REGION 3 TRINITY
REGIONAL FLOOD PLANNING GROUP

February 17, 2022

1. Call to order

2. Roll call

3. Approval of minutes

Region 3 Trinity Flood Planning Group Hybrid Meeting
Thursday, December 16, 2021
10:00 a.m.
North Central Texas Council of Governments
Tejas Room, Centerpoint III Building, 3rd Floor
600 Six Flags Drive
Arlington, TX 76011

The Region 3 Trinity Flood Planning Group held a meeting, in person as well as virtual, on Thursday, December 16, 2021 at 10:00 AM. Acting Chairman Glenn Clingenpeel called the meeting to order at 10:02 AM.

Voting Members Present:

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

10 voting members were present, constituting a quorum.

Ex Officio Members Present:

Adam Whisenant
Rob Barthen
Andrea Sanders
Steve Bednarz
Brooke Bacuetes
James Bronikowski for Richard Bagans
Humberto (Bert) Galvan
Greg Waller
Ellen Buchanan
Todd Burrer
Jerry Cotter
Lisa McCracken (absent)
Diane Howe (absent)
Edith Marvin
Justin Bower
Lonnie Hunt (absent)

Approval of the Minutes of the Last Meeting

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

Acknowledgement of written public comments received

No written public comments were received.

Receive registered public comments on specific agenda items

No registered public comments were received, and no members of the public asked to speak.

TWDB Update

James Bronikowski with TWDB gave an update on a few changes since the last meeting.

TWDB held two conference calls on Wednesday, December 8, 2021. First conference call was for technical consultants and planning group sponsors to provide for further guidance on the definition of flood mitigation strategies and the definition on emergency need. Examples for Exhibit B deliverables were provided including an issue related to unique ID's TWDB needed to clarify. The second conference call was for planning group chairs and included a round robin discussion on any issues, updates, questions that the chairs or agents have been experiencing.

Update from Region 3 Technical Consultant – Stephanie Griffin with Halff Associates

a. Chapter 2 Flood Risk Analyses -Jarred Overbey with Halff Associates

    I. Update on future conditions
        a. TWDB approved the future 100 yr methodology, but indicated that future 500 yr could not be shown as a gap in data. The consultant team came up with a proposal using a buffer derived from the difference between the existing 100 yr and 500 yr. This buffer works out to be approximately 40ft and was applied to the current 500 yr to produce a potential future 500 yr floodplain range.

b. Chapter 3 Floodplain Management Practices and Goals – Kimberly Miller with Halff Associates

    I. Edits were proposed on 4B, 5B and 7A following a QC review by the consultant team.

a. Goal 4B
    i. Following discussion on the proposed language, alternative language was decided upon that included the addition of “and planning documents” following “Future Land Use plans.”
    ii. Goal 5B. No comments or discussion on proposed changes.
    iii. Goal 7A. The Group agreed to move this goal to Chapter 8.

II. Proposed addition of new goals under Goal 3, Reducing Property Damage and Loss.

a. The consultant team proposed adding two new goals (D and E)
    i. Goal 3D would create a goal to “reduce the number of critical facilities within the 1% floodplain” with a short-term goal of 5% and a long-term goal of 10%.
    ii. Goal E would read, “When relocation and/or elevation adjustment is not possible, increase the number of non-residential facilities that implement flood proofing” with a short-term goal of 5 residential facilitates and a long-term goal of 25.
b. Goal 3B – after discussion, the Group decided to add “elevation of structures” to this goal, within the parentheses, as a means of reducing the number of structures in the 1% floodplain.

III. Proposed addition of new goals (C and D) under Goal 5, Flood Infrastructure Improvement

a. Proposed adding Goal C to be worded “Improve urban drainage infrastructure to minimize flood risk” with a short-term goal of 50 miles, and a long-term goal of 500 miles.
b. Proposed adding Goal D to be worded “Perform annual inspections to maintain existing dams, levees, ponds and other flood mitigation structures” with a short-term goal of establishing a baseline measurement, and a long-term goal of 10%.
    i. There was considerable discussion involving changes to the proposed language. As the Group was unable to reach a consensus on changes to the proposed language, the Group decided to move forward with the proposed language as presented and revisit additional changes at a later date.

IV. Consider approval of edits to goals – Motion: Andrew Isbell made a motion to approve the goals as edited and discussed; Second: Scott Harris; Action: passed unanimously

c. Chapter 4 Flood Mitigation Needs and Potentially Feasible Solutions – Stephanie Griffin - Halff Associates

I. Review Task 4C Technical Memo - Consider approval of Technical Memo to be submitted to TWDB by Jan 7, 2022, with understanding that attachments are being updated as appropriate.

a. Glenn Clingenpeel asked for a motion to approve the technical memorandum, to include changes to goals based on that day's discussions.

Motion: Matt Robinson moved to authorize the technical memorandum to include the discussed changes to goals; Second: Scott Harris; Action: Motion approved unanimously

II. Task 4A scoring criteria update on Storm Event Database – Dr. David Rivera with Halff Associates gave an update on questions raised at the last meeting. The original intent of using the database was to identify areas within the basin that were subjected to more frequent storms. Because of the nature of the Storm Event Database, it cannot be used for that specific purpose. However, the consultant team recommended keeping the data set in the scoring matrix, as it provided meaningful information regarding the occurrence and frequency of damaging storm events. Dr. Rivera clarified that this was an information item only, and no action was required or taken.

d. Schedule look ahead

a. The consultant team reviewed upcoming meetings and important deadlines.
- January 7, 2022 Technical Memorandum due to TWDB
- End of January 2022 the Group will begin to review of draft Technical Memorandum Addendum
- February 17, 2022
  - Group will meet to consider approval of the Technical Memorandum Addendum
  - Consultant team will introduce Chapters 5,6 & 7 for review
- March 7, 2022, Technical Memorandum Addendum is due to the TWDB
- April 21, 2022, Group will meet to:
  - Review Chapters 2 and 4
  - Receive updates on Chapters 5 through 10

<u>Consider establishing Technical Subcommittee(s)</u>

The Group discussed creating a subcommittee to review the list of potential FMEs/FMPs/FMs (flood management activities) and to create a list of recommended activities for the Regional Flood Plan. Mr. Clingenpeel called for volunteers to serve on the committee. The following individuals volunteered:

Craig Ottman
Sarah Standifer
Glenn Clingenpeel
Lissa Shepard
Matt Robinson
Andrews Isbell

Scott Harris
Galen Roberts

The Chair appointed these individuals to the subcommittee.

Glenn Clingenpeel clarified that while this list would be the official voting roster, any and all members would be welcomed to attend and participate in the committee meetings.

Updates from Liaisons Region 5 and 6

Region 5 Neches RFPG – Ellen Buchanan stated that the Region 5 Group is on relatively the same path as Region 3, and that they continue to discuss goals for their region. She stated that she appreciates Andrew Isbell's participation in their group.

Region 6 San Jacinto RFPG. No updates were provided.

Update from Planning Group Sponsor

Mr. Clingenpeel stated that an amendment to the Region 3 RFPG grant had been negotiated and was being routed for signatures. The amendment would add additional money and tasks to the contract with an associated time extension for the additional work only.

Consider approval of policy for reimbursing planning group members for expenses

A reimbursement policy was presented to the Group for consideration. The policy dictates how requests for mileage reimbursement are to be made. The chair then called for a motion to approve the policy.

Motion: Matt Robinson moved to approve the policy for reimbursements as presented;
Second: Sarah Standifer; Action: Motion approved unanimously

Review administrative costs requiring certification

There was no discussion or action under this item.

Receive general public comments

Mr. Clingenpeel opened the floor for public comments. No comments were received and the public comment section was closed.

Announcements –

Sarah Standifer provided a brief overview of the quarterly Regional Chairs call which she attended on behalf of the Group. She stated that other regions are

also holding hybrid meetings with no intention to change. She also stated that there was a conversation about public outreach and the need to have consistent messaging across the state. She said that the TWDB would put something together for the regions.

Confirm meeting date for next meeting
Feb 17th at 10 am – at Crockett Civic Center (location tentative)
April 21st hosted by City of Dallas

Agenda items for next meeting –

Approval of Technical Memorandum addendum;
Introducing chapters 5, 6, 7

Adjourn:

The meeting was adjourned at 11:43 a.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 DECEMBER 16, 2021.

_____ _____
SCOTT HARRIS, Secretary Date
REGION 3 TRINITY FLOOD
PLANNING GROUP

_____ _____
GLENN CLINGENPEEL, Chair Date
REGION 3 TRINITY FLOOD
PLANNING GROUP

4. Acknowledgement of written comments received

5. Public comments on agenda items

6. TWDB update

7. Officer elections

8. Consultant update

CONSULTANT UPDATE

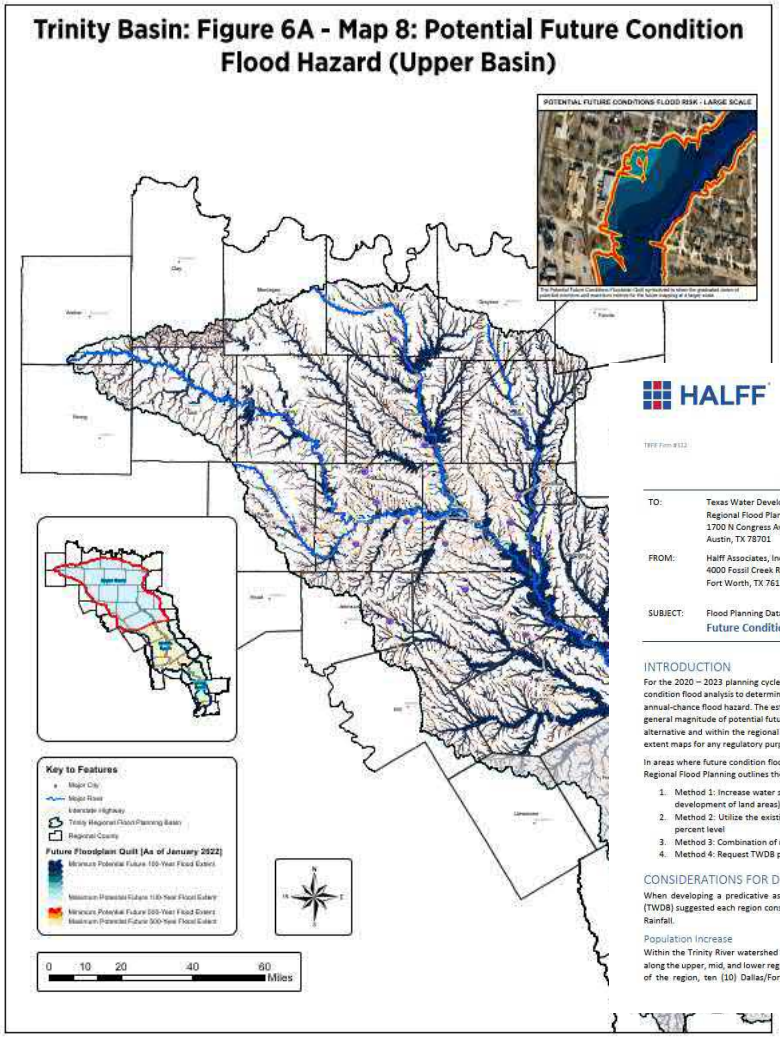
- **Update on Chapter 2 Flood Risk Analysis**
  - Future conditions update
  - Exposure and vulnerability assessment draft results
- **Update on Chapter 4 Flood Mitigation Needs & Potentially Feasible Solutions**
  - Emergency Needs definition
  - Consider approval of Tech Memo Addendum
  - Full analyses components
- **Overview and Approach to Chapter 5 Recommendation of FMEs, FMSs, and FMPs**
- **Overview and Approach to Chapter 6 Impacts of Regional Flood Plan**
- **Overview and Approach to Chapter 7 Flood Response Information and Activities**
- **Discussion on Chapter 8 Admin, Regulatory and Legislative Recommendations**
- **Public Outreach Updates**

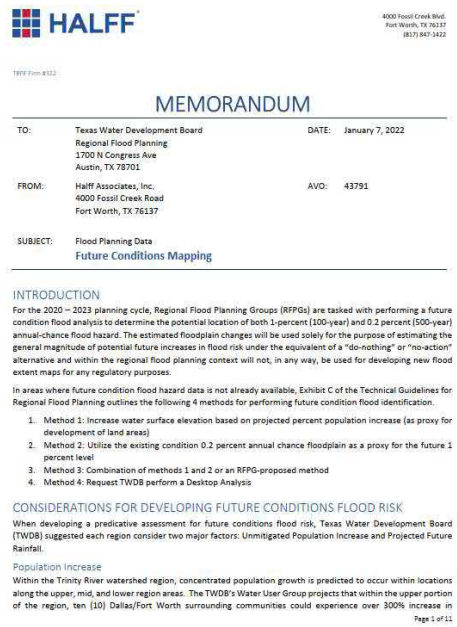
Ch. 2 Flood Risk Assessment Update

- Future Conditions Update
- Exposure and Vulnerability Assessment Draft Results

Task 2B – Future Flood Hazard Update

- Future Flood Hazard determination methodology was accepted by TWDB on January 21, 2022.
- Potential preliminary future flood hazard maps were generated and included as part of the addendum package





HALFF

4000 Fossil Creek Blvd.
Fort Worth, TX 76137
(817) 847-1422

MEMORANDUM

TO: Texas Water Development Board
Regional Flood Planning
1700 N Congress Ave
Austin, TX 78701

DATE: January 7, 2022

FROM: Halff Associates, Inc.
4000 Fossil Creek Road
Fort Worth, TX 76137

AVO: 43791

SUBJECT: Flood Planning Data
Future Conditions Mapping

INTRODUCTION

For the 2020 – 2023 planning cycle, Regional Flood Planning Groups (RFPGs) are tasked with performing a future condition flood analysis to determine the potential location of both 1-percent (100-year) and 0.2 percent (500-year) annual-chance flood hazard. The estimated floodplain changes will be used solely for the purpose of estimating the general magnitude of potential future increases in flood risk under the equivalent of a "do-nothing" or "no-action" alternative and within the regional flood planning context will not, in any way, be used for developing new flood extent maps for any regulatory purposes.

In areas where future condition flood hazard data is not already available, Exhibit C of the Technical Guidelines for Regional Flood Planning outlines the following 4 methods for performing future condition flood identification.

1. Method 1: Increase water surface elevation based on projected percent population increase (as proxy for development of land areas)
2. Method 2: Utilize the existing condition 0.2 percent annual chance floodplain as a proxy for the future 1 percent level
3. Method 3: Combination of methods 1 and 2 or an RFPG-proposed method
4. Method 4: Request TWDB perform a Desktop Analysis

CONSIDERATIONS FOR DEVELOPING FUTURE CONDITIONS FLOOD RISK

When developing a predicative assessment for future conditions flood risk, Texas Water Development Board (TWDB) suggested each region consider two major factors: Unmitigated Population Increase and Projected Future Rainfall.

Population Increase

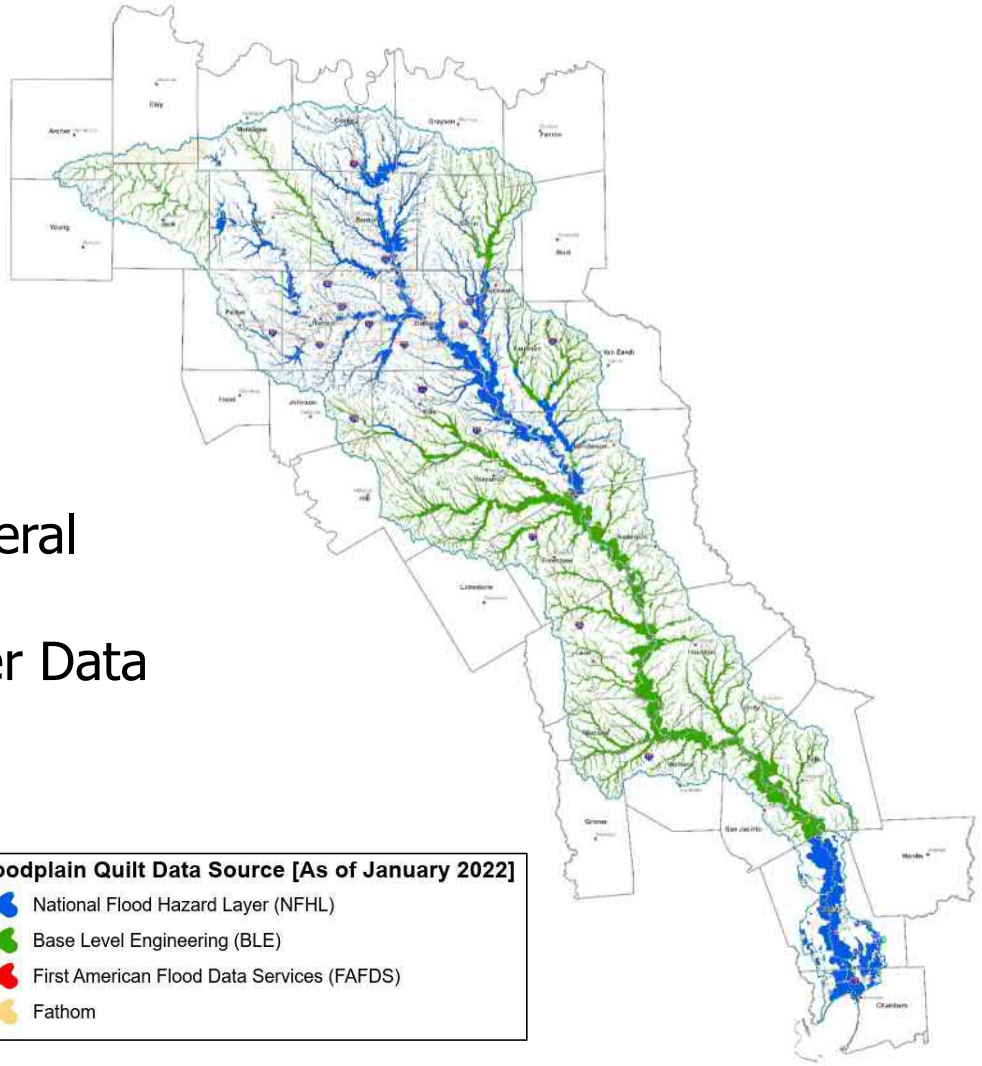
Within the Trinity River watershed region, concentrated population growth is predicted to occur within locations along the upper, mid, and lower region areas. The TWDB's Water User Group projects that within the upper portion of the region, ten (10) Dallas/Fort Worth surrounding communities could experience over 300% increase in

Page 1 of 11

Existing Conditions Flood Risk Assessment

DATA SOURCES

- TWDB Flood Quilt
  - FEMA
  - TWDB
  - FAFDS
- USACE or other Federal Data
- Regional Stakeholder Data
- Community Data
- FATHOM



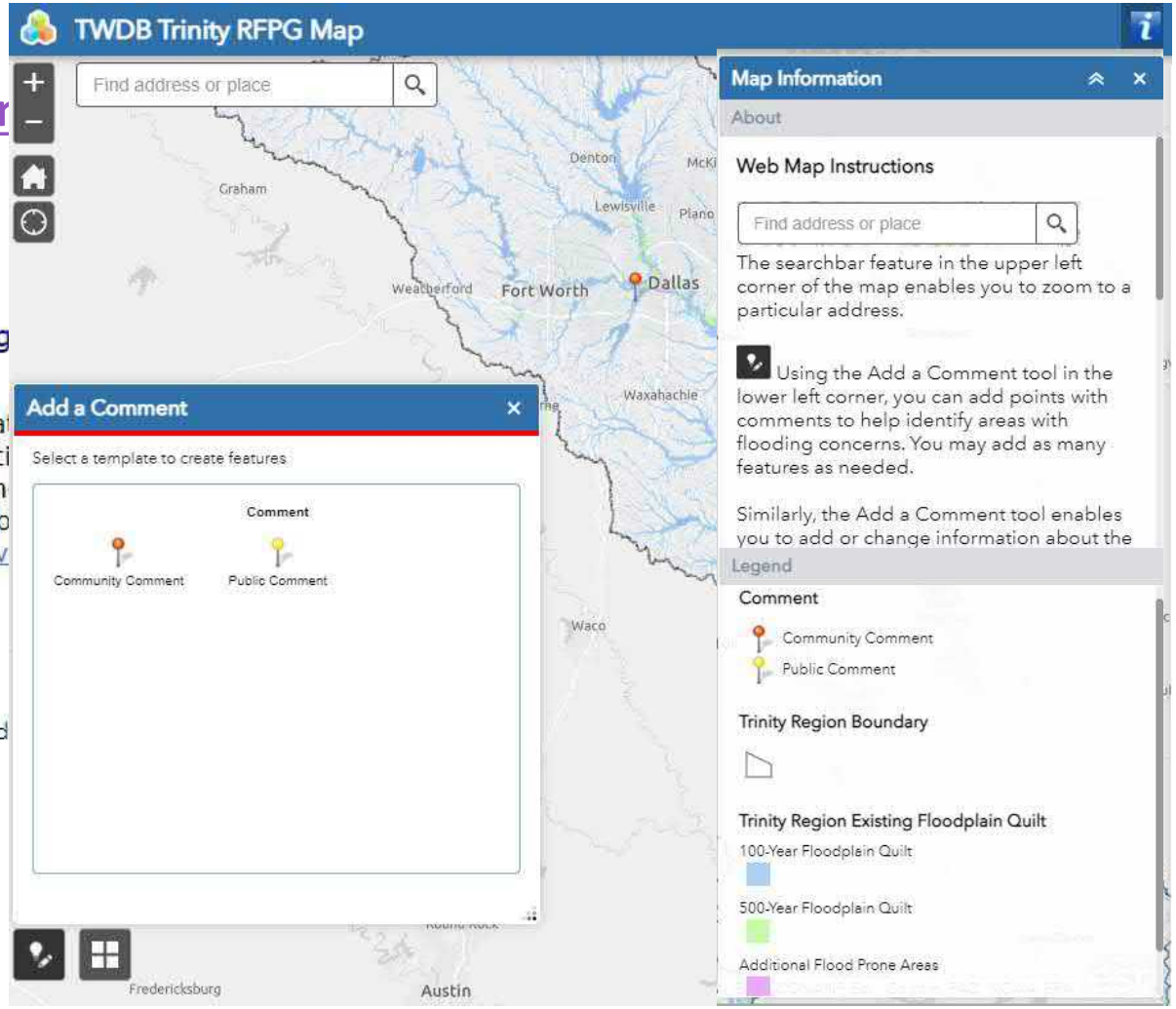
Public Webmap for Comments

Comments Webmap Lir

Data Disclaimer/Acknowledg

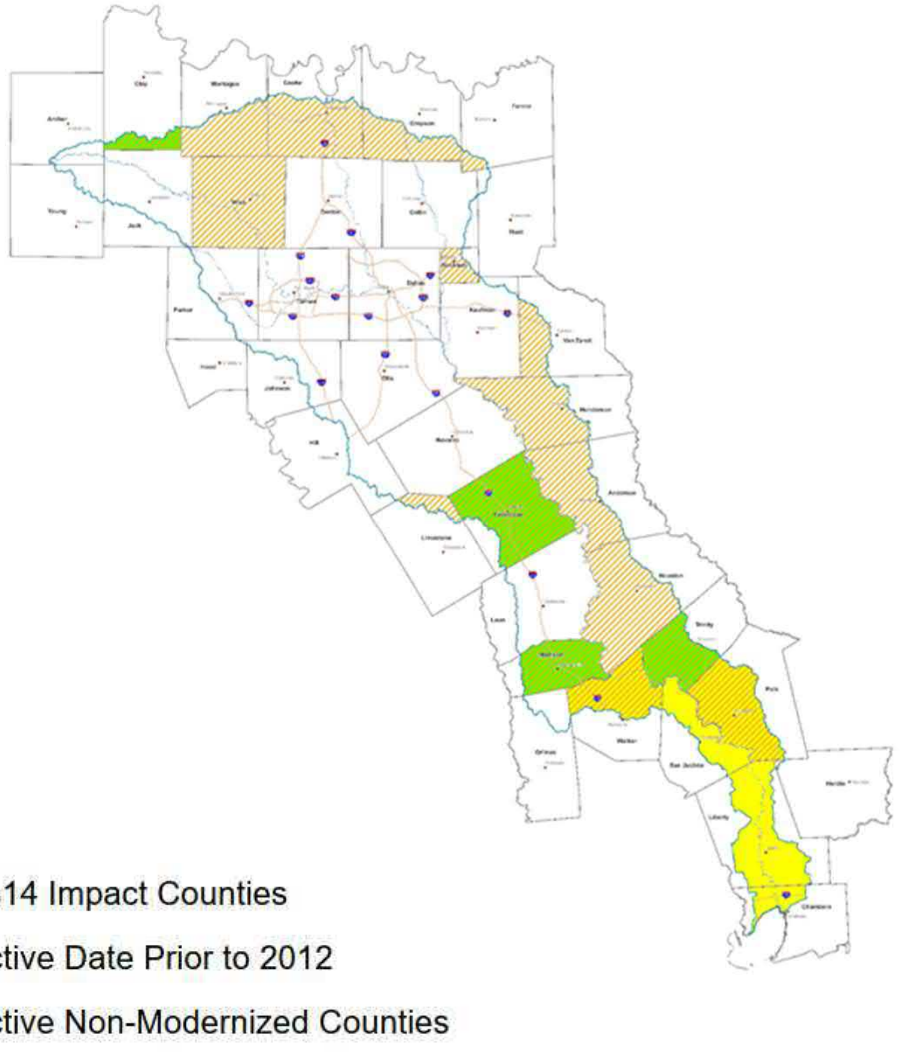
The floodplain quilt is a compila
approximate the extent of existi
planning purposes only and is n
floodplain maps, contact your lo
Center at https://msc.fema.gov

☐ I agree to the above terms and cond



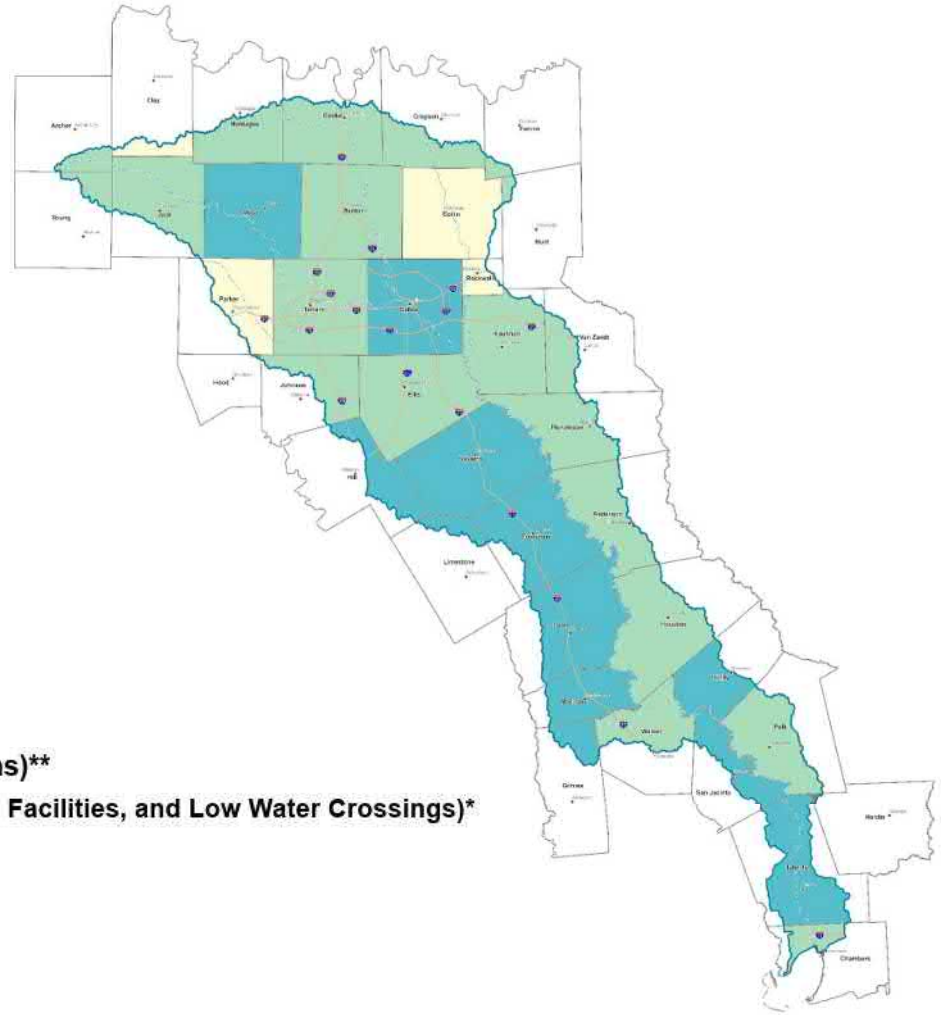
Data Gaps

- Absence of Modeling/Mapping
- Outdated Modeling/Mapping
- Historic Flooding Areas



Existing Vulnerability and Critical Infrastructure

County	Average SVI	County	Average SVI
Anderson	0.42	Jack	0.41
Archer	0.44	Johnson	0.31
Chambers	0.29	Kaufman	0.45
Clay	0.21	Leon	0.60
Collin	0.21	Liberty	0.60
Cooke	0.40	Limestone	0.53
Dallas	0.56	Madison	0.54
Denton	0.27	Montague	0.42
Ellis	0.38	Navarro	0.70
Fannin	0.34	Parker	0.23
Freestone	0.58	Polk	0.46
Grayson	0.28	Rockwall	0.24
Grimes	0.51	San Jacinto	0.51
Hardin	-999	Tarrant	0.42
Henderson	0.41	Trinity	0.55
Hill	0.61	Van Zandt	0.38
Hood	-999	Walker	0.35
Houston	0.47	Wise	0.51
Hunt	0.39	Young	0.48



Social Vulnerability Index (Existing Conditions)**

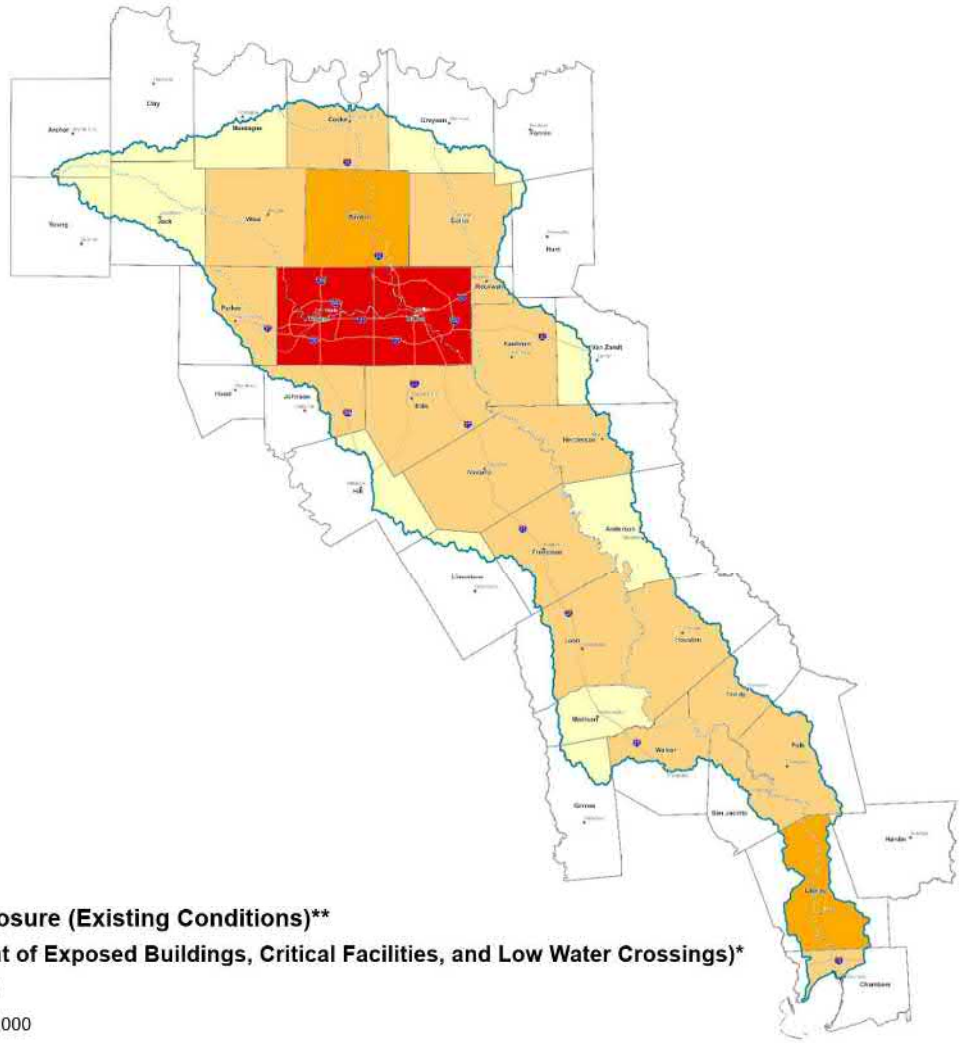
(County Averages of Exposed Buildings, Critical Facilities, and Low Water Crossings)*

- 0.50 - 0.75
- 0.25 - 0.50
- 0.00 - 0.25
- No Data Available

*Buildings = Residential, Commercial, Industrial, etc.
Critical Facilities = Fire Stations, Police Stations, Nursing Homes, Hospital, Schools, etc.
**Combination of 1% and 0.2% Annual Chance Flood Hazard

Existing Flood Exposure

County	1% Annual Chance Flood Hazard			0.2% Annual Chance Flood Hazard			Total
	Number of Structures in Floodplain	Low Water Crossings	Critical Facilities	Number of Structures in Floodplain	Low Water Crossings	Critical Facilities	
Anderson	164	4	72	28	1	6	275
Archer	1	0	4	1	0	2	8
Chambers	1,389	0	29	766	0	0	2,184
Clay	32	0	3	3	0	2	40
Collin	2,313	54	448	1,730	0	69	4,614
Cooke	1,384	32	186	315	0	2	1,919
Dallas	20,907	361	1,446	25,394	26	515	48,649
Denton	4,290	98	548	4,098	0	82	9,116
Ellis	1,638	56	379	563	0	31	2,667
Fannin	129	0	13	39	0	1	182
Freestone	370	2	102	88	0	12	574
Grayson	312	1	117	27	0	2	459
Grimes	100	0	24	32	0	2	158
Hardin	0	0	0	0	0	0	0
Henderson	2,481	11	84	59	0	3	2,638
Hill	46	0	75	25	0	11	157
Hood	0	0	0	0	0	0	0
Houston	435	14	97	128	3	5	682
Hunt	15	0	8	0	0	0	23
Jack	158	6	68	54	0	2	288
Johnson	1,467	22	132	323	0	13	1,957
Kaufman	1,324	16	270	311	0	9	1,930
Leon	408	5	102	77	0	6	598
Liberty	4,767	4	77	3,412	1	34	8,295
Limestone	32	3	28	18	0	4	85
Madison	329	1	61	83	0	5	479
Montague	350	0	42	7	0	2	401
Navarro	1,379	61	232	329	1	15	2,017
Parker	1,164	19	138	89	0	2	1,412
Polk	4,142	3	98	693	0	11	4,947
Rockwall	485	15	56	23	0	0	579
San Jacinto	2,701	0	33	536	0	4	3,274
Tarrant	15,217	341	1,138	10,533	4	152	27,385
Trinity	1,302	1	32	187	0	3	1,525
Van Zandt	256	2	59	84	0	6	407
Walker	1,398	5	50	253	0	2	1,708
Wise	1,741	6	175	59	0	8	1,989
Young	11	0	8	0	0	0	19



Flood Exposure (Existing Conditions)**

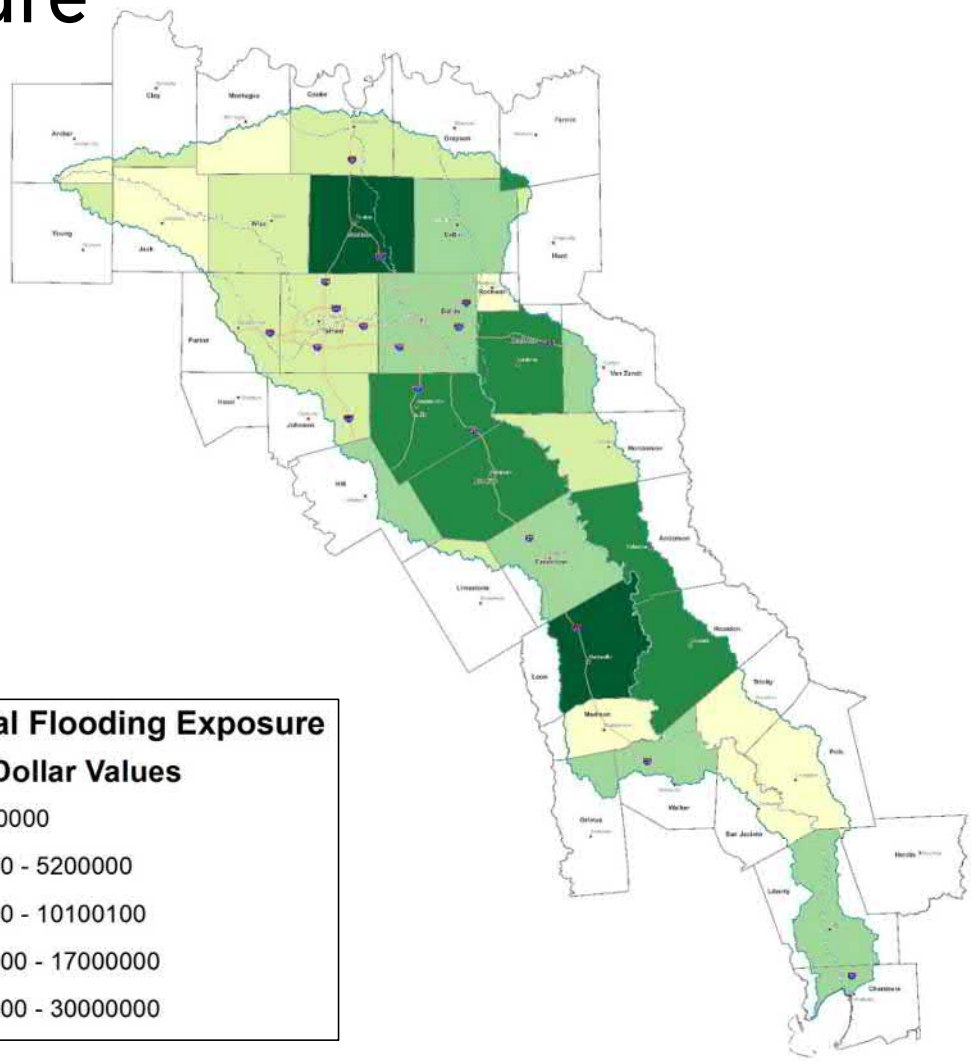
(Total Count of Exposed Buildings, Critical Facilities, and Low Water Crossings)*

- 0 - 500
- 501 - 5,000
- 5,001 - 10,000
- 10,001 - 48,649

*Buildings = Residential, Commercial, Industrial, etc.
Critical Facilities = Fire Stations, Police Stations, Nursing Homes, Hospital, Schools, etc.
**Combination of 1% and 0.2% Annual Chance Flood Hazard

Agricultural Flood Exposure

- Cropland data
- Livestock data



Ch. 4 Flood Mitigation Needs & Potentially Feasible Solutions

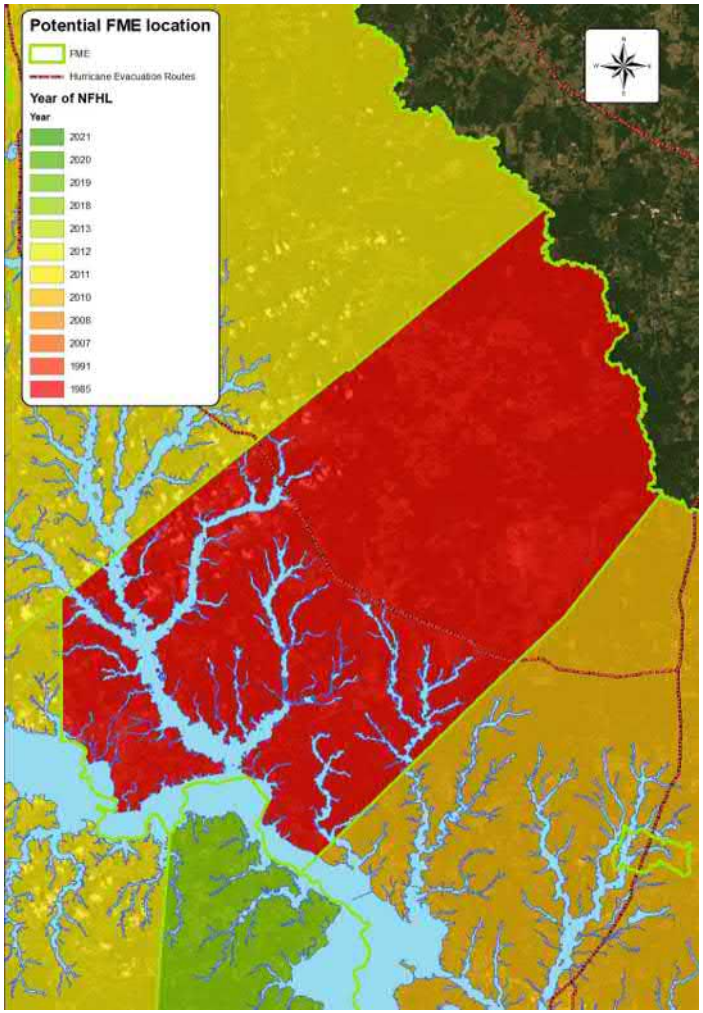
Emergency Needs Definition

Emergency Need

- Areas that have a history of severe and/or repetitive flooding
- Areas with older modeling and floodplain mapping
- Areas with a high density of flood insurance claims
- Areas with critical structures within the 1% annual chance flood area
- Areas containing hurricane evacuation routes
- Areas with a history of extremely costly events

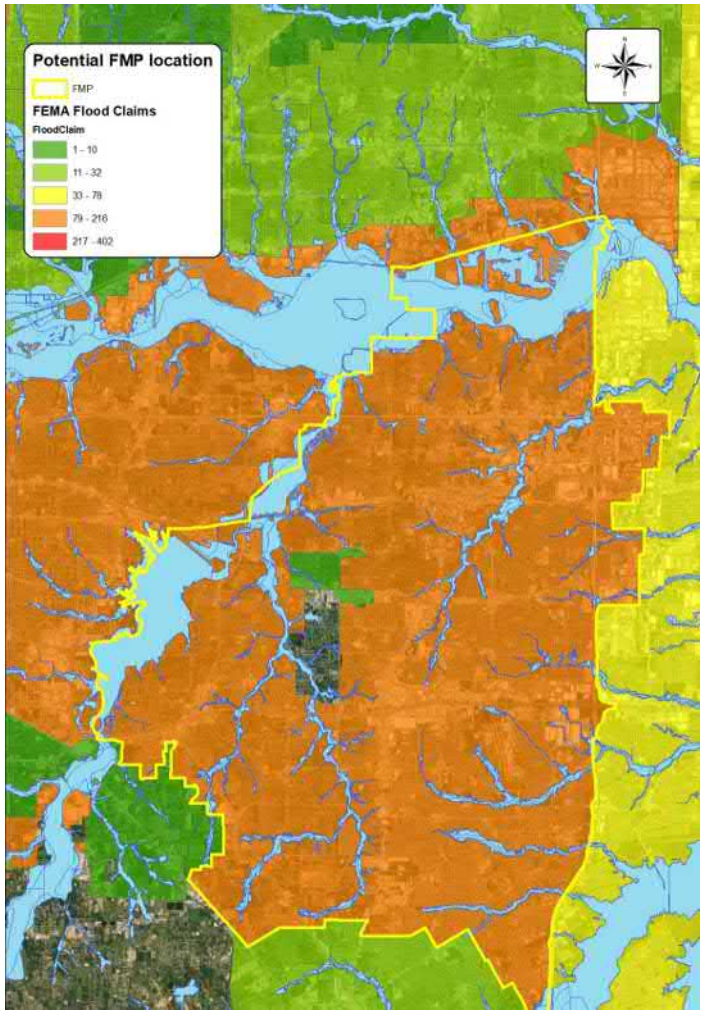
Emergency Need: Year of NFHL

A significant factor in determining emergency needs among the FMEs was the lack of recent countywide data. Counties with older, smaller scale flood data were indicated as emergency need for that purpose.



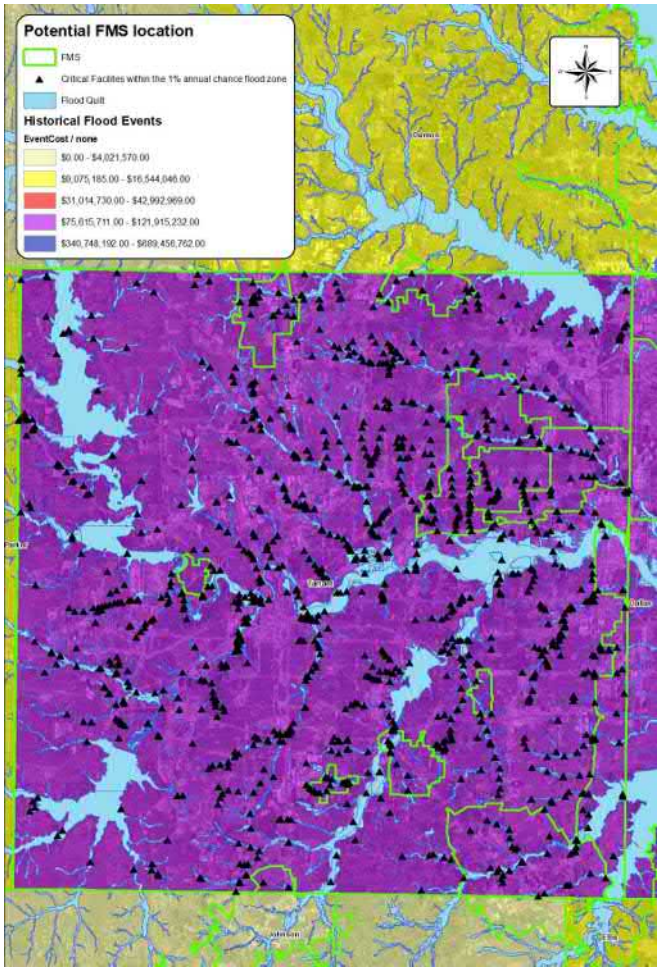
Emergency Need: Flood Claims

Among FMPs, projects that are within areas that have has significant repetitive loss via NFIP claims were listed as emergency need as they indicate areas with the potential to be problematic in the near future.



Emergency Need: Event Cost

Similarly, FMSs were designated as emergency need when the areas of the strategies were indicated as costly as well as highly probable to have a flood claim in the future.



EMERGENCY NEED

Areas that would sustain negative impacts within the foreseeable future were no measures taken.

Tech Memo Addendum

REGION 3 TRINITY
REGIONAL FLOOD PLANNING GROUP

DRAFT Technical Memorandum Addendum

TO:	Mr. Jeff Walker, Executive Administrator Texas Water Development Board Stephen F. Austin Building 1700 N. Congress Avenue, 6th Floor Austin, Texas 78701	DATE:	February 11, 2022
THROUGH	Mr. Glenn Clingenpeel, Chair Region 3 Trinity RFPG Trinity River Authority of Texas 5300 S. Collins Street Arlington, Texas 76018	AVO:	TRA Contract No. 2101792488 43791.001 - 000430
FROM:	Halff Associates, Inc. 4000 Fossil Creek Blvd. Fort Worth, TX 76137	SUBJECT:	Region 3 Trinity Regional Flood Plan Task 4C.1.c, 4C.1.d, 4C.1.e – Technical Memorandum Addendum

Addendum Overview

In August 2021, TWDB extended the deadline for completion and submittal of three subtasks associated with the Technical Memorandum to be submitted as an addendum by March 7, 2022. The purpose of this extension was to accommodate the delayed release of the Fathom data associated with the TWDB's floodplain quilt (TWDB Data Hub, 2021). Results presented in this memorandum are considered interim due to ongoing incorporation of best available data into the floodplain quilt. The Technical Memorandum Addendum includes:

- Existing and potential future conditions flood risk (Task 4C.1.c);
- Flood hazard data gaps and additional flood-prone areas (Task 4C.1.d); and
- Available hydrologic and hydraulic models needed to evaluate FMS's and FMP's (Task 4C.1.e)

Task 4C – Technical Memorandum Addendum Deliverables

The following sections introduce the technical memorandum addendum deliverables associated with the March 7th extension. Several additional attachments are included at the end of this document. **Table 1** indicates which subtasks and information are contained in each one.

Table 1: Technical Memorandum Addendum Attachments

Attachment	TWDB Task	Description
1,2,4	4C.1.c	A geodatabase and associated maps for: region-wide 1.0% annual chance flood event and 0.2% annual chance flood event inundation boundaries, and the source of flooding for each area, for use in its risk analysis, including indications of locations where such boundaries remain undefined. Includes TWDB-required Tables 3 and 5.
2,4	4C.1.d	A geodatabase and associated maps that identifies additional flood-prone areas not included in the floodplain quilt based on hydrologic features, historic flooding, and or local knowledge.
3,4	4C.1.e	A geodatabase and associated maps in accordance with TWDB Flood Planning guidance documents that identifies areas where existing hydrologic and hydraulic models needed to evaluate FMSs and FMPs are available

4C.1.c – Existing and potential future conditions flood risk

As of May 20, 2021, TWDB provided regional planning groups with an official version of the existing conditions floodplain quilt. The quilt was provided to establish a starting point in identifying flood risk within the region. The floodplain quilt compiled flood risk boundaries from several sources.

- National Flood Hazard Layer (NFHL) Pending Data
- National Flood Hazard Layer (NFHL) Preliminary Data
- National Flood Hazard Layer Effective Data (Detailed Study Areas only)
- Estimated Base Flood Elevation Data
- National Flood Hazard Layer (NFHL) Effective Data (Approximate Study Areas only)
- First American Flood Data Services (FAFDS)

On October 29, 2021, TWDB provided the planning group with Fathom floodplain data to estimate flood risk in locations where floodplain information was unavailable. The only area identified within Region 3 completely reliant on the Fathom data was Clay County. The draft existing conditions flood risk analysis was completed with the inclusion of the Fathom data. Methodologies to determine potential future flood risk were discussed and agreed upon during the September 9, 2021, November 18, 2021, and December 16, 2021 Regional Flood Planning Group meetings. The future conditions flood risk memorandum describing the approach is located in **Attachment 1**.

On December 1, 2021, TWDB supplied the planning groups with the final buildings dataset to be used for the existing and future conditions flood exposure analysis. The interim exposure analysis was performed to determine the number of at-risk structures (buildings, roadways, critical facilities, etc.), population estimates, the length of impacted roadways and area of agricultural land contained within the previously developed existing and potential future flood hazard boundary. **Table 2** provides overall Trinity Region 3 flood exposure results.

Table 2: Trinity Region 3 Existing and Potential Future Flood Exposure Analysis Results

Potential Flood Risk Event	Number of At-Risk Structures	Number of At-Risk Critical Facilities	Number of At-Risk Roadway Crossings*	Impacted Agricultural Area (sq. mi.)
Existing 1% Annual Chance (100-year)	74,637	6,434	1,143	1,317
Future 1% Annual Chance (100-year)	125,003	7,458	1,178	1,437

**includes low water crossings only*

Following the exposure analysis, a vulnerability analysis was performed for both existing and potential future conditions using the Social Vulnerability Index (SVI) dataset. The vulnerability analysis was performed to assess a community's resilience, with values closer to 1 denoting greater vulnerability.

Enhancement of the floodplain quilt with pluvial floodplain information from the Fathom dataset will be incorporated into the Region 3 existing conditions flood hazard dataset throughout the finalization of the flood risk analyses. The flood risk analyses (existing and potential future flood risk, exposure, and vulnerability) for this submittal are considered interim. TWDB-required **Table 3** and **Table 5** located in **Attachment 2** provide the results per county of the existing and future exposure and vulnerability analysis as outlined in the Technical Guidelines for Regional Flood Planning. A geodatabase and associated **Figures 1 through 10** are provided in **Attachments 2 and 4** as digital data.

4C.1.d – Flood hazard data gaps and additional flood-prone areas

Upon receipt of the final floodplain quilt, a flood hazard data gap assessment was performed. The flood hazard quilt for the Trinity Region 3 watershed was determined to have full regional coverage apart from Clay County. Preliminary identified gaps include counties with no modernized data since the completion of the FEMA Map Modernization initiative and areas with effective data that is more than 10 years old. At this time, areas that contain Base Level Engineering (BLE) or FEMA NFHL floodplain boundaries are not considered data gaps. An ongoing effort is being made to determine the validity of the associated hydrologic and hydraulic modeling in areas of greater risk. For example, Polk, Liberty, San Jacinto, Walker, and Chambers counties located in the southern portion of the basin were greatly affected by NOAA Atlas 14, invalidating their effective floodplain information contained within the quilt. Because of this, these counties are being reported as data gaps. Fathom data was incorporated into the floodplain quilt for Clay County to achieve full flood hazard coverage for the purposes of this planning effort. The Fathom pluvial dataset provided flood risk information for rivulets, urban drainage channels, and smaller potential flooding sources. An ongoing effort is being made to incorporate Fathom pluvial flood hazard information where reasonable.

In addition to incorporation of the Fathom dataset, a region-wide data collection and outreach effort was made to identify flood-prone areas typically outside of established flood hazard boundaries. These areas were identified by the region's stakeholders along with public datasets and are based on hydrologic features, historic flooding, and local knowledge. Through the data collection and outreach effort, over 3,000 individual flooding locations were identified within the region. A data gaps and additional flood-prone area geodatabase and associated **Figures 3 and 7** are provided in **Attachments 2 and 4** as digital data.

4C.1.e – Available hydrologic and hydraulic models needed to evaluate FMS's and FMP's.

A list of previous studies containing modeling data was submitted as part of the January 7, 2022 Technical Memorandum. These studies were added to a geodatabase to provide a georeferenced representation of model-backed study areas for use when conducting FMS and FMP evaluations. Also provided in the database are areas where BLE and FEMA NFHL modeling are available. It should be noted that for use in developing an FMS or FMP, these models will need some level of enhancement to provide fully detailed flood risk reduction evaluations. As the planning process continues, the list of available studies and associated models will be enhanced to document sources of information relevant to plan development within the Trinity Region. Available model locations geodatabase and associated **Figure 11** are provided in **Attachments 3 and 4** as digital data.

4C.1.c,d,e – Technical Memorandum Addendum Geodatabase and Tables

As outlined in the TWDB Extension of Time to Complete Technical Memorandum dated August 17, 2021 and associated Technical Memorandum Data Deliverable Clarification dated October 29, 2021, documentation in **Attachment 4** outlines geodatabase deliverables included in this Technical Memorandum as well as spatial files and tables. Specific data deliverables align with the TWDB's Exhibit D: Data Submittal Guidelines for Regional Flood Planning. The geodatabase files require ArcGIS software to be used to view the files. The RFPG can provide these files to anyone requesting said files by emailing info@trinityrfpg.org. Please keep in mind that these files will continue to be updated and enhanced throughout the development of the Regional Flood Plan and simply reflect a snapshot in time of the project as it stands today.

Attachment 1

Task 4C.1c – Potential Future Conditions Flood Risk Methodology Memorandum

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MEMORANDUM

TO:	Texas Water Development Board Regional Flood Planning 1700 N Congress Ave Austin, TX 78701	DATE:	January 7, 2022
FROM:	Halff Associates, Inc. 4000 Fossil Creek Road Fort Worth, TX 76137	AVO:	43791
SUBJECT:	Flood Planning Data **Future Conditions Mapping**		

INTRODUCTION

For the 2020 – 2023 planning cycle, Regional Flood Planning Groups (RFPGs) are tasked with performing a future condition flood analysis to determine the potential location of both 1-percent (100-year) and 0.2 percent (500-year) annual-chance flood hazard. The estimated floodplain changes will be used solely for the purpose of estimating the general magnitude of potential future increases in flood risk under the equivalent of a "do-nothing" or "no-action" alternative and within the regional flood planning context will not, in any way, be used for developing new flood extent maps for any regulatory purposes.

In areas where future condition flood hazard data is not already available, Exhibit C of the Technical Guidelines for Regional Flood Planning outlines the following 4 methods for performing future condition flood identification.

1. Method 1: Increase water surface elevation based on projected percent population increase (as proxy for development of land areas)
2. Method 2: Utilize the existing condition 0.2 percent annual chance floodplain as a proxy for the future 1 percent level
3. Method 3: Combination of methods 1 and 2 or an RFPG-proposed method
4. Method 4: Request TWDB perform a Desktop Analysis

CONSIDERATIONS FOR DEVELOPING FUTURE CONDITIONS FLOOD RISK

When developing a predicative assessment for future conditions flood risk, Texas Water Development Board (TWDB) suggested each region consider two major factors: Unmitigated Population Increase and Projected Future Rainfall.

Population Increase

Within the Trinity River watershed region, concentrated population growth is predicted to occur within locations along the upper, mid, and lower region areas. The TWDB's Water User Group projects that within the upper portion of the region, ten (10) Dallas/Fort Worth surrounding communities could experience over 300% increase in

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population over the next 30 years. Larger communities, such as Athens and Corsicana within the mid basin area are projected to experience over 30% population growth. The lower region is expected to see overflow growth from Harris County, with significant growth occurring in Dayton and Liberty. Population growth generally correlates to an increase in urbanization. This, in turn, leads to an increase in impervious ground cover as land use changes. Unmitigated, urbanized areas will increase watershed rainfall runoff leading to higher water surface elevations in the region's rivers, creeks, and channels during extreme rainfall events.

Projected Future Rainfall

The other factor TWDB suggested the planning group consider when estimating future flood risk is future rainfall patterns. To aid the regional planning groups, the Office of the Texas State Climatologist provided TWDB with guidance on how to incorporate projected future rainfall in their April 16, 2021 report, titled *"Climate Change Recommendations for Regional Flood Planning."* The report states that 1-day 100-year rainfall amounts increased by approximately 15% between 1960 and 2020. The climatologist coupled historic rainfall data with results from climate models to develop a relationship between extreme rainfall amounts and future increases in global temperature. Percent increase in future precipitation was developed for both urbanized and rural watershed conditions. Due to the uncertainty of predicting weather patterns for extreme rainfall events, the climatologist provided a minimum and maximum range for estimating future rainfall increases. The climatologist found even more uncertainty when analyzing rural and large river catchments due to future decreases in soil moisture. This led them to providing a percent decrease as a minimum range. The climatologist recommendations for future percent rainfall increase are provided in Table 1.

Table 1: Range of Potential Future Rainfall Increase 2050-2060

Location	Range -Minimum	Range -Maximum
Urban Areas	12%	20%
Rural Areas/River	-5%	10%

CASE STUDIES - FUTURE CONDITIONS FLOOD RISK

In order to obtain a better understanding of how future conditions affect extreme rainfall flood risk within the Trinity region, preexisting available hydrologic and hydraulic models containing future flood risk data were analyzed. Results from these studies served as an estimation of how future land use and climate change impact floodplain elevations and widths when compared to existing conditions. Comparable studies were chosen based on availability, location, and similar hydrologic/hydraulic parameters. Figure 1 provides a location for the existing studies collected for this assessment.

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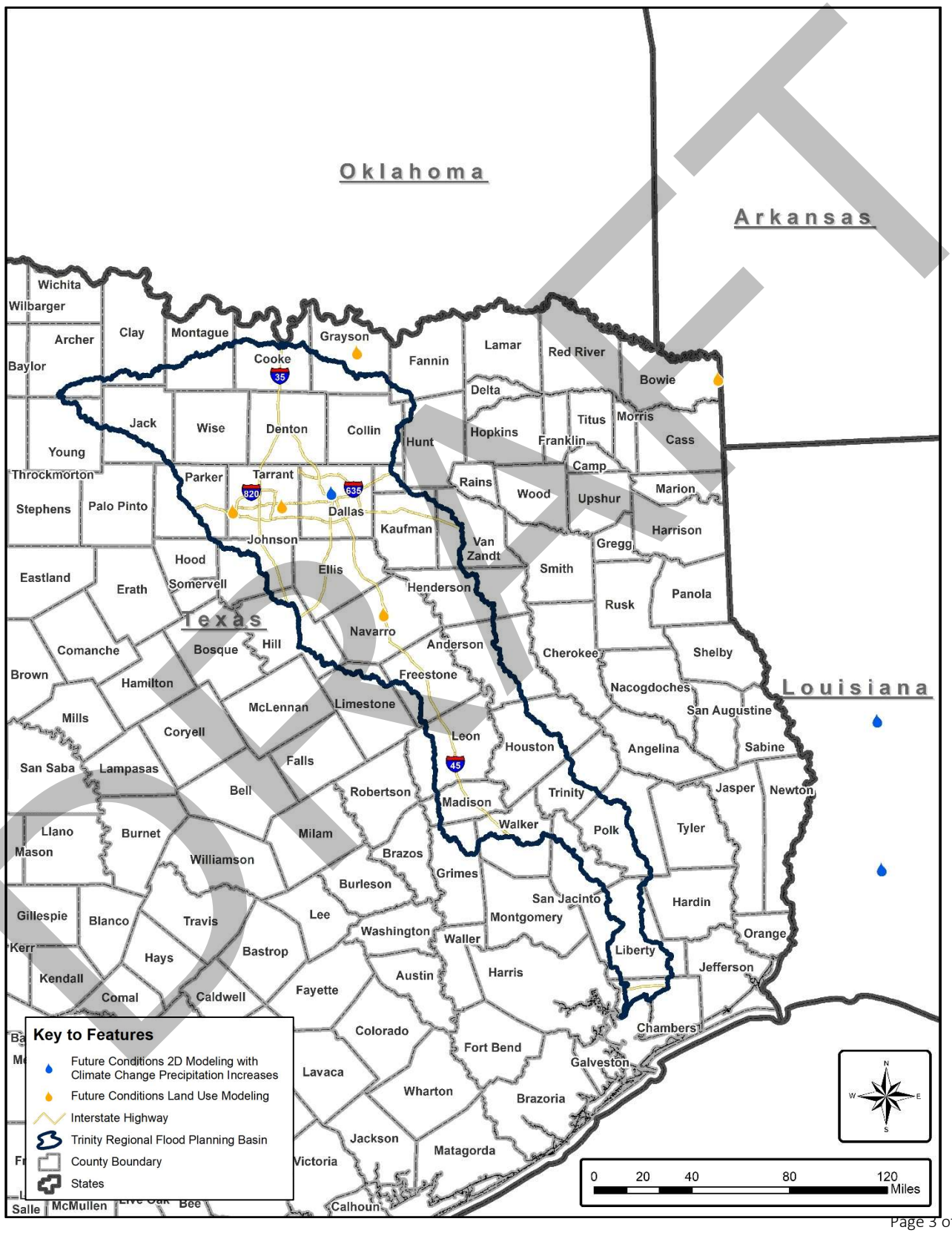

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Figure 1: Case Study Locations

Future Conditions - Land Use Studies

Five (5) drainage/floodplain master plans were utilized to assess potential flood risk increases due to future fully developed land use conditions. The future conditions analysis for these studies did not consider potential increases to rainfall data and are therefore based on land use changes only. A comparison was made between the existing and future conditions 100-year flood elevations. In addition to the future 100-year comparison, a flood elevation comparison was made between the existing 100-year and 500-year storm events to analyze the viability of utilizing Method 2 for future flood hazard data for this planning cycle. Results of the comparisons are provided in Table 2.

Table 2: Future Conditions Land Use Water Surface Elevation (WSEL) Comparison

Location	Flooding Source	Average WSEL Change Existing Vs Future 100yr (ft)	Average WSEL Change Existing 100yr vs 500yr (ft)
Parker County	Marys Creek	0.1	0.8
Grand Prairie	Fish, Kirby, Rush, Prairie Creek	0.2	1.4
Sherman	Post Oak, EF Post Oak, Sand Creek	0.7	1.0
Texarkana	Wagner, Swampoodle, Corral Creek	0.6	1.8
Corsicana	Post Oak, SF Post Oak, Mesquite Creek	0.2	1.0
Average		***0.4***	***1.2***

Future Conditions – Projected Future Rainfall

During the data collection phase, the consultant team was unable to obtain studies that analyzed future flood risk based on potential future rainfall predictions. As a substitute, two (2) large scale rain on grid studies were obtained: Dallas City-Wide Watershed Masterplan and the FEMA Louisiana Upper Calcasieu Base Level Engineering Analysis. The modeling methodology of these studies allowed for rainfall data to be quickly modified in accordance with the recommendations from the state climatologists. The 100-year storm event rainfall was increased by 15% for both studies and the flood elevation results were compared to the present-day conditions. The increase of 15% was chosen because it fell into the high range of rainfall increases and matched the historic period of record increase. The existing 100-year and 500-year flood elevations were also compared for the Method 2 consideration. Results of the comparisons are provided in Table 3.

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Table 3: Future Rainfall Increase WSEL 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
Average	***0.3***	***N/A***

** Dallas Watershed Master Plan only considered the 100-year storm event*

REGION 3 FUTURE CONDITIONS FLOOD HAZARD APPROACH

Potential Future 100-Year Flood Hazard Methodology

The potential future conditions 100-year flood hazard approach methodologies were discussed during the September 23, 2021 Region 3 RFPG meeting. Advantages and disadvantages of each methodology along with the results of the case studies were presented for consideration. Due to the relatively large coverage of adequate existing 500-year floodplain data within the region, Method 2 was considered the most reasonable approach. The planning group had reservations about the usage of the existing 500-year as a potential future 100-year flood risk proxy due to the case studies showing the floodplain may be too conservative of an approach.

From the future conditions land use case study results, the average change in potential future 100-year WSEL compared to existing conditions was only 0.4 feet while the comparison between the existing 100-year and existing 500-year water surface elevations yielded an average 1.2 feet change. By Increasing the average change in WSEL between existing and potential future conditions from Table 2 by the average taken from Table 3 to account for future rainfall projections, the results generally yielded a comparison less than that of the differences between the existing 100-year and existing 500-year water surface elevation.

The planning group also had concerns about the potential for Region 3 entities (communities and/or insurance companies) to mistakenly use the data for regulatory purposes. As a solution to both concerns, the planning group proposed that the potential future 100-year floodplain should be presented in this planning cycle as a range between the existing 100-year and the existing 500-year (zone of potential expanded risk). The methodology complies with the Method 2 approach and covers the uncertainty and variability resulting from the case study

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analysis. The exposure and vulnerability assessment data would be extracted from the maximum potential future 100-year floodplain limit.

Potential Future 500-Year Flood Hazard Methodology

The potential future conditions 500-year flood hazard approach methodology was discussed during the December 17, 2021 Region 3 RFPG meeting. Under Method 2 in the TWDB Technical Guidelines, an excerpt regarding the determination of the future 500-year flood hazard states*: "RFPGs will have to utilize an alternate approach to develop a proxy for the 0.2 percent annual chance future condition floodplain, such as adding freeboard (vertical) or buffer (horizontal) estimates. The decision on what specific approach or values to use, which may vary within the region (e.g., for urban vs rural areas), for these estimates will be up to the RFPGs, but technical justification should be provided to explain how the estimates were developed. This method cannot be applied to flood risk areas that do not already have a delineated existing condition 0.2 percent annual chance floodplain, (i.e., flood-prone areas)."* Based on this statement, reasonable buffer limits were researched based on the difference in existing top widths between the 100-year and 500-year floodplain quilt within the Trinity Region. It is reasonable to assume that the difference between top widths for the existing conditions, will be similar for potential future conditions. To establish a reasonable buffer zone to represent potential future 500-year flood risk, Base Level Engineering data previously collected for the plan was analyzed. Nine (9) large-scale studies were selected to form the basis for the buffering analysis. Figure 2 shows the general location and coverage of the nine (9) studies selected.

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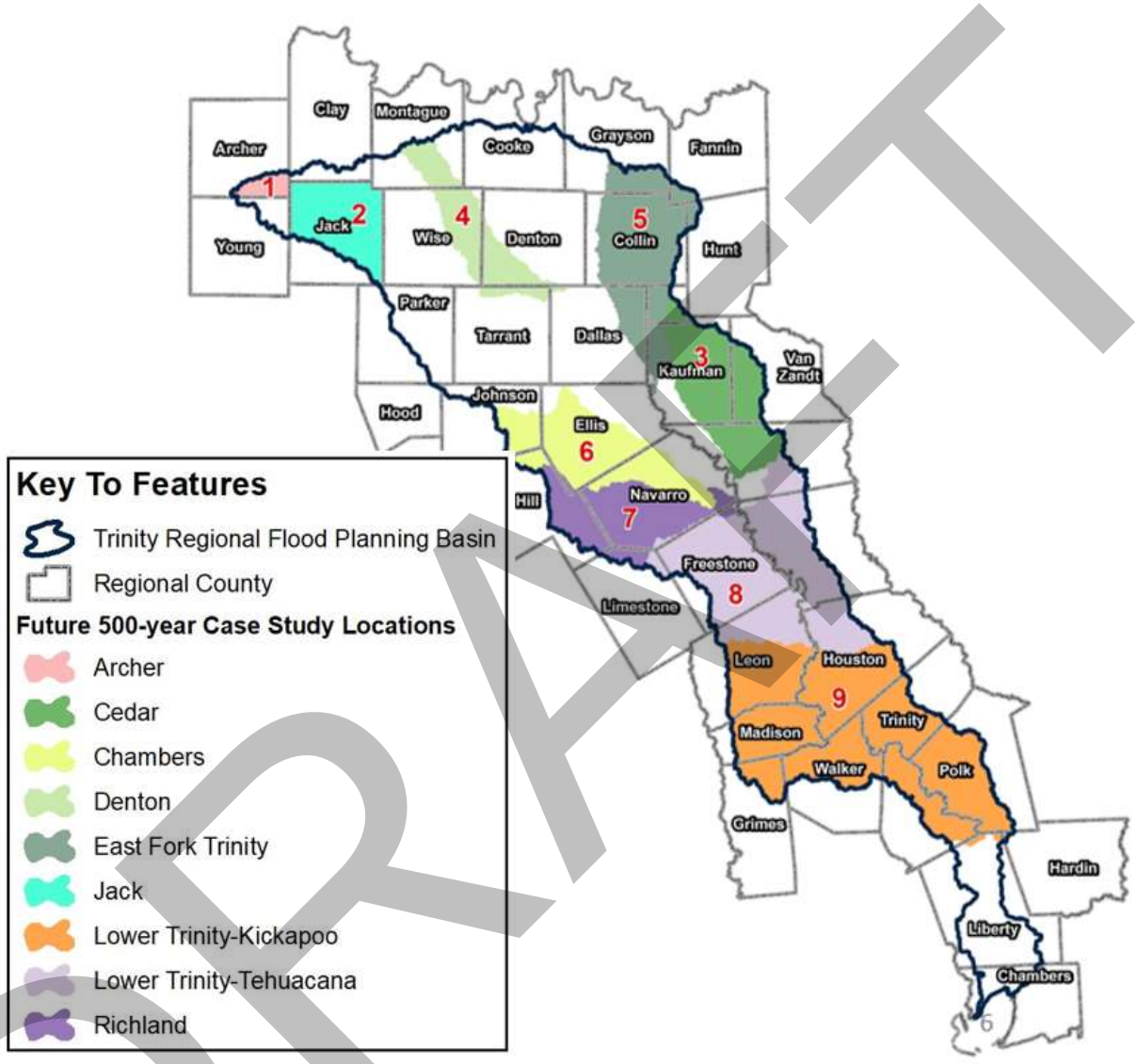

Figure 2: Future 500-year Case Study Locations

The nine (9) studies collected represent over 25,000 miles of floodplain, with over 300,000 cross-sections. Using automated means, 600,000 individual distance measurements were collected along these cross-sections between the existing 100-year and 500-year floodplains. Figure 3 shows an example of measurement locations.

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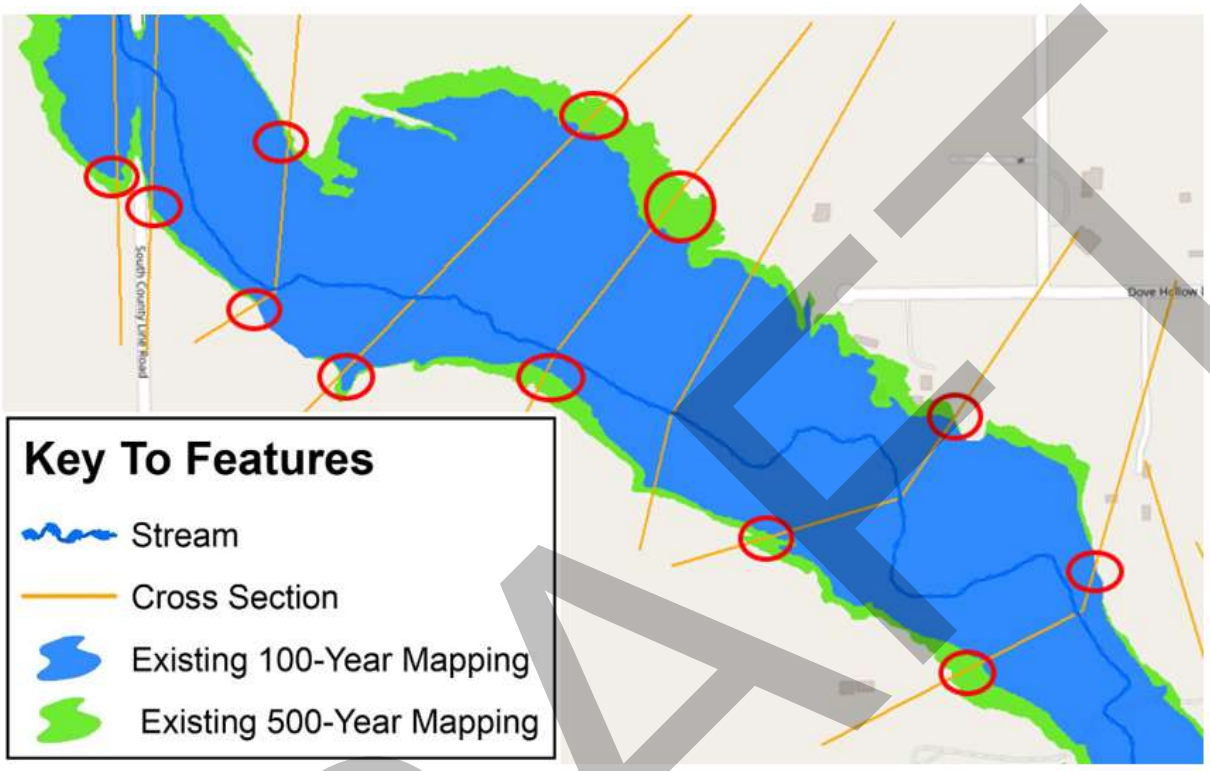

Figure 3: Measurement Locations to Develop Potential Future Condition 500-Year Flood Risk Buffer

The measurements were then averaged for each of the nine (9) study locations. The average distance measurement along the right or left overbank of the floodplain ranged from 30 feet to 50 feet. The total average overbank measurement of all nine (9) studies was determined to be approximately 40 feet, representing 80 feet total change in top width. Similar to the future 100-year flood risk boundary, the future 500-year will be presented as a range between the existing 500-year flood risk boundary and the 40-foot buffer. Table 4 provides the average measurement results of the analysis.

Table 4: Average Change in Horizontal Distance

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Location	Average Width Change (Left or Right Overbank) Existing 100yr vs 500yr (ft)
1. Archer	30.8
2. Jack	32.2
3. Denton	32.6
4. Cedar	30.8
5. East Fork Trinity	42.6
6. Chambers	37.2
7. Richland	44.5
8. Lower Trinity Tehuacana	36.3
9. Lower Trinity Kickapoo	47.6
Rounded Average	***40***

CONCLUSION

The Trinity RFPG and its consultant have developed a procedure for generating potential future 100-year and 500-year flood risk data that generally follows Method 2 of the TWDB's Technical Guidance document. The existing 500-year floodplain was selected to serve as a proxy for the potential maximum 100-year flood hazard. A 40-foot buffering of the existing 500-year flood hazard boundary was selected to serve as the potential maximum future 500-year flood hazard. Using the previously described buffering methodology for potential future 500-year conditions allows for rapid development of estimated expanded risk within the constraints of the flood plan timeline and lack of future 500-year detailed data throughout the planning area. A disadvantage of this approach is that average buffering is performed independent of topographic or water surface elevation changes. For areas with relatively flat terrain, the potential 500-year flood risk limit based on buffering may underestimate the expanded urban exposure risk. This disadvantage may be less impactful on rural floodplains whose exposure risks are large tracts of agricultural land. Table 5 shows the existing and range of potential future conditions flood risk approach summary. Figure 4 presents an example of the range of potential future flood risk.

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Table 5: Existing and Future Conditions Flood Hazard Approach

	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	Replaced with Fathom 100YR	Replaced with Fathom 500YR	Fathom 100YR	Fathom 500YR
Future	Local Study (if provided)	Local Study (if provided)	Range between Existing 100-year and 500-year	40-foot buffer of the existing 500YR	Range between BLE Existing 100-year and 500-year	40-foot buffer of the existing 500YR	Range between Fathom Existing 100-year and 500-year	40-foot buffer of the existing 500YR	Range between Fathom Existing 100-year and 500-year	40-foot buffer of the existing 500YR

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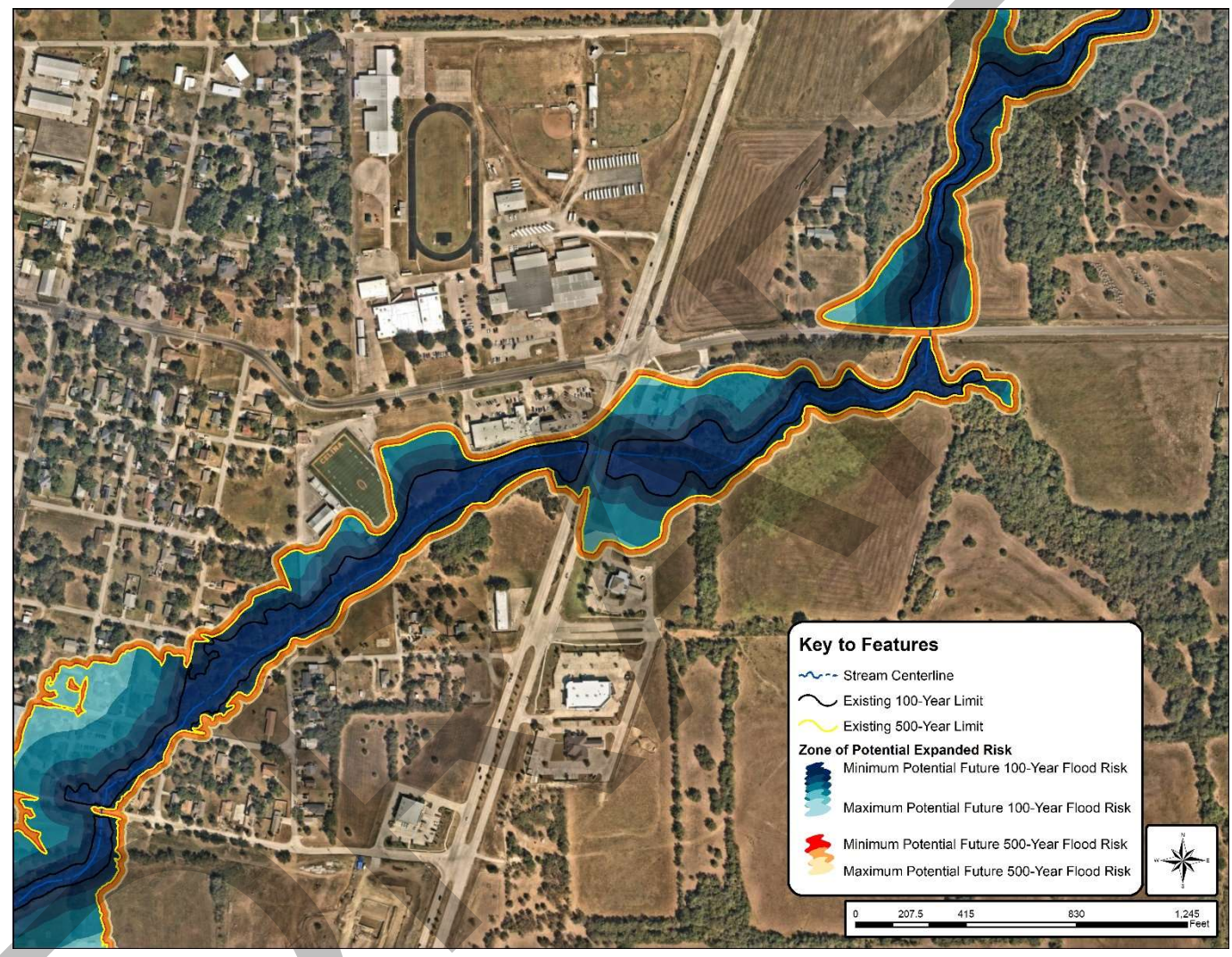


Figure 4: Example of 2020-2023 Planning Cycle Range of Potential Future Flood Risk Data

TWDB APPROVAL REQUEST

We are asking that the method discussed above be evaluated for approval to supplement future conditions mapping where data is unavailable.

Attachment 2

Task 4C.1c, 4C.1d – TWDB Required Table 3 and Table 5, Figures 1 through 12 as follows:

- Figure 1 – Data Sources
- Figure 2 - Map 4: Existing Condition Flood Hazard (2.2.A.1 Existing condition flood hazard analysis)
- Figure 3 - Map 5: Existing Condition Flood Hazard - Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas (2.2.A.1 Existing condition flood hazard analysis)
- Figure 4 - Map 6: Existing Condition Flood Exposure (2.2.A.2 Existing condition flood exposure analysis)
- Figure 5 - Map 7: Existing Condition Vulnerability and Critical Infrastructure (2.2A.3 Existing condition vulnerability analysis)
- Figure 6 - Map 8: Future Condition Flood Hazard (2.2.B.1 Future condition flood hazard analysis)
- Figure 7 - Map 9: Future Condition Flood Hazard - Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas (2.2.B.1 Future condition flood hazard analysis)
- Figure 8 - Map 10: Extent of Increase of Flood Hazard Compared to Existing Condition (2.2.B.1 Future condition flood hazard analysis)
- Figure 9 - Map 11: Future Condition Flood Exposure (2.2.B.2 Future condition flood exposure analysis)
- Figure 10 - Map 12: Future Condition Vulnerability and Critical Infrastructure (2.2.B.3 Future condition vulnerability analysis)

Due to the file sizes of the draft figures, they are available for individual download at the following link:
https://halff-my.sharepoint.com/:f:/p/ah3829/Eupw_B2yfMZOrVNAIW0UJLYB1RJGeo--9VwcWa4xTz1hEw?e=8zoTkQ
Because this document is intended to show progress towards the development of the draft regional flood plan, these figures will be removed from the link on March 7, 2022 when the Technical Memorandum Addendum is submitted to the Texas Water Development Board. Updated versions of these figures will be included in the draft flood plan.

ID	RFPG No.	RFPG Name	County	Area in Flood Planning Region (sqmi)	1% Annual Chance Flood Risk									
					Area in Floodplain (sqmi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population (daytime)	Population (nighttime)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)
1	3	Trinity	Anderson	578.4	137	164	61	46	74	74	4	23.4	41.9	72
2	3	Trinity	Archer	107.5	14.2	1	0	2	5	5	0	4.2	4.9	4
3	3	Trinity	Chambers	1417	79.4	1,389	757	874	2,635	2,635	0	33	5.7	29
4	3	Trinity	Clay	122.7	19.6	32	0	2	13	13	0	18.6	10.1	3
5	3	Trinity	Collin	830.6	145.8	2,313	1,643	16,561	6,009	16,561	54	113.1	41.5	448
6	3	Trinity	Cooke	605	84.6	1,384	782	1,764	1,417	1,764	32	65.7	37.5	186
7	3	Trinity	Dallas	905.2	193.9	20,907	15,150	341,478	101,226	341,478	361	686.9	43.3	1,446
8	3	Trinity	Denton	948.7	221	4,290	2,206	11,573	8,345	11,573	98	206.8	68.3	548
9	3	Trinity	Ellis	948	183.2	1,638	1,044	3,243	3,371	3,371	56	142.6	105	379
10	3	Trinity	Fannin	43.8	4.5	129	102	30	75	75	0	3.4	2	13
11	3	Trinity	Freestone	785.2	172.2	370	97	116	212	212	2	37.2	52.4	102
12	3	Trinity	Grayson	342.8	45.4	312	236	172	393	393	1	34.9	17.7	117
13	3	Trinity	Grimes	138.4	24	100	39	11	55	55	0	6.3	10.1	24
14	3	Trinity	Hardin	6.4	0	0	0	0	0	0	0	0	0	0
15	3	Trinity	Henderson	571.1	148.9	2,481	1,067	995	2,600	2,600	11	34.1	43.1	84
16	3	Trinity	Hill	320.6	38.3	46	21	88	25	88	0	11.8	23.3	75
17	3	Trinity	Hood	2.5	0.03	0	0	0	0	0	0	0	0.03	0
18	3	Trinity	Houston	813.9	174.9	435	200	104	334	334	14	42.8	97.4	97
19	3	Trinity	Hunt	29.5	4.3	15	10	1	6	6	0	2.3	2.1	8
20	3	Trinity	Jack	657.5	75.7	158	41	85	86	86	6	30.8	29	68
21	3	Trinity	Johnson	359.4	39	1,467	1,072	2,728	2,821	2,821	22	50.2	18.1	132
22	3	Trinity	Kaufman	763.8	211.4	1,324	756	1,957	1,713	1,957	16	85.8	109.5	270
23	3	Trinity	Leon	807.3	164.7	408	7	211	229	229	5	40.9	73.2	102
24	3	Trinity	Liberty	650.4	293.6	4,767	2,823	2,643	4,899	4,899	4	157.2	61.1	77
25	3	Trinity	Limestone	95.8	15.9	32	7	15	29	29	3	6.6	11.4	28
26	3	Trinity	Madison	400.5	98.2	329	111	367	294	367	1	30	50.1	61
27	3	Trinity	Montague	404	31.1	350	159	54	229	229	0	18.8	14.8	42
28	3	Trinity	Navarro	1,081.60	279	1,379	544	2,321	1,630	2,321	61	110.1	117.2	232
29	3	Trinity	Parker	473.5	39.5	1,164	390	2,300	1,647	2,300	19	39	21.3	138
30	3	Trinity	Polk	570.7	139.3	4,142	2,537	2,932	5,028	5,028	3	57.2	20.7	98
31	3	Trinity	Rockwall	115.8	31.9	485	306	849	1,047	1,047	15	26.1	5.6	56
32	3	Trinity	San Jacinto	307.5	113.4	2,701	2,159	1,635	2,507	2,507	0	64.9	15.6	33
33	3	Trinity	Tarrant	900.6	138.4	15,217	10,913	76,975	44,912	76,975	341	429.4	26.7	1,138
34	3	Trinity	Trinity	368.3	76.5	1,302	875	924	1,669	1,669	1	25.1	9.8	32
35	3	Trinity	Van Zandt	220.4	37.1	256	124	104	195	195	2	19.3	20.4	59
36	3	Trinity	Walker	403	102.7	1,398	1,008	3,654	2,609	3,654	5	36.4	39.5	50
37	3	Trinity	Wise	919.8	121.9	1,741	1,031	1,751	2,004	2,004	6	65.9	63.3	175
38	3	Trinity	Young	111.6	9.6	11	2	0	0	0	0	5.7	3.7	8
Total				**19,129**	**3,710**	**74,637**	**48,280**	**478,565**	**200,343**	**489,554**	**1,143**	**2,767**	**1,317.3**	**6,434**

ID	RFPG No.	RFPG Name	County	0.2% Annual Chance Flood Risk									
				Area in Floodplain (sqmi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population (daytime)	Population (nighttime)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)
1	3	Trinity	Anderson	6.4	28	15	12	38	38	1	6.6	2.2	6
2	3	Trinity	Archer	1.1	1	0	0	0	0	0	0.9	0.5	2
3	3	Trinity	Chambers	6.7	766	381	651	1,142	1,142	0	21.2	1.9	0
4	3	Trinity	Clay	1.8	3	0	0	1	1	0	2.7	1.2	2
5	3	Trinity	Collin	7	1,730	1,470	12,331	7,023	12,331	0	44.3	2.6	69
6	3	Trinity	Cooke	2.5	315	242	2,526	922	2,526	0	6.8	1.2	2
7	3	Trinity	Dallas	51.5	25,394	19,243	232,966	97,022	232,966	26	530.4	10.3	515
8	3	Trinity	Denton	14	4,098	3,360	33,060	21,976	33,060	0	84	4.9	82
9	3	Trinity	Ellis	11.5	563	392	862	1,190	1,190	0	24.4	8	31
10	3	Trinity	Fannin	0.4	39	22	45	30	45	0	1.2	0.2	1
11	3	Trinity	Freestone	10.8	88	36	23	60	60	0	9.5	4.7	12
12	3	Trinity	Grayson	1	27	27	17	62	62	0	1.4	0.6	2
13	3	Trinity	Grimes	2	32	17	2	17	17	0	1.4	1.2	2
14	3	Trinity	Hardin	0	0	0	0	0	0	0	0	0	0
15	3	Trinity	Henderson	4.9	59	32	17	43	43	0	3.3	2.2	3
16	3	Trinity	Hill	5.9	25	14	7	22	22	0	5.7	4.4	11
17	3	Trinity	Hood	0	0	0	0	0	0	0	0	0	0
18	3	Trinity	Houston	9.8	128	66	184	169	184	3	8.6	5.1	5
19	3	Trinity	Hunt	0.02	0	0	0	0	0	0	0	0.01	0
20	3	Trinity	Jack	8.3	54	10	27	26	27	0	7.8	4.3	2
21	3	Trinity	Johnson	2.9	323	230	1,778	664	1,778	0	8.5	1.5	13
22	3	Trinity	Kaufman	8.8	311	183	357	404	404	0	12.8	6.2	9
23	3	Trinity	Leon	11.6	77	0	37	50	50	0	8.5	6.6	6
24	3	Trinity	Liberty	33.1	3,412	2,373	8,323	6,506	8,323	1	77.1	16.4	34
25	3	Trinity	Limestone	1.8	18	8	26	17	26	0	2.6	1.6	4
26	3	Trinity	Madison	6.1	83	35	53	47	53	0	6.3	3.4	5
27	3	Trinity	Montague	2.1	7	0	1	3	3	0	2.4	1.3	2
28	3	Trinity	Navarro	13.8	329	241	250	384	384	1	23.6	9.2	15
29	3	Trinity	Parker	0.9	89	25	711	201	711	0	3.4	0.5	2
30	3	Trinity	Polk	9.7	693	533	581	1,096	1,096	0	18.9	2.7	11
31	3	Trinity	Rockwall	0.6	23	16	52	50	52	0	1	0.4	0
32	3	Trinity	San Jacinto	7.1	536	483	283	618	618	0	15.5	2.1	4
33	3	Trinity	Tarrant	20.8	10,533	9,039	43,207	37,945	43,207	4	204.4	4.4	152
34	3	Trinity	Trinity	7.1	187	144	115	196	196	0	4.9	1.2	3
35	3	Trinity	Van Zandt	3.2	84	42	17	63	63	0	5.6	2.3	6
36	3	Trinity	Walker	6.7	253	167	1,382	300	1,382	0	7.1	1.9	2
37	3	Trinity	Wise	4	59	52	28	86	86	0	2.7	2.6	8
38	3	Trinity	Young	0	0	0	0	0	0	0	0	0.0001	0
Total				**286**	**50,367**	**38,898**	**339,931**	**178,373**	**342,146**	**36**	**1,165.5**	**119.8**	**1,023**

ID	RFPG No.	RFPG Name	County	Possible Flood Prone Areas										Average SVI of features in floodplain or flood prone areas
				Area (sqmi)	Number of Structures in Flood Prone Area	Residential Structures in in Flood Prone Area	Population (daytime)	Population (nightime)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)	
1	3	Trinity	Anderson	0.03	0	0	0	0	0	0	0.03	0.02	0	0.39
2	3	Trinity	Archer	0	0	0	0	0	0	0	0	0	0	0.44
3	3	Trinity	Chambers	0	838	559	610	2,088	2,088	0	16.46	0.65	0	0.32
4	3	Trinity	Clay	0	0	0	0	0	0	0	0	0	0	0.21
5	3	Trinity	Collin	8.43	30	29	35	142	142	0	0.77	0.01	0	0.20
6	3	Trinity	Cooke	0.15	2	0	0	0	0	0	0	0.08	0	0.39
7	3	Trinity	Dallas	11.67	7,380	5,448	227,603	46,603	227,603	0	178.21	0.57	181	0.56
8	3	Trinity	Denton	0.05	1	0	553	0	553	0	0.04	0.01	0	0.26
9	3	Trinity	Ellis	0.25	1	0	1	2	2	0	0.37	0.18	1	0.41
10	3	Trinity	Fannin	0	0	0	0	0	0	0	0	0	0	0.33
11	3	Trinity	Freestone	0	0	0	0	0	0	0	0	0	0	0.56
12	3	Trinity	Grayson	0	0	0	0	0	0	0	0	0	0	0.27
13	3	Trinity	Grimes	0	0	0	0	0	0	0	0	0	0	0.46
14	3	Trinity	Hardin	0	0	0	0	0	0	0	0	0	0	-999
15	3	Trinity	Henderson	1.75	3	1	0	0	0	0	0.74	1.39	0	0.45
16	3	Trinity	Hill	0.29	4	3	2	7	7	0	0.36	0.21	0	0.64
17	3	Trinity	Hood	0	0	0	0	0	0	0	0	0	0	0.09
18	3	Trinity	Houston	0.19	0	0	0	0	0	0	0.03	0.16	0	0.45
19	3	Trinity	Hunt	0	0	0	0	0	0	0	0	0	0	0.39
20	3	Trinity	Jack	0.03	2	0	0	1	1	0	0.26	0.23	0	0.34
21	3	Trinity	Johnson	0	2	0	0	0	0	0	0.05	0.03	0	0.36
22	3	Trinity	Kaufman	1.27	110	92	64	202	202	0	2.53	0.93	0	0.46
23	3	Trinity	Leon	0.05	0	0	0	0	0	0	0	0.01	0	0.59
24	3	Trinity	Liberty	0.01	27	18	82	58	82	0	0.12	0	0	0.60
25	3	Trinity	Limestone	0.01	0	0	0	0	0	0	0	0.01	0	0.57
26	3	Trinity	Madison	0	0	0	0	0	0	0	0	0	0	0.43
27	3	Trinity	Montague	0.94	2	0	0	0	0	0	0.06	0.24	0	0.40
28	3	Trinity	Navarro	1.01	6	0	3	10	10	0	1.93	0.83	2	0.64
29	3	Trinity	Parker	0.05	0	0	0	0	0	0	0.03	0.02	0	0.25
30	3	Trinity	Polk	0	0	0	0	0	0	0	0	0	0	0.50
31	3	Trinity	Rockwall	0.06	0	0	0	0	0	0	0.04	0.06	0	0.15
32	3	Trinity	San Jacinto	0	0	0	0	0	0	0	0	0	0	0.52
33	3	Trinity	Tarrant	1.19	1,239	954	15,596	6,519	15,596	0	17.96	0.07	23	0.40
34	3	Trinity	Trinity	0	0	0	0	0	0	0	0	0	0	0.56
35	3	Trinity	Van Zandt	0	0	0	0	0	0	0	0	0	0	0.35
36	3	Trinity	Walker	0	0	0	0	0	0	0	0	0	0	0.39
37	3	Trinity	Wise	1.73	376	335	230	558	558	0	2.94	0.76	3	0.32
38	3	Trinity	Young	0	0	0	0	0	0	0	0	0	0	0.48
Total				**29**	**10,023**	**7,439**	**244,779**	**56,190**	**246,844**	**0**	**222.93**	**6.47**	**210**	

ID	RFPG No.	RFPG Name	County	Area in Flood Planning Region (sqmi)	1% Annual Chance Flood Risk									
					Area in Floodplain (sqmi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population (Day)	Population (Night)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)
1	3	Trinity	Anderson	578.4	143.4	192	76	58	112	112	4	30.1	44.1	78
2	3	Trinity	Archer	107.5	15.3	2	0	2	5	5	0	5.1	5.4	6
3	3	Trinity	Chambers	1417	86.2	2,155	1,138	1,525	3,777	3,777	0	54.6	7.6	29
4	3	Trinity	Clay	122.7	21.4	35	0	2	14	14	0	21.6	11.3	5
5	3	Trinity	Collin	830.6	152.8	4,042	3,112	28,891	13,029	28,891	54	158.1	44.1	518
6	3	Trinity	Cooke	605	87.1	1,699	1,024	4,290	2,339	4,290	32	72.5	38.7	188
7	3	Trinity	Dallas	905.2	245.4	46,300	34,393	573,935	198,248	573,935	387	1,219.70	53.6	1,962
8	3	Trinity	Denton	948.7	235	8,389	5,566	45,142	30,321	45,142	98	291.5	73.2	630
9	3	Trinity	Ellis	948	194.6	2,201	1,436	4,105	4,561	4,561	56	167.4	112.9	409
10	3	Trinity	Fannin	43.8	4.9	168	124	75	105	105	0	4.6	2.2	14
11	3	Trinity	Freestone	785.2	182.9	458	133	139	272	272	2	47	57.2	114
12	3	Trinity	Grayson	342.8	46.4	339	263	189	455	455	1	36.4	18.2	119
13	3	Trinity	Grimes	138.4	26	132	56	13	72	72	0	7.8	11.3	26
14	3	Trinity	Hardin	6.4	0	0	0	0	0	0	0	0	0	0
15	3	Trinity	Henderson	571.1	153.7	2,540	1,099	1,012	2,643	2,643	11	37.5	45.3	87
16	3	Trinity	Hill	320.6	44.2	71	35	95	47	95	0	17.7	27.6	86
17	3	Trinity	Hood	2.5	0.03	0	0	0	0	0	0	0	0.03	0
18	3	Trinity	Houston	813.9	184.7	563	266	288	503	503	17	51.6	102.4	102
19	3	Trinity	Hunt	29.5	4.3	15	10	1	6	6	0	2.3	2.1	8
20	3	Trinity	Jack	657.5	84	212	51	112	112	112	6	38.7	33.3	70
21	3	Trinity	Johnson	359.4	41.9	1,790	1,302	4,506	3,485	4,506	22	58.9	19.6	145
22	3	Trinity	Kaufman	763.8	220.1	1,635	939	2,314	2,117	2,314	16	98.8	115.6	279
23	3	Trinity	Leon	807.3	176.3	485	7	248	279	279	5	49.6	79.8	108
24	3	Trinity	Liberty	650.4	326.7	8,179	5,196	10,966	11,405	11,405	5	234.5	77.5	111
25	3	Trinity	Limestone	95.8	17.7	50	15	41	46	46	3	9.3	12.9	32
26	3	Trinity	Madison	400.5	104.3	412	146	420	341	420	1	36.5	54.1	66
27	3	Trinity	Montague	404	33.2	357	159	55	232	232	0	21.2	16.1	44
28	3	Trinity	Navarro	1081.6	292.8	1,708	785	2,571	2,014	2,571	62	134.3	126.4	247
29	3	Trinity	Parker	473.5	40.4	1,253	415	3,011	1,848	3,011	19	42.5	21.8	140
30	3	Trinity	Polk	570.7	149	4,835	3,070	3,513	6,124	6,124	3	76.4	23.4	109
31	3	Trinity	Rockwall	115.8	32.6	508	322	901	1,097	1,097	15	27.2	6	56
32	3	Trinity	San Jacinto	307.5	120.5	3,237	2,642	1,918	3,15	3,15	0	80.6	17.7	37
33	3	Trinity	Tarrant	900.6	15.2	25,750	19,952	120,182	82,857	120,182	345	636.2	31.2	1,290
34	3	Trinity	Trinity	368.3	83.7	1,489	1,019	1,039	1,865	1,865	1	30.1	11	35
35	3	Trinity	Van Zandt	220.4	40.3	340	166	121	258	258	2	24.9	22.7	65
36	3	Trinity	Walker	403	109.4	1,651	1,175	5,036	2,909	5,036	5	43.6	41.4	52
37	3	Trinity	Wise	919.8	125.9	1,800	1,083	1,779	2,090	2,090	6	68.7	65.9	183
38	3	Trinity	Young	111.6	9.6	11	2	0	0	0	0	5.7	3.7	8
Total				**19,128.8**	**3,852**	**125,003**	**87,177**	**818,495**	**375,588**	**826,426**	**1,178**	**3,943**	**1,437.3**	**7,458**

ID	RFPG No.	RFPG Name	County	0.2% Annual Chance Flood Risk									
				Area in Floodplain (sqmi)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population (Day)	Population (Night)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)
1	3	Trinity	Anderson	8.4	134	63	55	106	106	0	12.9	2.1	16
2	3	Trinity	Archer	1.5	3	0	0	0	0	0	2.3	0.8	0
3	3	Trinity	Chambers	2.8	848	458	1,062	1,569	1,569	0	14.3	0.7	3
4	3	Trinity	Clay	6.7	46	4	5	26	26	0	14.1	4.5	4
5	3	Trinity	Collin	14.3	6,661	5,883	41,287	30,790	41,287	4	76.9	5.3	216
6	3	Trinity	Cooke	6.7	884	630	3,338	1,710	3,338	0	11.5	4	10
7	3	Trinity	Dallas	15.1	19,734	16,665	178,631	110,524	178,631	28	113.4	1.8	402
8	3	Trinity	Denton	15	6,537	5,300	35,486	24,327	35,486	2	61	7.6	119
9	3	Trinity	Ellis	13.8	1,608	1,193	4,793	4,052	4,793	0	43	8.4	47
10	3	Trinity	Fannin	1	150	109	131	164	164	0	4.8	0.6	7
11	3	Trinity	Freestone	10.4	364	217	275	495	495	0	17.7	4.1	14
12	3	Trinity	Grayson	5.3	244	218	143	421	421	0	12.1	3	15
13	3	Trinity	Grimes	2.7	67	33	11	56	56	0	3.9	1.5	6
14	3	Trinity	Hardin	0.01	0	0	0	0	0	0	0.01	0.0001	0
15	3	Trinity	Henderson	9.6	2,515	1,978	1,892	5,070	5,070	1	15.4	3.4	18
16	3	Trinity	Hill	5.7	69	33	101	54	101	0	18.9	3.9	23
17	3	Trinity	Hood	0.01	0	0	0	0	0	0	0	0.01	0
18	3	Trinity	Houston	10.9	359	219	287	408	408	0	16.7	4	19
19	3	Trinity	Hunt	0.6	18	13	1	13	13	0	1.7	0.4	0
20	3	Trinity	Jack	11	159	45	115	137	137	0	19.6	5	15
21	3	Trinity	Johnson	5.9	1,350	970	5,263	3,066	5,263	0	22	3.2	17
22	3	Trinity	Kaufman	10.5	1,098	754	3,235	2,020	3,235	1	45.4	6.7	48
23	3	Trinity	Leon	9.9	282	1	547	265	547	1	19.4	3.7	20
24	3	Trinity	Liberty	7.8	970	616	2,482	2,243	2,482	0	36.4	3	9
25	3	Trinity	Limestone	1.6	40	14	65	62	65	1	5.1	1.3	2
26	3	Trinity	Madison	5.3	169	87	185	135	185	1	13.6	3.1	14
27	3	Trinity	Montague	4.6	172	86	48	149	149	0	8.4	2.3	9
28	3	Trinity	Navarro	16.6	1,002	775	2,344	1,841	2,344	1	43.9	10.2	43
29	3	Trinity	Parker	6	965	459	2,920	1,903	2,920	0	11.9	3.2	8
30	3	Trinity	Polk	8.7	1,736	1,503	1,729	3,095	3,095	0	17.6	1	19
31	3	Trinity	Rockwall	2.4	695	596	1,673	2,109	2,109	2	9.7	1.2	10
32	3	Trinity	San Jacinto	4.5	1,072	998	1,145	1,363	1,363	0	13.6	0.5	5
33	3	Trinity	Tarrant	17.9	21,830	19,016	108,809	91,344	108,809	9	127.9	4.1	257
34	3	Trinity	Trinity	5.9	398	302	332	538	538	0	7	0.8	9
35	3	Trinity	Van Zandt	5.1	331	175	1,112	291	1,112	0	18.2	3.4	10
36	3	Trinity	Walker	6.6	536	369	4,844	1,854	4,844	0	7.4	1.4	6
37	3	Trinity	Wise	11.9	857	627	1,087	1,351	1,351	0	17.1	6.5	22
38	3	Trinity	Young	1.7	4	1	0	2	2	0	1.3	0.8	1
Total				**274**	**73,907**	**60,410**	**405,433**	**293,553**	**412,514**	**51**	**886**	**117.5**	**1,443**

ID	RFPG No.	RFPG Name	County	Possible Flood Prone Areas										Average SVI of features in floodplain or flood prone areas
				Area (sqmi)	Number of Structures in Flood Prone Area	Residential Structures in in Flood Prone Area	Population (Day)	Population (Night)	Population (Highest)	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sqmi)	Critical Facilities (#)	
1	3	Trinity	Anderson	0.03	0	0	0	0	0	0	0.03	0.02	0	0.39
2	3	Trinity	Archer	0	0	0	0	0	0	0	0	0	0	0.44
3	3	Trinity	Chambers	0	838	559	610	2,088	2,088	0	16.46	0.65	0	0.32
4	3	Trinity	Clay	0	0	0	0	0	0	0	0	0	0	0.21
5	3	Trinity	Collin	8.43	30	29	35	142	142	0	0.77	0.01	0	0.20
6	3	Trinity	Cooke	0.15	2	0	0	0	0	0	0	0.08	0	0.39
7	3	Trinity	Dallas	11.67	7,380	5,448	227,603	46,603	227,603	0	178.21	0.57	181	0.56
8	3	Trinity	Denton	0.05	1	0	553	0	553	0	0.04	0.01	0	0.26
9	3	Trinity	Ellis	0.25	1	0	1	2	2	0	0.37	0.18	1	0.41
10	3	Trinity	Fannin	0	0	0	0	0	0	0	0	0	0	0.33
11	3	Trinity	Freestone	0	0	0	0	0	0	0	0	0	0	0.56
12	3	Trinity	Grayson	0	0	0	0	0	0	0	0	0	0	0.27
13	3	Trinity	Grimes	0	0	0	0	0	0	0	0	0	0	0.46
14	3	Trinity	Hardin	0	0	0	0	0	0	0	0	0	0	-999
15	3	Trinity	Henderson	1.75	3	1	0	0	0	0	0.74	1.39	0	0.45
16	3	Trinity	Hill	0.29	4	3	2	7	7	0	0.36	0.21	0	0.64
17	3	Trinity	Hood	0	0	0	0	0	0	0	0	0	0	0.09
18	3	Trinity	Houston	0.19	0	0	0	0	0	0	0.03	0.16	0	0.45
19	3	Trinity	Hunt	0	0	0	0	0	0	0	0	0	0	0.39
20	3	Trinity	Jack	0.03	2	0	0	1	1	0	0.26	0.23	0	0.34
21	3	Trinity	Johnson	0	2	0	0	0	0	0	0.05	0.03	0	0.36
22	3	Trinity	Kaufman	1.27	110	92	64	202	202	0	2.53	0.93	0	0.46
23	3	Trinity	Leon	0.05	0	0	0	0	0	0	0	0.01	0	0.59
24	3	Trinity	Liberty	0.01	27	18	82	58	82	0	0.12	0	0	0.60
25	3	Trinity	Limestone	0.01	0	0	0	0	0	0	0	0.01	0	0.57
26	3	Trinity	Madison	0	0	0	0	0	0	0	0	0	0	0.43
27	3	Trinity	Montague	0.94	2	0	0	0	0	0	0.06	0.24	0	0.40
28	3	Trinity	Navarro	1.01	6	0	3	10	10	0	1.93	0.83	2	0.64
29	3	Trinity	Parker	0.05	0	0	0	0	0	0	0.03	0.02	0	0.25
30	3	Trinity	Polk	0	0	0	0	0	0	0	0	0	0	0.50
31	3	Trinity	Rockwall	0.06	0	0	0	0	0	0	0.04	0.06	0	0.15
32	3	Trinity	San Jacinto	0	0	0	0	0	0	0	0	0	0	0.52
33	3	Trinity	Tarrant	1.19	1,239	954	15,596	6,519	15,596	0	17.96	0.07	23	0.40
34	3	Trinity	Trinity	0	0	0	0	0	0	0	0	0	0	0.56
35	3	Trinity	Van Zandt	0	0	0	0	0	0	0	0	0	0	0.35
36	3	Trinity	Walker	0	0	0	0	0	0	0	0	0	0	0.39
37	3	Trinity	Wise	1.73	376	335	230	558	558	0	2.94	0.76	3	0.32
38	3	Trinity	Young	0	0	0	0	0	0	0	0	0	0	0.48
Total				**29**	**10,023**	**7,439**	**244,779**	**56,190**	**246,844**	**0**	**223**	**6.47**	**210**	

Attachment 3

Task 4C.1e – Figure 11- Available Models for Potential FMSs and FMPs Development.

Attachment 4

Task 4C – Geodatabase

This March 7, 2022 Technical Memorandum Addendum submittal for the Trinity Basin incudes the follwoing geodatabases named:

- 03_RFP_GIS_Data_03072022.gdb,
- 03_RFP_Model_Locations_03072022.gdb
- 03_RFP_OthrFldProne_Areas_03072022.gdb
- 03_RFP_ExhibitC_Table3_5.xlsx

The geodatabases are populated with the layers and tables below:

Item Name	Description	Feature Class Name	Data Format Polygon/Line/ Point/GDB Table
Existing Flood Hazard	Perform existing condition flood hazard analyses to determine the location and magnitude of both 1.0% annual chance and 0.2% annual chance flood events	ExFldHazard	Polygon
Flood Mapping Gaps	Gaps in inundation boundary mapping	Fld_Map_Gaps	Polygon
Existing Exposure	Gaps in inundation boundary mapping Develop high-level, region-wide, and largely GIS-based existing condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	ExFldExpPol	Polygon
	Develop high-level, region-wide, and largely GIS-based existing condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	ExFldExpLn	Polyline
	Develop high-level, region-wide, and largely GIS-based existing condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	ExFldExpPt	Point
	Combines the Exposure Poly, Line, and Point data into a single master layer, also includes Vulnerability data	ExFldExpAll	Point

Item Name	Description	Feature Class Name	Data Format Polygon/Line/ Point/GDB Table
Future Flood Hazard	Perform future condition flood hazard analyses to determine the location and magnitude of both 1.0% annual chance and 0.2% annual chance flood events	FutFldHazard	Polygon
Future Exposure	Perform future condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	FutFldExpPol	Polygon
	Perform future condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	FutFldExpLn	Polyline
	Perform future condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events	FutFldExpPt	Point
	Combines the Exposure Poly, Line, and Point data into a single master layer, also includes Vulnerability data	FutFldExpAll	Point

Technical Memorandum Update

- Dec 17: TWDB provided checklist
- Jan 6: Consultant team submitted Tech Memo to TWDB
- Jan 26: TWDB notified RFPG
  - Tech Memo administratively complete
  - TWDB to provide informal comments for consideration in draft plan
  - Permission to begin Task 5

Tech Memo Addendum (Task 4C)

- Tech Memo Addendum
  - Explanation of each attachment
  - Attachments
    - Potential Future Flood Risk Methodology Memo
    - Tables and maps (existing and potential future conditions)
      - TWDB-required Table 3 Existing Conditions Flood Risk Summary
      - TWDB-required Table 5 Future Conditions Flood Risk Summary
      - Data sources
      - Flood hazard maps

Schedule

Jan 28, 2022: Preliminary Draft Tech Memo Addendum sent to RFPG

Feb 11: Draft Tech Memo Addendum posted to website and distributed for public review via email

Today: RFPG considers approval of Tech Memo Addendum

March 7: Tech Memo Addendum due to TWDB

Tech Memo Addendum (Task 4C)

- Tech Memo Addendum
  - Attachments (continued)
    - Tables and maps (continued)
      - Flood hazard data gaps and additional flood prone areas maps
      - Flood exposure maps
      - Vulnerability and critical infrastructure maps
      - Extent of increase in flood hazard
    - Available H&H models for potential FMSs and FMPs development
    - Associated geodatabase

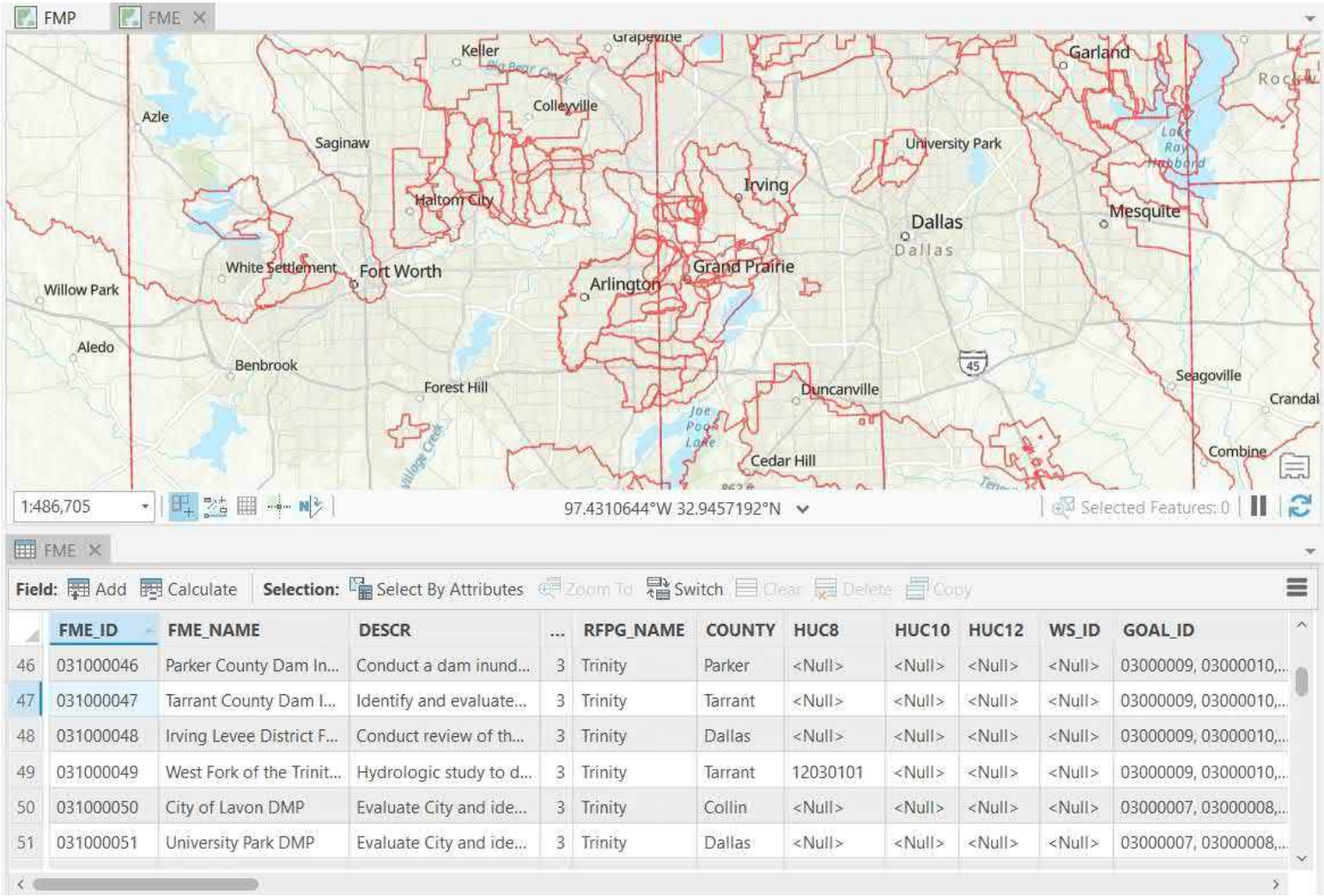
Tech Memo Addendum points to remember:

1. Snapshot in time
2. Progress to date
3. Incorporates Fathom data
4. Will continue to be refined

Consider approval of Technical Memorandum Addendum

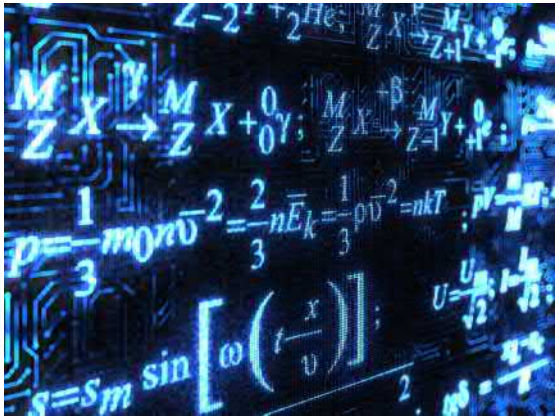
Task 4B Full Analysis Components

Task 4B Review



	FME_ID	FME_NAME	DESCR	...	RFPG_NAME	COUNTY	HUC8	HUC10	HUC12	WS_ID	GOAL_ID
46	031000046	Parker County Dam In...	Conduct a dam inund...	3	Trinity	Parker	<Null>	<Null>	<Null>	<Null>	03000009, 03000010,...
47	031000047	Tarrant County Dam I...	Identify and evaluate...	3	Trinity	Tarrant	<Null>	<Null>	<Null>	<Null>	03000009, 03000010,...
48	031000048	Irving Levee District F...	Conduct review of th...	3	Trinity	Dallas	<Null>	<Null>	<Null>	<Null>	03000009, 03000010,...
49	031000049	West Fork of the Trinit...	Hydrologic study to d...	3	Trinity	Tarrant	12030101	<Null>	<Null>	<Null>	03000009, 03000010,...
50	031000050	City of Lavon DMP	Evaluate City and ide...	3	Trinity	Collin	<Null>	<Null>	<Null>	<Null>	03000007, 03000008,...
51	031000051	University Park DMP	Evaluate City and ide...	3	Trinity	Dallas	<Null>	<Null>	<Null>	<Null>	03000007, 03000008,...

Planning Level Cost Estimates



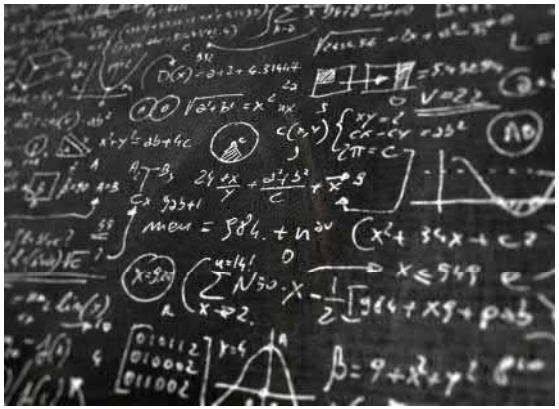


Table 22: Potential costs generally associated with FMSs, FMPs, and FMEs [A]

			FMS	FMP	FME
Non-recurring	Study costs and other (non-capital costs)	Non-engineering studies: (e.g., floodplain regulation development; flood authority or revenue raising studies; public awareness program)	x	x	x
		Engineering/technical/feasibility studies: (e.g. Hydrologic & hydraulic modeling/mapping; identification of potential flood risk reduction solutions; BCA and alternative analyses; project design; construction engineering)		x	x
		Surveying; geotechnical; testing		x	x
	Total study costs		x	x	x
	Construction-related (capital costs)	Design and Permitting		x	
	Construction-related (capital costs)	Environmental; archaeological & historical resources		x	
		Temporary and/or permanent easements; land acquisition		x	
		Mitigation; utility relocation		x	
		Legal assistance; fiscal services & costs (bond counsel); outreach		x	
		Direct construction costs of components/facilities		x	
		Buyouts; property elevations		x	
		Interest during construction		x	
		Project management (by engineer)		x	
		Inspection; pilot testing; warranty; manuals		x	
		(other special services or relevant costs)		x	
		Contingency(s)		x	
	Total construction costs			x	
TOTAL PROJECT COSTS [B]			x	x	x
Recurring		Debt service [interest rate & term (years)]		x	
		Operation & Maintenance		x	
		Other (i.e., public awareness campaign)	x		
TOTAL ANNUAL RECURRING COSTS			x	x	

Planning Level Cost Estimates - Templates

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
MANAGEMENT					
1	Project Management and Meetings	1	LS	$ -	$ -
DISCOVERY DATA CAPTURE					
2	Data Collection	0	HUC 8	$ 15,000.00	$ -
3	Data Collection QA/QC	0	LS	$ -	$ -
4	Event Data Capture	0	LS	$ -	$ -
SURVEY DATA CAPTURE					
5	Survey Data Collection	1	LS	$ -	$ -
6	Survey Data Collection QA/QC	1	LS	$ -	$ -
TOPOGRAPHIC: EXISING TOPOGRAPHIC DATA CAPTURE					
7	Processing Existing LiDAR	1	SQ MI	$ 27.00	$ 27.00
8	Processing Existing LiDAR QA/QC (internal processing)	0	STUDY	$ 2,500.00	$ -
ALLUVIAL FAN DATA CAPTURE					
9	High Alluvial Fan Analysis (low)	1	SQ MI	$ 3,000.00	$ 3,000.00
10	High Alluvial Fan Analysis (medium)	0	SQ MI	$ 6,250.00	$ -
11	High Alluvial Fan Analysis (high)	0	SQ MI	$ 9,500.00	$ -
12	High Alluvial Fan Analysis QA/QC	0	0	$ -	$ -
HYDROLOGIC DATA CAPTURE					
13	Rainfall-Runoff Analyses (low)	0	RV MI	$ 1,200.00	$ -
14	Rainfall-Runoff Analyses (medium)	0	RV MI	$ 2,000.00	$ -
15	Rainfall-Runoff Analyses (high)	0	RV MI	$ 2,800.00	$ -
16	Rainfall-Runoff Analyses QA/QC	1	LS	$ -	$ -
HYDRAULICS DATA CAPTURE					
17	Detailed Study (low)	0	RV MI	$ 2,500.00	$ -
18	Detailed Study (medium)	0	RV MI	$ 3,500.00	$ -
19	Detailed Study (high)	0	RV MI	$ 4,750.00	$ -
20	Floodplain Mapping (low detail)	0	RV MI	$ 65.00	$ -
21	Floodplain Mapping (medium detail)	0	RV MI	$ 100.00	$ -
22	Floodplain Mapping (high detail)	0	RV MI	$ 150.00	$ -
23	Riverine Workmaps	0	PANEL	$ 200.00	$ -
24	QA/QC	1	LS	$ -	$ -
COASTAL DATA CAPTURE					
25	Floodplain Mapping of Coastal	0	CO MI	$ 3,000.00	$ -
26	QA/QC	1	LS	$ -	$ -
FLOODPLAIN MAPPING DATA CAPTURE					
27	Redelineation (low)	0	RV MI	$ 200.00	$ -
28	Redelineation (medium)	0	RV MI	$ 350.00	$ -
29	Redelineation (high)	0	RV MI	$ 550.00	$ -
30	Redelineation QA/QC	0	RV MI	$ 80.00	$ -

FMP: No Negative Impact

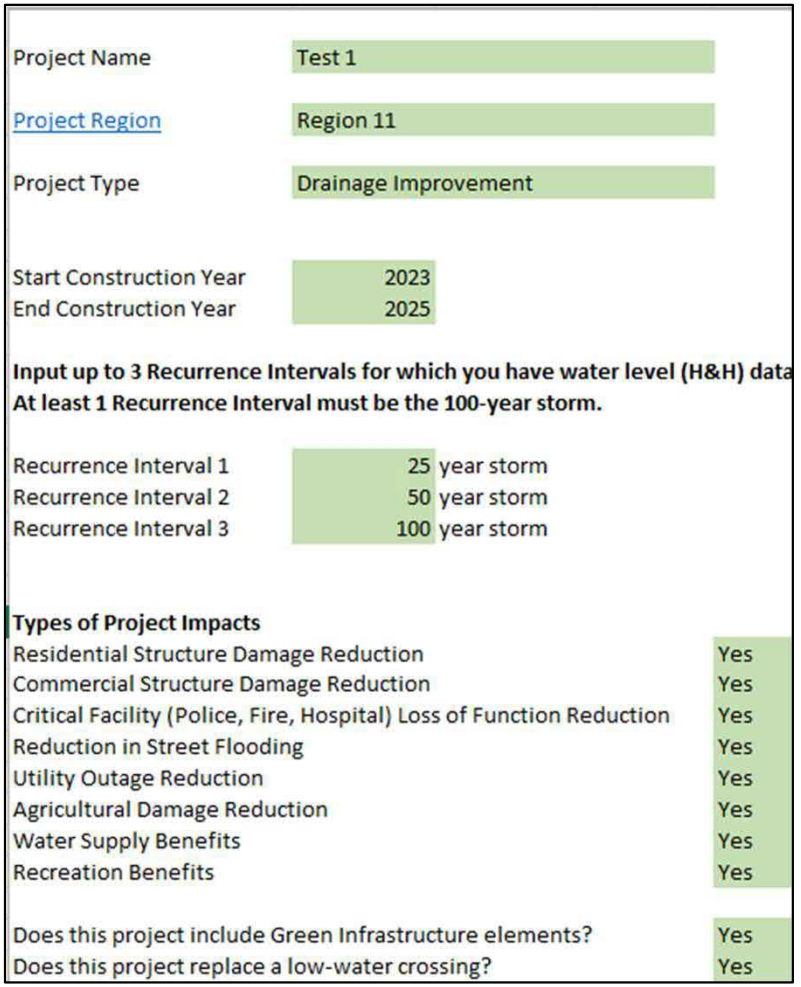
- Supporting Engineering Report should include:
  - Description of the Analysis
  - Description of the Proposed Improvements
  - Impacts of the Proposed Improvements
  - Description of Mitigation Measures
  - **No Negative Impact Certification**

- Evaluating reports and models submitted for existing Impact Analyses already completed

FMP: Benefit-Cost Analysis

- TWDB benefit BCR input interface and analysis tool works alongside FEMA's BCA Toolkit 6.0

- Uses the data calculated in Table 13 and formats it for the FEMA BCA Toolkit 6.0



Project Name	Test 1	
Project Region	Region 11	
Project Type	Drainage Improvement	
Start Construction Year	2023	
End Construction Year	2025	

Input up to 3 Recurrence Intervals for which you have water level (H&H) data
At least 1 Recurrence Interval must be the 100-year storm.

Recurrence Interval 1	25	year storm
Recurrence Interval 2	50	year storm
Recurrence Interval 3	100	year storm

Types of Project Impacts	
Residential Structure Damage Reduction	Yes
Commercial Structure Damage Reduction	Yes
Critical Facility (Police, Fire, Hospital) Loss of Function Reduction	Yes
Reduction in Street Flooding	Yes
Utility Outage Reduction	Yes
Agricultural Damage Reduction	Yes
Water Supply Benefits	Yes
Recreation Benefits	Yes
Does this project include Green Infrastructure elements?	Yes
Does this project replace a low-water crossing?	Yes

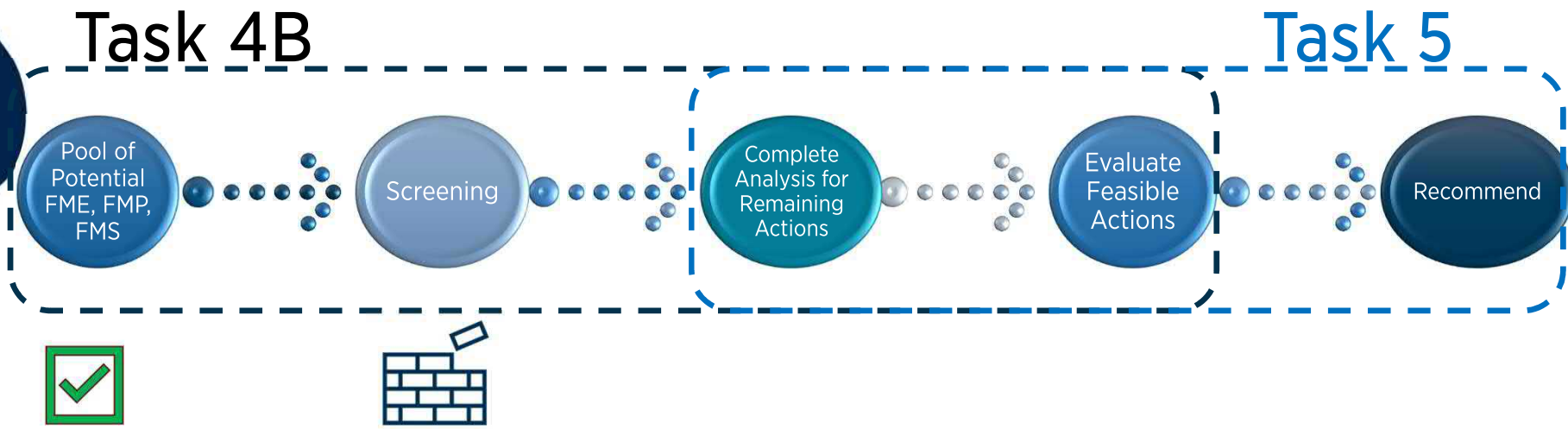
Ch. 5 Recommendation of FMEs, FMSs, and FMPs

Task 4B & 5 Interdependency

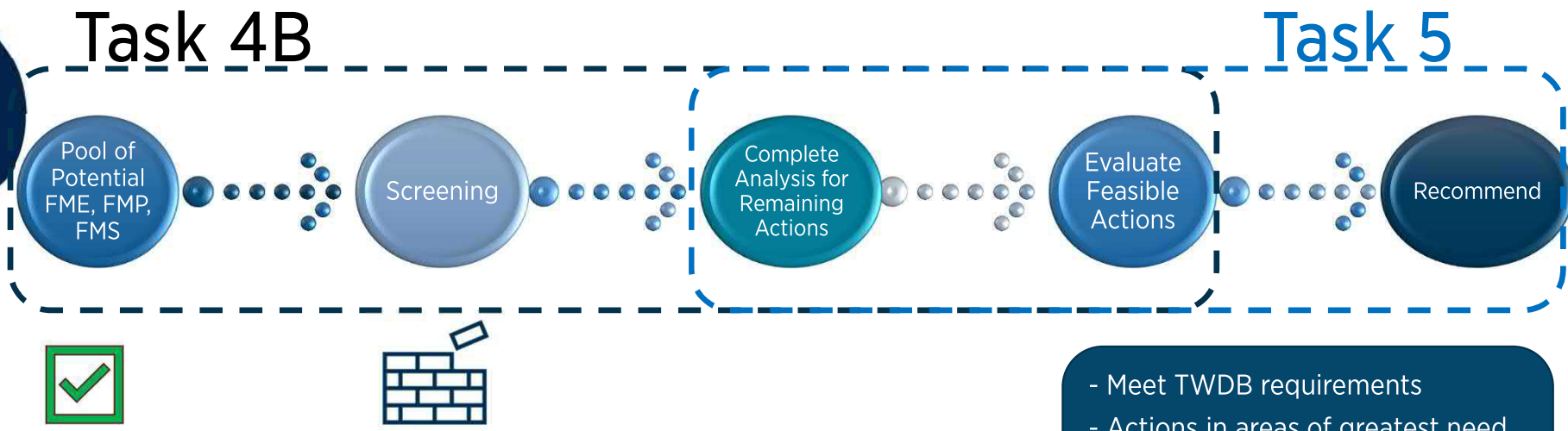
- Data Gathering
- Analysis

- Decision-making process

Task 4B & 5 General Strategy



Task 4B & 5 General Strategy



- Meet TWDB requirements
- Actions in areas of greatest need
- Actions with highest flood risk indicators and potential for benefit
- Sponsor support

Process for Recommending FMEs

Screening

"Not every conceivable FME will be recommended. The RFPG and technical consultant must decide which identified potential FME will be recommended."

1. Goals

- Remove FMEs that do not support a goal.

2. Contact Sponsors

- Verify if study has been completed.
- Verify interest in potential FME.
- Request additional data to refine FME Areas.
- Remove FMEs that have been completed or Sponsor is not interested.

3. Analysis

- Refine FME areas as needed.
- Populate Flood Risk Indicators.
- Calculate cost for FME.
- Propose FMEs, as needed, in areas of greatest need (Use Task 4A results).

Complete Analysis for Remaining Actions

Process for Recommending FMEs

Screening

"Not every conceivable FME will be recommended. The RFPG and technical consultant must decide which identified potential FME will be recommended."

1. Goals

- Remove FMEs that do not support a goal.

2. Contact Sponsors

- Verify if study has been completed.
- Verify interest in potential FME.
- Request additional data to refine FME Areas.
- Remove FMEs that have been completed or Sponsor is not interested.

3. Analysis

- Refine FME areas as needed.
- Populate Flood Risk Indicators.
- Calculate cost for FME.
- Propose FMEs, as needed, in areas of greatest need (Use Task 4A results).

Complete Analysis for Remaining Actions

Flood Risk Indicators (100-yr Flood)

- Structures
- Population
- Critical facilities
- Low water crossings
- Farm and ranch land
- Roads

Process for Recommending FMEs

Evaluate Feasible Actions

"Recommend FMEs that the RFPG determines are most likely to result in identification of potentially feasible FMSs and FMPs"

4. Evaluate

- Quantifiable results to ID FMEs with the most complete information and/or could result in the greatest benefits.
- Identify FMEs that have real potential to develop into FMP for the next cycle.
- Identify FMEs that could be promoted to FMP *(RFPG to decide whether FMEs will be performed during this planning cycle as part of Task 12).*
- Evaluate new proposed FMEs from Step 3 (Use Task 4A results).

5. Goals

- Review selected FMEs to verify if they cover all short-term goals.
- Develop additional FMEs as needed to cover missing short-term goal.
- Identify Sponsors for additional FMEs and obtain their commitment.

Recommend

6. Recommend

- **Final FME Recommendations.**

Process for Recommending FMPs

Screening

"The RFPGs will recommend specific FMPs in the regional flood plan. The primary function of each recommended FMP must be flood risk reduction and they must include quantifiable flood risk reduction benefits."

1. Goals

- Remove FMPs that do not support a goal.

2. Unfeasible

- **Focuses on addressing response and recovery rather than mitigation.**
- **Does not provide flood mitigation for the 100-yr flood event *(may still be recommended if RFPG desires)***
- **FMP is dependent on another action that was classified as unfeasible.**

3. Contact Sponsors

- Verify if project has been completed/already funded.
- Verify interest in potential FMP and request commitment to sponsor it.
- Request additional data to refine FMP Areas.
- Remove FMPs that have been completed or Sponsor is not interested.

Process for Recommending FMPs

Screening

"The RFPGs will recommend specific FMPs in the regional flood plan. The primary function of each recommended FMP must be flood risk reduction and they must include quantifiable flood risk reduction benefits."

4. Initial Analysis

- Refine FMP areas as needed.
- Populate Flood Risk Indicators.
- Reduction in Flood Risk
- Calculate costs (consider age of cost estimate)

5. Evaluate

- RFPG Sub-committee determines which FMPs to perform full analysis.

6. Full Analysis

- Negative Impacts Determination
- Benefit-Cost Analysis

Complete Analysis for Remaining Actions

Process for Recommending FMPs

"The RFPGs will recommend specific FMPs in the regional flood plan. The primary function of each recommended FMP must be flood risk reduction and they must include quantifiable flood risk reduction benefits."

Evaluate Feasible Actions

Recommend

7. Unfeasible

- Causes adverse impacts
- Duplicates benefits
- Overallocation of water supply source
- FMP is dependent on another action that was classified as unfeasible
- Does not result in quantifiable flood risk reduction benefits
- Implementation issues
- Known opposition

8. Demote

- Determine if there are any FMPs that need to be demoted to FME.

9. Evaluate

- Quantifiable results to ID FMPs with the most complete information and/or could result in the greatest benefits.
- Identify FMPs located in areas of greatest need (Use Task 4A results).

10. Recommend

- Final FMP Recommendations.

Task 5 and Sub-Committee Meeting Schedule

Feb/10/2022

- 1st Sub Committee Meeting
- Present Task 5 Approach and obtain feedback

Mar/15-17/2022

- 2nd Sub Committee Meeting
- TC presents Screening and Initial Analysis results
- Evaluate FMEs and FMPs

Apr/4-6/2022

- 3rd Sub Committee Meeting
- TC presents Full Analysis for FMPs
- Evaluate FMPs

Apr/19/2022

- TC completes development of additional FMEs

Apr/20-22/2022

- 4th Sub Committee Meeting
- Final Recommendations

May/12/2022

- TC submits Chapter 5 Draft to RFPG for review

Ch. 6 Impacts of Regional Flood Plan

Task 6A – Impacts of Regional Flood Plan

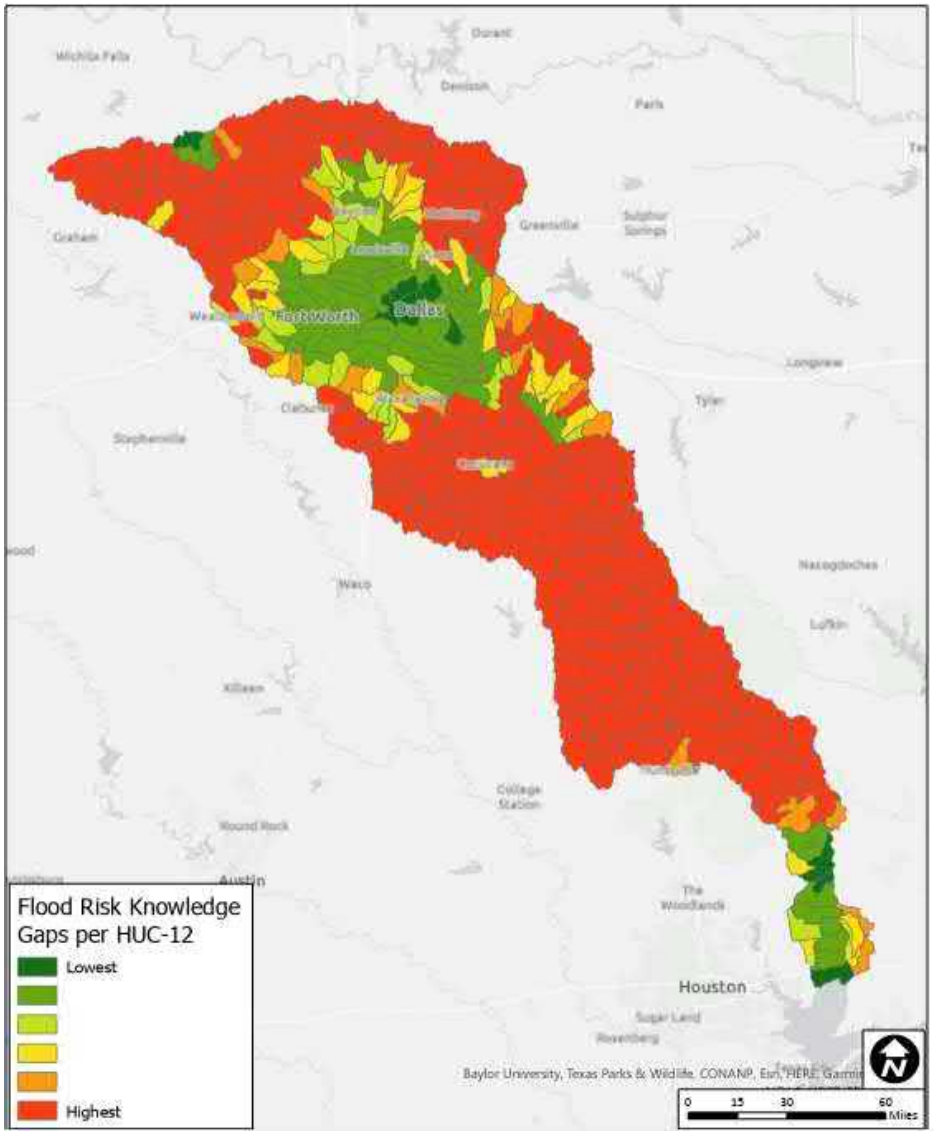
- Show impacts of implementing entirety of Trinity RFP in terms of the relative reduction in flood risk for the 100-yr and 500-yr storm events

Existing Conditions 100-yr Floodplain

100-yr Floodplain after FMP implementation (new detention pond)

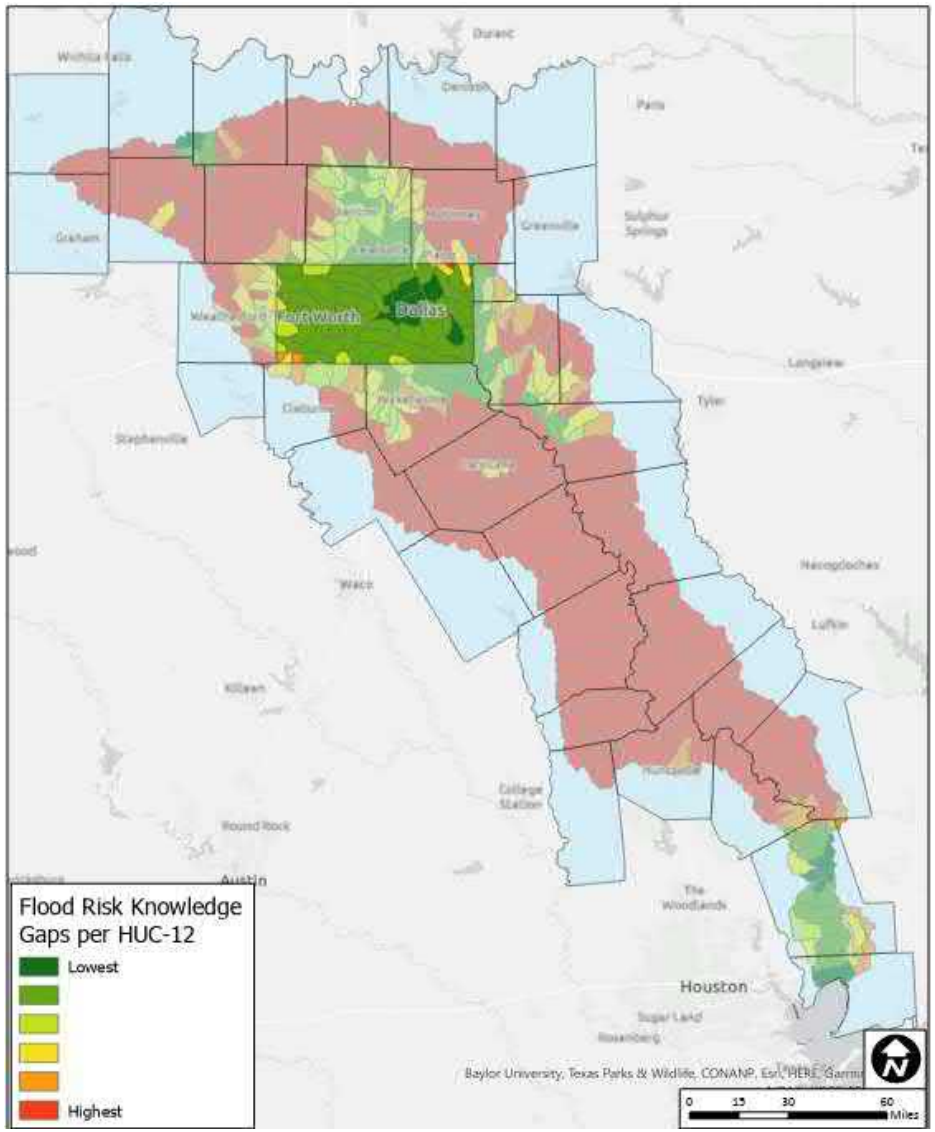
Task 6A – Impacts of Regional Flood Plan

- Total area in need of flood risk identification vs total area to be evaluated by recommended FMEs
- Example – Areas without proper mapping



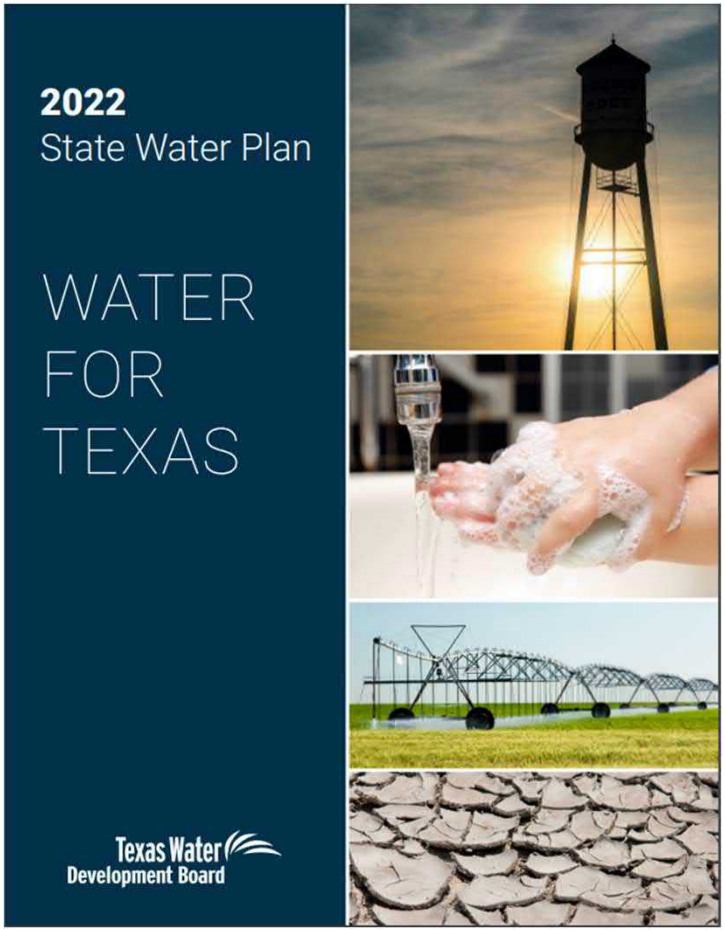
Task 6A – Impacts of Regional Flood Plan

- Total area in need of flood risk identification vs total area to be evaluated by recommended FMEs
- Example – Areas without proper mapping
- Mapping FMEs are currently listed for most Counties in the Trinity Basin



Task 6B Overview

- Flood planning process was established by the state legislature.
- Process was modeled after the Water Planning process.



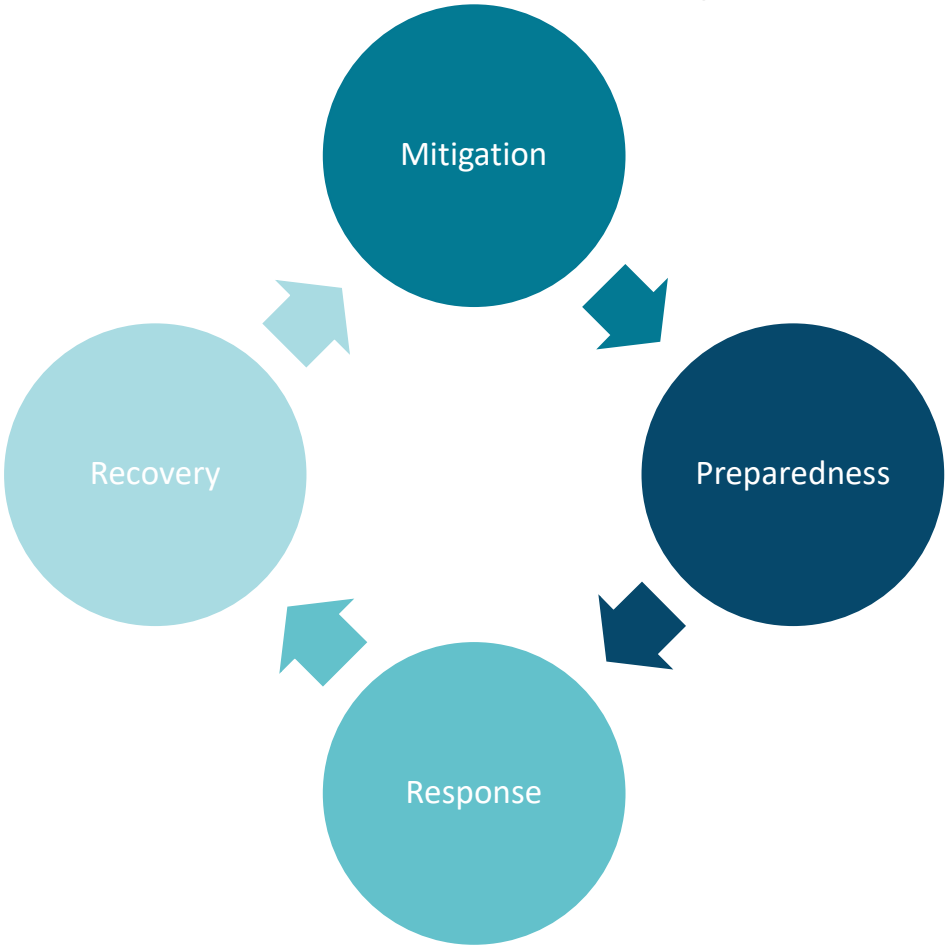
Task 6B – Contributions/Impacts on State Water Plan

Analyze impacts of State Flood Plan on State Water Plan

- RFP contribution to water supply development
- Positive or negative impacts to:
  - Water supply
  - Water availability
- RWPA
  - **Region C**
  - **Region H**
  - **East Texas**
  - Region B
  - Brazos G
  - North East Texas

Ch. 7 Flood Response Information and Activities

Four Phases of Emergency Management



A list of entities involved

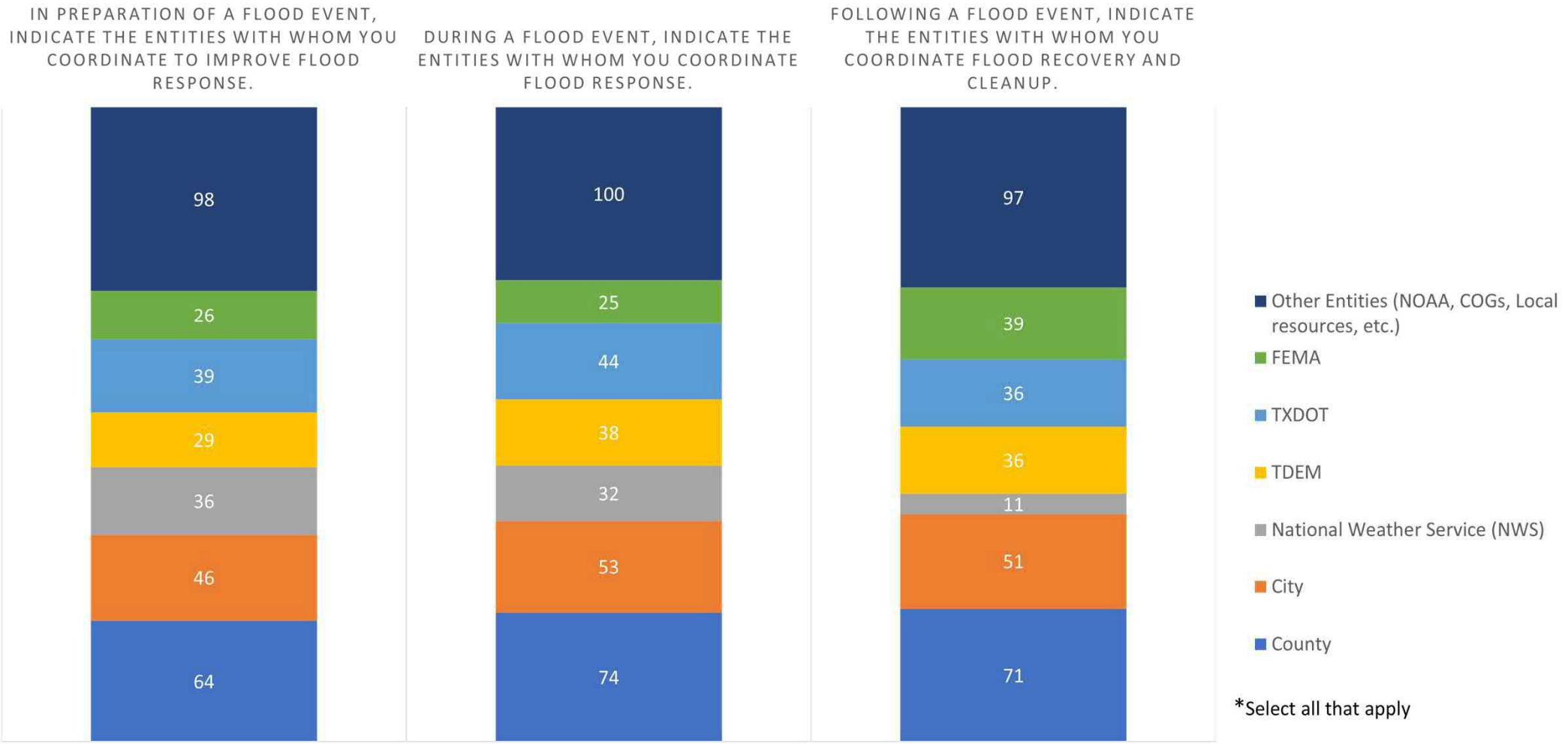
A summary of the roles and responsibilities of the various entities

Actions taken or planned for recovery from past flood disasters in the region

Entities Involved

Ag Extension Agents	City	County	Councils of Governments
TWDB	FEMA	Flood control district	Local dam owner/operator
Local levee owner/operator	National Weather Service (NWS)	NOAA	River Authority or District
River Forecast Center	TDEM	TxDOT	USACE

FLOOD EVENT ENTITIES SURVEY RESULTS BY PERCENTAGES



*Select all that apply

Plans to Consider

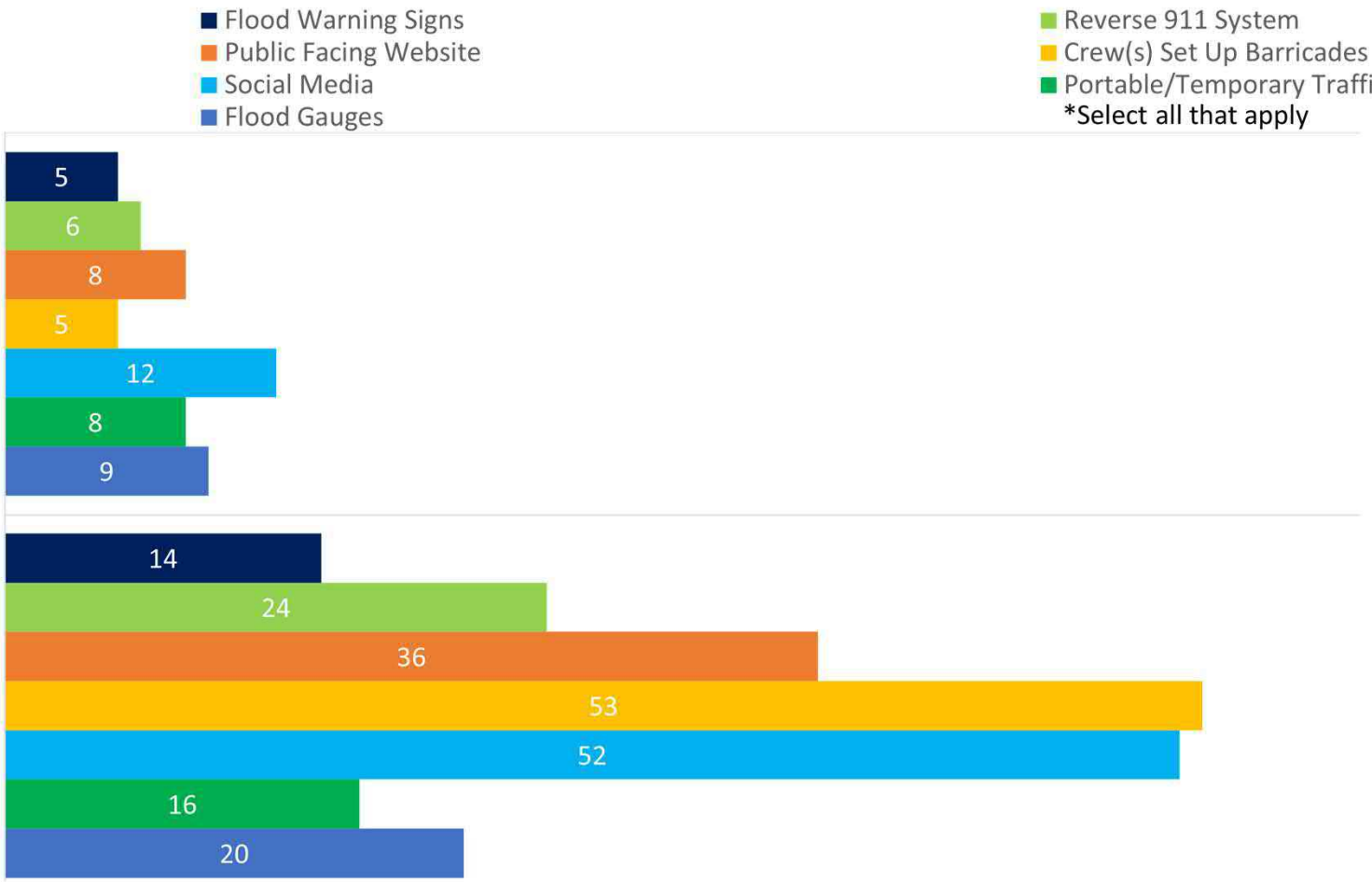
- Hazard Mitigation Action Plans
- Drainage Criteria Manual/Design Manuals
- Land Use Regulations
- Ordinances (Floodplain, Drainage, Stormwater, etc)
- Unified Development (UDC) and/or Zoning Ordinance

Actions Taken or Planned

Types of Mitigation Actions from Hazard Mitigation Action Plans

- Buyout/Acquisition/Elevation
- Drainage Control & Maintenance
- Education & Awareness for Citizens
- Equipment Procurement for Response
- Erosion Control Measures
- Flood Insurance Education
- Flood Study/Assessment
- Infrastructure Improvement
- Installation/Procurement of Generators
- Natural Planning Improvement
- Outreach and Community Engagement
- Technology Improvement
- Urban Planning and Maintenance

FLOOD RESPONSE SURVEY RESULTS BY PERCENTAGES



SELECT THE FLOOD RESPONSE MEASURES YOUR JURISDICTION PLANS TO IMPLEMENT AS CHANGES OR ADDITIONS TO THE EMERGENCY RESPONSE SYSTEM OVER THE NEXT FIVE YEARS.

SELECT THE FLOOD RESPONSE MEASURES YOUR JURISDICTION CURRENTLY USES FOR EMERGENCY RESPONSE.

Detail the roles and responsibilities of the various involved entities

Reference the plans, ordinances, and relevant documents for flood planning, damage prevention, and mitigation

Look at capabilities and actions for flood prevention, response, recovery, and mitigation

Ch. 8 Administrative, Regulatory & Legislative Discussion

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:**	February 14, 2022
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 February 14, 2022, the following ideas have been suggested for potential consideration by the RFPG (Red indicates new ideas since last memo update.):

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. (September 23, 2021 RFPG Meeting)

9. Expand eligibility for and use of funding for stormwater and flood mitigation solutions (Local, State, Federal, Public/Private Partnerships, etc.) (At Dec 16, 2021 RFPG meeting, this topic was moved from being draft Goal 7A to Chapter 8.)
10. Simplify the grant application processes.
11. Include audio and visual (A/V) equipment rental required for hybrid and/or virtual meetings to be eligible expenses for reimbursement through the Regional Flood Planning Group Grants.

The following represents consultant team ideas through December 16, 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. 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.

Ch. 8 Discussion of Potential Recommendations

- Administrative
- Regulatory
- Legislative
- Other

Ch. 10 Public Outreach Updates

Future Hybrid Public Meetings

2022 Preliminary Schedule

April 21

June TBD

July TBD

September TBD

Meeting Room Technical Implications

Requirements

- Within the Trinity Basin
- Publicly accessible with sufficient capacity for public attendees
- Minimal/no fee
- High-speed wired internet (wi-fi alone isn't reliable enough)
- On-site audio/visual equipment (video camera, speakers, microphones, etc.)
- Tech support staff or local tech resource familiar with the A/V equipment
- Availability/willingness to support a test run to debug issues prior to the meeting

- Many available locations do not meet all of these requirements
- ***Know of any city, county, COG or similar facilities we can use in mid- and/or lower Basin?*** Seeking a semi-permanent venue we can return to in each area going forward.

Hybrid Meeting Potential Locations Beyond DFW

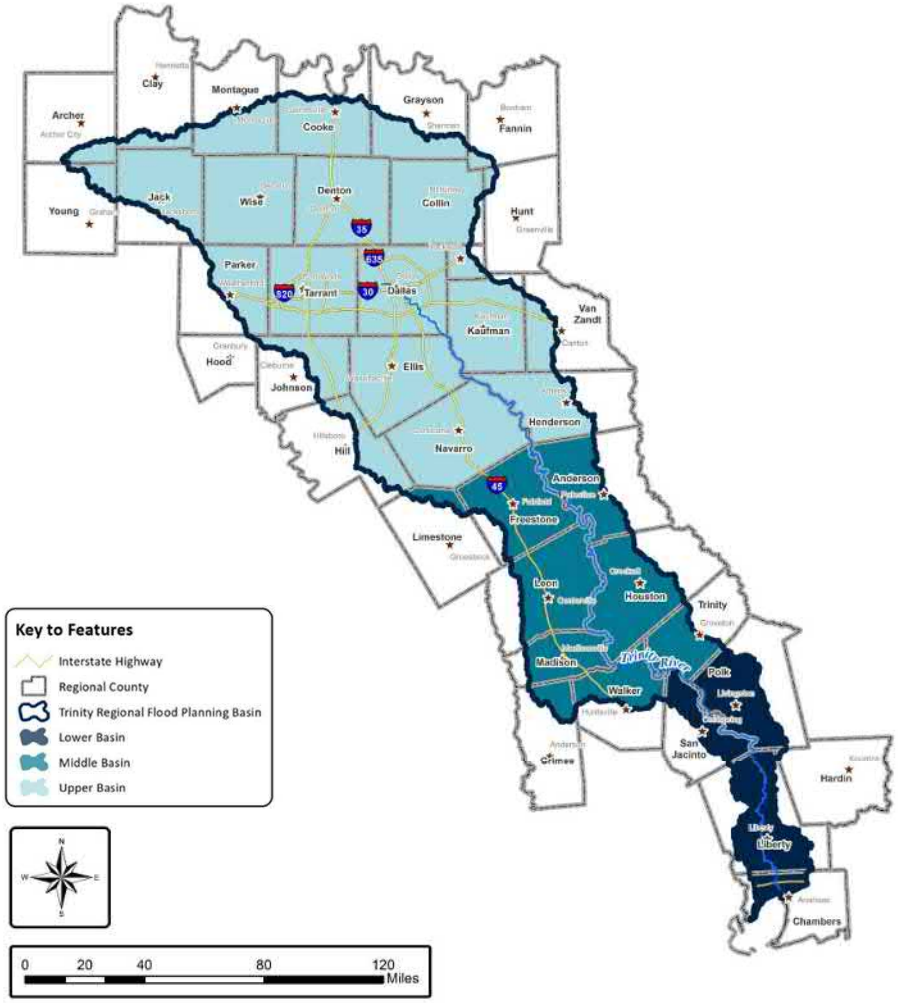
Mid-Basin (Richland-Chambers to Lake Livingston)

- Corsicana (met once at Navarro College – but relatively few local river flooding issues)
- Huntsville (met once in-person at Sam Houston Statue Visitor Center, but only wifi – no wired internet)
- Striking out so far in Crockett and Palestine
- Other suggestions?

Lower Basin (below Lake Livingston)

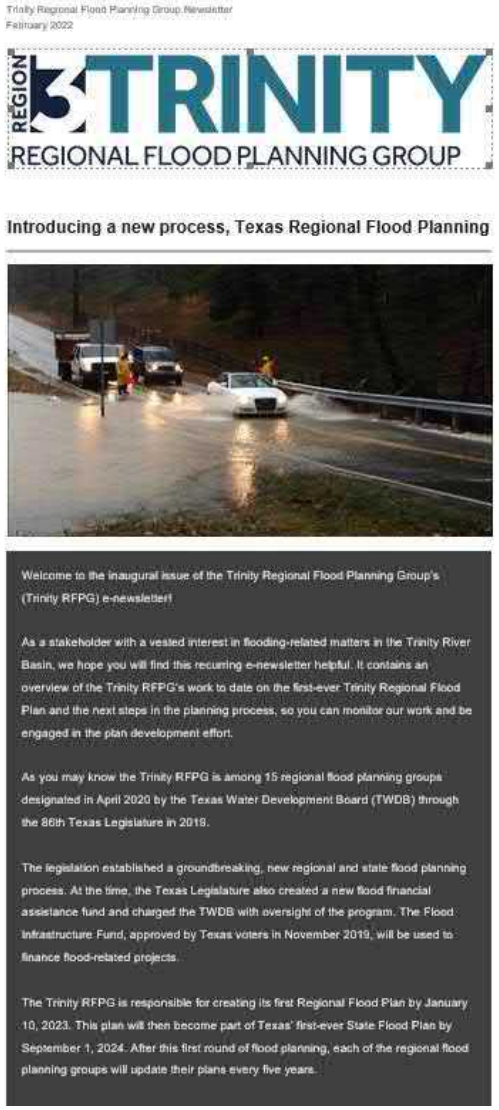
- Liberty City Hall may have suitable facility
- Other suggestions?

Locations with demonstration flood mitigation projects



Trinity RFPG E-newsletter

- Inaugural issue
- Distribution: nearly 900 regional stakeholders
- Content included:
  - Overview of Regional Flood Planning
  - Planning accomplishments to date
  - Next steps in the planning process
  - "Did you know" factoid about the Basin
  - "Meet the members" TRFPG roster
  - Feb. 17 public meeting information
  - Ways to communicate/engage with us
- Next issue: Spring/Summer 2022



Trinity Regional Flood Planning Group Newsletter
February 2022

REGION 3 TRINITY
REGIONAL FLOOD PLANNING GROUP

Introducing a new process, Texas Regional Flood Planning

Welcome to the inaugural issue of the Trinity Regional Flood Planning Group's (Trinity RFPG) e-newsletter!

As a stakeholder with a vested interest in flooding-related matters in the Trinity River Basin, we hope you will find this recurring e-newsletter helpful. It contains an overview of the Trinity RFPG's work to date on the first-ever Trinity Regional Flood Plan and the next steps in the planning process, so you can monitor our work and be engaged in the plan development effort.

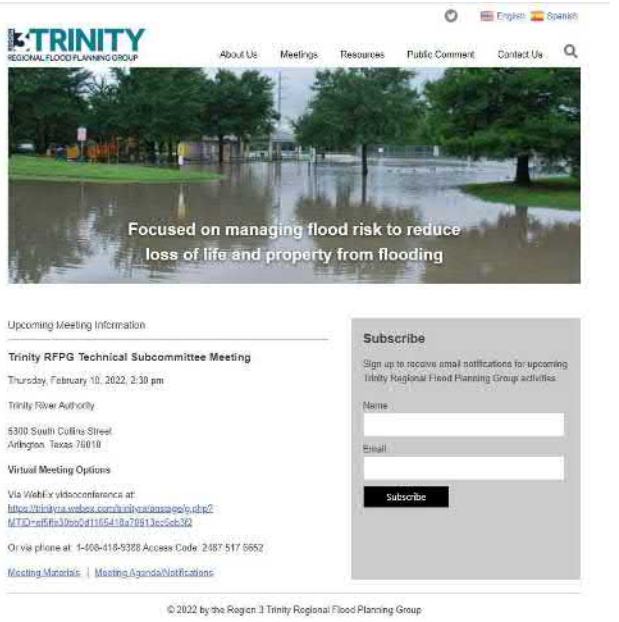
As you may know the Trinity RFPG is among 15 regional flood planning groups designated in April 2020 by the Texas Water Development Board (TWDB) through the 86th Texas Legislature in 2019.

The legislation established a groundbreaking, new regional and state flood planning process. At the time, the Texas Legislature also created a new flood financial assistance fund and charged the TWDB with oversight of the program. The Flood Infrastructure Fund, approved by Texas voters in November 2019, will be used to finance flood-related projects.

The Trinity RFPG is responsible for creating its first Regional Flood Plan by January 10, 2023. This plan will then become part of Texas' first-ever State Flood Plan by September 1, 2024. After this first round of flood planning, each of the regional flood planning groups will update their plans every five years.

Award Recognition

- Gold Award for Trinity RFPG website in 2022 AVA Digital Awards
  - International marketing competition recognizing excellence in digital communications
    - Thousands of entries worldwide
    - Gold Awards awarded to only 19% of entries
    - Administered and judged by the Association of Marketing and Communication Professionals



LOOK-AHEAD

March 7, 2022 (no meeting)

- Consultant submits Tech Memo Addendum to TWDB

April 21, 2022 🎯

- RFPG reviews Chapter 2
- RFPG reviews Chapter 4
- Consultant provides updates on Chapters 5, 6 & 7
- Consultant introduces Chapters 8, 9, 10 & 11

June 2022 Meeting

- RFPG reviews Chapter 5, 6 & 7
- Consultant provides update on Chapters 8, 9, 10 & 11

July 2022 Meeting

- RFPG reviews Chapters 8, 9, 10 & 11
- RFPG approves submittal of Draft Regional Flood Plan to TWDB

August 1, 2022 (no meeting)

- Consultant submits Draft Regional Flood Plan to TWDB

Notes: 🎯 indicates target date.

Yellow highlight indicates hard deadline.

9. Updates from adjoining coastal regions

10. Updates from Planning Group Sponsor

11. Administrative costs

12. General public comments

Limit 3 minutes per person

13. Announcements

14. Meeting date for next meeting

15. Agenda items for next meeting

16. Adjourn