

# Natural Section Shapes

In all versions of XPSWMM and XPStorm since version 9.0, the natural section profile data has been stored in a [global database](#). This allows profiles of, for example, channel improvements or roadway cross-sections to be re-used in multiple links.

Natural Section Shape: XS86-C3

X	Stage
0	40.16
2.952	40.134
3.872	40.081
7.042	39.823
7.816	39.85
10.08	39.888
11.391	39.909
13.361	39.943
13.461	39.874
15.297	38.822
18.082	38.82
18.255	38.819
18.478	38.932

Left Overbank: 13.361  
Right Overbank: 27.32

Roughness (Manning's n)  
Left Overbank: 0.09  
Center Channel: 0.09  
Right Overbank: 0.09  
 Depth-Varying Roughness

Graph

Graph Mode: Normal

OK Cancel

The data is defined by HEC-2 type natural surface cross-section coordinate pairs (*C4* or *GR*). Elevations are used only to determine the shape of the cross-section. Invert elevations are defined in the node data dialog box and also by the Upstream and Downstream Elevations shown in the appropriate link dialog.

The low point in the cross-section is the lowest point between the left and right Main Channel Stations. The high point is the highest point of all the cross-section coordinates. If the left-most or right-most elevations are less than this (maximum) value, vertical sides are projected up to the high point. Total cross-section depth is computed as the difference between the high point of the cross-section and low point of the cross-section (as described above).

The profile is defined in terms of:

- Station (Cross-Section Profile Station, STA.)** - the chainage of the cross-section (feet or metres). Stations must be in increasing order progressing from left to right across the section. Cross-sections are normally orientated looking downstream ("x" in the table above); and,
- Elevation** - (Cross-Section Profile Elevation, EL), the elevation of the cross-section (feet or meters) for the adjacent station. Cross-sections are normally orientated looking downstream. The actual elevations used are calculated from the upstream and downstream invert elevations. The elevations entered here are only used to describe the shape of the cross-section.

The following are the available parameters for this dialog:

### Insert

New points are inserted in the table using the Insert button. The new points can be inserted anywhere in the section and can be sorted in order of the Station (X) when focus is moved from one of the empty cells (a non-empty field is selected with the mouse).

### Delete

Deletes the currently selected row.

### **Left Overbank Station**

Enter the Station (X) defining the left overbank section. You can also click the LB button then click on the point on the graph representing the left overbank point.

### **Right Overbank Station**

Enter the Station (X) defining the right overbank section. You can also click the RB button then click on the point on the graph representing the right overbank point.

### **Left Overbank Roughness**

Enter Mannings's n for the left overbank.

### **Main Channel Roughness**

Enter Mannings's n for the main channel.

### **Right Overbank Roughness**

Enter Mannings's n for the right overbank.

### **Depth Varying Roughness**

Enter the roughness values as they vary by depth in a table. These values are used for all three parts of the channel, i.e. the depth-roughness (n) value table will be use for both the Left and right overbanks as well as the center channel.

Note: In the SWMM model all conduits are converted in to hydraulic tables comprising 25 horizontal slices. So the table will have 26 rows starting with a depth of zero to the maximum depth. The height of each slice is the maximum depth divided by 25. The table for a natural channel can be made visible in the model output file by selecting the Echo Natural Section Data in the HDR:Job Control->Output Control. Selecting this option then rerunning the model even for just a few time steps will prepare the tables to show you the data, and the computed properties such as hydraulic radius, width, area etc. You can identify which table using the sequence number which is echoed in Table E1. The tables will also show the roughness to be used based on the depth. The graph suggests a linear interpolation between the values but the only interpolation happens from the Hydraulic table that can be seen in the model output file. It is a step function generally but graphed with a line.

### **Graph Window**

There are 8 ways of manipulating data interactively using the graph window:

Icon	Description
	Set the graphics mode back to Normal. To Zoom In hold down the shift key and drag the mouse. To zoom out right-click the mouse and select Undo Zoom.
	Extend the cross section by adding to the left or right extremities of the section. Click the mouse at the location of the new point.
	Modify the cross section by inserting a new point between two existing points. Click the mouse at the location of the new point.
	Delete a point from the cross-section. Click the mouse on the point to be deleted.
	Modify the cross section by moving an existing points. Click the mouse and drag the point to its new location.
	Click the mouse on the point representing the Left Overbank station.
	Click the mouse on the point representing the Left Overbank station.
	Modify the display properties of the graph. See the Review Results <a href="#">Graph Customization Options</a> .