

HEC-RAS 2D Mesh Refinement

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Overview

- Common Terms
- How to Create a Mesh
- Limitations
- Fixing Mesh Problems
- Hydraulic Property Tables





Breaklines





- Breaklines enforce Cell Faces inside of the Mesh.
- Place along linear features that control water movement







Breaklines

- "Snapping" is part of mesh generation
 - Faces snap to breaklines if they are close enough
- "Enforcing" changes the cell points around a breakline
 - Improves the snapping of the 2D faces to the breaklines
 - Not perfect, might require tighter cell spacing and/or hand graphical editing





Breakline Properties

- Near Spacing Initial cell size (approx.) along the breakline.
 - Default value is 2D Area point spacing
- Near Repeats Repeats cell insertion using Near Spacing a multiple away from the breakline.
- Far Spacing Max cell size (approx.) of newly added cells.
 - Default value is 2D Area point spacing

- Enforce 1 Cell Protection Radius Once enforced cells near to the breakline will not be removed through the enforcement of additional breaklines.
 - Include cells added/edited by hand.

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+	▶ 1	Breakline 1	50	0	100	
	2	Breakline 2	50	0	100	
-	3	Breakline 3	50	0	100	
	4	testA	25	1	50	
	5	TestB	50	1	100	
	En	force Selected Breaklines			OK	Cancel





Breakline Process

- All points within a computed buffer are removed.
- Cells are added uniformly along the side of breakline.
- Buffer for point removal is computed as: Near Spacing * Near Repeats
 - + Double Near Spacing size n times until reach Far Spacing size (However, take 75% of last cell size so as to not delete too far)

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• A breaklines' area of influence is stopped by a neighboring breakline (will not proceed to opposite side).





Breakline Examples

• Grid spacing = 100

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Refinement Regions

- Cell Size X,Y Internal cell size dimension
- Perimeter is treated like a breakline
 - Perimeter Spacing, Near Repeats, Far Spacing, Cell Protection same as for breaklines
- Internal cell size used for perimeter spacing, if not defined

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+	Name	Cell Size X	Cell Size Y	Perimeter Spacing	Near Repeats	Far Spacing	Enforce 1 Cell Protection Radius
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	Enforce Selected Regions					ок	Cancel





Refinement Examples

• Grid spacing = 100







Refinement Regions and Break Lines to Align **Channel Cells**







2D Flow Area Editor Geometry Editor

- Connections
 - Similar to Storage Area
 - Quick Link to Connections

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Connections and References	to this 2D Flo =7300	ow Area						
Detaulit Manning sin Value:	0.00	2D Flow Area Computation Points						
Edit Land Classification to Ma	nnings n	Mesh contains: 1332 cells						
Cell Volume Filter Tol:	0.01	Cell size max = 10639.10 (sq ft) Cell size min = 6621.38 (sq ft) Cell size avg = 10347.02 (sq ft)						
Face Profile Filter Tol:	0.01	Generate Computation Points on						
Face Area-Elev Filter Tol:	0.01	Regular Interval with All Breaklines						
Face Conveyance Tol Ratio:	0.02	Enforce Selected Breaklines						
		View/Edit Computation Points						
Force Mesh Recomputation		Cancel						





Computation Points

- Final mesh is based on final computation point set.
- Enforcement of Breaklines and Refinement Regions modifies existing computation points.
- Can enforce a breakline once, change parameters and enforce again.
 - Each iteration modifies the previous points.
- Point Regeneration will automatically use Breaklines and Refinement Regions.

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Computation Points				
Points Spacing (ft) DX: 200 DY: 200	Mesh State =	Complete		^
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Generate Computation Points without Breaklines	Mesh Status : mesh read fro	= Success m hdf file ir	: Existing n 0.029	~
Hydraulic Cell/Face Properties Default Manning's n Value: 0.06	Com	pute Prope	erty Tables	3
Force Mesh Recomputation			Clo	se ¹²





Fixing Problems

• If cell spacing is too large, cell faces may not be enforced







Fixing Problems

• More than 8 sides on a cell.

2D_Area: 2 Error(s) - Maximum 8 Faces per Cell [Displaying Local Mesh] [Full Mesh Out-of-Date]

- Fix by Hand
- Auto "Try Fix" menu option







Fixing Problems

- Cells need to have exactly one Computation Point (Black Dot)
- Fix graphically by adding more points and/or moving points near perimeter



Questions?

