New Features of HEC-RAS 5.1: RAS Mapper

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Overview

- Geospatial Editing Tools
- Terrain Modifications
- 1D Model Layers
- 2D Model Layers
- Results Visualization
- RASter Calculator
Editing Tools

- Add New
- Edit / Select
- Undo/Redo
- Plot Profile
- Tools
- Help
Editing - Help

- Toolbar provides quick access to a help summary. Click on a tool to understand how it works.
Editing - Add New

- Points, Lines, and Polygons all created using the same tool
- Left-click to start
- Double-click to end
- Pan: Shift key, middle mouse, Pan tool.
- Right-click to re-center
Editing - Edit / Select

- Select feature(s)

- Edit (move, add points, delete, etc).

- Visual indicators:
  - Color (Magenta = selection, Green = action option)
  - Icon (Hand = move/delete point, Black Arrow = add point, White Arrow = select)
Vector Layers Support Shapefile Format

- Support Shapefile format
  - Export layers to shapefile
  - Import shape from shapefile
  - Add a shapefile
  - Copy/Paste features from vector layers in RAS Mapper
- Export to KMZ for Google Earth
Development of a good 1D or 2D river hydraulics model starts with a terrain model representative of the ground surface elevations.
Terrain Modification

- Terrain Replacement Approach
  - Use cross sections to replace terrain elevations in base Terrain Layer

- Vector Approach
  - Use vector overrides to raster-based Terrain Layer
  - Simple Shapes (Piers)
    - Circle, Rectangle, Ellipse
  - Line (Channel, Roads, Levees)
  - Polygon (Areas, Buildings)
Terrain Replacement

- Identify bad terrain
- Add River
- Add Cross Sections
- Add Bank Stations
- Interpolation
- Export Replacement GeoTiff
Terrain Replacement

- Create new RAS Terrain with original terrain and replacement surface(s).
- Set Priority to Replacement surface(s).
Terrain Replacement with XS

- Channel Example
Terrain Replacement with XS

- High Ground / Levee Example
Vector Modification – Constant Height

- Simple Shapes (Pier)
- High/Low Ground “Line” (Channel/Levee)
- Polygon (Area, Buildings)

- Set Value
- Take Higher
- Take Lower
- Replace NoData
- Add
- TIN Interpolation
Vector Modification

- Multiple Vector additions with a Terrain Layer
- Modifications are used for visualization and for all computations.
- Re-use Vector Features in other Layers
Vector Modification

Simple Example

- Channel by polygon
  - Define Elevation
- Piers by circle
  - Define Radius, Elevation
Vector Modification

- Base Terrain
- Levee Modification
  - Add Alignment
  - Top Elevation
  - Top Width
  - Left Side Slope
  - Right Side Slope
  - Lateral Extent
Vector Modification

- **Levee** (Take Higher)
- **Channel** (Take Lower)
Vector Modification – Variable Height
Vector Modification
Elevation Control Points

Elevation Needed

Enter the elevation for this elevation point

935.8134

OK  Cancel

Terrains

- [x] baseTerrain.Levee
- [x] Modifications
- [x] Levee
- [x] Control Points
1D Modeling Capabilities

- Use the Terrain, River, Bank Lines, Flow Path Lines and Cross Sections Layers
Cross Sections

- Information is extracted from the intersection of the Cross Sections Layer with other RAS Layers
- River, Reach, River Station
- Bank Stations, Reach Lengths
Cross Section Updates

- Cross Section information AUTOMATICALLY updates while it is a NEW cross section.
- EXISTING cross sections must be MANUALLY updated.
- Cross sections are new when created until the edit session it was created in is closed.
Cross Section Updates

- Auto Update Option
New Modeling Features for RAS 5.1

- CrossSections
  - $n$ values
  - Ineffective areas
  - Blocked Obstructions
- Hydraulic Structures
  - Bridges/Culverts
  - Lateral Structures
  - Inline Structures
  - Pump Stations
2D Model Development

- 2D Flow Areas are defined by
  - Perimeter and Computation Points
  - Breaklines and Refinement Regions
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
Refinement Examples

- Grid spacing = 100
Building a Channel Mesh
Results Analysis
Profile Lines

- Profile Lines Layer allow for use of Editing Tools to create lines in import places to evaluate results.
Profile Lines

- WS Profile / Tick Marks
Profile Lines

- WSE Comparison
Profile Lines

- Flow Distribution

- Rating Curve
RASter Calculator

- The RASter Calculator is intended to allow users to perform mathematical and logical operations on HEC-RAS spatial results.
- User-defined variables are used in scripts to evaluate raster data.
- Variables defined by
  - Plan, Map Type, Animation Behavior, Profile
- Scripts can be saved/loaded
RASter Calculator

- Variable Definition (Layers)

- Save

- Load
RASter Calculator

- View Compiled Code

```csharp
#VARIABLES:
'WSE' is the cell value from 'WSE = 2D 200ft Grid 15 sec T | WSE
'WithChannel' is the cell value from 'WithChannel'
'Output' is the desired output value.
****** Write/Modify the code below! ******
****** Use the View Code button to see the full/compiled code. ******

If WSE = NoData OrElse WithChannel = NoData Then
    Output = NoData
Else
    Output = WSE - WithChannel
End If

#VARIABLES:
'WSE' is the cell value from 'WSE = 2D 200ft Grid 15 sec T | WSE
'WithChannel' is the cell value from 'WithChannel'
'Output' is the desired output value.
****** Write/Modify the code below! ******
****** Use the View Code button to see the full/compiled code. ******

If WSE = NoData OrElse WithChannel = NoData Then
    Output = NoData
Else
    Output = WSE - WithChannel
End If
```

`!!SOMETHING_INPUT_WRONG!!`

Output = WSE - WithChannel
RASter Calculator Help

- Example scripts provided for often used tasks.

```plaintext
' This example demonstrates comparing water surface elevation results from 2 different plans using Depth information. ' Depth is computed using the compute WSEs and associated Terrain.

'depthPlan1' is the layer for Depths for Plan 1. 'depthPlan2' is the layer for Depths for Plan 2.

If depthPlan1 = NoData AndAlso depthPlan2 = NoData Then
    ' The grid cell is not wet for either plan
    Output = NoData
Else
    ' Compare the Water Surface Elevations (via Depth)
    ' One plan may have a wet cell while the other does not.
    If depthPlan1 = NoData Then depthPlan1 = 0
    If depthPlan2 = NoData Then depthPlan2 = 0
    Output = depthPlan1 - depthPlan2
End If
```
RASter Calculator

- Examples
  - Compare WSE

```plaintext
#VARIABLES:
'WSE1' is the cell value from 'WSE1 = 2D 25ft Grid 10 sec T | elevat
'WSE2' is the cell value from 'WSE2 = 2D 200ft Grid 15 sec T | elevat
'WithChannel' is the cell value from 'WithChannel'

If WSE1 = NoData AndAlso WSE2 = NoData Then
  'The grid cell is not wet for either plan
Output = NoData
Else
  'Compare the Water Surface Elevations
  'One plan may have a wet cell, while the other does not.
  If WSE1 = NoData Then WSE1 = WithChannel
  If WSE2 = NoData Then WSE2 = WithChannel
  Output = WSE1 - WSE2
End If
```
Water Surface Elevation Comparison

- Levee Breach WSE: WSE_Mesh200ft - WSE_Mesh25ft
Hazard Evaluation

- Extreme Hazard
- Low Hazard
- Moderate Hazard
RAS Mapper 5.1 Summary

-Geospatial editing tools in HEC-RAS make modeling building and refinement more efficient.
-Terrain modification tools in HEC-RAS will improve the modeling process.
-Data extraction is automatic for new feature but requires manual updates for existing data.
-Profile Lines as a feature layer gives the user more flexibility in creating and editing locations for evaluation results.
-RASter Calculator will simply model evaluation for model improvement and refinement and should result in more effective communication of model results.