City of Hammond, LA

FIRM RECONNAISSANCE

Study Summary

CITY OF HAMMOND, LA

March 10th, 2020

Prepared by:

PRINCIPAL Engineering, Inc.

CITY OF HAMMOND, LA

OVERVIEW

Study Objective

FIRM Basics

Observations

Study Summary

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Study Objective

<u>Objective</u>: Identify a strategy to reduce BFEs, by study of City maps, existing studies, supporting data, and physical conditions.

Potential Levels of Effort for Map Revision (increasing order):

1. Update topography, and remap FIRM flood zones.
2. Update modeling (hydrologic, hydraulic, or both) for part or all of the basin, and remap FIRM flood zones.
3. Recommend structural changes to the watershed and drainage system, update modeling, and remap.

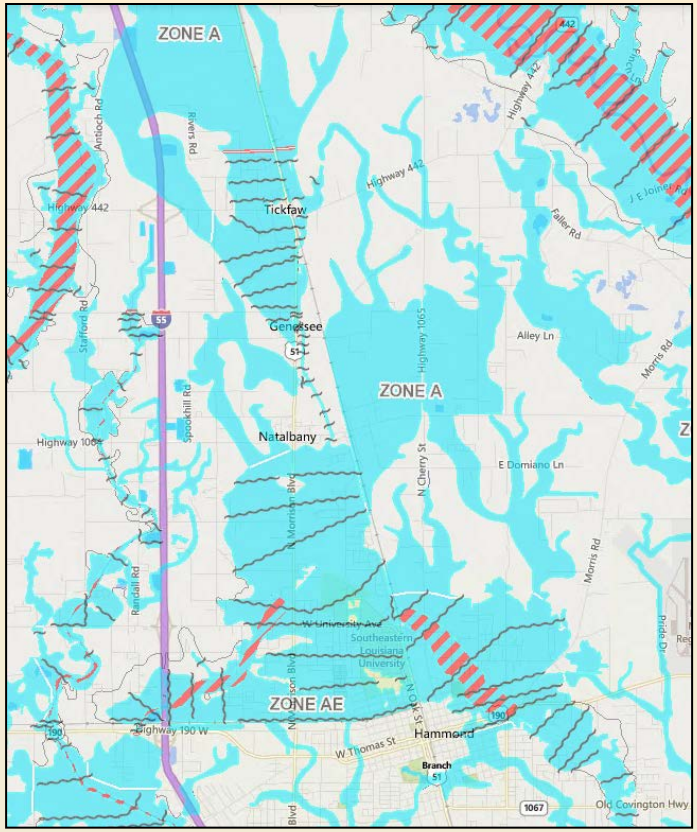
<u>December 2019 Memorandum of Findings Recommendation</u>:

Re-Model and submit LOMR within area of likely benefit.

FIRM Basics

Flood Insurance Rate Map (FIRM)

- Mapped Result of the Flood Insurance Study (FIS) Modeling
- For NFIP underwriting, establishes the 1% Exceedance Event (100-yr) Elevation and Spread, aka BFE



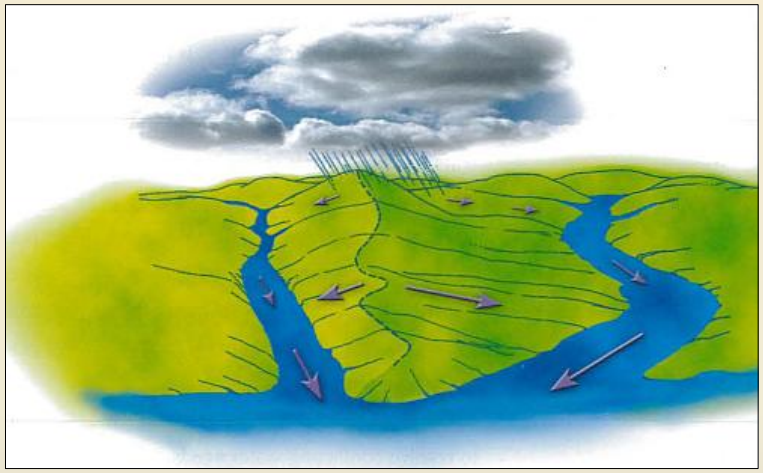
Above: Snapshot from FIRM Panel Including Hammond

FIS Modeling → **Mapping** → **FIS & FIRM**

FIRM Basics

FIS Modeling → Mapping

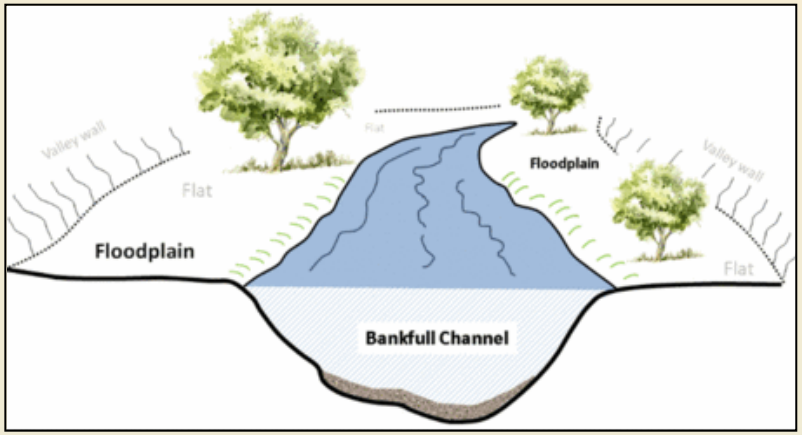
HYDROLOGY: Define watershed boundaries, and predict flow of water in each channel at locations on its length, for different rain events.



FIRM Basics

FIS Modeling → Mapping

HYDRAULICS: Define waterway cross section and use flows calculated in hydrology predict water depth.



GR	29.400	2190.000	28.600	2200.000	28.900	2207.000	34.200	2218.000	35.700	2230.000
GR	36.100	2240.000	42.400	2260.000	44.100	2310.000	43.600	2400.000	43.600	2455.000
GR	43.900	2505.000	44.000	2560.000	43.900	2590.000	44.400	2650.000	44.500	2690.000
GR	44.600	2745.000	44.200	2805.000	44.400	2860.000	44.700	2915.000	44.800	2970.000
GR	45.600	3010.000	46.000	3070.000	45.700	3115.000	46.000	3165.000	50.000	3985.000
QT	4.000	2150.000	3560.000	4960.000	8080.000	0.000	0.000	0.000	0.000	0.000
NC	0.090	0.050	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	4.000	0.090	6330.000	0.140	6675.000	0.050	6875.000	0.050	9260.001	0.000
NH	5.000	0.085	1240.000	0.140	1280.000	0.055	1456.000	0.140	1500.000	0.085
NH	3955.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	43580.007	50.000	6763.000	6875.000	880.000	880.000	880.000	0.000	0.000	0.000
X3	0.000	0.000	0.000	2952.000	46.600	0.000	0.000	0.000	0.000	0.000
GR	48.000	0.000	47.900	29.000	43.800	135.000	42.400	400.000	43.800	800.000
GR	43.500	1000.000	43.600	1100.000	42.400	1400.000	44.000	1900.000	44.100	2000.000
GR	43.800	2300.000	42.500	2700.000	43.200	3400.000	43.400	3600.000	44.500	4000.000
GR	44.700	4200.000	44.600	4600.000	44.600	4900.000	44.300	5100.000	45.000	5400.000
GR	44.700	5700.000	44.800	6000.000	44.800	6300.000	44.300	6600.000	45.300	6763.000
GR	35.600	6781.000	30.500	6800.000	30.700	6819.000	29.700	6828.000	34.700	6837.000
GR	39.500	6856.000	42.900	6875.000	44.800	6925.000	44.300	7015.000	44.300	7070.000
GR	44.500	7120.000	44.600	7175.000	44.500	7205.000	45.000	7265.000	45.100	7305.000
GR	45.200	7360.000	44.800	7420.000	45.000	7475.000	45.200			
GR	46.100	7625.000	46.500	7685.000	46.200	7730.000	46.700			
X1	43680.007	0.000	0.000	0.000	100.000	100.000	100.000			
X3	0.000	0.000	0.000	2852.000	46.600	0.000	0.000			
SB	1.250	1.500	2.500	0.000	18.000	5.000	824.000			

Model Input

SECTION NUMBER	CHANNEL LENGTH	MIN EL OF ROADWAY	MAX EL OF LOW CHORD	MIN EL GROUND	DISCHARGE (CFS)	CWSEL	CRIWS	EG	TOPWID	10K*S	TIME	VOL
34060.00	0.00	0.00	0.00	19.59	2660.00	33.59	0.00	33.72	120.11	13.91	0.00	0.00
34060.00	0.00	0.00	0.00	19.59	4200.00	36.62	0.00	36.77	145.71	13.65	0.00	0.00
34060.00	0.00	0.00	0.00	19.59	4930.00	37.75	0.00	37.91	211.71	19.79	0.00	0.00
34060.00	0.00	0.00	0.00	19.59	7200.00	39.53	0.00	39.74	272.00	25.10	0.00	0.00
34160.00	100.00	0.00	0.00	20.00	2660.00	33.70	0.00	33.79	148.46	2.85	0.01	2.36
34160.00	100.00	0.00	0.00	20.00	4200.00	36.73	0.00	36.83	180.79	2.72	0.01	3.39
34160.00	100.00	0.00	0.00	20.00	4930.00	37.87	0.00	37.98	193.35	2.71	0.01	3.85
34160.00	100.00	0.00	0.00	20.00	7200.00	39.66	0.00	39.83	341.00	3.38	0.00	4.78
34197.00	37.00	42.59	38.39	20.00	2660.00	33.72	0.00	33.81	148.70	2.82	0.01	3.32
34197.00	37.00	42.59	38.39	20.00	4200.00	36.76	0.00	36.86	181.06	2.70	0.01	4.77
34197.00	37.00	42.59	38.39	20.00	4930.00	37.89	0.00	38.00	193.63	2.69	0.01	5.41
34197.00	37.00	42.59	38.39	20.00	7200.00	39.90	0.00	40.06	200.94	3.15	0.01	6.67
34227.00	30.00	0.00	0.00	20.00	2660.00	33.73	0.00	33.82	148.78	2.81	0.01	4.10
34227.00	30.00	0.00	0.00	20.00	4200.00	36.76	0.00	36.87	181.15	2.69	0.01	5.90
34227.00	30.00	0.00	0.00	20.00	4930.00	37.90	0.00	38.01	193.72	2.69	0.01	6.68
34227.00	30.00	0.00	0.00	20.00	7200.00	39.91	0.00	40				
34264.00	37.00	42.00	38.00	20.00	2660.00	33.76	0.00	33				
34264.00	37.00	42.00	38.00	20.00	4200.00	36.79	0.00	36				
34264.00	37.00	42.00	38.00	20.00	4930.00	37.98	0.00	38				
34264.00	37.00	42.00	38.00	20.00	7200.00	40.15	0.00	40				

Model Output

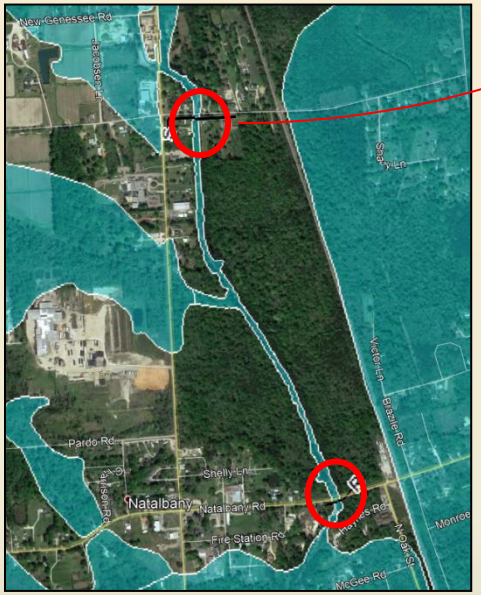
FIRM Basics

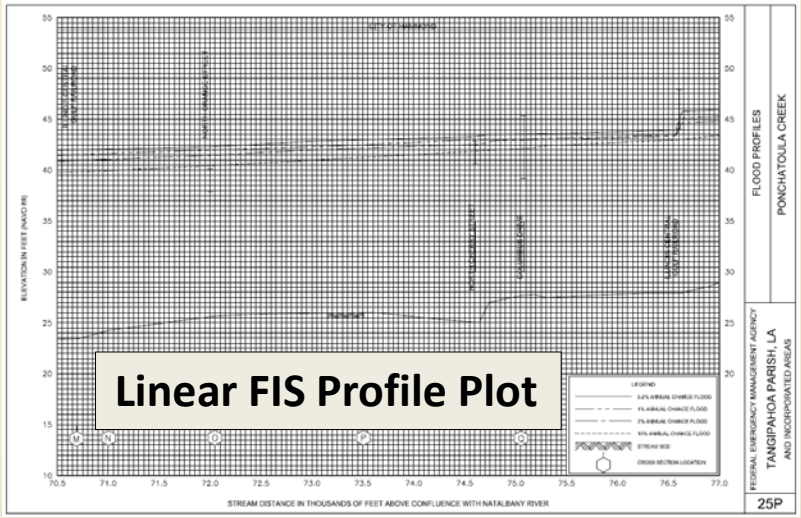
FIS Modeling → **Mapping**

FIS PROFILES: Use calculated points with stream bottom elevations to plot stream water surface.

Ponchatoula Creek								
H *	67,465 [2]	1,010	4,758	1.3	39.0	39.0	40.0	1.0
I	67,650 [2]	770	3,145	2.0	39.0	39.0	40.0	1.0
J	67,750 [2]	720	3,907	1.6	39.1	39.1	40.1	1.0
K	70,090 [2]	1,769	6,964	0.9	40.5	40.5	41.5	1.0
L	70,500 [2]	1,710	7,202	0.9	40.7	40.7	41.7	1.0
M	70,690 [2]	1,070	4,453	1.4	41.6	41.6	42.0	0.4
N	71,000 [2]	1,277	6,072	1.1	41.7	41.7	42.4	0.7
O	72,040 [2]	1,400						
P	73,500 [2]	1,350						
Q	75,060 [2]	1,075						

Individual X-Section Outputs





Linear FIS Profile Plot

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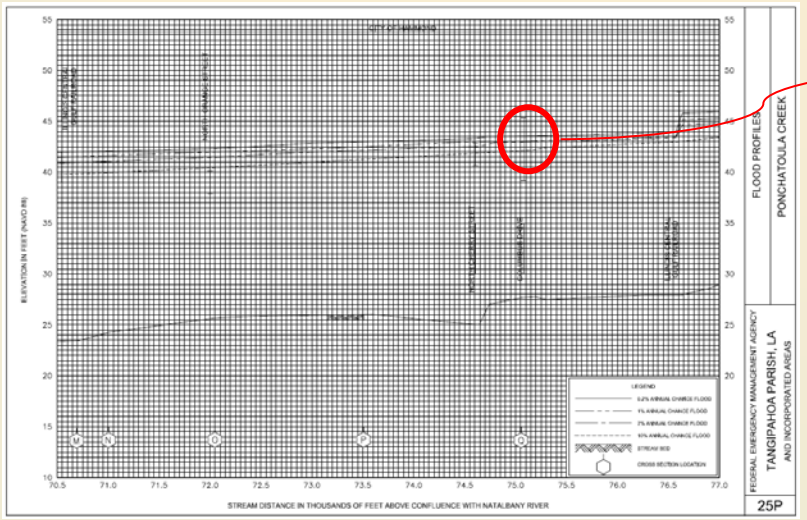
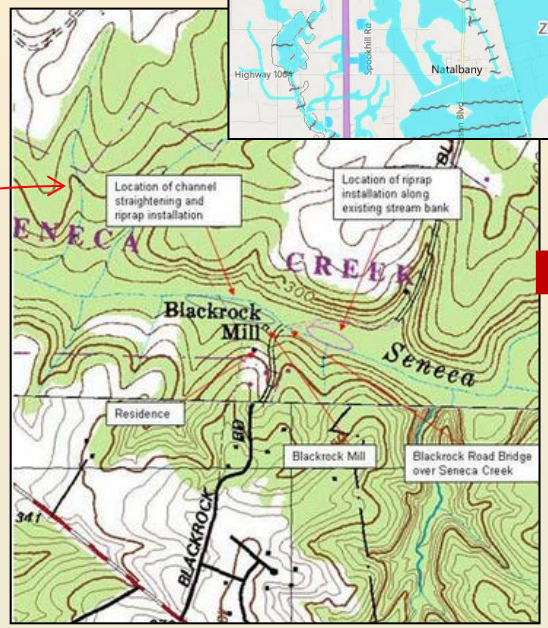
FIRM Basics

FIS Modeling → **Mapping**

FIRM: Use linear FIS profile plots with topography to define BFE and create FIRM.





Profile plot BFE is applied to topography, contours traced to define zone limits.

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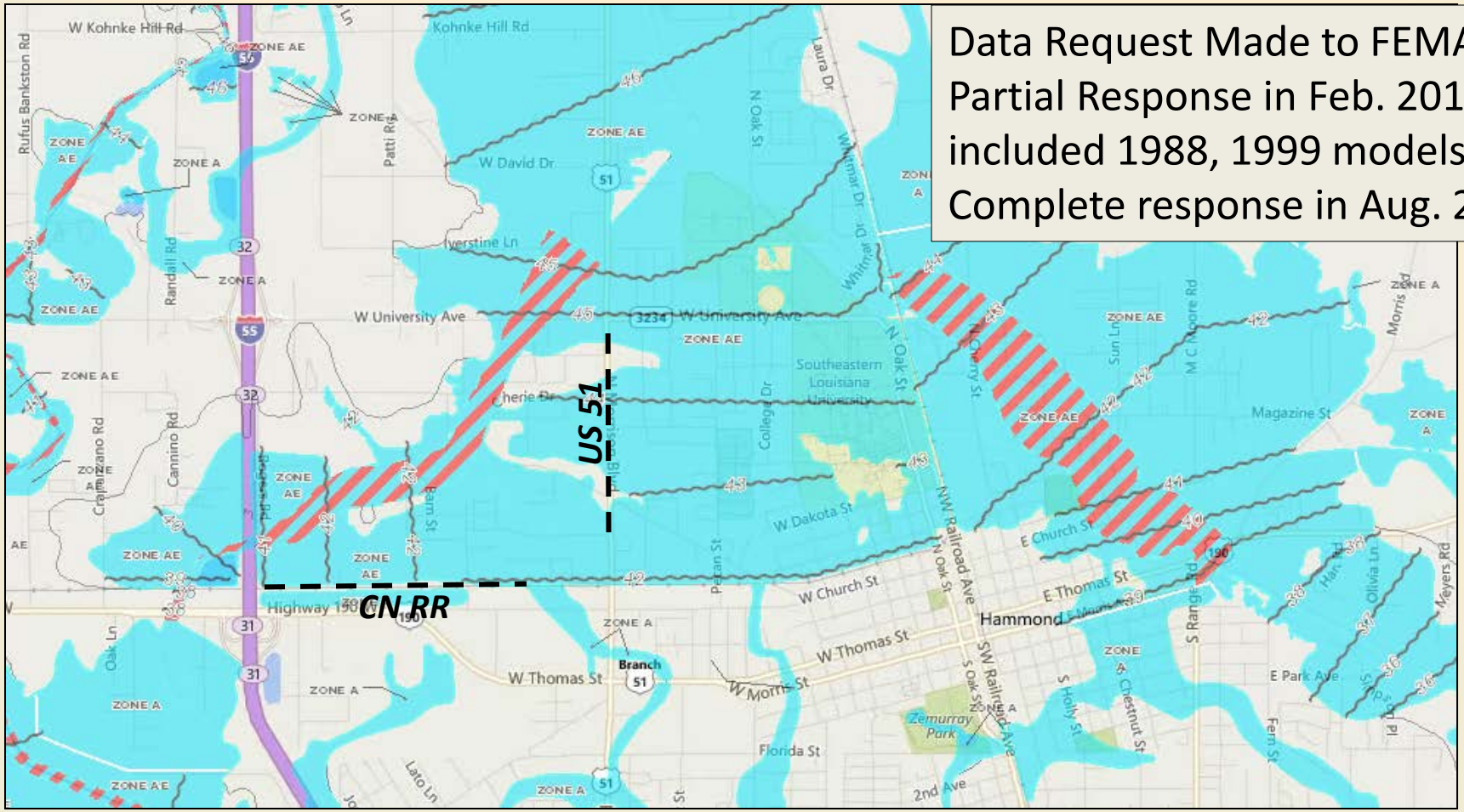
Observations



Data Request Made to FEMA, Partial Response in Feb. 2019; included 1988, 1999 models. Complete response in Aug. 2019

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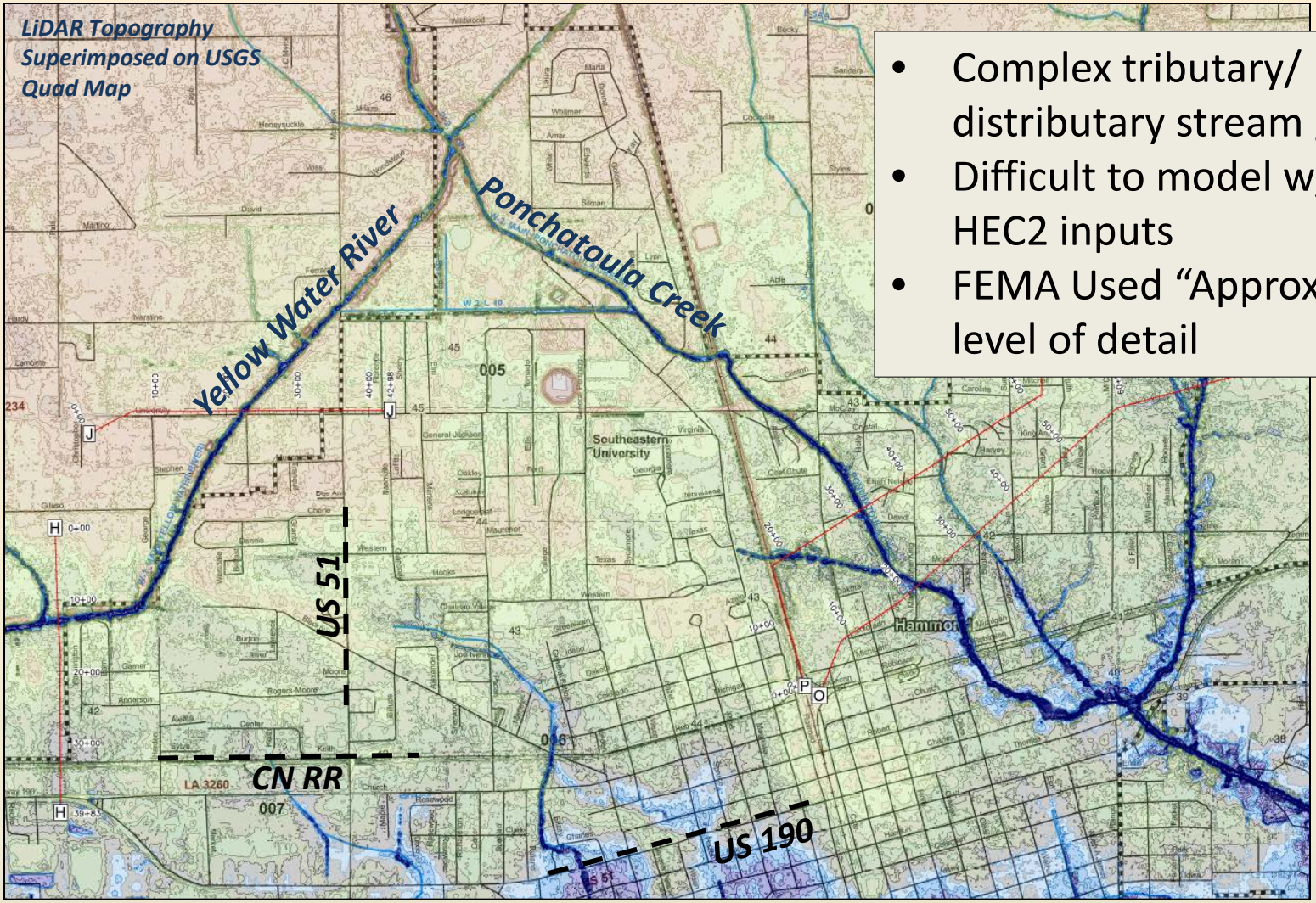
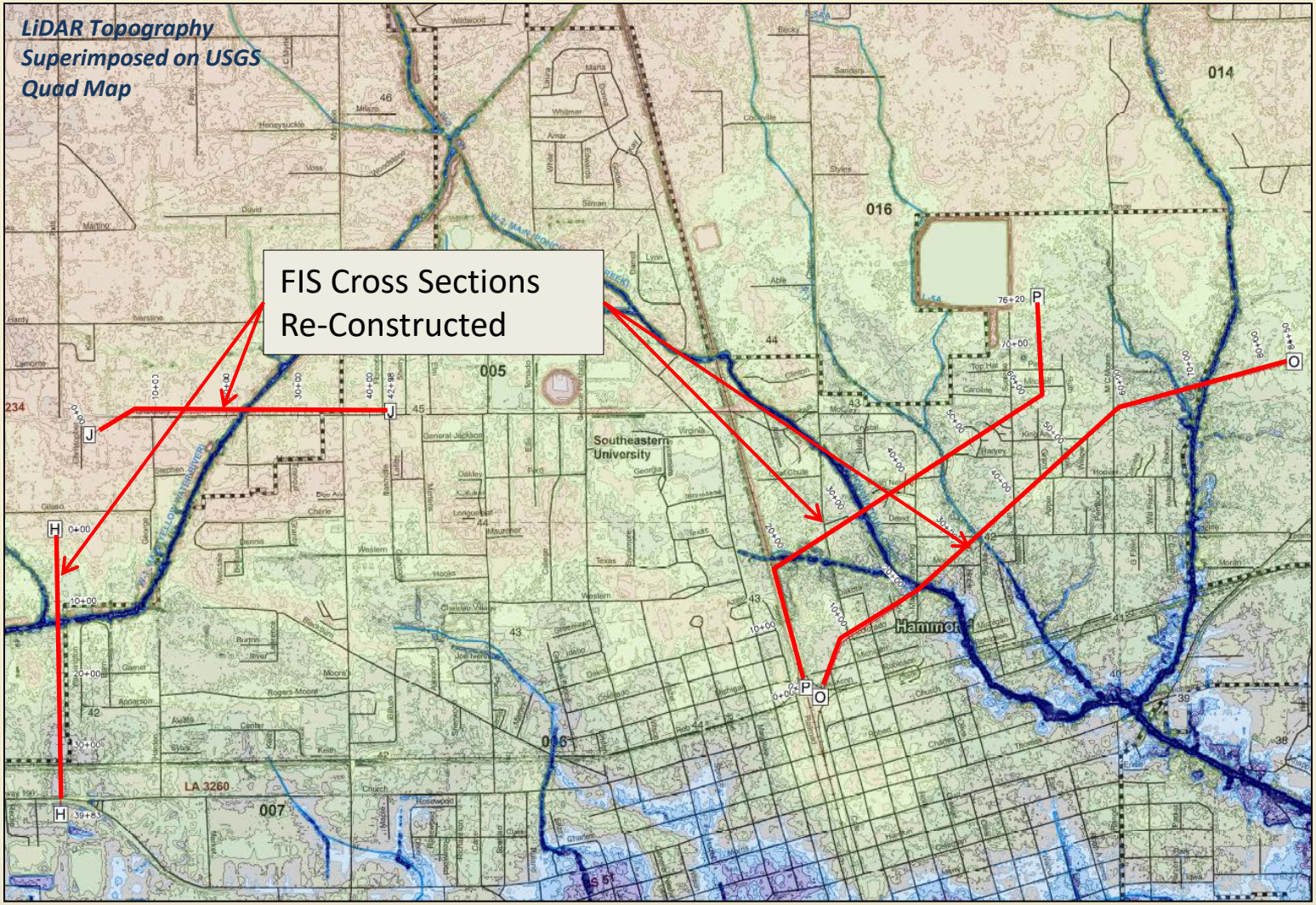
Observations



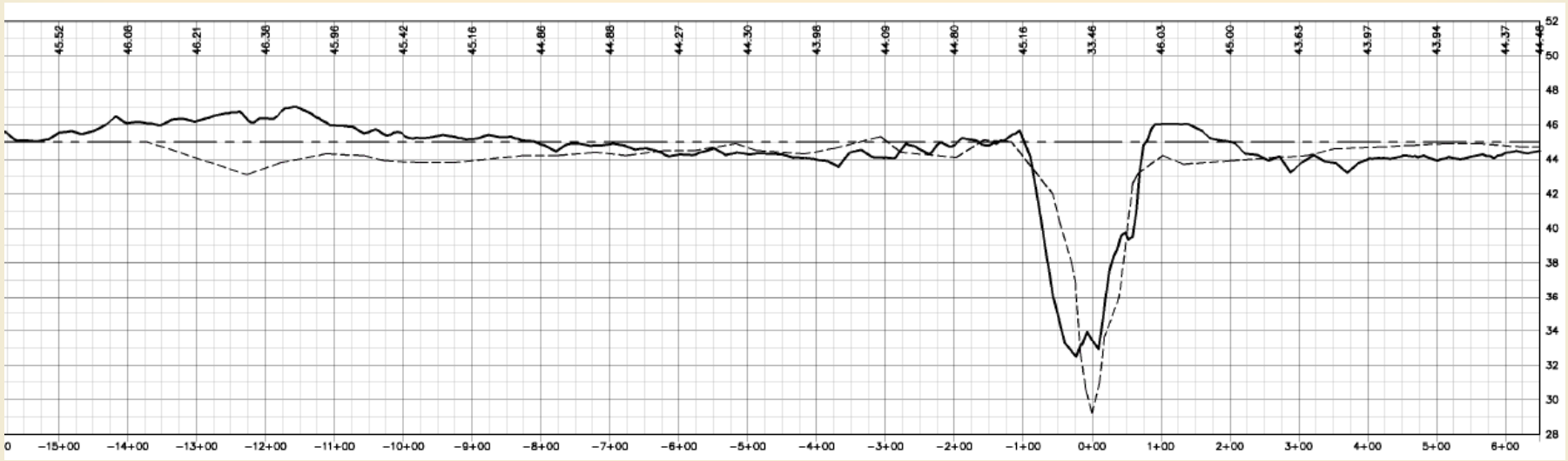
- Complex tributary/ distributary stream geometry
- Difficult to model w/typical HEC2 inputs
- FEMA Used “Approximate” level of detail

Observations



Observations

FIS Cross Sections Reconstructed, Plotted w/ LiDAR and BFE

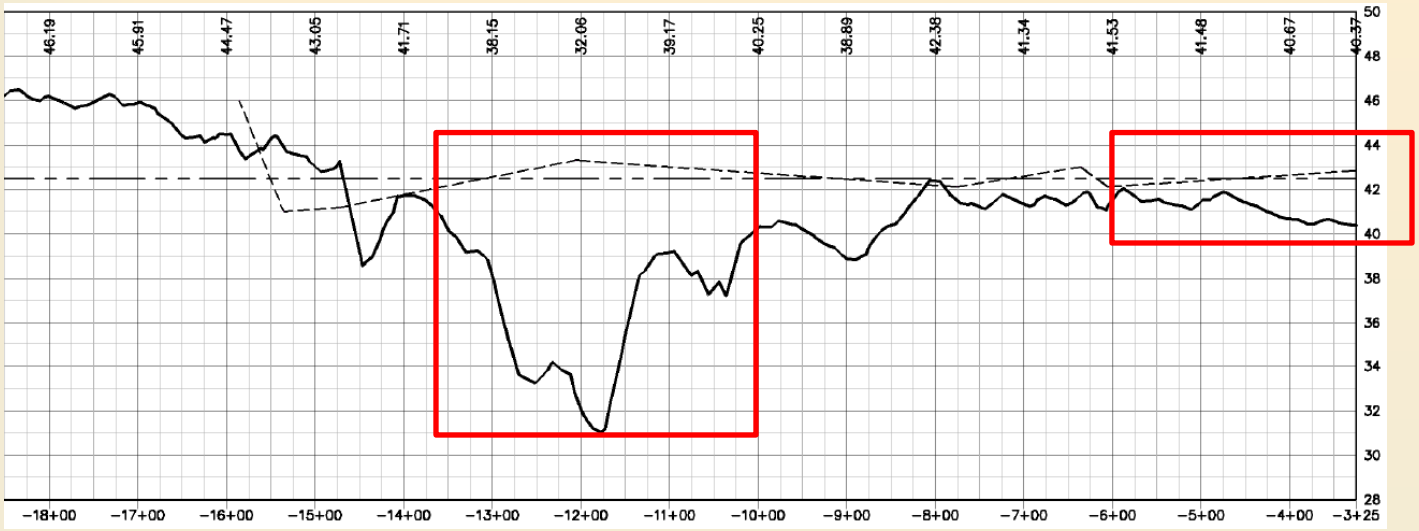


Interpretation: Good fidelity between LiDAR and HEC topography.

LIDAR SURFACE
HEC MODEL
FLOOD MAP BFE

Observations

FIS Cross Sections Reconstructed, Plotted w/ LiDAR and BFE

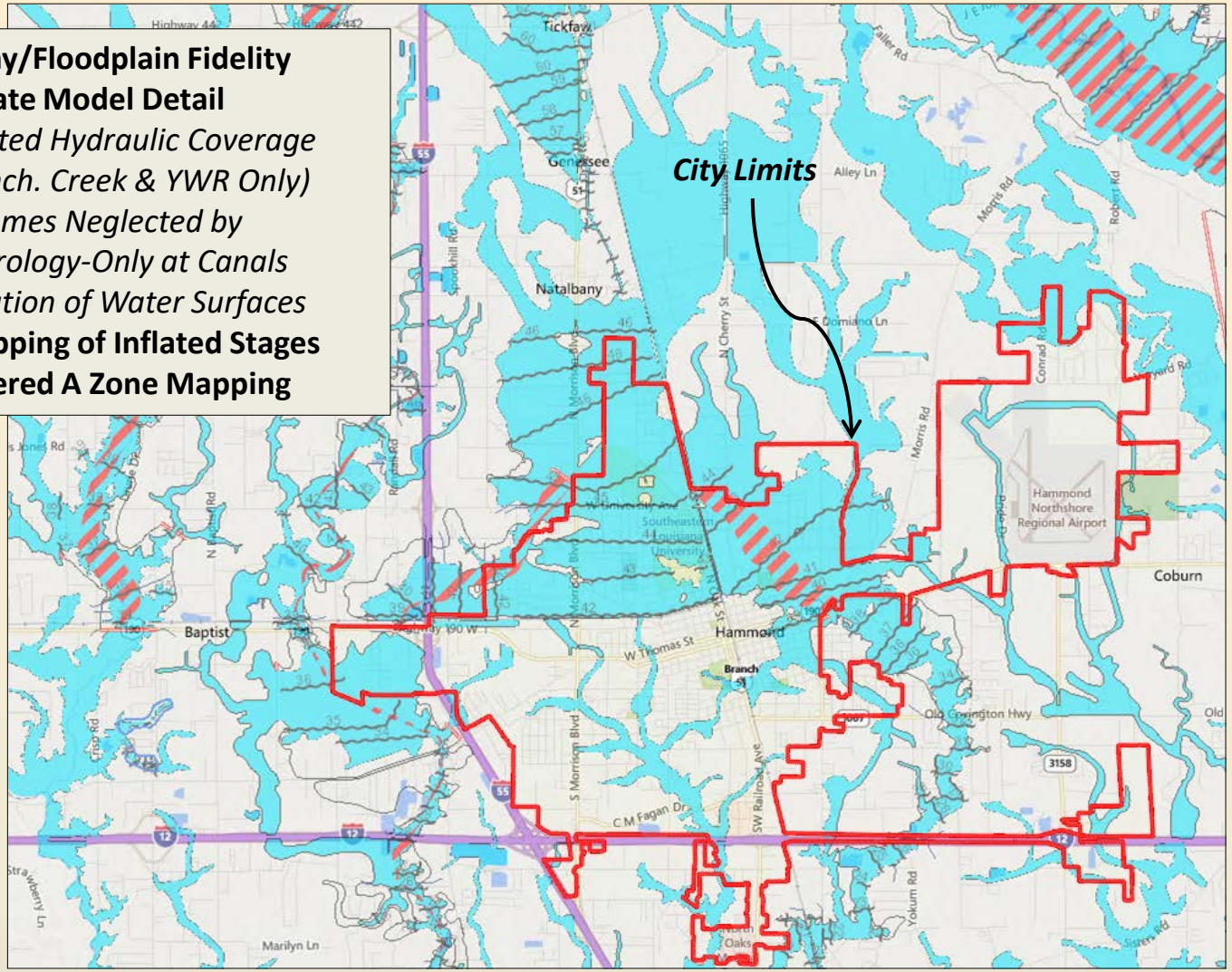


Interpretation: Hydraulic omission of channel from model; poor fidelity between LiDAR and HEC topography.

LIDAR SURFACE
HEC MODEL
FLOOD MAP BFE

Observations

- **Topography/Floodplain Fidelity**
- **Approximate Model Detail**
  - *Limited Hydraulic Coverage (Ponch. Creek & YWR Only)*
  - *Volumes Neglected by Hydrology-Only at Canals*
  - *Inflation of Water Surfaces*
- **Broad Mapping of Inflated Stages**
- **Un-Numbered A Zone Mapping**



Observations

FIS Comparisons to Measured Data and Detailed Modern Study

	Baptist Gauge		Robert Gauge		Ponchatoula Gauge	
Event	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)
FEMA 100 yr	33	13,850	32	75,000	15	80,000
2016	26	22,000	27	120,000	28	--

Gage 07376500 - Natalbany River at Baptist
Gage 07375500 - Tangipahoa River at Robert
Gage 07375650 - Tangipahoa River near Ponchatoula

2012 Forte & Tablada Study				Flood Insurance Study		
Ponchatoula Creek (10-yr)						
Section	Stage (ft)	Discharge (cfs)		Section	Stage (ft)	Discharge (cfs)
B	7.2	4246		A	15.1	4000
C	13.1	3255		C	19.6	3980
F	20.3	3241		G	31	3980
G	33.4	3013		H	38	3730
H	33.4	1251		H	38	3730
I	33.9	879		O	40.5	2620
J	39	827		Sta 790+	44	2410
N	46.3	1683		U	45	2350
Yellow Water River (10-yr)						
Section	Stage (ft)	Discharge (cfs)		Section	Stage (ft)	Discharge (cfs)
W	22.4	3485		F	21.2	3720
Z	29	1719		J	36	1010

Note: Sections on same row are at same location, although letter designations differ. Note significant stage differences for similar flows between the Forte & Tablada model, and FIS model; also note flow magnitude discrepancy between models at some sections.

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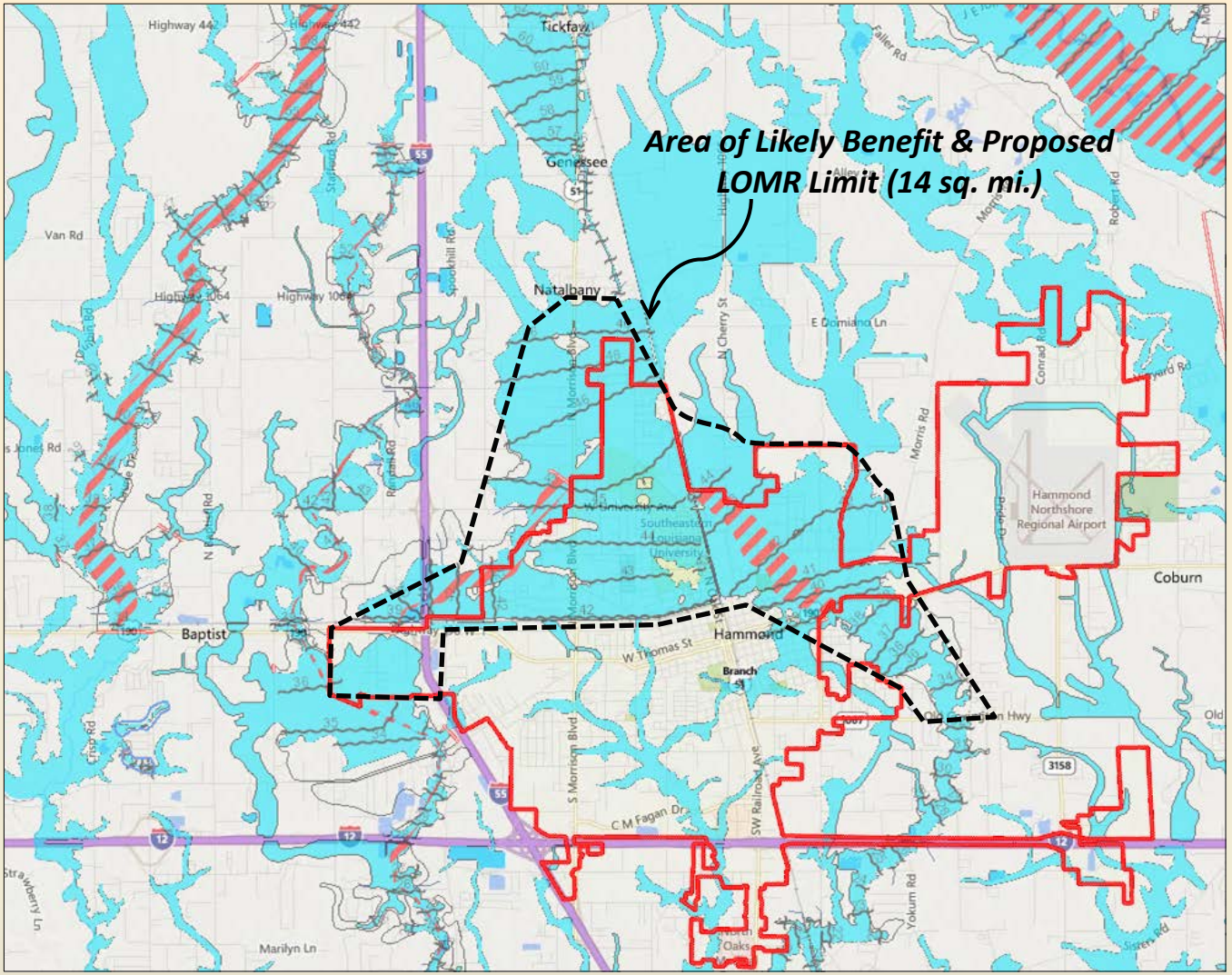
Observations



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Study Summary

Evidence Suggests:

- Approximate methods employed by FEMA do not account for complexity of the study area,
- BFE is likely over-predicted, and
- Re-modeling is likely to lower BFEs in candidate areas
- Re-mapping on better topography will achieve only minor/isolated benefit

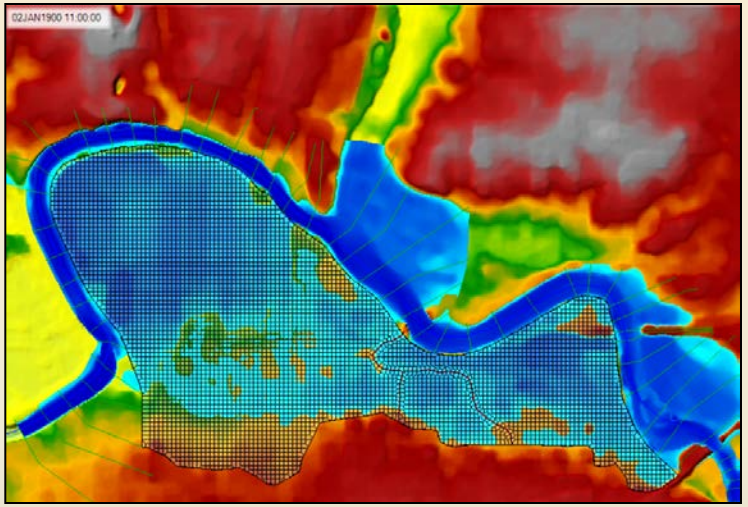
Recommendation:

Perform complete re-model and LOMR request within City in Area of Likely Benefit

Study Summary

Recommended LOMR Scope:

- Assemble specific additional data required for modeling
  - Existing 2D mesh models
  - New Survey at crossings and limited channel cross sections
- HEC-RAS 1D/2D model (USACE standard, widely accepted)
  - Use existing 2D mesh models, update with new LiDAR and survey
  - Refine within LOMR limits, and as required for transition
- Map new BFEs, submit technical report and application to FEMA
- Navigate the FEMA review process



Right: Example 1D/2D Model Graphic Representation

Study Summary

Anticipated LOMR Schedule:

- Survey, Modeling, Mapping, Tech. Report, LOMR Application: 6 months
- FEMA Review and Comment: 6 – 18 months

Anticipated LOMR Cost:

- Survey: $ 25,000
- Modeling/Mapping/Report/Application: $250,000
- Respond to FEMA Comments: $ 50,000??

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Questions?

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