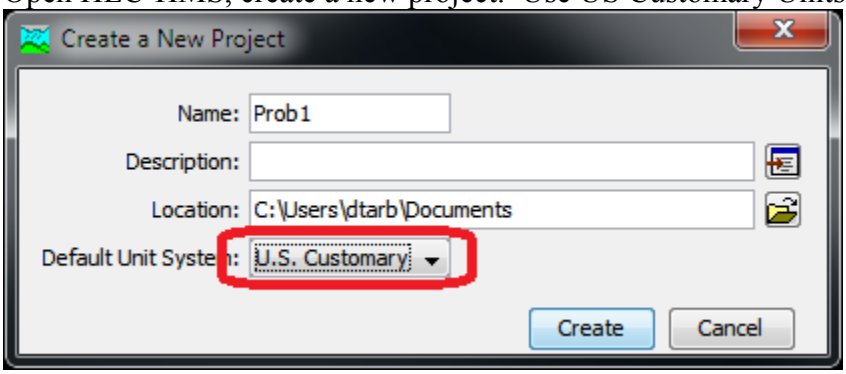
CEE3430 Engineering Hydrology

Homework 8. Step by Step Guidance for using HEC HMS to solve homework problems

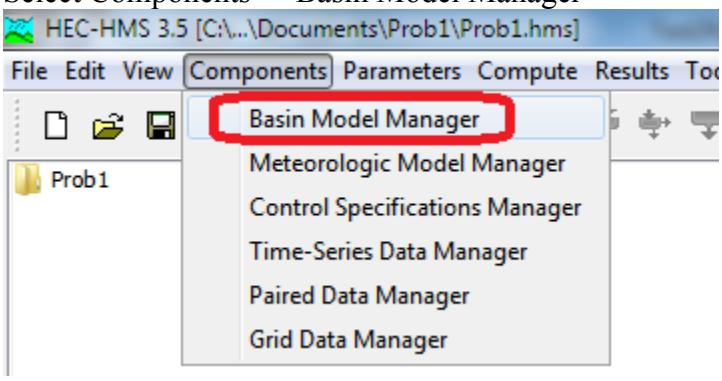
1. Solve Part 1, problem 3 above using HEC-HMS. The standard lag referred to in the inputs (and on page 156 of the HEC-HMS manual) is t_p from equation 8.4.1. The peaking coefficient is C_p.

    1. Review the handout HEC-HMS Bare Essentials Tutorial and Example http://www.neng.usu.edu/cee/faculty/dtarb/cee3430/2012/HEC-HMSExampleTutorial.pdf

    2. Open HEC-HMS, create a new project. Use US Customary Units

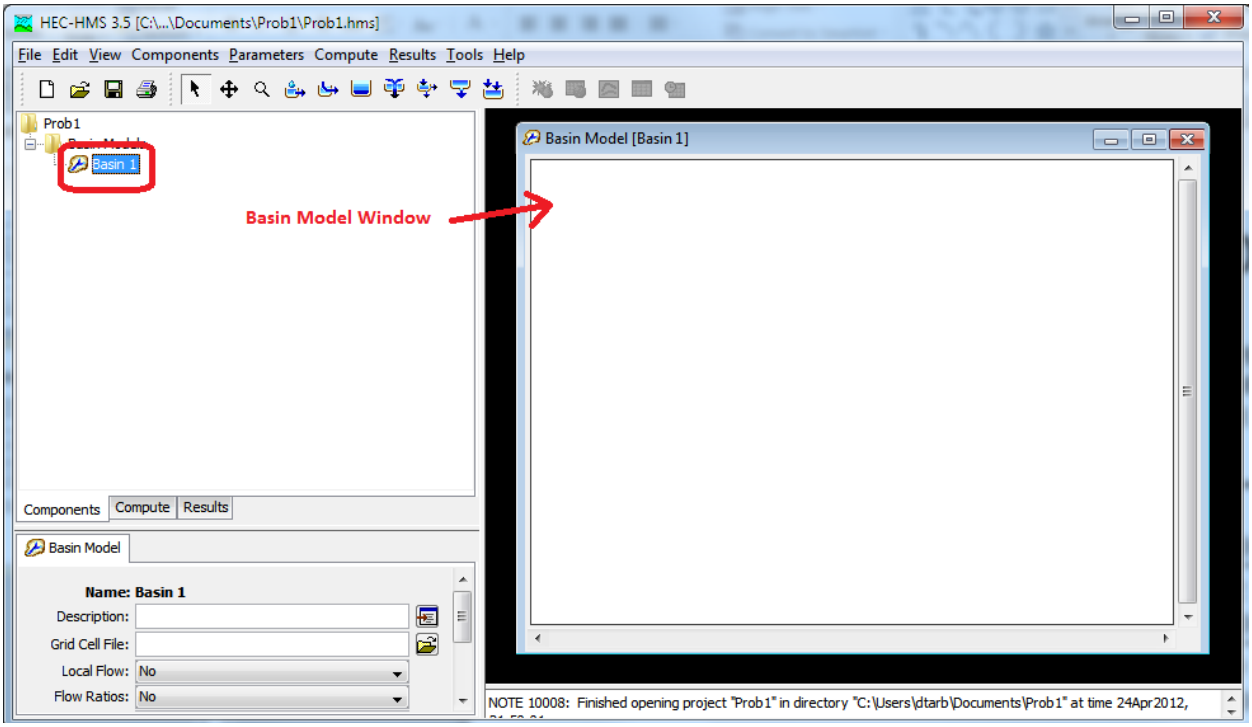


    3. Select Components -> Basin Model Manager

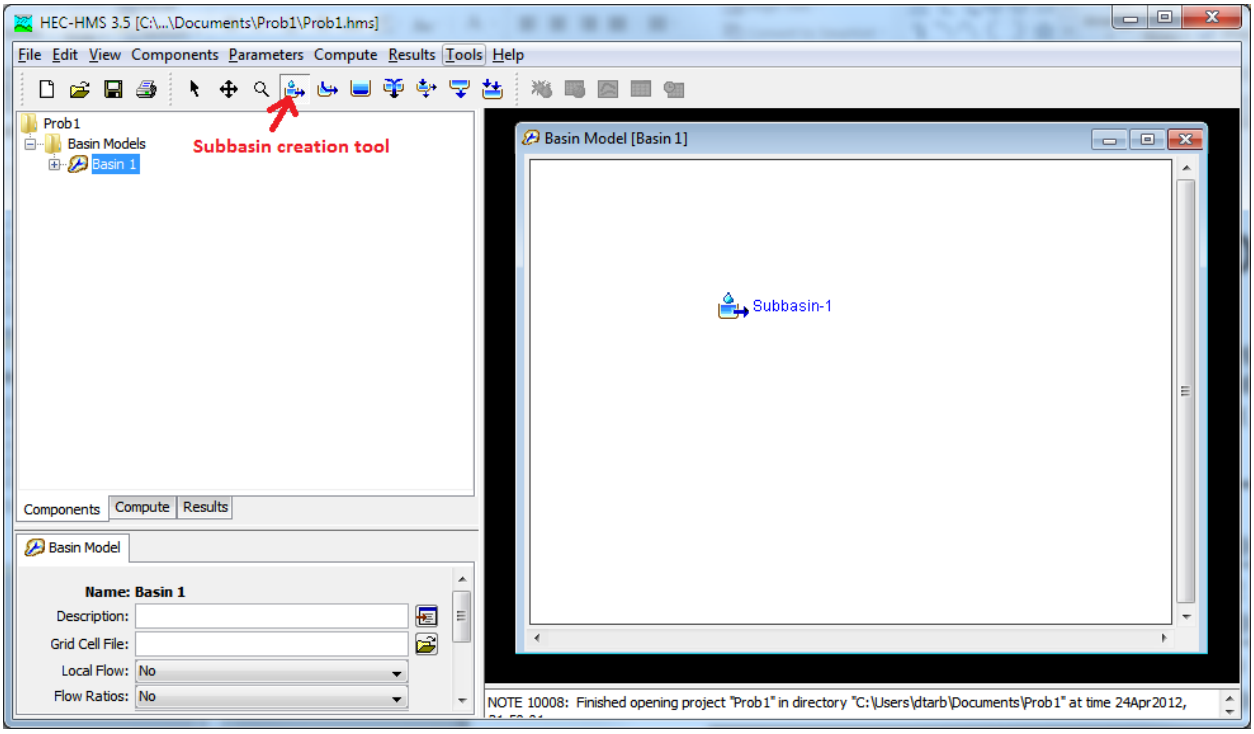


    Click New, Create, Close the Basin Model Manager (You can keep the default names or pick names of your choosing).

    Back in the main program expand the table of contents under basin models and click on the Basin symbol so that the Basin Model window appears

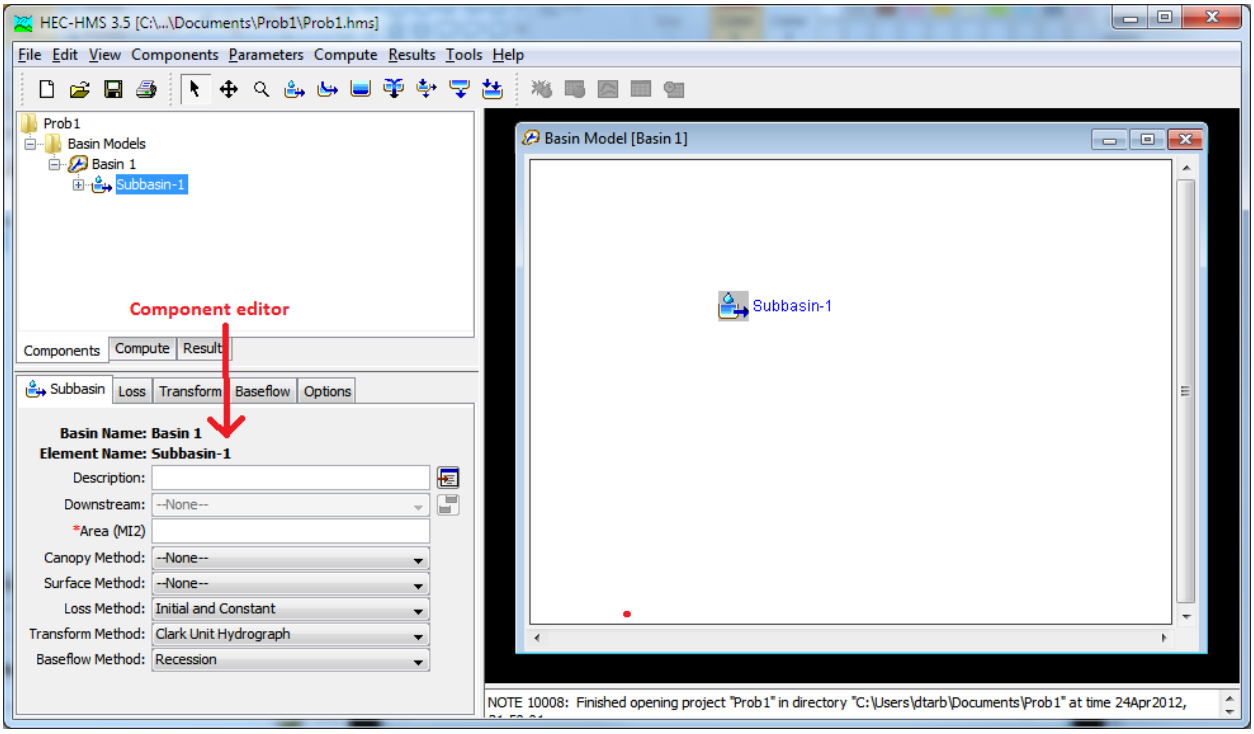


4. Click on the subbasin creation tool and click in the Basin Model Window to create a subbasin.

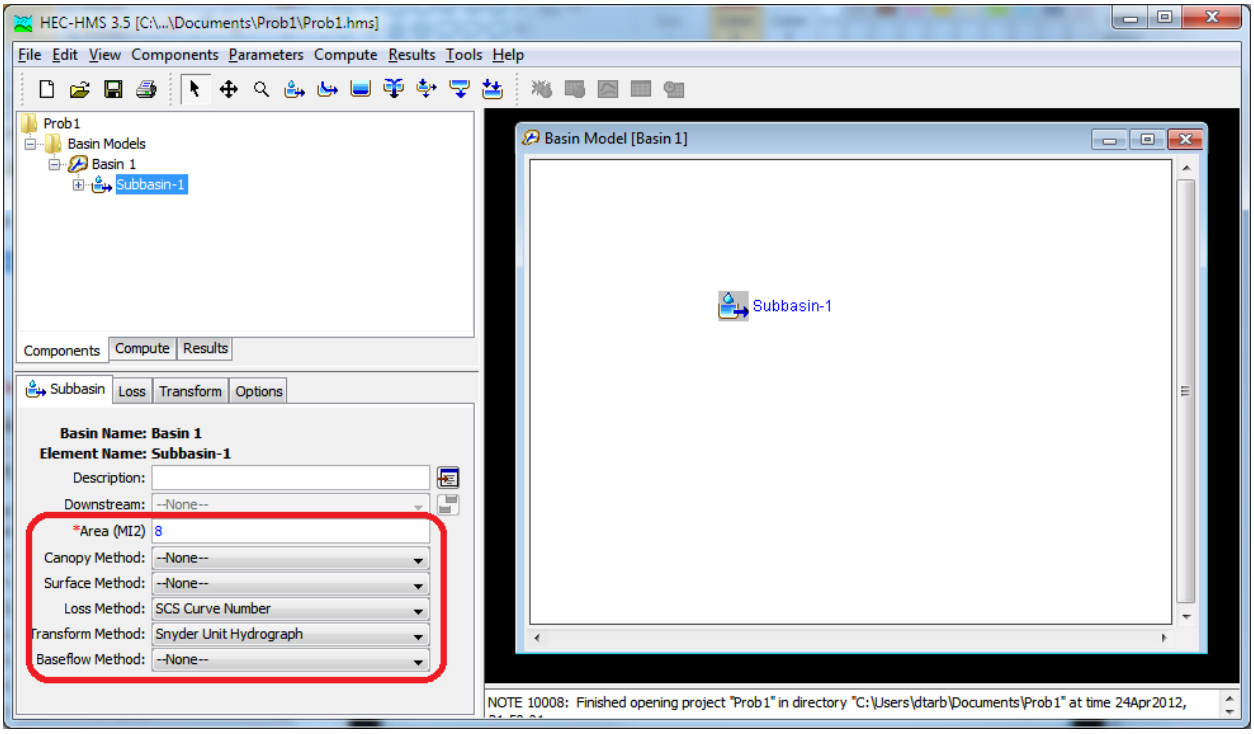


One subbasin is sufficient for this problem.

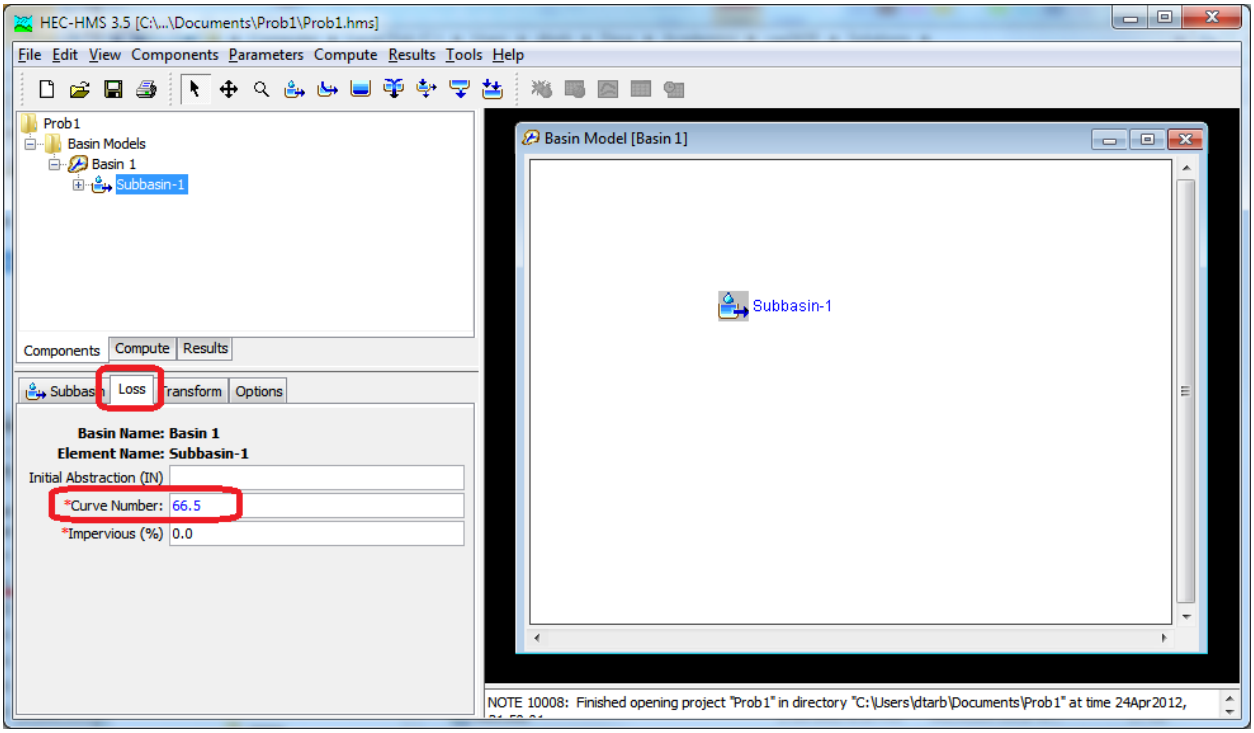
5. Select the Arrow tool to deactivate creation of subbasins and click on the icon for the subbasin you created. The component editor in bottom left should show properties of the subbasin.



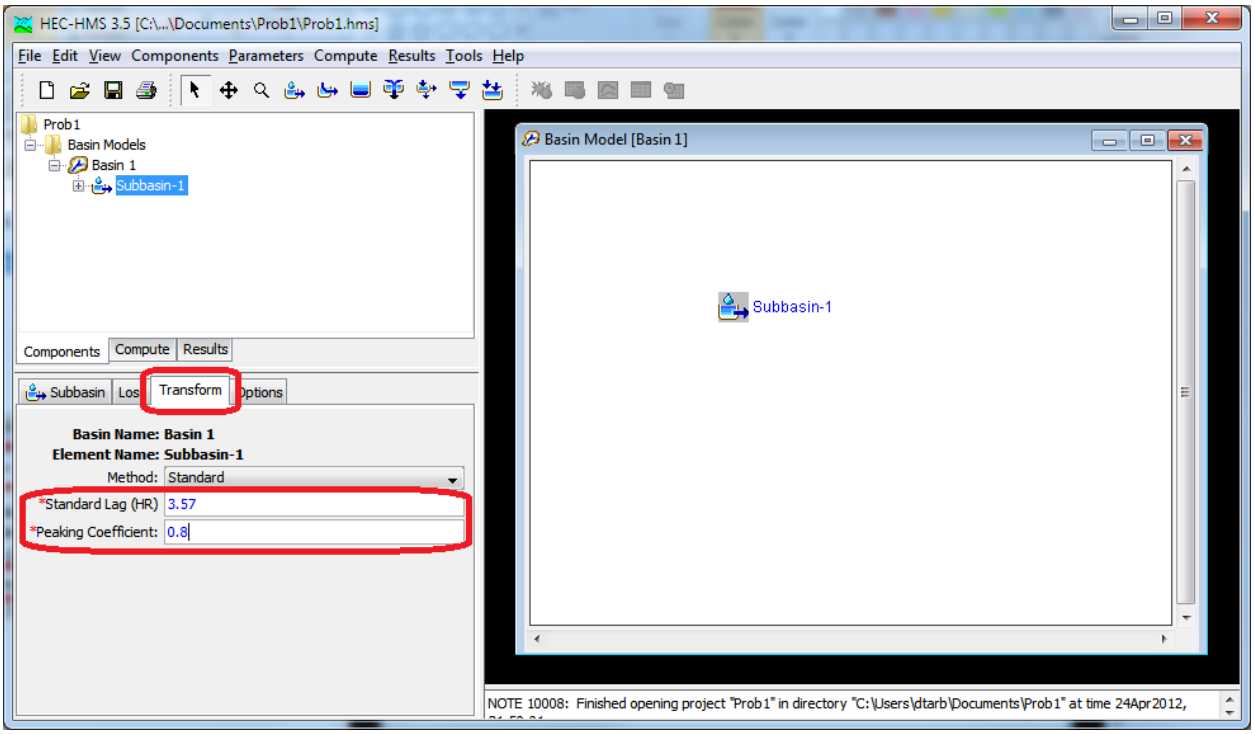
6. Set the properties as needed for this problem. Enter the Area, set the loss method to SCS Curve Number, transform method to Snyder Unit Hydrograph and baseflow method to None. Click Yes to each of the warnings about losing data.



7. Next click on the Loss tab and enter the appropriate Curve Number (from part 1)

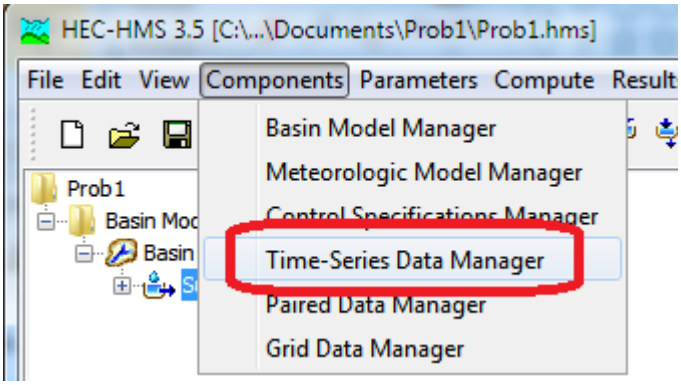


8. Next click on the Transform tab and enter the Standard Lag (t_p from part 1) and Peaking Coefficient (C_p)

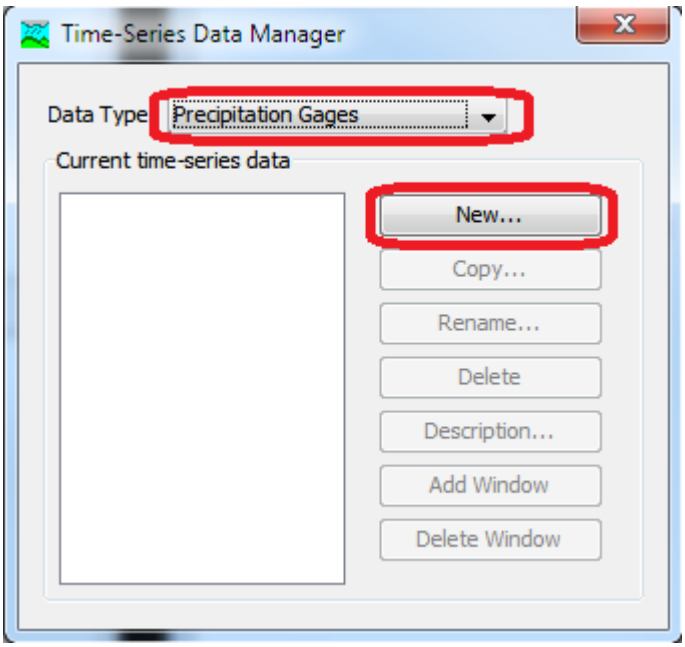


You have now entered all the necessary basin properties. You now need to enter the input rainfall. This is done using a rain gage from the time series data manager.

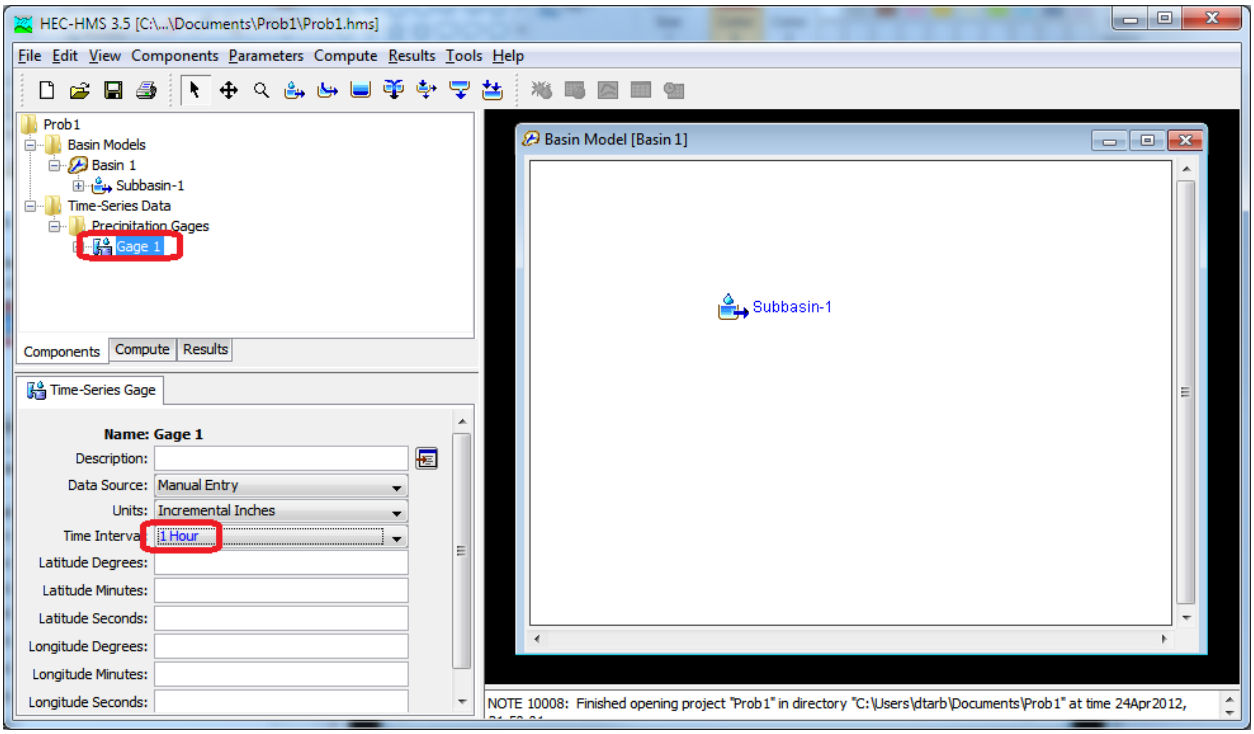
9. Click on Components -> Time-Series data manager



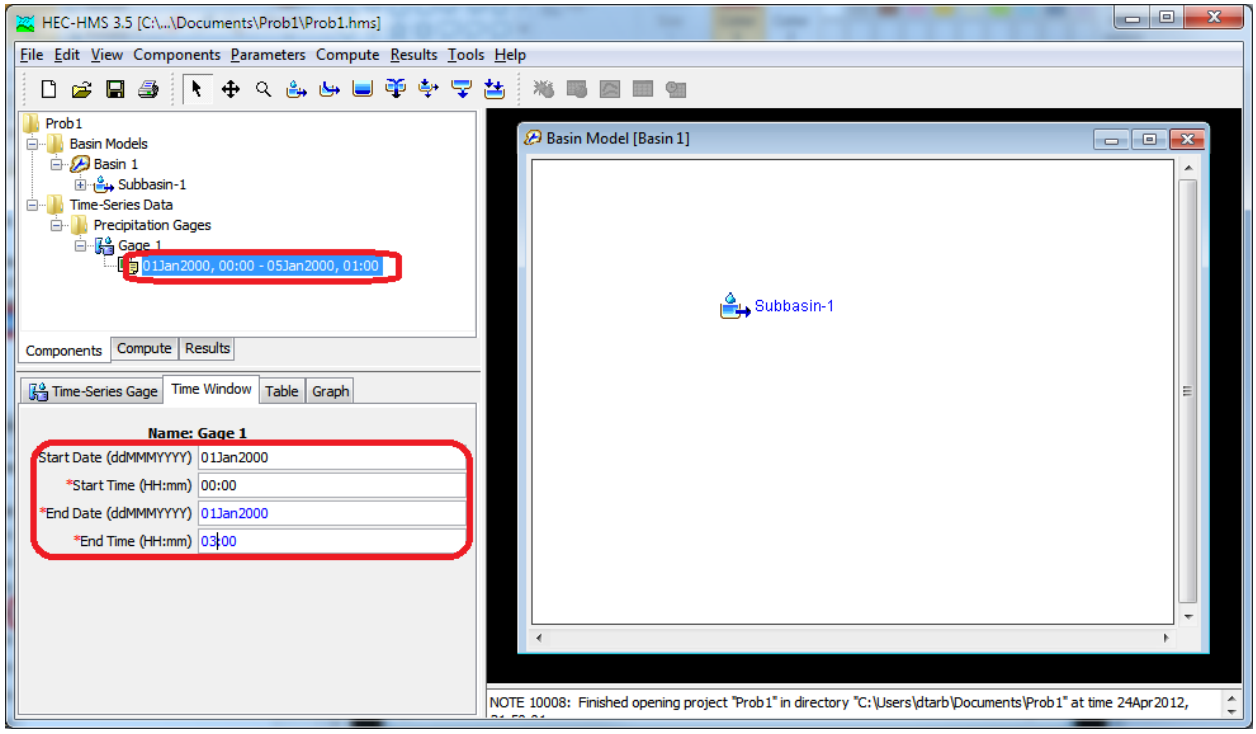
10. Make sure that Precipitation Gages is selected and Click New followed by Create



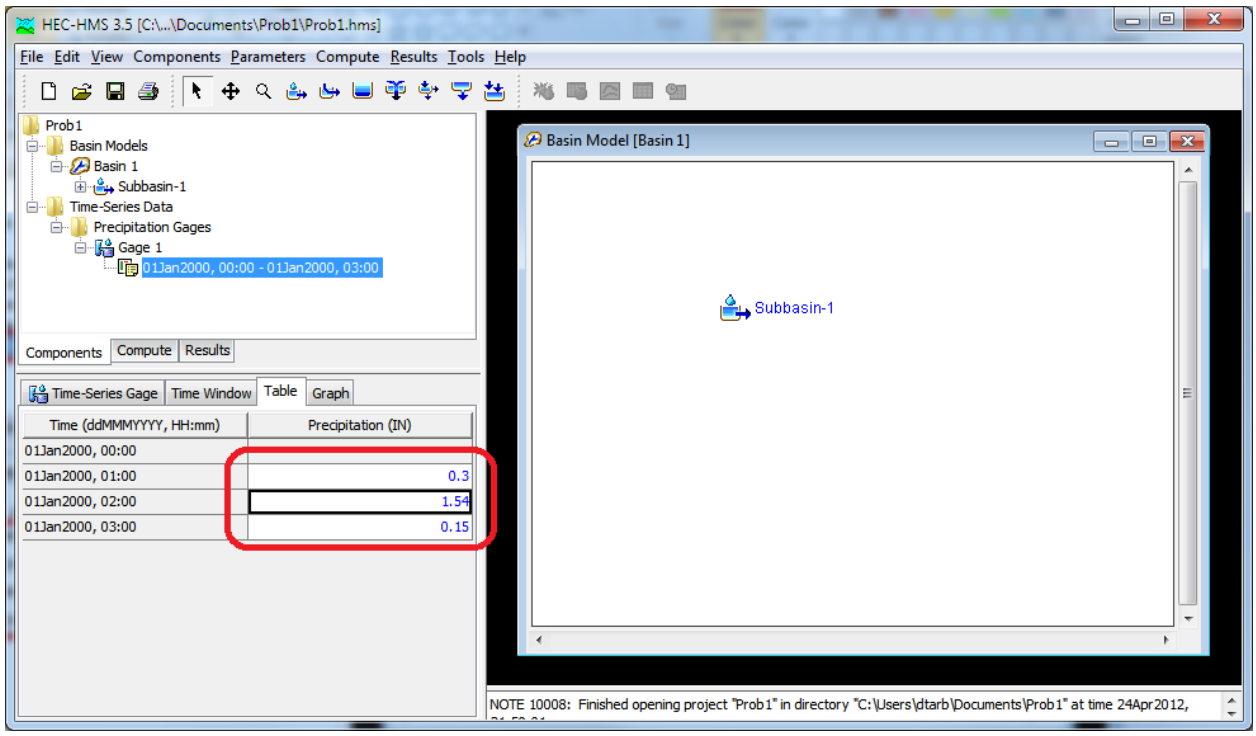
11. The result is a Time-Series entry in the table of contents. Expand the pluses and click on Gage 1 under Precipitation gages. This activates the time series information in the component editor. Set the time interval to 1 hour



12. Expand further on Gage 1 in the table of contents to display the time window and click on it. This activates the time window information in the component editor. Set the start and end date to any convenient times 3 hr apart.

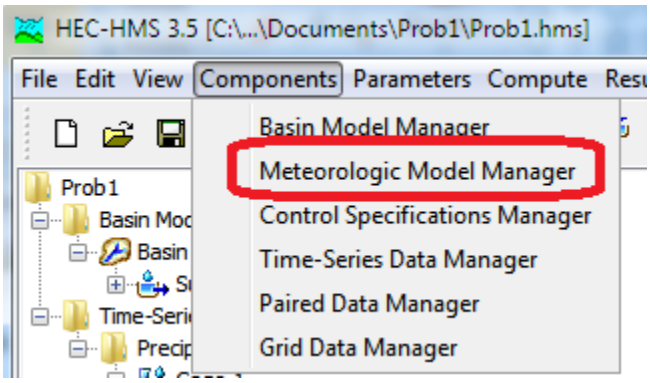


13. Next click on the Table tab in the component editor and enter the rainfall increments from the problem

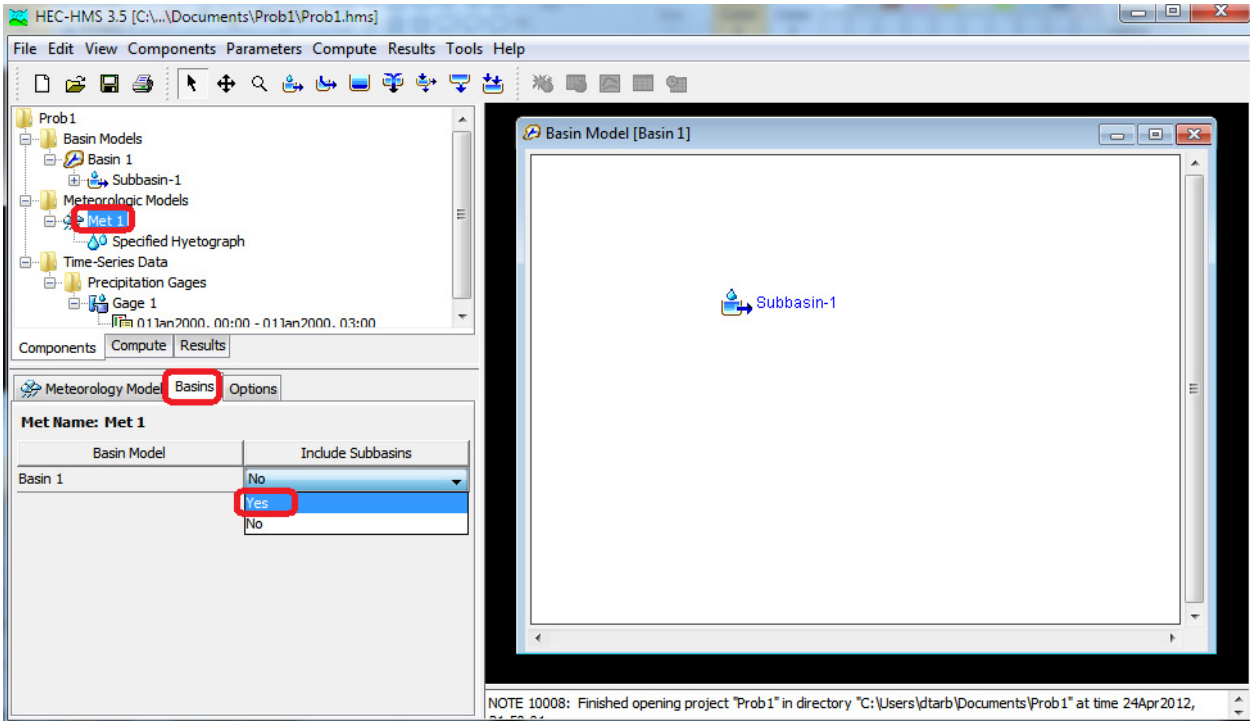


You have now completed entry of the rainfall information. Now we need to associate this rainfall data with the subbasin configured earlier. This is done in a Meteorology Model Component.

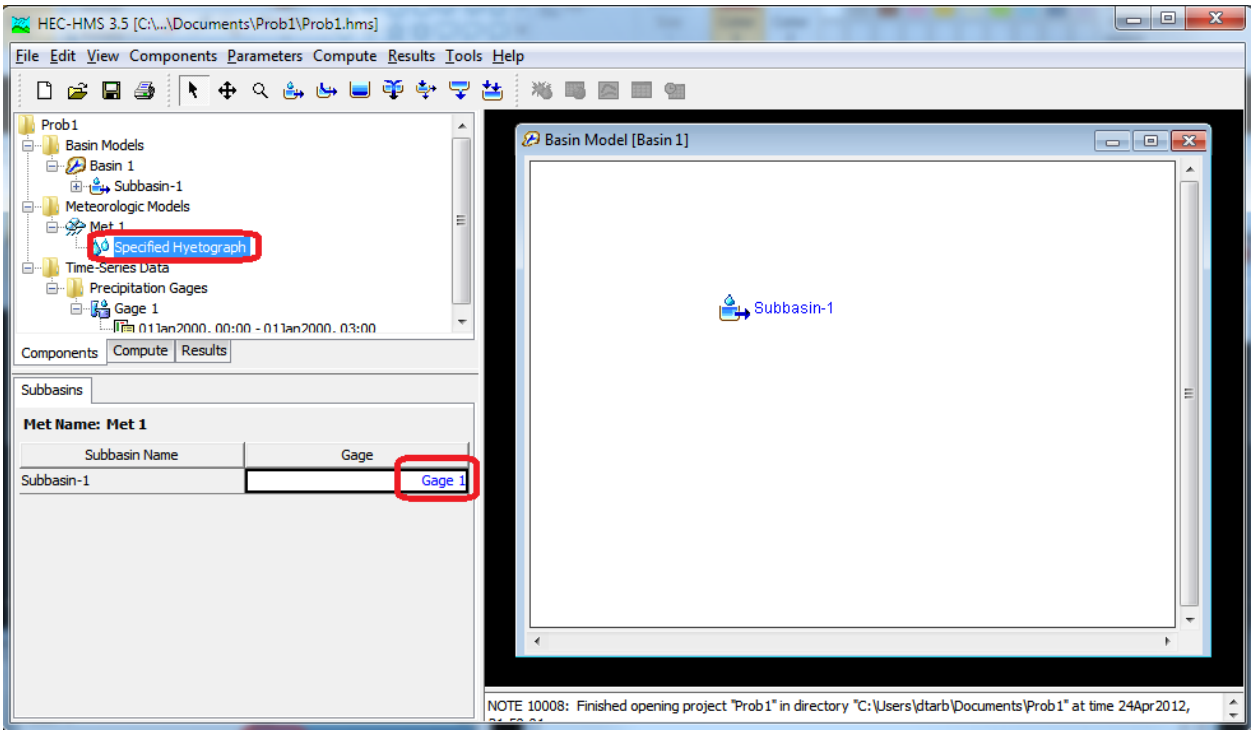
14. Select Components ->Meteorologic Model Manager, followed by New, Create, then close the Meteorologic Model Manager



15. The result is a meteorologic model in the table of contents that can be expanded. Click on the Met-1 Meteorologic model to activate its properties in the component editor, then click on Basins and in the Include Subbasins control click Yes



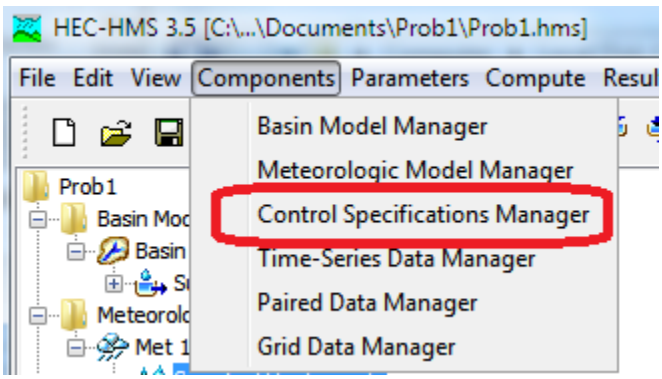
16. Next click on Specified Hyetograph under Met 1 in the table of contents and for Gage next to Subbasin-1 select Gage 1



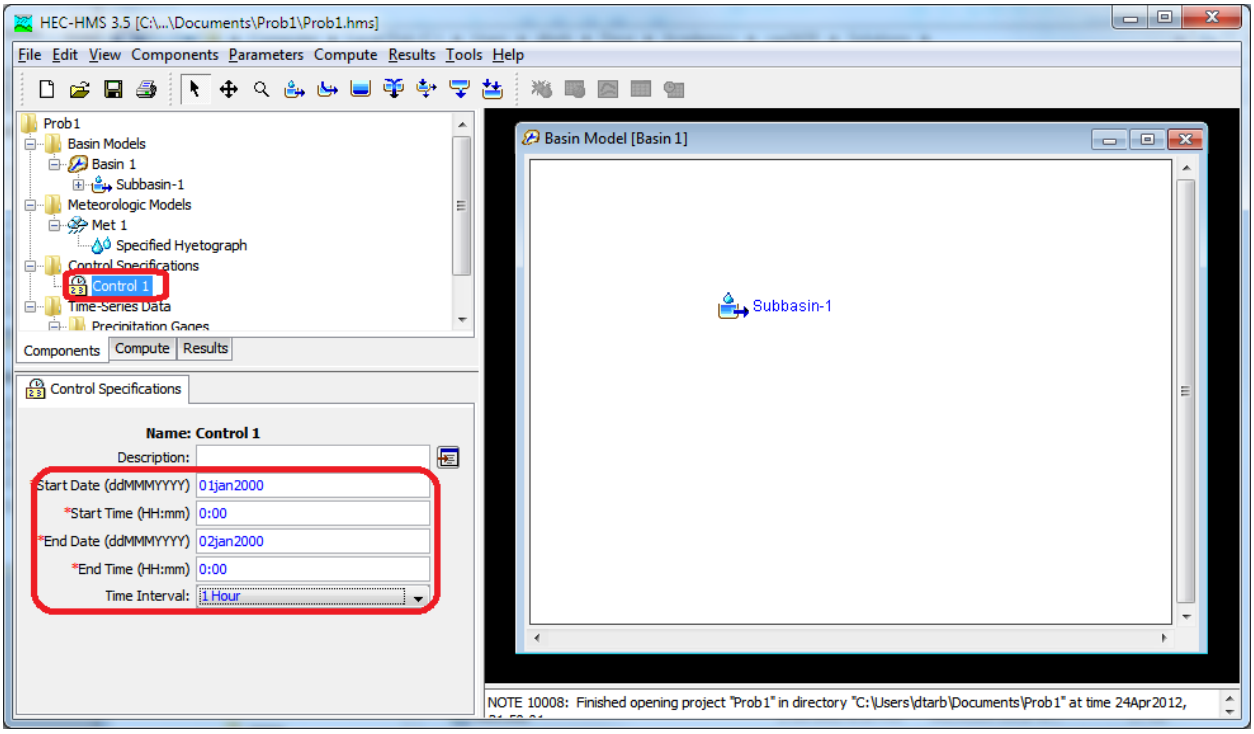
This associates data from precipitation gage "gage-1" with the input to Subbasin 1.

You are almost ready to run the model.

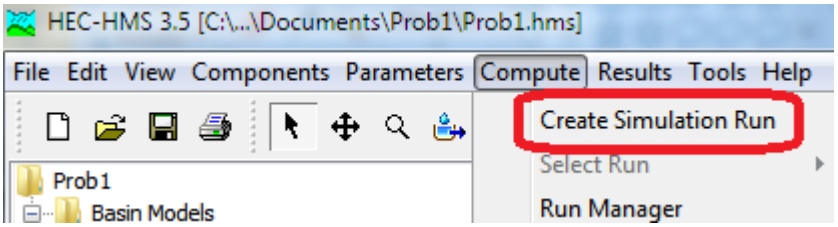
17. Select Components -> Control Specifications Manager, followed by New, Create, then close the Control Specifications Manager



18. Expand Control Specifications in the table of contents, click on Control-1 and specify the simulation start and end date and time. Use arbitrary times consistent with the times you used for the precipitation but for about 24 hours. Set the time interval to 1 hour

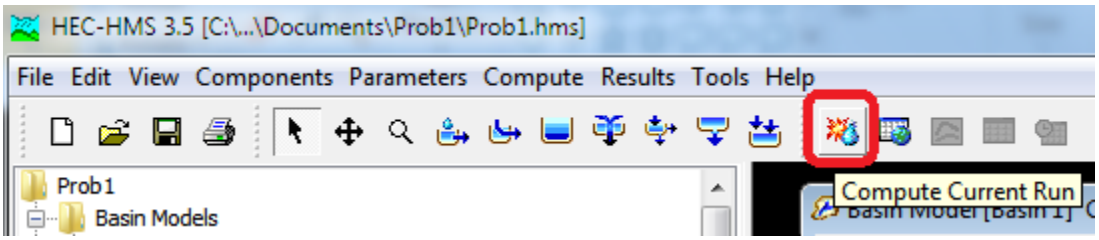


19. Now select Compute->Create Simulation Run. Click Next 3 times and Finish



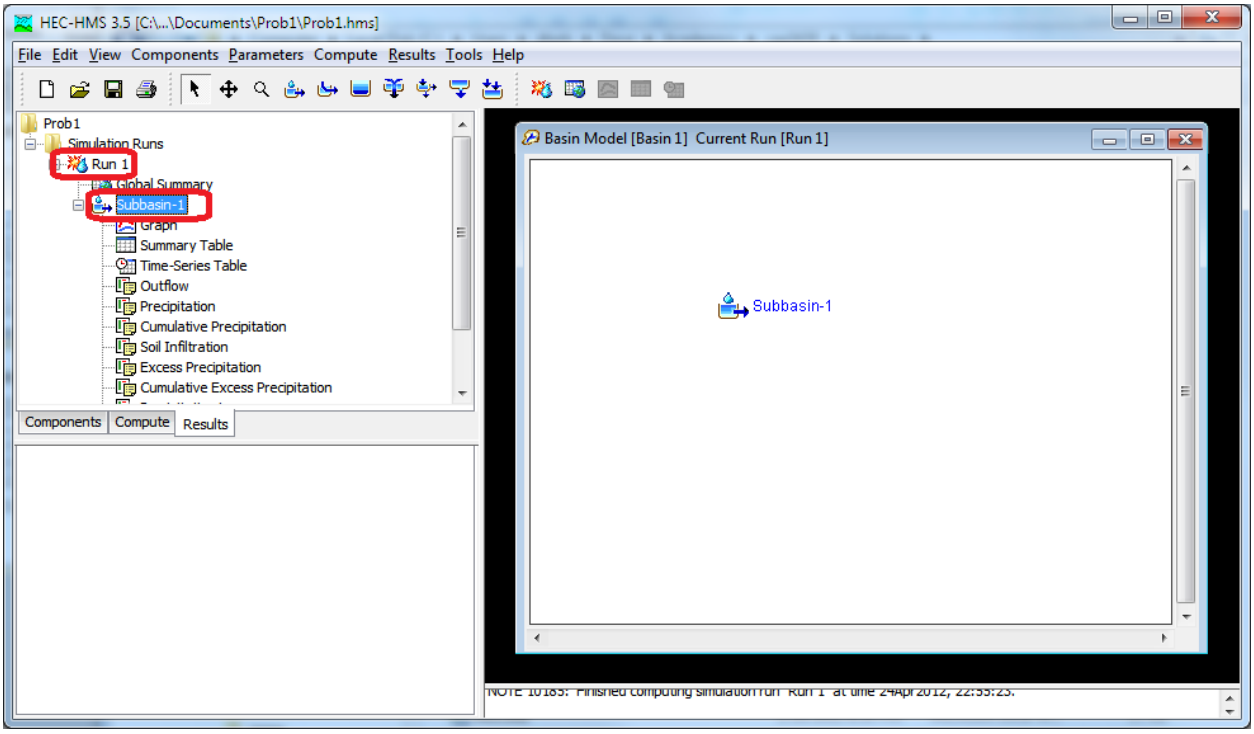
This sets the Basin, Meteorology and Control associated with the simulation run. This is done so that later, if desired the same basin could be simulated for a different time with different precipitation.

20. Click on the compute current run button

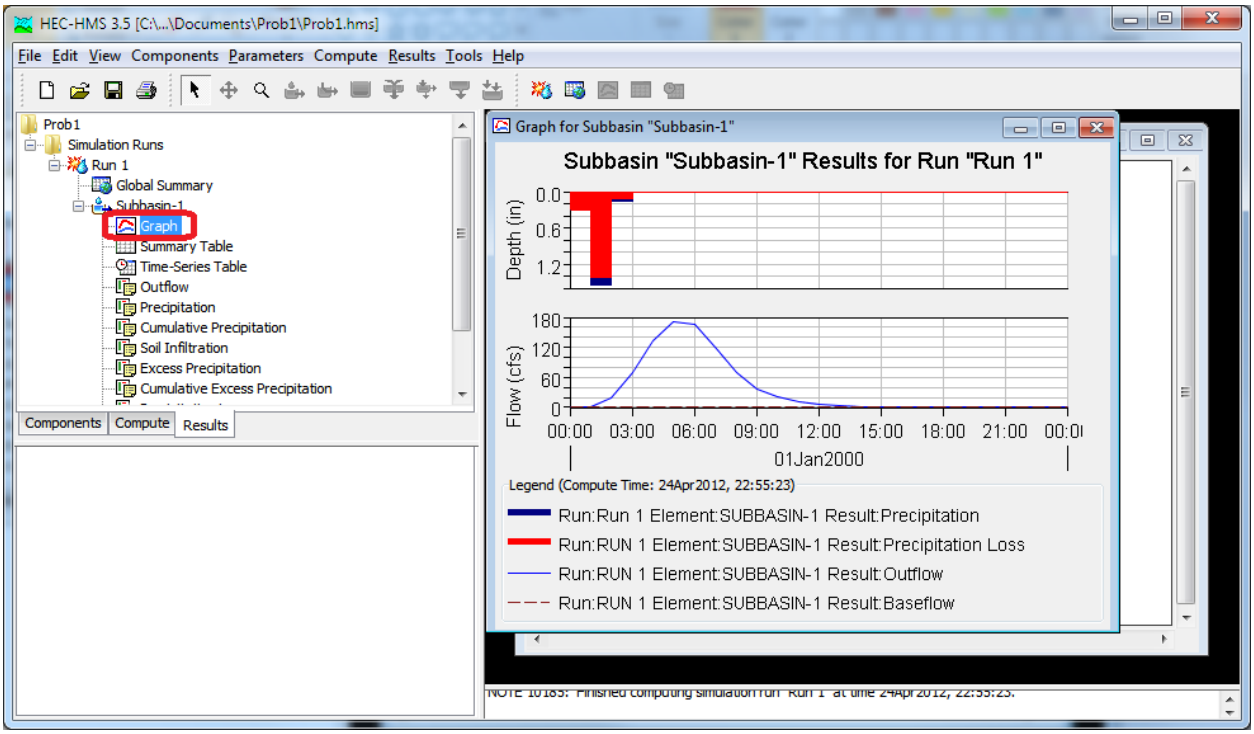


You should see a progress bar followed by indication of completion. If you get any errors it means that some input was not correctly set and you need to go back and check, deducing where to check from the error message.

21. In the table of contents click on the results tab and expand below Run 1->Subbasin 1



22. Click on Graph to get a display of the graphical results for Subbasin-1 (the only subbasin in this case).

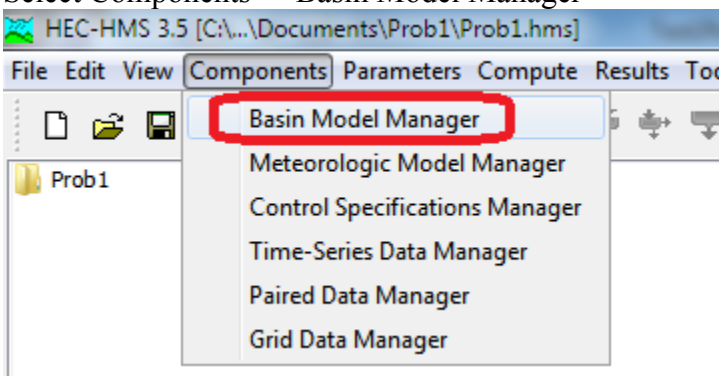


Also click on Summary Table or Time Series Table to see numerical results. You should note a total flow maximum similar to what you calculated by hand. There may be small differences due to HMS approximating the Snyder Unit Hydrograph using a modified Clark Unit Hydrograph.

Read off the peak flow from the table.

Solve Mays 9.2.2 using HEC-HMS

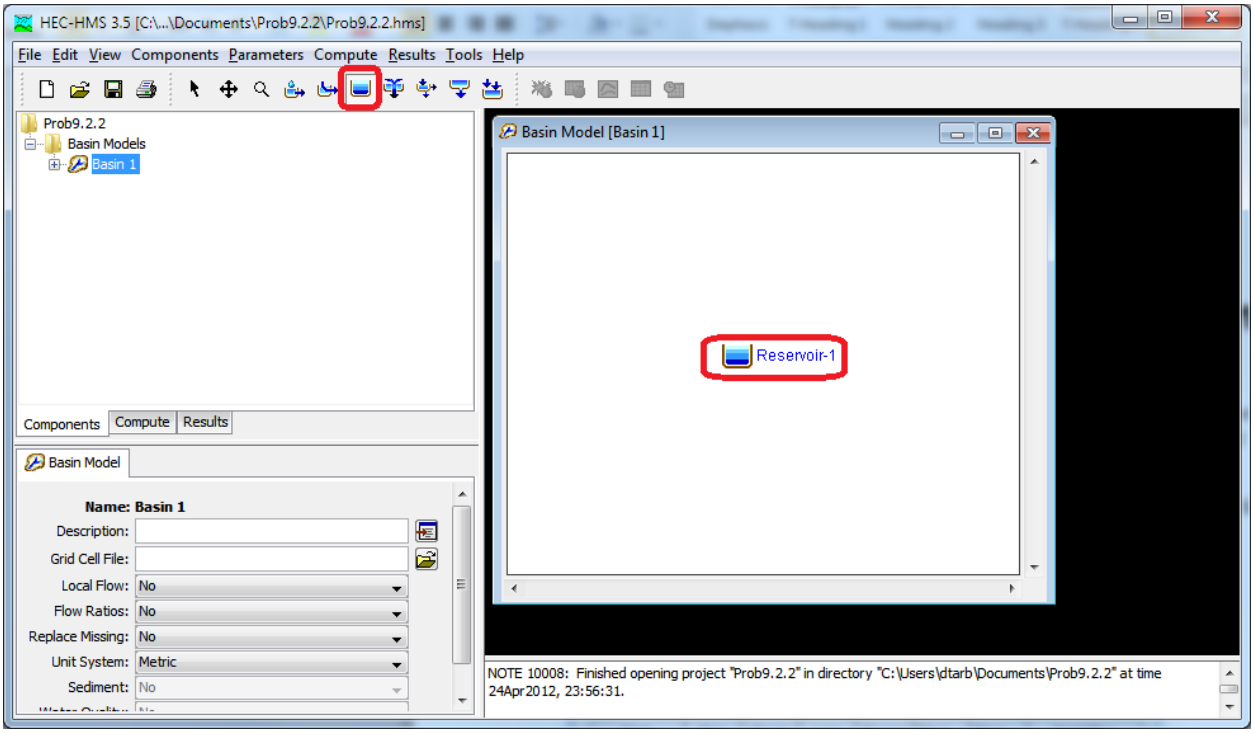
1. As before open HEC-HMS, create a new project. Use Metric Units
2. Select Components -> Basin Model Manager



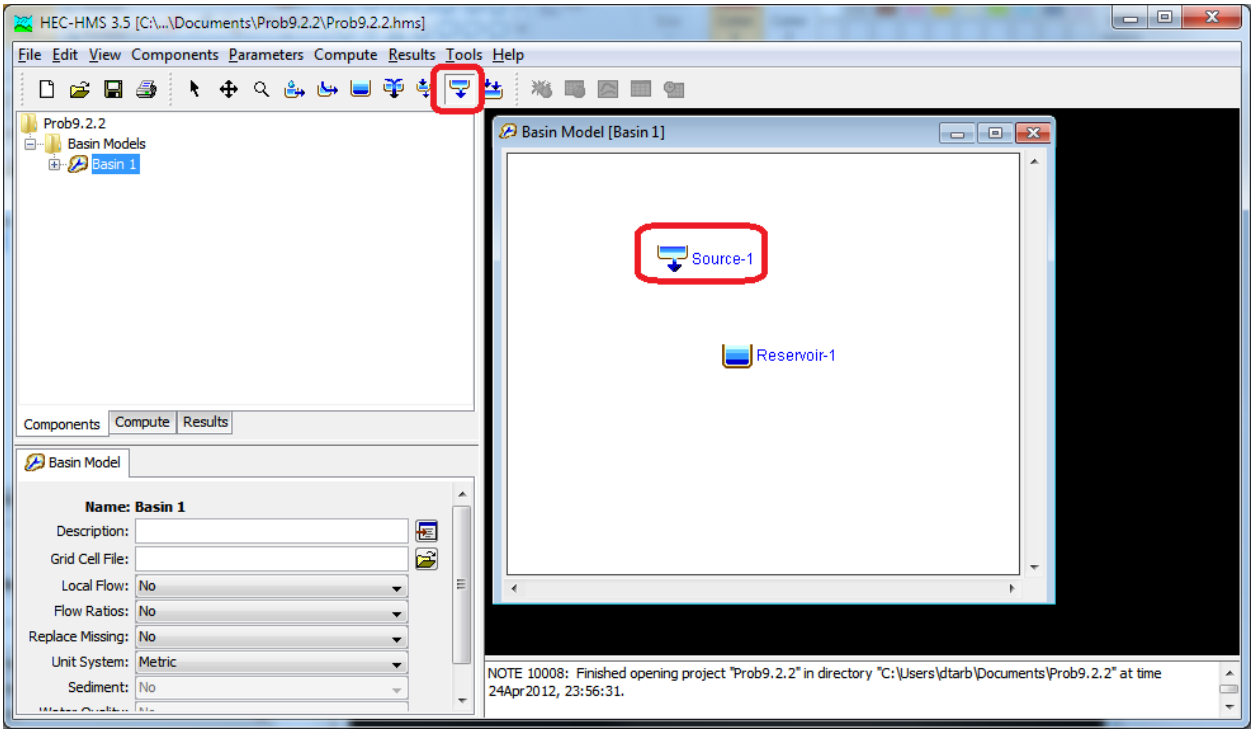
Click New, Create, Close the Basin Model Manager (You can keep the default names or pick names of your choosing).

Back in the main program expand the table of contents under basin models and click on the Basin symbol so that the Basin Model window appears

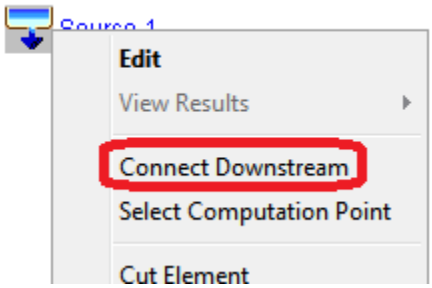
3. Click on the Reservoir Creation Tool and click in the Basin Model Window to create a Reservoir



4. Click on the Source Creation Tool and click in the Basin Model Window to create a Source.



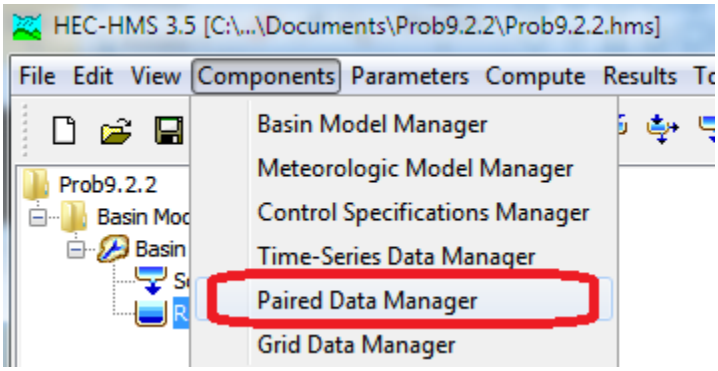
5. Click on the arrow tool and right click on the source, select connect downstream and click on the reservoir.



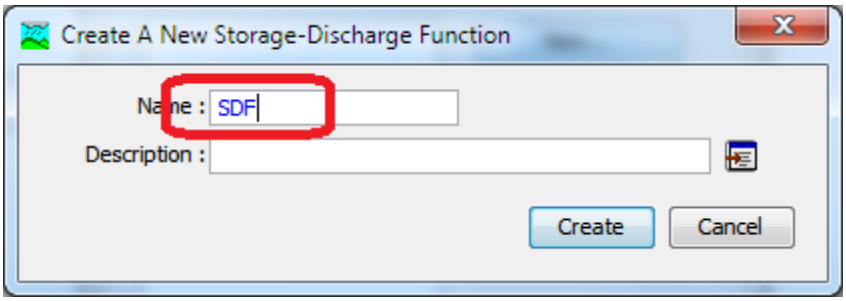
The result should be the reservoir connected to the source.

The Reservoir Storage-Discharge data needs to be entered as paired data.

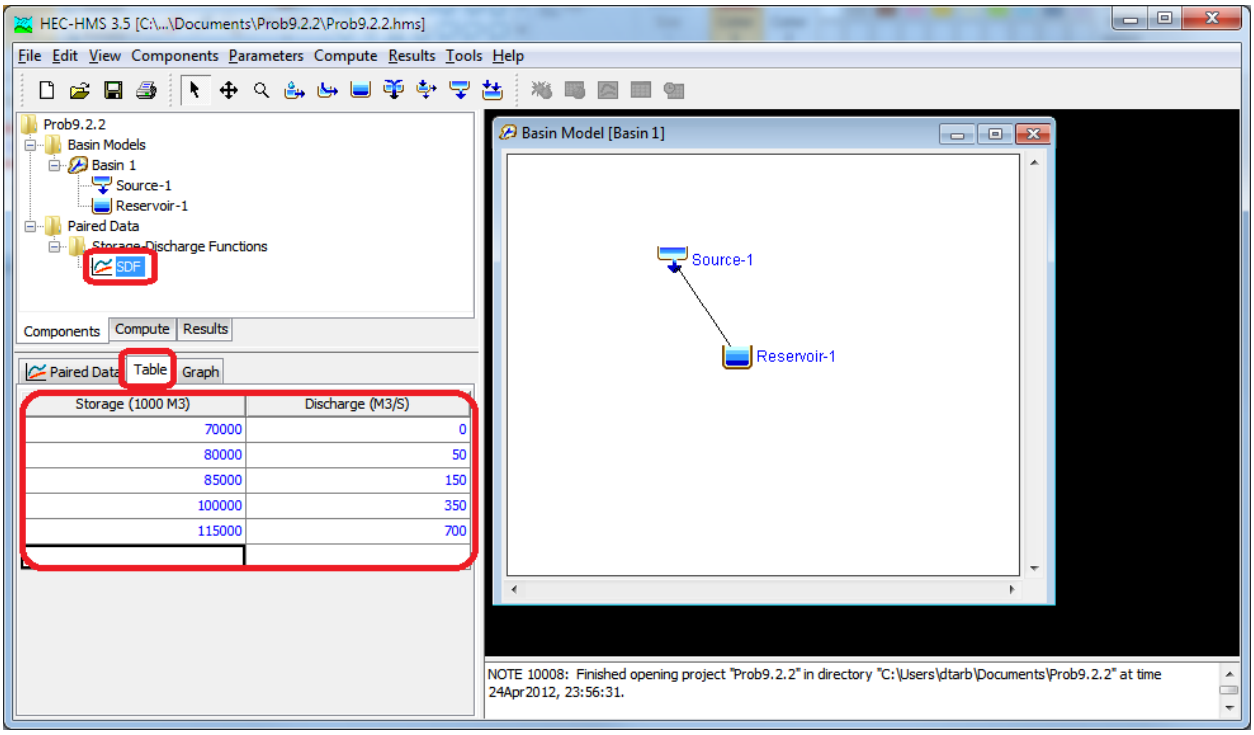
6. Select Components -> Paired Data Manager



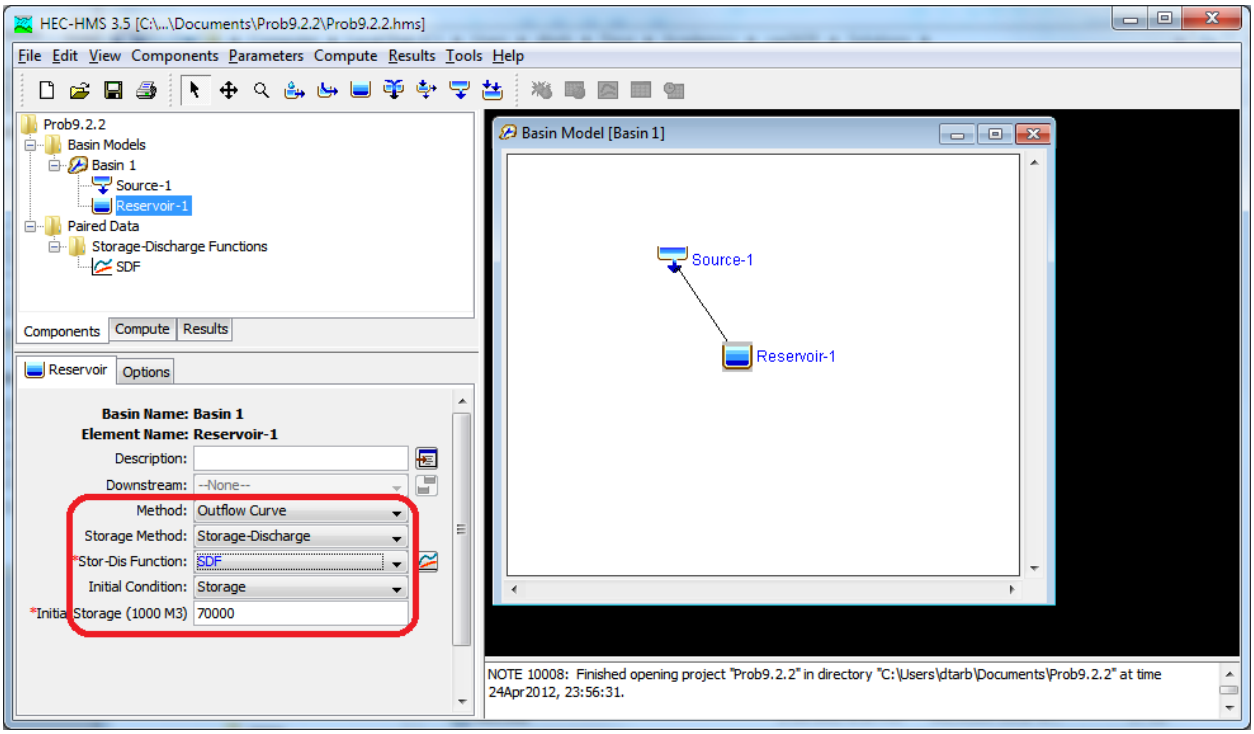
7. Ensure that the data type is Storage-Discharge Functions and select New. Specify the name as SDF and select Create, then close the Paired Data Manager



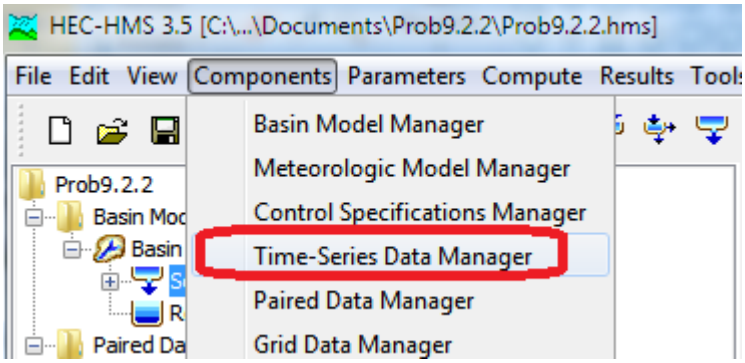
8. In the table of contents select SDF and the Table tab and enter the data from the problem



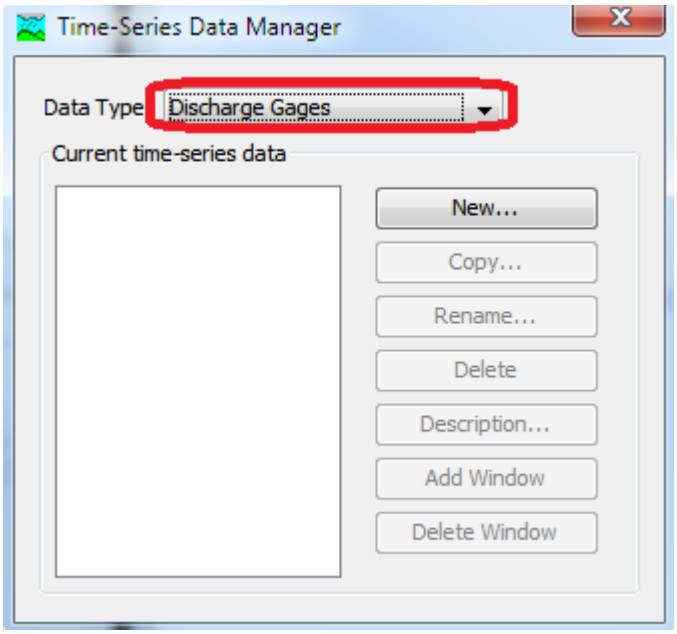
9. Select the Reservoir and in the component editor set the Reservoir properties as needed for this problem.



10. Select Components -> Time-Series Data Manager

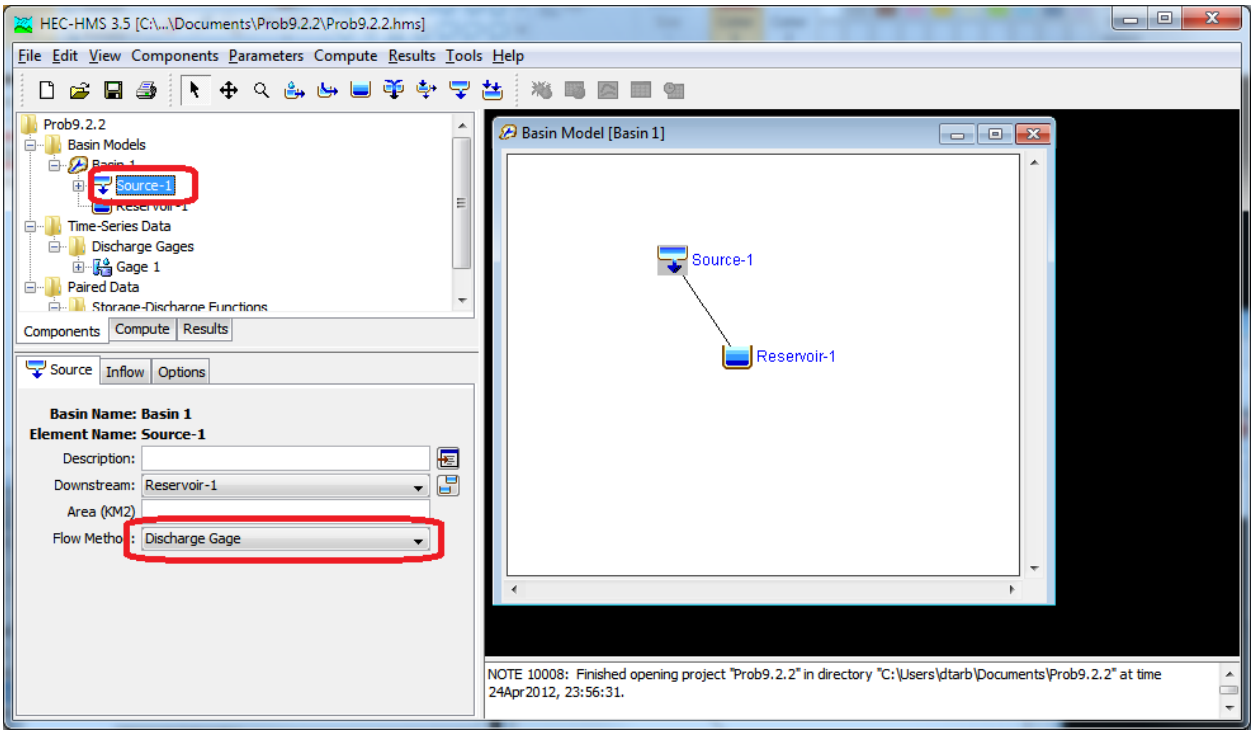


11. Select the data type as Discharge Gages, Click New and Create, noting the default name "Gage-1" for the discharge gage created

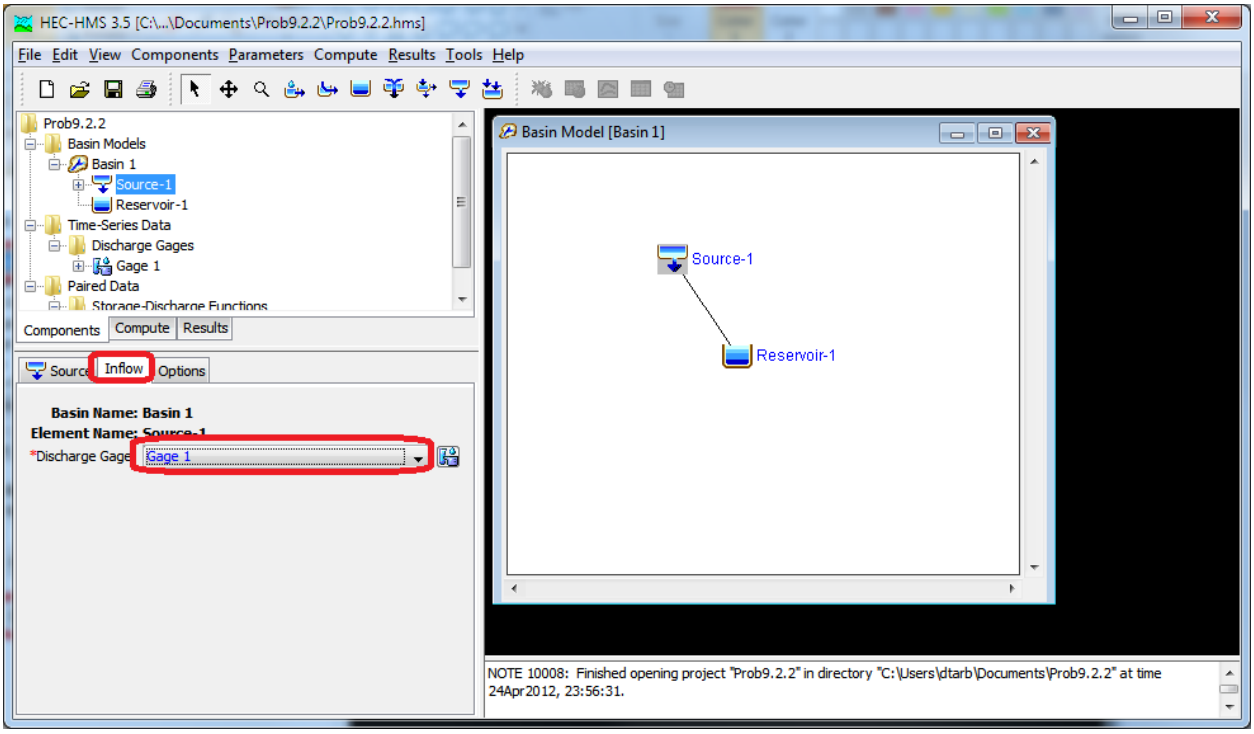


The discharge gage will be used to provide the discharge as Source-1 which is the inflow to the reservoir.

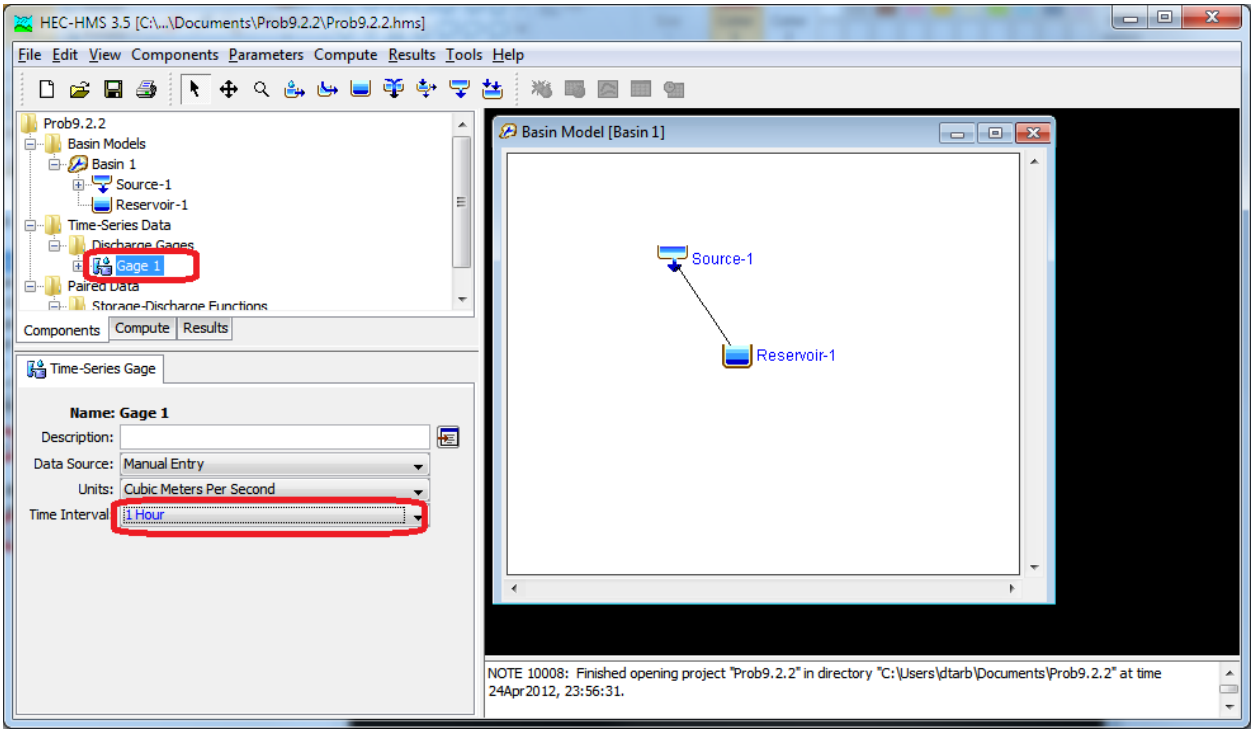
12. Select Source 1 and in the component editor ensure that the Flow Method is Discharge Gage



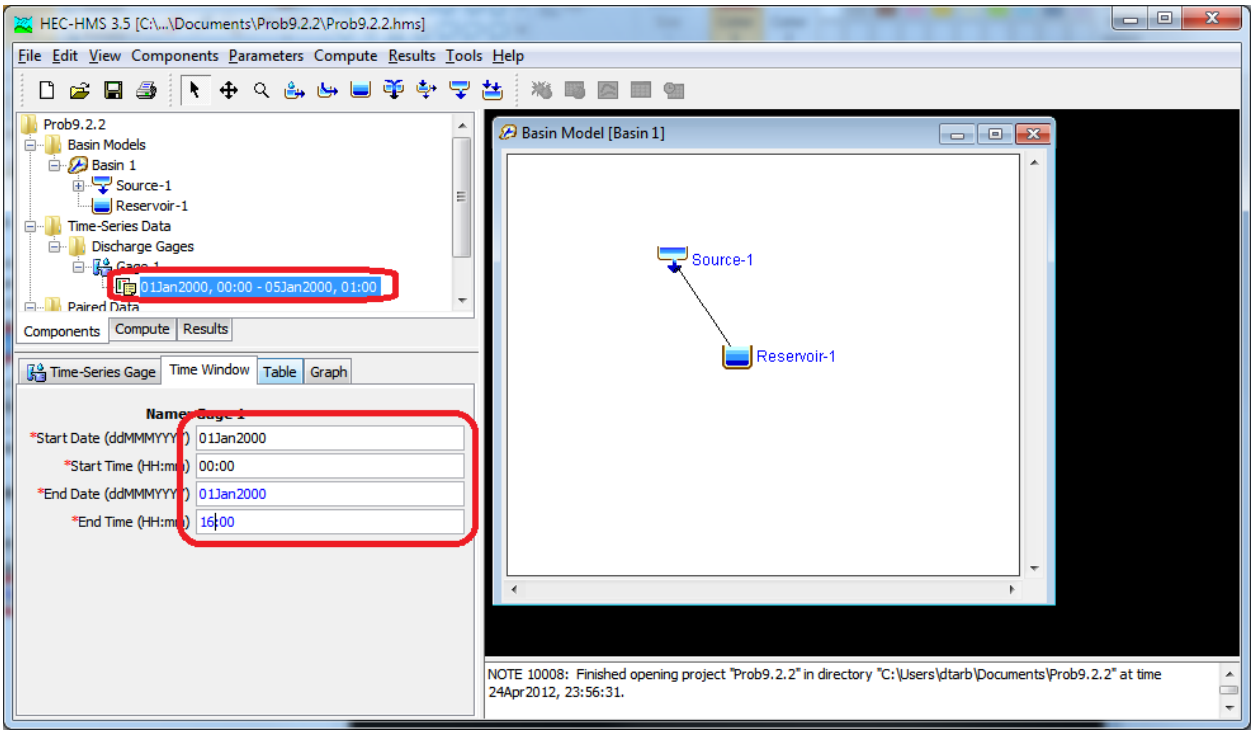
13. Select the inflow tab and set the Discharge Gage to Gage 1



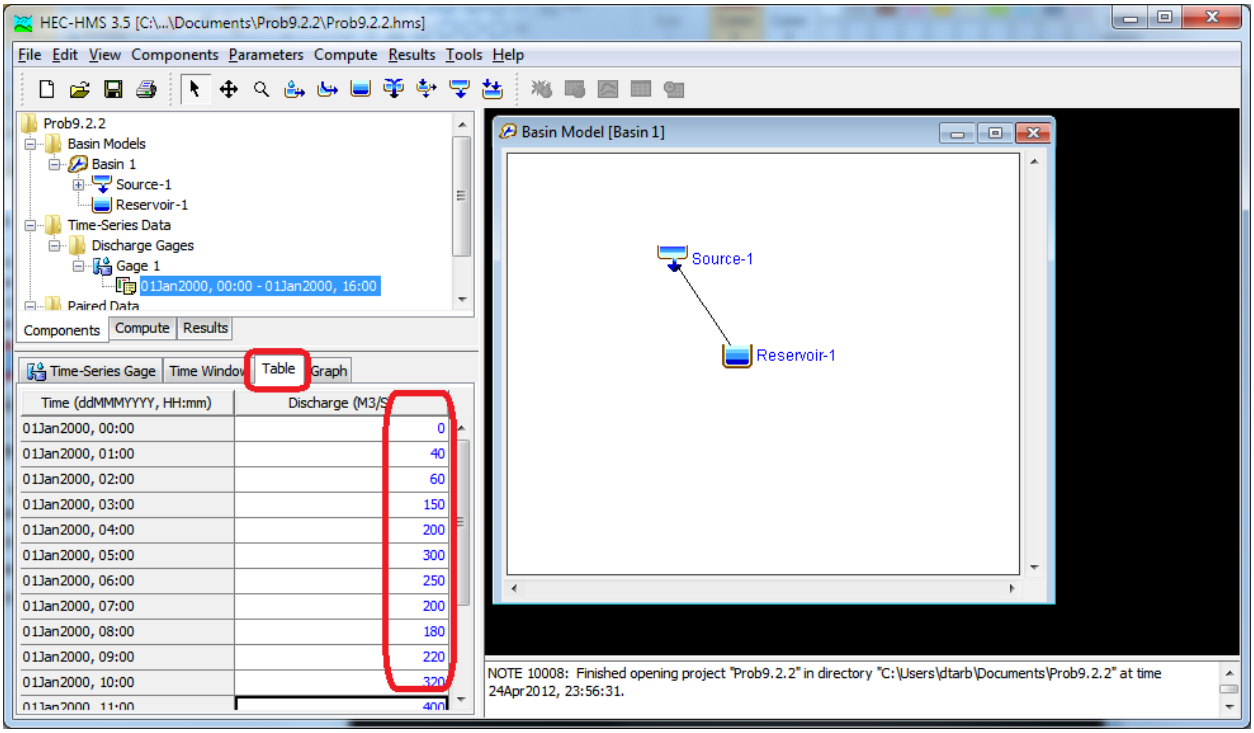
14. Click on Gage-1 and in the component editor set the time interval



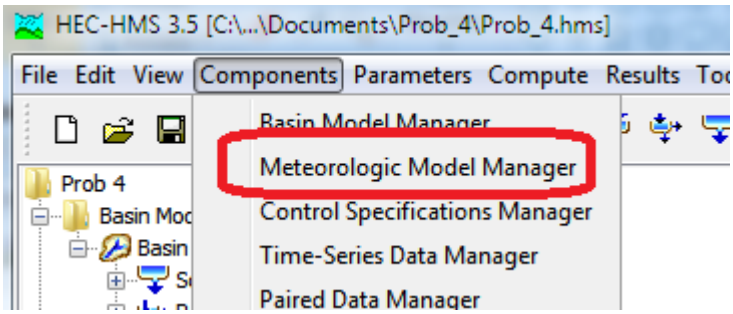
15. Expand Gage 1 to see the Time Window. Set start and end dates to be from 0 to 16 hr on a convenient date



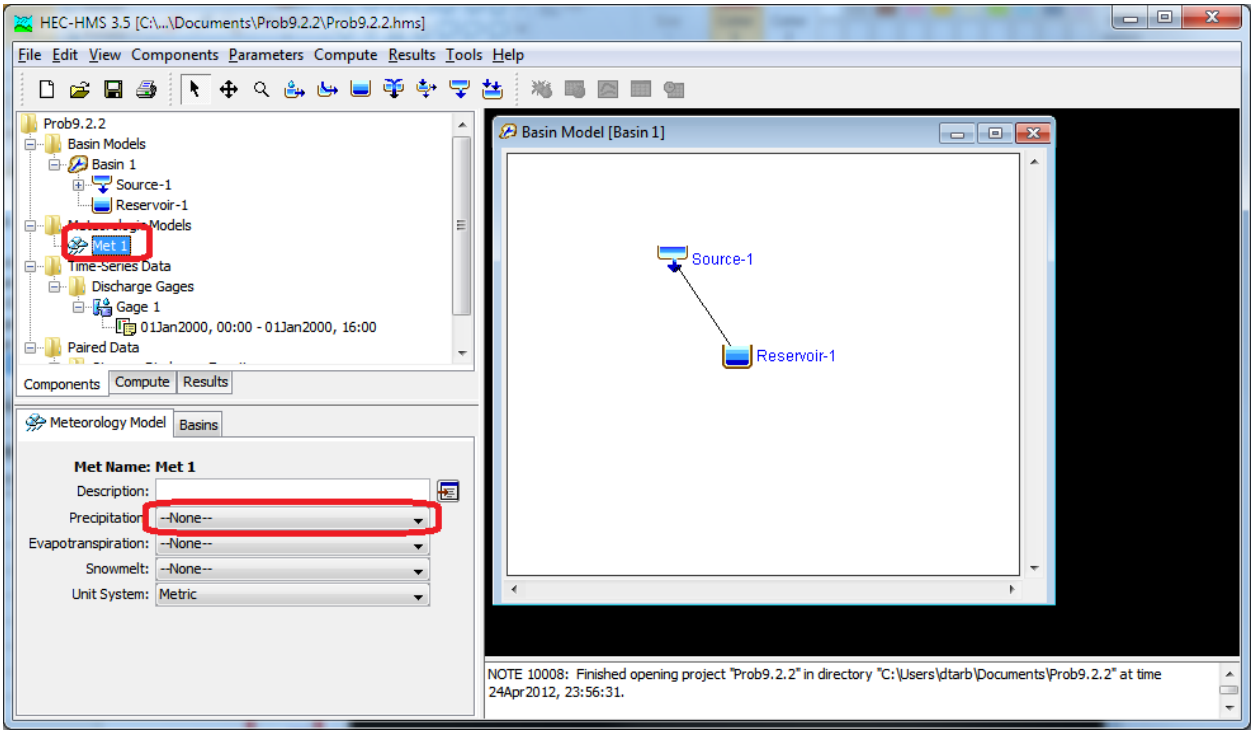
16. Select the table tab and enter the inflows from the problem



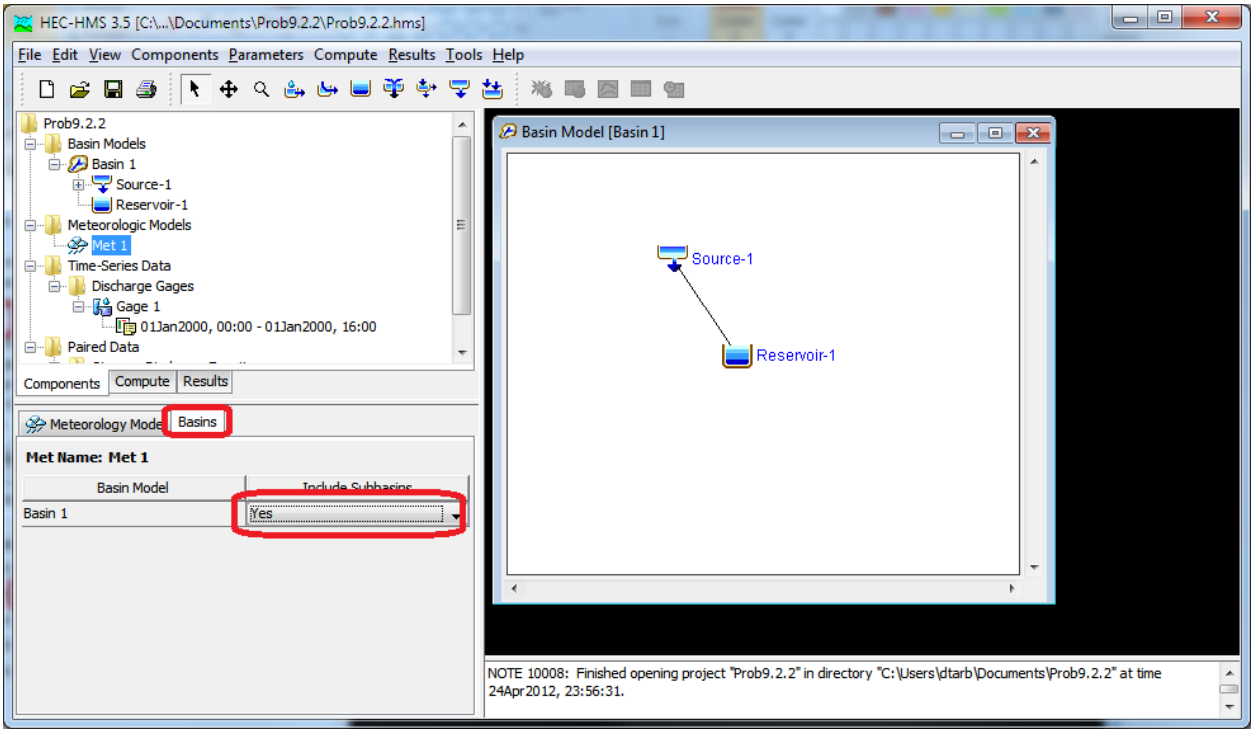
17. Create a Meteorologic Model using the Meteorologic Model Manager. Click New and Create and Close the Meteorologic Model Manager



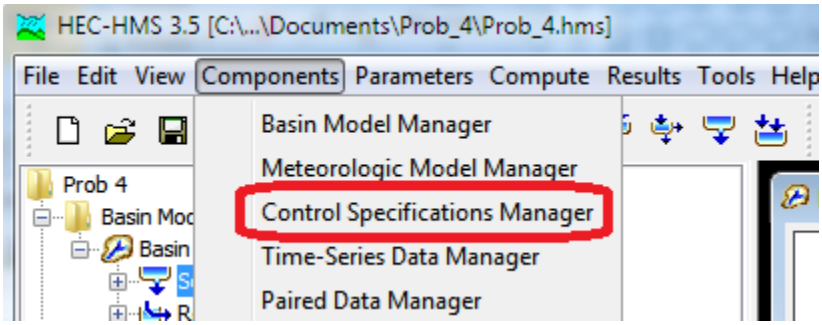
18. Select the Met-1 Meteorologic Model and set the precipitation to none



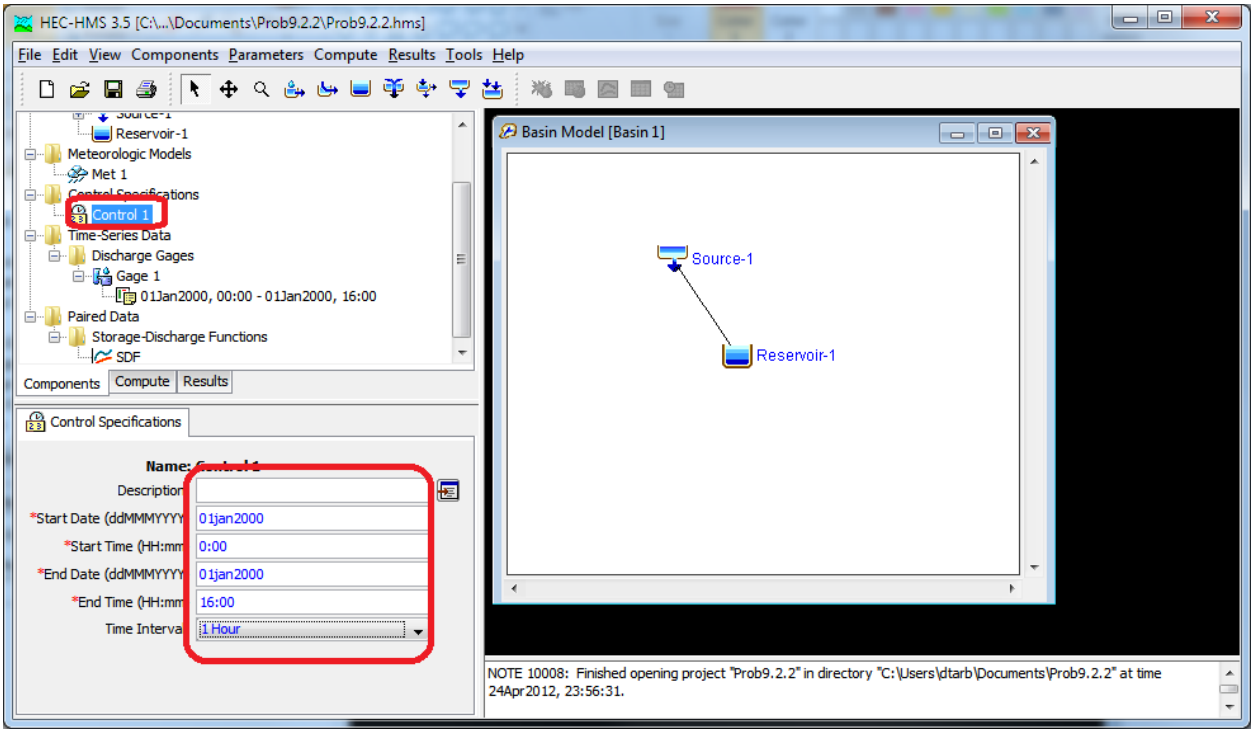
19. Click on the Basins tab and set Yes for Include Subbasins



20. Create a control specification using the Control Specifications Manager



21. Specify start and end times for the Control Specification.



22. Select Compute->Create Simulation Run and go through the steps of setting up a run.

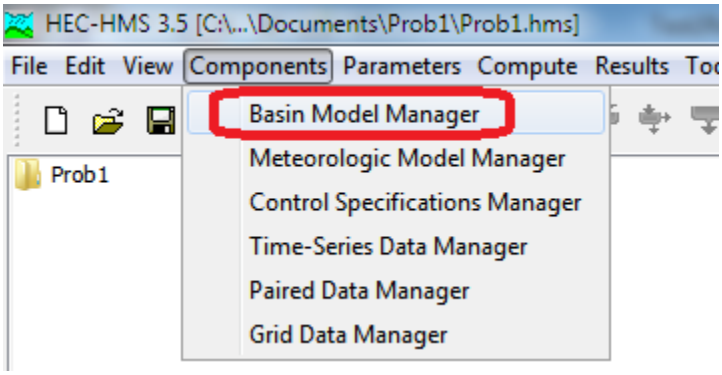
23. Click on the Compute Current Run button to run the model.

24. In the table of contents click on the results tab and examine the results

Mays 9.3.6

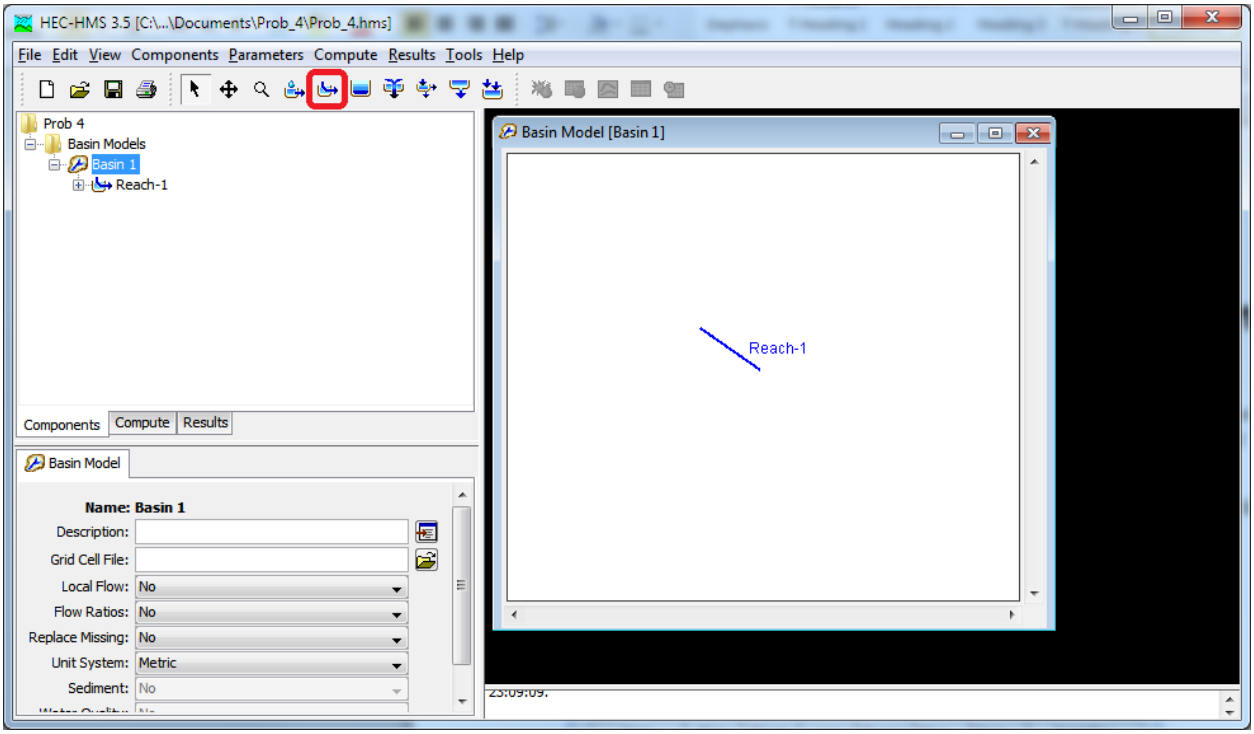
9.3.6 Use the U.S. Army Corps of Engineers HEC-HMS computer program to solve Problem 9.3.5.

1. As before open HEC-HMS, create a new project. Use US Customary Units
2. Select Components -> Basin Model Manager

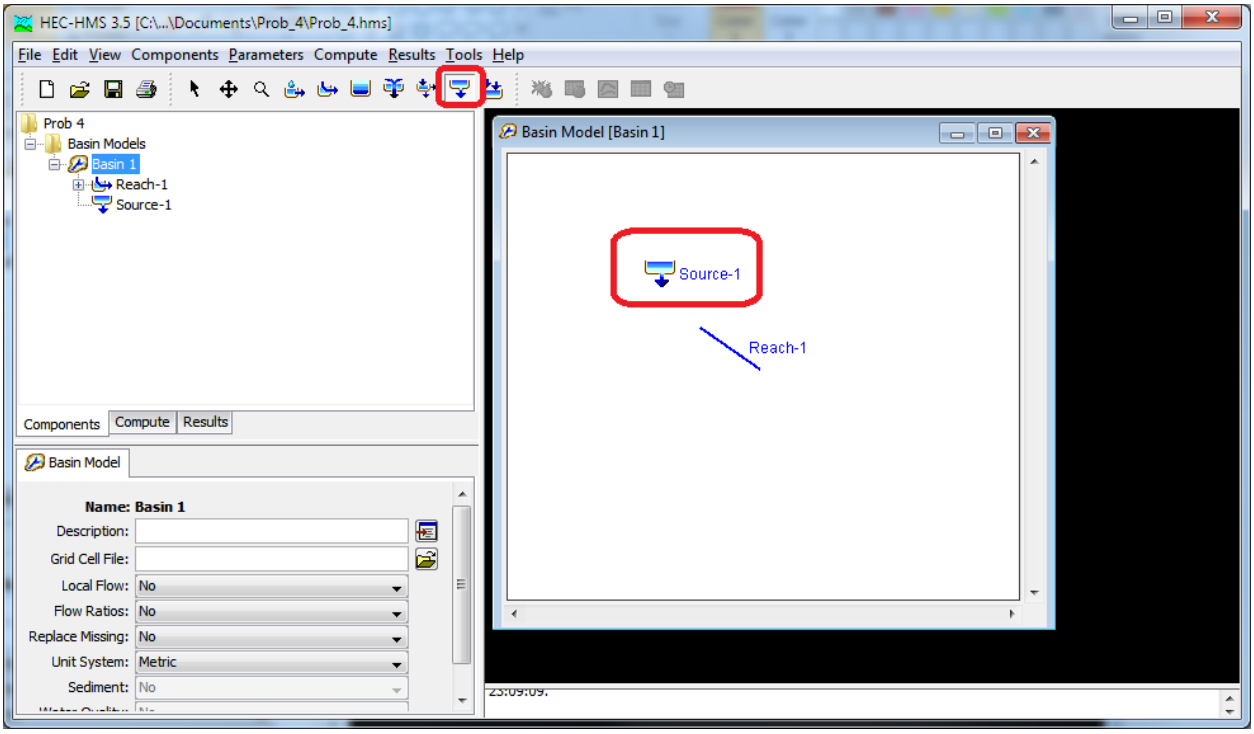


Click New, Create, Close the Basin Model Manager (You can keep the default names or pick names of your choosing).
Back in the main program expand the table of contents under basin models and click on the Basin symbol so that the Basin Model window appears

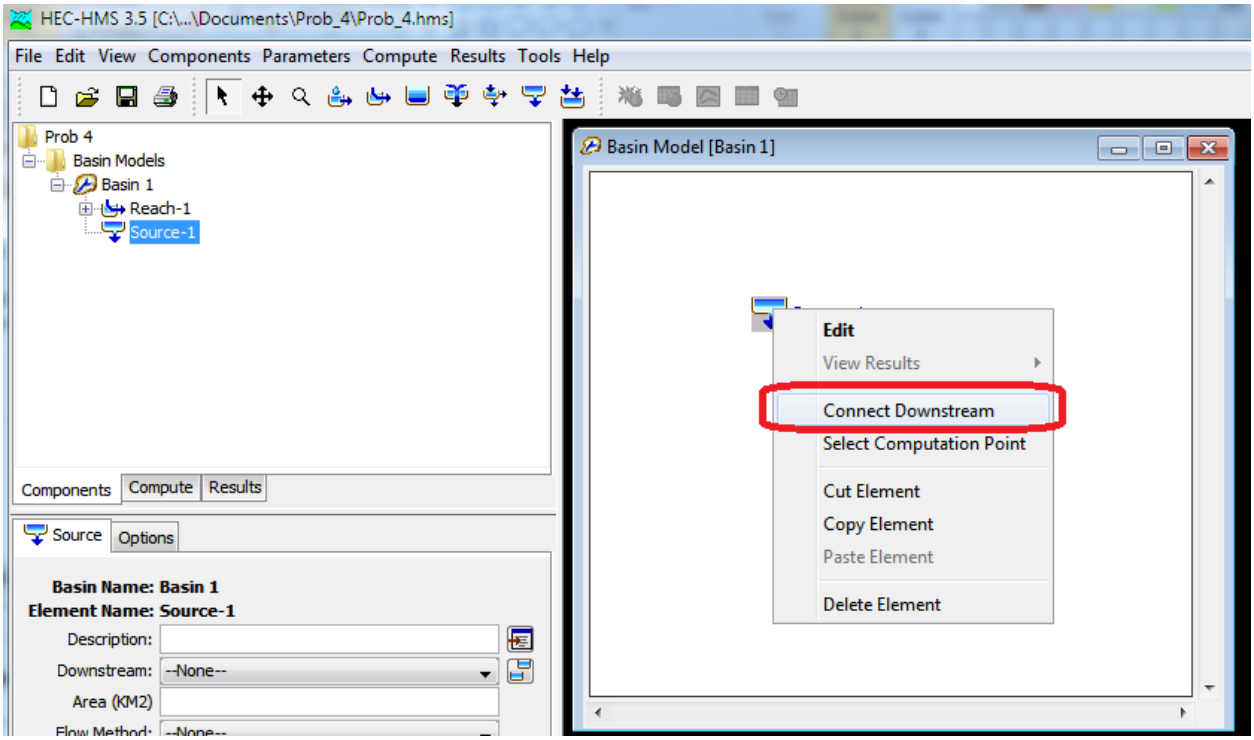
3. Click on the Reach creation tool and click twice in the Basin Model Window, then click Create to create a Reach.



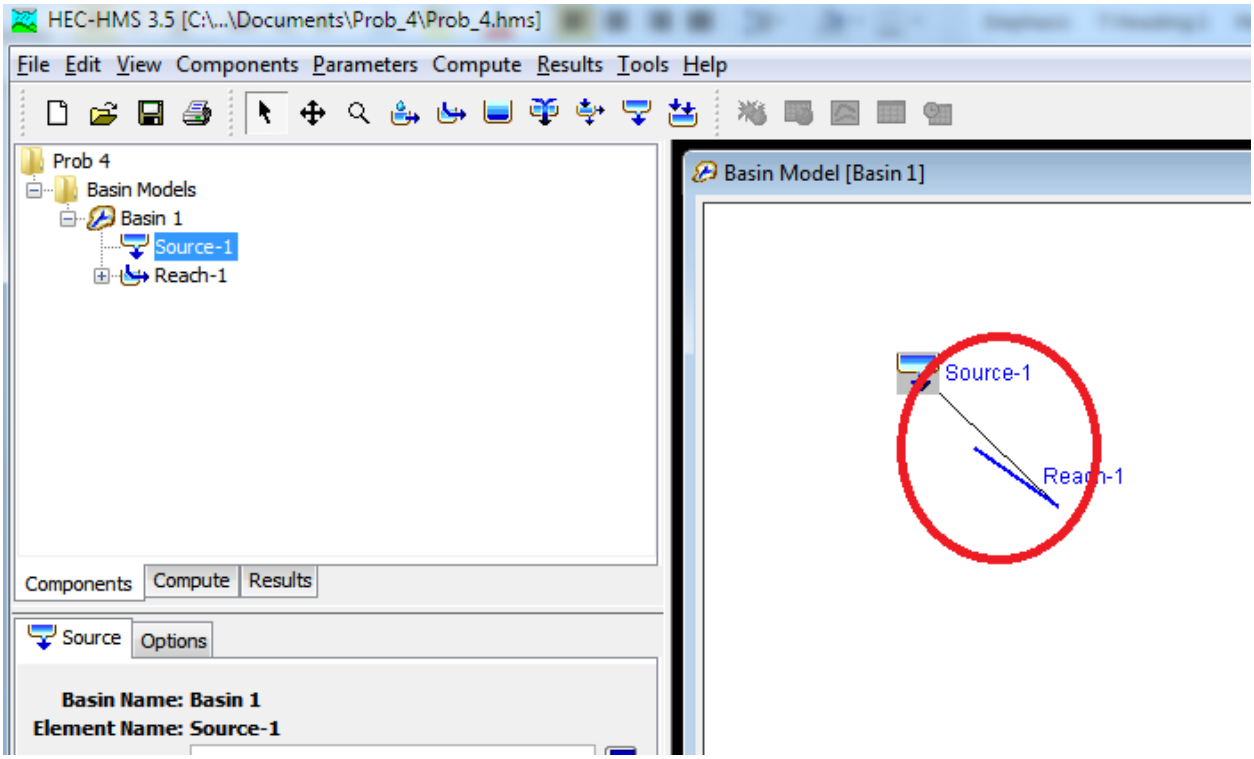
4. Click on the Source Creation Tool and click in the Basin Model Window to create a Source.



5. Click on the Arrow Tool, Right click on the Source and select "Connect Downstream" then click on the Reach.

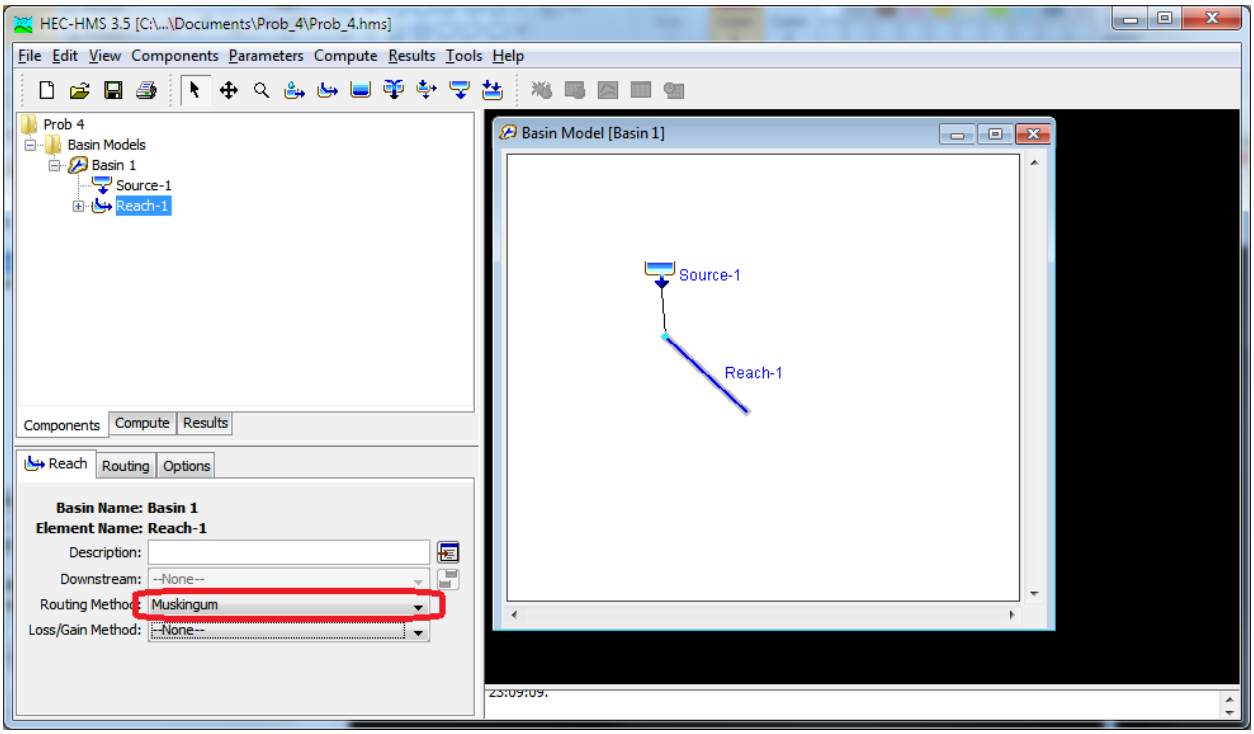


The source should now be connected to the Reach as indicated

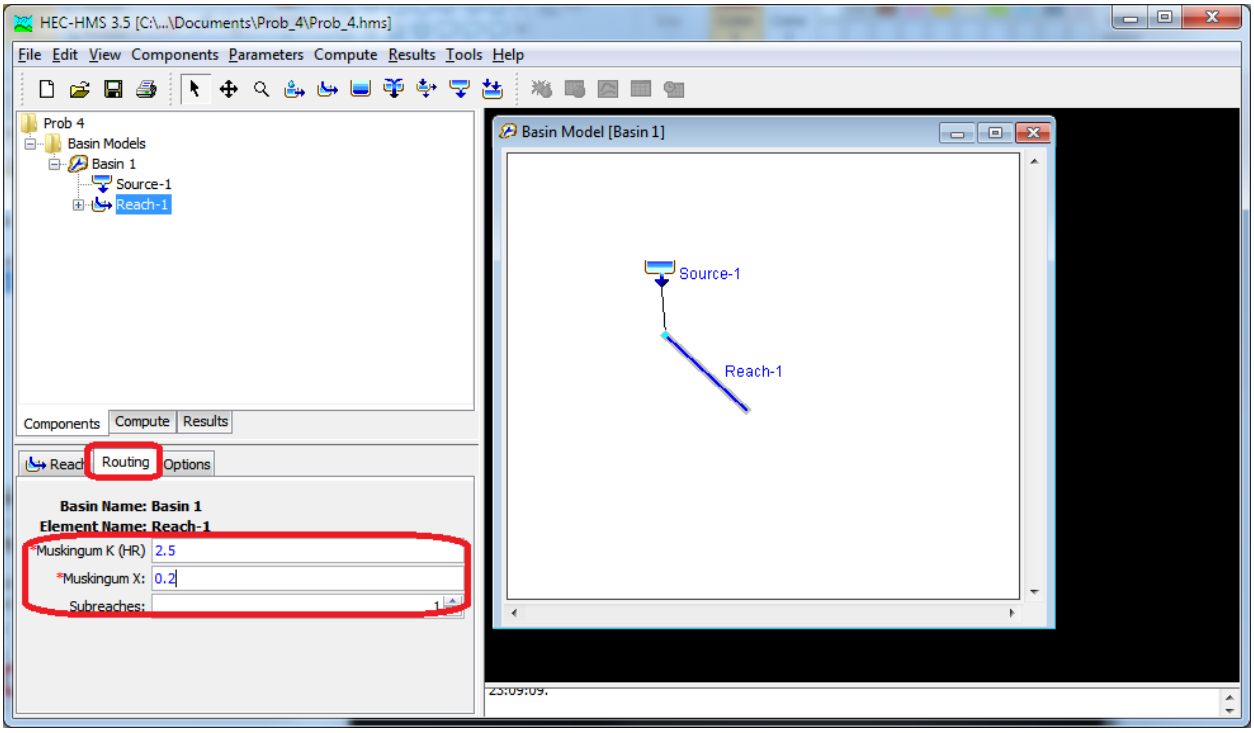


If necessary use the arrow tool to move objects around on the basin model to look better.

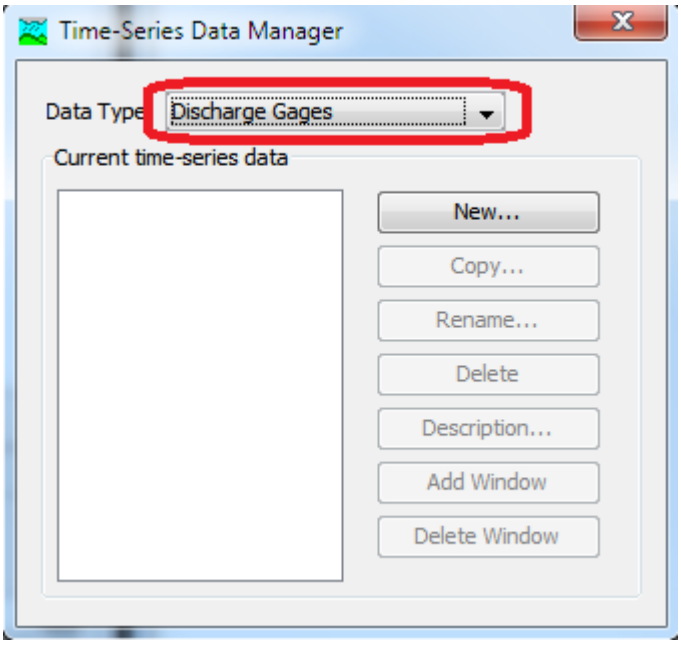
6. As you did earlier click on each of the objects to set properties. For the reach set the routing method to Muskingum



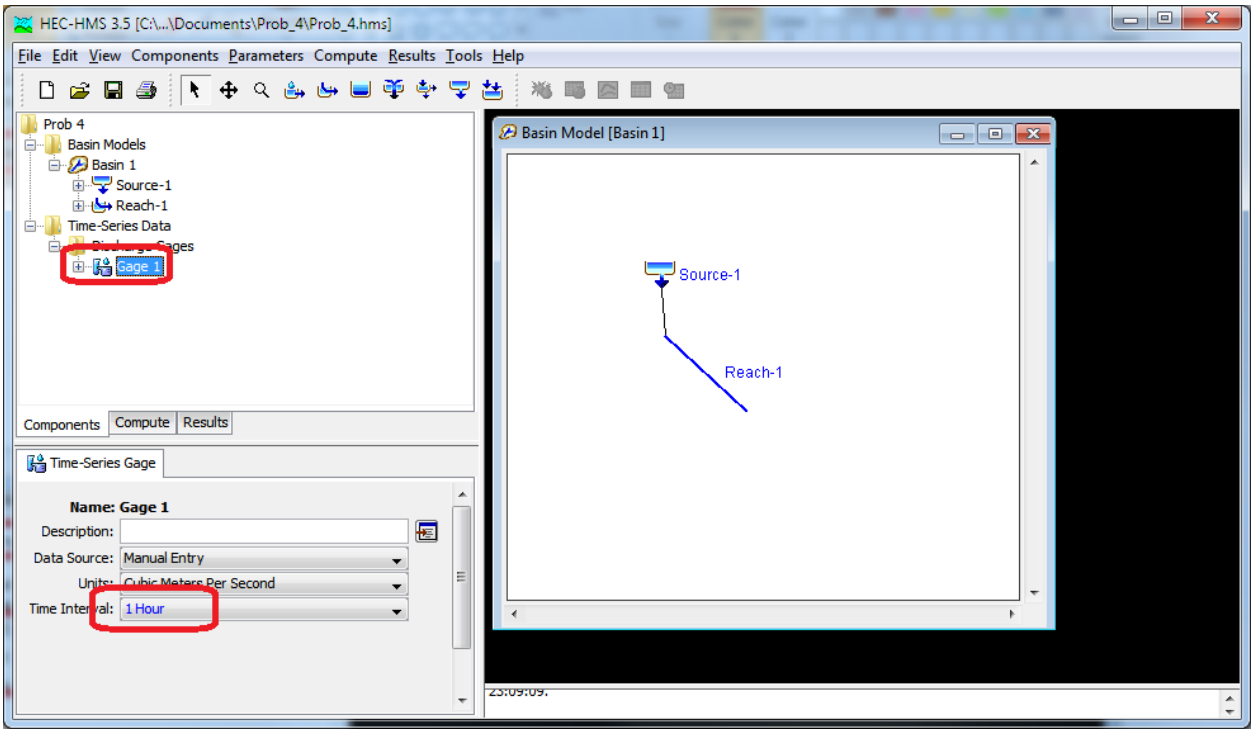
7. Click on the Routing tab and enter the parameters from the problem



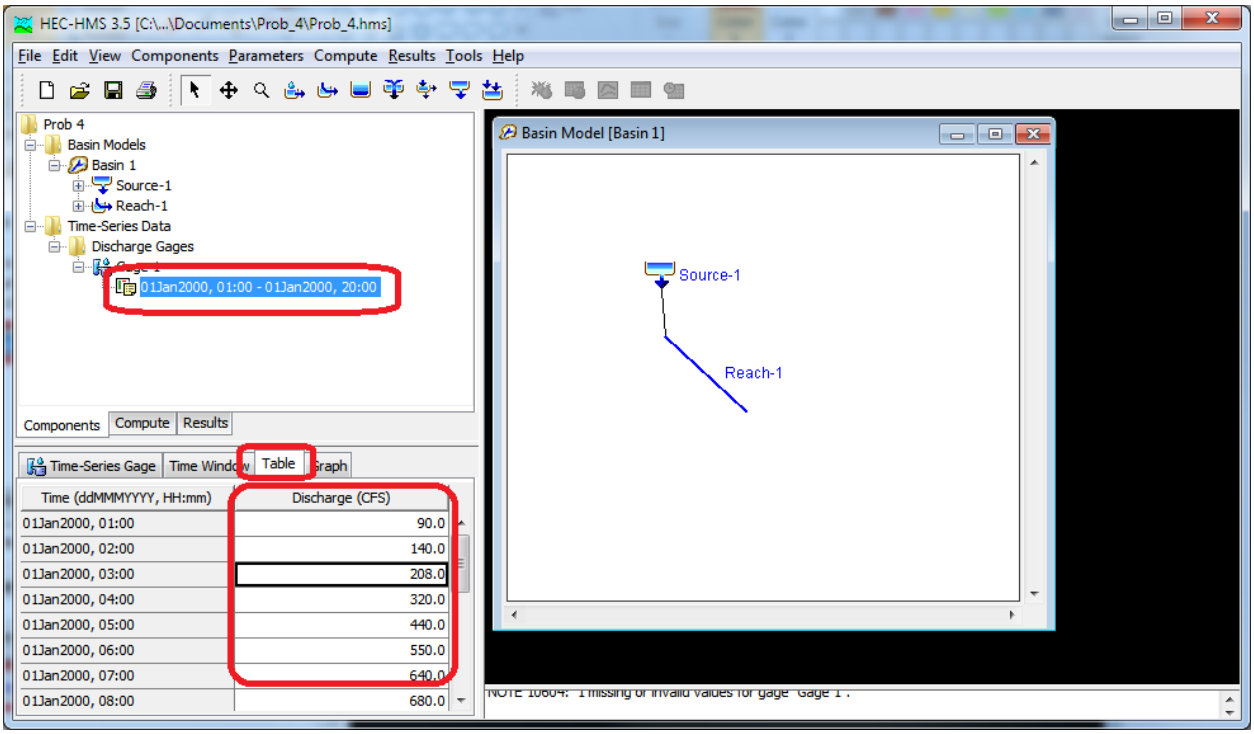
8. Click on Components->Time Series Data Manager. Set the Data Type as Discharge Gages, Click New and Create



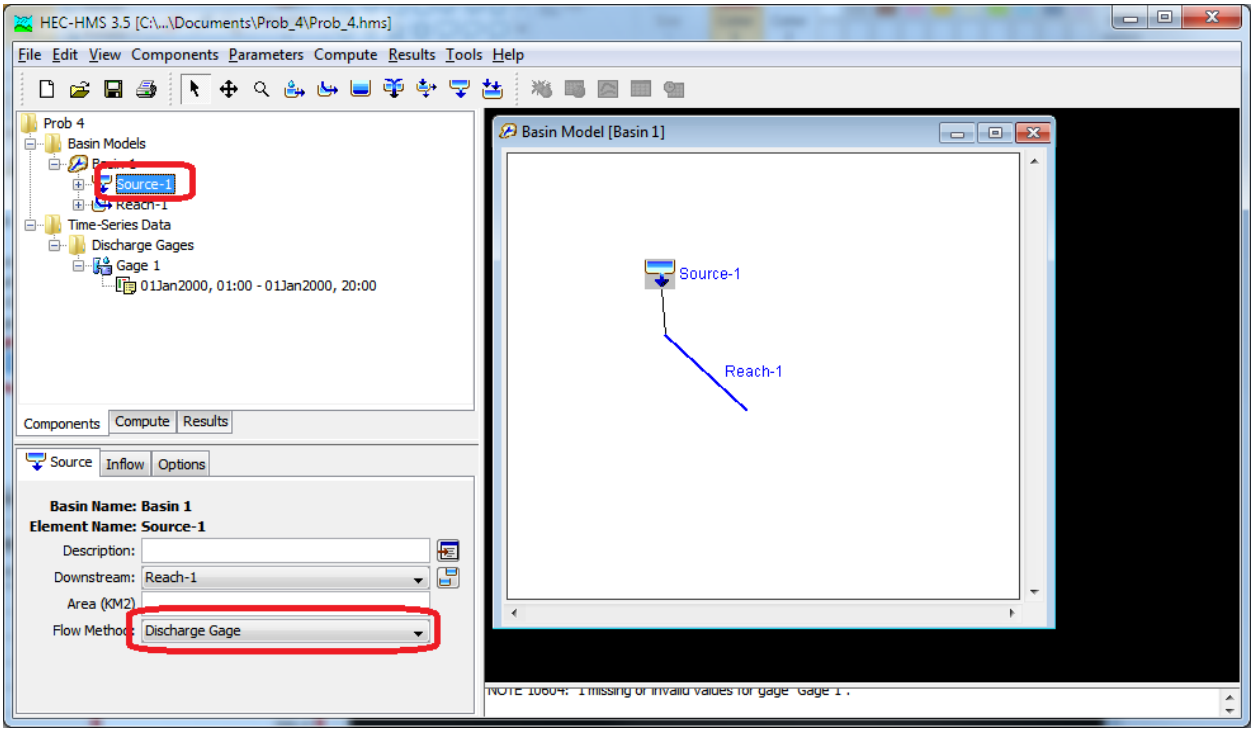
9. Click on the Discharge Gage in the table of contents, set the time step to 1 hour



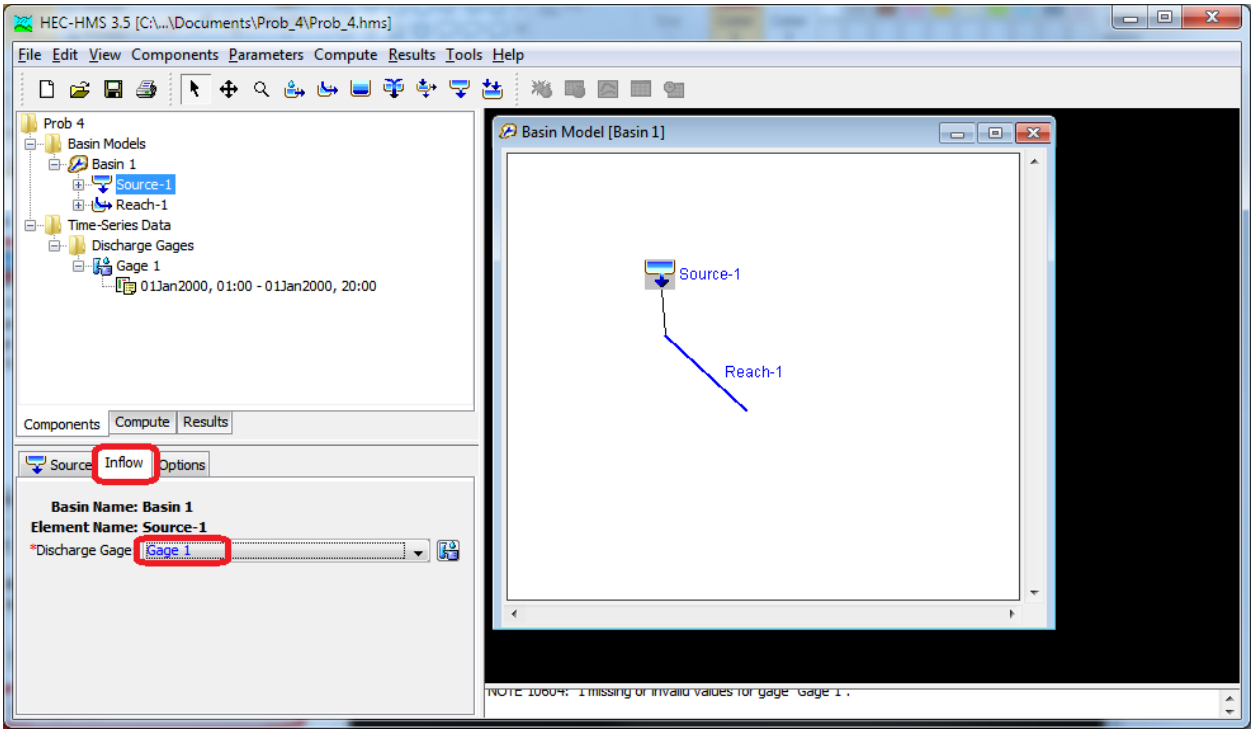
10. Expand to see the time window for the discharge gage and as you have done for other problems enter the upstream inflow data



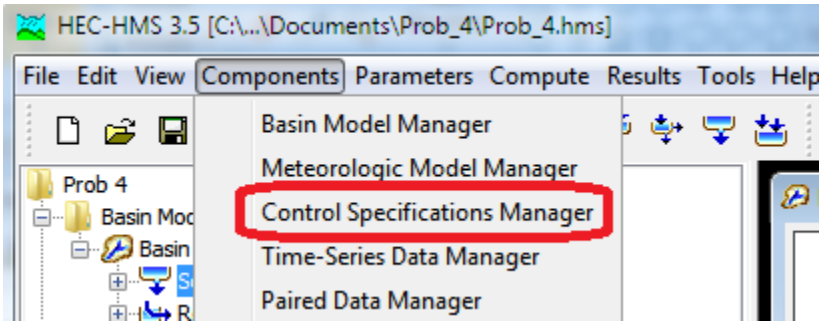
11. Click on Source-1 and set the flow method to discharge gage



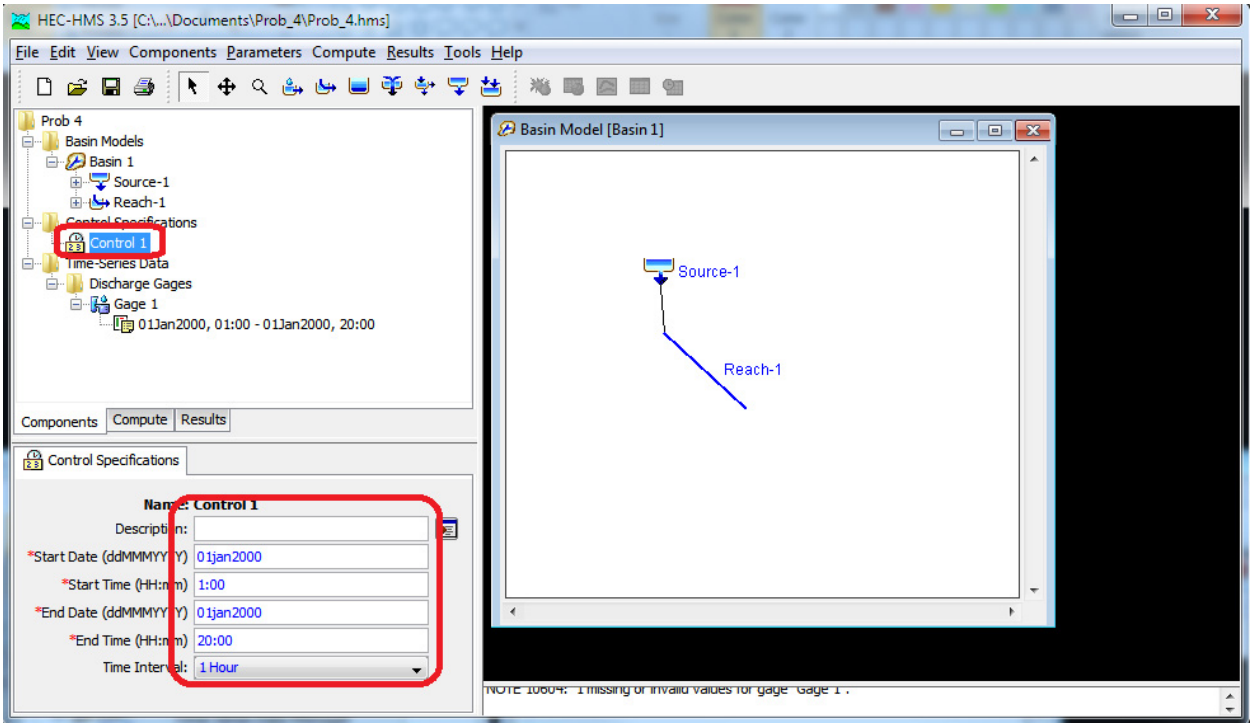
12. Click on the Inflow tab and select Gage 1 for Discharge Gage.



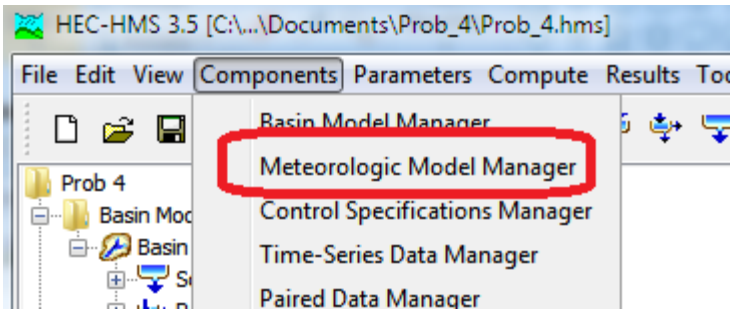
13. Create a control specification using the Control Specifications Manager



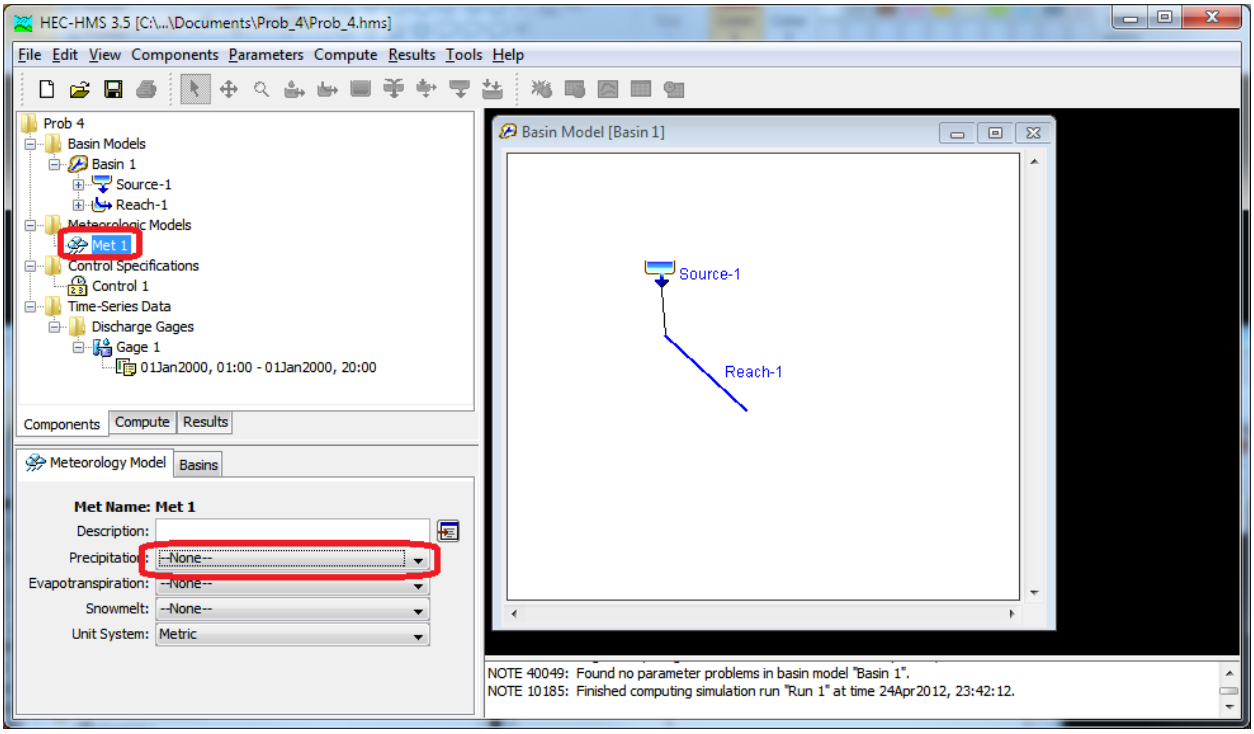
14. Specify start and end times for the Control Specification.



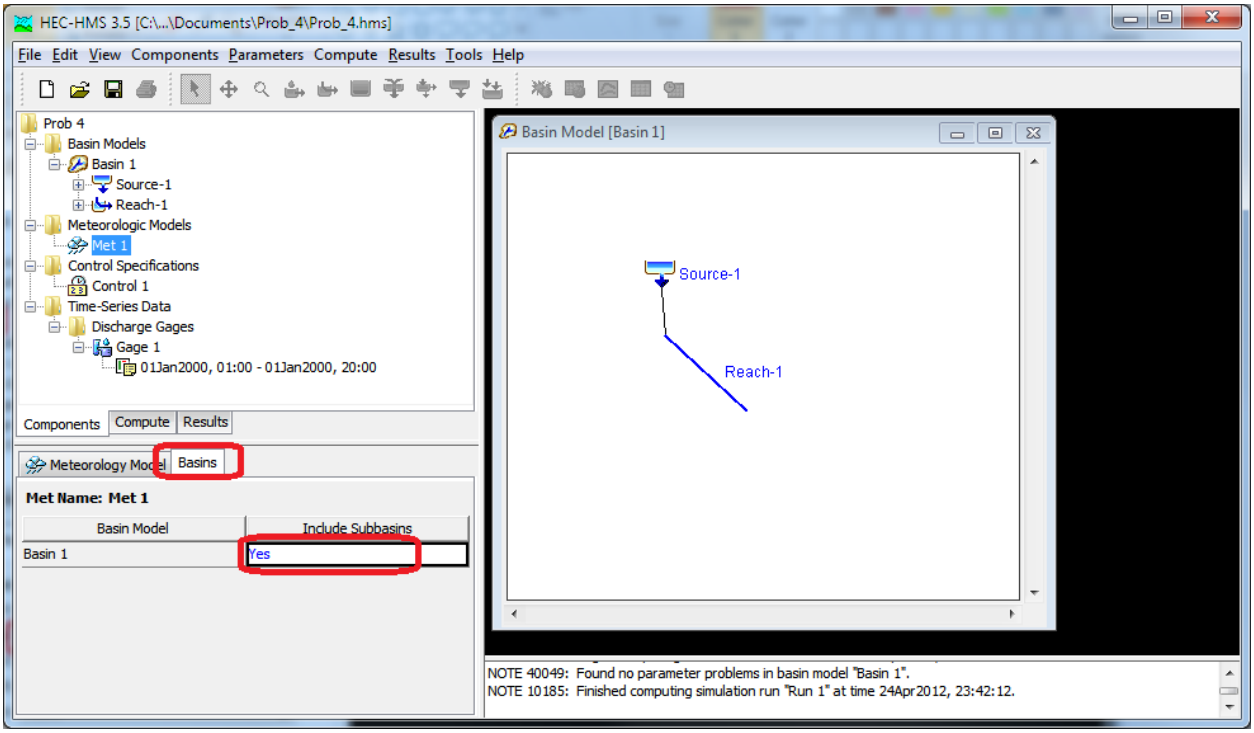
15. Create a Meteorologic Model using the Meteorologic Model Manager. Click New and Create and Close the Meteorologic Model Manager



16. Select the Met-1 Meteorologic Model and set the precipitation to none



17. Click on the Basins tab and set Yes for Include Subbasins



18. Select Compute->Create Simulation Run and go through the steps of setting up a run.

19. Click on the Compute Current Run button to run the model.

20. Examine the results