

Tutorial 3

2D Modelling using HEC-RAS

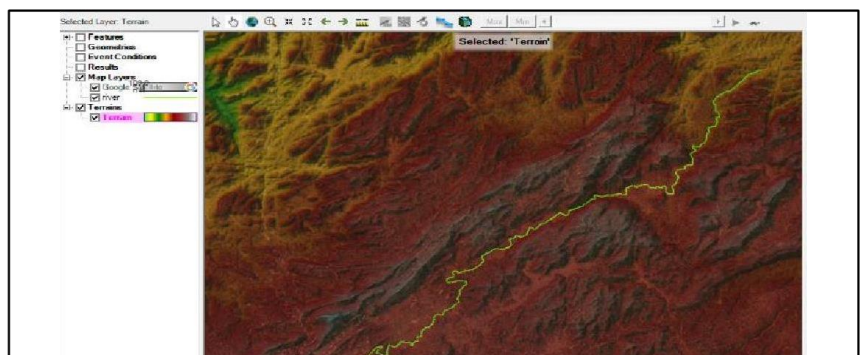
1. **Objective:** Learn 2D flow modelling and simulation in HEC RAS

2. **Available Data :** DEM, River network, Projection detail and Discharge data

3. **Step by step methodology:**

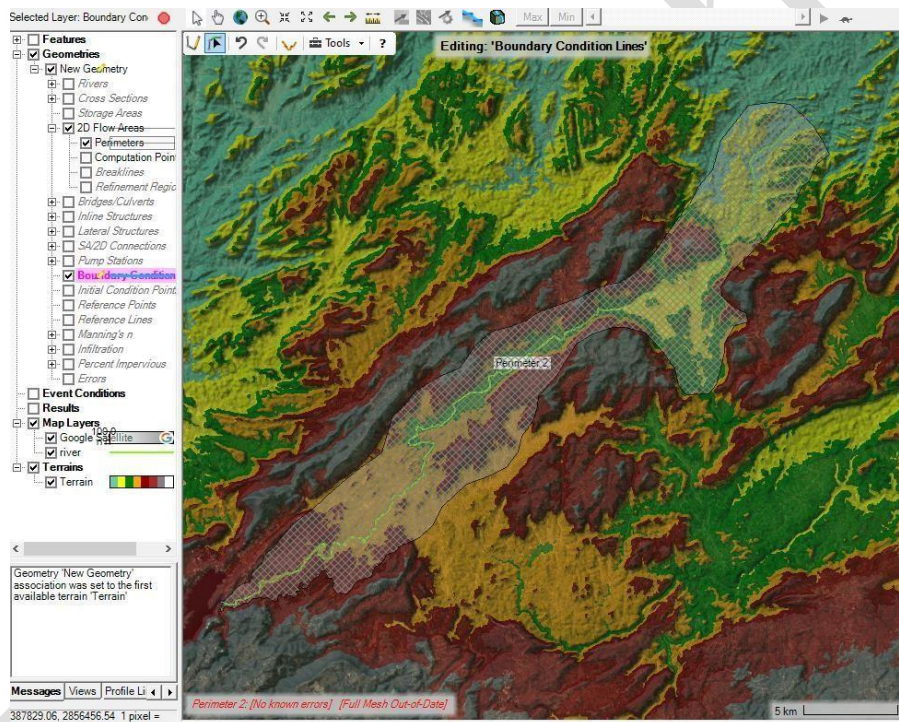
1. Open a new project and set the unit system to SI system (Options in the Main menu).
2. Open GIS Tools -> RAS Mapper (RM) to open the DEM file
(The data belongs to Umiam Lake Meghalaya)
 - a. Set Projection **Project >> Set Projection** Choose file Projection.prj and click OK.
 - b. Check Terrains in table of content of RM and right click. Choose **Create a New RAS Terrain**.
 - c. Use + **sign** to add file **DEM_Umiam** and leave other as default.
 - d. Click **Create** to create the terrain file and wait until finishes. Click **Close**.
 - e. If layer is not visible, right click on Terrain and use Zoom to Layer option.
 - f. Add two more layers in RM using **Map Layers** section (just above the Terrains). Right click and choose **Add Web Imagery Layers: Google Satellite** and **Google Map**. Adjust their transparencies using **Image Display Properties** (by right clicking on the layer) in such a way so that the DEM below the layers is visible. Also, check **Update Legend in View in Layer properties** window.
 - g. Add another layer using Map Layers. Right Click Map Layers . Add a Reference Layer and adjust colour and thickness. At this stage following or similar view shall be visible.

- g. Add another layer i.e., river shape file in **Map Layers** section. Right click and choose Map Data Layers -> Add an Existing Layer Right click on the layer to adjust the thickness of line etc.

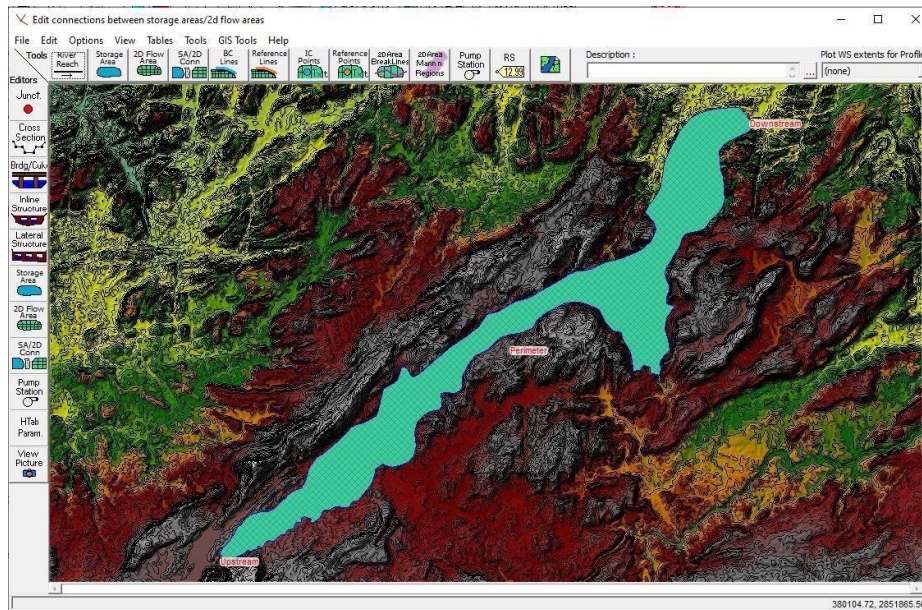


RM will be as shown in the image

3. Check Geometries. Right-click and select **Create New Geometry**. Give name Geometry press OK. Close the box if any opens.
4. Right click on Geometry and select **Edit Geometry**.
5. Check 2D flow area and select perimeters. Click perimeter (Turn it pink)
 - a. Create a 2D flow. Start with a click and finish with a double click. Use the extent of the area as visible in the figure below.
 - b. Use UmiamRiverPlain when asked for the name.
 - c. A dialogue box will appear give cell size Dx and Dy as 50 m in the box appeared and click on **Generate Points in 2D Flow Area**. The box will also show how many points it contains.
 - d. Click OK to create the mesh. The view will be as shown below:



6. Check Boundary Condition Lines.
 - a. Click to turn pink and draw left to right Upstream and Downstream Boundary conditions. And give suitable Names UpstreamBC and DownstreamBC when asked for name.
 - b. Stop Editing selected layers by clicking the Red symbol at the top and save geometry.
7. Switch to the main HECRAS Interface. Select **Edit > Gemoric Data**.
8. In New Window, select file> **Open Geometry data**, select Geometry, and Click Okay.



9. Save the Geometry File> Save Geometry Data.
10. Switch to the main HECRAS interface to enter the data of the boundary conditions.
11. Choose Unsteady Flow Data from Edit tab of the main menu.
 - a. Choose Normal Depth (0.007) for the Downstream boundary condition.
 - b. Choose Flow Hydrograph for the Upstream boundary Condition.
 - c. Enter the discharge data from the excel.
 - d. Use 0.007value for EG slope.
 - e. Save flow data in a file “UmiamUnsteady”
- 13 Go to main HECRAS interface and Select Run and Unsteady Flow Anaysis.
 - a. Save the plan and give name UmiamPlan and short as UP1.
 - b. To run, in the box select all except sediment.
 - c. Enter Starting date (01JAN2024 AT 00:00) and closing date (02JAN2024 AT 13:00)
 - d. Compute Interval 1 minute and all other as 1 hour.
 - e. Save the Plan and **Compute**
- 14 Use RAS Mapper to view the Result.