



## Step 2: To run an Extended Period Simulation (EPS)

1. Click Calculation Options  to open the Calculation Options dialog.
2. Double-click Base Calculation Options under Steady State/EPS Solver to open the properties manager and select EPS from the Time Analysis Type menu.

Calculation Times	
Simulation Start Date	1/1/2000
Time Analysis Type	EPS
Start Time	12:00:00 AM
Duration (hours)	24.000
Hydraulic Time Step (hours)	1.000
Reporting Time Step	<All>

3. Click Compute  to analyze the model.
4. When there are errors or warnings then the User Notifications dialog box opens. A blue light is an informational message, a yellow light indicates warnings, and a red light indicates issues.
5. Close the User Notifications dialog box and other open dialogs..



6. Click Save or choose File > Save to save the project.

## Scenario Management

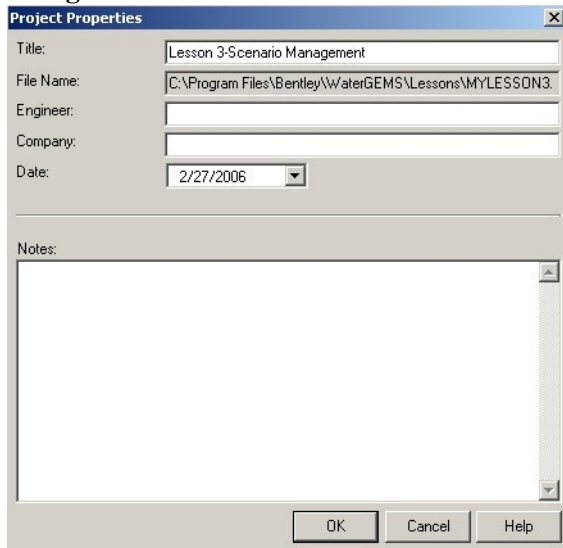
One of the many project tools in Bentley WaterCAD V8i is [Scenarios](#) Management. Scenarios allow you to calculate multiple “What If?” situations in a single project file. You may wish to try several designs and compare the results, or analyze an existing system using several different demand alternatives 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**.

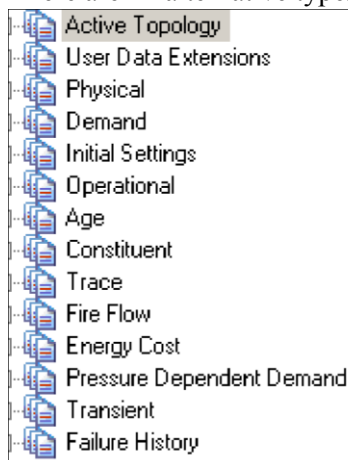


5. Click OK.

### 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.

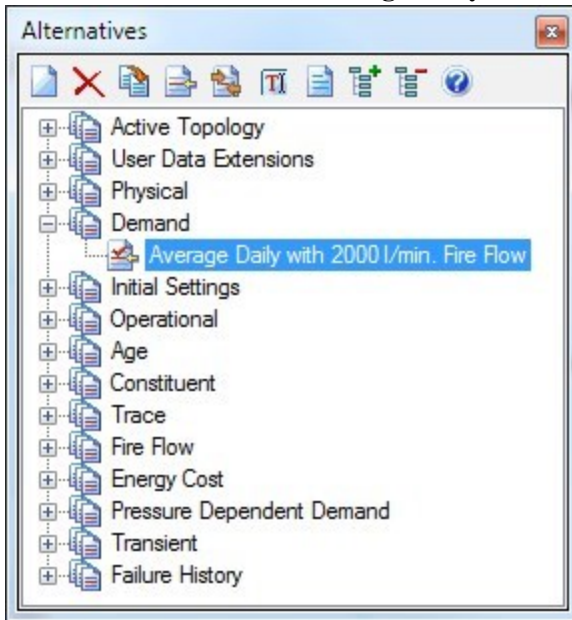
There are 14 alternative types:



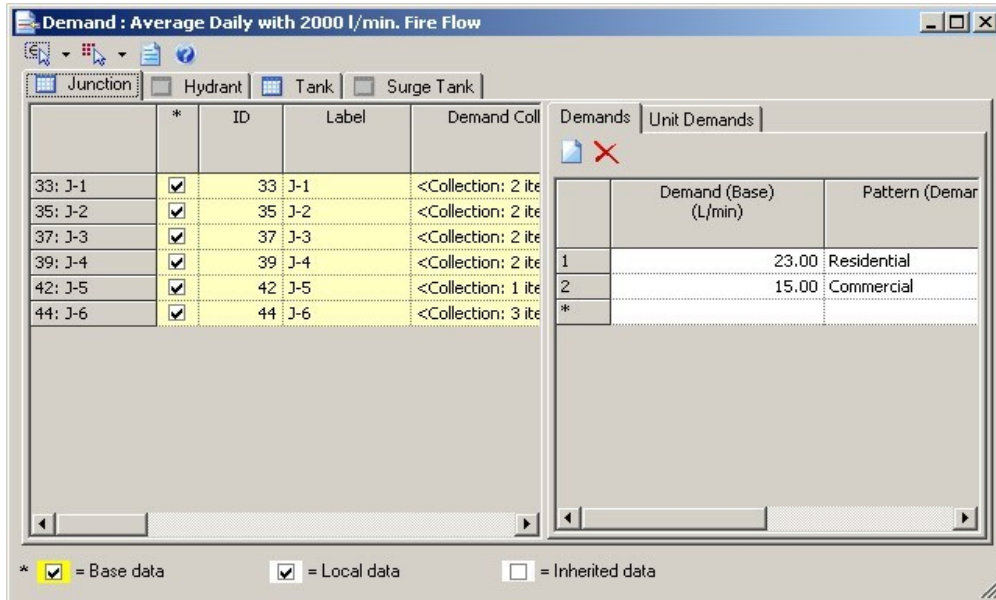
In this example, you need to set up a different physical or demand alternative for each design trial you want to evaluate. Each alternative will contain different pipe size or demand data.

In Bentley WaterCAD V8i , 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.

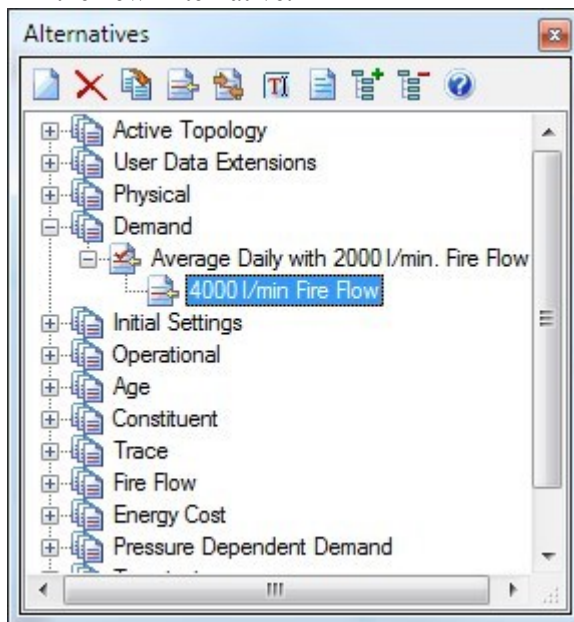
1. Click **Analysis > Alternatives** or click .
2. Click to open the Demand alternative. The Base Demand alternative contains the demands for the current distribution system.
3. Change the default demand name.
  - a. Click Rename  or right click to Rename.
  - b. Enter the new name, **Average Daily with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



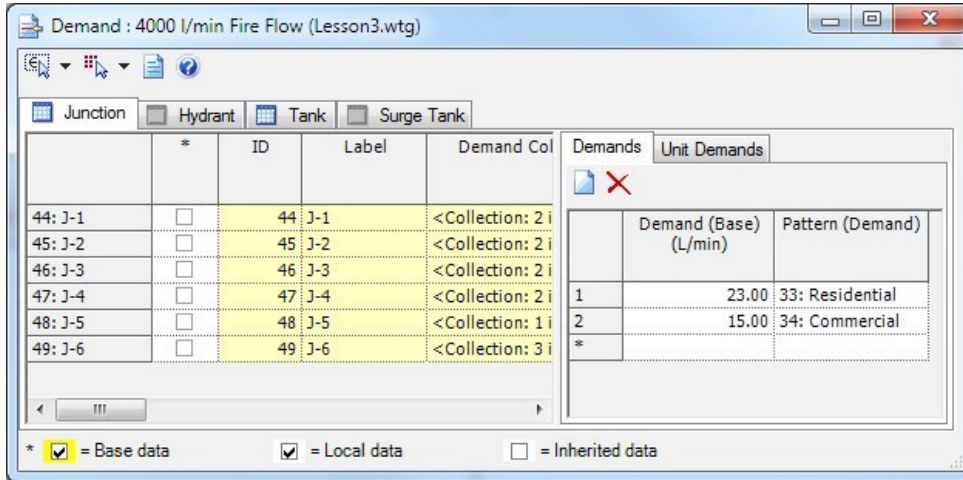
- c. Double-click on the alternative to open the Demand alternative manager.



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.

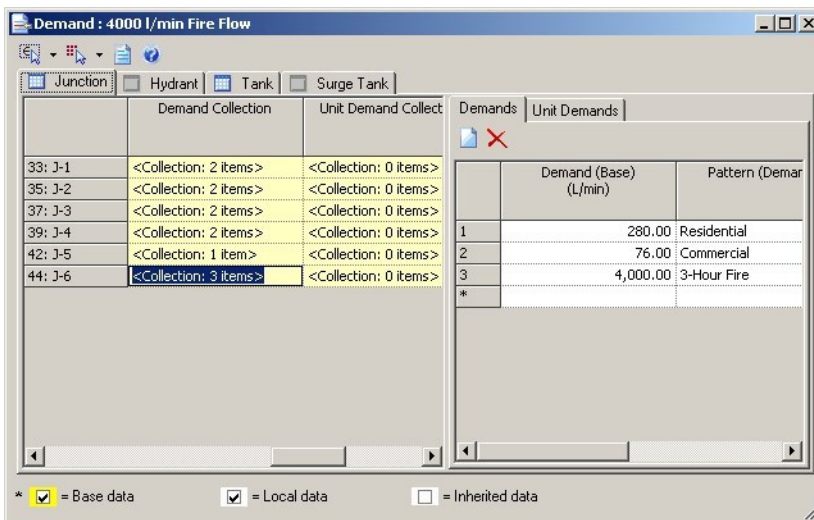


- c. Double-click to open the Demand Alternatives editor for the new alternative which shows the data that was inherited from the parent alternative.



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.

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




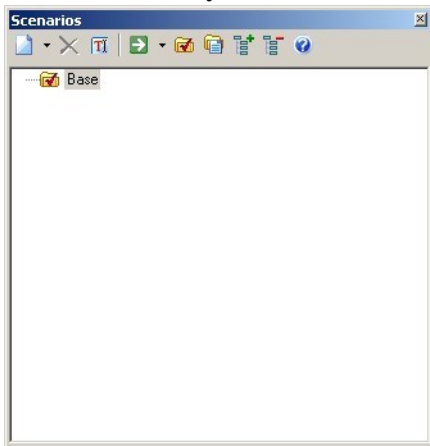
- Close the Demand Alternative Editor.
- Close the Alternatives Manager

**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.

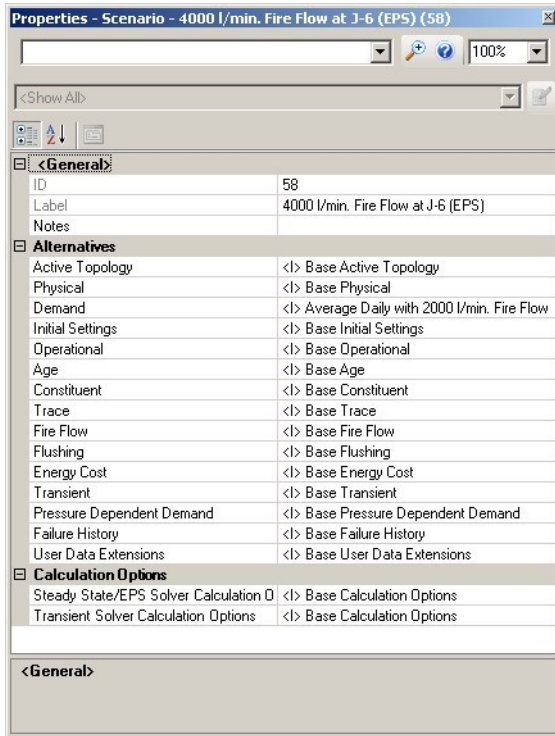
1. Choose **Analysis > Scenarios** or click  to open Scenarios.



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

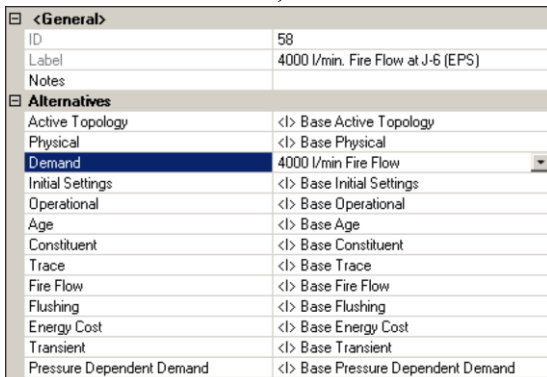
scenarios.

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.

4. 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.



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.

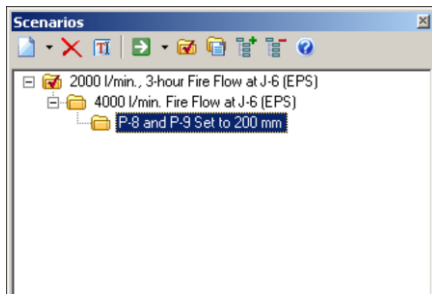
1. Click **Analysis > Alternatives**. Under **Physical**, highlight **Base Physical**. Rightclick and select **New > Child Alternative**.
2. Rename the new Child Alternative **P-8 and P-9 Set to 200 mm**.
3. Double-click the newly created physical alternative to open the Physical alternative editor.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



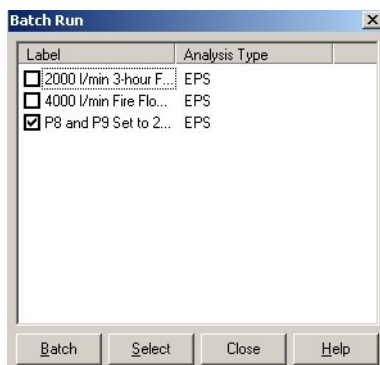
	Material	Diameter (mm)	Manning's n	Hazen-Williams C	Darcy-Weisbach e (m)	Has Us
54: P-1	Ductile Iron	1,000.0	0.012	130.0	0.0003	
55: P-2	Ductile Iron	150.0	0.012	130.0	0.0003	
56: P-3	Ductile Iron	150.0	0.012	130.0	0.0003	
57: P-4	PVC	150.0	0.010	150.0	0.0001	
58: P-5	Ductile Iron	150.0	0.012	130.0	0.0003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

\*  = Base data       = Local data       = Inherited data

4. **Close** the alternative editor dialog.
5. Create a new scenario having a new physical alternative with the pipe sizes for P8 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.

## Reporting Results

An important feature in all water distribution modeling software is the ability to present results clearly. This lesson outlines several of Bentley WaterCAD V8i reporting features, including:

- **Reports**, which display and print information on any or all elements in the system.
- **Element Tables (FlexTables)**, for viewing, editing, and presentation of selected data and elements in a tabular format.
- **Profiles**, to graphically show, in a profile view, how a selected attribute, such as hydraulic grade, varies along an interconnected series of pipes.
- **Contouring**, to show how a selected attribute, such as pressure, varies throughout the distribution system.
- **Element Annotation**, for dynamic presentation of the values of user-selected variables in the plan view.
- **Color Coding**, which assigns colors based on ranges of values to elements in the plan view. Color coding is useful in performing quick diagnostics on the network.

For this lesson, you will use the system from the [Scenario Management](#) lesson, saved as **MYLESSON3** in the Bentley\WaterGEMS\Lesson directory. If you did not complete this lesson, you may use the file **LESSON4.WTG** (**LESSON4.DWG** in

AutoCAD).

### To open the existing project

1. Open **MYLESSON3.WTG**.