YES. If card does not exist, the file can only be read through the Data Browser. The datasets would then be assigned to the objects corresponding to the active module.		
Format	OBJTYPE type		
Sample	OBJTYPE tin		
Field	*Variable*	*Value*	*Description*
1	type	"mesh2d" "scat2d" "cgrid2d" "specgrid2d"	2D mesh 2D scatterpoints 2D cartesian grid Spectral energy grid

Card Type	**OBJID**		
Description	Identifies the object that the data sets in the file are associated with.		
Required	NO. Card is only used if the OBJTYPE is scat2d.		
Format	OBJID id		
Sample	OBJID 1254		
Field	*Variable*	*Value*	*Description*
1	id	Integer > 0	The ID of the object.

Card Type	**RT_JULIAN**			
Description	The reference time as a Julian number.			
Required	NO			
Field	*Variable*	*Size*	*Value*	*Description*
1	reference time	8 byte float	+/-	Continuous count of days and fractions of days since noon Universal Time on January 1, 4713 BCE (on the Julian calendar).

Card Type	**TIMEUNITS**			
Description	The time units.			
Required	NO, but recommended			
Field	*Variable*	*Size*	*Value*	*Description*
1	time units	4 byte float	0 1 2	Hours Minutes Seconds

Card Type	**BEGSCL**
Description	Scalar data set file identifier. Marks beginning of scalar data set. No fields.
Required	YES

Card Type	**BEGVEC**
Description	Vector data set file identifier. Marks beginning of vector data set. No fields.
Required	YES

Card Type	**VECTYPE**			
Card ID	150			
Description	Identifies the type of vector data that will be read and where to apply it.			
Required	YES. If card does not exist, the file can only be read through the Data Browser. The data sets would then be assigned to the objects corresponding to the active module.			
Field	*Variable*	*Size*	*Value*	*Description*
1	type	4 byte int	0 1	The vectors are applied to the nodes/grid nodes. The vectors are applied to the elements/cells.

Card Type	**ND**		
Description	The number of data values that will be listed per time step. This number should correspond to the total number of vertices, nodes, cells centers (cell-centered grid), cell corners (mesh-centered grid), maximum node id (meshes) or scatter points.		
Required	YES.		
Format	ND numdata		
Sample	ND 10098		
Field	*Variable*	*Value*	*Description*
1	numdata	+	The number of items. At each time step, numdata values are printed.

Card Type	**NC**		
Description	This number should correspond to the maximum element id (meshes) or the number of cells (grids).		
Required	YES.		
Format	NC numcells		
Sample	NC 3982		
Field	*Variable*	*Value*	*Description*
1	numcells	+	The number of elements or cells

Card Type	**NAME**		
Description	The name of the data set.		
Required	YES.		
Format	NAME "name"		
Sample	NAME "Total head"		
Field	*Variable*	*Value*	*Description*
1	"name"	str	The name of the dataset in double quotes.

Card Type	**TS**		
Description	Marks the beginning of a new time step, indicates if stat flags are given, and defines the time step value, status flags, and scalar data values for each item.		
Required	YES.		
Format	TS istat time stat1 stat2 . . stat numcells val1 val2 . . valnumdata		
Field	*Variable*	*Value*	*Description*
1	active array flag	0 1	Activity or status values not specified Activity or status values specified - A value of 0 (inactive) or 1 (active) must be specified for each node following the TS card, before the scalar or vector values are specified.
2	Time step	double	Time step value for data

Related Topics

- File Formats
- Binary Dataset Files (*.dat)
- Export Dataset Dialog

Binary Dataset Files *.dat

Datasets can be stored to either ASCII or binary files. Compared to ASCII files, binary files require less memory and can be imported to SMS more quickly. The disadvantages of binary files are that they are not as portable and they cannot be viewed with a text editor. The binary format is patterned after the ASCII format in that the data are grouped into "cards". However, the cards are identified by a number rather than a card title.

Dataset files are opened through *File* | **Open** and are saved when other files are saved such as 2D Scatter Point Files.

File Format

Card	Item	Size	Description
	version	4 byte integer	The SMS binary dataset file format version. value = 3000
100	objecttype	4 byte integer	Indentifies the type of objects that the datasets in the file are associated with. Options are as follows: 1 TINs 3 2D meshes 5 2D scatter points
110	SFLT	4 byte integer	The number of bytes that will be used in the remainder of the file for each floating point value (4, 8, or 16).
120	SFLG	4 byte integer	The number of bytes that will be used in the remainder of the file for status flags.
110	SFLT	4 byte integer	The number of bytes that will be used in the remainder of the file for each floating point value (4, 8, or 16).
130 or 140	BEGSCL or BEGVEC		The number of bytes that will be used in the remainder of the file for status flags.
150	VECTYPE	4 byte integer	(0 or 1) In the case of vector dataset files, indicates whether the vectors will be applied at the nodes/gridnodes or the elements/cells.
160	OBJID	4 byte integer	The id of the associated object. Value is ignored for grids and meshes.
170	NUMDATA	4 byte integer	The number of data values that will be listed per time step. This number should correspond to the number of vertices, nodes, cell centers (cell-centered grid), cell corners (mesh-centered grid) or scatter points.
180	NUMCELLS	4 byte integer	This number should correspond to the number of elements (meshes) or the number of cells (mesh-centered grids). Value is ignored for other object types.
190	NAME	40 bytes	The name of the dataset. Use one character per byte. Mark the end of the string with the '\0' character.
200	TS		Marks the beginning of a time step.
	ISTAT	SFLG integer	(0 or 1) Indicates whether or not status flags will be included in the file.
	TIME	SFLT real	Time corresponding to the time step.
	statflag1	SFLG integer	Status flag (0 or 1) for node 1
	statflag2	SFLG integer	Status flag (0 or 1) for node 2
	...		

Repeat card 200 for each time step in the dataset.			
210	ENDDS		Signal the end of a set of cards defining a dataset.
240	RT_JULIAN	8 byte float	The reference time as a Julian number.
250	TIMEUNITS	4 byte integer	The time units as follows: 0 - hours 1 - minutes 2 - seconds 4 - days

Cards

Card Type	**VERSION**
Card ID	3000
Description	File type identifier. No fields.
Required	YES

Card Type	**OBJTYPE**			
Card ID	100			
Description	Identifies the type of objects that the datasets in the file are associated with.			
Required	YES. If card does not exist, the file can only be read through the Data Browser. The datasets would then be assigned to the objects corresponding to the active module.			
Format	OBJTYPE type			
Sample	OBJTYPE tin			
Field	*Variable*	*Size*	*Value*	*Description*
1	type	4 byte int	tin mesh2d scat2d	Tins 2D mesh 2D scatterpoints

Card Type	**SFLT**			
Card ID	110			
Description	Identifies the number of bytes that will be used in the remainder of the file for each floating point value (4, 8, or 16).			
Required	YES			
Field	*Variable*	*Size*	*Value*	*Description*
1	sizefloat	4 byte int	4 8 or 16	Number of bytes

Card Type	**SFLG**			
Card ID	120			
Description	Identifies the number of bytes that will be used in the remainder of the file for status flags (1, 2, or 4).			
Required	YES			
Field	*Variable*	*Size*	*Value*	*Description*
1	sizeflag	4 byte int 1 2 or 4	Number of bytes	

Card Type	**BEGSCL**
Card ID	130
Description	Marks the beginning of a set of cards defining a scalar dataset.
Required	YES

Card Type	**BEGVEC**
Card ID	140
Description	Marks the beginning of a set of cards defining a vector dataset.
Required	YES

Card Type	**VECTYPE**			
Card ID	150			
Description	Identifies the type of vector data that will be read and where to apply it.			
Required	YES. If card does not exist, the file can only be read through the Data Browser. The datasets would then be assigned to the objects corresponding to the active module.			
Field	*Variable*	*Size*	*Value*	*Description*
1	type	4 byte int	0 1	The vectors are applied to the nodes/grid nodes. The vectors are applied to the elements/cells.

Card Type	**OBJID**			
Card ID	160			
Description	The id of the associated object.			
Required	This card is required in the case of TINs, 2D scatter points, and 3D scatter points. With each of these objects, multiple objects may be defined at once. Hence the id is necessary to relate the dataset to the proper object.			
Field	*Variable*	*Size*	*Value*	*Description*
1	id	4 byte int	+	The id of the object.

Card Type	**NUMDATA**			
Card ID	170			
Description	The id of the associated object.			
Required	The number of data values that will be listed per time step. This number should correspond to the number of vertices, nodes, cell centers (cell-centered grid), cell corners (mesh-centered grid), maximum node id (meshes) or scatter points.			
Field	*Variable*	*Size*	*Value*	*Description*
1	numdata	4 byte int	+	The number of items. At each time step, numdata are listed.

Card Type	**NUMCELLS**			
Card ID	180			
Description	This number should correspond to the element id (meshes) or the number of cells (grids).			
Required	YES			
Field	*Variable*	*Size*	*Value*	*Description*
1	numcells	4 byte int	+	The number of elements or cells.

Card Type	**NAME**			
Card ID	190			
Description	The name of the dataset.			
Required	YES			
Field	*Variable*	*Size*	*Value*	*Description*
1	name	40 bytes	str	The name of the dataset. Use one character per byte. Mark the end of the string with the '\0' character.

Card Type	**TS**			
Card ID	200			
Description	Defines the set of scalar values associated with a time step. Should be repeated for each time step.			
Required	YES			
Field	*Variable*	*Size*	*Value*	*Description*
1	istat	SFLG int	0 1	Use status flags from previous time step. For the first time step, this value indicates that all cells are active. Status flags will be listed.
2	time	SFLT int	+	The time step value. This number is ignored if there is only one time step

	stat	SFLG int	0 1	Inactive Active One status flag should be listed for each cell or element. These flags are included only when istat = 1.
	val	SFLT real	+/-	The scalar values.

Card Type	**ENDDS**
Card ID	210
Description	Signals the end of a set of cards defining a dataset
Required	YES

Card Type	**RT_JULIAN**			
Card ID	240			
Description	The reference time as a Julian number.			
Required	NO			
Field	*Variable*	*Size*	*Value*	*Description*
1	reference time	8 byte float	+/-	Continuous count of days and fractions of days since noon Universal Time on January 1, 4713 BCE (on the Julian calendar).

Card Type	**TIMEUNITS**			
Card ID	250			
Description	The time units.			
Required	NO, but recommended			
Field	*Variable*	*Size*	*Value*	*Description*
1	time units	4 byte float	0 1 2	Hours Minutes Seconds

Related Topics

- File Formats
- ASCII Dataset Files (*.dat)

Boundary ID Files

Boundary ID Files (*.bid)

Boundary ID files are used to store the ids of the nodes on all of the nodestrings in a mesh. The idea of this file is to export only the boundary ids. To do this, make sure nodestrings only exist along the boundary.

Boundary ID files are not opened in SMS but are saved using the menu command *File* | **Save As...** in the Mesh module. To save a Boundary ID File (*.bid), the current mesh module model should be set to ADCIRC. Use the menu command *Data* | **Switch Current Model...** to change the current mesh module model.

Sample File

```
BOUNDARY
3 Number of nodestrings
3 Number of nodes in nodestring
24
18
12
5 Number of nodes in nodestring
149
49
43
37
31
8 Number of nodes in nodestring
11
112
120
127
134
141
148
155
```

Related Topics

- Boundary XY Files
- File Formats

Boundary XY Files

Boundary XY Files (*.bxy)

Boundary XY files are used to store the x,y location of the nodes on all the nodestrings in a mesh. If you would like to export only the boundary node locations, make sure nodestrings only exist on the boundary of the mesh. If nodestrings exist on the interior of the mesh, their locations will also be included in the Boundary XY file.

Boundary ID files are not opened in SMS but are saved using the menu command *File* | **Save As...** in the Mesh module. To save a Boundary XY File (*.bxy), the current mesh module model should be set to ADCIRC. Use the menu command *Data* | **Switch Current Model...** to change the current mesh module model.

Sample File

```
BOUNDARY
2 Number of nodestrings
3 Number of nodes in nodestring
500000.000000 0.000000
497592.400000 49008.600000
490392.600000 97545.200000
5 Number of nodes in nodestring
518643.200000 65498.400000
654128.400000 54688.400000
845478.800000 53491.100000
987681.700000 65385.800000
551972.600000 48687.200000
```

Related Topics

- Boundary ID Files
- File Formats

Coastline Files *.cst

Coastline files include lists of two-dimensional polylines that may be closed or open. The open polylines are converted to *Feature Arcs* and are interpreted as open sections of coastline. Closed polylines are converted to arcs and are assigned the attributes of islands. Coastline files contain x, y, z location information for arcs defining coastlines. The arcs defining a coastline can be created from ADCIRC and CGWAVE type coverages. When a Coastline file is read into SMS, feature arcs are created. If a coastline closes, the final point is not repeated. If no z-value is specified, SMS defaults the node z-value to 0.0.

Coastline files are opened through the menu *File* | **Open** and saved from *File* | **Save As...** from the Map module.

Sample File

```
COAST                          /* File type identifier */
2                              /* Number of coastlines */
1309 0                         /* Number of segments in coastline and if coastline closes (not closes = 0, closes = 1) */
-7794.9054 3396.0346 0.0       /* Node X, Y, Z Locations - Z is optional (defaults to 0.0) */
-7822.6129 3391.8341 0.0
-7852.6508 3386.68 0.0
.
.
.
151 1                          /* Start next coastline */
.
.
.
/* EOF */
```

Related Topics

- Create Coastline
- File Formats
- ADCIRC
- CGWAVE

Color Palette Files *.pal

Color Palette files hold user defined palette information. The process for creating a color palette is described in the User Defined Color Palettes article.

A sample palette file is shown below:

```
PALETTE                  File type identifier
2                        Number of Palettes
Palette1  3              Name of Palette; Number of colors in palette
0 0.0  1.0               Percentage (0) or Value (1); Min Range; Max Range
0.111111 0 0  0          1st color - Percentage; Red (0-255); Green; Blue
0.444444 45  136 45      2nd color
1.000000 255  255 255    3rd color
Palette2  5              Next Palette
...                      etc.
```

Related Topics

- File Formats
- Color Options Dialog

Drogue Files *.pth

Drogue files contain particle/path data. Drogue plots are generated by the ADCIRC model.

Drogue files are opened through *File* | **Open** but are not saved from SMS.

Sample File

ACE/vis drogue path file			/* Title */
5			/* Number of Time Steps */
7200.0000	199		/* Current Time Step and Number of Particles */
-0.766993322E+02	0.346589454E+02	1	/* xy values and id */
-0.766986001E+02	0.346616775E+02	2	
.			
.			
8000.0000	199		/* Next Time Step and Number of Particles */
.			
.			
/* EOF */			

The number of particles must be the same for each time step.

Related Topics

- File Formats

File Extensions

Model specific files such as those used by FESWMS, RMA2, and other models are documented in their respective reference documentation, which is available from the model developers, not the developers of the SMS software.

OPEN/SAVE FILES

- ASCII Data (*.dat)
- AutoCAD (*.dxf)
- Binary Data (*.dat)
- Bitmap Image Files (*.bmp)
- Coastline (*.cst)
- Image (*.img)
- INI / Settings (*.ini)
- JPEG Image Files (*.jpg, *.jpeg)
- Map (*.map)
- Material (*.mat)
- Meta Data (*.met)
- Observation Table (*.obt)
- Palette File (*.pal)
- Project (*.spr; *.prj)
- Scatter Point (*.xy)
- TIN (*.tin)
- 2D Mesh (*.2dm)
- XY Series (*.xys)
- XYZ (*.xyz)

OPEN ONLY

- Arc Info (*.arc)
- MIKE 21 (*.mesh)
- Shape File (*.shp)

ADCIRC

- ADCIRC Control (*.ctl; *.15)
- ADCIRC Harmonic Solution (*.53; *.54)
- ADCIRC Simulation (*.grd; *.14)
- ADCIRC Unit 63 (*.63; *.sol)
- ADCIRC Unit 64 (*.64; *.sol)
- ADCIRC Unit 71 (*.71; *.sol)
- ADCIRC Unit 72 (*.72; *.sol)
- ADCIRC Unit 73 (*.73; *.sol)
- ADCIRC Unit 74 (*.74; *.sol)

- ADCIRC Unit 75 (*.75; *.sol)
- ADCIRC Unit 83 (*.83; *.sol)
- ADCIRC Unit 84 (*.84; *.sol)
- ADCIRC Unit 85 (*.85, *.sol)
- ADCIRC Unit 91 (*.91, *.sol)
- ADCIRC Unit 93 (*.93, *.sol)
- Drogue (*.pth)

CGWAVE

- CGWAVE Simulation (*.cgi)
- CGWAVE Solution (*.cgo; *.out)
- CGWAVE 1-D (*.cg1)

CH3D

- CH3D Simulation (*.ch3)

CMS-Wave

- CMS-Wave Simulation (*.sim)
- CMS-Wave Current File (*.cur)
- CMS-Wave Depth File (*.dep)

DAMBRK

- DAMBRK Simulation (*.dat)

FESWMS

- FESWMS Simulation (*.fil)
- FESWMS Solution (*.flo; *.out)

GENESIS

- GENESIS Solution (*.sol)

STWAVE

- STWAVE Current (*.cur)
- STWAVE Depth (*.dep)
- STWAVE Observation (*.obs)
- STWAVE Simulation (*.sim)
- STWAVE Spectral Energy (*.eng)
- STWAVE Wavefield (*.wav)

TABS

- RMA2 BC (*.bc)
- RMA2 Geometry (*.geo)
- RMA2 Simulation (*.sim)
- RMA2 Solution (*.sol)
- RMA4 Simulation (*.trn)
- RMA10 Simulation (*.bc)

WSPRO

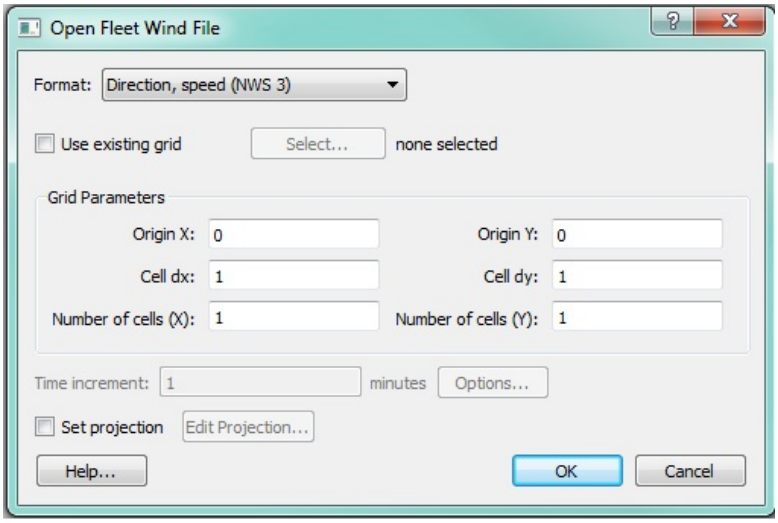
- WSPRO Simulation (*.dat)
- WSPRO Solution (*.out)

Related Topics

- File Formats

Fleet Wind Files

Datasets can be read in from fleet wind files (*.fleetwind). SMS supports two different formats for fleet wind files, which are equivalent to NWS = 3 and NWS = 6 for PBL models. More information regarding the format for these files can be found at http:// adcirc. org/ documentv49/ fort_22. html [1].



Fleet Wind dialog

Opening the Files

When opening a fleet wind file, SMS will bring up a dialog to prompt the user for information regarding file type, grid parameters, time steps, and projection.

Format: Option to select between "Direction, speed (NWS 3)" and "X, Y, pressure (NWS 6)"

Existing Grid: If the grid specified in the fleet wind file already exists in SMS, you can select to create the datasets on the existing grid

Grid Parameters: If the grid specified in the fleet wind file does not already exist, you must specify the origin, cell size, and number of cells to create the grid.

Time (NWS 6 only): Specify the size and units of the time increment, as well as a reference time (if desired).

Projection: Specify the projection of the grid. If the projection is not specified, the grid will be created using the current projection.

Datasets

When SMS reads a fleetwind file, it will create the following datasets on the grid:

- Wind (vector)
- Magnitude (scalar)
- Pressure (scalar) – NWS 6 only

Related Topics

- File Formats

References

[1] http://adcirc.org/documentv49/fort_22.html

Importing Non-Native SMS Files

SMS can import many files generated by other software in their native format. The files that can be imported to SMS are shown in the tables below. Each file type is identified by the file extension. The file filter corresponding to the desired extension should be selected in the *Open File* dialog.

In addition to the file types listed below, several other types of data can be imported via the Import Wizard. Refer to the Import Wizard article for more information.

Import File Types

File Type	File Ext	Description
Model Simulation Files	*.sim, *.fpr, *.cmcards, *.par	Numerous numerical engines use simulation files to help organize model files. These simulation files usually reference a number of other model specific geometry, parameter or data files. Opening the simulation file will import the entire model and all associated model files. This will NOT open any SMS specific data, such as Map data or TIN data etc. The models associated with each super file extension are as follows: *.sim = TABS or STWAVE or CMS-Wave, *.fpr = FST2DH, *.cmcards = CMS-Flow, *.par = BOUSS2D
Model Geometry Files	*.net, *.geo, *.dep, *.cgi, fort.14, *.grd	The numerical engines each support their own format for storing geometry (mesh or grid). Opening the geometry file will import create a geometric object of the appropriate type (mesh or grid) and set the current model to be the associated type. Some models use standard file formats such as *.2dm or *.3dm. Themodels associated with each geometry file extension are as follows: *.net = FST2DH, *.geo = RMA2 (TABS), *.dep =CMS-Wave , *.cgi = CGWAVE, fort.14 = ADCIRC (also uses *.grd), *.grd = BOUSS2D
DXF/DWG	*.dxf, *.dwg	Vector drawing data used for background display or for conversion to feature objects.
JPEG – TIFF	*.jpg, *.tif	Raster image files used for background display or for texture mapping to a surface.
Shapefiles	*.shp	ArcView shapefiles.
DEM / Grid	*.asc, *.ddf, *.ggd, *.dem	ASCII 2D grid exported from Arc/Info or ArcView, ASCII 2D grid exported from GRASS
ARC/INFO® ASCII Grid Files	*.arc	Cartesian grid and associated datasets.
Drogue Files	*.pth	Particle / path data from ADCIRC.
MIKE 21 *.mesh	*.mesh	Grid file in DHI grid format.

ARC/INFO® Shapefiles	*.shp	Geographical shapes and associated attributes.
MapInfor® MIF/MID Pairs	*.mid/*.mid	Geographical shapes and associated attributes.
NOAA HURDAT	*.hurdat	Tropical cyclones database.
LIDAR	*.las	Light detection and ranging.

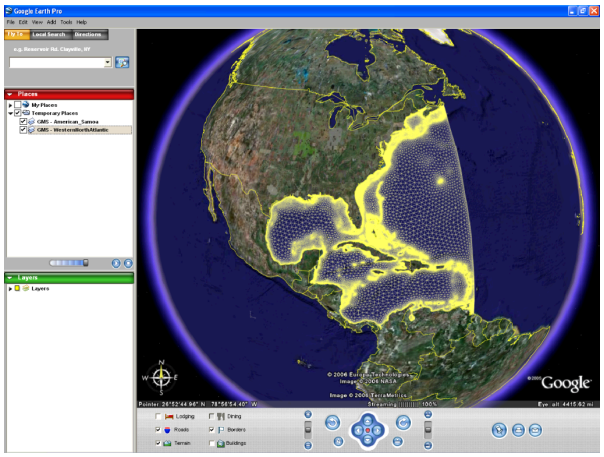
Related Topics

- File Import Wizard
- Native File Formats
- File Formats

KMZ Files

XMS software can export KMZ files. KMZ [1] files can be imported into Google Earth [2].

KMZ files can also be imported into GMS and WMS.



A 2D Mesh inside Google Earth

Raster vs. Vector

The KMZ file format supports both vector data (lines, points, polygons, triangles etc.) and raster data (images). When exporting raster data, the image shown in the XMS main graphics window is saved as a PNG image file with georeferencing data. The data is clipped to match the window bounds of the current view. When exporting vector data, all data displayed, as specified by the display options and project explorer, is exported to a raster KMZ file. The following versions of XMS software support vector export:

- GMS – 7.1
- SMS – 10.1
- WMS – 8.1

How To Export – Screen Capture

- You must be in plan view before you can export a KMZ file.
- You can export a KMZ file by using the standard *File*|**Save As** dialog and selecting either the **Google Earth© Raster KMZ File (*.kmz)** or **Google Earth© Vector KMZ File (*.kmz)** option in the *Save as type* field.
- To specify a resolution higher than the screen resolution:
  - GMS – Select the **Options** button in the *Save As* dialog.
  - SMS – Change the copy to clipboard scale factor in the Preferences dialog

The background color is made transparent in the exported KMZ file so the Earth can be seen through the overlayed image in Google Earth©.

How To Export – Transient Data Animation

Export a KMZ transient data animation using the Film Loop Wizard. This will export a series of raster images which can be animated in Google Earth©. The background color can be specified in the Film Loop Wizard. It is recommended that the option for no background be used so the Earth can be seen through the overlayed image in Google Earth©. You must be in Plan View to export a KMZ transient data animation.

By default, Coordinated Universal Time (UTC) [3] is assumed when exporting KMZ files. An offset from UTC can be specified. A list of time zone offsets from UTC is given here [4].

See "Viewing a Timeline" on page 90 of the Google Earth© user Guide [5] or here [6] for an explanation of how to change the time zone used by Google Earth©.

Coordinate System

KMZ files contain latitude and longitude information to define the location of the image. If your current coordinate system type is a projection, like UTM for example, and not a geographic system (which uses latitude and longitude), XMS will attempt to determine the latitude and longitude using coordinate conversion. It's possible that the coordinate conversion may fail, or that the distortion from converting from the current coordinate system to a geographic system is too high. In either case, XMS will issue a warning.

Transparency

The background color is made transparent in the exported PNG image which is in the KMZ file. This makes it so that the Earth can be seen through the overlayed image.

See Also

- Official Google Earth website [2]
- KML documentation [1]

Back to XMS

References

[1] http://code.google.com/apis/kml/documentation/
[2] http://earth.google.com/
[3] http://en.wikipedia.org/wiki/Coordinated_Universal_Time
[4] http://en.wikipedia.org/wiki/Timezones
[5] http://earth.google.com/userguide/v4/google_earth_user_guide.pdf
[6] http://earth.google.com/userguide/v4/ug_gps.html

LandXML Files

SMS supports importing TINs from a LandXML file.

LandXML Files (*.xml)

A LandXML file is a non-proprietary file format that stores civil/survey data such as points, faces, etc. making it easier to share surfaces between different programs. Several CAD and other packages support exporting data into the LandXML format. This makes LandXML a good choice for getting bathymetry/topographic data into SMS as the connectivity will be maintained.

Locating Data in a LandXML file

SMS only supports a subset of the LandXML definition specific to TINs. The specific data SMS looks for point location, and triangular connectivity information. To locate this data within the LandXML file, start by looking under the identifier "Definition surfType". Make sure that this is defined as "TIN". Then, look for the 'Pnts' identifier to read point locations by id. Next, look for the 'Faces' identifier to read the connectivity information. Note: In the LandXML file, the points are identified by their id number as well as by their coordinates (y,x,z) respectively.

LandXML Identifiers

A complete list of LandXML identifiers with their respective definitions can be found at www.landxml.org/ [1] on the right side of the page under LandXML-1.2 Schema. Click on the LandXML-1.2 Data Diagram.

References

[1] http://www.landxml.org/

Lidar Support

The term LIDAR [1] refers to a technology known as LIght Detection And Ranging. This technology is used to gather a large amount of survey data from fixed wing aircraft or helicopters as they fly over the survey region. The technique has the ability to penetrate clear water up to a limited depth (maybe up to 20 meters but varies based on conditions).

A LIDAR file (normally it has an extension of ".las") is a survey file that includes data points gathered from a LIDAR system and processed.

Importing a LIDAR File

When a lidar is read in, SMS uses the Global Mapper library. A dialog appears to allow the user to specify importing options. Principally, the user specifies whether the data should be loaded as a raster or scatter. Then create a raster or scatter set. This dialog is actually a component of the Global Mapper library. Therefore, the options in the dialog are described as a point cloud (scatter set) or a grid (raster).

This dialog also lists all the data sources/types of data included in the file and allows the user to select which data types should be imported.

Reading as a point cloud (scatter set)

If the user selects point cloud, SMS creates both a scatter set and an image. There are several options for the appearance of the image. These include:

- Use Colors if Present (Elevations Otherwise) – The points in the LIDAR set are given a color. This appears like a contour plot image.
- Color Elevations Using Current Shader – currently SMS does not allow the user to select shader options, so this option also appears as a contour plot image.
- Color by intensity – this results in a gray scale image.
- Color by classification – the points in the LIDAR set are colored based on their type. This can be useful to see what types of data (layers) exist in the file. If all the points in a file are the same type, the image is a single color.
- Color by random number – colored points – no documentation is available for this feature

The scatter points created when you read a LIDAR file are not triangulated. They must be triangulated to extract observation profiles or use them as source of bathymetry.

Reading as an elevation grid (raster)

If the user selects grid, SMS creates a raster and an image. SMS adds the raster as a VTK raster and the image as an image. The image appears as a hillshade.

This option is much slower than the point cloud option.

Options include:

- Grid creation Options – Tight to Loose
  - Loose (default) – for a test case it created 63752617 points/cells
  - Medium – for test case it created 63714287 points/cells with some holes
  - Tight – for test case it created 15058938 points that are mostly disjoint
- If the LIDAR data is not a box, you can fill either the entire box or just the convex hull with gridded data.

Holes left in the grid are also reflected as holes in the image. The tighter the option, the slower the process appears to be.

LIDAR Images

Reading a LIDAR file always results in an image in SMS. For some images, SMS allows the conversion to a RASTER. Since that option is available when you read the LIDAR file, this capability is not available for images created as a side effect of reading a LIDAR file.

General Options

In addition to filtering out point classifications, SMS supports the following options:

- Preview mode – load 1 in N points (user specifies N)
- Delete samples over N standard deviations from the mean (user specifies N)
- Swap elevations (multiply by -1)

Related Topics

- Rasters
- Scatter Module

References

[1] http://en.wikipedia.org/wiki/Lidar|

Map Files

When SMS saves a project, all the data related to coverages in the Map Module is written to a single ASCII file named *proj_name.map*.

Although this file is ASCII and can therefore be read in a text editor, we recommend that you do not edit these files. We also do not recommend that you develop utilities based the current format of these files. The format has changed between versions of SMS, and although SMS maintains backward compatibility to read older file formats, there is no guarantee that older formats will be written by future versions of SMS. In fact, the ASCII file may not be maintained at all.

Related Topics

- File Formats

MapInfo MID/MIF

MapInfo Interchange Format is a map and database exporting file format of MapInfo software product. The MIF-file filename usually ends with .mif-suffix. Some MIF-files also have a related MID-file.

Export

To export maps in MIF/MID format:

- Load or create an existing map
- Select *File* | **Save As**
- Select *Save as type:' and choose* Catalog file (*.xml)

An XML file is created which outlines the directories of the MIF/MID files. A points.mif/mid, polygons.mif/mid and polylines.mif/mid (if exists) is also created.

Import

Using the *File*|**Open** menu command, open the saved XML file to import the mesh from a MIF/MID file.

Material Files *.mat

Each element of a 2D mesh has an assigned material ID. Specific material properties are related to the analysis models, and are stored in the analysis files. However, general material properties, such as color, are not stored in these files. Therefore, they are stored in the material file. A material ID represents an index to a global list of materials. The material file associates general attributes such as a name, color, and pattern with each of the materials.

Material files are opened through *File* | **Open** and are saved from *File* | **Save As...** from the Mesh module.

File Format

```
MAT                 /* File type identifier */
MN id name          /*Material name */
MC id red green blue  /* Material color */
MS id stippleid     /* Material stipple (fill pattern) */
```

Cards

Card Type	**MAT**
Description	File type identifier. Must be on first line of file. No fields.
Required	YES

Card Type	**MN**		
Description	Identifies a name to be associated with the material.		
Required	NO		
Format	MN id name		
Sample	MN 5 bedrock		
Field	*Variable*	*Value*	*Description*
1	id	+	The ID of the material.
2	name	str	The name of the material.

Card Type	**MC**		
Description	Identifies a color to be associated with the material.		
Required	NO		
Format	MN id red green blue		
Sample	MN 5 124 67 245		
Field	*Variable*	*Value*	*Description*
1	id	+	The ID of the material.
2	red	0-255	The value of the red component of the color.
3	green	0-255	The value of the green component of the color.
4	blue	0-255	The value of the blue component of the color.

Card Type	**MS**		
Description	Identifies a stipple (fill pattern) to be associated with the material. This stipple is used whenever an object is being drawn using color filled polygons.		
Required	NO		
Format	MN id stippleid		
Sample	MN 5 13		
Field	*Variable*	*Value*	*Description*
1	id	+	The ID of the material.
2	stippleid	+	The ID of the stipple.

Related Topics

- File Formats

MIKE 21 *.mesh

A MIKE 21 mesh file is a text/plain file and has the *.mesh extension. The text file defines a simple unstructured grid and is similar to a *.2dm file. It lists the node and a simplified element table in text format using spaces as separators. The MIKE 21 program is produced and distributed by the DHI group.

If a grid/mesh is available in this format, it can be loaded into SMS and used for further model construction/management. SMS reads the grid, stores it as a two-dimensional unstructured mesh and allows the user to associate it with any of the numerical engines supported in SMS by using the *Data* | **Switch Current Model** command.

Loading a MIKE 21 *.mesh file into SMS

To load the file:

1. *File* | **Open...** or *File* | **Open As...**
2. In the *Open file* dialog change the *Files of type* to "Mike 21 files (*.mesh)"
3. Select the file and press **Open**

MIKE 21 File Format

A MIKE 21 mesh file uses the following format:

- **Header line –** The first line. This line contains two integers expressing the type and unit of the bathymetry data. This followed by the number of nodes then by a string defining the projection.
- **Node lines –** Every line after the header line for as many lines as stated in the header line. Each line contains information for one node in the format as follows:
  - The node point Id
  - The x coordinate (Easting or Longitude)
  - The y coordinate (Northing or Latitude)
  - The z value (bathymetry)
  - The node type (0 for water, 1 for land and above 1 for all other boundaries)
- **Element header line –** One line containing three numbers. The numbers represent the following:
  - The number of elements
  - The maximum number of nodes per element
  - Internal code for mesh type (21 for purely triangular elements, 25 if quadrangular elements exists)
- **Element lines –** Every line after the element header line for as many lines as stated in the element header line. Each line contains information for one element in the format as follows:
  - The element Id
  - Id for node_1
  - Id for node_2
  - Id for node_3
  - (Id for node_4)

    Each line contains at most as many nodes as stated in the element header line. If an element has fewer nodes than the maximum number of nodes per element stated in the element header line then the remaining node Id value is 0.

For additional information, see the DHI User Guide [1].

Related Topics

- File Formats
- File Import Wizard
- Importing Non-native SMS Files

References

[1] http://www.mikebydhi.com/~/media/Microsite_MIKEbyDHI/Downloads/DFSMatlab%20User%20Guide%20v2008.ashx

Native SMS Files

Native SMS Files are files SMS can read and write.

SMS Interface Files

SMS interface files contain data used by SMS to save display options, user preferences, etc.

SMS Interface Files include:

File Type	File Extension	Purpose
Color Palette Files	*.pal	User defined contour palette information
Settings (INI) Files	*.ini	SMS preferences and default settings

Generic Data Files

A generic file is defined as any file that was not formatted for a specific numeric model. Model specific files such as those used by FESWMS, RMA2, and other models are documented in their respective reference documentation, which is available from the model developers, not the developers of the SMS software.

Most of the generic files used by SMS use a modified form of the HEC style card type format. With this format, the different components of the file are grouped into logical groups called "cards." The first component of each card is a short name that serves as the card identifier. The remaining fields on the line contain the information associated with the card. In some cases, such as lists, a card can use multiple lines.

While card style input makes the file slightly more verbose, there are many advantages associated with the card type approach to formatting files. Some of the advantages are:

- Card identifiers make the file easier to read. Each input line has a label, which helps to identify the data on the line.
- The card names are useful as text strings for searching in a large file. All input lines of a particular type can be located quickly in a large input file.
- In many cases, Cards allow the data to be input in any order (i.e., the order that the cards appear in the file is usually not important).
- Cards make it easy to modify a file format. New card types can be added without invalidating older files. New files have additional data in the new cards. The new card must be optional (which is typically the case for new cards) for old files to remain compatible. If an old card type is no longer used, the card can simply be ignored without causing input errors.

The generic file formats supported by SMS include:

File Type	File Extension	Purpose
2D Mesh Files	*.2dm	Finite element mesh and generic model interface template definition
2D Scatter Point Files	*.xy	Scatter point x, y location
ASCII Dataset Files	*.dat	Mesh, grid, or scatter set datasets
Binary Dataset Files	*.dat	Mesh, grid, or scatter set datasets
Boundary ID Files	*.bid	Export node ids of nodestring nodes
Boundary XY Files	*.bxy	Export node x, y locations of nodestring nodes
Coastline Files	*.cst	Export node and vertice x, y locations of coastline arcs
Map Files	*.map	File that contains information for feature data
Material Files	*.mat, *.materials	Mesh material options for SMS (display options, name, etc.)
Quad4 Files	*.qd4	QUAD-4 format finite element mesh file
Shapefiles	*.shp	GIS vector data file
SMS Super Files	*.sup	File containing references to geometry and dataset files
Tabular Data Files – SHOALS	*.pts	Mesh node, or scatter point locations and values
TIN Files	*.tin	Triangulated irregular network data
XY Series Files	*.xys	X, Y series data curves
XYZ Files	*.xyz	Mesh node, or scatter point locations and values

Related Topics

- Import Wizard
- Non-native SMS Files
- File Formats

NOAA HURDAT

The North Atlantic hurricane database [1], or HURDAT, is the database for all tropical cyclones in the Atlantic Ocean, Gulf of Mexico and Caribbean Sea. SMS is able to open a HURDAT file starting in version 11.0.

File Format

HEADER

```
92620 08/16/1992 M=13  2 SNBR= 899 ANDREW      XING=1 SSS=4
Card# MM/DD/Year Days S# Total#... Name........US Hit.Hi US category
```

DAILY DATA

```
92580 04/22S2450610  30 1003S2490615  45 1002S2520620  45 1002S2550624  45 1003*
Card# MM/DD&LatLongWindPress&LatLongWindPress&LatLongWindPress&LatLongWindPress
```

TRAILER

```
92760 HRCFL4BFL3 LA3
Card# TpHit.Hit.Hit.
```

Header

- **Card# –** Sequential card number starting at 00005 in 1851
- **MM/DD/Year –** Month, Day, and Year of storm
- **Days –** Number of days in which positions are available (note that this also means number of lines to follow of Daily Data and then the one line of the *Trailer)
- **S# –** Storm number for that particular year (including subtropical storms)
- **Total# –** Storm number since the beginning of the record (since 1851)
- **Name –** Storms only given official names since 1950
- **US Hit –**
  - '1' – Made landfall (i.e., the center of the cyclone crossed the coast) on the continental United States as a tropical storm or hurricane,
  - '0' – did not make a U.S. landfall
- **Hi US category –**
  - '0' – Used to indicate U.S. tropical storm landfall, but this has not been utilized in recent years
  - '1' to '5' – Highest Saffir-Simpson Hurricane Scale impact in the United States based upon extimated maximum sustained surface winds produced at the coast. See scale below.

Daily Data

- **Card# –** As above.
- **MM/DD –** Month and Day
- Positions and intensities are at 00Z, 06Z, 12Z, 18Z
  - **& –**
    - '*' (tropical cyclone stage),
    - 'S' (Subtropical stage)
    - 'E' (extratropical stage)
    - 'W' (wave stage – rarely used)
    - 'L' (remanent Low stage – rarely used)
  - **Lat –** Latitude of storm: 24.5N
  - **Long –** Longitude of storm: 61.0W
  - **Wind –** Maximum sustained (1 minute) surface (10m) windspeed in knots (these are to the nearest 10 knots for 1851 to 1885 and to the nearest 5 kt for 1886 onward).
  - **Press –** Central surface pressure of storm in mb (if available). Since 1979, central pressures are given everytime even if a satellite estimation is needed.

Trailer

- **Card# –** As above.
- **Tp –** Maximum intensity of storm
  - 'HR' – hurricane
  - 'TS' – tropical storm
  - 'SS' – subtropical storm
- **Hit –** The impact of the hurricane on individual U.S. states ('LA' = Louisiana, etc.) based upon the Saffir-Simpson Scale category (through the estimate of the maximum sustained surface winds for each state). See scale below. Occasionally, a hurricane will cause a hurricane impact (estimated maximum sustained surface winds) in an inland state. To differentiate these cases versus coastal hurricane impacts, these inland hurricane strikes are denoted with an "I" prefix before the state abbreviation. States that have been so impacted at least once during this time period include Alabama (IAL), Georgia (IGA), North Carolina (INC), Virginia (IVA), and Pennsylvania (IPA). The Florida peninsula, by the nature of its relatively landmass, is all considered as coastal in this database.

  Note that Florida and Texas are split into smaller regions:

  - 'AFL' – Northwest Florida
  - 'BFL' – Southwest Florida
  - 'CFL' – Southeast Florida
  - 'DFL' – Northeast Florida
  - 'ATX' – South Texas
  - 'BTX' – Central Texas
  - 'CTX' – North Texas

Saffir-Simpson Scale

Saffir-Simpson Category	Maximum sustained wind speed		
	mph	m/s	kts
1	74-95	33-42	64-82
2	96-110	43-49	83-95
3	111-130	50-58	96-113
4	131-155	59-69	114-135
5	156+	70+	136+

Related Topics

- Non-Native Formats

References

[1] http://www.aoml.noaa.gov/hrd/

Quad4 Files

QUAD4 files are exported from SMS for use with a proprietary finite element program called QUAD-4. The file format is a specific format listed in the QUAD-4 documentation.

Related Topics

- File Formats

External Links

- Idriss, I.M., Lysmer, John, Hwang, Richard N., and Seed, H. Bolton, "QUAD-4, A Computer Program for Evaluating the Seismic Response of Soils Structures by Variable Damping Finite Elements, "Earthquake Engineering Research Center, Report No. EERC 73-16, University of California, Berkeley, June 1973.
- The Earthquake Engineering Online Archive QUAD-4 and QUAD4M Software and Manuals [1]

References

[1] http://nisee.berkeley.edu/elibrary/getpkg?id=QUAD4

Settings Files *.ini

Settings, or INI, files store all of the settings that the user sets inside of SMS. For example, the user defined display options, the coordinate system, mesh, grid, and scatter options, etc. are stored in the file. These files should not be confused with the old .ini files that were previously used as FESWMS Initial Condition files.

SMS.INI

The main settings file, called sms.ini, is created when SMS is started for the first time. The file is then opened every time SMS starts. When the user makes a change, such as setting mesh nodes to draw in blue, the change is permanently saved by invoking the File | Save Settings command, which updates the sms7.ini file. If the user deletes the sms7.ini, the next time that SMS begins, the settings will be reset to the factory defaults.

Other Settings Files

Settings files are also saved with a project file. The next time a project is loaded into SMS, the project settings are restored and the SMS environment returns to its saved state.

File Format

Settings files are ASCII text files. Each SMS setting is stored with a keyword and a value. For example:

```
Show Welcome Dialog=0
```

signifies that SMS will not show the *Welcome* dialog on startup.

Related Topics

- File Formats

Shapefiles

One common method for creating feature objects is to import a shapefile. The concept of a shapefile was established by Environmental Systems Research Institute (ESRI) [1] in their ArcView® program and it has become the defacto standard for sharing GIS vector data (points, lines, and polygons).

Shapefiles contain data exported from ARC/INFO® or ArcView® in binary format. When they are imported into SMS, the data is converted to feature objects, points, arcs, or polygons. Shapefiles are opened through *File* | **Open**. Only map data can be saved out from SMS as a shapefile.

A shapefile is actually comprised of three or more files. The primary file is the SHP and it contains the geometric information (coordinates and if necessary connectivity of the points, lines, polygons). The DBF file is a standard database file and stores the attributes of the feature objects. Finally there will be a SHX file which is an indexing file. There may be a few other files that accompany the shapefile and so you should always move them around together if you are copying or moving them to a new directory.

Only one "theme" or type of feature can exist in a shapefile. For example you cannot store points and polygons in the shapefile, or streams and basin boundaries and so you may be required to import multiple files to make up the drainage coverage in SMS.

When a shapefile is opened, the *Import Shapefile Data* dialog appears. The user must know if the file is a Point, Arc, or Polygon shapefile. The options in the dialog are:

- **Coverage Options –** Bring up the *coverage options* dialog to set the coverage in which the shapefile data is created.
- **Points / Arcs / Polygons –** Under each of these sections, the file browser button allows the user to select a point, arc, and polygon file. One file of each type may be selected.
- **Attribute Mapping –** This button brings up the *Map Shapefile Attributes* dialog. In this dialog, the user can select an attribute from each of the Database (from the shapefile) and Coverage attributes (SMS supported attributes) fields. If an attribute is selected from each, the Map button maps the attributes and the Unmap button unmaps the attributes. If an attribute is mapped, the attributes will be assigned in SMS when the file is opened.

SMS includes all of the tools necessary to import shapefiles and convert the geometric and attribute information into feature objects. This can be done by directly opening the shapefile and converting to feature objects in the active coverage or by loading the shapefile in the GIS module.

Related Topics

- Data Acquisition
- Importing Shapefiles
- GIS Module
- File Formats
- Feature Objects

References

[1] http://www.esri.com/

SMS Super Files *.sup

SMS Super files were used in previous versions of SMS to save most of the working data in SMS. Super files have been replaced by Project files. Old super files are still opened in SMS. Super files are only saved from the *File* | **Save Scatter Super File** command. These contain a 2D Scatter Point file and the corresponding ASCII data file.

A super file contains a list of other files. Each of the files in the list must be one of the basic SMS file types (2D meshes, 2D scatter points, materials, TINs). If a super file is selected using the *File* | **Open** command, each of the files listed in the super file are opened and imported. This makes it possible to quickly read in several files without having to identify each file individually in the file browser.

The file format for a super file is shown below. The first line in the file is the SUPER card, which identifies the file as a super file. Each of the other cards shown are optional. Each of the file cards has a card identifier representing the type of file. The identifier is followed by a file name. The file name should be a complete path if the file is not in the same directory as the super file. Any suffix may be used for the file name.

File Format

SUPER	/* File type identifier */
MAT filename	/* Material File */
SCAT2D filename	/* 2D scatter point file */
MAP filename	/* Map file */
MESH2D filename	/* 2D Mesh file */
DATA filename	/* Dataset File */
STNGS filename	/* Settings (*.ini) File */
IMAGE filename	/* Image file */

Sample File

```
SUPER
MAT    c:\SMS\DATA\SITE1\site1.mat
SCAT2D c:\SMS\DATA\SITE1\site1.xyf
```

Related Topics

- File Formats

Tabular Data Files - SHOALS *.pts

SMS includes the ability to import and export tabular data files. These files can include any number of columns of data. The user selects which columns are to be imported and how they are to be interpreted. The columns of data follow an optional header and may be delimited by any character (such as *TAB*, *SPACE*, *COMMA*, etc.). Files with the extensions of *.xyz and *.pts are defaulted to be of this type.

History

This capability was originally developed to support files generated by the SHOALS group of the US Army Corps of Engineers [1]. SHOALS files generally have an optional file header describing the data in each column of the file.

Importing Tabular Data

Tabular data files are opened using the *File* | **Open** menu command. The user selects the tabular data file to open. The *Text Import Wizard* appears and allows the user to select how the data should be interpreted (as scatter points, mesh nodes, or map nodes) and which columns should be imported.

Exporting Tabular Data

Tabular data files are saved using the *File* | **Save As...** menu command and selecting *Tabular Data Files (*.txt)* or *Shoal Files (*.pts)* from the save as type filter combo box.

When in the Scatter module this saves scattered data vertices to the tabular file. When in the Mesh module this save the mesh nodes into the tabular data file. In either case the Export Tabular File dialog appears to support this operation.

Related Topics

- File Formats

References

[1] http://www.erdc.usace.army.mil/

TIN Files

TIN files are used for storing Triangulated Irregular Networks. The TIN file format is shown below and a sample file is shown after. The TIN file format can be used to import a simple set of xyz coordinates since the triangle information (beginning with the TRI card) does not need to be present. If you have a file of xyz coordinates you only need to add the TIN, BEGT, and VERT nv cards to the top of the file and the ENDT card at the end.

```
TIN                 /* File type identifier */
BEGT                /* Beginning of TIN group */
TNAM name           /* Name of TIN */
TCOL id             /* TIN material id */
VERT nv             /* Beg. of vertices */
x1 y1 z1 lf1        /* Vertex coords. */
x2 y2 z2 lf2
.
.
.
xnv ynv znv lfnv
TRI nt              /* Beg. of triangles */
v11 v12 v13         /* Triangle vertices */
v21 v22 v23
.
.
.
vnt1 vnt2 vnt3
ENDT                /* End of TIN group */
```

Sample TIN File:

```
TIN
BEGT
TNAM Aspen
TCOL 255 255 255
VERT 408
0.0 3.1 7.8 0
5.3 8.7 4.0 1
.
.
2.4 4.4 9.0 1
TRI 408
5 1 4
4 1 2
.
.
4 2 3
ENDT
```

Cards used in the TIN file

Card Type	TIN
Card ID	3000
Description	File type identifier. Must be on first line of file. No fields.
Required	YES

Card Type	BEGT
Card ID	3000
Description	Marks the beginning of a group of cards describing a TIN. There should be a corresponding ENDT card at a latter point in the file. No fields.
Required	YES

Card Type	TNAM		
Description	Provides a name to be associated with the TIN.		
Required	NO		
Format	TNAM name		
Sample	`TNAM aspen`		
Field	**Variable**	**Value**	**Description**
1	name	str	The name of the TIN.

Card Type	TCOL		
Description	Defines a default color for the triangles of the TIN		
Required	NO		
Format	TCOL color_red color_green color_blue		
Sample	`TCOL 255 255 255`		
Field	**Variable**	**Value**	**Description**
1	color_red	0–255	The red color component of TIN triangles.
2	color_green	0–255	The green color component of TIN triangles.
3	color_blue	0–255	The blue color component of TIN triangles.

Card Type	MAT		
Description	Associates a material id with the TIN. This is typically the id of the material which is below the TIN.		
Required	NO		
Format	MAT id		
Sample	MAT 3		
Field	**Variable**	**Value**	**Description**
1	id	+	The material ID.

Card Type	VERT		
Description	Lists the vertices in the TIN		
Required	YES		
Format	VERT nv $x_1\ y_1\ z_1\ lf_1$ $x_2\ y_2\ z_2\ lf_2$ . . $x_{nv}\ y_{nv}\ z_{nv}\ lf_{nv}$		

Sample	`VERT 4`
	`0.0 3.1 7.8 0`
	`5.3 8.7 4.0 1`
	`2.4 4.4 9.0 1`
	`3.9 1.2 3.6 0`		

Field	**Variable**	**Value**	**Description**
1	nv	+	The number of vertices in the TIN
2–4	x,y,z	±	Coords. of vertex
5	lf	0,1	Locked / unlocked flag for vertex (optional). 0=unlocked, 1=locked. Repeat fields 2-5 nv times.

Card Type	TRI		
Description	Lists the triangles in the TIN		
Required	NO (a set of triangles can be generated from the vertices)		
Format	TRI nt $v_{11}\ v_{12}\ v_{13}$ $v_{21}\ v_{23}\ v_{23}$ . . $v_{nt1}\ v_{nt2}\ v_{nt3}$		

Sample	`TRI 4`
	`5 1 4`
	`4 1 2`
	`4 2 3`
	`5 4 3`		

Field	**Variable**	**Value**	**Description**
1	nt	+	The number of triangles in the TIN.
2–4	v1,v2,v3	+	Vertices of triangle listed in a counter-clockwise order. Repeat nt times.

Card Type	ENDT
Card ID	3000
Description	Marks the end of a group of cards describing a TIN. There should be a corresponding BEGT card at a previous point in the file. No fields.
Required	YES

XY Series Files

XY Series Files (*.xys)

The *XY Series Editor* is used to define x, y series data curves. These data curves can then be used to define such things as:

- Time dependent boundary conditions
- Rating curves

XY Series Files

XY Series files are imported and exported through the *XY Series Editor*.

XYS Format

```
Line 1  – XYS file identifier, Curve ID, Number of Points, and Curve Name.
Line 2+ – X Value, Y Value (one pair per line)
```

Sample File

```
XYS 1 5 Head
0.0     0.0
1.0     2.0
2.0     7.0
3.0     8.0
4.0     9.5
```

XY1 Format – Discontinued Format

Both the x and y values are listed for each point on the curve. There is no limit to the spacing or interval used between subsequent x values.

```
Line 1  – XY1 file identifier, Curve ID, Number of Points, Delta X (not
 used), Delta Y (not used), Repeat (not used), Begin X Cycle (not
used), and Curve Name.
Line 2+ – X Value, Y Value (one pair per line)
```

Sample File

XY1 1 5 0 0 0 0 Head	
0.0	0.0
1.0	2.0
2.0	7.0
3.0	8.0
4.0	9.5

XY2 Format – Discontinued Format

Identical to the XY1 card except that the number of points and the x values are assumed to be static and cannot be altered by the user.

```
Line 1  – XY2 file identifier, Curve ID, Number of Points, Delta X (not
 used), Delta Y (not used), Repeat (not used), Begin X Cycle (not
used), and Curve Name.
Line 2+ – X Value, Y Value (one pair per line)
```

Sample File

XY2 1 5 0 0 0 0 Head	
0.0	0.0
1.0	2.0
2.0	7.0
3.0	8.0
4.0	9.5

XY3 Format – Discontinued Format

The x values are defined by a beginning x value, an increment in x, and a percent change in x per increment (applied after adding the increment). Only the y values are explicitly listed. The x-values are calculated by starting with the Initial X value given and recursively adding the X Increment and then multiplying by the X Percent Change.

```
Line 1  – XY3 file identifier, Curve ID, Number of Points, Initial X, X
 Increment, X Percent Change, Delta X (not used), Delta Y  (not used),
Repeat (not used), Begin X Cycle (not used), and Curve Name.
Line 2+ – X Value, Y Value (one pair per line)
```

Sample File

```
XY3 1 5 0.0 2 10.0 0 0 0 0 Head
0.0
2.0
7.0
8.0
9.5
```

Related Topics

File Formats

XY Series Editor

The XY Series Editor is a special dialog that is used to generate and edit curves defined by a list of x and y coordinates. The curve can be created and edited by directly editing the xy coordinates using a spreadsheet list of the coordinates. An entire list of curves can be generated and edited with the Editor and curves can be imported from and exported to text files for future use. You can also paste your xy data directly to the spreadsheet.

The XY Series Editor is used in GMS, SMS, and WMS. It was designed to be general in nature so that it could be used anywhere that a curve or function needs to be defined. In some cases, the x values of the curve must correspond to a pre-defined set of values. For example, the x values may correspond to a set of time steps whose interval is established in a separate dialog. In such cases, the x fields cannot be edited but the y values associated with the pre-defined x values can be edited. In other cases, there is no limit on the number of x values or on the x spacing and both the x and y values can be edited.

The XY Edit Fields

The two vertical columns of edit fields on the left side of the dialog are for direct editing of the xy series values. A pair of application specific titles appears at the top of the columns.

The buttons below the xy edit fields are used to manipulate the values in the edit fields. The buttons are as follows:

Use dates/times

> For selected situations such as entering time series data in the Map module, it is useful to enter the data in date/time format. Checking this toggle allows the x values in your curve to be entered in date/time format.

Import/Export Buttons

> The **Import** and **Export** buttons allow the user to read in or save an xy series file.

The XY Series Plot

The window in the upper right hand corner of the XY Series Editor is used to plot the curve corresponding to the xy values in the edit fields. As each value in the edit fields is edited, the corresponding point on the curve is adjusted instantaneously. Plot options are accessed by right-clicking on the plot.

Related Pages

- GMS main page
- SMS main page
- WMS main page

XYZ Files

XYZ Files (*.xyz)

The File Import Wizard is used to import delimited or fixed width files. See the File Import Wizard article for more information. XYZ files are opened through the *Text Import Wizard*. Any ASCII tabular file can be opened through the wizard by renaming the file to have a *.xyz file extension. XYZ files may have an optional file header describing the data in each column of the file. The columns of data follow the header and may be delimited by any character (such as TAB, SPACE, COMMA, etc.). XYZ files are opened using the *File* | **Open** menu command.

Related Topics

- File Import Wizard
- File Formats

Generic Vector/Raster Files

There are several kinds of vector files and many kinds of raster files that are automatically identified and read into SMS.

These kinds of vector files include:

- DXF/DWG
- ESRI Shapefiles – read into GIS module
- MapInfo MIF/MID files – read into GIS module

Raster data is read in as images or rasters (for example DEMs). SMS will recognize most image and DEM formats.

The generic vector/raster files can be used to read in vector data not natively supported by SMS or not recognized as a raster/image format. Data unrecognized by SMS should try to load the data as generic vector/raster data. If this fails, Use the **Open As** command and specify for the type "Generic vector/raster data."

Generic vector data is converted into one of the natively supported types chosen by the user. After the conversion has been made, SMS will link to the converted data and not the original file. The conversion is performed by "GlobalMapper from Blue Marble Geographics." All of the formats supported by this package are supported. The list of formats can be found here: http://www.globalmapper.com/product/formats.htm [1].

References

[1] http://www.globalmapper.com/product/formats.htm

Import from Web

Overview

The *Import from Web* feature allows you to connect to the internet to download free data – images, elevation data etc. If you have an internet connection, this is an easy and convenient way to acquire this type of data.

The data is made available for free by various entities who provide web services [1]. Each of the XMS programs has a number of available data types they can retrieve.

It should be noted that the *Import from Web* feature links to external internet sites which can change without warning. For example, historically the XMS programs retrieved data from the *Terraserver* site which was terminated. The termination or modification of an online source may result in invalid links in the XMS program until the links can be corrected.

The *Import from Web* command is accessed in a number of ways. These include:

- From the "File" menu (WMS) or "Web" menu (SMS).
- From the "Get Data From Map" macro (WMS only).
- From the "Get Data" tool (SMS and WMS).

In the first two options the XMS program brings up a map locator tool (Virtual Earth) that allows the user to select (via pan and zoom) an area of interest and download data for this area. (As shown below)

The "Get Data" tool is available from the data toolbar when the XMS application is using a global projection. When this tool active in SMS or WMS, the user can graphically select a rectangle in the graphics window and download data inside this rectangle.

The XMS programs also have a **Get Online Maps** tool which can be used to get dynamic raster data, such as image or raster elevation data. The dynamic map is updated automatically when zooming in or out in the graphics window.

Any instance of a dynamic map on your screen can be downloaded by right-clicking on the map and selecting the **Export** command. This command will download the map to your computer.

Note: The *Import from Web* feature is no longer used for GMS as of GMS 9.0. The feature is still used in GMS 8.3 and earlier. However, since these tools used the now defunct "TerraServer" services, they are no longer referenced here.

SMS	WMS
• World Imagery [2] More Info [3] • World Street Maps [5] More Info [6] • World Topo Maps [8] More Info [9] • MapQuest OpenStreetMap Worldwide Street Maps [11] • OpenSTreetMap.org (Global Street Maps) • Other data sources (use the advanced button)	• NED data – USGS [4] • ASTER and SRTM data – USGS & NASA [7] • NLCD and CORINE (European) Land Cover data [10] • World Imagery [2] More Info [3] • World Street Maps [5] More Info [6] • World Topo Maps [8] More Info [9] • USA Topo Maps [12] More Info [13] • MapQuest OpenStreetMap Worldwide Street Maps [11] • USA Flood Hazard Zones [14] • Land Use Shapefiles [15] • STATSGO and SSURGO Soil Type Shapefiles [16] • Harmonized World Soil Database v 1.1 [17] • Global Land Cover [18] • Other data sources (use the advanced button)

Data Availability

Elevation (NED, ASTER, and SRTM) Data

- NED data contains the best available raster elevation data of the conterminous United States, Alaska, Hawaii, and territorial islands. NED data are not available for other areas.
- ASTER and SRTM data are available for most of the earth's surface. The ASTER dataset is reliable and high-quality.

Imagery

Most of the imagery (World Imagery, Street Maps, Topo Maps, and OpenStreetMap.org data) are available for anywhere on the earth. Some imagery, such as US Topo Maps, are only available for areas of the United States. Besides downloading these images using the Import from Web command, these images can be read as online maps that change resolution dynamically depending on your location.

Land Cover Data

- The 100 m Resolution CORINE dataset (raster) is available for anywhere in Europe.
- The 30 m NLCD dataset (raster) is only available for the conterminous United States.
- The Land Use Shapefile dataset is available for the entire United States.
- The Global Land Cover dataset is available in 2 degree by 2 degree blocks for the entire world. The following steps were used to convert the Land Use data to a format that can be used for WMS hydrologic modeling:

1. Go to the European Space Agency site to download land use data [18].
2. Download the .zip file Globcover2009_V2.3_Global_.zip and unzip this file on your computer.
3. Open GLOBCOVER_L4_200901_200912_V2.3.tif in a GIS (such as ArcMap) and convert it to an ESRI raster file. Trim the raster as needed, then convert the raster to a shapefile.
4. Convert the file Globcover2009_Legend.xls to a *.dbf file and join this file with the shapefile values to get the land use names and IDs.

Soil Data

- SSURGO soil datasets are available for all available SSURGO survey areas in the United States (as of August 2013).
- A STATSGO soil dataset is available every state in the United States.
- Data from the Harmonized World Soil Database are available in 2 degree by 2 degree blocks for the entire world. The WMS developers used the following steps to convert the soil data to a format that can be used for WMS hydrologic modeling:

1. Download and install the Harmonized World Soil Database program to your computer from the Harmonized World Soil Database web site [19].
2. Launch the HWSD Viewer on your computer. The soil data will be copied to the folder c:\program files (x86)\HWSD_v<xxx>\Data where <xxx> is the version of the viewer you have downloaded. The program may also be installed in c:\program files\<...> if you are running a 32-bit version of Windows. The following files are contained in this folder:
    1. The HWSD Raster *.zip file.
    2. The HWSD DBF file.
    3. The HWSD_META DBF file.
3. Copy the files in the data folder to a writable location on your computer and unzip the HWSD Raster *.zip file.
4. Open the .bil file in ArcMap and convert the *.bil file to a shapefile using the IDs.
5. Join the HWSD DBF file with the IDs in the shapefile.
6. Join the attribute IDs with the HWSD_META DBF file. This gives you a shapefile with the soil IDs and various soil attributes that can be used for hydrologic modeling in WMS.

Additional Information

Note that more vector-based soil and land use datasets are available; Contact Aquaveo [20] if you are interested in adding data from a specific area to the list of available land use or soil data that can be downloaded. A comprehensive list of soil and land use data available for download is located here.

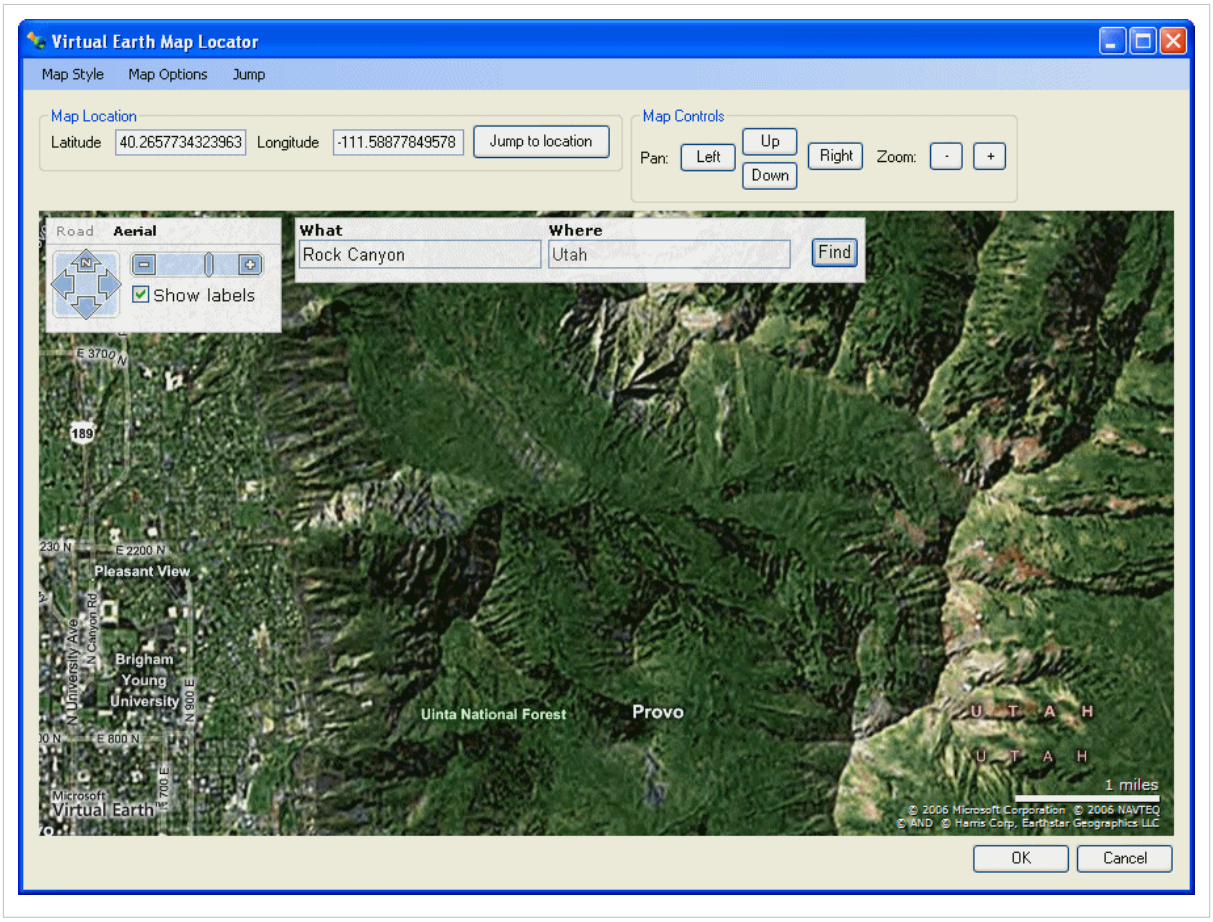
Terraserver images are no longer available because this web service has gone offline.

Using the Import from Web Command

When the *Import from web* command is invoked from a menu or macro, the virtual earth map locator is launched:

- **Virtual Earth Map Locator**:Use the map in this dialog to go to your location of interest.
    - You can **zoom** in or out using the controls or the mouse wheel.

- You can **pan** using the controls or by clicking and dragging. You can also enter the latitude and longitude to jump to a specific location.
- Use the *Map Options* menu to turn on the floating controls in the map (search, pan and zoom).
- Use the *Map Style* menu, or the floating controls, to change the map between **Road**, **Aerial**, and **Hybrid**.



Once the region for data download is defined, a series of dialogs appear which allow the user to define the data to be downloaded. These dialogs include:

1. **Data Service Options**

   Here you select which type of data you are interested in.

1. **Save**

   Now you are asked where you want to save the data. You only need to specify one file name, even if you've selected more than one type of data in the previous dialog. The files will all be given the same prefix but different suffixes.

1. **Confirm File Creation**

   You may be asked to confirm that you want to create the files.

1. **Initialize Connection**

   The following dialog is shown while the connection is being made.

1. **Select Scale**

   Smaller numbers (larger scales) will result in better resolution, but longer download times.

1. **Downloading**

   This dialog reports the download progress. If you click **Abort**, your image will exist but will be only that portion that you've downloaded so far.

Steps will repeat for each data type selected.

After everything is finished, the data (images etc.) will appear in the Project Explorer.

References

[1] http://en.wikipedia.org/wiki/Web_service
[2] http://services.arcgisonline.com/ArcGIS/rest/services/World_Imagery/MapServer
[3] http://www.arcgis.com/home/item.html?id=10df2279f9684e4a9f6a7f08febac2a9
[4] http://ned.usgs.gov/
[5] http://services.arcgisonline.com/ArcGIS/rest/services/World_Street_Map/MapServer
[6] http://www.arcgis.com/home/item.html?id=3b93337983e9436f8db950e38a8629af
[7] http://srtm.usgs.gov/
[8] http://services.arcgisonline.com/ArcGIS/rest/services/World_Topo_Map/MapServer
[9] http://www.arcgis.com/home/item.html?id=30e5fe3149c34df1ba922e6f5bbf808f
[10] http://seamless.usgs.gov/nlcd.php
[11] http://developer.mapquest.com/web/products/open
[12] http://services.arcgisonline.com/ArcGIS/rest/services/USA_Topo_Maps/MapServer
[13] http://www.arcgis.com/home/item.html?id=99cd5fbd98934028802b4f797c4b1732
[14] https://hazards.fema.gov/femaportal/wps/portal/NFHLWMS
[15] http://www.webgis.com/lulc_shplatlong.html
[16] http://soildatamart.nrcs.usda.gov/
[17] http://www.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/
[18] http://ionia1.esrin.esa.int/
[19] http://webarchive.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/
[20] http://www.aquaveo.com/contact-us

Registering an Image

If an image file is not geo-referenced then the user must define the coordinate system of the image. The register dialog allows the user to specify the coordinate system for the image. When an image is opened, if the image is not self-referenced, XMS attempts to find world file with the same name as the image (*.wld or *.jpgw extension). If neither of these is found, the register dialog opens.

What is Image Registration?

Before an image can be displayed, the image must be "registered" or geo-referenced. Registering an image involves identifying points on the image corresponding to locations with known real world (XY) coordinates. Once these points are identified, they are used to scale and translate the image to the proper location when it is drawn with the other objects in the Graphics Window. If an image is not registered properly, any objects which are created using the background image as a guide will have the wrong coordinates.

Register Image Dialog

An image is registered using the *Register Image* dialog. The main feature of the *Register Image* dialog is a large window in which the image is displayed. Two or three points (shown by "+" symbols) are also displayed in the window. These points are used to identify locations with known real world coordinates. The real world coordinates (X,Y) and image coordinates (U,V) of the registration points are listed in edit fields below the image. The points are moved to the desired locations on the image by dragging the points using the tools described below. Once the points are located, the real world coordinates can be entered in the corresponding edit fields. The dialog contains the following options:

- **2 point or 3 point registration –** Two point registration rotates and uniformly scales an image. Three point registration allows for non-uniform scaling to account for some parallax.
- **Import World File –** Used to import a TIFF world file (*.tfw). A TIFF world file has the information needed to set the (X,Y) and (U,V) coordinates in order to place the image in the correct world coordinates.
- **Image name –** Used to associate a name with the file. This name will appear in the project explorer.

Register Image Dialog Tools

The following tools can be used to help position the registration points:

Tool	Tool Name	Description
	Select Point Tool	The Select Point tool is used to select and drag register points to a location on the map for which real coordinates are known so that they can be entered in the corresponding XY edit fields.
	Zoom Tool	In some cases, it is useful to magnify a portion of the image so that a registration point can be placed with more accuracy. The Zoom Tool is used to zoom in a portion of the image.
	Pan Tool	After zooming in on a portion of the image, the Pan Tool is used to pan the image vertically or horizontally.
	Frame Macro	The Frame Macro is used to automatically center the entire image within the drawing window of the dialog after panning and zooming in on a specific location.

Import World File

The **Import World File** button can be used to automatically define the registration data. A world file is a special file associated with a previously registered image that is exported from ArcView® [1] or Arc/Info® [2]. The file contains registration data that can be used to register the image.

Saving/Reading Image Registration Data

When a project file is saved, a link to the image is saved in the project file, along with the current image registration information so that the image is re-registered to the same coordinates every time the project is opened. The original image file and world file (if one exists) are not altered.

Convert Point Coordinate System

The x, y coordinates of each register point must be specified. If the user has the (x,y) coordinates in a different coordinate system than their project, the coordinates will need to be converted.

GMS Point Conversion

The **Convert Point** button in the image registration dialog will allow the user to convert the coordinates.

SMS Point Conversion

The Single Point Conversion command in the *Edit* menu can be helpful if you need to convert between any two coordinate systems. You should perform this conversion and record the locations in the correct coordinate system prior to entering the registration dialog.

An alternative approach is to convert the coordinate system after importing by right clicking on the image in the Project Explorer and choosing ***Coordinate Conversion*** from the right click menu.

WMS Point Conversion

The Single Point Conversion command in the *Edit* menu can be helpful if you need to convert between any two coordinate systems. You should perform this conversion and record the locations in the correct coordinate system prior to entering the registration dialog.

References

[1] http://www.esri.com/software/arcview/
[2] http://www.esri.com/software/arcgis/arcinfo/

7.2.b. GSDA

GSDA

Geo-Spatial Data Acquisition Home

DEM

Bathymetry

TIN

Streams

Rivers, Lakes, and Seas

DRG Images

Aerial and Satellite Photos

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Meteorologic Data

Coastline

Tidal

Current

Wave

Land Use

Soil Type

GSDA:Digital Elevation

Topography and Terrain

Obtain DEMs directly from WMS using the Get Data tools [1]

WMS offers options to download various types of digital elevation data for anywhere in the world using the Get Data Toolbar. Use either the Get Data From Map button to select an area and download data for the selected area or the Get Data tool to get data for a selected area in the WMS window. This is the recommended method to get DEM data into WMS unless you have other DEM sources that may be more recent or of better quality.

Find US DEMs and bathymetry download sites [2]

The United States Interagency Elevation Inventory is a great source of high-resolution elevation and bathymetry information. If you need higher resolution elevation data, LIDAR data, or bathymetry data that cannot be downloaded directly from WMS, use this web site to locate your area of interest and find data for that area.

Obtain Data from USGS National Map Viewer Application [3]

The USGS provides DEM, imagery, land use, hydrography, and other datasets as part of the National Map. The types of data provided as part of this system include:

Shuttle Radar Topography Mission

30 Meter – Data available for contiguous US, Hawaii and southern Alaska
90 Meter *ndash; Extensive coverage including most areas of Earth

National Elevation Dataset (NED)

1/9 Arc Second – 3 meter resolution limited to select areas of the United States
1/3 Arc Second – 10 meter res. available covering most of the contiguous US
1 Arc Second – 30 meter res. for all of the United States
2 Arc Second – Dataset specific for the state of Alaska

Details:

SRTM and NED data is offered in Gridfloat, ArcGRID, and TIFF formats.
You can define a custom, seamless area to download.
The interface allows you to display various GIS layers to aid in the selection process.
Downloads are free (no cost).

Download various data (including elevation) from the USGS [4]

Details:

Download DEM data in various formats.
Download various land cover and vegetation data.
Download USGS imagery.
Downloads are free, but an account must be created to download.

Download various data collected by NASA [5]

Details:

Download DEM data from various sources and in various formats from around the world.
Downloads are free, but an account must be created to download.

DEM Data from webGIS [6]

Details:

Terrain data offered

USGS 7.5 minutes - 1:24K scale (~30 m res) <Covers all of contiguous United States>

USGS 1 degree - 1:250K scale (~90 m res) <Hawaii and Alaska only>

Data only available in *.dem format

Graphical US map makes locating an area easy

Downloads are free (no cost).

Canadian DEM Data [7]

Worldwide DEM data in SRTM format-90 meter resolution [8]

SDTS DEM data from MapMart [9]

Details:

Terrain data offered

10 Meter SDTS (Spatial Data Transfer Standard) <Limited coverage of US>
30 Meter SDTS <Covers all of contiguous United States and Hawaii>

Limit of 10 quads per download
Graphical US map makes locating an area easy
Downloads are free (no cost).
The following types of formats are also available for a fee

USGS DEM
XYY ASCII Grid
Arc ASCII Grid
DXF Mesh

SDTS DEM Data from GIS Data Depot [10]

Details:

Digital Elevation Model (DEM) data:

10 Meter Resolution
30 Meter Resolution

SDTS Format
Extensive coverage of the U.S.
Free downloads.
Data offered free may also be available in other formats for a fee.

Tips:

The USGS GNIS [11] and Google Maps [12] are useful tools to determine the *name* of the DEM you need.

DEM Data from Land Info [13]

Details:

Digital Elevation Model (DEM) data:

- 1:250K Resolution
- 1:24K Resolution

Numerous formats

- *.dem
- ESRI GRID
- ESRI BIL w/HDR
- *.dted

Downloads must be purchased

Bathymetric

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_NOAA_NGDC.png [14]

Obtain bathymetry data using GEODAS Design-a-Grid [15]

The National Oceanic and Atmospheric Administration (NOAA) has produced the National Geophysical Data Center (NGDC) website to allow for US data access. Oceanic bathymetry can be found using GEODAS (GEOphysical DAta System) Grid Translator Design-a-Grid.

Details:

- Must indicate latitude and longitude degree boundaries

- Three format choices all available with headers:
  1. Binary Raster
  2. ASCII Raster
  3. XYZ Delimited
- Downloads are free (no cost).

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_NOAA_NOS.png [14]

Obtain estuarine bathymetry data from NOAA's NOS [16]

The National Oceanic and Atmospheric Association (NOAA) has produced the National Ocean Service (NOS) Estuarine Bathymetry website to allow for US estuarine bathymetry access.

Details:

- Estuaries divided into six regions:
  1. North Atlantic
  2. Middle Atlantic
  3. South Atlantic
  4. East Coast Gulf of Mexico
  5. West Coast Gulf of Mexico
  6. Pacific Coast
- 4 downloadable options of individual estuaries in *.dem format:
  1. 1 Arc Second (30 meter resolution) – Split into 7.5" quads
  2. 1 Arc Second – One big file
  3. 3 Arc Seconds (90 meter resolution) – Split into 1 degree quads
  4. 3 Arc Seconds – One big file
- Downloads are free (no cost).

Obtain topographic and bathymetric data from the Topographic and Bathymetric Data Inventory [17]

The National Oceanic and Atmospheric Association (NOAA) offers topographic and bathymetric data from the NOAA coastal Services Center and the Federal emergency Management Agency through the Topographic and Bathymetric Data Inventory. This resource provides both topographic and bathymetric data for the coastal areas of the United States. More information on this resource can be found here [18].

DEM Overview

There are many uses and applications of DEMs. GIS (Geographic Information System) software such as ArcView and ARC/INFO, as well as modeling software such as WMS (Watershed Modeling System) can use DEMs for many engineering and scientific applications. WMS uses DEM data to produce watersheds which are then used to model storm events, create hydrographs, route floods down rivers and through reservoirs, etc. This information can be used to design culverts, dams, detention basins and other hydraulic structures. DEM data are commonly used to create another type of digital terrain model called a TIN (Triangulated Irregular Network). Public domain software is available for tasks such as simply viewing a DEM—one example is dlgv32 Pro [19], a tool provided by the USGS.

With powerful modeling software such as WMS, using DEM data to run a model is not difficult, and can be accomplished in four general steps:

1. Find and/or download the needed DEM data.
2. Import the DEM(s) into WMS
3. Delineate the watershed by inserting stream networks, one or more outlets, and reservoirs. If desired, a TIN can be created as well. Additional hydrologic data such as land use and soil type can also be used in WMS.

4. Run the model and view the results. WMS supports several models such as HEC-1, NFF, Rational, TR-55, TR-20, HEC-HMS, and GSSHA.

A DEM (Digital Elevation Model) is simply a digital map of elevation data. These maps, a type of DTM (Digital Terrain Model), are raster data meaning that they are made up of equally sized gridded cells each with a unique elevation.

DEMs come in different scales and resolutions. For example, 1:24,000 scale DEM is simply a USGS (United States Geological Survey) 7.5' quadrangle that has been digitized and each cell in the DEM represents a block of terrain 30 meters x 30 meters. The 1:250,000 scale DEM (also known as a 1-degree or a 3 arc-second DEM) has a resolution of 90 meters x 90 meters. DEMs with better resolution are available, but require large amounts of computer memory and disk space and are often impractical to use for large areas of land. If an individual DEM does not cover the entire area of interest, then multiple DEMs can be tiled together to make one large DEM.

The projection and datum for a DEM varies. A common projection for DEMs is UTM (Universal Transverse Mercator) coordinates (meters) and have a specific datum associated with them. Elevations are usually in meters, but sometimes are in feet for areas of low relief, and are referenced to mean sea level.

DEM Tips

- How do I obtain a DEM from USGS?
- How do I obtain a DEM from GIS Data Depot?
- How do I use the USGS Map Locator?
- How do I use the USGS GNIS (Geographic Names Information System)?
- How do I decompress data files?
- How do I import a DEM (native *.dem or SDTS format) into WMS?
- How do I import an NED Gridfloat file into WMS?
- How do I use WMS to convert data to a different coordinate system?

Bathymetry Tips

- How do I obtain bathymetry data from GEODAS Design-a-Grid?
- How do I obtain estuarine bathymetry data from NOAA's NOS?
- How do I import bathymetry data into SMS?
- How do I import estuarine bathymetry data into SMS?

References

[1] http://www.xmswiki.com/xms/Import_from_Web
[2] http://www.csc.noaa.gov/inventory/#
[3] http://viewer.nationalmap.gov/viewer/
[4] http://earthexplorer.usgs.gov/
[5] http://demex.cr.usgs.gov/DEMEX/
[6] http://www.webgis.com/
[7] http://www.geobase.ca/
[8] http://srtm.csi.cgiar.org/
[9] http://www.mapmart.com/DEM/DEM.htm
[10] http://data.geocomm.com/dem/demdownload.html
[11] http://geonames.usgs.gov/
[12] http://maps.google.com
[13] http://www.landinfo.com/
[14] http://www.noaa.gov/
[15] http://www.ngdc.noaa.gov/mgg/gdas/gd_designagrid.html

[16] http://estuarinebathymetry.noaa.gov/
[17] http://www.csc.noaa.gov/topobathy/#
[18] http://www.csc.noaa.gov/digitalcoast/tools/topobathy/index.html
[19] http://mcmcweb.er.usgs.gov/drc/dlgv32pro/

GSDA:Hydrography Data

Stream Depths, Flow Rates, and Forecasts

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_USGS.png [1] Obtain stream stage data from the USGS WaterWatch [2]

Water Watch offers real-time stage and discharge data for about 3,000 stream gages. Plus, it is linked to NWIS-Web, which furnishes surface and ground water data, as well as water quality data.

Advantages:

> Easy-to-use graphical map allows users to access data for a gaging station in a couple of clicks. Users can quickly access a list of all stations within a state.

- Help - Obtaining stream-stage data from WaterWatch

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_USGS.png [3] Obtain stream stage data from the USGS NWISWeb [4]

NWISWeb offers an extensive amount of data, including surface and ground water data, as well as water quality data.

Advantages:

> Users can search for a gaging station by its name, ID number, State, Drainage Basin, and more. Use this site if you need advanced search capabilities.

- Help - Obtaining stream-stage data from NWISWeb

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_NRCS.png [5] Obtain stream forecast data from the USDA/NRCS [6]

The USDA/NRCS offers stream forecast data as well as current water supply maps.

- Help - Obtaining stream forecast data from the USDA/NRCS

Rivers, Lakes, and Seas

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_webGIS.png [6] Obtain hydrographic data from WebGIS [6]

WebGIS provides data in shapefile and standard DLG formats

- Help - getting hydrographic data from WebGIS

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_ESRI.png [1] Obtain hydrographic data from ESRI Census 2000 TIGER [7]

ESRI and the U.S. Census Bureau offer hydrographic data in shapefile format for ArcView or ARC/INFO

- Help - Obtaining hydrographic data from ESRI Census TIGER 2000

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_USGS.png [3] Obtain hydrographic data from the USGS/EPA [8]

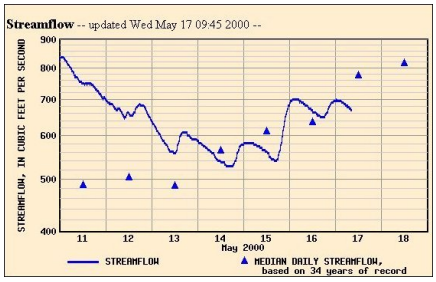
The USGS/EPA offers hydrographic data for each CU (cataloging unit) in the US in either ESRI/ARC or USGS/SDTS format.

- Help - Obtaining hydrographic data from the USGS/EPA

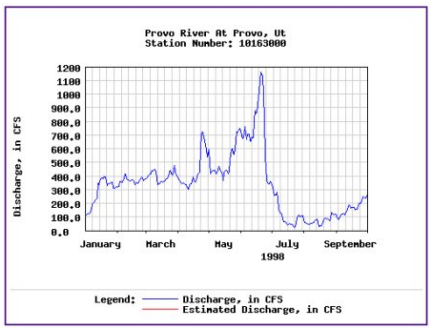
Stream Data Overview

Stream stage simply refers to the water depth in a stream or river. The water depth is related to the flowrate and rating curves (plots of stage vs. flowrate) have been created for many streams and rivers. Available data sources can give real-time (i.e., current to the moment) stream-stage data whereas other sources give historical figures along with statistical data such as median flowrates etc. Some examples are given below for the Provo River in Utah. Another important flow data type are flow-duration curves (also called reliability curves) which give engineers an idea of what flowrates can be expected a certain percentage of the time. An annual hydrograph is required to create a flow-duration curve which is shown in the third figure. Streamflow data used for forecasting is also available for specific streams or for regions in general.

Graph showing stream stage (depth) vs. time.



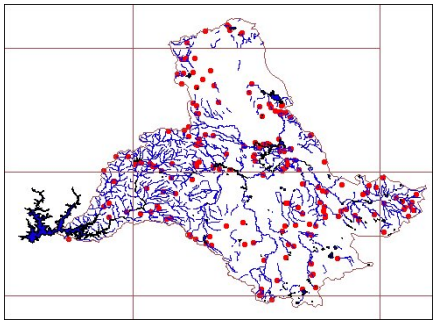
Graph showing flowrate vs. time (a hydrograph) for the same river in the above figure.



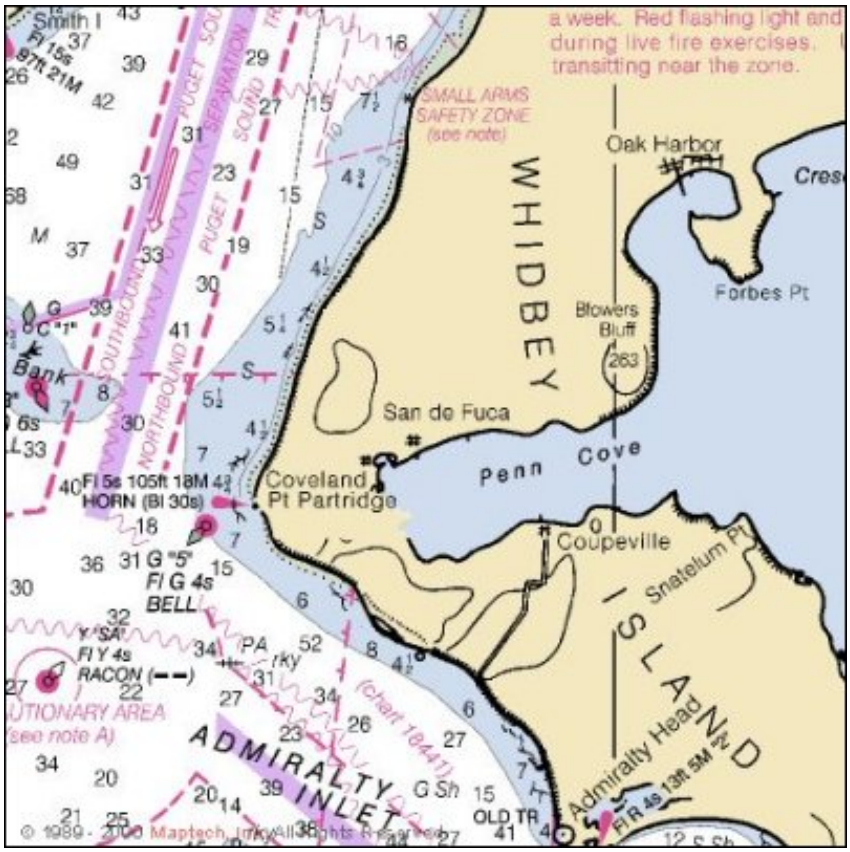
An annual hydrograph for the Provo River for station # 10163000.

Hydrographic Waterbody Overview

By definition, hydrography is the study and survey of rivers, streams, creeks, springs, wells, ponds, lakes, reservoirs, oceans, seas, bays and estuaries with respect to their tides, flow characteristics, and navigability. Much of the available hydrographic information is in a format compatible with a GIS such as ArcView. Locating streams and other water bodies may be essential in creating a good model.



USGS/EPA NHD (National Hydrography Dataset) showing stream networks and lakes.



Stream Data Tips

- Help – Obtain stream stage data from USGS NWISWeb?
- Help – Obtain real-time stream stage data from USGS WaterWatch?
- Help – Obtain stream forecast data from the USDA/NRCS?

Hydrographic Waterbody Tips

- How do I obtain hydrographic data from WebGIS?
- How do I obtain hydrographic data from the USGS/EPA?
- How do I obtain hydrographic data from ESRI Census TIGER 1995?
- How do I decompress data files?
- How do I import hydrographic data into WMS?
- How do I import a standard DLG file into WMS?

References

[1] http://www.usgs.gov/waterwatch/
[2] http://water.usgs.gov/waterwatch/
[3] http://www.usgs.gov/
[4] http://waterdata.usgs.gov/nwis
[5] http://http://www.nrcs.usda.gov/
[6] http://www.wcc.nrcs.usda.gov/wsf/
[7] http://www.esri.com/tiger
[8] http://nhdgeo.usgs.gov/viewer.htm

GSDA:Imagery

DRG Image Data

Obtain images directly from WMS using the Get Online Maps tool [1]

WMS offers an option to download various types of high-quality image data for anywhere in the world using the Get Online Maps tool. This is the recommended method to get image data into WMS unless you have other image sources that may be more recent or better quality.

Obtain Data from USGS National Map Viewer Application [3]
The national map viewer has several sources for downloading images, including GeoPDF's and high-resolution aerial photographs.

Obtain a DRG from MSR Maps [2]

MSR Maps offers USGS Topos in several different resolutions. WMS uses this web service to download imagery for the United States.

Obtain a DRG from other public sites [3]

Sometimes, the best way to locate GIS data from a public source, such as a state or county agency, is to consult an internet search engine. Go to a search engine website, such as www.google.com [4] and enter the search criteria, such as "DRG Georgia."

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_GeoCommunity.png [5] Obtain a DRG from GIS Data Depot [6]

- The USGS GNIS [11] and Google Maps [12] are useful tools for locating the correct DRG.
- Need additional help using USGS Map Locator?
- Need additional help using the USGS Geographic Names Information System (GNIS)?
- Need additional help obtaining a DRG from GIS Data Depot?

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_LandInfo.png [13] Obtain a DRG from Land Info [13]

Land Info is a commercial site offering a wide variety of spatial data for purchase.

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_USGS.png [3] Obtain a DRG from the USGS [7]

You may purchase DRGs from the USGS.

DOQ Image Data

Obtain images directly from WMS using the Get Online Maps tool [1]

WMS offers an option to download various types of high-quality image data for anywhere in the world using the Get Online Maps tool. This is the recommended method to get image data into WMS unless you have other image sources that may be more recent or better quality.

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_USGS.png [3] Obtain a High Resolution DOQ from The National Map [8]

This USGS site offers 1/3 meter resolution Orthos for various metropolitan areas.

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_GeoCommunity.png [5] Obtain a DOQ from GIS Data Depot [6]

- The USGS GNIS [9] can be a useful tool to determine the *name* of the correct DOQ (GIS Data Depot also requires that you know the county).
- Additional help obtaining a DOQ from GIS Data Depot
- Additional help using the USGS GNIS (Geographic Names Information System)

Obtain a DOQ from other public sites [3]

This list maintained by the USGS offers DOQ data for a selection of states.

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_TerraServer.png [10] Obtain a DOQ from Terraserver [10]

- Additional help obtaining a DOQ from Terraserver
- Additional help uncompressing data files

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_USGS.png [3] Obtain a DOQ from the USGS [11]

You may purchase DOQs from the USGS.

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_LandInfo.png [13] Obtain a DOQ from Land Info [13]

Land Info is a commercial site offering a wide variety of spatial data for purchase.

Satellite Data

http:// / wikis. aquaveo. com/ xms/ FTPImages/ GSDA/ GSDA_USGS. png [3] Obtain satellite images from the USGS SRTM [8]

The SRTM offers 30 meter elevation data in GeoTIFF and ArcGRID formats

- Additional help obtaining satellite images from the USGS SRTM database

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_TerraServerUSA.png [12]

Obtain satellite images from Terraserver [12]

Among other image types, Terraserver offers OrbView and SPIN-2 satellite images for purchase.

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_LandInfo.png [13]

Obtain satellite images from Land Info [13]

Land Info is a commercial site offering a wide variety of spatial data for purchase.

Nautical Charts

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_NOAA.png [14]

- Obtain nautical charts from NOAA. [13]
- Obtain historical nautical charts from NOAA. [14]
- Obtain additional information from NOAA. [15]

Image Overview

The use of maps and photographs within WMS/GIS serves many purposes. These images can be used as a backdrop to create a conceptual hydrologic model. In other words, the engineer can create feature objects (i.e., streams, outlets) on top of the map image to ensure that they are in the proper locations. There are three types of images generally used with WMS: TIFF, DRG, and DOQ. DRG images are the most commonly used.

In order for images to be useful they must be georeferenced. This means that the map image itself has been fit to actual coordinates on the earth's surface to some coordinate system such as UTM (Universal Transverse Mercator). If a map or image is not available for the area of interest, then any map or image can be scanned using a typical scanner. This image can then be georeferenced within WMS.

- Learn about TIFF images and DRGs.
- Learn about DOQ images.
- Learn about satellite images.

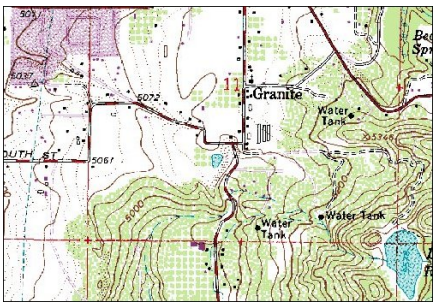
A common type of image format is a TIFF (tagged image file format) image. If a TIFF image is not already available from some source, they can be easily created by scanning a map using a typical scanner.

A special type of TIFF images that is already georeferenced is called a GEOTIFF, and does not need to be georeferenced with any additional steps since the georeferencing information is contained within the image itself. Some software will read GEOTIFF images and some won't. Other TIFF images come with a separate file called a TIFF World File which contains the georeferencing information. Finally, if a TIFF image is not georeferenced for some reason, it can be done in WMS or GIS through a process called registration (see WMS tutorial for more information).

DRGs are a special type of TIFF image. The USGS has scanned their standard series topographic maps and created georeferenced TIFF images from them - images like these are known as a DRG (Digital Raster Graphic). They are usually available in 1:24,000 (7.5' quads), 1:100,000, and 1:250,000 scale. The scale required for a project in WMS is very important since DRGs are not normally tiled together as are DEMs, but the proper size should be selected for

the project (i.e., a very large watershed may require a 1:250,000 scale DRG). DRG images are often large with respect to disk space, often exceeding 10 megabytes each. Most DRGs are GEOTIFFs.

WMS and GIS will both read a DRG, and most graphics programs will at least display one on the computer screen. The USGS offers free software that will also read a DRG image (visit http://mcmcweb.er.usgs.gov/viewers/dlg_view.html for more information).



A portion of the Draper, Utah 1:24,000 scale (7.5' quad) DRG map.

DOQ images are high-resolution (often 1 square meter per pixel) computer generated images of aerial photographs shot at about 20,000 ft altitude. They are usually very large in file size (often exceeding 40 megabytes for black & white) so typically 4 DOQ images are taken for each 7.5' quadrangle as a NW, NE, SW, and SE quarter-quad. The "ortho" refers to the fact that the image displacements caused by camera tilt and terrain topography have been removed from the aerial photo (this process is called orthorectification). This means that the image is a photographic map which can be used to accurately measure distances directly from the photograph and other cartographic (map) information can be directly overlaid onto the DOQ. DOQ images are sometimes georeferenced, and sometimes they are not. DOQs come in various file formats. Some images are in .jpg format and have a file associated with them similar to a TIFF world file (as is the case with DRGs). Another common format is .bil which stands for "band interleaved by line" multiband image. ArcView and ARC/INFO require the JPEG extension to view .jpg images but will automatically read the .bil format as an image data source (versus a feature data source such as a shapefile). WMS cannot read .bil format directly. DOQ images should be available for the conterminous United States by 2004, and then will be updated every 5 or 10 years depending on how rapid the land use change is in a certain area.

A portion of a DOQ showing a wharf and boat dock.

- FAQ about DOQs. [16]
- Learn more about DOQ images at the USGS. [17]

Other image types such as SPIN-2 and OrbView satellite photographs can be found, viewed, and purchased from several sources. As mentioned in the overview, satellite images are sometimes clearer and more resolute than aerial photographs.

Image Tips

- How do I obtain image data from Terraserver?
- How do I obtain a DRG from GIS Data Depot?
- How do I obtain a DOQ from USGS?
- How do I obtain a DOQ from GIS Data Depot?
- How do I obtain a DOQ from Terraserver?
- [[GSDA:|How do I obtain satellite images from USGS?]]
- How do I use the USGS Map Locator?
- How do I use the USGS GNIS (Geographic Names Information System)?
- How do I decompress data files?
- How do I register an image for use in WMS?
- How do I import a DRG into WMS?
- How do I use WMS to convert DRG data into a different coordinate system?

References

[1] http://www.xmswiki.com/xms/Get_Online_Maps
[2] http://msrmaps.com/
[3] http://libraries.mit.edu/gis/data/datalinks/statedataweb.html
[4] http://www.google.com
[5] http://www.geocomm.com/
[6] http://data.geocomm.com/catalog/index.html
[7] http://mcmcweb.er.usgs.gov/drg/
[8] http://seamless.usgs.gov/
[9] http://mapping.usgs.gov/www/gnis/
[10] http://www.terraserver.com/
[11] http://edc.usgs.gov/webglis
[12] http://terraserver-usa.com/
[13] http://nauticalcharts.noaa.gov/mcd/Raster/
[14] http://historicalcharts.noaa.gov/historicals/historical_zoom.asp
[15] http://www.csc.noaa.gov/crs
[16] http://mapping.usgs.gov/digitalbackyard/faqsnew.html#1
[17] http://www-wmc.wr.usgs.gov/doq/

GSDA:Meteorologic Data

Maps, Tables, and Charts of Snow and Rainfall

Obtain NEXRAD Radar Data from NCDC [1]

- Help – Obtaining NEXRAD Radar Data from NCDC

http:/ / wikis. aquaveo. com/ xms/ FTPImages/ GSDA/ GSDA_NOAA_NESDIS. png [14] Obtain historical precipitation data from the NNDC Online site [2]

Fifteen minute and hourly historical data in ascii format at no cost.

- Help – Obtaining precipitation data from the NNDC

http://wikis. aquaveo. com/ xms/ FTPImages/ GSDA/ GSDA_NOAA. png [14] Obtain digital rainfall grids from NOAA Atlas 2 [3]

Precipitation-Frequency maps for the Western US at a 15 ' resolution (~400m)

- Grid in Geographic NAD 83 coordinates
- Grid values in inches * 100,000
- Help – Obtaining a digital rainfall grid from NOAA Atlas 2

http:/ / wikis. aquaveo. com/ xms/ FTPImages/ GSDA/ GSDA_NOAA. png [14] Obtain precipitation data from NOAA [4]

A massive collection of climate-related data, tables and maps for gages, states and more.

- Help – Obtaining precipitation data from NOAA

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_NOAA_RCC.png [5] Obtain precipitation data from the RCC [6]

A variety of precipitation data from NOAA Atlas 2 precipitation/duration/frequency maps to snow data.

- Help – Obtaining precipitation data from the RCC

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_UCC.png [7] Obtain precipitation data from the Utah Climate Center [8]

Gage data (i.e., precipitation, snowfall, temperature) for all 50 US states and around the world.

- Help – Obtaining precipitation data from the UCC

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_NRCS.png [9] Obtain precipitation data from NRCS PRISM [10]

Thirty-year average (normal) precipitation maps for each state as well as GIS precipitation data.

- Help – Obtaining precipitation data from NRCS PRISM

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_NRCS.png [9] Obtain precipitation data from NRCS NWCC [11]

A wide variety of precipitation and snow data in graph, chart and table format.

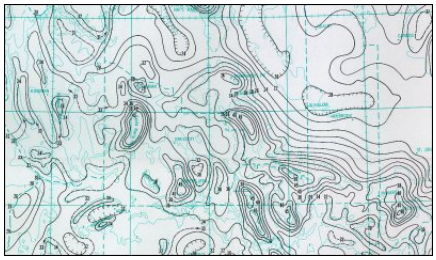
- Help – Obtaining precipitation data from the NRCS

http://wikis. aquaveo. com/ xms/ FTPImages/ GSDA/ GSDA_OneRain. png [12] Obtain precipitation data from OneRain [12]

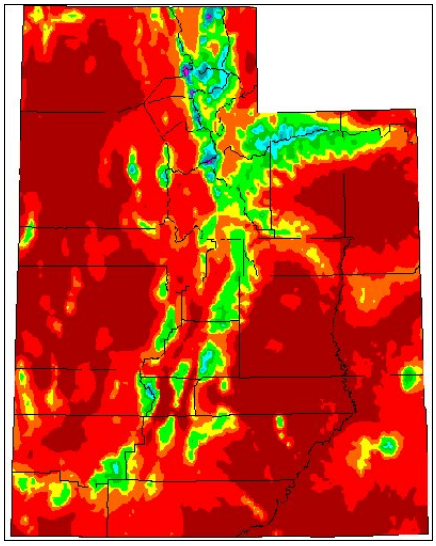
Radar and rain gage data combined to create accurate rainfall estimates. This data must be purchased.

Precipitation Overview

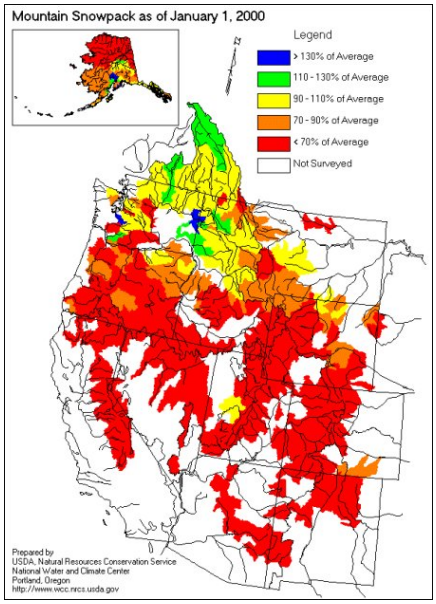
Climatological data such as precipitation, evapo-transpiration, wind and temperature are usually found in university libraries and are published by the U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA). Precipitation data includes depth, intensity, duration, recurrence intervals, snowfall etc. Methods of calculating precipitation for a watershed from gage data include the Thiessen polygon method, the isohyetal method, and a simple arithmetic mean. Other forms of precipitation such as snow are also important. Snow data can be collected by various means such as SNOTEL and snow course.



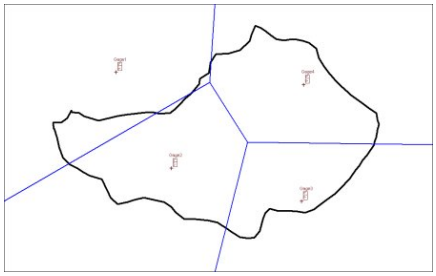
Precipitation map from NOAA Atlas 2 showing a portion of Arizona for the 100-year 6-hour storm event.



Normal annual precipitation for Utah (legend not shown) obtained from PRISM.



Snowpack data from the NRCS showing the western US.



Thiessen polygons can be created for a watershed based on gages locations.

COOP ID	STATION NAME	CD	ELEM	UN	YEAR	MO	DA	TIME	VALUE	F
517131	00KALA 223	00	QPCP	MT	1990	03	01	0015	00000	g
517131	00KALA 223	00	QPCP	MT	1990	03	01	0100	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0130	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0200	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0230	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0245	00050	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0300	00020	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0315	00020	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0330	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0345	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0400	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0415	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0845	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0915	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	0930	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1000	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1030	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1045	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1100	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1115	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1130	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1145	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1200	00020	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1215	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1230	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1300	00010	
517131	00KALA 223	00	QPCP	MT	1990	03	01	1315	00010	

Historical data can be obtained on the internet and at university libraries.

Precipitation Tips

- How do I obtain precipitation data from NNDC Climate Data Online
- How do I obtain precipitation data from NOAA
- How do I obtain precipitation data from RCC
- How do I obtain precipitation data from the UCC
- How do I obtain precipitation data from NRCS PRISM
- How do I obtain precipitation data from NRCS NWCC
- How do I decompress data files

References

[1] http://www.ncdc.noaa.gov/oa/radar/radardata.html
[2] http://hurricane.ncdc.noaa.gov/CDO/cdo
[3] http://www.nws.noaa.gov/oh/hdsc/noaaatlas2.htm
[4] http://www.noaa.gov/climate.html
[5] http://www.wrcc.dri.edu/
[6] http://www.wrcc.dri.edu/rcc.html
[7] http://climate.usurf.usu.edu/
[8] http://climate.usurf.usu.edu/products/data.php
[9] http://www.nrcs.usda.gov/
[10] http://www.wcc.nrcs.usda.gov/climate/prism.html
[11] http://www.wcc.nrcs.usda.gov/
[12] http://www.onerain.com/

GSDA:Oceanic Data

Coastline Data

Obtain coastline data from NOAA NGDC [1]

The National Oceanic and Atmospheric Association (NOAA) has produced the National Geophysical Data Center (NGDC) website to allow for US data access. It is possible to download coastline data from an interactive global map.

- Need help obtaining coastline data from NOAA NGDC, click here.

Tidal Data

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_NOAA.png [14]

NOAA's National Ocean Service (NOS) is home to the Center for Operational Oceanographic Products and Services (CO-OPS). This center gathers oceanographic data along the coast of the United States. Data available from this site includes historical and real-time observations and predictions of water levels and currents.

Obtain tidal data from NOAA's NOS [2]

Obtain historical tidal data from NOAA's NOS [3]

Obtain tidal precictions from NOAA's NOS [4]

Current Data

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_NOAA.png [14]

NOAA's National Ocean Service (NOS) is home to the Center for Operational Oceanographic Products and Services (CO-OPS). This center gathers oceanographic data along the coast of the United States. Data available from this site includes historical and real-time observations and predictions of water levels and currents.

Obtain current data from NOAA's NOS [5]

Help with NOAA's NOS [6]

About NOAA's NOS [7]

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_DNR.png [8]

The Texas Coastal Ocean Observation Network (TCOON) monitors several buoys off the coast of Texas. Real-time and historical data can be obtained from this sight. A variety of data types are available for each buoy. More help and information can be found on the web page.

Obtain current data from TCOON [9]

Wave Data

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_ERDC.png [1]

The Wave Information Studies (WIS) is part of the U.S. Army Corps of Engineers Coastal and Hydraulics Laboratory. Bulk wave parameters (significant wave height, period, direction) and wind speed and direction can be downloaded and viewed on the WIS site.

Obtain wave data from WIS [10]

Help with WIS [11]

About WIS [11]

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_NOAA.png [14]

NOAA's National Data Buoy Center (NDBC) supplies data for moored buoys. The buoys measure a variety of data including: barometric pressure; wind direction, speed, and gust; air and sea temperature; wave energy spectra; and direction of wave propagation. Significant wave height, dominant wave period, and average wave period are derived from the wave energy spectra. The data available depends on the buoy type and data provider.

Obtain wave data from NDBC [12]

Help with NOAA's NDBC [13]

About NOAA's NDBC [14]

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_CDIP.png [15]

The Coastal Data Information Program (CDIP) measures coastal environment data. A variety of data types and formats are available on their website.

Obtain wave data from CDIP [15]

Help with CDIP [16]

About CDIP [16]

Oceanic Data Overview

Oceanic Tips

Coastline Tips

- How do I obtain coastline data from NOAA NGDC?
- How do I import coastline data into SMS?

Tidal Tips

- Help with NOAA's NOS [6]
- About NOAA's NOS [7]

References

[1] http://www.ngdc.noaa.gov/mgg/shorelines/shorelines.html
[2] http://egisws01.nos.noaa.gov/website/co-ops/stations/viewer.htm?ActiveLayer=0
[3] http://egisws01.nos.noaa.gov/website/co-ops/stations/viewer.htm?ActiveLayer=3
[4] http://egisws01.nos.noaa.gov/website/co-ops/stations/viewer.htm?ActiveLayer=1
[5] http://egisws01.nos.noaa.gov/website/co-ops/stations/viewer.htm?ActiveLayer=4
[6] http://egisws01.nos.noaa.gov/website/co-ops/stations/helppage.html
[7] http://tidesandcurrents.noaa.gov/about.html
[8] http://lighthouse.tamucc.edu/
[9] http://lighthouse.tamucc.edu/TCOON/HomePage
[10] http://frf.usace.army.mil/cgi-bin/wis/atl/atl_main.html
[11] http://frf.usace.army.mil/wis/WIShowTo.html
[12] http://www.ndbc.noaa.gov/
[13] http://www.ndbc.noaa.gov/faq.shtml
[14] http://www.ndbc.noaa.gov/about_ndbc.shtml
[15] http://cdip.ucsd.edu/
[16] http://cdip.ucsd.edu/?nav=documents&sub=index

GSDA:Surface Characteristics

Land Use

Obtain a land use grid directly from WMS using the Get Data tool [1]

WMS offers an option to download NLCD land use data for anywhere in the United States and CORINE data for anywhere in Europe using the Get Data or the Get Data from Map tools. This is the recommended method to get land use data into WMS unless you have other land use sources that may be more recent or better quality.

Obtain Data from USGS National Map Viewer Application [3]

The national map viewer has several land use data sources (impervious areas, land use types, vegetation types, etc.) from various dates. All land use sources are in GeoTIFF format and can be read into WMS as raster GIS data and then converted to a land use grid. The land use grid can the be used to compute composite runoff parameters such as Curve Number and to assign parameters to 2D grids for distributed hydrology.

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_webGIS.png [6] Land use data from WebGIS [6]

WebGIS offers land use/cover shapefiles in Geographic and UTM coordinates at no cost.

- Additional help obtaining land use data from WebGIS
- View a text file containing the Land Use / Land Cover codes and their definitions
- Help with creating a land use table for Curve Number computation within WMS

http:/ / wikis. aquaveo. com/ xms/ FTPImages/ GSDA/ GSDA_EPA. png [2] Obtain the HUC number for your watershed [3]

The EPA provides the "Locate Your Watershed" site to help users determine their region's HUC.

Obtain the land use data from the EPA HUC index [4]

The EPA offers land use shapefiles.

- Additional help obtaining land use data from the EPA
- BASINS Metadata website [5]

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_USGS.png [3] Obtain land use data from the USGS [6]

The USGS offers land use data in GIRAS format for ARC/INFO.

- Additional help obtaining land use data from the USGS?
- More information about USGS land use data. [7]

Soil Type Data

http:// / wikis. aquaveo. com/ xms/ FTPImages/ GSDA/ GSDA_EPA. png [3] Obtain the HUC number for your watershed [3] Obtain land use and soil type data from the EPA HUC index [4]

The EPA offers land use and soil type shapefiles.

- Additional help obtaining soil type data from the EPA?
- BASINS Metadata website. [8]

http://wikis.aquaveo.com/xms/FTPImages/GSDA/GSDA_NRCS.png [9] Obtain STATSGO soil type data from the NRCS [9]

The United States Department of Agriculture (USDA) supports the Natural Resources Conservation Service (NRCS). A website they have developed is the National Cartography and Geospatial Center (NCGC). Supplied on this website are numerous links and descriptions of geospatial datasets. Through these links it is possible to acquire soil type data maps from the two main soils databases; STATSGO, and SSURGO.

State Soil Geographic (STATSGO) Database

Details:

- Database product files in three formats:
  1. USGS Digital Line Graphs (DLG-3)
  2. ArcInfo 7.0 Coverage
  3. GRASS 4.13 Vector
- Coordinate systems are:
  1. Albers Conical Equal - Area: Continental U.S. and Alaska
  2. UTM Zone 4: Hawaii
  3. UTM Zone 19: Puerto Rico
- Resolution at 1:250K scale, except Alaska (1:1M).
- Complete coverage of U.S. and includes Puerto Rico.
- Data files are downloadable in zip file compression.
- Downloads are free (no cost).
- Additional help obtaining soil type data (STATSGO format) from the NRCS

It is possible to obtain SSURGO data from the NRCS by two methods. The first is the Web Soil Survey. The other is through the Geospatial Data Gateway. Both are accessible on the NCGC website.

Obtain SSURGO soil type data from Web Soil Survey [10]

Web Soil Survey is a data request site supported by the United Sates Department of Agriculture (USDA) through the Natural Resources Conservation Service (NRCS). From Web Soil Survey you can place orders requesting certain soil survey maps. It specifically caters to only soil data needs.

Details:

- Database products available in three forms:
  1. Tabular
  2. Spatial
  3. Template Database
- Spatial products downloads provided in the following format:
  1. ESRI Shapefile
- Data are provided in the following coordinate system:
  1. Geographic WGS84

- Typical scale resolution between 1:16K and 1:64K.
- Soil downloads can be confined to a user defined area of interest
- Files can be downloaded only one survey at a time.
- Data files are acquired in zip file compression.
- Downloads are free (no cost).

- Additional help obtaining soil type data (SSURGO format) from Web Soil Survey

Obtain SSURGO soil type data from the Geospatial Data Gateway [11]

The Geospatial Data Gateway is a site sponsored by the United States Department of Agriculture (USDA) through the Natural Resources Conservation Service (NRCS). Numerous databases are available by means of the Geospatial Data Gateway including; transportation, census, land use / land cover, soil type, ortho imagery, elevation, and topographic maps. Description below applies to SSURGO soil type data only.

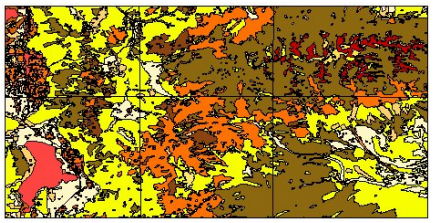
Details:

- Database product files in three formats:
  1. ESRI Shape File
  2. ESRI Coverage
  3. ESRI ASCII Export
- Coordinate systems are available in a variety of projections:
  1. Geographic
  2. Universal Transverse Mercator (UTM)
  3. State Plane
- Typical scale resolution between 1:16K and 1:64K.
- Extensive coverage of U.S.
- Data files are downloadable in zip file compression.
- Downloads are free (no cost).

- Additional help obtaining soil type data (SSURGO format) from the Geospatial Data Gateway

Land Use Overview

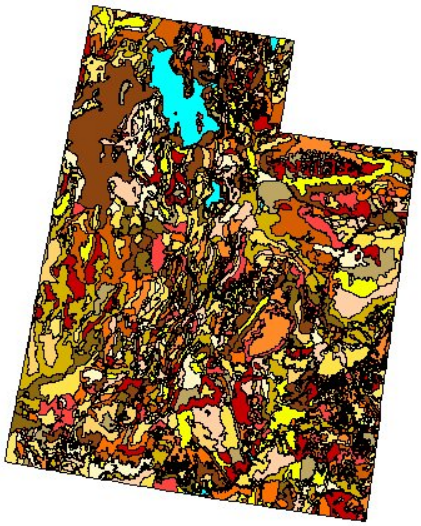
Of the many methods to estimate infiltration, the NRCS Curve Number (CN) method is one that is commonly used. For watersheds with multiple soil types and land uses, a composite CN (CCN) must be calculated to estimate the infiltration losses. The USDA/NRCS supplies tables so that a CCN can be determined from soil type, land use, moisture condition, and hydrologic condition. In hydrology, land use (also known as cover crop or land cover) refers to the way in which the land is being used and/or its condition. Land uses can be urban or agricultural/rural. Examples of these include streets, industrial areas, commercial areas, row crops, meadows, pasture/range and woods.



Land use data for the Provo, Utah region, displayed in ArcView.

Soil Type Overview

For watersheds with multiple soil types and land uses, a composite CN (CCN) must be calculated to estimate the infiltration losses. The NRCS (part of the USDA) supplies tables so that a CCN can be determined from soil type, land use, moisture condition, and hydrologic condition. In hydrology, soil type can be classified in many ways. The USDA classifies them according to their infiltration rate and are referred to as either A, B, C, or D soils. Soil type A has a high infiltration rate whereas soil type D usually consists of clays that are nearly impermeable (low infiltration) and produce higher volumes of runoff.



NRCS STATSGO soil type for the state of Utah.

EPA soil type for an EPA watershed near Provo, Utah.

Land Use Tips

- How do I obtain land use data from the EPA?
- How do I obtain land use data from the USGS?
- How do I format land use data (coordinate system, clipping) for use in WMS?
- How do I decompress data files?
- How do I import EPA land use data into WMS?
- How do I create a land use table for composite CN calculations?

Soil Type Tips

- How do I obtain soil type data from the EPA?
- How do I obtain STATSGO soil type data from the NRCS?
- How do I obtain SSURGO soil type data from Soil Data Mart?
- How do I obtain SSURGO soil type data from the Geospatial Data Gateway?
- How do I format soil type data (coordinate system, soil attribute, clipping) for use in WMS?
- How do I decompress data files?
- How do I import EPA soil type data into WMS?
- How do I create a land use table for composite CN calculations?
- How do I create a soil type runoff coefficient table for composite RC calculations?
- How do I obtain soil type data from the NRCS - STATSGO?
- How do I obtain soil type data from the NRCS - SSURGO?
- How do I use soil type data with GSSHA?

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7.3. Archives

Archived Models

The following models are either obsolete or have not yet been released to the public.

- Cascade
  - Cascade
- ELCIRC
  - ELCIRC
- GENESIS
  - GENESIS
  - GENESIS Arc Attributes Dialog
  - GENESIS Graphical Interface
  - GENESIS Model Control Dialog
  - GENESIS Observation Stations
  - Saving GENESIS
  - GENESIS Structures
  - GENESIS Menu
- HEC-RAS
  - HEC-RAS
  - HEC-RAS Material Properties
  - Q&A HEC-RAS
- Holland\PBL
  - Holland\PBL
  - Hurricane Path Pertubations Dialog
  - Holland Symetrical/Asymetrical
  - PBL
  - ADCIRC Wind Coverage PBL

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