



PIPE2018

QuickStart Guide for

- **KYPipe**
- **Surge**
- **GoFlow**
- **Gas**
- **Steam**
- **SWMM**

Installation Instructions

System Requirements

QuickStart Example

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Pipe2018 QuickStart Guide – Contents

Computer Requirements.....	2
Updating Pipe2018.....	2
Pipe2018 Installation and Key Options.....	3
Demo Installation.....	3
Pipe2018 KYnetic Interface.....	4
Contacting Us – Software Development and Support Team.....	5
Pipe2018 Help and Tutorial Videos.....	7
Network Elements.....	8
Laying out a Pipe System.....	11
QuickStart Example.....	12
Demonstration Examples.....	15

Computer Requirements

For outstanding performance the minimum RECOMMENDED system for PIPE2018 is:

- 2 gigahertz (GHz) or faster processor
- 4 gigabyte (GB) RAM
- 200 GB available hard disk space
- Windows XP or later
- 1280 x 800 screen resolution or higher

Updating Pipe2018

You can update Pipe2018 to the current version by visiting the support | download area of our website

<http://www.kypipe.com>. Because we update the image frequently (to add features, update compatibility, or fix reported issues) you should visit our www site regularly to update your software.

Pipe2018 Installation and Key Options

You may install the software on as many computers as you like (work, laptop, and home). Only computers with access to one of the Key Options below will run the software at the full license level. With the Portable Hardware USB Devices, if you need to do a presentation for a client, for example, you can simply unplug the key from your main computer and insert it into your laptop.

Demo Installation – no key required.

1. Download the latest version from the web site and unzip the file to a User location, e.g. Desktop.
2. Browse to the location of the unzipped files. Run (double click) the setup.exe file.
3. After installation, use the **Pipe2018 Demo** shortcut to access the demo version (KYnetic interface).

Key Options

Portable Hardware USB Devices:

USB Key – The current default key type. Hardware device for local and LAN Network licenses. Device may be a silver USB device with key chain and logo provided by the KYPipe Software Office or a USB storage device provided by the user. This key type may also be placed in a folder on a hard drive. May be remotely created and modified.

Wibukey – Hardware device for local and LAN network licenses. This is a blue-green USB device with key chain which is being phased out of use. May be remotely modified, but not created.

Software Keys - Dedicated Location:

Softkey - Software key for local (non-network) installations only (on a hard drive, not portable). May be remotely created and modified. The key may be moved to another dedicated location, contact the KYPipe Software Office for instructions.

LAN-WAN –Software key for any network application, both LAN and WAN (on a hard drive, not portable). Computer hosting key does not need to have Pipe2018 installed and key location does not need to be mapped. May be remotely created and modified. The key may be moved to another dedicated location, contact the KYPipe Software Office for instructions.

Floating License Keys – Internet-Based

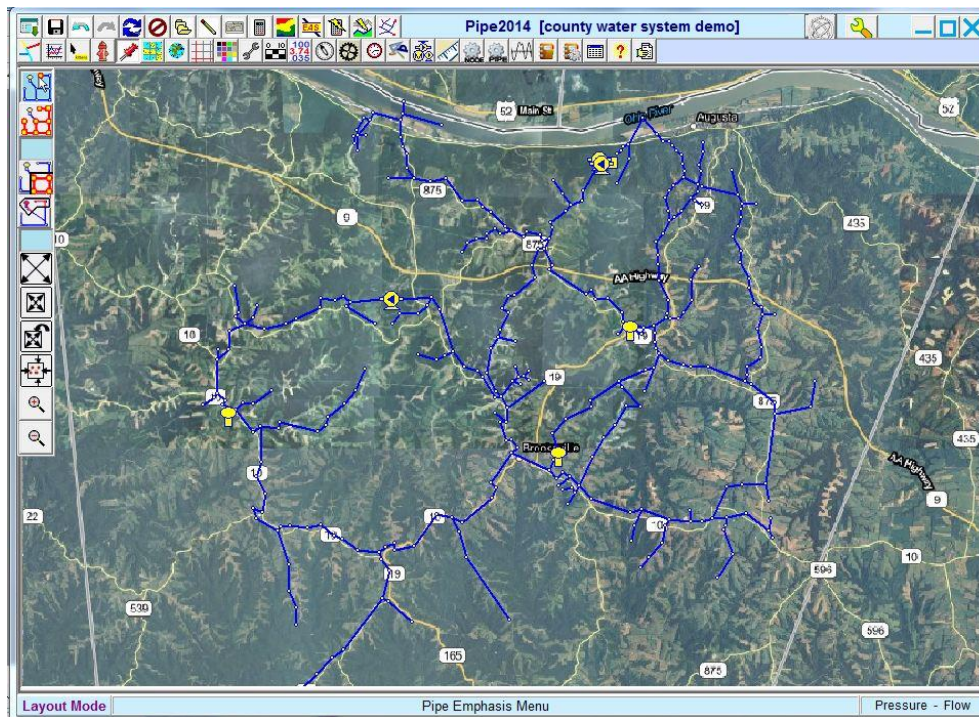
QuickKey. A code is entered and a search will be made to find the license on the internet. When that code is used during the next 30 days there will not be an internet search. After 30 days, the code will automatically be renewed via an internet search when the code is selected.

We have worked very hard over the years to enhance and improve upon the software. Many of the features and changes are the result of feedback of our users. If something does not seem to be working correctly or if you have feature suggestions please call Jana at 812-619-1901.

Pipe2018 KYnetic Interface

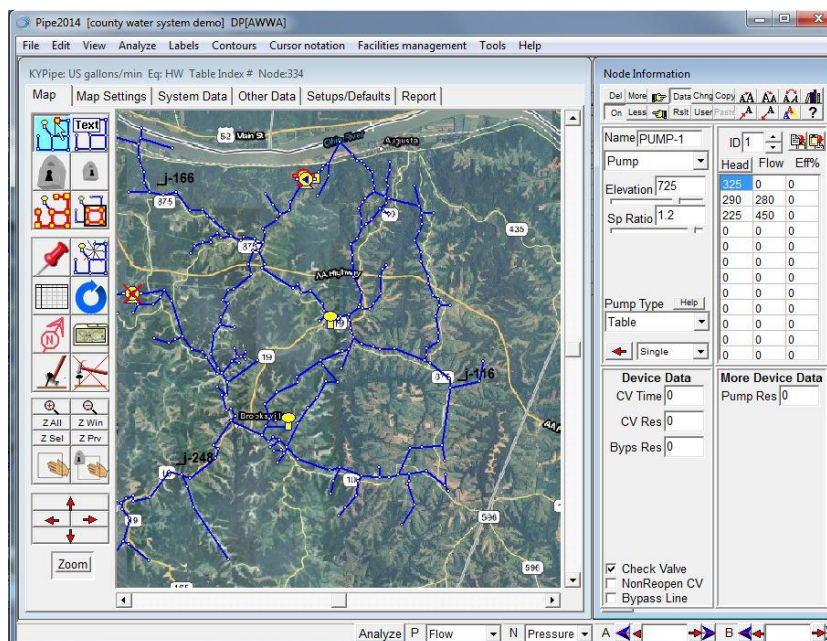
For tutorial instructions go to Support – Video tutorials on www.kypipe.com.

To launch: Start | Pipe2018 and use the **KYnetic** shortcut.



Pipe2018 Classic Interface

To launch: Start | Pipe2018 and use the **Classic** shortcut



Contacting Us - Software Development and Support Team

The following individuals are involved in the Software development including the Pipe2018 Series models, KYPipe, Surge, Gas, Steam, GoFlow, and SWMM and directly support the software.

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Check for updates regularly which can be downloaded.

Demo versions of Pipe2018 also can be downloaded as can the AVI tutorials.

Continuous research and development over the past 40 years has resulted in the most advanced hydraulic modeling capability available. Some noteworthy results of this very high level of development include:

1. Development of the full equation set approach for network hydraulics utilizing the Newton-Raphson linearized approach for solving the network equations. This is the most robust algorithm available for solving the complex and sometimes ill conditioned hydraulic relationships.
2. Development of enhanced network equations which allow direct calculation of design, operation and calibration parameters.
3. Development of a powerful general approach for transient flow in simple or complex pipe networks.
4. Application of genetic algorithms to optimize network hydraulic and water quality calibrations and operations.
5. Development of an effective time averaging water quality model.
6. The hydraulic model incorporates devices such as automatically adjusting regulating valves (pressure and flow), variable speed pumps, flow meters, switching capabilities to control valves and pumps, etc.
7. Extension of our steady state network models to compressible flow (gas and steam).

Our focus for many years has been hydraulic modeling. The KYPipe team of academics and engineers is, perhaps, the world's leading group of experts in this area. They have been most successful in quickly developing their advanced hydraulic modeling technology for use by practicing engineers

Over the last several years, high level computer engineers and engineering software developers have added their expertise to our product. Advanced graphical interfaces enhance the KYPipe and SURGE modeling environment. These engineers have worked very closely with our hydraulic modeling team of experts to develop a wide range of extremely advanced capabilities to simplify and speed up the essential modeling tasks and to provide additional useful capabilities. By incorporating suggestions and concepts provided to us by our large and knowledgeable user base, we have developed a truly outstanding environment for all aspects of hydraulic and water quality modeling. The ergonomics and capabilities of KYPIPE and SURGE are, by far, the best available anywhere at any cost.

The advanced graphical environment, PIPE2018, has been adapted to other models, analyzing gas (Pipe2018 : Gas), steam (Pipe2018 : Steam), fire sprinkler systems (Pipe2018 : GoFlow), transient flow (Pipe2018 : Surge), and stormwater (Pipe2018 : SWMM).

User support of our software is provided directly by our team of experts. This situation assures that the level of support is very high. Providing this level of support fosters a very close relationship between the development team and the users. Engineers who have used previous versions of our software will recognize that many of the new features and capabilities are ones they had wished for or suggested to us.

Online Help

Under Help in the main Pipe2018 menu, search the index for topics for which you have questions.

Pipe2018 Tutorial (Audio/Video)

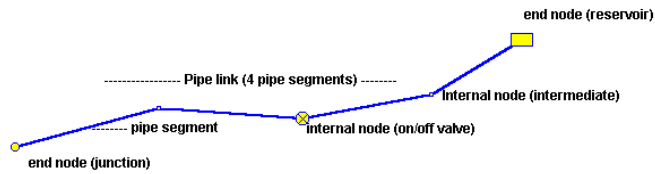
Tutorial videos are available online at www.kypipe.com under Support.

Network Elements

Pipe distribution systems are constructed using the following two elements:

1. Pipe Links
2. Nodes

All development is carried out using only these two elements. Important definitions are illustrated in the picture below and the following descriptions:



Pipe Links

Pipe links are uniform sections of pipes (same basic properties) following any route. A pipe link may be comprised of one or more pipe segments. A pipe segment is a straight run of pipe with no internal nodes.

Nodes

Nodes are located at the ends of pipe segments and include all distribution system devices that are modeled.

- **Internal nodes** - are located between two pipe segments.
- **End nodes** - are located at the ends of all pipe links and can connect other pipe links, represent a dead end or a connection to a supply.
- **Text nodes** - can be located anywhere on your map and are used for adding information to your map.

*End nodes count as nodes used for your model while internal and text nodes do not.

Internal Nodes

Internal nodes are located between two pipe segments of identical properties. The intermediate node is usually a point where a directional change occurs while the other internal nodes (valve, hydrant, in-line meter, metered connections, and check valves) are devices or model elements located in a pipe link. From the modeling viewpoint, internal nodes are essentially passive devices (they do not directly affect the calculation), although they do provide added modeling capabilities. Internal node types can be interchanged. They also can be changed to an end node at anytime. However, end nodes can be changed to internal nodes only if there are exactly two connecting pipe links with identical pipe properties.



1. Intermediate Node -

No device at this location - usually represents a change of alignment. To delete all intermediate nodes see [Deleting Intermediate Nodes](#)



2. Valve-

Indicates location of cut-off valves. The minor loss for this inactive valve is not automatically included in the network analysis or the report. To account for a minor loss due to a valve, the user may enter the loss as a pipe fitting or using the active valve element.



3. Hydrant -

Indicates location of fire hydrants.



4. In-line Meter -

Indicates presence of an in-line meter for pipe link. It is used for EPS reports of total flows.



5. Metered Connections -

Indicates location of metered connections. Meter ID

may be specified to interface with meter records.

Meters with IDs	
Add	Delete
Meter1	
Meter2	
ID	Meter2
Type	R
Demand	57



6. Check Valve (Directional) -

Indicates device in pipe link that prevents flow reversal. The correct direction (flow allowed in direction indicated) must be selected in the pipe link.



7. Customized Device -

Two additional internal nodes can be used to represent any desired devices (such as air release valves).

End Nodes

End nodes are located at each end of all pipe links. End nodes represent both passive connections, such as junctions and connections to supplies, and active elements, such as pumps. One or more pipe links can connect to a common end node. For non-directional end nodes (junctions, reservoirs, tanks, variable pressure supplies, and sprinklers), pipe links can be connected in any manner. For directional end nodes (pumps, loss elements, and regulators), an inlet and outlet connection point are shown and pipe links must be connected to the appropriate side of the element so that the direction indicated is correct. Pumps and loss elements (but not regulators) can connect (on one side) directly to a reservoir. This condition is modeled when no pipe link connections are made to one side of the element. This side is then modeled as a constant head reservoir and the reservoir head must be specified with the input data. All end node types can be interchanged. If a change is made from a non-directional to a directional node, the pipe links will connect arbitrarily. It is necessary to make sure that the direction is correct and the pipe links are properly connected. However, an end node can be changed to an internal node only if there are exactly two pipe links and the basic pipe link properties are the same (except length and minor coefficients). If the properties are not the same, the change to an internal node will be possible only if an option to utilize common properties is accepted.



1. Junction -

A connection of one (dead end junction) or more pipe links.



2. Reservoir -

A connection of one or more pipe links to a constant level reservoir. During a simulation, the reservoir level remains constant unless data is provided to change its value.



3. Tank -

A connection of one or more pipe links to a variable level storage node. For EPS (extended period simulations) level changes are calculated.



4. Variable Pressure Supply -

A connection of one or more pipe links to a supply where the supply pressure depends on the supply flow and is determined by using pressure flow data provided.



5. Sprinkler (Pressure Dependent Outflow) -

A connection of one or more pipe links to a point where flow is discharged based on the pressure in the distribution system. The characteristics of a connecting pipe may be defined (length, diameter, elevation change). This device can model a leak or a pressure sensitive demand.



6. Pumps (Directional) -

A connection of one or more pipe links to a pump. The pump direction must be set and pipe links connected to the appropriate sides.



7. Loss Element (Directional) -

An element identical to a pump except instead of a head gain, a head loss occurs.



8. Regulator (Directional) -

A connection of one or more pipes is required to each side of the device that maintains downstream pressure (pressure regulating valve), upstream pressure (pressure sustaining valve) or flow (flow control valve). The direction must be set and the pipe links connected to the appropriate side.



9. LE Library (Back Flow Preventer) -

A special loss element for which head flow data is provided based on manufacturer, model, and size. See Loss Elements Library.




10. Active Valve -


A valve which may be opened and closed and for which the minor loss is included in the network analysis. See **Active Valve**.


Laying Out a Pipe System

Pipe2018 is designed to provide a very simple, intuitive interface for your pipe system development. All development is done in 'Layout' mode. When you are not developing or modifying your system, you should select a different mode (usually 'Fixed') so you will not inadvertently modify the layout. The layout and subsequent modifications are done with the following operations

1. Select a Node or Pipe Link - Point to node or pipe and LC (left click).
2. Add Pipe Segment and Node - Select starting node (existing) and point mouse to ending node location (new) and RC (right click).
3. Add Pipe Segment - Select starting node (existing) and point mouse to ending node location (existing) and RC (right click).
4. Move Node - Point mouse to node and hold down left mouse button - drag to the new location.
5. Add Internal Node - Point mouse to desired location in pipe link and LC (left click). Click 'Insrt' (Pipe Information Window) and select internal node type from pop-up list.
6. Change Node Type - Select node and click on current node type selector (below name) and select from node type pop-up list (Node Information Window).
7. Delete Internal Node - Select internal node and click on 'Del' (delete) in the Node Information Window. **** Note that this will combine the two connecting pipe segments into one segment eliminating the internal node. To delete all intermediate nodes in a system, see Deleting Intermediate Nodes.
8. Delete End Node - Select end node and click on 'Del' (delete) in Node Information Window. **** Note that this will also delete ALL the pipe links connecting the node. If you do not wish to do this, change the node type to a junction.
9. Delete Pipe Link - Select pipe and click on 'Del' (delete) in Pipe Information Window.

10. Change Node Direction - For directional end nodes (pumps, loss elements and regulators), select node and click on  in the Node Information Window. The symbol in the node icon will change direction. You can do this to correct your model or to improve the appearance of the directional node.

11. Change Pipe Direction - The positive pipe direction (for referencing flows, etc.) is from Node 1 to Node 2. To reverse this, click on  (Pipe Information Window). It is necessary to insure pipes with check valves are in the correct direction.

12. Change Pipe Link Connection - For pipe link connections to directional nodes, click the  symbol adjacent to the directional node (Pipe Information Window). You will see the link connection change to the other side of the directional node.

As you layout your system (using operation 2), intermediate nodes are automatically inserted at all changes in alignment. These are automatically changed to junction nodes if only one or more than two pipes are connected or if the properties of the two connecting segments differ.

Quick Start Example

- Step 1 - Initial Preparation
- Step 2 - System Layout
- Step 3 - Analyze System and Review Results
- Step 4 - Some Additional Simulations

Step 1 - Initial Preparation

Initial steps include file selection, system data selections, and background preparation.

a. file selection

In the New File Specification box, select KYPipe and click OK. (If you are already in the program, click on File (top menu) and select New to access New File Specification box).

b. system data selection

Next go to System Data menu. To specify the flow units, click on the Units drop down list and select GPM. The default friction equation is showing (Hazen-Williams) and the defaults showing for data features are all acceptable.

Click on Return to Map icon to return to the Pipe2018 map.

c. background preparation

You can import a drawing map, utilize grid lines or choose not to use a background. For this demonstration we will turn on a grid and use it to guide our layout letting Pipe2018 calculate pipe lengths.

Click on Grids icon - The default grid settings of 1000 (major) and 100 (minor) are good for our demonstration so we will use them.

Click on Major Grid and Minor Grid check boxes. This will display background grid lines.

Click on Return to Map icon.

Step 2 - System Layout

The map area which appears on the screen will show a region approximately 1000 x 1000 feet with the 100-foot grid lines displayed. This area will be appropriate for the demonstration. A larger or smaller region can be displayed by clicking on the zoom in (+) or a zoom out (-) button on the left side.

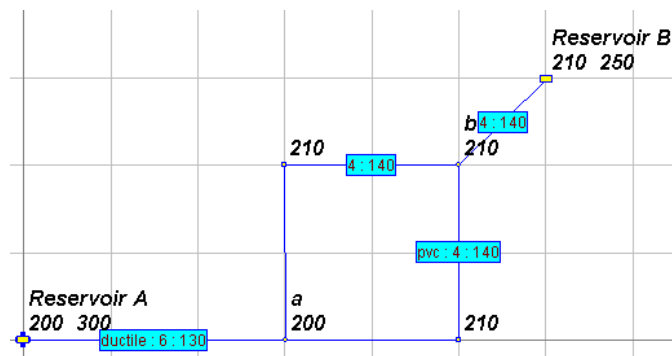


Figure 1 Example pipe system

The system we wish to lay out is shown above drawn on a 100-foot grid system. It is a loop fed by Reservoir A (HGL = 300) and discharges into Reservoir B (HGL = 250). The node elevations are noted. This is followed by the reservoir HGL's at the two reservoirs. The pipe material, diameter and roughness are noted for each pipe (box label). Points (a) and (b) are shown for reference in the discussion below. The development of the pipe system model is accomplished in three steps.

a. lay out pipes and nodes

The entire piping system can be laid out using the mouse and a right click (RC) to add pipes and nodes and a left click (LC) to select a node. The following operations will produce the system layout:

- 1) RC on gridline intersection to make first node
- 2) move mouse 300 feet (3 blocks) to right and RC (a)
- 3) move mouse 200 feet up and RC
- 4) move mouse 200 feet right and RC
- 5) move mouse 200 feet down and RC (a)
- 6) move mouse 200 feet left (back to existing node) and RC
- 7) select node at (b) and move 100 feet up and 100 feet to left and RC

Now all the pipes and nodes are laid out. Note all nodes are either junction or intermediate nodes and Pipe2018 has assigned pipe and node names.

b. change node types

Select any nodes which are different than shown and change to the correct node type. To do this select the node and click on Node Type cell and a drop down list will appear (top of Node Information Window) and select desired type from list.

- 1) Select node at Reservoir A (LC) and change node type to Reservoir (Grade)
- 2) Select node at Reservoir B and change node type to Reservoir (Grade)

The system should now look as shown below.

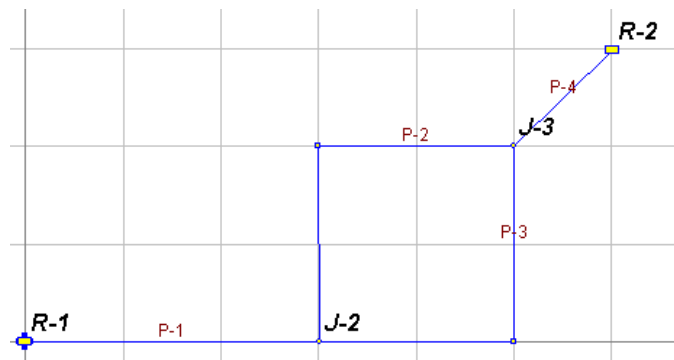


Figure 2 Completed pipe system layout

c. provide data

Select each pipe and end node and provide data

1. Select each pipe and click Pipe Type cell (Pipe Information Window) and select choice from drop down list. Select ductile:6 for pipe from Reservoir A and pvc:4 for the rest. Note that default roughness values are provided. Provide appropriate Fittings Data (elbow for pipes with 90° bend, for example)
2. Select each Reservoir and provide values shown for Grade (HGL) and Elevation
3. Select each junction and intermediate node, enter Elevation

d. save data file

Provide a name and save your data file

Click on File (top toolbar) and Save As and provide a file name in the popup menu. Such as QS1 (for Quick Start example 1).

Step 3 - Analyze System and Review Results

a. check data and run analysis

1. Click Analyze (top toolbar) and select Error Check. If errors are flagged correct these. If the message "No Errors" appears proceed
2. Click Analyze (Main Menu) and select Analyze System and click Analyze on the popup menu to accept the defaults (Analyze with KYPipe, Use Current Year)

b. review results

The results can be reviewed on the schematic using Results Labels or by looking at the tabulated output.

1. Click on Report (secondary toolbar) and scroll through the tabulated summary of data and results. Click on Return to Map icon to go back to the graphical display.
2. Click on Labels (top toolbar) and select Pipe Results A and Node Results A to show the results parameters indicated in the Results Selection bar on the bottom right of the screen. You can click on the Results Selection bar to bring up a menu where the pipe results and node results type may be changed. A helpful selection is Loss (head loss) for pipes and HGL for nodes because it provides a very useful view of the system operation. Printouts based on these selections are shown (Figure 3 and 4).

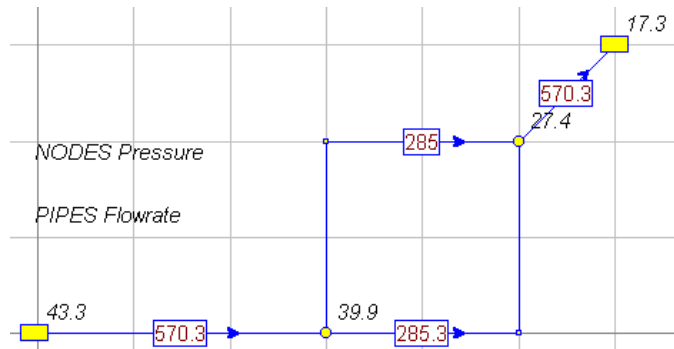


Figure 3 Case 1 - Pressure and Flow

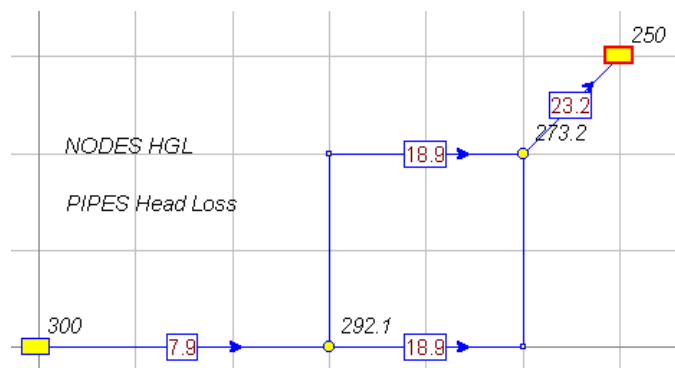


Figure 4 Case 1 - Loss and HGL

Step 4 - Some Additional Simulations

It is very easy to modify data and run a new simulation. Several are described:

a. age based roughness

Re-run the analysis but this time uncheck "Use Current Year" to remove that requirement and enter the year 2050. The analysis now shows a significant change in pipe roughness due to aging and a substantial decrease in the capacity to transport water from Reservoir A to Reservoir B. A printout showing flows and pressures which illustrate this (Figure 5), but which may vary from your results slightly.

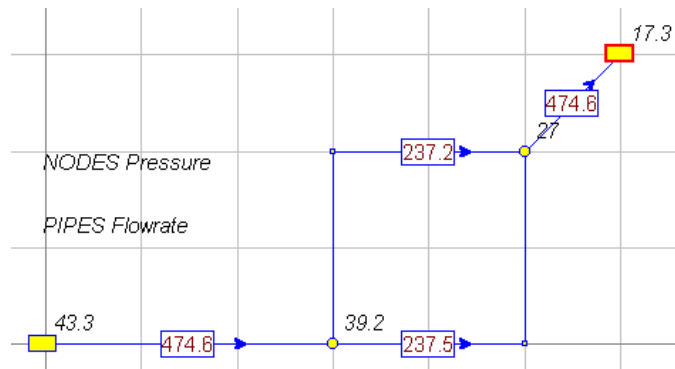


Figure 5 Case 2 - 25 years (2023)

b. add a pump

We want to add a 40 HP (useful horsepower) pump in the line leading from Reservoir A about 100 feet from the reservoir. To do this click on (LC) the pipe at the desired location and click on Insert icon (Pipe Information Window) and select Pump – Power. Select the pump and input 40 (HP) for the Power and 210 (ft.) for the elevation (Node Information Window). Now analyze the system and note the effect of this pump which provides around 136 feet of head and nearly doubles the flow. A printout showing flows and pressures is shown (Figure 6).

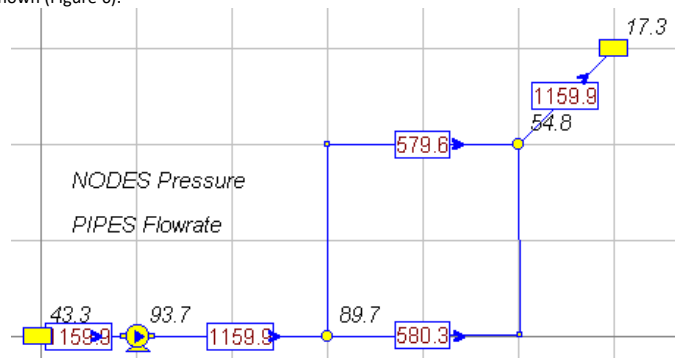


Figure 6 Case 3 - Added Pump