

HEC Modeling for Non-Engineers

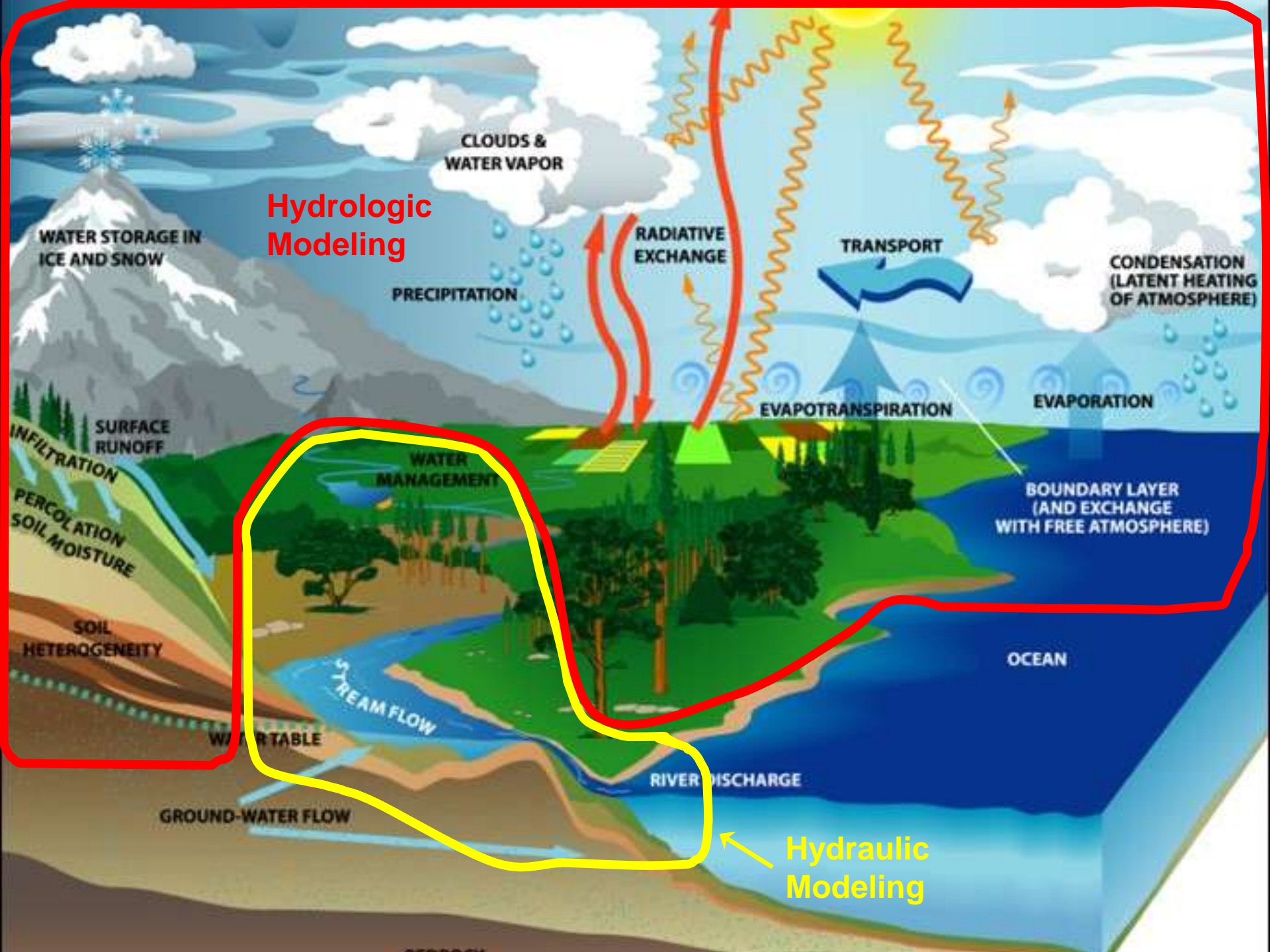
IAFSM Presentation
March 14, 2018

Jeff Macke, P.E., CFM and Sarah Runger, P.E., CFM

Hey and Associates, Inc.

Overview

- 💧 Hydrology
- 💧 Hydraulics
- 💧 Programs for modeling
- 💧 Why it's important



A black and white photograph of a wet surface, likely asphalt or concrete, covered with numerous concentric ripples from raindrops. The ripples are of various sizes and are densely packed in some areas, creating a complex, textured pattern. The lighting is somewhat dim, emphasizing the dark tones of the wet surface and the lighter highlights on the edges of the ripples.

Hydrologic Modeling:



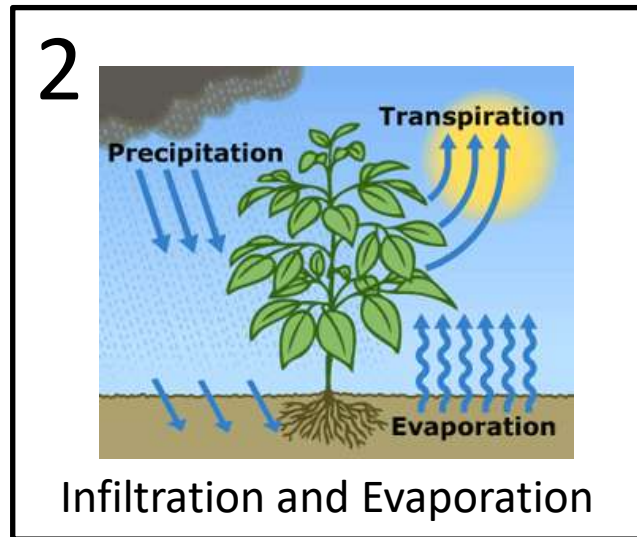
HEC-HMS

- Available for free from U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center (HEC)
- HMS - Hydrologic Model System
- Widely used and credible program

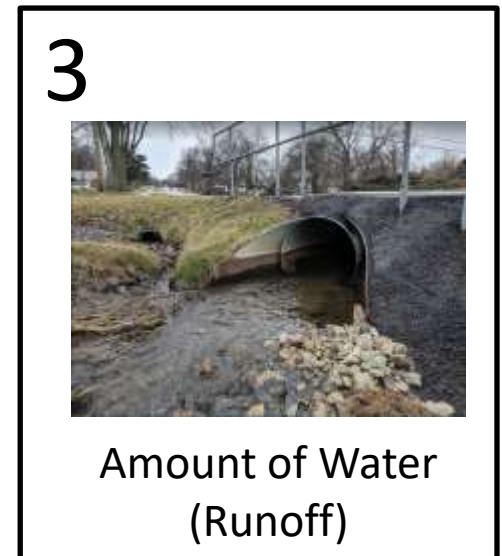
Hydrology Model – How much water?



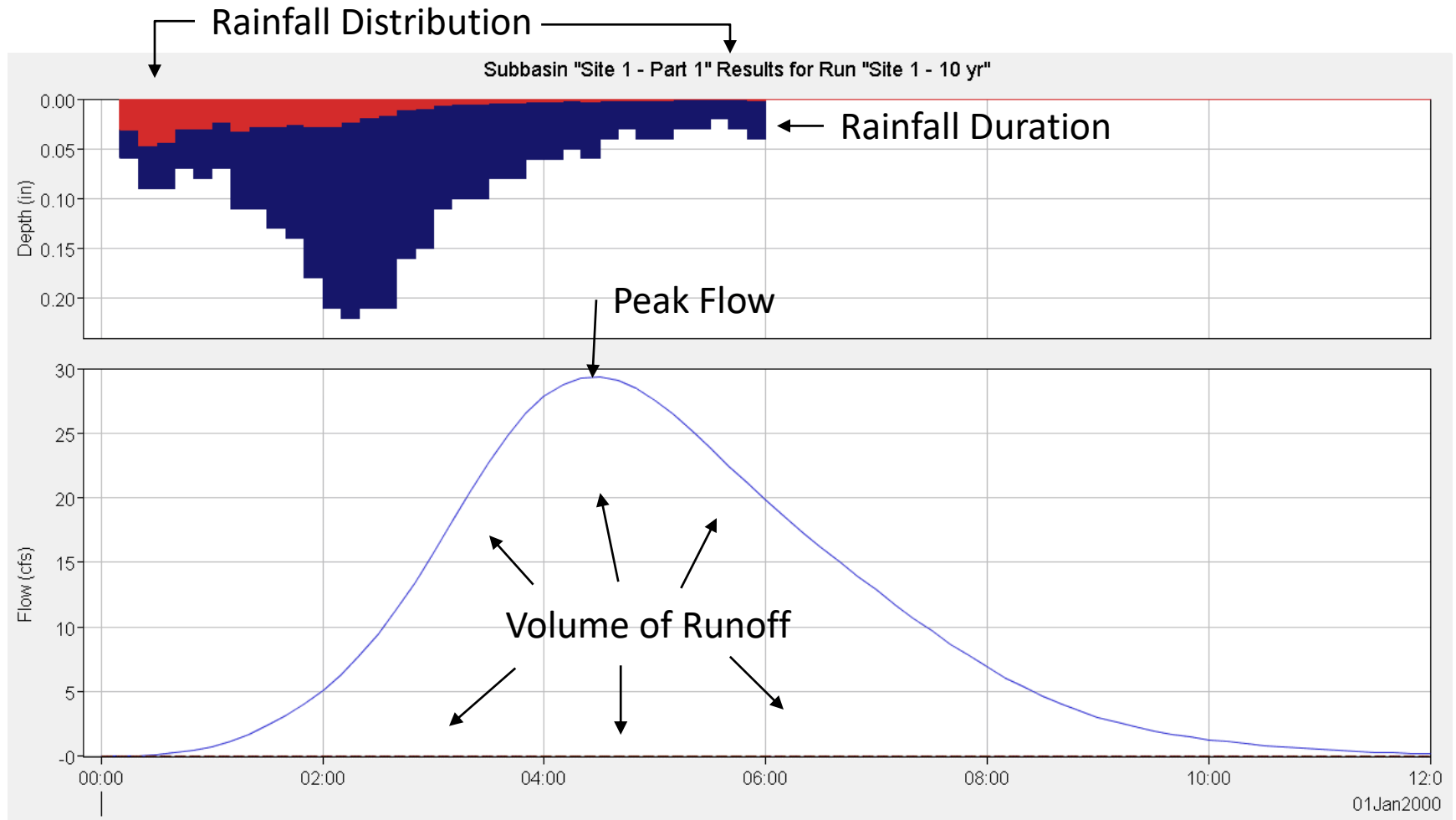
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What comes out of the model? – Hydrograph

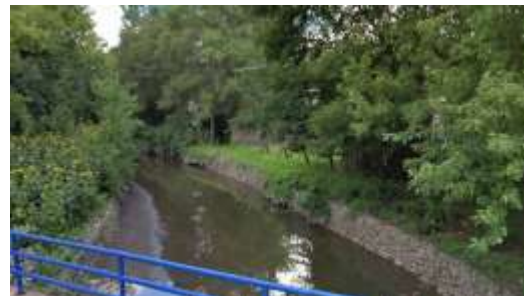


A scenic view of a river with a bridge and trees in autumn. The river is calm, reflecting the sky and the surrounding foliage. On the left, there are trees with green and yellow leaves. On the right, there are trees with yellow and orange leaves. In the background, a bridge with several piers spans the river. The sky is clear and blue. The text "Hydraulic Modeling:" is overlaid on the image in white, sans-serif font.

Hydraulic Modeling:

Reasons to use a HEC-RAS model:

- Determine existing flood elevations for
 - Floodplain and floodway mapping
 - Base Flood Elevation
- Analyze proposed improvements such as
 - Culverts
 - Bridges
 - Channel improvements
 - Flood mitigation



HEC-RAS



- Hydrologic Engineering Center – River Anal^ysis System
- Available for free from U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center
- Current version is 5.0.3
- Capabilities
 - Steady and Unsteady flow calculations
 - 1D and 2D
 - Improved and expanded RAS Mapper functions

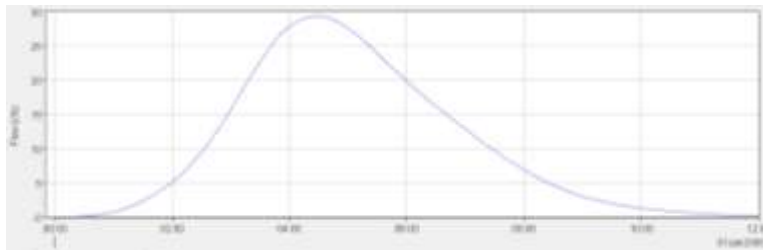
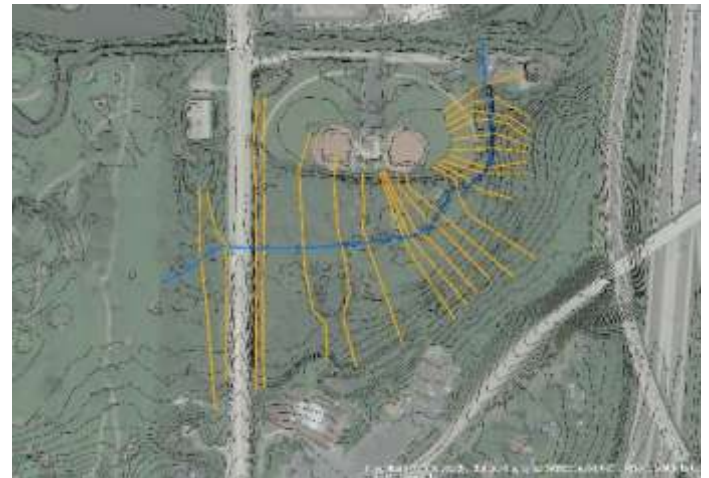
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Flow

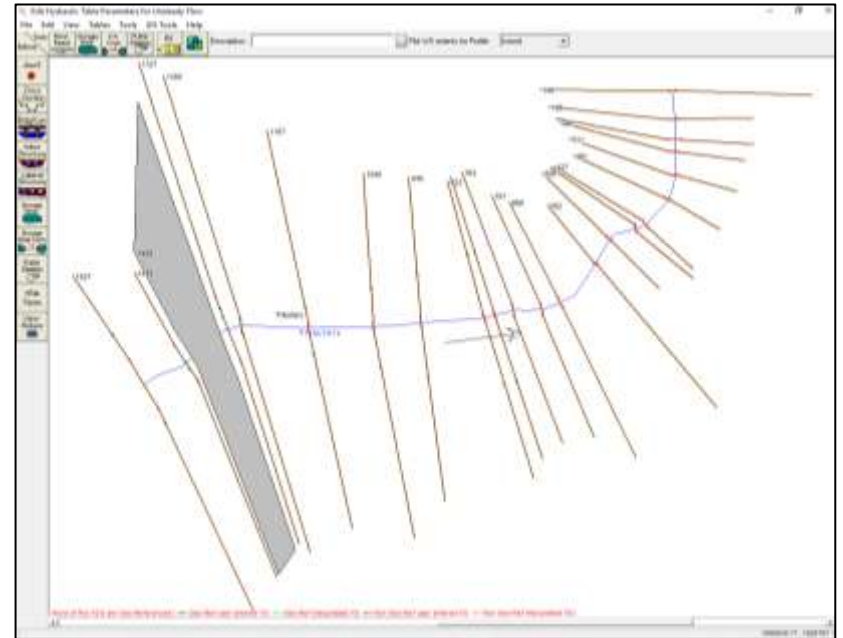


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Geometry



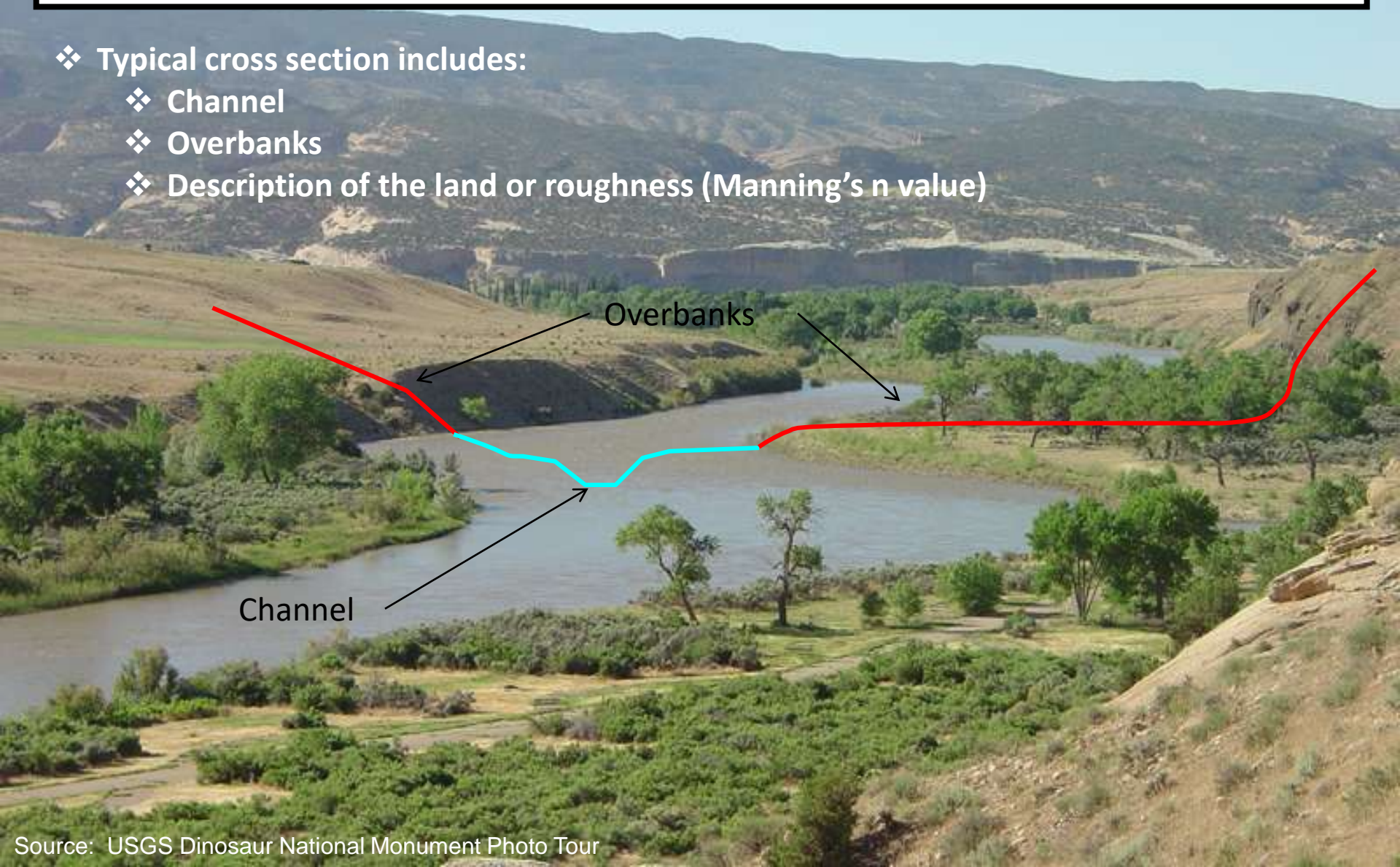
Geometry: Cross Sections



Cross Sections

❖ Typical cross section includes:

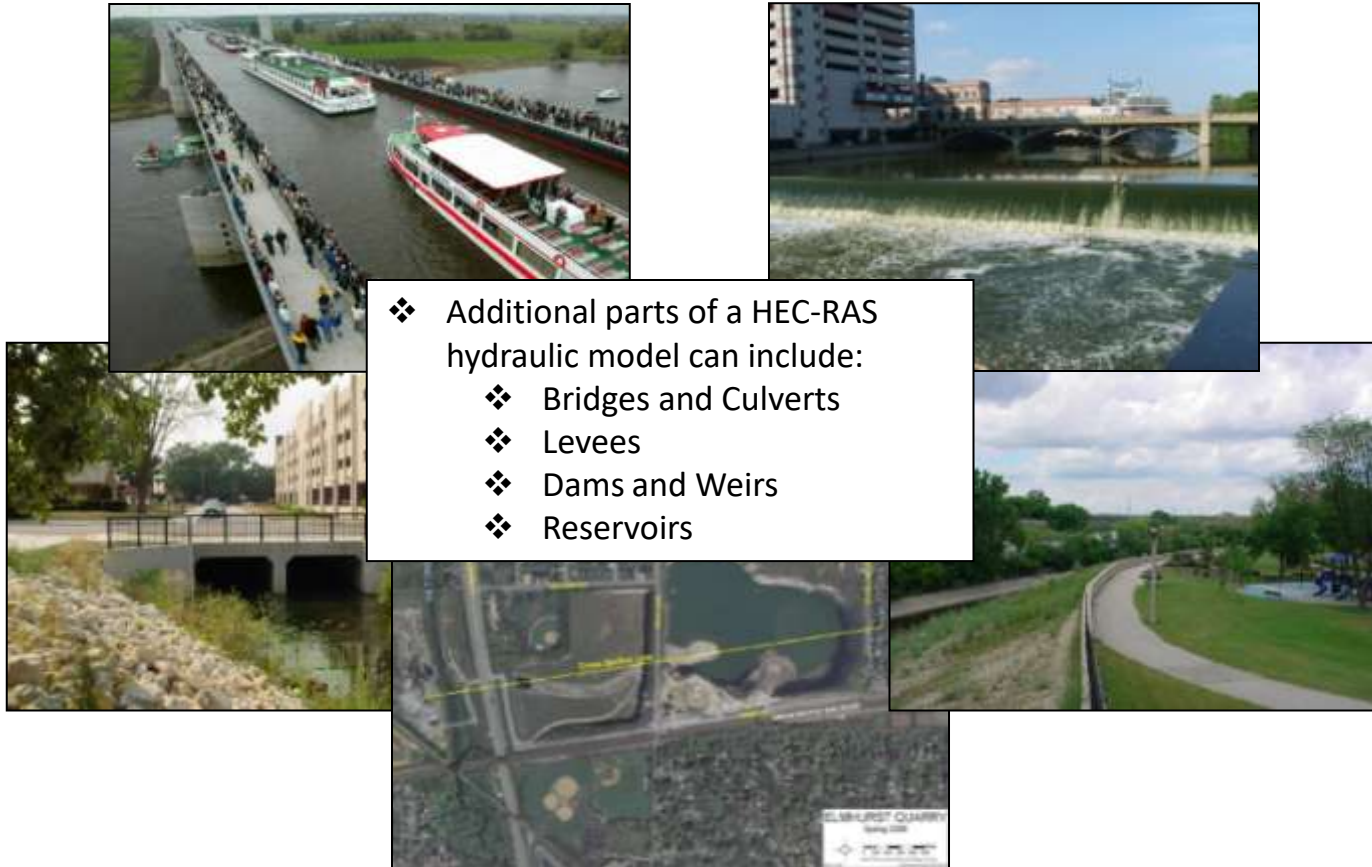
- ❖ Channel
- ❖ Overbanks
- ❖ Description of the land or roughness (Manning's n value)



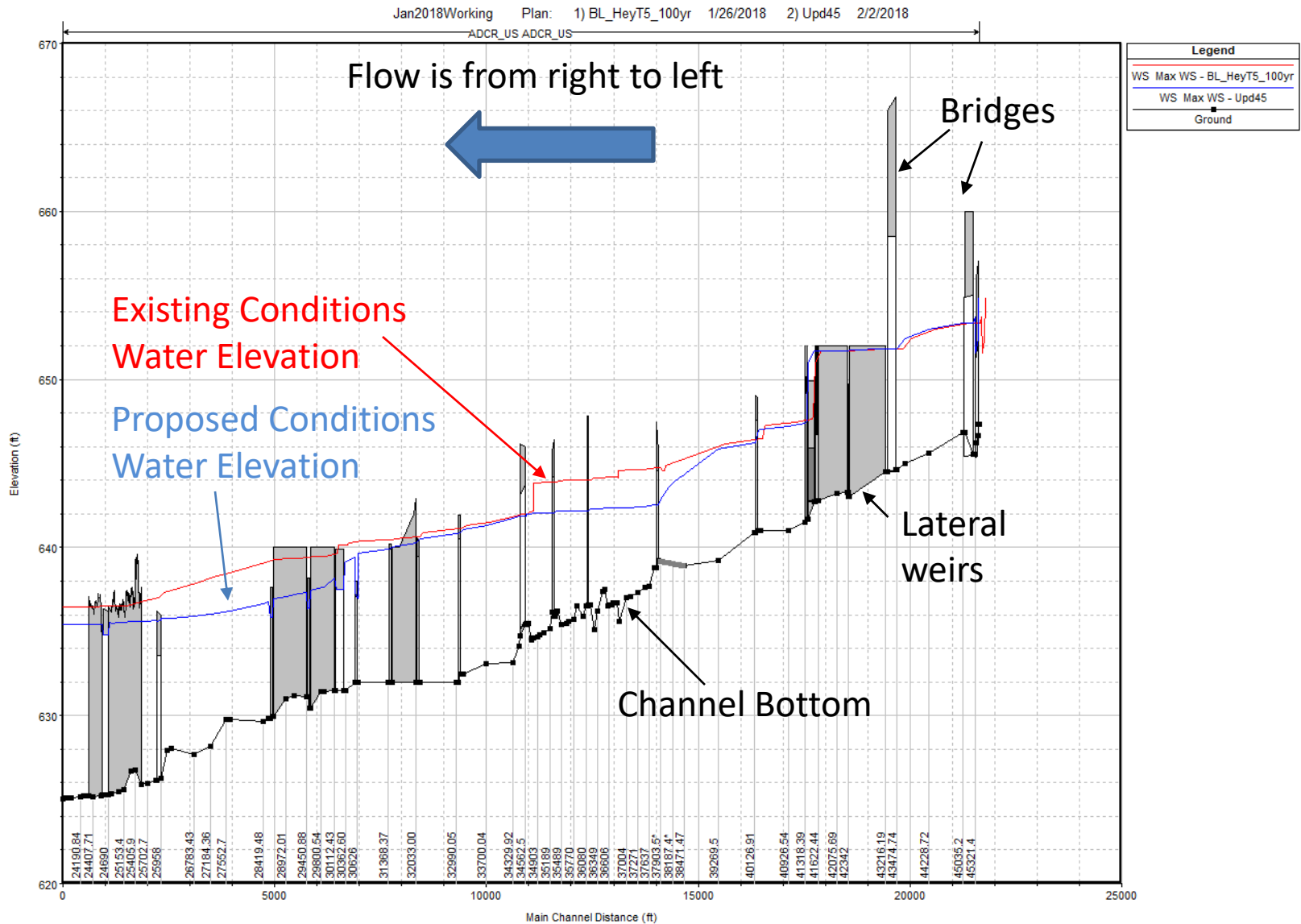
Overbanks

Channel

Geometry: Structures



Results



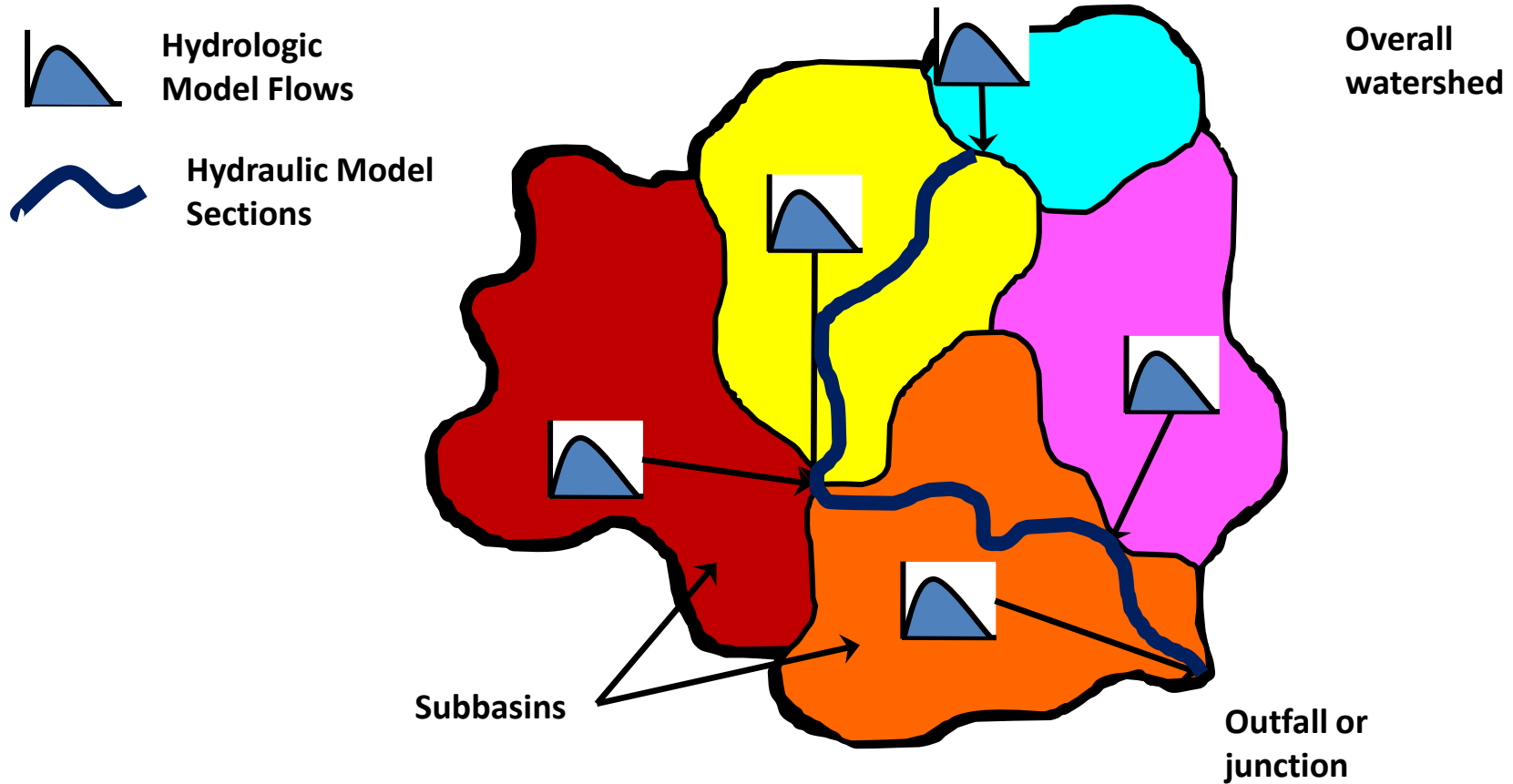
Floodplain Mapping

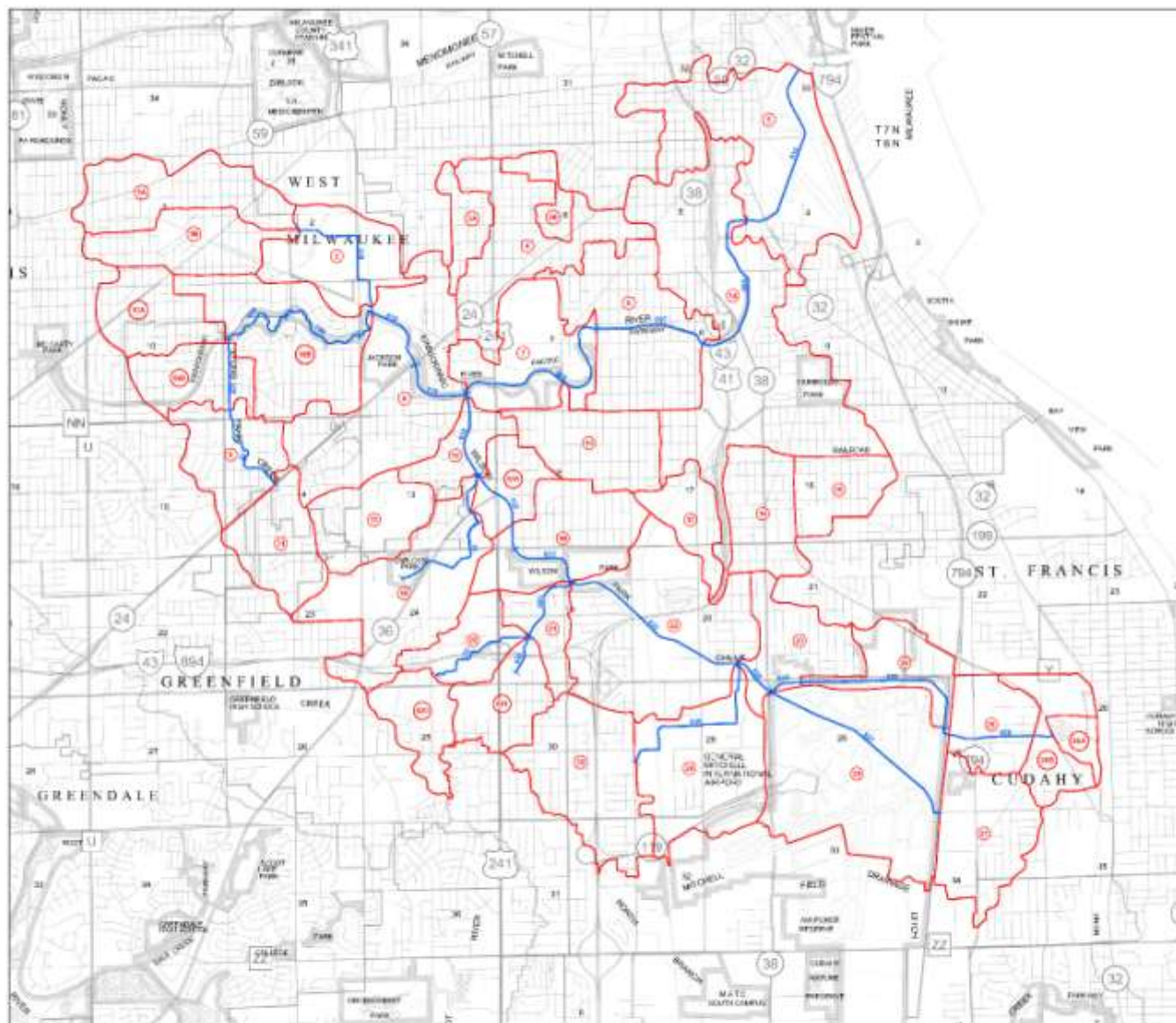


Calibration and Validation



Combining Hydrology and Hydraulics



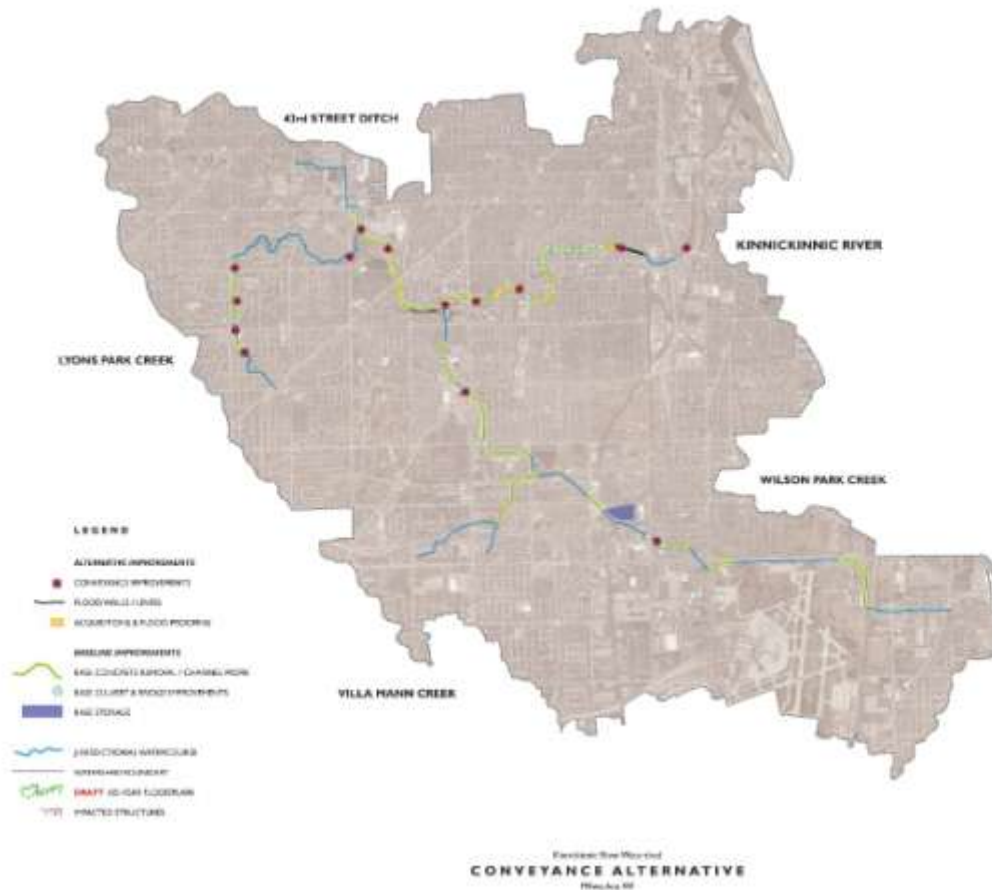


Kinnickinnic River Watershed
HSPF Model Subbasin/Reach Map

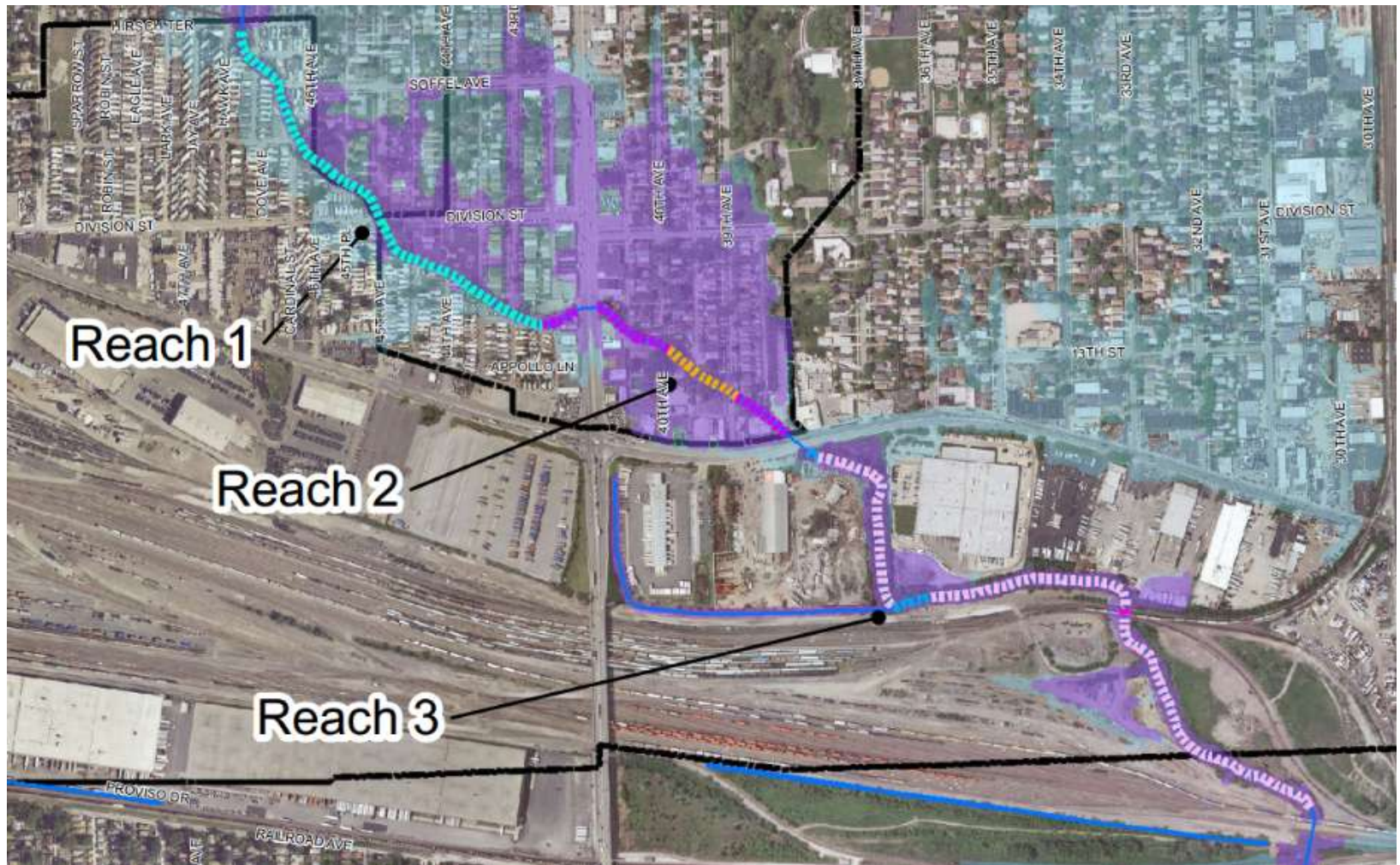
1 HSPF Model Subbasin
— HSPF Model Routing Reach



Real World Applications: Kinnickinnic River Watershed Plan



Real World Applications: Addison Creek Flood Mitigation



Real World Applications: Happ Road Bridge Replacement





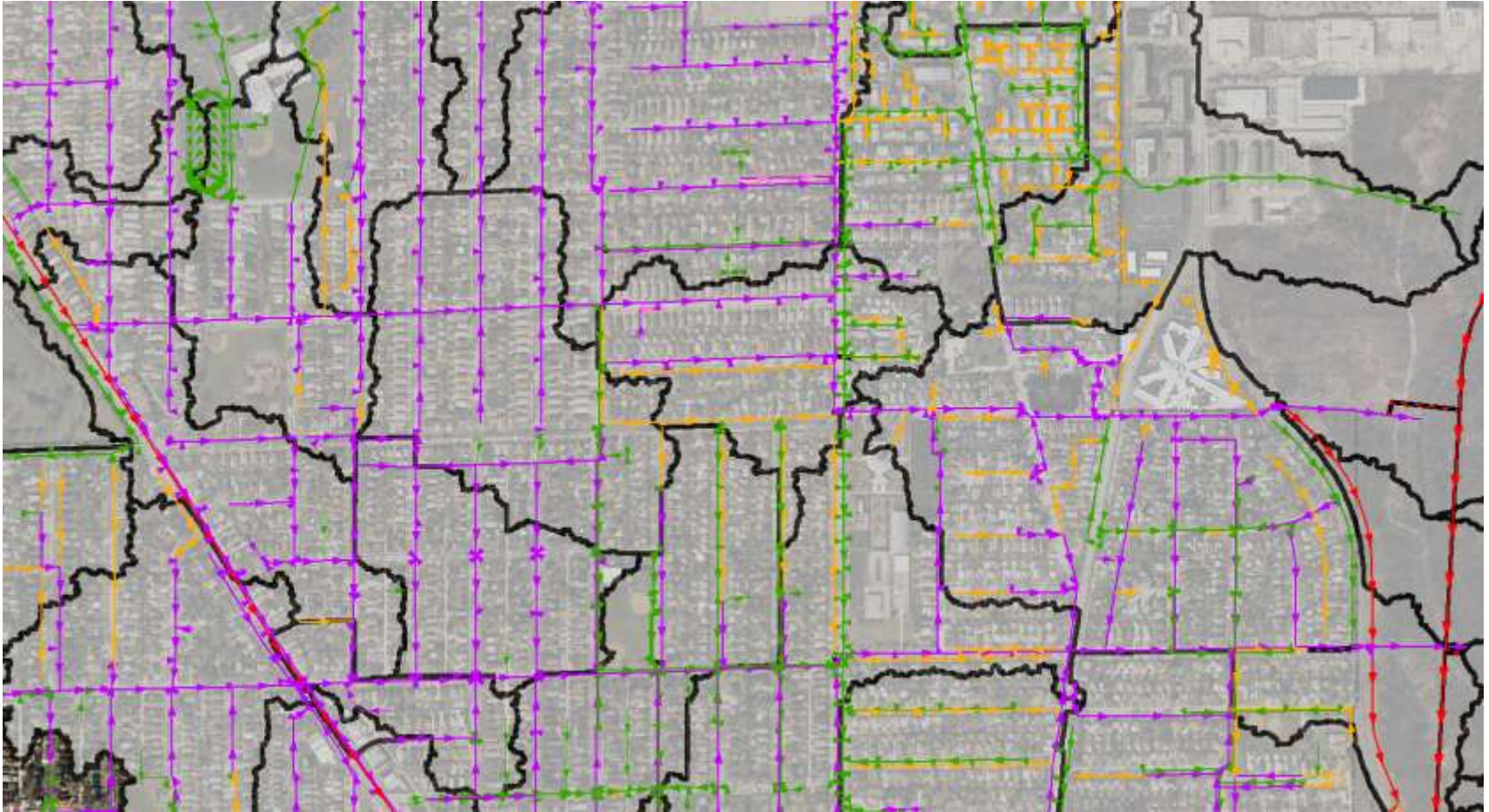
Hydrologic and
Hydraulic Modeling:



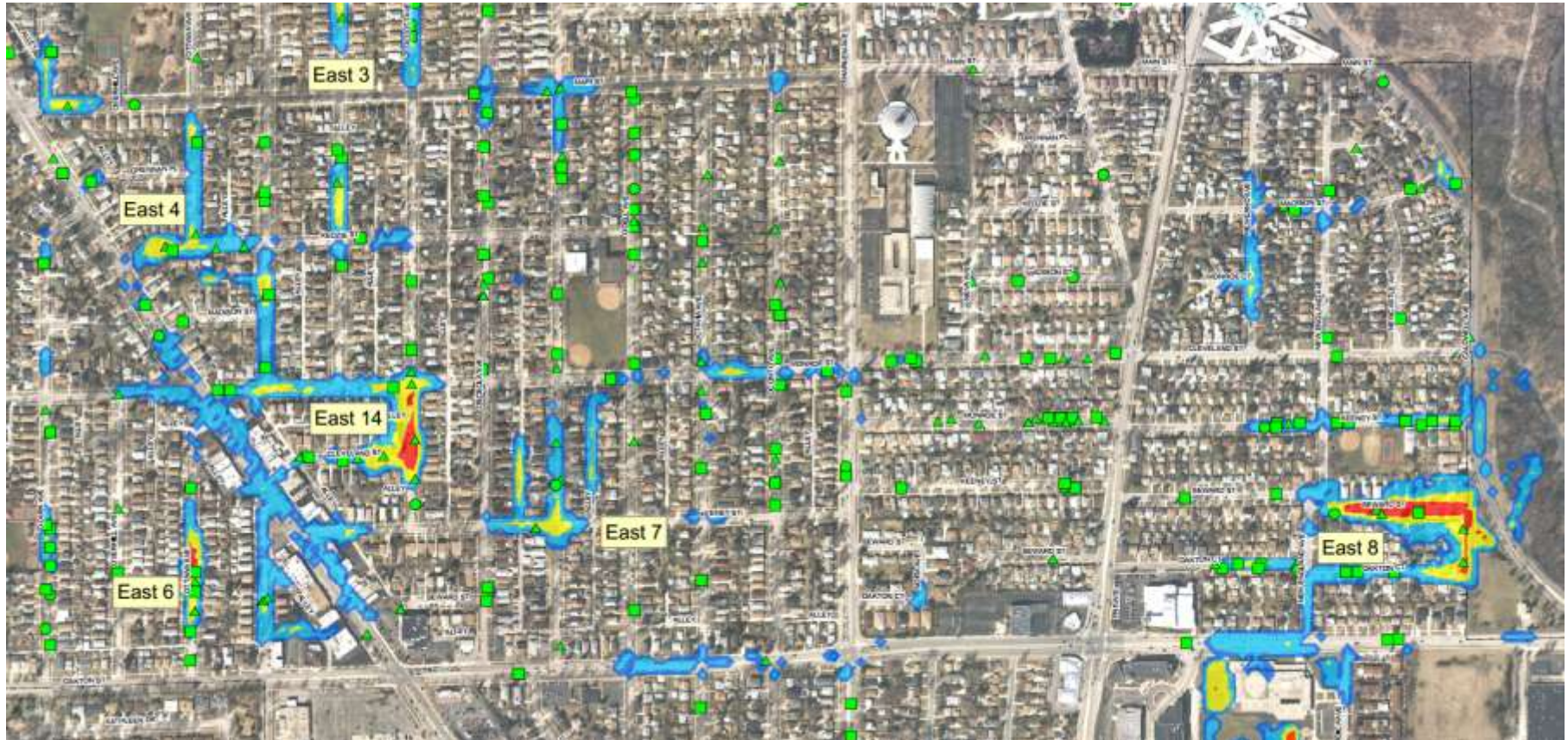
SWMM

- Environmental Protection Agency (EPA)
version available for free
- SWMM – Storm Water Management Model
- Generally used for modeling storm sewers
- Combines hydrology and hydraulics

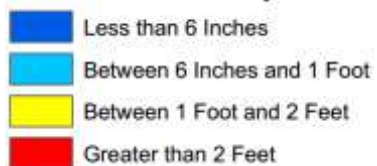
SWMM Applications



SWMM Applications



100-Year Flood Depths



Questions

Jeff Macke, P.E., CFM

Hey and Associates, Inc.

773-693-9200

jmacke@heyassoc.com

Sarah Runger, P.E., CFM

Hey and Associates, Inc.

773-693-9200

srunger@heyassoc.com