

CAPCOG Hazard Risk Program: GIS Flood Risk Program

Utilizing Additional/Best Available Flood Data to do Enhanced Flood Risk Analysis

for Effective Floodplain Management and Transportation Planning

Craig Eissler, GIS Program Manager



Thousands of miles of streams crisscross the CAPCOG region's watersheds creating the potential for flooding almost everywhere!

Austin American-Statesman
Saturday, January 5, 2019 | statesman.com | @statesman

BELOW: San Antonio firefighters Fernando Guerrero, left, and Lt. Doug Reed search a flooded neighborhood in Kingsland on Oct. 16. (DAY JAMER/AMERICAN-STATESMAN)

ABOVE: Steve Ray Vaughan's statue at Lady Bird Lake sports a life vest in anticipation of flooding in the area. (MICHAEL B. BRAZZILL/AMERICAN-STATESMAN)

RAINFALL IN 2018 MADE HISTORY

By Mary Huber | mhuber@statesman.com

From drought to floods to powerful hailstorms, 2018 was a remarkable year in Texas weather. In particular, meteorologists agree that the torrential September and October rainfall in Central Texas, which caused unprecedented flooding along the Colorado River, will go down as the state's most notable weather event last year. It was a story that dominated news headlines for at least two weeks in October, when flooding rains caused Lake Travis to swell to near-record levels. The water got so muddied that treatment plants weren't able to filter it quick enough, prompting a six-day boil water notice for Austin Water customers, the first in its history. In total, 15.7 inches of rain fell in the Austin area in September and October, making that two-month period the seventh-wettest ever recorded in the city. "The most unusual contributing factor was the record number of named storms in the east Pacific," state climatologist John Nielsen-Gammon said. "Texas tends to think of all our hurricane weather coming from the Atlantic Ocean, but a lot of the storms in the east Pacific make landfall in Mexico, and a lot of their moisture makes landfall in Texas and contributes to rainfall in our state." September and October were the fourth- and third-wettest months on record in the state, respectively. See WEATHER, A6

Austin's remarkable year in weather
The torrential September and October rainfall that caused unprecedented flooding along the Colorado River will go down as the most notable weather event to occur last year. For at least two weeks in October, flooding caused Lake Travis to swell to historic levels, and the muddied floodwaters overwhelmed Austin's treatment plants.

Daily temperatures at Camp Mabey

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
110°	100°	90°	80°	70°	60°	50°	40°	30°	20°	10°	0°
Record	High	Normal	High	Normal	High	Normal	High	Normal	High	Normal	High

Oct. 16 Daily record rainfall of 6.96 inches

Flood Modeling Primary (H&H) Inputs:

(preferred in red)

- **Ground Elevation data**
[Elevation accuracy]
 - LiDAR (various years)
 - Other methods (some very old)

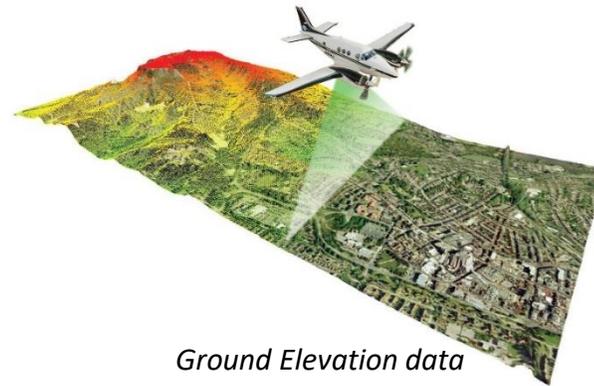
- **Rainfall/Runoff data**
[Data currency (historical period)]
 - NOAA: Atlas 14 (2017)
 - USDA/NRCS: 2010
 - USGS: some Texas 2004
 - ...or much older (1970s, 1960's)

- **Stream Gauge data**
[Measurement Density]
 - USGS
 - River Authority (i.e. LCRA)
 - Local (i.e. CoA)
 - [Regression Equations]

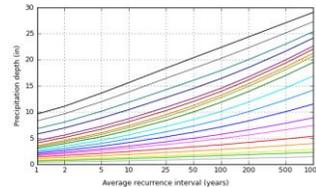
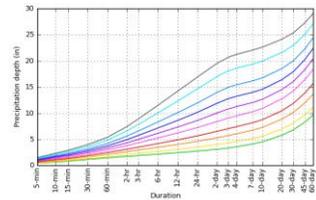
And of course, **the Model** itself:

- Advanced (i.e. HEC-RAS, HEC-HMS)
- Simplified (i.e. HAZUS*)

Primary Components of Flood Data



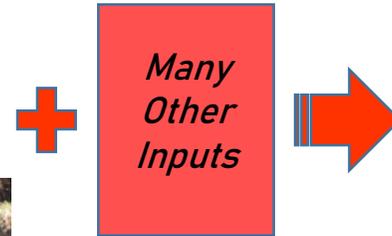
Ground Elevation data



Rainfall-Runoff data



Stream Gauge data



Additional Data

H&H Flood Modeling software



Flood Maps & Data

- ☐ Risk MAP
 - FIRM
 - Flood Risk Products
- ☐ Base Level Engineering (BLE)
- ☐ (Other)

"Best available data" is somewhat subjective, and coverage may vary

Conventional Flood Data > Products

FIRMs (Flood Insurance Rate Map) only show:

- 100-yr boundary...
- ...sometimes the 500-yr boundary
- ...some streams, but maybe not all
- ...and some streams are only mapped using Approximate (Zone A) methods
- ...and some input data may be very old

Additional/Best Available Flood Data > Products

Flood Risk Products show:

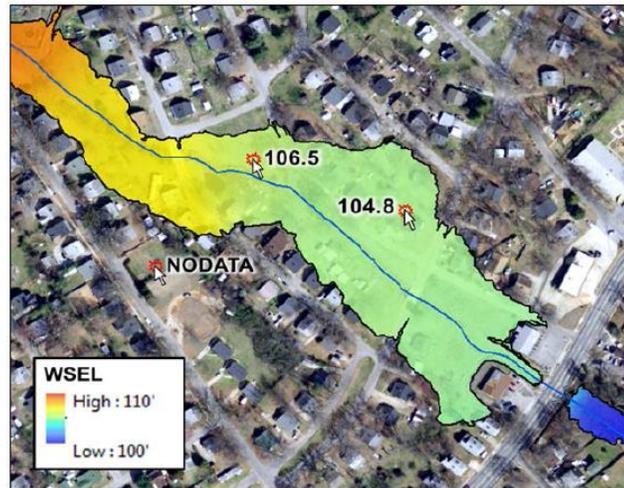
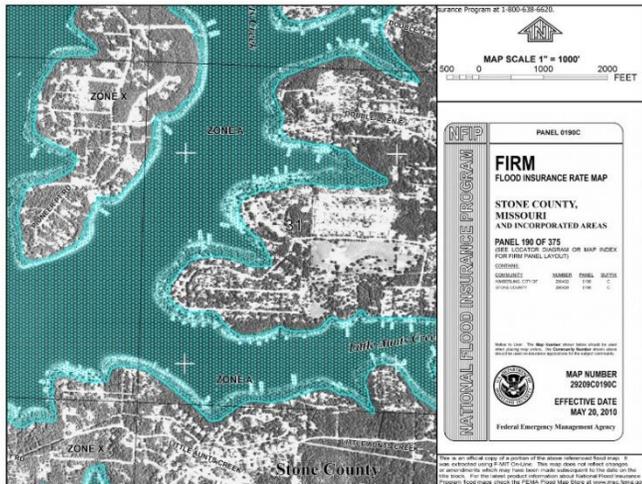
- The same 100-yr FIRM boundary, but also
- ...other flood scenarios, incl. **10-yr, 25-yr, 50-yr and 500-yr**
- **Flood-Water Surface Elevations** and **Flood Depths** data
- ...and other risk-oriented data (i.e. estimated economic losses, areas of mitigation interest, changes since last FIRM)
- And may cover more streams than the FIRM

FEMA
National
Risk MAP
Program

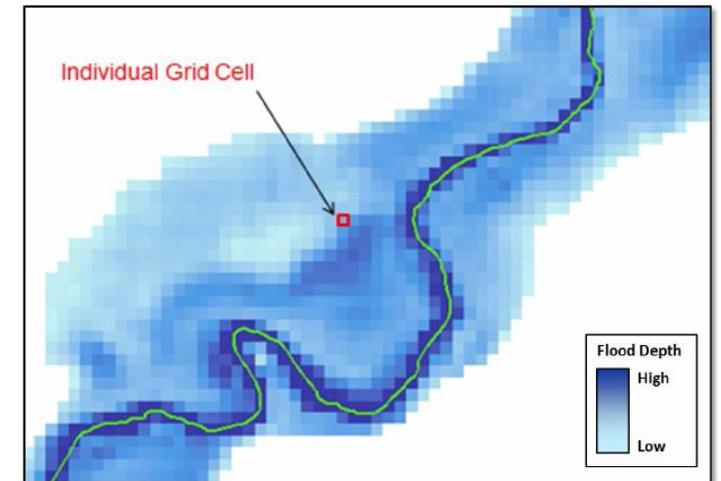
Interagency
(incl. FEMA Region 6)
Flood Risk Management
(InFRM) Program

BLE (Base Level Engineering) Products show:

- VERY SIMILAR TO ABOVE...with a few additions/subtractions
- ...but the **flood scenario boundaries are different!**
- ...and likely cover more streams than the FIRM/Flood Risk Products

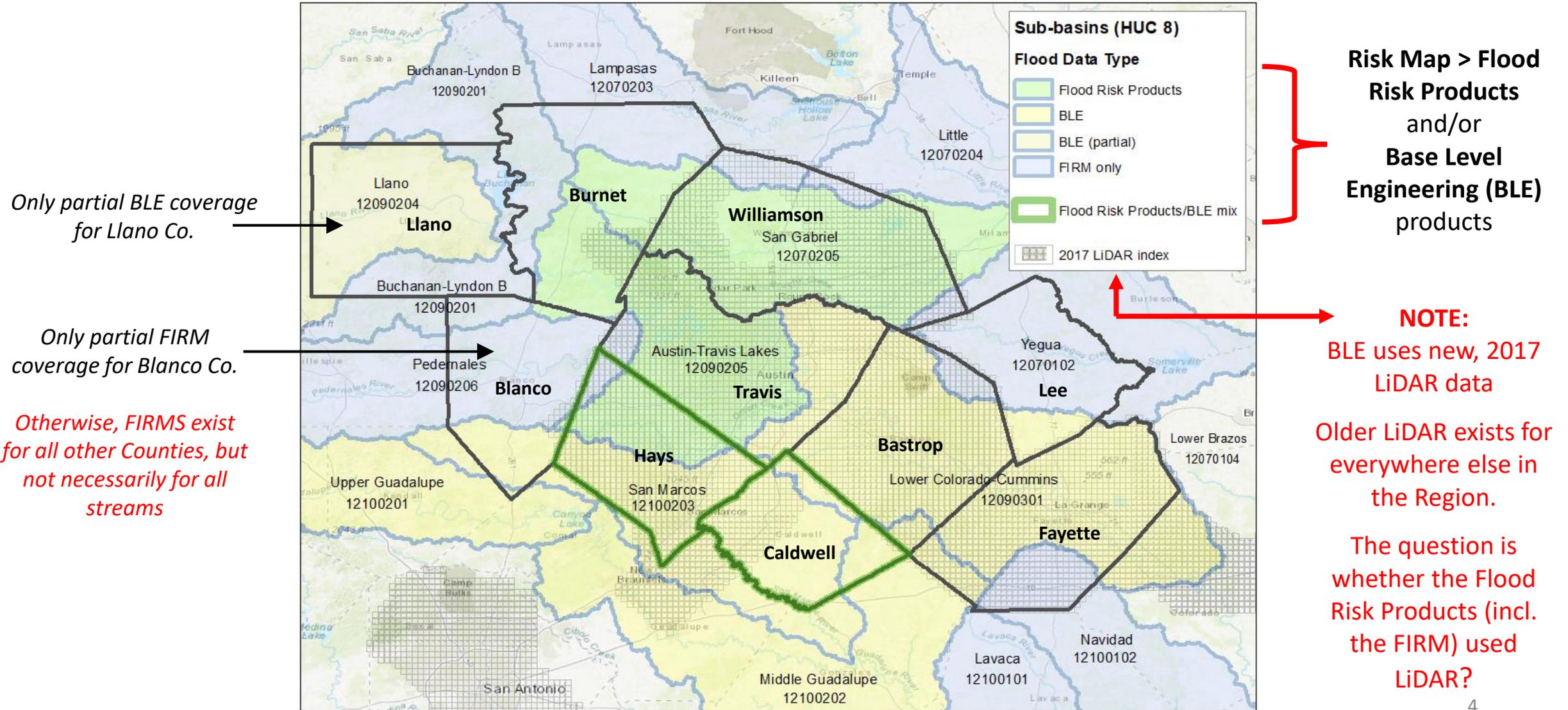


Flood-Water Surface Elevations (including
100-yr Base Flood Elevations (BFEs))



Flood Depths

CAPCOG Regional Map of Watersheds (Sub-basins; HUC 8) and some Additional/Best Available Flood Data



Flood Data Types (by Sub-basin) & Road-Floodplain Intersect Analysis

Road Segments across 100-yr Floodplain

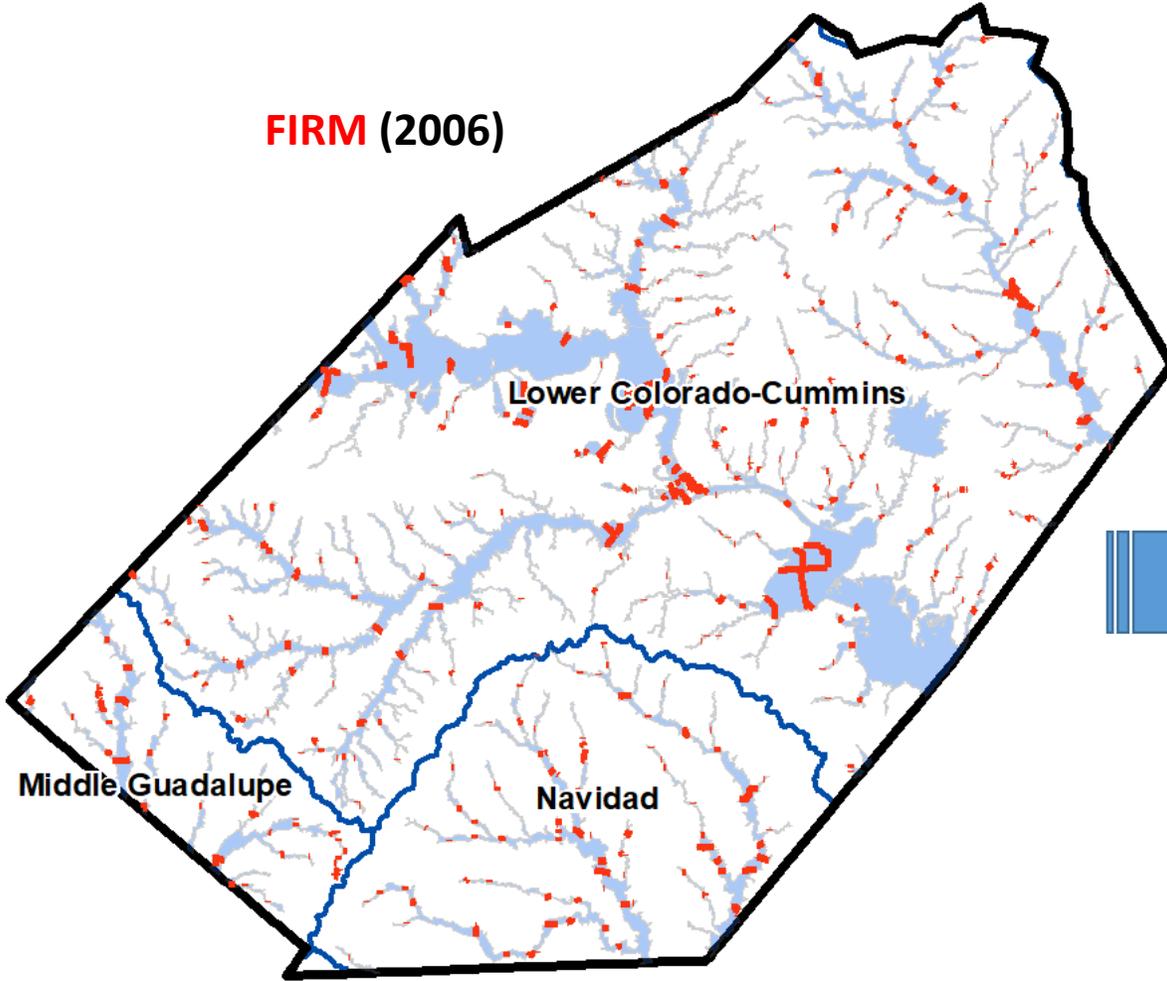
FIRM = 742

BLE* = 978

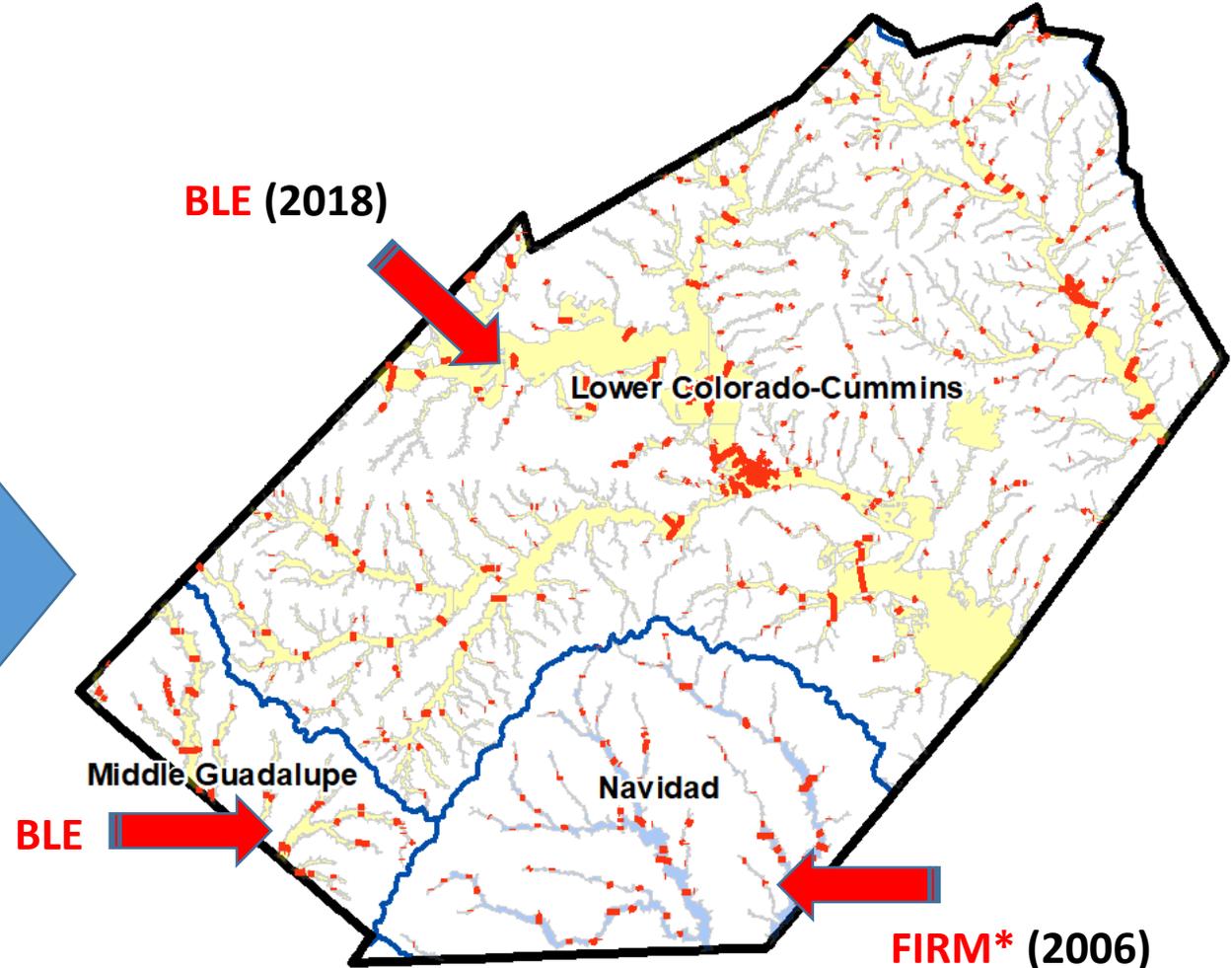
BLE area = 81% of
Fayette County



FIRM (2006)

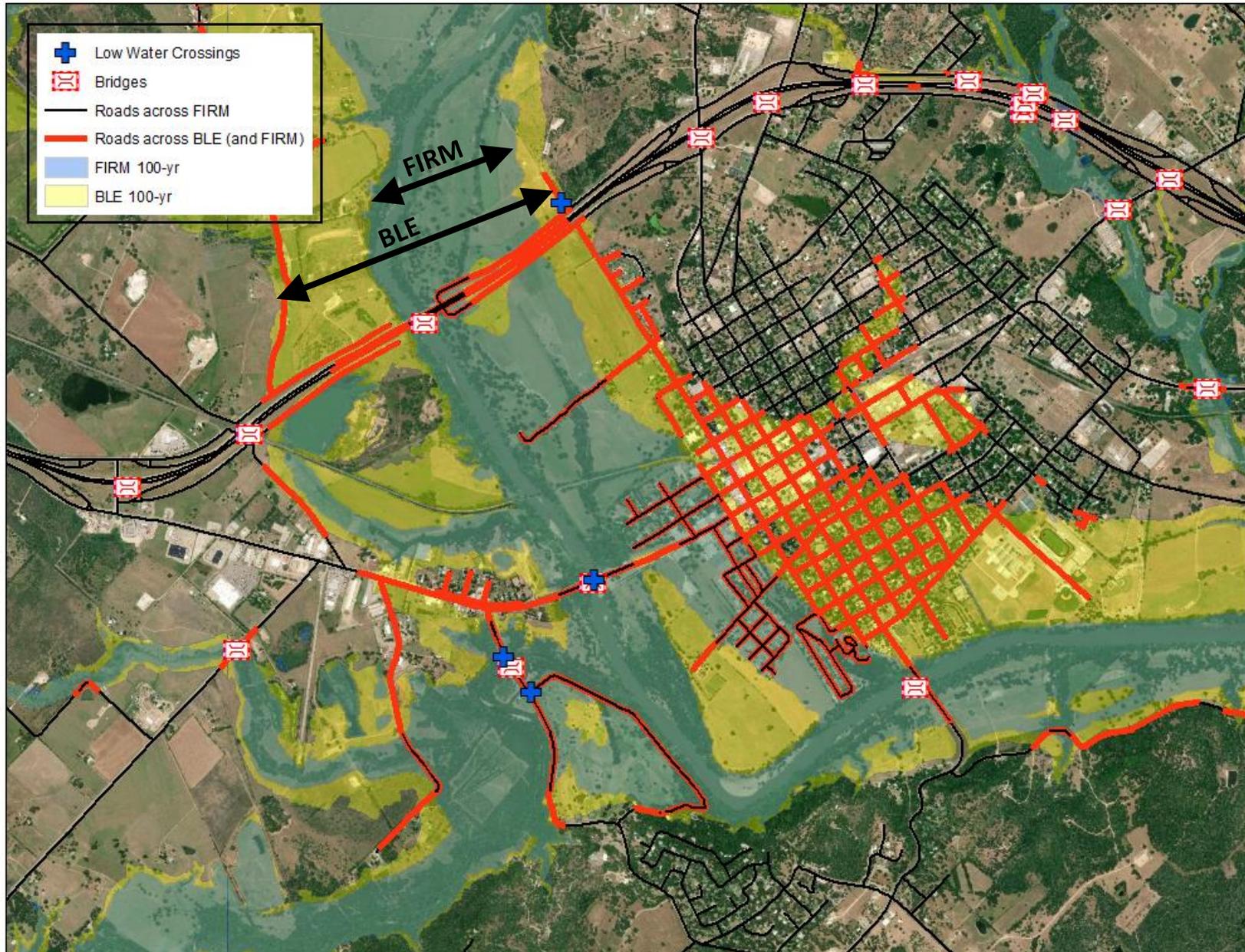


BLE (2018)



BLE

FIRM* (2006)
only for this area



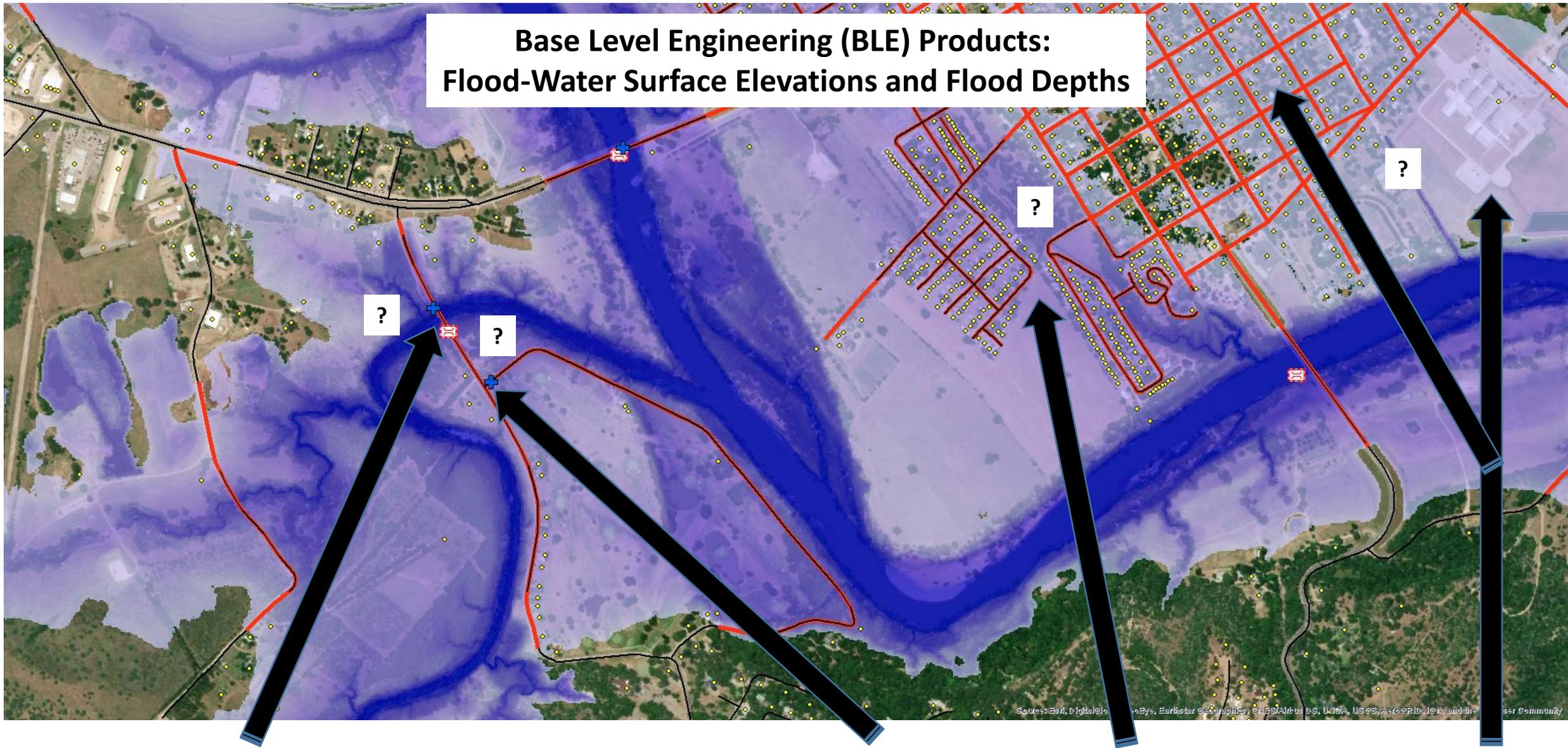
Road-Floodplain Intersect Analysis

New Base Level Engineering (BLE) flood modeling shows the roads in that 100-yr floodplain [compare to FIRM!]

Questions to Answer:

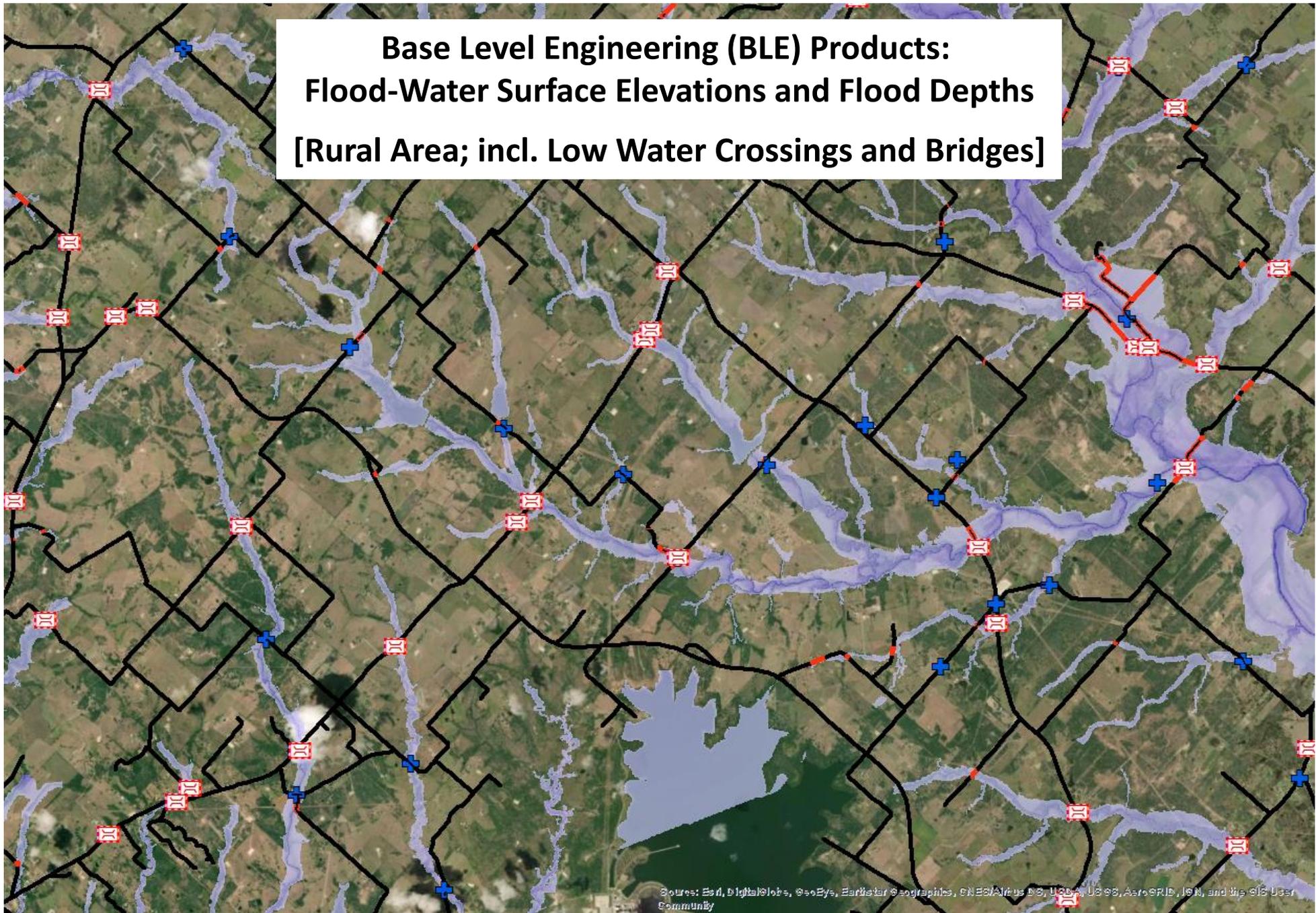
- Which roads are more vulnerable?
- Where are there populations that are likely to be isolated by flood-prone routes?
- Can communities plan to use certain routes that are less likely to flood in severe weather?
- Can plans for new road construction use this data to test a route's susceptibility to flooding?
- What about planning in Low Water Crossing and Bridge areas?

Base Level Engineering (BLE) Products: Flood-Water Surface Elevations and Flood Depths



- The Low Water Crossing (LWX) and Bridge locations are not precisely located
- The Flood-Water Surface Elevation is **265.9'** (above sea level)
...but what is the Bridge elevation? ...same as the road?
- The Flood Depth at that location is **53'**
- Flood Depths at this intersection/LWX area is in the **10' to 20'** range
- Flood Depths around these roads and homes are in the **10' to 15'** range
- Flood Depths less than **5'** in this area
...but which includes a school and other facilities

**Base Level Engineering (BLE) Products:
Flood-Water Surface Elevations and Flood Depths
[Rural Area; incl. Low Water Crossings and Bridges]**



SUMMARY

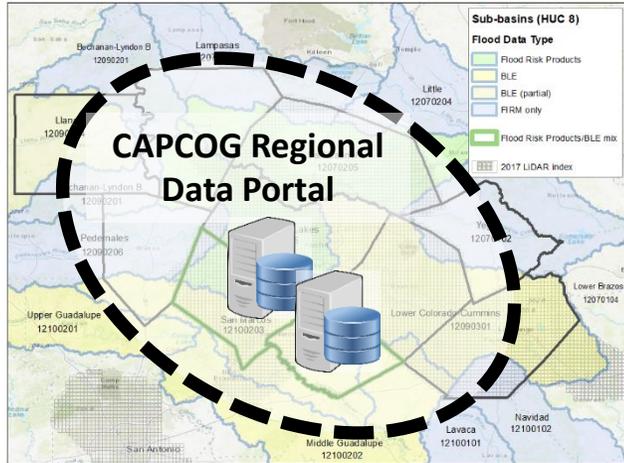
- ❑ The primary intention of the Flood Insurance Rate Map (FIRM) is to regulate insurance as required by the National Flood Insurance Program (NFIP); and it is focused on the 100-yr flood boundary (scenario)
 - ❑ Other flood data, in addition to the FIRM, may exist. And in some cases, it may be considered “best available data” for more effective floodplain management; be it insurance-regulatory, other-regulatory, or non-regulatory purposes
 - ❑ Risk MAP Flood Risk Products and Base Level Engineering (BLE) are just two examples of additional/potentially best available flood data
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- ❑ Additional flood data often includes extra, useful risk data (i.e. Flood Depths, and for other flood scenarios besides the 100-yr), that can be used for other-regulatory purposes (i.e. local ordinance/permitting) and many non-regulatory floodplain management activities
 - ❑ Additional flood data can be used to conduct enhanced risk analysis by overlying local data (i.e. community assets: population, buildings, infrastructure, etc.)
 - ❑ And an example of advanced-enhanced risk analysis is economic loss estimation that is performed with specialized software, called HAZUS

CAPCOG Hazard Risk Program: GIS Flood Risk Program

Local Floodplain Management

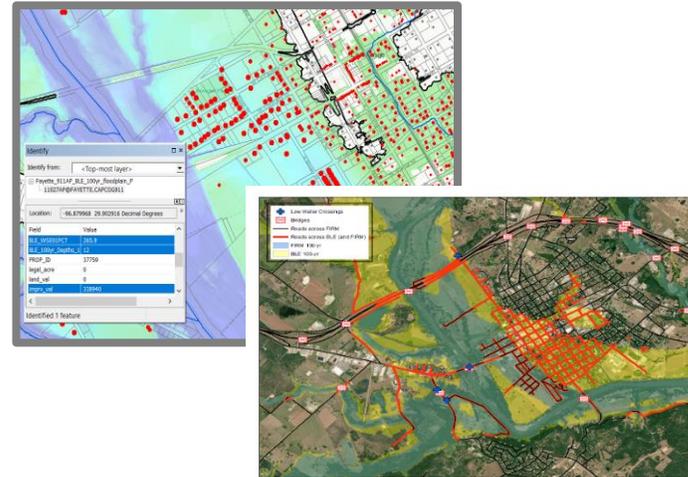
- City/County
- Other Users

Regional Flood Data Compilation



- Access and utilize yourself [AND/OR]
- Request CAPCOG analysis

Enhanced Flood Risk Analysis

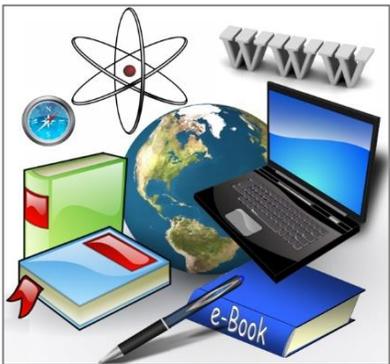


- Enhanced risk analysis (see details) [AND/OR]
- Request CAPCOG training

Training & Outreach



- Training



Flood Information Resources