2.3 Scenario Management

One of the many project tools in Bentley WaterCAD V8*i* is Scenarios Management. Scenarios allow you to calculate multiple "What If?" situations in a single project file. You may wish to try several designs and compare the results, or analyze an existing system using several different demand alternatives and compare the resulting system pressures.

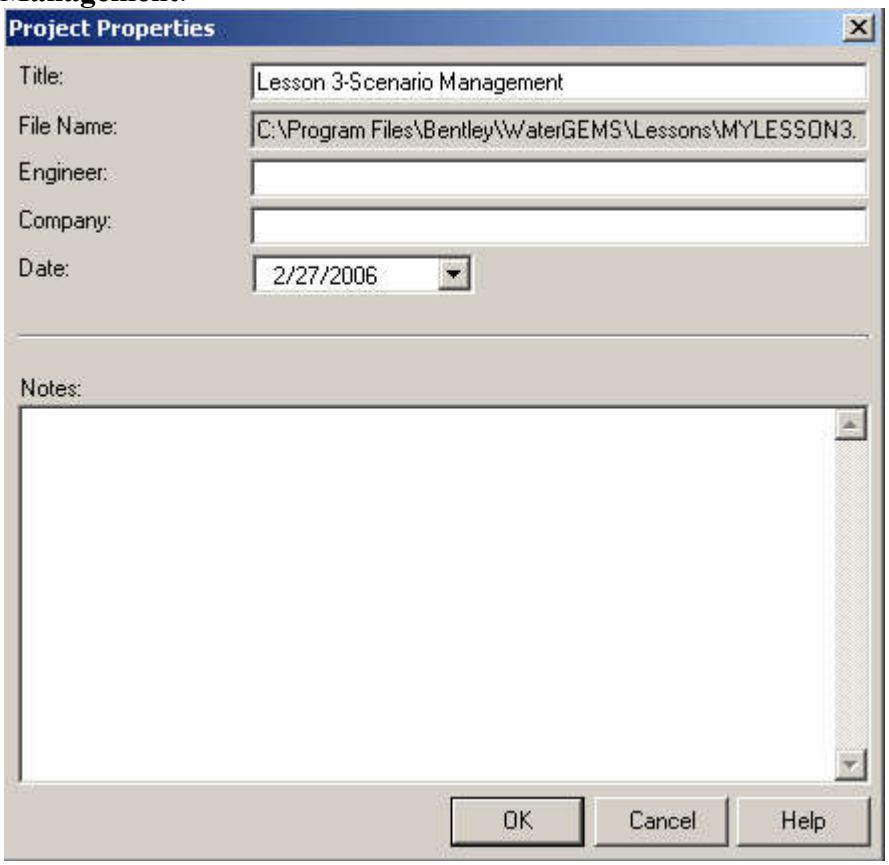
A scenario is a set of Alternatives, while alternatives are groups of actual model data. Scenarios and alternatives are based on a parent/child relationship where a child scenario or alternative inherits data from the parent scenario or alternative.

In Lessons 1 and 2, you constructed the water distribution network, defined the characteristics of the various elements, entered demands and demand patterns, and performed steady-state and extended period simulations. In this lesson, you will set up the scenarios needed to test four "What If?" situations for our water distribution system. These "What If?" situations will involve changing demands and pipe sizes. At the end of the lesson, you will compare all of the results using the Scenario Comparison tool.

To open the existing project

1. This lesson is based on the project created in the Extended Period Simulation lesson. If you have not completed it, then open the project LESSON3.WTG from the Bentley\WaterGEMS\Lesson directory. If you completed Lesson 2, then you can use the MYLESSON2 file you created.
2. After you have opened the file, choose **File > Save As**.
3. Enter the filename **MYLESSON3** and click **Save**.

4. Choose **File > Project Properties**, and change the Project Title to **Lesson 3—Scenario Management**.

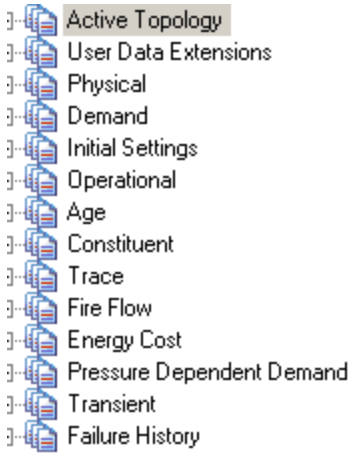


5. Click OK.

Step 1: Create a New Alternative

First, you need to set up the required data sets, or alternatives. An alternative is a group of data that describes a specific part of the model.

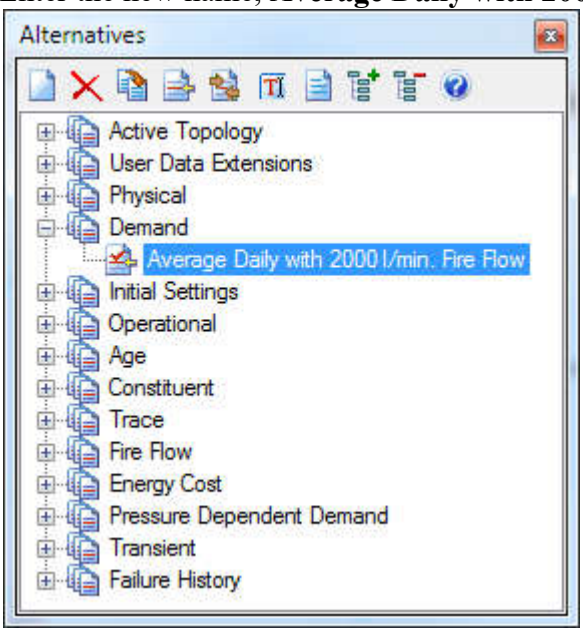
There are 14 alternative types:



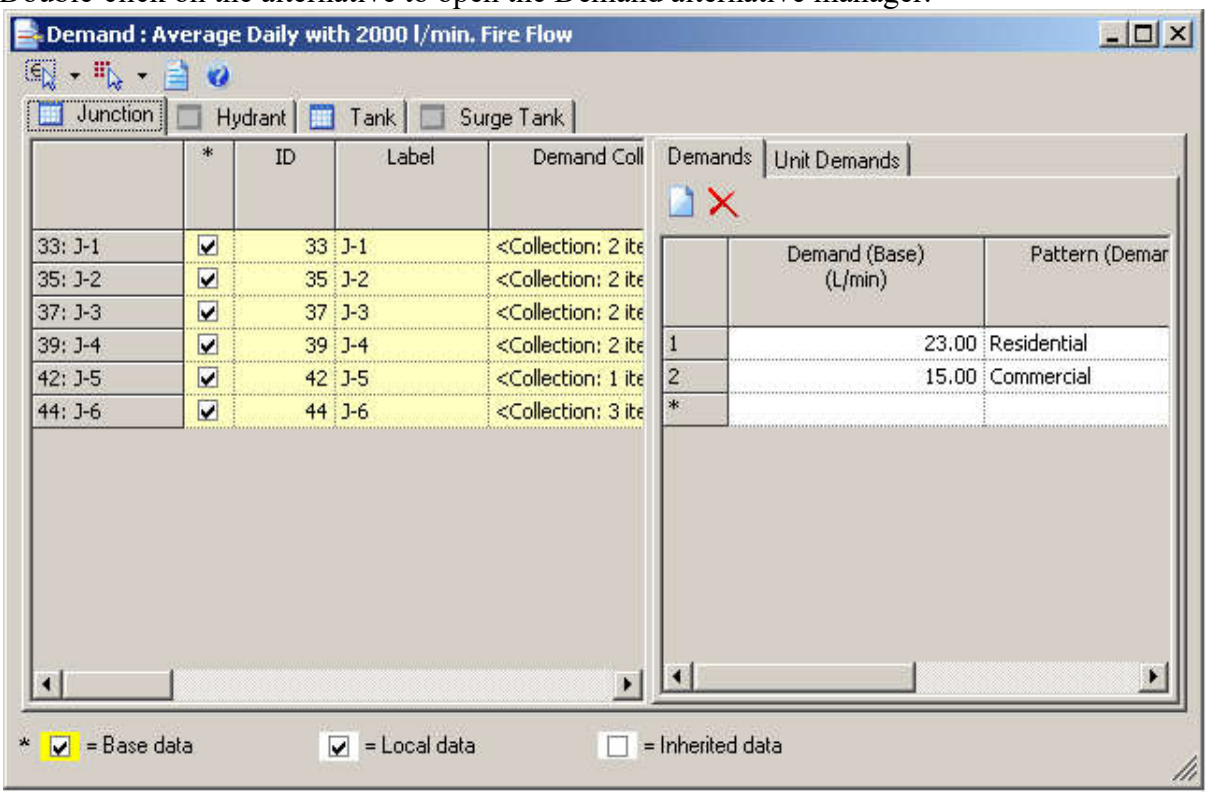
In this example, you need to set up a different physical or demand alternative for each design trial you want to evaluate. Each alternative will contain different pipe size or demand data.

In Bentley WaterCAD V8*i* , you create families of alternatives from base alternatives. Base alternatives are alternatives that do not inherit data from any other alternative. Child alternatives can be created from the base alternative. A Child alternative inherits the characteristics of its parent, but specific data can be overridden to be local to the child. A child alternative can, in turn, be the parent of another alternative.

1. Click **Analysis > Alternatives** or click  .
2. Click to open the Demand alternative. The Base Demand alternative contains the demands for the current distribution system.
3. Change the default demand name.
    a. Click Rename  or right click to Rename.
    b. Enter the new name, **Average Daily with 2000 l/min. Fire Flow**.

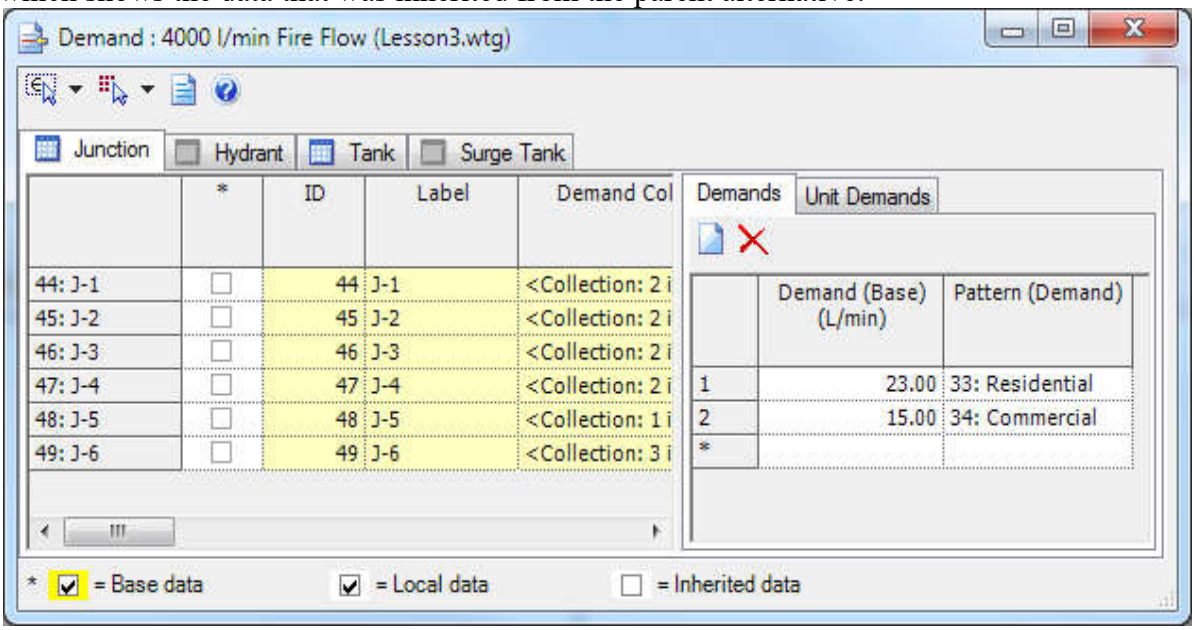


c. Double-click on the alternative to open the Demand alternative manager.



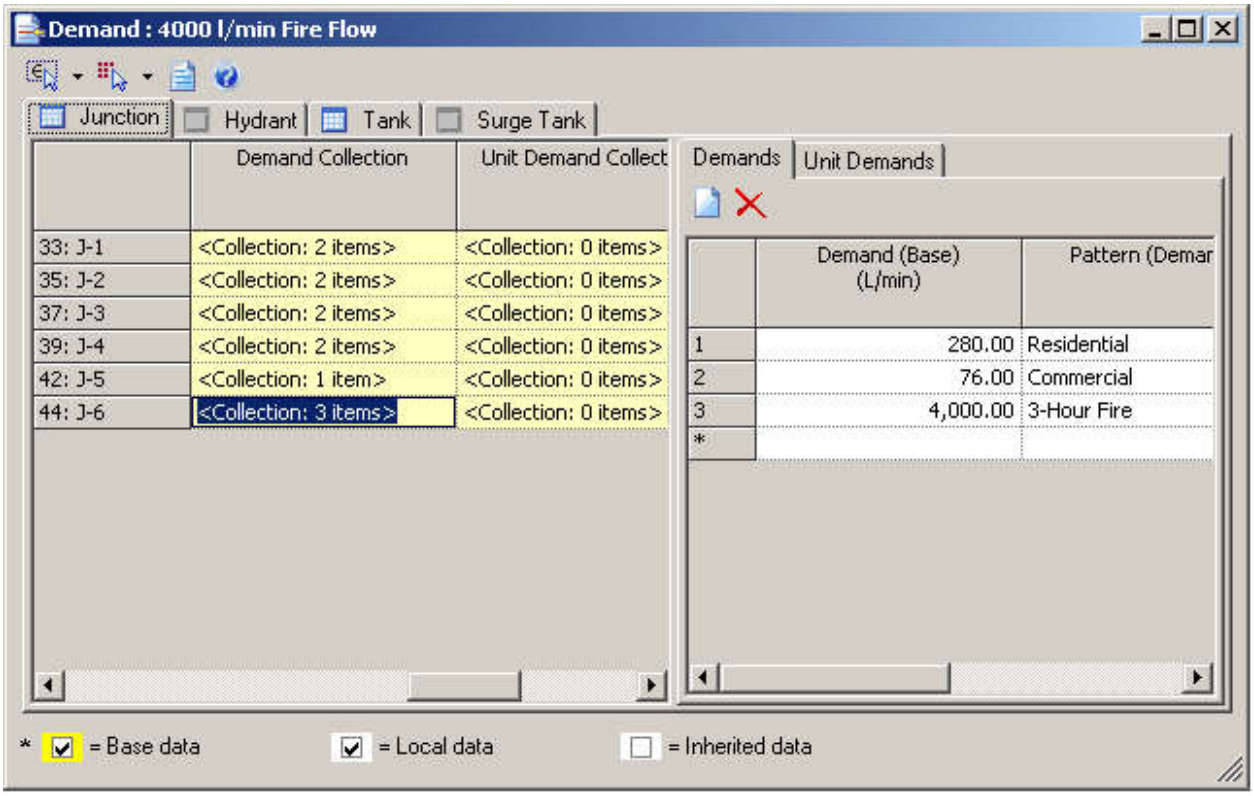
4. Now you should add a child of the base-demands alternative, because the new alternative will inherit most data. Then, you can locally change the data that you want to modify. You will modify the existing demand data by increasing the fire flow component at node J-6 from 2000 l/min. to **4000 l/min**.
   a. In the Alternatives manager, right-click the **Average Daily with 2000 l/min. Fire Flow alternative**, then select **New** > **Child Alternative**.
   b. Highlight the new alternative and click **Rename**. Enter a label of **4000 l/min Fire Flow** for the new Alternative.

c. Double-click to open the Demand Alternatives editor for the new alternative which shows the data that was inherited from the parent alternative.



If you change any piece of data, the check box will become selected because that record is now local to this alternative and not inherited from the parent.

5 Click in the Demand Collection column for node **J-6**. Change the 2000 l/min. fire demand to **4000 l/min**.



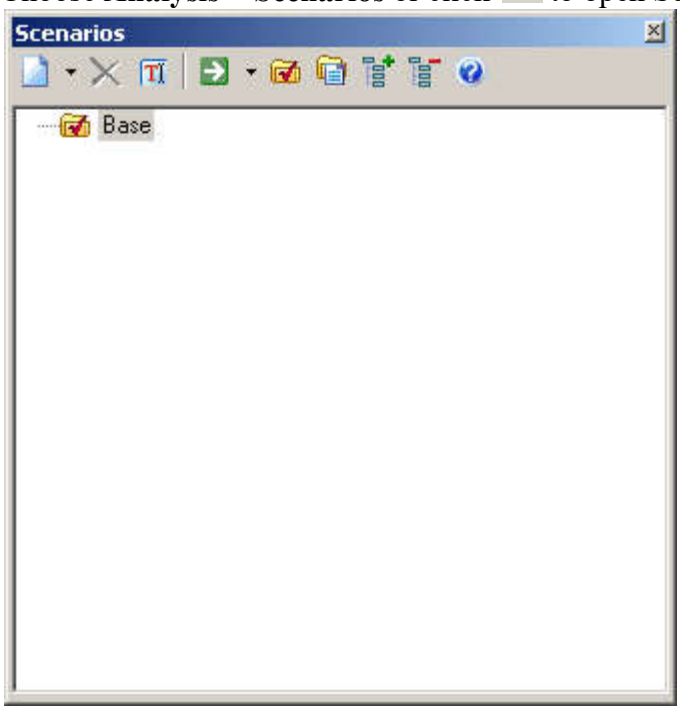
6 Close the Demand Alternative Editor.
7 Close the Alternatives Manager

Step 2: To create and edit Scenarios

Alternatives are the building blocks of a scenario. A scenario is a set of one of each of the types of alternatives, plus all of the calculation information needed to solve a model.

Just as there are base, parent, and child alternatives, there are also base, parent, and child scenarios. The difference is that instead of inheriting model data, scenarios inherit sets of alternatives. To change the new scenario, change one or more of the new scenario's alternatives. For this lesson, you will create a new scenario for each different set of conditions you need to evaluate.

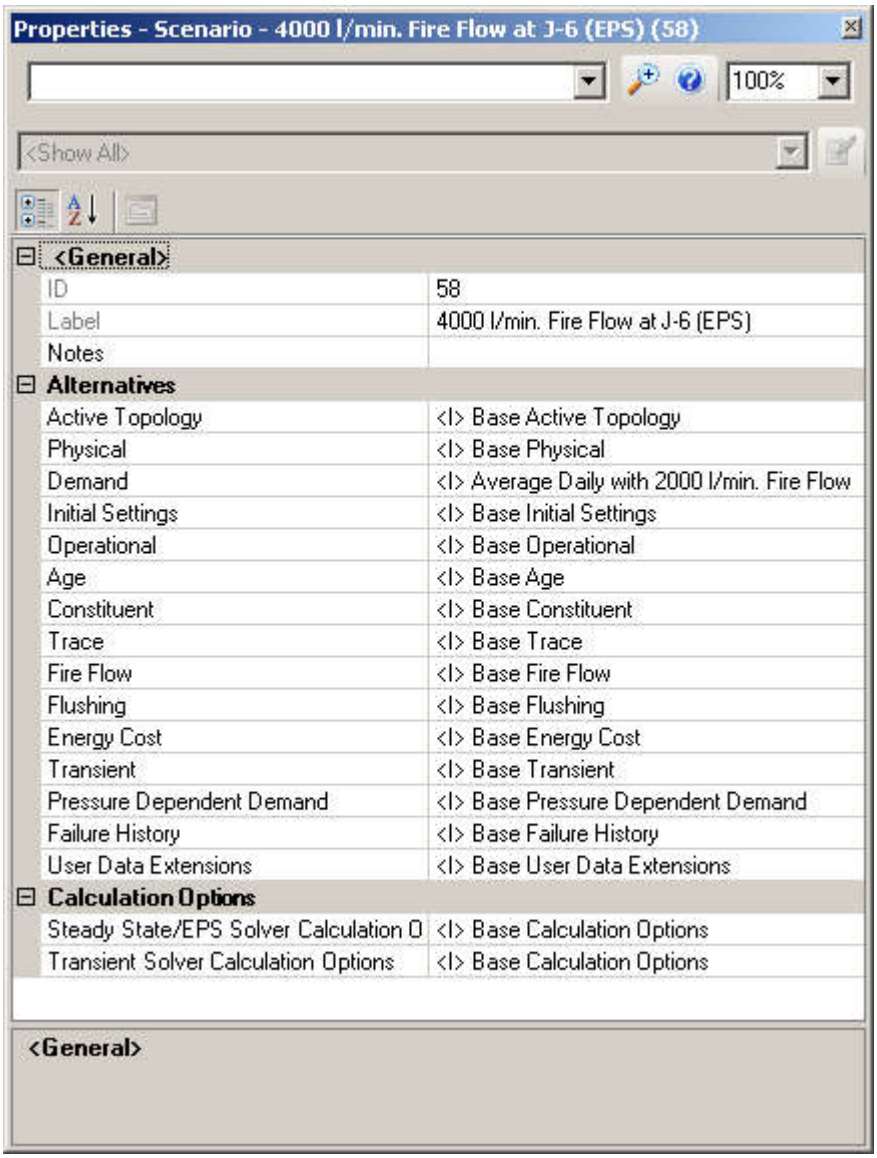
1. Choose **Analysis > Scenarios** or click to open Scenarios.



   There is always a default Base Scenario that is composed of the base alternatives. Initially, only the Base is available, because you have not created any new scenarios.

2. Click Rename to rename the Base Scenario to **2000 l/min., 3-hour Fire Flow at J-6 (EPS)**.
3. Create a child scenario from the existing base scenario to incorporate the new demand alternative.
   a. Right-click on the **2000 l/min., 3-hour Fire Flow at J-6 (EPS)** scenario and select **New** > **Child Scenario**.
   b. Highlight the new scenario and click **Rename**. Enter a scenario name of **4000 l/min. Fire Flow at J-6 (EPS)**. Double-click the scenario to open the Properties

editor for the scenario.



The new scenario lists the alternatives as inherited from the base scenario.

1. Your new Child Scenario initially consists of the same alternatives as its parent scenario. Set the Demand Alternative to the new alternative you created, **4000 l/min. Fire Flow**.
    a. Click in the **Demand** field

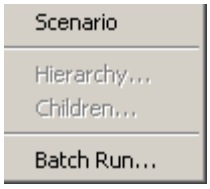
b. From the menu, select the **4000 l/min. Fire Flow** alternative.

<General>	
ID	58
Label	4000 l/min. Fire Flow at J-6 (EPS)
Notes	
Alternatives	
Active Topology	<I> Base Active Topology
Physical	<I> Base Physical
Demand	4000 l/min Fire Flow
Initial Settings	<I> Base Initial Settings
Operational	<I> Base Operational
Age	<I> Base Age
Constituent	<I> Base Constituent
Trace	<I> Base Trace
Fire Flow	<I> Base Fire Flow
Flushing	<I> Base Flushing
Energy Cost	<I> Base Energy Cost
Transient	<I> Base Transient
Pressure Dependent Demand	<I> Base Pressure Dependent Demand

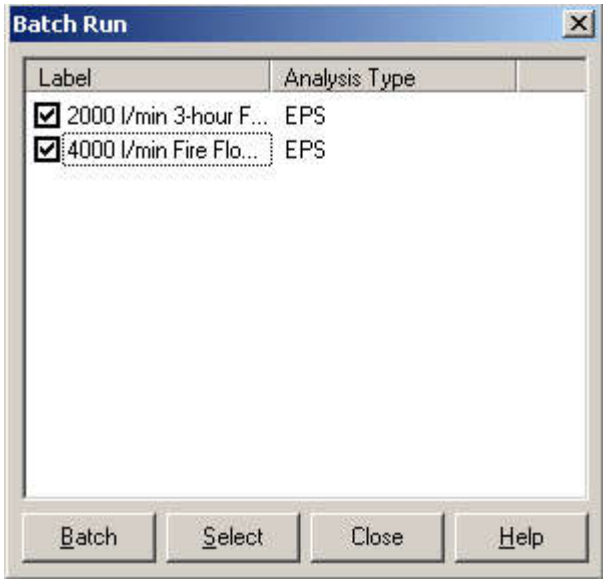
The new alternative is no longer inherited from the parent, but is local to this scenario.

Step 3: To calculate both of the scenarios using the Batch Run tool

1. In the Scenarios manager, click **Compute Scenario** and then **Batch Run**



2. Select both check boxes next to the scenario names in the Batch Run dialog box.



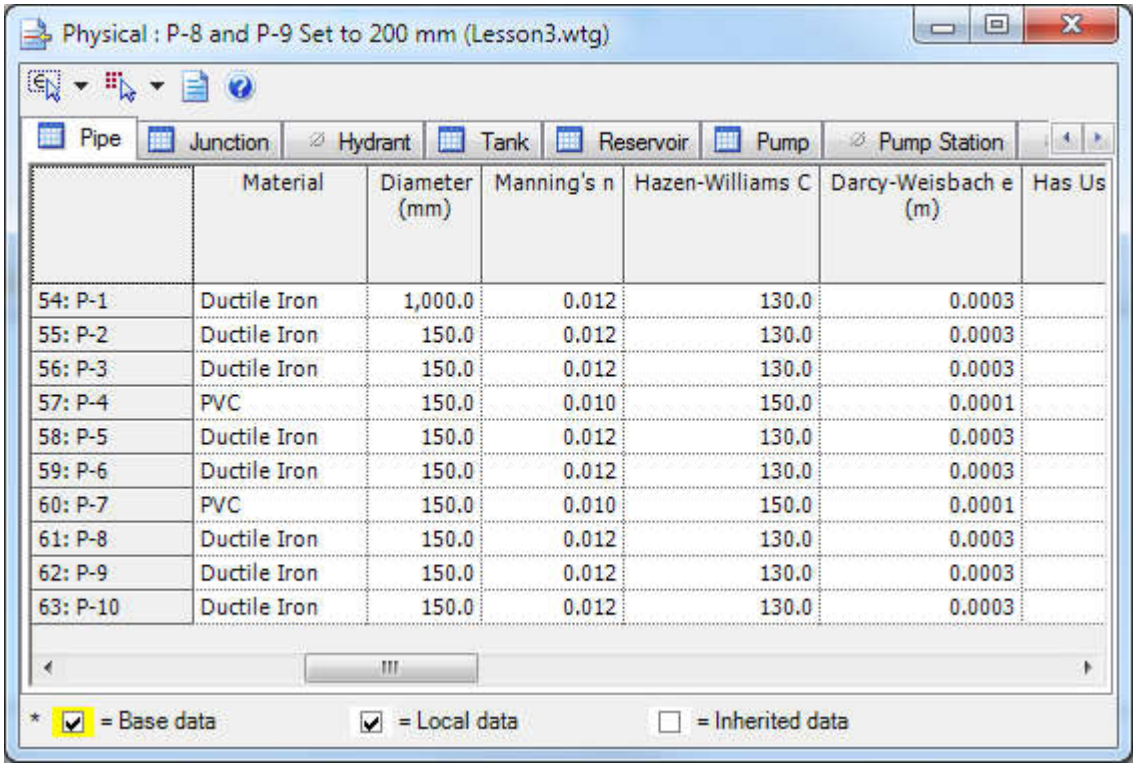
3. Click **Batch**.

4. Click **Yes** at the prompt to run the batch for two scenarios.
5. After computing finishes, click **OK**.

Step 4: To create a Physical Alternative

You need to further examine what is going on in the system as a result of the fire flow, and find solutions to any problems that might have arisen in the network as a result. You can review output tables to quickly see what the pressures and velocities are within the system, and create new alternatives and scenarios to capture your modifications.

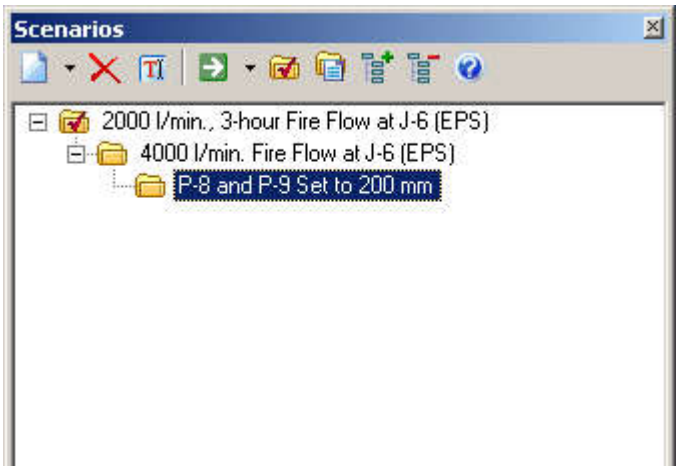
1. Click **Analysis** > **Alternatives**. Under **Physical**, highlight **Base Physical**. Right-click and select **New** > **Child Alternative**.
2. Rename the new Child Alternative **P-8 and P-9 Set to 200 mm**.
3. Double-click the newly created physical alternative to open the Physical alternative editor. In the Pipe tab for this Alternative, change the diameter for pipes **P-8** and **P-9** to **200** mm.



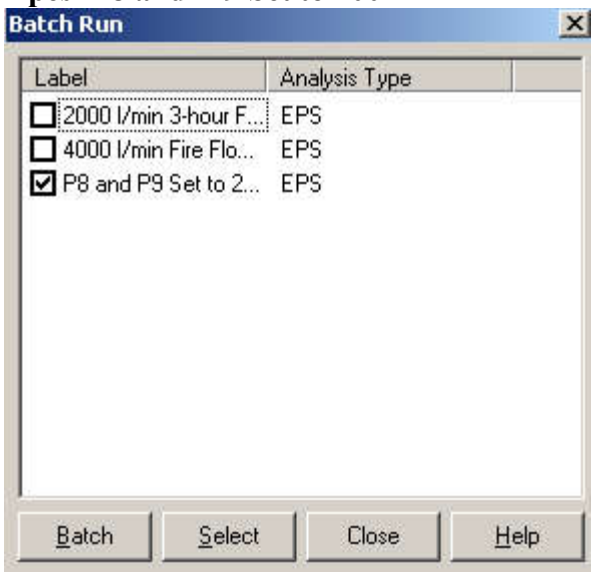
	Material	Diameter (mm)	Manning's n	Hazen-Williams C	Darcy-Weisbach e (m)	Has Us
54: P-1	Ductile Iron	1,000.0	0.012	130.0	0.0003	
55: P-2	Ductile Iron	150.0	0.012	130.0	0.0003	
56: P-3	Ductile Iron	150.0	0.012	130.0	0.0003	
57: P-4	PVC	150.0	0.010	150.0	0.0001	
58: P-5	Ductile Iron	150.0	0.012	130.0	0.0003	
59: P-6	Ductile Iron	150.0	0.012	130.0	0.0003	
60: P-7	PVC	150.0	0.010	150.0	0.0001	
61: P-8	Ductile Iron	150.0	0.012	130.0	0.0003	
62: P-9	Ductile Iron	150.0	0.012	130.0	0.0003	
63: P-10	Ductile Iron	150.0	0.012	130.0	0.0003	

4. **Close** the alternative editor dialog.
5. Create a new scenario having a new physical alternative with the pipe sizes for P-8 and P-9 increased to 200 mm.
    a. Click or choose **Analysis > Scenarios**.
    b. Select **4000 l/min. Fire Flow at J-6 (EPS)** in the list of Scenarios.
    c. Click New, and select Child Scenario.

d. Name the new Scenario **P-8 and P-9 Set to 200 mm**.



6. Double click scenario **P-8 and P-9 Set to 200 mm** to open the Properties editor for the scenario. Click **Physical** and select the **P-8 and P-9 Set to 200 mm** alternative.
7. In the Scenarios manager, click **Compute** > **Batch Run** and select the check box for **Pipes P-8 and P-9 Set to 200 mm**.



8. Click **Batch** and then **Yes** to confirm and run the Scenario.
9. Click **OK** after the run is complete.
10. Close the open boxes and save the project.