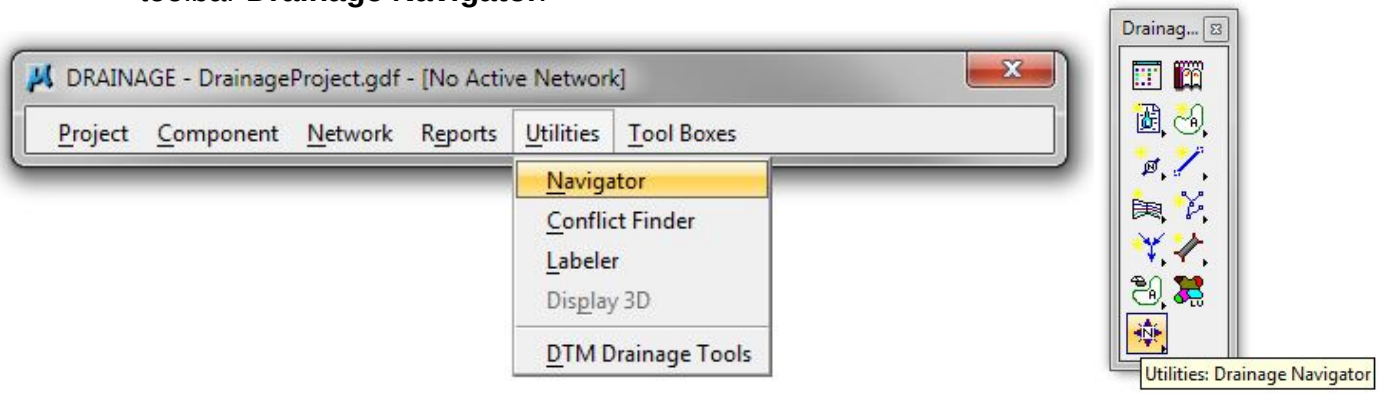
10. Drainage Navigator

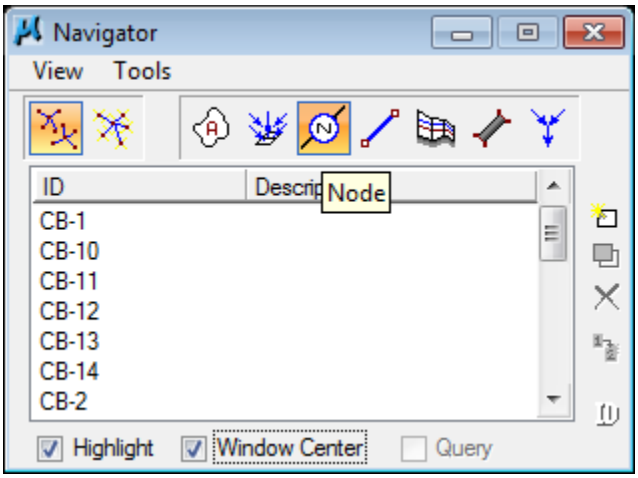
This exercise shows the user how to navigate a network and perform queries.

10.1 Navigating/Query

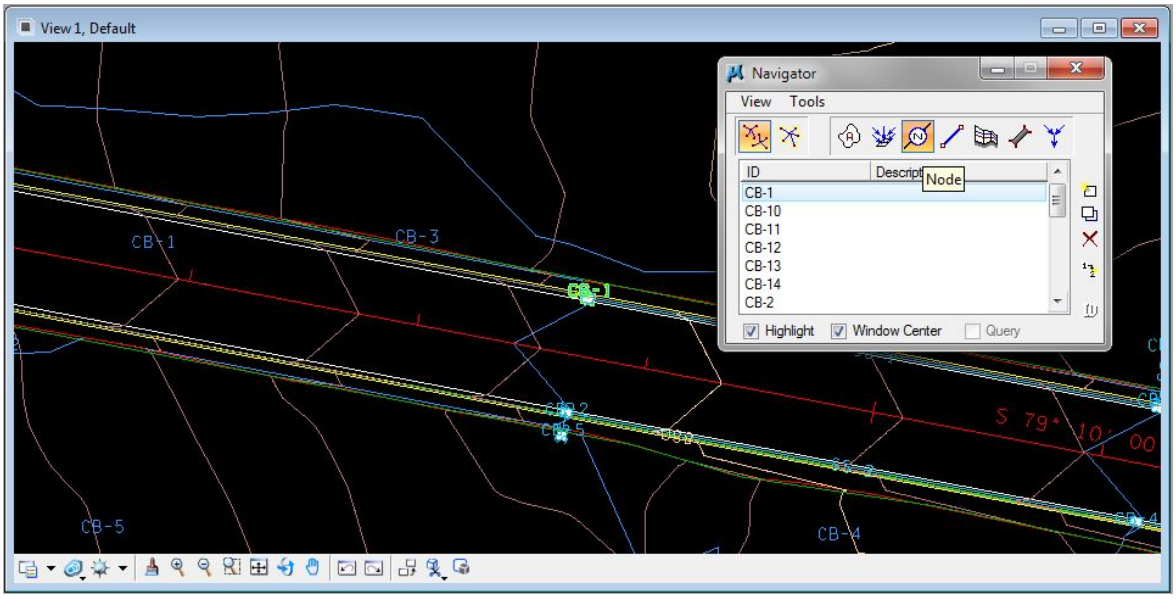
a) Select from the Drainage Menu Bar **Utilities > Navigator** or from the drainage main toolbar **Drainage Navigator**.



b) Select the Drainage **Nodes** button on the *Navigator*:



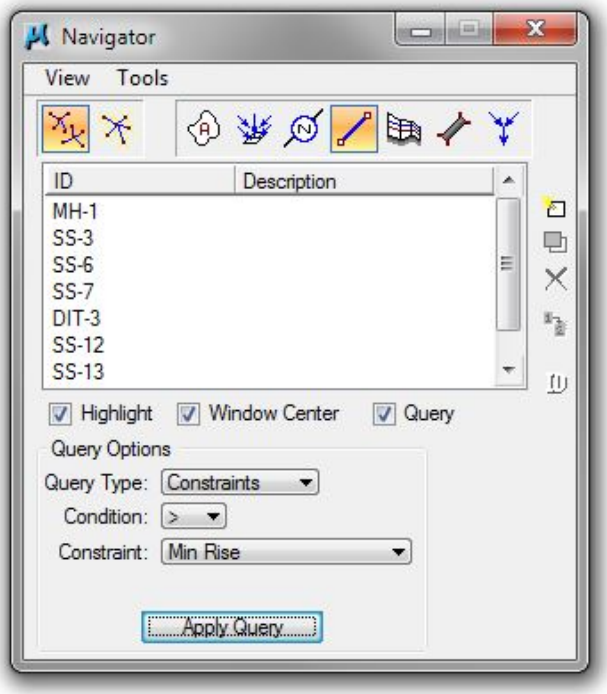
c) Toggle ON the Highlight and Window Center tools and click **once** on various nodes in the network.



As you can see the **Drainage Navigator** makes it easy to go to specific components in the network. A **double click** automatically opens the component's configuration dialog for easy editing of any Drainage component.

d) Set the Active Component Type to **Link** and toggle the **Query** option:

e) Use the Query tool to determine which Links have exceeded the Min Rise. Make the settings as shown and then click on **Apply Query**.



Note the results of your query here:

_____

f) Follow the same procedures to determine the following:

Using Query type **Values;**
Which pipes have a velocity less than 3 fps?

_____
(This will show you which links need to be modified to increase the velocity.)

Using Query type **Values;**
Which pipes have a velocity greater than 12 fps?

_____
(This will show you which links need to be modified to decrease the velocity.)

Using Query type **Constraints;**
Which links have slopes less than Min Slope?

_____
(This will show you which links need to have their slopes increased.)

Set the active component type to Inlet.
Using Query type **Constraints;**
Which inlets have exceeded their max ponded width?

_____
(This will show you which inlets need to be relocated to decrease the ponded width.)

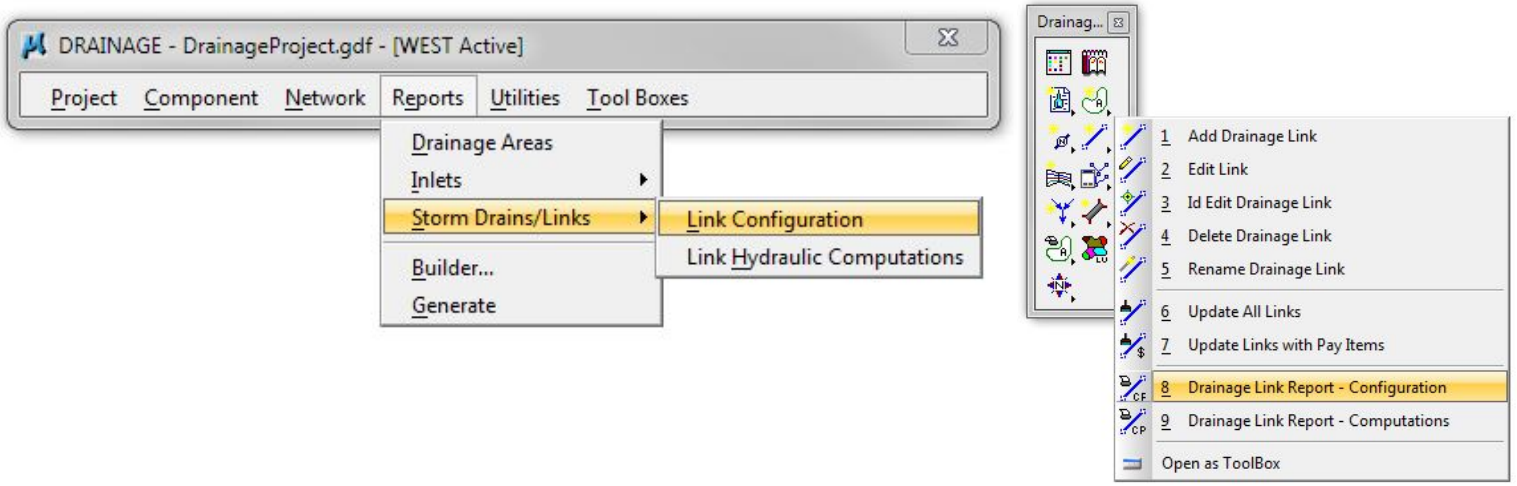
10.2 Navigating/Global Editor

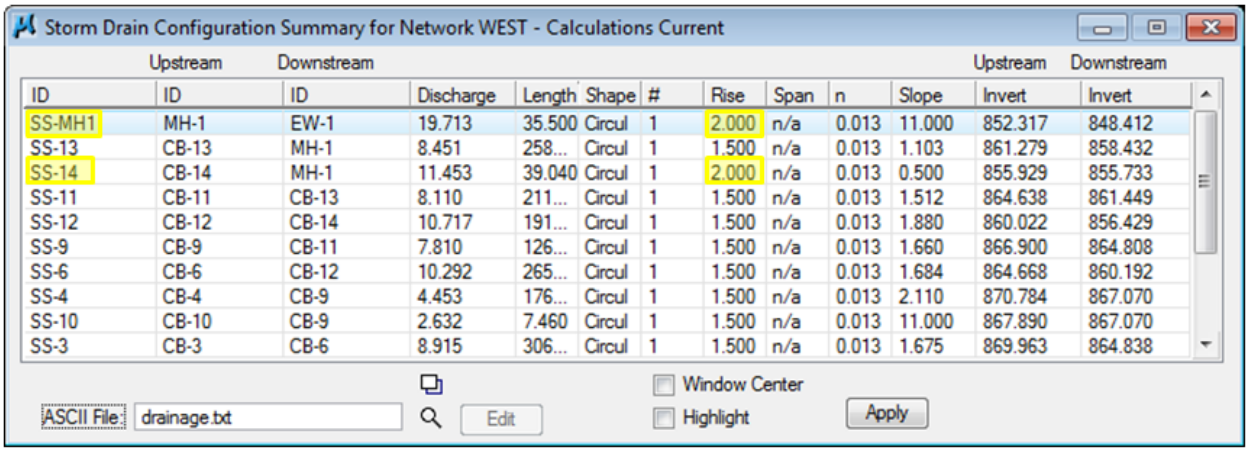
From the query in **Step 5** of Exercise 10.1 you should have found that 2 pipes were designed at a value greater than the minimum rise 1.5' (18"). These should have been SS-14 and SS-MH1.

Since for the initial design we set our minimum depth of cover based on the minimum pipe size it will be necessary to check our catch basin depths to be sure they have not violated minimum depth requirements and to make sure that the larger pipe size is valid for the node which was used. To do this take the following steps:

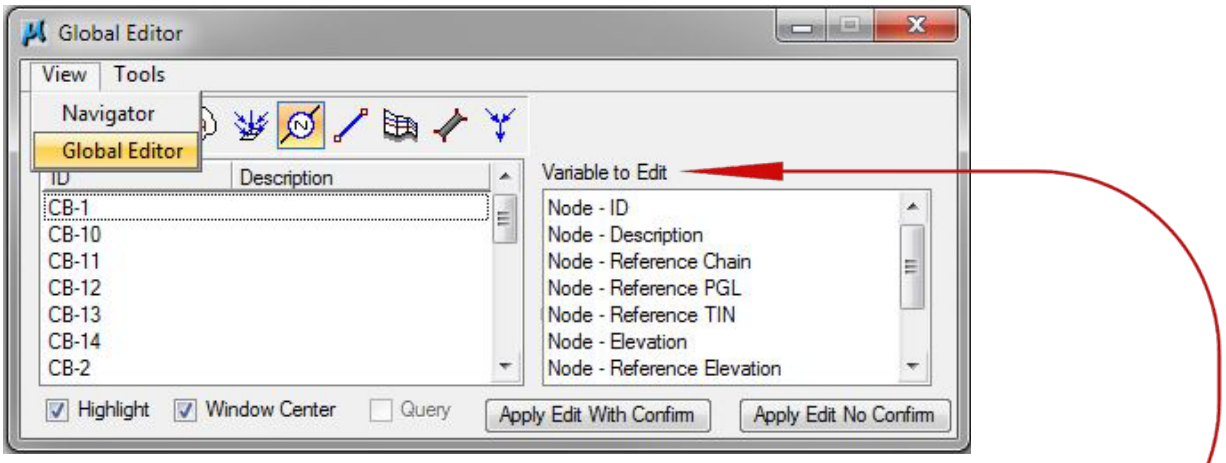
Checking Minimum Depth Requirements vs. Designed Node Depths & Pipe Sizes:

a) Identify which drainage nodes are involved by going to **Reports > Storm Drains/Links > Link Configuration** in the GEOPAK Drainage menu bar. This report describes each link including From Node (Upstream), To Node (Downstream) and Size/Diameter (Rise).

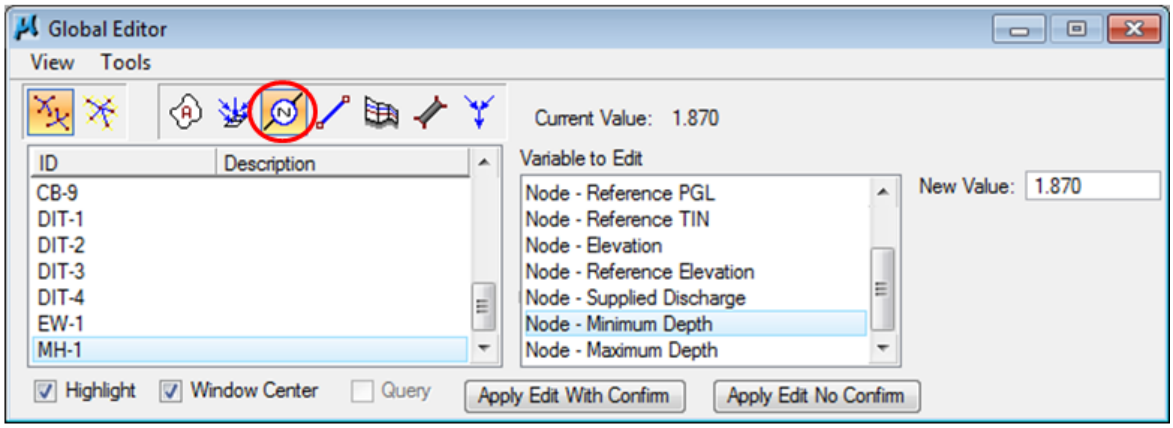




b) Open the **Navigator** tool under **Utilities** and expand it to the Global Editor by choosing from the pull-down menu **View > Global Editor**. Once the Global Editor is open, click on the **Node** button.



c) SS-MH1 is the first link shown in the Storm Drain Configuration Summary (**Step 1**). This link was designed by GEOPAK drainage to have a rise of 2.0 feet (24 inches). Find and select the Upstream Node (From Node) MH-1 for this Link in the Global Editor Dialog, then find and select **Node – Minimum Depth** in the *Variable to Edit* portion of the editor. Set the **New Value** to the correct minimum depth for a 2.0' (24") diameter pipe found in the TDOT GEOPAK Drainage Nodes document (Appendix A, pg. A-5).



NOTE: If the type of structure for a given node is unknown or needs to be changed (would happen if pipe size is too large for a given catch basin), simply double click the **Node ID** in the Global Editor and the Node Configuration Dialog will be invoked.

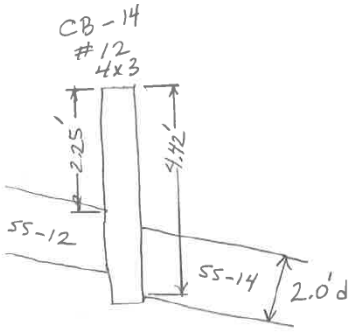
Min. Depth of Basin – Pipe Size – Drop Across Bottom of Structure = Minimum Depth

MH#3 5'DIA: 4.08' - 24"/12 - 0.21' = 1.87'

d) Click **Apply Edit With Confirm** to apply the New Value and Click Yes in the Alert box.

NOTE: Global Editor may be used to edit multiple Nodes/Links at once.

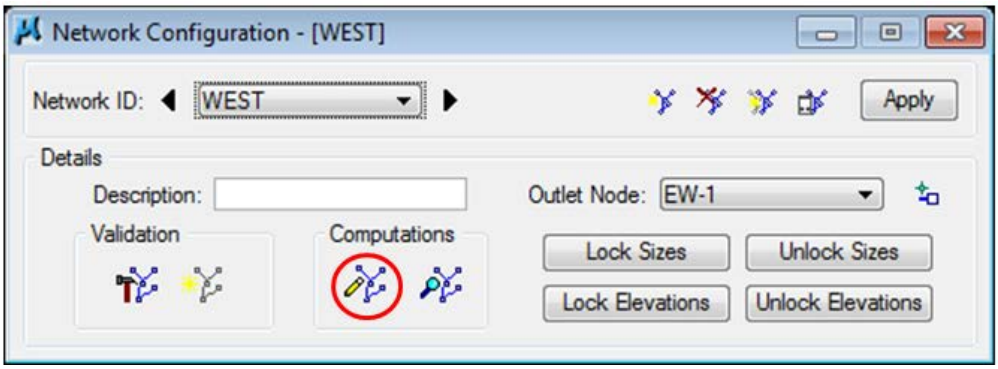
e) Repeat the previous steps to correct the minimum depth settings for the other storm drainage nodes for pipe link SS-14.



Min Depth of Basin – Pipe Size – Drop Across Bottom of Structure = Minimum Depth

CB#12 4x3, 24'DIA Pipe: 4.42 - 24"/12 - 0.17' = 2.25'

f) Re-design the network **WEST** and review your profile. The Nodes should now meet minimum depth requirements.



10.3 Re-Run the Network

It is recommended that once a drainage network is set up all component constraints should be reviewed to insure that all criteria for design has been met.

After re running the network **WEST** in Step 6 there are three errors:

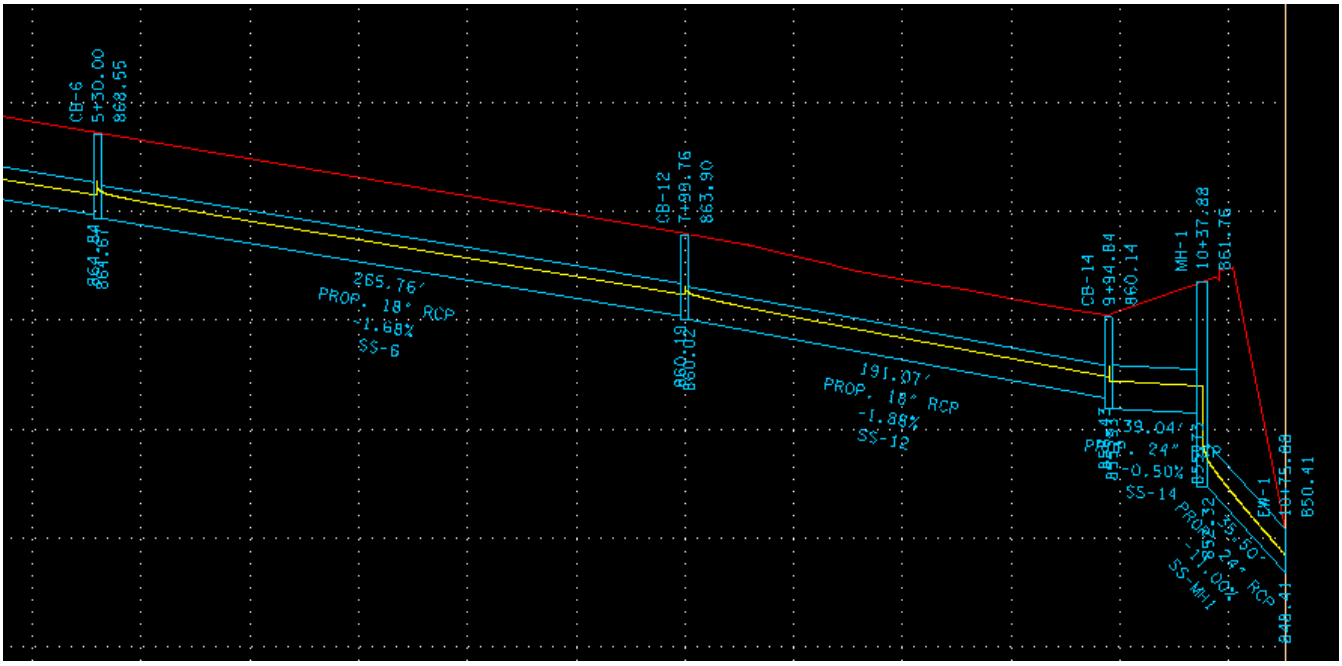
SS-8 Velocity less than minimum desired

SS-MH-1 Velocity greater than maximum desired

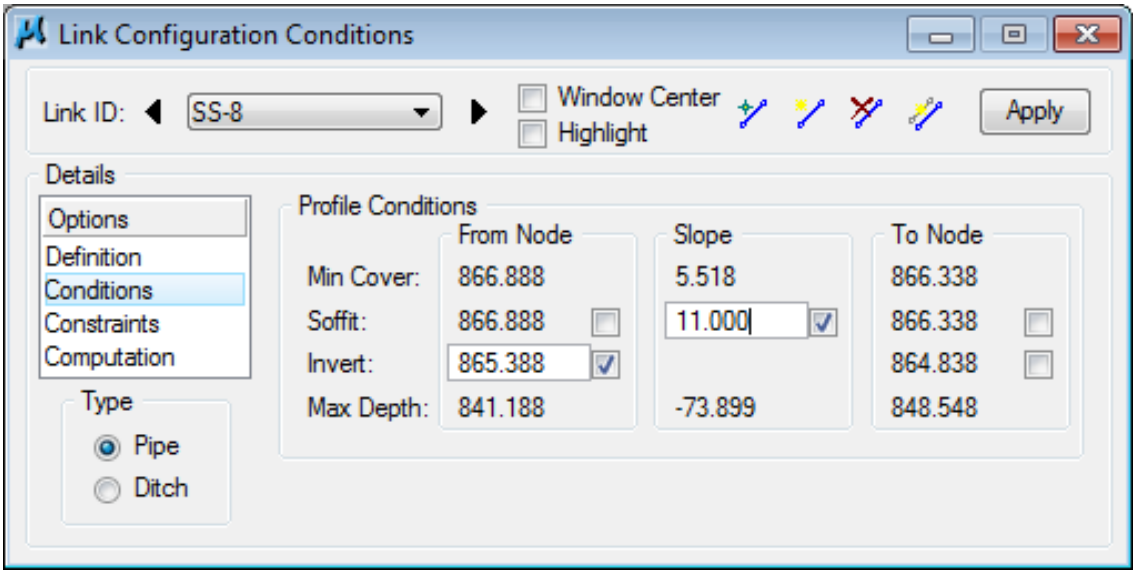
Capacity for Inlet CB-14 Exceeded Bypass Flow Unassigned

a) Navigate to Reports > Storm Drains/Links > Link Hydraulic Computations.

For link SS-8, the slope is 8.512 and the actual velocity is 0.538. To correct this error we can increase the slope of SS-8. The maximum slope is 11 percent. The upper end of SS-8 at CB-8 is at minimum depth, so we will have to lower the outlet end which is connected to CB-6. For link SS-MH-1, the slope is the maximum 11% and the actual velocity is 16.560. Looking at the profile, we definitely have some room to both lower the CB-6 outlet and to decrease the slope of SS-MH-1.

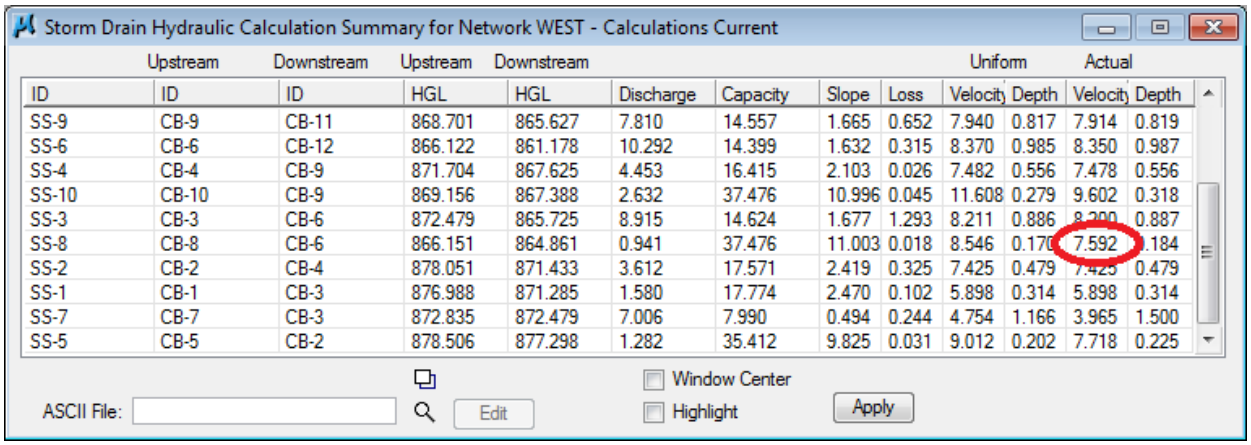


b) Go to **Component – Link- Edit – SS-8 – Conditions**. Fix the upper invert elevation at 865.388 and the slope at 11.000 by checking the boxes next to the elevations. Click Apply after making changes.

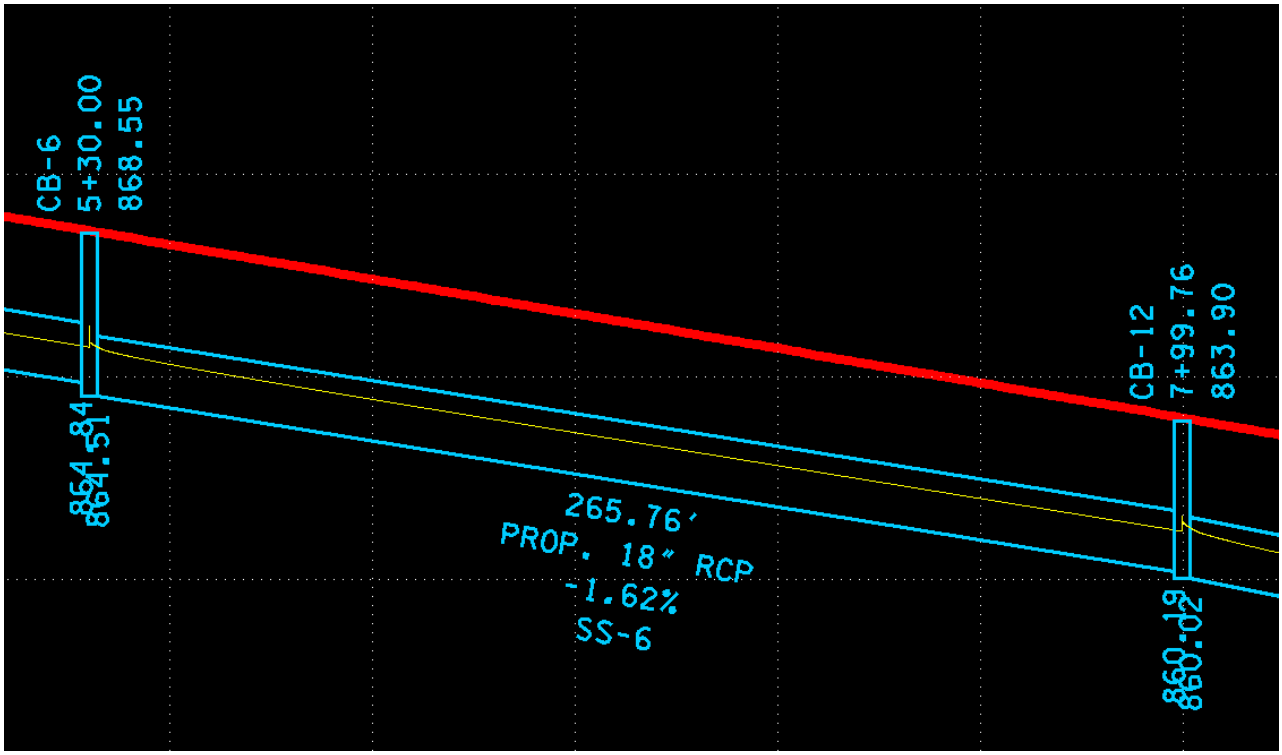


c) Re- run Network **WEST**

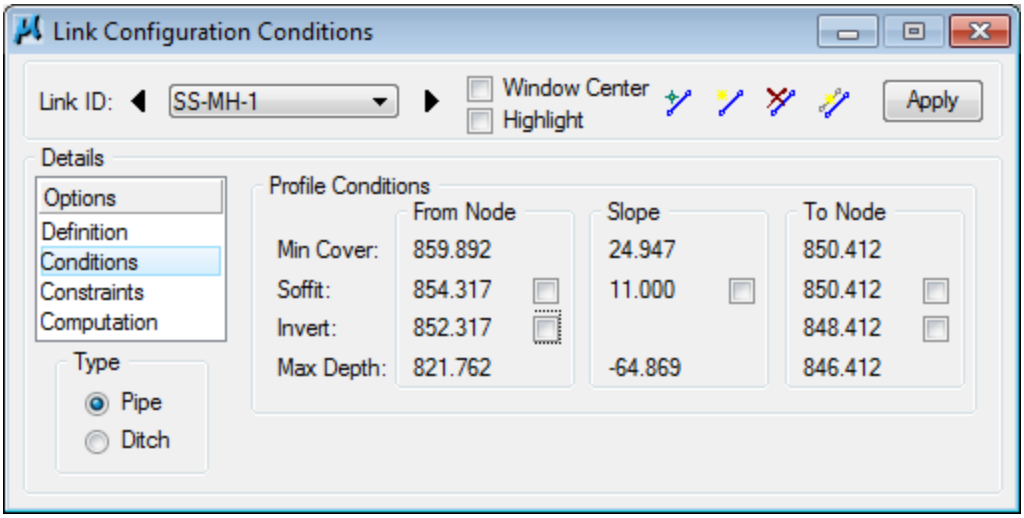
Upon checking the hydraulic computations, the new velocity is 7.592, which is in our acceptable range:



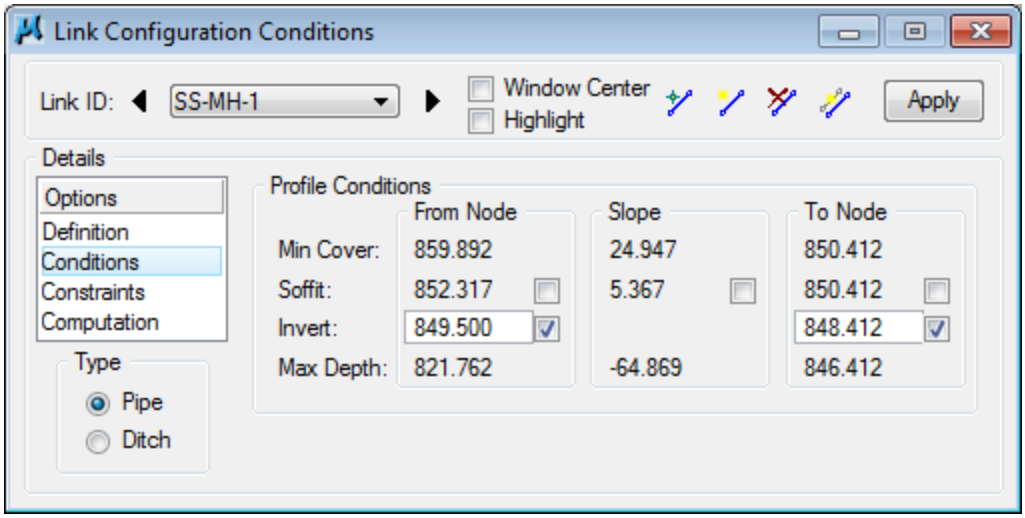
Upon rerunning the network, you can see the profile automatically updated, the upper invert of SS-6 changing to 864.51 from 864.67 and the slope to 1.62% from 1.68%. :



d) Now to correct, the high velocity in SS-MH-1, we need to reduce the slope. In Link Configuration Conditions for SS-MH-1, the upper invert is 852.317 so let's lower it to 849.5 and fix the lower at its current value of 848.412 which is the outlet endwall.

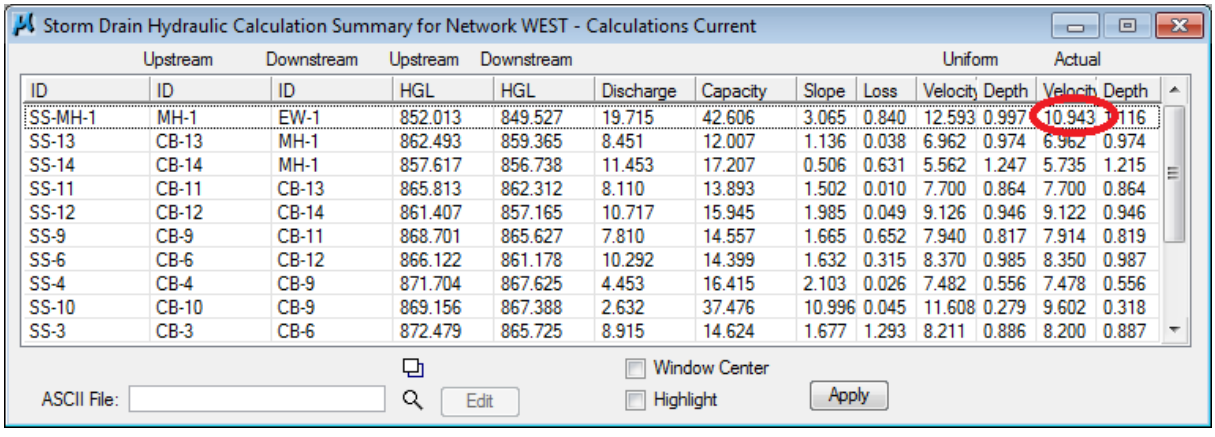


Change to:



e) Re-run Network **WEST**.

Check Hydraulic Computations, 10.943 is within our acceptable range



Also note that the profile at SS-MH-1 is automatically updated: