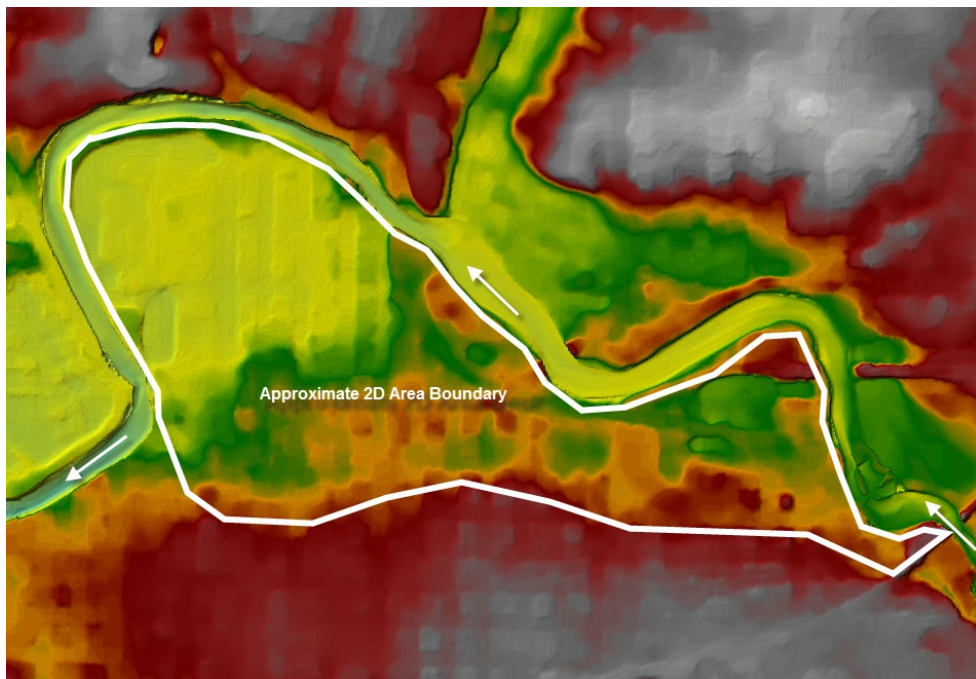

2D Mesh Refinement Workshop

1 Objective

In this workshop, you will generate a 2D Mesh and learn how to refine it using breaklines and refinement regions within a 2D Flow Area with HEC-RAS.


2 Background

You will be working with a section of the White River at Muncie, IN. You will evaluate how to lay out a 2D Flow Area in the left overbank of the river which is protected by a levee to model a levee breach or over-topping scenario.



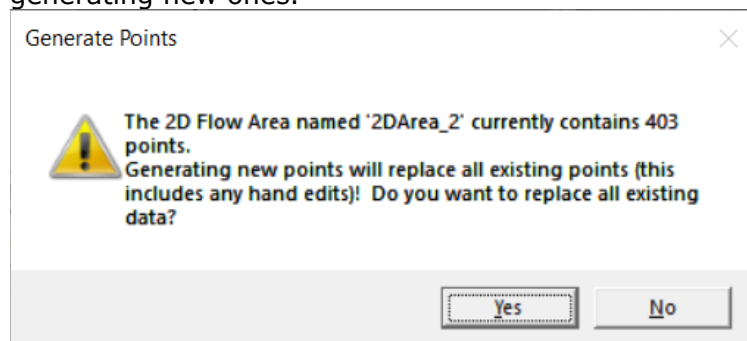
3 Get Started

You already created a RAS Terrain and mesh in the previous workshop.

1. **Start HEC-RAS.**
2. Open the HEC-RAS project "MeshRefinement".
3. Launch **RAS Mapper** .
4. Verify you have projection and Terrain model.

4 Copy an Existing Geometry

5. Create a new Geometry by **right-clicking** on the "Initial Mesh" group layer and choosing the **Save Geometry As** menu item.
6. Provide a **Name** for the Geometry ("Refined Mesh") and press **OK**.
7. **Start Editing** the new Geometry.
8. **Select the Perimeter** layer.
9. Use the **Edit Feature** tool to select the 2D Flow Area boundary.
10. **Right-click** to select the **Edit 2D Flow Properties** menu item.
11. **Rename** the 2D Area "2DArea_2" so you can tell it is the 2nd mesh created.
12. Re-generate the mesh in the 2D Flow Area to have **100ft grid cells**.
 - a. **Open** the 2D Flow Area editor.
 - b. Enter **100** for the **Point Spacing**.
 - c. Press the **Generate Computation Points** button.
A warning comes up that you will be deleting the existing points and generating new ones.

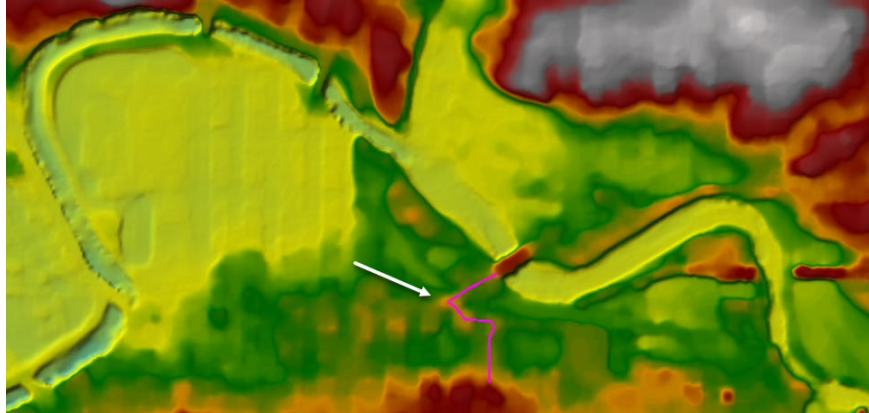


- d. **Close** the 2D Flow Area Editor.
 - e. Inspect the mesh and fix errors.
13. Cell Faces control the movement of flow from cell to cell. Add breaklines to improve the mesh by enforcing cell faces along high ground.
 - a. Select the **Breaklines** Layer.
 - b. Use the **Add New Feature** to create a new breakline.

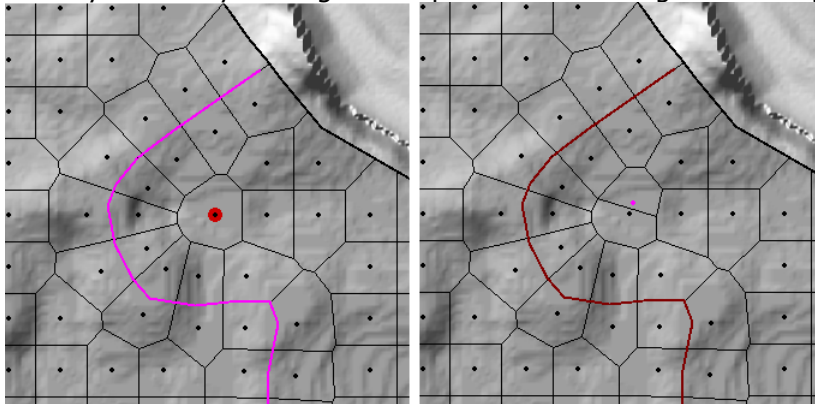
- c. Provide a name for the breakline in the dialog that appears or accept the default name.

Note what happens to the mesh with the breakline having been drawn!

- d. Right-click on the new breakline and select the **Enforce Breakline** option (or right-click on the Break Lines Layer and choose Enforce All break lines).



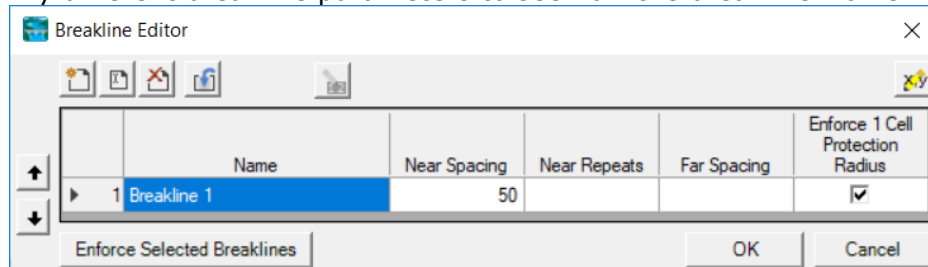
- e. Fix any errors by adding a new point or removing an existing point.



4.1 Refine the Breakline

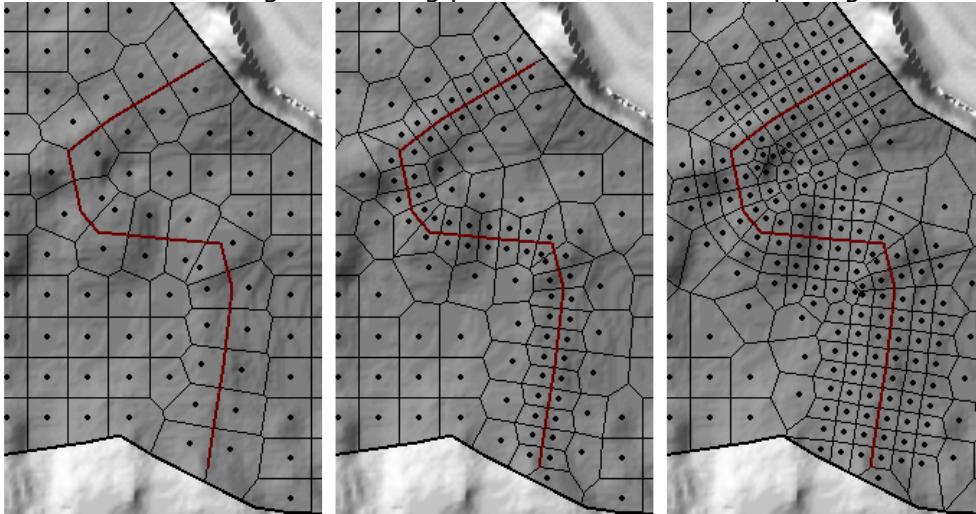
- 14. Right-click on the breakline and choose **Edit Breakline Properties**.

- 15. Try different breakline parameters to see how the breakline works



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- a. Repeated changes to the breakline using the Enforce Selected Breaklines button will ONLY make changes based on the current computation points.
 - b. To PROPERLY apply a breakline you will need to open the **2D Flow Area Editor** and **Generate Computation Points with All Breaklines**. This will regenerate points at the prescribed spacing and then enforce the breakline its parameters.

16. What looks to be a good starting point for breakline cell spacing?

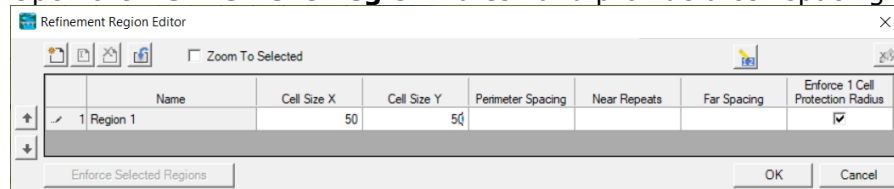


5 Refine a Mesh using Refinement Regions

In the next step, you are going to create a mesh and refine it to better represent the ground surface using refinement regions.

1. Create a copy of the geometry "Initial Mesh" geometry by right-clicking on the Geometry and choosing **Save Geometry As** (name it "Mesh 3").
2. **Start Editing** the new Geometry.
3. Rename the 2D Area to "2DArea_3" so you can tell it is the 3rd mesh created.
4. Cell Faces control the movement of flow from cell to cell. Add refinement regions to improve the mesh by enforcing cell faces along high ground and densifying the computation points.
 - a. Select the **Refinement Regions** Layer.
 - b. Use the **Add New Feature** to create a new region for the upper portion of the 2D Area where the land surface is highly variable.
 - c. Provide a name for the region.

- d. Open the **Refinement Region Editor** and provide a cell spacing.



- e. Enforce the new refinement region.



- f. Create additional refinement regions, adjust parameters, and recompute the mesh to see how the changes are applied.