

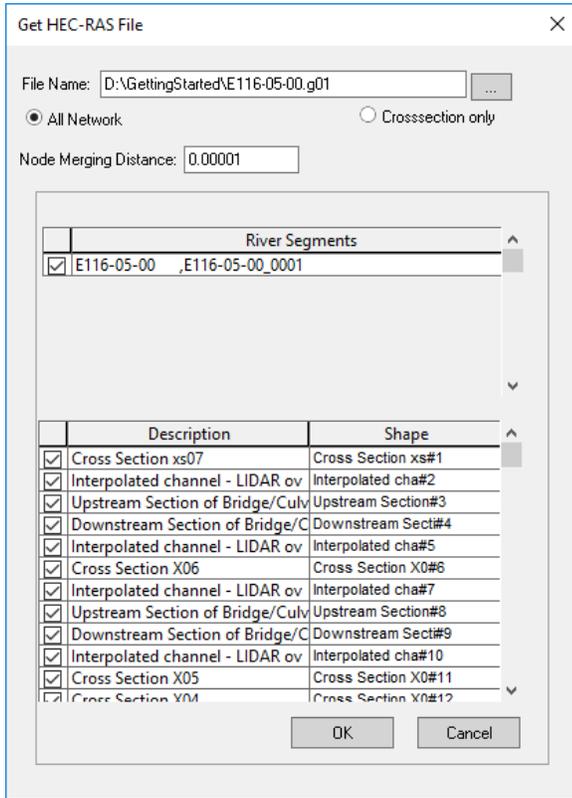
# Import HEC-RAS Data

This comprehensive HEC-RAS model importer provides users the ability to import the cross sections, reach layout, vertical reach data and downstream boundary conditions automatically from a HEC-RAS geometry file (\*.g0\*) by selecting the All Network option. The Cross Section only option allows the importing of only the cross sections from the given HEC-RAS geometry file.

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Descriptions of the various dialog options are listed below:

**File Name:** Select the HecRas geometry file that you want to import. All files \*.g0\* will be shown for selection.

**All Network/Crosssection only:** The 'All Network' option will import the whole model by creating xp nodes and links, assigning the cross sections to the link and determining elevations for the nodes. The 'Cross Section' option will only populate the Natural Section Shapes records within the [Global Database](#).

Note that the HecRas description names for the cross sections are used for the natural section global database entries in xp-swmm. Wherever a description is too long it is trimmed and a suffix # (enumeration) is added.

**Node Merging Distance:** This value is only used if a geometry file is imported using the 'All Network' option onto a non-empty xp-swmm network. Before a new node is created it is checked whether there is already an existing node in the network whose distance to the node to be created would be less than the node merging distance. If such a node is found, no new node is created and the existing node is used for connection of the links in the exported model.

**Description/Shape:** This table gives an overview on all Cross Sections that are to be imported before the final import is acknowledged by pushing the 'Ok' button. The user can elect to uncheck cross section in which case those cross sections then will not be written to the global database or used for the link cross section assignment when the 'All Network' option is used.

## Procedure for creating objects based on HEC-RAS geometry

The concept of nodes does not exist in HEC-RAS. However, in xp nodes are essential for modeling. Each time a HecRas river segment is read, the importing routine will first create an xp node at the start and end point of the river polyline that describes the segment. Since split/join nodes in a HecRas model are always start and/or endpoints of a river segment, this implies that an xp node will be created at each split/join location, refer to picture in the *Node Elevations Assignment* section below.



- Left and right overbank values
- Roughness values for left overbank, center channel and right overbank
- Channel length for left overbank, center channel and right overbank
- U/S and D/S invert elevation which are the nodes U/S and D/S invert elevations, see following section for additional details

With exemption of the invert elevation all of the above data stem from the HecRas cross section that gets assigned to the XP link.

For each XP link it is checked whether a Cross Section line triggered the creation of the U/S and/or D/S node. If this is the case we say that there is a cross section *available* at the U/S and/or D/S end of the link. Since in HEC-RAS the cross section is meant for the river segment directly downstream, an U/S available Cross Sections has precedence, i.e. each time there is a Cross Section available at the U/S end of the link, this Cross Section is assigned to the link.

Only if there is no Cross Section available at the U/S end, it is checked whether there is a Cross Section available at the D/S end and –if so- this Cross Section will be assigned to the link. This can for example happen for the links directly downstream of a junction/split node or whenever the user has unticked Cross Sections for assignment. If no Cross Section is found that can be assigned to the link, the natural section shape of that link will remain unassigned and a warning message is written to the error log.

We have to mention HEC-RAS bridge links here as they build an exception to the rule. First we state that at the moment only the natural channel data outlined above will be imported for bridge links, the bridge specific parameters will follow in a second step. If there is Cross Section data found in the section of the geometry file that defines the Bridge link, the U/S Cross Section data of the bridge will be assigned as natural shape to the Bridge link. If there is no Cross Section defined in the bridge section, the previously found Cross Section, i.e. the Cross Section of the river segment directly upstream ('Upstream of bridge embankment') will be assigned to the bridge link. The same holds true for the parameters mentioned above: if they are defined with the bridge par in the geometry file, those values will be assigned to the bridge link otherwise the values are taken from the link directly upstream.

As we handle the case in which the data is taken from the link directly upstream as a case of copying data, bridges will never have a Cross Section assigned that is linked to a GIS Cross Section link.

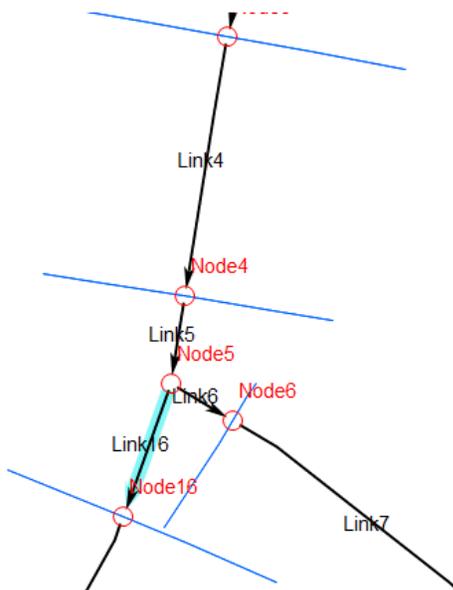


On the Cross Section defined for the river polyline endpoint in HEC-RAS: if the Cross Section is not assigned to the last XP link it is redundant in the XP simulation. It is planned to use this Cross Section for an outfall boundary condition.

## Node Elevation Assignment

If the node was created as an intersection of the river polyline and a GIS cross section line, the node's invert elevation will be the lowest point of the cross section profile that is linked to exactly that cross section line. This chain is broken if the cross section was unticked for import, in that case the node will not get an invert elevation assigned.

A special case arises for XP nodes that were created at a HEC-RAS junction/split location.



In HEC-RAS there is no cross section defined for the junction/join as this not required for the HEC-RAS engine. Hence, we cannot derive an invert elevation for the junction/split node from a cross section.

Instead, we are using an inverse distance weighted interpolation on all nodes adjacent to the junction /split node to derive the invert elevation.

This is best illustrated by an example. In the above model we already determined:

```
Invert Elevation Node4: 19.52, length Link5: 80
Invert Elevation Node16: 19.35, length Link16: 170
Invert Elevation Node6:: 19.32, length Link6: 130
```

Now the distance weighted interpolation for the invert elevation of Node5 yields:

$$1/80 * 19.52 + 1/170 * 19.35 + 1/130 * 19.32 / (1/80+1/170+1/130) = 19.4226.$$

Lastly we check whether the elevation computed is larger than the downstream invert elevations. For a split node it might happen that the computed elevation is indeed lower than one of the downstream elevations. But since we want to avoid creating a link with an adverse slope we would in this case set the invert elevation to the maximum of the downstream invert elevations.

In the example 19.4226 is larger than 19.35 and 19.32 so it will be the value that we assign as the invert elevation to Node5.

Each time such a weighted interpolation is performed an info message will be written to the log file. Note that nodes for which no invert elevation could be determined will have invert elevation 0.0.

In a last step the ground elevation is determined for every node. This is simply the invert elevation plus the maximum depth of all incident channels.

## Importing HEC RAS model - Bridge Data

The Bridge Data dialog in the xp model will be populated with the parameters used to represent the bridge in the HEC RAS model. This will also produce a Bridge Link in the xp model. Additionally, the River Reach is created as a River Link in the xp model. View the [River Links](#) page for more information.