Collaborative Hydraulics: Advancing to the Next Generation of Engineering

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Why CHANGE?

The current generation of hydraulic modeling tools– primarily one-dimensional modeling–has been in use for nearly 60 years. The next generation of hydraulic engineering tools, particularly two-dimensional modeling and graphical visualization features, allows users to create better representations of the often complex interaction between transportation assets and river environments, enabling better design and more efficient project delivery.

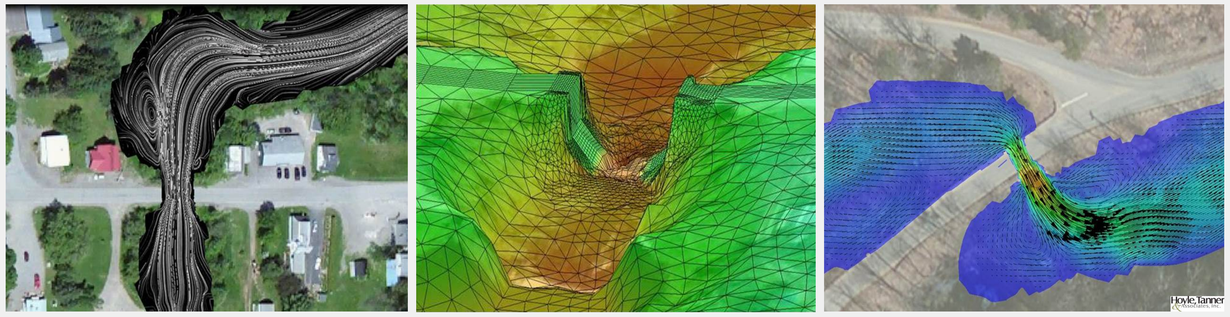
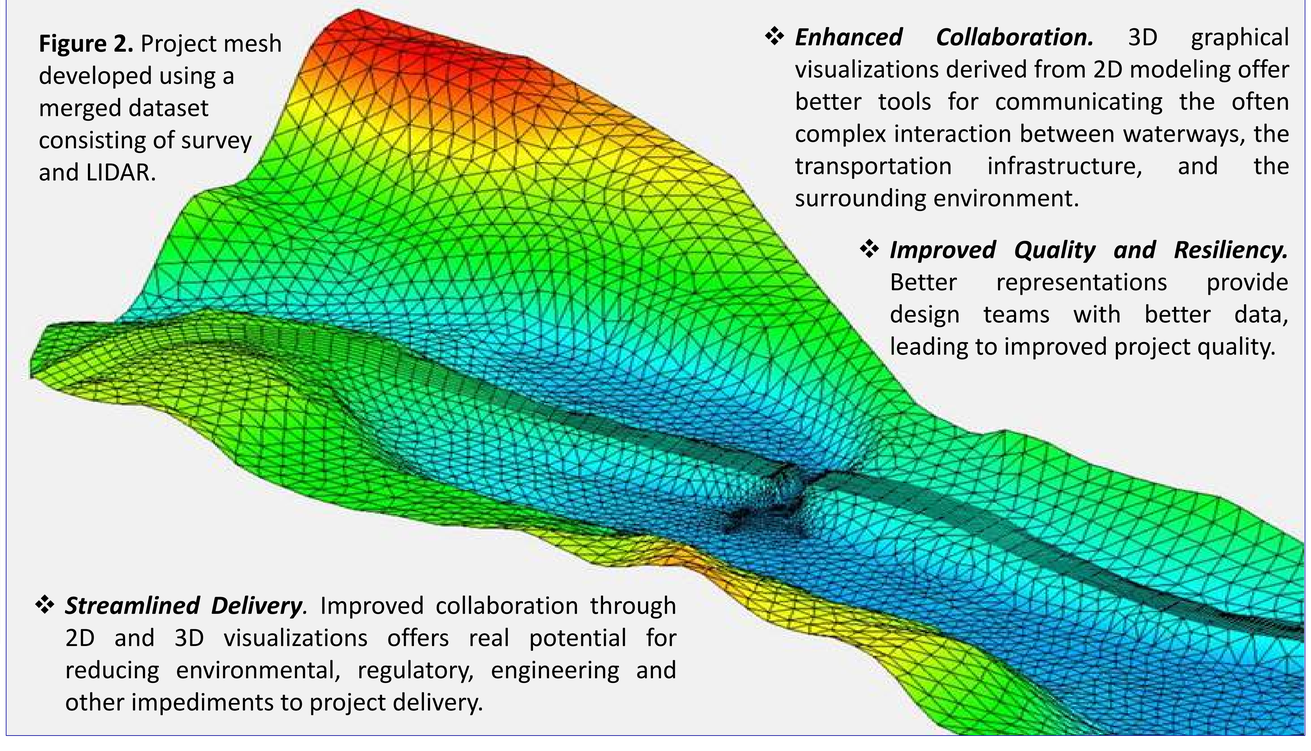


Figure 1. Sample 2D output for flow trace, mesh and vector fields.

Benefits of a Next-Generation Model

Figure 2. Project mesh developed using a merged dataset consisting of survey and LIDAR.



- ***Enhanced Collaboration.*** 3D graphical visualizations derived from 2D modeling offer better tools for communicating the often complex interaction between waterways, the transportation infrastructure, and the surrounding environment.
- ***Improved Quality and Resiliency.*** Better representations provide design teams with better data, leading to improved project quality.
- ***Streamlined Delivery***. Improved collaboration through 2D and 3D visualizations offers real potential for reducing environmental, regulatory, engineering and other impediments to project delivery.

Contrasting the Current State of Practice

Next-generation models allow for more accuracy in estimating flow conditions and flow paths, evaluating hydraulic considerations and assessing climate change or extreme weather event scenarios. These tools also provide realistic 3D graphical representations of anticipated hydraulic conditions, improving collaboration and ultimately reducing project delivery times.

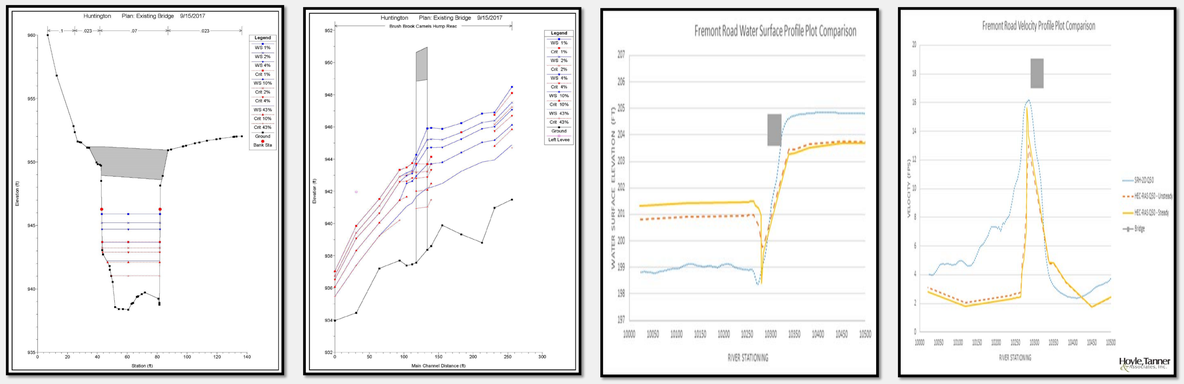


Figure 3. Current state of practice, HEC-RAS (1D) output cross-section and stream profile.

Figure 4. Comparing HEC-RAS (1D) and SRH (2D) output velocity and WSE for 50-yr storm.

Applications of 2D Hydraulic Design

- Complex bridge crossings
- Analysis of bridge options
- Complex floodplain geometry
- Flood risk assessment
- Flood mapping
- Channel restoration
- Fish habitat analysis
- Sediment transport analysis
- Bridge scour analysis
- Channel stability analysis

The Future of Hydraulics

Next-generation hydraulic modeling tools represent a significant evolution in hydraulic modeling theory and practice, with real potential for reducing environmental, regulatory, engineering and other impediments to project delivery. The results can significantly improve the ability of highway agencies to design safer, more cost-effective and resilient structures on waterways.