Tutorial 2

Dam Breach Modelling using HEC-RAS

1. Objective

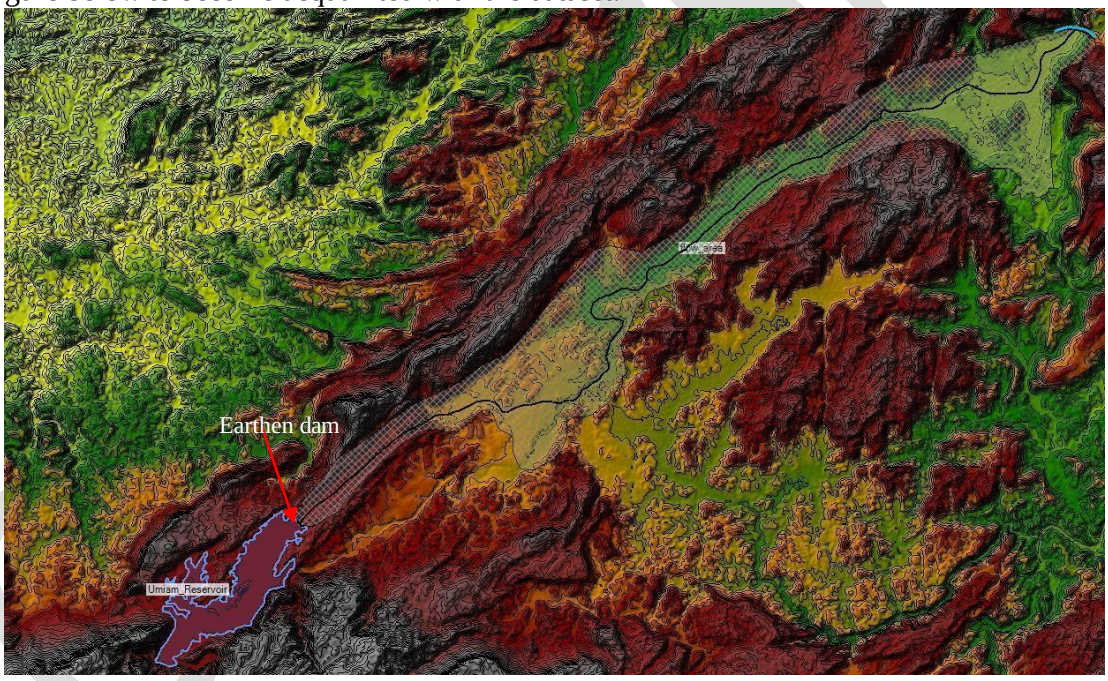
In this Session, you will exercise your knowledge on the 2D unsteady flow modelling to setup and compute a simulation for Umiam Dam breach. It consists of the following major tasks:

- Digitizing the Geometry such as Storage area, Dam axis and 2d flow area.
- Selection of Dam Breach Parameter.
- Setting initial conditions. • Reviewing results.

2. Available Data : DEM, River network, Reservoir extent, Dam line, Projection detail, Inflow data, Area-capacity curve etc

3. Background

You will be working with a dataset for Umiam Dam on Umiam River about 15 kilometres north of **Shillong, the capital city of Meghalaya**. See the figure below to become acquainted with the dataset.



4. Model Setup

1. Open a new project in HEC RAS and set the units to SI customary.

2. Open RAS-Mapper>Set Projection

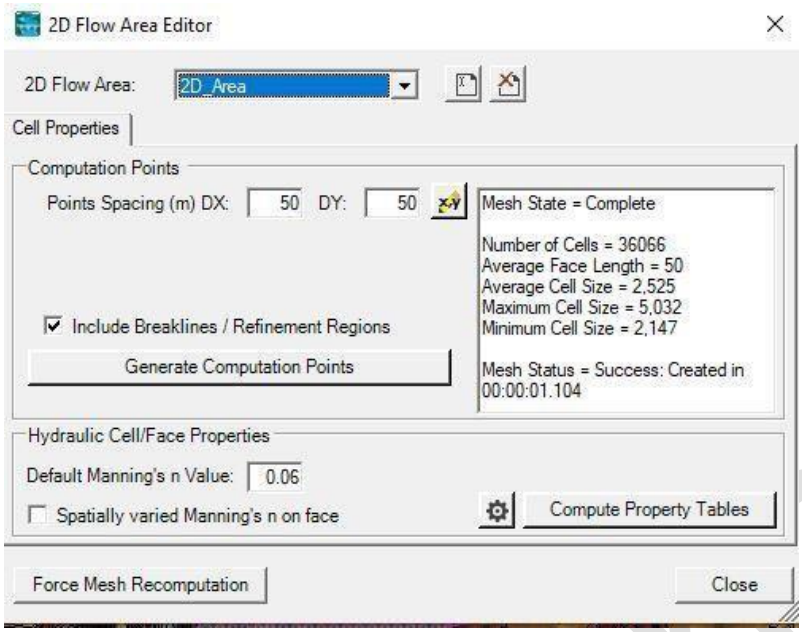
3. Load DEM as explained in 2D flood modelling exercise. It may take several minutes before it finishes.

4. Right click on generated Terrain>Image Display Properties and select update Legend with view option. Also select plot contour option and define interval as 20.

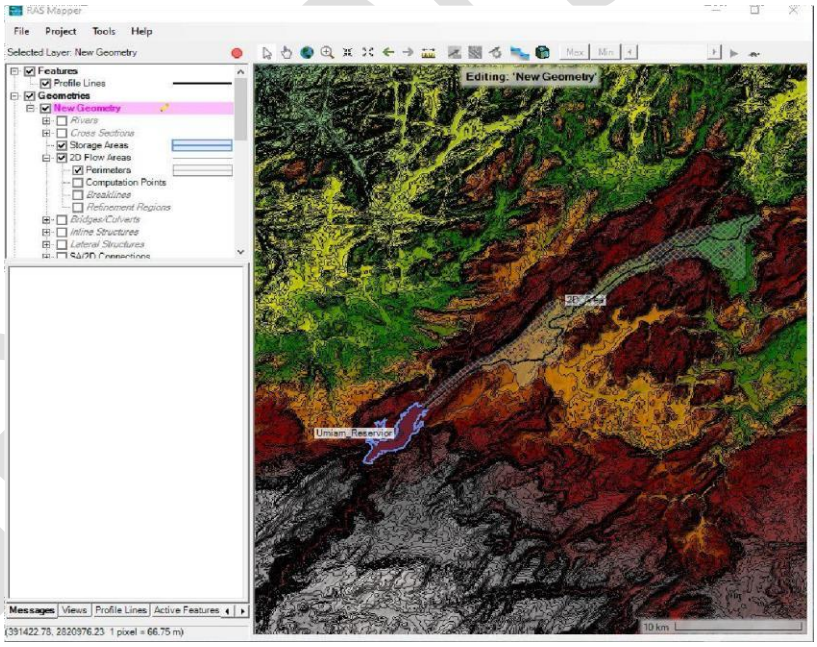
5. In the RAS-Mapper right click on Geometries > Add new geometry and give it a name as “geometry”. Now edit the geometry ( ) and create the following elements:
    a. Go to Storage Areas start digitizing storage area, give it name as Umiam_Reservoir (We can also import the shape file of reservoir by right clicking on storage Area >Layer Property>Features> Import Features>Select Umiam_Reservoir.shp>import).

    b. To know the fetch of study, add the river shape file by adding it as reference layer (Right click Map layer>Reference layer>add reference layer>select river shape file).

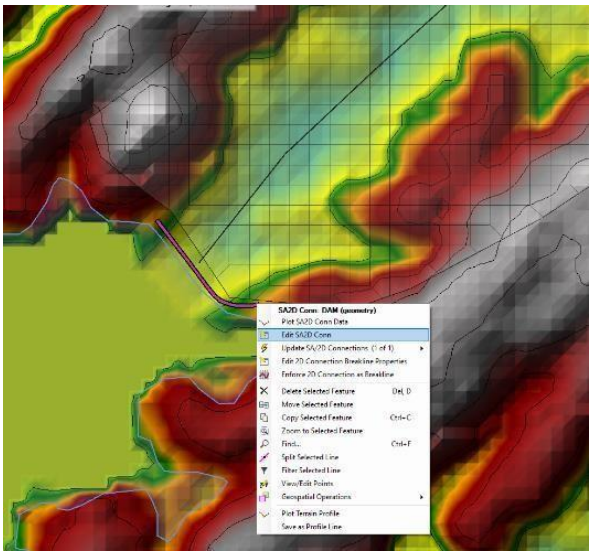
    c. Now, right click on 2D Flow Areas> Edit geometry > Perimeters, then start digitizing the flow area and give it name as 2D_Area, then assign DX and DY as 50 as mentioned below and click on Generate Computation Points.

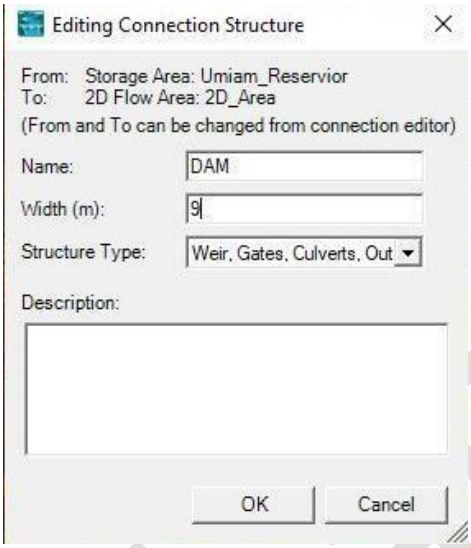


d. Final image will be visible as below:

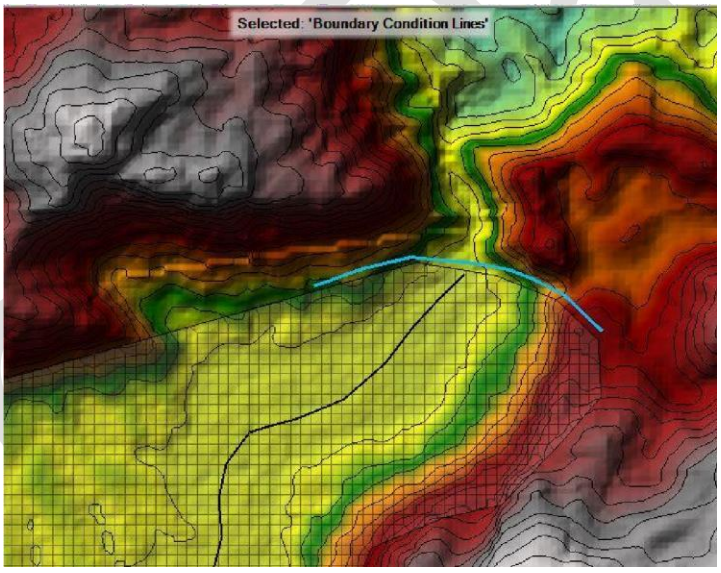


e. Create a Connection representing the dam between the storage area and 2D flow area using SA/2D Connections tool or import the axis of the dam same as storage area Now by right clicking on feature added> click on edit SA2D Conn and give it a name and weir width as mentioned below:

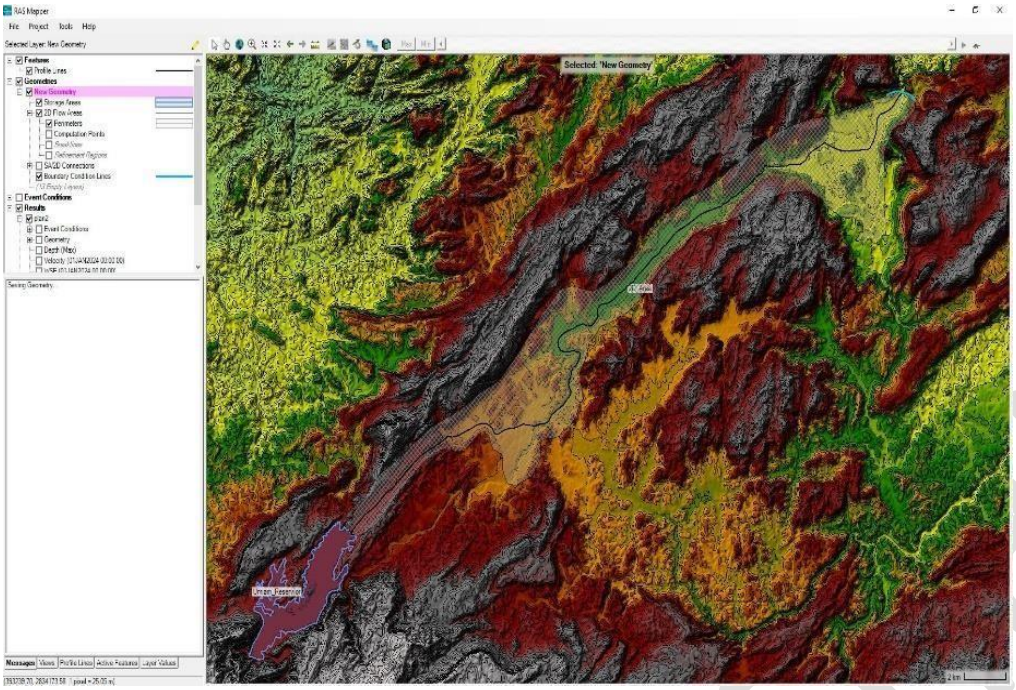




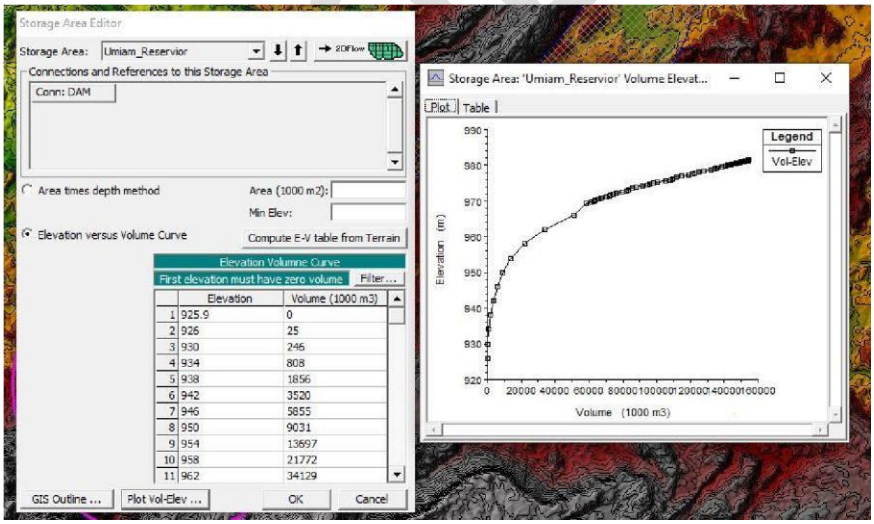
f. Create boundary condition as shown below and give it name as DS_BC.



g. The final map in the RAS mapper will be shown below:

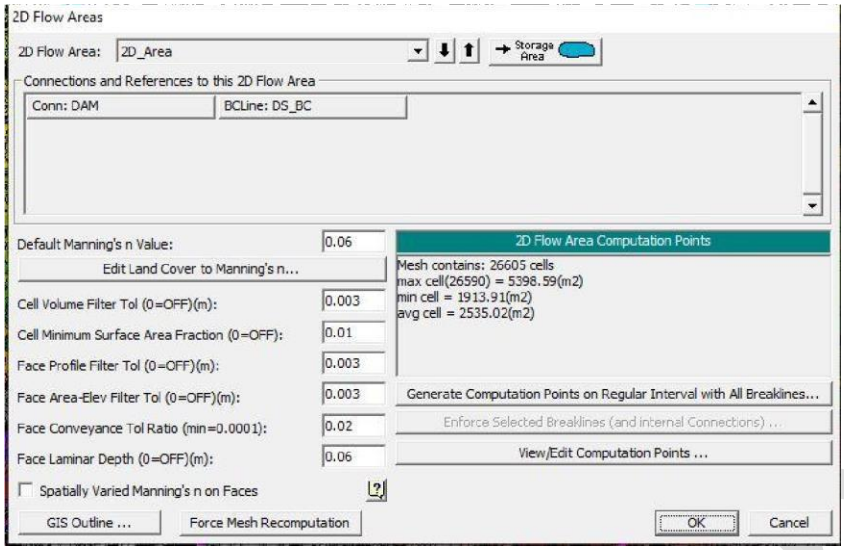


5. Now STOP EDITING ( ) and Save the geometry data and close the RAS Mapper.
6. Now go to Geometry data editor > File > Open Geometry Data then select the geometry created in RAS mapper.
7. Add data to the Elements created in the above steps.
    a. Enter the Elevation-volume curve in the Storage Area using Edit Storage Area option. The data entry and plot are shown in the diagram as given below:

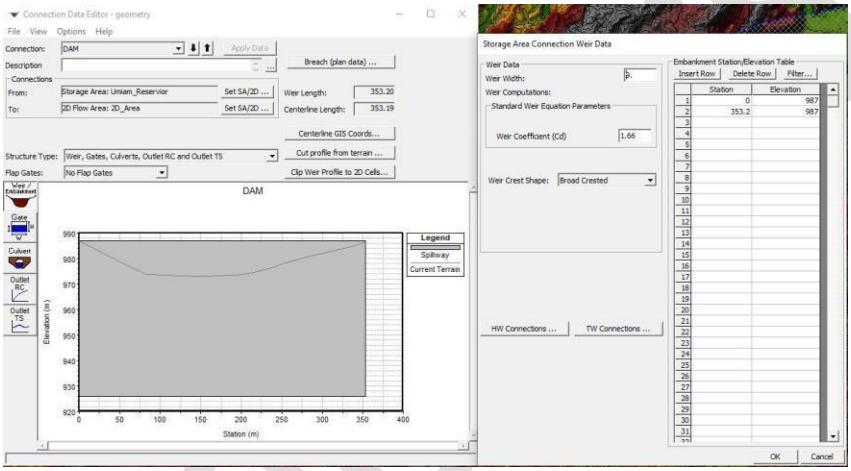


    b. If everything goes right, Conn DAM will also appear on the top in data entry dialogue box.

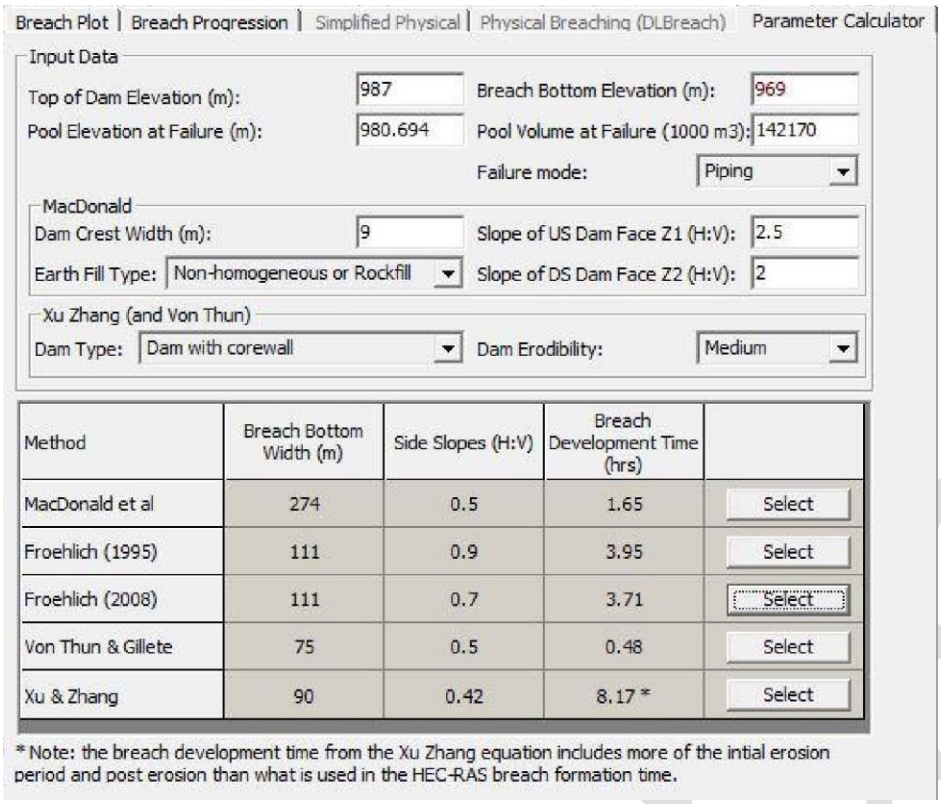
c. 2D Flow Area edit option will also show look as shown below. Notice three connections as shown.



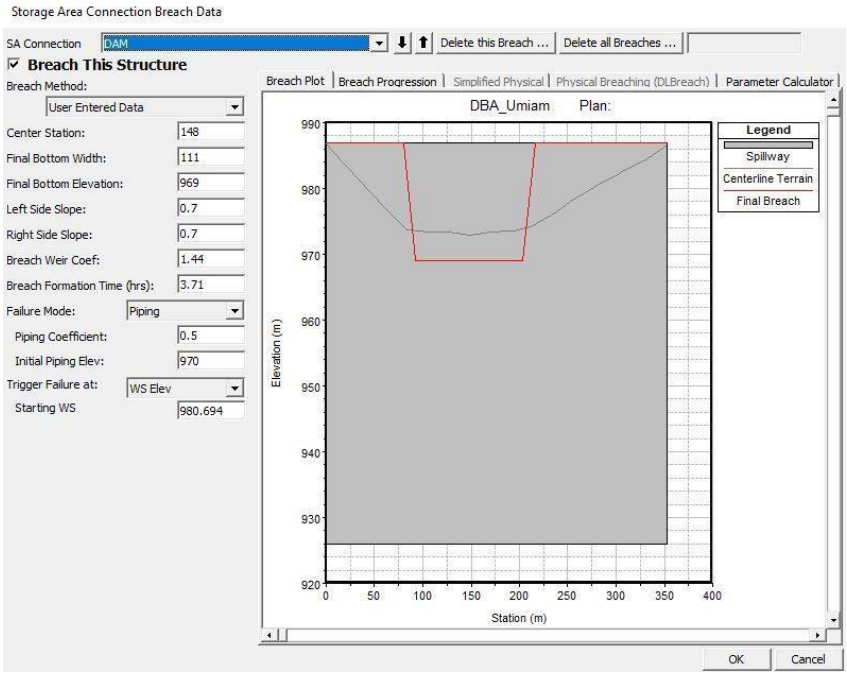
d. Finally use Edit connection i.e. Dam to enter the dam and breach related information.



e. Go to Breach (Plan Data). Go to Parameter calculator then fill the values as mentioned below:



f. Select the Froehlich (2008) then breach parameters will be visible as below. Also give the Center station as 148 and select Breach This Structure.



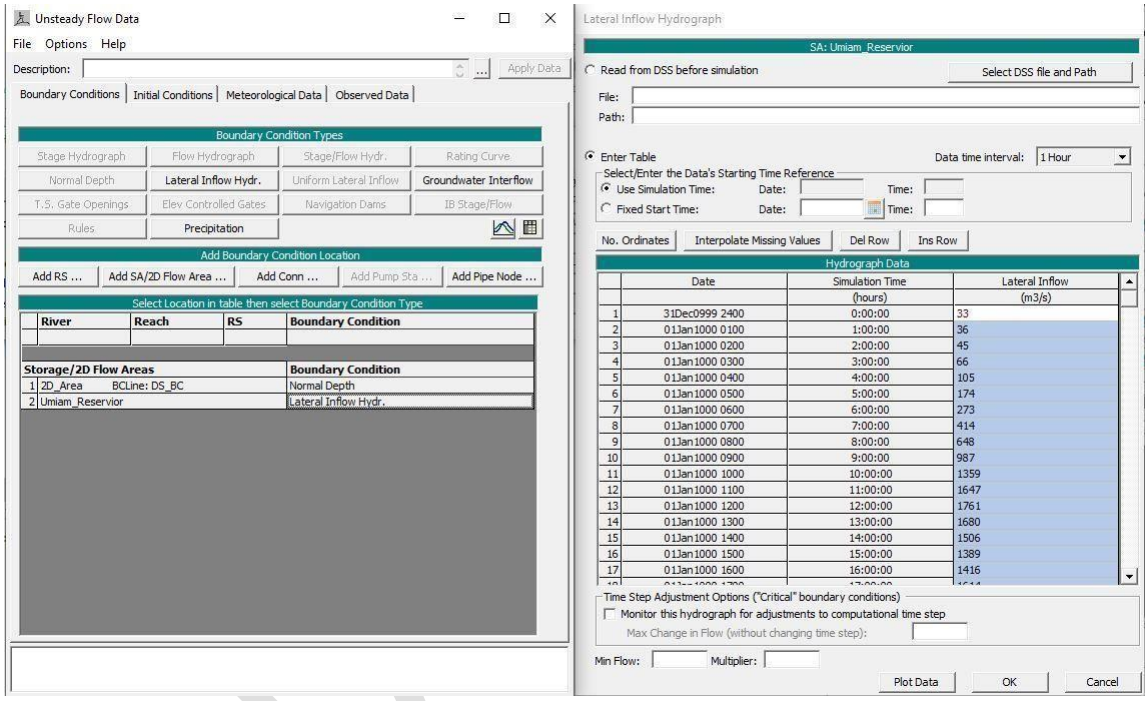
g. Save geometry data and close it.

h. Create the Unsteady Flow Data file. Select Edit Unsteady Flow Data from the main menu.

i Use Normal Depth for the DS_BC (0.001) ii Add more boundary conditions Add SA/2D Flow Area ->

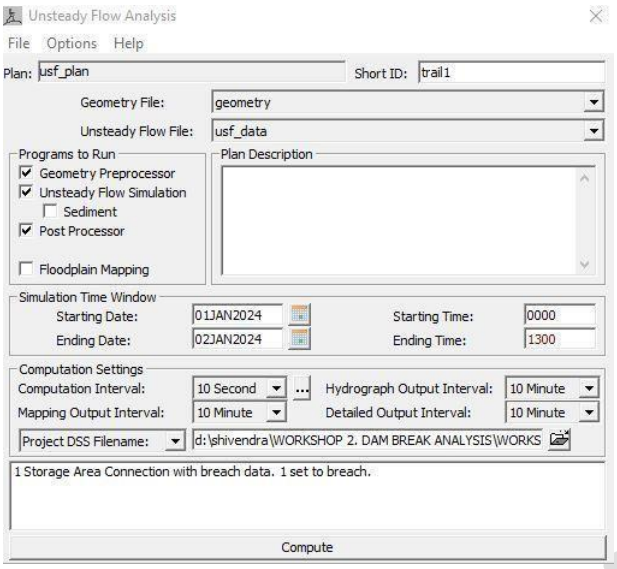
Umiam_Reservoir iii Use Lateral Flow Hydrograph as the boundary condition for reservoir.

iv. Use 980.694 as the initial condition for reservoir.



iv Save the file (usf_data).

8. Finally run the plan using Run from main menu and using option Unsteady Flow Analysis.
9. Give computation interval as 10s and Hydrograph output interval, Mapping output interval, Detailed output interval as 10 min each. Select Geometry Preprocessor, Unsteady Flow simulation and Post Processor and save the file (usf_plan) and provide a short id (trail1). Now click on compute



10. Open the RAS Mapper and look at the results in Result option in the table of Content.