REGION 3 TRINITY
REGIONAL FLOOD PLANNING GROUP

November 18, 2021

1. Call to order

2. Roll call

3. Approval of minutes

Region 3 Trinity Flood Planning Group Hybrid Meeting
September 23, 2021
1:00 PM to 3:30 PM
North Central Texas Council of Governments
Regional Forum Room
616 Six Flags Drive
Arlington, TX 76011

The Region 3 Trinity Flood Planning Group held a meeting, in person as well as virtual, on Thursday September 23, 2021 at 1:00 PM. Chairman Glenn Clingenpeel called the meeting to order at 1:00 PM.

Voting Members Present:

Melissa Bookhout
Lissa Shepard
Sano Blocker
Jordan Macha
Rachel Ickert
Matt Robinson
Sarah Standifer
Andrew Isbell
Glenn Clingenpeel
Chad Ballard (absent)
Mike Rickman (absent)
Scott Harris

Nine voting members were present, constituting a quorum.

Ex Officio Members Present:

Adam Whisenant
Rob Barthen (absent)
Andrea Sanders
Rory Halpin (alternate TDEM)
Steve Bednarz – alternate Allen Nash
Brooke Bacuetes (absent)
Richard Bagans
Kevin McCalla (absent)
Greg Waller (absent)
Ellen Buchanan (absent)
Todd Burrer (absent)
Jerry Cotter (absent)
Lisa McCracken (absent)
Diane Howe (absent)
Edith Marvin (absent)
Justin Bower
Lonnie Hunt (absent)

Approval of the Minutes of the Last Meeting

Motion: Rachel Ickert moved to approve the minutes as presented; Second: Matt Robinson; Action: Minutes were unanimously approved.

Acknowledgement of written public comments received

No written public comments were received.

Consider resignation for Water District Category

Mike Rickman is retiring from the North Texas Municipal Water District and has resigned as NTWD representative on the committee, conditional upon appointment of a replacement. Mr. Clingenpeel asked the group to act upon that resignation with his alternate serving until such time as the Nominating Committee is prepared to recommend his replacement.

Motion to accept Mr. Rickman's resignation; Scott Harris motioned to accept; Second: Matt Robinson; Action: Motion was accepted unanimously.

Appoint Nominating Committee

Glenn Clingenpeel stated that since there was a standing Nominating Committee, he asked Scott Harris if he would be willing to serve as chair for that committee. Mr. Harris agreed and stated they would move to recommend a replacement for the Water Districts position.

TWDB Update

Richard Bagans with TWDB gave an update on what happened in the Legislative Session. Additional funding was approved by their Board. Region 3 was awarded an additional $756,000. Mr. Bagans stated that more details would follow. He further stated that they are currently working on an amendment for that funding, which would be used to help identify more flood mitigation projects. He reiterated that some of the deliverables for the Technical Memo have been extended until March for the existing conditions analysis (GIS deliverables). Mr. Bagans also mentioned that the Trinity River Authority as well as Kaufman County had received commitments in April from the Board for Flood Infrastructure Fund (FIF) funding and that they are working on executing those agreements before October 22, 2021, but expected to execute their agreement with Dallas County within the next week.

Update from Region 3 Technical Consultant

Stephanie Griffin outlined the updates to be covered in the meeting stating that no action was needed at the time on the updates. She stated that they would be sending out chapters as they were ready for the group's

review and feedback but clarified that each chapter would not need to be approved individually. She said she expected the first Chapter to be sent out early October.

a. Chapter 1 Planning Area Description:

    i. Kimberly Miller, Halff Assoc. gave update on some of the new content. They gathered as much information on dams, levees, and low water crossings as possible to look for potential flood implications. Ms. Miller went over the types of Flood Mitigation Projects, from data collection, that were thought to be needed.

b. Chapter 2 Flood Risk Analyses – presented by Sam Amoako-Atta, Halff Associates. Mr. Amoako-Atta went over existing Floodplain Mapping, Data Gaps, Exposure/Vulnerability Assessment, Approach to Future Conditions and Maps of current 100-yr and 500-yr floodplains. He explained how their mapping process works and where they get their information. Some of their data sources include FEMA, TWDB, FAFDS, USACE and other Federal data, regional stakeholders, and FATHOM. Also covered was:

    - Existing Flood Hazard
    - Exposure
    - Inventory – buildings, population, critical facilities, utilities, and agriculture.
    - Vulnerability – social impacts

    Jarred Overbey, with Halff Associates spoke on future flood hazards such as population increase and urbanization, climate change impacts on extreme events, future conditions assessment, and the proposed future conditions methodology. Reem Zoun, with TWDB weighed in on clarification of future risk analysis methods. She stated that there are several alternative methods presented in TWDB's guidance document, and that the purpose is to identify future conditions of flood risk.

    Glenn Clingenpeel raised a question about some of the methodology and its impact on future flood projections. He also stated he would not be in favor of using the current 500-yr as the future 100-yr methodology. Scott Harris agreed. Mr. Clingenpeel proposed to have a range where the potential future condition would be a range between no change (current 100-yr floodplain is the same as the future 100-yr floodplain) to the current 500-yr floodplain being the new 100-yr floodplain.

    Andrew Isbell also voiced his concern on being cautious when basing a prediction on a 30-40-year projection. There were also concerns voiced that even though this is a planning map and not a regulatory map, there would be the potential for it to be inappropriately used for funding allocations and regulatory compliance. Halff Associates stated that they would compile a memo describing the proposed future conditions methodology, and would submit it to the TWDB for approval.

c. Chapter 3 Floodplain Management Practices and Goals – presented by Kimberly Miller, Halff Assoc.

i. Ms. Miller led a discussion on the consideration to approve floodplain management goals for inclusion in the regional flood plan. The goals considered included:

- **Goal 1. Improving Flood Warning & Public Safety** – increasing public safety and low water crossings.
- **Goal 2. Improving Flood Analyses** – Increase the number and extent of regional flood planning studies (FMEs) and analysis to better prepare communities for implementing flood mitigation projects.
- **Goal 3. Reducing Property Damage & Loss** – Increase the number and extent of protective regulatory measures and programs to limit future risk and reduce flood damage in the flood planning region.
- **Goal 4. Floodplain Preservation** – Maintain the natural and beneficial functions of floodplains by preservation and conservation programs.
- **Goal 5. Flood Infrastructure Improvement** – Reduce flood risk and mitigate flood hazards to life and property through the maintenance and rehabilitation of existing infrastructure and implementation of new flood infrastructure projects.
- **Goal 6. Expanding Flood Education & Outreach** – Increase the amount of flood education and outreach opportunities to improve awareness of flood hazards and future participation throughout the flood planning region (FPR).

Scott Harris suggested that the group consider adding an increased funding goal. The group agreed to add this as a goal.

ii. There was a discussion of potential floodplain management practices within the region. Data sources provided by the consultant team included:

- City ordinances
- County court orders
- National Flood Insurance Program (NFIP) participation
- Community Rating System (CRS)
- Survey responses
- TWDB Guidance Document

iii. Consider approval of recommending or adopting (requiring) specific floodplain management practices – Ms. Miller asked if the group had an interest in recommending any specific or minimum standards across the region. She noted that in the survey the two highest ranking options were participation in the NFIP or adoption

of equivalent standards, and regulating development in the FEMA floodplain or other local floodplains designated by local jurisdiction.

Glenn Clingenpeel suggested that the group recommend the floodplain management practices, rather than require them. He suggested the group could help get resources to develop and implement them and at some point in the future, they could become requirements. Scott Harris suggested that the group recommend the full list, go through the public input meetings to see what comments are received and then have this for an item of discussion at a later date.

Scott Harris made motion to recommend all of the listed practices; Second; Sarah Standifer; Action; unanimously approved.

d. Chapter 4 Flood Mitigation Needs and Potentially Feasible Solutions – David Rivera, Halff Associates gave an update this chapter. He showed a series of examples of what they will be using (HUC 12 will be used as a unit of analysis) for the areas of evaluations in order to find hot spots. He stated that they will also be using the Social Vulnerability Index as a criticality factor. The results will be collected and input into a map to show the areas that are high risk.

    i. Consider approval of process to identify potential FMEs and potentially feasible FMSs and FMPs – Mr. Rivera gave a brief recap of the process. Mr. Rivera stated that at this stage they need to look into the survey, determine what is available in terms of modeling, and use that to generate the project.

    Andrew Isbell asked how big of a weight the SVI would be given. Mr. Rivera stated that they were planning on using the SVI as a factor or a multiplier. Glenn Clingenpeel asked if there was a motion to approve this process, or if the group would like to consider it at a subsequent meeting. After discussion, it was decided to table the item until the next meeting.

e. Chapter 8 Administrative, Regulatory and Legislative Recommendations – Stephanie Griffin gave a brief overview on this chapter as a discussion item only. Ms. Griffin went over the schedule for upcoming deadlines. She stated that Chapter 1 should be sent out for review in early October, followed by Chapter 3 in the latter part of that month. She stated that the Technical Memorandum would need to be approved in December in order to be submitted to TWDB in January of 2022. Chapters 2 & 4 are to be reviewed in February along with the Technical Memorandum addendum, which is to be submitted in March.

Updates from Liaisons Region 5 and 6

Region 5 Neches RFPG – Andrew Isbell stated that Region 5 was reviewing the same chapters with some of the same questions with which the Region 3 group is struggling.
Region 6 San Jacinto RFPG – Scott Harris said they were also in the middle of narrowing down their goals and expected the group would take a vote during their next meeting. He stated that their last meeting was on September 9, 2021, and that they held their first public preplanning meeting on August 31.

Update from Planning Group Sponsor

There was no update form the planning group sponsor.

Review administrative costs requiring certification

There were no administrative costs requiring certification.

Receive general public comments

Mr. Clingenpeel opened the meeting to public comments. No members of the public indicated they wished to make comments, and the public comment period was closed.

Announcements

It was announced that the TWDB Texas Water conference registration was open through September 24.

Meeting date for Next meeting

The meeting (contingent on finding a location) was set for Thursday, November 18, 2021 at 10:00 a.m. Mr. Clingenpeel stated that it would be a hybrid meeting again.

Other Business

There was no other business brought before the group.

Adjourn:

The meeting was adjourned at 4:37 p.m.

THE ABOVE AND FOREGOING ARE CERTIFIED TO BE TRUE AND CORRECT MINUTES OF THE REGULAR MEETING OF THE REGION 3 TRINITY FLOOD PLANNING GROUP HELD SEPTEMBER 23, 2021.

_____ _____

SCOTT HARRIS, Secretary
REGION 3 TRINITY FLOOD
PLANNING GROUP

Date

_____ _____

GLENN CLINGENPEEL, Chair
REGION 3 TRINITY FLOOD
PLANNING GROUP

Date

4. Acknowledgement of written comments received

5. Public comments on agenda items

6. TWDB update

7. Discussion and potential action on proposed contract amendment (new Tasks 11, 12 and 13)

RFPG Contract Amendment

- Task 11 – Outreach and data collection to support Tasks 1 – 9
  - Proposed budget: $105,840
  - No additional deliverable
  - Deadline: Jan 10, 2023
- Task 12 – Perform FMEs & Identify, evaluate and recommend more FMPs
  - Proposed budget: $461,160
  - Deliverable: anything required of Tasks 4B and 5
  - Deadline: July 14, 2023
- Task 13 – Prepare and adopt Amended Regional Flood Plan
  - Proposed budget: $189,000
  - Deliverable: New amended flood plan in its entirety, including any of the Chapters 1 through 10 based on information developed in Task 12
  - Deadline: July 14, 2023

8. Discussion and potential action to authorize planning group sponsor to negotiate and execute proposed contract amendment

9. Consultant update

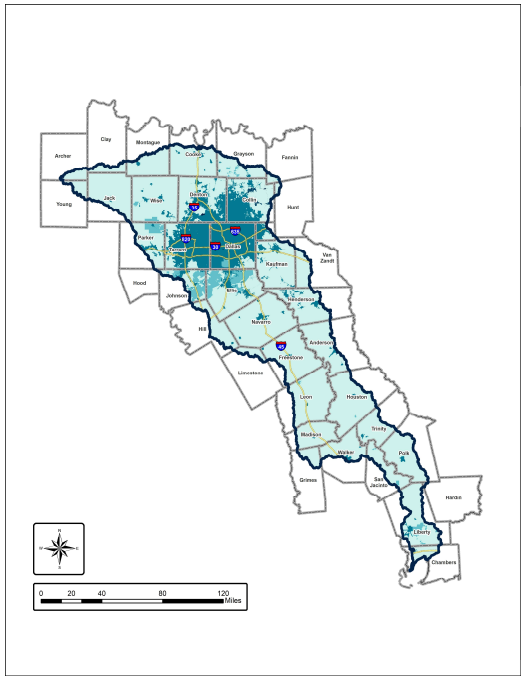
CONSULTANT UPDATE

- **Chapter 1 Planning Area Description**
  - Feedback on draft chapter
- **Chapter 2 Flood Risk Analysis**
  - Future conditions
- **Chapter 3 Floodplain Management Practices and Goals**
  - Update on outreach to stakeholders
  - Feedback on draft chapter
- **Chapter 4 Flood Mitigation Needs & Potentially Feasible Solutions**
  - Task 4A memo
  - Consider approval of process to identify potential FMEs, FMSs, and FMPs
  - Tech Memo overview
- **Ch. 8 Admin, Regulatory and Legislative Recommendations**
- **Public Outreach Updates**

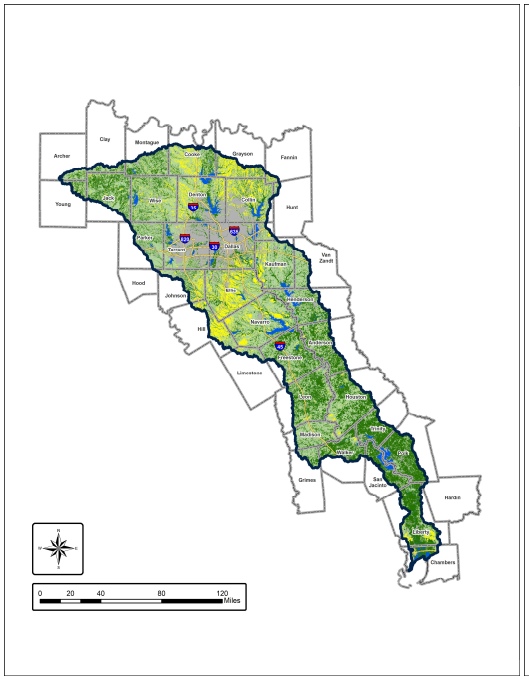
Ch. 1 Planning Area Description

Chapter 1: Introduction to Trinity River Flood Planning Region

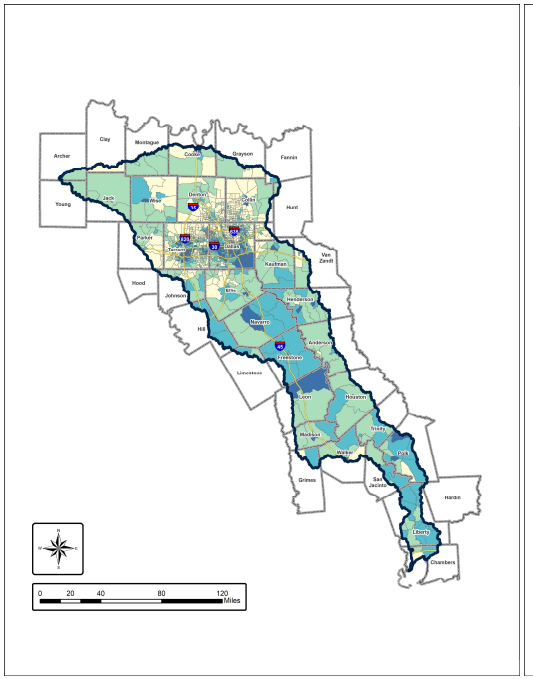
Population Density



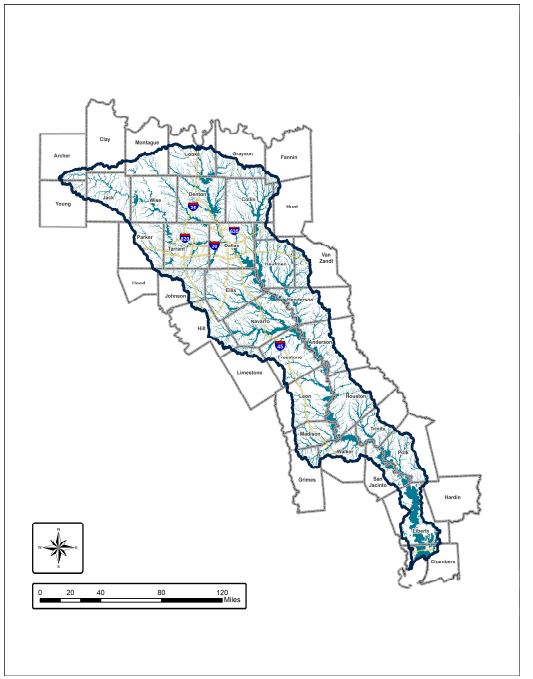
Land Use by Land Cover



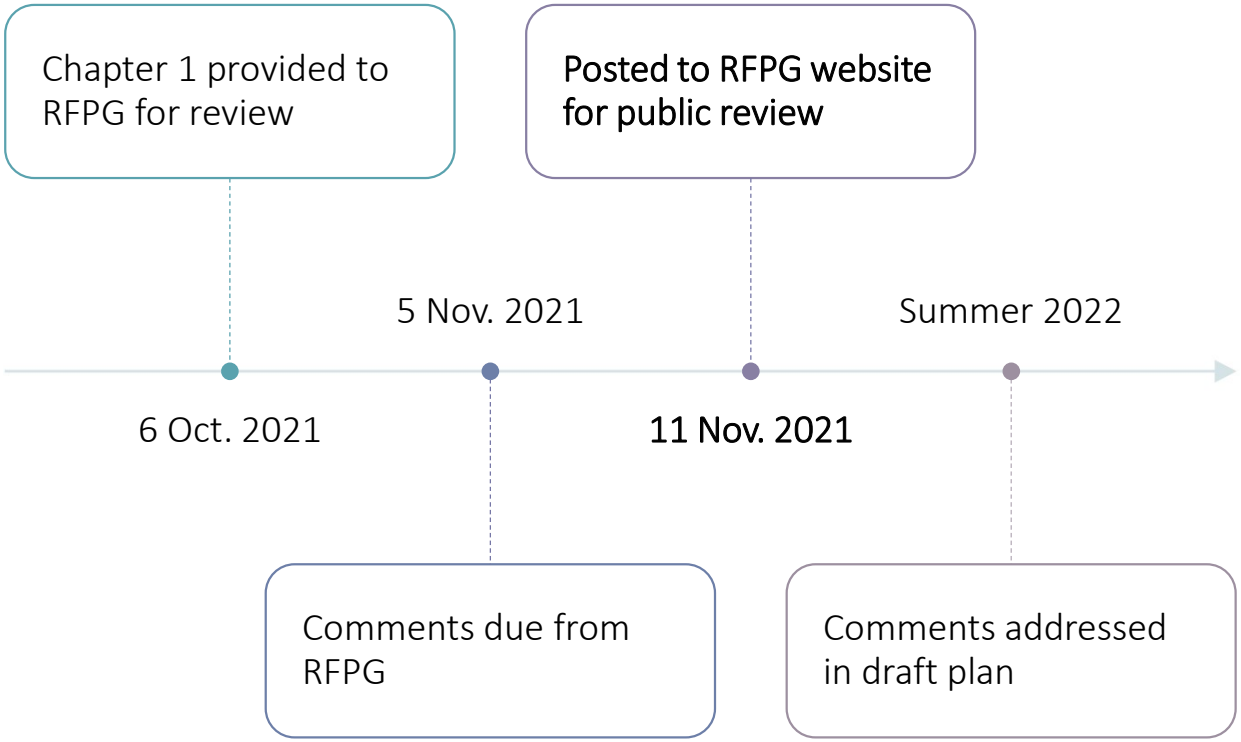
Social Vulnerability Index



Flood Quilt



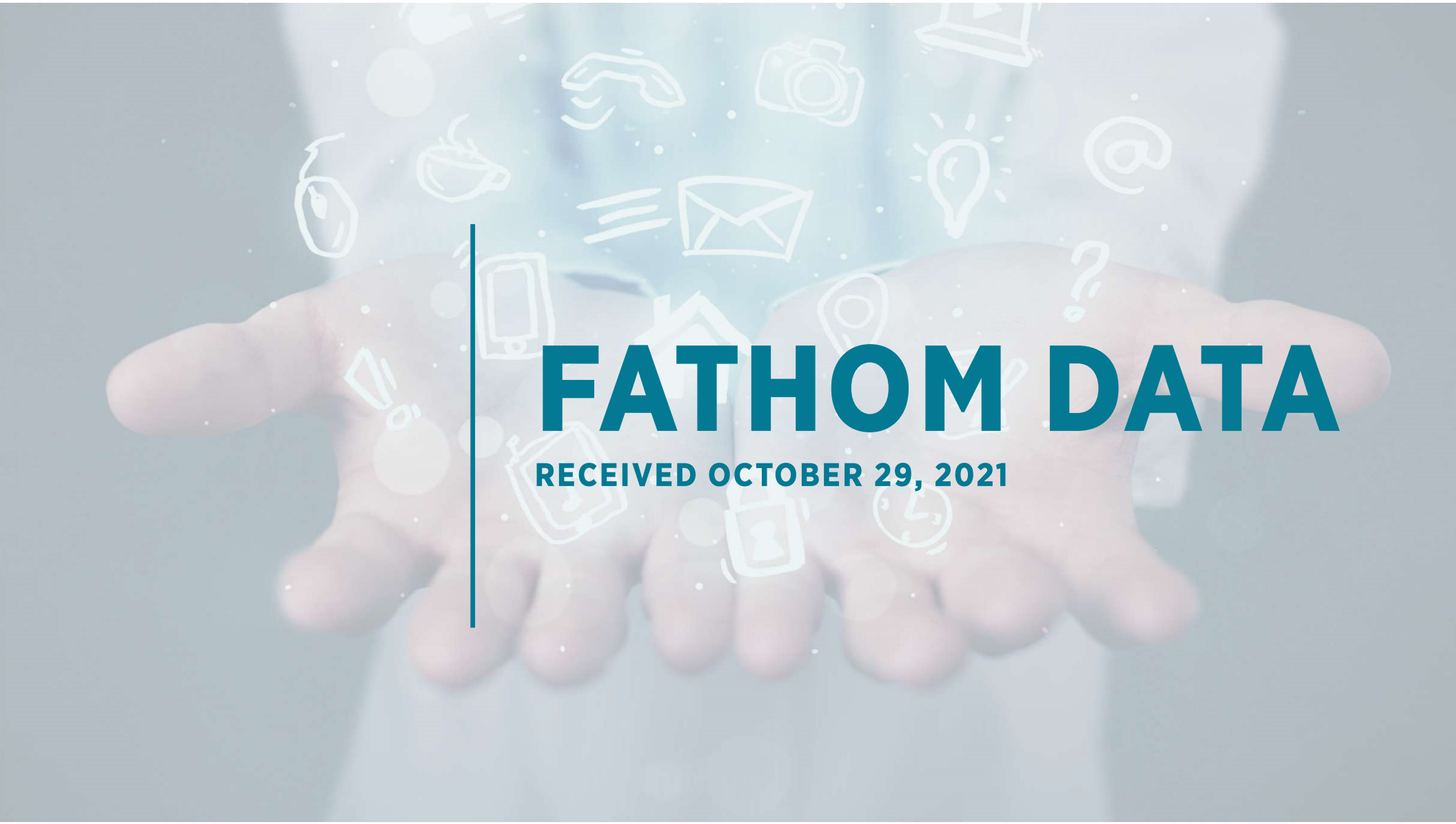
Chapter 1 Review Schedule



Ch. 2 Updates

FATHOM Data

Future Conditions Mapping



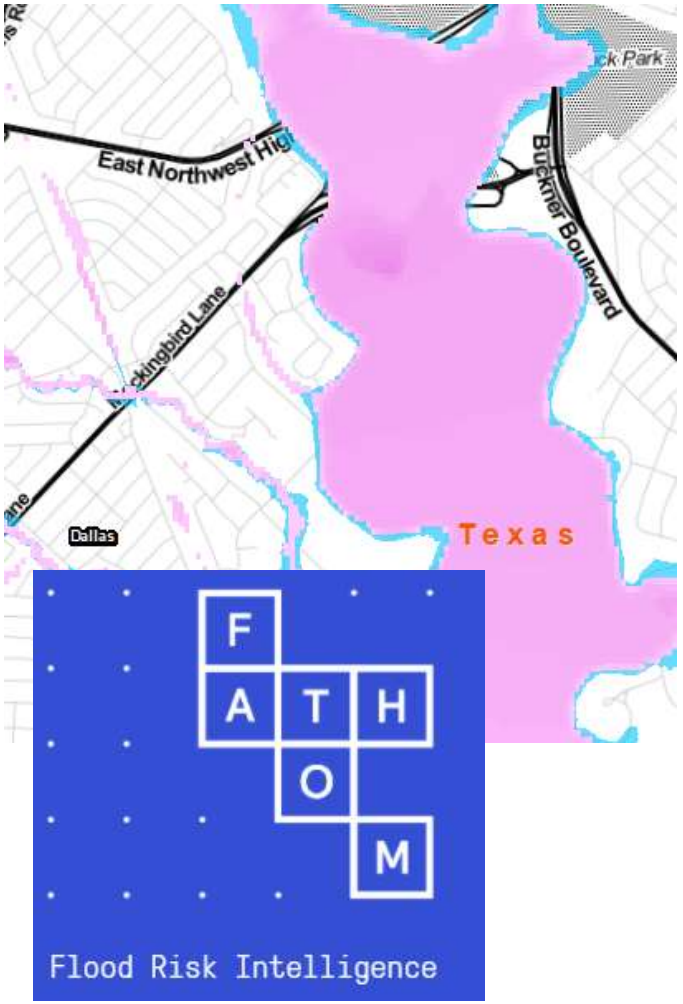
FATHOM DATA

RECEIVED OCTOBER 29, 2021

FATHOM

Overview

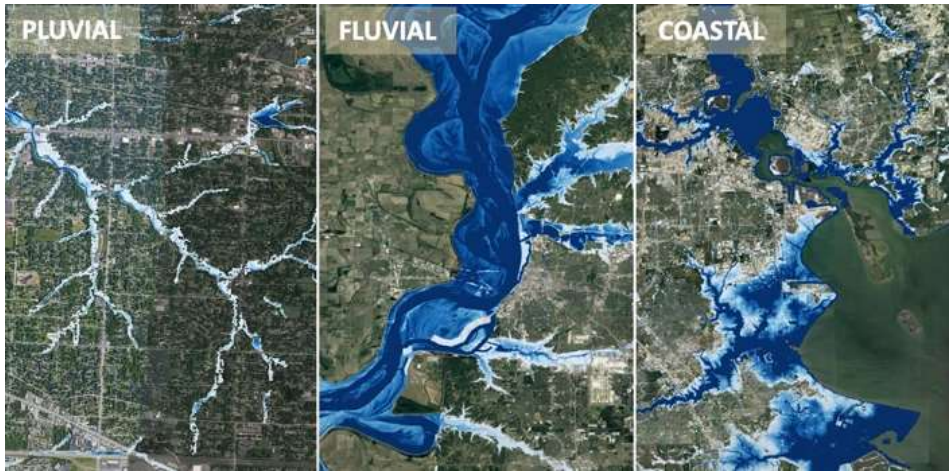
- Developed out of a research group at the University of Bristol, England
- **2D Hydraulic Model Framework:**
  - Global dataset (300-ft scale)
  - US Continental dataset (100-ft scale)
  - Some areas have improved scale
- **Currently used for:**
  - Insurance Industry
  - Corporate Risk
  - Disaster Response
- Model has been peer-reviewed and compares reasonably well to FEMA flood data



FATHOM

Data Outputs

- **Fluvial**
  - Drainage areas > 19 sq. mi.
  - Statistics to determine stream flows
  - Sub-grid hydrodynamic modeling
  - Levees included
- **Pluvial**
  - Rain-on-mesh methodology
  - NOAA Atlas 14 rainfall
- **Coastal**
  - Represents compound flooding
  - Tide, surge, and waves modeled
  - Uses flood gage data



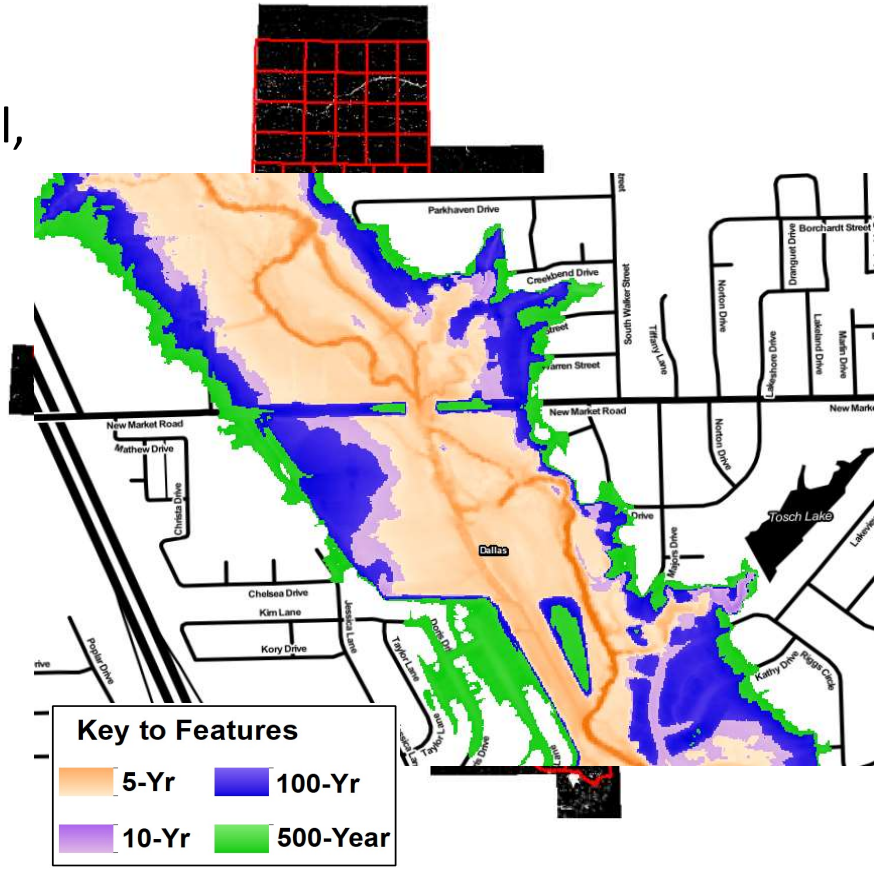
FATHOM

Customized Texas Data

- Run Fathom Model on 30-Meter DEM
- Map results on 10-ft LiDAR
- Statewide flood depths for Fluvial, Pluvial, and

- **Coastal for 4 flood frequencies**
  - 20-percent-annual-chance (5-yr)
  - 10-percent-annual-chance (10-yr)
  - 1-percent-annual-chance (100-yr)
  - 0.2-percent-annual-chance (500-yr)

- **Three depth rasters for each flood frequency at 10-ft resolution:**
  - Fluvial (Filter out depths < 6-in)
  - Pluvial (filter out depths < 6-in)
  - Coastal

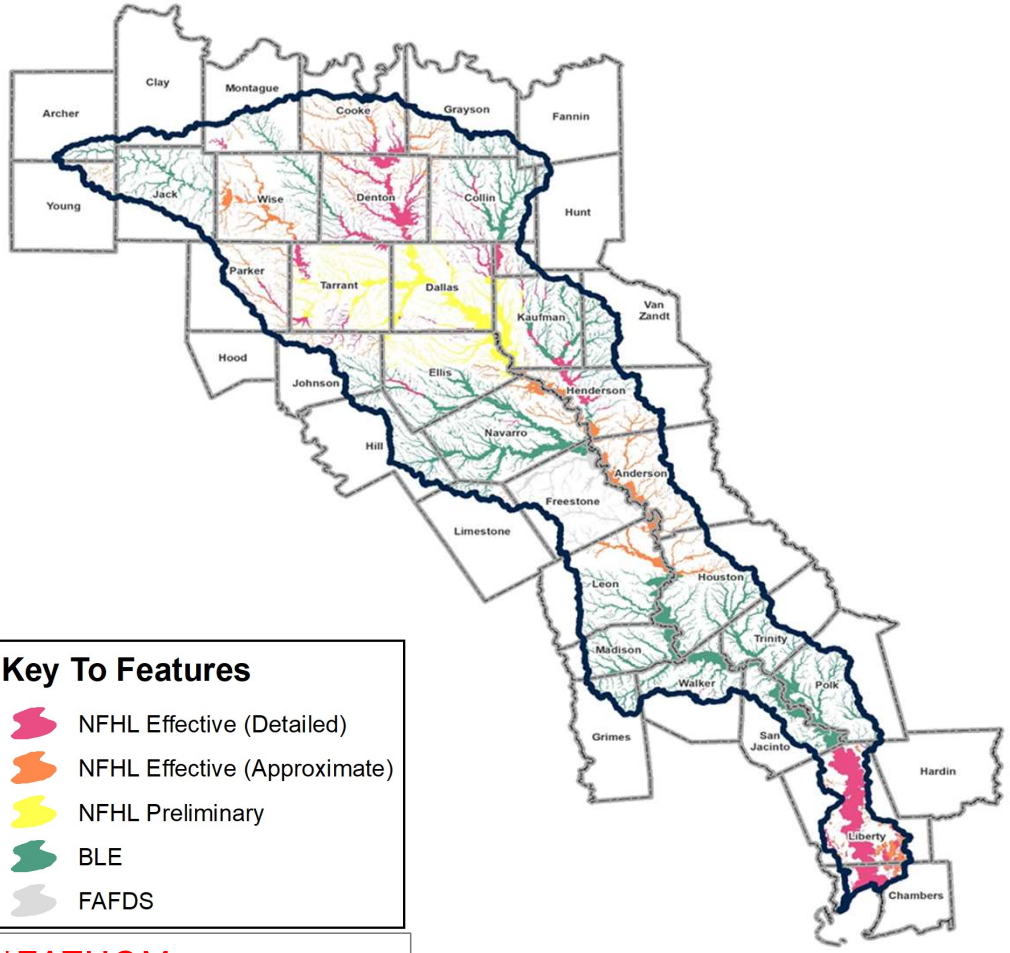


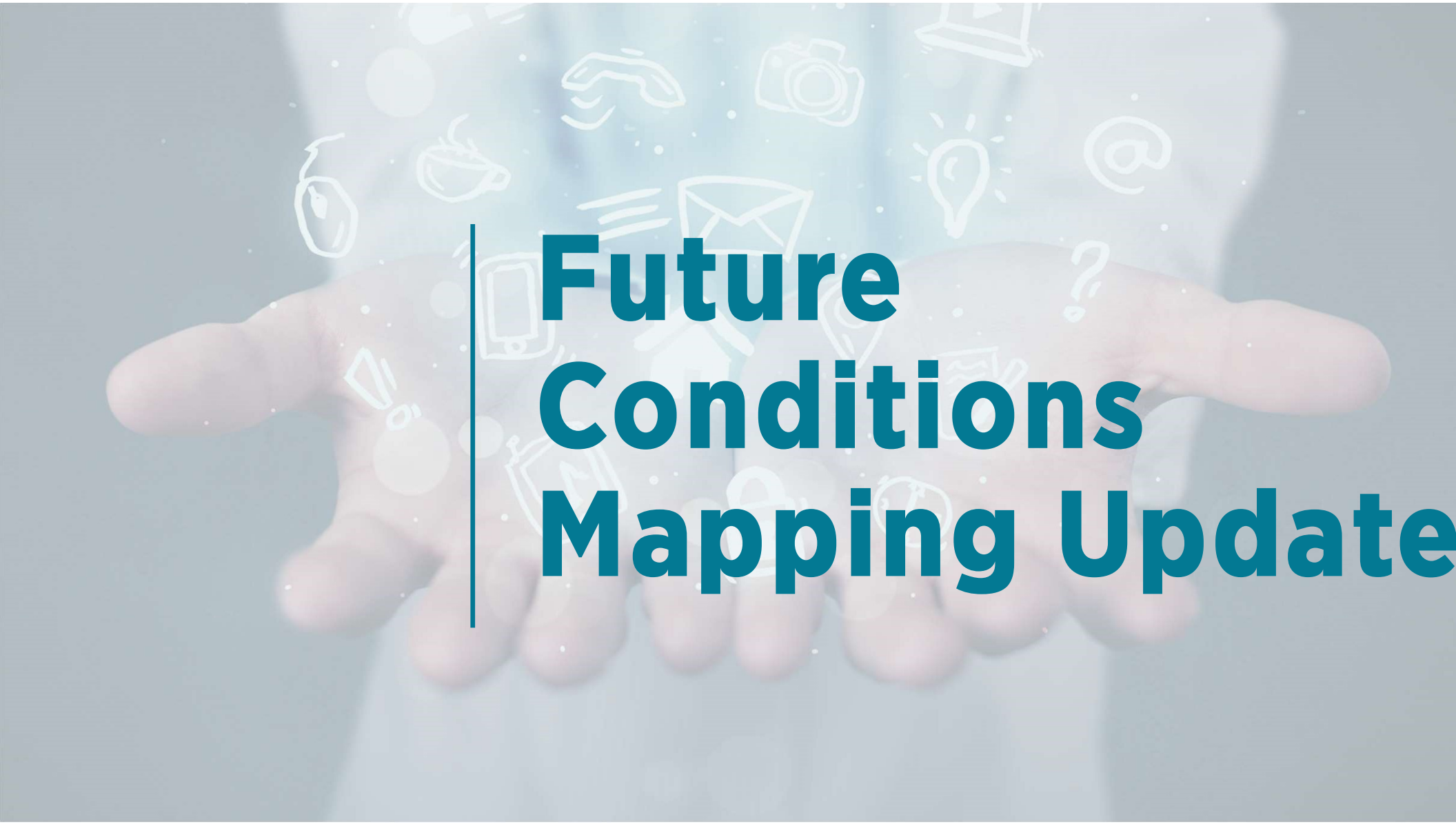
Customized Trinity Basin

FATHOM

Post-Processing

- Mosaicked together with greatest depth where datasets overlap
- Geoprocessing to create flood polygons
- Consistent 10-ft resolution flood layer





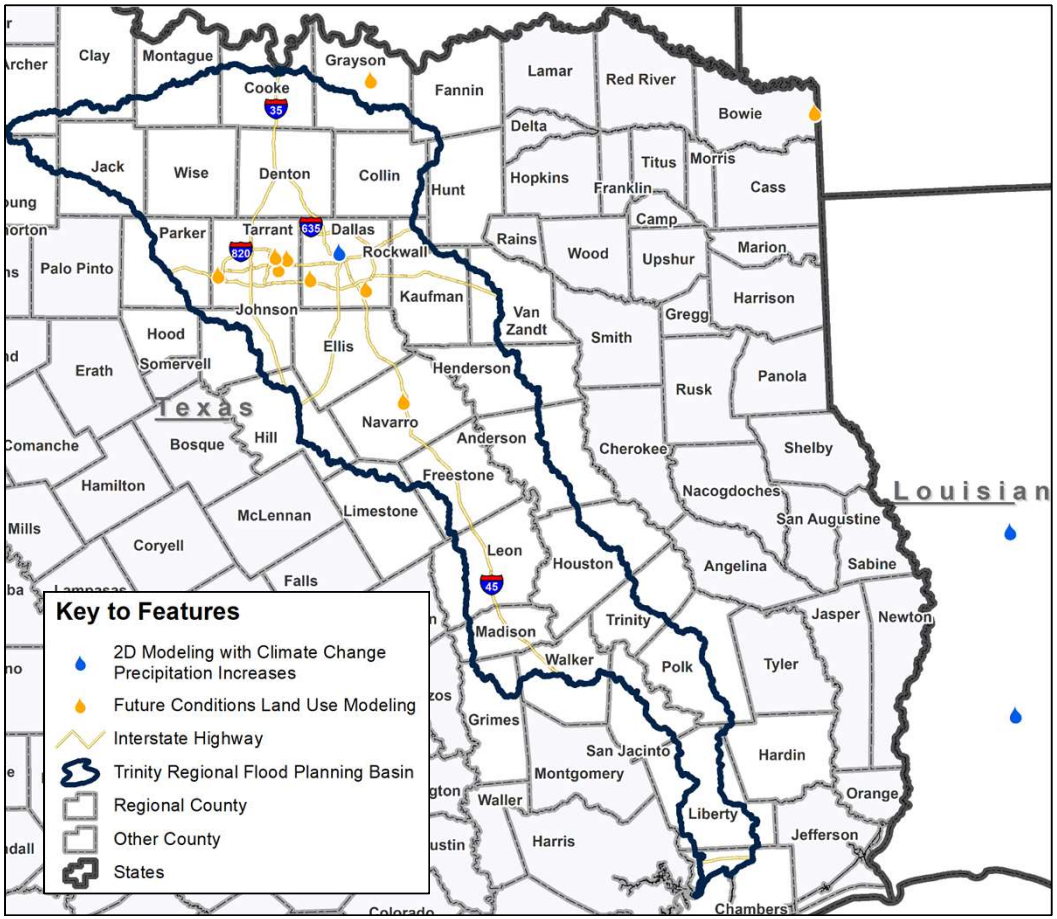
Future Conditions Mapping Update

FUTURE FLOOD HAZARD

Task 2B –Future Conditions Assessment

- **Future Land Use Hydraulic Model Comparison**
  - Trinity River
  - Parker County
  - Grand Prairie
  - Sherman
  - Texarkana
  - Corsicana

- **2D Modeling with Climate Change Increase Comparison**
  - Dallas
  - Upper Calcasieu River



FUTURE FLOOD HAZARD

Task 2B –Future Conditions Assessment

Future Land Use Hydraulic Model Comparison

Location	Average WSEL Change Existing Vs Future 100yr (ft)	Average WSEL Change Existing 100yr vs 500yr (ft)
Parker County	0.1	0.8
Grand Prairie	0.2	1.4
Sherman	0.7	1.0
Texarkana	0.6	1.8
Corsicana	0.2	1.0

2D Modeling with Climate Change Increase Comparison

Location	Average WSEL Change Existing Vs Future 100yr (ft)	Average WSEL Change Existing 100yr vs 500yr (ft)
Dallas	0.2	Unavailable
Upper Calcasieu	0.4	1.7

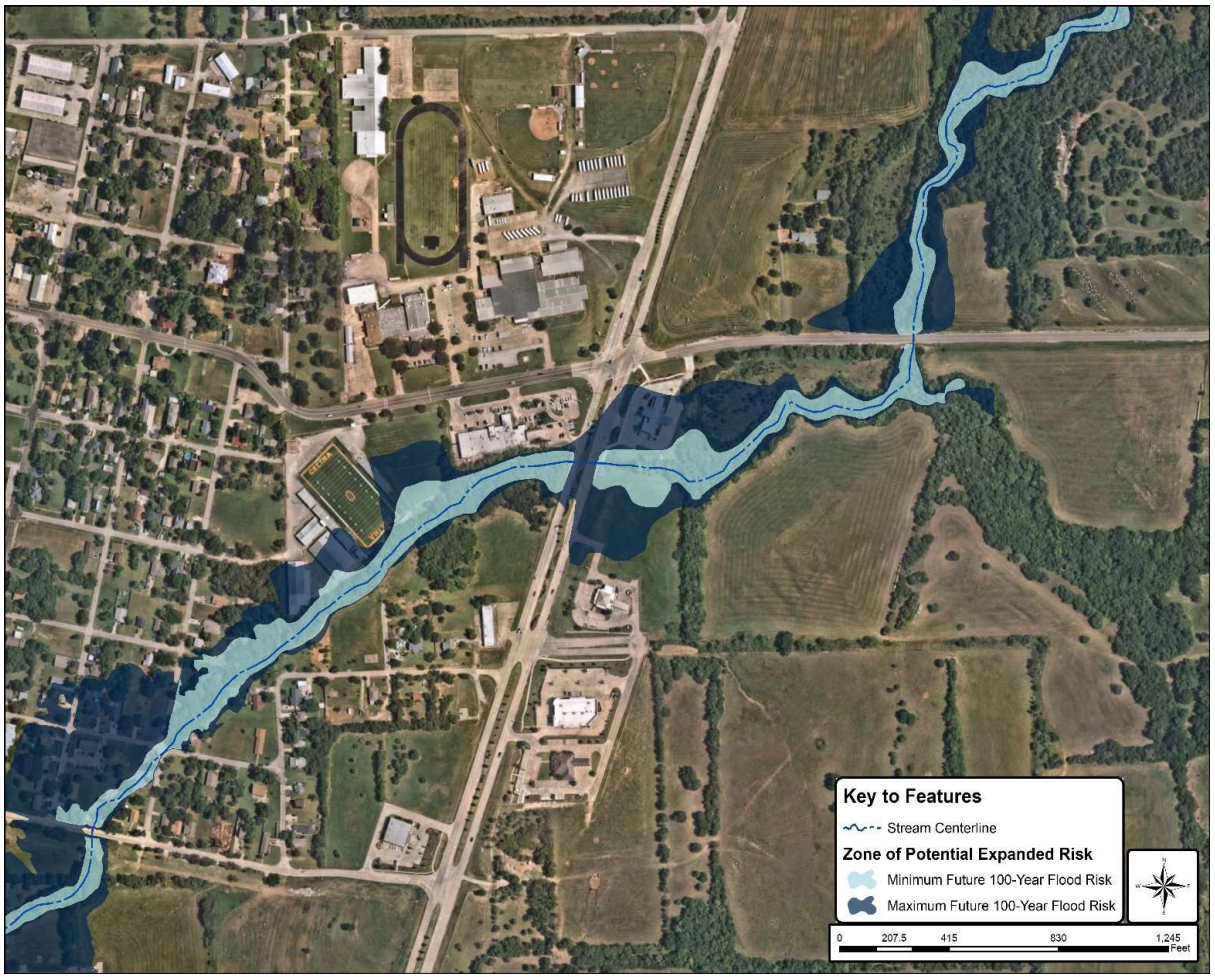
Task 2B –Proposed Future Conditions Methodology

FUTURE FLOOD HAZARD

	Best Available		→		→		→		Most Approximate	
	Local Floodplain (if determined current)		NFHL AE		BLE		NFHL A / FAFDS		No FEMA or Better than Quilt	
	100YR	500YR	100YR	500YR	100YR	500YR	100YR	500YR	100YR	500YR
Existing	Local Study (if provided)	Local Study (if provided)	Floodplain quilt 100YR	Floodplain quilt 500YR	BLE 100YR	BLE 500YR	Zone A	Fathom 500YR or (Areas w/o 500YR) included as floodplain gaps	Fathom 100YR	Fathom 500YR
Future	Local Study (if provided)	Local Study (if provided)	Range between Existing 100-year and 500-year	(Areas w/o 500YR) included as floodplain gaps	Range between BLE Existing 100-year and 500-year	(Areas w/o 500YR) included as floodplain gaps	Range between Zone A Existing 100-year and Fathom 500-year	(Areas w/o 500YR) included as floodplain gaps	Range between Fathom Existing 100-year and 500-year	(Areas w/o 500YR) included as floodplain gaps

FUTURE FLOOD HAZARD

Task 2B – Future Conditions Flood Risk Assessment



Ch. 3 Floodplain Management Practices and Goals

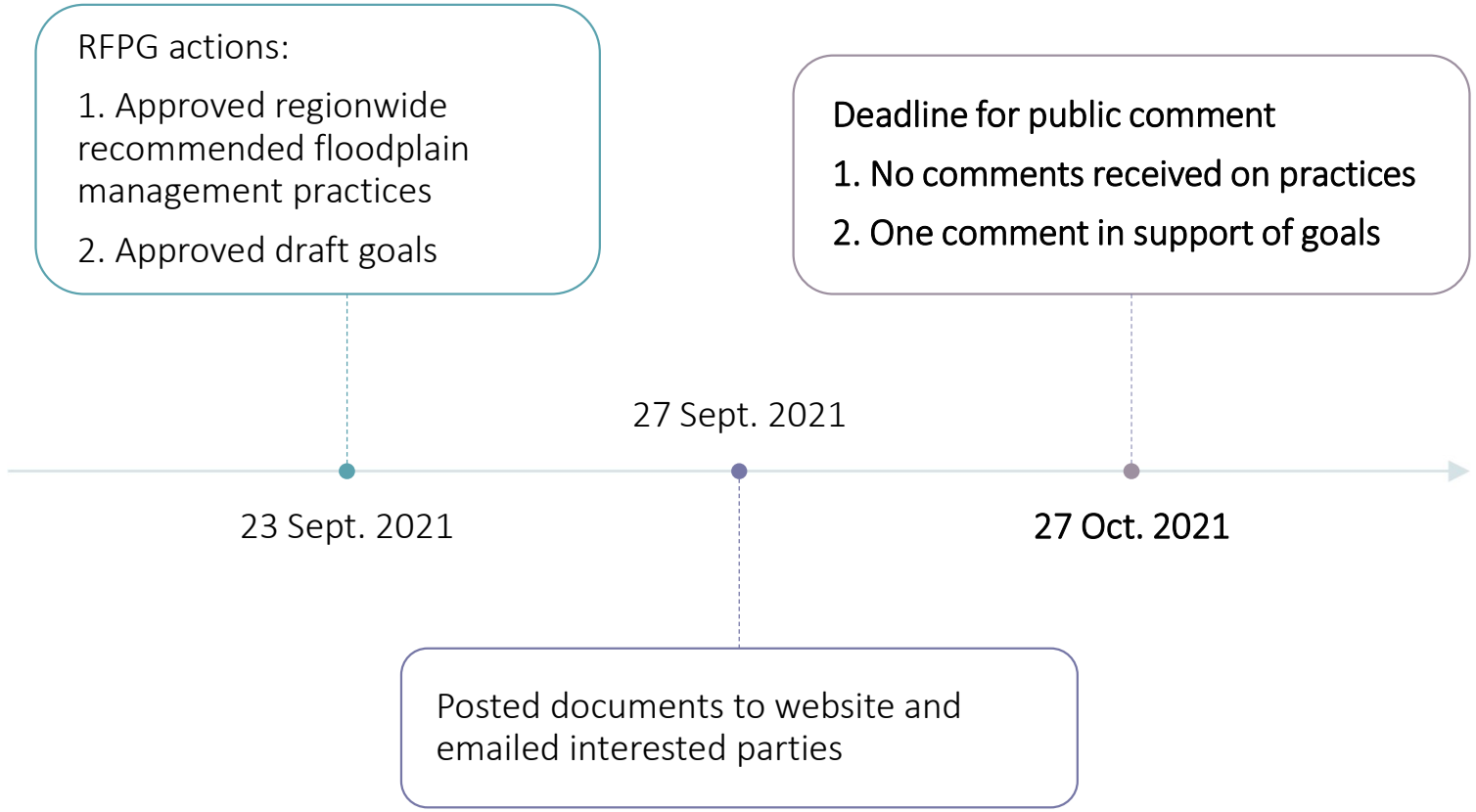
Practices/Standards

- Introduction and history
- Survey questions and responses
- Method applied to populate TWDB-required Tables
- RFPG decision to **recommend** six minimum standards

Goals

- Summary of goal development
- 7 overarching goal categories
  - 2+ goal statements for each
  - Short-term and long-term measurements
- Benefits and risk after goals are met
- Applicable regionwide
- TWDB-required Table

Additional outreach



Ch. 4 Flood Mitigation Needs & Potentially Feasible Solutions

Approach and Examples

FREESE AND NICHOLS
Innovative approaches
Practical results
Outstanding service
2711 N. Haskell Ave., Suite 3300 + Dallas, Texas 75204 + 214-217-2200 + FAX 817-735-7491
www.freese.com

TO: Region 3 Trinity Regional Flood Planning Group

CC: Stephanie Griffin, PE, CFM – Halff Associates, Inc.

FROM: David Rivera, PhD, PE, CFM; Caroline Short, PE, CFM – Freese and Nichols, Inc.

SUBJECT: Task 4A – Flood Mitigation Needs Analysis

DATE: 10/22/2021

PROJECT: Trinity Regional Flood Plan (FNI Proj. No. HAF21337)

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1. Background

The purpose of this memo is to describe the process used by the Technical Consultant (TC) to conduct the Flood Mitigation Needs Analysis (Task 4A), resulting in identifying the areas with the greatest gaps in flood risk knowledge and the areas of greatest known flood risk and mitigation needs. This memo expands upon the September 15, 2021 Technical Memo (TM) that describes the "Process for Identification and Evaluation of Potential FMEs and Potentially Feasible FMPs and FMSs". The Task 4A process is a big picture assessment that guides the Task 4B effort of identifying FMEs, FMPs, and FMSs. The September 2021 TM included the following table showing the TWDB guidance and considerations used in the assessment.

Table 1.1 TWDB Guidance and Factors to Consider

Guidance	Factors to Consider
1. Most prone to flooding that threatens life and property	• Area overlapped by inundation mapping and/or included in any historical flooding record • Building footprints / polygons within flood hazard layer • Critical facilities with evacuation routes impacted by flooding • Fully developed flood models (where available) • Low water crossings • Agricultural areas at risk of flooding
2. Locations, extent and performance of current floodplain management and land use policies and infrastructure	• Communities not participating in NFIP and/or without NFIP equivalent or higher standards • Disadvantaged / Underserved communities • City / County design manuals • Community Rating System (CRS) score • Land use policies • Floodplain ordinance(s)
3. Inadequate inundation mapping	• No mapping • Presence of Fathom / BLE / FEMA Zone A flood risk data • Detailed FEMA models older than 10 years

Guidance	Factors to Consider
4. Lack of hydrologic and hydraulic (H&H) models	• Communities with zero models • Communities with limited models
5. Emergency need	• Damaged or failing infrastructure • Other emergency conditions
6. Existing models and flood risk mitigation plans	• Exclude flood mitigation plans already in implementation • Leverage existing models, analyses, and flood risk mitigation plans • Benefit-Cost Ratio > 1
7. Previously identified and evaluated flood mitigation projects	• Exclude flood mitigation projects already in implementation • Leverage existing flood mitigation projects • Benefit-Cost Ratio > 1
8. Historic flooding events	• Disaster declarations • Flood insurance claim information • Other significant local events
9. Previously implemented flood mitigation projects	• Exclude areas where flood mitigation projects have already been implemented unless significant residual risk remains
10. Additional other factors deemed relevant by RFPG	• Alignment with RFPG goals • Alignment with TWDB guidance principles

2. Task 4A Process and Scoring Criteria

The main objectives of Task 4A are to identify the areas of greatest **known flood risk** and areas where the greatest **flood risk knowledge gaps** exist. The TC developed a geospatial process that combines information from multiple datasets representing several of the factors listed in **Table 1.1** and provides a basis for achieving the Task 4A objectives. Not every factor was included in this assessment due to limitations in data availability. The geospatial process was developed in GIS and was based on the data collected in Tasks 1 through 3. A variety of data sources were used in this assessment, including GIS data collected directly from stakeholders during outreach efforts. During the data collection phase, stakeholders participated in an online survey where they were able to respond geographically on a map. The stakeholder responses, as of September 16, 2021, were directly applied to this assessment.

The geospatial assessment was prepared at a HUC-12 watershed level of detail, which is consistent with the minimum watershed size for Task 4B specified in the Technical Guidelines (at least 1 square mile). A Hydrologic Unit Code (HUC) is a unique code assigned to watersheds in the United States. As the watersheds get smaller, the number of units used to identify them get longer. Therefore, the smallest unit of division used to identify a watershed is 12 digits, or a HUC-12. The Trinity basin has a total of 471 HUC-12 watersheds, with an average size of 40 square miles.

A total of 14 data categories were used in the geospatial assessment. A scoring range was determined for each data category based on the distribution of the data. The scoring ranges vary for each category based on the HUC-12s with the smallest and largest quantity. The TC established a uniform scoring scale of zero to five and each HUC-12 was assigned an appropriate score for each category. The scores for each HUC-12 under each category were then added to obtain a total score that was used to reveal the areas of greatest known flood risk. A separate score was also determined for each HUC-12 to reveal the

areas where the greatest flood risk knowledge gaps exist. The second score was based on two of the data categories that represented flood risk data gaps (see **Sections 3** and **4**).

The following gives a brief description of the data categories included and how each HUC-12 watershed was scored. Note that the objective of the Task 4A process is to determine the factors that are present within a given HUC-12, and to what degree; not necessarily to determine the relative importance of each factor in determining flood risk. Therefore, no weight has been applied to emphasize one factor over another at this time.

1) **Buildings in the 100-year Floodplain (Guidance Item #1 in Table 1.1)**
This dataset was divided into point values based on the total number of buildings in the 100-year floodplain within each HUC-12. This dataset was provided by the TWDB on the Data Hub. The count ranged widely for each HUC-12. Some rural HUC-12s only have 1-2 buildings in the floodplain, while the urban areas may have over 1,000 buildings in the floodplain.

Table 2.1 Scoring ranges for buildings in the 100-year floodplain

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
# of Buildings	0	1-50	51-250	251-500	501-750	751+

2) **Low Water Crossings/Add a New Low Water Crossing/Remove a Low Water Crossing (Guidance Item #1 in Table 1.1)**
Low Water Crossings were identified in Task 1 and were downloaded from the TWDB Data Hub. Add a New Low Water Crossing and Remove a Low Water Crossing were results from the stakeholder survey in Task 2. This category is scored based on the quantity of low water crossings occurring in a HUC-12. Urban areas have more roadways and low water crossings, therefore, urban HUC-12s will tend to score higher than rural areas in this category.

Table 2.2 Scoring ranges for low water crossings

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
# of Crossings	0	1-5	6-10	11-15	16-20	21+

3) **Agricultural Areas at Risk of Flooding (Guidance Item #1 in Table 1.1)**
Agricultural areas have been defined for this task as a land use of either farming or ranching. For this category, we analyzed the impacted agricultural area in each HUC-12. The impacted agricultural area is the farming and ranching land use parcels located within the 100-year floodplain (as defined by the flood quilt data). This layer will emphasize rural HUC-12s where agricultural impacts due to flooding are most prominent.

Table 2.3 Scoring ranges for agricultural areas at risk of flooding

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
Total Impacted Area (sq. mi.)	0	0.01-0.35	0.36-2	2.01-3	3.01-5.5	5.51+

4) **Existing Critical Facilities/Add a New Critical Facility (Guidance Item #1 in Table 1.1)**
Critical facilities for this assessment include hospitals, schools, fire stations, shelters, electric and gas lines. Existing Critical Facilities were identified in Task 1 from the TWDB Data Hub. The stakeholders were able to update the existing critical facilities by adding or removing facilities in the survey from Task 2. This category is scored based on the total number of critical facilities identified within the 100-year floodplain. The number of critical facilities within a HUC-12 is primarily a function of population density.

Table 2.4 Scoring ranges for critical facilities

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
# of Facilities	0	1-5	5-10	11-25	26-50	51+

5) **Locations where the Road Floods (Guidance Item #1 in Table 1.1)**
This dataset is entirely based on survey responses from Task 2. Although this factor (like item 2 above) addresses water over roadways, this factor includes potential urban flooding scenarios, and is entirely based on survey responses from Task 2. The survey participants were able to draw lines on the map to identify roads that are prone to flooding in their community. Each line inputted was given 1 point. If the line was drawn across multiple HUC-12s, then both HUCs receive a point.

Table 2.5 Scoring ranges for locations where the road floods

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
# of Locations	0	1	2	3	4	5+

6) **Communities Not Participating in the NFIP (Guidance Item #2 in Table 1.1)**
These communities were identified in Task 1. If a community is not a participant in the NFIP, all HUC-12s intersected by that community are given 5 points. These communities are mostly clustered in the mid-basin area, with others dispersed throughout the Region.

Table 2.6 Scoring for communities not participating in the NFIP

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
Community	NFIP Participant					Non-NFIP Participant

7) **Social Vulnerability Index (SVI) (Guidance Item #10 in Table 1.1)**
SVI refers to the potential negative effects on communities caused by external stresses on human health. Such stresses include natural or human-caused disasters, or disease outbreaks. SVI values for the State of Texas were downloaded from the Agency for Toxic Substances and Disease Registry (ATSDR) website (https://www.atsdr.cdc.gov/placeandhealth/svi/index.html). The most recent SVI values published on the website (2018) we used in this assessment. SVI values are assigned per census tract, which needed to be converted to SVI per HUC-12. SVI values were assigned to each HUC-12 based on an area-weighted average. The percent of a census tract that

intersects a HUC-12 was multiplied by the SVI for the census tract. This procedure is followed for all census tracts intersecting a HUC-12 boundary, and those weighted SVI values are added together to produce one SVI value for each HUC-12. The SVI ratings vary between 0-1 and were scored according to **Table 2.7**. The higher the SVI, the higher the vulnerability of a community; the lower the SVI, the higher the resilience. Overall, the HUC-12s in the middle and lower basins resulted in the highest SVI values.

Table 2.7 Scoring ranges for SVI ratings

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
SVI rating	0	0.01-0.16	0.17-0.33	0.34-0.50	0.51-0.67	0.67+

8) **Report Flood Concerns (Guidance Item #8 in Table 1.1)**
This category was generated by the community responses to the survey in Task 2. The points are assigned to HUC-12s and scored based on the count of flood concern locations within each HUC-12 boundary.

Table 2.8 Scoring for reported flood concerns

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
# of Flood Concerns	0	1	2	3	4	5+

9) **FEMA Claims (Guidance Item #8 in Table 1.1)**
This dataset compiles all the FEMA flood claims within the Trinity watershed as of July 31st, 2021. The geospatial data assigned to the claims was highly redacted. Therefore, the TC decided to use the cities to which the flood claims were assigned. Each city was divided into the HUC-12s that intersected the city limits. The number of flood claims for each city was divided proportionately amongst the HUC-12s composing each city. Most of the claims recorded in this dataset occurred in the DFW metropolitan area.

Table 2.9 Scoring ranges for FEMA claims

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
# of Claims	0	1-5	6-10	11-30	31-50	51+

10) **Historic Storms (Guidance Item #8 in Table 1.1)**
The occurrence of historic storms was evaluated using the NOAA National Centers for Environmental Information Storm Events Database (https://www.ncdc.noaa.gov/stormevents/details.jsp). This database compiles historic storms from 1950 to 2020. The number of historic storms on record occurring within each HUC-12 was tabulated and scored. Most of these storms are scattered throughout the middle and upper parts of the Trinity watershed.

Table 2.10 Scoring ranges for historic storms

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
# of Storms	0	1-2	3-4	5-6	7-8	9+

11) Damages from Historic Storms (Guidance Item #8 in Table 1.1)

In addition to the frequency of historic storms, the severity of these storms was also considered in the analysis. The Historic Storms dataset, cited above in category 10, included information on reported damages, injuries, and deaths associated with each storm. Severity was considered as follows: 0 to 5 points based on reported property damages (according to the scoring scale in **Table 2.11**), 1 additional point if injuries were reported, and 2 additional points if deaths were reported.

Table 2.11 Scoring ranges for damages from historic storms

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
Damages ($)	0	1-10,000	10,001-30,000	30,001-100,000	100,001-500,000	500,000+

12) Areas With a History of Flooding (Guidance Item #8 in Table 1.1)

The communities entered datapoints into the survey performed in Task 2 to mark areas in their communities that repetitively flood. Within each HUC-12 boundary, the number of areas marked were scored according to the scale shown in **Table 2.12**. This dataset is limited to locations identified by stakeholders in the Task 2 survey, it does not include additional information regarding high water rescues, injuries, or deaths.

Table 2.12 Scoring for areas with a history of flooding

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
# of Areas	0	1	2	3	4	5+

13) **Areas That Need Mitigation, Study Need or Data Gap (Guidance Items #1, #3, #4 and #8 in Table 1.1)**

These polygon layers were populated by community responses to the survey in Task 2. These responses were combined into one polygon layer for this task. The scoring for this category gives points to any HUC-12 intersecting these polygons, according to the scoring in **Table 2.13**.

Table 2.13 Scoring for areas that need mitigation, study need, or data gaps

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
# of Mitigation Areas	0	1	2	3	4	5+

14) **Inadequate Inundation Mapping (Guidance Item #3, #4, #6 in Table 1.1)**

The flood quilt provided by the TWDB included the source of the floodplain data in the GIS attribute table. Based on the definitions of the source data from TWDB (Flood Quilt Pri | Hub: GIS Resources, Flooding Planning, Texas), it was assumed that the sources that represented adequate inundation mapping data are:

- National Flood Hazard Layer (NFHL) Preliminary Data (zones AE, AH, OH, and VE)
- NFHL Effective Data (zones AE, AH, OH, and VE)

The following flood quilt data sources were considered inadequate inundation mapping data in this assessment:

- Base Level Engineering (BLE)
- NFHL Zone A
- First American Flood Data Services (FAFDS)
- Fathom

The total amount of floodplain area (from all sources in the flood quilt) and the amount of inadequate floodplain data in each HUC-12 were calculated. This computation produced a percentage of the HUC-12 floodplain data that is considered inadequate for the purposes of this assessment. The HUC-12s with the highest percentages of inadequate data appear in the very far north and the middle of the region. These percentages were scored on the following metrics.

Table 2.14 Scoring ranges for the percentage of inadequate flood risk data

	Score					
	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
% Inadequate	0	0.01-20%	21-50%	51-75%	76-90%	90%+

3. Scoring Process Examples

Five HUC-12 basins were selected to demonstrate in detail the scoring process described in **Section 2**. The selected basins are located in the same general area of the Region, on the Lower Trinity-Kickapoo and Lower Trinity subbasins, south of Lake Livingston (see **Exhibit 2**). These 5 basins, labeled A through E for simplicity, had a wide variety of scores for each category and resulted in total scores that represent the entire range of known flood risk levels as defined in this assessment.

Table 3.1 shows the detailed scores for the selected HUC-12 basins. These results are presented graphically in **Figure 3.1**. This data demonstrates how the combination of different factors can help determine if a given HUC-12 has a high level of known flood risk relative to the others. In this example, basin E scored high in about half of the categories, which resulted in the highest total score. On the other hand, basin A only scored high in the SVI category, indicating a much lower level of known flood risk. However, the fact that a HUC-12 results in a low score does not necessarily mean that there is no flood risk in this area. The results for basin B show a relatively low total score, but it scored high in the SVI and inadequate inundation mapping categories. In addition, there are some buildings, critical

facilities, and low water crossings that would be impacted by the 100-year flood event. This clearly indicates that there is still a level of flood risk associated this area, but not as significant as in basin E.

A separate score was also determined for each HUC-12 to reveal the areas where the greatest flood risk knowledge gaps exist. This second score was based on two categories: (13) Areas That Need Mitigation, Study Need or Data Gap, and (14) Inadequate Inundation Mapping. These categories were considered to represent flood risk data gaps. This score is primarily defined by Category 14, as data for Category 13 was based on survey input and it has a limited coverage. In this example, 4 of the selected HUC-12s scored high on this category, indicating that inundation maps in these areas are considered inadequate. This result indicates that there is significant uncertainty regarding floodplain boundaries in these areas and studies would be needed to reduce that uncertainty and in turn minimize flood risk.

Table 3.1 Example HUC-12 Scoring

Category / Score	HUC12				
	A	B	C	D	E
Category 1 - # of Buildings	27	15	311	56	1018
Category 1 - Score	1	1	3	2	5
Category 2 - # of Crossings	0	3	0	0	0
Category 2 - Score	0	1	0	0	0
Category 3 - Total Impacted Area (sq.mi)	0.28	0.06	5.30	0.34	16.67
Category 3 - Score	1	1	4	1	5
Category 4 - # of Facilities	0	1	0	5	7
Category 4 - Score	0	1	0	1	2
Category 5 - # of Locations	0	0	0	0	0
Category 5 - Score	0	0	0	0	0
Category 6 - Community	0	0	0	0	0
Category 6 - Score	0	0	0	0	0
Category 7 - SVI Rating	0.55	0.66	0.57	0.60	0.61
Category 7 - Score	4	4	4	4	4
Category 8 - # of Flood Concerns	0	0	0	0	0
Category 8 - Score	0	0	0	0	0
Category 9 - # of Claims	0	0	0	76	12
Category 9 - Score	0	0	0	5	3
Category 10 - # of Storms	0	0	1	1	3
Category 10 - Score	0	0	1	1	2
Category 11 - Damages ($)	$ -	$ -	$ 13,000	$ 10,000	$ 35,000
Category 11 - Score*	0	0	2	1	3
Category 12 - # of Areas	0	0	0	0	0
Category 12 - Score	0	0	0	0	0
Category 13 - # of Mitigation Areas	0	0	0	0	0
Category 13 - Score	0	0	0	0	0
Category 14 - %Inadequate	0.1%	81%	100%	100%	84%
Category 14 - Score	1	4	5	5	4
Total Score	7	12	19	20	28

*These HUC-12s did not have any injuries or deaths associated with the Historic Storms, therefore, no additional points were given for this category.

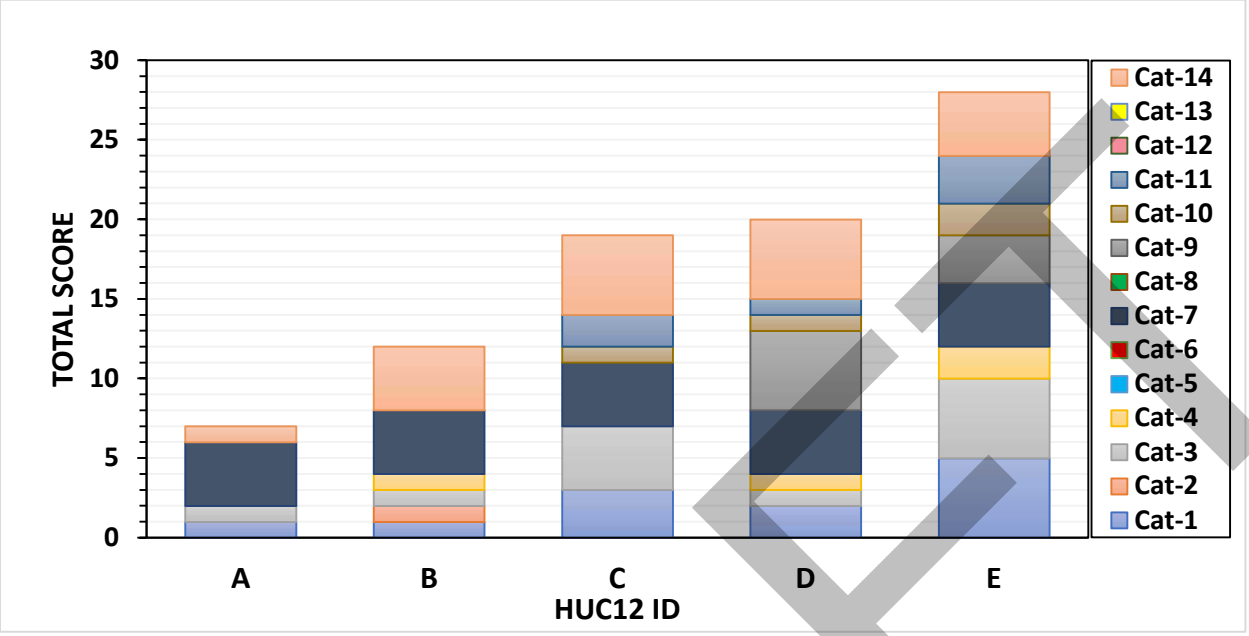


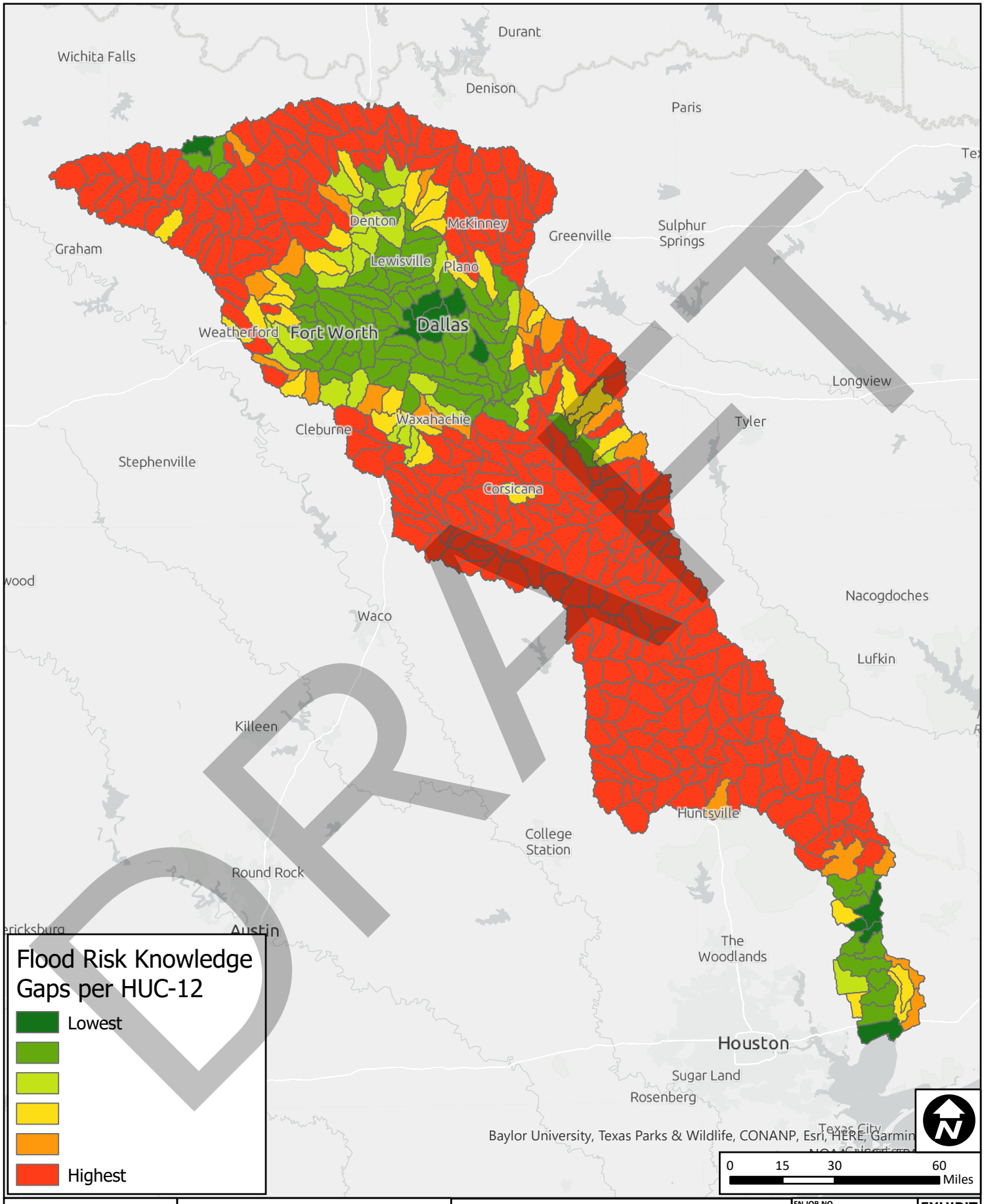
Figure 3.1 Distribution of points and total score for HUC-12 examples

4. Final Results

The process and scoring methodology described in **Sections 2** and **3** was implemented across the entire Trinity basin. As previously discussed, two separate assessments were performed to address the two goals of Task 4A. The first goal is to identify the areas where the greatest **flood risk knowledge gaps** exist. These areas are represented in **Exhibit 1**. As described in **Section 3**, **Exhibit 1** was generated based on the analysis of the last two categories: (13) Areas That Need Mitigation, Study Need or Data Gap, and (14) Inadequate Inundation Mapping. Based on the data utilized in this preliminary assessment, approximately two-thirds of the Trinity watershed is considered inadequately mapped (as indicated by the red HUC-12s in **Exhibit 1**). Note that the red HUC-12s may contain studies that have been completed but are not yet regulatory products.

The second assessment addresses the second goal: to determine the areas of greatest **known flood risk** and flood mitigation needs. For each HUC-12 in the Trinity region, the score from each of the 14 categories were added together to obtain a total score. All categories have an equal representation in the total score. This analysis also included Categories 13 and 14 because uncertainty itself is a risk. Based on the distribution of the final scores in this preliminary assessment, the top 10% were colored red, and the top 30% were colored either red or orange. Unlike **Exhibit 1**, **Exhibit 2** highlights areas in red and orange where there is more data indicating a known flood risk occurs. HUC-12s shaded light green or dark green represent areas where there is less known about the flood risk level for that area.

The maps resulting from the Task 4A assessment will serve as a guide to the RFPG's subsequent efforts in Task 4B. The red and orange HUC-12s in **Exhibit 1** highlight the areas in the Trinity watershed where potentially feasible flood risk studies (FMEs) should be considered as part of Task 4B. The red and orange HUC-12s in **Exhibit 2** emphasize watersheds where the RFPG should strive to identify and implement FMSs and FMPs as part of Task 4B to reduce the known flood risks within those areas.



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REGION 3 TRINITY REGIONAL FLOOD PLANNING GROUP

Flood Risk Knowledge Gaps

Trinity River Watershed, TX

FN JOB NO	HAF21337
FILE	HUC12_Scoring_Trinity
DATE	10/21/202
SCALE	1:2,290,145
DRAFTED	02271

EXHIBIT 1

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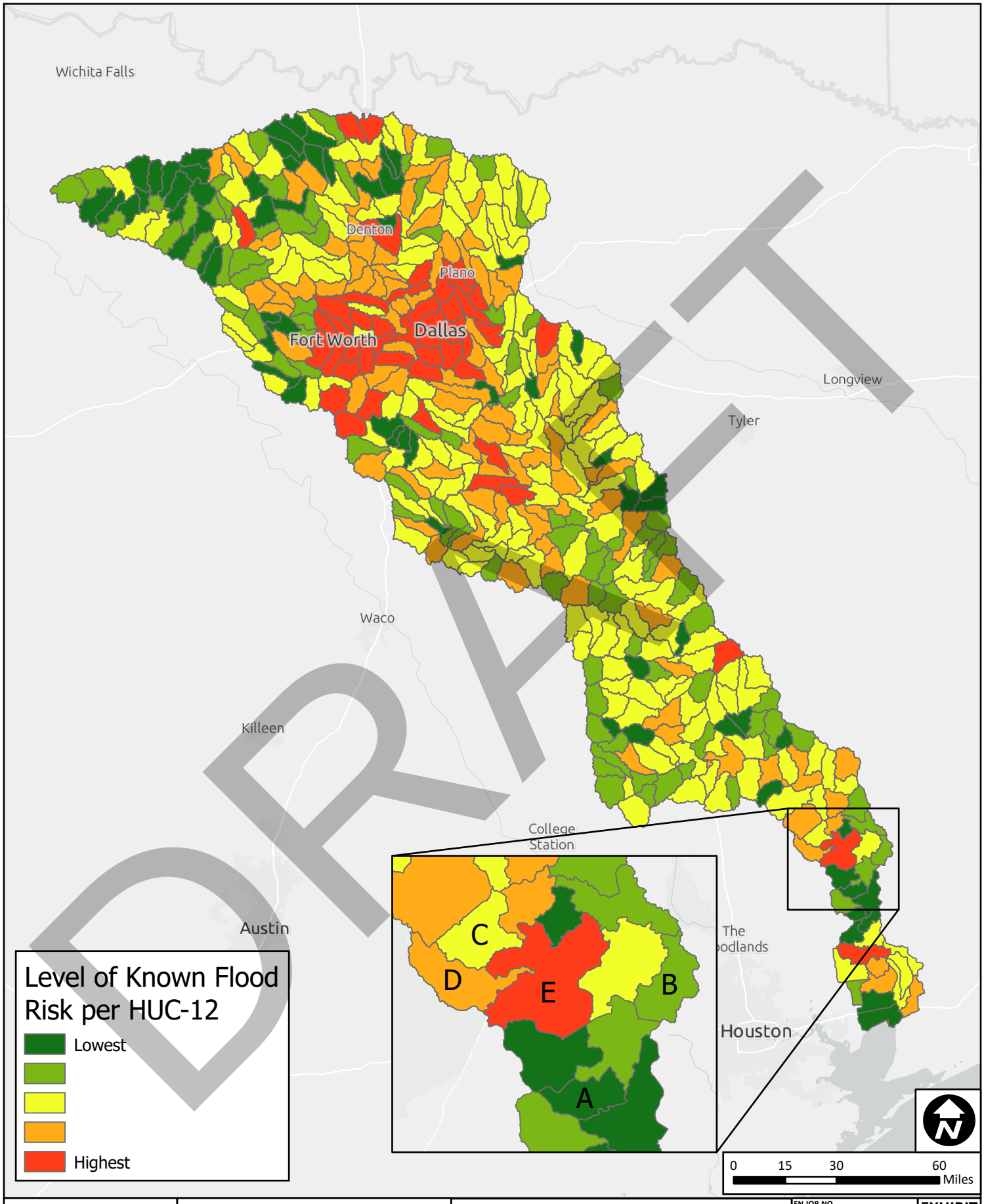

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REGION 3 TRINITY REGIONAL FLOOD PLANNING GROUP

Flood Risk and Flood Mitigation Needs

Trinity River Watershed, TX

FN JOB NO	HAF21337
FILE	HUC12_Scoring_Trinity
DATE	10/21/202
SCALE	1:2,329,540
DRAFTED	02271

EXHIBIT 2

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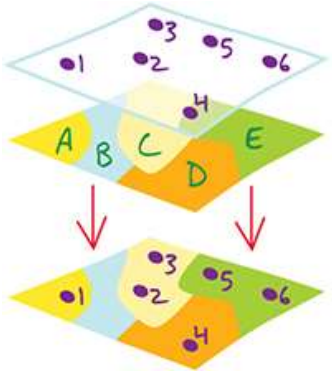
Task 4A - Process for Identifying Areas of Greatest Need (Screening Analysis)

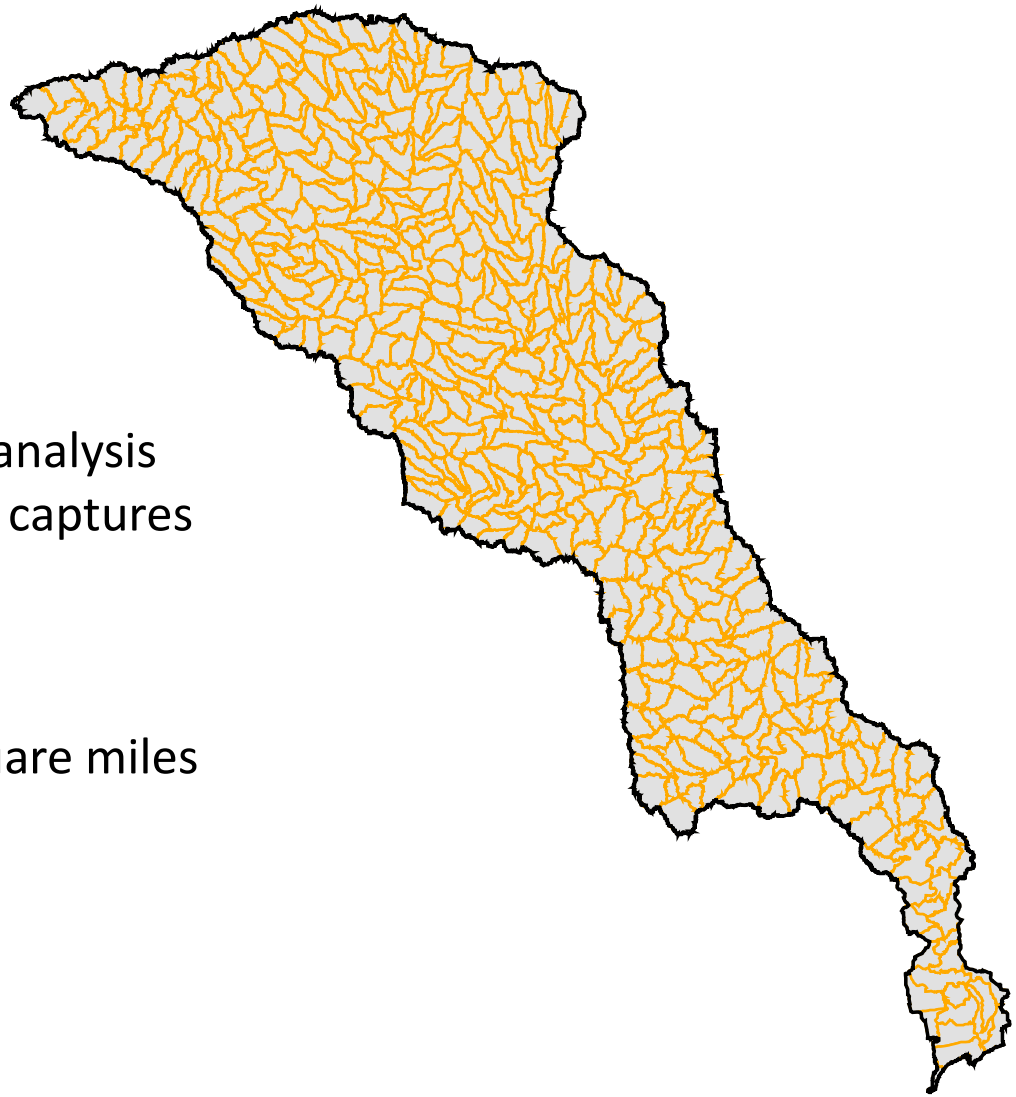
Most prone to flooding that threatens life & property	Locations, extent, & performance of policies & infrastructure	Prone to flooding with inadequate inundation maps	Prone to flooding with w/o H&H models
Emergency need	Existing models, analysis, & flood risk mitigation plans	Already identified flood mitigation projects	
Historic flooding events	Already implemented flood mitigation projects	Other relevant factors	



1	A
2	C
3	C
4	D
5	E
6	E

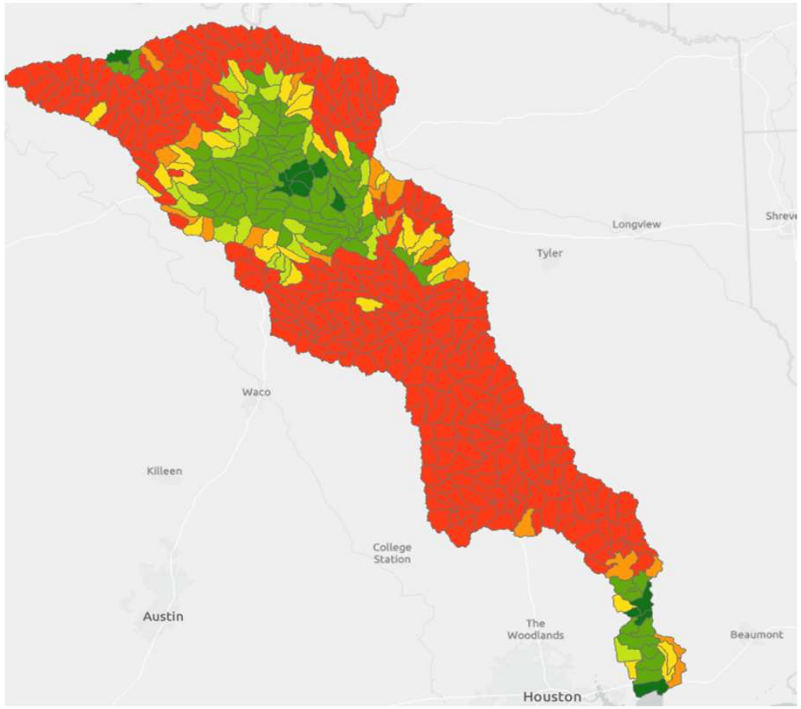
Task 4A - Unit of Analysis

- HUC = Hydrologic Unit Code
- **HUC 12** will be used as unit of analysis (local sub-watershed level that captures tributary systems)
- **471** HUC 12 sub-watersheds
- HUC 12 average area = ~40 square miles



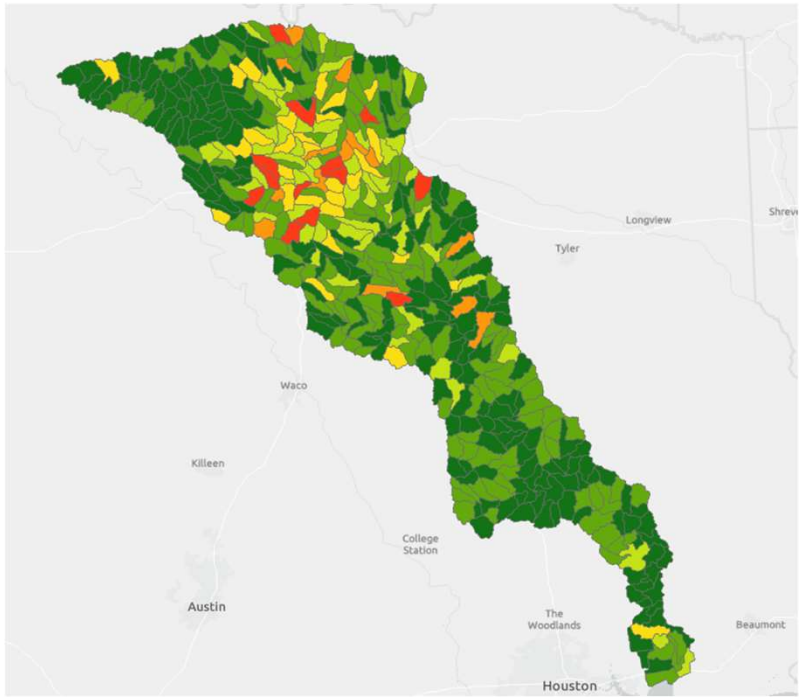
Task 4A - Scoring Categories

Percent Inadequately Mapped



Score					
0 pts	**1 pt**	**2 pts**	**3 pts**	**4 pts**	**5 pts**
0	0.01-20%	21-50%	51-75%	76-90%	90%+

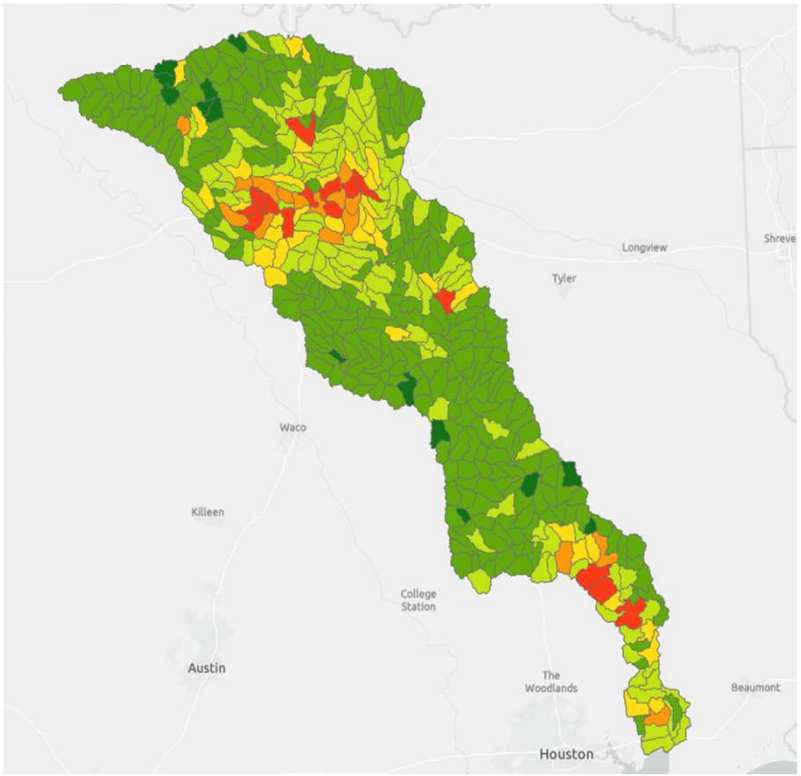
Historic Storms - Frequency



Score					
0 pts	**1 pt**	**2 pts**	**3 pts**	**4 pts**	**5 pts**
0	1-2	3-4	5-6	7-8	9+

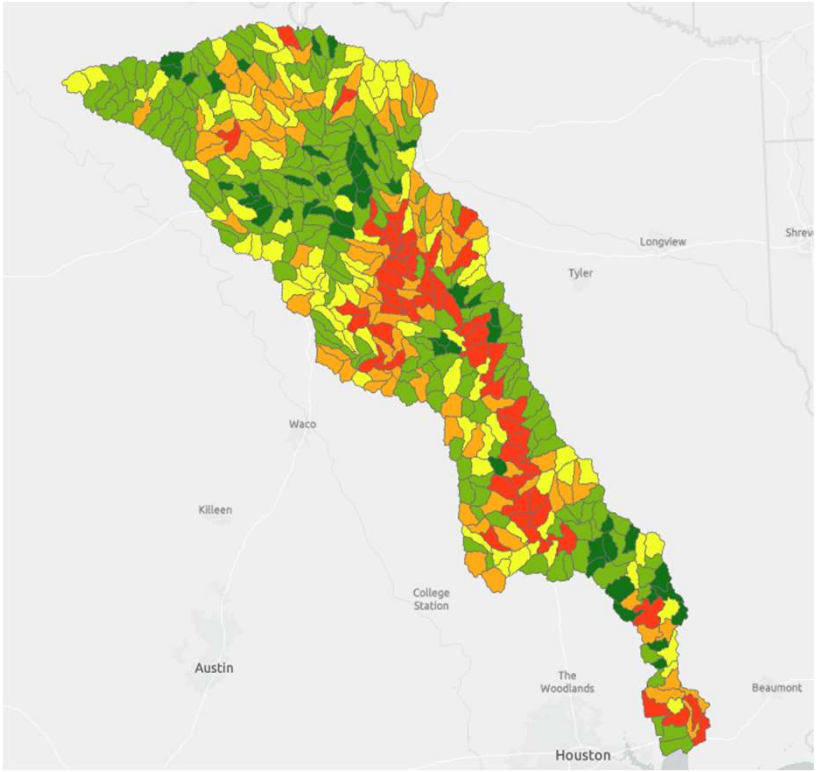
Task 4A - Scoring Categories

Buildings in the 100-yr floodplain



Score					
0 pts	**1 pt**	**2 pts**	**3 pts**	**4 pts**	**5 pts**
0	1-50	51-250	251-500	501-750	751+

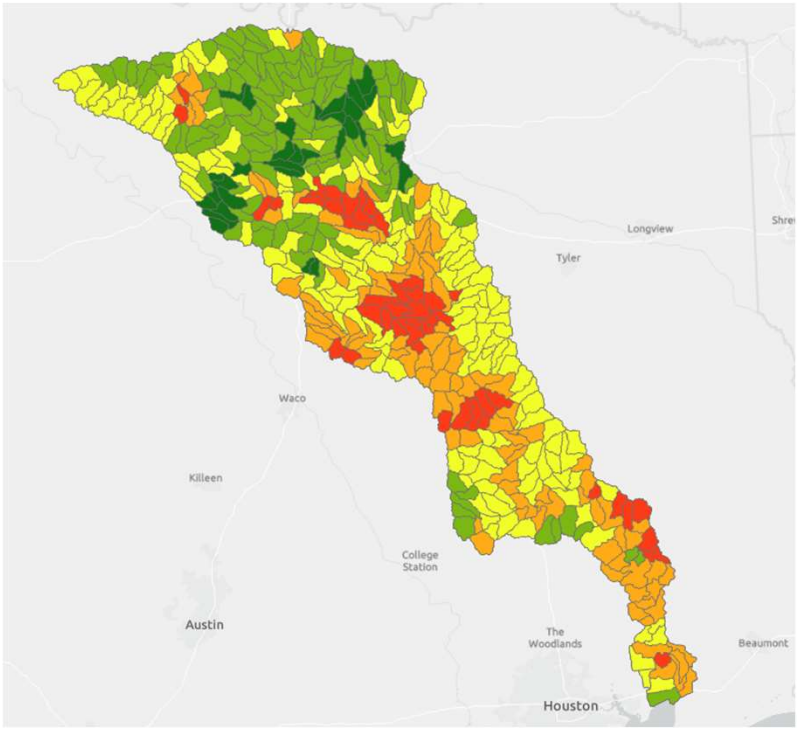
Agricultural Areas Impacted by 100-yr flood



	Score					
	0 pts	**1 pt**	**2 pts**	**3 pts**	**4 pts**	**5 pts**
Total Impacted Area (sq. mi.)	0	0.01-0.35	0.36-2	2.01-3	3.01-5.5	5.51+

Task 4A - Scoring Categories

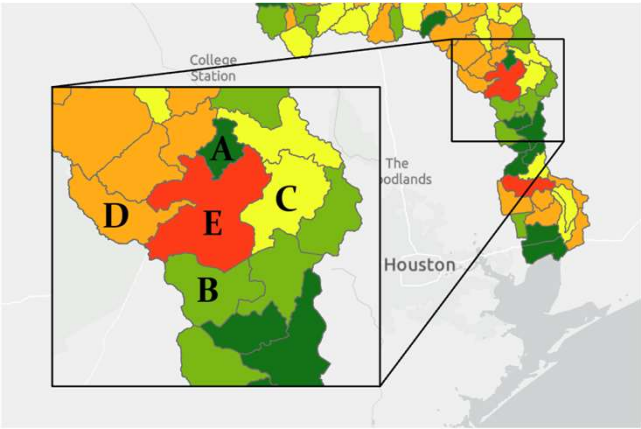
Social Vulnerability Index (SVI)



	Score					
	0 pts	**1 pt**	**2 pts**	**3 pts**	**4 pts**	**5 pts**
SVI rating	0	0.01-0.16	0.17-0.33	0.34-0.50	0.51-0.67	0.67+

Task 4A - Scoring Process Example

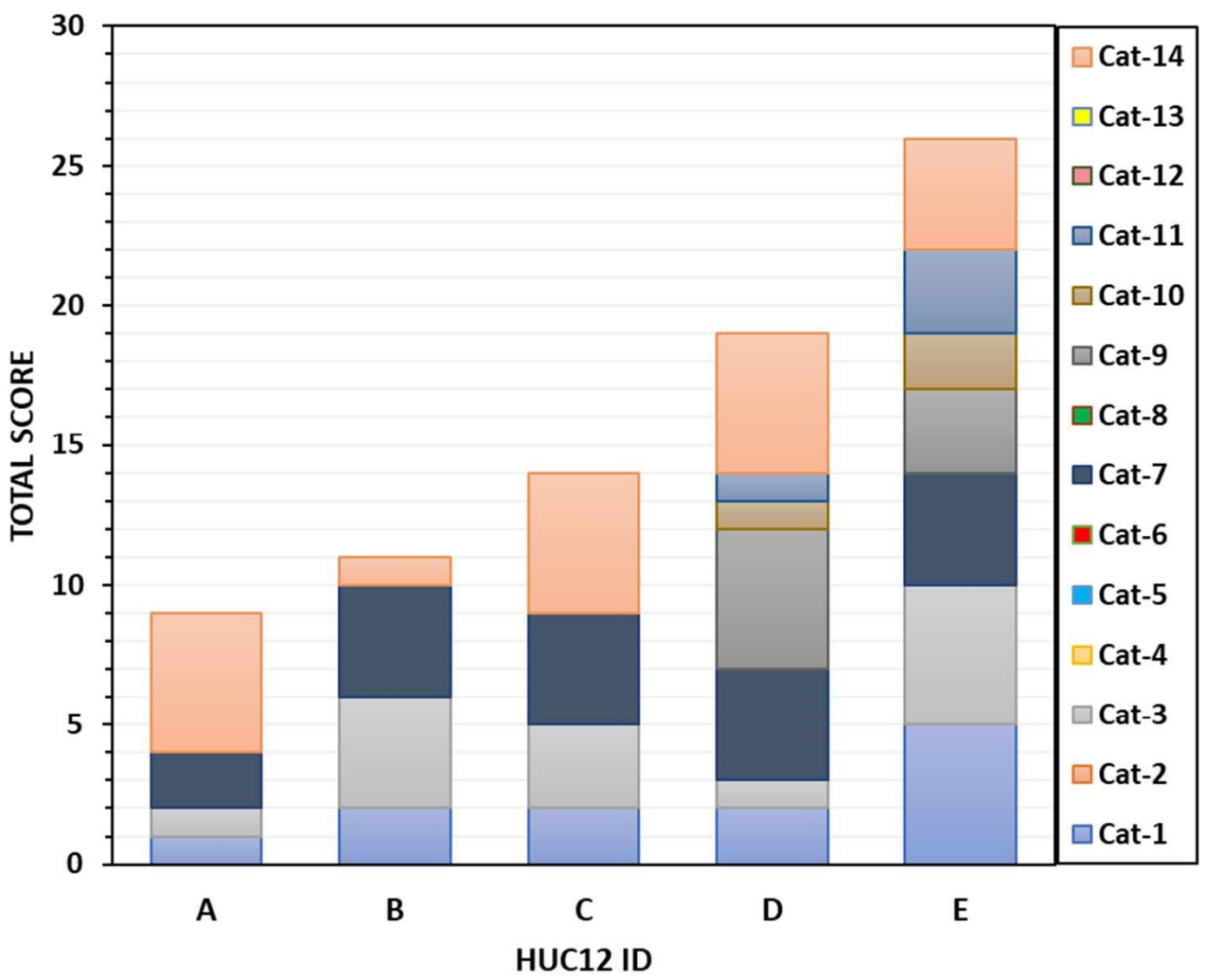
- 5 HUC-12 basins selected
- Demonstrates different categories
- A low score does **not** mean there is no flood risk.



Category / Score	HUC12				
	A	B	C	D	E
Category 1 - # of Buildings	2	191	203	56	1018
Category 1 - Score	1	2	2	2	5
Category 2 - # of Crossings	0	0	0	0	0
Category 2 - Score	0	0	0	0	0
Category 3 - Total Impacted Area (mi^2)	0.09	4.64	2.27	0.34	16.67
Category 3 - Score	1	4	3	1	5
Category 4 - # of Facilities	0	0	0	0	0
Category 4 - Score	0	0	0	0	0
Category 5 - # of Locations	0	0	0	0	0
Category 5 - Score	0	0	0	0	0
Category 6 - Community	0	0	0	0	0
Category 6 - Score	0	0	0	0	0
Category 7 - SVI Rating	0.23	0.57	0.59	0.60	0.61
Category 7 - Score	2	4	4	4	4
Category 8 - # of Flood Concerns	0	0	0	0	0
Category 8 - Score	0	0	0	0	0
Category 9 - # of Claims	0	0	0	76	12
Category 9 - Score	0	0	0	5	3
Category 10 - # of Storms	0	0	0	1	3
Category 10 - Score	0	0	0	1	2
Category 11 - Damages ($)	$ -	$ -	$ -	$ 10,000	$ 35,000
Category 11 - Score*	0	0	0	1	3
Category 12 - # of Areas	0	0	0	0	0
Category 12 - Score	0	0	0	0	0
Category 13 - # of Mitigation Areas	0	0	0	0	0
Category 13 - Score	0	0	0	0	0
Category 14 - %Inadequate	100%	5%	96%	100%	84%
Category 14 - Score	5	1	5	5	4
Total Score	9	11	14	19	26

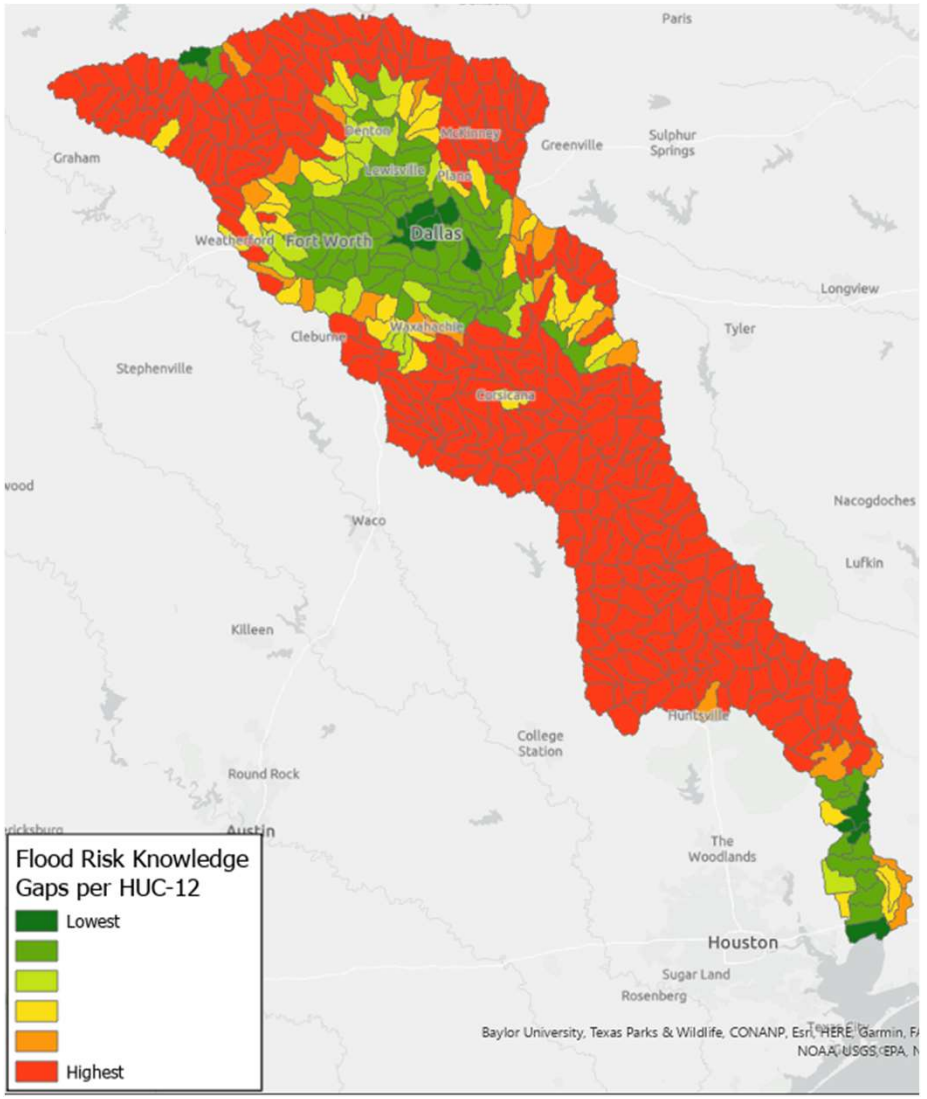
Task 4A - Scoring Process Example

- Total score for HUC-12 and distribution of points per category



Task 4A Results - Knowledge Gaps

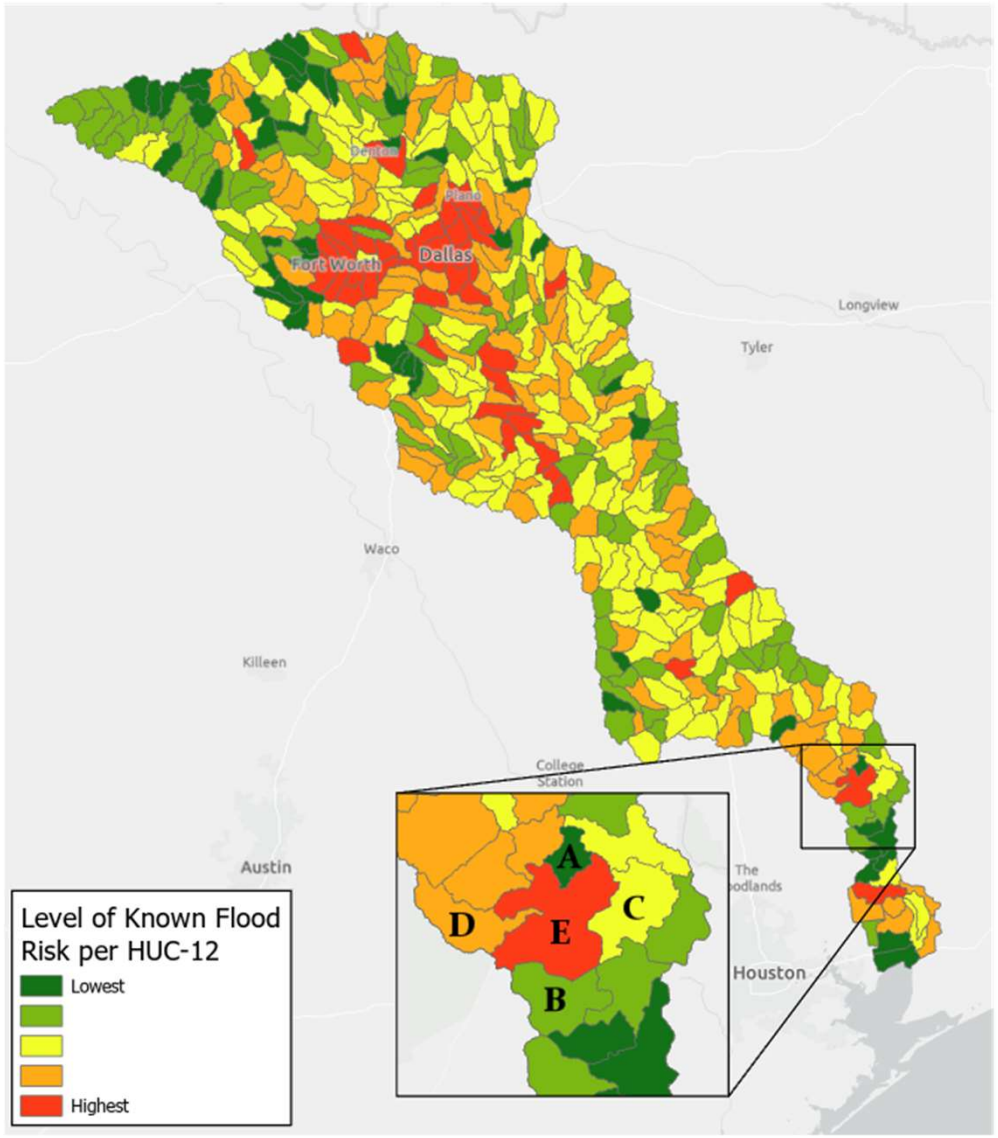
- Based on analysis of:
  - Areas that need mitigation (Cat. 13)
  - Inadequate inundation mapping (Cat. 14)
- ~ 67% of watershed is inadequately mapped



**Note: red HUC-12s may contain studies that have been completed but are not yet regulatory products*

Task 4A Results - Flood Mitigation Needs

- Based on all 14 categories
- Preliminary assessment:
  - 10% red
  - 30% red/orange
- Red/orange = highest known flood risk level
- Green = less known flood risk level
- Low score does **not** mean there is no flood risk.



DRAFT MEMORANDUM

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TO: Region 3 Trinity Regional Flood Planning Group

CC: Stephanie Griffin – Halff Associates, Inc., David Rivera – Freese and Nichols, Inc.

FROM: Scott Hubley, PE, CFM – Vice President, Freese and Nichols, Inc.

SUBJECT: Process for Identification and Evaluation of Potential FMEs and Potentially Feasible FMPs and FMSs

DATE: 9/15/2021

PROJECT: Trinity Regional Flood Plan (FNI Proj. No. HAF21337)

Introduction

Halff Associates, Inc. (Halff) along with Freese and Nichols, Inc. (FNI) has been retained as the Technical Consultant (TC) to the Trinity Regional Flood Planning Group (RFPG) to develop the first ever Regional Flood Plan (RFP) for the basin, as part of the state flood planning process administered by the Texas Water Development Board (TWDB). A major component of the process is to identify, evaluate, and recommend Flood Management Evaluations (FMEs), Flood Mitigation Projects (FMPs), and Flood Management Strategies (FMSs) to be included in the RFP and the cumulative State Flood Plan (SFP).

The *Scope of Work* (*SOW*) developed by TWDB includes a requirement to "receive public comment on a proposed process to be used by the RFPG to identify and select FMEs, FMSs, and FMPs for the 2023 Regional Flood Plan." This Technical Memorandum (TM) has been furnished to provide background information about the overall flood planning process and the associated technical requirements and to document the TC's proposed process for this task. It is intended to comply with the *SOW* and the relevant provisions of *Title 31* of the *Texas Administrative Code (TAC) Chapters 361* and *362* (*Rules*) which serve as the statute and rules that govern regional flood planning, and to be consistent with the *Exhibit C Technical Guidelines for Regional Flood Planning (Technical Guidelines)* prepared by the TWDB.

Definitions

According to the *Technical Guidelines*, definitions of key terms include:

A **Flood Management Evaluation (FME)** is a proposed flood study of a specific, flood-prone area that is needed in order to assess flood risk and/or determine whether there are potentially feasible FMSs or FMPs.

A **Flood Mitigation Project (FMP)** is a proposed project, either structural or non-structural, that has non-zero capital costs or other non-recurring cost and when implemented will reduce flood risk, and mitigate flood hazards to life or property.

A **Flood Management Strategy (FMS)** is a proposed plan to reduce flood risk or mitigate flood hazards to life or property. At a minimum, RFPGs should include as FMSs any proposed action that they would like to identify, evaluate, and recommend that does not qualify as either an FME or FMP.

Background

Identification and evaluation of FMEs, FMPs, and FMSs occur under *Task 4B* of the *SOW*, with recommendations being developed as part of *SOW Task 5*. Each of these recommendations must tie back to the floodplain management goals adopted by the RFPG and must contribute to the assessment and mitigation of flood risk across the basin.

FMEs, FMSs, and FMPs are broadly categorized as "flood risk reduction projects" (henceforth, "actions") in the *Technical Guidelines*. The *Technical Guidelines* also list several potential action types for each subcategory, summarized in ***Table 1*** below:

Table 1: Flood Risk Reduction Action Types

Flood Risk Reduction Action Category	Action Types
Flood Management Evaluation (FME)	a. Watershed Planning i. H&H Modeling ii. Flood Mapping Updates iii. Regional Watershed Studies b. Engineering Project Planning i. Feasibility Assessments c. Preliminary Engineering (alternative analysis and up to 30% design) d. Studies on Flood Preparedness
Flood Mitigation Project (FMP)	**Structural** a. Low Water Crossings or Bridge Improvements b. Infrastructure (channels, ditches, ponds, stormwater pipes, etc.) c. Regional Detention d. Regional Channel Improvements e. Storm Drain Improvements f. Reservoirs g. Dam Improvements, Maintenance, and Repair h. Flood Walls/Levees i. Coastal Protections j. Nature Based Projects – living levees, increasing storage, increasing channel roughness, increasing losses, de-synchronizing peak flows, dune management, river restoration, riparian restoration, run-off pathway management, wetland restoration, low impact development, green infrastructure k. Comprehensive Regional Project – includes a combination of projects intended to work together
	Non-Structural a. Property or Easement Acquisition b. Elevation of Individual Structures c. Flood Readiness and Resilience d. Flood Early Warning Systems, including stream gauges and monitoring stations e. Floodproofing f. Regulatory Requirements for Reduction of Flood Risk
Flood Management Strategy (FMS)	None specified; at a minimum, RFPGs should include as FMSs any proposed action that the group would like to identify, evaluate, and recommend that does not qualify as either a FME or FMP.

Particularly during this first round of flood planning, several areas are likely to be identified for potential FMEs due to a lack of sufficiently complete or current flood study data to accurately evaluate and quantify flood risk. Not every conceivable FME can or will be recommended for inclusion in the plan. The RFPG and the TC must decide which potential FMEs will be recommended in the RFP so that limited state and stakeholder resources can be directed efficiently and accordingly to implement those studies.

Similarly, regional stakeholders will likely propose several projects and strategies for managing flood risk that could be candidates for inclusion in the plan and eligible for state funding. Each FMP and FMS identified by the TC will be screened to determine if the FMP or FMS is potentially feasible. At a minimum, FMPs and FMSs must be developed in an adequate level of detail to furnish the required technical information and adhere to the minimum criteria set forth in the *SOW*, the *Rules*, and the *Technical Guidelines*.

For FMPs, these minimum criteria include having appropriate hydrologic and hydraulic (H&H) models required to evaluate that the project adheres to TWDB Mapping and Modeling Guidelines and a requirement that the FMP causes No Negative Impact on a neighboring area. These requirements must also be met for FMSs, as applicable. These standards are described in more detail in *Section 3.5* and *Section 3.6* of the *Technical Guidelines*.

Process for Identification of Potential FMEs and Potentially Feasible FMPs and FMSs

Identification

Identification of potential FMEs and potentially feasible FMPs and FMSs begins with the development of the Flood Mitigation Needs Analysis (*Task 4A*). Generally, this task is meant to guide action, evaluation and recommendation by highlighting:

- The areas with the greatest gaps in flood risk knowledge that should be considered for potential FMEs.
- The areas of greatest known flood risk and flood mitigation needs that should be considered for implementation of potentially feasible FMSs and FMPs.

FNI has developed a process for identifying areas of greatest need based on application of the requirements outlined in the *Rules* and *SOW*. The process is summarized in ***Table 2***, below.

Table 2: Guidance for Assessment and Identification of Flood Mitigation Needs

Guidance	Factors to Consider
1. Most prone to flooding that threatens life and property	• Area overlapped by inundation mapping and/or included in any historical flooding record • Building footprints / polygons within flood hazard layer • Critical facilities with evacuation routes impacted by flooding • Fully developed flood models (where available) • Low water crossings • Agricultural areas at risk of flooding

Guidance	Factors to Consider
2. Locations, extent and performance of current floodplain management and land use policies and infrastructure	• Communities not participating in NFIP and/or without NFIP equivalent or higher standards • Disadvantaged / Underserved communities • City / County design manuals • Community Rating System (CRS) score • Land use policies • Floodplain ordinance(s)
3. Inadequate inundation mapping	• No mapping • Presence of Fathom / BLE / FEMA Zone A flood risk data • Detailed FEMA models older than 10 years
4. Lack of H&H models	• Communities with zero models • Communities with limited models
5. Emergency need	• Damaged or failing infrastructure • Other emergency conditions
6. Existing models, analysis and flood risk mitigation plans	• Exclude flood mitigation plans already in implementation • Leverage existing models, analyses, and flood risk mitigation plans • Benefit-Cost Ratio > 1
7. Already identified and evaluated flood mitigation projects	• Exclude flood mitigation projects already in implementation • Leverage existing flood mitigation projects • Benefit-Cost Ratio > 1
8. Historic flooding events	• Disaster declarations • Flood insurance claim information • Other significant local events
9. Already implemented flood mitigation projects	• Exclude areas where flood mitigation projects have already been implemented unless significant residual risk remains
10. Additional other factors deemed relevant by RFPG	• Alignment with RFPG goals • Alignment with TWDB guidance principles

After identification of the areas of greatest flood mitigation need, the TC will review the available data to develop a list of potential flood risk reduction actions for addressing the needs in these areas. The data will include information compiled under previous tasks in the *SOW*, including:

- Data collection regarding existing flood infrastructure, flood projects currently in progress, and known flood mitigation needs (*Task 1*);
- Quantification of existing and future flood risk exposure and vulnerability (*Tasks 2A* and *2B*);
- Goals and strategies adopted and/or recommended by the RFPG for addressing existing flood hazards and mitigating future flood risk (*Tasks 3A* and *3B*); and,
- Stakeholder-provided input throughout the flood planning process.

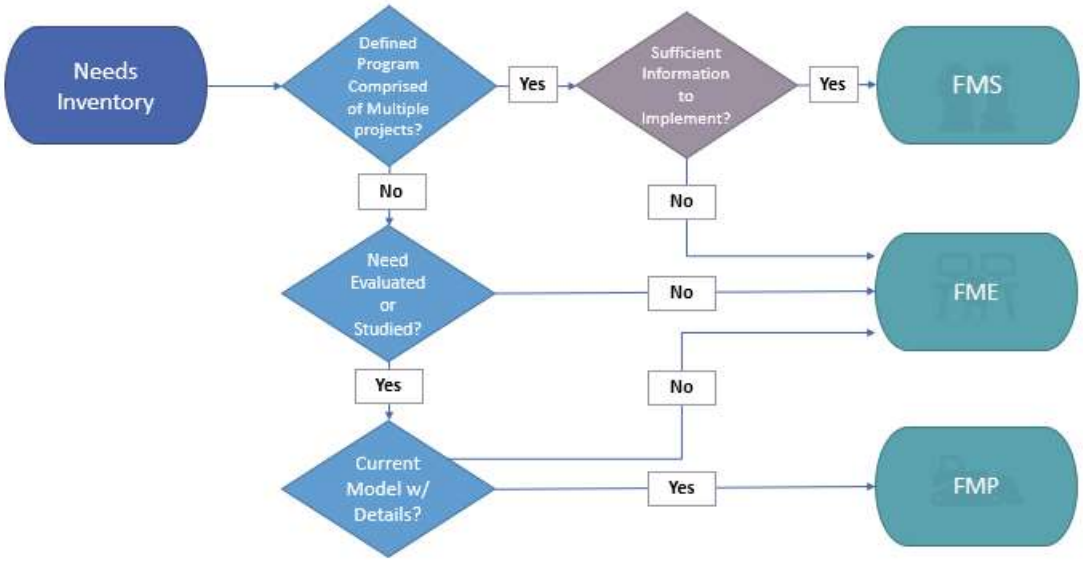
The TC anticipates several potential actions will be identified, primarily FMEs, to address gaps in available flood risk data associated with the first planning cycle. The *Rules* and *SOW* require FMSs and FMPs to be developed in a sufficient level of detail to be included in the RFP and recommended for state funding. The

TC does not anticipate that this first planning cycle will have sufficient data, time, or budget to develop new FMSs and FMPs. Rather, the list of potentially feasible FMSs and FMPs likely will be compiled based on contributions from the RFPG and other regional stakeholders from sources such as previous flood studies, drainage master plans, and capital improvement programs.

Evaluation

Once potential flood risk reduction actions are identified, the TC will perform a screening process to sort actions into their appropriate categorization. The screening process is shown below in ***Figure 1***.

Figure 1: Potential Flood Risk Reduction Action Screening Process



In addition to falling into the general buckets of action types outlined in ***Table 1***, FMPs and FMSs will be screened to determine if they have been developed in enough detail and include current technical data to meet the TWDB's requirements for these action types as outlined in the *Technical Guidelines*. For instance, one requirement is to prove the project has no negative impacts on neighboring areas. Table 21 in Section 3.6 of the *Technical Guidelines* specifies the impacts analysis should include discharge, velocity, valley storage, and downstream conveyance considerations. This detailed analysis is only achievable if hydrologic and hydraulic models are available. Furthermore, a Benefit-Cost Analysis (BCA) is also required to demonstrate that a recommended FMP has a Benefit-Cost Ratio (BCR) greater than one (see Section 3.8 of the *Technical Guidelines).* As part of the FMP evaluation, it is likely that the BCA will need to be updated to reflect updated cost estimates. Therefore, sufficient data must be available to perform the necessary BCA calculations. Actions that were initially considered for FMSs and FMPs that do not meet these requirements may be recommended for future study as part of an FME.

Selection

The TC will seek to identify and recommend a comprehensive list of potential flood risk reduction actions for inclusion in the RFP. In practice, this means that as many FMPs and FMSs as possible will be recommended which have information available to meet the detailed requirements specified in the *Technical Guidelines*. FMSs will also be recommended for other strategies the RFPG wishes to pursue that do not fit cleanly into the FME or FMP categorizations. One example of a potential FMS is a program of separate FMPs that is part of an overall strategy to reduce flood risk within a particular area, such as a

community-wide buyout program to be implemented over several years. Generally, FMEs will be recommended for any remaining areas with potential flood risk and exposure of people and property based on results of *Task 4A*.

All recommended actions must meet the technical requirements of the *Technical Guidelines*, including demonstrating No Negative Impacts and identifying at least one local sponsor. However, some potential actions that meet these baseline requirements may not be appropriate for recommendation. While this is not a comprehensive list, some potential reasons a project may not be recommended include:

- Action does not achieve flood risk reduction
- Action does not align with the flood mitigation goal(s) adopted by the region and/or the guidance principles set forth by the state
- Action does not demonstrate benefits at a scale appropriate for inclusion in a regional plan
- Action duplicates the benefits of another action(s) included in the plan
- Action cannot obtain a Memorandum of Understanding (MOU) or other form of concurrence from impacted entities
- Action does not demonstrate a sensible benefit-cost ratio or other metric
- Public input regarding the action demonstrates a need for further evaluation or consensus building with regional stakeholders
- Action does not receive a simple majority vote from a quorum of the RFPG members for inclusion in the RFP.

Schedule

The process to identify and evaluate FMEs, FMPs, and FMSs must be approved by the RFPG and included in the Technical Memorandum (TM) furnished under *Task 4C* of the *SOW*. This deliverable deadline has been set for January 7, 2022 by the TWDB. After the delivery of the TM, the TWDB will review and provide Notice to Proceed (NTP) on *Task 5*, after which the TC may begin the process of recommending FMEs and FMPs for inclusion in the RFP. The TWDB has not provided an anticipated date for issuance of NTP. As such, the schedule provided in ***Table 3*** below is the TC's proposed timeline of activities to meet the TM deadline and anticipated schedule of activities after NTP on *Task 5*.

Table 3: Proposed Timeline of Activities

Flood Planning Process Activity	Anticipated Date
TC delivers *Process for Identification and Evaluation of Potential FMEs and Potentially Feasible FMPs and FMSs* TM to RFPG for review	September 16, 2021
RFPG considers approval of Process at September meeting	September 23, 2021
TC presents identified potential FMEs and potentially feasible FMPs and FMSs to **RFPG**	November 2021
TC refines list of identified potential FMEs and potentially feasible FMPs and FMSs and deliver ITM to **RFPG** for review	November 2021 – December 2021

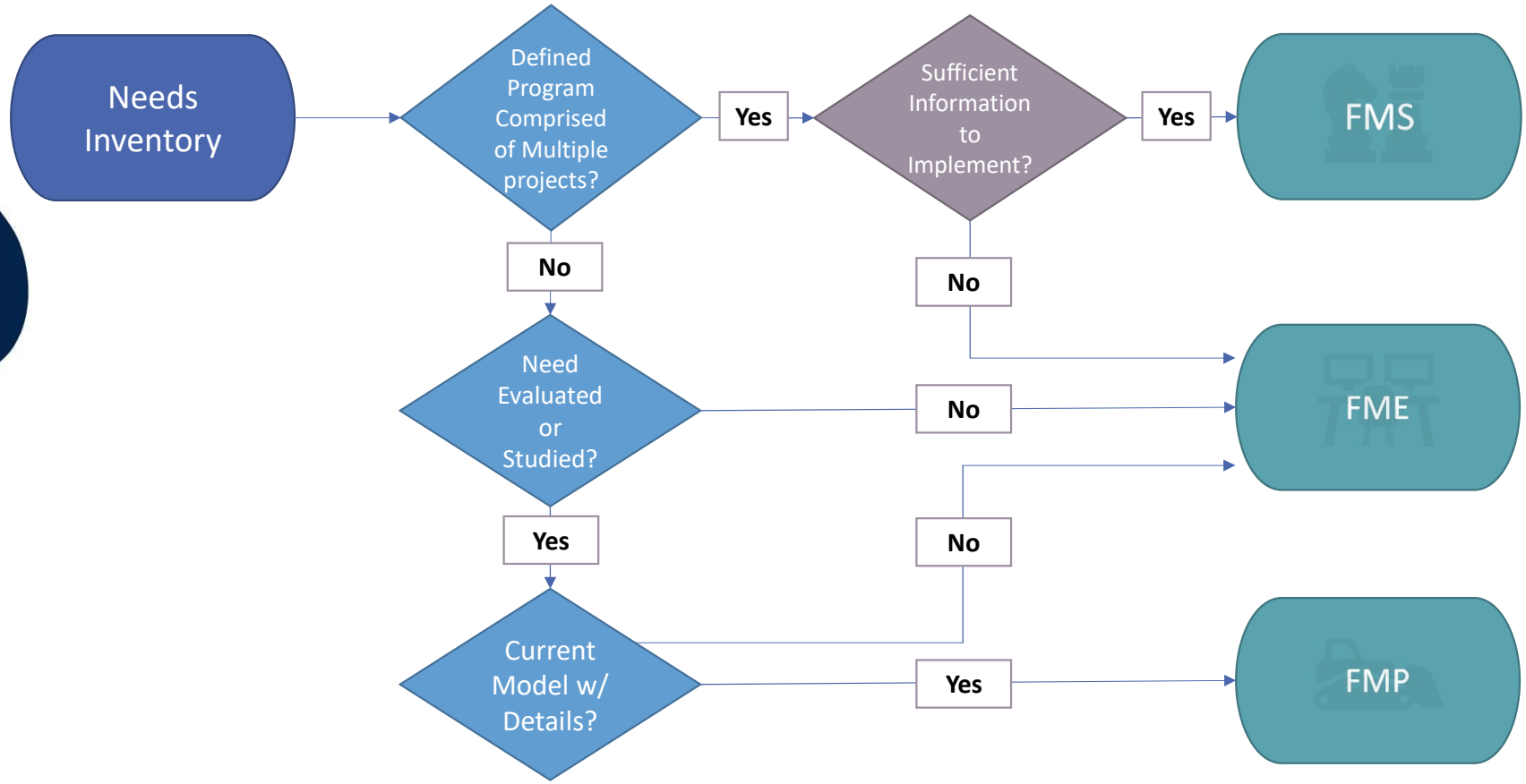
Flood Planning Process Activity	Anticipated Date
RFPG considers approval to submit TM	December 2021
TC delivers TM to **TWDB**	January 7, 2022
TWDB review TM; **TC** continue process to evaluate FMEs, FMPs, and FMSs	January 2022 – TBD
TWDB issues NTP on Task 5; **TC** to begin process of recommending FMEs, FMPs, and FMS for inclusion in RFP	TBD (after NTP by TWDB)

When reviewing and considering whether to approve drafts of the TM, the RFPG members should do so with the understanding that the TWDB has established the TM as a "draft, mid-point, work-in-progress deliverable…to demonstrate that [the RFPG] are making appropriate progress towards the development of their regional flood plan and in meeting contract requirements." On August 17, 2021, the TWDB emailed the TC and further clarified that:

> "If RFPGs need to make changes to content that was included in deliverables submitted under the technical memorandum after the submission deadline, RFPGs do not need to resubmit any previously submitted deliverables. The content of the draft and final versions of each regional flood plan will supersede all content included in any previous deliverables."

As such, the TM does not need to include the final list of potential flood risk reduction actions. Actions can be updated, added, or removed as additional flood risk information or other details are evaluated by the TC and through future engagement with stakeholders.

Task 4B - Process for Identifying FME, FMS, FMP



Flood Management Evaluation Identification

FMEs

- Study a specific, flood-prone area
- Assess flood risk
- Identify potentially feasible FMSs or FMPs

Types of FMEs listed in Technical Guidance

- Watershed Planning
- H&H Modeling
- Flood Mapping Updates
- Regional Watershed Studies
- Engineering Project Planning
- Feasibility Assessments
- Preliminary Engineering (up to 30% design)
- Studies on Flood Preparedness

Flood Management Evaluation Identification

FME

Sources for identifying FMEs

- Survey responses for flood prone areas
- Results of Flood Risk Evaluation (Task 2)
  - Structures, Low water crossings
- Results of Needs Analysis (Task 4A)
- Hazard Mitigation Action Plans (HMAP)
- FIF applications not chosen for funding
- County or City Drainage Master Plan

Flood Mitigation Project Identification

FMPs:

- Proposed projects to reduce flood risk or mitigate flood hazards to life or property
- Can be structural or non-structural

Specific analyses required in Technical Guidance:

- Detailed hydrologic and hydraulic modeling results
- Quantified reduction of impact from floods
- Associated benefits and costs
- Must complete required columns in Table 13 of Exhibit C

Projects that don't meet the requirements for FMPs can be reclassified as FMEs

Flood Mitigation Project Identification

Structural FMPs listed in Technical Guidance:

- Low Water Crossings or Bridge Improvements
- Infrastructure (channels, ditches, ponds, stormwater pipes, etc.)
- Regional Detention
- Regional Channel Improvements
- Storm Drain Improvements
- Reservoirs
- Dam Improvements, Maintenance, and Repair
- Flood Walls / Levees
- Coastal Productions
- Nature Based Projects
- Comprehensive Regional Project(s)
- Other?

Flood Mitigation Project Identification

Non-Structural FMPs listed in Technical Guidance:

- Property or Easement Acquisition
- Elevation of Individual Structures
- Flood Readiness and Resilience
- Flood Early Warning Systems, including stream gauges and monitoring stations
- Floodproofing
- Regulatory Requirements for Reduction of Flood Risk
- Other?

Flood Mitigation Project Identification

Received potential project information from Master Plans/Drainage Studies:

- City of Mont Belvieu
- City of Burleson
- City of Sachse
- North Central Texas Council of Governments (NCTCOG)
- Corridor Development Certificate (CDC) Model

Follow-up coordination to discuss projects and classify as FMP/FME

Tell us if you are aware of other drainage master plans or flood mitigation studies!

Flood Management Strategy Identification

FMSs:

- Proposed plans to reduce flood risk or mitigate flood hazards to life or property
- May or may not require associated FMPs to be implemented
- Also includes an actions the group would like to recommend that don't fall into FMEs or FMPs

Types of FMSs:

- Public awareness about flood safety
- Assessments of low water crossings in several areas to evaluate design and construction possibilities
- Others?

Consider approval of process to identify potential FMEs and potentially feasible FMSs and FMPs

Technical Memorandum (Task 4C)

- Tech Memo
  - Introduction to Regional Flood Planning Process
  - Explanation of attachments
  - Attachments
    - TWDB-required lists, tables & maps
    - Associated geodatabase

Schedule

Nov 22, 2021: Draft Tech Memo

Dec 2021: RFPG approves Tech Memo

Jan 7, 2022: Tech Memo due to TWDB

Technical Memorandum Addendum (Task 4C)

- Tech Memo Addendum
  - Explanation of attachments
  - Attachments
    - TWDB-required lists, tables & maps
    - Associated geodatabase

Schedule

Jan 2022: Draft Tech Memo Addendum

Feb 2022: RFPG approves Tech Memo Addendum

Mar 7, 2022: Tech Memo Addendum due to TWDB

Tech Memo points to remember:

1. Snapshot in time
2. Progress to date
3. Will continue to be refined after Jan 7
4. Addendum will include recent Fathom data

Ch. 8 Administrative, Regulatory & Legislative Discussion

Ch. 8 Discussion of Potential Recommendations

- Administrative
- Regulatory
- Legislative
- Other

4000 Fossil Creek Boulevard
Fort Worth, Texas 76137
(817) 847-1422
Fax (817) 232-9784

DRAFT MEMORANDUM

TO:	Region 3 Trinity Regional Flood Planning Group (RFPG)	**DATE:**	November 10, 2021
FROM:	Stephanie Griffin	**AVO:**	43791.001 000800
EMAIL:	sgriffin@halff.com		
SUBJECT:	Potential Ideas for Consideration in Chapter 8 Administrative, Regulatory and Legislative Recommendations – Trinity Regional Flood Plan		

Throughout the development of the Trinity Regional Flood Plan, the RFPG has discussed multiple topics during its meetings that warrant future discussion and consideration for potential inclusion in the plan with regards to potential Administrative, Regulatory and Legislative Recommendations. This memo serves as the buoy for the Trinity RFPG to place potential ideas for future discussion and decision-making with regards to Chapter 8.

As of September 23, 2021, the following ideas have been suggested for potential consideration by the RFPG:

1. Assist smaller jurisdictions in preparing funding applications or make the application process easier. Current funding opportunities require significant time and resources to prepare a project for application, as well as the application itself. The smaller jurisdictions have fewer resources to put together a project to a point where the project is detailed enough for a funding application. The application forms are also time consuming and confusing. Even phased applications can be challenging for jurisdictions with limited resources. Thus, the smaller jurisdictions get left behind in current funding opportunities. (June 24, 2021 RFPG meeting)
2. Add legislative ability to allow counties the opportunity to establish and assess drainage (stormwater) utility fees. Legislation is needed to allow counties and others with flood control responsibilities to establish drainage (stormwater) utilities and collect fees for these services. Extend Local Government Code, Title 13, Subtitle A, Chapter 552 to allow counties the opportunity to establish and collect drainage utilities/fees (August 19, 2021 RFPG meeting and August 31, 2021 Goals Subcommittee meeting)
3. TxDOT design criteria should require all roadways to be elevated above the 1% ACE water surface elevation. (August 31, 2021 Goals Subcommittee meeting)
4. Funding for projects that benefit agricultural activities should not be scored or awarded based on a traditional benefit-cost ratio. (August 31, 2021 Goals Subcommittee meeting)
5. Flooding does not recognize jurisdictional boundaries. Remove barriers that prevent jurisdictions from working together to provide regional flood mitigation solutions. Provide for regional detention across jurisdictional boundaries. (August 31, 2021 Goals Subcommittee meeting)
6. Develop and allocate State funding to assist privately-owned dam owners with the costs associated in repairing and maintaining dam structures. (August 31, 2021 Goals Subcommittee meeting)
7. Use consistent HUC reporting requirements throughout the TWDB-required tables. (September 23, 2021 RFPG Meeting)
8. FEMA is developing/updating its Social Vulnerability Index (SVI). TWDB should consider using the FEMA SVI instead of the CDC SVI in future planning cycles.

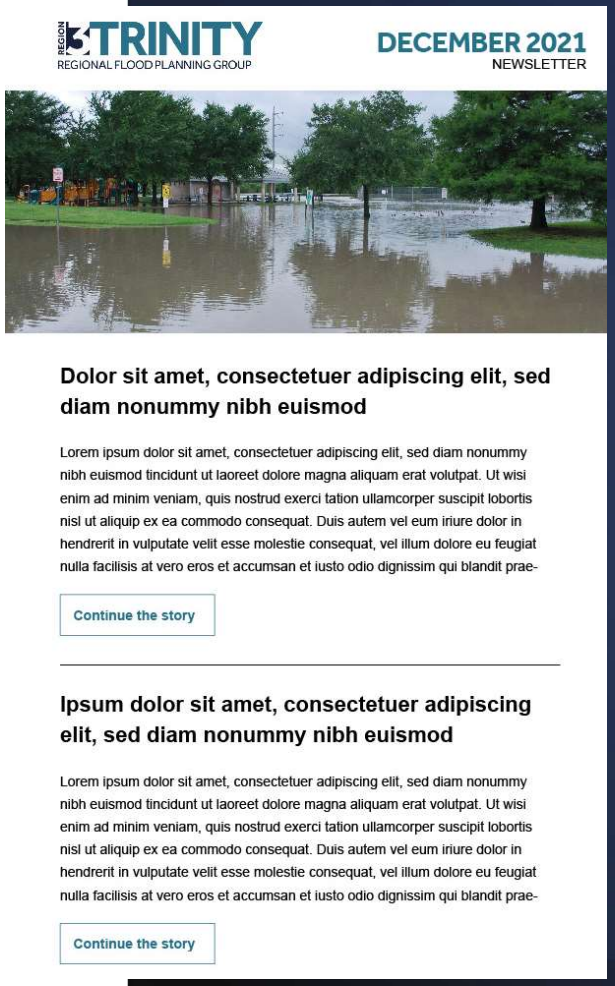
The following represents consultant team ideas through November 10, 2021.

1. Establish common criteria across the region or subregions (common floodplain management standards).
2. Clarify the phrase “regional flood entity responsibilities” and what that includes.
3. Educate county officials regarding the county’s ability/authorization to establish and enforce higher development standards.
4. Provide for alternative revenue generating sources of funding. Expand eligibility for and use of funding for stormwater and flood mitigation solutions (Local, State, Federal, Public/Private Partnerships, etc.)
5. Provide funding and/or assistance to develop floodplain maps.
6. Develop a statewide database and tracking system to document flood-related fatalities that is publicly available.
7. Address the concern of “takings” with regards to floodplain development regulations, comprehensive plans, land use regulations and zooming ordinances.
8. ~~Allow counties to have zoning authority.~~
8. Establish a levee safety program similar to the dam safety program.
9. Adopt state mandatory building code requirement (2015 or 2018 versions of International Building Code and International Residential Code) to improve FEMA BRIC scores.
10. TWDB provide applicable data sources and a methodology to determine infrastructure functionality and deficiencies in the next cycle of the Flood Planning Process.
11. TWDB provide additional guidance regarding potential restoration of infrastructure in the next cycle of the Flood Planning Process.

Public Outreach

E-Newsletter: Inaugural Edition

- Objective:
  - To educate, inform and encourage public participation while keeping stakeholders engaged in between meetings
- Timing:
  - Template design and content underway now
  - Inaugural issue scheduled for Dec. 2021; subsequently 4x/year or as needed
- Distribution list:
  - 850+ subscribers in Trinity RFPG's stakeholder database (city / county contacts, state and "other entity" officials, interested parties and public sign-ups)
  - ~100 media outlets / contacts region-wide



REGION TRINITY
REGIONAL FLOOD PLANNING GROUP

DECEMBER 2021
NEWSLETTER

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Continue the story

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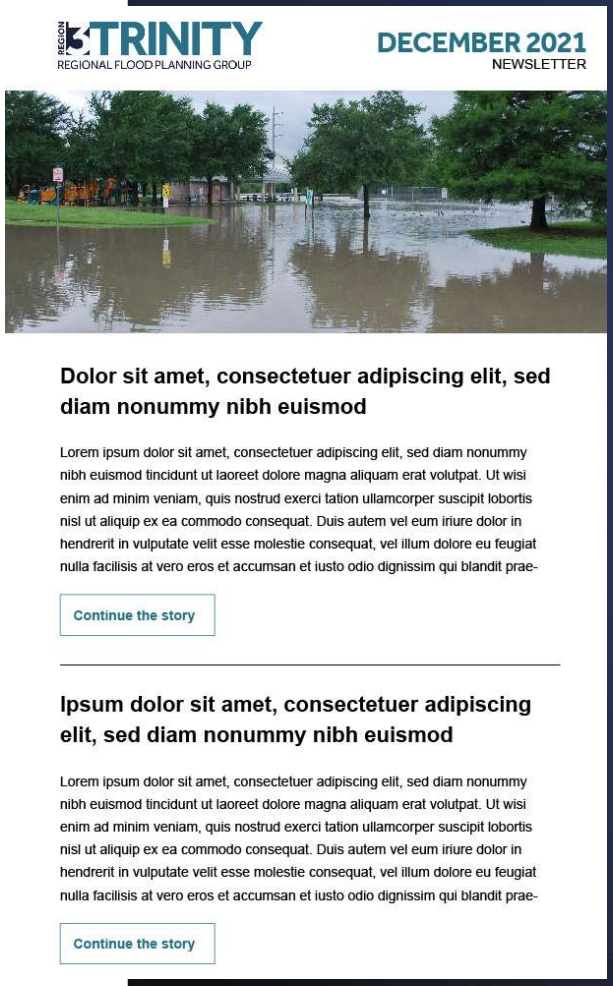
Continue the story

E-Newsletter: Inaugural Edition

- Proposed topics/articles:
  - Overview: introducing the Regional Flood Planning Group and planning process
  - Latest Activities: featuring key discussion and action items from recent RFPG meetings (goal setting, floodplain management standards, process for FME / FMS / FMP evaluation, etc.)
  - Next Steps: upcoming milestones such as the Tech Memo
  - Trinity River Basin "Fast Facts" about the region's geography, population, incidence of flooding
  - RFPG Member Roster & rotating feature on 1-2 RFPG members / issue
  - Public Participation Opportunities: a reminder of RFPG communications channels, contact info (website, Twitter, process for written and oral comments, public meetings)



Media Outreach: Select Media Briefings

Objective:

- To schedule (sit-down or virtual) briefings with editors / editorial boards to inform them about the planning process, key milestones – in partnership with local officials
- So they will follow our work and inform their readers about public participation opportunities, our data / input needs, the limited nature of this planning round

Timing:

- Willingness of Editorial Board/Reporter, though interest will likely increase closer to the draft plan

Selection criteria:

- Geographic diversity (Upper, Mid, Lower Basin)
- Largest reach (circulation / readership)

Potential media targets:

- Upper Basin: The Dallas Morning News, Fort Worth Star-Telegram, Denton Record-Chronicle
- Mid-Basin: Corsicana Sun, Fairfield Recorder, Huntsville Item, Palestine Herald-Press, Athens Daily Review
- Lower Basin: Polk County Enterprise, Anahuac Progress or Seabreeze Beacon (Chambers Co.), Bluebonnet News (Liberty Co.)

LOOK-AHEAD

November 22, 2021 🎯
- RFPG begins review of draft Tech Memo

Early December 2021
- RFPG approves Tech Memo

January 7, 2022 (no meeting)
- Consultant submits Tech Memo to TWDB

End of January 2022 🎯
- RFPG begins review of draft Tech Memo Addendum

Mid-February 2022
- RFPG approves Tech Memo Addendum
- Consultant introduces Chapter 5

March 7, 2022 (no meeting)
- Consultant submits Tech Memo Addendum to TWDB

April 🎯
- RFPG reviews Chapter 2
- RFPG reviews Chapter 4
- Consultant provides update on Chapter 5
- Consultant introduces additional chapters

Notes: 🎯 indicates target date.

Yellow highlight indicates hard deadline.

10. Consider establishing Technical Subcommittee(s)

11. Updates from adjoining coastal regions

12. Updates from Planning Group Sponsor

13. Administrative costs

14. General public comments

Limit 3 minutes per person

15. Announcements

16. Meeting date for next meeting

17. Agenda items for next meeting

18. Adjourn