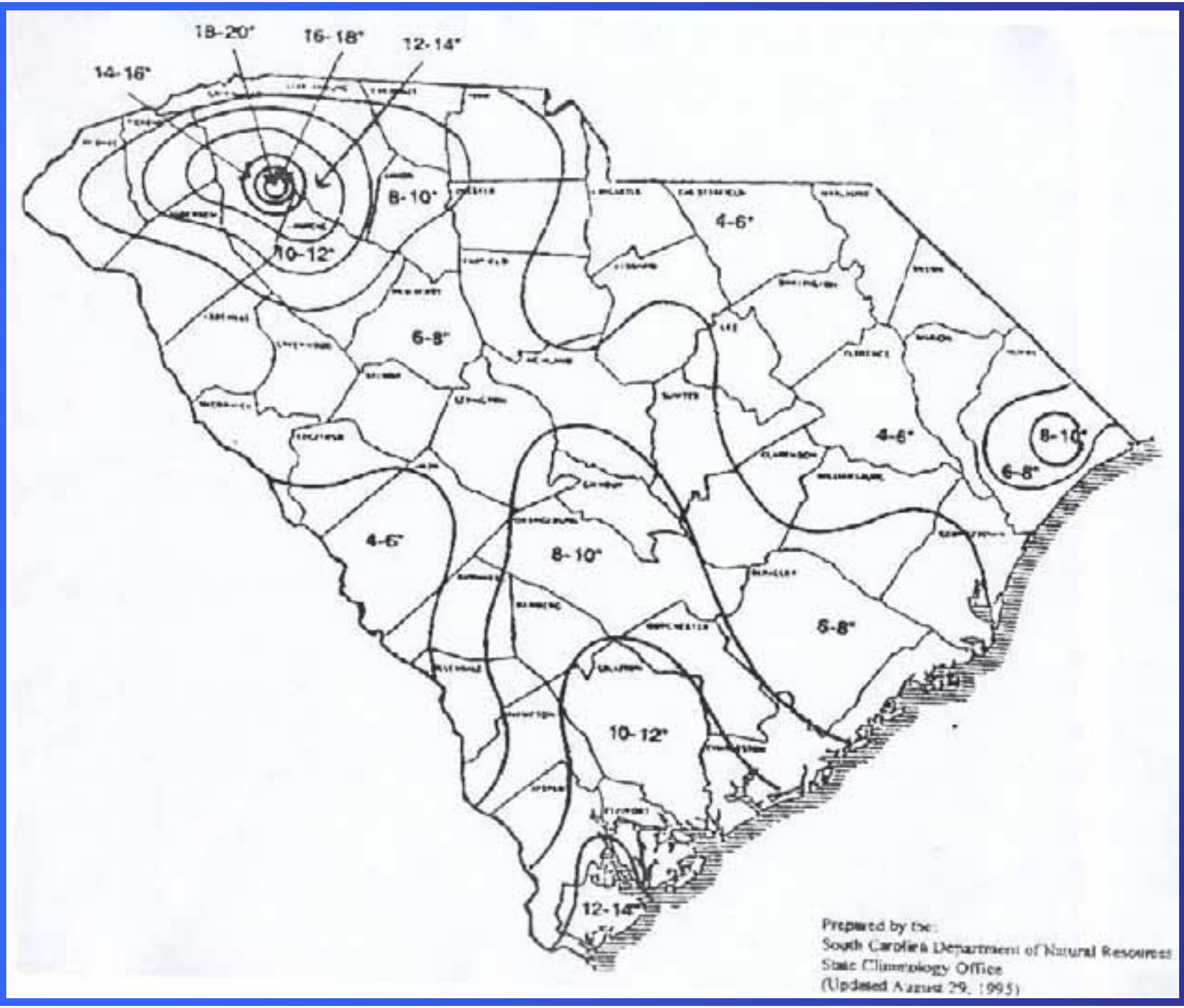
GIS in Support of Detailed Flood Modeling

Gilder Creek Watershed Study

Greenville County, SC

Woolpert

Tropical Storm Jerry


18-20"
16-18"
12-14"
14-16"
8-10"
4-6"
10-12"
6-8"
4-6"
8-10"
6-8"
4-6"
8-10"
6-8"
10-12"
12-14"
Prepared by the:
South Carolina Department of Natural Resources
State Climatology Office
(Updated August 29, 1995)

Not your everyday storm…

2-inches

Summer Thunderstorm

9.45-inches

100-year Storm

18-inches

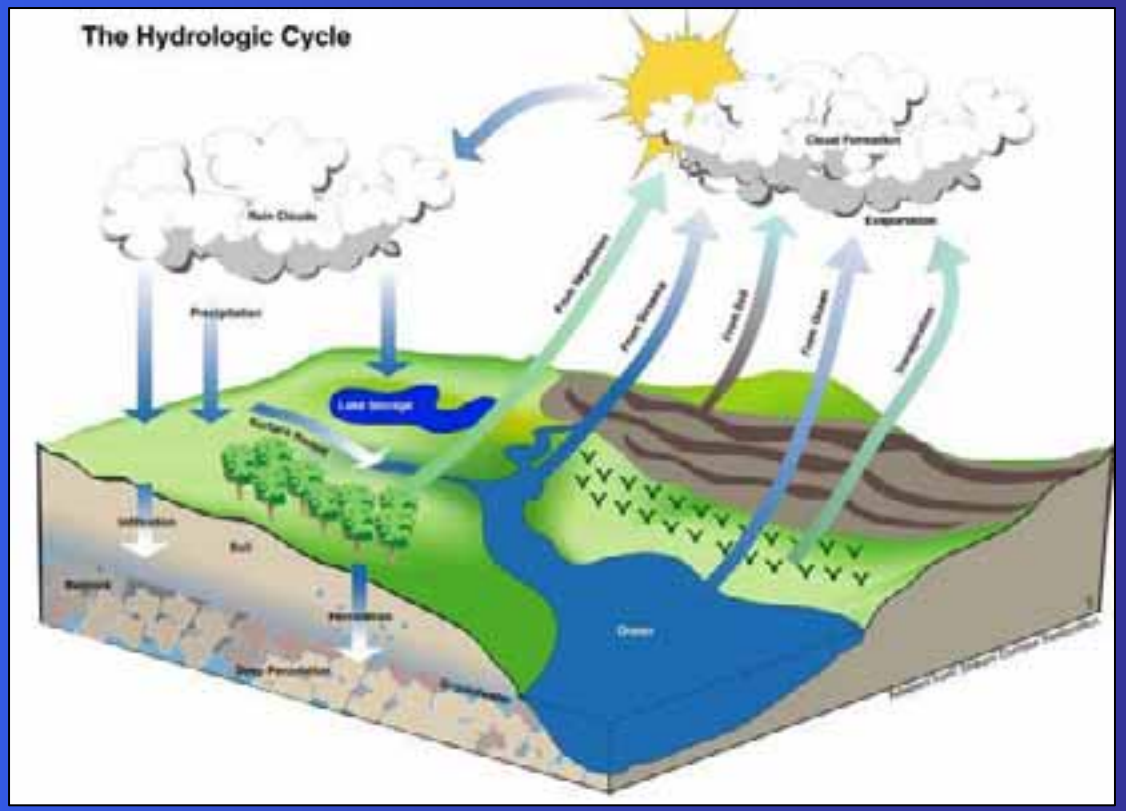
TS Jerry

Study Purpose

- Identify flood prone structures and develop potential alternatives to reduce flooding damage
  - Develop hydrologic and hydraulic models
  - Prepare accurate floodplain mapping
  - Identify potential capital improvement projects to reduce and/or prevent future increases in flooding

GIS Usage Throughout Study

- **Field Data Collection**
- **Development of Modeling Input Data**
- **Model Creation**
- **Model Verification and Calibration**
- **Display of Modeling Results**



Field Data Collection

Stream Walks

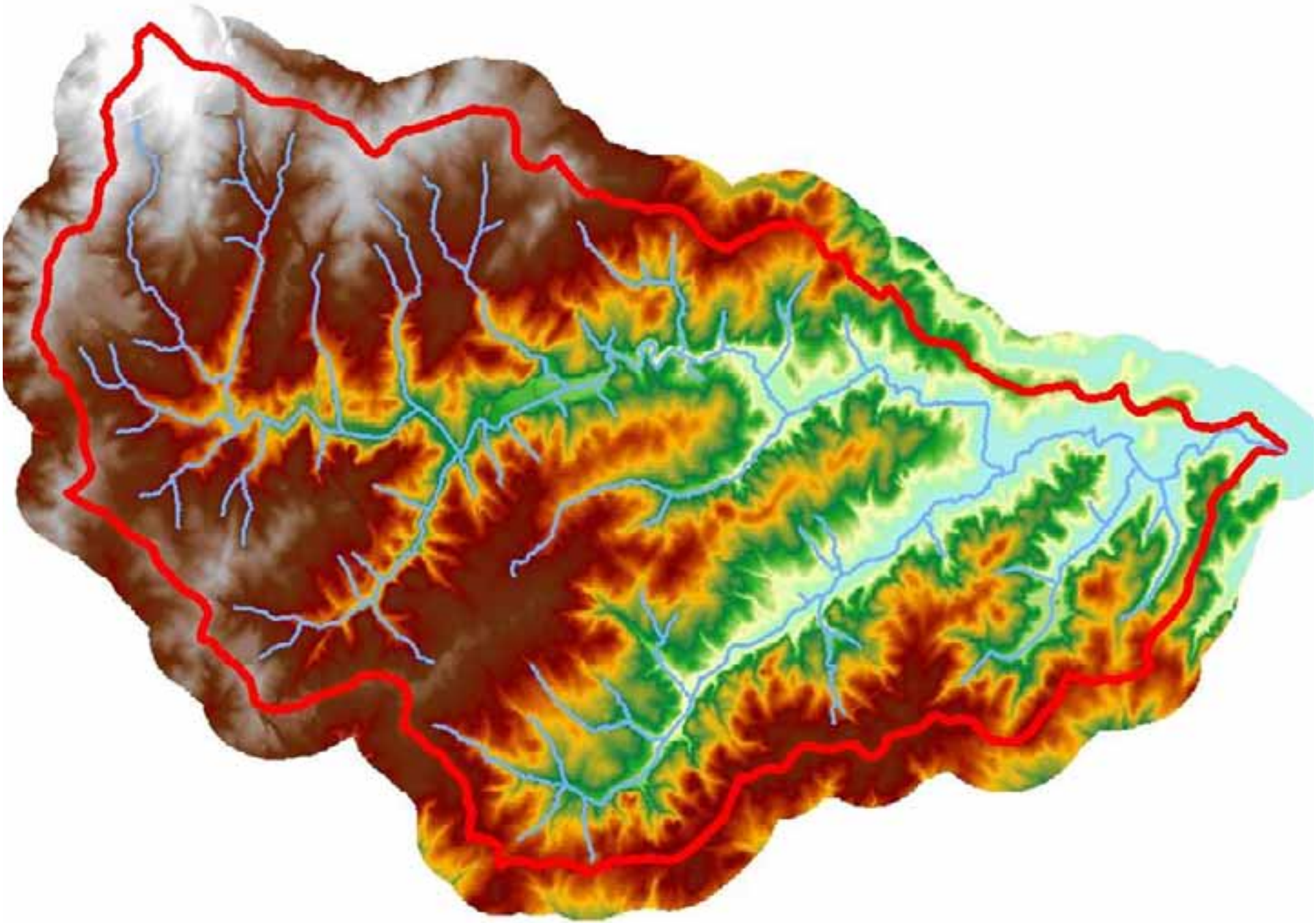
- Field crews walked 67 miles of streams to collect the following:
  - Channel/pipe measurements
  - 1,800 cross sections
  - Digital pictures
  - Estimates of channel resistance (i.e. vegetation, trees, channel bends)

Bridge/Culvert Survey

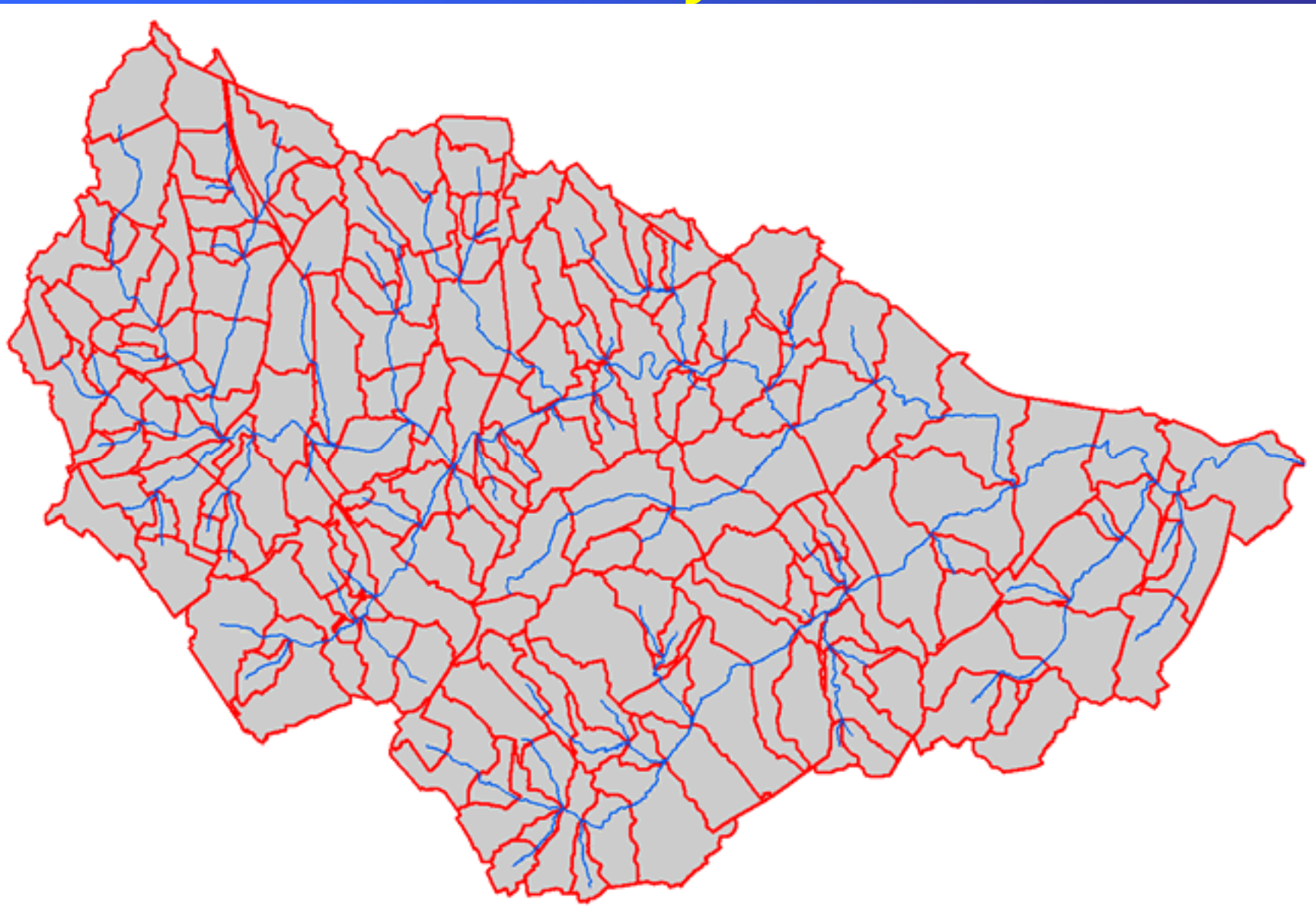
- Surveyed a total of 141 culvert and bridge crossings

Residential Structure Survey

Development of Modeling Input Data

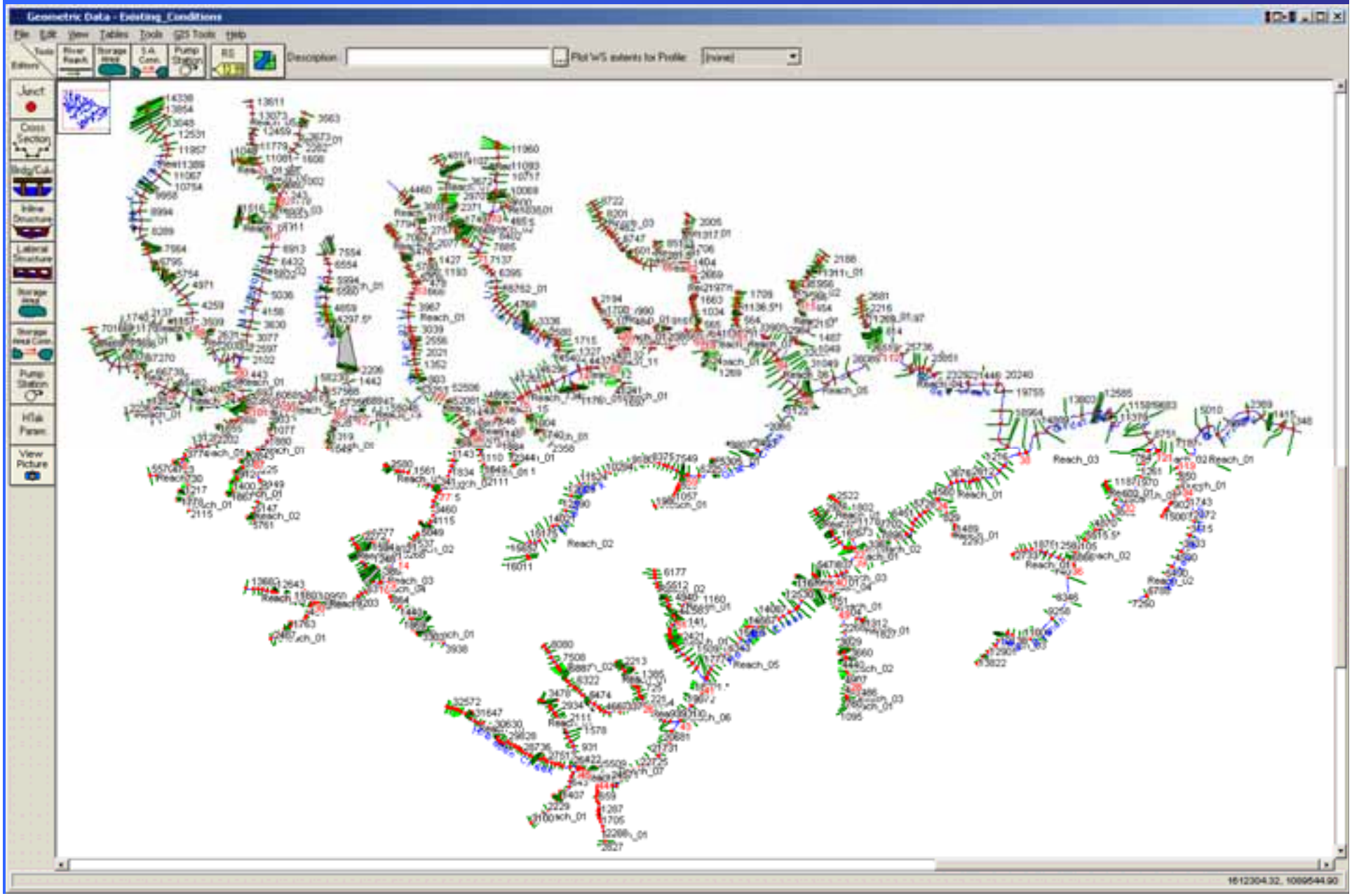


Arc Hydro

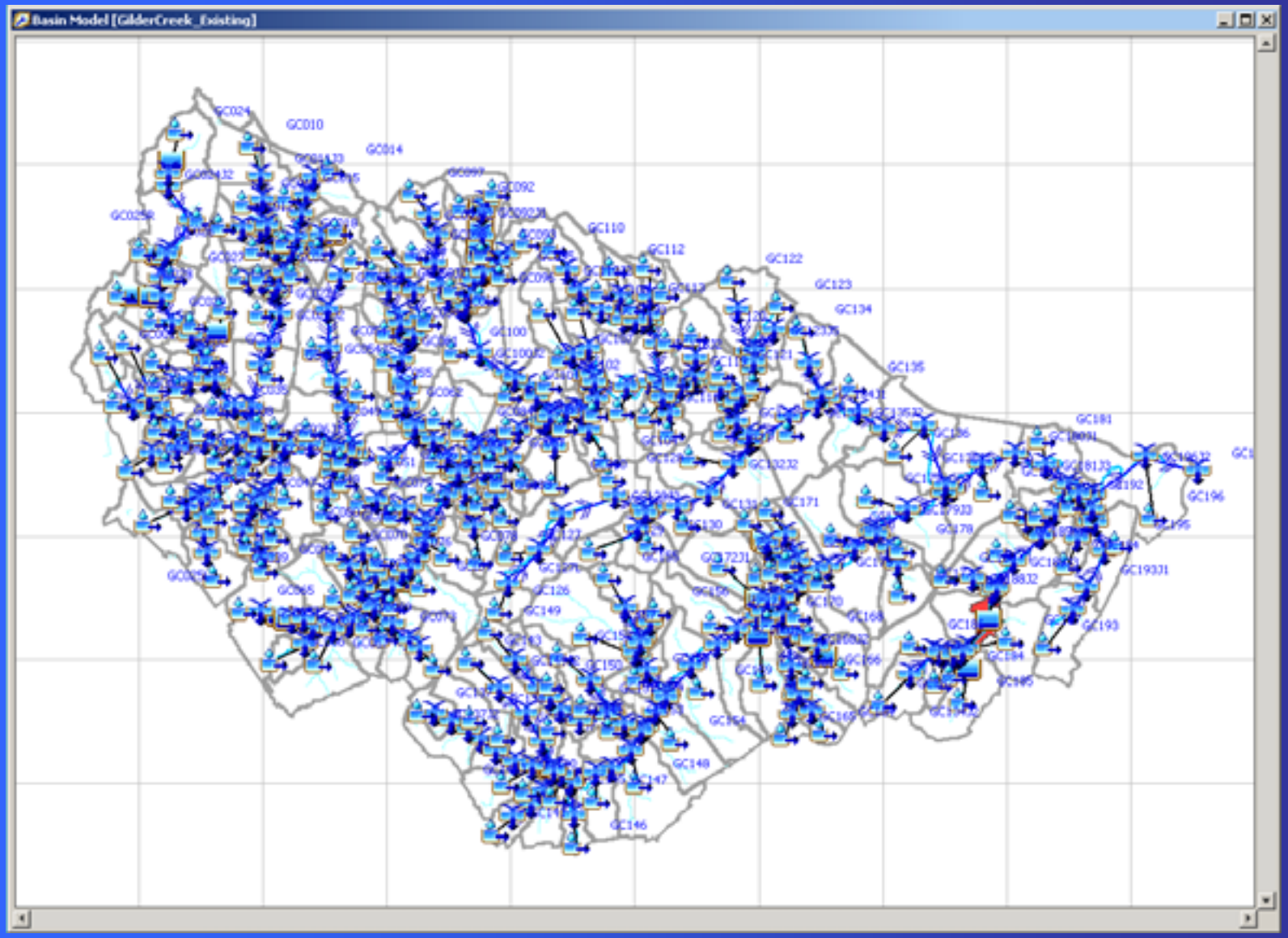


Model Creation

HEC-GeoRAS – HEC-RAS



HEC-GeoHMS – HEC-HMS

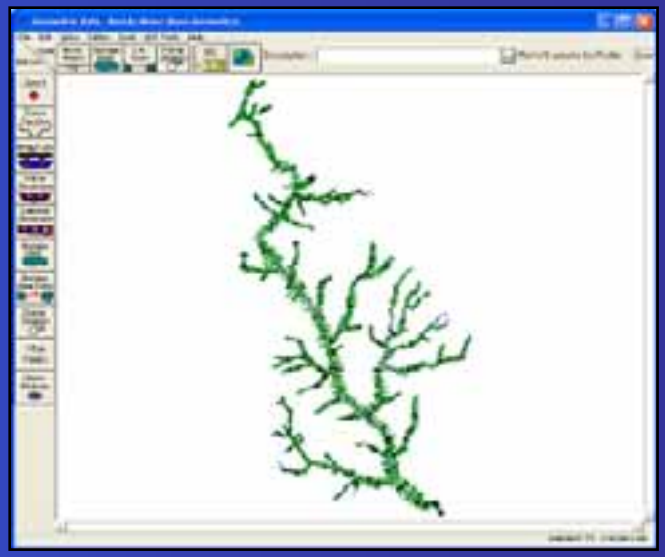


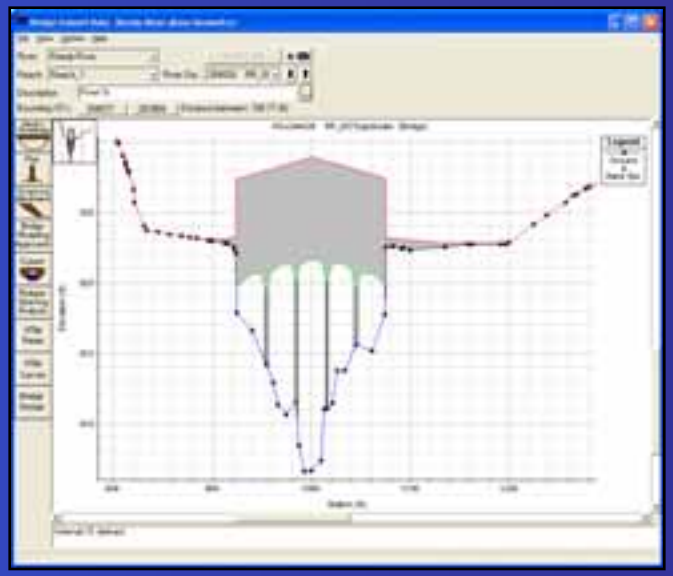
Hydrologic Modeling

- Divided the basin into 196 sub-watersheds to predict the amount of storm water runoff during rainfall events using:
  - Drainage area
  - Soils
  - Landuse

Hydraulic Modeling

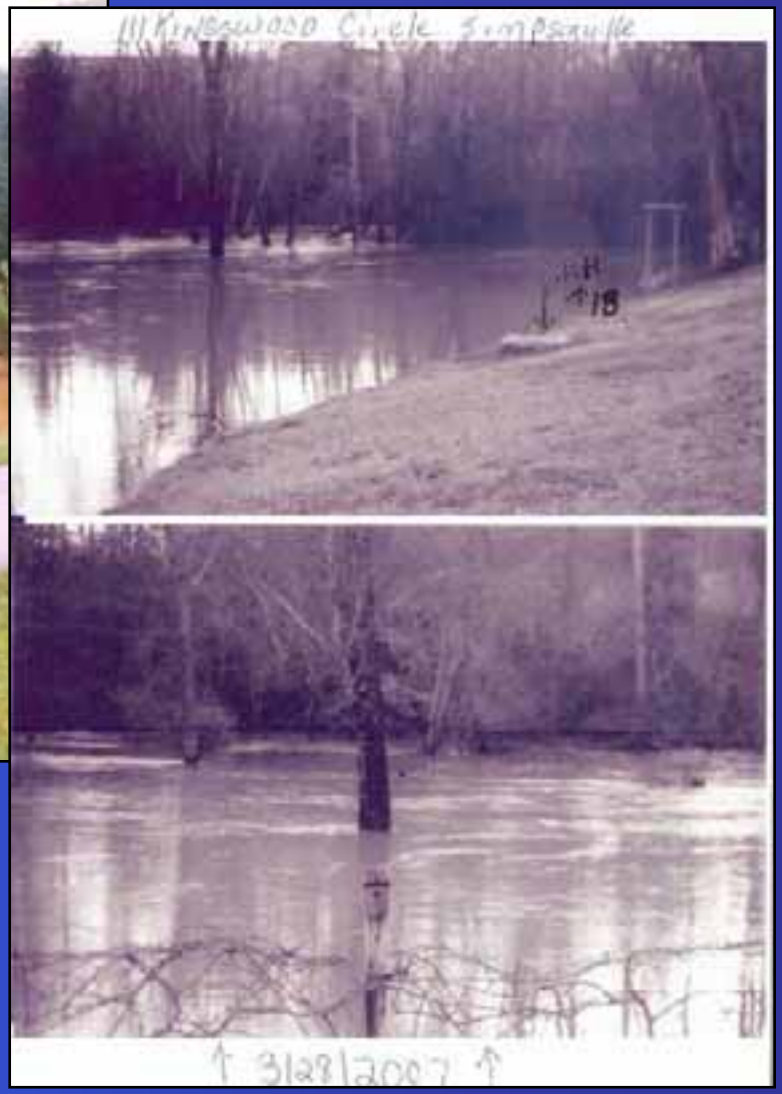
- Predicted water surface elevations using the following:
  - Bridge/culvert survey data
  - Runoff predicted from hydrologic modeling
  - Channel and floodplain geometry
  - Channel slope
  - Channel resistance (i.e. vegetation, trees, channel bends)





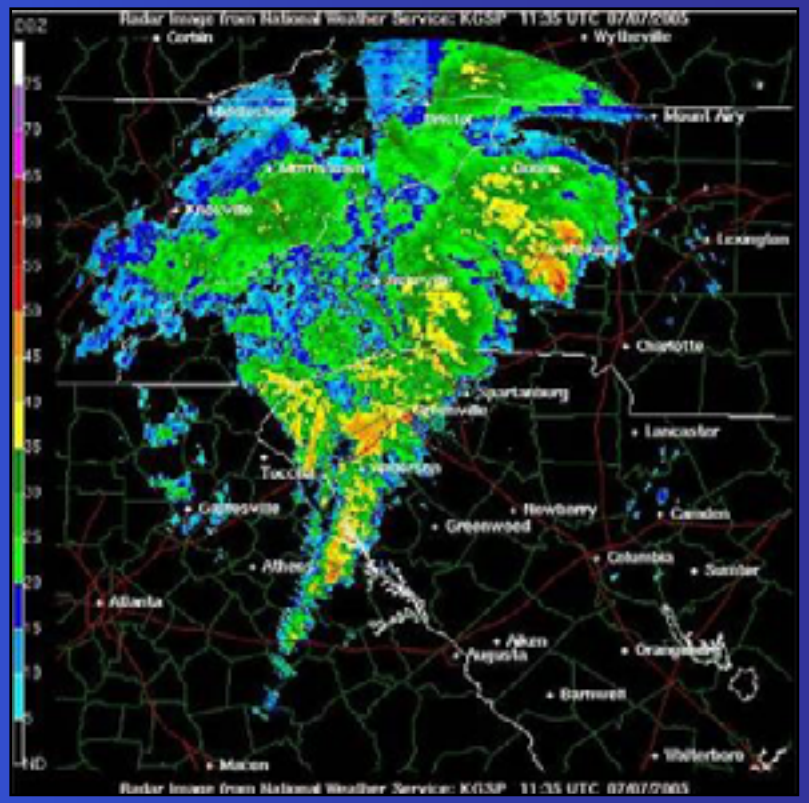
Model Verification and Calibration

High Water Marks



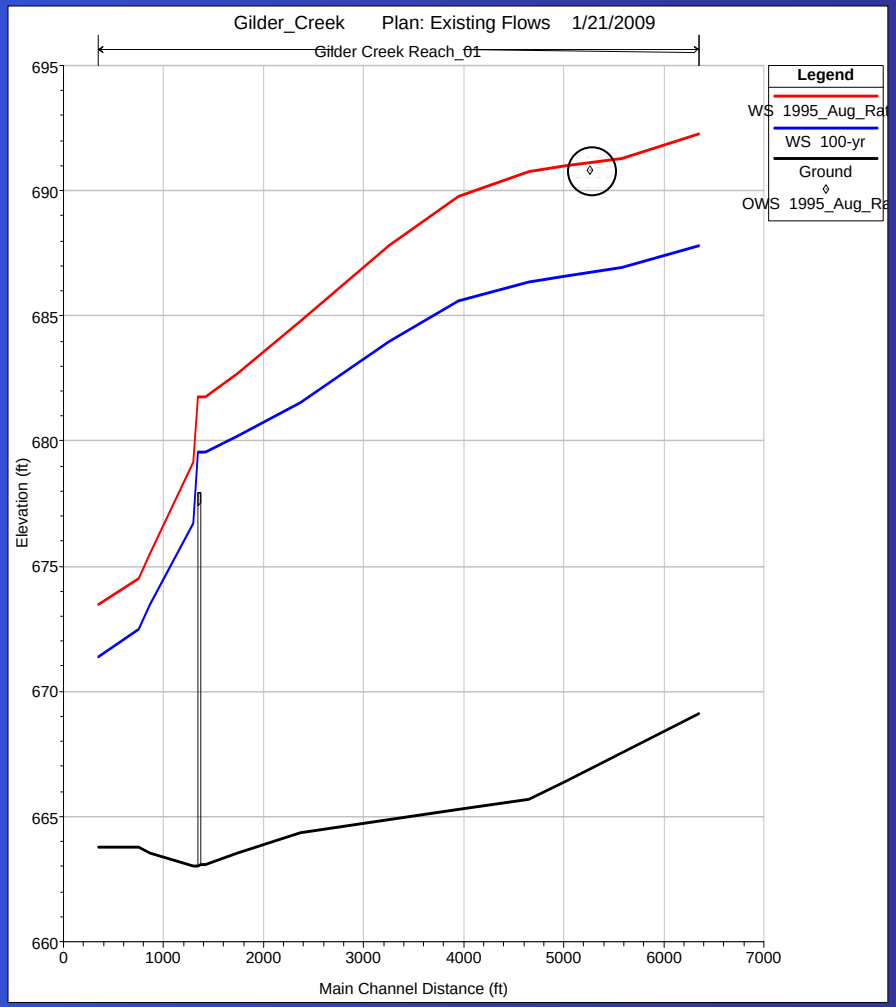
Model Validation

- Obtained NWS historical rainfall data where available
- Received pictures and documentation of historical flood events
- Selected TS Jerry (Aug ’95) and July ’05 storms for validation

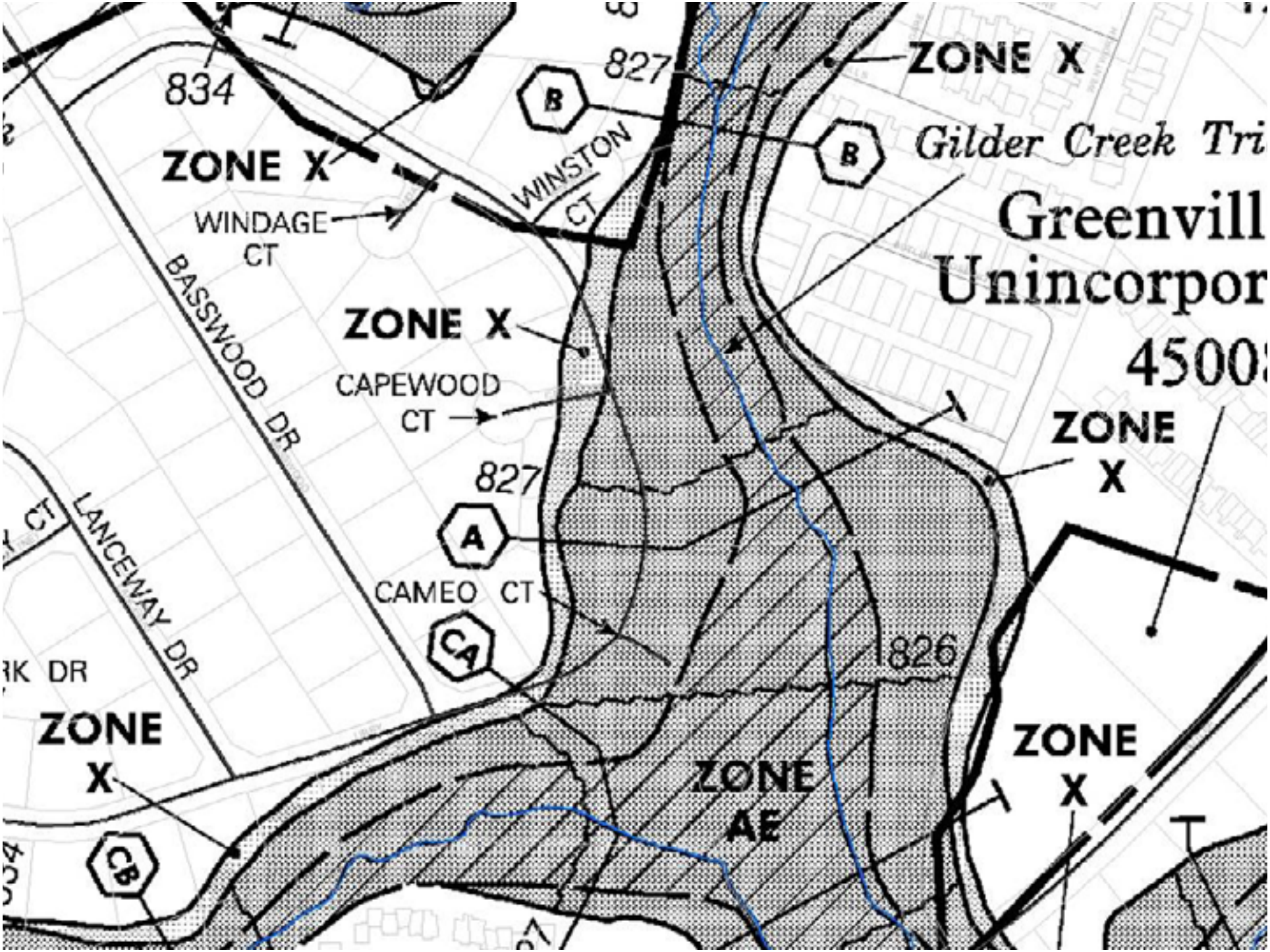


Final Validation

- Matched HWMs within 0.2 -1.0 feet
- Model inputs provide representative results for other events



Display of Modeling Results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827
ZONE X
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Gilder Creek Tri
WINSTON CT
WINDAGE CT
Greenvill
Unincorpor
4500
ZONE X
BASSWOOD DR
CAPEWOOD CT
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ZONE X
CAMEO CT
C4
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LANCEWAY DR
ZONE X
ZONE AE
ZONE X
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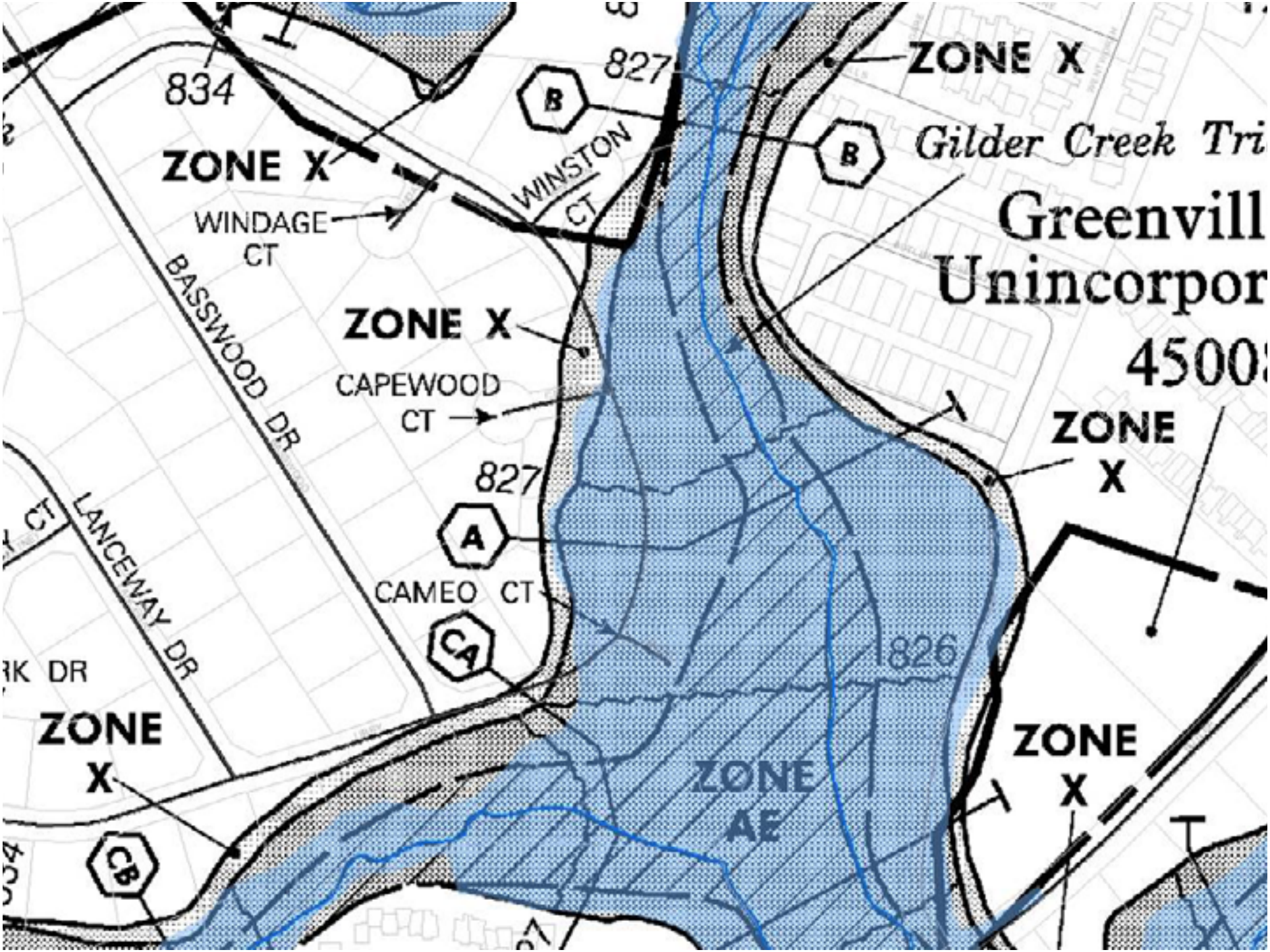
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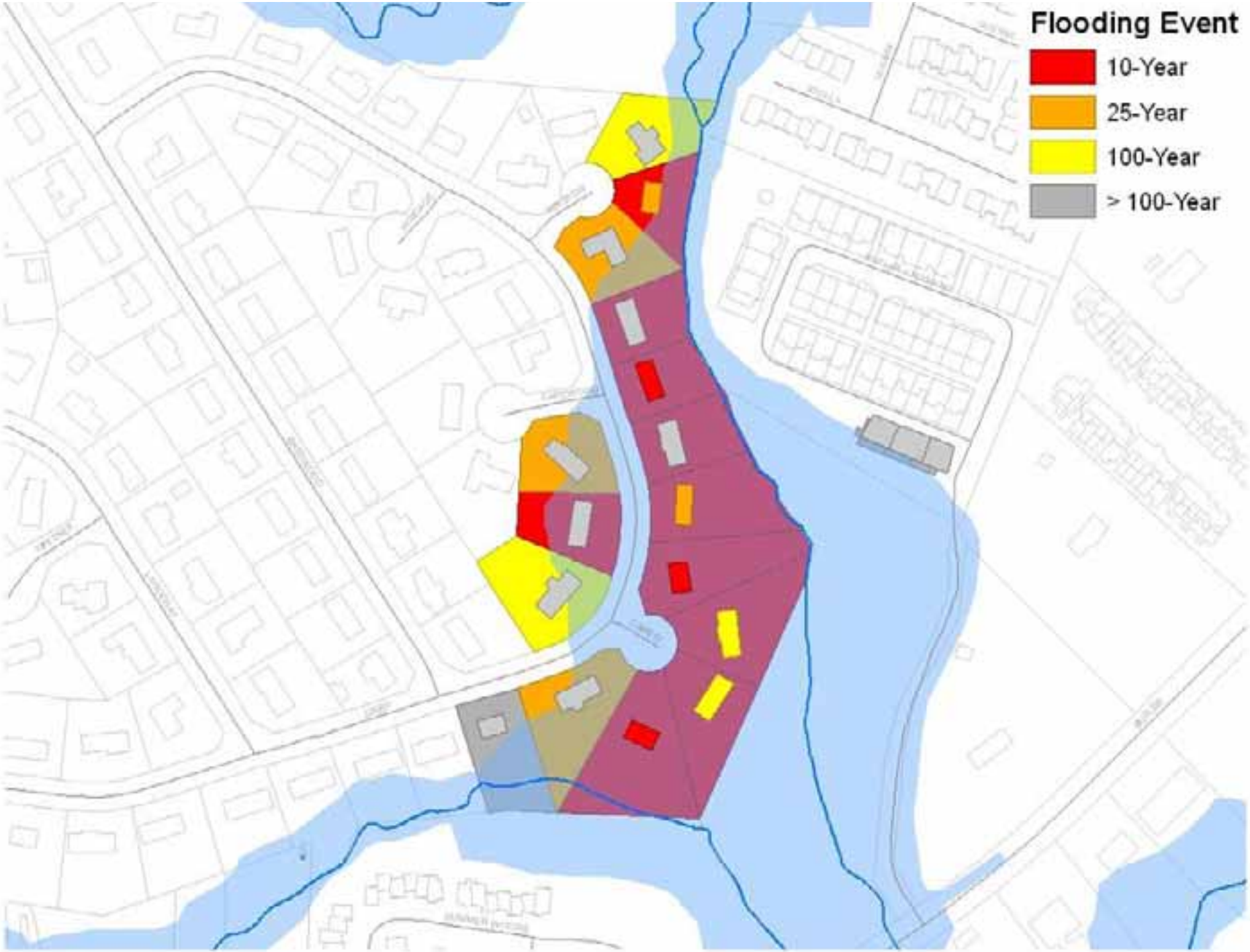

Flooding Event
10-Year
25-Year
100-Year
> 100-Year

Neighborhood Flooding

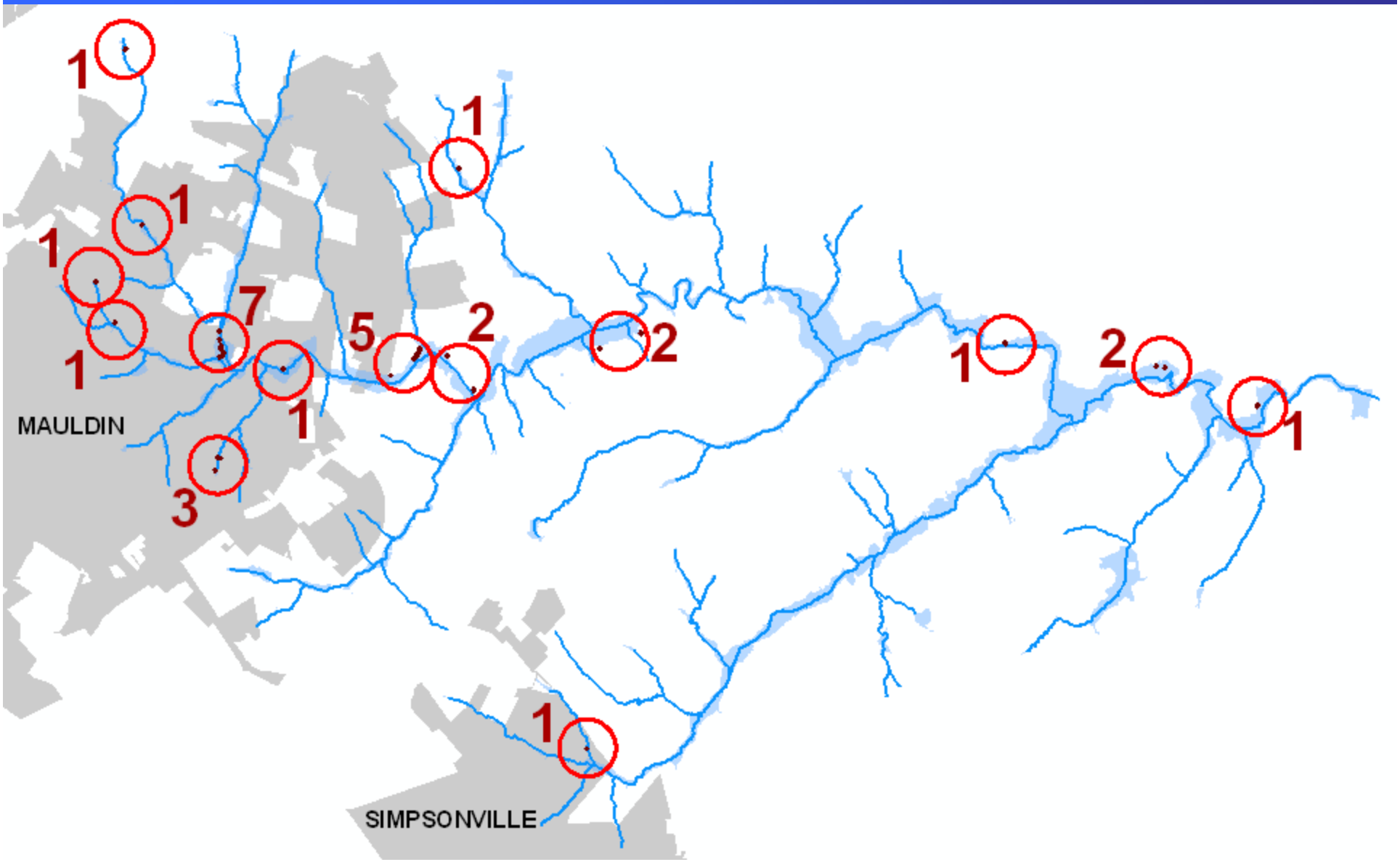
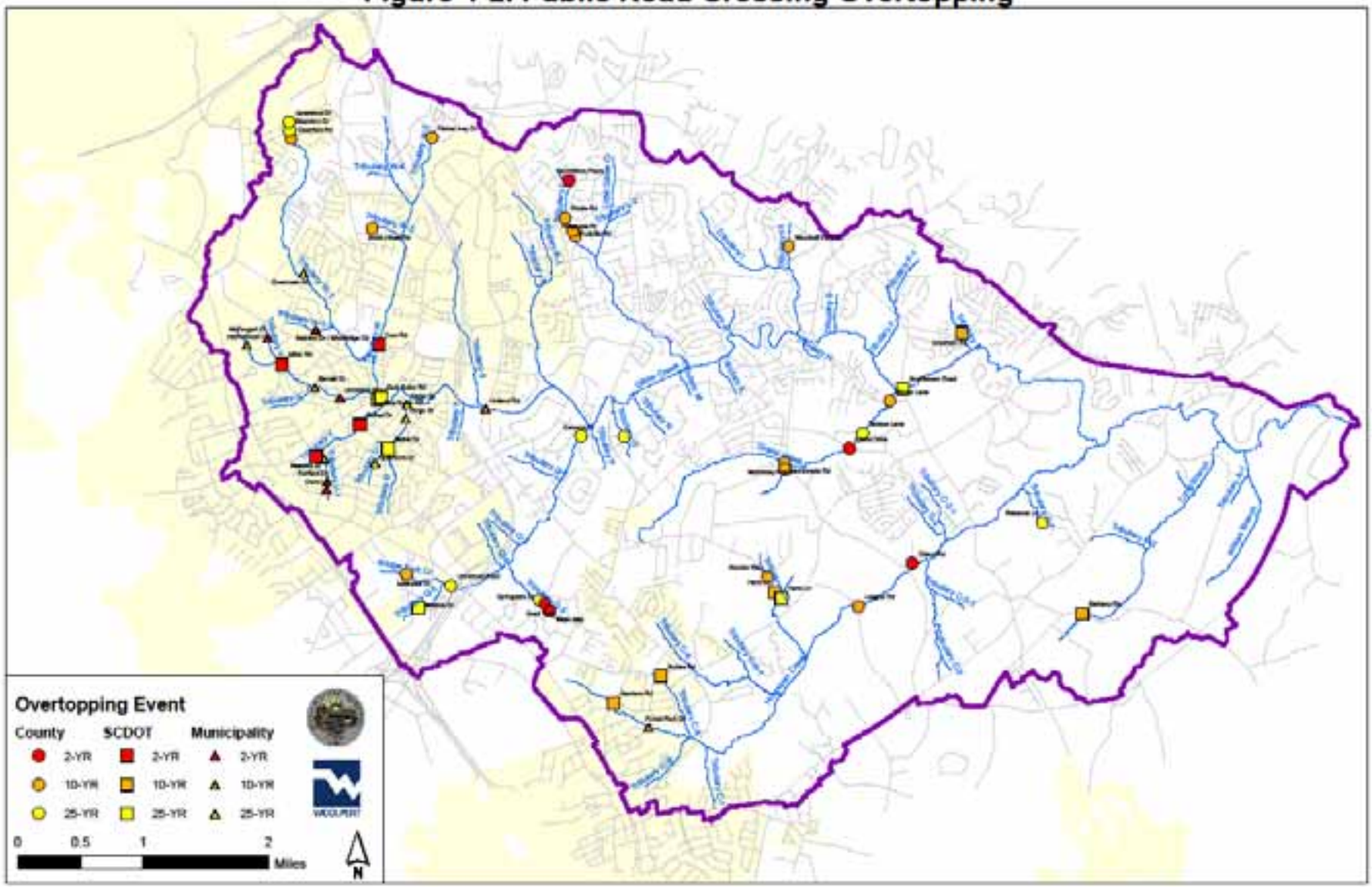


Figure 4-2. Public Road Crossing Overtopping



Results

- Yard flooding
- Culvert/bridge overtopping
  - 8 County roads (2-year storm)
- Structures at risk during flooding
  - 30 homes (100-year storm)

Alternatives Analysis

- Based on initial evaluation, typical capital improvements such as regional detention, large scale channel improvements, diversions, or flood walls will not solve the problem

- Analysis will focus on more localized solutions such as:

  - House-by-house solutions
  - Culvert/bridge upgrades

Contact Information

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