2023 AMENDED REGIONAL FLOOD PLAN

REGION 14

UPPER RIO GRANDE

JULY 2023

Prepared for Region 14 Upper Rio Grande Regional Flood Planning Group

2023 AMENDED REGIONAL FLOOD PLAN
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UPPER RIO GRANDE

July 2023

Prepared for:

Region 14 Upper Rio Grande Regional Flood Planning Group

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2023 Amended Regional Flood Plan – Upper Rio Grande (Region 14)

July 2023

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Executive Summary

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ES. Executive Summary

In response to flooding across the State of Texas, the 2019 Texas Legislature formed the state's first regional and state flood planning process and provided funding for investments in flood science and mapping efforts to support flood plan development. Through this legislation, a state flood planning framework was created, charging the Texas Water Development Board (TWDB) with creating flood planning regions based on river basins and administering the flood planning process.

In April 2020, the TWDB established 15 regional flood planning areas across the State of Texas to develop the first planning cycle (2020-2023) Regional Flood Plans (RFPs). These adopted regional plans will be consolidated into a State Flood Plan (SFP) to be adopted by the TWDB by September 1, 2024. Regional and state plans will be updated every five years.

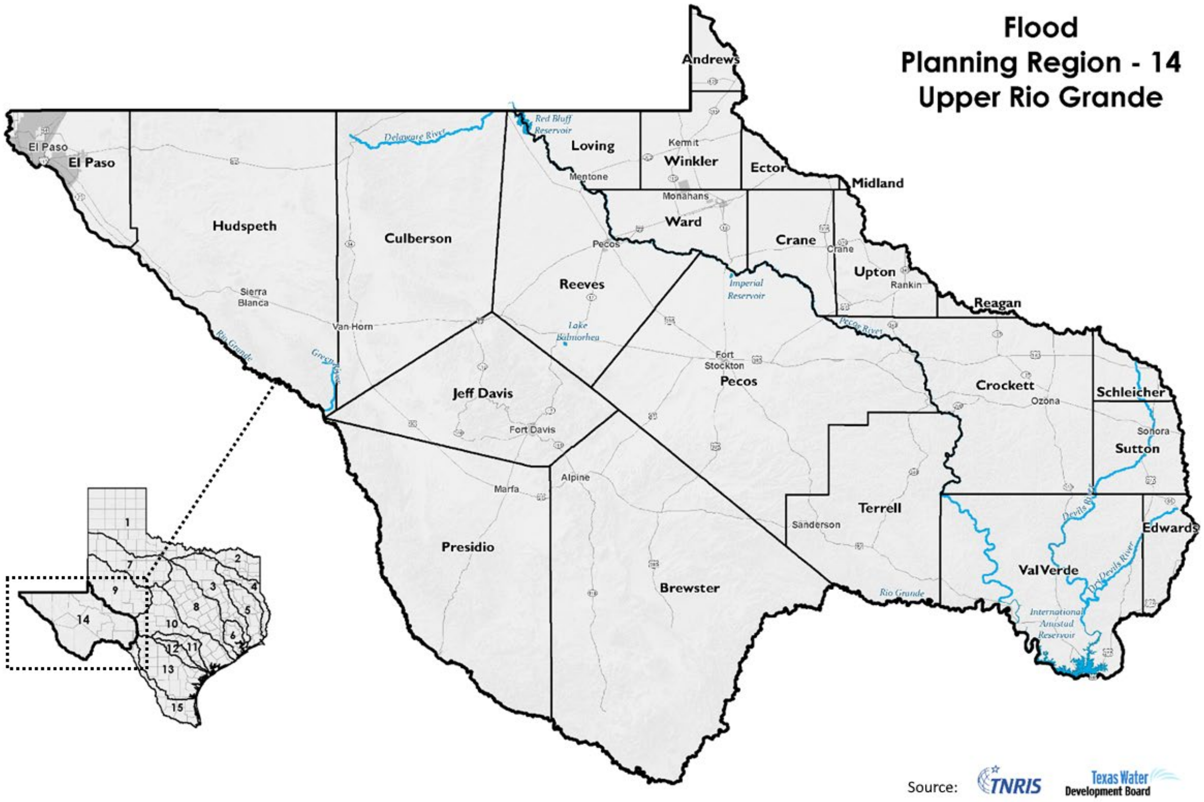
The overall goal of the Regional and State Flood Plans is to identify flood risks and recommend flood solutions at the local level, including flood studies, strategies, and projects. The effort is aimed at better managing flood risk overall to reduce loss of life and property from flooding.

ES.1 Introduction and Description of the Upper Rio Grande Flood Planning Region

The Upper Rio Grande Flood Planning Region, designated by the TWDB as "Region 14" and led by the Upper Rio Grande Flood Planning Group (URGFPG), encompasses all or part of 23 West Texas counties as listed below and shown in **Figure ES.1** (partial counties denoted with asterisks):

- Andrews*
- Brewster
- Crane
- Crockett*
- Culberson
- Ector*
- Edwards*
- El Paso
- Hudspeth
- Jeff Davis
- Loving
- Midland*
- Pecos
- Presidio
- Reagan*
- Reeves
- Schleicher*
- Sutton*
- Terrell
- Upton*
- Val Verde*
- Ward
- Winkler

The Region 14 planning area follows the Upper Rio Grande in West Texas along the US-Mexico border from the City of El Paso to the Amistad Reservoir in Val Verde County as well as the Pecos River from the New Mexico Border to the Rio Grande. This region is the largest of the fifteen state flood planning regions by area, covering more than 43,000 square miles across three river basins – the Upper Rio Grande, the Pecos River, and the Devils River.



Source: TNRIS Texas Water Development Board

Figure ES.1 Upper Rio Grande Flood Planning Region (Region 14)

ES.1.1 Social and Economic Characteristics

The Far West Texas region is known for its open expanses and rugged landscapes. Compared to other regions, Region 14 remains largely rural and less impacted by urban development.[1] The region is approximately 99% rural or undeveloped land, including about 2,500 square miles of grassland or pasture (6% of the total area) and 300 square miles of other agricultural property (1% of the total area). Based on population estimates from the 2020 Decennial Census, the total population is approximately 1.04 million with nearly 90% residing in El Paso County.

Among the Upper Rio Grande Region's most defining characteristics are the many small towns and unincorporated communities. The region encompasses 61 incorporated and unincorporated communities with populations less than 10,000 except for six (El Paso, Socorro, Horizon City, Pecos, Fort Bliss, and San Elizario). Only four of the 23 counties have populations exceeding 10,000, including the Counties of El Paso, Pecos, Reeves, and Ward.

As of 2021, the region has an estimated 590,000 jobs across its 23 counties, with about 91,000 added since 2010. Jobs in the region have grown at an annual rate of 1.5%, faster than the U.S. average (0.9%) and like the Texas average (1.7%). By total employment, the region's top five

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[1] Texas A&M Natural Resources Institute (NRI). *West Texas Landowner Report: Energy and Growth Trends.* December 2019. *https://nri.tamu.edu/media/2786/west-texas-landowner-report-final-20200115.pdf*

industries (representing about 45% of total jobs) include healthcare, food services, education, oil and gas upstream, and non-food retail.

ES.1.2 Historical Flooding

Flooding in Texas is principally associated with hurricanes, tropical storms, and high intensity storms. Flooding is usually caused by high precipitation volumes, long precipitation duration, and high precipitation intensity. Hurricanes and tropical storms have the potential for each dangerous mode of precipitation as they are large storms fed from warm oceans and can linger.

El Paso County has experienced long duration/low intensity rain events (e.g., 7.95 inches over four days in 2006) and short duration/high intensity rain events (e.g., 3.18 inches over one hour in 2021) which result in different flood hazards and mitigation strategies. Both storm events had an extremely low Annual Exceedance Probability (AEP) of approximately 0.4% (or the 250-year return period). Both storms covered the streets in debris and caused significant damage.

ES.1.3 Agricultural & Natural Resources

More than 30 types of crops are grown in the Upper Rio Grande Region, with the top seven crops most at risk to flooding; grassland/pasture, cotton, alfalfa, pecans, winter wheat, oats, and sorghum. The top five counties for agricultural production are the Counties of Hudspeth (notably Dell City), El Paso, Jeff Davis, Pecos, and Presidio.

Approximately 50 federal- and state-listed threatened and endangered species have been identified in the region, including most notably the western yellow-billed cuckoo, for which the U.S. Fish and Wildlife Services has designated critical habitat along much of the Rio Grande in Brewster County and which may potentially live in many other counties across the region. Other prominent protected species may include the federally endangered southwestern willow flycatcher bird species and the Texas hornshell freshwater mussel.

ES.1.4 Constructed Major Flood Infrastructure

Region 14 includes the following existing stormwater infrastructure: stream crossings; levees; flood protection dams; detention and retention ponds; storm drain systems; stormwater canals; pump stations; and weirs. While statewide and nationwide data sets for dams and levees are available throughout the region, there was a lack of digital data for infrastructure in all Region 14 counties other than El Paso County. The RFP incorporates available data for constructed flood mitigation features into the “Existing Flood Infrastructure” dataset, summarizing the existing flood infrastructure geodatabase and identifying both constructed and natural features.

ES.2 Flood Risk Analyses

The RFP included an evaluation of flood risks and flood hazard data gaps across the region for existing and future conditions.

Flood risks can be defined in terms of *flood hazards* (i.e., the location, magnitude, and frequency of flooding), *flood exposure* (i.e., who and what might be harmed in the region), and *vulnerabilities* (i.e., areas of exposure including communities and critical facilities particularly susceptible to impacts). Flood risk may also be evaluated based on *existing conditions*, accounting for present-day land use and impervious cover, as well as *future conditions* for land use and impervious cover trends, as well as overall climate and precipitation trends.

Existing and future condition risk analyses for the 1% annual chance (1% AC) and 0.2% annual chance (0.2% AC) flood events were performed for the Upper Rio Grande region with the best available hydrologic and hydraulic data in the region, including models developed for the RFP.

The results of the flood risk analyses are intended for use by the RFPG to establish priorities in subsequent planning tasks and to identify areas for potential flood solutions. The flood risk maps presented in this RFP do not reflect the effective regulatory floodplains and do not supersede or change federal flood insurance requirements.

Regionwide flood risk analyses are intended to establish baseline flood risk levels as currently recognized by the Federal Emergency Management Agency (FEMA) and other best available modeling. In accordance with State RFP requirements, any existing levees in the region that do not meet FEMA accreditation are excluded from the baseline flood risk analysis. This is applicable to El Paso County, with unaccredited levees present on the Upper Rio Grande.

In addition to the overview of flood risk analyses process and results described below, *Chapter 2 ("Flood Risk Analyses")* provides additional details regarding potential flood exposure, vulnerabilities, and anticipated loss of function for different types of critical facilities.

ES.2.1 Existing Conditions Analysis

Existing condition flood hazard data sources include the FEMA National Flood Hazard Layer Preliminary data (for El Paso County only), NFHL Approximate Effective data (for Ector and Val Verde Counties), the First American Flood Data Services (FAFDS) layer (outside of El Paso County), and the Fathom Cursory Floodplain dataset.

While recent flood hazard mapping information is available for El Paso County, Ector County, and Val Verde County, the availability of recent flood hazard data across the rest of the region is limited. Two types of existing condition data gaps were identified across the region.

The first type of existing condition data gap includes counties which do not have a broad coverage of available FAFDS information or any other available flood hazard data apart from the Fathom dataset. This includes counties with limited FAFDS coverage (e.g., for small areas within selected municipalities) that do not have broad countywide coverage of flood hazard data. This first group is made up of five counties with no FAFDS coverage (including the Counties of Andrews, Crane, Loving, Reagan, and Schleicher) and four counties with limited FAFDS coverage (including the Counties of Pecos, Reeves, Upton, and Winkler).

The second type of existing condition data gap includes counties which do have broad coverage of FAFDS information in addition to the Fathom dataset but need updated flood hazard information due to the age of the FAFDS floodplains. This second group is made up of 11 counties, including the Counties of Brewster, Crockett, Culberson, Edwards, Hudspeth, Jeff Davis, Midland, Presidio, Sutton, Terrell, and Ward.

Maps showing the results of the existing condition flood risk and flood hazard data gaps analyses are provided in **Map Exhibits 4-7**, and a summary of the existing condition flood exposure results is provided in **Table ES.1**.

Table ES.1 Existing Flood Exposure Summary

Exposure Type	Number of Features		
	1% AC	0.2% AC*	Possible Flood Prone Areas
Floodplain Area (sq. mi.)	9,285	1,755	161
Structures (#)	40,121	14,290	12,393
Population (#)	115,530	47,985	71,036
Critical Facilities (#)	94	41	19
Roadway Segments (mi.)	3,047	548	353
Roadway Stream Crossings (#)	1,377	548	147
Agricultural Areas (sq. mi.)	615	135	39

*0.2% AC flood exposure results are reported separately from the 1% AC results and do not include cumulative flood hazard areas or property impacts from 1% AC flood hazard areas.

ES.2.2 Future Conditions Analysis

Future condition flood hazards were estimated to account for future projections in land use and precipitation over the next 30 years.

According to population projections from the 2021 Regional Water Plan, the Upper Rio Grande Region is projected to grow in population between 2020-2050 by approximately 400,000, a 38% increase over 30 years with an average annual growth rate of 1.08%. El Paso County is projected to see the highest future population growth compared to other counties in the region with an increase of approximately 370,000 by 2050 or 93% of the region's total growth.

To account for these population growth trends in El Paso County, the El Paso County FEMA Preliminary 2D models were updated based on future condition hydrologic data derived from local population projections. Outside of El Paso County, existing condition 0.2% and 0.1% AC flood hazard areas were utilized as a proxy for future condition 1% and 0.2% AC flood hazard areas, respectively, with changes limited to areas of anticipated future development.

Future precipitation projections influenced by present changes in climate show the potential for increases in the magnitude of extreme precipitation events. In an April 2021 report, the Office of Texas State Climatologist recommended applying a 20% increase to precipitation totals for future rainfall. This adjustment was applied to the El Paso County FEMA Preliminary 2D models for the future condition analysis. Outside of El Paso County, no modifications were made for precipitation in the future condition analysis due to inconclusive precipitation trends shown for a majority of the region east of El Paso County in the Texas State Climatologist report.

Due to the limited availability of future condition flood hazard information (such as detailed future land use data or future conditions flood studies), future data gaps were identified for the entire region except for the watersheds of El Paso County and western Hudspeth County. These areas were analyzed as part of the RFP future flood hazard analysis described in Chapter 2.

Maps showing the results of the flood hazard data gaps analysis are provided in **Map Exhibits 5 and 9**, and a summary of the future condition flood exposure results is provided in **Table ES.2**.

Table ES.2 Future Flood Exposure Summary

Exposure Type	Number of Features		
	1% AC	0.2% AC	Possible Flood Prone Areas
Floodplain Area (sq. mi.)	9,543	1,807	161
Structures (#)	67,134	35,167	12,393
Population (#)	253,678	110,302	71,036
Critical Facilities (#)	178	56	19
Roadway Segments (mi.)	3,846	1,035	353
Roadway Stream Crossings (#)	1,467	585	147
Agricultural Areas (sq. mi.)	678	149	39

*0.2% AC flood exposure results are reported separately from the 1% AC results and do not include cumulative flood hazard areas or property impacts from 1% AC flood hazard areas.

ES.3 Floodplain Management Practices and Goals

The RFP included an evaluation of floodplain management practices across the region as well as recommendations for floodplain management standards and both short-term (10-year) and long-term (30-year) flood mitigation and floodplain management goals.

ES.3.1 Evaluation of Floodplain Management Practices

In the Upper Rio Grande Region, 75% of all eligible communities participate in the NFIP (40 out of 53), including 78% of counties (18 out of 23 counties representing 31 unincorporated communities) and 73% of incorporated places (22 out of 30). All county and incorporated entities in the region are encouraged to enact ordinances that meet minimum requirements for NFIP Participation and remain active NFIP participants in good standing.

Higher floodplain management standards are recognized through the Texas Floodplain Management Association (TFMA) Higher Standards Survey and the FEMA Community Rating System (CRS). The City of El Paso is the only entity in the region with higher standards recognized by the TFMA Higher Standards Survey and enrolled in the CRS Program (earning an entry-level rating of 9).[2] Applications for CRS participation have also been submitted by El Paso County and City of Sonora with an expected rating date by the end of 2022.

Communities not participating in the NFIP include seven incorporated places (Barstow, Kermit, Rankin, Thorntonville, Valentine, Wickett, and Wink) and five counties (Andrews, Edwards, Pecos, Reeves, and Winkler). All non-participating communities in the region are in a Zone A FEMA flood hazard area or are unmapped.

ES.3.2 Recommendations for Minimum Standards and Best Practices

The Upper Rio Grande RFPG is required to consider whether to recommend or adopt region-wide minimum floodplain management standards and land use practices. *Recommending* minimum practices by the RFPG encourages entities to adopt similar floodplain management practices within their communities. *Adopting* minimum practices by the RFPG requires potential sponsoring entities to adopt these minimum standards before their flood needs (FMEs, FMSs, and FMPs) may be considered for inclusion in the RFP and be eligible for potential state funding.

During this first planning cycle of the 2023 Region/2024 State Flood Plan, the **Upper Rio Grande RFPG voted to recommend but not adopt** the following minimum standards for the region. In future planning cycles, the RFPG may reconsider whether to adopt these recommendations as minimum standards requirements.

- Participate (and maintain active status) in the National Flood Insurance Program (NFIP).
- Require development permits for all proposed construction to determine whether such construction is proposed within flood-prone areas and will be reasonably safe from flooding (44 CFR § 60.3a[1-4]).
- Require new and replacement sanitary sewage and water supply systems within flood prone areas to be designed to minimize or eliminate infiltration of flood waters into the systems (44 CFR § 60.3a[1-5]).
- Require additional minimum standards for flood-prone areas associated with designated special flood hazard areas (Zone A and AE) (44 CFR § 60.3b-d).
- Require additional minimum standards associated with mudslide- (i.e., mudflow) prone areas (44 CFR § 60.4).
- Require additional minimum standards associated with flood-related erosion-prone areas (44 CFR § 60.5).

The following general recommendations for best practices were recommended by the RFPG during the first planning cycle. While these general recommendations are strongly encouraged, the RFPG does not anticipate adopting them as minimum standards in future planning cycles at this time.

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[2] CRS Rating classes range from 9 to 1 where CRS Class 1 is the highest possible classification. Most communities enter the program at a CRS Class 9 or Class 8 rating.

- Establish local flood outreach and awareness programs (addressing flood risk, resiliency, and mitigation), including providing access to FEMA informational resources.
- Coordinate with TxDOT and NWS to use flood warning signs, traffic message boards, and other media (TV, radio, social media) to communicate flood warnings.
- Conduct public outreach to identify ongoing flood needs (data gaps, flood management strategies, and flood mitigation projects).
- Develop and maintain local stormwater asset management plans.
- Adopt higher-than-NFIP-minimum standards (e.g., higher freeboard) and participate in the TFMA Higher Standards Survey.
- Enroll in CRS Program for reduction in flood insurance premiums and flood risk.
- Consider and incorporate nature-based practices in flood mitigation projects where possible.

ES.3.3 Flood Mitigation and Floodplain Management Goals

The Upper Rio Grande RFPG adopted both Short-Term (10-year) and Long-Term (30-year) flood mitigation and floodplain management goals. These goals help to establish the RFPG's objectives and priorities for the first-cycle flood plan and are presented in **Table ES.3**.

Table ES.3 Flood Mitigation and Floodplain Management Goals

Short Term (10 years)	**Long Term (30 years)**
Increase NFIP participation or adoption of equivalent standards with 90% of communities meeting qualifying standards	Enroll all current non-participating communities into the NFIP and maintain 100% community enrollment with no suspensions or sanctions
Increase number of communities that have adopted higher-than-NFIP-minimum standards	n/a
Increase number of communities enrolled in CRS Program	n/a
Improve CRS rating for the City of El Paso (which has a current CRS Rating of 9)	n/a
Adopt recommended minimum stormwater infrastructure design standards applicable across the region	n/a
Increase flood protection of unaccredited levees in El Paso County watersheds to meet FEMA levee accreditation requirements and update flood mapping to account for any changes in levee accreditation status	Increase flood protection of unaccredited levees in the region outside of El Paso County watersheds to meet FEMA levee accreditation requirements and update flood mapping to account for any changes in levee accreditation status
Increase the number of flood gages (rainfall and/or stream gages) in the region	n/a
Develop and implement region-wide flood warning and emergency response program	n/a
Increase the number of entities that use flood warning signs, traffic message boards, and other media (TV, radio, social media) to communicate flood warnings	n/a

Short Term (10 years)	Long Term (30 years)
Establish community-led flood outreach and awareness programs (addressing risk, resiliency, and mitigation) in 30% of communities in the region	Establish community-led flood outreach and awareness programs (addressing risk, resiliency, and mitigation) in 90% of communities in the region
Increase entity and public stakeholder participation in the regional flood planning process	n/a
Increase the coverage of flood hazard data across the region by completing studies in 40% of the areas identified as having current gaps in flood mapping in the first cycle Flood Plan	Have complete coverage of flood hazard data across the region by completing studies in 100% of the areas identified as having current gaps in flood mapping in the first cycle Flood Plan and have an ongoing, funded maintenance plan for updates
Remove 10% of the existing structures in El Paso County watersheds from 1% annual chance floodplain in the region (either by remapping or flood risk reduction)	Remove 20% of the existing structures in El Paso County watersheds from 1% annual chance floodplain in the region (either by remapping or flood risk reduction)
Remove 25% of the existing structures outside of El Paso County watersheds from 1% annual chance floodplain in the region (either by remapping or flood risk reduction)	Remove 50% of the existing structures outside of El Paso County watersheds from 1% annual chance floodplain in the region (either by remapping or flood risk reduction)
Remove 40% of the low water crossings from 10% annual chance floodplain in the region (either by remapping or flood risk reduction)	Remove 90% of the low water crossings from 10% annual chance floodplain in the region (either by remapping or flood risk reduction)
Increase the number of entities that utilize regional detention for floodplain management	n/a
Consider and incorporate nature-based practices in flood risk reduction projects	n/a
Establish dual usage regional storage facilities for flood mitigation and water supply	n/a
Increase the number of communities with documented, operational, and fully funded stormwater asset management plans	n/a
Increase number of new funding sources used to pay for implementation of flood management activities and decrease number of communities without a local funding source	n/a
Increase the number of entities that have a dedicated drainage fee to help implement future Flood Mitigation Evaluations (FMEs) and Flood Mitigation Projects (FMPs)	n/a

ES.4 Identification of Flood Mitigation Needs and Solutions

Based on the identified flood hazard areas, the RFP included an analysis of flood needs with a consideration of the greatest flood risk areas and greatest flood risk information gaps. Following this and with coordination between the RFPG and stakeholders, potential flood solutions were identified including Flood Management Evaluations (FMEs), Flood Mitigation Projects (FMPs), and Flood Management Strategies (FMSs).

ES.4.1 Flood Mitigation Needs Analysis

Flood mitigation needs were identified based on both a quantitative comparison of the Task 2 exposure results at the county and subcounty level and qualitative evaluation by the RFPG and stakeholders.

The quantitative analysis considered areas of greatest potential flood exposure based on at risk structures, population, roadways, critical facilities, agricultural area, and social vulnerability. It also included an evaluation of the greatest gaps in flood risk information and the areas with the greatest flood risk.

The qualitative analysis was conducted over several stakeholder workshop meetings and considered historic flooding events, flood prone areas, existing flood mapping and modeling availability, emergency needs, and other factors.

A summary of flood mitigation needs and at risk communities by county are shown in **Table ES.4**.

Table ES.4 Summary of Flood Mitigation Needs by County

County	Greatest Flood Risk Data Gap (Limited or No FEMA Flood Mapping Information)	Greatest Flood Risk Data Gap (Old FEMA Flood Mapping Information	Greatest Flood Risk	Top At Risk Communities by Estimated Number of Structures in Floodplain
Andrews	✓	-	-	-
Brewster	-	✓	✓	Alpine city
Crane	✓	-	-	Crane city
Crockett	-	✓	✓	Ozona CDP
Culberson	-	✓	✓	Van Horn town
Ector	-	-	-	-
Edwards	-	-	-	-
El Paso	-	-	✓	El Paso city, Socorro city, Fort Bliss CDP, Canutillo CDP, San Elizario city, Homestead Meadows North CDP, Clint town, Fabens CDP, Prado Verde CDP
Hudspeth	-	✓	✓	Dell City city
Jeff Davis	-	✓	✓	Fort Davis CDP
Loving	-	-	-	-
Midland	-	-	-	-
Pecos	✓	-	✓	Imperial CDP, Fort Stockton city
Presidio	-	✓	✓	Presidio city, Marfa city
Reagan	-	-	-	-
Reeves	✓	-	✓	Pecos city, Balmorhea city, Lindsay CDP, Toyah town
Schleicher	-	-	-	-
Sutton	-	✓	✓	Sonora city
Terrell	-	✓	-	Sanderson CDP
Upton	✓	-	-	McCamey city
Val Verde	-	-	-	-

County	Greatest Flood Risk Data Gap (Limited or No FEMA Flood Mapping Information)	Greatest Flood Risk Data Gap (Old FEMA Flood Mapping Information	Greatest Flood Risk	Top At Risk Communities by Estimated Number of Structures in Floodplain
Ward	-	✓	✓	Southwest Sandhill CDP, Monahans city, Thorntonville town, Barstow city
Winkler	✓	-	✓	Kermit city

ES.4.2 Process for Identifying Flood Mitigation Solutions

The primary objective of the Upper Rio Grande Regional Flood Plan (RFP) is to identify specific flood risks within the region and identify, evaluate, and recommend potential solutions to mitigate and manage these risks in alignment with the region's short-term and long-term goals. These solutions may include FMEs, FMSs, and FMPs, as defined below:

- Flood Management Evaluation – a proposed flood study of a specific, flood-prone area that is needed to assess flood risk and/or determine whether there are potentially feasible FMSs or FMPs;
- Flood Mitigation Project – a proposed project, either structural or non-structural, that has non-zero capital costs or other non-recurring costs, and when implemented, will reduce flood risk, mitigating flood hazards to life or property; and
- Flood Management Strategy – a proposed plan to reduce flood risk or mitigate flood hazards to life or property.

FMSs and FMPs that were identified to be potentially feasible through the processes described Chapter 4 were selected for further evaluation as part of Task 4B to determine whether they have sufficient H&H modeling data to be analyzed for project impacts and benefits.

ES.4.3 Identification of Flood Management Evaluations (FMEs), Flood Mitigation Projects (FMPs), and Flood Management Strategies (FMSs)

Due to the large portion of Region 14 which has limited or no available flood risk mapping or modeling available, a significant part of the process of identifying potential FMEs and potentially feasible FMSs and FMPs involved extensive stakeholder coordination. Through the coordination conducted in workshops, public meetings, and phone interviews, the RFPG identified and evaluated 22 potential FMEs, 21 potential FMPs, and 22 potential FMSs.

FMEs identified fell into the categories of project planning, storm water master plans (SWMPs) which also includes development of flood risk mapping, dam safety/emergency need, riverine risk related to sediment or levees, irrigation and stormwater interaction, and preparedness.

Most of the FMPs identified were detention/retention storage basins or related to transportation/mobility from the City of El Paso SWMP (2021) or the El Paso County SWMP (2021), which were both recently updated. The lack of modeled and evaluated stormwater projects meeting the minimum criteria for FMPs in the region is related to the lack of available or updated flood risk models and mapping. Due to the large number of projects in the City SWMP (96 projects) and in the County (69 projects), heavy coordination was involved with the

City, County, and RFPG in selecting and prioritizing which projects would be evaluated within the limited schedule available for the RFP.

Potentially feasible types vary between regulatory and guidance strategies, infrastructure projects, flood measurement and warning, and education and outreach. In general, FMSs do not typically fit into the FME or FMP categories for a variety of reasons. Below is a list of criteria that led to the decision to list a flood reduction action as an FMS rather than an FME or FMP:

- Studies, projects, and/or program development involving complex coordination between multiple entities (local, state, federal, or international);
- Associated with other FMEs, FMSs, or FMPs requiring a specified sequence of actions as part of a larger plan;
- Involve multiple projects with varying statuses of design/construction; and
- Include recurring costs.

ES.5 Evaluation and Recommendation of Flood Solutions

The recommended FMEs, FMPs, and FMSs (also referred to as “Flood Solutions”) were discussed and refined with the RFPG throughout the regional flood planning process and were approved by the RFPG in a General RFPG meeting held July 20, 2022.

ES.5.1 Evaluation & Recommendation Process for FMEs, FMSs, and FMPs

As each FME, FMP, or FMS was evaluated in the regional flood planning process, relevant issues, changes, and refinements were presented and discussed with the RFPG during General RFPG meetings, meetings for Subcommittee 2 (FMPs), and/or meetings for Subcommittee 3 (FMEs and FMSs). Any feedback provided from the RFPG, stakeholders, or the general public was discussed with the RFPG and/or applicable subcommittee members, and agreed upon changes were incorporated into the evaluations or the scope associated with each flood solution.

ES.5.2 Summary of Evaluation Process for FMEs and FMSs without Project Specific Data

For FMEs and FMSs without project-specific H&H models or mapping, evaluations of the required parameters were typically based on the RFP 1% annual chance flood risk boundaries intersected with enhanced spatial layers for buildings, agricultural land, and other infrastructure, including roadways, low water crossings, and critical facilities. The sources for the development of these spatial layers and the methods used to estimate flood risk region-wide are documented in Chapter 2, Flood Risk Analyses.

In some instances, if reliable depth data were available, existing flood risk estimates were based upon a more detailed analysis of estimating maximum depths greater than 0.5 ft associated with the building footprint of each intersecting structure. Only maximum depths greater than 0.5 ft were considered in these analyses to account for potential raised finished floor elevations

ES.5.3 Methods for Evaluation of FMSs and FMPs with Project-Specific Data

The methods and assumptions related to flood risks and benefits varied depending on the project type and available modeling/mapping data for each project-specific FMS or FMP. However, when proposed condition hydraulic model outputs or mapping were available, water surface elevations and ground elevations were used to estimate flood risk within El Paso County, and Fathom depth data were used for project-specific FMSs or FMPs located outside of El Paso County. Finished floor elevations were assumed to be 0.5 ft above ground elevations intersecting the footprint of a building. Where depth data were used to estimate 1% AC flood risk, raised finished floor elevations were considered by subtracting 0.5 ft from the maximum flood depth intersecting a building footprint. In El Paso County, finished floor elevations were estimated by adding 0.5 ft to the average ground elevation in a building footprint.

FMSs and FMPs are required to demonstrate that they will not negatively affect a neighboring area. While this criterion did not require analyses to demonstrate for non-structural FMPs or FMSs, the documentation of engineering analyses and/or assumptions is required for FMSs or FMPs involving proposed flood control infrastructure. The methods for demonstrating no negative impact varied for each FMS or FMP involving flood infrastructure projects. To document the methods and assumptions associated with the negative impact analysis, it is necessary to explain the source and type of H&H models used in the flood risk analysis for existing and proposed conditions, which were provided in Chapter 5 appendices.

Each project-specific FMS and FMP was analyzed for potential benefits and to demonstrate no negative impacts on neighboring areas. Individual mapbook figures displaying project locations and existing downstream flood risk areas are provided for each project area. Chapter 5 appendices also document the Benefit Cost Analysis (BCA) and the process used to estimate that each FMP or Project-specific FMS will have no negative impact on neighboring areas.

ES.5.4 Summary of Recommendation Process

The process for recommending FMEs, FMSs, and FMPs includes coordination with the RFPG throughout the regional flood planning process. As new information became available or as evaluations were completed, evaluation results were shared with the RFPG during periodic General RFPG Meetings. The following General RFPG Meetings included votes by the RFPG on Recommended FMEs, FMPs, and/or FMSs:

- General RFPG Meeting held April 21, 2022;
- General RFPG Meeting held May 25, 2022;
- General RFPG Meeting held July 20, 2022; and
- General RFPG Meeting held June 07, 2023.

Each of the Recommended FMEs, FMSs, and FMPs are included in Appendices 5C, 5D, and 5E. Each FME, FMS, and FMP recommended is in alignment with RFPG and stakeholder goals. All of the flood solutions which were fully evaluated are presented Appendices 4A, 4C, and 4E were also recommended by the RFPG.

Each recommended FMP was evaluated based upon scoring criteria required for potential impacts and benefits. This information is presented in Table 5F of Appendix 5F, “Data Entry Table for TWDB Scoring of Flood Mitigation Projects”. The table was filled out according to the criteria and instructions in the Technical Guidelines provided by TWDB. Notes applicable to specific scores are also included in the table.

ES.6 Impacts and Contribution of Regional Flood Plan

Chapter 6 summarizes the overall impacts of the Regional Flood Plan (RFP), considering the potential for both positive and negative outcomes related to flood risk and multiple other considerations. Other resources which are not directly related to flood planning, but which can be strongly influenced by flood-related actions include water supply, the environment, agriculture, recreation, water quality, and navigation.

ES.6.1 Impacts of Regional Flood Plan

The methods applied to estimate potential increases in future conditions flood risk are documented in *Chapter 2 (“Flood Risk Analyses”)*. The anticipated increased flood risk was modeled and mapped in the RFP based on the following:

- Best available flood risk modeling and mapping data;
- Future precipitation projections based on recent studies (for El Paso County watersheds only);
- Future land use planning documents (for El Paso County watersheds only); and
- Population projections throughout the region.

Based on these methods, a future 1% annual chance and 0.2% annual chance floodplain was developed for Region 14 and compared to the existing conditions inundation areas. The extent of increased 1% annual chance risk inundation area is **242** square miles (sq. mi.). The extent of increased 0.2% annual chance risk inundation area (separate from the 1% annual chance risk inundation area) is **181** sq. mi. These anticipated increases in flood risk are estimated to be reduced if the FMEs, FMSs, and FMPs recommended in the RFP are performed.

As noted in *Chapter 4*, there are 20 out of the 23 counties within Region 14 that are in need of flood risk identification or in need of updated flood risk mapping. The exceptions are El Paso, Ector, and Val Verde Counties, which have recent flood risk mapping. Out of these 20 counties which need current floodplain mapping, there are 39 cities or Census Designated Places (CDPs) within Region 14, which have a combined jurisdictional area of 175 sq. mi. To address this need, there are 9 FMEs recommended for cities with outdated or no floodplain mapping. These 9 cities have a combined total jurisdictional area of **110 sq. mi**. These cities were selected for SWMP FMEs based on an assessment of cities within the region with the greatest number of structures at risk of 1% annual chance flooding.

As noted in *Chapter 2*, there are approximately 40,121 structures at risk of 1% annual chance flooding in the region with a population of 115,530. There are an additional 14,290 structures in the 0.2% annual chance flood risk inundation area (separate from the 1% annual chance risk inundation area) with a population of 47,985. The recommended FMPs and FMSs analyzed for flood risk benefits are estimated to remove **12,428** structures from the 1% annual chance flood risk boundary with a combined population of approximately **36,855**. The recommended FMPs are estimated to remove **2002** structures from the 0.2% annual chance flood risk boundary with an approximate population of **2,400**. Furthermore, the recommended FMPs and FMS are estimated to remove **41** low water crossings from the 1% annual chance flood risk boundary.

ES.6.2 Contributions to and Impacts on Water Supply Development and the State Water Plan

There are no recommended FMPs that would measurably contribute to water supply. In the RFP, the FMS named, "Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine" (FMS ID: 142000002) is estimated to contribute to water supply. It is recommended in the adopted State Water Plan (TWDB, 2022) as well as in the current Far West Texas Water Plan (TWDB, 2021) for Region E, where it is identified as Strategy E-2, "Irrigation and Recharge Application of Captured Rainwater Runoff."

The Water User Group identified for this strategy in the Region E Water Plan is the City of Alpine. The State Water Plan identified the City of Alpine as the Sponsor of the recommended strategy. Based on the information provided by the project planners and the Far West Texas Water Plan (TWDB, 2021) for Region E, this strategy is expected to directly increases water supply volume available during droughts of record for the City of Alpine.

The RFPG is also required to list recommended FMSs or FMPs that, if implemented, would negatively impact and/or measurably reduce:

- Water availability volumes that are the basis for the most recently adopted SWP; and
- Water supply volumes if implemented.

Based on the evaluations of recommended FMSs and FMPs previously discussed in *Chapter 5*, no measurable negative impacts are anticipated.

ES.7 Flood Response Information and Activities

The RFP includes a summary of flood emergency management to address the preparedness, response, and recovery phases of flood emergencies. Information was based on agency coordination, survey responses, and hazard mitigation planning documents.

Flood emergency preparedness activities include emergency management and action plans, hazard mitigation plans, and the building of flood early warning and alert systems, flood gages, or automatic low water crossings. Several Emergency Action Plans (EAPs) have been developed for dams throughout the region including the City of El Paso High Hazard Dams EAP (2008), the Red Bluff Dam EAP (2021), and the Elephant Butte & Caballo Dams EAP (2018). In addition, Hazard Mitigation Plans (HMPs) have been developed for the Counties of Brewster, Ector, El Paso, Hudspeth, Jeff Davis, and Presidio. These HMPs encourage interregional coordination with flood planning stakeholders and assist with flood preparedness by reducing emergency response demands during a flood.

In addition to these planning documents, El Paso currently utilizes a flood early warning system based on early warnings provided by a dedicated meteorologist with coordination between EPWater, EPCWID1, and the operators of Caballo Dam in New Mexico. *Chapter 5 ("Evaluation and Recommendation of Flood Solutions")* of this RFP includes six recommended FMPs for flood early warning systems for the City/County of El Paso and the Cities of Pecos, Alpine, Presidio, Fort Stockton, and Marfa. A general FMS is also recommended for the entire region to prioritize, fund, and develop new flood gages (rainfall and/or stream gages) for flood warning system improvements. Lastly, an FMP is recommended to install automatic low water crossing gates along Alamito Creek in Marfa, and the installation of a gage for monitoring and detection.

In response to flooding emergencies, several communities reported using a public alert or alarm system to broadcast via an outdoor siren or send notifications via text, website, or social media. Cities and counties coordinate with the Texas Department of Transportation (TxDOT) on road closures and traffic message boards. Emergency managers rely on public information from the National Oceanic and Atmospheric Administration (NOAA), the National Weather Service (NWS), and the United States Geologic Survey (USGS). The Bureau of Reclamation El Paso Field Division (EPFD) works with offices and divisions from New Mexico to regulate releases from the Elephant Butte and Caballo Dams to minimize flows during a flood event.

Flood recovery activities include debris removal from culvert entrances and bridges by cities, counties, and TxDOT. Due to the region's arid landscape, sedimentation from arroyos is a common issue after floods, especially in El Paso where the Franklin Mountains deposit sediment impacting culverts, roadways, agricultural land, and irrigation system infrastructure. In the event of flood damages, assessment and recovery efforts are supported with assistance and resources by FEMA Region VI and the Texas Division of Emergency Management (TDEM) Region 4.

ES.8 Administrative, Regulatory, and Legislative Recommendations

The Upper Rio Grande engaged with stakeholders to develop administrative, regulatory, and legislative recommendations for consideration by the Texas Legislature, TWDB, TCEQ, other water planning regions, and all stakeholders and participants in Texas' regional and state flood planning efforts. Prior to these engagements, interviews were conducted with comparative entities outside the region to solicit feedback for the RFPG. Four RFPG subcommittee meetings were held to develop recommendations for management and mitigation implementation. A list of region-specific needs was developed with recommendations to address these needs. Recommendations are organized by stakeholders (i.e., for the El Paso County area and the flood planning area outside of El Paso County) as well as by type (i.e., legislative, regulatory/ administrative, fundraising, and other recommendations). Recommendations from the legislative and regulatory/administrative categories are presented below in **Table ES.5** through **Table ES.8**, the fundraising recommendations and other recommendations details are provided in *Chapter 8 ("Administrative, Regulatory, and Legislative Recommendations").*

Table ES.5 Legislative Recommendations (El Paso County Area Stakeholders)

Need to Address	Recommendation
Burden on sponsors for levee certification is excessive	Communicate with the federal government about lessening the burden for levee certification
Counties perceive lack of ability to regulate drainage outside of FEMA floodplains	Counties to consider adoption of drainage requirements beyond areas that are in flood zone (e.g., within County Road ROWs outside floodplains)
Revolving state funds are not self-sustaining	Create specific revolving state funds to provide matching to federal dollars for FMPs

Table ES.6 Regulatory/Administrative Recommendations (El Paso County Area Stakeholders)

Need to Address	Recommendation
Identified potential design standard improvements	Develop recommendations for inlets, curb cuts, on-site storage, sediment controls at inlets, discharges into irrigation drains, 2D modeling (include freeboard requirements)
Erosion in natural channels	Develop recommendations for design guidelines for erosion mitigation in arroyos
Issues with outfalls into Rio Grande	Develop guidelines for design of outfalls
EPCWID1 is concerned with the risk of loss of Clean Water Act exemptions associated with stormwater accumulated in irrigation drains	Recommend that USACE develop clear guidance relevant to situation in El Paso County to ensure exemption is retained
There are uncertainties in El Paso County associated with the capture of stormwater with the potential for reuse	Investigate permitting issues and develop clear guidance to ensure compliance and optimize opportunities for capture/blend
Improve coordination with other jurisdictions to facilitate floodplain management (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate floodplain management involving multiple jurisdictions. (e.g., create consensus requiring no adverse impact)
Codify use of most restrictive standard where conflicts exist	Revise local standards to codify this requirement and address adverse impact
Drainage component is not part of certificate of compliance (In Ector County there is no review of any building or development permit, no component for flood mitigation)	Counties should have the option to be empowered to enforce drainage requirements within the requirements for a certificate of compliance
ATV-induced erosion on state lands	Review existing regulatory/ admin controls and effectiveness. Recommend changes
Improve coordination with other jurisdictions to facilitate (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate flood mitigation planning involving multiple jurisdictions.
Improve coordination with other jurisdictions to facilitate (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate flood mitigation implementation involving multiple jurisdictions.
Coordinate with State Historic Preservation Office to develop acceptable mitigation practices for the El Paso region	Develop county-wide procedures for accelerating compliance, reducing delays in projects due to interaction with the historic preservation office.
Shortfalls with use of existing El Paso area MOUs with State Historic Preservation Office	Negotiate with the State Historic Preservation Office to address shortfalls

Table ES.7 Legislative Recommendations (Flood Planning Area Outside of El Paso County)

Need to Address	Recommendation
New federal requirements addressing historic preservation	Develop a set of regional comments on new requirements to be provided to the federal agency
Counties perceive lack of ability to regulate drainage outside of FEMA floodplains	Counties to consider adoption of drainage requirements beyond areas that are in flood zone (e.g., within County Road ROWs outside floodplains)

Table ES.8 Regulatory/Administrative Recommendations (Flood Planning Area Outside of El Paso County)

Need to Address	Recommendation
Unregulated/ minimally regulated development in Hudspeth County	Develop program to regulate drainage from development in Hudspeth County and similar counties that elect to participate
No technical personnel on staff nor funds to develop drainage criteria/standards	Provide regional coordination for technical assistance and/or funding to update drainage criteria and development standards
Improve coordination with other jurisdictions to facilitate floodplain management (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate floodplain management involving multiple jurisdictions. (e.g., create consensus requiring no adverse impact)
Codify use of most restrictive standard where conflicts exist	Revise local standards to codify this requirement and address adverse impact
Drainage component is not part of certificate of compliance (In Ector County there is no review of any building or development permit, no component for flood mitigation)	Counties should have the option to be empowered to enforce drainage requirements within the requirements for a certificate of compliance
Improve flood mitigation planning coordination with other jurisdictions to facilitate (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate flood mitigation planning involving multiple jurisdictions.
Improve flood mitigation implementation coordination with other jurisdictions to facilitate (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate flood mitigation implementation involving multiple jurisdictions.
Coordinate with State Historic Preservation Office to develop acceptable mitigation practices for the Upper Rio Grande Flood Planning region outside of El Paso County	Develop regional procedures for accelerating compliance, reducing delays in projects due to interaction with the historic preservation office.

ES.9 Flood Infrastructure Financing Analysis

The Region 14 RFPG has recommended a total of 58 actions to address flood risk across the planning region. These actions are anticipated to cost $160.3 million to implement. Given the funding challenges, local sponsors will likely be required to use a combination of funding sources, including local, state, and federal sources. This chapter discusses the common avenues of generating local funding and various state and federal financial assistance programs.

TWDB requires that each RFPG assess and report on how local sponsors propose to finance recommended FMEs, FMSs, and FMPs. The RFPG conducted a survey for local sponsors to determine the funding needs and propose what role the state should have in financing the recommended FMEs, FMSs, and FMPs.

While the response rate appears low, there is significant interest and participation from major regional stakeholders. The communities that responded to the survey are listed as sponsors for a combined 46 of the 58 flood mitigation actions (79%) accounting for $156.5 million (97.6%) of the total implementation cost needed. As a result, even with a low overall response rate, the information received provides a representative picture of total funding needs across the basin.

Of the 11 entities that responded, the likely sources of funding included general or dedicated revenues, bonds, tax notes, or utility fees. Five of the respondents had not applied for grant funding in the past five years (one respondent left this blank). Three had been successful in receiving a grant and loan, one had been unsuccessful, one had received an invitation for a full application but decided not to pursue the project, and one application was still under review.

ES.10 Public Participation and Plan Adoption

The Upper Rio Grande RFPG held 16 formal meetings between November 2020 and July 2022 to discuss RFP topics, conduct pre-planning and administrative activities, receive updates from the technical consultant, and vote on measures. All meetings conducted in accordance with the Texas Open Meetings Act (OMA) with recordings and minutes posted online on the RFPG website (www.urgfpg.org) following the meetings.

In addition, public meetings were held in the region to facilitate engagement with the public and other stakeholders including two in El Paso (October 27, 2021, and June 8, 2022), one in Pecos (February 9, 2022), and one in Presidio (February 10, 2022).

From September to October 2021, the RFPG conducted a stakeholder survey to obtain flood-related information from the public and other stakeholders. An interactive map was developed to collect feedback from the public regarding flood prone areas, critical infrastructure or resources, existing infrastructure, and existing or proposed flood mitigation projects.

Following the submittal of the Draft RFP to the TWDB, a Public Hearing was held in El Paso on September 14, 2022, to receive public comments. Printed copies of the Draft RFP were in three publicly accessible locations in the region including the cities of El Paso, Pecos, and Presidio. The Draft RFP was also posted to the RFPG website for public review, and public comments were accepted electronically during the public review and comment period. The Final RFP was adopted by the RFPG on December 15, 2022, and submitted to the TWDB along with supporting materials on January 10, 2023.

The state and regional flood planning process is guided by 39 principles adopted in Title 31 Texas Administrative Code (TAC) §362.3. This RFP conforms with each of these flood planning guidance principles, including the requirement that the plan will not negatively affect any neighboring areas.

Chapter 1: Introduction and Description of the Upper Rio Grande Flood Planning Region

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1. Introduction and Description of the Upper Rio Grande Flood Planning Region

Sections 16.061 and 16.062 of the Texas Water Code direct the Executive Administrator of the Texas Water Development Board (TWDB) to prepare and maintain a comprehensive State Flood Plan. The overall goal of the State Flood Plan is to identify specific flood risks as well as flood studies, strategies, and projects to reduce those risks in coming years within Texas. This effort is aimed at better managing flood risk to reduce loss of life and property from flooding.

In April 2020, the TWDB adopted rules establishing 15 regional flood planning areas (**Figure 1.1**). Each planning area has its own regional flood planning group (RFPG) responsible for preparing a consensus-based Regional Flood Plan (RFP). The TWDB incorporates the resulting RFPs into the State Flood Plan, which is updated in 5-year cycles. It is anticipated that the current cycle of Regional Flood Plans will be finalized and adopted by January 2023. Subsequently, by September 2024, the TWDB will prepare its first State Flood Plan.

The Upper Rio Grande Flood Planning Region, designated by the TWDB as "Region 14" and led by the Upper Rio Grande Flood Planning Group (URGFPG), encompasses all or part of 23 West Texas counties as listed below and shown in **Figure 1.2** (partial counties denoted with asterisks):

- Andrews*
- Brewster
- Crane
- Crockett*
- Culberson
- Ector*
- Edwards*
- El Paso
- Hudspeth
- Jeff Davis
- Loving
- Midland*
- Pecos
- Presidio
- Reagan*
- Reeves
- Schleicher*
- Sutton*
- Terrell
- Upton*
- Val Verde*
- Ward
- Winkler

The planning area for Region 14 follows the Upper Rio Grande in West Texas along the US-Mexico border from the City of El Paso to the Amistad Reservoir in Val Verde County as well as the Pecos River from the New Mexico Border to the Rio Grande. This region is the largest of the fifteen state flood planning regions by area, covering more than 43,000 square miles across three river basins – the Upper Rio Grande, the Pecos River, and the Devils River.

The entirety of the Upper Rio Grande watershed area covers nearly 180,000 square miles, draining into the Lower Rio Grande through the Amistad Reservoir and, ultimately, into the Gulf of Mexico. A majority of the Upper Rio Grande watershed originates upstream of the Texas state line, with Texas representing only 24% of the total watershed area. The remainder of the watershed covers New Mexico (43%), Mexico (29%), and Colorado (4%).

The regional flood plan includes the following sections:

- Planning area description (Chapter 1);

- Existing and future condition flood risk analysis (Chapter 2);
- Evaluation and recommendations on floodplain management practices; Flood mitigation and floodplain management goals (Chapter 3);
- Identification of flood needs and identification and recommendation of flood solutions including flood management evaluations (FMEs), flood management strategies (FMSs), and flood mitigation projects (FMPs) (Chapter 4);
- Impacts of regional flood plan; contributions to and impacts on water supply development and the State Water Plan (Chapter 5);
- Flood response information and activities (Chapter 6);
- Administrative, regulatory, and legislative recommendations (Chapter 7);
- Flood infrastructure financing analysis (Chapter 8); and
- Public participation and plan adoption (Chapter 9).

The overall goal of the State Flood Plan is “to protect against the loss of life and property,” as set forth in the Guidance Principles in 31 Texas Administrative Code (TAC) §362.3. Flood management evaluations, flood management strategies, and flood mitigation projects aim to mitigate flood events associated with a 1% annual chance flood event. During the process of developing flood management evaluations and strategies and flood mitigation projects within each region, benefits to water supplies, economic and environmental impacts, and public acceptance were considered. This includes local impacts to agriculture, recreational resources, transportation, and sustainability.

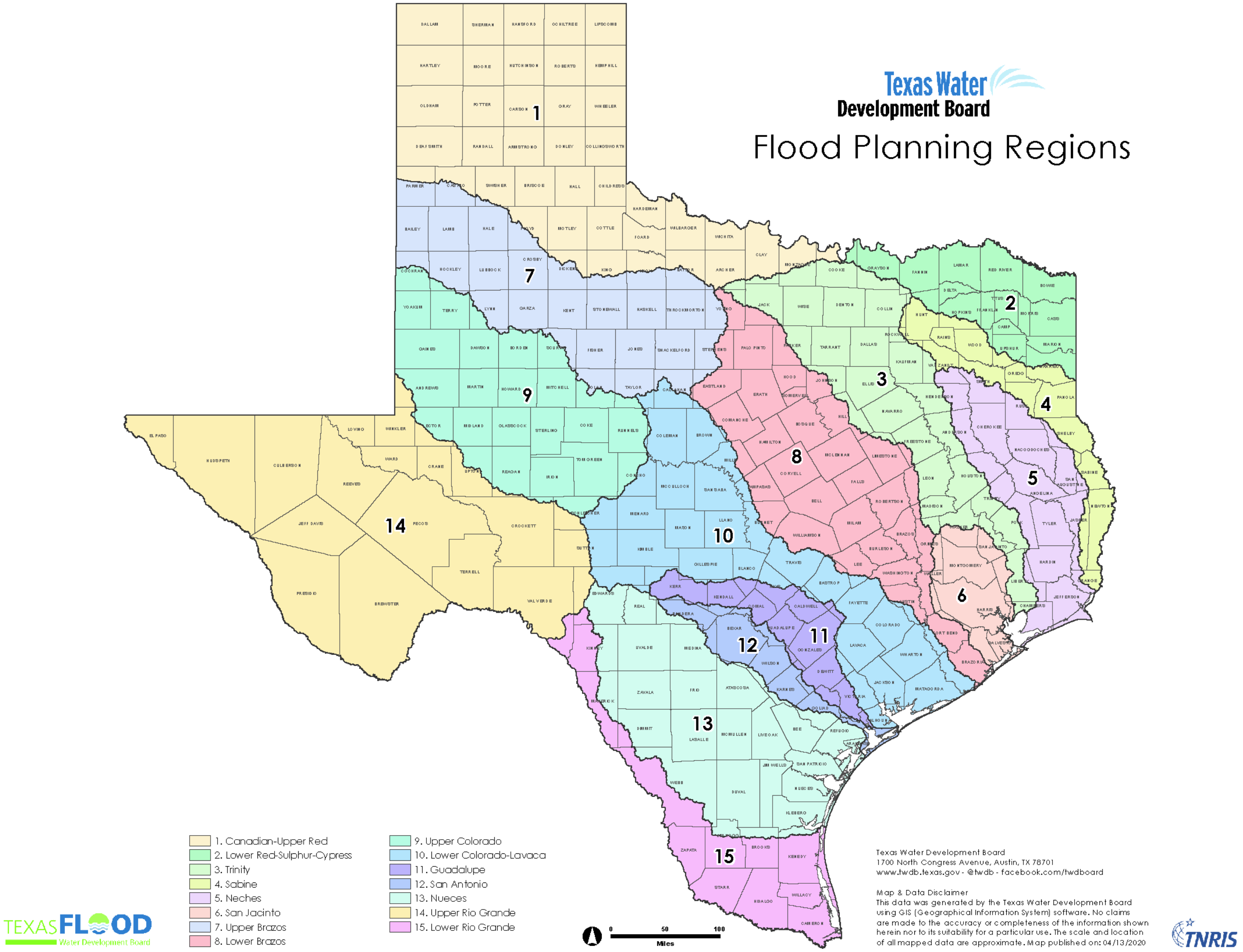

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Figure 1.1 TWDB Designated Flood Planning Regions

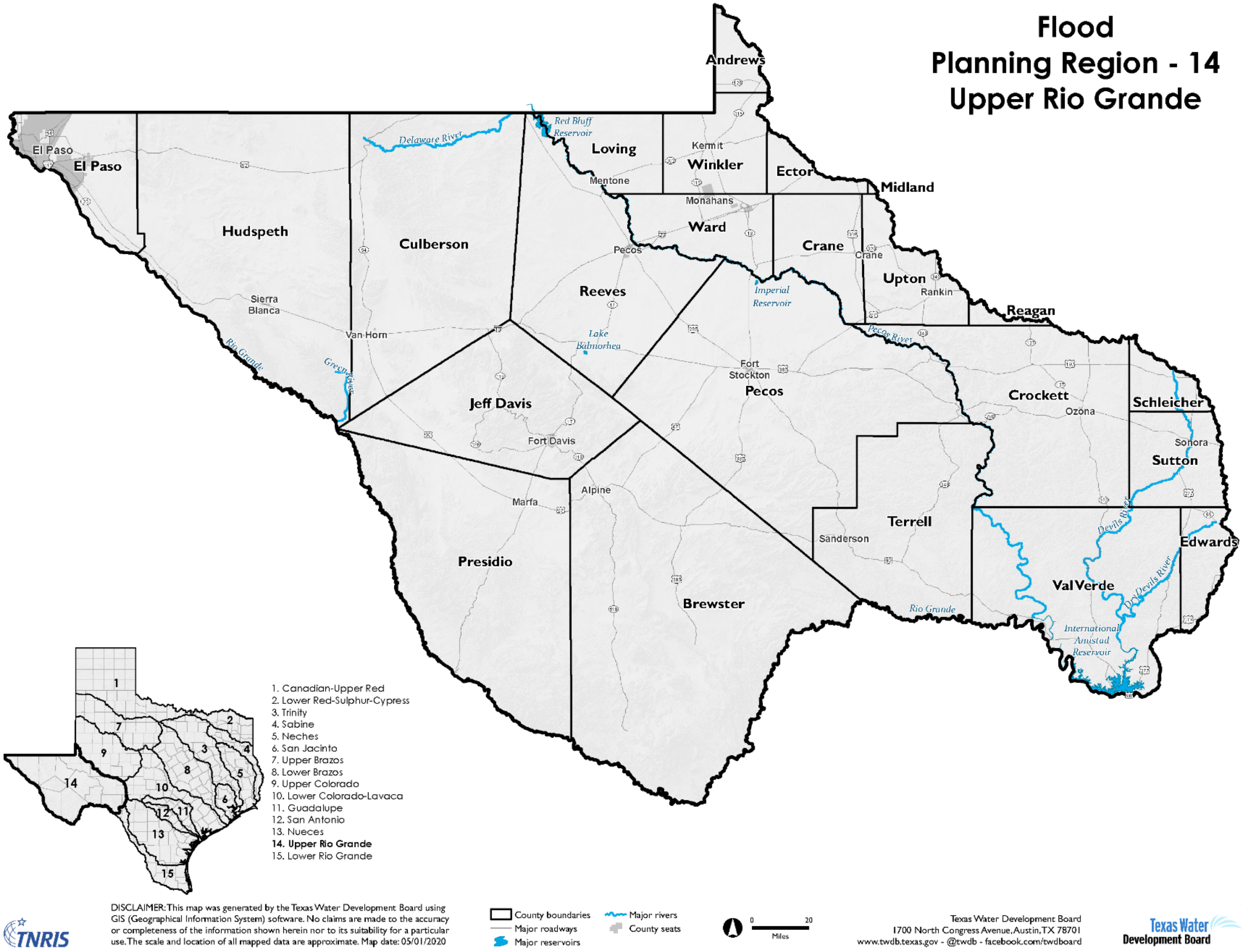

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Figure 1.2 Upper Rio Grande Flood Planning Region (Region 14)

1.1 Social and Economic Characteristics

The Far West Texas region is well known for its wide-open expanses and rugged landscapes. Compared to other flood planning regions across the state, Region 14 remains primarily rural and less impacted by urban development.[1] Nevertheless, flooding continues to pose a substantial risk to communities of all sizes across the region. The following section describes the social and economic characteristics of the region, including development, population, and economic activity.

1.1.1 Population and Development

Population

Regional county-level population estimates were obtained and compared from multiple sources including the TWDB Regional Water Plan (2021), the Texas Demographic Center Texas Population Projections Program (2018), the American Community Survey (ACS) 5-year Estimates (2016-2020), and the 2020 Decennial Census Redistricting Data Summary Files.

Existing (2020) populations by county in the region are summarized in **Table 1.1**. Populations were adjusted to reflect only the population estimated inside the Region 14 Flood Planning boundaries, excluding populations for urban centers outside the region such as the Cities of Midland and Odessa (represented in Region 9) as well as the City of Del Rio (represented in Region 15). In addition, populations for smaller counties such as Loving and Midland County were estimated using Landscan nighttime population estimates from the Oak Ridge National Laboratory (ORNL) datasets.

The top five counties by population in Region 14 include the Counties of El Paso (89%), Pecos (2%), Reeves (2%), Ward (1%), and Brewster (1%). Several of the region's largest cities are located in El Paso County, including the Cities of El Paso, Socorro, Horizon City, and San Elizario. Other prominent cities in the region by population include the City of Fort Stockton (Pecos County), the City of Pecos (Reeves County), the City of Alpine (Brewster County), the City of Monahans (Ward County), and the City of Presidio (Presidio County).

Population within Region 14 is projected to grow on pace with the rest of Texas between 2020 and 2050, with an estimated annual growth rate between 1.1% and 1.8%, according to the TWDB 2021 Regional Water Plan and 2018 Texas Demographic Center estimates. A more detailed analysis of future population trends is presented in *Chapter 2 (Flood Risk Analyses)*.

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[1] Texas A&M Natural Resources Institute (NRI). *West Texas Landowner Report: Energy and Growth Trends.* December 2019. *https://nri.tamu.edu/media/2786/west-texas-landowner-report-final-20200115.pdf*

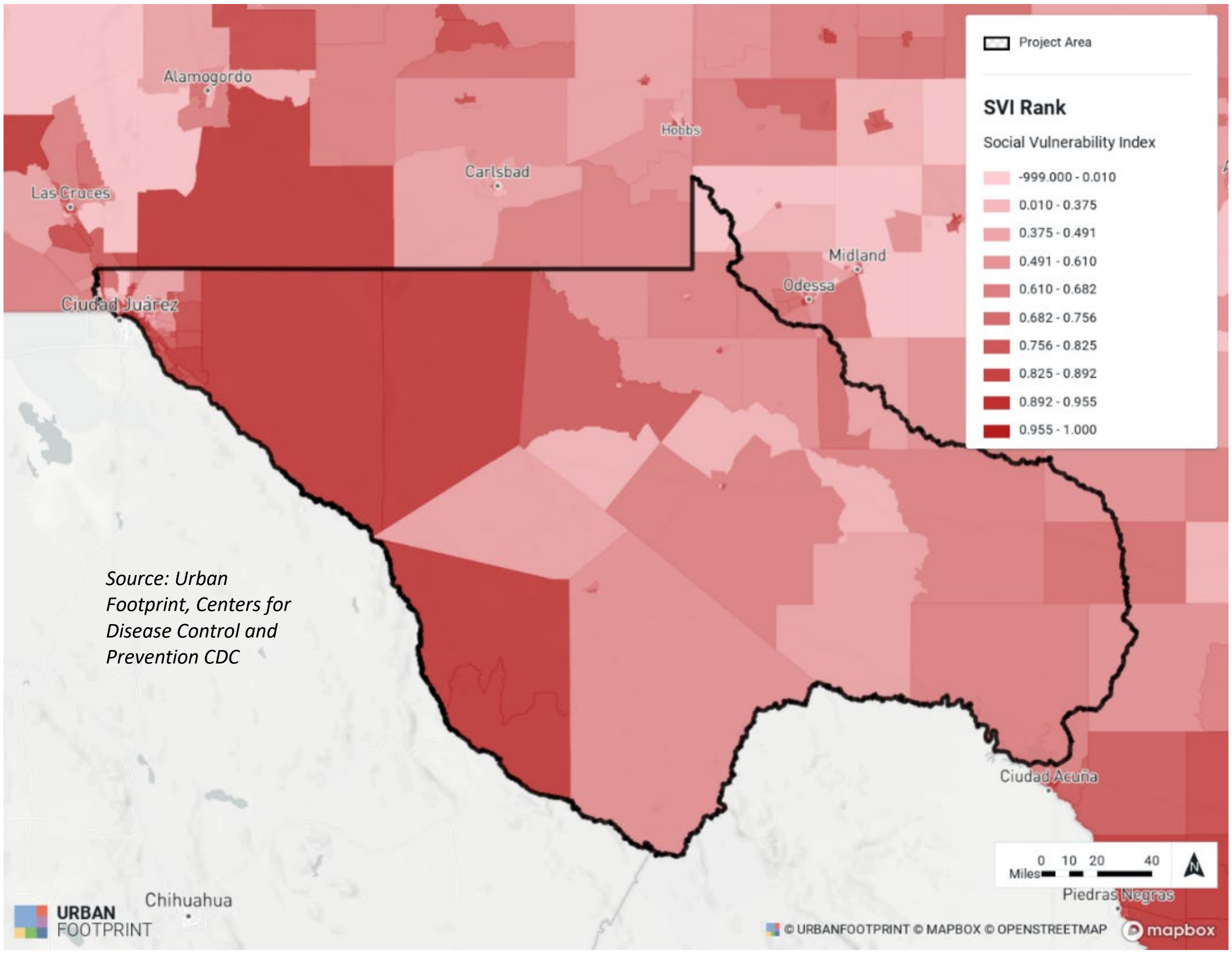
Table 1.1 Existing Population by County in Region

County	Estimated Population in Region, 2020	% of Population in Region
Andrews	138	<0.1%
Brewster	9,727	0.9%
Crane	5,056	0.5%
Crockett	4,111	0.4%
Culberson	2,695	0.3%
Ector	4,705	0.5%
Edwards	2,123	0.2%
El Paso	925,565	89.0%
Hudspeth	3,913	0.4%
Jeff Davis	2,398	0.2%
Loving	157	<0.1%
Midland	80	<0.1%
Pecos	17,718	1.7%
Presidio	8,692	0.8%
Reagan	3,853	0.4%
Reeves	15,125	1.5%
Schleicher	3,811	0.4%
Sutton	3,817	0.4%
Terrell	1,045	0.1%
Upton	3,690	0.4%
Val Verde	1,933	0.2%
Ward	11,454	1.1%
Winkler	8,033	0.8%
Total	1,039,839	100%

Social Vulnerability

The Social Vulnerability Index (SVI) is an index used by the Centers for Disease Control and Prevention (CDC) that measures 15 social factors from the U.S Census, including poverty, lack of vehicle access, and crowded housing, among others. The SVI can help public health officials and local planners better prepare for and respond to emergency events like flooding, hurricanes, disease outbreaks, or exposure to dangerous chemicals. The SVI ranges from zero (0) to one (1) with higher SVI values indicating a higher degree of vulnerability relative to other areas.

Figure 1.3 shows a percentile ranking of social vulnerability for each census tract in Region 14. Based on these estimates, the west portion of the region (including the Counties of El Paso, Hudspeth, Culberson, and Presidio) exhibits a high degree of vulnerability with SVI values of 0.8 or greater. SVI values are examined in further detail in *Chapter 4 (Flood Mitigation Solutions)*.



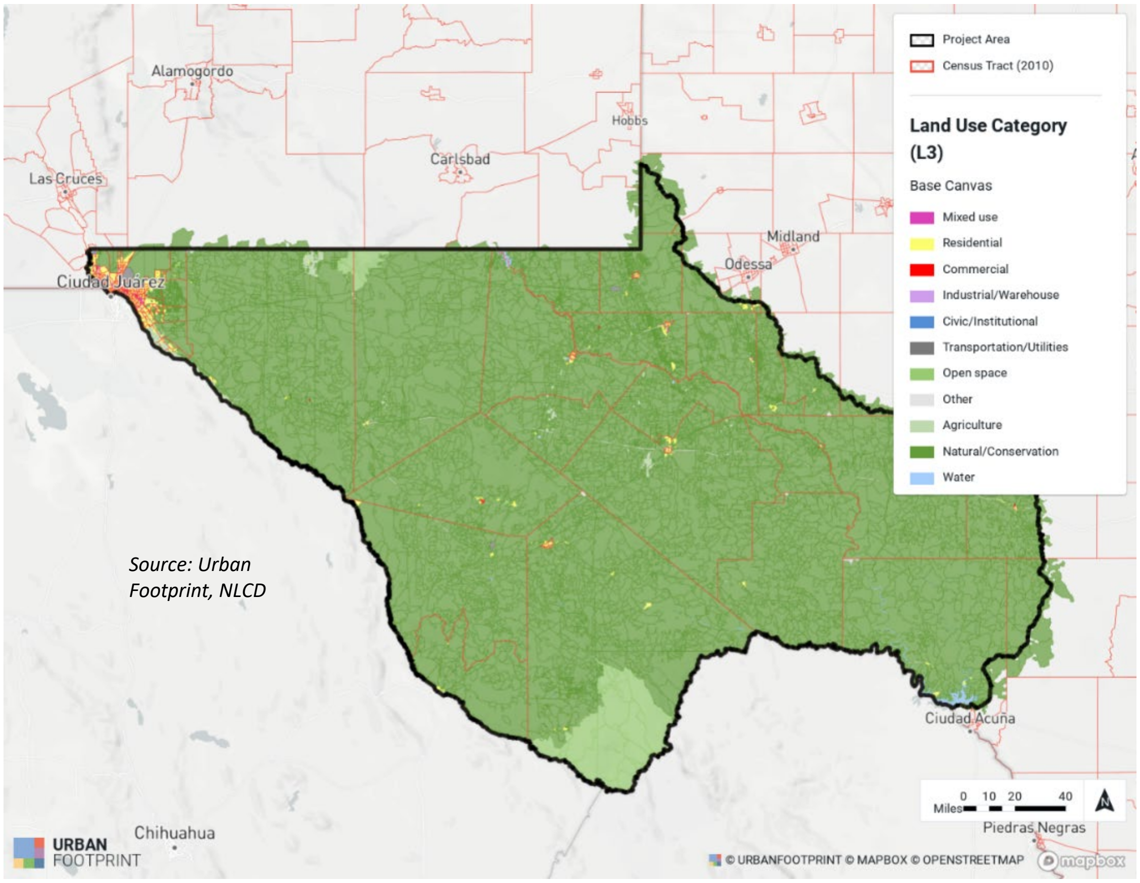
Source: Urban Footprint, Centers for Disease Control and Prevention CDC

Figure 1.3 Social Vulnerability by Census Tract

Development

Regionwide land use data were obtained using Urban Footprint for a variety of Land Use types. These land use types are shown below in **Figure 1.4** and summarized in **Table 1.2**.

According to these estimates, nearly 90% of the region's area consists of natural, undeveloped land, and approximately 3% of the area is represented by parks and open space (such as Big Bend National Park and Guadalupe Mountains National Park). Of the remaining developed land use categories, the highest land use categories are residential (approximately 41% of developed areas) and agricultural cropland (approximately 39% of developed areas, excluding grassland/ pasture). In total, all developed areas, which include residential, agricultural (excluding grassland/pasture areas), civic, commercial, industrial, mixed-use, and transportation/utilities land use types, make up approximately 2.0% of the total region by area.



Source: Urban Footprint, NLCD

Figure 1.4 Regionwide Land Use

Table 1.2 Summary of Land Use Types

Land Use Type	Total Area (acres)	% of Total
Agriculture (grassland/pasture)	1,571,000	6%
Agriculture (other crops)	206,000	<1%
Civic/Institutional	2,000	<1%
Commercial	13,000	<1%
Industrial	68	<1%
Mixed-use	27,000	<1%
Natural/Conservation	25,349,000	89%
Parks & Open Space	972,000	3%
Other	40,000	<1%
Residential	216,000	1%
Transportation/Utilities	25,000	<1%
Water	68,000	<1%

Source: USDA CropScape Data Layer used for agricultural areas (including grassland/pasture and other crops); Urban Footprint used for non-agricultural areas

1.1.2 Primary Economic Activities and At-Risk Sectors

To evaluate economic activities and trends across the region, industry and business data were obtained from Esri Business Analyst Data, Emsi Labor Market Analytics & Economic Data, and the Texas Almanac. Economic activity can be evaluated in the region both by total employment and by the concentration of industries relative to the national average.

As of 2021, the region employs an estimated 590,000 jobs across its 23 counties, with about 91,000 of these jobs added since 2010. In the past decade, jobs in the region have grown at an annual rate of 1.5%, faster than the U.S. average (0.9%) and similar to the Texas average (1.7%).

By total employment, the region's top five industries (representing approximately 45% of total jobs) include human health (healthcare, such as hospitals and pharmaceuticals), food services (restaurants and other food services), education (schools and universities, public and private), oil and gas upstream (oil extraction and related activities), and non-food retail. With the exception of the oil and gas upstream industry, the concentration of these industries in the region is similar to the average concentration of the industries across the U.S.

In terms of regional specialization (i.e., evaluating the concentration of industries relative to the national average), the region's top five industries include oil and gas upstream (oil extraction and related activities), oil and gas downstream (manufacturing from processed petroleum or support services for oil/gas), federal military, rental and leasing, and textile manufacturing. In particular, the region's oil and gas upstream industry is highly specialized, with a concentration 17 times higher than the U.S. average. Other noteworthy industries, based on Texas Almanac data, include tourism and ranching.

Table 1.3 lists the primary economic base of each county as well as the breakdown of mining and agricultural activities, according to data from the Texas Almanac.

Many economic sectors are susceptible to flood risks. In reviewing data for major businesses in the region, around 450 businesses with more than 100 employees were identified, and, among these, approximately 60 (14%) were found to be located in the existing 1% or 0.2% annual chance floodplains.

In the event of major flooding, post-disaster impacts to businesses include damages to properties, facilities and assets directly owned by the business, as well as disruptions to suppliers, customers and employees. A business' ability to recover and resume operations is typically dependent on its size since larger companies are more likely to have a continuity plan in place. For oil and gas industries, flooding can result in the disruption of oil and gas operations and damage to supply systems, such as ruptured flow lines and storage tanks.[2] For agricultural resources, extended periods of flooding may damage crops leading to reduced crop yields or total loss (the region's agricultural resources are discussed in further detail later in this chapter in Section 0).

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[2] Cornell, Kenneth. *Environmental Exposure: Flood Risk in the Oil & Gas Industry.* April 7, 2014. https://www.insurancejournal.com/magazines/mag-features/2014/04/07/325072.htm

Table 1.3 Primary Economic Activities by County

County	Primary Economic Base	Mineral Deposits	Agriculture
Andrews*	Natural resources/mining; manufacturing; trade, construction; government/ services; agribusiness.	Oil and gas.	Beef, cotton, sorghums, grains, corn, hay.
Brewster	Agriculture, tourism, government/ services, Sul Ross State University, mining.	Bentonite.	Beef cattle, meat goats, horses.
Crane	Oil and gas; agriculture; government/services.	Oil, gas production.	Beef cattle, goats.
Crockett*	Oil and gas, ranching, hunting leases.	Oil, gas production.	Sheep (first in numbers), goats; beef cattle.
Culberson	Tourism, government/services, talc mining and processing, agribusiness, sulfur mining.	Sulfur, talc, marble, oil.	Beef cattle; cotton, vegetables, melons, pecans; 6,000 acres in irrigation.
Ector*	Center for Permian Basin oil field operations, plastics, electric generation plants.	More than 3 billion barrels of oil produced since 1926; gas, cement, stone.	Beef cattle, horses are chief producers; pecans, hay, poultry; minor irrigation.
Edwards*	Hunting leases, tourism, oil, gas production, ranching.	Gas.	Second in number of goats. Mohair-wool production, Angora goats (first in numbers), sheep, cattle, some pecans. Cedar for oil.
El Paso	Government, military are major economic factors; wholesale and retail distribution center, education, tourism, maquiladora plants, varied manufacturing, oil refining, cotton, food processing.	Production of cement, stone, sand and gravel.	Dairies, cattle, cotton, pecans, onions, forage, peppers. Third in colonies of bees. 25,000 acres irrigated, mostly cotton.
Hudspeth	Agribusiness, mining, tourism, hunting leases.	Talc, stone, gypsum.	Most income from cotton, vegetables, hay, alfalfa; beef cattle raised; 18,000 acres irrigated.
Jeff Davis	Tourism, agriculture, McDonald Observatory.	Not significant.	Greenhouse tomatoes, beef cattle, horses, meat goats.
Loving	Oil and gas operations; cattle.	Oil, gas.	Cattle ranching.
Midland*	Among leading petroleum-producing counties; distribution, administrative center for oil industry; varied manufacturing; government/services.	Oil, natural gas.	Beef cattle, horses, sheep and goats; cotton, hay, pecans; some 11,000 acres irrigated.
Pecos	Oil, gas, agriculture, government/services, wind turbines.	Natural gas, oil, gravel, caliche.	Cattle, alfalfa, pecans, sheep, goats, onions, peppers, melons. Aqua-culture firm producing shrimp.
Presidio	Government/services, ranching, hunting leases, tourism.	Sand, gravel, silver, zeolite.	Cattle, tomatoes, hay, onions, melons. Some irrigation near Rio Grande.
Reagan*	Oil and gas production, hunting, ranching.	Gas, oil.	Cotton, cattle, sheep, goats.

County	Primary Economic Base	Mineral Deposits	Agriculture
Reeves	Oil and gas, agriculture, tourism, food processing, government/services, gravel.	Oil, gas, gravel.	Ranching, dairies, hay, cotton, cantaloupes, pecans, pistachios. Some 11,000 acres irrigated.
Schleicher*	Oil, ranching, and hunting.	Oil and natural gas.	Beef cattle, sheep, goats, and cotton, hay.
Sutton*	Natural gas, ranching, hunting.	Oil, natural gas.	Meat goats (first in numbers), sheep, cattle, Angora goats (second in numbers). Exotic wildlife. Wheat and oats raised for grazing, hay; minor irrigation.
Terrell	Ranching, hunting leases, oil, gas exploration, tourism.	Gas, oil, limestone.	Goats (meat, Angora); sheep (meat, wool); some beef cattle.
Upton*	Oil, wind turbines, farming, ranching.	Oil, natural gas.	Cotton, sheep, goats, cattle, watermelons, pecans. Extensive irrigation.
Val Verde*	Agribusiness, tourism, trade center, military, Border Patrol, hunting leases, fishing.	Production sand and gravel, gas, oil.	Sheep, Angora goats, meat goats (second in numbers); cattle; minor irrigation.
Ward	Oil, gas, government/services.	Oil, gas, caliche, sand, gravel.	Beef cattle, greenhouse crops, alfalfa, horses.
Winkler	Oil, natural gas, ranching, prison, some farming.	Oil, gas.	Beef cattle.

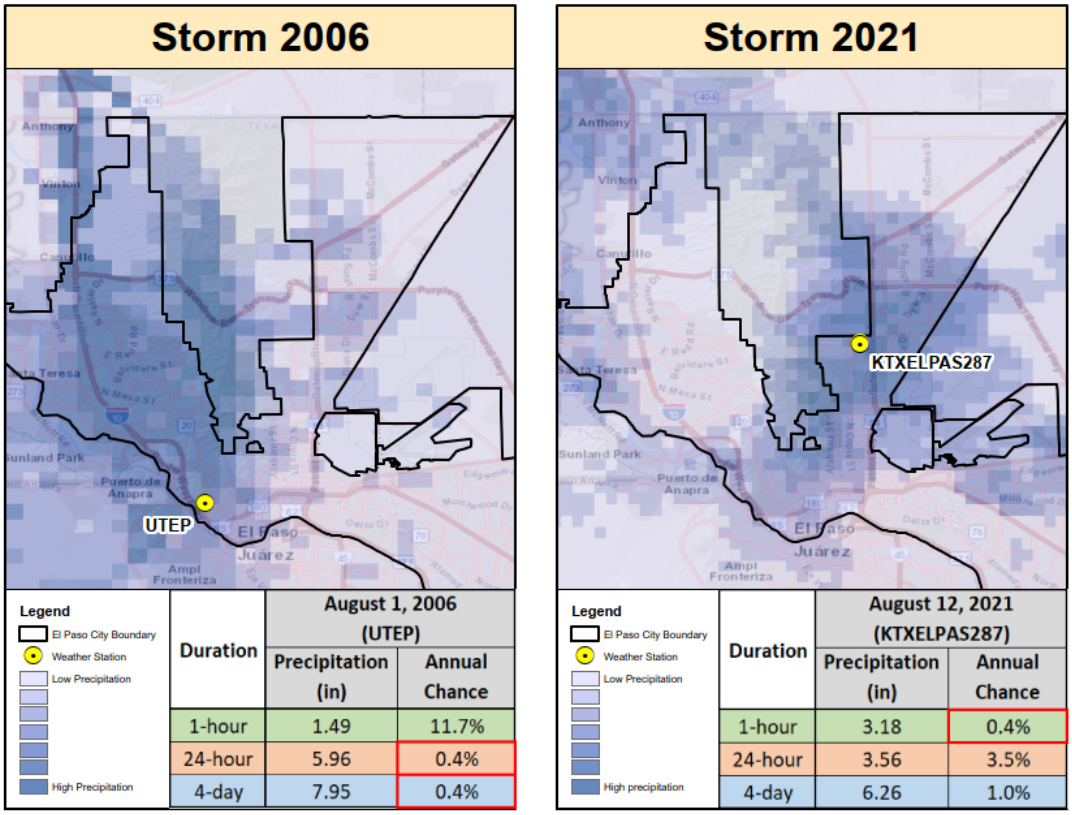
**indicates this county is partially within this RFPG and is also represented by at least one other RFPG*

1. *Source: Texas State Historical Association (Texas Almanac 2018-2019). Texas Comptroller of Public Accounts, Texas Economy.*

1.2 Historical Flooding

Flooding in Texas is principally associated with hurricanes, tropical storms, and high intensity storms. Flooding is usually caused by high precipitation volumes, long precipitation duration, and high precipitation intensity. Hurricanes and tropical storms have the potential for each dangerous mode of precipitation as they are large storms fed from warm oceans and can linger over a location. A summary of historical flooding events throughout the region is presented in **Table 1.4**.

El Paso County has experienced long duration/low intensity rain events (e.g., 7.95 inches over four days in 2006) and short duration/high intensity rain events (e.g., 3.18 inches over one hour in 2021) which result in various flood hazards and require different mitigation strategies. Both of these storm events, shown in **Figure 1.5**, had an extremely low Annual Exceedance Probability (AEP) of approximately 0.4% (or the 250-year return period). Both of these storms covered the streets in debris and caused significant damage.



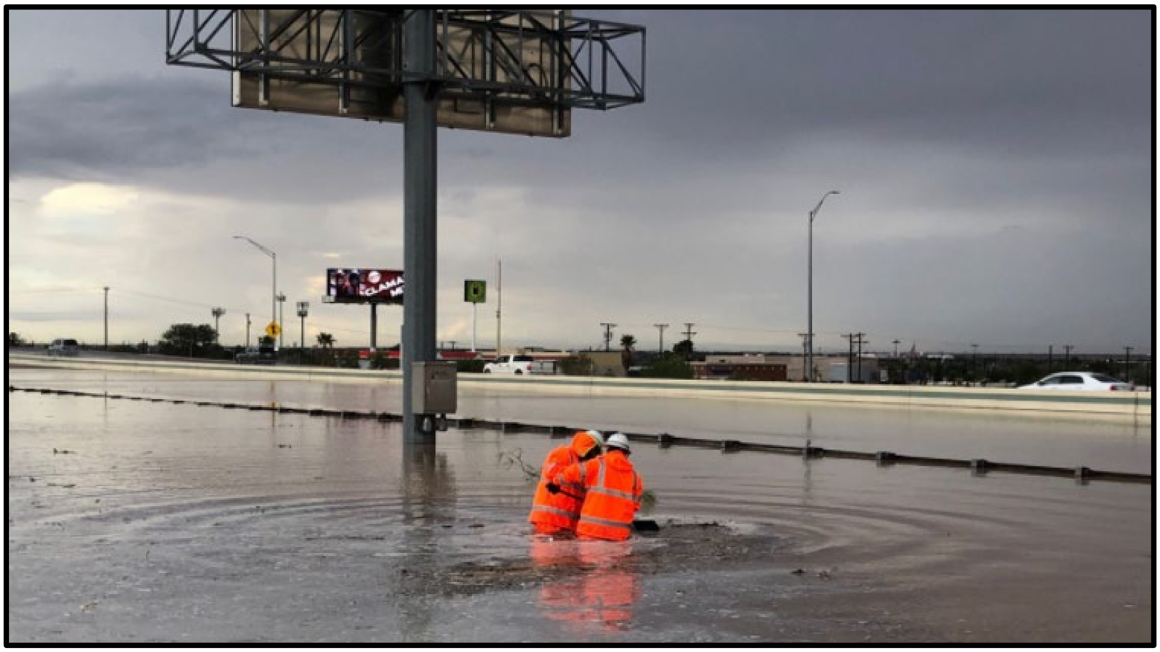
Duration	August 1, 2006 (UTEP) Precipitation (in)	August 1, 2006 (UTEP) Annual Chance
1-hour	1.49	11.7%
24-hour	5.96	0.4%
4-day	7.95	0.4%

Duration	August 12, 2021 (KTXELPAS287) Precipitation (in)	August 12, 2021 (KTXELPAS287) Annual Chance
1-hour	3.18	0.4%
24-hour	3.56	3.5%
4-day	6.26	1.0%

Note: Annual chances are based on NOAA Atlas-14 (2018) point precipitation frequency estimates at a location near central El Paso

Figure 1.5 Precipitation and Annual Exceedance Probabilities of 2006 and 2021 Floods in El Paso, Texas

The August 2021 is an example of high precipitation intensity flooding (see **Figure 1.6**). This short, intense, extreme storm overwhelmed drainage infrastructure in east central El Paso. Several small flood control structures had major releases from emergency spillways, Interstate Highway (IH)-10, was overtopped, and numerous neighborhoods and streets experienced short-term flooding.



U.S. 54 and Hercules Flooded from 2021 Storm. Source: KVIA News, https://kvia.com/traffic/2021/07/01/for-3rd-day-this-week-flash-floods-hamper-el-paso-commute/

Figure 1.6 Example of High-Intensity Flooding during 2021 Flood in El Paso, Texas

The August of 2006 storm in El Paso County (the most populated county in Region 14) is an example of a long duration high volume flood event in the region. The County received one year's worth of rainfall in two days, with more rain falling before and after the peak of the event. In addition to the exceptional volume, saturated conditions created more runoff than what would usually occur on dry ground, worsening the effects downstream. It led to the overtopping of Interstate IH-10, and sediment/debris flows from Franklin mountain arroyos into the city drainage infrastructure in west/ northwest El Paso and in northeast El Paso. The resulting blockage of drainage infrastructure led to extensive property damage. The storm caused $200 million in damages to businesses and homes, and an additional $115 million in damage to the city's stormwater system. The high stage in the Rio Grande coupled with limited drainage structure/ pump station capacity led to extensive flood damage in several locations within the flat riverine terrace adjacent to the Rio Grande.

A significant flooding event also affected Presidio, Texas, and Ojinaga, Mexico in September 2008, causing damaging flooding along the Rio Grande and Rio Conchos as shown in **Figure 1.7**. This storm, centered over the Rio Conchos watershed in Mexico, sent a massive flood down the Rio Conchos into the Rio Grande. Flooding occurred along the Rio Grande from the confluence with the Rio Conchos to Amistad Reservoir. This flood breached and/or overtopped both US and Mexican levees at locations along the Rio Conchos and the Rio Grande. Flooding in Presidio was primarily limited to the low-lying farmland adjacent to the levees.

Figure 1.7 Flooding along the Rio Grande and Rio Conchos in Presidio, Texas and Ojinaga, Mexico on September 19, 2008

Image: Jeff Bennett, Upper Rio Grande Regional Flood Planning Group

Western Texas has a history of damaging and dangerous floods. Despite the region's largely arid climate and low rainfall totals, extreme storms are influenced by weather systems from the Gulf of Mexico including warm fronts, tropical storms, and hurricanes. During previous hurricanes, Hurricane Paul caused 2.26" of rain in El Paso County in 1982, and Hurricane Alice caused 34" of rain in Val Verde County in 1954. Carefully analyzing and evaluating needs and improvements associated with stormwater infrastructure remains important for dealing with these severe events.

Another significant component of flooding in the region is the Upper Rio Grande watershed which has more than 76% of its area lying outside of the region in New Mexico, Mexico, and Colorado. It is estimated that only 5% of typical flow from New Mexico reaches Texas, as water supply in New Mexico is heavily managed to meet the needs of communities in New Mexico, Texas, and Mexico.

Historic Flooding occurred in April 2004 in Pecos and Reeves County, resulting in significant flooding downstream of Comanche Creek Dam in Fort Stockton and a collapsed I-20 bridge over Salt Draw between Toyah and Pecos (see **Figure 1.8**). In addition, a levee protecting Toyah was breached during the flood event.

April 2004 flood caused this I-20 bridge over Salt Draw to collapse, located between Toyah and Pecos. Source: NOAA and NWS; https://www.weather.gov/maf/2004_04_02_SevereWeather

Figure 1.8 Toyah and Pecos, Texas, 2004 Flood

Table 1.4 Historical Flood Events with the Upper Rio Grande Region

County	Date	Location	Significance	Source*
Brewster	September 9, 2008	Brewster	Indeterminate amount of rainfall caused $16.8M in flood damages. Large portions of FM-170 were inundated and suffered damage. Rio Grande Village was evacuated and facilities were closed for months.	6, 8
Brewster	October 1, 1990	Brewster	Indeterminate amount of rainfall caused $1.98M in flood damages.	6
Brewster	September 3, 1986	Brewster	Indeterminate amount of rainfall caused $1.18M in flood damages	6
Brewster	August 10, 1980	Chisos Basin, Pecos and Devils Rivers	Hurricane Allen caused 6" of rain over a 5 day period.	3
Culberson	September 24, 1978	Guadalupe National Park	Tropical Storm Paul caused 15" of rain in one day. (See Hudspeth County)	3
Edwards	June 23, 1948	Countywide	24" of rainfall caused $3.6M in damages	3
Edwards	June 10, 1935	Carta Valley	17.6" of rainfall caused $20M in damages	3
El Paso	August 12, 2021	City of El Paso, Franklin Mnt.	Some parts of El Paso received over 4 inches of rain in a short period of time creating significant flash flooding which included two deaths in the east side of the Franklin Mountains.	8
El Paso	June 28, 2021	City of El Paso	Some locations of the city received over 4 inches of rain in 36 hours. $500k in property damages occurred as water entered homes in parts of West El Paso when nearby drainage ponds overflowed. One death occurred on Thunderbird Trail after water rushed down the side of the mountain.	8
El Paso	July 31, 2006	City of El Paso, Franklin Mnt.	FEMA-1658-DR-Recorded the highest level in Rio Grande since 1912. Several storms contributed to high environmental moisture and more runoff that expected. 3.5" of rainfall was recorded for July 31st through August 1st. 19.5" of total rainfall was recorded 2006.	1, 2, 4
El Paso	August 1, 2002	City of El Paso, Franklin Mnt.	An intense storm over the mountains causes 1" of rain over a 10 minute period leading to flash floods.	1
El Paso	August 3, 1966	City of El Paso	2" of rain in under an hour caused flash flooding that damaged homes, businesses, and made several roads and railroads impassible.	1
El Paso	June 1884	City of El Paso	A storm of Indeterminate strength caused over $1M in damages to rail infrastructure.	3
El Paso	July 21, 1880	City of El Paso	3.3" of rain was recorded over two days in 1880.	2
Hudspeth	August 12, 2021	Sierra Blanca/ Allamoore	Heavy rains and flash flooding, washed out poorly maintained county roads, trapping ranchers and Sunset Ranch (20 acre) residents for 5+ days during monsoon season. Heaviest rains began 8/12. Residents and workers could not leave or access ranches until 8/18.	7
Hudspeth	September	Guadalupe	Tropical Storm Paul caused 15" of rain in one day.	3

County	Date	Location	Significance	Source*
	24, 1978	National Park	(See Culberson County)	
Hudspeth	September 14, 1974	Continental Ranch	23" of rain over 9 days.	3
Hudspeth	August 22, 1966	Dell City	12" of rain over two days caused $4.3M in damages, with 3' of flooding in 50 houses.	3
Midland	October 9, 1985	Midland	6" of rain over 2 days.	3
Pecos	April 4, 2004	Fort Stockton	A rare early morning severe weather event hit Fort Stockton area around 5am CDT. The area adjacent to Comanche Creek, which runs through James Rooney Memorial Park, was one of the worst flooded areas in Fort Stockton.	9
Presidio	June 27,2021	Marfa	5" of rainfall over two days created flash floods and high currents at low water crossings. One fatality occurred near a border control outpost where a jeep utility car was swept off a crossing.	10
Presidio	September 9, 2008	City of Presidio	Indeterminate amount of rainfall caused $1.17M in flash flood damages. During the summer of 2008, monsoon rainfall filled reservoirs across northern Mexico. On September 7, Governor Perry executed the State Emergency Plan, issued a Disaster Declaration for Presidio County, TX, and a Proclamation of State Disaster. On September 9, the levees near Redford, TX failed. This resulted in water covering the entire city of Redford. Water also topped the levees near Presidio Golf Course on the September 16th-17th, and IBWC reported cracks in the levees near the golf course.	6, 8
Presidio	April 4, 2004	Toyah	Indeterminate amount of rainfall caused $1.33M in flood damages.	6
Presidio	October 1, 1990	Presidio County	Indeterminate amount of rainfall caused $1.92M in flood damages.	6
Reeves	July 1, 1945	Kingston Farm	13.1" of rain over 3 days causing $52,000 in damages.	3
Schleicher	August 30, 1932	Eldorado	15.4" of rainfall	3
Schleicher	July 16, 1928	Eldorado	13" of rainfall in Eldorado caused 6 fatalities and $5M in damages	3
Sutton	September 22, 2018	Sonora	Flash flooding damaged or destroyed 250 houses after 16" of rain fell in a couple hours.	5
Sutton	August 26, 1932	Sonora	A long storm over 13 days caused 13.74" of rain to fall in Sonora causing 9 deaths and $1M in damages	3
Terrell	June 10, 1965	Sanderson	9" of rain fell over a period of 2 days causing flash floods. $2.7M in damages were caused, with 26 deaths and hundreds displaced.	3
Upton	October 4, 1986	McCamey	16" of rain over a day caused 1 death due to a flash flood washing a car off the road.	3

County	Date	Location	Significance	Source*
Val Verde	August 22, 1998	Del Rio	Tropical Storm Charlie caused 16" of rain over a single day with significant rapid rise in San Felipe Creek. Entire residential slabs were wiped down to the foundation. A total of 13 fatalities were recorded in relation to the storm and subsequent flooding.	3
Val Verde	June 24, 1954	Langtry, Del Rio	Hurricane Alice moved inland up the Rio Grande. Several ranches in the region recorded rainfall of 35" causing significant flooding. International Bridge was destroyed when overtopped by 10' with the Rio Grande measuring 3 miles wide in Eagle Pass.	3

*Sources:
1) FEMA Study, https://elpasoready.org/history/
2) Robert Bettes 2021, KTSM, Accessed 17 December 2021, https://www.ktsm.com/weather/as-of-610-pm-today-is-the-25th-highest-rainfall-event-in-el-paso-history/
3) R. M. Slade & J. Patton 2002, USGS, Accessed 17 December 2021, https://www.floodsafety.com/texas/USGSdemo/county.htm
4) El Paso City-County Office of Emergency Management, Accessed 17 December 2021, https://elpasoready.org/history/
5) Joe Holley 2018, Houston Chronicle, Accessed 17 December 2021, https://www.houstonchronicle.com/news/columnists/native-texan/article/Flood-waters-ravage-a-little-West-Texas-town-13281371.php
6) Historical County Hazard Mitigation Plans
7) Hudspeth County Emergency Management Coordinator/County Administrator (email dated 4/26/2022).
8) NOAA Storm Events Database: https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=48%2CTEXAS
9) National Weather Service: https://www.weather.gov/maf/2004_04_02_SevereWeather.
10) Ursula Muñoz-Schaefer, *High water at Alamito Creek overtakes 2 vehicles, killing 1 Marfa resident.* Big Bend Sentinel. Accessed July 19, 2022, https://bigbendsentinel.com/2021/06/30/high-water-at-alamito-creek-overtakes-2-vehicles-killing-1-marfa-resident/

1.3 Flood-Related Authorities and Regulation

The Upper Rio Grande Region spans multiple entities, including 23 counties, 30 municipalities, and 31 unincorporated areas. To prepare for potential flood impacts, flood risk planning and regulation is essential among authorities within the region. While cities and counties can engage in flood planning activities, the flood planning role extends to all political subdivisions with flood-related districts or authorities created under Article III, Section 52, or Article XVI, Section 59, of the Texas Constitution. This includes any political subdivision of the state, any interstate compact commission, and any nonprofit water supply corporation created and operating under Chapter 67.

The region includes several entities which have influence over the region's flood mitigation planning and responses efforts. These include 2 Councils of Government (Rio Grande COG and Concho Valley COG); 46 water supply and utility districts; 5 National Parks, 1 National Historic Site, 7 State Parks, 1 State Historic Site, 3 State Natural Areas, 3 Wildlife Management Areas, and the US Army's Fort Bliss. A detailed list of entities within the region is provided in **Appendix Table 1A**.

Flood-regulating entities, such as counties and incorporated areas, have the authority to define and enforce flood regulations and ordinances for flood mitigation. For communities which participate in the National Flood Insurance Program (NFIP), the Texas Water Code § 16.315 requires NFIP participants to adopt a floodplain management ordinance and to designate a local floodplain administrator who is responsible for ensuring floodplain management regulations are followed within the community. Other entities in the region play an important role in flood planning in various ways such as communicating flood response efforts, planning and maintaining flood infrastructure, and supporting flood-related development codes. **Table 1.5** provides a summary of political subdivisions with flood-related authority and shows that all 23 counties (100%) and 24 out of 30 municipalities (80%) within the region are active in some form of floodplain management activity.

Table 1.5 Political Subdivisions with Flood-Related Authority

Type of Political Entity	# of Entities	# of Entities Active in Flood Planning	% of Entities Active in Flood Planning
Municipality	30	24	80%
County	23	23	100%
Government/Council/Commission	19	17	89%
Water Supply & Utility District	58	51	88%
National Park, State Park, Wildlife Management Area	24	5	21%

The Upper Rio Grande basin faces unique challenges. These include flash flooding, significant sediment transport during rain events, limited populace to fulfil regulatory planning roles, vast private lands, a state border and an international border to consider when coordinating flood planning and emergency response. Local regulations and development codes, floodplain ordinances, zoning and land use policies, drainage and building design standards, flood plans, and hazardous mitigation plans exist and are in development to prepare for and mitigate negative impacts of stormwater in the region. These efforts are often conducted with the cooperation of county, city, utility districts, COG, private and government bodies to mitigate shared flood risks at the watershed scale.

A summary of existing floodplain regulations adopted by entities in the region is provided in **Table 1.6**. Local regulations and development codes, as well as their prevalence in Region 14, are discussed in greater detail in Chapter 3 (*Floodplain Management Practices and Goals*).

Table 1.6 Summary of Existing Flood Plans and Regulations

Type of Regulation	Count
Comprehensive Plan / Unified Development Code (UDC)	22
Drainage Criteria Manual /Design Manual	2
Floodplain and Drainage Ordinances	9
Land Use Regulations (Zoning and Subdivision Ordinances)	10

1.4 Agricultural Resources

More than 30 types of crops are grown in the Upper Rio Grande Region, with the top seven crops most at risk to flooding including grassland/pasture, cotton, alfalfa, pecans, winter wheat, oats, and sorghum. The top five counties for agricultural production include the Counties of Hudspeth (notably Dell City), El Paso, Jeff Davis, Pecos, and Presidio. Additional agricultural activities are listed by county in Section 1.1.2.

1.4.1 Crop Production and Value Per Yield

To identify the agricultural resources most at risk to flooding and their estimated values, a cursory level analysis was performed using historical crop production datasets and information from the United States Department of Agriculture (USDA) Cropscape dataset[3] and Texas A&M University. Yield per acre and normalized price per unit values were obtained from the 2021 USDA State Agriculture Overview[4] for Texas and the USDA Quick Stats tool[5], as shown in **Table 1.7**.

Detailed flood exposure analyses for all crop types were performed based on the estimated 1% and 0.2% annual chance flood hazard areas identified in *Chapter 2 (Flood Risk Analyses).*

Table 1.7 Crop Production Value Per Yield

Crop	Yield Per Acre	Value per Yield
Alfalfa	5.4 Tons/Acre	$209/Ton
Cotton	695 LB/Acre	$0.882/LB
Grassland	2 Tons/Acre	$147/Ton
Oats	45 BU/Acre	$4.4/BU
Pecans	1,000 LB/Acre	$1.31/LB
Sorghum	61 BU/Acre	$9.85/CWT*
Winter Wheat	37 BU/Acre	$6.5/BU

*1 CWT = 2.22 BU

1.4.2 Potential Factors Impacting Flood Damage to Crops

Flooding of crops may result in a wide range of outcomes, including no crop damage, damage requiring a replant of the crop, reduced crop yields, or the total loss of a crop. Some critical factors that impact the extent of damage from flooding are the type of crop, production stage at the time of flooding, depth of flooding, velocity of floodwaters, and duration of inundation. Other damages from floods include sedimentation that covers crops or reduces soil fertility, and increased soil salinity, which can damage roots and reduce yields for multiple planting seasons.

One key factor of the impact that flooding will have on agriculture is the timing of the flood. In general, production stages for any crop would include field preparation, seeding/planting, growing season, and post-harvest/dormant. The production stage of the crop when flooding

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[3] USDA National Agricultural Statistics Service Cropland Data Layer. 2020. Published crop-specific data layer [Online]. Available at http://nassgeodata.gmu.edu/CropScape/ (accessed 2/23/2022). USDA-NASS, Washington, DC.

[4] 2021 State Agriculture Overview (https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=TEXAS)

[5] USDA Quick Stats Tool. Published database [Online]. Available at https://quickstats.nass.usda.gov/ (accessed 7/27/2022). USDA-NASS, Washington, DC.

occurs can have a significant impact on the extent of damage/loss for the crop and the options available to the farmer to salvage the growing season. If a flood occurs prior to the start of field preparation, it may result in a delay of seeding, which could result in reduced yields at harvest. A damaging flood that occurs near the beginning of the growing season may require that the farmer rework the land and replant the same or a substitute crop to minimize loss at harvest. Flooding during the growing season may result in a reduced yield or loss of all or a portion of the crop. Depending on the crop, flooding during the harvest season may have little impact on production or it could result in a total loss.

In general, floods occurring during the growing season have the largest potential for damages/crop loss, as the crops are susceptible to damage while maturing; and if the crops are damaged, the farmer will have fewer options and less opportunity to salvage the growing season. In addition, when planting or replanting following a flood, the variable production costs are usually higher than without a flood due to the following reasons:

- Additional fertilizer must be applied to offset loss of soil fertility;
- Herbicides are often required to combat weed infestation;
- Additional preparation of seed beds is required; and
- Severe loss of nitrogen due to denitrification in saturated soils.

Information on the usual planting and harvesting month for the major crops in the study area was obtained from the Texas Agricultural Statistics, which is provided in **Table 1.8**.

Table 1.8 Crop Planting and Harvesting Schedule

Crop		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alfalfa	Planted												
	Harvested					8%	33%	32%	23%	4%			
Cotton	Planted			15%	37%	36%	12%						
	Harvested									6%	16%	44%	36%
Oats	Planted									28%	49%	23%	
	Harvested					33%	62%	5%	6%				
Pecans	Planted												
	Harvested								6%	33%	36%	21%	4%
Sorghum	Planted			5%	40%	43%	12%						
	Harvested							8%	33%	32%	27%		
Winter Wheat	Planted									34%	47%	19%	
	Harvested					9%	74%	17%					

Precipitation by month can be used as a proxy to estimate the likelihood of when flood inundation could occur. While this does not determine if a flood event would occur, the likelihood of a flood occurring during months of higher precipitation is greater. Average monthly precipitation values for Climate Division 5[6] were divided by the total average annual

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[6] Division 5 averages were between 2000 and 2021 from National Oceanic and Atmospheric Administration's (NOAA's) National Center for Environmental Information

precipitation to calculate the percentage of precipitation that occurs each month (**Table 1.9**). As the table shows, there is a higher chance of precipitation during the summer months, which would indicate a greater likelihood of flooding.

Table 1.9 Likelihood of Flooding by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4%	4%	3%	4%	9%	13%	16%	15%	15%	9%	4%	4%

Source: NOAA National Centers for Environmental information, Climate at a Glance: County Time Series, published December 2020, retrieved on January 29, 2021 from https://www.ncdc.noaa.gov/cag/

While the season a flood occurs is important, the depth and duration that a crop is submerged is also an important factor in determining crop damages. Plants can be damaged from lack of oxygen if fully submerged and/or from root rot for long duration floods. Yield reductions could occur as a result of as little as one day of inundation for cotton, while other crops, such as grasslands, can withstand a week of inundation. **Table 1.10** provides a summary of anticipated damages from flooding by crop for the major crops found in the 1% annual chance floodplain within the study area.

Table 1.10 Anticipated Damages by Crop

Crop	Anticipated Damages Occurring During a Flood	Anticipated Damages Occurring During Reseeding/Recovery
Alfalfa/Hay/Sorghum[7]	*Dormant:* Can withstand flooding up to 10 days without significant loss *Harvest:* Can withstand submersion up to 3-4 days without significant loss	Limited reseeding of established fields may be necessary
Corn/Oats[8]	Can withstand flooding up to 48 hours with limited damage Greater yield losses likely earlier in the season	Flooding may have long term negative impact on crop yield and root damage
Cotton[9]	*Planting:* Water-logged soils can reduce crop growth rate *Harvesting:* Potential for crop loss	Stunted growth is a potential lingering effect
Pecans[10]	*Harvesting:* Beyond 5 days of flooding will prompt a photosynthesis reduction, and reduction in harvest.	If trees remain flooded for 35 days or more, they may lose part of their root system
Winter Wheat[11]	*Harvesting:* Yield reduction impacts to flooding in as few as 48 hours	If submerged more than 5 to 7 days, plants will die

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[7] "Salvaging Crops After Flooding". North Dakota State University. Online. https://www.ndsu.edu/agriculture/ag-hub/salvaging-crops-after-flooding

[8] "Flooding Effects on Corn". Updated 2018. Corn Agronomy. University of Wisconsin. Online. http://corn.agronomy.wisc.edu/Management/L038.aspx

[9] "What should I do with a flooded cotton field? University of Georgia Cotton Team, 2013. Online. https://www.farmprogress.com/cotton/what-should-i-do-flooded-cotton-field

[10] Wells, Lenny. "Effects of Flooding on Pecan Trees." University of Georgia Cooperative Extension, 2014. Online. https://site.extension.uga.edu/pecan/2014/04/effects-of-flooding-on-pecan-trees/#:~:text=The%20pecan%20tree%E2%80%99s%20native%20environment%20is%20found%20along,in%20a%20river-bottom%3F%20The%20key%20is%20soil%20drainage.

[11] "Flooding Impacts Winter Wheat". North Dakota State University, 2009. Online. Flooding Impacts Winter Wheat — Extension and Ag Research News (ndsu.edu)

Table 1.11 and **Table 1.12** provide estimates of percent crop yield loss for one and three days of inundation, which represent an estimate of the percentage of the mature crop value that is expected to be reported as damaged (assuming the crop was planted on the beginning of the season).

Table 1.11 Crop Damages from One-Day Inundation

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Corn	0%	0%	0%	4%	13%	22%	25%	27%	32%	24%	10%	0%
Oats	14%	22%	25%	27%	32%	24%	10%	0%	0%	0%	0%	4%
Winter Wheat	25%	24%	21%	11%	1%	0%	0%	0%	4%	13%	22%	25%

Source: HEC-FIA

Table 1.12 Crop Damages from Three-Day Inundation

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Corn	0%	0%	0%	12%	40%	66%	75%	82%	95%	72%	29%	0%
Oats	42%	67%	75%	81%	96%	73%	30%	0%	0%	0%	0%	13%
Winter Wheat	75%	72%	63%	34%	4%	0%	0%	0%	12%	40%	66%	75%

Source: HEC-FIA

The timing of the flood and the production stage of the crop during a flood can determine whether damage occurs and the potential extent of that damage. As shown previously in **Table 1.9**, there is a greater chance of precipitation during the summer months, which would indicate a higher likelihood of flooding. In addition, as shown previously in **Table 1.8**, flooding occurring during this time would have an impact on the majority of the crops that are planted in the study area and could lead to crop damage or reduced yields. If flooding occurs in late spring or summer, the opportunity to replant a flooded field is limited given the time needed for soil dry-out and balancing. In those cases, crop production for the fall harvest would be significantly reduced.

While the timing of the flood is key, the depth and duration of submerged crops is also an important factor in determining crop damages from flooding events. Plants can be damaged from lack of oxygen if fully submerged and/or from root rot for long duration floods. Yield reductions could occur as little as one day of inundation for cotton (which has production value of over $16 million in the study area), while some crops can withstand a week of inundation, such as grassland (which has production value of nearly $85 million in the study area).

Overall, the longer the inundation, the greater the potential damages to the crops and the lower the production value for the counties. While the production values are for annual harvest, there is evidence that continued damages occur beyond the typical harvest from increased soil salinity, imbalanced soil, mold issues, and weed control.

Lastly, uncertainties related to flooding impacts to grassland/pasture areas are significant. Grasslands can often withstand multiple days of flooding without a significant negative impact, especially when the grass is dormant. At times, flooding may even increase the yield of grasslands because of the increased moisture content in the soil. Another consideration is if grasslands are being grazed at the time of the flooding, which could lead to negative impacts to the herd from increased disease and injuries. If flooding is extensive enough, the herd may need to be relocated to another pasture and/or provided with supplemental feed until the grasslands recover.

1.5 Natural Resources

Ephemeral, perennial, and intermittent watercourses are the dominant hydrologic features of arid landscapes and serve the vital functions of storing and moving water and sediment throughout their respective water catchments. Unfortunately, many of the streams in the deserts of west Texas are characterized by incised channels that quickly and efficiently collect and transport water and sediment downstream. Stream incision results from a combination of historic impacts including grazing pressure, logging and other vegetation impacts; physical impacts to streams; and ecosystem changes such as removal of beavers. Water catchments now have diminished water and sediment storage capacities.

The resulting rapid runoff and transport of flood waters, especially when land development and population growth result in increased frequency and severity of flood events, may disproportionately affect natural and agricultural resources. In addition, as streams become more deeply incised, the water table is lowered and the riparian vegetation is negatively affected.[12] Livestock and wildlife depend on intact riparian resources; In arid regions, about 60% of all vertebrate species and 70% of all threatened and endangered species depend on riparian areas.[13] and forage for livestock is often best in riparian areas. Flooding could have the following potential impacts on vegetation and wildlife species:

- Channel erosion leading to decreased floodplain connectivity and recharge of riparian aquifers.
- Loss of vegetation: forage for livestock and wildlife due to scouring.
- Loss of nesting or sheltering habitat for both livestock and wildlife due to vegetation impacts.
- For aquatic species, direct impacts to rearing and reproductive habitat due to flooding.
- Impacts to water quality in aquatic habitats.
- Impacts to streambed habitats due to increased sediment loading or sediment deposition.
- Impacts to streamflow in aquatic habitats.

A summary of federal- and state-listed threatened and endangered species in the Upper Rio Grande Region is provided in **Table 1.13**. Several protected species in the region are dependent on native riparian habitats (vegetation occurring along water bodies) and aquatic habitats. The western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is a federally threatened bird species that occurs in riparian habitats and potentially occurs in most Region 14 counties. The U.S. Fish and Wildlife Service (USFWS) has designated critical habitat for this species along much of Rio Grande in Brewster County. The southwestern willow flycatcher (*Empidonax traillii extimus*) is a federally endangered bird species occurring in riparian habitat. Critical habitat for this species has not been designated in the Region 14 Plan Area. Since these bird species nest in

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[12] USDA. 2020. Incised stream restoration in the Western U.S. USDA Northwest Climate Hub, https://www.climatehubs.usda.gov./hubs/northwest/topic/incised -stream-restoration-western-us. Accessed July 11, 2022.

[13] USDA. 2012. Threats to western United States riparian ecosystems: a bibliography. General Technical Report RMRS-GTR-269. December 2012.

riparian habitats along water bodies, they may be affected by increasing frequency and severity of flood events.

Federally endangered and rare freshwater mussel species that occur in Region 14 may be affected by flood-induced impacts to water quality and streambed substrates. Protected freshwater mussels in the Region 14 Plan Area include the federally endangered Texas hornshell (*Popenaias popeii*), which occurs in the Rio Grande and Pecos Rivers, and the federal candidate species Texas fatmucket (*Lampsilis bracteata*), which occurs in the Colorado River basin.

Similar to many wildlife species, human settlements have always had a close connection to water sources. Hundreds of known archaeological sites and historic structures occur along the Rio Grande and other rivers and streams within the Region 14 Plan Area and a significant proportion of these occur within the 1% annual chance floodplain. Historic resources that may be negatively affected by flooding include:

- Cemeteries;
- Historic districts;
- Historic irrigation systems; and
- Historic structures (residences, businesses, public buildings, churches, missions, bridges, etc.).

A few examples of historic resources identified in the Region 14 Plan Area include the El Paso County Water Improvement District No. 1 (EPCWID) National Register District, the Elephant Butte Irrigation National Register District, Fort Bliss Main Post Historic District and National Cemetery, and San Elizario Historic District. Historic adobe structures may be particularly vulnerable to impacts from rising flood levels and/or flood frequency. Flood damage to foundations can also pose significant risk to the stability of historic structures.

Table 1.13 Threatened and Endangered Species Listings

Species Common Name[a]	Species Scientific Name	Federal Status*	State Status*	Federally Designated Critical Habitat in Region?	Where Found
Birds					
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	T		Yes	Breeds in riparian habitat and associated drainages; springs, developed wells, and earthen ponds supporting mesic vegetation; deciduous woodlands with cottonwoods and willows.
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	E	No	Thickets of willow, cottonwood, mesquite, and other species along desert streams

Species Common Name[a]	Species Scientific Name	Federal Status*	State Status*	Federally Designated Critical Habitat in Region?	Where Found
Rose-throated becard	*Pachyramphus aglaiae*		T	N/A	Riparian corridors; trees, woodlands, open forest, scrub, and mangroves; breeding April to July. Included on TPWD county species list for Jeff Davis County but no other counties in the planning area.
Tropical parula	*Setophaga pitiayumi*		T	N/A	Dense of open woods and understory long edges of rivers and other water bodies.
Interior least tern	*Sternula antillarum athalassos*	DL: Delisted	E	N/A	Nests along sand and gravel bars within braided streams, rivers; also known to nest on man-made structures, Rio Grande and Pecos rivers.
Fish					
Mexican stoneroller	*Campostoma ornatum*		T	N/A	Rio Grande tributaries in Brewster and Presidio counties.
Proserpine shiner	*Cyprinella proserpina*		T	N/A	Limited range includes Devils and lower Pecos rivers; Las Moras, Pinto, and San Felipe creeks; and Independence Creek in the Rio Grande watershed in western Texas. Associated with spring-fed tributaries and spring-runs. May be found in flowing pools, swift runs and riffles.
Leon Springs pupfish	*Cyprinodon bovinus*	E	E	Yes	Leon Creek, a tributary of the Pecos River (Pecos County); Diamond Y Spring. Natural spring-fed marshes, pools, and slow-flowing waters; usually near edges with minimal growth of vegetation.
Comanche Springs pupfish	*Cyprinodon elegans*	E	E	No	Restricted to small series of springs and their outflows, and man-made irrigation canals in the area of Balmorhea, Texas, including Phantom Springs (Jeff Davis County), San Solomon Springs, Griffin Springs and Toyah Creek (Reeves County). Native range: Comanche, Phantom Cave, San Solomon springs (Pecos and Reeves counties). Presently restricted to San Solomon and Phantom Cave and associated springs, and downstream irrigation canals.
Conchos pupfish	*Cyprinodon eximius*		T	N/A	Devils River and Alamito Creek.
Pecos pupfish	*Cyprinodon pecosensis*		T	N/A	Presently restricted to upper basin of the Pecos River.

Species Common Name[a]	Species Scientific Name	Federal Status*	State Status*	Federally Designated Critical Habitat in Region?	Where Found
Devils River minnow	*Dionda diaboli*	T	T	Yes	Devils River, San Felipe and Sycamore creeks in Val Verde County.
Roundnose minnow	*Dionda episcopa*		T	N/A	Clear spring-fed waters with stable temperatures.
Rio Grande darter	*Etheostoma grahami*		T	N/A	Essentially restricted to the mainstream and spring-fed tributaries of the Rio Grande and the lower Pecos River downstream to the Devils River and Dolan, San Felipe and Sycamore creeks.
Big Bend gambusia	*Gambusia gaigei*	E	E	No	Presently restricted to two artificial spring-fed pools in Big Bend National Park close to the Rio Grande.
Spotfin gambusia	*Gambusia krumholzi*		T	N/A	Restricted to San Felipe and Sycamore creeks in Texas.
Pecos gambusia	*Gambusia nobilis*	E	E	No	Restricted to two locations in Texas (Balmorhea springs complex and Diamond Y Draw).
Rio Grande chub	*Gila pandora*		T	N/A	Isolated population found in Little Aguja Creek in the Davis Mountains of Trans-Pecos Texas.
Headwater catfish	*Ictalurus lupus*		T	N/A	Limited to Rio Grande drainage, including Pecos River basin; springs, and sandy and rocky riffles, runs, and pools of clear creeks and small rivers.
Speckled chub	*Macrhybopsis aestivalis*		T	N/A	Found throughout the Rio Grande and lower Pecos River but occurs most frequently between the Rio Conchos confluence and the Pecos River.
Tamaulipas shiner	*Notropis braytoni*		T	N/A	Restricted to the Rio Grande basin in Texas including the lower Pecos River.
Chihuahua shiner	*Notropis chihuahua*		T	N/A	Limited to smaller tributaries of the Rio Grande in the Big Bend region.
Rio Grande shiner	*Notropis jemezanus*		T	N/A	Rio Grande drainage.
Mexican blindcat	*Prietella phreatophila*	E	E	No	Subterranean freshwater cave environments in the northern Coahuila, Mexico and Val Verde County, Texas portions of the Edwards-Trinity Aquifer.
Mammals					
White-nosed coati	*Nasua narica*		T	N/A	Woodlands, riparian corridors and canyons. Most individuals in Texas probably transients from Mexico.
Reptiles					
Chihuahuan mud	*Kinosternon hirtipes*		T	N/A	Observed in permanent water along lower Alamito Creek in Presidio

Species Common Name[a]	Species Scientific Name	Federal Status*	State Status*	Federally Designated Critical Habitat in Region?	Where Found
turtle	*murrayi*				County.[b]
Crustaceans					
Diminutive amphipod	*Gammarus hyalelloides*	E	E	Yes	Known only from the Phantom Lake Spring system.
Pecos amphipod	*Gammarus pecos*	E	E	Yes	Springs.
Mollusks					
Pecos assiminea snail	*Assiminea pecos*	E	E	Yes	Semiaquatic; usually found on moist ground or beneath emergent plants within a few centimeters of flowing water; only known remaining Texas population at near Fort Stockton, Pecos County.
Crowned cavesnail	*Phreatodrobia coronae*		T	N/A	Springs.
Texas Hornshell	*Popenaias popeii*	E	E	Yes	Rio Grande and Pecos River.
Salina Mucket	*Potamilus metnecktayi*		T	N/A	Rio Grande Basin.
Diamond Y springsnail	*Pseudotryonia adamantina*	E	E	Yes	Known from a spring system and associated outflows in Pecos County.
Limpia Creek spring snail	*Pyrgulopsis davisi*		T	N/A	In and on mud and rocks among patches of watercress in spring-fed rivulets
Caroline's Springs pyrg	*Pyrgulopsis ignota*		T	N/A	Known only from Caroline Springs in Terrell County.
Presidio County spring snail	*Pyrgulopsis metcalfi*		T	N/A	Found in the outflows of springs in fine mud and dense watercress.
Phantom springsnail	*Pyrgulopsis texana*	E	E	Yes	Known only from three spring systems and associated outflows in Jeff Davis and Reeves counties.
Mexican Fawnsfoot	*Truncilla cognata*		T	N/A	Rio Grande Basin.
Phantom tryonia	*Tryonia cheatumi*	E	E	Yes	Known only from three spring systems and associated outflows in Jeff Davis and Reeves counties.
Gonzales tryonia	*Tryonia circumstriata*	E	E	Yes	Only known from a spring system and associated outflows in Pecos County.
Metcalf's tryonia	*Tryonia metcalfi*		T	N/A	Locality is a complex of small seeps that discharges into a broad arroyo. This species was found on mud, decaying vegetation, and on the undersides of rocks in water in Presidio County.
Carolinae tryonia	*Tryonia oasiensis*		T	N/A	Lower Pecos River basin in a complex of large springs, which is also known

Species Common Name[a]	Species Scientific Name	Federal Status*	State Status*	Federally Designated Critical Habitat in Region?	Where Found
					as T5 Springs.
Plants					
Pecos sunflower	*Helianthus paradoxus*	T	T	No	Perennially wet soils of subirrigated terraces just above the wettest sites.
Leoncita false-foxglove	*Agalinis calycina*		T	N/A	Grasslands on perennially moist, heavy, alkaline/saline, calcareous silty clays and loams in and around cienegas (desert springs) and seeps.
Little Aguja pondweed	*Potamogeton clystocarpus*	E	E	No	Submersed in still or slowly flowing water of pools in intermittent creeks and rooted in sand and gravel derived from igneous rock of surrounding mountain slopes.
Tobusch fishhook cactus	*Sclerocactus brevihamatus ssp. tobuschii*	T	E	No	Usually on level to slightly sloping hilltops; occasionally on relatively level areas on steeper slopes, and in rocky floodplains.
Texas snowbells	*Styrax platanifolius ssp. texanus*	E	E	No	Limestone bluffs, boulder slopes, cliff faces, and gravelly streambeds, usually along perennial streams or intermittent drainages in canyon bottoms.

* T = Threatened, E = Endangered, C = Candidate, DL = Delisted

[a] TPWD. 2022. Texas Parks and Wildlife Department Annotated County Lists of Rare Species. Last Update March 17, 2022.

[b] iNaturalist. 2022. Big Bend Mud Turtle (Subspecies Kinosternon hirtipes murrayi) · iNaturalist, accessed July 11, 2022.

1.6 Existing Natural Flood Mitigation Features

The arid climate and landscape associated with Region 14 provides a unique selection of natural flood mitigation features, but also requires careful consideration of groundwater recharge and discharge, geomorphology, and native ecosystems, which have a strong influence on sustainable flood benefits in a changing environment. Due to the region's arid landscape, sedimentation from arroyos is a common issue after floods, especially in El Paso where arroyos from the Franklin Mountains frequently deposit sediment impacting downstream culverts, roadways, agricultural land, and irrigation system infrastructure. Conventional flood protection infrastructure (e.g., dams, levees, channels, etc.) designed to decrease flood risk and capture sediment, can eventually have an adverse effect on natural sediment movement and downstream habitats which are sensitive to minimum seasonal flow cycles.

Therefore, it is important to consider stormwater operations and land management techniques that promote a healthy ecosystem, and design new stormwater infrastructure which mimics and utilizes surrounding natural flood mitigation features, where possible. The following natural features will be discussed in this section, along with their flood mitigation benefits and risks: floodplains; arroyos; natural depressions; wetlands; playa lakes; sinkholes; and alluvial fans. **Exhibit 1B** summarizes the existing flood infrastructure geodatabase and identifies both constructed and natural features. The locations of features described in this section are shown in **Map Exhibit 1** ("Existing Flood Infrastructure"), while non-functional or deficient flood mitigation features are shown in **Map Exhibit 3** ("Non-Functional or Deficient Flood Mitigation Features or Infrastructure").

1.6.1 Rivers and Tributaries

The watershed contributing to the Rio Grande (also known as the Río Bravo del Norte in Mexico), includes sub-basins for the Pecos River, the Devils River, and the Rio Conchos. The Rio Conchos joins from the Mexican side just upstream of the City of Presidio, Texas, while the Pecos River and the Devils River flow through Region 14. The Upper Rio Grande Basin and Bay Expert Science Team (URG BBEST) conducted an assessment of Sound Ecological Environment (SEE) for the Rio Grande Basin between the City of Presidio, Texas and Amistad Reservoir, including the Pecos and Devils River Basins. The results are documented in "Environmental Flows Recommendations Report" (URG BBEST, 2012), and the authors conclude that that the "Lower Pecos" reach of the Pecos River, the "Lower Canyons" reach of the Rio Grande (La Linda, Mexico to the headwaters of Amistad Reservoir) and the Devils River currently support a sound ecological environment. These reaches are identified with a condition of "Functional" and a deficiency description of "Non-deficient" in the RFP "Existing Flood Infrastructure" dataset. Specific flow recommendations to sustain or improve this status are provided in the report.

However, URG BBEST also concludes that the "Parks" reach of the Rio Grande (the Rio Conchos confluence to La Linda, Mexico) and the upper Pecos (between Red Bluff reservoir and Independence Creek) are not sound, and variable recommendations are made to improve or not degrade the environment in these reaches. These reaches are identified with a condition of "Non-functional" and a deficiency description of "Deficient" in the RFP "Existing Flood Infrastructure" dataset. Environmental flow recommendations provided by URG BBEST for the Pecos and the Rio Grande do not exceed the limitations of the 1944 Treaty with Mexico or the

Pecos River Compact, and include components for subsistence flows, base flows, high flow pulses, and overbank flows (URG BBEST, 2012).

Tributaries for all counties within Region 14 except for El Paso County were identified in the "Existing Flood Infrastructure" RFP dataset using the National Hydrography Dataset (NHD) spatial data provided by TWDB in the Flood Planning Data Hub.[14] In El Paso County, the stream lines developed in the El Paso County Federal Emergency Management Agency (FEMA) mapping project, completed by Compass PTS JV (Compass) in 2019, were used to identify the natural rivers and tributaries within the county.

1.6.2 Floodplains

Floodplains can provide flood mitigation benefits because these areas can absorb a great deal of water during flooding and slowly release them over time. When floodwaters can connect with a floodplain, floodwater velocity is reduced, and the water is delivered downstream over a longer period. Each of the rivers flowing through Region 14 and their vast tributary systems have their own diverse history and floodplain footprints, which have widened and narrowed over time depending on their topography, geology, flow sources, groundwater characteristics, and influences from development and complex socio-ecological systems. While the United States (U.S.) generally associates floodplains with risk, it is important to recognize the benefits of floods for ecology, water quality, and water supply purposes. "Flood policy—at least on the aspirational level—is shifting from flood 'control' to a new view that integrates ecosystem components and functionality as part of social-ecological systems." (Frontiers in Environmental Science, 2022).

The upper Rio Grande hydrology is affected by inflows from rivers and several large desert arroyos, runoff from monsoonal rains, groundwater inflows from aquifers, as well as hurricanes and tropical storms from both the Pacific Ocean and the Gulf of Mexico (URG BBEST, 2012). With segments that establish the border between two countries, the Rio Grande attracts many cultures, economies, and political interactions between the U.S. and Mexico. The political landscape controlling water rights and agricultural needs has had long term effects on the Rio Grande floodplain throughout the Region 14 boundary. Two particular reaches, which have been studied from an environmental and geomorphic perspective, and which are the focus of tourist attractions include the "Forgotten Reach" of the Rio Grande from Fort Quitman to the City of Presidio, Texas and the "Rio Grande Wild and Scenic River" which begins at the Big Bend National Park and ends at the boundary between Val Verde County and Terrell County.

1.6.3 Arroyos

Arroyos are dry washes and often steep-sided gullies that traverse steep terrain in semi-arid and arid landscapes, such as Region 14. Some are deeply incised and broken streams with significant unrealized storage capacity. If an arroyo does not enter an urban area, the defined channel tends to disappear where the terrain flattens out. Throughout El Paso County, many arroyos are named as "Flowpaths" followed by a number.

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[14] U.S. Geological Survey. National Hydrography Dataset. Available at https://twdb-flood-planning-resources-twdb.hub.arcgis.com/pages/national-hydrography-dataset-nhd

Increased impervious cover associated with new development and/or unregulated off-road vehicle activity can redirect and concentrate additional stormwater runoff, which can then form new arroyos, putting downstream communities at risk of flooding and sediment deposition. This has been a reported issue in El Paso and Hudspeth counties, where rapid development is taking place. It is important to establish effective construction permitting and stormwater management procedures and enforce appropriate regulations to prevent new arroyos from forming upstream of populated areas.

1.6.4 Natural Depressions

Natural depressions in the terrain can serve as flood storage to recharge the groundwater table and reduce or eliminate downstream flooding, depending on the size of the available storage volume. In the “Montana Sector” of El Paso, County, an ArcGIS (ESRI) spatial analysis was performed as part of the El Paso County Stormwater Master Plan (EP County SWMP) (AECOM, 2021) to identify large natural depressions for consideration in the development of hydrologic and hydraulic (H&H) models. The EP County SWMP spatial analysis results were used to identify a portion of the natural depressions identified in this report.

As the flow reaches the residential areas in the Montana Sector, the natural arroyos become less defined and the flow begins to disperse, traveling along the path of least resistance, until the arroyos disappear altogether in large natural depressions. While these depressions can store floodwater and reduce risk of flooding downstream, they can be a risk themselves if development occurs inside these low-lying areas, which has occurred in this rapidly growing area of northeast El Paso County.

Additional natural depressions were identified typically outside of city limits by reviewing surface water polygons developed during Phase 2 of the El Paso County FEMA mapping project (Compass, 2019). The publicly available preliminary mapping data were used as a basis for several flood-related data sets and will be referenced as “El Paso County Preliminary FEMA” (Compass, 2019) data throughout this report. The National Parks Service also provides publicly available land subsidence features spatial data in Terrell and Val Verde counties in the form of polygons, which were included in the RFP data set as natural depressions.

1.6.5 Wetlands

Wetlands are areas where water is present either at or near the surface of the soil for varying periods of time throughout the year. The U.S. Fish and Wildlife Service’s (USFWS) National Wetlands Inventory (NWI) was used to identify different types of wetlands throughout Region 14, including: freshwater emergent wetlands, freshwater forested/shrub wetlands, as well as wetlands associated with freshwater ponds, lakes, and riverine features.

Wetlands can provide flood mitigation benefits because they act similar to natural sponges, absorbing large volumes of water, and slowly releasing them over time. They can also slow the velocity of floodwater in a floodplain during and after a storm event. Wetland-associated habitats in the Chihuahuan Desert’s Rio Grande floodplain have undergone a 93% reduction over the past century (Hink and Ohmart 1984, Scurlock 1998). Constructed wetland projects can clean stormwater, graywater, and/or wastewater, improving habitat and enhancing biodiversity. Stormwater wetlands thoughtfully designed in urban settings can clean urban runoff, reduce flooding, and create spaces for tourists and the community to enjoy nature.

The 372-acre Rio Bosque Wetlands Park in southeast El Paso is a compilation of wetlands and riverside forest which serves as habitat for over 200 species of birds. The United States Army Corps of Engineers (USACE) is proposing improvements to the Wetlands Park to address issues associated with lower quality wetland habitats and a reduction in wildlife diversity compared to the Park's potential.

Southeast of the City of Presidio, Texas, the La Junta Heritage Center is creating a master plan to restore the La Junta site, including wetland and riparian restoration. The natural systems along this neglected segment of the Rio Grande have been greatly impacted by flood-control levies and flood events over the past several decades. Restoration efforts for the B.J. Bishops wetland would also provide economic benefits to this largely low-income, agricultural region. The nearby wetlands in the "Forgotten Reach of the Rio Grande", upstream of Presidio and near Candelaria, are a popular birding destination for tourists.

1.6.6 Playas

Playas are extremely flat, dried lake beds found in interior desert basins which form when evaporation processes exceed recharge. During flood events, due to their flat terrain, playa surfaces may be inundated for many miles, leading to a residual concentration of fine-grained sediment and salts after flood waters evaporate. As with other types of flat terrain flooding, playa lakes create a unique flood risk challenge, typically requiring long, attenuated hydrographs and 2D hydraulic analysis.

The Upper Rio Grande region consists of several playas, including most notably the West Texas Salt Basin, which stretches from Dell City to Van Horn. Based on maps available in studies from the New Mexico Geological Society Guidebook and the Texas Water Development Board, playa boundaries for the West Texas Salt Basin, covering approximately 560 square miles, were digitized and overlaid with available flood hazard layers.[15,16]

In addition to the West Texas Salt Basin, playa areas were identified and delineated near the Town of Pecos City (Mosquito Lake and Toyah Lake) as well as near Imperial north of the Pecos River. These playas, covering approximately 36 square miles, were identified based on discussions with stakeholders from Reeves County and the Town of Pecos City and digitized using aerial imagery.

1.6.7 Sinkholes

A sinkhole is a geologic feature characterized by ground depression with no external surface drainage. Stormwater runoff intercepted by a sinkhole typically ponds or drains into the subsurface. The size of sinkholes can vary significantly, from a couple square feet to hundreds of acres, and depths can vary from 1 ft to greater than 100 feet. In west Texas, the most common category of sinkhole is bedded salt dissolution. While sinkholes can be beneficial to flooding during storm events by capturing and removing surface water runoff, they are

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[15] Sharp, John M., Jr., James R. Mayer, and Eldon McCutcheon. Hydrogeologic Trends in the Dell City Area, Hudspeth County, Texas. New Mexico Geological Society Guidebook, 44th Field Conference, Carlsbad Region, New Mexico and West Texas, 1993, pp. 327-330. https://nmgs.nmt.edu/publications/guidebooks/downloads/44/44_p0327_p0330.pdf (accessed 2/14/2022)

[16] Angle, Edward S. Aquifers of West Texas (R356), Chapter 17: Hydrogeology of the Salt Basin. Texas Water Development Board, December 2001, page 233. https://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R356/Chapter17.pdf (accessed 2/14/2022)

sometimes hazardous because they can form very quickly, jeopardizing buildings or roadways with little to no warning. They can develop due to natural or man-made activities.

According to FEMA, "the number of human-induced sinkholes has doubled since 1930, insurance claims for damages as a result of sinkholes has increased 1,200 percent from 1987 to 1991, costing nearly $100 million." Areas in Texas prone to sinkhole development are located where underlying rock layers of salt, limestone, and gypsum occur. Human activity such as oil well drilling, can potentially exacerbate the danger in these areas. The Permian Basin is a large sedimentary basin which is known for oil well drilling, and covers a large portion of Region 14, stretching from Lubbock, past Midland and Odessa, and south toward the Rio Grande. While it is difficult to correlate a relationship between oil extraction locations and sinkholes, there is anecdotal evidence suggesting a relation between the two activities. In order to verify this relationship, sinkhole location data must be acquired. However, Texas government sinkhole data are extremely sparse at this time. The National Parks Service provides publicly available spatial data in Terrell and Val Verde counties in the forms of point locations of sinkholes.

Sinkholes have also formed in Region 14 during or immediately after significant flood events. This occurred during the April 2004 flood event along a County Road located southwest of the City of Pecos, as shown in **Figure 1.9.**

Sinkholes formed along this County Road southwest of Pecos, Texas during the April 2004 storm event.
Source: NOAA and NWS; https://www.weather.gov/maf/2004_04_02_SevereWeather

Figure 1.9 Sinkholes in Pecos, Texas, April 2004 Flood

1.6.8 Alluvial Fans

An alluvial fan is a fan-shaped mass composed of loose, unconsolidated materials deposited as the flow of a river decreases in velocity, typically found at a topographic break where stream channels become less confined. The downstream boundary, or "toe," of an alluvial fan is located at an axial stream, lake or landform that was not formed by alluvial fan flooding processes. Alluvial fans are important to societies in arid and semiarid locations where they may be the principal groundwater source for irrigation farming. While these natural features decrease flood depths as they disperse upstream concentrated flows over wide areas, the shallow flow velocities on alluvial fans typically remain high, exposing downstream areas to debris flow, erosion hazards, and flood waters bulked with sediment. Moreover, as was observed in the August 2006 flood event in El Paso, Texas, the erosion and removal of stabilizing vegetation can increase the amount of sediment and debris available for transport during future flash flood events. In addition to the debris hazards that were experienced in the 2006 event, the City of El Paso experienced significant debris flow on the east side of the Franklin mountains during the August 2021 flood event, where multiple streets at the base of the mountains were buried with sediment and/or exposed to large boulders and debris from the flash flooding that occurred.

The El Paso Water Utilities and City of El Paso Stormwater Master Plan (EP City SWMP) (URS and MCi, 2009) identifies areas at risk of potential sediment and debris flow, and documents alluvial fan investigations, providing active fan process area maps. These risk areas are mapped on the east and west sides of the Franklin Mountains to help prevent future development from occurring in and around these areas. Recommendations in Appendix C of the EP City SWMP (URS and MCi, 2009) include the strategic design of new sediment basins with consideration of the mapped hazard areas and applying increased sediment bulking factors during the sizing of the basins. Regular maintenance of existing sediment basins following flood events can also decrease the risk of debris hazards downstream of those basins during future flood events.

In addition, the 2019 El Paso County Preliminary FEMA study included an investigation and floodplain mapping report for alluvial fans in El Paso County entitled, “Alluvial Fan Landform Assessment” (JE Fuller, 2019). This report documents the detailed assessment of geology and topography applied to identify and map flood hazards associated with alluvial fans. While several active alluvial fans were identified through field observations, most were either located on military reservation lands (with unexploded ordinance risks preventing future development) or they had been altered with flood/sediment mitigation structures which reduced the flow path uncertainty; these features were eliminated from the analysis. One area located near Vinton Road and Interstate 1 was found to meet the FEMA criteria for mapping alluvial fan flood hazard zones. The report states that due to the significant uncertainty associated with flow paths on alluvial fans, the Preliminary FEMA flood zones on these features had to be delineated using geomorphic data in conjunction with two-dimensional (2D) hydraulic modeling results (JE Fuller, 2019).

1.7 Constructed Major Flood Infrastructure

Region 14 includes the following existing stormwater infrastructure, which will be discussed in this section: stream crossings; levees; flood protection dams; detention and retention ponds; storm drain systems; stormwater canals; pump stations; and weirs. While statewide and nationwide data sets for dams and levees are available throughout the region, there was generally a lack of digital data for stormwater infrastructure in all Region 14 counties other than El Paso County. This section discusses available digital infrastructure data for constructed flood mitigation features incorporated into the RFP "Existing Flood Infrastructure" dataset. **Appendix Table 1B** summarizes the existing flood infrastructure geodatabase and identifies both constructed and natural features.

1.7.1 Stream and Low Water Crossings

Stream crossing features, including crossings at roadways and railroads as well as low water crossings, were identified using the following sources:

- Texas Statewide Low Water Crossings Inventory, maintained by TNRIS and publicly available at: https://data.tnris.org/collection?c=f692bfd4-4dea-4c8b-a14d-a5a73660c074#5.09/31.32/-100.08
- TxDOT Bridges Dataset, publicly available at: https://gis-txdot.opendata.arcgis.com/datasets/TXDOT::txdot-bridges/about
- El Paso County Interior Drainage Study for the City of El Paso and El Paso Water Utilities (2021)
- Drainage Study for FM 170 from Candelaria to US-67 (TxDOT, 2020)
- Drainage Study for SH-20 (Mesa Street) from Doniphan Drive to Texas Avenue (TxDOT, 2019)
- Spatial analysis by AECOM using a combination of centerline data for roadways and streams along with aerial imagery (2022)

Where possible, stream crossing level of service information was identified using detailed hydraulic analyses from previous studies. For other stream crossings where previous detailed analyses were not available, level of service information was estimated using available flood depth data (i.e., from 2019 Preliminary FEMA El Paso County Mapping and Fathom Cursory Floodplain Data). All crossings with an estimated level of service equal to or less than the 10% annual chance flood event were identified as low water crossings, including all crossings identified from the Texas Statewide Low Water Crossings inventory.

Further information pertaining to the level of service methodology and results is discussed in *Chapter 2 (Flood Risk Analyses).*

1.7.2 Levees

The following datasets were utilized in the development of levee spatial data for the RFP:

- National Levee Database (NLD), maintained by USACE and publicly available at: https://levees.sec.usace.army.mil/#/
- 2019 El Paso County Preliminary FEMA spatial data set; publicly available through at https://msc.fema.gov/portal/home
- The FEMA Mid-Term Levee Inventory (MLI) database; publicly available through FEMA's Regional Service Centers
- U.S. International Boundary and Water Commission (USIBWC) geospatial database, provided by USIBWC for the development of the RFP

Populations at risk for levees were estimated based on populations within service areas of levees, as documented in the National Levee Database.

1.7.2.1 Levee Accreditation

There are multiple unaccredited levee segments along the Rio Grande River through El Paso County that currently provide flood protection to adjacent areas. These levees are designed and operated by the USIBWC. A certified levee indicates that the levee segment is formally recognized by FEMA as providing flood risk reduction for the 1% annual chance (AC) flood on the applicable Flood Insurance Rate Map(s) (FIRMs). While the USIBWC levee segments through El Paso are typically designed to contain the 1% AC flood level with freeboard, in order to achieve FEMA accreditation, the levee systems must meet and continue to meet the minimum design, operation, and maintenance standards per Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR Section 65.10). This regulation specifies select items that need to be submitted and reviewed by FEMA to obtain levee accreditation, including the following:

- Documentation that the levee meets design criteria (freeboard, stability, settlement, etc.);
- Certified as-built levee plans showing tie-ins at roads, bridges, and high ground;
- Officially adopted operation and maintenance (O&M);
- Emergency Preparedness Plan (including documentation of flood warning systems, emergency notification flowchart); and
- Interior drainage evaluation.

The reasons specific levees are not accredited throughout the region vary based on the geology, topography, and hydrologic conditions at each identified levee segment. For example, in El Paso County, the reasons for unaccredited levees may include not meeting minimum freeboard or geotechnical requirements, tie-in requirements, and/or lack of an interior drainage study throughout the entire levee segment. Note, some levee segments extend into Doña Ana County, New Mexico and an interior drainage study has not been performed on the Rio Grande outside of El Paso County for these segments.

Per the RFP scope of work, if a levee is not accredited by FEMA, the levee segment was assumed not to be in place when developing the 1% AC flood map boundaries. This approach is consistent with the 2019 El Paso County Preliminary FEMA mapping approach, which was incorporated in the RFP flood mapping within El Paso County. These unaccredited levee segments are identified with a condition of “Non-functional” in the RFP “Existing Flood Infrastructure” dataset. As of June 2022, there is only one FEMA accredited levee in Region 14, which stretches along the U.S. side of the Rio Grande in El Paso County from International Dam to Zaragosa Road. This FEMA- accredited levee segment is identified with a condition of “Functional” in the RFP “Existing Flood Infrastructure” dataset.

Since the 2019 El Paso County Preliminary FEMA floodplains only incorporate flood protection from one FEMA-accredited levee segment, there are large portions of the county which will be mapped in the 1% AC flood hazard zone when the Preliminary FEMA maps become effective, assuming additional levee segments do not become FEMA-accredited before that time. The 1% AC flood inundation extents preliminarily mapped by FEMA in areas adjacent to unaccredited levees are based upon mapping and H&H models documented in the “FEMA Natural Valley Analysis Pre-LAMP Report” (FEMA, 2016), which considers all levee segments to be removed. This 1% AC “no-levee” flood mapping scenario is referenced as the “natural valley floodplain” throughout this report.

1.7.2.2 Interior Drainage Studies

Additional 1% AC spatial flood mapping and H&H models are available in El Paso County which consider the levees to be in place. These studies are required to be completed before a levee can be certified for accreditation and are referenced as “interior drainage studies” throughout this report; however, it is important to note that these flood maps are non-regulatory. The “El Paso County Interior Drainage Study” (AECOM, 2021) incorporates best available interior drainage studies for levee segments along the Rio Grande, where available, and developed new interior drainage flood maps and H&H models where previous interior drainage studies along the Rio Grande were not previously available in El Paso County. In the RFP, these interior drainage models and maps were utilized, where appropriate, to evaluate existing and proposed conditions for Flood Mitigation Projects (FMPs) affected by the natural valley floodplain in areas adjacent to non-certified levees.

1.7.2.3 Presidio Levees

Additional unaccredited levees exist along Cibolo Creek and the Rio Grande in the City of Presidio. While the Cibolo Creek levees are noted in the NLD as having an “Incipient Overtopping Annual Exceedance Probability (AEP)” of 0.001 (the 1,000-year flood event), the level of service annual probability was reported as “0.2” since the 0.2% AC flood (500-year) is the lowest exceedance value considered as a valid entry in the RFP geodatabase. The left Cibolo Creek levee, which was designed to protect the City of Presidio is identified as “Deficient” in the RFP “Existing Flood Infrastructure” database based upon the description of levee performance provided in the NLD which states, “There is a moderate likelihood of embankment erosion leading to poor performance given there are areas without riprap revetment or other forms of erosion protection. However, given the short flood durations and the levee material composed of compacted granular material it is believed the levee is moderately resistant to erosion.” USACE constructed the Cibolo Creek levees, which run along the northwest boundary of the City of Presidio; however, they are currently maintained and operated by Presidio County.

The Rio Grande levee which runs along the southern boundary of the City of Presidio, owned and operated by USIBWC, was designed to provide 4-ft of freeboard protection above the flood event associated with 42,000 cfs, which was documented to be less than the 5% A.C. (20-year flood) of 43,000 cfs in a report entitled, "Hydraulic Modeling Analysis for the Presidio/Ojinaga Flood Control Project" (USIBWC, 2003). However, during the September 2008 flood of the Rio Conchos and the Rio Grande, from Presidio to the Amistad Reservoir, sections of the Rio Grande levee on the U.S. side were damaged in the Presidio area (including the presence of boils), flooding low-lying agricultural areas adjacent to the levee. These levee failures required emergency responses from USIBWC, who coordinated with USACE and Texas Division of Emergency Management (TDEM) on temporary repairs including sand bags and plastic lining of the levees. While failed levee segments in the Presidio area were later repaired by USIBWC, breached Rio Grande levees protecting agricultural land adjacent to the City of Redford, located downstream of Presidio, were not repaired.

1.7.3 Flood Protection Dams

Multiple data sources were used to identify and complete "Existing Flood Infrastructure" data fields for flood protection dams in Region 14, including:

- National Inventory of Dams (NID), maintained by USACE;
- Texas Commission on Environmental Quality (TCEQ) database of dams regulated by the State of Texas, maintained by TCEQ; and
- Natural Resources Conservation Service (NRCS) database of NRCS-designed dams in Texas, maintained by the NRCS State office.

1.7.3.1 Data Sources

The NID database includes basic information for 127 dams in Region 14, including location, owner, purpose (water supply, flood control, irrigation, etc.), dimensions (height of dam, normal and maximum reservoir storage), and information on whether an Emergency Action Plan was developed and when. The TCEQ maintains an updated database of the same information for 122 state regulated Texas dams (i.e., dams above the size thresholds of Texas Administrative Code Title 30, Part 1, Chapter 299). Dams of unregulated size are deemed not to provide a safety risk to lives in the event of a breach.

The TCEQ list also contains fields that provide the dam hazard class per Chapter 299, and hydraulic information about dam discharges during dam safety events (events much larger than the 1% AC event). The TCEQ dam database is provided to the USACE every two years minus the hazard class and hydraulic information. The Texas NRCS State office maintains a similar dam database of NRCS-designed dams in Texas, with dam hazard class per NRCS Technical Report 60. There are inconsistencies between TCEQ and NRCS hazard class determinations, which, because of the varying wording between the federal and state definitions, are not resolved. The TCEQ dam inventory is not readily available to the public (i.e. is not at a web link), but can be procured through a Public Information Request. The TCEQ dam inventory provided to the public will not include hazard class or the hydraulic information; thus, property owners are not readily aware of risk associated with a dam.

According to the TCEQ hazard classifications, the dam hazard classifications are as follows:

- High Hazard: In the event of failure, the hazards may include the loss of 7 or more lives, inundate 3 or more permanent habitable structures, and/or result in excessive economic loss.
- Significant Hazard: In the event of failure, the hazards may include the loss of 1-6 or more lives, inundate 1-2 permanent habitable structures, and/or result in appreciable economic loss.
- Low Hazard: In the event of failure, the hazards will not include loss of life, inundation of permanent habitable structures, or result in significant economic loss.

1.7.3.2 Data Input Assumptions

Due to the confidential nature of dam hazard classifications, the “Existing Flood Infrastructure” attribute, “Population Protected by Infrastructure” was not completed for dams as part of the RFP. However, the “Condition” attribute from the available data were compared, giving priority to the TCEQ data, to estimate whether a dam was “Deficient” or “Non-deficient” in the RFP dataset. Dams with a “Condition” of “FAIR” or “GOOD” in the TCEQ dataset were assumed to be “Non-deficient” while a condition of “POOR” was identified as “Deficient” in the RFP dataset.

Another attribute included in the TCEQ dataset is “Hydraulic Adequacy” attribute, which is identified by TCEQ as “YES,” “NO,” or “NOT DETERMINED”. There are 27 dams in Region 14 that are determined to be hydraulically inadequate by TCEQ, while 51 dams are identified by TCEQ as hydraulically adequate. The hydraulically adequate dams were assigned a “CONDITION” rating of “Functional” in the RFP dataset; since the dams are assumed to meet their intended design level of service per its current hazard classification. Per TCEQ, it is possible that prior “Not Determined” has been assigned in the “Hydraulically Inadequate” data field due to a myriad of factors, such as

- Not yet being studied for hydraulic adequacy based on the current hazard classification;
- Configuration issues – current dam/spillway(s) size/elevation/etc. not (or no longer) consistent with prior H&H study;
- Significant changes to drainage area (and/or upstream channel), along with the age of H&H study;
- Uncertainty if a dam (that was designed to be overtopped) can safely pass its design storm without suffering undue erosion; or
- Other issues that would ‘invalidate’ a prior H&H study

Furthermore, the Level of Service (LOS) associated with dams was assigned as either 1, indicating it can safely pass the 1% AC event or 0.2, indicating it can safely pass the 0.2% AC event based upon the hydraulic adequacy and the Probable Maximum Flood (PMF) percent passing, per the TCEQ dataset. If the dam was identified to pass 100% of the PMF per the TCEQ dataset, and the dam was determined to be hydraulically adequate, the LOS was assumed to be 0.2% AC (the 500-year flood and the largest flood considered a valid entry in the RFP dataset). Similarly, if the dam was hydraulically adequate and the percent PMF passing was less than 100%, but still equal to or greater than the PMF required per the TCEQ dataset, then the dam was assumed to have a LOS of 1% AC (i.e., it safely passes the 1% AC flood event).

1.7.4 Detention and Retention Ponds

The digital data sources for detention and retention ponds obtained for Region 14 were from the following sources, which were all located within El Paso County:

- 2019 El Paso County Preliminary FEMA (Compass, 2019) spatial data set (polygons); publicly available at https://msc.fema.gov/portal/home;
- EP City SWMP (URS and MCi, 2009) Electronic Files spatial data for ponds (points); and
- EPWater's City of El Paso stormwater infrastructure GIS dataset (EPWater, 2021) for pond (points).

Point and polygon features symbolizing ponds and basins from each spatial dataset were compared to eliminate duplicate features in the RFP dataset.

1.7.5 Storm Drains, Stormwater Canals, and Pump Stations

EPWater's City of El Paso stormwater infrastructure GIS dataset (EPWater, 2021) for Conduits, Channels, and Pump Stations was used to identify constructed infrastructure features within Region 14. These features were input as "Storm Drains", "Stormwater Canals", and "Pump Stations," respectively, for the "Infrastructure Type" attribute of the RFP geodatabase. In addition, the line features identified as "Agricultural_Drain" in the infrastructure geodatabase provided by EPWater were included as "Stormwater Canals" in the RFP dataset. In El Paso, there are multiple agricultural drains which are sometimes utilized for stormwater conveyance purposes during flood events. The EPWater dataset does not indicate the condition or level of service associated with the City infrastructure.

A report entitled, "Final Hydraulic Report/Drainage Study for the City of Presidio, Texas" (S&B Infrastructure, 2008) was obtained from the City of Presidio, which includes an "Appendix B – Structure Inventory" documenting the location and sizes of stormwater infrastructure in the City of Presidio at the time of that study. The digital data associated with the Appendix were not included in the electronic files provided with the report. S&B Infrastructure was contacted to obtain the electronic files associated with the report appendix but confirmed that digital versions of the data were no longer available. Therefore, these infrastructure data were not included in the RFP geodatabase.

1.7.6 Weirs

Only six weirs were identified in Region 14, all located in the northwest portion of El Paso County. These weir locations were obtained from the 2019 El Paso County Preliminary FEMA (Compass, 2019) spatial data set ("S_Gen_Struct.shp" polylines); which are publicly available at https://msc.fema.gov/portal/home. Five of these weirs are located on a channelized section Flowpath No. 4, and one is located immediately downstream of the Resler Channel crossing under IH-10.

1.8 Proposed or Ongoing Major Flood Infrastructure and Mitigation Projects

The table in **Appendix Table 1C** includes a summary of proposed or ongoing flood mitigation projects within Region 14, and **Map Exhibit 2** ("Proposed or Ongoing Flood Mitigation Projects") shows the location of the proposed or ongoing flood mitigation projects. These are projects within the region that already have committed funding for final design and/or construction. The status of each project in **Appendix Table 1C** states what phase each project is currently under. It should be noted that these projects are different from the Flood Management Evaluations (FMEs), Flood Management Strategies (FMSs), and Flood Mitigation Projects (FMPs) identified and recommended in Chapters 4 and 5 of the RFP, respectively; since they already have committed funding and some are even currently under construction. All of the projects are located within El Paso County, and two are located within El Paso city limits. Existing funding sources include the TWDB Flood Infrastructure Fund (FIF), El Paso Water, and USACE.

1.9 Relevant Existing Planning Documents

Appendix Table 1D provides a list of relevant existing planning documents for Region 14. The list is consistent with types of planning study documents referenced under 31 TAC §361.22. The most relevant planning documents for Region 14, which are directly related to Flood Management Evaluations (FMEs), Flood Management Strategies (FMSs), and Flood Mitigation Projects (FMPs) evaluated in the RFP, are described below and organized by Study ID number associated with **Appendix Table 1D**.

3- DRAFT EPCWID Incident Report, Arroyo Flow and Flooding into Mesa Spur Drain Near Mankato Road, July 22, 2017 at 4 pm

- On July 22, 2017, a short duration intense rainfall event occurred in the watershed of the un-named arroyo that drains into the Mesa Spur Drain near Mankato Road in Socorro, Texas. This document is a collection of weather data from that event. The later named, "Mankato Arroyo" was evaluated as the SOC4 Flood Mitigation Project (FMP 143000021) in the RFP. SOC4 is a proposed sediment basin in the EP County SWMP (AECOM, 2021), and the project is a high priority for the El Paso County Water Improvement District No.1.

4- Final - Evaluation of Reduced Flow Capacity of the Rio Grande and the Impacts on the Operations of the Rio Grande Project Leasburg Dam to American Dam, Phase I - Main Channel and Floodways - Anthony, NM to American Dam

- This report documents existing conveyance capacity of the Rio Grande from NM Highway 225 to the American Diversion Dam in El Paso, Texas. The report, authored by a Joint Committee on Rio Grande Project Flood Risk documents the changes to flood risk and impact on Rio Grande Project operations resulting from accumulated sediment and vegetation in the main channel. The RFP Flood Management Evaluation (FME 141000001) is based on the findings and recommendations from this report.

13- El Paso Stormwater Master Plan Update (2021)

- The main purpose of the updated EP City SWMP (AECOM, MCi, 2021) was to update the original 2009 EP City SWMP to improve the drainage infrastructure of El Paso and reduce the flood risk to the public and property. Five FMPs and one FME from this document are evaluated in the RFP.

24- El Paso County Interior Drainage Study, Methodology and Mapping Results Report

- The purpose of the El Paso County Interior Drainage Study is to identify the sources of flooding from the landward sides of the levees along the 65 miles of the Rio Grande within El Paso County, where depths exceed 1 ft based on current conditions. The modeling and mapping from this study was utilized to help analyze existing damages and proposed benefits for FMPs affected by the natural valley floodplain, including NW3 (FMP 143000111) and NW26 (FMP 143000113).

25- El Paso County Stormwater Master Plan

- The EP County SWMP addresses stormwater needs in El Paso County, outside of City of El Paso limits. As the City master plan was being completed, El Paso County recognized that a similar effort was needed to address stormwater needs throughout the rest of the County. Four FMPs and one FME from this document are evaluated in the RFP.

33- Hudspeth County, Texas. Villa Alegre, Fort Hancock East Unit 1, & Fort Hancock East Unit 2. Colonia Area Study and Plan 2019 - 2029.

- The information gathered in this study sheds light on the housing needs of the community, helps to direct the formation of housing goals, and establishes a blueprint for future actions Hudspeth County might take to provide adequate housing for those residents. This document was the basis for the evaluation of FMP 143000009 and FME 141000014 in the RFP.

38- Technical Memorandum with Project Recommendation. Montoya Drain H&H Analysis.

- This Study was performed to provide a recommendation to El Paso Water regarding the use of a parcel of land as a potential site for floodwater detention. The project concept was later modified to include a constructed wetland on the same site. Project NW26 (FMP 143000113) from the EP City SWMP (AECOM, MCi, 2021) is based upon this Memo.

44- Pecos River Basin Salinity Assessment, Santa Rosa Lake, New Mexico, to the Confluence of the Pecos River and the Rio Grande, Texas, 2015. Scientific Investigations Report 2019-5071.

- The salinity of the Pecos River increases downstream and affects the availability of useable water in the Pecos River Basin. The document explains how specific areas might be contributing to the elevated salinity in the Pecos River and how salinity of the Pecos River has changed over time. FMS 142000007 is based upon information presented in this document.

49- Drainage Feasibility Study. Socorro Rd. Intersections with San Antonio St. and Main St.

- The City of San Elizario, Texas has continuously experienced flooding of the intersections of Socorro Rd. and San Antonio St., and Socorro Rd. and Main St. This study identifies existing flood risk and related drainage infrastructure, and analyzes three alternative improvements. FMP 143000003 is based upon this document.

59- Drainage Study for SH 20 (Mesa Street) From Doniphan Drive to Texas Avenue

- The drainage analysis includes assessing cross drainage structures of multiple varieties, evaluating the current level of service (LOS) of the roadway at all cross drainage structures, identifying locations where the roadway drainage system provides less than a 1% AC LOS and providing conceptual recommendations to mitigate localized flooding and erosion. FMP 143000005 was based upon this document.

78- A Watershed Protection Plan for the Pecos River in Texas

- This WPP addresses water quality concerns for the Pecos River in Texas. The Pecos River watershed is assessed, and baseline data is established for a voluntary watershed protection plan. FMS 142000007 is based upon information presented in this document.

87- Environmental Flow Recommendations Report

- The Upper Rio Grande Basin and Bay Expert Science Team (URG BBEST) conducted an assessment of Sound Ecological Environment (SEE) for the Rio Grande Basin between the City of Presidio, Texas and Amistad Reservoir, including the Pecos and Devils River Basins. Environmental flow recommendations provided for the Pecos and the Rio Grande include components for subsistence flows, base flows, high flow pulses, and overbank flows. FMS 142000006 is based upon information presented in this document.

Appendix 1A
Entities with Flood-Related Authorities or Responsibilities

Appendix Table 1A: Entities with Flood-Related Authorities or Responsibilities[17]

Entity	Entity Type	Political Subdivision (Y/N)	Entity Active in Flood Planning (Y/N)
Andrews County	County	Y	Y
Brewster County	County	Y	Y
Crane County	County	Y	Y
Crockett County	County	Y	Y
Culberson County	County	Y	Y
Ector County	County	Y	Y
Edwards County	County	Y	Y
El Paso County	County	Y	Y
Hudspeth County	County	Y	Y
Jeff Davis County	County	Y	Y
Loving County	County	Y	Y
Midland County	County	Y	Y
Pecos County	County	Y	Y
Presidio County	County	Y	Y
Reagan County	County	Y	Y
Reeves County	County	Y	Y
Schleicher County	County	Y	Y
Sutton County	County	Y	Y
Terrell County	County	Y	Y
Upton County	County	Y	Y
Val Verde County	County	Y	Y
Ward County	County	Y	Y
Winkler County	County	Y	Y
Alpine city	Municipality	Y	Y
Anthony town	Municipality	Y	Y
Balmorhea city	Municipality	Y	Y
Barstow city	Municipality	Y	N
Clint town	Municipality	Y	Y
Crane city	Municipality	Y	Y
Dell City city	Municipality	Y	Y
El Paso city	Municipality	Y	Y
Fort Stockton city	Municipality	Y	Y

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[17] Acronyms: FWSD (Fresh Water Supply District), MMD (Municipal Management District), MUD (Municipal Utility District), SHS (State Historic Site), SNA (State National Area), SP (State Park), WCID (Water Control and Improvement District), WID (Water Improvement District), WSD (Water Supply District), WMA (Wildlife Management Area)

Entity	Entity Type	Political Subdivision (Y/N)	Entity Active in Flood Planning (Y/N)
Grandfalls town	Municipality	Y	Y
Horizon City city	Municipality	Y	Y
Iraan city	Municipality	Y	Y
Kermit city	Municipality	Y	Y
Marfa city	Municipality	Y	Y
McCamey city	Municipality	Y	Y
Monahans city	Municipality	Y	Y
Pecos city	Municipality	Y	Y
Presidio city	Municipality	Y	Y
Pyote town	Municipality	Y	Y
Rankin city	Municipality	Y	N
San Elizario city	Municipality	Y	Y
Socorro city	Municipality	Y	Y
Sonora city	Municipality	Y	Y
Thorntonville town	Municipality	Y	N
Toyah town	Municipality	Y	Y
Valentine town	Municipality	Y	N
Van Horn town	Municipality	Y	Y
Vinton village	Municipality	Y	Y
Wickett town	Municipality	Y	N
Wink city	Municipality	Y	N
Amistad National Recreation Area	Other	N	N
Balmorhea SP	Other	N	N
Big Bend National Park	Other	N	Y
Big Bend Ranch SP	Other	N	N
Black Gap WMA	Other	N	N
Butterfield Trail MUD 1	Other	Y	Y
Butterfield Trail MUD 2	Other	Y	Y
Chamizal National Memorial	Other	N	Y
Chinati Mountains SNA	Other	N	N
City of El Paso MMD 1	Other	Y	N
Concho Valley Council of Governments	Other	Y	Y
Crane County Water District	Other	Y	Y
Crockett County WCID 1	Other	Y	Y
Crockett SWCD	Other	N	Y
Davis Mountains SP	Other	N	N

Entity	Entity Type	Political Subdivision (Y/N)	Entity Active in Flood Planning (Y/N)
Devils River SNA - Big Satan Unit	Other	N	N
Devils River SNA - Del Norte Unit	Other	N	N
Edwards Plateau SWCD	Other	N	Y
El Paso County MUD 3	Other	Y	Y
El Paso County MUD 4	Other	Y	Y
El Paso County Tornillo WID	Other	Y	Y
El Paso County WCID 4	Other	Y	Y
El Paso County WID 1	Other	Y	Y
El Paso Downtown Management District	Other	Y	N
El Paso Water	Other	N	Y
El Paso-Hudspeth SWCD	Other	N	Y
Eldorado Divide SWCD	Other	N	Y
Elephant Butte Irrigation District, Precinct 9	Other	Y	Y
Elephant Mountain WMA	Other	N	N
Esperanza FWSD 1 of Hudspeth County	Other	Y	Y
Fort Bliss, U.S. Army	Other	N	Y
Fort Davis National Historic Site	Other	N	Y
Fort Hancock WCID	Other	Y	Y
Fort Leaton SHS	Other	N	N
Franklin Mountains SP	Other	N	N
Guadalupe Mountains National Park	Other	N	N
Haciendas Del Norte WID	Other	Y	N
Highland SWCD	Other	N	Y
Highpoint SWCD	Other	N	Y
Horizon Regional MUD	Other	Y	Y
Hudspeth County Conservation & Reclamation District 1	Other	Y	Y
Hudspeth County CRD 1	Other	N	Y
Hudspeth County UWCD 1	Other	N	Y
Hudspeth County WCID 1	Other	Y	Y
Hueco Tanks SP & SHS	Other	N	N
International Boundary And Water Commission	Other	N	Y
Loving County WID 1	Other	Y	Y
Lower Valley Water District	Other	Y	Y
Maderas del Carmen Wildlife and Plant Protection Area	Other	N	N
Mexico Comision Internacional De Limites Y Aguas	Other	N	Y
Middle Rio Grande Development Council	Other	Y	Y

Entity	Entity Type	Political Subdivision (Y/N)	Entity Active in Flood Planning (Y/N)
Monahans Sandhills SP	Other	N	N
Montecillo MMD 1	Other	Y	Y
National Park Service	Other	N	Y
Ocampo Wildlife and Plant Protection Area	Other	N	N
Paseo Del Este MUD 1	Other	Y	Y
Paseo Del Este MUD 10	Other	Y	Y
Paseo Del Este MUD 11	Other	Y	Y
Paseo Del Este MUD 2	Other	Y	Y
Paseo Del Este MUD 3	Other	Y	Y
Paseo Del Este MUD 4	Other	Y	Y
Paseo Del Este MUD 5	Other	Y	Y
Paseo Del Este MUD 6	Other	Y	Y
Paseo Del Este MUD 7	Other	Y	Y
Paseo Del Este MUD 8	Other	Y	Y
Paseo Del Este MUD 9	Other	Y	Y
Pecos County WCID 1	Other	Y	Y
Pecos County WID 2	Other	Y	Y
Pecos County WID 3	Other	Y	Y
Permian Basin Regional Planning Commission	Other	Y	Y
Presidio County WID 1	Other	Y	Y
Reagan County WSD	Other	Y	N
Red Bluff Water Power Control District	Other	Y	N
Reeves County WID 1	Other	N	Y
Reeves County WID 2	Other	Y	Y
Rio Grande Council of Governments	Other	Y	Y
Rio Grande Wild and Scenic River	Other	N	Y
Rio Grande-Pecos River SWCD	Other	N	Y
Santa Elena Canyon Wildlife and Plant Protection Area	Other	N	N
Seminole Canyon SP & SHS	Other	N	N
Sierra Diablo WMA	Other	N	N
State of Texas	Other	Y	Y
Terrell County WCID 1	Other	Y	Y
Texas General Land Office	Other	N	Y
Texas Parks And Wildlife Department	Other	N	Y
Texas State University System	Other	N	Y
Tornillo Management District	Other	Y	Y

Entity	Entity Type	Political Subdivision (Y/N)	Entity Active in Flood Planning (Y/N)
TxDOT	Other	N	Y
U.S. Army	Other	N	N
Upper Rio Grande Regional Flood Planning Group	Other	Y	Y
Upton County Water District	Other	Y	Y
US Department Of The Interior	Other	N	N
USACE	Other	N	Y
USACE - Albuquerque District	Other	N	Y
USIBWC	Other	N	Y
Val Verde County WCID-Comstock	Other	Y	N
Van Horn Municipal Services	Other	N	Y
Ward County Irrigation District 1	Other	Y	Y
Ward County Irrigation District 3	Other	Y	N
Ward County WID 2	Other	Y	Y
West Pecos Management District	Other	Y	Y

Appendix 1B
Existing Flood Infrastructure Summary

Appendix Table 1B.1: Existing Flood Infrastructure Summary (Part 1—Type/Description)

Existing Infrastructure ID	Counties	HUC8s	Feature Name	Infrastructure Type	Description	Natural or Constructed or Combination
Various	El Paso	13030102, 13040100	El Paso Co Ponds (Areas)	Constructed Ponds	138 Constructed Ponds (831 acres total)	Constructed
14006267	Brewster	13040204	Hammond Ranch Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006280	Brewster	13040204	Ament Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006281	Brewster	13040208	Sanderson Canyon WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006294	Brewster	13040207	Meriwether Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006295	Brewster	13040207	Goddard Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006310	Brewster	13040207	Nevill Ranch Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006248	Crockett	13040301	Johnsons Draw WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006249	Crockett	13040301	Johnsons Draw WS SCS Site 2 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006247	Crockett	13040301	Johnsons Draw WS SCS Site 3 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006250	Crockett	13040301	Johnsons Draw WS SCS Site 4 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006251	Crockett	13040301	Johnsons Draw WS SCS Site 5 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006252	Crockett	13040301	Johnsons Draw WS SCS Site 6 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006246	Crockett	13040301	Johnsons Draw WS SCS Site 7 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006215	Culberson	13050004	Harold Martin Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006216	Culberson	13070004	Big Charlie Tank Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006264	Culberson	13050004	Horse Camp Tank Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006265	Culberson	13070002	Cowden Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006282	Culberson	13050004	Three Mile And Sulfur Draw WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006283	Culberson	13050004	Three Mile And Sulfur Draw WS SCS Site 2 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006243	Edwards	13040303	Dry Devils And Lowrey WS SCS Site 8 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006199	El Paso	13040100	Riverside Diversion Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006217	El Paso	13040100	Fabens Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006218	El Paso	13040100	Rattlesnake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006219	El Paso	13040100	Cottonwood Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006220	El Paso	13040100	Roberts Tank Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed

Existing Infrastructure ID	Counties	HUC8s	Feature Name	Infrastructure Type	Description	Natural or Constructed or Combination
14006221	El Paso	13030102	Thorn Drive Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006222	El Paso	13030102	Portland Cement Reservoir Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006223	El Paso	13040100	International Diversion	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006224	El Paso	13040100	American Diversion	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006225	El Paso	13030102	Mulberry Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006226	El Paso	13040100	Northgate Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006227	El Paso	13040100	Fusselman Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006228	El Paso	13040100	Range Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006256	El Paso	13040100	Indian Cliff Ranch Main Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006269	El Paso	13030102	Mesa Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006273	El Paso	13040100	North Hills Detention Pond 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006274	El Paso	13040100	Knapp Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006276	El Paso	13040100	Americas Ten Detention Pond Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006277	El Paso	13040100	Hudspeth Regulating Reservoir No 1	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006279	El Paso	13040100	North Hills Detention Pond 2 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006296	El Paso	13050003	Hueco Tanks State Park Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006297	El Paso	13040100	Phelps Dodge Basin Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006298	El Paso	13040100	Van Buren Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006299	El Paso	13040100	Morehead Avenue Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006300	El Paso	13040100	Nashville Avenue Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006301	El Paso	13040100	Memphis Avenue Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006302	El Paso	13040100	Wheeling Avenue Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006303	El Paso	13040100	Copper Avenue Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006304	El Paso	13040100	Tremont Avenue Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006305	El Paso	13040100	Murchison Drive Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006306	El Paso	13040100	Denver Avenue Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006307	El Paso	13040100	Medical Center Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006308	El Paso	13030102	Montoya Detention Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006309	El Paso	13040100	San Diego Avenue Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006313	El Paso	13040100	Mountain Park Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006314	El Paso	13040100	Pershing Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006315	El Paso	13040100	Sunrise Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006316	El Paso	13030102	Keystone Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed

Existing Infrastructure ID	Counties	HUC8s	Feature Name	Infrastructure Type	Description	Natural or Constructed or Combination
14006317	El Paso	13030102	Oxidation Pond Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006318	El Paso	13040100	McKelligon Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006319	El Paso	13040100	Americas Basin Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006320	El Paso	13040100	Lomaland Basin Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006321	El Paso	13040100	Carolina Basin Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006322	El Paso	13040100	Portland Avenue Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006323	El Paso	13040100	Richmond Ave Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006200	Hudspeth	13040100	Diablo Arroyo WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006201	Hudspeth	13040100	Madden Arroyo WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006202	Hudspeth	13040100	Camp Rice Arroyo WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006203	Hudspeth	13040100	Diablo Arroyo WS SCS Site 2 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006204	Hudspeth	13040100	Fort Quitman Lake Dam No 1	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006205	Hudspeth	13040100	Fort Quitman Lake Dam No 2	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006206	Hudspeth	13040100	Macho Arroyo WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006207	Hudspeth	13040201	Gibson Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006208	Hudspeth	13040100	Alamo Arroyo WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006209	Hudspeth	13040100	Alamo Arroyo WS SCS Site 3 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006275	Hudspeth	13040100	Tx No Name No 47 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006268	Hudspeth	13050004	Hitson-C&L-Washburn Draws WS SCS Site 2 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006275	Hudspeth	13040100	Hudspeth County Reservoir No 2 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006278	Hudspeth	13040100	Diablo Reservoir Levee	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006284	Hudspeth	13050004	Cornudas North And Culp Draw WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006285	Hudspeth	13050004	Hitson C And L Washburn Draws WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006286	Hudspeth	13050004	Hitson C And L Washburn Draws WS SCS Site 3 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006287	Jeff Davis	13070004	Cowden Ranch Pond No 14 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006213	Jeff Davis	13070003	T And P Railroad Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006214	Jeff Davis/ Culberson	13070004	Levinson Reservoir Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed

Existing Infrastructure ID	Counties	HUC8s	Feature Name	Infrastructure Type	Description	Natural or Constructed or Combination
14006244	Loving	13070001	Red Bluff Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006229	Pecos	13070007	Comanche Creek Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006230	Pecos	13070007	Imperial Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006271	Pecos	13040211	Allison Ranch GSS Dam No 1	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006272	Pecos	13040211	Allison Ranch GSS Dam No 2	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006288	Pecos	13040208	Sanderson Canyon WS SCS Site 2 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006289	Pecos	13040208	Sanderson Canyon WS SCS Site 3 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006210	Presidio	13040202	Sutton Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006211	Presidio	13040202	Mimms Draw WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006212	Presidio	13040202	San Esteban Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006266	Presidio	13040204	Fowlkes Ranch Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006270	Presidio	13040204	Montgomery Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006245	Reeves	13070003	Balmorhea Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006311	Reeves	13070003	Section 304 Produced Water Pit	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006231	Schleicher	13040301	Dry Devils And Lowrey WS SCS Site 2 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006232	Schleicher	13040301	Dry Devils And Lowrey WS SCS Site 1 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006239	Sutton	13040301	Dry Devils And Lowrey WS SCS Site 10 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006240	Sutton	13040301	Dry Devils And Lowrey WS SCS Site 11 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006241	Sutton	13040301	Dry Devils And Lowrey WS SCS Site 12 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006242	Sutton	13040301	Dry Devils And Lowrey WS SCS Site 13 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006233	Sutton	13040301	Dry Devils And Lowrey WS SCS Site 3 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006234	Sutton	13040301	Dry Devils And Lowrey WS SCS Site 4 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006237	Sutton	13040301	Dry Devils And Lowrey WS SCS Site 5 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006235	Sutton	13040301	Dry Devils And Lowrey WS SCS Site 6 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006236	Sutton	13040301	Dry Devils And Lowrey WS SCS Site 7 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed

Existing Infrastructure ID	Counties	HUC8s	Feature Name	Infrastructure Type	Description	Natural or Constructed or Combination
14006238	Sutton	13040301	Dry Devils And Lowrey WS SCS Site 9 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006257	Terrell	13040208	Sanderson Canyon WS SCS Site 9 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006255	Terrell	13040208	Sanderson Canyon WS SCS Site 8 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006258	Terrell	13040208	Sanderson Canyon WS SCS Site 7 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006292	Terrell	13040208	Sanderson Canyon WS SCS Site 6 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006291	Terrell	13040208	Sanderson Canyon WS SCS Site 5 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006290	Terrell	13040208	Sanderson Canyon WS SCS Site 4 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006293	Terrell	13040208	Sanderson Canyon WS SCS Site 11 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006259	Terrell	13040208	Sanderson Canyon WS SCS Site 10 Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006253	Terrell	13070010	Roden Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006254	Upton	13070007	Mc Elroy Reservoir Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006261	Val Verde	13040302	Moody Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006262	Val Verde	13040302	Gillis West Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006263	Val Verde	13040302	Gillis East Lake Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006260	Ward	13070007	Permian Basin Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
14006312	Winkler	13070007	Felix 20-37 Impoundment Dam	Dam/ Reservoir	Regional Flood Control Dam	Constructed
Various	El Paso	13030102, 13040100	El Paso Co - Dams	Dam/ Reservoir	80 Regional Flood Control Dams (2,686 acres total)	Constructed
14000140	El Paso	13030102	Alluvial Fan A	Fan	Alluvial Fan from El Paso County Preliminary FEMA Mapping	Natural
14000564	Brewster	13070006	City of Alpine Levees System-Brewster, TX	Levee	ID: 1605885337; USACE, 2021	Constructed
14000572	Brewster	13070006	Moss Creek Levee	Levee	ID: 1605995083; USACE, 2021	Constructed
14000005	Culberson	13050004	City of Van Horn Levee System	Levee	Levee; ID: 1605885338; NLD	Constructed
14000565	Culberson	13050004	City of Van Horn Levee System	Levee	ID: 1605885338; USACE, 2021	Constructed
14000566	Culberson	13050004	Culberson County Airport Levee	Levee	ID: 1605995185; USACE, 2021	Constructed
14000585	Culberson	13050004	Van Horn I-10 Diversion	Levee	ID: 1605995184; USACE, 2021	Constructed
14000586	Culberson	13050004	Wild Horse Draw Diversion South	Levee	ID: 1605995183; USACE, 2021	Constructed
Various	El Paso	13030102, 13040100	El Paso Co - 46 Levees	Levee	Levee System (approximately 117 miles total)	Constructed
14000579	Hudspeth	13040201	Rio Grande Levee 1- Hudspeth	Levee	ID: 1605995138; USACE, 2021	Constructed

Existing Infrastructure ID	Counties	HUC8s	Feature Name	Infrastructure Type	Description	Natural or Constructed or Combination
14000580	Hudspeth	13040100, 13040201	Rio Grande Levee System - Hudspeth	Levee	ID: 1605885434; USACE, 2021	Constructed
14000576	Presidio	13040201	Presidio, TX, Cibolo Creek Left Levee	Levee	ID: 2205000038; USACE, 2021	Constructed
14000577	Presidio	13040201	Presidio, TX, Cibolo Creek Right Levee	Levee	ID: 2205000039; USACE, 2021	Constructed
14000578	Presidio	13040201	Rio Grande Levee 1 (Presidio)	Levee	ID: 1605995139; USACE, 2021	Constructed
14000581	Presidio	13040201	Rio Grande River Levee System (Presidio)	Levee	ID: 1605885492; USACE, 2021	Constructed
14012953	Presidio	13040203	Unnamed Levee	Levee	Levee for farmland protection breached in several locations since 2008	Constructed
Various	Brewster	13040203, 13040204, 13040205, 13040206, 13040207, 13070006,	Brewster Co - 159 Low Water Crossings	Low Water Crossings	14 Road Culverts, 5 Road Bridges, 8 Rail Bridges, 132 Low Water Crossings.	Constructed
Various	Crane	13070007	Crane Co - 5 Low Water Crossings	Low Water Crossings	5 Low Water Crossings	Constructed
Various	Crockett	13070011, 13070008, 13040301	Crockett Co - 173 Low Water Crossings	Low Water Crossings	38 Low Water Crossings, 19 Road Bridges, 116 Road Culverts	Constructed
Various	Culberson	13050004, 13070001, 13070002, 13070004	Culberson Co - 29 Low Water Crossings	Low Water Crossings	6 Low Water Crossings, 2 Rail Bridges, 2 Road Bridges, 19 Road Culverts.	Constructed
Various	Edwards	13040303	Edwards Co - 17 Low Water Crossings	Low Water Crossings	14 Road Culvert and 3 Road Bridge low water crossings.	Constructed
Various	El Paso	13030102, 13040100, 13050003	El Paso Co - 266 Low Water Crossings	Low Water Crossings	113 Low Water Crossings, 8 Rail Bridges, 73 Road Bridges, 72 Culverts	Constructed
Various	Hudspeth	13040100, 13040201, 13050004,	Hudspeth Co - 39 Low Water Crossings	Low Water Crossings	4 Rail Bridges, 9 Road Culverts, 26 Low Water Crossings	Constructed
Various	Jeff Davis	13040202, 13070003, 13070004, 13070005, 13070006	Jeff Davis Co - 111 Low Water Crossings	Low Water Crossings	9 Road Culverts, 4 Road Bridges, 98 Low Water Crossings.	Constructed
Various	Loving	13070001	Loving Co - 7 Low Water Crossings	Low Water Crossings	7 Low Water Crossings.	Constructed

Existing Infrastructure ID	Counties	HUC8s	Feature Name	Infrastructure Type	Description	Natural or Constructed or Combination
Various	Pecos	13040211, 13070007, 13070008, 13070009, 13070010	Pecos Co - 26 Low Water Crossings	Low Water Crossings	1 Road Culvert, 25 Low Water Crossings.	Constructed
Various	Presidio	13040201, 13040202, 13040203, 13070006	Presidio Co - 282 Low Water Crossings	Low Water Crossings	1 Rail Bridge, 10 Road Culverts, 271 Low Water Crossings.	Constructed
Various	Reeves	13070001, 13070003, 13070004	Reeves Co - 26 Low Water Crossings	Low Water Crossings	26 Low Water Crossings.	Constructed
Various	Sutton	13040301	Sutton Co - 128 Low Water Crossings	Low Water Crossings	56 Low Water Crossings, 11 Road Bridges, 61 Road Culverts	Constructed
Various	Terrell	13040208, 13040210, 13040211, 13070010,	Terrell Co - 49 Low Water Crossings	Low Water Crossings	20 Low Water Crossings, 13 Rail Bridges, 5 Road Bridges, 11 Road Culverts.	Constructed
Various	Upton	13070008	Upton Co - 2 Low Water Crossings	Low Water Crossings	1 Road Culvert, 1 Low Water Crossing.	Constructed
Various	Val Verde	13040210, 13040212, 13040301, 13040302, 13040303, 13070011, 13070012	Val Verde Co - 257 Low Water Crossings	Low Water Crossings	7 Road Bridges, 7 Rail Bridges, 193 Low Water Crossings, 50 Road Culverts,	Constructed
Various	Ward	13070001, 13070007	Ward Co - 4 Low Water Crossings	Low Water Crossings	2 Low water crossings, 2 Road Culverts.	Constructed
Various	Winkler	13070007	Winkler Co - 4 Low Water Crossings	Low Water Crossings	4 Low Water Crossings.	Constructed
Various	El Paso	13040100	El Paso Co Crossings	Major Crossings	25 Major Crossings	Constructed
Various	El Paso	13050003, 13040100	El Paso Co - Natural Depressions	Natural Depression	30 Natural Depressions (2,149 acres total)	Natural
14000131	Hudspeth	13050003	Natural Depression A	Natural Depression	Natural depression A from El Paso County SWMP, Montana Sector Study Area	Natural
Various	El Paso	13030102, 13040100	El Paso Co Ponds (Points)	Ponds	454 Ponds	Constructed
Various	El Paso	13030102, 13040100	El Paso Co Pump Stations	Pump Stations	24 Pump Stations	Constructed
Various	El Paso	13040100	El Paso Co - Small Ponds	Small Ponds	50 Small Ponds (122 acres total)	Constructed

Existing Infrastructure ID	Counties	HUC8s	Feature Name	Infrastructure Type	Description	Natural or Constructed or Combination
Various	El Paso	13030102, 13040100	El Paso Co - Storm Drain System	Storm Drain System	Storm Drain System (approximately 378 miles total)	Constructed/Unknown
14013213	Reeves	13070001	Unnamed Conduit	Storm Drain System	Underground storm drain and open channel system in Pecos	Constructed
Various	El Paso	13030102, 13040100	El Paso Co - Storm Water Canals	Storm Water Canals	Storm Water Canals (approximately 111 miles total)	Unknown
Various	El Paso	13030102	El Paso Co - Weirs	Weir	6 Weirs	Constructed

Appendix Table 1B.2: Existing Flood Infrastructure Summary (Part 2—Level of Service/Condition/Deficiency/Entity)

Existing Infrastructure ID	Feature Name	Level of Service	Condition	Condition Description	Deficiency	Deficiency Description	Owning/Operating Entity
Various	El Paso Co Ponds (Areas)	Unknown	Multiple (Functional, Unknown)	Multiple (Unknown, Natural Depression)	Multiple (Non-deficient, Unknown)	Multiple (Unknown, Natural Depression)	Various
14006267	Hammond Ranch Lake Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	Hammond Ranch
14006280	Ament Lake Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Texas State University System
14006281	Sanderson Canyon WS SCS Site 1 Dam	Unknown	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Rio Grande-Pecos River SWCD, Brewster County
14006294	Meriwether Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	Ralph Meriwether
14006295	Goddard Dam	Unknown	Unknown	Unknown	Non-deficient	FAIR Condition per NRCS	Bill Goddard
14006310	Nevill Ranch Dam	Unknown	Unknown	Unknown	Unknown	Fair Condition per TCEQ	Nevill Properties LP
14006248	Johnsons Draw WS SCS Site 1 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	CR Sutton, Crockett County
14006249	Johnsons Draw WS SCS Site 2 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	CR Sutton, Crockett County
14006247	Johnsons Draw WS SCS Site 3 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	CR Sutton, Crockett County
14006250	Johnsons Draw WS SCS Site 4 Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	CR Sutton, Crockett County
14006251	Johnsons Draw WS SCS Site 5 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	CR Sutton, Crockett County
14006252	Johnsons Draw WS SCS Site 6 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	CR Sutton, Crockett County
14006246	Johnsons Draw WS SCS Site 7 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	CR Sutton, Crockett County
14006215	Harold Martin Lake Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	William Allan
14006216	Big Charlie Tank Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	GOOD Condition per TCEQ	JM Fowlkes
14006264	Horse Camp Tank Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	Horse Camp Tank Dam
14006265	Cowden Lake Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	Jax Cowden
14006282	Three Mile And Sulfur Draw WS SCS Site 1 Dam	Unknown	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	GOOD Condition per TCEQ	Highpoint SWCD, Van Horn town, Culberson County
14006283	Three Mile And Sulfur Draw WS SCS Site 2 Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Highpoint SWCD, Van Horn town, Culberson County

Existing Infrastructure ID	Feature Name	Level of Service	Condition	Condition Description	Deficiency	Deficiency Description	Owning/Operating Entity
14006243	Dry Devils And Lowrey WS SCS Site 8 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Edwards Plateau SWCD, Sutton County
14006199	Riverside Diversion Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	US Department Of The Interior
14006217	Fabens Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso County
14006218	Rattlesnake Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Indian Cliffs Ranch Inc
14006219	Cottonwood Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Indian Cliffs Ranch Inc
14006220	Roberts Tank Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	FAIR Condition per TCEQ	Indian Cliffs Ranch Inc
14006221	Thorn Drive Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006222	Portland Cement Reservoir Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	GOOD Condition per TCEQ	Cemex El Paso Inc
14006223	International Diversion	Unknown	Unknown	Unknown	Non-deficient	Satisfactory Condition per NID	International Boundary And Water Commission, Mexico Comision Internacional De Limites Y Aguas
14006224	American Diversion	Unknown	Unknown	Unknown	Non-deficient	Satisfactory Condition per NID	International Boundary And Water Commission
14006225	Mulberry Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006226	Northgate Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006227	Fusselman Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	El Paso city
14006228	Range Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006256	Indian Cliff Ranch Main Lake Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	FAIR Condition per TCEQ	Indian Cliffs Ranch Inc
14006269	Mesa Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006273	North Hills Detention Pond 1 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006274	Knapp Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Deficient	POOR Condition per TCEQ	Texas Parks And Wildlife Department
14006276	Americas Ten Detention Pond Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	El Paso city

Existing Infrastructure ID	Feature Name	Level of Service	Condition	Condition Description	Deficiency	Deficiency Description	Owning/Operating Entity
14006277	Hudspeth Regulating Reservoir No 1	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	Hudspeth County Conservation & Reclamation District 1
14006279	North Hills Detention Pond 2 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006296	Hueco Tanks State Park Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Deficient	POOR Condition per TCEQ	Texas Parks And Wildlife Department
14006297	Phelps Dodge Basin Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006298	Van Buren Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	El Paso city
14006299	Morehead Avenue Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Deficient	POOR Condition per TCEQ	El Paso city
14006300	Nashville Avenue Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	El Paso city
14006301	Memphis Avenue Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006302	Wheeling Avenue Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	El Paso city
14006303	Copper Avenue Dam	Unknown	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	GOOD Condition per TCEQ	El Paso city
14006304	Tremont Avenue Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006305	Murchison Drive Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006306	Denver Avenue Dam	Unknown	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006307	Medical Center Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	El Paso city
14006308	Montoya Detention Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006309	San Diego Avenue Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006313	Mountain Park Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006314	Pershing Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006315	Sunrise Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006316	Keystone Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city

Existing Infrastructure ID	Feature Name	Level of Service	Condition	Condition Description	Deficiency	Deficiency Description	Owning/Operating Entity
14006317	Oxidation Pond Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006318	McKelligon Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006319	Americas Basin Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006320	Lomaland Basin Dam	Unknown	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006321	Carolina Basin Dam	Unknown	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006322	Portland Avenue Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006323	Richmond Ave Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	El Paso city
14006200	Diablo Arroyo WS SCS Site 1 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	Hudspeth County Conservation & Reclamation District 1, El Paso-Hudspeth SWCD, Hudspeth County
14006201	Madden Arroyo WS SCS Site 1 Dam	Unknown	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	FAIR Condition per TCEQ	Hudspeth County Conservation & Reclamation District 1, El Paso-Hudspeth SWCD, Hudspeth County
14006202	Camp Rice Arroyo WS SCS Site 1 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	Hudspeth County Conservation & Reclamation District 1, El Paso-Hudspeth SWCD, Hudspeth County
14006203	Diablo Arroyo WS SCS Site 2 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Hudspeth County Conservation & Reclamation District 1, El Paso-Hudspeth SWCD, Hudspeth County
14006204	Fort Quitman Lake Dam No 1	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	Fort Quitman Land Company
14006205	Fort Quitman Lake Dam No 2	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	Fort Quitman Land Company
14006206	Macho Arroyo WS SCS Site 1 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	El Paso-Hudspeth SWCD, Hudspeth County, Hudspeth County CRD 1
14006207	Gibson Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	HM Gibson Jr

Existing Infrastructure ID	Feature Name	Level of Service	Condition	Condition Description	Deficiency	Deficiency Description	Owning/Operating Entity
14006208	Alamo Arroyo WS SCS Site 1 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Hudspeth County Conservation & Reclamation District 1, El Paso-Hudspeth SWCD, Hudspeth County
14006209	Alamo Arroyo WS SCS Site 3 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Hudspeth County Conservation & Reclamation District 1, El Paso-Hudspeth SWCD, Hudspeth County
14006275	Tx No Name No 47 Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	Hudspeth County Conservation & Reclamation District 1
14006268	Hitson-C&L-Washburn Draws WS SCS Site 2 Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	El Paso-Hudspeth SWCD, Dell City city, Hudspeth County, Hudspeth County WCID 1
14006275	Hudspeth County Reservoir No 2 Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	Hudspeth County Conservation & Reclamation District 1
14006278	Diablo Reservoir Levee	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	Hudspeth County Conservation & Reclamation District 1
14006284	Cornudas North And Culp Draw WS SCS Site 1 Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	El Paso-Hudspeth SWCD, Dell City city, Hudspeth County, Hudspeth County WCID 1
14006285	Hitson C And L Washburn Draws WS SCS Site 1 Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	El Paso-Hudspeth SWCD, Dell City city, Hudspeth County, Hudspeth County WCID 1
14006286	Hitson C And L Washburn Draws WS SCS Site 3 Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	El Paso-Hudspeth SWCD, Dell City city, Hudspeth County, Hudspeth County WCID 1
14006287	Cowden Ranch Pond No 14 Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	Cowden Cattle Company
14006213	T And P Railroad Lake Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	Balmorhea city
14006214	Levinson Reservoir Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	FAIR Condition per TCEQ	Union Pacific Railroad Company
14006244	Red Bluff Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	FAIR Condition per TCEQ	Red Bluff Water Power Control District
14006229	Comanche Creek Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Deficient	POOR Condition per TCEQ	Pecos County
14006230	Imperial Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	FAIR Condition per TCEQ	Pecos County WID 2

Existing Infrastructure ID	Feature Name	Level of Service	Condition	Condition Description	Deficiency	Deficiency Description	Owning/Operating Entity
14006271	Allison Ranch GSS Dam No 1	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	Allison Ranch Corporation
14006272	Allison Ranch GSS Dam No 2	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	Allison Ranch Corporation
14006288	Sanderson Canyon WS SCS Site 2 Dam	Unknown	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	GOOD Condition per TCEQ	Rio Grande-Pecos River SWCD, Presidio County
14006289	Sanderson Canyon WS SCS Site 3 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Rio Grande-Pecos River SWCD, Presidio County
14006210	Sutton Lake Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	CR Sutton
14006211	Mimms Draw WS SCS Site 1 Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Highland SWCD, Schleicher County
14006212	San Esteban Lake Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	MacGuire Ranches
14006266	Fowlkes Ranch Lake Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	Clegg Fowlkes
14006270	Montgomery Lake Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	Montgomery Lake Dam
14006245	Balmorhea Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ. Potential Seepage issues per Reeves County	Non-deficient	FAIR Condition per TCEQ	Reeves County WID 1
14006311	Section 304 Produced Water Pit	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	Reeves County, Permian Basin Regional Planning Commission
14006231	Dry Devils And Lowrey WS SCS Site 2 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Eldorado Divide SWCD, Schleicher County
14006232	Dry Devils And Lowrey WS SCS Site 1 Dam	Unknown	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Eldorado Divide SWCD, Schleicher County
14006239	Dry Devils And Lowrey WS SCS Site 10 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Edwards Plateau SWCD, Sutton County
14006240	Dry Devils And Lowrey WS SCS Site 11 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Edwards Plateau SWCD, Sutton County
14006241	Dry Devils And Lowrey WS SCS Site 12 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Edwards Plateau SWCD, Sutton County
14006242	Dry Devils And Lowrey WS SCS Site 13 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Edwards Plateau SWCD, Sutton County
14006233	Dry Devils And Lowrey WS SCS Site 3 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Edwards Plateau SWCD, Sutton County
14006234	Dry Devils And Lowrey WS SCS Site 4 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Edwards Plateau SWCD, Sutton County

Existing Infrastructure ID	Feature Name	Level of Service	Condition	Condition Description	Deficiency	Deficiency Description	Owning/Operating Entity
14006237	Dry Devils And Lowrey WS SCS Site 5 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Edwards Plateau SWCD, Sutton County
14006235	Dry Devils And Lowrey WS SCS Site 6 Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Edwards Plateau SWCD, Sutton County
14006236	Dry Devils And Lowrey WS SCS Site 7 Dam	Unknown	Non-functional	Hydraulically Inadequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Edwards Plateau SWCD, Sutton County
14006238	Dry Devils And Lowrey WS SCS Site 9 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Edwards Plateau SWCD, Sutton County
14006257	Sanderson Canyon WS SCS Site 9 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Rio Grande-Pecos River SWCD, Terrell County
14006255	Sanderson Canyon WS SCS Site 8 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Rio Grande-Pecos River SWCD, Terrell County
14006258	Sanderson Canyon WS SCS Site 7 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Rio Grande-Pecos River SWCD, Terrell County
14006292	Sanderson Canyon WS SCS Site 6 Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Rio Grande-Pecos River SWCD, Terrell County
14006291	Sanderson Canyon WS SCS Site 5 Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Rio Grande-Pecos River SWCD, Terrell County
14006290	Sanderson Canyon WS SCS Site 4 Dam	1% AC (100-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Rio Grande-Pecos River SWCD, Terrell County
14006293	Sanderson Canyon WS SCS Site 11 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Rio Grande-Pecos River SWCD, Terrell County
14006259	Sanderson Canyon WS SCS Site 10 Dam	0.2% AC (500-year)	Functional	Hydraulically Adequate per TCEQ	Non-deficient	GOOD Condition per TCEQ	Rio Grande-Pecos River SWCD, Terrell County
14006253	Roden Lake Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	JT Trotter Trustee
14006254	Mc Elroy Reservoir Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	GOOD Condition per TCEQ	Gulf Oil Corporation
14006261	Moody Lake Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	WL Moody
14006262	Gillis West Lake Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	Gillis Ranch
14006263	Gillis East Lake Dam	1% AC (100-year)	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Unknown	N/A Condition per TCEQ	Gillis Ranch
14006260	Permian Basin Dam	Unknown	Unknown	Hydraulic Adequacy Not Determined per TCEQ	Non-deficient	GOOD Condition per TCEQ	Luminant Generation Company LLC
14006312	Felix 20-37 Impoundment Dam	Unknown	Unknown	Unknown	Unknown	Not Rated Condition per TCEQ	Felix Water LLC

Existing Infrastructure ID	Feature Name	Level of Service	Condition	Condition Description	Deficiency	Deficiency Description	Owning/Operating Entity
Various	El Paso Co - Dams	Multiple (1% AC [100-year], 0.2% AC [500-year], Unknown)	Multiple (Functional, Non-functional, Unknown)	Multiple (Unknown, Hydraulic Adequacy Not Determined per TCEQ, Hydraulically Adequate per TCEQ)	Multiple (Deficient, Non-deficient, Unknown)	Multiple (Unknown, FAIR Condition per TCEQ, GOOD Condition per TCEQ, POOR Condition per TCEQ, Not Rated Condition per TCEQ)	Various
14000140	Alluvial Fan A	Unknown	Functional	Alluvial Fan	Non-deficient	Alluvial Fan	El Paso County, Vinton village, Rio Grande Council of Governments
14000564	City of Alpine Levees System-Brewster, TX	Unknown	Non-functional	Not FEMA Accredited	Unknown	Unknown	El Paso County, Lower Valley Water District, Rio Grande Council of Governments
14000572	Moss Creek Levee	Unknown	Non-functional	Not FEMA Accredited	Unknown	Unknown	Brewster County, Rio Grande Council of Governments
14000005	City of Van Horn Levee System	Unknown	Unknown	Unknown	Unknown	Unknown	Van Horn Municipal Services
14000565	City of Van Horn Levee System	Unknown	Non-functional	Not FEMA Accredited	Unknown	Unknown	Culberson County, Van Horn town, Rio Grande Council of Governments
14000566	Culberson County Airport Levee	Unknown	Non-functional	Not FEMA Accredited	Unknown	Unknown	Culberson County, Van Horn town, Rio Grande Council of Governments
14000585	Van Horn I-10 Diversion	Unknown	Non-functional	Not FEMA Accredited	Unknown	Unknown	Culberson County, Rio Grande Council of Governments
14000586	Wild Horse Draw Diversion South	Unknown	Non-functional	Not FEMA Accredited	Unknown	Unknown	Culberson County, Rio Grande Council of Governments
Various	El Paso Co - 46 Levees	Multiple (1% AC [100-year], 0.2% AC [500-year], Unknown)	Multiple (Functional, Non-functional, Unknown)	Multiple (Unknown, FEMA Accredited, Not FEMA Accredited)	Multiple (Non-deficient, Unknown)	Multiple (Unknown, All performance modes deemed to have a low likelihood to lead to poor performance per NLD, FEMA Accredited, Levee expected to perform well per NLD, No obvious performance concerns per NLD, Per USIBWC, levee is ready to have FEMA certification package submitted, Railroad acts as non-engineered levee with multiple openings, Risk is low for breach prior to overtopping per NLD)	Various
14000579	Rio Grande Levee 1- Hudspeth	Unknown	Non-functional	Not FEMA Accredited	Unknown	Unknown	Culberson County, Rio Grande Council of Governments

Existing Infrastructure ID	Feature Name	Level of Service	Condition	Condition Description	Deficiency	Deficiency Description	Owning/Operating Entity
14000580	Rio Grande Levee System - Hudspeth	Unknown	Non-functional	Not FEMA Accredited	Unknown	Unknown	Hudspeth County, Hudspeth County Conservation & Reclamation District 1, Rio Grande Council of Governments
14000576	Presidio, TX, Cibolo Creek Left Levee	0.2% AC (500-year)	Non-functional	Not FEMA Accredited	Deficient	Moderate likelihood of embankment erosion leading to poor performance	Presidio County, Rio Grande Council of Governments
14000577	Presidio, TX, Cibolo Creek Right Levee	0.2% AC (500-year)	Non-functional	Not FEMA Accredited	Non-deficient	Levee is expected to perform well per NLD.	Presidio County, Rio Grande Council of Governments
14000578	Rio Grande Levee 1 (Presidio)	4% AC (25-Year)	Non-functional	Not FEMA Accredited	Unknown	Unknown	Presidio County, Rio Grande Council of Governments
14000581	Rio Grande River Levee System (Presidio)	4% AC (25-Year)	Non-functional	Not FEMA Accredited	Unknown	Unknown	Presidio County, Presidio city, Rio Grande Council of Governments
14012953	Unnamed Levee	Unknown	Non-functional	Levee was breached in 2008 and was never repaired.	Deficient	Levee is breached in several locations and no longer protects farmland	Presidio County, Presidio County WID 1, Rio Grande Council of Governments
Various	Brewster Co - 159 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Crane Co - 5 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Crockett Co - 173 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Culberson Co - 29 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Edwards Co - 17 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	El Paso Co - 266 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Hudspeth Co - 39 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Jeff Davis Co - 111 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Loving Co - 7 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Pecos Co - 26 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Presidio Co - 282 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Reeves Co - 26 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various

Existing Infrastructure ID	Feature Name	Level of Service	Condition	Condition Description	Deficiency	Deficiency Description	Owning/Operating Entity
Various	Sutton Co - 128 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Terrell Co - 49 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Upton Co - 2 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Val Verde Co - 257 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Ward Co - 4 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	Winkler Co - 4 Low Water Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	El Paso Co Crossings	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	El Paso Co - Natural Depressions	Unknown	Functional	Natural Depression	Non-deficient	Natural Depression	Various
14000131	Natural Depression A	Unknown	Functional	Natural Depression	Non-deficient	Natural Depression	Hudspeth County, Rio Grande Council of Governments
Various	El Paso Co Ponds (Points)	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	El Paso Co Pump Stations	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	El Paso Co - Small Ponds	Unknown	Unknown	Unknown	Unknown	Unknown	Various
Various	El Paso Co - Storm Drain System	Multiple (1% AC [100-year], 0.2% AC [500-year], Unknown)	Multiple (Functional, Unknown)	Multiple (Unknown, 0.2-pct annual chance storm contained within structure per El Paso County Preliminary FEMA study, 1-pct annual chance storm contained within structure per El Paso County Preliminary FEMA study, Less than 100-yr capacity per SH20 TXDT Study, Portions of channel are damaged and need repair)	Unknown	Multiple (Unknown, Portions of channel are damaged and need repair)	Various
14013213	Unnamed Conduit	0.2% AC (500-year)	Functional	0.2-pct annual chance storm contained within structure per El Paso County Preliminary FEMA study	Unknown	Unknown	El Paso County, Socorro city, Lower Valley Water District, Rio Grande Council of Governments

Existing Infrastructure ID	Feature Name	Level of Service	Condition	Condition Description	Deficiency	Deficiency Description	Owning/Operating Entity
Various	El Paso Co - Storm Water Canals	Multiple (1% AC [100-year], Unknown)	Multiple (Functional, Non-functional, Unknown)	Multiple (Unknown, 1-pct annual chance storm contained within structure per El Paso County Preliminary FEMA study, Portions of channel are damaged and need repair)	Multiple (Deficient, Unknown)	Multiple (Unknown, Concrete Failure. Channel needs to be re-constructed, Failure under houses due to erosion, Portions of channel are damaged and need repair)	Various
Various	El Paso Co - Weirs	Unknown	Unknown	Unknown	Unknown	Unknown	Various

Appendix 1C
Proposed or Ongoing Flood Mitigation Projects Summary

Appendix Table 1C: Proposed or Ongoing Flood Mitigation Projects Summary

Existing Project ID	Existing Project Name	Description	Counties	Project Status	Project Cost ($)	Dedicated Funding for Construction	Planned Funding Source	Expected Completion Year	Anticipated Benefit
14000001	SOC1 & SOC2	Sediment/Detention Basin - SOC1; Sediment/Detention Basin - SOC2 (design not yet started); 51% will be a 0% interest loan; 49% will be a Flood Infrastructure Fund (FIF) grant	El Paso	Proposed	$4,960,000	No	TWDB FIF, El Paso County – Pending (invited for submission of full FIF application)	2025	Mitigate downstream flooding and sediment load due to uncontrolled flows from Stream 4 through the breached El Paso Hills Dam
14000002	SSA1	Detention Basin SSA1 (design not yet started)	El Paso	Proposed	$34,530,000	Yes	TWDB FIF, El Paso County	2024	Mitigate uncontrolled flows from arroyos A1, A2, and A3 causing flooding problems in downstream communities
14000003	HAC7	Sediment/Detention Basin at Location A; Sediment/Detention Basin at Location B (design currently ongoing)	El Paso	Proposed	$5,990,000	Yes	TWDB FIF, El Paso County, City of El Paso	2025	Mitigate downstream flooding and sediment load due to uncontrolled flows from Stream 13.5
14000004	EA6A	Sam Snead Storm Drain System (Pico Norte to Lee Trevino) (currently under construction)	El Paso	Ongoing	$4,532,000	Yes	El Paso Water CIP	2022	Mitigate street flows that travel too far over flat slopes causing flooding, street closures, and damage from Pico Norte St. to Lee Trevino Blvd
14000005	Keystone Dam Seepage Improvements	At Keystone Dam, install a toe drain, a toe berm, and a seepage collection system consisting of concrete lined ditch with a weir (in design by USACE)	El Paso	Proposed	$1,500,000	Yes	USACE, El Paso Water	2024	Prevention of surficial erosion issues on Keystone Dam protecting urban area along Doniphan Drive
14000006	CAN1	Reconstruction of the channel with concrete lining	El Paso	Proposed	$1,960,000	No	TWDB FIF, El Paso County – Pending (invited for submission of full FIF application)	2025	Stabilizes the existing channel and adds sufficient capacity to relieve flooding residences adjacent to the channel.
14000008	SSA6	Constructing 2 retention basins west of Sparks Arroyo. North basin ~8 ac-ft w/ 940-ft concrete channel from north and 390-ft concrete channel from south. South basin ~13 ac-ft w/ 980-ft concrete channel from north and 250-fot concrete channel from south	El Paso	Proposed	$2,700,000	Yes	Design and Construction of project to be funded by El Paso County for $1,210,000 through CIP fund.	2024	Mitigate downstream flooding and sediment load due to runoff from the Sparks Community downstream of the Sparks Arroyo.
14000009	VIN12	Adding three more 9-foot by 5-foot culverts to the existing battery of culverts.	El Paso	Proposed	$270,000	Yes	Design and Construction of project to be funded by El Paso County for $70,000 through CIP fund.	2024	Stabilizes the crossing and adds sufficient capacity equal to the upstream end to relieve flooding.
140000010	SSA3	Constructing a 21 ft deep w/106 acre-ft of excavation for flood and sediment pool storage. detention basin near the lower end of Arroyos 5 and 6 at a location owned by the County. The outlet structure for this basin consists of a 2-foot RCP.	El Paso	Proposed	$1,510,000	No	Project has been approved for design documents through County CIP fund for $151,000. Committed funding for construction has not been identified.	2024	Mitigate flooding problems for downstream communities from the uncontrolled flows from Arroyos A5 and A6
140000011	FAB3	Constructing 1,165 ft of 4-ft-high parapet wall along the crest of Fabens Dam. East auxiliary spillway will be widened 100 feet to a total width of 150 feet.	El Paso	Proposed	$1,750,000	No	Project has been approved for design documents through County CIP fund for $175,000. Committed funding for construction has not been identified.	2024	Mitigate the issue that the dam will not pass the 75% PMP

Existing Project ID	Existing Project Name	Description	Counties	Project Status	Project Cost ($)	Dedicated Funding for Construction	Planned Funding Source	Expected Completion Year	Anticipated Benefit
140000012	VIN6	Removing the existing 16-foot by 5-foot culvert and replacing it with three 9-foot by 8-foot culverts.	El Paso	Proposed	$880,000	No	Project has been approved for design documents through County CIP fund for $88,000. Committed funding for construction has not been identified.	2024	Stabilizes the crossing and adds sufficient capacity equal to the upstream end to relieve flooding.
140000013	FAB1	Constructing a sediment/retention basin at the base of Fabens North 1. Basin embankment will be 15 feet high with 18-inch riprap on the interior face, and a box culvert principal outlet. Embankment height includes 5 feet of freeboard for PMP event.	El Paso	Proposed	$3,310,000	No	Project has been approved for design documents through County CIP fund for $331,000. Committed funding for construction has not been identified.	2024	Mitigate downstream flooding and sediment load due to uncontrolled flows from Fabens North 1.
140000014	CE Dam 2	Upgrade Dam to meet TCEQ requirements	El Paso	Proposed	$2,000,000	No	There is a request for City Council to authorize $25M within the next 9 months to pay-off a line of credit for CIP drainage projects for Fiscal Year ‘22-‘23. Other sources of funding are FIF, bonds, grants, and pay as you go funding estimated at $8.7M.	2023	Upgrade Dam to meet TCEQ requirements
140000015	NW9	Construction of new debris and volume Dam to prevent breach of existing channel.	El Paso	Proposed	$3,000,000	Yes	There is a request for City Council to authorize $25M within the next 9 months to pay-off a line of credit for CIP drainage projects for Fiscal Year ‘22-‘23. Other sources of funding are FIF, bonds, grants, and pay as you go funding estimated at $8.7M.	2024	Mitigate breach of existing channel
140000016	CE Dam 10	Upgrade Dam to meet TCEQ requirements	El Paso	Proposed	$600,000	No	There is a request for City Council to authorize $25M within the next 9 months to pay-off a line of credit for CIP drainage projects for Fiscal Year ‘22-‘23. Other sources of funding are FIF, bonds, grants, and pay as you go funding estimated at $8.7M.	2023	Upgrade Dam to meet TCEQ requirements

Existing Project ID	Existing Project Name	Description	Counties	Project Status	Project Cost ($)	Dedicated Funding for Construction	Planned Funding Source	Expected Completion Year	Anticipated Benefit
140000017	CE Dam 4	Upgrade Dam to meet TCEQ requirements	El Paso	Proposed	$1,750,000	Yes	There is a request for City Council to authorize $25M within the next 9 months to pay-off a line of credit for CIP drainage projects for Fiscal Year ‘22-‘23. Other sources of funding are FIF, bonds, grants, and pay as you go funding estimated at $8.7M.	2022	Upgrade Dam to meet TCEQ requirements
140000018	NE3A	New Will Ruth Pond to catch FP 15 midstream	El Paso	Proposed	$26,300,000	Yes	TWDB FIF, EPWater Municipal Drainage Utility Revenue Bonds Series 2022	2025	The project will remove about 600 homes from the floodplain, prevent private property damage, reduce flooding of major streets, and increase safe traffic flow through Northeast El Paso
140000019	WC6A	Improve existing dam, build new basin	El Paso	Proposed	$5,600,000	Yes	EPWater CIP	2024	Reduce risk of sediment blockage of culverts under streets (Campbell, Kansas, Stanton, Mesa) and associated flooding
140000020	MidV1	Add pumps in empty bays and upgrade electrical service of Clardy Fox PS	El Paso	Proposed	$5,100,000	Yes	$3,825,000 USACE; $1,275,000 EPWater CIP	2024-2025	storm sewer system is being improved in the Clardy Fox neighborhood and current PS capacity is not enough to handle
140000021	MV7	Increase existing culvert capacity to two 5-ft x 5-ft concrete box culverts	El Paso	Ongoing	$200,000	Yes	EPWater CIP	2022	The following crossing on Playa Drain is undersized: Just Downstream of Yarbrough Drive (one 36-inch RCP).
140000022	NE9	Placing RCP culverts to divert Flowpath from Northgate Diversion Channel to Northgate Dam	El Paso	Proposed	$5,400,000	Yes	EPWater paying 25%, USACE paying 75%, $5.4M total for design and construction, EPWater funding $1.35M, Expected to complete by 2025	2025	Relieves flooding and erosion issues at intersection of Hondo Pass Ave. and Hondo Pass Dr. due to flow from Northgate Diversion Channel

Appendix 1D

Relevant Existing Planning Documents Summary

Appendix Table 1D: Relevant Existing Planning Documents Summary

Study ID	Title	Prepared By	Prepared For	Publication Date
1	Federal Flood Assessment Conference Recommendations and Proceedings	Dr. Ari Michelsen, El Paso Agricultural Research Center, Texas Agricultural Experiment Station, Texas A&M University	16th Congressional District of Texas	9/6/2006
2	Meteorological Aspects of the 2006 El Paso Texas Metropolitan Area Floods, Vol 33, No 1, National Weather Digest	Joseph Rogash, et al., NOAA, National Weather Service, Santa Teresa, NM/El Paso, TX	NOAA, National Weather Service, Weather Forecast Office	8/1/2009
3	DRAFT EPCWID Incident Report, Arroyo Flow and Flooding into Mesa Spur Drain Near Mankato Road, July 22, 2017 @ 4 pm	EPCWID No. 1	EPCWID No. 1	July 2017
4	Final - Evaluation of Reduced Flow Capacity of the Rio Grande and the Impacts on the Operations of the Rio Grande Project Leasburg Dam to American Dam, Phase I - Main Channel and Floodways - Anthony, NM to American Dam	Joint Committee on Rio Grande Project Flood Risk	Elephant Butte Irrigation District, City of El Paso EPWater/Stormwater, and El Paso County Water Improvement District No. 1	11/26/2019
5	Building Resilience to Drought in Big Bend Creeks Through Stream Flow Harvesting and Reforestation, Chihuahuan Desert Conservation Partnership Field Trip, Fall 2021	Jeff Bennett, Rio Grande Joint Venture; Philip Boyd, Dixon Water Foundation	Chihuahuan Desert Conservation Partnership	Fall 2021
6	The Role of Feedback Mechanisms in Historic Channel Changes of the Lower Rio Grande in the Big Bend Region	David J. Dean, John C. Schmidt, Dept of Watershed Sciences, Utah State Univ., Logan, UT	Elsevier, GEOMOR-03223	3/9/2010
7	The Geomorphic Effectiveness of a Large Flood on the Rio Grande in the Big Bend Region: Insights on Geomorphic Controls and Post-Flood Geomorphic Response	David J. Dean, John C. Schmidt, Dept of Watershed Sciences, Utah State Univ., Logan, UT	Elsevier, Geomorphology 201 (2013)	6/28/2013
8	Atlas-14 Precipitation Research and Analysis for the City of El Paso	Clinton Kimball, AECOM	El Paso Water	12/20/2019
9	Emergency Action Plan, City of El Paso High Hazard Dams	URS Corp	City of El Paso and El Paso Water Utilities	7/1/2010
10	Technical Memo - Existing Condition Analysis & Improvement Concepts, South Central Street and Drainage Projects, Simplified Master Drainage Study	Chris Wright, AECOM	Geoffrey Espineli, CNU-A, City of El Paso	5/26/2015
11	Technical Memo - Comment Responses and General Discussion to Simplified Master Drainage Study, Existing Condition Analysis & Improvement Concepts	Chris Wright, AECOM	Yesenia Castro, City of El Paso	11/23/2015
12	El Paso Stormwater Master Plan	URS Corp and Moreno Cardenas, Inc.	El Paso Water and the City of El Paso	3/1/2009
13	El Paso Stormwater Master Plan Update	Jeff Irvin, Gilbert Andujo, AECOM	El Paso Water and the City of El Paso	7/15/2021
14	Concho Valley Council of Governments, Hazard Mitigation Plan Update, 2012 - 2017	H2O Partners, Inc.	CVOCOG	Unknown
15	Preliminary Engineering Analysis - Rio Grande Outlet Structures	Conde, Inc., EMC	City of El Paso	7/1/2007
16	Metropolitan Transportation Plan, Destino 2045	El Paso Metropolitan Planning Organization Transportation Project Advisory Committee, Texas Dept of Transportation, New Mexico Dept of Transportation	Alliance Transportation Group	5/18/2018
17	Figure 8-35. DRAFT Doniphan System, Doniphan Ditch (NW1 & NW2), Northwest Region, El Paso Stormwater Master Plan	URS Corp and Moreno Cardenas, Inc.	El Paso Water and the City of El Paso	11/1/2010
18	Supplemental Information to Tech Memo, Doniphan Ditch Upstream Project, El Paso, Texas	Quantum Engineering Consultants, Inc.	El Paso Water Utilities	10/4/2010
19	Dam Analysis Report, Drainage On-Call Services	Jeff Irvin, URS Corp	City of El Paso	2/21/2008
20	Plan El Paso, A Policy Guide for El Paso for the next 25 years and beyond, Vol 1, City Patterns	Various	City of El Paso	3/6/2012

Study ID	Title	Prepared By	Prepared For	Publication Date
21	Final Results of Hydraulic Study, El Paso County, TX	Compass PTS JV, Arlington, VA	DHS/FEMA, Region 6, Washington DC	6/30/2019
22	Final Results of Hydrology Study, El Paso County, TX	Compass PTS JV, Arlington, VA	DHS/FEMA, Region 6, Washington DC	6/30/2019
23	Controlled Reclamation, Managing Water in the West, Emergency Flood Response, Elephant Butte & Caballo Dams Emergency Action Plan, Rio Grande Project, Albuquerque Area Office, Upper Colorado Region	Albuquerque Area Office, Bureau of Reclamation, U.S. Dept of the Interior	Albuquerque Area Office, Bureau of Reclamation, U.S. Dept of the Interior	10/1/2018
24	El Paso County Interior Drainage Study, Methodology and Mapping Results Report	Chris Wright, AECOM	City of El Paso and El Paso Water Utilities	2/6/2021
25	El Paso County Stormwater Master Plan	URS Corp	El Paso Water Utilities, TWDB, and El Paso County	8/1/2010
26	El Paso County Stormwater Master Plan	AECOM	El Paso Water Utilities, TWDB, and El Paso County	2/1/2021
27	City of El Paso, Rio Grande River, EP2A Levee Certification Summary Report	AECOM	City of El Paso	3/11/2020
28	Flood Frequency Determination, El Paso County and Incorporated Communities, Texas, Disaster Response Flood Recovery Data	Mapping Alliance Partnership, Albuquerque, NM	FEMA, Region VI, Denton, TX	3/26/2007
29	High Water Mark Data Collection for El Paso County and Incorporated Communities, Texas	Mapping Alliance Partnership, Albuquerque, NM	FEMA, Region VI, Denton, TX	2/23/2007
30	Flood Insurance Study, Brewster County, Texas. Unincorporated Areas	FEMA	FEMA	4/2/1991
30a	Flood Insurance Study, City of Alpine, Texas. Brewster County.	FEMA	FEMA	11/16/1990
30b	Flood Insurance Study, city of Balmorhea, Texas. Reeves County.	FEMA	FEMA	9/16/1988
30c	Flood Insurance Study, City of Sonora, Texas. Sutton County	FEMA	FEMA	2/17/1989
30d	Flood Insurance Study, City of Van Horn, Texas. Culberson County.	FEMA	FEMA	11/2/1994
30e	Flood Insurance Study, Ector County, Texas and incorporated areas. Ector County, City of Goldsmith, City of Odessa.	FEMA	FEMA	3/15/2012
30f	Flood Insurance Study, Volume 1 of 5, City of El Paso, Texas. El Paso County.	FEMA	FEMA	2/16/2006
30g	Flood Insurance Study, Volume 2 of 5, City of El Paso, Texas. El Paso County.	FEMA	FEMA	2/16/2006
30h	Flood Insurance Study, Volume 3 of 5, City of El Paso, Texas. El Paso County.	FEMA	FEMA	2/16/2006
30i	Flood Insurance Study, Volume 4 of 5, City of El Paso, Texas. El Paso County.	FEMA	FEMA	2/16/2006
30j	Flood Insurance Study, Volume 5 of 5, City of El Paso, Texas. El Paso County.	FEMA	FEMA	2/16/2006
30k	Flood Insurance Study. FEMA. Volume 1 of 8. El Paso County, Texas and incorporated areas.	FEMA	FEMA	7/8/2020
30l	Flood Insurance Study. FEMA. Volume 2 of 8. El Paso County, Texas and incorporated areas.	FEMA	FEMA	7/8/2020
30m	Flood Insurance Study. FEMA. Volume 3 of 8. El Paso County, Texas and incorporated areas.	FEMA	FEMA	7/8/2020

Study ID	Title	Prepared By	Prepared For	Publication Date
30n	Flood Insurance Study. FEMA. Volume 4 of 8. El Paso County, Texas and incorporated areas.	FEMA	FEMA	7/8/2020
30o	Flood Insurance Study. FEMA. Volume 5 of 8. El Paso County, Texas and incorporated areas.	FEMA	FEMA	7/8/2020
30p	Flood Insurance Study. FEMA. Volume 6 of 8. El Paso County, Texas and incorporated areas.	FEMA	FEMA	7/8/2020
30q	Flood Insurance Study. FEMA. Volume 7 of 8. El Paso County, Texas and incorporated areas.	FEMA	FEMA	7/8/2020
30r	Flood Insurance Study. FEMA. Volume 8 of 8. El Paso County, Texas and incorporated areas.	FEMA	FEMA	7/8/2020
30s	Flood Insurance Study, El Paso County, Texas. Unincorporated areas.	FEMA	FEMA	9/4/1991
30t	Flood Insurance Study, Midland County, Texas and incorporated areas.	FEMA	FEMA	9/16/2005
30u	Flood Insurance Study. Val Verde County, Texas and incorporated areas.	FEMA	FEMA	7/22/2010
31	Flowpath 39 Flood Mitigation Alternatives. Final Report.	AECOM	El Paso Water Utilities	12/5/2016
32	El Paso Water. Final Survey for the Rio Grande Storm Upstream/Outfall Structures.	Frank X. Spencer & Associates, Inc.	El Paso Water	4/29/2019
33	Hudspeth County, Texas. Villa Alegre, Fort Hancock East Unit 1, & Fort Hancock East Unit 2. Colonia Area Study and Plan 2019 - 2029.	GreatWorks	Commissioners Court of Hudspeth County, Texas	12/1/2019
34	Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project: Final Report	Tetra Tech	International Boundary and Water Commission	10/20/2015
35	Final Environmental Assessment. Improvements to the Rio Grande Rectification Project.	Parsons	United States Section, International Boundary and Water Commission United States and Mexico.	3/1/2009
36	Conceptual Restoration Plan and Cumulative Effects Analysis, Rio Grande - Caballo Dam to American Dam, New Mexico and Texas.	U.S. Army Corps of Engineers. Albuquerque District.	United States Section International Boundary and Water Commission (USIBWC) Under (MOU) IBM 92-21, IWO No. 31	3/5/2009
37	Hydrologic and Hydraulic Analysis of the Montoya and Nemexas Drains and Contributing Drainage Areas	URS	El Paso Water Utilities, Stormwater Engineering, El Paso.	10/27/2014
38	Technical Memorandum with Project Recommendation. Montoya Drain H&H Analysis.	AECOM	El Paso Water Utilities. Ryan Stubbs.	1/27/2016
39	Hydrologic Analysis Review Memorandum. Rio Grande-Caballo Dam to Ft Quitman.	AECOM		7/12/2019
40	Technical Memorandum. Rio Grande (El Paso County, Texas). Hydraulic Analysis.	AECOM	El Paso County, Texas	2/10/2020
41	Natural Valley Analysis Pre-LAMP Report.	Federal Emergency Management Agency		10/28/2016
42	Monthly Report of Hydrologic Conditions	U.S. Department of Commerce. National Oceanic and Atmospheric Administration.	Hydrometeorological Information Center	9/1/2008
43	2019 Water Management and Civil Works Activities. Pecos River Basin.	U.S. Army Corps of Engineers. Albuquerque District.		4/7/2020
44	Pecos River Basin Salinity Assessment, Santa Rosa Lake, New Mexico, to the Confluence of the Pecos River and the Rio Grande, Texas, 2015. Scientific Investigations Report 2019-5071.	U.S. Army Corps of Engineers, New Mexico. Interstate Stream Commission, Texas Commission on Environmental Quality, and Texas Water Development Board.	U.S. Department of the Interior. U.S. Geological Survey.	2/1/2015
45	Reclamation Managing Water in the West, Emergency Action Plan, Avalon Dam, Carlsbad Project, New	U.S. Dept of the Interior, Bureau of Reclamation, Upper Colorado Region,	Carlsbad Irrigation District, Carlsbad, New Mexico	5/1/2013

Study ID	Title	Prepared By	Prepared For	Publication Date
	Mexico	Albuquerque Office		
46	Probable maximum precipitation update.	Freese and Nichols, Inc.	El Paso Water	6/1/2018
47	Multi-Hazard Mitigation Action Plan. 2015 El Paso County, Texas.	Rio Grande Council of Governments. URS.	El Paso County, Texas	12/5/2018
48	Wetlands, Vol. 18, No. 4. Chronology of the spread of Tamarisk in the Central Rio Grande.	Benjamin L. Everitt. Utah Division of Water Resources.	The Society of Wetland Scientists	2006-2007
49	Drainage Feasibility Study. Socorro Rd. Intersections with San Antonio St. & Main St.	Brock & Bustillos Inc.	City of San Elizario	1/1/2021
50	Southwest Weather Bulletin. National Weather Service El Paso/Santa Teresa.	National Weather Service El Paso/Santa Teresa	NWS	9/1/2020
51	Far West Texas Water Plan	Far West Texas Water Planning Group	Texas Water Development Board	8/21/2020
52	Statewide Survey of Aquifer. Suitability for Aquifer Storage and Recovery Projects or Aquifer Recharge Projects.	HDR	Texas Water Development Board	4/16/2001
53	Cebada Pump Station Wet Well Improvements. Feasibility Study. Final Report.	AECOM	El Paso Water	12/1/2018
54	Climate Change Recommendations for Regional Flood Planning. OSC Report 2021-01		Office of the Texas State Climatologist.	12/1/2018
55	Bridge Scour Analysis for US 190 at Draw	Civil Tech Engineering, Inc.	Texas Department of Transportation. Pecos County.	5/1/2020
56	Bridge Scour Analysis for US 190 at Richburg Draw. TxDOT CSJ No. 1640-01-005	Civil Tech Engineering, Inc.	Texas Department of Transportation. Pecos County.	2/1/2013
57	Drainage Study for FM 170 from Candelaria to US-67	AECOM	TxDOT Presidio County, Texas	1/1/2019
58	Preliminary Engineering Drainage Report. Border Highway West Extension Loop 375.	Moreno Cardenas Inc.	TxDOT El Paso, Texas	10/1/2005
59	Drainage Study for SH 20 (Mesa Street) From Doniphan Drive to Texas Avenue	AECOM	TxDOT El Paso, Texas	January 2019
60	FLO-2D Model Development below Caballo Dam URGWOM	Tetra Tech. Inc.	U.S. Army Corps of Engineers	2005
61	URGWOM FLO-2D Model Development. Rio Grande - American Dam to Fort Quitman, TX	Mussetter Engineering, Inc.	U.S. Army Corps of Engineers. Albuquerque District and International Boundary and Water Commission, El Paso, Texas.	
62	Draft - HEC-RAS Model Development for the Rio Grande Canalization Project	Mussetter Engineering, Inc.	URGWOM	11/14/2007
63	Cibolo Creek, Presidio, Texas, Vol 1 - Main Report; Feasibility Report for Water Resources Development	USACE, Albuquerque District, Albuquerque, NM	USACE	5/1/1976
64	Interior Drainage Analysis Report for El Paso, Texas, Doniphan Drive, Borderland to American Dam	3AEGREEN - A Joint Venture	USACE and El Paso Water Utilities	3/16/2018
65	Technical Memo - Keystone Dam - Limited Seepage Study, El Paso, Texas	Arias & Associates, Inc. and URS Corporation	URS Corporation	11/6/2014
66	Hydrologic, Hydraulic, & Sediment Analysis for Northwest El Paso, TX, Arroyos 38 to 48 Final Report	Southwest Water Design, LLC - A Joint Venture	USACE, Albuquerque District, Albuquerque, NM	5/1/2015
67	Rio Grande Canalization Project - LiDAR and Orthophotography Report	Wilson & FNI JV	IBWC	6/12/2020
68	O&M Manual upper Rio Grande Projects	Upper Rio Grande Projects, American Dam/Carlos Marin Field Office, El Paso, TX	IBWC	10/1/2010

Study ID	Title	Prepared By	Prepared For	Publication Date
69	Flood Frequency Study for the Rio Grande Between El Paso, Texas/Juarez, Chihuahua and Brownsville, Texas/Matamoros, Tamaulipas	Engineering Services Division, US Section, IBWC, United States and Mexico	IBWC	Sept. 2003
70	Appendix A1, American Canal Hydrologic and Hydraulic Analysis Report	URS Corp., Dallas, TX	US Section, IBWC, El Paso, TX	8/9/2021
71	Rehabilitation Improvements for the Rio Grande Canalization Protective Levee System, Canutillo Phase II, El Paso, Texas - 100% Design Documentation Report	URS Group, Inc., Austin, TX	US Section, IBWC, El Paso, TX	8/1/2013
72	Rehabilitation Improvements for the Rio Grande Canalization Protective Levee System, Canutillo Phase II - Hydrologic & Hydraulic Analysis Report	URS Group, Inc., Austin, TX	US Section, IBWC, El Paso, TX	8/21/2013
73	Interior Drainage Hydrologic and Hydraulic Analysis for El Paso, TX, International Dam to Riverside Weir Report; Stormwater Master Plan Task Order No. 13	URS Corp, Austin, TX	US Section, IBWC, El Paso, TX	3/2/2019
74	State of Texas Hazard Mitigation Plan	Texas Dept of Public Safety, Emergency Mgmt.	Texas Dept of Public Safety	10/1/2018
75	Geotechnical Investigation Report, Keystone Dam Sluice Gate Modification, El Paso, Texas	URS Corp.	El Paso Water Utilities	Nov. 2014
76	City of El Paso Flood Risk Management, TX, Investigations	USACE, Albuquerque District, Albuquerque, NM	USACE	
77	Flood Control Challenges of the El Paso Central Watershed	EPWater	USACE	
78	A Watershed Protection Plan for the Pecos River in Texas	Lucas Gregory, Texas Water Resources Institute and Will Hatler, Texas AgriLife Extension Service	TSSWCB and USEPA	10/1/2008
79	Andrews County Subdivision and Development Regulations	Andrews County Commissioner's Court	Andrews County Commissioner's Court	6/16/2014
80	Flood Damage Prevention Ordinance	Brewster County Commissioner's Court	Brewster County Commissioner's Court	12/13/2017
81	Ector County Multi-jurisdictional Hazard Mitigation Plan	H2O Partners, Inc	Ector County, City of Odessa, City of Goldsmith	2011
82	El Paso County Multi-Hazard Mitigation Action Plan	URS/Rio Grande Council Of Governments	El Paso County; Cities of El Paso, Socorro; Towns of Anthony, Clint, Horizon City, Vinton	2015
83	Hazard Mitigation Action Plan for the Rio Grande Border	H2O Partners, Inc	Rio Grande border region, multiple communities	10/20/2008
84	Environmental Flows Recommendations Report	The Upper Rio Grande Basin & Bay Expert Science Team	Environmental Flows Advisory Group, Rio Grande Basin and Bay Area Stakeholders Committee, and TCEQ	7/12/2012
85	Economic effects of a reservoir re-operation policy in the Rio Grande/Bravo for integrated human and environmental water management	J. Pablo Ortiz-Partida (Graduate Student Researcher)1, B.A. Lane (Graduate Student Researcher)1, S. Sandoval-Solis (Assistant Professor) Department of Land, Air and Water Resources, University of California, Davis, USA	Journal of Hydrology: Regional Studies	8/11/2016
86	Assessing the State of Water Resources Management Policies and Water Resources Planning Tools for the Rio Grande/Bravo	S. Sandoval-Solis, J. Pablo Ortiz-Partida Department of Land, Air and Water Resources, University of California, Davis, USA	State of WRM policies and tools for the Rio Grande/Bravo Activities Report	3/1/2017
87	Environmental Flows Recommendations Report	Upper Rio Grande Basin and Bay Expert Science Team	Environmental Flows Advisory Group, Rio Grande Basin and Bay Area Stakeholders Committee, and Texas Commission on Environmental Quality	7/1/2012
88	Final Hydraulic Report/Drainage Study for the City of Presidio, Texas	S&B Infrastructure, LTD.	Border Environment Cooperation Committee, City of Presidio	August 2008

Study ID	Title	Prepared By	Prepared For	Publication Date
89	Northeast Sump Improvements – Hydrologic and Hydraulic Analysis	MCi	El Paso Water Utilities	November 13, 2017
90	Doniphan Storm Water Pump Stations PS1 and PS2 System Evaluation and Potential Improvements	URS	El Paso Water Utilities	July 2014
91	Interior Drainage and River Hydraulics Analysis Draft Report	URS	USIBWC	January 2013
92	The City of El Paso Drainage Design Manual	City of El Paso Engineering Department	City of El Paso Engineering Department	June 2008
93	Final Wetland Delineation Fort Bliss Sump, Fort Bliss, Texas and New Mexico	Gulf South Research Corporation on behalf of U.S. Army Fort Bliss	Cherokee Nation Management and Consulting, LLC	July 2021

Appendix 1E
Map Exhibits


Anthony
Westway
Vinton village
Canutillo
Prado Verde
El Paso
Fort Bliss
Homestead Meadows North
Butterfield
Homestead Meadows South
Vinton Village
Westway
Canutillo
Prado Verde
Fort Bliss
Homestead Meadows North
EL PASO
Homestead Meadows South
El Paso
Sparks
Socorro
Agua Dulce
San Elizario
Clint
Morning Glory
Fabens
Tornillo
HUDSPETH
Acala
Fort Hancock
Dell city
CULBERSON
Sierra Blanca
Van Horn
Pecos River
LOVING
Kermit
WINKLER
Mentone
Wink
Monahans
Pecos
Barstow
Pyote
Wickett
Thorntonville
WARD
CRANE
Crane
Toyah
Lindsay
Pecos River
Grandfalls
Imperial
REEVES
Coyanosa
Rankin
McCamey
Rio Grande
Pecos River
JEFF DAVIS
Balmorhea
Fort Stockton
Iraan
PECOS
CROCKETT
Ozona
Sheffield
Valentine
Fort Davis
Rio Grande
SUTTON
Sonora
Marfa
Alpine
TERRELL
The Forgotten Reach of the Rio Grande
Marathon
Pecos River
VAL VERDE
Devils River
Sanderson
PRESIDIO
BREWSTER
Rio Grande
El Paso
Sparks
Horizon city
Socorro
Agua Dulce
San Elizario
Clint
Morning Glory
Fabens
Tornillo
Rio Grande
Acala
Fort Hancock
Presidio
Redford
Study Butte
Terlingua
Rio Grande
Box Canyon
Amistad
Devils River
Lake View
Presidio
Rio Grande


VIN6
Vinton village
CAN1
Canutillo
El Paso
Prado Verde
NE8A
NW9
NE9
Vinton Village
Westway
Canutillo
Prado Verde
Fort Bliss
Homestead Meadows North
Dell city
Keystone Dam Seepage Improvements
Fort Bliss
EL PASO
Homestead Meadows South
El Paso
Sparks
Socorro
Agua Dulce
San Elizario
Clint
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Fabens
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HUDSPETH
Acala
Fort Hancock
CULBERSON
Sierra Blanca
Van Horn
LOVING
Kermit
WINKLER
Mentone
Wink
Monahans
Pyote
Barstow
Wickett
Thorntonville
Pecos
WARD
CRANE
Crane
Toyah
Lindsay
Grandfalls
Imperial
REEVES
Coyanosa
Rankin
McCamey
CE Dam 2
Fort Bliss
WC6A
CE Dam 4
El Paso
CE Dam 10
MidV1
Balmorhea
JEFF DAVIS
Fort Stockton
Iraan
PECOS
CROCKETT
Ozona
Sheffield
Valentine
Fort Davis
Sonora
SUTTON
Marfa
Alpine
Marathon
TERRELL
Sanderson
PRESIDIO
BREWSTER
VAL VERDE
Inset C
EA6A
El Paso
MV7
SSA1
SSA6
SSA3
Horizon city
Sparks
SOC1 & SOC2
SOC1 & SOC2
Socorro
Agua Dulce
HAC7
Clint
San Elizario
Morning Glory
FAB1
Fabens
Presidio
Redford
Study Butte
Terlingua
Box Canyon
Amistad
Lake View


Anthony
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Vinton village
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PECOS
CROCKETT
Ozona
Valentine
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Sheffield
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Chapter 2: Flood Risk Analyses

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2. Flood Risk Analyses

Flood risks can be defined in terms of *flood hazards* (i.e., the location, magnitude, and frequency of flooding), *flood exposure* (i.e., who and what might be harmed within the region), and *vulnerabilities* (i.e., areas of exposure including communities and critical facilities which may be particularly susceptible to flood impacts). Flood risk may also be evaluated based on *existing conditions*, accounting for present-day land use and impervious cover, as well as based on *future conditions*, accounting for future land use and impervious cover trends as well as overall climate and precipitation trends.

The following chapter summarizes the existing and future condition flood risk analyses performed for the Upper Rio Grande region. Flood risks were estimated using the best available hydrologic and hydraulic modeling data within the region, including models developed specifically for the RFP.

The results of the flood risk analyses are intended for use by the RFPG to establish priorities in subsequent planning tasks and to identify areas requiring flood management evaluations (FMEs), flood management strategies (FMSs), and flood mitigation projects (FMPs). The flood risk maps presented in this RFP do not reflect the effective regulatory floodplains and do not supersede or change federal flood insurance requirements.

Similarly, the flood risk analyses in this chapter establish baseline flood risk levels as currently recognized by FEMA and other best available modeling. As a result, and in accordance with State RFP requirements, any existing levees in the region that do not meet FEMA accreditation are excluded from the baseline flood risk analysis. This consideration is especially applicable to El Paso County, where unaccredited levees are present along the Upper Rio Grande. Chapter 4 discusses potential solutions and improvements that would be needed to achieve certification of these levees.

2.1 Available Hydrologic and Hydraulic Models

In reviewing the flood studies described in *Chapter 1 (Introduction and Description of the Upper Rio Grande Flood Planning Region),* relevant flood-related models were identified and obtained. These models, and their associated flood risk data, were evaluated to identify flood hazards and data gaps for the regionwide flood risk analysis as well as to evaluate flood reduction impacts from potential FMSs and FMPs as discussed in *Chapter 4 (Flood Mitigation Solutions)*.

Table 2.1 provides a summary of flood-related models most relevant to the Upper Rio Grande RFP. In addition, descriptions of the associated planning documents are included in Chapter 1, and an overview of model coverage boundaries across the region are shown in **Map Exhibit 22** (“Model Coverage”).

Two of the primary flood risk data sources used in the baseline flood risk analysis include the 2019 Preliminary FEMA El Paso County Mapping Study (Model IDs 1 and 11) and the 2021 Statewide Fathom 2D Study (Model ID 20). These studies are described in greater detail in Section 2.2.1 along with the methodology used for the identification of flood risks.

Several of the models listed in **Table 2.1** were not incorporated into the baseline flood risk analyses but are still relevant to flood planning in the region. For example, the models developed for the El Paso County Interior Drainage Study (Model IDs 3-10) were excluded since they represent flood risks based on the flood protection of unaccredited levees through most of El Paso. The remaining models were excluded from the flood risk mapping since they are primarily associated with evaluating proposed Flood Mitigation Projects (FMPs), Flood Management Evaluations (FMEs), and/or Flood Management Strategies (FMSs), which are addressed in Chapter 4.

Other relevant floodplain layers were identified for the region, although models for these floodplains were not located or obtained, since the models are either out of date, superseded by other models, or not publicly available. These floodplain layers include the First American Flood Data Services (FAFDS) dataset (containing digitized flood hazard information from previously published FIRMs and FISs), Base Level Engineering (BLE) data for El Paso County, FEMA Approximate layers for Val Verde and Ector Counties, and a floodplain study for Fort Bliss in El Paso County.

Table 2.1 Relevant Flood-Related Models

Model ID	Study ID	Location	Modeling Software	Source
3-10	24	El Paso County, within the Rio Grande Natural Valley Floodplain	FLO-2D, HEC-HMS, and HEC-RAS 2D	El Paso County Interior Drainage Study (El Paso Water and El Paso County, 2021)
1, 11	21, 22	El Paso County	HEC-HMS and HEC-RAS 2D	Preliminary FEMA El Paso County Mapping Study (FEMA, 2019) (Note: as of November 2021, preliminary models are being adjusted to address appeals submitted during the appeal process – no current timeline is available for completion)
39, 40	N/A	El Paso County	HEC-HMS and HEC-RAS 2D	El Paso County Future Conditions Analysis for Regional Flood Plan (AECOM, 2022)
15-22	26	El Paso County	HEC-HMS, HEC-RAS 1D, and CulvertMaster	El Paso County Stormwater Master Plans (El Paso County, 2010 and 2021)
38	N/A	Texas, statewide	Fathom 2D models	TWDB/Fathom (October 2021)
28, 29	N/A	Americas Ten Dam in El Paso	HEC-HMS and HEC-RAS 2D	Ongoing Planning and Design to Decommission Americas Ten Dam (El Paso Water)
2, 12	59	SH 20 (Mesa Street) From Doniphan Drive to Texas Avenue	HEC-HMS, EPA SWMM	Drainage Study for SH 20 (Mesa Street) From Doniphan Drive to Texas Avenue (TXDOT, 2019)
13, 14	57	FM 170 (Mesa Street) From Candelaria to US-67	HEC-HMS, HEC-RAS 1D	Drainage Study for FM 170 From Candelaria to US-67 (TXDOT, 2020)
27	88	City of Presidio	HEC-HMS, HY-8	Final Hydraulic Report/Drainage Study for the City of Presidio, Texas (S&B Infrastructure, 2008)
30, 31	89	Northeast El Paso	HEC-HMS, FLO-2D	Northeast Sump Improvements – Hydrologic and Hydraulic Analysis (MCi, 2017)
34	38	West El Paso	HEC-HMS	Montoya Drain H&H Analysis (AECOM)
35	90	West El Paso	HEC-HMS	Doniphan Storm Water Pump Stations PS-1 and PS-2 System Evaluation & Potential Improvements (URS, 2014)
32, 33	N/A	West El Paso	HEC-HMS, HEC-RAS 2D	NW16 from modified version of El Paso County Preliminary FEMA Hydraulic Model (WA2) and modified version of SH20 (Mesa Street) Hydrologic Model

Model ID	Study ID	Location	Modeling Software	Source
1, 11	49	San Elizario	HEC-HMS, HEC-RAS 2D	San Elizario Alt 3 from Preliminary FEMA El Paso County Mapping Study (FEMA, 2019)
41-47	24	El Paso County, within the Rio Grande Natural Valley Floodplain	HEC-HMS	El Paso County Interior Drainage Study (El Paso Water and El Paso County, 2021)
48	24	El Paso County, within the Rio Grande Natural Valley Floodplain	StormCAD	El Paso County Interior Drainage Study (El Paso Water and El Paso County, 2021)

2.2 Existing Conditions Analysis

Existing condition flood hazard analyses were performed at the region-wide level using best available data to determine the location and magnitude of both 1% annual chance (100-year) and 0.2% annual chance (500-year) flood events. To evaluate the level of service of low water crossings, flood risks for the 10% annual chance (10-year) event were also evaluated.

2.2.1 Existing Flood Hazard Identification

Several flood hazard datasets were evaluated for the 1% and 0.2% annual chance events to develop the existing conditions flood hazard area layers for the RFP. These datasets were prioritized and consolidated into a single overall "flood quilt" for the entire region. **Table 2.2** summarizes the flood hazard datasets evaluated in this study as well as their priority order in the final existing conditions flood quilt. These datasets are also described in further detail later in this section. Existing condition flood hazard areas identified as part of this analysis are shown in **Map Exhibit 4** ("Existing Condition Flood Hazard").

The final consolidated existing conditions flood hazard spatial files are included in a GIS geodatabase format along with the RFP. Existing condition flood hazard areas are contained in a single feature class ("ExFldHazard") which includes flood hazard areas for both 1% and 0.2% annual chance events. In cases of overlapping floodplain sources during consolidation, the flood frequency attribute field ("FLOOD_FREQ") was populated using the highest intensity storm event of the overlapping layers.

Any existing levees or dams in the region that do not meet FEMA accreditation, such as unaccredited levees in El Paso County, were excluded from the baseline flood hazard analysis and addressed separately in *Chapter 4 (Flood Mitigation Solutions)*.

Table 2.2 Existing Conditions Flood Hazard Datasets and Priorities

Flood Hazard Data Source	Description	Priority Order (1 – Highest)	
		El Paso County	Outside El Paso County
National Flood Hazard Layer Preliminary Data	Detailed mapping of flood hazards for 1% and 0.2% annual chance events subject to public review and finalization. Available in El Paso County only.	1	n/a
Base Level Engineering (BLE) Floodplain	Watershed-scale modeling and mapping using automated methods. Available in El Paso County only (but mostly superseded by NFHL Preliminary Data).	n/a	n/a
National Flood Hazard Layer Approximate Effective Data	Approximate studies (Flood Zone A) on the effective FIRM map. Available in Ector and Val Verde Counties only.	n/a	1
First American Flood Data Services (FAFDS)	Digitized flood hazard information from previously published FIRMs and FISs.	n/a	2
Cursory Floodplain (Fathom)	Regionwide flood hazard dataset developed using 3-meter resolution fluvial and pluvial models by Fathom	2 (Fort Bliss only)	3

To supplement the available flood hazard datasets, community feedback was requested to identify any other potential flood prone areas that may not be captured by existing mapping. These flood prone areas were collected throughout the planning process during in-person public meetings and through an online form and map survey. Additional information pertaining to the data collection and public input process is provided in *Chapter 9 (Public Participation and Plan Adoption)*.

National Flood Hazard Layer (NFHL) Preliminary Data

The NFHL is used by FEMA to represent the regulatory floodplains for the National Flood Insurance Program (NFIP). This layer includes flood hazard maps for the 1% and 0.2% annual chance storm events, as well as other lower intensity storm events. When the NFHL is updated, preliminary NFHL datasets are issued for public review and awareness of the proposed change. Preliminary datasets include both detailed and approximate flood study data and typically represent the best available information for their study area.

The FEMA El Paso County Mapping Study was issued as preliminary on July 8, 2020, and is intended to revise the existing FIS for El Paso County. The latest available floodplains from the Preliminary study were used as the top priority floodplain layer for El Paso County in the RFP existing conditions flood quilt.

The Preliminary study was divided into 11 watershed areas, shown in **Figure 2.1**, with a selection of streams to received detailed studies. All portions of the study, with the exception of the Horizon Arroyo (Stream 2), were developed using 2D hydraulic modeling and detailed terrain data to better represent the physical characteristics of the county. As of June 2022, the preliminary models are being adjusted to address public comments submitted during the appeal process, and revised preliminary draft floodplains are anticipated to be issued for public review in late fall of 2022. No current timeline is available for the new floodplain maps to become effective.

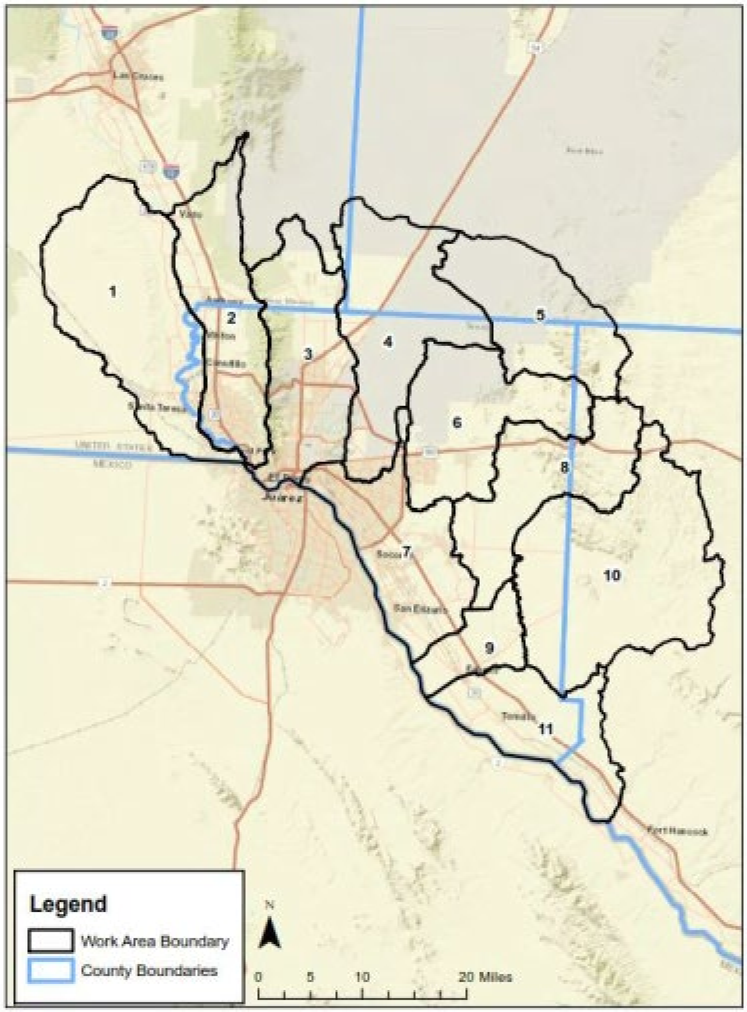

Figure 2.1 FEMA El Paso County Mapping Study Watershed Area Boundaries

Base Level Engineering (BLE) Floodplain

BLE floodplains are developed using automated methods for watershed-scale modeling and mapping. BLE floodplains were developed for El Paso County in 2016 for the FEMA Region IV RiskMAP Program and have since largely been superseded by the recent 2019 Preliminary FEMA El Paso County Mapping Study.

Fort Bliss in El Paso County is one exception to this, as the area is not covered in the 2019 Preliminary Mapping dataset, even though it is covered in the earlier BLE floodplains dataset. However, in this area, the Cursory Floodplain (Fathom) dataset was used to fill data gaps in the RFP existing conditions flood quilt and was selected over the BLE data because it is more conservative than the BLE data overall and overlaps with more than 95% of the buildings shown to be at-risk of flooding in the BLE layer. For this reason, and since the BLE floodplain is superseded by the Preliminary datasets for the rest of El Paso County, the BLE floodplain dataset was not used in developing the RFP existing conditions flood quilt.

National Flood Hazard Layer (NFHL) Approximate Effective Data

The effective NFHL contains current regulatory floodplains and includes both detailed and approximate flood study data. Two locations in the Upper Rio Grande Region have available NFHL Approximate floodplain data, including Val Verde County (with an effective floodplain date of July 22, 2010) and Ector County (with an effective floodplain date of March 15, 2012). These floodplains were used as the top priority floodplains in the RFP existing conditions flood quilt for both counties, replacing the lesser priority First American Flood Data Services (FAFDS) floodplain layer.

First American Flood Data Services (FAFDS) Floodplain

The FAFDS floodplain layer contains digitized flood hazard information from previously published FIRMs and FISs and is not available for viewing in the NFHL. While FAFDS floodplains are typically old and potentially outdated, they make up a large component of the available floodplain data in the Upper Rio Grande Region.

Due to the limited availability of more recent floodplain data across the region, FAFDS floodplains were utilized as the top priority floodplains in the RFP existing conditions flood quilt for 11 counties, including the Counties of Brewster, Crockett, Culberson, Edwards, Hudspeth, Jeff Davis, Midland, Presidio, Sutton, Terrell, and Ward. Effective map dates of these FAFDS floodplains are listed in **Table 2.3** by county.

Table 2.3 FAFDS Effective Map Dates by County

County	FAFDS Effective Map Date
Brewster	10/15/1985
Crockett	4/1/2004
Culberson	11/1/1985
Edwards	2/19/1982
Hudspeth	11/1/1985
Jeff Davis	7/18/1985
Midland	12/6/1999
Presidio	7/3/1985
Sutton	9/1/1987
Terrell	9/1/1987
Ward	10/23/1977-10/25/1977

FAFDS floodplains were not utilized for El Paso, Val Verde, or Ector Counties, where more recent floodplain data are available, or for the other nine counties where FAFDS floodplains are unavailable, including the Counties of Andrews, Schleicher, Pecos, Reagan, Upton, Crane, Loving, Reeves, and Winkler. Floodplains for these latter counties were populated in the RFP existing conditions flood quilt using the Cursory Floodplain (Fathom) dataset only.

Cursory Floodplain (Fathom)

The Cursory Floodplain dataset was developed for the TWDB by Fathom, consisting of both pluvial and fluvial floodplains. Both pluvial and fluvial floodplains were produced using 30-meter resolution models and mapped to a 3-meter resolution for the entire state of Texas. The dataset incorporates NOAA Atlas 14 rainfall data in all areas of the state and includes an estimation of flood hazards for the 20%, 10%, 1%, and 0.2% annual chance events.

At the request of the TWDB, the datasets were post-processed by Fathom to remove fluvial and pluvial cells with depths less than 0.5 feet. The Fathom datasets were provided by TWDB to each region in raster format. The datasets associated with the Upper Rio Grande Region were then processed for the RFP in accordance with additional TWDB post-processing specifications. The final post-processed Fathom floodplain layer was used in union with other available data to fill data gaps for the entire Upper Rio Grande Region outside of El Paso County and for Fort Bliss inside El Paso County.

While the Fathom dataset is useful at filling flood hazard data gaps, it also has several limitations as indicated in the TWDB Fathom dataset documentation (TWDB 2021)[1]:

- Cursory flood data may not appropriately depict flood risk associated with:
    - Constructed features that may alter flow patterns (roadways, railroads, urban areas, storm drainage systems, dams, levees, embankments, etc.)
    - Natural features that may not be fully represented in the 30-meter model (alluvial fans, sinkholes, small tributaries, waterbodies, areas of immediate topographic change, etc.)
    - Border areas along the Texas state boundary
- Limitations exist above bodies of water where underwater bathymetry might alter flood depths.
- Cursory flood depths were developed using a high-level statewide assessment and should be used as approximations of flood risk.

As a result of these limitations, the Fathom dataset was used as the lowest priority floodplain in the RFP existing conditions flood quilt for all parts of the region. However, in the case of nine counties where FAFDS floodplains were unavailable (including the Counties of Andrews, Schleicher, Pecos, Reagan, Upton, Crane, Loving, Reeves, and Winkler), the Fathom dataset was used as the primary floodplain dataset.

For additional insight, Aqua Strategies performed an evaluation for the Upper Rio Grande Region comparing a draft version of the Fathom dataset (developed using a 30-meter mapping resolution) with 1D-derived floodplain maps in the region. The comparison found reasonable similarities between the two sets of floodplains. This memorandum is provided for reference in Appendix 2C.

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[1] Texas Water Development Board. Cursory Floodplain Data 3m Technical Documentation, October 2021. Accessed at https://twdb.maps.arcgis.com/sharing/rest/content/items/a59cbeae4a754cee9f38b17459521629/data

2.2.2 Existing Flood Hazard Data Gaps

While recent flood hazard mapping information is available for El Paso County, Ector County, and Val Verde County, the availability of recent flood hazard data across the rest of the region is much more limited. For the other areas outside of these three counties, as described in the previous section, the existing conditions flood hazard layer utilized a combination of digitized flood hazard areas from the FAFDS dataset (dating between 1977 and 2004) and the Cursory Floodplain Fathom dataset (with its previously-stated limitations).

As a result, two types of existing condition flood hazard data gaps were identified across the region based on data availability and reliability. The first type of data gap includes counties which do not have a broad coverage of available FAFDS information or any other available flood hazard data apart from the Fathom dataset. It also includes counties with limited FAFDS coverage (e.g., for small areas within selected municipalities) that do not have broad countywide coverage of flood hazard data. This first group is made up of five counties with no FAFDS coverage (including the Counties of Andrews, Crane, Loving, Reagan, and Schleicher) and four counties with limited FAFDS coverage (including the Counties of Pecos, Reeves, Upton, and Winkler).

The second type of data gap includes counties which do have broad coverage of FAFDS information in addition to the Fathom dataset but are in need of updated flood hazard information due to the age of the FAFDS floodplains. This second group is made up of 11 counties, including the Counties of Brewster, Crockett, Culberson, Edwards, Hudspeth, Jeff Davis, Midland, Presidio, Sutton, Terrell, and Ward.

Existing flood hazard data gaps, along with the public-provided flood prone areas, are shown in **Map Exhibit 5** (“Existing Condition Flood Hazard – Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas”).

2.2.3 Existing Flood Exposure

Based on the identified existing conditions flood hazard areas, a high-level existing flood exposure analysis was performed to identify who or what might be harmed within the region for the 1% and 0.2% annual chance flood events. The exposure analysis evaluated potential flood impacts to population, property, critical facilities, public infrastructure, roadways, and agricultural resources.

This section describes the exposure analysis methodologies for each flood risk type. Existing conditions flood exposure results are summarized at the regionwide level in **Table 2.4**, by county in **Figure 2.2**, and by flood risk type in **Figure 2.3**. In addition, detailed results are provided in **Appendix Table 2A** and illustrated at the regionwide level in **Map Exhibit 6** (“Existing Condition Flood Exposure”)**.**

Table 2.4 Existing Flood Exposure Summary

Exposure Type	Number of Features		
	1% AC	0.2% AC*	Possible Flood Prone Areas
Floodplain Area (sq. mi.)	9,285	1,755	99
Structures (#)	40,121	14,290	8,426
Population (#)	115,530	47,985	35,740
Critical Facilities (#)	95	41	23
Roadway Segments (mi.)	3,047	746	178
Roadway Stream Crossings (#)	3,943	189	31
Agricultural Areas (sq. mi.)	615	135	21

*0.2% AC flood exposure results are reported separately from the 1% AC results and do not include cumulative flood hazard areas or property impacts from 1% AC flood hazard areas.

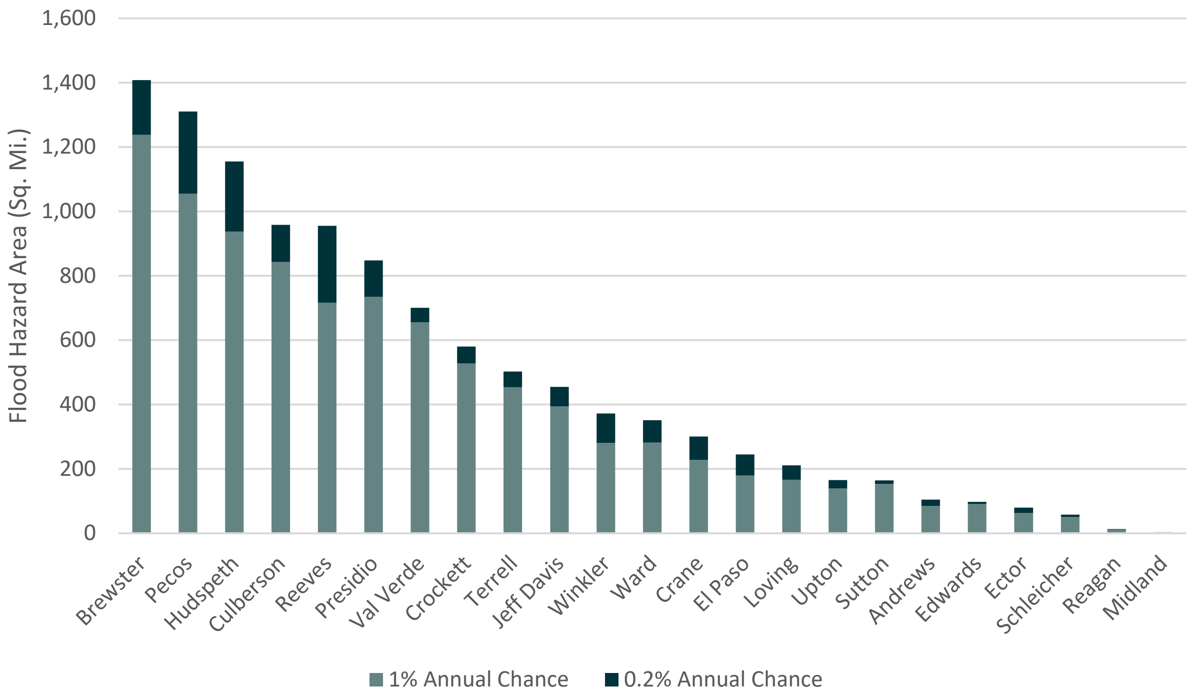
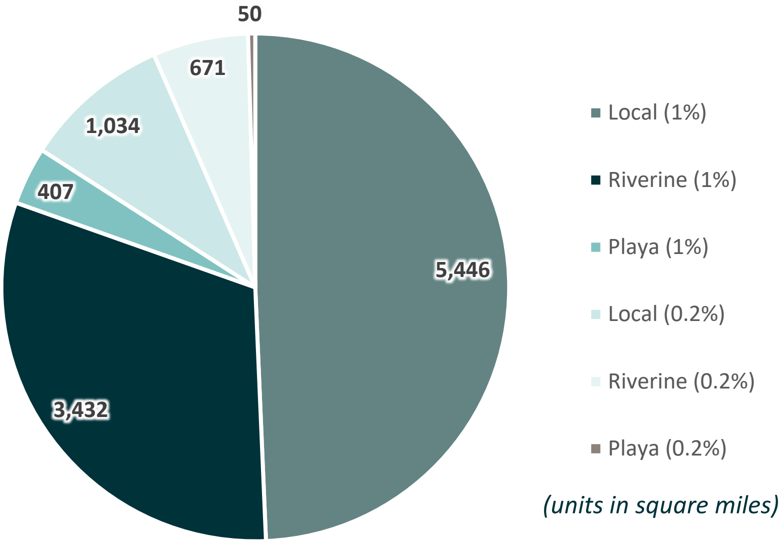


Figure 2.2 Total Existing Condition Flood Hazard Area by County



Note: Flood hazard areas with more than one potential flood risk type are characterized in this figure using a simplified priority order (i.e., playa, riverine, local).

Figure 2.3 Total Existing Condition Flood Hazard Area by Flood Risk Type

2.2.3.1 Population and Property

To estimate potential flood impacts to population and property, the "Texas Buildings with SVI and Estimated Population" dataset was used as developed by the TWDB and the Texas Natural Resources Information System (TNRIS).[2] This dataset contains building footprints across the region from multiple sources including Microsoft Buildings and Stratmap LiDAR as well as various building attributes for use in the exposure analysis including land use types (residential, non-residential, vacant, etc.), daytime and nighttime population estimates, and social vulnerability index (SVI) data.

Flood impacts to building property were estimated by intersecting the building footprints with the existing conditions 1% and 0.2% annual chance event flood hazard areas. Building impacts were summarized separately for residential and non-residential building types based on the land use types populated in the source buildings dataset.

Flood impacts to population were estimated based on the building population estimates. Building populations in the source buildings dataset were derived from the ORNL LandScan dataset, which uses available data and satellite imagery to capture ambient daytime and nighttime activity and estimate associated populations. Due to the typical movement of population during the day, an area's nighttime population estimates will typically match more closely to the total census-derived population compared to its daytime population estimates.

In comparing the LandScan nighttime population estimates to the TWDB 2021 Regional Water Plan and 2020 Decennial Census population estimates, the LandScan nighttime population

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[2] Texas Water Development Board. Texas Buildings with SVI and Estimated Population (November 2021). Accessed from https://twdb-flood-planning-resources-twdb.hub.arcgis.com/pages/buildings-nov2021

estimates were found to be significantly lower. In addition, due to limitations in the LandScan data from the TWDB buildings dataset, several buildings across the region were noted as having a zero population values for both daytime and nighttime populations. To correct for this (and to better match the LandScan population estimates with the population estimates from the TWDB 2021 Regional Water Plan and 2020 Decennial Census), a nighttime population of three people was added to all zero-population buildings. At a regionwide level, this method resulted in a close population match between the building populations and the previous population estimates, with the total building populations matching within 1% of the TWDB 2021 Regional Water Plan populations and within 6% of the 2020 Census data.

Once the building populations were adjusted, estimated population impacts were summarized by county for buildings in the existing condition flood hazard areas. Population impacts were initially summarized separately for daytime and nighttime populations, and the maximum of the two values was used as the total estimated population for the county.

2.2.3.2 Critical Facilities and Public Infrastructure

To identify potential flood risks to critical facilities and public infrastructure across the region, the following datasets were reviewed and obtained for the region:

- *Homeland Infrastructure Foundation-Level Data (HIFLD)* – an open-source dataset distributed by the U.S. Department of Homeland Security to support nationwide community preparedness, resiliency, and research. Layers are sourced from the Oak Ridge National Laboratory (ORNL), the United States Geological Survey (USGS), the National Geospatial-Intelligence Agency (NGA) Homeland Security Infrastructure Program (HSIP) Team, and the United States Environmental Protection Agency (EPA), among other sources. Several critical facilities layers were reviewed from the HIFLD dataset including:
    - EPA Facility Registry Service (FRS) Power Plants
    - Ferrous and Nonferrous Metal Processing Plants
    - Fire Stations
    - Hospitals
    - Police Departments/Local Law Enforcement Locations (Law Enf)
    - National Shelter System Facilities (including libraries, schools, civic centers, churches, and other large public facilities)
    - Natural Gas Processing Plants (NGPP)
    - Nursing Homes
    - Power Plants and Power Stations
- *National Pollutant Discharge Elimination System (NPDES) Database* – a dataset developed by the U.S. Environmental Protection Agency (EPA) with the locations of Wastewater Treatment Facilities/Plants (WWTF/WWTP) and Water Treatment Facilities/Plants (WTF/WTP). Original points in the source database are typically located at discharge locations along creeks rather than at the facilities. To correct for this issue

in the flood exposure analysis, the wastewater and water treatment plant points were manually reviewed and updated across the region using aerial imagery. Other facility locations were identified by EPWater and by manual review using Google Maps. Wastewater treatment plant points were also compared with EPA FRS Wastewater Treatment Plants data from the HIFLD dataset.

- *Texas Schools Database (2019-2020)* – developed by the Texas Education Agency (TEA) with the locations of public schools including Elementary Schools (EL), Middle Schools (MIDDLE), and High Schools (H S). Original points in the source database are located by street address rather than by physical building location. To correct for this issue in the flood exposure analysis, school locations were manually reviewed and verified across the region. In cases where there were multiple buildings on a school property partially inundated by the floodplain, the school point was moved to correspond to one or more of the buildings located in the floodplain.
- National Transportation Atlas Database (NTAD) – a public dataset distributed by the U.S. Department of Transportation (USDOT). The following layers were reviewed from this dataset:
    - Intermodal Freight Facility
    - Intermodal Transit Facility (including passenger transportation terminals such as intercity bus stations, rail transit stations, and other terminals)

Critical facilities and infrastructure features are populated in the accompanying RFP GIS geodatabase in the feature class (“ExFldExpPol”) including at-risk features for both 1% and 0.2% annual chance flood events. Critical facilities are discussed in additional detail in the following Section 2.2.4 (Existing Vulnerability).

2.2.3.3 Roadway Crossings and Segments

Potential roadway flood impacts were estimated using existing conditions flood hazard areas as well as detailed hydraulic analyses from previous studies. Both roadway crossings and roadway segments (i.e., roadways not crossing the stream centerline) were included in the flood exposure analysis. Additional details related to the stream crossings datasets used in this analysis are provided in Chapter 1 Section 1.7.1 (Stream Crossings).

Where possible, stream crossing flood exposure information was first identified using detailed hydraulic analyses from previous studies. Different studies define roadway flood risk in different ways. In the TxDOT Bridges Dataset, the Bridge Waterway Adequacy Classifications attribute defines flood risk in terms of overtopping potential, while the FM170 dataset defines risk in terms of level of service (the point at which the roadway is not overtopped). While the two classifications are similar, the variations in nomenclature have subtle implications for flood exposure analyses. For instance, a bridge that has an overtopping potential between 3-10 years may be flooded by a 10% annual chance event, while another bridge that has a 10-year level of service may not be flooded by the 10% annual chance event.

Based on this approach, the relationships shown in **Table 2.5** were developed to match flood frequency values to overtopping potential values (from the TxDOT Bridges Dataset) and level of service values (from the FM170 dataset). According to the TWDB “Exhibit D: Data Submittal

Guidelines for Regional Flood Planning" document, valid entries for flood frequencies include the 10%, 4%, 1%, and 0.2% annual chance events.

Table 2.5 Roadway Crossing Flood Frequency Relationships

TxDOT Bridges Dataset	
Overtopping Potential (recurrence interval in years)	Flood Frequency (% Annual Chance)
<3	10
3-10	10
11-100	1
>100	0.2

FM170 Roadway Crossings	
Level of Service (recurrence interval in years)	Flood Frequency (% Annual Chance)
<5-yr	10
5-yr	10
10-yr	4
25-yr	1
50-yr	1
100-yr	0.2

Once the flood frequency relationships were developed, flood frequencies were populated for crossings that were included in these hydraulic studies based on their defined overtopping potential or level of service.

Next, roadway crossings that originated from the TNRIS Statewide Low Water Crossing Inventory were assumed to be overtopped by flood events of lower intensity than the 10% annual chance event (such as the 5-year or 20% annual chance event) based on information provided in the dataset's supporting documentation.

Lastly, for roadway crossings that were not populated with flood frequency values by either of the previous methods, flood frequencies were estimated using flood depths from the Fathom Cursory Floodplain dataset. Using this method, flood frequencies were identified for each roadway crossing based on the lowest intensity (highest frequency) overtopping flood event.

Additionally, exposed roadway segments were identified by intersecting roadway segments from the TxDOT Roadway Inventory dataset with the existing conditions flood hazard areas. For this regionwide analysis, roadway segmentation rules were preserved from the source TxDOT dataset, so that a single roadway segment flooded in multiple locations would count as a single flooded segment.

2.2.3.4 Agricultural Area and Value of Crops

Potential flood risks to agricultural areas were estimated by comparing existing conditions flood hazard areas with different crop areas as identified by USDA Cropscape data. Estimated crop impacts were summarized in terms of impacted crop acreage by county as well as by the estimated crop yield and crop production value. Esri ArcMap was used to intersect the spatial Cropscape data layer with both the 1% annual chance and the 0.2% annual chance floodplains to estimate the number of agricultural acres that could potentially be impacted as a result of the two storm events. This information was summarized by county and is provided in **Table 2.6**.

Additional details regarding the assumptions and datasets used in this analysis are provided in the regionwide summary located in *Chapter 1 Section 1.4 (Agricultural Resources)*.

Table 2.6 Study Area Crop Acreage by County

County	Crop Acreage in the 1% Annual Chance Floodplain	Crop Acreage in the 0.2% Annual Chance Floodplain
Andrews	11,637	14,757
Brewster	27,234	31,244
Crane	1,680	2,281
Crockett	4,205	4,608
Culberson	20,544	22,980
Ector	266	339
Edwards	210	220
El Paso	38,830	48,552
Hudspeth	157,199	195,945
Jeff Davis	33,773	39,480
Loving	2,710	3,586
Midland	3	3
Pecos	30,393	37,174
Presidio	28,584	34,076
Reagan	9	10
Reeves	11,524	17,005
Schleicher	2,426	3,082
Sutton	1,120	1,187
Terrell	1,688	1,900
Upton	937	1,027
Val Verde	14,342	14,902
Ward	2,503	3,263
Winkler	1,627	2,091
Total	**393,444**	**479,710**

Esri ArcMap was also used to estimate the acres, by crop, potentially impacted in the 1% and 0.2% annual chance floodplains. This information is provided in **Table 2.7** (sorted by acreage in the 1% annual chance floodplain). The major crops (by acreage) within the 1% annual chance floodplain in the Rio Grande region are grassland/pasture, cotton, alfalfa, and pecans.

Table 2.7 Summary of Crops in Study Area

Crop	Crop Acreage in the 1% Annual Chance Floodplain	Crop Acreage in the 0.2% Annual Chance Floodplain
Grassland/Pasture	288,639	359,938
Cotton	27,229	30,679
Fallow/Idle	20,646	23,299
Alfalfa	18,826	21,306
Pecans	14,132	15,282
Winter Wheat	9,110	11,640
Oats	4,765	5,322
Sorghum	2,760	3,464

Crop	Crop Acreage in the 1% Annual Chance Floodplain	Crop Acreage in the 0.2% Annual Chance Floodplain
Rye	1,577	2,156
Dbl Crop WinWht/Cotton	1,041	1,241
Other Hay/Non Alfalfa	894	1,140
Grapes	726	730
Peppers	667	668
Corn	626	707
Triticale	375	427
Dbl Crop WinWht/Sorghum	360	448
Watermelons	338	424
Peanuts	239	287
Barley	199	208
Onions	136	154
Pumpkins	85	99
Dbl Crop WinWht/Corn	29	36
Peas	17	20
Sod/Grass Seed	10	10
Dbl Crop Triticale/Corn	8	12
Rice	2	2
Soybeans	2	3
Millet	2	6
Herbs	1	1
Other Tree Crops	1	1
Dbl Crop WinWht/Soybeans	0	0
Durum Wheat	0	0
Sunflower	0	0
Sugarcane	0	0
Total	**393,444**	**479,710**
Total (excluding Fallow/Idle)	**372,798**	**456,411**

The four crops (excluding grasslands and fallow/idle land) with the highest acreage within the 1% annual chance floodplain for each of the study area counties are shown in **Table 2.8**. In addition, because of the prevalence of grasslands in the study area, the table includes grasslands as a separate column. **Table 2.9** presents the same information for crops located in the 0.2% annual chance floodplain.

Table 2.8 Acres of Cropland for Major Crops in the 1% AC Floodplain by County

County	Top Crop Impacts (with Impacted Acres), 1% Annual Chance Floodplain				
	Primary Crop	Secondary Crop	Tertiary Crop	Quaternary Crop	Grasslands/Pasture
Andrews	Cotton (153)	Winter Wheat (34)	Winter Wheat/Cotton (17)	Barley (3)	(11,390)
Brewster	Cotton (202)	Winter Wheat (85)	Alfalfa (57)	Sorghum (34)	(26,577)
Crane	Winter Wheat (77)	Cotton (35)	Pecans (18)	Sorghum (16)	(1,496)
Crockett	Winter Wheat (116)	Cotton (56)	Sorghum (17)	Triticale (11)	(3,960)
Culberson	Cotton (2,449)	Pecans (1,266)	Alfalfa (332)	Winter Wheat (254)	(8,843)
Ector	Cotton (8)	Winter Wheat (7)	Peanuts (2)	Alfalfa (1)	(246)
Edwards	Winter Wheat (63)	Sorghum (14)	Oats (12)	Corn (12)	(58)
El Paso	Cotton (13,565)	Pecans (11,390)	Alfalfa (847)	Corn (227)	(11,712)
Hudspeth	Alfalfa (13,464)	Cotton (5,957)	Oats (2,901)	Grapes (724)	(122,031)
Jeff Davis	Cotton (23)	Alfalfa (22)	Sorghum (6)	Corn (5)	(33,689)
Loving	Cotton (67)	Winter Wheat (63)	Other Hay/Non Alfalfa (2)	Winter Wheat/Sorghum (1)	(2,569)
Midland	Cotton (2)	Winter Wheat/Cotton (1)	(--)	(--)	(--)
Pecos	Winter Wheat (4,823)	Alfalfa (2,573)	Cotton (1,978)	Oats (1,312)	(14,817)
Presidio	Cotton (248)	Winter Wheat (189)	Sorghum (104)	Alfalfa (92)	(27,741)
Reagan	Cotton (3)	Sorghum (1)	(--)	(--)	(4)
Reeves	Winter Wheat (1,553)	Alfalfa (1,285)	Winter Wheat/Cotton (605)	Cotton (585)	(4,710)
Schleicher	Cotton (1,122)	Sorghum (457)	Winter Wheat (380)	Oats (97)	(14)
Sutton	Winter Wheat (648)	Cotton (70)	Sorghum (59)	Other Hay/Non Alfalfa (26)	(31)
Terrell	Cotton (53)	Winter Wheat (43)	Triticale (8)	Sorghum (7)	(1,530)
Upton	Winter Wheat (142)	Cotton (54)	Winter Wheat/Cotton (31)	Sorghum (23)	(245)
Val Verde	Oats (132)	Cotton (95)	Winter Wheat (57)	Sorghum (48)	(13,870)
Ward	Winter Wheat (93)	Sorghum (55)	Cotton (54)	Alfalfa (34)	(2,144)

County	Top Crop Impacts (with Impacted Acres), 1% Annual Chance Floodplain				
	Primary Crop	Secondary Crop	Tertiary Crop	Quaternary Crop	Grasslands/Pasture
Winkler	Cotton (444)	Alfalfa (73)	Winter Wheat (46)	Peanuts (42)	(961)

Table 2.9 Acres of Cropland for Major Crops in the 0.2% AC Floodplain by County

County	Top Crop Impacts (with Impacted Acres), 0.2% Annual Chance Floodplain				
	Primary Crop	Secondary Crop	Tertiary Crop	Quaternary Crop	Grasslands/Pasture
Andrews	Cotton (192)	Winter Wheat (44)	Winter Wheat/Cotton (21)	Barley (5)	(14,441)
Brewster	Cotton (214)	Winter Wheat (90)	Alfalfa (60)	Sorghum (35)	(30,547)
Crane	Winter Wheat (81)	Cotton (47)	Pecans (21)	Sorghum (20)	(2,067)
Crockett	Winter Wheat (131)	Cotton (63)	Sorghum (18)	Triticale (12)	(4,333)
Culberson	Cotton (2,720)	Pecans (1,292)	Alfalfa (346)	Winter Wheat (266)	(10,760)
Ector	Cotton (9)	Winter Wheat (7)	Peanuts (2)	Alfalfa (1)	(316)
Edwards	Winter Wheat (66)	Sorghum (14)	Oats (13)	Corn (12)	(61)
El Paso	Cotton (14,633)	Pecans (12,145)	Alfalfa (886)	Corn (230)	(19,501)
Hudspeth	Alfalfa (13,717)	Cotton (6,693)	Oats (2,938)	Grapes (727)	(158,217)
Jeff Davis	Cotton (25)	Alfalfa (22)	Sorghum (6)	Corn (6)	(39,389)
Loving	Cotton (78)	Winter Wheat (78)	Other Hay/Non Alfalfa (3)	Winter Wheat/Sorghum (2)	(3,415)
Midland	Cotton (2)	Winter Wheat/Cotton (1)	(--)	(--)	(--)
Pecos	Winter Wheat (6,302)	Alfalfa (3,585)	Cotton (2,454)	Oats (1,730)	(16,831)
Presidio	Cotton (253)	Winter Wheat (207)	Sorghum (105)	Alfalfa (92)	(33,206)
Reagan	Cotton (3)	Sorghum (1)	(--)	(--)	(5)
Reeves	Winter Wheat (2,266)	Alfalfa (2,352)	Winter Wheat/Cotton (765)	Cotton (914)	(6,561)
Schleicher	Cotton (1,484)	Sorghum (541)	Winter Wheat (466)	Oats (128)	(18)
Sutton	Winter Wheat (675)	Cotton (75)	Sorghum (62)	Other Hay/Non Alfalfa (29)	(34)

County	Top Crop Impacts (with Impacted Acres), 0.2% Annual Chance Floodplain				
	Primary Crop	Secondary Crop	Tertiary Crop	Quaternary Crop	Grasslands/Pasture
Terrell	Cotton (58)	Winter Wheat (44)	Triticale (8)	Sorghum (7)	(1,728)
Upton	Winter Wheat (157)	Cotton (60)	Winter Wheat/Cotton (34)	Sorghum (24)	(259)
Val Verde	Oats (133)	Cotton (100)	Winter Wheat (59)	Sorghum (50)	(14,407)
Ward	Winter Wheat (175)	Sorghum (156)	Cotton (62)	Alfalfa (52)	(2,610)
Winkler	Cotton (537)	Alfalfa (140)	Winter Wheat (61)	Peanuts (45)	(1,232)

To estimate the potential value of the agricultural resources within the 1% annual chance floodplain, the total acreage of each crop in the floodplain was multiplied by the average yield and by the normalized price per unit (as presented in Chapter 1). The estimated value for the major crops within the study area's 1% annual chance floodplain is approximately $148 million as shown in **Table 2.10**.

Table 2.10 Estimated Value of Top Agricultural Impacts

Crop	Number of Acres (1% AC)	Value of Major Crops (1% AC)*
Alfalfa	18,826	$21,247,000
Cotton	27,229	$16,691,000
Grassland	288,639	$84,860,000
Oats	4,765	$944,000
Pecans	14,132	$18,513,000
Sorghum	2,760	$3,682,000
Winter Wheat	9,110	$2,191,000
TOTAL		**$148,128,000**

* Values rounded to nearest thousand dollars

The estimated value for each of the four crops with the largest acreage (excluding grasslands and fallow/idle land) in the 1% annual chance floodplain for each county is shown in **Table 2.11**. In addition, the table includes grasslands as a separate column. **Table 2.12** presents the same information for crops located in the 0.2% annual chance floodplain.

Table 2.13 summarizes the damages by county for the major crop types for the 1% and 0.2% annual chance floodplains. Due to uncertainties related to flood damages to grasslands (as discussed in Chapter 1), this table includes estimated damages with and without grassland damages.

Table 2.11 Estimated Value of Crop Production for Major Crops in the 1% Annual Chance Floodplain by County

County	Top Crop Impacts by Acreage (with Estimated Damages), 0.1% Annual Chance Floodplain				
	Primary Crop	Secondary Crop	Tertiary Crop	Quaternary Crop	Grasslands/Pasture
Andrews	Cotton ($94,000)	Winter Wheat ($8,000)	Winter Wheat/Cotton ($4,000/$10,000)	Barley ($1,000)	($3,349,000)
Brewster	Cotton ($124,000)	Winter Wheat ($20,000)	Alfalfa ($65,000)	Sorghum ($20,000)	($7,814,000)
Crane	Winter Wheat ($19,000)	Cotton ($22,000)	Pecans ($24,000)	Sorghum ($10,000)	($440,000)
Crockett	Winter Wheat ($28,000)	Cotton ($34,000)	Sorghum ($10,000)	Triticale* ($2,000)	($1,164,000)
Culberson	Cotton ($1,501,000)	Pecans ($1,659,000)	Alfalfa ($374,000)	Winter Wheat ($61,000)	($2,600,000)
Ector	Cotton ($5,000)	Winter Wheat ($2,000)	Peanuts ($1,000)	Alfalfa ($2,000)	($72,000)
Edwards	Winter Wheat ($15,000)	Sorghum ($18,000)	Oats ($2,000)	Corn ($9,000)	($17,000)
El Paso	Cotton ($8,315,000)	Pecans ($14,921,000)	Alfalfa ($956,000)	Corn ($174,000)	($3,443,000)
Hudspeth	Alfalfa ($15,195,000)	Cotton ($3,652,000)	Oats ($574,000)	Grapes ($4,425,000)	($35,877,000)
Jeff Davis	Cotton ($14,000)	Alfalfa ($24,000)	Sorghum ($3,000)	Corn ($4,000)	($9,904,000)
Loving	Cotton ($41,000)	Winter Wheat ($15,000)	Other Hay/Non Alfalfas ($1,000)	Winter Wheat/Sorghum (--)/($1,000)	($755,000)
Midland	Cotton ($1,000)	(--)	(--)	(--)	(--)
Pecos	Winter Wheat ($1,160,000)	Alfalfa ($2,904,000)	Cotton ($1,213,000)	Oats ($260,000)	($4,356,000)
Presidio	Cotton ($152,000)	Winter Wheat ($46,000)	Sorghum ($63,000)	Alfalfa ($104,000)	($8,156,000)
Reagan	Cotton ($2,000)	Sorghum ($1,000)	(--)	(--)	($1,000)
Reeves	Winter Wheat ($374,000)	Alfalfa ($1,450,000)	Winter Wheat/Cotton ($145,000/$371,000)	Cotton ($358,000)	($1,385,000)
Schleicher	Cotton ($688,000)	Sorghum ($610,000)	Winter Wheat ($91,000)	Oats ($19,000)	($4,000)
Sutton	Winter Wheat ($156,000)	Cotton ($43,000)	Sorghum ($79,000)	Other Hay/Non Alfalfas ($8,000)	($9,000)
Terrell	Cotton ($33,000)	Winter Wheat ($10,000)	Triticale* ($2,000)	Sorghum ($4,000)	($450,000)
Upton	Winter Wheat ($34,000)	Cotton ($33,000)	Winter Wheat/Cotton ($8,000/$19,000)	Sorghum ($14,000)	($72,000)
Val Verde	Oats ($26,000)	Cotton ($58,000)	Winter Wheat ($14,000)	Sorghum ($29,000)	($4,078,000)
Ward	Winter Wheat ($22,000)	Sorghum ($73,000)	Cotton ($33,000)	Alfalfa ($38,000)	($630,000)

County	Top Crop Impacts by Acreage (with Estimated Damages), 0.1% Annual Chance Floodplain				
	Primary Crop	Secondary Crop	Tertiary Crop	Quaternary Crop	Grasslands/Pasture
Winkler	Cotton ($272,000)	Alfalfa ($82,000)	Winter Wheat ($11,000)	Peanuts ($48,000)	($283,000)

*Note: Triticale was calculated using Rye yield/price figures from USDA, as they did not exist for Triticale

Table 2.12 Estimated Value of Crop Production for Major Crops in the 0.2% Annual Chance Floodplain by County

County	Top Crop Impacts by Acreage (with Estimated Damages), 0.1% Annual Chance Floodplain				
	Primary Crop	Secondary Crop	Tertiary Crop	Quaternary Crop	Grasslands/Pasture
Andrews	Cotton ($117,000)	Winter Wheat ($11,000)	Winter Wheat/Cotton ($5,000/$13,000)	Barley ($2,000)	($4,246,000)
Brewster	Cotton ($131,000)	Winter Wheat ($22,000)	Alfalfa ($68,000)	Sorghum ($21,000)	($8,981,000)
Crane	Winter Wheat ($20,000)	Cotton ($29,000)	Pecans ($27,000)	Sorghum ($12,000)	($608,000)
Crockett	Winter Wheat ($32,000)	Cotton ($38,000)	Sorghum ($11,000)	Triticale* ($3,000)	($1,274,000)
Culberson	Cotton ($1,667,000)	Pecans ($1,692,000)	Alfalfa ($391,000)	Winter Wheat ($64,000)	($3,163,000)
Ector	Cotton ($6,000)	Winter Wheat ($2,000)	Peanuts ($2,000)	Alfalfa ($2,000)	($93,000)
Edwards	Winter Wheat ($16,000)	Sorghum ($9,000)	Oats ($2,000)	Corn ($10,000)	($18,000)
El Paso	Cotton ($8,970,000)	Pecans ($15,910,000)	Alfalfa ($1,000,000)	Corn ($177,000)	($5,733,000)
Hudspeth	Alfalfa ($15,481,000)	Cotton ($4,103,000)	Oats ($582,000)	Grapes ($4,446,000)	($46,516,000)
Jeff Davis	Cotton ($15,000)	Alfalfa ($25,000)	Sorghum ($4,000)	Corn ($4,000)	($11,580,000)
Loving	Cotton ($48,000)	Winter Wheat ($19,000)	Other Hay/Non Alfalfa ($1,000)	Winter Wheat/ Sorghum (--)/($1,000)	($1,004,000)
Midland	Cotton ($1,000)	(--)	(--)	(--)	(--)
Pecos	Winter Wheat ($1,516,000)	Alfalfa ($4,047,000)	Cotton ($1,504,000)	Oats ($343,000)	($4,948,000)
Presidio	Cotton ($155,000)	Winter Wheat ($50,000)	Sorghum ($63,000)	Alfalfa ($104,000)	($9,763,000)
Reagan	Cotton ($2,000)	Sorghum ($1,000)	(--)	(--)	($1,000)
Reeves	Winter Wheat ($545,000)	Alfalfa ($2,655,000)	Winter Wheat/Cotton ($184,000/$469,000)	Cotton ($560,000)	($1,929,000)
Schleicher	Cotton ($910,000)	Sorghum ($325,000)	Winter Wheat ($112,000)	Oats ($25,000)	($5,000)
Sutton	Winter Wheat ($162,000)	Cotton ($46,000)	Sorghum ($37,000)	Other Hay/Non Alfalfa ($8,000)	($10,000)

County	Top Crop Impacts by Acreage (with Estimated Damages), 0.1% Annual Chance Floodplain				
	Primary Crop	Secondary Crop	Tertiary Crop	Quaternary Crop	Grasslands/Pasture
Terrell	Cotton ($36,000)	Winter Wheat ($11,000)	Triticale* ($2,000)	Sorghum ($4,000)	($508,000)
Upton	Winter Wheat ($38,000)	Cotton ($36,000)	Winter Wheat/Cotton ($8,000/$21,000)	Sorghum ($15,000)	($76,000)
Val Verde	Oats ($26,000)	Cotton ($62,000)	Winter Wheat ($14,000)	Sorghum ($30,000)	($4,236,000)
Ward	Winter Wheat ($42,000)	Sorghum ($94,000)	Cotton ($38,000)	Alfalfa ($59,000)	($767,000)
Winkler	Cotton ($329,000)	Alfalfa ($158,000)	Winter Wheat ($15,000)	Peanuts ($52,000)	($362,000)

Table 2.13 Summary of Crop Production for the 1% and 0.2% AC Floodplain by County

County	1% Annual Chance Crop Damages		0.2% Annual Chance Crop Damages	
	With Grasslands	Without Grasslands	With Grasslands	Without Grasslands
Andrews	$3,459,000	$110,000	$4,385,000	$139,000
Brewster	$8,043,000	$229,000	$9,223,000	$242,000
Crane	$515,000	$75,000	$696,000	$88,000
Crockett	$1,238,000	$74,000	$1,358,000	$84,000
Culberson	$6,195,000	$3,595,000	$6,977,000	$3,814,000
Ector	$82,000	$10,000	$105,000	$12,000
Edwards	$61,000	$44,000	$55,000	$37,000
El Paso	$27,809,000	$24,366,000	$31,790,000	$26,057,000
Hudspeth	$59,723,000	$23,846,000	$71,128,000	$24,612,000
Jeff Davis	$9,949,000	$45,000	$11,628,000	$48,000
Loving	$813,000	$58,000	$1,073,000	$69,000
Midland	$1,000	$1,000	$1,000	$1,000
Pecos	$9,893,000	$5,537,000	$12,358,000	$7,410,000
Presidio	$8,521,000	$365,000	$10,135,000	$372,000
Reagan	$4,000	$3,000	$4,000	$3,000
Reeves	$3,825,000	$2,440,000	$6,015,500	$4,086,500
Schleicher	$1,412,000	$1,408,000	$1,377,000	$1,372,000
Sutton	$295,000	$286,000	$263,000	$253,000

County	1% Annual Chance Crop Damages		0.2% Annual Chance Crop Damages	
	With Grasslands	Without Grasslands	With Grasslands	Without Grasslands
Terrell	$499,000	$49,000	$561,000	$53,000
Upton	$166,500	$94,500	$179,500	$103,500
Val Verde	$4,205,000	$127,000	$4,368,000	$132,000
Ward	$796,000	$166,000	$1,000,000	$233,000
Winkler	$696,000	$413,000	$916,000	$554,000

2.2.4 Existing Vulnerability

Based on the results of the existing conditions flood risk identification and exposure analyses, an existing condition vulnerability analysis was performed to identify the level of resilience or vulnerabilities related to communities, critical facilities, and critical transportation routes.

The social vulnerability index (SVI) is developed by the Centers for Disease Control and Prevention (CDC) to indicate the relative vulnerability of every U.S. Census tract. The SVI ranks tracts on 15 social factors based on survey data collected by the U.S. Census, including poverty, income, employment, minority status, disability, housing status, and other variables. SVI values are calculated as a percentage, scaled as a decimal fraction between 0-1, with higher values indicating higher levels of vulnerability.

While building footprints from TNRIS Buildings Dataset had previously been assigned SVI values, these values were verified using the complete 2018 SVI dataset obtained from the CDC website.

Another indicator of community vulnerabilities is the colonia, a substandard housing development where residents may lack basic services such as drinking water, sewage treatment, and paved roads. Colonias are found in relatively high concentration along the Texas-Mexico border, and the Office of the Attorney General of Texas maintains a database of colonias locations used to help identify and assist vulnerable populations. Within the Upper Rio Grande Region, 338 colonias were identified with a majority located in the Counties of El Paso, Pecos, Presidio, Hudspeth, and Val Verde.

Table 2.14 shows the relative vulnerability of communities across the region, including incorporated and unincorporated communities, based on the number of structures in the 1% and 0.2% annual chance floodplains (unincorporated communities are also referred to as Census Designated Places or CDPs). In addition, the table provides two specific indicators of vulnerability, including the number of buildings in each community that are within colonias as well as the average SVI value of buildings in the floodplain. The top five communities by number of structures within colonias in the 1% annual chance floodplain were found to be the City of Socorro, the City of San Elizario, Canutillo, Sanderson, and the Town of Clint. The top five communities by average SVI of buildings in the floodplain were found to be Fabens, Redford, the City of Presidio, the City of San Elizario, and the Town of Van Horn. Five counties (Culberson, El Paso, Hudspeth, Presidio, and Reeves) contain areas with high SVI values (greater than 0.75).

In addition to summarizing SVI values by community, average building SVI values were summarized by county and reported as part of the existing conditions flood exposure results in **Appendix Table 2A**. An overview of regionwide existing condition vulnerability results is provided in **Map Exhibit 7** ("Existing Condition Flood Vulnerability including Critical Infrastructure"). Detailed maps of communities with more than 100 buildings in the floodplain are also provided as part of **Map Exhibit 15** ("Greatest Flood Risk") included with *Chapter 4.1 (Flood Mitigation Needs Analysis).*

Apart from direct flood risks to communities, flood risks to critical facilities and infrastructure also increase overall community vulnerabilities based on the potential for cascading negative impacts from loss of function during a flood. **Table 2.15** summarizes the potential vulnerabilities of critical facilities for the existing conditions 1% and 0.2% annual chance flood events by county. In addition, Section 2.4 provides qualitative descriptions of the expected loss of function for various critical facility types in the region.

Furthermore, flood risks along critical transportation routes lead to increased community vulnerabilities due to the potential for a community to become isolated during a flood from emergency services, such as police and fire departments or hospital, ambulance, and rescue services. Since the rate and urgency of emergency incidents is likely to increase during a flood event, reduced roadway access may be especially detrimental to community emergency response efforts. To identify critical routes across the region, roadways were categorized according to their TxDOT roadway classification, and the top 10% of roadways by annual average daily traffic (AADT) from each category were selected as critical routes. In addition to this analysis, major roadways appearing on commonly-used region-wide base maps were also considered to be critical routes. Critical routes with potential flood exposure were then identified as potential vulnerabilities. **Table 2.16** summarizes the potential vulnerabilities of critical routes for the existing conditions 1% and 0.2% annual chance flood events by county.

Table 2.14 Summary of Existing Conditions Vulnerability – Community Property Impacts

Place Name	1% Annual Chance Flood Risk		0.2% Annual Chance Flood Risk*		Average SVI of Structures in Floodplain*
	Number of Structures in Floodplain	Number of Structures in Floodplain within Colonias	Number of Structures in Floodplain	Number of Structures in Floodplain within Colonias	
Acala CDP	**3**	**3**	**5**	**3**	**0.932**
Agua Dulce CDP	**7**	**7**	**7**	**7**	**0.915**
Alpine city	1,643	0	1,837	0	0.574
Amistad CDP	11	11	11	11	0.549
Anthony town	**86**	**0**	**125**	**0**	**0.923**
Balmorhea city	361	0	361	0	0.357
Barstow city	149	0	249	0	0.520
Box Canyon CDP	27	21	27	21	0.549
Butterfield CDP	**12**	**7**	**23**	**15**	**0.784**

Place Name	1% Annual Chance Flood Risk Number of Structures in Floodplain	1% Annual Chance Flood Risk Number of Structures in Floodplain within Colonias	0.2% Annual Chance Flood Risk* Number of Structures in Floodplain	0.2% Annual Chance Flood Risk* Number of Structures in Floodplain within Colonias	Average SVI of Structures in Floodplain*
Canutillo CDP	**676**	**298**	**683**	**302**	**0.759**
Clint town	**249**	**249**	**268**	**268**	**0.753**
Crane city	143	0	181	0	0.560
Dell City city	**293**	**0**	**293**	**0**	**0.932**
El Paso city	12,324	39	18,480	39	0.678
Fabens CDP	**200**	**12**	**528**	**12**	**0.980**
Fort Bliss CDP	1,145	0	1,836	0	0.344
Fort Davis CDP	131	0	163	0	0.408
Fort Hancock CDP	**54**	**29**	**92**	**39**	**0.932**
Fort Stockton city	168	0	316	1	0.586
Grandfalls town	71	0	227	0	0.520
Homestead Meadows North CDP	359	246	562	377	0.747
Homestead Meadows South CDP	8	0	14	0	0.519
Horizon City city	11	0	11	0	0.518
Imperial CDP	272	246	276	246	0.329
Iraan city	83	82	101	100	0.329
Kermit city	1,126	0	1,979	0	0.594
Lake View CDP	9	9	12	12	0.549
Lindsay CDP	**189**	**189**	**194**	**194**	**0.825**
Marathon CDP	89	85	117	109	0.512
Marfa city	**212**	**0**	**350**	**0**	**0.913**
McCamey city	172	0	437	0	0.658
Mentone CDP	2	0	11	0	0.502
Monahans city	440	0	802	0	0.683
Morning Glory CDP	**1**	**0**	**1**	**0**	**0.930**
Ozona CDP	944	0	1,046	0	0.608
Pecos city	1,944	7	2,798	7	0.587
Prado Verde CDP	112	57	112	57	0.095
Presidio city	**655**	**0**	**674**	**0**	**0.951**
Pyote town	15	0	24	0	0.520
Rankin city	74	0	82	0	0.426
Redford CDP	**15**	**6**	**19**	**9**	**0.951**

Place Name	1% Annual Chance Flood Risk		0.2% Annual Chance Flood Risk*		Average SVI of Structures in Floodplain*
	Number of Structures in Floodplain	Number of Structures in Floodplain within Colonias	Number of Structures in Floodplain	Number of Structures in Floodplain within Colonias	
San Elizario city	**544**	**421**	**544**	**421**	**0.938**
Sanderson CDP	258	258	313	313	0.453
Sheffield CDP	2	0	4	0	0.329
Sierra Blanca CDP	**36**	**36**	**38**	**38**	**0.932**
Socorro city	**2,578**	**1,228**	**3,106**	**1,630**	**0.919**
Sonora city	690	0	827	0	0.651
Southwest Sandhill CDP	794	0	1,005	0	0.520
Sparks CDP	7	4	21	17	0.695
Study Butte CDP	23	19	26	22	0.512
Terlingua CDP	4	3	4	3	0.512
Thorntonville town	195	0	333	0	0.520
Tornillo CDP	**49**	**43**	**214**	**199**	**0.930**
Toyah town	**101**	**101**	**101**	**101**	**0.825**
Valentine town	16	16	18	18	0.408
Van Horn town	**170**	**159**	**227**	**215**	**0.935**
Vinton village	**73**	**0**	**119**	**1**	**0.870**
Westway CDP	**36**	**34**	**63**	**60**	**0.785**
Wickett town	23	0	31	0	0.520
Wink city	23	0	41	0	0.544
All Other Colonias (outside boundaries of incorporated place or CDP)	-	1,818	-	2,026	-

*0.2% AC flood vulnerability results include cumulative property impacts from 1% AC flood hazard areas.

Communities in **bold have a high SVI (over 0.75)

Table 2.15 Summary of Existing Conditions Vulnerability – Critical Facilities

County	Potential Existing Conditions Critical Facilities Vulnerabilities	
	1% Annual Chance	0.2% Annual Chance
Andrews	• None identified	• None identified
Brewster	• EPA NPDES: CITY OF ALPINE MUNICIPAL WWTF • HIFLD Law Enf: ALPINE POLICE DEPARTMENT • HIFLD Law Enf: BREWSTER COUNTY SHERIFFS OFFICE • Hospital: BIG BEND REGIONAL MEDICAL CENTER • School: ALPINE EL • School: ALPINE H S • School: ALPINE MIDDLE	• Same as 1% Annual Chance
Crane	• National Shelter System Facility: Crane County Library	• HIFLD Law Enf: CRANE COUNTY SHERIFFS OFFICE / CRANE COUNTY JAIL • HIFLD NGPP: CORDONA LAKE GAS PLANT
Crockett	• EPA NPDES: MAIN WWTF • HIFLD NGPP: NELEH GAS SYSTEM • HIFLD NGPP: SOUTHWEST OZONA GAS PLANT • HIFLD NGPP: TIPPETT GAS PLANT • Intermodal Transit Facility: Caprock Diesel • National Shelter System Facility: Ozona Convention Center • School: OZONA EL • School: OZONA MIDDLE	• Same as 1% Annual Chance
Culberson	• None identified	• None identified
Ector	• None identified	• None identified
Edwards	• None identified	• None identified
El Paso	• EPA NPDES: CANUTILLO ISD WWTP • EPA NPDES: TORNILLO WWTF • Fire Station: El Paso Fire Department Station 9 • Fire Station: West Valley Fire Department Canutillo Station • Google: Bonnie Moorhouse Reverse Osmosis Water Treatment Facility • HIFLD Nursing Homes: ADAM MC CARE LLC • HIFLD Nursing Homes: VILLAS DEL SOL ASSISTED LIVING LLC • HIFLD: FORT BLISS (DEA EPIC) • Hospital: UNIVERSITY MEDICAL CENTER OF EL PASO • Intermodal Freight Facility, RAIL & TRUCK: EL PASO TERMINAL WAREHOUSES, INC.-EL PASO-TX • Intermodal Freight Facility, RAIL & TRUCK: SWIG COTTON-EL PASO-TX • National Shelter System Facility: DAACG • National Shelter System Facility: Nations Tobin Recreation Center • National Shelter System Facility: WELLINGTON CHEW SENIOR CENTER • School: CANUTILLO MIDDLE • School: CHAPIN H S • School: CLINT H S	• EPA NPDES: HORIZON REGIONAL MUD - HORIZON CITY WWTP • Fire Station: El Paso Fire Department Station 26 • Fire Station: El Paso Fire Department Station 31 • Fire Station: Montana Vista Fire Rescue Station 2 • Fire Station: West Valley Fire Department Anthony Station • HIFLD Nursing Homes: GOOD SAMARITAN SOCIETY--WHITE ACRES • HIFLD Nursing Homes: LA FAMILIA ASSISTING LIVING • HIFLD Nursing Homes: THE FOREST ASSISTED LIVING • HIFLD: HOOVER COMPANY • National Shelter System Facility: DON HASKINS REC CENTER • School: ANDRESS H S • School: CONSTANCE HULBERT EL • School: CROSBY EL • School: DAVINCI SCHOOL FOR SCIENCE AND THE ARTS • School: DOWELL EL

County	Potential Existing Conditions Critical Facilities Vulnerabilities	
	1% Annual Chance	**0.2% Annual Chance**
	• School: CLINT ISD EARLY COLLEGE ACADEMY • School: COOLEY EL • School: EL PASO ACADEMY WEST • School: EL PASO LEADERSHIP ACADEMY • School: HAWKINS EL • School: HENDERSON MIDDLE • School: JOSE H DAMIAN EL • School: LEE EL/National Shelter System Facility • School: MILAM EL • School: NEWMAN EL • School: RED SANDS EL • School: ROBBIN E L WASHINGTON EL • School: SAN ELIZARIO H S/National Shelter System Facility • School: STANTON EL • School: TEJAS SCHOOL OF CHOICE • School: THE LINGUISTIC ACAD OF EL PASO-CULTURAL DEMO SITE • School: WESTERN HILLS EL • School: WM DAVID SURRATT EL • School: YSLETA PK CENTER • School: ZACH WHITE EL	• School: H D HILLEY EL • School: H R MOYE EL • School: HORNEDO MIDDLE • School: LE BARRON PARK EL • School: MAGOFFIN MIDDLE/National Shelter System Facility • School: MARIAN MANOR EL • School: NORTH LOOP EL • School: RAMONA EL • School: TORNILLO EL
Hudspeth	• Fire Station: Hueco Volunteer Fire Department • School: DELL CITY SCHOOL	• Same as 1% Annual Chance
Jeff Davis	• EPA NPDES: FORT DAVIS WWTF	• Same as 1% Annual Chance
Loving	• HIFLD NGPP: PECOS RIVER PLANT	• Same as 1% Annual Chance
Midland	• None identified	• None identified
Pecos	• EPA FRS: CENTURY GAS PLANT • Fire Station: Imperial Fire Department • HIFLD NGPP: WAHA GAS PLANT • HIFLD: EAST PECOS SOLAR • Hospital: PECOS COUNTY MEMORIAL HOSPITAL • School: BUENA VISTA SCHOOL • School: FORT STOCKTON ALAMO EL • School: IRAAN J H • School: LYNAUGH UNIT	• EPA FRS: WAHA GAS PLANT • HIFLD NGPP: MITCHELL PLANT • HIFLD: ALAMO 6 • School: FORT STOCKTON HIGH
Presidio	• None identified	• School: PRESIDIO H S
Reagan	• None identified	• None identified
Reeves	• EPA NPDES: ORLA WWTP • Fire Station: Balmorhea Volunteer Fire Department • Fire Station: Toyah Volunteer Fire Department • HIFLD Law Enf: PECOS POLICE DEPARTMENT • HIFLD NGPP: EAST TOYAH GAS PLANT • National Shelter System Facility: Civic Center in Balmorhea • National Shelter System Facility: Community Center in Pecos City	• School: CROCKETT MIDDLE • School: PECOS H S

County	Potential Existing Conditions Critical Facilities Vulnerabilities	
	1% Annual Chance	0.2% Annual Chance
	• National Shelter System Facility: First Baptist Church - Balmorhea • School: AUSTIN EL • School: BALMORHEA SCHOOL/National Shelter System Facility	
Schleicher	• None identified	• None identified
Sutton	• EPA FRS: CITY OF SONORA • Fire Station: Border Line Volunteer Fire Department • HIFLD NGPP: SONORA GAS PLANT • Intermodal Transit Facility: Picos Food Mart • National Shelter System Facility: SUTTON COUNTY CIVIC CENTER	• HIFLD Law Enf: SONORA POLICE DEPARTMENT
Terrell	• Fire Station: Terrell County Volunteer Fire Department • Intermodal Transit Facility: Amtrak Station	• Same as 1% Annual Chance
Upton	• Fire Station: McCamey Volunteer Fire Department • HIFLD: CASTLE GAP SOLAR • HIFLD: UPTON COUNTY SOLAR	• Hospital: MCCAMEY HOSPITAL • School: MCCAMEY PRI
Val Verde	• None identified	• None identified
Ward	• Fire Station: Grandfalls Volunteer Fire Department • HIFLD NGPP: BONE SPRINGS GAS PROCESSING PLANT • HIFLD NGPP: MIVIDA JV PROCESSING PLANT • School: MONAHANS H S	• HIFLD Nursing Homes: MONAHANS MANAGED CARE CENTER • School: GRANDFALLS-ROYALTY SCHOOL • School: SUDDERTH EL
Winkler	• EPA FRS: EL PASO NATURAL GAS - KEYSTONE COMPRESSOR STATION • HIFLD Law Enf: WINKLER COUNTY SHERIFFS OFFICE / WINKLER COUNTY JAIL • HIFLD NGPP: HALLEY PLANT • Hospital: WINKLER COUNTY MEMORIAL HOSPITAL	• School: KERMIT EL • School: WINK EL

Table 2.16 Summary of Existing Conditions Vulnerability – Critical Routes

County	Existing Conditions Critical Route Vulnerabilities	
	1% Annual Chance	**0.2% Annual Chance**
Andrews	• SW 900 Rd, resulting in access issues to South FM 181. • West Hwy 128 resulting in access issues.	• Includes existing condition 1% vulnerabilities. • SW 900 Rd, resulting in significant access issues to South FM 181. • West Hwy 128 resulting in significant access issues.
Brewster	• US67, Connection between Marfa and Alpine resulting in access issue to Alpine city, therefore access issues to the nearest hospital Big Bend Regional Medical Center. • N 5TH St. access issue to the Big Bend Regional Medical Center • SH-118, connection between Fort Davis and Alpine resulting in access issue. • Segments of US90 and intersection with US 385, resulting in access issues. • North US385, resulting in access issues, connection with Pecos County. • Roadway US67, connection from Alpine to Chancellor, resulting in access issues.	• Includes existing condition 1% vulnerabilities. • US67, Connection between Marfa and Alpine resulting in significant access issue to Alpine city, therefore access issues to the nearest hospital Big Bend Regional Medical Center. • Roadway US67, connection from Alpine to Chancellor, resulting in significant access issues. • Segments of US90 and intersection with US 385, resulting in significant access issues. • US385, connection between Marathon and Fort Stockton, resulting in significant access issue.
Crane	• Golf Course Rd, at intersection with US Highway 385 N resulting in access issues. • E 20 ST at intersection with US Highway 385 resulting in access issues. • US Highway 67, connection between Girvin Town and McCamey Town resulting in access issues.	• Includes existing condition 1% vulnerabilities. • US Highway 67, connection between Girvin Town and McCamey Town resulting in significant access issues. • Golf Course Rd, at intersection with US Highway 385 N resulting in significant access issues.
Crockett	• State Highway 163 S. Intersection with FM 1973. Resulting in access issues. The connection between Ozona city and Juno town. • Segments of IH10 resulting in access problems all along Crocket County. Main connector Route. • Segments of W US Highway 190, resulting in access problems. Connection between Iraan city and Crocket County. Possible problems accessing the nearest hospital: Iraan General Hospital.	• Includes existing condition 1% vulnerabilities. • State Highway 163 S. Intersection with FM 1973. Resulting in significant access issues. The connection between Ozona city and Juno town. • Segments of W US Highway 190, resulting in significant access problems. Connection between Iraan city and Crocket County. Possible problems accessing the nearest hospital: Iraan General Hospital. • Segments of IH10 resulting in significant access problems all along Crocket County. Main connector Route.
Culberson	• US90 Resulting in potential access issue, Connection Lobo to Van Horn. Access issue to Culberson Hospital located at Van Horn. • IH10 Resulting in Potential access issue. Connection between Hudspeth and Culberson Counties and possible access issue for Town of Van Horn. • Segments of East IH10 resulting in potential access issues. The connection between Van Horn and Kent may also be at risk leading to possible access issues for the nearest hospital, Culberson Hospital.	• Includes existing condition 1% vulnerabilities. • US180, Resulting in potential access issue between Pine Springs and Nickel Creek Station.

County	Existing Conditions Critical Route Vulnerabilities	
	1% Annual Chance	**0.2% Annual Chance**
Ector	• County Rd 307, near White Horse Tank area, possible access issues. • IH20, Judkins area with possible access issues. • Penwell Town, Avenue A, Avenue B and Avenue J with possible access issues. • In Pleasant Farms town, Roads: W Ivory St., Thomas Blvd. and segments of US 385. Resulting in possible access issues.	• Includes existing condition 1% vulnerabilities. • Segments of County Rd 307, resulting in possible access issues. • Blockline Rd. Intersection with County Rd 307. Resulting in access issues. • IH20, Judkins area with significant access issues.
Edwards	• S US Highway 277, Connection between Sonora city and Loma Alta town resulting in access issues. • Segments of S IS Highway 377 along the county, resulting in possible access issues. Significant issues at Connection between Carta Valley town and N US Highway 277.	• Includes existing condition 1% vulnerabilities. • S US Highway 277, Connection between Sonora city and Loma Alta town resulting in significant access issues. • Segments of S IS Highway 377 along the county, resulting in significant access issues
El Paso	• Fabens Rd., intersection with IH10, resulting in potential access issue to the IH10. • West Spur 601, resulting in a potential access issue to the US 54. • East Spur 601, resulting in a potential access issue to Loop 375. • Pierce Ave, and Louisiana Ave. resulting in potential access issues to the El Paso VA Health Care System. • IH10 and US54 intersection, Durazno Ave, potential access issue to Hospitals, EP Children's Hospital, EP Psychiatric Center, and University Medical Center of El Paso.	• All Existing 1% data. • West Spur 601, and US 54 intersection, resulting in potential access issue to the nearest Hospital, El Paso VA Health Care System, critical. • Montana Ave. SH180 connection of El Paso County to Hudspeth County, Butterfield area resulting in potential access issue. • Fabens neighborhood, resulting in access issue to the nearest Police department, El Paso County Sheriff's Office, Access issue to the roads: Fassett St. Davis St. NW 3RD ST. Avenue H. Eubanks St. NW 3RD St. and CC Camp Rd.
Hudspeth	• Segments of roadway US62-180 may result in potential access issues between El Paso and Hudspeth County and Culberson County. • Segments of IH10 may result in potential access issues between El Paso/Hudspeth and Culberson/Hudspeth.	• This includes the Existing 1% • Hueco Ranch Rd. may result in potential access issues to the US62-180. • Segments of roadway US62-180 may result in potential access issues between El Paso and Hudspeth County and Culberson County. • Segments of IH10 may result in potential access issues between El Paso/Hudspeth and Culberson/Hudspeth.
Jeff Davis	• SH-118, the connection between Kent and Jeff Davis, resulting in access issues. • SH-118, the connection between Jeff Davis and Fort Davis, resulting in access issues. • SH-17, the connection between Fort Davis and Reeves County, resulting in access issues. • SH-118, the connection between Fort Davis and Alpine (Brewster County). • Roadway US90, the connection between Valentine and Culberson County, resulting in access issues.	• Includes existing condition 1% vulnerabilities. • SH-118, the connection between Kent and Jeff Davis, resulting in significant access issues. • SH-118, the connection between Jeff Davis and Fort Davis, resulting in significant access issues. • SH-17, the connection between Fort Davis and Reeves County, resulting in significant access issues. • SH-118, the connection between Fort Davis and Alpine (Brewster County), resulting in significant access issues. • SH-17, the connection between Marfa and Fort Davis, resulting in access issues.

County	Existing Conditions Critical Route Vulnerabilities	
	1% Annual Chance	0.2% Annual Chance
Loving	• County Road 2 Intersection with RM 652, resulting in access issues. • West portion of RM 652, resulting in access issues to Orla in Reeves County. • South County Road 22 intersection with County Road 2, resulting in access issues to Loving County Sheriff’s office. • Roadway 302 in intersection with County Rd. 200 (Metor Rd) resulting in access issues to Mentone.	• Includes existing condition 1% vulnerabilities. • South Portion of Road 302, resulting in access issues to US Hwy 285. • North County Road 2 resulting in significant access issues to RM652. • West portion of RM 652, resulting in significant access issues to Orla in Reeves County • South County Road 22 intersection with County Road 2, resulting in significant access issues to Loving County Sheriff’s office.
Midland	• None identified	• None identified
Pecos	• Segments of US Highway 385 N, resulting in access issues. Connection between Fort Stockton and McCamey. • Segments of the IH10, resulting in access issues along Pecos County. IH10 segments near Fort Stockton may cause problems accessing the Pecos County Memorial Hospital. • Segments of US Highway 385 S, resulting in access issues. Connection between Marathon and Fort Stockton. • Segments of US Highway 285 S, resulting in access issues. Connection between Fort Stockton and Sanderson.	• Includes existing condition 1% vulnerabilities. • Segments of US Highway 385 S, resulting in significant access issues. Connection between Marathon and Fort Stockton. • Segments of US Highway 285 S, resulting in significant access issues. Connection between Fort Stockton and Sanderson. • Segments of the IH10, resulting in significant access issues along Pecos County. IH10 segments near Fort Stockton may cause problems accessing the Pecos County Memorial Hospital • Segments of US Highway 385 N, resulting in significant access issues. Connection between Fort Stockton and McCamey. • Segments of N US Highway 285, resulting in significant access issues. Connection between Mann Town and Fort Stockton. Possible problems accessing Pecos County Memorial Hospital.
Presidio	• US67, Connection between Presidio and Marfa, resulting in access issues. • US90, Connection between Marfa and Alpine, resulting in access issues. • US67, Intersection with roadway 170, resulting in access issues to presidio city.	• Includes existing condition 1% vulnerabilities. • US67, Connection between Presidio and Marfa, resulting in significant access issues. • US90, Connection between Marfa and Alpine, resulting in significant access issues.
Reagan	• None identified	• None identified
Reeves	• North County Road 118 may result in access issues to Pecos area. Therefore, possible access issues to the Reeves County Hospital. • Segments of the IH10 in possible access issues. • Roads: County Road 2, S Pigman St., W Schmidt Dr., S Texas St., W Stafford BL, S Cactus St., and W County RD with possible access issues to the Reeves County Hospital. • Roads: W F St, and W E St. with possible access issues to Pecos.	• Includes existing condition 1% vulnerabilities. • North County Road 118 may result in significant access issues to Pecos area. Therefore, possible access issues to the Reeves County Hospital. • South Central US 285 with possible access issues at Pecos area. • Segments of the IH20 in possible access issues near Pecos. • Segments of the IH10 in significant access issues. • Segments of the State Highway 17 in possible access issues.
Schleicher	• None identified	• None identified

County	Existing Conditions Critical Route Vulnerabilities	
	1% Annual Chance	**0.2% Annual Chance**
Sutton	• S US Highway 277, Connection between Sonora city and Loma Alta town resulting in access issues. Therefore, possible problems accessing Lilian M. Hudspeth Memorial Hospital. • Segments of IH10, resulting in access issues. Significant problems at Sonora city. Therefore, possible problems accessing Lilian M. Hudspeth Memorial Hospital. • N US Highway 277, Segments near Sonora city resulting in access issues. Therefore, possible problems accessing Lilian M. Hudspeth Memorial Hospital.	• Includes existing condition 1% vulnerabilities. • Segments of IH10, resulting in access issues. Significant problems at Sonora city. Therefore, possible problems accessing Lilian M. Hudspeth Memorial Hospital • S US Highway 277, Connection between Sonora city and Loma Alta town resulting in access issues. Therefore, possible problems accessing Lilian M. Hudspeth Memorial Hospital.
Terrell	• US Highway 90 W, resulting in access issues. Connection between Dryden and Emerson. • US 285, resulting in access issue. Connection between Sanderson and Fort Stockton. • SH-349, resulting in access issues. Connection between Dryden and Sheffield.	• Includes existing condition 1% vulnerabilities. • US Highway 90 W, resulting in significant access issues along the county. Connection between Emerson and Val Verde County. • US 285, resulting in significant access issue. Connection between Sanderson and Fort Stockton. • SH-349, resulting in significant access issues. Connection between Dryden and Sheffield.
Upton	• US Highway 67, resulting in access issues at Rankin Town. Therefore, possible problems accessing the Hospitals: Rankin County Hospital District and Rankin County Hospital District. • Rankin Town, Roads: Francis St., 3rd Ave., Main St., Upon St, and 4th St. resulting in access issues. Therefore, possible problems accessing the Hospitals: Rankin County Hospital District and Rankin County Hospital District. • County Road 410 at intersection with Highway 385 S resulting in access issues. • McCamey Town, Roads: 7th St., Houston Ave., 11TH St., 6th St. Bowie Ave., 8th St., 4th St., Emerson Ave. and Ellis Ave. resulting in access issues. Possible problems accessing the McCamey Hospital.	• Includes existing condition 1% vulnerabilities. • County Road 410 at intersection with Highway 385 S resulting in significant access issue. • McCamey Town, Roads: 9th St, 10th St, 2ND St, 6Th St, Eisenhower St., Emerson Ave. Patton St. 1st.ST. resulting in access issues. Possible problems accessing the McCamey Hospital. • US Highway 67, resulting in significant access issues at Rankin Town. Therefore, possible problems accessing the Hospitals: Rankin County Hospital District and Rankin County Hospital District.
Val Verde	• Roadway FM 163 resulting in access issues along the county. Connection between Comstock and Ozona. • N US Highway 277, resulting in access issues along the county. Connection between Val Verde County and Edwards County.	• Includes existing condition 1% vulnerabilities. • W US Highway 90, resulting in access issues along the county. • Roadway FM 163 resulting in significant access issues along the county. Connection between Comstock and Ozona. • N US Highway 277, resulting in significant access issues along the county. Connection between Val Verde County and Edwards County.
Ward	• IH20 Connection between Ward and Reeves County, with possible access issues. • Business Loop 20, connection between Ward and Reeves County, with possible access issues. • S County Road 170, with possible access issues to Business Loop 20.	• Includes existing condition 1% vulnerabilities. • RM-2355 and County Road 146 with significant access issues. • S County Road 170, with significant access issues to Business Loop 20. • IH20, Monahans city area with significant access issues.

County	Existing Conditions Critical Route Vulnerabilities	
	1% Annual Chance	**0.2% Annual Chance**
	• RM-2355 and County Road 146 with possible access issues. • IH20, Monahans city area with possible access issues. • Roads: Colorado St., 15th, 36th, and 45th St. located at Monahans city, with possible access issues.	• County Road 427 with possible access issues. • N State Highway 18 with possible access issues to Monahans.
Winkler	• County Road 101 with possible access issues. Connection between Winkler and Bennett County. • S Roadway 115, with possible access issues. Connection between Wink and Pyote town. • S State Highway 18, with possible access issues. Connection between Kermit and Monahans town. • W TX-302 at intersection with State Highway 18, possible access issues at Kermit town. Therefore, possible access issues to Winkler County Memorial Hospital.	• Includes existing condition 1% vulnerabilities. • S State Highway 18, with significant access issues. Connection between Kermit and Monahans town. • County Road 404, resulting in access issues. Connection between Ector County and Winkler. • W TX-302, resulting in significant access issues to Kermit town. Therefore, possible access issues to Winkler County Memorial Hospital.

2.3 Future Conditions Analysis

Future condition flood hazard analyses were performed to determine the location and magnitude of both 1% annual chance (100-year) and 0.2% annual chance (500-year) flood events under future conditions, accounting for future projections in land use and precipitation over the next 30 years.

Due to overall differences future trends as well as in data availability, different future conditions analysis methods were utilized for El Paso County and for the remainder of the Upper Rio Grande region outside of El Paso County. In El Paso County, future condition flood risk was estimated by developing new future condition 2D models with considerations for future land use and precipitation. Outside El Paso County, future condition flood risk was identified by estimating areas of future development and using the existing condition floodplains as a proxy for future condition floodplains within those areas. The following section describes the methodology and findings of these analyses.

2.3.1 Future Land Use and Development

According to population projections from the 2021 Regional Water Plan, the Upper Rio Grande Region is projected to grow in population between 2020-2050 by approximately 400,000, which is equivalent to a 38% increase over 30 years with an average annual growth rate of 1.08%. Three counties have major population centers located outside the region watershed boundaries and are excluded from this estimate, including Ector County (City of Odessa), Midland County (City of Midland), and Val Verde County (City of Del Rio). However, even when these population centers are included in the estimate, the projected region population growth rate remains generally unchanged over the same period. El Paso County is projected to see the highest future population growth compared to other counties in the region with an increase of approximately 370,000 by 2050 or 93% of the region’s total growth.

El Paso County

To perform the future land use analysis for El Paso County, future population projection data were obtained from the El Paso Metropolitan Planning Organization (MPO) Regional Mobility Strategy (RMS) 2050 Metropolitan Transportation Plan (MTP). The RMS MTP provides existing (2017) and future (2050) population and employment estimates using more than 800 Traffic Analysis Zones (TAZs) throughout El Paso County, each ranging in size from 1 acre (for dense urban areas) to 158 square miles (for dispersed rural areas).

In order to develop future condition hydrologic models based on these future population projections, a statistical analysis was performed to correlate existing TAZ population densities with land use intensity classes from the National Land Cover Database (NLCD) land cover raster layer. The NLCD land cover layer was selected for this analysis, since the layer was previously used in the 2019 Preliminary FEMA study to estimate runoff curve numbers for the hydrologic model. The future condition analysis utilized a similar modified approach by estimating a future condition land cover layer with NLCD classes developed based on future population.

To perform the statistical correlation analysis, the 2016 NLCD Land Cover dataset was used to provide a reasonably close match compared to the existing 2017 population and employment estimates from the RMS MTP dataset. Referencing the 2016 NLCD Land Cover raster, polygons were delineated in GIS to identify representative NLCD class boundaries for “open space”, “low intensity”, “medium intensity”, and “high intensity” categories. Upon delineating these representative zones for the four NLCD class types, the 2017 TAZ population and employment densities were converted to rasters, and zonal histograms were created for each zone based on the gridded TAZ densities. Using this process, correlations were developed between the NLCD intensity class zones and the TAZ densities. Correlations were defined separately for population and employment, identifying lower and upper bounds for each. The results of the correlation analysis are presented in **Table 2.17**.

These existing condition correlations were then used to estimate future condition NLCD classes based on the future condition TAZ densities. Future condition NLCD classes were estimated for population and employment separately, and the higher of the two resulting NLCD classes was assigned to the future condition NLCD class layer. The future condition NLCD class layer was then converted to a raster, and the portion of the raster within the Franklin Mountains State Park was removed from the analysis to avoid counting population growth in that area.

Table 2.17 NLCD and TAZ Correlation Ranges for Population and Employment

	Population		Employment	
NLCD Class	Lower Bound TAZ Density, population per sq. mi.	Upper Bound TAZ Density, population per sq. mi.	Lower Bound TAZ Density, population per sq. mi.	Upper Bound TAZ Density, population per sq. mi.
Open Space	100	1000	10	100
Low Intensity	1,000	3,500	100	300
Medium Intensity	3,500	12,000	300	3,500
High Intensity	12,000	-	3,500	-

Lastly, the future condition NLCD class layer was converted to runoff curve numbers using the same methodology discussed in the 2019 Preliminary FEMA Hydrology Report. In some instances, the estimated future condition curve number values were found to be lower than existing condition curve numbers from the 2019 Preliminary FEMA study (indicating a lower amount of runoff in future conditions). Therefore, as a conservative measure, a mosaic dataset was developed combining the maximum values from the existing condition and future condition curve number raster datasets to create the final future condition curve number raster.

A weighted area analysis was performed using the future condition curve number raster to estimate future curve number values for each of the 11 previously defined watersheds (or “work areas”) from the 2019 Preliminary FEMA study. **Table 2.18** summarizes the final curve number values used for the future condition analysis (column #4), compared to curve numbers developed using the 2019 NLCD land cover dataset (column #1), the 2019 Preliminary FEMA study (column #2), and future condition NLCD class dataset without modifications (column #3).

Upon calculating the final future condition curve numbers for each work area, the 2019 Preliminary FEMA study hydrologic model parameters were updated with the new curve numbers for calculating the future condition flows.

Table 2.18 Future Runoff Curve Numbers (CN) for El Paso County

	Curve Number			
Work Area	#1 Existing Condition, NLCD (2019)	#2 Existing Condition, FEMA Preliminary Mapping (2019)	#3 Estimated Future Condition (2050)	#4 Estimated Future Condition (2050) Mosaic with FEMA CN*
WA 1	62	62	62	64
WA 2	77	77	79	80
WA 3	77	78	77	79
WA 4	64	65	64	66
WA 5	76	77	76	77
WA 6	69	69	73	73
WA 7	74	73	81	82
WA 8	74	75	75	76
WA 9	66	66	66	68
WA 10	76	79	76	79
WA 11	65	67	63	68

* The final future condition CN mosaic (#4) was developed by combining maximum raster cell values from the Existing Condition FEMA Preliminary Mapping (2019) CN raster (#2) and the Estimated Future Condition (2050) CN raster (#3).

Outside El Paso County

For the rest of the Upper Rio Grande Region outside of El Paso County, a simpler method was used to account for future land use changes. This method included identifying the potential limits of future development based on future county level population projections and then using the existing condition floodplains as a proxy for future condition floodplains within those areas.

To develop boundaries for the potential limits of future development, existing (2020) and future (2050) population estimates were obtained for each county in the region from the 2021 Regional Water Plan and the 2018 Texas Demographic Center population projection datasets. Using these two datasets, future population increases were calculated in terms of the percentage increase by 2050 for each county and for each population dataset as shown in **Table 2.19**. The maximum percent increase value from each dataset was used as the basis for creating a spatial buffer around existing developed areas to represent the limits of future development.

Spatial buffers were applied to existing development boundaries (incorporated and unincorporated area limits) by calculating the effective radius of each developed area (assuming a circular boundary) and scaling the effective radius by the percent future population growth rate of the area’s applicable county. This process produced a buffer distance for the projected area of future development over the next 30 years.

Table 2.19 Future Population Projections (2020-2050) by County

	Population Estimates						
	TWDB Regional Water Plan (2021)			Texas Demographic Center (2018)			
County	**2020**	**2050**	**% Increase by 2050**	**2020**	**2050**	**% Increase by 2050**	**Max % Increase by 2050**
Andrews	19,089	30,111	58%	22,269	100,655	352%	352%
Brewster	9,727	10,334	6%	9,133	7,816	-14%	6%
Crane	5,056	6,737	33%	6,209	18,425	197%	197%
Crockett	4,111	4,486	9%	4,040	4,224	5%	9%
Culberson	2,695	3,173	18%	2,245	1,594	-29%	18%
Ector	164,289	233,048	42%	184,841	494,892	168%	168%
Edwards	2,123	2,123	0%	1,991	1,641	-18%	0%
El Paso	925,565	1,296,927	40%	876,120	1,046,847	19%	40%
Hudspeth	3,913	4,511	15%	3,400	2,399	-29%	15%
Jeff Davis	2,398	2,398	0%	2,113	1,458	-31%	0%
Loving	82	82	0%	92	77	-16%	0%
Midland	169,062	232,357	37%	187,364	573,981	206%	206%
Pecos	17,718	22,021	24%	16,533	17,112	4%	24%
Presidio	8,692	10,972	26%	5,906	2,662	-55%	26%
Reagan	3,853	4,812	25%	4,226	8,150	93%	93%
Reeves	15,125	17,650	17%	15,707	22,013	40%	40%
Schleicher	3,811	4,350	14%	3,312	3,858	16%	16%
Sutton	3,817	4,279	12%	4,381	4,229	-3%	12%
Terrell	1,045	1,069	2%	1,054	1,017	-4%	2%
Upton	3,690	4,272	16%	3,983	6,559	65%	65%
Val Verde	54,694	71,566	31%	48,253	41,593	-14%	31%
Ward	11,454	13,029	14%	13,592	33,350	145%	145%
Winkler	8,033	10,147	26%	9,295	23,364	151%	151%

Once the areas of potential future development were identified, existing condition floodplains from the Fathom dataset were used as a proxy for future condition floodplains within those areas. This process is described in further detail in Section 2.3.3.

2.3.2 Future Precipitation

Future precipitation trends are influenced by changes in climate. Future climate projections for the Southwest and Southern Great Plains have primarily projected decreases to total annual precipitation and increased drought risk.[3] On the other hand, future increases to atmospheric

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[3] Hayhoe, K., D.J. Wuebbles, D.R. Easterling, D.W. Fahey, S. Doherty, J. Kossin, W. Sweet, R. Vose, and M. Wehner, 2018: Our Changing Climate. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 72–144. doi: 10.7930/NCA4.2018.CH2. Accessed at https://nca2018.globalchange.gov/chapter/2/

temperatures have also been projected to increase the magnitude of extreme precipitation events throughout the U.S, as a result of increased atmospheric moisture carrying capacity.[4]

In addition to these projections, the Office of the Texas State Climatologist issued recommendations in April 2021 on accounting for future precipitation in Regional Flood Planning.[5] The analysis showed moderate trends of increasing rainfall near El Paso County based on trends in 100-year return values of 1-day precipitation amounts in NOAA Atlas 14 data. However, for the majority of the Upper Rio Grande region, results were inconclusive regarding future precipitation trends.

Furthermore, while increased rainfall is likely to result in increased runoff in urban areas where land cover is impervious, the Rio Grande and other rivers (which are primarily controlled by upstream dams) are less likely to see significantly increased flows during extreme precipitation events due to the influence of upstream controlling reservoirs.

Based on the recommendations from the Texas State Climatologist report, the future condition analysis for El Paso County was modified to include a 20% increase in precipitation. This amount corresponds to the report's high change scenario for urban watersheds in the 2050-2060 time horizon, whereas no changes were made along the Rio Grande due to the larger uncertainty of impacts for riverine watersheds.

For the rest of the Upper Rio Grande Region outside of El Paso County, no modifications were made to the future condition analysis to account for future precipitation. This is consistent with the inconclusive precipitation trends shown for a majority of the region east of El Paso County in the Texas State Climatologist report.

2.3.3 Future Flood Hazard Identification

The future conditions flood quilt was developed to include the future 1% and 0.2% annual chance events as described in the following section. Future condition flood hazard areas identified as part of this analysis are shown in **Map Exhibit 8** ("Future Condition Flood Hazard"). In addition, a comparison between the existing and future condition flood hazard areas is provided in Section 2.3.4.

El Paso County

Future conditions flood hazards were estimated for El Paso County by modifying the input parameters for the 2019 Preliminary FEMA models to account for future trends in land use and precipitation. Hydrologic (HEC-HMS) and hydraulic (HEC-RAS) models for each of the 2019 Preliminary FEMA study work areas were obtained and updated based on the findings presented previously in Sections 2.3.1 and 2.3.2.

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[4] Easterling, D.R., K.E. Kunkel, J.R. Arnold, T. Knutson, A.N. LeGrande, L.R. Leung, R.S. Vose, D.E. Waliser, and M.F. Wehner, 2017: Precipitation change in the United States. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 207-230, doi: 10.7930/J0H993CC. Accessed at https://science2017.globalchange.gov/chapter/7/

[5] Nielsen-Gammon, J., S. Jorgensen, 2021: Climate Change Recommendations for Regional Flood Planning. Department of Atmospheric Sciences, Texas A&M University. Accessed at https://climatexas.tamu.edu/files/CliChFlood.pdf

Updates to the hydrologic models included replacing the existing condition curve number inputs with future condition curve number inputs (to estimate future land use) and scaling the input rainfall by 20% (to estimate future precipitation increases).

After running the future condition hydrologic models for all work areas, the updated excess precipitation results were applied as inputs in the 2D hydraulic models. To account for interdependent work areas that share outflow and inflow boundary conditions, initial 2D simulations were performed to identify outflows greater than 1,000 cfs. In cases where flows from an upstream work area were found to have a significant impact on flows in a downstream work area, model inflows were updated for the downstream work area based on the outflows from the upstream work area.

Based on the results of the future condition 2D hydraulic analyses, future condition floodplains were mapped for all 11 work areas, covering El Paso County and the west part of Hudspeth County (corresponding to the HUC-8 watersheds 13040100 and 13030102). Whereas the 2019 Preliminary FEMA study did not include the area inside Fort Bliss, the area was included along with the rest of El Paso County in the future conditions results.

Future floodplain polygons for El Paso County were post-processed using 2D BLE Tools from a proprietary AECOM Hydraulics tool set. The tool delineates 1% and 0.2% flood hazard areas using stream centerlines and HEC-RAS outputs including water surface elevation and depth rasters. Floodplain polygons were delineated based on areas which have a depth of at least 1 foot and intersect the streamlines. Areas of isolated flooding disconnected from the stream centerline were removed during this process.

Finally, the future condition flood hazard areas were merged with the existing condition flood hazard areas ensuring that the future conditions flood hazard area is equal to or greater than the existing condition flood hazard area. This process also ensured that all flood hazard areas from the 2019 Preliminary FEMA study were included in the future conditions floodplain, since portions of the study were not delineated based on the 2D work area models but were instead delineated based on the results of other studies such as the Rio Grande Natural Valley Study.

Outside El Paso County

After estimating the limits of future development areas outside El Paso County (discussed in Section 2.3.1), proxy floodplains for these future development areas were selected by using the higher intensity *pluvial* floodplain from the existing conditions dataset as a proxy for future conditions. For example, within these areas, the 0.2% existing 3m Fathom pluvial floodplain was used as a proxy for the 1% future pluvial floodplain, while the 0.1% existing 30m Fathom floodplain [from an earlier July 2021 Draft Cursory version of the Fathom release] was used as a proxy for the 0.2% future pluvial floodplain. No changes were made to the fluvial floodplains during this process since, at the regionwide level, future development is estimated to impact localized runoff to a greater degree than watershed-scale riverine runoff.

For areas outside the limits of future development, future condition flood hazards were estimated to be equivalent to existing condition flood hazards without the need for a proxy floodplain. Due to the Upper Rio Grande region’s size and remote nature, it was assumed there would be no significant changes in land use outside the limits of future development.

2.3.4 Extent of Increase of Future Flood Hazard Compared to Existing Condition

A comparison showing the extent of increase between the existing condition and future condition flood hazard areas is summarized in **Table 2.20** and illustrated in **Map Exhibit 10** ("Extent of Increase of Flood Hazard Compared to Existing Condition").

As a result of the future conditions flood hazard analysis, future flood hazard areas in El Paso County were increased by a significantly greater degree than the future flood hazard areas outside of El Paso County. Whereas the future condition adjustments in El Paso County resulted in a total future condition flood hazard area between 1.5-2 times the size of the total existing condition flood hazard area, adjustments outside of El Paso County resulted in only a 1% increase in the flood hazard area change. Several reasons were noted to explain this difference:

- In El Paso County[6], future condition flood hazards included an additional rainfall adjustment of 20% to account for future precipitation projections; whereas, outside of El Paso County, a similar adjustment was not applied (discussed in Section 2.3.2);
- In El Paso County, future condition flood hazards were estimated by adjusting hydrologic model parameters based on detailed future population projections from the El Paso MPO; whereas, outside of El Paso County, future condition flood hazards were estimated by using higher intensity existing condition floodplains as a proxy for future condition floodplains (discussed in Section 2.3.3); and
- In El Paso County, future condition flood hazards were estimated for the entire area of the county; whereas, outside of El Paso County, future condition flood hazards were only estimated for areas of projected future development, which were approximated by applying a spatial buffer to the current development area equal to the county-level future population growth rates (discussed in Section 2.3.3).

Table 2.20 Extent of Increase of Future Flood Hazard Compared to Existing Condition

Flood Hazard	Extent	Total Existing Area (Sq. Mi.)	Total Future Area (Sq. Mi.)	Area Change (sq. mi.)	Area Change (%)
1% AC	El Paso County	179	356	175	99%
1% AC	Outside El Paso County	9,106	9,187	67	1%
0.2% AC*	El Paso County	66	105	105	59%
0.2% AC*	Outside El Paso County	1,689	1,702	76	1%

*0.2% AC flood hazard area results are reported separately from the 1% AC results and do not include cumulative 1% AC flood hazard areas.

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[6] For the purpose of this comparison, "El Paso County" represents El Paso County watersheds which also include a small portion of west Hudspeth County.

2.3.5 Future Flood Hazard Data Gaps

Due to the limited availability of future condition flood hazard information across the region (such as detailed future land use data or future conditions flood studies), future flood hazard data gaps were identified for the entire region with one exception. As part of the RFP future flood hazard analysis described in the previous section, the watersheds of El Paso County and western Hudspeth County were evaluated under a potential 2050 future condition scenario (accounting for future population growth and future increases in precipitation), which fills the future flood hazard data gaps for these areas.

Future flood hazard data gaps, along with the public-provided flood prone areas, are shown in **Map Exhibit 9** ("Future Condition Flood Hazard – Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas").

2.3.6 Future Flood Exposure

Based on the identified future conditions flood hazard areas, a high-level future flood exposure analysis was performed to identify who or what might be harmed within the region for the future condition 1% and 0.2% annual chance flood events. The exposure analysis evaluated potential flood impacts to population, property, critical facilities, public infrastructure, roadways, and agricultural resources.

The methodology of the future condition exposure analyses was based on the methodology previously discussed for the existing condition exposure analyses in Section 2.2.3.

Future conditions flood exposure results are summarized at the regionwide level in **Table 2.21**, by county in **Figure 2.4**, and by flood risk type in **Figure 2.5**. In addition, detailed results are provided in **Appendix Table 2B** and illustrated at the regionwide level in **Map Exhibit 11** ("Future Condition Flood Exposure")**.**

Table 2.21 Future Flood Exposure Summary

Exposure Type	Number of Features		
	1% AC	0.2% AC*	Possible Flood Prone Areas
Floodplain Area (sq. mi.)	9,543	1,807	161
Structures (#)	67,134	35,167	12,393
Population (#)	253,678	110,302	71,036
Critical Facilities (#)	178	56	19
Roadway Segments (mi.)	3,846	1,035	353
Roadway Stream Crossings (#)	1,467	585	147
Agricultural Areas (sq. mi.)	678	149	39

*0.2% AC flood exposure results are reported separately from the 1% AC results and do not include cumulative flood hazard areas or property impacts from 1% AC flood hazard areas.

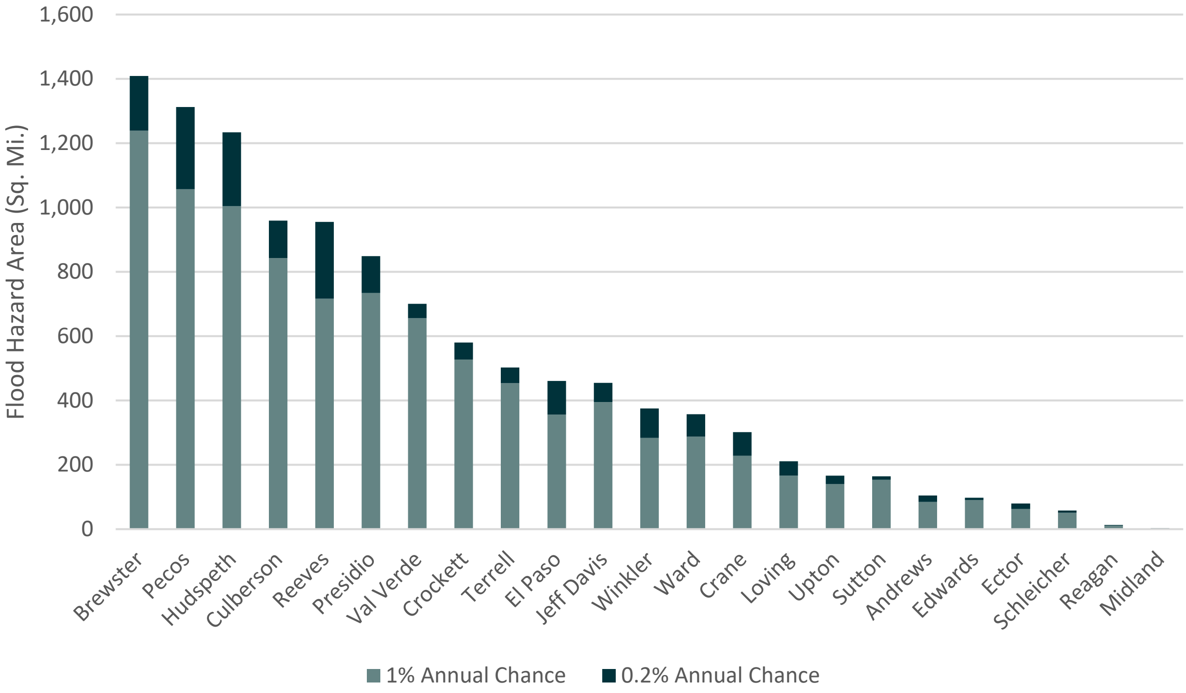
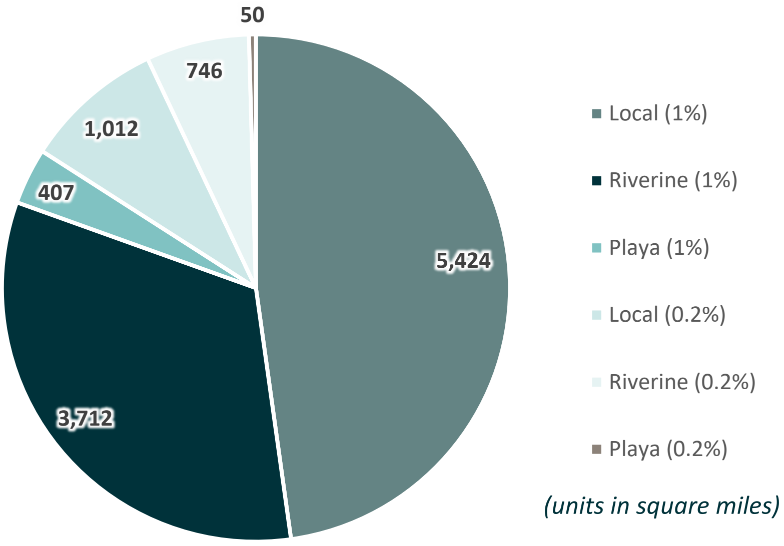


Figure 2.4 Total Future Condition Flood Hazard Area by County



Note: Flood hazard areas with more than one potential flood risk type are characterized in this figure using a simplified priority order (i.e., playa, riverine, local).

Figure 2.5 Total Future Condition Flood Hazard Area by Flood Risk Type

2.3.7 Future Vulnerability

Based on the results of the future conditions flood risk identification and exposure analyses, a future condition vulnerability analysis was performed to identify the level of resilience or vulnerabilities related to communities, critical facilities, and critical transportation routes.

The methodology of the future condition vulnerability analyses was based on the methodology previously discussed for the existing condition vulnerability analyses in Section 2.2.4.

Table 2.22 shows the relative vulnerability of communities across the region, including incorporated and unincorporated communities, based on the number of structures in the 1% and 0.2% future condition annual chance floodplains. The top five communities by number of structures within colonias in the 1% future condition annual chance floodplain were found to be the City of Socorro, Homestead Meadows North, Homestead Meadows South, the City of San Elizario, and the Town of Clint. The top five communities by average SVI of buildings in the floodplain were found to be Fabens, Redford, the City of Presidio, the Town of Van Horn, and the City of San Elizario.

In addition to summarizing SVI values by community, average building SVI values were summarized by county and reported as part of the future conditions flood exposure results in **Appendix Table 2B**. An overview of regionwide future condition vulnerability results is provided in **Map Exhibit 12** (“Future Condition Flood Vulnerability including Critical Infrastructure”).

Table 2.23 summarizes the potential vulnerabilities of critical facilities for the future conditions 1% and 0.2% annual chance flood events by county, while **Table 2.24** summarizes potential vulnerabilities oof critical routes for the same events. In addition, Section 2.4 provides qualitative descriptions of the expected loss of function for various critical facility types in the region.

Table 2.22 Summary of Future Conditions Vulnerability – Community Property Impacts

	1% Annual Chance Flood Risk		0.2% Annual Chance Flood Risk*		
Place Name	Number of Structures in Floodplain	Number of Structures in Floodplain within Colonias	Number of Structures in Floodplain	Number of Structures in Floodplain within Colonias	Average SVI of Structures in Floodplain**
Acala CDP	**3**	**3**	**5**	**3**	**0.932**
Agua Dulce CDP	**357**	**346**	**468**	**451**	**0.902**
Alpine city	1,784	0	1,980	0	0.570
Amistad CDP	11	11	11	11	0.549
Anthony town	**258**	**3**	**264**	**3**	**0.925**
Balmorhea city	361	0	363	0	0.357
Barstow city	166	0	249	0	0.520
Box Canyon CDP	27	21	27	21	0.549
Butterfield CDP	**26**	**18**	**26**	**18**	**0.784**

	1% Annual Chance Flood Risk		0.2% Annual Chance Flood Risk*		
Place Name	Number of Structures in Floodplain	Number of Structures in Floodplain within Colonias	Number of Structures in Floodplain	Number of Structures in Floodplain within Colonias	Average SVI of Structures in Floodplain**
Canutillo CDP	**710**	**325**	**749**	**340**	**0.768**
Clint town	**406**	**406**	**493**	**493**	**0.753**
Crane city	182	0	242	0	0.560
Dell City city	**293**	**0**	**293**	**0**	**0.932**
El Paso city	29,043	72	50,174	128	0.711
Fabens CDP	**580**	**12**	**888**	**12**	**0.974**
Fort Bliss CDP	1,156	0	1,844	0	0.344
Fort Davis CDP	155	0	226	0	0.408
Fort Hancock CDP	**92**	**39**	**117**	**43**	**0.932**
Fort Stockton city	296	1	322	1	0.589
Grandfalls town	192	0	253	0	0.520
Homestead Meadows North CDP	1,222	881	1,612	1,179	0.754
Homestead Meadows South CDP	783	587	1,619	1,299	0.641
Horizon City city	926	5	1,898	7	0.540
Imperial CDP	272	246	276	246	0.329
Iraan city	101	100	120	119	0.329
Kermit city	1,293	0	2,075	0	0.593
Lake View CDP	12	12	12	12	0.549
Lindsay CDP	**189**	**189**	**194**	**194**	**0.825**
Marathon CDP	91	87	118	109	0.512
Marfa city	**285**	**0**	**488**	**0**	**0.913**
McCamey city	196	0	577	0	0.658
Mentone CDP	11	0	15	0	0.502
Monahans city	789	0	891	0	0.687
Morning Glory CDP	**96**	**67**	**134**	**94**	**0.930**
Ozona CDP	1,047	0	1,056	0	0.608
Pecos city	1,958	7	2,835	7	0.588
Prado Verde CDP	112	57	112	57	0.095
Presidio city	**666**	**0**	**754**	**0**	**0.951**
Pyote town	18	0	30	0	0.520
Rankin city	82	0	82	0	0.426

Place Name	1% Annual Chance Flood Risk		0.2% Annual Chance Flood Risk*		Average SVI of Structures in Floodplain**
	Number of Structures in Floodplain	Number of Structures in Floodplain within Colonias	Number of Structures in Floodplain	Number of Structures in Floodplain within Colonias	
Redford CDP	**16**	**7**	**30**	**14**	**0.951**
San Elizario city	**816**	**502**	**1,050**	**678**	**0.934**
Sanderson CDP	291	291	323	323	0.453
Sheffield CDP	4	0	12	7	0.329
Sierra Blanca CDP	**38**	**38**	**50**	**50**	**0.932**
Socorro city	**4,382**	**2,222**	**6,066**	**3,245**	**0.903**
Sonora city	827	0	876	0	0.651
Southwest Sandhill CDP	828	0	1,046	0	0.520
Sparks CDP	115	111	212	206	0.695
Study Butte CDP	24	20	31	26	0.512
Terlingua CDP	4	3	6	5	0.512
Thorntonville town	217	0	333	0	0.520
Tornillo CDP	**186**	**179**	**228**	**210**	**0.930**
Toyah town	**101**	**101**	**101**	**101**	**0.825**
Valentine town	18	18	49	48	0.408
Van Horn town	**229**	**217**	**638**	**623**	**0.935**
Vinton village	**147**	**1**	**397**	**2**	**0.866**
Westway CDP	**93**	**90**	**164**	**160**	**0.785**
Wickett town	31	0	39	0	0.520
Wink city	41	0	70	0	0.544
All other colonias (outside boundaries of incorporated place or CDP)	-	2,410	-	3,193	-

*0.2% AC flood vulnerability results include cumulative property impacts from 1% AC flood hazard areas.

Communities in **bold have a high SVI (over 0.75)

Table 2.23 Summary of Future Conditions Vulnerability – Critical Facilities

County	Future Conditions Critical Facilities Vulnerabilities*	
	1% Annual Chance	**0.2% Annual Chance**
Andrews	• None identified	• None identified
Brewster	• EPA NPDES: CITY OF ALPINE MUNICIPAL WWTF • HIFLD Law Enf: ALPINE POLICE DEPARTMENT • HIFLD Law Enf: BREWSTER COUNTY SHERIFFS OFFICE • Hospital: BIG BEND REGIONAL MEDICAL CENTER • School: ALPINE EL • School: ALPINE H S • School: ALPINE MIDDLE	• Same as 1% Annual Chance
Crane	• HIFLD Law Enf: CRANE COUNTY SHERIFFS OFFICE / CRANE COUNTY JAIL • National Shelter System Facility: Crane County Library • **School: CRANE EL**	• HIFLD NGPP: CORDONA LAKE GAS PLANT • **National Shelter System Facility: Mountain View Community Center**
Crockett	• EPA NPDES: MAIN WWTF • HIFLD NGPP: NELEH GAS SYSTEM • HIFLD NGPP: SOUTHWEST OZONA GAS PLANT • HIFLD NGPP: TIPPETT GAS PLANT • Intermodal Transit Facility: Caprock Diesel • National Shelter System Facility: Ozona Convention Center • School: OZONA EL • School: OZONA MIDDLE	• Same as 1% Annual Chance
Culberson	• None identified	• **Intermodal Transit Facility: Pilot Travel Center** • **School: VAN HORN SCHOOL**
Ector	• None identified	• None identified
Edwards	• None identified	• None identified
El Paso	• **EPA NPDES: CANAL WTP** • EPA NPDES: CANUTILLO ISD WWTP • EPA NPDES: HORIZON REGIONAL MUD - HORIZON CITY WWTP • EPA NPDES: TORNILLO WWTF • **Fire Station: El Paso Fire Department Station 25** • Fire Station: El Paso Fire Department Station 26 • Fire Station: El Paso Fire Department Station 9 • **Fire Station: Montana Vista Fire Rescue Station 1** • Fire Station: Montana Vista Fire Rescue Station 2 • Fire Station: West Valley Fire Department Anthony Station • Fire Station: West Valley Fire Department Canutillo Station • Google: Bonnie Moorhouse Reverse Osmosis Water Treatment Facility	• **Fire Station: El Paso Fire Department Station 18** • Fire Station: El Paso Fire Department Station 31 • **HIFLD Nursing Homes: OASIS NURSING & REHABILITATION CENTER** • **Hospital: DEL SOL MEDICAL CENTER A CAMPUS OF LPDS HEALTHCARE** • **Intermodal Freight Facility, RAIL & TRUCK: UP-EL PASO-TX-201 DODGE** • **National Shelter System Facility: GARY DEL PALACIOS REC CENTER** • **National Shelter System Facility: Marty Robbins Recreation Center** • **National Shelter System Facility: Socorro Community Center**

*Critical Facilities in **bold** were identified as potential vulnerabilities in future conditions flood events (1% or 0.2% annual chance) but were not previously identified as potential vulnerabilities in the existing conditions flood events (1% or 0.2% annual chance) listed in **Table 2.15.**

County	Future Conditions Critical Facilities Vulnerabilities*	
	1% Annual Chance	0.2% Annual Chance
	• **HIFLD Law Enf: CLINT POLICE DEPARTMENT** • **HIFLD Law Enf: EL PASO COUNTY SHERIFFS OFFICE - HEADQUARTERS** • HIFLD Nursing Homes: ADAM MC CARE LLC • HIFLD Nursing Homes: GOOD SAMARITAN SOCIETY--WHITE ACRES • HIFLD Nursing Homes: LA FAMILIA ASSISTING LIVING • **HIFLD Nursing Homes: ROSEMARY WILLIAMS MELENDEZ CASA FELICITAS** • **HIFLD Nursing Homes: SUNRIDGE AT CAMBRIA** • **HIFLD Nursing Homes: THE ETERNAL YOUTH HOME** • HIFLD Nursing Homes: THE FOREST ASSISTED LIVING • HIFLD Nursing Homes: VILLAS DEL SOL ASSISTED LIVING LLC • HIFLD: FORT BLISS (DEA EPIC) • HIFLD: HOOVER COMPANY • **HIFLD: MONTANA POWER STATION** • **Hospital: EL PASO CHILDREN'S HOSPITAL** • **Hospital: PREMIER SPECIALTY HOSPITAL OF EL PASO** • **Hospital: THE HOSPITALS OF PROVIDENCE TRANSMOUNTAIN CAMPUS** • Hospital: UNIVERSITY MEDICAL CENTER OF EL PASO • Intermodal Freight Facility, RAIL & TRUCK: EL PASO TERMINAL WAREHOUSES, INC.-EL PASO-TX • Intermodal Freight Facility, RAIL & TRUCK: SWIG COTTON-EL PASO-TX • **Intermodal Freight Facility, TRUCK - PORT - RAIL: YELLOW-EL PASO-TX TERMINAL** • **Intermodal Transit Facility: Greyhound Station** • National Shelter System Facility: DAACG • National Shelter System Facility: DON HASKINS REC CENTER • **National Shelter System Facility: EPCC Administrative Building** • **National Shelter System Facility: Houchen Center** • **National Shelter System Facility: MULTIPURPOSE CENTER** • National Shelter System Facility: Nations Tobin Recreation Center • **National Shelter System Facility: San Pablo Lutheran Church** • **National Shelter System Facility: Socorro Entertainment Ctr** • **National Shelter System Facility: St. Ignatius Church**	• **School: ALICIA R CHACON** • School: ANDRESS H S • **School: CACTUS TRAILS** • **School: CARROLL T WELCH EL** • **School: CEDAR GROVE EL** • **School: COL JOHN O ENSOR MIDDLE** • School: DAVINCI SCHOOL FOR SCIENCE AND THE ARTS • **School: DEL VALLE H S/National Shelter System Facility** • **School: DELTA ACADEMY** • **School: DESERTAIRE EL** • **School: DOLPHIN TERRACE EL** • **School: EASTWOOD KNOLLS** • **School: EL DORADO H S/National Shelter System Facility** • **School: ESCONTRIAS EARLY CHILD CTR** • **School: FANNIN EL** • **School: FRANKLIN H S** • **School: GUILLEN MIDDLE** • **School: HARMONY SCIENCE ACAD (EL PASO)** • **School: HORIZON HEIGHTS EL** • School: HORNEDO MIDDLE • **School: HOWARD BURNHAM EL** • **School: HUECO EL** • **School: IDEA EDGEMERE ACADEMY** • **School: JANE A HAMBRIC SCHOOL** • **School: JEFFERSON H S** • **School: PASO DEL NORTE SCHOOL** • **School: PEBBLE HILLS H S** • **School: PRESA EL** • **School: RIVERSIDE H S** • **School: RIVERSIDE MIDDLE** • **School: SANCHEZ STATE JAIL** • **School: SCOTSDALE EL** • **School: SUN RIDGE MIDDLE; LUJAN-CHAVEZ EL/National Shelter System Facility** • **School: TIPPIN EL** • **School: YSLETA H S**

*Critical Facilities in **bold** were identified as potential vulnerabilities in future conditions flood events (1% or 0.2% annual chance) but were not previously identified as potential vulnerabilities in the existing conditions flood events (1% or 0.2% annual chance) listed in **Table 2.15.**

County	Future Conditions Critical Facilities Vulnerabilities*	
	1% Annual Chance	**0.2% Annual Chance**
	• National Shelter System Facility: WELLINGTON CHEW SENIOR CENTER • **School: AMERICAS H S/National Shelter System Facility** • **School: ANTHONY EL** • **School: ASCARATE EL** • **School: BONHAM EL** • School: CANUTILLO MIDDLE • School: CHAPIN H S • School: CLINT H S • School: CLINT ISD EARLY COLLEGE ACADEMY • **School: CLINT J H SCHOOL** • School: CONSTANCE HULBERT EL • School: COOLEY EL • School: CROSBY EL • **School: DESERT VIEW MIDDLE** • **School: DESERT WIND EL** • School: DOWELL EL • **School: EAST POINT EL** • **School: EASTWOOD H S/National Shelter System Facility** • **School: EASTWOOD MIDDLE** • School: EL PASO ACADEMY WEST • School: EL PASO LEADERSHIP ACADEMY • **School: GLEN COVE EL** • School: H D HILLEY EL • School: H R MOYE EL • School: HAWKINS EL • School: HENDERSON MIDDLE • **School: HORIZON H S** • **School: HORIZON MIDDLE** • **School: IRVIN H S** • **School: J M HANKS H S** • **School: JOHN DRUGAN SCHOOL** • **School: JOHNSON EL** • School: JOSE H DAMIAN EL • **School: JOSEFA L SAMBRANO EL** • **School: LA FE PREPARATORY SCHOOL** • School: LE BARRON PARK EL • School: LEE EL/National Shelter System Facility • **School: LORENZO LOYA PRI** • **School: MACARTHUR EL-INT** • School: MAGOFFIN MIDDLE/National Shelter System Facility • School: MARIAN MANOR EL • **School: MESITA EL** • School: MILAM EL • **School: MONTWOOD MIDDLE; ELFIDA CHAVEZ EL**	

*Critical Facilities in **bold** were identified as potential vulnerabilities in future conditions flood events (1% or 0.2% annual chance) but were not previously identified as potential vulnerabilities in the existing conditions flood events (1% or 0.2% annual chance) listed in **Table 2.15.**

County	Future Conditions Critical Facilities Vulnerabilities*	
	1% Annual Chance	**0.2% Annual Chance**
	• School: NEWMAN EL • School: NORTH LOOP EL • **School: PARKLAND H S/National Shelter System Facility** • **School: PARKLAND PRE K CENTER** • **School: PASODALE EL** • **School: POLK EL** • **School: PREMIER H S OF EL PASO** • School: RAMONA EL • School: RED SANDS EL • **School: RIO BRAVO MIDDLE** • School: ROBBIN E L WASHINGTON EL • School: SAN ELIZARIO H S/National Shelter System Facility • **School: SILVA HEALTH MAGNET** • **School: SOUTH LOOP EL** • School: STANTON EL • School: TEJAS SCHOOL OF CHOICE • **School: TELLES ACADEMY** • School: THE LINGUISTIC ACAD OF EL PASO-CULTURAL DEMO SITE • **School: TIERRA DEL SOL EL** • School: TORNILLO EL • School: WESTERN HILLS EL • **School: WILLIAM D SLIDER MIDDLE** • School: WM DAVID SURRATT EL • School: YSLETA PK CENTER • School: ZACH WHITE EL • **School: ZAVALA EL**	
Hudspeth	• Fire Station: Hueco Volunteer Fire Department • School: DELL CITY SCHOOL	• Same as 1% Annual Chance
Jeff Davis	• EPA NPDES: FORT DAVIS WWTF	• **School: VALENTINE SCHOOL**
Loving	• HIFLD NGPP: PECOS RIVER PLANT	• Same as 1% Annual Chance
Midland	• None identified	• None identified
Pecos	• EPA FRS: CENTURY GAS PLANT • Fire Station: Imperial Fire Department • HIFLD NGPP: WAHA GAS PLANT • HIFLD: EAST PECOS SOLAR • Hospital: PECOS COUNTY MEMORIAL HOSPITAL • School: BUENA VISTA SCHOOL • School: FORT STOCKTON ALAMO EL • School: FORT STOCKTON HIGH • School: IRAAN J H • School: LYNAUGH UNIT	• EPA FRS: WAHA GAS PLANT • HIFLD NGPP: MITCHELL PLANT • HIFLD: ALAMO 6
Presidio	• None identified	• School: PRESIDIO H S

*Critical Facilities in **bold** were identified as potential vulnerabilities in future conditions flood events (1% or 0.2% annual chance) but were not previously identified as potential vulnerabilities in the existing conditions flood events (1% or 0.2% annual chance) listed in **Table 2.15.**

County	Future Conditions Critical Facilities Vulnerabilities*	
	1% Annual Chance	0.2% Annual Chance
Reagan	• None identified	• None identified
Reeves	• EPA NPDES: ORLA WWTP • Fire Station: Balmorhea Volunteer Fire Department • Fire Station: Toyah Volunteer Fire Department • HIFLD Law Enf: PECOS POLICE DEPARTMENT • HIFLD NGPP: EAST TOYAH GAS PLANT • National Shelter System Facility: Civic Center in Balmorhea • National Shelter System Facility: Community Center in Pecos City • National Shelter System Facility: First Baptist Church - Balmorhea • School: AUSTIN EL • School: BALMORHEA SCHOOL/National Shelter System Facility	• School: CROCKETT MIDDLE • School: PECOS H S
Schleicher	• None identified	• None identified
Sutton	• EPA FRS: CITY OF SONORA • Fire Station: Border Line Volunteer Fire Department • HIFLD Law Enf: SONORA POLICE DEPARTMENT • HIFLD NGPP: SONORA GAS PLANT • Intermodal Transit Facility: Picos Food Mart • National Shelter System Facility: SUTTON COUNTY CIVIC CENTER	• Same as 1% Annual Chance
Terrell	• Fire Station: Terrell County Volunteer Fire Department • Intermodal Transit Facility: Amtrak Station	• Same as 1% Annual Chance
Upton	• Fire Station: McCamey Volunteer Fire Department • HIFLD: CASTLE GAP SOLAR • HIFLD: UPTON COUNTY SOLAR • Hospital: MCCAMEY HOSPITAL	• School: MCCAMEY PRI
Val Verde	• None identified	• None identified
Ward	• Fire Station: Grandfalls Volunteer Fire Department • HIFLD NGPP: BONE SPRINGS GAS PROCESSING PLANT • HIFLD NGPP: MIVIDA JV PROCESSING PLANT • HIFLD Nursing Homes: MONAHANS MANAGED CARE CENTER • School: GRANDFALLS-ROYALTY SCHOOL • School: MONAHANS H S • School: SUDDERTH EL	• Same as 1% Annual Chance
Winkler	• EPA FRS: EL PASO NATURAL GAS - KEYSTONE COMPRESSOR STATION • HIFLD Law Enf: WINKLER COUNTY SHERIFFS OFFICE / WINKLER COUNTY JAIL	• KERMIT EL

*Critical Facilities in **bold** were identified as potential vulnerabilities in future conditions flood events (1% or 0.2% annual chance) but were not previously identified as potential vulnerabilities in the existing conditions flood events (1% or 0.2% annual chance) listed in **Table 2.15.**

County	Future Conditions Critical Facilities Vulnerabilities*	
	1% Annual Chance	**0.2% Annual Chance**
	• HIFLD NGPP: HALLEY PLANT • Hospital: WINKLER COUNTY MEMORIAL HOSPITAL • School: WINK EL	

*Critical Facilities in **bold** were identified as potential vulnerabilities in future conditions flood events (1% or 0.2% annual chance) but were not previously identified as potential vulnerabilities in the existing conditions flood events (1% or 0.2% annual chance) listed in **Table 2.15.**

Table 2.24 Summary of Future Conditions Vulnerability – Critical Routes

County	Future Conditions Critical Route Vulnerabilities	
	1% Annual Chance	**0.2% Annual Chance**
Andrews	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities.
Brewster	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • Roadway 118, resulting in access issues to the hospital Big Bend Regional Medical Center.
Crane	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • US Highway 385 S, resulting in access issues. Problem accessing the Crane Memorial Hospital.
Crockett	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • Segments of IH10 near Ozona town, resulting in significant access issues.
Culberson	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • IH10 intersection with US90, may result in access issues to the nearest hospital, Culberson Hospital.
Ector	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities.
Edwards	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities.
El Paso	• Includes existing condition 1% vulnerabilities. • N Boone, Reynolds St. and N Concepcion St. resulting in potential access issues to Hospitals: EP Children's Hospital, EP Psychiatric Center, and University Medical Center of El Paso. • South US 54, Above intersection with IH10, potential access issue to main Highway. • Butterfield area, O Leary Dr. resulting in potential access issue to Montana Ave.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • N Mesa St. resulting in potential access issue to hospital: Las Palmas Rehabilitation Hospital. • Tierra Arroyo Dr. and Tierra Este Dr. resulting in potential Access issues to Hospital: The Hospitals of Providence east campus. • Homestead Meadows South area, roadway: N Ascension St. resulting in potential access to Agua Dulce.
Hudspeth	• Includes existing condition 1% vulnerabilities. • Segments of roadway US62-180 may result in potential access issues between El Paso and Hudspeth County and Culberson County. • Segments of IH10 may result in potential access issues between El Paso/Hudspeth and Culberson/Hudspeth.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • Hueco Ranch Rd. may result in potential access issues to the US62-180. • Segments of IH10 may result in potential access issues between El Paso/Hudspeth and Culberson/Hudspeth. • IH10 at the Sierra Blanca area may result in potential access issues.
Jeff Davis	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • SH-17, the connection between Marfa and Fort Davis, resulting in access issues near the intersection with SH-17.

County	Future Conditions Critical Route Vulnerabilities	
	1% Annual Chance	0.2% Annual Chance
Loving	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • South County Road 22 intersection with County Road 2, resulting in significant access issues. • Roadway 302 at the intersection with County Rd. 20 (Metor Rd) resulting in access issues to Mentone city.
Midland	• None identified	• None identified
Pecos	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • IH10 near Fort Stockton may cause problems accessing the Pecos County Memorial Hospital • N US Highway 285, near Fort Stockton may cause problems accessing the Pecos County Memorial Hospital.
Presidio	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • US67, Intersection with roadway 170, resulting in access issues to presidio city. • US90 Intersection with US67, resulting in access issues to Marfa city.
Reagan	• None identified	• None identified
Reeves	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • North Central US285 with possible access issues near Pecos area. • IH20 near Toyah town with possible access issues.
Schleicher	• None identified	• None identified
Sutton	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • Segments of IH10 at Sonora city resulting in access issues. Therefore, possible problems accessing Lilian M. Hudspeth Memorial Hospital • E 2ND St. resulting in access issues. Possible problems accessing Lilian M. Hudspeth Memorial Hospital.
Terrell	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities.
Upton	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • McCamey Town, Roads: 21St St. Medical Dr. resulting in access issues. Possible problems accessing the McCamey Hospital. • McCamey Town, Segments of US Highway 385-FM 305, resulting in access issues. Possible problems accessing the McCamey Hospital. • US Highway 67, resulting in significant access issues at Rankin Town. Therefore, possible problems accessing the Hospitals: Rankin County Hospital District and Rankin County Hospital District.

County	Future Conditions Critical Route Vulnerabilities	
	1% Annual Chance	0.2% Annual Chance
Val Verde	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities.
Ward	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • IH20, Monahans city area with significant access issues. • S State Highway 18 with significant access issues to Grandfalls Town.
Winkler	• Includes existing condition 1% vulnerabilities.	• Includes existing condition 0.2% and future condition 1% vulnerabilities. • S Roadway 115, with significant access issues. Connection between Wink and Pyote town. • S State Highway 18, with significant access issues. Connection between Kermit and Monahans

2.4 Expected Loss of Function

When key community assets are impacted by floods, the associated flood damages may result in reduced or total loss of function of the affected assets. These disruptions can also lead to cascading risks of harm to life, property, and transportation throughout the community. This summary discusses the potential impacts of flood events on the operations and expected functions for the following community assets:

- Fire stations
- Hospitals
- National Shelter System Facility
- Schools
- Intermodal Freight Facility
- Intermodal Transit Facility
- Water treatment plants
- Wastewater treatment plants
- Police departments
- Assisted living facilities
- Natural gas processing plants
- Power plants
- Solar farms

Fire Stations

The public relies heavily on first responders and fire fighters during emergencies such as flood events, and the more substantial the incident, the greater the need for assistance delivered by the fire department and others with public safety missions. During flood events, fire departments coordinate with other agencies and respond to:

- Incidents caused by structural damage from moving water, disruptions to utility services and damage from debris being moved by the water.
- Evacuation of low-lying areas.
- Increased rescue problems or situations such as people trapped in structures by rising waters, and people trapped in motor vehicles by rising waters.
- Damage to infrastructure such as roads and bridges, limiting response. During flood events, the fire department usually works closely with law enforcement and the agencies that maintain the roads and highways.
- Some communities that are prone to severe flood pre-deploy specialized rescue teams when heavy rains are forecast or when ground saturation levels reach predetermined

points. These teams include rescue swimmers, small boat handlers, rope riggers, and team leadership.[7]

If fire service facilities are compromised due to being inundated, there may be cascading impacts on the communities they serve. Service personnel will have limited access to the equipment they need for their operations and this will impede their service delivery. Communication and coordination may be impacted or delayed if communication hubs situated within fire service centers are disabled due to water inundation. If fire service vehicles are parked in low lying areas, flooding of these vehicles will disable them and limit resources during rescue operations. It is therefore imperative that these facilities are prepared for flood events.

Hospitals

Hospitals provide critical services during flood events for vulnerable population groups. Severe flood events can impact medical services, ancillary services such as the functioning of pharmacies, laboratories, blood banks, mechanical systems such as ventilation and lift systems, water and sewer systems.

Severe flood events can both damage hospital facilities directly and disrupt access to them. Damage to the hospital facilities can result in loss of life at worst but also delays in providing routine medical services and emergency services to highly vulnerable populations. Flooding may also lead to direct costs due to damage to infrastructure, or expensive medical equipment. There may also be indirect costs of such as increased risk of outbreaks due to loss of laboratory and diagnostic support, and the loss income normally generated by health care services.[8]

The emergency power supply system is the most critical service in continued operation of a hospital during a power outage. Together with fuel supply and storage facilities, this system enables all the other hospital installations and equipment that have not sustained direct physical damage to function normally in any disaster. However, uninterrupted operation of a hospital during a power outage is possible only if adequate electrical wiring is installed in all the areas that require uninterrupted power supply. Since extra wiring and additional circuits for emergency power increase the initial construction costs of the building, the decision on the emergency power coverage requires a thorough evaluation of the relative vulnerability of various functions to power outage. As patients become more critically ill and the nature of diagnosis and treatment becomes more dependent on computers, monitors, and other electrical equipment, the need for emergency power is pertinent. In some healthcare facilities, to make critical services more accessible for maintenance and monitoring, they are placed on the ground floor or basement. This increases the risks from flooding to these services. Storm water can fill the basements and first floor and cause the backup generators to be inoperable. During flood events, sewers can overflow, back up, or breakdown. Waste disposal is essential for

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[7] FEMA, 2008. *Special Report: Fire Department Preparedness for Extreme Weather Emergencies and Natural Disasters*. [online] Available at: <https://www.usfa.fema.gov/downloads/pdf/publications/tr_162.pdf> [Accessed 24 March 2022].

[8] Yusoff, N., Shafii, H., & Omar, R. (2017). The impact of floods in hospital and mitigation measures: A literature review. *IOP Conference Series: Materials Science And Engineering*, *271*, 012026. doi: 10.1088/1757-899x/271/1/012026

any hospital, because when the toilets back up, or sterilizers, dishwashers, and other automated cleaning equipment cannot be discharged, patient care is immediately affected.[9]

Elevator service is vulnerable not only to power outages, but also to direct damage to elevator installations. The flooding of elevator pits was a common problem during Hurricane Katrina, and responsible for the loss of elevator service.

In anticipation of severe flooding, timely evacuation of some or all of the hospital patients to facilities out of the disaster area may be a prudent choice for patient welfare. Severe floods can cause blockage of access roads, cutting off a hospital from normal evacuation routes. Surface escape routes can be under water and unusable, and air evacuation can be impaired if many ground level helicopter landing pads are under water. Elevated helipads located on roof tops or elevated parking structures are invaluable features in this type of an emergency. The spatial relationship of helipads to hospital building is another aspect that greatly influences the evacuation and reduced the risk of aggravating patients' condition. Helipads physically connected to the hospital are most useful, because patients could be transported directly and very rapidly from the upper levels of the hospital to the helipad without interference from other hospital functions.[9]

When an existing facility is exposed to flooding, or if a new facility is proposed to be in a flood hazard area, steps need to be taken to minimize the risks. A well-planned, designed, constructed, and maintained hospital should be able to withstand damage and remain functional after and during a flooding event.

National Shelter System Facilities

The National Shelter System is a network of facilities that can house individuals in the event of an issued evacuation for the facilities service area. The facilities included in this network are those have been designated as a Shelter by either the Federal Emergency Management Agency (FEMA) or the American Red Cross (ARC).[10] In addition to general population shelters, the system includes:

- Medical shelters, shelter-in-place locations (SIP);
- Household pet shelters, kitchens;
- Points of Distribution (POD's), warehouses
- Warming, cooling, and respite centers;
- Embarkation, Debarkation, and Reception processing sites; and
- Any type of shelter or facility related to the management of the people affected by the operation[11].

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[9] FEMA. (2007). Risk Management Series Design Guide for Improving Hospital Safety in Earthquakes, Floods, and High Winds. *Risk Management Series*. Retrieved from https://www.wbdg.org/FFC/DHS/fema577.pdf

[10] National Shelter System Facilities. (2022). Retrieved 3 April 2022, from https://hifld-geoplatform.opendata.arcgis.com/datasets/geoplatform::national-shelter-system-facilities/about

[11] FEMA. (Not Dated). NATIONAL SHELTER SYSTEM – FACT SHEET. Retrieved from https://www.fema.gov/pdf/media/factsheets/2011/fema_national_shelter_system.pdf

Sheltering facilities are primarily for planned as survival places for the victims displaced after a flood event when rehabilitation is underway immediately afterwards. These will be used only for a short period of time during a flood.

Ideally, shelters should also be located outside areas known to be flood prone, including areas within the 100-year floodplain. Shelters in flood-prone areas will be susceptible to damage from hydrostatic and hydrodynamic forces associated with rising flood waters. Damage may also be caused by debris floating in the water. Most importantly, flooding of occupied shelters may well result in injuries or deaths. Furthermore, shelters located in flood-prone areas, but properly elevated above the 100-year flood elevation, could become isolated if access routes were flooded. As a result, shelter occupants could be injured, and no emergency services would be available.[12]

Schools

Existing schools that are in flood hazard areas are exposed to flood risk. The nature and severity of damage are functions of site-specific characteristics. Damages may impact the property, buildings, , service equipment, and also pose health and safety threats due to contaminated floodwater.

Regardless of the nature and severity of damage, schools impacted by floods are typically not functional while cleanup and repairs are undertaken. The length of closure impacts the ability of the school district to provide instruction and may setback students from achieving their education milestones. The duration of the closure depends on the severity of the damage and lingering health hazards. It may also depend on whether the building was fully insured or whether disaster assistance is made available quickly to allow speedy repairs and reconstruction. Sometimes, repairs are put on hold pending a determination of whether a school should be rebuilt on the same site. When damage is substantial, rehabilitation or reconstruction is allowed by FEMA only if full compliance with flood-resistant design requirements is achieved.[13]

Potential damage identified by FEMA include:[14]

- Health threats - Mold growth and contaminants in flooded schools can pose significant health threats to students and staff.
- Playing field surfaces - In addition to damage by erosion and scour, graded grass fields and applied track surfaces can be damaged by standing water and deposited sediments.
- Vehicles and buses - If left in flood prone areas, vehicles may not be functional and available for service immediately after a flood and must be replaced or cleaned to be serviceable.

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[12] FEMA. (2006). Risk Management Series Design Guidance for Shelters and Safe Rooms. *Risk Management Series*. Retrieved from https://www.fema.gov/pdf/plan/prevent/rms/453/fema453.pdf

[13] National Clearinghouse for Educational Facilities. (2011). Flooding and Schools. *National Clearinghouse For Educational Facilities*. Retrieved from https://files.eric.ed.gov/fulltext/ED539485.pdf

[14] FEMA. (2010). Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds, *FEMA P-424*. Retrieved from https://www.fema.gov/sites/default/files/documents/fema_p-424-design-guide-improving-school-safety.pdf

- Site damage - School grounds may be subject to erosion and scour, with the possible loss of soil and damage to paved areas, including access roads. Large amounts of debris and sediment can accumulate on the site, especially against fences.
- Structural damage - Foundations can be eroded, destabilizing or collapsing walls and heaving floors.
- Saturation damage - Saturated walls and floors can lead to plaster, drywall, insulation, and tile damage, mold and moisture problems, wood decay, and metal corrosion.
- Utility system damage - Electrical wiring and equipment can be shorted, and their metal components corrode. Ductwork can be fouled and expensive heating and cooling equipment ruined. Oil storage tanks can be displaced and leak, polluting the areas around them. Sewers can back up and contaminate the water supply and building components.
- Content damage - School furniture, computers, files, books, lab materials and equipment, and kitchen goods and equipment can be damaged or contaminated.

Intermodal Freight Facility

Flooding events can disrupt the operations of freight transportation facilities and infrastructure. This may result in significant economic impacts due to delivery delays associated with rerouting in affected areas . The inability to deliver to locations that have been cut off from the freight network will also have economic impact. Overall, the cost rates of moving goods, increase as roads become impassable. The need to take alternate routes is likely to increase fuel consumption and lengthen driver on-duty time, both of which increases costs for companies and ultimately consumers. After a severe flood event, there is often increased competition for limited transportation resources and equipment such as shipping containers, trucks and trains. This limited capacity will naturally push costs up, but even if there is affordability, the capacity might be impossible to find. This overall disruption in the supply chain and increase in overall costs will impact community members access to necessary resources.

Water stagnation or other structural damage caused by the floods to freight facilities will limit its operations. It may reduce storage capacity and further stress the supply-chain.[15]

Intermodal Transit Facility

Transportation networks underpin socio-economic development by enabling the movement of goods and people. Disruptions due to flooding of roadway and rail tracks can cause operating services to reroute or suspend service to hard hit areas. Power outages can also disable transit service. Highways and arterials need electrical power to operate traffic lights and signs. Railroads require electricity to operate signal systems and crossing gates. Under this situation, it is likely that headway time will increase as transit is re-routed, travel speed is reduced and hence travel time increases. This leads to substantial economic costs to local commuters. Overall, accessibility to jobs decreases under flooded conditions. As most transit users are from

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[15] Grenzeback, L. R., Lukman, A. T., & Systematics, C. (2008). *Case study of the transportation sector's response to and recovery from Hurricane's Katrina and Rita*. Transportation Research Board.

lower income communities, this raises an equity concern. The closure of transit facilities due to water stagnation will cut-off access for all its users.[16]

Water Treatment Facilities/Plants

Floods can impact the operations of water treatment plants. For example, reductions in the ability to feed raw water to the process tanks or damage to the Automatic Transfer Switch (which detects power failures, initiate generator startup, transfer load, and perform other functions without human intervention would render the facility inoperable. Additionally, the inability to provide high air pressure will limit the operation of pneumatic valves on the treatment process systems. This can also render the facility inoperable.[17]

Flood events may lead to water contamination or reduced water supply, which impacts consumers who rely on these systems for safe drinking water, cooking or cleaning. Depending on the severity of the flood, it could take up to several months to have a water professional monitor and certify it as safe for drinking. Without access to clean drinking water, consumers ultimately become reliant on bottled water which is likely to increase drastically in price during such a time. In poor and impoverished communities, this reality is even more detrimental because they may not have the economic means to “stock up” on bottled water in comparison to more affluent communities. Moreover, during a severe flood event, retail locations are often inaccessible and/or low on water supply as well.[18]

Wastewater Treatment Facilities/Plants

A wastewater treatment plant is most at risk for flooding when it’s in a low-lying area near a water body from which it discharges its final effluent and enables gravity-fed collection systems. Pump stations, where differential head is insufficient for flow, are included in some systems and increases the likelihood of flooding. Pumps develop differential head, or differential pressure. This means the pump takes suction pressure, adds more pressure (the design pressure), and generates discharge pressure . In cases where the differential head is not adequate, the pump station will be located closer to the discharge location. If components are in areas vulnerable to flooding, designing them to be submersible is preferred.[19]

In older water systems, sanitary sewer overflow is an issue. Unexpected heavy rainfalls introduce too much water into the system and can cause pump stations and treatment plants to break down, as well as untreated sewage to overflow from manhole covers and pour into water

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[16] He, Y., Thies, S., Avner, P., & Rentschler, J. (2021). Flood impacts on urban transit and accessibility—A case study of Kinshasa. *Transportation Research Part D: Transport And Environment*, *96*, 102889. doi: 10.1016/j.trd.2021.102889

[17] FLOOD RESILIENCE A Basic Guide for Water and Wastewater Utilities. (EPA, 2014). Retrieved from: https://www.epa.gov/sites/default/files/2015-08/documents/flood_resilience_guide.pdf

[18] Flooding's Impact on Public Water Supplies, Sanitation. (Water Utility Management, 2021). Retrieved from: https://www.waterworld.com/water-utility-management/article/14211783/floodings-impact-on-public-water-supplies

[19] Tips for Flood-Proofing Wastewater Treatment Plants. (Nielson, 2018). Retrieved from: https://atsinnovawatertreatment.com/blog/flood-proof-wastewater-treatment-plant/

bodies. The outflow of raw sewage can endanger the local aquatic ecosystem and impact water quality.[20]

Excess floodwater can contaminate private drinking water sources, such as wells and springs, when rainfall makes contact with the ground and comes into contact with contaminants such as animal waste. This increases the amount of bacteria, sewage, and other industrial waste or chemicals that seep into the water source or leaky pipes. Additionally, excess water makes it more difficult for water treatment devices to treat the water efficiently and effectively. If there is any contamination at any step of the water flow process, this puts consumers at risk of exposure to dangerous toxins that could result in serious harm such as wound infections, skin rashes, gastrointestinal illnesses, and tetanus.[21]

Police Departments

The police co-ordinate with emergency services during a major flood and assist with the evacuation of people from their homes when necessary. If police facilities are compromised due to being inundated, there may be cascading impacts on the communities they serve. Service personnel will have limited access to the equipment they need for their operations and this will impede their service delivery. Communication and coordination may be impacted or delayed if communication hubs that are situated within police stations are disabled due to water inundation. If police vehicles are parked in low lying areas, flooding of these vehicles will disable them and limit resources during rescue operations. It is therefore imperative that these facilities are prepared for flood events.

Assisted Living Facilities

Assisted living facilities tend to house vulnerable, medically frail elderly and disabled residents. The residents, in the case of severe floods, tend to have lesser resources and higher health risks during evacuation. If inundated during flood events, assisted living facilities will have limited capacity to provide the necessary care needed for its residents in the form of power, food and water, medications, and supplies.

Assisted living facilities ideally require an emergency stockpile of medications and medical supplies adequate to cover all residents in the facility for at least 72 hours and ideally, up to a week. In the case of both food and medications/supplies, facility leaders may face supply chain issues after severe flood events. Even if they have secured purchasing agreements with more than one vendor, if roadways are flooded, delivery may be difficult or impossible, and supplies may be scarce.[22]

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[20] Sewage Floods Likely to Rise. (Scientific America, 2016). Retrieved from: https://www.scientificamerican.com/article/sewage-floods-likely-to-rise/

[21] Flooding's Impact on Public Water Supplies, Sanitation. (Water Utility Management, 2021). Retrieved from: https://www.waterworld.com/water-utility-management/article/14211783/floodings-impact-on-public-water-supplies

[22] Emergency Preparedness Planning for Nursing Homes and Residential Care Settings in Vermont. (JSI, 2010). Retrieved from: https://www.michigan.gov/documents/mdch/Emergency_Preparedness_Planning.-_Vermont_428874_7.pdf

Natural Gas Processing Plants

Impacts from flooding of natural gas processing plants can include damage to infrastructure assets and disruption to service. Severe flooding at the regional scale can lead to supply chain disruptions and delays in in transporting Liquified Natural Gas (LNG) products to the market. Natural gas processing plants in the study area include plants which produce petroleum products such as natural gas, propane, butane, and condensate from raw natural gas or carbon dioxide. Petroleum products such as propane and butane serve as fuel for other industrial processes.

In the case of carbon capture plants, flood damages could disrupt or reduce carbon sequestration and could cause an interruption in the production of methane gas, which is the byproduct of the carbon capture process. As methane is also used to retrieve oil and natural gas from underground deposits, interruptions to carbon capture facilities due to flooding could have cascading impacts on other parts of the oil and natural gas supply chain.

Severe flooding of facilities can impact labor productivity and safety. In some cases, it can lead to environmental contamination that will require separate remediation efforts. If damage to the facilities cannot be restored quickly after a flood event, the limitation in production will have economic consequences. This may be in the form of an increase in product price that could then cascade to other products in the supply-chain. For instance, liquid propane gas is a necessary ingredient in the production of propylene, the building block of the plastic polypropylene. That particular plastic is used in the making of automotive interiors and packaging.

Power Plants

Severe flooding can disrupt the electricity supply chain, including electricity generation, transmission and distribution. Flood risks to electricity generation are a consequence of the need for most power plants to be close to sources of cooling water for their operations. In most cases, these are located next to natural water bodies such as lakes. As a result, they tend to be located in low lying areas and are prone to flooding. Floods can impact power plants in several ways including damage to equipment, which can knock out the plant's electrical systems and disable its cooling mechanisms. This in turn, may limit or halt electricity generation. Power plants that require fossil fuels for operation can be impacted by limited fuel supply if there are delays in the supply chain or flood damage to transportation infrastructure such as roadways and ports.

After severe flood events, key community assets such as police and fire stations, and hospitals, will rely on backup generators until power is restored. Damage to the network would need to be fixed as soon as possible. In cases where the power plants are limited in generating electricity, even after transmission and distribution infrastructure is restored, the shortage in supply may lead to a rise in price, which will have a disproportionate impact on lower income communities. Shortages of electricity will impact every household and business is likely to have wide reaching economic and quality of life repercussions. [23]

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[23] Climate change, disasters and electricity generation. Urban, F., & Mitchell, T. (2011). Retrieved from: https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.825.4966&rep=rep1&type=pdf

Solar Farms

When solar farms are located in low lying areas, they are prone to inundation which may impact their operations. Solar panels can be damaged by floods but selecting high quality components such as module junction boxes, backsheets and cables can dramatically increase the resilience of panels and a solar powered farm to floods.

The continuous immersion in water has the potential to adversely affect the bottom of solar panels, which consists of a module junction box and a backsheet. Cables that go from solar panels to inverters can potentially be damaged by flood water as these parts are exposed to the outside to a large extent. Design interventions and material selection can minimize damage.[24]

Solar farms play important role in community resilience. After severe flood events, key community assets such as police and fire stations and hospitals, rely on backup generators until power is restored. More frequent storms and flood events increases the importance of the electricity system to become less centralized so that when one component of the distribution or generation system stops working, others can remain online. A less centralized system would be less vulnerable to mass outages when a power line breaks or when a substation floods. A more decentralized system is well-suited to renewable energy, and solar energy in specific, which is spread out across the grid.[25]

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[24] Can Solar Panels be Damaged by Floods? - Solar Mango – #1 guide for solar. (2022). Retrieved 6 May 2022, from https://www.solarmango.com/2016/08/07/can-solar-panels-damaged-floods/

[25] Solar Energy Largely Unscathed by Hurricane Florence's Wind and Rain - Inside Climate News. (2022). Retrieved 6 May 2022, from https://insideclimatenews.org/news/20092018/hurricane-florence-solar-panel-energy-resilience-extreme-weather-damage-wind-flooding/

Appendix 2A
Existing Condition Flood Risk Summary Table

Appendix Table 2A: Existing Condition Flood Risk Summary Table

		1% Annual Chance Flood Risk										0.2% Annual Chance Flood Risk*							
County	Area in Flood Planning Region (sq. mi.)	Area in Floodplain (sq. mi.)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population (daytime)	Population (nighttime)	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)	Area in Floodplain (sq. mi.)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)
Andrews	269	85	9	0	41	30	41	0	8	18	0	20	1	0	2	0	2	5	0
Brewster	6,171	1,238	2,640	1,615	4,943	7,217	7,217	338	210	43	7	170	351	213	838	4	30	6	0
Crane	782	227	277		293	591	591	12	41	3	1	74	94	0	189	0	19	1	2
Crockett	2,720	527	1,292	680	1,027	2,392	2,392	355	187	7	8	53	169	83	296	4	23	1	0
Culberson	3,799	843	567	115	362	1,382	1,382	295	317	32	0	116	87	32	183	5	33	4	0
Ector	282	63	340	234	346	606	606	3	26	0.4	0	18	100	80	152	0	8	0.11	0
Edwards	444	91	58	27	5	127	127	44	19	0.3	0	6	8	1	18	0	1	0.02	0
El Paso	1,010	179	21,377	16,860	68,858	70,260	70,260	834	458	61	37	66	8,450	6416	33947	89	149	15	24
Hudspeth	4,550	937	823	44	1,002	1,629	1,629	285	288	246	3	218	93	2	205	3	31	61	0
Jeff Davis	2,254	395	660	135	720	1,431	1,431	201	63	53	1	60	117	17	261	5	11	9	0
Loving	674	167	95	2	25	291	291	10	17	4	1	45	57	5	174	0	9	1	0
Midland	7	2	7	2	2	20	20	0	3	0.004	0	1	7	6	19	0	0.2	0.0001	0
Pecos	4,744	1,055	1,040	370	2,713	3,424	3,424	212	284	47	9	256	466	247	1325	28	100	11	4
Presidio	3,841	734	1,353	696	1,081	2,973	2,973	274	122	45	0	114	272	138	518	25	24	9	1
Reagan	83	11	2	0	0	3	3	1	0.01	0.01	0	2	0	0	0	0	0	0.0008	0
Reeves	2,632	717	3,535	1,580	6,287	10,707	10,707	141	337	18	10	238	1,174	473	3805	16	133	9	2
Schleicher	332	50	33	5	6	73	73	0	5	4	0	8	7	0	21	0	2	1	0
Sutton	798	154	963	492	1,336	1,562	1,562	212	96	2	5	11	173	100	337	3	9	0.1	1
Terrell	2,349	453	391	146	149	945	945	179	51	3	2	49	105	43	246	0	11	0.3	0
Upton	759	140	331	185	388	599	599	19	28	1	3	26	313	198	773	5	15	0.1	2
Val Verde	2,871	656	577	147	102	1,393	1,393	411	163	22	0	45	95	15	235	2	14	1	0
Ward	833	281	2,071	470	2,508	4,189	4,189	114	196	4	4	70	1,131	294	2152	0	73	1	3
Winkler	827	281	1,680	1,126	2,101	3,675	3,675	3	126	3	4	91	1,020	743	2289	0	48	1	2
Total	43,031	9,285	40,121	24,931	94,295	115,519	115,530	3,943	3,047	615	95	1,755	14,290	9,106	47,985	189	746	135	41

*0.2% AC flood exposure results are reported separately from the 1% AC results and do not include cumulative flood hazard areas or property impacts from 1% AC flood hazard areas.

Appendix Table 2A: Existing Condition Flood Risk Summary Table (Continued)

County	Possible Flood Prone Areas								Average SVI of features in floodplain or flood prone areas
	Area (sq. mi.)	Number of Structures in Flood Prone Area	Residential Structures in Flood Prone Area	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)	
Andrews	-	-	-	-	-	-	-	-	0.234
Brewster	0.1	91	81	216	-	2	-	-	0.515
Crane	-	-	-	-	-	-	-	-	0.559
Crockett	-	-	-	-	-	-	-	-	0.607
Culberson	-	-	-	-	-	-	-	-	0.935
Ector	-	-	-	-	-	-	-	-	0.593
Edwards	-	-	-	-	-	-	-	-	0.470
El Paso	9	7450	6004	33755	8	77	2	18	0.665
Hudspeth	89	724	42	1382	23	95	18	4	0.932
Jeff Davis	-	-	-	-	-	-	-	-	0.408
Loving	-	-	-	-	-	-	-	-	0.502
Midland	-	-	-	-	-	-	-	-	0.664
Pecos	-	-	-	-	-	-	-	-	0.502
Presidio	0.2	51	41	124	-	1	0.0004	1	0.916
Reagan	-	-	-	-	-	-	-	-	0.558
Reeves	0.1	13	-	37	-	0.4	-	-	0.646
Schleicher	-	-	-	-	-	-	-	-	0.534
Sutton	-	-	-	-	-	-	-	-	0.651
Terrell	-	-	-	-	-	-	-	-	0.453
Upton	-	-	-	-	-	-	-	-	0.539
Val Verde	-	-	-	-	-	-	-	-	0.549
Ward	0.4	97	-	226	-	3.0	0.001	-	0.531
Winkler	-	-	-	-	-	-	-	-	0.555
Total	99	8,426	6,168	35,740	31	178	21	23	

Appendix 2B
Future Condition Flood Risk Summary Table

Appendix Table 2B: Future Condition Flood Risk Summary Table

County	Area in Flood Planning Region (sq. mi.)	1% Annual Chance Flood Risk								0.2% Annual Chance Flood Risk*							
		Area in Floodplain (sq. mi.)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)	Area in Floodplain (sq. mi.)	Number of Structures in Floodplain	Residential Structures in Floodplain	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)
Andrews	269	85	9	0	41	0	8	18	0	20	1	0	2	0	2	5	0
Brewster	6,171	1,239	2,798	1,730	7,534	339	214	43	7	171	359	234	856	4	32	6	0
Crane	782	228	333		950	12	42	3	3	74	128	0	249	2	20	1	2
Crockett	2,720	527	1,396	764	2,577	355	189	7	8	53	77	7	135	5	23	1	0
Culberson	3,799	843	629	148	1,482	295	319	32	0	116	443	327	1,094	6	42	4	2
Ector	282	63	340	234	606	3	26	0.4	0	18	100	80	152	0	8	0	0
Edwards	444	91	58	27	127	44	19	0.3	0	6	8	1	18	0	1	0	0
El Paso	1,010	356	46,530	37,576	204,426	975	1,199	99	112	105	29,219	24,513	96,095	68	420	25	43
Hudspeth	4,550	1,004	936	45	1,868	287	296	270	3	229	121	4	283	8	37	65	0
Jeff Davis	2,254	395	686	145	1,474	201	64	53	1	61	185	43	391	5	14	9	1
Loving	674	167	104	6	311	10	17	4	1	45	52	4	164	0	9	1	0
Midland	7	2	7	2	20	0	3	0.004	0	1	7	6	19	0	0.2	0	0
Pecos	4,744	1,056	1,269	539	4,023	212	293	48	10	256	418	185	953	30	103	11	3
Presidio	3,841	735	1,447	768	3,125	277	125	45	0	114	421	240	774	23	26	9	1
Reagan	83	11	2	0	3	1	0.01	0.01	0	2	0	0	0	0	0	0.001	0
Reeves	2,632	717	3,550	1,586	10,726	141	341	18	10	238	1,208	478	3,993	18	134	9	2
Schleicher	332	50	33	5	73	0	5	4	0	8	7	0	21	0	2	1	0
Sutton	798	154	1,101	590	1,784	212	98	2	6	11	85	42	190	5	8	0.1	0
Terrell	2,349	453	424	173	1,028	179	51	3	2	49	83	21	184	0	10	0.3	0
Upton	759	140	377	211	689	19	30	1	4	26	440	302	843	6	16	0.1	1
Val Verde	2,871	656	587	155	1,409	411	163	22	0	45	88	8	222	2	14	1	0
Ward	833	287	2,650	518	5,319	114	211	4	7	70	753	246	1,549	1	67	1	0
Winkler	827	283	1,868	1,266	4,083	3	131	3	5	92	964	700	2,115	0	46	1	1
Total	43,031	9,543	67,134	46,488	253,678	4,090	3,846	678	179	1,807	35,167	27,441	110,302	183	1,035	149	56

*0.2% AC flood exposure results are reported separately from the 1% AC results and do not include cumulative flood hazard areas or property impacts from 1% AC flood hazard areas.

Appendix Table 2B: Future Condition Flood Risk Summary Table (Continued)

County	Possible Flood Prone Areas								Average SVI of features in floodplain or flood prone areas
	Area (sq. mi.)	Number of Structures in Flood Prone Area	Residential Structures in Flood Prone Area	Population	Roadway Stream Crossings (#)	Roadways Segments (miles)	Agricultural Areas (sq. mi.)	Critical Facilities (#)	
Andrews	-	-	-	-	-	-	-	-	0.234
Brewster	0.1	91	81	216	-	2	-	-	0.515
Crane	-	-	-	-	-	-	-	-	0.559
Crockett	-	-	-	-	-	-	-	-	0.607
Culberson	-	-	-	-	-	-	-	-	0.935
Ector	-	-	-	-	-	-	-	-	0.593
Edwards	-	-	-	-	-	-	-	-	0.470
El Paso	7	6079	5101	23907	8	43	1	13	0.718
Hudspeth	84	681	40	1306	19	90	14	4	0.932
Jeff Davis	-	-	-	-	-	-	-	-	0.408
Loving	-	-	-	-	-	-	-	-	0.502
Midland	-	-	-	-	-	-	-	-	0.664
Pecos	-	-	-	-	-	-	-	-	0.502
Presidio	0.2	36	28	99	-	1	0.0004	1	0.916
Reagan	-	-	-	-	-	-	-	-	0.558
Reeves	0.1	13	-	37	-	0.4	-	-	0.646
Schleicher	-	-	-	-	-	-	-	-	0.534
Sutton	-	-	-	-	-	-	-	-	0.651
Terrell	-	-	-	-	-	-	-	-	0.453
Upton	-	-	-	-	-	-	-	-	0.545
Val Verde	-	-	-	-	-	-	-	-	0.549
Ward	0.4	92	-	195	-	3	0.001	-	0.532
Winkler	-	-	-	-	-	-	-	-	0.555
Total	91	6,992	5,250	25,760	27	139	15	18	

Appendix 2C
Comparison of Draft Fathom Floodplain Data in Region 14 (Memo)

AquaStrategies
Water Planning, Science & Engineering

Memorandum

TO: Jeff Irvin, AECOM

FROM: Paul Southard, Aqua Strategies

THROUGH: Barney Austin, Aqua Strategies

DATE: August 6th, 2021

RE: Comparison of Draft Fathom Floodplain with 1D-Derived Floodplain Maps used in TWDB Floodplain Quilt in Region 14, West Texas

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This document details a comparison of floodplain maps produced by the Fathom pluvial and fluvial floodplain models at a 30m resolution and traditional 1D-derived floodplain mapping methods that are incorporated into the TWDB Flood Hazard Quilt[1] for TWDB flood mapping Region 14. Fathom results are compared to all four of the flood hazard maps available in the quilt, presented below in order of accuracy and subsequent prioritization in the TWDB flood quilt:

1. Preliminary recent National Flood Hazard Layer (NFHL) flood hazard zones
2. Effective NFHL flood hazard zones
3. Base Level Engineering (BLE) flood hazard maps.
4. First American Flood Data Services (FAFDS) flood hazard maps

In all cases, the comparison detailed here is of the 100-yr recurrence interval, 1% probability flood. Fathom fluvial defended and pluvial datasets are colored to show depth of flooding in cm, and any of the data sources from the TWDB Flood Hazard Quilt just show the areal extent of flooding. Note that Fathom pluvial and fluvial results are clipped for any depth less than 20 cm in an attempt to remove the many very small, disconnected, shallow areas of pluvial flooding in this dataset. Also, note that areas outside of the border of Texas, which can be seen somewhat in some of the figures, have invalid data and should not be considered in this comparison. Final Fathom datasets will be merged and combined with forthcoming coastal data to produce a final floodplain map. Final floodplain maps will also be converted to 3m resolution using downscaling techniques.

It is important to note that the Fathom model methodology in some cases differs from typical floodplain modeling that informs the NFHL and, subsequently, the FEMA Flood Insurance Rate Map (FIRM). For one thing, the Fathom model is a 2D model, and NFHL results are from 1D models. Fathom also uses high resolution topography data from LiDAR, which may only be implemented in some 1D modeling, or may be more recent than elevation datasets used in NFHL models. Additionally, Fathom may implement hydrologic structures that would affect flooding differently than NFHL models. It should be noted that levees in particular are implemented in the Fathom model by ensuring that water cannot enter service areas of levees for

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[1] https://twdb-flood-planning-resources-twdb.hub.arcgis.com/pages/flood-hazard-quilt

simulations where the return period is lower than the design standard of the levee. Levees that are represented in this way are those that are available in the USACE National Levees Database (NLD).

NFHL Preliminary Data

Preliminary NFHL data represents future updates to the NFHL map that have been released for review, and subsequently details results of very recent flood studies. In Region 14, preliminary data is only available in the vicinity of El Paso.

The Fathom data details floodplains north (Figure 1a upper left) and east (Figure 1b lower left and upper center) of the city that are not present in preliminary NFHL data. Additionally, wide swaths of the city adjacent to the Rio Grande are mapped as floodplains in the preliminary data and not included in the Fathom data (Figure 1a lower left), as well as large areas to the south and east of the city (Figure 1c lower center and top left). The Fathom and preliminary NFHL floodplains are reasonably similar in many of the smaller tributaries in this region (Figure 1a center, Figure 1b upper left, Figure 1c lower left).

NFHL Effective Data

Effective NFHL data is effective in the current FEMA FIRM (FIRM) and is available in some locations from “Detailed” studies and in others from “Approximate” studies. These data are combined here for the purposes of comparison against Fathom results. These data are only available in the southeast corner of El Paso, in an area that is much smaller than for the preliminary NFHL data.

In areas where NFHL data from a detailed study is available, it is typically much more extensive and continuous than Fathom results (Figure 2a and Figure 2b). That being said, there are also locations where NFHL detailed study flood zones are confined in narrow areas and are in close agreement with Fathom floodplains (Figure 2a lower right). Fathom also identifies more widespread, small areas of flooding than NFHL data (Figure 2b). Fathom does not identify flooding in portions of the Rio Grande that are available from NFHL approximate studies (Figure 2b lower left and Figure 2c).

BLE Data

BLE data can be used as best available information in areas that are Zone A’s in the FIRM from approximate studies. For Region 14, BLE data is only available in the vicinity of El Paso, for the same area as the preliminary NFHL data. BLE data are quite similar to preliminary NFHL data, and the same areas are shown in Figure 3 as in Figure 1.

The Fathom data still details large, continuous floodplain running parallel to the Rio Grande (Figure 3a upper left) and north and east of El Paso (Figure 3b lower left and upper center) that are not present in the BLE data. Areas adjacent to the Rio Grande that are in the floodplain (Figure 3a lower left) are considerably less extensive and continuous than they were in the preliminary NFHL data. In these areas, the Fathom floodplain is still much narrower and less continuous, but it is closer than it was in the preliminary NFHL data. Large floodplain extents to the south and east of the city are also present in the BLE data that are considerably wider than Fathom floodplains (Figure 3b lower right and Figure 3c). The Fathom and BLE floodplains are reasonably similar in many of the smaller tributaries in this region (Figure 3a center, Figure 3b upper left, Figure 3c lower left), as they were for the preliminary NFHL data.

FAFDS Data

FAFDS flood hazard maps contain digitized flood hazard information from historical FIRMs and Flood Information Studies. For Region 14, FAFDS data are available throughout most of the planning region.

Several extensive floodplains in broad, flat basins located southwest of the Guadalupe mountains are detailed in FAFDS data for which Fathom floodplains are also present, but are considerably narrower (Figure 4a). The floodplains for the two datasets in drainage networks upslope of these basins are quite similar, but Fathom floodplains usually extend further upstream (Figure 4a lower left). In areas of Amistad's upland watershed with well-defined drainage networks, the floodplains for the two datasets are quite similar, with the Fathom floodplain being just slightly narrower (Figure 4b). Closer to Amistad, the FAFDS floodplain is considerably wider than the Fathom floodplain, but the Fathom floodplain extends farther upstream (Figure 4c).

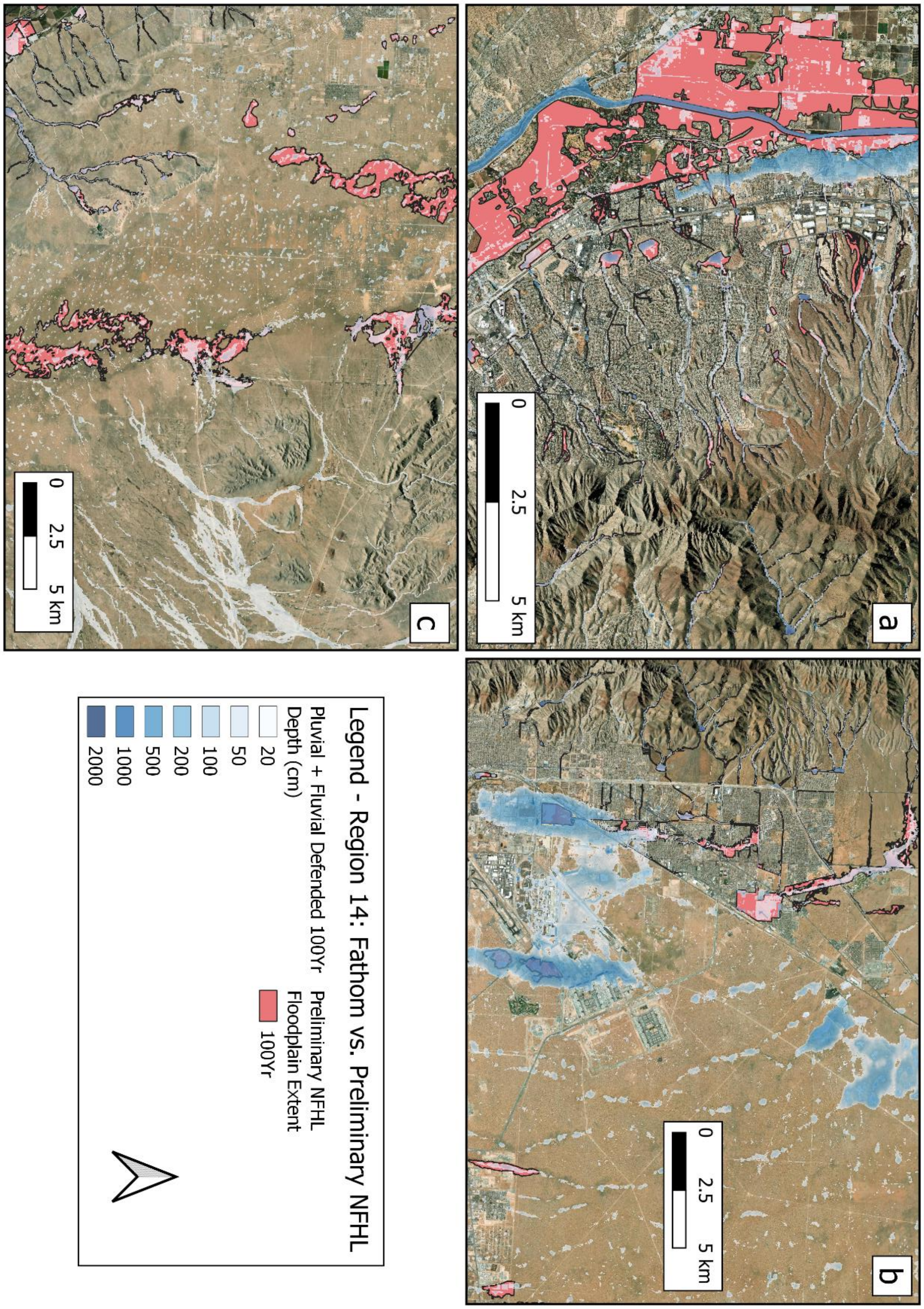


Figure 1: Comparison of Fathom floodplain with preliminary NFHL data just northwest of El Paso (a), just northeast of El Paso (b) and east of Horizon City (c).

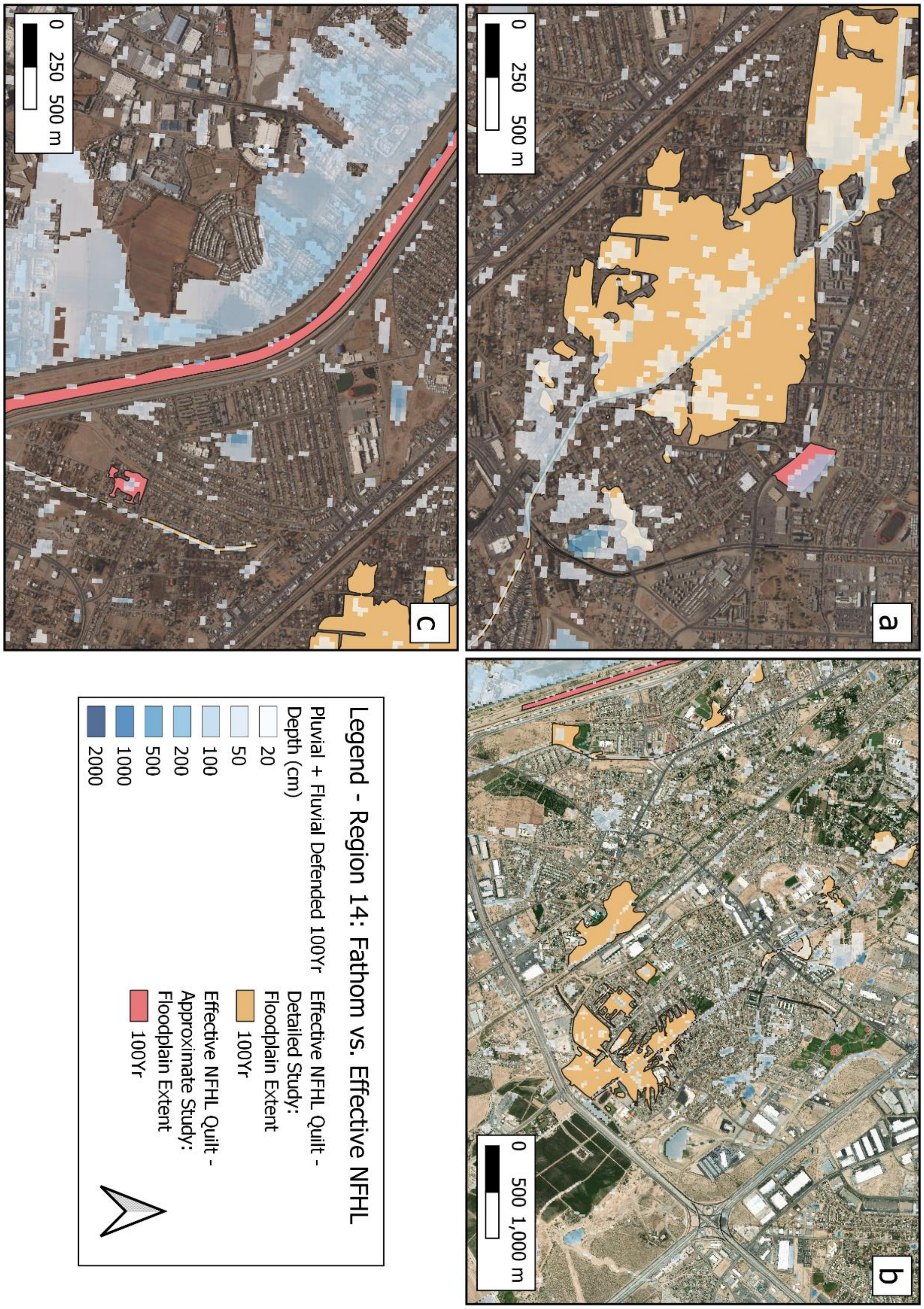


Figure 2: Comparison of Fathom floodplain with effective NFHL data just southeast of El Paso (a, b, c).

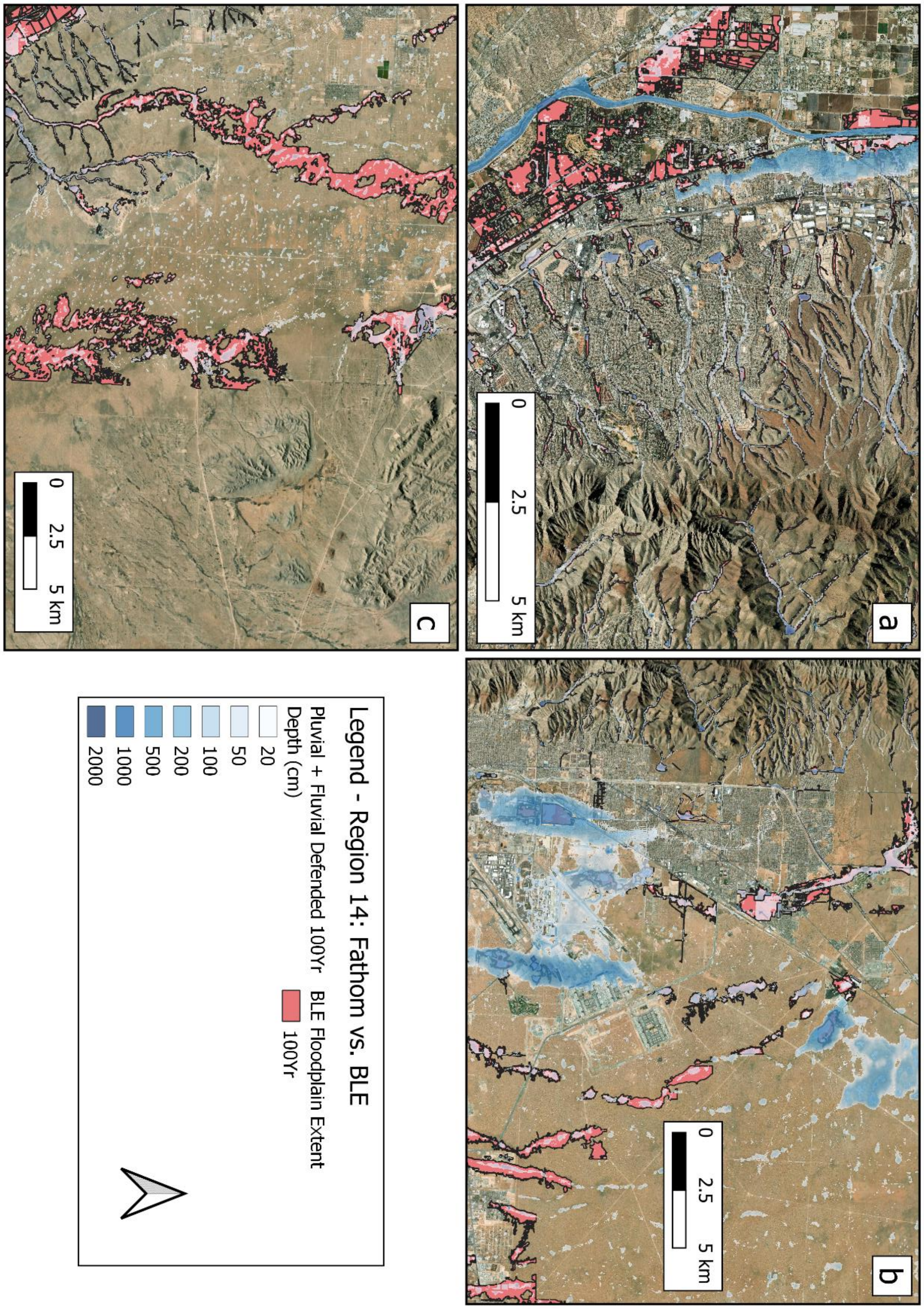


Figure 3: Comparison of Fathom floodplain with BLE data just northwest of El Paso (a), just northeast of El Paso (b) and east of Horizon City (c).

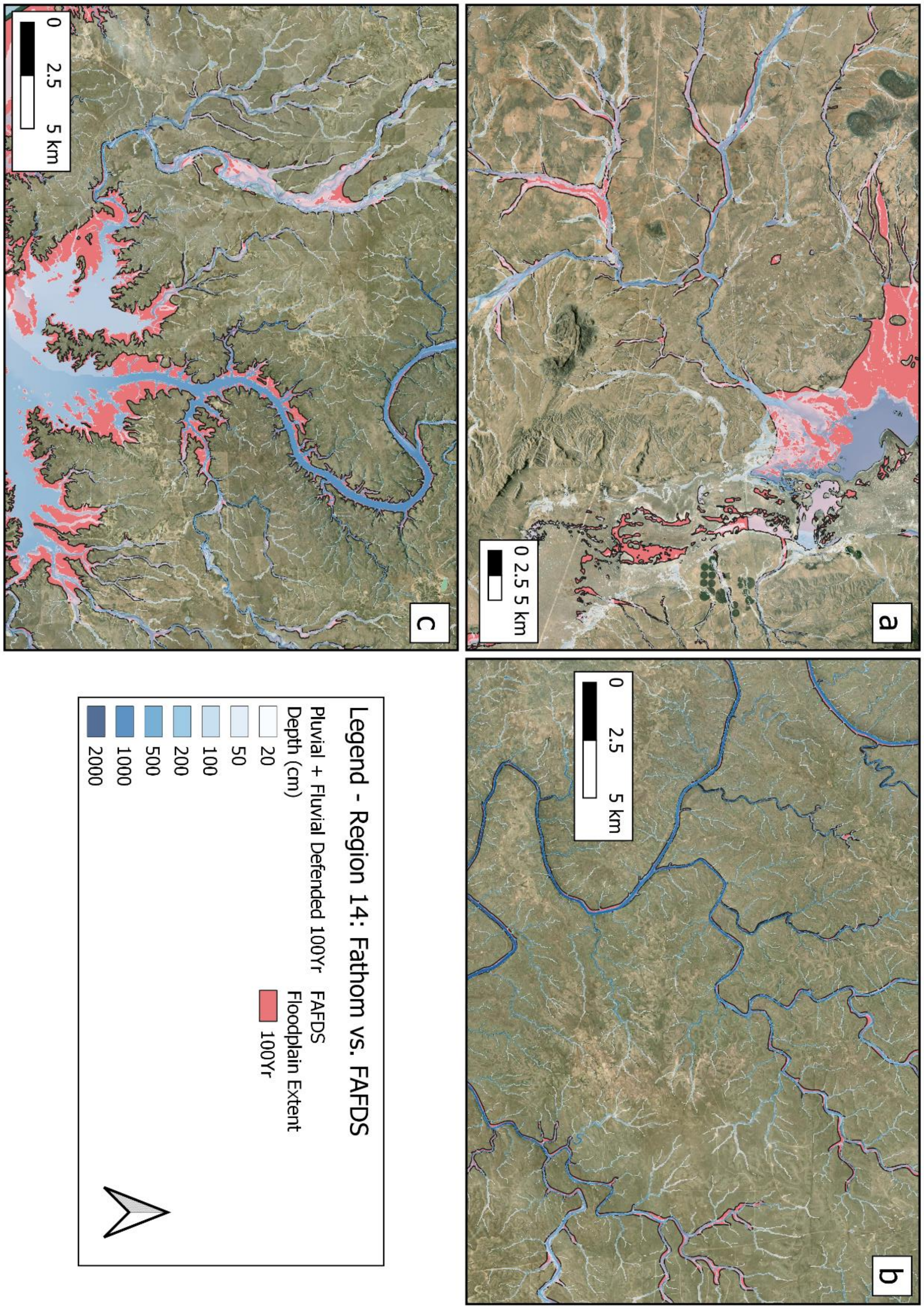
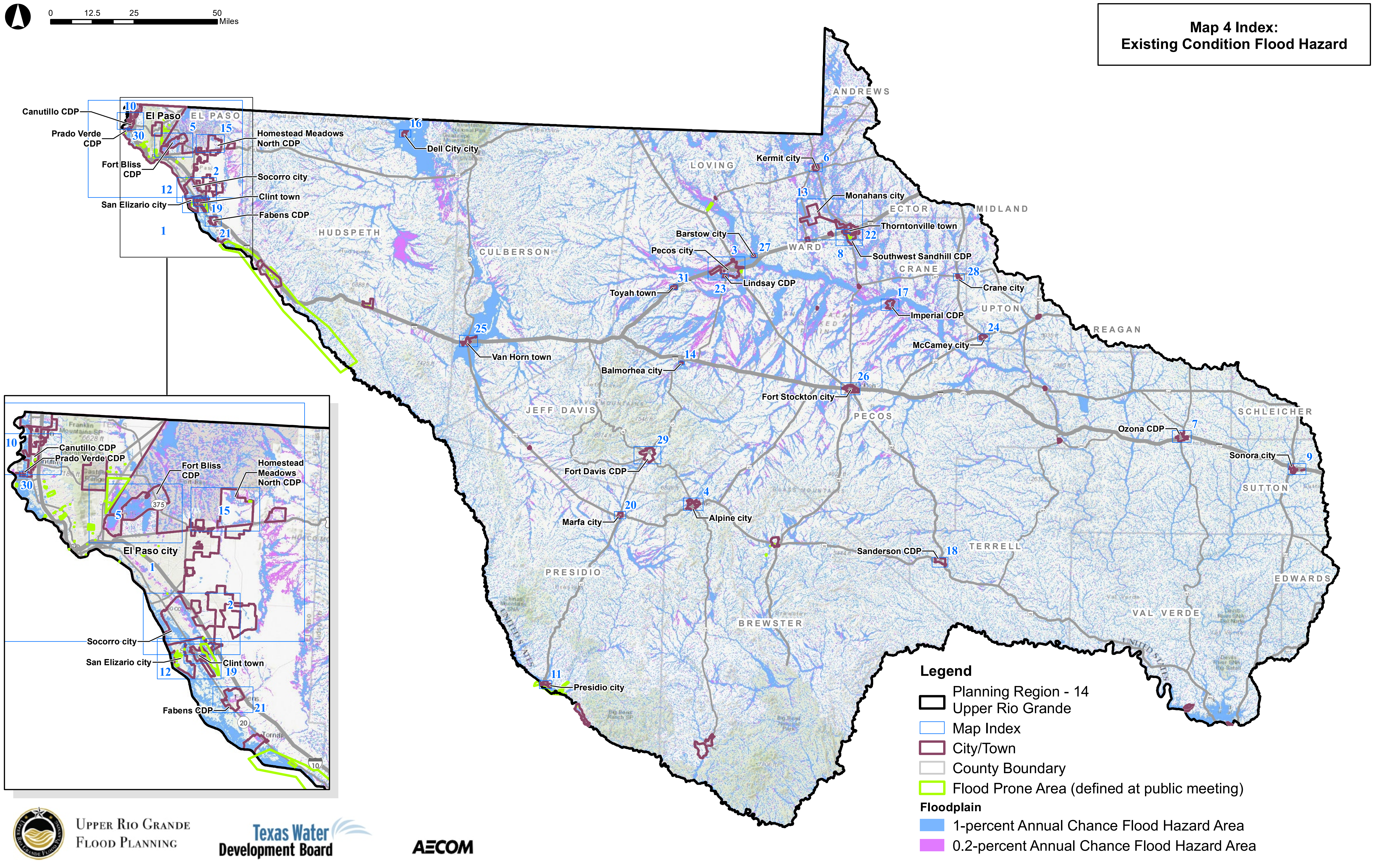


Figure 4: Comparison of Fathom floodplain with FAFDS data south of Dell City (a), northwest of Comstock (b) and at Lake Amistad (c).

Appendix 2D
Map Exhibits

Map 4 Index:
Existing Condition Flood Hazard



Legend

- ▭ Planning Region - 14 Upper Rio Grande
- ▭ Map Index
- ▭ City/Town
- ▭ County Boundary
- ▭ Flood Prone Area (defined at public meeting)

Floodplain

- 🟦 1-percent Annual Chance Flood Hazard Area
- 🟪 0.2-percent Annual Chance Flood Hazard Area

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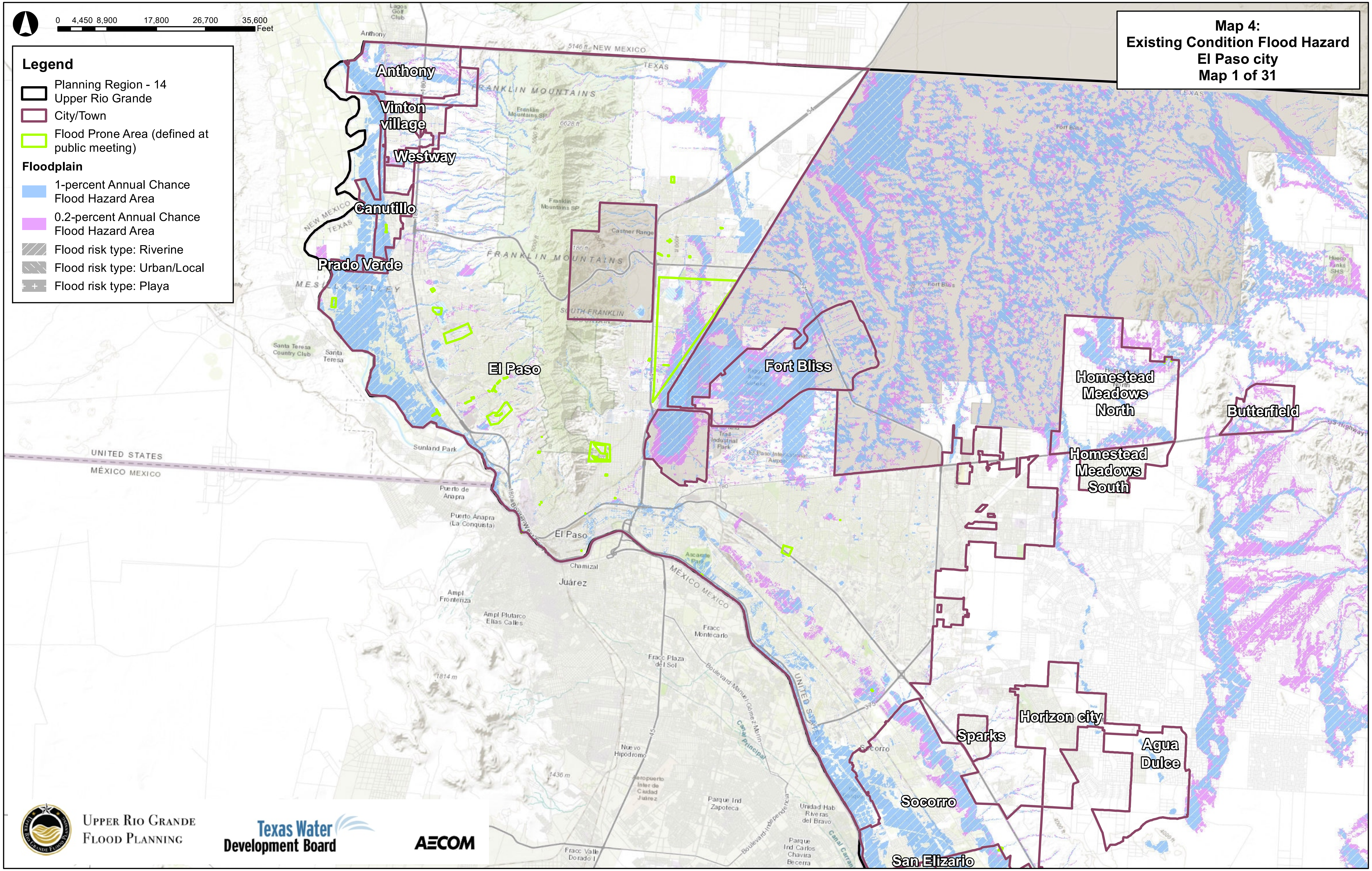
Map 4:
Existing Condition Flood Hazard
El Paso city
Map 1 of 31



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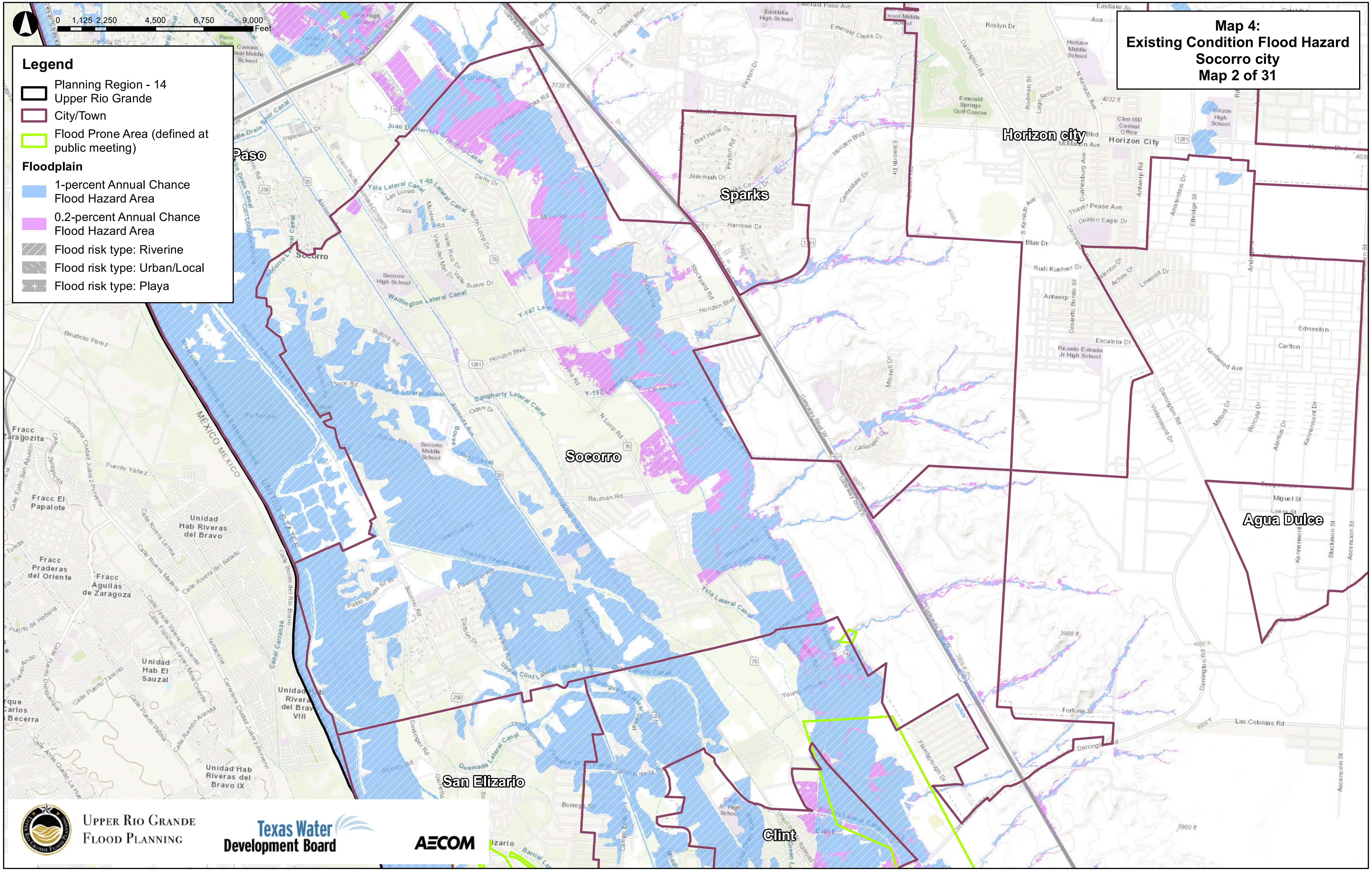
Map 4:
Existing Condition Flood Hazard
Socorro city
Map 2 of 31



Legend

▭ Planning Region - 14 Upper Rio Grande

▭ City/Town

▭ Flood Prone Area (defined at public meeting)

Floodplain

🟦 1-percent Annual Chance Flood Hazard Area

🟪 0.2-percent Annual Chance Flood Hazard Area

▨ Flood risk type: Riverine

▨ Flood risk type: Urban/Local

▨ Flood risk type: Playa

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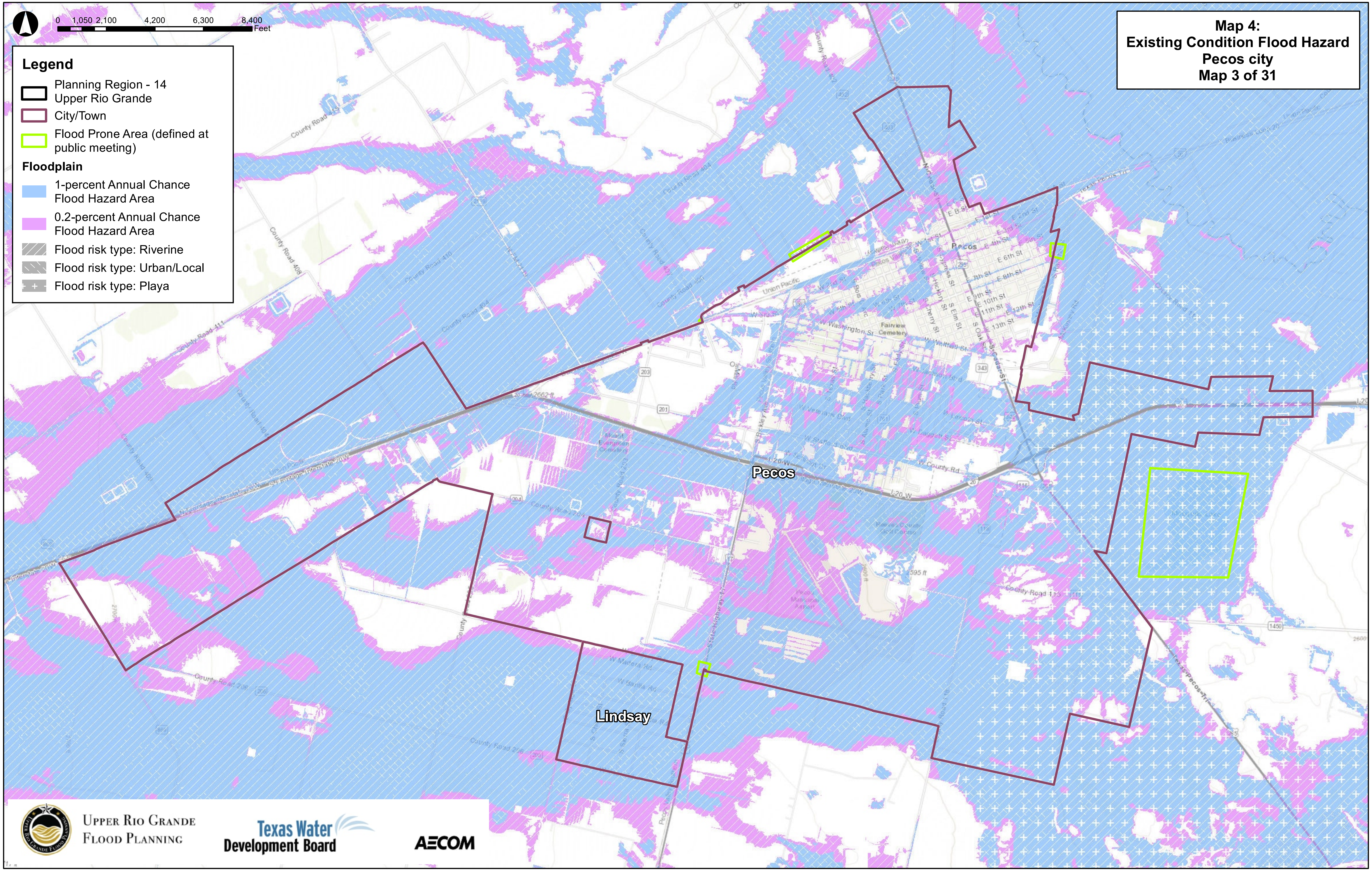

Map 4:
Existing Condition Flood Hazard
Pecos city
Map 3 of 31

Legend

- ▭ Planning Region - 14 Upper Rio Grande
- ▭ City/Town
- ▭ Flood Prone Area (defined at public meeting)

Floodplain

- 🟦 1-percent Annual Chance Flood Hazard Area
- 🟪 0.2-percent Annual Chance Flood Hazard Area
- ▨ Flood risk type: Riverine
- ▧ Flood risk type: Urban/Local
- ⊞ Flood risk type: Playa

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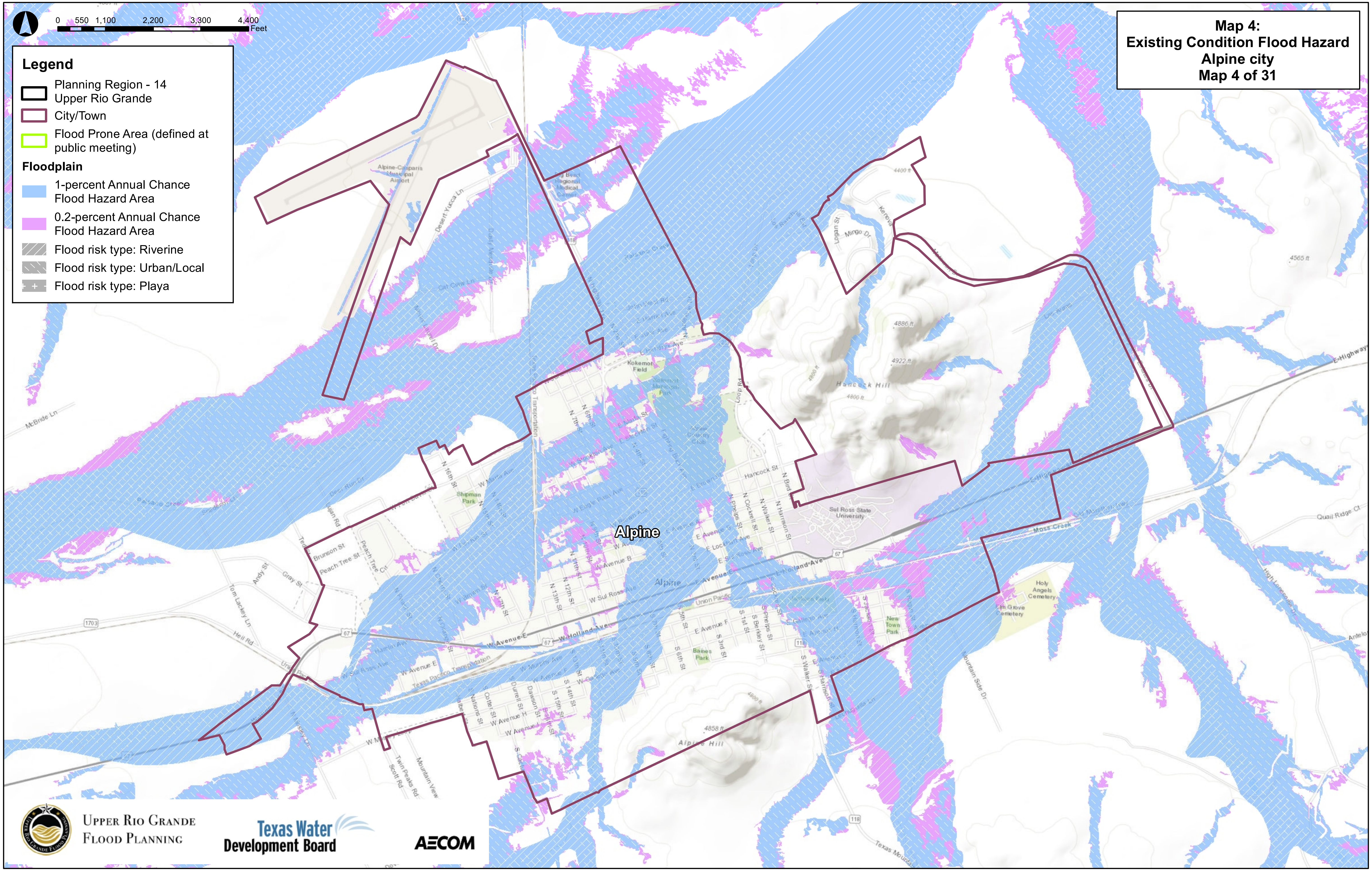
Map 4:
Existing Condition Flood Hazard
Alpine city
Map 4 of 31



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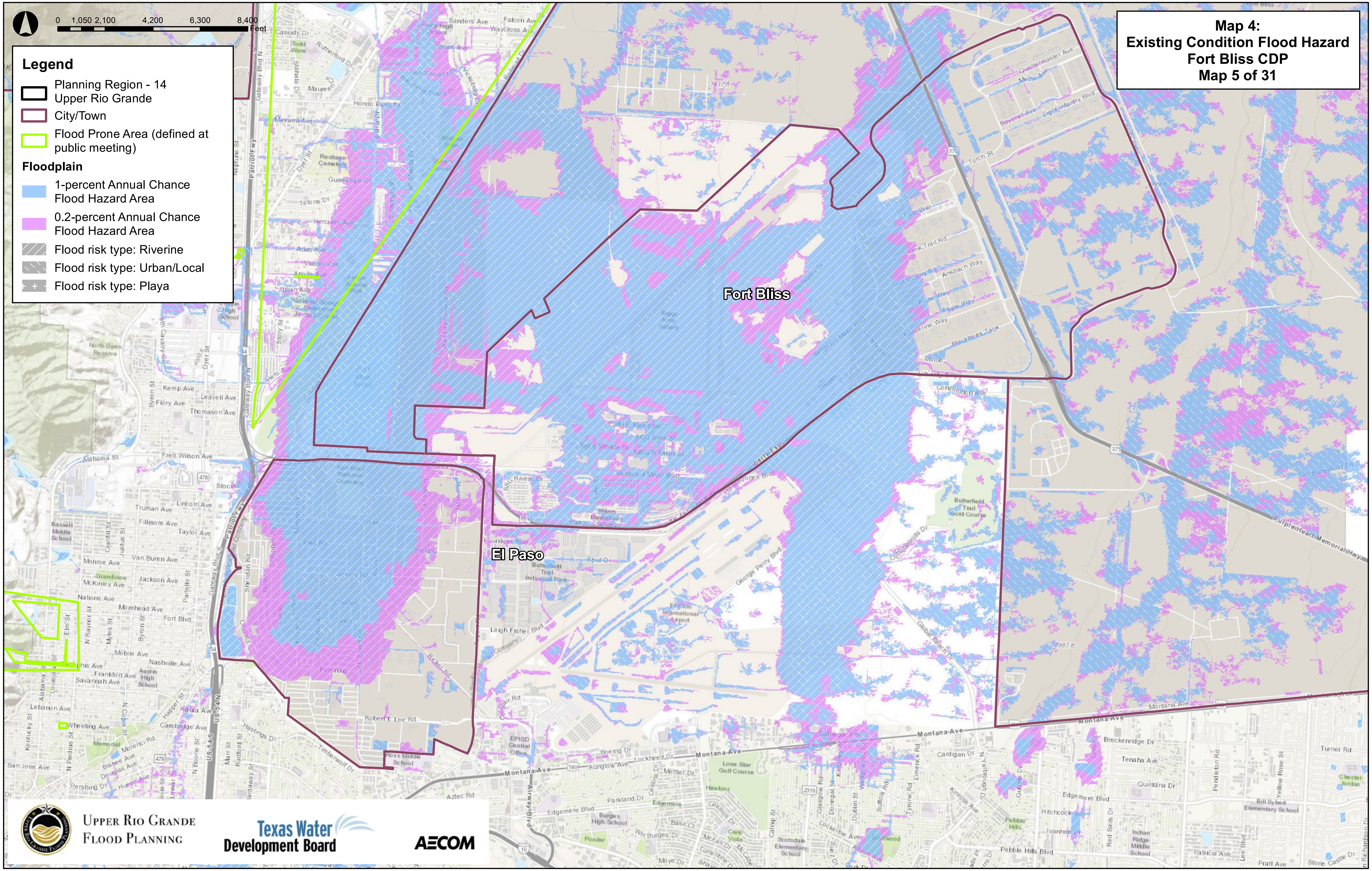
Map 4:
Existing Condition Flood Hazard
Fort Bliss CDP
Map 5 of 31



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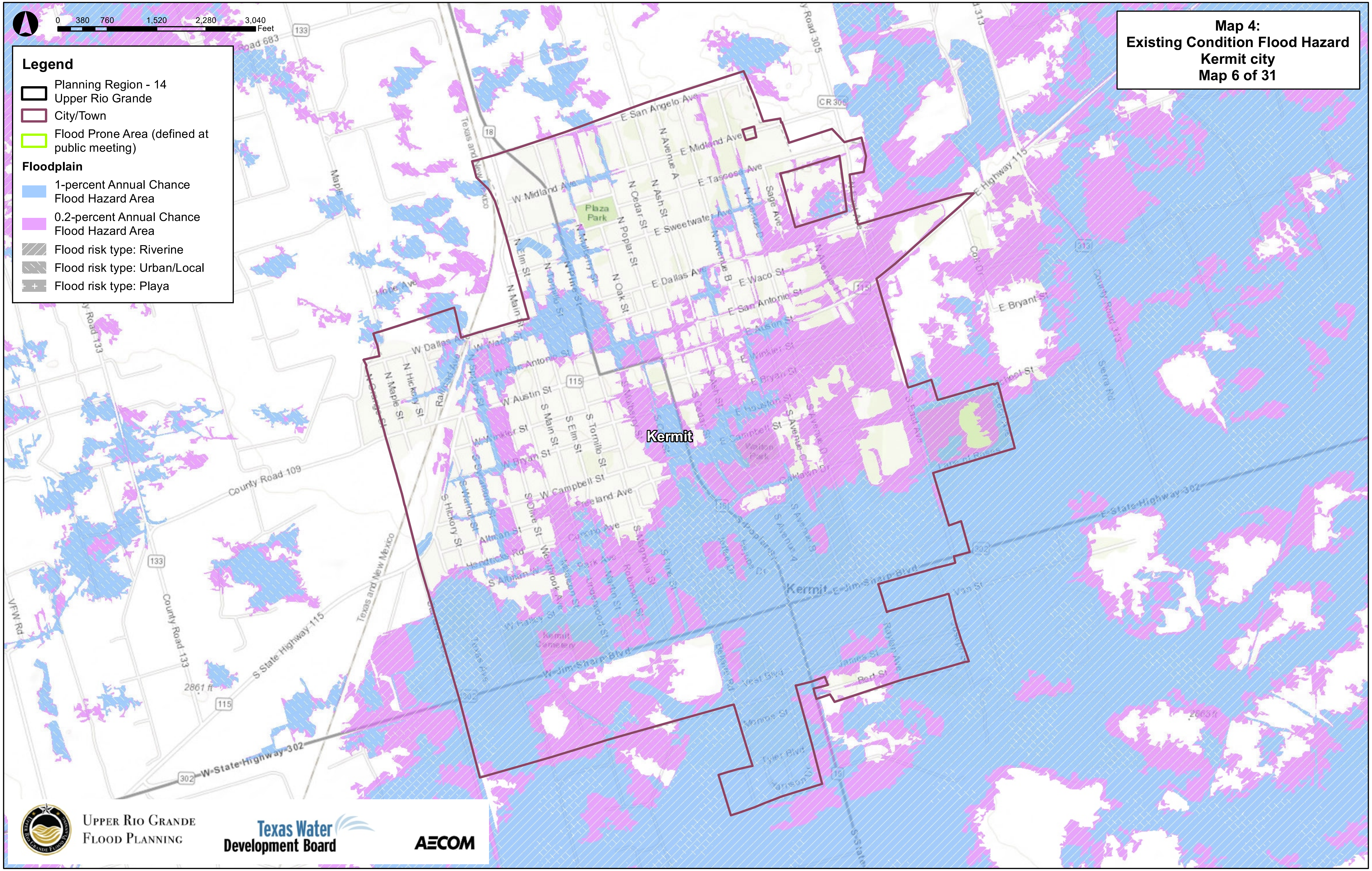
Map 4:
Existing Condition Flood Hazard
Kermit city
Map 6 of 31



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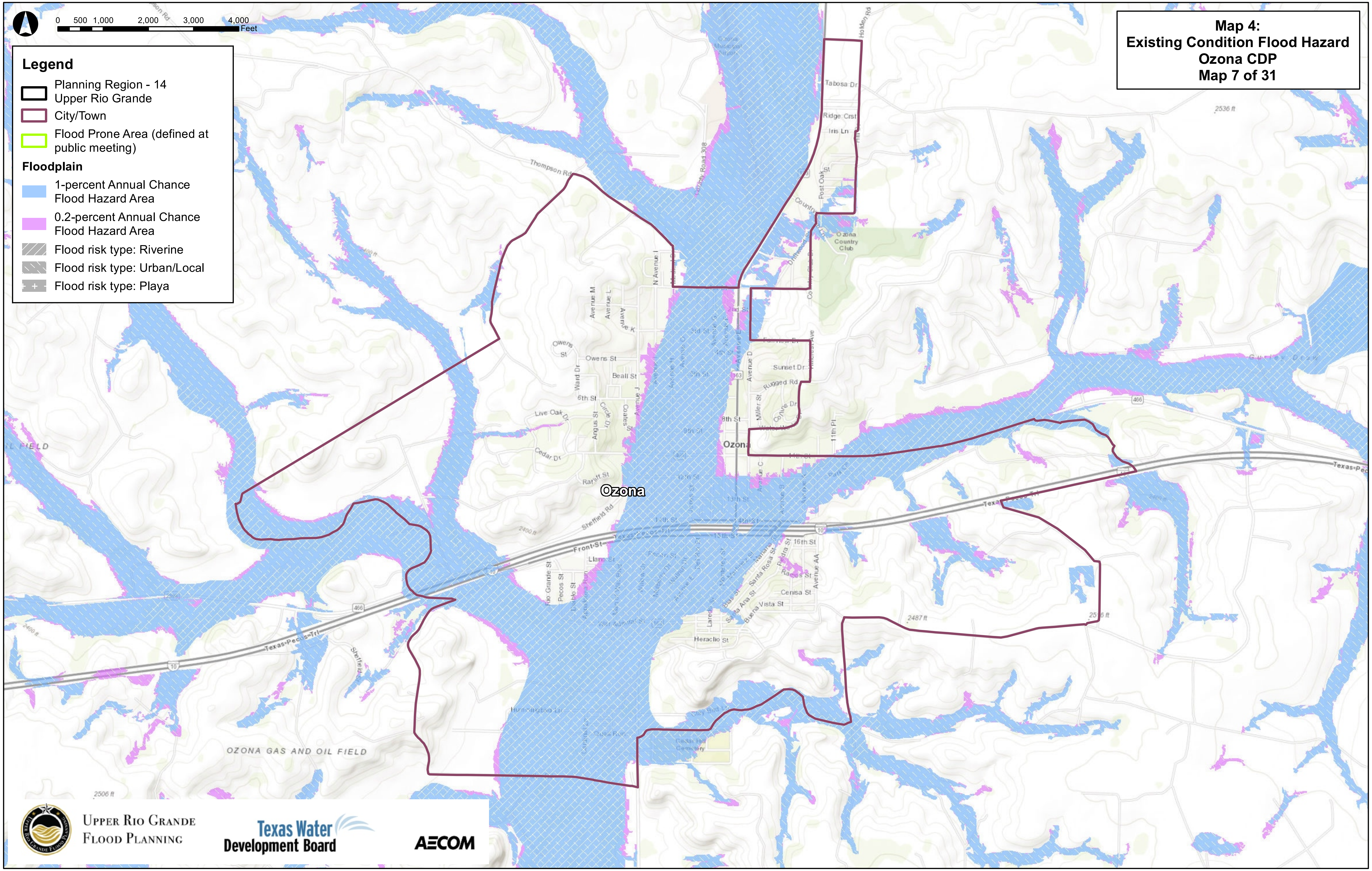
Map 4:
Existing Condition Flood Hazard
Ozona CDP
Map 7 of 31



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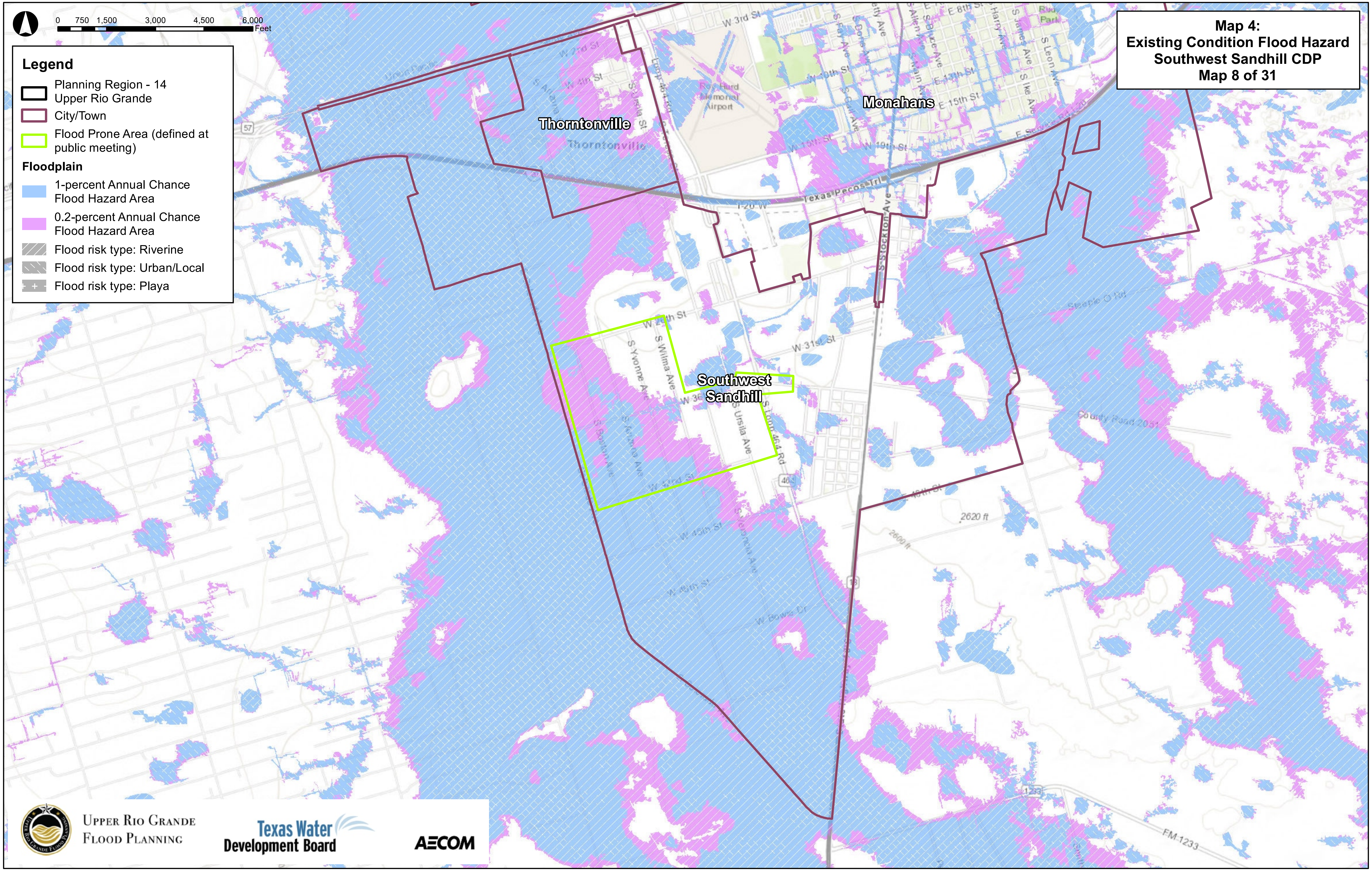

Map 4: Existing Condition Flood Hazard Southwest Sandhill CDP Map 8 of 31

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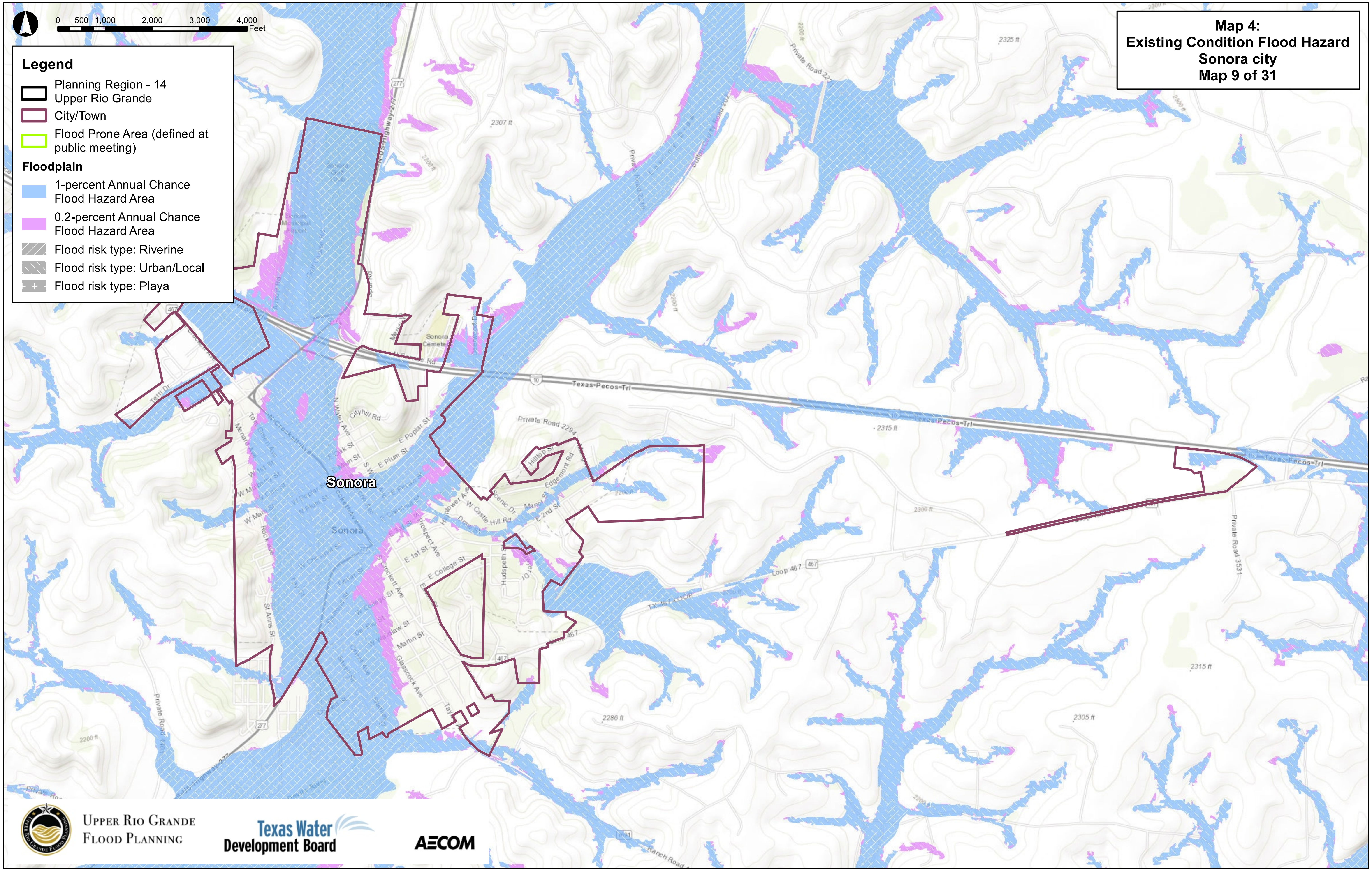

Map 4: Existing Condition Flood Hazard Sonora city Map 9 of 31

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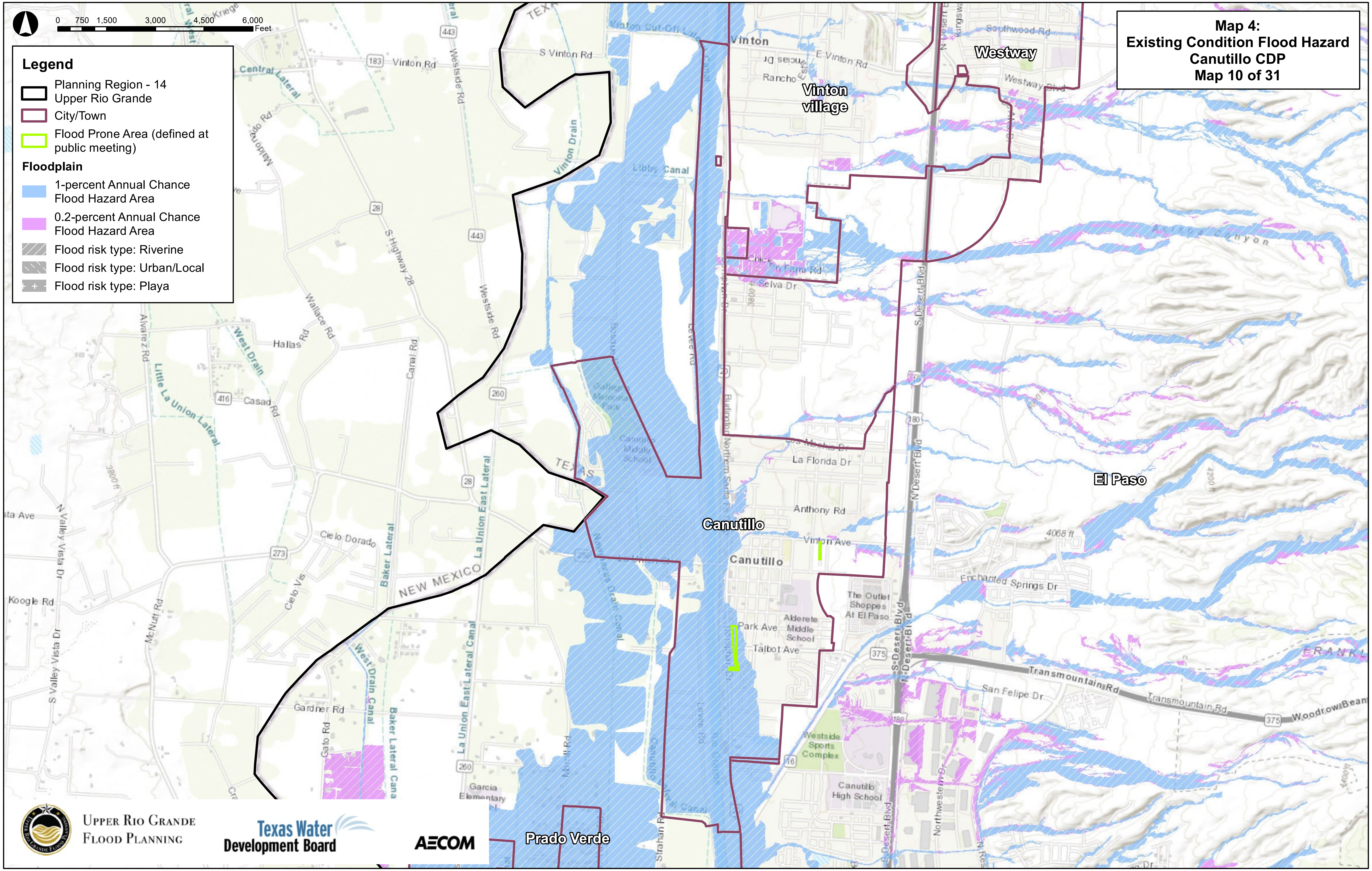
Map 4:
Existing Condition Flood Hazard
Canutillo CDP
Map 10 of 31



Legend

- ▭ Planning Region - 14 Upper Rio Grande
- ▭ City/Town
- ▭ Flood Prone Area (defined at public meeting)

Floodplain

- 🟦 1-percent Annual Chance Flood Hazard Area
- 🟪 0.2-percent Annual Chance Flood Hazard Area
- ▨ Flood risk type: Riverine
- ▨ Flood risk type: Urban/Local
- + Flood risk type: Playa

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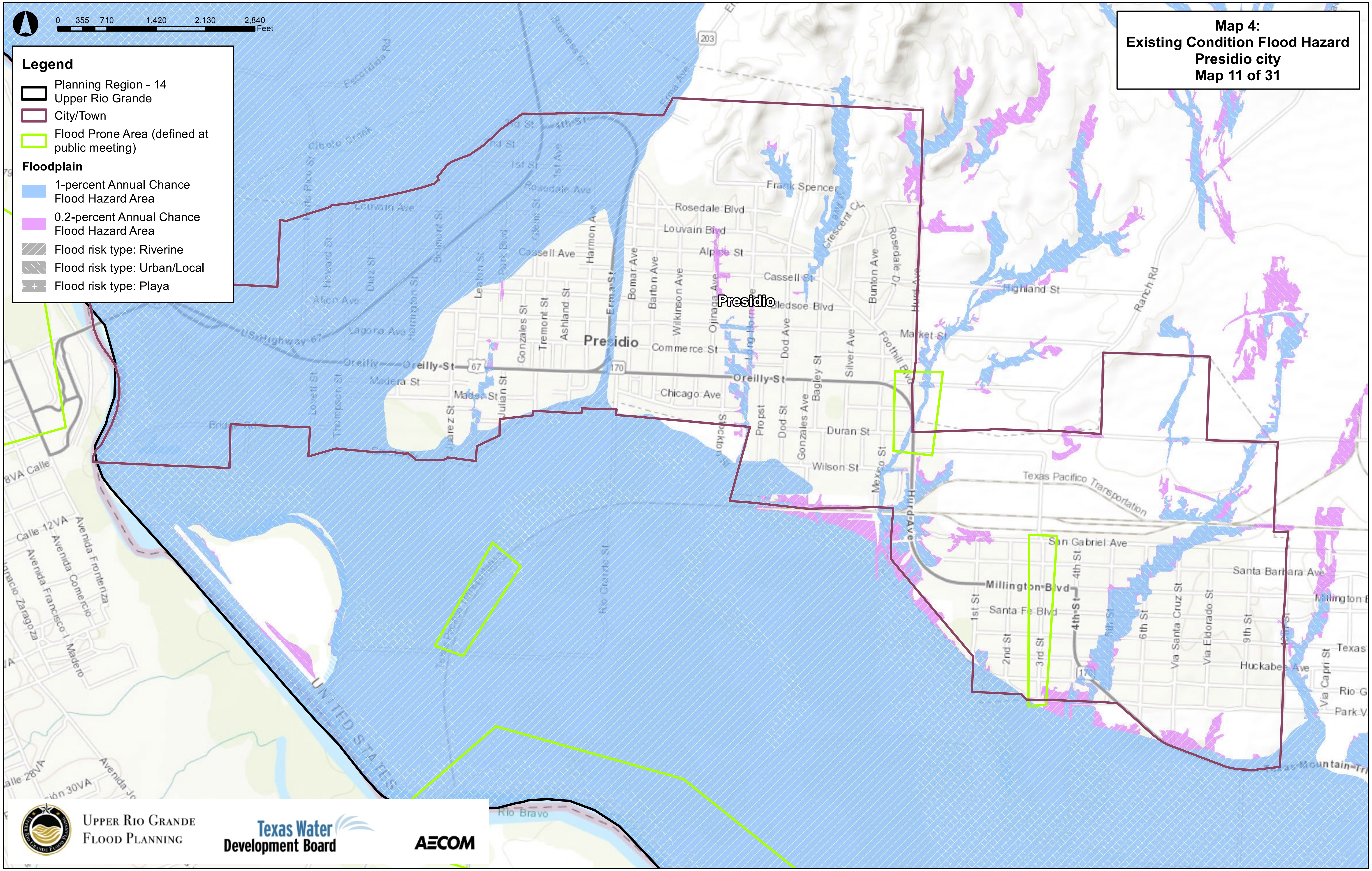
Map 4:
Existing Condition Flood Hazard
Presidio city
Map 11 of 31



Legend

▭ Planning Region - 14 Upper Rio Grande

▭ City/Town

▭ Flood Prone Area (defined at public meeting)

Floodplain

🟦 1-percent Annual Chance Flood Hazard Area

🟪 0.2-percent Annual Chance Flood Hazard Area

▨ Flood risk type: Riverine

▨ Flood risk type: Urban/Local

▨ Flood risk type: Playa

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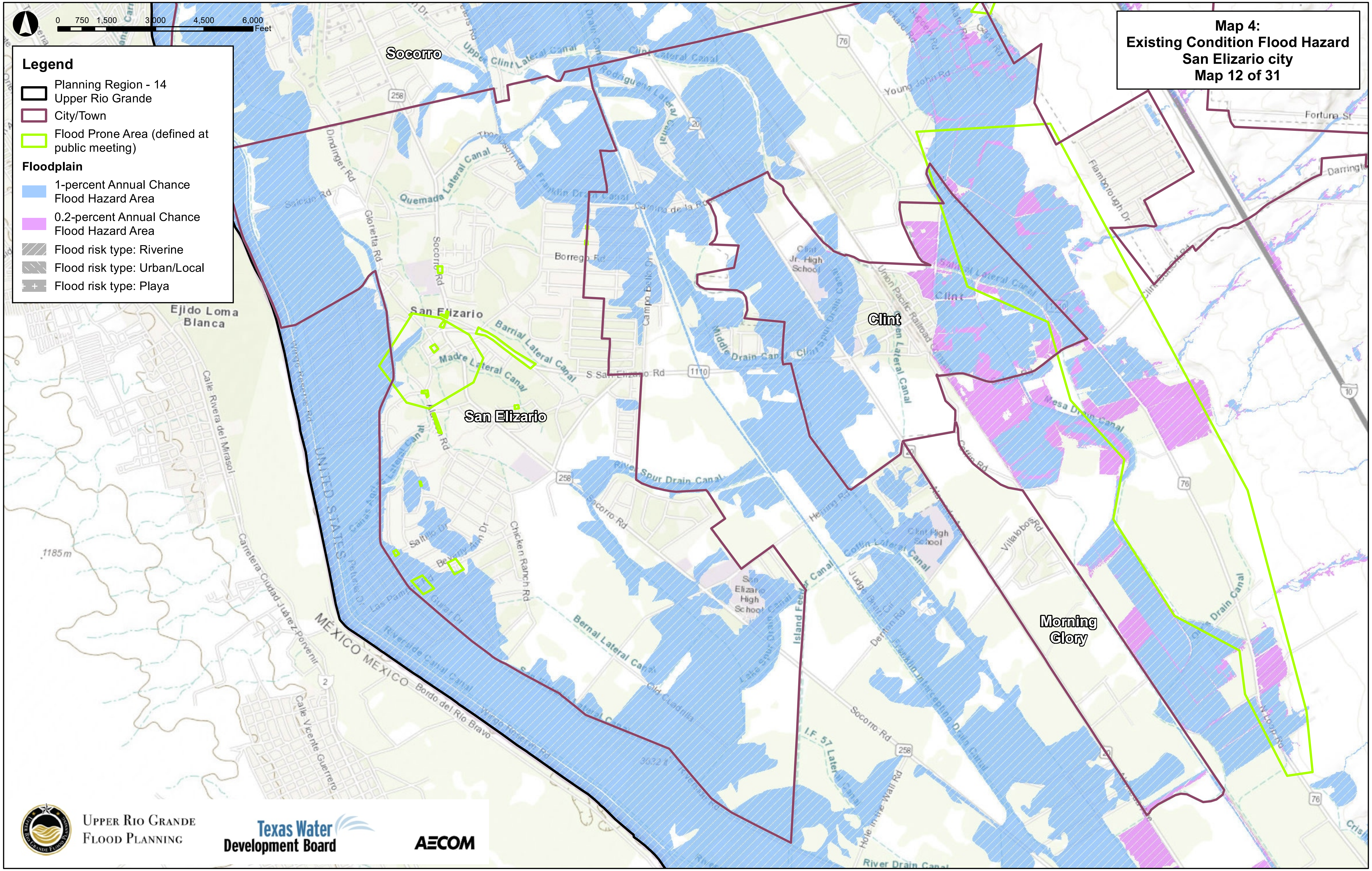
Map 12 of 31



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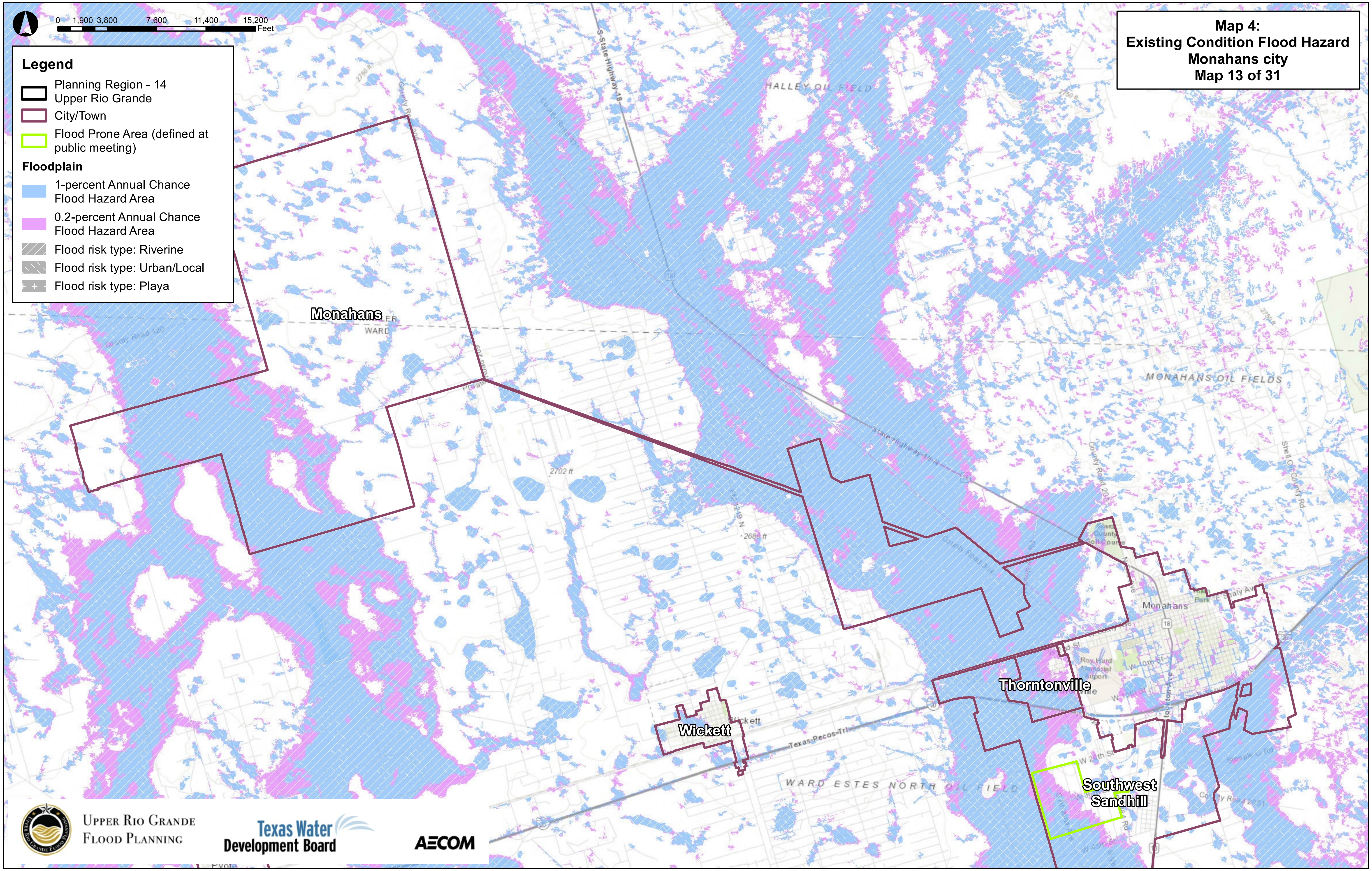

Map 4:
Existing Condition Flood Hazard
Monahans city
Map 13 of 31

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Map 4:
Existing Condition Flood Hazard
Balmorhea city
Map 14 of 31

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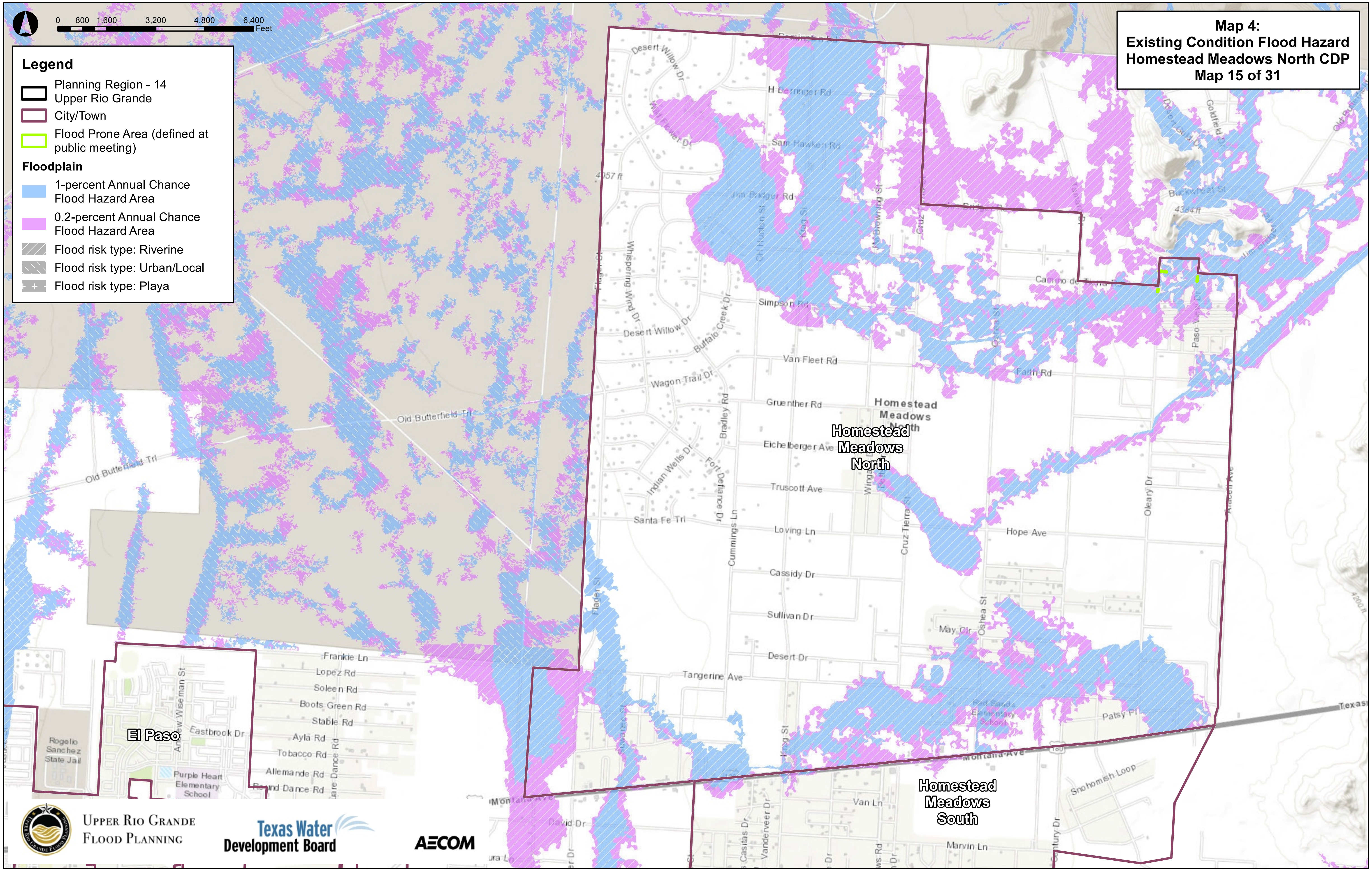
Map 4:
Existing Condition Flood Hazard
Homestead Meadows North CDP
Map 15 of 31



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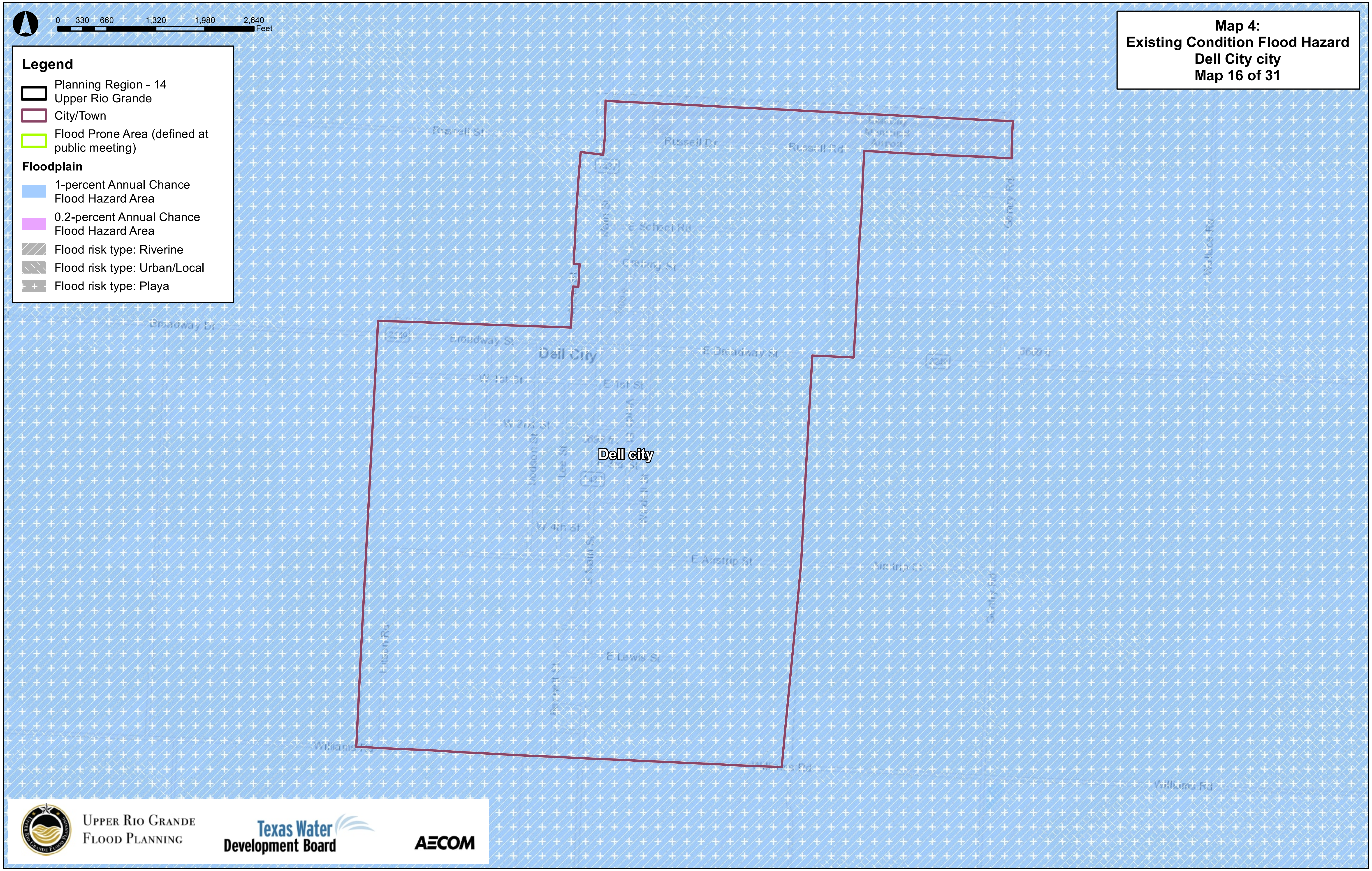
Map 4:
Existing Condition Flood Hazard
Dell City city
Map 16 of 31



Legend

- ▭ Planning Region - 14 Upper Rio Grande
- ▭ City/Town
- 🟩 Flood Prone Area (defined at public meeting)

Floodplain

- 🟦 1-percent Annual Chance Flood Hazard Area
- 🟪 0.2-percent Annual Chance Flood Hazard Area
- ▨ Flood risk type: Riverine
- ▨ Flood risk type: Urban/Local
- + Flood risk type: Playa

Upper Rio Grande Flood Planning

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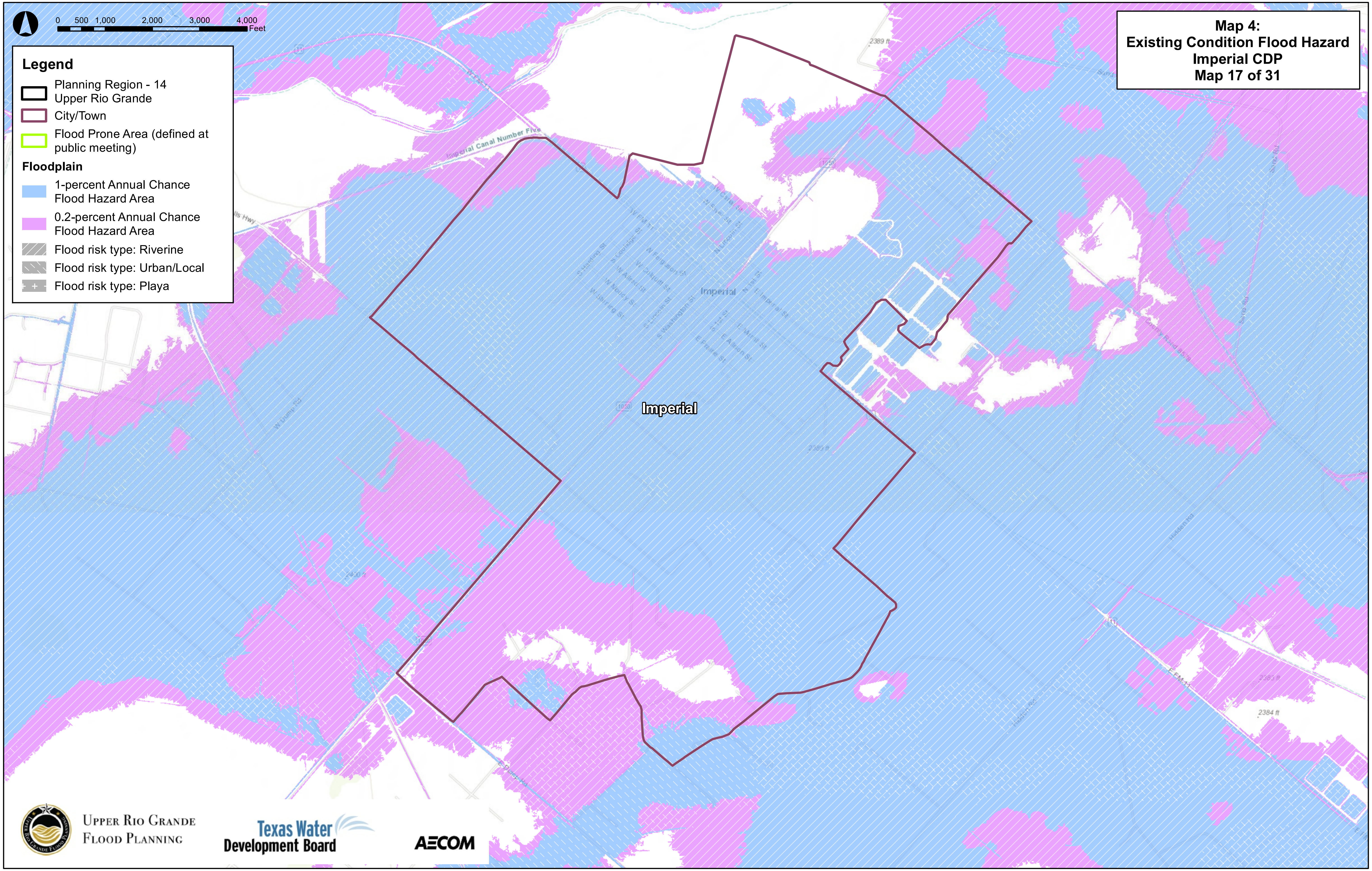
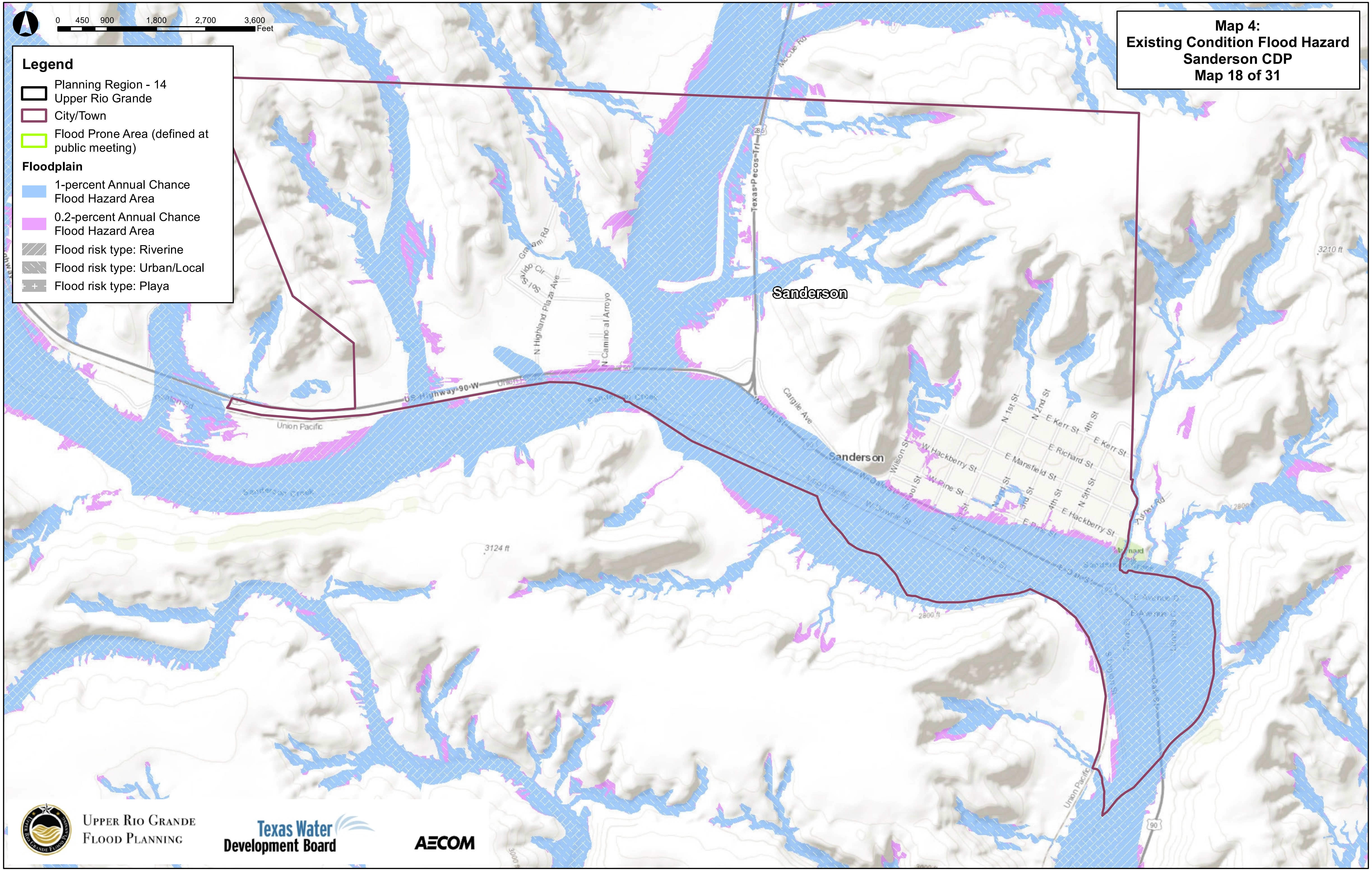
Map 4:
Existing Condition Flood Hazard
Imperial CDP
Map 17 of 31



Map 4:
Existing Condition Flood Hazard
Sanderson CDP
Map 18 of 31



Upper Rio Grande Flood Planning

Texas Water Development Board

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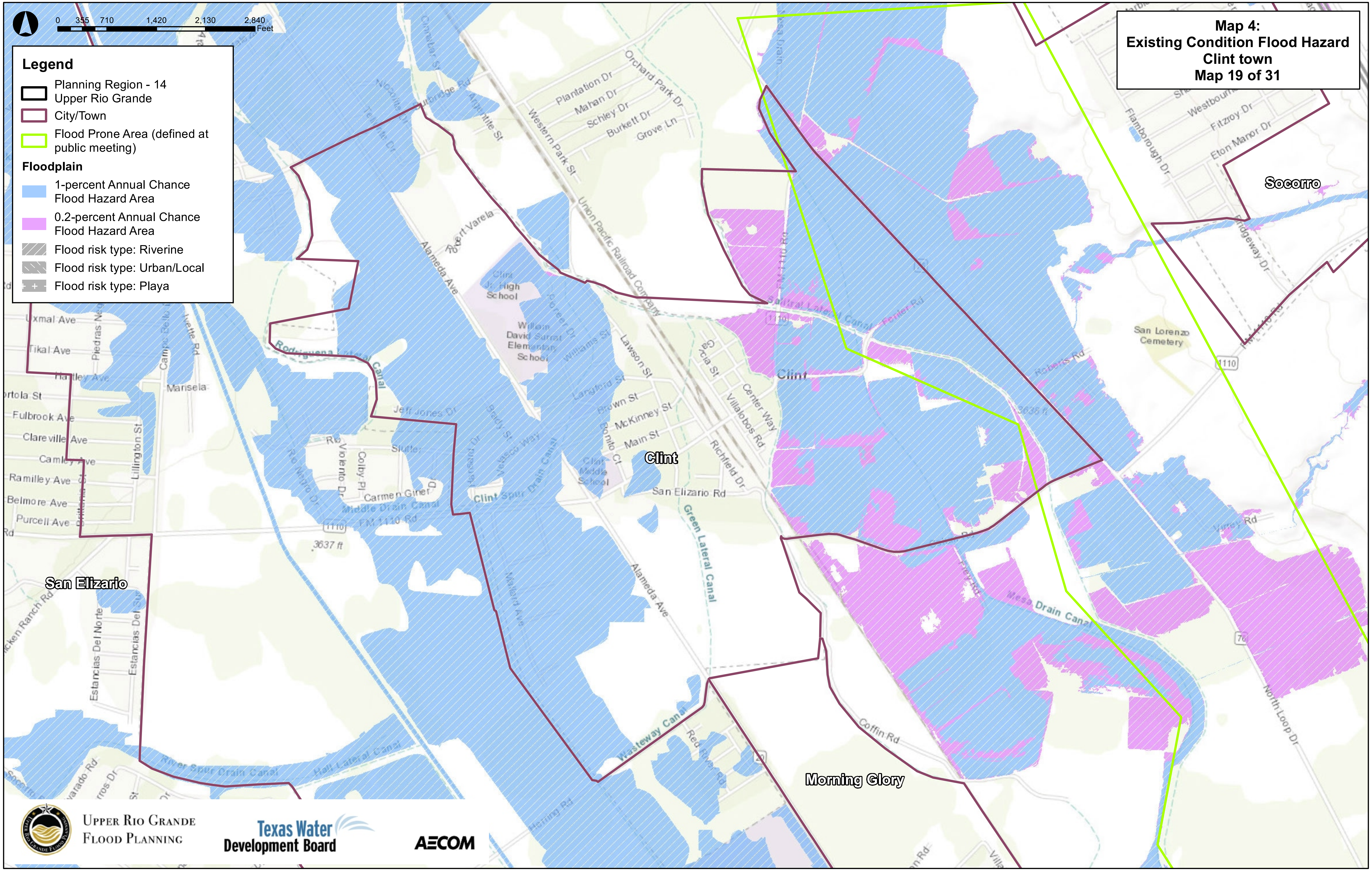
Map 4:
Existing Condition Flood Hazard
Clint town
Map 19 of 31



Legend

- ▭ Planning Region - 14 Upper Rio Grande
- ▭ City/Town
- ▭ Flood Prone Area (defined at public meeting)

Floodplain

- 🟦 1-percent Annual Chance Flood Hazard Area
- 🟪 0.2-percent Annual Chance Flood Hazard Area
- ▨ Flood risk type: Riverine
- ▨ Flood risk type: Urban/Local
- ▨ Flood risk type: Playa

UPPER RIO GRANDE FLOOD PLANNING

Texas Water Development Board

AECOM

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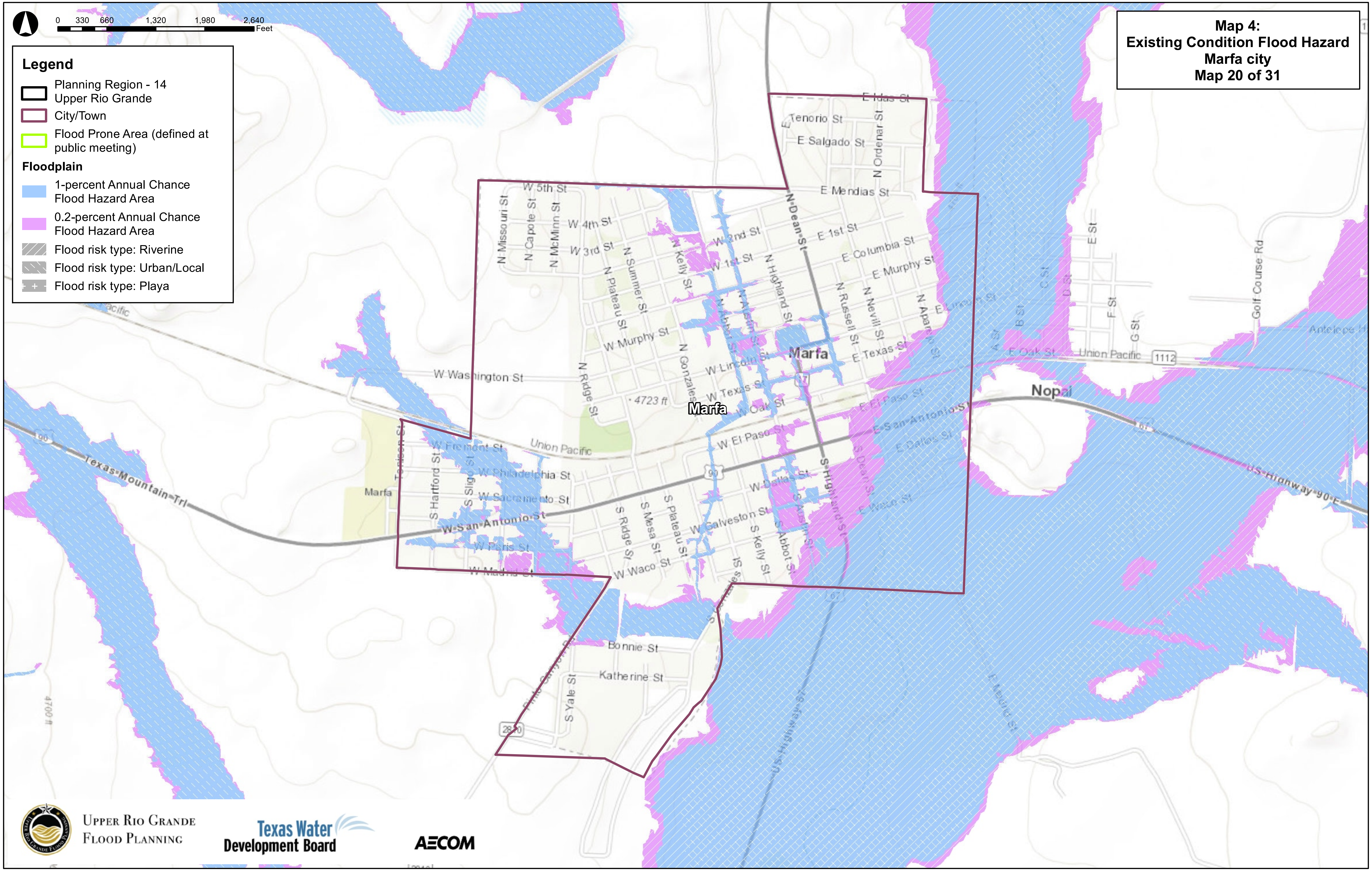
Map 4:
Existing Condition Flood Hazard
Marfa city
Map 20 of 31



UPPER RIO GRANDE FLOOD PLANNING

Texas Water Development Board

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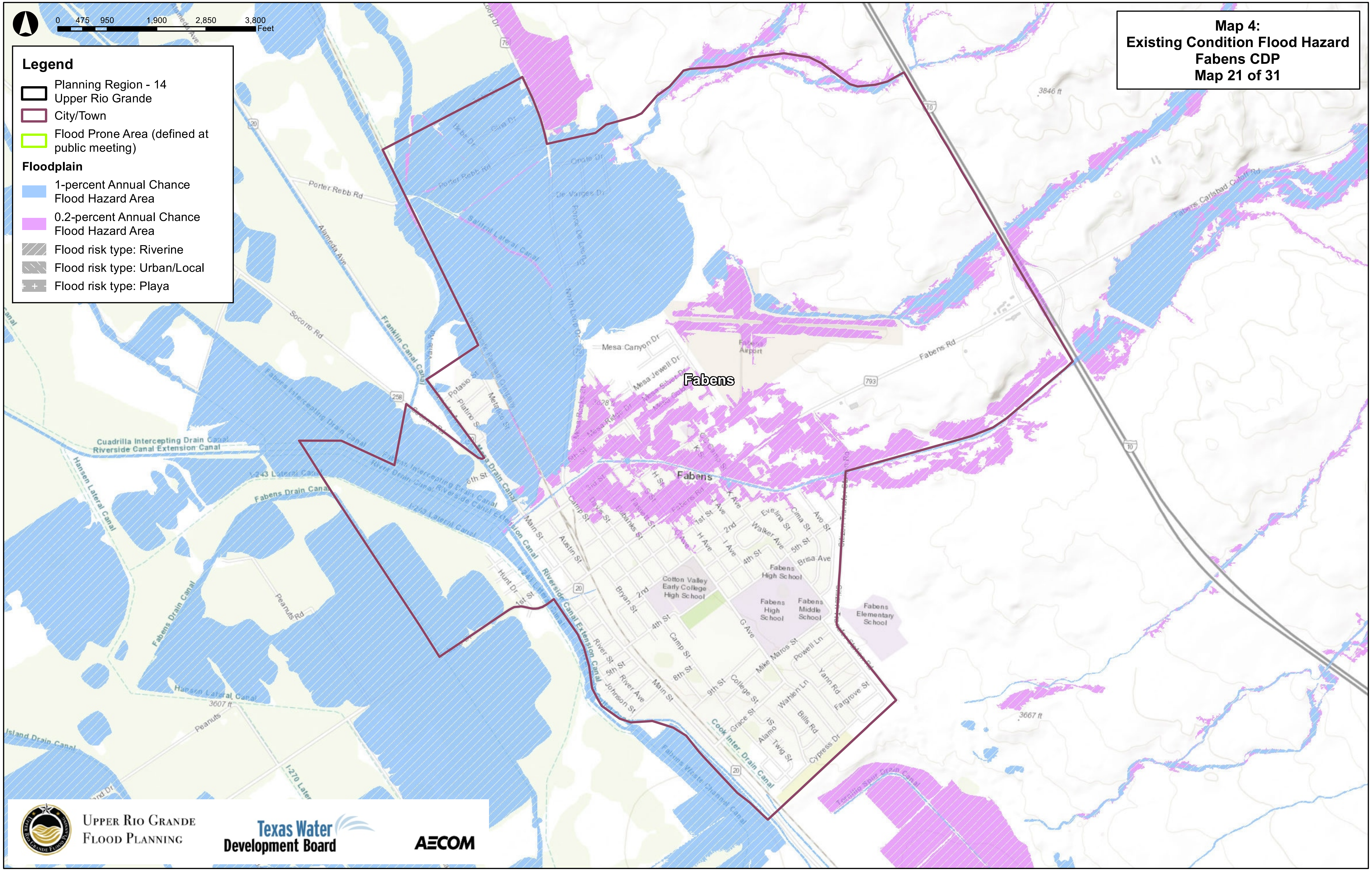
Map 4:
Existing Condition Flood Hazard
Fabens CDP
Map 21 of 31



Upper Rio Grande Flood Planning

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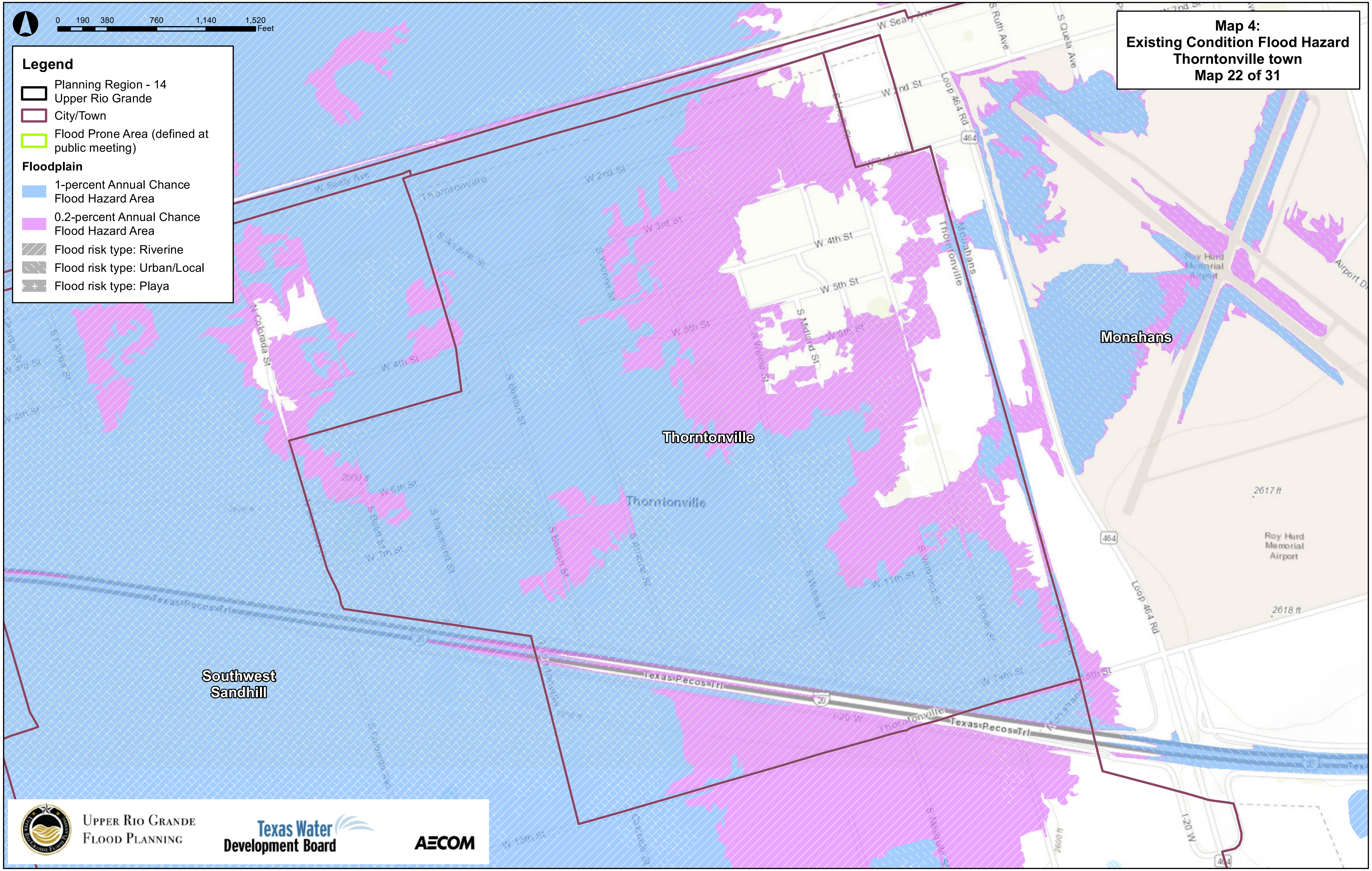
Map 4:
Existing Condition Flood Hazard
Thorntonville town
Map 22 of 31



Upper Rio Grande Flood Planning

Texas Water Development Board

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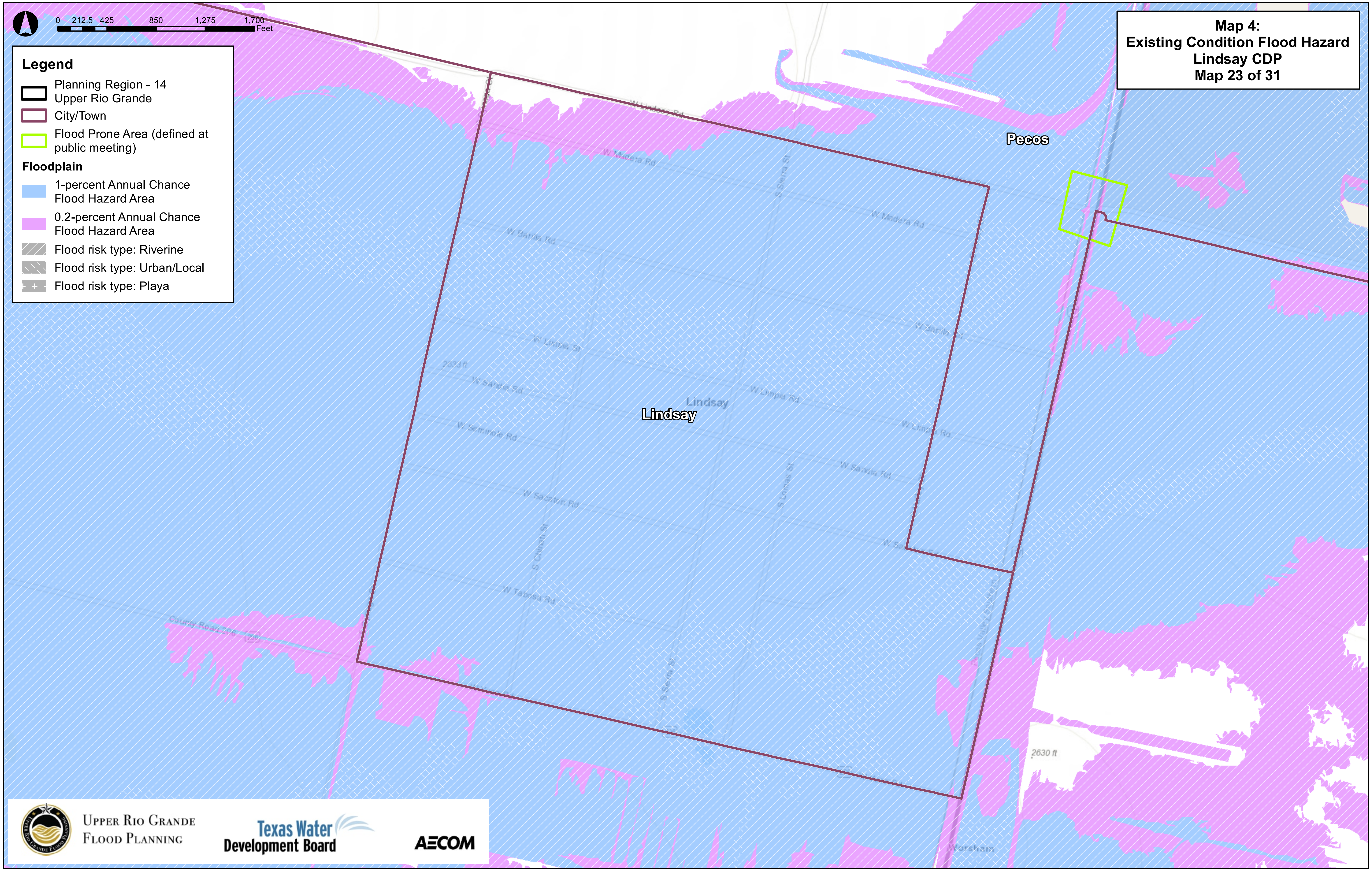

Map 4:
Existing Condition Flood Hazard
Lindsay CDP
Map 23 of 31

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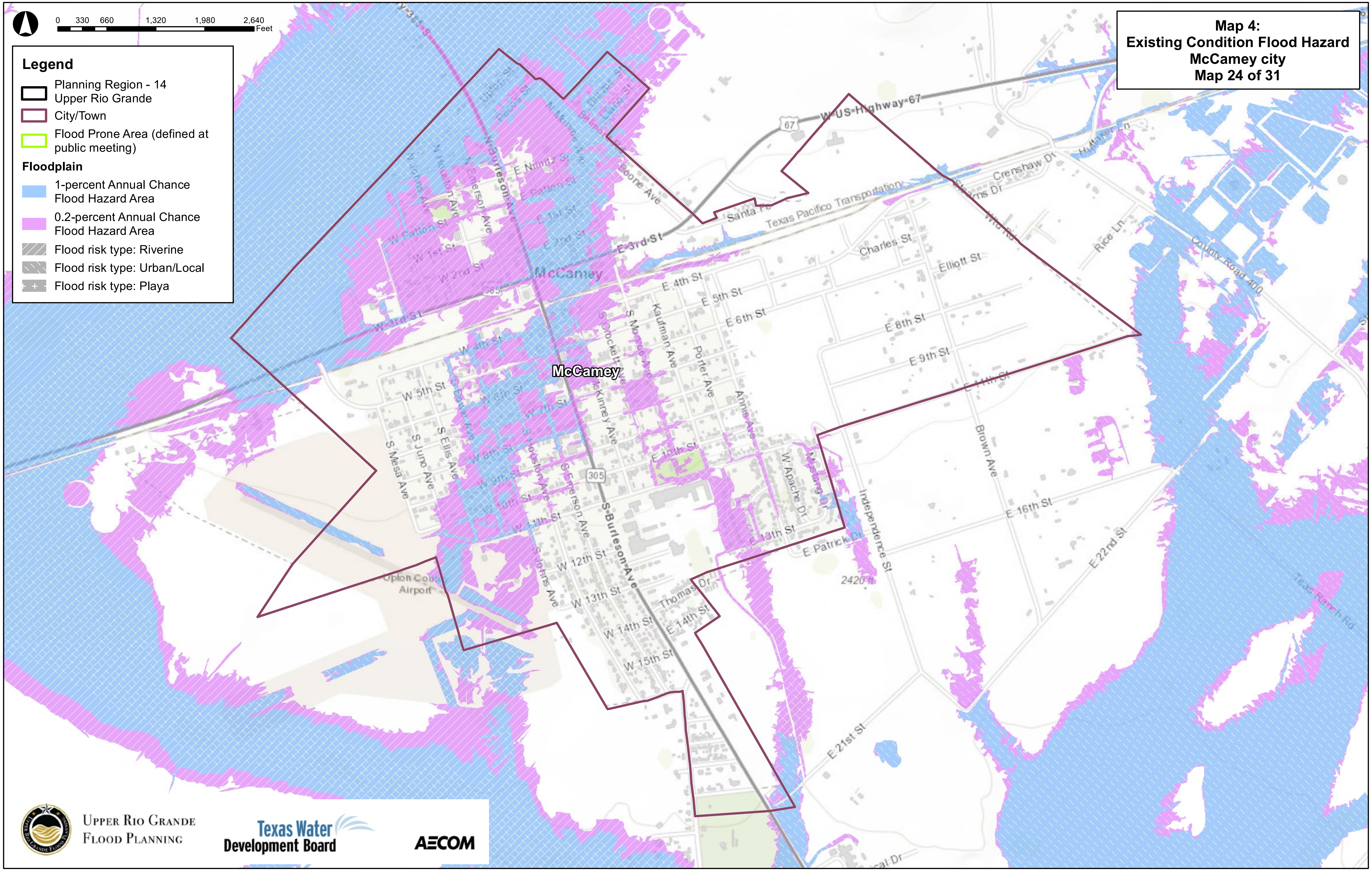
Map 4:
Existing Condition Flood Hazard
McCamey city
Map 24 of 31



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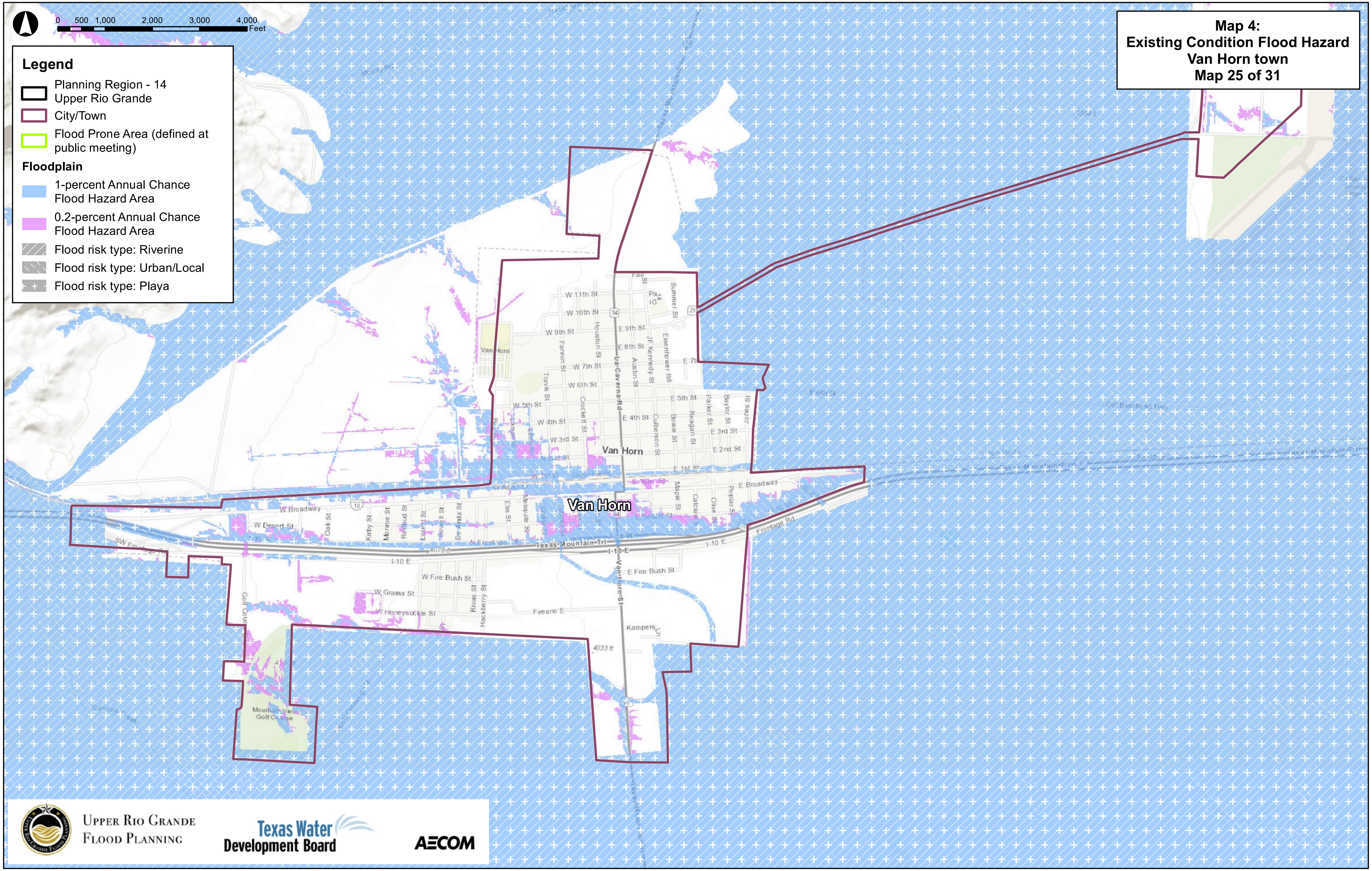
Map 4:
Existing Condition Flood Hazard
Van Horn town
Map 25 of 31



Legend

- ▭ Planning Region - 14 Upper Rio Grande
- ▭ City/Town
- ▭ Flood Prone Area (defined at public meeting)

Floodplain

- 🟦 1-percent Annual Chance Flood Hazard Area
- 🟪 0.2-percent Annual Chance Flood Hazard Area
- ▨ Flood risk type: Riverine
- ▨ Flood risk type: Urban/Local
- ▨ Flood risk type: Playa

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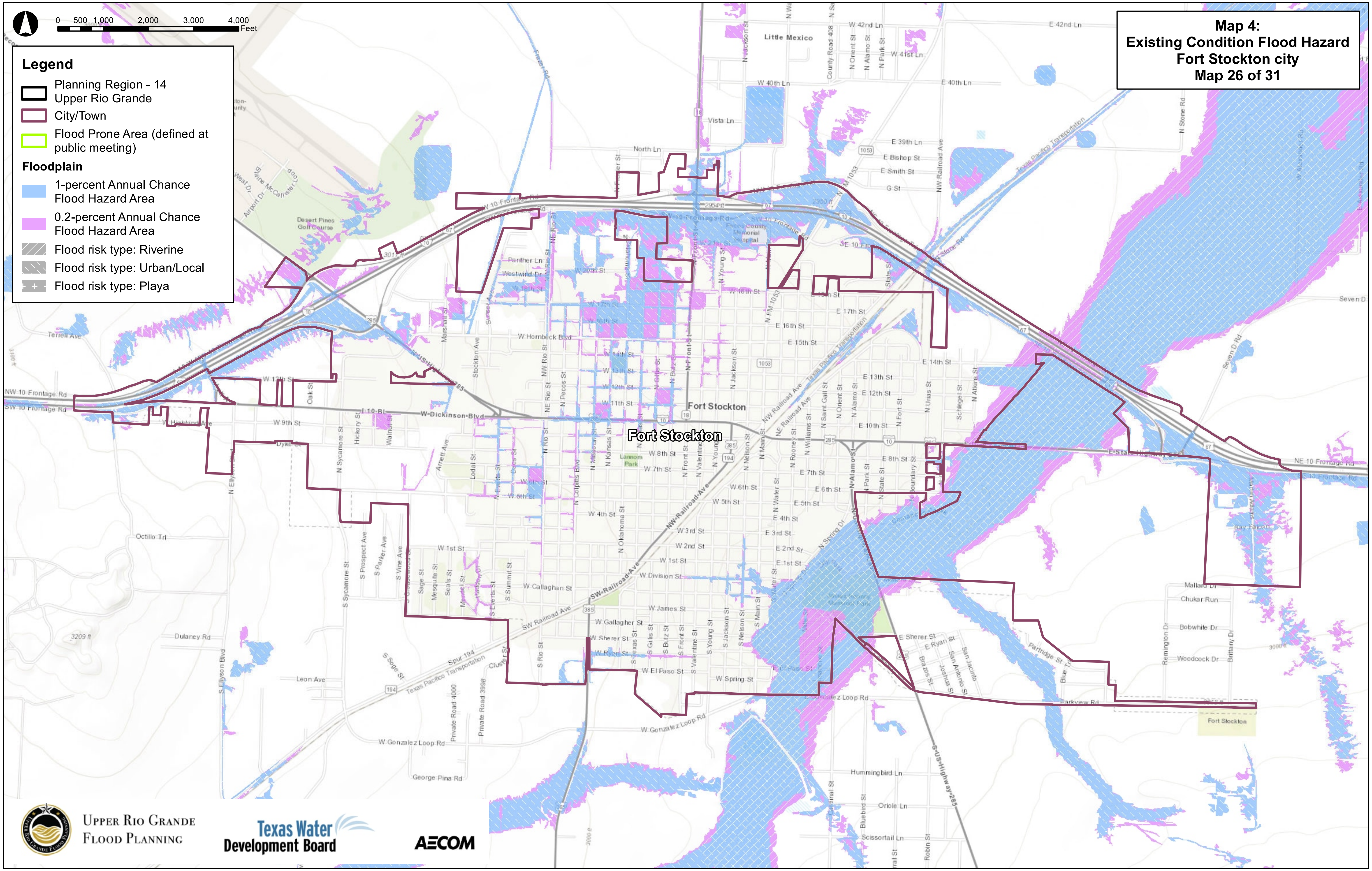
Map 4:
Existing Condition Flood Hazard
Fort Stockton city
Map 26 of 31



Legend

▭ Planning Region - 14 Upper Rio Grande

▭ City/Town

🟩 Flood Prone Area (defined at public meeting)

Floodplain

🟦 1-percent Annual Chance Flood Hazard Area

🟪 0.2-percent Annual Chance Flood Hazard Area

▨ Flood risk type: Riverine

▨ Flood risk type: Urban/Local

\+ Flood risk type: Playa

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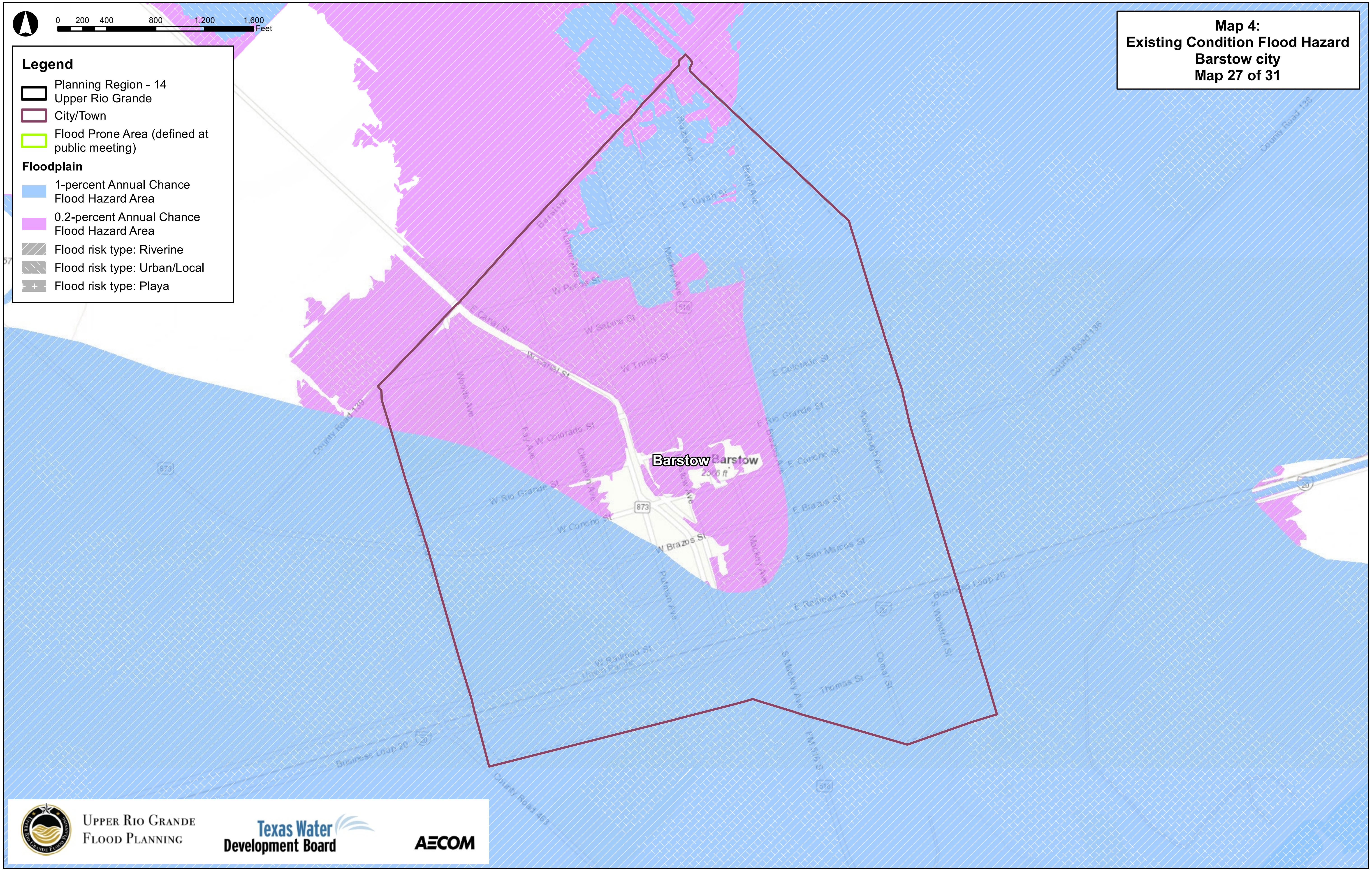
Map 4:
Existing Condition Flood Hazard
Barstow city
Map 27 of 31



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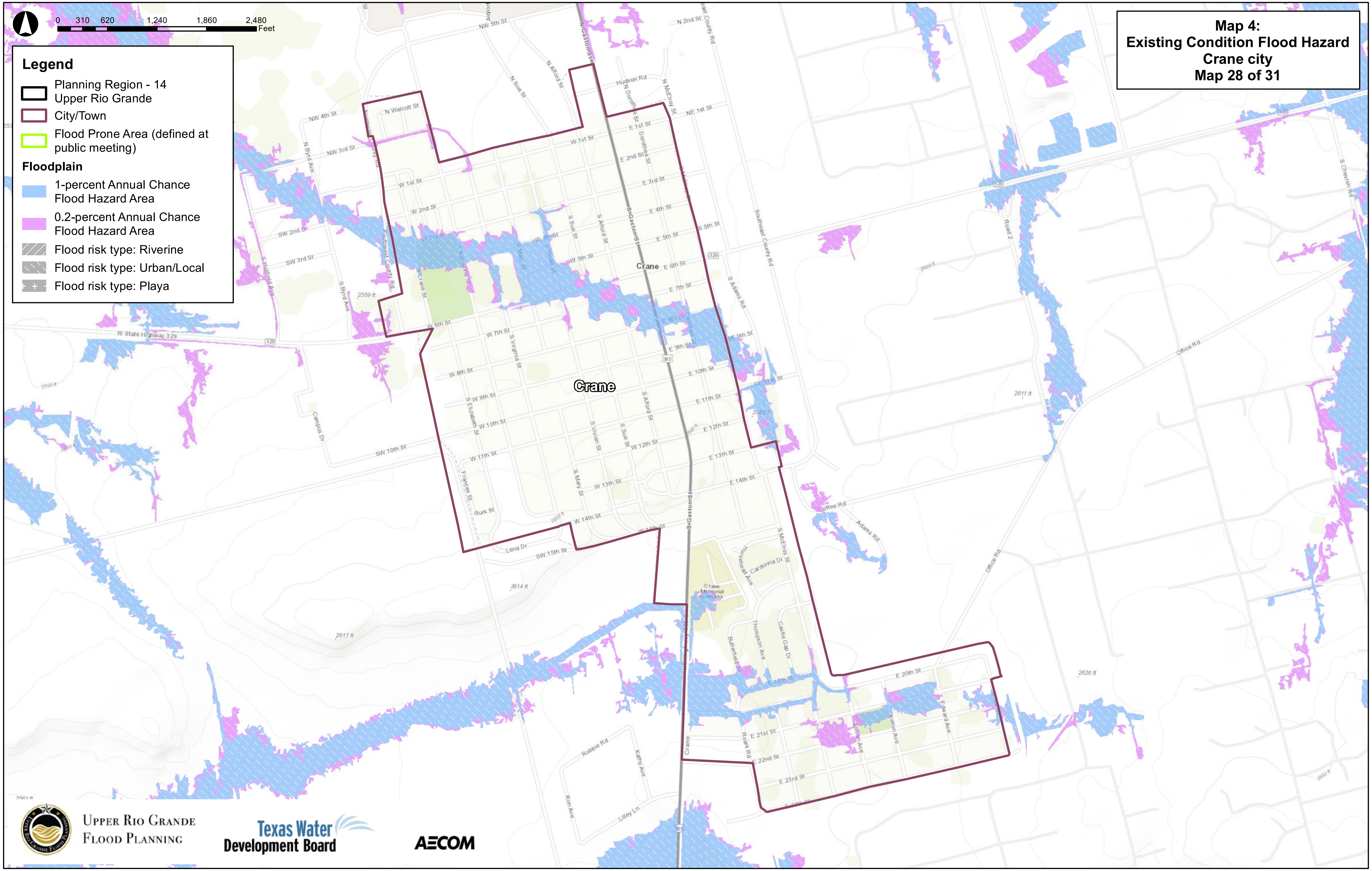
Map 4:
Existing Condition Flood Hazard
Crane city
Map 28 of 31



Legend

- ▭ Planning Region - 14 Upper Rio Grande
- ▭ City/Town
- ▭ Flood Prone Area (defined at public meeting)

Floodplain

- 🟦 1-percent Annual Chance Flood Hazard Area
- 🟪 0.2-percent Annual Chance Flood Hazard Area
- ▨ Flood risk type: Riverine
- ▨ Flood risk type: Urban/Local
- ⊞ Flood risk type: Playa

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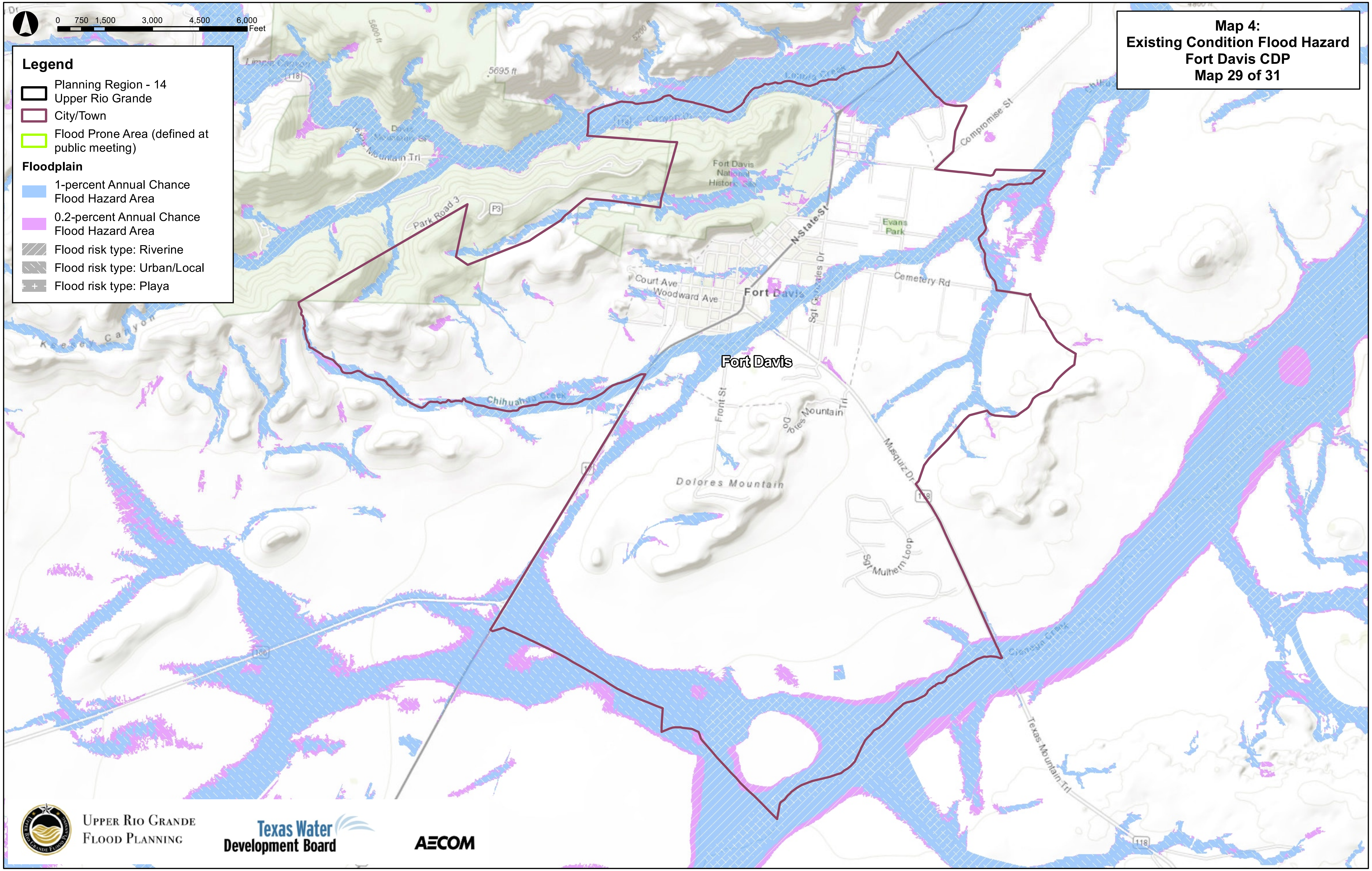

Map 4:
Existing Condition Flood Hazard
Fort Davis CDP
Map 29 of 31

Legend

▭ Planning Region - 14 Upper Rio Grande

▭ City/Town

▭ Flood Prone Area (defined at public meeting)

Floodplain

▨ 1-percent Annual Chance Flood Hazard Area

▨ 0.2-percent Annual Chance Flood Hazard Area

▨ Flood risk type: Riverine

▨ Flood risk type: Urban/Local

▨ Flood risk type: Playa

UPPER RIO GRANDE FLOOD PLANNING

Texas Water Development Board

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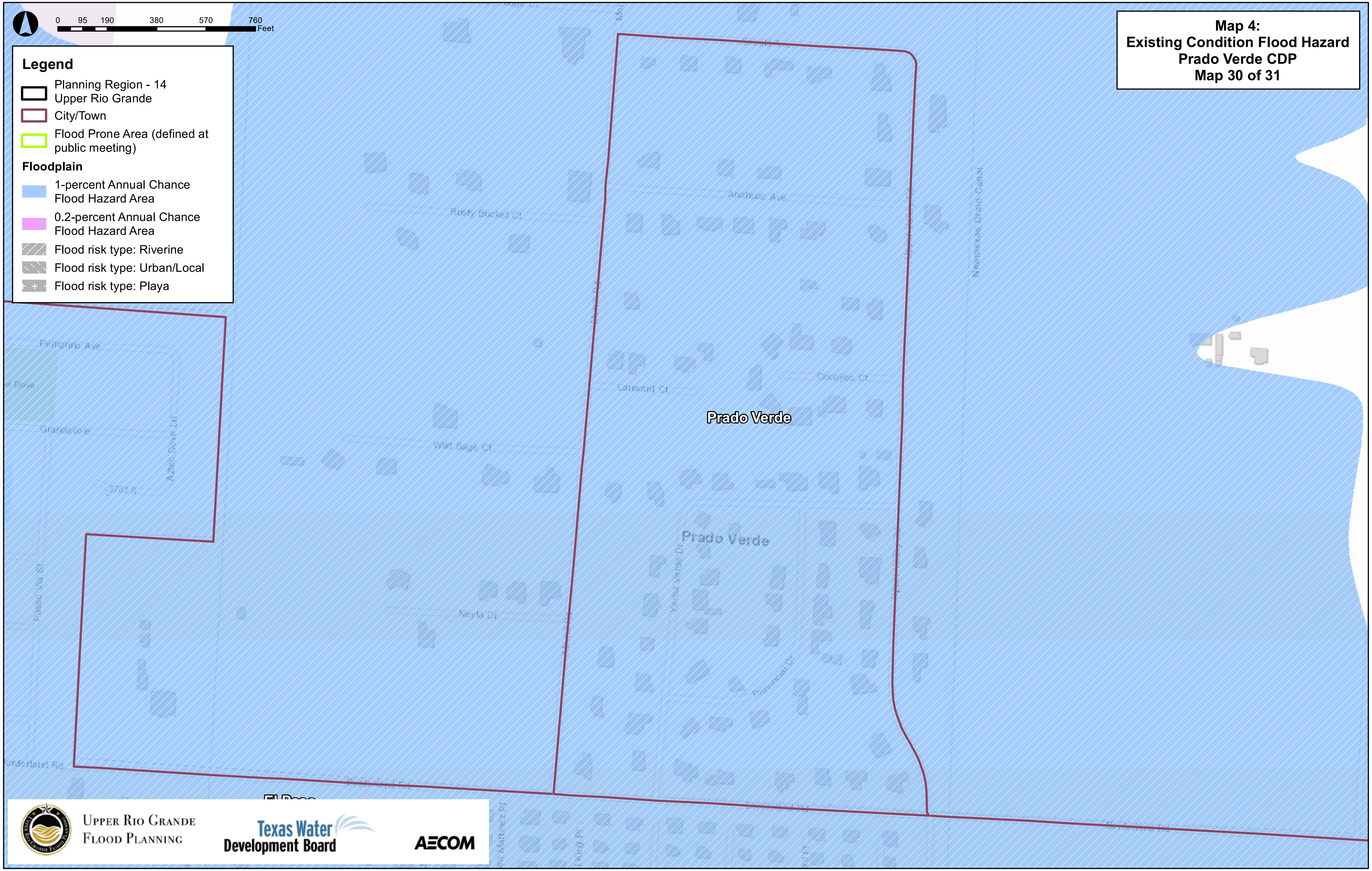
Map 4:
Existing Condition Flood Hazard
Prado Verde CDP
Map 30 of 31



Legend

- ▭ Planning Region - 14 Upper Rio Grande
- ▭ City/Town
- 🟩 Flood Prone Area (defined at public meeting)

Floodplain

- 🟦 1-percent Annual Chance Flood Hazard Area
- 🟪 0.2-percent Annual Chance Flood Hazard Area
- ▨ Flood risk type: Riverine
- ▨ Flood risk type: Urban/Local
- ▨ Flood risk type: Playa

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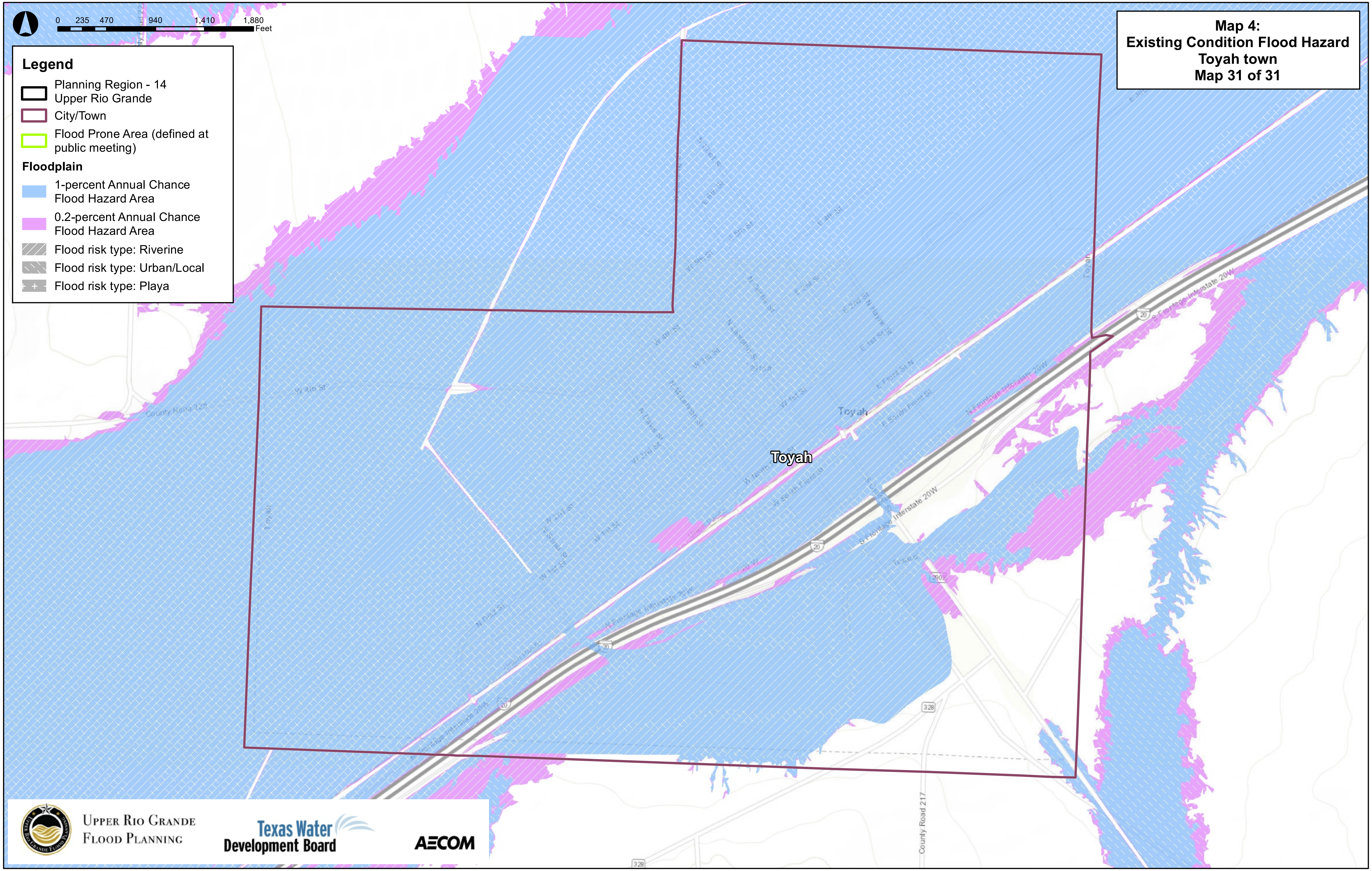
Map 4:
Existing Condition Flood Hazard
Toyah town
Map 31 of 31



Legend

▭ Planning Region - 14 Upper Rio Grande

▭ City/Town

▭ Flood Prone Area (defined at public meeting)

Floodplain

🟦 1-percent Annual Chance Flood Hazard Area

🟪 0.2-percent Annual Chance Flood Hazard Area

▨ Flood risk type: Riverine

▨ Flood risk type: Urban/Local

▨ Flood risk type: Playa

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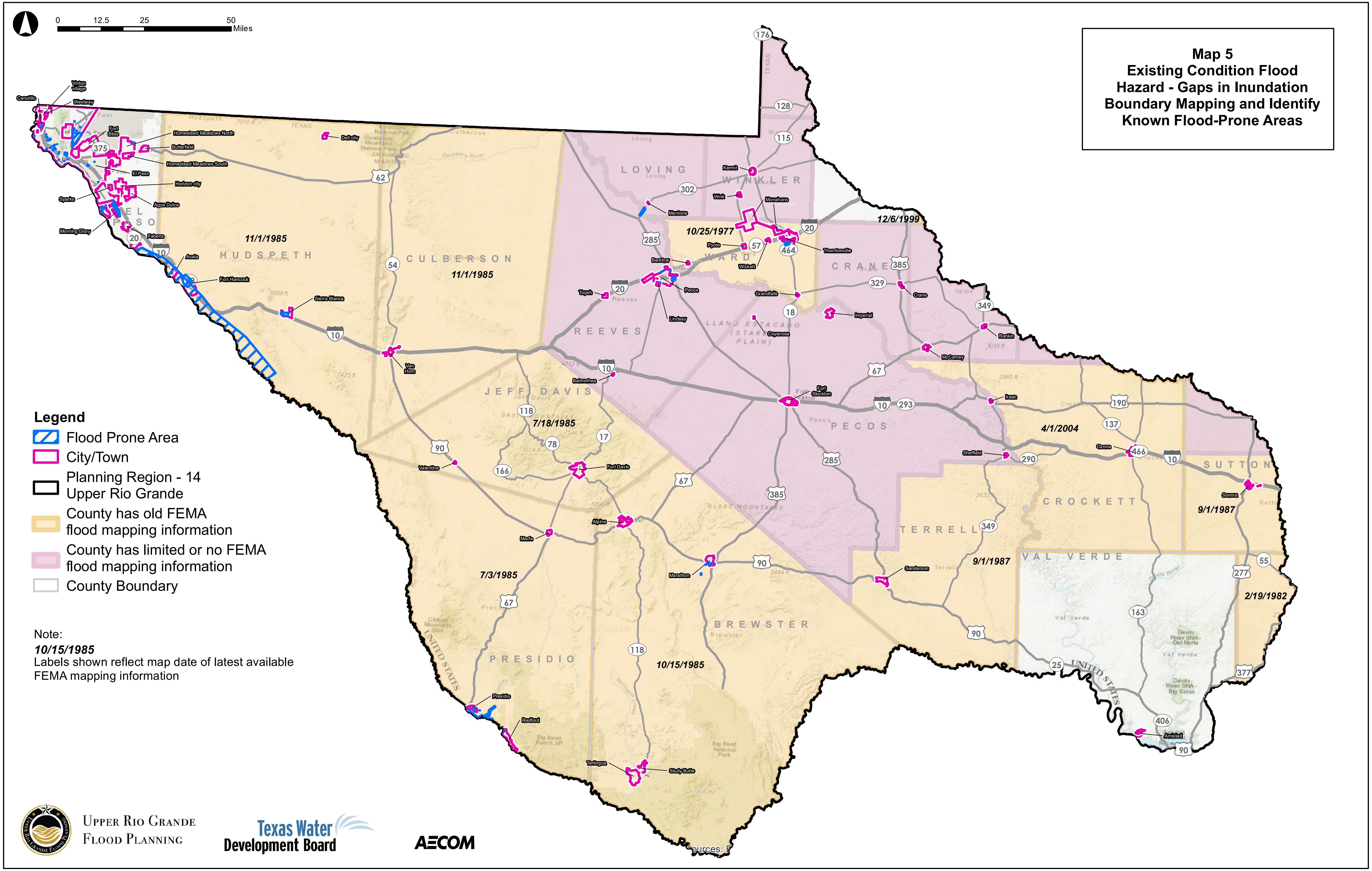
Map 5
Existing Condition Flood Hazard - Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas



Legend

▨ Flood Prone Area

☐ City/Town

☐ Planning Region - 14
Upper Rio Grande

🟧 County has old FEMA flood mapping information

🟪 County has limited or no FEMA flood mapping information

☐ County Boundary

Note:
10/15/1985
Labels shown reflect map date of latest available FEMA mapping information

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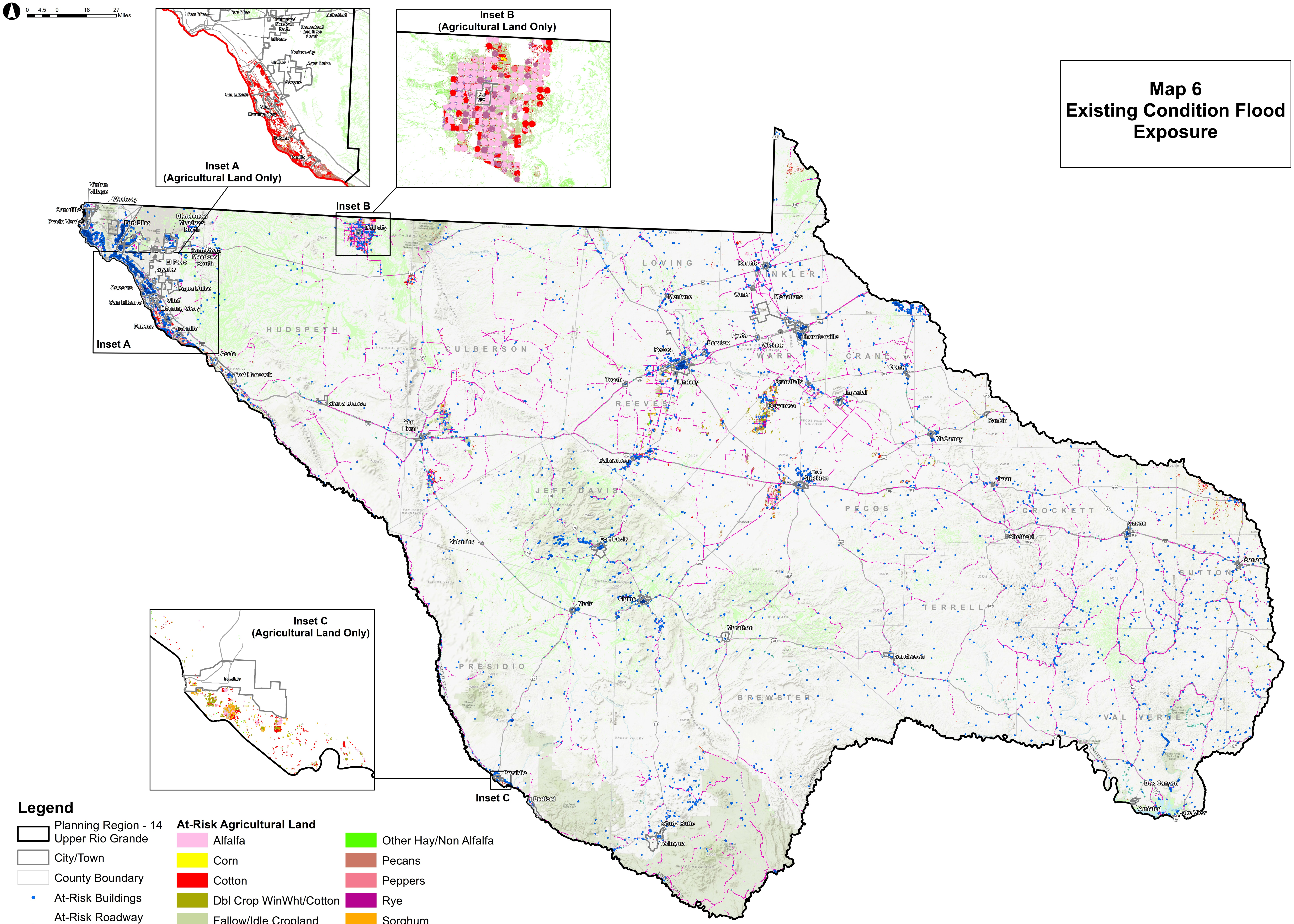
Map 6
Existing Condition Flood Exposure



Legend

- ▭ Planning Region - 14 Upper Rio Grande
- ▭ City/Town
- ▭ County Boundary
- • At-Risk Buildings
- + At-Risk Roadway Crossings
- — At-Risk Roadway Segments

At-Risk Agricultural Land

- ■ Alfalfa
- ■ Corn
- ■ Cotton
- ■ Dbl Crop WinWht/Cotton
- ■ Fallow/Idle Cropland
- ■ Grapes
- ■ Grassland/Pasture
- ■ Oats
- ■ Other Hay/Non Alfalfa
- ■ Pecans
- ■ Peppers
- ■ Rye
- ■ Sorghum
- ■ Triticale
- ■ Winter Wheat
- ■ Other Crops

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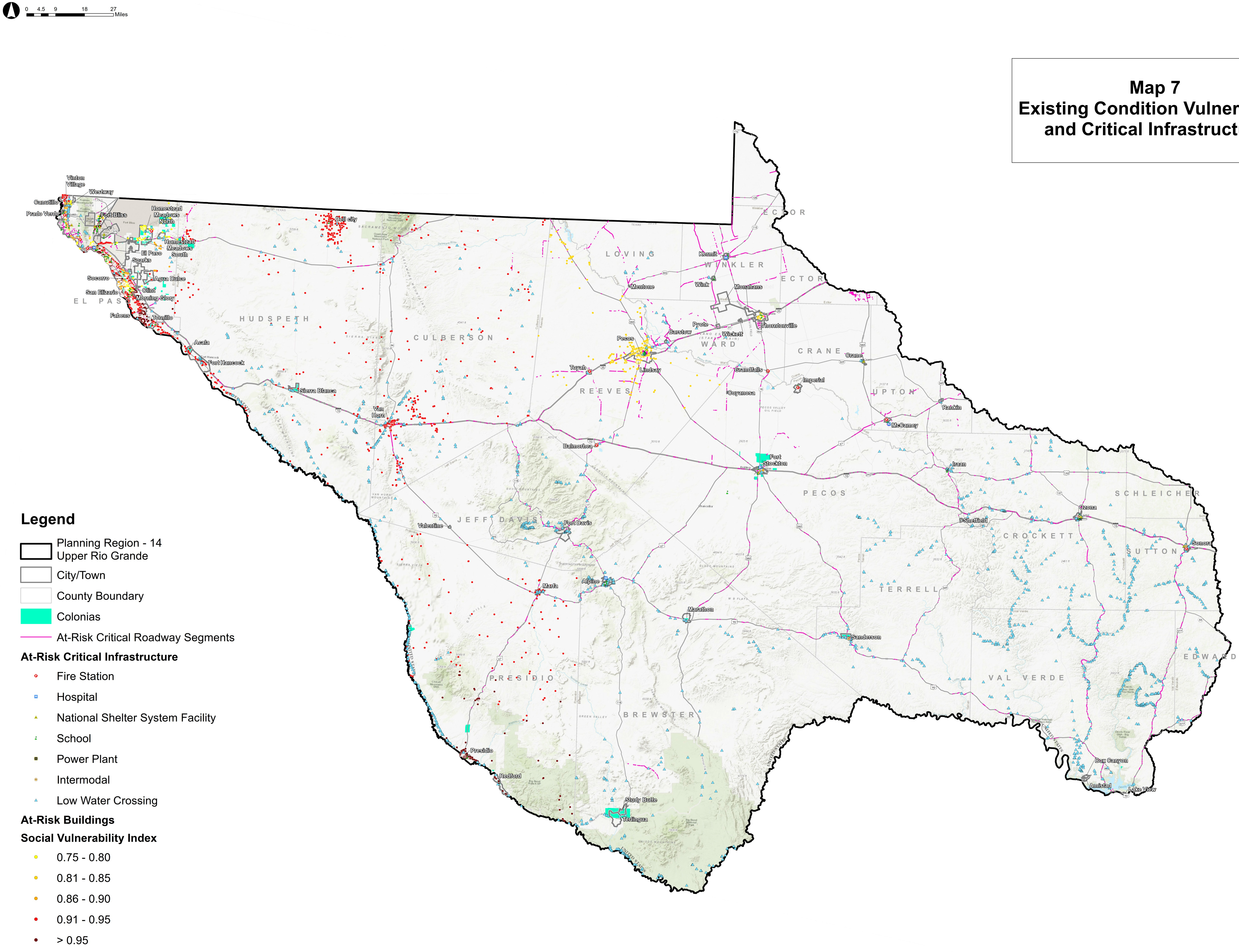
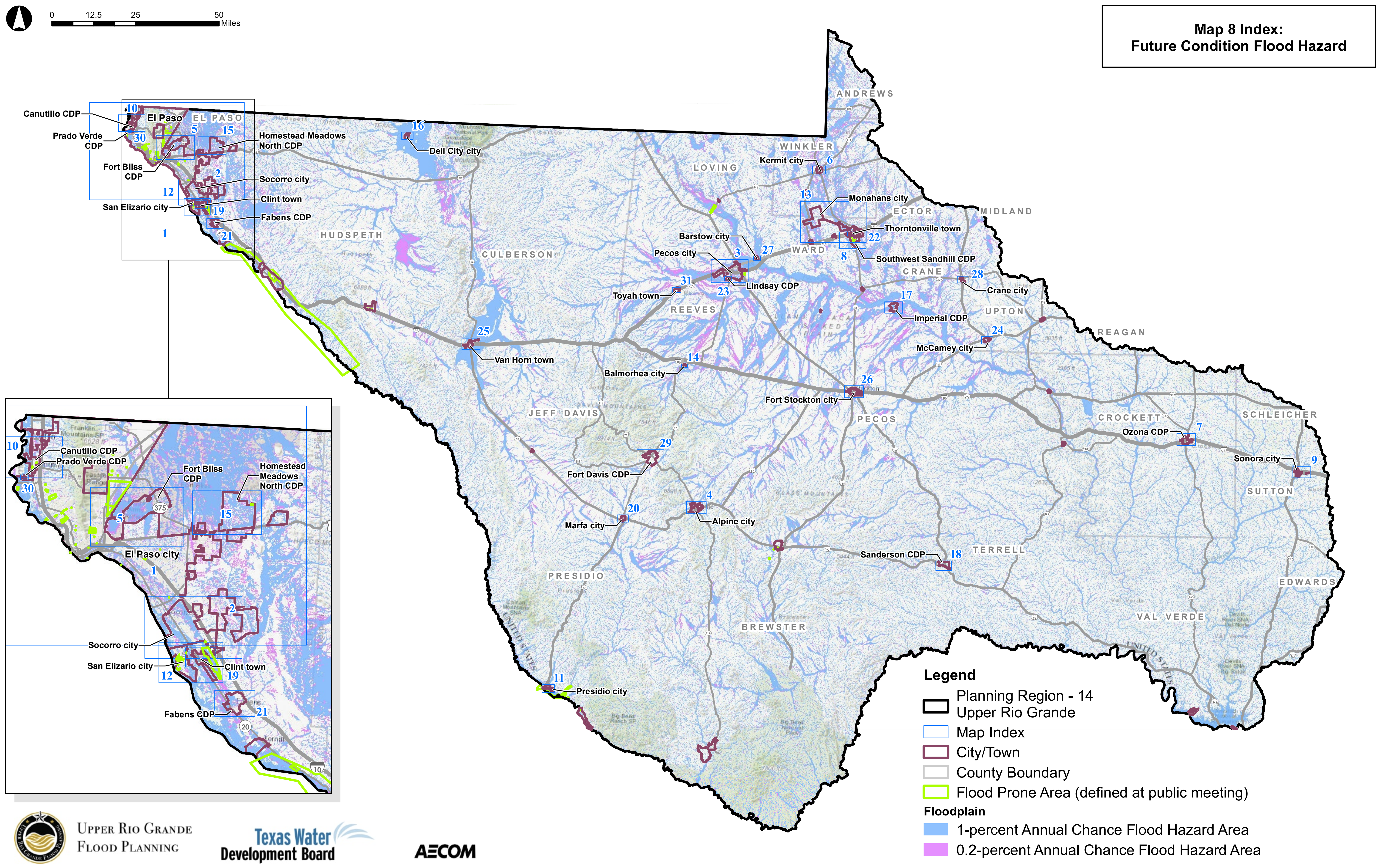
Map 7
Existing Condition Vulnerability and Critical Infrastructure



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Map 8 Index:
Future Condition Flood Hazard



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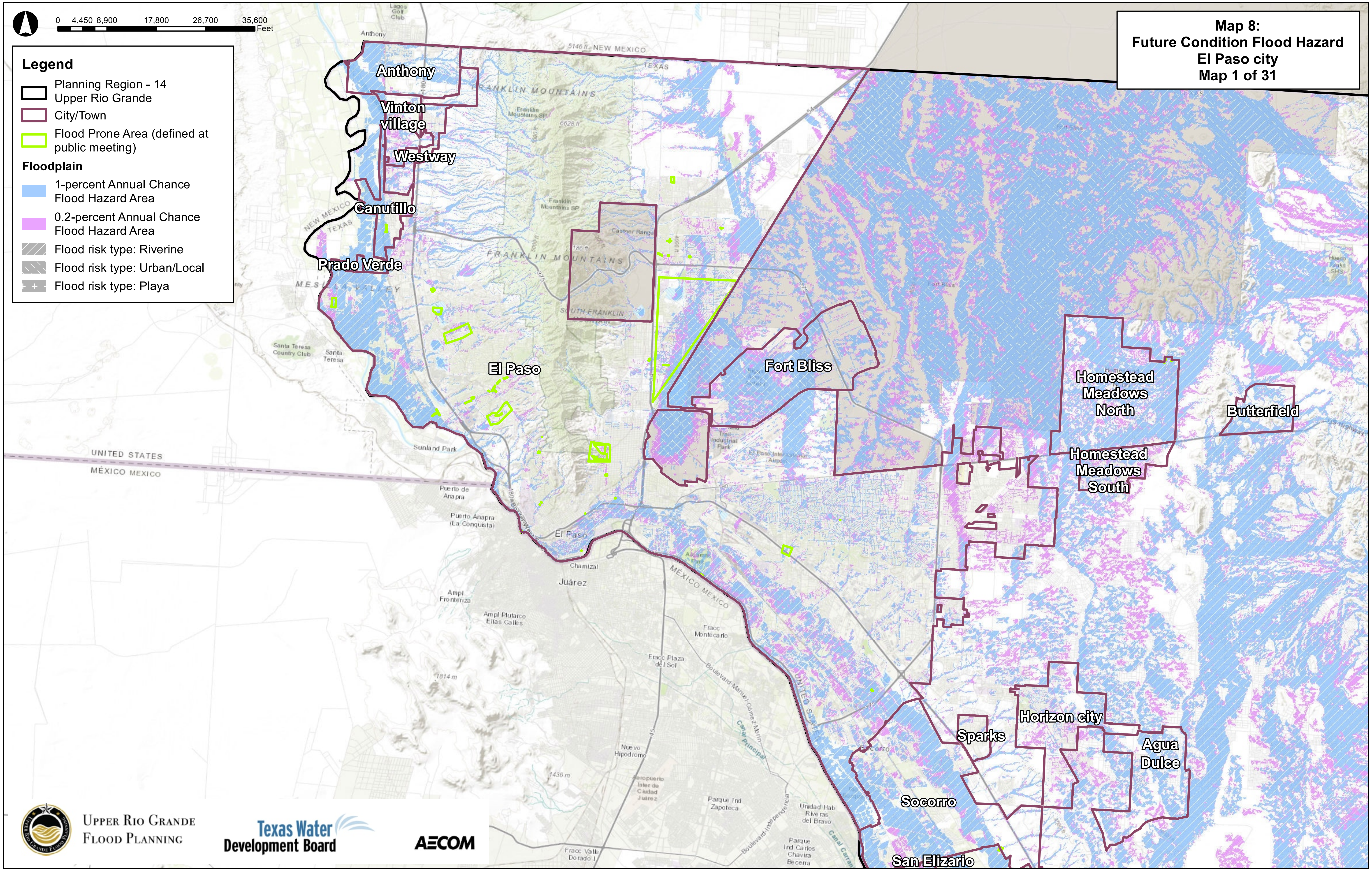
Map 8:
Future Condition Flood Hazard
El Paso city
Map 1 of 31



Legend

▭ Planning Region - 14 Upper Rio Grande

▭ City/Town

▭ Flood Prone Area (defined at public meeting)

Floodplain

🟦 1-percent Annual Chance Flood Hazard Area

🟪 0.2-percent Annual Chance Flood Hazard Area

▨ Flood risk type: Riverine

▨ Flood risk type: Urban/Local

▨ Flood risk type: Playa

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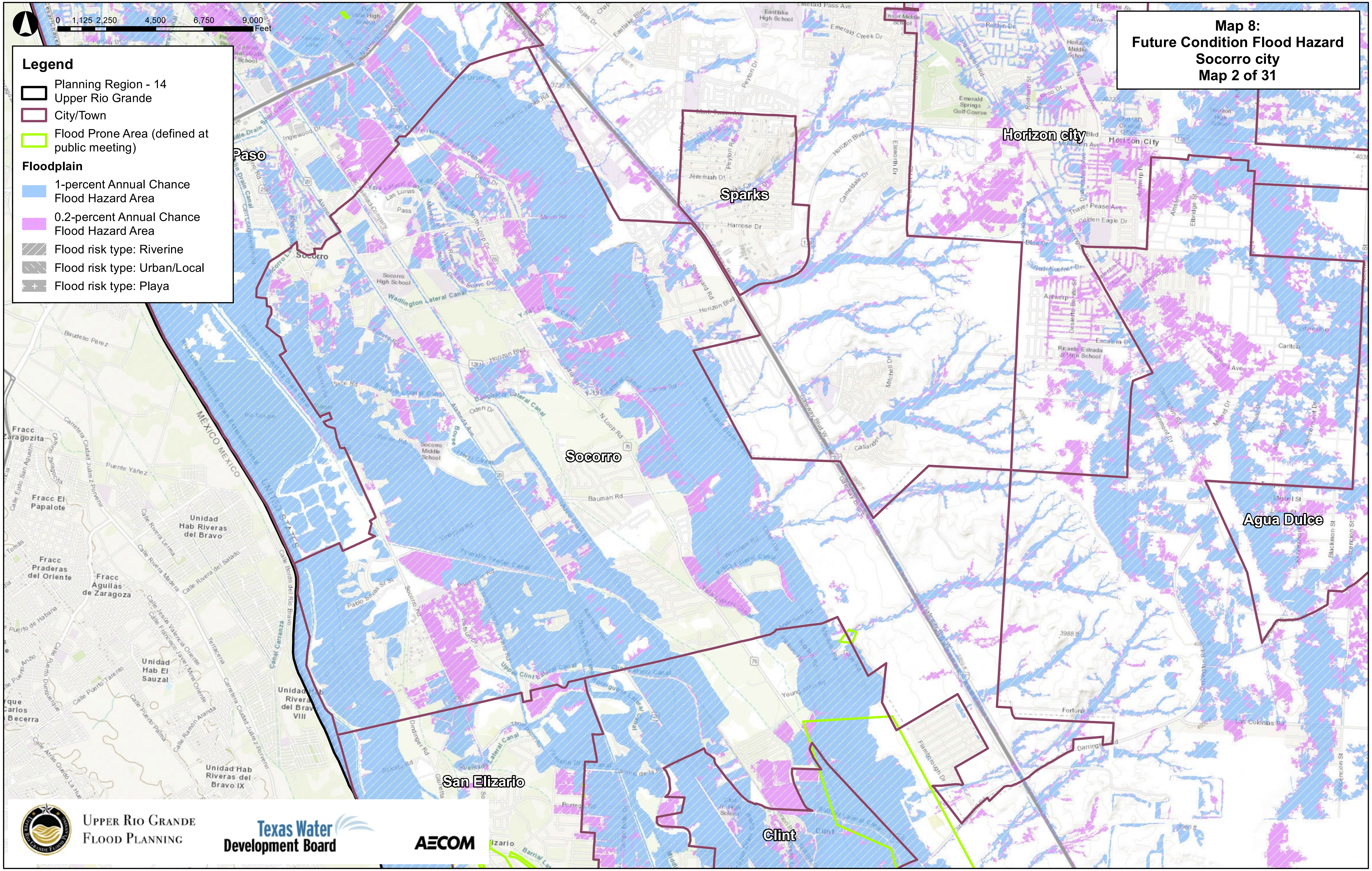
Map 8:
Future Condition Flood Hazard
Socorro city
Map 2 of 31



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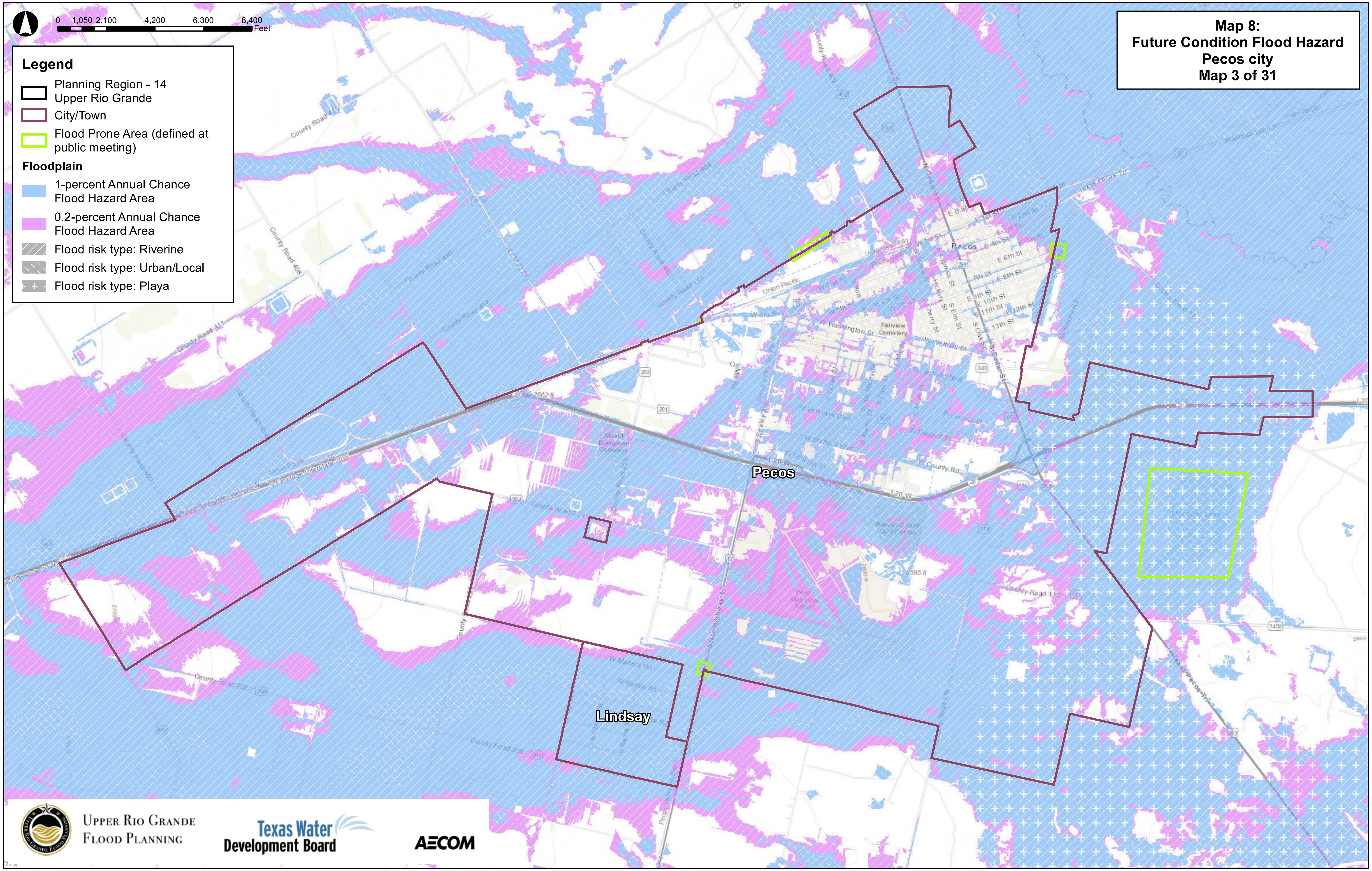
Map 8:
Future Condition Flood Hazard
Pecos city
Map 3 of 31



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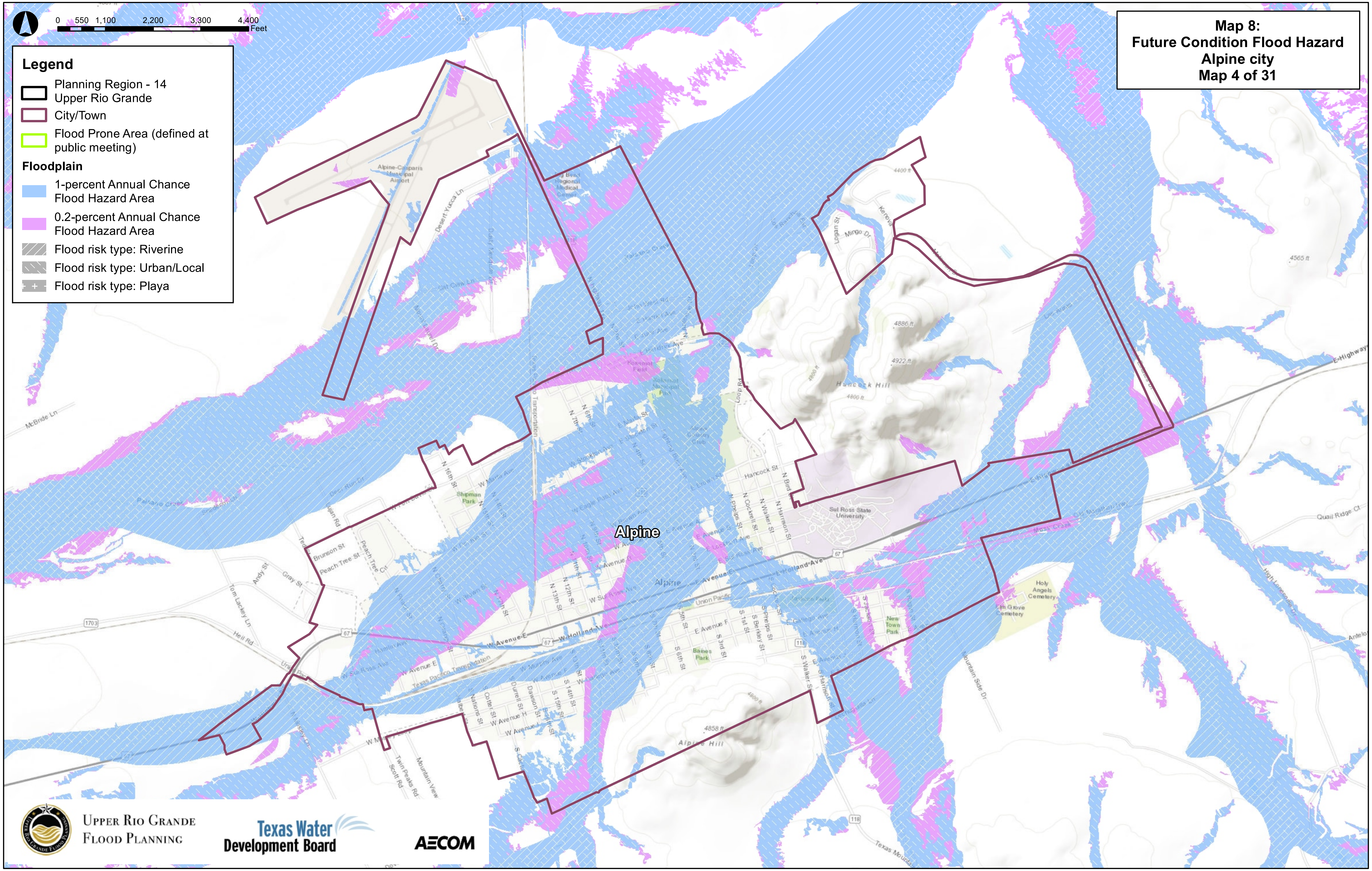
Map 8:
Future Condition Flood Hazard
Alpine city
Map 4 of 31



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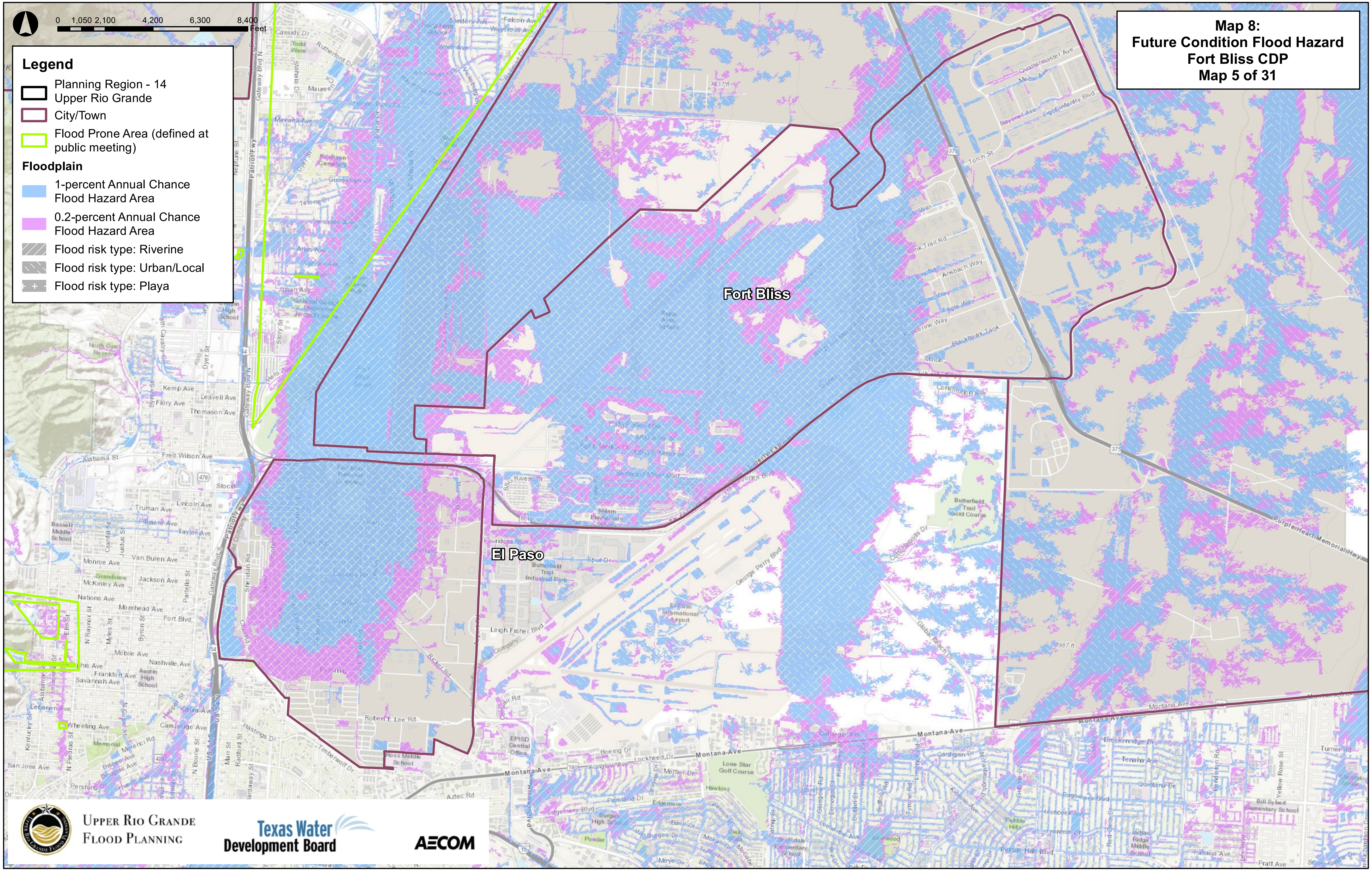
Map 8:
Future Condition Flood Hazard
Fort Bliss CDP
Map 5 of 31



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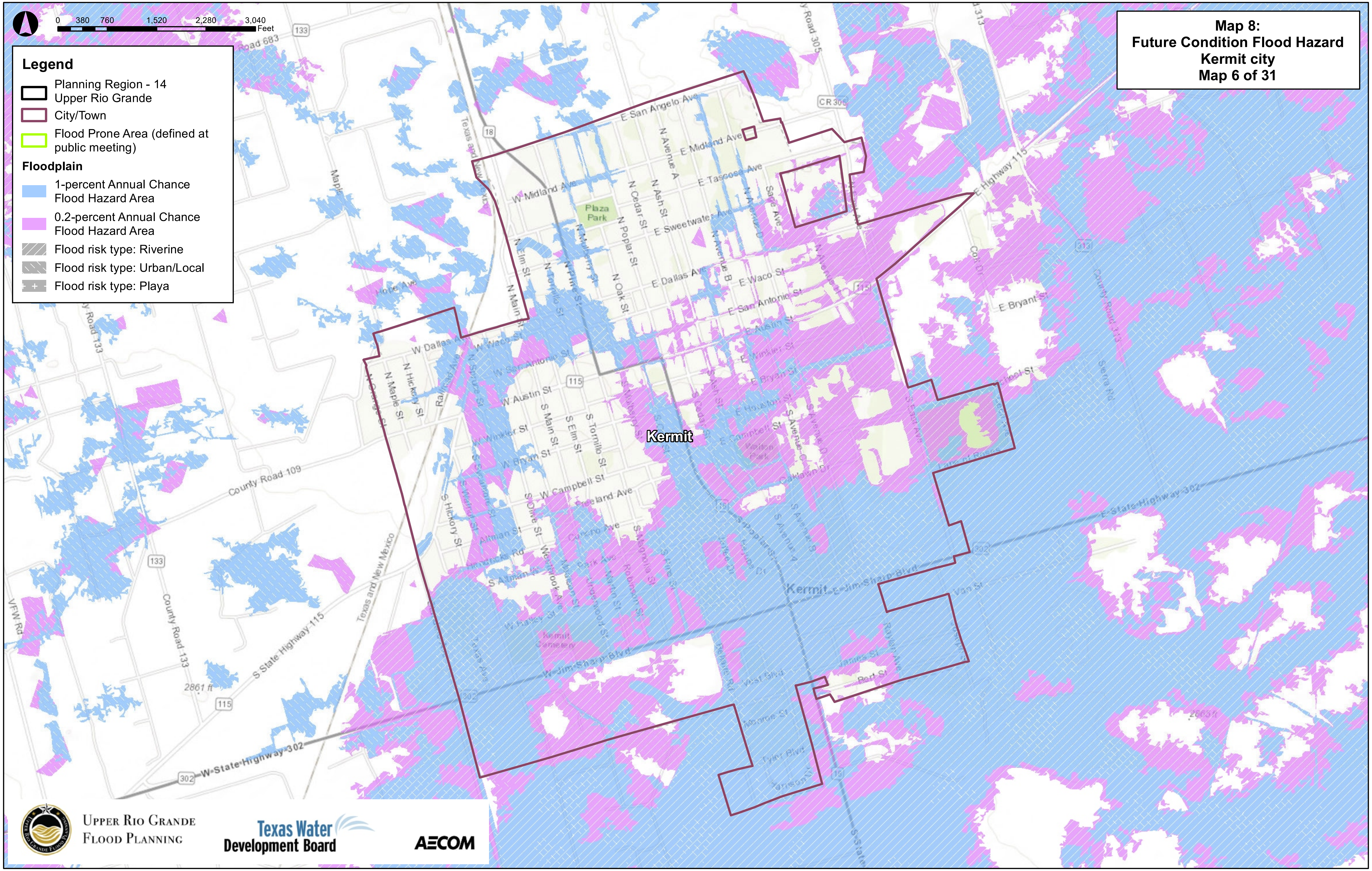
Map 8:
Future Condition Flood Hazard
Kermit city
Map 6 of 31



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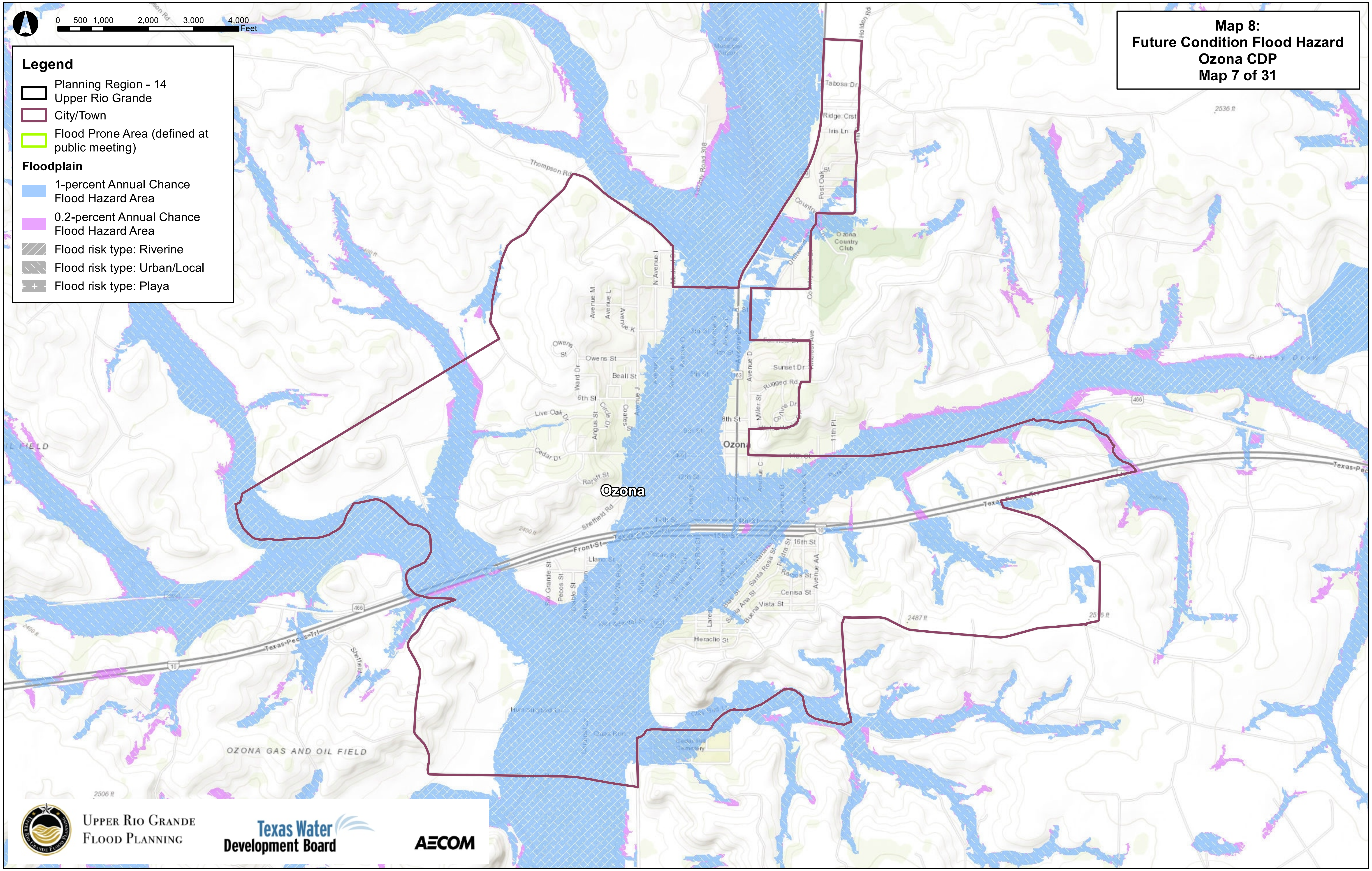
Map 8:
Future Condition Flood Hazard
Ozona CDP
Map 7 of 31



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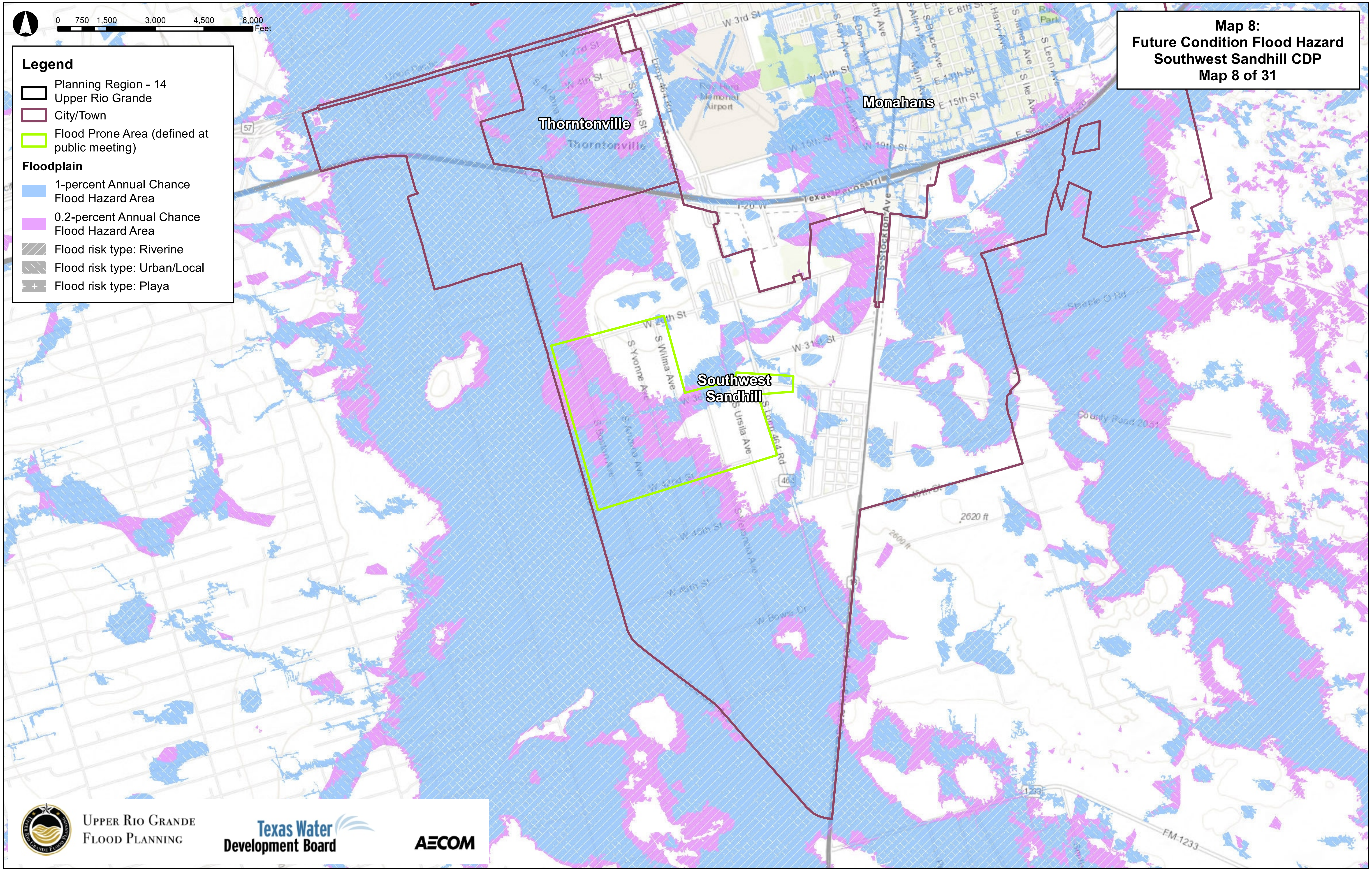

Map 8:
Future Condition Flood Hazard
Southwest Sandhill CDP
Map 8 of 31

Legend

- ▭ Planning Region - 14 Upper Rio Grande
- ▭ City/Town
- ▭ Flood Prone Area (defined at public meeting)

Floodplain

- 🟦 1-percent Annual Chance Flood Hazard Area
- 🟪 0.2-percent Annual Chance Flood Hazard Area
- ▨ Flood risk type: Riverine
- ▨ Flood risk type: Urban/Local
- ▨ Flood risk type: Playa

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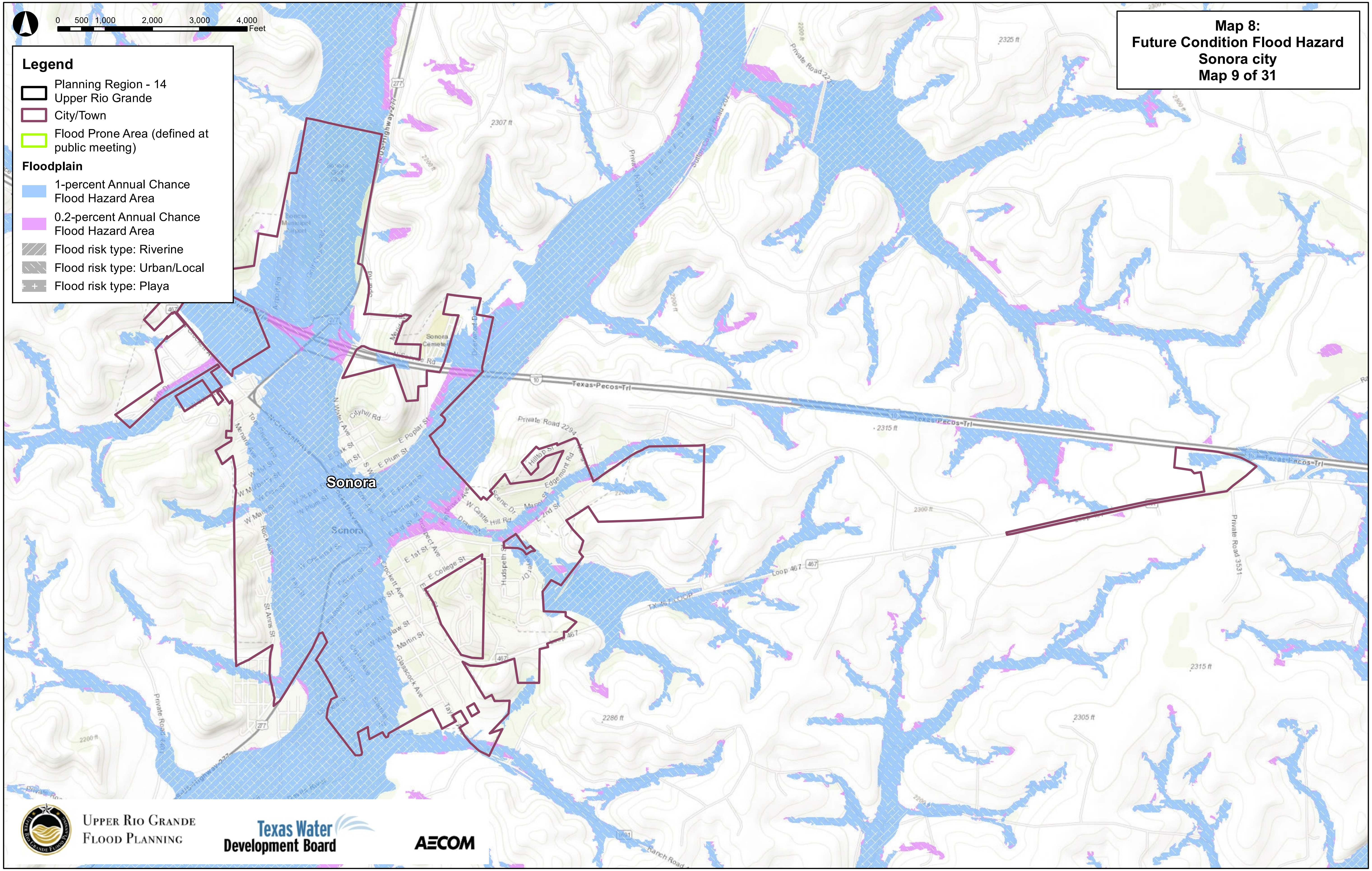
Map 8:
Future Condition Flood Hazard
Sonora city
Map 9 of 31



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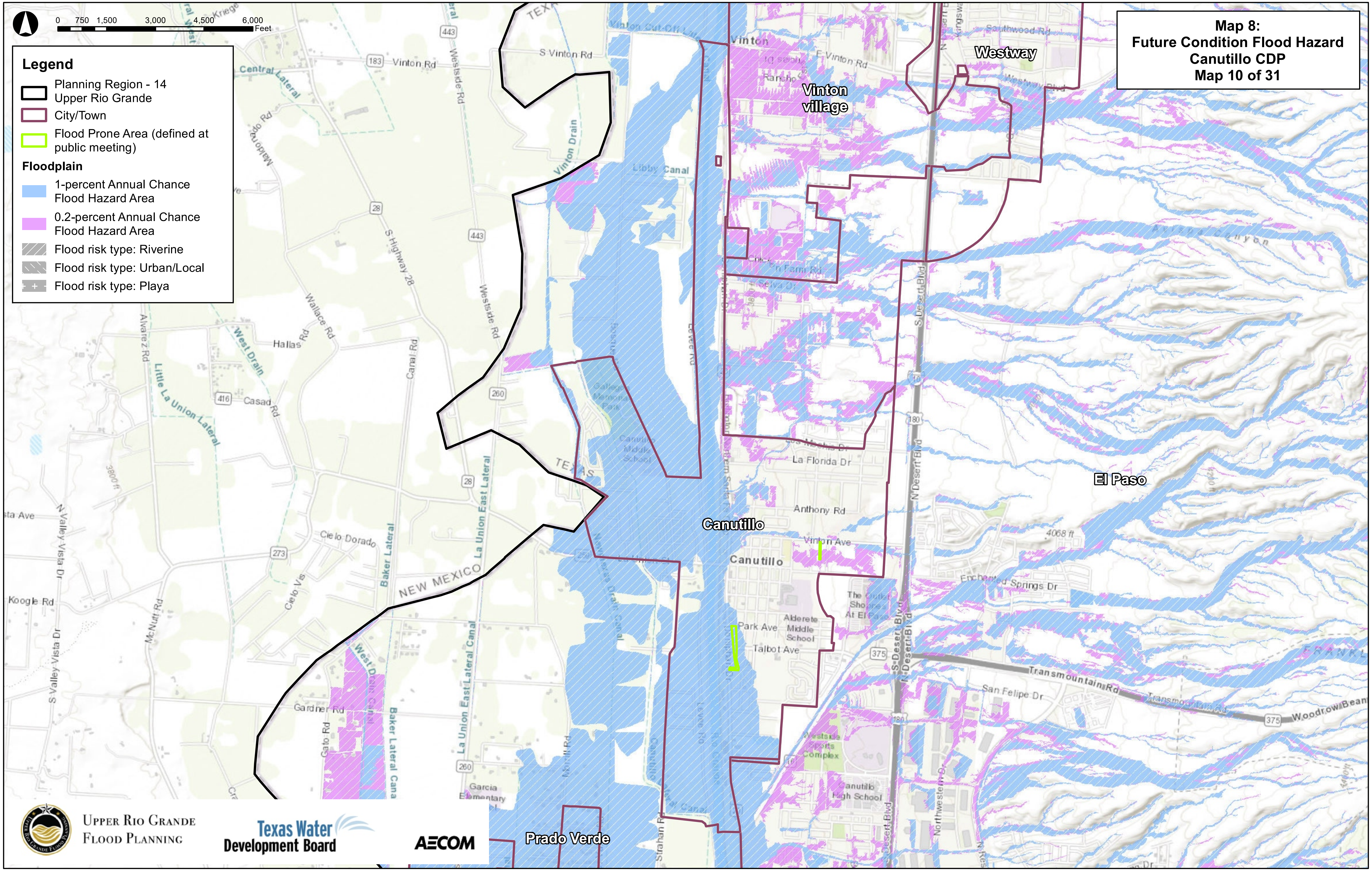
Map 8:
Future Condition Flood Hazard
Canutillo CDP
Map 10 of 31



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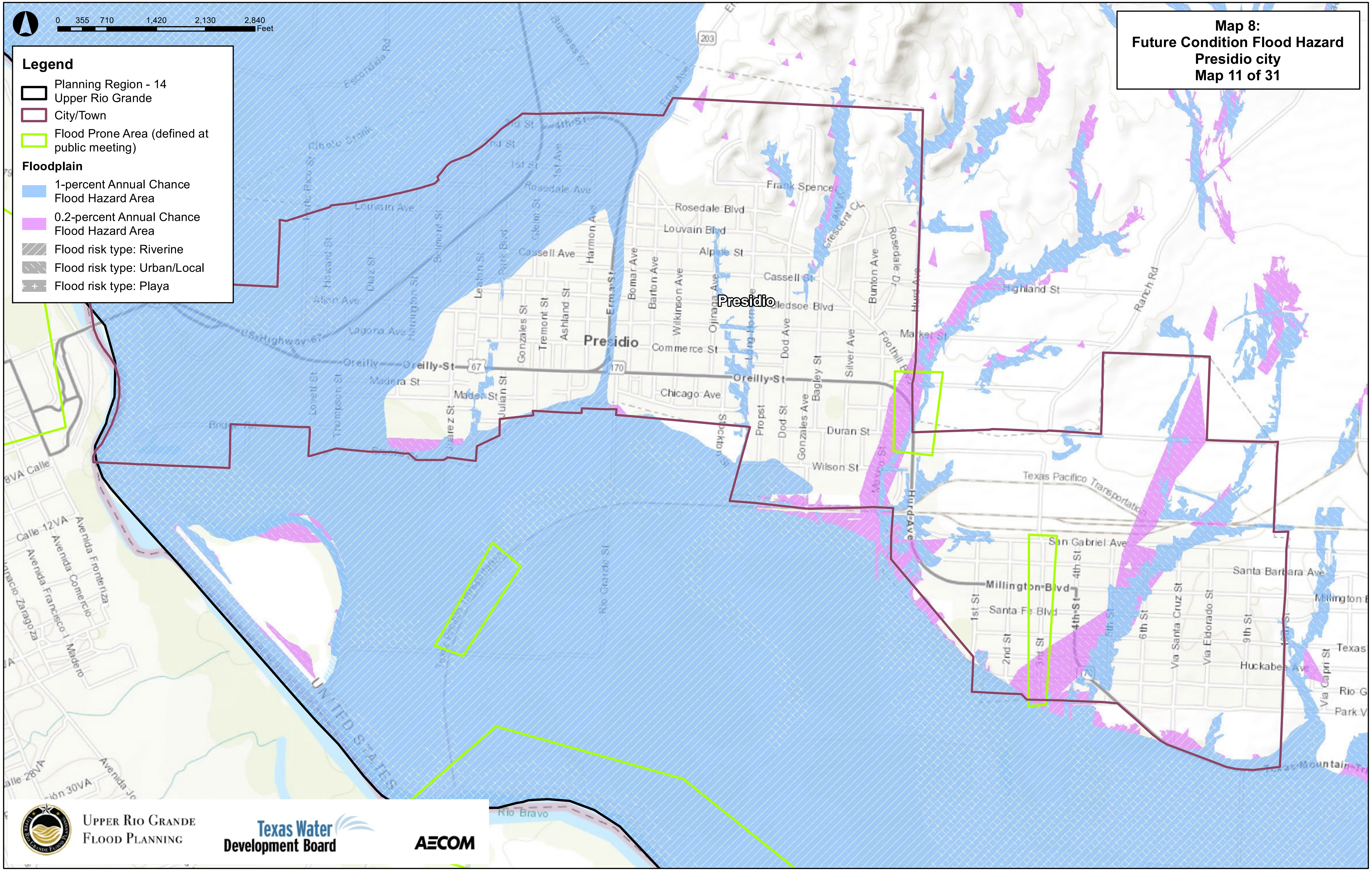

Map 8:
Future Condition Flood Hazard
Presidio city
Map 11 of 31

Legend

▭	Planning Region - 14 Upper Rio Grande
▭	City/Town
▭	Flood Prone Area (defined at public meeting)

Floodplain

🟦	1-percent Annual Chance Flood Hazard Area
🟪	0.2-percent Annual Chance Flood Hazard Area
▨	Flood risk type: Riverine
▨	Flood risk type: Urban/Local
+	Flood risk type: Playa

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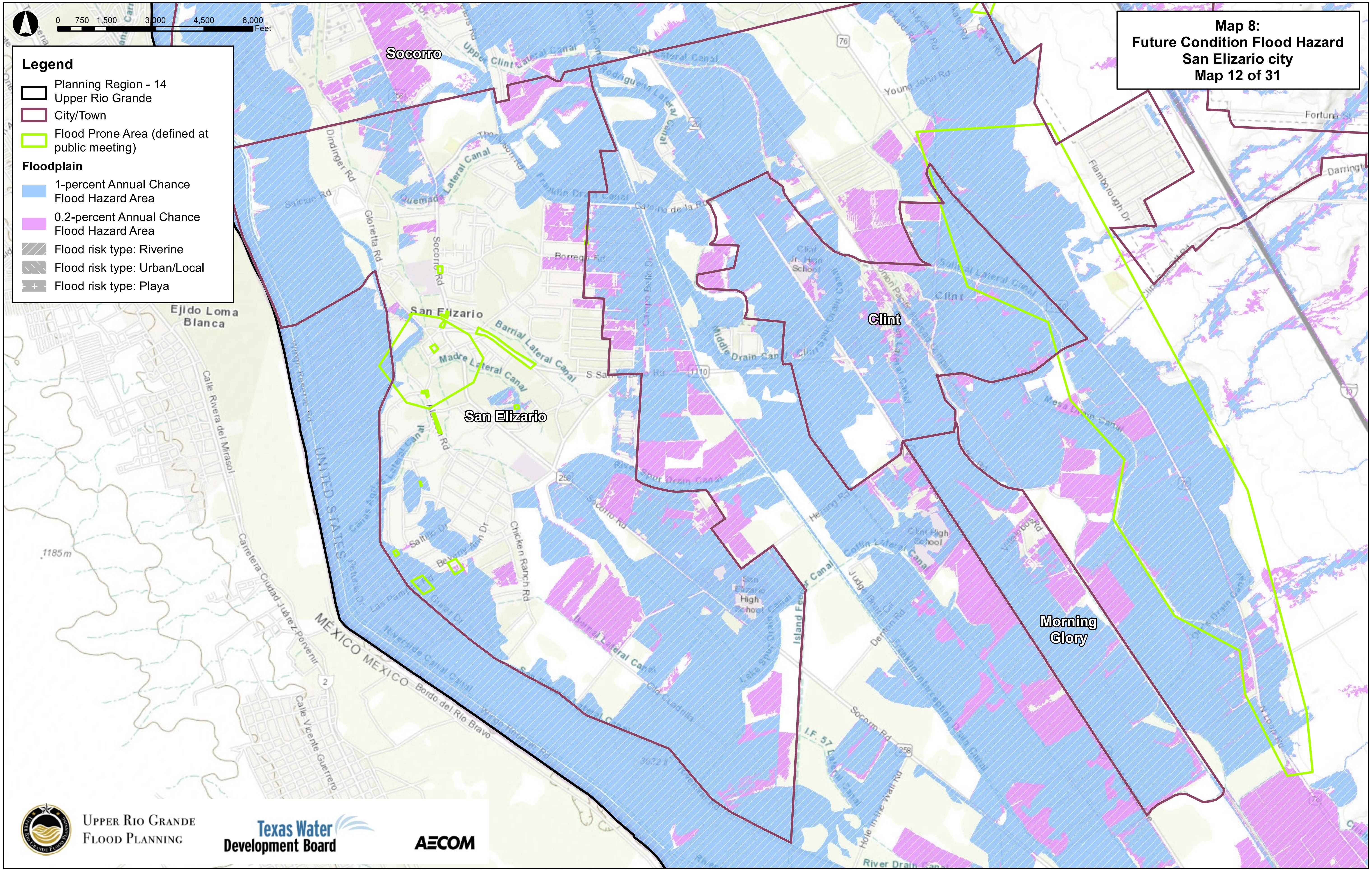
Map 8:
Future Condition Flood Hazard
San Elizario city
Map 12 of 31



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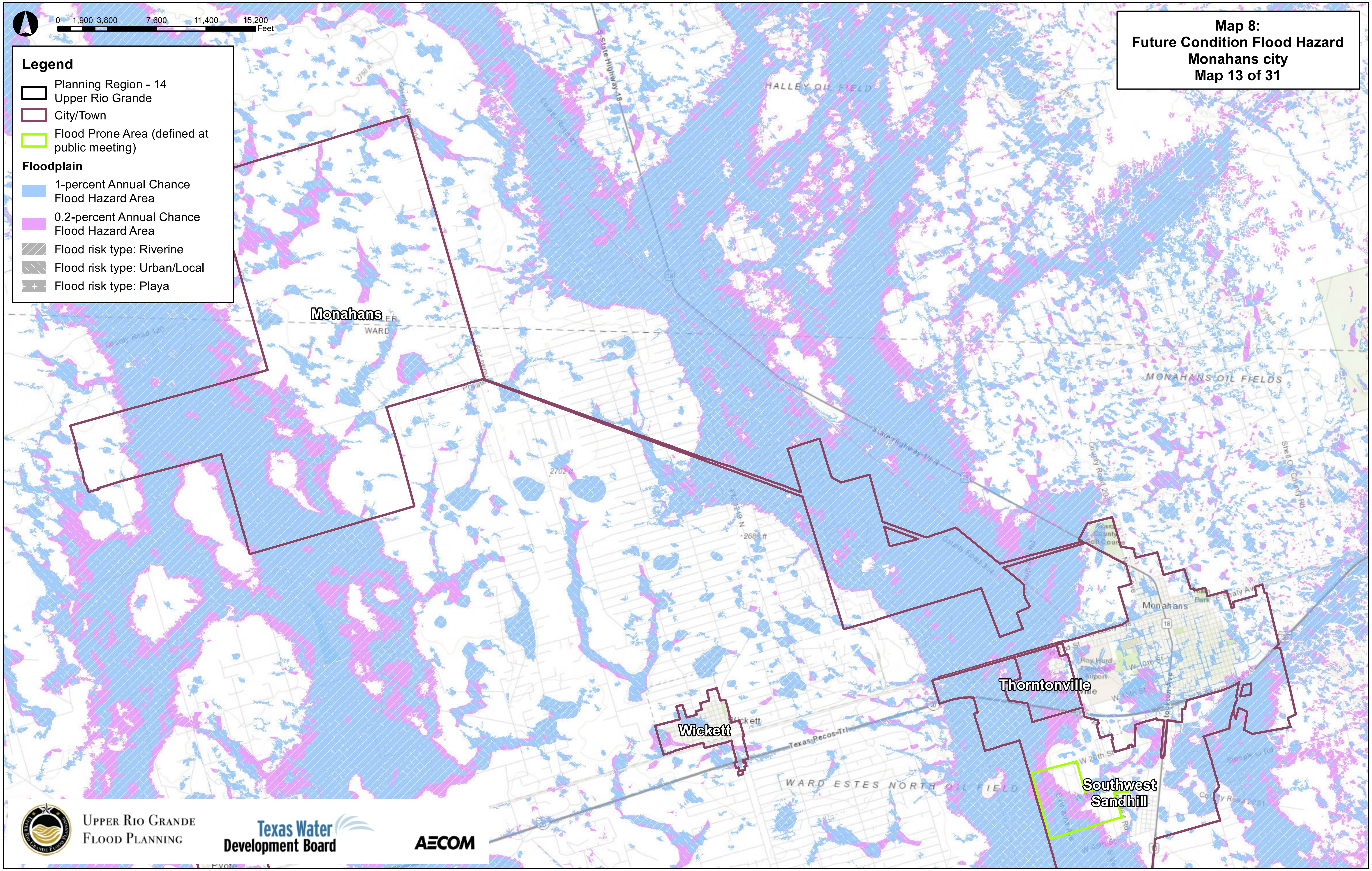

Map 8:
Future Condition Flood Hazard
Monahans city
Map 13 of 31

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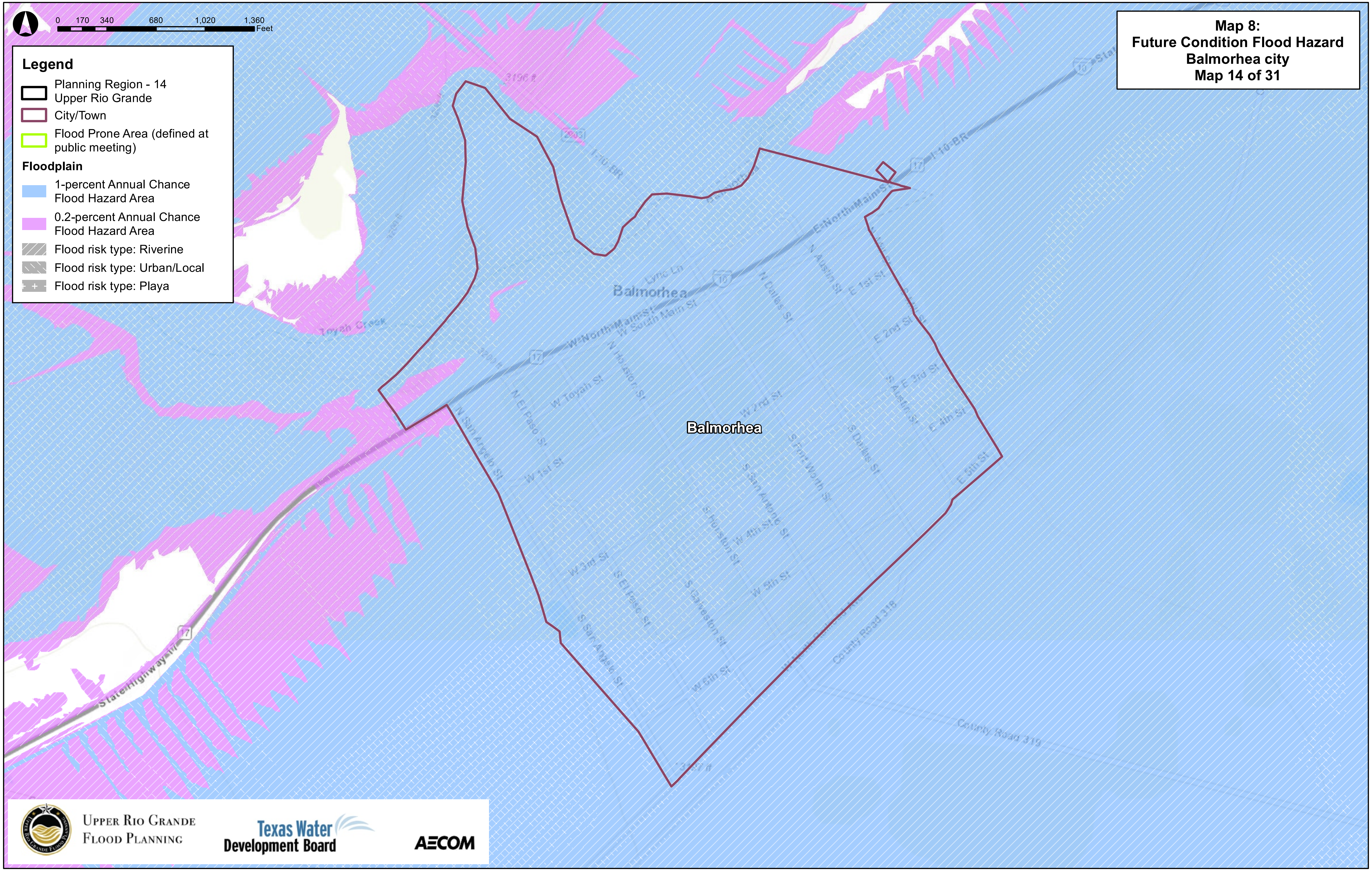
Map 8:
Future Condition Flood Hazard
Balmorhea city
Map 14 of 31



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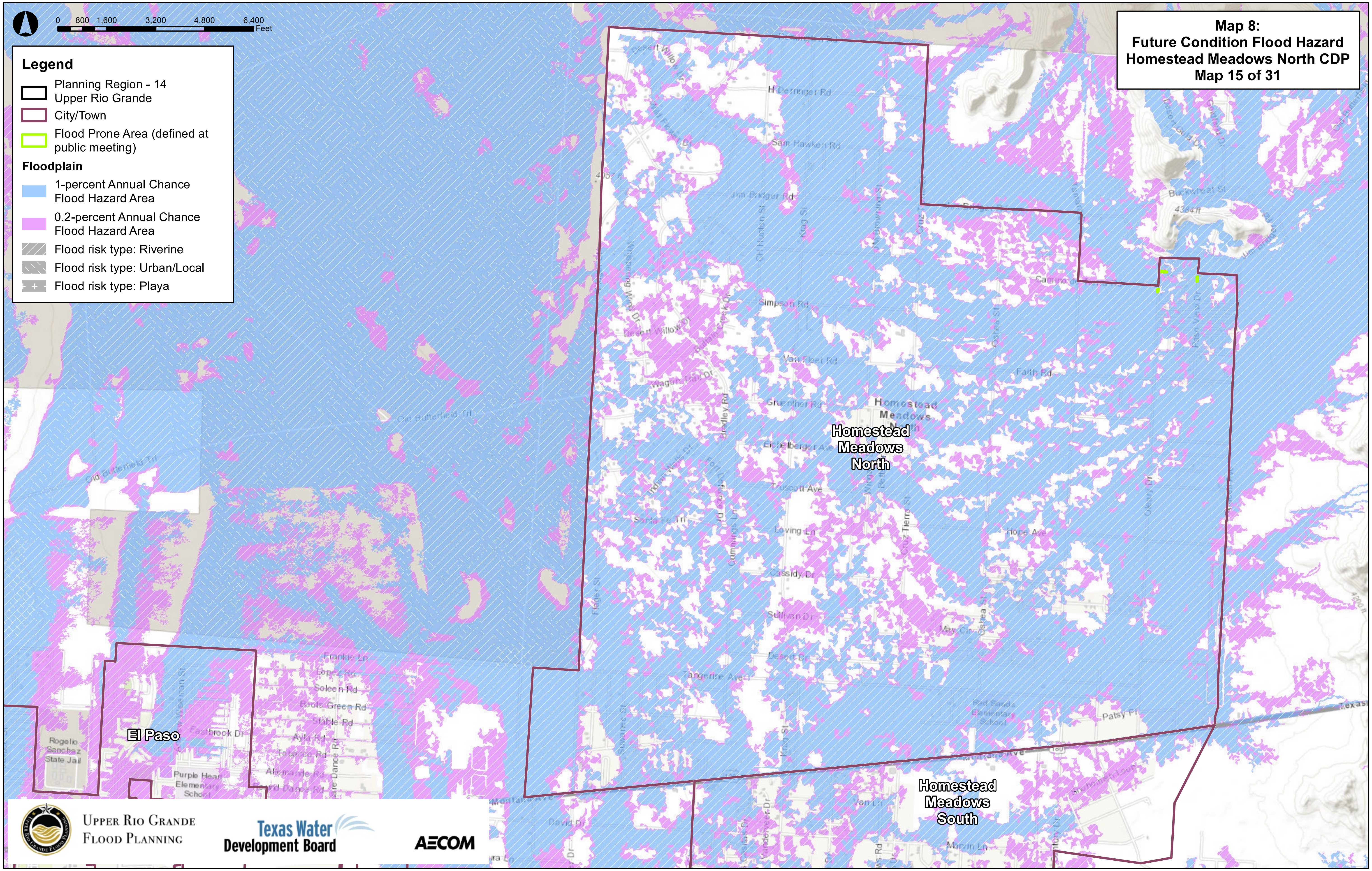
Map 8:
Future Condition Flood Hazard
Homestead Meadows North CDP
Map 15 of 31



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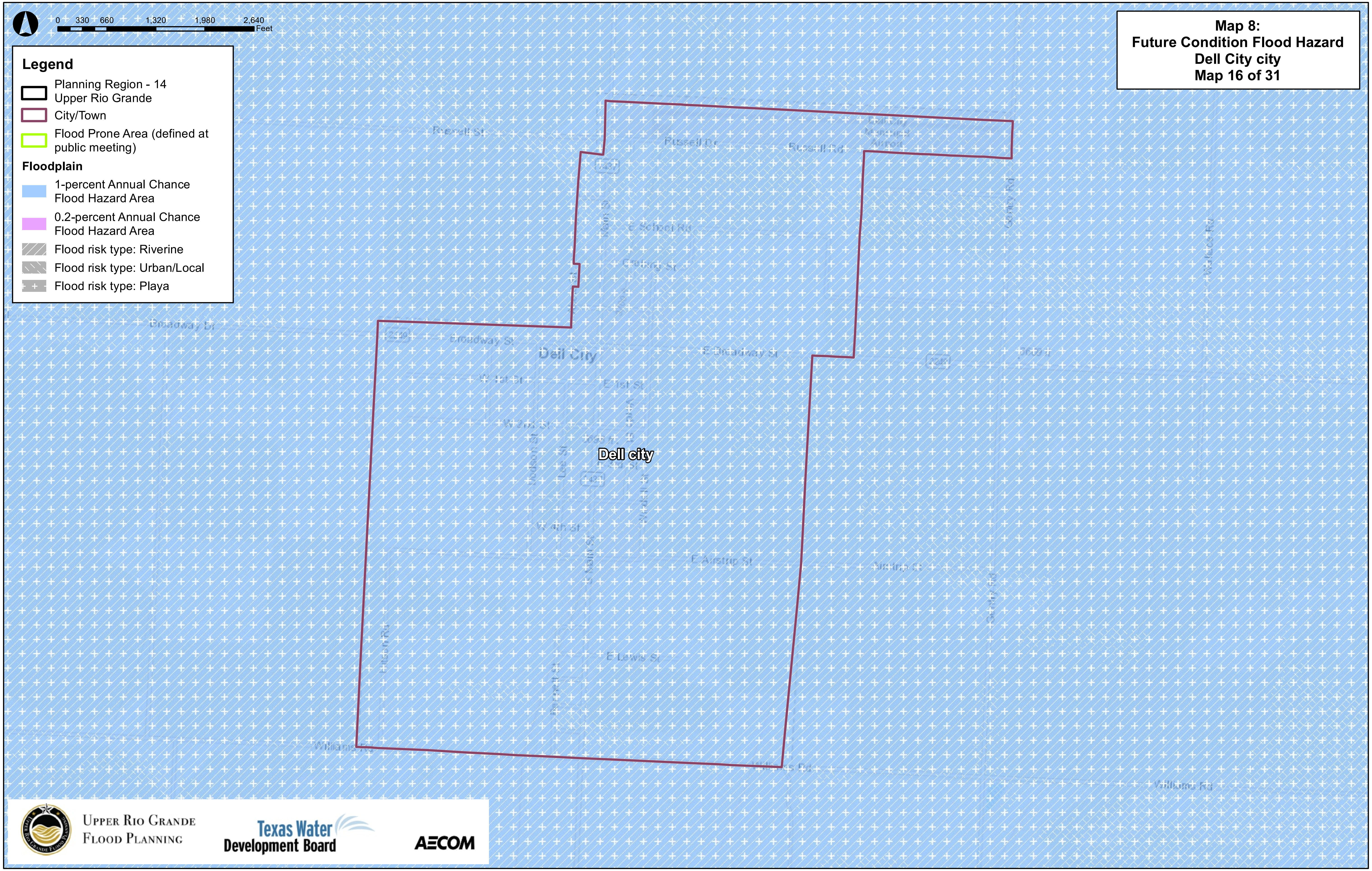
Map 8:
Future Condition Flood Hazard
Dell City city
Map 16 of 31



Legend

▭ Planning Region - 14 Upper Rio Grande

▭ City/Town

▭ Flood Prone Area (defined at public meeting)

Floodplain

🟦 1-percent Annual Chance Flood Hazard Area

🟪 0.2-percent Annual Chance Flood Hazard Area

▨ Flood risk type: Riverine

▨ Flood risk type: Urban/Local

＋ Flood risk type: Playa

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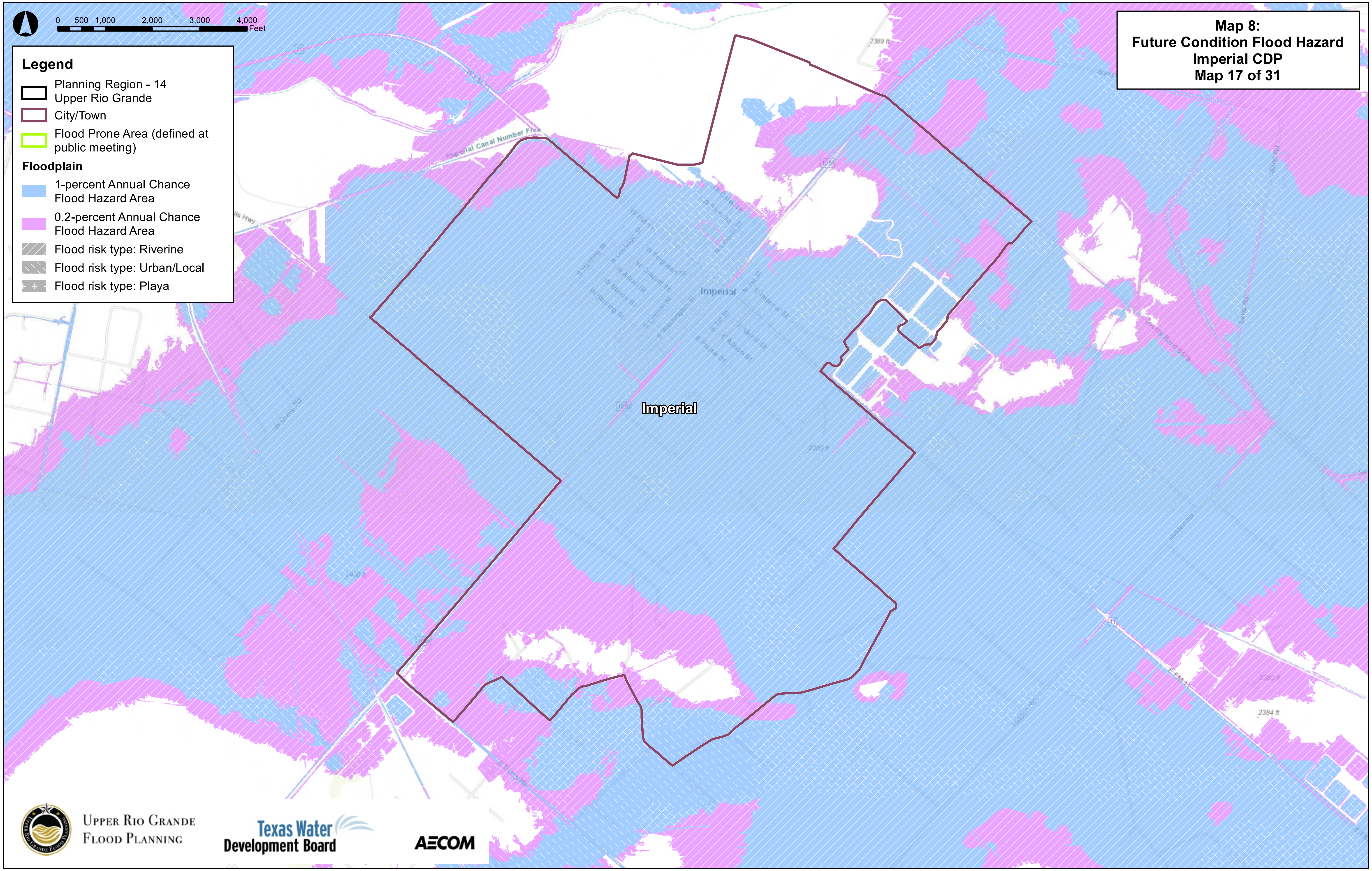
Map 8:
Future Condition Flood Hazard
Imperial CDP
Map 17 of 31



Upper Rio Grande Flood Planning

Texas Water Development Board

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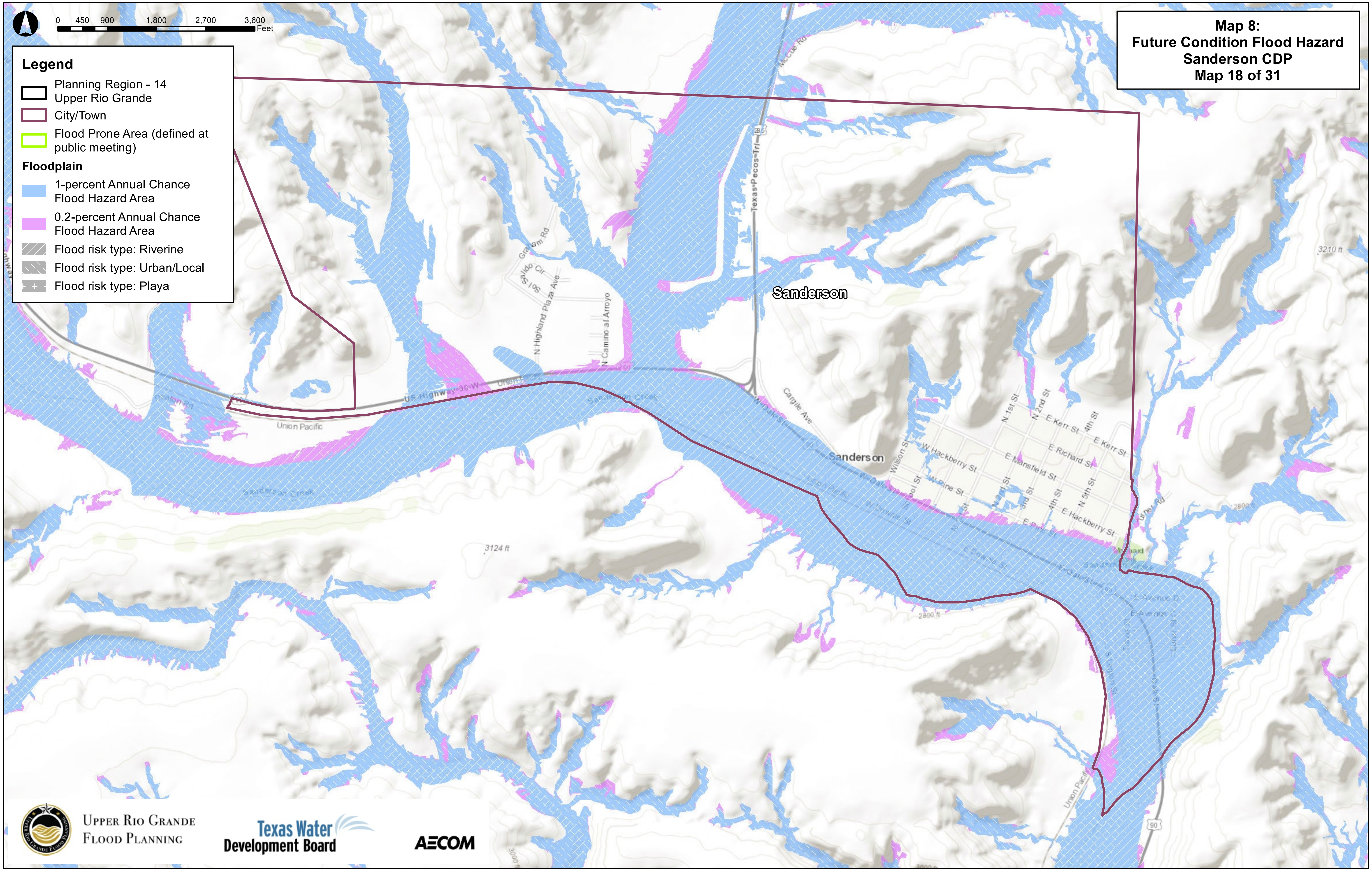

Map 8:
Future Condition Flood Hazard
Sanderson CDP
Map 18 of 31

Legend

▭ Planning Region - 14 Upper Rio Grande

▭ City/Town

▭ Flood Prone Area (defined at public meeting)

Floodplain

▨ 1-percent Annual Chance Flood Hazard Area

▨ 0.2-percent Annual Chance Flood Hazard Area

▨ Flood risk type: Riverine

▨ Flood risk type: Urban/Local

▨ Flood risk type: Playa

Upper Rio Grande Flood Planning

Texas Water Development Board

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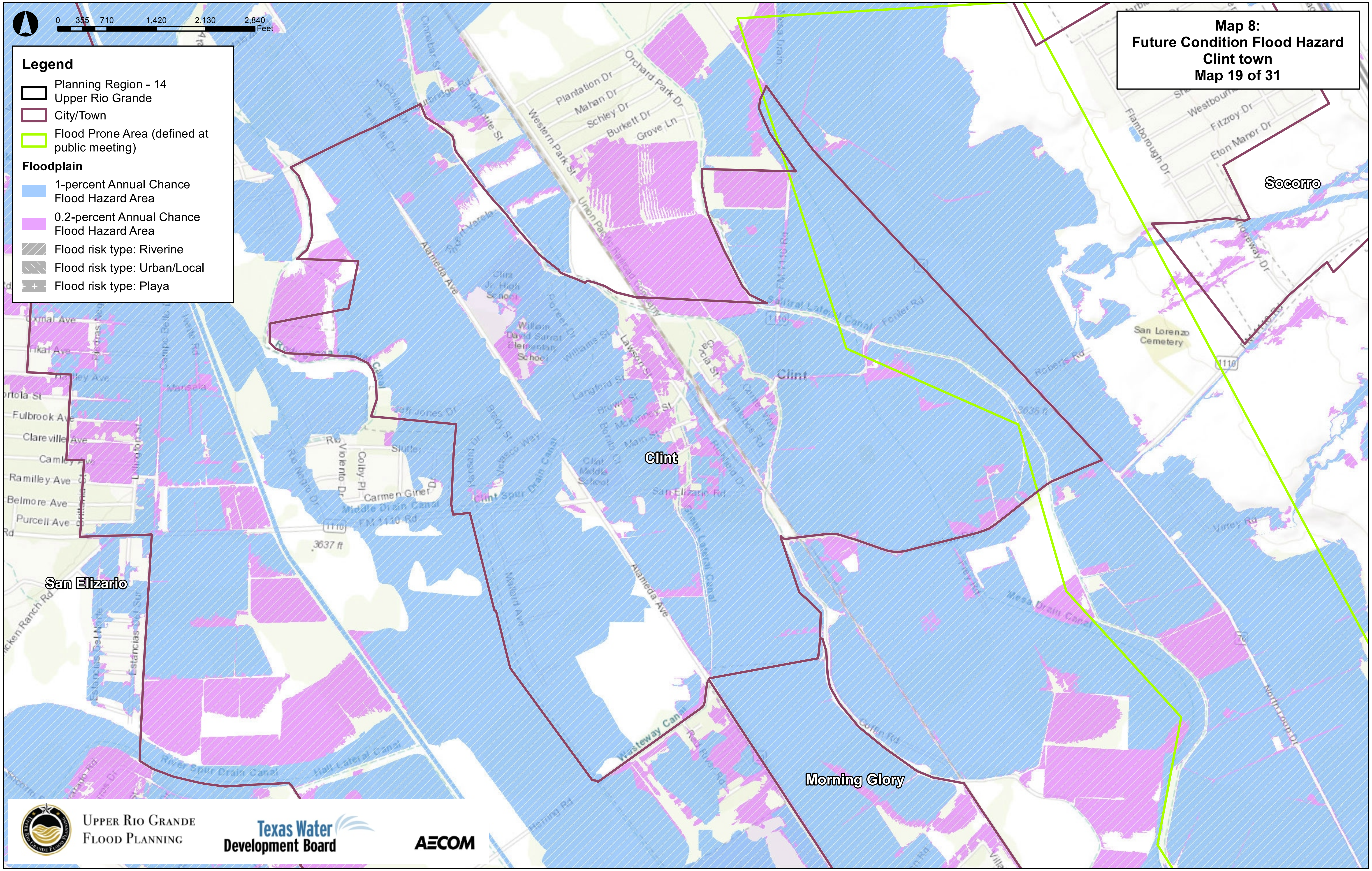
Map 8: Future Condition Flood Hazard Clint town
Map 19 of 31



Upper Rio Grande Flood Planning

Texas Water Development Board

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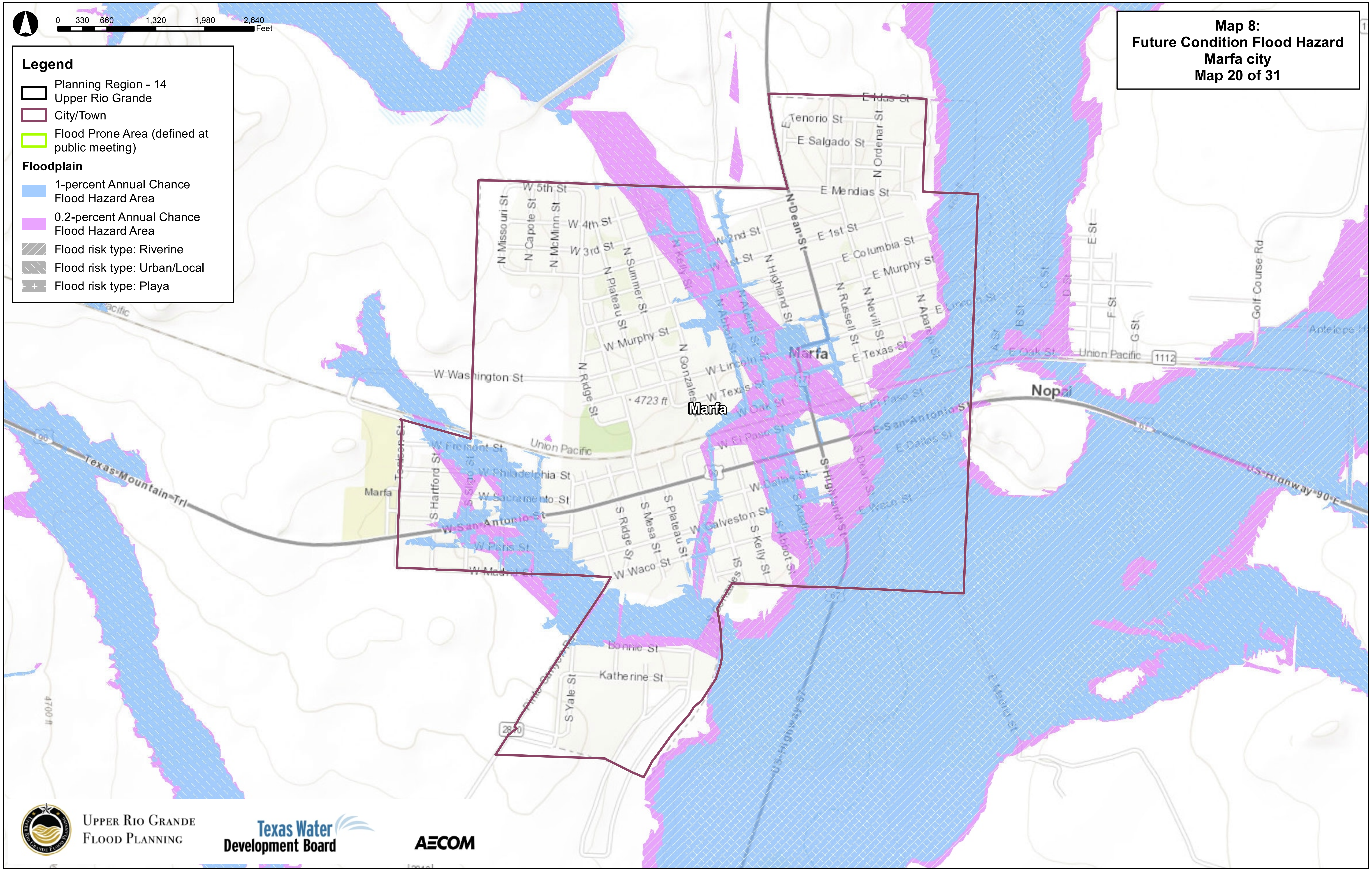
Map 8:
Future Condition Flood Hazard
Marfa city
Map 20 of 31



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Texas Water Development Board

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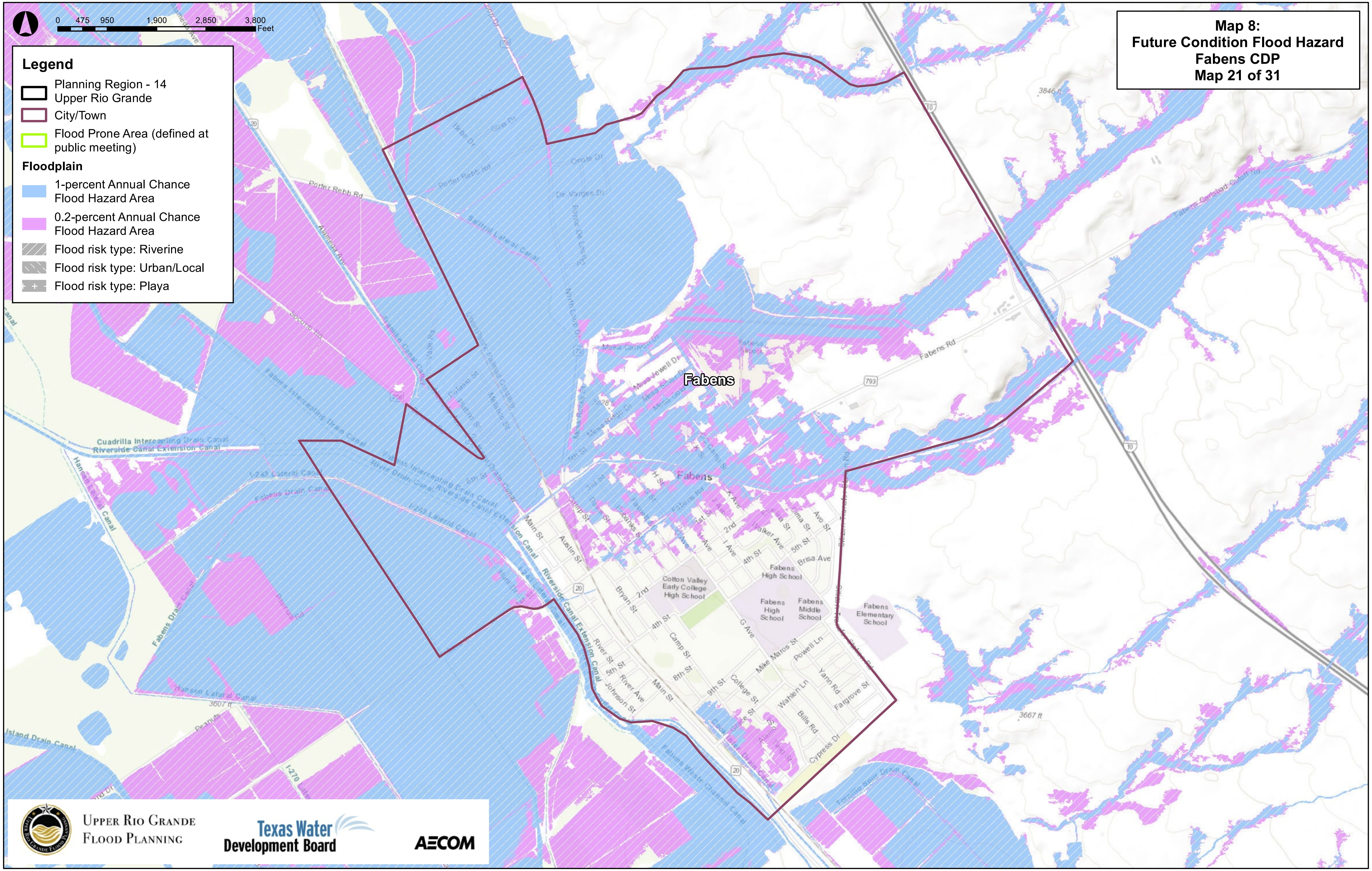
Map 8:
Future Condition Flood Hazard
Fabens CDP
Map 21 of 31



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Texas Water Development Board

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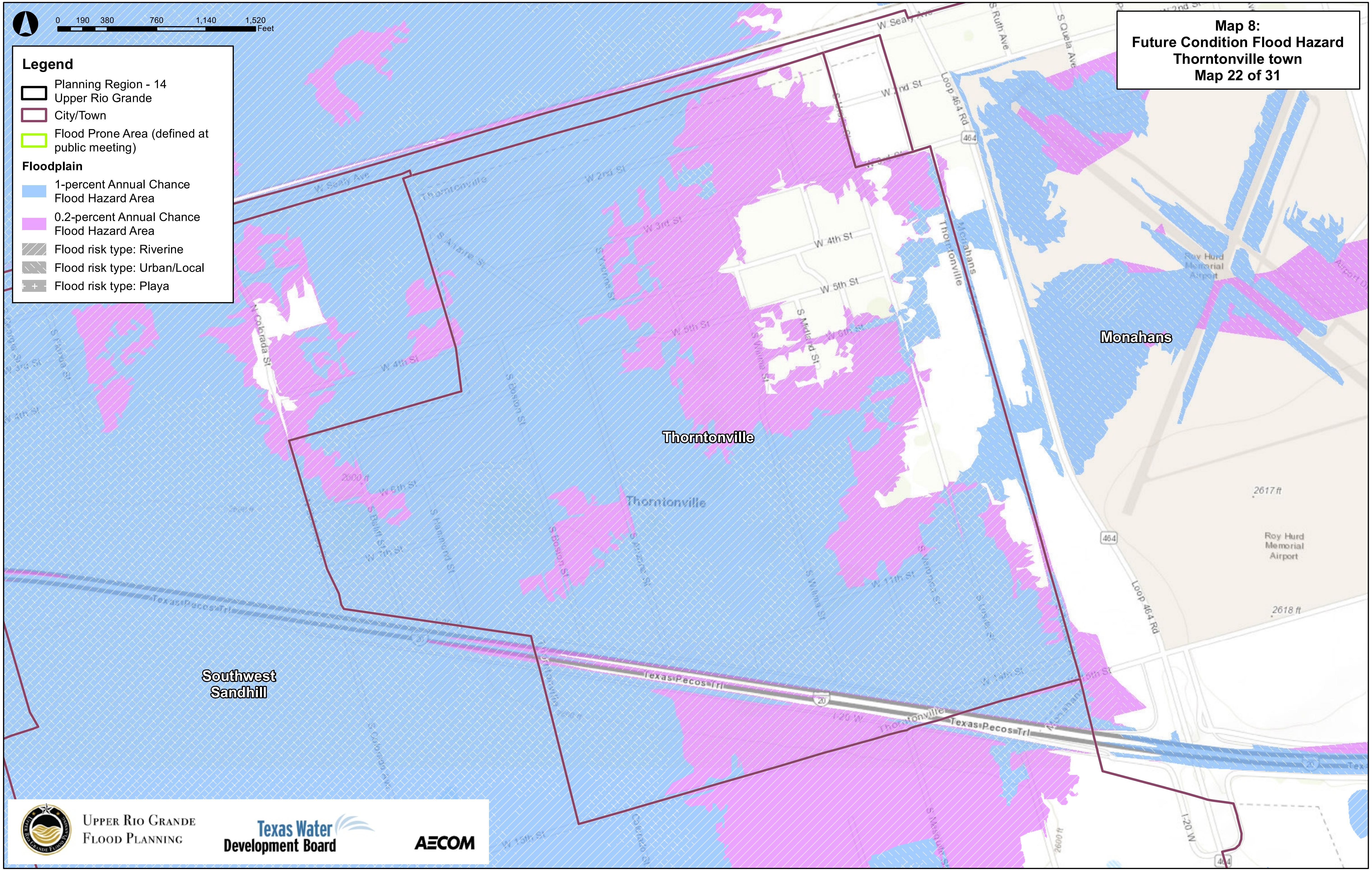
Map 8:
Future Condition Flood Hazard
Thorntonville town
Map 22 of 31



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Texas Water Development Board

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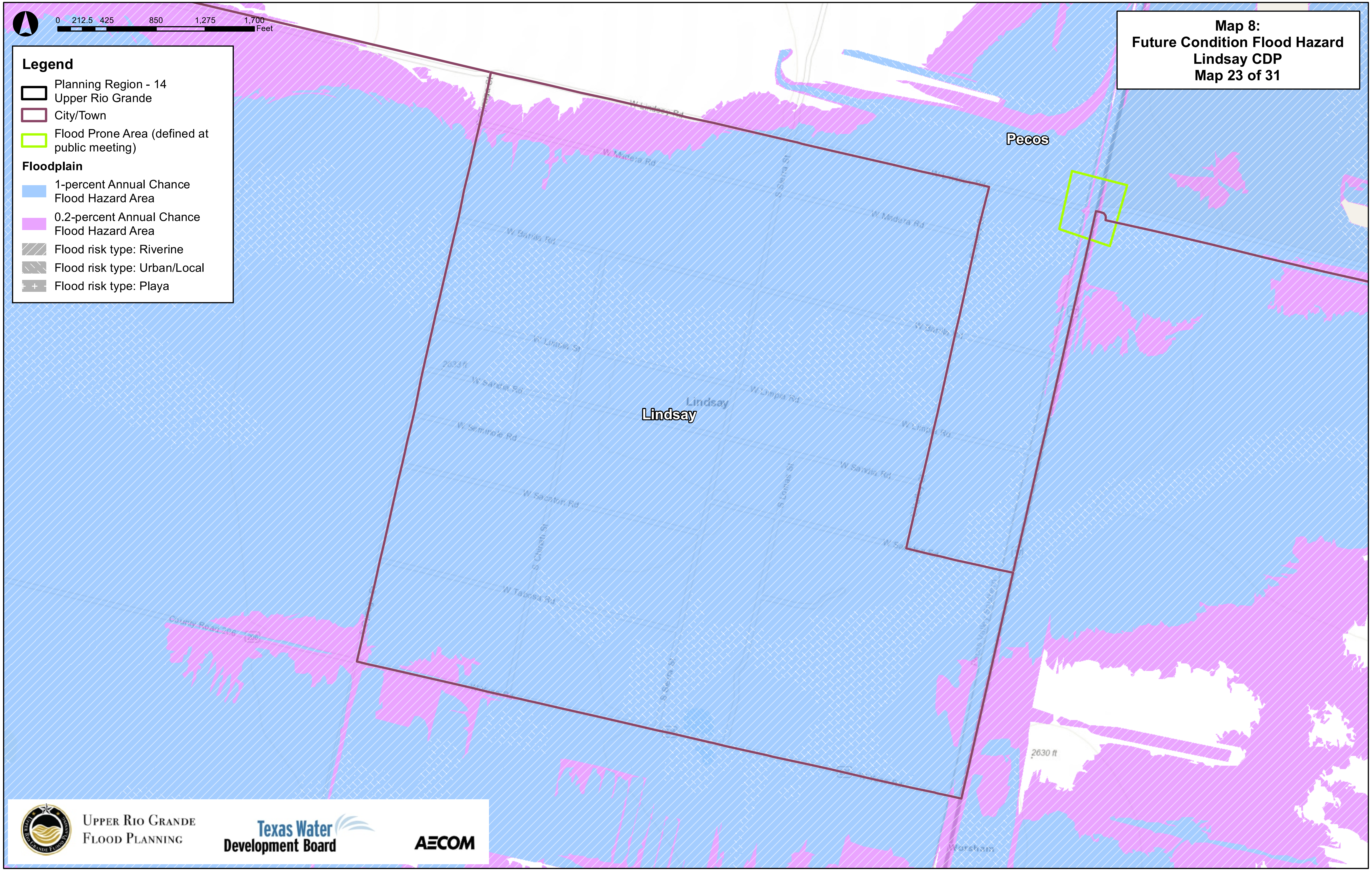
Map 8:
Future Condition Flood Hazard
Lindsay CDP
Map 23 of 31



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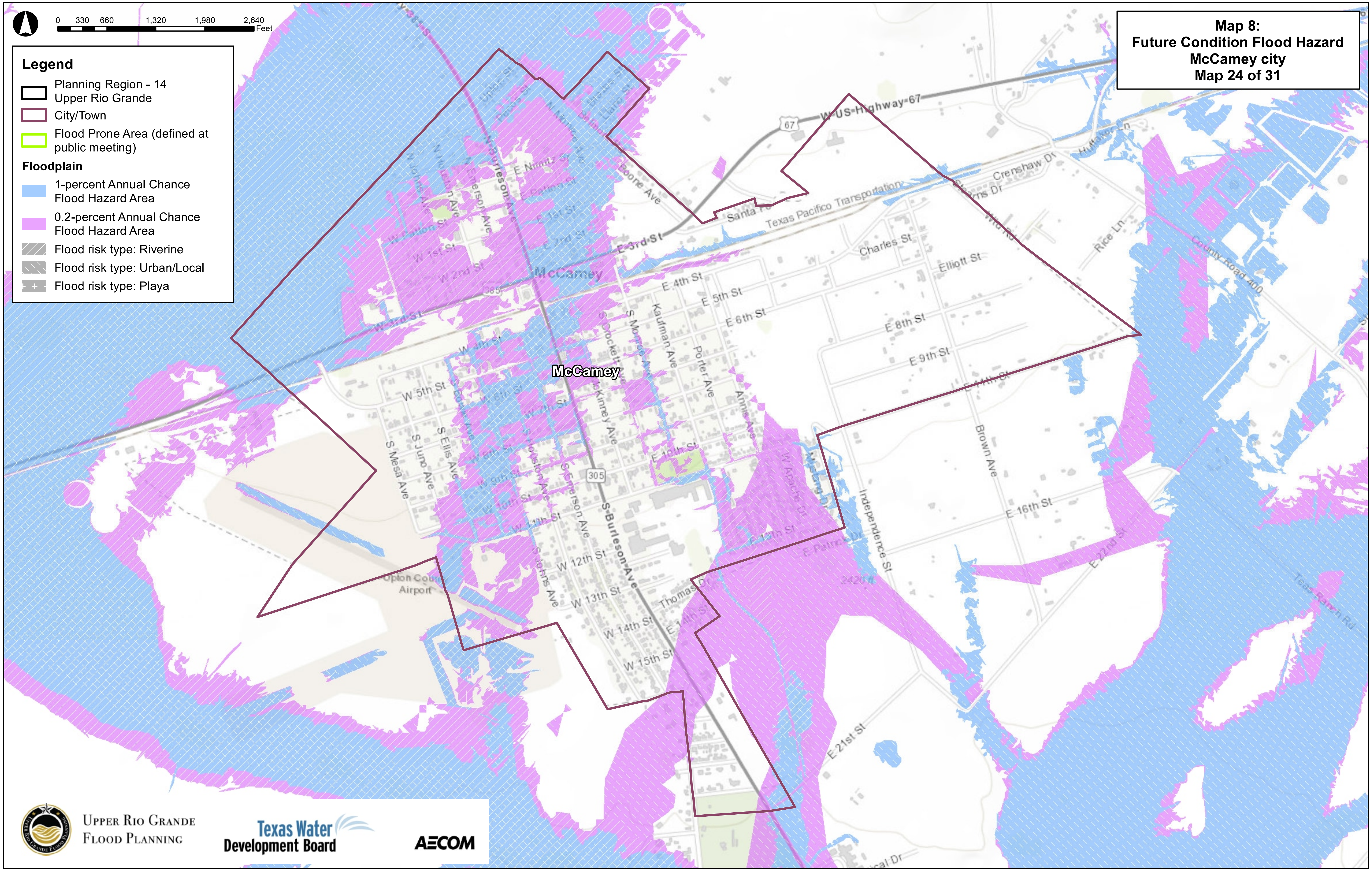
Map 8:
Future Condition Flood Hazard
McCamey city
Map 24 of 31



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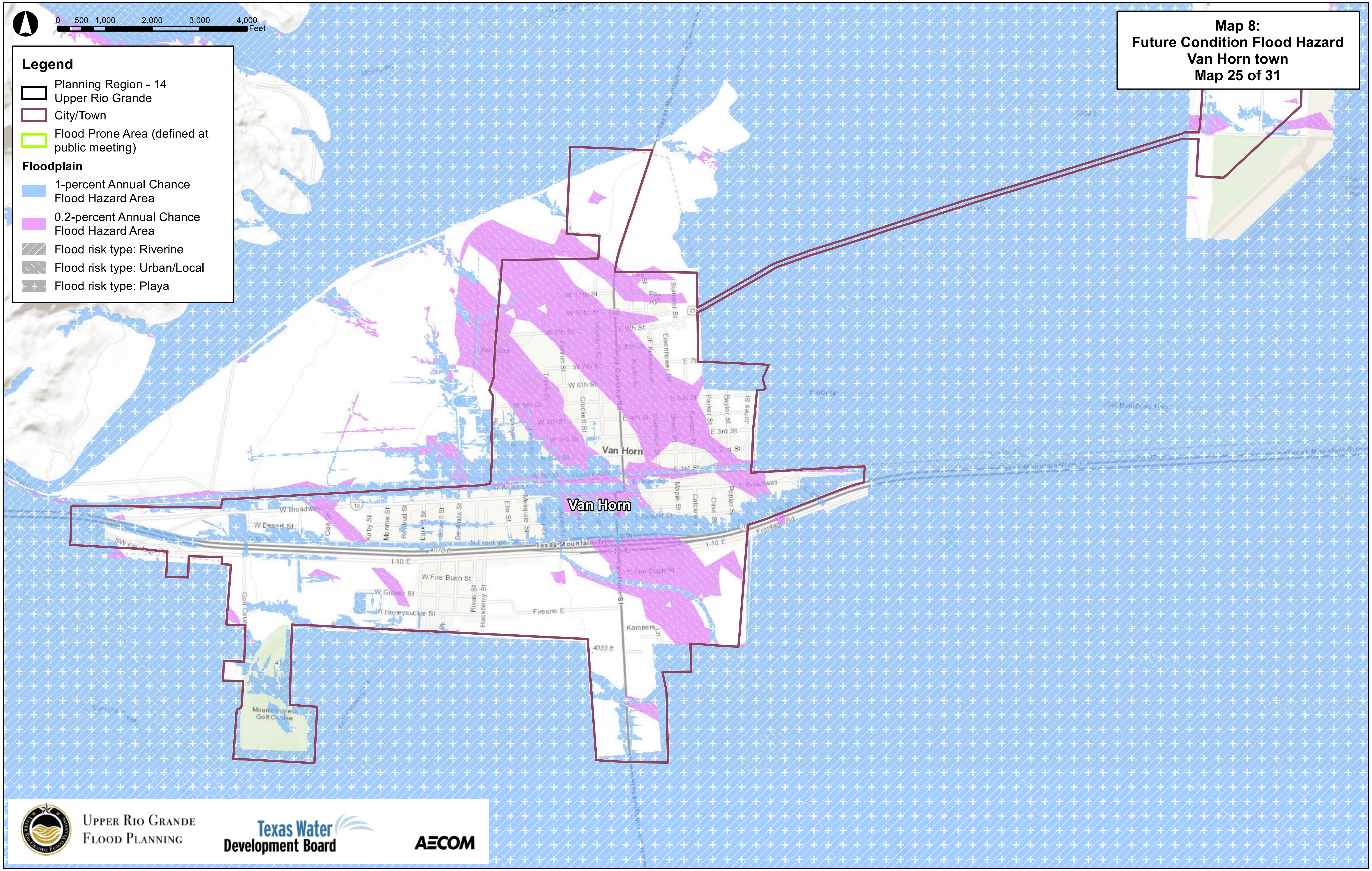
Map 8:
Future Condition Flood Hazard
Van Horn town
Map 25 of 31



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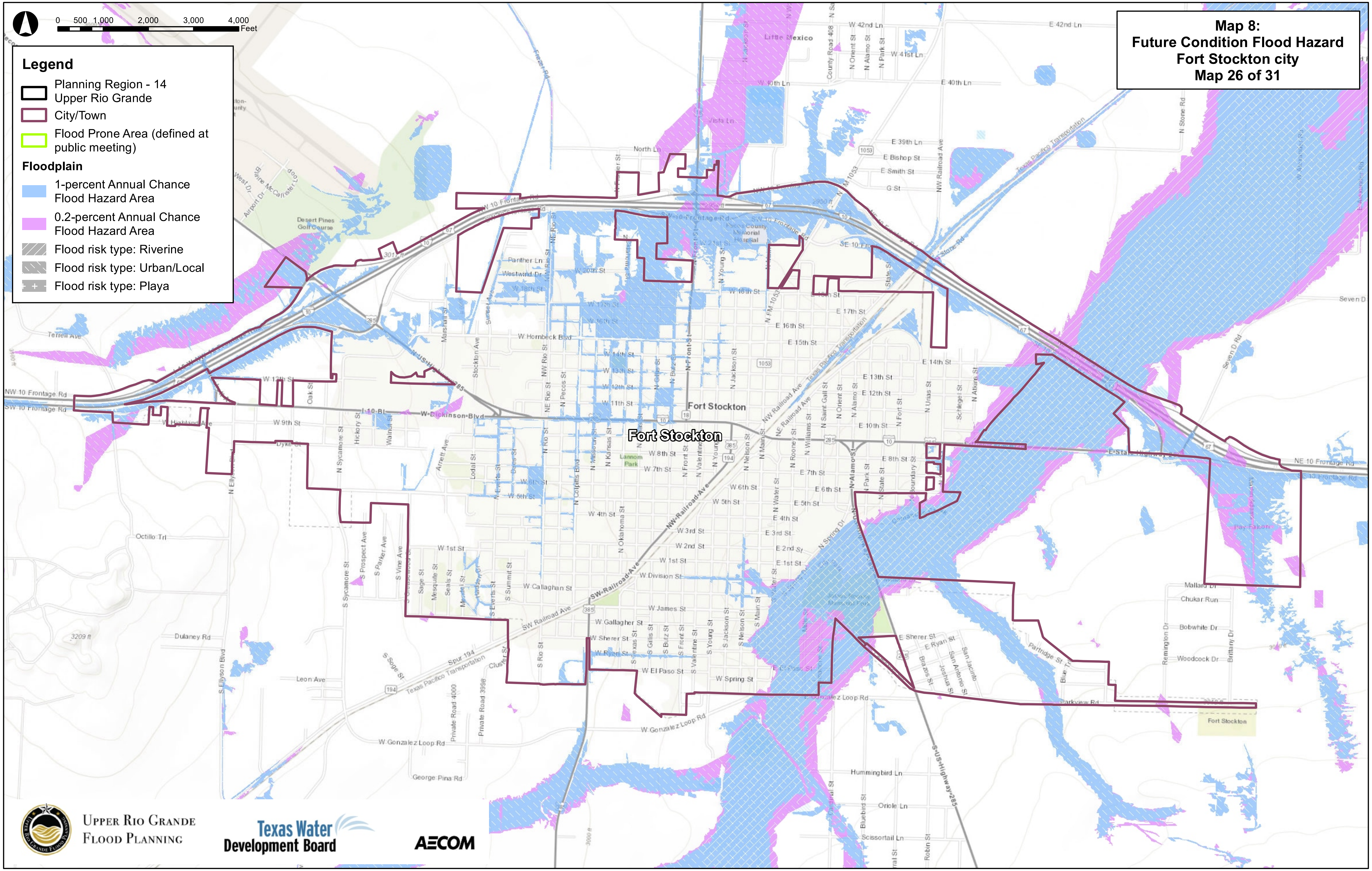
Map 8:
Future Condition Flood Hazard
Fort Stockton city
Map 26 of 31



UPPER RIO GRANDE FLOOD PLANNING

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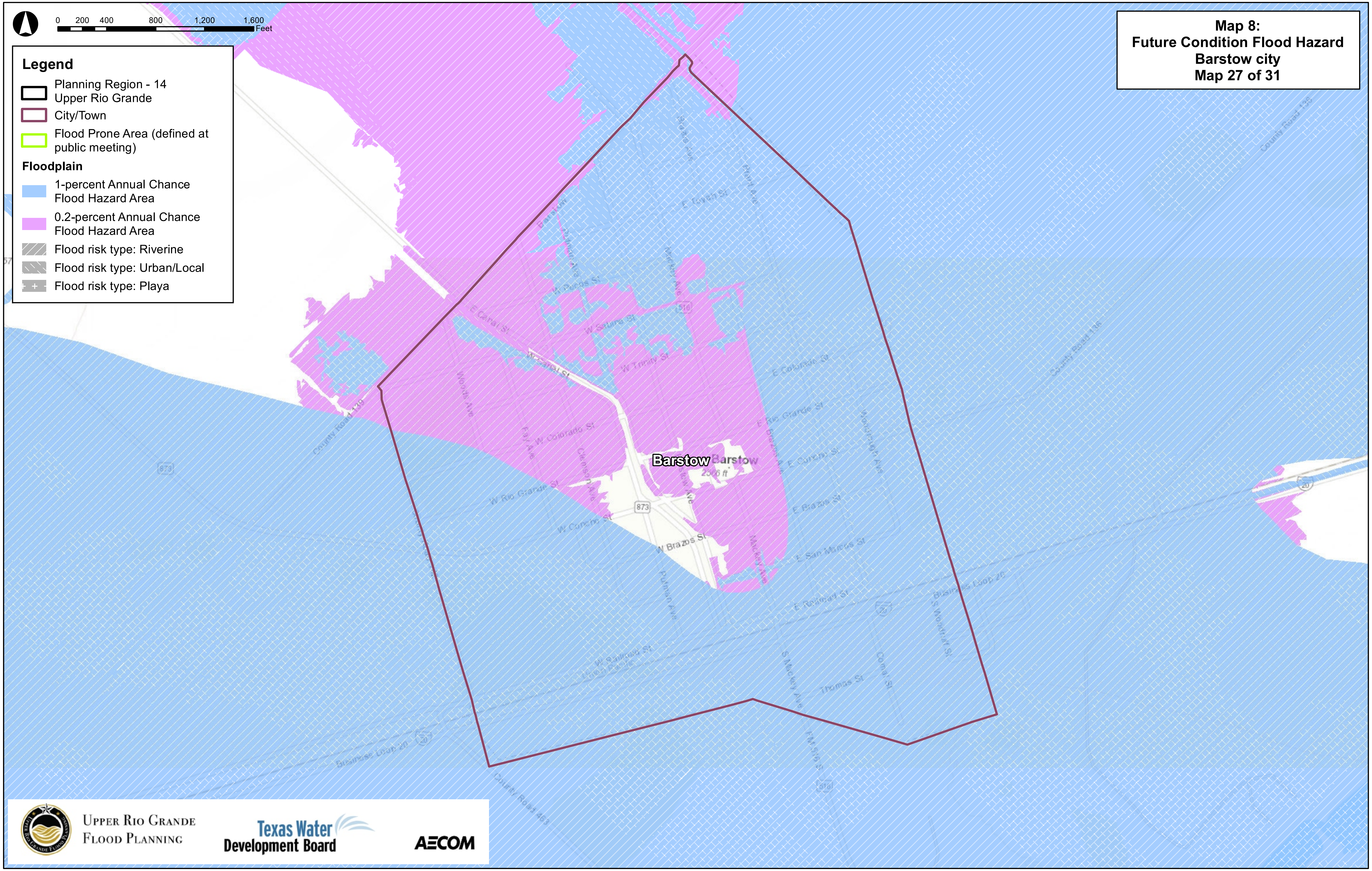
Map 8:
Future Condition Flood Hazard
Barstow city
Map 27 of 31



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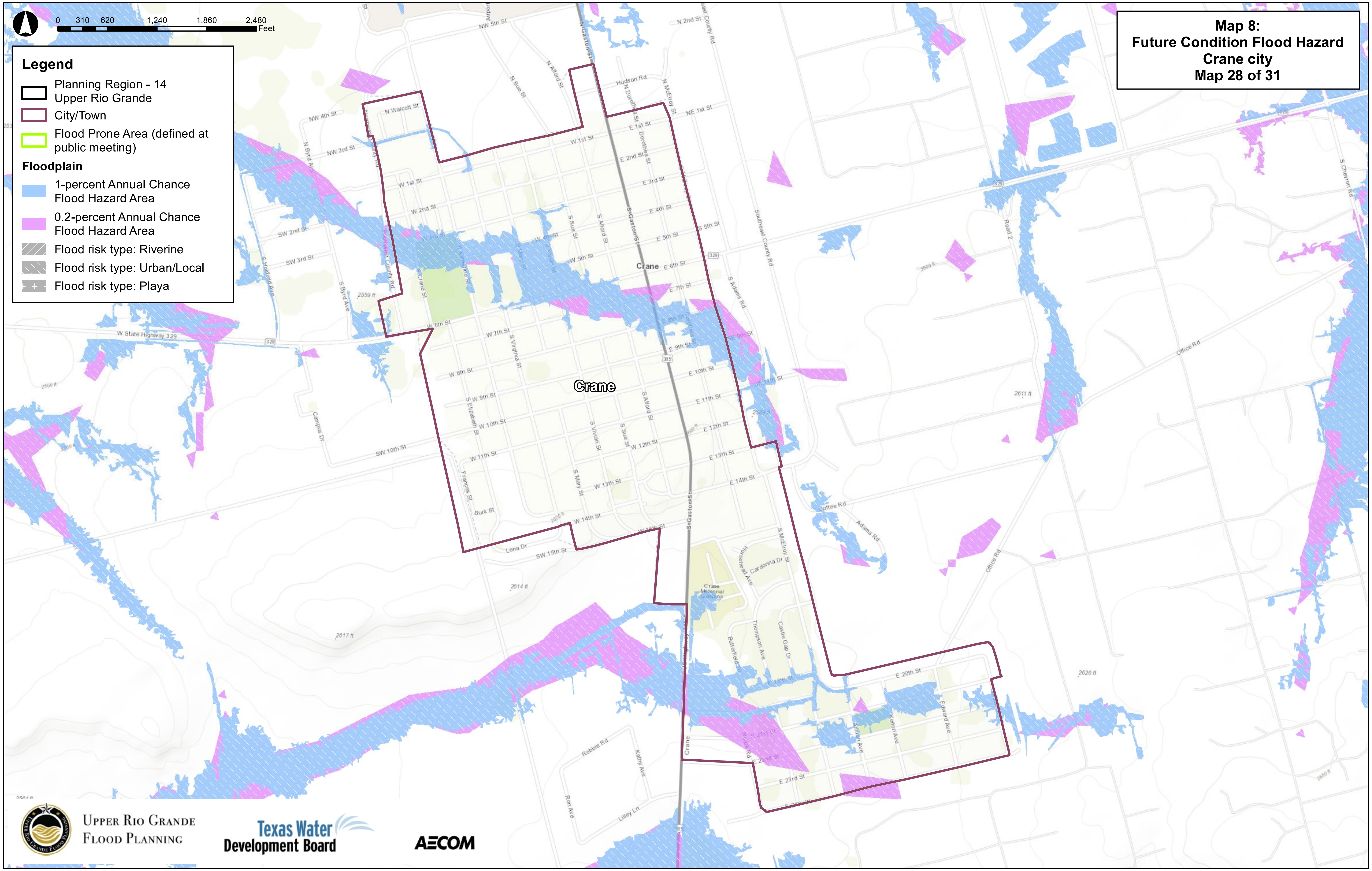
Map 8:
Future Condition Flood Hazard
Crane city
Map 28 of 31



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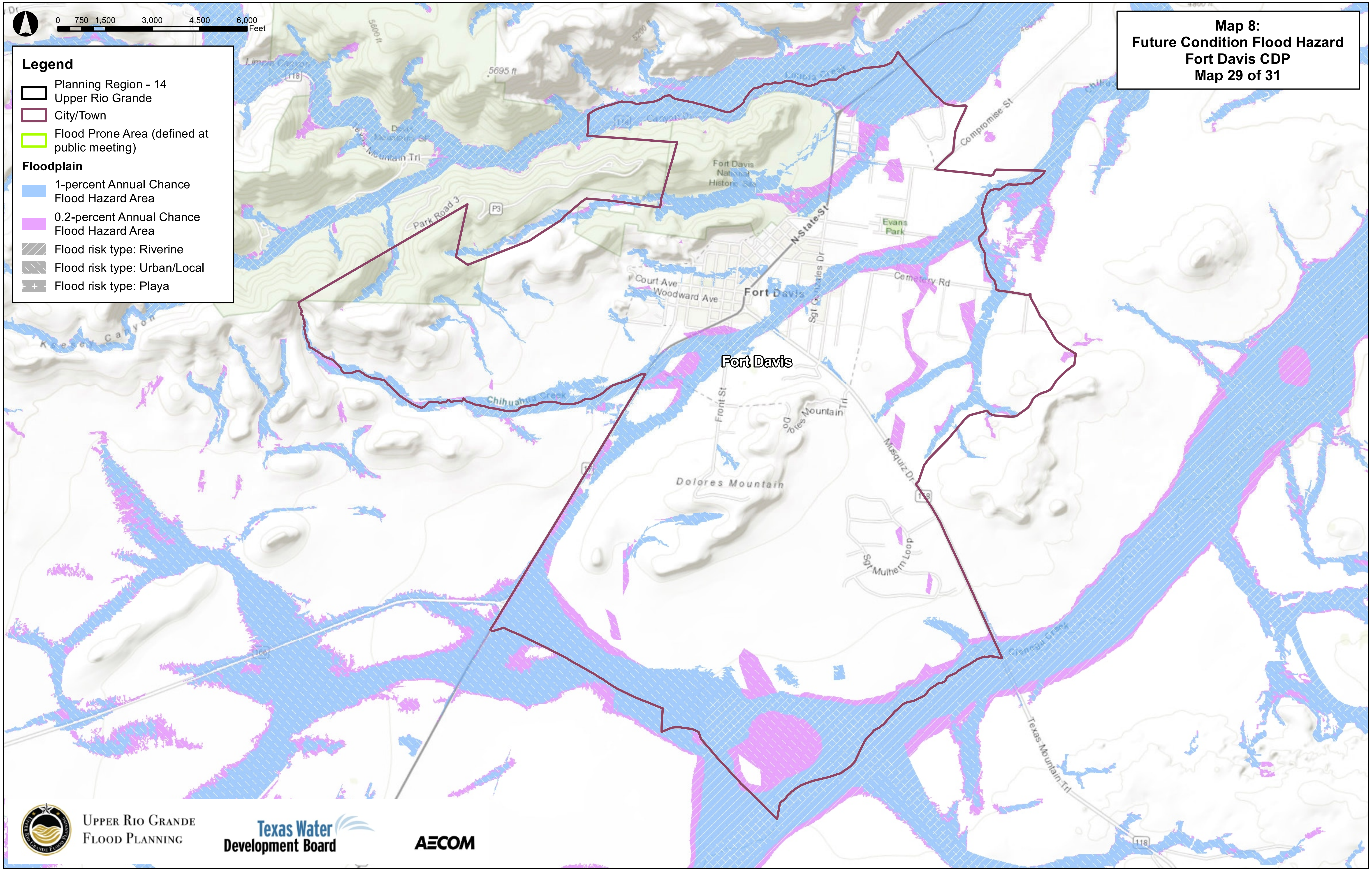
Map 8:
Future Condition Flood Hazard
Fort Davis CDP
Map 29 of 31



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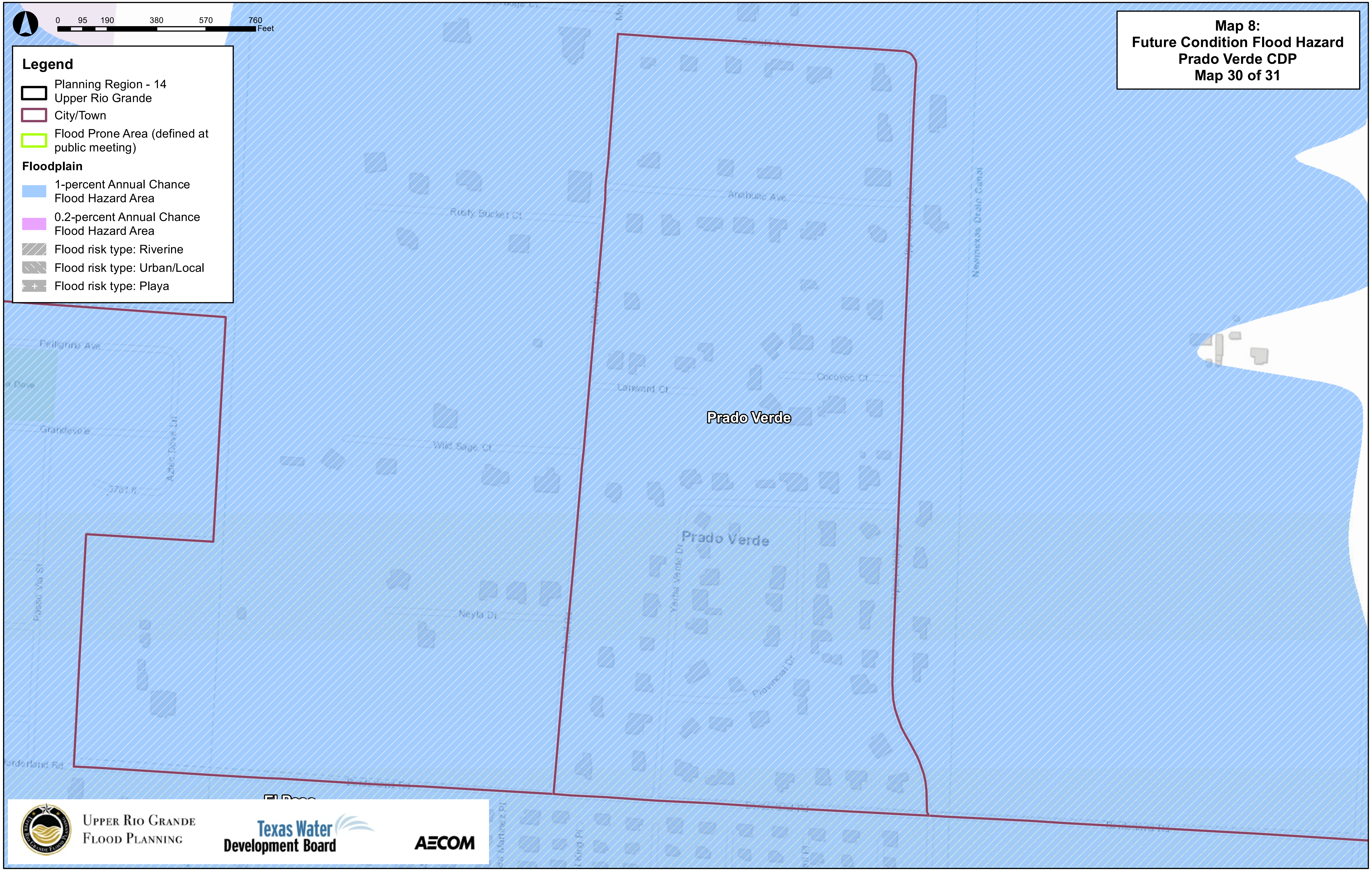
Map 8:
Future Condition Flood Hazard
Prado Verde CDP
Map 30 of 31



Legend

▭ Planning Region - 14 Upper Rio Grande

▭ City/Town

▭ Flood Prone Area (defined at public meeting)

Floodplain

🟦 1-percent Annual Chance Flood Hazard Area

🟪 0.2-percent Annual Chance Flood Hazard Area

▨ Flood risk type: Riverine

▨ Flood risk type: Urban/Local

▨ Flood risk type: Playa

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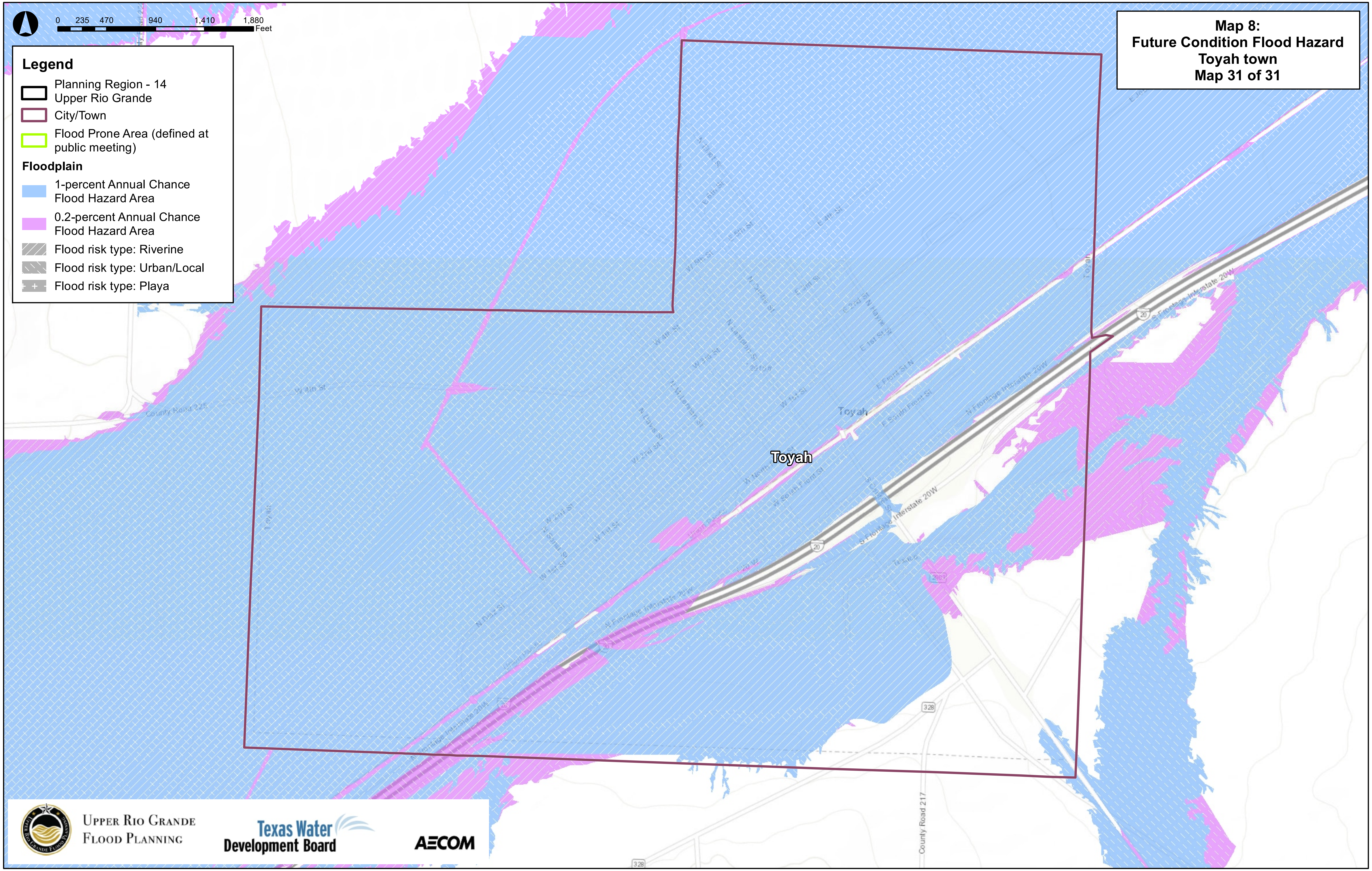
Map 8:
Future Condition Flood Hazard
Toyah town
Map 31 of 31



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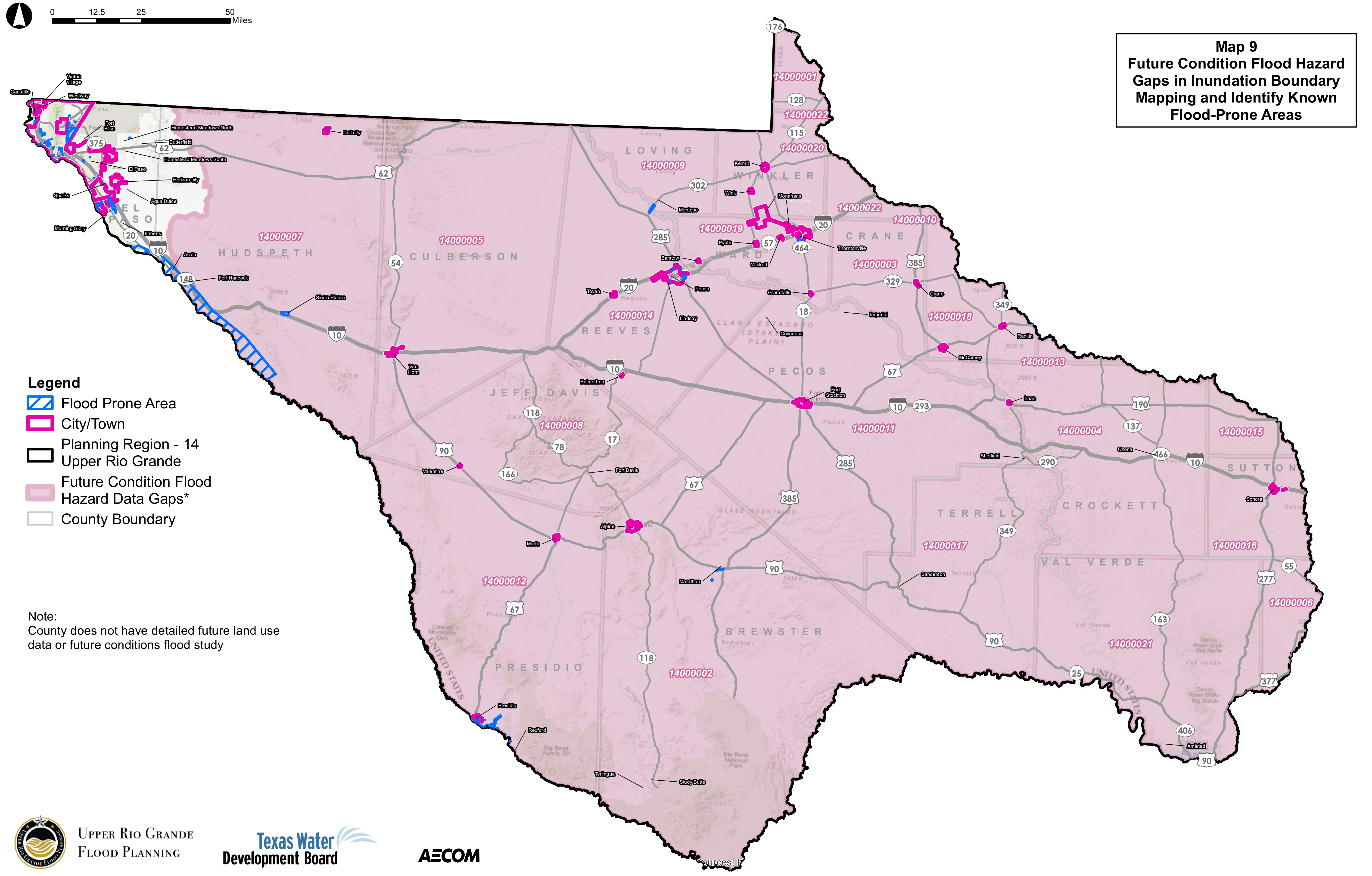
Map 9
Future Condition Flood Hazard Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas



Legend
- ▨ Flood Prone Area
- ▭ City/Town
- ▭ Planning Region - 14 Upper Rio Grande
- ▭ Future Condition Flood Hazard Data Gaps*
- ▭ County Boundary

Note:
County does not have detailed future land use data or future conditions flood study

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Map 10
Extent of Increase of Flood Hazard Compared to Existing Condition

Legend

☐ Planning Region - 14 Upper Rio Grande

☐ City/Town

☐ County Boundary

Existing Floodplain

🟨 1-percent Annual Chance Flood Hazard Area

🟩 0.2-percent Annual Chance Flood Hazard Area

Future Floodplain

🟦 1-percent Annual Chance Flood Hazard Area

🟪 0.2-percent Annual Chance Flood Hazard Area

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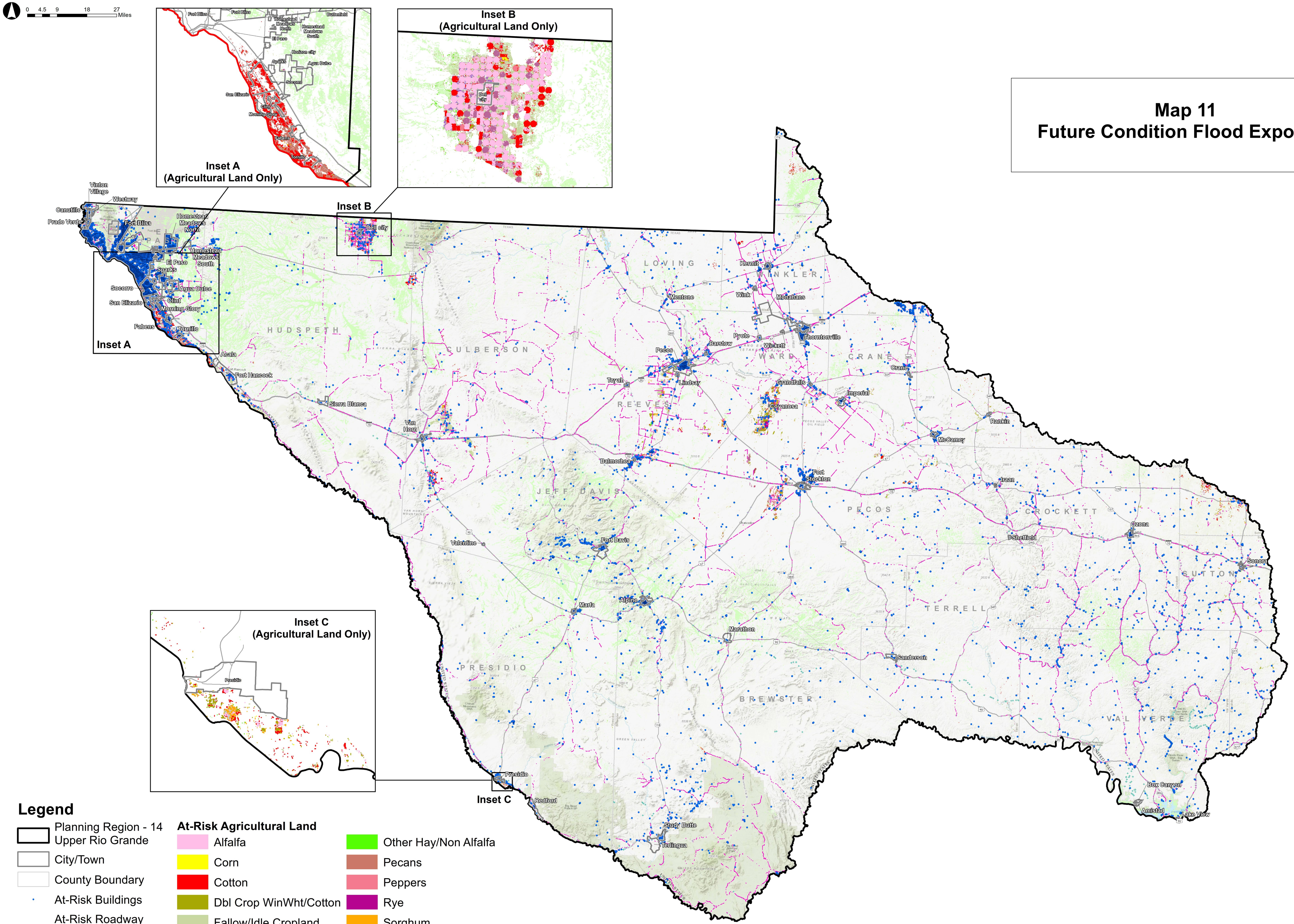
Map 11
Future Condition Flood Exposure



Legend

▭ Planning Region - 14 Upper Rio Grande
▭ City/Town
▭ County Boundary
· At-Risk Buildings
· At-Risk Roadway Crossings
— At-Risk Roadway Segments

At-Risk Agricultural Land

🟪	Alfalfa	🟩	Other Hay/Non Alfalfa
🟨	Corn	🟫	Pecans
🟥	Cotton	🟥	Peppers
🟫	Dbl Crop WinWht/Cotton	🟪	Rye
🟩	Fallow/Idle Cropland	🟧	Sorghum
🟪	Grapes	🟪	Triticale
🟩	Grassland/Pasture	🟫	Winter Wheat
🟪	Oats	⬜	Other Crops

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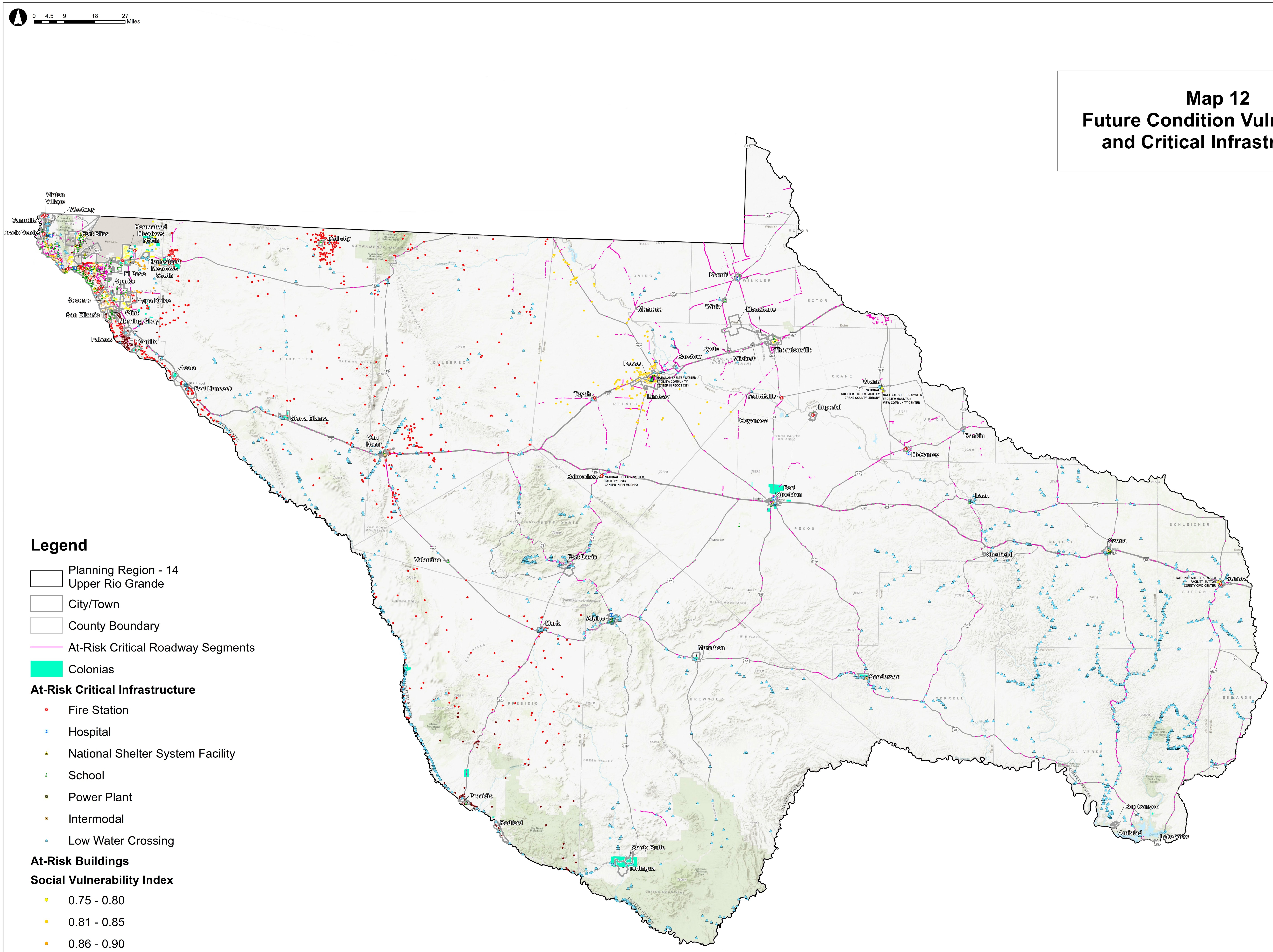
Map 12
Future Condition Vulnerability and Critical Infrastructure



Legend

- ▭ Planning Region - 14 Upper Rio Grande
- ▭ City/Town
- ▭ County Boundary
- — At-Risk Critical Roadway Segments
- 🟩 Colonias

At-Risk Critical Infrastructure

- Fire Station
- Hospital
- National Shelter System Facility
- School
- Power Plant
- Intermodal
- Low Water Crossing

At-Risk Buildings

Social Vulnerability Index

- ● 0.75 - 0.80
- ● 0.81 - 0.85
- ● 0.86 - 0.90
- ● 0.91 - 0.95
- ● > 0.95

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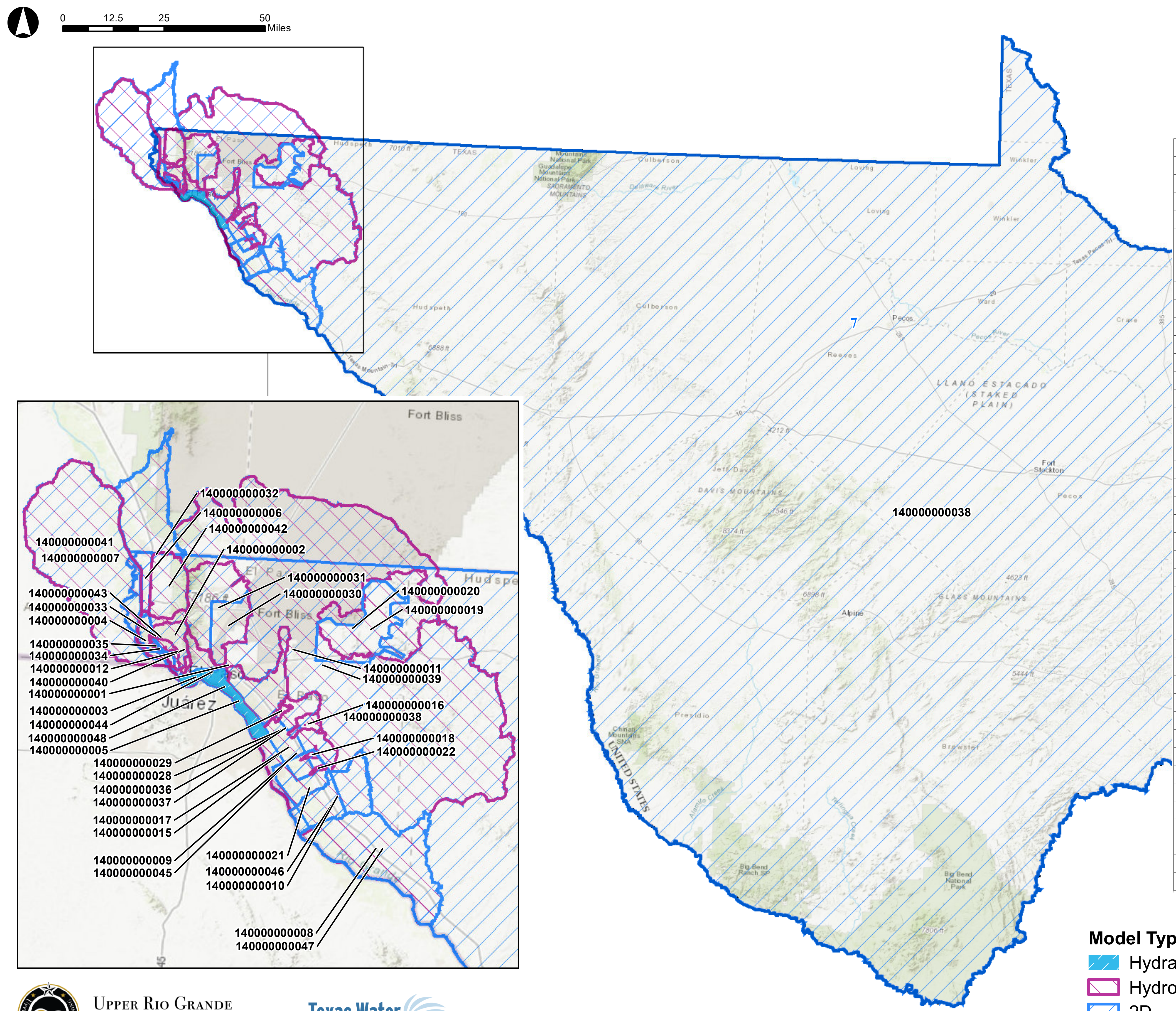
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Index Map



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140000000001	EP_COUNTY_HYDRA	HEC-RAS
140000000002	SH20_HYDRO	HEC-HMS
140000000003	EP_INT_DRNG_CENT_HYDRA	FLO-2D
140000000004	EP_INT_DRNG_DON_HYDRA	FLO-2D
140000000005	EP_INT_DRNG_EAST_HYDRA	FLO-2D
140000000006	EP_INT_DRNG_NW_HYDRA	FLO-2D
140000000007	EP_INT_DRNG_WA1_HYDRA	HEC-RAS
140000000008	EP_INT_DRNG_WA11_HYDRA	HEC-RAS
140000000009	EP_INT_DRNG_WA7_HYDRA	HEC-RAS
140000000010	EP_INT_DRNG_WA9_HYDRA	HEC-RAS
140000000011	EP_COUNTY_HYDRO	HEC-HMS
140000000012	SH20_HYDRA	SWMM
140000000015	SSA4_HYDRA	HEC-RAS
140000000016	SSA4_HYDRO	HEC-HMS
140000000017	SOC4_HYDRA	HEC-RAS
140000000018	SOC4_HYDRO	HEC-HMS
140000000019	MON3_HYDRO	HEC-HMS
140000000020	MON3_HYDRA	HEC-RAS
140000000021	HAC3_HYDRA	HEC-RAS
140000000022	HAC3_HYDRO	HEC-HMS
140000000028	EA9A_EA10A_HYDRA	HEC-RAS
140000000029	EA9A_EA10A_HYDRO	HEC-HMS
140000000030	NE3B_HYDRA	FLO-2D
140000000031	NE3B_HYDRO	HEC-HMS
140000000032	NW16_HYDRA	HEC-RAS
140000000033	NW16_HYDRO	HEC-HMS
140000000034	NW26_HYDRO	HEC-HMS
140000000035	NW3_HYDRO	HEC-HMS
140000000036	SAN_ELIZ_HYDRA	HEC-RAS
140000000037	SAN_ELIZ_HYDRO	HEC-HMS
140000000038	Fathom 2D Hydrologic and Hydraulic Model	Other
140000000039	FUT_EP_COUNTY_HYDRA	HEC-RAS
140000000040	FUT_EP_COUNTY_HYDRO	HEC-HMS
140000000041	EP_INT_DRNG_WA1_HYDRO	HEC-HMS
140000000042	EP_INT_DRNG_NW_HYDRO	HEC-HMS
140000000043	EP_INT_DRNG_DON_HYDRO	HEC-HMS
140000000044	EP_INT_DRNG_CE_HYDRO	HEC-HMS
140000000045	EP_INT_DRNG_WA7_HYDRO	HEC-HMS
140000000046	EP_INT_DRNG_WA9_HYDRO	HEC-HMS
140000000047	EP_INT_DRNG_WA11_HYDRO	HEC-HMS
140000000048	EP_INT_DRNG_CE_HYDRA	StormCAD

Model Type

- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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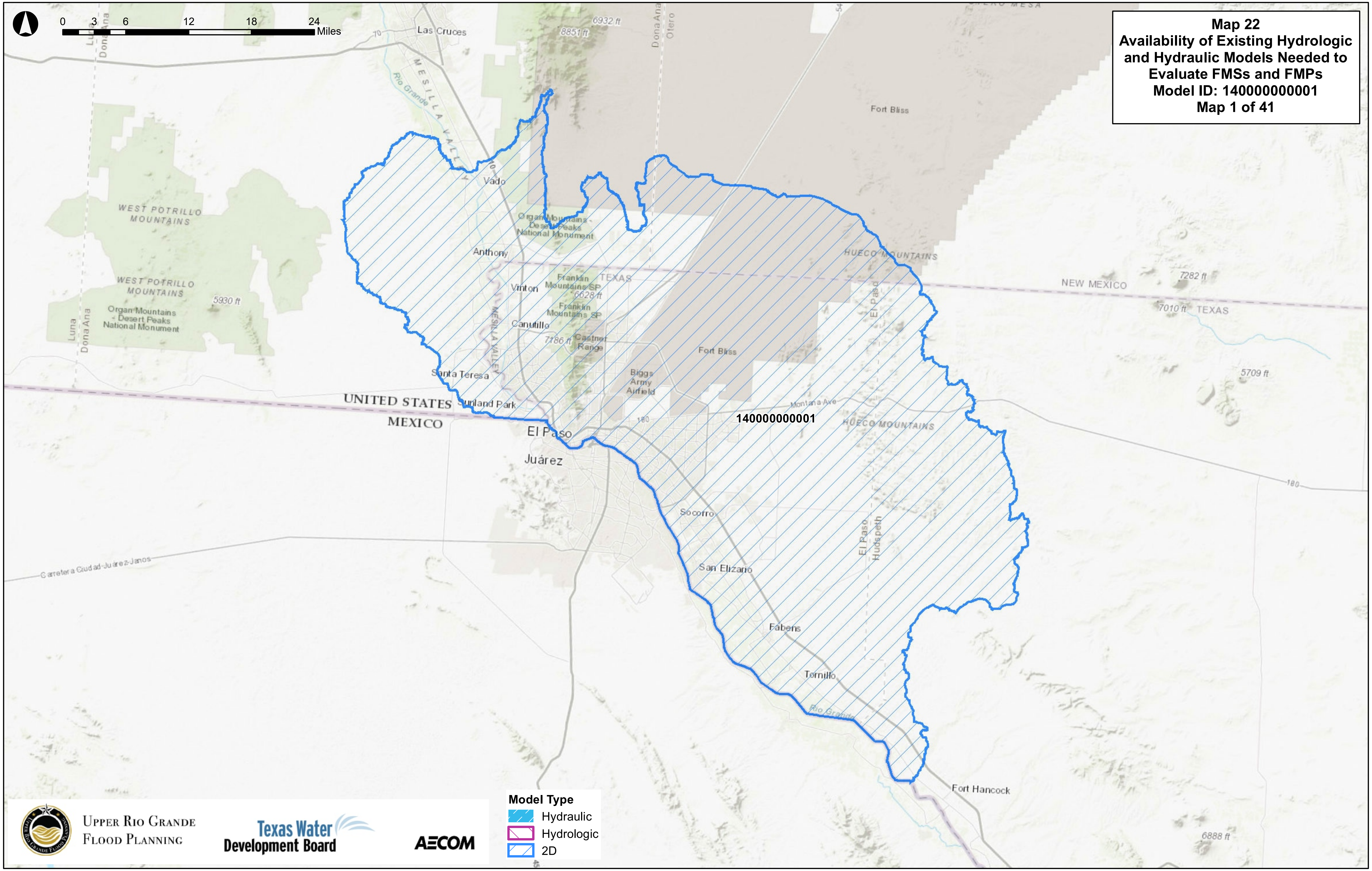
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000001
Map 1 of 41



Model Type
- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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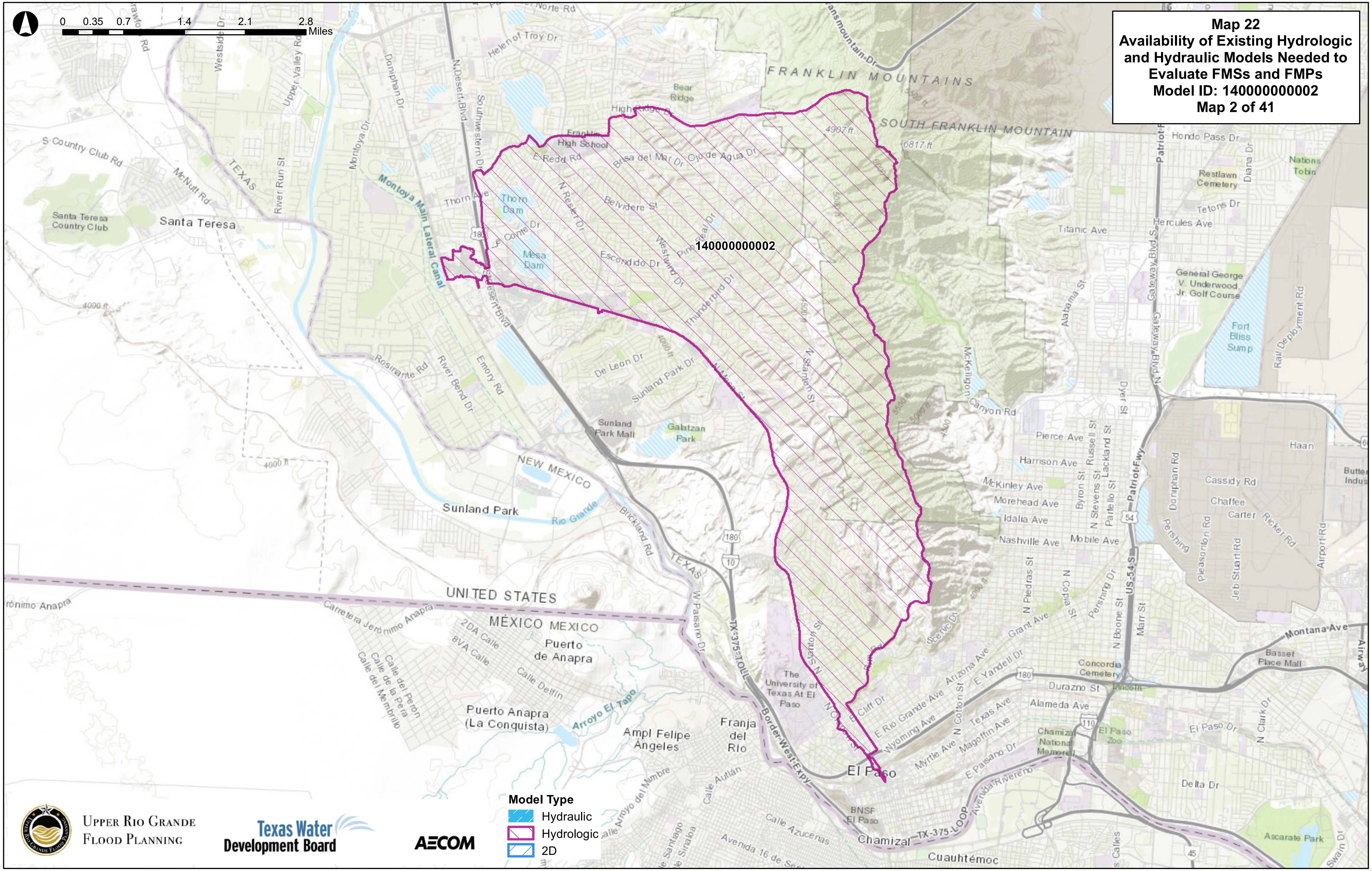
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000002
Map 2 of 41



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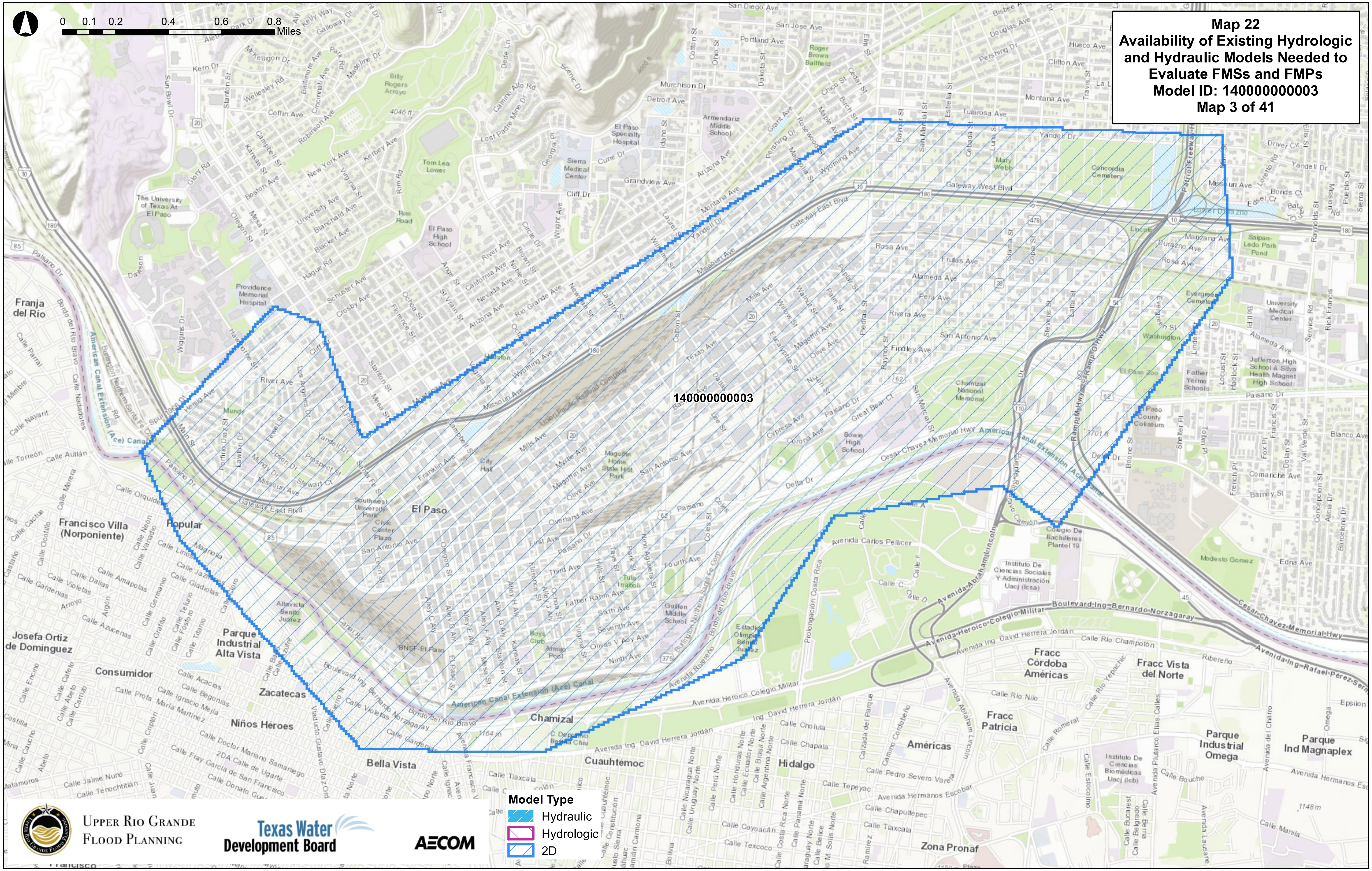
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000003
Map 3 of 41



Model Type

▨ Hydraulic

▨ Hydrologic

▨ 2D

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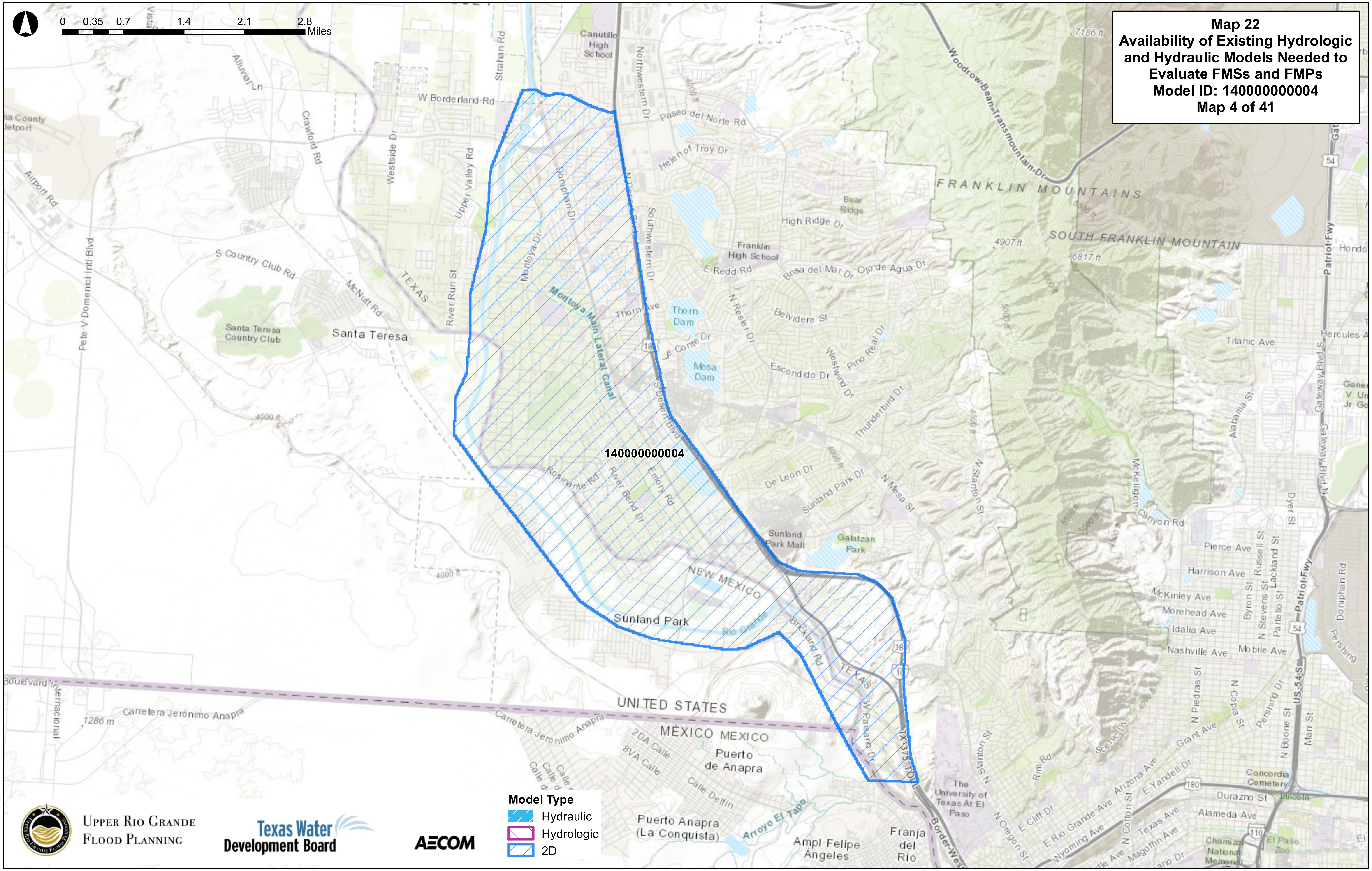
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000004
Map 4 of 41



Model Type
▨ Hydraulic
▨ Hydrologic
▨ 2D

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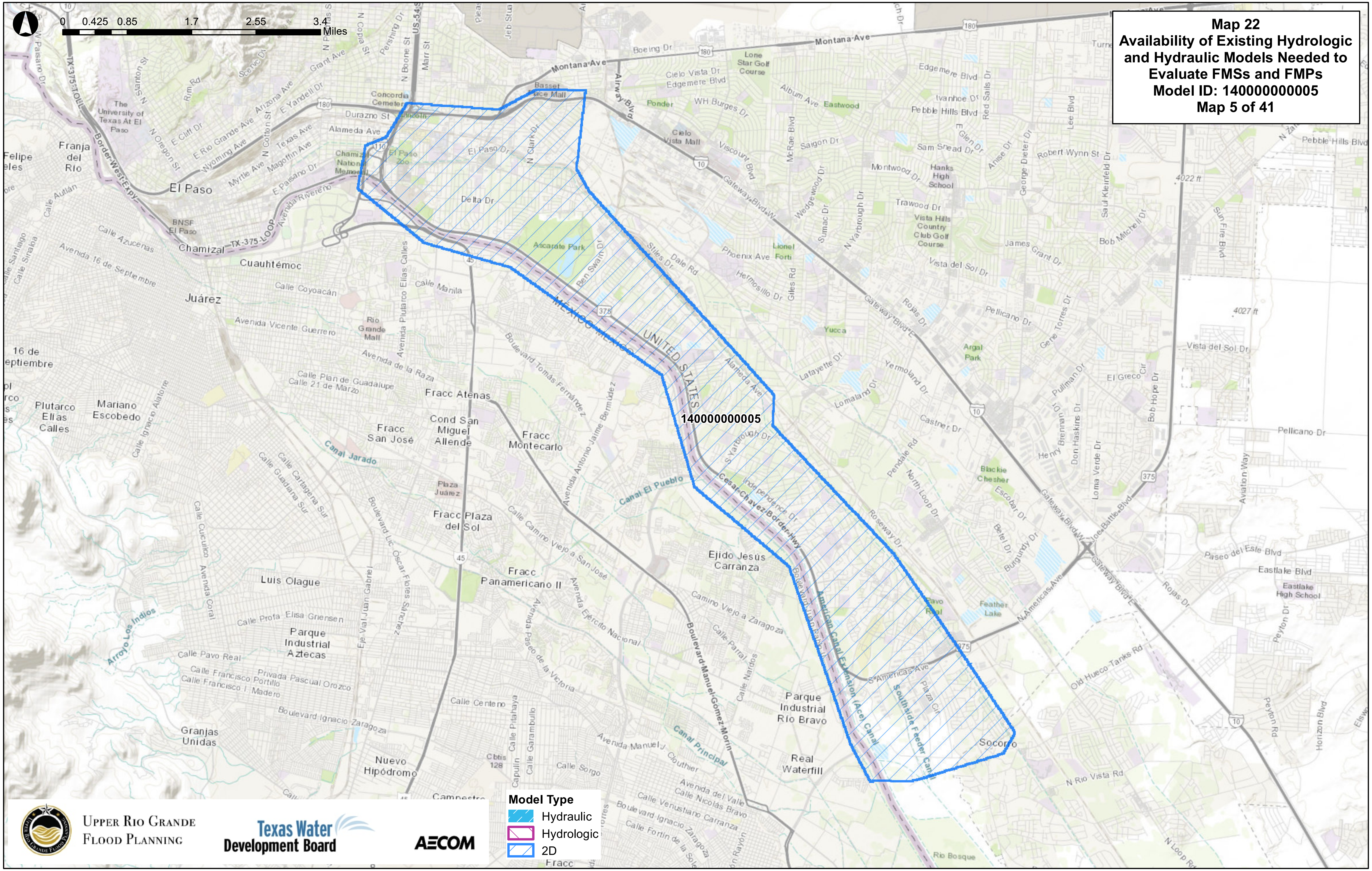
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000005
Map 5 of 41



Model Type
- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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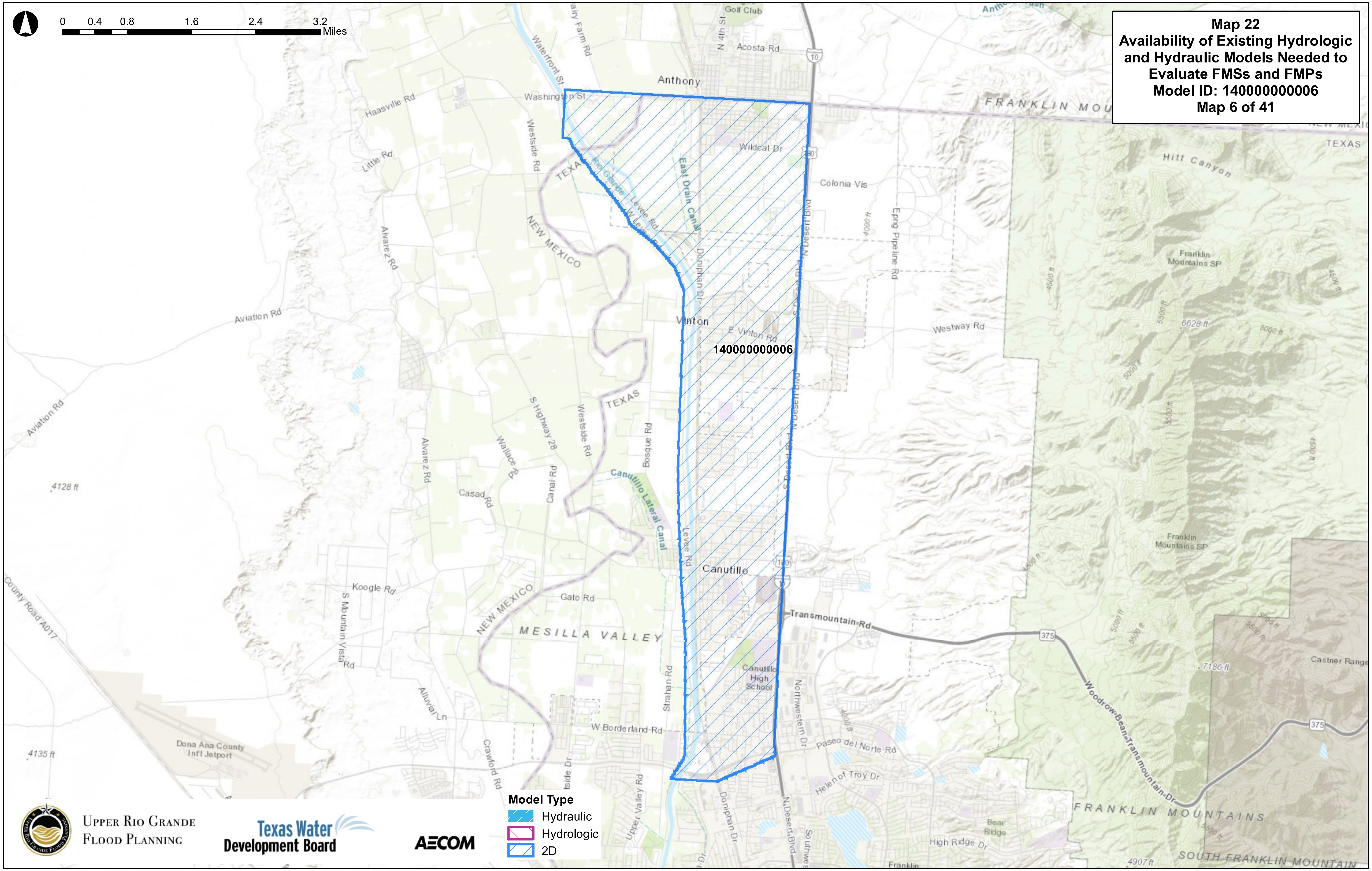
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000006
Map 6 of 41



Model Type
- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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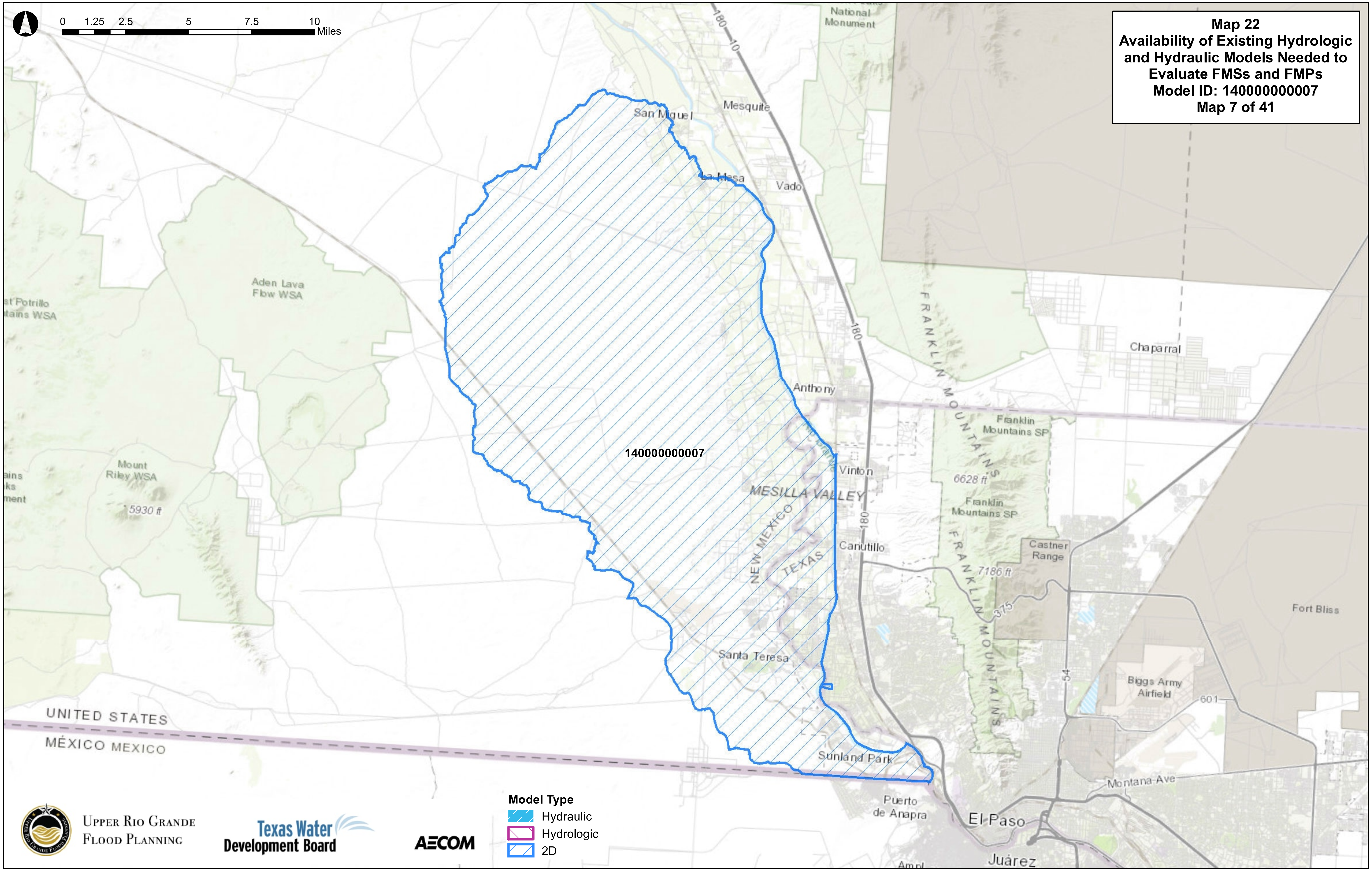
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000007
Map 7 of 41



Model Type
▨ Hydraulic
▨ Hydrologic
▨ 2D

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Texas Water Development Board

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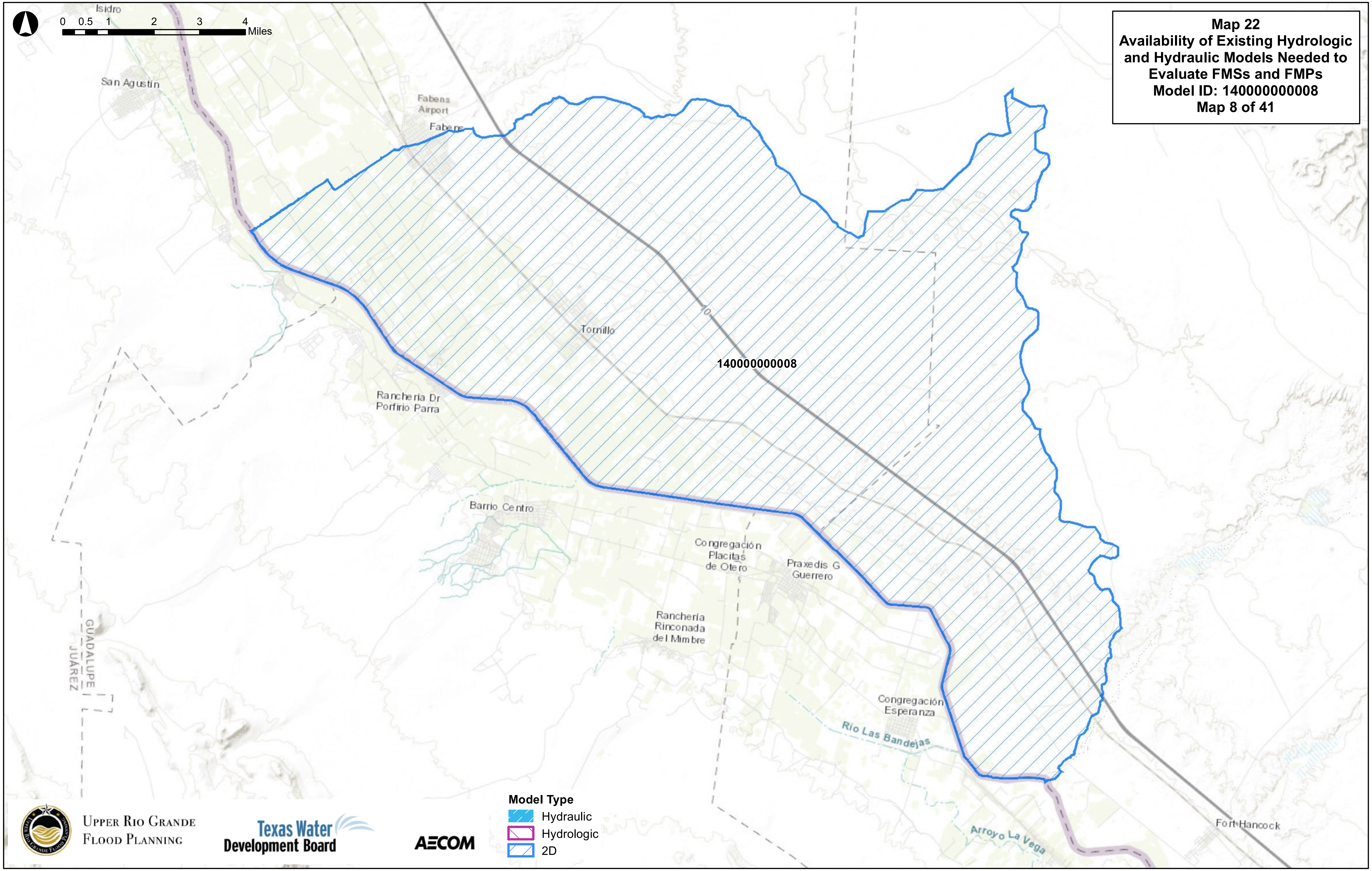
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000008
Map 8 of 41



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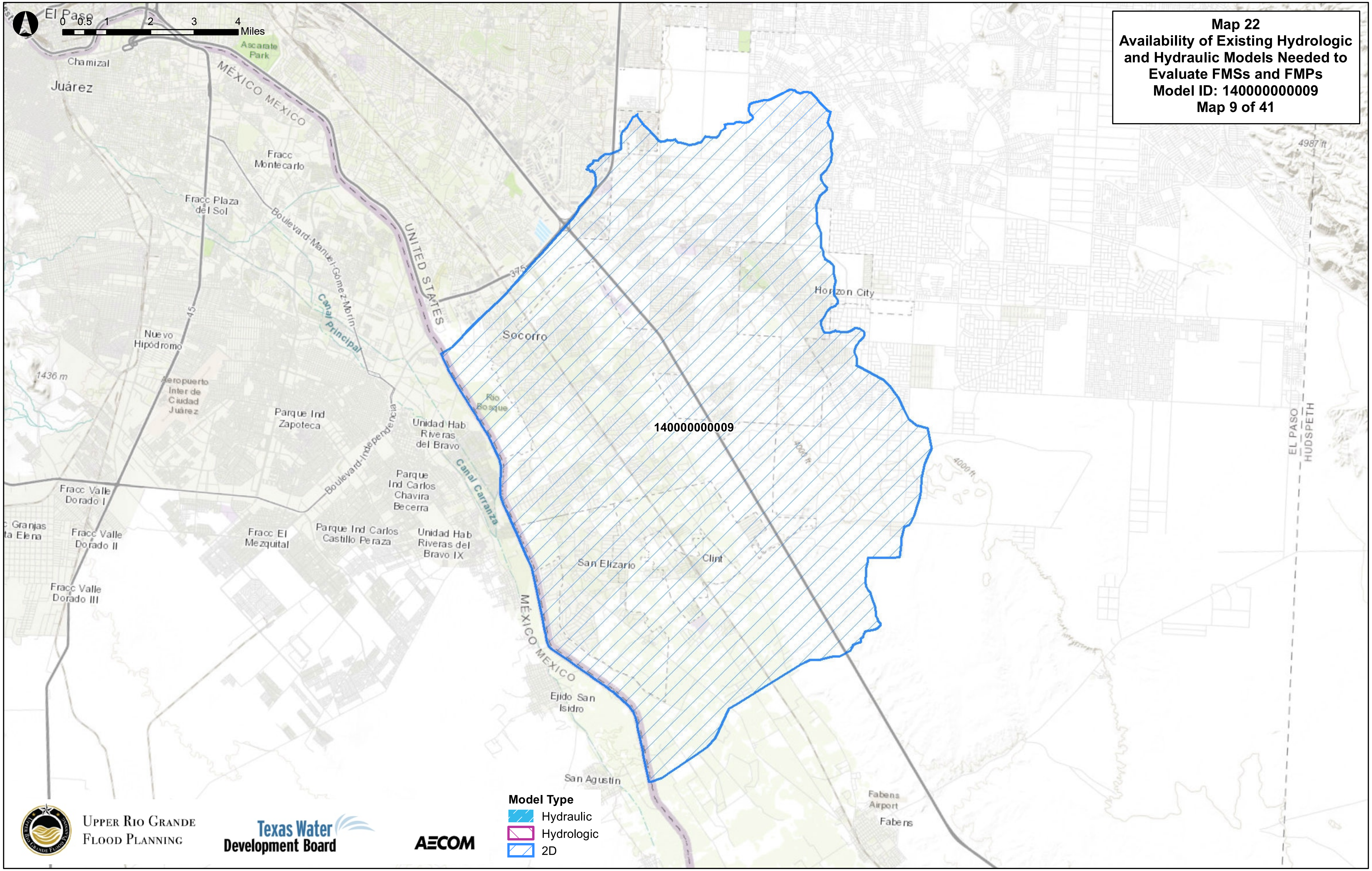
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000009
Map 9 of 41



Model Type
- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

Upper Rio Grande Flood Planning

Texas Water Development Board

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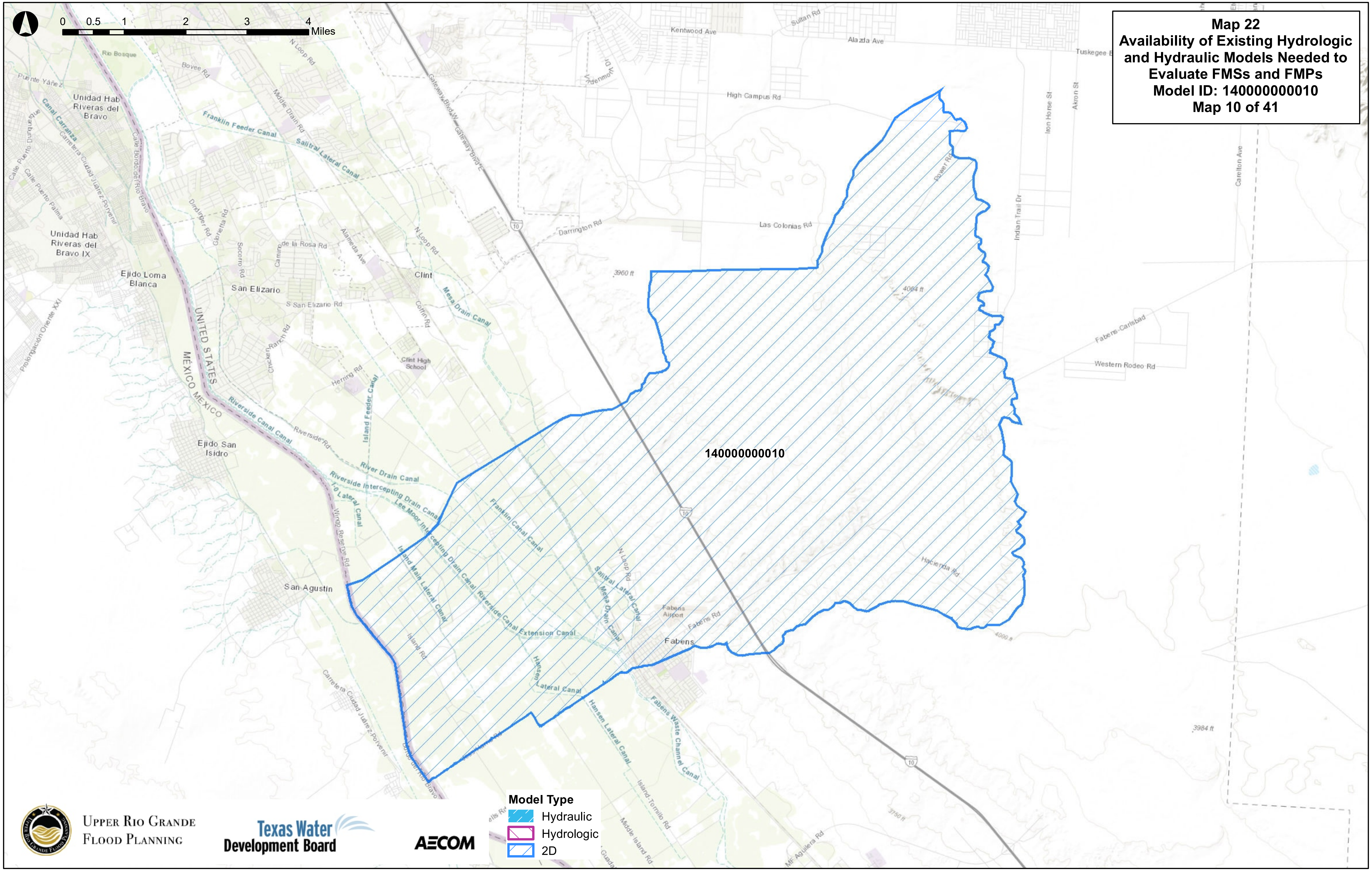
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000010
Map 10 of 41



Model Type

- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

Upper Rio Grande Flood Planning

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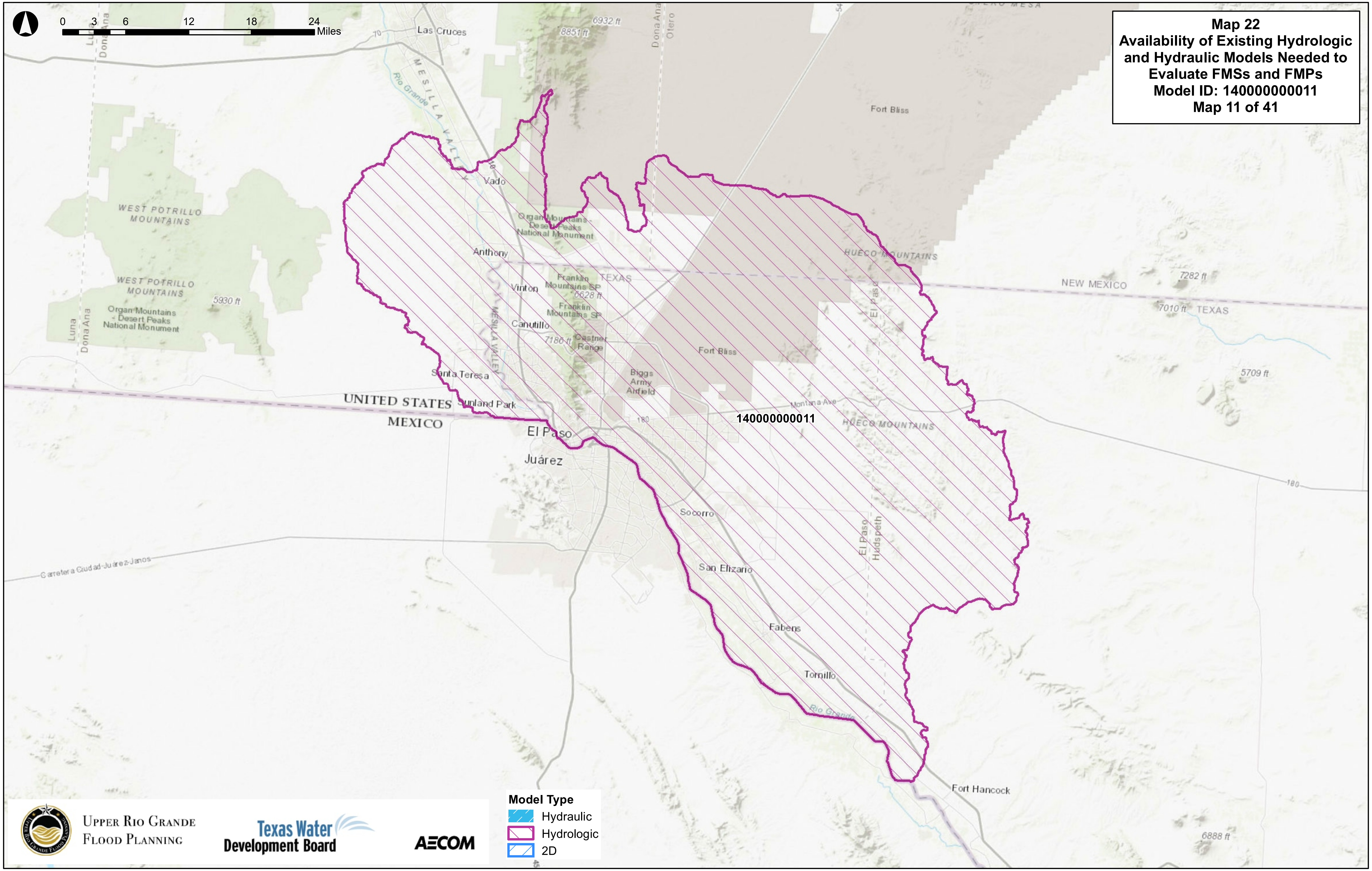
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000011
Map 11 of 41



Model Type
- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

Upper Rio Grande Flood Planning

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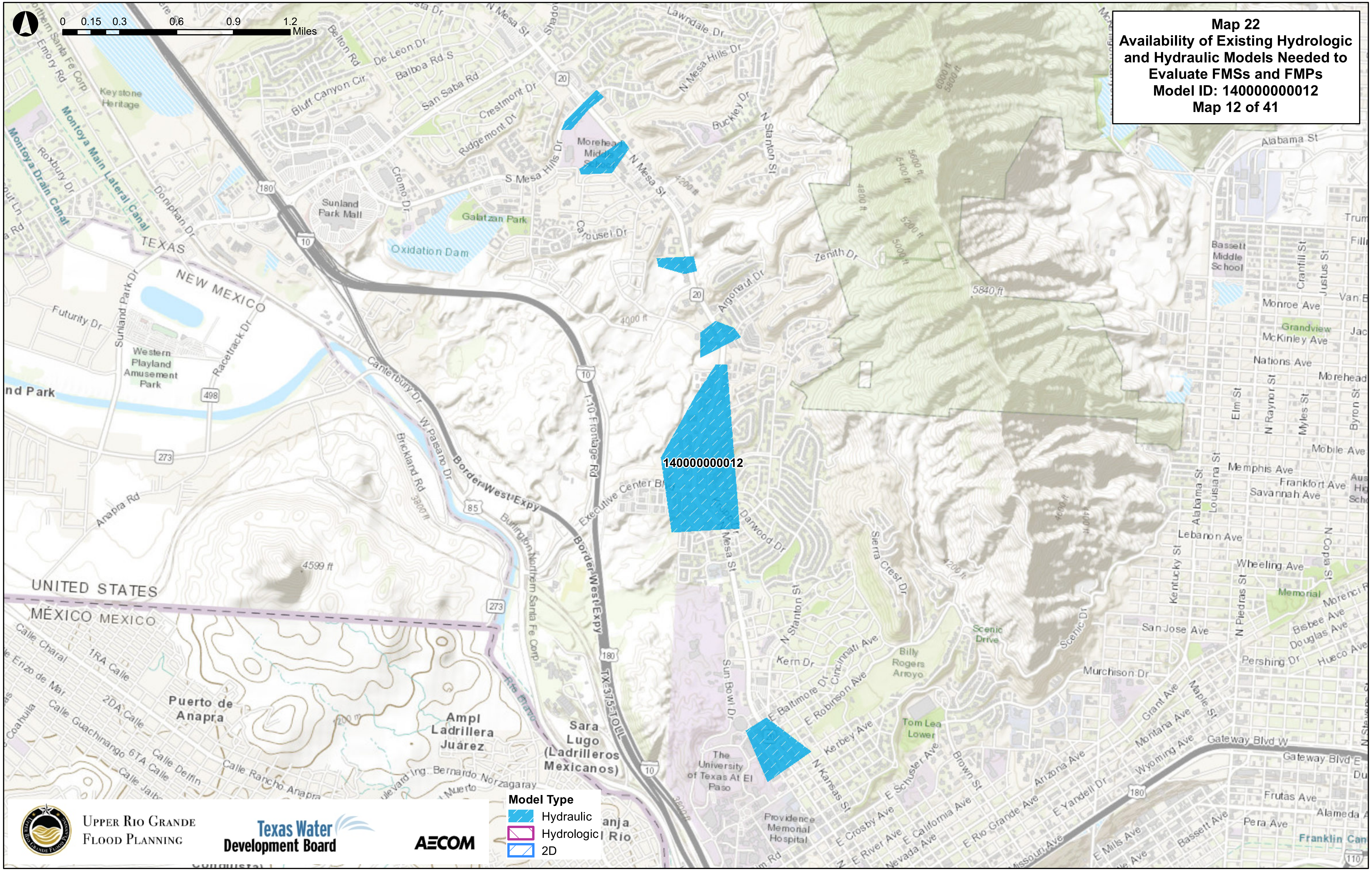
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000012

Map 12 of 41



Model Type
- 🟦 Hydraulic
- ▭ Hydrologic
- ▨ 2D

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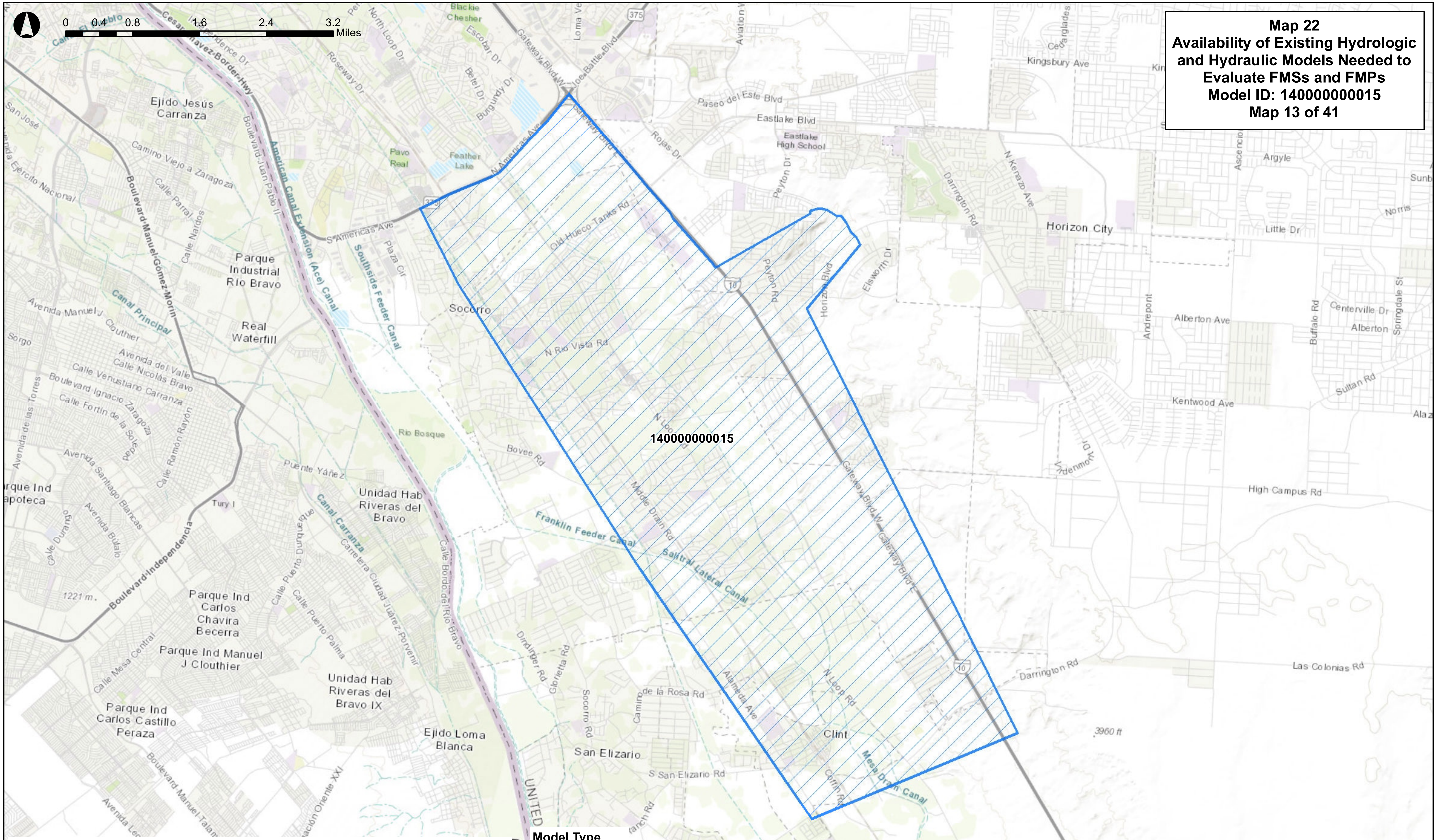
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000015
Map 13 of 41



Model Type
- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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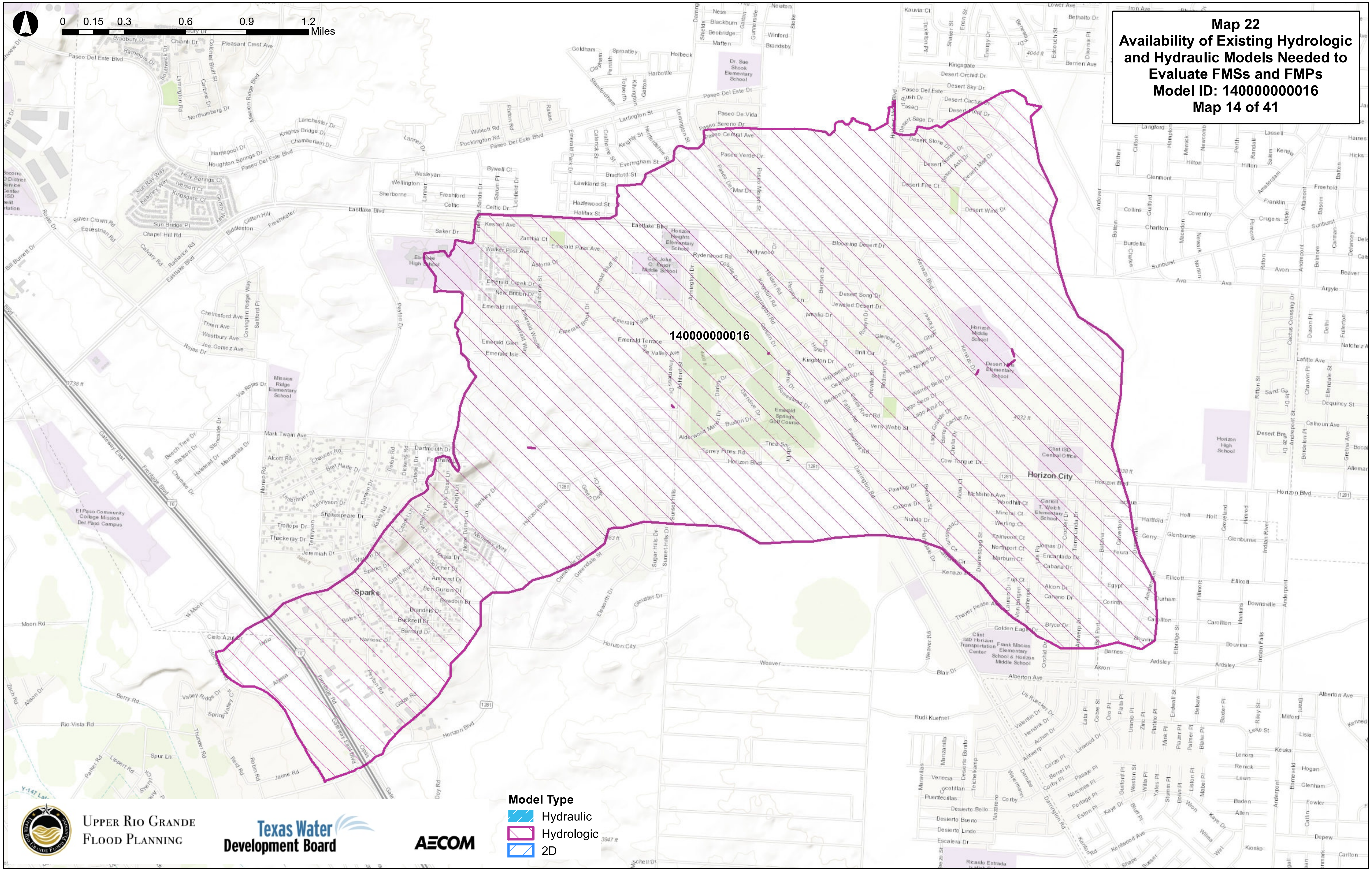
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000016
Map 14 of 41



Model Type

- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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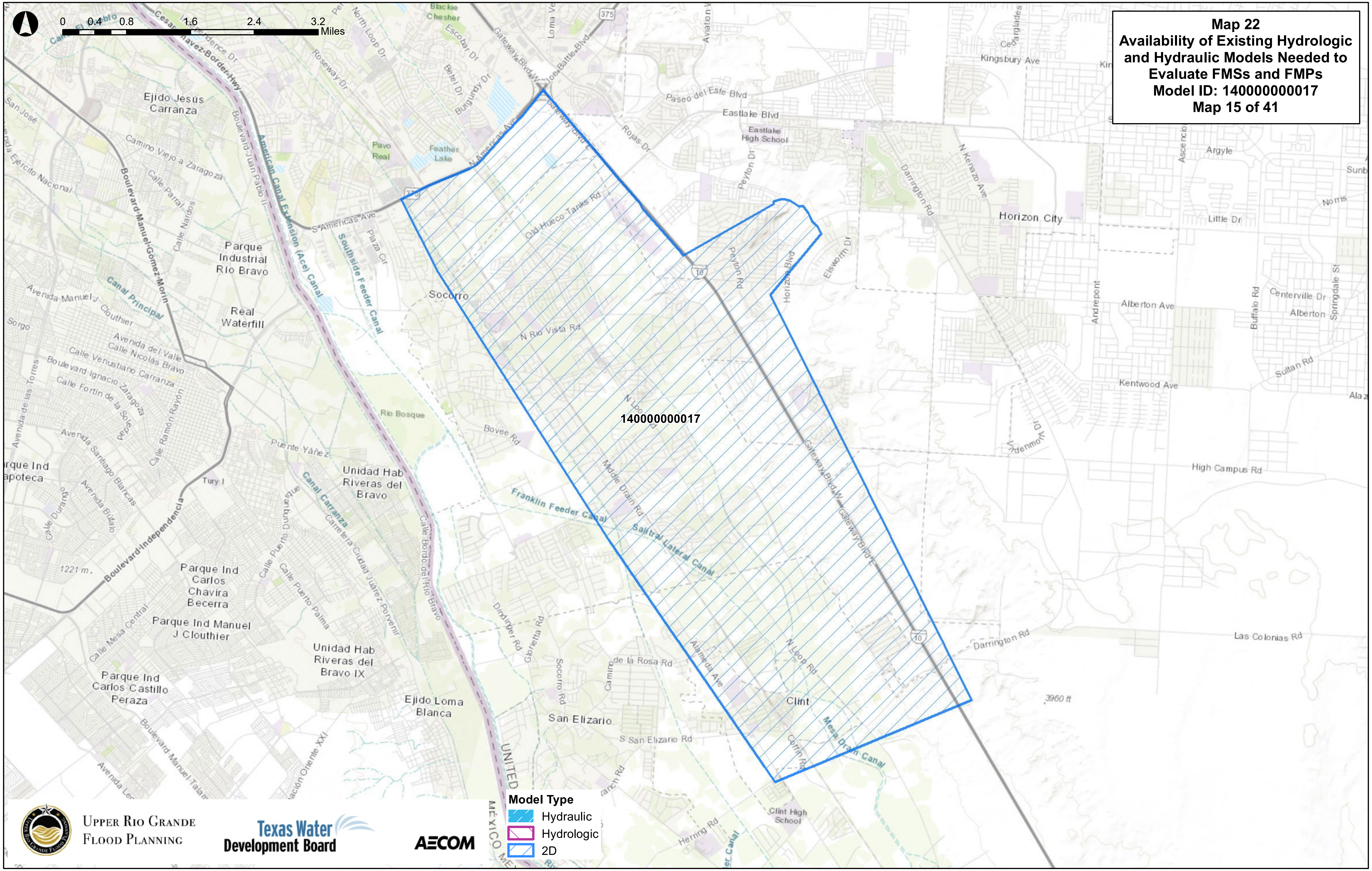
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000017
Map 15 of 41



Model Type

- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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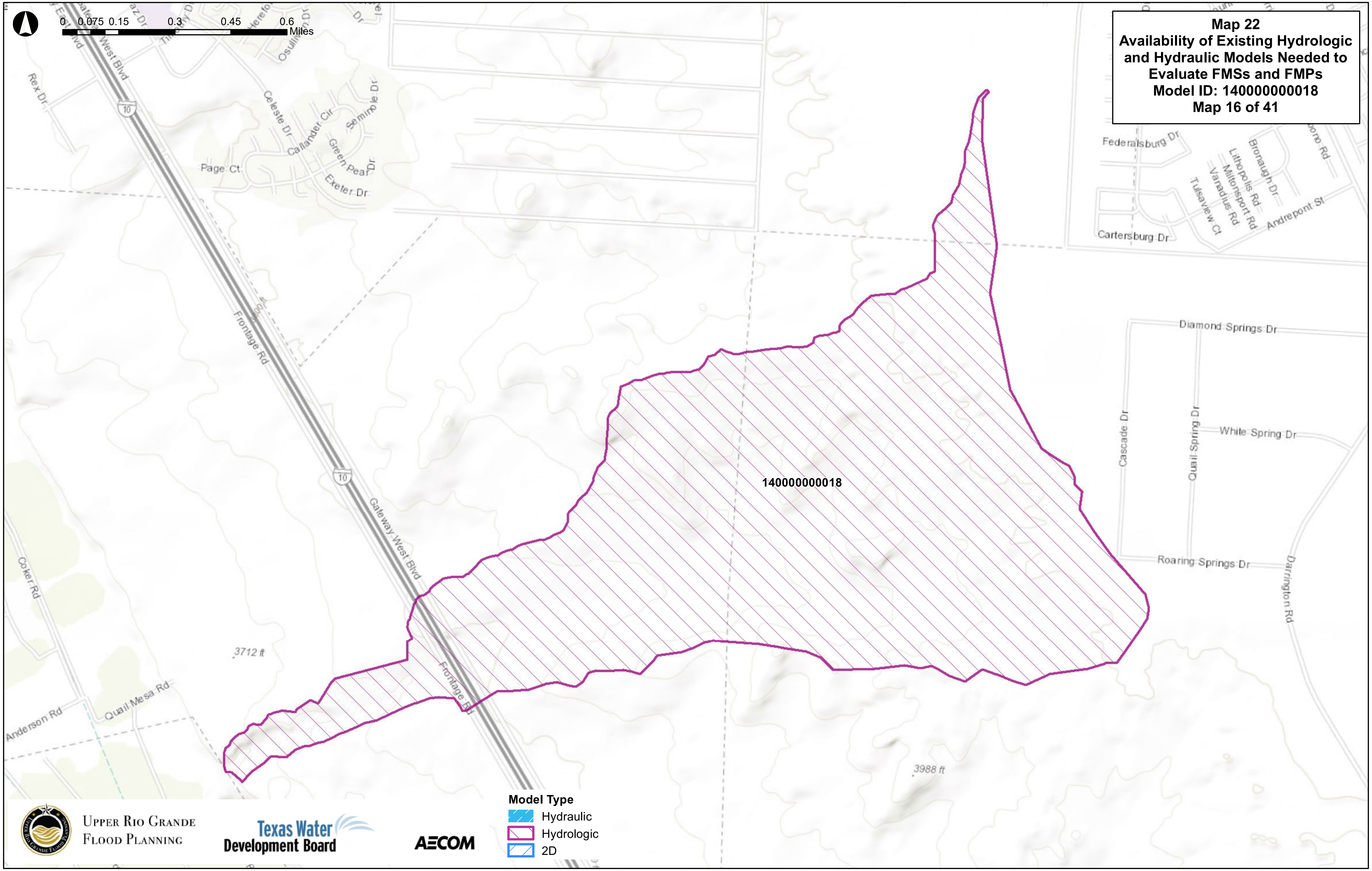
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000018
Map 16 of 41



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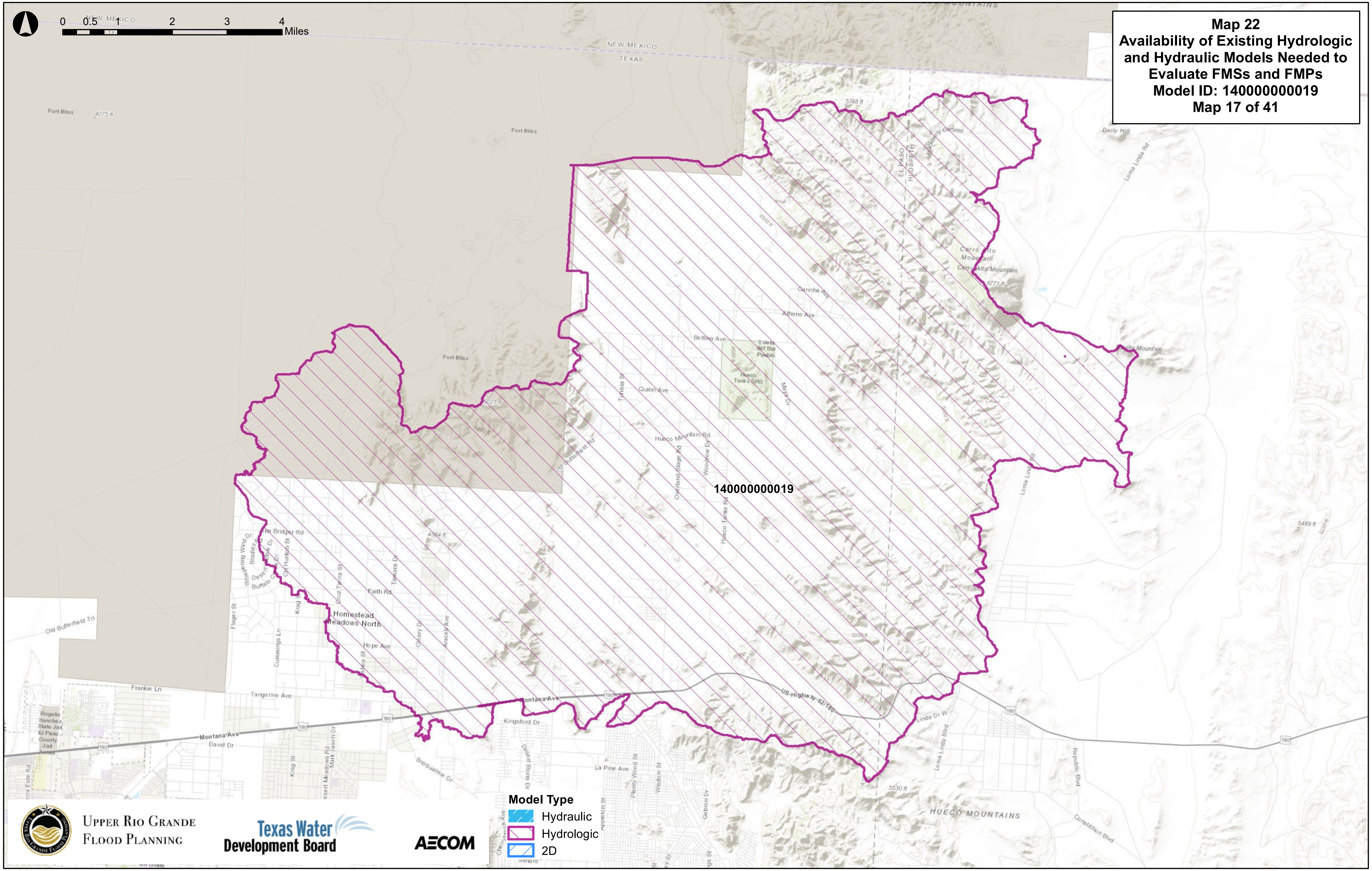
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000019
Map 17 of 41



Model Type
▨ Hydraulic
▨ Hydrologic
▨ 2D

Upper Rio Grande Flood Planning

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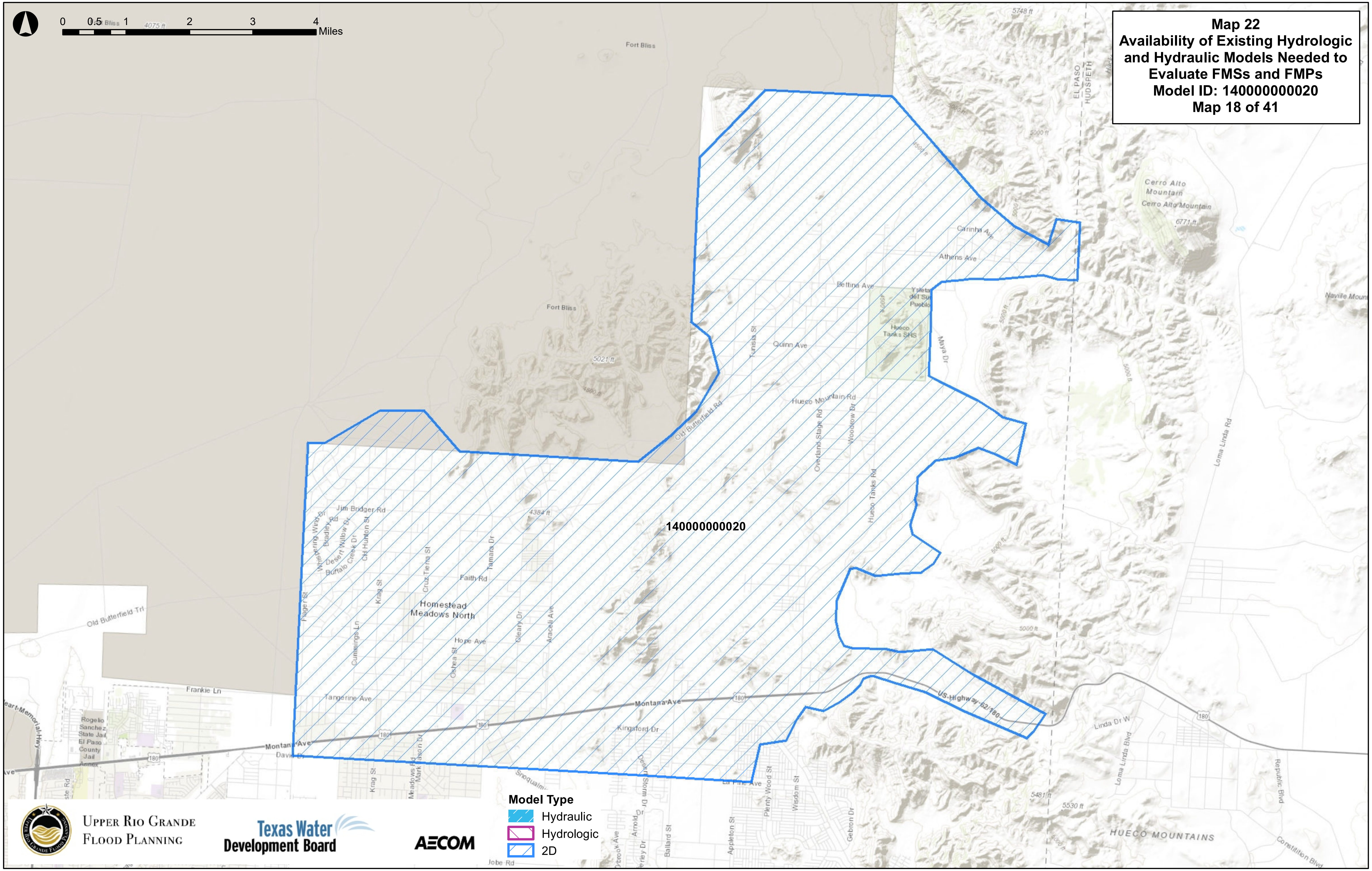
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000020
Map 18 of 41



Model Type
- Hydraulic
- Hydrologic
- 2D

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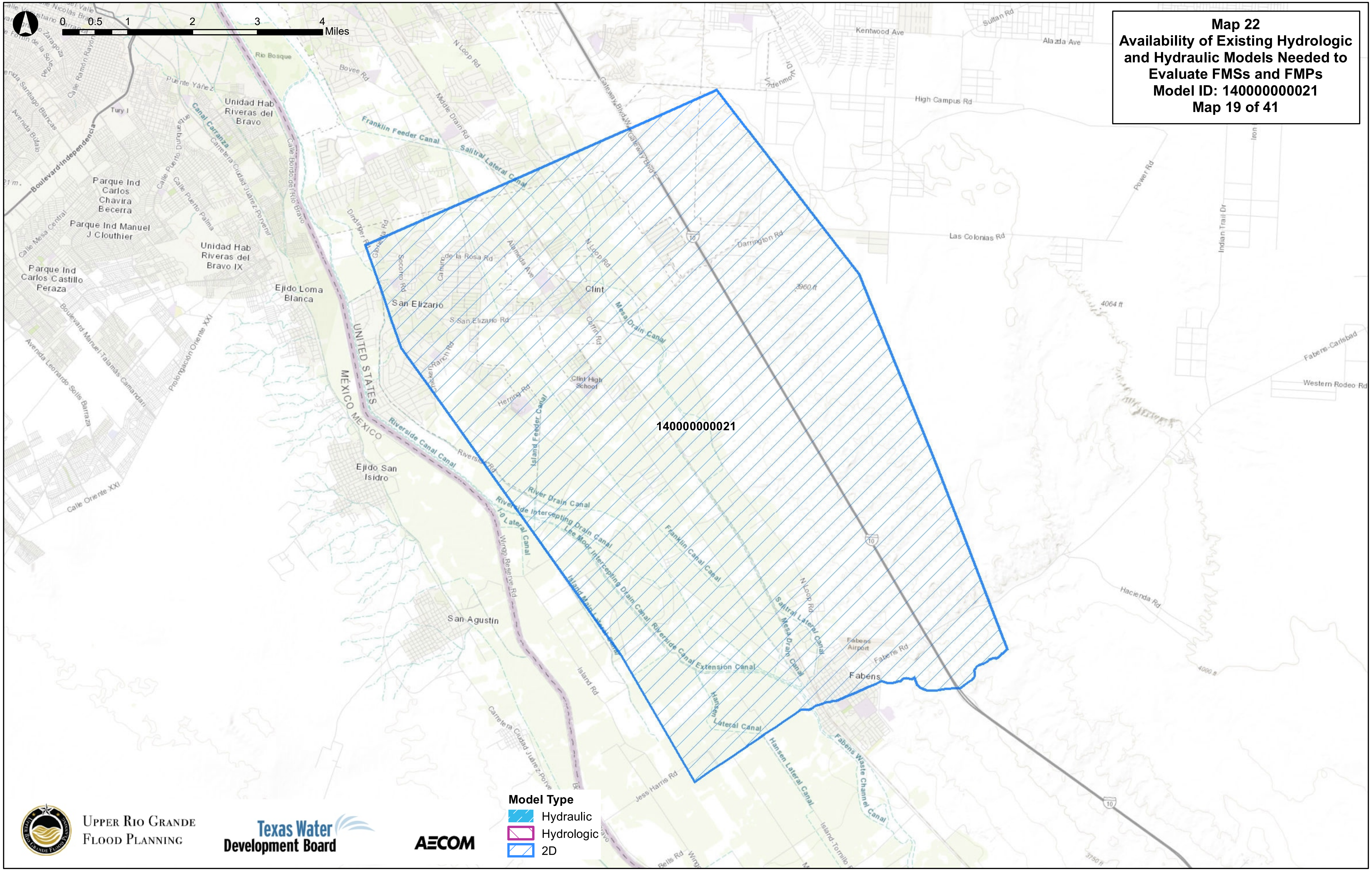
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000021
Map 19 of 41



Model Type
▨ Hydraulic
▨ Hydrologic
▨ 2D

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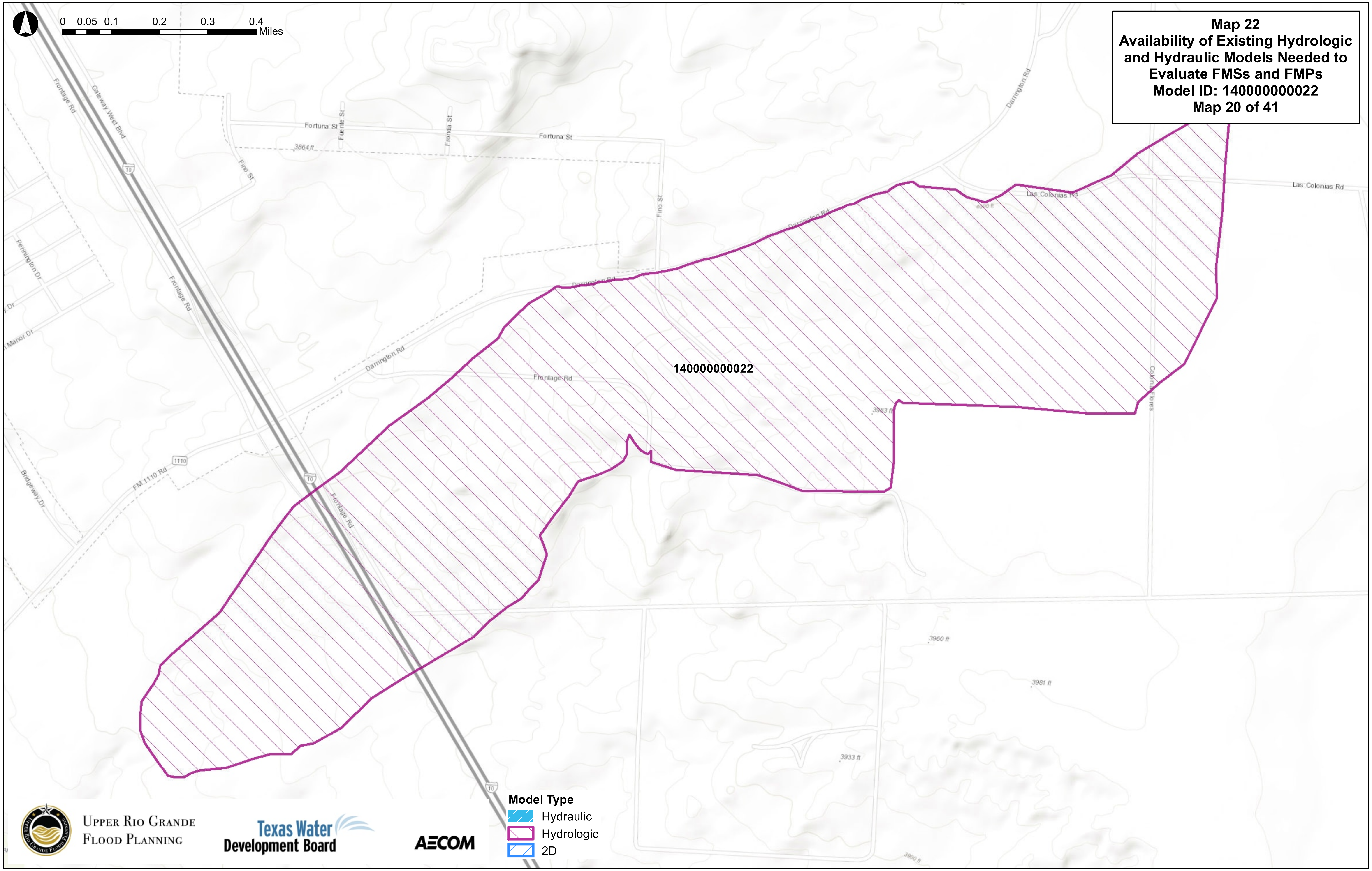
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000022
Map 20 of 41



Upper Rio Grande Flood Planning

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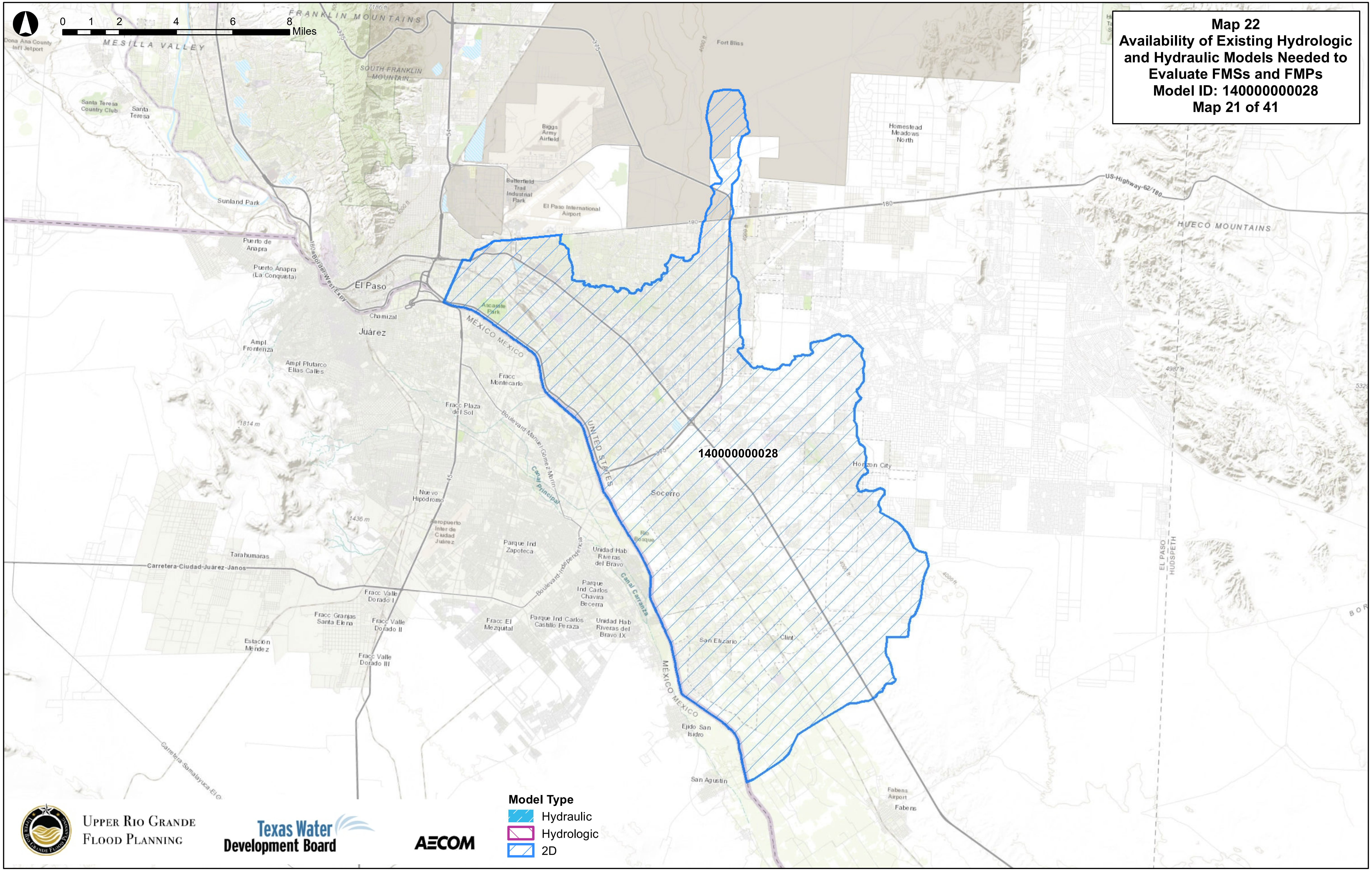

Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000028
Map 21 of 41

Model Type

▨ Hydraulic

▨ Hydrologic

▨ 2D

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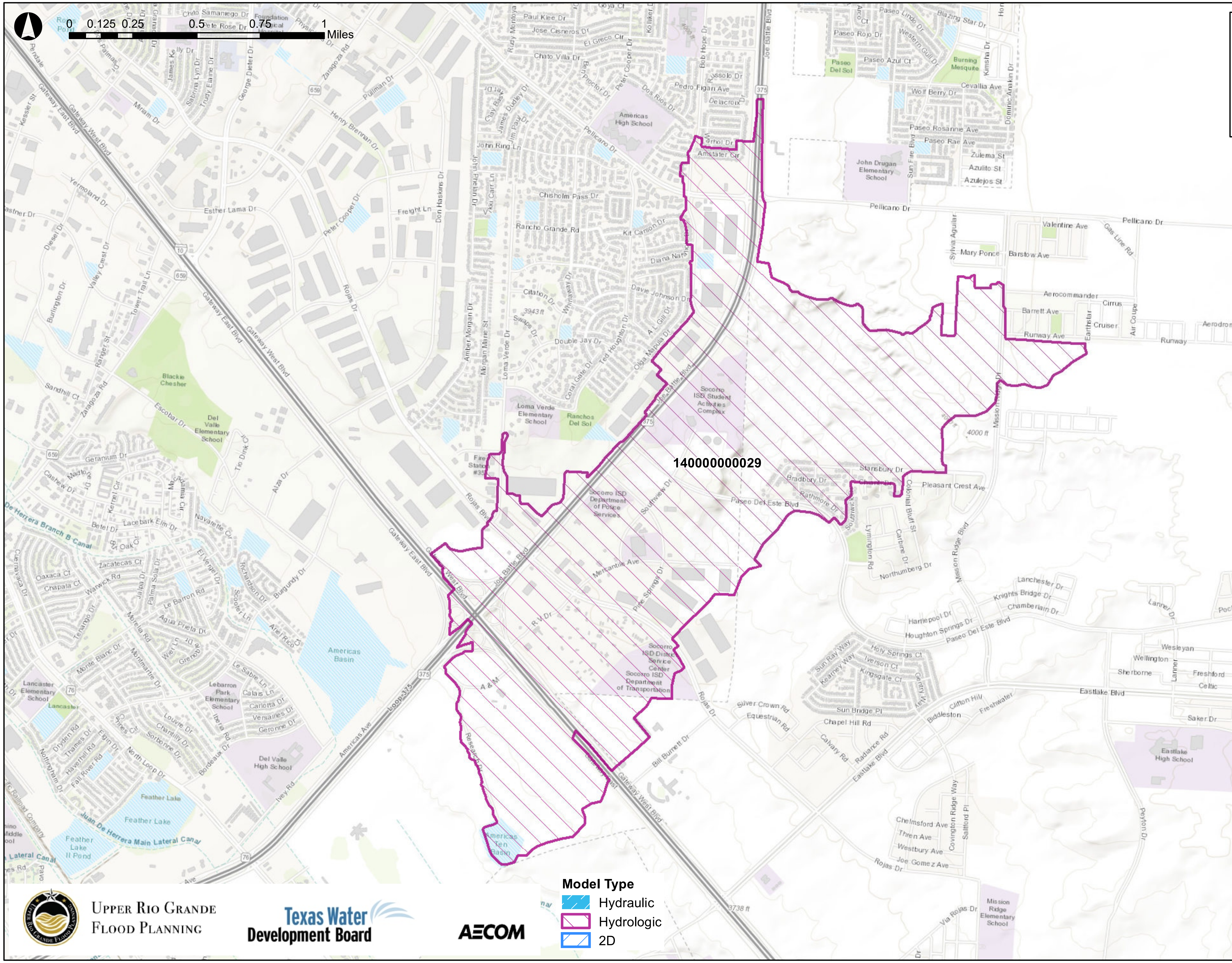
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000029
Map 22 of 41



Model Type

▨ Hydraulic

▨ Hydrologic

▨ 2D

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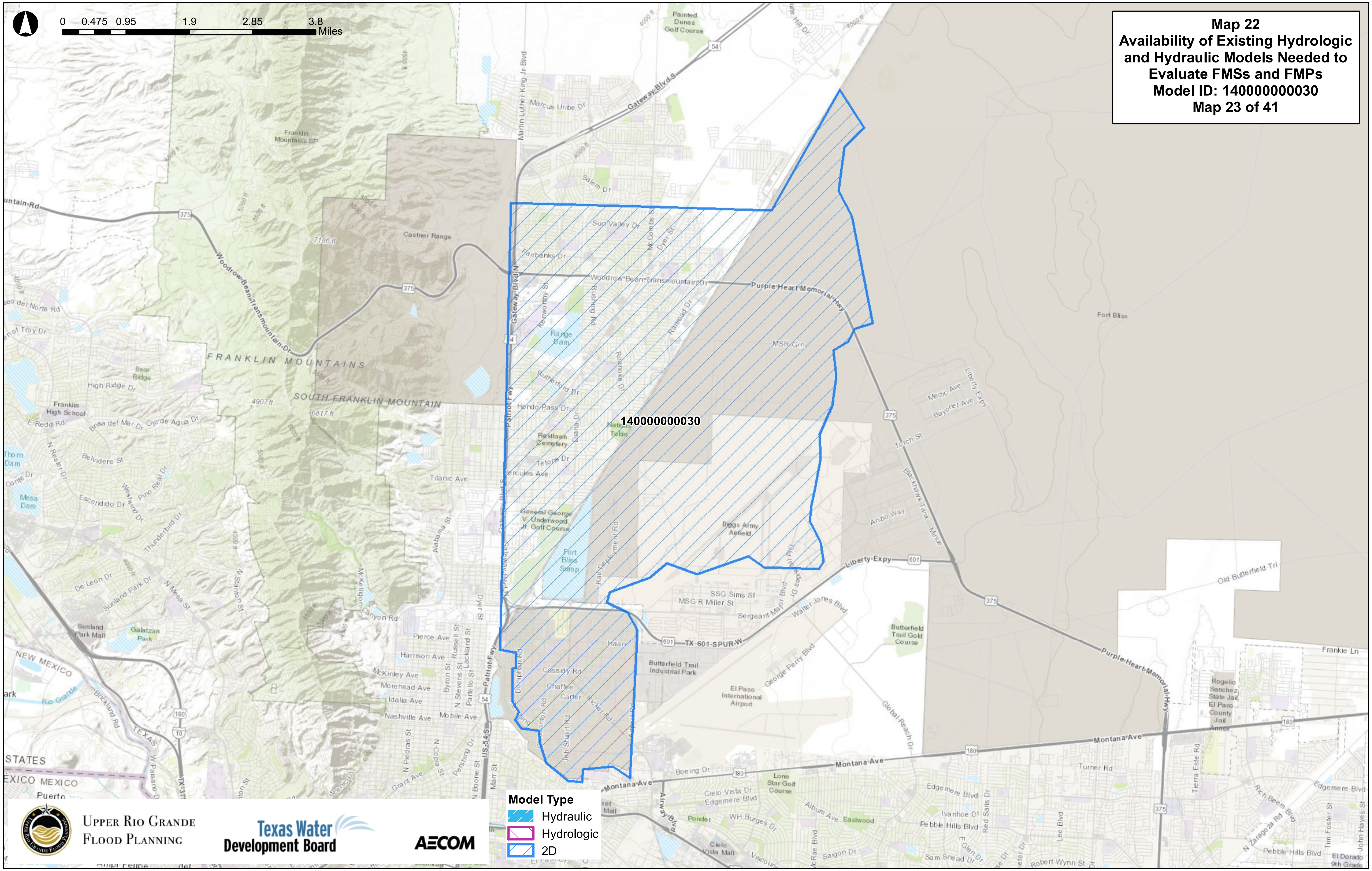
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000030
Map 23 of 41



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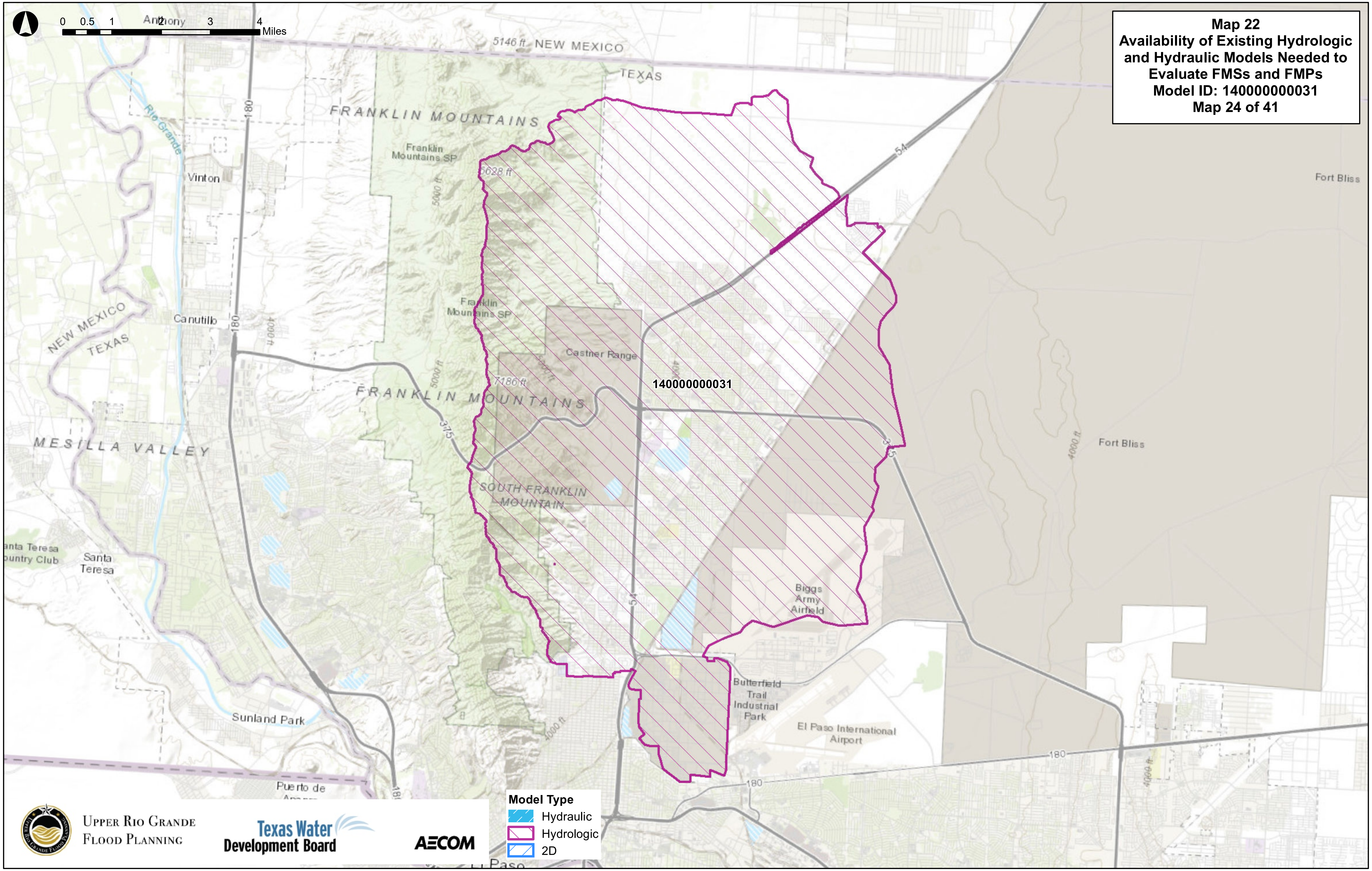
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000031
Map 24 of 41



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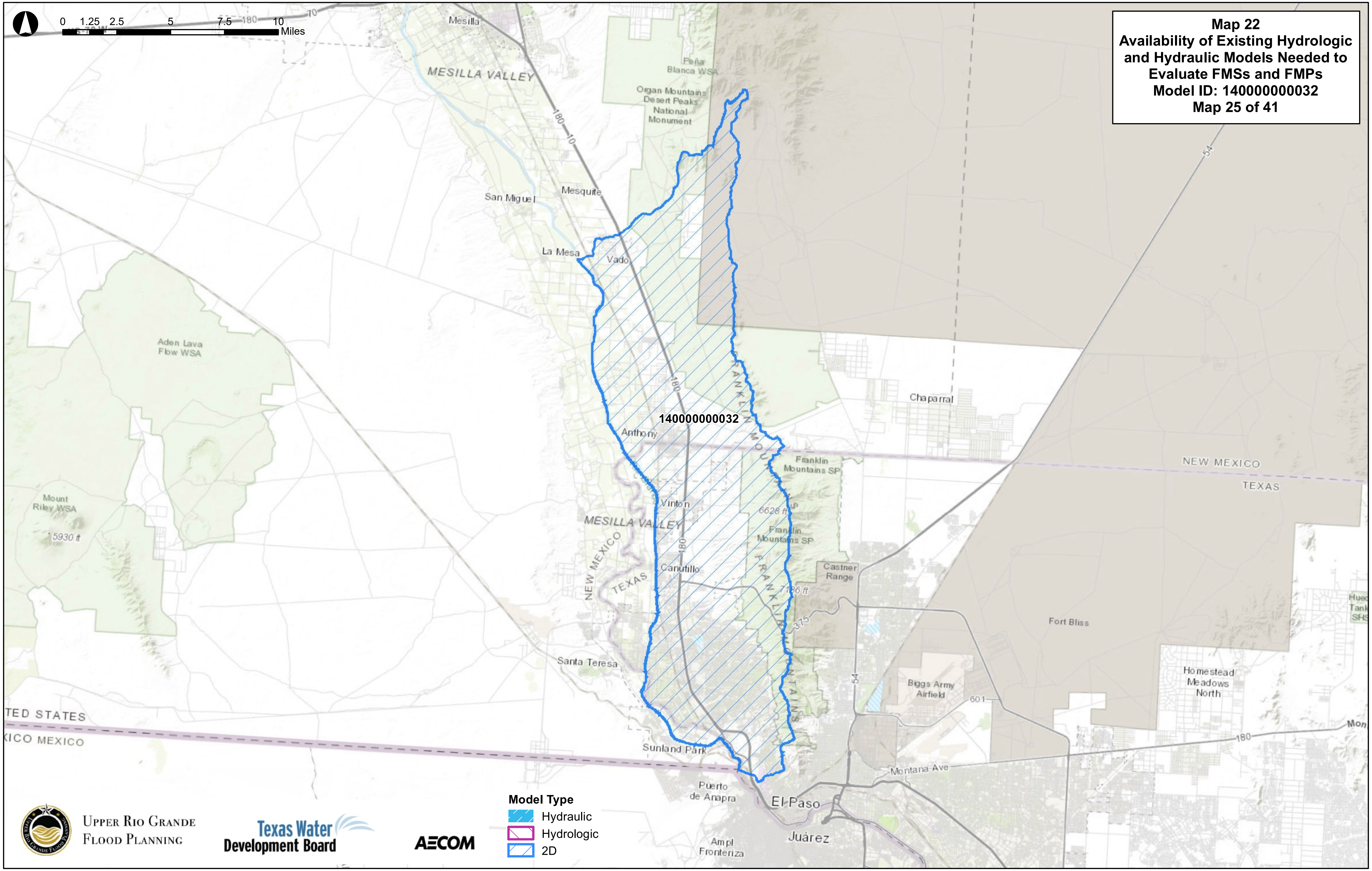

Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000032
Map 25 of 41

Model Type

▨	Hydraulic
▨	Hydrologic
▨	2D

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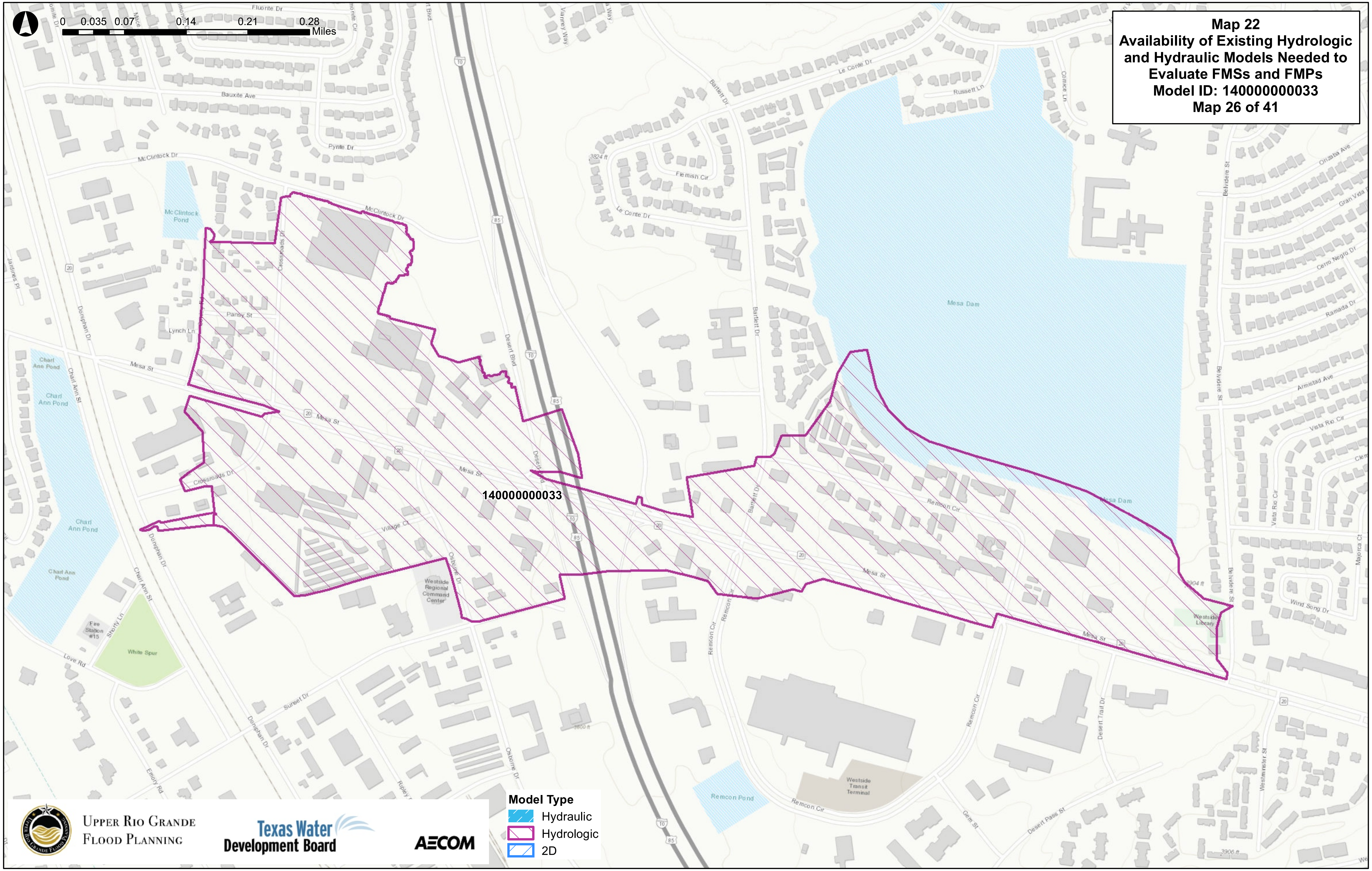
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000033
Map 26 of 41



Model Type
- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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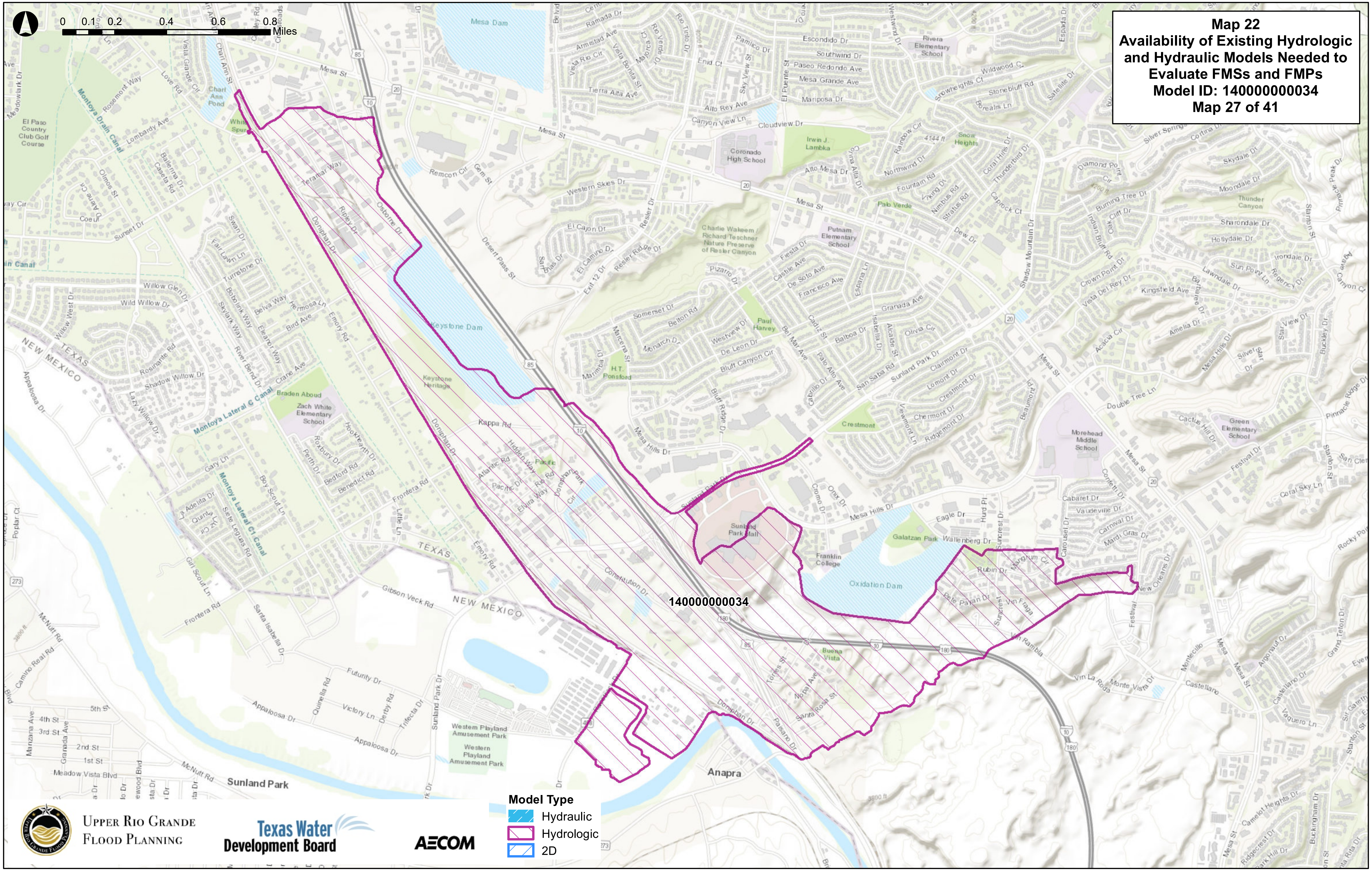
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000034
Map 27 of 41



Model Type
▨ Hydraulic
▨ Hydrologic
▨ 2D

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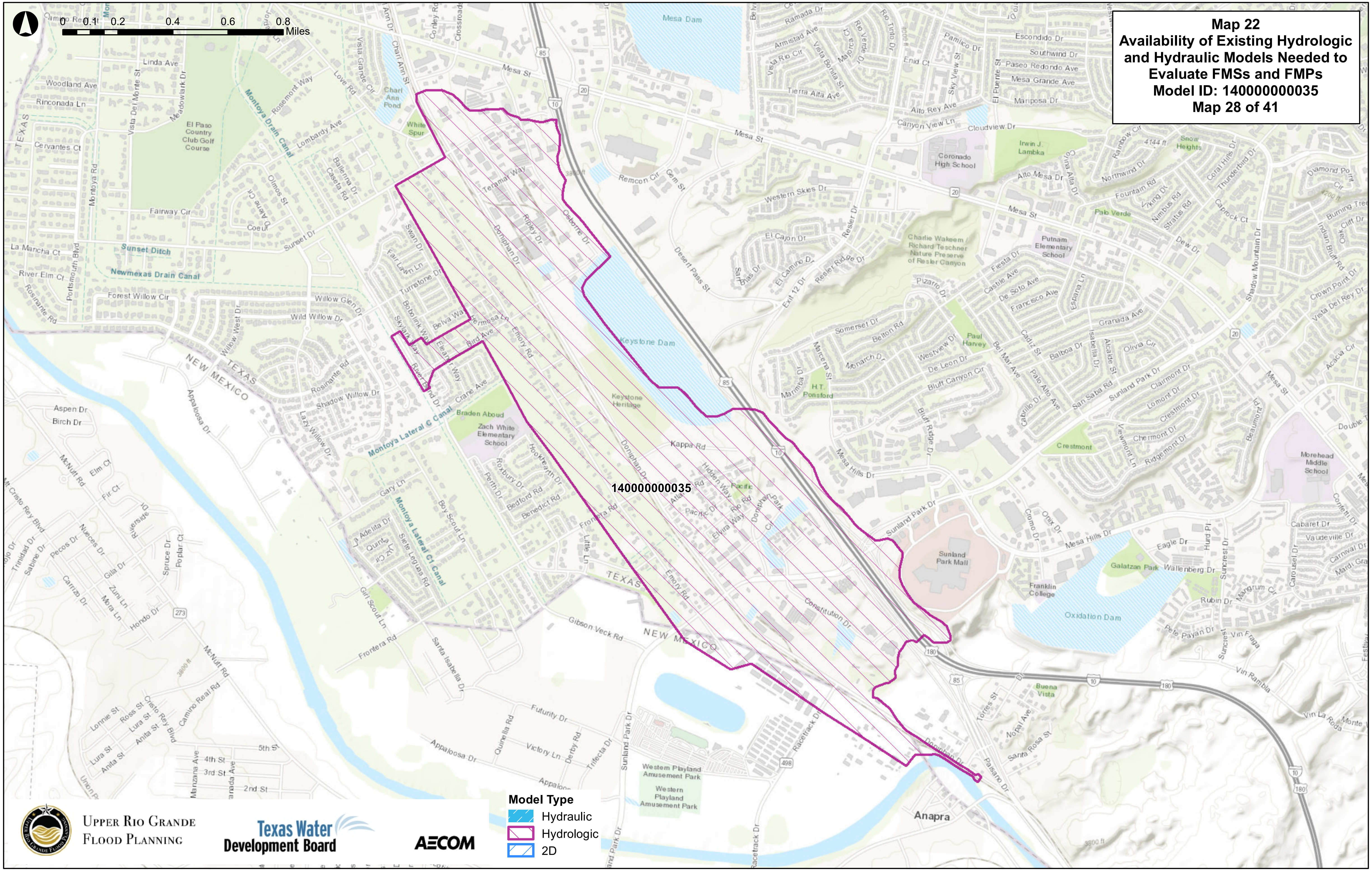

Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000035
Map 28 of 41

Model Type

- 🟦 Hydraulic
- ▨ Hydrologic
- ▨ 2D

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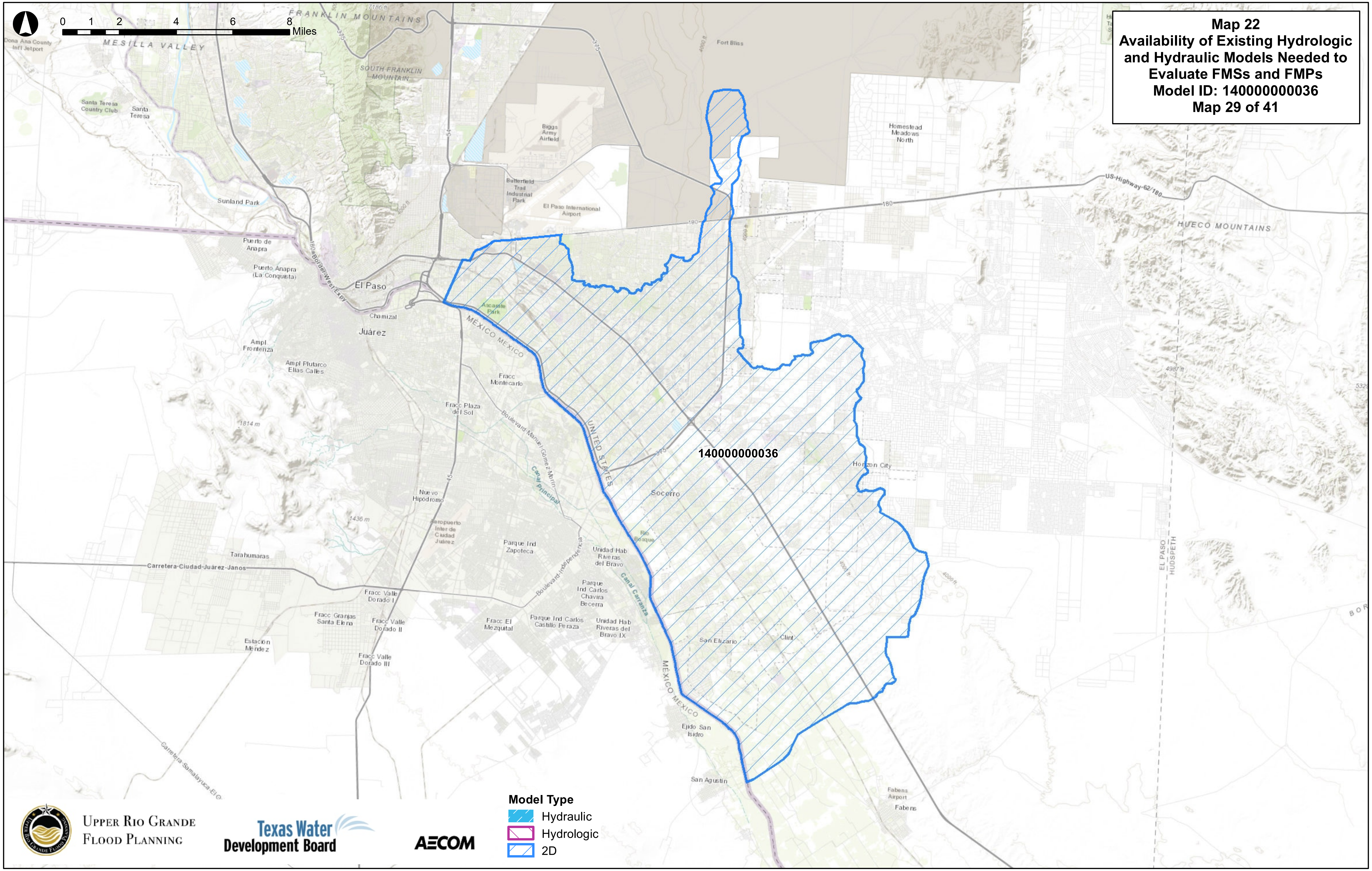
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000036
Map 29 of 41



Model Type

- ▨ Hydraulic
- ▢ Hydrologic
- ▨ 2D

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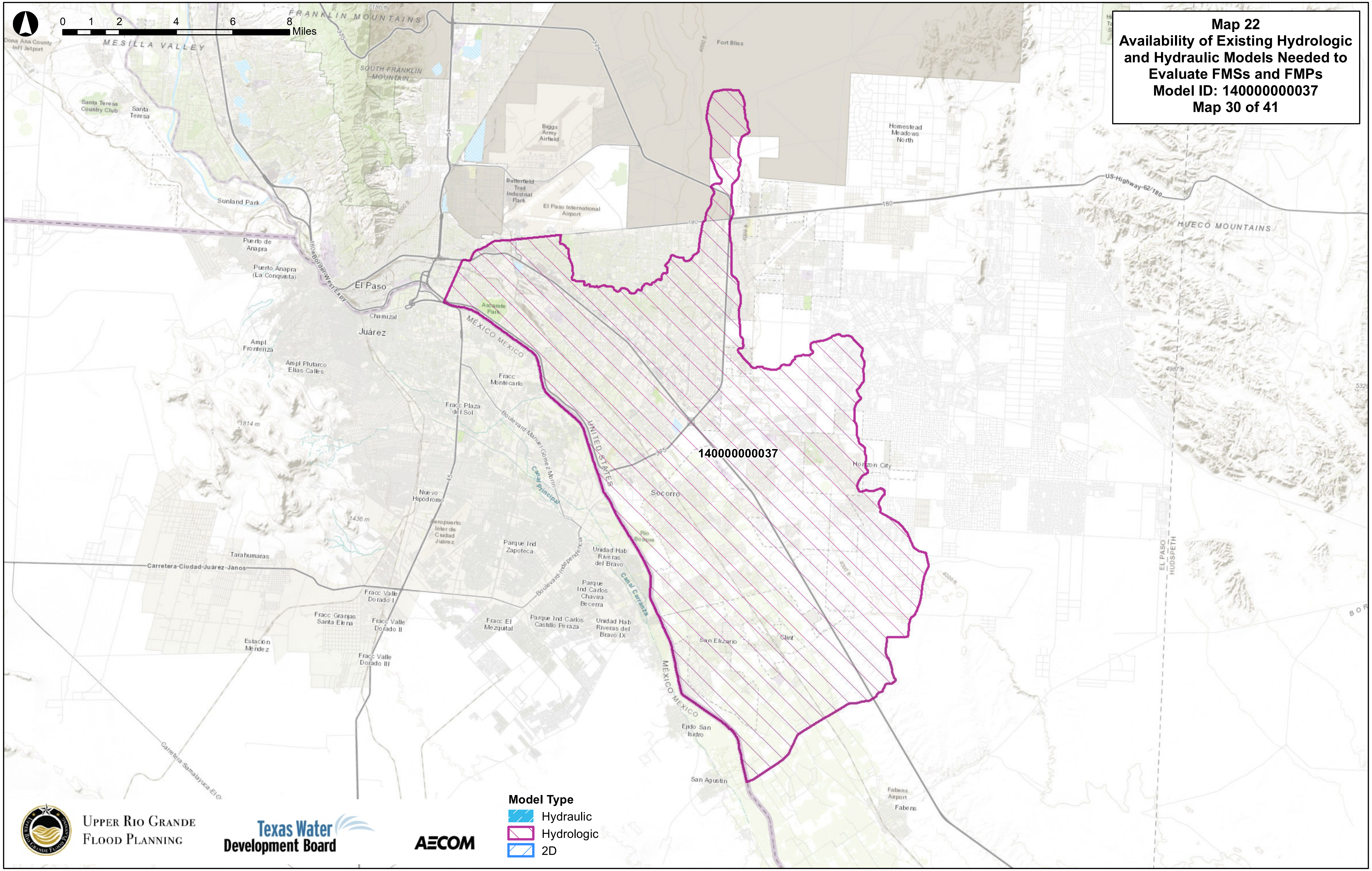
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000037
Map 30 of 41



Model Type
- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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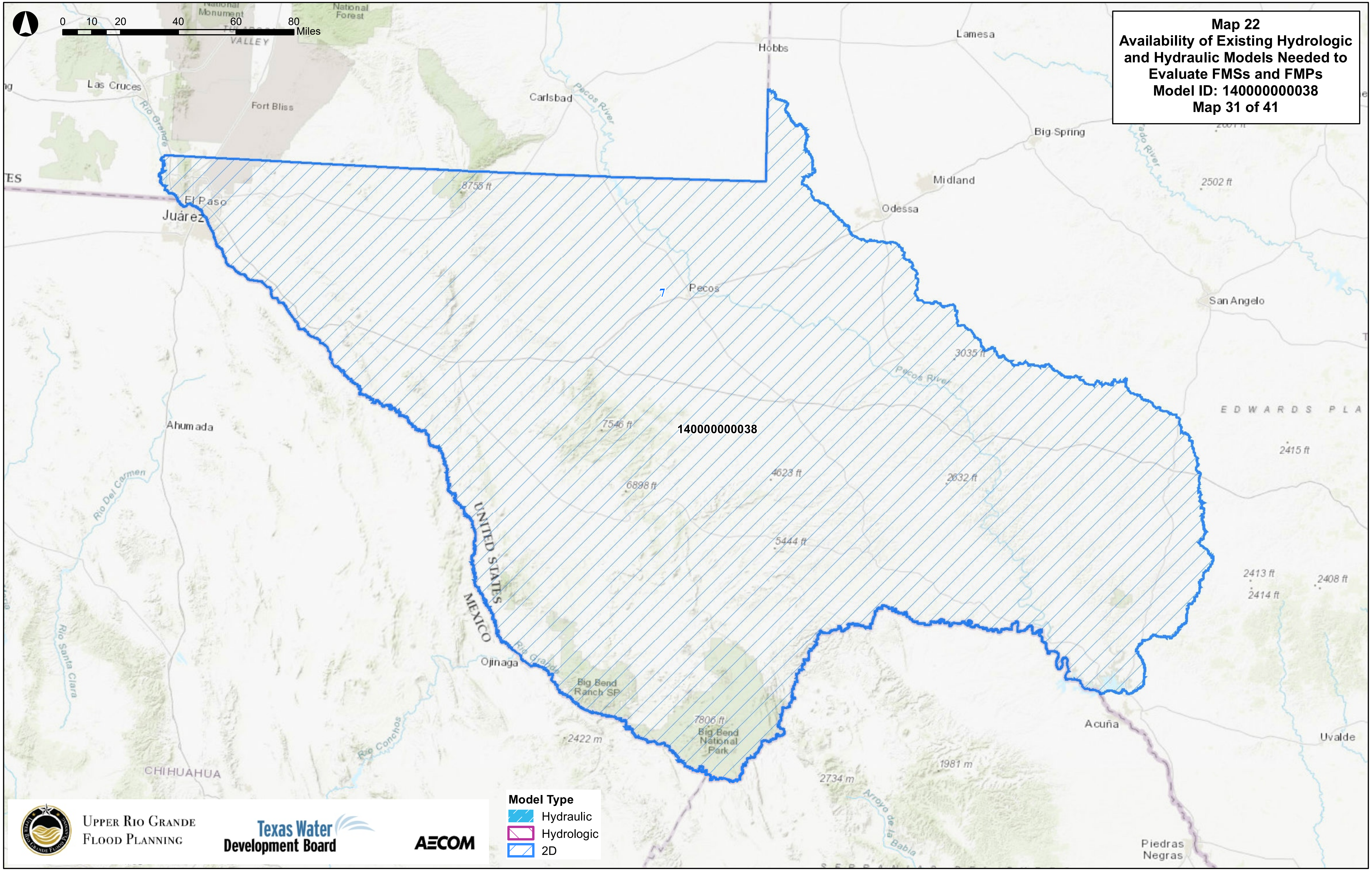
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000038
Map 31 of 41



Model Type
- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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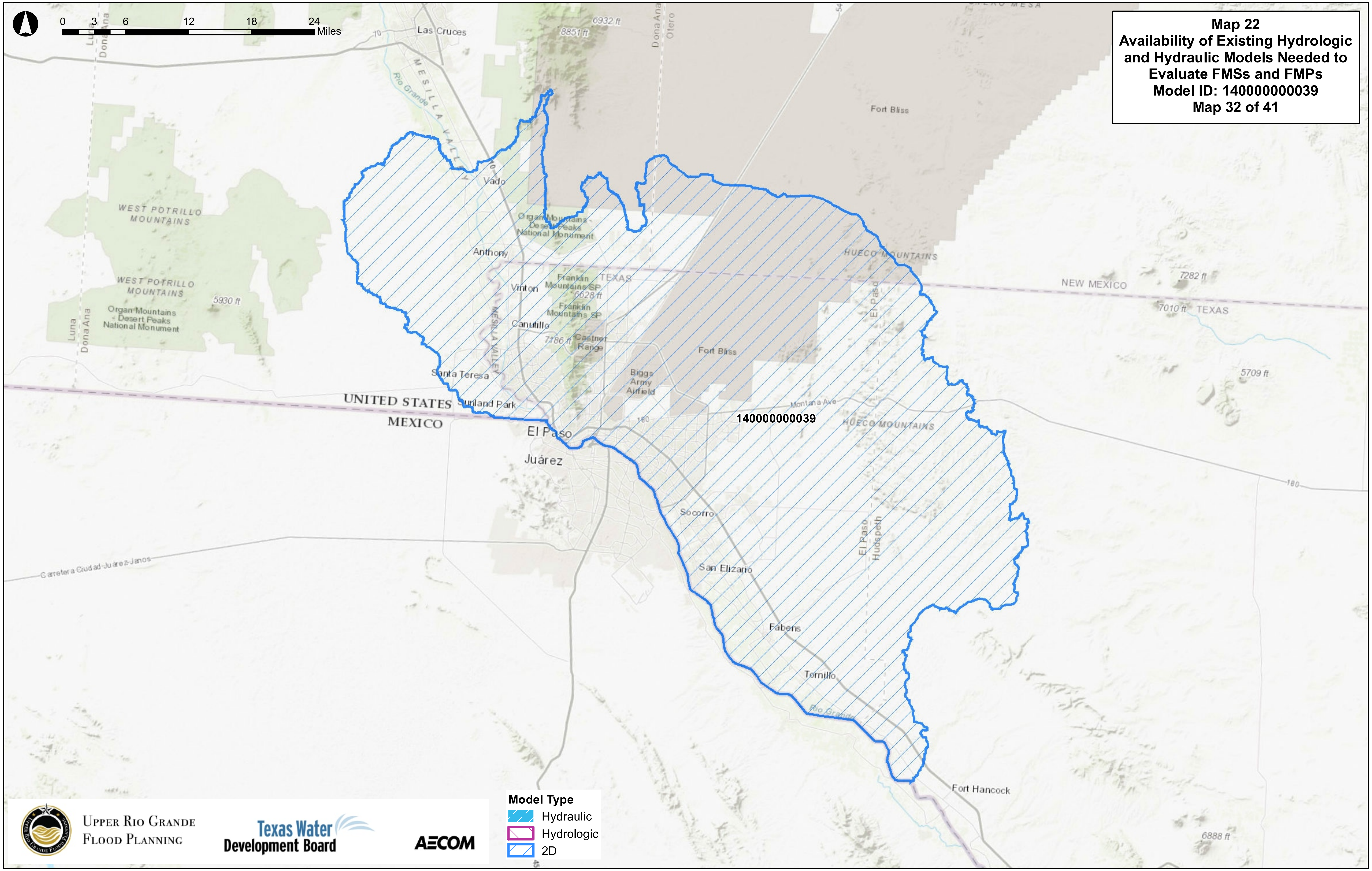
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000039
Map 32 of 41



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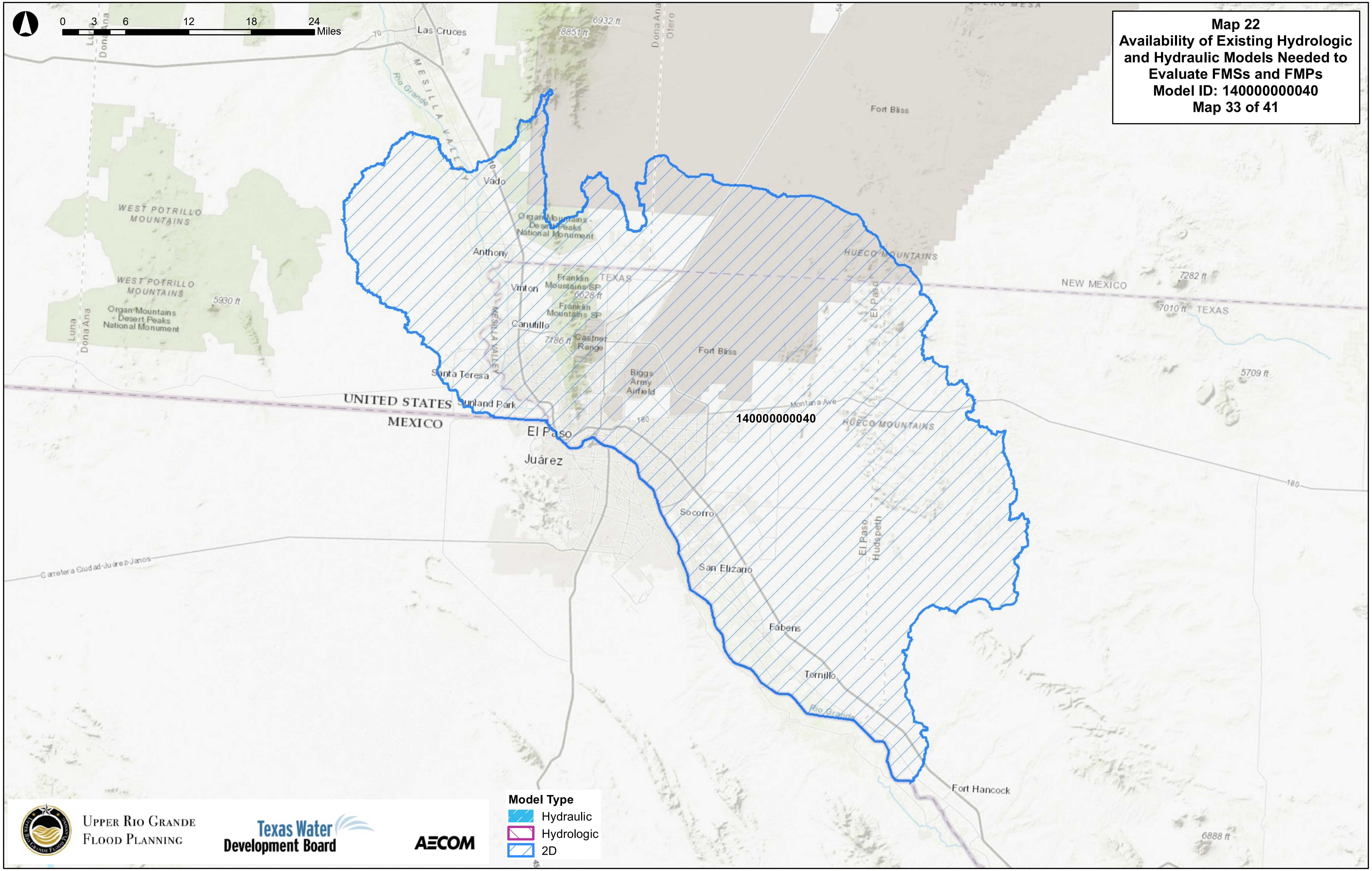
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000040
Map 33 of 41



Model Type
▨ Hydraulic
▨ Hydrologic
▨ 2D

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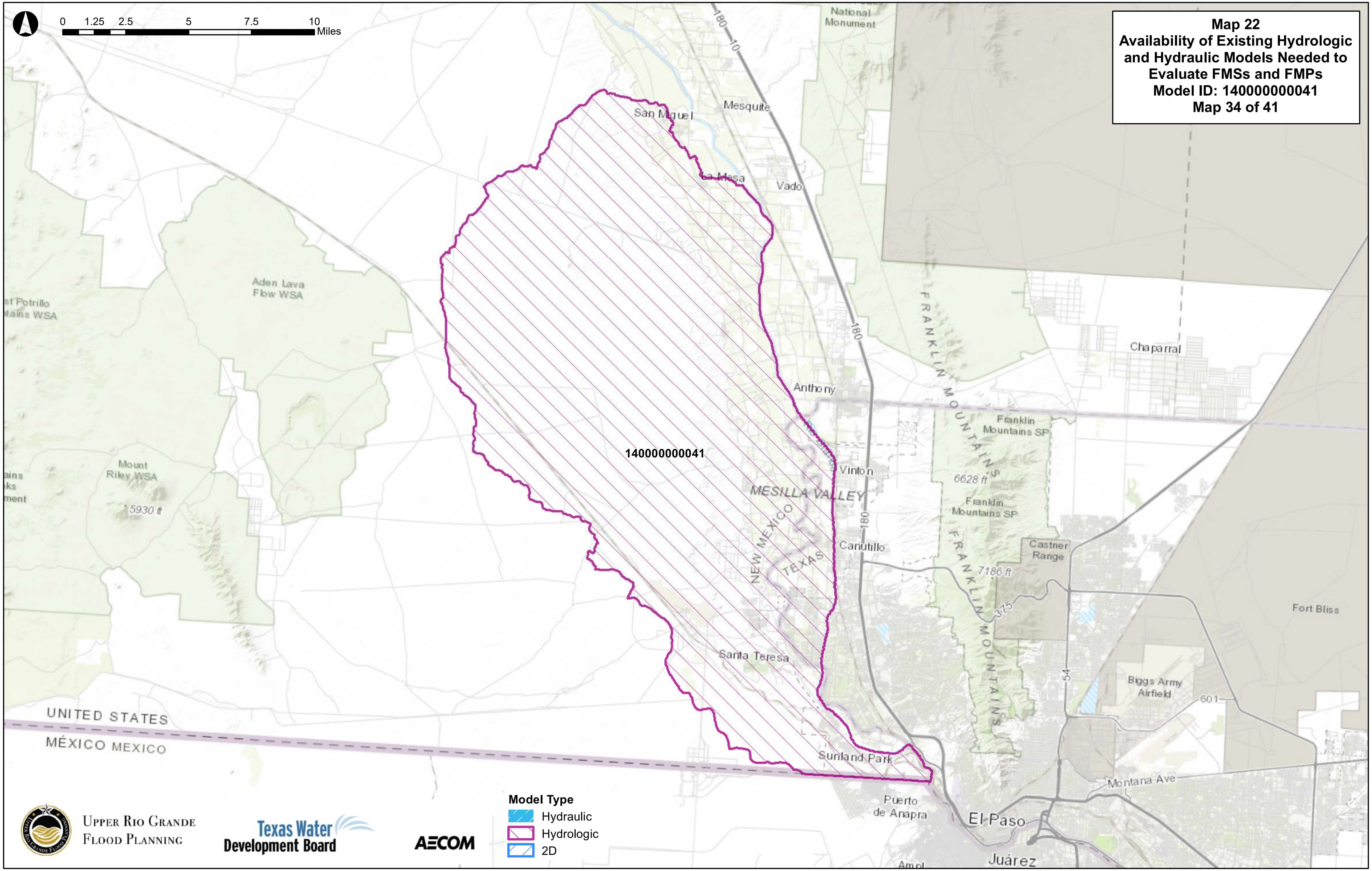
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000041
Map 34 of 41



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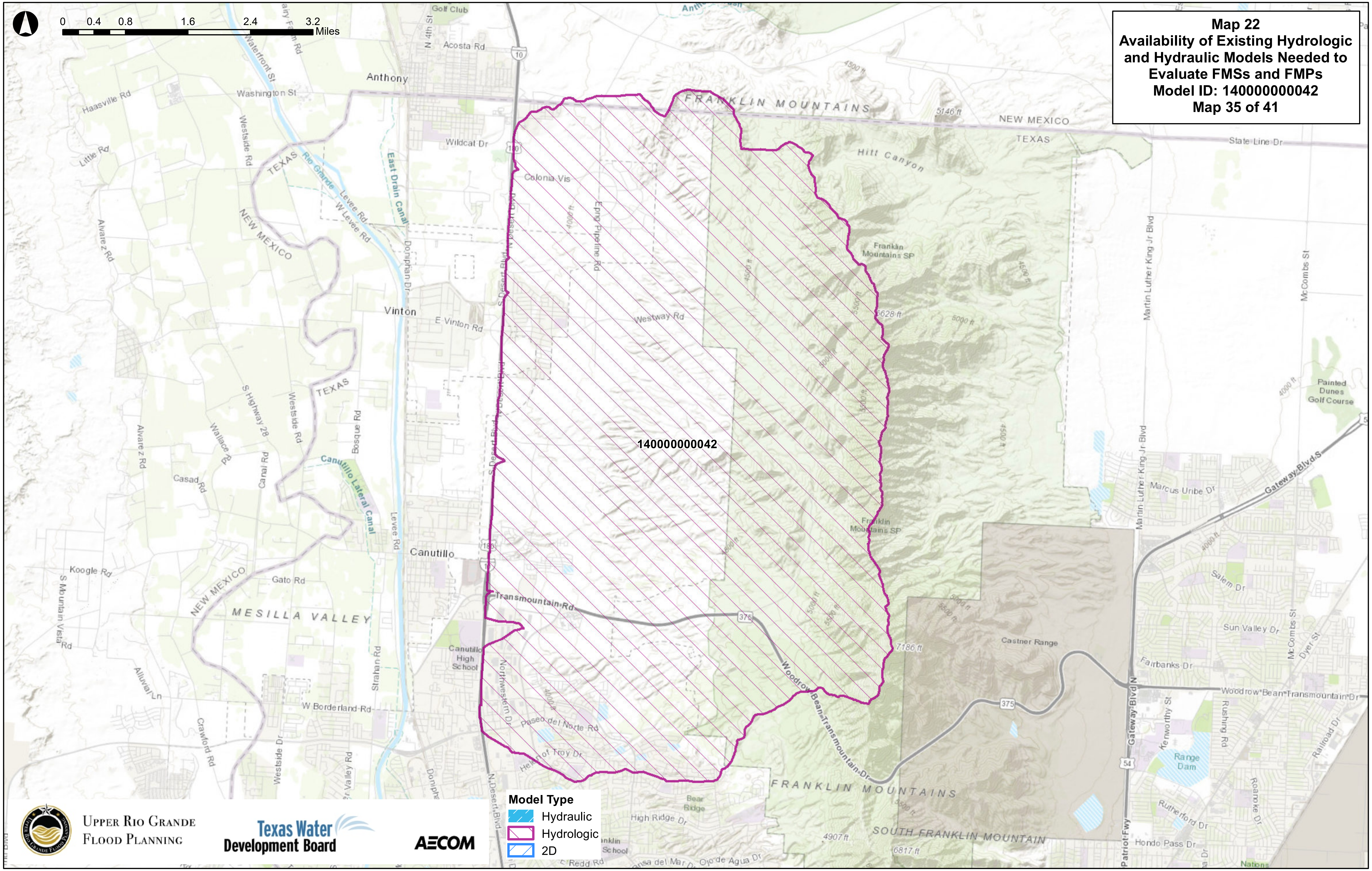
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000042
Map 35 of 41



Model Type
- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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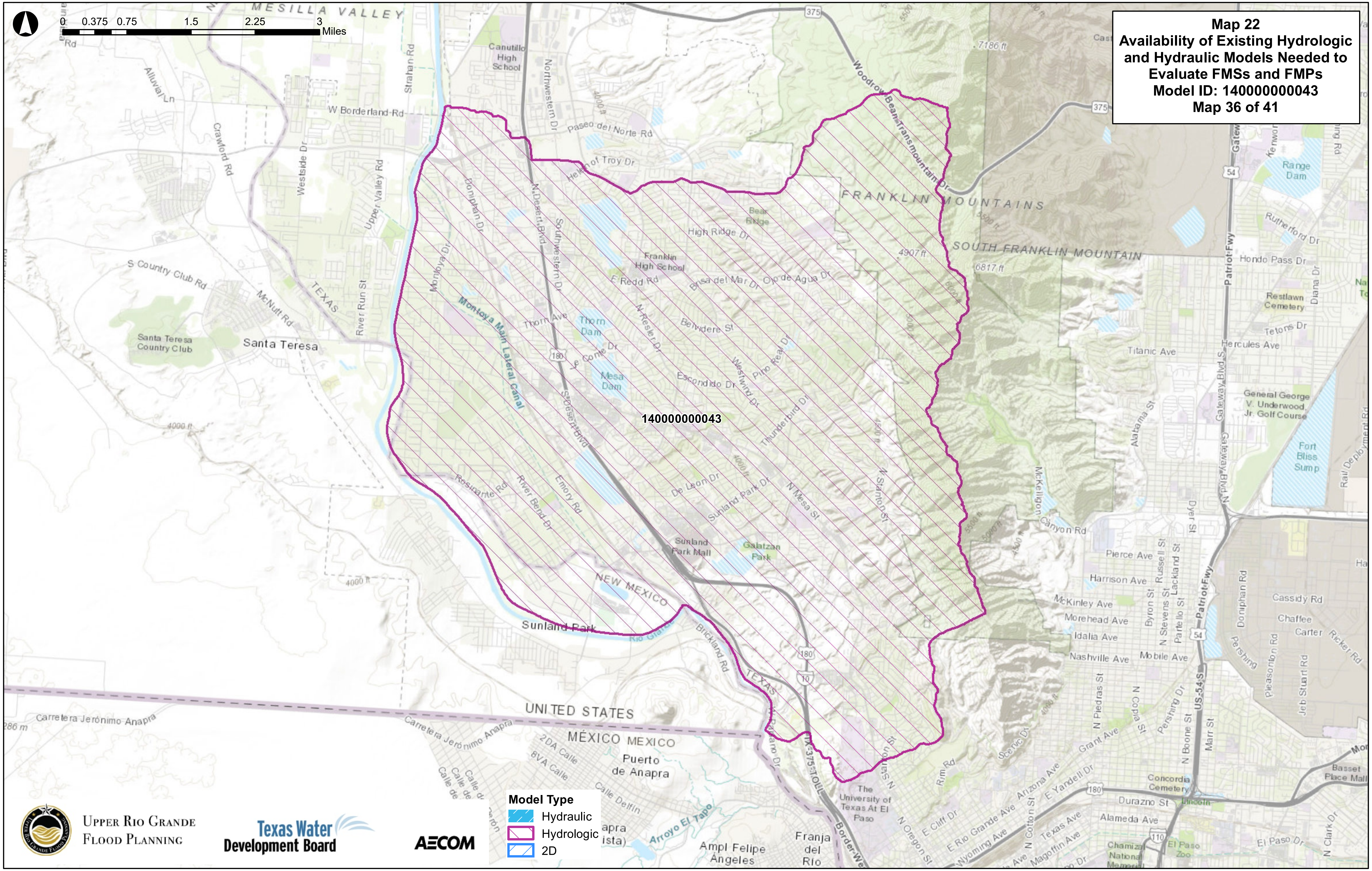

Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000043
Map 36 of 41

Model Type

- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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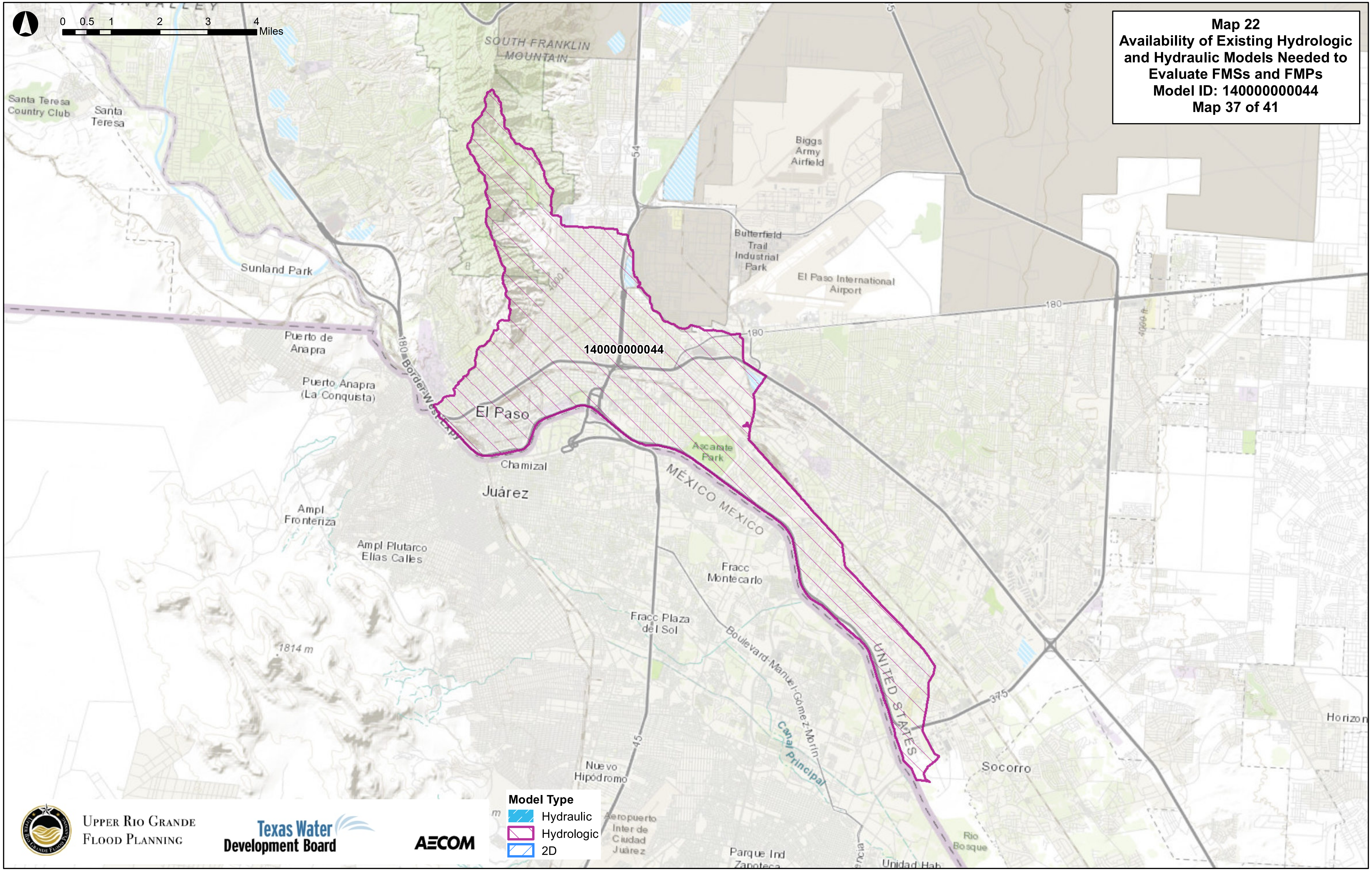
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000044
Map 37 of 41



Model Type
- ▨ Hydraulic
- ▨ Hydrologic
- ▨ 2D

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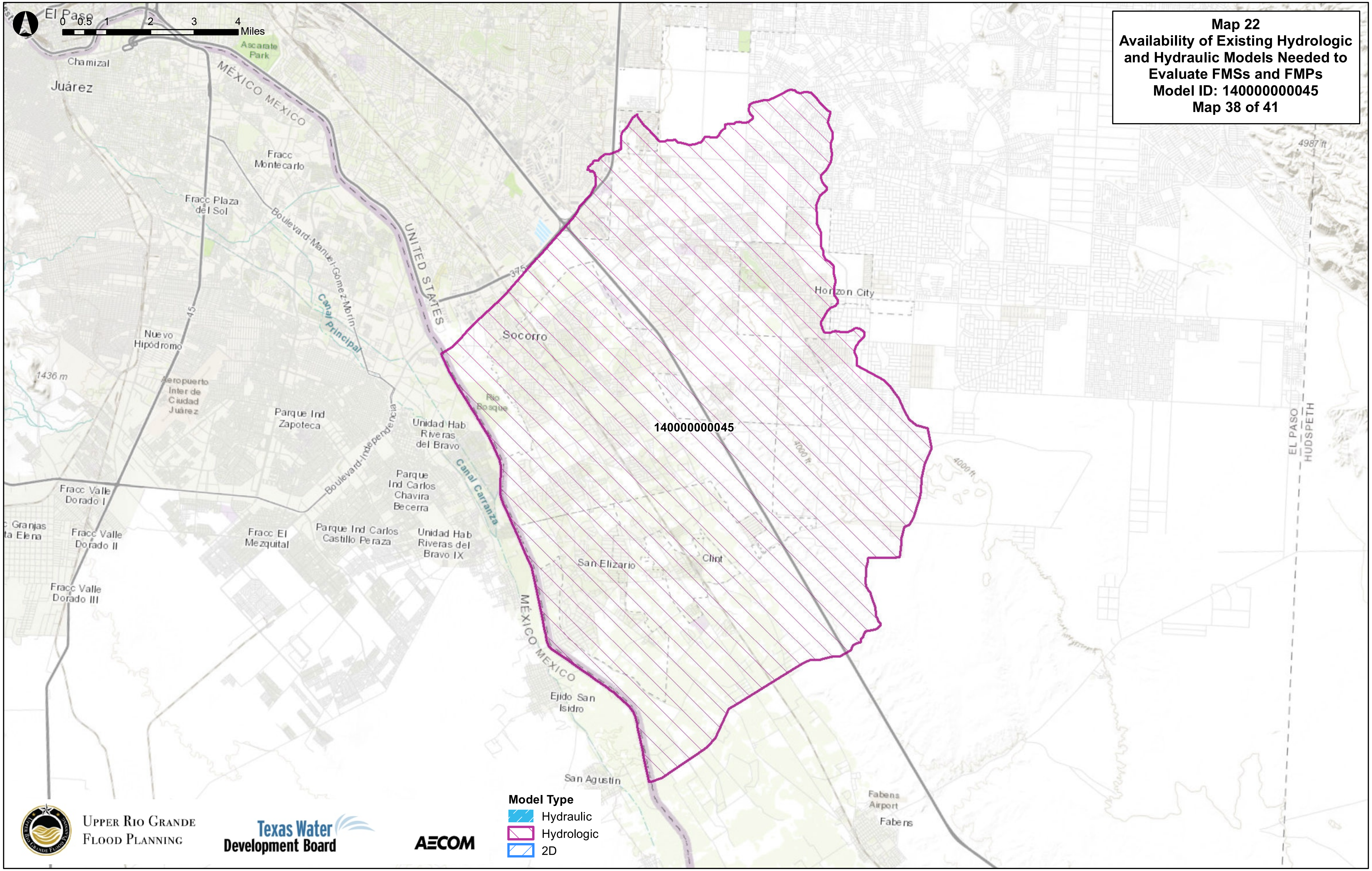
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000045
Map 38 of 41



Model Type

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- ▨ Hydrologic
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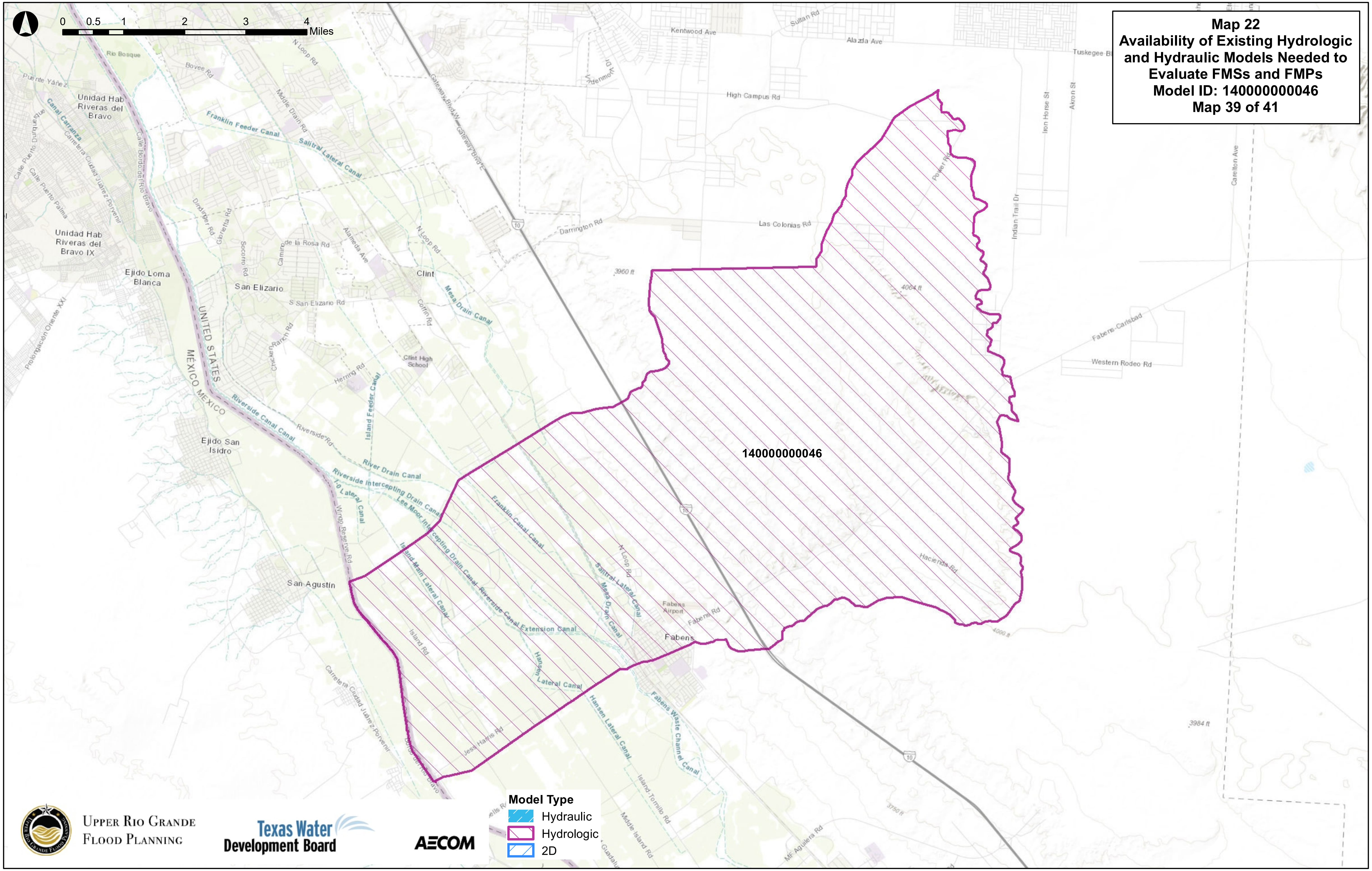
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000046
Map 39 of 41



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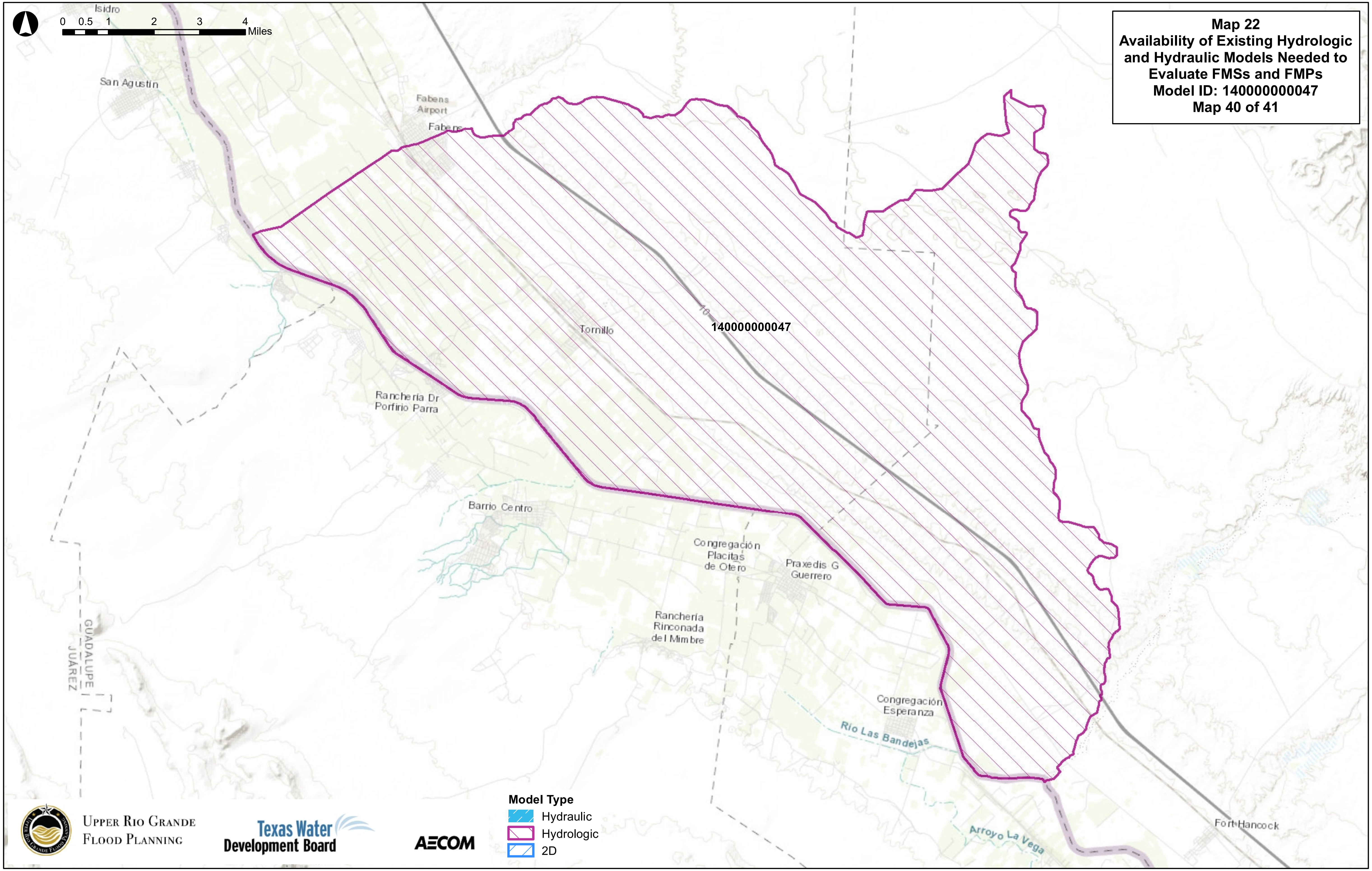
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000047
Map 40 of 41



Model Type
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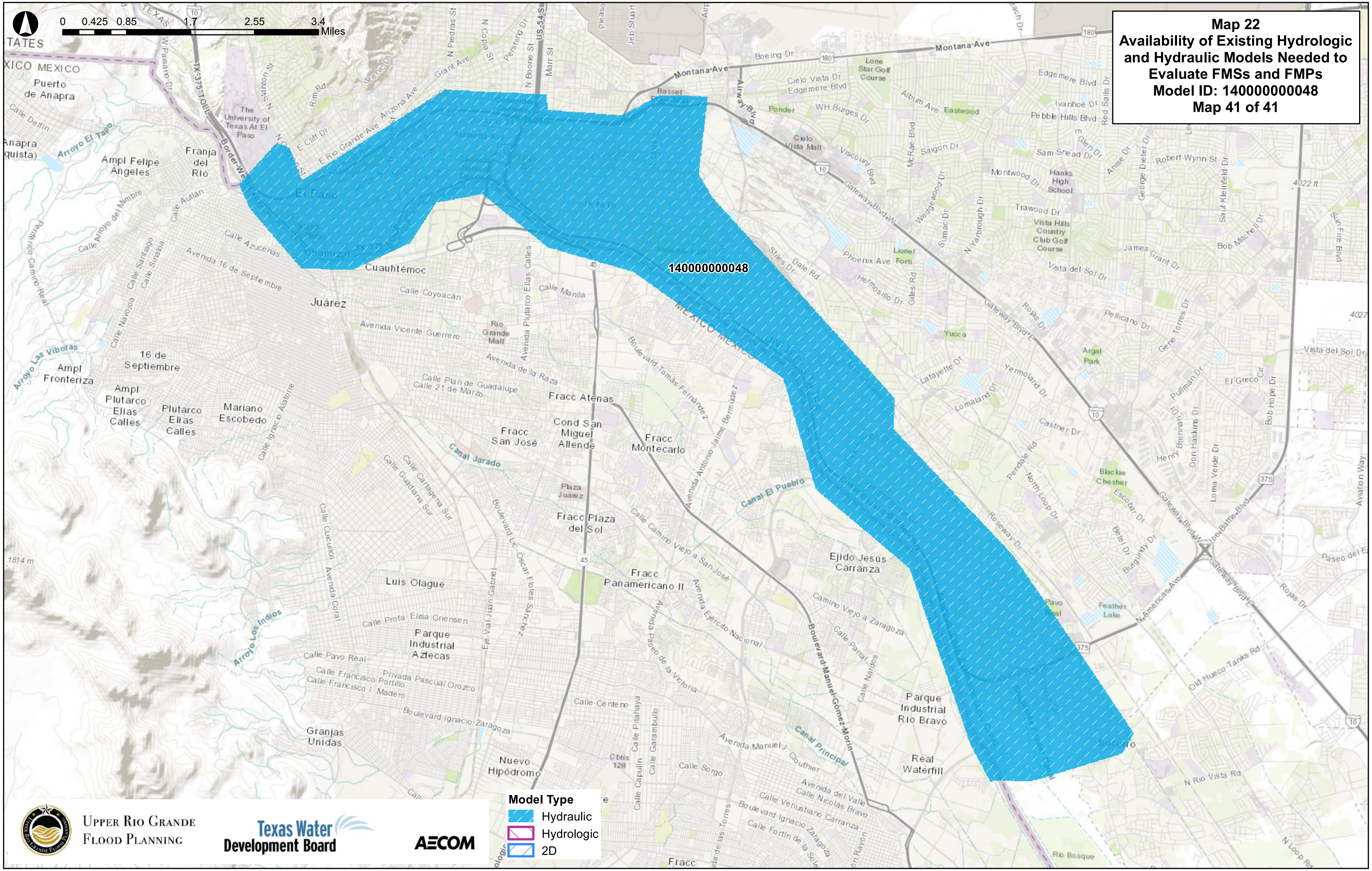
Map 22
Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs
Model ID: 140000000048
Map 41 of 41



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Chapter 3: Floodplain Management Practices and Goals

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3. Floodplain Management Practices and Goals

The Upper Rio Grande Regional Flood Planning Group (RFPG) reviewed local regulations and solicited input from stakeholders across the region to develop floodplain management practices and flood protection goals for the Upper Rio Grande region as part of Task 3. Public input and feedback on the practices and goals were received at planning group meetings, public meetings, via an online survey, and through independent outreach by phone and email to stakeholders within the region. The data collection effort provided feedback from more than 100 entities on specific topics representing all counties and a majority of the municipalities in the region.

The Region 14 RFPG divided into subcommittees to focus on specific tasks of the flood plan development. Subcommittee 1 was assigned to address Task 3a, the evaluation and development of recommendations on Floodplain Management Practices, and Task 3b, Flood Mitigation and Floodplain Management Goals. Subcommittee 1 met for discussion and development of these objectives in September, October, and twice in November 2021. The floodplain management practices and goals that resulted from these conferences were presented to and approved by the general body of the RFPG during the November 30th, 2021, monthly meeting. The floodplain management standards and goals described in the following chapter are the result of these meetings and developed with respect to the region under the guidance of regional residents, stakeholders, and the planning group.

3.1 Evaluation and Recommendations on Floodplain Management Practices

The Upper Rio Grande RFPG is required to evaluate and recommend floodplain management practices for the region. From a floodplain management perspective, the region faces issues such as uncontrolled development in unincorporated areas and a lack of resources needed for community officials to effectively enforce drainage and/or development regulations. Standardized floodplain management and land use practices help to reduce existing and future flood risk and promote regionwide flood resiliency.

3.1.1 Evaluation of Floodplain Management Practices

Data Collection

Task 3a involved the collection and qualitative assessment of current floodplain management regulations within the region (i.e., floodplain ordinances, drainage design standards and other related policies). To begin this task, floodplain management regulations and related documents were collected via local entities’ websites, as well as through the Federal Emergency Management Agency (FEMA) and other online resources. Follow up outreach via email, phone call, and via a web-based stakeholders survey provided further regulatory documents and information. These documents are summarized in **Table 3-1** and described in further detail in the following sections. A summary of floodplain practices across the region is shown on **Map Exhibit 13** (“Floodplain Management”) and in **Appendix Table 3A**.

Table 3.1 Existing Floodplain Management Documents

Type of Regulation	Purpose of Document	Entities with Document
Land Use Regulations (Zoning and Subdivision Ordinances)	Regulate types of land use and development in a community and can limit development in and near flood prone areas	Counties of Andrews, Brewster, Ector, El Paso, Midland, Presidio, Reeves, Sutton, Val Verde
Comprehensive Plan / Unified Development Code (UDC)	Guides development within an area for land use and both structural and infrastructure development and retrofit	Culberson County; City of El Paso
Hazard Mitigation Plan	Guides prevention and response for hazards in a region including stormwater/flood-related hazards	Concho Valley Council of Governments; Counties of Brewster, Ector, El Paso, Hudspeth, Jeff Davis; Presidio, Rio Grande Border (includes Counties of Pecos, Reeves, and Terrell)
FEMA Flood Insurance Study (FIS)	FEMA's report on flood hazard data for floodplain management and flood insurance in communities participating in the NFIP; Includes list of flood protection measures	Counties of Brewster, Ector, El Paso, Midland, Sutton, Val Verde; Cities of Alpine, Balmorhea, El Paso, Sonora, Van Horn
Floodplain and Drainage Ordinances	Regulate development within floodplain and the impact new development has on floodplain	All NFIP participants (see “National Flood Insurance Program [NFIP]” discussion below)
Drainage Criteria Manual/Design Manual	Minimum standards for the design of stormwater infrastructure to not increasing flood risk and increase resiliency	City of El Paso, Val Verde County, TxDOT

Land Use Regulations

Development impacts floodplains and flood storage. Local and regional land use plans often provide information regarding a community’s forecasted growth or land use regulations. In Region 14, with the exception of the City of El Paso, significant urban development is not expected, so most of the region’s local and regional governments do not have future land use estimates.

In Texas, cities have planning and zoning powers, while counties have the right to review and regulate the subdivision of land, as granted in *Section 232 of the Texas Local Government Code*. This requirement allows counties to review plats prior to development. Given the limitations of land use regulation that counties in Texas face, land use regulations like zoning and subdivision ordinances are used to influence land use and development.

Hazard Mitigation Planning

Hazard Mitigation Plans (HMPs) are developed to guide actions at the county or regional level to reduce potential hazard impacts and improve emergency response. These planning documents often address risks related to stormwater and flooding and consider characteristics such as land use, resilience, climate adaptation, and economic development plans.

The Rio Grande Council of Governments (RGCOG), representing Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, and Presidio Counties, has led coordination with many of these counties to develop HMPs. Several plans have been completed recently and are awaiting FEMA's approval, including for Brewster County, Jeff Davis County, and Presidio County. In addition, a HMP for Hudspeth County has been approved by FEMA and is waiting for local adoption.

In addition, the County of El Paso prepared a multi-jurisdictional hazard mitigation plan, which has been approved by FEMA and incorporated by participating jurisdictions. This plan was approved on August 16, 2021, and will expire in five years.

Flood Insurance Studies (FIS)/National Flood Insurance Program (NFIP)

FEMA Flood Insurance Studies (FIS) provide an overview of flood risk information for communities as part of the National Flood Insurance Program (NFIP). The NFIP is a program created by the US Congress in 1968 through the National Flood Insurance Act of 1968 and is managed and administrated by FEMA. The NFIP has two purposes: to share the risk of flood losses through flood insurance and to reduce flood damages by restricting floodplain development. NFIP participation is voluntary; however, it allows for discounted flood insurance premiums, eligibility for federal grants and loans, and federal disaster assistance.

All county and incorporated entities in the region are encouraged to enact ordinances that meet minimum requirements for NFIP Participation and remain active NFIP participants in good standing. While incorporated entities (cities/towns/villages) are independently eligible to participate in the NFIP, the participation of unincorporated communities is determined by the participation status of their associated county.

In the Upper Rio Grande Region, 75% of all eligible communities participate in the NFIP (40 out of 53), including 78% of counties (18 out of 23 counties representing 31 unincorporated communities) and 73% of incorporated places (22 out of 30). Communities not participating in the NFIP include seven incorporated places and five counties (including Coyanosa CDP, Imperial CDP, and Sheffield CDP in Pecos County and Lindsay CDP in Reeves County) as listed in **Table 3.2**.

Table 3.2 Communities Not Participating in the NFIP

Incorporated Places (Cities/Towns/Villages)	Counties
Barstow, City of	Andrews County
Kermit, City of	Edwards County
Rankin, City of	Reeves County
Thorntonville, City of	Pecos County
Valentine, Town of	Winkler County
Wickett, City of	
Wink, City of	

For communities to participate in the NFIP program, they must meet requirements based off their flood map zoning designation. NFIP food map zones are based on available mapping data from FEMA. The majority of the Upper Rio Grande Region is in a FEMA Zone A Special Flood Hazard Area. Zone A flood zones are subject to inundation by the 1% annual chance flood event as generally determined using approximate mapping methods. These areas do not have detailed hydraulic analyses and are without defined Base Flood Elevations (BFEs) and flood depths. As an exception to this, the City of El Paso and El Paso County do have detailed hydraulic analyses and include 1% annual chance Zone AE flood zones (with defined BFEs and flood depths) in addition to Zone A (approximate mapped areas) and Zone X (shaded) (for areas between the limits of Zone AE and the 0.2% annual chance event).

All communities in the region which do not participate in the NFIP are located either in a Zone A FEMA flood hazard area or are unmapped. The following NFIP criteria for Zone A and unmapped areas are taken from 44 CFR § 60.3 (“Floodplain management criteria for flood-prone areas”).

No FEMA-Defined Flood Zone

- Development permits and proposals
    - Require development permits for all proposed construction to determine location relative to flood-prone areas
    - Review proposed development for all necessary permits
    - Review permit applications for flooding safety
    - Review subdivision/development proposals for flooding safety

- Flood resiliency for water supply and sanitary sewage systems
    - Require flood resiliency measures for new and replacement water supply systems within flood prone areas
    - Require flood resiliency measures for new and replacement sanitary sewage systems (including locating onsite waste disposal systems to avoid impairment or contamination during flooding)

FEMA Flood Zone A (no defined flood elevations)

- Require all standards from previous plus those applied to Zone A hazard areas (cumulative)

- Development permits and proposals
    - Require floodplain development permits for all proposed construction to determine location relative to Zone A hazard areas
    - Require all subdivision/development proposals greater than 50 lots (or 5 acres) include base flood elevation (BFE) data

- Base Flood Elevations (BFE) and lowest floor elevations
    - Obtain, review, and utilize BFE and floodway data available from a Federal, State, or other source
    - Where BFE data are utilized within Zone A (1) obtain elevations of structure lowest floor elevation (including basement), (2) obtain structure floodproofing information, (3) and maintain records of obtained information

- Watercourse alteration or relocation
  - Notify communities adjacent to a riverine area prior to any alteration or relocation of a watercourse
  - Assure that the flood carrying capacity within the altered or relocated watercourse is maintained

- Manufactured homes
  - Require that manufactured homes in Zone A shall be installed using methods which minimize flood damage

In addition to the baseline flood protection required for NFIP participation, FEMA rewards NFIP communities that take advanced measures for flood resilience with better insurance premiums. Advanced resiliency measures are characterized by TFMA's Higher Standards and measured by voluntary participation in the Community Rating System (CRS).

TFMA Higher Standards

The Texas Floodplain Management Association (TFMA) periodically publishes a survey of Higher Standards to document higher floodplain management standards adopted by Texas cities and counties. The survey collects information on various floodplain management practices adopted by communities such as freeboard requirements, stormwater storage, elevation requirements, land use controls, playa lake standards, and setbacks for development.

The City of El Paso is currently the only entity in the region with higher standards recognized by the 2018 TFMA Higher Standards Survey. Floodplain management standards for the City of El Paso vary depending on structure type, regulatory flood zone, and whether a Base Flood Elevation (BFE) has been established. Those standards can be found in Section 15 of Study ID: 92, the City of El Paso Drainage Design Manual (City of El Paso Engineering Department, 2008).

The Community Rating System (CRS)

The CRS is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP. The three goals of the CRS are to 1) reduce and avoid flood damage to insurable property.; 2) strengthen and support the insurance aspects of the NFIP; and 3) foster comprehensive floodplain management. The rating system awards points to communities for flood resiliency activities and assigns a CRS class based on the accumulated points where 10 is the lowest score and 1 is the highest score or most activities performed.

The four CRS activity categories are:

- Public Information Activities – programs that advise people about flood hazard & insurance;
- Mapping and Regulations – programs that provide increased protection to new development;
- Flood Damage Reduction Activities – programs that provide increased protection to existing development; and
- Warning and Response – measures that protect life and property during a flood.

The City of El Paso is currently the only entity in the region enrolled in the CRS Program (earning an entry-level rating of 9).[1] Applications for CRS participation have also been submitted by El Paso County and City of Sonora and are under review with an expected rating date by the end of 2022.

3.1.2 Recommendations for Minimum Standards

The Upper Rio Grande RFPG is required to consider whether to recommend or adopt region-wide minimum floodplain management standards and land use practices. *Recommending* minimum practices by the RFPG encourages entities to adopt similar floodplain management practices within their communities. On the other hand, a*dopting* minimum practices by the RFPG requires potential sponsoring entities to adopt these minimum standards before their flood needs (FMEs, FMSs, and FMPs) may be considered for inclusion in the RFP and be eligible for potential state funding.

During the course of this first planning cycle of the 2023 Region/2024 State Flood Plan, the **Upper Rio Grande RFPG voted to recommend but not adopt** the following minimum standards for the region. <u>In future planning cycles, the RFPG may reconsider whether to adopt these recommendations as minimum standards requirements.</u>

- Participate (and maintain active status) in the National Flood Insurance Program (NFIP).
- Require development permits for all proposed construction to determine whether such construction is proposed within flood-prone areas and will be reasonably safe from flooding (44 CFR § 60.3a[1-4]).
- Require new and replacement sanitary sewage and water supply systems within flood prone areas to be designed to minimize or eliminate infiltration of flood waters into the systems (44 CFR § 60.3a[1-5]).
- Require additional minimum standards for flood-prone areas associated with designated special flood hazard areas (Zone A and AE) (44 CFR § 60.3b-d).
- Require additional minimum standards associated with mudslide- (i.e., mudflow) prone areas (44 CFR § 60.4).
- Require additional minimum standards associated with flood-related erosion-prone areas (44 CFR § 60.5).

These minimum standards recommendations were approved by the Upper Rio Grande RFPG during the General Meeting on November 30, 2021.

3.1.3 Recommendations for Floodplain Management Best Practices

In addition to the recommendations for minimum standards described above, the Upper Rio Grande RFPG considered other region-specific general recommendations. These recommendations include floodplain management best practices, such as adopting higher-than-minimum floodplain standards and participating in the FEMA CRS Program. Implementing these best practices will not only increase flood protection and resiliency in communities, but also provide direct economic benefit through improved insurance coverage during national disasters, discounts on flood insurance through the CRS Program, and increased eligibility for other

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[1] CRS Rating classes range from 9 to 1 where CRS Class 1 is the highest possible classification. Most communities enter the program at a CRS Class 9 or Class 8 rating.

financial resources available in the form of disaster recovery and flood infrastructure planning grants and loans.

The following general recommendations were recommended by the RFPG during the first planning cycle. While these general recommendations are strongly encouraged, the RFPG does not anticipate adopting them as minimum standards in future planning cycles at this time.

- Establish local flood outreach and awareness programs (addressing flood risk, resiliency, and mitigation), including providing access to FEMA informational resources.
- Coordinate with TxDOT and NWS to use flood warning signs, traffic message boards, and other media (TV, radio, social media) to communicate flood warnings.
- Conduct public outreach to identify ongoing flood needs (data gaps, flood management strategies, and flood mitigation projects).
- Develop and maintain local stormwater asset management plans.
- Adopt higher-than-NFIP-minimum standards (e.g., higher freeboard) and participate in the TFMA Higher Standards Survey.
- Enroll in CRS Program for reduction in flood insurance premiums and flood risk.
- Consider and incorporate nature-based practices in flood mitigation projects where possible.

3.2 Flood Mitigation and Floodplain Management Goals

The Upper Rio Grande RFPG is required to adopt both Short-Term (10-year) and Long-Term (30-year) flood mitigation and floodplain management goals. These goals help to establish the RFPG's objectives and priorities for the first-cycle flood plan. With input from the Upper Rio Grande RFPG discussed during Subcommittee 1 meetings, 28 individual goals were identified with the following objectives:

- Improve floodplain management practices and design standards (Goals 14001001, 14001002, 14002001, 14002002, 14002003, and 14003001).
- Increase flood protection of unaccredited levees (Goals 14004001 and 14004002).
- Increase availability of flood gages (Goal 14005001).
- Improve region-wide flood warning and communication (Goals 14006001 and 14006002).
- Increase community flood awareness and Flood Plan participation (Goals 14007001, 14007002, and 14007003).
- Improve coverage of flood hazard data through flood mapping (Goals 14008001 and 14008002).
- Reduce flood risk to structures and low water crossings (Goals 14009001, 14009002, 14009003, 14009004, 14010001, and 14010002).
- Increase use of regional stormwater detention (Goal 14011001).
- Increase use of nature-based practices (Goal 14012001).
- Increase use of dual-use flood mitigation/water supply structures (Goal 14013001).
- Increase communities with stormwater asset management plans (Goal 14014001).
- Increase communities with new and/or dedicated flood funding sources (Goals 14015001 and 14015002).

For each of the identified goals, the RFPG defined the goal term (short-term or long-term), target year (2033 for short-term goals or 2053 for long-term goals), goal application area (region-wide or specific HUC-8 watersheds), and method of measuring future progress against the goal. Additionally, AECOM identified residual risk, associated goal identification numbers, and consistency with overarching goals from the Guiding Principles outlined in TAC Chapter 362. A list of the 28 Short-Term and Long-Term goals is presented in **Appendix Table 3B.**

These goals were first adopted by the Upper Rio Grande RFPG during a General Meeting on November 30, 2021. A second revision to the goals was later adopted by the RFPG on May 25, 2022, including updates to the goals related to increasing the flood protection of unaccredited levees (Goals 14004001 and 14004002).

Appendix 3A
Existing Floodplain Management Practices

Appendix Table 3A: Existing Floodplain Management Practices Summary Table

Entity	Floodplain Management Regulations (Yes/No/Unknown)	Adopted minimum regulations pursuant to Texas Water Code Section 16.3145? (Yes/No)	NFIP Participant (Yes/No)	Higher Standards Adopted (Yes/No)
Alpine city	Yes	Yes	Yes	No
Andrews County	Yes	No	No	No
Anthony town	Yes	Yes	Yes	No
Balmorhea city	Yes	Yes	Yes	No
Barstow city	Unknown	No	No	No
Brewster County	Yes	Yes	Yes	No
Clint town	Yes	Yes	Yes	No
Crane city	Yes	Yes	Yes	No
Crane County	Yes	Yes	Yes	No
Crockett County	Yes	Yes	Yes	No
Culberson County	Yes	Yes	Yes	No
Dell City	Yes	Yes	Yes	No
Ector County	Yes	Yes	Yes	No
Edwards County	Yes	No	No	No
El Paso city	Yes	Yes	Yes	Yes
El Paso County	Yes	Yes	Yes	No
Fort Stockton city	Yes	Yes	Yes	No
Grandfalls town	Yes	Yes	Yes	No
Horizon City	Yes	Yes	Yes	No
Hudspeth County	Yes	Yes	Yes	No
Iraan city	Yes	Yes	Yes	No
Jeff Davis County	Yes	Yes	Yes	No
Kermit city	Unknown	No	No	No
Loving County	Yes	Yes	Yes	No
Marfa city	Yes	Yes	Yes	No
McCamey city	Yes	Yes	Yes	No
Midland County	Yes	Yes	Yes	No
Monahans city	Yes	Yes	Yes	No
Pecos city	Yes	Yes	Yes	No
Pecos County	Unknown	No	No	No
Presidio city	Yes	Yes	Yes	No
Presidio County	Yes	Yes	Yes	No

Entity	Floodplain Management Regulations (Yes/No/Unknown)	Adopted minimum regulations pursuant to Texas Water Code Section 16.3145? (Yes/No)	NFIP Participant (Yes/No)	Higher Standards Adopted (Yes/No)
Pyote town	No	No	No	No
Rankin city	Unknown	No	No	No
Reagan County	Yes	Yes	Yes	No
Reeves County	Yes	No	No	No
San Elizario city	Yes	Yes	Yes	No
Schleicher County	Yes	Yes	Yes	No
Socorro city	Yes	Yes	Yes	No
Sonora city	Yes	Yes	Yes	No
Sutton County	Yes	Yes	Yes	No
Terrell County	Yes	Yes	Yes	No
Thorntonville town	Unknown	No	No	No
Toyah town	Yes	Yes	Yes	No
Upton County	Yes	Yes	Yes	No
Val Verde County	Yes	Yes	Yes	No
Valentine town	Unknown	No	No	No
Van Horn town	Yes	Yes	Yes	No
Vinton village	Yes	Yes	Yes	No
Ward County	Yes	Yes	Yes	No
Wickett town	Unknown	No	No	No
Wink city	Unknown	No	No	No
Winkler County	Unknown	No	No	No

Appendix 3B
Regional Flood Plan Flood Mitigation and Floodplain Management Goals

Appendix Table 3B: Regional Flood Plan Flood Mitigation and Floodplain Management Goals

Goal ID	Goal	Term of Goal	Target Year	Applicable To	Residual Risk	How Will the Goal Be Measured	Overarching Goal	Associated Goal IDs
14001001	Increase NFIP participation or adoption of equivalent standards with 90% of communities meeting qualifying standards	Short Term (10-year)	2033	Entire RFPG	Improved floodplain management practices limit flood risk increases to existing structures; annual flood risk to new construction in participating communities will be less than 1%	Number of entities participating in NFIP; number of entities with equivalent standards	Adoption of floodplain management practices to reduce future flood risk (362.3.b.6)	14001002
14001002	Enroll all current non-participating communities into the NFIP and maintain 100% community enrollment with no suspensions or sanctions	Long Term (30-year)	2053	Entire RFPG	Improved floodplain management practices limit flood risk increases to existing structures; annual flood risk to new construction will be less than 1%	Number of entities participating in NFIP; number of entities with equivalent standards	Adoption of floodplain management practices to reduce future flood risk (362.3.b.6)	14001001
14002001	Increase number of communities that have adopted higher-than-NFIP-minimum standards	Short Term (10-year)	2033	Entire RFPG	Adopting higher floodplain management standards may help to reduce flood risk to existing and new structures; residual flood risk to structures will remain for flood events with less than 1% annual occurrence	Number of communities that have adopted higher-than-NFIP-minimum standards	Adoption of floodplain management practices to reduce future flood risk (362.3.b.6)	14002002, 14002003
14002002	Increase number of communities enrolled in CRS Program	Short Term (10-year)	2033	Entire RFPG	Enrolling in the CRS Program may help to increase community flood awareness and reduce flood risk to existing and new structures; residual flood risk to structures will remain for flood events with less than 1% annual occurrence	Number of communities that have enrolled in CRS Program	Adoption of floodplain management practices to reduce future flood risk (362.3.b.6)	14002001, 14002003

Goal ID	Goal	Term of Goal	Target Year	Applicable To	Residual Risk	How Will the Goal Be Measured	Overarching Goal	Associated Goal IDs
14002003	Improve CRS rating for the City of El Paso (which has a current CRS Rating of 9)	Short Term (10-year)	2033	HUC 8 Watersheds 13040100, 13030102	Improving CRS Rating will help to increase community flood awareness and reduce flood risk to existing and new structures; residual flood risk to structures will remain for flood events with less than 1% annual occurrence	Improvement in City of El Paso CRS Rating	Adoption of floodplain management practices to reduce future flood risk (362.3.b.6)	14002002, 14002003
14003001	Adopt recommended minimum stormwater infrastructure design standards applicable across the region	Short Term (10-year)	2033	Entire RFPG	Region-wide recommended minimum design standards would serve as a guide for communities to implement; residual flood risk will remain for flood events not typically covered in design standards or for communities that do not adopt	Development of recommended minimum stormwater infrastructure design standards	Adoption of floodplain management practices to reduce future flood risk (362.3.b.6)	n/a
14004001	Increase flood protection of unaccredited levees in El Paso County watersheds to meet FEMA levee accreditation requirements and update flood mapping to account for any changes in levee accreditation status	Short Term (10-year)	2033	HUC 8 Watersheds 13040100, 13030102	Residual flood risk will remain for flood events exceeding the design capacity of the accredited levees or for areas where levees remain unaccredited	Accreditation of current unaccredited levees by FEMA followed by associated risk map updates	Protect against loss of life and property (362.3.b.13-14)	14004002

Goal ID	Goal	Term of Goal	Target Year	Applicable To	Residual Risk	How Will the Goal Be Measured	Overarching Goal	Associated Goal IDs
14004002	Increase flood protection of unaccredited levees in the region outside of El Paso County watersheds to meet FEMA levee accreditation requirements and update flood mapping to account for any changes in levee accreditation status	Long Term (30-year)	2053	Entire RFPG Except for HUC 8 Watersheds 13040100, 13030102	Residual flood risk will remain for flood events exceeding the design capacity of the accredited levees or for areas where levees remain unaccredited	Accreditation of current unaccredited levees by FEMA followed by associated risk map updates	Protect against loss of life and property (362.3.b.13-14)	14004001
14005001	Increase the number of flood gages (rainfall and/or stream gages) in the region	Short Term (10-year)	2033	Entire RFPG	No changes in flood risk; additional flood gages would improve ability to validate or calibrate existing and new flood models	Number of rainfall and/or stream gages installed	Utilize best available science, data, models, and flood risk mapping (362.3.b.2)	n/a
14006001	Develop and implement region-wide flood warning and emergency response program	Short Term (10-year)	2033	Entire RFPG	No physical changes in flood risk; a flood warning and emergency response program would provide advanced warning of flood risks to mitigate loss of life and property during a flood event	Implementation of regional flood warning system	Protect against loss of life and property (362.3.b.13-14)	14006002
14006002	Increase the number of entities that use flood warning signs, traffic message boards, and other media (TV, radio, social media) to communicate flood warnings	Short Term (10-year)	2033	Entire RFPG	No physical changes in flood risk; improved flood warning messaging services would provide critical information to communities to mitigate loss of life and property during a flood event	Number of entities using flood warning signs, traffic message boards, and other media to communicate flood warnings	Protect against loss of life and property (362.3.b.13-14)	14006001

Goal ID	Goal	Term of Goal	Target Year	Applicable To	Residual Risk	How Will the Goal Be Measured	Overarching Goal	Associated Goal IDs
14007001	Establish community-led flood outreach and awareness programs (addressing risk, resiliency, and mitigation) in 30% of communities in the region	Short Term (10-year)	2033	Entire RFPG	Flood risk for communities without flood outreach and awareness programs will be greater than in communities with these programs; in addition, outreach programs will only reach a portion of community members	Percentage of communities with community-led flood outreach and awareness programs	Enhanced public understanding of flood risk; equity and accountability in decision-making (362.3.b.3, 20-21, 26)	14007002, 14007003
14007002	Establish community-led flood outreach and awareness programs (addressing risk, resiliency, and mitigation) in 90% of communities in the region	Long Term (30-year)	2053	Entire RFPG	Flood risk for communities without flood outreach and awareness programs will be greater than in communities with these programs; in addition, outreach programs will only reach a portion of community members	Percentage of communities with community-led flood outreach and awareness programs	Enhanced public understanding of flood risk; equity and accountability in decision-making (362.3.b.3, 20-21, 26)	14007001, 14007003
14007003	Increase entity and public stakeholder participation in the regional flood planning process	Short Term (10-year)	2033	Entire RFPG	No direct change in short-term flood risk; increased stakeholder participation will lead to more comprehensive future regional flood plans and indirect flood risk reduction in the long-term	Number of entities and public stakeholders contributing to future-cycle RFPs	Cooperative planning with local, state, and federal partners (362.3.b.29)	14007002, 14007003
14008001	Increase the coverage of flood hazard data across the region by completing studies in 40% of the areas identified as having current gaps in flood mapping in the first cycle Flood Plan	Short Term (10-year)	2033	Entire RFPG	No physical change in flood risk; completing FMEs will help to better identify flood risk, exposure, and vulnerabilities to life and property	Percentage of FMEs completed from the first-cycle RFP	Evaluate flood risk, exposure, and vulnerabilities to life and property (362.3.b.3-5)	14008002

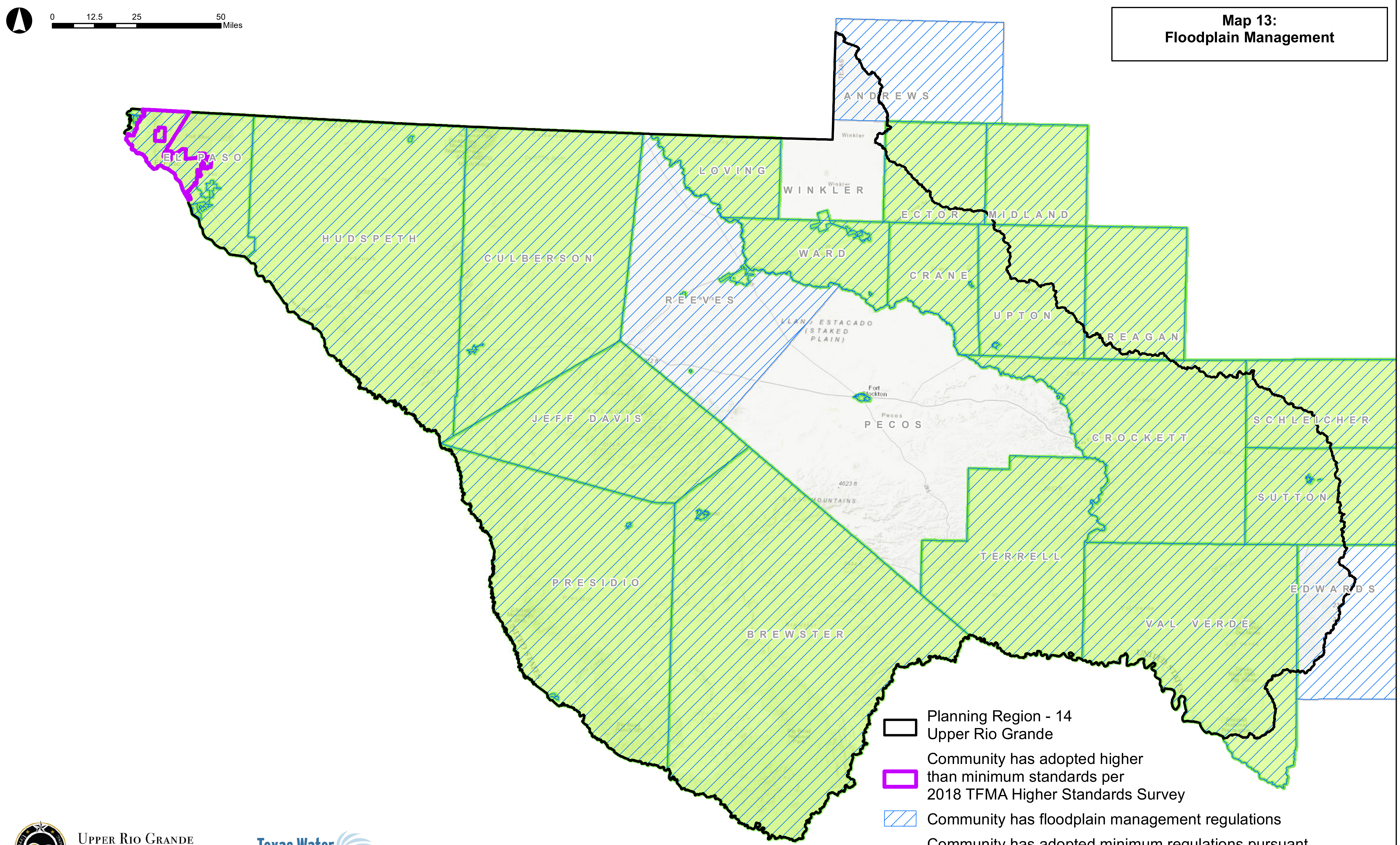
Goal ID	Goal	Term of Goal	Target Year	Applicable To	Residual Risk	How Will the Goal Be Measured	Overarching Goal	Associated Goal IDs
14008002	Have complete coverage of flood hazard data across the region by completing studies in 100% of the areas identified as having current gaps in flood mapping in the first cycle Flood Plan and have an ongoing, funded maintenance plan for updates	Long Term (30-year)	2053	Entire RFPG	No physical change in flood risk; completing FMEs will help to better identify flood risk, exposure, and vulnerabilities to life and property	Percentage of FMEs completed from the first-cycle RFP	Evaluate flood risk, exposure, and vulnerabilities to life and property (362.3.b.3-5)	14008001
14009001	Remove 10% of the existing structures in El Paso County watersheds from 1% annual chance floodplain in the region (either by remapping or flood risk reduction)	Short Term (10-year)	2033	HUC 8 Watersheds 13040100, 13030102	90% of identified structures will have an annual risk of flooding of >1%; 10% of structures will have an annual risk of flooding of <1%	Number of structures removed from 1% annual chance existing flood hazard layer	Protect against loss of life and property (362.3.b.13-14)	14009002, 14009003, 14009004
14009002	Remove 25% of the existing structures outside of El Paso County watersheds from 1% annual chance floodplain in the region (either by remapping or flood risk reduction)	Short Term (10-year)	2033	Entire RFPG Except for HUC 8 Watersheds 13040100, 13030102	75% of identified structures will have an annual risk of flooding of >1%; 25% of structures will have an annual risk of flooding of <1%	Number of structures removed from 1% annual chance existing flood hazard layer	Protect against loss of life and property (362.3.b.13-14)	14009001, 14009003, 14009004
14009003	Remove 20% of the existing structures in El Paso County watersheds from 1% annual chance floodplain in the region (either by remapping or flood risk reduction)	Long Term (30-year)	2053	HUC 8 Watersheds 13040100, 13030102	80% of identified structures will have an annual risk of flooding of >1%; 20% of structures will have an annual risk of flooding of <1%	Number of structures removed from 1% annual chance existing flood hazard layer	Protect against loss of life and property (362.3.b.13-14)	14009001, 14009002, 14009004

Goal ID	Goal	Term of Goal	Target Year	Applicable To	Residual Risk	How Will the Goal Be Measured	Overarching Goal	Associated Goal IDs
14009004	Remove 50% of the existing structures outside of El Paso County watersheds from 1% annual chance floodplain in the region (either by remapping or flood risk reduction)	Long Term (30-year)	2053	Entire RFPG Except for HUC 8 Watersheds 13040100, 13030102	50% of identified structures will have an annual risk of flooding of >1%; 50% of structures will have an annual risk of flooding of <1%	Number of structures removed from 1% annual chance existing flood hazard layer	Protect against loss of life and property (362.3.b.13-14)	14009001, 14009002, 14009003
14010001	Remove 40% of the low water crossings from 10% annual chance floodplain in the region (either by remapping or flood risk reduction)	Short Term (10-year)	2033	Entire RFPG	60% of identified low water crossings will have an annual risk of flooding of >10%; 40% of low water crossings will have an annual risk of flooding of <10%	Number of low water crossings removed from 10% annual chance existing flood hazard layer	Protect against loss of life and property (362.3.b.13-14)	14010002
14010002	Remove 90% of the low water crossings from 10% annual chance floodplain in the region (either by remapping or flood risk reduction)	Long Term (30-year)	2053	Entire RFPG	10% of identified low water crossings will have an annual risk of flooding of >10%; 90% of low water crossings will have an annual risk of flooding of <10%	Number of low water crossings removed from 10% annual chance existing flood hazard layer	Protect against loss of life and property (362.3.b.13-14)	14010001
14011001	Increase the number of entities that utilize regional detention for floodplain management	Short Term (10-year)	2033	Entire RFPG	No change in flood risk for communities that do not utilize regional detention; regional detention does not fully remove flood risk but mitigates flooding for a specified area and design flood event	Number of entities utilizing regional detention	Protect against loss of life and property (362.3.b.13-14)	n/a
14012001	Consider and incorporate nature-based practices in flood risk reduction projects	Short Term (10-year)	2033	Entire RFPG	No additional change in flood risk relative to other project types; nature-based solutions will reduce impacts to the environment	Number of flood risk reduction projects with nature-based components	Include strategies and projects that use nature-based features (362.3.b.17)	n/a

Goal ID	Goal	Term of Goal	Target Year	Applicable To	Residual Risk	How Will the Goal Be Measured	Overarching Goal	Associated Goal IDs
14013001	Establish dual usage regional storage facilities for flood mitigation and water supply	Short Term (10-year)	2033	Entire RFPG	No changes in flood risk; dual-use projects will contribute to the water supply	Establishment of new dual-use flood mitigation/water supply structures	Contribute to the water supply where possible (362.3.b.18-19)	n/a
14014001	Increase the number of communities with documented, operational, and fully funded stormwater asset management plans	Short Term (10-year)	2033	Entire RFPG	Entities without stormwater asset management plans have no change in flood risk; entities with new stormwater asset management plans have reduced risk due to better stormwater O&M practices	Number of new entities with stormwater asset management plans	Consideration of funding and long-term operation and maintenance (362.3.b.38)	n/a
14015001	Increase number of new funding sources used to pay for implementation of flood management activities and decrease number of communities without a local funding source	Short Term (10-year)	2033	Entire RFPG	Entities without additional funding have no change in flood risk; entities with new funding sources have reduced flood risk as stormwater O&M and capital projects are funded and implemented	Number of entities with new funding sources for implementation of flood management activities	Consideration of funding and long-term operation and maintenance (362.3.b.38)	14015002
14015002	Increase the number of entities that have a dedicated drainage fee to help implement future Flood Mitigation Evaluations (FMEs) and Flood Mitigation Projects (FMPs)	Short Term (10-year)	2033	Entire RFPG	Entities without dedicated drainage fee have no change in flood risk; entities with dedicated drainage fee have reduced flood risk as stormwater O&M and capital projects are funded and implemented	Number of new entities with dedicated drainage fee for implementation of flood management activities	Consideration of funding and long-term operation and maintenance (362.3.b.38)	14015001

Appendix 3C
Map Exhibits

Map 13:
Floodplain Management



☐ Planning Region - 14
Upper Rio Grande

☐ Community has adopted higher than minimum standards per 2018 TFMA Higher Standards Survey

▨ Community has floodplain management regulations

🟩 Community has adopted minimum regulations pursuant to Texas Water Code § 16.3145 and is an NFIP participant

Upper Rio Grande Flood Planning

Texas Water Development Board

AECOM

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Chapter 4: Identification of Flood Mitigation Needs and Solutions

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4. Identification of Flood Mitigation Needs and Solutions

4.1 Flood Mitigation Needs Analysis

Based on the flood risk analyses described previously in *Chapter 2 (Flood Risk Analyses)* and the Regional Flood Planning Group (RFPG) goals identified in *Chapter 3 (Floodplain Management Practices and Goals)*, a needs analysis was performed to identify locations within the region which have the greatest flood mitigation and flood risk study needs.

Flood mitigation needs were identified based on a quantitative comparison of the Task 2 exposure results at the county and subcounty level as well as a qualitative consideration of the following factors outlined in the Task 4 Scope of Work (SOW):

a. The areas in the Flood Planning Region (FPR) that the RFPG identified as the most prone to flooding that threaten life and property;
b. The relative locations, extent, and performance of current floodplain management and land use policies and infrastructure located within the FPR, particularly within the locations described in (a);
c. Areas identified by the RFPG as prone to flooding that do not have adequate inundation maps;
d. Areas identified by the RFPG as prone to flooding that do not have hydrologic and hydraulic (H&H) models;
e. Areas with an emergency need;
f. Existing modeling analyses and flood risk mitigation plans within the FPR;
g. Flood mitigation projects already identified and evaluated by other flood mitigation plans and studies;
h. Documentation of historic flooding events;
i. Flood mitigation projects already being implemented; and
j. Other factors that the RFPG deemed relevant, such as flood projects with nature-based solutions and equal representation throughout the region.

The quantitative needs analysis included an evaluation of: (1) the greatest gaps in flood risk information; and (2) the areas with the greatest flood risk, as described in Sections 4.1.1 through 4.1.3. The qualitative needs analysis was conducted over several stakeholder workshop meetings, described as part of the flood solutions identification process overview in Section 4.2. Both quantitative and qualitative needs analyses were utilized to identify Flood Management Evaluations (FMEs), Flood Mitigation Projects (FMPs), and Flood Management Strategies (FMSs) across the region as described later in this chapter in Sections 4.3 through 4.5.

4.1.1 Greatest Gaps in Flood Risk Information by County

Flood risk information gaps are areas that do not have sufficient flood risk data to estimate flood risks or to identify or compare project alternatives to mitigate the associated flood risks. These gaps may include areas that have limited or no Federal Emergency Management Agency (FEMA) regulatory flood mapping data as well as areas that have flood data lacking sufficient quality, such as outdated information or data with inadequate resolution. Summaries of the region's existing conditions and future conditions flood risk data gaps are presented in Chapter 2 Section 2.2.2 and Section 2.3.5, respectively.

To identify the greatest flood risk information gaps, counties were ranked based on the results of the existing conditions 1% annual chance (AC) flood exposure analysis from Chapter 2, accounting for the following flood hazard exposure estimate categories:

- Number of residential and non-residential properties and associated population;
- Number of roadway crossings;
- Length of roadway segments;
- Agricultural area;
- Number of critical facilities; and
- Average Social Vulnerability Index (SVI) of buildings in the floodplain.

The results of this county ranking analysis are presented in **Table 4.1**. Comparing these county ranks with the flood risk information gaps identified in Chapter 2, counties with the greatest flood risk data gaps were identified if they ranked among the top 10 (roughly equivalent to the top 40%) of all counties in the region for any of the flood exposure categories. These greatest flood risk data gaps are presented in **Map Exhibit 14** (Greatest Gaps in Flood Risk Information).

Based on this analysis, the greatest gaps in terms of areas with limited or no FEMA regulatory flood mapping data include the counties of Reeves, Winkler, Pecos, Andrews, Upton, and Crane (in ranked order).

Similarly, the greatest gaps in terms of areas with outdated FEMA regulatory flood mapping data include the counties of Brewster, Ward, Presidio, Crockett, Sutton, Hudspeth, Culberson, Jeff Davis, and Terrell (in ranked order).[1]

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[1] Although Midland County was ranked among the top 10 counties for greatest flood risk data gaps based on "Average SVI of Buildings in the Floodplain", it was excluded from the final ranked list since there is only a small portion of the county which overlaps the Upper Rio Grande region.

Table 4.1 Greatest Flood Data Gaps by County (Exposure to 1% AC Flood Risk)

County Rank	County	Number of Structures in Floodplain	County	Residential Structures in Floodplain	County	Population	County	Roadway Stream Crossings (#)	County	Roadway Segments (miles)	County	Agricultural Areas (sq. mi.)	County	Critical Facilities (#)	County	Average SVI of Features in Floodplain or Flood-Prone Areas
1	El Paso	21,377	El Paso	16,860	El Paso	70,260	El Paso	457	El Paso	458	Hudspeth	246	El Paso	37	Culberson	0.935
2	**Reeves**	**3,535**	Brewster	1,615	**Reeves**	**10,707**	**Pecos**	**182**	**Reeves**	**337**	El Paso	61	**Reeves**	**10**	Hudspeth	0.932
3	Brewster	2,640	**Reeves**	**1,580**	Brewster	7,217	Presidio	101	Culberson	317	Jeff Davis	53	**Pecos**	**9**	Presidio	0.916
4	Ward	2,071	**Winkler**	**1,126**	Ward	4,189	Culberson	90	Hudspeth	288	**Pecos**	**47**	Crockett	8	El Paso	0.665
5	**Winkler**	**1,680**	Presidio	696	**Winkler**	**3,675**	Brewster	81	**Pecos**	**284**	Presidio	45	Brewster	7	Midland	0.664
6	Presidio	1,353	Crockett	680	**Pecos**	**3,424**	Crockett	80	Brewster	210	Brewster	43	Sutton	5	Sutton	0.651
7	Crockett	1,292	Sutton	492	Presidio	2,973	**Reeves**	**72**	Ward	196	Culberson	32	Ward	4	**Reeves**	**0.646**
8	**Pecos**	**1,040**	Ward	470	Crockett	2,392	Hudspeth	70	Crockett	187	Val Verde	22	**Winkler**	**4**	Crockett	0.607
9	Sutton	963	**Pecos**	**370**	Hudspeth	1,629	Jeff Davis	53	Val Verde	163	**Andrews**	**18**	**Upton**	**3**	Ector	0.593
10	Hudspeth	823	Ector	234	Sutton	1,562	Terrell	50	**Winkler**	**126**	**Reeves**	**18**	Hudspeth	2	**Crane**	**0.559**
11	Jeff Davis	660	Upton	185	Jeff Davis	1,431	Val Verde	38	Presidio	122	Crockett	7	Terrell	2	Reagan	0.558
12	Val Verde	577	Val Verde	147	Val Verde	1,393	Ward	30	Sutton	96	Loving	4	Crane	1	Winkler	0.555
13	Culberson	567	Terrell	146	Culberson	1,382	Schleicher	29	Jeff Davis	63	Schleicher	4	Jeff Davis	1	Val Verde	0.549
14	Terrell	391	Jeff Davis	135	Terrell	945	Upton	21	Terrell	51	Ward	4	Loving	1	Upton	0.539
15	Ector	340	Culberson	115	Ector	606	Edwards	11	Crane	41	Crane	3	Andrews	0	Schleicher	0.534
16	Upton	331	Hudspeth	44	Upton	599	Crane	7	Upton	28	Terrell	3	Culberson	0	Ward	0.531
17	Crane	277	Edwards	27	Crane	591	Loving	3	Ector	26	Winkler	3	Ector	0	Brewster	0.515
18	Loving	95	Schleicher	5	Loving	291	Reagan	1	Edwards	19	Sutton	2	Edwards	0	Loving	0.502
19	Edwards	58	Loving	2	Edwards	127	Winkler	1	Loving	17	Upton	1	Midland	0	Pecos	0.502
20	Schleicher	33	Midland	2	Schleicher	73	Andrews	0	Andrews	8	Ector	0	Presidio	0	Edwards	0.47
21	Andrews	9	Andrews	0	Andrews	41	Ector	0	Schleicher	5	Edwards	0	Reagan	0	Terrell	0.453
22	Midland	7	Crane	0	Midland	20	Midland	0	Midland	3	Reagan	0	Schleicher	0	Jeff Davis	0.408
23	Reagan	2	Reagan	0	Reagan	3	Sutton	0	Reagan	0	Midland	0	Val Verde	0	Andrews	0.234

Legend:

▨	Greatest Gaps in Flood Risk (limited or no FEMA flood mapping information)
░	Greatest Gaps in Flood Risk (old FEMA flood mapping information)

4.1.2 Greatest Flood Risk by County and Community

Areas of greatest flood risk were identified at the county level by ranking each county based on the results of the existing conditions 1% AC flood exposure analysis from Chapter 2 and using the same exposure estimate categories as described in Section 4.1.1. In the county analysis, counties with the greatest flood risks were identified if they ranked among the top 6 (roughly equivalent to the top 25%) of all counties in the region for any of the flood exposure categories. The results of this county ranking analysis are presented in **Table 4.2**. Based on this analysis, the greatest flood risks by county include the counties of El Paso, Reeves, Brewster, Ward, Winkler, Presidio, Crockett, Pecos, Culberson, Hudspeth, Jeff Davis, and Sutton (in ranked order).[2]

In addition to ranking flood risk by county, subcounty entities were ranked (including both incorporated and census designated places [CDPs]) according to the estimated number of structures in the floodplain within each community. The results of the community ranking analysis are presented in **Table 4.3**. Based on this analysis, the top 10 subcounty entities by flood risk to structures include the City of El Paso, the City of Socorro, the City of Pecos, the City of Alpine, Fort Bliss CDP, the City of Kermit, Ozona CDP, Southwest Sandhill CDP, the City of Sonora, and Canutillo CDP (in ranked order).

Using the results of the existing conditions 1% AC flood exposure analysis, a spatial density analysis was also performed across the region to identify potential flood risk "hot spots." The results of this density analysis, along with detailed flood hazard and building exposure maps for the top-risk subcounty entities, are presented in **Map Exhibit 15** (Greatest Flood Risk).

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[2] Although Midland County was ranked among the top 6 counties for greatest flood risks based on "Average SVI of Buildings in the Floodplain", it was excluded from the final ranked list since there is only a small portion of the county which overlaps the Upper Rio Grande region.

Table 4.2 Greatest Flood Risk by County

County Rank	County	Number of Structures in Floodplain	County	Residential Structures in Floodplain	County	Population	County	Roadway Stream Crossings (#)	County	Roadway Segments (miles)	County	Agricultural Areas (sq. mi.)	County	Critical Facilities (#)	County	Average SVI of Features in Floodplain or Flood-Prone Areas
1	**El Paso**	**21,377**	**El Paso**	**16,860**	**El Paso**	**70,260**	**El Paso**	**457**	**El Paso**	**458**	**Hudspeth**	**246**	**El Paso**	**37**	**Culberson**	**0.935**
2	**Reeves**	**3,535**	**Brewster**	**1,615**	**Reeves**	**10,707**	**Pecos**	**182**	**Reeves**	**337**	**El Paso**	**61**	**Reeves**	**10**	**Hudspeth**	**0.932**
3	**Brewster**	**2,640**	**Reeves**	**1,580**	**Brewster**	**7,217**	**Presidio**	**101**	**Culberson**	**317**	**Jeff Davis**	**53**	**Pecos**	**9**	**Presidio**	**0.916**
4	**Ward**	**2,071**	**Winkler**	**1,126**	**Ward**	**4,189**	**Culberson**	**90**	**Hudspeth**	**288**	**Pecos**	**47**	**Crockett**	**8**	**El Paso**	**0.665**
5	**Winkler**	**1,680**	**Presidio**	**696**	**Winkler**	**3,675**	**Brewster**	**81**	**Pecos**	**284**	**Presidio**	**45**	**Brewster**	**7**	**Midland**	**0.664**
6	**Presidio**	**1,353**	**Crockett**	**680**	**Pecos**	**3,424**	**Crockett**	**80**	**Brewster**	**210**	**Brewster**	**43**	**Sutton**	**5**	**Sutton**	**0.651**
7	Crockett	1,292	Sutton	492	Presidio	2,973	Reeves	72	Ward	196	Culberson	32	Ward	4	Reeves	0.646
8	Pecos	1,040	Ward	470	Crockett	2,392	Hudspeth	70	Crockett	187	Val Verde	22	Winkler	4	Crockett	0.607
9	Sutton	963	Pecos	370	Hudspeth	1,629	Jeff Davis	53	Val Verde	163	Andrews	18	Upton	3	Ector	0.593
10	Hudspeth	823	Ector	234	Sutton	1,562	Terrell	50	Winkler	126	Reeves	18	Hudspeth	2	Crane	0.559
11	Jeff Davis	660	Upton	185	Jeff Davis	1,431	Val Verde	38	Presidio	122	Crockett	7	Terrell	2	Reagan	0.558
12	Val Verde	577	Val Verde	147	Val Verde	1,393	Ward	30	Sutton	96	Loving	4	Crane	1	Winkler	0.555
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14	Terrell	391	Jeff Davis	135	Terrell	945	Upton	21	Terrell	51	Ward	4	Loving	1	Upton	0.539
15	Ector	340	Culberson	115	Ector	606	Edwards	11	Crane	41	Crane	3	Andrews	0	Schleicher	0.534
16	Upton	331	Hudspeth	44	Upton	599	Crane	7	Upton	28	Terrell	3	Culberson	0	Ward	0.531
17	Crane	277	Edwards	27	Crane	591	Loving	3	Ector	26	Winkler	3	Ector	0	Brewster	0.515
18	Loving	95	Schleicher	5	Loving	291	Reagan	1	Edwards	19	Sutton	2	Edwards	0	Loving	0.502
19	Edwards	58	Loving	2	Edwards	127	Winkler	1	Loving	17	Upton	1	Midland	0	Pecos	0.502
20	Schleicher	33	Midland	2	Schleicher	73	Andrews	0	Andrews	8	Ector	0	Presidio	0	Edwards	0.47
21	Andrews	9	Andrews	0	Andrews	41	Ector	0	Schleicher	5	Edwards	0	Reagan	0	Terrell	0.453
22	Midland	7	Crane	0	Midland	20	Midland	0	Midland	3	Reagan	0	Schleicher	0	Jeff Davis	0.408
23	Reagan	2	Reagan	0	Reagan	3	Sutton	0	Reagan	0	Midland	0	Val Verde	0	Andrews	0.234

Legend:

🟦 Greatest Flood Risk

Table 4.3 Estimated Number of Structures in Floodplain by Community

Rank	Community	County	Number of Structures in Floodplain within Community
1	El Paso city	El Paso	12,324
2	Socorro city	El Paso	2,578
3	Pecos city	Reeves	1,944
4	Alpine city	Brewster	1,643
5	Fort Bliss CDP	El Paso	1,145
6	Kermit city	Winkler	1,126
7	Ozona CDP	Crockett	944
8	Southwest Sandhill CDP	Ward	794
9	Sonora city	Sutton	690
10	Canutillo CDP	El Paso	676
11	Presidio city	Presidio	655
12	San Elizario city	El Paso	544
13	Monahans city	Ward	440
14	Balmorhea city	Reeves	361
15	Homestead Meadows North CDP	El Paso	359
16	Dell City city	Hudspeth	293
17	Imperial CDP	Pecos	272
18	Sanderson CDP	Terrell	258
19	Clint town	El Paso	249
20	Marfa city	Presidio	212
21	Fabens CDP	El Paso	200
22	Thorntonville town	Ward	195
23	Lindsay CDP	Reeves	189
24	McCamey city	Upton	172
25	Van Horn town	Culberson	170
26	Fort Stockton city	Pecos	168
27	Barstow city	Ward	149
28	Crane city	Crane	143
29	Fort Davis CDP	Jeff Davis	131
30	Prado Verde CDP	El Paso	112
31	Toyah town	Reeves	101

4.1.3 Summary of Flood Mitigation Needs

Combining the results of the quantitative needs analysis for the greatest flood risk data gaps and greatest flood risks, a summary of flood mitigation needs by county was developed as shown in **Table 4.4**. For reference, this table also includes the corresponding IDs to potential flood solutions for each county, including FMEs, FMPs, and FMSs, that were identified based on both quantitative and qualitative needs analyses. These flood solutions are described later in this Chapter in Sections 4.3 through 4.5 as well as in *Chapter 5 (Evaluation and Recommendation of Flood Solutions)*.

Table 4.4 Summary of Flood Mitigation Needs by County

County	Greatest Flood Risk Data Gap (Limited or No FEMA Flood Mapping Information)	Greatest Flood Risk Data Gap (Old FEMA Flood Mapping Information	Greatest Flood Risk	Top At Risk Communities by Estimated Number of Structures in Floodplain (from Table 4.3)	FMEs	FMPs	FMSs[a]
Andrews	✓	-	-	-	-	-	142000013
Brewster	-	✓	✓	Alpine city	141000023, 141000036	-	142000002, 142000013, 142000017, 142000022
Crane	✓	-	-	Crane city	-	-	142000007
Crockett	-	✓	✓	Ozona CDP	141000025	-	142000007
Culberson	-	✓	✓	Van Horn town	-	-	-[a]
Ector	-	-	-	-	-	-	-[a]
Edwards	-	-	-	-	-	-	142000013
El Paso	-	-	✓	El Paso city, Socorro city, Fort Bliss CDP, Canutillo CDP, San Elizario city, Homestead Meadows North CDP, Clint town, Fabens CDP, Prado Verde CDP	141000001, 141000003, 141000004, 141000005, 141000006, 141000015, 141000018, 141000019, 141000033, 141000034, 141000035	143000003, 143000005, 143000011, 143000021, 143000024, 143000025, 143000097, 143000100, 143000105, 143000111, 143000113, 143000116, 143000117, 143000118, 143000121, 143000122, 143000123	142000001, 142000004, 142000009, 142000010, 142000015, 142000017, 142000019, 142000020
Hudspeth	-	✓	✓	Dell City city	141000014, 141000022	143000009	142000003, 142000013, 142000017
Jeff Davis	-	✓	✓	Fort Davis CDP	-	-	-[a]
Loving	-	-	-	-	-	-	142000007
Midland	-	-	-	-	-	-	-[a]
Pecos	✓	-	✓	Imperial CDP, Fort Stockton city	141000012	-	142000007, 142000013, 142000024

County	Greatest Flood Risk Data Gap (Limited or No FEMA Flood Mapping Information)	Greatest Flood Risk Data Gap (Old FEMA Flood Mapping Information	Greatest Flood Risk	Top At Risk Communities by Estimated Number of Structures in Floodplain (from Table 4.3)	FMEs	FMPs	FMSs[a]
Presidio	-	✓	✓	Presidio city, Marfa city	141000002, 141000008, 143000120	143000007	142000005, 142000006, 142000008, 142000013, 142000017, 142000023, 142000025
Reagan	-	-	-	-	-	-	- [a]
Reeves	✓	-	✓	Pecos city, Balmorhea city, Lindsay CDP, Toyah town	141000010, 143000119		142000007, 142000013, 142000021
Schleicher	-	-	-	-	-	-	- [a]
Sutton	-	✓	✓	Sonora city	141000024	-	142000013
Terrell	-	✓	-	Sanderson CDP	-	-	142000007, 142000017
Upton	✓	-	-	McCamey city	-	-	- [a]
Val Verde	-	-	-	-	-	-	142000007
Ward	-	✓	✓	Southwest Sandhill CDP, Monahans city, Thorntonville town, Barstow city	141000026	-	142000007, 142000013
Winkler	✓	-	✓	Kermit city	141000021	-	142000013

[a] *FMS 142000014 and FMS 142000016 are identified for all counties. FMS 142000013 includes the following entities as well as those listed in this table: City of Rankin, Town of Valentine, City of Wickett, and City of Wink.*

4.2 Process for Identifying Flood Mitigation Solutions

The primary objective of the Upper Rio Grande Regional Flood Plan (RFP) is to identify specific flood risks within the region and identify, evaluate, and recommend potential solutions to mitigate and manage these risks in alignment with the region's short-term and long-term goals. These solutions may include FMEs, FMSs, and FMPs, as defined below:

- Flood Management Evaluation – a proposed flood study of a specific, flood-prone area that is needed to assess flood risk and/or determine whether there are potentially feasible FMSs or FMPs;
- Flood Mitigation Project – a proposed project, either structural or non-structural, that has non-zero capital costs or other non-recurring costs, and when implemented, will reduce flood risk, mitigating flood hazards to life or property; and
- Flood Management Strategy – a proposed plan to reduce flood risk or mitigate flood hazards to life or property.

FMPs and FMSs that were identified as potentially feasible flood reduction projects with measurable benefits require the use of detailed H&H models to quantify flood risk reductions to structures and populations, including residential properties, agricultural land, and critical facilities. Furthermore, applicable FMSs and FMPs must be evaluated to adhere to General Mapping and Modeling Guidelines (defined in Section 3.5 of the Technical Guidelines) and ensure that no negative impacts are received by neighboring areas.

FMSs and FMPs that were identified to be potentially feasible through the processes described in this section were selected for further evaluation as part of Task 4B to determine whether they have sufficient H&H modeling data to be analyzed for project impacts and benefits. The FMP flow chart from Section 2.4B of the RFP Technical Guidelines (shown in **Figure 4.1**) was implemented as part of this screening process.

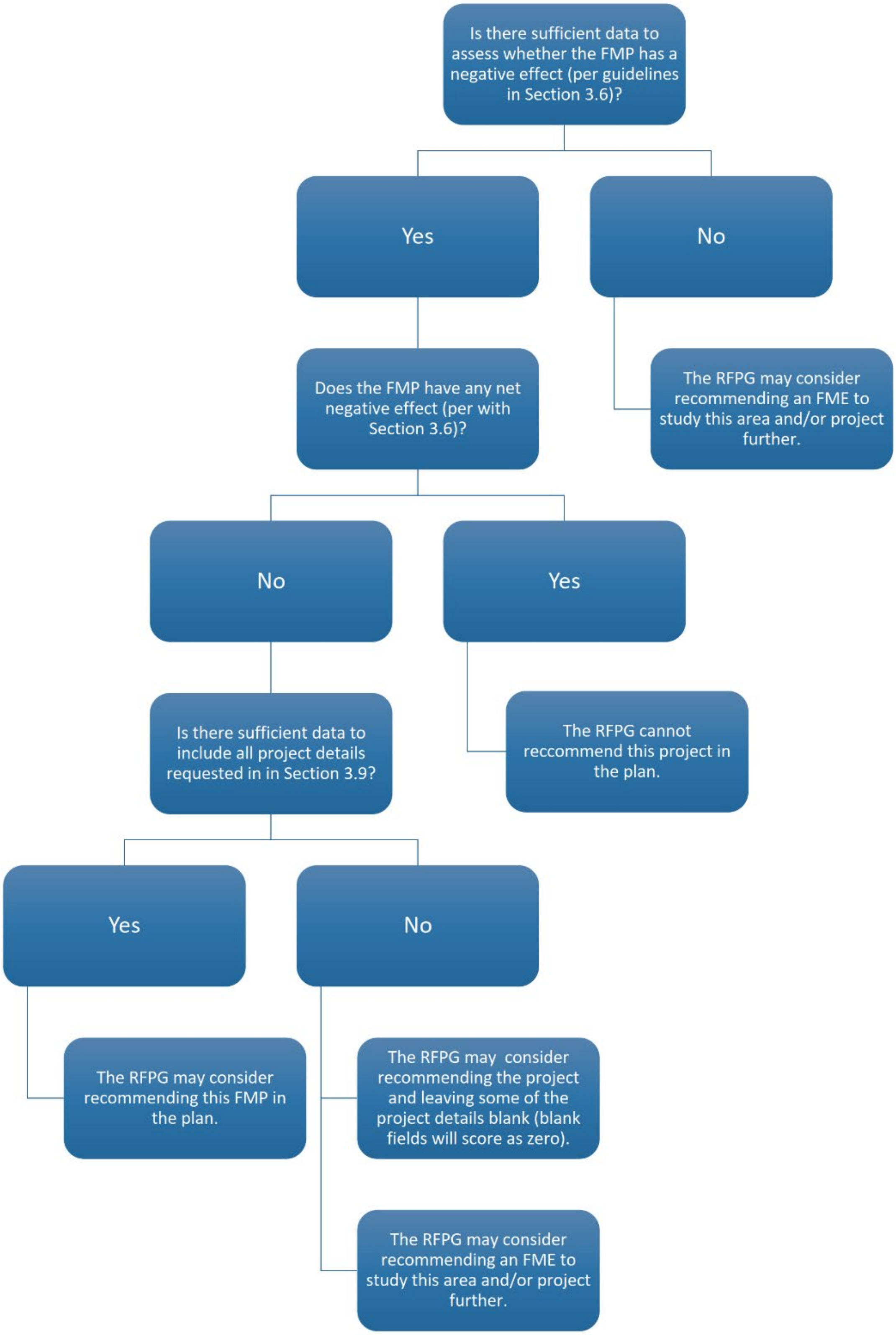


Figure 4.1 FMP Flowchart from Texas Water Development Board (TWDB) Technical Guidelines for Regional Flood Planning

If best available H&H models were deemed insufficient for quantifying project benefits and impacts, or if negative impacts are estimated for neighboring areas, those potentially feasible FMSs and FMPs were categorized instead as potential FMEs. The general scope items associated with those FMEs would include:

- Development of detailed H&H models;
- Evaluating alternatives to define flood mitigation projects resulting in no negative impacts;
- Quantifying project impacts and benefits; and
- Estimating project costs.

The process described in the following section would then be re-applied to the potentially feasible FMSs and FMPs to be considered for recommendation in either the amended RFP for this cycle or for the next RFP cycle.

There are some exceptions where FMSs cannot be modeled, but do not fall into the typical categories of FMPs or FMEs due to their requiring recurring costs or if it is an educational outreach program, for example. Other types of specific FMSs are described in Section 4.5, along with the reasons they were classified as FMSs. In addition, some FMPs or FMSs that were identified in the RFP may be non-structural, such as regulatory requirements for reduction of flood risk or early warning systems. These types of FMPs and FMSs are discussed in Sections 4.4 and 4.5, respectively. The RFPG approved the process for identifying FMEs, FMSs, and FMPs in a technical memorandum to the TWDB, signed January 7, 2022 and in a General RFPG Meeting held December 16, 2021.

4.2.1 Process for Identification of Potential FMEs and Potentially Feasible FMSs

A subcommittee of the RFPG was formed to identify and evaluate potential FMEs and potentially feasible FMSs (Subcommittee 3 for Task 4B, a-b). This subcommittee developed recommendations to define the process used to identify potential FMEs and potentially feasible FMSs, which were then voted on by the subcommittee, presented to the RFPG, and ultimately approved by the RFPG.

The RFPG-approved process for identification of potential FMEs and potentially feasible FMSs included these steps:

- Selection of recent historic storms, either by stakeholders or the public during the General RFPG Meetings, Subcommittee Meetings, or via the public survey process. The selected historic storms would then serve as the basis for identification of needs.
  - Selection of historic storms included the August 2006 storm affecting west and northwest El Paso County, the August 2021 storm affecting east central El Paso, and the September-October 2008 storm affecting the Rio Grande near Presidio.
  - Descriptions of these storms are provided in *Section 1.2 (Historical Flooding)* of *Chapter 1.*

- Within a series of subcommittee meetings:
  - Presentation by RFPG members, stakeholders, and public of experience during the selected events that describes flood-related problems.
  - In public discussion, development of a short description of each problem that defines a need.
  - In public discussion, proposal of FMEs and FMSs to address the need.
  - The subcommittee votes on how to proceed with each FMS and FME identified and makes a recommendation to the RFPG for approval.
  - The RFPG votes on whether to approve the subcommittee's recommendation.

Presentation by RFPG Members, Stakeholders, and Public of Flood Experience

Presenters were briefed at the beginning of Subcommittee 3 meetings to structure their experience of historic flooding as follows: (1) for each storm event discussed, give a tour of the general or specific locations of the experienced damages/ issues; and (2) present a map during the presentation showing locations as discussed. Notes were taken by RFPG consultant staff describing in brief terms the flood-related problem(s) experienced for each storm and location. Following the presentation, RFPG consultant staff queried the presenter to discuss and note each of the following broader issues:

- Primary public concerns;
- Adequacy of early warning;
- Issues with emergency route/ critical facility access;
- Post-flood cleanup issues; and
- Issues with agency coordination.

Background information on historic floods was presented to the subcommittee by:

- Active stormwater professionals at El Paso Water;
- Retired staff from City of El Paso (COEP) and El Paso Water;
- El Paso County Engineer;
- Staff at El Paso County Water Improvement District No. 1 (EPCWID1);
- Current and former staff from the U.S. International Boundary and Water Commission (USIBWC);
- Hudspeth County Emergency Management Coordinator/County Administrator; and
- In the event that a flood experience or potential need was identified by the general public or a stakeholder within the region who could not present their experiences or describe their flood-related issue in a subcommittee meeting, AECOM or a subcommittee member presented to the subcommittee on behalf of that person. In

addition, any flood damage centers that were identified by AECOM through a desktop analysis, but which have not been identified by the public or by stakeholders, were presented to the subcommittee or directly to the RFPG by AECOM. Following the presentation to Subcommittee 3, the subcommittee and/or RFPG decided whether to recommend the FME or FMS for approval by the RFPG.

Develop a Short Description of Each Problem that Defines a Need

In public discussion, the notes from each presentation were reviewed by the subcommittee and public attending the subcommittee meeting. The noted problems were reformulated as needs relevant to the region.

Propose FMEs and FMSs to Address the Need

During the public meetings, drainage issues and challenges were discussed along with identifying potential FMEs and FMSs. Identified FMEs and FMSs were presented, discussed, and refined at subsequent Subcommittee 3 meetings and/or General RFPG meetings as needed.

4.2.2 Process for Identification of Potentially Feasible FMPs

A subcommittee was formed to identify and evaluate potentially feasible FMPs (Subcommittee 2 for Task 4B, c). “Potentially feasible FMPs” comprise a subset of the full list of regional FMPs that are to be carried forward for technical evaluation and considered for recommendation in the RFP. This subcommittee proposed a process for identifying and selecting potentially feasible FMPs, which was then voted on by the subcommittee, presented to the RFPG, and approved by the RFPG. A recommended process was developed for each of two scenarios:

1. FMPs that are currently listed in an active Stormwater Master Plan (SWMP). An active SWMP is defined as current planning for future funding of selected stormwater infrastructure projects, where the projects have been identified, planned (i.e., undergone concept design and cost estimation) and prioritized via a public process; and
2. Other potential FMPs identified by the RFPG process and the public.

Identification of Potentially Feasible FMPs via an Active SWMP

The RFPG identified two recently updated SWMPs that reflect current needs and projects which are still under consideration by city and county officials: a list of 96 stormwater mitigation projects developed by El Paso Water for the City of El Paso (Study ID 13 in *Chapter 1 Appendix Table 1D - Relevant Existing Planning Documents Summary*), and a list of 69 stormwater mitigation projects developed by El Paso County (Study ID 26 in *Appendix Table 1D*). The recommended process for identifying potential FMPs from these two SWMPs is:

- Address all projects within each SWMP as a separate group;
- The subcommittee and public reviews and modifies the existing SWMP project ranking system (if they are ranked) per public discussion within a subcommittee meeting; and

- The subcommittee reviews the list of projects following re-ranking per the revised ranking system and chooses an option for selecting which projects ("Potentially Feasible FMPs") will undergo further evaluation. The project scores used in ranking will limit the number of projects carried forward into the evaluation phase.

Subcommittee 2 has reviewed and approved, with minor alterations, the ranking systems used in the City of El Paso and El Paso County SWMPs.

Identification of Potentially Feasible FMPs not Included in an Active SWMP

The recommended process for identifying "potentially feasible FMPs" from the identified full list of projects not included in an active SWMP is:

- Create a list of regional projects not included in an active SWMP;
- Develop an FMP scoring method in a subcommittee meeting;
- Apply the FMP scoring method to score each project in the regional list; and
- Via subcommittee consensus, select "Potentially Feasible FMPs" from the list using the developed project scores.

Create a List of Regional Projects not Included in an Active SWMP

The RFPG has identified potential FMPs developed outside of a SWMP process by these entities:

- USIBWC;
- EPCWID1;
- U.S. Army Corps of Engineers (USACE);
- Texas Department of Transportation (TXDOT); and
- Others (three counties and a water supply project by El Paso Water).

Develop the FMP Scoring Method in a Subcommittee Meeting

The following two lists of project scoring categories have been recommended to the RFPG by Subcommittee 2 and were voted upon and approved by the RFPG on December 16, 2021. These lists were recommended by Subcommittee 2 based on a comparison of these lists to the finalized Flood Mitigation and Floodplain Management Goals, documented in *Section 3.2 (Flood Mitigation and Floodplain Management Goals)*. These lists derive from similar lists of categories used in the City of El Paso SWMP, with added categories available through information developed as part of the exposure analysis documented in *Chapter 2*.

The first list, shown in **Table 4.5**, is a list of project benefits to be qualitatively compared between projects. These categories were assigned a range of potential scoring points per subcommittee judgement of the relative importance of each category.

Table 4.5 Proposed Benefit Categories and Data Sources

Source	Benefit Category	Current Data Source	Range of Potential RFPG Scoring Points	
			No Benefit	Provides Benefit
City of El Paso SWMP	Increase Dam Safety	National Inventory of Dams, Chapter 299 TWC	0	4
	Reduce Flooding of Property	Best available risk maps, TWDB structure inventory	0	3-4
	Remove 100+ Properties from the Flood Zone	Best available risk maps, TWDB structure inventory	0	4
	Reduce Flooding of IH-10	FMP location versus IH-10	0	1-3
	Reduce Flooding of Major Arterial Roadways	Road classification database	0	3
	Reduce the Risk Associated with Debris Flow	Review of aerial photography to ID mobile bed arroyo	0	3-4
	Reduce Maintenance	Review of aerial photography to ID mobile bed arroyo	0	1-4
	Reduce Nuisance Flooding	Review of likely flat terrain-related routine flooding	0	2
TWDB	Reduce # of low water crossings in floodplain	RFP Task 2 exposure dataset	0	1-3
	Reduce # of vulnerable buildings in floodplain	RFP Task 2 exposure dataset	0	1-3
	Reduce # of critical buildings in floodplain	RFP Task 2 exposure dataset	0	1-4

The second list, shown in Table 4.6, is of federal, state, and local agencies with potential permit authority. The difficulty of obtaining an agency permit for each project was qualitatively judged, adding a positive or negative score adjustment to each project.

Table 4.6 Scoring Adjustments Agencies with Permit Authority

Permit Agency	
• Railroad Permit	• Texas Parks and Wildlife
• USIBWC	• Historic District / Archaeologic
• Texas Commission on Environmental Quality (TCEQ)	• Land Acquisition
• USACE	• Street, Utility, and Amenities Reconstruction
• EPCWID1 / Elephant Butte Irrigation District (EBID) Permit	• Environmental Impacts
• TxDOT Permit	• Other Ordinances (Parks, Unexploded Ordnances, Open Space)
• Fort Bliss Permit	
Scoring Adjustments for Permit Required: Yes (-1), No (0) **Scoring Adjustments for Permit Complexity:** Easy (+1), Normal (0), Difficult (-1), Unknown (-2)	

Apply the FMP Scoring Method to Score Each Project in the Regional List

For each project, the scoring method considers:

- Total scored benefits from **Table 4.5**.
- Total score adjustments from **Table 4.6**.

- The total score when adding the scored benefits from Table 4.5 to the score adjustments from **Table 4.6**.
- After scoring of each project, the list of projects is sorted in order of descending score value.

Select Potentially Feasible FMPs based on Project Scores

The last step in the process for selecting potentially feasible FMPs that are not included in SWMPs is via Subcommittee 2 consensus, selecting "Potentially Feasible FMPs" from the sorted list using the developed project scores.

Combining and Prioritizing All Groups of Feasible FMPs

After the process described above is implemented to rank FMPs within groups of separate SWMPs and projects not selected from SWMPs, projects in each group were separated into tiers with no more than five projects in each tier (Tier 1 being the highest priority in each group). Then, an additional round of prioritization and ranking was needed to combine all the projects into a single list of FMPs for evaluation. The agreed upon process for further prioritization of projects identified by the RFPG included selecting an equal number of projects (the top tier) from each group identified (five from the El Paso County SWMP, five from the City of El Paso SWMP, and five projects that were not selected from SWMPs). This combined list of FMPs for Region 14 was sorted within a Subcommittee 2 meeting based upon the following factors (in order of sorting priority):

- The ranking/tier of each project within their respective groups;
- Complexity of the required H&H modeling analyses;
- Remaining time and budget to complete the RFP;
- Desire to have an equal number of projects from each group (each separate SWMP and the group of non-SWMPs); and
- One additional project was added to the top 15 for evaluation due to the desire of the RFPG to select projects throughout different areas of the region as opposed to focusing all of them in the most populated county, i.e., El Paso County.

Despite the efforts of the RFPG to identify and select FMPs for evaluation throughout all areas of the region, due to the lack of recent/available H&H models and planning documents in regions outside of El Paso County, the majority of the selected FMPs (12 of the initial 16 projects) were located in El Paso County. This initial set of prioritized projects selected for evaluation as potentially feasible FMPs in the RFP is provided in **Table 4.7**, along with the associated sorting criteria.

Table 4.7 Initial Prioritized List of FMPs for Evaluation

Overall Evaluation Order	FMP Name	Description	Evaluation Complexity/ Level of Effort	Category Name	Category (3rd Sort Priority)	Tier (1st Priority Sort)	Category LOE Rank (2nd Sort Priority)
1	Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	Coordinate with Hudspeth County Commissioners, Road & Bridge Departments, Safety & Inspection Departments, & County Attorney to draft a floodplain ordinance (or modify existing subdivision ordinance) to regulate development standards in Hudspeth County.	Less Complex	Not in SWMP	1	1	1
2	HAC3	Sediment/Retention Basin	Less Complex	El Paso County SWMP	2	1	1
3	EA10A	Build sediment/detention basin upstream of Paseo del Este Drive	Less Complex	COEP/El Paso Water SWMP	3	1	1
4	SOC4	Sediment/Detention Basin at “Mankato Arroyo”	Less Complex	Not in SWMP	1	1	2
5	FAB1	Sediment/Retention Basin	Less Complex	El Paso County SWMP	2	1	2
6	NW16	Expand channel from Village Ct to Doniphan Dr	Average	COEP/El Paso Water SWMP	3	1	2
7	Regional Pond and Storm Drain System at San Elizario	Construct an 11.5 ac-ft regional Pond and storm drain system with drainage inlets and approximately 740-ft of 30" RCP. Described as Alternative 1 from 12/5/2018 City of San Elizario “Drainage Feasibility Study”. (During the evaluation process, Alternative 3 was selected instead of Alternative 1).	Average	Not in SWMP	1	1	3
8	CAN1	Reconstruction of the channel with concrete lining	Less Complex	El Paso County SWMP	2	1	3
9	NW3	Construction of New larger capacity Doniphan Pump Station to replace PS1, with new force main directly to the Rio Grande. Install new catch basin with mechanical bar screen upstream of PS2.	Average	COEP/El Paso Water SWMP	3	1	3
10	SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	Improvements to inlet and culvert capacities at 14 crossings, with cost estimates and prioritizations available.	Average	Not in SWMP	1	1	4
11	MON3	Sediment/Retention Basin	More Complex	El Paso County SWMP	2	1	4
12	NW26	Acquire land, construct a permanent wetland, install a storm drain system to Doniphan Drive, construct pipeline to Doniphan Pump Station and build new pump station to control flood levels.	Average	COEP/El Paso Water SWMP	3	1	4

Overall Evaluation Order	FMP Name	Description	Evaluation Complexity/ Level of Effort	Category Name	Category (3rd Sort Priority)	Tier (1st Priority Sort)	Category LOE Rank (2nd Sort Priority)
13	Excavate Fort Bliss Sump	Excavate Ft. Bliss Sump for additional storage capacity (not in SWMP)	Average	Not in SWMP	1	1	5
14	SSA4	Detention Basin SSA4	More Complex	El Paso County SWMP	2	1	5
15	NE3B	Alcan Pond: new catch basin to capture FP15 upstream	Average	COEP/El Paso Water SWMP	3	1	5
16	Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	Add flood gates to Alamito Creek low water crossings in Marfa, and a monitoring gage/early detection on North Alamito Creek under Hwy 17 Bridge (between Marfa and the airport). This would provide 5-10 minutes early warning to allow Presidio County Office of Emergency Management to deploy before imminent road flooding.	Less Complex	Not in SWMP	1	2	6

Secondary Process for Identification and Selection of Potential FMEs, FMSs, and FMPs

The estimation of region-wide 1% AC flood risk has identified a number of regional locations outside of El Paso County with high numbers of estimated structures-at-risk, as discussed in Section 4.1. In general, the data collection process for the RFP has identified few incorporated and unincorporated areas outside of El Paso County with stakeholders who have presented awareness of or current plans for addressing this risk. Through public outreach efforts, including three public “road show” meetings in the cities of El Paso, Pecos, and Presidio, discussed in *Chapter 10 (Public Participation and Plan Adoption)*, additional areas of significant flood risk were identified and discussed with each appropriate local stakeholder, expanding the list of potential regional FMPs.

If no FMP or FMS is previously identified by Subcommittees 2 and 3 for areas at risk of 1% AC flooding, or if the best available H&H models lack sufficient detail to allow for evaluations of FMPs or FMSs, then FMEs to develop detailed H&H models and evaluate flood mitigation alternatives are selected for the at-risk areas. Subcommittee 3 reviewed the higher risk areas identified in Section 4.1 and assigned FMEs for these areas, so that these FMEs can be performed at a later date to identify potential FMSs and FMPs in the amended RFP or in future RFP cycles. Based upon recommendations from Subcommittee 3, the RFPG voted for approval of the potential FMEs.

Refinements to the List of Evaluated FMPs

Throughout the evaluation phase of the first cycle of the RFP, the status of two of the projects from the El Paso County SWMP that were selected for evaluation changed, as alternative sources of funding were identified. Therefore, the RFPG agreed those projects no longer needed to be evaluated (CAN1 and FAB1) for the RFP. In addition, other high priority FMPs and FMSs continued to be investigated as they were brought to the attention of the RFPG by different stakeholders throughout the planning cycle; however, none of these additional projects were determined to have sufficient modeling and documentation to be considered as potentially feasible FMPs or FMSs in the RFP, and they were instead considered as potential FMEs, per the secondary process discussed in the previous section.

4.3 Identification of FMEs

Based on analyses and decisions described in Sections 4.1 and 4.2, the RFPG identified and evaluated 22 potential FMEs throughout Region 14. The extent of these identified FME study areas is shown in **Map Exhibit 16**, along with counties which have existing mapping needs. The FMEs are also listed in an evaluation table with supporting data in **Table 4A** of **Appendix 4A**. A narrative of each FME identified is provided in **Appendix 4B**, including the following:

- Discussion on flood risk;
- SOW assumed for each FME; and
- Cost breakdown of labor fee by task.

Table 4A documents the desktop analysis results of each FME and lists RFP data fields for classifications of FMEs, which require the RFPG to choose from a list of acceptable inputs for attributes such as “Flood Risk Type” and “Study Type.” **Table 4.7** includes more region-specific descriptions of FMEs combined with TWDB-allowable categories to provide a more complete representation of the evaluated FMEs for Region 14. Due to the lack of reliable floodplains, modeling, or flood planning documents available outside of El Paso County, the identification of FMEs and FMSs for evaluation required extensive coordination with local stakeholders to understand unique flood issues associated with each part of the region. The types of FMEs identified to address specific flood risks are based upon RFPG and stakeholder goals, which are documented in *Chapter 3 (Floodplain Management Practices and Goals)*.

Table 4.8 Classification of Evaluated FMEs

FME ID	Project Planning	SWMPs	Dam Safety/ Emergency Need	Riverine Risk Related to Sediment or Levees	Irrigation and Stormwater Interaction	Preparedness
141000001	-	-	-	✓	✓	✓
141000002	✓	✓	-	✓	-	-
141000003	✓	-	-	-	✓	-
141000004	✓	-	-	-	✓	-
141000005	✓	✓	-	-	✓	-
141000006	✓	-	-	-	-	-
141000008	✓	-	-	✓	-	-
141000010	✓	✓	-	-	-	-
141000012	✓	-	✓	-	-	-
141000014	✓	✓	✓	-	-	-
141000015	-	-	-	✓	✓	✓
141000018	-	-	-	-	✓	✓
141000019	✓	-	-	-	✓	-
141000021	✓	✓	-	-	-	-

FME ID	Project Planning	SWMPs	Dam Safety/ Emergency Need	Riverine Risk Related to Sediment or Levees	Irrigation and Stormwater Interaction	Preparedness
141000022	✓	✓	-	-	-	-
141000023	✓	✓	-	-	-	-
141000024	✓	✓	✓	-	-	-
141000025	✓	✓	✓	-	-	-
141000026	✓	✓	-	-	-	-
141000033	✓	✓	-	-	-	-
141000034	✓	-	✓	-	-	-
141000035	✓	-	✓	-	-	-

4.3.1 Project Planning and SWMPs

The primary study type of the FMEs identified is “Project Planning,” with 19 of the 22 FMEs falling into this category. The remaining three FMEs were categorized with the Study Type “Preparedness” in **Table 4A**. Project planning FMEs were primarily selected by the RFPG for evaluation because it was noted during the identification process that very few entities had SWMPs outside of El Paso County, despite there being significant numbers of structures at risk in multiple cities throughout the region (see **Table 4.3**). Eleven of the 19 Project Planning FMEs propose to develop SWMPs; however, some of these FMEs include other more specific tasks as well. The lack of SWMPs in the region is likely related to the lack of updated flood risk maps and H&H models. However, developing these planning documents is essential to reducing flood risk in populated areas, and the public availability of LiDAR terrain throughout the region allows for detailed flood risk models to be developed and used to plan proposed flood improvements. Hazard Mitigation Plans were reviewed for proposed flood-related projects/studies/needs; however, most of these plans in the region were outdated at the time of the selection of FMEs, FMSs, and FMPs for the RFP.

City of Presidio Flood Planning Documents

The only other flood infrastructure planning documents outside of El Paso County that were identified for consideration in the RFP were for the City of Presidio, and both were based upon the same modeling analysis from 2008. The original planning document, entitled, “Final Hydraulic Report/Drainage Study for the City of Presidio, Texas” (S&B Infrastructure, 2008) was developed prior to a TXDOT roadway project, which has since paved several of the roadways throughout the city. These roadways were incorporated into the designs of the proposed improvements by proposing inverse crowns to redirect flows. This planning document was also referenced in the “City of Presidio Comprehensive Plan (2020-2030)”, but the existing hydrologic and culvert hydraulic models available from the 2008 study were not updated. Also, the proposed improvements were altered in the Comprehensive Plan relative to the original planning document. Proposed ponds/sediment basins were relocated upstream of the city rather than downstream, as they were located in the original document. Proposed condition models were not developed for either of the City of Presidio planning documents. FME ID 141000002 proposes to update the H&H models for watersheds draining to the City of Presidio from natural arroyos to the north, as well as developing H&H models for Cibolo Creek, which has an unaccredited levee protecting the City of Presidio from riverine flooding.

FMEs to Develop FMPs from El Paso SWMP Projects

Due to the fast-paced schedule and limited budget associated with this first cycle of Regional Flood Planning, only a limited number of FMPs could be evaluated from the robust list of projects in the recently updated El Paso City and County SWMPs (96 projects in the City plan and 69 in the County plan). Following the FMP prioritization and selection process described in Section 4.2.2, continued coordination took place with El Paso Water and El Paso County stormwater officials to review the details and status of each project from the SWMPs that was not selected for evaluation as an FMP through the approved Subcommittee 2 scoring and ranking process. This coordination led to the selection of 52 El Paso Water projects and 21 El Paso County projects from their respective SWMPs.

4.3.2 Dam Safety and Emergency Needs

A Hudspeth County stakeholder alerted the RFPG to flood risk associated with two dams identified by TCEQ as "hydraulically inadequate" that are located upstream of rapidly developing Fort Hancock and Acala CDPs. As noted in *Chapter 1, Introduction and Description of the Upper Rio Grande Flood Planning Region,* there are 27 dams (approximately 25% of the dams in the region) that are identified by TCEQ as hydraulically inadequate in Region 14. As is the case with many dams throughout Texas, significant development has occurred downstream of Camp Rice Arroyo Dam 1 and Alamo Arroyo Dam 3, located in Hudspeth County.

A colonia-wide SWMP is proposed as FME ID: 141000014, which includes the development of dam rehabilitation alternatives in a Supplemental Watershed Plan for both dams, as defined by the Natural Resources Conservation Service (NRCS). This FME includes a SWMP for Fort Hancock CDP, which is required before an implementation strategy (identified in FMS ID: 142000008) for constructing the stormwater improvements can be performed.

Additional hydraulically inadequate dams identified upstream of populated areas in the region include the following:

- FME ID 141000012 - Comanche Creek Dam upstream of Fort Stockton in Pecos County;
- FME ID 141000024 - Dry Devils and Lowry Dams 3, 4, 5, 7, 8, 10, & 12 upstream of Sonora in Sutton County; and
- FME ID 141000025 - Johnsons Draw SCS Site 7 Dam upstream of Ozona in Crockett County.

The FMEs for Sonora and Ozona also include Supplemental Watershed Plans; however, Comanche Creek Dam does not include one, since it is not an NRCS dam.

All four of these dam-related FMEs include the development of SWMPs for the downstream cities at risk and are identified as having an "Emergency Need" in **Table 4A**. In this RFP, the classification of a proposed action as an “Emergency Need” is reserved for actions related to Emergency Response (such as early warning systems) or significant flood protection infrastructure that has been identified as inadequate by authorities responsible for inspecting and regulating stormwater infrastructure, such as TCEQ Dam Safety.

4.3.3 Riverine Flood Risk Related to Sediment or Levees

Eight of the FMEs identified by the RFPG are categorized as having a “Riverine” flood risk type. Riverine flooding typically occurs along rivers or streams when the runoff exceeds the capacity of the channel. For significant creeks or rivers adjacent to populated areas, levees are sometimes constructed to protect the populated areas from out-of-bank flooding. This is the case for segments of the Rio Grande, including those running through El Paso County and the City of Presidio. This is also the case for Cibolo Creek which flows into the Rio Grande on the western border of the City of Presidio. In arid landscapes such as Region 14, the accumulation of sediment in arroyos and rivers such as these can have a significant effect on flood risk if natural flood patterns or regular maintenance are not achieved. FMEs 141000001 and 141000002 both address flood risk related to these significant sources of flooding in El Paso and Presidio, respectively. In Presidio, the FME includes a coincident peak analysis to assess the probability of peak flows from Cibolo Creek aligning with peak flows in the Rio Grande, creating an even more disastrous flood event. In addition, coincident peaks in the Rio Conchos at the confluence with the Rio Grande will be studied in the FME.

While FME 141000001 is categorized as a “Preparedness” Study type and is primarily related to maintenance of sediment and vegetation in the Rio Grande floodway to prevent overtopping of levees, the Cibolo Creek FME 141000002 is part of a larger strategy (FMS ID: 142000008) to develop a levee certification package for the FEMA accreditation of the “Cibolo Creek Left Levee” (per the National Levee Database) located along the City of Presidio side of the creek. As part of the levee accreditation requirements, an interior drainage study must be performed for the levee adjacent to the city. Since flow in the city limits is primarily draining from north to south, along the outer edge of the levee and is not ponding against the levee, the cost estimate for this FME did not assume a significant effort for the required interior drainage analysis, as it would likely be developed as part of the SWMP analysis.

FMEs 141000008 and 141000015 are both also related to sediment causing flood risk and maintenance issues for entities such as USIBWC, El Paso Water, and EPCWID1. USIBWC is responsible for clearing sediment in problem areas of the Rio Grande, and El Paso Water has urban/local runoff issues with sediment clogging their storm drains and culverts. High intensity storms on the Franklin mountains can wash sediment and large masses of debris into the streets, as it did in the recent August 2021 storm.

4.3.4 FMEs Related to Irrigation Systems in El Paso

EPCWID1 manages the vast and complex system of irrigation canals and drains in El Paso County and coordinates closely with both City and County stormwater officials, as well as with neighboring irrigation districts (EBID and Hudspeth County Conservation and Reclamation District 1) to aid in managing stormwater during emergency flood events. In the Subcommittee

3 stakeholder workshop, discussed as part of the FME/FMS identification process in Section 4.2.1, RFPG members shared the history of emergency response efforts and coordination that took place between EPWater and EPCWID1 to utilize drains designed to discharge to the Rio Grande as flood relief strategies for the river, which was close to overtopping at some locations. EPCWID1 was able to open irrigation gates at the river to allow flow from the Rio Grande into the irrigations system and helped prevent segments of Rio Grande levees from potentially overtopping or breaching during the 2006 flood. It was reported in the workshop that the high flood levels in the Rio Grande were also related to significant sediment build-up, which is the reason FME 141000001 was established and approved by the RFPG.

In addition to relieving Rio Grande flooding, when necessary, EPCWID1 also has relieved urban/local flood infrastructure from exceeding capacities during interior flood events by allowing El Paso Water to utilize EPCWID1's Mesa Drain for flood control purposes. However, since this drain was not designed for this purpose, it needs to be studied, including the development of a 1D hydraulic HEC-RAS model to evaluate several Mesa Drain crossings, which are identified in the El Paso County SWMP as being undersized. This was the driver for creating FME 141000004, which has been included in grant requests by EPCWID1, who worked closely with the RFPG to review and update best available cost estimates and SOWs needed to document the FME.

FME 141000003 was reported by EPCWID1 as a significant need due to a new arroyo which has formed and causes overtopping of State Highway (SH) 20 in southeast El Paso County. The significant amount of uncontrolled flow over SH20 causes a flood safety hazard to the public. The newly formed arroyo is also a flood risk to agricultural areas (pecan orchards) on the other side of SH20 and transports a significant amount of sediment into EPCWID1's irrigation drain, which runs adjacent to SH20. This study will involve coordination with TXDOT to establish a flood mitigation alternative, likely involving a sediment basin and a siphon to allow the significant flood source to cross under both the roadway and the adjacent drain.

4.4 Identification of FMPs

Based on analyses and decisions described in Sections 4.1 and 4.2, the RFPG identified and evaluated 21 potentially feasible FMPs, which are listed with supporting data in **Table 4C** of **Appendix 4C**. The extent of these identified FMP study areas is shown in **Exhibit Map 17**, along with contributing watersheds. In addition, **Appendix 4D** includes a narrative of each FMP identified, including the following information extracted from associated SWMPs or other feasibility studies:

- Flood risk discussions;
- Project descriptions;
- Breakdown of cost estimates, which include land values, where applicable, as well as final design and construction contingencies. All costs are adjusted to September 2020 dollars (a requirement for the RFP), using the Construction Cost Index (CCI) and the Consumer Price Index (CPI), where appropriate; and
- Figures showing project components and locations.

The 21 potentially feasible FMPs which were evaluated for the RFP have been labeled with the following Project Types:

- One FMP is a non-structural project (FMP ID: 143000009), categorized as "Other" in **Table 4B**;
- Two FMPs are related to storm drains (FMP IDs: 143000005 and 143000111);
- One FMP is for preparedness (FMP ID: 143000007);
- One FMP is a channel improvement (FMP ID: 143000097); and
- The remaining sixteen FMPs are ponds or basins.

These Projects align with the listed RFPG and stakeholder goals shown in **Table 4B**, as documented in *Chapter 3 (Floodplain Management Practices and Goals)*.

4.4.1 Sources of Potentially Feasible FMPs

A variety of structural and non-structural FMPs were selected by the RFPG to address flood risks related to major access routes, residential and commercial structures, agricultural property and infrastructure, and regulation of development. The sources of each FMP and the types of flood issues addressed are discussed in this section.

Non-Structural FMPs and Emergency Needs

Two non-structural FMPs were identified by the RFPG for evaluation. FMP ID: 143000009 is associated with Hudspeth County developing and implementing a floodplain ordinance to regulate development, and FMP ID: 143000007 includes installing a flood gage upstream of Marfa and adding flood gates to roadways at four low water crossings (LWCs).

The Hudspeth County regulatory need was communicated to the RFPG at a Subcommittee 3 workshop by the County Emergency Management Coordinator/Administrator. The issue is related to rapid development, outdated and insufficient floodplain mapping, and limited availability to process and monitor the amount of development that is occurring. The need for this FMP was also documented in the "Colonia Area Study and Plan 2019-2029" (Grantworks, 2019) and in a Fiscal Year 2023 earmark for federal funding, submitted to the Congressman of the 23rd District of Texas in April 2022 (the funding request was initially accepted, but later deemed ineligible).

The LWCs and flood gage project in Marfa (FMP ID: 143000007) was brought to the RFPG's attention through coordination with Presidio County Emergency Management, who informed the RFPG that a flood-related death occurred on June 27-28, 2021 at one of the LWCs considered in the FMP. The location where a driver was swept away in his vehicle is the LWC of Alamito Creek near the intersection of Neville Street and Dallas Street. The other three proposed locations for automatic road closure gates are also for Alamito Creek LWCs near the intersections of Waco Street and Dean Street, Dallas Street and Spring Street, and Lincoln Street and A Street. This recent flood casualty at the FMP site is the reason that the FMP is documented as having an emergency need and an estimated reduction in fatalities in **Table 4B**. No other FMPs were identified as an emergency need by the RFPG.

The City of Marfa had recently procured a bid for the four LWCs and the flood gage from High Sierra Electronics. This bid is included in **Appendix 4G** for reference and includes an option to wave annual maintenance fees for a one-time training, which City of Marfa confirmed is their preference. Therefore, it was assumed this FMP would be a fixed cost, with no recurring costs.

A related strategy that was identified (FMS ID: 142000025) includes a separate bid for an additional early warning system in Marfa, which does include recurring monthly costs. The RFPG coordinated with High Sierra Electronics, who assisted in preparing the additional bid for FMS ID: 142000025 (also included in **Appendix 4G**), and ensured there is not an overlap in equipment or services proposed in the two bids provided.

FMPs Affecting Mobility and Localized Flooding

Three of the FMPs identified for evaluation are related to mobility and localized flooding, with two of the projects affecting the same roadway, Doniphan Drive. FMP IDs: 143000111 and 143000113 are relatively close in proximity to each other and mitigate flooding on Doniphan Drive by capturing runoff to the roadway on either side of a known localized ponding area between Sunland Park Drive and Racetrack Drive. Doniphan Drive is a major access route and has a roadway classification of “Principal Arterial.” Both of the FMPs relieve flooding from a segment of Doniphan Drive identified in the “Incident Management Plan Standard Operating Guidelines” (TXDOT, 2011) as a detour route for Tier 3 traffic incidents occurring on IH-10 between Sunland Park Drive and Paisano Drive.

The known local ponding area on Doniphan Drive is adjacent to a multi-box culvert with sluice gates, draining to the Rio Grande. This ponding area has caused repeated nuisance flooding in El Paso for several years, including during the recent storm event on June 28, 2021, when the world-famous Rosa’s Cantina was inundated for long durations with both flood water and sediment/debris. The owner, who reportedly could not initially open the door due to the amount of mud and water in the building, eventually found eight inches of water in the building and stated for news reporters, “After 13 years, this is probably our fifth time flooding but this is definitely one of the worst,” Telles said *(Source: https://kfoxtv.com/ news/local/severe-flooding-in-west-el-paso-caused-extensive-damage-to-properties)*.

El Paso Water funded a feasibility study for FMP ID: 143000111 entitled, “Doniphan Storm Water Pump Stations PS1 and PS2 System Evaluation and Potential Improvements” (Study ID 90 from *Chapter 1*), which evaluated alternatives and recommend immediate, short-term, and long-term improvements. One of the mid- to long-term improvements (labeled Project G in the feasibility study and “NW3” in the City of El Paso SMWP) is associated with this FMP and involves constructing a storm drain system to intercept flooding on the southern extension of Racetrack Drive. The intercepted flow would be coming from the northeast side of Loop 375, and it would be conveyed to a new 110-cfs pump station (with 1% AC capacity) to be constructed next to the existing “Pump Station 1,” discharging directly into the Rio Grande.

El Paso Water also funded a separate feasibility study for FMP ID: 143000113 entitled, "Montoya Drain H&H Analysis" (Study ID 38 from *Chapter 1*), which evaluated flooding of Doniphan Drive from a different location (from the northwest, along Doniphan). This project is identified in the City of El Paso SWMP as "NW26." The Project will intercept runoff coming from the northwest along Doniphan Drive and Doniphan Ditch with a storm drain system and/or trench drain and convey flow to the southwest, along the northern extension of Racetrack Drive. The diverted runoff would need to cross Montoya Drain (with either a siphon or pipe bridge) and discharge into a proposed pond on undeveloped property, located adjacent to a Rio Grande levee in Sunland Park, New Mexico.

This general project area surrounding the Doniphan pump station and Montoya Drain wetland FMPs is known to have a high water table, which also causes issues for EPCWID1 draining Montoya Drain into the Rio Grande (FME ID: 141000019 increases the capacity of the Montoya Drain for stormwater conveyance in this area). Therefore, the proposed pond, which will also serve as a constructed wetland habitat, is proposed to include a series of groundwater dewatering wells with submersible pumps to lower the groundwater table when the pond storage volume is needed for the 1% AC event. In addition, the project could benefit the irrigation districts (EPCWID1 and EBID) needing to discharge flow in Montoya Drain to the Rio Grande when groundwater is high. This project provides a nature-based solution with stormwater benefits to a critical roadway, and it reduces flooding in the nearby known ponding area where residential and commercial structures are at risk.

A roadway drainage improvement (FMP ID: 143000005) affecting mobility on SH20, also known as Mesa Street, was identified from the TXDOT feasibility study entitled "Drainage Study for SH20, from Doniphan Drive to Texas Avenue" (AECOM, 2019). SH20 is a major access route and has a roadway classification of "Principal Arterial". Conceptual designs for the eight prioritized and recommended improvements from the SH20 Study (all of which are part of the FMP) will improve the capacity of drainage crossings on a critical route from conveying less than the 20% annual chance event to a 10% annual chance level of service. All of the projects are on a segment of SH20 identified in the "Incident Management Plan Standard Operating Guidelines" (TXDOT, 2011) as a detour route for Tier 3 traffic incidents occurring on IH-10 between Executive Center Boulevard and Schuster Avenue.

Channel Expansion FMP

One FMP identified for evaluation in the RFP by El Paso Water (FMP ID: 143000097) involves the expansion of the upper segment of the White Spur Drain in Northwest El Paso (labeled "NW16" in the City of El Paso SWMP). This concrete channel, located in a commercially developed area of northwest EL Paso, conveys stormwater runoff from along SH20 (Mesa Street) and from local drainage systems in the surrounding shopping developments. The downstream portion of the channel, on the other side of Doniphan Drive, is significantly wider than the upper section. Commercial buildings adjacent to the narrower upper section are at risk due to the insufficient capacity of the channel. The channel widening project would not only help contain the 100-year flows within the channel, but it would lower the tailwater on storm drains discharging to the channel from surrounding roadways and commercial developments.

Sediment and Flood Storage FMPs

The remaining nine FMPs are flood and sediment storage basins or ponds, which are identified in the El Paso County and City of El Paso SWMPs. These projects typically involve detaining and/or retaining runoff upstream of developed areas and/or agricultural areas and critical routes that are known to have flooding issues. They were identified in their respective SWMPs, and by the RFPG because they are considered a high priority for El Paso Water and El Paso County. While each of the flood sources and related flooding issues is unique to the project area, all of the storage solutions were designed to have capacity for at least the 1% AC event.

One of these storage basins (FMP ID: 143000021, labeled “SOC4” in the El Paso County SWMP) was identified by EPCWID1 after a flood event on July 22, 2017 caused damages to commercial development detention ponds, which failed, releasing additional flow into the newly-formed arroyo. This flood source causes erosion, sediment, and flooding issues for downstream rural residences as well as agricultural land and infrastructure, including the Mesa Spur Drain.

Another storage project (FMP ID: 143000100, labeled as NE3B in the City of El Paso SWMP) is a proposed pond in a highly developed area of northeast El Paso. The FMP concept was initially developed in a feasibility study entitled, “Northeast Sump Improvements – Hydrologic and Hydraulic Analysis” (MCi, 2017), where it was modeled in conjunction with the Will Ruth Pond, a proposed project being funded by the Flood Infrastructure Fund. While the FMP does not contribute to any additional flood benefits downstream of Will Ruth Pond, it does intercept runoff and relieve flooding upstream of Will Ruth Pond.

4.5 Identification of FMSs

Based on analyses and decisions described in Sections 4.1 and 4.2, the RFPG identified and evaluated 22 potentially feasible FMSs, which are listed with supporting data in **Table 4E** of **Appendix 4E**. The extent of these identified FMS study areas is shown in **Exhibit Map 18**, along with HUC-12 watersheds. A narrative of each FMS identified is provided in **Appendix 4F**, including the following:

- Discussion on flood risk;
- SOW assumed for each FMS; and
- Cost breakdown of labor fees, construction costs, and/or recurring costs.

These strategies align with the listed RFPG and stakeholder goals shown in **Table 4E**, as documented in *Chapter 3 (Floodplain Management Practices and Goals)*. Almost all of the strategies are associated with Urban/Local and/or Riverine Flood Risk, and strategy types vary between the following:

- Six FMSs are for regulatory and guidance purposes;
- Three FMSs include infrastructure projects;
- Six FMSs are for flood measurement and warning; and
- Two FMSs include education and outreach.

In general, FMSs do not typically fit into the FME or FMP categories for a variety of reasons. Below are a list of criteria that led to the decision to list a flood reduction action as an FMS rather than an FME or FMP:

- Studies, projects, and/or program development involving complex coordination between multiple entities (local, state, federal, or international);
- Associated with other FMEs, FMSs, or FMPs requiring a specified sequence of actions as part of a larger plan;
- Involve multiple projects with varying statuses of design/construction; and
- Include recurring costs.

This section describes the general types of potentially feasible FMSs identified for Region 14, with discussion of specific strategies to explain the importance of varying components affecting each overall flood reduction plan.

4.5.1 FMSs Requiring Complex Coordination

Region 14 has several unique flood-related issues involving multiple entities and stakeholders, sometimes requiring inter-state or international agreements. These types of objectives may require multiple studies or coordination between different entities who may not typically partner on projects. If an initial study is required to quantify flood benefits, but it also requires identifying all necessary stakeholders as well as identifying complex political obstacles and documented agreements, as in the Binational Streamflow Recommendations for Big Bend Reach of Rio Grande/Rio Bravo (FMS ID: 142000006), that flood reduction solution was classified as an FMS rather than an FME. In this example, water rights agreements between the U.S. and Mexico would need to be explored before the opportunity to accomplish the broader goal of releasing environmental flows from the Luis León Dam in Mexico could be deemed as feasible.

Similarly, the type of multi-step process needed to accredit all of the Rio Grande levees in El Paso (FMS ID: 142000001) will require coordination between USIBWC, FEMA, and local stakeholders sponsoring the interior drainage studies (City of El Paso, El Paso County, Doña Ana County, and Hudspeth County) to package and deliver all of the requirements for levee certification. As part of the RFP process, multiple coordination meetings have been conducted between the USIBWC and local stakeholders, as well as between those stakeholders and FEMA. However, each levee segment remaining to be certified in El Paso County has a unique status and set of issues keeping it from being certified. The first step in planning a solution to accomplish the RFPG short-term goal (Goal ID: 14004001) of certifying all levees in El Paso County is to identify the outstanding issues associated with each segment and prioritize which segments should be accredited first, considering population at risk and several other factors. Due to the high level of complexity and coordination involved in this plan, this solution was categorized as an FMS rather than an FMP or an FME.

Another example of a strategy with complex coordination necessary is FMS ID: 142000004, which involves facilitating discussions between El Paso Water, El Paso County, and the U.S. Army to address the subject of unexploded ordnances (UXOs) on Fort Bliss property, where both the City and the County have planned flood control projects in their respective SWMPs.

4.5.2 FMSs Requiring Associated FMEs, FMSs, or FMPs

If a study or project was identified that requires an initial FME, FMS, or FMP to take place before it can occur, it was also categorized as an FMS. Associated FMEs, FMSs, and FMPs are listed in **Table 4E** for seven of the identified FMSs. For example, FMS ID: 142000003 includes a portion of funding for construction of drainage swales along roadways, documented in the "Colonia Area Study and Plan 2019-2029" (Grantworks, 2019), but first requires FME ID: 141000014 to be performed, which includes developing a SWMP. This strategy also includes a recurring cost associated with an educational outreach program, also documented in the "Colonia Area Study and Plan 2019-2029" (Grantworks, 2019).

4.5.3 Multi-Project FMSs with Varying Statuses of Design or Construction

Similarly, if specific phases or portions of an overall plan have already been designed or constructed, it was classified as an FMS. An example is FMS ID: 142000002, which is a strategy recommended for the City of Alpine in the current Region E Water Plan. This nature-based solution involves three related projects centered around Kokernot Park to accomplish a shared goal of reducing stormwater in roadways while promoting green infrastructure and harvesting rainwater. In this strategy, one of the projects has been constructed, with reconstruction of some portions of that project still pending. Another site location is planned for construction by the City Streets Department in Fall of 2022, and the third phase is not expected to be constructed by TXDOT until 2024. The City confirmed they are still seeking grants, and no funding is currently available. All previous planning time and plants/trees installed to date have been donated.

4.5.4 FMSs Including Recurring Costs

Bids are provided for early warning systems for the City and County of El Paso, as well as for the cities of Pecos (FMS ID: 142000021), Alpine (FMS ID: 142000022), Presidio (FMS ID: Presidio), Fort Stockton (FMS ID: Fort Stockton), and Marfa (FMS ID: 142000025). The general scope and equipment proposed in each system was prepared for each entity as part of the RFP based upon availability of nearby rain/flow gages, radar availability, and the needs and general budget available for such a system by each entity. All of these systems include recurring costs, which are specified in the cost summary tables in **Appendix 4H**. In addition, a bid document is available for each FMS in **Appendix 4G**.

Other FMSs with recurring costs are FMS ID: 142000003 (Fort Hancock Colonia-wide public outreach strategy discussed above), FMS ID: 142000013 (support for at-risk communities to join and/or enforce the National Flood Insurance Program), and FMS ID: 142000014 (developing new flood gages throughout the region). More information on these FMSs, as well as all other potentially feasible FMSs shown in **Table 4E** can be found in the narratives provided in **Appendix 4F.**

Appendix 4A
Evaluation Summary Table of Potential Flood Management Evaluations

Table 4A. Potential Flood Management Evaluations Identified by RFPG

FME ID	FME Name	Description	Associated Goals	Associated FME, FMS, or FMP	Associated FME, FMS, or FMP Description	Counties	HUC8s
141000001	Develop a plan for a Sediment and Vegetation Control Program in the Rio Grande at El Paso	Assess Rio Grande capacity in El Paso County considering updated hydrology, sediment, and vegetation conditions. Establish maintenance program with minimum risk-based channel capacity. Address maintenance agreements between U.S. and Mexico.	14007003, 14004001	N/A	N/A	El Paso	13030102, 13040100
141000002	Develop H&H Models for Cibolo Creek and arroyos through the City of Presidio, and develop an FMP for flood reduction of buildings and emergency access roadways.	Develop H&H models for Cibolo Creek and the City of Presidio arroyos to evaluate flood risk. Develop FMPs, an interior drainage analysis for east Cibolo Creek levee, and a coincident storm analysis for Cibolo Creek, the Rio Conchos, and the Rio Grande.	14007003, 14014002, 14009002, 14009004	FMS ID: 142000008	FMS ID: 142000008 will follow, as interior drainage is needed for levee certification.	Presidio	13040201
141000003	Arroyo Siphon at SH20 near Tornillo	Coordinate with TXDOT to install siphon at SH20 to prevent road from overtopping and stormwater from entering EPCWID1 canal system.	14010001, 14010002	N/A	N/A	El Paso	13040100
141000004	Lower Mesa Drain Improvements at El Paso	Assess capacity of upstream reservoirs; develop detailed hydraulic model of Lower Mesa Drain to design 30+ culvert improvements; assess capacity of Mesa Drain to accept runoff without impacting downstream agricultural property.	14007003, 14009001, 14009003	N/A	N/A	El Paso	13040100
141000005	Develop solution for flooding of San Elizario historic district, and localized flooding in San Elizario and adjacent communities	Develop Stormwater Master Plan for San Elizario, including drainage swales to convey runoff into the River Drain and relieve localized ponding, as well as plantings along flowpaths for butterfly habitat.	14009001, 14009003	N/A	N/A	El Paso	13040100
141000006	Increase Storage Capacity of Fort Bliss Sump	Excavate Fort Bliss Sump while avoiding newly delineated wetland to increase storage capacity of sump. Requires continued coordination with U.S. Army due to project location on Fort Bliss.	14009001, 14009003	N/A	N/A	El Paso	13040100
141000008	Sediment Control at Alamito and Terneros Creek	Design sediment control structures on Alamito Creek and Terneros Creek upstream of confluence with the Rio Grande to reduce sediment in the Rio Grande and reduce USIBWC maintenance burden.	14004002, 14011001	FME ID: 141000015; FMS ID: 142000006; FMS ID: 142000016	FME 141000015 & FMS 142000016 precede as they provide method for estimating sediment loads & develop erosion solutions for region. FMS ID 142000006 follows as it considers updated sediment loads into the Rio Grande for recommended environmental flows.	Presidio	13040201, 13040202, 13040203, 13040204, 13070005, 13070006, 13050004
141000010	Develop city-wide drainage study and stormwater master plan for Pecos	Develop city-wide drainage study and stormwater master plan for City of Pecos and adjacent Lindsay Census Designated Place. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002	FMS ID: 142000007 FMP ID: 143000119	FMS ID: 142000007 will follow as it addresses flood-related saltcedar issue FMP ID: 143000119 Construct detention pond on city-owned parcel west of Town	Reeves	13070003, 13070001
141000012	Dam Improvements at Comanche Creek Reservoir at Fort Stockton	Inspect and evaluate rehabilitation improvements for Comanche Creek Reservoir to protect Fort Stockton from similar flooding to that which occurred on April 4, 2004.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Pecos	13070007
141000014	Develop a Colonia-wide Drainage System at Fort Hancock	Conduct surveys and drainage study to define flood areas, size 5th St crossing structures, develop H&H models, and propose FMPs. Address flooding at Hwy 20, Mustang Rd, and complete Supplemental Watershed Plans for Camp Rice Dam 1, Alamo Dam 3.	14014001, 14009002, 14009004, 14010001, 14010002	FMS ID: 142000003	FMS ID: 142000003 will follow as it develops a maintenance program for the improvements.	Hudspeth	13040100
141000015	Prioritize arroyos on their likelihood of producing sediment/ debris flows	Investigate uncontrolled arroyos that have created flood damages and high maintenance costs. Develop method to estimate relative production of sediment for uncontrolled arroyos and estimate added flood risk associated with drainage conveyance blockage.	14009001, 14009003, 14010001, 14010002	FME ID: 141000008; FMS ID: 142000016	FMS ID: 142000016 will follow as it develops solutions to reduce sediment in an arroyo identified in this FME. FME ID: 141000008 will follow as it utilizes the method for estimating sediment loads developed in this FME.	El Paso	13030102, 13040100, 13050003

Table 4A. Potential Flood Management Evaluations Identified by RFPG

FME ID	FME Name	Description	Associated Goals	Associated FME, FMS, or FMP	Associated FME, FMS, or FMP Description	Counties	HUC8s
141000018	Conduct flood risk assessment at El Paso locations where drainage is controlled by river stage, and there are significant flood risks on the non-river side of the levee.	Identify the Rio Grande outfalls that are most susceptible to blockage, and most likely to allow flood damage during periods of high river stage.	14009001, 14009003, 14004001	FMS ID: 142000017	FMS ID: 142000017 will follow as it uses results from this FME to develop solutions for conveyance of stormwater into the Rio Grande in El Paso County	El Paso	13030102, 13040100
141000019	Plan for mitigation of drainage controls where ground water reduces storm water conveyance capacity in the Montoya Drain	Perform H&H modeling to develop a FMP for increasing the capacity of Montoya Drain through measures to control groundwater intrusion into the drain.	14007003	N/A	N/A	El Paso	13030102
141000021	Develop city-wide drainage study and stormwater master plan for the City of Kermit.	Develop city-wide drainage study and stormwater master plan for Kermit. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Winkler	13070007
141000022	Develop solutions for flooding near Sierra Blanca	Develop drainage study and stormwater master plan for Sierra Blanca and surrounding ranches with access issues during floods. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Hudspeth	13040201
141000023	Develop city-wide drainage study and stormwater master plan for Alpine	Develop city-wide drainage study and stormwater master plan for Alpine. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002	141000036	Install Instrumentation to Enhance Estimate of Flood Risk for City of Alpine	Brewster	13070006
141000024	Develop Supplemental Watershed Plans for flood control dams protecting Sonora	Assess & evaluate rehabilitation improvements for 7 NRCS dams identified by TCEQ as "Hydraulically Inadequate". Define upgrades of dams in Supplemental Watershed Plans for Dry Devils & Lowry Dams 3, 4, 5, 7, 8, 10, & 12.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Sutton	13040301
141000025	Develop Supplemental Watershed Plans for flood control dams protecting Ozona	Assess & evaluate rehabilitation improvements for NRCS dam identified by TCEQ as "Hydraulically Inadequate". Define upgrades of dam in Supplemental Watershed Plans for Johnsons Draw SCS Site 7 Dam.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Crockett	13040301
141000026	Develop city-wide drainage study and stormwater master plan for Monahans/ Southwest Sandhill	Develop drainage study and stormwater master plan for City of Monahans and Southwest Sandhill Census Designated Place. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002	N/A	N/A	Ward, Winkler	13070007
141000033	Develop city-wide drainage study and stormwater master plan for City of Socorro	Develop city-wide drainage study and stormwater master plan for Socorro. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009001, 14009003, 14010001, 14010002	N/A	N/A	El Paso	13040100
141000034	Develop FMPs for additional projects in City of El Paso/El Paso Water Stormwater Master Plan	Develop all required datasets and models for 52 projects from the City of El Paso/El Paso Water Stormwater Master Plan to be recommended as FMPs in the Regional Flood Plan.	14009001, 14009003, 14010001, 14010002	N/A	N/A	El Paso	13030102, 13040100, 13050003
141000035	Develop FMPs for additional projects from the El Paso County Stormwater Master Plan	Develop all required datasets and models for 21 projects from the El Paso County Stormwater Master Plan to be considered as FMPs in the Regional Flood Plan.	14009001, 14009003, 14010001, 14010002	N/A	N/A	El Paso	13030102, 13040100, 13050003
141000036	Install Instrumentation to Enhance Estimate of Flood Risk for City of Alpine	Procure and install 5 stage gages and 6 precipitation gages in and upstream of the City of Alpine, Texas.	14014001, 14009002, 14009004, 14010001, 14010002	14100023	Develop city-wide drainage study and stormwater master plan for Alpine	Brewster	13070006

Table 4A. Potential Flood Management Evaluations Identified by RFPG

FME ID	FME Name	Study Type	FME Area (sqmi)	Flood Risk Type	Sponsor	Entities with Oversight	Emergency Need	Estimated Study Cost
141000001	Develop a plan for a Sediment and Vegetation Control Program in the Rio Grande at El Paso	Preparedness	110.7	Riverine	El Paso Water, El Paso County, EPCWID1	USIBWC, El Paso Water, El Paso County, Doña Ana County, Hudspeth County, EPCWID1	No	$ 107,000
141000002	Develop H&H Models for Cibolo Creek and arroyos through the City of Presidio, and develop an FMP for flood reduction of buildings and emergency access roadways.	Project Planning	10.2	Riverine	Presidio city, Presidio County	Presidio city, Presidio County, USIBWC, USACE	No	$ 183,000
141000003	Arroyo Siphon at SH20 near Tornillo	Project Planning	0.1	Riverine	El Paso County, EPCWID1, TXDOT	El Paso County, EPCWID1, TXDOT	No	$ 38,000
141000004	Lower Mesa Drain Improvements at El Paso	Project Planning	5.6	Urban/Local	El Paso Water, El Paso County, EPCWID1	El Paso Water, El Paso County, EPCWID1	No	$ 689,000
141000005	Develop solution for flooding of San Elizario historic district, and localized flooding in San Elizario and adjacent communities	Project Planning	7.3	Urban/Local	San Elizario city, El Paso County	San Elizario city, El Paso County	No	$ 73,000
141000006	Increase Storage Capacity of Fort Bliss Sump	Project Planning	0.7	Urban/Local	El Paso Water	U.S. Army, El Paso Water	No	$ 30,000
141000008	Sediment Control at Alamito and Terneros Creek	Project Planning	1621.9	Riverine	Presidio County	USIBWC, Presidio County	No	$ 111,000
141000010	Develop city-wide drainage study and stormwater master plan for Pecos	Project Planning	23.1	Urban/Local, Playa, Riverine	Pecos city, Lindsay CDP, Reeves County, TXDOT	Pecos city, Lindsay CDP, Reeves County, TXDOT	No	$ 92,000
141000012	Dam Improvements at Comanche Creek Reservoir at Fort Stockton	Project Planning	6.1	Urban,/Local, Riverine	Fort Stockton city, Pecos County	Fort Stockton city, Pecos County	Yes	$ 68,000
141000014	Develop a Colonia-wide Drainage System at Fort Hancock	Project Planning	22.0	Urban/Local, Riverine	Hudspeth County	Fort Hancock CDP, Acala CDP, Hudspeth County	Yes	$ 795,000
141000015	Prioritize arroyos on their likelihood of producing sediment/ debris flows	Preparedness	1011.0	Riverine	El Paso Water, El Paso County, EPCWID1	El Paso Water, El Paso County, EPCWID1	No	$ 70,000

Table 4A. Potential Flood Management Evaluations Identified by RFPG

FME ID	FME Name	Study Type	FME Area (sqmi)	Flood Risk Type	Sponsor	Entities with Oversight	Emergency Need	Estimated Study Cost
141000018	Conduct flood risk assessment at El Paso locations where drainage is controlled by river stage, and there are significant flood risks on the non-river side of the levee.	Preparedness	110.7	Urban/Local, Riverine	El Paso Water, El Paso County	El Paso Water, El Paso County	No	$ 70,000
141000019	Plan for mitigation of drainage controls where ground water reduces storm water conveyance capacity in the Montoya Drain	Project Planning	0.3	Urban/Local	El Paso Water, EPCWID1	El Paso Water, EPCWID1, Doña Ana County, EBID	No	$ 130,000
141000021	Develop city-wide drainage study and stormwater master plan for the City of Kermit.	Project Planning	2.5	Urban/Local, Playa	Kermit city, Winkler County	Kermit city, Winkler County	No	$ 75,000
141000022	Develop solutions for flooding near Sierra Blanca	Project Planning	4.8	Riverine	Hudspeth County	Hudspeth County	No	$ 76,000
141000023	Develop city-wide drainage study and stormwater master plan for Alpine	Project Planning	4.8	Urban/Local, Riverine	Alpine city, Brewster County	Alpine city, Brewster County	No	$ 233,000
141000024	Develop Supplemental Watershed Plans for flood control dams protecting Sonora	Project Planning	2.2	Riverine	Sonora city, Sutton County	Sonora city, Sutton County	Yes	$ 1,456,000
141000025	Develop Supplemental Watershed Plans for flood control dams protecting Ozona	Project Planning	4.6	Riverine	Ozona CDP, Crockett County	Ozona CDP, Crockett County	Yes	$ 1,456,000
141000026	Develop city-wide drainage study and stormwater master plan for Monahans/ Southwest Sandhill	Project Planning	36.1	Urban/Local, Playa	Monahans city, Southwest Sandhill CDP, Ward County	Monahans city, Southwest Sandhill CDP, Ward County	No	$ 104,000
141000033	Develop city-wide drainage study and stormwater master plan for City of Socorro	Project Planning	21.9	Urban/Local, Riverine	Socorro city, El Paso County	Socorro city, El Paso County	No	$ 73,000
141000034	Develop FMPs for additional projects in City of El Paso/El Paso Water Stormwater Master Plan	Project Planning	298.8	Urban/Local, Riverine	El Paso Water	El Paso Water	No	$ 1,288,000
141000035	Develop FMPs for additional projects from the El Paso County Stormwater Master Plan	Project Planning	711.1	Urban/Local, Riverine	El Paso County	El Paso County	No	$ 276,000
141000036	Install Instrumentation to Enhance Estimate of Flood Risk for City of Alpine	Project Planning	85.7	Urban/Local, Riverine	Alpine city, Brewster County	Alpine city, Brewster County	No	$ 94,400

Table 4A. Potential Flood Management Evaluations Identified by RFPG

FME ID	FME Name	Potential Funding Sources and Amount	Estimated number of structures at flood risk	Habitable structures at flood risk	Estimated Population at flood risk	Critical facilities at flood risk (#)	Number of low water crossings at flood risk (#)	Estimated number of road closures (#)	Estimated length of roads at flood risk (miles)	Estimated active farm & ranch land at flood risk (acres)	Existing or Anticipated Models (year)	Existing or Anticipated Maps (year)
141000001	Develop a plan for a Sediment and Vegetation Control Program in the Rio Grande at El Paso	Taxes, Water Use Fees, 50%	12341	10696	34727	16	2	20	228.13	26706.88	2222	2019
141000002	Develop H&H Models for Cibolo Creek and arroyos through the City of Presidio, and develop an FMP for flood reduction of buildings and emergency access roadways.	General Revenue, 20%	760	479	187	0	0	0	16.27	412.21	2008	1985
141000003	Arroyo Siphon at SH20 near Tornillo	Taxes, Water Use Fees, 50%	0	0	2126	0	0	0	0.25	10.93	2019	2019
141000004	Lower Mesa Drain Improvements at El Paso	Taxes, Water Use Fees, 50%	375	216	75	0	0	0	12.46	1474.78	2009	2019
141000005	Develop solution for flooding of San Elizario historic district, and localized flooding in San Elizario and adjacent communities	General Revenue / General Funds or Bonds or Tax notes, 25%	641	598	4364	1	0	0	10.39	1201.38	2019	2019
141000006	Increase Storage Capacity of Fort Bliss Sump	Revenue bonds, Cash Revenues, Credit, 0%	3766	2331	24444	45	2	82	150.70	666.10	2019	2018
141000008	Sediment Control at Alamito and Terneros Creek	Unknown	444	173	1599	0	24	132	46.96	28207.58	None	1985
141000010	Develop city-wide drainage study and stormwater master plan for Pecos	Unknown	2120	1240	2536	3	18	295	89.92	536.60	None	1985
141000012	Dam Improvements at Comanche Creek Reservoir at Fort Stockton	Unknown	169	111	7825	2	4	27	22.15	14.47	None	1985
141000014	Develop a Colonia-wide Drainage System at Fort Hancock	General Revenue, 0%	57	0	55754	0	9	9	5.02	2482.87	None	1985
141000015	Prioritize arroyos on their likelihood of producing sediment/ debris flows	Taxes, Water Use Fees, 50%	21373	16856	20411	37	132	841	607.25	48550.99	2019	2019

Table 4A. Potential Flood Management Evaluations Identified by RFPG

FME ID	FME Name	Potential Funding Sources and Amount	Estimated number of structures at flood risk	Habitable structures at flood risk	Estimated Population at flood risk	Critical facilities at flood risk (#)	Number of low water crossings at flood risk (#)	Estimated number of road closures (#)	Estimated length of roads at flood risk (miles)	Estimated active farm & ranch land at flood risk (acres)	Existing or Anticipated Models (year)	Existing or Anticipated Maps (year)
141000018	Conduct flood risk assessment at El Paso locations where drainage is controlled by river stage, and there are significant flood risks on the non-river side of the levee.	Revenue bonds, Cash Revenues, Credit, 0%	12341	10696	34914	16	2	20	228.13	26706.88	2021	2021
141000019	Plan for mitigation of drainage controls where ground water reduces storm water conveyance capacity in the Montoya Drain	Taxes, Water Use Fees, 50%	63	58	245	0	0	0	1.80	10.88	None	2019
141000021	Develop city-wide drainage study and stormwater master plan for the City of Kermit.	Unknown	1119	916	2152	1	0	5	31.63	2.67	None	1976
141000022	Develop solutions for flooding near Sierra Blanca	General Revenue, 0%	36	13	75	0	4	28	7.81	5.53	None	1985
141000023	Develop city-wide drainage study and stormwater master plan for Alpine	Unknown	1640	1181	4367	6	18	199	38.03	49.91	None	1985
141000024	Develop Supplemental Watershed Plans for flood control dams protecting Sonora	Unknown	682	419	1106	2	20	97	14.98	0.36	None	1989
141000025	Develop Supplemental Watershed Plans for flood control dams protecting Ozona	Unknown	944	661	1599	4	29	144	19.76	1.86	None	1973
141000026	Develop city-wide drainage study and stormwater master plan for Monahans/ Southwest Sandhill	Dedicated Revenue, 10%	1222	92	2550	1	0	38	51.27	57.44	None	1988
141000033	Develop city-wide drainage study and stormwater master plan for City of Socorro	General Funds or Bonds or Tax notes, 55%	2578	2267	7825	0	0	0	43.73	3083.54	2019	2019
141000034	Develop FMPs for additional projects in City of El Paso/El Paso Water Stormwater Master Plan	Revenue bonds, Cash Revenues, Credit, 0%	13881	10736	55807	26	51	614	374.95	6056.93	2019	2019
141000035	Develop FMPs for additional projects from the El Paso County Stormwater Master Plan	General Funds or Bonds or Tax notes, 5%	7480	6117	20421	10	81	224	228.22	42408.64	2021	2021
141000036	Install Instrumentation to Enhance Estimate of Flood Risk for City of Alpine	Unknown	1877	1181	4684	5	35	822	44.74	1762.48	None	1985

Appendix 4B
Narratives of Potential Flood Management Evaluations

Appendix 4B. Narratives for Flood Management Evaluations

4B-1. Flood Management Evaluation ID: 141000001

Name: Develop a plan for a Sediment and Vegetation Control Program in the Rio Grande at El Paso.

Description: Assess Rio Grande capacity in El Paso County considering updated hydrology, sediment, and vegetation conditions. Establish maintenance program with minimum risk-based channel capacity. Address maintenance agreements between the U.S. and Mexico. Assess risks in El Paso and Hudspeth Counties associated with varying levels of Rio Grande channel maintenance.

Affected Jurisdiction: City of El Paso, El Paso County, Hudspeth County, Doña Ana County

Discussion on Flood Risk: The Rio Grande through El Paso County has an alluvial bed subject to progressive deposition of sediments on river banks and within the channel (eventually forming islands). High vegetation grows on these deposits, limiting channel capacity during floods. A 2019 study by the Joint Committee on Rio Grande Project Flood Risk (JCRGPFR) [Elephant Butte Irrigation District (EBID), El Paso Water, and El Paso County Water Improvement District No. 1 (EPCWID1)] developed a hydraulic model (HEC-RAS) of the Rio Grande from Anthony to American Dam. This model simulation, based upon detailed survey of sediment and vegetation conditions in 2018, included these conclusions:

> “1) The HEC-RAS simulations showed that there are multiple locations within the study area where flow rates which are significantly less than the reported 100 year flood flow will result in water overflowing from the Rio Grande and potentially flooding large areas of the Mesilla Valley. Once water escapes the Rio Grande the water cannot return until after it has flowed through neighborhoods, schools, and business areas and reaches the outlet of the Montoya drainage channel which returns the water to the Rio Grande 2 miles upstream of the American Dam.
>
> 2) The obstruction of the main channel by vegetated sandbars increases the flow depth in both normal and flood conditions. The rate of growth of the surface area of the vegetated sandbars in the main channels was 45% from 2016 to 2018. The growth in the median size (acres) of vegetated island was 125%.
>
> 3) The increased sediment in the main channel of the Rio Grande results in increased sediment load in the water diverted from the Rio Grande and the American Canal and delivered to the irrigated lands and water treatment facilities in the El Paso Valley. The cost to EPCWID1 and the City of El Paso for the annual removal of sediment from the Franklin and Riverside canals and from the settling ponds of the Jonathan Rogers Water Treatment Plant has increased significantly in the last 20 years and has resulted in an increase in annual maintenance and construction cost of over $2 million per year.”

Since this study, significant effort has been made by the U.S. International Boundary and Water Commission (USIBWC) to remove sediment and vegetation and restore river hydraulic capacity. The purpose of this Flood Management Evaluation (FME) is to establish a plan by which the Texas stakeholders (El Paso Water, EPCWID1, and El Paso County) can provide proactive action to identify and promote the addressing of any future loss of design hydraulic capacity of the river through El Paso County.

Flood Management Evaluation Scope of Work:

The sponsors for this FME will be the public stakeholders in El Paso County that manage flood-related infrastructure affected by Rio Grande capacity: El Paso Water, EPCWID1, and El Paso County.

The scope of work (SOW) for the FME will include these tasks.

Task 1 - Data Collection. Data will be collected that is relevant to the estimation of current and future hydraulic capacity of the Rio Grande through El Paso County. This will include assembly and processing of the most recent survey, LiDAR and satellite image data. In addition, an updated hydrologic and hydraulic (H&H) model for the Rio Grande is expected to be issued by the USIBWC during the period following the issuance of the draft Upper Rio Grande Regional Flood Plan (URGRFP). This model is expected to show substantive differences in riverine hydrology (i.e., river design flood flowrates) versus the hydrology used in the 2019 JCRGPFR flood study cited above. New conditions expected to lead to the change are recent changes in estimated statistical rainfall and reductions in access of riverine floods into the riverine terrace beyond the levees. This model and its report will be reviewed and its changes incorporated into the FME planning.

Task 2 - Engineering Analysis of Existing Conditions. **Exhibit Map 19.01** of *Chapter 5* depicts the FME area (based upon Rio Grande Natural Valley flood extents) and the local watersheds associated with the two-dimensional hydraulic model domains used in the El Paso County Interior Drainage Analysis (AECOM , 2021). The new USIBWC model will be reviewed, adjusted as needed to reflect current data, and prepared for use in FME planning. In addition:

- The historic data presented in the 2019 report will be analyzed to estimate the historic range of annual increases in sediment deposition within the Rio Grande through El Paso County, with explanation for years with extreme high and low rates of deposition.
- The current capacity of the river versus federal levee design requirements will be noted.
- The excess flood capacity over design capacity in the river reach through El Paso, if any, will be noted and quantified in terms of excess flood conveyance volume in the subject reach.
- This volume will be compared to the range of historic annual sediment depositions
- Assumptions in the new USIBWC model will be reviewed to identify any revised assumptions that the FME sponsors want to consider in developing riverine flood capacity targets.

Task 3 - Alternatives Development. Alternatives will be developed for target minimum river cross-sections to be maintained that protect the reach of the river within El Paso County from flood damages. Alternatives will vary by:

- Target minimum flow capacity criteria (e.g., federal levee design standards, 500-year flood, 100-year flood, amount of freeboard over design flood level, overtopping flow);
- How to consider likelihood periods when Rio Grande releases from upstream USBR dams are raised to lower reservoir levels;
- Level of instrumentation to be installed on/adjacent to the river;
- Estimated rate of future sediment deposition for use in planning; and
- How to apply any revised model assumptions that the plan sponsors wish to consider.

Task 4 - Alternatives Selection. Alternatives will be developed for a proposed strategy for: 1) ongoing monitoring of river flow capacity, 2) future recommendations to USIBWC as to flow capacity status, and 3) a future communications plan with USIBWC on this issue. A workshop will be held with plan stakeholders to develop criteria for alternative selection and to select an alternative based on those criteria.

Task 5 - Report. A report will present the plan for future sponsor interaction with USIBWC over Rio Grande capacity through El Paso County. The report will document the data and process for plan development. A Flood Mitigation Project (FMP)will be developed for installation of added riverine instrumentation. The FMP will be developed consistent with Texas Water Development Board (TWDB) criteria for FMPs. Full Regional Flood Plan (RFP)-required data for the FMP will be developed.

Task 6 - Stakeholder Coordination. It is assumed that bi-weekly meetings will take place with affected stakeholders such as the City of El Paso, El Paso County, EBID, EPCWID1, and USIBWC, since the selected alternative will potentially affect flooding issues, maintenance, and/or operating procedures managed by these different entities.

Estimated Cost for FME:

Labor Cost	
Task 1 – Data Collection	$ 16,820
Task 2 – Existing Condition Engineering Analyses	$ 15,140
Task 3 – Alternatives Development	$ 36,850
Task 4 - Alternatives Selection	$ 11,860
Task 5 – Report	$ 17,210
Task 6 – Stakeholder Coordination	$ 9,520
Total Project Labor	**$ 107,400**
Travel	**$ -**
Total FME cost	**$ 107,000**

4B-2. Flood Management Evaluation ID: 141000002

Name: Develop H&H Models for Cibolo Creek and arroyos through the City of Presidio, and develop an FMP for flood reduction of buildings and emergency access roadways.

Description: Develop H&H models for Cibolo Creek and the City of Presidio arroyos to evaluate flood risk. Develop FMPs, an interior drainage analysis for east Cibolo Creek levee, and a coincident storm analysis for Cibolo Creek, the Rio Conchos, and the Rio Grande.

Affected Jurisdictions: City of Presidio, Presidio County

Discussion on Flood Risk: The City of Presidio is an incorporated area in Presidio County. Approximate modeling performed as a task for the RFP identified over 650 structures at risk in the 1% Annual Chance (AC) flood within the City of Presidio, assuming the Cibolo Creek levees (which are not certified) are absent. Extent of 1% AC flood risk is depicted in **Exhibit Map 15 (Map 1 of 31)**. The City of Presidio Comprehensive Plan 2020-2030 (Kleinman, 2020) provides a concept for future drainage infrastructure to address flooding associated with the smaller arroyos east of Cibolo Creek. Fifteen new stormwater detention ponds are proposed in the Plan.

Flood Management Evaluation Scope of Work:

The Flood Management Evaluation (FME) for City of Presidio will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. Flood Management Strategy (FMS) ID: 142000008 (which includes developing a levee certification package) will follow this FME, as a requirement for levee certification by the Federal Emergency Management Agency (FEMA) is an interior drainage study which will be conducted as part of this FME. The SOW for the FME will include these tasks.

Task 1 - Data Collection. Cibolo Creek - Engineering reports on Cibolo Creek by the United State Army Corps of Engineers (USACE) or other sources will be reviewed, to include review of previous assumptions concerning coincidence of Rio Conchos/Rio Grande/Cibolo Creek flooding. The 63.6 square mile watershed of Cibolo Creek is shown in **Exhibit Map 19.02** of *Chapter 5*. Historic data will be collected from previous reports available through public data sources to identify and characterize historic extreme events. Spatial rainfall data will be collected to facilitate model replication of selected extreme event(s). Data will be collected from local residents or entities with drainage oversight to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

Arroyos east of Cibolo Creek - The City of Presidio 2020 Comprehensive Plan includes updated proposed flood improvements based upon 2008 H&H modeling of existing conditions with existing and future land use, developed as part of the “Final Hydraulic Report/Drainage Study for the City of Presidio, Texas" (S&B Infrastructure, LTD). The available hydraulic modeling in the 2008 analysis consists of HY-8 culvert analyses only, and does not include hydraulic models of floodplains through the study area. Basic hydrologic information (watershed topography, rainfall statistics, current land use) will be developed per the most recent data sources.

Task 2 - Engineering Analysis of Existing Conditions. Cibolo Creek - A coincident flood analysis will be performed for flooding on the Rio Conchos, Rio Grande, and Cibolo Creek. A hydrologic model will be developed for the Cibolo Creek watershed. A hydraulic model for Cibolo Creek will be developed for the reach including City of Presidio, the existing levee, and critical local routes. It is expected that the levee will contain the 1% AC flood per the National Levee Database.

Arroyos east of Cibolo Creek (see Figure below) - The City of Presidio 2020 Comprehensive Plan modeling will be reviewed and updated to reflect existing conditions and current rainfall statistics. Hydraulic models will be developed for floodplains flowing through the City of Presidio, and floodplains will be mapped assuming the Cibolo Creek levees are in place and the Rio Grande levees are not in place. As a requirement for levee certification of the Cibolo Creek levees in FMS ID: 142000008, which includes levee certification of the left (east) Cibolo Creek levee, an interior drainage analysis will be required per §65.10 in Title 44 of the Code of Federal Regulations (CFR). That interior drainage analysis will be performed as part of the floodplain modeling and mapping associated with this FME.

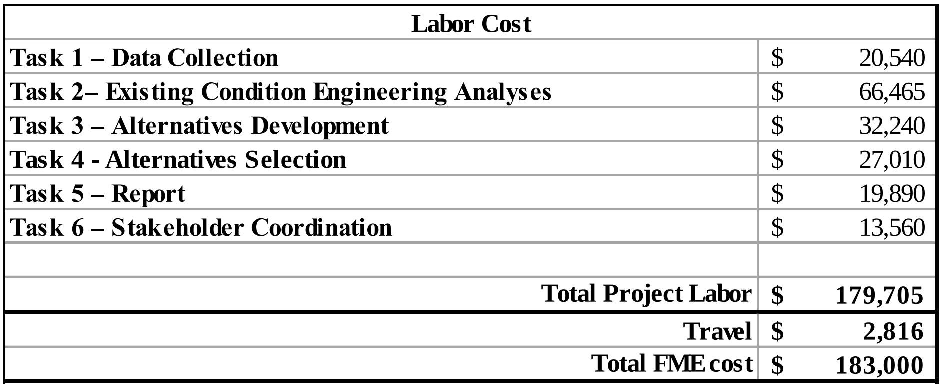
Task 3 - Alternatives Development. Alternatives in the Comprehensive Plan will be reviewed and edited as needed to provide improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, nature-based solutions, etc.). Plan concept design(s) and cost estimate(s) will be reviewed and revised as needed for structural alternatives (e.g., detention basins). Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative. Alternatives for Cibolo Creek in the City of Presidio area are not expected to be required, although upland restoration would benefit incised segments of the creek with diminished storage capacity.

Task 4 - Alternatives Selection. Structural and non-structural FMPs will be selected for inclusion in a future RFP using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMPs will be developed.

Task 5 - Report. A report will be generated for presentation to the sponsors providing documentation of the proposed FMP.

Task 6 - Stakeholder Coordination. It is assumed that up to four virtual coordination meetings will take place with affected stakeholders such as the City of Presidio, Presidio County, USACE, and USIBWC since the selected alternative will potentially affect flood infrastructure owned, designed, maintained, and/or operated by different entities.

Estimated Cost for FME:



Labor Cost		
Task 1 – Data Collection	$	20,540
Task 2– Existing Condition Engineering Analyses	$	66,465
Task 3 – Alternatives Development	$	32,240
Task 4 - Alternatives Selection	$	27,010
Task 5 – Report	$	19,890
Task 6 – Stakeholder Coordination	$	13,560
Total Project Labor	**$**	**179,705**
Travel	**$**	**2,816**
Total FME cost	**$**	**183,000**

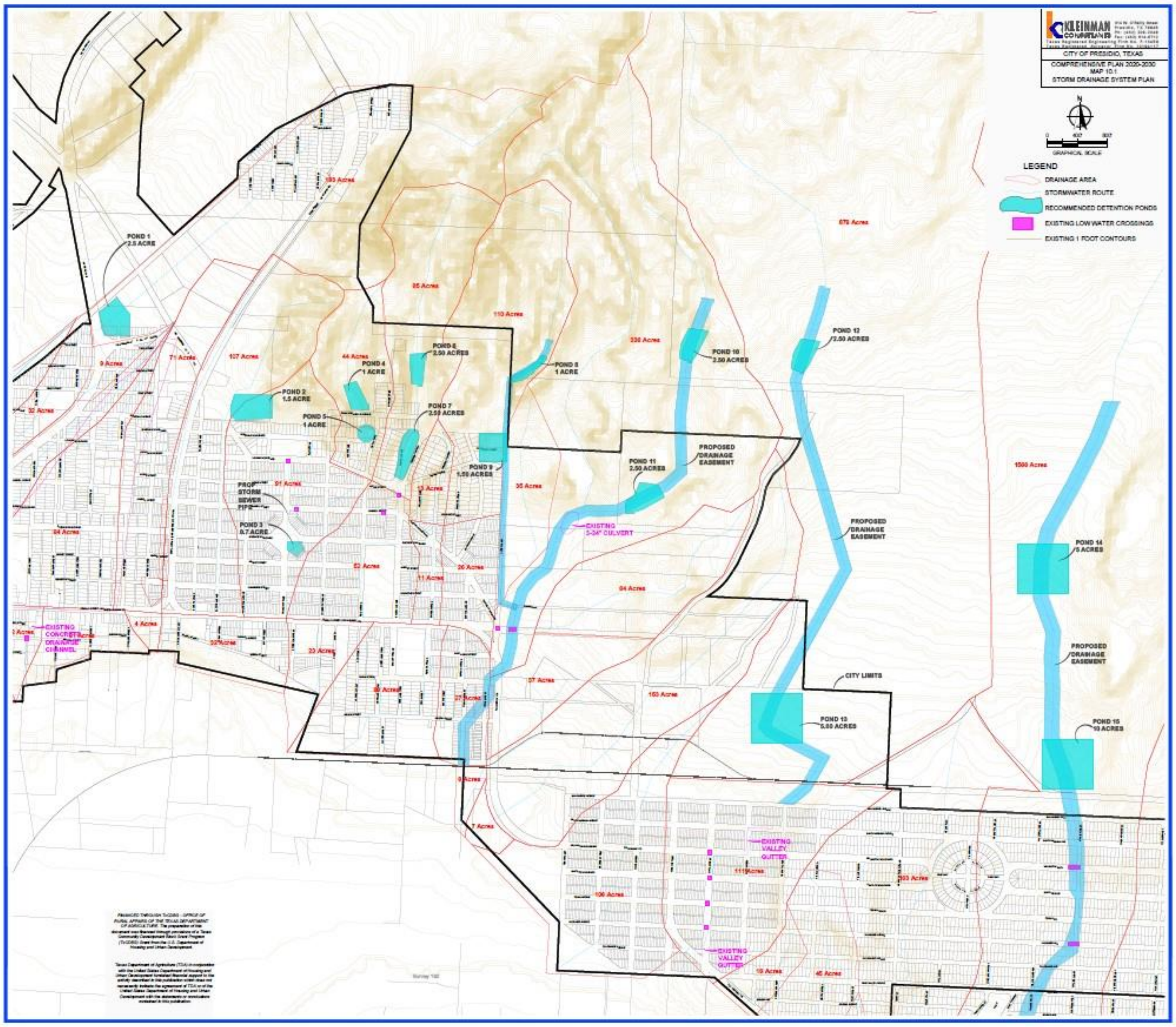


Figure 4B-2. Proposed Project Locations Figure from City of Presidio Comprehensive Plan 2020-2030 (Kleinman, 2020)

4B-3. Flood Management Evaluation ID: 141000003

Name: Arroyo Siphon at State Highway (SH) 20 near Tornillo.

Description: Coordinate with Texas Department of Transportation (TXDOT) to install siphon at SH20 to prevent road from overtopping and stormwater from entering EPCWID1 canal system.

Affected Jurisdictions: El Paso County

Discussion on Flood Risk: Floods from an unnamed arroyo in El Paso County located approximately 4.5 miles southeast of the Census Designated Place, Tornillo, with a watershed area of 6.7 square miles routinely causes interruptions of traffic along SH20 and conveys sediment into the Tornillo Canal and pecan orchards located south of SH20. This watershed is shown in **Exhibit Map 19.03** of *Chapter 5*.

Flood Management Evaluation Scope of Work:

The FME for the unnamed arroyo near Tornillo crossing of SH20 will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

Task 1 - Data Collection. Field survey data will be collected at the crossing and in the area downstream of the crossing to the Tornillo Canal. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

Task 2 - Existing Condition Engineering Analysis. A hydrologic model will be developed for the 6.7 square mile Bianca Draw watershed. A hydraulic model will be developed for the flows overtopping SH20, entering the Tornillo Canal, and exceeding the capacity of the Tornillo Canal, which runs parallel to SH20, immediately downstream (southwest) of the roadway.

Task 3 - Alternatives Development. Alternatives will be developed for improved performance of SH20 and the Tornillo Canal during floods, and reduction of risk to downstream agricultural land. Concept design(s) and cost estimate(s) will be developed for structural alternatives, which will likely include a debris basin with limited flood pool, and a siphon under SH20 and the Tornillo Canal. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative. Alternatives will involve measures outside of the TXDOT right-of-way.

Task 4 - Alternatives Selection. An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

Task 5 - Report. A report will be generated for presentation to the Regional Flood Planning Group (RFPG) and TWDB providing documentation of the proposed FMP.

Task 6 - Stakeholder Coordination. It is assumed that two virtual coordination meetings will need to take place with EPCWID1 and TXDOT since the selected alternative will improve sediment and flooding issues on the TXDOT-owned roadway (SH20) and the EPCWID1-owned Tornillo Canal.

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	3,200
Task 2– Existing Condition Engineering Analyses	$	8,635
Task 3 – Alternatives Development	$	10,220
Task 4 - Alternatives Selection	$	6,070
Task 5 – Report	$	6,225
Task 6 - Stakeholder Coordination	$	3,460
Total Project Labor	**$**	**37,810**
Travel	**$**	**-**
Total FME cost	**$**	**38,000**

4B-4. Flood Management Evaluation ID: 141000004

Name: Lower Mesa Drain Improvements at El Paso.

Description: Assess capacity of upstream reservoirs; develop detailed hydraulic model of Lower Mesa Drain to design 30+ culvert improvements; assess capacity of Mesa Drain to accept runoff without impacting downstream agricultural property.

Affected Jurisdictions: The City of El Paso, City of Socorro, and El Paso County.

Discussion on Flood Risk: The study will evaluate existing conditions and proposed improvements to infrastructure in the Mesa Spur Drain, Mesa Drain, and Fabens Waste Channel. These drains are currently designed primarily for the groundwater drainage of surrounding agricultural fields, but are currently used as flood mitigation infrastructure during storm events in the El Paso County Lower Valley. The drainage watershed includes urban, suburban, agricultural, and desert range land. Approximately 40 ephemeral drainage paths (arroyos) discharge water and sediment into the Mesa Drain/Fabens Channel system. Increased industrial development within the portions of the watershed adjacent to Interstate Highway (IH) 10 have increased the volume of runoff and reduced the time-of-concentration of flows. Stormwater intake during major storm events exceeds design capacity, leading to overflow, breaking, and flooding of surrounding streets, homes, businesses, and agricultural fields.

Flood Management Evaluation Scope of Work:

The purpose of this FME is to develop a FMP for increasing the capacity of Mesa Drain through measures to improve conveyance capacity of road crossings and channel expansion. The SOW for the FME will include these tasks.

Task 1 - Data Collection. This task includes:

- Land surveying of approximately 31.4 miles of drain with right of way varying from 80 feet to 120 feet. Tasks include LiDAR and aerial images collection, field observations, measurements, and a review of historical records of the drain system necessary for the development of preliminary engineering designs and H&H studies.
- Structure surveying and hydraulic assessment includes reviewing existing road crossings, including approximately 45 culverts, 10 flumes, 7 free-span bridges, utilities, O&M roads, and other appurtenances.

Task 2 - Existing Condition Engineering Analyses. H&H modeling will be performed to estimate Drain hydraulic capacity throughout Mesa Drain, Mesa Spur Drain, and Fabens Waste Channel. **Exhibit Map 19.04** of *Chapter 5* depicts the local watershed.

Task 3 - Flood Mitigation Project Development. H&H modeling will be performed to estimate system changes to establish a uniform 1% AC hydraulic capacity. Preliminary engineering design work will include developing concept-level plans for the proposed drain lengths and for any upgrades needed on culverts, drain gates, floodway headings, and intake and waste structures. This task includes preliminary environmental and compliance work necessary for developing documents that adhere to Federal, state, and local laws, regulations, and codes, as applicable. The task also includes defining the FMP per TWDB guidance to facilitate inclusion in the URGRFP.

Task 4 - Report. A report will be generated that provides technical backup for the proposed FMP in accordance with TWDB guidance.

Task 5 - Stakeholder Coordination. It is assumed that monthly virtual coordination meetings will take place with EPCWID1 and with other affected stakeholders as needed (e.g., El Paso Water, City of Socorro, etc.) since the selected alternative will improve sediment and flooding issues for multiple entities.

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	256,409
Task 2 – Existing Condition Engineering Analyses	$	78,720
Task 3 – Flood Mitigation Project Development	$	252,665
Task 4 – Report	$	60,800
Task 5 – Stakeholder Coordination	$	40,200
Total Project Labor	**$**	**688,794**
Travel	**$**	**-**
Total FME cost	**$**	**689,000**

4B-5. Flood Management Evaluation ID: 141000005

Name: Develop stormwater master plan (SWMP) for City of San Elizario.

Description: The SWMP includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address that risk.

Affected Jurisdiction: City of San Elizario, El Paso County

Description of Flood Risk. The City of San Elizario is an incorporated area in El Paso County. Per recent modeling of flood risk within El Paso County, there are over 500 structures at risk within San Elizario from the 1% AC flood, with an additional 800 structures at risk for the same flood within populated areas adjacent to San Elizario. See **Exhibit Map 15 (Map 12 of 31)** for a depiction of the flood risk.

Flood Management Evaluation Scope of Work:

The FME for the City of San Elizario and adjacent populated areas will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

Task 1 - Data Collection. Data will be collected from local residents to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Spatial rainfall data will be collected to facilitate model replication of the August, 2022 event. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

Task 2 - Engineering Analysis of Existing Conditions. A hydrologic model will be developed for the area watershed. A 2-D hydraulic model for San Elizario will be developed for the incorporated area and adjacent populated areas. Existing flood damages will be assessed per TWDB guidance. **Exhibit Map 19.05** of *Chapter 5* depicts the relevant watershed.

Task 3 - Alternatives Development. Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

Task 4 - Alternatives Selection. An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

Task 5 - Report. A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

Task 6 – Stakeholder Coordination

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	9,900
Task 2– Existing Condition Engineering Analyses	$	12,075
Task 3 – Alternatives Development	$	22,340
Task 4 - Alternatives Selection	$	11,250
Task 5 – Report	$	10,770
Task 6 – Stakeholder Coordination	$	6,760
Total Project Labor	**$**	**73,095**
Travel	**$**	**-**
Total FME cost	**$**	**73,000**

4B-6. Flood Management Evaluation ID: 141000006

Name: Increase Storage Capacity of Fort Bliss Sump

Description: Excavate Fort Bliss Sump while avoiding newly delineated wetland to increase storage capacity of sump. Requires continued coordination with U.S. Army due to project location on Fort Bliss.

Affected Jurisdiction: City of El Paso, Fort Bliss

Description of Flood Risk. The City of El Paso is an incorporated area in El Paso County, and Fort Bliss is a United States Army post in northeast El Paso, extending into New Mexico. Fort Bliss Sump is located on Fort Bliss property; however, El Paso Water is able to access the sump for maintenance purposes. Per recent modeling of flood risk within El Paso County, there are over 2,300 structures at risk from the 1% AC flood within the Fort Bliss Sump Drainage System, which is a drainage system originally delineated as part of the City of El Paso Stormwater Master Plan (URS, MCi, 2009). See **Exhibit Map 19.06** for a depiction of the contributing drainage system and flood risk.

Flood Management Evaluation Scope of Work:

The FME for Fort Bliss Sump will develop and select an FMP alternative for the extent and volume of excavation needed for mitigation of the identified flood risk. The SOW for the FME will include these tasks.

Task 1 - Data Collection. This project was originally identified by El Paso Water in the 2015 time frame. A high level drainage assessment was performed by MCi for El Paso Water in 2015; however, the evaluation was never documented in the form of a memorandum or report, and further study was put on hold pending a wetland delineation by the U.S. Army. The U.S. Army has recently provided to El Paso Water a recent wetland delineation report (Study ID: 93), dated July 2021. A hydrologic model of this drainage system was developed for the City of El Paso Stormwater Master Plan (URS, MCi, 2009), but the effective FEMA model is based upon a more recent Letter of Map Change (LOMC) approved by the Federal Emergency Management Agency (FEMA), Case No. 18-06-0885P. This “Northeast LOMC” was developed using a HEC-HMS hydrologic model and a FLO-2D hydraulic model with point discharge hydrographs from the HEC-HMS results applied to the 2D hydraulic model as inputs. In addition, hydrologic and hydraulic models are currently being developed by El Paso Water for Tobin Drain and Diana Ditch, which both contribute to Fort Bliss Sump. If these models are available at the time this study begins, they would likely be the best available models to assess existing conditions; however, these models, along with the 2009 hydrologic model and the Northeast LOMC hydrologic and hydraulic models will be reviewed and compared as part of the data collection phase to select the most appropriate an accurate models to use as the starting point for assessing existing flood conditions affected by the capacity of Fort Bliss Sump.

Task 2 - Existing Condition Engineering Analyses. A hydrologic model will be developed for the area watershed. One dimensional and/or two dimensional hydraulic models will be developed for the contributing area to Fort Bliss Sump, depending on which of the previously developed models are deemed most appropriate to use as base models. Existing flood damages will be assessed per TWDB guidance.

Task 3 - Alternatives Development. Alternatives will be developed for the extent and volume of excavation needed in Fort Bliss Sump for the mitigation of the identified flood risk. As part of the high level assessment performed by MCi in 2015, a concept-level cost estimate for $19.5 million was developed by MCi in September 2015. Concept design(s) and cost estimate(s) will be developed/refined for structural alternatives as part of this FME. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

Task 4 - Report. A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	3,960
Task 2 – Existing Condition Engineering Analyses	$	12,075
Task 3 – Alternatives Development	$	4,740
Task 4 – Report	$	6,550
Task 5 – Stakeholder Coordination	$	2,560
Total Project Labor	**$**	**29,885**
Travel	**$**	**-**
Total FME cost	**$**	**30,000**

4B-7. Flood Management Evaluation ID: 141000008

Name: Sediment Control at Alamito and Terneros Creek

Description: Design sediment control structures on Alamito Creek and Terneros Creek upstream of confluence with the Rio Grande to reduce sediment in the Rio Grande and reduce USIBWC maintenance burden.

Affected Jurisdiction: City of Presidio, Presidio County

Description of Flood Risk. Alamito Creek and Terneros Creek drain watersheds of 1500 square miles and 230 square miles within Presidio, Jeff Davis, and Brewster Counties. The watershed is shown in Map 16.08. These natural arroyos convey large volumes of sediment into the Rio Grande, raising the river bed in the vicinity of the City of Presidio, exacerbating flooding in that city. This FE develops solutions to address this issue. See **Exhibit Map 19.08** for a depiction of the contributing drainage areas and flood risk.

Flood Management Evaluation Scope of Work:

This FMS has the goal of developing structural and non-structural solutions for control of sediment inflow into the Rio Grande from Alamito Creek and Terneros Creek. This FME is necessarily preceded by FME 141000015 (which provides a method for estimation of annual sediment loadings for regional arroyos) and FMS 142000016 (which provides a set of erosion control solutions reviewed and recommended by the RFPG). FMS ID: 142000006 will follow this FME as it considers updated sediment loads into the Rio Grande from Alamito and Terneros Creeks for recommended environmental flows through the Rio Conchos and the Rio Grande.

The Scope of Work (SOW) for this FME includes five tasks.

Task 1 - Estimation of existing condition sediment loadings. This task includes:

- Review of past studies of Alamito Creek and Terneros Creek
- Assembly of GIS data, to include historic LiDAR data for the two arroyos.
- Estimation of annual and event-based sediment loadings per literature review and method developed in FME 141000015
- Use of historic LiDAR data (and maintenance data) to estimate changes in bed elevations and sediment volume between dates of LiDAR.

Task 2. Alternatives Development. Alternatives will be developed for control of sediment within each of the two watersheds, per RFPG-approved guidelines presented in FMS 142000016. Alternatives will be developed which present a range of sediment volume controlled versus construction costs and benefits/ costs to the environment. Maintenance costs for sustaining the benefits will be presented.

Task 3 - Workshop to review initial alternatives. The workshop with RFPG-defined stakeholders will review and discuss the conceptual designs developed as part of Task 2. The goals of the workshop will be to select alternative(s) for development into FMPs.

Task 4 - Define FMPs and FMSs to improve sediment controls on the two creeks. The concept designs selected for each creek will be refined and aggregated as two FMPs (one for Alamito Creek, one Terneros Creek). FMPs will conform to TWDB guidance. The SOWs for non-structural solutions will be combined into a single FMS.

Task 5 - Develop report. The report will include documentation of Tasks 1-4.

Task 6 - Stakeholder Coordination.

Estimated Cost for FME:

Labor Cost		
Task 1 – Estimation of Existing Condition Sediment Loadings	$	20,220
Task 2 – Alternatives Development	$	19,780
Task 3– Workshop to review initial alternatives	$	11,140
Task 4 – Define FMPs and FMSs to improve sediment controls on 2 creeks	$	41,440
Task 5 – Report	$	10,580
Task 6 – Stakeholder Coordination	$	7,900
Total Project Labor	**$**	**111,060**
Travel	**$**	**-**
Total FME cost	**$**	**111,000**

4B-8. Flood Management Evaluation ID: 141000010

Name: Develop city-wide drainage study and stormwater master plan for Pecos.

Description: Develop city-wide drainage study and stormwater master plan for City of Pecos and adjacent Lindsay Census Designated Place. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.

Affected Jurisdictions: City of Pecos, Lindsay Census Designated Place (CDP), Reeves County

Discussion on Flood Risk: The City of Pecos incorporated area is located adjacent and to the north of Lindsay CDP in Reeves County. For the 1% AC flood, per mapping performed for the RFP, the floodplain potentially causes damage to over 1,900 structures and restricts travel. Extent of 1% AC flood risk is depicted in **Exhibit Map 15 (Map 3 of 31)**. As part of the public outreach effort, a public roadshow meeting was held in the City of Pecos on February 9, 2022. Approximate flood inundation maps were presented to local flood-related entities, who confirmed that flooding throughout large areas can be a problem due to the extremely flat topography and raised embankments of roadways and railroads, which sometimes re-direct runoff. A playa lake known as Mosquito Lake was also confirmed to be present southeast of the City of Pecos. As part of a recent RFPG effort to aid the City in the development of an FMP, data have been collected and analyzed from local rainfall gages. A meeting with the City has captured experience with recent flood events and identified areas of priority flood risk concern. In addition, a watershed hydrologic model has been developed, and a 2D hydraulic model has been developed. Insight from these studies has shown that estimation of flood risk associated with Cottonwood Creek requires detailed hydrologic model calibration. This model calibration is included in the scope of work of FMP 141000119.

Flood Management Evaluation Scope of Work:

The FME for the City of Pecos will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. FMS ID: 142000007 will follow this FME, as it addresses flood-related saltcedar issues in the City of Pecos which may benefit from knowing the locations of existing flood hazards relative to saltcedar growth. The SOW for the FME will include the following tasks.

Task 1 - Data Collection. Flood waters in the City of Pecos primarily arise from two sources: 1) the Pecos River watershed below Red Bluff Dam (approximately 2,500 square miles) and tributaries to the Pecos River from the west, e.g., Cottonwood Creek (watershed exceeding 674 square miles). This latter 674 square mile watershed is shown in **Exhibit Map 19.10** of *Chapter 5*. Flood risk in the City of Pecos is strongly influenced by the potential coincidence of major floods from these two watersheds. Data collection will include:

- Stage and flow data will be collected from the USGS gages on the Pecos River upstream and downstream of the City of Pecos.
- Data will be collected from local residents and/or entities with drainage oversight to: 1) identify the primary critical route(s) that have been inundated; 2) collect locations of

physical HWMs or anecdotal flood depths at known locations; and 3) solicit ideas for potential solutions.

- Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling.
- Historic spatial rainfall data will be collected to replicate a selected recent event on Pecos River Lateral No. 1.
- Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

Task 2 - Existing Condition Engineering Analysis. A hydrologic model will be developed for the Pecos River Lateral No. 1 watershed. Potential coincident flood hydrographs on the Pecos River will be developed based upon Pecos River USGS gage data. Existing flood damages for coincident flood scenarios will be assessed per TWDB guidance.

Task 3 - Alternatives Development. Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

Task 4 - Alternatives Selection. FMPs for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. Alternatives for diverting flood sources from the west toward the playa located southeast of the City of Pecos (Mosquito Lake) will be considered and evaluated for no negative impact. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMPs will be developed.

Task 5 - Report. A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMPs.

Task 6 - Stakeholder Coordination. It is assumed that up to four virtual coordination meetings will take place with affected stakeholders such as the City of Pecos, Lindsay CDP, Reeves County, and TXDOT, since the selected alternative will potentially affect flood infrastructure owned, designed, maintained, and/or operated by different entities.

Estimated Cost for FME:

Labor Cost	
Task 1 – Data Collection	$ 14,030
Task 2– Existing Condition Engineering Analyses	$ 22,070
Task 3 – Alternatives Development	$ 23,660
Task 4 - Alternatives Selection	$ 12,500
Task 5 – Report	$ 9,970
Task 6 – Stakeholder Coordination	$ 8,440
Total Project Labor	**$ 91,000**
Travel	**$ 1,440**
Total FME cost	**$ 92,000**

4B-9. Flood Management Evaluation ID: 141000012

Name: Dam Improvements at Comanche Creek Reservoir at Fort Stockton.

Description: Inspect and evaluate rehabilitation improvements for Comanche Creek Reservoir to protect Fort Stockton from similar flooding to that which occurred on April 4, 2004.

Affected Jurisdictions: City of Fort Stockton, Pecos County

Discussion on Flood Risk: The City of Fort Stockton is an incorporated area in Pecos County, and Comanche Creek Dam is located immediately upstream of the city, to the southeast. On April 4, 2004, a rare early morning severe weather event hit Fort Stockton area, and Comanche Creek, which is downstream of the Comanche Creek Dam, was one of the worst flooding areas in Fort Stockton. Comanche Creek runs through James Rooney Memorial Park, which had multiple feet of flooding. Best available floodplain mapping in the area identified over 160 structures at risk in the 1% AC flood within Fort Stockton. Extent of 1% AC flood risk is depicted in **Exhibit Map 15 (Map 26 of 31)**. In addition, Comanche Creek Dam has been identified by the Texas Commission on Environmental Quality (TCEQ) as being in poor condition and hydraulically inadequate.

Flood Management Evaluation Scope of Work:

The FME for City of Fort Stockton will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

Task 1 - Data Collection. Historic data will be collected from previous reports available through public data sources to identify and characterize historic extreme events. Spatial rainfall data will be collected to facilitate model replication of selected extreme event(s). Data will be collected from local residents and/or entities with drainage oversight to: 1) identify the primary critical route(s) that have been inundated; 2) collect locations of physical HWMs or anecdotal flood depths at known locations; and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

Task 2 - Engineering Analysis of Existing Conditions. A hydrologic model will be developed for the Comanche Creek watershed, to include development of a hydraulic model to route flood flows through Comanche Creek Dam. The 64 square mile watershed of Comanche Creek above Comanche Creek Dam is shown in **Exhibit Map 19.12** of *Chapter 5*. A hydraulic model for Comanche Creek will be developed for the reach, including City of Fort Stockton and critical local routes. Existing flood damages will be assessed per TWDB guidance. Design floods for the dam will be developed in accordance with TCEQ dam safety guidance. A dam breach inundation model will be developed for Comanche Creek Dam.

Task 3 - Alternatives Development. Alternatives will be developed for rehabilitation of Comanche Creek Dam to meet TCEQ dam safety guidance. In addition, alternatives will include improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

Task 4 - Alternatives Selection. An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

Task 5 - Report. A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

Task 6 - Stakeholder Coordination. It is assumed that up to three virtual coordination meetings will take place with affected stakeholders such as the City of Fort Stockton, Pecos County, and TCEQ since the selected alternative will potentially affect flood infrastructure owned, designed, maintained, and/or operated by different entities.

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	6,450
Task 2– Existing Condition Engineering Analyses	$	15,205
Task 3 – Alternatives Development	$	24,120
Task 4 - Alternatives Selection	$	5,880
Task 5 – Report	$	8,120
Task 6 – Stakeholder Coordination	$	5,920
Total Project Labor	**$**	**65,695**
Travel	**$**	**2,208**
Total FME cost	**$**	**68,000**

4B-10. Flood Management Evaluation ID: 141000014

Name: Develop a Colonia-wide Drainage System at Fort Hancock.

Description: Conduct surveys and a drainage study to define flood areas, size 5th St. crossing structures, develop H&H models, and propose FMPs. Address flooding at Hwy 20, Mustang Rd., and complete Supplemental Watershed Plans for Camp Rice Dam 1 and Alamo Dam 3.

Affected Jurisdictions: Fort Hancock CDP, Acala CDP, Hudspeth County

Discussion on Flood Risk: Fort Hancock CDP and Acala CDP are unincorporated areas in Hudspeth County, which is experiencing rapid development. Eight flood control dams were designed and constructed in Hudspeth County by the federal Soil Conservation Service, now the Natural Resources Conservation Service (NRCS), during the 1960s, and three additional dams in the 1980s. Six of the older dams have been identified as hydraulically inadequate by TCEQ Dam Safety. Two of these latter dams (Camp Rice Arroyo Dam 1 and Alamo Arroyo Dam 3) provide flood protection to Fort Hancock and Acala. These CDPs, dams and the relevant watershed areas are shown in **Exhibit Map 19.14** of *Chapter 5*.

Flood Management Evaluation Scope of Work:

The FME for Fort Hancock and Acala will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for this FME is divided into three tasks: 1) Perform a Comprehensive Engineering Study with appropriate surveys and H&H modeling to fully define specific area flood risks and propose detailed remedial methods to mitigate the identified risks; and 2) develop a Supplemental Watershed Plan and Environmental Assessment (EA) for Camp Rice Arroyo Dam 1 and Alamo Arroyo Dam 3, which provide current flood protection to Fort Hancock and Acala. FMS ID: 142000003 will follow this FME as it develops a County program for long-term maintenance to sustain the FME-recommended improvements.

Task 1 – Comprehensive Engineering Study. Goal 4.1 of the “Colonia Area Study and Plan 2019 - 2029” (Grantworks, 2019) defines this task to perform a Comprehensive Engineering Study with appropriate surveys and H&H modeling to fully define specific area flood risks and propose detailed remedial methods to mitigate the identified risks. This task includes sizing cross drainage structures for 5th Street and addressing drainage issues at Highway 20 and Mustang Road. The study will also include investigating benefits of expanding roadside ditches/culverts and regrading ditches throughout the study area. Cost estimates for proposed FMPs will also be developed as part of the plan.

Task 2 – Supplemental Watershed Plan and EA. The SOW for planning the needed upgrades for Camp Rice Arroyo Dam 1 and Alamo Arroyo Dam 3 (originally built by the federal government as part of the USDA Small Watershed Program) is expected to be executed as part of the development of a Supplemental Watershed Plan and EA, as defined by NRCS. A Supplemental Watershed Plan is funded 100% by the federal government (NRCS) and includes concept designs and cost estimates to upgrade watershed dams to meet federal dam safety requirements. The

State of Texas (TCEQ) recognizes these standards as appropriate and generally waives full compliance with State dam safety requirements when federal requirements are met. The inclusion of RFPG approval for performance of a Supplemental Watershed Plan for this watershed will strengthen the request to the federal government for leadership and funding of the needed planning. The tasks in the table below derive directly from the required SOW for a Supplemental Watershed Plan in the NRCS *National Watershed Manual*. The estimated cost provided below is based upon recent pricing of Supplemental Watershed Plans within the State of Texas for plans involving upgrade of multiple dams, assuming a watershed evaluation would identify two dams for upgrade.

Estimated Cost for FME:

Total FME Cost. The total estimated cost for this FME is $791,000, per the table below. Detailed costs for the subtasks of Tasks 1 and 2 are also provided following the summary cost table below.

FME ID 141000014 Total Cost		
Task 1 – Comprehensive Engineering Study	$	99,000
Task 2 – Supplemental Watershed Plan and EA	$	696,000
Total FME Cost	**$**	**795,000**

Task 1 Cost. Estimated cost for Task 1 is $99,000, per the table below.

Task 1 Labor Cost		
Task 1.1 – Data Collection	$	12,700
Task 1.2– Existing Condition Engineering Analyses	$	17,075
Task 1.3 – Alternatives Development	$	29,220
Task 1.4 - Alternatives Selection	$	12,690
Task 1.5 – Report	$	18,810
Task 1.6 – Stakeholder Coordination	$	7,600
Total Task 1 Labor	**$**	**98,095**
Task 1 Travel	**$**	**1,112**
Total Task 1 cost	**$**	**99,000**

Task 2 Cost. Estimated Cost for Task 2 is $696,000, per the table below.

Task 2 Labor Cost			
Task 2.1 – Data Collection		$	31,571
Task 2.2 - Identify Problems, Opportunities & Concerns		$	24,769
Task 2.3 - Meetings / Determine Objectives		$	37,954
Task 2.4 - Inventory Resources (Conduct Planning Studies)			
A.	Analyze Existing Data	$	1,080
B.	Environmental Assessment	$	8,820
C.	Analyze Exsiting Resource Data	$	1,380
D.	Economics and Social Effects	$	5,025
E.	Archeological and Historic Resources	$	61,155
F.	Engineering	$	10,898
G.	Geology (see Geology Tab)	$	14,910
Task 2.5 - Analyze Resource Data			
A.	Support Maps	$	3,503
B.	Hydrology	$	8,633
C.	Hydraulics	$	30,150
D.	Economics (all alternatives)	$	16,358
E.	QA/QC	$	4,680
Task 2.6 - Formulate And Evaluate Alternatives			
A.	Formulate Alternatives	$	10,463
B.	Evaluate Alternatives (SITES)	$	60,585
C.	Evaluate Economic Impacts	$	5,828
D.	Evaluate Environmental Impacts	$	7,166
E.	Evaluate Social Impacts	$	7,166
F.	Alternative Trade-off Analysis (Economic, Environmental, Social)	$	5,996
G.	Review Alternatives w/Sponsors & Steering Committee	$	623
H.	Identify Preferred Alternative	$	1,193
I.	QA/QC	$	5,700
Task 2.7 - Prepare Supplemental Watershed Plan/Environmental Assessment			
A.	Prepare Draft Document	$	59,366
B.	Draft Document Technical Reviews	$	27,563
C.	Prepare Final Plan/EA	$	3,443
Task 2.8 - Prepare Finding of No Significant Impact		$	-
Task 2.10 - Subcontracts			
A.	Sediment Survey	$	20,000
B.	Topographic Survey	$	50,000
C.	Geologic Investigation	$	120,000
D.	Geologic Investigation (Lab)	$	40,000
	Total Task 2 Labor	**$**	**685,978**
	Task 2 Travel	**$**	**10,000**
	Total Task 2 Cost	**$**	**696,000**

4B-11. Flood Management Evaluation ID: 141000015

Name: Prioritize arroyos on their likelihood producing sediment/debris flows.

Description: Prioritize arroyos in the City of El Paso, El Paso County, and Hudspeth County on their likelihood of producing sediment/debris flows

Affected Jurisdictions: City of El Paso, El Paso County

Discussion on Flood Risk: Numerous arroyos in El Paso County have alluvial fans that extend through developed areas and irrigated areas. Many of these arroyos lack sediment/debris control structures to prevent sediment deposition in flood water conveyance structures (flood control channels, culverts, irrigation drains that periodically convey stormwater). This deposition reduces or blocks flood conveyance capacity, leading to increased risk of flood-induced damages, high post-flood maintenance costs, and the potential for loss of life.

Flood Management Evaluation Scope of Work:

This FME will provide research and engineering evaluations of arroyos that have historically created flood damages and high maintenance costs. FMS ID: 142000016 will follow this FME as the FMS focuses on 1) developing structural and non-structural solutions to reduce sediment loadings from arroyos (using an arroyo identified in FME 141000015 as an example), and 2) generalizing the strategies and technical methods suggested for the example arroyo for application throughout the region. The SOW for this FME will includes:

Task 1 - Data Collection. This task includes:

- Regional studies and local maintenance records will be reviewed to assemble data that can be used to estimate future sediment loadings for a variety of typical local watershed conditions.
- Interviews with stakeholder engineering and maintenance staff to identify priority uncontrolled arroyos and characterize historic sedimentation associated with those arroyos.
- Collection of watershed data from identified arroyos: terrain slopes, vegetation, soil type, changes per readily accessible historic aerial photography.

Task 2 - Existing Condition Engineering Analysis. The data collected will be analyzed and a refined method developed to estimate relative production of sediment for each identified uncontrolled arroyo. Available floodplain models will be reviewed to estimate, for each identified uncontrolled arroyo, the added flood risk associated with drainage conveyance blockage. **Exhibit Map 19.15** of *Chapter 5* depicts major watersheds in the County.

Task 3 - Report. A report will be generated that estimates annual and event-based sediment transport volume associated with each of the identified uncontrolled arroyos. These estimates are expected to be used in refining stakeholder requirements for sediment storage in future detention basins and in refinement of design and prioritization of construction for future regional detention projects.

Task 4 - Stakeholder Coordination. It is assumed that up to four virtual coordination meetings will take place with affected stakeholders such as the City of El Paso, El Paso County, Hudspeth County, EBID, and EPCWID1, since the selected alternative will potentially affect flooding issues, maintenance, and/or operating procedures managed by these different entities.

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	20,800
Task 2– Existing Condition Engineering Analyses	$	25,340
Task 3 – Report	$	14,840
Task 4 – Stakeholder Coordination	$	9,400
Total Project Labor	**$**	**70,380**
Travel	**$**	**-**
Total FME cost	**$**	**70,000**

4B-12. Flood Management Evaluation ID: 141000018

Name: Conduct flood risk assessment at El Paso locations where drainage is controlled by river stage, and there are significant flood risks on the non-river side of the levee.

Description: Identify the Rio Grande outfalls that are most susceptible to blockage and most likely to allow flood damage during periods of high river stage.

Affected Jurisdictions: City of El Paso, El Paso County

Discussion on Flood Risk: The City and County of El Paso have 79 outfalls of stormwater into the Rio Grande, identified and tabulated in the Interior Drainage Study performed as part of the Rio Grande levee certification process. Ten of these outfalls are associated with pump stations; the remainder drain via gravity into the river. Because of the extreme flat slopes of the river terrace adjacent to the river, when these outfalls fail to properly function (due to blockage or partial blockage by river sedimentation), there can be extensive localized flooding occurring until the flows can be conveyed into the river (by opening the planned outlet or conveyance to the next outlet). In circumstances when the river is at flood stage and the gravity outlet is submerged, there is heightened risk of further interior flooding. Outfall locations are shown in the figure below.

Flood Management Evaluation Scope of Work

The purpose of this FME is to identify the river outfalls that are: 1) most susceptible to blockage, and 2) most likely to allow flood damage during periods of high river stage. The FME will create a prioritized listing of outfalls requiring designs for upgrades to address these issues. Flood Management Strategy (FMS) ID: 142000017 will follow this FME, as it will utilize the results of this study to develop structural and non-structural solutions for improvement of conveyance of stormwater into the Rio Grande in El Paso County. The SOW for this FME includes:

Task 1 - Data Collection. This task includes:

- Review of existing data concerning river gravity outfalls, to include confirmation of outfall location, structure type and size, outfall invert elevation and condition (blocked, partially blocked, free), tributary watershed area, size of detention pond upstream of the outfall (if any), and description of backflow controls (if any).
- Interviews with stakeholder engineering and maintenance staff to identify outfalls per stakeholder criteria.

Task 2 - Engineering Analysis of Existing Conditions. **Exhibit Map 19.18** of *Chapter 5* depicts the major watersheds contributing to the Rio Grande. A qualitative comparison will be made between outfalls with a significant size of watershed (TBD with sponsors) via approximate analysis methods, for example:

- For each significant outfall, an elevation-volume curve will be developed for the area above the outfall inlet.

- For each significant outfall, rating curves (flowrate versus ponded area elevation) will be developed for three river scenarios (normal operation plus two more TBD per sponsors).
- 1% AC runoff volume for each tributary watershed will be estimated based upon hydrologic characteristics (% impervious, curve number).
- 1% AC flood elevation assuming outfall is blocked; or open for each of the river scenarios (four elevations).
- Estimates of numbers of impacted structures for each of the four flood elevations upstream of the outfall will be estimated.

Task 3 - Report. A report will be generated that identifies and prioritizes outfalls for consideration for new construction or improvement to reduce flood risk from interior floods during periods of high river stage.

Task 4 – Stakeholder Coordination.

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	20,850
Task 2– Existing Condition Engineering Analyses	$	31,500
Task 3 – Report	$	12,280
Task 4 – Stakeholder Coordination	$	5,420
Total Project Labor	**$**	**70,050**
Travel	**$**	**-**
Total FME cost	**$**	**70,000**

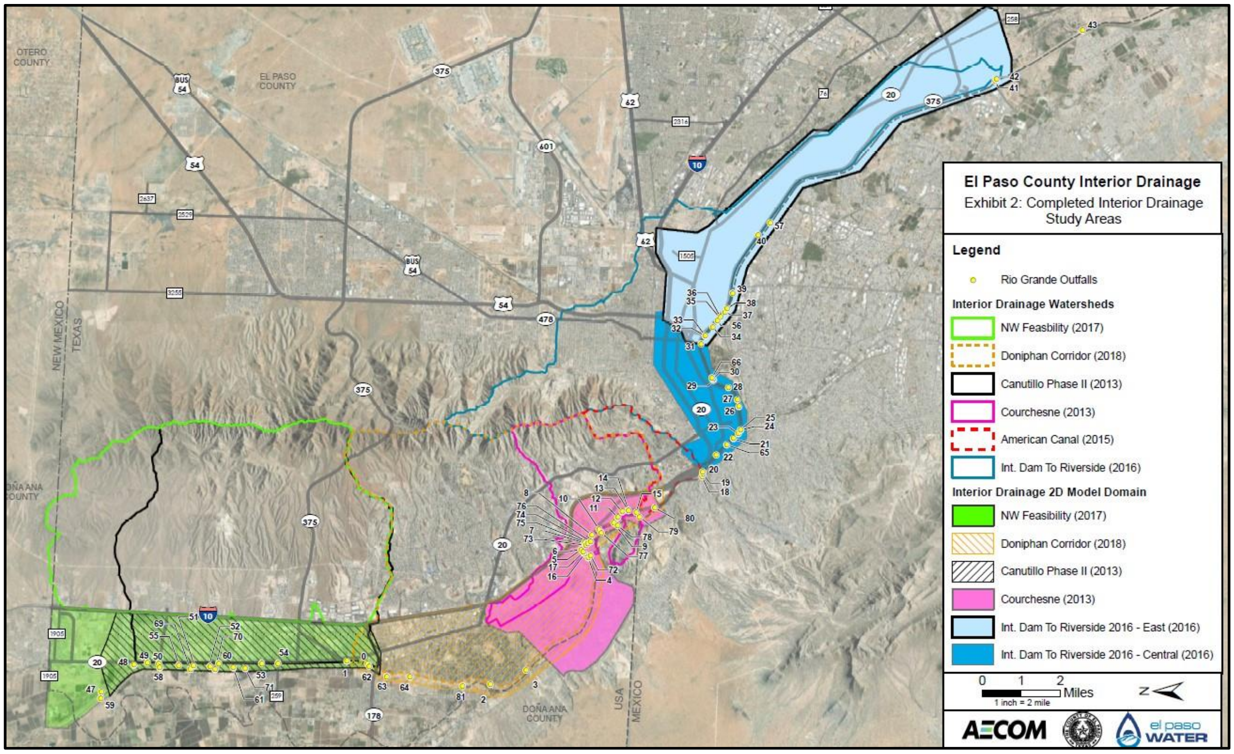


Figure 4B-12. Location of Rio Grande Outfalls in El Paso County from Exhibit 2 of El Paso County Interior Drainage Study (AECOM, 2021)

4B-13. Flood Management Evaluation ID: 141000019

Name: Plan for mitigation of drainage controls where ground water reduces stormwater conveyance capacity in the Montoya Drain.

Description: Perform H&H modeling to develop a FMP for increasing the capacity of Montoya Drain through measures to control groundwater intrusion into the drain.

Affected Jurisdictions: City of El Paso, City of Sunland Park, New Mexico, El Paso County, Doña Ana County

Discussion on Flood Risk: The Montoya Drain is a primary conveyor of stormwater for neighborhoods in the Mesilla Valley (west) portion of the City of El Paso. The original purpose of the drain was to control the elevation of groundwater under agricultural land and provide limited conveyance of surface water runoff from agricultural fields. The Montoya Drain also conveys drain flows from the West Drain (New Mexico) and the Nemexas Drain (New Mexico and Texas) and numerous arroyos and stormwater discharges. The capacity of this drain is significantly reduced by high ground water in the lower reaches of the Drain, upstream of the point of discharge into the Rio Grande, and backwater from flow in the Rio Grande. The immediate watershed to the drain is shown in **Exhibit Map 19.19** of *Chapter 5*.

Flood Management Evaluation Scope of Work:

The purpose of this FME is to develop a FMP for increasing the capacity of Montoya Drain through improvement of the discharge structure at the outlet of the drain and providing a pumping plant to lower the water elevation in the drain during periods of high groundwater or flooding in the Rio Grande. This SOW will include:

Task 1 - Data Collection. This task includes:

- Review of existing data concerning: 1) transmissivity of the surficial soils in the vicinity of lower Montoya Drain, 2) range of water surface elevations in lower Montoya Drain through the seasons and through larger storm events, and 3) current topographic data.
- Collection of updated survey data in the vicinity of the drain outfall into the Rio Grande.

Task 2 - Existing Condition Engineering Analyses. H&H modeling will be performed to estimate Drain hydraulic capacity (in cfs) without groundwater controls.

Task 3 - Alternatives Development. H&H modeling will be performed to estimate Montoya Drain's hydraulic capacity (in cfs) with groundwater controls of varying capacity and location. Three alternative concept designs for groundwater controls will be developed with costs and benefits. Lead times for lowering the drain water surface elevation will be estimated for each alternative.

Task 4 - Alternatives Selection. A stakeholder workshop will be conducted for the selection of a preferred alternative configuration. Cost/benefit data for the preferred alternative will be developed per TWDB guidance to allow for the inclusion of the alternative as an FMP in the RFP.

Task 4 - Report. A report will be generated that provides technical backup for the proposed FMP in accordance with TWDB guidance.

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	11,120
Task 2 – Existing Condition Engineering Analyses	$	5,200
Task 3 – Alternatives Development	$	47,800
Task 4 – Alternatives Selection	$	26,300
Task 5 – Report	$	39,200
Total Project Labor	**$**	**129,620**
Travel		
Total FME cost	**$**	**130,000**

4B-14. Flood Management Evaluation ID: 141000021

Name: Develop stormwater master plan (SWMP) for City of Kermit.

Description: The SWMP includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address that risk.

Affected Jurisdictions. City of Kermit, Winkler County

Discussion of Flood Risk. The City of Kermit is an incorporated area in Winkler County. The terrain in the vicinity of the City of Kermit is exceptionally flat, such that no continuous streamlines carrying concentrated flow have been mapped in the region. Nuisance flooding occurs within local discontinuous depressions. For the 1% AC flood (per mapping performed for the RFP), there is ponding to depths of 2-5 feet within the city potentially causing damage to over 1,100 structures and restricting travel. As part of the public outreach effort, a meeting was held between RFPG and City staff that confirmed that this flood issue was present. **Exhibit Map 15 (Map 6 of 31)** depicts the area of flood risk.

Flood Management Evaluation Scope of Work

The FME for the City of Kermit and adjacent populated areas will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

Task 1 - Data Collection. Data will be collected from local residents to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Historic spatial rainfall data will be collected to replicate a selected recent event. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

Task 2 - Engineering Analysis of Existing Conditions. A hydrologic model will be developed for the area watershed. The watershed is depicted in **Exhibit Map 19.21** of *Chapter 5*. A 2-D hydraulic model for the City of Kermit will be developed for the incorporated area and adjacent populated areas. Existing flood damages will be assessed per TWDB guidance.

Task 3 - Alternatives Development. Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

Task 4 - Alternatives Selection. An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

Task 5 - Report. A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

Task 6 – Stakeholder Coordination.

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	9,900
Task 2– Existing Condition Engineering Analyses	$	12,075
Task 3 – Alternatives Development	$	22,340
Task 4 - Alternatives Selection	$	11,250
Task 5 – Report	$	10,770
Task 6 – Stakeholder Coordination	$	6,760
Total Project Labor	**$**	**73,095**
Travel	**$**	**1,632**
Total FME cost	**$**	**75,000**

4B-15. Flood Management Evaluation ID: 141000022

Name: Develop stormwater master plan (SWMP) for Sierra Blanca.

Description: The SWMP includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address that risk.

Affected Jurisdictions. Sierra Blanca CDP, Hudspeth County

Description of Flood Risk. Sierra Blanca is a CDP in Hudspeth County. The County Floodplain Administrator provided a written description and pictorial evidence of flooding that occurred August 12-15, 2022. For 5 days, the flooding inundated long stretches of roads that provide sole access to the residences of local ranchers and portions of a local subdivision (Sunset Ranch). Garrett Road was washed out. The risk analysis that was performed as part of Task 2 of this RFP shows Blanca Draw collects runoff from an uncontrolled 20.7 square mile watershed and passes through Sierra Blanca. The 1% AC flood in Blanca Draw is estimated to inundate 38 structures and to overtop several roadways that provide sole access to Interstate 10 and regional services.

Flood Management Evaluation Scope of Work:

The FME for Sierra Blanca will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

Task 1 - Data Collection. Data will be collected from local residents to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Spatial rainfall data will be collected to facilitate model replication of the August, 2022 event. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

Task 2 - Engineering Analysis of Existing Conditions. A hydrologic model will be developed for the Bianca Draw watershed. A hydraulic model for Bianca Draw will be developed for the reach, including Sierra Blanca and critical local routes. Existing flood damages will be assessed per TWDB guidance. **Exhibit Map 19.22** of *Chapter 5* depicts the watershed.

Task 3 - Alternatives Development. Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

Task 4 - Alternatives Selection. An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

Task 5 - Report. A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

Task 6 – Stakeholder Coordination

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	12,160
Task 2– Existing Condition Engineering Analyses	$	12,075
Task 3 – Alternatives Development	$	22,340
Task 4 - Alternatives Selection	$	11,250
Task 5 – Report	$	10,770
Task 6 – Stakeholder Coordination	$	6,760
Total Project Labor	**$**	**75,355**
Travel	**$**	**1,112**
Total FME cost	**$**	**76,000**

4B-16. Flood Management Evaluation ID: 141000023

Name: Develop stormwater master plan (SWMP) for City of Alpine.

Description: The SWMP includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address that risk.

Affected Jurisdictions: City of Alpine, Brewster County

Description of Flood Risk: The City of Alpine is an incorporated area in Brewster County. Three named creeks traverse the City of Alpine: Paisano Creek and Alpine Creek (combined watershed of 56.2 sq mi) and Moss Creek (watershed of 29.5 sq mi). Per modeling performed as part of Task 2 of the RFP, over 1,600 structures within the city are estimated to be potentially impacted during the 1% AC (100-year) flood. Exhibit **Map 15 (Map 4 of 31)** depicts this risk. Recent study performed under this plan has shown this map to present an overestimation of flood risk within the City and FME 14000036 is proposed to develop a more accurate estimate of flood risk.

Flood Management Evaluation Scope of Work:

The FME for the City of Alpine will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

Task 1 - Data Collection. Per study performed under the preparation of this Plan, further data need to be collected to calibrate loss rates and lag times for the watersheds of each of the three creeks that traverse the City of Alpine. New instrumentation (stage and rainfall gages) is required to collect these data. FME 14000036 is proposed to address this need.

Task 2 - Engineering Analysis of Existing Conditions. . Under work performed for this Plan, new detailed hydrologic models have been developed for the Paisano Creek, Alpine Creek and Moss Creek watersheds. Similarly new a 2-D hydraulic model for each of the three creeks through the City of Alpine has been developed for the incorporated area and adjacent populated areas. Once sufficient event data has been collected per Task 1, these models will be calibrated. Refined estimates for existing flood damages for each creek will be assessed per TWDB guidance, using these calibrated models. **Exhibit Map 19.23** of *Chapter 5* depicts the watersheds from these creeks.

Task 3 - Alternatives Development. Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, nature-based solutions, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural and natural alternatives. Moss and Alpine Creeks will be considered for upland restoration to address diminished storage capacity associated with incised channels. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative. Separate alternatives will be derived for each of the three creeks.

Task 4 - Alternatives Selection. FMP(s) for each of the three creeks for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

Task 5 - Report. A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

Task 6 – Stakeholder Coordination.

Estimated Cost for FME:

The initial cost estimate of $105,000 was increased to $250,000 per request by the City of Alpine. The request was provided through a financing survey sent to City of Alpine. The following question was asked in the survey:

> "Does the estimated cost for the specified FME/FMS/FMP from the link provided in Question No. 4 seem accurate? If not, please provide revised costs or additional information you would like to be considered in the cost estimate. Our Technical Consultant, AECOM, developed the cost estimates with the available information, and they can set up a phone call to explain the details of the scope and cost estimate if you request it in your response."

City of Alpine's response was that an additional $145,000 was needed "(due to increased costs and inflation)".

The cost estimate is documented in the table below.

Labor Cost	
Task 1 – Data Collection	$ -
Task 2 – Existing Condition Engineering Analyses	$ 14,140
Task 3 – Alternatives Development	$ 32,620
Task 4 - Alternatives Selection	$ 16,820
Task 5 – Report	$ 13,490
Task 6 – Stakeholder Coordination	$ 9,400
Total Project Labor	**$ 86,470**
Travel	**$ 1,536**
Total FME Cost Estimated by AECOM	**$ 88,000**
Additional Labor Cost Requested by City of Alpine (due to increased costs and inflation):	**$ 145,000**
Total FME Cost	**$ 233,000**

4B-17. Flood Management Evaluation ID: 141000024

Name: Develop Supplemental Watershed Plans (SWP) for the flood control dams that protect the city.

Description: The SWP is a federally funded plan that will identify scopes of work and costs for addressing hydraulically inadequate dams that protect the City of Sonora.

Affected Jurisdictions. City of Sonora, Sutton County

Description of Flood Risk. The City of Sonora is an incorporated area in Sutton County. In 1959, the city council commissioned plans for a series of flood-control dams; 13 were constructed on the Devil's River Draw and Lowrey Draw by March 1961. Eight of these dams have been identified as hydrologically inadequate by TCEQ Dam Safety. Per approximate H&H modeling performed as part of the RFP effort, over 650 structures in Sonora are potentially impacted by the 1% AC flood. **Exhibit Map 15 (Map 9 of 31)** depicts the area of flood risk. **Exhibit Map 19.24** of *Chapter 5* depicts the relevant watershed and the locations of the relevant dams.

Flood Management Evaluation Scope of Work:

The FME for City of Sonora will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME is expected to be executed as part of the development of a Supplemental Watershed Plan and EA for the Dry Devil Draw and Lowrey Draw Watershed, as defined by the NRCS. A Supplemental Watershed Plan is funded 100% by the federal government and includes concept designs and cost estimates to upgrade watershed dams to meet federal dam safety requirements. The State of Texas (TCEQ) recognizes these standards as appropriate and generally waives full compliance with State dam safety requirements when federal requirements are met. Federal standards for upgrade of the high hazard dam(s) upstream of Sonora include increasing flood pool storage of each dam to fully control the 1% AC flood. Therefore, the federal planning for dam upgrades will include planning for an increase in flood protection for the City of Sonora. The inclusion of RFPG approval for performance of a Supplemental Watershed Plan for this watershed will strengthen the request to the federal government for leadership and funding of the needed planning. The tasks in the table below derive directly from the required SOW for a Supplemental Watershed Plan in the NRCS *National Watershed Manual*. The estimated cost provided below is based upon recent pricing of Supplemental Watershed Plans within the State of Texas for plans involving upgrade of multiple dams, assuming a watershed evaluation would identify four dams for upgrade.

Estimated Cost for FME:

I	DATA COLLECTION		$	84,190
II	IDENTIFY PROBLEMS, OPPORTUNITIES & CONCERNS		$	66,050
III	MEETINGS / DETERMINE OBJECTIVES		$	101,210
IV	INVENTORY RESOURCES (CONDUCT PLANNING STUDIES)			
	A.	Analyze Existing Data	$	2,880
	B.	Environmental Assessment	$	23,520
	C.	Analyze Exsiting Resource Data	$	3,680
	D.	Economics and Social Effects	$	13,400
	E.	Archeological and Historic Resources	$	163,080
	F.	Engineering	$	29,060
	G.	Geology (see Geology Tab)	$	39,760
V	ANALYZE RESOURCE DATA			
	A.	Support Maps	$	9,340
	B.	Hydrology	$	23,020
	C.	Hydraulics	$	80,400
	D.	Economics (all alternatives)	$	43,620
	E.	QA/QC	$	12,480
VI	FORMULATE AND EVALUATE ALTERNATIVES			
	A.	Formulate Alternatives	$	27,900
	B.	Evaluate Alternatives (SITES)	$	161,560
	C.	Evaluate Economic Impacts	$	15,540
	D.	Evaluate Environmental Impacts	$	19,110
	E.	Evaluate Social Impacts	$	19,110
	F.	Alternative Trade-off Analysis (Economic, Environmental, S	$	15,990
	G.	Review Alternatives w/Sponsors & Steering Committee	$	1,660
	H.	Identify Preferred Alternative	$	3,180
	I.	QA/QC	$	15,200
VII	PREPARE SUPPLEMENTAL WATERSHED PLAN/EA			
	A.	Prepare Draft Document	$	158,310
	B.	Draft Document Technical Reviews	$	73,500
	C.	Prepare Final Plan/EA	$	9,180
VIII	PREPARE FINDING OF NO SIGNIFICANT IMPACT		$	-
IX	OTHER DIRECT COSTS			
	A.	Travel	$	10,000
X	SUBCONTRACTS			
	A.	Sediment Survey	$	20,000
	B.	Topographic Survey	$	50,000
	C.	Geologic Investigation	$	120,000
	D.	Geologic Investigation (Lab)	$	40,000
			$	**1,456,000**

4B-18. Flood Management Evaluation ID: 141000025

Name: Develop Supplemental Watershed Plans (SWP) for the flood control dams that protect the City of Ozona.

Description: The SWP is a federally funded plan that will identify SOWs and costs for addressing hydraulically inadequate dams that protect the City of Ozona.

Affected Jurisdictions. City of Ozona, Crockett County

Description of Flood Risk. Ozona is an unincorporated area in Crockett County. Seven dams were designed and constructed by the Soil Conservation Service, now NRCS, during the 1950s. Five of these dams have been identified as hydrologically inadequate by TCEQ Dam Safety due to their change in hazard class from Low/ Significant Hazard to High Hazard. Approximate modeling performed as a task for the RFP identified over 900 structures at risk in the 1% AC flood within Ozona. **Exhibit Map 15 (Map 7 of 31)** depicts the area of flood risk. **Exhibit Map 19.25** of *Chapter 5* depicts the relevant watershed and the locations of the relevant dams.

Flood Management Evaluation Scope of Work:

The FME for Ozona will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME is expected to be executed as part of the development of a Supplemental Watershed Plan and EA for the Johnson's Draw Watershed, as defined by the NRCS. A Supplemental Watershed Plan is funded 100% by the federal government and includes concept designs and cost estimates to upgrade watershed dams to meet federal dam safety requirements. The State of Texas (TCEQ) recognizes these standards as appropriate and generally waives full compliance with State dam safety requirements when federal requirements are met. Federal standards for upgrade of the high hazard dam(s) upstream of Ozona include increasing flood pool storage of each dam to fully control the 1% AC flood. Therefore, the federal planning for dam upgrades will include planning for an increase in flood protection for Ozona. The inclusion of RFPG approval for performance of a Supplemental Watershed Plan for this watershed will strengthen the request to the federal government for leadership and funding of the needed planning. The tasks in the table below derive directly from the required SOW for a Supplemental Watershed Plan in the NRCS National Watershed Manual. The estimated cost provided below is based upon recent pricing of Supplemental Watershed Plans within the State of Texas for plans involving upgrade of multiple dams, assuming a watershed evaluation would identify four dams for upgrade.

Estimated Cost for FME:

I	DATA COLLECTION		$	84,190
II	IDENTIFY PROBLEMS, OPPORTUNITIES & CONCERNS		$	66,050
III	MEETINGS / DETERMINE OBJECTIVES		$	101,210
IV	INVENTORY RESOURCES (CONDUCT PLANNING STUDIES)			
	A.	Analyze Existing Data	$	2,880
	B.	Environmental Assessment	$	23,520
	C.	Analyze Exsiting Resource Data	$	3,680
	D.	Economics and Social Effects	$	13,400
	E.	Archeological and Historic Resources	$	163,080
	F.	Engineering	$	29,060
	G.	Geology (see Geology Tab)	$	39,760
V	ANALYZE RESOURCE DATA			
	A.	Support Maps	$	9,340
	B.	Hydrology	$	23,020
	C.	Hydraulics	$	80,400
	D.	Economics (all alternatives)	$	43,620
	E.	QA/QC	$	12,480
VI	FORMULATE AND EVALUATE ALTERNATIVES			
	A.	Formulate Alternatives	$	27,900
	B.	Evaluate Alternatives (SITES)	$	161,560
	C.	Evaluate Economic Impacts	$	15,540
	D.	Evaluate Environmental Impacts	$	19,110
	E.	Evaluate Social Impacts	$	19,110
	F.	Alternative Trade-off Analysis (Economic, Environmental, S	$	15,990
	G.	Review Alternatives w/Sponsors & Steering Committee	$	1,660
	H.	Identify Preferred Alternative	$	3,180
	I.	QA/QC	$	15,200
VII	PREPARE SUPPLEMENTAL WATERSHED PLAN/EA			
	A.	Prepare Draft Document	$	158,310
	B.	Draft Document Technical Reviews	$	73,500
	C.	Prepare Final Plan/EA	$	9,180
VIII	PREPARE FINDING OF NO SIGNIFICANT IMPACT		$	-
IX	OTHER DIRECT COSTS			
	A.	Travel	$	10,000
X	SUBCONTRACTS			
	A.	Sediment Survey	$	20,000
	B.	Topographic Survey	$	50,000
	C.	Geologic Investigation	$	120,000
	D.	Geologic Investigation (Lab)	$	40,000
			$	**1,456,000**

4B-19. Flood Management Evaluation ID: 141000026

Name: Develop stormwater master plan (SWMP) for City of Monahan and Southwest Sandhill CDP.

Description: The SWMP includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address that risk.

Affected Jurisdictions: City of Monahans, Ward County

Description of Flood Risk. The City of Monahans is located in Ward County. Southwest Sandhill is an adjacent census designated place. Approximate modeling performed as a task for the RFP identified over 790 structures at risk in West Sandhill and over 450 structures at risk in Monahans for the 1% AC flood. **Exhibit Map 15 (Maps 8 and 13 of 31)** depict the areas of flood risk.

Flood Management Evaluation Scope of Work:

The FME for Southwest Sandhill and the City of Monahans will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk for both entities. The SOW for the FME will include these tasks.

Task 1 - Data Collection. Data will be collected from local residents to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Spatial rainfall data will be collected to facilitate model replication of the August, 2022 event. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

Task 2 - Engineering Analysis of Existing Conditions. A hydrologic model will be developed for the tributary watershed that drains to both communities. A hydraulic model for each community and critical local routes. Existing flood damages in each community will be assessed per TWDB guidance. **Exhibit Map 19.26** of *Chapter 5* depicts the relevant watersheds.

Task 3 - Alternatives Development. Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative. Benefits to each of the two communities (Monahans and Southwest Sandhill) will be estimated separately for each alternative.

Task 4 - Alternatives Selection. FMP(s) for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP(s) will be developed.

Task 5 - Report. A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

Task 6 – Stakeholder Coordination.

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	11,700
Task 2– Existing Condition Engineering Analyses	$	19,490
Task 3 – Alternatives Development	$	32,620
Task 4 - Alternatives Selection	$	16,820
Task 5 – Report	$	13,490
Task 6 – Stakeholder Coordinationt	$	8,440
Total Project Labor	**$**	**102,560**
Travel	**$**	**1,596**
Total FME cost	**$**	**104,000**

4B-20. Flood Management Evaluation ID: 141000033

Name: Develop a flood mitigation for specific areas of known flood risk in the City of Socorro.

Description: The SOW includes data collection, refinement of existing flood maps, refinement of flood risk, and development and selection of alternatives to address these specific areas of identified risk.

Affected Jurisdictions: City of Socorro, El Paso County

Description of Flood Risk. The City of Socorro is an incorporated area in El Paso County. Per current available floodplain modeling, there are over 2,500 structures in the city potentially impacted by a 1% AC flood. In addition, city drainage infrastructure is at risk of being plugged by sediment conveyed by arroyos upstream of the City. **Exhibit Map 15 (Map 2 of 31)** depicts this risk.

Flood Management Evaluation Scope of Work:

The FME for the City of Socorro and adjacent populated areas will develop and select FMP alternatives (both structural and non-structural) for the mitigation of the identified flood risk. The SOW for the FME will include these tasks.

Task 1 - Data Collection. Data will be collected from local residents to: 1) identify the primary critical route(s) that have been inundated, 2) collect locations of physical HWMs or anecdotal flood depths at known locations, and 3) solicit ideas for potential solutions. Field survey data will be collected at HWMs and at selected locations (e.g., culverts/ bridges) needed to refine hydraulic modeling. Spatial rainfall data will be collected to facilitate model replication of the August, 2022 event. Existing topographic data will be refined and processed as needed. Local property and infrastructure valuations and vulnerability data will be collected.

Task 2 - Engineering Analysis of Existing Conditions. A hydrologic model will be developed for the area watershed. A 2-D hydraulic model for Socorro will be developed for the incorporated area and adjacent populated areas. Existing flood damages will be assessed per TWDB guidance. **Exhibit Map 19.33** of *Chapter 5* depicts the relevant watershed for study.

Task 3 - Alternatives Development. Alternatives will be developed for improved performance of local critical route(s) during floods, reduction of risk to occupied structures, and addressing of other identified flood-related community concerns (e.g., planning for improved communication, improved emergency response, etc.). Concept design(s) and cost estimate(s) will be developed for structural alternatives. Costs will also be developed for additional non-structural alternatives. Revised flood damages and locally defined evaluation criteria will be estimated for each alternative.

Task 4 - Alternatives Selection. An FMP for inclusion in a future RFP will be selected using criteria developed in a workshop with local stakeholders. These criteria will be consistent with TWDB criteria for FMPs. Full RFP-required data for the selected FMP will be developed.

Task 5 - Report. A report will be generated for presentation to the RFPG and TWDB providing documentation of the proposed FMP.

Task 6 – Stakeholder Coordination.

Estimated Cost for FME:

Labor Cost		
Task 1 – Data Collection	$	9,900
Task 2– Existing Condition Engineering Analyses	$	12,075
Task 3 – Alternatives Development	$	22,340
Task 4 - Alternatives Selection	$	11,250
Task 5 – Report	$	10,770
Task 6 – Stakeholder Coordination	$	6,760
Total Project Labor	**$**	**73,095**
Travel	**$**	**-**
Total FME cost	**$**	**73,000**

4B-21. Flood Management Evaluation ID: 141000034

Name: Develop Flood Mitigation Projects (FMPs) for additional projects in City of El Paso/El Paso Water Stormwater Master Plan

Description: Develop all required datasets and models for 52 projects from the City of El Paso/El Paso Water Stormwater Master Plan to be recommended as FMPs in the RFP.

Affected Jurisdictions: City of El Paso

Description of Flood Risk. The "El Paso Water and City of El Paso El Paso Stormwater Master Plan Update" (AECOM, 2021) includes 96 recommended stormwater infrastructure projects to mitigate flooding within the City of El Paso jurisdiction. The City Stormwater Master Plan (SMP) is an update to the 2009 SMP, resulting in the elimination of some projects that were constructed, modifications to projects which have revised designs since 2009, and new projects that were not in the original SMP. The 2021 City SMP describes the existing flood risk addressed by the plan as the following:

> "… the 2009 SMP considered all parts of the City for evaluation, but then focused its attention on areas where flood risk was particularly high. This process allowed the evaluation and planning efforts to focus on major threats and produced a more cost-effective and useful plan than a broader and more costly effort might have produced."

Flood Management Evaluation Scope of Work:

Exhibit Map 19.34 of *Chapter 5* depicts the major drainage systems in the City of El Paso. Six of the projects from the 96 recommended projects in the City SMP were evaluated and recommended as FMPs in this RFP. Through coordination with El Paso Water, 52 additional projects from the County SMP were selected for inclusion in this FME. The SOW for each project in this FME includes developing or refining all required H&H models to meet the RFP data and modeling requirements for recommended FMPs. The process for selecting projects for this FME and estimating labor fees for the evaluation of each project was based upon a series of meetings with El Paso Water in which the status of each project was discussed, and the following general questions were asked about each project:

- Have there been potential design or development changes since the concept designs and cost estimates were defined in the SMP?
- Is the Project likely to have a low Benefit Cost Ratio (BCR)?
- Does the Project already have committed funding?
- Is the Project already under final design?
- Is the Project already under construction?
- Has the Project already been conceptually studied or designed by others outside of the SMP?
- Is the Project too small for El Paso Water to consider for inclusion in a state or federal grant application?

Based on the information provided by El Paso Water, the 52 projects listed in the cost estimate for this FME were selected, and labor fees needed to convert each project to an FMP in the RFP were estimated. In addition to the factors listed in the questions above, the labor cost estimates for each project in this FME were developed considering the following additional factors:

- What is the project type (basin, channel, storm drain, pump station, etc.)?
- Will the evaluation potentially involve evaluation of multiple alternatives?
- Are previously developed H&H models available for the Project? If so, which software was used?
- Are previously developed BCRs available for the project?
- Do previously developed feasibility studies confirm no negative impact for a project?

A labor estimate for each project in this FME is provided below as a unique task number, along with the reported Total Project Cost from the SMP, for reference. Note, in some cases (i.e., Task Numbers 7, 9, 12, and 37), multiple related SMP projects were combined into a single task for the purpose of estimating labor fees. In these cases, the reported Total SMP Project costs, which include construction, were also combined in the right column of the cost estimate table provided below.

Estimated Cost for FME:

Labor Cost		Estimated SMP Project Cost	
Task - 1 - Develop FMP Data Requirements for CE Dam 6	$ 10,000		$ 600,000
Task - 2 - Develop FMP Data Requirements for CE Dam 7	$ 10,000		$ 600,000
Task - 3 - Develop FMP Data Requirements for CE Dam 8	$ 10,000		$ 600,000
Task - 4 - Develop FMP Data Requirements for CE3	$ 50,000		$ 2,500,000
Task - 5 - Develop FMP Data Requirements for CE4A	$ 20,000		$ 7,200,000
Task - 6 - Develop FMP Data Requirements for CE4B	$ 35,000		$ 1,700,000
Task - 7 - Develop FMP Data Requirements for CE5A, CE5B, and CE 5C Combined	$ 60,000		$ 18,200,000
Task - 8 - Develop FMP Data Requirements for EA11	$ 30,000		$ 550,060
Task - 9 - Develop FMP Data Requirements for EA1A and EA1B Combined	$ 45,000		$ 10,150,000
Task - 10 - Develop FMP Data Requirements for EA2	$ 30,000		$ 900,000
Task - 11 - Develop FMP Data Requirements for EA2 Alternate	$ 40,000		$ 5,000,000
Task - 12 - Develop FMP Data Requirements for EA4A and EA4B Combined	$ 50,000		$ 11,000,000
Task - 13 - Develop FMP Data Requirements for EA5	$ 30,000		$ 2,500,000
Task - 14 - Develop FMP Data Requirements for EA6B	$ 40,000		$ 3,922,000
Task - 15 - Develop FMP Data Requirements for EA6C	$ 40,000		$ 5,600,000
Task - 16 - Develop FMP Data Requirements for EA7 Ph2	$ 35,000		$ 8,400,000
Task - 17 - Develop FMP Data Requirements for EA8A	$ 30,000		$ 2,500,000
Task - 18 - Develop FMP Data Requirements for EA8B	$ 30,000		$ 3,000,000
Task - 19 - Develop FMP Data Requirements for EA8C	$ 30,000		$ 3,000,000
Task - 20 - Develop FMP Data Requirements for EA8D	$ 30,000		$ 4,000,000
Task - 21 - Develop FMP Data Requirements for EA8E	$ 30,000		$ 4,000,000
Task - 22 - Develop FMP Data Requirements for EA9B	$ 5,000		$ 2,700,000
Task - 23 - Develop FMP Data Requirements for MidV10	$ 15,000		$ 585,004
Task - 24 - Develop FMP Data Requirements for MidV5	$ 15,000		$ 5,000,000
Task - 25 - Develop FMP Data Requirements for MidV6	$ 40,000		$ 3,000,000
Task - 26 - Develop FMP Data Requirements for MidV8	$ 15,000		$ 4,304,300
Task - 27 - Develop FMP Data Requirements for MV1	$ 25,000		$ 24,804,000
Task - 28 - Develop FMP Data Requirements for MV2B	$ 40,000		$ 13,536,900
Task - 29 - Develop FMP Data Requirements for MV2C	$ 25,000		$ 7,829,900
Task - 30 - Develop FMP Data Requirements for MV3	$ 35,000		$ 1,000,000
Task - 31 - Develop FMP Data Requirements for MV4	$ 50,000		$ 21,000,000
Task - 32 - Develop FMP Data Requirements for MV8	$ 40,000		$ 13,962,000
Task - 33 - Develop FMP Data Requirements for NE1	$ 40,000		$ 1,200,000
Task - 34 - Develop FMP Data Requirements for NE2	$ 18,000		$ 6,500,000
Task - 35 - Develop FMP Data Requirements for NE5	$ 12,000		$ 2,197,000
Task - 36 - Develop FMP Data Requirements for NE6	$ 30,000		$ 800,000
Task - 37 - Develop FMP Data Requirements for NW11A, NW11B, NW11C, and NW11D Combined	$ 30,000		$ 4,277,100
Task - 38 - Develop FMP Data Requirements for NW2	$ 40,000		$ 6,500,000
Task - 39 - Develop FMP Data Requirements for NW6	$ 12,000		$ 4,600,000
Task - 40 - Develop FMP Data Requirements for NW7	$ 12,000		$ 4,000,000
Task - 41 - Develop FMP Data Requirements for WC1	$ 12,000		$ 1,000,000
Task - 42 - Develop FMP Data Requirements for WC3	$ 25,000		$ 3,800,000
Task - 43 - Develop FMP Data Requirements for WC4	$ 12,000		$ 3,000,000
Task - 44 - Develop FMP Data Requirements for WC6C	$ 35,000		$ 1,796,600
Task - 45 - Develop FMP Data Requirements for WC8	$ 20,000		$ 897,000
Total Project Labor	**$ 1,288,000**	**Total SMP Project Cost:**	**$ 234,211,864**
Total FME cost	**$ 1,288,000**		

4B-22. Flood Management Evaluation ID: 141000035

Name: Develop Flood Mitigation Projects (FMPs) for additional projects from the El Paso County Stormwater Master Plan

Description: Develop all required datasets and models for 21 projects from the El Paso County Stormwater Master Plan to be considered as FMPs in the RFP.

Affected Jurisdictions: El Paso County

Description of Flood Risk. The "El Paso County Stormwater Master Plan Update" (AECOM, 2021) includes 66 recommended stormwater infrastructure projects to mitigate flooding within the El Paso County jurisdiction, outside of the City of El Paso limits.

Flood Management Evaluation Scope of Work:

Exhibit Map 19.35 of *Chapter 5* depicts the major watersheds for El Paso County. Four of the projects from the 66 recommended projects in the City SMP were evaluated and recommended as FMPs in this RFP, and six of the crossing improvement projects on Mesa Drain (HAC9, HAC10, HAC11, HAC12, HAC13, and HAC14) are included in Flood Management FME (FME) FME ID: 141000004. Through coordination with El Paso County, 21 additional projects from the County SMP were selected for inclusion in this FME. The SOW for each Project in this FME includes developing or refining all required H&H models to meet the RFP data and modeling requirements for recommended FMPs. The process for selecting projects for this FME and estimating labor fees for the evaluation of each project was based upon coordination with El Paso County, during which the status of each project was provided by the County, and the following general questions were asked about each project:

- Was the project already evaluated as an FME or FMP in the RFP?
- Have there been potential design or development changes since the concept designs and cost estimates were defined in the SMP?
- Is the Project likely to have a low Benefit Cost Ratio (BCR)?
- Does the Project already have committed funding?
- Is the Project already under final design?
- Is the Project already under construction?
- Has the Project already been conceptually studied or designed by others outside of the SMP?
- Is the Project too small for El Paso County to consider applying for inclusion in a state or federal grant application?

Based on the information provided by El Paso County and the Tier specified for each project in the SMP, the 21 projects listed in the cost estimate for this FME were selected, and labor fees needed to convert each project to an FMP in the RFP were estimated. In addition to the factors listed in the questions above, the labor cost estimates for each project in this FME were developed considering the following additional factors:

- What is the project type (basin, channel, crossing, etc.)?
- Will the evaluation potentially involve evaluation of multiple alternatives?
- Are previously developed H&H models available for the Project? If so, which software was used?
- Are previously developed BCRs available for the project?
- Do previously developed feasibility studies confirm no negative impact for a project?

A labor estimate for each task of this FME is provided below, along with the reported total Project cost from the SMP, for reference.

Estimated Cost for FME:

Labor Cost		Estimated SMP Project Cost	
Task 1 - Develop FMP Data Requirements for CAN1	$ 20,000		$ 1,960,000
Task 2 - Develop FMP Data Requirements for CAN2	$ 12,000		$ 6,030,000
Task 3 - Develop FMP Data Requirements for CAN3	$ 12,000		$ 200,000
Task 4 - Develop FMP Data Requirements for FAB3	$ 12,000		$ 1,750,000
Task 5 - Develop FMP Data Requirements for HAC1	$ 12,000		$ 1,080,000
Task 6 - Develop FMP Data Requirements for HAC2	$ 12,000		$ 37,810,000
Task 7 - Develop FMP Data Requirements for HAC4	$ 12,000		$ 1,890,000
Task 8 - Develop FMP Data Requirements for HAC5	$ 12,000		$ 2,920,000
Task 9 - Develop FMP Data Requirements for HAC6	$ 12,000		$ 4,470,000
Task 10 - Develop FMP Data Requirements for MON1	$ 12,000		$ 15,780,000
Task 11 - Develop FMP Data Requirements for MON15	$ 12,000		$ 1,470,000
Task 12 - Develop FMP Data Requirements for MON2	$ 12,000		$ 8,030,000
Task 13 - Develop FMP Data Requirements for SOC3	$ 12,000		$ 1,100,000
Task 14 - Develop FMP Data Requirements for SSA3	$ 12,000		$ 1,510,000
Task 15 - Develop FMP Data Requirements for SSA5	$ 20,000		$ 12,300,000
Task 16 - Develop FMP Data Requirements for SSA6	$ 12,000		$ 2,700,000
Task 17 - Develop FMP Data Requirements for TOR1	$ 12,000		$ 3,120,000
Task 18 - Develop FMP Data Requirements for TOR3	$ 12,000		$ 60,000
Task 19 - Develop FMP Data Requirements for TOR4	$ 12,000		$ 1,750,000
Task 20 - Develop FMP Data Requirements for VIN1	$ 12,000		$ 29,500,000
Task 21 - Develop FMP Data Requirements for VIN3	$ 20,000		$ 160,000
Total Project Labor:	**$ 276,000**	**Total SMP Project Cost:**	**$ 135,590,000**
Total FME cost:	**$ 276,000**		

4B-23. Flood Management Evaluation ID: 141000036

Name: Install Instrumentation to Enhance Estimate of Flood Risk for City of Alpine.

Description: This evaluation includes the procurement and installation of 5 stage gages and 6 precipitation gages in and upstream of the City of Alpine, Texas. The purpose of the gages is to record instantaneous (i.e. fifteen minute time step or less) rainfall data and associated runoff stage data within the watersheds of Paisano Creek, Moss Creek, and Alpine Creek per the figures below. The gages will be isolated from public power and will record data for later download. The expected service time for the gages is 5 to ten years. The City will provide periodic gage maintenance and collect data post-storm events. Costs will include training of City staff on gage maintenance and data download.

Affected Jurisdictions: City of Alpine, Brewster County

Description of Flood Risk: The City of Alpine is an incorporated area in Brewster County. Three named creeks traverse the City of Alpine: Paisano Creek and Alpine Creek (combined watershed of 56.2 sq mi) and Moss Creek (watershed of 29.5 sq mi). Per modeling performed as part of Task 2 of the RFP, over 1,600 structures within the city are estimated to be potentially impacted during the 1% AC (100-year) flood. Exhibit **Map 15 (Map 4 of 31)** depicts this risk. Recent study performed under this plan has shown this map to present an overestimation of flood risk within the City and this FME is proposed as an essential step in the development of a more accurate estimate of flood risk.

Flood Management Evaluation Scope of Work:

Task 1: Procure and install precipitation gages.

Task 2: Procure and install stage gages.

Task 3: Training of City Staff on Gage Operation and Data Collection.

Task 4: Labor support by City Staff through first 5 years of gage operation.

The cost estimate is documented in the table below.

Scope Item	Unit	Unit Cost	Quantity	Cost
(1) Precipitation Gages				
Equipment	**Site**	**$ 1,500**	**6**	**$ 9,000**
Installation (including travel)	**Site**	**$ 4,600**	**6**	**$ 27,600**
(2) Stage gages				
Equipment	**Site**	**$ 1,000**	**5**	**$ 5,000**
Installation (including travel)	**Site**	**$ 4,600**	**5**	**$ 23,000**
(3) Training of City Staff on maintenance/data download	**hr**	**$ 150**	**32**	**$ 4,800**
(4) City Staff Support Costs for 5 years	**Per year**	**$ 5,000**	**5**	**$ 25,000**
TOTAL COST				**$ 94,400**

Notes

1. Assumes City of Alpine will be responsible for labor and equipment costs associated with gage maintenance and data-retrieval after 5 years.

2. Does not include security or land acquisition.

3. Assumes site access.

4. For comparison purposes, USGS-provided labor for precipitation gages is up to $3,500/year per gage, including remote data-logging capabilities. These gages will not have remote data-logging capability

Appendix 4C
Evaluation Summary Table of Potentially Feasible Flood Mitigation Projects

Table 4C. Potentially Feasible Flood Mitigation Projects Identified by RFPG

Table 4B. Potentially Feasible Flood Mitigation Projects Identified by RFPG			x	x	x	x	x	o	x	x	x	x	x	x	x	x
FMP ID	**FMP Name**	**Description**	**Associated Goals (ID)**	**Associated FME, FMS, or FMP**	**Associated FME, FMS, or FMP Description**	**Counties**	**HUC12s**	**Watershed Name**	**Project Type**	**Project Area (sqmi)**	**Flood Risk Type (Riverine, Coastal, Urban, Playa, Other)**	**Sponsor**	**Entities with Oversight**	**Emergency Need (Y/N)**	**Estimated Project Cost ($)**	**Potential Funding Sources and Amount**
143000003	Small pond at San Elizario	Construct a new 0.34 ac-ft pond to relieve roadway flooding. Described as Alternative 3 from City of San Elizario "Drainage Feasibility Study" (2018).	14009001, 14009003	N/A	N/A	El Paso	130401000307		Detention Pond	0.001	Urban/Local	San Elizario city	San Elizario city	No	$224,000	General Revenue; $45,000
143000005	SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	Improvements to inlet and culvert capacities at 8 crossings, with cost estimates and prioritizations available.	14010001, 14010002	N/A	N/A	El Paso	130401000107		Storm Drain	0.1	Urban/Local	TXDOT, El Paso Water	TXDOT, El Paso Water	No	$3,745,000	Revenue bonds, Cash Revenues, Credit; $0
143000007	Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	Add flood gates to roadways at 4 LWCs on Alamito Creek, and a monitoring gage/early detection on North Alamito Creek at Hwy 17 Bridge upstream of Marfa. This provides early warning for Emergency Management to deploy before imminent road flooding.	14005001, 14006001	FMS ID: 142000025	FMS ID: 142000025 also improves early warning in Marfa, but is not required before or after this FMS.	Presidio County	130402020105		Preparedness	0.02	Riverine	Marfa city	Marfa city, Presidio County	Yes	$358,000	General Funds; $71,600
143000009	Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	Coordinate with Hudspeth County Commissioners, Road & Bridge Departments, Safety & Inspection Departments, & County Attorney to draft a floodplain ordinance (or modify existing subdivision ordinance) to regulate development standards in Hudspeth County.	14001001, 14002001	N/A	N/A	Hudspeth County			Other	4552.1	Riverine, Playa, Urban/Local	Hudspeth County	Hudspeth County	No	$50,000	General Revenue; $25,000
143000011	SSA4	Detention Basin SSA4	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000204		Detention Pond	0.1	Riverine	El Paso County	El Paso County	No	$14,744,000	General Funds, Bonds, Tax Notes; $ 737,200
143000021	SOC4	Sediment/Detention Basin at "Mankato Arroyo"	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000307		Detention Pond	0.04	Riverine	El Paso County, EPCWID1	El Paso County, EPCWID1, Socorro city	No	$2,383,000	Taxes, water use fees; $ 2,384,000
143000024	MON3	Sediment/Retention Basin	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000203		Detention Pond	1.3	Playa	El Paso County	El Paso County	No	$27,033,000	General Funds, Bonds, Tax Notes; $ 1,351,650
143000025	HAC3	Sediment/Retention Basin	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000307		Detention Pond	0.1	Riverine	El Paso County	El Paso County	No	$4,619,000	General Funds, Bonds, Tax Notes; $ 230,950
143000097	NW16	Expand channel from Village Ct to Doniphan Dr	14009003, 14009001	N/A	N/A	El Paso	130301020906		Channel	0.0	Urban/Local	El Paso Water	El Paso Water	No	$1,570,000	Revenue bonds, Cash Revenues, Credit; $ 0
143000100	NE3B	Alcan Pond: new catch basin to capture FP15 upstream	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000103		Detention Pond	0.1	Urban/Local	El Paso Water	El Paso Water	No	$21,234,000	Revenue bonds, Cash Revenues, Credit; $ 0
143000105	EA10A	Build sediment/detention basin upstream of Paseo del Este Drive	14009003, 14009001, 1401101	N/A	N/A	El Paso	130401000204		Detention Pond	0.02	Riverine	El Paso Water	El Paso Water, El Paso County	No	$9,647,000	Revenue bonds, Cash Revenues, Credit; $ 0
143000111	NW3	Construction of new larger capacity Doniphan Pump Station to replace PS1, with new force main directly to the Rio Grande. Install new catch basin with mechanical bar screen upstream of PS2.	14009003, 14009001	N/A	N/A	El Paso	130401000107		Detention Pond	0.3	Urban/Local	El Paso Water	El Paso Water	No	$16,132,000	Revenue bonds, Cash Revenues, Credit; $ 0
143000113	NW26	Acquire land, construct a permanent wetland, install a storm drain system to Doniphan Drive, construct pipeline to Doniphan Pump Station and build new pump station to control flood levels.	14009003, 14009001	N/A	N/A	El Paso	130401000107		Detention Pond	0.2	Urban/Local	El Paso Water	El Paso Water	No	$35,568,000	Revenue bonds, Cash Revenues, Credit; $ 0
143000116	EA9A	Build sediment/detention basin upstream of Paseo del Este Drive	14009003, 14009001, 14011001	N/A	N/A	El Paso	130401000204		Detention Pond	0.0	Riverine	El Paso Water	El Paso Water	No	$11,897,000	Revenue bonds, Cash Revenues, Credit; $ 0
143000123	WC4	Construct a new 37.59 ac-ft pond to relieve roadway flooding on Mesa Street.	14009003, 14009001, 14011001	141000034	Develop all required datasets and models for 52 projects from the City of El Paso/El Paso Water Stormwater Master Plan to be recommended as FMPs in the Regional Flood Plan.	El Paso	130301020906	Doniphan Corridor 2018, Courchesne 2013, FPN21_2	Detention Pond	0.0	Urban/Local, Riverine	El Paso Water	El Paso Water	No	$10,198,410	State, Local
143000118	VIN1	Construction of a diversion channel and two combination of sediment/detention basins.	14009003, 14009001, 14011001	141000035	Develop all required datasets and models for 21 projects from the El Paso County Stormwater Master Plan to be considered as FMPs in the Regional Flood Plan.	El Paso	130301020804	FPN45_4, FPN45_5	Detention Pond	0.1	Riverine	El Paso County	El Paso County	No	$59,386,500	State, Local

Table 4C. Potentially Feasible Flood Mitigation Projects Identified by RFPG

FMP ID	FMP Name	Description	Associated Goals (ID)	Associated FME, FMS, or FMP	Associated FME, FMS, or FMP Description	Counties	HUC12s	Watershed Name	Project Type	Project Area (sqmi)	Flood Risk Type (Riverine, Coastal, Urban, Playa, Other)	Sponsor	Entities with Oversight	Emergency Need (Y/N)	Estimated Project Cost ($)	Potential Funding Sources and Amount
143000117	Gateway Ponds	Acquire land, expand the existing detention basin north of I-10. Construction of new larger capacity Pump Station with capacity of 350 cfs in the north pond, with new force main directly to the Rio Grande.	14009003, 14009001, 14011001	141000035	Develop all required datasets and models for 21 projects from the El Paso County Stormwater Master Plan to be considered as FMPs in the Regional Flood Plan.	El Paso	130401000103, 130401000107	Cebada_Reservoir	Detention Pond	298.8	Urban/Local, Riverine	El Paso Water	El Paso Water	No	$108,224,900	State, Local
143000121	Dallas Ponds	Acquire land, build new detention basin north of IH-10. Construction of new larger capacity Pump Station with capacity of 250 cfs in the basin with new force main directly to the Rio Grande.	14009003, 14009001, 14011001	141000034	Develop all required datasets and models for 52 projects from the City of El Paso/El Paso Water Stormwater Master Plan to be recommended as FMPs in the Regional Flood Plan.	El Paso	130401000103, 130401000107	Cotton_Dallas_US	Detention Pond	0.0	Urban/Local, Riverine	El Paso Water	El Paso Water	No	$160,532,300	State, Local
143000120	Presidio	Retention & Detention Basin	14004002, 14009004, 14009002	142000005, 142000002	Develop H&H Models for Cibolo Creek and arroyos through the City of Presidio, and develop an FMP for flooding reduction of buildings and emergency access roadways	Presidio	130402011406	Arroyo Tortola-Rio Grande	Detention Pond	10.2	Urban/Local	RGCOG, Presidio County, TXDOT, USIBWC, USACE	Presidio County, TXDOT, USIBWC, USACE	N	$4,620,933	Federal, State, Local
143000122	WC1	Sediment Retention Basin	14004001, 14009003, 14009001	141000034	Develop all required datasets and models for 52 projects from the City of El Paso/El Paso Water Stormwater Master Plan to be recommended as FMPs in the regional floodplain	El Paso	130301020906	City of Cotonado Hills - Rio Grande	Detention Pond	0.0	Urban/Local	El Paso Water, El Paso County	El Paso Water, El Paso County	N	$4,461,518	State, Local
143000119	City of Pecos	Retention Basin	14004002	141000010, 141000007	Develop city-wide drainage study and stormwater master plan for Pecos, Study to plan the management of saltcedar growth and debris in channel in/adjacent to City of Pecos	Reeves	13070010903	Salt Draw	Detention Pond	23.06	Urban/Local, Playa, Riverine	Pecos City, Lindsay CDP, Reeve	Pecos City, Lindsay CDP, Reeves County, TxDOT	N	$11,161,000	Federal, State, Local

Table 4C. Potentially Feasible Flood Mitigation Projects Identified by RFPG

Table 4B. Potentially Feasible Flood Mitig		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Flood Risk										Reduction in Flood Risk									
FMP ID	FMP Name	Area in 100yr (1% annual chance) Floodplain in square miles	Area in 500yr (0.2% annual chance) Floodplain in square miles	Estimated number of structures at 100yr flood risk	Residential structures at 100-year flood risk	Estimated Population at 100-year flood risk	Critical facilities at 100-year flood risk (#)	Number of low water crossings at flood risk (#)	Estimated number of road closures (#)	Estimated length of roads at 100-year flood risk (Miles)	Estimated farm & ranch land at 100-year flood risk (acres)	Number of structures with reduced 100yr (1% annual chance) flood risk	Number of structures removed from 100yr (1% annual chance) flood risk	Number of structures removed from 500yr (0.2% annual chance) flood risk	Residential structures removed from 100yr (1% annual chance) flood risk	Estimated Population removed from 100yr (1% annual chance) flood risk	Critical facilities removed from 100yr (1% annual chance) flood risk (#)	Number of low water crossings removed from 100yr (1% annual chance) flood risk (#)	Estimated reduction in road closure occurrences	Estimated length of roads removed from 100yr flood risk (Miles)	Estimated farm & ranch land removed from 100yr flood risk (acres)	Estimated reduction in fatalities (if available)
143000003	Small pond at San Elizario	0.0	0	0	0	0	0	0	2	0.2	0	0	0	0	0	0	0	0	2	0.2	0	
143000005	SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	0.005	0.004	2	0	30	0	8	16	0.21	0	0	0	0	0	0	0	8	0	0	0	
143000007	Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	0.022	0	0	0	0	0	4	4	0.32	0.001	0	0	0	0	0	0	0	0	0	0	1
143000009	Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	937	1155	823	44	1629	2	70	489	288	246	44	0	0	0	0	0	0	0	0	0	
143000011	SSA4	0.77	2.8	185	139	564	1	0	32	3.7	314.6	168	99	184	74	299	0	0	0	0.02	4.0	
143000021	SOC4	0.21	0.6	10	2	26	0	0	4	0.3	99.9	10	10	65	2	26	0	0	4	0.3	19.2	
143000024	MON3	8.69	13.4	756	557	1977	2	23	267	64.1	0.0	603	327	609	248	820	0	0	11	14.9	0	
143000025	HAC3	0.42	0.7	10	6	23	0	0	1	0.2	96.7	10	10	11	6	23	0	0	1	0.1	43.2	
143000097	NW16	0.01	0.02	3	0	12	0	0	0	0.01	0.0	0	3	0	0	12	0	0	0	0.01	0	
143000100	NE3B	0.11	0.3	136	107	615	1	0	34	3.9	0.0	119	54	0	104	167	0	0	8	1.1	0	
143000105	EA10A	0.79	1.7	17	6	287	0	10	23	4.3	331.5	11	1	30	1	3	0	0	0	0.1	29.2	
143000111	NW3	0.03	0.3	6	1	37	1	0	7	0.7	0.0	1	6	0	1	37	1	0	7	0.7	0	
143000113	NW26	0.03	0.3	6	1	37	1	0	7	0.7	0.0	1	0	0	0	0	0	0	1	0.1	0	
143000116	EA9A	0.79	1.7	17	6	287	0	10	23	4.3	331.5	11	13	37	2	282	0	1	9	1.4	89.23	
143000123	WC4	0.01	0.0	15	11	109	1	0	2	0.1	0.0	15	15	17	11	109	1	0	2	0.1	0	N/A
143000118	VIN1	1.00	1.2	431	328	918	0	12	45	9.6	1.3	431	392	386	302	879	0	0	34	8.3	0.08	N/A

Table 4C. Potentially Feasible Flood Mitigation Projects Identified by RFPG

		Flood Risk										Reduction in Flood Risk										
FMP ID	**FMP Name**	**Area in 100yr (1% annual chance) Floodplain in square miles**	**Area in 500yr (0.2% annual chance) Floodplain in square miles**	**Estimated number of structures at 100yr flood risk**	**Residential structures at 100-year flood risk**	**Estimated Population at 100-year flood risk**	**Critical facilities at 100-year flood risk (#)**	**Number of low water crossings at flood risk (#)**	**Estimated number of road closures (#)**	**Estimated length of roads at 100-year flood risk (Miles)**	**Estimated farm & ranch land at 100-year flood risk (acres)**	**Number of structures with reduced 100yr (1% annual chance) flood risk**	**Number of structures removed from 100yr (1% annual chance) flood risk**	**Number of structures removed from 500yr (0.2% annual chance) flood risk**	**Residential structures removed from 100yr (1% annual chance) flood risk**	**Estimated Population removed from 100yr (1% annual chance) flood risk**	**Critical facilities removed from 100yr (1% annual chance) flood risk (#)**	**Number of low water crossings removed from 100yr (1% annual chance) flood risk (#)**	**Estimated reduction in road closure occurrences**	**Estimated length of roads removed from 100yr flood risk (Miles)**	**Estimated farm & ranch land removed from 100yr flood risk (acres)**	**Estimated reduction in fatalities (if available)**
143000117	Gateway Ponds	0.16	0.6	206	135	899	0	0	34	4.5	0.0	206	206	255	142	899	0	0	34	3.6	0	N/A
143000121	Dallas Ponds	0.67	0.9	169	94	3226	3	0	107	20.3	0.0	169	169	316	111	3226	3	0	107	19.5	0	N/A
143000120	Presidio	0.10	0.1	10	6	16	0	0	3	2.1	0.0	10	9	2	6	16	0	0	3	1.1	0	0
143000122	WC1	0.11	0.1	110	94	384	0	0	54	1.9	0.0	110	102	74	90	349	0	0	46	1.9	0	0
143000119	City of Pecos	10.08	10.3	993	479	2310	7	16	122	53.7	362.4	120	51	16	0	144	0	0	0	2.4	8.1	**0**

Table 4C. Potentially Feasible Flood Mitigation Projects Identified by RFPG

Table 4B. Potentially Feasible Flood Mitig x x x x x x x x x

FMP ID	FMP Name	Pre-Project Level-of-Service	Post-Project Level-of-Service	Cost/ Structure removed	Percent Nature-based Solution (by cost)	Negative Impact (Y/N)	Negative Impact Mitigation (Y/N)	Social Vulnerability Index (SVI)	Water Supply Benefit (Y/N)	Benefit-Cost Ratio
143000003	Small pond at San Elizario	Unknown	10% annual chance	N/A	0	No	No	0	No	0
143000005	SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	<20% annual chance	10% annual chance	N/A	0	No	No	0.29	No	0
143000007	Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	<20% annual chance	<20% annual chance	N/A	0	No	No	0.00	No	0
143000009	Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	Unknown	Unknown	N/A	0	No	No	0.56	No	0
143000011	SSA4	<1% annual chance	1% annual chance	$148,929	0	No	No	0.90	No	0.1
143000021	SOC4	<1% annual chance	1% annual chance	$238,300	0	No	No	0.94	No	0.1
143000024	MON3	<1% annual chance	1% annual chance	$82,670	0	No	No	0.74	No	0.2
143000025	HAC3	<1% annual chance	1% annual chance	$461,900	0	No	No	0.99	No	0
143000097	NW16	<1% annual chance	1% annual chance	$523,333	0	No	No	0.89	No	0
143000100	NE3B	<1% annual chance	1% annual chance	$393,222	0	No	No	0.78	No	0.1
143000105	EA10A	<1% annual chance	0.2% annual chance	$9,647,000	0	No	No	0.64	No	0
143000111	NW3	<1% annual chance	1% annual chance	$2,688,670	0	No	No	0.79	No	0
143000113	NW26	<1% annual chance	1% annual chance	N/A	1	No	No	0.00	No	0
143000116	EA9A	<1% annual chance	0.2% annual chance	$915,154	0	No	No	0.64	No	0
143000123	WC4	<1% Annual Chance	1% Annual Chance	$679,894	0	N	N	0.77	N	0.042833542
143000118	VIN1	N/A	0.2% Annual Chance	$151,496	0	N	N	0.84	N	0.123002003

Table 4C. Potentially Feasible Flood Mitigation Projects Identified by RFPG

FMP ID	FMP Name	Pre-Project Level-of-Service	Post-Project Level-of-Service	Cost/ Structure removed	Percent Nature-based Solution (by cost)	Negative Impact (Y/N)	Negative Impact Mitigation (Y/N)	Social Vulnerability Index (SVI)	Water Supply Benefit (Y/N)	Benefit-Cost Ratio
143000117	Gateway Ponds	<1% Annual Chance	1% Annual Chance	$525,364	0	N	N	0.93	N	0.077447525
143000121	Dallas Ponds	N/A	1% Annual Chance	$949,895	0	N	N	0.98	N	0.035646086
143000120	Presidio	<1% Annual Chance	1% Annual Chance	$513,437	0	N	N	0.95	N	0.015
143000122	WC1	<1% Annual Chance	1% Annual Chance	$43,740	0	N	N	0.59	N	0.366824331
143000119	City of Pecos	<50% Annual Chance	50% Annual Chance	$218,843	0	N	N	0.51	N	0.173

Appendix 4D
Narratives of Potentially Feasible Flood Mitigation Projects

Appendix 4D. Narratives for Flood Mitigation Projects

4D-1. Flood Mitigation Project ID: 143000003

Name: Small pond at San Elizario

Description: Construct a new 0.34 ac-ft pond to relieve roadway flooding. Described as Alternative 3 from City of San Elizario "Drainage Feasibility Study" (2018).

Affected Jurisdictions: City of San Elizario

Discussion on Cultural Resources Background: Two National Register Districts and five archaeological sites are located within and /or adjacent to the proposed project area. As the project area is located within one National Register Districts, Section 106 of the NHPA will take effect and a cultural resources survey of the entire project area will be required to evaluate any unrecorded, potential cultural resources that can contribute to this district, and determine if any adverse effects will happen on historic properties.

Table 4D. Cultural Resources Within and/or Adjacent to FMP ID: 143000003

Resource Name	Resource Type	Prehistoric/ Historic	NRHP Eligibility	Location
Archaeological Site	Historic Structure	Historic	Ineligible	Adjacent
Archaeological Site	Historic Structure	Historic	Ineligible	Adjacent
Archaeological Site	Historic Structure	Historic	Ineligible	Adjacent
Archaeological Site	Historic Homestead	Historic	Ineligible	Adjacent
Archaeological Site	Historic Homestead	Historic	Ineligible	Adjacent
EPCWID	National Register District	Historic	Listed	Intersects
San Elizario Historic District	National Register District	Historic	Listed	Adjacent

Discussion on Flood Risk: The Drainage Feasibility Study (Brock & Bustillos, Inc., 2018) describes the existing flood risk for the project as the following:

> "The City of San Elizario, Texas has continuously experienced flooding of the intersections of Socorro Rd. and San Antonio St., and Socorro Rd. and Main St. as shown in Figure 1. The flooding occurs on practically any storm event and causes disruption to traffic, area residents, and business owners. It also creates unsanitary conditions as trash and debris accumulates in the area as these are transported by the storm water. The City of San Elizario contracted the services of Brock & Bustillos Inc. (B&B) to develop a feasibility study to determine up to three (3) potential alternatives to mitigate flooding and ponding problems at these intersections. This study identifies existing drainage infrastructure, determines the contributing watershed area, determines expected storm water flows, identifies potential regional ponding areas, presents flood mitigating alternatives, determines

> estimated probable construction costs, and provides a recommendation for flooding mitigation."

Project Description: The Drainage Feasibility Study (Brock & Bustillos, Inc., 2018) describes the project as the following:

> "This alternative was identified by City of San Elizario officials due to its practical and proximity location to the flooding intersections. It consists of the creation of a new pond located in a portion of 1408 San Antonio St. identified by EPCAD Property ID 394930. The proposed layout is shown on Exhibit D. Unfortunately, the vacant portion where a pond can be located is only about 0.128-Ac and has approximate capacity of 0.34-Ac-ft or only 3% of the required 10.4-Ac-ft expected runoff from a 1% AC storm event."

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – Drainage Feasibility Study Construction Cost (Brock&Bustillos, Dec. 2018)	$ 81,183
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	$ 83,455
Subtotal 3 – RFP Construction Contingency (35%)	$ 29,209
Total Construction Cost	**$ 112,664**
Subtotal 4 – Drainage Feasibility Study Land Acquisition Cost (Brock&Bustillos, Dec. 2018)	$ 50,000
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	$ 51,801
Subtotal 6 – RFP Final Design Cost (20%)	$ 22,533
Subtotal 7 – RFP Permitting Cost (10%)	$ 11,266
Subtotal 8 – RFP Construction Oversight Cost (8%)	$ 9,013
Subtotal 9 – RFP Geotech Cost (15%)	$ 16,900
Total Non-Construction Cost	**$ 111,512**
Total FMP Cost	**$ 224,000**

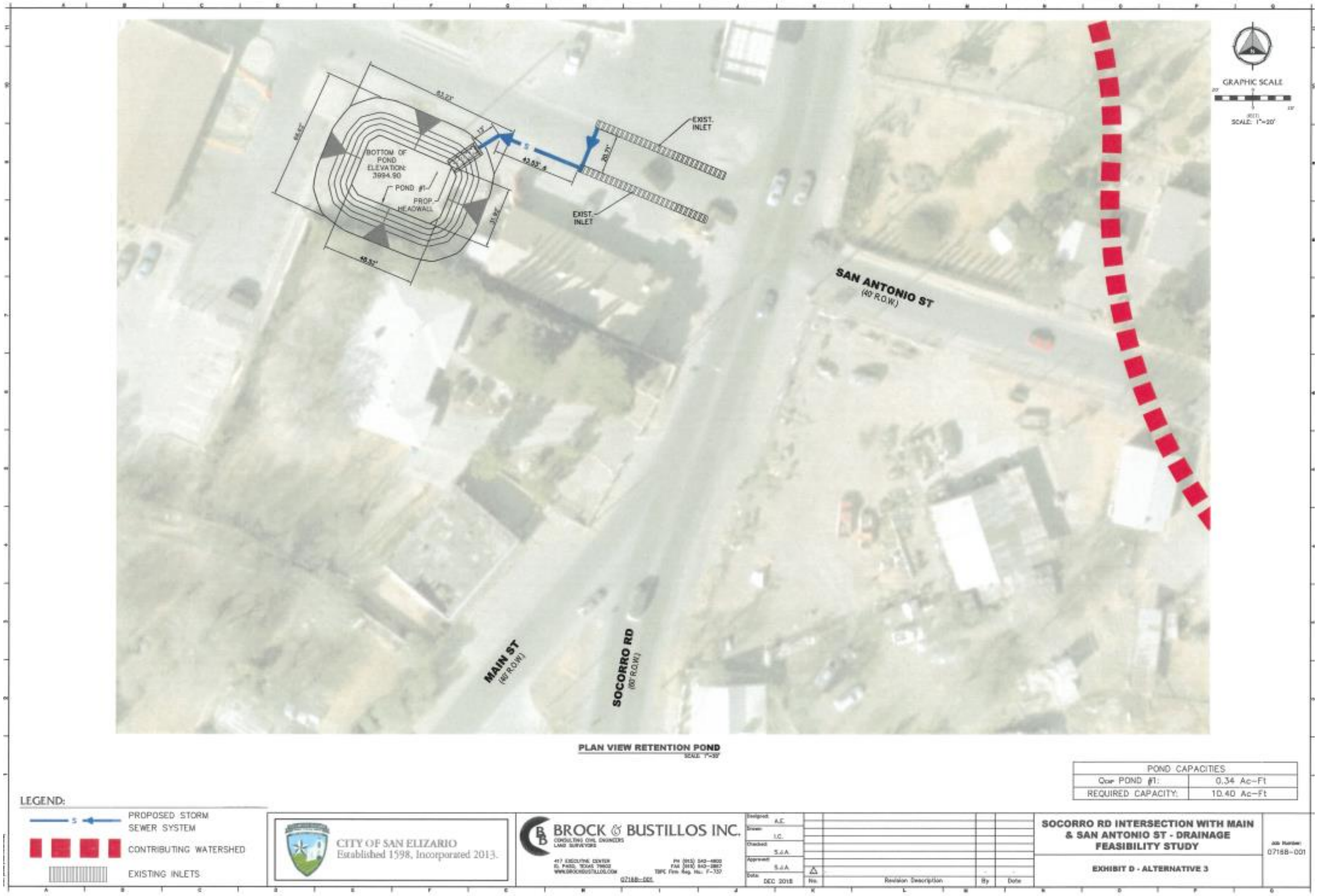


Figure 4D-1: Exhibit D, Alternative 3 from Drainage Feasibility Study Socorro Rd. Intersections with San Antonio St. & Main St. (Brock & Bustillos, 2018)

4D-2. Flood Mitigation Project ID: 143000005

Name: SH20 Drainage Improvements from Doniphan Drive to Texas Avenue

Description: Improvements to inlet and culvert capacities at eight crossings, with cost estimates and prioritizations available.

Affected Jurisdictions: City of El Paso

Discussion on Cultural Resources Background: No cultural resources are located within or immediately adjacent to the project area. Given the proposed design includes facility improvements, SWCA recommends no cultural resources survey of the project area based on current design plans.

Discussion on Flood Risk: The “Drainage Study for SH20 (Mesa Street), from Doniphan Drive to Texas Avenue” (AECOM, 2019) describes the existing flood risk for the project as the following:

> “Most of the existing drainage crossings have adequate capacity to convey the 1% AC flows without overtopping the roadway. The primary issue is the inability of the runoff from offsite areas and at some locations runoff from within the SH 20 ROW to efficiently drain to the crossings.”

Project Description: The “Drainage Study for SH20 (Mesa Street), from Doniphan Drive to Texas Avenue” (AECOM, 2019) describes the project as the following:

> “Potential drainage improvements were developed at a conceptual level for locations with a LOS less than a 10-yr event. The drainage improvements recommended in this report are conceptual and require further study before detailed design. Each drainage improvement will improve the LOS around each crossing or identified flooding location and reduce the frequency of flooding. It should be expected that roadway flooding will occur post improvements for storm events in excess of a 20% AC 24-hour storm event.”

Each of the recommended and prioritized drainage improvements is described below in order of priority, from the “Drainage Study for SH20 (Mesa Street), from Doniphan Drive to Texas Avenue” (AECOM, 2019):

> “10-1 - Increase the length of the weir along Mesa Hills drive to increase the capacity by 75 cfs.
>
> 10-2 - Add inlets along Festival Drive connected to crossings 7D. Estimated necessary capacity 75 cfs.
>
> 10-3 - Increase the capacity of the inlets and crossing at 9A & 9B by 30 cfs.

10-4 - Add an inlet upstream of the inlet along E Castellano Drive. Also increase the size of the inlet at the sag at the intersection of E Castellano Drive and SH 20. Connect both inlets to crossing 11. Estimated necessary capacity of each inlet 75 cfs.

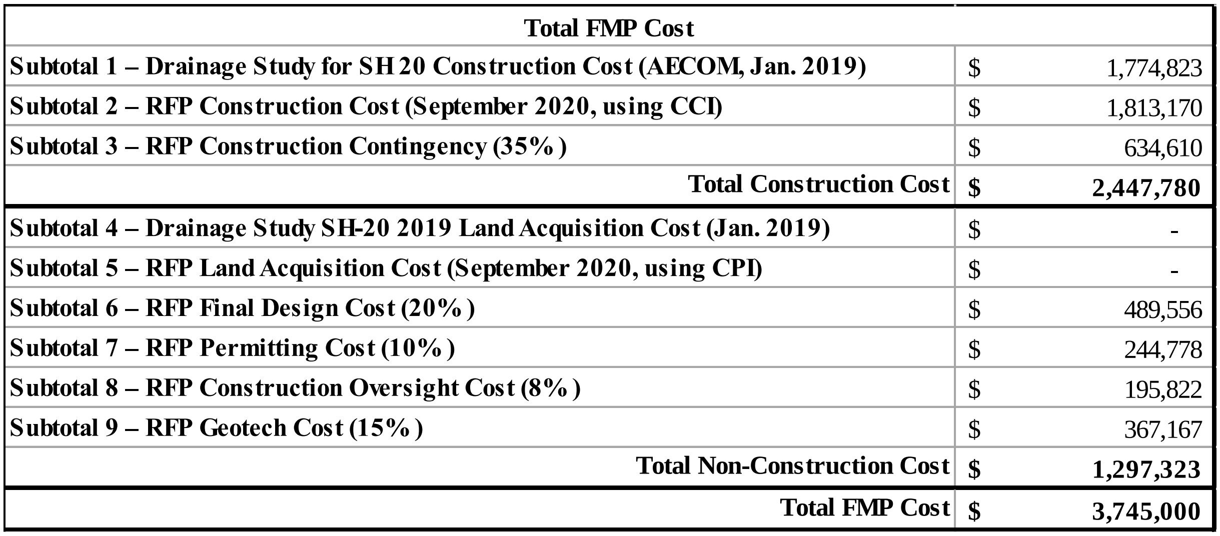
10-5 - Add inlets along SH 20 connecting to crossings 12A. Estimated necessary capacity: Approximately 250 cfs.

10-6 - Add inlets at the sag at the Brentwood intersection. Connect the inlets to the downstream side of crossing 14B. Estimated necessary capacity: Approximately 90 cfs.

10-7 - Add inlets at the sag near crossing 18. Connect the inlets to crossing 18. Estimated capacity: Approximately 50 cfs.

10-8 - Add inlets at the Sag within the Kerbey intersection and the sag near crossing 19. Connect the inlets to crossing 19. Estimated necessary capacity for each inlet: Approximately 60 cfs.”

Estimated Cost for FMP:



Total FMP Cost		
Subtotal 1 – Drainage Study for SH 20 Construction Cost (AECOM, Jan. 2019)	$	1,774,823
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	$	1,813,170
Subtotal 3 – RFP Construction Contingency (35%)	$	634,610
Total Construction Cost	**$**	**2,447,780**
Subtotal 4 – Drainage Study SH-20 2019 Land Acquisition Cost (Jan. 2019)	$	-
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	$	-
Subtotal 6 – RFP Final Design Cost (20%)	$	489,556
Subtotal 7 – RFP Permitting Cost (10%)	$	244,778
Subtotal 8 – RFP Construction Oversight Cost (8%)	$	195,822
Subtotal 9 – RFP Geotech Cost (15%)	$	367,167
Total Non-Construction Cost	**$**	**1,297,323**
Total FMP Cost	**$**	**3,745,000**

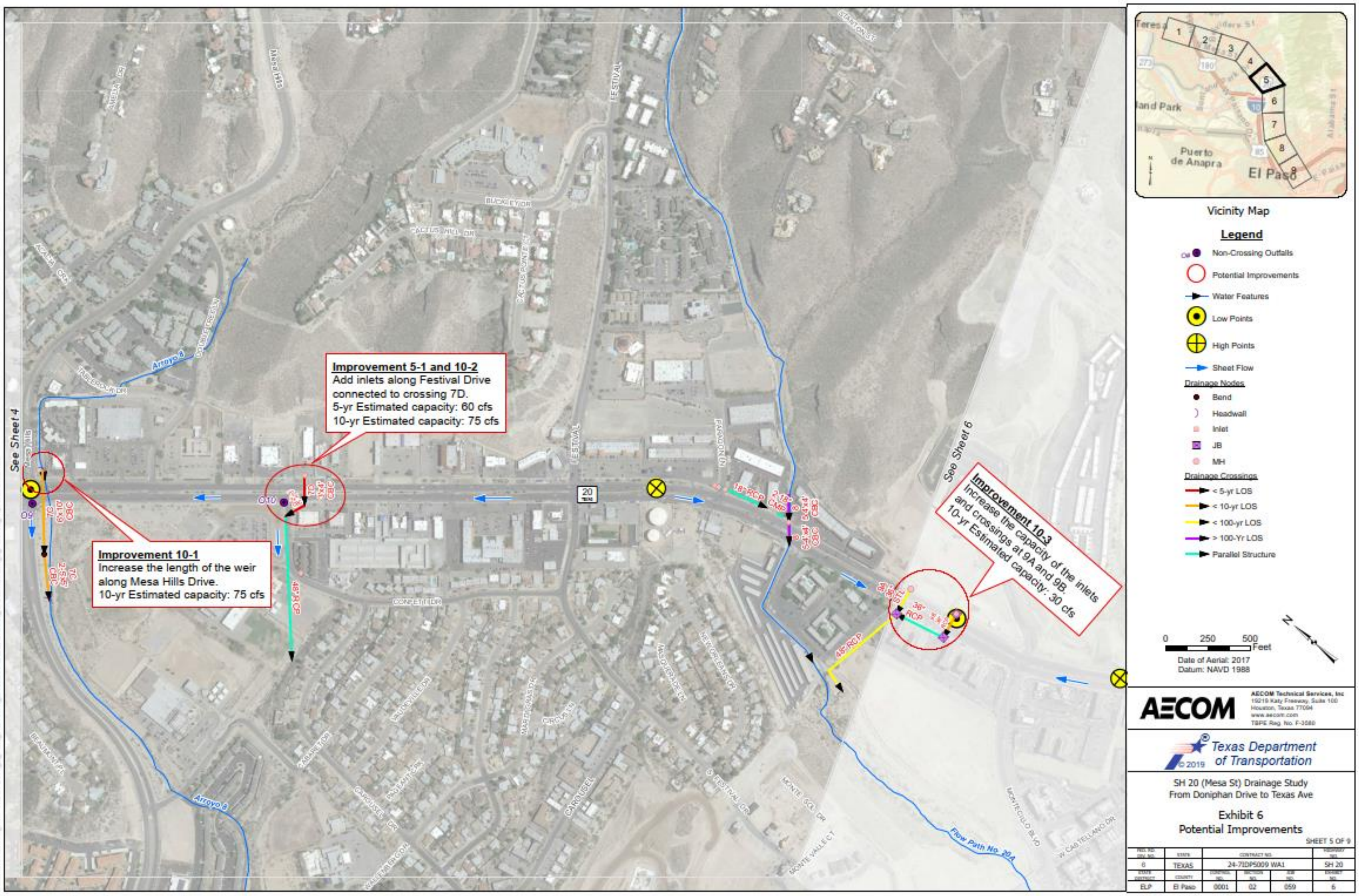
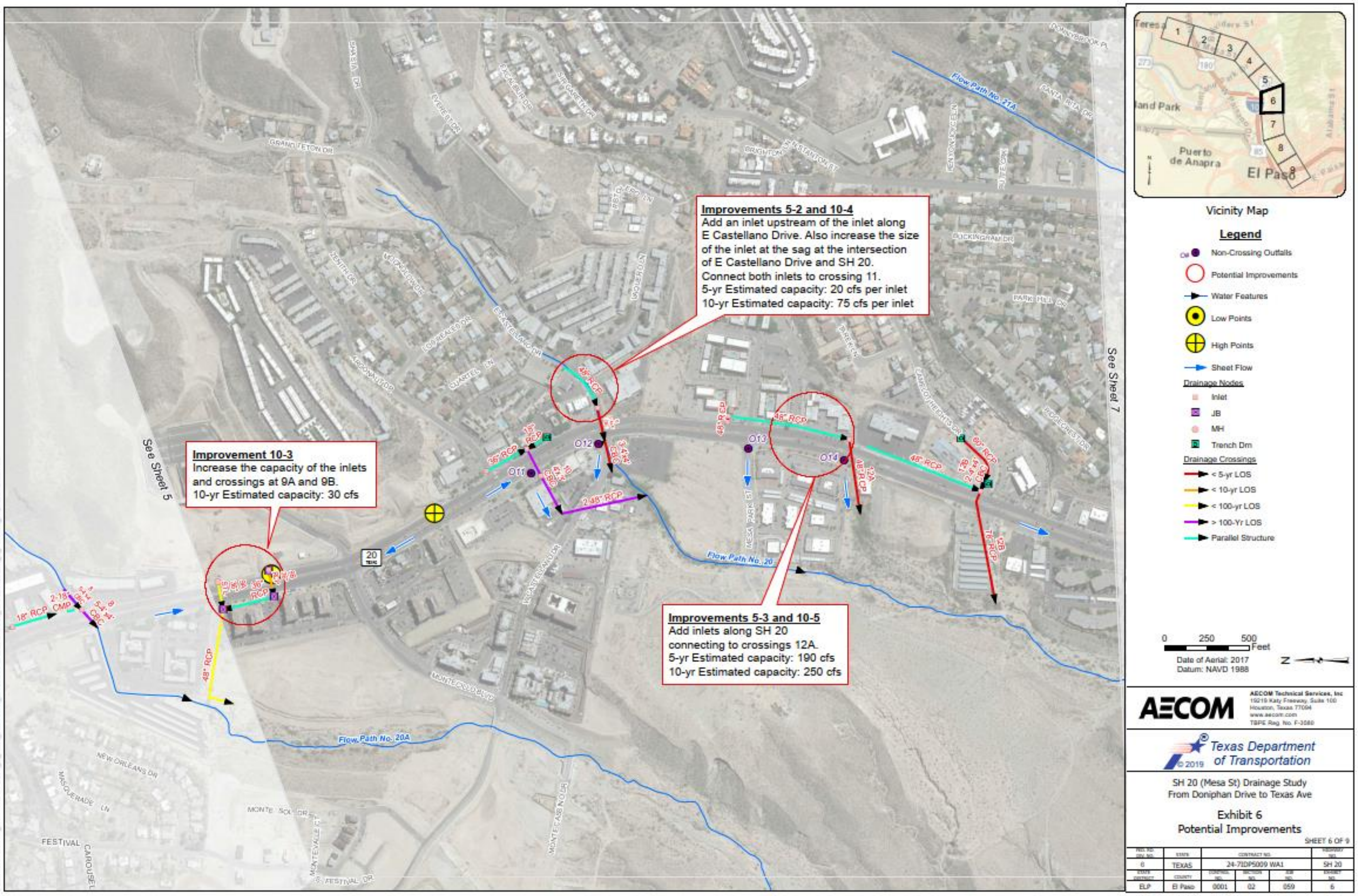


Figure 4D-2.1: Exhibit 6, Sheet 5 from Drainage Study for SH20 (Mesa Street) from Doniphan Drive to Texas Avenue (AECOM, 2019)

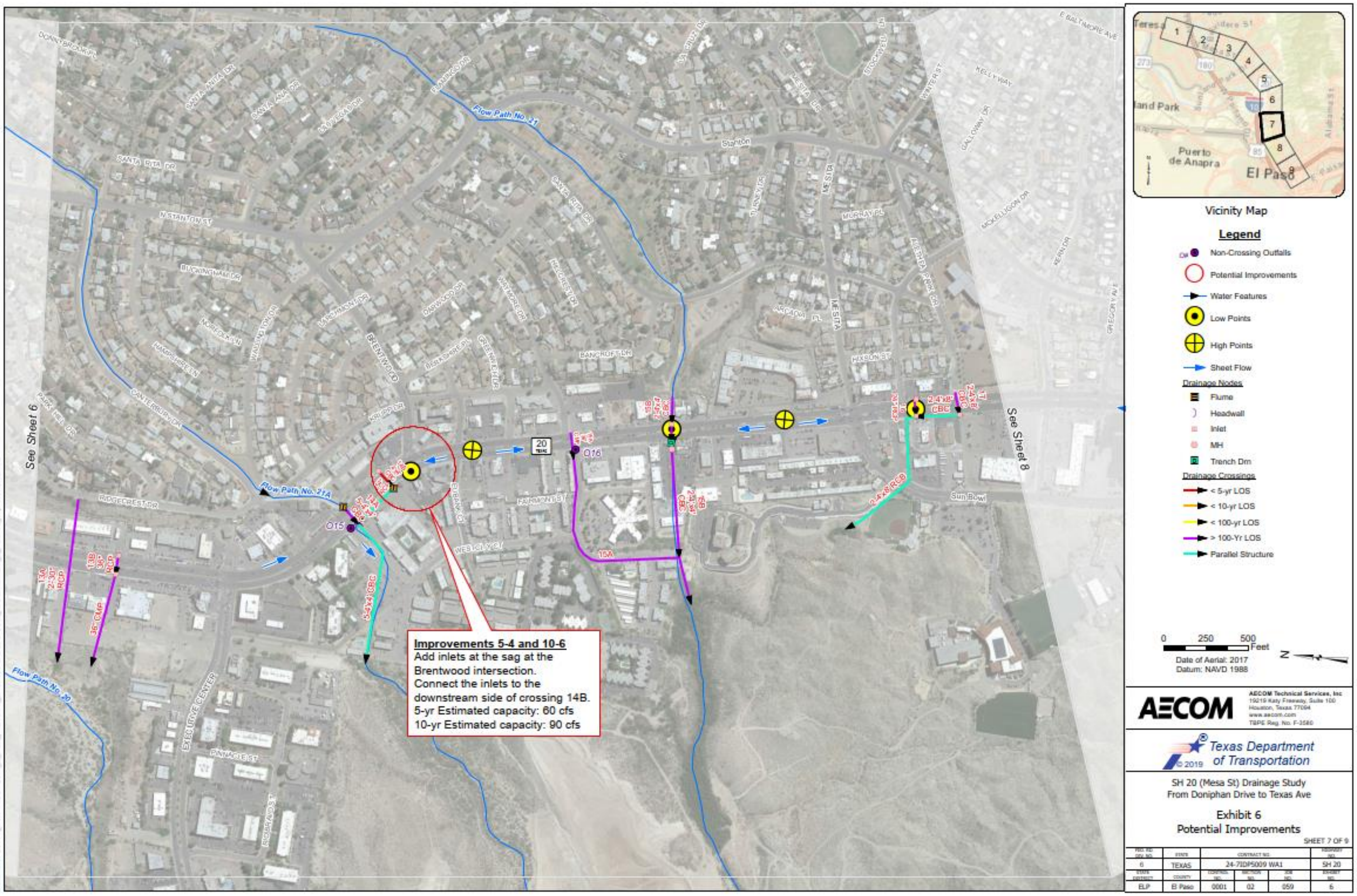


Improvements 5-2 and 10-4
Add an inlet upstream of the inlet along E Castellano Drive. Also increase the size of the inlet at the sag at the intersection of E Castellano Drive and SH 20. Connect both inlets to crossing 11.
5-yr Estimated capacity: 20 cfs per inlet
10-yr Estimated capacity: 75 cfs per inlet

Improvement 10-3
Increase the capacity of the inlets and crossings at 9A and 9B.
10-yr Estimated capacity: 30 cfs

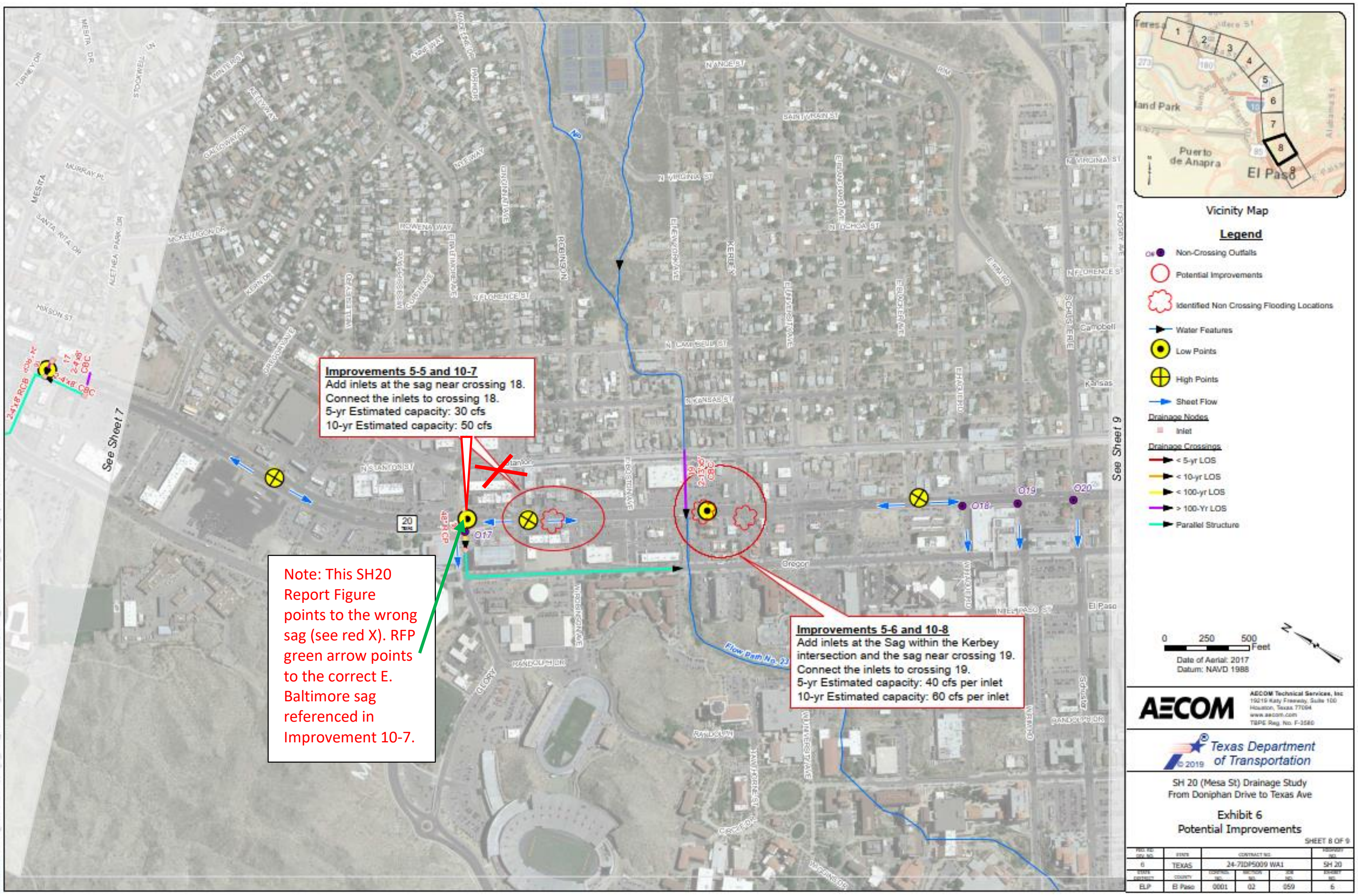
Improvements 5-3 and 10-5
Add inlets along SH 20 connecting to crossings 12A.
5-yr Estimated capacity: 190 cfs
10-yr Estimated capacity: 250 cfs

Figure 4D-2.2: Exhibit 6, Sheet 6 from Drainage Study for SH20 (Mesa Street) from Doniphan Drive to Texas Avenue (AECOM, 2019)



Improvements 5-4 and 10-6
Add inlets at the sag at the Brentwood intersection.
Connect the inlets to the downstream side of crossing 14B.
5-yr Estimated capacity: 60 cfs
10-yr Estimated capacity: 90 cfs

Figure 4D-2.3: Exhibit 6, Sheet 7 from Drainage Study for SH20 (Mesa Street) from Doniphan Drive to Texas Avenue (AECOM, 2019)



Improvements 5-5 and 10-7
Add inlets at the sag near crossing 18.
Connect the inlets to crossing 18.
5-yr Estimated capacity: 30 cfs
10-yr Estimated capacity: 50 cfs

Improvements 5-6 and 10-8
Add inlets at the Sag within the Kerbey intersection and the sag near crossing 19.
Connect the inlets to crossing 19.
5-yr Estimated capacity: 40 cfs per inlet
10-yr Estimated capacity: 60 cfs per inlet

Note: This SH20 Report Figure points to the wrong sag (see red X). RFP green arrow points to the correct E. Baltimore sag referenced in Improvement 10-7.

Figure 4D-2.4: Exhibit 6, Sheet 8 from Drainage Study for SH20 (Mesa Street) from Doniphan Drive to Texas Avenue (AECOM, 2019)

4D-3. Flood Mitigation Project ID: 143000007

Name: Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17

Description: Add flood gates to roadways at 4 LWCs on Alamito Creek, and a monitoring gage/early detection on North Alamito Creek at Hwy 17 Bridge upstream of Marfa. This provides early warning for Emergency Management to deploy before imminent road flooding.

Affected Jurisdictions: City of Marfa, Presidio County

Discussion on Cultural Resources Background: No cultural resources are located within or immediately adjacent to the project area. Assuming that the project design just includes facility updates and no ground disturbing activities are planned, SWCA recommends no cultural resources survey is necessary.

Project Description: A total of four flood gates will be added to the low water crossings shown in **Exhibit Map 20.7** of *Chapter 5*, and a new flood gage will be installed at North Alamito Creek under Hwy 17 Bridge to aid in providing early warning. While the FMS ID: 142000025 also affects early warning in the City of Marfa, the FMS depends on the implementation of a gage system which requires recurring costs, unlike this FMP. While the FMS would improve early warning times associated with this FMP, it is not required to be implemented before or after this FMP is constructed. A bid is included in **Appendix 4G**, provided by High Sierra Electronics, Inc. to City of Marfa on January 26, 2022 for the equipment and services associated with this FMP.

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – High Sierra Electronics Construction/Equipment Cost (Jan. 2022)	$ 253,425
Subtotal 2 – RFP Construction/Equipment Cost (September 2020, using CCI)	$ 232,099
RFP Total Construction/Equipment Cost (Sept. 2020)	**$ 232,099**
Subtotal 3 – High Sierra Electronics Services/Installation Cost (Jan. 2022)	$ 132,189
Subtotal 4 – High Sierra Electronics Maintenance/Operation Training Cost (Jan. 2022)	$ 3,566
High Sierra Total Non Construction Cost (Jan 2022)	**$ 135,755**
RFP Total Non-Construction Cost (September 2020, using CPI)	**$ 125,679**
Total FMP Cost	**$ 358,000**

4D-4. Flood Mitigation Project ID: 143000009

Name: Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County

Description: Coordinate with Hudspeth County Commissioners, Road & Bridge Departments, Safety & Inspection Departments, and County Attorney to draft a floodplain ordinance (or modify an existing subdivision ordinance) to regulate development standards in Hudspeth County.

Affected Jurisdictions: Hudspeth County

Discussion on Cultural Resources Background: One NHRP District, 172 archaeological sites, and two cemeteries are located within Hudspeth County. The Butterfield Overland Mail Route National Register District is located within the northeastern corner of Hudspeth County, near Guadalupe Mountains National Park. The district includes multiple nineteenth century to mid-twentieth century road segments associated with the broad national pattern of western expansion and settlement . As the most significant cultural resource within the county, and the association of many archaeological sites within and outside of the district limits, cultural resources survey will be required within the district boundaries through Section 106; SWCA recommends cultural resource survey anywhere within 0.6-mile (1.0 kilometer) of the district boundary.

Project Description: A request submitted by Hudspeth County to receive an earmark for Federal funding from FEMA in April 2022 stated the following:

> “Task 1. Develop and implement floodplain management regulations within Hudspeth County. In recent years, paid residential development has occurred in Hudspeth County in the region covered by this project. The County lacks an administrative and legal structure to require review and approval of drainage impacts of these developments. This task was recommended in the 2019 Colonia Area Plan, and endorsed as a potential non-structural Floodplain Mitigation Project (FMP) by the URGFPG. Cost is estimated at $50,000.”

Estimated Cost for FMP:

The funding earmark request submitted by Hudspeth County included an estimated cost of **$50,000** based on coordination with the Regional Flood Planning Group (RFPG) and El Paso County. A coordination call was held with Hudspeth County, El Paso County, and the RFPG on April 7, 2022 to discuss the needs of Hudspeth County concerning regulation of new development and to seek input from El Paso County based on their current system. El Paso County described their challenges and successes related to new development. The discussion aided in the decision on an appropriate cost estimate for a consultant to evaluate Hudspeth County’s development process and make recommendations for improvements.

4D-5. Flood Mitigation Project ID: 143000011

Name: SSA4

Description: Detention Basin SSA4.

Affected Jurisdictions: City of Socorro, Sparks CDP, El Paso County

Discussion on Cultural Resources Background: The entire project area has been previously surveyed in 2010 by Geo-Marine Inc. on behalf of United States Army Corps of Engineers for a proposed detention basin , resulting in no newly documented cultural resources within the project area. SWCA, therefore, recommends no cultural resource survey necessary based on current design plans.

Discussion on Flood Risk: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

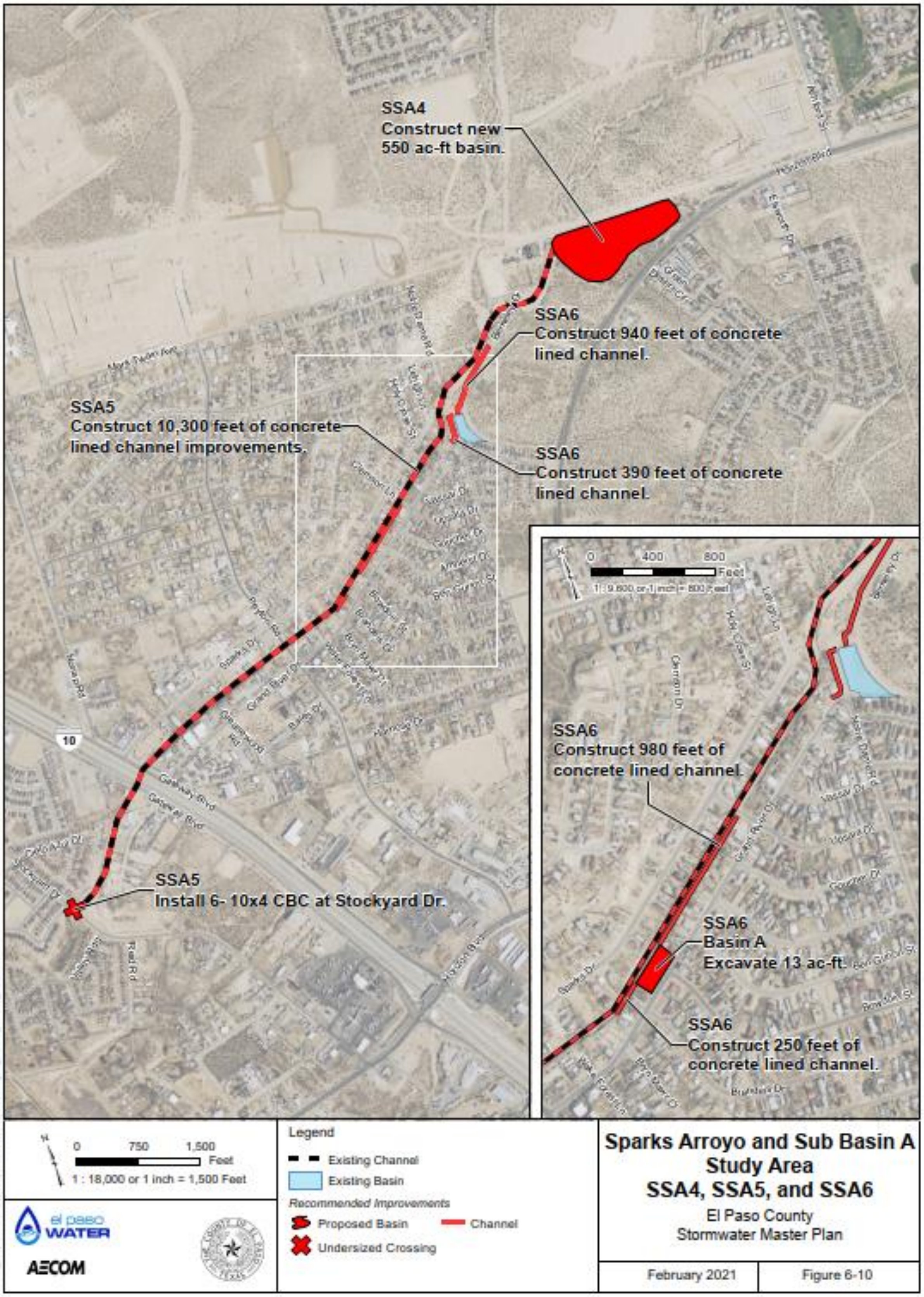
> "Uncontrolled flows originating in the upper end of the watershed pose a flood risk to the WWTP at the upstream end of the Sparks Arroyo and to residences located adjacent to the arroyo. Runoff from the development in Horizon City and other undeveloped areas on the mesa enters the upper tributaries of the watershed that converge to form the Sparks Arroyo. According to the USACE feasibility study, flows from these tributaries pose a flood risk to the WWTP at the upstream end of the Sparks Arroyo. The tributaries converge approximately 300 feet downstream of the WWTP. At this location, flows from the tributaries exceed the capacity of the Sparks Arroyo and pose a flood risk to residences downstream."

Project Description: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the project as the following:

> "This project involves constructing a detention basin at the upper end of the Sparks Arroyo, just upstream of the WWTP. The proposed basin requires approximately 550 acre-feet of excavation for flood and sediment pool storage. The outlet structure for this basin consists of a 4-foot RCP. The basin has two primary purposes:
>
> - Capture sediment being transported down the arroyos and reduce deposition in the downstream channels and floodplains; and
> - Detain the flood flows coming down the arroyos and release them slowly from the detention basin at a rate that will reduce flooding downstream."

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1 – El Paso County 2021 SWMP Construction Cost (February 2020)	$	6,768,982
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	$	6,830,162
Subtotal 3 – RFP Construction Contingency (35%)	$	2,390,557
Total Construction Cost	**$**	**9,220,718**
Subtotal 4 – El Paso County 2021 SWMP Land Acquisition Cost (February 2020)	$	632,000
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	$	635,914
Subtotal 6 – RFP Final Design Cost (20%)	$	1,844,144
Subtotal 7 – RFP Permitting Cost (10%)	$	922,072
Subtotal 8 – RFP Construction Oversight Cost (8%)	$	737,657
Subtotal 9 – RFP Geotech Cost (15%)	$	1,383,108
Total Non-Construction Cost	**$**	**5,522,895**
Total FMP Cost	**$**	**14,744,000**



Sparks Arroyo and Sub Basin A Study Area SSA4, SSA5, and SSA6

El Paso County Stormwater Master Plan

February 2021

Figure 6-10

Figure 4D-5: Figure 6-10 from the El Paso County Stormwater Master Plan (AECOM, 2021)

4D-6. Flood Mitigation Project ID: 143000021

Name: SOC4

Description: Sediment/Detention Basin at “Mankato Arroyo”.

Affected Jurisdictions: El Paso County, City of Socorro, Athena West Colonia

Discussion on Cultural Resources Background: The project area is located within the EPCWID National Register District. As such, Section 106 of the NHPA will take effect and a cultural resources survey of the entire project area will be required to evaluate any unrecorded, potential cultural resources that can contribute to this district, and determine if any adverse effects will happen on historic properties.

Discussion on Flood Risk: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> “Uncontrolled flows originating in the upper end of the watershed pose a flood risk to residences upstream of the intersection of Stream 5.5 and the Mesa Spur Drain. Runoff from undeveloped areas along the mesa is conveyed through the watershed via Stream 5.5. Additional runoff and sediment are accumulated as flows travel through the steepest part of the watershed. Several feet of sediment have been observed on Gateway E. Drive after major storm events. Approximately 1,000 feet upstream of the intersection of Stream 5.5 and Mankato Road, development and agricultural lands are present on both sides of the arroyo. The arroyo passes over a low water crossing at Mankato Road, depositing sediment before converging with the Mesa Spur Drain. The flows in the arroyo are uncontrolled and pose a flood risk to residences and agricultural lands adjacent to Stream 5.5.”

Project Description: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the project as the following:

> “This project involves constructing a detention basin at the lower end of Stream 5.5. The proposed embankment is approximately 29 feet tall and requires approximately 11 acre-feet of excavation for flood and sediment pool storage. The outlet structure for this basin consists of a 2-foot by 2-foot CBC. The basin has two primary purposes:
>
> - Capture sediment being transported down the arroyos and reduce deposition in the downstream channels and floodplains.
> - Detain the flood flows coming down the arroyos and release them slowly from the detention basin at a rate that will reduce flooding downstream.”

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1 – El Paso County 2010 SWMP Construction Cost (February 2010)	$	739,907
Subtotal 2 – RFP Construction Cost (September 2020, Using CCI)	$	980,000
Subtotal 3 – El Paso County 2021 SWMP Additional Construction Cost due to Atlas 14	$	70,000
Subtotal 4 – RFP Construction Contingency (35%)	$	367,500
Total Construction Cost	**$**	**1,417,500**
Subtotal 5 – El Paso County 2010 Land Acquisition Cost (February 2010)	$	178,626
Subtotal 6 – RFP Land Acquisition Cost (September 2020, Using CPI)	$	214,508
Subtotal 7 – RFP Final Design Cost (20%)	$	283,500
Subtotal 8 – RFP Permitting Cost (10%)	$	141,750
Subtotal 9 – RFP Construction Oversight Cost (8%)	$	113,400
Subtotal 10 – RFP Geotech Cost (15%)	$	212,625
Total Non-Construction Cost	**$**	**965,783**
Total FMP Cost	**$**	**2,383,000**

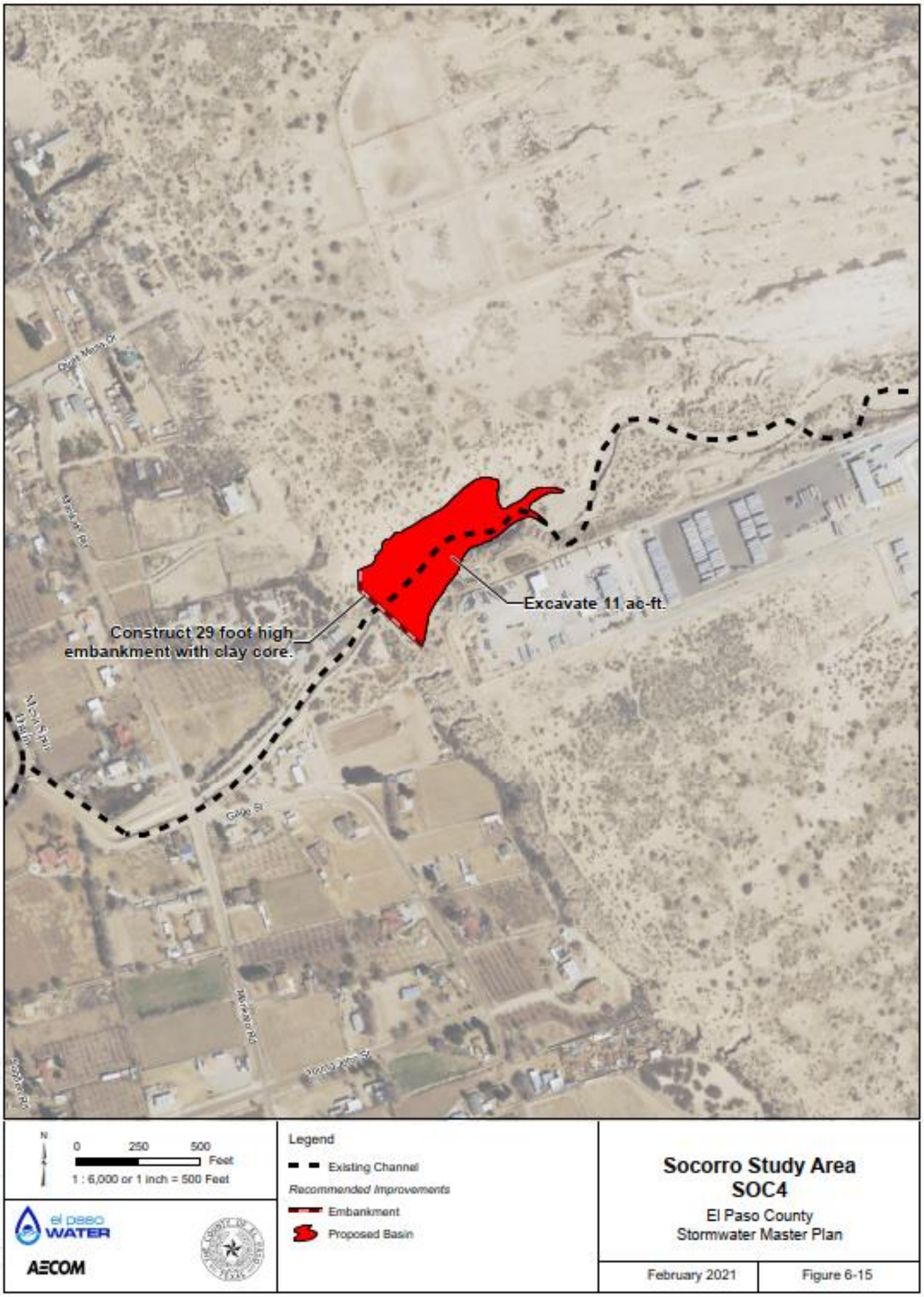

Excavate 11 ac-ft.
Construct 29 foot high embankment with clay core.
Gage St
N
0 250 500 Feet
1 : 6,000 or 1 inch = 500 Feet
el paso WATER
AECOM
Legend
Existing Channel
Recommended Improvements
Embankment
Proposed Basin
Socorro Study Area
SOC4
El Paso County
Stormwater Master Plan
February 2021
Figure 6-15

Figure 4D-6: Figure 6-15 from the El Paso County Stormwater Master Plan (AECOM, 2021)

4D-7. Flood Mitigation Project ID: 143000024

Name: MON3

Description: Sediment/Retention Basin.

Affected Jurisdictions: Homestead Meadows North CDP, Homestead Meadows South CDP, Butterfield CDP, El Paso County

Discussion on Cultural Resources Background: One prehistoric archaeological site is located within the proposed project area with undetermined NRHP eligibility. Given the proposed project includes significant ground disturbance and potential for cultural resources, SWCA recommends a structured cultural resources survey of the project area for due diligence.

Discussion on Flood Risk: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> "Uncontrolled flows originating in the slopes above Flowpaths M-2, M-3, and M-5 spread out over a vast area, merging and diverging from each other at various points. The majority of the flows concentrate at a narrow opening between hills located approximately 2,000 feet south of the intersection of Stagecoach Drive and Old Butterfield Trail. From here, these flows continue westward down Flowpath M-3 contributing to flooding of numerous residences and conveying debris that overwhelms a series of culvert crossings. These flows ultimately terminate at several large natural depressions. Several residences are located within this natural depression and are impacted by major storm events."

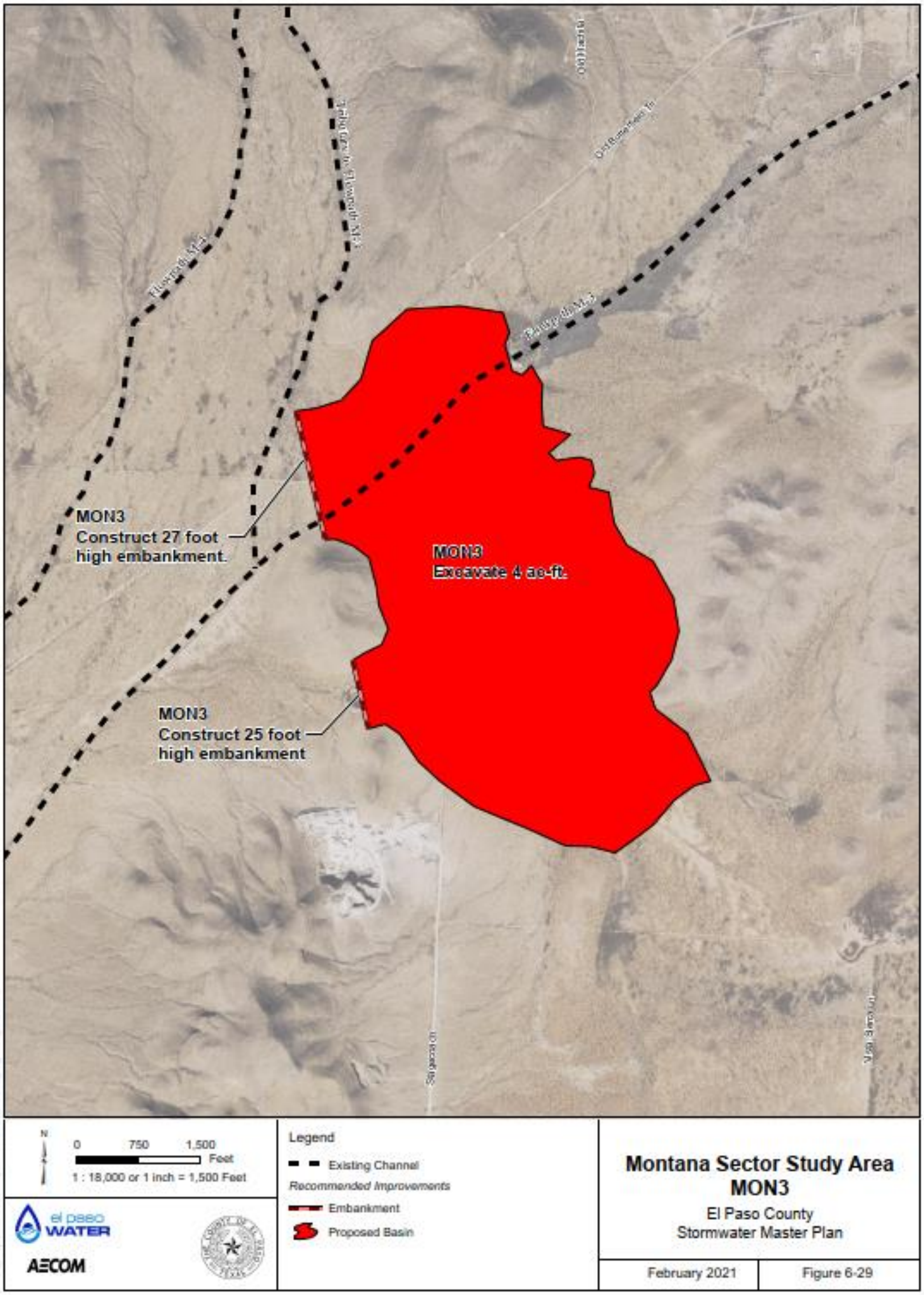
Project Description:

The El Paso County Stormwater Master Plan (AECOM, 2021) describes the project as the following:

> "This project involves constructing a detention basin on Flowpath M-3. The proposed basin controls flows from the upper end of the watershed and contains two embankments. The proposed embankments for the basin are approximately 25 feet tall and 27 feet tall and require approximately 4 acre-feet of excavation for flood and sediment pool storage. The outlet structure for the basin consists of two 4-foot by 4-foot CBCs. The basin has two primary purposes:
>
> - Capture sediment being transported down the arroyos and reduce deposition in the downstream channels and floodplains.
> - Detain the flood flows coming down the arroyos and release them slowly from the detention basin at a rate that will reduce flooding downstream."

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1 – El Paso County 2021 SWMP Construction Cost (February 2020)	$	12,970,769
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	$	13,088,002
Subtotal 3 – RFP Construction Contingency (35%)	$	4,580,801
Total Construction Cost	**$**	**17,668,803**
Subtotal 4 – El Paso County 2021 SWMP Land Acquisition Cost (February 2010)	$	-
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	$	-
Subtotal 6 – RFP Final Design Cost (20%)	$	3,533,761
Subtotal 7 – RFP Permitting Cost (10%)	$	1,766,880
Subtotal 8 – RFP Construction Oversight Cost (8%)	$	1,413,504
Subtotal 9 – RFP Geotech Cost (15%)	$	2,650,320
Total Non-Construction Cost	**$**	**9,364,465**
Total FMP Cost	**$**	**27,033,000**



Montana Sector Study Area MON3

El Paso County
Stormwater Master Plan

February 2021

Figure 6-29

Figure 4D-7: Figure 6-29 from the El Paso County Stormwater Master Plan (AECOM, 2021)

4D-8. Flood Mitigation Project ID: 143000025

Name: HAC3

Description: Sediment/Retention Basin.

Affected Jurisdictions: El Paso County

Discussion on Cultural Resources Background: El Paso County Water Improvement District No. 1 (EPCWID) National Register District is located 770 feet (234 meters) to the west of the proposed project area. The EPCWID National Register District is an operational, historic-age irrigation system designed by the Bureau of Reclamation in the early twentieth century. The historic irrigation system is located within the El Paso Valley of the Rio Grande River, serving over 56,000 acres of farmland through the major Franklin and Riverside canals. The system helped to transform local and statewide irrigation agriculture as El Paso Valley shifted exclusively to the production of cash crops. Only publicly owned properties are included within this district; this does not include privately owned features, such as ditches and fields, served by the publicly owned portions of the system, or the thousands of properties lying between the ditches defining the system (National Park Service 1997). As the project area is located within a National Register District, Section 106 of the NHPA will take effect and a cultural resources survey of the entire project area will be required to evaluate any unrecorded, potential cultural resources that can contribute to this district, and determine if any adverse effects will happen on historic properties.

Discussion on Flood Risk: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> “Uncontrolled flows originating in the upper end of the watershed are causing flooding at the mouth of Stream 8, upstream of Northloop Drive. Runoff from undeveloped areas along the mesa is conveyed through the watershed via Stream 8. Additional runoff and sediment are accumulated as flows travel through the steepest part of the watershed. Approximately 1,500 feet east of the intersection of Virrey Road and Reina Road, the arroyo becomes undefined, with no clear outfall to the Mesa Drain. At this location, flows spread out flooding a number of residences and depositing sediment.”

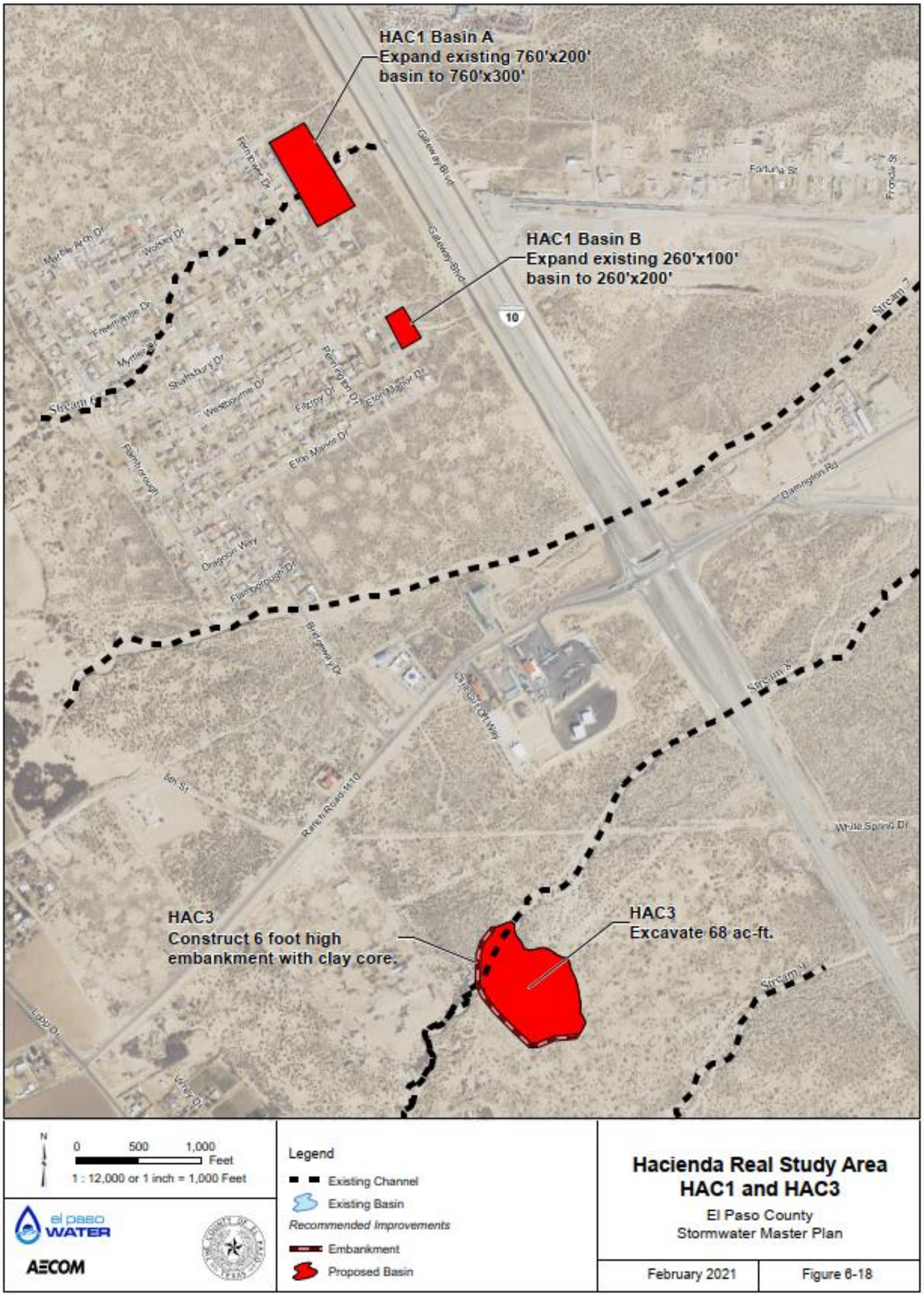
Project Description: The El Paso County Stormwater Master Plan (AECOM, 2021) describes the project as the following:

> “This project involves constructing a retention basin at the lower end of Stream 8. The proposed embankment is approximately 6 feet tall and requires approximately 68 acre-feet of excavation for flood and sediment pool storage. The outlet structure for the basin consists of a 2-foot by 2-foot CBC. The basin has two primary purposes:

- Capture sediment being transported down the arroyos and reduce deposition in the downstream channels and floodplains; and
- Retain the flood flows coming down the arroyos and allow minimal releases."

Estimated Cost for FMP:

Total FMP Cost	
Subtotal 1 – El Paso County 2010 SWMP Construction Cost (February 2010)	$ 1,582,638
Subtotal 2 – RFP Construction Cost (September 2020, Using CCI)	$ 2,100,000
Subtotal 3 – El Paso County 2021 SWMP Additional Construction Cost due to Atlas 14	$ 120,000
Subtotal 4 – RFP Construction Contingency (35%)	$ 777,000
Total Construction Cost	**$ 2,997,000**
Subtotal 5 – El Paso County 2010 Land Acquisition Cost (February 2010)	$ 27,833
Subtotal 6 – RFP Land Acquisition Cost (September 2020, Using CPI)	$ 33,424
Subtotal 7 – RFP Final Design Cost (20%)	$ 599,400
Subtotal 8 – RFP Permitting Cost (10%)	$ 299,700
Subtotal 9 – RFP Construction Oversight Cost (8%)	$ 239,760
Subtotal 10 – RFP Geotech Cost (15%)	$ 449,550
Total Non-Construction Cost	**$ 1,621,834**
Total FMP Cost	**$ 4,619,000**



Hacienda Real Study Area HAC1 and HAC3

El Paso County Stormwater Master Plan

February 2021

Figure 6-18

Figure 4D-8: Figure 6-18 from the El Paso County Stormwater Master Plan (AECOM, 2021)

4D-9. Flood Mitigation Project ID: 143000097

Name: NW16

Description: Expand channel from Village Ct to Doniphan Dr.

Affected Jurisdictions: City of El Paso

Discussion on Cultural Resources Background: The proposed project area is located within the Elephant Butte Irrigation National Register District. The Elephant Butte Irrigation National Register District is an operational, historic-age irrigation system designed by the Bureau of Reclamation in the early twentieth century. The historic irrigation system is located within the Rincon and Mesilla Valley of the Rio Grande River, serving over 100,000 acres of farmland between New Mexico and Texas. The system was developed in 1906 by the Bureau of Reclamation, impacting local and statewide irrigation agriculture as El Paso Valley shifted exclusively to the production of cash crops. Only publicly owned properties are included within this district; this does not include privately owned features, such as ditches and fields, served by the publicly owned portions of the system (National Park Service 1997). As the project area is located within a National Register District, Section 106 of the NHPA will take effect and a cultural resources survey of the entire project area will be required to evaluate any unrecorded, potential cultural resources that can contribute to this district, and determine if any adverse effects will happen on historic properties.

Discussion on Flood Risk: The El Paso Water Utilities and City of El Paso Stormwater Master Plan (AECOM, 2009) describes the existing flood risk for the project (White Spur Drain – Upstream) as the following:

> “East extent of White Spur Drain is undersized.”

Project Description:

The El Paso Water Utilities and City of El Paso Stormwater Master Plan (AECOM, 2009) describes the project as the following:

> “The hydraulic analysis indicates the channel in the upper section of the White Spur Drain is undersized. The existing concrete-lined channel has a depth of 3 feet, with side slopes of 1.25H:1V, and a bottom width of 6 feet. The proposed channel should be 4.5 feet deep, with side slopes of 1.25H:1V and a bottom width of 6 feet.”

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1 – EPW 2009 SWMP Construction Cost (March 2009)	$	561,481
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	$	760,000
Subtotal 3 – RFP Construction Contingency (35%)	$	266,000
Total Construction Cost	**$**	**1,026,000**
Subtotal 4 – EPW 2009 SWMP Land Acquisition Cost (March 2009)	$	-
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	$	-
Subtotal 6 – RFP Final Design Cost (20%)	$	205,200
Subtotal 7 – RFP Permitting Cost (10%)	$	102,600
Subtotal 8 – RFP Construction Oversight Cost (8%)	$	82,080
Subtotal 9 – RFP Geotech Cost (15%)	$	153,900
Total Non-Construction Cost	**$**	**543,780**
Total FMP Cost	**$**	**1,570,000**

Montoya Drain System - White Spur Drain (NW16) Northwest Region

El Paso 2021 Stormwater Master Plan Update

Date: 6/15/2021

Figure 8-5-12

Figure 4D-9: Figure 8-5-12 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

4D-10. Flood Mitigation Project ID: 143000100

Name: NE3B

Description: Alcan Pond: new catch basin to capture FP15 upstream.

Affected Jurisdictions: City of El Paso

Discussion on Cultural Resources Background: No cultural resources are located within or immediately adjacent to the project area, and the area has not been previously surveyed for cultural resources. Given that the proposed design includes facility improvements, SWCA recommends no cultural resources survey of the project area are necessary based on current design plans.

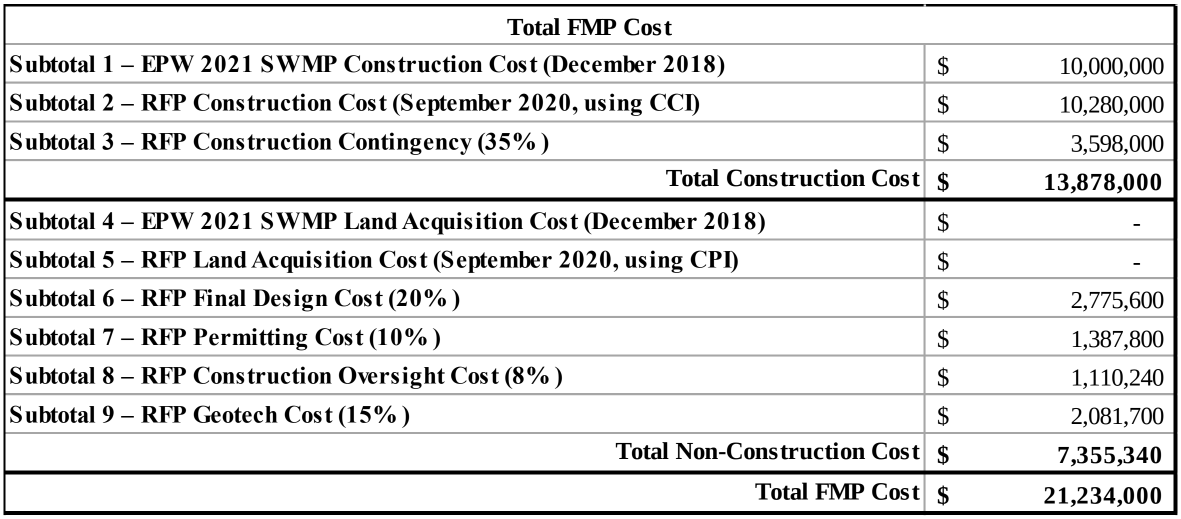
Discussion on Flood Risk: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> "Undersized crossings, unfinished earthen channels, and sediment transfer clogging culverts."

Project Description: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> "Construct Alcan Pond: new catch basin to capture Flow Path 15 upstream."

Estimated Cost for FMP:



Total FMP Cost		
Subtotal 1 – EPW 2021 SWMP Construction Cost (December 2018)	$	10,000,000
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	$	10,280,000
Subtotal 3 – RFP Construction Contingency (35%)	$	3,598,000
Total Construction Cost	**$**	**13,878,000**
Subtotal 4 – EPW 2021 SWMP Land Acquisition Cost (December 2018)	$	-
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	$	-
Subtotal 6 – RFP Final Design Cost (20%)	$	2,775,600
Subtotal 7 – RFP Permitting Cost (10%)	$	1,387,800
Subtotal 8 – RFP Construction Oversight Cost (8%)	$	1,110,240
Subtotal 9 – RFP Geotech Cost (15%)	$	2,081,700
Total Non-Construction Cost	**$**	**7,355,340**
Total FMP Cost	**$**	**21,234,000**

Fort Bliss Sump System - Flow Path 15
Tobin Drain / Will Ruth Pond
(NE3) Northeast Region
El Paso 2021 Stormwater
Master Plan Update

Date: 6/15/2021
Figure 8-4-3

Figure 4D-10: Figure 8-4-3 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

4D-11. Flood Mitigation Project ID: 143000105

Name: EA10A

Description: Build sediment/detention basin upstream of Paseo del Este Drive.

Affected Jurisdictions: City of El Paso, City of Socorro, El Paso County

Discussion on Cultural Resources Background: No cultural resources are within or immediately adjacent to the project area. Given the lack of cultural resources, and overall, shallowly buried, weakly developed soils within the area, SWCA recommends no cultural resources survey of the project area, based on current design plans.

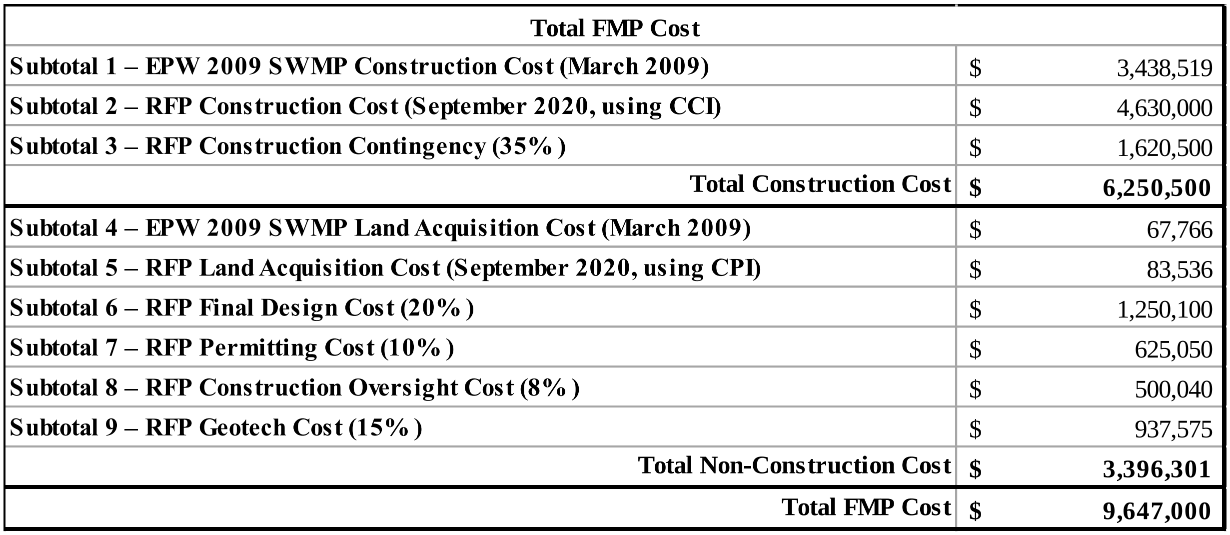
Discussion on Flood Risk: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> “Undersized crossings, unfinished earthen channels, and sediment transfer clogging culverts.”

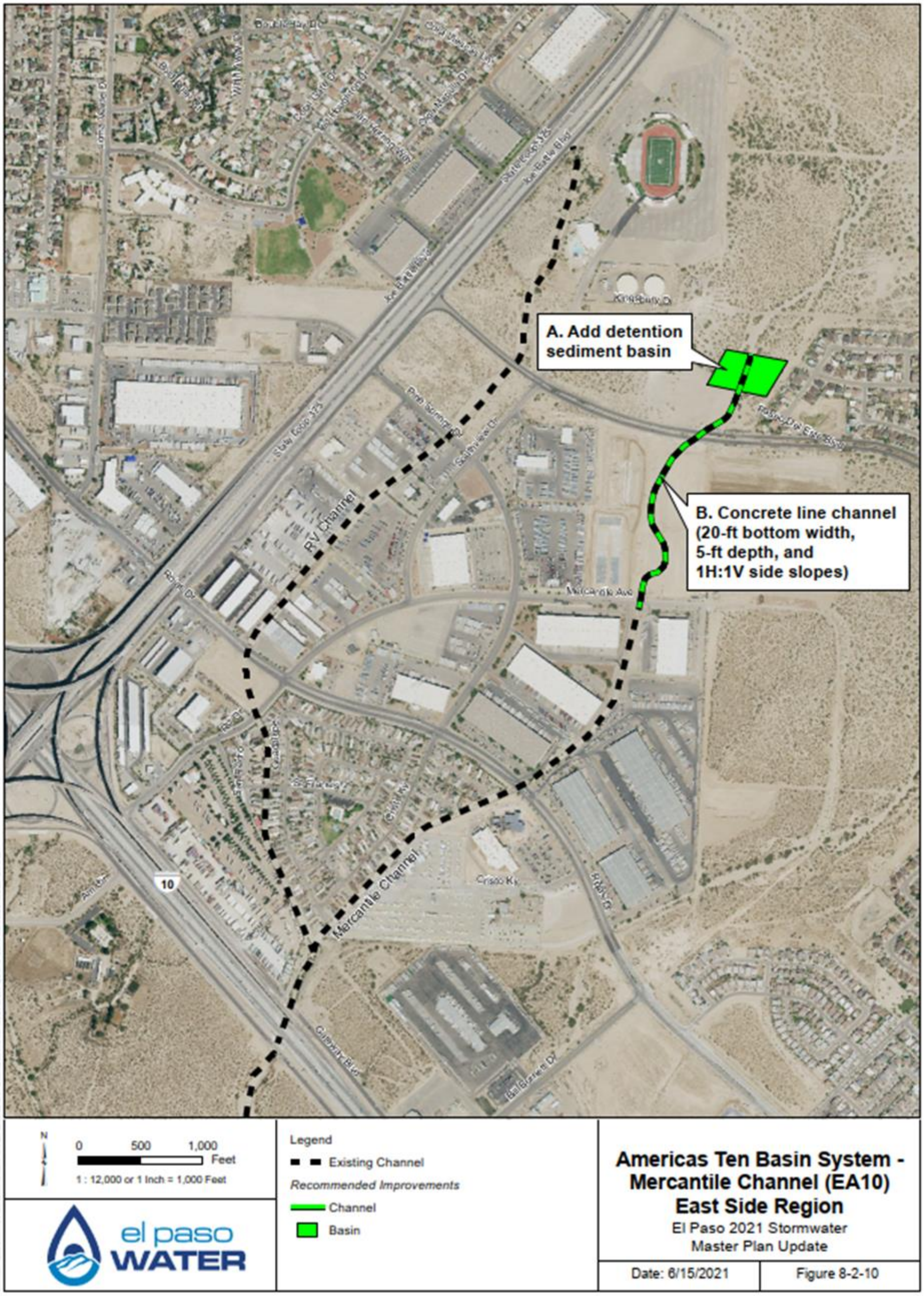
Project Description: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> “The proposed improvements at Mercantile Channel consist of two phases, as shown on Figure. Phase 1 consists of a 140 acre-feet desilting/detention basin. The desilting/detention basin would be located upstream of the Mercantile Channel crossing at Mercantile Avenue. Phase 2 consists of one new concrete-lined channel section. The concrete-lined channel section would consist of a trapezoidal section with approximate dimensions consisting of a 20-foot bottom, 1H:1V side slopes and 5-foot normal depth.”

Estimated Cost for FMP:



Total FMP Cost		
Subtotal 1 – EPW 2009 SWMP Construction Cost (March 2009)	$	3,438,519
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	$	4,630,000
Subtotal 3 – RFP Construction Contingency (35%)	$	1,620,500
Total Construction Cost	**$**	**6,250,500**
Subtotal 4 – EPW 2009 SWMP Land Acquisition Cost (March 2009)	$	67,766
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	$	83,536
Subtotal 6 – RFP Final Design Cost (20%)	$	1,250,100
Subtotal 7 – RFP Permitting Cost (10%)	$	625,050
Subtotal 8 – RFP Construction Oversight Cost (8%)	$	500,040
Subtotal 9 – RFP Geotech Cost (15%)	$	937,575
Total Non-Construction Cost	**$**	**3,396,301**
Total FMP Cost	**$**	**9,647,000**



Americas Ten Basin System - Mercantile Channel (EA10) East Side Region

El Paso 2021 Stormwater Master Plan Update

Date: 6/15/2021 | Figure 8-2-10

Figure 4D-11: Figure 8-2-10 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

4D-12. Flood Management Evaluation ID: 143000111

Name: NW3

Description: Construction of new larger capacity Doniphan Pump Station to replace PS1, with new force main directly to the Rio Grande. Install new catch basin with mechanical bar screen upstream of PS2.

Affected Jurisdictions: City of El Paso

Discussion on Cultural Resources Background: The proposed project area is located within the Elephant Butte Irrigation National Register District. As the project area is located within a National Register District, Section 106 of the NHPA is triggered, however, as the project consists of facility upgrades and is located along a developed, concrete roadway, SWCA proposes no cultural resources survey and instead a consultation with THC for concurrence of no survey.

Discussion on Flood Risk: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> "PSs in Doniphan system are undersized."

The El Paso Water Utilities and City of El Paso Stormwater Master Plan (URS, MCi, 2009) describes the existing flood risk for the project as the following:

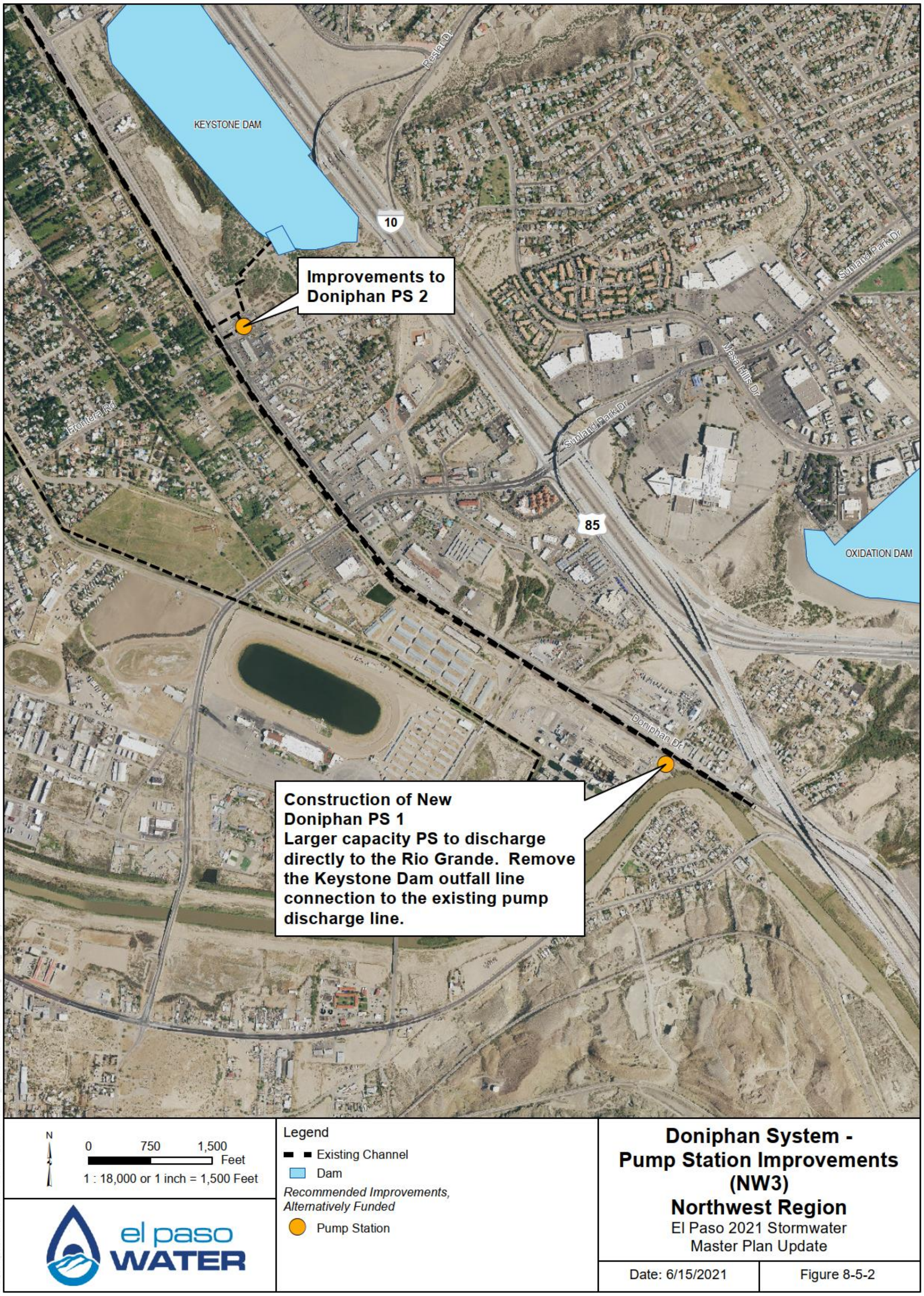
> "The two pump stations (PS13 and PS14) located along Doniphan Drive currently take flow from the roadway and discharge it into the Keystone Dam Outlet Conduit. This is not a preferred condition as it can adversely affect the functionality of the Keystone Dam Outlet Conduit and the pump stations. The proposed solution is to have the pump stations discharge directly into Doniphan Ditch via a 36-inch pipe for PS14 and a 42-inch pipe for PS13, as shown on Figure 8-36. As PS13 is within the State of New Mexico, coordination with relevant stakeholders will be required. This project will only be possible after projects NW1 and NW2 are complete."

Project Description: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> "Acquire land, construct a permanent wetland, install a storm drain system to Doniphan Drive, construct pipeline to Doniphan Pump Station and build new pump station to control flood levels."

Estimated Cost for FME:

Total FMP Cost	
Subtotal 1 – Feasibility Study Construction Cost (URS, July 2014)	$ 6,680,900
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	$ 7,810,000
Subtotal 3 – RFP Construction Contingency (35%)	$ 2,733,500
Total Construction Cost	**$ 10,543,500**
Subtotal 4 – EPW 2021 SWMP Land Acquisition Cost (December 2018)	$ -
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	$ -
Subtotal 6 – RFP Final Design Cost (20%)	$ 2,108,700
Subtotal 7 – RFP Permitting Cost (10%)	$ 1,054,350
Subtotal 8 – RFP Construction Oversight Cost (8%)	$ 843,480
Subtotal 9 – RFP Geotech Cost (15%)	$ 1,581,525
Total Non-Construction Cost	**$ 5,588,055**
Total FMP Cost	**$ 16,132,000**



Improvements to Doniphan PS 2

Construction of New Doniphan PS 1
Larger capacity PS to discharge directly to the Rio Grande. Remove the Keystone Dam outfall line connection to the existing pump discharge line.

Legend

- ▬ ▬ Existing Channel
- 🟦 Dam

Recommended Improvements, Alternatively Funded

- ● Pump Station

Doniphan System - Pump Station Improvements (NW3)
Northwest Region
El Paso 2021 Stormwater Master Plan Update

Date: 6/15/2021

Figure 8-5-2

Figure 4D-12: Figure 8-5-2 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

4D-13. Flood Mitigation Project ID: 143000113

Name: NW26

Description: Acquire land, construct a permanent wetland, install a storm drain system to Doniphan Drive, construct pipeline to Doniphan Pump Station, and build new pump station to control flood levels.

Affected Jurisdictions: City of El Paso, City of Sunland Park (New Mexico)

Discussion on Cultural Resources Background: No cultural resources are located within or immediately adjacent to the project area. The Elephant Butte Irrigation National Register District is located 0.2 miles (0.3 kilometers) to the northeast of the proposed project area. As such, SWCA recommends that a structured cultural resources survey of the final design plan, for due diligence, be performed to accurately assess the presence and significance of unrecorded cultural resources within its boundaries, especially in relation to the Elephant Butte Irrigation National Register District.

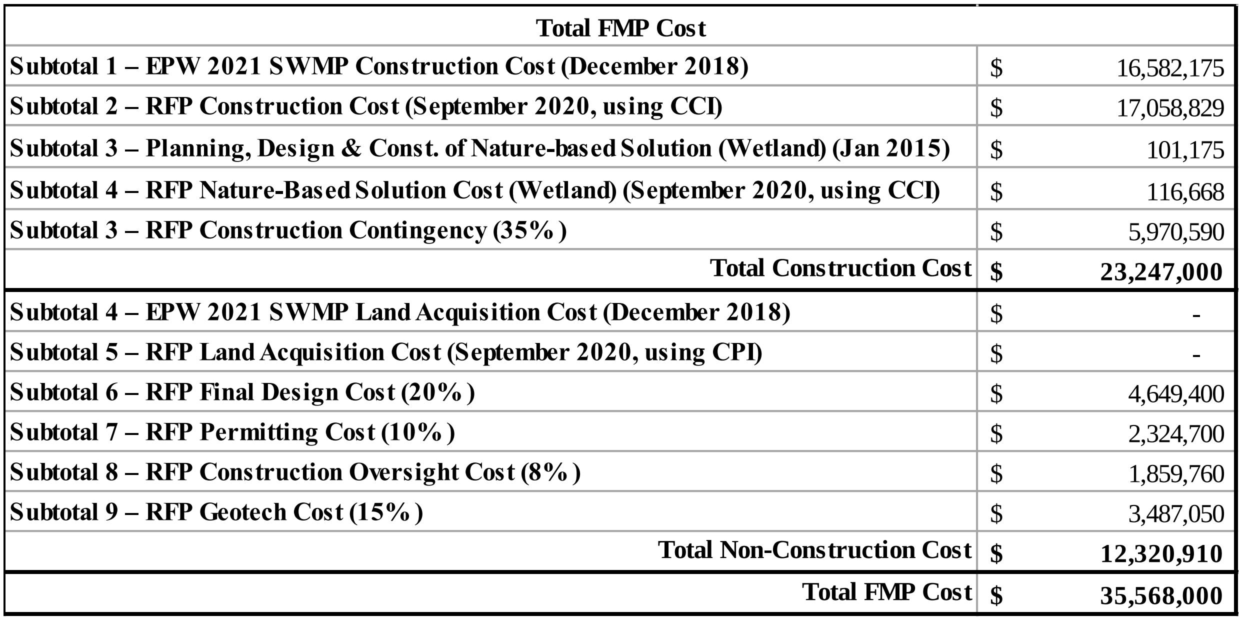
Discussion on Flood Risk: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> “Reduce flooding of Doniphan Drive and create control of the Montoya Drain System & Keystone Outfall with new pump station”

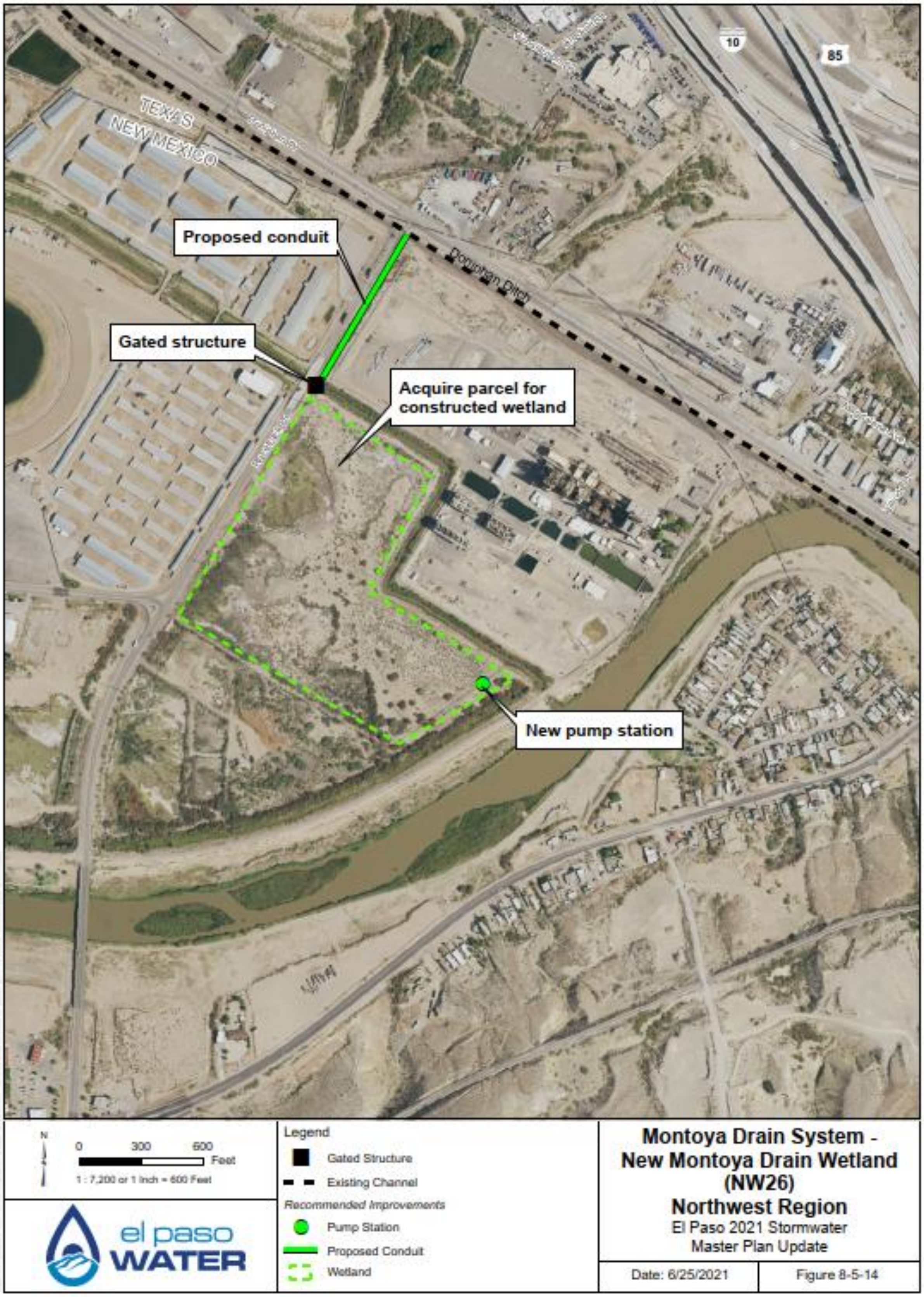
Project Description: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> “Acquire land, construct a permanent wetland, install a storm drain system to Doniphan Drive, construct pipeline to Doniphan Pump Station and build new pump station to control flood levels.”

Estimated Cost for FMP:



Total FMP Cost		
Subtotal 1 – EPW 2021 SWMP Construction Cost (December 2018)	$	16,582,175
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	$	17,058,829
Subtotal 3 – Planning, Design & Const. of Nature-based Solution (Wetland) (Jan 2015)	$	101,175
Subtotal 4 – RFP Nature-Based Solution Cost (Wetland) (September 2020, using CCI)	$	116,668
Subtotal 3 – RFP Construction Contingency (35%)	$	5,970,590
Total Construction Cost	**$**	**23,247,000**
Subtotal 4 – EPW 2021 SWMP Land Acquisition Cost (December 2018)	$	-
Subtotal 5 – RFP Land Acquisition Cost (September 2020, using CPI)	$	-
Subtotal 6 – RFP Final Design Cost (20%)	$	4,649,400
Subtotal 7 – RFP Permitting Cost (10%)	$	2,324,700
Subtotal 8 – RFP Construction Oversight Cost (8%)	$	1,859,760
Subtotal 9 – RFP Geotech Cost (15%)	$	3,487,050
Total Non-Construction Cost	**$**	**12,320,910**
Total FMP Cost	**$**	**35,568,000**



Montoya Drain System - New Montoya Drain Wetland (NW26)
Northwest Region
El Paso 2021 Stormwater Master Plan Update
Date: 6/25/2021
Figure 8-5-14

Figure 4D-13: Figure 8-5-14 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

4D-14. Flood Mitigation Project ID: 143000116

Name: EA9A

Description: Build sediment/detention basin upstream of Paseo del Este Drive.

Affected Jurisdictions: City of El Paso, City of Socorro

Discussion on Cultural Resources Background: No cultural resources are within or immediately adjacent to the project area. Given the lack of cultural resources, and overall, shallowly buried, weakly developed soils within the area, SWCA recommends no cultural resources survey of the project area, based on current design plans.

Discussion on Flood Risk: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

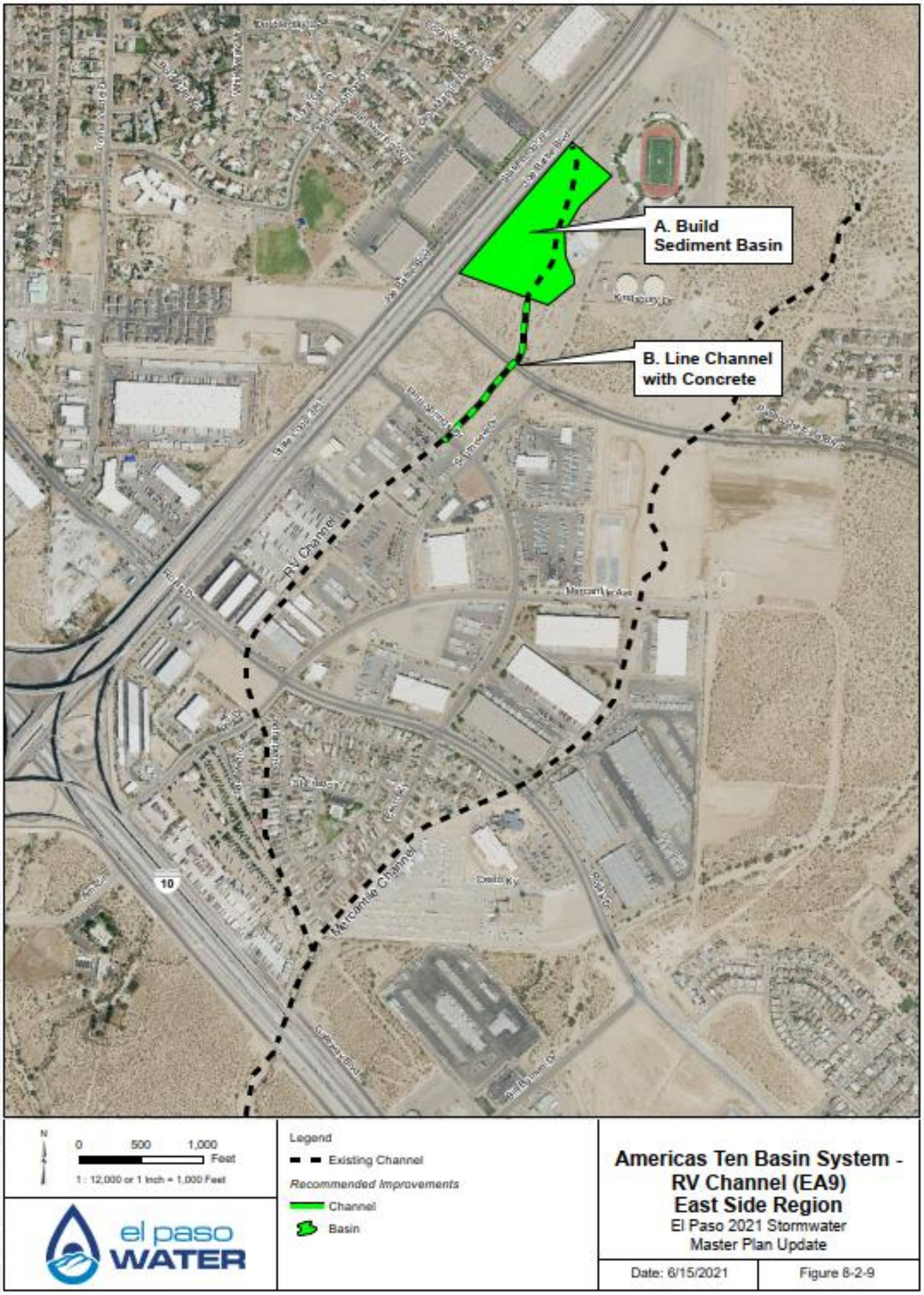
> “Undersized crossings, unfinished earthen channels, and sediment transfer clogging culverts.”

Project Description: The City of El Paso Stormwater Master Plan (AECOM, 2021) describes the existing flood risk for the project as the following:

> “The proposed improvements at RV Channel consist of two phases, as shown on Figure 8-14. Phase 1 consists of an 80 acre-feet desilting/detention basin. The desilting/detention basin would be located upstream of the RV Channel crossing at Paseo del Este Boulevard. Phase 2 consists of three concrete-lined channel sections. The first concrete-lined channel section would consist of a trapezoidal section with approximate dimensions consisting of a 20-foot bottom, 1H:1V side slopes and 4-foot normal depth. The second concrete-lined channel section would consist of a trapezoidal section with approximate dimensions consisting of a 30-foot bottom, 1H:1V side slopes and 4-foot normal depth. The third concrete-lined channel section would consist of a trapezoidal section with approximate dimensions consisting of a 40-foot bottom, 1H:1V side slopes and 2-foot normal depth, located downstream of the junction point with the Mercantile Channel heading towards IH-10.”

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1 – EPW 2009 SWMP Construction Cost (March 2009)	$	4,273,333
Subtotal 2 – RFP Construction Cost (September 2020, using CCI)	$	5,760,000
Subtotal 3 – RFP Construction Contingency (35%)	$	2,016,000
Total Construction Cost	**$**	**7,776,000**
Subtotal 4 – EPW/COEP 2009 SWMP Land Acquisition Cost (March 2009)	$	3,155,850
Subtotal 5 – RFP Land Acquisition Cost (Land is Acquired per EPWater Coordination)	$	-
Subtotal 6 – RFP Final Design Cost (20%)	$	1,555,200
Subtotal 7 – RFP Permitting Cost (10%)	$	777,600
Subtotal 8 – RFP Construction Oversight Cost (8%)	$	622,080
Subtotal 9 – RFP Geotech Cost (15%)	$	1,166,400
Total Non-Construction Cost	**$**	**4,121,280**
Total FMP Cost	**$**	**11,897,000**



Americas Ten Basin System - RV Channel (EA9)
East Side Region
El Paso 2021 Stormwater Master Plan Update

Date: 6/15/2021
Figure 8-2-9

Figure 4D-14: Figure 8-2-9 from EPWater & COEP Stormwater Master Plan (AECOM, 2021)

4D-15. Flood Mitigation Project ID: 143000117

Name: Gateway Ponds

Description: Phase I includes two major components.

1. Proposed detention basin construction (North Side of I-10), including an intertie between the existing North Pond and Proposed Pond

2. Proposed construction of large capacity pump station (PS), partially equipped and force main (North Side of I-10), routed to existing gravity outfall opening at the existing pond at the south Side of I-10 along Durazno Avenue

Phase II includes two major components.

1. Proposed construction of fully equipping PS North of I-10 and proposed force main to a proposed elevated outfall structure at the Rio Grande.
2. Proposed construction to cut and plug the force main of Phase I, fill it with grout and abandon it in-place

Affected Jurisdictions: City of El Paso, TXDOT, USIBWC

Discussion on Cultural Resources Background:

Discussion on Flood Risk: The project area has been flood-prone since the construction of I-10 in the 1960's. In this section of I-10, adjacent to the existing ponds is a low area of the interstate situated between two overpasses, one at Copia Street and one at Piedras Street. Additionally, this section of I-10 intercepts a large urban watershed. Per recent hydrologic modeling, during large storm events (2% AC flood and greater) flood flows conveyed by city streets rapidly fill the existing detention pond at the north side of I-10, and overflows flooding a large area north of I-10. This area overflows through the Piedras Street overpass to the low area south of I-10, filling the existing pond south of I-10 and flooding a large area between I-10 and the Union Pacific Railroad (UPRR) embankment. In addition, flooding occurs within the urban area south of the UPRR due to pond discharges into the gravity line intended to drain that area.

The basic concept for addressing the flooding is to add to existing flood detention and provide expanded pump station capacity. The existing detention pond located across I-10 on the south side of the interstate, is interconnected with the existing north detention pond by a 72-inch diameter pipe; however, during the 2% AC and 1% AC storm events, the north side pond is inundated, fills and overtops before the south side detention pond can fully fill, since the volume of flow from the watershed far exceeds the capacity of the 72-inch diameter intertie pipe. Once filled; however, under these two storm events, the south side detention pond will also overtop. The proposed additional storage capacity in conjunction with the proposed pump station (PS) will serve to flatten the peak flow before overtopping occurs and the proposed PS will not only remove stormwater from the detention ponds during such events, but it is necessary to keep the pond system in a dry state before the next storm event. Therefore, when the next storm event occurs, the pond system will have 100% available capacity to capture the flow and effectively manage it through the use of the PS that will convey the stormflow to the Rio Grande.

Project Description-Gateway Ponds System: The proposed project will include two phases. Phase I is designed to fully control the 2% AC flood, i.e. all flood flows are contained within the expanded detention pond north of I-10 and within the existing pond south of I-10. Following Phase I during the 2% AC flood, I-10 is estimated to not overflow, and flooding is removed from large areas north and south of I-10. Phase II expands this protection to control the 1% AC flood.

Phase I is proposed to include a new 79-acre-foot detention pond, located in the vicinity of the existing detention pond on the north side of I-10. Also included in Phase I is a proposed 350-CFS PS, but not fully equipped. This PS would be equipped with two proposed high flow low head pumps generally, at a capacity of approximately 58.33-CFS, to be used to drain the pond system, so that the ponds can be kept available for storm events with 100% holding capacity. The force main associated with the Phase I pumping condition would be an approximately sized 42-inch diameter force main. This force main at 2,000-LF would convey flow from the PS to the existing dual 5-foot by 5-foot box culverts that serve as the overflow line for the existing south detention pond. This overflow line is the Cebada conduit that conveys stormflow to the existing Cebada PS.

Under Phase II, the proposed PS of Phase I would be fully equipped with 6-pumps total, each with a capacity of approximately 58.33-CFS for the total pumping capacity of 350-CFS. The associated force main would generally be sized at 96-inches in diameter with a length of approximately 6,000-LF. At the outfall location at the Rio Grande, an elevated discharge structure would allow pumped flow to enter the river from above the water surface of the river.

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1-RFP Construction Cost	$	8,568,340
Subtotal 2-RFP PS Cost, Partially Equiped, FM to South Pond Overflow	$	16,945,500
Total Construction Cost	**$**	**25,513,840**
Subtotal 3-RFP EPWater Land Acquisition	$	4,000,000
Subtotal 4-RFP Preliminary Engineering Cost (10%)	$	2,551,384
Subtotal 5-RFP Final Design / Bidding Cost (20%)	$	5,102,768
Subtotal 6-RFP Construction Administration Cost (8%)	$	2,041,107
Subtotal 7-RFP Construction Inspection Cost (15%)	$	3,827,076
Total Non-Construction Cost	**$**	**17,522,335**
Phase I Total FMP Cost	**$**	**46,036,175**

Total FMP Cost		
Subtotal 1-Fully Equipping PS, FM & Elevated Outfall Structure at Rio Grande	$	40,000,000
Subtotal 2-Cutting / Plugging Phase I FM and Tie-in to South Pond Overflow	$	2,607,000
Total Construction Cost	**$**	**42,607,000**
Subtotal 3-RFP Preliminary Engineering Cost (10%)	$	4,260,700
Subtotal 4-RFP Final Design / Bidding Cost (20%)	$	8,521,400
Subtotal 5-RFP Construction Administration Cost (8%)	$	3,408,560
Subtotal 6-RFP Construction Inspection Cost (15%)	$	6,391,050
Total Non-Construction Cost	**$**	**22,581,710**
Phase II Total FMP Cost	**$**	**65,188,710**

Phase I & Phase II Total FMP Cost	**$**	**108,224,885**

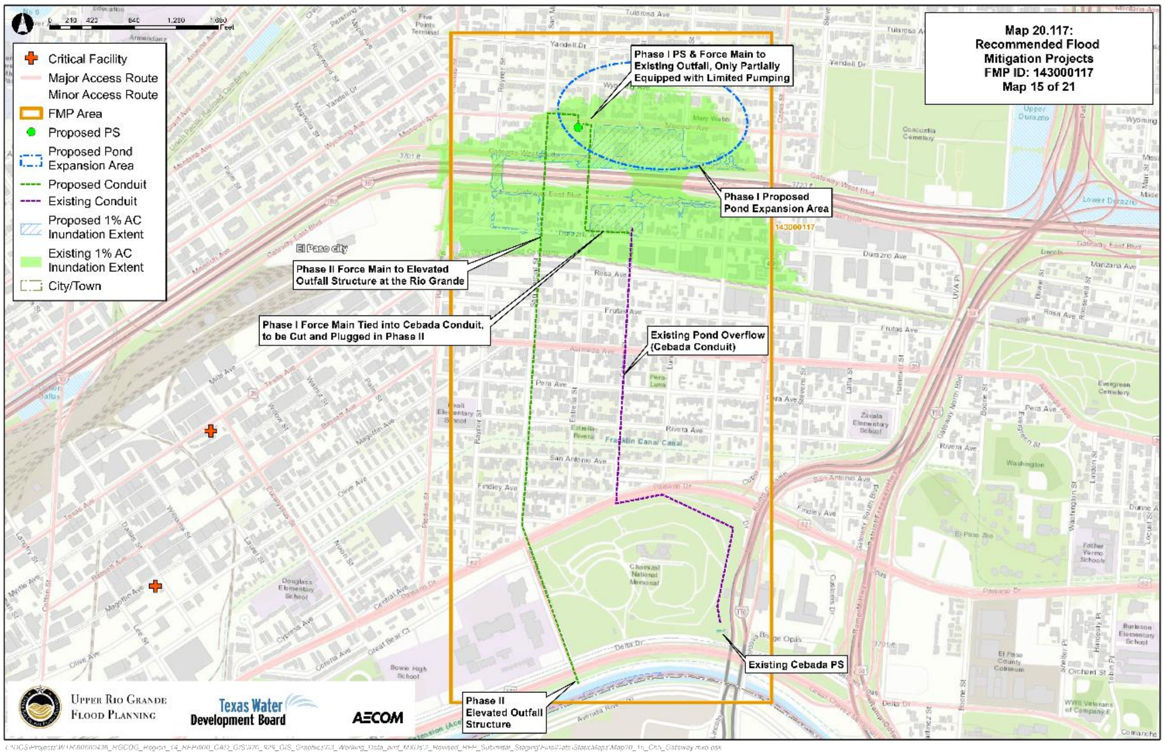


Figure 4D-15: Project Map (AECOM, 2023)

4D-16. Flood Mitigation Project ID: 143000118

Name: Vinton 1

Description: Vinton 1 was originally conceived as Project VIN1 within the Storm Water Master Plan for El Paso County. Vinton 1 consists of three parts: Basin A, a diversion channel, and Basin B. Basin A intercepts flood and sediment flow from the ephemeral stream Flow Path 45. Basin B, intercepts flood and sediment along Flow Path 45A. Downstream of these two retention basins, a diversion channel and channel improvements run north to south between the contributing watershed and the neighborhood to be protected by this project.

Affected Jurisdictions: El Paso County

Discussion on Cultural Resources Background: No cultural resources are located within or immediately adjacent to the project area.

Discussion on Flood Risk: Flow Path Number 45 capacity is exceeded causing flooding in the Vinton study area.

Project Description: Vinton 1 incorporates three improvements to address this issue. Basin A is designed as a retention basin to capture flood flows and sediment from the tributary to Flow Path Number 45. A diversion channel is designed parallel to and upstream of Remington Drive to intercept flood flows from the watershed downstream of Basin A. This diversion channel discharges into Flow Path Number 45 upstream of Tom Mays Drive. The diversion would increase flood flows in Flow Path Number 45 without a linked improvement along that channel. Basin B is the proposed improvement on Flow Path Number 45. This basin is designed as a retention basin and intercepts flood and sediment flows from Flow Path Number 45; resulting in a net reduction of flows into Vinton along Flow Path Number 45.

Figure 4D-16 shows Flow Path Number 45 and a tributary to Flow Path Number 45 in the area immediately upstream of the El Paso Natural Gas (EPNG) Pipeline Road. Immediately upstream of the intersection of this tributary with the road, flows from the tributary split during floods, with the bulk of the flows proceeding southwest to the junctions with Flow Path Number 45. The remainder of the flood flow in this tributary heads due west across Westway Boulevard and the EPNG Pipeline Road. Split flow arrives from the east and entering Vinton near Banker Road, Flow Path Number 45A, and their intersection with Remington Drive. The split flow exceeds the capacity of the existing Flow Path Number 45A and causes flood damages in this part of Vinton and downstream to the immediate west.

The proposed basin on Flow Path Number 45 requires approximately 230 acre-feet of excavation for flood and sediment pool storage, and the proposed basin on the flow path contributing to Flow Path Number 45 requires approximately 440 acre-feet of excavation for flood and sediment pool storage. Sediment sources are identified in the upstream watershed of Flow Path Number 45 within the City of El Paso Stormwater Master Plan. The sediment pools within the basins are included to intercept flood-borne sediment that currently deposits and blocks drainage crossings downstream within Vinton.

Results of the modeling with this proposed project demonstrate the removal of 392 structures from the 1% AC floodplain. This is a removal of 91% of structures, which protects a population of approximately 879 people that are presently at risk of flooding during that event.

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1-RFP Construction Cost	$	42,157,000
Subtotal 2-RFP Construction Contingency	$	8,431,000
Total Construction Cost	**$**	**50,588,000**
Subtotal 3-Drainage Feasibility Study Land Acquisition Cost	$	80,000
Subtotal 4-RFP Land Acquisition Cost	$	668,000
Subtotal 5-RFP Final Design Cost	$	7,307,000
Subtotal 6-RFP Permitting Cost	$	180,000
Subtotal 7-RFP Construction Oversight Cost	$	363,000
Subtotal 8-RFP Geotech Cost	$	200,000
Total Non-Construction Cost	**$**	**8,798,000**
Total FMP Cost	**$**	**59,386,000**

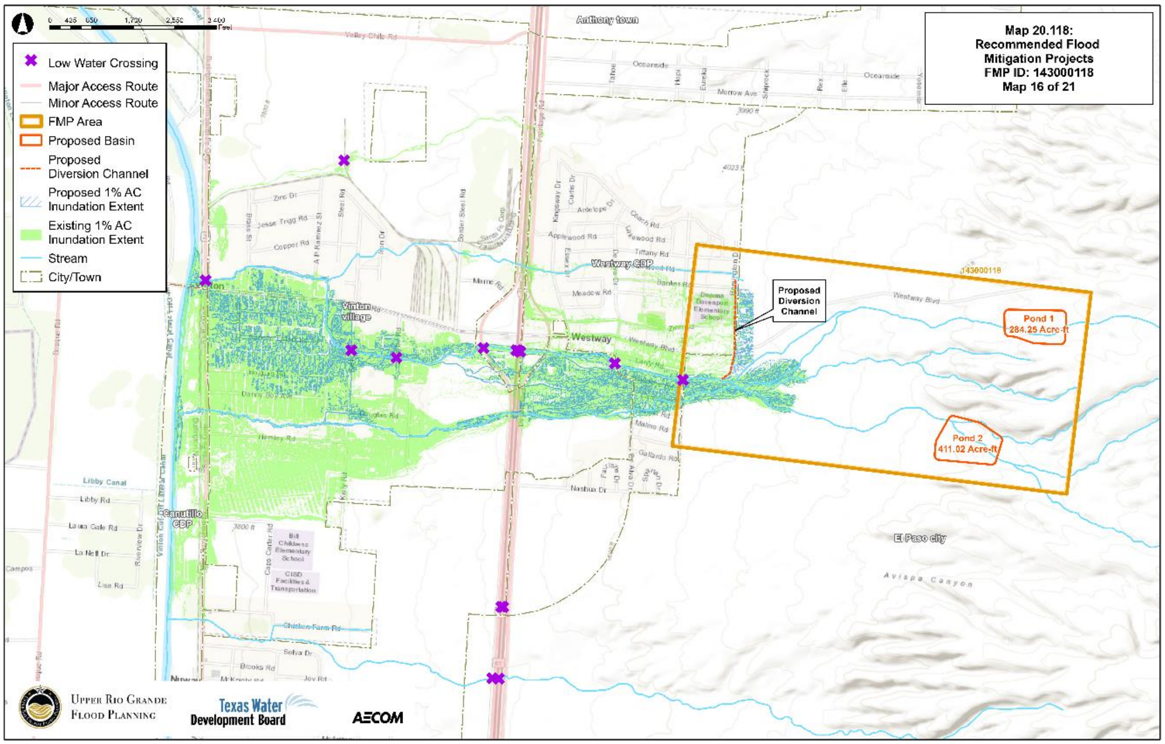


Figure 4D-16: Project Map (AECOM, 2023)

4D-17. Flood Mitigation Project ID: 143000119

Name: Pecos 1

Description: Construct detention pond on city-owned parcel in western part of Town of Pecos City.

Affected Jurisdictions: Town of Pecos City, Lindsay Census Designated Place, Reeves County

Discussion on Cultural Resources Background: No cultural resources are located within or immediately adjacent to the project area.

Discussion on Flood Risk: The Town of Pecos City incorporated area is located adjacent and to the north of Lindsay CDP in Reeves County. For the 1% AC flood, per mapping performed for the RFP, the floodplain potentially causes damage to over 1,900 structures and restricts travel.

Extent of 1% AC flood risk is depicted in Figure 4D-17. As part of the public outreach effort, a public roadshow meeting was held in the Pecos on February 9, 2022. Approximate flood inundation maps were presented to local flood-related entities, who confirmed that flooding throughout large areas can be a problem due to the extremely flat topography and raised embankments of roadways and railroads, which sometimes re-direct runoff. A playa lake known as Mosquito Lake was also confirmed to be present southeast of the City of Pecos.

The watershed impacting Town of Pecos City extends west encompassing close to 700 square miles. In the event of a significant storm distributed across the contributing watershed, flows from the west will greatly impact the city. Town of Pecos City and associated staff identified six areas of flood concern during a RFP-related meeting on March 24th, 2023. This FMP reduces routine flooding in 4 of those areas.

The flood extents modeled for the Atlas 14 statistical 50% AC, 20% AC, and 10% AC floods are worse than have been experienced in the town's memory, suggesting the hydrology in the model is overly conservative. This may be due to large losses in the watershed which are not being considered, or due to use of an unrealistic uniformly distributed rain pattern over the large watershed. The volume of flood runoff into the area being addressed by this FMP in the flood is estimated by the modeling to exceed 4,000 acre-feet.

Project Description:

The proposed pond will be located on a Town-owned parcel of land bordering County Road 204. Due to the size of this watershed, a flood structure large enough to address the 1% AC flood would have to detain tens of thousands of acre-feet and be prohibitively expensive. As such, the proposed project is suggested as a Phase 1 solution to address the city's flood risk. This pond will provide emergency storage to reduce the scale of routine flooding described in meetings with the Town of Pecos City.

The pond will be 32-acre footprint constructed within the approximately 160-acre parcel. This pond will capture 130 ac-ft of upstream flows from the contributing watershed that stretches across 702 square miles. The pond size is an engineering judgment based estimate as to the size needed to address the type and extent of relatively routine flooding described by Town of Pecos City staff. The pond will provide essentially no improvement to the large theoretical flood risk to residential structures identified in the RFP, but will provide significant improvement to road access during routine funds.

Modeling results suggest the proposed project will reduce flooding at 120 structures within the existing 1% AC floodplain and completely removes 51 of those structures (many vacant, and all non-residential), potentially increasing the safety of approximately 143 people (non-residents).

To support the town, the suggested strategy will be to construct the detention basin which helps with theoretical routine flooding and update the existing FME in the URGFP to include performance of a study addressing the loss rates in the Pecos watershed.

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1-RFP Construction Cost	$	7,711,000
Subtotal 2-RFP Construction Contingency	$	1,542,000
Total Construction Cost	**$**	**9,253,000**
Subtotal 3-Drainage Feasibility Study Land Acquisition Cost	$	45,000
Subtotal 4-RFP Land Acquisition Cost	$	000
Subtotal 5-RFP Final Design Cost	$	1,378,000
Subtotal 6-RFP Permitting Cost	$	130,000
Subtotal 7-RFP Construction Oversight Cost	$	255,000
Subtotal 8-RFP Geotech Cost	$	100,000
Total Non-Construction Cost	**$**	**1,908,000**
Total FMP Cost	**$**	**11,161,000**

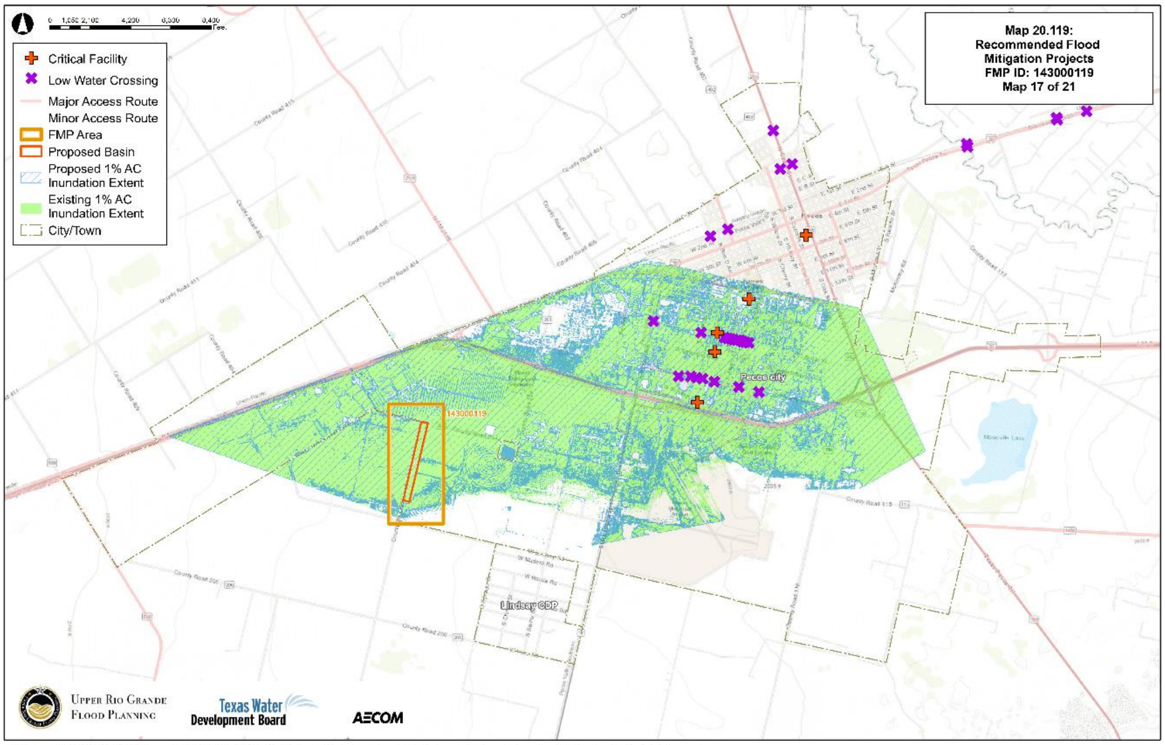


Figure 4D-17: Project Map (AECOM, 2023)

4D-18. Flood Mitigation Project ID: 143000120

Name: City of Presidio 1

Description: Construct two basins and an outlet pipe to reduce flooding of buildings and emergency access roadways.

Affected Jurisdictions: City of Presidio, Presidio County

Discussion on Cultural Resources Background: No cultural resources are located within the proposed project area.

Discussion on Flood Risk: The City of Presidio is an incorporated area in Presidio County. Approximate modeling performed as a task for the RFP identified over 650 structures at risk in the 1% Annual Chance (AC) flood within the City of Presidio, assuming the Cibolo Creek levees (which are not certified) are absent. Extent of 1% AC flood risk is depicted in Figure 4D-18. The City of Presidio Comprehensive Plan 2020-2030 (Kleinman, 2020) provides a concept for future drainage infrastructure to address flooding associated with the smaller arroyos east of Cibolo Creek. Fifteen stormwater detention ponds are proposed in the Plan.

Project Description: This proposed FMP for City of Presidio will result in reduction of flooding in 10 structures and remove 9 buildings from the 100-yr floodplain as well as 1.6 miles of road. This removal of flooding on Hurd Rd will allow emergency access to two critical facilities (powerplant and school) during a 1% AC storm event.

The project includes the development of two basins and a drainage pipe extending from the western basin to discharge into a natural channel. The detention basin on the east will be approximately 3-feet deep and have a 0.9-acre footprint. The western retention basin with the outlet pipe will be approximately 6-feet deep and have a 1.4-acre footprint. The gravity-fed outlet pipe will have a 24” diameter and release to an open channel along the western side of the powerplant. Locations shown in the figure are approximate.

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1-RFP Construction Cost	$	2,172,000
Subtotal 2-RFP Construction Contingency	$	434,000
Total Construction Cost	**$**	**2,606,000**
Subtotal 3-Drainage Feasibility Study Land Acquisition Cost	$	90,000
Subtotal 4-RFP Land Acquisition Cost	$	5,000
Subtotal 5-RFP Final Design Cost	$	560,000
Subtotal 6-RFP Permitting Cost	$	258,000
Subtotal 7-RFP Construction Oversight Cost	$	510,000
Subtotal 8-RFP Geotech Cost	$	200,000
Total Non-Construction Cost	**$**	**1,624,000**
Total FMP Cost	**$**	**4,230,000**

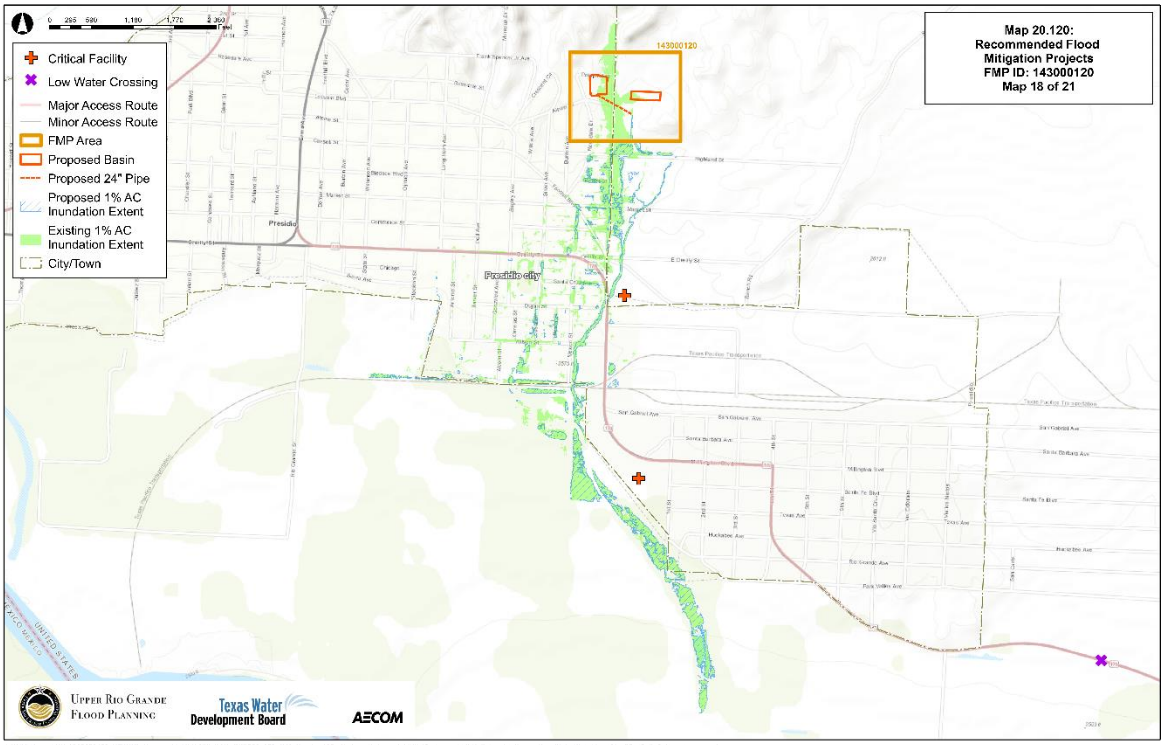


Figure 4D-18: Project Map (AECOM, 2023)

4D-19. Flood Mitigation Project ID: 143000121

Name: Dallas Basin

Description: The project includes two major components.

Phase I includes two major components.

1. Proposed detention basin construction (North Side of I-10)
2. Proposed construction of large capacity pump station (PS), partially equipped and force main (North Side of I-10), routed to the existing pump station discharge box at the existing east Dallas Street pond.

Phase II includes 4 major components.

1. Proposed construction of fully equipping PS North of I-10 and proposed force main to a proposed elevated outfall structure at the Rio Grande.
2. Proposed construction for cutting and modifying the force main of Phase I to serve as a highwater gravity-flow conduit from the new pond of Phase I to the east Dallas Street pond, for continued gravity-flow conveyance to the Cebada PS. Removal of the existing pump station discharge box and replacement with a standard gravity-flow headwall opening to the existing Williams Street gravity-flow conduit.
3. Proposed construction of smaller capacity PS (South of I-10 and North of Rio Grande) and its force main to a separate elevated outfall structure at the Rio Grande.
4. Construction for cutting and plugging existing Dallas Street outfall conduit at the location of south-most proposed PS for flow diversion from the Dallas Street conduit to the smaller capacity PS. Cutting and plugging the existing Dallas Street gravity-flow conduit opening at the river.

Affected Jurisdictions: City of El Paso, TXDOT, USIBWC

Discussion on Cultural Resources Background: If the proposed project area is located within public ROWs, it would therefore fall under the purview of the THC and require an ACT permit. Additionally, as listed below, the project intersects three National Register Districts and NRHP listed properties; therefore, the project would also trigger Section 106 of the NHPA. The project intersects the Franklin Canal, the EPCWID, and the Magoffin Historic District, all of which are NRHP districts. The Magoffin Historic District was listed in 2016 (National Park Service 2016) for its architectural significance comprising Late Victoria, Adobe, to Spanish Colonial Revival style structures. The district also includes the original Magoffin home site, resided in by Joseph Magoffin who was an important figure to local El Paso history13. Finally, the project area also intersects with a historic age archaeological site, consisting of an early to mid-twentieth century telecommunications line, with NRHP eligibility remaining undetermined according to the SHPO.

As the project area is located within multiple NRHP districts, Section 106 of the NHPA, and an ACT permit through the THC will take effect and a cultural resources survey of the entire project area will be required to evaluate any unrecorded, potential cultural resources that can contribute to this district and historic properties, and determine if any adverse effects will happen on historic properties.

Resource Name	Resource Type	Prehistoric / Historic	NRHP Eligibility	Location
Archaeological Site	Historic Structure	Historic	Undetermined	Intersects
Magoffin Historic District	National Register District	Historic	Listed	Intersects
Franklin Canal	National Register District / Property	Historic	Listed	Intersects
El Paso County Water Improvement District No. 1	National Register District	Historic	Listed	Intersects

Discussion on Flood Risk: The proposed project includes two areas, the first area is generally at the intersection of Cotton Street and Interstate-10 (I-10), due to inland flooding and the second area is generally south of the first project area, located generally between Paisano (Hwy-62) and the Rio Grande, due to river flooding. The combined areas have been flood-prone since the construction of I-10 in the 1960's. This proposed project is further necessitated as a result of TXDOTs current planning of the anticipated I-10 Reimagination Project.

TXDOT's project is intended to eliminate the existing Dallas Street Stormwater Pump Station, which is integral to managing and disposing of stormwater that collects within the TXDOT controlled ponds underneath the Cotton Street overpass, referred to as Dallas Street Ponds. Additionally, limited existing detention pond capacity continues to result in significant flooding at this location, that generally results in the spread of floodwater south to Paisano (Hwy-62) and generally east to Palm Street. The area south of I-10 and north of the Rio Grande is also subject to flooding when flow in the Rio Grande surcharges the Dallas Street gravity-flow outfall line and overflows into streets through existing drop inlets. This type of flooding occurs during high water elevations of the Rio Grande, while in a flood stage condition.

Project Description-Dallas Basin:

- Phase I is proposed to include a new 143-acre-foot detention pond that will utilize approximately three city blocks. The sizing will accommodate both the 2% AC flood and, if the Phase II improvements are built, the 1% AC flood. Also, under Phase I, a proposed 250 cfs pump station would replace the existing pump station and be located in the area of the proposed pond, on the north side of I-10. The proposed pump station would be sized for the 1% AC flood, but would not be fully equipped with all pumps. It would only be provided with enough pumping capacity, using one duty pump sized at approximately 42 cfs and one stand-by pump sized at 42 cfs to drain the proposed pond after a flood. These pumps will discharge to the existing pump station discharge box, located at the east Dallas Street Pond, where the Williams Street gravity-flow conduit begins. This existing gravity-flow conduit ultimately discharges into the existing Cebada pump station. Under Phase I, the proposed force main will be approximately 800-lf of 36-inch diameter pipe that will pump to existing discharge box. The existing Dallas Street Pond is separated into two ponds by Dallas Street, with an intertie from the west pond to the east pond. The east pond is where the Williams Street conduit begins.

- Phase II would fully equip the proposed 250 cfs pump station with a total of six (6 ea.) high-flow, low-head pumps at approximately 42 cfs each, to handle the 1% AC flood. Phase II also includes an 84-inch diameter force main. The force main is proposed to be routed within the Cotton Street alignment directly to the Rio Grande, at approximately 8,000 lf in length, where an elevated outfall structure would be constructed for the discharge of stormflow into the river. The proposed elevated outfall into the river would eliminate the existing under-the-levee outfall conduit that currently discharges directly within the river channel.

Phase II would also include modifying the 36-inch force main of Phase I to serve as a highwater gravity-flow outfall from the new pond to the existing east Dallas Pond. This converted gravity-flow conduit would convey flow from the proposed pond to the existing east Dallas Street pond. All stormflow that collects within the existing east Dallas Street pond would continue to be conveyed by gravity within the Williams Street conduit alignment. The existing pump station outfall box at the existing east Dallas pond would be demolished and replaced with a standard head-wall gravity-flow opening.

Phase II will include cutting and plugging the east side leg of the existing cross-fitting at the Dallas Street pond intertie, isolating the two Dallas Street ponds from one another. All stormflow conveyed to the west side Dallas Street pond, including pumped flow from the downtown area, will be conveyed as it is currently, within the existing Dallas Street conduit to a smaller capacity PS at 180-cfs. This new pump station will be located generally between Hwy-62 and the river. Flow within the existing Dallas Street outfall conduit will be diverted to this proposed 180-cfs PS under Phase II for the 1% AC flood condition.

The proposed 180-cfs PS will mitigate flooding in the area south of I-10 and north of the river and will discharge this flow to a similar but smaller elevated outfall structure, proposed in the vicinity of the existing Dallas Street outfall opening, which will be cut and plugged. The proposed smaller capacity pump station with 36-inch force main, approximately 2,000-lf in length will eliminate the threat of flooding caused when the Rio Grande exceeds its flood stage elevation for the 1% AC flood.

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1-RFP Construction Cost	$	15,507,305
Subtotal 2-RFP PS Cost, Partially Equipped, FM	$	13,904,000
Total Construction Cost	**$**	**29,411,305**
Subtotal 3-RFP EPWater Land Acquisition	$	3,000,000
Subtotal 4-RFP Preliminary Engineering Cost (10%)	$	2,941,131
Subtotal 5-RFP Final Design / Bidding Cost (20%)	$	5,882,261
Subtotal 6-RFP Construction Administraction Cost (8%)	$	2,352,904
Subtotal 7-RFP Construction Inspection Cost (15%)	$	4,411,696
Total Non-Construction Cost	**$**	**18,587,992**
Phase I Total FMP Cost	**$**	**47,999,297**

Total FMP Cost		
Subtotal 1-Fully Equipping PS, FM & Elevated Outfall Structure	$	46,000,000
Subtotal 2-Modifications to Williams St Outfall Opening	$	2,607,000
Subtotal 3-Southern most PS, FM & Elevated Outfall Structure	$	21,464,300
Subtotal 4-Dallas St Outfall cutting / plugging, Flow Diversion	$	2,172,500
Total Construction Cost	**$**	**72,246,800**
Subtotal 3-Drainage Feasibility Study Land Acquisition Cost	$	2,000,000
Subtotal 4-RFP Land Acquisition Cost	$	7,224,380
Subtotal 5-RFP Final Design Cost	$	14,448,760
Subtotal 6-RFP Permitting Cost	$	5,779,504
Subtotal 7-RFP Constuction Oversight Cost	$	10,836,570
Total Non-Construction Cost	**$**	**40,289,214**
Phase II Total FMP Cost	**$**	**112,533,014**

Phase I & Phase II Total FMP Cost	**$**	**160,532,311**

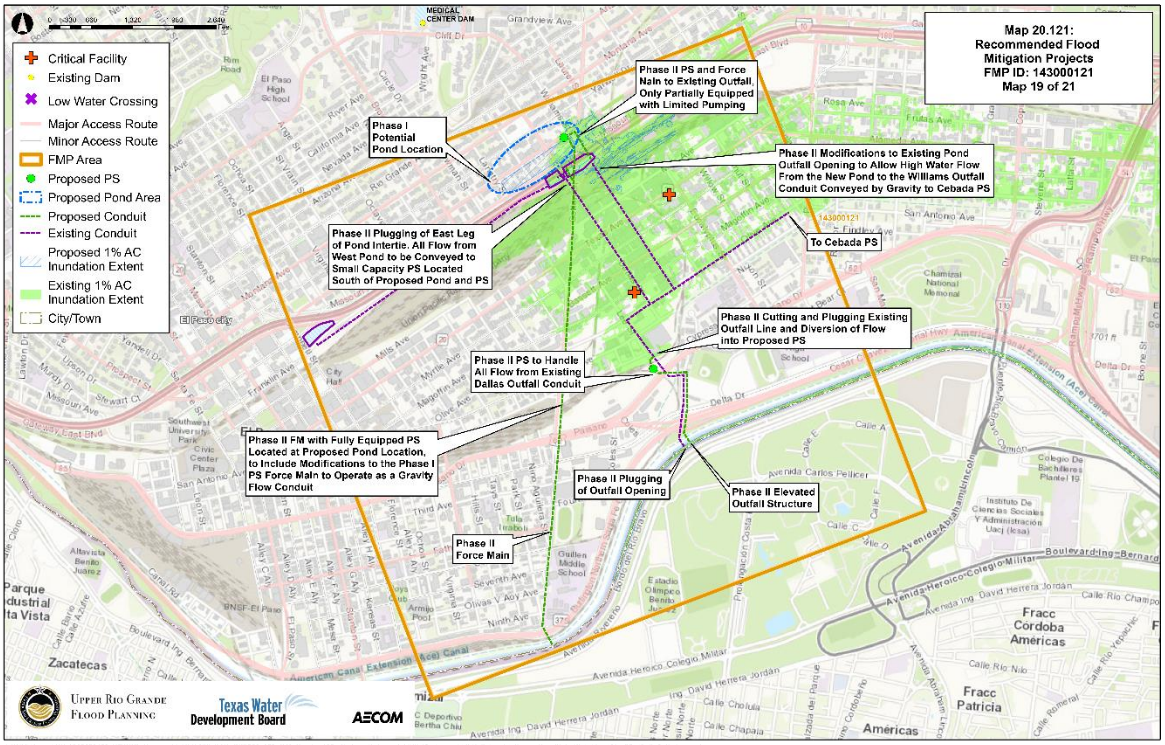


Figure 4D-19: Project Map (AECOM, 2023)

4D-20. Flood Mitigation Project ID: 143000122

Name: Canterbury Channel (WC1)

Description: Canterbury Channel involves the construction of a 5.7 ac-ft debris retention basin. The project was originally conceived and approved as Project WC1 in the Storm Water Master Plan for the City of El Paso (2010, with 2023 update).

Affected Jurisdictions: City of El Paso

Discussion on Cultural Resources Background: No cultural resources are located within the project area.

Discussion on Flood Risk: In 2006, protracted high volume rainfall over several days filled existing natural alluvial channels and triggered debris flows: a viscous mixture of floodwater, sediment, and cobbles. These debris flows blocked downstream culverts and filled small detention ponds, allowing overflow to proceed uncontrolled through structures and blocking critical access routes. A similar significant risk exists within the watershed that feeds flood flows to Canterbury Channel.

Project Description: Studies documented in the City of El Paso Drainage Design Manual have presented analytical procedures for the sizing of debris basins to address debris flow risk within El Paso County watersheds. These procedures estimated a recommended retention basin size of 5.7 acre-feet. The project consists of constructing a 5.7 ac-ft debris retention basin to the east of Stanton Street at the end of Kenyon Joyce Lane. Hydraulic benefits will be achieved by allowing existing stormwater infrastructure to operate unimpeded during significant storm events.

Results of modeling the 1% AC storm event indicate that the construction of this project will prevent the blockage of drainage structures likely to be blocked during this event, removing 102 structures from the 1% annual chance floodplain, and positively impacting a population of approximately 349 people.

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1-RFP Construction Cost	$	2,328,000
Subtotal 2-RFP Construction Contingency	$	466,000
Total Construction Cost	**$**	**2,793,000**
Subtotal 3-Drainage Feasibility Study Land Acquisition Cost	$	90,000
Subtotal 4-RFP Land Acquisition Cost	$	150,000
Subtotal 5-RFP Final Design Cost	$	595,000
Subtotal 6-RFP Permitting Cost	$	260,000
Subtotal 7-RFP Construction Oversight Cost	$	510,000
Subtotal 8-RFP Geotech Cost	$	200,000
Total Non-Construction Cost	**$**	**1,668,000**
Total FMP Cost	**$**	**4,462,000**

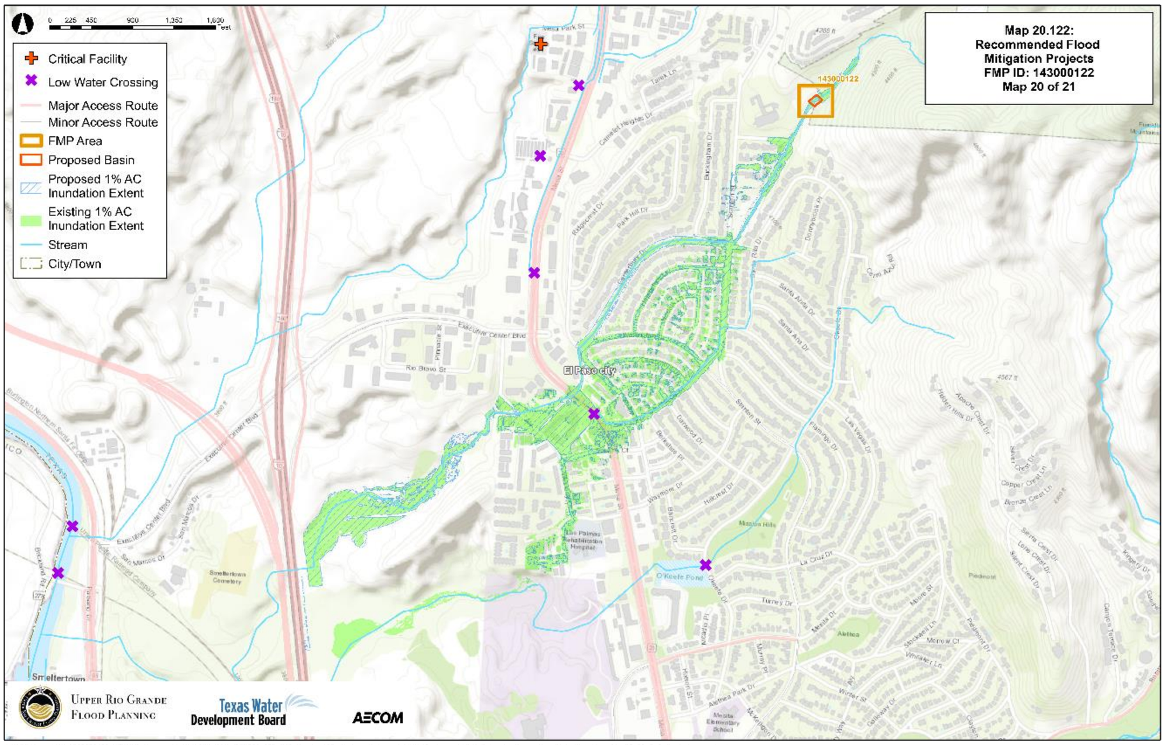


Figure 4D-20: Project Map (AECOM, 2023)

4D-21. Flood Mitigation Project ID: 143000123

Name: New Detention Pond (WC4)

Description: Construct a new 37.6 ac-ft detention pond to intercept Flow Path No. 21 to relieve roadway flooding on Mesa Street. The project was originally conceived and approved as Project WC4 in the Storm Water Master Plan for the City of El Paso (2010, with 2023 update).

Affected Jurisdictions: City of El Paso

Discussion on Cultural Resources Background: No cultural resources are located within or immediately adjacent to the project area.

Discussion on Flood Risk:

Flow Path No. 21 carries flow from the Franklin Mountains to the Rio Grande. This FMP addresses two identified flood risks:

- Under existing conditions, flooding of Mesa Street in this area impacts emergency access routes across the city and to a hospital within this project area.
- In 2006, protracted high volume rainfall over several days filled existing natural alluvial channels and triggered debris flows: a viscous mixture of floodwater, sediment and cobbles. These debris flows blocked downstream culverts and filled small detention ponds, allowing overflow to proceed uncontrolled through structures and blocking critical access routes. A similar significant risk exists within the Flow Path 21 watershed.

Project Description: The intent of the Flow Path No. 21 detention basin is to increase both debris and stormwater capacity. The basin is intended to be constructed on El Paso Water property in the current location of significant ponding. The debris capacity is intended to lengthen the time between required maintenance to remove debris, while maintaining the required stormwater capacity. The increase in stormwater capacity will reduce the load on undersized existing infrastructure.

Damages to be relieved by this project are associated with the expected blockage with debris of an existing conduit at the site of the future detention basin. The proposed basin will prevent the blockage of this conduit and reduce flood risk at 15 structures within the 1% annual chance floodplain, reducing flood risk for a population of approximately 109 lives. This project will additionally remove a critical facility (hospital) from the 1% AC floodplain.

Estimated Cost for FMP:

Total FMP Cost		
Subtotal 1-RFP Construction Cost	$	6,998,000
Subtotal 2-RFP Construction Contingency	$	1,400,000
Total Construction Cost	**$**	**8,398,000**
Subtotal 3-Drainage Feasibility Study Land Acquisition Cost	$	45,000
Subtotal 4-RFP Land Acquisition Cost	$	000
Subtotal 5-RFP Final Design Cost	$	1,270,000
Subtotal 6-RFP Permitting Cost	$	130,000
Subtotal 7-RFP Construction Oversight Cost	$	255,000
Subtotal 8-RFP Geotech Cost	$	100,000
Total Non-Construction Cost	**$**	**1,800,000**
Total FMP Cost	**$**	**10,198,000**

Figure 4D-21: Project Map (AECOM, 2023)

Appendix 4E
Evaluation Summary Table of Potentially Feasible Flood Management Strategies

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

FMS ID	FMS Name	Description	Associated Goals (ID)	Associated FME, FMS, or FMP	Associated FME, FMS, or FMP Description	Counties	HUC8s	Strategy Type	Strategy Project Area (sqmi)	Flood Risk Type (Riverine, Coastal, Urban, Playa, Other)	Sponsor
142000001	FEMA Levee Accreditation for All Rio Grande Levees at El Paso	Coordination needed between USIBWC, FEMA, El Paso Water, El Paso County, Doña Ana County, and Hudspeth County to certify and accredit all remaining levee segments through El Paso County. Interior drainage studies are needed in Hudspeth and Doña Ana.	14004001	N/A	N/A	El Paso	13030102, 13040100	Regulatory and Guidance	91.19	Riverine	USIBWC, El Paso Water, El Paso County, Doña Ana County, Hudspeth County
142000002	Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine	Construct rainwater basins at 3 locations around Kokernot Park to drain neighboring streets, impound runoff volume, promote infiltration and aquifer recharge, reduce landscaping water costs, and remediate pollutants.	14012001, 14013001	N/A	N/A	Brewster	13070006	Infrastructure Projects	0.06	Urban/Local	City of Alpine, Brewster County
142000003	Implement Colonia-wide Drainage System and Maintenance and Outreach Program for Roadside Swales and Driveway Culverts at Fort Hancock	Construct drainage improvements as detailed in FME ID: 141000014; maintain existing roadside ditches/swales to ensure positive drainage; and develop an outreach program to encourage residents to maintain and repair driveway culverts.	14007001, 14007002, 14014001, 14009002, 14009004, 14010001, 14010002	FME ID: 141000014	FME ID: 141000014 will be done prior to identify flood mitigation improvements in Fort Hancock and Acala.	Hudspeth	13040100	Education and Outreach, Other	1.12	Urban/Local	Fort Hancock CDP, Hudspeth County
142000004	Coordination with Ft. Bliss for FMP Permitting and Maintenance Access	El Paso Water designed NE7 on Ft. Bliss near unexploded ordinances (UXOs), and has an easement to maintain Fusselman and Northgate Dams, but can't access them due to UXOs. El Paso County designed MON1 on Ft. Bliss near a training ground and potential UXOs.	14007003, 14011001, 14009001, 14009003,14010001, 14010002	N/A	N/A	El Paso	13040100	Infrastructure Projects	0.67	Urban/Local	El Paso Water, El Paso County, U.S. Army
142000005	Maintenance Program to control Salt Cedar vegetation along Rio Grande upstream of Presidio	Study to develop alternatives to clear vegetation along the Rio Grande between Candelaria and City of Presidio to allow for proper drainage for communities located along FM 170. Coordination needed between RGCOG, Presidio County, TXDOT, USACE and USIBWC.	14007003, 14012001	FMS ID: 142000007	FMS ID: 142000007 will follow as it utilizes this FME's saltcedar research.	Presidio	13040201	Education and Outreach, Other	28.86	Urban/Local	RGCOG, Presidio County, TXDOT, USIBWC, USACE
142000006	Study Binational Streamflow Recommendations for Big Bend Reach of Rio Grande/Rio Bravo	Conduct study with recommendations for binationally beneficial stream flows for Big Bend reach of the Rio Grande/Rio Bravo. Study will identify stream flows to support the river's ecological environment in state and federal parks in the U.S. and Mexico.	14007003, 14012001	FME ID: 141000008; FME ID: 141000015; FMS ID: 142000016	FME 141000008 precedes to assess how proposed sediment control on Alamito & Terneros Creeks affect recommended pulse flows. FME 141000015 & FMS 142000016 precede as they provide method for estimating sediment loads & develop erosion solutions for region.	Presidio, Brewster	13040203,13040204,13040205,13040202, 13040201	Other	212.79	Riverine	Presidio County, USIBWC, RG/B Basin Flows Collaboration, Rio Grande Joint Venture
142000007	Study to plan the management of saltcedar growth and debris in channels in/adjacent to City of Pecos	Study to identify and characterize alternatives to manage vegetation in natural drainages in and adjacent to the City of Pecos to increase conveyance and reduce flooding within the City of Pecos.	14012001	FME ID: 141000010; FMS ID: 142000005	FME ID: 141000010 will be done prior as it studies flooding in City of Pecos; FMS ID: 142000005 will be done prior as it involves saltcedar research that will be utilized.	Reeves	13060007, 13060011, 13040212, 13070002, 13070003, 13070006, 13070008, 13070009, 13070010, 13070011, 13070012, 13070001, 13070007	Other	124.33	Riverine	City of Pecos, Reeves County
142000008	Develop Certification Package for Cibolo Creek Channel and Levee	Perform planning and design required by FEMA for levee accreditation, then complete certification package for Cibolo Creek levee in vicinity of City of Presidio. Package includes O&M Plan.	14015001, 14007000, 14004002	FME ID: 141000002	FME ID: 141000002 will be done prior as the interior drainage sudy is needed for levee certification	Presidio	13040201	Regulatory and Guidance	2.75	Riverine	USACE, Presidio County, City of Presidio
142000009	Regulatory Review of Off-Road Traffic on State Lands	Coordination should take place between EPCWID1, El Paso County, and State land owners to discuss enforcement of restrictions associated with off-road motor vehicles on undeveloped land.	14002001, 14007003	N/A	N/A	El Paso	13040100, 13050003	Regulatory and Guidance	620.49	Other	EPCWID1, El Paso County, Texas GLO
142000010	Regulatory Review of Impervious Cover on New Development in El Paso County	Coordination should take place between EPCWID1, El Paso County, and Texas GLO land owners to discuss revisions to development regulations associated with detention and impervious cover.	14001001, 14007003	N/A	N/A	El Paso	13040100, 13050003	Regulatory and Guidance	619.88	Urban/Local	EPCWID1, El Paso County, Texas GLO

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

FMS ID	FMS Name	Description	Associated Goals (ID)	Associated FME, FMS, or FMP	Associated FME, FMS, or FMP Description	Counties	HUC8s	Strategy Type	Strategy Project Area (sqmi)	Flood Risk Type (Riverine, Coastal, Urban, Playa, Other)	Sponsor
142000013	Staff augmentation support or funding for at risk communities to join and/or enforce the NFIP	Prioritize and provide staff augmentation support or funding for at risk communities not currently participating in the NFIP or communities with limited resources to enforce the NFIP. Aid communities in implementing recommended minimum standards.	14001001, 14001002	N/A	N/A	Presidio, Hudspeth, Reeves, Andrews, Edwards, Pecos, Winkler		Regulatory and Guidance	16144.52	Urban/Local, Riverine	RGCOG
142000014	Develop new flood gages throughout the region	Prioritize, fund, and develop new flood gages (rainfall and/or stream gages) throughout the region to support flood warning system improvements and improve ability to validate or calibrate existing and new flood models	14005001, 14006001, 1400602	N/A	N/A	All of Region 14		Flood Measurement and Warning	43031.15	Riverine	RGCOG
142000015	Develop and design standard options for addressing identified development-related flooding in El Paso	Evaluate COEP and El Paso County drainage design standards for inlets, curb cuts, requirements for on-site storage in new developments, addressing as-built elevations, protecting remaining on-site storage and recovering original storage for existing developments.	14002001, 14003001	N/A	N/A	El Paso	13030102, 13040100, 13050003	Regulatory and Guidance	1011.05	Urban/Local	El Paso Water, El Paso County
142000016	Develop regional solutions to address erosion issues in natural channels affecting stormwater conveyance	Develop consensus region-specific erosion-resistant designs to prevent removal of material from drainage conveyances, with functional comparisons to aid selection of best practices.	14007003, 14002001, 14003001, 14007001, 14007002	FME ID: 141000008; FME ID: 141000015	FME ID: 141000008 will follow as it utilizes the erosion control solutions developed in this FME. FME ID: 141000015 will be done prior as it estimates sediment in arroyos and develops method to estimate sediment in arroyos throughout region.	All of Region 14	13030102, 13040100, 13050003	Other	1011.05	Urban/Local, Riverine	RGCOG
142000017	Develop solutions to address city/county stormwater conveyance into the Rio Grande (El Paso County)	Refine agency action coordination in conveyance of interior flooding to the Rio Grande. Develop FMP designs and costs for improvements of conveyance from river terrace storm water infrastructure, considering high ground water.	14006001, 14004001, 14004002, 14007003	FME ID: 14000018	FME ID: 14000018 will be done prior as it identifies new outfalls and prioritizes existing outfalls improvements	El Paso	13030102, 13040100, 13040201, 13040202, 13040203, 13040204, 13040205, 13040206, 13040207, 13040208, 13040209, 13040210, 13040211, 13040212, 13070006, 13070008, 13070010, 13070012, 13050003, 13050004, 13070007	Infrastructure Projects, Other	17923.72	Urban/Local, Riverine	El Paso Water, El Paso County
142000019	Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area	Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area	14014001, 14007000	N/A	N/A	El Paso	13030102, 13040100, 13050003	Other	1011.05	Urban/Local, Riverine	El Paso Water, El Paso County, EPCWID1
142000020	Develop and Improve Early Warning System for El Paso City/ County interior drainage	Conduct study to evaluate and proposed improvements to Early Warning Systems (EWSs) for interior drainage in El Paso City and El Paso County. Includes assessment of existing flood EWS.	14006001, 1400602	N/A	N/A	El Paso	13030102, 13040100, 13050003	Flood Measurement and Warning	1010.83	Urban/Local, Riverine	El Paso Water, COEP, El Paso County, EPCWID1
142000021	Develop and Improve Early Warning System for City of Pecos	Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Pecos and adjacent Lindsay Census Designated Place. Includes assessment of existing flood EWS.	14006001, 1400602	N/A	N/A	Reeves	13070003, 13070001	Flood Measurement and Warning	23.03	Urban/Local, Riverine	City of Pecos, Reeves County
142000022	Develop and Improve Early Warning System for City of Alpine	Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Alpine. Includes assessment of existing flood EWS.	14006001, 1400602	N/A	N/A	Brewster	13070006	Flood Measurement and Warning	4.79	Urban/Local, Riverine	City of Alpine, Brewster County
142000023	Develop and Improve Early Warning System for City of Presidio, Presidio County	Identify and design access routes and bridges/culverts to provide emergency access during extreme flood events in the City of Presidio.	14006001, 1400602	N/A	N/A	Presidio	13040201	Flood Measurement and Warning	2.57	Urban/Local, Riverine	City of Presidio, Presidio County
141000024	Develop and Improve Early Warning System for City of Fort Stockton	Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Fort Stockton. Includes assessment of existing flood EWS.	14006001, 1400602	N/A	N/A	Pecos	13070007	Flood Measurement and Warning	5.53	Urban/Local, Riverine	City of Fort Stockton, Pecos County
142000025	Develop and Improve Early Warning System for City of Marfa, Presidio County	Identify and design access routes and bridges/culverts to provide emergency access during extreme flood events in Marfa. Southeast Marfa and dirt portion of FM2810 were identified as problem areas by Presidio County Office of Emergency Management.	14006001, 1400602	FMP ID: 143000007	FMP ID: 143000007 also improves early warning in Marfa, but is not required before or after this FMS.	Presidio	13040202	Flood Measurement and Warning	1.62	Urban/Local, Riverine	City of Marfa, Presidio County

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

						Flood Risk									
FMS ID	**FMS Name**	**Entities with Oversight**	**Emergency Need (Y/N)**	**Estimated Project Cost ($)**	**Potential Funding Sources and Amount**	**Area in 100yr (1% annual chance) Floodplain**	**Area in 500yr (0.2% annual chance) Floodplain**	**Estimated number of structures at 100yr flood risk**	**Residential structures at flood risk**	**Estimated population at flood risk**	**Critical facilities at flood risk (#)**	**Number of low water crossings at flood risk (#)**	**Estimated number of road closures (#)**	**Estimated length of roads at flood risk (miles)**	**Estimated active farm & ranch land at flood risk (acres)**
142000001	FEMA Levee Accreditation for All Rio Grande Levees at El Paso	USIBWC, El Paso Water, El Paso County, Doña Ana County, Hudspeth County	No	$ 482,000	Federal, State, Local	54.3	65.7	11251	9905	30450	35	34	334	196	23451
142000002	Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine	City of Alpine, Brewster County	No	$ 1,282,000	State, Local	0.06	0.1	13	5	42	0	0	5	0.45	0.0
142000003	Implement Colonia-wide Drainage System and Maintenance and Outreach Program for Roadside Swales and Driveway Culverts at Fort Hancock	Fort Hancock CDP, Acala CDP, Hudspeth County	No	$ 404,000	State, Local	0.3	0.4	12	0	16	0	6	0	2	61
142000004	Coordination with Ft. Bliss for FMP Permitting and Maintenance Access	El Paso Water, El Paso County, U.S. Army	No	$ 49,000	Federal, State, Local	1.0	1.1	119	104	443	3	5	87	30.1	0
142000005	Maintenance Program to control Salt Cedar vegetation along Rio Grande upstream of Presidio	Presidio County, TXDOT, USIBWC, USACE	No	$ 97,000	Federal, State, Local	21.6	22.5	18	0	49	0	2	2	1	109
142000006	Study Binational Streamflow Recommendations for Big Bend Reach of Rio Grande/Rio Bravo	City of Presidio, Presidio County, Brewster County, Big Bend National Park, Rio Grande Wild and Scenic River, Big Bend Ranch State Park, Black Gap Wildlife Management Area, Santa Elena Canyon Wildlife and Plant Protection Area, Maderas del Carmen Wildlife and Plant Protection Area, Ocampo Wildlife and Plant Protection Area, and the Rio Bravo Monument	No	$ 63,000	Federal, State	64.9	70.9	136	46	361	0	107	113	182.1	282
142000007	Study to plan the management of saltcedar growth and debris in channels in/adjacent to City of Pecos	City of Pecos, Reeves County	No	$ 73,000	Federal, State, Local	12.8	12.9	2120	1240	7359	3	18	295	89.9	532
142000008	Develop Certification Package for Cibolo Creek Channel and Levee	USACE, Presidio County	No	$ 79,000	Federal, State, Local	1.6	1.7	712	479	1472	0	0	22	14.1	34
142000009	Regulatory Review of Off-Road Traffic on State Lands	EPCWID1, El Paso County, Texas GLO	No	$ 99,000	State, Local	118.0	168.7	2603	2056	7134	1	51	104	97	35063
142000010	Regulatory Review of Impervious Cover on New Development in El Paso County	EPCWID1, El Paso County, Texas GLO	No	$ 64,000	State, Local	117.9	168.5	2603	2056	7134	1	51	103	97	35026

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

FMS ID	FMS Name	Entities with Oversight	Emergency Need (Y/N)	Estimated Project Cost ($)	Potential Funding Sources and Amount	Flood Risk									
						Area in 100yr (1% annual chance) Floodplain	Area in 500yr (0.2% annual chance) Floodplain	Estimated number of structures at 100yr flood risk	Residential structures at flood risk	Estimated population at flood risk	Critical facilities at flood risk (#)	Number of low water crossings at flood risk (#)	Estimated number of road closures (#)	Estimated length of roads at flood risk (miles)	Estimated active farm & ranch land at flood risk (acres)
142000013	Staff augmentation support or funding for at risk communities to join and/or enforce the NFIP	Presidio County, Hudspeth County, Reeves County, Andrews County, Edwards County, Pecos County, Winkler County, City of Alpine, City of Sonora, City of Barstow, City of Kermit, City of Rankin, City of Thorntonville, Town of Valentine, City of Wickett, City of Wink	No	$ 44,000	Federal, State, Local	3900.0	4843.0	8498	3843	22565	22	523	1188	1243.2	28217
142000014	Develop new flood gages throughout the region		Yes	$ 240,000	Federal, State, Local	9286.0	11041.0	40121	24931	115519	94	1778	5871	3792	479713
142000015	Develop and design standard options for addressing identified development-related flooding in El Paso	El Paso Water, El Paso County	No	$ 35,000	State, Local	179	245	21373	16856	70212	37	132	841	607	48551
142000016	Develop regional solutions to address erosion issues in natural channels affecting stormwater conveyance		No	$ 57,000	State, Local	9286.0	11041.0	40121	24931	115519	94	1778	5871	3792	479713
142000017	Develop solutions to address city/county stormwater conveyance into the Rio Grande (El Paso County)	El Paso Water, El Paso County	No	$ 99,000	Federal, State, Local	179	245	21373	16856	70212	37	132	841	607	48551
142000019	Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area	El Paso Water, El Paso County, EPCWID1	No	$ 21,000	State, Local	179	245	21373	16856	70212	37	132	841	607	48551
142000020	Develop and Improve Early Warning System for El Paso City/ County interior drainage	El Paso Water, COEP, El Paso County, EPCWID1	Yes	$ 140,000	State, Local	179	245	21373	16856	70212	37	132	841	607.00	48551
142000021	Develop and Improve Early Warning System for City of Pecos	City of Pecos, Reeves County	Yes	$ 50,000	State, Local	12.8	12.9	2120	1240	7359	3	18	295	89.92	532
142000022	Develop and Improve Early Warning System for City of Alpine	City of Alpine, Brewster County	Yes	$ 50,000	State, Local	2.0	2.3	1640	1181	4364	6	18	199	38.03	50
142000023	Develop and Improve Early Warning System for City of Presidio, Presidio County	City of Presidio, Presidio County	Yes	$ 50,000	State, Local	0.8	0.9	655	513	1292	0	0	56	15.71	14
141000024	Develop and Improve Early Warning System for City of Fort Stockton	City of Fort Stockton, Pecos County	Yes	$ 50,000	State, Local	0.8	1.1	166	108	899	2	4	26	21.61	14
142000025	Develop and Improve Early Warning System for City of Marfa, Presidio County	City of Marfa, Presidio County	Yes	$ 50,000	State, Local	0.3	0.4	212	140	334	1	12	55	6.46	0

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

FMS ID	FMS Name	Reduction in Flood Risk												Cost/ Structure removed	Consideration of nature-based solution (Y/N)	Negative Impact (Y/N)	Negative Impact Mitigation (Y/N)	Water Supply Benefit (Y/N)
		Number of structures with reduced 100yr (1% annual chance) flood risk	Number of structures removed from 100yr (1% annual chance) flood risk	Number of structures removed from 500yr (0.2% annual chance) flood risk	Residential structures removed from 100yr (1% annual chance) flood risk	Estimated Population removed from 100yr (1% annual chance) flood risk	Critical facilities removed from 100yr (1% annual chance) flood risk (#)	Number of low water crossings removed from 100yr (1% annual chance) flood risk (#)	Estimated reduction in road closure occurrences	Estimated length of roads removed from 100yr flood risk (miles)	Estimated active farm & ranch land removed from 100yr flood risk (acres)	Estimated reduction in fatalities (if available)	Estimated reduction in injuries (if available)					
142000001	FEMA Levee Accreditation for All Rio Grande Levees at El Paso	11036	10275	0	9160	28148	30	32	188	168	17834	0	0	$ 44	No	No	No	No
142000002	Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine	0	0	0	0	0	0	0	0	0	0	0	0	N/A	Yes	No	No	Yes
142000003	Implement Colonia-wide Drainage System and Maintenance and Outreach Program for Roadside Swales and Driveway Culverts at Fort Hancock	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000004	Coordination with Ft. Bliss for FMP Permitting and Maintenance Access	118	5	0	4	15	0	0	0	0.8	0	0	0	$ 415	No	No	No	No
142000005	Maintenance Program to control Salt Cedar vegetation along Rio Grande upstream of Presidio	0	0	0	0	0	0	0	0	0	0	0	0	N/A	Yes	No	No	No
142000006	Study Binational Streamflow Recommendations for Big Bend Reach of Rio Grande/Rio Bravo	0	0	0	0	0	0	0	0	0	0	0	0	N/A	Yes	No	No	No
142000007	Study to plan the management of saltcedar growth and debris in channels in/adjacent to City of Pecos	0	0	0	0	0	0	0	0	0	0	0	0	N/A	Yes	No	No	No
142000008	Develop Certification Package for Cibolo Creek Channel and Levee	681	681	0	462	1401	0	0	11	13.4	30	0	0	$ 116	No	No	No	No
142000009	Regulatory Review of Off-Road Traffic on State Lands	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000010	Regulatory Review of Impervious Cover on New Development in El Paso County	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No

Table 4E. Potentially Feasible Flood Management Strategies Identified by RFPG

FMS ID	FMS Name	Reduction in Flood Risk												Cost/ Structure removed	Consideration of nature-based solution (Y/N)	Negative Impact (Y/N)	Negative Impact Mitigation (Y/N)	Water Supply Benefit (Y/N)
		Number of structures with reduced 100yr (1% annual chance) flood risk	Number of structures removed from 100yr (1% annual chance) flood risk	Number of structures removed from 500yr (0.2% annual chance) flood risk	Residential structures removed from 100yr (1% annual chance) flood risk	Estimated Population removed from 100yr (1% annual chance) flood risk	Critical facilities removed from 100yr (1% annual chance) flood risk (#)	Number of low water crossings removed from 100yr (1% annual chance) flood risk (#)	Estimated reduction in road closure occurrences	Estimated length of roads removed from 100yr flood risk (miles)	Estimated active farm & ranch land removed from 100yr flood risk (acres)	Estimated reduction in fatalities (if available)	Estimated reduction in injuries (if available)					
142000013	Staff augmentation support or funding for at risk communities to join and/or enforce the NFIP	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000014	Develop new flood gages throughout the region	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000015	Develop and design standard options for addressing identified development-related flooding in El Paso	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000016	Develop regional solutions to address erosion issues in natural channels affecting stormwater conveyance	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000017	Develop solutions to address city/county stormwater conveyance into the Rio Grande (El Paso County)	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000019	Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000020	Develop and Improve Early Warning System for El Paso City/ County interior drainage	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000021	Develop and Improve Early Warning System for City of Pecos	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000022	Develop and Improve Early Warning System for City of Alpine	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000023	Develop and Improve Early Warning System for City of Presidio, Presidio County	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
141000024	Develop and Improve Early Warning System for City of Fort Stockton	0	0	0	0	0	0	0	0	0	0	0	0	N/A	No	No	No	No
142000025	Develop and Improve Early Warning System for City of Marfa, Presidio County	0	0	0	0	0	0	0	0	0	0	1	0	N/A	No	No	No	No

Appendix 4F
Narratives of Potentially Feasible Flood Management Strategies

Appendix 4F. Narratives for Flood Management Strategies

4F-1. Flood Management Strategy ID: 142000001

Name: FEMA Levee Accreditation for All Rio Grande Levees at El Paso.

Description: Coordination needed between the United States International Boundary and Water Commission (USIBWC), the Federal Emergency Management Agency (FEMA), El Paso Water (EPWater), El Paso County, Doña Ana County, and Hudspeth County to certify and accredit all remaining levee segments through El Paso County. Interior drainage studies are needed in Hudspeth and Doña Ana counties.

Affected Jurisdictions: City of El Paso, El Paso County, Hudspeth County, Doña Ana County

Discussion on Flood Risk: Areas adjacent to the Rio Grande River protected by FEMA-accredited levees are not only protected from riverine flooding, but residents will also be eligible for reduced flood insurance premiums.

Flood Management Strategy Scope of Work:

There are multiple unaccredited levee segments along the Rio Grande River through El Paso County that currently provide flood protection to adjacent areas. These levees are designed and operated by the USIBWC. A certified levee indicates that the levee segment is formally recognized by FEMA as providing flood risk reduction for the 1% annual chance (AC) flood on the applicable Flood Insurance Rate Map(s) (FIRMs). To achieve this recognition, the levee systems must meet and continue to meet the minimum design, operation, and maintenance standards per Title 44, Chapter 1, Section 65.10 of the *Code of Federal Regulations* (44 CFR Section 65.10). This regulation specifies select items that need to be submitted and reviewed by FEMA to obtain levee accreditation, including the following:

Documentation that the levee meets design criteria (freeboard, stability, settlement, etc.);
Certified as-built levee plans showing tie-ins;
Officially adopted operation and maintenance (O&M);
Emergency Preparedness Plan (including documentation of flood warning systems, emergency notification flowchart); and
Interior drainage evaluation.

This Flood Management Strategy (FMS) will prepare an individual certification package and summary report, including all associated attachments, by levee segment for FEMA submission. The package will include all elements required by 44 CFR Section 65.10 and described in FEMA guidance, *Meeting the Criteria for Accrediting Levee Systems on Flood Insurance Rate Maps* (FEMA Fact Sheet May 2021). The text of the report will reference other studies/data as necessary to show compliance with 44 CFR Section 65.10. Preparation of each package does not include performing the detailed studies required for certification, but rather aggregation, review, and summary/presentation of the certification material. Sections and/or items to be included in the package and report include the following:

Purpose of Certification package and background;
Certification Statement (to be signed by levee owner/sponsor);
Regulation Compliance;
As-Built Plans and Freeboard Check;
Natural Valley Analysis;
Levee System Check (roadway crossings, structure crossings, upstream and downstream tie-in locations);
Interior Drainage Analysis;
Geotechnical Report of the levee assessing embankment and foundation stability, seepage, and settlement;
Embankment Protection, including vegetation and cover assessment and analysis of shear stress ;
Closure Structure Data;
O&M Plan;
Emergency Preparedness Plan;
Inspection reports, and
Statement of compliance with all local, state, and federal laws.

There are eight USIBWC levee segments along the Rio Grande within the County of El Paso that require certification, three of which extend outside of the County limits, requiring an interior drainage study and/or a hydraulic independence analysis to be performed to certify portions of the levee segments within El Paso County:

Canutillo/Mesilla – East 1 (extends into New Mexico):
  - Requires interior drainage study in Doña Ana County and/or hydraulic independence analysis to certify levee segments in El Paso County.

Canutillo/Mesilla – East 2 (includes Canutillo Phase 2 Floodwall and Sunland Park East).
  - A construction contract for levee repair of the Sunland Park East levee from the Borderland Road Bridge to the El Paso Electric Rio Grande Power Plant (8.42 miles) was awarded on September 20, 2022 and is expected to be completed by March 2025.

Canutillo/Mesilla – West (extends into New Mexico, includes Nemexas and Sunland Park West):
  - Requires interior drainage study in Doña Ana County and/or hydraulic independence analysis to certify levee segments in El Paso County.
  - Levee repair construction of the Sunland Park West levee from the Borderland Road Bridge to Country Club Road Bridge reached substantial completion on June 11, 2021.
  - A construction contract for levee repair of Sunland Park West levee from Country Club Road Bridge to the Nemexas Siphon (0.59 miles) was awarded on September 20, 2022.

Courchesne – West.
El Paso 1 / Paisano (American Dam to International Dam).

El Paso 2B (South Zaragoza Road to Riverside Weir).
El Paso 3 (Riverside Weir to Wingo Reserve Road/upstream of Shaffer Road, Tornillo, TX, includes Ysleta to Fabens and Fabens).
El Paso 4 (Wingo Reserve Road/upstream of Shaffer Road, Tornillo, TX to extends into Hudspeth County):

  - Requires interior drainage study in Doña Ana County and/or hydraulic independence analysis to certify portions of levee segments in El Paso County.

The project is divided into the major tasks below.

Task 1 – Stakeholder Coordination;
Task 2 – Meetings;
Task 3 – Data Collection;
Task 4 – Interior Drainage Studies; and
Task 5 – Levee Certification Package by Segment.

Estimated Cost for FMS:

Labor Cost		
Task 1 – Stakeholder Coordination	$	40,000
Task 2– Meetings	$	49,200
Task 3 – Data Collection	$	40,380
Task 5 – Levee Certification Package Preparation	$	350,620
Total Project Labor	**$**	**480,200**
Travel	**$**	**2,091**
Total FME cost	**$**	**482,000**

4F-2. Flood Management Strategy ID: 142000002

Name: Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine.

Description: Construct rainwater basins at three locations around Kokernot Park to drain neighboring streets, impound runoff volume, promote infiltration and aquifer recharge, reduce landscaping water costs, and remediate pollutants.

Affected Jurisdictions: City of Alpine, Brewster County

Discussion on Flood Risk: This strategy was recommended in the Regional Water Plan for Region E (January 2021, FNI and WSP). A description of the flood risk in Alpine from Section E-2 of the Regional Water Plan for Region E (January 2021, FNI and WSP) is provided below for reference:

> “In a good year, the City of Alpine receives approximately 17 inches of rain, much of which is lost to runoff. High-intensity thunderstorms contribute to greater runoff into nearby Alpine Creek, causing higher peak flooding. This prevents the creek from functioning properly as evidenced by the scoured, cut and straightened channel that exists today which must be armored with engineered banks. Additionally, runoff transports pollutants into the creek, which eventually flows into the Rio Grande. As with many towns in West Texas, the streets act as a storm water drainage system. These water catchments take that liability and turn it into an asset.”

Flood Management Strategy Scope of Work:

A description of the strategy from Section E-2 of the Regional Water Plan for Region E (January 2021, FNI and WSP) is provided below for reference:

> “This strategy proposes constructing rainwater catchment basins at three locations around Kokernot Park, which will drain neighboring streets. Impounding a large volume of water from the roads will allow the captured water time to infiltrate the soil, recharge the underlying aquifer, and remediate pollutants. These basins will also be landscaped with water-efficient plants without tapping into the city’s aquifer water for irrigation. These catchments will also demonstrate how residents can reduce water use and cost by capturing rainwater and landscaping with water-efficient native plants. This project will also help reduce down-stream flooding.”

A figure of the three proposed project locations where runoff will be diverted from roadways toward Kokernot Park is provided below.

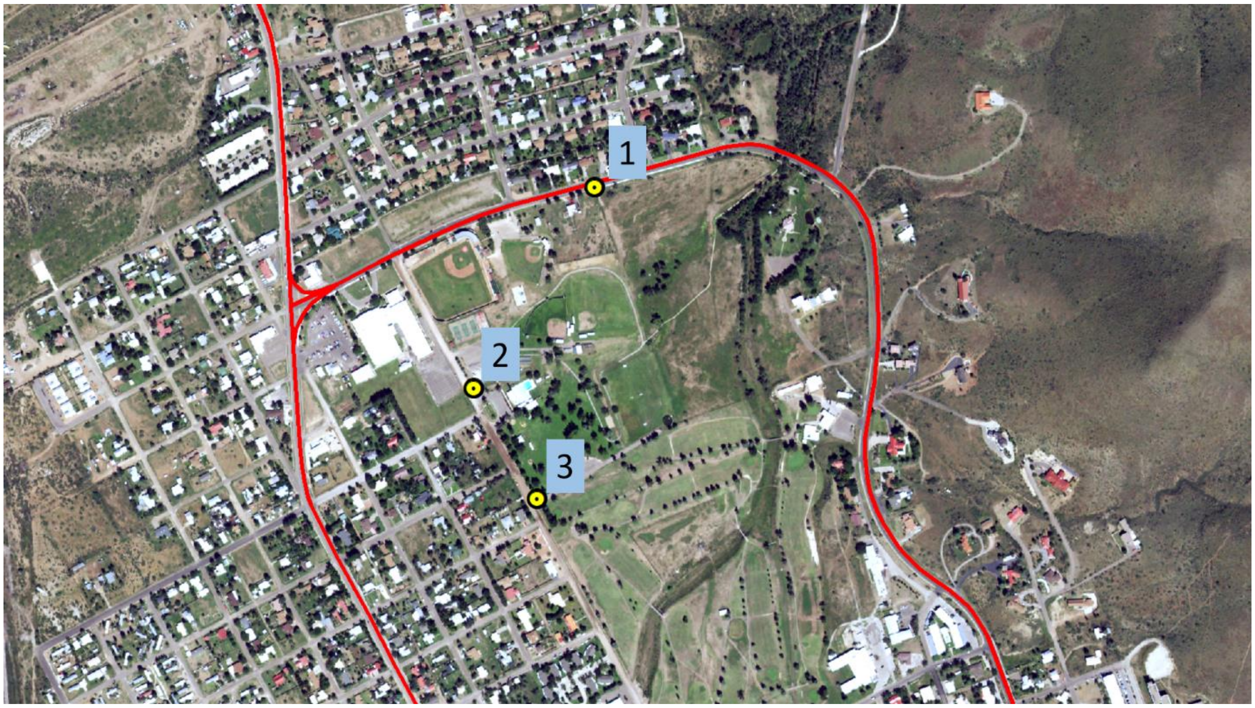


Figure 4D-2. Project locations for diverting runoff to Kokernot Park

Estimated Cost for FMS:

The total estimated Cost for this strategy is $1,282,000. The strategy cost from the Region E water plan ($1,296,000) was adjusted from January 2021 dollars to September 2020 dollars ($1,282,000) using the Construction Cost Index to be consistent with other costs documented in the Regional Flood Plan. A description of the cost associated with this strategy from Section E-2 of the Regional Water Plan for Region E (January 2021, FNI and WSP) is provided below for reference:

> “The three catchment basins (approximately 70 acres in combined size) are calculated to capture approximately 70 acre-feet during an average drought (12 inches or 75% of average annual rainfall) year. The project is planned for construction within the 2030 decade and come online prior to 2030. The estimated capital cost to construct the thee catchment basins and retention dams is $1,296,000.“

4F-3. Flood Management Strategy ID: 142000003

Name: Implement Colonia-wide Drainage System and Maintenance and Outreach Program for Roadside Swales and Driveway Culverts at Fort Hancock.

Description: Construct drainage improvements as detailed in FME ID: 141000014; maintain existing roadside ditches/swales to ensure positive drainage; and develop an outreach program to encourage residents to maintain and repair driveway culverts.

Affected Jurisdictions: Fort Hancock (CDP), Acala (CDP)

Discussion on Flood Risk: Fort Hancock and Acala are unincorporated areas in Hudspeth County located within the Rio Grande terrace, just downstream from El Paso County. The area has been recently developed without strict drainage controls, and as a result, is subject to frequent shallow flooding which interrupts routine road traffic. The County is responsible for the road maintenance which provides the primary drainage in the area. The County lacks the resources to plan for system improvements and has limited staff and means for system maintenance. The Regional Flood Planning Group (RFPG) has proposed a Flood Management Evaluation (FME ID: 141000014) for Fort Hancock and Acala that will develop and select Flood Mitigation Project (FMP) alternatives (both structural and non-structural) for the mitigation of the identified flood risk. This strategy follows this FME and develops a County program to sustain the FME-recommended improvements.

Flood Management Strategy Scope of Work:

This FMS has the goal of establishing a program for long-term maintenance that includes a plan for future county staff, county equipment, and county infrastructure needed to sustain the flood improvements recommended under FME ID: 14000014. The FMS will include a recommended funding strategy and public education program to develop support for that strategy.

The Scope of Work (SOW) for this FMS includes five tasks.

Task 1. Assessment of existing county drainage maintenance program needs. The existing county program will be reviewed, and interviews/data collected from the County to assess current needs in terms of staffing, equipment, and infrastructure.

Task 2. Assessment of future county drainage maintenance program needs. The study associated with FME 14000014 will be reviewed to estimate County needs (staffing, equipment, and infrastructure and associated annual costs) following planned execution of recommended FMPs.

Task 3. Develop a plan to fund the estimated annual costs. The funding of similar regional county maintenance programs will be reviewed. A plan will be developed to address:
1) existing funding needs and 2) future funding needs.

Task 4. Public Education Program. A public education program will be developed that explains drainage system maintenance needs and solicits public ideas and support for addressing the funding of those needs.

Task 5. Develop report. The report will include documentation of Tasks 1-4.

Task 6. Stakeholder Coordination.

Estimated Cost for FMS:

In addition to the labor costs associated with the tasks noted above, this strategy includes a recurring cost associated with the public education program and a lump sum assumed for construction and implementation of this strategy, including recommendations from FME 14000014. The lump sum construction cost is based upon the cost requested in a 2022 earmark funding request by Hudspeth County and the planning document entitled, "Villa Allegre, Fort Hancock East Unit 1, & Fort Hancock East Unit 2 Colonia Area Study and Plan 2019-2029" (Grantworks, 2019).

Labor Cost		
Task 1 – Assessment of existing county drainage maintenance program needs	$	12,820
Task 2– Assessment of future county drainage maintenance program needs	$	5,760
Task 3 – Develop plan to fund estimated annual costs	$	8,060
Task 4 - Public Education Program	$	12,140
Task 5 – Report	$	11,860
Task 6 – Stakeholder Coordination	$	5,360
Total Project Labor	**$**	**56,000**
Travel	**$**	**1,500**
Total Fixed Non-Construction Costs	**$**	**57,500**

Implementation Estimate		
Subtotal 1 - Recurring Cost Associated with Public Education and Outreach Program	**$**	**3,500**
Subtotal 2 - Assumed Construction Cost From 2019-2029 Colonia Plan (Dec. 2019)	$	251,000
Subtotal 3 – RFP Construction Cost (September 2020, using CCI)	$	254,000
Subtotal 4 – RFP Construction Contingency (35%)	$	88,900
Total Construction Cost	**$**	**342,900**
Total Fixed FME cost	**$**	**400,000**
Total Recurring FME cost	**$**	**3,500**

4F-4. Flood Management Strategy ID: 142000004

Name: Coordination with Ft. Bliss for FMP Permitting and Maintenance Access.

Description: EPWater designed NE7 on Ft. Bliss near unexploded ordinances (UXOs) and has an easement to maintain Fusselman and Northgate Dams, but can't access them due to UXOs. El Paso County designed MON1 on Ft. Bliss near a training ground and potential UXOs.

Affected Jurisdictions: Fort Bliss (CDP), City of El Paso, El Paso County

Discussion on Flood Risk: The U.S. Army Ft. Bliss has an area of about 1,700 square miles, including a large tract within the Franklin Mountains north, west, and adjacent to the City of El Paso, and a large portion of the northeast portion of El Paso County. Training ranges within Fort Bliss have historically been used for live fire exercises, and in these areas, there is some risk of UXOs being present in surficial soils. The potential presence of UXOs impacts the permitting, construction, and maintenance of needed flood mitigation infrastructure in both the City of El Paso and El Paso County. In the City of El Paso and El Paso County, needed new sediment/debris flow basins identified as part of extensive public stormwater master planning are impeded from construction due to UXO issues. These basins are designated as project NE7 within the City of El Paso Stormwater Master Plan (AECOM 2021) and as project MON1 within the El Paso County Stormwater Master Plan (AECOM, 2021). The easements to maintain existing stormwater detention infrastructure (Fusselman Dam and Northgate Dam) cannot be accessed due to UXO issues.

Flood Management Strategy Scope of Work:

This FMS has the goal of developing a plan for the resolution of UXO-related impediments to implementation and maintenance of stormwater infrastructure within the City of El Paso and El Paso County.

The SOW for this FMS includes the following tasks.

Task 1. Identification and characterization of UXO-related impediments to implementation and maintenance of stormwater infrastructure within the City of El Paso and El Paso County. This task will involve two meetings with the U.S. Army staff at Fort Bliss and review of existing relevant studies. The deliverable from this task will be a memorandum summarizing the issues and providing available details useful in planning solutions.

Task 2. Stakeholder meetings. A series of three meetings will be held with City of El Paso, EPWater, El Paso County, and the U.S. Army to develop short- and long-term plans with solutions that address issues defined in the Task 1 memorandum. This SOW includes:

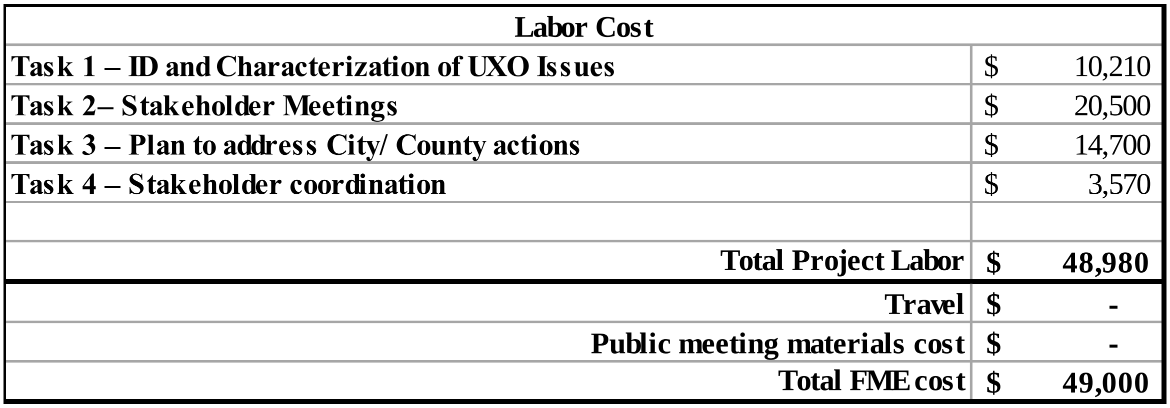
Meeting 1 will be a workshop including City of El Paso, EPWater, and El Paso County where alternatives are developed for addressing issues defined in the Task 1 memorandum. These suggested alternatives will be summarized in a written communication to the U.S. Army.

Meeting 2 will be a workshop including the City of El Paso, EPWater, El Paso County, and the U.S. Army and will include discussions centered on the suggestions from Meeting 1. Remaining/edited /new alternatives and ideas on how to proceed with implementing those ideas will be summarized in a written communication to the U.S. Army.

Task 3. Plan to address City/County actions. A plan will be developed including concept designs and costs sufficient to define a FME, FMS, or FMP per the RFP, for actions that will have City/County sponsorship.

Task 4. Stakeholder coordination.

Estimated Cost for FMS:



Labor Cost		
Task 1 – ID and Characterization of UXO Issues	$	10,210
Task 2– Stakeholder Meetings	$	20,500
Task 3 – Plan to address City/ County actions	$	14,700
Task 4 – Stakeholder coordination	$	3,570
Total Project Labor	**$**	**48,980**
Travel	**$**	**-**
Public meeting materials cost	**$**	**-**
Total FME cost	**$**	**49,000**

4F-5. Flood Management Strategy ID: 142000005

Name: Maintenance Program to control Salt Cedar vegetation along Rio Grande upstream of Presidio.

Description: Study to develop alternatives to clear vegetation along the Rio Grande between Candelaria and the City of Presidio to allow for proper drainage for communities located along FM 170. Coordination needed between the Rio Grande Council of Governments (RGCOG), Presidio County, Texas Department of Transportation (TXDOT), U.S. Army Corps of Engineers (USACE), and USIBWC.

Affected Jurisdictions: Presidio County, Candelaria Colonia

Discussion on Flood Risk: In Rio Grande reach between Candelaria and the City of Presidio, the growth of saltcedar between FM 170 and the Rio Grande, and within the flood conveyance area of the river has a number of ancillary negative impacts on flooding and drainage: the cedar growth promotes sedimentation that reduces flow area, the height of the vegetation impinges on flood flows and increases resistance to flow (roughness). This increases riverine flood risk and causes issues for communities adjacent to FM 170 with local runoff draining toward the Rio Grande. The sediment accumulation in the river blocks gravity outfalls of stormwater into the river, increasing interior flooding adjacent to the river. The saltcedar growth has also been studied for other impacts (USACE, *Forgotten Reach of the Rio Grande, Fort Quitman To Presidio, Texas*, Section 729, January 2008). Identified impacts of cedar growth include:

> “The consequences of this noxious shrub invasion is increased salinization of soils and water, substantial loss of habitat quality for many faunal species, displacement of native flora, increased surface and groundwater loss due to evapotranspiration losses by saltcedar, and loss of agricultural productivity. Seventeen faunal or fish species are federally or state listed in the study area (Rio Grande reach upstream of Presidio) and the entire reach is declared an impaired stream by TCEQ for total dissolved solids, bacteria, and chloride salts (USACE, 2007).”

This strategy will be focused on providing basic planning information necessary for later definition of projects/strategies that meet the multiple goals associated with saltcedar removal. This strategy will:

Estimate current flood capacity within the reach;
Set goals for minimum flood capacity at selected population centers;
Estimate flood benefits associated achieving those capacities;
Estimate annual sediment loadings into the reach;
Develop alternatives for communities along FM 170 which have drainage issues with runoff directed toward the river; and
Include a qualitative evaluation of alternatives for cedar control in this reach for criteria to be determined by the public sponsors of the FMS.

The 2008 report proposes a number of alternatives for addressing saltcedar growth in the Rio Grande reach upstream of Presidio. These alternatives include:

Vegetation Management: large-scale land treatment;
Saltcedar Controls: biological control using natural predators, active re-vegetation;
Sediment management: in-channel enhancements to increase sediment transport capacity, and arroyo detention structures;
Channel improvement via river training measures;
Wetland construction;
Water Management and Improved Stream Flows; and
Research.

Current information on these alternatives will be assembled and applied to this reach to perform this FMS qualitative assessment.

Flood Management Strategy Scope of Work:

This FMS includes the development of alternatives to address saltcedar impacts in the Rio Grande, and includes two tasks (literature review, qualitative comparison of salt cedar controls) that will have overlap with FMS ID: 142000007. Costs for FMS ID: 142000007 are reduced assuming FMS ID: 142000005 will be executed prior to it.

The SOW for this FMS includes five tasks:

Task 1. Literature Review. The science that underlies identifying potential solutions to saltcedar growth is rapidly expanding. The USACE 2007 report reviewed for this FMS provides recommendations for important research on the issue that are likely to have been initiated and partially completed prior to issuance of this RFP. This task will include coordination between RGCOG, Presidio County, TXDOT, USACE, USIBWC, and other public stakeholders to identify the most current relevant research. This research will be reviewed and a meeting held with coordination partners to develop: 1) a list of priority data gaps and identify alternatives for cedar control to be evaluated in Task 4, and 2) a list of the evaluation criteria to be quantitatively applied for each method.

Task 2. Data Collection. Data collection will include:

Assembly of the full range of available recent (2000-current) LiDAR for the subject reach.
Assembly of the best available hydraulic and hydrologic models for the reach.
Assembly of historic (2000-current) imagery suitable for estimating vegetation change by species.
Review of existing well locations relative to the Rio Grande floodplain, using Fathom risk boundaries and the TWDB groundwater data viewer. There are expected to be shallow wells in unconfined riparian aquifers, which could be negatively impacted by increased conveyance velocities.

Task 3. Engineering Analyses. This task includes these subtasks:

Risk Analyses for Riverine Floods. Available hydrologic and hydraulic models will be revised as needed to map flood risk for three flood risk levels deemed appropriate by the sponsors of the FMS, for existing conditions:

The goal for riverine flood capacity in terms of statistical flood (e.g., 4% AC) within the limits of the study area will be procured from the USIBWC.
The existing condition hydraulic model will be altered (by removal of vegetation and sediment) such that the goal flood risk criterion is met within the reach within the boundaries of defined populated areas (cities, census designated place, colonia).

Estimation of Sedimentation/Vegetation Removal to Meet Goals. The volume of sediment removal and area of vegetation removal needed to achieve the riverine flood capacity goal will be estimated using the above model results.

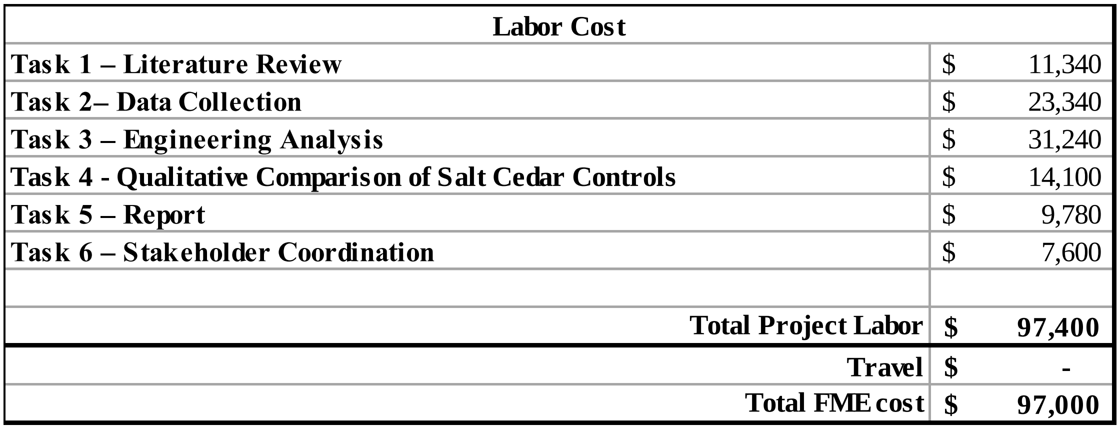
Estimation of Historic Annual Changes in Vegetation and Sedimentation. Historic LiDAR and aerial imagery in the reach will be analyzed to quantify changes in channel conveyance volume and areas of major vegetation types within the data record. These changes will be summarized in terms of average and extreme annual changes within the reach within the areas affecting flood stage in the populated areas.

A desktop analysis of Candelaria drainage patterns will be performed with best available topographic data. Coordination will take place with Presidio County and/or local stakeholders to investigate historical drainage issues for the community related to excessive sediment and/or vegetation in outfalls draining to the Rio Grande. Solutions identified for outfalls will be considered for application at other communities along FM 170 with similar drainage issues. Alternatives will be reviewed with coordination partners to discuss maintenance responsibilities.

Task 4. Qualitative Comparison of Salt Cedar Controls. The alternatives for saltcedar control identified in Task 1 will be qualitatively evaluated versus the evaluation criteria set in Task 1. Reasoning underlying selection of qualitative rankings for each criterion will be documented. Data gaps impeding evaluation will be noted, and details provided as to data/research required for evaluation.

Task 5. Report: Future Planning Information. A summary report will be prepared that summarizes Tasks 1-4.

Estimated Cost for FMS:



Labor Cost		
Task 1 – Literature Review	$	11,340
Task 2– Data Collection	$	23,340
Task 3 – Engineering Analysis	$	31,240
Task 4 - Qualitative Comparison of Salt Cedar Controls	$	14,100
Task 5 – Report	$	9,780
Task 6 – Stakeholder Coordination	$	7,600
Total Project Labor	**$**	**97,400**
Travel	**$**	**-**
Total FME cost	**$**	**97,000**

4F-6. Flood Management Strategy ID: 142000006

Name: Study Binational Streamflow Recommendations for Big Bend Reach of Rio Grande/Rio Bravo.

Description: Conduct study with recommendations for binationally beneficial stream flows for Big Bend reach of the Rio Grande/Rio Bravo. Study will identify stream flows to support the river's ecological environment in state and federal parks in the U.S. and Mexico.

Affected Jurisdictions: City of Presidio, Presidio County, Brewster County, Big Bend National Park, Rio Grande Wild and Scenic River, Big Bend Ranch State Park, Black Gap Wildlife Management Area, Santa Elena Canyon Wildlife and Plant Protection Area, Maderas del Carmen Wildlife and Plant Protection Area, Ocampo Wildlife and Plant Protection Area, and the Rio Bravo Monument

Discussion on Flood Risk:

The reach of the Rio Grande adjacent to the City of Presidio and including a series of downstream state and federal parks in the U.S. and Mexico (listed under "Affected Jurisdictions" above) is subject to loss of hydraulic capacity due to sediment inflows from the Rio Conchos (upstream of the city), and from Alamito and Terneros Creeks (downstream of the city). Prior fluvial geomorphic and environmental study of this reach (downstream through Big Bend National Park) includes this report:

"Environmental Flows Recommendations Report, Final Submission to the Environmental Flows Advisory Group, Rio Grande Basin and Bay Area Stakeholders Committee, and Texas Commission on Environmental Quality", Upper Rio Grande Basin and Bay Expert Science Team, July 2012.

This report includes this recommendation for high pulse flows that "mobilize and reorganize coarse gravel and cobble deposits on the [Rio Grande] channel bed, and must be of sufficient duration to export fine sediment that has accumulated within the river channel." Specifically, the report recommends:

> "To achieve these geomorphic goals, we recommend that annual channel filling flows of 10,500 ft^3/s with a minimum of a 5-day duration be excluded from permit consideration. Ideally, high-flow pulses for channel maintenance purposes would happen during, near the end of, or soon after monsoon season for the purposes of exporting the sediment inputs that occur during the monsoon. Alternatively, if an annual high flow pulse is not available during the monsoon season; geomorphic goals could be met with a high pulse flow during the Spring season and would have the benefit of providing biological cues to species such as the Rio Grande Silvery Minnow. Therefore, The URG BBEST recommends that the first high flow pulse of the above stated magnitude and duration following the monsoon season be excluded from permit consideration."

This recommendation has numerous benefits to the environment (cited in the report), in addition to flood benefits to the City of Presidio and downstream communities adjacent to the Rio Grande. The flood benefits are primarily associated with maintaining Rio Grande flood conveyance capacity.

Flood Management Strategy Scope of Work:

This FMS has the goal of facilitating use of high pulse flows to maintain both flood capacity and riverine environmental function in the reach of the Rio Grande downstream of the Rio Conchos. The releases for these high pulse flows will necessarily originate from reservoir storage in Mexico. FME F141000008 within this plan has the goal of developing sediment controls on Alamito Creek and Terneros Creek, which would have the potential for lessening the high pulse flows needed from the Rio Conchos watershed per the 2012 study cited above. This FMS would follow FME F141000008 and would assemble a portion of the 2012 technical team to assess whether potential sediment control improvements to Alamito Creek and Terneros Creek would affect recommended pulse flows from the 2012 study.

The SOW for this FMS includes five tasks:

Task 1. Given revised sediment inflow estimates to the Rio Grande from Alamito Creek and Terneros Creek (per improvements defined in FME F141000008), confirm or adjust the 2012 recommendations for magnitude and frequency of high pulse flows from the Rio Conchos, and given the specific goal of maintaining Rio Grande channel capacity in the vicinity of the City of Presidio. It is expected that the modeling performed for the 2012 study would serve as a starting point for the revised estimates.

Task 2. Estimate flood benefits to City of Presidio of maintaining Rio Grande capacity via management of high pulse flows. This task will include: estimation of Rio Grande bed and banks configuration in the reach affects flooding in the City of Presidio that: 1) meets the regional goal for riverine flood protection in this area and 2) serves environmental goals in the 2012 study. Hydraulic modeling will be performed to compare flood risk in the City of Presidio with and without high pulse flows. Assumptions for the “without high pulse flows” condition will be developed in consultation with strategy stakeholders.

Task 3. Estimate multiple benefits (to habitat, stream function) associated with the revised recommended high pulse flows for the full reach of the Rio Grande from the junction with the Rio Conchos downstream through Big Bend National Park to Amistad Dam.

Task 4. Develop report. The report will provide recommendations from the RFPG to TWDB detailing benefits to reduction of flood risk associated with providing high pulse flows from the Rio Conchos.

Task 5. Stakeholder coordination.

Estimated Cost for FMS:

Labor Cost		
Task 1 – Revise High Pulse Flow Recommendations for Rio Conchos	$	4,660
Task 2 – Estimate Flood Risk Benefits of Task 1 Recommendations	$	26,300
Task 3 – Estimate Multiple Benefits of Task 1 Recommendations	$	15,740
Task 4 – Define FMPs and FMSs to improve sediment controls on 2 creeks	$	-
Task 4 – Report	$	10,420
Task 5 – Stakeholder Coordination	$	5,420
Total Project Labor	**$**	**63,000**
Travel	**$**	**-**
Total FME cost	**$**	**63,000**

4F-7. Flood Management Strategy ID: 142000007

Name: Study to plan the management of saltcedar growth and debris in channels in/adjacent to City of Pecos

Description: Study to identify and characterize alternatives to manage vegetation in natural drainages in and adjacent to the City of Pecos to increase conveyance and reduce flooding within the City of Pecos.

Affected Jurisdictions: City of Pecos, Reeves County

Discussion on Flood Risk: The growth of saltcedar within the Pecos River has a number of ancillary negative impacts on floodwater conveyance: the saltcedar growth promotes sedimentation that reduces flow area, and the height of the vegetation impinges on flood flows and increases resistance to flow (roughness). This increases riverine flood risk. The sediment accumulation in the river blocks gravity outfalls of stormwater into the river, increasing interior flooding adjacent to the river. The saltcedar growth has also been studied for other impacts, which have been identified in a study of the Rio Grande (US Army Corp of Engineers [USACE], Forgotten Reach of the Rio Grande, Fort Quitman To Presidio, Texas, Section 729, January 2008). Identified impacts of cedar growth include:

> “The consequences of this noxious shrub invasion is increased salinization of soils and water, substantial loss of habitat quality for many faunal species, displacement of native flora, increased surface and groundwater loss due to evapotranspiration losses by saltcedar, and loss of agricultural productivity.”

FMS ID: 142000005 includes the development of alternatives to address saltcedar impacts in the Rio Grande, and includes two tasks (literature review, qualitative comparison of salt cedar controls) that will have overlap to this strategy. Costs for this strategy are reduced assuming FMS ID: 142000005 will be executed prior to this strategy. In addition, FME ID: 141000010 (which models and maps flood hazards in City of Pecos) will be performed prior to FMS ID: 142000007, as this FMS would potentially benefit from knowing the locations of existing flood hazards relative to locations of saltcedar growth.

This strategy will also include a qualitative evaluation of alternatives for cedar control in the vicinity of the City of Pecos, which is the primary population center potentially affected by riverine flooding in the Pecos River basin. The 2007 report proposes a number of alternatives for addressing salt cedar growth in the Rio Grande reach upstream of Presidio. These alternatives (which might be considered for the City of Pecos area) include:

Vegetation Management: large scale land treatment;
Saltcedar Controls: biological control using natural predators, active re-vegetation;
Sediment management: in-channel enhancements to increase sediment transport capacity, and arroyo detention structures;
Channel improvement via river training measures;
Wetland construction;

Water Management and Improved Stream Flows; and
Research.

Current information on these alternatives will be assembled and applied to the relevant waterways for the City of Pecos.

Flood Management Strategy Scope of Work:

Task 1. Literature Review. The science that underlies identifying potential solutions to salt cedar growth is rapidly expanding. The USACE 2007 report reviewed for this FMS provides recommendations for important research on the issue that is likely to have been initiated and partially completed prior to issuance of this RFP. Recent relevant studies on the Pecos River and relevant tributaries from the west (e.g., Cottonwood Creek) will also be reviewed. This task will include coordination between RGCOG, City of Pecos, Reeves County, TXDOT, USACE, and other public stakeholders to identify the most current relevant research. This research will be reviewed and a meeting held with coordination partners to develop 1) a list of priority data gaps to identify alternatives for saltcedar control to be evaluated in Task 4, and 2) a list of the evaluation criteria to be quantitatively applied for each method.

Task 2. Data Collection. Data collection will include:

Assembly of full range of available recent (2000-current) LiDAR for reaches of the Pecos River and tributaries to the Pecos River from the west.
Assembly of best available hydraulic and hydrologic models for relevant reaches (note FME 141000010 will develop updated models for these reaches).
Assembly of historic (2000 – current) imagery suitable for estimating vegetation change by species.

Task 3. Engineering Analyses. This task includes these subtasks:

Risk Analyses for Riverine Floods*.* The existing condition hydraulic models for the Pecos Rover and tributaries from the west will be altered (by removal of vegetation and sediment) such that the goal flood risk criterion is met within boundaries of defined populated areas (cities, census designated place, colonia).

Estimation of Sedimentation/ Vegetation Removal to Meet Goals. The volume of sediment removal and area of vegetation removal needed to achieve the riverine flood capacity goal will be estimated using the above model results.

Estimation of Historic Annual Changes in Vegetation and Sedimentation. Historic LiDAR and aerial imagery in the reaches will be analyzed to quantify changes in channel conveyance volume and areas of major vegetation types within the data record. These changes will be summarized in terms of average and extreme annual changes within the reach within the areas affecting flood stage in the populated areas.

Task 4. Qualitative Comparison of Saltcedar Controls. The alternatives for saltcedar and sediment control identified in Task 1 will be qualitatively evaluated, including the consideration of nature-based solutions for upland restoration of tributaries to the west, utilizing structures such as loose rock dams or gabion baskets. Reasoning underlying selection of qualitative rankings for each criterion will be documented. Data gaps impeding evaluation will be noted, and details will be provided as to data/ research required for evaluation.

Task 5. Report: Future Planning Information. A summary report will be prepared that summarizes Tasks 1-4.

Estimated Cost for FMS:

These costs assume that this strategy will be preceded by FMS 14200005 (development of alternatives to address salt cedar impacts in the Rio Grande) and FME 141000010 (storm water planning for City of Pecos). These two studies will perform tasks relevant to this FMS, reducing the costs for Tasks 1 and 3.

Labor Cost		
Task 1 – Literature Review	$	11,340
Task 2– Data Collection	$	11,520
Task 3 – Engineering Analysis	$	23,440
Task 4 - Qualitative Comparison of Salt Cedar Controls	$	11,780
Task 5 – Report	$	9,780
Task 6 – Project Management	$	5,120
Total Project Labor	**$**	**72,980**
Travel	**$**	**-**
Total FME cost	**$**	**73,000**

4F-8. Flood Management Strategy ID: 142000008

Name: Develop Certification Package for Cibolo Creek Channel and Levee

Description: Perform planning and design required by FEMA for levee accreditation, then complete certification package for Cibolo Creek levee in vicinity of City of Presidio. Package includes O&M Plan.

Affected Jurisdictions: City of Presidio

Description of Flood Risk:

The City of Presidio is protected by a levee owned by the City. The levee was constructed by the U.S. Army Corps of Engineers to meet federal levee standards, but the levee has not been certified under the federal NFIP. Per recent approximate hydraulic modeling performed as part of Regional Flood Plan risk analysis, over 600 structures in the City would be at risk without the levee. This strategy is to develop a FEMA-compliant levee maintenance program for the city that sustains the infrastructure and allows for levee certification. FME ID: 141000002 will precede this FMS, as the FME includes an interior drainage analysis, which is a requirement for levee certification.

Flood Management Strategy Scope of Work:

The reach of levee along Cibolo Creek adjacent to the City of Presidio is not certified the requirements of the NFIP. A certified levee indicates that the levee segment is formally recognized by FEMA as providing flood risk reduction for the 1% annual chance (AC) flood on the applicable FIRMs. To achieve this recognition, the levee systems must meet and continue to meet the minimum design, operation, and maintenance standards per Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR Section 65.10). This regulation specifies select items that need to be submitted and reviewed by FEMA to obtain levee accreditation, including the following:

Documentation that the levee meets design criteria (freeboard, stability, settlement, etc.);
Certified as-built levee plans showing tie-ins;
Officially adopted operation and maintenance (O&M);
Emergency Preparedness Plan (including documentation of flood warning systems, emergency notification flowchart); and
Interior drainage evaluation.

It is assumed that an Emergency Preparedness Plan is currently available for the levee, and that modeling for an interior drainage evaluation will not be needed.

Task 1. Stakeholder Coordination

It is assumed that coordination web/phone meetings will need to occur with stakeholders and sponsoring entities involved.

Task 2. Data Collection

Collect, review, and organize applicable studies and plans necessary for submittal to FEMA for levee certification.

Task 3. Develop an Operations and Maintenance Plan for the Levee.

An Operations and Maintenance (O&M) Plan for the levee will be developed in accordance with USACE and FEMA requirements. This will include:

Meeting with City staff to ascertain and document the existing maintenance program, and to document any known city needs identified as part of the current program;
Assessment of the existing program versus federal requirements;
Meeting with the City to strategize means to meet federal maintenance requirements, if needed; and
Writing the O&M Plan.

Task 4. Prepare Levee Certification Package.

This FMS will prepare an individual certification package and summary report, including all associated attachments, for the Cibol Creek levee segment adjacent to the City of Presidio for FEMA submission. The package will include all elements required by 44 CFR Section 65.10 and described in FEMA guidance, *Meeting the Criteria for Accrediting Levee Systems on Flood Insurance Rate Maps* (FEMA Fact Sheet May 2021). The text of the report will reference other studies/data as necessary to show compliance with 44 CFR Section 65.10. Preparation of each package does not include performing the detailed studies required for certification, but rather aggregation, review, and summary/presentation of the certification material. Sections and/or items to be included in the package and report include the following:

Purpose of Certification package and background;
Certification Statement (to be signed by levee owner/sponsor);
Regulation Compliance;
As-Built Plans and Freeboard Check;
Natural Valley Analysis;
Levee System Check (Roadway crossings, structure crossings, upstream and downstream tie-in locations);
Interior Drainage Analysis (to be performed as part of FME ID: 141000002);
Geotechnical report of the levee assessing embankment and foundation stability, seepage, and settlement;
Embankment Protection, including vegetation and cover assessment and analysis of shear stress;

Closure Structure Data;
O&M Plan;
Emergency Preparedness Plan;
Inspection reports; and
Statement of compliance with all local, state, and federal laws.

The project is divided into the major tasks below.

Task 1 – Stakeholder Coordination;
Task 2 – Meetings;
Task 3 – Data Collection; and
Task 4 – Levee Certification Package. Estimated costs for this task derive from recent experience in El Paso County with development of a certification package for a segment of the Rio Grande levee.

Estimated Cost for FMS:

Labor Cost		
Task 1 – Stakeholder Coordination	$	6,700
Task 2 – Data Collection	$	10,220
Task 3– Develop O&M Plan	$	7,020
Task 4 – Levee Certification Package Preparation	$	55,260
Total Project Labor	**$**	**79,200**
Travel	**$**	**-**
Total FME cost	**$**	**79,000**

4F-9. Flood Management Strategy ID: 142000009

Name: Regulatory Review of Off-Road Traffic on State Lands.

Description: Coordination should take place between EPCWID No. 1, El Paso County, and State land owners to discuss enforcement of restrictions associated with off-road motor vehicles on undeveloped land.

Affected Jurisdictions: El Paso County

Description of Strategy

State Lands in El Paso County (EPC) have annual damages to their arid watersheds due to trespassing off-road motor vehicles. These all-terrain vehicles (ATVs) cause extensive damage to the fragile surficial ecosystem, notably through destruction of native vegetation and creation of surficial trails with exposed alluvial soils. These destruction compounds during flood events, when gullying leads to large volumes of sediment deposition at roads and drainage structures, exacerbating flood-related infrastructure damages.

Flood Management Strategy Scope of Work:

This FMS has the goal of developing data and alternative courses of action for assessing and reducing illegal ATV-induced damage to State Lands within EPC.

The SOW for this FMS is includes five tasks.

Task 1. Assessment of existing damages. This assessment will include:

Review of relevant records of stewards of State Lands within EPC and statewide.
Interviews with relevant staff within oversight agencies.
Identification via the above of priority areas to address.
GIS analysis following data collection and interviews to quantify rate of watershed damages within the priority areas. Historic high resolution images will be compared using images spanning over a decade to estimate rate of area disturbance. High density historic LIDAR data will be analyzed to estimate gully expansion within portions of priority areas, where data availability permits.

Task 2. Stakeholder meetings. Two meetings will be held with EPC public stakeholders impacted by increased sediment loads from Task 1 priority watersheds.

Meeting 1: Presentation of Task 1 results, definition of issue and workshop to develop potential alternatives and evaluation factors for alternative selection.
Meeting 2: Discussion of results of alternatives analyses and alternative(s) selection.

Task 3. Alternatives analyses. Qualitative estimates of alternative impacts on illegal ATV use per evaluation factors developed in Meeting 1.

Task 4. Public Education Program. A public education program will be developed that presents information developed in Tasks 1-3. Two public meetings will be held.

Task 5. Develop report. The report will include documentation of Tasks 1-4. Alternatives will be presented with actions defined per TWDB guidance as FMEs, FMSs, or as legislative/ administrative changes per Task 8 of the RFP.

Task 6. Stakeholder Coordination.

Estimated Cost for FMS:

Labor Cost		
Task 1 – Assessment of existing damages	$	25,980
Task 2– Stakeholder Meetings	$	18,340
Task 3 – Alternatives Analyses	$	15,800
Task 4 - Public Education Program	$	12,500
Task 5 – Report	$	12,540
Task 6 – Stakeholder Coordination	$	8,400
Total Project Labor	**$**	**93,560**
Travel	**$**	**500**
Public meeting materials cost	**$**	**5,000**
Total FME cost	**$**	**99,000**

4F-10. Flood Management Strategy ID: 142000010

Name: Regulatory Review of Impervious Cover on New Development in El Paso County.

Description: Coordination should take place between EPCWID No. 1, El Paso County, and Texas GLO land owners to discuss revisions to development regulations associated with detention and impervious cover.

Affected Jurisdictions: El Paso County

Discussion on Flood Risk: There has been significant population, public infrastructure, and private infrastructure growth in El Paso County over the past two decades. There have been two historically extreme major floods (August 2006 and August 2021) during that period, each with extensive transportation disruptions and property damage. This experience demonstrates a need for review of existing local (city, county, water district) regulatory restrictions and design guidance associated with addition of impervious cover and associated design of detention/ retention basins.

Flood Management Strategy Scope of Work:

This FMS has the goal of facilitating the developing of revisions to existing regulatory restrictions and design guidance associated with addition of impervious cover and associated design of detention/ retention basins.

The SOW for this FMS is includes five tasks.

Task 1. Data collection. Recent construction costs will be reviewed and tabulated to provide a current basis for FMS alternatives cost estimates.

Task 2. Workshop to review existing regulatory restrictions and design guidance. The workshop will review and discuss current restrictions and guidance cited by City of El Paso (COEP), El Paso County (EPC), and El Paso County WID1 (EPCWID1). Attendees will include both public agencies (COEP, EPC, and EPCWID1) and representatives of the development community. Alternatives for the current restrictions and guidance will be discussed and selected for further evaluation. Costs per Task 1 will be reviewed. Potential impacts of each alternative to land development feasibility, developer infrastructure costs, and city/ county maintenance costs will be tabulated. Impacts that can be quantified in terms of maintenance cost reduction, flood damage reduction, critical route access, and associated developer cost will be identified for study in Task 2.

Task 3. Alternatives analyses. Study on alternatives impacts will be performed per workshop consensus.

Task 4. Public Meeting. A public meeting will be held, using info derived from Tasks 1-2

Task 5. Develop report. The report will include documentation of Tasks 1-4. Alternatives will be presented with actions defined per TWDB guidance as FMEs, FMSs, or as legislative/ administrative changes per Task 8 of the RFP. Impacts per Task 3 for each alternative will be presented. No selection of alternatives will be performed within the report.

Task 6. Stakeholder Coordination.

Estimated Cost for FMS:

Labor Cost		
Task 1 – Data collection	$	9,820
Task 2– Workshop to review existing regulatory restrictions and design guidance	$	18,340
Task 3 – Alternatives Analyses	$	11,660
Task 4 - Public Meeting	$	8,260
Task 5 – Report	$	8,740
Task 6 – Stakeholder Coordination	$	5,420
Total Project Labor	**$**	**62,240**
Travel	**$**	**500**
Public meeting materials cost	**$**	**1,500**
Total FME cost	**$**	**64,000**

4F-11. Flood Management Strategy ID: 142000013

Name: Staff augmentation support or funding for at risk communities to join and/or enforce the NFIP

Description: Prioritize and provide staff augmentation support or funding for at risk communities not currently participating in the NFIP or communities with limited resources to enforce the NFIP. Aid communities in implementing recommended minimum standards.

Affected Jurisdictions: Presidio County, Hudspeth County, Reeves County, Andrews County, Edwards County, Pecos County, Winkler County, City of Alpine, City of Sonora, City of Barstow, City of Kermit, City of Rankin, City of Thorntonville, Town of Valentine, City of Wickett, City of Wink

Discussion on Flood Risk: During several meetings of the RFPG, and during the June 16, 2022 RFPG Subcommittee 4 meeting (with Presidio County, Hudspeth County, Reeves County, City of Alpine and City of Sonora in attendance), jurisdictions within the large sparsely populated Flood Planning Area outside of El Paso County expressed a common major issue: lack of resources. This lack of ability to hire and fund qualified staff is a primary reason for the lack of focus on local floodplain management, flood mitigation planning, and implementation of flood mitigation measures. Specific shortfalls in these areas include:

For floodplain management: lack of qualified staff/ training for administration of the National Flood Insurance Program (NFIP), lack of funding for badly needed new floodplain maps, lack of training of staff in development and technical oversight of local drainage design criteria for new development, lack of resource for education of local populace in importance of floodplain management.
For flood mitigation planning: lack of funding for strategic growth plan essential for planning future drainage infrastructure, lack of training of staff in FEMA disaster programs (e.g., post-disaster Public Assistance), lack of funding for storm water master planning, lack of resources for education of local populace in importance of storm water master planning.
For flood mitigation implementation: lack of training in USACE Section 404 permitting of channel maintenance, lack of training in selection of grant opportunities across the full spectrum of available grants, lack of technical support for the associated grant application data requirements and processes, lack of resources for education of local populace in importance of implementation of priority flood mitigation actions.

One consensus partial solution to the above issues is to establish a Flood Planning Region-wide staff resource that the small population jurisdictions can access as needed. This strategy develops such a solution.

Flood Management Strategy Scope of Work:

This FMS has the goal of establishing a Flood Planning Region-wide staff resource that the small population jurisdictions can access as needed to address wide-ranging needs associated with flood mitigation. The RFPG will request that this part time position be funded out of the TWDB regional allocation for state-sponsored flood mitigation planning.

The SOW for this FMS includes two tasks.

Task 1. Definition of a part-time position at the Rio Grande Council of Governments to support small population jurisdictions as needed to improve floodplain management, flood mitigation planning, and flood mitigation implementation within the full Upper Rio Grande Flood Planning Region. This position definition will include:

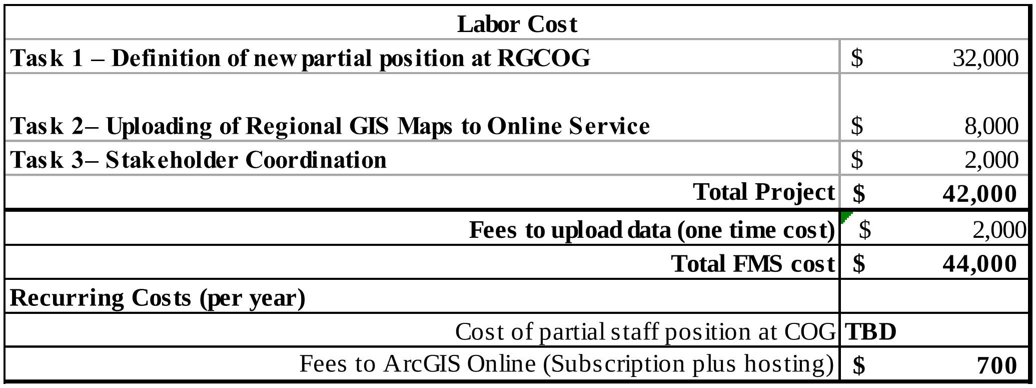
Requirements for education and experience. This position is not expected to have an engineering education, but will be expected to have GIS skills.
Required training to be undertaken once hired, to include training costs (estimated for this FMS as $30,000)
A list of support activities (derived from the strategy definition above) to be provided
An estimate of hours per year and cost per year required for providing support.

Task 2. Preparation of Regional Interactive GIS Maps. This task will include loading selected GIS layers from the Regional Flood Plan into ArcGIS Online to be available for use as needed by regional jurisdictions. The part time staff that is the focus of Task 1 will be available to aid local jurisdictions with use of these GIS layers.

Existing Flood Hazard
Existing Flood Hazard Gaps
Existing Flood Exposure/Vulnerability
Future Flood Hazard
Future Flood Hazard Gaps
Future Flood Exposure/Vulnerability
Availability of H&H Models

Task 3. Stakeholder Coordination

Estimated Cost for FMS:



Labor Cost	
Task 1 – Definition of new partial position at RGCOG	$ 32,000
Task 2– Uploading of Regional GIS Maps to Online Service	$ 8,000
Task 3– Stakeholder Coordination	$ 2,000
Total Project	**$ 42,000**
Fees to upload data (one time cost)	$ 2,000
Total FMS cost	**$ 44,000**
Recurring Costs (per year)	
Cost of partial staff position at COG	**TBD**
Fees to ArcGIS Online (Subscription plus hosting)	**$ 700**

4F-12. Flood Management Strategy ID: 142000014

Name: Develop new flood gages throughout the region.

Description: Prioritize, fund, and develop new flood gages (rainfall and/or stream gages) throughout the region to support flood warning system improvements and improve ability to validate or calibrate existing and new flood models

Affected Jurisdictions: All of Region 14

Discussion on Flood Risk: Across Flood Planning Region 14 there is a growing need for flood gages that can improve real-time flood alert systems or enhance existing or future flood forecast models. This strategy proposes installing 12 flood gages by using a prioritization process for identifying optimal gage locations, and the development of a simple flood alert system for notifying key emergency personnel. This SOW provides a tailored approach for the Upper Rio Grande Basin, with key aspects that have been used previously for enhancing flood forecast capabilities by the Texas Water Development Board (TWDB) and TxDOT.

Flood Management Strategy Scope of Work:

The preliminary SOW for this project is summarized in five general tasks described below.

Task 1 – Stakeholder Engagement. One in person and up to three virtual meetings with key project stakeholders, such as the flood planning group, will be held throughout the project process to describe the proposed site location prioritization process, solicit feedback on preliminary gage locations, and flood alert or forecasting needs. Stakeholder understanding and contribution will ensure the project's goals are being fully represented and achieved.

Meetings will also be used to better understand long-term objectives for these gage data, such as integrated real-time flood forecasting capabilities or more simplified and easier to maintain flood alert systems. Stakeholder meetings will present opportunities to review and refine the preliminary scope, which will allow the project team to integrate stakeholder knowledge and input across the entire life of the project.

Task 2 – Data Collection and Prioritization. With 10-12 new streamgages being proposed for installation, a framework is necessary to identify and prioritize locations across the flood planning region that will best enhance existing flood warning systems or at locations that have the greatest overall need for flood alerts or forecasting. A site selection process such as the analytic hierarchy process (AHP) is proposed herein, and will provide an objective and defensible process for ranking and recommending streamgage locations. Since its introduction in the 1980s by Saaty, AHP has been applied in a wide variety of settings to model complex decisions and excels at quantitatively ranking decision alternatives, including geospatially.

In 2016 AHP was used in a Texas Water Development Board (TWDB) study, which identified communities with the most pressing need for streamgages for improved flood forecasting services. The TWDB study worked closely with the NWS and USGS in identifying new streamgage locations and increasing the forecasting accuracy of the NWS Advanced Hydrologic Prediction Service (AHPS). As part of an ongoing TxDOT Project, AHP was utilized to rank 60 new streamgage locations based on vulnerable bridges susceptible to overtopping and sustaining flood and economic damages.

Applicable datasets will be identified and integrated in the AHP for ranking streamgage locations. Each dataset would have a weight, or ranking, compared to other utilized datasets, allowing the project team to decide which data are the most important factors. While dataset are anticipated to be reviewed and selected during the project and through careful consultation with stakeholders, some example datasets that could be utilized are as follows:

Flood fatalities: regions with increased fatalities due to flooding, such as vehicle related
Bridge/Roadway flooding: bridges that have been closed due to flooding or flood damage.
National Flood Insurance Program claim payment data: regions with high levels of flood claim payments, such as high repetitive losses or frequency of flooding.
Recent Fathom Floodplain mapping data: these recently completed data products provide a detailed floodplain map and water level depths in areas previously unrepresented in traditional FEMA maps.
Terrain Slope: regions with higher slope have the potential for increased flash flood risk.
EPA's Environmental Justice Map Data: identify regions with populations more vulnerable to flooding risks and flood impacts.

Task 3 – Site Investigation and Gage Equipment Review. Once a final ranking of gage locations are provided, a further site review to assess the feasibility of a streamgage installation and operation will be conducted. Virtual visits using aerial photography, or even street view photos, will be used to conduct a preliminary site review and reduce the need for physical visits. Many streamgage locations initially ranked through the prioritization process may not be practically feasible due to a number of reasons, including inaccessible location, or other installation or operation and maintenance limitations.

With a large number of gage locations anticipated to be identified at low water crossings or even culverts, a variety of water level monitoring technology will need to be considered. Beyond the traditional streamgage, which uses a pressure transducer to measure water levels, other approaches that will be considered include radar or doppler technology.

Another important component of a gage is its ability to transmit collected data for integration into a flood alert system or forecast model. Data transmission should occur in real-time and can utilize cell, VHF radio, or satellite technology. A variety of options and considerations, such as ongoing operational and maintenance needs, can be discussed during the stakeholder engagement process of this project.

Task 4 – Streamgage Equipment and Installation. Once feasible gage sites and a streamgage type have been identified, gage installation can occur. In addition to necessary equipment, installation will require permitting and approval from the appropriate governing authorities.

Task 5 – Flood Alert System. Flood gages transmitting data will require data storage and management, and to use these data to implement an alert system to notify key emergency personnel when flooding is occurring or water levels have reached a critical level. These systems can range from relatively simple emails, website notifications and visual interfaces, to more complicated system-wide forecasting approaches. Some equipment suppliers offer integrated alert systems and software with associated annual usage fees. For this proposal a simple flood alert system is budgeted, which aims to reduce annual software fees.

Task 6 – Stakeholder Coordination and Reporting. A project manager will oversee the project. A report will also be written, summarizing the project's methodology, site prioritization process, installed and implemented streamgages, the data management system, and any implemented alert system. A staff training on system operations and maintenance, along with an operations manual, will ensure project continuity and long-term success.

Estimated Cost for FMS:

The total estimated fixed project cost for this FMS is $240,000, with a task and equipment cost breakdown provided below. Annual operation and maintenance costs are estimated at $7,000. Alternative flood alert system proprietary software costs can also be explored but will likely cost more than estimated in the second cost stable shown below.

Estimate of Fixed Strategy Costs

Task	Labor Cost	Travel Costs	Equipment Cost	Estimate of Total Cost	Notes
Task 1 - Stakeholder Engagement	$ 5,165	$ 690		$ 5,855	Three stakeholder meetings, 1 in-person in El Paso, 2 virtual
Task 2 - Data Collection and Prioritization	$ 8,100			$ 8,100	
Task 3 - Site Investigation and Gage Equipment Review	$ 11,200	$1,997		$ 13,197	
Task 4 - Streamgage Equipment and Installation	$ 24,640	$5,434	$ 168,000	$ 198,074	Equipment estimated at $14,000 per gage site
Task 5 - Real-time Monitoring and Alert System	$ 10,125			$ 10,125	Simple flood alert notification system developed by Aqua Strategies
Task 6 - Stakeholder Coordination and Reporting	$ 4,600			$ 4,600	
Total	**$ 63,830**	**$8,121**	**$ 168,000**	**$ 240,000**	

Estimate of Recurring Annual Strategy Costs

Annual O&M Costs	Labor Cost	Travel Costs	Annual O&M Total Cost Estimate
Annual site/maintenance visit for 1 staff	$ 3,240	$ 2,477	$ 5,717
Simple Flood Alert Notification/System Maintenance	$ 980		$ 980
Total Recurring Costs (Annually)	**$ 4,220**	**$ 2,477**	**$ 7,000**

4F-13. Flood Management Strategy ID: 142000015

Name: Develop and design standard options for addressing identified development-related flooding in El Paso.

Description: Evaluate COEP and EPC drainage design standards for inlets, curb cuts, requirements for on-site storage in new developments, addressing as-built elevations, protecting remaining on-site storage and recovering original storage for existing developments.

Affected Jurisdictions: El Paso County

Discussion on Flood Risk: There has been significant population, public infrastructure, and private infrastructure growth in El Paso County over the past two decades. There have been two historically extreme major floods (August 2006 and August 2021) during that period, each with extensive transportation disruptions and property damage. Local agency experience in two events were discussed in an URGFPG meeting in November, 2021. This expressed experience identified a need for review of existing local (city, county, water district) design requirements for specific types of drainage structures. These structures include 1) storm drain system inlets across the El Paso County environment. Issues include a) inlet capacity on steep slopes, b) addressing risk of sediment blockage, and c) addressing discharge into irrigation drains. Other structures for technical design requirement review include 2) curb cuts into off-channel detention and 3) on-site detention for individual residential structures.

Flood Management Strategy Scope of Work:

This FMS involves coordination between El Paso Water, El Paso County, and EPCWID1 with the goal of facilitating the developing of revisions to existing design guidance for storm drain inlets, curb cuts, and on-site detention.

The SOW for this FMS is includes five tasks.

Task 1. Reference review. Current design guidance will be reviewed versus current technical studies associated with inlets on steep slopes, protection of inlets from sediment blockage, discharge from developments into existing flood channels, rating curves (flow versus depth) of curb cuts, and effectiveness of on-site detention. Interviews will also be held with City of El Paso, El Paso County, and El Paso County Water Improvement District No 1 to document agency history with current design standards addressing these issues.

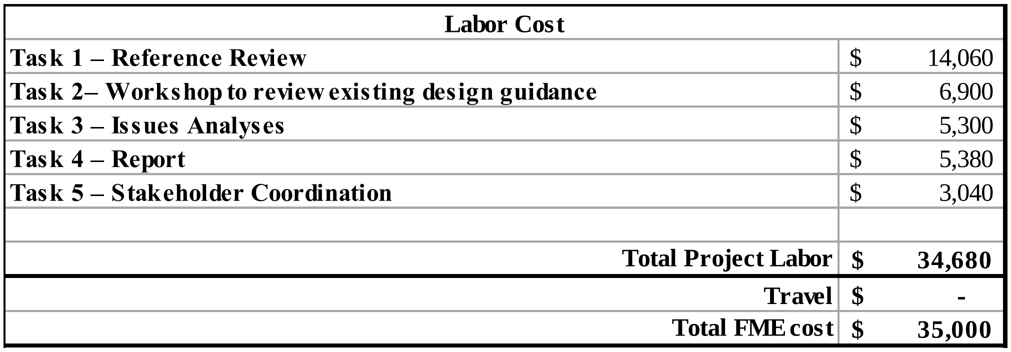
Task 2. Workshop to review existing design guidance. The workshop will review and discuss current design guidance issued by City of El Paso (COEP), El Paso County (EPC), and El Paso County WID1 (EPCWID1) for the above issues. Attendees will include both public agencies (COEP, EPC, and EPCWID1) and representatives of the development community. Technical recommendations will be presented for improvement of the existing design guidance, with associated technical justification. Issues to address via further technical study will be identified.

Task 3: Issues analyses. Study of outstanding issues will be performed per workshop consensus.

Task 4. Develop report. The report will include documentation of Tasks 1-3. Technical recommendations for revised design standards will be provided for each of the issues associated with this FMS.

Task 5. Stakeholder Coordination.

Estimated Cost for FMS:



Labor Cost		
Task 1 – Reference Review	$	14,060
Task 2– Workshop to review existing design guidance	$	6,900
Task 3 – Issues Analyses	$	5,300
Task 4 – Report	$	5,380
Task 5 – Stakeholder Coordination	$	3,040
Total Project Labor	**$**	**34,680**
Travel	**$**	**-**
Total FME cost	**$**	**35,000**

4F-14. Flood Management Strategy ID: 142000016

Name: Develop regional solutions to address erosion issues in natural channels affecting stormwater conveyance.

Description: Develop consensus region-specific erosion-resistant designs to prevent removal of material from drainage conveyances, with functional comparisons to aid selection of best practices.

Affected Jurisdictions: All of Region 14

Discussion on Flood Risk: In the arid URGFPR, unlined, broad natural channels (e.g., arroyos) convey a significant portion of the flood waters that impact structures (buildings, roads) in the region. Arroyos potentially also convey a high volume of sediment/ debris during floods which can greatly add to the damage of these structures. The sediment deposition leads to high post-flood maintenance/ clean-up costs that can be a significant financial burden on regional cities and counties. This Regional Flood Plan has a Flood Management Evaluation (FME ID: 141000015) that estimates sediment loadings from floods in selected arroyos in El Paso County, and presents a refined method to estimate relative production of sediment in arroyos throughout the region. This FMS follows that FME and is focused on 1) developing structural and non-structural solutions to reduce sediment loadings from arroyos (using an arroyo identified in FME 141000015 as an example), and 2) generalizing the strategies and technical methods suggested for this arroyo for application throughout the region. This strategy is focused on arroyos in general within the region. FME 141000015 is focused more specifically on arroyo-related issues in the El Paso area.

The solutions to be developed as part of this FMS are expected to incorporate the recent experience of the Rio Grande Joint Venture (RGJV). At Alamito Creek Preserve, Rio Grande Joint Venture has installed a dozen loose rock structures and road aprons along with high density large woody debris structures. In Cienega Creek, brush-weir structures at Las Cienegas were installed. The RGJV plans to install Beaver Dam Analogs adjacent to the other structures and scale up these types of streamflow harvesting and groundwater recharge techniques.

Flood Management Strategy Scope of Work:

This FMS has the goal of developing regional solutions to address erosion issues in natural channels affecting stormwater conveyance. These solutions will be designed to meet state-wide and RFPG stated goals to serve multiple purposes: reduce erosion, preserve/ enhance the natural environment, promote water conservation, etc.

The SOW for this FMS includes five tasks.

Task 1. Reference review. Current publicly available design guidance issued/ in use by regional (Texas and New Mexico) natural resource management agencies for erosion mitigation will be collected and reviewed. Each potential erosion mitigation action (and its associated design) will be classified as to relevance for application to the conditions present in the URGRFPA.

Where feasible, watersheds where relevant practices have been employed will be investigated to ascertain relative success in serving the defined RFPG multiple goals.

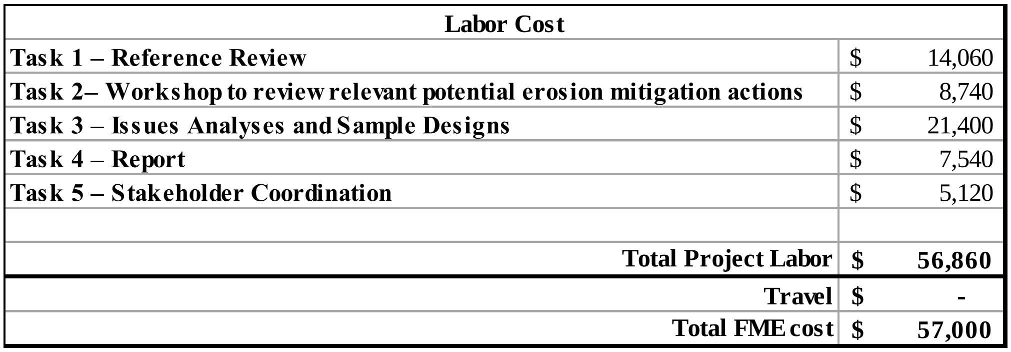
Task 2. Workshop to review relevant potential erosion mitigation actions. The workshop will review and discuss potential erosion mitigation actions deemed relevant for consideration in the URGRFPA. Invitees to the workshop will be determined by the RFPG. Alternative actions presented will include qualitative technical evaluations as to 1) limitation on applicability within the region, 2) relative benefits in meeting each of the multiple goals, 3) costs of implementation, and 4) costs of maintaining benefits. Issues to address via further technical study for each potential action will be identified. A regional arroyo will be chosen for development of example designs.

Task 3: Issues analyses and sample designs. Study of outstanding issues will be performed per workshop consensus. Develop example designs for a selected regional arroyo.

Task 4. Develop report. The report will include documentation of Tasks 1-3. Technical recommendations for design standards will be provided for each of the potential mitigation actions identified with this FMS. Individual action design guidance will generally consist of 1) appropriate site conditions for action application, 2) a reference to existing design guidance (available for download from a public source),3) a list of the issues identified in Task 2 and their resolution via Task 3, and 4) a qualitative relative cost.

Task 5. Stakeholder Coordination.

Estimated Cost for FMS:



Labor Cost		
Task 1 – Reference Review	$	14,060
Task 2– Workshop to review relevant potential erosion mitigation actions	$	8,740
Task 3 – Issues Analyses and Sample Designs	$	21,400
Task 4 – Report	$	7,540
Task 5 – Stakeholder Coordination	$	5,120
Total Project Labor	**$**	**56,860**
Travel	**$**	**-**
Total FME cost	**$**	**57,000**

4F-15. Flood Management Strategy ID: 142000017

Name: Develop solutions to address city/county stormwater conveyance into the Rio Grande (El Paso County).

Description: Refine agency action coordination in conveyance of interior flooding to the Rio Grande. Develop FMP designs and costs for improvements of conveyance from river terrace storm water infrastructure, considering high ground water.

Affected Jurisdictions: City of El Paso, El Paso County

Discussion on Flood Risk: The City and County of El Paso have 79 outfalls of storm water into the Rio Grande, identified and tabulated in the Interior Drainage Study performed as part of the Rio Grande levee certification process. Ten of these outfalls are associated with pump stations, the remainder drain via gravity into the river. Because of the extreme flat slopes of the river terrace adjacent to the river, when these outfalls fail to properly function (due to blockage or partial blockage by river sedimentation) there can be extensive localized flooding occurring until the flows can be conveyed into the river (by opening the planned outlet, or conveyance to the next outlet). A study recommended by the RFPG, FME ID: 14000018 identifies site for new outfalls and prioritizes existing outfalls for consideration for improvement. This FMS provides concept level designs and costs to install new outfall(s) and improve the existing priority outfalls. In addition, non-structural measures (e.g., improved interagency coordination, early warning planning) will be developed to improve stormwater conveyance into the Rio Grande as part of this FMS.

Flood Management Strategy Scope of Work:

This FMS has the goal of developing structural and non-structural solutions for improvement of conveyance of stormwater into the Rio Grande in El Paso County. This FMS is necessarily preceded by an evaluation of the existing system per the SOW presented in FME 14000018.

The SOW for this FMS includes five tasks.

Task 1. Alternatives Development. For each priority outfall (assumed 5), an alternative will be developed to prevent localized flood damage due to the 1% AC flood, for each of these scenarios

Rio Grande at normal operational stage;
Rio Grande at intermediate flood stage (to be determined by the RFPG); and
Rio Grande at 2% AC flood sage (or alternate level to be determined by the RFPG).

Solutions may include conduit upsizing, addition of a new pump/ expanded pump capacity, addition of detention. Rough order of magnitude coasts will be developed for each outfall and scenario.

Non-structural solutions to be developed will include potential actions to improve system operation/ interagency coordination; and actions to improve early warning, if needed.

Task 2. Workshop to review initial alternatives. The workshop will review and discuss the conceptual designs developed as part of Task 1. The goals of the workshop will be to:

For each outfall addressed:
  - Select a scenario to use as a design criteria
  - Identify potential improvements for the design for the selected scenario
  - Identify issues to address in conversion to a FMP

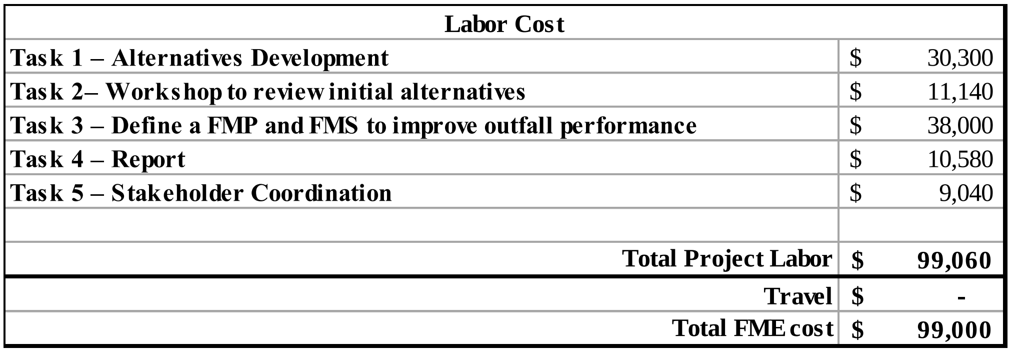
Review scopes of work (SOWs) for non-structural improvements and:
  - Edit per workshop consensus

Task 3: Define a FMP and FMS to improve outfall performance. The concept designs selected for each priority outfall will be refined and aggregated as two FMPs (one for the aggregate City outfalls, one for the aggregate county outfalls). FMPs will conform to TWDB guidance. The SOWs for non-structural solutions will be combined into a single FMS. Agencies expected to be involved in the proposed development of interagency flood and emergency planning concerning Rio Grande discharges will review this FMS. A meeting will be held to achieve consensus on the SOW among planning participants.

Task 4. Develop report. The report will include documentation of Tasks 1-3.

Task 5. Stakeholder Coordination.

Estimated Cost for FMS:



Labor Cost		
Task 1 – Alternatives Development	$	30,300
Task 2– Workshop to review initial alternatives	$	11,140
Task 3 – Define a FMP and FMS to improve outfall performance	$	38,000
Task 4 – Report	$	10,580
Task 5 – Stakeholder Coordination	$	9,040
Total Project Labor	**$**	**99,060**
Travel	**$**	**-**
Total FME cost	**$**	**99,000**

4F-16. Flood Management Strategy ID: 142000019

Name: Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area.

Description: Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area.

Affected Jurisdictions: El Paso County

Discussion on Flood Risk: Historically, river water has been conveyed from the Rio Grande (via diversion at American Dam) via canals into the riverine terrace adjacent to the Rio Grande. These canals are necessarily at an elevation above the agricultural fields. Farmers divert water via gravity flow from the canals into their fields. The flow from the fields is collected in drains (e.g., Mesa Drain), conveyed to wasteways where the water is eventually discharged back into the Rio Grande. These linear structures (canals, drains, wasteways) are operated and maintained by EPCWID1. The Playa Drain, maintained by COEP is an exception. These structures necessarily interact with stormwater and divert and concentrate stormwater into the same wasteways. The historic agricultural operations have been progressively replaced within El Paso County by urban area, and in some areas of the city and county the agricultural drain system is the primary conveyor of urban stormwater. The purpose of this strategy is to enhance the existing active cooperation between EPCWID1, El Paso Water, and El Paso County by developing a storm water-focused report for the canal/ drain/ wasteway system developed jointly by the three entities (and other Regional Flood Plan-defined stakeholders). The report will provide recommendations addressing identified needs for multi-agency administrative and regulatory action for improved storm water conveyance. Identifications of FMPs for system improvements are addressed by FME 141000004 (Mesa Drain improvements) and FME 141000019 (Montoya Drain Improvements) and are not addressed by this FMS.

Flood Management Strategy Scope of Work:

This FMS will identify relevant issues involving administrative (e.g., development permitting) and regulatory actions associated with stormwater conveyance into the Rio Grande via the drains and wasteways operated and maintained by EPCWID1 and COEP. Recommendations will be developed to address those issues.

The SOW for this FMS is includes five tasks.

Task 1. Data Collection. A map will be developed using existing models and agency datasets displaying: 1) city and county jurisdictional boundaries, 2) system elements: canals, drains, wasteways, 3) watershed areas tributary to historic agricultural drains, 4) locations of permitted storm water connections into drains, 5) system gates/ controls, and 6) crossings/ siphons under canals. This map will be prepared in such a way that stakeholders can annotate the map with issues as appropriate. The map will be provided to the sponsors prior to the kickoff meeting.

Task 2. Project scoping and Kickoff Meeting. The sponsors (EPCWID1, EPW, and EPC) will invite other stakeholders representing multipurpose issues (environment, water supply) as appropriate. This kickoff meeting will be a workshop where issues associated with the use of the irrigation system for stormwater conveyance are identified and physically located (if appropriate) on the map developed in Task 1. The deliverable from the meeting will be a list of action items for meeting participants (sponsors, stakeholders, technical consultants). These action items are to be addressed prior to Task 4.

Task 3: Issues analyses. Action items to be performed by the project technical consultant will be performed.

Task 4. Workshop to Define/Address Future Action. A second workshop will be held where sponsors, stakeholders and the technical consultant present their resolution of the action items raised in Task 2. Issues associated with action items will be defined as resolved or deferred for future action. The final deliverable for the FMS will be a summary of the issues, action items, and resolution from this workshop.

Task 5. Stakeholder Coordination.

Estimated Cost for FMS:

Labor Cost		
Task 1 – Data Collection	$	4,860
Task 2– Kickoff meeting	$	2,850
Task 3 – Issues Analyses	$	6,460
Task 4 –Workshop to Address Future Action	$	4,530
Task 5 – Stakeholder Coordination	$	1,890
Total Project Labor	**$**	**20,590**
Travel	**$**	**-**
Total FME cost	**$**	**21,000**

4F-17. Flood Management Strategy IDs: 142000020

Name: Develop and Improve Early Warning System (EWS) for El Paso City/ County interior drainage

Description: Conduct study to evaluate and proposed improvements to Early Warning Systems (EWSs) for interior drainage in El Paso City and El Paso County. Includes assessment of existing flood EWS.

Affected Jurisdictions: City of El Paso, El Paso County

Discussion on Flood Risk: While the City of El Paso has an existing flood warning system in place for both the Rio Grande and interior flooding, there are varying warning times that can be provided from meteorologists associated with providing those warnings. This strategy aims to improve the existing Early Warning System in the City of El Paso County and El Paso County.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes two options (specified as Level 1 and Level 2 in the proposal) with varying fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services, installation, and training were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following two cost tables.

Total FMS Cost - Level 1 Option		
Subtotal 1.1 – Vieux/aem Construction/Equipment Cost (July. 2022)	$	17,389
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	$	15,000
RFP Total Construction/Equipment Cost (Sept. 2020)	**$**	**15,000**
Subtotal 1.3 – Vieux/aem Services/Installation Cost (July 2022)	$	107,420
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	$	94,906
RFP Total Non-Construction Cost (September 2020, using CPI)	**$**	**95,000**
Total Fixed FMS Cost	**$**	**110,000**
Total Recurring FMS Cost (Annually)	**$**	**30,000**

Total FMS Cost - Level 2 Option	
Subtotal 2.1 – Vieux/aem Construction/Equipment Cost (July. 2022)	$ 5,000
Subtotal 2.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	$ 4,000
RFP Total Construction/Equipment Cost (Sept. 2020)	**$ 4,000**
Subtotal 2.3 – Vieux/aem Services/Installation Cost (July 2022)	$ -
Subtotal 2.4 - RFP Services/Installation Cost (September 2020, using CPI)	$ -
RFP Total Non-Construction Cost (September 2020, using CPI)	**$ -**
Total Fixed FMS Cost	**$ 4,000**
Total Recurring FMS Cost (Annually)	**$ 108,000**

4F-18. Flood Management Strategy IDs: 142000021

Name: Develop and Improve Early Warning System for City of Pecos

Description: Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Pecos and adjacent Lindsay Census Designated Place (CDP). Includes assessment of existing flood EWS.

Affected Jurisdictions: City of Pecos, Lindsay CDP, Reeves County

Discussion on Flood Risk: The City of Pecos incorporated area is located adjacent and to the north of Lindsay CDP, in Reeves County. For the 1% AC flood, per mapping performed for the Regional Flood Plan, the floodplain potentially causes damage to over 1,900 structures and restricts travel. Extent of 1% AC flood risk is depicted in Map 15, Map 3 of 31. This strategy aims to develop an Early Warning System for the City of Pecos and improve Reeves County Emergency Management warning times for road closures and evacuations.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes both fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services and installation were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following cost table.

Total FMS Cost		
Subtotal 1.1 – Vieux/aem Construction/Equipment Cost (July. 2022)	$	1,060
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	$	926
RFP Total Construction/Equipment Cost (Sept. 2020)	**$**	**1,000**
Subtotal 1.3 – Vieux/aem Services/Installation Cost (July 2022)	$	41,580
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	$	36,736
RFP Total Non-Construction Cost (September 2020, using CPI)	**$**	**37,000**
Total Fixed FMS Cost	**$**	**38,000**
Total Recurring FMS Cost (Annually)	**$**	**12,000**

4F-19. Flood Management Strategy IDs: 142000022

Name: Develop and Improve Early Warning System for City of Alpine

Description: Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Alpine. Includes assessment of existing flood EWS.

Affected Jurisdictions: City of Alpine, Brewster County

Discussion on Flood Risk: The City of Alpine is an incorporated area in Brewster County. Three named creeks traverse the City of Alpine: Paisano Creek and Alpine Creek (combined watershed of 56.2 sq mi) and Moss Creek (watershed of 29.5 sq mi). Per modeling performed as part of Task 2 of the Regional Flood Plan, over 1,600 structures within the city are estimated to be potentially impacted during the 1% Annual Chance (100-year) flood. Map 15, Map 4 of 31 depicts this risk. This strategy aims to develop an Early Warning System for the City of Alpine and improve Brewster County Emergency Management warning times for road closures and evacuations.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes both fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services and installation were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following cost table.

Total FMS Cost		
Subtotal 1.1 – Vieux/aem Construction/Equipment Cost (July. 2022)	$	1,060
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	$	926
RFP Total Construction/Equipment Cost (Sept. 2020)	**$**	**1,000**
Subtotal 1.3 – Vieux/aem Services/Installation Cost (July 2022)	$	41,580
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	$	36,736
RFP Total Non-Construction Cost (September 2020, using CPI)	**$**	**37,000**
Total Fixed FMS Cost	**$**	**38,000**
Total Recurring FMS Cost (Annually)	**$**	**12,000**

4F-20. Flood Management Strategy IDs: 142000023

Name: Develop and Improve Early Warning System for City of Presidio, Presidio County

Description: Identify and design access routes and bridges/culverts to provide emergency access during extreme flood events in the City of Presidio.

Affected Jurisdictions: City of Presidio, Presidio County

Discussion on Flood Risk: The City of Presidio is an incorporated area in Presidio County, and is subject to flooding from the confluences of several large creeks with the Rio Grande (Cibolo Creek, Alamito Creek, Terneros Creek), as well as potential flooding from the Rio Conchos confluence with the Rio Grande. Approximate modeling performed as a task for the Regional Flood Plan identified over 650 structures at risk in the 1% AC flood within City of Presidio, assuming the Cibolo Creek and Rio Grande levees (which are not accredited by FEMA) are absent. Extent of 1% AC flood risk is depicted in Map 15, Map 1 of 31.

Presidio does not have a meteorologist dedicated to early flood warnings for the county, and they share information with Jeff Davis (upstream watershed) based off National Weather Service flood warnings. Per Presidio County Emergency Management, the County can check online gage monitors and notify the public through a reverse 911 system. The County also coordinates with the USIBWC on flood warning related to the Rio Grande. This strategy aims to develop an Early Warning System for the City of Presidio and improve Presidio County Emergency Management warning times for road closures and evacuations.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes both fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services and installation were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following cost table.

Total FMS Cost		
Subtotal 1.1 – Vieux/aem Construction/Equipment Cost (July. 2022)	$	1,060
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	$	926
RFP Total Construction/Equipment Cost (Sept. 2020)	**$**	**1,000**
Subtotal 1.3 – Vieux/aem Services/Installation Cost (July 2022)	$	41,580
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	$	36,736
RFP Total Non-Construction Cost (September 2020, using CPI)	**$**	**37,000**
Total Fixed FMS Cost	**$**	**38,000**
Total Recurring FMS Cost (Annually)	**$**	**12,000**

4F-21. Flood Management Strategy IDs: 142000024

Name: Develop and Improve Early Warning System for City of Fort Stockton

Description: Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Fort Stockton. Includes assessment of existing flood EWS.

Affected Jurisdictions: City of Fort Stockton, Pecos County

Discussion on Flood Risk: The City of Fort Stockton is an incorporated area in Pecos County. Best available floodplain mapping in the area identified over 160 structures at risk in the 1% AC flood within Fort Stockton. Extent of 1% AC flood risk is depicted in Map 15, Map 26 of 31. In addition, Comanche Creek Dam has been identified by the Texas Commission on Environmental Quality (TCEQ) as being in poor condition and hydraulically inadequate. This strategy aims to develop an Early Warning System for the City of Fort Stockton and improve Pecos County Emergency Management warning times for road closures and evacuations.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes both fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services and installation were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following cost table.

Total FMS Cost	
Subtotal 1.1 – Vieux/aem Construction/Equipment Cost (July. 2022)	$ 1,060
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	$ 926
RFP Total Construction/Equipment Cost (Sept. 2020)	**$ 1,000**
Subtotal 1.3 – Vieux/aem Services/Installation Cost (July 2022)	$ 41,580
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	$ 36,736
RFP Total Non-Construction Cost (September 2020, using CPI)	**$ 37,000**
Total Fixed FMS Cost	**$ 38,000**
Total Recurring FMS Cost (Annually)	**$ 12,000**

4F-22. Flood Management Strategy IDs: 142000025

Name: Develop and Improve Early Warning System for City of Marfa, Presidio County.

Description: Identify and design access routes and bridges/culverts to provide emergency access during extreme flood events in Marfa. Southeast Marfa and dirt portion of FM 2810 were identified as problem areas by Presidio County Office of Emergency Management.

Affected Jurisdictions: City of Marfa, Presidio County

Discussion on Flood Risk: The City of Marfa is an incorporated area in Presidio County. On June 28, 2021, a car was swept away while attempting to pass the Alamito Creek low water crossing (LWC) at Neville Street in Marfa, Texas, resulting in the death of the driver. A non-structural FMP is proposed (FMP ID: 143000007) in the Regional Flood Plan to add flood gates to four low water crossings in Marfa and install an upstream flood gage at the Highway 17 crossing of North Alamito Creek. While the FMP would prevent drivers from crossing LWCs during floods, and the upstream gage would provide additional warning time for Emergency Management to deploy, a more robust Early Warning System could provide even more warning time and aid in preparing for evacuations, if needed. This strategy aims to develop an Early Warning System for the City of Marfa and improve Presidio County Emergency Management warning times for road closures and evacuations.

Flood Management Strategy Scope of Work:

A proposal prepared by aem and Vieux & Associates (July 2022) for the purposes of the Regional Flood Plan is attached, which describes the SOW and costs associated with this strategy. While the FMP ID: 143000007 also affects early warning in the City of Marfa, the FMP does not require recurring costs, and this FMS includes a system that does have recurring costs. While this FMS would supplement early warning times associated with the FMP, it is not required to be implemented before or after this FMP is constructed.

Estimated Cost for FMS:

The attached bid estimate prepared by aem and Vieux & Associates (July 2022) includes both fixed and recurring costs. The equipment/construction costs were adjusted from July 2022 dollars to September 2020 dollars using the Construction Cost Index, while the non-construction costs associated with services and installation were converted to September 2020 dollars using the Consumer Price Index. The fixed and recurring costs for each option are provided in the following cost table.

Total FMS Cost		
Subtotal 1.1 – Vieux/aem Construction/Equipment Cost (July. 2022)	$	1,060
Subtotal 1.2 – RFP Construction/Equipment Cost (September 2020, using CCI)	$	926
RFP Total Construction/Equipment Cost (Sept. 2020)	**$**	**1,000**
Subtotal 1.3 – Vieux/aem Services/Installation Cost (July 2022)	$	41,580
Subtotal 1.4 - RFP Services/Installation Cost (September 2020, using CPI)	$	36,736
RFP Total Non-Construction Cost (September 2020, using CPI)	**$**	**37,000**
Total Fixed FMS Cost	**$**	**38,000**
Total Recurring FMS Cost (Annually)	**$**	**12,000**

Appendix 4G
Bid Documents Associated with Flood Management Evaluations and Flood Management Strategies

Quotation

High Sierra Electronics, Inc.
High Sierra Electronics, Inc.
155 Spring Hill Dr., Suite 106
Grass Valley, CA 95945
Phone: 530-273-2080
Email: sales@hsierra.com

Order #	Date
S186674	01/26/2022

Bill To:
Marfa, City of
113 S Highland Ave
Marfa, TX 79843
Phone:
Email: mroane@cityofmarfa.com

Customer: Marfa, City of

Ship To:
Marfa, City of
c/o HSE Warehouse
12786 O'Connor Road
San Antonio, TX 78223

Contact: Mandy Roane

Notes: Budgetary Estimate for High Water Detection System consisting of 2 Master Gauging Stations with 8 corresponding Remote Stations with Automatic Barrier Gates, and 1 Rain-Stream Gauging Station in the northern watershed, plus Base Station with Software, Assorted Services, Turn-Key Installation.

8-12 Weeks ARO

Sales Rep	Payment Terms	Shipping Terms	Carrier	Ship Service
sswenor	NET 30	Prepaid & Billed	UPS	Ground

Item #	Number	Description	Unit Price	Qty Ordered	Total Price
1	HWDS A2 Master	ALERT2 Master Gauging Station kit for concrete foundation, complete.	$0.00	2 ea	$ 0.00
2	7410-20	Traffic Pole Assembly: Includes; 16 ft Pole, Breakaway Base with Extended Neck, Locking Collar, 4 in. Cap and Anchor Bolts, Nuts and Washer Kit for concrete foundation.	$1,216.00	2 ea	$ 2,432.00
3	3582-30	ALERT2 HydroMet Controller (Master or Remote); Includes: Model 3512-00 HydroMet Data Logger, ALERT2 Transceiver, Ritron Radio (148 to 174 MHz) Radio, Lightning Protection (VHF GPS), 5315-01 Solar Charger Load Control. Mounted on a L-Panel Assy Note: Radio frequency pending FCC license assistance.	$5,063.00	2 ea	$ 10,126.00
4	2400-15	Rain Gauge Top Section for Slotted Standpipe (12 Diameter). Includes Tipping Bucket Mechanism and 25 Signal Cable with MS-Connector. (Cal: 1mmTip)	$1,012.00	2 ea	$ 2,024.00
5	5950-02	Telemetry Cabinet (Only) w/ Rain Gauge Adapter, 26x17x16	$1,102.00	2 ea	$ 2,204.00
6	5940-02	Cabinet Saddle Brackets (Pair) for 4in Spun Aluminum Pole. Includes U-Bolts	$127.00	2 pr	$ 254.00
7	7410-12	4 Vandal Cone for Cabinet Bracket U-Bolts	$48.00	2 ea	$ 96.00

Item #	Number	Description	Unit Price	Qty Ordered	Total Price
8	5306-01	Solar Panel (3 Amp 55 W); Includes: 25 ft Cable, Mounting Bracket for 4 in Pole	$753.00	2 ea	$ 1,506.00
9	5611-00	Battery; 12 V, 100 Amp Hour, Sealed AGM	$381.00	2 ea	$ 762.00
10	7135-12	GPS Antenna Kit for Cabinet, No LPD; 5' RG58 Antenna Cable TNC to N-Type, 7131-00 Antenna, 7133-00 Mounting Bkt.	$290.00	2 ea	$ 580.00
11	7110-00	Omni Antenna; VHF 169-173 MHz, 3dB Gain	$123.00	2 ea	$ 246.00
12	7150-17	Antenna Cable (Omni); Includes: 23 ft RG58 Cable with (M) PL-259 and (M) BNC Connector and (M) Type-N to (F) BNC Adapter. Use with Traffic Cabinet Mount	$67.00	2 ea	$ 134.00
13	7300-03	Antenna Mast, 5 ft with Silver Finish	$34.00	2 ea	$ 68.00
14	6640-00	15 PSI Pressure Transducer with 0-5V Output. Submersible Cable, Desiccant Box (6x6x4), Signal Conditioning Module, and 12ft Signal Cable. Note: Estimated 200' of Submersible Cable per Sensor.	$1,709.00	2 ea	$ 3,418.00
15		Subtotal - MASTER Stations			$ 23,850.00
16		Subtotal - REMOTE Stations w/Gates			$ 23,850.00
17	HWDS A2 Remote, BGO	ALERT2 Advanced Warning Station w/ Barrier Gate Operator, kit for concrete foundation, complete.	$0.00	8 ea	$ 0.00
18	7410-20	Traffic Pole Assembly: Includes; 16 ft Pole, Breakaway Base with Extended Neck, Locking Collar, 4 in. Cap and Anchor Bolts, Nuts and Washer Kit for concrete foundation.	$1,216.00	8 ea	$ 9,728.00
19	3582-34	ALERT2 HydroMet Controller (Remote); Model 3512-00 HydroMet Data Logger, Model 3701-00 VHF (148 to 174 MHz) Radio, and Model 5315-01 Solar Charger Load Control. Mounted on L-Panel Assembly. Use with Barrier Gate Operator Control and Monitoring. Note: Radio frequency pending FCC license assistance.	$5,174.00	8 ea	$ 41,392.00
20	5826-01	Signal Light; Includes: (1) 12 in Dia. Red LED Signal Light, Housing, Cap Visor and Mounting Hardware for 4" Pole	$282.00	16 ea	$ 4,512.00

Item #	Number	Description	Unit Price	Qty Ordered	Total Price
21	5940-00	Cabinet (Only); 26x17x16 in, Door Handle and Key Lock. Mounting Brackets Sold Separately.	$946.00	8 ea	$ 7,568.00
22	5940-02	Cabinet Saddle Brackets (Pair) for 4in Spun Aluminum Pole. Includes U-Bolts	$127.00	8 pr	$ 1,016.00
23	7410-12	4 Vandal Cone for Cabinet Bracket U-Bolts	$48.00	8 ea	$ 384.00
24	5306-01	Solar Panel (3 Amp 55 W); Includes: 25 ft Cable, Mounting Bracket for 4 in Pole	$753.00	8 ea	$ 6,024.00
25	5611-00	Battery; 12 V, 100 Amp Hour, Sealed AGM	$381.00	16 ea	$ 6,096.00
26	7135-12	GPS Antenna Kit for Cabinet, No LPD; 5' RG58 Antenna Cable TNC to N-Type, 7131-00 Antenna, 7133-00 Mounting Bkt.	$290.00	8 ea	$ 2,320.00
27	7110-00	Omni Antenna; VHF 169-173 MHz, 3dB Gain	$123.00	8 ea	$ 984.00
28	7150-17	Antenna Cable (Omni); Includes: 23 ft RG58 Cable with (M) PL-259 and (M) BNC Connector and (M) Type-N to (F) BNC Adapter. Use with Traffic Cabinet Mount	$67.00	8 ea	$ 536.00
29	7300-03	Antenna Mast, 5 ft with Silver Finish	$34.00	8 ea	$ 272.00
30	7300-04	Mast to Pole Mounting Kit (Pair); Up to 5 in OD	$197.00	8 ea	$ 1,576.00
31	2620-40	Road Sign: WATCH FOR WATER ON ROAD; 36 x 36 in	$288.00	8 ea	$ 2,304.00
32	5850-01	Sign Brackets (Pair) for 4 in Pole Mount. Used with Model 5850-00	$44.00	8 ea	$ 352.00
33	9080-01	Barrier Gate Operator Interface Unit (BGOIU); Includes: HSE BGO Interface Controller, 5830-03 Aurora Gate Arm Beacon and Parts Kit, and (2) 12 V 18 Amp Hr Batteries. Unit supports local One-Button Control for local activation or deactivation.	$2,684.00	8 ea	$ 21,472.00
34	9080-00	Barrier Gate Operator; Yellow, Gearbox Operator, APEX Controller, 25 ft Wishbone Arm, AC or 24 VDC Operation. Requires Concrete Foundation. Use with Model 9080-01 BGOIU.	$11,075.00	8 ea	$ 88,600.00
35	9080-30	Tape, Conspicuity; 150 Foot Roll. High Visibility Long Service Life Tape for Barrier Gate Arms.	$385.00	8 ea	$ 3,080.00

Item #	Number	Description	Unit Price	Qty Ordered	Total Price
36		Subtotal - REMOTE Stations with 2/ea Gates (per site)			$ 198,216.00
37	7190-01	4" Dia 12' Galvanized Sched 40 Pole	$223.00	1 ea	$ 223.00
38	3316-02	ALERT2 Data Transmitter; (6) Analog, (5) Digital and SDI-12 Inputs, Data Logging with 16 GB SD Card, VHF 148 to 174 MHz Radio,12 V 12 Amp Hr Battery, in 10 x 8 x 6 in NEMA Enclosure. (Specify Radio Freq) Note: Radio frequency pending FCC license assistance.	$3,000.00	1 ea	$ 3,000.00
39	7135-11	GPS Antenna Kit for Cabinet; 5' RG58 Antenna Cable TNC to N-Type, 7131-00 Antenna, 7133-00 Mounting Bkt, 7201-00 LPD, 3' RG58 Transmitter Cable N-Type to SMA.	$472.00	1 ea	$ 472.00
40	2400-15	Rain Gauge Top Section for Slotted Standpipe (12 Diameter). Includes Tipping Bucket Mechanism and 25 Signal Cable with MS-Connector. (Cal: 1mmTip)	$1,012.00	1 ea	$ 1,012.00
41	6640-00	15 PSI Pressure Transducer with 0-5V Output. Submersible Cable, Desiccant Box (6x6x4), Signal Conditioning Module, and 12ft Signal Cable. Note: 150' of Submersible Cable.	$1,577.50	1 ea	$ 1,577.50
42	5301-03	Solar Panel (100 mA 16.5 V); Includes: 13.7 V Output Voltage Regulator, 12 ft Power Cable with 3- pin MS Connector, Mounting Bracket, and Hardware	$221.00	1 ea	$ 221.00
43	7110-00	Omni Antenna; VHF 169-173 MHz, 3dB Gain	$123.00	1 ea	$ 123.00
44	7150-02	Antenna Cable (RG58); Includes: 12 ft RG58 Cable with (M) PL-259 and (M) N-Type Connectors, 10.8 ft RG58 Cable with (M) BNC and (M) N-Type Connectors. Use for Model 71007110 with existing Lightning Protection.	$84.00	1 ea	$ 84.00
45	7200-00	Antenna Lightning Protector (Non-Rotated); N-Type F both sides.	$119.00	1 ea	$ 119.00
46		Subtotal - GAUGING STATION (north watershed)			$ 6,831.50

Item #	Number	Description	Unit Price	Qty Ordered	Total Price
47	3345-24	ALERT2 Base Station Transceiver; Includes; HSE 2U DesktopRack Mount Enclosure, Encoder and Decoder Subsystems w/RSSI Indicator, VHF 148 to 174 MHz Radio, (Specify Radio Frequency) Note: Radio frequency pending FCC license assistance.	$5,555.00	1 ea	$ 5,555.00
48	7101-00	Antenna (Omni) with VHF 6 dB Directional High Gain, 21 ft length. Ships via truck freight.	$1,320.00	1 ea	$ 1,320.00
49	7150-12	Antenna Cable (RG58 to RG8); Includes: 50 ft RG8 Cable with (M) N-Type and (M) PL-259 Connectors, 10.8 ft RG58 Cable with (M) BNC and (M) N-Type Connectors. Use for Model 71007110 with existing Lightning Protection.	$274.00	1 ea	$ 274.00
50	7135-11	GPS Antenna Kit for Cabinet; 5' RG58 Antenna Cable TNC to N-Type, 7131-00 Antenna, 7133-00 Mounting Bkt, 7201-00 LPD, 3' RG58 Transmitter Cable N-Type to SMA.	$472.00	1 ea	$ 472.00
51	7170-01	Antenna VHF Bandpass Single Cavity Filter, 148 to 174 MHz. Specify Frequency	$956.00	1 ea	$ 956.00
52	Materials	Installation Materials Note: Additional hardware & cable for mounting antenna on building.	$390.00	1 ea	$ 390.00
53	8410-06	OneRain Contrail Server 50 sensors, cloud-hosted services within US, 12-month annual subscription. Note: Annual subscription fee of 6K.	$6,000.00	1 ea	$ 6,000.00
54	8400-03	Contrail software installation and configuration done remotely, working with the agency and IT staff. Price is charged only once for any quantity of servers at initial setup.	$3,000.00	1 ea	$ 3,000.00
55	8400-04A	Contrail Training; Administration Webinar Training, session lasting 4 hours.	$1,000.00	1 ea	$ 1,000.00
56		Subtotal - BASE STATION & SOFTWARE			$ 18,967.00

Item #	Number	Description	Unit Price	Qty Ordered	Total Price
57	Project-Mgmt	Dedicated Project Manager at HSE to serve as primary interface with Owners representative in all matters pertaining to execution of the project. Note: Includes Network Design by Developing ALERT2 ID and TDMA Plan based on current sites and expansion plans.	$1,740.00	1 ..	$ 1,740.00
58	SiteSurvey	Survey of site(s) to evaluate suitability of site for intended use, document any safety and environmental concerns, and determine site preparation and equipment required. Priced per hour plus materials, travel and sustenance.	$3,635.60	1 ..	$ 3,635.60
59	FCC-Assist	FCC Licensing Assistance, See Statement of Work for details.	$2,784.00	1 ..	$ 2,784.00
60	8310-01	Data Services, Data Connectivity Set-up (Hourly rate)	$129.00	4 ea	$ 516.00
61	Install-HSE	Installation Service performed by certified HSE Technician(s). Work will be scheduled through HSE's Project Management team after coordination with site owner. See attached SCOPE of WORK for additional details and information.	$123,513.60	1 ..	$ 123,513.60
62		Subtotal - SERVICES			$ 132,189.20
63	Shipping Estimate	Shipping Estimate; actual amount will be billed.	$2,780.00	1 $	$ 2,780.00
64		Note: Optional Cost for 1 Year of Preventative Maintenance by Two (2) Certified HSE Technicians consisting of 2 Site Visits (example: Spring / Fall). $21,651.20 Annually (includes mobilizaton and daily per diem)			
65		Note: Optional In-Person Training Class for up to 10 Students. 6-Hour workshop. Price = $3,565.60 (Includes mobilization and daily per diem) and all course materials.			

Quotation

High Sierra Electronics, Inc.
High Sierra Electronics, Inc.
155 Spring Hill Dr., Suite 106
Grass Valley, CA 95945
Phone: 530-273-2080
Email: sales@hsierra.com

Order #	Date
S186674	01/26/2022

Subtotal:	**$382,833.70**
Sales Tax:	**$0.00**
Total:	**$382,833.70**

Quote Valid for 60 Days

Approval:_____________________________ Date:___________

By ordering, receiving, or accepting HSE provided products and/or services, Buyer agrees to these General Terms and Conditions of Sale incorporated by reference and available at: https://www.hsierra.com/download/general-terms-conditions-sale/

Proposal for El Paso, Texas

Flood Early Warning System

SUBMITTED BY
Sue Swenor
Sales Manager – Texas & Oklahoma
[Phone: 1.512.931.9530 | Email: sue.swenor@aem.eco

DATE
July 11, 2022

Background

There are 13 primary HUC12 watersheds responsible for runoff production and contributing to flood risk in the City of El Paso, shown in Table 1. The predominant flood risk in El Paso is from the Rio Grande River. The flooding risk associated with the Rio Grande River is monitored and mitigated by an international agreement between the United States and Mexico, and thus no additional monitoring of this river is recommended. The remaining flood risk in El Paso is produced from smaller ephemeral streams and unnamed tributaries of the Rio Grande River (Figure 1).

Table 1. Primary HUC12 watersheds in El Paso, TX.

HUC 12 ID	**To HUC 12**	**Main Flooding sources in El Paso other than the Rio Grande River**
130301020802	130301020804	Anthony Wash and Unnamed Tributaries of Rio Grande
130301020804	130301020904	Unnamed Tributaries of Rio Grande
130301020902	130301020904	Unnamed Tributaries of Rio Grande
130301020904	130301020905	Unnamed Tributary of Rio Grande
130301020905	130301020906	Unnamed Tributaries of Rio Grande
130301020906	130401000107	Unnamed Tributaries of Rio Grande
130401000101	130401000103	Ephemeral streams
130401000102	130401000107	No defined channels
130401000103	130401000107	Ephemeral streams
130401000107	130401000203	Unnamed Tributaries of Rio Grande
130401000203	130401000204	Unnamed Tributaries of Rio Grande and Ephemeral streams
130401000204	130401000307	Unnamed Tributaries of Rio Grande
130401000307	130401000410	Unnamed Tributaries of Rio Grande

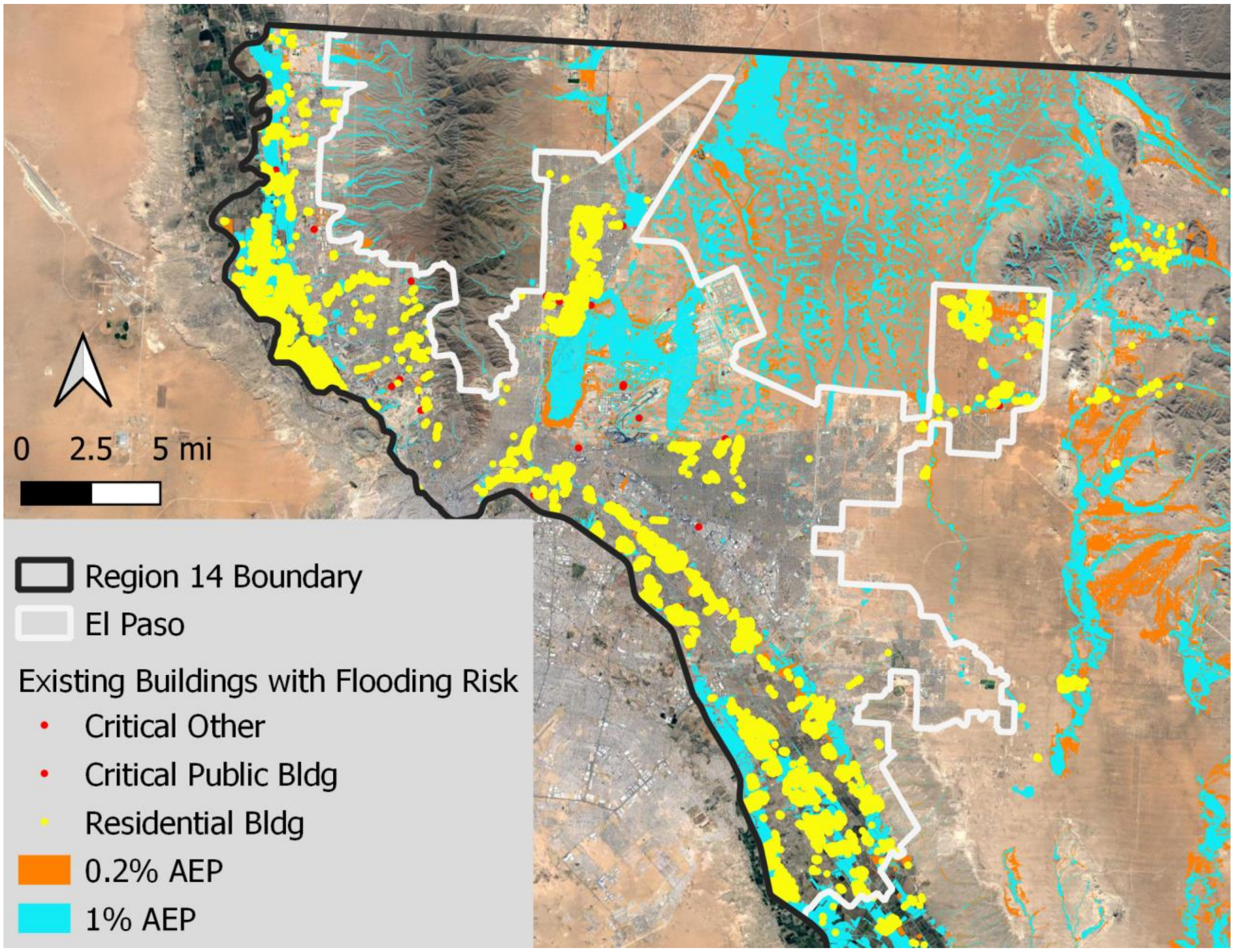


Figure 1. Flooding risk in El Paso, Texas.

The primary radar source for El Paso is KEPZ (Santa Teresa, New Mexico), with a secondary radar source of KHDX (Holloman Air Force Base, New Mexico) available for backup (Figure 2). Additionally, there are two NWS-ASOS rain gauges in El Paso and 14 additional gauges in the surrounding area. There are 2 HADS rain gauges within the City and 27 HADS rain gauges in the surrounding area. In addition to the NWS-ASOS stations and HADS rain gauges there are four TWDB Mesonet stations, four West TX Mesonet rain gauges, and three USGS rain gauges in the surrounding area.

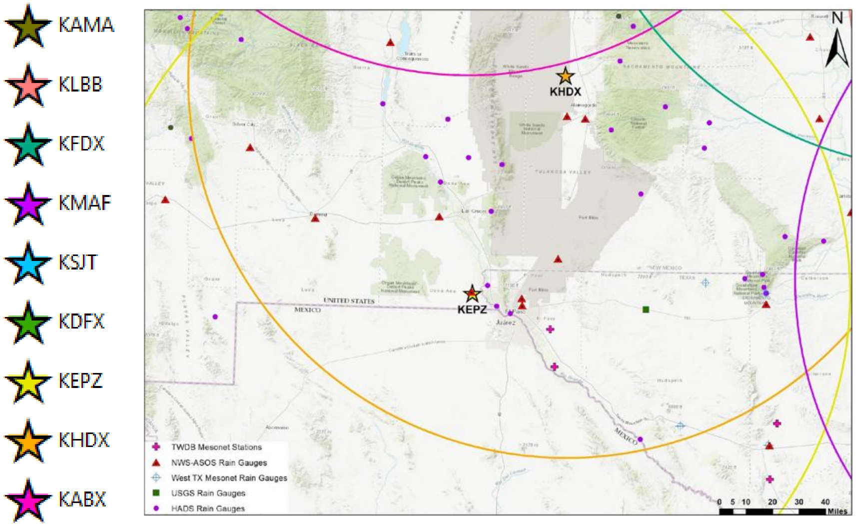


Figure 2. Radar coverage and rain gauge locations for El Paso, Texas.

Scope of Services

Vieux & Associates, an AEM brand, proposes two levels of service to comprise a Flood Early Warning System for the City of El Paso, Texas.

Level 1 of the Flood Early Warning System recommends a rain gauge network analysis to assess the current rain gauge network in the City of El Paso and make recommendations to move rain gauges to better locations or to add additional rain gauges to fill in network gaps. A double mass analysis and a technical memorandum will accompany the rain gauge network analysis. Additionally, pressure transducer sensors, which measure water elevation, are recommended to be installed at highways that cross arroyos and at dam pools and tipping bucket rain gauges, following the rain gauge analysis, are recommended for installation. Base stations are recommended for automatic transmission of sensor data. Finally, a monthly subscription for automated email alerts that provide the rainfall forecast along with measurement from the sensors is recommended. The rainfall forecast product that will be provided is the High Resolution Rapid Refresh model, which is an 18-hour quantitative precipitation forecast produced by the National Weather Service, as well as the 72-hour quantitative precipitation forecast produced by the National Weather Service. An alert threshold analysis will be utilized establish region-specific alert thresholds for the automated email alerts.

Level 2 of the Flood Early Warning System recommends monthly subscription of Near Real Time (NRT) Gauge-Adjusted Radar Rainfall (GARR), which is delivered via the Vieux Information Platform (VIP) and accessed via a secure login. NRT GARR is a spatially continuous rainfall product that is superior to individual radar rainfall or gauge rainfall measurement, and is produced through automated, real time quality control of gauge and radar data at a 15-minute temporal resolution over a gridded 1x1-km domain. Forecast HRRR and NDFD will also be hosted on the VIP platform for seamless visualization.

Cost Proposal

The quoted cost proposal for Level 1 and Level 2 of the Flood Early Warning System is listed below. The quote is valid until January 1, 2023.

No.	Item	Unit	Amount	Quantity	Total
1	Rain Gauge Network and Alert Threshold Analysis	One Time, Labor Included	$102,520	1	$102,520
	Includes double mass analysis & technical memorandum				
2	Automated Email Alerts				
	HRRR Forecast	Monthly	$500	12	$6,000
	NDFD Forecast	Monthly	$500	12	$6,000
	In Situ Sensors (up to 15)	Monthly	$500	12	$6,000
	Configuration & Set Up	One Time, Labor Included	$900	1	$900
3	Tipping Bucket Rain Gauge				
	Standpipe Assembly. Includes Omni Antenna with Cable Set and Lightning Protection	Each	$1,416	1	$1,416
	ALERT Data Transmitter with 12-volt 12-amp hour battery & Cellular Modem	Each	$3,707	1	$3,707

	GPS Antenna with Cable Set and Mounting Bracket	Each	$472	1	$472
	Tipping Bucket Rain Gauge Top Section	Each	$1,012	1	$1,012
4	Pressure Transducer Sensor				
	10mA solar panel with voltage regulator and mounting bracket	Each	$221	1	$221
	Pressure transducer with 35' submersible cable, desiccant box, and 12' signal cable	Each	$1,183	1	$1,183
	Estimated 115' of additional submersible cable for a total length of 150;	Each	$3.00	115	$345
	Interface converter for PT	Each	$278	1	$278
5	Base Station				
	ALERT Data Transceiver with Port Server	Each	$5,555	1	$5,555.00
	Contrail Server (annual subscription)	Each	$12,000.00	1	$12,000.00
	Set-up Configuration & Online 4-hr Training	Each	$4,000.00	1	$4,000.00
	Directional Antenna with Mounting Hardware & Cable	Each	$3,200.00	1	$3,200.00
				Level 1 Total Fixed Price[1] =	**$154,809.00**
6	Vieux NRT GARR Bundle				
	VIP Configuration	One Time	$2,000	1	$2,000
	NRT GARR Configuration	One Time	$3,000	1	$3,000
	NRT GARR Delivery	Monthly, Labor Included	$6,000	12	$72,000
	NRT GARR & VIP Maintenance, VIP Subscription, & Project Management	Monthly, Labor Included	$3,000	12	$36,000
				Level 2 Total Fixed Price[2] =	**$113,000**

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[1] The Level 1 Total Fixed Price assumes 12 months for the automated email alerts and complete set-up for 1 tipping bucket rain gauge and 1 pressure transducer sensor. The number of months for automated email alerts and quantity of tipping bucket rain gauges and pressure transducer sensors is an estimate for the purpose of this quote and can be adjusted according to the recommendations made as part of the rain gauge network analysis.

[2] The level 2 Total Fixed Price assumes 12 months of subscription for NRT GARR delivery, maintenance, subscription, and project management. The number of months is an estimate for the purpose of this quote and can be adjusted accordingly.

Appendix

Hardware

A tipping bucket rain gauge is recommended to provide precipitation measurements according to National Weather Service standards. The tipping bucket rain gauge consists of an aluminum 12-inch diameter powder coated housing and a tipping bucket mechanism, available in 1-mm or 0.01-inch tip increments. The accuracy of the recommended tipping bucket rain gauge is ±1.5% for 0-3.6 inches/hour of rainfall.

The pressure transducer sensor is submersible and provides high accuracy of a wide range of operating conditions, making it ideally suited to environmental monitoring applications such as surface water, streams, and reservoirs. These sensors feature a compensated temperature range of 14° to 178°F, a durable stainless-steel housing, and a dual output (analog and RS-485). Each sensor is calibrated with an accuracy of ±0.1% and is field programmable.

The base station is necessary to convey data from the tipping bucket rain gauge and submersible pressure transducer in real time. A 2-way ALERT2 base station transceiver is recommended, which uses a single model for receiving messages and transmitting command messages over the ALERT2 network. This base station is compatible with the Contrail software platform, which can be used to visualize measured field data in near real time.

Rain Gauge Network and Alert Threshold Analysis

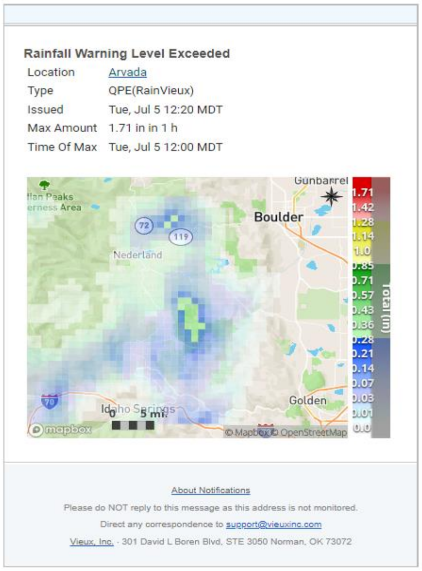
A rain gauge network analysis will be conducted that evaluates the existing rain gauge network, placement of existing gauges, and makes recommendations for the installation (including location and number) of new rain gauges to create a full coverage rain gauge network. For existing rain gauges, a double mass analysis will be conducted to evaluate station performance and identify any blockages. The findings from the rain gauge network analysis will be documented in a technical memorandum. The alert threshold analysis will be conducted to analyze historical rainfall events and identify up to 5 rainfall events (including size and duration) for a flood triggering event.

Automated Email Alerts

Automated email alerts will be generated when a pre-defined rainfall threshold is exceeded based upon rainfall information for the area from the High Resolution Rapid Refresh (HRRR) model or as measured by in-situ rain gauges. HRRR is a longer-term quantitative precipitation forecast (QPF), maintained by the National Weather Service, and provides a forecast up to 18 hours. HRRR is provided in a gridded format, and is generated by numerical weather prediction models which Vieux improves by filling gaps in the operational data stream to enhance reliability.

The area of coverage will include the City of El Paso and its nearby surrounding areas, up to a radius of 15 km from the city center. The rainfall thresholds are user-defined, and up to 5 thresholds can be set to trigger automated email alerts.

Images from an example email alert are shown in Figure 3. The example automated email alert displays the alert location, maximum storm depth, time of the maximum, and alert type (e.g., HRRR). A map of the radar with a rainfall depth legend accompanies the email alert.



Rainfall Warning Level Exceeded

Location	Arvada
Type	QPE(RainVieux)
Issued	Tue, Jul 5 12:20 MDT
Max Amount	1.71 in in 1 h
Time Of Max	Tue, Jul 5 12:00 MDT

About Notifications

Please do NOT reply to this message as this address is not monitored.

Direct any correspondence to support@vieuxinc.com

Vieux, Inc. - 301 David L Boren Blvd, STE 3050 Norman, OK 73072

Figure 3. An example automated email alert.

Proposal for Pecos, Texas

Flood Early Warning System

SUBMITTED BY

Sue Swenor
Sales Manager – Texas & Oklahoma
[Phone: 1.512.931.9530 | Email: sue.swenor@aem.eco

DATE
June 6, 2022

Background

There are two primary HUC12 watersheds responsible for runoff production and contribute to flood risk in the City of Pecos: Mosquito Lake and Lateral Number One-Pecos River. Mosquito Lake watershed encompasses the majority of Pecos. The flooding risk generated from the Mosquito Lake watershed is predominantly pluvial flooding because only the headwaters are located in Pecos. The main flooding risk generated from the Lateral Number One-Pecos River watershed in Pecos is the Pecos River. The contributing drainage area for the Pecos River in Pecos is approximately 22,000 square miles. Efforts to develop an early warning system for Pecos River could use USGS Gauge 08419000 as an upstream boundary condition. Several ephemeral streams in the Lateral Number One-Pecos River also produce a flooding risk in Pecos. These streams are fed from upstream drainage areas in HUC 12 watersheds 130700010902 and 130700010901.

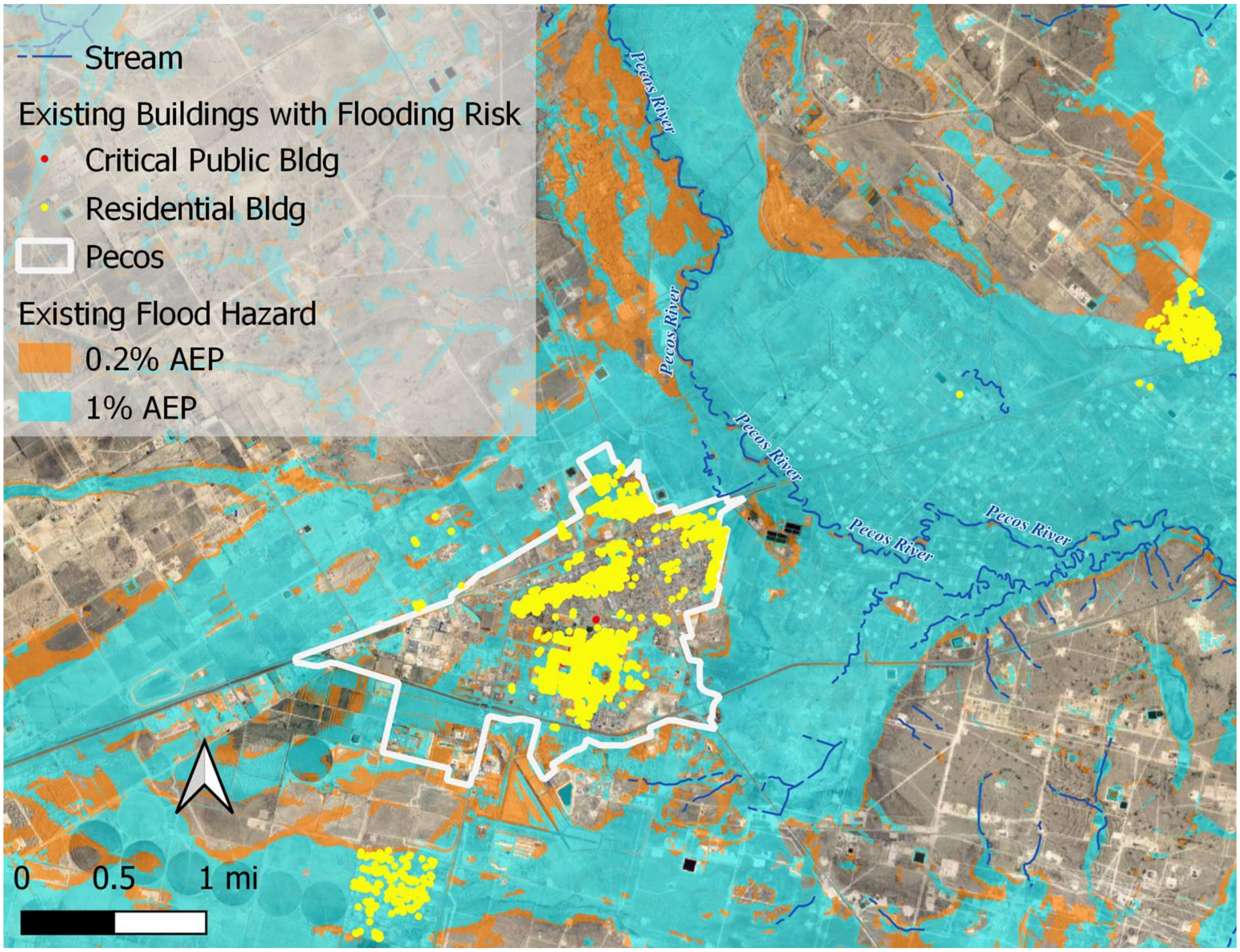


Figure 1. Flooding risk in Pecos, Texas.

Only one radar source, KMAF (Midland, Texas), provides coverage to Pecos, Texas. The City sits on the very edge of the radar's coverage radius, shown in Figure 2, and there is no backup radar. There is no radar coverage to the south of the City of Alpine.

There are limited rain gauges in the immediate vicinity of Pecos, although there are 12 NWS-ASOS rain gauges in the area surrounding the City. In addition to the NWS-ASOS stations there are eight TWDB Mesonet stations, 12 West TX Mesonet rain gauges, seven USGS Rain Gauges, and 14 HADS rain gauges in the surrounding area.

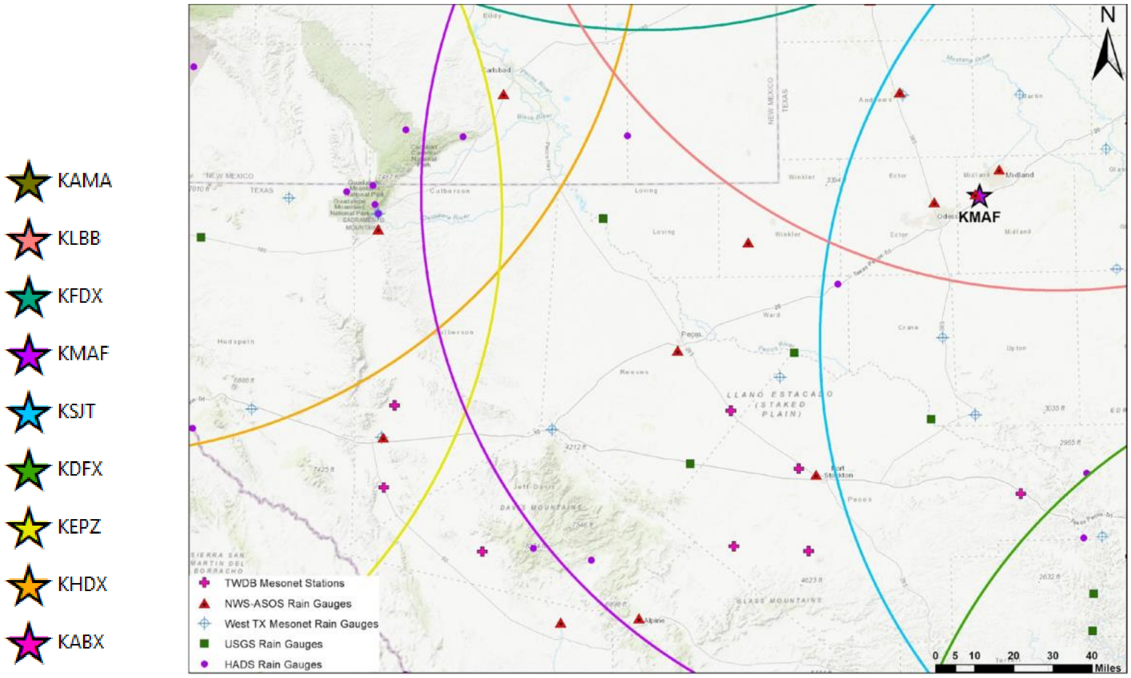


Figure 2. Radar coverage and rain gauge locations for Pecos, Texas.

Scope of Services

Vieux & Associates, an AEM brand, proposes one level of service to comprise a Flood Early Warning System for the City of Pecos, Texas.

Level 1 of the Flood Early Warning System recommends the installation of new hardware for in situ measurement of rainfall and water elevation combined with a monthly subscription for automated email alerts that provide the rainfall forecast along with measurement from the sensors, if the sensors are connected to a cellular network to transmit data in real time. The rainfall forecast product that will be provided is the High Resolution Rapid Refresh model, which is an 18-hour quantitative precipitation forecast produced by the National Weather Service. Additionally, a rain gauge network and alert threshold analysis is recommended to evaluate the current rain gauge network, make recommendations for the installation of additional hardware along with specifications for a low cost, compact weather station, and establish region-specific alert thresholds for the automated email alerts. More information about these services can be found in the Appendix.

Cost Proposal

The quoted cost proposal for Level 1 of the Flood Early Warning System is listed below. The quote is valid until January 1, 2023.

No.	Item	Unit	Amount	Quantity	Total
1	Automated Email Alerts				
	HRRR Forecast	Recurring Monthly	$500	12	$6,000
	In Situ Sensors (up to 15 sensors if transmitting data in real time over a cellular network)	Recurring Monthly	$500	12	$6,000
	Alert Configuration & Set Up	Labor	$900	1	$900
2	Rain Gauge Network and Alert Threshold Analysis	Labor	$40,680	1	$40,680
3	Wireless Weather Station with Console for Measuring Rainfall, Temp/RH, Wind Speed Note: Requires AC Power	Each	$910.00	1	$910.00
	Mounting Hardware	Each	$150.00	1	$150.00
				Level 1 Total Fixed Price[1] =	**$54,640.00**

*The Level 1 Total Fixed Price assumes 12 months for the automated email alerts and complete set-up for one wireless weather station. The number of months for automated email alerts and quantity of weather stations is an estimate for the purpose of this quote and can be adjusted according to the recommendations made as part of the rain gauge network analysis.

Appendix

Hardware

A compact, low-cost weather station that provides measurements of precipitation, temperature, relative humidity, wind speed and direction, and barometric pressure is recommended. The hardware package for this station includes a small desktop console for viewing real-time data so decision makers can take appropriate action. Each weather station can be configured to transmit data in real time using a data plan from any cellular provider; without a data plan, the data can be collected and viewed on the console. Note that without a data plan, data collected from this weather station cannot be included in the automated email alerts.

Rain Gauge Network and Alert Threshold Analysis

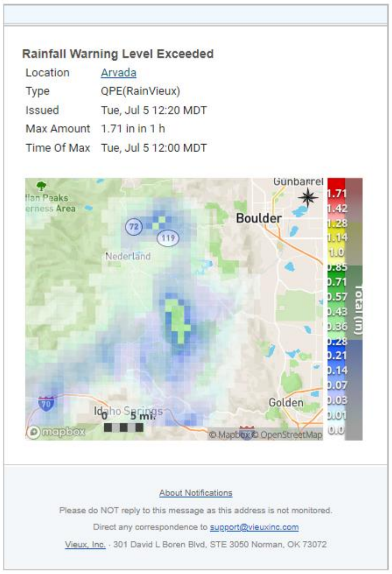
A rain gauge network analysis will be conducted that evaluates the existing rain gauge network, placement of existing gauges, and makes recommendations for the installation (including location and number) of new rain gauges to create a full coverage rain gauge network. The findings from the rain gauge network analysis will be documented in a technical memorandum. The alert threshold analysis will be conducted to analyze historical rainfall events and identify up to 5 rainfall events (including size and duration) for a flood triggering event.

Automated Email Alerts

Automated email alerts will be generated when a pre-defined rainfall threshold is exceeded based upon rainfall information for the area from the High Resolution Rapid Refresh (HRRR) model or as measured by in-situ rain gauges (if the gauges are connected to a cellular plan for data transmittal). HRRR is a longer-term quantitative precipitation forecast (QPF), maintained by the National Weather Service, and provides a forecast up to 18 hours. HRRR is provided in a gridded format, and is generated by numerical weather prediction models which Vieux improves by filling gaps in the operational data stream to enhance reliability.

The area of coverage will include the City of Pecos and its nearby surrounding areas, up to a radius of 15 km from the city center. The rainfall thresholds are user-defined, and up to 5 thresholds can be set to trigger automated email alerts.

Images from an example email alert are shown in Figure 3. The example automated email alert displays the alert location, maximum storm depth, time of the maximum, and alert type (e.g., HRRR). A map of the radar with a rainfall depth legend accompanies the email alert.



Rainfall Warning Level Exceeded

Location	Arvada
Type	QPE(RainVieux)
Issued	Tue, Jul 5 12:20 MDT
Max Amount	1.71 in in 1 h
Time Of Max	Tue, Jul 5 12:00 MDT

About Notifications

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Figure 3. An example automated email alert.

Proposal for Alpine, Texas

Flood Early Warning System

SUBMITTED BY

Sue Swenor
Sales Manager – Texas & Oklahoma
[Phone: 1.512.931.9530 | Email: sue.swenor@aem.eco

DATE
July 11, 2022

Background

There are three primary HUC12 watersheds responsible for runoff production and contribute to flood risk in the City of Alpine: Headwaters Alpine Creek, Ramirez Tank-Alpine Creek, and Moss Creek. Ramirez Tank-Alpine Creek watershed covers approximately 40 acres on the northern edge of the City. The current flood risk generated from this watershed is low, but the risk level could increase if property development continues in this area. The Headwater Alpine Creek watershed encompasses the majority of Alpine and includes three main flooding sources: Paisano Creek, Alpine Creek, and an unnamed tributary to Alpine Creek (Figure 1). Moss Creek covers the southern portion of the City of Alpine and also provides flood risk in this area of the City.

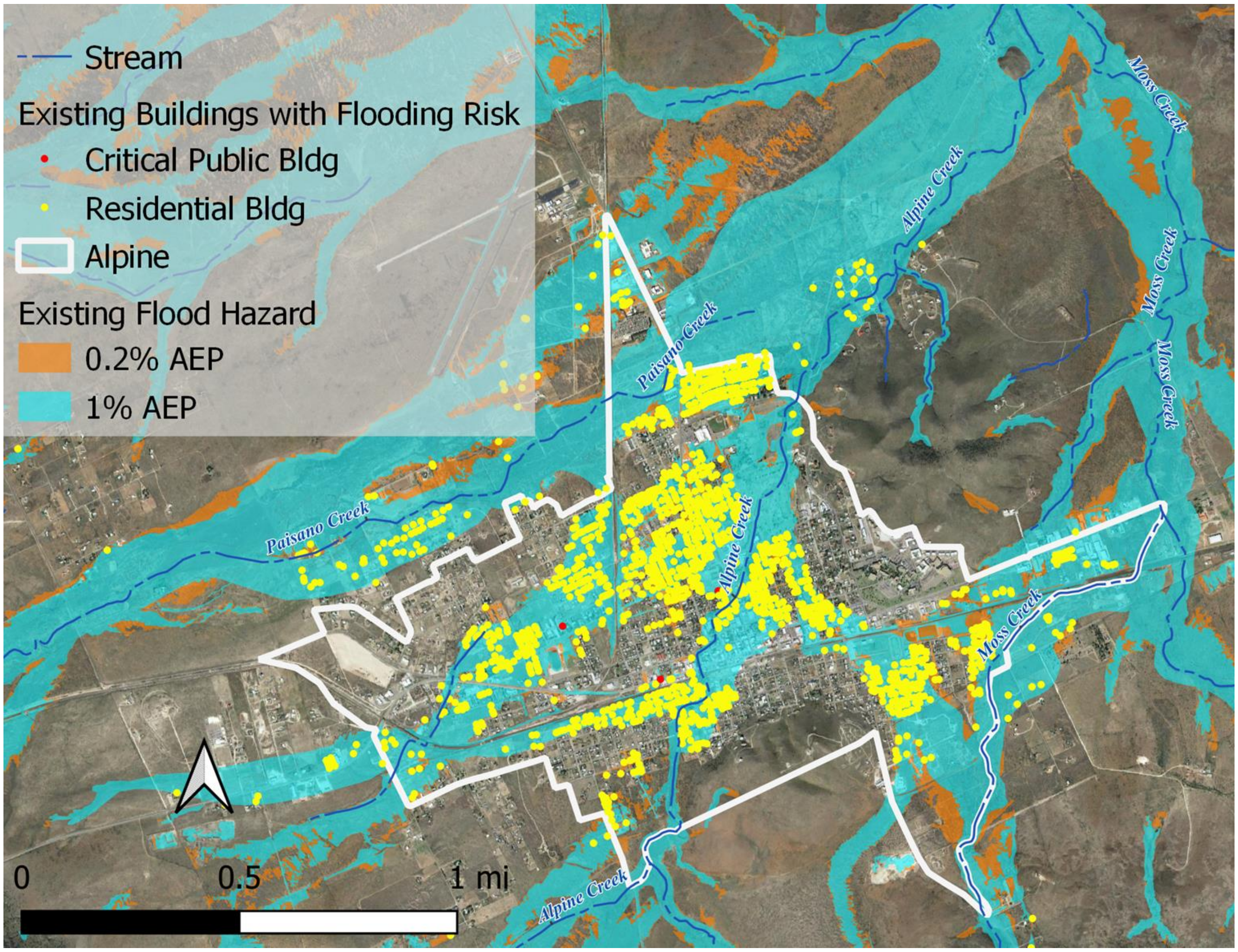


Figure 1. Flooding risk in Alpine, Texas.

Only one radar source, KMAF (Midland, Texas), provides coverage to Alpine, Texas. The City sits on the very edge of the radar's coverage radius, shown in Figure 2, and there is no backup radar. There is no radar coverage to the south of the City of Alpine.

There is one NWS-ASOS rain gauge currently operational in Alpine, and five additional gauges in the surrounding areas (Figure 2). In addition to the NWS-ASOS stations, there are seven TWDB Mesonet stations, two West Texas Mesonet rain gauges, two USGS rain gauges, and seven HADS rain gauges in the areas surrounding Alpine.

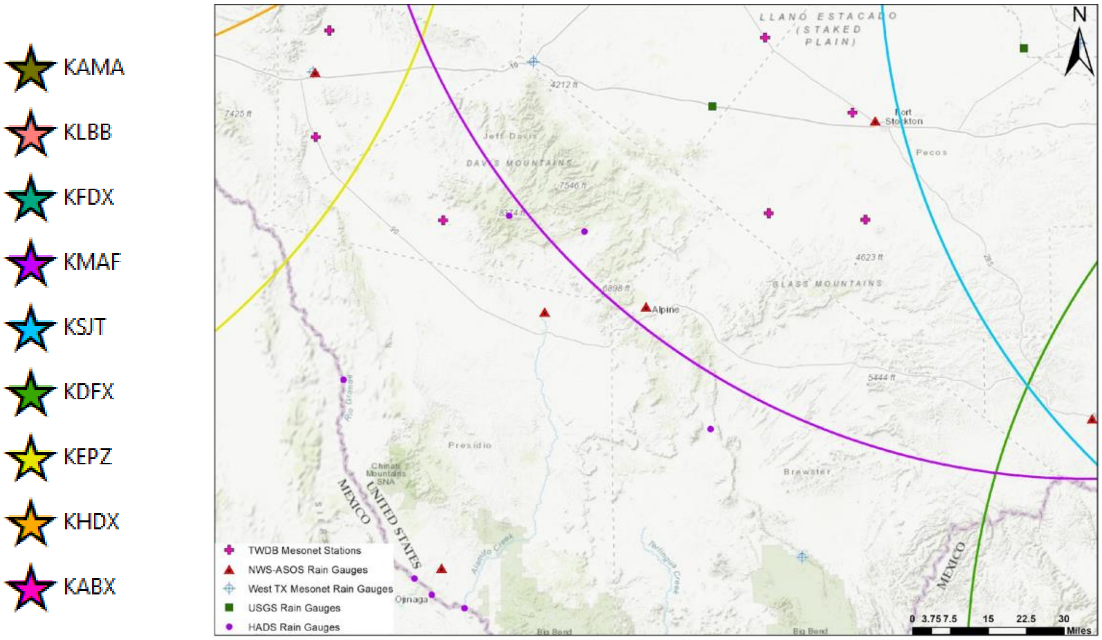


Figure 2. Radar coverage and rain gauge locations for Alpine, Texas.

Scope of Services

Vieux & Associates, an AEM brand, proposes one level of service to comprise a Flood Early Warning System for the City of Alpine, Texas.

Level 1 of the Flood Early Warning System recommends the installation of new hardware for in situ measurement of rainfall and water elevation combined with a monthly subscription for automated email alerts that provide the rainfall forecast along with measurement from the sensors, if the sensors are connected to a cellular network to transmit data in real time. The rainfall forecast product that will be provided is the High Resolution Rapid Refresh model, which is an 18-hour quantitative precipitation forecast produced by the National Weather Service. Additionally, a rain gauge network and alert threshold analysis is recommended to evaluate the current rain gauge network, make recommendations for the installation of additional hardware along with specifications for a low cost, compact weather station, and establish region-specific alert thresholds for the automated email alerts. More information about these services can be found in the Appendix.

Cost Proposal

The quoted cost proposal for Level 1 of the Flood Early Warning System is listed below. The quote is valid until January 1, 2023.

No.	Item	Unit	Amount	Quantity	Total
1	Automated Email Alerts				
	HRRR Forecast	Recurring Monthly	$500	12	$6,000
	In Situ Sensors (up to 15 sensors if transmitting data in real time over a cellular network)	Recurring Monthly	$500	12	$6,000
	Alert Configuration & Set Up	Labor	$900	1	$900
2	Rain Gauge Network and Alert Threshold Analysis	Labor	$40,680	1	$40,680
3	Wireless Weather Station with Console for Measuring Rainfall, Temp/RH, Wind Speed Note: Requires AC Power	Each	$910.00	1	$910.00
	Mounting Hardware	Each	$150.00	1	$150.00
				Level 1 Total Fixed Price[1] =	**$54,640.00**

*The Level 1 Total Fixed Price assumes 12 months for the automated email alerts and complete set-up for one wireless weather station. The number of months for automated email alerts and quantity of weather stations is an estimate for the purpose of this quote and can be adjusted according to the recommendations made as part of the rain gauge network analysis.

Appendix

Hardware

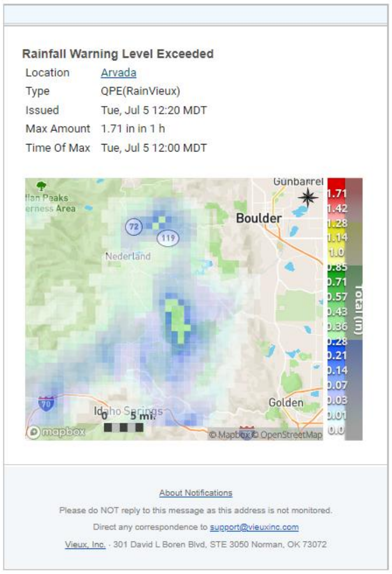
A compact, low-cost weather station that provides measurements of precipitation, temperature, relative humidity, wind speed and direction, and barometric pressure is recommended. The hardware package for this station includes a small desktop console for viewing real-time data so decision makers can take appropriate action. Each weather station can be configured to transmit data in real time using a data plan from any cellular provider; without a data plan, the data can be collected and viewed on the console. Note that without a data plan, data collected from this weather station cannot be included in the automated email alerts.

Rain Gauge Network and Alert Threshold Analysis

A rain gauge network analysis will be conducted that evaluates the existing rain gauge network, placement of existing gauges, and makes recommendations for the installation (including location and number) of new rain gauges to create a full coverage rain gauge network. The findings from the rain gauge network analysis will be documented in a technical memorandum. The alert threshold analysis will be conducted to analyze historical rainfall events and identify up to 5 rainfall events (including size and duration) for a flood triggering event.

Automated Email Alerts

Automated email alerts will be generated when a pre-defined rainfall threshold is exceeded based upon rainfall information for the area from the High Resolution Rapid Refresh (HRRR) model or as measured by in-situ rain gauges (if the gauges are connected to a cellular plan for data transmittal). HRRR is a longer-term quantitative precipitation forecast (QPF), maintained by the National Weather Service, and provides a forecast up to 18 hours. HRRR is provided in a gridded format, and is generated by numerical weather prediction models which Vieux improves by filling gaps in the operational data stream to enhance reliability.



Rainfall Warning Level Exceeded

Location	Arvada
Type	QPE(RainVieux)
Issued	Tue, Jul 5 12:20 MDT
Max Amount	1.71 in in 1 h
Time Of Max	Tue, Jul 5 12:00 MDT

About Notifications

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Figure 3. An example automated email alert.

The area of coverage will include the City of Alpine and its nearby surrounding areas, up to a radius of 15 km from the city center. The rainfall thresholds are user-defined, and up to 5 thresholds can be set to trigger automated email alerts.

Images from an example email alert are shown in Figure 3. The example automated email alert displays the alert location, maximum storm depth, time of the maximum, and alert type (e.g., HRRR). A map of the radar with a rainfall depth legend accompanies the email alert.

Proposal for Presidio, Texas

Flood Early Warning System

SUBMITTED BY
Sue Swenor
Sales Manager – Texas & Oklahoma
[Phone: 1.512.931.9530 | Email: sue.swenor@aem.eco

DATE
July 11, 2022

Background

There are two primary HUC12 watersheds responsible for runoff production and contribute to flood risk in the City of Presidio: Arroyo Monias-Cibolo Creek and Arroyo Tortola-Rio Grande. Arroyo Tortola-Rio Grande encompasses the majority of Presidio. The flooding risk generated from the Arroyo Tortola-Rio Grande watershed is predominantly from the Rio Grande River and several unnamed arroyos. The main flooding risk generated from the Arroyo Monias-Cibolo Creek watershed in Presidio is Cibolo Creek (Figure 1).

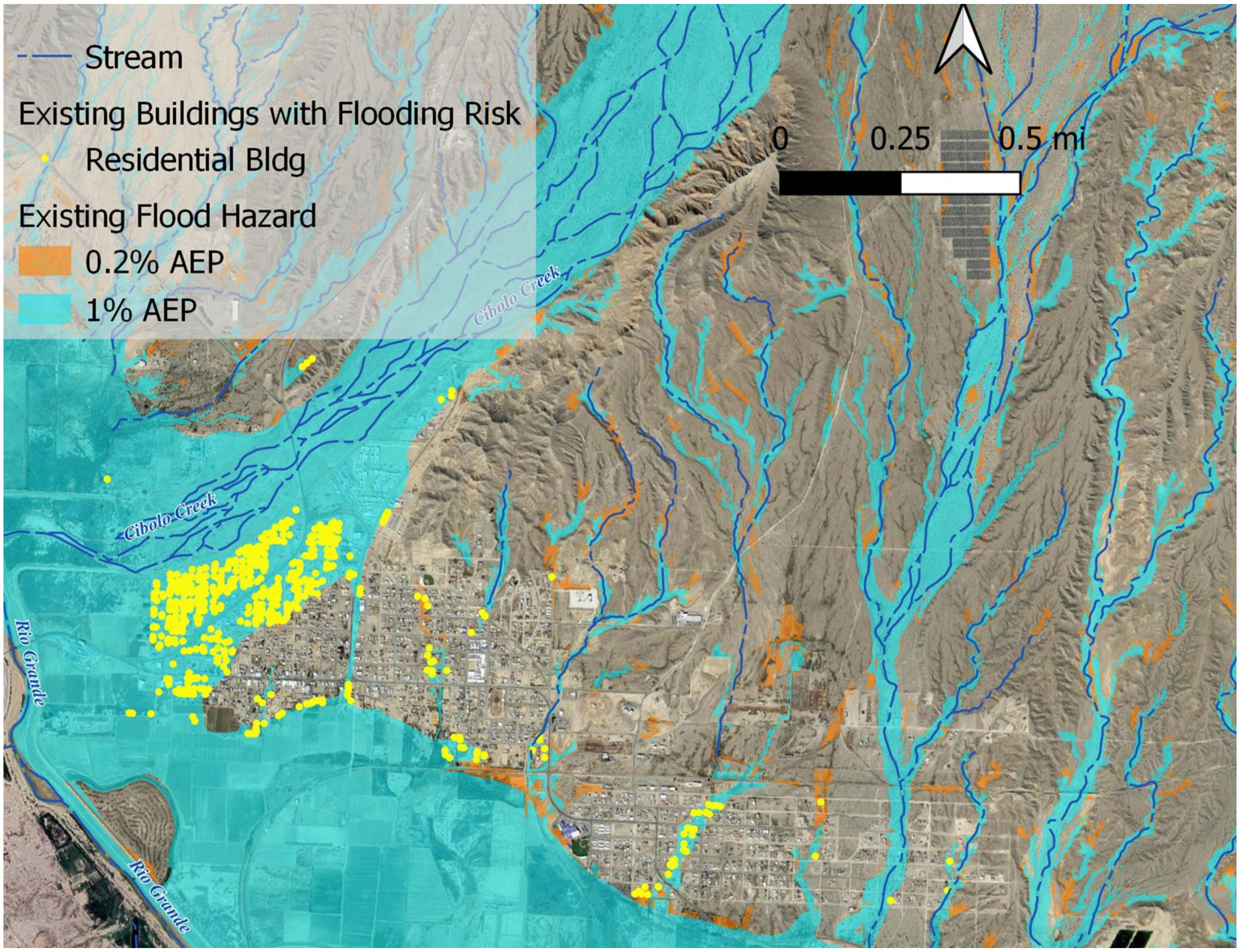


Figure 1. Flooding risk in Presidio, Texas.

There is no NEXRAD radar coverage for Presidio, Texas. However, there are three NWS-ASOS rain gauges in the area surrounding the City. In addition to the NWS-ASOS stations there are two TWDB Mesonet stations, one West TX Mesonet rain gauges, and seven HADS rain gauges in the surrounding area.

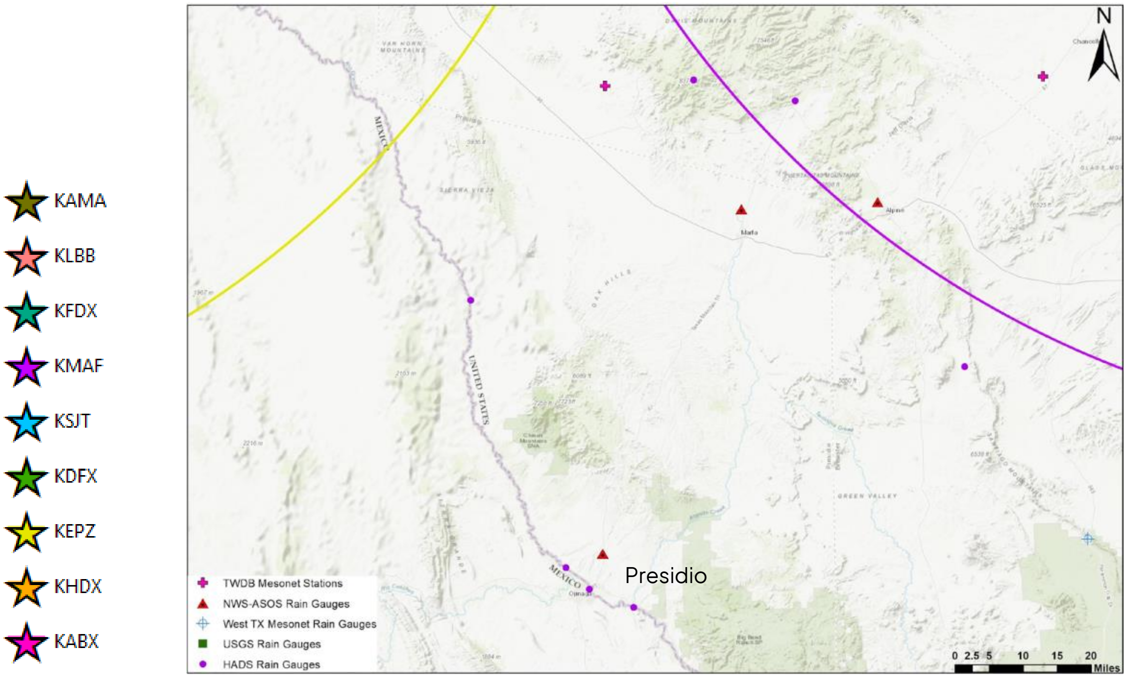


Figure 2. Radar coverage and rain gauge locations for Presidio Texas.

Scope of Services

Vieux & Associates, an AEM brand, proposes one level of service to comprise a Flood Early Warning System for the City of Presidio, Texas.

Level 1 of the Flood Early Warning System recommends the installation of new hardware for in situ measurement of rainfall and water elevation combined with a monthly subscription for automated email alerts that provide the rainfall forecast along with measurement from the sensors, if the sensors are connected to a cellular network to transmit data in real time. The rainfall forecast product that will be provided is the High Resolution Rapid Refresh model, which is an 18-hour quantitative precipitation forecast produced by the National Weather Service. Additionally, a rain gauge network and alert threshold analysis is recommended to evaluate the current rain gauge network, make recommendations for the installation of additional hardware along with specifications for a low cost, compact weather station, and establish region-specific alert thresholds for the automated email alerts. More information about these services can be found in the Appendix.

Cost Proposal

The quoted cost proposal for Level 1 of the Flood Early Warning System is listed below. The quote is valid until January 1, 2023.

No.	Item	Unit	Amount	Quantity	Total
1	Automated Email Alerts				
	HRRR Forecast	Recurring Monthly	$500	12	$6,000
	In Situ Sensors (up to 15 sensors if transmitting data in real time over a cellular network)	Recurring Monthly	$500	12	$6,000
	Alert Configuration & Set Up	Labor	$900	1	$900
2	Rain Gauge Network and Alert Threshold Analysis	Labor	$40,680	1	$40,680
3	Wireless Weather Station with Console for Measuring Rainfall, Temp/RH, Wind Speed Note: Requires AC Power	Each	$910.00	1	$910.00
	Mounting Hardware	Each	$150.00	1	$150.00
Level 1 Total Fixed Price[1] =					**$54,640.00**

*The Level 1 Total Fixed Price assumes 12 months for the automated email alerts and complete set-up for one wireless weather station. The number of months for automated email alerts and quantity of weather stations is an estimate for the purpose of this quote and can be adjusted according to the recommendations made as part of the rain gauge network analysis.

Appendix

Hardware

A compact, low-cost weather station that provides measurements of precipitation, temperature, relative humidity, wind speed and direction, and barometric pressure is recommended. The hardware package for this station includes a small desktop console for viewing real-time data so decision makers can take appropriate action. Each weather station can be configured to transmit data in real time using a data plan from any cellular provider; without a data plan, the data can be collected and viewed on the console. Note that without a data plan, data collected from this weather station cannot be included in the automated email alerts.

Rain Gauge Network and Alert Threshold Analysis

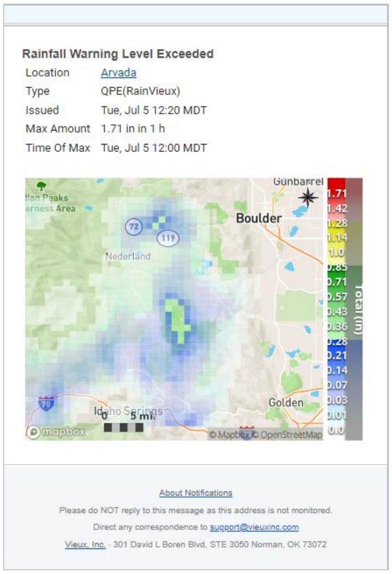
A rain gauge network analysis will be conducted that evaluates the existing rain gauge network, placement of existing gauges, and makes recommendations for the installation (including location and number) of new rain gauges to create a full coverage rain gauge network. The findings from the rain gauge network analysis will be documented in a technical memorandum. The alert threshold analysis will be conducted to analyze historical rainfall events and identify up to 5 rainfall events (including size and duration) for a flood triggering event.

Automated Email Alerts

Automated email alerts will be generated when a pre-defined rainfall threshold is exceeded based upon rainfall information for the area from the High Resolution Rapid Refresh (HRRR) model or as measured by in-situ rain gauges (if the gauges are connected to a cellular plan for data transmittal). HRRR is a longer-term quantitative precipitation forecast (QPF), maintained by the National Weather Service, and provides a forecast up to 18 hours. HRRR is provided in a gridded format, and is generated by numerical weather prediction models which Vieux improves by filling gaps in the operational data stream to enhance reliability.

The area of coverage will include the City of Presidio and its nearby surrounding areas, up to a radius of 15 km from the city center. The rainfall thresholds are user-defined, and up to 5 thresholds can be set to trigger automated email alerts.

Images from an example email alert are shown in Figure 3. The example automated email alert displays the alert location, maximum storm depth, time of the maximum, and alert type (e.g., HRRR). A map of the radar with a rainfall depth legend accompanies the email alert.



Rainfall Warning Level Exceeded

Location	Arvada
Type	QPE(RainVieux)
Issued	Tue, Jul 5 12:20 MDT
Max Amount	1.71 in in 1 h
Time Of Max	Tue, Jul 5 12:00 MDT

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Figure 3. An example automated email alert.

Proposal for Fort Stockton, Texas

Flood Early Warning System

SUBMITTED BY

Sue Swenor
Sales Manager – Texas & Oklahoma
[Phone: 1.512.931.9530 | Email: sue.swenor@aem.eco

DATE
July 11, 2022

Background

There are three primary HUC12 watersheds responsible for runoff production and contribute to flood risk in the City of Fort Stockton: Headwaters Comanche Creek, Fivemile Mesa-Comanche Creek, and City of Fort Stockton-Twomile Hill. The Headwaters Comanche Creek watershed covers the southern portion of Fort Stockton, and the main flooding risk generated from this watershed is Comanche Creek and its tributaries (Figure 1). Comanche Creek flows north into the Fivemile Mesa-Comanche Creek watershed, and is the main flood risk for Fort Stockton in the Fivemile Mesa-Comanche Creek watershed. The flooding risk generated from the City of Fort Stockton-Twomile Hill watershed is pluvial flooding, because only the headwaters are located in Fort Stockton.

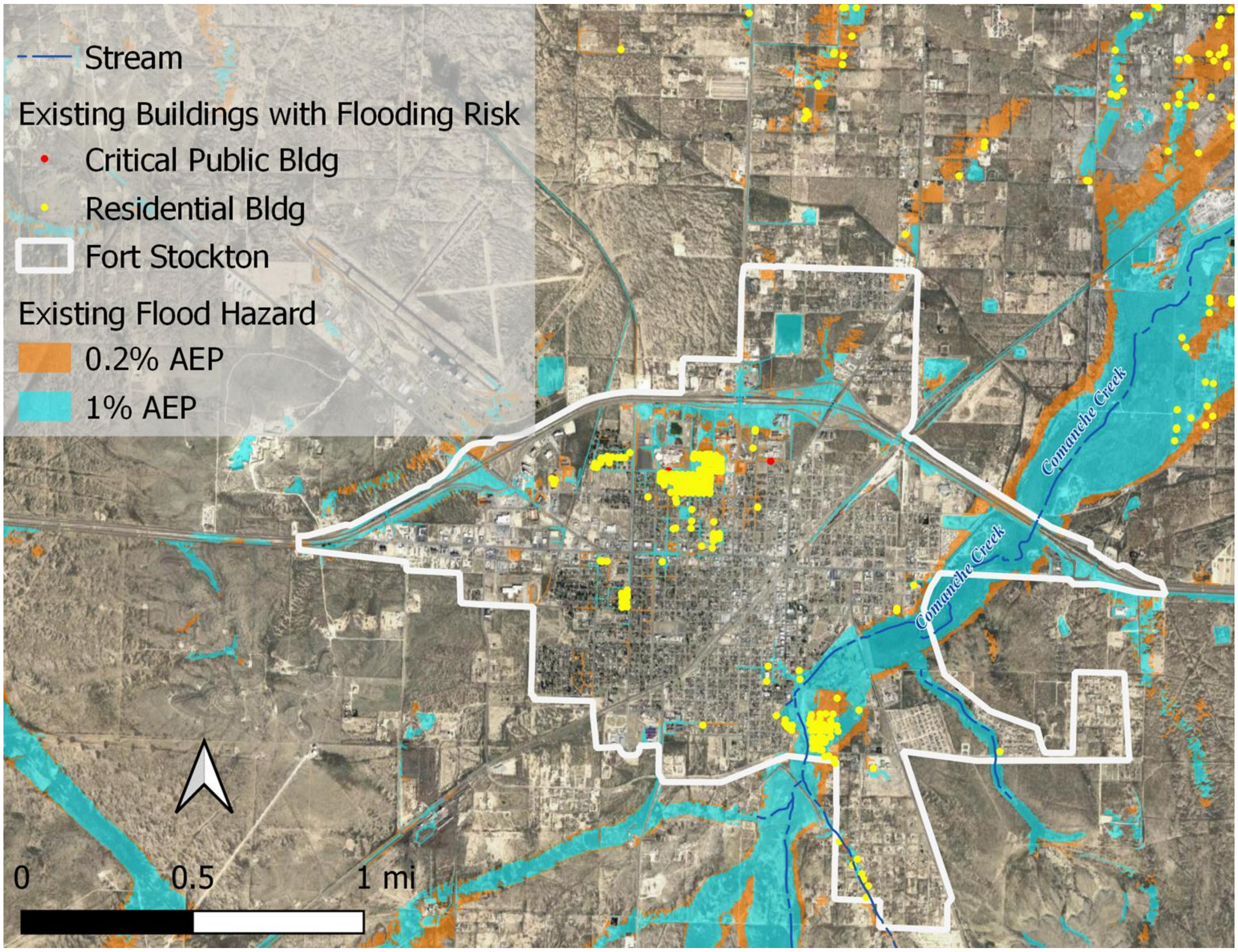


Figure 1. Flooding risk in Fort Stockton, Texas.

Only one radar source, KMAF (Midland, Texas), provides coverage to Fort Stockton, Texas. The City sits just outside the coverage radar for KSJT (John Murtha Johnstown Cambria County Airport, Texas), shown in Figure 2, and there is no backup radar.

There is one NWS-ASOS rain gauge in Fort Stockton (Figure 2) and 11 additional gauges in the surrounding area. In addition to the NWS-ASOS stations there are ten TWDB Mesonet stations, eight West TX Mesonet rain gauges, seven USGS rain gauges, and 12 HADS rain gauges in the surrounding area.

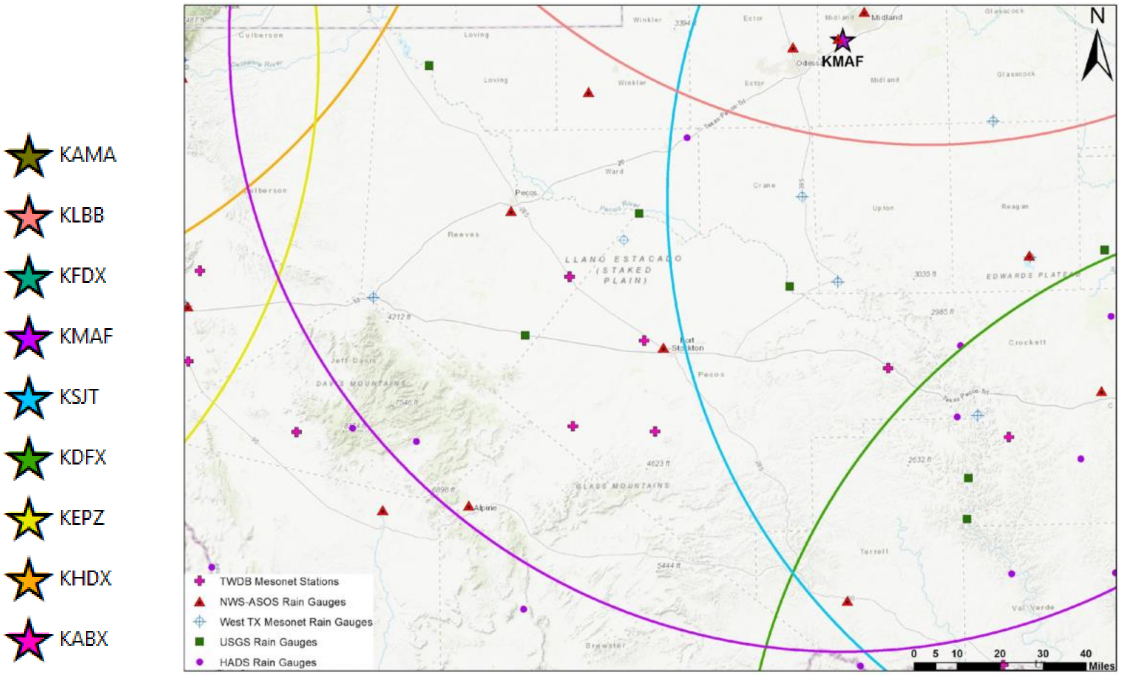


Figure 2. Radar coverage and rain gauge locations for Fort Stockton, Texas.

Scope of Services

Vieux & Associates, an AEM brand, proposes one level of service to comprise a Flood Early Warning System for the City of Ft. Stockton, Texas.

Level 1 of the Flood Early Warning System recommends the installation of new hardware for in situ measurement of rainfall and water elevation combined with a monthly subscription for automated email alerts that provide the rainfall forecast along with measurement from the sensors, if the sensors are connected to a cellular network to transmit data in real time. The rainfall forecast product that will be provided is the High Resolution Rapid Refresh model, which is an 18-hour quantitative precipitation forecast produced by the National Weather Service. Additionally, a rain gauge network and alert threshold analysis is recommended to evaluate the current rain gauge network, make recommendations for the installation of additional hardware along with specifications for a low cost, compact weather station, and establish region-specific alert thresholds for the automated email alerts. More information about these services can be found in the Appendix.

Cost Proposal

The quoted cost proposal for Level 1 of the Flood Early Warning System is listed below. The quote is valid until January 1, 2023.

No.	Item	Unit	Amount	Quantity	Total
1	Automated Email Alerts				
	HRRR Forecast	Recurring Monthly	$500	12	$6,000
	In Situ Sensors (up to 15 sensors if transmitting data in real time over a cellular network)	Recurring Monthly	$500	12	$6,000
	Alert Configuration & Set Up	Labor	$900	1	$900
2	Rain Gauge Network and Alert Threshold Analysis	Labor	$40,680	1	$40,680
3	Wireless Weather Station with Console for Measuring Rainfall, Temp/RH, Wind Speed Note: Requires AC Power	Each	$910.00	1	$910.00
	Mounting Hardware	Each	$150.00	1	$150.00
				Level 1 Total Fixed Price[1] =	**$54,640.00**

*The Level 1 Total Fixed Price assumes 12 months for the automated email alerts and complete set-up for one wireless weather station. The number of months for automated email alerts and quantity of weather stations is an estimate for the purpose of this quote and can be adjusted according to the recommendations made as part of the rain gauge network analysis.

Appendix

Hardware

A compact, low-cost weather station that provides measurements of precipitation, temperature, relative humidity, wind speed and direction, and barometric pressure is recommended. The hardware package for this station includes a small desktop console for viewing real-time data so decision makers can take appropriate action. Each weather station can be configured to transmit data in real time using a data plan from any cellular provider; without a data plan, the data can be collected and viewed on the console. Note that without a data plan, data collected from this weather station cannot be included in the automated email alerts.

Rain Gauge Network and Alert Threshold Analysis

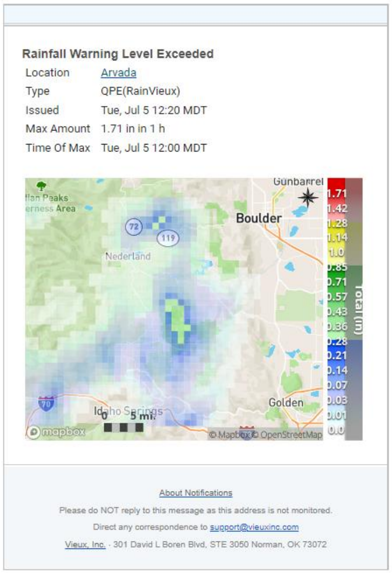
A rain gauge network analysis will be conducted that evaluates the existing rain gauge network, placement of existing gauges, and makes recommendations for the installation (including location and number) of new rain gauges to create a full coverage rain gauge network. The findings from the rain gauge network analysis will be documented in a technical memorandum. The alert threshold analysis will be conducted to analyze historical rainfall events and identify up to 5 rainfall events (including size and duration) for a flood triggering event.

Automated Email Alerts

Automated email alerts will be generated when a pre-defined rainfall threshold is exceeded based upon rainfall information for the area from the High Resolution Rapid Refresh (HRRR) model or as measured by in-situ rain gauges (if the gauges are connected to a cellular plan for data transmittal). HRRR is a longer-term quantitative precipitation forecast (QPF), maintained by the National Weather Service, and provides a forecast up to 18 hours. HRRR is provided in a gridded format, and is generated by numerical weather prediction models which Vieux improves by filling gaps in the operational data stream to enhance reliability.

The area of coverage will include the City of Fort Stockton and its nearby surrounding areas, up to a radius of 15 km from the city center. The rainfall thresholds are user-defined, and up to 5 thresholds can be set to trigger automated email alerts.

Images from an example email alert are shown in Figure 3. The example automated email alert displays the alert location, maximum storm depth, time of the maximum, and alert type (e.g., HRRR). A map of the radar with a rainfall depth legend accompanies the email alert.



Rainfall Warning Level Exceeded

Location	Arvada
Type	QPE(RainVieux)
Issued	Tue, Jul 5 12:20 MDT
Max Amount	1.71 in in 1 h
Time Of Max	Tue, Jul 5 12:00 MDT

About Notifications

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Vieux, Inc. - 301 David L Boren Blvd, STE 3050 Norman, OK 73072

Figure 3. An example automated email alert.

Proposal for Marfa, Texas

Flood Early Warning System

SUBMITTED BY

Sue Swenor
Sales Manager – Texas & Oklahoma
[Phone: 1.512.931.9530 | Email: sue.swenor@aem.eco

DATE
July 11, 2022

Background

There are three primary HUC12 watersheds responsible for runoff production and contribute to flood risk in the City of Marfa: Cuervo Draw-Alamito Creek, Fourmile Draw-Alamito Creek, and Ponder Draw. The Fourmile Draw-Alamito Creek watershed covers the southern portion of Marfa, and the main flooding risk generated from this watershed is an unnamed tributary of Alamito Creek. The main flooding risk generated from the Fourmile Draw-Alamito Creek watershed is an unnamed tributary of Alamito Creek. Alamito Creek is the main flooding risk for Marfa in the Cuervo Draw-Alamito Creek watershed. The contributing drainage area for Alamito Creek in Marfa includes two additional HUC12 watersheds: North Fork Alamito Creek and South Fork Alamito Creek. Efforts to develop a early warning system for Alamito Creek should consider all three HUC12 basins contributing drainage area to the segment of Alamito Creek in Marfa because Alamito Creek is ungauged upstream of Marfa.

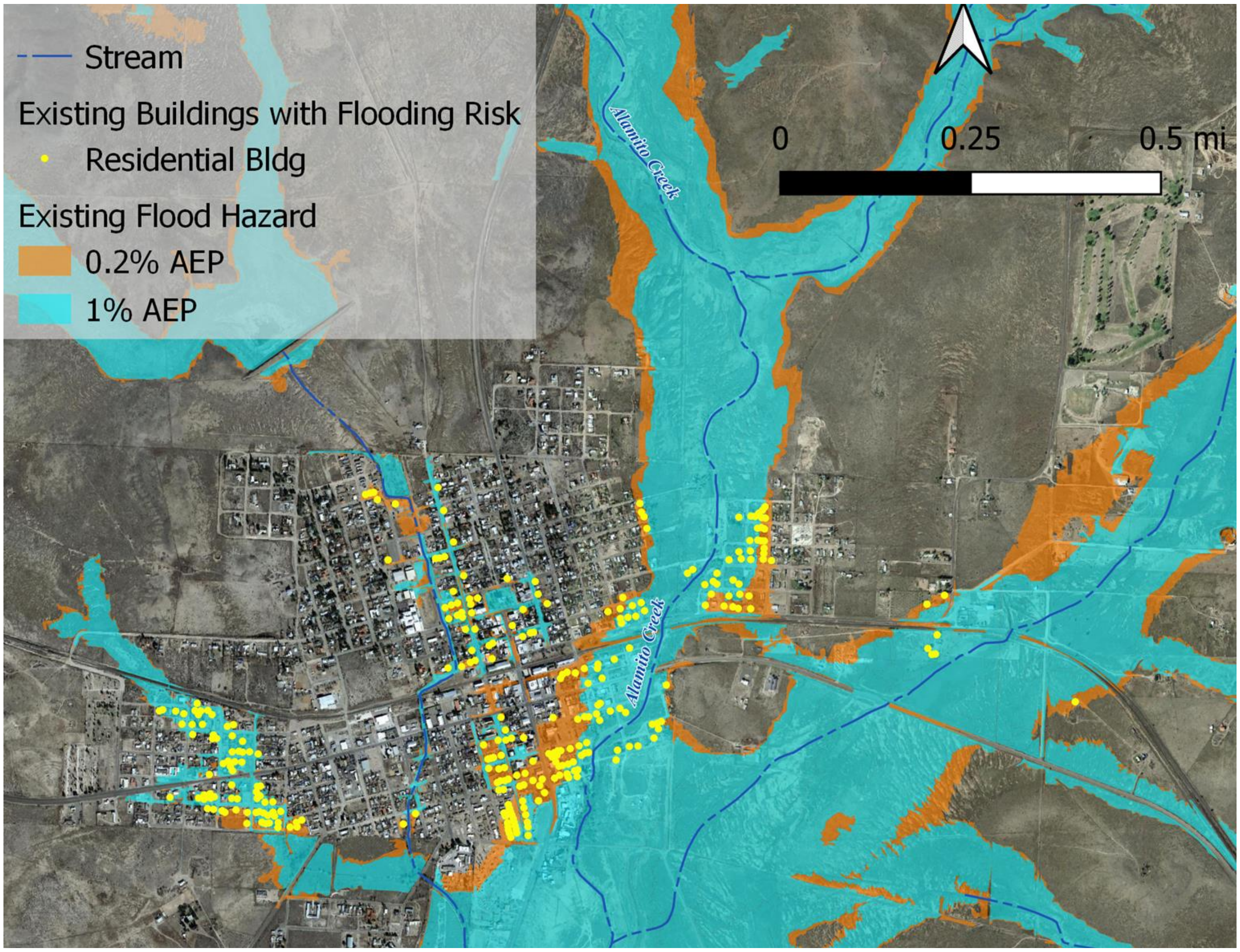


Figure 1. Flooding risk in Marfa, Texas.

There is currently no NEXRAD radar coverage for the City of Marfa because it sits outside the coverage radius of KMAF and KEPZ (Figure 2). However, there are three NWS-ASOS rain gauges in the area surrounding the City. In addition to the NWS-ASOS stations there are two TWDB Mesonet stations, one West TX Mesonet rain gauges, and seven HADS rain gauges in the surrounding area.

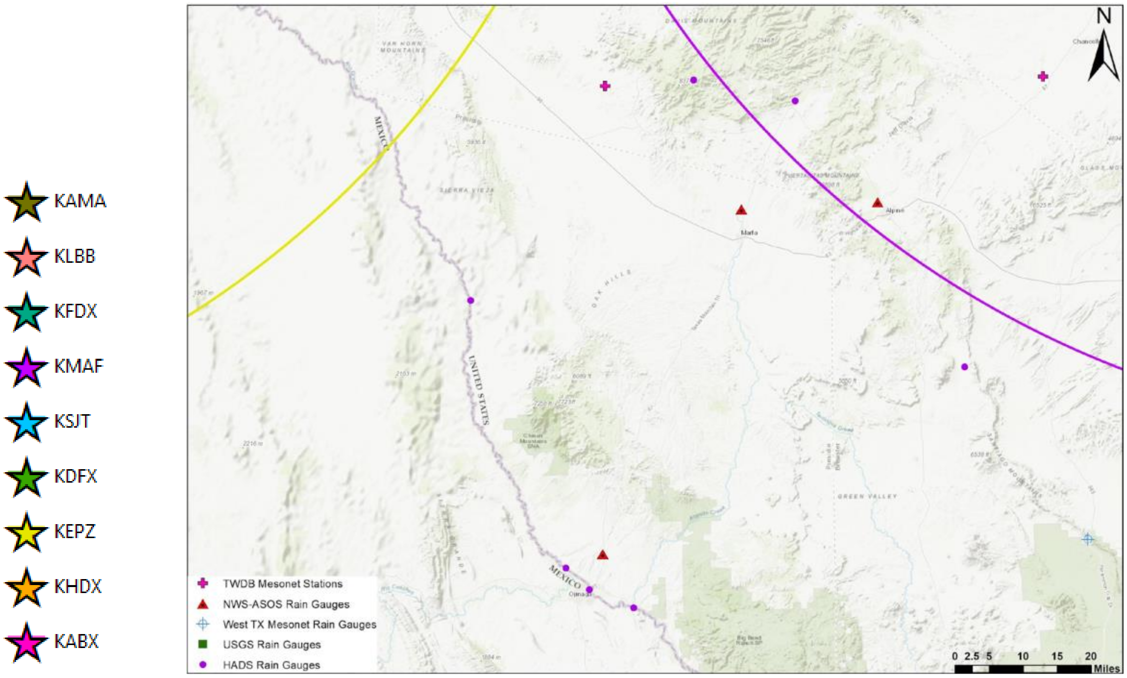


Figure 2. Radar coverage and rain gauge locations for Marfa, Texas.

Scope of Services

Vieux & Associates, an AEM brand, proposes one level of service to comprise a Flood Early Warning System for the City of Marfa, Texas.

Level 1 of the Flood Early Warning System recommends the installation of new hardware for in situ measurement of rainfall and water elevation combined with a monthly subscription for automated email alerts that provide the rainfall forecast along with measurement from the sensors, if the sensors are connected to a cellular network to transmit data in real time. The rainfall forecast product that will be provided is the High Resolution Rapid Refresh model, which is an 18-hour quantitative precipitation forecast produced by the National Weather Service. Additionally, a rain gauge network and alert threshold analysis is recommended to evaluate the current rain gauge network, make recommendations for the installation of additional hardware along with specifications for a low cost, compact weather station, and establish region-specific alert thresholds for the automated email alerts. More information about these services can be found in the Appendix.

Cost Proposal

The quoted cost proposal for Level 1 of the Flood Early Warning System is listed below. The quote is valid until January 1, 2023.

No.	Item	Unit	Amount	Quantity	Total
1	Automated Email Alerts				
	HRRR Forecast	Recurring Monthly	$500	12	$6,000
	In Situ Sensors (up to 15 sensors if transmitting data in real time over a cellular network)	Recurring Monthly	$500	12	$6,000
	Alert Configuration & Set Up	Labor	$900	1	$900
2	Rain Gauge Network and Alert Threshold Analysis	Labor	$40,680	1	$40,680
3	Wireless Weather Station with Console for Measuring Rainfall, Temp/RH, Wind Speed Note: Requires AC Power	Each	$910.00	1	$910.00
	Mounting Hardware	Each	$150.00	1	$150.00
				Level 1 Total Fixed Price[1] =	**$54,640.00**

*The Level 1 Total Fixed Price assumes 12 months for the automated email alerts and complete set-up for one wireless weather station. The number of months for automated email alerts and quantity of weather stations is an estimate for the purpose of this quote and can be adjusted according to the recommendations made as part of the rain gauge network analysis.

Appendix

Hardware

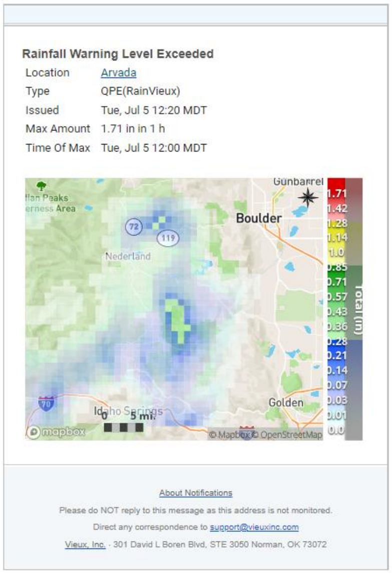
A compact, low-cost weather station that provides measurements of precipitation, temperature, relative humidity, wind speed and direction, and barometric pressure is recommended. The hardware package for this station includes a small desktop console for viewing real-time data so decision makers can take appropriate action. Each weather station can be configured to transmit data in real time using a data plan from any cellular provider; without a data plan, the data can be collected and viewed on the console. Note that without a data plan, data collected from this weather station cannot be included in the automated email alerts.

Rain Gauge Network and Alert Threshold Analysis

A rain gauge network analysis will be conducted that evaluates the existing rain gauge network, placement of existing gauges, and makes recommendations for the installation (including location and number) of new rain gauges to create a full coverage rain gauge network. The findings from the rain gauge network analysis will be documented in a technical memorandum. The alert threshold analysis will be conducted to analyze historical rainfall events and identify up to 5 rainfall events (including size and duration) for a flood triggering event.

Automated Email Alerts

Automated email alerts will be generated when a pre-defined rainfall threshold is exceeded based upon rainfall information for the area from the High Resolution Rapid Refresh (HRRR) model or as measured by in-situ rain gauges (if the gauges are connected to a cellular plan for data transmittal). HRRR is a longer-term quantitative precipitation forecast (QPF), maintained by the National Weather Service, and provides a forecast up to 18 hours. HRRR is provided in a gridded format, and is generated by numerical weather prediction models which Vieux improves by filling gaps in the operational data stream to enhance reliability.



Rainfall Warning Level Exceeded

Location	Arvada
Type	QPE(RainVieux)
Issued	Tue, Jul 5 12:20 MDT
Max Amount	1.71 in in 1 h
Time Of Max	Tue, Jul 5 12:00 MDT

About Notifications

Please do NOT reply to this message as this address is not monitored.

Direct any correspondence to support@vieuxinc.com

Vieux, Inc. · 301 David L Boren Blvd, STE 3050 Norman, OK 73072

Figure 3. An example automated email alert.

The area of coverage will include the City of Marfa and its nearby surrounding areas, up to a radius of 15 km from the city center. The rainfall thresholds are user-defined, and up to 5 thresholds can be set to trigger automated email alerts.

Images from an example email alert are shown in Figure 3. The example automated email alert displays the alert location, maximum storm depth, time of the maximum, and alert type (e.g., HRRR). A map of the radar with a rainfall depth legend accompanies the email alert.

Appendix 4H
Map Exhibits

Chapter 5: Recommended Flood Mitigation Evaluations, Strategies, and Projects

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5. Evaluation and Recommendation of Flood Solutions

This chapter discusses the evaluation and recommendation of Flood Management Evaluations (FMEs), Flood Mitigation Projects (FMPs), and Flood Management Strategies (FMSs) by the Regional Flood Planning Group (RFPG). It describes the general process for evaluating these flood solutions, including the more detailed hydraulic analyses associated with specified FMSs and FMPs. Zoomed in Exhibit Maps are provided for individual flood solutions, and summarized evaluation results tables are presented for recommended flood solutions. The recommended FMEs, FMPs, and FMSs (also referred to as "Flood Solutions") presented in this chapter were discussed and refined with the RFPG throughout the regional flood planning process and were approved by the RFPG in a General RFPG meeting held July 20, 2022.

5.1 Evaluation Process for FMEs, FMPs, and FMSs

As each FME, FMP, or FMS was evaluated throughout the regional flood planning process, relevant issues, changes, and refinements were presented and discussed with the RFPG during General RFPG meetings, meetings for Subcommittee 2 (FMPs), and/or meetings for Subcommittee 3 (FMEs and FMSs). Any feedback provided from the RFPG, stakeholders, or the general public was discussed with the RFPG and/or applicable subcommittee members, and agreed upon changes were incorporated into the evaluations or the scope associated with each flood solution. As FMPs were considered for evaluation, if necessary hydraulic and hydrologic (H&H) modeling was not available, that information was shared with the RFPG, and those projects were evaluated as FMEs rather than FMPs.

Flood Solution evaluations which require additional explanation of methods and assumptions are discussed in this section. These methods and assumptions were applied to estimate specific required flood risk indicators identified in **Appendices 4A, 4C,** and **4E** of *Chapter 4, Identification of Flood Mitigation Needs and Solutions*, respectively. Zoomed-in boundaries of FMEs, FMPs, and FMSs are shown in individual mapbook figures associated with **Exhibit Maps 19, 20,** and **21**, respectively, in **Appendix 5G**. The blue index box label numbers shown in the Index Map of each Exhibit Map in **Appendix 5G** are based upon the last three digits of their respective FME, FMP, and FMS ID numbers, respectively. For example, in **Exhibit Map 21**, Recommended Flood Management Strategies, the index box labeled "24" on the Index Map represents the extent of the zoomed-in mapbook figure for FMS ID: 142000<u>24</u>. The associated mapbook figure is numbered Map 21 of<u>24</u> and shows the zoomed-in boundary for the strategy. Since there are a total of <u>22</u> FMSs recommended in the Regional Flood Plan (RFP), this mapbook figure is Map 21 of <u>22</u>.

Information associated with existing flood risk, scope of work (SOW), cultural resources background (FMPs only), and cost estimates for each FME, FMP, and FMS is provided in narratives included in **Appendices 4B, 4E,** and **4F** of *Chapter 4, Identification of Flood Mitigation Needs and Solutions*, respectively.

5.1.1 Cost Estimates and Potential Funding Sources

Scopes and cost estimates documented in the narratives for typical FMEs include tasks such as Data Collection, Engineering Analysis, Alternatives Development/Selection, Report/ Documentation, and Stakeholder Coordination. Some exceptions include FMEs which involve Supplemental Watershed Plans and Environmental Assessments for the development of alternatives for rehabilitation of dams (FME IDs: 141000012, 141000024, 141000025).

Typical additional costs for FMSs include construction costs or recurring costs, if applicable to the strategy. FMP cost estimates include capital cost breakdowns showing original construction costs estimated from associated SWMPs, converted to September 2020 dollars using the Construction Cost Index, land cost estimates converted to September 2020 dollars using the Consumer Price Index, and the following contingencies:

- 35% Construction Contingency;
- Final Design (20% of Total Construction Cost);
- Permitting (10% of Total Construction Cost); and
- Geotech (15% of Total Construction Costs).

The assumed construction contingency of 35% is consistent with assumptions applied to both the City of El Paso SWMP and the El Paso County SWMP, the primary sources of most of the FMPs evaluated. The additional cost percentages associated with final design, permitting, and geotechnical costs are also consistent with assumptions applied to new projects developed in the 2021 El Paso County SWMP.

A survey was sent to the identified sponsors of each FME, FMP, and FMS to: 1) request permission to include the entity as a sponsor in the RFP, 2) receive feedback on costs estimated and SOWs, and 3) query potential funding sources of each sponsor and possible match percentages. The results of the funding survey are incorporated in the “Potential Funding Sources and Amount” column of the evaluation tables shown in **Appendices 4A, 4C,** and **4E.** Additional results of the funding survey are summarized and discussed in greater detail in *Chapter 9, Flood Infrastructure Financing Analysis*.

5.1.2 Model and Mapping Availability

Only FME evaluation tables require indication of whether floodplain mapping or H&H models, which could potentially be utilized for the FME, are already being developed, or if they are anticipated to be available in the near future. It can be seen in the FME evaluation table in **Appendix 4A** that most available or anticipated H&H models or flood mapping are extremely out of date for all FME areas outside of El Paso County. The reported dates do not consider the anticipated Texas Water Development Board (TWDB) and Federal Emergency Management Agency (FEMA) modeling and mapping effort to develop Base Level Engineering data covering all of Region 14 by 2023.

5.1.3 Emergency Need

As discussed in Chapter 4, flood solutions were identified to be an emergency need based on the following criteria:

- Flood solution is associated with emergency flood response activities, e.g., early warning systems; or
- Flood control infrastructure protecting a populated area has been identified as inadequate by authorities responsible for inspecting and regulating stormwater infrastructure, e.g., FMEs involving dam rehabilitation alternatives based on determination of the dam to be “hydraulically inadequate” by the Texas Commission of Environmental Quality (TCEQ) Dam Safety.

Evaluations resulted in emergency needs being identified for four FMEs (all involve dam rehabilitations for hydraulically inadequate dams per TCEQ), seven FMSs (new stream gages and early warning systems), and one FMP (new stream gage and flood gates).

5.1.4 Evaluation Methodology without Project-Specific Models or Mapping

The evaluation tables in **Appendices 4A, 4C**, and **4E** of Chapter 4 have specific attributes that are common to all three types of flood solutions, and others that are specific to FMEs, FMSs, or FMPs. For example, all FMEs, FMSs, and FMPs include the following analyses:

1. A reference to the specific flood mitigation or floodplain management goal to be addressed;
2. A determination of whether it meets an emergency need;
3. An indication regarding the potential use of federal funds or other sources of funding as a component of the total funding mechanism;
4. A quantitative reporting of the estimated overall cost of the flood solution;
5. A quantitative reporting of the estimated existing 1% annual chance (AC) flood risk affecting the following estimated risk indicators:
    a. Number of structures (all building types, excluding sheds or uninhabitable structures);
    b. Number of residential structures;
    c. Population;
    d. Low water crossings;
    e. Critical facilities;
    f. Number of roads closures occurrences; and
    g. Acres of active farmland and ranchland.

General Methodology for Existing Risk without Project-Specific Data

For FMEs and FMSs without project-specific H&H models or mapping, evaluations of the parameters listed above were typically based on the RFP 1% annual chance flood risk boundaries intersected with enhanced spatial layers for buildings, agricultural land, and other infrastructure, including roadways, low water crossings, and critical facilities. The sources for the development of these spatial layers and the methods used to estimate flood risk region-wide are documented in *Chapter 2, Flood Risk Analyses*.

In some instances, if reliable depth data were available, existing flood risk estimates were based upon a more detailed analysis of estimating maximum depths greater than 0.5 ft associated with the building footprint of each intersecting structure. Only maximum depths greater than 0.5 ft were considered in these analyses to account for potential raised finished floor elevations.

Methods for Road Closures without Project-Specific Data

An exception is the “Estimated Number of Road Closures” required data field. Exhibit D of the Data Submittal Guidelines for the RFP states that the “Estimated Number of Road Closures” to be reported in evaluation tables is the “estimated number of road closure occurrences in the past 10 years.” Since there is not an accessible database that was identified to retrieve this information for the large number of roadways in all areas affected by FMEs, FMSs, and FMPs, high level assumptions were applied. Where project-specific modeling or mapping data were not available and proposed benefits were not analyzed, the 10% AC risk inundation boundaries from the preliminary FEMA data set in El Paso and from the Fathom data set outside of El Paso were used to estimate the number of road segments intersecting the existing inundation boundaries. Roadway segments are defined as continuous lengths of road between intersections, or on highways, between exits.

Methods for Low Water Crossings without Project-Specific Data

As discussed in *Chapter 2, Flood Risk Analyses*, a low water crossing spatial geodatabase layer was developed for the RFP based upon the TNRIS statewide low water crossing database as well as data sets from existing studies identified in Region 14 during the flood planning process. Low water crossings were assumed to be crossings inundated by flood events more frequent (lower intensity) than the 10% AC flood. This low water crossing data set was utilized to estimate the number of low water crossings intersecting the existing 1% AC flood risk boundary developed for the RFP.

5.1.5 Evaluation Methodology for Project-Specific FMSs and FMPs

For FMSs and FMPs that have project-specific H&H models or mapping data available, those data were utilized to estimate the existing flood risk as well as flood risk reductions associated with the indicators listed in 5-a through 5-g from Section 5.1.4. In addition, the FMS and FMP evaluation tables both include the following information which is not in the FME evaluation table:

1. Number of structures removed from the 0.2% AC flood risk;
2. Cost per structure removed;
3. Nature-based solutions;
4. Negative impacts;
5. Negative impact mitigation; and
6. Water supply benefits.

While the presence of nature-based solutions is only required to be reported as "Yes" or "No" for each FMS, FMPs require a calculated percentage of the total project cost for those components of the project. There were four FMSs identified as having nature-based solutions, and one FMS identified to have a water supply benefit. There were no FMPs identified as having nature-based solutions or water supply benefits.

Methods for Structures at Risk with Project-Specific Data

The methods and assumptions related to flood risks and benefits varied depending on the project type and available modeling/mapping data for each project-specific FMS or FMP. However, in general, when proposed condition hydraulic model outputs or mapping were available, water surface elevations and ground elevations were used to estimate flood risk within El Paso County, and Fathom depth data were used for project-specific FMSs or FMPs located outside of El Paso County. Finished floor elevations were assumed to be 0.5 ft above ground elevations intersecting the footprint of a building. Where depth data were utilized to estimate 1% AC flood risk, raised finished floor elevations were considered by subtracting 0.5 ft from the maximum flood depth intersecting a building footprint. Within El Paso County, finished floor elevations of buildings were estimated by adding 0.5 ft to the average ground elevation within a building footprint.

Ground elevations were estimated from the digital terrain surface utilized in the 2019 Preliminary FEMA hydraulic models developed for El Paso County. The topographic sources of this terrain mosaic vary spatially, but primarily consist of Rio Grande QL2 LiDAR data within El Paso city limits, collected in the Fall of 2014. The different sources of the terrain mosaic are documented in the Hydraulic Report for the Preliminary FEMA study (Study ID 21, from **Appendix Table 1D** of *Chapter 1, Introduction and Description of the Upper Rio Grande Flood Planning Region*). A figure of the topographic data sources from Study ID 21 is shown below for reference.

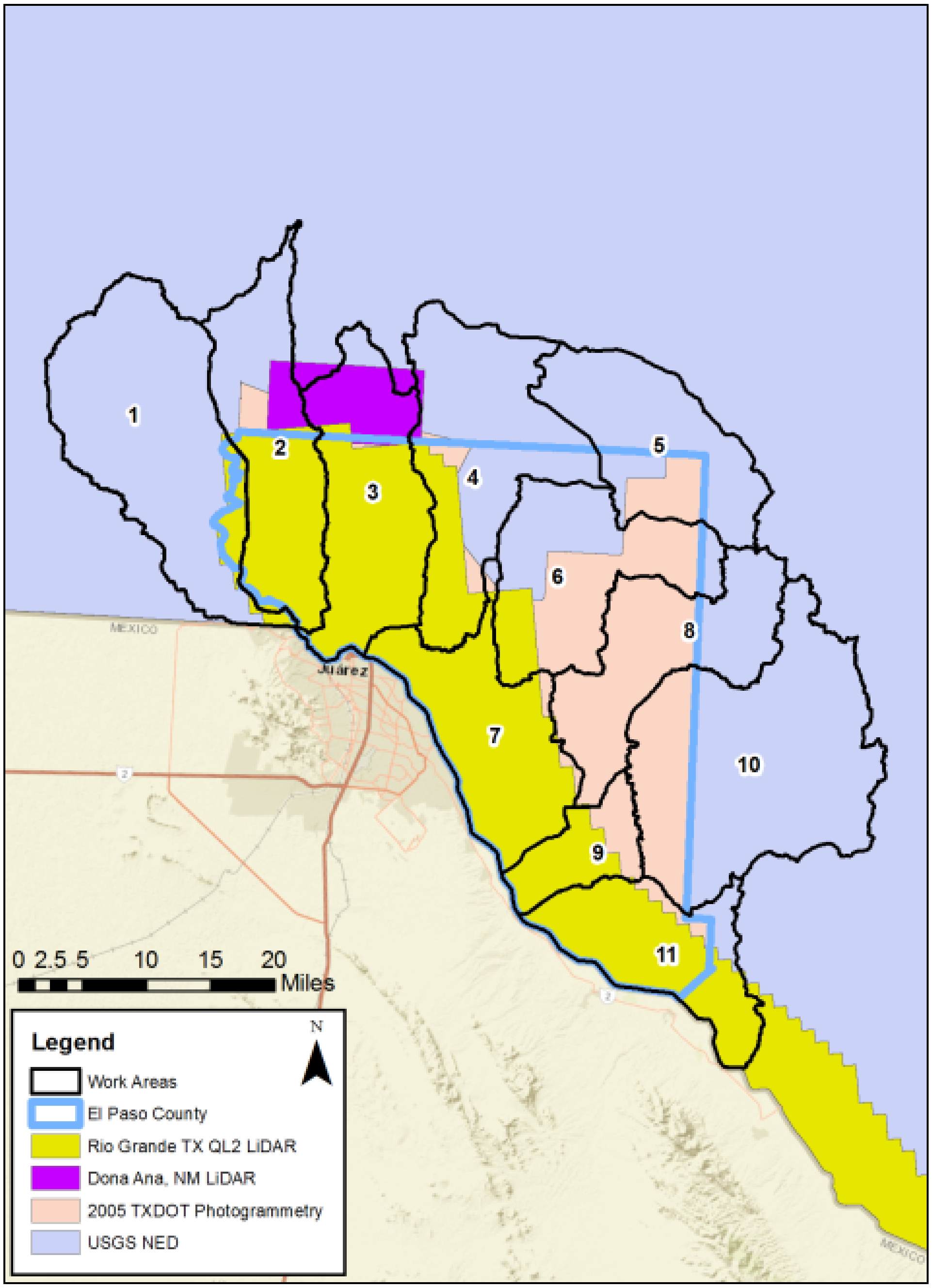

Figure 5.1 Sources of Preliminary FEMA Hydraulic Modeling Terrain (from Study ID 21)

Methods for Structures Removed from 0.2% AC Flood with Project-Specific Data

While all FMPs specified as having 1% AC post-project level-of-service in **Appendix Table 4C** were capable of containing the 1% AC flood based on hydrologic modeling of the upstream watershed, the exact configurations of outfall pipes and auxiliary spillways of detention structures was not modeled at this planning level; so there is uncertainty as to the downstream discharge associated with the 0.2% AC flood event. To be conservative, FMPs and FMSs associated with roadway drainage, storm drain, or channel improvement infrastructure projects were assumed not to have any structures removed from the 0.2% AC flood risk.

However, for FMPs involving detention/retention structures, maximum storage capacities associated with original construction costs were compared to total inflow volumes of the 0.2% AC flood to estimate potential downstream discharges for that event. Diversions were set up in each applicable FMP proposed condition hydrologic models to divert all upstream runoff from the 0.2% AC event into a sink until the total inflow volume reached the capacity of each detention/retention structure. All excess runoff beyond the reported capacity of each structure was discharged downstream. The resulting discharge hydrograph was applied to the corresponding post-project 2D hydraulic model immediately downstream of each proposed structure.

Pre- and post- project water surface elevations were compared at downstream structures at risk to measure reductions in 0.2% AC flood risk. This approach assumed no outflow through a principal or auxiliary spillway. This is a conservative assumption, since outflow from principal and/or auxiliary spillways would likely limit the releases from the 0.2% AC flood.

Methods for Road Closures with Project-Specific Data

In locations where pre- and post-project modeling and mapping data were available for the 1% AC event, roadway closures were estimated based on a scaling factor applied to the 1% AC flood depths on inundated roadways. The scaling ratio was obtained by dividing the 1% AC, 24-hour duration rainfall depth by the 10% AC 24-hour rainfall depth. If the reduced maximum depth on each road segment after applying the scaling factor was less than 0.5 ft, a road closure was assumed for that road segment.

Methods for Low Water Crossings with Project-Specific Data

In locations where pre- and post-project modeling and mapping data are available for the 1% AC event, the number of low water crossings at risk in pre-project and post-project conditions was based upon whether the low water crossing point layer, described in *Chapter 2*, intersected the pre- and post-project 1% AC floodplains.

Methods for Evaluating Water Supply Benefits and Impacts

To report an FMP or FMS as having a water supply benefit, it must be included as a recommended strategy in the most recently adopted State Water Plan with all relevant evaluations relating to Identification and Evaluation of Potentially Feasible Water Management Strategies and Water Management Strategy Projects (as required under §357.34[e]). In addition, FMSs or FMPs that contribute to water supply may not result in an overallocation of a water source based on the water availability allocations in the most recently adopted State Water Plan. Only one potentially feasible FMS meets these criteria (FMS ID: 142000002, Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine). This FMS is recommended in the most recently adopted State Water Plan (TWDB, 2022) as well as in the current Far West Texas Water Plan (TWDB, 2021) for Region E, where it is identified as Strategy E-2, “Irrigation and Recharge Application of Captured Rainwater Runoff.” Details related to the water supply benefits of this strategy and its evaluation methods are provided in *Chapter 6, Impacts and Contribution of Regional Flood Plan.*

While FMS ID: 142000002 is the only water supply project evaluated in the RFP, two other recommended water supply projects from the most recently adopted State Water Plan and Region E Water Plan were identified as having flood benefits in the initial data collection phase of the RFP. These strategies are:

- Strategy E-14, EPW - Hueco Bolson Artificial Recharge; and
- Strategy E-18, El Paso County - EPCWID1 - Regulating Riverside Reservoir.

Based on the FMP selection and prioritization process for identifying potentially feasible FMPs, described in *Chapter 4, Identification of Flood Mitigation Needs and Solutions*, the above strategies were presented to the RFPG and included in the FMP scoring/ranking process. Due to limited budget and time available for FMP and FMS evaluations, and because other potentially feasible FMPs were anticipated to have more significant expected flood benefits, the RFPG chose not to evaluate these two strategies.

Methods for Evaluating Negative Impacts with Project-Specific Data

FMSs and FMPs are required to demonstrate that they will not negatively affect a neighboring area. While this criterion did not require analyses to demonstrate for non-structural FMPs or FMSs such as FMP ID: 143000007 (stream gage and flood gates in Marfa) or FMP ID: 143000009 (Hudspeth County floodplain ordinance), the documentation of engineering analyses and/or assumptions is required for FMSs or FMPs involving proposed flood control infrastructure.

The methods for demonstrating no negative impact varied for each FMS or FMP involving flood infrastructure projects. To document the methods and assumptions associated with the negative impact analysis, it is necessary to explain the source and type of H&H models used in the flood risk analysis for existing and proposed conditions. This level of explanation is provided for project-specific FMSs in **Appendix 5A**, and for project-specific FMPs in **Appendix 5B**. These appendices provide an overview of modeling methods and assumptions for specific FMSs and FMPs, respectively, as well as documentation explaining why none of the proposed FMSs or FMPs are anticipated to have a negative impact on neighboring areas. In addition, **Appendix Table 5D** (“Flood Mitigation Projects Recommended by RFPG”) includes a column entitled, “How No Negative Impact was Determined,” which specifies the method and/or models used to assess pre-project vs. post-project conditions to confirm that no negative impacts are anticipated on neighboring areas to FMPs.

Since no negative impacts are anticipated, there are no negative impact mitigations recommended to address potential negative impacts of FMSs or FMPs. **Appendix 5H** includes a table of building IDs which were analyzed for FMPs which have project-specific models and floodplain mapping for existing and proposed conditions. These tables demonstrate no negative impacts of depths at buildings for the proposed 1% annual chance event relative to existing conditions. In addition, the spatial data (GIS building polygons) associated with the data table in **Appendix 5H** is provided in the “FPR14_Supplemental” geodatabase for the Region 14 RFP, named “Appendix_5H_FMP_Flooded_Structures.gdb”

H&H Modeling and Mapping Methods for FMSs

Evaluations of all potential FMEs and most potentially feasible FMSs were performed at a reconnaissance or screening-level, unsupported by associated detailed H&H analyses. The exceptions were the following three FMSs, which had specified hydrologic, hydraulic, and/or mapping information available that could be used to estimate proposed FMS benefits:

- FMS ID: 142000001, FEMA Levee Accreditation for All Rio Grande Levees at El Paso (see **Exhibit Map 21.01**);
- FMS ID: 142000004, Coordination with Ft. Bliss for FMP Permitting and Maintenance Access (see **Exhibit Map 21.04**); and
- FMS ID: 142000008, Develop Certification Package for Cibolo Creek Channel and Levee (see **Exhibit Map 21.08**).

Individual mapbook figures displaying zoomed-in project locations and existing downstream flood risk areas are provided as part of **Exhibit Map 21** (see specified mapbook figure numbers listed above for each FMS). In addition, **Exhibit Map 22** shows a region-wide map of H&H model coverage extents, with coverage areas displayed according to Model IDs. Each Model ID coverage area also has an individual mapbook figure (44 total).

Each of these three FMSs were analyzed to estimate potential flood benefits as well as demonstrate no negative impacts on neighboring areas. Methods and assumptions related to these evaluations are discussed for each FMS in the **Appendix 5A**, along with documentation of the process used to estimate that each project-specific FMS noted above will have no negative impact on neighboring areas. The remaining FMSs are not estimated to have a direct effect on 1% AC flooding; therefore, no flood benefits or impacts are anticipated or reported.

H&H Modeling and Mapping Methods for FMPs

Appendix 5B explains sources of H&H models, mapping, and other information utilized to estimate pre-project and post-project benefits for specific FMPs evaluated in the RFP. Each project-specific FMP was analyzed to estimate potential flood benefits as well as demonstrate no negative impacts on neighboring areas. Individual mapbook figures displaying zoomed-in project locations and existing downstream flood risk areas are provided as part of **Exhibit Map 20** (with specified mapbook figure numbers corresponding to the last three digits of each FMP ID). In addition, **Exhibit Map 22** shows a region-wide index map of H&H model coverage extents, with coverage areas displayed according to Model IDs. Each Model ID coverage area also has an individual mapbook figure (44 total). **Appendix 5B** also documents the Benefit Cost Analysis (BCA) and the process used to estimate that each FMP will have no negative impact on neighboring areas.

5.1.6 Evaluations Applicable to FMPs Only

For applicable FMPs involving infrastructure projects, evaluation data fields unique to just FMPs include the following estimates:

- Reductions in injuries or fatalities (if available);
- Pre- and Post- Project Levels of Service;
- Social Vulnerability Index; and
- Benefit Cost Ratio (BCR).

This section describes methods associated with evaluating each of the risk indicators above.

Methods for Reductions in Injuries or Fatalities

Since this is the first cycle of the RFP, these attributes were not required. However, one of the potentially feasible FMPs evaluated affects public safety at a low water crossing where a flood-related death occurred in Marfa in 2021. The low water crossings and flood gage project in Marfa (FMP ID: 143000007) includes installing a stream gage upstream of Marfa to aid in providing early warning. It also includes installing road closure gates at four low water crossings in Marfa. The flood-related death occurred on June 27-28, 2021, at one of the low water crossings considered in the FMP. The location where a driver was swept away in his vehicle is the low water crossing of Alamito Creek near the intersection of Neville Street and Dallas Street. For this reason, FMP ID: 143000007 is anticipated to have one reduction in fatalities due to the FMP.

Pre- and Post- Project Levels of Service

Each potentially feasible FMP involving flood protection infrastructure was evaluated using H&H modeling and mapping, as described in **Appendix 5B**. The information available to estimate pre-project levels of service depended on the flood events modeled previously in the original studies where projects were initially conceived. In most cases, only 1% AC flood events were previously modeled for pre-project conditions, and those conditions involved flood damages to property. Therefore, in most cases, the minimum event known to cause flood damages is the 1% annual chance storm, and the pre-project level of service is reported as "<1% annual chance". If previous studies documented the pre-project levels of services for higher frequency events than the 1% annual chance, and provided the associated models for those evaluations, a pre-project level of service is identified in **Appendix 4C** according to the highest frequency (lowest intensity) flood event known to incur damages on public property.

Since the 1% and 0.2% AC events were modeled for all proposed FMPs associated with stormwater detention/retention structures, the post-project level of service could be documented for each of those projects. All projects which were reported to be designed for the 1% annual chance event in previous studies were documented as providing a 1% annual chance level of service. This required engineering judgment in some cases where a detention structure is proposed to include a principal spillway outfall, which would allow outflow during an event. Since the exact principal spillway elevations and configurations were not provided, the previously reported capacity for the detention/retention structure was compared to the total inflow volume for 1% annual chance event with no outflow assumed. In cases where the total inflow exceeded the structure's reported capacity with no outflow, engineering judgment was applied to estimate whether the proposed principal spillway described in the previous study would allow for sufficient discharge from the structure, such that the 1% annual chance capacity would not be exceeded in a flood event.

Estimating the level of service for the 0.2% annual chance required different assumptions, since the elevation and dimensions of an auxiliary spillway outfall can have a significant effect on water surface elevations and outflows of a detention/retention structures. Since the precise outflow configurations were not reported or modeled in previous studies for all projects, only the FMPs with model results showing they could contain the entire 0.2% AC flood with no outflow were reported to have a 0.2% AC post-project level of service.

Social Vulnerability Index

The buildings layer used to estimate number of structures at risk for the 1% AC event was attributed with data from the Social Vulnerability Index (SVI) and day/night population data documented in *Chapter 2* to report the corresponding SVI and population at risk data for each flood solution, respectively.

Benefit Cost Ratio

Consistent with TWDB guidelines, benefits associated with FMPs considered in the evaluation process are based upon pre-project and post-project water surface elevations relative to estimated finished floor elevations, assumed to be raised 0.5 ft above existing ground. The existing ground elevation for each building was estimated by calculating the average ground level within each building footprint, based upon the same topographic data used to estimate water surface elevations. Annual structural benefits were estimated for the 1% and 0.2% AC events by comparing the depth of water above each finished floor elevation to the residential and commercial building depth-structure damage curves and depth-content damage curves provided in the FEMA BCA toolkit 6.0 by TWDB.

Benefit Cost Analysis (BCA) methodology was adopted from the El Paso County SWMP 2021 methods with updates applied for the purposes of the RFP, including the use of the FEMA BCA toolkit 6.0 depth-damage and depth-content curves. Each detention/retention basin project expected to have significant undeveloped flow contributing to it was assumed to have annual operation and maintenance (O&M) costs of $10,000 associated with sediment clearing.

The sum of the annual structural and agricultural benefits was divided by the annualized project cost with a discount rate of 2.75% and a planning horizon of 50 years to obtain the BCR for each project. Flooded roadways were not directly evaluated for benefits associated with the BCR, so it is anticipated that the projects will have higher BCRs than presented in the FMP evaluation table (**Appendix 4C**). A summary of the estimated BCR calculations for each of the FMP which reported any 1% AC benefits is provided in **Appendix 5B**.

5.2 Recommendation Process for FMEs, FMSs, and FMPs

The process for recommending FMEs, FMSs, and FMPs includes coordination with the RFPG throughout the regional flood planning process. As new information became available or as evaluations were completed, evaluation results were shared with the RFPG during periodic

General RFPG Meetings. The following General RFPG Meetings included votes by the RFPG on Recommended FMEs, FMPs, and/or FMSs:

- General RFPG Meeting held April 21, 2022;
- General RFPG Meeting held May 25, 2022; and
- General RFPG Meeting held July 20, 2022.

Each of the Recommended FMEs, FMPs, and FMSs are included in **Appendices 5C**, **5D**, and **5E**, respectively. The general reason for recommendation for each FME, FMS, and FMP is that the evaluated Flood Solutions were in alignment with RFPG and stakeholder goals. All of the flood solutions which were fully evaluated, and which are presented **Appendices 4A, 4C**, and **4E** were also recommended by the RFPG. Two projects from the El Paso County SWMP (CAN1 and FAB1) were initially identified to be evaluated as FMP for the RFP, but the evaluations were not completed because likely alternative funding sources were identified for each project. There were no potential FMEs or potentially feasible FMSs or FMPs that were evaluated and found to be infeasible by the RFPG.

Even projects with a lower BCR than expected were recommended by the RFPG, as it was recognized that including the flood solution in the RFP would be a minimum requirement to allow the sponsors to apply for funding for the study, strategy, or project in the future. At the time when sponsors apply for funding, there may have been additional studies performed which can demonstrate higher benefits and a higher benefit cost ratio, which they can submit at that time for consideration. This is the RFPG's understanding based upon communication with TWDB. For example, future grant applications for the same FMPs included in this RFP may include modified designs to alternatives, an increased number of frequency storms analyzed, and/or listing additional benefits that may become associated with each FMP, depending on the evolution of each project.

In addition, each recommended FMP was evaluated based upon scoring criteria required for potential impacts and benefits from the FMP to flood risk, life and safety, the environment, agriculture, recreational resources, navigation, water quality, erosion, sedimentation, and implementation/permitting. This information is presented in **Table 5F** of **Appendix 5F**, "Data Entry Table for TWDB Scoring of Flood Mitigation Projects". The table was filled out according to specific criteria and instructions included in the Technical Guidelines provided by TWDB. Notes applicable to specific scores are also included in the table.

Appendix 5A
Hydrologic and Hydraulic Analysis of Project Specific FMSs

Appendix 5A. Project-Specific Evaluation Methodology for FMSs

This appendix explains sources of hydrologic and hydraulic models, mapping, and other information utilized to estimate pre-project and post-project benefits for specific FMSs evaluated in the RFP. Evaluations of all potential FMEs and most potentially feasible FMSs were performed at a reconnaissance or screening-level, unsupported by associated detailed hydrologic and hydraulic analyses. The exceptions were the following three FMSs which had specified hydrologic, hydraulic, and/or mapping information available which could be used to estimate proposed FMS benefits:

- FMS ID: 142000001, FEMA Levee Accreditation for All Rio Grande Levees at El Paso (see **Exhibit Map 21.01**)
  - Sufficient hydrologic and hydraulic models and mapping available
    - Hydrologic Model ID: 140000000011 (Preliminary FEMA)
    - Hydraulic Model IDs: 140000000001 (Preliminary FEMA) and 140000000003 through 140000000010 (El Paso County Interior Drainage 2021)
- FMS ID: 142000004, Coordination with Ft. Bliss for FMP Permitting and Maintenance Access (see **Exhibit Map 21.04**)
  - Sufficient hydrologic and hydraulic models and mapping available
    - Hydrologic Model IDs: 140000000011 (Preliminary FEMA) and 140000000019 [El Paso County Stormwater Master Plan (SWMP), Montana Sector]
    - Hydraulic Model ID: 140000000001 (Preliminary FEMA) and 140000000020 (El Paso County SWMP, Montana Sector)
- FMS ID: 142000008, Develop Certification Package for Cibolo Creek Channel and Levee (see **Exhibit Map 21.08**)
  - Sufficient mapping available
    - Existing conditions – RFP 1% annual chance flood risk boundary (*see Chapter 2, Flood Risk Analyses*)
    - Proposed conditions – Fathom 1% annual chance flood risk boundary (Model ID: 140000000038)

Individual mapbook figures displaying zoomed-in project locations and existing downstream flood risk areas are provided as part of **Exhibit Map 21** (see specified mapbook figure numbers listed above for each FMS). In addition, **Exhibit Map 22** shows a region-wide map of hydrologic and hydraulic model coverage extents, with coverage areas displayed according to the last two digits of the corresponding Model IDs.

Each of these three FMSs were analyzed to estimate potential flood benefits as well as demonstrate no negative impacts on neighboring areas. Methods and assumptions related to these detailed evaluations are provided in this appendix, along with discussion on the remaining FMSs which were not evaluated for 1% annual chance flood benefits.

5A-1. Mapping Analysis for FMS ID: 142000001

The RFPG has a short-term goal to accredit all levees in El Paso County by 2033 (Goal ID: 14004001). This FMS is associated with achieving that goal. Currently, only one Rio Grande levee is accredited by FEMA, extending through Central and East El Paso. All other existing levees are assumed to not be present in the 2019 Preliminary FEMA 1% annual chance mapping in El Paso County, based upon FEMA regulations. This mapping was also utilized in the RFP as it is a TWDB requirement to assume levees that are not accredited by FEMA are not present in RFP flood risk mapping.

Interior drainage studies are a requirement to certify and accredit levees with FEMA, which would remove areas protected by those accredited levees from the regulatory floodplain. An interior drainage study consists of hydrologic and hydraulic mapping performed to estimate 1% annual chance flood risk on the landward side of a levee. If a FEMA levee is accredited, FEMA will utilize results from the interior drainage analysis and mapping to establish regulatory flood risk inundation boundaries on the landward side of the levee.

Data Sources and FMS Extent

In locations where the levees are assumed not to be present, results from a natural valley flood analysis (2D hydraulic model, FLO-2D software) were utilized by FEMA to develop preliminary regulatory floodplain mapping extents as well as 1% annual chance depth and water surface grids. The National Levee Database, maintained by USACE, includes service area boundaries which can be downloaded as ArcMap (ESRI) GIS shp files for specific levees, where available. These service area boundaries represent locations where areas are protected from flooding due to existing levees.

The FMS boundary shown in **Exhibit Map 21.01** was derived for the RFP, using engineering judgment, to estimate areas at risk from a failure of the existing levees along the Rio Grande which affect flooding in El Paso and are not accredited by FEMA. The two primary flood extents utilized to develop this boundary were the 1% annual chance flood extents from the El Paso County Natural Valley Analysis Pre-LAMP Report (Study ID 41 in Appendix Table 1D from *Chapter 1*), and the service area boundaries for the Rio Grande levees through El Paso County, downloaded from the National Levee Database website.

Pre- and Post- Project Risk Analyses

Original source models were not modified as part of the analysis for this FMS. To estimate existing conditions for this FMS, 1% annual chance inundation extent boundaries and water surface elevation rasters resulting from the hydrologic and hydraulic models associated with the 2019 Preliminary FEMA Mapping study for El Paso County (Model IDs 140000000001 and 140000000011 from Table 2.1 in *Chapter 2*) were utilized. To estimate proposed conditions for this FMS, 1% annual chance inundation extent boundaries and water surface elevation rasters resulting from the hydrologic and hydraulic models developed as part of the 2021 El Paso

County Interior Drainage Study (Model IDs 140000000003 through 140000000010 in Table 2.1 from *Chapter 2*) were utilized.

Pre- and post-project water surface elevations intersecting building footprints within the FMS extent were compared to estimated finished floor elevations, which were assumed to be 0.5 ft higher than the average ground elevation from the terrain used in the Preliminary FEMA models. Structures at risk were assumed for buildings with finished floor elevations lower than pre- or post-project water surface elevations. No flood benefits were assumed for the 0.2% annual chance flood event, since levee accreditation does not require analysis of the 0.2% annual chance flooding.

No Negative Impact Analyses

The potential for this FMS to negatively impact neighboring areas depends upon specific requirements needed for individual levee segments to meet FEMA certification standards. For levee segments which have already been constructed to FEMA standards, but which lack continuous interior drainage studies along the entire levee segment, there are no additional proposed flood infrastructure improvements associated with this FMS. The benefits of accrediting those levee segments are associated with updated flood risk mapping only; therefore, an impact analysis is not required to confirm that this FMS would not negatively impact neighboring areas.

For levee segments which may require various infrastructure improvements to be certified by project sponsors and accredited by FEMA, the necessary improvements should be identified early in the scope of work associated with performing this FMS. Any potential negative flood impacts associated with proposed levee improvements or the construction process for levee improvements, which may be needed to certify existing levees, should be identified by project sponsors early in the design phases of each specific levee project.

5A-2. Modeling and Mapping Analysis for FMS ID: 142000004

This FMS is primarily associated with facilitating coordination between El Paso Water and the U.S. Army to allow for necessary access on Fort Bliss property to maintain two existing dams (Fusselman and Northgate) by removing sediment regularly, and to eventually perform final design and construct two proposed sediment/detention basins. The two proposed basins are NE7 from the El Paso Water SWMP (Study ID: 13) and MON1 from the El Paso County SWMP (Study ID: 26).

Data Sources and FMS Extent

Existing dams and proposed basin areas are identified in **Exhibit Map 21.04**, along with existing downstream areas at risk of 1% annual chance flooding (shown in purple). The flood risk areas downstream of Northgate and Fusselman dams, as well as downstream of the proposed NE7 basin were delineated based upon 2019 Preliminary FEMA 1% annual chance flood extents. Proposed conditions were not modeled for the existing dams since the amount of sediment to be removed and additional storage volume which may become available is unknown at this time. Proposed conditions were not modeled for NE7 because hydrologic and hydraulic models were not available for this proposed project.

Pre-project and post-project conditions for the area associated with the proposed basin, MON1 were mapped based on a hydrologic HEC-HMS model and a 2D hydraulic HEC-RAS model developed for the MON1 project as part of the 2021 El Paso County SWMP (Study ID: 26). The source models were set up with outflow hydrographs from the existing conditions HEC-HMS hydrologic model applied to the proposed 2D hydraulic model terrain in selected locations toward the downstream end of each contributing watershed. As part of the RFP, the existing condition HEC-HMS hydrographs were re-applied to the 2D hydraulic HEC-RAS model to ensure that the latest hydrologic model output hydrographs are consistent with the hydraulic model inputs. The proposed condition model was not modified as part of the RFP.

Pre- and Post- Project Risk Analyses

The 2019 Preliminary FEMA 1% annual chance water surface elevation grids were compared to finished floor elevations to estimate pre- and post-project conditions for the two existing dams and proposed basin NE7.

The post-project conditions hydraulic model obtained from the El Paso County SWMP assumes that all 1% annual chance flood risk upstream of the proposed basin is detained by the basin, resulting in no flow being discharged directly downstream of the proposed basin. All other subbasins affecting discharge downstream of the project, which are applied in the existing conditions model, are still applied in the proposed conditions hydraulic model. Pre- and post-project water surface elevation grids from the MON1 analysis were exported from the 2D hydraulic model results and compared to finished floor elevations of buildings within building footprint areas to estimate structures at risk.

Since proposed conditions were not modeled for the two existing dams or proposed NE7 basin, there were no structures downstream of these project areas anticipated to be removed from 1% annual chance flooding as part of the FMS risk analyses. However, downstream structures with finished floor elevations impacted by 1% annual chance water surface elevations are anticipated to have reduced flood risk, due to the creation of additional flood storage volume upstream. Therefore, these structures were included, along with structures measured to be benefited by the MON1 project, in the reported number of structures with reduced 1% annual chance flood risk in the FMS evaluation table shown in **Appendix 4F**. There were no benefits assumed for the 0.2% annual chance flood.

No Negative Impact Analyses

While proposed condition modeling was not performed for the proposed maintenance of the two existing dams (Northgate and Fusselman) or for the proposed NE7 basin, results of the MON1 analysis showed that post-project downstream water surface elevations are lower than or equal to pre-project water surface elevations. Similar positive benefits would be expected if the two existing dams were maintained by clearing out sediment (because more storage volume would be available), and if the proposed basin NE7 were constructed (it would capture and detain runoff, reducing flows downstream). Therefore, there are no negative impacts estimated for this FMS.

5A-3. Mapping Analysis for FMS ID: 142000008

The RFPG has a long-term goal of accrediting all levees in Region 14 by 2053 (Goal ID: 14004002). In alignment with that goal, this FMS is associated with accrediting the "Presidio, TX, Cibolo Creek Left Levee" as identified in the National Levee Database, maintained by USACE. The extent of the FMS study area is shown on **Exhibit Map 21.08**.

Data Sources and FMS Extent

The National Levee Database includes a service area boundary for this levee, which can be downloaded as an ArcMap (ESRI) GIS shp file. The National Levee Database service area boundary was used as the FMS extent, and represents the area protected from flooding due to the existing Cibolo Creek levee. The 1% annual chance risk boundary developed for the RFP in this location includes a merged inundation extent consisting of the 1% annual chance Fathom flood risk boundary combined with the FAFDS boundary, which assumes the unaccredited Cibolo Creek levees are not in place. This mapping was utilized in the RFP flood risk layer because it is a TWDB requirement to assume levees that are not accredited by FEMA are not present in RFP flood risk mapping.

Interior drainage studies are a requirement to certify and accredit levees with FEMA. The certification and accreditation of a levee would remove areas protected by those accredited levees from the regulatory floodplain. An interior drainage study consists of hydrologic and hydraulic mapping performed to estimate 1% annual chance flood risk on the landward side of a levee. If a FEMA levee is accredited, FEMA will utilize results from the interior drainage analysis and mapping to establish regulatory flood risk inundation boundaries on the landward side of the levee.

An associated FME, to be completed prior to this FMS, is the development of hydrologic and hydraulic models for Cibolo Creek and interior drainage as part of the SWMP for the City of Presidio (FME ID: 141000002). It is expected this interior drainage analysis would be relatively straight forward, since topography does not drain toward the Cibolo Creek levee, but rather, it drains south, toward the Rio Grande. Therefore, significant ponding against the levee from the landward side is not anticipated.

Pre- and Post- Project Risk Analyses

The developers of the Fathom flood risk boundaries were interviewed as part of the regional flood planning process to understand assumptions and modeling methods related to levees in the 2D hydrologic and hydraulic modeling and mapping software. According to the Fathom modelers/developers, the assumptions related to levee protection in the software are consistent with flood protection service areas and information regarding frequency of overtopping included in the National Levee Database (which gets updated periodically as new information becomes available). If the information is not available for a specific levee, the model and mapping results are based upon the quality and resolution of the terrain used in that area, which may or may not capture the continuous raised ground elevations associated with a levee, depending on the height and extent of the levee.

Where the information is available, a National Levee Database field named, "Incipient Overtopping Annual Exceedance Probability (AEP)" specifies the frequency of flood event contained by a levee before it is overtopped. For the Cibolo Creek Left and Right levees, the National Levee Database specifies this AEP as 0.001 (or the 1,000-year return period). Based on the information provided, it is assumed that the Fathom risk layer incorporates levee protection from the 1% annual chance Cibolo Creek riverine flooding within the associated service area obtained from the National Levee Database. Inspection of the Fathom 1% annual chance flood risk layer in this area (shown in purple on **Exhibit Map 21.08**) demonstrates that minimal flood extents are inundated within the FMS extent, which is consistent with the assumptions communicated to the RFPG by the Fathom modelers/developers.

Therefore, to estimate post-project flood risk, it was estimated that the building polygons that intersect the Fathom 1% annual chance risk boundary within the National Levee Database service area are approximately the same number of buildings that would remain in the 1% annual chance flood risk area if a detailed interior drainage analysis were performed, and the levee was accredited by FEMA.

Furthermore, since the RFP 1% annual chance flood risk boundary does not consider the left or right Cibolo Creek levees to be in place, the pre-project flood risk boundary for this FMS was assumed to match the RFP flood risk boundary within the study limits of the National Levee Database service area for the levee. Pre-project flood risk was then estimated by performing a spatial analysis in ArcMap (ESRI) to intersect the building footprint polygons and road layers, documented in *Chapter 2*, with the RFP 1% annual chance flood risk boundary. There were no benefits assumed for the 0.2% annual chance event, due to the high level of uncertainty associated with the capacity and performance of the Cibolo Creek levees relative to the 0.2% annual chance flood.

No Negative Impact Analyses

The potential for this FMS to negatively impact neighboring areas depends upon specific requirements that must be met for the levee segment to meet FEMA certification standards. If the existing left Cibolo Creek levee is already constructed to FEMA certification standards, there would be no proposed flood infrastructure improvements associated with this FMS. The levee accreditation benefits would be associated with updated flood risk mapping only, and an impact analysis would not be required to confirm that the FMS does not negatively impact neighboring areas.

If various infrastructure improvements are required for the levee segment to be certified by project sponsors and accredited by FEMA, the necessary improvements should be identified early in the scope of work associated with performing this FMS. Any potential negative flood impacts associated with proposed levee improvements or the construction process for levee improvements, which may be needed to certify existing levees, should be identified by project sponsors early in the design phases of each specific levee project.

5A-4. FMSs not analyzed for flood risk benefits

The only other FMSs involving potential infrastructure improvements are FMS IDs: 142000002 and 142000003 (discussed in the following subsections), which both involve more conceptual level planning before specific flood benefits can be quantified. The remaining FMSs are non-structural strategies involving early warning systems with recurring costs, developing regulatory standards to be applied by multiple entities, complex stakeholder coordination, or other associated FMEs, FMSs, or FMPs required to be completed prior to implementation. Since these FMSs are not estimated to have a direct effect on 1% annual chance flooding due to the nature of the FMS or the early conceptual phase, no flood benefits are reported, and it is estimated there will be no negative impacts to neighboring areas.

Discussion of FMS ID: 142000002

FMS ID: 142000002 (Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine) involves landscaping design and minor street runoff diversions into rainwater harvesting catchment areas in Kokernot Park in the City of Alpine. Hydrologic calculations were performed as a donation from project supporters to quantify annual water supply benefits (discussed in *Chapter 6*). However, hydrologic and hydraulic models were not available, nor were spatial files defining specific watersheds or project components. This project was selected for evaluation as a strategy since it includes multiple project locations and phases, with some portions already constructed, and others still in need of funding and design.

The strategy is primarily associated with water quality benefits and groundwater infiltration, since the proposed curb cut openings for roadway runoff diversions would only have the capacity to divert very high frequency/low intensity rain events, such as the 50% annual chance event. Since, this strategy is supported by volunteers, including the City of Alpine Street Department, who are in favor of diverting local street runoff into the City park for landscaping and infiltration purposes, this strategy was not evaluated for 1% annual chance flood risk benefits, and it is estimated to cause no negative impacts on neighboring areas.

Discussion of FMS ID: 142000003

FMS ID: 142000003 includes implementing a colonia-wide drainage system and maintenance and outreach program for roadside swales and driveway culverts at Fort Hancock. However, it first requires associated FME ID: 141000014, to be performed, which includes a SWMP for Fort Hancock. The designs developed as part of the SWMP would be used to implement this strategy in a second phase. This strategy also involves a public education and outreach component to inform residents of the importance of maintaining drainage systems. This outreach component of the strategy has a recurring cost. Since the FME ID: 141000014 is required before any proposed designs can be conceptualized, this FMS was not analyzed for flood risk benefits, and it is estimated to cause no negative impacts on neighboring areas.

Appendix 5B
Evaluation Methodology for FMPs

Appendix 5B. Project-Specific Evaluation Methodology for FMPs

This appendix explains sources of hydrologic and hydraulic models, mapping, and other information utilized to estimate pre-project and post-project benefits for specific FMPs evaluated in the Regional Flood Plan (RFP). Each of these Flood Mitigation Projects (FMPs) were analyzed to estimate potential flood benefits as well as demonstrate no negative impacts on neighboring areas. Methods and assumptions related to these evaluations are discussed for each FMP in the following sections.

5B-1. Modeling and Mapping Analysis for FMPs involving Detention/Retention Basins

Four of the FMPs discussed in this section are from the 2021 El Paso County SWMP, while the other two (EA10A and EA9A) are from the El Paso Water SWMP/Americas Ten Dam Study. All of the FMPs in this group of FMPs were modeled with HEC-HMS point discharge hydrographs applied to HEC-RAS 2D Hydraulic models. The first five projects listed below were prioritized and selected for evaluation by the Regional Flood Planning Group (RFPG) using the process for identifying potentially feasible FMPs, documented in *Chapter 4, Identification of Flood Mitigation Needs and Solutions*. The proposed EA9A project was later added to the list of evaluated FMPs by the RFPG, since it was adjacent to EA10A, it was included in the same Americas Ten Study hydrologic and hydraulic models, and it was also included in the El Paso Water SWMP. See the list of evaluated storage basin FMPs below, with corresponding Model IDs from *Chapter 2, Flood Risk Analyses*:

- **FMP ID: 143000011**, SSA4 – Proposed detention basin with sufficient hydrologic and hydraulic models and mapping available (see **Exhibit Map 20.11**)
    - Hydrologic Model ID: 140000000016 (Original Source: El Paso County SWMP)
    - Hydraulic Model ID: 140000000015 (Original Source: El Paso County SWMP)
- **FMP ID: 143000021**, SOC4 – Proposed sediment/detention basin with sufficient hydrologic and hydraulic models and mapping available (see **Exhibit Map 20.21**)
    - Hydrologic Model ID: 140000000017 (Original Source: El Paso County SWMP)
    - Hydraulic Model ID: 140000000018 (Original Source: El Paso County SWMP)
- **FMP ID: 143000024**, MON3 – Proposed sediment/retention basin with sufficient hydrologic and hydraulic models and mapping available (see **Exhibit Map 20.24**)
    - Hydrologic Model ID: 140000000019 (Original Source: El Paso County SWMP)
    - Hydraulic Model ID: 140000000020 (Original Source: El Paso County SWMP)
- **FMP ID: 143000025**, HAC3 – Proposed sediment/retention basin with sufficient hydrologic and hydraulic models and mapping available (see **Exhibit Map 20.25**)
    - Hydrologic Model ID: 140000000021 (Original Source: El Paso County SWMP)
    - Hydraulic Model ID: 140000000022 (Original Source: El Paso County SWMP)
- **FMP ID: 143000105**, EA10A – Proposed sediment/detention basin with sufficient hydrologic and hydraulic models and mapping available (see **Exhibit Map 20.105**)

  - Hydrologic Model ID: 140000000029 (Original Source: Americas Ten Study)
  - Hydraulic Model ID: 140000000028 (Original Source: Americas Ten Study)
- **FMP ID: 143000116**, EA9A – Proposed sediment/detention basin with sufficient hydrologic and hydraulic models and mapping available (see **Exhibit Map 20.116**)
  - Hydrologic Model ID: 140000000029 (Original Source: Americas Ten Study)
  - Hydraulic Model ID: 140000000028 (Original Source: Americas Ten Study)

Data Sources and FMP Extents

Individual mapbook figures displaying zoomed-in project locations and existing downstream flood risk areas are provided as part of **Exhibit Map 20** (see specified mapbook figure numbers listed above for each FMP). In addition, **Exhibit Map 22** shows a region-wide map of hydrologic and hydraulic model coverage extents, with coverage areas displayed according to the last two digits of the corresponding Model IDs.

Pre-project and post-project conditions for the areas associated with the six proposed basins listed above were mapped based on the hydrologic HEC-HMS models and a 2D hydraulic HEC-RAS models listed above. Four of these project area models were originally developed as part of the 2021 El Paso County Interior Drainage Study and the other two (EA10A and EA9A) were developed as part of an unpublished feasibility study recently performed by AECOM for El Paso Water (2021). The proposed EA10A and EA9A sediment/detention basins were also included in the El Paso Water SWMP for the City of El Paso (2021).

All original models obtained were modified for the purposes of the RFP. The source models were set up with outflow hydrographs from the existing conditions HEC-HMS hydrologic models applied to the corresponding proposed 2D hydraulic model terrains in selected locations toward the downstream end of each contributing watershed. As part of the RFP, the existing and proposed condition HEC-HMS hydrographs were re-applied to the 2D hydraulic HEC-RAS models with modifications for the purposes of the RFP analysis, and to ensure that the latest hydrologic model output hydrographs are consistent with the hydraulic model inputs.

Pre- and Post- Project 1% Annual Chance Risk Analyses

The original post-project conditions hydraulic models obtained from the specified sources assume that all 1% annual chance flood risk upstream of the proposed basins are detained by the basin, resulting in no flow being discharged directly downstream of each proposed basin. All other subbasins affecting discharge downstream of the project, which are applied in the existing conditions models, are still applied in the proposed conditions hydraulic models. Pre- and post-project water surface elevation grids from the FMP analyses were exported from the 2D hydraulic model results and compared to finished floor elevations of buildings within building footprint areas to estimate structures at risk.

Pre- and Post- Project 0.2% Annual Chance Risk Analyses

The 0.2% annual chance events were not modeled as part of the original studies. Since this event is required for FMP evaluations in the RFP, meteorological models were added to the existing and proposed HEC-HMS hydrologic models for each project area. The 0.2% annual chance rainfall parameters from the same data source locations as the 1% annual chance rainfall were utilized for the pre- and post-project hydrologic and hydraulic analyses.

Diversions were set up in each applicable FMP proposed condition hydrologic models to divert all upstream runoff from the 0.2% annual chance event into a sink until the total inflow volume reached the capacity of each detention/retention structure. All excess runoff beyond the reported capacity of each structure was discharged downstream. The resulting discharge hydrograph was applied to the corresponding post-project 2D hydraulic model immediately downstream of each proposed structure.

Pre- and post- project water surface elevations were compared at downstream structures at risk to measure reductions in 0.2% annual chance flood risk. This approach assumed no outflow through a principal or auxiliary spillway. This is a conservative assumption, since outflow from principal and/or auxiliary spillways would likely limit the releases from the 0.2% annual chance flood.

However, even with the assumption noted above, FMPs for structures EA10A and EA9A from the El Paso Water SWMP (FMP IDs: 143000105 and 143000116) are estimated to have 0.2% annual chance flood capacity based on the design volumes included in the original 2009 City of El Paso SWMP. This is because existing upstream storage from both natural depressions and constructed features now contains a significant portion of the contributing watershed for each project. This existing upstream storage capacity was not accounted for when the projects were initially conceived in the 2009 SWMP.

No Negative Impact Analyses

The hydraulic analyses performed as part of the RFP demonstrated that post-project downstream water surface elevations extracted at building footprints are lower than or equal to pre-project water surface elevations. Similar positive benefits were observed throughout the study area, as would be expected since the projects add storage volume to reduce downstream flows. Therefore, there are no negative impacts estimated for the four FMPs listed above, from the El Paso County SWMP. The determination of no negative impact is based upon analysis of existing and proposed condition models, using the hydrologic HEC-HMS and hydraulic HEC-RAS models listed for each of the six FMPs referenced at the beginning of this section (Section 5B-1). The existing and proposed hydraulic model results showing depth of flooding at buildings relative to estimated Finished Floor Elevations (FFEs) are provided in **Appendix 5H** for reference. In addition, the spatial data (GIS building polygons) associated with the data table in **Appendix 5H** is provided in the “FPR14_Supplemental” geodatabase for the Region 14 RFP, named “Appendix_5H_FMP_Flooded_Structures.gdb.”

Benefit Cost Ratio

Consistent with TWDB guidelines, benefits associated with FMPs considered in the evaluation process are based upon pre-project and post-project water surface elevations relative to estimated finished floor elevations, assumed to be raised 0.5 feet above existing ground. The existing ground elevation for each building was estimated by calculating the average ground level within each building footprint, based upon the same LiDAR data used to estimate water surface elevations. Annual structural benefits were estimated for the 1% and 0.2% annual chance events by comparing the depth of water above each finished floor elevation to the residential and commercial building depth-structure damage curves and depth-content damage curves provided in the FEMA BCA toolkit 6.0 by TWDB.

Benefit Cost Analysis (BCA) methodology was adopted from the El Paso County SWMP 2021 methods with updates applied for the purposes of the RFP, including the use of the FEMA BCA toolkit 6.0 depth-damage and depth-content curves. Each detention/retention project noted above was assumed to have annual operation and maintenance (O&M) costs of $10,000 associated with sediment clearing. The sum of the annual structural and agricultural benefits was divided by the annualized project cost with a discount rate of 2.75% and a planning horizon of 50 years to obtain the Benefit Cost Ratio (BCR) for each project. Flooded roadways were not directly evaluated for benefits associated with the BCR, so it is anticipated that the projects will have higher BCRs than presented in the FMP evaluation table (**Appendix 4C**). A summary of the estimated BCR calculations for each of the six projects discussed in this section is provided below.

Table 5B.1. BCA Calculations for FMPs involving Detention/Retention Basins

FMP ID	**143000116**	**143000105**	**143000024**	**143000021**	**143000011**	**143000025**
FMP Name	**EA9**	**EA10**	**MON3**	**SOC4**	**SSA4**	**HAC3**
Total FMP Cost Sep (2020)	$11,897,000	$9,647,000	$27,033,000	$2,383,000	$14,744,000	$4,619,000
Discount Rate:	2.75%	2.75%	2.75%	2.75%	2.75%	2.75%
Planning Horizon (years)	50	50	50	50	50	50
Annuity	0.037	0.037	0.037	0.037	0.037	0.037
Average Annual FMP Cost	$440,676	$357,334	$1,001,327	$88,269	$546,131	$171,092
Annual O&M	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
Total Annual Cost	**$450,676**	**$367,334**	**$1,011,327**	**$98,269**	**$556,131**	**$181,092**
Annual Benefit to Houses	$8,367	$8,367	$200,385	$5,828	$77,198	$1,704
Annual Benefit to Agriculture	$4,609	$4,609	$0	$1,303	$4,581	$2,181
Total Annual Benefit	**$12,976**	**$12,976**	**$200,385**	**$7,131**	**$81,779**	**$3,885**
BCR	**0.0**	**0.0**	**0.2**	**0.1**	**0.1**	**0.0**

5B-2. Modeling and Mapping Analysis for FMP ID: 143000100

The **FMP ID: 143000100** (NE3B) project in the El Paso SWMP (also known as Alcan Pond) is a proposed pond located in an highly developed area in northeast El Paso. This pond was originally conceived as part of a feasibility study (MCi, 2017) for El Paso Water entitled, "Northeast Sump Improvements – Hydrologic and Hydraulic Analysis" (Study ID: 89 from *Chapter 1*), where it was modeled with FLO2D software in conjunction with the Will Ruth Pond (Existing Project ID: 1400007), a proposed pond with contributing storm drain system located downstream of Alcan pond. Will Ruth Pond currently has the 100% final design plans completed, and committed funding by the Flood Infrastructure Fund.

Data Sources and FMP Extents

Exhibit Map 20.100 shows the proposed FMP extent as well as the proposed Will Ruth Pond location. The pre- and post-project conditions hydrologic HEC-HMS model (Model ID: 140000000031) and hydraulic FLO-2D model (Model ID: 140000000030) from the above-referenced feasibility study were provided by El Paso Water for the purpose of evaluating this FMP for the RFP. Consistent with the feasibility study, the post-project conditions hydraulic model for this FMP assumes that the proposed Will Ruth Pond, located downstream of Alcan pond, is constructed first. The pre-project hydraulic model assumes that neither Will Ruth Pond nor Alcan pond are constructed, and it is based upon a modified version of the model submitted to FEMA as part of the LOMR Case Number 18-06-0885P (published on June 12, 2018).

Pre- and Post- Project Risk Analyses

While Alcan pond would likely have flood risk benefits downstream of the proposed Will Ruth pond if the Will Ruth pond were not constructed, only the cost of Alcan pond, and the benefits associated with the flood risk area between Alcan pond and Will Ruth pond were considered in the BCR associated with this Project.

The pre-and post-project hydraulic models 2D models developed in FLO-2D software, with HEC-HMS point discharge hydrographs applied directly on the terrain surface, which was modified from existing conditions to represent the proposed pond in the proposed hydraulic model.

Water surface elevation grids from pre- and post-project hydraulic model results were extracted at building footprint polygons to compare depth inundation based on finished floor elevations. Finished floor elevations were assumed to be 0.5 ft above the average FLO-2D terrain elevation within the footprint of each building.

No Negative Impact Analyses

Pre- and post-project water surface elevation grids as well as depth grids were compared to assess potential negative impacts associated with the project. The comparison showed that the only locations where post project depths exceeded pre-project depths were in the location of the proposed pond. Buildings in the location of the proposed pond were not assumed to have negative impacts as the project would not be constructed if they remained in place. None of the buildings analyzed within the affected flood risk area between the two ponds were observed to have increased water surface elevations. Therefore, this FMP is estimated to have negative impacts.

The determination of no negative impact is based upon analysis of existing and proposed condition models, using the hydrologic HEC-HMS model (Model ID: 140000000031) and hydraulic FLO-2D model (Model ID: 140000000030) from the feasibility study entitled, "Northeast Sump Improvements – Hydrologic and Hydraulic Analysis" (Study ID: 89). The existing and proposed hydraulic model results showing depth of flooding at buildings relative to estimated Finished Floor Elevations (FFEs) are provided in **Appendix 5H** for reference. In addition, the spatial data (GIS building polygons) associated with the data table in **Appendix 5H** is provided in the "FPR14_Supplemental" geodatabase for the Region 14 RFP, named "Appendix_5H_FMP_Flooded_Structures.gdb."

Benefit Cost Ratio

Consistent with TWDB guidelines, benefits associated with FMPs considered in the evaluation process are based upon pre-project and post-project water surface elevations relative to estimated finished floor elevations, assumed to be raised 0.5 feet above existing ground. The existing ground elevation for each building was estimated by calculating the average ground level within each building footprint, based upon the same FLO-2D terrain used to estimate water surface elevations. Annual structural benefits were estimated for the 1% and 0.2% annual chance events by comparing the depth of water above each finished floor elevation to the residential and commercial building depth-structure damage curves and depth-content damage curves provided in the FEMA BCA toolkit 6.0 by TWDB.

Benefit Cost Analysis (BCA) methodology was adopted from the El Paso County SWMP 2021 methods with updates applied for the purposes of the RFP, including the use of the FEMA BCA toolkit 6.0 depth-damage and depth-content curves. The project was assumed to have annual operation and maintenance (O&M) costs of $5,000 associated with clearing the pond and contributing system of trash/sediment/debris. The sum of the annual structural benefits was divided by the annualized project cost with a discount rate of 2.75% and a planning horizon of 50 years to obtain the Benefit Cost Ratio (BCR) for each project. Flooded roadways were not directly evaluated for benefits associated with the BCR, so it is anticipated that the projects will have higher BCRs than presented in the FMP evaluation table (**Appendix 4C**). A summary of the estimated BCR calculations for FMP ID: 143000100 is provided below.

Table 5B.2. BCA Calculations for FMP ID: 143000100

FMP ID	**143000100**
FMP Name	**NE3B**
Total FMP Cost Sep (2020)	$21,234,000
Discount Rate:	2.75%
Planning Horizon (years)	50
Annuity	0.037
Average Annual FMP Cost	$786,527
Annual O&M	$5,000
Total Annual Cost	**$791,527**
Annual Benefit to Houses	$39,646
Annual Benefit to Agriculture	$0
Total Annual Benefit	**$39,646**
BCR	**0.1**

5B-3. Modeling and Mapping Analysis for FMPs Affecting Doniphan Drive

This subsection documents modeling and mapping assumptions for two FMPs (**FMP IDs: 143000111 and 143000113**), which both address flooding on Doniphan Drive in the cities of El Paso, Texas and Sunland Park, New Mexico. This area experiences repetitive localized flooding and sediment/debris damage to multiple buildings and major access road, Doniphan Drive. This is a high priority flood improvement area for El Paso Water. Both FMP IDs: 143000111 and 143000113 are included in the El Paso Water SWMP as NW3 and NW 26, respectively.

Data Sources and FMP Extents

El Paso Water funded a feasibility study (URS, 2014) for FMP ID: 143000111 entitled, “Doniphan Storm Water Pump Stations PS1 and PS2 System Evaluation and Potential Improvements” (Study ID: 90). These pump station locations can be seen along with other relevant stormwater infrastructure in the area in **Exhibit Map 16.111.** The HEC-HMS hydrologic model associated with this study is identified as Model ID: 140000000035. The study recommends a proposed pump station replacement of PS1 with a new 110 cfs pump (1% annual chance capacity) and proposed storm drain system to relieve flooding in localized ponding areas on Doniphan, also shown in **Exhibit Map 16.111**. The hydrologic modeling analysis from the feasibility study considers the following drainage components:

- Existing overland drainage for Doniphan Drive;
- Channel routing for Doniphan Ditch;
- Contributing flows to existing Pump Station, PS1;
- Contributing flows to existing Pump Station, PS2; and
- Storm drain routing of principal spillway outfall for Keystone Dam, a 96-inch diameter RCP connected to Pump Station 1, which discharges to the Rio Grande.

A later feasibility study (AECOM, 2016) for FMP ID: 143000113 entitled, “Technical Memorandum with Project Recommendation, Montoya Drain H&H Analysis” (Study ID: 38) was also performed for El Paso Water to further investigate alternative improvements for flooding along Doniphan Drive with a proposed pond and a constructed wetland (a nature-based solution). The proposed pond and conduit/channel routing flow to it are depicted in **Exhibit Map 16.113**. The hydrologic and storm drain routing HEC-HMS model from the initial feasibility study (Study ID: 90, discussed above) was used as the base model for existing conditions, and it was refined as part of the 2016 study (Model ID: 140000000034).

The 2016 feasibility study defines existing 1% annual chance flood risk based upon the 2013 Courchesne Interior Drainage Study (Study ID: 91). However, since 2013, a more recent interior drainage study has been completed in the area, which is the Doniphan Corridor Interior Drainage Study (Study: ID 64). Mapping from the Doniphan Corridor study is partially incorporated in both the 2019 Preliminary FEMA (Study ID: 21) mapping for El Paso County, as well as the recent 2021 El Paso County Interior Drainage Study (Study: ID 24).

Pre- and Post- Project Risk Analyses

Based upon the history of hydrologic and hydraulic models discussed above, the most updated hydrologic model available for specific design purposes related to these two FMPs is the hydrologic model associated with the 2016 feasibility study (Model ID: 140000000034). Since the Preliminary FEMA mapping in this area is based upon the Natural Valley Analysis (Study ID 41), which assumes there are no Rio Grande levees in place, the most appropriate existing conditions hydraulic model for the 1% AC risk mapping in this area is estimated to be the 2021 El Paso County Interior Drainage Study (Study ID: 24, Model ID: 140000000004), which is a FLO-2D hydraulic model with point discharges applied from a corresponding HEC-HMS model. **Exhibit Maps 16.111** and **16.113** both depict existing 1% annual chance flood risk in this area, which is based upon Study ID: 24 and the following assumptions:

- The existing Rio Grande levees (which are not accredited by FEMA in this area) are in place;
- Tailwater of the interior drainage outfalls to the Rio Grande in the area are associated with typical base flow in the river, and not the 1% annual chance flood in the Rio Grande. This assumption was applied in the El Paso County Interior Drainage study based upon a coincident flooding analysis of the Rio Grande with local interior flooding.

In the pre-project conditions evaluation for both FMP IDs: 143000111 and 143000113, the 1% annual chance water surface elevation raster associated with the El Paso County Interior Drainage Study (Study ID: 24, Model ID: 140000000004) was compared to finished floor elevations extracted from the associated FLO-2D model terrain (assuming finished floor elevations are 0.5 ft higher than existing ground) at intersecting building footprint locations. This comparison was used to estimate the number of existing structures and population at risk.

The Doniphan Pump Station 2014 feasibility study assumes a storm drain system and pump station with 1% annual chance capacity would be installed along repetitive flooding locations of Doniphan and the surrounding area. Therefore, the post-project conditions for FMP ID: 143000111 (Doniphan Pump Station 1 Reconstruction Project, NW3) assume that all the localized 1% annual chance flood risk areas shown in **Exhibit Maps 16.111** are mitigated.

Based upon the information available from the 2016 feasibility study (Study ID: 38) and the recently updated El Paso Water SWMP, the proposed FMP ID: 143000113 (the Montoya Pond/Wetland Project, NW26) is only anticipated to relieve localized flooding coming from the northwest along Doniphan, which does not inundate any buildings according to the pre-project 1% annual chance risk mapping. Therefore, no buildings are anticipated to be removed from flood risk for this FMP.

However, the FMP ID: 143000113 is expected to reduce flooding coming from the northwest on Doniphan toward the buildings that are estimated to be removed from flooding in the post-project conditions for FMP ID: 143000111. Therefore, the number of structures removed from flood risk in FMP ID: 143000111 was estimated to be equal to the number of structures with reduced 1% annual chance flooding in FMP ID: 143000113. Based upon vicinity of the project to the Rio Grande levees, which are not designed for the 0.2% annual chance flood, there are no 0.2% annual chance flood risk benefits assumed for either of the FMPs.

No Negative Impact Analyses

Based upon the modeling and information available about **FMP ID: 143000111**, a new storm drain system along Doniphan Drive is proposed to route 1% annual chance runoff to a proposed reconstructed pump station with additional capacity relative to the existing Pump Station 1, discharging directly to the Rio Grande. This is expected to improve the performance of the Keystone Dam 96-inch RCP outfall conduit, which currently routes stormwater through the existing Pump Station 1. At this conceptual phase of design, and since the nature of flooding in this area is associated with localized flooding, there are no project components or modeling results which are anticipated to have negative impacts on neighboring areas.

This determination of no negative impact for **FMP ID: 143000111** is based upon engineering judgment after reviewing the feasibility study entitled, "Doniphan Storm Water Pump Stations PS1 and PS2 System Evaluation and Potential Improvements" (Study ID: 90) and analysis of existing condition models, using the hydrologic HEC-HMS model (Model ID: 140000000035) and the hydraulic FLO-2D model (Model ID: 140000000004) discussed in this section (Section 5B-3).

For **FMP ID: 143000113**, runoff coming from the northwest, along Doniphan is proposed to be routed to a proposed pond by channel or storm drain. The proposed pond will add storage capacity to the system, and discharge from the pond is proposed to be pumped into the Rio Grande with a new pump station. A series of new pump stations are also proposed to control groundwater levels in the area, creating more additional storage volume, and benefitting the Montoya Drain outfall to the Rio Grande which has historically reported issues related to high groundwater tables in the area. At this conceptual phase of design, and since the nature of flooding in this area is associated with localized flooding, there are no project components or modeling results which are anticipated to have negative impacts on neighboring areas.

This determination of no negative impact for **FMP ID: 143000113** is based upon engineering judgment after reviewing the feasibility study entitled, "Technical Memorandum with Project Recommendation, Montoya Drain H&H Analysis" (Study ID: 38) and analysis of existing condition models, using the hydrologic HEC-HMS model (Model ID: 140000000034) and the hydraulic FLO-2D model (Model ID: 140000000004) discussed in this section (Section 5B-3).

Benefit Cost Ratio

Consistent with TWDB guidelines, benefits associated with FMPs considered in the evaluation process are based upon pre-project and post-project water surface elevations relative to estimated finished floor elevations, assumed to be raised 0.5 feet above existing ground. The existing ground elevation for each building was estimated by calculating the average ground level within each building footprint, based upon the same FLO-2D terrain used to estimate water surface elevations. Annual structural benefits were estimated for the 1% and 0.2% annual chance events by comparing the depth of water above each finished floor elevation to the residential and commercial building depth-structure damage curves and depth-content damage curves provided in the FEMA BCA toolkit 6.0 by TWDB.

Benefit Cost Analysis (BCA) methodology was adopted from the El Paso County SWMP 2021 methods with updates applied for the purposes of the RFP, including the use of the FEMA BCA toolkit 6.0 depth-damage and depth-content curves. Each project was assumed to have annual operation and maintenance (O&M) costs of $5,000 associated with maintaining the pumps and stormwater conveyance systems. The sum of the annual structural benefits was divided by the annualized project cost with a discount rate of 2.75% and a planning horizon of 50 years to obtain the Benefit Cost Ratio (BCR) for each project. Flooded roadways were not directly evaluated for benefits associated with the BCR, so it is anticipated that the projects will have higher BCRs than presented in the FMP evaluation table (**Appendix 4C**). A summary of the estimated BCR calculations for FMP ID: 143000100 is provided below.

Table 5B.3. BCA Calculations for FMPs Affecting Doniphan Drive

FMP ID	**143000111**	**143000113**
FMP Name	**NW3**	**NW26**
Total FMP Cost Sep (2020)	$16,132,000	$35,568,000
Discount Rate:	2.75%	2.75%
Planning Horizon (years)	50	50
Annuity	0.037	0.037
Average Annual FMP Cost	$597,544	$1,317,471
Annual O&M	$5,000	$5,000
Total Annual Cost	**$602,544**	**$1,322,471**
Annual Benefit to Houses	$2,307	$506
Annual Benefit to Agriculture	$0	$0
Total Annual Benefit	**$2,307**	**$506**
BCR	**0.0**	**0.0**

5B-4. Modeling and Mapping Analysis for FMP ID: 143000097

The El Paso Water SWMP identifies **FMP ID: 143000097** as a channel improvement project in northwest El Paso city limits, named NW16. The channel segment is also known as the Upper White Spur Drain, which extends from Village Court to Doniphan Drive. The downstream channel segment on the west side of the Doniphan Drive crossing has been widened; however, the FMP area is identified to be undersized in the SWMP (see FMP area identified in **Exhibit Map 20.97)**. The existing concrete-lined channel has a depth of 3 feet (ft) with side slopes of 1.25 horizontal (H) : 1 vertical (V), and a bottom width of 6 ft. The proposed channel is designed to be 4.5 ft deep with side slopes of 1.25H: 1V, and a bottom width of 6 ft..

Data Sources and FMP Extents

Due to the significant portion of drainage area contributing to this channel from SH20 (Mesa Street), the most appropriate base hydrologic model was assumed to be from the 2019 TXDOT feasibility study for SH20 (Study ID: 59, Model ID: 140000000002), entitled "Drainage Study for SH 20 (Mesa Street) From Doniphan Drive to Texas Avenue." Spatial hydrologic modeling layers such as drainage areas and longest flowpaths, as well as the applicable hydrologic HEC-HMS model were obtained from the SH20 study and were modified for the purposes of the RFP evaluation of FMP ID: 143000097. The base hydrologic model was modified in the RFP to create an updated hydrologic HEC-HMS model (Model ID: 140000000033) to estimate flows contributing to the White Spur Drain.

The most appropriate hydraulic model identified as the base model for this FMP (before modifications) is the 2019 Preliminary FEMA hydraulic 2D HEC-RAS model (Model ID: 140000000001). As part of the evaluation of FMP ID: 143000097 for the RFP, the base hydraulic model was modified to develop a pre-project and post-project conditions 2D hydraulic HEC-RAS model (Model ID: 140000000032).

Pre- and Post- Project Risk Analyses

Output point discharge hydrographs from the modified HEC-HMS model were released onto the HEC-RAS 2D hydraulic model terrain within the White Spur Drain channel. The Preliminary FEMA hydraulic model terrain was developed by FEMA to allow flow to pass through the downstream Doniphan Drive culvert crossing and subsequent downstream crossings with the placement of breaklines rather than the use of 2D connections for detailed culvert hydraulic analyses. As part of the RFP analysis, the 2D hydraulic model mesh was modified with revised breaklines around the White Spur Drain, and the Doniphan Drive culvert crossing was modeled as a 2D connection. The hydraulic model results in the FMP area showed that the upstream portion of the White Spur Drain is undersized, resulting in out of bank flooding affecting commercial buildings adjacent to the channel. However, the model shows flow eventually draining back into the channel further downstream, just upstream of the Doniphan Drive crossing.

Due to limitations associated with 2D models simulating channelized flow, and since survey data were not available for channel flowlines or downstream crossing dimensions, a field visit was conducted to measure relevant channel, culvert, and headwall dimensions. Then, additional CulvertMaster and Flowmaster models were developed to check capacities of existing and proposed channel dimensions, as well as the downstream crossings. Since proposed channel and culvert dimensions were estimated to contain existing 1% AC flows based on the different hydraulic modeling analyses performed, the buildings adjacent to the existing channels were estimated to be removed from flood risk in post-project conditions. Due to the uncertainties associated with capacities of contributing storm drains conveying the 0.2% annual chance runoff into the channel from the various inlets and pipe networks draining to the channel, this event was not modeled in detail, and the FMP was assumed to have no benefits for the 0.2% annual chance flood.

No Negative Impact Analyses

Channel widening projects can sometimes present an increased risk to downstream properties if out of bank flooding from pre-project conditions is contained in post-project conditions, and the channel is undersized further downstream. This FMP is not estimated to have that issue, as the downstream channel segment is already significantly wider (~13 ft bottom width, 6ft depth) than the upstream segment being widened from a bottom width of 3ft to 6ft, with 4.5 ft depth, and flow from the channel is allowed to interact with flow in the adjacent pond downstream and northwest of the channel. Furthermore, pre-project out of bank flooding was observed to re-enter the channel further downstream in the 2D hydraulic model results, which indicates the total flow in the channel is not increasing. As an additional test, the full flows estimated to enter the upper channel segment based on the hydrologic modeling results were released downstream of the Doniphan crossing, and results showed the same flood extents as pre-project conditions. Based upon the analyses described above, it is estimated that this FMP would cause no negative impacts on neighboring areas.

The determination of no negative impact is based upon analysis of existing and proposed condition models, using the hydrologic HEC-HMS model (Model ID: 140000000033) and hydraulic HEC-RAS 2D model (Model ID: 140000000032) described in this section. The existing and proposed hydraulic model results showing depth of flooding at buildings relative to estimated Finished Floor Elevations (FFEs) are provided in **Appendix 5H** for reference. In addition, the spatial data (GIS building polygons) associated with the data table in **Appendix 5H** is provided in the “FPR14_Supplemental” geodatabase for the Region 14 RFP, named “Appendix_5H_FMP_Flooded_Structures.gdb.”

Benefit Cost Ratio

Consistent with TWDB guidelines, benefits associated with FMPs considered in the evaluation process are based upon pre-project and post-project water surface elevations relative to estimated finished floor elevations, assumed to be raised 0.5 feet above existing ground. The existing ground elevation for each building was estimated by calculating the average ground level within each building footprint, based upon the same FLO-2D terrain used to estimate water surface elevations. Annual structural benefits were estimated for the 1% and 0.2% annual chance events by comparing the depth of water above each finished floor elevation to the residential and commercial building depth-structure damage curves and depth-content damage curves provided in the FEMA BCA toolkit 6.0 by TWDB.

Benefit Cost Analysis (BCA) methodology was adopted from the El Paso County SWMP 2021 methods with updates applied for the purposes of the RFP, including the use of the FEMA BCA toolkit 6.0 depth-damage and depth-content curves. The project was assumed to have annual operation and maintenance (O&M) costs of $1,000 associated with trash and debris removal from the channel and contributing storm drain systems. The sum of the annual structural benefits was divided by the annualized project cost with a discount rate of 2.75% and a planning horizon of 50 years to obtain the Benefit Cost Ratio (BCR) for each project. Flooded roadways were not directly evaluated for benefits associated with the BCR, so it is anticipated that the projects will have higher BCRs than presented in the FMP evaluation table (**Appendix 4C**). A summary of the estimated BCR calculations for FMP ID: 143000097 is provided below.

Table 5B.3. BCA Calculations for FMP ID: 143000097

FMP ID	**143000097**
FMP Name	**NW16**
Total FMP Cost Sep (2020)	$1,570,000
Discount Rate:	2.75%
Planning Horizon (years)	50
Annuity	0.037
Average Annual FMP Cost	$58,154
Annual O&M	$1,000
Total Annual Cost	**$59,154**
Annual Benefit to Houses	$2,826
Annual Benefit to Agriculture	$0
Total Annual Benefit	**$2,826**
BCR	**0.0**

5B-5. Modeling and Mapping Analysis for FMP ID: 143000003

The City of San Elizario has communicated to the RFPG several flooding issues associated with their historic district. A 2021 feasibility study was identified, entitled, “Drainage Feasibility Study, Socorro Rd. Intersections with San Antonio St. & Main St.” (Study ID: 49). The feasibility study used TXDOT aerial imagery and topography to delineate a 48-acre drainage area, and used the Rational Method to estimate a proposed 1% annual chance runoff volume of 10.4 ac-ft. The study identified three alternatives for flooding locations in San Elizario:

- Alternative 1 - An 11.5 ac-ft regional pond with contributing storm drain system ($758,493);
- Alternative 2 - A series of park ponds with a total capacity of 6.7 ac-ft ($910,391); and
- Alternative 3 - A small pond with a 0.34 ac-ft capacity ($192,375)

The recommended alternative from the feasibility study is the Alternative 1; however, **FMP ID: 143000003** is associated with Alternative 3 from the feasibility study. The approximate localized flooding extent estimated from the feasibility study is shown in **Exhibit Map 20.03**.

Data Sources and FMP Extents

An analysis performed as part of the RFP, reviewing 2D Preliminary FEMA and Fathom hydraulic model results. In addition, the 2014 LiDAR topography data associated with the Preliminary FEMA study was analyzed in the area, along with aerial imagery to estimate existing flow patterns. A copy of the Preliminary FEMA hydrologic HEC-HMS model (Model ID: 140000000011) for Work Area 7 (WA7) was utilized as the hydrologic model for this FMP (Model ID: 140000000037). Similarly, a copy of the Preliminary FEMA 2D hydraulic HEC-RAS model (Model ID: 140000000001) for WA7 was utilized as the hydraulic model for this FMP (Model ID: 140000000036).

Pre- and Post- Project Risk Analyses

The analysis did not agree with the extent of the drainage area delineated in the feasibility study, which prevented the RFPG from recommending Alternative 1. It is anticipated that in order for the Alternative 1 pond to provide flood benefits for a drainage area of the size estimated in the feasibility study (48 acres), a more extensive storm drain network than the one proposed would be necessary, which was not reflected in the proposed cost for the alternative.

However, through continued coordination with local stakeholders at the City of San Elizario, specific known localized flooding areas near the proposed Alternative 3 small pond location were identified (circled in **Exhibit Map 20.03**). In reference to Alternative 3, the feasibility study states, “This alternative was identified by the City of San Elizario officials due to its practical and close proximity location to the flooding intersections.”

A small local drainage area that could be captured by Alternative 3 without an extensive storm drain network was delineated at approximately 3 acres. City of San Elizario utilizes the City of El Paso Drainage Design Manual (COEP, 2008) to regulate stormwater design. The feasibility study utilized “El Paso Design Standards for Construction,” dated June 2008 (COEP-DSC) to estimate the 1% annual chance volume required for retention basins such as the Alternative 3 pond. These standards require a 4-inch rainfall depth for the 1% annual chance event, which is between the 12-hour and 24-hour duration rainfall depth in this area according to NOAA Atlas 14 rainfall. Assuming the reduced drainage area of approximately 3 acres results in a 1% annual chance volume of 0.65 acre-feet.

Since the proposed Alternative 3 volume is 0.34 acre-feet, it is not anticipated to contain the 1% annual chance event based on these standards. Assuming a similar storm duration as the design standards (between 12-hour and 24-hour) results in the proposed pond having an estimated capacity to contain an event between the 20% and 10% annual chance storm. Since a minimum time of concentration is assumed for a drainage area of 3 acres, a shorter duration storm intensity is more applicable to the site; so it is estimated that the pond would relieve localized flooding in this known ponding area for approximately the 10% annual chance level of service. This is in alignment with the RFPG goal to remove 40% of the low water crossings from 10% annual chance floodplain by 2033, and to remove 90% of low water crossings in the region from 10% annual chance floodplain by 2053.

This Alternative 3 pond location could intercept runoff draining toward one of the repetitive ponding areas through curb cuts or minimal storm drain infrastructure. Therefore, with approval from the RFPG and local City of San Elizario stakeholders, Alternative 3 was selected for evaluation as part of the RFP.

Since the Preliminary FEMA 2D hydraulic model (Model ID: 140000000001) is considered the best available model in this location, and it does not delineate significant flood depths in the repetitive flooding locations, there are no structures estimated to be removed from flooding due to the FMP.

No Negative Impact Analyses

Since this a small-scale project to alleviate localized road flooding, and it adds storage volume to the project area, there are estimated to be no negative impacts on neighboring areas associated with this FMP. This determination of no negative impact is based upon engineering judgment after reviewing the feasibility study entitled, “Drainage Feasibility Study, Socorro Rd. Intersections with San Antonio St. & Main St.” (Study ID: 49) and analysis of existing condition runoff patterns in the contributing drainage area, using a copy of the Preliminary FEMA 2D hydraulic model for WA7 (Model ID: 140000000036).

Benefit Cost Ratio

Since there were no 1% or 0.2% annual chance benefits associated with this project, a BCA of 0 was assumed for the FMP.

5B-6. Modeling and Mapping Analysis for FMP ID: 143000005

The 2019 TXDOT feasibility study for **FMP ID: 143000005** (SH 20 Drainage improvements) is entitled "Drainage Study for SH20, from Doniphan Drive to Texas Avenue" (Study ID: 59). The report documents a hydrologic HEC-HMS (Model ID: 140000000002) and hydraulic EPA SWMM (Model ID: 140000000012) modeling analysis of 39 culvert/storm drain crossings on SH20 (Mesa Street) on the Westside of the City of El Paso. The capacity of each crossing was analyzed and reported for roadway gutter/inlet level of service as well as crossing capacity level of service.

Data Sources and FMP Extents

Eight drainage improvement projects are proposed in the feasibility study (all of which were evaluated for inclusion in this FMP) to increase roadway drainage levels of service from less than the 20% annual chance in pre-project conditions to the 10% annual chance level of service in post-project conditions. The projects are identified and prioritized with documented cost estimates in the feasibility study (Study ID: 59). Descriptions of the proposed improvements are documented in the FMP narratives in **Appendix 4D** of *Chapter 4*, and the locations of each improvement are shown in **Exhibit Map 20.05**, along with relevant existing inlet and conduit locations. A summary of the proposed projects is below:

- Six projects include expanding the capacity of existing inlets and/or adding new inlets and connecting them to existing crossings;
- One project includes lengthening a weir that conveys flow to an existing crossing; and
- One project includes increasing the capacity of inlets and increasing the capacity of the existing crossing to which they are connected.

Pre- and Post- Project Risk Analyses

Since all of the projects are proposed to only increase levels of service for roadway flooding to the 10% annual chance, this FMP was estimated to have no 1% annual chance benefits affecting buildings or roadways. While this outcome does not achieve a 1% annual chance level of service at each crossing, it is in alignment with the RFPG goal of removing 40% of low water crossings from the 10% annual chance floodplain in the region by 2033, and removing 90% of low water crossings from the 10% annual chance floodplain by 2053.

No Negative Impact Analyses

All of the proposed projects would increase runoff to existing crossings, but only one project includes expanding the crossing which receives the additional runoff. To investigate potential negative impacts related to the eight proposed projects, the level of service of each existing crossing that is proposed to receive increased runoff due to the projects was reviewed. Based on the EPA SWMM hydraulic model results, two of the crossings that are proposed to receive increased runoff have less than the capacity needed to convey the 1% annual chance flood:

- Crossings 9A and 9B, a 36" Steel pipe and a 36" Reinforced Concrete Pipe (RCP) located near the intersection of Vin Granada and SH20
  - Associated with Improvement 10-3 to "Increase the capacity of the inlets and crossing at 9A & 9B by 30 cfs"

- Crossing 18, a 48” RCP located near the Baltimore Avenue/SH20 intersection
  - Associated with Improvement 10-7 to “Add inlets at the sag near crossing 18. Connect the inlets to crossing 18. Estimated capacity: Approximately 50 cfs”

At the locations listed above, the following data were reviewed to assess potential negative impacts associated with increasing conveyance to crossings that are undersized for the 1% annual chance flood:

- Existing drainage infrastructure;
- HEC-HMS and EPA SWMM inputs/results;
- Existing downstream flood risk boundaries based on Preliminary FEMA 1% annual chance floodplains; and
- Overflow flooding patterns and contributing drainage areas based on 2014 LiDAR topography associated with the Preliminary FEMA 2D hydraulic model

At the location of proposed Improvement 10-3, the two drainage areas contributing to the inlets that are proposed to have increased capacity/conveyance (C_9A_1 and C_9B_1) are significantly smaller (~52 acres and ~19 acres, respectively) than the drainage area of Flowpath No. 20A (C_8_1, ~588 acres), which would receive the increased runoff due to the improvements. As expected, based on the difference in drainage area sizes, there are significant differences in lag times/timing of peak flows (6.7 minutes for C_9A_1 and 6 minutes for C_9B_1 vs. 17.2 minutes for C_8_1). Therefore, the anticipated increased runoff associated with the 30 cfs increased capacity of the inlets and crossing at Improvement 10-3 is expected to arrive much sooner than the approximate 1,768 cfs peak flow of the receiving stream (Crossing 8, Flowpath No. 20A), and any impact to the peak flow of the receiving stream is expected to be negligible. In addition, the 1% annual chance floodplain is contained within the banks of the channel of the receiving stream for more than 2,000 feet downstream of the outfall location from Improvement 10-3. Based on the information above, the project Improvement 10-3 is not estimated to cause negative impacts on neighboring areas.

At the location of proposed Improvement 10-7, the pre-project 1% annual chance event is currently estimated to cause 120 cfs to overflow at Crossing 18, with overflow draining downstream (southwest) down Baltimore Avenue. By installing new inlets at the sag located on East Baltimore Avenue, where there is currently a grate inlet, any existing overflows associated with the 1% annual chance event are not expected to change since there is no new flow being directed into the drainage area, and the roadway inlets are not designed to convey the 1% annual chance flood. Based on the information above, the project Improvement 10-3 is not estimated to cause negative impacts on neighboring areas.

Based on the analyses of the two projects above, and since the other 6 proposed projects are estimated to improve 10% annual chance conveyance to crossings which are reported to have capacity for greater than the 1% annual chance flood, there are estimated to be no negative impacts on neighboring areas associated with this FMP. This determination of no negative impact is based upon engineering judgment after reviewing the feasibility study entitled, “Drainage Study for SH20, from Doniphan Drive to Texas Avenue” (Study ID: 59) and analysis of existing condition models, using the hydrologic HEC-HMS (Model ID: 140000000002) and hydraulic EPA SWMM (Model ID: 140000000012).

Benefit Cost Ratio

Since there were no 1% or 0.2% annual chance benefits associated with this project, a BCA of 0 was assumed for the FMP.

5B-7. Non-structural FMPs that were not Analyzed

The two remaining FMPs are non-structural FMPs, and were not analyzed with modeling or mapping data.

FMP ID: 143000007 (flood gage and flood gates for low water crossings in Marfa) was not analyzed for 1% annual chance flood benefits or impacts, since there is no flood infrastructure proposed which would have a measurable effect on flood conditions. The determination of no negative impact is based upon engineering judgment.

Since the **FMP ID: 143000009** is a non-structural FMP associated with Hudspeth County developing and implementing a floodplain ordinance to regulate development, a hydrologic and hydraulic analysis was not performed, and the post-project level of service is not applicable. The determination of no negative impact is based upon engineering judgment.

Appendix 5C
FMEs Recommended by the RFPG

Table 5C. Flood Management Evaluations Recommended by the RFPG

FME ID	FME Name	Description	Associated Goals	Associated FME, FMS, or FMP	Counties	HUC8s	Study Type	FME Area (sqmi)	Flood Risk Type	Sponsor	Entities with Oversight	Emergency Need	Estimated Study Cost	Potential Funding Sources and Amount	Estimated number of structures at flood risk	Habitable structures at flood risk	Estimated Population at flood risk	Critical facilities at flood risk (#)	Number of low water crossings at flood risk (#)	Estimated number of road closures (#)	Estimated length of roads at flood risk (miles)	Estimated active farm & ranch land at flood risk (acres)	Existing or Anticipated Models (year)	Existing or Anticipated Maps (year)	RFPG Recommen-dation (Y/N)	Reason for Recommendation
141000001	Develop a plan for a Sediment and Vegetation Control Program in the Rio Grande at El Paso	Assess Rio Grande capacity in El Paso County considering updated hydrology, sediment, and vegetation conditions. Establish maintenance program with minimum risk-based channel capacity. Address maintenance agreements between U.S. and Mexico.	14007003, 14004001		El Paso	13030102, 13040100	Preparedness	110.7	Riverine	El Paso Water, El Paso County, EPCWID1	USIBWC, El Paso Water, El Paso County, Doña Ana County, Hudspeth County, EPCWID1	No	$ 107,000	Taxes, Water Use Fees, 50%	760	479	1624	0	0	0	16.27	412.21	2008	1985	Yes	Aligns with RFPG and stakeholder goals
141000002	Develop H&H Models for Cibolo Creek and arroyos through the City of Presidio, and develop an FMP for flood reduction of buildings and emergency access roadways.	Develop H&H models for Cibolo Creek and the City of Presidio arroyos to evaluate flood risk. Develop FMPs, an interior drainage analysis for east Cibolo Creek levee, and a coincident storm analysis for Cibolo Creek, the Rio Conchos, and the Rio Grande.	14007003, 14014002, 14009002, 14009004	FMS ID: 142000008	Presidio	13040201	Project Planning	10.2	Riverine	Presidio city, Presidio County	Presidio city, Presidio County, USIBWC, USACE	No	$ 183,000	General Revenue, 20%	0	0	0	0	0	0	0.25	10.93	2019	2019	Yes	Aligns with RFPG and stakeholder goals
141000003	Arroyo Siphon at SH20 near Tornillo	Coordinate with TXDOT to install siphon at SH20 to prevent road from overtopping and stormwater from entering EPCWID1 canal system.	14010001, 14010002		El Paso	13040100	Project Planning	0.1	Riverine	El Paso County, EPCWID1, TXDOT	El Paso County, EPCWID1, TXDOT	No	$ 38,000	Taxes, Water Use Fees, 50%	375	216	1004	0	0	0	12.46	1474.78	2009	2019	Yes	Aligns with RFPG and stakeholder goals
141000004	Lower Mesa Drain Improvements at El Paso	Assess capacity of upstream reservoirs; develop detailed hydraulic model of Lower Mesa Drain to design 30+ culvert improvements; assess capacity of Mesa Drain to accept runoff without impacting downstream agricultural property.	14007003, 14009001, 14009003		El Paso	13040100	Project Planning	5.6	Urban/Local	El Paso Water, El Paso County, EPCWID1	El Paso Water, El Paso County, EPCWID1	No	$ 689,000	Taxes, Water Use Fees, 50%	641	598	1524	1	0	0	10.39	1201.38	2019	2019	Yes	Aligns with RFPG and stakeholder goals
141000005	Develop solution for flooding of San Elizario historic district, and localized flooding in San Elizario and adjacent communities	Develop Stormwater Master Plan for San Elizario, including drainage swales to convey runoff into the River Drain and relieve localized ponding, as well as plantings along flowpaths for butterfly habitat.	14009001, 14009003		El Paso	13040100	Project Planning	7.3	Urban/Local	San Elizario city, El Paso County	San Elizario city, El Paso County	No	$ 73,000	General Revenue / General Funds or Bonds or Tax notes, 25%	3766	2331	24444	45	2	82	150.70	666.10	2019	2018	Yes	Aligns with RFPG and stakeholder goals
141000006	Increase Storage Capacity of Fort Bliss Sump	Excavate Fort Bliss Sump while avoiding newly delineated wetland to increase storage capacity of sump. Requires continued coordination with U.S. Army due to project location on Fort Bliss.	14009001, 14009003		El Paso	13040100	Project Planning	0.7	Urban/Local	El Paso Water	U.S. Army, El Paso Water	No	$ 30,000	Revenue bonds, Cash Revenues, Credit, 0%	444	173	890	0	24	132	46.96	28207.58	None	1985	Yes	Aligns with RFPG and stakeholder goals
141000008	Sediment Control at Alamito and Terneros Creek	Design sediment control structures on Alamito Creek and Terneros Creek upstream of confluence with the Rio Grande to reduce sediment in the Rio Grande and reduce USIBWC maintenance burden.	14004002, 14011001	FMS ID: 142000006	Presidio	13040201, 13040202, 13040203, 13040204, 13070005, 13070006, 13050004	Project Planning	1621.9	Riverine	Presidio County	USIBWC, Presidio County	No	$ 111,000	Unknown	2120	1240	7359	3	18	295	89.92	536.60	None	1985	Yes	Aligns with RFPG and stakeholder goals
141000010	Develop city-wide drainage study and stormwater master plan for Pecos	Develop city-wide drainage study and stormwater master plan for City of Pecos and adjacent Lindsay Census Designated Place. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002	FMS ID: 142000005; FMS ID: 142000007; FMP ID: 143000119	Reeves	13070003, 13070001	Project Planning	23.1	Urban/Local, Playa, Riverine	Pecos city, Lindsay CDP, Reeves County, TXDOT	Pecos city, Lindsay CDP, Reeves County, TXDOT	No	$ 92,000	Unknown	169	111	900	2	4	27	22.15	14.47	None	1985	Yes	Aligns with RFPG and stakeholder goals
141000012	Dam Improvements at Comanche Creek Reservoir at Fort Stockton	Inspect and evaluate rehabilitation improvements for Comanche Creek Reservoir to protect Fort Stockton from similar flooding to that which occurred on April 4, 2004.	14014001, 14009002, 14009004, 14010001, 14010002		Pecos	13070007	Project Planning	6.1	Urban,/Local, Riverine	Fort Stockton city, Pecos County	Fort Stockton city, Pecos County	Yes	$ 68,000	Unknown	57	0	115	0	9	9	5.02	2482.87	None	1985	Yes	Aligns with RFPG and stakeholder goals
141000014	Develop a Colonia-wide Drainage System at Fort Hancock	Conduct surveys and drainage study to define flood areas, size 5th St crossing structures, develop H&H models, and propose FMPs. Address flooding at Hwy 20, Mustang Rd, and complete Supplemental Watershed Plans for Camp Rice Dam 1, Alamo Dam 3.	14014001, 14009002, 14009004, 14010001, 14010002	FMS ID: 142000003	Hudspeth	13040100	Project Planning	22.0	Urban/Local, Riverine	Hudspeth County	Fort Hancock CDP, Hudspeth County	Yes	$ 795,000	General Revenue, 0%	21373	16856	70212	37	132	841	607.25	48550.99	2019	2019	Yes	Aligns with RFPG and stakeholder goals
141000015	Prioritize arroyos on their likelihood of producing sediment/ debris flows	Investigate uncontrolled arroyos that have created flood damages and high maintenance costs. Develop method to estimate relative production of sediment for uncontrolled arroyos and estimate added flood risk associated with drainage conveyance blockage.	14009001, 14009003, 14010001, 14010002	FMS ID: 142000016	El Paso	13030102, 13040100, 13050003	Preparedness	1011.0	Riverine	El Paso Water, El Paso County, EPCWID1	El Paso Water, El Paso County, EPCWID1	No	$ 70,000	Taxes, Water Use Fees, 50%	12341	10696	34727	16	2	20	228.13	26706.88	2021	2021	Yes	Aligns with RFPG and stakeholder goals
141000018	Conduct flood risk assessment at El Paso locations where drainage is controlled by river stage, and there are significant flood risks on the non-river side of the levee.	Identify the Rio Grande outfalls that are most susceptible to blockage, and most likely to allow flood damage during periods of high river stage.	14009001, 14009003, 14004001	FMS ID: 142000017	El Paso	13030102, 13040100	Preparedness	110.7	Urban/Local, Riverine	El Paso Water, El Paso County	El Paso Water, El Paso County	No	$ 70,000	Revenue bonds, Cash Revenues, Credit, 0%	63	58	187	0	0	0	1.80	10.88	None	2019	Yes	Aligns with RFPG and stakeholder goals
141000019	Plan for mitigation of drainage controls where ground water reduces storm water conveyance capacity in the Montoya Drain	Perform H&H modeling to develop a FMP for increasing the capacity of Montoya Drain through measures to control groundwater intrusion into the drain.	14007003		El Paso	13030102	Project Planning	0.3	Urban/Local	El Paso Water, EPCWID1	El Paso Water, EPCWID1, Doña Ana County, EBID	No	$ 130,000	Taxes, Water Use Fees, 50%	1119	916	2126	1	0	5	31.63	2.67	None	1976	Yes	Aligns with RFPG and stakeholder goals
141000021	Develop city-wide drainage study and stormwater master plan for the City of Kermit.	Develop city-wide drainage study and stormwater master plan for Kermit. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002		Winkler	13070007	Project Planning	2.5	Urban/Local, Playa	Kermit city, Winkler County	Kermit city, Winkler County	No	$ 75,000	Unknown	36	13	75	0	4	28	7.81	5.53	None	1985	Yes	Aligns with RFPG and stakeholder goals
141000022	Develop solutions for flooding near Sierra Blanca	Develop drainage study and stormwater master plan for Sierra Blanca and surrounding ranches with access issues during floods. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002		Hudspeth	13040201	Project Planning	4.8	Riverine	Hudspeth County	Hudspeth County	No	$ 76,000	General Revenue, 0%	1640	1181	4364	6	18	199	38.03	49.91	None	1985	Yes	Aligns with RFPG and stakeholder goals

Table 5C. Flood Management Evaluations Recommended by the RFPG

FME ID	FME Name	Description	Associated Goals	Associated FME, FMS, or FMP	Counties	HUC8s	Study Type	FME Area (sqmi)	Flood Risk Type	Sponsor	Entities with Oversight	Emergency Need	Estimated Study Cost	Potential Funding Sources and Amount	Estimated number of structures at flood risk	Habitable structures at flood risk	Estimated Population at flood risk	Critical facilities at flood risk (#)	Number of low water crossings at flood risk (#)	Estimated number of road closures (#)	Estimated length of roads at flood risk (miles)	Estimated active farm & ranch land at flood risk (acres)	Existing or Anticipated Models (year)	Existing or Anticipated Maps (year)	RFPG Recommen-dation (Y/N)	Reason for Recommendation
141000023	Develop city-wide drainage study and stormwater master plan for Alpine	Develop city-wide drainage study and stormwater master plan for Alpine. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002	14100036	Brewster	13070006	Project Planning	4.8	Urban/Local, Riverine	Alpine city, Brewster County	Alpine city, Brewster County	No	$ 233,000	Unknown	1640	1181	4364	6	18	199	38.03	49.91	None	1989	Yes	Aligns with RFPG and stakeholder goals
141000024	Develop Supplemental Watershed Plans for flood control dams protecting Sonora	Assess & evaluate rehabilitation improvements for 7 NRCS dams identified by TCEQ as "Hydraulically Inadequate". Define upgrades of dams in Supplemental Watershed Plans for Dry Devils & Lowry Dams 3, 4, 5, 7, 8, 10, & 12.	14014001, 14009002, 14009004, 14010001, 14010002		Sutton	13040301	Project Planning	2.2	Riverine	Sonora city, Sutton County	Sonora city, Sutton County	Yes	$ 1,456,000	Unknown	944	661	1599	4	29	144	19.76	1.86	None	1973	Yes	Aligns with RFPG and stakeholder goals
141000025	Develop Supplemental Watershed Plans for flood control dams protecting Ozona	Assess & evaluate rehabilitation improvements for NRCS dam identified by TCEQ as "Hydraulically Inadequate". Define upgrades of dam in Supplemental Watershed Plans for Johnsons Draw SCS Site 7 Dam.	14014001, 14009002, 14009004, 14010001, 14010002		Crockett	13040301	Project Planning	4.6	Riverine	Ozona CDP, Crockett County	Ozona CDP, Crockett County	Yes	$ 1,456,000	Unknown	1222	92	2536	1	0	38	51.27	57.44	None	1988	Yes	Aligns with RFPG and stakeholder goals
141000026	Develop city-wide drainage study and stormwater master plan for Monahans/ Southwest Sandhill	Develop drainage study and stormwater master plan for City of Monahans and Southwest Sandhill Census Designated Place. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009002, 14009004, 14010001, 14010002		Ward, Winkler	13070007	Project Planning	36.1	Urban/Local, Playa	Monahans city, Southwest Sandhill CDP, Ward County	Monahans city, Southwest Sandhill CDP, Ward County	No	$ 104,000	Dedicated Revenue, 10%	2578	2267	7825	0	0	0	43.73	3083.54	2019	2019	Yes	Aligns with RFPG and stakeholder goals
141000033	Develop city-wide drainage study and stormwater master plan for City of Socorro	Develop city-wide drainage study and stormwater master plan for Socorro. Develop detailed H&H models and floodplain maps. Evaluate FMP alternatives.	14014001, 14009001, 14009003, 14010001, 14010002		El Paso	13040100	Project Planning	21.9	Urban/Local, Riverine	Socorro city, El Paso County	Socorro city, El Paso County	No	$ 73,000	General Funds or Bonds or Tax notes, 55%	2578	2267	7825	0	0	0	43.73	3083.54	2019	2019	Yes	Aligns with RFPG and stakeholder goals
141000034	Develop FMPs for additional projects in City of El Paso/El Paso Water Stormwater Master Plan	Develop all required datasets and models for 52 projects from the City of El Paso/El Paso Water Stormwater Master Plan to be recommended as FMPs in the Regional Flood Plan.	14009001, 14009003, 14010001, 14010002		El Paso	13030102, 13040100, 13050003	Project Planning	298.8	Urban/Local, Riverine	El Paso Water	El Paso Water	No	$ 1,288,000	Revenue bonds, Cash Revenues, Credit, 0%	13881	10736	55754	26	51	614	374.95	6056.93	2019	2019	Yes	Aligns with RFPG and stakeholder goals
141000035	Develop FMPs for additional projects from the El Paso County Stormwater Master Plan	Develop all required datasets and models for 21 projects from the El Paso County Stormwater Master Plan to be considered as FMPs in the Regional Flood Plan.	14009001, 14009003, 14010001, 14010002		El Paso	13030102, 13040100, 13050003	Project Planning	711.1	Urban/Local, Riverine	El Paso County	El Paso County	No	$ 276,000	General Funds or Bonds or Tax notes, 5%	7480	6117	20411	10	81	224	228.22	42408.64	2021	2021	Yes	Aligns with RFPG and stakeholder goals
141000036	Install Instrumentation to Enhance Estimate of Flood Risk for City of Alpine	Procure and install 5 stage gages and 6 precipitation gages in and upstream of the City of Alpine, Texas.	14014001, 14009002, 14009004, 14010001, 14010002	14100023	Brewster	13070006	Project Planning	85.7	Urban/Local, Riverine	Alpine city, Brewster County	Alpine city, Brewster County	No	$ 94,400	Unknown	1877	1181	4684	5	35	822	44.74	1762.48	None	1989	Yes	Aligns with RFPG and stakeholder goals

Appendix 5D
FMPs Recommended by the RFPG

Table 5D. Flood Mitigation Projects Recommended by RFPG

FMP ID	FMP Name	Description	Associated Goals (ID)	Counties	HUC12s	Project Type	Project Area (sqmi)	Flood Risk Type (Riverine, Coastal, Urban, Playa, Other)	Sponsor	Entities with Oversight	Emergency Need (Y/N)	Estimated Project Cost ($)	Potential Funding Sources and Amount	Cost/ Structure removed	Percent Nature-based Solution (by cost)	Negative Impact (Y/N)	Negative Impact Mitigation (Y/N)	How No Negative Impact was Determined	Social Vulnerability Index (SVI)	Water Supply Benefit (Y/N)	Traffic Count for Low Water Crossings	Benefit-Cost Ratio	RFPG Recommendation (Y/N)	Reason for Recommendation
143000003	Small pond at San Elizario	Construct a new 0.34 ac-ft pond to relieve roadway flooding. Described as Alternative 3 from City of San Elizario "Drainage Feasibility Study" (2018).	14009001, 14009003	El Paso	130401000307	Detention Pond	0.001	Urban/Local	San Elizario city	San Elizario city	N	$224,000	General Revenue	N/A	0	N	N	Engineering Judgment (Append. 5B, Section 5B-5)	0	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000005	SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	Improvements to inlet and culvert capacities at 8 crossings, with cost estimates and prioritizations available.	14010001, 14010002	El Paso	130401000107	Storm Drain	0.1	Urban/Local	TXDOT, El Paso Water	OT, El Paso W	N	$3,745,000	Revenue bonds, Cash Revenues, Credit	N/A	0	N	N	Engineering Judgment (Append. 5B, Section 5B-6)	0.29	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000007	Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	Add flood gates to roadways at 4 LWCs on Alamito Creek, and a monitoring gage/early detection on North Alamito Creek at Hwy 17 Bridge upstream of Marfa. This provides early warning for Emergency Management to deploy before imminent road flooding.	14005001, 14006001	Presidio County	130402020105	Preparedness	0.02	Riverine	Marfa city	Marfa city, Presidio County	Y	$358,000	General Funds	N/A	0	N	N	Engineering Judgment (Append. 5B, Section 5B-7)	0.00	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000009	Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	Coordinate with Hudspeth County Commissioners, Road & Bridge Departments, Safety & Inspection Departments, & County Attorney to draft a floodplain ordinance (or modify existing subdivision ordinance) to regulate development standards in Hudspeth County	14001001, 14002001	Hudspeth County		Other	4552.1	Riverine, Playa, Urban/Local	Hudspeth County	Hudspeth County	N	$50,000	General Revenue	N/A	0	N	N	Engineering Judgment (Append. 5B, Section 5B-7)	0.56	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000011	SSA4	Detention Basin SSA4	14009003, 14009001, 14011001	El Paso	130401000204	Detention Pond	0.1	Riverine	El Paso County	El Paso County	N	$14,744,000	General Funds, Bonds, Tax Notes	$148,929	0	N	N	Model IDs: 140000000016 and 140000000015	0.902	N		0.1	Y	In alignment with RFPG and Stakeholder Goals
143000021	SOC4	Sediment/Detention Basin at "Mankato Arroyo"	14009003, 14009001, 14011001	El Paso	130401000307	Detention Pond	0.04	Riverine	El Paso County, EPCWID1	El Paso County, EPCWID1, Socorro city	N	$2,383,000	Taxes, water use fees	$238,300	0	N	N	Model IDs: 140000000021 and 140000000018	0.943	N		0.1	Y	In alignment with RFPG and Stakeholder Goals
143000024	MON3	Sediment/Retention Basin	14009003, 14009001, 14011001	El Paso	130401000203	Detention Pond	1.3	Playa	El Paso County	El Paso County	N	$27,033,000	General Funds, Bonds, Tax Notes	$82,670	0	N	N	Model IDs: 140000000019 and 140000000020	0.739	N		0.2	Y	In alignment with RFPG and Stakeholder Goals
143000025	HAC3	Sediment/Retention Basin	14009003, 14009001, 14011001	El Paso	130401000307	Detention Pond	0.1	Riverine	El Paso County	El Paso County	N	$4,619,000	General Funds, Bonds, Tax Notes	$461,900	0	N	N	Model IDs: 140000000021 and 140000000022	0.985	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000097	NW16	Expand channel from Village Ct to Doniphan Dr	14009003, 14009001	El Paso	130301020906	Channel	0.0	Urban/Local	El Paso Water	El Paso Water	N	$1,570,000	Revenue bonds, Cash Revenues, Credit	$523,333	0	N	N	Model IDs: 140000000002 and 140000000001	0.889	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000100	NE3B	Alcan Pond: new catch basin to capture FP15 upstream	14009003, 14009001, 14011001	El Paso	130401000103	Detention Pond	0.1	Urban/Local	El Paso Water	El Paso Water	N	$21,234,000	Revenue bonds, Cash Revenues, Credit	$393,222	0	N	N	Model IDs: 140000000031 and 140000000030	0.779	N		0.1	Y	In alignment with RFPG and Stakeholder Goals
143000105	EA10A	Build sediment/detention basin upstream of Paseo del Este Drive	14009003, 14009001, 1401101	El Paso	130401000204	Detention Pond	0.02	Riverine	El Paso Water	El Paso Water, El Paso County	N	$9,647,000	Revenue bonds, Cash Revenues, Credit	$9,647,000	0	N	N	Model IDs: 140000000029 and 140000000028	0.644	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000111	NW3	Construction of new larger capacity Doniphan Pump Station to replace PS1, with new force main directly to the Rio Grande. Install new catch basin with mechanical bar screen upstream of PS2.	14009003, 14009001	El Paso	130401000107	Detention Pond	0.3	Urban/Local	El Paso Water	El Paso Water	N	$16,132,000	Revenue bonds, Cash Revenues, Credit	$2,688,667	0	N	N	Engineering Judgment (Append. 5B, Section 5B-3)	0.786	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000113	NW26	Acquire land, construct a permanent wetland, install a storm drain system to Doniphan Drive, construct pipeline to Doniphan Pump Station and build new pump station to control flood levels.	14009003, 14009001	El Paso	130401000107	Detention Pond	0.2	Urban/Local	El Paso Water	El Paso Water	N	$35,568,000	Revenue bonds, Cash Revenues, Credit	N/A	1	N	N	Engineering Judgment (Append. 5B, Section 5B-3)	0	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000116	EA9A	Build sediment/detention basin upstream of Paseo del Este Drive	14009003, 14009001, 14011001	El Paso	130401000204	Detention Pond	0.04	Riverine	El Paso Water	El Paso Water	N	$11,897,000	Revenue bonds, Cash Revenues, Credit	$915,154	0	N	N	Model IDs: 140000000029 and 140000000028	0.644	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000123	WC4	Construct a new 37.59 ac-ft pond to relieve roadway flooding on Mesa Street.	14009003, 14009001, 14011001	El Paso	130301020906	Detention Pond	0.0	Urban/Local, Riverine	El Paso Water	El Paso Water	N	$10,198,412	State, Local	$679,894	0	N	N	Model IDs: 140000000060 and 140000000061	0.767	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000118	VIN1	Construction of a diversion channel and two combination of sediment/detention basins.	14009003, 14009001, 14011001	El Paso	130301020804	Detention Pond/Channel	0.1	Riverine	El Paso County	El Paso County	N	$59,386,497	State, Local	$151,496	0	N	N	Model IDs: 140000000058 and 140000000059	0.838	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000117	Gateway Ponds	Acquire land, expand the existing detention basin north of I-10. Construction of new larger capacity Pump Station with capacity of 350 cfs in the north pond, with new force main directly to the Rio Grande.	14009003, 14009001, 14011001	El Paso	130401000103, 130401000107	Detention Pond & Pump Station	0.0	Urban/Local, Riverine	El Paso Water	El Paso Water	N	$108,224,885	State, Local	$525,364	0	N	N	Model IDs: 140000000056 and 140000000057	0.935	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000121	Dallas Ponds	Acquire land, build new detention basin north of IH-10. Construction of new larger capacity Pump Station with capacity of 250 cfs in the basin with new force main directly to the Rio Grande.	14009003, 14009001, 14011001	El Paso	130401000103, 130401000107	Detention Pond & Pump Station	0.0	Urban/Local, Riverine	El Paso Water	El Paso Water	N	$160,532,311	State, Local	$949,895	0	N	N	Model IDs: 140000000054 and 140000000055	0.983	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000120	Presidio	Retention & Detention Basin	14004002, 14009004, 14009002	Presidio	130402011406	Detention Pond	0.0	Urban/Local	RGCOG, Presidio County, TXDOT, USIBWC, USACE	Presidio County, TXDOT, USIBWC, USACE	N	$4,620,933	Federal, State, Local	$513,437	0	N	N	Model IDs: 140000000062 and 140000000049	0.951	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000122	WC1	Sediment Retention Basin	14004001, 14009003, 14009001	El Paso	130301020906	Sediment Detension Pond	0.0	Urban/Local	El Paso Water, El Paso County	El Paso Water, El Paso County	N	$4,461,518	State, Local	$43,740	0	N	N	Model IDs: 140000000050 and 140000000051	0.592	N		0	Y	In alignment with RFPG and Stakeholder Goals
143000119	City of Pecos	Retention Basin	14004002	Reeves	13070010903	Detention Pond	0.1	Urban/Local, Playa, Riverine	Pecos City, Lindsay CDP, Reeves County, TxDOT	Pecos City, Lindsay CDP, Reeves County, TxDOT	N	$11,161,000	Federal, State, Local	$218,843	0	N	N	Model IDs: 140000000052 and 140000000053	0.513	N		0	Y	In alignment with RFPG and Stakeholder Goals

Appendix 5E
FMSs Recommended by the RFPG

Table 5E. Flood Management Strategies Recommended by RFPG

FMS ID	FMS Name	Description	Associated Goals (ID)	Counties	HUC8s	Strategy Type	Strategy Project Area (sqmi)	Flood Risk Type (Riverine, Coastal, Urban,	Sponsor	Entities with Oversight	Emergency Need (Y/N)	Estimated Project Cost ($)	Potential Funding Sources and Amount	Cost/ Structure removed	Consideration of nature-based solution (Y/N)	Negative Impact (Y/N)	Negative Impact Mitigation (Y/N)	Water Supply Benefit (Y/N)	RFPG Recommendation (Y/N)	Reason for Recommendation
142000001	FEMA Levee Accreditation for All Rio Grande Levees at El Paso	Coordination needed between USIBWC, FEMA, El Paso Water, El Paso County, Doña Ana County, and Hudspeth County to certify and accredit all remaining levee segments through El Paso County. Interior drainage studies are needed in Hudspeth and Doña Ana.	14004001	El Paso	13030102, 13040100	Regulatory and Guidance	91.19	Riverine	USIBWC, El Paso Water, El Paso County, Doña Ana County, Hudspeth County	USIBWC, El Paso Water, El Paso County, Doña Ana County, Hudspeth County	No	$ 482,000	Federal, State, Local	$ 44	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000002	Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine	Construct rainwater basins at 3 locations around Kokernot Park to drain neighboring streets, impound runoff volume, promote infiltration and aquifer recharge, reduce landscaping water costs, and remediate pollutants.	14012001, 14013001	Brewster	13070006	Infrastructure Projects	0.06	Urban/Local	City of Alpine, Brewster County	City of Alpine, Brewster County	No	$ 1,282,000	State, Local	N/A	Yes	No	No	Yes	Yes	Aligns with RFPG and stakeholder goals
142000003	Implement Colonia-wide Drainage System and Maintenance and Outreach Program for Roadside Swales and Driveway Culverts at Fort Hancock	Construct drainage improvements as detailed in FME ID: 141000014; maintain existing roadside ditches/swales to ensure positive drainage; and develop an outreach program to encourage residents to maintain and repair driveway culverts.	14007001, 14007002, 14014001, 14009002, 14009004, 14010001, 14010002	Hudspeth	13040100	Education and Outreach, Other	1.12	Urban/Local	City of Fort Hancock, Hudspeth County	City of Fort Hancock, Hudspeth County	No	$ 404,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000004	Coordination with Ft. Bliss for FMP Permitting and Maintenance Access	El Paso Water designed NE7 on Ft. Bliss near unexploded ordinances (UXOs), and has an easement to maintain Fusselman and Northgate Dams, but can't access them due to UXOs. El Paso County designed MON1 on Ft. Bliss near a training ground and potential UXOs.	14007003, 14011001, 14009001, 14009003,14010001, 14010002	El Paso	13040100	Infrastructure Projects	0.67	Urban/Local	El Paso Water, El Paso County, U.S. Army	El Paso Water, El Paso County, U.S. Army	No	$ 49,000	Federal, State, Local	$ 415	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000005	Maintenance Program to control Salt Cedar vegetation along Rio Grande upstream of Presidio	Study to develop alternatives to clear vegetation along the Rio Grande between Candelaria and City of Presidio to allow for proper drainage for communities located along FM 170. Coordination needed between RGCOG, Presidio County, TXDOT, USACE and USIBWC.	14007003, 14012001	Presidio	13040201	Education and Outreach, Other	28.86	Urban/Local	RGCOG, Presidio County, TXDOT, USIBWC, USACE	Presidio County, TXDOT, USIBWC, USACE	No	$ 97,000	Federal, State, Local	N/A	Yes	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000006	Study Binational Streamflow Recommendations for Big Bend Reach of Rio Grande/Rio Bravo	Conduct study with recommendations for binationally beneficial stream flows for Big Bend reach of the Rio Grande/Rio Bravo. Study will identify stream flows to support the river's ecological environment in state and federal parks in the U.S. and Mexico.	14007003, 14012001	Presidio, Brewster	13040203,13040204,13040205,13040202, 13040201	Other	212.79	Riverine	Presidio County, USIBWC, RG/B Basin Flows Collaboration, Rio Grande Joint Venture	City of Presidio, Presidio County, Brewster County, Big Bend National Park, Rio Grande Wild and Scenic River, Big Bend Ranch State Park, Black Gap Wildlife Management Area, Santa Elena Canyon Wildlife and Plant Protection Area, Maderas del Carmen Wildlife and Plant Protection Area, Ocampo Wildlife and Plant Protection Area, and the Rio Bravo Monument	No	$ 63,000	Federal, State	N/A	Yes	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000007	Study to plan the management of saltcedar growth and debris in channels in/adjacent to City of Pecos	Study to identify and characterize alternatives to manage vegetation in natural drainages in and adjacent to the City of Pecos to increase conveyance and reduce flooding within the City of Pecos.	14012001	Reeves	13060007, 13060011, 13040212, 13070002, 13070003, 13070006,	Other	124.33	Riverine	City of Pecos, Reeves County	City of Pecos, Reeves County	No	$ 73,000	Federal, State, Local	N/A	Yes	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000008	Develop Certification Package for Cibolo Creek Channel and Levee	Perform planning and design required by FEMA for levee accreditation, then complete certification package for Cibolo Creek levee in vicinity of City of Presidio. Package includes O&M Plan.	14015001, 14007000, 14004002	Presidio	13040201	Regulatory and Guidance	2.75	Riverine	USACE, Presidio County, City of Presidio	USACE, Presidio County	No	$ 79,000	Federal, State, Local	$ 116	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000009	Regulatory Review of Off-Road Traffic on State Lands	Coordination should take place between EPCWID1, El Paso County, and State land owners to discuss enforcement of restrictions associated with off-road motor vehicles on undeveloped land.	14002001, 14007003	El Paso	13040100, 13050003	Regulatory and Guidance	620.49	Other	EPCWID1, El Paso County, Texas GLO	EPCWID1, El Paso County, Texas GLO	No	$ 99,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals

Table 5E. Flood Management Strategies Recommended by RFPG

FMS ID	FMS Name	Description	Associated Goals (ID)	Counties	HUC8s	Strategy Type	Strategy Project Area (sqmi)	Flood Risk Type (Riverine, Coastal, Urban,	Sponsor	Entities with Oversight	Emergency Need (Y/N)	Estimated Project Cost ($)	Potential Funding Sources and Amount	Cost/ Structure removed	Consideration of nature-based solution (Y/N)	Negative Impact (Y/N)	Negative Impact Mitigation (Y/N)	Water Supply Benefit (Y/N)	RFPG Recommendation (Y/N)	Reason for Recommendation
142000010	Regulatory Review of Impervious Cover on New Development in El Paso County	Coordination should take place between EPCWID1, El Paso County, and Texas GLO land owners to discuss revisions to development regulations associated with detention and impervious cover.	14001001, 14007003	El Paso	13040100, 13050003	Regulatory and Guidance	619.88	Urban/Local	EPCWID1, El Paso County, Texas GLO	EPCWID1, El Paso County, Texas GLO	No	$ 64,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000013	Staff augmentation support or funding for at risk communities to join and/or enforce the NFIP	Prioritize and provide staff augmentation support or funding for at risk communities not currently participating in the NFIP or communities with limited resources to enforce the NFIP. Aid communities in implementing recommended minimum standards.	14001001, 14001002	Presidio, Hudspeth, Reeves, Andrews, Edwards, Pecos, Winkler		Regulatory and Guidance	16144.52	Urban/Local, Riverine	RGCOG	Presidio County, Hudspeth County, Reeves County, Andrews County, Edwards County, Pecos County, Winkler County, City of Alpine, City of Sonora, City of Barstow, City of Kermit, City of Rankin, City of Thorntonville, Town of Valentine, City of Wickett, City of Wink	No	$ 44,000	Federal, State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000014	Develop new flood gages throughout the region	Prioritize, fund, and develop new flood gages (rainfall and/or stream gages) throughout the region to support flood warning system improvements and improve ability to validate or calibrate existing and new flood models	14005001, 14006001, 1400602	All of Region 14		Flood Measurement and Warning	43031.15	Riverine	RGCOG		Yes	$ 240,000	Federal, State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000015	Develop and design standard options for addressing identified development-related flooding in El Paso	Evaluate COEP and El Paso County drainage design standards for inlets, curb cuts, requirements for on-site storage in new developments, addressing as-built elevations, protecting remaining on-site storage and recovering original storage for existing developments.	14002001, 14003001	El Paso	13030102, 13040100, 13050003	Regulatory and Guidance	1011.05	Urban/Local	El Paso Water, El Paso County	El Paso Water, El Paso County	No	$ 35,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000016	Develop regional solutions to address erosion issues in natural channels affecting stormwater conveyance	Develop consensus region-specific erosion-resistant designs to prevent removal of material from drainage conveyances, with functional comparisons to aid selection of best practices.	14007003, 14002001, 14003001, 14007001, 14007002	All of Region 14	13030102, 13040100, 13050003	Other	1011.05	Urban/Local, Riverine	RGCOG		No	$ 57,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000017	Develop solutions to address city/county stormwater conveyance into the Rio Grande (El Paso County)	Refine agency action coordination in conveyance of interior flooding to the Rio Grande. Develop FMP designs and costs for improvements of conveyance from river terrace storm water infrastructure, considering high ground water.	14006001, 14004001, 14004002, 14007003	El Paso	13030102, 13040100, 13040201, 13040202, 13040203, 13040204, 13040205, 13040206, 13040207, 13040208, 13040209, 13040210, 13040211, 13040212, 13070006, 13070008, 13070010, 13070012, 13050003, 13050004, 13070007	Infrastructure Projects, Other	17923.72	Urban/Local, Riverine	El Paso Water, El Paso County	El Paso Water, El Paso County	No	$ 99,000	Federal, State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000019	Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area	Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area	14014001, 14007000	El Paso	13030102, 13040100, 13050003	Other	1011.05	Urban/Local, Riverine	El Paso Water, El Paso County, EPCWID1	El Paso Water, El Paso County, EPCWID1	No	$ 21,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000020	Develop and Improve Early Warning System for El Paso City/ County interior drainage	Conduct study to evaluate and proposed improvements to Early Warning Systems (EWSs) for interior drainage in El Paso City and El Paso County. Includes assessment of existing flood EWS.	14006001, 1400602	El Paso	13030102, 13040100, 13050003	Flood Measurement and Warning	1010.83	Urban/Local, Riverine	El Paso Water, COEP, El Paso County, EPCWID1	El Paso Water, COEP, El Paso County, EPCWID1	Yes	$ 140,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000021	Develop and Improve Early Warning System for City of Pecos	Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Pecos and adjacent Lindsay Census Designated Place. Includes assessment of existing flood EWS.	14006001, 1400602	Reeves	13070003, 13070001	Flood Measurement and Warning	23.03	Urban/Local, Riverine	City of Pecos, Reeves County	City of Pecos, Reeves County	Yes	$ 50,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000022	Develop and Improve Early Warning System for City of Alpine	Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Alpine. Includes assessment of existing flood EWS.	14006001, 1400602	Brewster	13070006	Flood Measurement and Warning	4.79	Urban/Local, Riverine	City of Alpine, Brewster County	City of Alpine, Brewster County	Yes	$ 50,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000023	Develop and Improve Early Warning System for City of Presidio, Presidio County	Identify and design access routes and bridges/culverts to provide emergency access during extreme flood events in the City of Presidio.	14006001, 1400602	Presidio	13040201	Flood Measurement and Warning	2.57	Urban/Local, Riverine	City of Presidio, Presidio County	City of Presidio, Presidio County	Yes	$ 50,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
141000024	Develop and Improve Early Warning System for City of Fort Stockton	Conduct study to evaluate and propose improvements to Early Warning Systems (EWSs) for City of Fort Stockton. Includes assessment of existing flood EWS.	14006001, 1400602	Pecos	13070007	Flood Measurement and Warning	5.53	Urban/Local, Riverine	City of Fort Stockton, Pecos County	City of Fort Stockton, Pecos County	Yes	$ 50,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals
142000025	Develop and Improve Early Warning System for City of Marfa, Presidio County	Identify and design access routes and bridges/culverts to provide emergency access during extreme flood events in Marfa. Southeast Marfa and dirt portion of FM2810 were identified as problem areas by Presidio County Office of Emergency Management.	14006001, 1400602	Presidio	13040202	Flood Measur	1.62	Urban/Local, Riverine	City of Marfa, Presidio County	City of Marfa, Presidio County	Yes	$ 50,000	State, Local	N/A	No	No	No	No	Yes	Aligns with RFPG and stakeholder goals

Appendix 5F
Data Entry Scoring Summary Table for FMPs

		General Project Data												
Project Name	**FMP ID**	**Project Description**	**Flood Region**	**Project Type**	**FIUP Project Category**	**Project Watershed**	**Rural Applicant**	**Project Cost**	**Benefit Cost Ratio**	**Cost per Structure Removed**	**Pre-Project Level-of-Service**	**Post-Project Level-of-Service**	**# of Structures in 1% Annual Chance FP (Pre-Project)**	**Project Status**
Small pond at San Elizario	143000003	Construct a new 0.34 ac-ft pond to relieve roadway flooding. Described as Alternative 3 from City of San Elizario "Drainage Feasibility Study" (2018).	14	Detention Pond	Category 2	Daugherty Lateral-Rio Grande,Small pond at San Elizario,Unnamed_FME_Watershed,City of Socorro-Rio Grande	N	$224,000	0	N/A	Unknown	10% annual chance	0	Planning
SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	143000005	Improvements to inlet and culvert capacities at 8 crossings, with cost estimates and prioritizations available.	14	Storm Drain	Category 4	<Null>	N	$3,745,000	0	N/A	<20% annual chance	10% annual chance	4	Planning
Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	143000007	Add flood gates to roadways at 4 LWCs on Alamito Creek, and a monitoring gage/early detection on North Alamito Creek at Hwy 17 Bridge upstream of Marfa. This provides early warning for Emergency Management to deploy before imminent road flooding.	14	Preparedness	Category 4	Alamito_Creek_US_of_Marfa,Unnamed_FME_Watershed,Alamito Creek-San Esteban Lake	Y	$358,000	0	Not applicable, non-structural FMP (early warning)	<20% annual chance	Not applicable, non-structural FMP (early warning)	0	Planning
Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	143000009	Coordinate with Hudspeth County Commissioners, Road & Bridge Departments, Safety & Inspection Departments, & County Attorney to draft a floodplain ordinance (or modify existing subdivision ordinance) to regulate development standards in Hudspeth County.	14	Other	Category 1	<Null>	N	$50,000	0	Not applicable, non-structural FMP (regulatory)	Unknown	Not applicable, non-structural FMP (regulatory)	823	Planning
SSA4	143000011	Detention Basin SSA4	14	Detention Pond	Category 2	SSA4-B,SSA4-C,SSa4-DS-1,Unnamed_FME_Watershed,City of Socorro-Rio Grande	N	$14,744,000	0.1	$148,929	<1% annual chance	1% annual chance	185	Planning
SOC4	143000021	Sediment/Detention Basin at "Mankato Arroyo"	14	Detention Pond	Category 2	A_Hacienda Real-1,A_Stream 5.5-1,A_Mesa Spur 5.5-1,Daugherty Lateral-Rio Grande,SOC_4,Unnamed_FME_Watershed,City of Socorro-Rio Grande	N	$2,383,000	0.1	$238,300	<1% annual chance	1% annual chance	10	Planning

Texas Water Development Board

		Score 1: Severity - Pre-Project Average Depth of Flooding (100-year)				Score 2: Severity - Community Need (% Population)						Score 3: Flood Risk Reduction						
Project Name	**FMP ID**	**Average Flood Depth (100yr)**	**Notes**	**Severity Ranking: Pre-Project Average Depth of Flooding (100-year)**	**Score 1**	**Communities Served by Project**	**Community Population Served**	**Flood Plain Population**	**Notes 2**	**Severity Ranking: Community Need (% Population)**	**Score 2**	**# of Structures Removed from 1% Annual Chance FP**	**Notes 3**	**Structures in 100yr Floodplain**	**Structures Removed from 100yr FP**	**% Structures Removed from 100yr FP2**	**Flood Risk Reduction**	**Score 3**
Small pond at San Elizario	143000003	0.3	Preliminary FEMA 2D model does not show 1% AC flood depths, but community reports localized flooding	Baseline average flood depth < 0.5ft	2	San Elizario city	10,116	0	0.00%	<25% of project community affected	1	0.00	100%	0	0	#DIV/0!	Reduced risk to 0 structures in floodplain	0
SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	143000005	0.9	Preliminary FEMA 2D model does not show 1% AC flood depths at all crossing locations. Average depth is based on locations with flood depths shown in 2D model results.	Baseline average flood depth > 0.5ft	4	El Paso city	678,815	30	0.004%	<25% of project community affected	1	0.00	0%	4	0	0.0%	Reduced risk to 0 structures in floodplain	0
Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	143000007	9.2	Based on Fathom 1% annual chance depth grid	Baseline average flood depth > 9.2 ft	10	Marfa city	1,788	0	Not applicable, non-structural FMP (early warning)		0	0.00	Not applicable, non-structural FMP (early warning)	0	0	#DIV/0!		0
Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	143000009	0.47	Not applicable, non-structural FMP (regulatory)	Not applicable, non-structural FMP (regulatory)	0	Hudspeth County	3,913	1629	Not applicable, non-structural FMP (regulatory)		0	0.00	Not applicable, non-structural FMP (early warning)	823	0	0.0%		0
SSA4	143000011	0.727		Baseline average flood depth > 0.5ft	4	Sorroco City, Sparks CDP	39,066	564	1.44%	<25% of project community affected	1	99.00	54%	185	99	53.5%	Reduced risk to <75% of structures in floodplain	7
SOC4	143000021	0.598		Baseline average flood depth > 0.5ft	4	Sorroco City	34,306	26	0.08%	<25% of project community affected	1	10.00	100%	10	10	100.0%	Reduced risk to >75% of structures in floodplain	10

Texas Water Development Board

		Score 4: Flood Damage Reduction						Score 5: Critical Facilities Damage Reduction			
Project Name	**FMP ID**	**# of Structures with Reduced 1% Annual Chance Flood Risk**	**Pre-Project Damage $**	**Post-Project Damage $**	**Notes 4**	**Flood Damage Reduction**	**Score 4**	**# of Critical Facilites Removed from 1% Annual Chance FP**	**Notes 5**	**Reduction in Critical Facilities Flood Risk**	**Score 5**
Small pond at San Elizario	143000003	0	$0	$0	Project does not have 1% annual chance Level of service		0	0	No Critical Facilities in Floodplain		0
SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	143000005	0	$355,136	$355,136	Project does not have 1% annual chance Level of service		0	0	No Critical Facilities in Floodplain		0
Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	143000007	0	$0	$0	Not applicable, non-structural FMP (early warning)		0	0	Not applicable, non-structural FMP (regulatory)		0
Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	143000009	N/A	$0	$0	Not applicable, non-structural FMP (regulatory)		0	0	Not applicable, non-structural FMP (regulatory)		0
SSA4	143000011	185	$8,172,542	$2,996,393	63.34%	Flood Damage Reduction > 50%	6	0	No Critical Facilities in Floodplain		0
SOC4	143000021	10	$432,110	$0	100.00%	Flood Damage Reduction > 95%	10	0	No Critical Facilities in Floodplain		0

Texas Water Development Board

		Score 6: Life and Safety				Score 7: Water Supply						Score 8: Social Vulnerability			
Project Name	FMP ID	Adjusted Injury Risk (%)	Notes 6	Life and Safety Ranking (Injury/ Loss of Life)	Score 6	Water Supply Benefit in Acre-Feet	SourceID	WMS_ID	Notes 7	Water Supply Yield Ranking	Score 7	SVI Score	Notes 8	Social Vulnerability Ranking	Score 8
Small pond at San Elizario	143000003	0.4		Life/injury risk percentage <20%	2	0				No impact on water supply	0	0.96		SVI between 0.75-1.00 (high vulnerability)	10
SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	143000005	11.1		Life/injury risk percentage <20%	2	0				No impact on water supply	0	0.29		SVI between 0.25-0.5 (low to moderate vulnerability)	4
Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	143000007	90.5		Life/injury risk percentage >50%	10	0				No impact on water supply	0	0.91		SVI between 0.01-0.25 (low vulnerability)	1
Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	143000009	0	Not applicable, non-structural FMP (regulatory)			N/A				No impact on water supply	0	0.56		SVI between 0.5-0.75 (moderate to high vulnerability)	7
SSA4	143000011	4.0		Life/injury risk percentage <20%		0				No impact on water supply	0	0.90		SVI between 0.75-1.00 (high vulnerability)	10
SOC4	143000021	2.7		Life/injury risk percentage <20%		0				No impact on water supply	0	0.94		SVI between 0.75-1.00 (high vulnerability)	10

		Score 9: Nature-Based Solution				Score 10: Multiple Benefites				Score 11: O&M			
Project Name	**FMP ID**	**% Nature Based Solution by Cost**	**Notes 9**	**Nature-Based Solutions Ranking**	**Score 9**	**Multiple Benefits Description**	**Notes 10**	**Multiple Benefit Ranking**	**Score 10**	**O&M Cost (Annual)**	**Notes 11**	**Operations and Maintenance Ranking**	**Score 11**
Small pond at San Elizario	143000003	0%			0		Transportation benefit	Project delivers benefits in only 1 wider benefit category	1	$2,000	sediment/trash/ debris removal	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	143000005	0%			0		Transportation benefit	Project delivers benefits in only 1 wider benefit category	1	$2,000	sediment/trash/ debris removal	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	143000007	0%			0		Transportation benefit	Project delivers benefits in only 1 wider benefit category	1	$21,650	One time training course is available to train City staff on annual maintenance requirements for $3,500. To contract out annual maintenance is $21,650 annually.	Project will require ongoing operation and maintenance outside of the owner's regular maintenance practices; long-term O&M requirements are undefined; and/or high annual O&M cost > 1% of project (high);	4
Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	143000009		Not applicable, non-structural FMP (regulatory)					Not applicable, non-structural FMP (regulatory)			Ongoing operation costs of new program to regulate development are currently unknown.	Project will require ongoing operation and maintenance outside of the owner's regular maintenance practices; long-term O&M requirements are undefined; and/or high annual O&M cost > 1% of project (high);	4
SSA4	143000011	0%			0		Agricultural benefit	Project delivers benefits in only 1 wider benefit category	1	$10,000	Sediment Clearing	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
SOC4	143000021	0%			0		Transportation and agricultural benefits	Project delivers benefits in 2 wider benefit categories	4	$10,000	Sediment Clearing	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7

		Score 12: Admin, Regulatory Obstacles			Score 13: Enviromental Benefit			Score 14: Enviromental Impact			Score 15: Mobility			
Project Name	**FMP ID**	**Notes 12**	**Administrative, Regulatory and Other Obstacle Ranking**	**Score 12**	**Notes 13**	**Environmental Benefit Ranking**	**Score 13**	**Notes 14**	**Environmental Impact Ranking**	**Score 14**	**Traffic Count for LWC Project**	**Notes 15**	**Mobility Ranking**	**Score 15**
Small pond at San Elizario	143000003	Potential stream and cultural resources impacts. National Register district compliance.	Project has a typical number of administrative, regulatory and limitations / requirements	6	Captures sediment and trash, improving water quality. Slows velocities by adding storage volume to the system.	Project will deliver a low level of environmental benefits (benefits in only 1 category)	3	Impacts to cultural heritage. Two National Register Districts and five archaeological sites are located within and /or adjacent to the proposed project area.	Project will have adverse environmental impacts in 1 environmental category	6			Project provides no change to major, minor, or emergency access routes in the project area.	0
SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	143000005	Potential for impacts to stream channels.	Project has a typical number of administrative, regulatory and limitations / requirements	6	Improvements to inlet and culvert capacities will help facilitate flow of stormwater in the drainage system, reducing erosion caused by stormwater overflowing from the system.	Project will deliver a low level of environmental benefits (benefits in only 1 category)	3	Low potential for impacts to protected species. No cultural resources are located within or immediately adjacent to the project areas.	Project has no adverse environmental impacts	10			Project provides no change to major, minor, or emergency access routes in the project area.	0
Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	143000007	Low potential for impacts to protected species.	Project has few administrative, regulatory and implementation limitations / requirements	10		Project does not provide any environmental benefits	0	non-structural FMP (early warning)	Project has no adverse environmental impacts	10		Project would provide early warning to deploy road closures and would prevent drivers from injury/fatalities associated with crossing low water crossings during a flood.	Project will protect some major access routes in floodplain and the majority (>50%) of emergency service access. Some major and many minor access routes will remain flooded, and emergency services access may be restricted in some areas (i.e. >50% of floodplain by area inaccessible).	4
Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	143000009	Not applicable, non-structural FMP (regulatory)			Expected to increase Section 404 permitting/regulatory compliance	Project will deliver a moderate level of environmental benefits (benefits in 2-3 categories)	6	Non-structural FMP (regulatory), FMP would reduce impacts on jurisdictional waters of the U.S. by improving regulation.	Project has no adverse environmental impacts	10		Not applicable, non-structural FMP (regulatory)		
SSA4	143000011	Moderate bird nesting, mammal, and reptile potential habitat adjacent to arroyo. Federally listed southwestern willow flycatcher and western yellow-billed cuckoo could occur in riparian habitats	Project has a typical number of administrative, regulatory and limitations / requirements	6	Mitigate flooding events and keep sediment and/or trash from washing downstream during severe storms.	Project will deliver a moderate level of environmental benefits (benefits in 2-3 categories)	6	Potential for impacts to protected species	Project will have adverse environmental impacts in 1 environmental category	6			Project provides no change to major, minor, or emergency access routes in the project area.	0
SOC4	143000021	Federally listed southwestern willow flycatcher and western yellow-billed cuckoo could occur in riparian habitats. National Register district compliance.	Project has a typical number of administrative, regulatory and limitations / requirements	6	Captures sediment coming down the arroyos reducing sedimentation, slowing velocities (erosion), and promotes infiltration. Agricultural Properties removed from flooding.	Project will deliver a moderate level of environmental benefits (benefits in 2-3 categories)	6	Federally listed southwestern willow flycatcher and western yellow-billed cuckoo could occur in riparian habitats. Located within the EPCWID1 National Register District, requiring cultural resources survey.	Project will have adverse environmental impacts in 2-3 environmental categories	3			Project will protect major and minor access routes in floodplain and emergency service access to EMS, police stations, and fire stations. Allows emergency services access to the entire administrative area.	10

		General Project Data												
Project Name	FMP ID	Project Description	Flood Region	Project Type	FIUP Project Category	Project Watershed	Rural Applicant	Project Cost	Benefit Cost Ratio	Cost per Structure Removed	Pre-Project Level-of-Service	Post-Project Level-of-Service	# of Structures in 1% Annual Chance FP (Pre-Project)	Project Status
MON3	143000024	Sediment/Retention Basin	14	Detention Pond	Category 2	SUB_C11,SUB_G01,SUB_G02,MON3,Unnamed_FME_Watershed,City of Socorro-Rio Grande	N	$27,033,000	0.2	$82,670	<1% annual chance	1% annual chance	756	Planning
HAC3	143000025	Sediment/Retention Basin	14	Detention Pond	Category 2	A_Stream 8-1,A_Stream 8-2,A_Hacienda Real-4,Daugherty Lateral-Rio Grande,HAC3,Unnamed_FME_Watershed,City of Socorro-Rio Grande	N	$4,619,000	0	$461,900	<1% annual chance	1% annual chance	10	Planning
NW16	143000097	Expand channel from Village Ct to Doniphan Dr	14	Channel	Category 2	WSD_2,DD_1,DD_3,D_1A_2,D_O1_2,NW16,Unnamed_FME_Watershed,City of El Paso-Rio Grande	N	$1,570,000	0	$523,333	<1% annual chance	1% annual chance	3	Planning
NE3B	143000100	Alcan Pond: new catch basin to capture FP15 upstream	14	Detention Pond	Category 2	A_Tobin Drain U/S Irvin High,Unnamed_FME_Watershed,Bowman Lateral-Rio Grande	N	$21,234,000	0.1	$393,222	<1% annual chance	1% annual chance	136	Planning
EA10A	143000105	Build sediment/detention basin upstream of Paseo del Este Drive	14	Detention Pond	Category 2	Unnamed Watershed,WS-124C,A_Ten_130,Unnamed_FME_Watershed,City of Socorro-Rio Grande	N	$9,647,000	0	$9,647,000	<1% annual chance	0.2% annual chance	17	Preliminary Design
NW3	143000111	Construction of new larger capacity Doniphan Pump Station to replace PS1, with new force main directly to the Rio Grande. Install new catch basin with mechanical bar screen upstream of PS2.	14	Detention Pond	Category 2	OO_1,DD_1,Ind_1,Doniphan_PS1,Doniphan_PS2,Montoya_Wetland,Unnamed_FME_Watershed,City of El Paso-Rio Grande	N	$16,132,000	0	$2,688,667	<1% annual chance	1% annual chance	6	Planning
NW26	143000113	Acquire land, construct a permanent wetland, install a storm drain system to Doniphan Drive, construct pipeline to Doniphan Pump Station and build new pump station to control flood levels.	14	Detention Pond	Category 2	OO_1,DD_1,Doniphan_PS2,Montoya_Wetland,Unnamed_FME_Watershed,City of El Paso-Rio Grande	N	$35,568,000	0	N/A	<1% annual chance	1% annual chance	6	Planning

		Score 1: Severity - Pre-Project Average Depth of Flooding (100-year)				Score 2: Severity - Community Need (% Population)						Score 3: Flood Risk Reduction						
Project Name	**FMP ID**	**Average Flood Depth (100yr)**	**Notes**	**Severity Ranking: Pre-Project Average Depth of Flooding (100-year)**	**Score 1**	**Communities Served by Project**	**Community Population Served**	**Flood Plain Population**	**Notes 2**	**Severity Ranking: Community Need (% Population)**	**Score 2**	**# of Structures Removed from 1% Annual Chance FP**	**Notes 3**	**Structures in 100yr Floodplain**	**Structures Removed from 100yr FP**	**% Structures Removed from 100yr FP2**	**Flood Risk Reduction**	**Score 3**
MON3	143000024	1.373		Baseline average flood depth > 1ft	6	Homestead Meadows North CDP, Homestead Meadows South CDP	12,352	1977	16.01%	<25% of project community affected	1	327.00	43%	756	327	43.3%	Reduced risk to <50% of structures in floodplain	4
HAC3	143000025	0.150		Baseline average flood depth < 0.5ft	2	Morning Glory CDP	522	23	4.41%	<25% of project community affected	1	10.00	100%	10	10	100.0%	Reduced risk to >75% of structures in floodplain	10
NW16	143000097	1.316		Baseline average flood depth > 1ft	6	El Paso City	678,815	12	0.00%	<25% of project community affected	1	3.00	100%	3	3	100.0%	Reduced risk to >75% of structures in floodplain	10
NE3B	143000100	0.704		Baseline average flood depth > 0.5ft	4	El Paso city	678,815	615	0.09%	<25% of project community affected	1	54.00	40%	136	54	39.7%	Reduced risk to <50% of structures in floodplain	4
EA10A	143000105	1.147		Baseline average flood depth > 1ft	6	El Paso city, Sorroco city	713,121	287	0.04%	<25% of project community affected	1	1.00	6%	17	1	5.9%	Reduced risk to <10% of structures in floodplain	1
NW3	143000111	0.618		Baseline average flood depth > 0.5ft	4	El Paso city	678,815	37	0.01%	<25% of project community affected	1	6.00	100%	6	6	100.0%	Reduced risk to >75% of structures in floodplain	10
NW26	143000113	0.618		Baseline average flood depth > 0.5ft	4	El Paso city	678,815	37	0.01%	<25% of project community affected	1	0.00	100%	6	0	0.0%	Reduced risk to 0 structures in floodplain	10

Project Name	FMP ID	Score 4: Flood Damage Reduction						Score 5: Critical Facilities Damage Reduction			
		# of Structures with Reduced 1% Annual Chance Flood Risk	Pre-Project Damage $	Post-Project Damage $	Notes 4	Flood Damage Reduction	Score 4	# of Critical Facilites Removed from 1% Annual Chance FP	Notes 5	Reduction in Critical Facilities Flood Risk	Score 5
MON3	143000024	655	$30,463,281	$14,206,208	53.37%	Flood Damage Reduction > 50%	6	0	No Critical Facilities in Floodplain		0
HAC3	143000025	10	$104,579	$0	100.00%	Flood Damage Reduction > 95%	10	0	No Critical Facilities in Floodplain		0
NW16	143000097	11	$225,771	$0	100.00%	Flood Damage Reduction > 95%	10	0	No Critical Facilities in Floodplain		0
NE3B	143000100	98	$7,162,935	$3,198,310	55.35%	Flood Damage Reduction > 50%	6	0	No Critical Facilities in Floodplain		0
EA10A	143000105	8.00	$214,923	$121,861	43.30%	Flood Damage Reduction > 25%	4	0	No Critical Facilities in Floodplain		0
NW3	143000111	6	$230,709	$0	100.00%	Flood Damage Reduction > 95%	10	1	100%	Critical Facilties reduction >95%	10
NW26	143000113	0	$312,687	$269,098	13.94%	Flood Damage Reduction < 25%	2	0	Does not remove critical facility from floodplain	Critical facilties reduction <25%	2

		Score 6: Life and Safety				Score 7: Water Supply						Score 8: Social Vulnerability			
Project Name	**FMP ID**	**Adjusted Injury Risk (%)**	**Notes 6**	**Life and Safety Ranking (Injury/ Loss of Life)**	**Score 6**	**Water Supply Benefit in Acre-Feet**	**SourceID**	**WMS_ID**	**Notes 7**	**Water Supply Yield Ranking**	**Score 7**	**SVI Score**	**Notes 8**	**Social Vulnerability Ranking**	**Score 8**
MON3	143000024	13.5		Life/injury risk percentage <20%		0				No impact on water supply	0	0.74		SVI between 0.5-0.75 (moderate to high vulnerability)	7
HAC3	143000025	2.0		Life/injury risk percentage <20%		0				No impact on water supply	0	0.99		SVI between 0.75-1.00 (high vulnerability)	10
NW16	143000097	5.9		Life/injury risk percentage <20%		0				No impact on water supply	0	0.89		SVI between 0.75-1.00 (high vulnerability)	10
NE3B	143000100	9.0		Life/injury risk percentage <20%		0				No impact on water supply	0	0.78		SVI between 0.75-1.00 (high vulnerability)	10
EA10A	143000105	2.6		Life/injury risk percentage <20%		0				No impact on water supply	0	0.64		SVI between 0.5-0.75 (moderate to high vulnerability)	7
NW3	143000111	12.7		Life/injury risk percentage <20%		0				No impact on water supply	0	0.79		SVI between 0.75-1.00 (high vulnerability)	10
NW26	143000113	12.7		Life/injury risk percentage <20%		0				No impact on water supply	0	0.79		SVI between 0.75-1.00 (high vulnerability)	10

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		Score 9: Nature-Based Solution				Score 10: Multiple Benefites				Score 11: O&M			
Project Name	**FMP ID**	**% Nature Based Solution by Cost**	**Notes 9**	**Nature-Based Solutions Ranking**	**Score 9**	**Multiple Benefits Description**	**Notes 10**	**Multiple Benefit Ranking**	**Score 10**	**O&M Cost (Annual)**	**Notes 11**	**Operations and Maintenance Ranking**	**Score 11**
MON3	143000024	0%			0		Transportation benefit	Project delivers benefits in only 1 wider benefit category	1	$10,000	Sediment Clearing	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
HAC3	143000025	0%			0		Transportation and agricultual benefits	Project delivers benefits in 2 wider benefit categories	2	$10,000	Sediment Clearing	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
NW16	143000097	0%			0			Project does not deliver any wider benefits	0	$1,000	sediment/trash/ debris removal	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
NE3B	143000100	0%			0		Transportation benefit	Project delivers benefits in only 1 wider benefit category	1	$5,000	Sediment/trash removal	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
EA10A	143000105	0%			0		Agricultural benefit	Project delivers benefits in only 1 wider benefit category	1	$10,000	Sediment Clearing	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
NW3	143000111	0%			0		Transportation benefit	Project delivers benefits in only 1 wider benefit category	1	$5,000	Pump Maintenance	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
NW26	143000113	1%	1% of the project cost is associated with a nature-based solution (constructed wetland)	< 25% of the project cost is nature-based	1		Transportation benefit	Project delivers benefits in only 1 wider benefit category	1	$5,000	Pump Maintenance	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7

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		Score 12: Admin, Regulatory Obstacles			Score 13: Enviromental Benefit			Score 14: Environmental Impact			Score 15: Mobility			
Project Name	FMP ID	Notes 12	Administrative, Regulatory and Other Obstacle Ranking	Score 12	Notes 13	Environmental Benefit Ranking	Score 13	Notes 14	Environmental Impact Ranking	Score 14	Traffic Count for LWC Project	Notes 15	Mobility Ranking	Score 15
MON3	143000024	High bird nesting, reptile, and mammal habitat potential throughout project area. Low amphibian habitat potential in low, depressional areas. Federally listed southwestern willow flycatcher and western yellow-billed cuckoo could occur in riparian habitats.	Project has a typical number of administrative, regulatory and limitations / requirements	6	Captures sediment coming down the arroyos reducing sedimentation, slowing velocities (erosion), and promotes infiltration.	Project will deliver a low level of environmental benefits (benefits in only 1 category)	3	Potential for impacts to protected species and stream channels. One prehistoric archaeological site is located within the proposed project area with undetermined NRHP eligibility, recommend structured cultural resources survey	Project will have adverse environmental impacts in 2-3 environmental categories	3			Project provides no change to major, minor, or emergency access routes in the project area.	0
HAC3	143000025	Potential for impacts to protected species and stream channels. National Register district compliance.	Project has a typical number of administrative, regulatory and limitations / requirements	6	Captures sediment coming down the arroyos reducing sedimentation, slowing velocities (erosion), and promotes infiltration. Agricultural Properties removed from flooding.	Project will deliver a moderate level of environmental benefits (benefits in 2-3 categories)	6	The state threatened Texas horned lizard may be present in open habitats. Located within the EPCWID1 National Register District, requiring cultural resources survey.	Project will have adverse environmental impacts in 2-3 environmental categories	3			Project provides no change to major, minor, or emergency access routes in the project area.	0
NW16	143000097	Low potential for impacts to protected species. National Register district compliance.	Project has few administrative, regulatory and implementation limitations / requirements	10		Project does not provide any environmental benefits	0	Low potential for impacts to protected species.	Project will have adverse environmental impacts in 1 environmental category	6			Project provides no change to major, minor, or emergency access routes in the project area.	0
NE3B	143000100	No state or federally listed species are likely to occur within or adjacent to the project area.	Project has few administrative, regulatory and implementation limitations / requirements	10	Captures sediment and trash, improving water quality. Slows velocities by adding storage volume to the system.	Project will deliver a low level of environmental benefits (benefits in only 1 category)	3	Low potential for impacts based on desktop analysis and available information.	Project has no adverse environmental impacts	10			Project provides no change to major, minor, or emergency access routes in the project area.	0
EA10A	143000105	Federally listed southwestern willow flycatcher and western yellow-billed cuckoo could occur in riparian habitats.	Project has a typical number of administrative, regulatory and limitations / requirements	6	Captures sediment coming down the arroyos reducing sedimentation, slowing velocities (erosion), and promotes infiltration. Agricultural Properties removed from flooding.	Project will deliver a moderate level of environmental benefits (benefits in 2-3 categories)	6	Federally listed southwestern willow flycatcher and western yellow-billed cuckoo could occur in riparian habitats.	Project will have adverse environmental impacts in 1 environmental category	6			Project provides no change to major, minor, or emergency access routes in the project area.	0
NW3	143000111	Low bird nesting potential along proposed new force main.	Project has a typical number of administrative, regulatory and limitations / requirements	6	Catch screen will filter out trash and debris from drainage.	Project will deliver a low level of environmental benefits (benefits in only 1 category)	3	Low bird nesting potential along proposed new force main.	Project has no adverse environmental impacts	10			Project will protect major and minor access routes in floodplain and emergency service access to EMS, police stations, and fire stations. Allows emergency services access to the entire administrative area.	10
NW26	143000113	Moderate bird nesting, mammal, and reptile potential habitat adjacent to Rio Grande River. Federally listed southwestern willow flycatcher and western yellow-billed cuckoo could occur in riparian habitats.	Project has a typical number of administrative, regulatory and limitations / requirements	6	Construction of artificial wetland will improve wildlife habitat and water quality in the area.	Project will deliver a moderate level of environmental benefits (benefits in 2-3 categories)	6	Proposed constructed wetland is directly adjacent to but not connected to Segment 2314 of the Rio Grande River, TCEQ classifies this portion of the river as impaired due to bacteria in water. Cultural resource survey recommended due to close proximity (0.2 mi) to Elephant Butte Irrigation National Register District.	Project will have adverse environmental impacts in 2-3 environmental categories	3			Project will protect major and minor access routes in floodplain and emergency service access to EMS, police stations, and fire stations. Allows emergency services access to the entire administrative area.	10

		General Project Data												
Project Name	**FMP ID**	**Project Description**	**Flood Region**	**Project Type**	**FIUP Project Category**	**Project Watershed**	**Rural Applicant**	**Project Cost**	**Benefit Cost Ratio**	**Cost per Structure Removed**	**Pre-Project Level-of-Service**	**Post-Project Level-of-Service**	**# of Structures in 1% Annual Chance FP (Pre-Project)**	**Project Status**
EA9A	143000116	Build sediment/detention basin upstream of Paseo del Este Drive	14	Detention Pond	Category 2	Unnamed Watershed,WS-124A,A_Ten_121,Unnamed_FME_Watershed,City of Socorro-Rio Grande	N	$11,897,000	0	$915,154	<1% annual chance	0.2% annual chance	17	Preliminary Design
WC4	143000123	Construct a new 37.59 ac-ft pond to relieve roadway flooding on Mesa Street.	14	Detention Pond	Category 2	Doniphan Corridor 2018, Courchesne 2013, FPN21_2	N	$10,198,412	0.043	$679,894	<1% Annual Chance	1% Annual Chance	15	Planning
VIN1	143000118	Construction of a diversion channel and two combination of sediment/detention basins.	14	Detention Pond/Channel	Category 2	FPN45_4, FPN45_5	Y	$59,386,497	0.123	$151,496	N/A	0.2% Annual Chance	431	Planning
Gateway Ponds	143000117	Acquire land, expand the existing detention basin north of I-10. Construction of new larger capacity Pump Station with capacity of 350 cfs in the north pond, with new force main directly to the Rio Grande.	14	Detention Pond & Pump Station	Category 2	Cebada_Reservoir	N	$108,224,885	0.077	$525,364	<1% Annual Chance	1% Annual Chance	206	Planning
Dallas Ponds	143000121	Acquire land, build new detention basin north of IH-10. Construction of new larger capacity Pump Station with capacity of 250 cfs in the basin with new force main directly to the Rio Grande.	14	Detention Pond & Pump Station	Category 2	Cotton_Dallas_US	N	$160,532,311	0.036	$949,895	N/A	1% Annual Chance	169	Planning
Presidio	143000120	Retention & Detention Basin	14	Detention Pond	Category 2	Arroyo Tortola- Rio Grande	Y	$4,620,933	0.015	$513,437	<1% Annual Chance	1% Annual Chance	10	Planning

		Score 1: Severity - Pre-Project Average Depth of Flooding (100-year)				Score 2: Severity - Community Need (% Population)						Score 3: Flood Risk Reduction						
Project Name	**FMP ID**	**Average Flood Depth (100yr)**	**Notes**	**Severity Ranking: Pre-Project Average Depth of Flooding (100-year)**	**Score 1**	**Communities Served by Project**	**Community Population Served**	**Flood Plain Population**	**Notes 2**	**Severity Ranking: Community Need (% Population)**	**Score 2**	**# of Structures Removed from 1% Annual Chance FP**	**Notes 3**	**Structures in 100yr Floodplain**	**Structures Removed from 100yr FP**	**% Structures Removed from 100yr FP2**	**Flood Risk Reduction**	**Score 3**
EA9A	143000116	1.147		Baseline average flood depth > 1ft	6	El Paso city, Sorroco city	713,121	287	0.04%	<25% of project community affected	1	13.00	76%	17	13	76.5%	Reduced risk to >75% of structures in floodplain	10
WC4	143000123	1.41	Based on 2023 HEC-RAS 2-D modeling with Atlas 14 1% AC rain data.	Baseline average flood depth > 1ft	6	El Paso City	765447	109	0.01%	<25% of project community affected	1	15	100%	15	0	0%	Reduced risk to >75% of structures in floodplain	10
VIN1	143000118	0.80	Based on 2023 HEC-RAS 2-D modeling with Atlas 14 1% AC rain data.	Baseline average flood depth > 0.5ft	4	Vinton	2769	918	33.15%	25%-50% of project community affected	4	392	91%	431	392	91%	Reduced risk to >75% of structures in floodplain	10
Gateway Ponds	143000117	1.35	Based on 2023 HEC-RAS 2-D modeling with Atlas 14 1% AC rain data.	Baseline average flood depth > 1ft	6	El Paso city	678815	899	0.13%	<25% of project community affected	1	206	100%	206	206	100%	Reduced risk to >75% of structures in floodplain	10
Dallas Ponds	143000121	0.37	Based on 2023 HEC-RAS 2-D modeling with Atlas 14 1% AC rain data.	Baseline average flood depth > 0.5ft	4	El Paso city	678815	3226	0.48%	<25% of project community affected	1	169	100%	169	169	100%	Reduced risk to >75% of structures in floodplain	10
Presidio	143000120	0.31	Based on 2023 HEC-RAS 2-D modeling with Atlas 14 1% AC rain data.	Baseline average flood depth < 0.5ft	2	Presidio City		16		<25% of project community affected	1	9	90%	10	9	90%	Reduced risk to >75% of structures in floodplain	10

		Score 4: Flood Damage Reduction						Score 5: Critical Facilities Damage Reduction			
Project Name	**FMP ID**	**# of Structures with Reduced 1% Annual Chance Flood Risk**	**Pre-Project Damage $**	**Post-Project Damage $**	**Notes 4**	**Flood Damage Reduction**	**Score 4**	**# of Critical Facilites Removed from 1% Annual Chance FP**	**Notes 5**	**Reduction in Critical Facilities Flood Risk**	**Score 5**
EA9A	143000116	17	$856,243	$86,910	89.85%	Flood Damage Reduction > 75%	8	0	No Critical Facilities in Floodplain		0
WC4	143000123	15	$1,377,258	$0	100%	Flood damage reduction > 95%	10	1	Hospital removed from Floodplain.	critical facilities reduction >95%	10
VIN1	143000118	431	$22,623,009	$1,277,840	94%	Flood damage reduction > 75%	8	0	No Critical Facilities in Floodplain	0	0
Gateway Ponds	143000117	206	$26,087,093	$0	100%	Flood damage reduction > 95%	10	0	No Critical Facilities in Floodplain	0	0
Dallas Ponds	143000121	169	$2,704,344.32	$0	100%	Flood damage reduction > 95%	10	3	Fire Station, School, and Hospital	critical facilities reduction >95%	10
Presidio	143000120	10	$191,305.73	$0	100%	Flood damage reduction > 95%	10	0		Reduced risk for 0 structures in floodplain	0

Project Name	FMP ID	Score 6: Life and Safety				Score 7: Water Supply						Score 8: Social Vulnerability			
		Adjusted Injury Risk (%)	Notes 6	Life and Safety Ranking (Injury/ Loss of Life)	Score 6	Water Supply Benefit in Acre-Feet	SourceID	WMS_ID	Notes 7	Water Supply Yield Ranking	Score 7	SVI Score	Notes 8	Social Vulnerability Ranking	Score 8
EA9A	143000116	2.6		Life/injury risk percentage <20%		0				No impact on water supply	0	0.64		SVI between 0.5-0.75 (moderate to high vulnerability)	7
WC4	143000123	134.0	1 Flood-related injury in El Paso County in 1997.	Life/injury risk percentage >50%	10	0				No impact on water supply	0	0.77	Areal weighted-average SVI	SVI between 0.75-1.00 (high vulnerability)	10
VIN1	143000118	31.3	1 Flood-related injury in El Paso County in 1997.	Life/injury risk percentage >30%	6	0				No impact on water supply	0	0.84	Areal weighted-average SVI	SVI between 0.75-1.00 (high vulnerability)	10
Gateway Ponds	143000117	34.7	1 Flood-related injury in El Paso County in 1997.	Life/injury risk percentage >30%	6	0				No impact on water supply	0	0.93	Areal weighted-average SVI	SVI between 0.75-1.00 (high vulnerability)	10
Dallas Ponds	143000121	17.45	1 Flood-related injury in El Paso County in 1997.	Life/injury risk percentage <20%	2	0				No impact on water supply	0	0.98	Areal weighted-average SVI	SVI between 0.75-1.00 (high vulnerability)	10
Presidio	143000120	16.66		Life/injury risk percentage <20%	2	0				No impact on water supply	0	0.95	Areal weighted-average SVI	SVI between 0.75-1.00 (high vulnerability)	10

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		Score 9: Nature-Based Solution				Score 10: Multiple Benefites				Score 11: O&M			
Project Name	**FMP ID**	**% Nature Based Solution by Cost**	**Notes 9**	**Nature-Based Solutions Ranking**	**Score 9**	**Multiple Benefits Description**	**Notes 10**	**Multiple Benefit Ranking**	**Score 10**	**O&M Cost (Annual)**	**Notes 11**	**Operations and Maintenance Ranking**	**Score 11**
EA9A	143000116	0%			0		Transportation and agricultual benefits	Project delivers benefits in 2 wider benefit categories	2	$10,000	Sediment Clearing	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
WC4	143000123	0%			0	Project resilience goals that indicate that project is planned to withsatnd a long term service life (>50 yr)	Transportation benefit	Project delivers benefits in 2 wider benefit categories	4	$16,000	sediment/trash/ debris removal	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
VIN1	143000118	0%			0	Project resilience goals that indicate that project is planned to withsatnd a long term service life (>50 yr)	Transportation benefit	Project delivers benefits in 2 wider benefit categories	4	$32,000	sediment/trash/ debris removal	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
Gateway Ponds	143000117	0%			0	Project resilience goals that indicate that project is planned to withsatnd a long term service life (>50 yr)	Transportation benefit	Project delivers benefits in 2 wider benefit categories	4	$16,000	sediment/trash/ debris removal	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
Dallas Ponds	143000121	0%			0	Project resilience goals that indicate that project is planned to withsatnd a long term service life (>50 yr)	Transportation benefit	Project delivers benefits in 2 wider benefit categories	4	$16,000	sediment/trash/ debris removal	Project requires regular, ongoing operation and maintenance; and/or O&M requirements are well defined (Regular)	7
Presidio	143000120	0%			0	Project resilience goals that indicate that project is planned to withsatnd a long term service life (>50 yr)		Project delivers benefits in 2 wider benefit categories	4			Project will not require any ongoing operation and maintenance (low);	10

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		Score 12: Admin, Regulatory Obstacles			Score 13: Enviromental Benefit			Score 14: Environmental Impact			Score 15: Mobility			
Project Name	**FMP ID**	**Notes 12**	**Administrative, Regulatory and Other Obstacle Ranking**	**Score 12**	**Notes 13**	**Environmental Benefit Ranking**	**Score 13**	**Notes 14**	**Environmental Impact Ranking**	**Score 14**	**Traffic Count for LWC Project**	**Notes 15**	**Mobility Ranking**	**Score 15**
EA9A	143000116	Low potential for impacts to protected species; cultural resources due diligence survey recommended	Project has a typical number of administrative, regulatory and limitations / requirements	6	Captures sediment coming down the arroyos reducing sedimentation, slowing velocities (erosion), and promotes infiltration. Agricultural Properties removed from flooding.	Project will deliver a moderate level of environmental benefits (benefits in 2-3 categories)	6	Low potential for impacts based on desktop analysis and available information.	Project has no adverse environmental impacts	10			Project provides no change to major, minor, or emergency access routes in the project area.	0
WC4	143000123	Moderate bird nesting, reptile, and mammal habitat potential throughout project area; ephemeral stream impacts. Federally listed southwestern willow flycatcher and western yellow-billed cuckoo could occur in riparian habitats. Not expected to impact cultural resources.	2	2	Sediment capture	3	3	Moderate potential for impacts.	3	3			Project will protect major access route in floodplain and emergency service access to EMS, police stations, and fire stations.	10
VIN1	143000118	Moderate to high bird nesting potential within densely vegetated riparian areas within project area. Federally listed southwestern willow flycatcher and western yellow-billed cuckoo could occur in riparian habitats; cultural resources due diligence survey recommended.	2	2	Sediment capture	3	3	Moderate potential for impacts.	3	3			Project will protect some major access routes in floodplain and the majority (>50%) of emergency service access. Some major and many minor access routes will remain flooded, and emergency services access may be restricted in some areas	4
Gateway Ponds	143000117	Low potential for impacts to protected species; numerous known cultural resources intersecting or adjacent; in National Register District.	2	2	Sediment capture	3	3	Low potential for impacts.	6	6			Project will protect major and minor access routes in floodplain and emergency service access to EMS, police stations, and fire stations. Allows emergency services access to the entire administrative area.	10
Dallas Ponds	143000121	Low potential for impacts to protected species. Known cultural resources intersecting or adjacent; National Historic Districts.	2	2	Flood control	3	3	Low potential for resource impacts.	6	6			Project will protect major and minor access routes in floodplain and emergency service access to EMS, police stations, and fire stations. Allows emergency services access to the entire administrative area.	10
Presidio	143000120	Moderate bird nesting, mammal, and reptile potential habitat adjacent to arroyo. Federally listed southwestern willow flycatcher, Mexican long-nosed bat and western yellow-billed cuckoo could occur in riparian habitats; cultural resources due diligence survey recommended.	6	6	Sediment capture	3	3	Moderate potential for impacts.	3	3			Project will protect major and minor access routes in floodplain and emergency service access to EMS, police stations, and fire stations. Allows emergency services access to the entire administrative area.	10

		General Project Data												
Project Name	**FMP ID**	**Project Description**	**Flood Region**	**Project Type**	**FIUP Project Category**	**Project Watershed**	**Rural Applicant**	**Project Cost**	**Benefit Cost Ratio**	**Cost per Structure Removed**	**Pre-Project Level-of-Service**	**Post-Project Level-of-Service**	**# of Structures in 1% Annual Chance FP (Pre-Project)**	**Project Status**
WC1	143000122	Sediment Retention Basin	14	Sediment Detention Pond	Category 2	City of Coronado Hills - Rio Grande	N	$4,461,518	0.367	$43,740	<1% Annual Chance	1% Annual Chance	110	Planning
City of Pecos	143000119	Retention Basin	14	Detention Pond	Category 2	Salt Draw	N	$11,161,000	0.173	$218,843	<50% Annual Chance	50% Annual Chance	993	Planning

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		Score 1: Severity - Pre-Project Average Depth of Flooding (100-year)				Score 2: Severity - Community Need (% Population)						Score 3: Flood Risk Reduction						
Project Name	**FMP ID**	**Average Flood Depth (100yr)**	**Notes**	**Severity Ranking: Pre-Project Average Depth of Flooding (100-year)**	**Score 1**	**Communities Served by Project**	**Community Population Served**	**Flood Plain Population**	**Notes 2**	**Severity Ranking: Community Need (% Population)**	**Score 2**	**# of Structures Removed from 1% Annual Chance FP**	**Notes 3**	**Structures in 100yr Floodplain**	**Structures Removed from 100yr FP**	**% Structures Removed from 100yr FP2**	**Flood Risk Reduction**	**Score 3**
WC1	143000122	0.71	Based on 2023 HEC-RAS 2-D modeling with Atlas 14 1% AC rain data.	Baseline average flood depth > 0.5ft	4	El Paso City		384		<25% of project community affected	1	102	93%	110	102	93%	Reduced risk to >75% of structures in floodplain	10
City of Pecos	143000119	1.24	Based on 2023 HEC-RAS 2-D modeling with Atlas 14 1% AC rain data.	Baseline average flood depth > 1ft	6	Pecos City		1137		<25% of project community affected	1	51	5%	993	51	5%	Reduced risk to <10% of structures in floodplain	1

		Score 4: Flood Damage Reduction						Score 5: Critical Facilities Damage Reduction			
Project Name	**FMP ID**	**# of Structures with Reduced 1% Annual Chance Flood Risk**	**Pre-Project Damage $**	**Post-Project Damage $**	**Notes 4**	**Flood Damage Reduction**	**Score 4**	**# of Critical Facilites Removed from 1% Annual Chance FP**	**Notes 5**	**Reduction in Critical Facilities Flood Risk**	**Score 5**
WC1	143000122	110	$1,547,199.94	$240,130	84%	Flood damage reduction > 75%	8	0		Reduced risk for 0 structures in floodplain	0
City of Pecos	143000119	120	$7,490,724.84	$628,772	92%	Flood damage reduction > 75%	8	7		Reduced risk for 7 structures in floodplain	10

Project Name	FMP ID	Score 6: Life and Safety				Score 7: Water Supply						Score 8: Social Vulnerability			
		Adjusted Injury Risk (%)	Notes 6	Life and Safety Ranking (Injury/ Loss of Life)	Score 6	Water Supply Benefit in Acre-Feet	SourceID	WMS_ID	Notes 7	Water Supply Yield Ranking	Score 7	SVI Score	Notes 8	Social Vulnerability Ranking	Score 8
WC1	143000122	25.72	1 Flood-related injury in El Paso County in 1997.	Life/injury risk percentage >20%	4	0				No impact on water supply	0	0.59	Areal weighted-average SVI	SVI between 0.5-0.75 (moderate to high vulnerability)	7
City of Pecos	143000119	25.63		Life/injury risk percentage >20%	4	0				No impact on water supply	0	0.51	Areal weighted-average SVI	SVI between 0.5-0.75 (moderate to high vulnerability)	7

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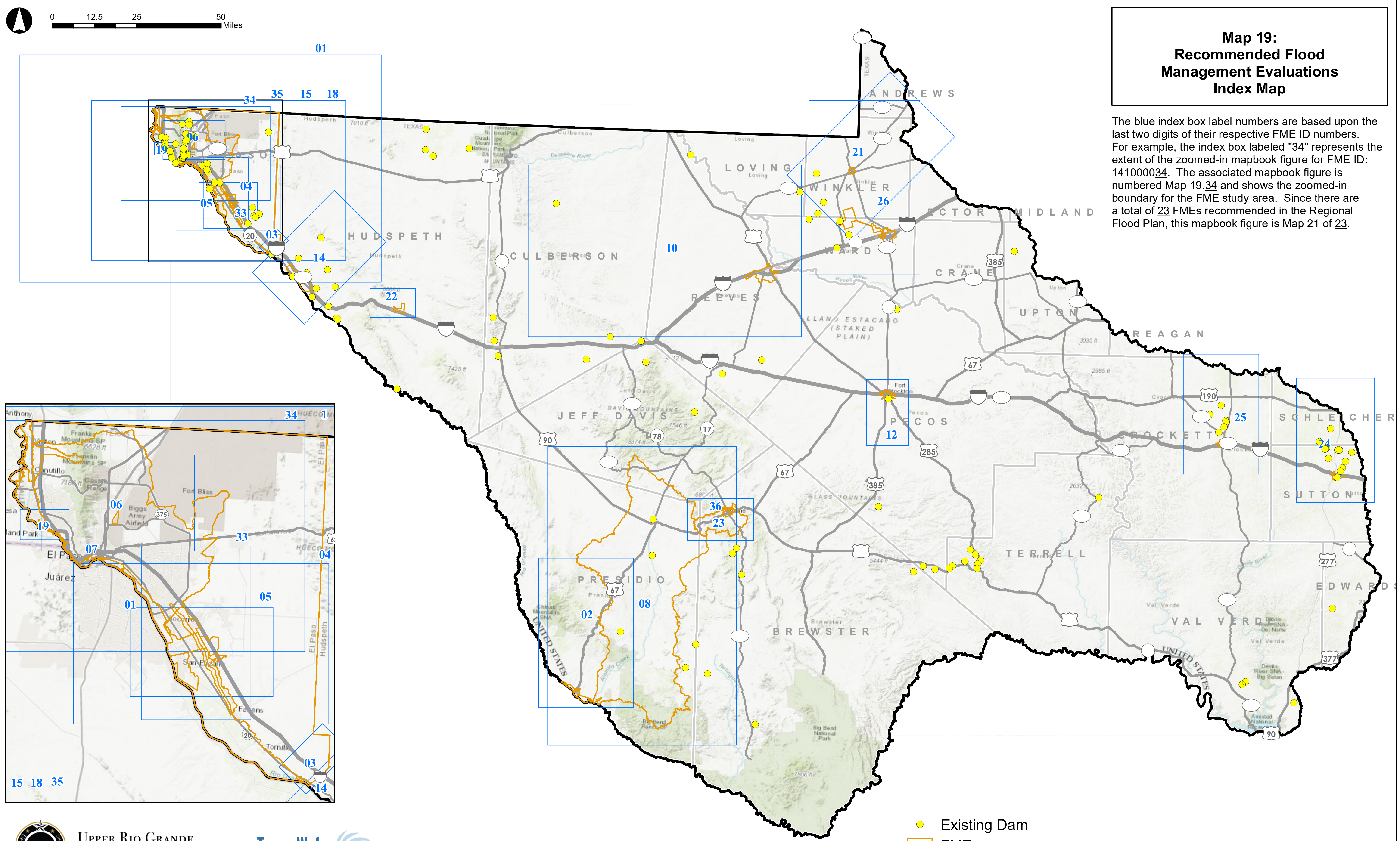
		Score 9: Nature-Based Solution				Score 10: Multiple Benefites				Score 11: O&M			
Project Name	**FMP ID**	**% Nature Based Solution by Cost**	**Notes 9**	**Nature-Based Solutions Ranking**	**Score 9**	**Multiple Benefits Description**	**Notes 10**	**Multiple Benefit Ranking**	**Score 10**	**O&M Cost (Annual)**	**Notes 11**	**Operations and Maintenance Ranking**	**Score 11**
WC1	143000122	0%			0	Project resilience goals that indicate that project is planned to withsatnd a long term service life (>50 yr)		Project delivers benefits in 2 wider benefit categories	4			Project will not require any ongoing operation and maintenance (low);	10
City of Pecos	143000119	0%			0			Project does not deliver any wider benefits	0			Project will not require any ongoing operation and maintenance (low);	10

		Score 12: Admin, Regulatory Obstacles			Score 13: Enviromental Benefit			Score 14: Environmental Impact			Score 15: Mobility			
Project Name	**FMP ID**	**Notes 12**	**Administrative, Regulatory and Other Obstacle Ranking**	**Score 12**	**Notes 13**	**Environmental Benefit Ranking**	**Score 13**	**Notes 14**	**Environmental Impact Ranking**	**Score 14**	**Traffic Count for LWC Project**	**Notes 15**	**Mobility Ranking**	**Score 15**
WC1	143000122	High bird nesting, reptile, and mammal habitat potential throughout project area; ephemeral stream impacts. Federally listed southwestern willow flycatcher and western yellow-billed cuckoo could occur in riparian habitats; cultural resources due diligence survey recommended.	2	2	Sediment capture	3	3	Moderate potential for impacts.	3	3			Project provides no change to major, minor, or emergency access routes in the project area.	0
City of Pecos	143000119	Agricultural impacts. Low potential to affect protected species.	10	10	Sediment capture	3	3	Low potential for impacts.	3	3			Project provides no change to major, minor, or emergency access routes in the project area.	0

Appendix 5G
Map Exhibits

Map 19: Recommended Flood Management Evaluations Index Map

The blue index box label numbers are based upon the last two digits of their respective FME ID numbers. For example, the index box labeled "34" represents the extent of the zoomed-in mapbook figure for FME ID: 141000034. The associated mapbook figure is numbered Map 19.34 and shows the zoomed-in boundary for the FME study area. Since there are a total of 23 FMEs recommended in the Regional Flood Plan, this mapbook figure is Map 21 of 23.



Upper Rio Grande Flood Planning

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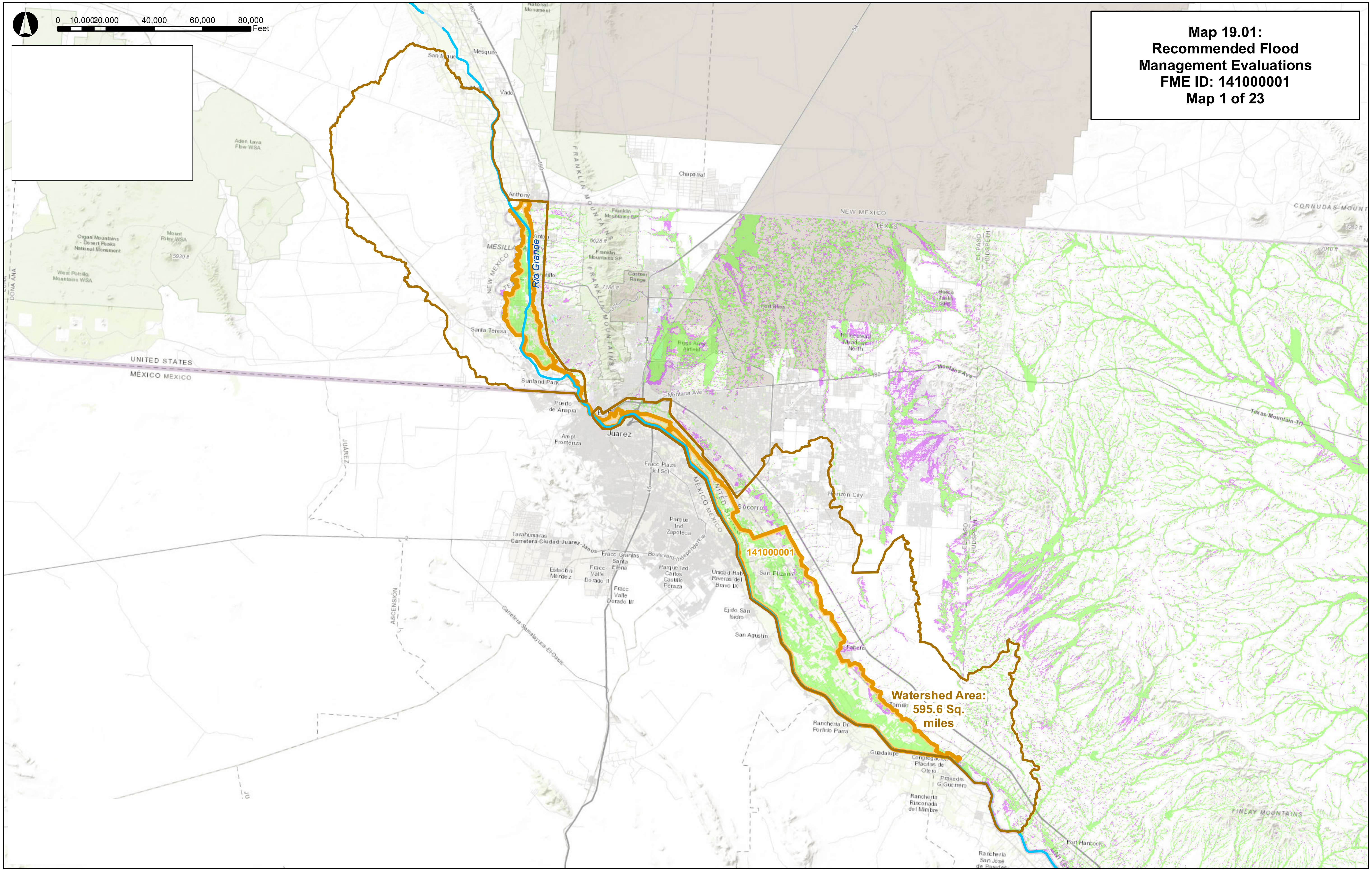
Map 19.01: Recommended Flood Management Evaluations

FME ID: 141000001

Map 1 of 23



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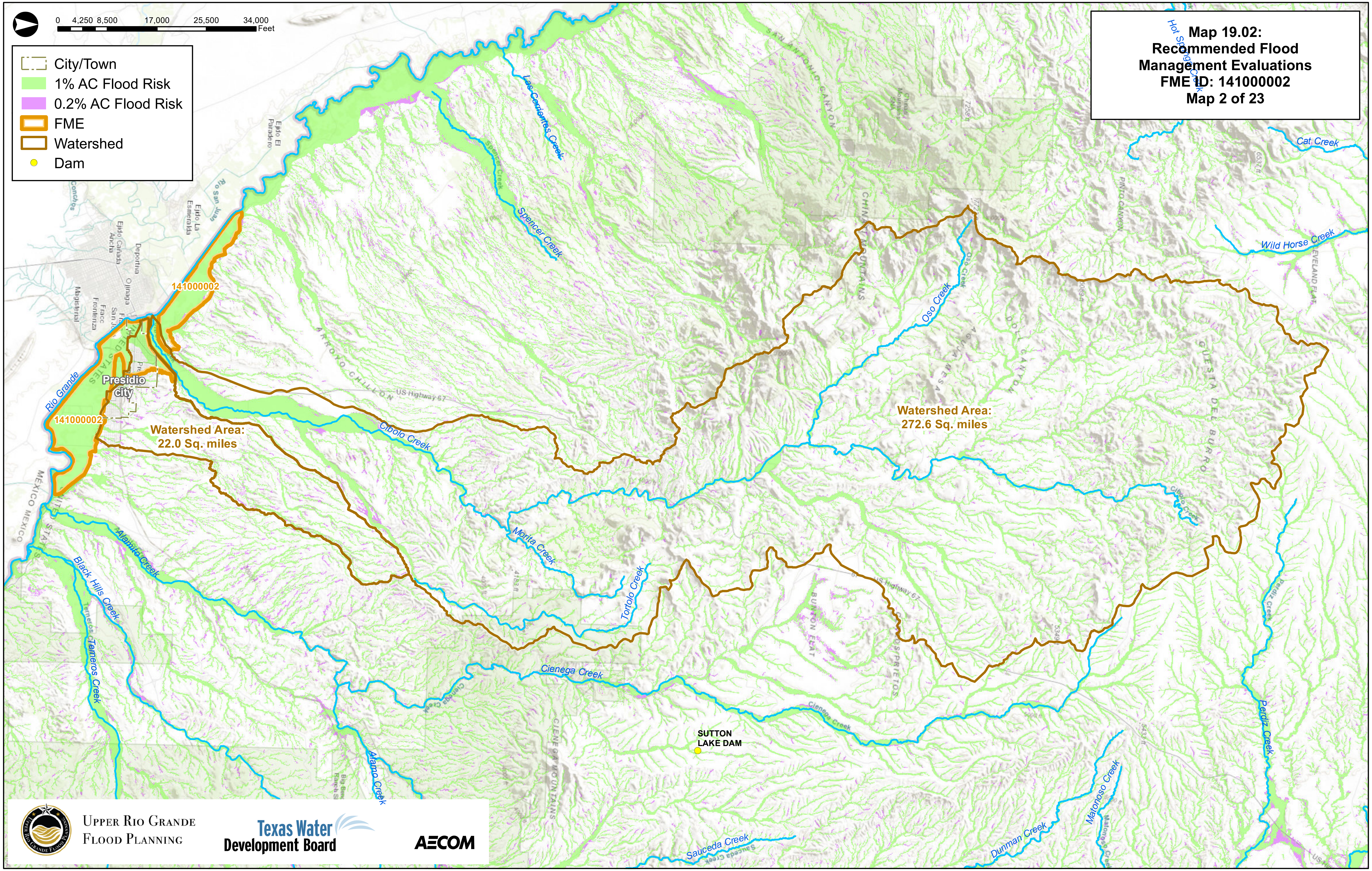
Map 19.02:
Recommended Flood Management Evaluations
FME ID: 141000002
Map 2 of 23



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Texas Water Development Board

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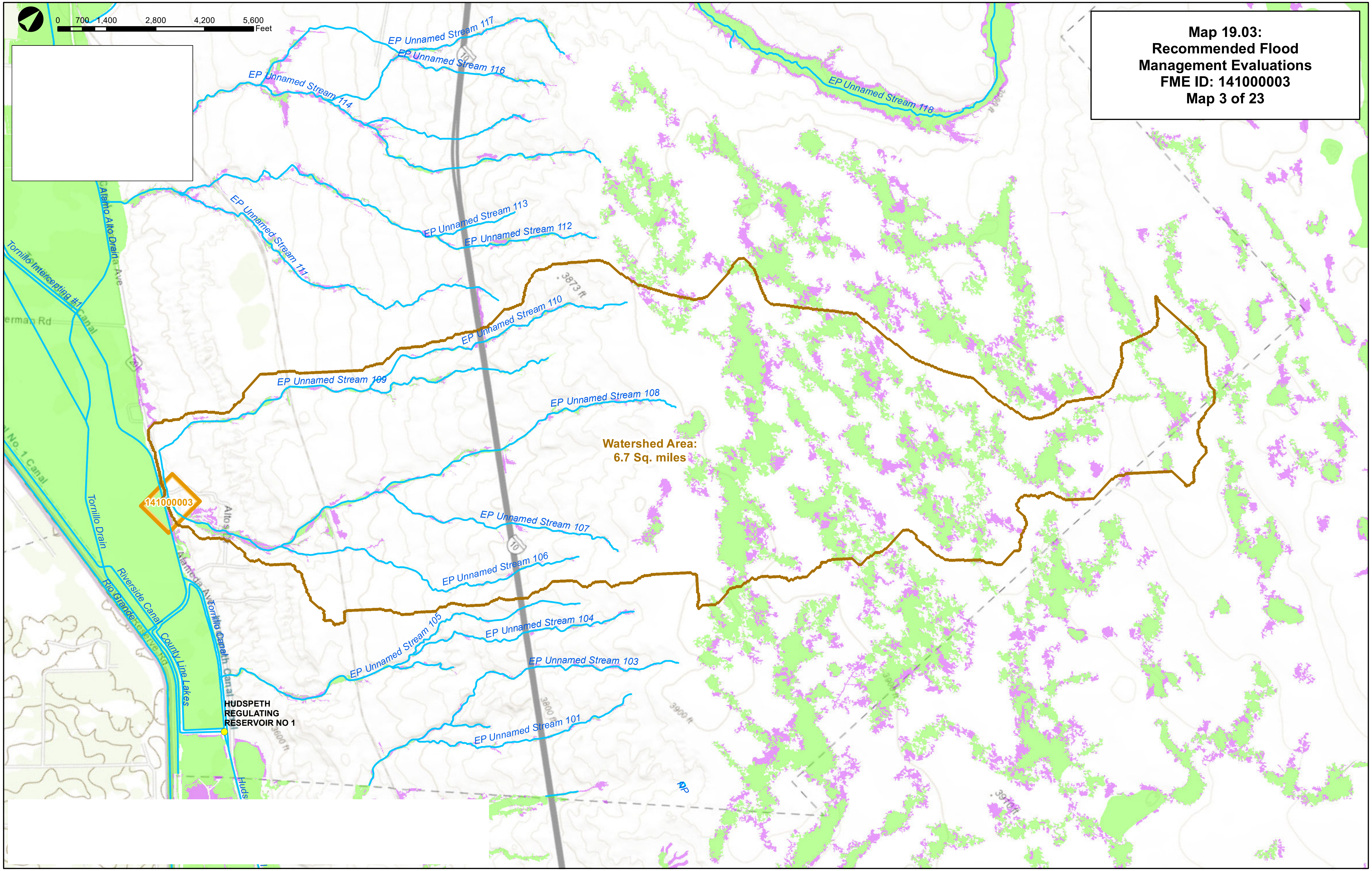
Map 19.03:
Recommended Flood Management Evaluations
FME ID: 141000003
Map 3 of 23



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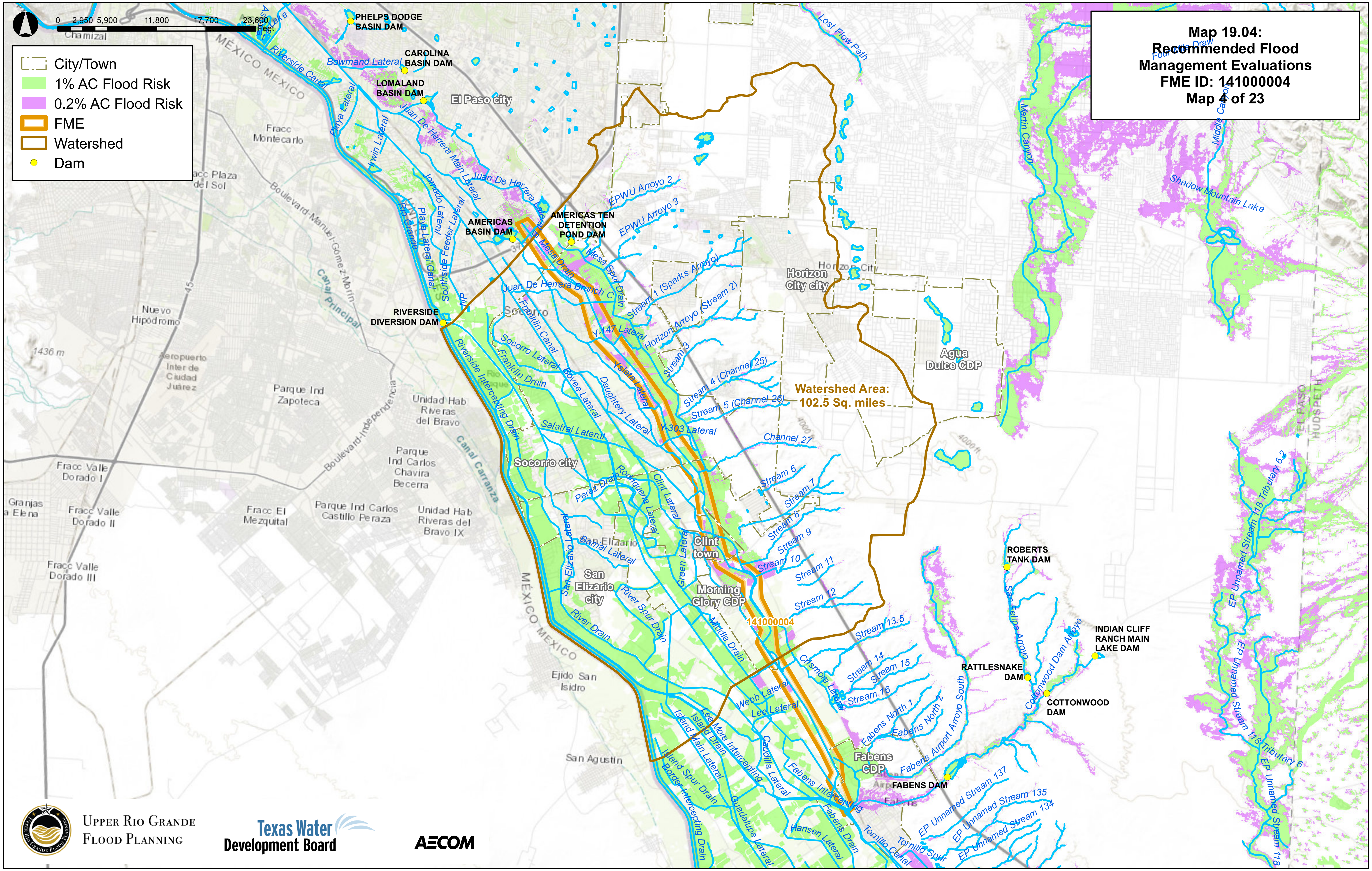
Map 19.04:
Recommended Flood Management Evaluations
FME ID: 141000004
Map 4 of 23



⬚ City/Town
🟩 1% AC Flood Risk
🟪 0.2% AC Flood Risk
▭ FME
▭ Watershed
● Dam

Upper Rio Grande Flood Planning

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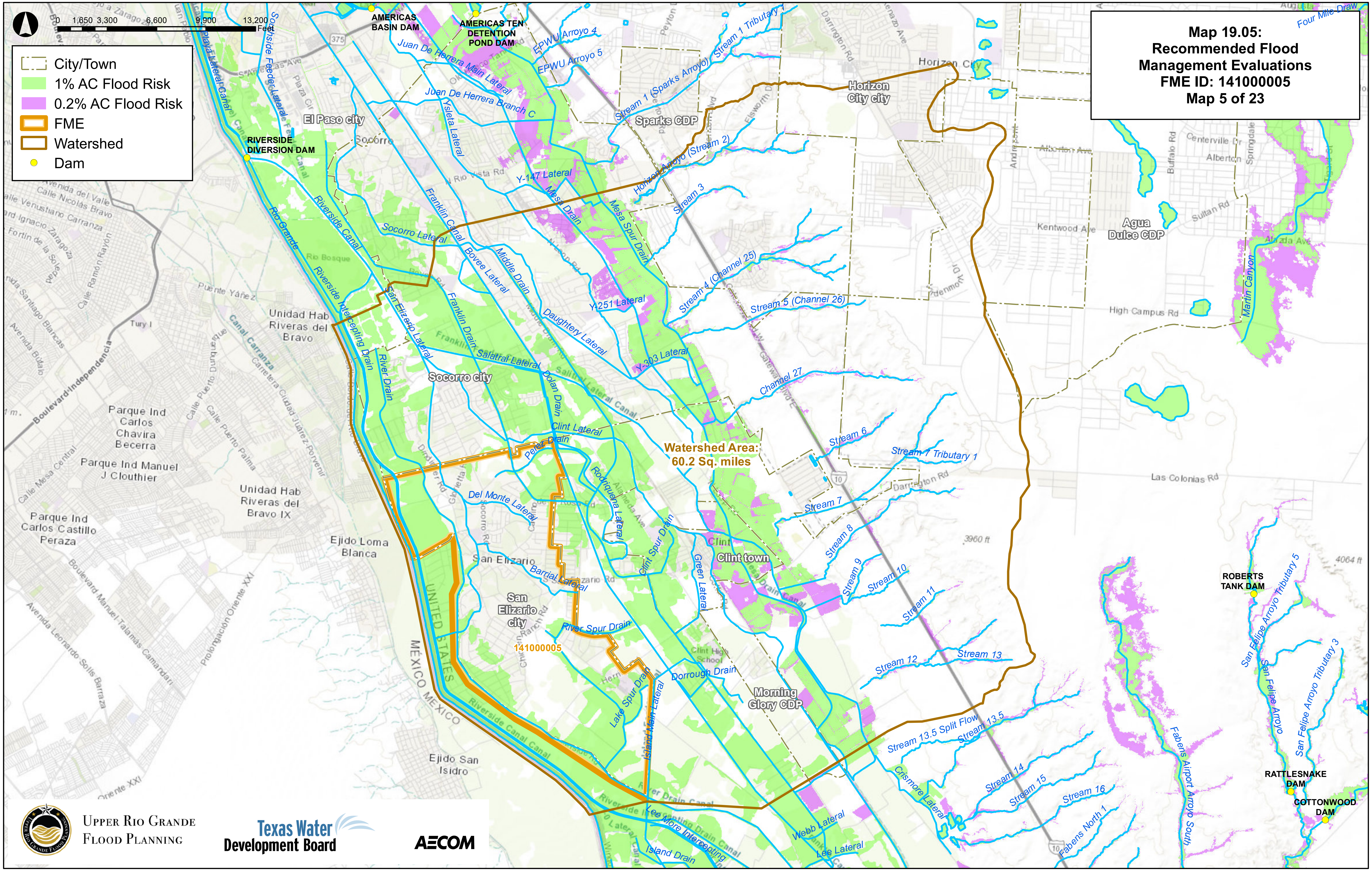

Map 19.05: Recommended Flood Management Evaluations
FME ID: 141000005
Map 5 of 23

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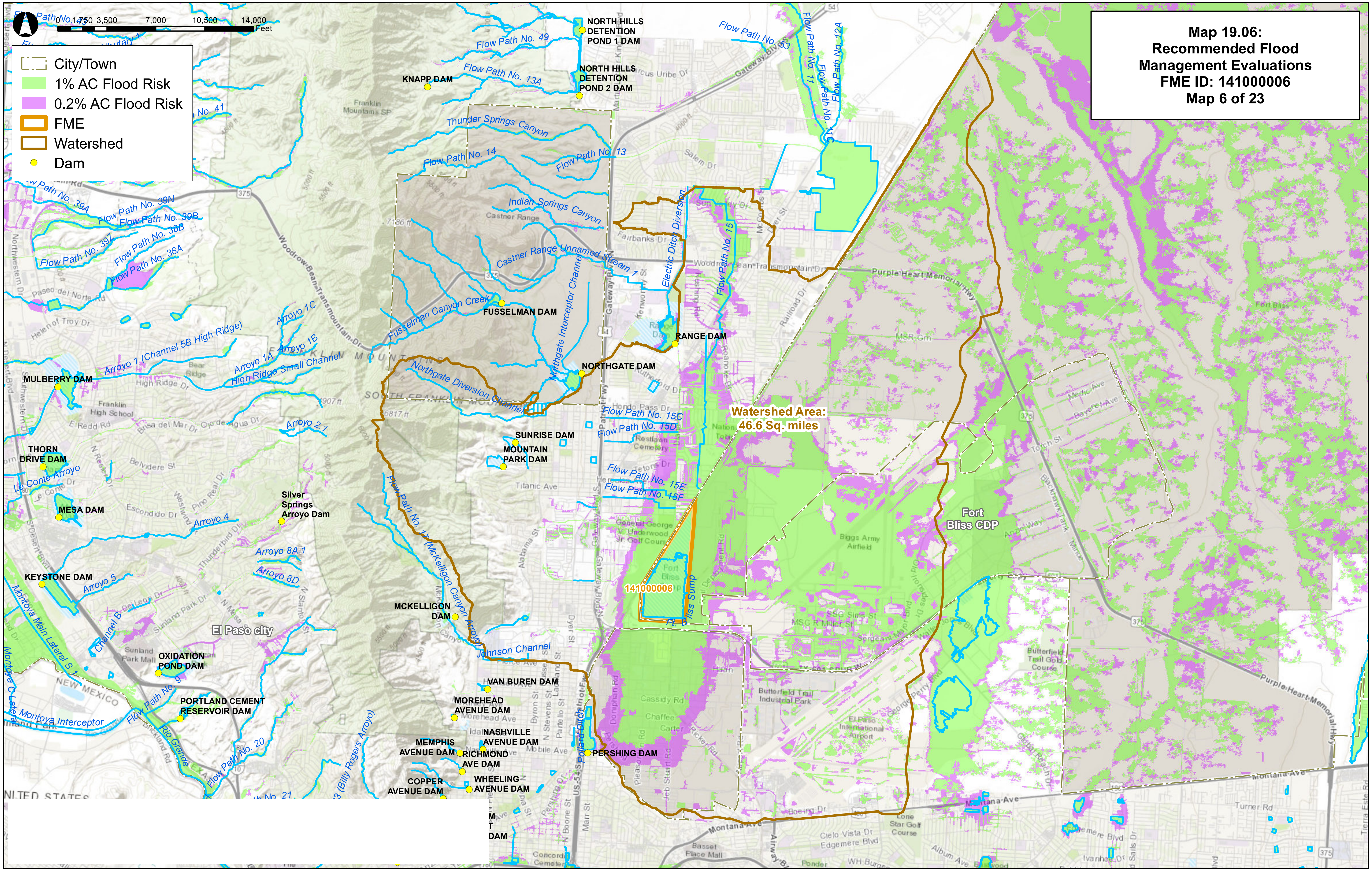

Map 19.06:
Recommended Flood Management Evaluations
FME ID: 141000006
Map 6 of 23

City/Town
🟩 1% AC Flood Risk
🟪 0.2% AC Flood Risk
FME
Watershed
● Dam

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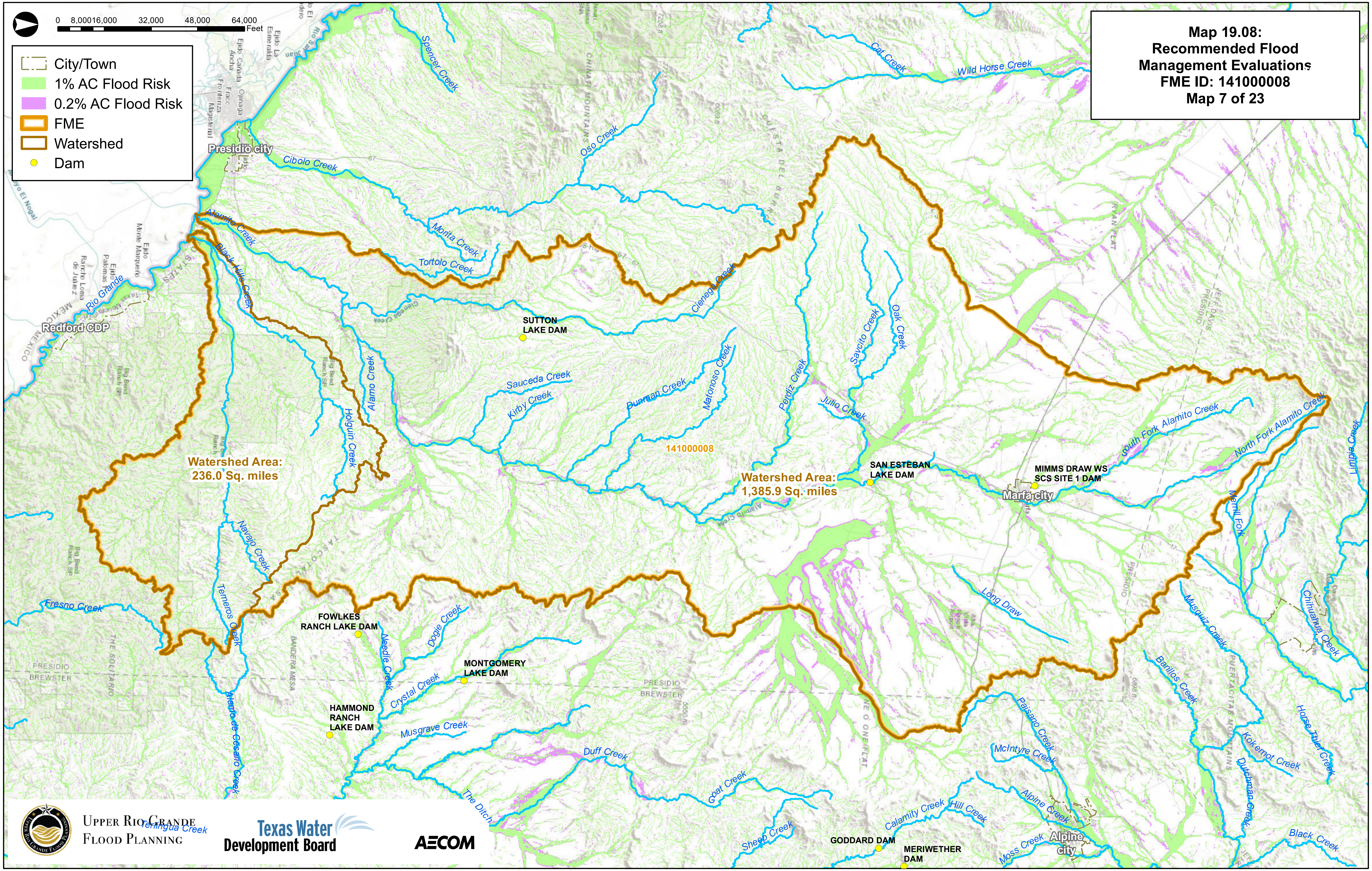
Map 19.08:
Recommended Flood Management Evaluations
FME ID: 141000008
Map 7 of 23



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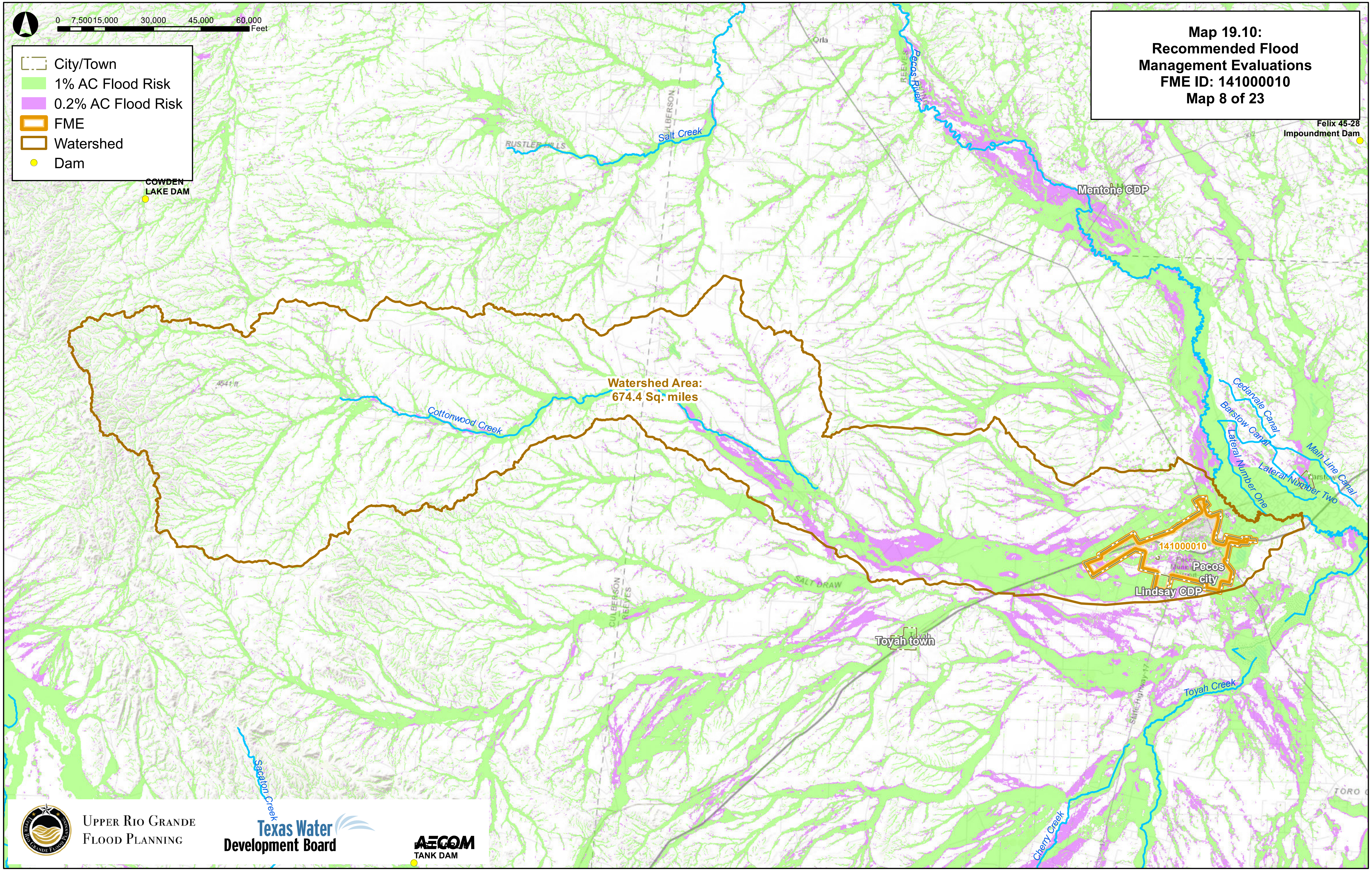

Map 19.10: Recommended Flood Management Evaluations FME ID: 141000010 Map 8 of 23

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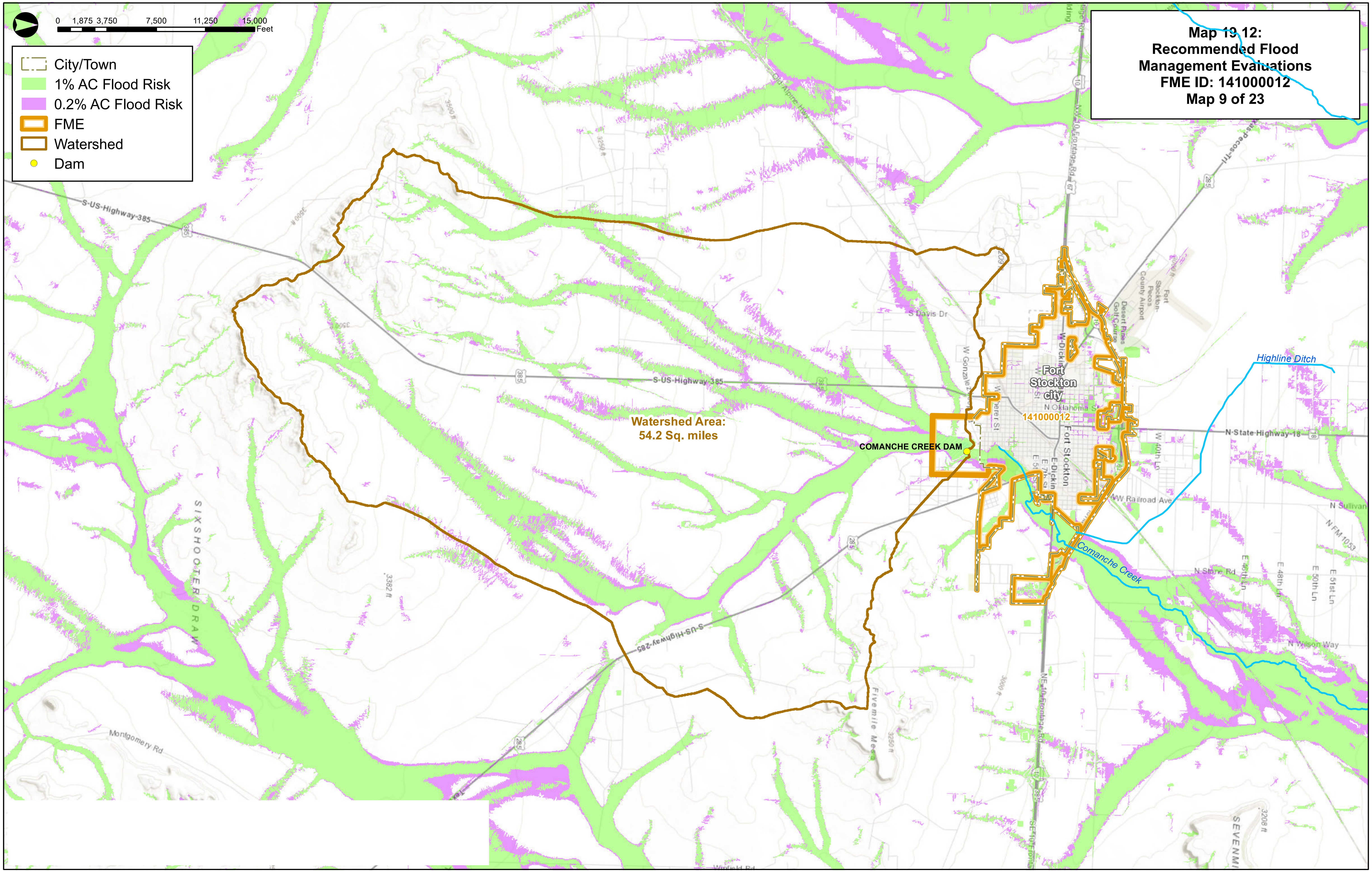

Map 19.12:
Recommended Flood Management Evaluations
FME ID: 141000012
Map 9 of 23

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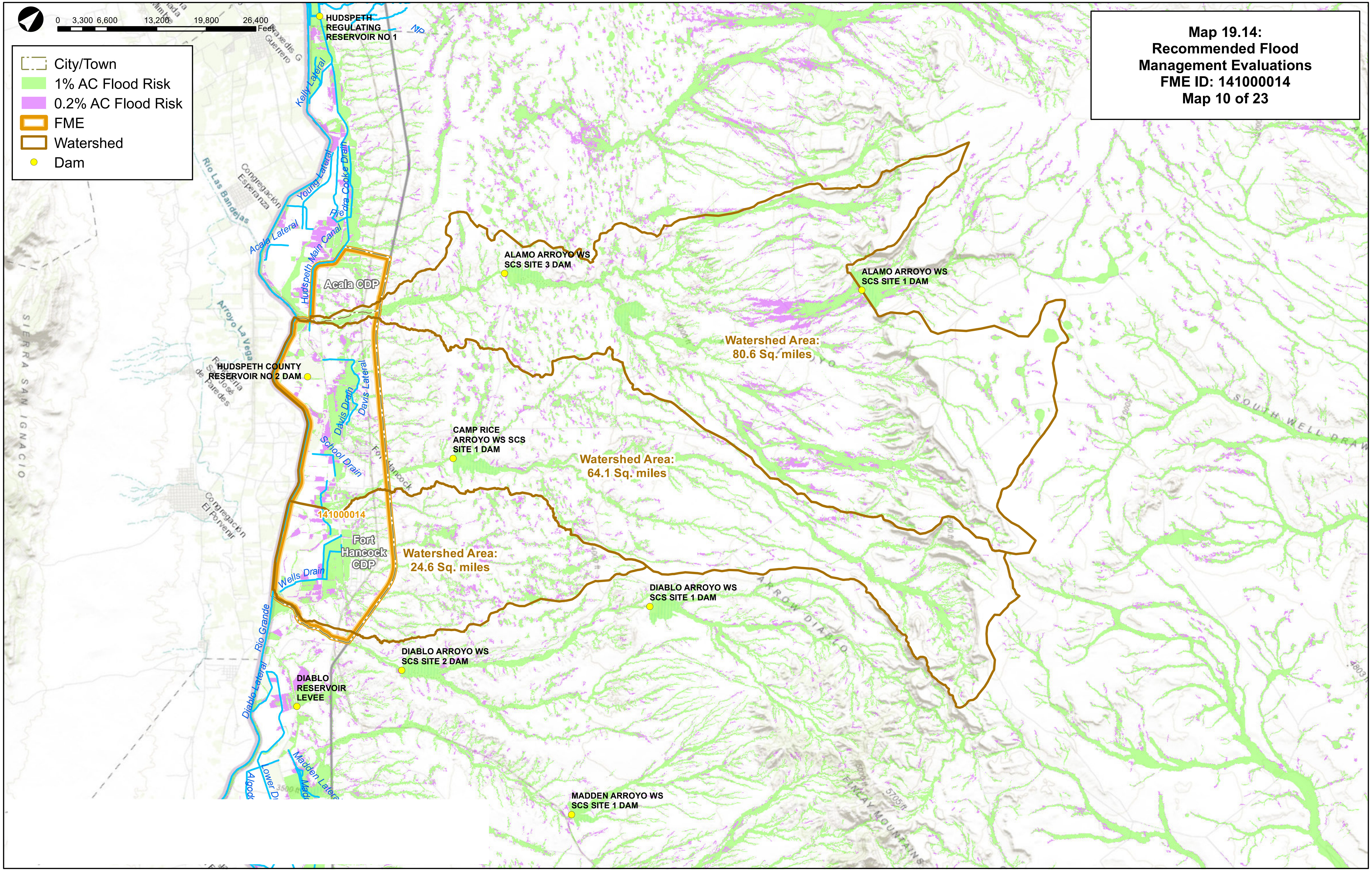

Map 19.14: Recommended Flood Management Evaluations FME ID: 141000014 Map 10 of 23

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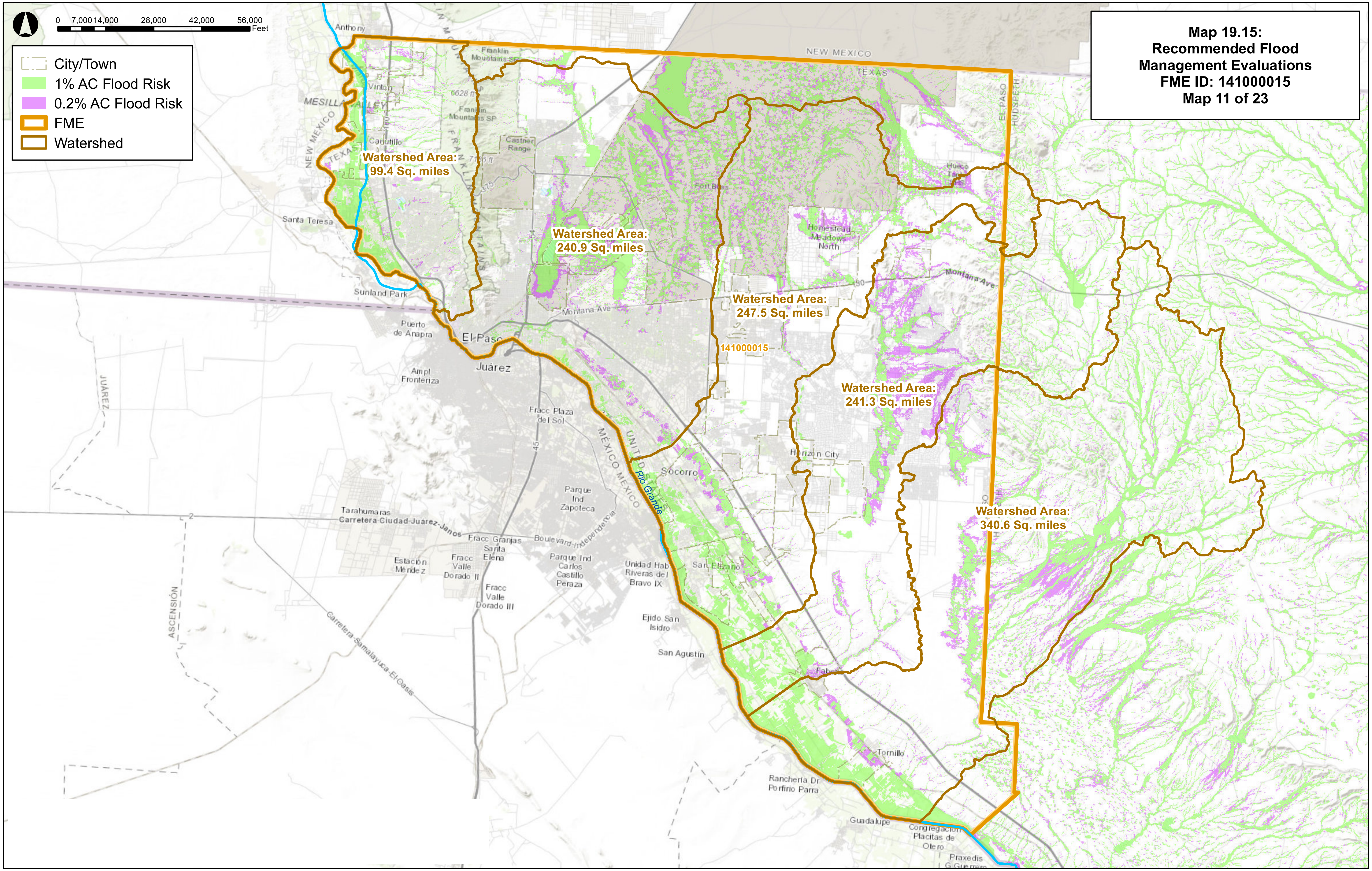

Map 19.15:
Recommended Flood Management Evaluations
FME ID: 141000015
Map 11 of 23

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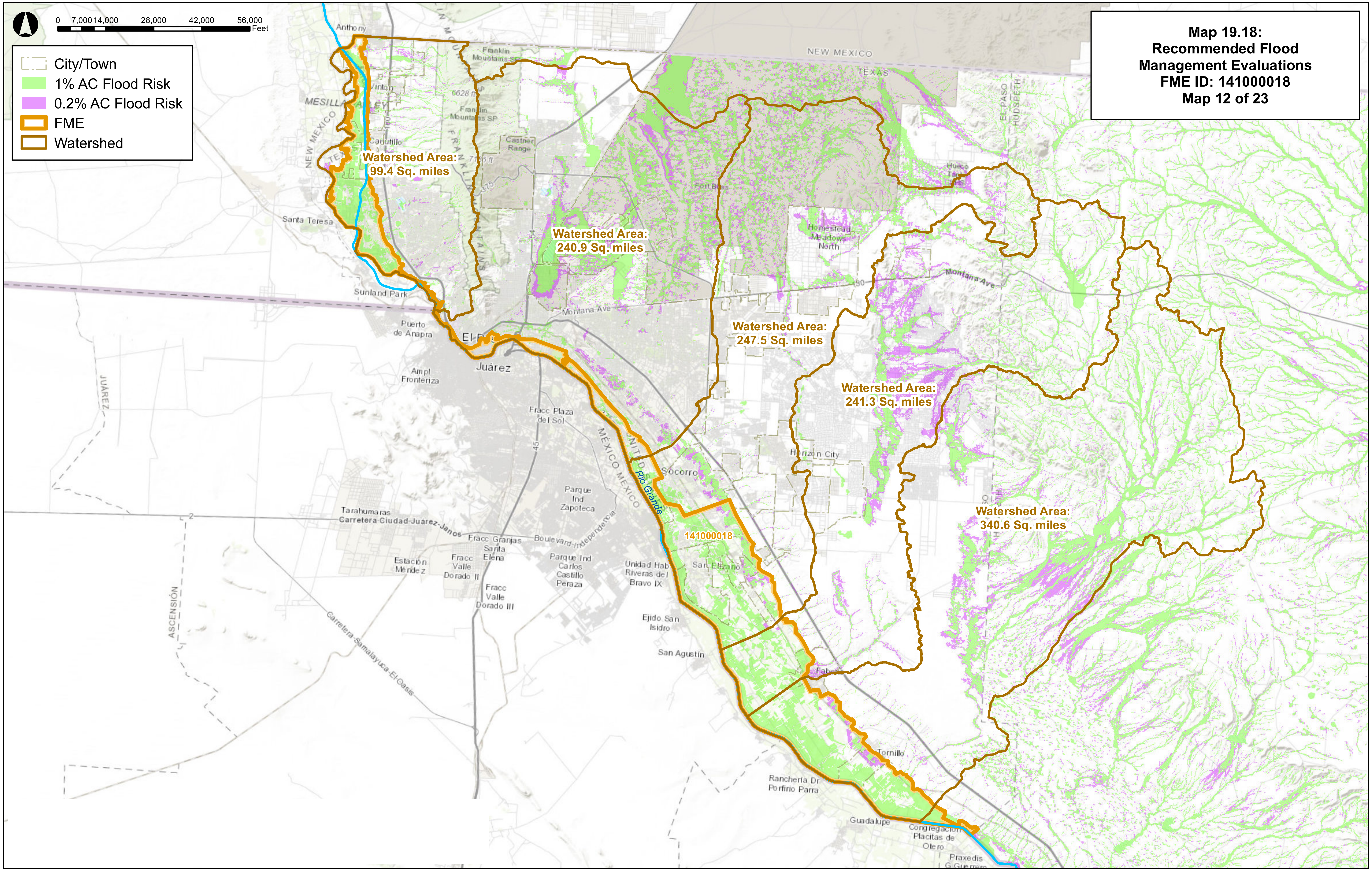
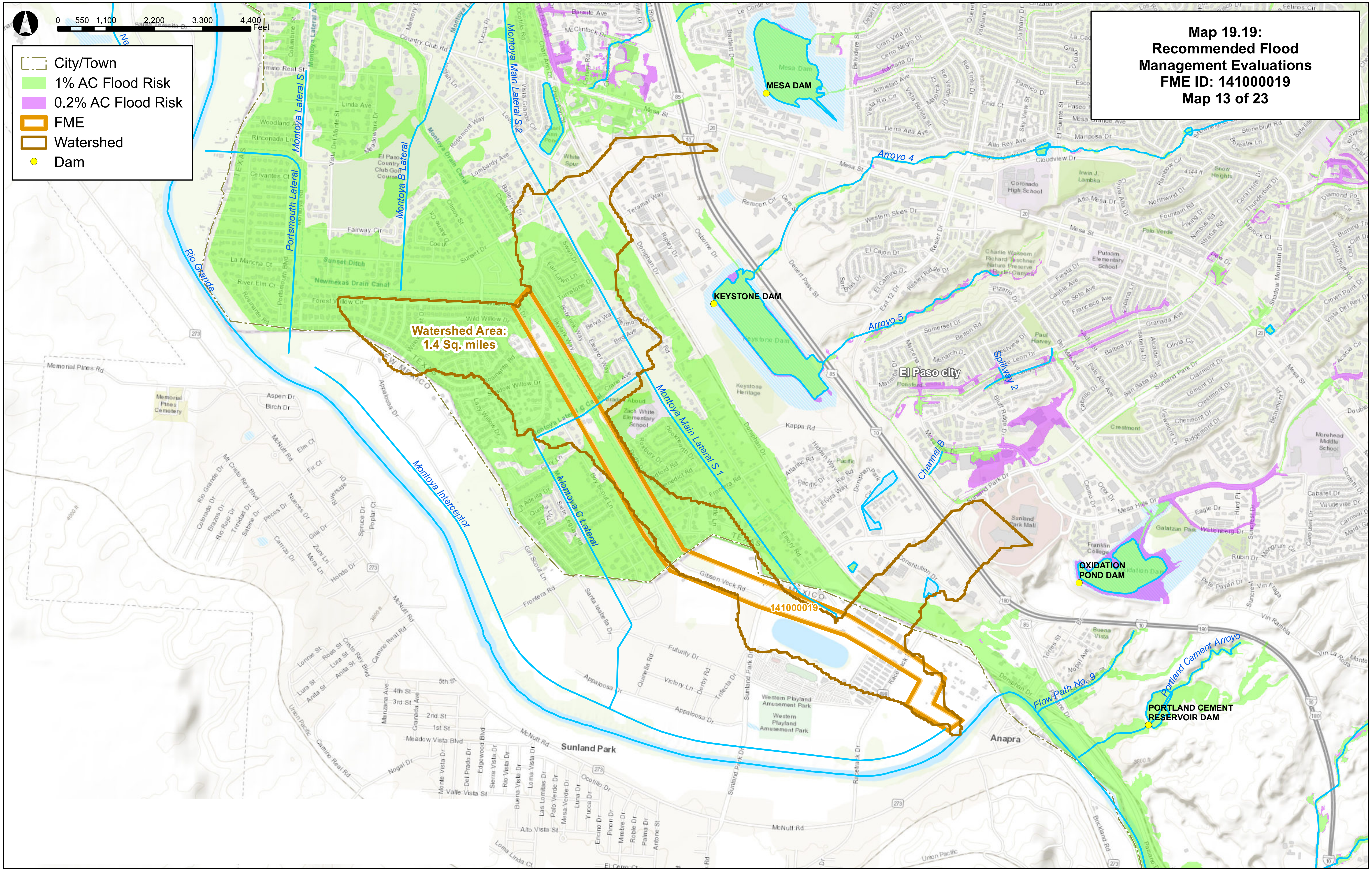


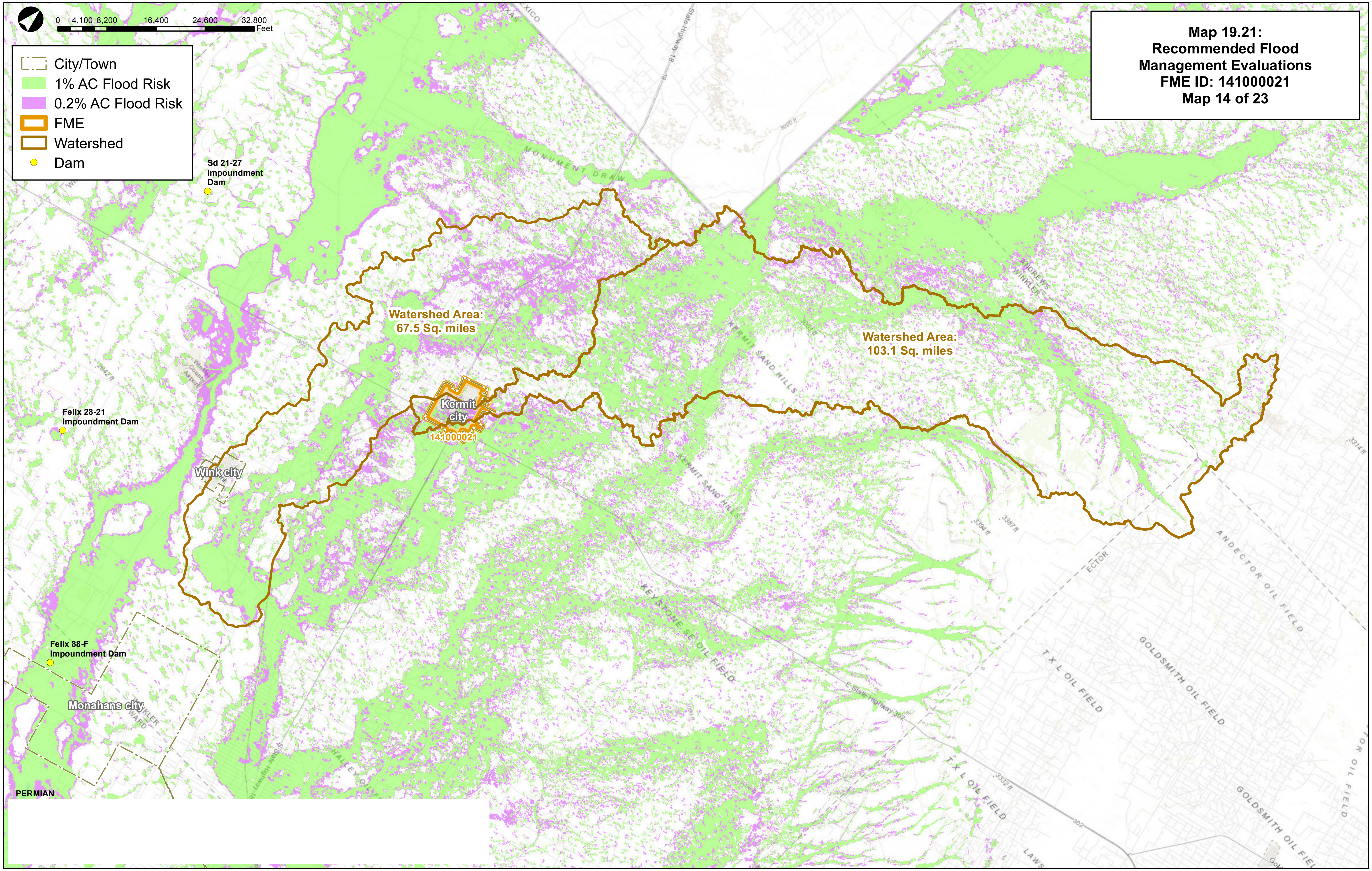
Map 19.18:
Recommended Flood Management Evaluations
FME ID: 141000018
Map 12 of 23

City/Town
🟩 1% AC Flood Risk
🟪 0.2% AC Flood Risk
FME
Watershed

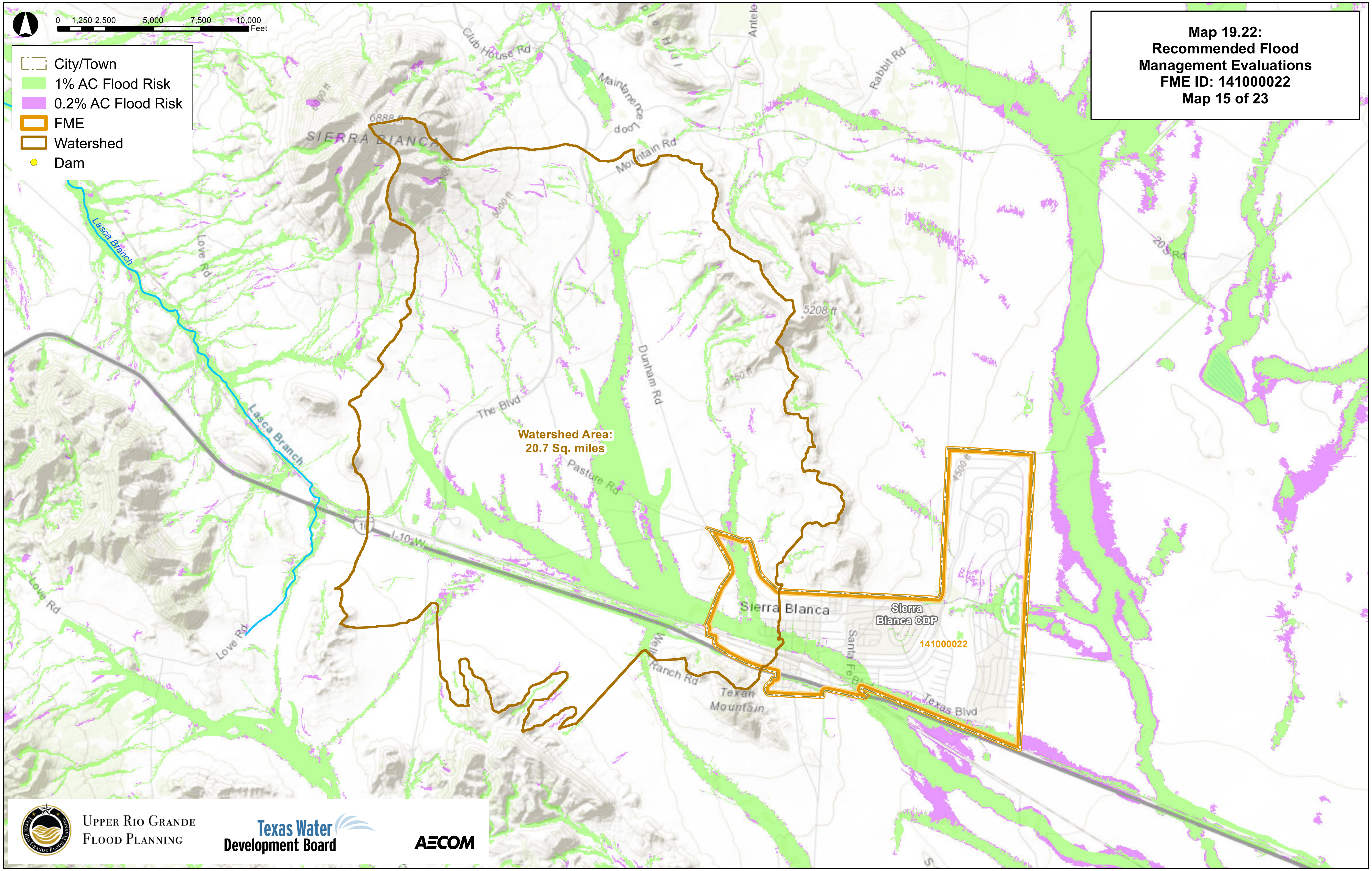
Map 19.19:
Recommended Flood Management Evaluations
FME ID: 141000019
Map 13 of 23



Map 19.21: Recommended Flood Management Evaluations FME ID: 141000021 Map 14 of 23



Map 19.22: Recommended Flood Management Evaluations FME ID: 141000022 Map 15 of 23



Upper Rio Grande Flood Planning

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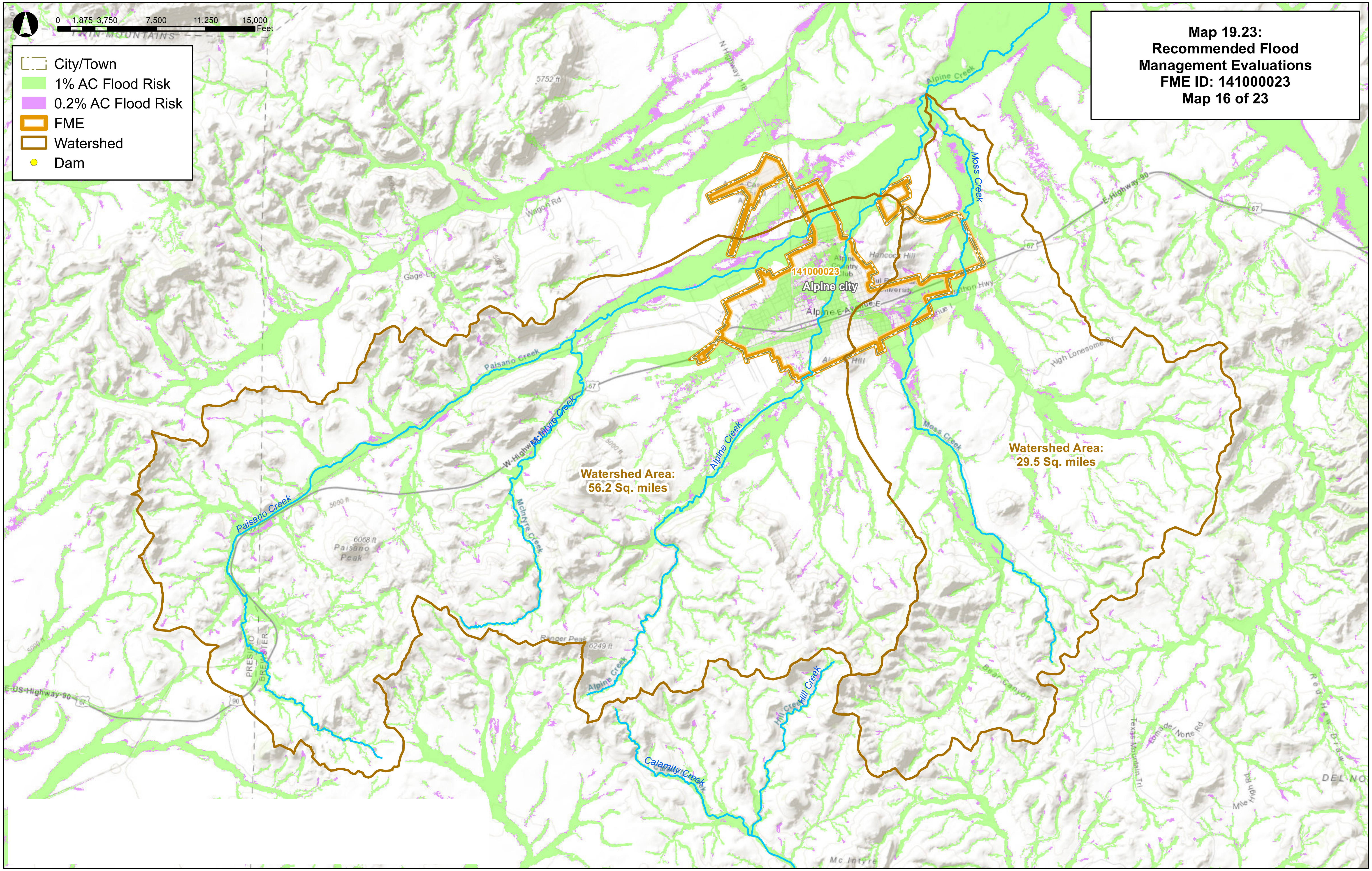

Map 19.23: Recommended Flood Management Evaluations FME ID: 141000023 Map 16 of 23

- ⬚ City/Town
- 🟩 1% AC Flood Risk
- 🟪 0.2% AC Flood Risk
- 🟧 FME
- ▭ Watershed
- ● Dam

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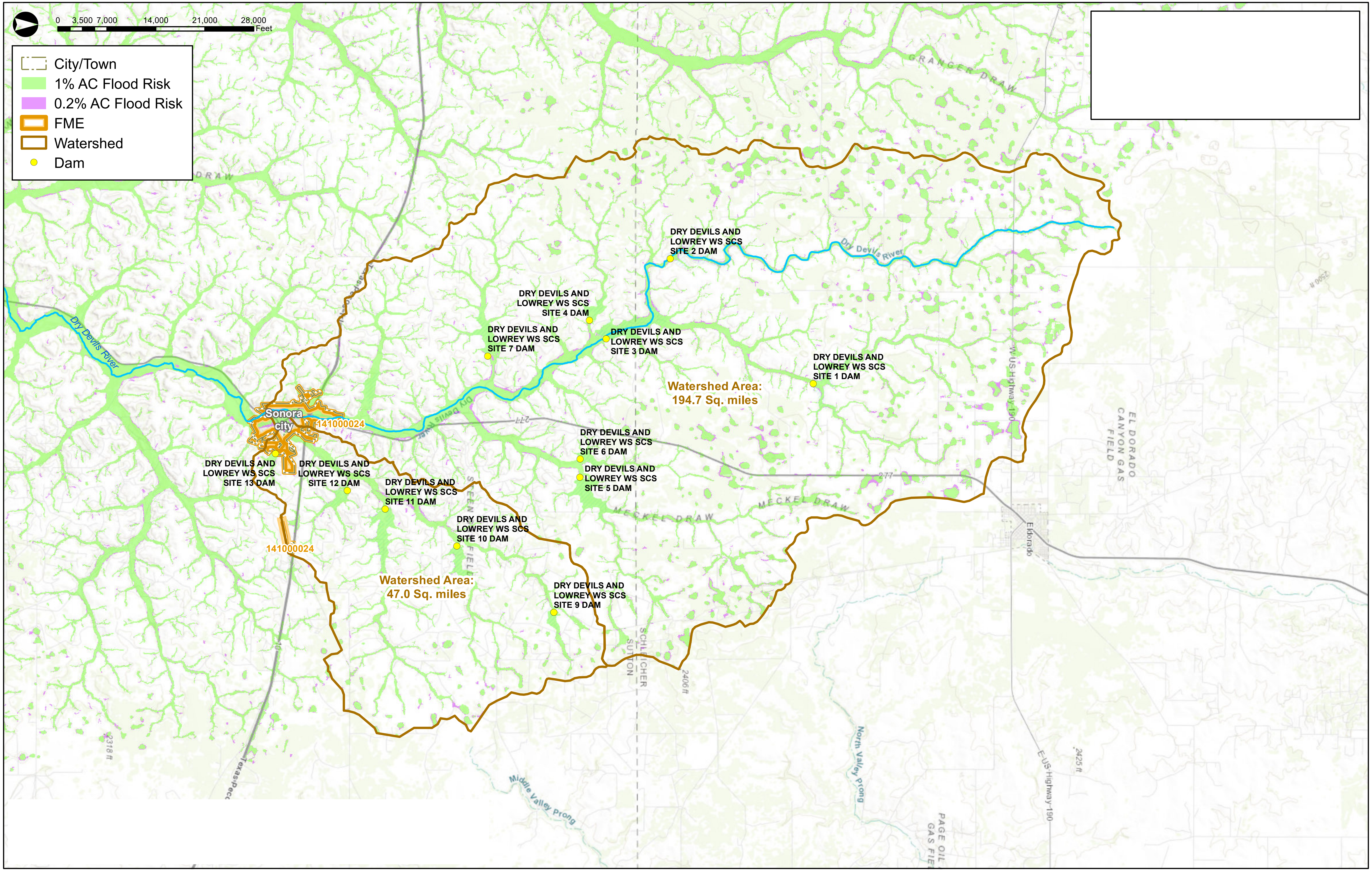

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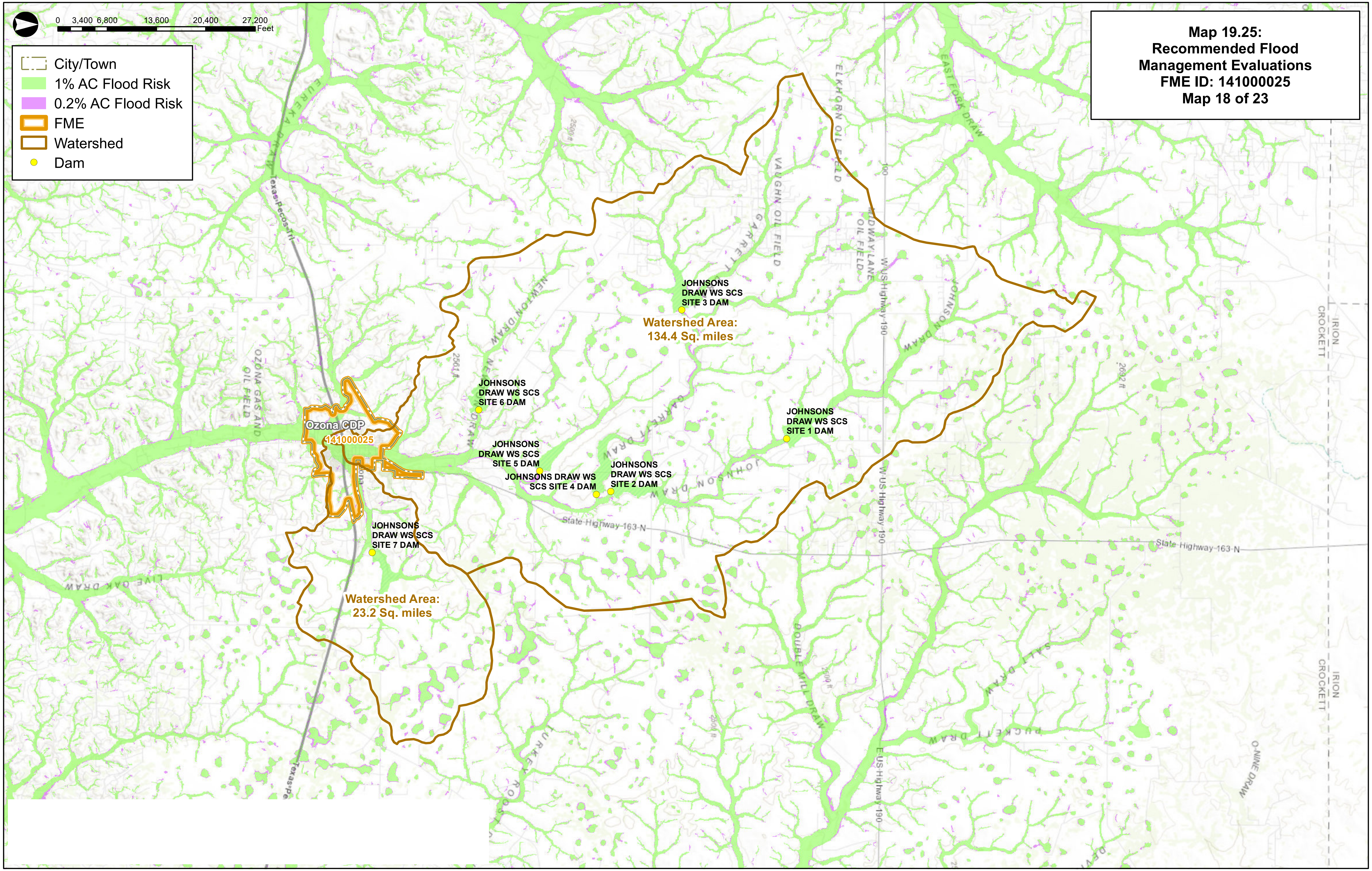

Map 19.25:
Recommended Flood
Management Evaluations
FME ID: 141000025
Map 18 of 23

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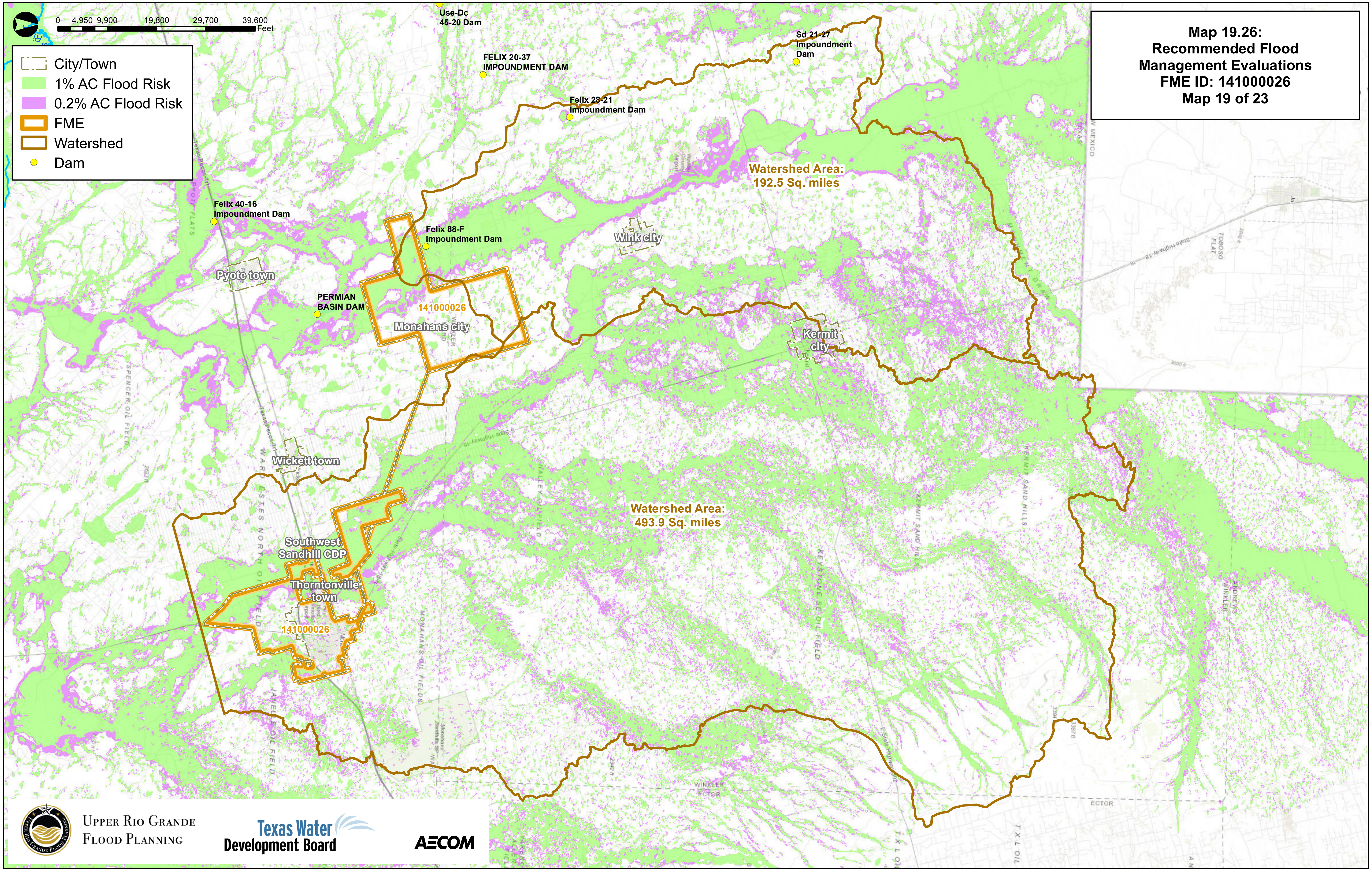

Map 19.26:
Recommended Flood Management Evaluations
FME ID: 141000026
Map 19 of 23

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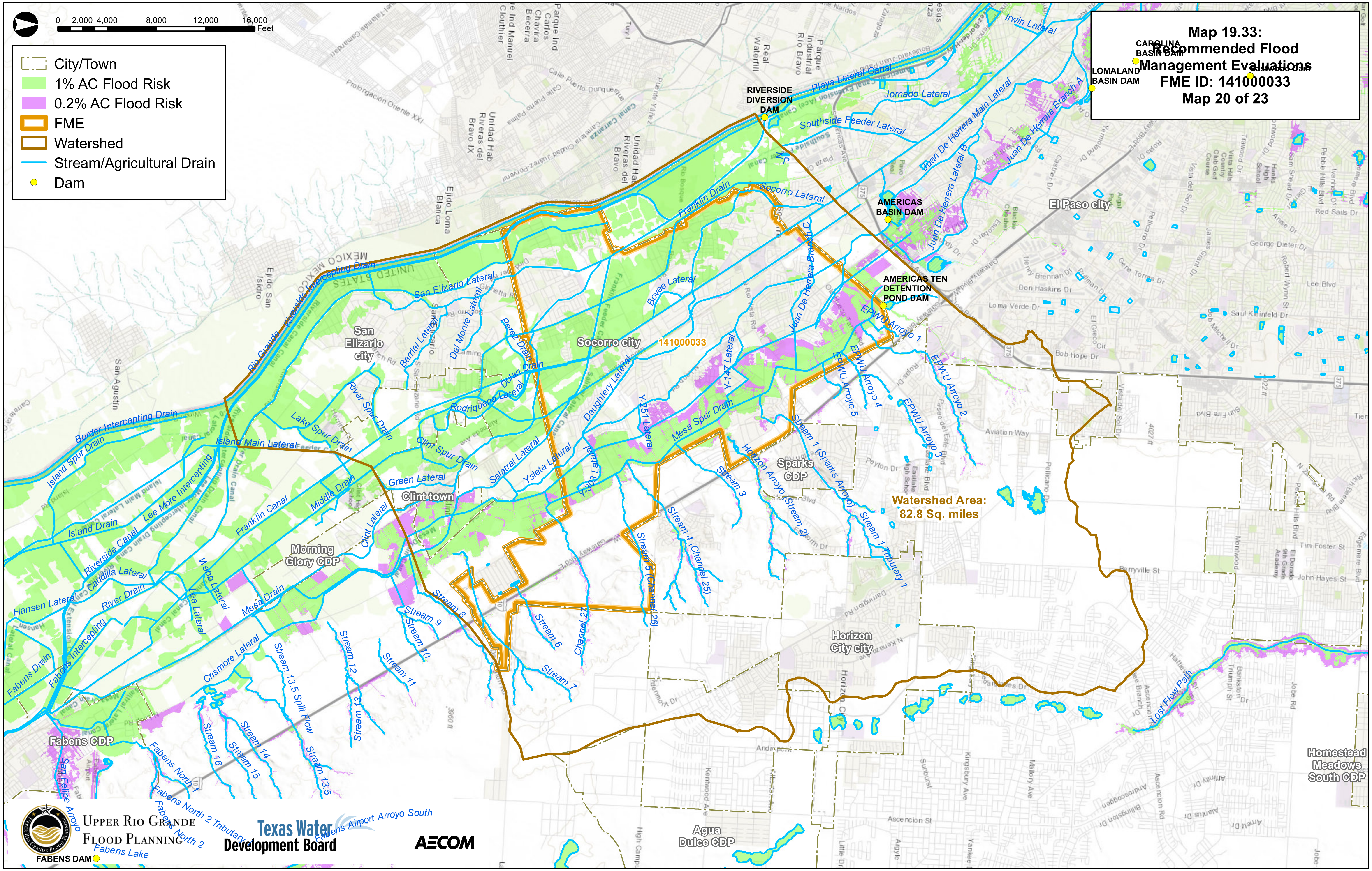

Map 19.33: Recommended Flood Management Evaluations
FME ID: 141000033
Map 20 of 23

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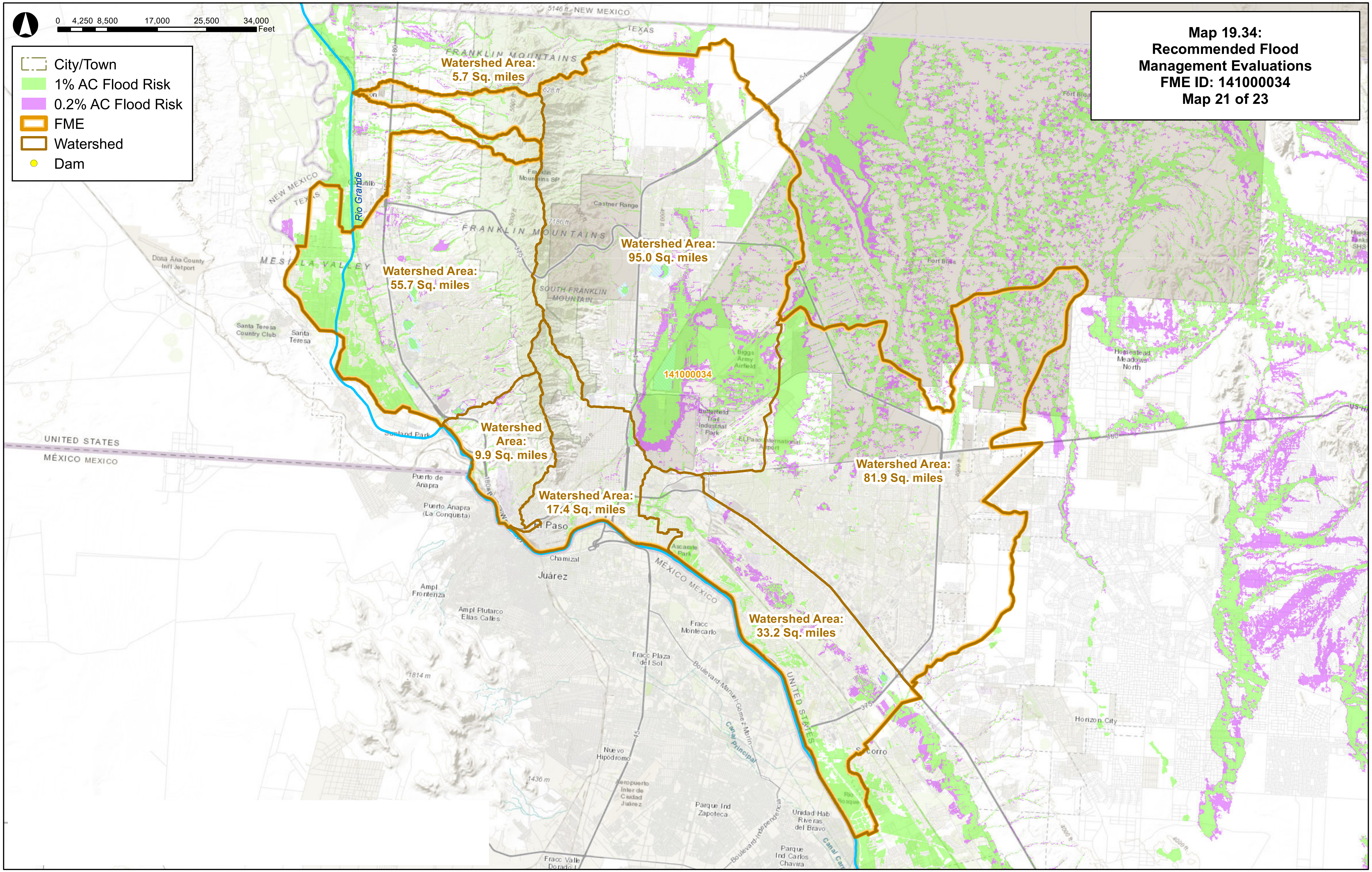

Map 19.34: Recommended Flood Management Evaluations FME ID: 141000034 Map 21 of 23

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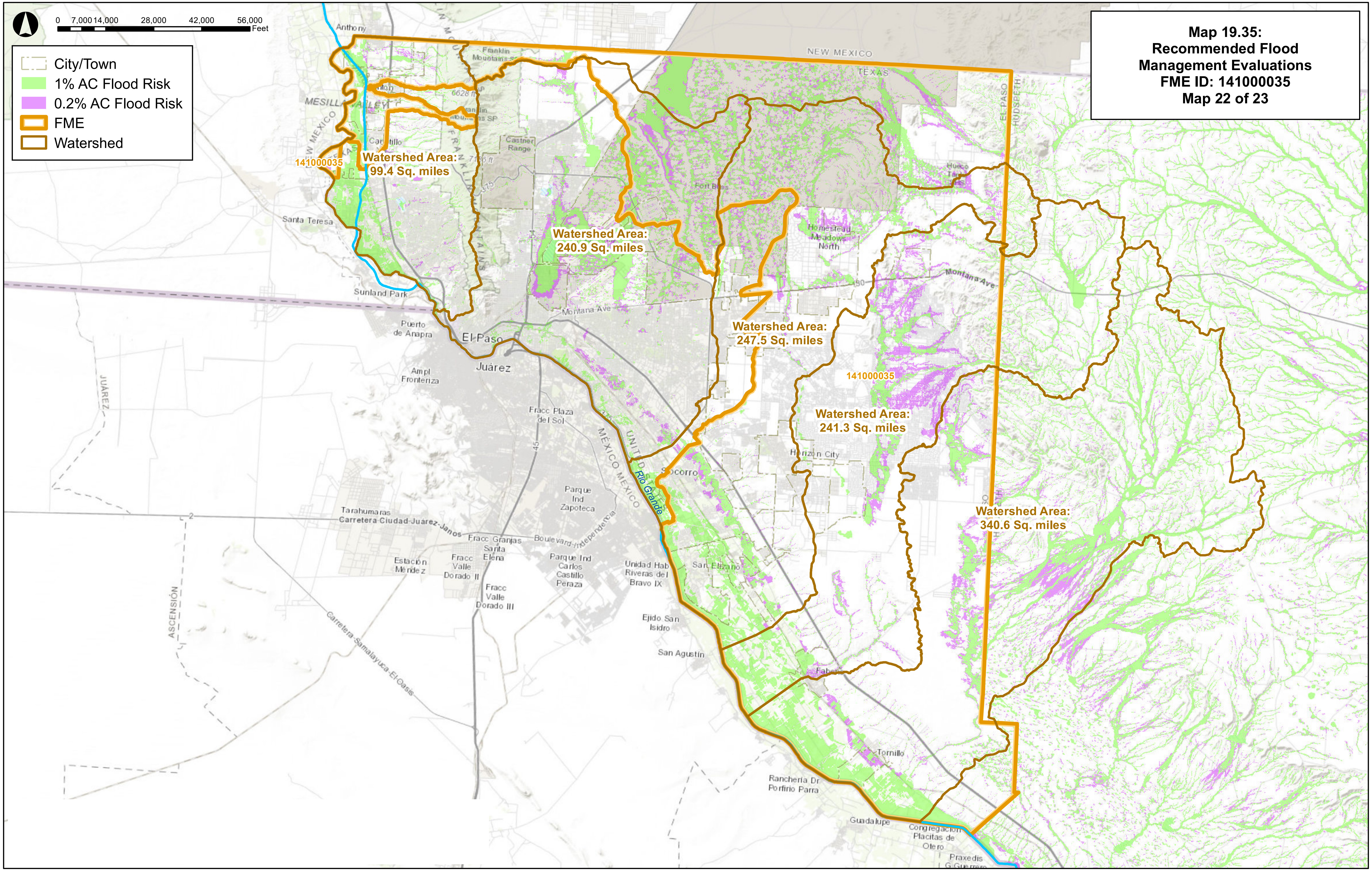
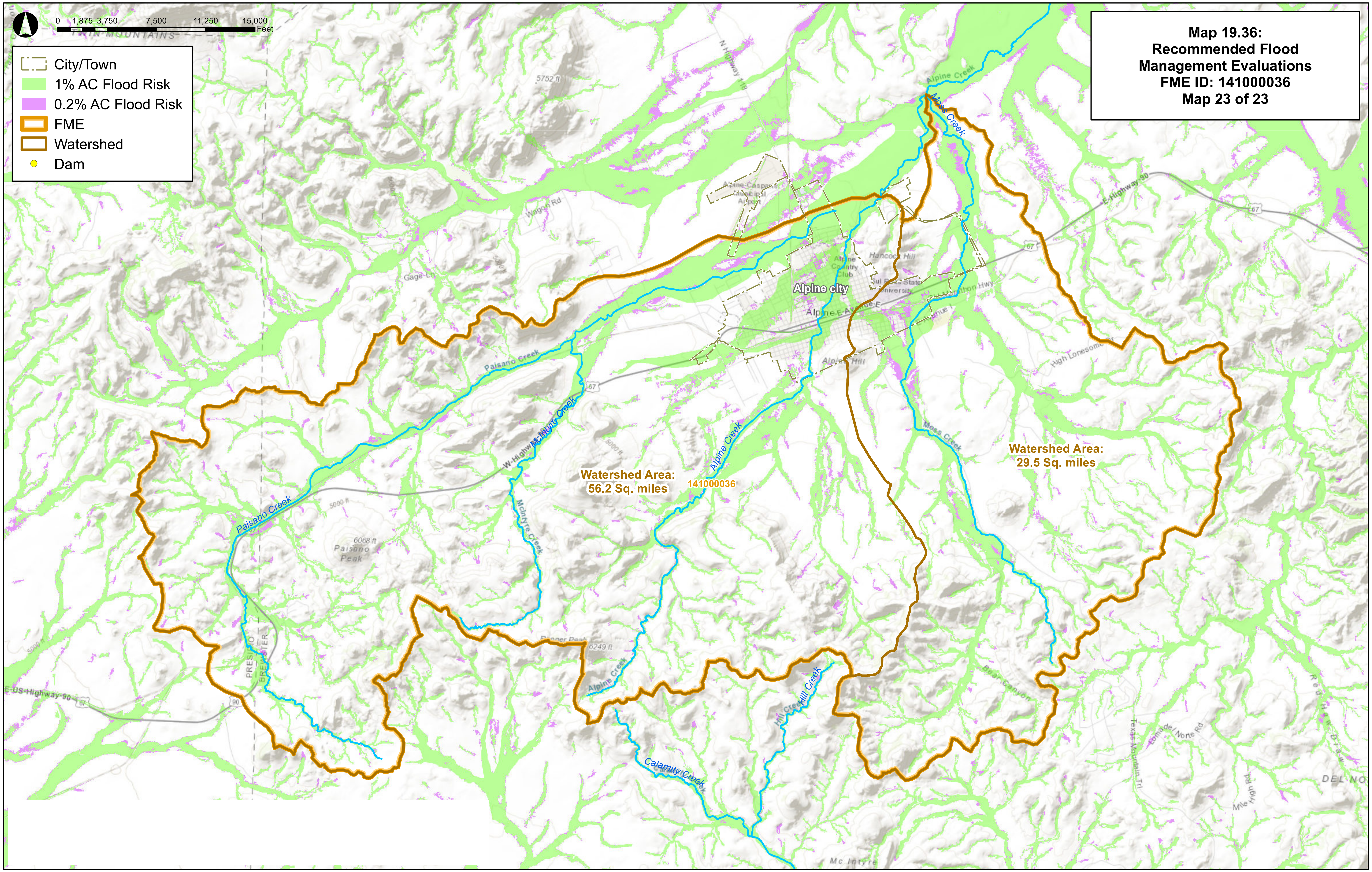
Map 19.35: Recommended Flood Management Evaluations FME ID: 141000035 Map 22 of 23



Map 19.36:
Recommended Flood Management Evaluations
FME ID: 141000036
Map 23 of 23



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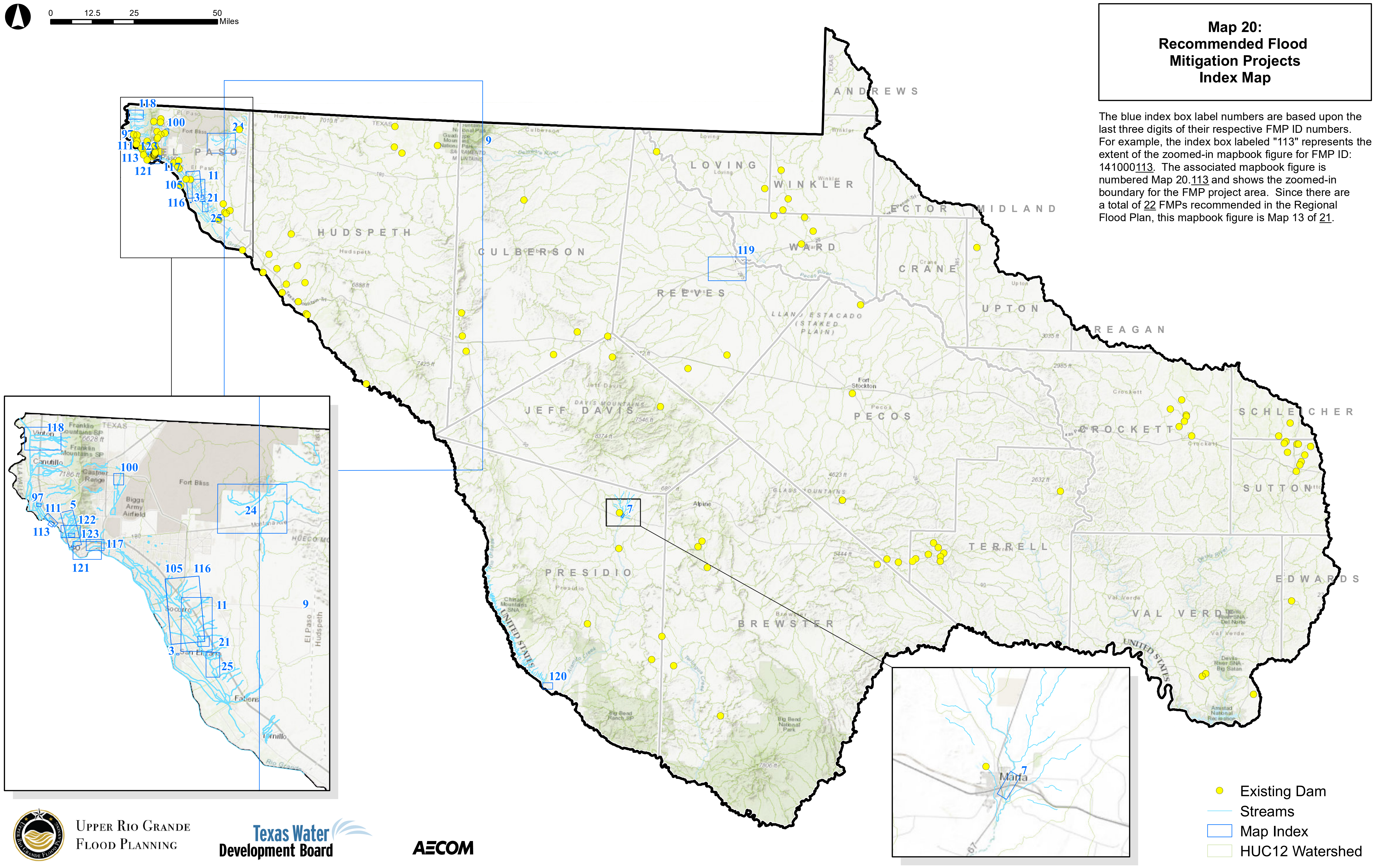

Map 20:
Recommended Flood Mitigation Projects Index Map

The blue index box label numbers are based upon the last three digits of their respective FMP ID numbers. For example, the index box labeled "113" represents the extent of the zoomed-in mapbook figure for FMP ID: 141000113. The associated mapbook figure is numbered Map 20.113 and shows the zoomed-in boundary for the FMP project area. Since there are a total of 22 FMPs recommended in the Regional Flood Plan, this mapbook figure is Map 13 of 21.

Upper Rio Grande Flood Planning

Texas Water Development Board

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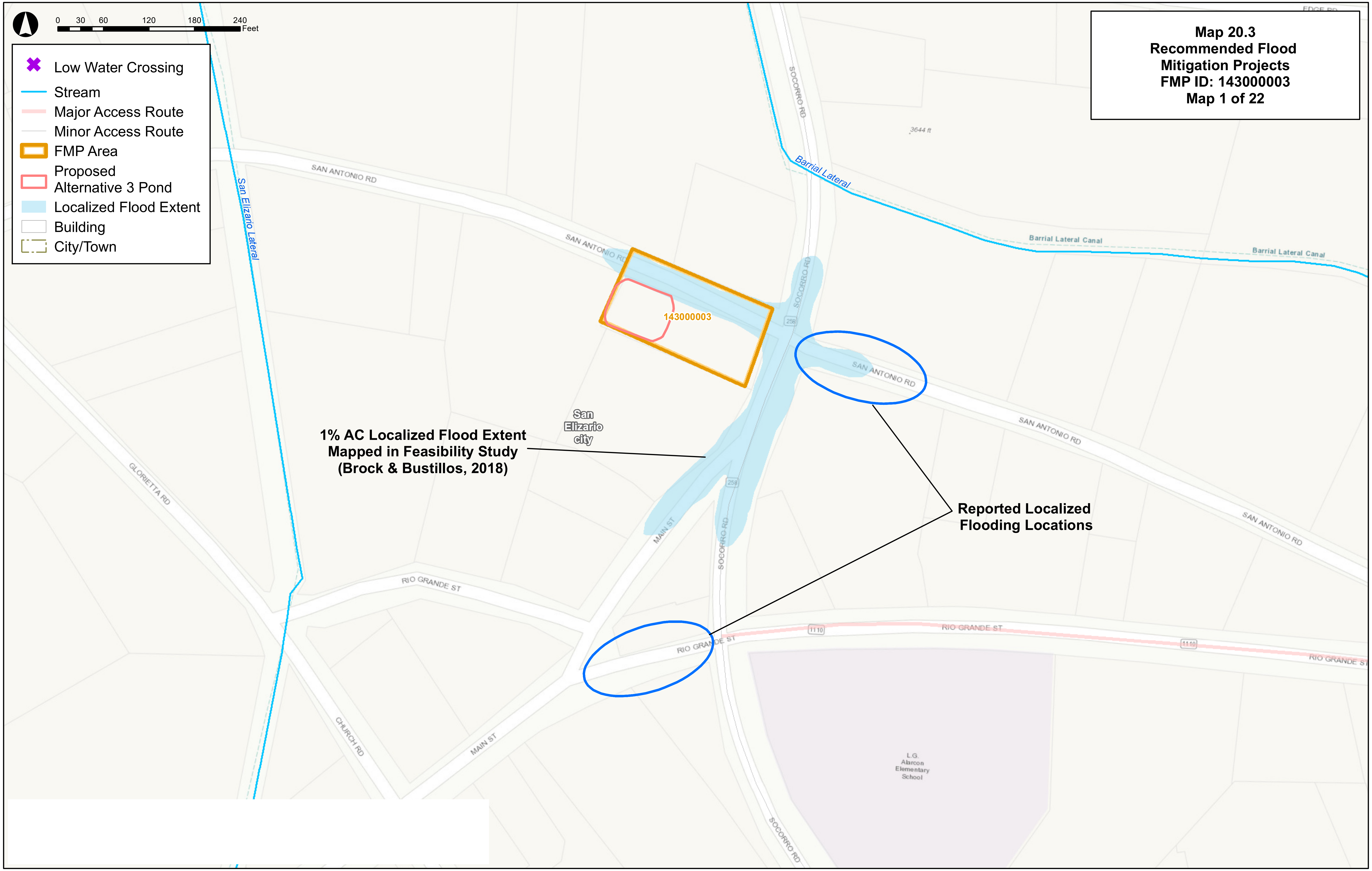
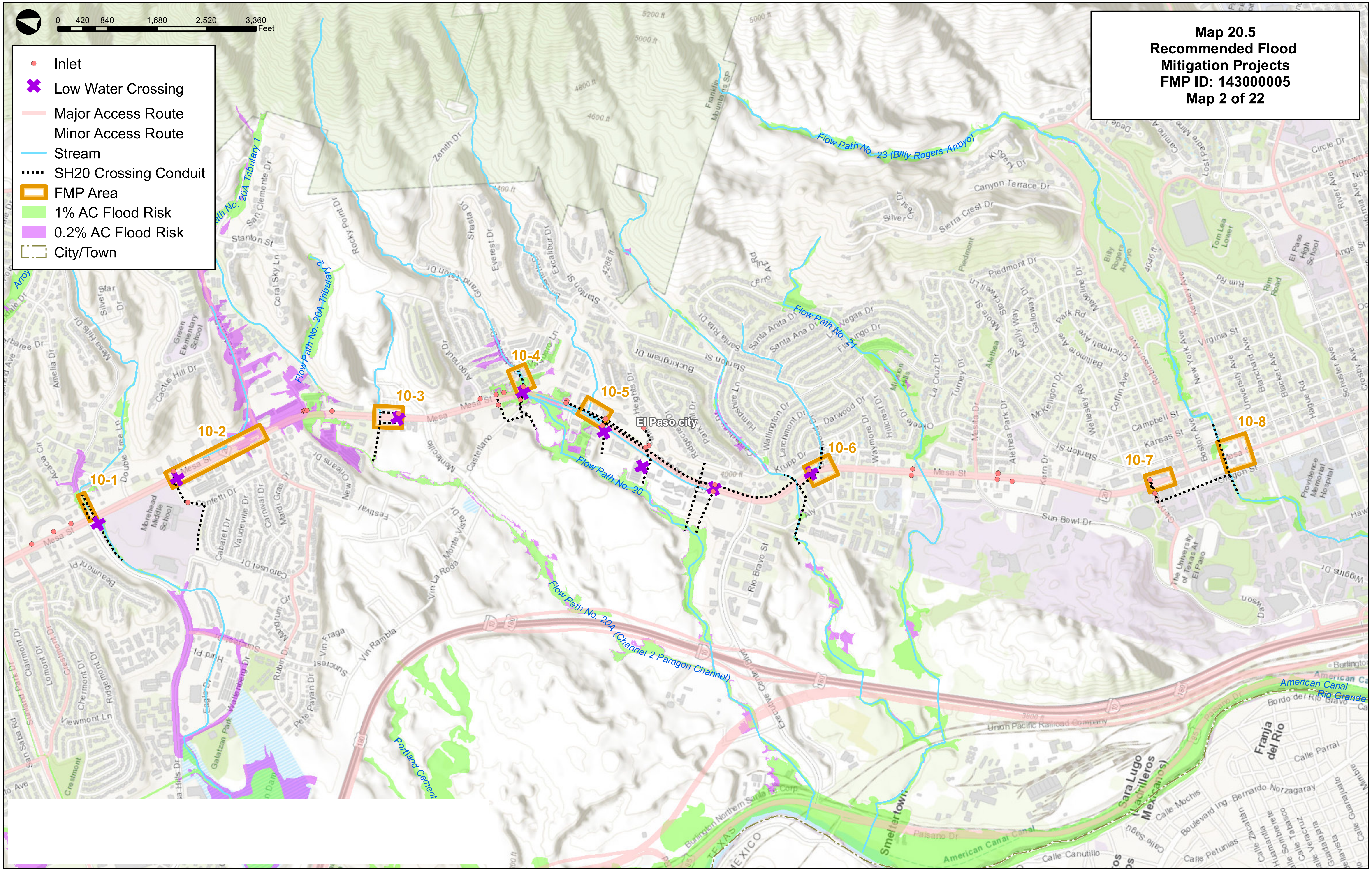
Map 20.3 Recommended Flood Mitigation Projects FMP ID: 143000003 Map 1 of 22



1% AC Localized Flood Extent Mapped in Feasibility Study (Brock & Bustillos, 2018)

Reported Localized Flooding Locations

Map 20.5
Recommended Flood Mitigation Projects
FMP ID: 143000005
Map 2 of 22



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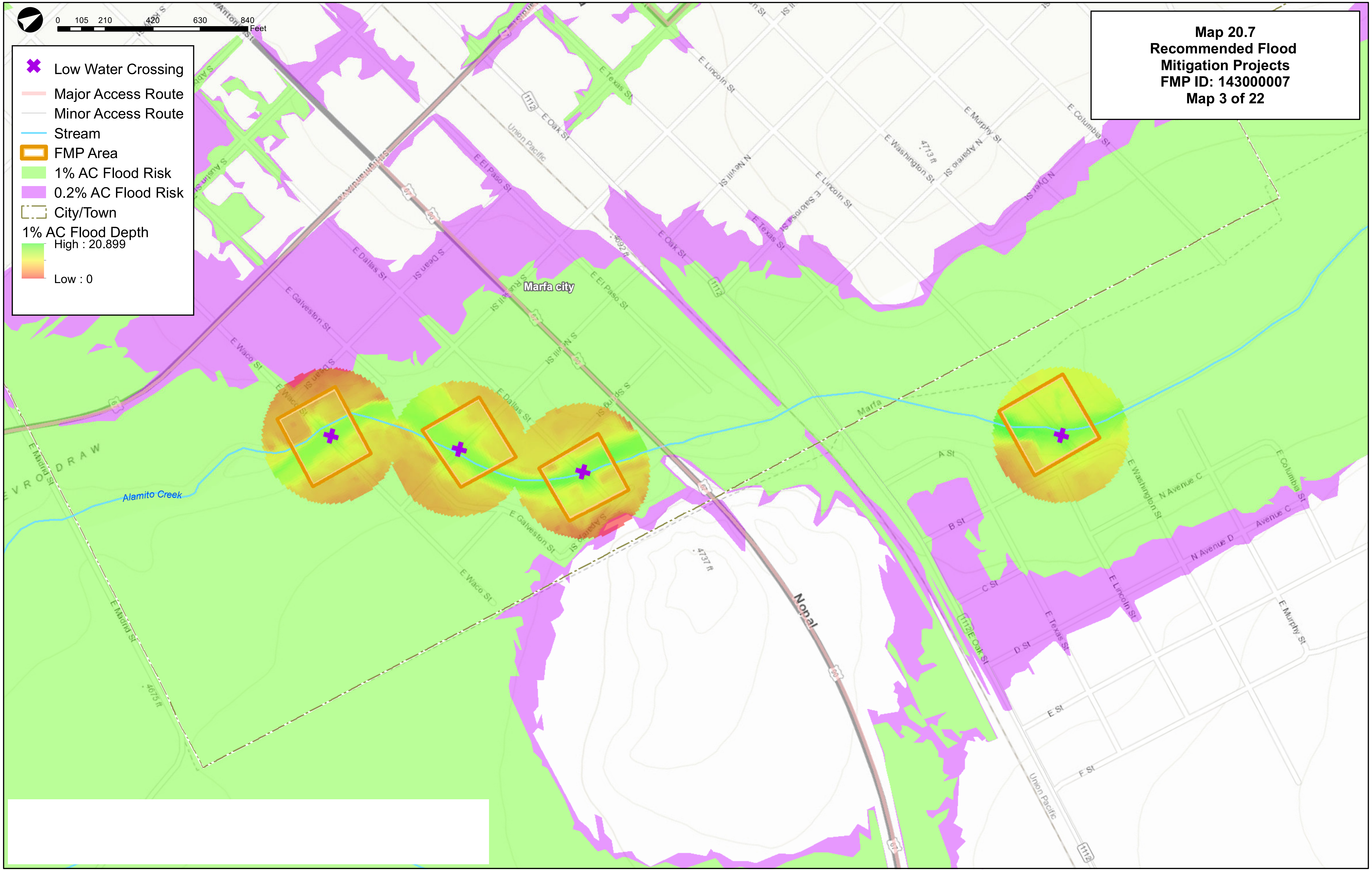
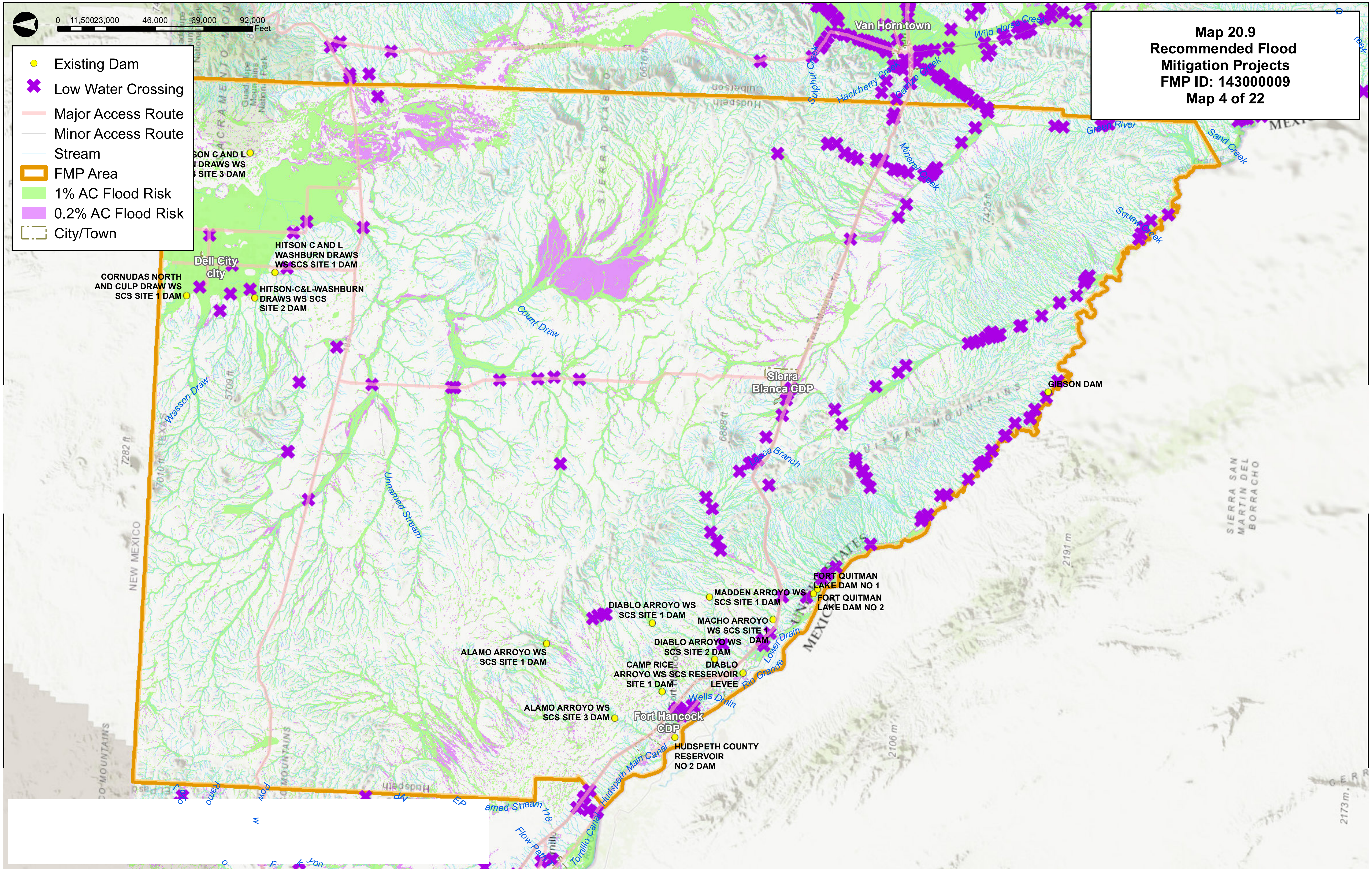


Map 20.7
Recommended Flood Mitigation Projects
FMP ID: 143000007
Map 3 of 22



Map 20.9
Recommended Flood Mitigation Projects
FMP ID: 143000009
Map 4 of 22

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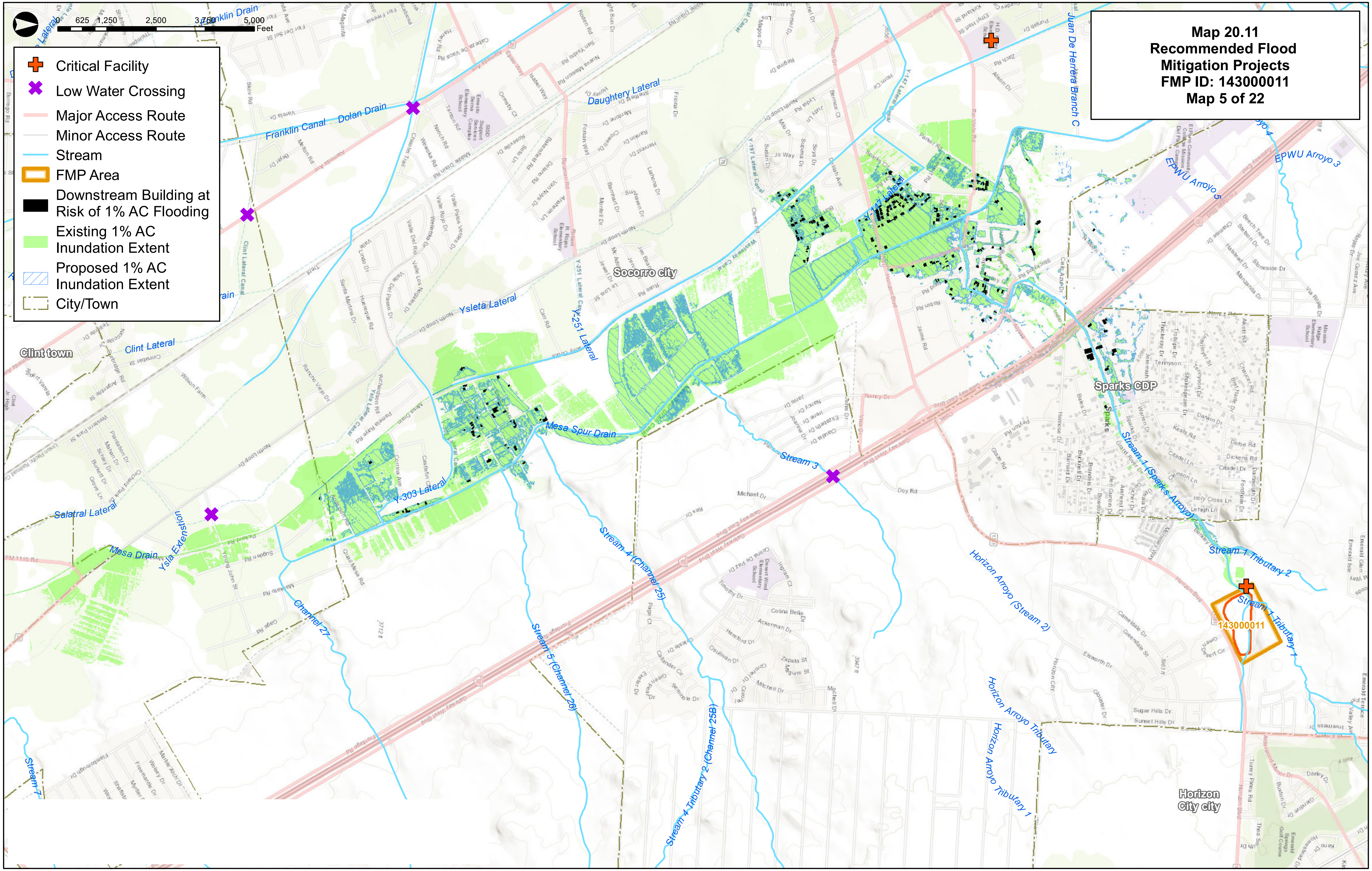

Map 20.11
Recommended Flood Mitigation Projects
FMP ID: 143000011
Map 5 of 22

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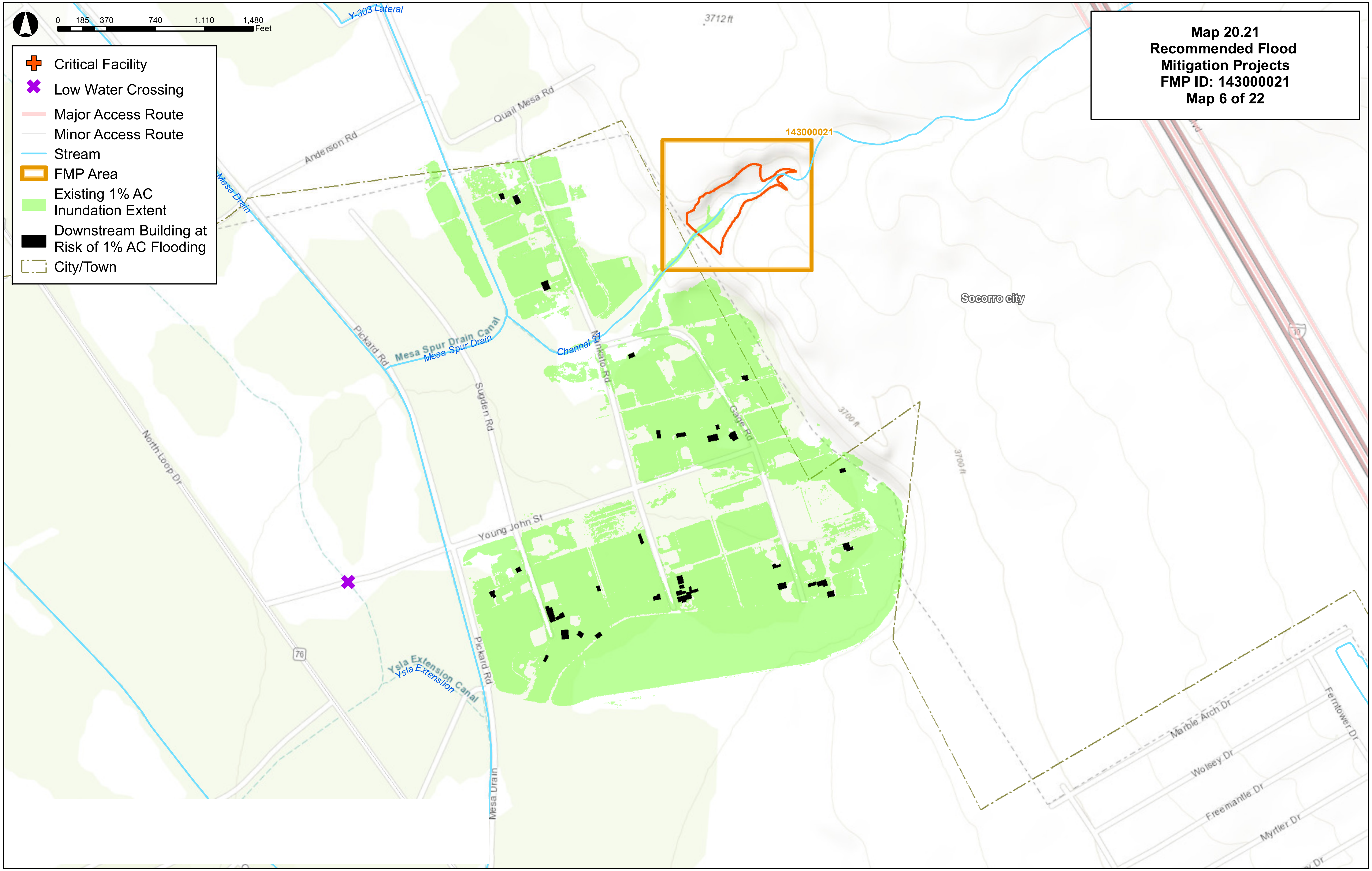

Map 20.21
Recommended Flood Mitigation Projects
FMP ID: 143000021
Map 6 of 22

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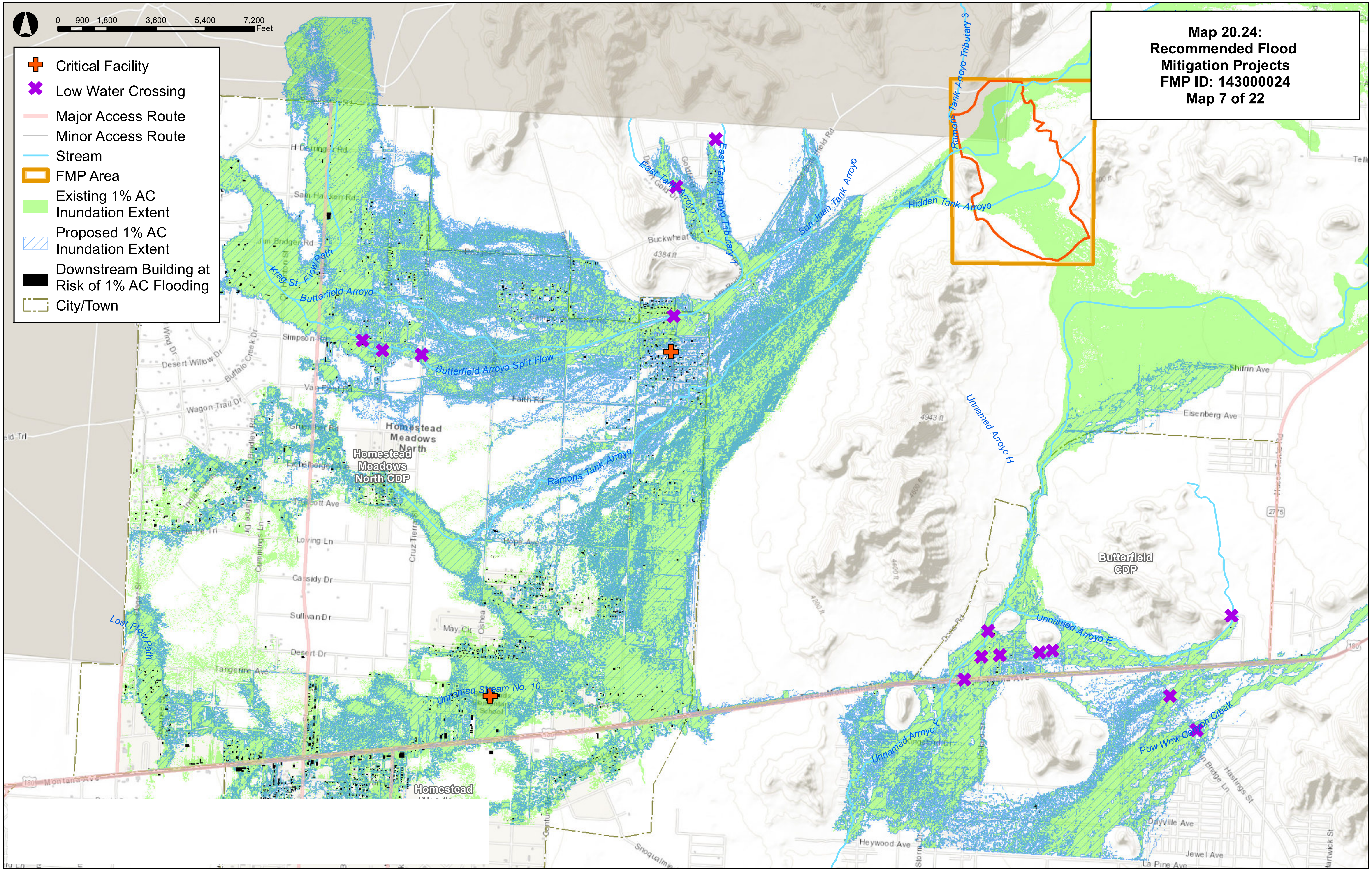

Map 20.24: Recommended Flood Mitigation Projects FMP ID: 143000024 Map 7 of 22

- ✚ Critical Facility
- ✖ Low Water Crossing
- Major Access Route
- Minor Access Route
- Stream
- ▭ FMP Area
- 🟩 Existing 1% AC Inundation Extent
- ▨ Proposed 1% AC Inundation Extent
- ■ Downstream Building at Risk of 1% AC Flooding
- City/Town

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Map 20.25:
Recommended Flood Mitigation Projects
FMP ID: 143000025

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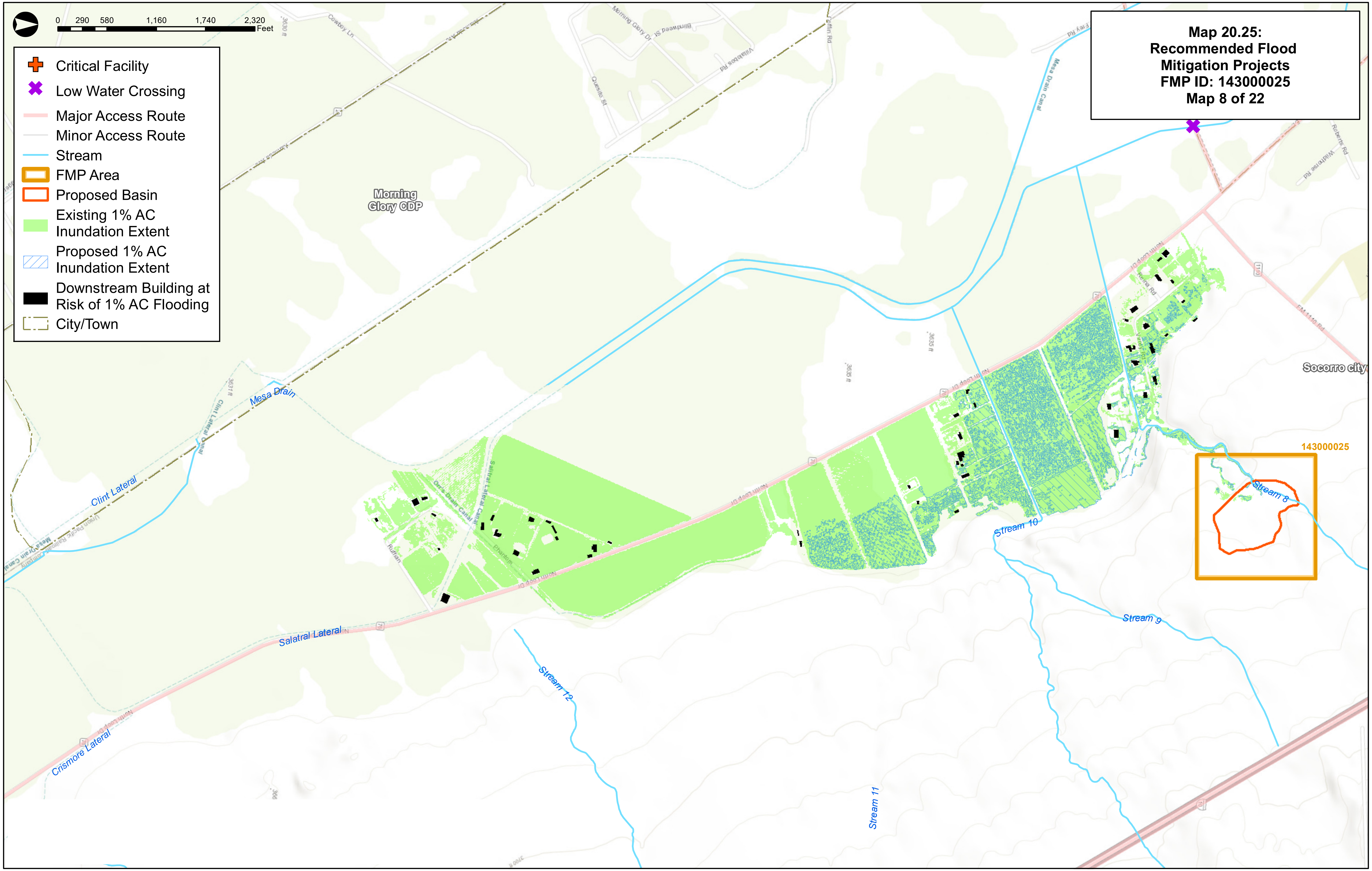

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Map 20.97
Recommended Flood Mitigation Projects
FMP ID: 143000097
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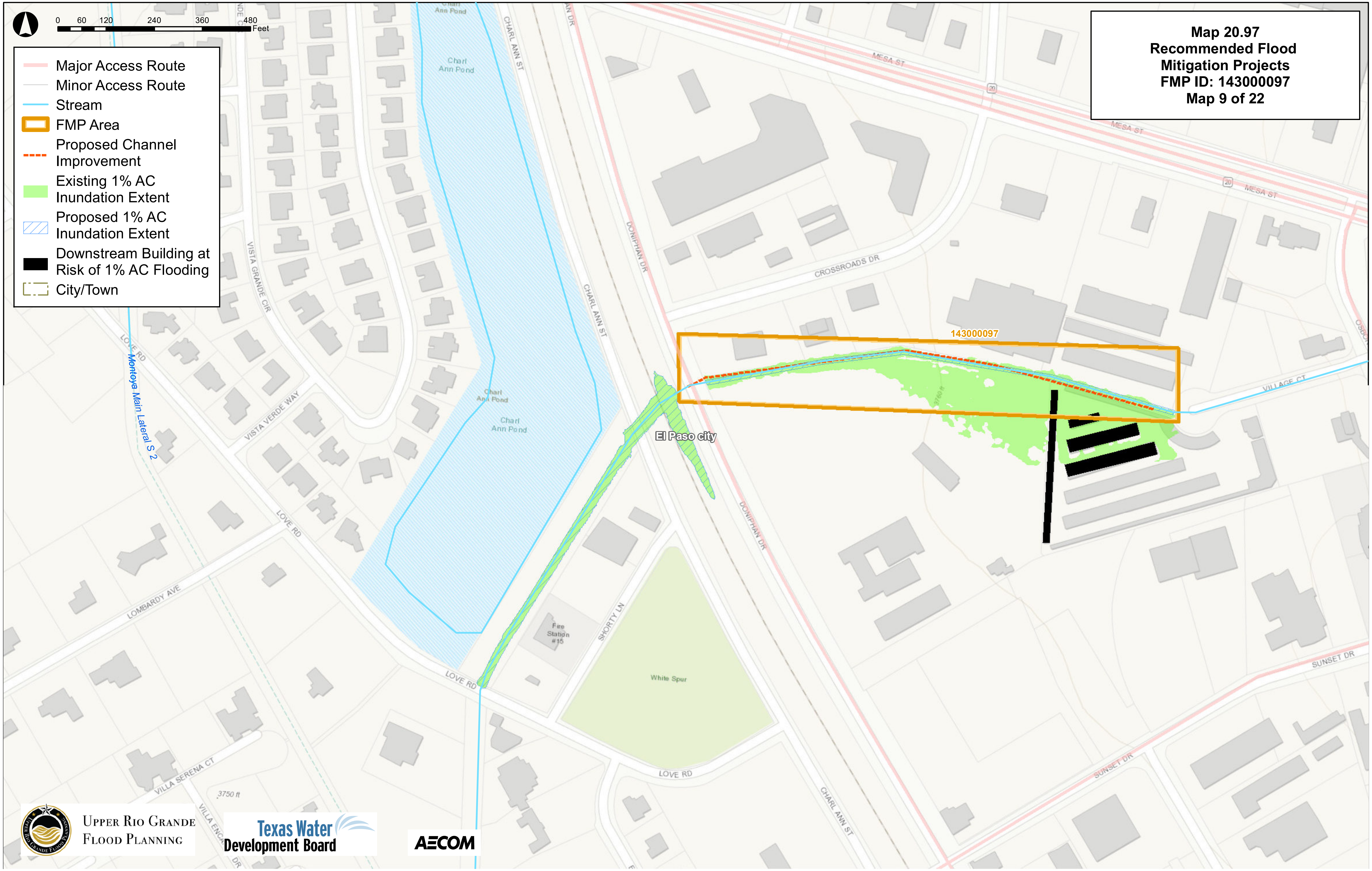

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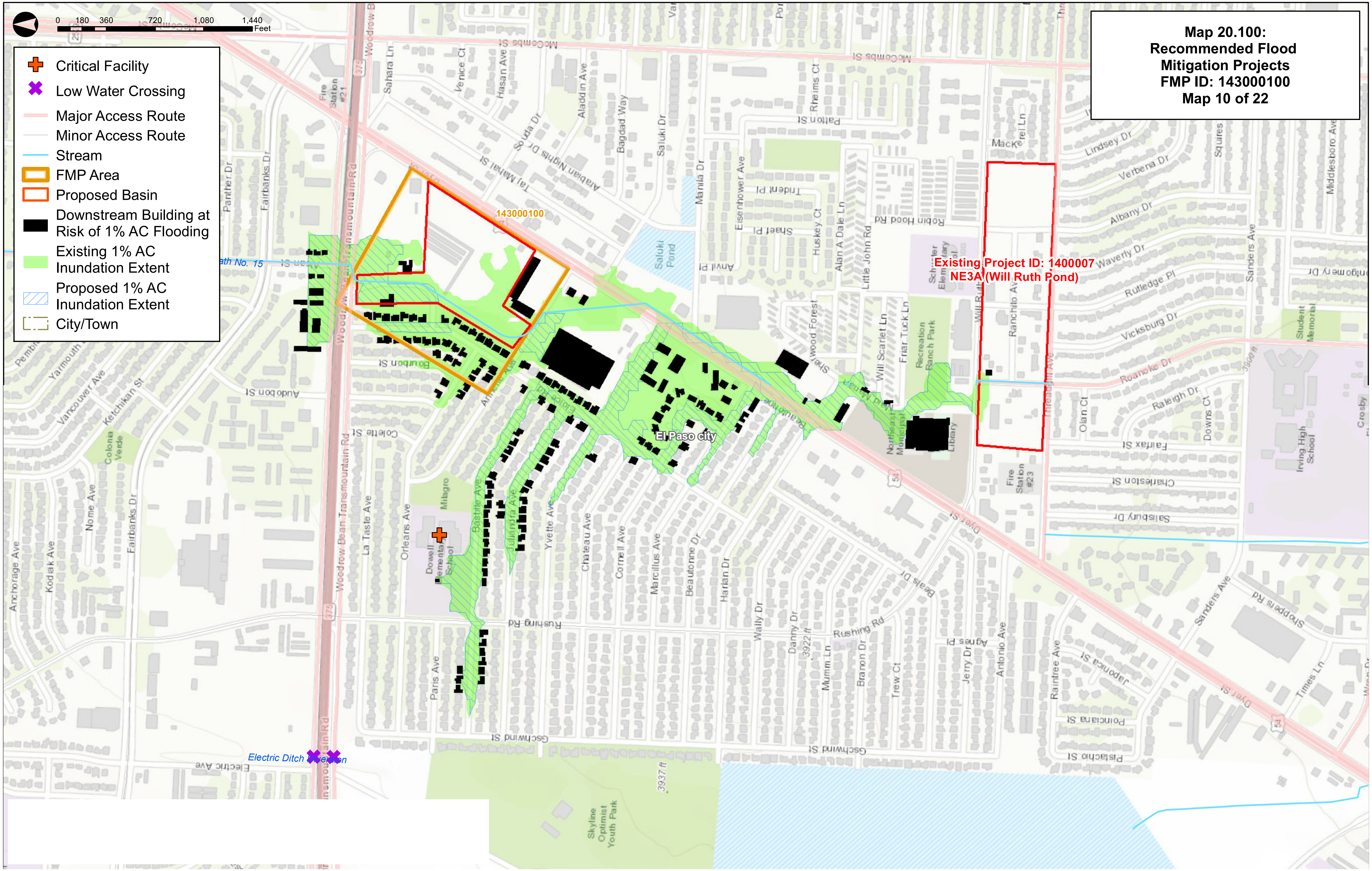

Map 20.100:
Recommended Flood
Mitigation Projects
FMP ID: 143000100
Map 10 of 22

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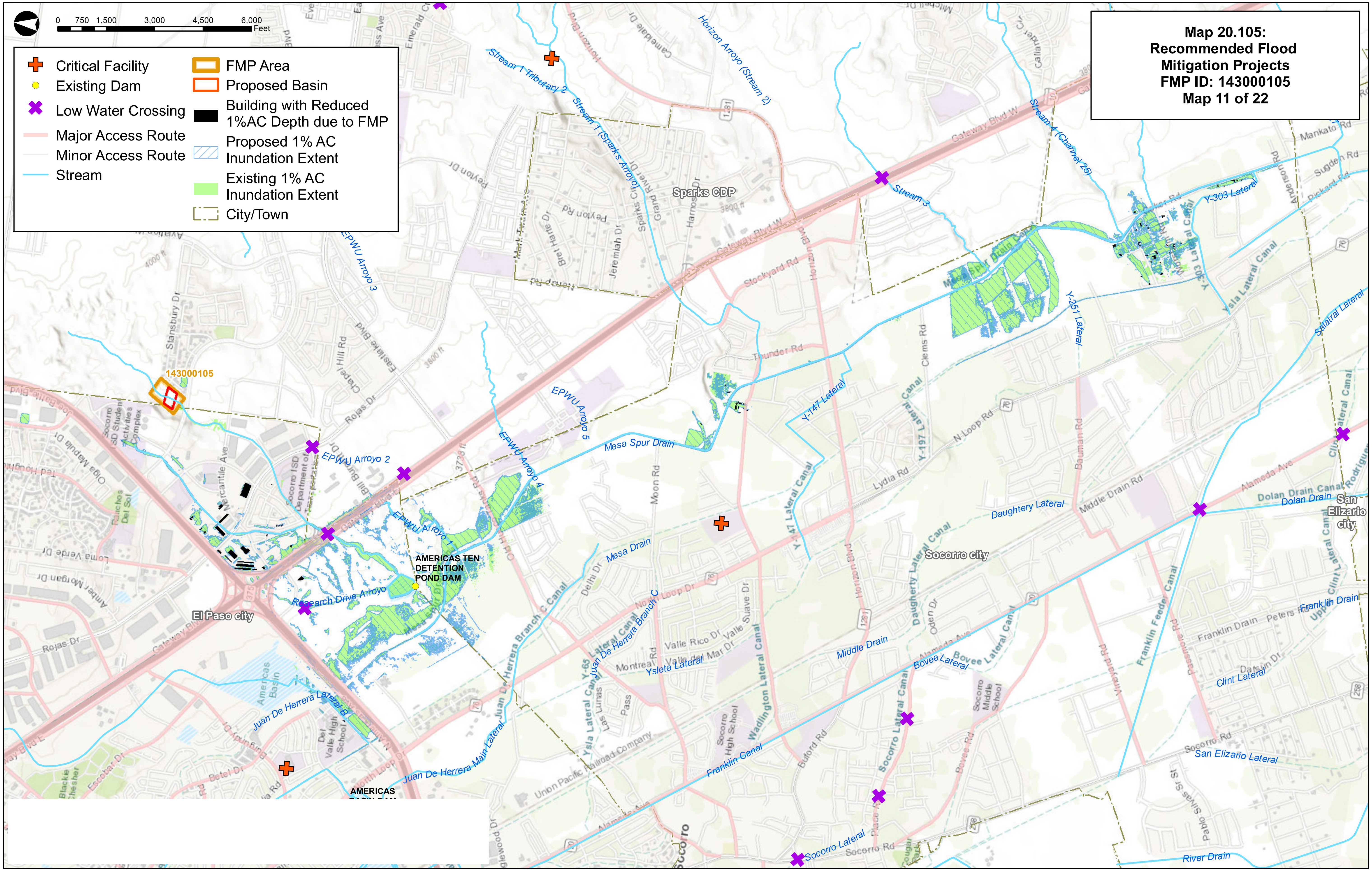
Map 20.105: Recommended Flood Mitigation Projects
FMP ID: 143000105
Map 11 of 22



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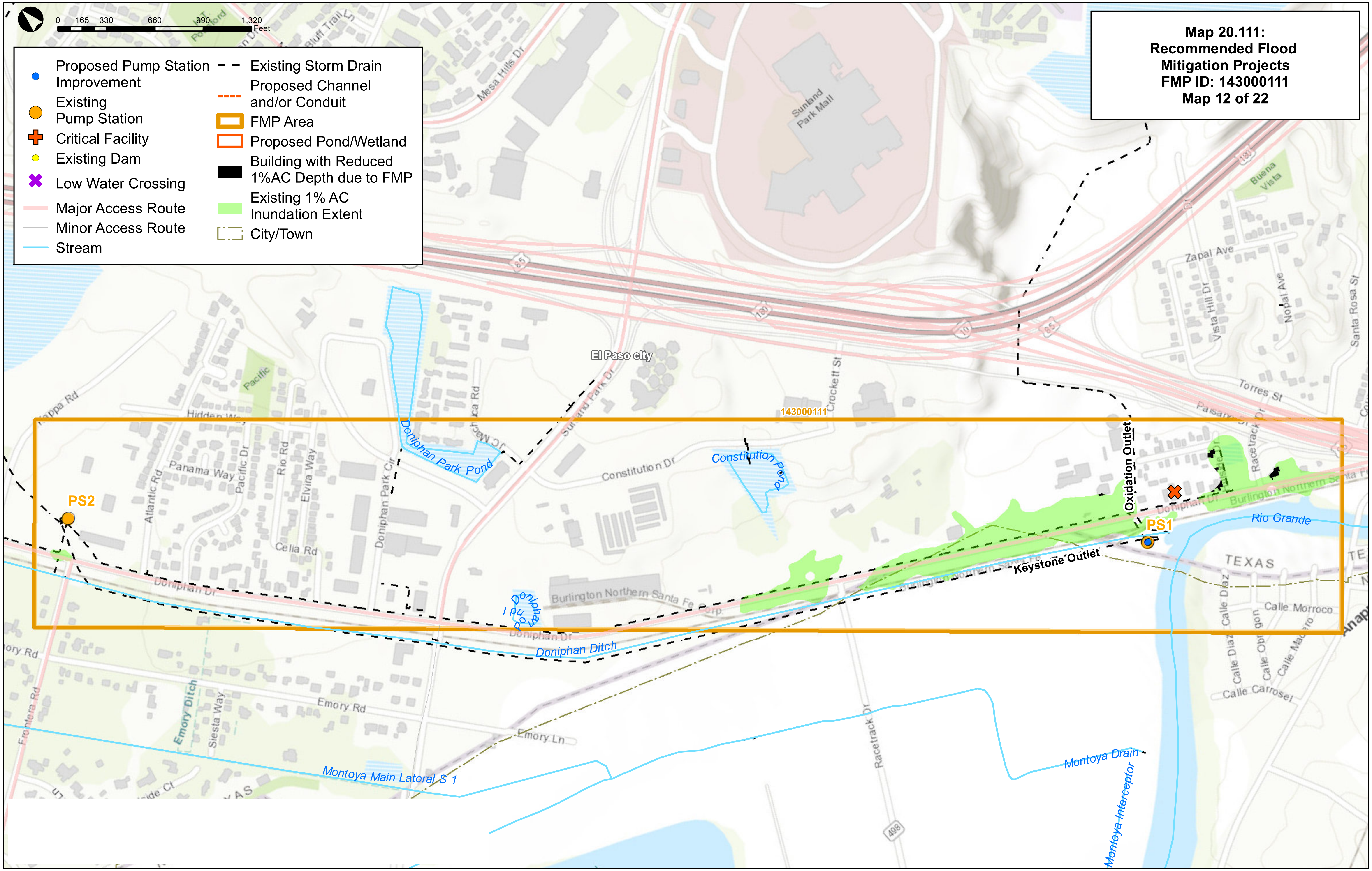
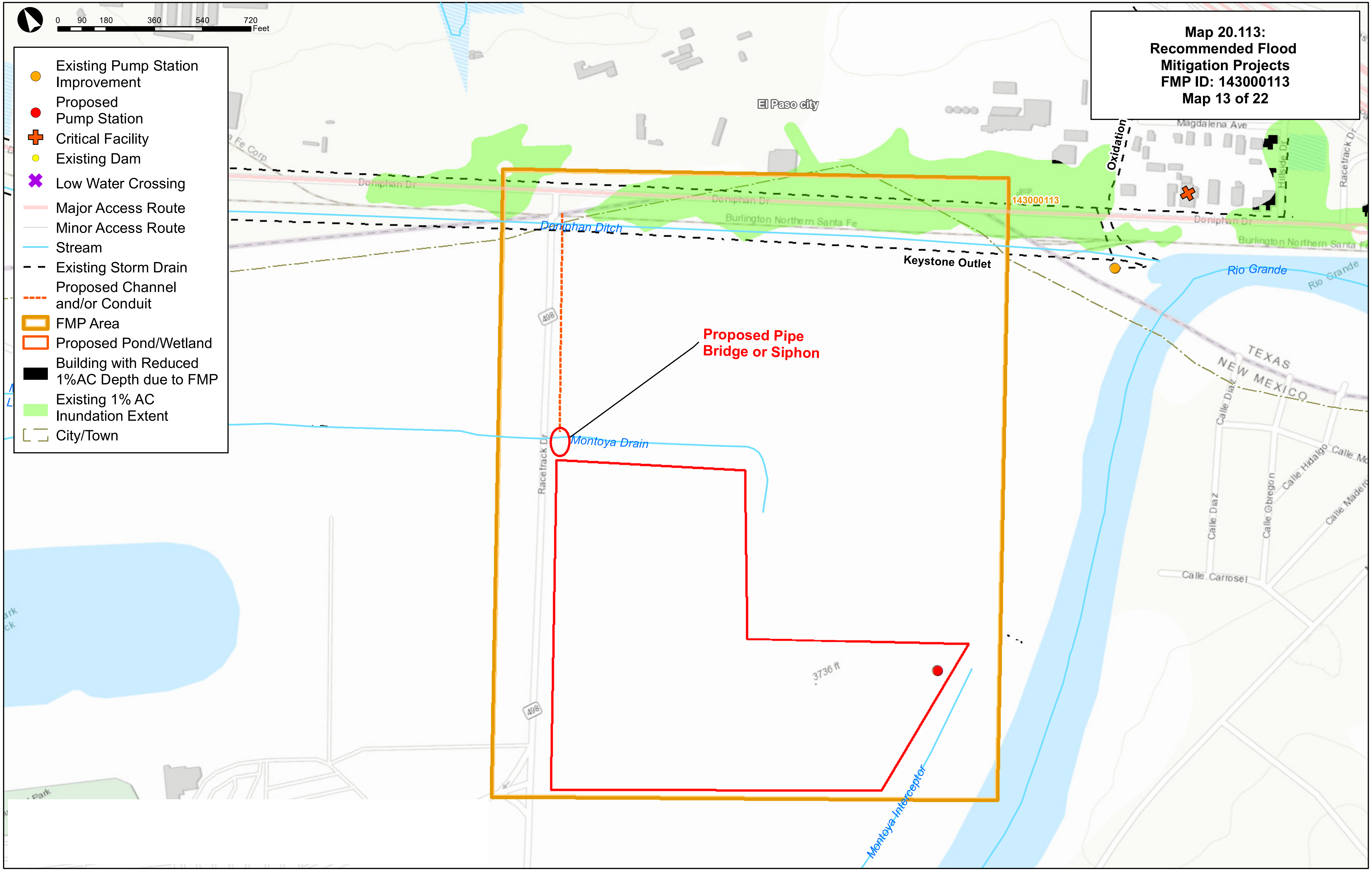


**Map 20.111:
Recommended Flood
Mitigation Projects
FMP ID: 143000111
Map 12 of 22**



Map 20.113: Recommended Flood Mitigation Projects
FMP ID: 143000113
Map 13 of 22

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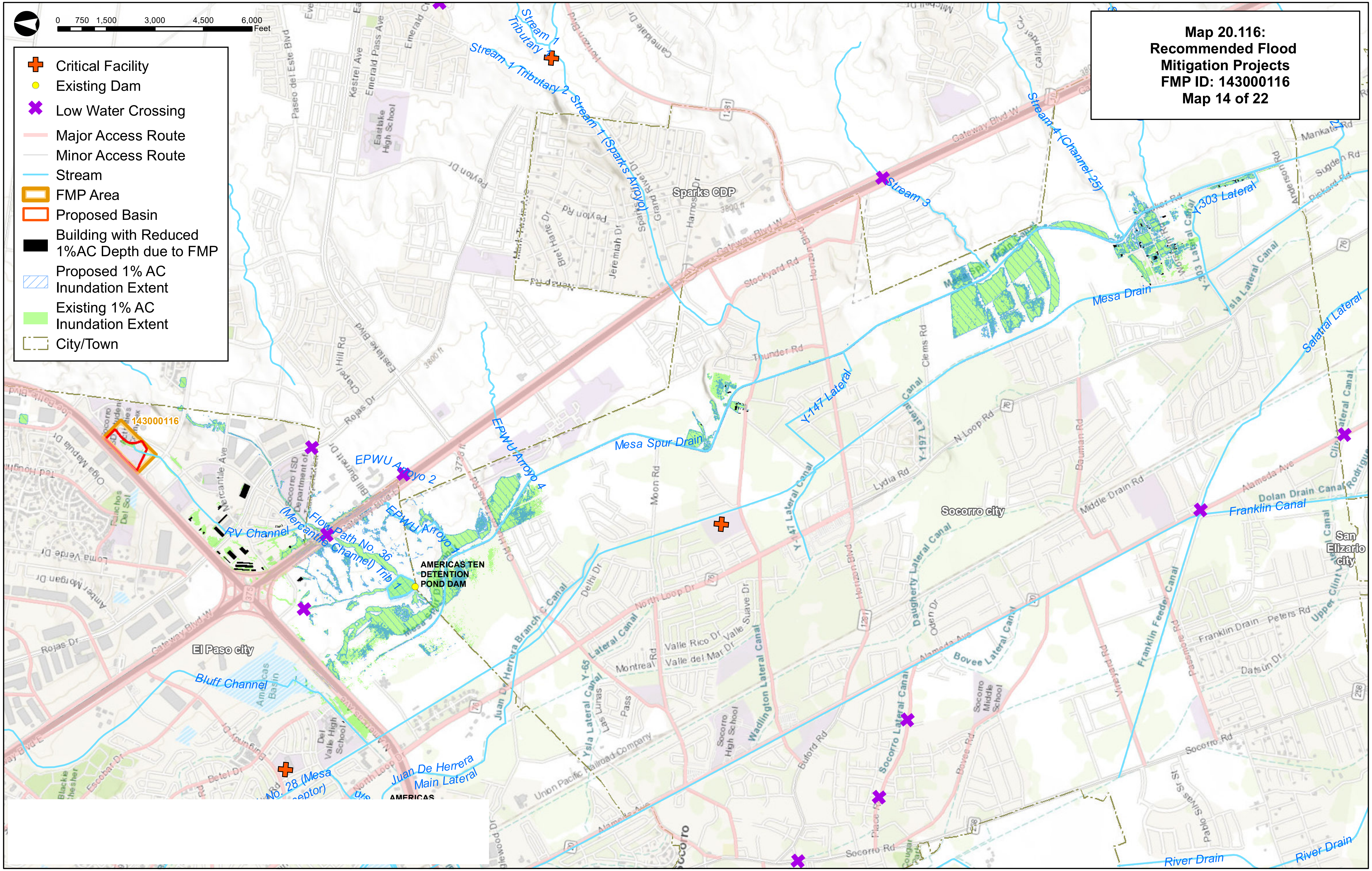
Map 20.116: Recommended Flood Mitigation Projects FMP ID: 143000116 Map 14 of 22



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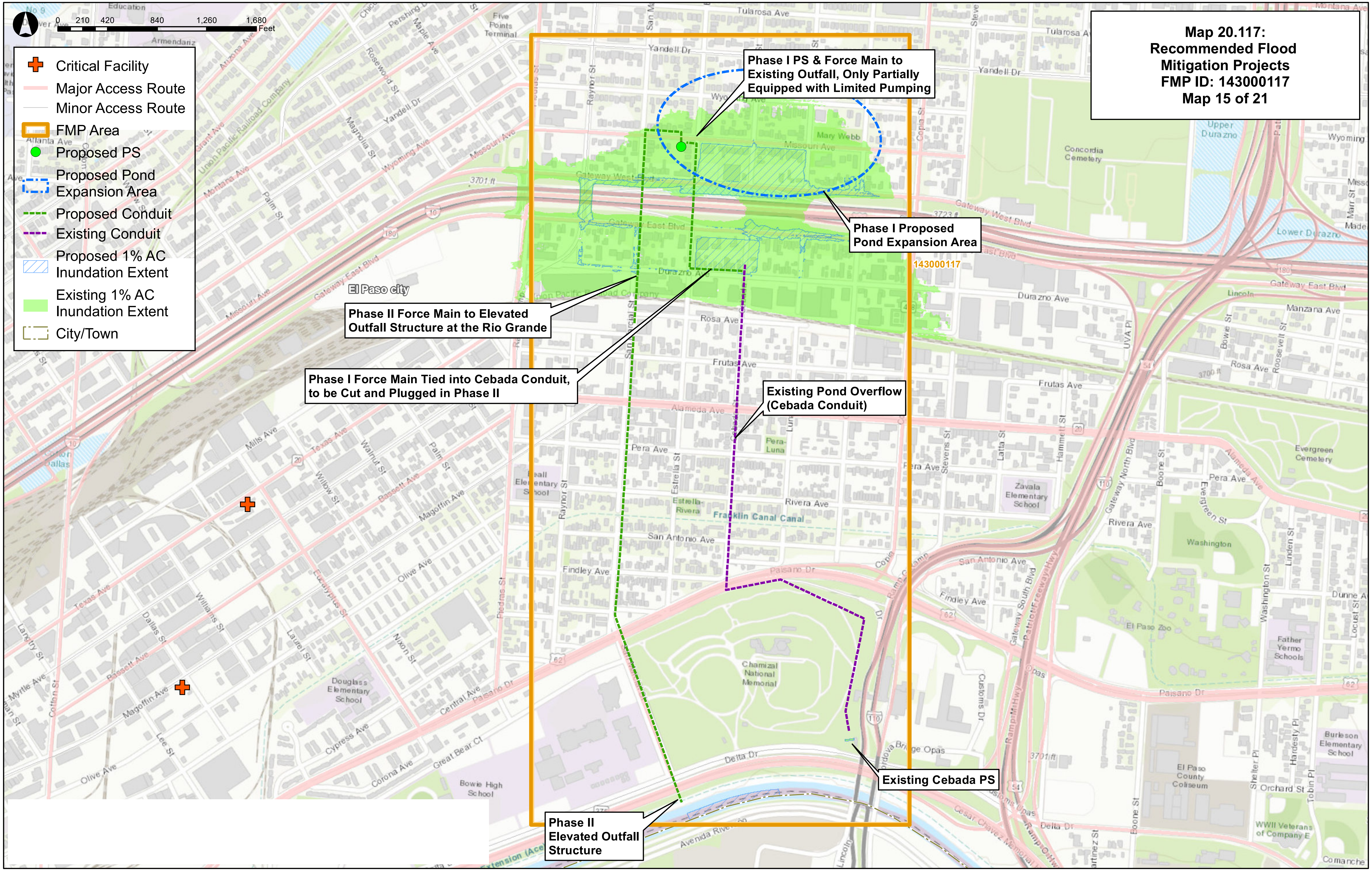

Map 20.117: Recommended Flood Mitigation Projects FMP ID: 143000117 Map 15 of 21

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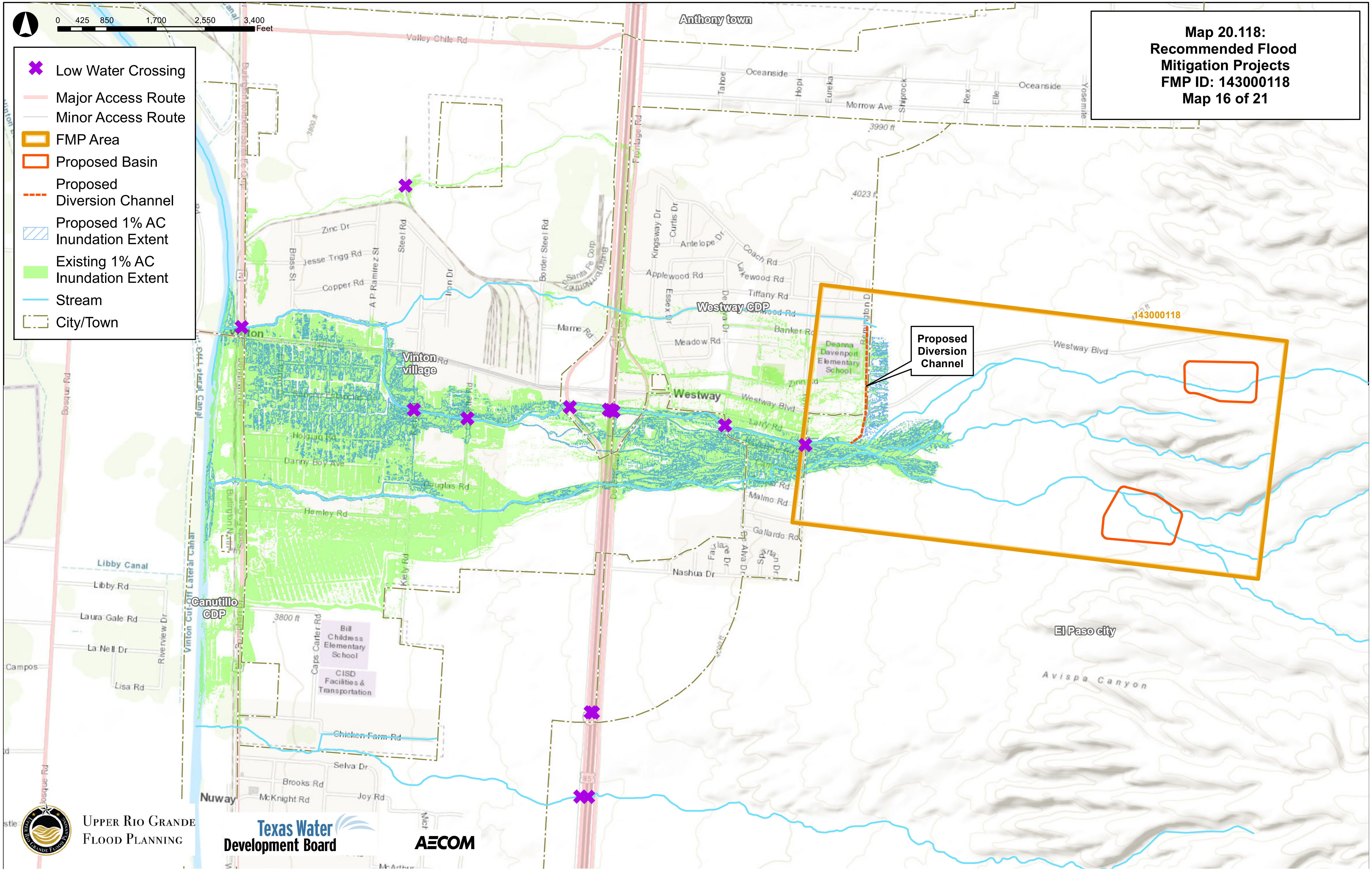

Map 20.118: Recommended Flood Mitigation Projects FMP ID: 143000118 Map 16 of 21

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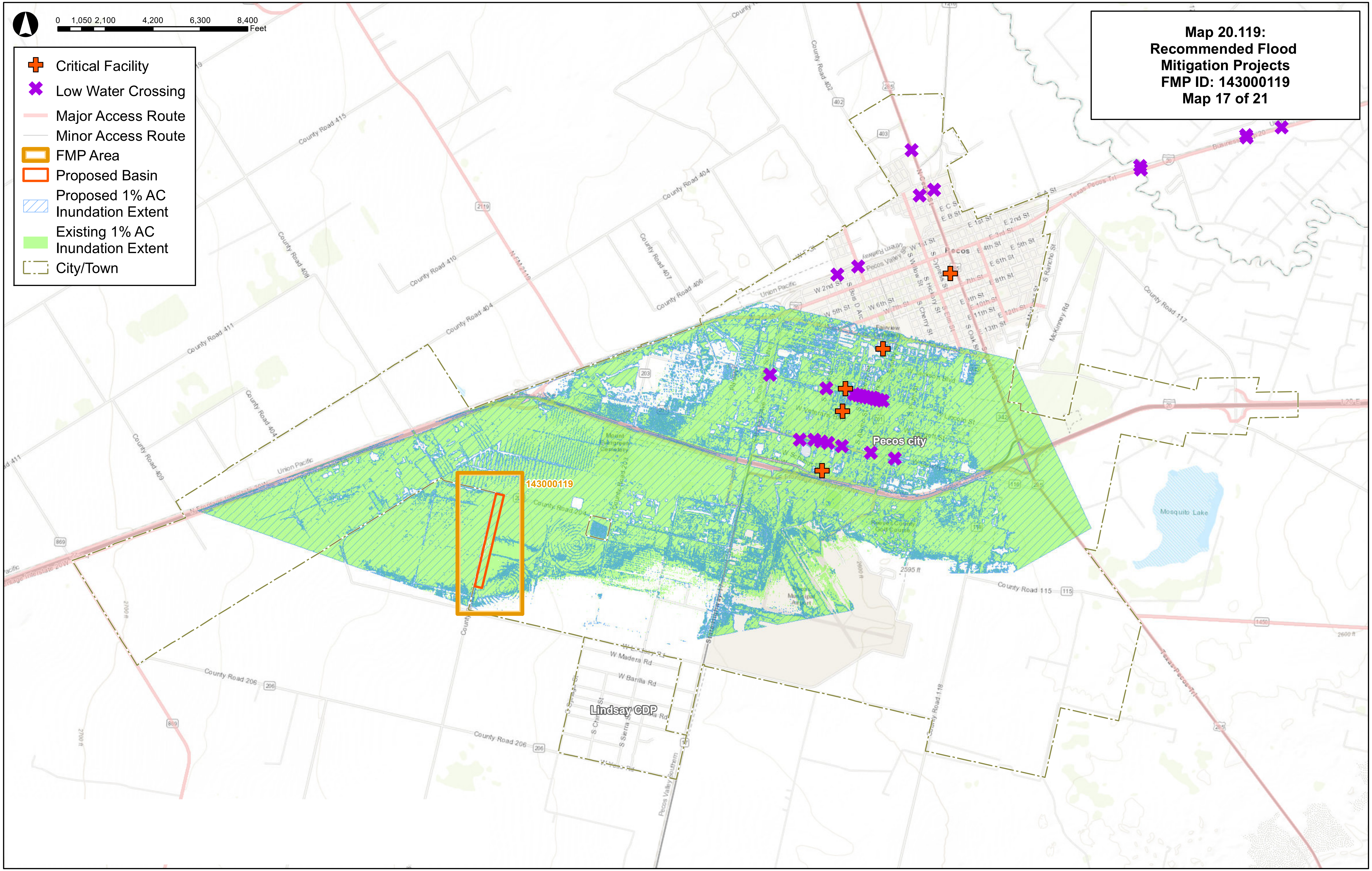

Map 20.119:
Recommended Flood Mitigation Projects
FMP ID: 143000119
Map 17 of 21

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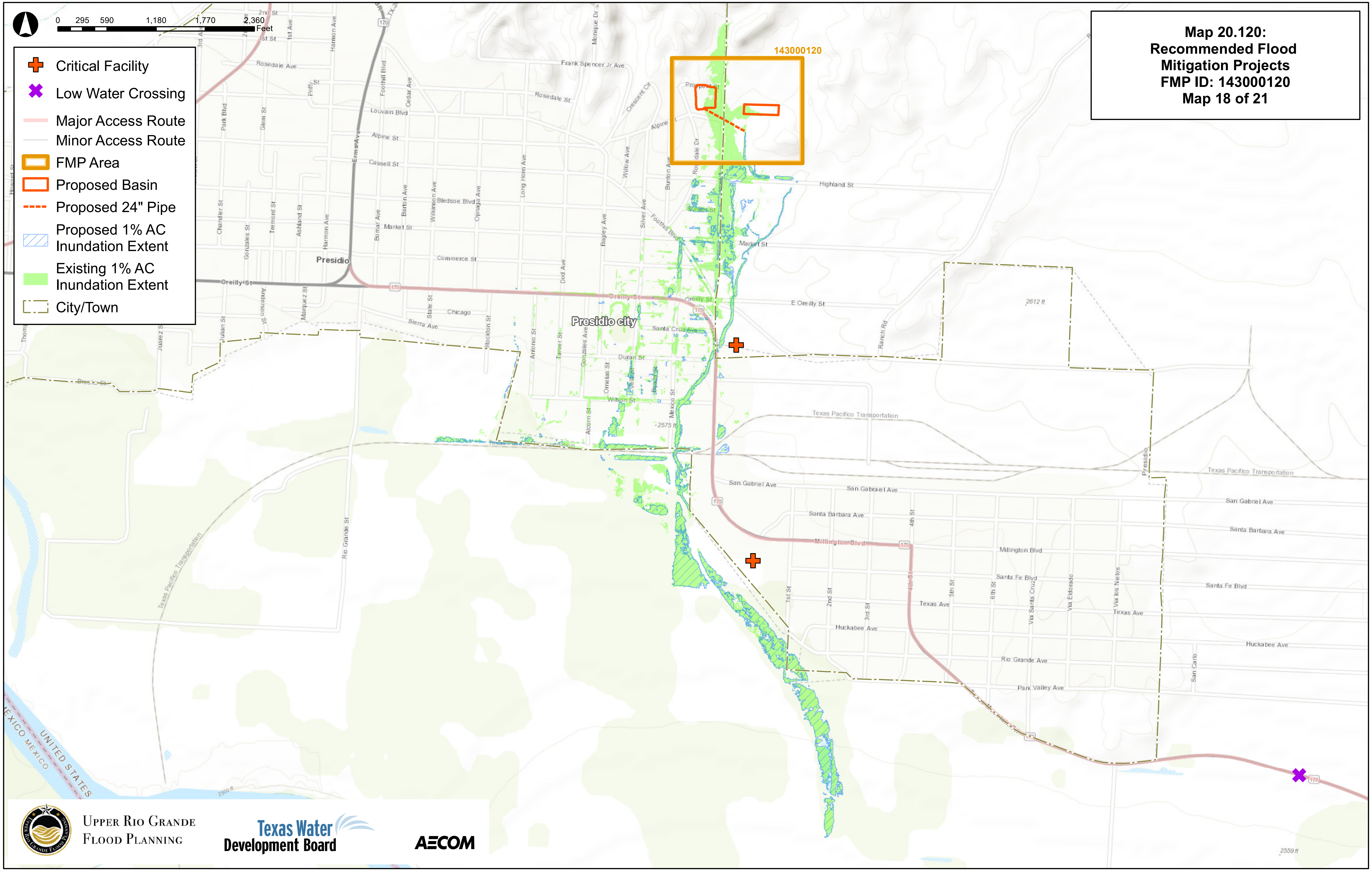
Map 20.120: Recommended Flood Mitigation Projects FMP ID: 143000120 Map 18 of 21



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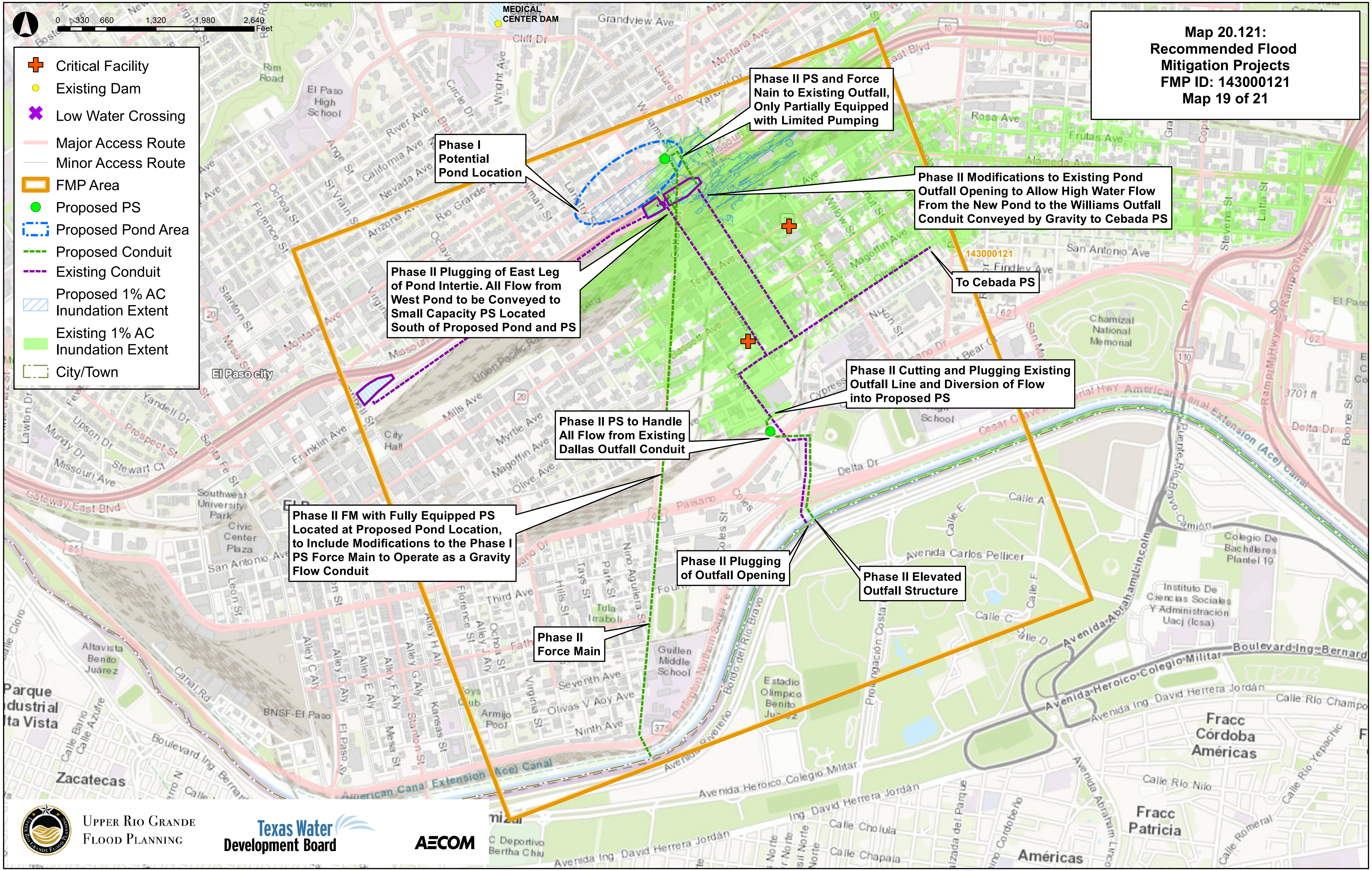

Map 20.121: Recommended Flood Mitigation Projects FMP ID: 143000121 Map 19 of 21

✚	Critical Facility
●	Existing Dam
✖	Low Water Crossing
▬	Major Access Route
▬	Minor Access Route
▭	FMP Area
●	Proposed PS
⬚	Proposed Pond Area
----	Proposed Conduit
----	Existing Conduit
▨	Proposed 1% AC Inundation Extent
🟩	Existing 1% AC Inundation Extent
⬚	City/Town

Phase II PS and Force Nain to Existing Outfall, Only Partially Equipped with Limited Pumping

Phase I Potential Pond Location

Phase II Modifications to Existing Pond Outfall Opening to Allow High Water Flow From the New Pond to the Williams Outfall Conduit Conveyed by Gravity to Cebada PS

Phase II Plugging of East Leg of Pond Intertie. All Flow from West Pond to be Conveyed to Small Capacity PS Located South of Proposed Pond and PS

To Cebada PS

Phase II Cutting and Plugging Existing Outfall Line and Diversion of Flow into Proposed PS

Phase II PS to Handle All Flow from Existing Dallas Outfall Conduit

Phase II FM with Fully Equipped PS Located at Proposed Pond Location, to Include Modifications to the Phase I PS Force Main to Operate as a Gravity Flow Conduit

Phase II Plugging of Outfall Opening

Phase II Elevated Outfall Structure

Phase II Force Main

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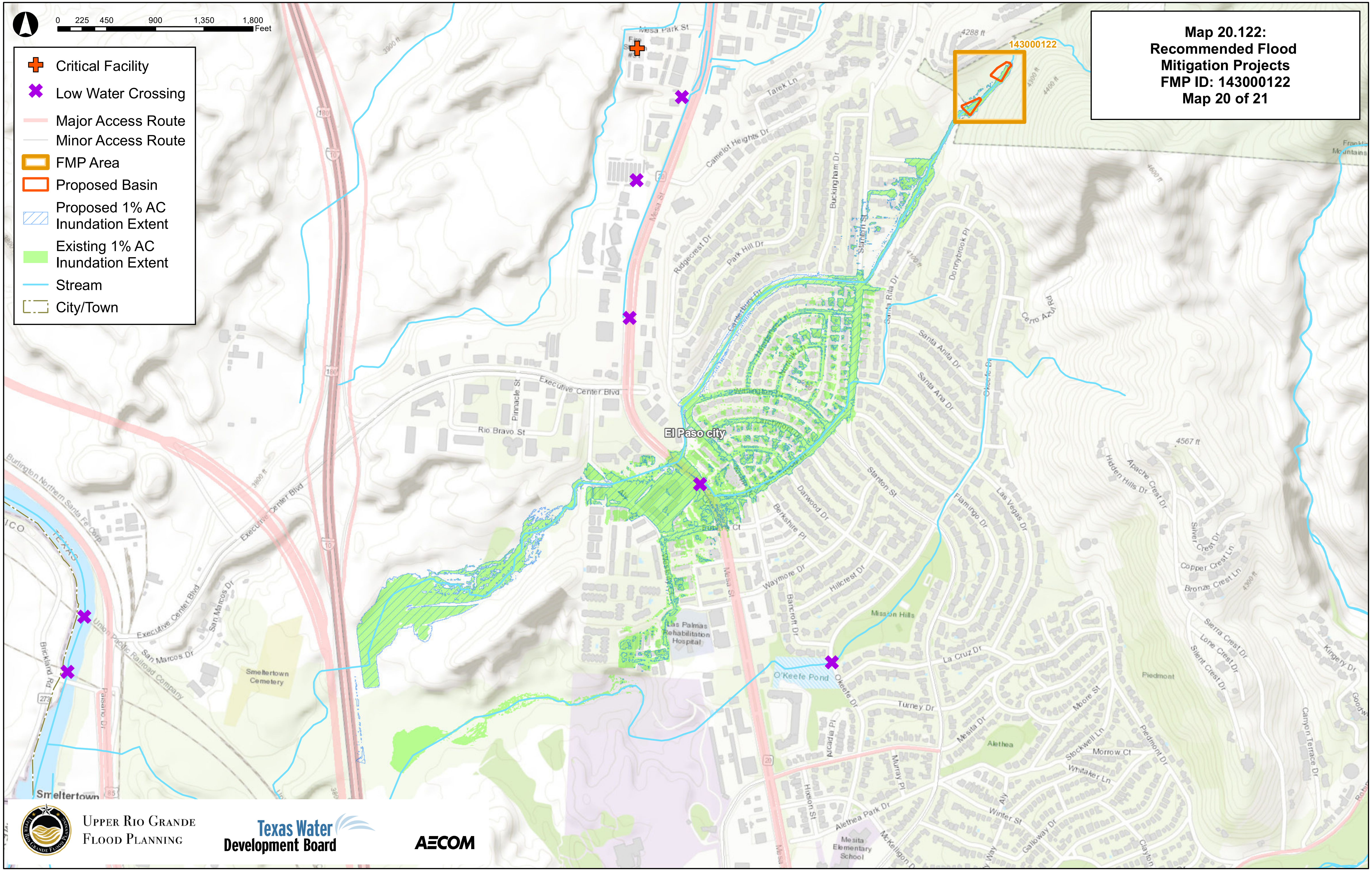

Map 20.122:
Recommended Flood Mitigation Projects
FMP ID: 143000122
Map 20 of 21

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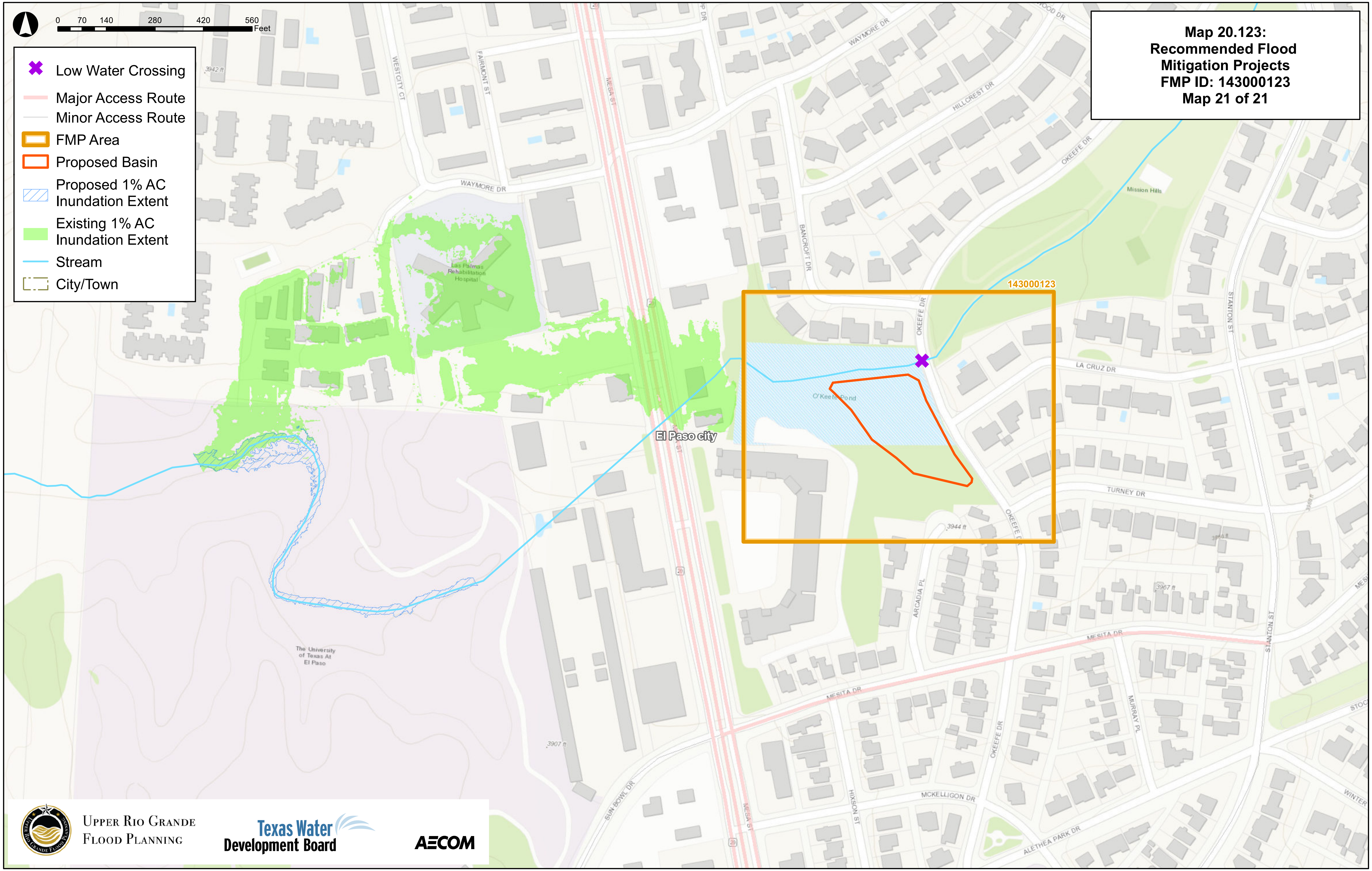
Map 20.123: Recommended Flood Mitigation Projects FMP ID: 143000123 Map 21 of 21



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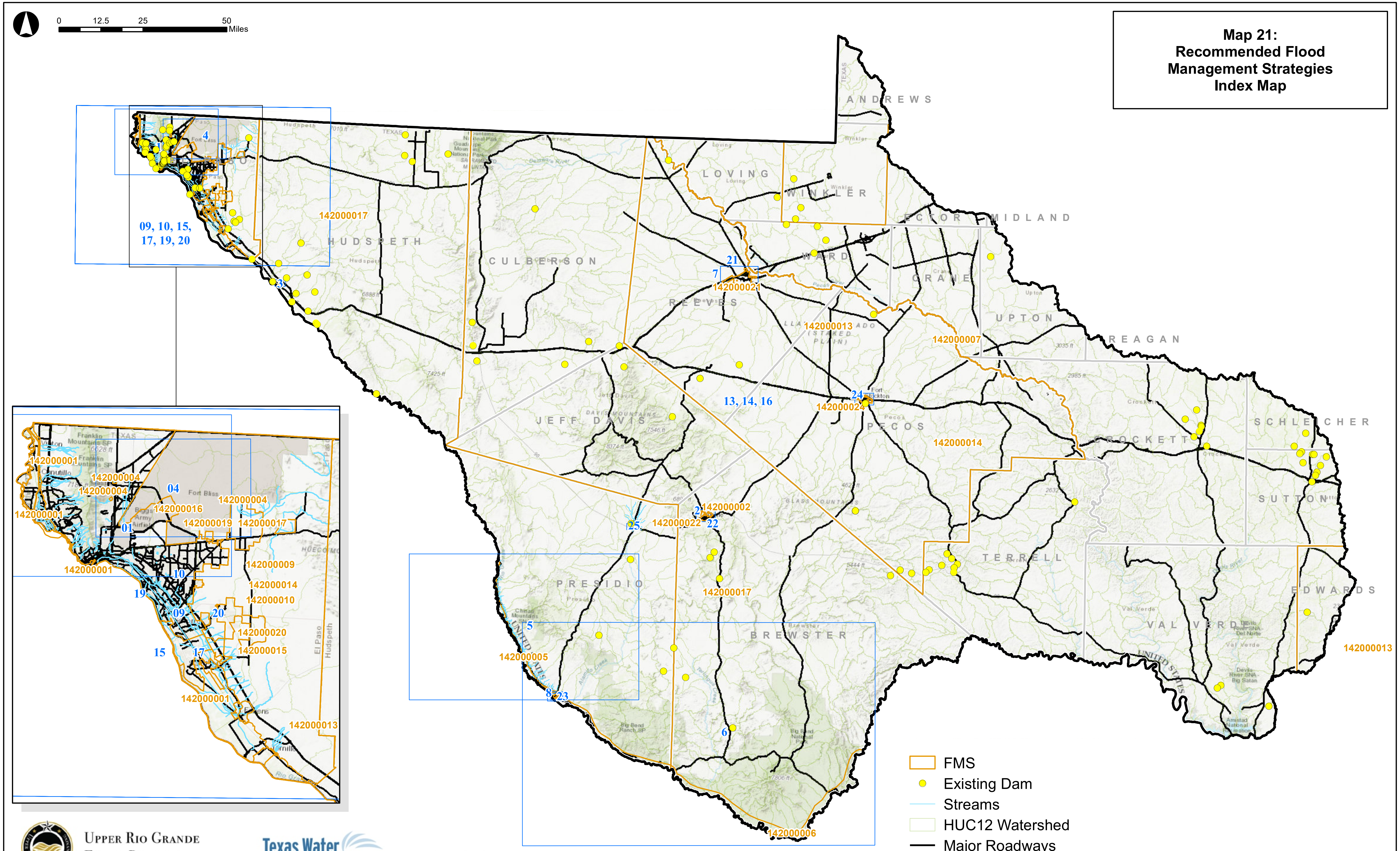
Map 21: Recommended Flood Management Strategies Index Map



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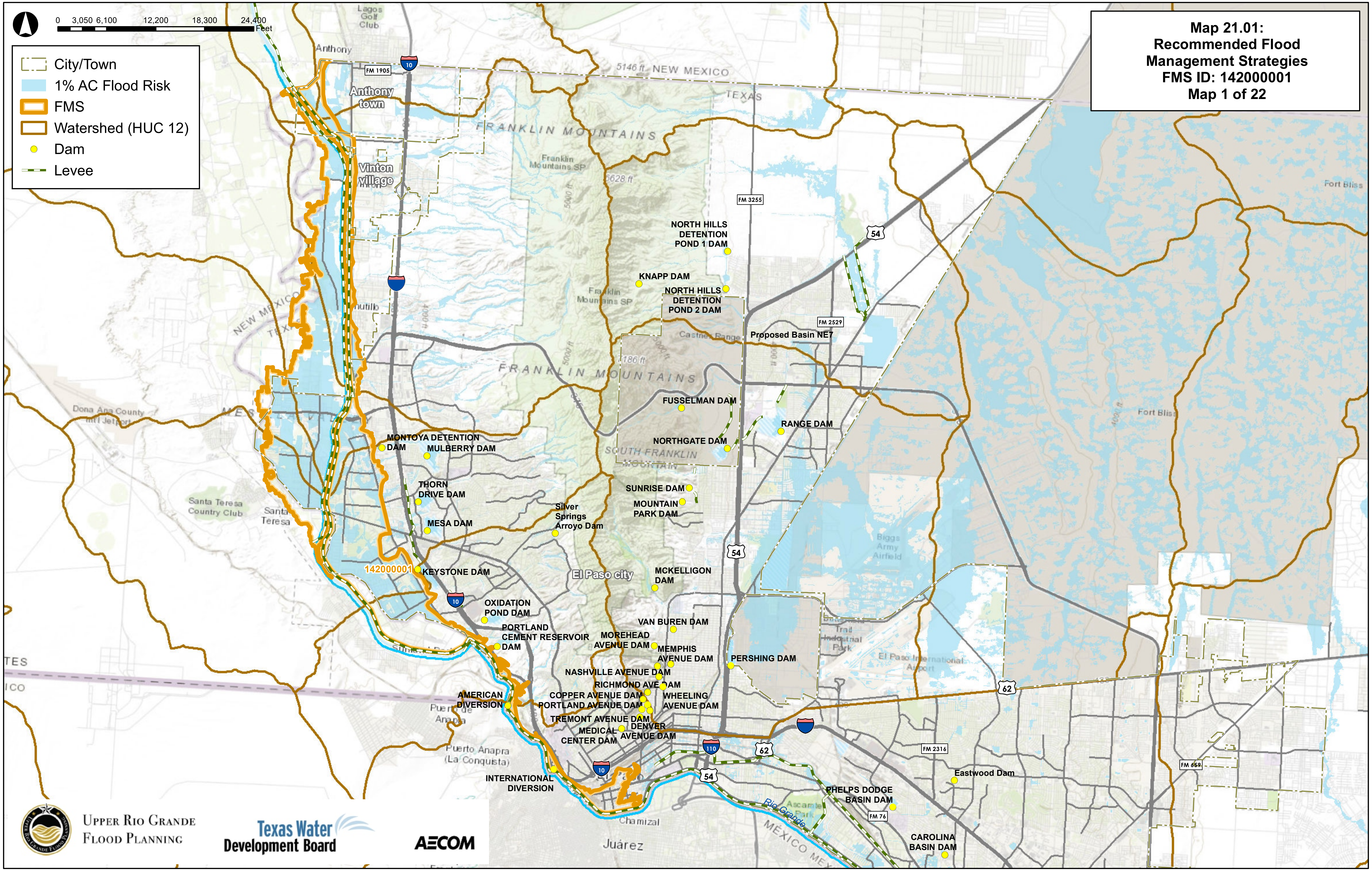

Map 21.01: Recommended Flood Management Strategies FMS ID: 142000001 Map 1 of 22

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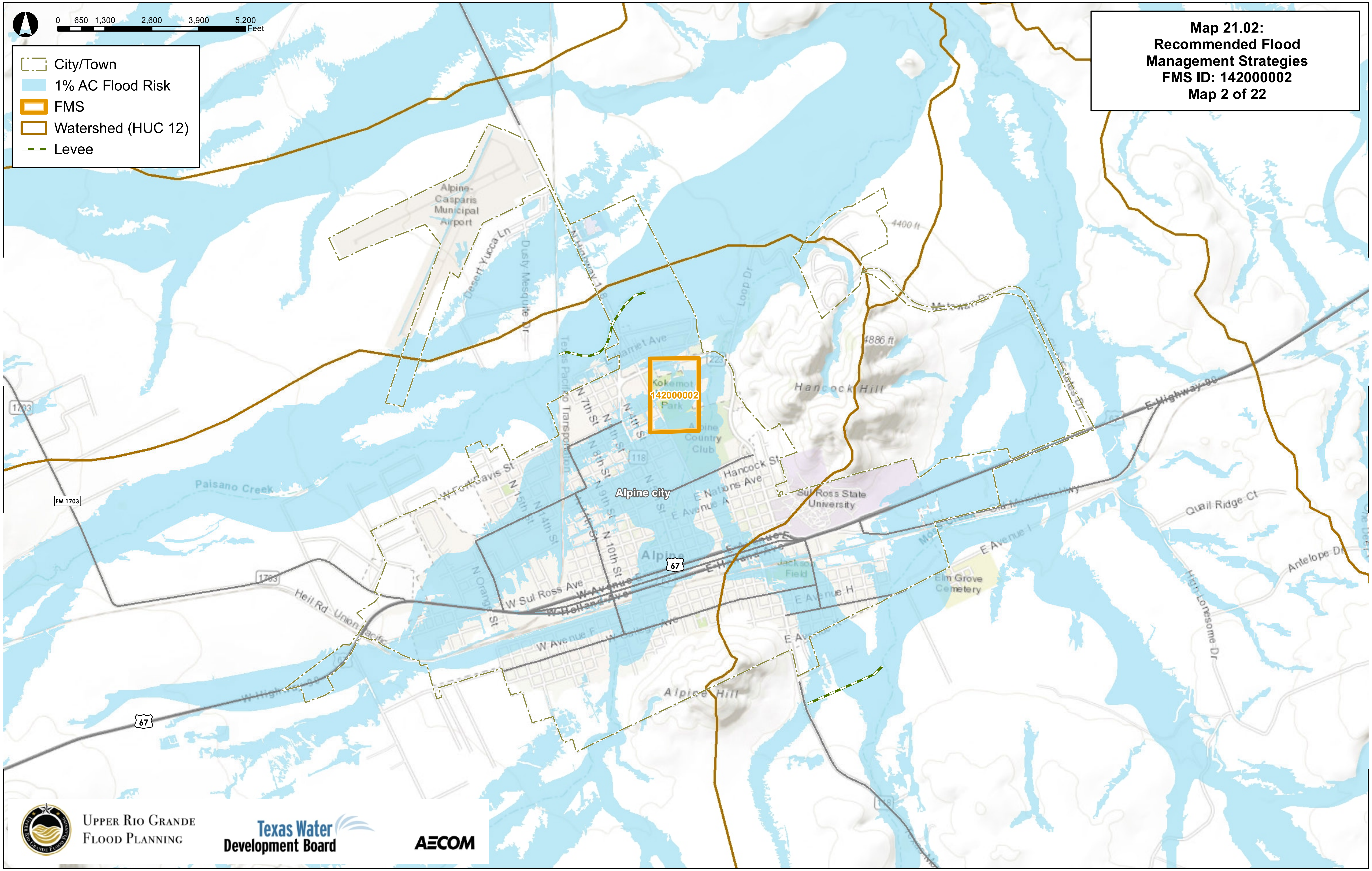
Map 21.02:
Recommended Flood Management Strategies
FMS ID: 142000002
Map 2 of 22



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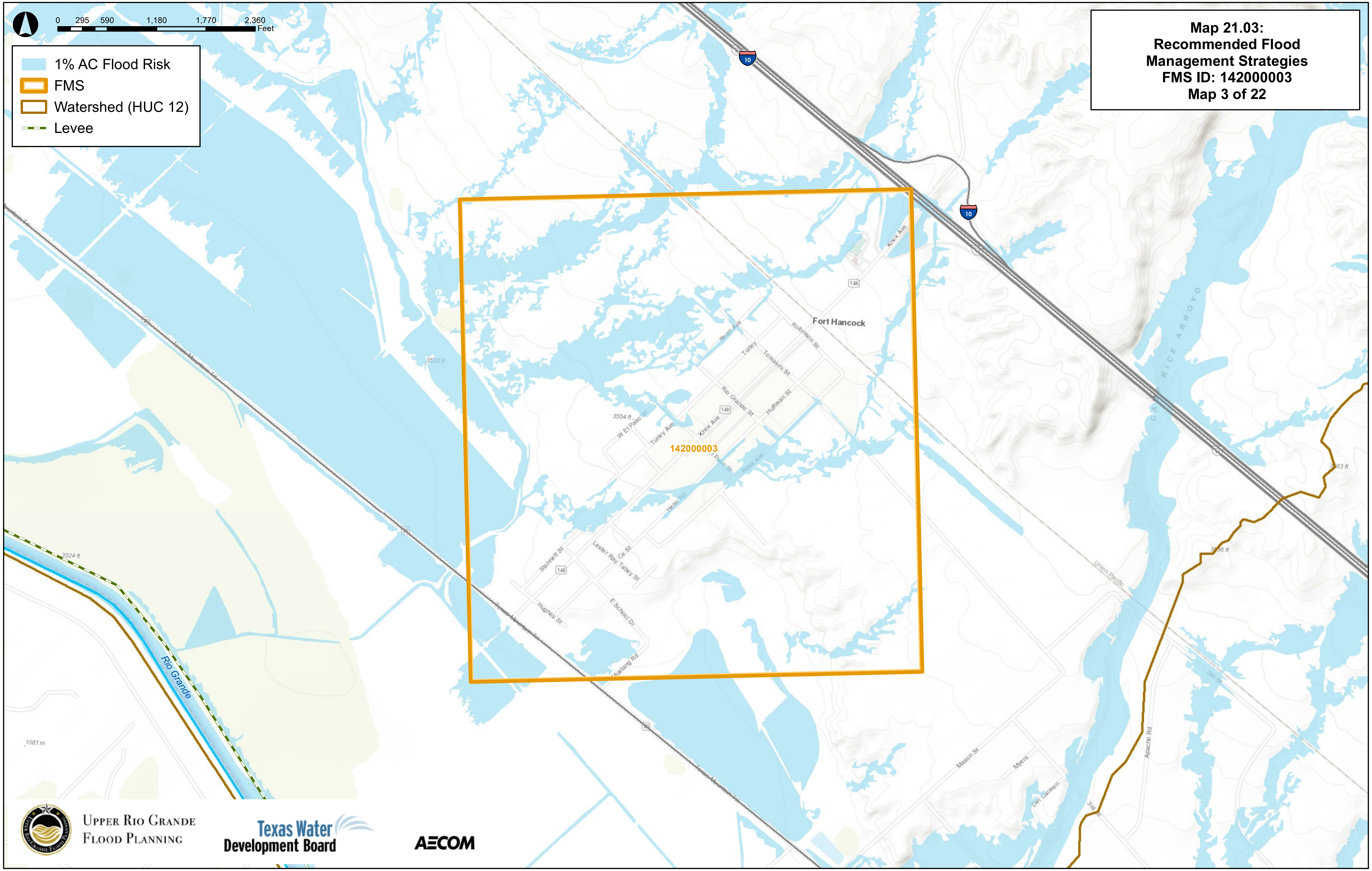

Map 21.03:
Recommended Flood Management Strategies
FMS ID: 142000003
Map 3 of 22

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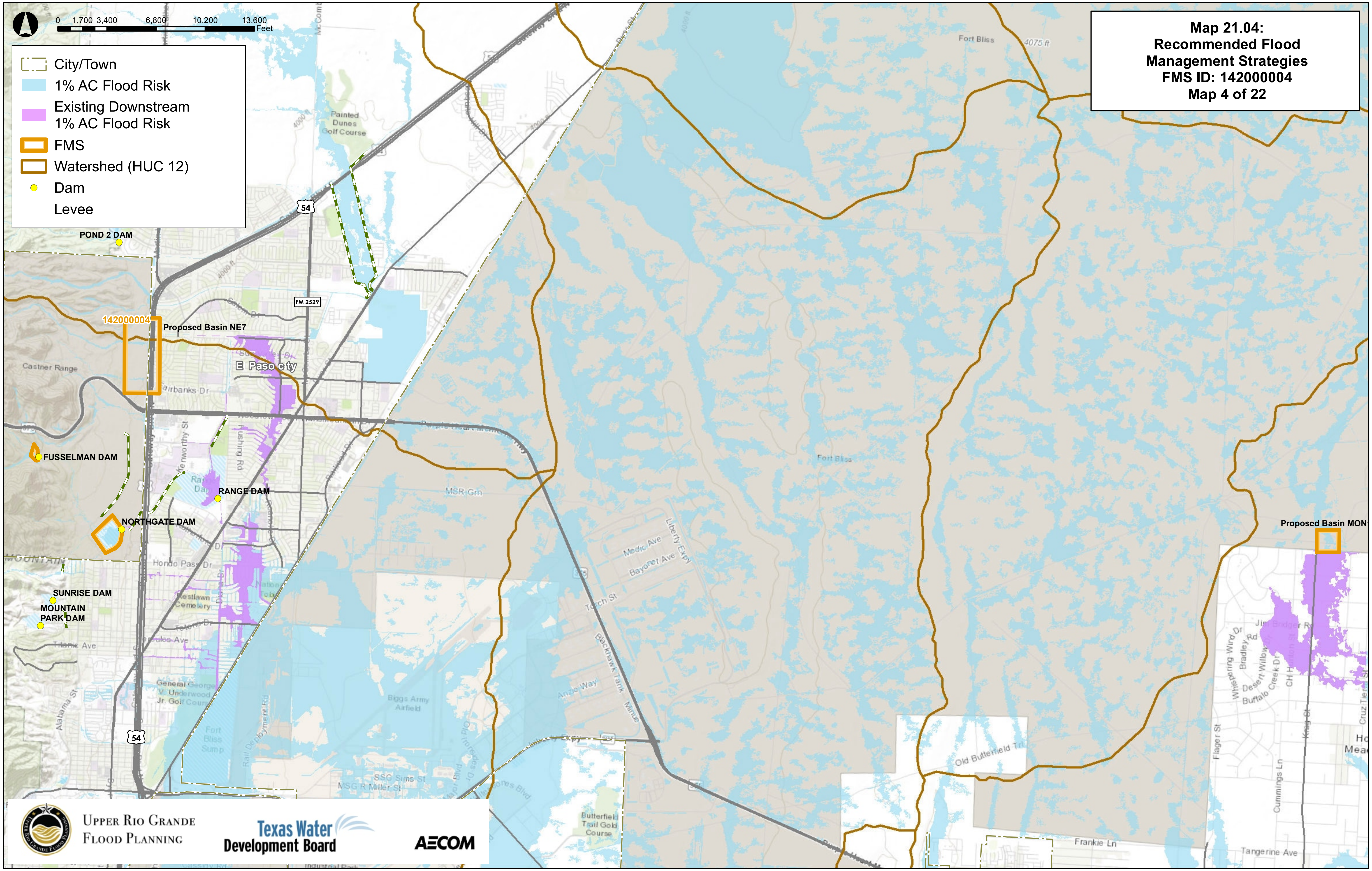

Map 21.04:
Recommended Flood Management Strategies
FMS ID: 142000004
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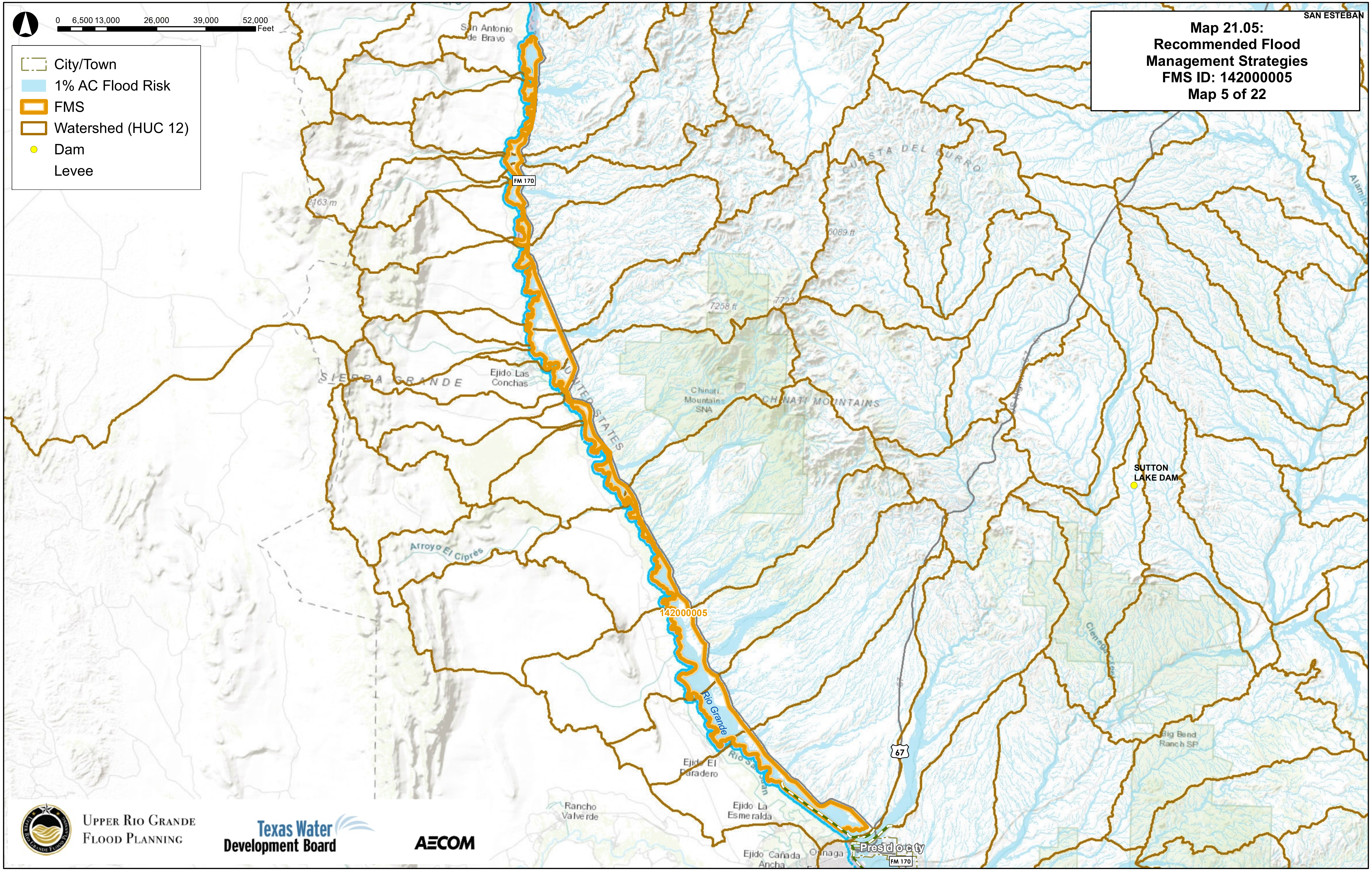
Map 21.05:
Recommended Flood Management Strategies
FMS ID: 142000005
Map 5 of 22



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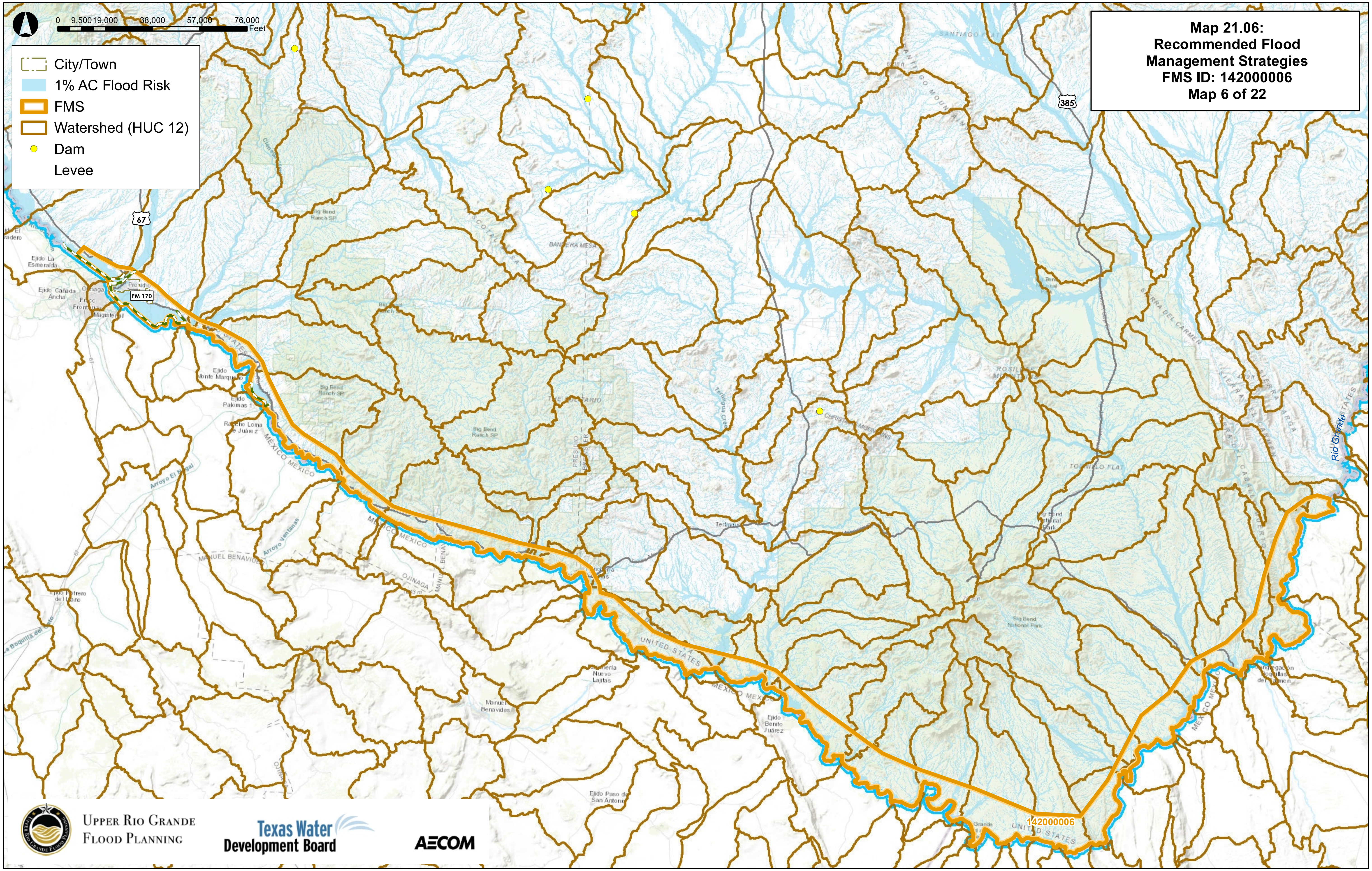

Map 21.06:
Recommended Flood Management Strategies
FMS ID: 142000006
Map 6 of 22

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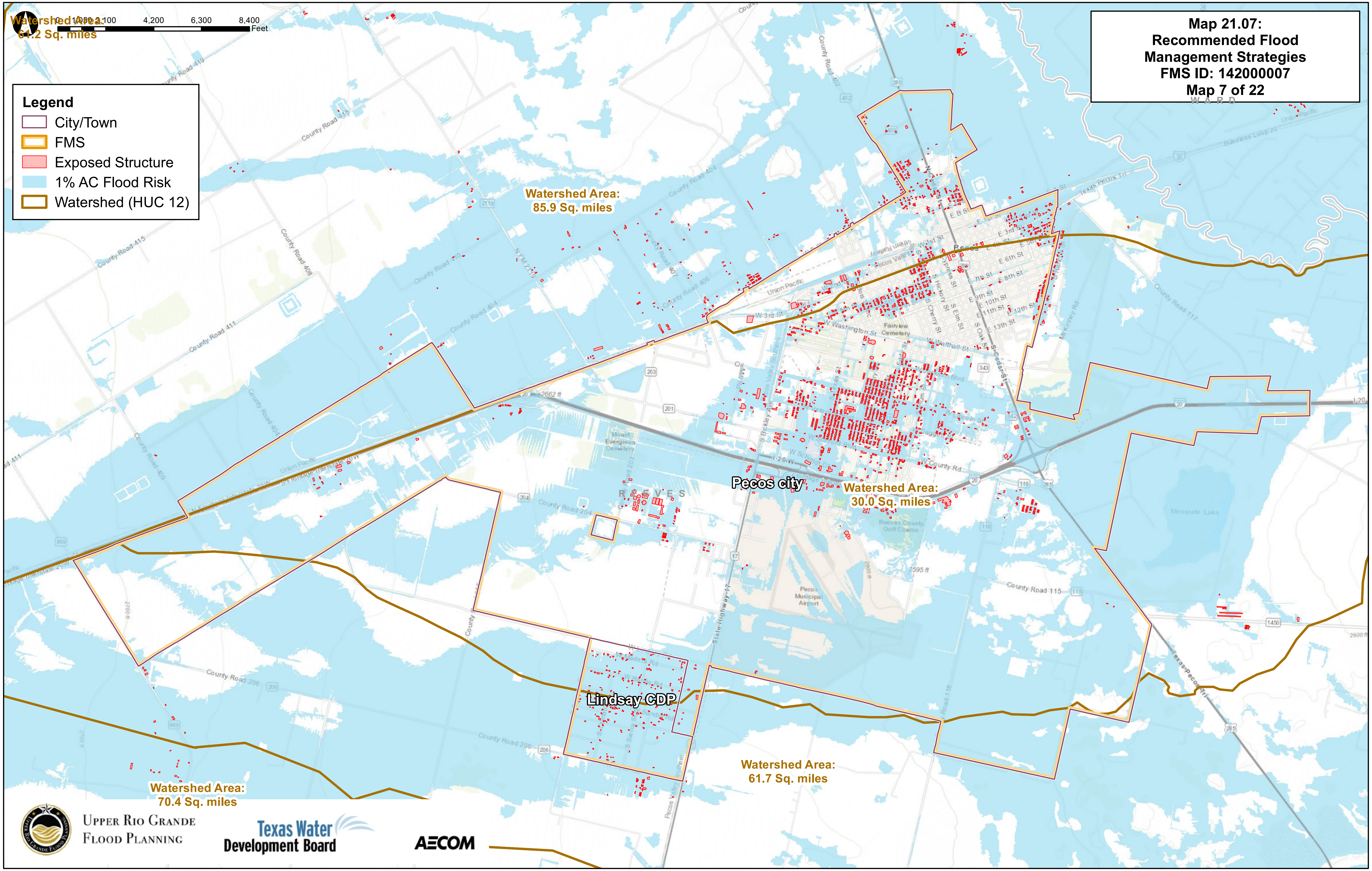
Map 21.07: Recommended Flood Management Strategies FMS ID: 142000007 Map 7 of 22



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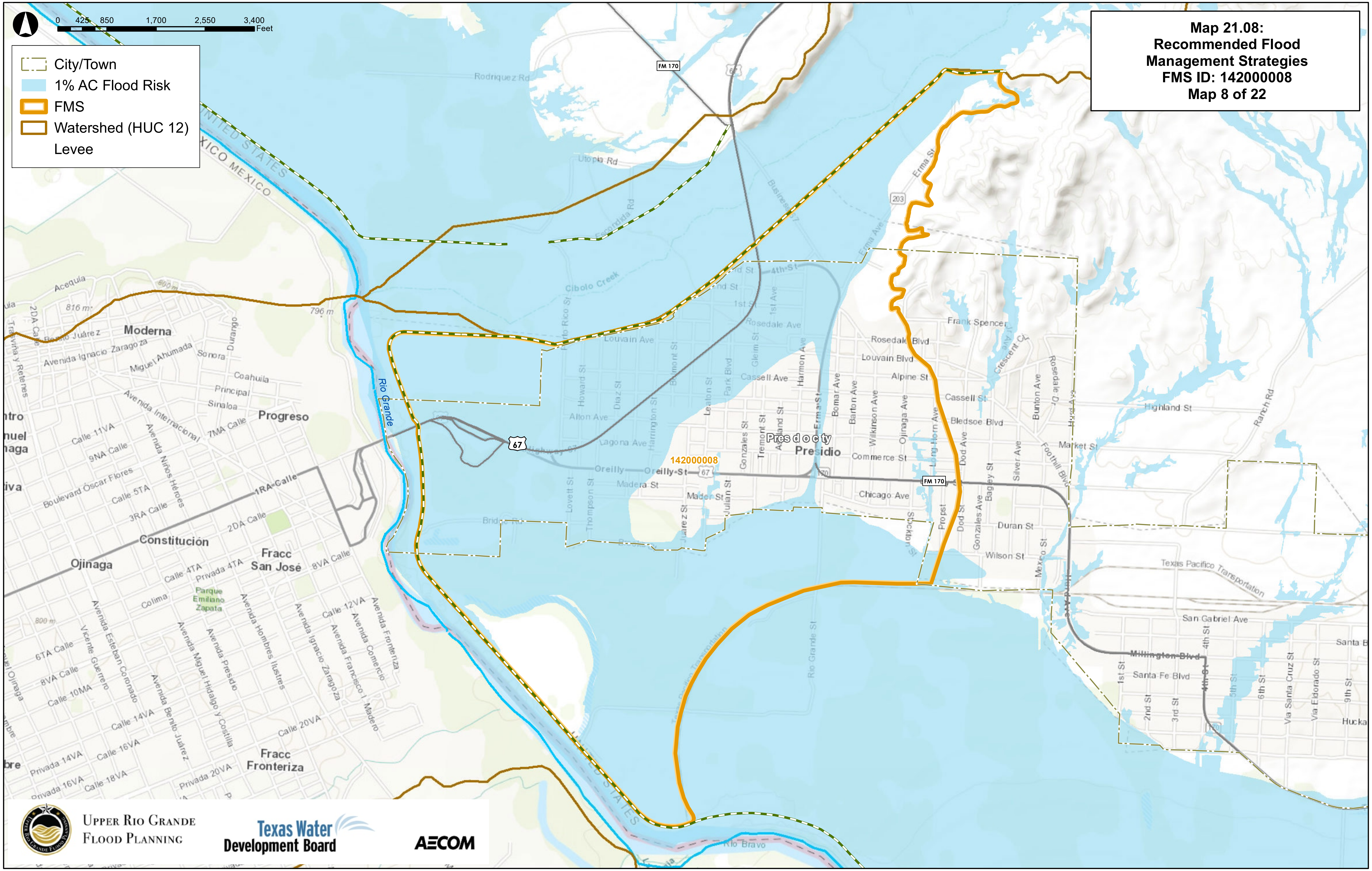

Map 21.08: Recommended Flood Management Strategies
FMS ID: 142000008
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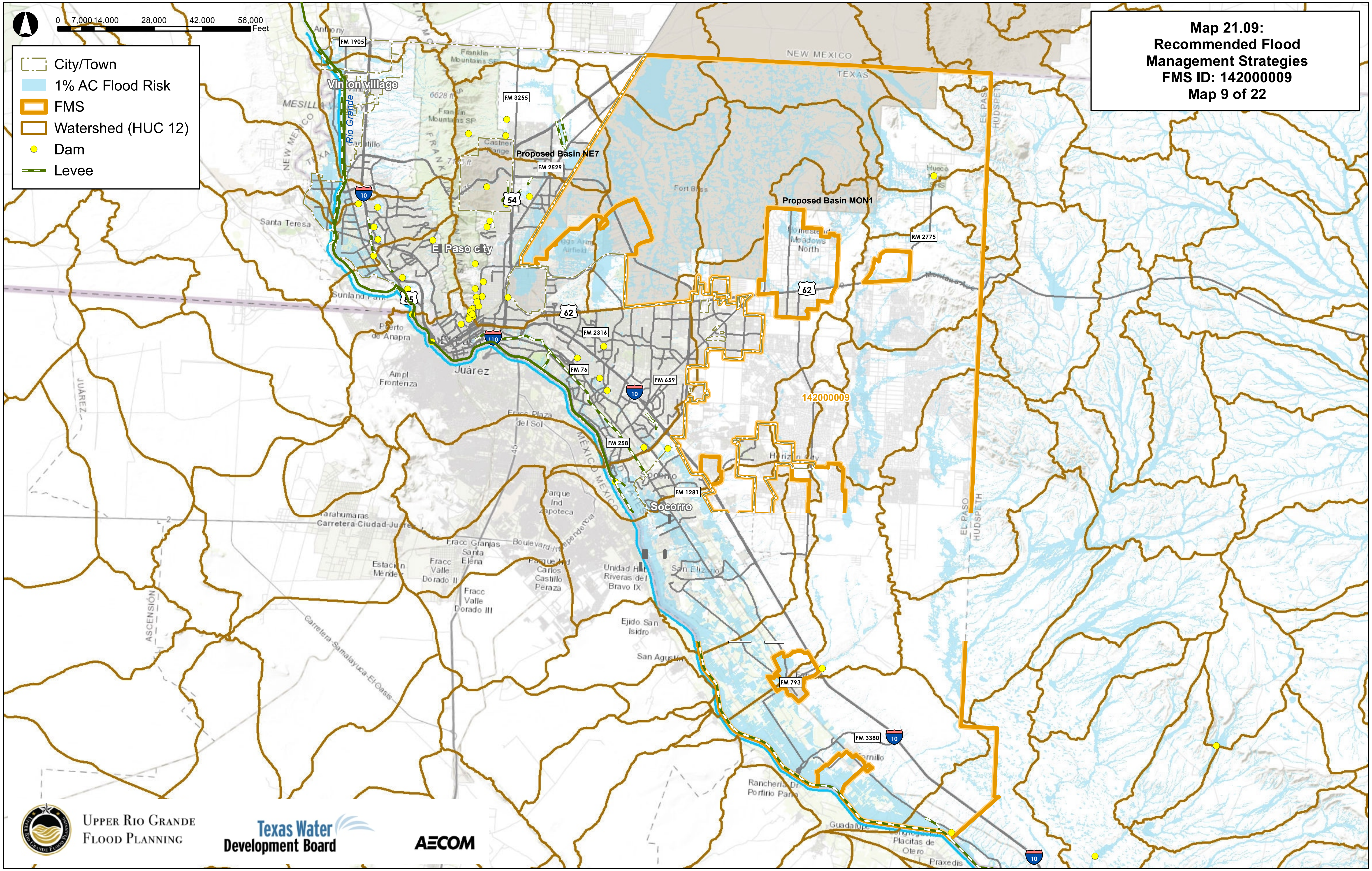

Map 21.09:
Recommended Flood Management Strategies
FMS ID: 142000009
Map 9 of 22

- ⬚ City/Town
- 🟦 1% AC Flood Risk
- ▭ FMS
- ▭ Watershed (HUC 12)
- ● Dam
- - - Levee

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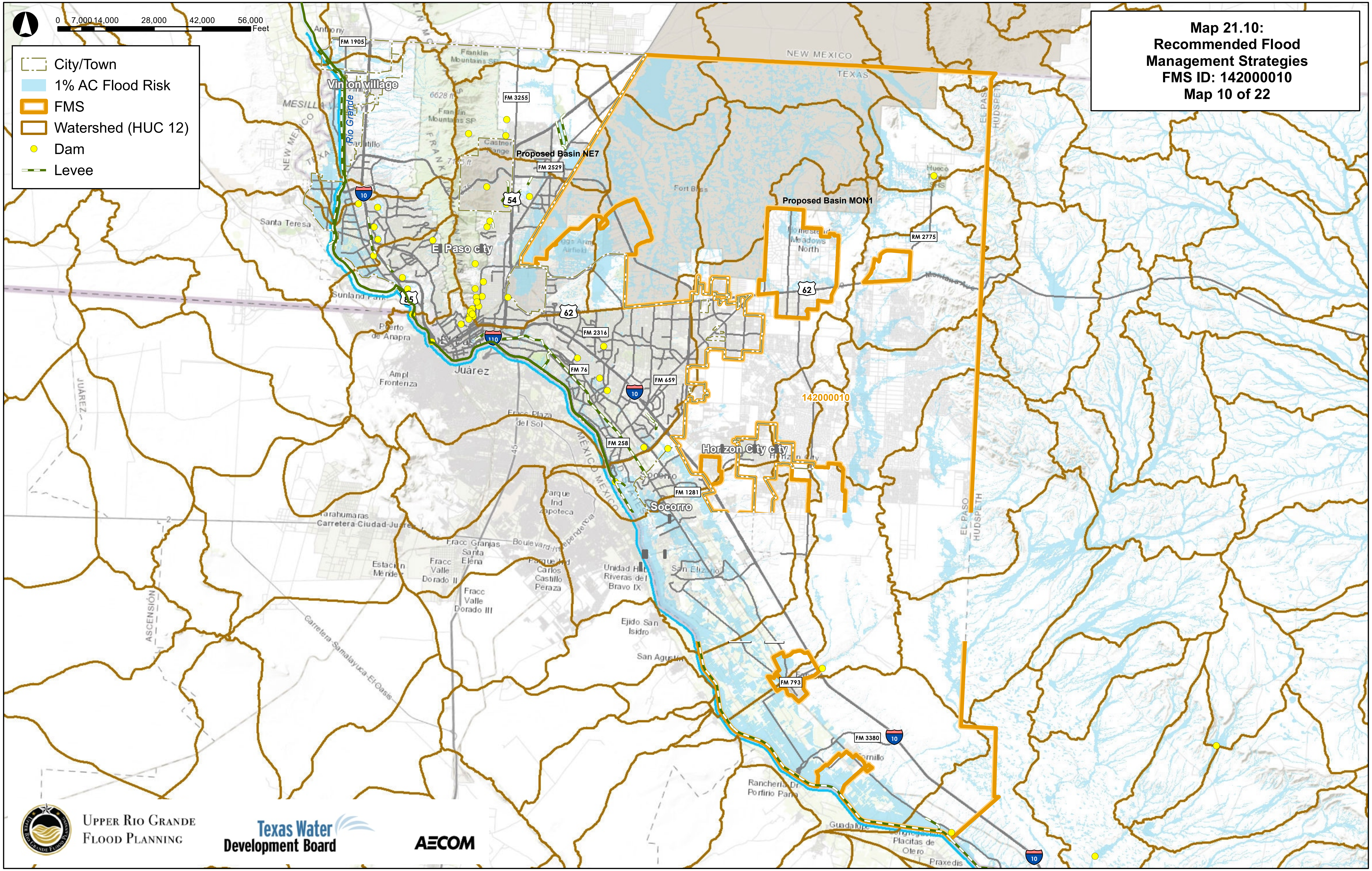

Map 21.10:
Recommended Flood Management Strategies
FMS ID: 142000010
Map 10 of 22

Upper Rio Grande Flood Planning

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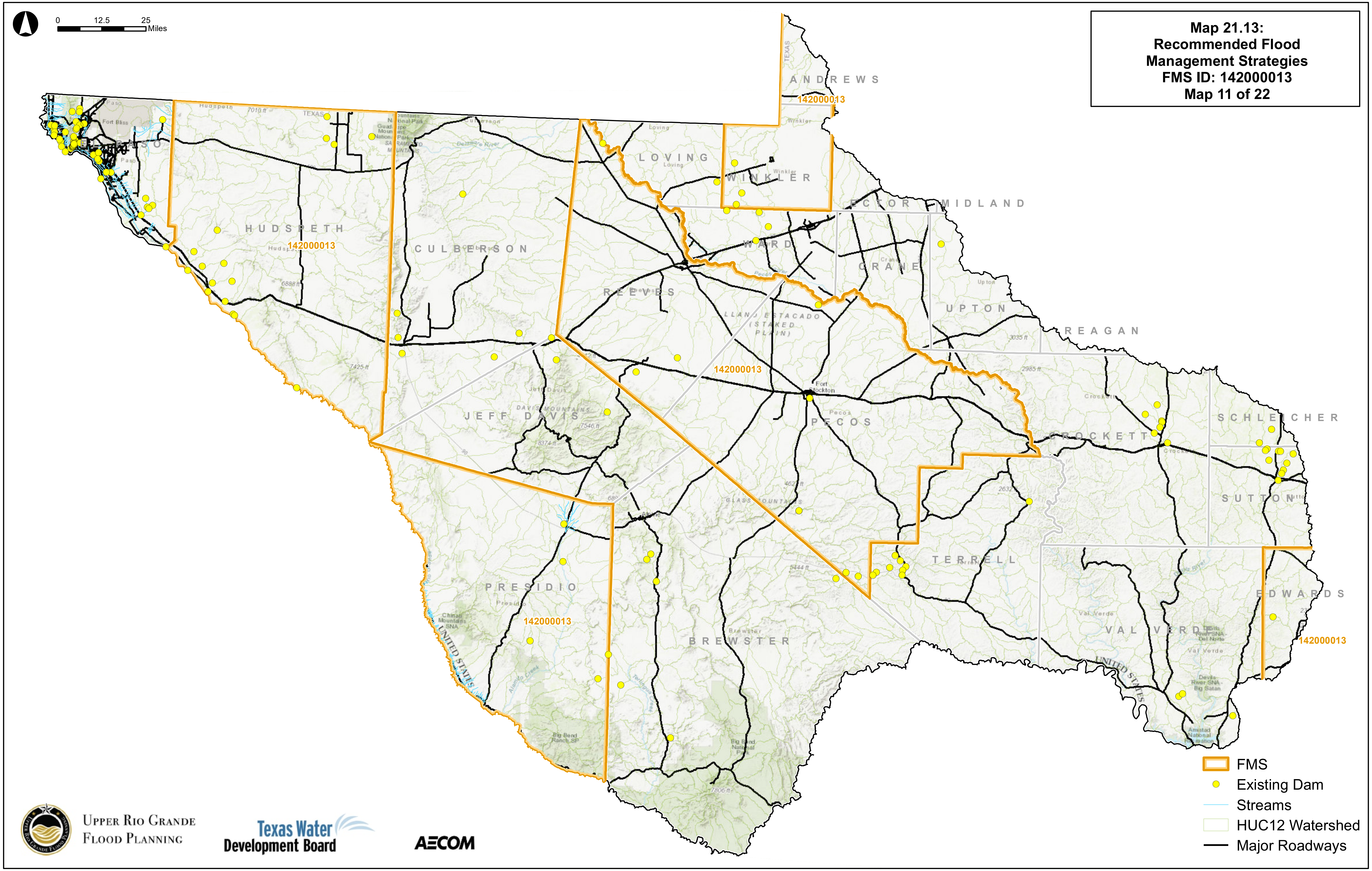
Map 21.13: Recommended Flood Management Strategies FMS ID: 142000013 Map 11 of 22



Upper Rio Grande Flood Planning

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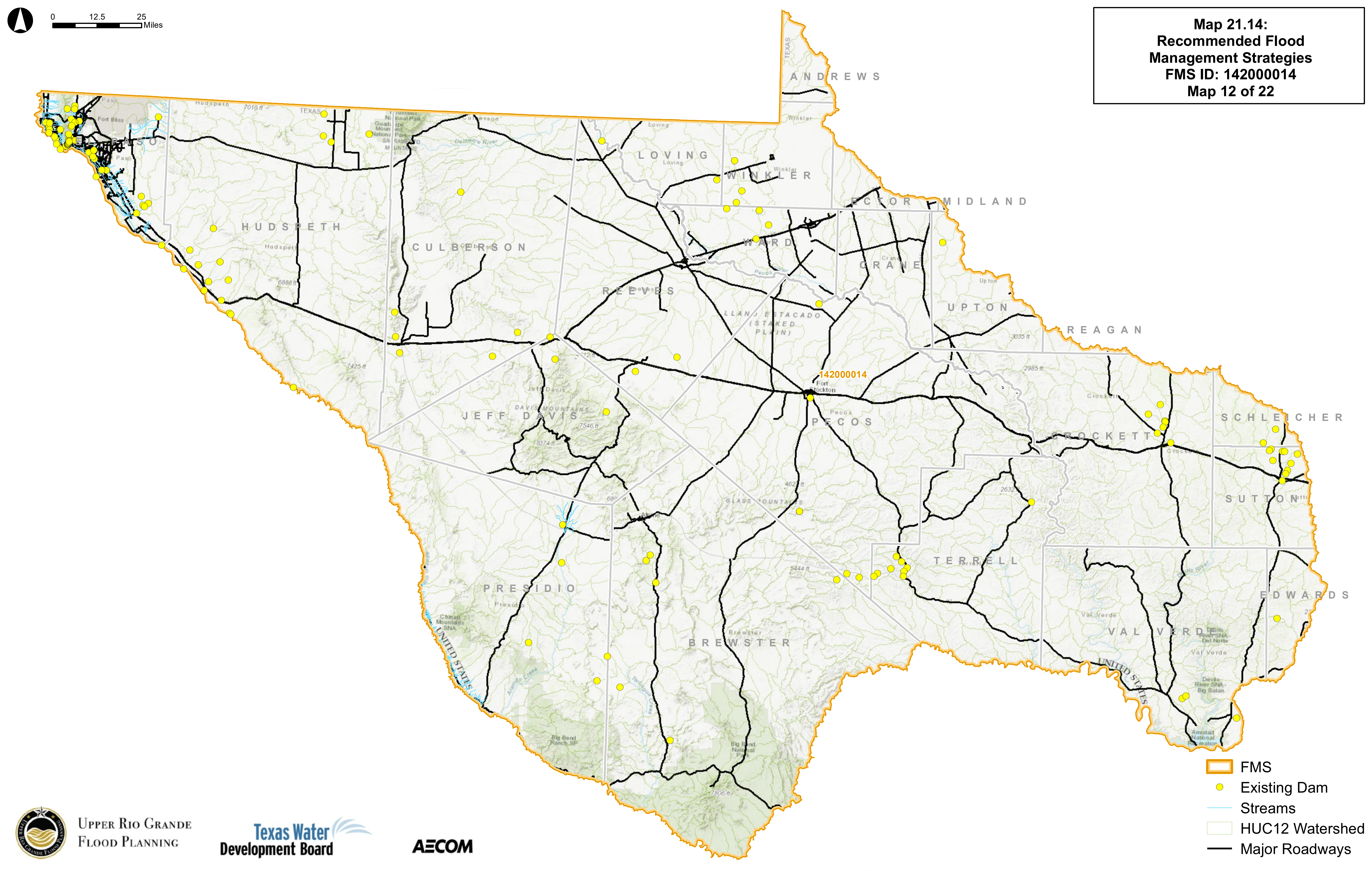
Map 21.14:
Recommended Flood Management Strategies
FMS ID: 142000014
Map 12 of 22



▭ FMS
● Existing Dam
Streams
HUC12 Watershed
Major Roadways

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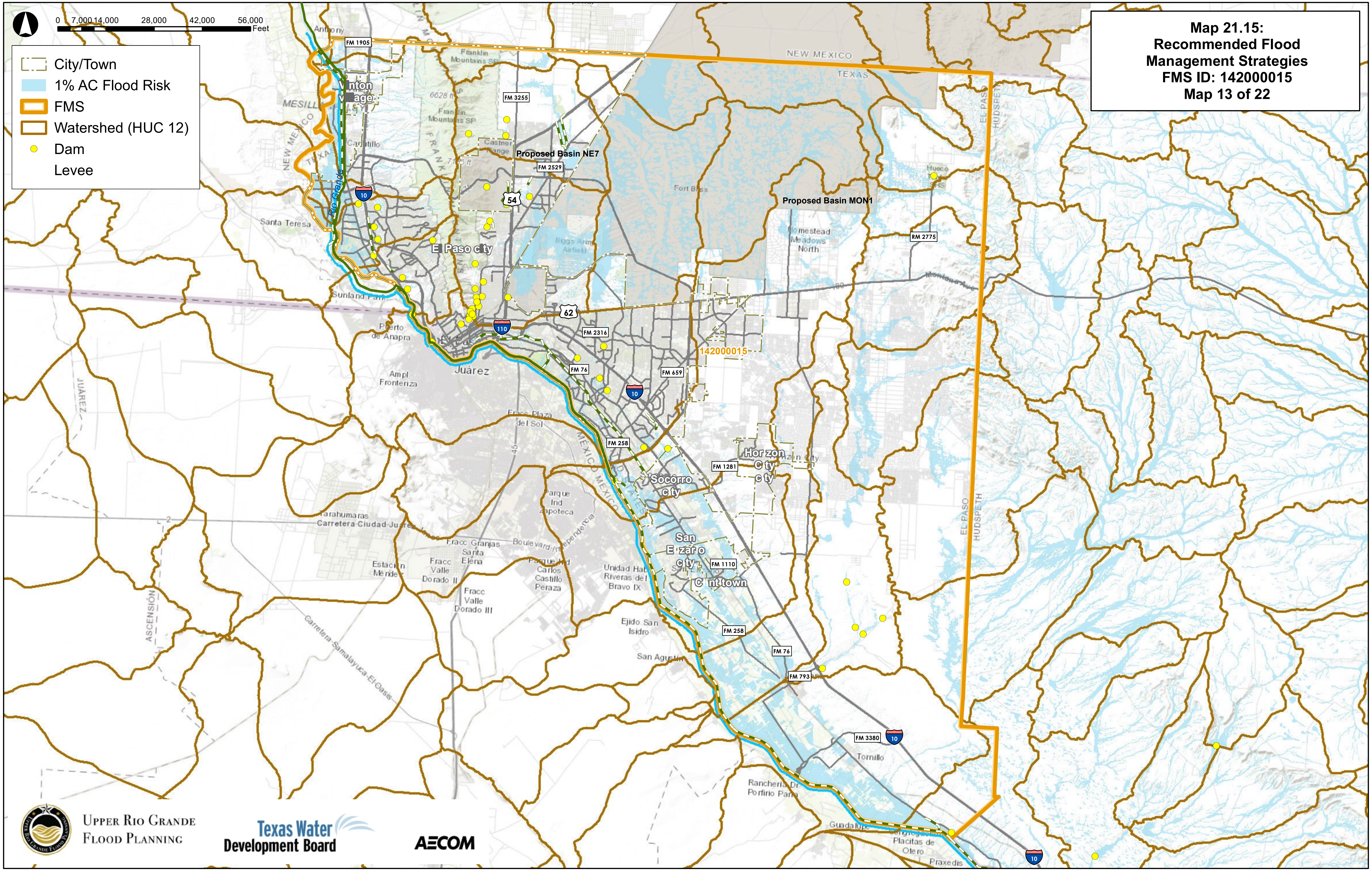

Map 21.15:
Recommended Flood Management Strategies
FMS ID: 142000015
Map 13 of 22

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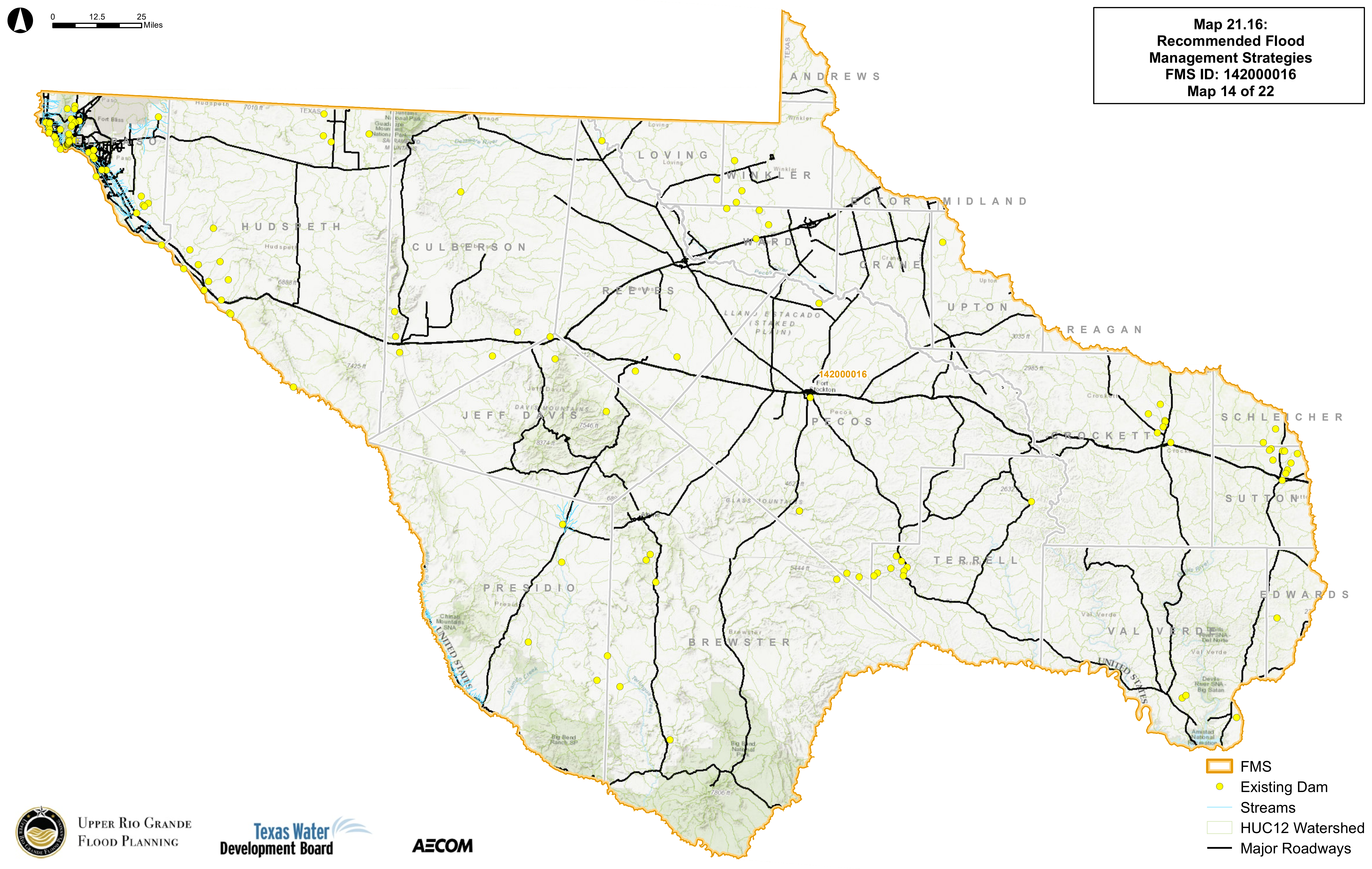
Map 21.16:
Recommended Flood Management Strategies
FMS ID: 142000016
Map 14 of 22



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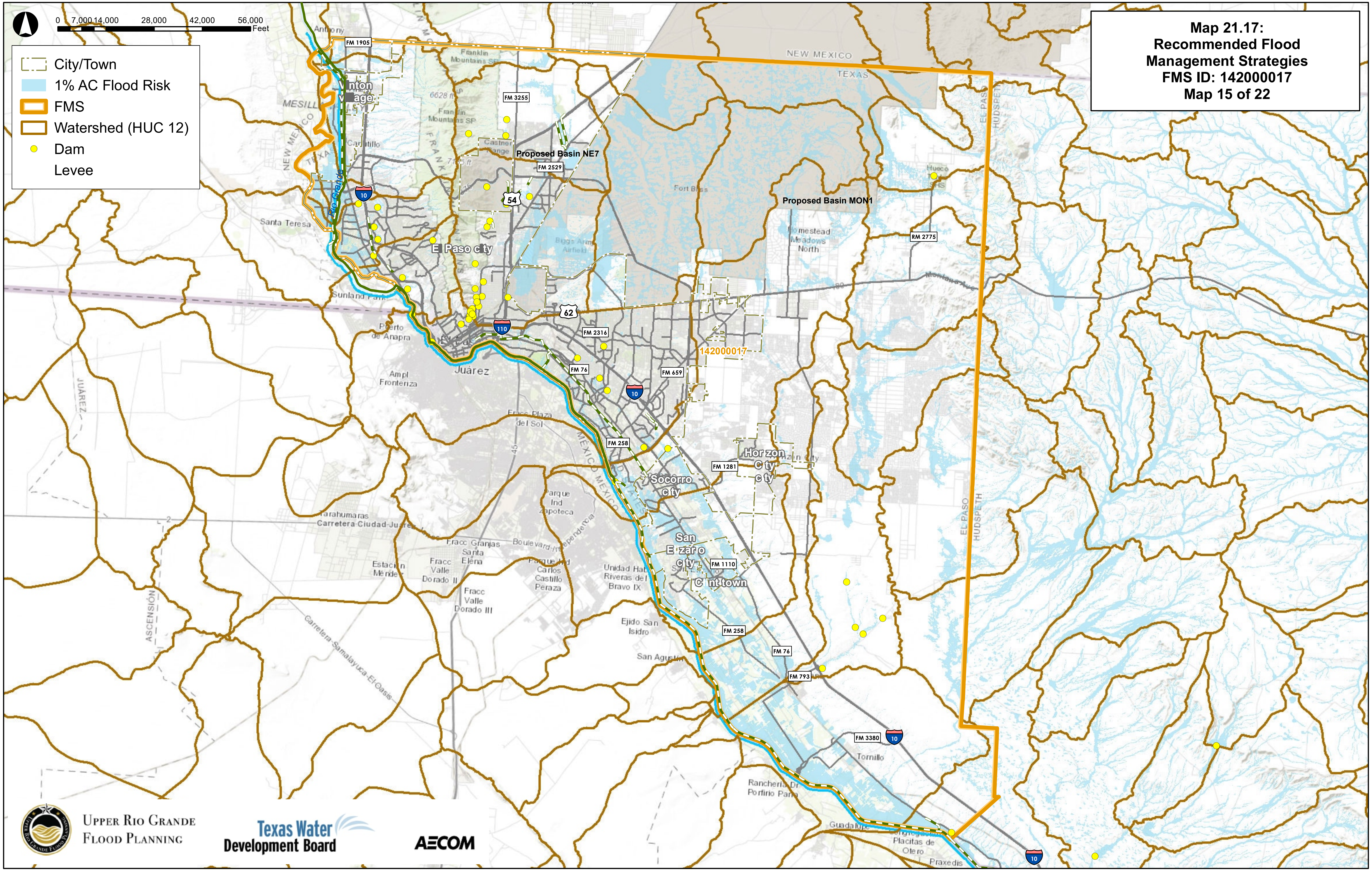

Map 21.17:
Recommended Flood Management Strategies
FMS ID: 142000017
Map 15 of 22

Upper Rio Grande Flood Planning

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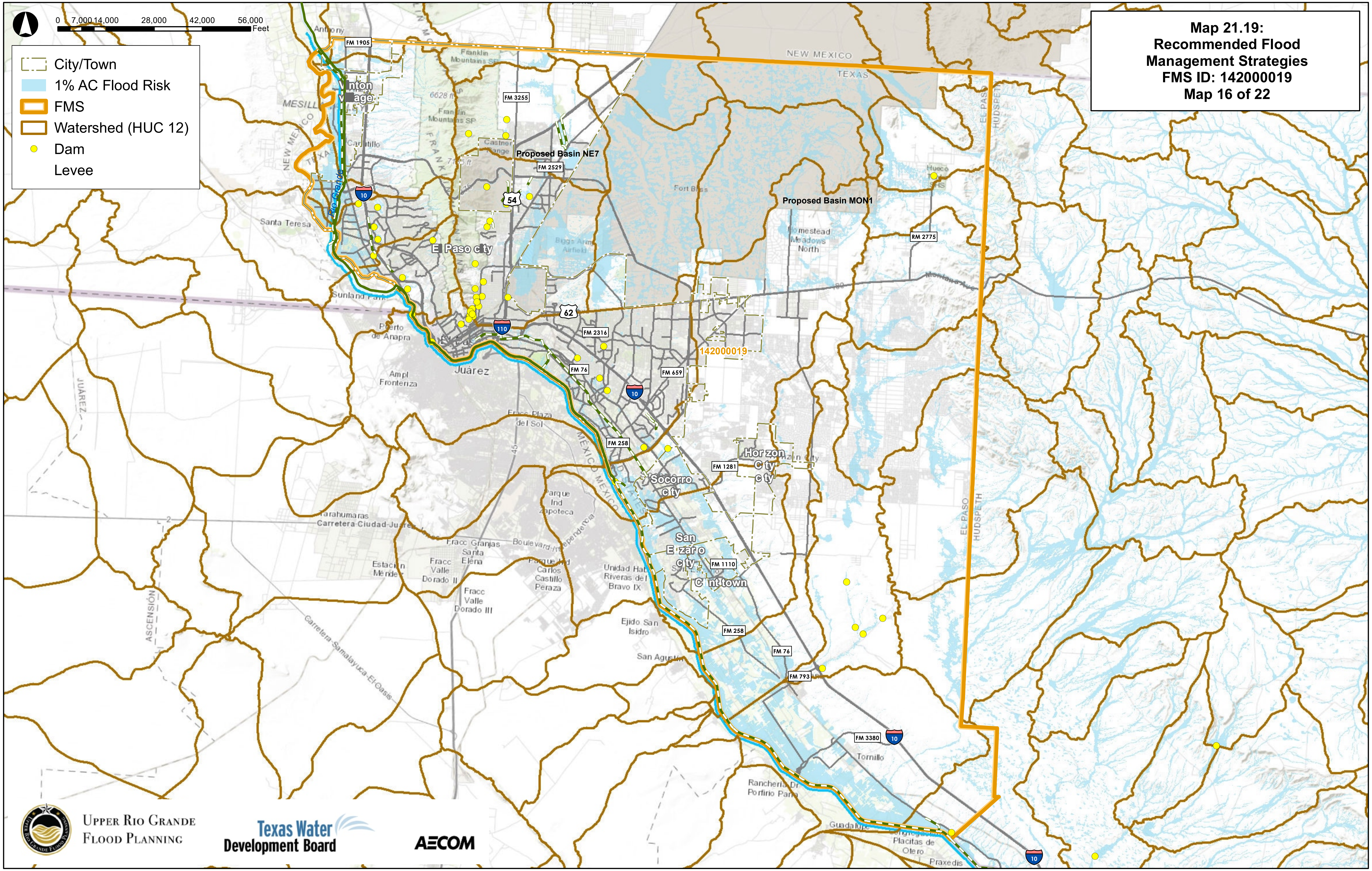
Map 21.19: Recommended Flood Management Strategies FMS ID: 142000019 Map 16 of 22



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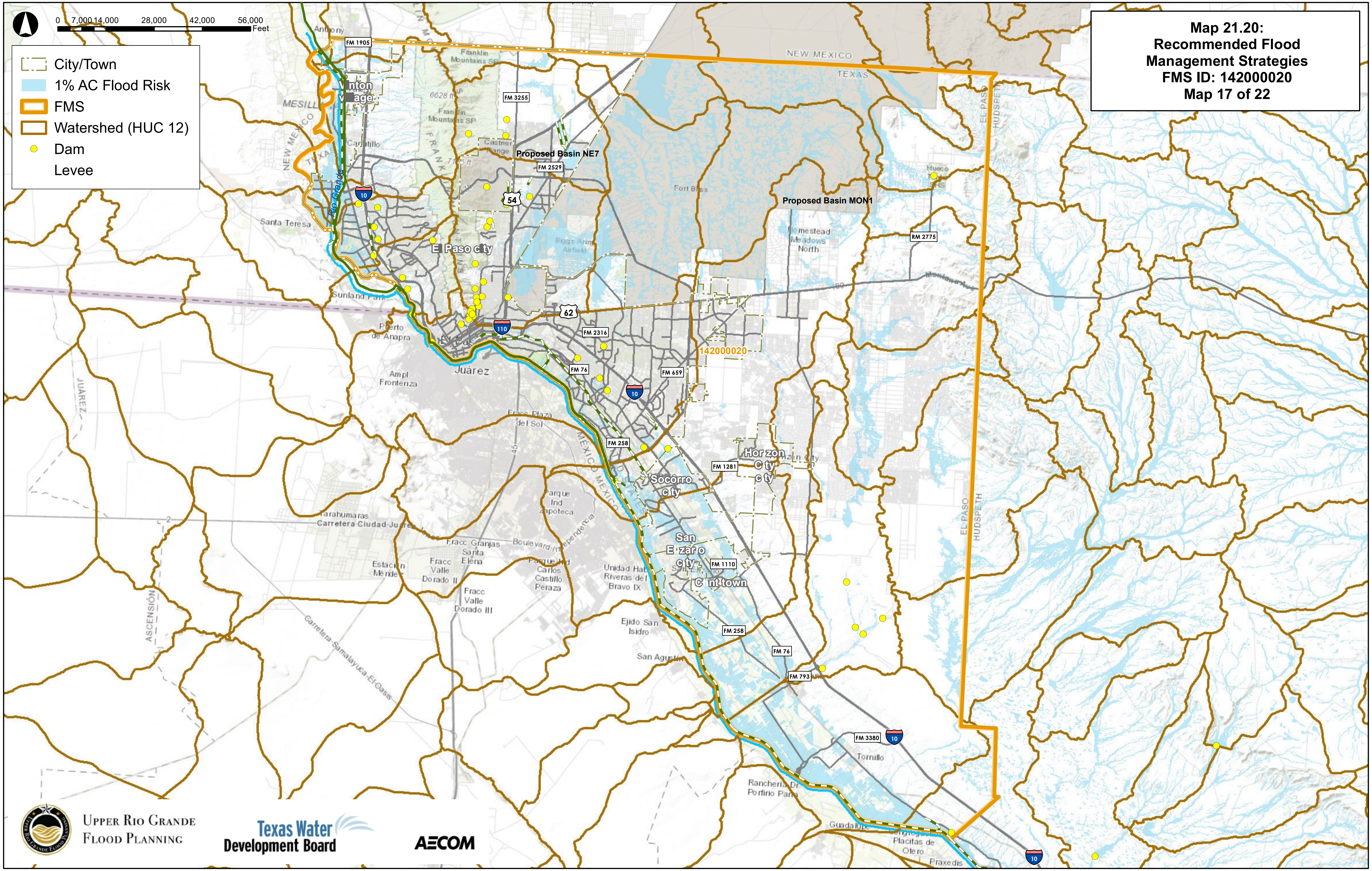
Map 21.20:
Recommended Flood Management Strategies
FMS ID: 142000020
Map 17 of 22



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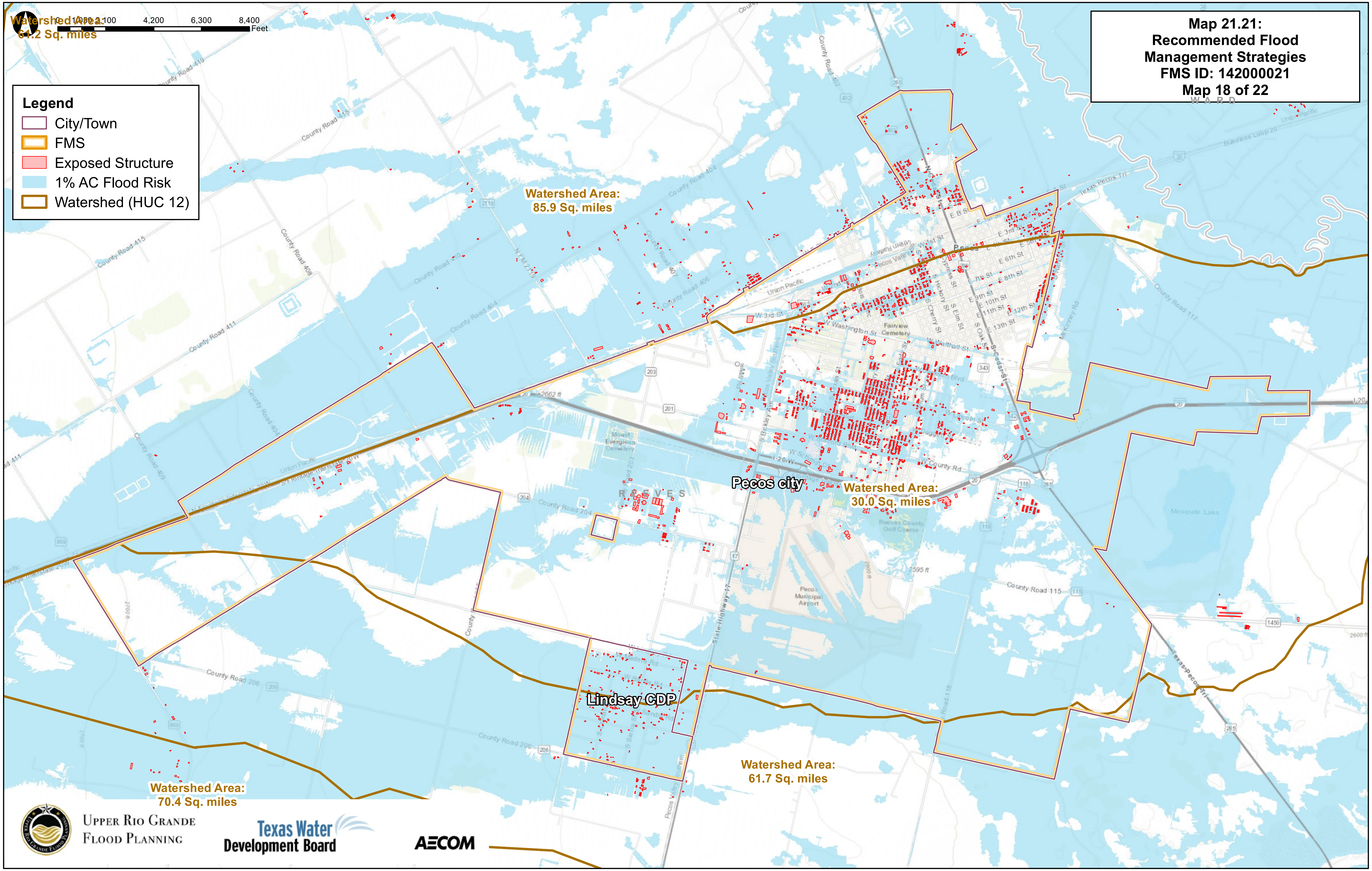
Map 21.21:
Recommended Flood Management Strategies
FMS ID: 142000021
Map 18 of 22

Legend

▭	City/Town
🟧	FMS
🟥	Exposed Structure
🟦	1% AC Flood Risk
▭	Watershed (HUC 12)



Upper Rio Grande Flood Planning

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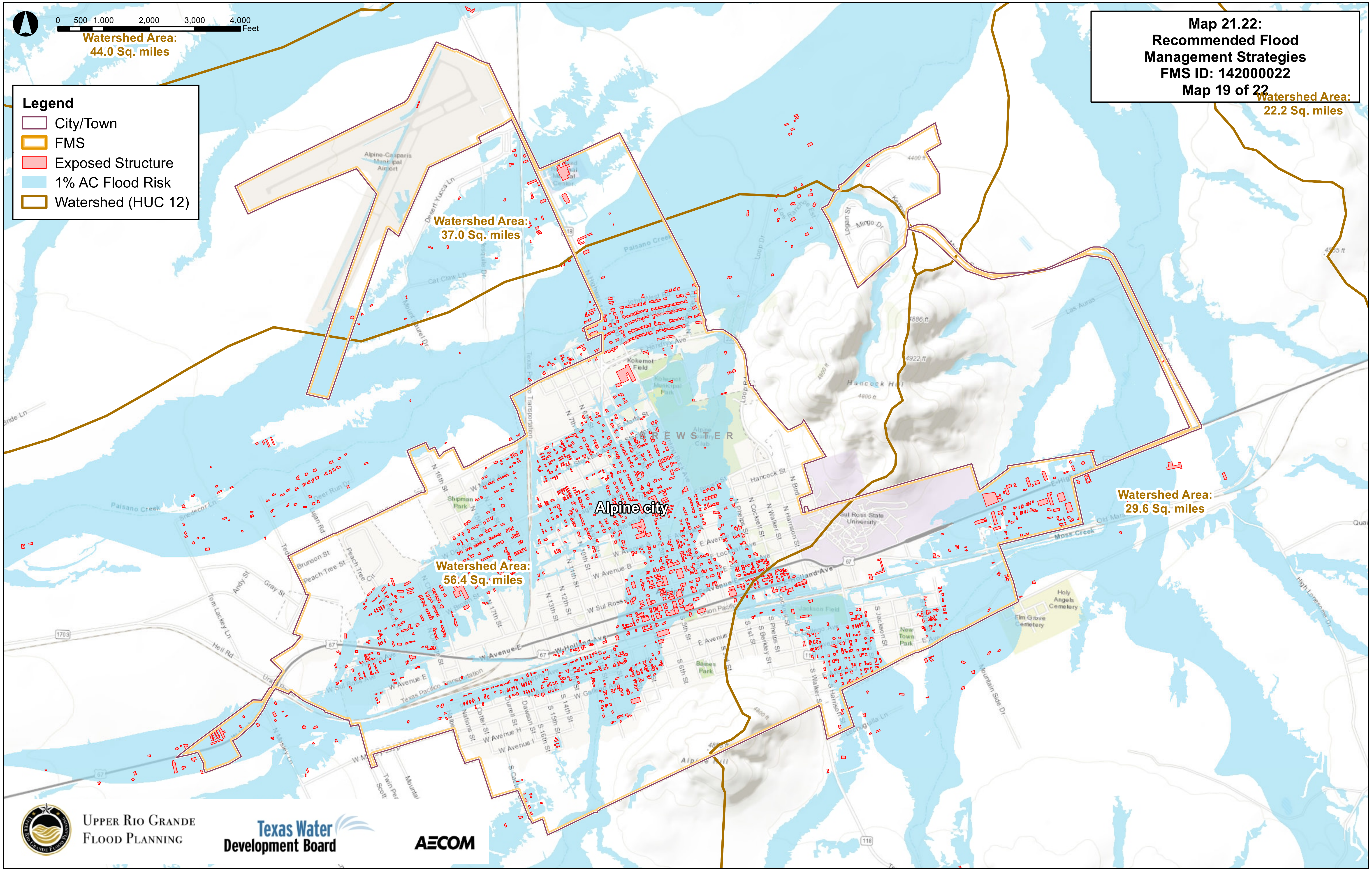

Map 21.22: Recommended Flood Management Strategies
FMS ID: 142000022
Map 19 of 22

Legend
- ☐ City/Town
- 🟧 FMS
- 🟥 Exposed Structure
- 🟦 1% AC Flood Risk
- ☐ Watershed (HUC 12)

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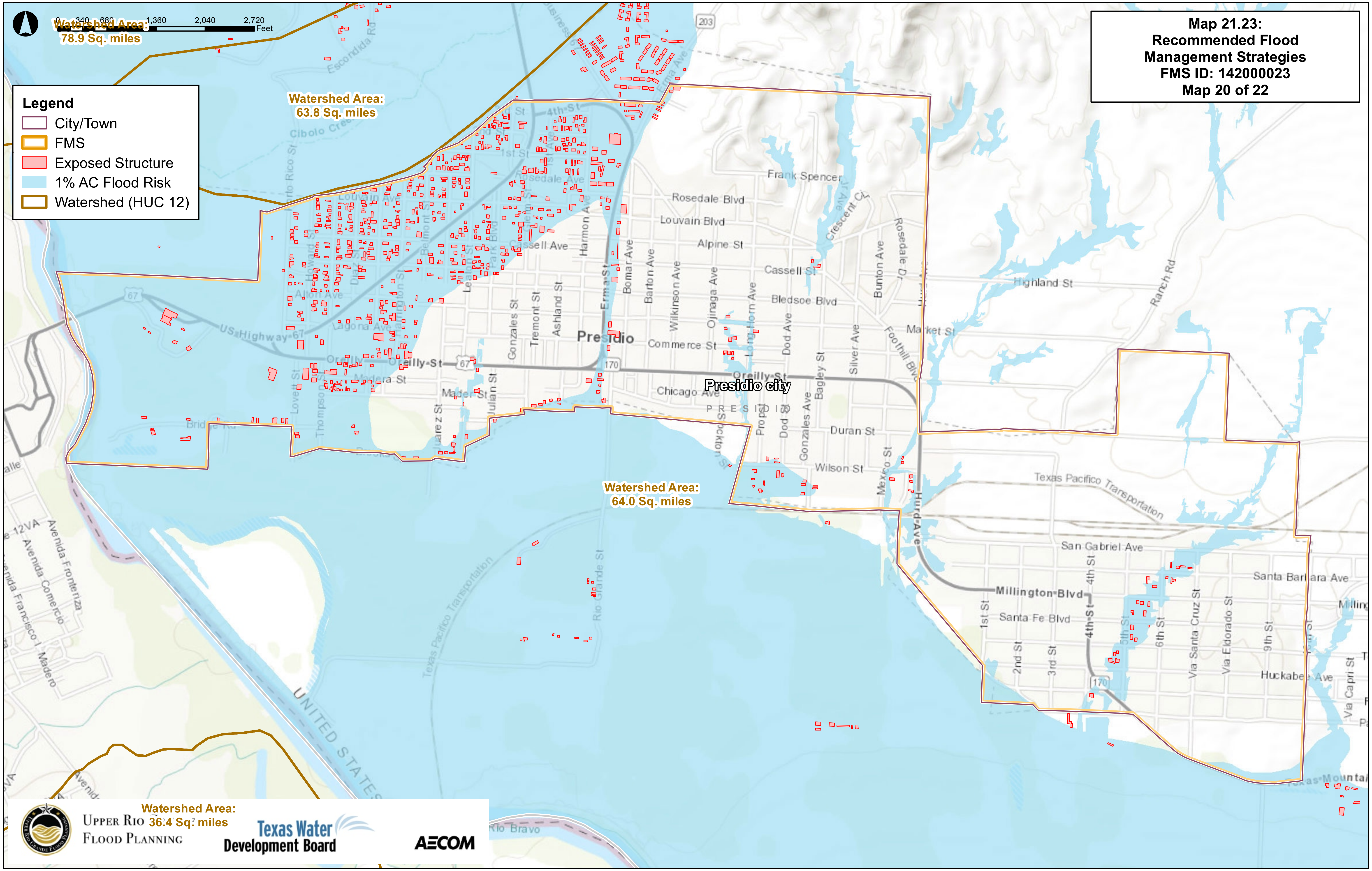
Map 21.23: Recommended Flood Management Strategies

FMS ID: 142000023

Map 20 of 22



Legend

- City/Town
- FMS
- Exposed Structure
- 1% AC Flood Risk
- Watershed (HUC 12)

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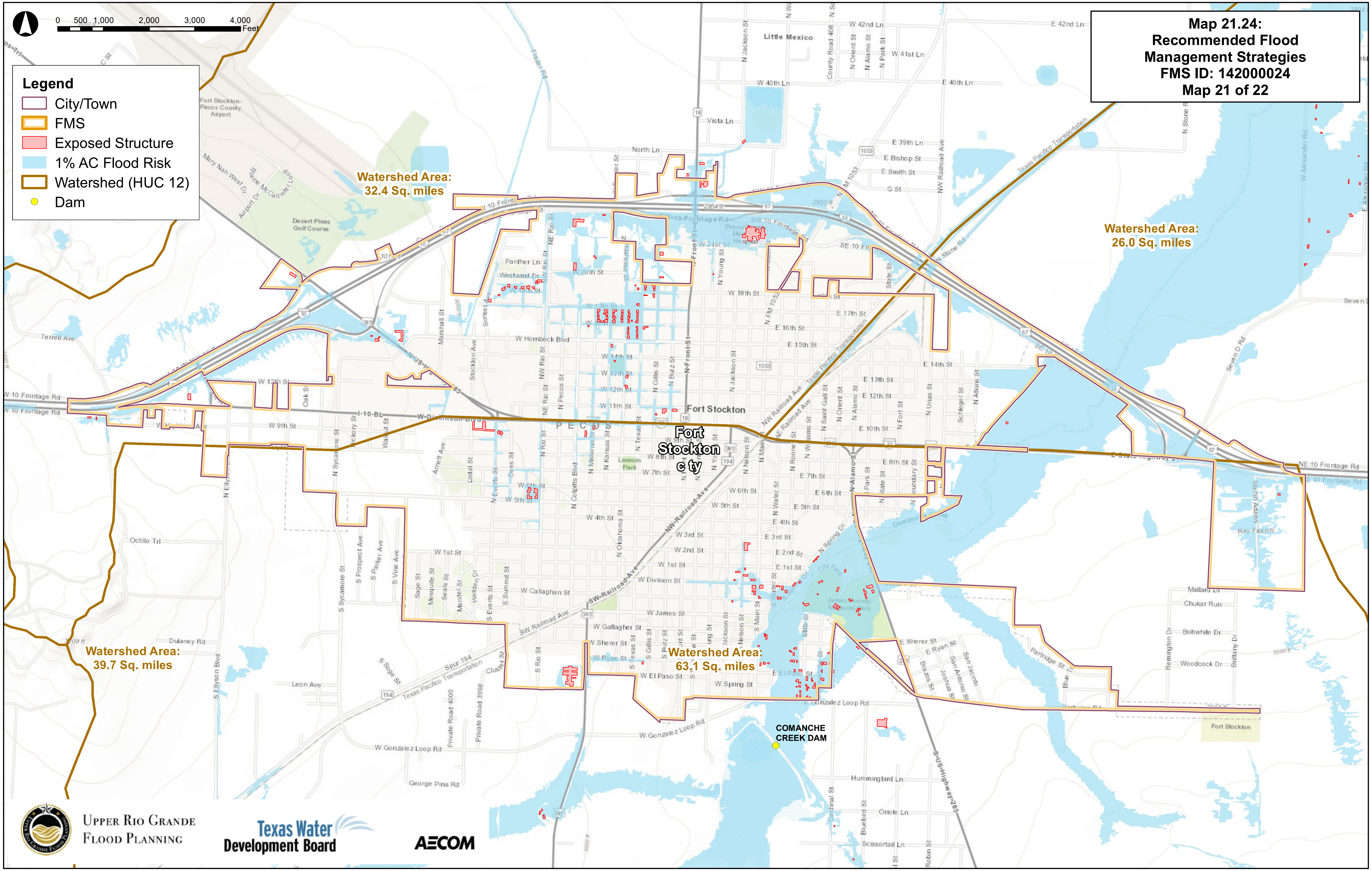
Map 21.24:
Recommended Flood Management Strategies
FMS ID: 142000024
Map 21 of 22



Legend

- ▭ City/Town
- 🟧 FMS
- 🟥 Exposed Structure
- 🟦 1% AC Flood Risk
- ▭ Watershed (HUC 12)
- ● Dam

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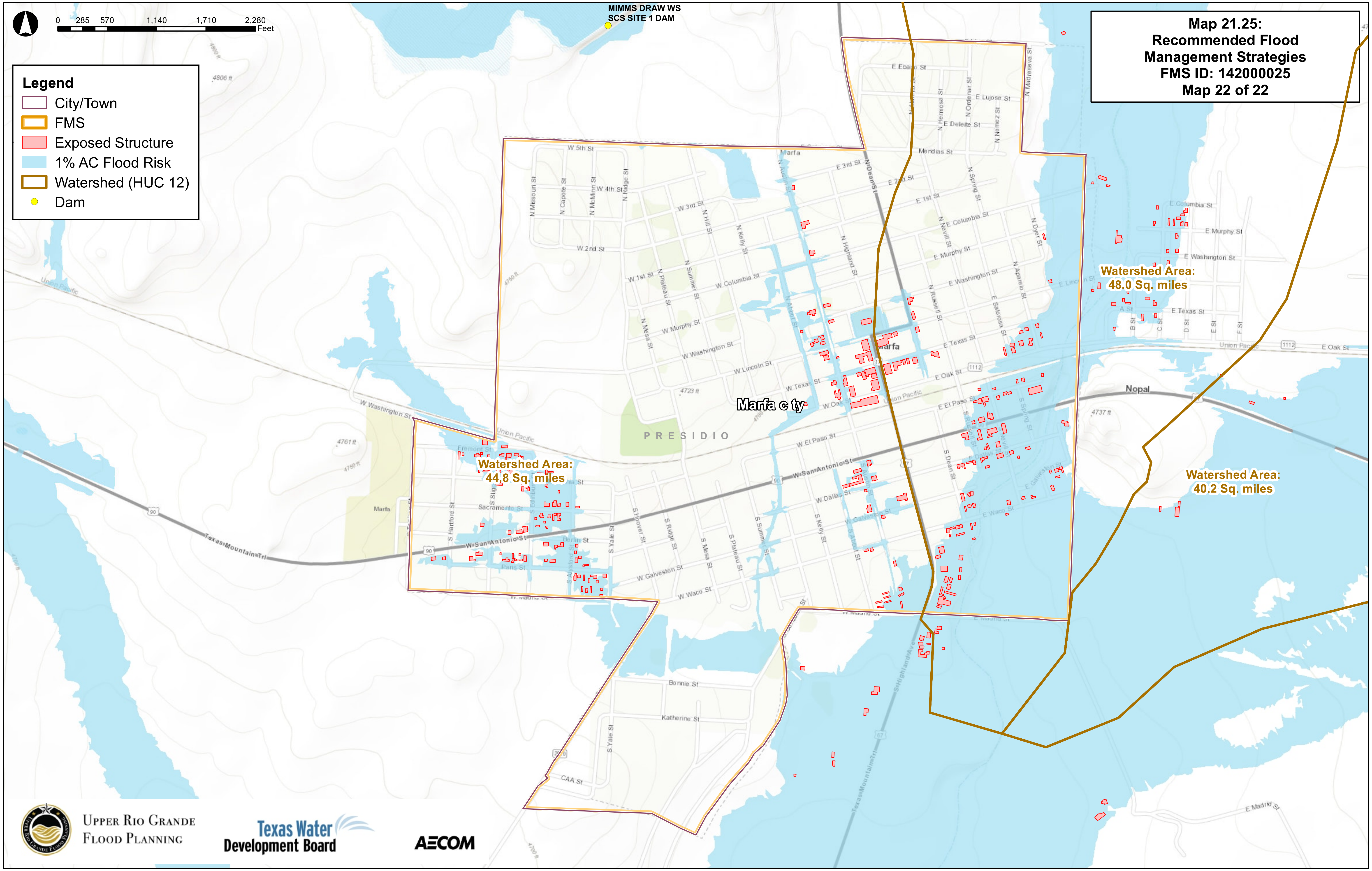

Map 21.25:
Recommended Flood Management Strategies
FMS ID: 142000025
Map 22 of 22

Upper Rio Grande Flood Planning

Texas Water Development Board

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Appendix 5H
Hydraulic Model Depth Results and Buildings Analyzed

Appendix 5H

EA10A (FMP ID: 143000105) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	568680	3639.03	3639.53	3639.88	3639.58	0.35	0.04	-0.31
	123037	3638.50	3639.00	3639.88	3639.57	0.88	0.57	-0.31
	398344	3643.23	3643.73	3643.77	3643.61	0.04	0.00	-0.04
	451120	3652.65	3653.15	3653.52	3653.38	0.37	0.24	-0.14
	492701	3652.55	3653.05	3653.52	3653.38	0.47	0.33	-0.14
	166442	3652.58	3653.08	3653.52	3653.39	0.44	0.31	-0.14
	76960	3653.67	3654.17	3654.41	3654.25	0.24	0.07	-0.16
	77779	3766.47	3766.97	3769.53	3769.53	2.56	2.56	0.00
	30575	3765.83	3766.33	3770.70	3770.70	4.38	4.38	0.00
	679498	3780.01	3780.51	3781.74	3781.74	1.22	1.22	0.00
	701113	3780.34	3780.84	3783.13	3783.13	2.29	2.29	0.00
1% Annual Chance Commercial Buildings	425531	3754.56	3755.06	3755.22	3755.22	0.16	0.15	-0.01
	701110	3774.23	3774.73	3777.94	3777.94	3.21	3.21	0.00
	701111	3790.29	3790.79	3791.27	3791.27	0.48	0.48	0.00
	679516	3795.34	3795.84	3796.73	3796.73	0.89	0.89	0.00
	77892	3803.52	3804.02	3805.21	3805.21	1.19	1.19	0.00
	77768	3807.43	3807.93	3808.52	3808.52	0.59	0.59	0.00
0.2% Annual Chance Residences	75658	3639.88	3640.38	3640.59	3640.54	0.21	0.17	-0.04
	568680	3639.03	3639.53	3640.61	3640.56	1.07	1.03	-0.04
	28170	3643.78	3644.28	3644.37	3644.32	0.10	0.04	-0.06
	399236	3643.67	3644.17	3644.39	3644.33	0.22	0.16	-0.06
	589672	3643.86	3644.36	3644.39	3644.33	0.03	0.00	-0.03
	203019	3643.74	3644.24	3644.45	3644.37	0.21	0.14	-0.08
	492381	3644.11	3644.61	3644.67	3644.61	0.06	0.00	-0.06
	589968	3653.59	3654.09	3654.41	3654.18	0.31	0.08	-0.23
	633160	3653.27	3653.77	3654.40	3654.17	0.63	0.39	-0.23
	126183	3830.28	3830.78	3831.50	3831.50	0.72	0.72	0.00
	348053	3648.84	3649.34	3650.19	3649.45	0.85	0.11	-0.74
	633025	3648.87	3649.37	3650.26	3649.45	0.89	0.08	-0.81
	671745	3648.29	3648.79	3650.19	3649.45	1.40	0.66	-0.74
	124126	3649.37	3649.87	3650.18	3649.45	0.31	0.00	-0.31
	322978	3649.63	3650.13	3650.19	3649.45	0.06	0.00	-0.06
	164642	3649.14	3649.64	3650.19	3649.45	0.55	0.00	-0.55
	424811	3653.81	3654.31	3654.38	3654.11	0.07	0.00	-0.07
	3407	3639.66	3640.16	3640.58	3640.54	0.41	0.37	-0.04
	123037	3638.50	3639.00	3640.58	3640.54	1.58	1.54	-0.04
	204029	3643.81	3644.31	3644.37	3644.32	0.07	0.01	-0.06
	399262	3643.71	3644.21	3644.37	3644.32	0.16	0.11	-0.06
	283301	3642.28	3642.78	3643.43	3643.34	0.65	0.57	-0.09
	398344	3643.23	3643.73	3644.37	3644.32	0.64	0.59	-0.06
	240339	3643.84	3644.34	3644.36	3644.30	0.02	0.00	-0.02
	374724	3643.75	3644.25	3644.34	3644.29	0.09	0.04	-0.06
	399849	3653.73	3654.23	3654.42	3654.19	0.18	0.00	-0.18
	203037	3653.84	3654.34	3654.42	3654.20	0.08	0.00	-0.08
	75347	3653.72	3654.22	3654.42	3654.19	0.20	0.00	-0.20
	399848	3653.61	3654.11	3654.42	3654.19	0.30	0.08	-0.22
	654546	3653.58	3654.08	3654.42	3654.19	0.33	0.11	-0.22
	607764	3653.46	3653.96	3654.42	3654.20	0.45	0.23	-0.22
	243447	3653.74	3654.24	3654.42	3654.19	0.18	0.00	-0.18
	451120	3652.65	3653.15	3654.42	3654.19	1.27	1.05	-0.22
	492701	3652.55	3653.05	3654.42	3654.19	1.37	1.15	-0.22
	166442	3652.58	3653.08	3654.42	3654.20	1.34	1.12	-0.22
	300625	3655.27	3655.77	3655.85	3655.19	0.09	0.00	-0.09
	76960	3653.67	3654.17	3655.46	3655.27	1.29	1.10	-0.19
	4201	3761.27	3761.77	3762.46	3762.46	0.68	0.68	0.00
	77779	3766.47	3766.97	3770.53	3770.53	3.56	3.56	0.00
	30575	3765.83	3766.33	3770.94	3770.94	4.61	4.61	0.00
	679498	3780.01	3780.51	3781.88	3781.88	1.37	1.37	0.00
	701113	3780.34	3780.84	3783.27	3783.27	2.43	2.43	0.00
0.2% Annual Chance Commercial Buildings	425531	3754.56	3755.06	3,755.35	3755.34	0.28	0.27	-0.01
	701110	3774.23	3774.73	3,778.12	3778.12	3.39	3.39	0.00
	701111	3790.29	3790.79	3,791.52	3791.52	0.74	0.74	0.00
	679516	3795.34	3795.84	3,797.00	3797.00	1.16	1.16	0.00
	77892	3803.52	3804.02	3,805.55	3805.55	1.54	1.54	0.00
	77768	3807.43	3807.93	3,808.89	3808.89	0.96	0.96	0.00

Appendix 5H

SSA4 (FMP ID: 143000011) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	75658	3639.88	3640.38	3641.56	3640.44	1.18	0.06	-1.12
	517861	3640.83	3641.33	3641.60	3640.44	0.28	0.00	-0.28
	568680	3639.03	3639.53	3641.64	3640.44	2.11	0.90	-1.21
	28170	3643.78	3644.28	3644.75	3643.95	0.47	0.00	-0.47
	372519	3644.13	3644.63	3644.75	3643.95	0.12	0.00	-0.12
	399236	3643.67	3644.17	3644.76	3643.98	0.59	0.00	-0.59
	122836	3644.26	3644.76	3644.77	3643.99	0.01	0.00	-0.01
	589672	3643.86	3644.36	3644.77	3644.01	0.41	0.00	-0.41
	242628	3643.96	3644.46	3644.77	3644.00	0.31	0.00	-0.31
	492374	3644.05	3644.55	3644.78	3644.01	0.23	0.00	-0.23
	564041	3644.24	3644.74	3644.83	3644.03	0.09	0.00	-0.09
	203019	3643.74	3644.24	3644.89	3644.05	0.65	0.00	-0.65
	492381	3644.11	3644.61	3645.06	3644.06	0.45	0.00	-0.45
	424635	3650.66	3651.16	3651.42	3650.57	0.26	0.00	-0.26
	564274	3650.10	3650.60	3651.42	3650.57	0.82	0.00	-0.82
	284099	3650.31	3650.81	3651.42	3650.57	0.61	0.00	-0.61
	492606	3650.33	3650.83	3651.42	3650.57	0.59	0.00	-0.59
	628601	3652.62	3653.12	3654.57	3654.03	1.45	0.90	-0.55
	589968	3653.59	3654.09	3654.62	3653.91	0.52	0.00	-0.52
	633160	3653.27	3653.77	3654.62	3653.91	0.84	0.14	-0.70
	348053	3648.84	3649.34	3651.42	3650.57	2.08	1.24	-0.84
	633025	3648.87	3649.37	3651.43	3650.61	2.06	1.24	-0.82
	671745	3648.29	3648.79	3651.42	3650.57	2.63	1.78	-0.84
	124126	3649.37	3649.87	3651.42	3650.57	1.55	0.71	-0.84
	322978	3649.63	3650.13	3651.49	3650.69	1.36	0.56	-0.80
	164642	3649.14	3649.64	3651.42	3650.57	1.78	0.94	-0.84
	655584	3638.22	3638.72	3640.21	3638.20	1.50	0.00	-1.50
	283514	3639.09	3639.59	3640.31	3638.83	0.72	0.00	-0.72
	3407	3639.66	3640.16	3641.43	3640.43	1.26	0.27	-1.00
	123037	3638.50	3639.00	3641.49	3640.43	2.49	1.43	-1.06
	45365	3641.74	3642.24	3644.75	0.00	2.51	0.00	-2.51
	517973	3643.80	3644.30	3644.75	3643.95	0.46	0.00	-0.46
	202222	3643.95	3644.45	3644.75	3643.95	0.30	0.00	-0.30
	300175	3643.98	3644.48	3644.75	3643.95	0.27	0.00	-0.27
	204029	3643.81	3644.31	3644.75	3643.95	0.44	0.00	-0.44
	399262	3643.71	3644.21	3644.75	3643.95	0.54	0.00	-0.54
	45337	3644.04	3644.54	3644.75	3643.95	0.21	0.00	-0.21
	283301	3642.28	3642.78	3644.76	3643.44	1.98	0.66	-1.32
	398344	3643.23	3643.73	3644.75	3643.95	1.02	0.23	-0.80
	568810	3643.88	3644.38	3644.75	3643.95	0.37	0.00	-0.37
	202235	3644.03	3644.53	3644.75	3643.96	0.22	0.00	-0.22
	240339	3643.84	3644.34	3644.71	3643.98	0.37	0.00	-0.37
	240385	3644.18	3644.68	3644.76	3643.95	0.08	0.00	-0.08
	607381	3644.09	3644.59	3644.69	3643.98	0.10	0.00	-0.10
	374724	3643.75	3644.25	3644.63	3643.97	0.38	0.00	-0.38
	476650	3650.43	3650.93	3651.42	3650.57	0.49	0.00	-0.49
	164865	3650.46	3650.96	3651.42	3650.57	0.46	0.00	-0.46
	492670	3650.17	3650.67	3651.42	3650.57	0.74	0.00	-0.74
	76431	3650.34	3650.84	3651.42	3650.57	0.58	0.00	-0.58
	425495	3650.67	3651.17	3651.42	3650.57	0.25	0.00	-0.25
	45614	3650.15	3650.65	3651.42	3650.57	0.77	0.00	-0.77
	347852	3650.28	3650.78	3651.42	3650.57	0.64	0.00	-0.64
	45585	3650.66	3651.16	3651.42	3650.57	0.26	0.00	-0.26
	347842	3650.62	3651.12	3651.42	3650.57	0.30	0.00	-0.30
	240884	3650.35	3650.85	3651.42	3650.57	0.57	0.00	-0.57
	203625	3650.53	3651.03	3651.42	3650.57	0.39	0.00	-0.39
	29545	3650.76	3651.26	3651.42	3650.57	0.16	0.00	-0.16
	654367	3650.44	3650.94	3651.42	3650.57	0.47	0.00	-0.47
	399704	3650.05	3650.55	3651.42	3650.57	0.87	0.02	-0.85
	323180	3650.25	3650.75	3651.42	3650.57	0.67	0.00	-0.67
	240854	3650.41	3650.91	3651.42	3650.57	0.51	0.00	-0.51
	321663	3650.51	3651.01	3651.42	3650.57	0.41	0.00	-0.41
	564278	3650.48	3650.98	3651.42	3650.57	0.44	0.00	-0.44
	656111	3650.23	3650.73	3651.42	3650.57	0.69	0.00	-0.69
	589905	3650.19	3650.69	3651.42	3650.57	0.73	0.00	-0.73
	628619	3650.51	3651.01	3651.45	3650.57	0.44	0.00	-0.44
	594241	3652.17	3652.67	3653.90	3652.97	1.23	0.30	-0.93
	321583	3651.96	3652.46	3654.03	3653.04	1.57	0.58	-0.99
	543410	3652.20	3652.70	3653.96	3652.91	1.26	0.21	-1.04

Appendix 5H

SSA4 (FMP ID: 143000011) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	323207	3652.72	3653.22	3654.58	3654.02	1.36	0.80	-0.55
	203838	3652.82	3653.32	3654.58	3654.02	1.26	0.71	-0.55
	321677	3653.55	3654.05	3654.58	3654.02	0.53	0.00	-0.53
	243269	3652.96	3653.46	3654.57	3654.02	1.11	0.56	-0.55
	240893	3653.31	3653.81	3654.57	3654.02	0.75	0.20	-0.55
	475847	3652.94	3653.44	3654.58	3654.02	1.14	0.59	-0.56
	372796	3653.45	3653.95	3654.58	3654.02	0.63	0.07	-0.56
	241949	3652.84	3653.34	3654.58	3654.02	1.24	0.68	-0.56
	425491	3652.70	3653.20	3654.58	3654.02	1.37	0.82	-0.56
	424683	3653.62	3654.12	3654.58	3654.02	0.45	0.00	-0.45
	424642	3653.18	3653.68	3654.58	3654.02	0.90	0.34	-0.55
	4128	3653.67	3654.17	3654.58	3654.02	0.41	0.00	-0.41
	347972	3652.84	3653.34	3654.58	3654.02	1.24	0.68	-0.56
	656145	3652.89	3653.39	3654.58	3654.02	1.18	0.63	-0.56
	476665	3652.93	3653.43	3654.58	3654.02	1.15	0.59	-0.56
	425479	3653.13	3653.63	3654.58	3654.02	0.95	0.39	-0.56
	241051	3653.24	3653.74	3654.58	3654.02	0.84	0.29	-0.56
	656166	3653.20	3653.70	3654.58	3654.02	0.88	0.32	-0.56
	300481	3653.07	3653.57	3654.58	3654.02	1.01	0.45	-0.56
	124487	3652.91	3653.41	3654.58	3654.02	1.17	0.62	-0.56
	518202	3652.97	3653.47	3654.58	3654.02	1.11	0.56	-0.56
	399725	3653.05	3653.55	3654.58	3654.02	1.03	0.48	-0.56
	450104	3653.87	3654.37	3654.58	3654.02	0.21	0.00	-0.21
	569089	3652.29	3652.79	3654.58	3654.02	1.79	1.23	-0.56
	76741	3653.52	3654.02	3654.58	3654.02	0.56	0.00	-0.56
	76722	3653.46	3653.96	3654.58	3654.02	0.62	0.07	-0.56
	300470	3653.21	3653.71	3654.58	3654.02	0.87	0.32	-0.56
	594336	3654.02	3654.52	3654.58	3654.02	0.06	0.00	-0.06
	45618	3653.45	3653.95	3654.58	3654.02	0.63	0.07	-0.56
	476647	3653.87	3654.37	3654.58	3654.02	0.21	0.00	-0.21
	518220	3653.72	3654.22	3654.58	3654.02	0.36	0.00	-0.36
	323224	3652.93	3653.43	3654.58	3654.02	1.15	0.59	-0.56
	348000	3653.53	3654.03	3654.58	3654.02	0.55	0.00	-0.55
	372794	3653.29	3653.79	3654.58	3654.02	0.79	0.23	-0.56
	607732	3654.04	3654.54	3654.58	3654.02	0.04	0.00	-0.04
	165242	3653.73	3654.23	3654.58	3654.02	0.35	0.00	-0.35
	204856	3653.45	3653.95	3654.58	3654.02	0.64	0.07	-0.56
	124413	3652.88	3653.38	3654.58	3654.02	1.21	0.64	-0.56
	123422	3653.58	3654.08	3654.72	3654.67	0.64	0.59	-0.05
	399823	3653.78	3654.28	3654.59	3654.02	0.30	0.00	-0.30
	45622	3653.75	3654.25	3654.59	3654.02	0.34	0.00	-0.34
	202898	3654.39	3654.89	3654.59	3654.02	0.99	0.00	-0.99
	628692	3653.90	3654.40	3654.59	3654.02	0.18	0.00	-0.18
	348241	3653.65	3654.15	3654.59	3654.02	0.43	0.00	-0.43
	283736	3653.72	3654.22	3654.62	3654.03	0.40	0.00	-0.40
	124103	3654.56	3655.06	3655.18	3655.14	0.12	0.09	-0.04
	607616	3654.08	3654.58	3655.19	3655.15	0.61	0.57	-0.04
	425482	3654.02	3654.52	3654.66	3654.04	0.14	0.00	-0.14
	241953	3653.50	3654.00	3654.66	3654.04	0.65	0.03	-0.62
	283968	3653.66	3654.16	3655.43	3655.39	1.27	1.23	-0.04
	243273	3654.14	3654.64	3654.69	3654.05	0.05	0.00	-0.05
	654275	3692.37	3692.87	3693.13	3693.07	0.25	0.20	-0.05
	166067	3653.71	3654.21	3656.37	3656.34	2.16	2.12	-0.04
	76307	3693.53	3694.03	3695.38	3695.33	1.36	1.30	-0.05
	543387	3671.15	3671.65	3673.23	3673.16	1.58	1.52	-0.06
	476529	3655.41	3655.91	3655.98	3655.86	0.08	0.00	-0.08
	398766	3655.48	3655.98	3656.45	3656.23	0.46	0.25	-0.22
	399849	3653.73	3654.23	3654.60	3653.91	0.37	0.00	-0.37
	29414	3700.57	3701.07	3701.54	3701.45	0.47	0.38	-0.09
	240867	3655.96	3656.46	3657.10	3656.67	0.63	0.21	-0.43
	203037	3653.84	3654.34	3654.60	3653.91	0.27	0.00	-0.27
	75347	3653.72	3654.22	3654.60	3653.91	0.38	0.00	-0.38
	594147	3700.03	3700.53	3702.40	3702.27	1.87	1.74	-0.13
	399848	3653.61	3654.11	3654.60	3653.91	0.49	0.00	-0.49
	399865	3653.92	3654.42	3654.60	3653.91	0.18	0.00	-0.18
	372846	3654.06	3654.56	3654.60	3653.91	0.04	0.00	-0.04
	492539	3700.66	3701.16	3703.17	3702.94	2.02	1.78	-0.24
	399571	3688.72	3689.22	3694.76	3694.33	5.54	5.11	-0.43
	654546	3653.58	3654.08	3654.60	3653.91	0.52	0.00	-0.52

Appendix 5H

SSA4 (FMP ID: 143000011) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	607764	3653.46	3653.96	3654.60	3653.91	0.64	0.00	-0.64
	449833	3703.24	3703.74	3704.36	3704.19	0.63	0.45	-0.18
	243447	3653.74	3654.24	3654.60	3653.91	0.37	0.00	-0.37
	323083	3659.50	3660.00	3665.00	3664.65	5.00	4.66	-0.34
	451120	3652.65	3653.15	3654.60	3653.91	1.46	0.76	-0.70
	628606	3659.69	3660.19	3662.25	3661.69	2.06	1.50	-0.56
	492701	3652.55	3653.05	3654.60	3653.91	1.56	0.86	-0.70
	166442	3652.58	3653.08	3654.60	3653.91	1.52	0.82	-0.70
	632983	3704.12	3704.62	3705.61	3705.41	0.99	0.79	-0.20
	594145	3705.38	3705.88	3706.35	3706.20	0.47	0.32	-0.15
	3930	3705.25	3705.75	3706.35	3706.17	0.59	0.41	-0.18
	124142	3705.76	3706.26	3706.55	3706.34	0.29	0.07	-0.21
	29518	3700.71	3701.21	3701.65	3701.12	0.44	0.00	-0.44
	530664	3704.53	3705.03	3707.42	3707.25	2.40	2.22	-0.18
	424489	3706.04	3706.54	3706.83	3706.56	0.29	0.02	-0.26
	323050	3700.31	3700.81	3701.10	3700.68	0.29	0.00	-0.29
	123661	3669.93	3670.43	3672.01	3671.37	1.58	0.94	-0.64
	425193	3716.37	3716.87	3717.83	3717.26	0.96	0.39	-0.57
	76960	3653.67	3654.17	3656.32	3653.88	2.14	0.00	-2.14
	450998	3654.47	3654.97	3655.43	3653.91	0.46	0.00	-0.46
	203626	3716.31	3716.81	3716.92	3716.15	0.11	0.00	-0.11
	671780	3717.58	3718.08	3718.25	3717.69	0.17	0.00	-0.17
	166085	3717.94	3718.44	3718.84	3718.22	0.40	0.00	-0.40
	450061	3713.23	3713.73	3714.20	3712.98	0.47	0.00	-0.47
	425498	3713.12	3713.62	3713.98	3712.97	0.36	0.00	-0.36
	505420	3713.16	3713.66	3714.43	3713.15	0.77	0.00	-0.77
	654152	3802.29	3802.79	3803.40	3802.59	0.62	0.00	-0.62
	492626	3650.13	3650.63	3651.42	3650.57	0.79	0.00	-0.79
	569059	3655.23	3655.73	3655.74	3655.51	0.01	0.00	-0.01
	164845	3700.53	3701.03	3701.20	3700.69	0.18	0.00	-0.18
1% Annual Chance Commercial Buildings	607385	3644.05	3644.55	3644.72	3643.99	0.17	0.00	-0.17
	321669	3650.64	3651.14	3651.42	3650.57	0.28	0.00	-0.28
	321669	3650.64	3651.14	3651.42	3650.57	0.28	0.00	-0.28
	607688	3653.27	3653.77	3653.90	3652.97	0.13	0.00	-0.13
	243267	3652.84	3653.34	3653.91	3652.97	0.57	0.00	-0.57
	372737	3652.56	3653.06	3653.93	3653.04	0.87	0.00	-0.87
	29564	3652.93	3653.43	3654.56	3654.02	1.12	0.59	-0.54
	76144	3689.91	3690.41	3691.16	3691.11	0.75	0.70	-0.05
	204453	3689.77	3690.27	3691.35	3691.30	1.08	1.03	-0.05
	262148	3656.07	3656.57	3657.26	3657.18	0.68	0.61	-0.07
	607634	3655.35	3655.85	3656.06	3656.03	0.21	0.18	-0.03
	450881	3655.26	3655.76	3656.16	3656.12	0.40	0.37	-0.03
	375080	3654.22	3654.72	3656.33	3656.28	1.61	1.56	-0.05
	300364	3656.88	3657.38	3658.21	3658.13	0.83	0.76	-0.07
	543358	3713.68	3714.18	3714.98	3714.54	0.80	0.36	-0.43
	372634	3764.50	3765.00	3765.31	3765.30	0.31	0.30	-0.01
	74741	3778.50	3779.00	3779.63	3779.62	0.63	0.63	0.00
0.2% Annual Chance Residences	202620	3639.20	3639.70	3640.10	0.00	0.40	0.00	-0.40
	321041	3638.39	3638.89	3640.10	0.00	1.20	0.00	-1.20
	240794	3639.04	3639.54	3640.11	0.00	0.57	0.00	-0.57
	424575	3638.95	3639.45	3640.12	0.00	0.66	0.00	-0.66
	589463	3638.73	3639.23	3640.10	0.00	0.87	0.00	-0.87
	423838	3639.37	3639.87	3640.08	0.00	0.21	0.00	-0.21
	542945	3639.47	3639.97	3640.07	0.00	0.10	0.00	-0.10
	164748	3639.28	3639.78	3640.07	0.00	0.29	0.00	-0.29
	27707	3639.21	3639.71	3640.07	0.00	0.36	0.00	-0.36
	202427	3639.22	3639.72	3639.88	0.00	0.16	0.00	-0.16
	119994	3640.60	3641.10	3641.17	0.00	0.06	0.00	-0.06
	75718	3639.02	3639.52	3641.18	3639.77	1.66	0.25	-1.41
	75658	3639.88	3640.38	3642.46	3641.43	2.08	1.06	-1.02
	517861	3640.83	3641.33	3642.55	3641.48	1.23	0.15	-1.08
	568680	3639.03	3639.53	3642.62	3641.51	3.09	1.98	-1.11
	374749	3644.63	3645.13	3645.18	3644.72	0.05	0.00	-0.05
	347623	3644.56	3645.06	3645.18	3644.72	0.12	0.00	-0.12
	475292	3644.36	3644.86	3645.18	3644.72	0.32	0.00	-0.32
	28170	3643.78	3644.28	3645.18	3644.72	0.91	0.45	-0.46
	321270	3644.65	3645.15	3645.18	3644.72	0.04	0.00	-0.04
	372519	3644.13	3644.63	3645.18	3644.72	0.55	0.10	-0.46
	399236	3643.67	3644.17	3645.19	3644.73	1.02	0.56	-0.46

Appendix 5H

SSA4 (FMP ID: 143000011) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	122836	3644.26	3644.76	3645.20	3644.75	0.44	0.00	-0.44
	589672	3643.86	3644.36	3645.20	3644.75	0.84	0.39	-0.45
	242628	3643.96	3644.46	3645.19	3644.74	0.74	0.28	-0.45
	492374	3644.05	3644.55	3645.20	3644.75	0.65	0.20	-0.45
	564041	3644.24	3644.74	3645.25	3644.80	0.51	0.06	-0.45
	203019	3643.74	3644.24	3645.29	3644.83	1.05	0.59	-0.46
	492381	3644.11	3644.61	3645.48	3644.91	0.87	0.30	-0.57
	424635	3650.66	3651.16	3651.90	3651.05	0.74	0.00	-0.74
	564274	3650.10	3650.60	3651.90	3651.05	1.30	0.46	-0.85
	284099	3650.31	3650.81	3651.90	3651.05	1.09	0.25	-0.85
	492606	3650.33	3650.83	3651.90	3651.05	1.07	0.23	-0.85
	348198	3651.00	3651.50	3651.90	3651.05	0.40	0.00	-0.40
	628601	3652.62	3653.12	3654.98	3654.27	1.86	1.14	-0.71
	589968	3653.59	3654.09	3655.01	3654.37	0.92	0.28	-0.64
	633160	3653.27	3653.77	3655.02	3654.37	1.24	0.59	-0.65
	120424	3744.33	3744.83	3744.95	0.00	0.12	0.00	-0.12
	398574	3749.86	3750.36	3751.08	0.00	0.72	0.00	-0.72
	204230	3644.35	3644.85	3645.21	3644.73	0.36	0.00	-0.36
	164424	3643.98	3644.48	3645.21	3644.73	0.72	0.24	-0.48
	492427	3644.24	3644.74	3645.21	3644.73	0.46	0.00	-0.46
	348053	3648.84	3649.34	3651.90	3651.05	2.56	1.72	-0.84
	633025	3648.87	3649.37	3651.91	3651.07	2.53	1.70	-0.83
	671745	3648.29	3648.79	3651.90	3651.05	3.11	2.26	-0.84
	124126	3649.37	3649.87	3651.90	3651.05	2.03	1.19	-0.84
	322978	3649.63	3650.13	3651.92	3651.11	1.79	0.98	-0.81
	164642	3649.14	3649.64	3651.90	3651.05	2.26	1.42	-0.84
	166229	3651.27	3651.77	3651.97	3651.05	0.20	0.00	-0.20
	424811	3653.81	3654.31	3654.93	3654.23	0.62	0.00	-0.62
	165878	3747.06	3747.56	3747.74	0.00	0.19	0.00	-0.19
	28767	3639.45	3639.95	3640.10	0.00	0.15	0.00	-0.15
	322282	3639.27	3639.77	3640.10	0.00	0.32	0.00	-0.32
	632560	3639.49	3639.99	3640.20	3639.05	0.21	0.00	-0.21
	423847	3639.21	3639.71	3640.09	0.00	0.39	0.00	-0.39
	74068	3639.53	3640.03	3640.36	3639.36	0.33	0.00	-0.33
	474878	3639.38	3639.88	3640.07	0.00	0.19	0.00	-0.19
	543036	3639.62	3640.12	3640.24	0.00	0.12	0.00	-0.12
	282877	3639.19	3639.69	3640.10	0.00	0.40	0.00	-0.40
	45068	3639.51	3640.01	3640.07	0.00	0.06	0.00	-0.06
	628196	3639.74	3640.24	3640.34	0.00	0.10	0.00	-0.10
	589480	3639.71	3640.21	3640.35	0.00	0.13	0.00	-0.13
	449140	3638.04	3638.54	3640.03	0.00	1.50	0.00	-1.50
	202448	3639.29	3639.79	3639.83	0.00	0.04	0.00	-0.04
	398966	3639.81	3640.31	3641.17	3639.68	0.85	0.00	-0.85
	202051	3639.35	3639.85	3641.17	3639.68	1.31	0.00	-1.31
	240107	3640.09	3640.59	3641.17	0.00	0.58	0.00	-0.58
	589589	3638.50	3639.00	3641.17	3639.69	2.17	0.68	-1.48
	655584	3638.22	3638.72	3641.17	3639.68	2.45	0.97	-1.49
	2538	3639.44	3639.94	3641.17	3639.68	1.23	0.00	-1.23
	283115	3639.37	3639.87	3641.17	3639.69	1.30	0.00	-1.30
	492209	3640.55	3641.05	3641.17	0.00	0.12	0.00	-0.12
	120012	3640.64	3641.14	3641.17	0.00	0.03	0.00	-0.03
	475938	3639.36	3639.86	3641.17	3639.69	1.31	0.00	-1.31
	543109	3639.55	3640.05	3641.17	3639.73	1.12	0.00	-1.12
	450298	3639.68	3640.18	3641.17	3639.70	1.00	0.00	-1.00
	322526	3639.85	3640.35	3641.18	3639.80	0.83	0.00	-0.83
	45209	3640.11	3640.61	3641.17	0.00	0.56	0.00	-0.56
	300047	3639.93	3640.43	3641.17	3639.79	0.74	0.00	-0.74
	632647	3639.96	3640.46	3641.18	3640.00	0.72	0.00	-0.72
	163988	3640.40	3640.90	3641.18	3640.37	0.28	0.00	-0.28
	163849	3640.52	3641.02	3641.18	0.00	0.17	0.00	-0.17
	164067	3639.46	3639.96	3641.19	3639.88	1.22	0.00	-1.22
	74387	3639.77	3640.27	3641.19	3639.87	0.92	0.00	-0.92
	283514	3639.09	3639.59	3641.19	3639.87	1.60	0.29	-1.31
	424153	3639.18	3639.68	3641.19	3639.87	1.51	0.19	-1.32
	3407	3639.66	3640.16	3642.20	3641.31	2.03	1.15	-0.88
	123037	3638.50	3639.00	3642.34	3641.37	3.34	2.37	-0.97
	425010	3643.73	3644.23	3645.20	3644.73	0.97	0.50	-0.48
	322721	3644.46	3644.96	3645.20	3644.73	0.24	0.00	-0.24
	505220	3642.14	3642.64	3645.20	3644.73	2.57	2.09	-0.48

Appendix 5H

SSA4 (FMP ID: 143000011) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	607313	3641.09	3641.59	3642.79	3641.85	1.20	0.26	-0.94
	165656	3644.26	3644.76	3645.20	3644.73	0.44	0.00	-0.44
	45365	3641.74	3642.24	3645.20	3644.73	2.96	2.48	-0.48
	517973	3643.80	3644.30	3645.19	3644.73	0.90	0.43	-0.47
	203175	3644.33	3644.83	3645.20	3644.73	0.37	0.00	-0.37
	202222	3643.95	3644.45	3645.18	3644.72	0.72	0.27	-0.45
	300175	3643.98	3644.48	3645.18	3644.72	0.70	0.24	-0.46
	204029	3643.81	3644.31	3645.18	3644.72	0.87	0.42	-0.46
	449630	3644.48	3644.98	3645.20	3644.73	0.22	0.00	-0.22
	241367	3644.02	3644.52	3645.20	3644.73	0.69	0.21	-0.48
	564018	3644.56	3645.06	3645.16	3644.72	0.11	0.00	-0.11
	204016	3644.33	3644.83	3645.13	3644.70	0.30	0.00	-0.30
	399262	3643.71	3644.21	3645.20	3644.73	0.99	0.52	-0.47
	45337	3644.04	3644.54	3645.19	3644.73	0.65	0.18	-0.47
	424775	3642.97	3643.47	3644.02	3643.51	0.56	0.05	-0.51
	347744	3644.68	3645.18	3645.21	3644.73	0.03	0.00	-0.03
	283301	3642.28	3642.78	3645.21	3644.73	2.43	1.95	-0.48
	398344	3643.23	3643.73	3645.19	3644.73	1.46	1.00	-0.46
	568810	3643.88	3644.38	3645.20	3644.73	0.81	0.34	-0.47
	120267	3644.50	3645.00	3645.19	3644.73	0.19	0.00	-0.19
	202235	3644.03	3644.53	3645.19	3644.73	0.66	0.19	-0.46
	240339	3643.84	3644.34	3645.12	3644.68	0.78	0.34	-0.44
	240385	3644.18	3644.68	3645.21	3644.73	0.53	0.05	-0.48
	450453	3644.18	3644.68	3645.12	3644.68	0.44	0.00	-0.44
	607381	3644.09	3644.59	3645.11	3644.67	0.51	0.08	-0.44
	374724	3643.75	3644.25	3645.04	3644.62	0.79	0.36	-0.42
	124416	3651.16	3651.66	3651.90	3651.05	0.24	0.00	-0.24
	123946	3651.14	3651.64	3651.90	3651.05	0.26	0.00	-0.26
	476650	3650.43	3650.93	3651.90	3651.05	0.97	0.12	-0.85
	492677	3651.02	3651.52	3651.90	3651.05	0.38	0.00	-0.38
	164865	3650.46	3650.96	3651.90	3651.05	0.94	0.09	-0.85
	492670	3650.17	3650.67	3651.90	3651.05	1.22	0.38	-0.85
	76431	3650.34	3650.84	3651.90	3651.05	1.06	0.21	-0.85
	165241	3650.96	3651.46	3651.90	3651.05	0.44	0.00	-0.44
	425495	3650.67	3651.17	3651.90	3651.05	0.73	0.00	-0.73
	45614	3650.15	3650.65	3651.90	3651.05	1.25	0.40	-0.85
	347852	3650.28	3650.78	3651.90	3651.05	1.12	0.28	-0.85
	45585	3650.66	3651.16	3651.90	3651.05	0.74	0.00	-0.74
	347842	3650.62	3651.12	3651.90	3651.05	0.78	0.00	-0.78
	240884	3650.35	3650.85	3651.90	3651.05	1.05	0.20	-0.85
	203625	3650.53	3651.03	3651.90	3651.05	0.87	0.03	-0.85
	29545	3650.76	3651.26	3651.90	3651.05	0.64	0.00	-0.64
	654367	3650.44	3650.94	3651.90	3651.05	0.95	0.11	-0.85
	399704	3650.05	3650.55	3651.90	3651.05	1.35	0.50	-0.85
	323180	3650.25	3650.75	3651.90	3651.05	1.15	0.30	-0.85
	240854	3650.41	3650.91	3651.90	3651.05	0.99	0.14	-0.85
	321663	3650.51	3651.01	3651.90	3651.05	0.89	0.04	-0.85
	76733	3651.09	3651.59	3651.90	3651.05	0.31	0.00	-0.31
	564278	3650.48	3650.98	3651.90	3651.05	0.92	0.07	-0.85
	656111	3650.23	3650.73	3651.90	3651.05	1.17	0.32	-0.85
	589905	3650.19	3650.69	3651.90	3651.05	1.21	0.36	-0.85
	628619	3650.51	3651.01	3651.91	3651.05	0.90	0.04	-0.86
	262203	3650.87	3651.37	3651.97	3651.05	0.60	0.00	-0.60
	284122	3651.25	3651.75	3651.90	0.00	0.15	0.00	-0.15
	124375	3650.99	3651.49	3651.92	3651.05	0.43	0.00	-0.43
	399689	3650.66	3651.16	3652.05	3651.05	0.89	0.00	-0.89
	451165	3653.96	3654.46	3654.97	3654.08	0.51	0.00	-0.51
	654587	3653.61	3654.11	3654.97	3654.08	0.85	0.00	-0.85
	594241	3652.17	3652.67	3654.47	3653.27	1.80	0.60	-1.20
	283864	3654.31	3654.81	3654.97	3654.12	0.16	0.00	-0.16
	628706	3654.35	3654.85	3654.97	3654.12	0.12	0.00	-0.12
	628726	3654.20	3654.70	3654.97	3654.12	0.27	0.00	-0.27
	492742	3653.87	3654.37	3654.97	3654.08	0.60	0.00	-0.60
	165090	3654.22	3654.72	3654.97	0.00	0.25	0.00	-0.25
	321583	3651.96	3652.46	3654.57	3653.30	2.11	0.84	-1.27
	530861	3654.29	3654.79	3654.97	3654.12	0.17	0.00	-0.17
	530857	3654.25	3654.75	3654.97	3654.12	0.22	0.00	-0.22
	543410	3652.20	3652.70	3654.51	3653.25	1.81	0.54	-1.27
	323207	3652.72	3653.22	3654.99	3654.27	1.77	1.05	-0.72

Appendix 5H

SSA4 (FMP ID: 143000011) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	203838	3652.82	3653.32	3654.98	3654.27	1.67	0.95	-0.72
	321677	3653.55	3654.05	3654.98	3654.27	0.94	0.22	-0.72
	243269	3652.96	3653.46	3654.98	3654.27	1.52	0.80	-0.72
	240893	3653.31	3653.81	3654.97	3654.26	1.16	0.45	-0.71
	45653	3654.25	3654.75	3654.97	3654.14	0.22	0.00	-0.22
	120944	3654.33	3654.83	3654.97	3654.15	0.14	0.00	-0.14
	475847	3652.94	3653.44	3654.99	3654.27	1.55	0.83	-0.72
	372796	3653.45	3653.95	3654.99	3654.27	1.04	0.32	-0.72
	241949	3652.84	3653.34	3654.99	3654.27	1.65	0.93	-0.72
	425491	3652.70	3653.20	3654.99	3654.27	1.78	1.07	-0.72
	3187	3654.10	3654.60	3654.99	3654.27	0.39	0.00	-0.39
	424683	3653.62	3654.12	3654.99	3654.27	0.86	0.15	-0.72
	450103	3654.13	3654.63	3654.99	3654.27	0.35	0.00	-0.35
	205043	3654.36	3654.86	3654.97	3654.15	0.11	0.00	-0.11
	424642	3653.18	3653.68	3654.99	3654.27	1.31	0.59	-0.72
	4128	3653.67	3654.17	3654.99	3654.27	0.82	0.10	-0.72
	347972	3652.84	3653.34	3654.99	3654.27	1.65	0.93	-0.72
	656145	3652.89	3653.39	3654.99	3654.27	1.60	0.87	-0.72
	476665	3652.93	3653.43	3654.99	3654.27	1.56	0.84	-0.72
	671890	3654.30	3654.80	3654.97	3654.24	0.17	0.00	-0.17
	425479	3653.13	3653.63	3654.99	3654.27	1.36	0.64	-0.72
	241051	3653.24	3653.74	3654.99	3654.27	1.25	0.53	-0.72
	656166	3653.20	3653.70	3654.99	3654.27	1.29	0.57	-0.72
	300481	3653.07	3653.57	3654.99	3654.27	1.42	0.70	-0.72
	124487	3652.91	3653.41	3654.99	3654.27	1.58	0.86	-0.72
	518202	3652.97	3653.47	3654.99	3654.27	1.52	0.80	-0.72
	633235	3654.40	3654.90	3654.97	3654.24	0.07	0.00	-0.07
	399725	3653.05	3653.55	3654.99	3654.27	1.45	0.72	-0.72
	450104	3653.87	3654.37	3654.99	3654.27	0.62	0.00	-0.62
	569089	3652.29	3652.79	3654.99	3654.27	2.20	1.48	-0.72
	633232	3654.28	3654.78	3654.97	3654.25	0.20	0.00	-0.20
	166428	3654.39	3654.89	3654.98	3654.26	0.09	0.00	-0.09
	76741	3653.52	3654.02	3654.99	3654.27	0.97	0.25	-0.72
	76722	3653.46	3653.96	3654.99	3654.27	1.04	0.31	-0.72
	300470	3653.21	3653.71	3654.99	3654.27	1.29	0.56	-0.72
	594336	3654.02	3654.52	3654.99	3654.27	0.47	0.00	-0.47
	45618	3653.45	3653.95	3654.99	3654.27	1.04	0.32	-0.72
	476647	3653.87	3654.37	3654.99	3654.27	0.63	0.00	-0.63
	518220	3653.72	3654.22	3655.00	3654.27	0.78	0.05	-0.73
	372807	3654.47	3654.97	3654.99	3654.27	0.02	0.00	-0.02
	323224	3652.93	3653.43	3655.00	3654.27	1.56	0.84	-0.73
	348000	3653.53	3654.03	3654.99	3654.27	0.96	0.24	-0.72
	372794	3653.29	3653.79	3655.00	3654.27	1.21	0.48	-0.73
	607732	3654.04	3654.54	3655.00	3654.27	0.45	0.00	-0.45
	671840	3654.13	3654.63	3655.00	3654.27	0.37	0.00	-0.37
	165242	3653.73	3654.23	3655.00	3654.27	0.77	0.04	-0.73
	262130	3654.40	3654.90	3655.03	3654.75	0.14	0.00	-0.14
	204856	3653.45	3653.95	3655.00	3654.27	1.05	0.32	-0.73
	124413	3652.88	3653.38	3655.00	3654.27	1.62	0.89	-0.73
	505454	3654.36	3654.86	3655.00	3654.27	0.15	0.00	-0.15
	123422	3653.58	3654.08	3655.05	3654.79	0.97	0.71	-0.26
	399823	3653.78	3654.28	3655.01	3654.27	0.72	0.00	-0.72
	45622	3653.75	3654.25	3655.01	3654.27	0.76	0.02	-0.73
	372795	3654.24	3654.74	3655.01	3654.27	0.27	0.00	-0.27
	202898	3654.39	3654.89	3655.01	3654.27	0.11	0.00	-0.11
	628692	3653.90	3654.40	3655.01	3654.27	0.60	0.00	-0.60
	348241	3653.65	3654.15	3655.01	3654.27	0.86	0.12	-0.74
	76721	3654.33	3654.83	3655.02	3654.28	0.19	0.00	-0.19
	450086	3654.42	3654.92	3655.02	3654.29	0.10	0.00	-0.10
	283736	3653.72	3654.22	3655.04	3654.29	0.82	0.07	-0.75
	476621	3654.23	3654.73	3655.04	3654.29	0.32	0.00	-0.32
	124103	3654.56	3655.06	3655.38	3655.33	0.32	0.28	-0.05
	425570	3654.47	3654.97	3655.04	3654.31	0.08	0.00	-0.08
	75182	3654.31	3654.81	3655.05	3654.31	0.24	0.00	-0.24
	607616	3654.08	3654.58	3655.39	3655.34	0.81	0.76	-0.05
	323117	3654.29	3654.79	3655.07	3654.33	0.28	0.00	-0.28
	425482	3654.02	3654.52	3655.07	3654.32	0.55	0.00	-0.55
	241953	3653.50	3654.00	3655.07	3654.32	1.07	0.31	-0.75
	283968	3653.66	3654.16	3655.63	3655.60	1.47	1.44	-0.03

SSA4 (FMP ID: 143000011) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	323346	3653.96	3654.46	3654.93	3654.23	0.48	0.00	-0.48
	505447	3654.19	3654.69	3655.09	3654.33	0.39	0.00	-0.39
	243273	3654.14	3654.64	3655.10	3654.35	0.46	0.00	-0.46
	654275	3692.37	3692.87	3693.53	3693.47	0.65	0.59	-0.06
	241945	3654.41	3654.91	3655.13	3654.38	0.23	0.00	-0.23
	76306	3695.13	3695.63	3696.10	3696.02	0.47	0.39	-0.08
	530809	3654.57	3655.07	3655.11	3654.36	0.04	0.00	-0.04
	166067	3653.71	3654.21	3656.59	3656.57	2.38	2.36	-0.02
	76307	3693.53	3694.03	3695.88	3695.80	1.85	1.78	-0.07
	505455	3654.24	3654.74	3655.12	3654.36	0.38	0.00	-0.38
	425575	3654.37	3654.87	3655.12	3654.36	0.25	0.00	-0.25
	45657	3653.91	3654.41	3654.93	3654.23	0.53	0.00	-0.53
	399827	3654.36	3654.86	3655.11	3654.36	0.26	0.00	-0.26
	543387	3671.15	3671.65	3672.44	3672.41	0.79	0.76	-0.03
	300509	3654.39	3654.89	3654.95	3654.32	0.06	0.00	-0.06
	476529	3655.41	3655.91	3656.21	3656.00	0.30	0.09	-0.21
	76608	3654.22	3654.72	3654.97	3654.34	0.25	0.00	-0.25
	398766	3655.48	3655.98	3656.70	3656.43	0.71	0.44	-0.27
	399849	3653.73	3654.23	3654.99	3654.37	0.76	0.13	-0.62
	29414	3700.57	3701.07	3702.07	3701.97	0.99	0.90	-0.10
	240867	3655.96	3656.46	3657.44	3656.94	0.98	0.48	-0.50
	3331	3654.18	3654.68	3654.98	3654.37	0.30	0.00	-0.30
	203037	3653.84	3654.34	3654.99	3654.37	0.65	0.03	-0.62
	75347	3653.72	3654.22	3654.99	3654.37	0.77	0.15	-0.62
	241105	3654.11	3654.61	3654.99	3654.37	0.38	0.00	-0.38
	3323	3654.45	3654.95	3654.99	3654.37	0.04	0.00	-0.04
	594147	3700.03	3700.53	3702.88	3702.74	2.35	2.21	-0.14
	399848	3653.61	3654.11	3654.99	3654.37	0.88	0.25	-0.62
	399865	3653.92	3654.42	3654.99	3654.37	0.57	0.00	-0.57
	372846	3654.06	3654.56	3654.99	3654.37	0.43	0.00	-0.43
	492539	3700.66	3701.16	3703.48	3703.25	2.33	2.10	-0.23
	348012	3654.23	3654.73	3654.99	3654.37	0.26	0.00	-0.26
	399571	3688.72	3689.22	3695.00	3694.59	5.78	5.37	-0.41
	123656	3660.25	3660.75	3660.80	3660.56	0.05	0.00	-0.05
	654546	3653.58	3654.08	3654.99	3654.37	0.91	0.28	-0.62
	607764	3653.46	3653.96	3654.99	3654.37	1.03	0.40	-0.62
	449833	3703.24	3703.74	3704.56	3704.42	0.82	0.69	-0.14
	243447	3653.74	3654.24	3654.99	3654.37	0.76	0.13	-0.63
	323083	3659.50	3660.00	3665.18	3664.91	5.18	4.91	-0.27
	451120	3652.65	3653.15	3654.99	3654.37	1.85	1.22	-0.62
	628606	3659.69	3660.19	3662.42	3662.16	2.23	1.97	-0.26
	492701	3652.55	3653.05	3654.99	3654.37	1.95	1.32	-0.63
	166442	3652.58	3653.08	3654.99	3654.37	1.91	1.29	-0.62
	632983	3704.12	3704.62	3705.96	3705.66	1.34	1.05	-0.29
	564190	3704.66	3705.16	3705.36	3705.00	0.20	0.00	-0.20
	594145	3705.38	3705.88	3706.77	3706.58	0.89	0.70	-0.19
	3930	3705.25	3705.75	3706.69	3706.48	0.94	0.73	-0.21
	124142	3705.76	3706.26	3706.87	3706.58	0.61	0.32	-0.29
	29518	3700.71	3701.21	3701.87	3701.40	0.66	0.19	-0.47
	594158	3705.40	3705.90	3706.09	3705.78	0.19	0.00	-0.19
	530664	3704.53	3705.03	3708.00	3707.76	2.97	2.73	-0.24
	424489	3706.04	3706.54	3707.05	3706.74	0.50	0.20	-0.30
	323050	3700.31	3700.81	3701.31	3700.90	0.50	0.09	-0.41
	518097	3707.61	3708.11	3708.16	0.00	0.05	0.00	-0.05
	203622	3665.84	3666.34	3666.56	3666.18	0.22	0.00	-0.22
	124176	3700.42	3700.92	3700.95	3700.44	0.03	0.00	-0.03
	425349	3666.85	3667.35	3667.81	0.00	0.47	0.00	-0.47
	633078	3668.56	3669.06	3669.18	0.00	0.11	0.00	-0.11
	656011	3700.11	3700.61	3700.86	0.00	0.25	0.00	-0.25
	476505	3669.18	3669.68	3670.27	3669.63	0.59	0.00	-0.59
	372686	3709.30	3709.80	3710.34	3709.81	0.55	0.01	-0.54
	123661	3669.93	3670.43	3672.59	3671.66	2.17	1.23	-0.94
	564201	3709.46	3709.96	3710.64	3710.16	0.67	0.20	-0.47
	607601	3709.59	3710.09	3710.66	3710.23	0.57	0.13	-0.44
	425193	3716.37	3716.87	3718.07	3717.60	1.20	0.73	-0.47
	29509	3708.22	3708.72	3709.25	3708.73	0.53	0.00	-0.53
	568959	3719.34	3719.84	3719.84	0.00	0.01	0.00	-0.01
	632990	3719.27	3719.77	3720.11	0.00	0.33	0.00	-0.33
	202531	3719.35	3719.85	3720.56	3719.49	0.71	0.00	-0.71

Appendix 5H

SSA4 (FMP ID: 143000011) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	28420	3719.66	3720.16	3721.03	3720.00	0.88	0.00	-0.88
	492551	3719.80	3720.30	3720.65	3719.80	0.35	0.00	-0.35
	241916	3664.61	3665.11	3665.82	0.00	0.71	0.00	-0.71
	424674	3654.60	3655.10	3656.17	3655.57	1.07	0.47	-0.60
	76960	3653.67	3654.17	3656.64	3656.14	2.47	1.97	-0.51
	450998	3654.47	3654.97	3655.72	3655.14	0.75	0.17	-0.58
	204663	3715.24	3715.74	3716.32	3715.83	0.58	0.09	-0.49
	203626	3716.31	3716.81	3717.22	3716.75	0.41	0.00	-0.41
	3991	3717.34	3717.84	3717.98	3717.50	0.14	0.00	-0.14
	671780	3717.58	3718.08	3718.58	3718.03	0.50	0.00	-0.50
	166085	3717.94	3718.44	3719.19	3718.58	0.74	0.14	-0.61
	569026	3719.03	3719.53	3719.87	3719.23	0.34	0.00	-0.34
	450061	3713.23	3713.73	3714.55	3713.56	0.82	0.00	-0.82
	300391	3719.58	3720.08	3720.52	3719.88	0.45	0.00	-0.45
	425498	3713.12	3713.62	3714.33	3713.39	0.72	0.00	-0.72
	671760	3720.47	3720.97	3721.58	3720.99	0.61	0.01	-0.60
	505420	3713.16	3713.66	3715.10	3713.72	1.44	0.06	-1.38
	240911	3713.64	3714.14	3714.21	3713.25	0.07	0.00	-0.07
	475735	3714.50	3715.00	3715.72	3713.95	0.72	0.00	-0.72
	564222	3723.81	3724.31	3724.68	3724.02	0.38	0.00	-0.38
	204834	3714.78	3715.28	3715.41	0.00	0.13	0.00	-0.13
	564246	3721.26	3721.76	3722.15	3721.35	0.38	0.00	-0.38
	628596	3724.08	3724.58	3724.66	0.00	0.08	0.00	-0.08
	654463	3712.54	3713.04	3713.06	0.00	0.02	0.00	-0.02
	283701	3724.41	3724.91	3725.17	3724.48	0.26	0.00	-0.26
	322984	3730.01	3730.51	3730.66	0.00	0.16	0.00	-0.16
	607611	3736.76	3737.26	3737.41	0.00	0.15	0.00	-0.15
	655994	3736.90	3737.40	3737.45	3736.88	0.05	0.00	-0.05
	518113	3736.94	3737.44	3737.71	3737.11	0.27	0.00	-0.27
	530679	3737.38	3737.88	3737.89	3737.33	0.00	0.00	0.00
	262136	3741.71	3742.21	3742.51	3742.07	0.30	0.00	-0.30
	654152	3802.29	3802.79	3804.51	3803.04	1.72	0.26	-1.47
	2786	3801.84	3802.34	3802.47	0.00	0.13	0.00	-0.13
	123567	3809.85	3810.35	3811.21	0.00	0.85	0.00	-0.85
	28200	3810.21	3810.71	3811.58	0.00	0.87	0.00	-0.87
	122864	3810.85	3811.35	3811.64	0.00	0.30	0.00	-0.30
	425018	3809.52	3810.02	3811.06	0.00	1.04	0.00	-1.04
	654136	3813.10	3813.60	3814.67	0.00	1.07	0.00	-1.07
	632757	3831.06	3831.56	3832.10	0.00	0.54	0.00	-0.54
	300154	3838.74	3839.24	3839.27	0.00	0.03	0.00	-0.03
	374746	3835.19	3835.69	3836.21	0.00	0.53	0.00	-0.53
	492361	3837.62	3838.12	3838.32	0.00	0.19	0.00	-0.19
	593952	3836.37	3836.87	3837.52	0.00	0.65	0.00	-0.65
	75863	3838.25	3838.75	3839.63	3838.69	0.88	0.00	-0.88
	543198	3839.43	3839.93	3840.78	0.00	0.85	0.00	-0.85
	671527	3846.64	3847.14	3847.44	0.00	0.29	0.00	-0.29
	28102	3846.31	3846.81	3848.25	3846.48	1.44	0.00	-1.44
	300153	3847.15	3847.65	3848.04	0.00	0.38	0.00	-0.38
	589640	3847.59	3848.09	3849.13	3846.75	1.04	0.00	-1.04
	475225	3848.98	3849.48	3849.54	0.00	0.06	0.00	-0.06
	449496	3849.01	3849.51	3850.28	0.00	0.77	0.00	-0.77
	374728	3850.47	3850.97	3851.48	0.00	0.51	0.00	-0.51
	449493	3852.43	3852.93	3853.27	0.00	0.34	0.00	-0.34
	475220	3852.73	3853.23	3853.69	0.00	0.46	0.00	-0.46
	424139	3852.28	3852.78	3854.18	0.00	1.40	0.00	-1.40
	424874	3854.29	3854.79	3855.21	0.00	0.42	0.00	-0.42
	75525	3860.27	3860.77	3860.92	0.00	0.16	0.00	-0.16
	164071	3860.93	3861.43	3861.46	0.00	0.03	0.00	-0.03
	475513	3635.48	3635.98	3636.67	0.00	0.69	0.00	-0.69
	242016	3639.19	3639.69	3640.08	0.00	0.39	0.00	-0.39
	372301	3639.10	3639.60	3640.08	0.00	0.48	0.00	-0.48
	347165	3639.26	3639.76	3640.08	0.00	0.31	0.00	-0.31
	122818	3644.48	3644.98	3645.15	3644.71	0.17	0.00	-0.17
	607714	3650.95	3651.45	3651.90	3651.05	0.44	0.00	-0.44
	492626	3650.13	3650.63	3651.90	3651.05	1.27	0.43	-0.85
	451135	3654.31	3654.81	3654.97	3654.36	0.16	0.00	-0.16
	569059	3655.23	3655.73	3656.00	3655.62	0.27	0.00	-0.27
	164845	3700.53	3701.03	3701.41	3700.98	0.39	0.00	-0.39
	449801	3715.02	3715.52	3715.68	3714.91	0.16	0.00	-0.16

SSA4 (FMP ID: 143000011) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	398597	3716.75	3717.25	3717.58	3717.24	0.33	0.00	-0.33
	321471	3754.45	3754.95	3755.28	0.00	0.33	0.00	-0.33
	122588	3845.72	3846.22	3846.63	0.00	0.41	0.00	-0.41
0.2% Annual Chance Commercial Buildings	568700	3639.29	3639.79	3,641.17	3639.68	1.38	0.00	-1.38
	242452	3639.12	3639.62	3,641.17	3639.68	1.55	0.07	-1.49
	3520	3639.07	3639.57	3,641.17	3639.68	1.60	0.12	-1.49
	492323	3640.36	3640.86	3,641.17	0.00	0.31	0.00	-0.31
	240218	3638.48	3638.98	3,641.17	3639.68	2.19	0.70	-1.49
	28984	3639.39	3639.89	3,641.17	3639.69	1.28	0.00	-1.28
	123284	3639.43	3639.93	3,641.17	3639.69	1.24	0.00	-1.24
	517881	3638.36	3638.86	3,641.17	3639.68	2.31	0.83	-1.49
	300109	3639.13	3639.63	3,641.17	3639.69	1.54	0.06	-1.49
	505137	3639.63	3640.13	3,641.17	3639.69	1.04	0.00	-1.04
	240204	3638.10	3638.60	3,641.17	3639.68	2.57	1.09	-1.49
	283151	3640.03	3640.53	3,641.17	3639.69	0.64	0.00	-0.64
	475967	3638.07	3638.57	3,641.17	3639.68	2.60	1.12	-1.49
	449451	3637.73	3638.23	3,641.17	3639.68	2.94	1.46	-1.49
	476063	3638.45	3638.95	3,641.17	3639.69	2.22	0.74	-1.48
	164184	3638.07	3638.57	3,641.17	3639.69	2.60	1.12	-1.48
	530479	3637.95	3638.45	3,641.17	3639.68	2.72	1.23	-1.49
	449453	3637.47	3637.97	3,641.17	3639.68	3.20	1.72	-1.49
	165397	3638.61	3639.11	3,641.17	3639.69	2.06	0.58	-1.48
	372470	3638.17	3638.67	3,641.17	3639.69	2.50	1.02	-1.48
	122989	3637.95	3638.45	3,641.17	3639.68	2.72	1.23	-1.49
	589625	3638.70	3639.20	3,641.17	3639.69	1.98	0.50	-1.48
	75697	3637.85	3638.35	3,641.17	3639.69	2.83	1.34	-1.49
	202854	3638.29	3638.79	3,641.17	3639.69	2.39	0.90	-1.48
	632672	3637.65	3638.15	3,641.17	3639.68	3.02	1.54	-1.49
	75700	3637.78	3638.28	3,641.17	3639.69	2.89	1.41	-1.48
	530476	3637.60	3638.10	3,641.17	3639.68	3.07	1.58	-1.49
	607385	3644.05	3644.55	3,645.14	3644.69	0.59	0.15	-0.44
	164241	3644.50	3645.00	3,645.18	3644.73	0.18	0.00	-0.18
	321669	3650.64	3651.14	3,651.90	3651.05	0.76	0.00	-0.76
	321669	3650.64	3651.14	3,651.90	3651.05	0.76	0.00	-0.76
	607688	3653.27	3653.77	3,654.47	3653.27	0.70	0.00	-0.70
	243267	3652.84	3653.34	3,654.48	3653.28	1.14	0.00	-1.14
	594363	3654.25	3654.75	3,654.97	3654.12	0.21	0.00	-0.21
	372737	3652.56	3653.06	3,654.49	3653.34	1.43	0.27	-1.16
	29564	3652.93	3653.43	3,654.96	3654.26	1.53	0.83	-0.70
	164848	3654.40	3654.90	3,654.98	3654.27	0.08	0.00	-0.08
	476477	3653.89	3654.39	3,654.53	0.00	0.14	0.00	-0.14
	518104	3654.24	3654.74	3,654.99	3654.50	0.26	0.00	-0.26
	76144	3689.91	3690.41	3,691.58	3691.52	1.17	1.11	-0.07
	204453	3689.77	3690.27	3,691.76	3691.70	1.49	1.42	-0.07
	262148	3656.07	3656.57	3,657.66	3657.60	1.09	1.02	-0.06
	607634	3655.35	3655.85	3,656.25	3656.22	0.39	0.37	-0.03
	450881	3655.26	3655.76	3,656.37	3656.35	0.61	0.59	-0.03
	375080	3654.22	3654.72	3,656.54	3656.52	1.82	1.80	-0.02
	300364	3656.88	3657.38	3,658.50	3658.47	1.12	1.09	-0.03
	543358	3713.68	3714.18	3,715.25	3714.87	1.07	0.69	-0.38
	76089	3774.67	3775.17	3,775.50	3774.51	0.33	0.00	-0.33
	671656	3765.48	3765.98	3,766.45	0.00	0.47	0.00	-0.47
	671653	3767.18	3767.68	3,768.71	3767.43	1.03	0.00	-1.03
	29289	3770.29	3770.79	3,771.55	0.00	0.76	0.00	-0.76
	372634	3764.50	3765.00	3,765.48	3765.45	0.49	0.45	-0.03
	45410	3777.10	3777.60	3,777.99	3775.41	0.39	0.00	-0.39
	164574	3781.99	3782.49	3,782.59	3781.11	0.09	0.00	-0.09
	74741	3778.50	3779.00	3,779.73	3779.73	0.73	0.73	0.00
	568833	3808.48	3808.98	3,810.44	3808.70	1.47	0.00	-1.47

Appendix 5H

SOC4 (FMP ID: 143000021) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	321041	3638.39	3638.89	3639.68	0.00	0.79	0.00	-0.79
	240794	3639.04	3639.54	3639.68	0.00	0.15	0.00	-0.15
	424575	3638.95	3639.45	3639.68	0.00	0.23	0.00	-0.23
	589463	3638.73	3639.23	3639.68	0.00	0.46	0.00	-0.46
	372301	3639.10	3639.60	3639.68	0.00	0.08	0.00	-0.08
	449140	3638.04	3638.54	3640.03	0.00	1.50	0.00	-1.50
	202427	3639.22	3639.72	3640.41	0.00	0.69	0.00	-0.69
	202448	3639.29	3639.79	3640.45	0.00	0.66	0.00	-0.66
	240770	3641.87	3642.37	3642.74	0.00	0.36	0.00	-0.36
	242033	3647.78	3648.28	3649.34	0.00	1.06	0.00	-1.06
0.2% Annual Chance Residences	475513	3635.48	3635.98	3636.19	3635.79	0.21	0.00	-0.21
	202620	3639.20	3639.70	3640.11	3640.01	0.41	0.31	-0.10
	28767	3639.45	3639.95	3640.11	3640.01	0.17	0.07	-0.10
	322282	3639.27	3639.77	3640.11	3640.01	0.34	0.24	-0.10
	321041	3638.39	3638.89	3640.11	3640.01	1.22	1.12	-0.10
	240794	3639.04	3639.54	3640.11	3640.01	0.57	0.48	-0.10
	424575	3638.95	3639.45	3640.11	3640.01	0.66	0.56	-0.10
	632560	3639.49	3639.99	3640.11	3640.01	0.12	0.03	-0.10
	423847	3639.21	3639.71	3640.11	3640.01	0.40	0.31	-0.10
	589463	3638.73	3639.23	3640.11	3640.01	0.88	0.79	-0.10
	242016	3639.19	3639.69	3640.11	3640.01	0.42	0.32	-0.10
	423838	3639.37	3639.87	3640.11	3640.01	0.24	0.15	-0.10
	372301	3639.10	3639.60	3640.11	3640.01	0.51	0.41	-0.10
	542945	3639.47	3639.97	3640.11	3640.01	0.15	0.05	-0.10
	474878	3639.38	3639.88	3640.11	3640.01	0.23	0.13	-0.10
	347165	3639.26	3639.76	3640.11	3640.01	0.35	0.25	-0.10
	164748	3639.28	3639.78	3640.11	3640.01	0.34	0.24	-0.10
	27707	3639.21	3639.71	3640.11	3640.01	0.40	0.30	-0.10
	671301	3639.59	3640.09	3640.11	3640.01	0.02	0.00	-0.02
	282877	3639.19	3639.69	3640.11	3640.01	0.42	0.32	-0.10
	45068	3639.51	3640.01	3640.11	3640.01	0.10	0.01	-0.10
	449140	3638.04	3638.54	3640.47	3640.31	1.93	1.78	-0.15
	202427	3639.22	3639.72	3640.94	3640.74	1.22	1.02	-0.20
	28665	3640.08	3640.58	3640.99	3640.79	0.41	0.21	-0.21
	202448	3639.29	3639.79	3641.00	3640.79	1.20	1.00	-0.21
	423769	3640.13	3640.63	3640.93	3640.74	0.30	0.10	-0.19
	28642	3640.42	3640.92	3640.93	3640.74	0.01	0.00	-0.01
	163513	3640.04	3640.54	3640.95	3640.75	0.41	0.21	-0.20
	240770	3641.87	3642.37	3642.86	3642.86	0.49	0.48	-0.01
	242033	3647.78	3648.28	3649.78	3649.75	1.50	1.47	-0.03
	282886	3649.90	3650.40	3650.43	3650.39	0.03	0.00	-0.03
	240204	3638.10	3638.60	3638.80	3638.45	0.21	0.00	-0.21
	475967	3638.07	3638.57	3638.80	3638.45	0.24	0.00	-0.24
	449451	3637.73	3638.23	3638.80	3638.45	0.58	0.22	-0.36
	164184	3638.07	3638.57	3638.80	3638.45	0.23	0.00	-0.23
	530479	3637.95	3638.45	3638.80	3638.45	0.35	0.00	-0.35
	449453	3637.47	3637.97	3638.80	3638.45	0.84	0.48	-0.36
	372470	3638.17	3638.67	3638.80	3638.45	0.13	0.00	-0.13
	122989	3637.95	3638.45	3638.80	3638.45	0.35	0.00	-0.35
	75697	3637.85	3638.35	3638.80	3638.45	0.46	0.10	-0.36
	202854	3638.29	3638.79	3638.80	3638.45	0.02	0.00	-0.02
	632672	3637.65	3638.15	3638.80	3638.45	0.66	0.30	-0.36
	75700	3637.78	3638.28	3638.80	3638.45	0.52	0.17	-0.36
	530476	3637.60	3638.10	3638.80	3638.45	0.70	0.35	-0.36
	655584	3638.22	3638.72	3638.80	3638.53	0.09	0.00	-0.09
	202620	3639.20	3639.70	3640.11	3640.01	0.41	0.31	-0.10
	321041	3638.39	3638.89	3640.11	3640.01	1.22	1.12	-0.10
	240794	3639.04	3639.54	3640.11	3640.01	0.57	0.48	-0.10
	424575	3638.95	3639.45	3640.11	3640.01	0.66	0.56	-0.10
	589463	3638.73	3639.23	3640.11	3640.01	0.88	0.79	-0.10
	423838	3639.37	3639.87	3640.11	3640.01	0.24	0.15	-0.10
	542945	3639.47	3639.97	3640.11	3640.01	0.15	0.05	-0.10
	164748	3639.28	3639.78	3640.11	3640.01	0.34	0.24	-0.10
	27707	3639.21	3639.71	3640.11	3640.01	0.40	0.30	-0.10
	202427	3639.22	3639.72	3640.94	3640.74	1.22	1.02	-0.20
	28665	3640.08	3640.58	3640.99	3640.79	0.41	0.21	-0.21
	423769	3640.13	3640.63	3640.93	3640.74	0.30	0.10	-0.19
	163513	3640.04	3640.54	3640.95	3640.75	0.41	0.21	-0.20
	28767	3639.45	3639.95	3640.11	3640.01	0.17	0.07	-0.10

Appendix 5H

SOC4 (FMP ID: 143000021) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	322282	3639.27	3639.77	3640.11	3640.01	0.34	0.24	-0.10
	632560	3639.49	3639.99	3640.11	3640.01	0.12	0.03	-0.10
	423847	3639.21	3639.71	3640.11	3640.01	0.40	0.31	-0.10
	474878	3639.38	3639.88	3640.11	3640.01	0.23	0.13	-0.10
	671301	3639.59	3640.09	3640.11	3640.01	0.02	0.00	-0.02
	282877	3639.19	3639.69	3640.11	3640.01	0.42	0.32	-0.10
	45068	3639.51	3640.01	3640.11	3640.01	0.10	0.01	-0.10
	449140	3638.04	3638.54	3640.47	3640.31	1.93	1.78	-0.15
	202448	3639.29	3639.79	3641.00	3640.79	1.20	1.00	-0.21
	655584	3638.22	3638.72	3638.80	3638.53	0.09	0.00	-0.09
	475513	3635.48	3635.98	3636.19	3635.79	0.21	0.00	-0.21
	242016	3639.19	3639.69	3640.11	3640.01	0.42	0.32	-0.10
	372301	3639.10	3639.60	3640.11	3640.01	0.51	0.41	-0.10
	347165	3639.26	3639.76	3640.11	3640.01	0.35	0.25	-0.10
0.2% Annual Chance Commercial Buildings	240204	3638.10	3638.60	3,638.80	3638.45	0.21	0.00	-0.21
	475967	3638.07	3638.57	3,638.80	3638.45	0.24	0.00	-0.24
	449451	3637.73	3638.23	3,638.80	3638.45	0.58	0.22	-0.36
	164184	3638.07	3638.57	3,638.80	3638.45	0.23	0.00	-0.23
	530479	3637.95	3638.45	3,638.80	3638.45	0.35	0.00	-0.35
	449453	3637.47	3637.97	3,638.80	3638.45	0.84	0.48	-0.36
	372470	3638.17	3638.67	3,638.80	3638.45	0.13	0.00	-0.13
	122989	3637.95	3638.45	3,638.80	3638.45	0.35	0.00	-0.35
	75697	3637.85	3638.35	3,638.80	3638.45	0.46	0.10	-0.36
	202854	3638.29	3638.79	3,638.80	3638.45	0.02	0.00	-0.02
	632672	3637.65	3638.15	3,638.80	3638.45	0.66	0.30	-0.36
	75700	3637.78	3638.28	3,638.80	3638.45	0.52	0.17	-0.36
	530476	3637.60	3638.10	3,638.80	3638.45	0.70	0.35	-0.36

Appendix 5H

NW26 (FMP ID: 143000113) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	328884	3732.83	3733.33	3733.94	3733.85	0.61	0.52	-0.09
1% Annual Chance Commercial Buildings	85506	3732.84	3733.34	3733.99	3733.90	0.65	0.56	-0.09
	48824	3732.75	3733.25	3733.93	3733.84	0.68	0.59	-0.09
	136831	3732.79	3733.29	3733.93	3733.84	0.64	0.55	-0.09
	534042	3732.81	3733.31	3733.94	3733.85	0.63	0.54	-0.09
	495976	3734.11	3734.61	3735.13	3735.04	0.52	0.43	-0.09

Appendix 5H

NW16 (FMP ID: 143000097) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Commercial	214028	3766.77	3767.27	3768.85	0.00	1.58	0.00	-1.58
	457467	3765.39	3765.89	3766.98	0.00	1.09	0.00	-1.09
	662517	3767.49	3767.99	3769.26	0.00	1.27	0.00	-1.27
0.2% Annual Chance Residences	252687	3743.75	3744.25	3744.95	3744.96	0.70	0.71	0.01
	381022	3745.48	3745.98	3746.28	3746.08	0.30	0.10	-0.20
	355192	3744.68	3745.18	3745.77	3745.75	0.59	0.58	-0.02
	677273	3764.05	3764.55	3765.09	0.00	0.55	0.00	-0.55
0.2% Annual Chance Commercial	662517	3767.49	3767.99	3,769.26	0.00	1.27	0.00	-1.27
	214028	3766.77	3767.27	3,768.85	0.00	1.58	0.00	-1.58
	457467	3765.39	3765.89	3,766.98	0.00	1.09	0.00	-1.09

Appendix 5H

NW3 (FMP ID: 143000111) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	328884	3732.83	3733.33	3733.94	0.00	0.61	0.00	-0.61
1% Annual Chance Commercial Buildings	85506	3732.84	3733.34	3733.99	0.00	0.65	0.00	-0.65
	48824	3732.75	3733.25	3733.93	0.00	0.68	0.00	-0.68
	136831	3732.79	3733.29	3733.93	1.00	0.64	0.00	-0.64
	534042	3732.81	3733.31	3733.94	0.00	0.63	0.00	-0.63
	495976	3734.11	3734.61	3735.13	0.00	0.52	0.00	-0.52

Appendix 5H

NE3B (FMP ID: 143000100) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	566378	3908.04	3908.54	3908.86	3908.70	0.33	0.17	-0.16
	352308	3908.34	3908.84	3909.67	3909.46	0.83	0.61	-0.21
	630687	3917.08	3917.58	3917.90	3917.74	0.32	0.15	-0.16
	352276	3917.29	3917.79	3918.00	3917.99	0.21	0.19	-0.02
	132486	3917.86	3918.36	3918.60	3918.59	0.24	0.23	-0.01
	302672	3918.10	3918.60	3919.07	3919.06	0.47	0.46	-0.02
	7675	3919.84	3920.34	3920.47	3920.46	0.13	0.12	-0.01
	132829	3920.11	3920.61	3920.69	0.00	0.08	0.00	-0.08
	171377	3920.54	3921.04	3921.15	0.00	0.11	0.00	-0.11
	132779	3922.71	3923.21	3924.09	3923.79	0.88	0.58	-0.30
	81927	3925.07	3925.57	3925.68	3925.68	0.10	0.10	0.00
	404145	3930.12	3930.62	3930.84	3930.84	0.22	0.22	0.00
	288110	3927.74	3928.24	3928.77	3928.77	0.53	0.53	0.00
	327146	3929.24	3929.74	3929.95	3929.95	0.21	0.21	0.00
	658940	3930.50	3931.00	3931.23	3931.23	0.23	0.23	0.00
	172667	3915.45	3915.95	3916.39	3916.38	0.44	0.43	-0.01
	302675	3916.03	3916.53	3916.99	3916.98	0.47	0.46	-0.01
	288013	3923.19	3923.69	3924.85	3924.38	1.16	0.69	-0.47
	571284	3925.30	3925.80	3926.06	3926.06	0.26	0.26	0.00
	352362	3925.69	3926.19	3926.48	3926.48	0.29	0.29	0.00
	429058	3930.59	3931.09	3932.04	0.00	0.95	0.00	-0.95
	132794	3919.20	3919.70	3919.93	3919.93	0.23	0.23	0.00
	660317	3920.16	3920.66	3920.69	3920.17	0.03	0.00	-0.03
	247730	3920.57	3921.07	3921.22	3921.02	0.15	0.00	-0.15
	81914	3920.39	3920.89	3921.17	0.00	0.28	0.00	-0.28
	288310	3920.30	3920.80	3921.21	3920.88	0.41	0.08	-0.33
	33060	3920.60	3921.10	3921.39	3921.09	0.29	0.00	-0.29
	454534	3921.51	3922.01	3922.14	3922.11	0.12	0.10	-0.02
	566402	3923.47	3923.97	3924.16	3924.16	0.19	0.19	0.00
	288016	3923.15	3923.65	3924.54	3924.15	0.89	0.51	-0.39
	211360	3923.34	3923.84	3924.29	3923.96	0.45	0.12	-0.32
	209869	3923.43	3923.93	3925.10	3924.49	1.17	0.56	-0.61
	404031	3923.86	3924.36	3924.85	3924.69	0.49	0.33	-0.16
	209584	3923.91	3924.41	3925.44	3924.60	1.03	0.19	-0.84
	132763	3924.31	3924.81	3925.92	3924.70	1.11	0.00	-1.11
	403328	3924.08	3924.58	3925.31	3924.72	0.73	0.14	-0.59
	132478	3924.75	3925.25	3926.08	3925.24	0.83	0.00	-0.83
	635423	3926.22	3926.72	3927.21	3927.21	0.50	0.50	0.00
	327113	3924.88	3925.38	3925.78	3925.22	0.40	0.00	-0.40
	378955	3925.29	3925.79	3926.63	3925.40	0.84	0.00	-0.84
	592131	3927.31	3927.81	3928.13	3928.13	0.31	0.31	0.00
	264475	3930.65	3931.15	3931.18	3931.18	0.03	0.03	0.00
	33153	3929.29	3929.79	3930.06	3930.06	0.27	0.27	0.00
	327240	3931.27	3931.77	3931.84	3931.84	0.07	0.07	0.00
	171519	3929.71	3930.21	3930.36	3930.36	0.15	0.15	0.00
	352248	3925.33	3925.83	3926.30	3925.38	0.47	0.00	-0.47
	7596	3927.11	3927.61	3927.86	0.00	0.25	0.00	-0.25
	288343	3926.00	3926.50	3926.71	3926.71	0.21	0.21	0.00
	326185	3926.46	3926.96	3927.07	3927.07	0.12	0.12	0.00
	302687	3926.77	3927.27	3927.43	3927.43	0.16	0.16	0.00
	211502	3927.07	3927.57	3927.84	3927.84	0.27	0.27	0.00
	264454	3929.59	3930.09	3930.51	3930.51	0.42	0.42	0.00
	209848	3926.91	3927.41	3928.27	0.00	0.86	0.00	-0.86
	288588	3939.15	3939.65	3939.92	3939.92	0.27	0.27	0.00
	171708	3940.43	3940.93	3941.13	3941.13	0.20	0.20	0.00
	8575	3939.97	3940.47	3940.93	3940.93	0.46	0.46	0.00
	83567	3939.63	3940.13	3940.63	3940.63	0.50	0.50	0.00
	133213	3938.78	3939.28	3939.56	3939.56	0.28	0.28	0.00
	133247	3937.81	3938.31	3938.47	3938.47	0.16	0.16	0.00
	172871	3934.33	3934.83	3934.91	3934.91	0.09	0.09	0.00
	249425	3928.58	3929.08	3929.38	3929.38	0.30	0.30	0.00
	264485	3934.89	3935.39	3935.75	3935.75	0.36	0.36	0.00
	171537	3933.44	3933.94	3934.47	3934.47	0.53	0.53	0.00
	327243	3932.89	3933.39	3933.81	3933.81	0.43	0.43	0.00
	47722	3932.33	3932.83	3933.33	3933.33	0.50	0.50	0.00
	288451	3931.78	3932.28	3932.51	3932.51	0.22	0.22	0.00
	210019	3931.04	3931.54	3932.07	3932.07	0.53	0.53	0.00
	326260	3930.14	3930.64	3930.83	3930.83	0.18	0.18	0.00
	210002	3929.32	3929.82	3929.90	3929.90	0.09	0.09	0.00

NE3B (FMP ID: 143000100) Hydraulic Model Depth Results at Buildings Analyzed

1% Annual Chance Residences	172518	3927.10	3927.60	3928.46	0.00	0.86	0.00	-0.86
	132819	3927.09	3927.59	3928.56	0.00	0.97	0.00	-0.97
	8297	3927.43	3927.93	3928.67	0.00	0.74	0.00	-0.74
	132822	3927.50	3928.00	3928.56	0.00	0.56	0.00	-0.56
	429114	3927.33	3927.83	3928.81	0.00	0.98	0.00	-0.98
	404265	3940.51	3941.01	3941.21	3941.21	0.21	0.21	0.00
	480745	3927.52	3928.02	3929.01	0.00	1.00	0.00	-1.00
	430057	3941.00	3941.50	3941.93	3941.93	0.43	0.43	0.00
	609973	3940.46	3940.96	3941.62	3941.62	0.66	0.66	0.00
	264400	3927.70	3928.20	3928.88	0.00	0.68	0.00	-0.68
	82686	3927.87	3928.37	3928.97	0.00	0.60	0.00	-0.60
	264382	3927.72	3928.22	3929.22	0.00	1.00	0.00	-1.00
	326158	3928.02	3928.52	3928.95	0.00	0.43	0.00	-0.43
	326166	3928.14	3928.64	3929.01	0.00	0.37	0.00	-0.37
	532889	3927.90	3928.40	3929.22	0.00	0.81	0.00	-0.81
	287985	3927.73	3928.23	3929.42	0.00	1.19	0.00	-1.19
	480760	3928.25	3928.75	3929.19	0.00	0.44	0.00	-0.44
	480750	3928.08	3928.58	3929.46	0.00	0.87	0.00	-0.87
	302624	3927.76	3928.26	3929.62	0.00	1.37	0.00	-1.37
	660404	3935.51	3936.01	3936.63	3936.63	0.62	0.62	0.00
	288313	3928.56	3929.06	3929.42	0.00	0.36	0.00	-0.36
	171361	3928.26	3928.76	3929.15	0.00	0.39	0.00	-0.39
	571225	3928.24	3928.74	3929.77	0.00	1.03	0.00	-1.03
	403292	3928.52	3929.02	3930.05	3928.80	1.03	0.00	-1.03
	288003	3928.57	3929.07	3929.78	0.00	0.72	0.00	-0.72
	507569	3928.40	3928.90	3930.00	0.00	1.10	0.00	-1.10
	404008	3928.39	3928.89	3930.09	0.00	1.20	0.00	-1.20
	609824	3928.94	3929.44	3930.43	3929.31	0.99	0.00	-0.99
	532887	3928.68	3929.18	3930.34	0.00	1.16	0.00	-1.16
	82531	3928.78	3929.28	3930.52	3929.44	1.24	0.16	-1.08
	132740	3929.04	3929.54	3930.46	0.00	0.93	0.00	-0.93
	592062	3929.19	3929.69	3930.88	3929.78	1.19	0.09	-1.10
	592036	3931.12	3931.62	3932.13	3931.75	0.51	0.13	-0.38
	287992	3929.46	3929.96	3930.70	0.00	0.74	0.00	-0.74
	209839	3929.38	3929.88	3930.91	3929.94	1.02	0.06	-0.96
	264380	3929.75	3930.25	3931.10	3930.12	0.84	0.00	-0.84
	403299	3929.68	3930.18	3930.89	0.00	0.72	0.00	-0.72
	596859	3930.14	3930.64	3931.85	3930.84	1.20	0.20	-1.01
	403290	3930.68	3931.18	3932.04	3930.84	0.85	0.00	-0.85
	209453	3932.37	3932.87	3934.09	3934.08	1.22	1.21	-0.01
	172486	3932.95	3933.45	3934.30	3934.29	0.85	0.84	-0.01
	709196	3933.67	3934.17	3934.63	3934.63	0.46	0.46	0.00
	129837	3932.46	3932.96	3934.25	3934.24	1.29	1.28	-0.01
	709192	3933.00	3933.50	3934.54	3934.54	1.04	1.04	0.00
	709193	3933.02	3933.52	3934.55	3934.55	1.03	1.03	0.00
	132282	3933.32	3933.82	3934.45	3934.45	0.64	0.63	0.00
	566331	3932.68	3933.18	3934.40	3934.39	1.22	1.21	-0.01
	709194	3933.36	3933.86	3934.67	3934.67	0.82	0.82	0.00
	709183	3933.86	3934.36	3934.67	3934.67	0.31	0.31	0.00
	709191	3932.97	3933.47	3934.65	0.00	1.18	0.00	-1.18
1% Annual Chance Commercial Buildings	171650	3906.95	3907.45	3907.96	3907.85	0.51	0.41	-0.11
	82693	3909.92	3910.42	3911.00	3910.94	0.58	0.52	-0.06
	326156	3910.50	3911.00	3911.64	3911.57	0.64	0.57	-0.07
	596893	3911.35	3911.85	3912.75	3912.58	0.90	0.73	-0.17
	33830	3912.86	3913.36	3914.22	3913.67	0.87	0.32	-0.55
	658862	3914.00	3914.50	3915.34	3915.23	0.84	0.72	-0.12
	81893	3915.25	3915.75	3915.95	0.00	0.20	0.00	-0.20
	571251	3916.17	3916.67	3916.89	0.00	0.22	0.00	-0.22
	327097	3915.93	3916.43	3916.89	0.00	0.46	0.00	-0.46
	81819	3916.28	3916.78	3917.22	0.00	0.44	0.00	-0.44
	429073	3916.14	3916.64	3917.37	0.00	0.72	0.00	-0.72
	592071	3918.59	3919.09	3919.89	0.00	0.80	0.00	-0.80
	302634	3919.78	3920.28	3920.79	3920.38	0.51	0.09	-0.41
	403244	3923.35	3923.85	3924.58	0.00	0.74	0.00	-0.74
	47633	3924.11	3924.61	3925.32	0.00	0.71	0.00	-0.71
	480751	3925.22	3925.72	3927.27	3926.31	1.55	0.59	-0.96
	82837	3927.77	3928.27	3928.58	0.00	0.32	0.00	-0.32

Appendix 5H

HAC3 (FMP ID: 143000025) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	504775	3627.17	3627.67	3627.73	0.00	0.07	0.00	-0.07
	671136	3627.12	3627.62	3627.73	0.00	0.12	0.00	-0.12
	424049	3627.21	3627.71	3627.73	0.00	0.03	0.00	-0.03
	530124	3627.09	3627.59	3627.73	0.00	0.15	0.00	-0.15
	321773	3627.14	3627.64	3627.73	0.00	0.09	0.00	-0.09
	44984	3631.10	3631.60	3631.67	3631.13	0.07	0.00	-0.07
	655059	3645.09	3645.59	3645.84	0.00	0.25	0.00	-0.25
	202948	3632.66	3633.16	3633.35	3632.77	0.19	0.00	-0.19
	627999	3639.27	3639.77	3640.04	3639.74	0.27	0.00	-0.27
	449678	3639.99	3640.49	3640.77	3640.05	0.28	0.00	-0.28
0.2% Annual Chance Residences	530123	3625.97	3626.47	3626.58	3625.93	0.11	0.00	-0.11
	119717	3625.55	3626.05	3626.58	3625.93	0.53	0.00	-0.53
	504775	3627.17	3627.67	3628.02	3627.77	0.35	0.11	-0.25
	671136	3627.12	3627.62	3628.02	3627.77	0.40	0.15	-0.25
	423490	3627.37	3627.87	3628.02	3627.77	0.15	0.00	-0.15
	424049	3627.21	3627.71	3628.02	3627.77	0.31	0.06	-0.25
	530124	3627.09	3627.59	3628.02	3627.77	0.43	0.18	-0.25
	321773	3627.14	3627.64	3628.02	3627.77	0.38	0.13	-0.25
	121724	3627.43	3627.93	3628.02	3627.77	0.09	0.00	-0.09
	517547	3627.26	3627.76	3628.03	3627.78	0.27	0.02	-0.25
	346765	3630.40	3630.90	3630.97	3630.66	0.07	0.00	-0.07
	44984	3631.10	3631.60	3631.93	3631.63	0.33	0.03	-0.30
	44985	3637.67	3638.17	3638.33	3638.16	0.17	0.00	-0.17
	655059	3645.09	3645.59	3646.17	3645.87	0.58	0.28	-0.30
	202948	3632.66	3633.16	3633.76	3633.32	0.59	0.16	-0.43
	27563	3632.50	3633.00	3633.12	3632.90	0.12	0.00	-0.12
	627999	3639.27	3639.77	3640.35	3640.06	0.59	0.29	-0.29
	449678	3639.99	3640.49	3641.02	3640.79	0.53	0.30	-0.23

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	504571	4073.16	4073.66	4076.25	0.00	2.59	0.00	-2.59
	261492	4047.85	4048.35	4054.49	4054.48	6.14	6.13	-0.01
	27900	4051.53	4052.03	4055.13	4055.13	3.11	3.11	0.00
	119572	4051.32	4051.82	4055.14	4055.14	3.31	3.31	0.00
	627862	4063.52	4064.02	4064.61	4064.22	0.59	0.20	-0.40
	44836	4064.41	4064.91	4065.41	4065.13	0.50	0.22	-0.29
	74280	4064.92	4065.42	4065.84	4065.50	0.42	0.08	-0.33
	654537	4066.47	4066.97	4067.04	0.00	0.07	0.00	-0.07
	120714	4065.87	4066.37	4066.59	4066.14	0.21	0.00	-0.21
	475030	4065.91	4066.41	4066.46	4066.23	0.05	0.00	-0.05
	653536	4066.80	4067.30	4067.32	4066.96	0.02	0.00	-0.02
	542679	4065.57	4066.07	4066.61	4066.27	0.54	0.20	-0.34
	606851	4065.44	4065.94	4066.63	4066.26	0.69	0.32	-0.37
	261453	4065.77	4066.27	4066.87	4066.33	0.60	0.06	-0.54
	239411	4066.40	4066.90	4067.34	4066.64	0.44	0.00	-0.44
	423787	4066.28	4066.78	4067.28	4066.64	0.51	0.00	-0.51
	74134	4062.83	4063.33	4063.81	0.00	0.48	0.00	-0.48
	448633	4500.15	4500.65	4502.62	4502.62	1.97	1.97	0.00
	449286	4061.91	4062.41	4063.38	4063.27	0.96	0.86	-0.10
	346344	4061.19	4061.69	4061.81	4061.52	0.13	0.00	-0.13
	299706	4041.76	4042.26	4042.31	0.00	0.05	0.00	-0.05
	119597	4043.14	4043.64	4044.07	0.00	0.43	0.00	-0.43
	373854	4041.75	4042.25	4043.04	4042.67	0.79	0.42	-0.37
	74296	4047.12	4047.62	4048.69	0.00	1.07	0.00	-1.07
	121006	4062.55	4063.05	4063.39	4061.47	0.34	0.00	-0.34
	239840	4062.86	4063.36	4063.55	0.00	0.18	0.00	-0.18
	120885	4043.55	4044.05	4044.59	4044.40	0.54	0.36	-0.19
	320627	4062.74	4063.24	4063.26	4062.17	0.02	0.00	-0.02
	27885	4062.81	4063.31	4063.43	4063.06	0.12	0.00	-0.12
	606868	4042.07	4042.57	4043.17	4042.94	0.60	0.37	-0.23
	282281	4062.41	4062.91	4063.38	0.00	0.47	0.00	-0.47
	373852	4042.20	4042.70	4043.49	4042.98	0.79	0.28	-0.51
	606865	4043.11	4043.61	4044.40	4044.00	0.78	0.39	-0.40
	321519	4044.47	4044.97	4045.40	0.00	0.43	0.00	-0.43
	239422	4048.63	4049.13	4049.13	0.00	0.01	0.00	-0.01
	73971	4062.00	4062.50	4063.58	0.00	1.08	0.00	-1.08
	346421	4043.56	4044.06	4045.04	0.00	0.98	0.00	-0.98
	491889	4045.08	4045.58	4046.84	4046.50	1.26	0.92	-0.34
	27395	4046.84	4047.34	4048.17	4047.72	0.84	0.38	-0.46
	654724	4046.00	4046.50	4047.32	4046.85	0.82	0.35	-0.47
	73400	4063.02	4063.52	4063.58	4063.14	0.06	0.00	-0.06
	121290	4063.74	4064.24	4064.34	4063.82	0.10	0.00	-0.10
	321414	4062.30	4062.80	4063.57	4061.84	0.77	0.00	-0.77
	73973	4062.86	4063.36	4063.57	0.00	0.21	0.00	-0.21
	201555	4063.95	4064.45	4064.69	4064.29	0.25	0.00	-0.25
	239968	4050.05	4050.55	4050.85	4050.63	0.30	0.09	-0.21
	653546	4048.56	4049.06	4049.62	0.00	0.56	0.00	-0.56
	44845	4044.89	4045.39	4045.93	0.00	0.54	0.00	-0.54
	163740	4047.21	4047.71	4048.26	0.00	0.55	0.00	-0.55
	593239	4042.08	4042.58	4043.02	4042.54	0.43	0.00	-0.43
	474536	4041.28	4041.78	4042.35	0.00	0.57	0.00	-0.57
	423811	4041.23	4041.73	4042.41	4042.10	0.68	0.37	-0.31
	2350	4061.00	4061.50	4063.59	4059.28	2.09	0.00	-2.09
	568224	4046.49	4046.99	4047.75	4046.91	0.76	0.00	-0.76
	653545	4052.14	4052.64	4053.38	0.00	0.74	0.00	-0.74
	27415	4041.02	4041.52	4042.48	0.00	0.97	0.00	-0.97
	627871	4047.00	4047.50	4048.14	0.00	0.63	0.00	-0.63
	162747	4062.78	4063.28	4063.59	0.00	0.31	0.00	-0.31
	372040	4041.03	4041.53	4042.34	4042.03	0.82	0.50	-0.31
	491890	4043.10	4043.60	4044.44	0.00	0.84	0.00	-0.84
	44850	4042.70	4043.20	4044.17	0.00	0.97	0.00	-0.97
	398032	4042.27	4042.77	4042.77	4042.33	0.00	0.00	0.00
	593232	4044.25	4044.75	4045.43	0.00	0.68	0.00	-0.68
	241006	4044.97	4045.47	4046.04	4045.85	0.58	0.39	-0.19
	27402	4043.14	4043.64	4044.58	4044.03	0.94	0.39	-0.55
	542687	4052.73	4053.23	4053.29	0.00	0.06	0.00	-0.06
	27995	4042.52	4043.02	4044.22	4043.83	1.20	0.82	-0.38
	504681	4045.33	4045.83	4046.53	4046.33	0.69	0.50	-0.20
	504674	4046.93	4047.43	4048.69	0.00	1.27	0.00	-1.27

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	568225	4045.78	4046.28	4046.94	4046.75	0.66	0.47	-0.19
	241025	4040.66	4041.16	4042.33	4042.03	1.17	0.87	-0.30
	517464	4042.83	4043.33	4044.16	4043.92	0.83	0.59	-0.24
	627872	4048.69	4049.19	4049.92	4049.55	0.73	0.36	-0.37
	423342	4062.94	4063.44	4063.74	4062.40	0.31	0.00	-0.31
	449400	4040.72	4041.22	4042.41	4042.07	1.19	0.85	-0.34
	44860	4040.47	4040.97	4042.33	4042.03	1.36	1.06	-0.30
	1997	4040.69	4041.19	4042.39	4042.04	1.20	0.85	-0.35
	398024	4043.03	4043.53	4044.61	4044.61	1.08	1.08	0.00
	73446	4056.02	4056.52	4058.93	4057.78	2.40	1.26	-1.15
	654634	4065.43	4065.93	4065.98	4065.37	0.05	0.00	-0.05
	239974	4050.32	4050.82	4051.37	0.00	0.54	0.00	-0.54
	449382	4061.87	4062.37	4062.48	4062.17	0.11	0.00	-0.11
	423381	4055.55	4056.05	4058.40	0.00	2.35	0.00	-2.35
	163023	4044.95	4045.45	4045.72	4045.53	0.27	0.09	-0.18
	517462	4043.41	4043.91	4044.41	4044.26	0.50	0.36	-0.14
	162877	4060.81	4061.31	4061.78	0.00	0.46	0.00	-0.46
	530022	4047.60	4048.10	4049.57	4049.15	1.47	1.04	-0.42
	504675	4050.21	4050.71	4051.18	4051.12	0.48	0.42	-0.06
	530015	4061.62	4062.12	4062.34	4062.07	0.22	0.00	-0.22
	2459	4059.98	4060.48	4061.95	4061.45	1.47	0.96	-0.51
	517430	4066.40	4066.90	4066.91	4066.49	0.02	0.00	-0.02
	73392	4064.47	4064.97	4065.06	4063.81	0.09	0.00	-0.09
	163024	4041.53	4042.03	4043.26	4043.15	1.23	1.12	-0.11
	627850	4066.55	4067.05	4067.12	4066.64	0.07	0.00	-0.07
	282350	4043.83	4044.33	4045.34	4045.15	1.01	0.82	-0.19
	530023	4046.62	4047.12	4047.63	0.00	0.51	0.00	-0.51
	27397	4050.09	4050.59	4051.37	4051.35	0.78	0.76	-0.02
	320662	4041.91	4042.41	4043.43	4043.30	1.02	0.89	-0.13
	282353	4043.77	4044.27	4045.50	4045.31	1.23	1.05	-0.19
	606857	4059.35	4059.85	4060.01	0.00	0.15	0.00	-0.15
	121022	4066.84	4067.34	4067.42	4066.84	0.07	0.00	-0.07
	201557	4066.36	4066.86	4067.31	4066.72	0.45	0.00	-0.45
	202084	4065.99	4066.49	4067.20	4066.68	0.71	0.19	-0.51
	74301	4041.79	4042.29	4043.40	4043.28	1.11	0.99	-0.12
	589160	4043.51	4044.01	4045.46	4045.35	1.45	1.33	-0.11
	163748	4041.88	4042.38	4043.41	4043.32	1.03	0.94	-0.09
	261460	4060.12	4060.62	4060.96	0.00	0.34	0.00	-0.34
	162803	4065.81	4066.31	4066.70	4065.44	0.39	0.00	-0.39
	371988	4064.77	4065.27	4065.41	4064.23	0.14	0.00	-0.14
	346423	4042.39	4042.89	4044.01	4043.00	1.13	0.12	-1.01
	491860	4066.74	4067.24	4067.91	4066.94	0.67	0.00	-0.67
	346333	4067.24	4067.74	4067.94	4066.94	0.20	0.00	-0.20
	491922	4038.46	4038.96	4041.17	4040.21	2.21	1.24	-0.96
	2030	4038.16	4038.66	4041.18	4040.21	2.52	1.55	-0.97
	568270	4038.35	4038.85	4041.16	4040.20	2.31	1.36	-0.95
	654841	4038.99	4039.49	4041.14	4040.19	1.64	0.70	-0.94
	321623	4038.29	4038.79	4041.24	4040.32	2.45	1.54	-0.91
	563564	4039.26	4039.76	4041.10	4040.16	1.34	0.40	-0.94
	73492	4037.85	4038.35	4041.43	4040.53	3.08	2.18	-0.90
	320713	4038.49	4038.99	4041.10	4040.16	2.11	1.16	-0.95
	563551	4038.90	4039.40	4041.22	4040.31	1.82	0.91	-0.91
	44884	4038.54	4039.04	4041.11	4040.16	2.07	1.12	-0.95
	239481	4038.61	4039.11	4041.09	4040.13	1.98	1.03	-0.96
	371880	4078.63	4079.13	4079.35	4077.98	0.22	0.00	-0.22
	474635	4026.38	4026.88	4027.82	4026.82	0.94	0.00	-0.94
	201845	4038.64	4039.14	4040.99	4040.03	1.85	0.89	-0.96
	163946	4038.46	4038.96	4041.14	4040.25	2.19	1.29	-0.90
	299643	4071.41	4071.91	4072.32	4070.87	0.41	0.00	-0.41
	282500	4026.36	4026.86	4027.84	4026.86	0.98	0.00	-0.98
	27490	4026.48	4026.98	4027.88	4027.02	0.89	0.04	-0.85
	653636	4028.89	4029.39	4030.35	4029.60	0.95	0.21	-0.75
	627723	4078.25	4078.75	4079.31	4077.97	0.57	0.00	-0.57
	120472	4078.12	4078.62	4079.33	4077.98	0.72	0.00	-0.72
	201019	4078.39	4078.89	4079.37	4077.98	0.48	0.00	-0.48
	448653	4078.71	4079.21	4079.39	4077.99	0.18	0.00	-0.18
	201497	4078.75	4079.25	4079.36	4077.99	0.11	0.00	-0.11
	162824	4065.74	4066.24	4067.73	4067.02	1.49	0.79	-0.70
	282540	4066.45	4066.95	4068.08	4067.35	1.13	0.40	-0.73

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	2146	4078.62	4079.12	4079.38	4078.00	0.26	0.00	-0.26
	397567	4066.75	4067.25	4067.87	4067.05	0.62	0.00	-0.62
	119575	4066.86	4067.36	4068.01	4067.11	0.65	0.00	-0.65
	653541	4066.94	4067.44	4068.28	4067.32	0.84	0.00	-0.84
	201671	4066.52	4067.02	4068.22	4067.24	1.20	0.22	-0.97
	164322	4022.82	4023.32	4027.73	4026.80	4.41	3.47	-0.93
	423366	4066.89	4067.39	4068.25	0.00	0.86	0.00	-0.86
	346354	4066.99	4067.49	4068.26	0.00	0.77	0.00	-0.77
	491980	4027.15	4027.65	4028.39	4028.06	0.74	0.41	-0.33
	44959	4024.14	4024.64	4027.73	4026.80	3.09	2.16	-0.93
	28252	4022.21	4022.71	4027.73	4026.80	5.01	4.09	-0.93
	74283	4067.61	4068.11	4068.15	0.00	0.04	0.00	-0.04
	632237	4024.95	4025.45	4027.74	4026.80	2.28	1.35	-0.93
	593200	4067.56	4068.06	4068.16	0.00	0.09	0.00	-0.09
	201670	4067.50	4068.00	4068.06	0.00	0.06	0.00	-0.06
	504796	4023.58	4024.08	4027.72	4026.80	3.64	2.71	-0.92
	163013	4067.07	4067.57	4068.11	0.00	0.54	0.00	-0.54
	517562	4026.04	4026.54	4027.85	4027.12	1.30	0.58	-0.72
	398014	4067.10	4067.60	4068.03	0.00	0.44	0.00	-0.44
	320799	4022.72	4023.22	4027.72	4026.80	4.50	3.58	-0.92
	491874	4067.03	4067.53	4068.04	0.00	0.51	0.00	-0.51
	320773	4025.43	4025.93	4028.07	4027.63	2.14	1.70	-0.44
	321883	4024.64	4025.14	4025.41	4024.50	0.27	0.00	-0.27
	423550	4024.63	4025.13	4027.71	4026.80	2.58	1.67	-0.91
	2080	4025.57	4026.07	4028.12	4027.74	2.06	1.68	-0.38
	74088	4071.62	4072.12	4073.11	4071.77	0.99	0.00	-0.99
	299688	4066.70	4067.20	4068.11	0.00	0.92	0.00	-0.92
	239568	4020.18	4020.68	4027.72	4026.80	7.04	6.12	-0.92
	491873	4067.37	4067.87	4068.27	0.00	0.40	0.00	-0.40
	346780	4024.57	4025.07	4025.81	0.00	0.74	0.00	-0.74
	397709	4020.48	4020.98	4027.72	4026.80	6.74	5.82	-0.92
	241410	4021.45	4021.95	4027.72	4026.80	5.77	4.85	-0.92
	4865953	4024.47	4024.97	4025.86	0.00	0.89	0.00	-0.89
	423786	4067.25	4067.75	4068.15	0.00	0.41	0.00	-0.41
	202783	4025.40	4025.90	4026.63	0.00	0.73	0.00	-0.73
	654965	4021.00	4021.50	4027.72	4026.80	6.22	5.30	-0.92
	74089	4071.23	4071.73	4073.11	4071.77	1.39	0.04	-1.34
	398013	4067.37	4067.87	4068.35	0.00	0.48	0.00	-0.48
	121671	4026.02	4026.52	4027.09	0.00	0.57	0.00	-0.57
	589083	4073.49	4073.99	4074.32	4073.11	0.33	0.00	-0.33
	373833	4067.09	4067.59	4068.14	0.00	0.55	0.00	-0.55
	653660	4019.61	4020.11	4027.71	4026.80	7.61	6.69	-0.92
	346777	4025.61	4026.11	4027.00	0.00	0.88	0.00	-0.88
	44786	4071.15	4071.65	4072.92	4071.67	1.27	0.03	-1.25
	73580	4022.52	4023.02	4027.72	4026.80	4.69	3.77	-0.92
	346762	4022.98	4023.48	4027.72	4026.80	4.24	3.32	-0.92
	346142	4079.41	4079.91	4080.96	4079.99	1.06	0.09	-0.97
	299631	4071.64	4072.14	4073.10	4071.76	0.96	0.00	-0.96
	240996	4066.67	4067.17	4068.07	0.00	0.90	0.00	-0.90
	27772	4073.06	4073.56	4074.38	4073.10	0.82	0.00	-0.82
	529950	4073.25	4073.75	4074.31	4073.05	0.55	0.00	-0.55
	346388	4073.85	4074.35	4074.50	4073.26	0.15	0.00	-0.15
	474650	4021.06	4021.56	4027.71	4026.80	6.15	5.24	-0.91
	163097	4022.87	4023.37	4027.71	4026.80	4.34	3.43	-0.91
	563629	4022.91	4023.41	4027.71	4026.80	4.30	3.39	-0.91
	2110	4022.60	4023.10	4027.71	4026.80	4.61	3.70	-0.91
	449181	4072.28	4072.78	4073.02	4071.70	0.24	0.00	-0.24
	74282	4066.80	4067.30	4068.03	0.00	0.73	0.00	-0.73
	321307	4074.29	4074.79	4074.99	4073.81	0.20	0.00	-0.20
	423785	4066.73	4067.23	4068.04	0.00	0.81	0.00	-0.81
	74279	4066.87	4067.37	4068.08	0.00	0.71	0.00	-0.71
	120135	4078.82	4079.32	4080.96	4079.99	1.65	0.67	-0.97
	589257	4023.36	4023.86	4027.71	4026.80	3.85	2.94	-0.91
	74281	4066.55	4067.05	4068.03	4067.14	0.97	0.09	-0.88
	201784	4072.87	4073.37	4074.56	4073.23	1.19	0.00	-1.19
	654968	4021.83	4022.33	4027.71	4026.80	5.38	4.47	-0.91
	27517	4024.32	4024.82	4027.70	4026.80	2.88	1.98	-0.91
	606794	4072.86	4073.36	4074.52	4073.23	1.16	0.00	-1.16
	504794	4021.79	4022.29	4027.71	4026.80	5.42	4.51	-0.91

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	239546	4027.39	4027.89	4028.44	0.00	0.55	0.00	-0.55
	346352	4066.79	4067.29	4068.33	0.00	1.05	0.00	-1.05
	2450	4066.52	4067.02	4068.01	4067.13	0.99	0.11	-0.89
	164327	4021.69	4022.19	4027.70	4026.80	5.52	4.61	-0.91
	670940	4073.37	4073.87	4074.75	4073.46	0.88	0.00	-0.88
	201381	4025.02	4025.52	4027.21	0.00	1.69	0.00	-1.69
	2802	4022.35	4022.85	4027.70	4026.80	4.85	3.95	-0.90
	201992	4022.35	4022.85	4027.70	4026.80	4.84	3.94	-0.90
	121301	4066.43	4066.93	4068.32	0.00	1.39	0.00	-1.39
	240273	4021.48	4021.98	4027.70	4026.80	5.72	4.82	-0.90
	239240	4079.67	4080.17	4080.97	4080.14	0.81	0.00	-0.81
	606982	4022.24	4022.74	4027.70	4026.80	4.96	4.06	-0.91
	28244	4021.60	4022.10	4027.70	4026.80	5.60	4.69	-0.91
	474654	4024.31	4024.81	4027.70	4026.80	2.89	1.99	-0.90
	593005	4074.60	4075.10	4080.96	4079.99	5.86	4.89	-0.97
	568164	4073.53	4074.03	4074.89	4073.59	0.86	0.00	-0.86
	346145	4074.24	4074.74	4080.96	4079.99	6.23	5.25	-0.97
	320804	4021.37	4021.87	4027.70	4026.80	5.83	4.93	-0.90
	606795	4073.55	4074.05	4074.69	4073.24	0.64	0.00	-0.64
	589034	4076.69	4077.19	4077.82	4076.83	0.63	0.00	-0.63
	119436	4074.89	4075.39	4080.96	4079.99	5.57	4.60	-0.97
	474352	4074.31	4074.81	4080.96	4079.99	6.15	5.18	-0.97
	321092	4079.95	4080.45	4080.95	4079.99	0.51	0.00	-0.51
	73685	4077.49	4077.99	4080.96	4079.99	2.97	2.00	-0.97
	201010	4074.79	4075.29	4080.96	4079.99	5.67	4.70	-0.97
	120250	4078.60	4079.10	4079.45	4078.47	0.35	0.00	-0.35
	529850	4077.38	4077.88	4080.97	4079.99	3.08	2.11	-0.97
	397418	4078.92	4079.42	4080.10	0.00	0.68	0.00	-0.68
	239598	4075.33	4075.83	4077.66	4076.71	1.83	0.88	-0.95
	504555	4079.50	4080.00	4080.09	4079.23	0.10	0.00	-0.10
	73229	4076.24	4076.74	4080.97	4079.99	4.22	3.25	-0.97
	593236	4049.63	4050.13	4050.37	0.00	0.24	0.00	-0.24
	373463	4076.69	4077.19	4080.96	4079.98	3.77	2.79	-0.98
	504535	4076.52	4077.02	4080.96	4079.98	3.93	2.96	-0.98
	423443	4076.20	4076.70	4080.96	4079.98	4.25	3.28	-0.98
	201783	4073.97	4074.47	4075.48	4074.42	1.01	0.00	-1.01
	201208	4040.75	4041.25	4041.44	0.00	0.19	0.00	-0.19
	120519	4074.73	4075.23	4075.35	4074.41	0.11	0.00	-0.11
	162855	4072.85	4073.35	4075.49	4074.42	2.13	1.07	-1.07
	449156	4073.98	4074.48	4075.51	4074.42	1.03	0.00	-1.03
	1915	4074.57	4075.07	4075.48	4074.42	0.41	0.00	-0.41
	201100	4073.23	4073.73	4075.49	4074.42	1.75	0.69	-1.07
	517373	4073.63	4074.13	4075.50	4074.42	1.37	0.29	-1.07
	627761	4074.67	4075.17	4076.08	0.00	0.91	0.00	-0.91
	542637	4074.35	4074.85	4075.48	4074.42	0.64	0.00	-0.64
	589081	4073.60	4074.10	4075.49	4074.42	1.39	0.32	-1.06
	517479	4042.34	4042.84	4043.61	0.00	0.77	0.00	-0.77
	44681	4194.40	4194.90	4195.90	4195.86	1.00	0.96	-0.03
	627762	4074.75	4075.25	4076.06	4074.72	0.81	0.00	-0.81
	120862	4074.98	4075.48	4075.93	4074.68	0.45	0.00	-0.45
	517348	4074.95	4075.45	4076.12	4074.83	0.68	0.00	-0.68
	239663	4075.42	4075.92	4076.01	4074.71	0.09	0.00	-0.09
	299594	4075.24	4075.74	4075.88	4074.58	0.13	0.00	-0.13
	606787	4073.48	4073.98	4075.49	4074.42	1.50	0.44	-1.07
	120373	4074.76	4075.26	4075.96	0.00	0.70	0.00	-0.70
	654409	4075.39	4075.89	4076.04	4074.75	0.15	0.00	-0.15
	670945	4074.34	4074.84	4075.46	4074.42	0.62	0.00	-0.62
	320551	4075.39	4075.89	4076.13	4074.92	0.24	0.00	-0.24
	517383	4073.90	4074.40	4075.49	4074.42	1.08	0.02	-1.07
	627759	4075.38	4075.88	4076.11	4074.96	0.24	0.00	-0.24
	504614	4073.63	4074.13	4075.49	4074.42	1.36	0.30	-1.06
	73411	4201.31	4201.81	4201.87	4201.87	0.06	0.06	0.00
	670941	4073.87	4074.37	4075.48	4074.42	1.11	0.05	-1.06
	282424	4074.73	4075.23	4075.48	0.00	0.25	0.00	-0.25
	563429	4074.57	4075.07	4075.49	4074.42	0.41	0.00	-0.41
	163408	4074.62	4075.12	4075.49	0.00	0.37	0.00	-0.37
	542632	4074.70	4075.20	4075.49	4074.42	0.29	0.00	-0.29
	282420	4074.53	4075.03	4075.49	4074.42	0.46	0.00	-0.46
	448728	4074.49	4074.99	4075.49	4074.42	0.49	0.00	-0.49

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	529943	4074.69	4075.19	4075.49	4074.42	0.30	0.00	-0.30
	162648	4075.93	4076.43	4076.48	4075.44	0.06	0.00	-0.06
	627791	4074.38	4074.88	4075.49	4074.42	0.60	0.00	-0.60
	517384	4074.66	4075.16	4075.49	4074.42	0.32	0.00	-0.32
	529906	4075.50	4076.00	4076.18	4075.04	0.19	0.00	-0.19
	201657	4074.63	4075.13	4075.49	4074.42	0.36	0.00	-0.36
	589080	4074.89	4075.39	4075.49	4074.38	0.10	0.00	-0.10
	397486	4074.82	4075.32	4075.49	0.00	0.16	0.00	-0.16
	27746	4075.42	4075.92	4076.09	0.00	0.17	0.00	-0.17
	320579	4074.87	4075.37	4075.49	4074.35	0.12	0.00	-0.12
	346385	4074.65	4075.15	4075.49	0.00	0.34	0.00	-0.34
	163275	4076.50	4077.00	4077.30	0.00	0.29	0.00	-0.29
	449060	4075.33	4075.83	4076.30	4075.13	0.47	0.00	-0.47
	201069	4076.69	4077.19	4077.34	4076.46	0.16	0.00	-0.16
	44756	4076.26	4076.76	4077.08	4076.30	0.32	0.00	-0.32
	517343	4075.21	4075.71	4077.37	4076.46	1.66	0.76	-0.91
	4866045	4207.55	4208.05	4208.26	4208.10	0.21	0.05	-0.16
	474499	4210.98	4211.48	4211.58	4211.51	0.10	0.03	-0.06
	4866046	4210.60	4211.10	4211.43	4211.34	0.33	0.25	-0.08
	120237	4083.41	4083.91	4083.99	4082.50	0.09	0.00	-0.09
	627758	4076.71	4077.21	4077.45	4076.45	0.24	0.00	-0.24
	448670	4083.26	4083.76	4084.02	4082.59	0.26	0.00	-0.26
	4866047	4219.33	4219.83	4220.38	4220.37	0.55	0.54	-0.01
	27234	4216.58	4217.08	4217.71	4217.62	0.63	0.55	-0.09
	589059	4076.69	4077.19	4077.26	4076.43	0.07	0.00	-0.07
	474397	4076.89	4077.39	4077.89	4077.03	0.51	0.00	-0.51
	423273	4076.14	4076.64	4077.70	4076.72	1.06	0.09	-0.98
	320513	4084.67	4085.17	4085.41	4083.86	0.24	0.00	-0.24
	120861	4076.45	4076.95	4077.15	4076.38	0.19	0.00	-0.19
	654287	4085.40	4085.90	4086.06	4084.97	0.16	0.00	-0.16
	491740	4086.46	4086.96	4087.00	4085.74	0.04	0.00	-0.04
	397369	4338.77	4339.27	4340.95	4340.88	1.68	1.61	-0.08
	653394	4101.25	4101.75	4102.26	4101.99	0.51	0.25	-0.26
	201211	4047.14	4047.64	4048.55	0.00	0.90	0.00	-0.90
	504532	4099.42	4099.92	4100.13	4099.54	0.21	0.00	-0.21
	202763	4039.13	4039.63	4041.52	4041.07	1.89	1.44	-0.45
	163108	4035.85	4036.35	4038.55	0.00	2.20	0.00	-2.20
	202763	4039.13	4039.63	4041.52	4041.07	1.89	1.44	-0.45
	671140	4039.10	4039.60	4041.11	4040.29	1.51	0.69	-0.82
	44922	4042.40	4042.90	4043.45	0.00	0.55	0.00	-0.55
	654838	4043.68	4044.18	4046.00	0.00	1.82	0.00	-1.82
	654953	4038.88	4039.38	4041.11	4040.22	1.73	0.84	-0.89
	73510	4043.81	4044.31	4046.00	0.00	1.69	0.00	-1.69
	44972	4033.56	4034.06	4034.42	0.00	0.36	0.00	-0.36
	202001	4029.19	4029.69	4031.20	0.00	1.51	0.00	-1.51
	74682	4036.58	4037.08	4038.35	0.00	1.27	0.00	-1.27
	239532	4042.20	4042.70	4042.96	0.00	0.26	0.00	-0.26
	121478	4048.64	4049.14	4050.15	0.00	1.02	0.00	-1.02
	449640	4039.11	4039.61	4041.11	0.00	1.50	0.00	-1.50
	475168	4043.90	4044.40	4045.12	0.00	0.72	0.00	-0.72
	241035	4048.46	4048.96	4049.16	0.00	0.20	0.00	-0.20
	28144	4042.90	4043.40	4045.07	4044.45	1.66	1.04	-0.62
	74381	4039.15	4039.65	4040.96	0.00	1.31	0.00	-1.31
	449650	4039.40	4039.90	4041.14	0.00	1.24	0.00	-1.24
	632240	4039.30	4039.80	4041.14	0.00	1.34	0.00	-1.34
	397644	4043.23	4043.73	4045.10	4044.42	1.37	0.69	-0.68
	162911	4048.96	4049.46	4049.74	0.00	0.27	0.00	-0.27
	119672	4043.17	4043.67	4045.16	4044.46	1.49	0.79	-0.70
	398370	4028.16	4028.66	4029.61	0.00	0.95	0.00	-0.95
	321655	4043.98	4044.48	4045.10	4044.42	0.62	0.00	-0.62
	261567	4037.43	4037.93	4038.95	0.00	1.02	0.00	-1.02
	632250	4035.05	4035.55	4036.42	0.00	0.87	0.00	-0.87
	448874	4043.00	4043.50	4045.13	0.00	1.62	0.00	-1.62
	474581	4046.03	4046.53	4047.25	4046.67	0.71	0.14	-0.57
	606929	4045.26	4045.76	4045.95	4045.47	0.19	0.00	-0.19
	654969	4038.88	4039.38	4040.58	0.00	1.21	0.00	-1.21
	606872	4047.18	4047.68	4050.16	4048.60	2.48	0.92	-1.55
	321875	4038.86	4039.36	4039.66	0.00	0.30	0.00	-0.30
	239484	4045.85	4046.35	4047.30	0.00	0.95	0.00	-0.95

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	424030	4043.38	4043.88	4045.21	0.00	1.33	0.00	-1.33
	74526	4040.19	4040.69	4041.63	0.00	0.94	0.00	-0.94
	201292	4044.40	4044.90	4045.23	0.00	0.33	0.00	-0.33
	163031	4047.92	4048.42	4050.16	0.00	1.73	0.00	-1.73
	2086	4039.44	4039.94	4041.71	0.00	1.78	0.00	-1.78
	27491	4042.14	4042.64	4042.93	0.00	0.29	0.00	-0.29
	671100	4043.67	4044.17	4045.45	4044.85	1.28	0.69	-0.59
	632182	4046.33	4046.83	4047.65	0.00	0.82	0.00	-0.82
	74322	4047.96	4048.46	4050.15	0.00	1.70	0.00	-1.70
	121483	4047.88	4048.38	4050.16	0.00	1.78	0.00	-1.78
	121099	4043.93	4044.43	4045.32	0.00	0.89	0.00	-0.89
	74332	4043.94	4044.44	4045.32	0.00	0.88	0.00	-0.88
	654835	4047.77	4048.27	4048.93	0.00	0.66	0.00	-0.66
	74517	4040.99	4041.49	4041.88	0.00	0.39	0.00	-0.39
	589226	4044.04	4044.54	4045.32	0.00	0.78	0.00	-0.78
	320623	4073.98	4074.48	4074.52	4073.93	0.05	0.00	-0.05
	654628	4073.32	4073.82	4073.86	4073.20	0.04	0.00	-0.04
	1955	4072.10	4072.60	4072.82	0.00	0.21	0.00	-0.21
	670978	4074.01	4074.51	4074.87	4074.07	0.36	0.00	-0.36
	320622	4072.77	4073.27	4074.79	4074.06	1.52	0.78	-0.73
	299756	4044.74	4045.24	4045.35	0.00	0.11	0.00	-0.11
	44816	4072.25	4072.75	4072.77	0.00	0.03	0.00	-0.03
	632185	4046.63	4047.13	4047.66	0.00	0.53	0.00	-0.53
	74118	4073.37	4073.87	4074.31	0.00	0.44	0.00	-0.44
	162948	4073.44	4073.94	4073.96	4073.45	0.01	0.00	-0.01
	346542	4069.55	4070.05	4070.66	0.00	0.61	0.00	-0.61
	563608	4044.73	4045.23	4045.64	0.00	0.41	0.00	-0.41
	504741	4047.19	4047.69	4049.19	0.00	1.49	0.00	-1.49
	397546	4069.41	4069.91	4070.65	0.00	0.74	0.00	-0.74
	346521	4047.42	4047.92	4049.24	0.00	1.32	0.00	-1.32
	121520	4047.21	4047.71	4048.09	0.00	0.38	0.00	-0.38
	163051	4047.85	4048.35	4049.48	4049.03	1.13	0.68	-0.45
	162952	4069.89	4070.39	4070.65	4069.72	0.27	0.00	-0.27
	589197	4047.11	4047.61	4049.48	4049.03	1.87	1.42	-0.45
	671084	4047.64	4048.14	4049.13	4048.47	0.99	0.33	-0.66
	121085	4047.63	4048.13	4049.31	0.00	1.19	0.00	-1.19
	475268	4042.31	4042.81	4043.04	0.00	0.23	0.00	-0.23
	491864	4069.97	4070.47	4070.65	4069.72	0.18	0.00	-0.18
	449550	4044.58	4045.08	4046.25	0.00	1.17	0.00	-1.17
	397539	4072.17	4072.67	4072.81	4072.16	0.13	0.00	-0.13
	240118	4048.11	4048.61	4049.21	0.00	0.60	0.00	-0.60
	423350	4071.63	4072.13	4072.24	0.00	0.11	0.00	-0.11
	589131	4070.01	4070.51	4070.66	4069.72	0.15	0.00	-0.15
	346141	4112.70	4113.20	4113.74	4113.01	0.54	0.00	-0.54
	121285	4070.23	4070.73	4070.80	4069.72	0.07	0.00	-0.07
	163950	4048.34	4048.84	4049.58	4049.13	0.73	0.29	-0.45
	653518	4071.69	4072.19	4072.95	4072.37	0.76	0.18	-0.58
	542671	4071.63	4072.13	4072.29	4071.46	0.16	0.00	-0.16
	474493	4071.69	4072.19	4072.51	4071.62	0.32	0.00	-0.32
	321509	4060.60	4061.10	4061.14	0.00	0.03	0.00	-0.03
	2117	4035.63	4036.13	4036.21	0.00	0.08	0.00	-0.08
	606906	4048.22	4048.72	4049.86	4049.52	1.14	0.80	-0.34
	119553	4073.43	4073.93	4074.29	4073.64	0.36	0.00	-0.36
	653523	4070.98	4071.48	4072.23	4071.42	0.74	0.00	-0.74
	201397	4112.06	4112.56	4113.22	4112.50	0.67	0.00	-0.67
	201987	4041.51	4042.01	4042.87	4041.90	0.86	0.00	-0.86
	240140	4043.63	4044.13	4046.59	0.00	2.46	0.00	-2.46
	397649	4043.70	4044.20	4046.56	4045.99	2.37	1.79	-0.57
	589119	4070.79	4071.29	4072.23	4071.42	0.94	0.13	-0.81
	162578	4111.18	4111.68	4112.82	4112.00	1.14	0.32	-0.81
	299557	4112.94	4113.44	4114.67	4113.83	1.23	0.39	-0.84
	239241	4114.60	4115.10	4116.22	4115.37	1.13	0.27	-0.85
	397622	4047.06	4047.56	4049.48	4048.95	1.93	1.40	-0.53
	448644	4112.38	4112.88	4114.10	4113.29	1.22	0.41	-0.81
	240815	4071.56	4072.06	4072.74	4072.24	0.67	0.17	-0.50
	202758	4043.43	4043.93	4046.48	4045.87	2.55	1.94	-0.61
	654202	4111.75	4112.25	4113.11	4112.22	0.86	0.00	-0.86
	627919	4048.79	4049.29	4050.75	0.00	1.46	0.00	-1.46
	671065	4047.52	4048.02	4052.08	0.00	4.06	0.00	-4.06

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	474351	4113.89	4114.39	4115.01	4114.24	0.62	0.00	-0.62
	119645	4049.93	4050.43	4052.31	4051.55	1.89	1.12	-0.76
	282389	4049.26	4049.76	4052.36	4051.63	2.60	1.87	-0.73
	201161	4114.89	4115.39	4116.88	4115.98	1.49	0.59	-0.90
	593001	4115.93	4116.43	4117.40	4116.67	0.97	0.23	-0.74
	2448	4059.86	4060.36	4060.38	0.00	0.02	0.00	-0.02
	517497	4050.44	4050.94	4052.92	0.00	1.98	0.00	-1.98
	568068	4119.93	4120.43	4121.37	4120.53	0.94	0.10	-0.84
	474518	4057.96	4058.46	4060.12	4059.57	1.65	1.11	-0.55
	119631	4051.21	4051.71	4053.83	4053.20	2.12	1.49	-0.63
	2013	4052.49	4052.99	4053.86	0.00	0.88	0.00	-0.88
	530069	4053.31	4053.81	4053.87	0.00	0.06	0.00	-0.06
	530064	4052.10	4052.60	4053.89	0.00	1.28	0.00	-1.28
	28029	4053.31	4053.81	4055.42	4054.85	1.61	1.03	-0.58
	163059	4054.41	4054.91	4055.61	0.00	0.70	0.00	-0.70
	373933	4054.00	4054.50	4056.19	4055.69	1.70	1.19	-0.50
	372056	4054.81	4055.31	4056.18	0.00	0.87	0.00	-0.87
	239865	4057.14	4057.64	4058.09	4058.09	0.44	0.44	0.00
	27894	4057.27	4057.77	4058.14	4058.14	0.37	0.37	0.00
	282541	4054.46	4054.96	4055.52	4055.45	0.56	0.49	-0.07
	27387	4055.21	4055.71	4056.15	4056.15	0.43	0.43	0.00
	475029	4054.28	4054.78	4055.58	4055.45	0.79	0.67	-0.13
	163018	4053.99	4054.49	4055.40	0.00	0.91	0.00	-0.91
	346561	4053.07	4053.57	4055.40	4054.88	1.83	1.31	-0.52
	449280	4062.11	4062.61	4063.34	4063.34	0.73	0.73	0.00
	589125	4062.58	4063.08	4063.32	4063.32	0.24	0.24	0.00
	653524	4062.15	4062.65	4063.40	4063.40	0.75	0.75	0.00
	504659	4058.27	4058.77	4059.20	4059.20	0.42	0.42	0.00
	448796	4057.33	4057.83	4058.83	4058.83	1.00	1.00	0.00
	397557	4057.65	4058.15	4059.73	4059.73	1.57	1.57	0.00
	201550	4061.43	4061.93	4062.73	4062.73	0.81	0.81	0.00
	121293	4057.19	4057.69	4059.33	4059.33	1.64	1.64	0.00
	282533	4056.50	4057.00	4058.39	4058.39	1.39	1.39	0.00
	299671	4059.57	4060.07	4061.33	4061.33	1.26	1.26	0.00
	372003	4061.72	4062.22	4062.25	4062.25	0.04	0.04	0.00
	201541	4062.75	4063.25	4064.09	4064.09	0.83	0.83	0.00
	162820	4054.59	4055.09	4056.55	4056.55	1.47	1.47	0.00
	372023	4050.17	4050.67	4054.49	4054.48	3.82	3.81	-0.01
	121019	4059.79	4060.29	4060.97	4060.97	0.68	0.68	0.00
	423382	4049.77	4050.27	4054.49	4054.48	4.22	4.21	-0.01
	397532	4069.34	4069.84	4070.14	4070.14	0.30	0.30	0.00
	299672	4059.17	4059.67	4060.03	4060.03	0.36	0.36	0.00
	653526	4060.04	4060.54	4061.17	4061.17	0.63	0.63	0.00
	120341	4136.35	4136.85	4136.88	4136.88	0.03	0.03	0.00
	239873	4052.56	4053.06	4054.49	4054.49	1.43	1.43	0.00
	239870	4053.21	4053.71	4055.17	4055.17	1.45	1.45	0.00
	654280	4136.66	4137.16	4137.30	4137.30	0.14	0.14	0.00
	504664	4052.60	4053.10	4054.51	4054.51	1.41	1.41	0.00
	73270	4111.18	4111.68	4112.09	4112.09	0.41	0.41	0.00
	593246	4045.55	4046.05	4054.49	4054.48	8.44	8.43	-0.01
	448869	4053.28	4053.78	4054.49	4054.48	0.71	0.70	-0.01
	240456	4098.94	4099.44	4099.73	4099.73	0.29	0.29	0.00
	201280	4053.92	4054.42	4054.49	4054.48	0.07	0.06	-0.01
	239249	4138.47	4138.97	4139.15	4139.15	0.18	0.18	0.00
	491727	4147.16	4147.66	4148.09	4148.09	0.43	0.43	0.00
	670865	4145.35	4145.85	4146.34	4146.34	0.49	0.49	0.00
	474400	4097.71	4098.21	4098.31	4098.31	0.10	0.10	0.00
	474575	4047.18	4047.68	4054.49	4054.48	6.81	6.80	-0.01
	654843	4046.74	4047.24	4054.49	4054.48	7.25	7.24	-0.01
	449397	4048.12	4048.62	4054.49	4054.48	5.87	5.86	-0.01
	631876	4137.54	4138.04	4138.17	4138.17	0.12	0.12	0.00
	346658	4046.35	4046.85	4054.49	4054.48	7.64	7.62	-0.01
	653399	4141.84	4142.34	4143.30	4143.30	0.96	0.96	0.00
	28136	4049.82	4050.32	4054.49	4054.48	4.17	4.16	-0.01
	44900	4053.13	4053.63	4054.49	4054.48	0.86	0.85	-0.01
	606729	4135.75	4136.25	4136.29	4136.29	0.05	0.05	0.00
	1835	4137.37	4137.87	4138.29	4138.29	0.42	0.42	0.00
	28138	4052.42	4052.92	4054.49	4054.48	1.57	1.56	-0.01
	589113	4057.25	4057.75	4058.58	4058.58	0.83	0.83	0.00

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	2460	4051.76	4052.26	4054.49	4054.48	2.23	2.22	-0.01
	606726	4141.11	4141.61	4141.61	4141.61	0.00	0.00	0.00
	282700	4053.45	4053.95	4054.49	4054.48	0.54	0.53	-0.01
	201816	4066.35	4066.85	4067.59	4067.59	0.74	0.74	0.00
	448848	4043.93	4044.43	4054.49	4054.48	10.06	10.05	-0.01
	474584	4044.23	4044.73	4054.49	4054.48	9.76	9.75	-0.01
	74172	4042.51	4043.01	4054.49	4054.48	11.48	11.47	-0.01
	121075	4066.63	4067.13	4067.43	4067.43	0.29	0.29	0.00
	120845	4100.09	4100.59	4100.61	4100.61	0.03	0.03	0.00
	449523	4043.73	4044.23	4054.49	4054.48	10.26	10.25	-0.01
	397643	4053.89	4054.39	4054.49	4054.48	0.10	0.09	-0.01
	606858	4053.41	4053.91	4054.49	4054.48	0.58	0.57	-0.01
	241212	4046.81	4047.31	4054.49	4054.48	7.18	7.17	-0.01
	563465	4066.50	4067.00	4067.40	4067.40	0.40	0.40	0.00
	121473	4053.03	4053.53	4054.49	4054.48	0.96	0.95	-0.01
	163021	4052.65	4053.15	4054.49	4054.48	1.34	1.33	-0.01
	448785	4053.28	4053.78	4055.14	4055.14	1.36	1.36	0.00
	654647	4052.16	4052.66	4055.06	4055.06	2.40	2.40	0.00
	239383	4061.61	4062.11	4062.14	4062.14	0.03	0.03	0.00
	27877	4063.33	4063.83	4064.27	4064.27	0.44	0.44	0.00
	449527	4042.00	4042.50	4054.49	4054.48	11.99	11.98	-0.01
	397536	4057.85	4058.35	4059.23	4059.23	0.88	0.88	0.00
	589128	4053.77	4054.27	4055.79	4055.79	1.52	1.52	0.00
	27378	4052.65	4053.15	4055.09	4055.09	1.94	1.94	0.00
	201149	4053.03	4053.53	4055.44	4055.44	1.91	1.91	0.00
	282510	4059.30	4059.80	4060.18	4060.18	0.38	0.38	0.00
	201150	4053.56	4054.06	4055.29	4055.29	1.23	1.23	0.00
	163958	4040.46	4040.96	4054.49	4054.48	13.53	13.52	-0.01
	529991	4060.05	4060.55	4060.80	4060.78	0.25	0.23	-0.02
	568279	4044.44	4044.94	4054.49	4054.48	9.55	9.54	-0.01
	121008	4059.41	4059.91	4061.13	4061.13	1.22	1.22	0.00
	2051	4044.93	4045.43	4054.49	4054.48	9.06	9.05	-0.01
	517516	4042.15	4042.65	4054.49	4054.48	11.84	11.83	-0.01
	593285	4041.82	4042.32	4054.49	4054.48	12.17	12.16	-0.01
	27883	4060.17	4060.67	4061.14	4061.14	0.47	0.47	0.00
	27884	4059.86	4060.36	4061.20	4061.20	0.84	0.84	0.00
	121020	4055.69	4056.19	4056.70	4056.70	0.51	0.51	0.00
	397549	4055.00	4055.50	4055.93	4055.93	0.43	0.43	0.00
	73441	4053.25	4053.75	4055.11	4055.11	1.36	1.36	0.00
	299669	4055.66	4056.16	4056.47	4056.47	0.31	0.31	0.00
	449285	4055.13	4055.63	4056.08	4056.08	0.45	0.45	0.00
	2437	4055.71	4056.21	4056.61	4056.61	0.40	0.40	0.00
	491849	4068.42	4068.92	4068.99	4068.99	0.06	0.06	0.00
	121023	4054.11	4054.61	4056.10	4056.10	1.48	1.48	0.00
	671000	4055.13	4055.63	4056.47	4056.47	0.85	0.85	0.00
	2345	4068.50	4069.00	4069.06	4069.06	0.06	0.06	0.00
	321499	4052.81	4053.31	4055.12	4055.12	1.81	1.81	0.00
	321428	4054.52	4055.02	4056.25	4056.25	1.23	1.23	0.00
	423360	4052.75	4053.25	4055.12	4055.12	1.87	1.87	0.00
	2440	4054.18	4054.68	4056.02	4056.02	1.34	1.34	0.00
	27892	4054.11	4054.61	4056.23	4056.23	1.62	1.62	0.00
	504655	4055.24	4055.74	4056.40	4056.40	0.66	0.66	0.00
	568207	4054.72	4055.22	4056.09	4056.09	0.87	0.87	0.00
	321406	4067.80	4068.30	4068.74	4068.74	0.44	0.44	0.00
	27893	4054.11	4054.61	4055.98	4055.98	1.37	1.37	0.00
	654734	4052.51	4053.01	4054.49	4054.48	1.48	1.47	-0.01
	606828	4064.20	4064.70	4064.72	4064.72	0.02	0.02	0.00
	120704	4054.00	4054.50	4056.31	4056.31	1.80	1.80	0.00
	398057	4046.80	4047.30	4054.49	4054.48	7.19	7.17	-0.01
	654642	4054.26	4054.76	4055.85	4055.85	1.09	1.09	0.00
	201561	4051.82	4052.32	4055.13	4055.13	2.81	2.81	0.00
	423356	4054.57	4055.07	4055.77	4055.77	0.70	0.70	0.00
	282395	4049.13	4049.63	4054.49	4054.48	4.86	4.85	-0.01
	27898	4051.98	4052.48	4055.13	4055.13	2.65	2.65	0.00
	1960	4054.78	4055.28	4055.57	4055.57	0.29	0.29	0.00
	119564	4054.09	4054.59	4055.98	4055.98	1.39	1.39	0.00
	261448	4054.52	4055.02	4055.20	4055.20	0.18	0.18	0.00
	164132	4053.12	4053.62	4054.49	4054.48	0.87	0.86	-0.01
	627928	4051.86	4052.36	4054.49	4054.48	2.13	2.12	-0.01

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	261532	4049.92	4050.42	4054.49	4054.48	4.07	4.06	-0.01
	163725	4052.10	4052.60	4055.14	4055.14	2.54	2.54	0.00
	44904	4051.51	4052.01	4054.49	4054.48	2.48	2.47	-0.01
	449385	4051.22	4051.72	4055.14	4055.14	3.41	3.41	0.00
	449547	4051.22	4051.72	4054.49	4054.48	2.77	2.76	-0.01
	398258	4052.08	4052.58	4054.49	4054.48	1.91	1.90	-0.01
	491880	4050.12	4050.62	4055.14	4055.14	4.51	4.51	0.00
	73572	4053.43	4053.93	4054.49	4054.48	0.56	0.55	-0.01
	563495	4052.66	4053.16	4055.14	4055.14	1.98	1.98	0.00
	282719	4051.64	4052.14	4054.49	4054.48	2.35	2.33	-0.01
	299748	4053.24	4053.74	4054.49	4054.48	0.75	0.74	-0.01
	397640	4052.99	4053.49	4054.49	4054.48	1.00	0.99	-0.01
	201179	4052.41	4052.91	4055.14	4055.14	2.23	2.23	0.00
	346410	4052.04	4052.54	4055.14	4055.14	2.59	2.59	0.00
	163022	4052.31	4052.81	4055.14	4055.14	2.32	2.32	0.00
	449389	4051.51	4052.01	4055.14	4055.14	3.13	3.13	0.00
	299693	4051.14	4051.64	4055.14	4055.14	3.50	3.50	0.00
	282307	4051.55	4052.05	4055.14	4055.14	3.10	3.10	0.00
	475033	4051.16	4051.66	4055.14	4055.14	3.49	3.49	0.00
	423370	4051.88	4052.38	4055.14	4055.14	2.76	2.76	0.00
	202091	4051.36	4051.86	4055.14	4055.14	3.28	3.28	0.00
	163733	4051.39	4051.89	4055.14	4055.14	3.25	3.25	0.00
	606839	4053.66	4054.16	4055.14	4055.14	0.98	0.98	0.00
	593207	4050.37	4050.87	4055.14	4055.14	4.28	4.28	0.00
	589145	4052.09	4052.59	4055.14	4055.14	2.55	2.55	0.00
	373845	4048.34	4048.84	4049.47	4049.24	0.64	0.40	-0.24
	589102	4057.79	4058.29	4063.59	4056.50	5.30	0.00	-5.30
	346321	4058.58	4059.08	4063.59	4057.53	4.51	0.00	-4.51
	529980	4060.34	4060.84	4063.59	4059.41	2.75	0.00	-2.75
	2570	4039.66	4040.16	4041.43	4040.61	1.27	0.46	-0.82
	73999	4065.79	4066.29	4067.75	4067.10	1.45	0.80	-0.65
	423431	4078.15	4078.65	4080.95	4079.99	2.30	1.34	-0.96
	120858	4072.32	4072.82	4075.57	4074.43	2.75	1.61	-1.14
	504523	4079.74	4080.24	4080.97	4080.28	0.73	0.03	-0.70
	120132	4080.18	4080.68	4080.98	4080.50	0.29	0.00	-0.29
	162839	4074.08	4074.58	4075.55	4074.43	0.97	0.00	-0.97
	631879	4078.56	4079.06	4080.96	4079.98	1.90	0.93	-0.97
	27238	4183.40	4183.90	4184.19	4184.15	0.29	0.25	-0.04
	568242	4042.19	4042.69	4043.67	0.00	0.98	0.00	-0.98
	239304	4075.58	4076.08	4077.34	4076.45	1.26	0.37	-0.89
	517299	4100.46	4100.96	4101.41	4100.80	0.45	0.00	-0.45
	449393	4051.59	4052.09	4053.06	0.00	0.97	0.00	-0.97
	475019	4069.96	4070.46	4070.73	0.00	0.27	0.00	-0.27
	423432	4109.34	4109.84	4110.49	4109.62	0.65	0.00	-0.65
	563544	4053.66	4054.16	4054.86	0.00	0.70	0.00	-0.70
	530053	4054.27	4054.77	4055.28	0.00	0.51	0.00	-0.51
	530016	4052.98	4053.48	4054.49	4054.48	1.01	1.00	-0.01
	504521	4182.59	4183.09	4183.36	4183.29	0.27	0.21	-0.06
	201158	4183.09	4183.59	4184.09	4184.09	0.50	0.50	0.00
	627854	4055.32	4055.82	4055.93	4055.93	0.11	0.11	0.00
	119567	4053.95	4054.45	4055.14	4055.14	0.68	0.68	0.00
1% Annual Chance Commercial Buildings	474559	4039.19	4039.69	4040.36	0.00	0.67	0.00	-0.67
	241024	4040.72	4041.22	4042.31	4042.02	1.09	0.80	-0.29
	201200	4040.91	4041.41	4042.34	0.00	0.93	0.00	-0.93
	120892	4040.77	4041.27	4042.46	4042.16	1.18	0.89	-0.29
	593238	4041.01	4041.51	4042.57	0.00	1.06	0.00	-1.06
	606987	4027.57	4028.07	4028.26	0.00	0.19	0.00	-0.19
	321620	4039.36	4039.86	4041.44	4040.61	1.57	0.75	-0.82
	372053	4039.13	4039.63	4041.44	4040.61	1.81	0.98	-0.82
	239460	4039.01	4039.51	4041.44	4040.61	1.93	1.10	-0.82
	163933	4039.57	4040.07	4041.45	4040.64	1.39	0.58	-0.81
	282470	4030.97	4031.47	4032.83	0.00	1.36	0.00	-1.36
	121442	4031.35	4031.85	4033.31	0.00	1.46	0.00	-1.46
	606941	4032.48	4032.98	4034.61	0.00	1.63	0.00	-1.63
	239991	4040.16	4040.66	4041.88	4041.71	1.22	1.05	-0.17
	671029	4042.54	4043.04	4044.29	0.00	1.25	0.00	-1.25
	28140	4034.47	4034.97	4036.43	0.00	1.46	0.00	-1.46
	320709	4039.07	4039.57	4041.15	4040.20	1.58	0.62	-0.95
	593279	4038.49	4038.99	4041.15	4040.20	2.15	1.21	-0.95

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Commercial Buildings	320707	4039.37	4039.87	4041.17	4040.20	1.31	0.34	-0.97
	475040	4046.63	4047.13	4048.71	4048.27	1.59	1.15	-0.44
	530078	4038.78	4039.28	4041.15	4040.20	1.87	0.92	-0.96
	239996	4037.89	4038.39	4041.59	4040.70	3.20	2.31	-0.89
	163955	4038.70	4039.20	4041.15	4040.20	1.95	1.00	-0.95
	2016	4039.11	4039.61	4041.47	4040.59	1.85	0.97	-0.88
	162965	4038.62	4039.12	4041.17	4040.21	2.05	1.09	-0.96
	282631	4038.49	4038.99	4041.39	4040.51	2.40	1.52	-0.88
	530068	4038.59	4039.09	4041.33	4040.47	2.25	1.39	-0.86
	474557	4039.33	4039.83	4041.43	4040.54	1.60	0.71	-0.89
	423705	4067.73	4068.23	4068.67	4067.74	0.44	0.00	-0.44
	163038	4039.66	4040.16	4041.69	4040.91	1.53	0.75	-0.78
	282625	4039.25	4039.75	4041.47	4040.54	1.72	0.79	-0.93
	397596	4039.41	4039.91	4041.45	4040.54	1.54	0.63	-0.91
	2554	4039.71	4040.21	4041.73	4040.94	1.52	0.73	-0.78
	44820	4068.28	4068.78	4069.17	4068.12	0.39	0.00	-0.39
	321418	4069.63	4070.13	4070.58	4069.91	0.45	0.00	-0.45
	1956	4068.92	4069.42	4069.74	4068.83	0.32	0.00	-0.32
	321502	4065.57	4066.07	4067.71	4067.00	1.64	0.93	-0.71
	119683	4031.86	4032.36	4033.41	0.00	1.04	0.00	-1.04
	74275	4065.48	4065.98	4067.64	4066.89	1.65	0.91	-0.74
	627863	4063.42	4063.92	4067.01	4066.16	3.09	2.24	-0.85
	491872	4065.38	4065.88	4067.28	4066.40	1.40	0.52	-0.88
	397946	4065.81	4066.31	4067.57	4066.74	1.26	0.43	-0.83
	423782	4066.35	4066.85	4067.40	4066.66	0.55	0.00	-0.55
	27340	4071.49	4071.99	4072.29	4070.86	0.30	0.00	-0.30
	121299	4066.32	4066.82	4067.46	4066.69	0.64	0.00	-0.64
	119574	4066.23	4066.73	4067.54	4066.75	0.81	0.02	-0.79
	397560	4066.45	4066.95	4067.76	4066.95	0.81	0.00	-0.81
	504662	4065.92	4066.42	4067.61	4066.83	1.19	0.41	-0.78
	239408	4066.59	4067.09	4067.92	4067.18	0.83	0.09	-0.74
	2443	4066.43	4066.93	4067.71	4066.97	0.78	0.04	-0.74
	542678	4066.69	4067.19	4068.09	4067.38	0.90	0.19	-0.71
	346551	4066.46	4066.96	4067.82	4067.11	0.86	0.15	-0.71
	606845	4066.59	4067.09	4068.23	4067.48	1.14	0.39	-0.75
	504756	4033.01	4033.51	4034.26	0.00	0.75	0.00	-0.75
	201169	4066.30	4066.80	4067.94	4067.24	1.15	0.45	-0.70
	397945	4066.50	4067.00	4068.34	4067.57	1.34	0.57	-0.76
	373830	4066.07	4066.57	4068.07	4067.34	1.49	0.77	-0.73
	542677	4066.40	4066.90	4068.45	4067.65	1.56	0.76	-0.80
	589095	4071.72	4072.22	4072.31	4070.84	0.09	0.00	-0.09
	73430	4066.09	4066.59	4068.21	4067.45	1.63	0.86	-0.77
	397948	4066.38	4066.88	4068.56	4067.71	1.68	0.84	-0.85
	423781	4066.25	4066.75	4068.29	4067.54	1.54	0.79	-0.75
	163540	4071.32	4071.82	4072.66	4071.22	0.85	0.00	-0.85
	504779	4027.16	4027.66	4027.77	4026.86	0.11	0.00	-0.11
	627861	4066.31	4066.81	4068.35	4067.58	1.54	0.77	-0.76
	27388	4066.05	4066.55	4068.42	4067.64	1.86	1.08	-0.78
	240165	4028.12	4028.62	4028.86	4028.17	0.25	0.00	-0.25
	448799	4066.64	4067.14	4068.47	4067.68	1.33	0.54	-0.79
	73433	4066.60	4067.10	4068.50	4067.71	1.40	0.61	-0.79
	299780	4028.47	4028.97	4029.12	4028.63	0.15	0.00	-0.15
	671008	4066.50	4067.00	4068.51	4067.71	1.51	0.71	-0.80
	320586	4072.54	4073.04	4073.06	4071.86	0.02	0.00	-0.02
	121298	4066.67	4067.17	4068.51	4067.72	1.34	0.54	-0.80
	320586	4072.54	4073.04	4073.06	4071.86	0.02	0.00	-0.02
	239868	4066.85	4067.35	4068.51	4067.72	1.16	0.37	-0.79
	44831	4066.81	4067.31	4068.51	4067.72	1.20	0.41	-0.79
	397563	4067.03	4067.53	4068.50	4067.72	0.97	0.19	-0.79
	44834	4067.31	4067.81	4068.49	4067.71	0.69	0.00	-0.69
	73431	4067.38	4067.88	4068.49	4067.71	0.61	0.00	-0.61
	606846	4067.51	4068.01	4068.48	4067.70	0.47	0.00	-0.47
	671011	4067.72	4068.22	4068.47	4067.70	0.25	0.00	-0.25
	120712	4067.74	4068.24	4068.46	4067.70	0.23	0.00	-0.23
	373831	4067.48	4067.98	4068.45	4067.70	0.47	0.00	-0.47
	589139	4067.53	4068.03	4068.43	4067.63	0.41	0.00	-0.41
	653539	4067.70	4068.20	4068.41	0.00	0.20	0.00	-0.20
	27775	4072.75	4073.25	4073.32	4071.91	0.07	0.00	-0.07
	423363	4067.57	4068.07	4068.32	0.00	0.25	0.00	-0.25

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Commercial Buildings	397681	4080.16	4080.66	4080.95	4079.99	0.28	0.00	-0.28
	121029	4067.74	4068.24	4068.26	0.00	0.02	0.00	-0.02
	162731	4072.32	4072.82	4073.30	4071.92	0.48	0.00	-0.48
	517435	4067.35	4067.85	4068.20	0.00	0.34	0.00	-0.34
	530011	4067.24	4067.74	4068.14	0.00	0.40	0.00	-0.40
	563338	4079.54	4080.04	4080.95	4079.99	0.92	0.00	-0.92
	121030	4067.42	4067.92	4068.13	0.00	0.21	0.00	-0.21
	239409	4067.61	4068.11	4068.19	0.00	0.08	0.00	-0.08
	239869	4067.61	4068.11	4068.26	0.00	0.15	0.00	-0.15
	239603	4021.92	4022.42	4027.72	4026.80	5.30	4.38	-0.92
	120713	4067.61	4068.11	4068.35	0.00	0.24	0.00	-0.24
	670936	4074.15	4074.65	4074.69	4073.65	0.05	0.00	-0.05
	371866	4079.19	4079.69	4080.97	4080.58	1.27	0.89	-0.39
	632082	4067.41	4067.91	4068.43	0.00	0.52	0.00	-0.52
	542552	4079.52	4080.02	4080.97	4080.62	0.94	0.59	-0.35
	423365	4067.49	4067.99	4068.46	4067.76	0.47	0.00	-0.47
	346351	4067.48	4067.98	4068.47	4067.76	0.49	0.00	-0.49
	162639	4079.25	4079.75	4080.97	4080.60	1.22	0.85	-0.37
	299625	4071.48	4071.98	4073.21	4071.80	1.23	0.00	-1.23
	201666	4067.24	4067.74	4068.48	4067.76	0.74	0.02	-0.72
	423364	4066.90	4067.40	4068.47	4067.76	1.07	0.36	-0.72
	261576	4024.32	4024.82	4026.02	0.00	1.20	0.00	-1.20
	240832	4066.39	4066.89	4068.47	4067.76	1.58	0.86	-0.72
	653540	4066.48	4066.98	4068.47	4067.76	1.49	0.78	-0.71
	448893	4075.72	4076.22	4080.96	4079.99	4.74	3.77	-0.97
	606847	4066.58	4067.08	4068.47	4067.76	1.39	0.67	-0.71
	73429	4066.75	4067.25	4068.47	4067.76	1.22	0.51	-0.71
	631844	4074.39	4074.89	4080.96	4079.99	6.07	5.10	-0.97
	74818	4025.33	4025.83	4026.92	0.00	1.09	0.00	-1.09
	119435	4080.45	4080.95	4080.97	4080.08	0.02	0.00	-0.02
	1968	4066.97	4067.47	4068.46	4067.76	1.00	0.29	-0.71
	504663	4066.91	4067.41	4068.46	4067.76	1.05	0.34	-0.70
	670864	4074.28	4074.78	4080.96	4079.99	6.18	5.21	-0.97
	202095	4066.70	4067.20	4068.46	4067.76	1.26	0.56	-0.70
	74277	4066.79	4067.29	4068.45	4067.76	1.16	0.46	-0.70
	627860	4066.75	4067.25	4068.45	4067.76	1.20	0.51	-0.69
	27390	4066.64	4067.14	4068.45	4067.76	1.30	0.61	-0.69
	653478	4074.17	4074.67	4075.28	4074.27	0.61	0.00	-0.61
	589138	4066.69	4067.19	4068.45	4067.76	1.25	0.56	-0.69
	261452	4066.68	4067.18	4068.45	4067.76	1.26	0.57	-0.69
	73996	4066.62	4067.12	4068.45	4067.76	1.33	0.64	-0.69
	299686	4066.51	4067.01	4068.45	4067.76	1.44	0.75	-0.69
	671009	4066.44	4066.94	4068.44	4067.76	1.50	0.82	-0.69
	346153	4077.95	4078.45	4080.96	4079.99	2.51	1.54	-0.97
	44778	4074.11	4074.61	4074.63	0.00	0.01	0.00	-0.01
	397564	4066.47	4066.97	4068.44	4067.76	1.47	0.78	-0.68
	27780	4073.16	4073.66	4074.24	0.00	0.59	0.00	-0.59
	73997	4066.62	4067.12	4068.43	4067.76	1.31	0.64	-0.68
	120125	4203.60	4204.10	4204.22	4204.09	0.11	0.00	-0.11
	517295	4115.96	4116.46	4116.58	4116.58	0.12	0.12	-0.01
	423208	4115.61	4116.11	4116.83	4116.83	0.73	0.73	0.00
	397389	4115.85	4116.35	4116.63	4116.58	0.28	0.23	-0.05
	201691	4052.58	4053.08	4054.54	4053.91	1.46	0.83	-0.63
	2473	4052.71	4053.21	4054.80	4054.12	1.59	0.91	-0.68
	654736	4053.35	4053.85	4054.57	4053.93	0.72	0.08	-0.64
	504665	4053.69	4054.19	4055.50	4055.38	1.31	1.19	-0.12
	563497	4055.24	4055.74	4056.12	4056.11	0.38	0.37	-0.01
	239418	4054.73	4055.23	4056.32	4056.32	1.08	1.08	0.00
	320646	4055.53	4056.03	4056.63	4056.63	0.59	0.59	0.00
	73998	4056.02	4056.52	4056.57	4056.57	0.04	0.04	0.00
	671012	4053.68	4054.18	4054.74	4054.74	0.57	0.57	0.00
	1967	4052.83	4053.33	4054.95	4054.95	1.62	1.62	0.00
	73434	4052.29	4052.79	4054.83	4054.83	2.04	2.04	0.00
	239464	4042.34	4042.84	4054.49	4054.48	11.65	11.64	-0.01
	398018	4049.97	4050.47	4055.13	4055.13	4.67	4.66	0.00
	653543	4050.60	4051.10	4055.13	4055.13	4.03	4.03	0.00
0.2% Annual Chance Residences	299706	4041.76	4042.26	4042.39	4042.18	0.13	0.00	-0.13
	119597	4043.14	4043.64	4044.16	4044.01	0.52	0.36	-0.15
	373854	4041.75	4042.25	4043.12	4042.94	0.86	0.69	-0.17

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	74296	4047.12	4047.62	4048.73	4048.62	1.12	1.00	-0.11
	373742	4062.87	4063.37	4063.80	4062.25	0.43	0.00	-0.43
	121006	4062.55	4063.05	4064.03	4062.25	0.99	0.00	-0.99
	239840	4062.86	4063.36	4064.28	4062.26	0.92	0.00	-0.92
	120885	4043.55	4044.05	4044.66	4044.49	0.62	0.45	-0.17
	320627	4062.74	4063.24	4063.82	4062.61	0.58	0.00	-0.58
	27885	4062.81	4063.31	4063.89	4063.22	0.59	0.00	-0.59
	606868	4042.07	4042.57	4043.19	4043.10	0.62	0.53	-0.09
	282281	4062.41	4062.91	4064.06	4062.59	1.15	0.00	-1.15
	373852	4042.20	4042.70	4043.56	4043.32	0.86	0.62	-0.24
	606865	4043.11	4043.61	4044.49	4044.27	0.88	0.66	-0.22
	321519	4044.47	4044.97	4045.60	4045.26	0.63	0.29	-0.34
	239422	4048.63	4049.13	4049.23	0.00	0.10	0.00	-0.10
	474929	4063.23	4063.73	4064.07	4062.94	0.34	0.00	-0.34
	73971	4062.00	4062.50	4064.35	4062.26	1.86	0.00	-1.86
	373824	4063.97	4064.47	4064.51	4064.13	0.04	0.00	-0.04
	346421	4043.56	4044.06	4045.19	0.00	1.13	0.00	-1.13
	162897	4042.05	4042.55	4042.75	0.00	0.21	0.00	-0.21
	491889	4045.08	4045.58	4046.93	4046.72	1.35	1.15	-0.21
	27395	4046.84	4047.34	4048.28	4048.02	0.94	0.68	-0.26
	654724	4046.00	4046.50	4047.40	4047.17	0.90	0.67	-0.23
	73400	4063.02	4063.52	4064.07	4063.38	0.55	0.00	-0.55
	423778	4063.48	4063.98	4064.00	4063.57	0.01	0.00	-0.01
	373845	4048.34	4048.84	4049.58	4049.38	0.74	0.54	-0.20
	121290	4063.74	4064.24	4064.53	4064.13	0.29	0.00	-0.29
	321414	4062.30	4062.80	4064.33	4062.31	1.53	0.00	-1.53
	542672	4063.45	4063.95	4064.29	0.00	0.33	0.00	-0.33
	73973	4062.86	4063.36	4064.33	4062.48	0.97	0.00	-0.97
	201555	4063.95	4064.45	4064.87	4064.51	0.42	0.07	-0.36
	282531	4063.88	4064.38	4064.39	4064.10	0.01	0.00	-0.01
	239851	4063.65	4064.15	4064.19	0.00	0.04	0.00	-0.04
	423704	4063.85	4064.35	4064.44	4064.21	0.09	0.00	-0.09
	239968	4050.05	4050.55	4050.91	4050.75	0.37	0.20	-0.17
	653546	4048.56	4049.06	4049.75	4049.43	0.69	0.37	-0.33
	44845	4044.89	4045.39	4046.18	4045.75	0.79	0.36	-0.43
	163740	4047.21	4047.71	4048.35	4047.91	0.64	0.20	-0.44
	593239	4042.08	4042.58	4043.08	4042.82	0.49	0.23	-0.26
	474536	4041.28	4041.78	4042.52	0.00	0.74	0.00	-0.74
	423811	4041.23	4041.73	4042.57	4042.28	0.84	0.55	-0.29
	2350	4061.00	4061.50	4064.36	4062.33	2.87	0.83	-2.03
	593184	4063.49	4063.99	4064.35	4062.99	0.36	0.00	-0.36
	568224	4046.49	4046.99	4047.86	4047.42	0.86	0.42	-0.44
	653545	4052.14	4052.64	4053.44	4053.31	0.81	0.67	-0.14
	27415	4041.02	4041.52	4042.54	4042.43	1.02	0.91	-0.11
	627871	4047.00	4047.50	4048.31	4047.91	0.81	0.41	-0.40
	162747	4062.78	4063.28	4064.38	4062.26	1.10	0.00	-1.10
	240819	4063.82	4064.32	4064.51	4063.99	0.19	0.00	-0.19
	372040	4041.03	4041.53	4042.52	4042.20	0.99	0.67	-0.32
	491890	4043.10	4043.60	4044.57	4044.38	0.97	0.78	-0.19
	373846	4049.72	4050.22	4051.61	0.00	1.39	0.00	-1.39
	201539	4063.82	4064.32	4064.48	4063.90	0.16	0.00	-0.16
	44850	4042.70	4043.20	4044.33	0.00	1.13	0.00	-1.13
	398032	4042.27	4042.77	4042.92	4042.58	0.15	0.00	-0.15
	593232	4044.25	4044.75	4045.55	4045.25	0.81	0.50	-0.30
	241006	4044.97	4045.47	4046.17	4045.91	0.71	0.45	-0.26
	27402	4043.14	4043.64	4044.74	4044.26	1.10	0.62	-0.48
	542687	4052.73	4053.23	4053.42	0.00	0.18	0.00	-0.18
	27995	4042.52	4043.02	4044.37	4044.02	1.36	1.00	-0.35
	504681	4045.33	4045.83	4046.64	4046.42	0.81	0.59	-0.22
	504674	4046.93	4047.43	4048.82	4048.60	1.40	1.17	-0.23
	568225	4045.78	4046.28	4047.08	4046.84	0.80	0.56	-0.24
	241025	4040.66	4041.16	4042.49	4042.19	1.33	1.03	-0.29
	517464	4042.83	4043.33	4044.31	4044.02	0.98	0.69	-0.29
	627872	4048.69	4049.19	4050.11	4049.82	0.92	0.63	-0.29
	423342	4062.94	4063.44	4064.47	4062.92	1.03	0.00	-1.03
	282301	4064.77	4065.27	4065.38	0.00	0.10	0.00	-0.10
	449400	4040.72	4041.22	4042.60	4042.25	1.38	1.04	-0.35
	44860	4040.47	4040.97	4042.50	4042.20	1.53	1.23	-0.30
	1997	4040.69	4041.19	4042.57	4042.24	1.38	1.05	-0.33

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	398024	4043.03	4043.53	4044.67	0.00	1.14	0.00	-1.14
	73446	4056.02	4056.52	4059.05	4058.50	2.53	1.98	-0.55
	654634	4065.43	4065.93	4066.14	4065.69	0.21	0.00	-0.21
	239974	4050.32	4050.82	4051.58	4050.47	0.76	0.00	-0.76
	449382	4061.87	4062.37	4062.63	4062.36	0.26	0.00	-0.26
	423381	4055.55	4056.05	4058.60	0.00	2.55	0.00	-2.55
	163023	4044.95	4045.45	4045.86	4045.61	0.41	0.16	-0.25
	517462	4043.41	4043.91	4044.57	4044.31	0.66	0.40	-0.26
	162877	4060.81	4061.31	4061.87	4061.67	0.56	0.35	-0.21
	530022	4047.60	4048.10	4049.65	4049.51	1.55	1.41	-0.14
	504675	4050.21	4050.71	4051.30	4051.11	0.59	0.40	-0.19
	530015	4061.62	4062.12	4062.47	4062.22	0.35	0.10	-0.25
	2459	4059.98	4060.48	4062.07	4061.80	1.59	1.31	-0.28
	517430	4066.40	4066.90	4067.08	4066.74	0.19	0.00	-0.19
	73392	4064.47	4064.97	4065.36	4064.56	0.39	0.00	-0.39
	163024	4041.53	4042.03	4043.32	4043.21	1.29	1.18	-0.11
	627850	4066.55	4067.05	4067.31	4066.92	0.26	0.00	-0.26
	282350	4043.83	4044.33	4045.44	4045.26	1.11	0.92	-0.18
	653517	4064.82	4065.32	4065.53	4064.68	0.21	0.00	-0.21
	589102	4057.79	4058.29	4064.38	4062.26	6.10	3.98	-2.12
	530023	4046.62	4047.12	4047.72	0.00	0.60	0.00	-0.60
	27397	4050.09	4050.59	4051.49	4051.26	0.90	0.67	-0.23
	320662	4041.91	4042.41	4043.50	4043.37	1.09	0.96	-0.13
	282353	4043.77	4044.27	4045.61	4045.42	1.34	1.15	-0.19
	606857	4059.35	4059.85	4060.39	4059.81	0.54	0.00	-0.54
	346321	4058.58	4059.08	4064.39	4062.26	5.31	3.18	-2.13
	239845	4065.71	4066.21	4066.57	4065.74	0.35	0.00	-0.35
	321189	4075.32	4075.82	4076.21	4075.44	0.40	0.00	-0.40
	530003	4067.23	4067.73	4067.86	0.00	0.13	0.00	-0.13
	529980	4060.34	4060.84	4064.39	4062.26	3.55	1.42	-2.13
	121022	4066.84	4067.34	4067.64	4067.17	0.30	0.00	-0.30
	201557	4066.36	4066.86	4067.53	4067.06	0.67	0.20	-0.47
	202084	4065.99	4066.49	4067.39	4066.98	0.90	0.49	-0.41
	74301	4041.79	4042.29	4043.44	4043.35	1.15	1.06	-0.09
	589160	4043.51	4044.01	4045.55	0.00	1.54	0.00	-1.54
	163748	4041.88	4042.38	4043.46	4043.40	1.07	1.02	-0.06
	261460	4060.12	4060.62	4060.91	4060.10	0.29	0.00	-0.29
	73402	4067.44	4067.94	4067.96	4067.45	0.02	0.00	-0.02
	162803	4065.81	4066.31	4067.12	4066.14	0.81	0.00	-0.81
	239844	4066.22	4066.72	4067.04	4066.21	0.33	0.00	-0.33
	627862	4063.52	4064.02	4064.83	4064.42	0.81	0.40	-0.41
	371988	4064.77	4065.27	4065.75	4065.02	0.48	0.00	-0.48
	346423	4042.39	4042.89	4044.11	4043.36	1.23	0.48	-0.75
	654537	4066.47	4066.97	4067.20	4066.85	0.23	0.00	-0.23
	346418	4045.21	4045.71	4046.52	4046.49	0.80	0.78	-0.02
	74129	4067.75	4068.25	4068.33	4067.70	0.08	0.00	-0.08
	44836	4064.41	4064.91	4065.59	4065.28	0.68	0.37	-0.31
	491860	4066.74	4067.24	4068.24	4067.55	1.00	0.31	-0.69
	346333	4067.24	4067.74	4068.26	4067.59	0.52	0.00	-0.52
	2570	4039.66	4040.16	4041.76	4041.02	1.61	0.87	-0.74
	74280	4064.92	4065.42	4066.03	4065.68	0.61	0.26	-0.35
	239771	4068.12	4068.62	4068.70	4067.68	0.08	0.00	-0.08
	529830	4194.93	4195.43	4195.45	4195.45	0.02	0.02	0.00
	120714	4065.87	4066.37	4066.79	4066.38	0.42	0.00	-0.42
	475030	4065.91	4066.41	4066.66	4066.32	0.25	0.00	-0.25
	653536	4066.80	4067.30	4067.52	4067.14	0.22	0.00	-0.22
	542679	4065.57	4066.07	4066.82	4066.40	0.75	0.34	-0.41
	606851	4065.44	4065.94	4066.85	4066.40	0.91	0.46	-0.45
	261453	4065.77	4066.27	4067.13	4066.62	0.85	0.34	-0.51
	491922	4038.46	4038.96	4041.48	4040.76	2.51	1.79	-0.72
	2030	4038.16	4038.66	4041.50	4040.76	2.83	2.10	-0.73
	568270	4038.35	4038.85	4041.46	4040.75	2.61	1.90	-0.71
	654841	4038.99	4039.49	4041.43	4040.73	1.94	1.24	-0.69
	321623	4038.29	4038.79	4041.56	4040.81	2.77	2.03	-0.74
	563564	4039.26	4039.76	4041.40	4040.69	1.63	0.93	-0.70
	73492	4037.85	4038.35	4041.77	4040.99	3.42	2.65	-0.77
	320713	4038.49	4038.99	4041.40	4040.69	2.40	1.70	-0.70
	563551	4038.90	4039.40	4041.54	4040.80	2.14	1.40	-0.74
	44884	4038.54	4039.04	4041.42	4040.69	2.38	1.65	-0.73

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	239481	4038.61	4039.11	4041.40	4040.67	2.29	1.57	-0.72
	371880	4078.63	4079.13	4079.88	4078.95	0.75	0.00	-0.75
	474665	4079.32	4079.82	4079.88	4078.95	0.06	0.00	-0.06
	474635	4026.38	4026.88	4028.22	4027.29	1.33	0.41	-0.92
	201845	4038.64	4039.14	4041.30	4040.57	2.15	1.43	-0.72
	163946	4038.46	4038.96	4041.46	4040.73	2.51	1.77	-0.74
	320509	4079.17	4079.67	4079.87	4078.95	0.20	0.00	-0.20
	299643	4071.41	4071.91	4072.92	4071.67	1.01	0.00	-1.01
	282120	4079.09	4079.59	4079.89	4078.96	0.30	0.00	-0.30
	282500	4026.36	4026.86	4028.23	4027.31	1.37	0.44	-0.93
	239411	4066.40	4066.90	4067.61	4067.05	0.71	0.15	-0.57
	27490	4026.48	4026.98	4028.27	4027.39	1.29	0.40	-0.89
	653636	4028.89	4029.39	4030.47	4030.20	1.08	0.81	-0.27
	240301	4078.85	4079.35	4079.77	4078.89	0.42	0.00	-0.42
	423787	4066.28	4066.78	4067.52	4067.03	0.74	0.25	-0.49
	627723	4078.25	4078.75	4079.83	4078.93	1.08	0.18	-0.90
	120472	4078.12	4078.62	4079.85	4078.94	1.24	0.33	-0.91
	201019	4078.39	4078.89	4079.91	4078.96	1.02	0.08	-0.95
	73999	4065.79	4066.29	4068.00	4067.47	1.71	1.18	-0.53
	448653	4078.71	4079.21	4079.95	4078.99	0.74	0.00	-0.74
	201497	4078.75	4079.25	4079.91	4078.96	0.65	0.00	-0.65
	162824	4065.74	4066.24	4067.98	4067.44	1.74	1.20	-0.54
	282540	4066.45	4066.95	4068.34	4067.78	1.39	0.83	-0.56
	2146	4078.62	4079.12	4079.93	4078.98	0.80	0.00	-0.80
	397567	4066.75	4067.25	4068.13	4067.57	0.87	0.32	-0.56
	119575	4066.86	4067.36	4068.26	4067.72	0.90	0.36	-0.54
	654973	4027.26	4027.76	4028.06	4027.27	0.30	0.00	-0.30
	653541	4066.94	4067.44	4068.55	4067.97	1.11	0.53	-0.58
	201671	4066.52	4067.02	4068.47	4067.92	1.45	0.90	-0.55
	164322	4022.82	4023.32	4028.06	4027.27	4.74	3.94	-0.79
	423366	4066.89	4067.39	4068.51	4067.94	1.12	0.55	-0.57
	346354	4066.99	4067.49	4068.52	4067.95	1.03	0.46	-0.57
	491980	4027.15	4027.65	4028.53	4028.24	0.88	0.59	-0.29
	44959	4024.14	4024.64	4028.06	4027.27	3.42	2.63	-0.79
	28252	4022.21	4022.71	4028.05	4027.27	5.34	4.55	-0.78
	74283	4067.61	4068.11	4068.45	4067.74	0.33	0.00	-0.33
	632237	4024.95	4025.45	4028.06	4027.27	2.61	1.82	-0.79
	593200	4067.56	4068.06	4068.49	4067.80	0.43	0.00	-0.43
	201670	4067.50	4068.00	4068.43	4067.71	0.42	0.00	-0.42
	504796	4023.58	4024.08	4028.04	4027.27	3.95	3.18	-0.77
	423431	4078.15	4078.65	4081.41	4080.71	2.76	2.07	-0.70
	163013	4067.07	4067.57	4068.45	4067.80	0.88	0.24	-0.65
	517578	4027.05	4027.55	4028.01	0.00	0.46	0.00	-0.46
	517562	4026.04	4026.54	4028.14	4027.44	1.60	0.89	-0.71
	398014	4067.10	4067.60	4068.38	4067.72	0.79	0.12	-0.66
	320799	4022.72	4023.22	4028.03	4027.27	4.81	4.04	-0.77
	491874	4067.03	4067.53	4068.40	4067.72	0.86	0.19	-0.67
	320773	4025.43	4025.93	4028.30	4027.80	2.37	1.87	-0.50
	321883	4024.64	4025.14	4025.58	4025.04	0.44	0.00	-0.44
	423550	4024.63	4025.13	4028.02	4027.26	2.88	2.13	-0.75
	2080	4025.57	4026.07	4028.35	4027.92	2.28	1.85	-0.43
	74088	4071.62	4072.12	4073.77	4072.48	1.65	0.36	-1.29
	299688	4066.70	4067.20	4068.46	4067.80	1.26	0.60	-0.66
	239568	4020.18	4020.68	4028.03	4027.26	7.35	6.58	-0.76
	491873	4067.37	4067.87	4068.56	0.00	0.69	0.00	-0.69
	346780	4024.57	4025.07	4026.04	4025.37	0.97	0.30	-0.67
	397709	4020.48	4020.98	4028.03	4027.26	7.05	6.29	-0.76
	241410	4021.45	4021.95	4028.03	4027.26	6.08	5.32	-0.76
	4865953	4024.47	4024.97	4026.10	4025.45	1.12	0.47	-0.65
	423786	4067.25	4067.75	4068.49	0.00	0.75	0.00	-0.75
	202783	4025.40	4025.90	4026.94	4026.13	1.04	0.23	-0.81
	654965	4021.00	4021.50	4028.02	4027.26	6.52	5.76	-0.76
	74089	4071.23	4071.73	4073.77	4072.48	2.05	0.76	-1.29
	398013	4067.37	4067.87	4068.63	4068.14	0.76	0.27	-0.49
	121671	4026.02	4026.52	4027.37	4026.69	0.85	0.17	-0.68
	589083	4073.49	4073.99	4074.93	4073.77	0.94	0.00	-0.94
	373833	4067.09	4067.59	4068.49	0.00	0.90	0.00	-0.90
	653660	4019.61	4020.11	4028.02	4027.26	7.92	7.16	-0.76
	346777	4025.61	4026.11	4027.30	4026.39	1.18	0.28	-0.90

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	44786	4071.15	4071.65	4073.55	4072.33	1.90	0.68	-1.22
	73580	4022.52	4023.02	4028.02	4027.26	5.00	4.24	-0.76
	346762	4022.98	4023.48	4028.03	4027.26	4.55	3.79	-0.76
	346142	4079.41	4079.91	4081.44	4080.72	1.53	0.82	-0.71
	299631	4071.64	4072.14	4073.77	4072.47	1.63	0.33	-1.30
	240996	4066.67	4067.17	4068.45	4067.69	1.28	0.52	-0.76
	27772	4073.06	4073.56	4074.99	4073.81	1.43	0.25	-1.18
	529950	4073.25	4073.75	4074.90	4073.75	1.15	0.00	-1.15
	346388	4073.85	4074.35	4075.11	4073.94	0.76	0.00	-0.76
	474650	4021.06	4021.56	4028.01	4027.26	6.46	5.70	-0.75
	163097	4022.87	4023.37	4028.02	4027.26	4.65	3.89	-0.76
	563629	4022.91	4023.41	4028.02	4027.26	4.61	3.86	-0.76
	2110	4022.60	4023.10	4028.01	4027.26	4.91	4.16	-0.75
	449181	4072.28	4072.78	4073.68	4072.39	0.90	0.00	-0.90
	74282	4066.80	4067.30	4068.39	4067.69	1.09	0.39	-0.70
	321307	4074.29	4074.79	4075.58	4074.45	0.79	0.00	-0.79
	423785	4066.73	4067.23	4068.41	0.00	1.17	0.00	-1.17
	74279	4066.87	4067.37	4068.47	4067.70	1.10	0.32	-0.77
	120135	4078.82	4079.32	4081.44	4080.72	2.12	1.41	-0.71
	589257	4023.36	4023.86	4028.02	4027.26	4.16	3.40	-0.76
	74281	4066.55	4067.05	4068.36	4067.70	1.31	0.65	-0.66
	201784	4072.87	4073.37	4075.18	4073.98	1.81	0.61	-1.20
	654968	4021.83	4022.33	4028.01	4027.26	5.68	4.93	-0.75
	27517	4024.32	4024.82	4028.00	4027.26	3.18	2.44	-0.74
	606794	4072.86	4073.36	4075.11	4073.95	1.75	0.59	-1.16
	504794	4021.79	4022.29	4028.01	4027.26	5.72	4.97	-0.75
	239546	4027.39	4027.89	4028.58	4028.04	0.69	0.15	-0.54
	346352	4066.79	4067.29	4068.61	4068.04	1.32	0.76	-0.57
	2450	4066.52	4067.02	4068.33	4067.69	1.31	0.67	-0.63
	120858	4072.32	4072.82	4076.20	4075.03	3.38	2.21	-1.18
	164327	4021.69	4022.19	4028.00	4027.26	5.82	5.07	-0.75
	504523	4079.74	4080.24	4081.45	4080.74	1.21	0.50	-0.71
	120132	4080.18	4080.68	4081.46	4080.84	0.77	0.16	-0.62
	670940	4073.37	4073.87	4075.37	4074.17	1.50	0.30	-1.20
	162839	4074.08	4074.58	4076.17	4075.01	1.59	0.44	-1.16
	201381	4025.02	4025.52	4027.47	4026.71	1.95	1.20	-0.76
	2802	4022.35	4022.85	4028.00	4027.26	5.15	4.41	-0.74
	201992	4022.35	4022.85	4028.00	4027.26	5.14	4.40	-0.74
	121301	4066.43	4066.93	4068.48	4067.97	1.55	1.04	-0.51
	240273	4021.48	4021.98	4028.00	4027.26	6.02	5.28	-0.74
	239240	4079.67	4080.17	4081.45	4080.74	1.28	0.57	-0.71
	606982	4022.24	4022.74	4028.00	4027.26	5.26	4.52	-0.75
	28244	4021.60	4022.10	4028.00	4027.26	5.90	5.16	-0.74
	474654	4024.31	4024.81	4027.99	4027.26	3.19	2.45	-0.74
	593005	4074.60	4075.10	4081.43	4080.72	6.33	5.62	-0.71
	162709	4080.85	4081.35	4081.38	4080.67	0.03	0.00	-0.03
	568164	4073.53	4074.03	4075.51	4074.30	1.48	0.27	-1.21
	346145	4074.24	4074.74	4081.44	4080.72	6.70	5.99	-0.71
	320804	4021.37	4021.87	4028.00	4027.26	6.13	5.39	-0.74
	606795	4073.55	4074.05	4075.26	4074.11	1.21	0.06	-1.14
	589034	4076.69	4077.19	4078.40	4077.49	1.21	0.30	-0.91
	119436	4074.89	4075.39	4081.43	4080.72	6.04	5.33	-0.71
	474352	4074.31	4074.81	4081.44	4080.72	6.63	5.91	-0.71
	321092	4079.95	4080.45	4081.41	4080.71	0.97	0.26	-0.71
	73685	4077.49	4077.99	4081.43	4080.72	3.44	2.73	-0.71
	201010	4074.79	4075.29	4081.43	4080.72	6.14	5.43	-0.71
	120250	4078.60	4079.10	4079.90	4079.16	0.80	0.07	-0.73
	529850	4077.38	4077.88	4081.44	4080.73	3.56	2.84	-0.71
	397418	4078.92	4079.42	4080.56	4079.77	1.14	0.36	-0.79
	631842	4080.50	4081.00	4081.46	4080.74	0.45	0.00	-0.45
	474485	4072.44	4072.94	4073.18	4072.21	0.24	0.00	-0.24
	239598	4075.33	4075.83	4078.21	4077.35	2.38	1.52	-0.86
	631879	4078.56	4079.06	4081.42	4080.71	2.36	1.65	-0.71
	504555	4079.50	4080.00	4080.52	4079.85	0.53	0.00	-0.53
	504571	4073.16	4073.66	4076.96	4075.66	3.29	2.00	-1.29
	73229	4076.24	4076.74	4081.44	4080.72	4.70	3.98	-0.71
	593236	4049.63	4050.13	4050.53	4048.55	0.40	0.00	-0.40
	240824	4069.58	4070.08	4070.09	0.00	0.01	0.00	-0.01
	74134	4062.83	4063.33	4064.69	0.00	1.36	0.00	-1.36

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	27238	4183.40	4183.90	4184.96	4184.93	1.07	1.03	-0.04
	373463	4076.69	4077.19	4081.43	4080.70	4.24	3.51	-0.73
	74313	4042.85	4043.35	4043.90	0.00	0.56	0.00	-0.56
	504535	4076.52	4077.02	4081.43	4080.70	4.41	3.68	-0.73
	423443	4076.20	4076.70	4081.43	4080.70	4.73	4.00	-0.73
	653562	4042.05	4042.55	4043.48	0.00	0.93	0.00	-0.93
	201783	4073.97	4074.47	4076.07	4074.97	1.60	0.50	-1.10
	201208	4040.75	4041.25	4041.73	0.00	0.48	0.00	-0.48
	120519	4074.73	4075.23	4075.83	4074.90	0.60	0.00	-0.60
	261475	4042.34	4042.84	4043.77	0.00	0.93	0.00	-0.93
	162855	4072.85	4073.35	4076.08	4074.98	2.72	1.62	-1.10
	449156	4073.98	4074.48	4076.11	4074.99	1.63	0.50	-1.13
	1915	4074.57	4075.07	4076.06	4074.97	0.99	0.00	-0.99
	201100	4073.23	4073.73	4076.07	4074.97	2.34	1.24	-1.10
	517373	4073.63	4074.13	4076.09	4074.98	1.96	0.85	-1.11
	627761	4074.67	4075.17	4076.75	4075.51	1.58	0.34	-1.23
	542637	4074.35	4074.85	4076.07	4074.97	1.22	0.13	-1.09
	589081	4073.60	4074.10	4076.07	4074.97	1.97	0.87	-1.10
	119506	4075.18	4075.68	4076.13	4074.99	0.45	0.00	-0.45
	474445	4075.24	4075.74	4075.77	4074.89	0.03	0.00	-0.03
	517479	4042.34	4042.84	4043.86	0.00	1.01	0.00	-1.01
	44681	4194.40	4194.90	4196.28	4196.24	1.38	1.33	-0.04
	627762	4074.75	4075.25	4076.72	4075.48	1.48	0.23	-1.25
	120862	4074.98	4075.48	4076.57	4075.36	1.09	0.00	-1.09
	504590	4075.44	4075.94	4076.46	4075.23	0.52	0.00	-0.52
	517348	4074.95	4075.45	4076.80	4075.55	1.36	0.11	-1.25
	201341	4075.74	4076.24	4076.29	4075.14	0.04	0.00	-0.04
	239344	4200.54	4201.04	4201.32	4201.32	0.29	0.28	-0.01
	239663	4075.42	4075.92	4076.68	4075.42	0.76	0.00	-0.76
	568242	4042.19	4042.69	4043.95	0.00	1.26	0.00	-1.26
	299594	4075.24	4075.74	4076.53	4075.30	0.78	0.00	-0.78
	606787	4073.48	4073.98	4076.07	4074.97	2.09	0.99	-1.10
	120373	4074.76	4075.26	4076.61	4075.38	1.35	0.13	-1.22
	654409	4075.39	4075.89	4076.71	4075.48	0.82	0.00	-0.82
	670945	4074.34	4074.84	4076.03	4074.96	1.19	0.12	-1.07
	320551	4075.39	4075.89	4076.80	4075.56	0.91	0.00	-0.91
	517383	4073.90	4074.40	4076.08	4074.97	1.67	0.57	-1.10
	529914	4075.81	4076.31	4076.43	4075.21	0.11	0.00	-0.11
	627759	4075.38	4075.88	4076.78	4075.56	0.91	0.00	-0.91
	504614	4073.63	4074.13	4076.07	4074.97	1.95	0.85	-1.10
	542535	4201.60	4202.10	4202.34	4202.33	0.24	0.24	-0.01
	201788	4074.89	4075.39	4075.80	4074.90	0.41	0.00	-0.41
	120386	4075.24	4075.74	4076.12	4074.99	0.38	0.00	-0.38
	73411	4201.31	4201.81	4202.20	4202.18	0.39	0.38	-0.01
	670941	4073.87	4074.37	4076.07	4074.97	1.69	0.60	-1.09
	201656	4075.41	4075.91	4076.09	4074.98	0.18	0.00	-0.18
	282424	4074.73	4075.23	4076.06	4074.97	0.83	0.00	-0.83
	670919	4075.57	4076.07	4076.53	4075.31	0.46	0.00	-0.46
	373637	4075.44	4075.94	4076.55	4075.33	0.60	0.00	-0.60
	282613	4042.14	4042.64	4043.92	0.00	1.28	0.00	-1.28
	563429	4074.57	4075.07	4076.07	4074.97	1.00	0.00	-1.00
	163408	4074.62	4075.12	4076.08	4074.97	0.96	0.00	-0.96
	542632	4074.70	4075.20	4076.07	4074.97	0.87	0.00	-0.87
	282420	4074.53	4075.03	4076.07	4074.97	1.04	0.00	-1.04
	448728	4074.49	4074.99	4076.07	4074.97	1.08	0.00	-1.08
	529943	4074.69	4075.19	4076.07	4074.97	0.88	0.00	-0.88
	346256	4075.45	4075.95	4076.12	4074.99	0.17	0.00	-0.17
	346376	4075.14	4075.64	4076.10	4074.98	0.46	0.00	-0.46
	162648	4075.93	4076.43	4077.05	4075.98	0.62	0.00	-0.62
	627791	4074.38	4074.88	4076.07	4074.97	1.19	0.09	-1.10
	320565	4075.73	4076.23	4076.54	0.00	0.31	0.00	-0.31
	517384	4074.66	4075.16	4076.07	4074.97	0.91	0.00	-0.91
	397449	4076.38	4076.88	4077.11	4076.12	0.22	0.00	-0.22
	589064	4075.69	4076.19	4076.66	4075.43	0.46	0.00	-0.46
	529906	4075.50	4076.00	4076.85	4075.62	0.86	0.00	-0.86
	423281	4075.58	4076.08	4076.62	4075.40	0.54	0.00	-0.54
	670932	4075.57	4076.07	4076.13	4074.99	0.05	0.00	-0.05
	201205	4040.88	4041.38	4042.36	0.00	0.98	0.00	-0.98
	201657	4074.63	4075.13	4076.08	4074.97	0.95	0.00	-0.95

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	73335	4075.05	4075.55	4076.07	4074.97	0.52	0.00	-0.52
	202117	4043.10	4043.60	4044.19	0.00	0.59	0.00	-0.59
	121209	4043.86	4044.36	4044.36	0.00	0.00	0.00	0.00
	589080	4074.89	4075.39	4076.08	4074.95	0.69	0.00	-0.69
	1908	4075.25	4075.75	4076.09	0.00	0.34	0.00	-0.34
	73479	4041.45	4041.95	4042.34	0.00	0.39	0.00	-0.39
	162728	4075.40	4075.90	4076.07	0.00	0.17	0.00	-0.17
	397486	4074.82	4075.32	4076.07	4074.96	0.75	0.00	-0.75
	27317	4075.06	4075.56	4076.07	4074.96	0.52	0.00	-0.52
	27746	4075.42	4075.92	4076.74	4075.52	0.83	0.00	-0.83
	320579	4074.87	4075.37	4076.08	4074.95	0.71	0.00	-0.71
	346385	4074.65	4075.15	4076.07	4074.95	0.93	0.00	-0.93
	654417	4075.86	4076.36	4076.69	4075.43	0.33	0.00	-0.33
	163275	4076.50	4077.00	4077.69	4076.88	0.69	0.00	-0.69
	449060	4075.33	4075.83	4076.88	4075.78	1.06	0.00	-1.06
	239224	4219.57	4220.07	4220.16	4220.16	0.09	0.09	0.00
	201069	4076.69	4077.19	4077.76	4076.92	0.58	0.00	-0.58
	201080	4077.03	4077.53	4077.70	4076.90	0.17	0.00	-0.17
	73929	4076.83	4077.33	4077.46	0.00	0.13	0.00	-0.13
	44756	4076.26	4076.76	4077.44	4076.74	0.68	0.00	-0.68
	517343	4075.21	4075.71	4077.81	4076.94	2.10	1.23	-0.87
	4866045	4207.55	4208.05	4208.87	4208.62	0.82	0.57	-0.25
	474499	4210.98	4211.48	4211.91	4211.88	0.43	0.40	-0.03
	4866046	4210.60	4211.10	4211.78	4211.74	0.68	0.65	-0.03
	239304	4075.58	4076.08	4077.77	4076.90	1.69	0.81	-0.88
	239516	4323.87	4324.37	4324.67	4324.67	0.30	0.30	0.00
	120237	4083.41	4083.91	4084.51	4083.11	0.60	0.00	-0.60
	119745	4379.88	4380.38	4381.22	4381.22	0.84	0.84	0.00
	627758	4076.71	4077.21	4077.87	4076.90	0.66	0.00	-0.66
	448670	4083.26	4083.76	4084.53	4083.15	0.77	0.00	-0.77
	654286	4084.03	4084.53	4084.66	4083.21	0.13	0.00	-0.13
	423455	4084.02	4084.52	4084.62	4083.16	0.09	0.00	-0.09
	4866047	4219.33	4219.83	4220.86	4220.62	1.03	0.79	-0.24
	27234	4216.58	4217.08	4218.06	4218.03	0.98	0.96	-0.02
	589059	4076.69	4077.19	4077.67	4076.85	0.48	0.00	-0.48
	474397	4076.89	4077.39	4078.21	4077.44	0.83	0.06	-0.77
	320521	4084.56	4085.06	4085.41	4083.96	0.35	0.00	-0.35
	423273	4076.14	4076.64	4078.11	4077.03	1.47	0.39	-1.08
	320513	4084.67	4085.17	4085.97	4084.43	0.80	0.00	-0.80
	120861	4076.45	4076.95	4077.54	4076.76	0.58	0.00	-0.58
	504542	4085.66	4086.16	4086.23	4084.69	0.07	0.00	-0.07
	606740	4085.43	4085.93	4086.39	4084.84	0.46	0.00	-0.46
	654287	4085.40	4085.90	4086.59	4085.31	0.69	0.00	-0.69
	504594	4076.62	4077.12	4077.35	4076.61	0.23	0.00	-0.23
	491740	4086.46	4086.96	4087.54	4086.14	0.58	0.00	-0.58
	397369	4338.77	4339.27	4341.63	4341.63	2.37	2.37	0.00
	120634	4084.08	4084.58	4084.72	4083.94	0.13	0.00	-0.13
	1868	4084.42	4084.92	4085.21	4084.28	0.30	0.00	-0.30
	321280	4085.72	4086.22	4086.56	4085.60	0.33	0.00	-0.33
	589049	4086.54	4087.04	4087.08	4086.38	0.04	0.00	-0.04
	1827	4098.20	4098.70	4098.76	4098.26	0.06	0.00	-0.06
	448633	4500.15	4500.65	4503.37	4503.37	2.73	2.73	0.00
	517299	4100.46	4100.96	4101.67	4101.12	0.71	0.17	-0.54
	653394	4101.25	4101.75	4102.54	4102.24	0.79	0.50	-0.30
	163300	4028.55	4029.05	4030.14	0.00	1.09	0.00	-1.09
	201211	4047.14	4047.64	4048.90	4048.41	1.25	0.77	-0.49
	504532	4099.42	4099.92	4100.36	4099.81	0.44	0.00	-0.44
	202763	4039.13	4039.63	4041.75	4041.43	2.12	1.80	-0.32
	163108	4035.85	4036.35	4038.63	4038.52	2.29	2.18	-0.11
	202763	4039.13	4039.63	4041.75	4041.43	2.12	1.80	-0.32
	299738	4045.38	4045.88	4046.93	0.00	1.06	0.00	-1.06
	671140	4039.10	4039.60	4041.35	4041.03	1.75	1.42	-0.33
	397599	4046.50	4047.00	4048.70	0.00	1.71	0.00	-1.71
	44922	4042.40	4042.90	4043.81	4043.33	0.92	0.43	-0.48
	654838	4043.68	4044.18	4046.93	4045.35	2.75	1.18	-1.58
	654953	4038.88	4039.38	4041.36	4041.03	1.97	1.64	-0.33
	73510	4043.81	4044.31	4046.93	4045.35	2.62	1.05	-1.58
	44972	4033.56	4034.06	4034.92	4034.34	0.86	0.28	-0.58
	202001	4029.19	4029.69	4031.36	0.00	1.67	0.00	-1.67

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	74682	4036.58	4037.08	4038.45	4038.33	1.36	1.24	-0.12
	239532	4042.20	4042.70	4043.29	4042.91	0.59	0.21	-0.37
	261502	4044.44	4044.94	4046.93	0.00	1.98	0.00	-1.98
	121478	4048.64	4049.14	4050.71	4049.95	1.57	0.81	-0.76
	449640	4039.11	4039.61	4041.37	4041.03	1.76	1.42	-0.34
	74348	4043.32	4043.82	4045.01	0.00	1.19	0.00	-1.19
	475168	4043.90	4044.40	4045.57	4044.99	1.17	0.59	-0.58
	241035	4048.46	4048.96	4049.72	0.00	0.75	0.00	-0.75
	589247	4040.60	4041.10	4041.65	0.00	0.55	0.00	-0.55
	28144	4042.90	4043.40	4045.45	4044.94	2.05	1.54	-0.51
	74381	4039.15	4039.65	4041.12	4040.91	1.47	1.27	-0.21
	449650	4039.40	4039.90	4041.34	4041.09	1.44	1.18	-0.25
	632240	4039.30	4039.80	4041.34	4041.09	1.54	1.29	-0.25
	397644	4043.23	4043.73	4045.54	4044.96	1.81	1.23	-0.57
	162911	4048.96	4049.46	4049.96	0.00	0.49	0.00	-0.49
	119672	4043.17	4043.67	4045.61	4045.00	1.94	1.33	-0.61
	398370	4028.16	4028.66	4029.76	4029.51	1.10	0.85	-0.25
	321655	4043.98	4044.48	4045.56	4044.96	1.08	0.48	-0.60
	449672	4030.85	4031.35	4031.47	4031.23	0.12	0.00	-0.12
	261567	4037.43	4037.93	4039.28	4038.85	1.35	0.92	-0.43
	299710	4048.90	4049.40	4050.11	0.00	0.71	0.00	-0.71
	632250	4035.05	4035.55	4036.64	4036.33	1.09	0.79	-0.31
	448874	4043.00	4043.50	4045.55	4045.00	2.05	1.49	-0.56
	474581	4046.03	4046.53	4047.55	4047.14	1.01	0.61	-0.40
	606929	4045.26	4045.76	4046.19	4045.87	0.43	0.11	-0.32
	654969	4038.88	4039.38	4040.83	4040.52	1.45	1.14	-0.31
	606872	4047.18	4047.68	4050.73	4049.95	3.05	2.27	-0.78
	321875	4038.86	4039.36	4039.93	4039.57	0.57	0.21	-0.36
	239484	4045.85	4046.35	4047.66	4047.20	1.31	0.85	-0.45
	373941	4048.05	4048.55	4050.22	0.00	1.67	0.00	-1.67
	449393	4051.59	4052.09	4052.94	4052.97	0.72	0.72	0.00
	321631	4047.25	4047.75	4048.19	0.00	0.44	0.00	-0.44
	424030	4043.38	4043.88	4045.61	4045.09	1.73	1.21	-0.52
	163172	4044.86	4045.36	4045.64	0.00	0.28	0.00	-0.28
	74526	4040.19	4040.69	4041.79	4041.58	1.10	0.89	-0.21
	201292	4044.40	4044.90	4045.63	4045.11	0.74	0.21	-0.52
	163031	4047.92	4048.42	4050.74	4049.95	2.31	1.52	-0.79
	2086	4039.44	4039.94	4041.96	4041.64	2.03	1.70	-0.32
	27491	4042.14	4042.64	4043.11	4042.89	0.47	0.25	-0.22
	321659	4043.33	4043.83	4045.78	0.00	1.95	0.00	-1.95
	671100	4043.67	4044.17	4045.90	4045.32	1.73	1.15	-0.58
	632182	4046.33	4046.83	4048.04	4047.54	1.20	0.70	-0.50
	74322	4047.96	4048.46	4050.73	4049.95	2.28	1.49	-0.79
	492008	4038.34	4038.84	4038.88	0.00	0.05	0.00	-0.05
	121483	4047.88	4048.38	4050.75	4049.95	2.37	1.57	-0.80
	121099	4043.93	4044.43	4045.77	4045.19	1.35	0.76	-0.59
	74332	4043.94	4044.44	4045.78	4045.19	1.34	0.75	-0.59
	654835	4047.77	4048.27	4049.37	4048.81	1.10	0.53	-0.56
	74517	4040.99	4041.49	4042.21	4041.77	0.72	0.29	-0.43
	589226	4044.04	4044.54	4045.78	4045.19	1.24	0.65	-0.59
	475019	4069.96	4070.46	4071.47	4070.53	1.00	0.07	-0.94
	320623	4073.98	4074.48	4075.00	4074.40	0.53	0.00	-0.53
	654628	4073.32	4073.82	4074.40	4073.72	0.59	0.00	-0.59
	121443	4044.56	4045.06	4045.78	0.00	0.72	0.00	-0.72
	239847	4073.34	4073.84	4074.02	4073.40	0.18	0.00	-0.18
	1955	4072.10	4072.60	4073.14	4072.70	0.54	0.09	-0.44
	670978	4074.01	4074.51	4075.54	4074.70	1.02	0.19	-0.84
	320622	4072.77	4073.27	4075.37	4074.64	2.10	1.36	-0.74
	654981	4037.79	4038.29	4038.78	0.00	0.49	0.00	-0.49
	299756	4044.74	4045.24	4045.80	4045.23	0.56	0.00	-0.56
	44816	4072.25	4072.75	4073.05	4072.68	0.31	0.00	-0.31
	164168	4041.91	4042.41	4042.70	4042.22	0.28	0.00	-0.28
	632185	4046.63	4047.13	4047.94	4047.60	0.81	0.47	-0.34
	320630	4073.13	4073.63	4073.98	4073.39	0.35	0.00	-0.35
	74118	4073.37	4073.87	4074.98	4074.19	1.11	0.32	-0.79
	162948	4073.44	4073.94	4074.41	4073.87	0.46	0.00	-0.46
	346542	4069.55	4070.05	4071.41	4070.47	1.36	0.42	-0.94
	491932	4048.25	4048.75	4049.44	0.00	0.69	0.00	-0.69
	563608	4044.73	4045.23	4045.74	4045.60	0.50	0.36	-0.14

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	593179	4074.18	4074.68	4075.10	4074.35	0.42	0.00	-0.42
	121481	4051.92	4052.42	4053.98	0.00	1.56	0.00	-1.56
	504741	4047.19	4047.69	4049.52	4049.05	1.83	1.36	-0.47
	397546	4069.41	4069.91	4071.37	4070.46	1.46	0.56	-0.91
	346521	4047.42	4047.92	4049.60	4049.12	1.68	1.20	-0.48
	27880	4073.97	4074.47	4074.56	0.00	0.09	0.00	-0.09
	397931	4074.17	4074.67	4074.75	4074.09	0.08	0.00	-0.08
	121520	4047.21	4047.71	4048.37	4047.95	0.65	0.23	-0.42
	163051	4047.85	4048.35	4049.92	4049.35	1.57	1.01	-0.56
	163003	4045.75	4046.25	4046.42	0.00	0.17	0.00	-0.17
	162952	4069.89	4070.39	4071.40	4070.47	1.01	0.08	-0.93
	589197	4047.11	4047.61	4049.91	4049.36	2.30	1.74	-0.55
	239382	4074.15	4074.65	4074.84	4074.20	0.19	0.00	-0.19
	671084	4047.64	4048.14	4049.45	4049.02	1.32	0.88	-0.44
	121085	4047.63	4048.13	4049.70	4049.19	1.57	1.07	-0.50
	475268	4042.31	4042.81	4043.28	4042.97	0.48	0.16	-0.31
	491864	4069.97	4070.47	4071.37	4070.47	0.91	0.00	-0.90
	449550	4044.58	4045.08	4046.54	4046.13	1.46	1.05	-0.41
	27879	4073.50	4074.00	4074.10	4073.49	0.10	0.00	-0.10
	397539	4072.17	4072.67	4073.35	4072.65	0.67	0.00	-0.67
	240118	4048.11	4048.61	4049.59	4049.08	0.98	0.47	-0.51
	423350	4071.63	4072.13	4073.03	4072.11	0.91	0.00	-0.91
	589131	4070.01	4070.51	4071.38	4070.48	0.87	0.00	-0.87
	346141	4112.70	4113.20	4114.07	4113.37	0.88	0.17	-0.71
	2089	4111.43	4111.93	4111.95	4111.22	0.02	0.00	-0.02
	121285	4070.23	4070.73	4071.46	4070.64	0.73	0.00	-0.73
	44983	4034.49	4034.99	4035.49	4034.90	0.51	0.00	-0.51
	449525	4047.78	4048.28	4049.31	0.00	1.03	0.00	-1.03
	163950	4048.34	4048.84	4049.95	4049.47	1.11	0.63	-0.47
	653518	4071.69	4072.19	4073.53	4072.81	1.35	0.62	-0.73
	542671	4071.63	4072.13	4072.90	4072.11	0.76	0.00	-0.76
	474493	4071.69	4072.19	4073.16	4072.31	0.97	0.13	-0.85
	321509	4060.60	4061.10	4061.48	4061.00	0.38	0.00	-0.38
	423432	4109.34	4109.84	4110.84	4109.99	1.00	0.15	-0.85
	2117	4035.63	4036.13	4036.32	4036.17	0.19	0.04	-0.15
	606906	4048.22	4048.72	4050.19	4049.78	1.47	1.05	-0.42
	119553	4073.43	4073.93	4074.71	4074.17	0.78	0.23	-0.55
	74325	4046.37	4046.87	4048.82	0.00	1.94	0.00	-1.94
	653523	4070.98	4071.48	4072.80	4072.05	1.32	0.57	-0.75
	201397	4112.06	4112.56	4113.50	4112.83	0.94	0.27	-0.68
	492006	4039.88	4040.38	4041.43	0.00	1.04	0.00	-1.04
	201987	4041.51	4042.01	4043.11	4042.76	1.10	0.75	-0.35
	240140	4043.63	4044.13	4046.95	4046.48	2.82	2.36	-0.46
	397649	4043.70	4044.20	4046.89	4046.47	2.69	2.27	-0.42
	474494	4072.02	4072.52	4072.95	4072.15	0.43	0.00	-0.43
	589119	4070.79	4071.29	4072.80	4072.06	1.51	0.77	-0.75
	162578	4111.18	4111.68	4113.14	4112.38	1.46	0.70	-0.76
	299557	4112.94	4113.44	4114.98	4114.21	1.54	0.77	-0.77
	653593	4047.16	4047.66	4049.91	0.00	2.25	0.00	-2.25
	239241	4114.60	4115.10	4116.56	4115.75	1.46	0.65	-0.80
	397622	4047.06	4047.56	4049.82	4049.39	2.26	1.84	-0.43
	282512	4072.13	4072.63	4073.06	4072.34	0.44	0.00	-0.44
	627846	4072.25	4072.75	4072.82	4072.06	0.06	0.00	-0.06
	448644	4112.38	4112.88	4114.39	4113.67	1.51	0.79	-0.71
	240815	4071.56	4072.06	4073.30	4072.60	1.23	0.53	-0.70
	202758	4043.43	4043.93	4046.74	4046.39	2.81	2.46	-0.35
	654202	4111.75	4112.25	4113.48	4112.61	1.23	0.36	-0.88
	240816	4072.50	4073.00	4073.22	4072.54	0.22	0.00	-0.22
	606965	4045.69	4046.19	4046.45	0.00	0.26	0.00	-0.26
	627919	4048.79	4049.29	4051.01	4050.68	1.72	1.39	-0.33
	239574	4111.14	4111.64	4111.93	4111.28	0.29	0.00	-0.29
	671065	4047.52	4048.02	4052.42	4051.97	4.40	3.95	-0.46
	474351	4113.89	4114.39	4115.27	4114.57	0.88	0.18	-0.70
	241401	4045.42	4045.92	4046.39	0.00	0.48	0.00	-0.48
	119645	4049.93	4050.43	4052.71	4052.19	2.28	1.76	-0.52
	282389	4049.26	4049.76	4052.76	4052.23	3.01	2.47	-0.54
	201161	4114.89	4115.39	4117.19	4116.42	1.80	1.03	-0.77
	654950	4045.61	4046.11	4046.43	4046.01	0.31	0.00	-0.31
	593001	4115.93	4116.43	4117.71	4116.98	1.28	0.55	-0.73

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	120900	4053.56	4054.06	4054.43	4053.83	0.37	0.00	-0.37
	449286	4061.91	4062.41	4063.76	4063.30	1.35	0.89	-0.45
	2448	4059.86	4060.36	4060.76	4060.24	0.40	0.00	-0.40
	517497	4050.44	4050.94	4053.43	0.00	2.49	0.00	-2.49
	568068	4119.93	4120.43	4121.72	4120.89	1.29	0.46	-0.83
	346344	4061.19	4061.69	4062.03	4061.75	0.34	0.07	-0.27
	474518	4057.96	4058.46	4060.50	4060.01	2.03	1.55	-0.49
	119631	4051.21	4051.71	4054.22	4053.72	2.51	2.00	-0.51
	2013	4052.49	4052.99	4054.27	4053.74	1.28	0.75	-0.53
	530069	4053.31	4053.81	4054.29	0.00	0.48	0.00	-0.48
	530064	4052.10	4052.60	4054.34	4053.77	1.74	1.17	-0.57
	563544	4053.66	4054.16	4055.07	4054.82	0.91	0.66	-0.25
	530053	4054.27	4054.77	4055.46	4055.24	0.69	0.47	-0.22
	28029	4053.31	4053.81	4055.62	4055.36	1.81	1.55	-0.26
	163059	4054.41	4054.91	4055.90	4055.53	0.99	0.62	-0.37
	373933	4054.00	4054.50	4056.45	4056.11	1.96	1.62	-0.34
	372056	4054.81	4055.31	4056.42	4056.09	1.12	0.79	-0.33
	2574	4052.13	4052.63	4056.39	0.00	3.76	0.00	-3.76
	632109	4056.89	4057.39	4058.12	0.00	0.73	0.00	-0.73
	120896	4056.07	4056.57	4057.53	0.00	0.97	0.00	-0.97
	563509	4056.92	4057.42	4058.11	0.00	0.70	0.00	-0.70
	239865	4057.14	4057.64	4058.44	4058.43	0.80	0.79	0.00
	27894	4057.27	4057.77	4058.55	4058.54	0.78	0.78	0.00
	346346	4057.70	4058.20	4058.37	4058.37	0.17	0.16	0.00
	568067	4140.18	4140.68	4140.97	4140.49	0.28	0.00	-0.28
	239404	4057.27	4057.77	4058.10	4058.09	0.33	0.33	0.00
	282541	4054.46	4054.96	4056.54	4056.34	1.59	1.38	-0.21
	27387	4055.21	4055.71	4056.60	4056.56	0.89	0.84	-0.04
	475029	4054.28	4054.78	4056.54	4056.37	1.76	1.59	-0.17
	163018	4053.99	4054.49	4056.54	4056.34	2.06	1.85	-0.21
	346561	4053.07	4053.57	4056.54	4056.34	2.98	2.77	-0.21
	163724	4055.72	4056.22	4056.54	0.00	0.33	0.00	-0.33
	449280	4062.11	4062.61	4063.53	4063.53	0.92	0.92	0.00
	448811	4053.97	4054.47	4056.54	4056.34	2.07	1.87	-0.21
	589125	4062.58	4063.08	4063.51	4063.51	0.43	0.43	0.00
	653524	4062.15	4062.65	4063.58	4063.58	0.93	0.93	0.00
	504659	4058.27	4058.77	4059.50	4059.50	0.72	0.72	0.00
	201175	4055.44	4055.94	4056.54	0.00	0.60	0.00	-0.60
	448810	4055.44	4055.94	4056.54	0.00	0.61	0.00	-0.61
	632067	4063.37	4063.87	4063.96	4063.96	0.10	0.09	0.00
	448796	4057.33	4057.83	4059.00	4059.00	1.16	1.16	0.00
	397557	4057.65	4058.15	4059.87	4059.87	1.72	1.72	0.00
	542834	4047.70	4048.20	4048.34	4048.33	0.14	0.13	-0.02
	372006	4061.31	4061.81	4061.84	4061.84	0.03	0.03	0.00
	201550	4061.43	4061.93	4062.85	4062.85	0.93	0.93	0.00
	121293	4057.19	4057.69	4059.46	4059.46	1.77	1.77	0.00
	282533	4056.50	4057.00	4058.54	4058.54	1.54	1.54	0.00
	299671	4059.57	4060.07	4061.43	4061.43	1.36	1.36	0.00
	27288	4108.56	4109.06	4109.23	4109.23	0.17	0.17	0.00
	372003	4061.72	4062.22	4062.41	4062.41	0.19	0.19	0.00
	121024	4058.17	4058.67	4058.87	4058.87	0.20	0.20	0.00
	201541	4062.75	4063.25	4064.29	4064.29	1.04	1.04	0.00
	162820	4054.59	4055.09	4056.84	4056.84	1.75	1.75	0.00
	372023	4050.17	4050.67	4056.23	4056.21	5.56	5.55	-0.02
	121019	4059.79	4060.29	4061.08	4061.08	0.79	0.79	0.00
	423382	4049.77	4050.27	4056.23	4056.21	5.96	5.94	-0.02
	397532	4069.34	4069.84	4070.24	4070.24	0.40	0.40	0.00
	299672	4059.17	4059.67	4060.08	4060.08	0.41	0.41	0.00
	653526	4060.04	4060.54	4061.27	4061.27	0.73	0.73	0.00
	568340	4051.20	4051.70	4052.05	4052.02	0.35	0.32	-0.03
	74510	4054.68	4055.18	4056.22	4056.21	1.04	1.03	-0.02
	120341	4136.35	4136.85	4137.16	4137.16	0.31	0.31	0.00
	241398	4052.35	4052.85	4053.23	4053.22	0.38	0.37	-0.01
	448938	4050.65	4051.15	4052.05	4052.02	0.90	0.87	-0.03
	239873	4052.56	4053.06	4056.23	4056.21	3.17	3.15	-0.02
	239870	4053.21	4053.71	4056.23	4056.21	2.52	2.50	-0.02
	654280	4136.66	4137.16	4137.61	4137.61	0.45	0.45	0.00
	44975	4050.41	4050.91	4052.03	4052.00	1.13	1.10	-0.03
	320812	4050.86	4051.36	4052.05	4052.02	0.69	0.66	-0.03

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	563645	4050.73	4051.23	4052.05	4052.02	0.82	0.79	-0.03
	517551	4053.61	4054.11	4054.18	4054.17	0.07	0.06	-0.01
	346782	4050.89	4051.39	4052.01	4051.98	0.62	0.59	-0.03
	374118	4050.30	4050.80	4052.02	4051.99	1.21	1.18	-0.03
	261552	4051.47	4051.97	4052.62	4052.60	0.65	0.63	-0.02
	282709	4054.96	4055.46	4056.10	4056.09	0.63	0.62	-0.01
	491772	4108.16	4108.66	4108.71	4108.71	0.05	0.05	0.00
	241209	4054.68	4055.18	4056.22	4056.21	1.05	1.03	-0.02
	27573	4141.54	4142.04	4142.18	4142.18	0.14	0.14	0.00
	282731	4052.38	4052.88	4054.23	4054.21	1.34	1.33	-0.01
	504664	4052.60	4053.10	4056.23	4056.21	3.13	3.12	-0.02
	542815	4049.13	4049.63	4052.06	4052.03	2.43	2.40	-0.03
	593272	4053.76	4054.26	4056.23	4056.21	1.97	1.95	-0.02
	201355	4051.75	4052.25	4053.36	4053.35	1.11	1.10	-0.01
	373967	4053.64	4054.14	4056.21	4056.20	2.07	2.06	-0.02
	164335	4049.24	4049.74	4052.04	4052.01	2.30	2.27	-0.03
	28259	4049.63	4050.13	4052.05	4052.02	1.92	1.89	-0.03
	73270	4111.18	4111.68	4112.32	4112.32	0.64	0.64	0.00
	593246	4045.55	4046.05	4056.23	4056.21	10.18	10.16	-0.02
	517553	4053.10	4053.60	4054.09	4054.08	0.49	0.47	-0.02
	448869	4053.28	4053.78	4056.21	4056.20	2.43	2.42	-0.02
	261492	4047.85	4048.35	4056.23	4056.21	7.88	7.87	-0.02
	121697	4053.46	4053.96	4056.22	4056.21	2.27	2.25	-0.02
	517564	4051.32	4051.82	4052.58	4052.56	0.76	0.75	-0.01
	240456	4098.94	4099.44	4099.95	4099.95	0.50	0.50	0.00
	671169	4050.12	4050.62	4052.04	4052.01	1.42	1.39	-0.03
	201280	4053.92	4054.42	4056.23	4056.21	1.81	1.79	-0.02
	121329	4049.79	4050.29	4052.05	4052.02	1.76	1.73	-0.03
	239249	4138.47	4138.97	4139.38	4139.38	0.42	0.42	0.00
	491727	4147.16	4147.66	4148.43	4148.43	0.76	0.76	0.00
	162577	4144.88	4145.38	4145.39	4145.39	0.01	0.01	0.00
	670865	4145.35	4145.85	4146.66	4146.66	0.81	0.81	0.00
	282568	4051.39	4051.89	4052.04	4052.01	0.15	0.12	-0.03
	120345	4131.17	4131.67	4131.69	4131.69	0.02	0.02	0.00
	474400	4097.71	4098.21	4098.44	4098.44	0.24	0.24	0.00
	474575	4047.18	4047.68	4056.23	4056.21	8.55	8.54	-0.02
	589230	4054.45	4054.95	4056.18	4056.17	1.23	1.22	-0.02
	423213	4141.62	4142.12	4142.25	4142.25	0.12	0.12	0.00
	654843	4046.74	4047.24	4056.23	4056.21	8.99	8.97	-0.02
	74674	4050.02	4050.52	4052.06	4052.03	1.54	1.51	-0.03
	449397	4048.12	4048.62	4056.23	4056.21	7.61	7.59	-0.02
	631876	4137.54	4138.04	4138.53	4138.53	0.48	0.48	0.00
	346658	4046.35	4046.85	4056.23	4056.21	9.38	9.36	-0.02
	542557	4144.21	4144.71	4144.84	4144.84	0.13	0.13	0.00
	653399	4141.84	4142.34	4143.67	4143.67	1.33	1.33	0.00
	28136	4049.82	4050.32	4056.23	4056.21	5.91	5.89	-0.02
	44900	4053.13	4053.63	4056.23	4056.21	2.60	2.58	-0.02
	606729	4135.75	4136.25	4136.56	4136.56	0.31	0.31	0.00
	1835	4137.37	4137.87	4138.63	4138.63	0.76	0.76	0.00
	423554	4050.25	4050.75	4052.05	4052.02	1.30	1.27	-0.03
	28138	4052.42	4052.92	4056.23	4056.21	3.31	3.30	-0.02
	163267	4104.77	4105.27	4105.39	4105.39	0.12	0.12	0.00
	163116	4049.79	4050.29	4052.05	4052.02	1.76	1.73	-0.03
	589113	4057.25	4057.75	4058.84	4058.84	1.09	1.09	0.00
	2460	4051.76	4052.26	4056.23	4056.21	3.97	3.95	-0.02
	606726	4141.11	4141.61	4141.62	4141.62	0.01	0.01	0.00
	282700	4053.45	4053.95	4056.23	4056.21	2.28	2.27	-0.02
	201816	4066.35	4066.85	4067.90	4067.90	1.05	1.05	0.00
	239611	4048.97	4049.47	4052.05	4052.02	2.59	2.56	-0.03
	448848	4043.93	4044.43	4056.23	4056.21	11.80	11.78	-0.02
	474584	4044.23	4044.73	4056.23	4056.21	11.51	11.49	-0.02
	530016	4052.98	4053.48	4056.23	4056.21	2.75	2.73	-0.02
	74172	4042.51	4043.01	4056.23	4056.21	13.22	13.20	-0.02
	121075	4066.63	4067.13	4067.69	4067.69	0.55	0.55	0.00
	121319	4049.95	4050.45	4052.05	4052.02	1.60	1.57	-0.03
	120845	4100.09	4100.59	4100.79	4100.79	0.20	0.20	0.00
	449523	4043.73	4044.23	4056.23	4056.21	12.00	11.98	-0.02
	397643	4053.89	4054.39	4056.23	4056.21	1.84	1.82	-0.02
	606858	4053.41	4053.91	4056.23	4056.21	2.32	2.30	-0.02

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	241212	4046.81	4047.31	4056.23	4056.21	8.92	8.90	-0.02
	2804	4048.97	4049.47	4052.05	4052.02	2.59	2.56	-0.03
	563465	4066.50	4067.00	4067.64	4067.64	0.64	0.64	0.00
	121473	4053.03	4053.53	4056.23	4056.21	2.70	2.68	-0.02
	73965	4065.29	4065.79	4065.85	4065.85	0.06	0.06	0.00
	163021	4052.65	4053.15	4056.23	4056.21	3.08	3.07	-0.02
	448785	4053.28	4053.78	4056.23	4056.21	2.45	2.44	-0.02
	654647	4052.16	4052.66	4056.23	4056.21	3.57	3.55	-0.02
	162753	4066.14	4066.64	4066.89	4066.89	0.25	0.25	0.00
	239383	4061.61	4062.11	4062.35	4062.35	0.24	0.24	0.00
	27877	4063.33	4063.83	4064.54	4064.54	0.72	0.72	0.00
	346627	4049.22	4049.72	4052.05	4052.02	2.34	2.31	-0.03
	449527	4042.00	4042.50	4056.23	4056.21	13.73	13.71	-0.02
	504521	4182.59	4183.09	4183.79	4183.79	0.70	0.70	0.00
	397536	4057.85	4058.35	4059.54	4059.54	1.19	1.19	0.00
	201158	4183.09	4183.59	4184.57	4184.57	0.98	0.98	0.00
	589128	4053.77	4054.27	4056.24	4056.22	1.97	1.96	-0.01
	27378	4052.65	4053.15	4056.23	4056.21	3.08	3.06	-0.02
	201149	4053.03	4053.53	4056.23	4056.21	2.70	2.68	-0.02
	282510	4059.30	4059.80	4060.43	4060.43	0.63	0.63	0.00
	593186	4059.30	4059.80	4059.93	4059.93	0.13	0.13	0.00
	201150	4053.56	4054.06	4056.23	4056.21	2.17	2.15	-0.02
	163958	4040.46	4040.96	4056.23	4056.21	15.27	15.25	-0.02
	529991	4060.05	4060.55	4061.00	4061.00	0.45	0.45	0.00
	568279	4044.44	4044.94	4056.23	4056.21	11.29	11.27	-0.02
	121439	4054.19	4054.69	4056.23	4056.21	1.54	1.52	-0.02
	121008	4059.41	4059.91	4061.37	4061.37	1.47	1.47	0.00
	589222	4054.31	4054.81	4056.23	4056.21	1.42	1.40	-0.02
	2051	4044.93	4045.43	4056.23	4056.21	10.80	10.78	-0.02
	517516	4042.15	4042.65	4056.23	4056.21	13.58	13.56	-0.02
	593285	4041.82	4042.32	4056.23	4056.21	13.91	13.89	-0.02
	27883	4060.17	4060.67	4061.40	4061.40	0.73	0.73	0.00
	475036	4053.95	4054.45	4056.23	4056.21	1.78	1.76	-0.02
	27884	4059.86	4060.36	4061.45	4061.45	1.08	1.08	0.00
	121020	4055.69	4056.19	4056.84	4056.84	0.65	0.65	0.00
	397549	4055.00	4055.50	4056.23	4056.22	0.73	0.72	-0.02
	73441	4053.25	4053.75	4056.23	4056.21	2.48	2.46	-0.02
	398146	4055.49	4055.99	4056.23	4056.21	0.24	0.22	-0.02
	299669	4055.66	4056.16	4056.75	4056.75	0.59	0.59	0.00
	449285	4055.13	4055.63	4056.31	4056.31	0.68	0.68	0.00
	2437	4055.71	4056.21	4056.83	4056.83	0.63	0.63	0.00
	491849	4068.42	4068.92	4069.30	4069.30	0.37	0.37	0.00
	121023	4054.11	4054.61	4056.34	4056.34	1.73	1.73	0.00
	671000	4055.13	4055.63	4056.76	4056.76	1.13	1.13	0.00
	2345	4068.50	4069.00	4069.39	4069.39	0.39	0.39	0.00
	321499	4052.81	4053.31	4056.23	4056.21	2.92	2.91	-0.02
	321428	4054.52	4055.02	4056.54	4056.54	1.51	1.51	0.00
	423360	4052.75	4053.25	4056.23	4056.21	2.98	2.97	-0.02
	2440	4054.18	4054.68	4056.27	4056.27	1.59	1.59	0.00
	27892	4054.11	4054.61	4056.52	4056.52	1.91	1.91	0.00
	504655	4055.24	4055.74	4056.70	4056.70	0.96	0.96	0.00
	568207	4054.72	4055.22	4056.35	4056.35	1.13	1.13	0.00
	321406	4067.80	4068.30	4069.00	4069.00	0.70	0.70	0.00
	121201	4055.34	4055.84	4056.23	4056.21	0.39	0.38	-0.02
	27893	4054.11	4054.61	4056.24	4056.23	1.63	1.63	-0.01
	654734	4052.51	4053.01	4056.23	4056.21	3.22	3.20	-0.02
	606828	4064.20	4064.70	4064.89	4064.89	0.19	0.19	0.00
	120704	4054.00	4054.50	4056.59	4056.59	2.09	2.09	0.00
	398057	4046.80	4047.30	4056.23	4056.21	8.93	8.91	-0.02
	654642	4054.26	4054.76	4056.23	4056.21	1.47	1.45	-0.02
	530000	4056.29	4056.79	4056.89	4056.89	0.09	0.09	0.00
	201561	4051.82	4052.32	4056.23	4056.21	3.91	3.89	-0.02
	423356	4054.57	4055.07	4056.23	4056.21	1.16	1.14	-0.02
	119603	4053.92	4054.42	4056.23	4056.21	1.81	1.79	-0.02
	163755	4054.32	4054.82	4056.23	4056.21	1.41	1.40	-0.02
	282395	4049.13	4049.63	4056.23	4056.21	6.60	6.58	-0.02
	27898	4051.98	4052.48	4056.23	4056.21	3.75	3.73	-0.02
	121212	4053.56	4054.06	4056.23	4056.21	2.17	2.15	-0.02
	1960	4054.78	4055.28	4056.23	4056.21	0.95	0.94	-0.02

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	119564	4054.09	4054.59	4056.25	4056.24	1.66	1.66	-0.01
	121225	4054.64	4055.14	4056.23	4056.21	1.09	1.08	-0.02
	627854	4055.32	4055.82	4056.28	4056.28	0.46	0.46	-0.01
	261448	4054.52	4055.02	4056.23	4056.21	1.21	1.19	-0.02
	632201	4055.26	4055.76	4056.23	4056.21	0.47	0.45	-0.02
	449536	4054.97	4055.47	4056.23	4056.21	0.76	0.74	-0.02
	164132	4053.12	4053.62	4056.23	4056.21	2.61	2.59	-0.02
	27900	4051.53	4052.03	4056.23	4056.21	4.20	4.18	-0.02
	346502	4054.06	4054.56	4056.23	4056.21	1.67	1.66	-0.02
	627928	4051.86	4052.36	4056.23	4056.21	3.87	3.86	-0.02
	119572	4051.32	4051.82	4056.23	4056.21	4.41	4.39	-0.02
	320787	4054.27	4054.77	4056.23	4056.21	1.46	1.45	-0.02
	261532	4049.92	4050.42	4056.23	4056.21	5.81	5.79	-0.02
	653656	4055.12	4055.62	4056.23	4056.21	0.61	0.59	-0.02
	163725	4052.10	4052.60	4056.23	4056.21	3.63	3.61	-0.02
	44904	4051.51	4052.01	4056.23	4056.21	4.22	4.20	-0.02
	449385	4051.22	4051.72	4056.23	4056.21	4.51	4.49	-0.02
	449547	4051.22	4051.72	4056.23	4056.21	4.51	4.49	-0.02
	398258	4052.08	4052.58	4056.23	4056.21	3.65	3.63	-0.02
	491880	4050.12	4050.62	4056.23	4056.21	5.61	5.59	-0.02
	73572	4053.43	4053.93	4056.23	4056.21	2.30	2.28	-0.02
	563495	4052.66	4053.16	4056.23	4056.21	3.07	3.06	-0.02
	282719	4051.64	4052.14	4056.23	4056.21	4.09	4.07	-0.02
	299748	4053.24	4053.74	4056.23	4056.21	2.49	2.47	-0.02
	397640	4052.99	4053.49	4056.23	4056.21	2.74	2.72	-0.02
	201179	4052.41	4052.91	4056.23	4056.21	3.32	3.31	-0.02
	119567	4053.95	4054.45	4056.23	4056.21	1.78	1.76	-0.02
	121100	4054.85	4055.35	4056.23	4056.21	0.88	0.87	-0.02
	346410	4052.04	4052.54	4056.23	4056.21	3.69	3.67	-0.02
	163022	4052.31	4052.81	4056.23	4056.21	3.42	3.40	-0.02
	2433	4055.44	4055.94	4056.23	4056.22	0.29	0.27	-0.02
	449389	4051.51	4052.01	4056.23	4056.21	4.22	4.21	-0.02
	299693	4051.14	4051.64	4056.23	4056.21	4.59	4.57	-0.02
	670997	4055.04	4055.54	4056.23	4056.21	0.69	0.67	-0.02
	282307	4051.55	4052.05	4056.23	4056.21	4.18	4.17	-0.02
	475033	4051.16	4051.66	4056.23	4056.21	4.58	4.56	-0.02
	589124	4055.47	4055.97	4056.23	4056.21	0.26	0.24	-0.02
	423370	4051.88	4052.38	4056.23	4056.21	3.85	3.83	-0.02
	202091	4051.36	4051.86	4056.23	4056.21	4.37	4.35	-0.02
	163733	4051.39	4051.89	4056.23	4056.21	4.34	4.32	-0.02
	606839	4053.66	4054.16	4056.23	4056.21	2.07	2.05	-0.02
	593207	4050.37	4050.87	4056.23	4056.21	5.37	5.35	-0.02
	589145	4052.09	4052.59	4056.23	4056.21	3.64	3.62	-0.02
0.2% Annual Chance Commercial Buildings	474559	4039.19	4039.69	4,040.58	0.00	0.89	0.00	-0.89
	241024	4040.72	4041.22	4,042.45	4042.18	1.23	0.96	-0.27
	201200	4040.91	4041.41	4,042.50	4042.19	1.09	0.79	-0.31
	120892	4040.77	4041.27	4,042.65	4042.29	1.38	1.02	-0.36
	593238	4041.01	4041.51	4,042.75	0.00	1.24	0.00	-1.24
	517561	4027.14	4027.64	4,027.93	0.00	0.29	0.00	-0.29
	606987	4027.57	4028.07	4,028.61	0.00	0.54	0.00	-0.54
	346552	4065.18	4065.68	4,065.88	0.00	0.19	0.00	-0.19
	321620	4039.36	4039.86	4,041.77	4041.03	1.91	1.17	-0.74
	372053	4039.13	4039.63	4,041.77	4041.03	2.14	1.40	-0.74
	239460	4039.01	4039.51	4,041.78	4041.03	2.27	1.52	-0.74
	163933	4039.57	4040.07	4,041.79	4041.04	1.73	0.97	-0.75
	282470	4030.97	4031.47	4,033.01	0.00	1.54	0.00	-1.54
	121442	4031.35	4031.85	4,033.53	4032.55	1.68	0.69	-0.99
	606941	4032.48	4032.98	4,034.79	4033.80	1.82	0.82	-0.99
	2468	4045.30	4045.80	4,047.96	0.00	2.16	0.00	-2.16
	239991	4040.16	4040.66	4,042.03	4041.83	1.37	1.17	-0.21
	671034	4040.96	4041.46	4,042.10	0.00	0.64	0.00	-0.64
	671029	4042.54	4043.04	4,044.42	4044.18	1.39	1.15	-0.24
	28140	4034.47	4034.97	4,036.64	4035.83	1.67	0.87	-0.80
	320709	4039.07	4039.57	4,041.44	4040.75	1.87	1.18	-0.69
	593279	4038.49	4038.99	4,041.43	4040.75	2.44	1.76	-0.68
	320707	4039.37	4039.87	4,041.48	4040.76	1.61	0.90	-0.71
	475040	4046.63	4047.13	4,048.97	4048.55	1.85	1.43	-0.42
	530078	4038.78	4039.28	4,041.45	4040.75	2.16	1.47	-0.69
	239996	4037.89	4038.39	4,041.96	4041.16	3.56	2.77	-0.80

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Commercial Buildings	163955	4038.70	4039.20	4,041.43	4040.75	2.24	1.55	-0.68
	2016	4039.11	4039.61	4,041.82	4041.04	2.20	1.42	-0.78
	162965	4038.62	4039.12	4,041.47	4040.76	2.35	1.64	-0.71
	282631	4038.49	4038.99	4,041.72	4040.96	2.73	1.98	-0.76
	530068	4038.59	4039.09	4,041.66	4040.92	2.57	1.83	-0.74
	474557	4039.33	4039.83	4,041.78	4041.00	1.95	1.17	-0.77
	423705	4067.73	4068.23	4,069.05	4068.25	0.82	0.02	-0.80
	163038	4039.66	4040.16	4,042.05	4041.30	1.89	1.14	-0.75
	282625	4039.25	4039.75	4,041.83	4041.02	2.08	1.27	-0.80
	397596	4039.41	4039.91	4,041.80	4041.01	1.89	1.10	-0.79
	397537	4069.35	4069.85	4,069.98	4069.37	0.13	0.00	-0.13
	374042	4026.94	4027.44	4,028.63	0.00	1.19	0.00	-1.19
	2554	4039.71	4040.21	4,042.09	4041.34	1.88	1.13	-0.75
	44820	4068.28	4068.78	4,069.63	4068.68	0.85	0.00	-0.85
	321418	4069.63	4070.13	4,070.92	4070.26	0.79	0.13	-0.66
	1956	4068.92	4069.42	4,070.10	4069.36	0.68	0.00	-0.68
	321502	4065.57	4066.07	4,068.01	4067.39	1.94	1.31	-0.63
	119683	4031.86	4032.36	4,033.60	4032.67	1.24	0.31	-0.93
	74275	4065.48	4065.98	4,067.95	4067.30	1.97	1.32	-0.65
	2707	4027.70	4028.20	4,028.45	0.00	0.25	0.00	-0.25
	627863	4063.42	4063.92	4,067.29	4066.69	3.37	2.76	-0.61
	491872	4065.38	4065.88	4,067.58	4066.93	1.70	1.05	-0.65
	397946	4065.81	4066.31	4,067.90	4067.21	1.59	0.90	-0.69
	423782	4066.35	4066.85	4,067.70	4067.08	0.85	0.23	-0.62
	27340	4071.49	4071.99	4,072.88	4071.65	0.89	0.00	-0.89
	121299	4066.32	4066.82	4,067.77	4067.13	0.94	0.30	-0.64
	119574	4066.23	4066.73	4,067.85	4067.20	1.13	0.47	-0.65
	397560	4066.45	4066.95	4,068.08	4067.44	1.12	0.49	-0.64
	504662	4065.92	4066.42	4,067.92	4067.28	1.50	0.86	-0.64
	239408	4066.59	4067.09	4,068.22	4067.62	1.12	0.53	-0.59
	2443	4066.43	4066.93	4,068.00	4067.39	1.08	0.46	-0.61
	542678	4066.69	4067.19	4,068.39	4067.78	1.19	0.59	-0.60
	346551	4066.46	4066.96	4,068.11	4067.51	1.15	0.55	-0.60
	606845	4066.59	4067.09	4,068.53	4067.91	1.44	0.82	-0.62
	504756	4033.01	4033.51	4,034.40	4033.91	0.89	0.40	-0.49
	201169	4066.30	4066.80	4,068.23	4067.63	1.43	0.84	-0.60
	163079	4027.67	4028.17	4,028.22	4027.50	0.05	0.00	-0.05
	397945	4066.50	4067.00	4,068.64	4068.01	1.64	1.00	-0.64
	373830	4066.07	4066.57	4,068.35	4067.75	1.78	1.18	-0.60
	542677	4066.40	4066.90	4,068.76	4068.11	1.87	1.22	-0.65
	589095	4071.72	4072.22	4,072.92	4071.64	0.70	0.00	-0.70
	73430	4066.09	4066.59	4,068.50	4067.89	1.92	1.30	-0.61
	397948	4066.38	4066.88	4,068.88	4068.20	2.00	1.32	-0.68
	423781	4066.25	4066.75	4,068.58	4067.96	1.83	1.22	-0.62
	163540	4071.32	4071.82	4,073.26	4072.05	1.44	0.24	-1.20
	504779	4027.16	4027.66	4,028.13	4027.29	0.48	0.00	-0.48
	627861	4066.31	4066.81	4,068.64	4068.02	1.83	1.21	-0.62
	474627	4028.19	4028.69	4,028.72	4028.46	0.03	0.00	-0.03
	27388	4066.05	4066.55	4,068.71	4068.09	2.16	1.53	-0.62
	240165	4028.12	4028.62	4,029.00	4028.63	0.38	0.01	-0.37
	448799	4066.64	4067.14	4,068.77	4068.14	1.63	1.00	-0.63
	73433	4066.60	4067.10	4,068.80	4068.17	1.70	1.07	-0.63
	299780	4028.47	4028.97	4,029.28	4028.93	0.31	0.00	-0.31
	671008	4066.50	4067.00	4,068.81	4068.18	1.81	1.17	-0.63
	320586	4072.54	4073.04	4,073.70	4072.47	0.66	0.00	-0.66
	282495	4028.19	4028.69	4,028.81	4028.29	0.11	0.00	-0.11
	121298	4066.67	4067.17	4,068.81	4068.18	1.64	1.01	-0.63
	320586	4072.54	4073.04	4,073.70	4072.47	0.66	0.00	-0.66
	239868	4066.85	4067.35	4,068.81	4068.18	1.46	0.83	-0.63
	44831	4066.81	4067.31	4,068.80	4068.18	1.49	0.87	-0.63
	397563	4067.03	4067.53	4,068.79	4068.17	1.27	0.65	-0.62
	44834	4067.31	4067.81	4,068.78	4068.17	0.98	0.36	-0.62
	73431	4067.38	4067.88	4,068.77	4068.16	0.90	0.28	-0.61
	606846	4067.51	4068.01	4,068.76	4068.15	0.76	0.15	-0.61
	671011	4067.72	4068.22	4,068.76	4068.14	0.54	0.00	-0.54
	120712	4067.74	4068.24	4,068.75	4068.13	0.51	0.00	-0.51
	373831	4067.48	4067.98	4,068.73	4068.11	0.75	0.13	-0.62
	589139	4067.53	4068.03	4,068.72	4068.10	0.70	0.07	-0.63
	653539	4067.70	4068.20	4,068.70	4068.08	0.50	0.00	-0.50

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Commercial Buildings	27775	4072.75	4073.25	4,073.99	4072.68	0.74	0.00	-0.74
	423363	4067.57	4068.07	4,068.65	4068.04	0.58	0.00	-0.58
	397681	4080.16	4080.66	4,081.41	4080.71	0.74	0.05	-0.69
	121029	4067.74	4068.24	4,068.61	4068.01	0.36	0.00	-0.36
	423215	4079.35	4079.85	4,080.96	0.00	1.11	0.00	-1.11
	162731	4072.32	4072.82	4,073.98	4072.66	1.16	0.00	-1.16
	517435	4067.35	4067.85	4,068.54	4067.94	0.68	0.09	-0.59
	530011	4067.24	4067.74	4,068.49	4067.87	0.75	0.12	-0.62
	563338	4079.54	4080.04	4,081.42	4080.72	1.38	0.68	-0.70
	121030	4067.42	4067.92	4,068.47	4067.86	0.55	0.00	-0.55
	239409	4067.61	4068.11	4,068.49	4067.92	0.38	0.00	-0.38
	239869	4067.61	4068.11	4,068.58	4068.06	0.47	0.00	-0.47
	239603	4021.92	4022.42	4,028.03	4027.26	5.61	4.84	-0.76
	120713	4067.61	4068.11	4,068.66	4068.10	0.55	0.00	-0.55
	346386	4074.09	4074.59	4,075.12	4074.09	0.53	0.00	-0.53
	670936	4074.15	4074.65	4,075.24	4074.22	0.59	0.00	-0.59
	371866	4079.19	4079.69	4,081.44	4081.17	1.75	1.48	-0.27
	632082	4067.41	4067.91	4,068.71	4068.13	0.80	0.21	-0.58
	542552	4079.52	4080.02	4,081.44	4081.22	1.42	1.19	-0.23
	423365	4067.49	4067.99	4,068.73	4068.15	0.75	0.16	-0.58
	346351	4067.48	4067.98	4,068.75	4068.16	0.77	0.17	-0.60
	162639	4079.25	4079.75	4,081.44	4081.18	1.69	1.44	-0.26
	299625	4071.48	4071.98	4,073.90	4072.55	1.93	0.57	-1.36
	201666	4067.24	4067.74	4,068.76	4068.15	1.02	0.41	-0.60
	423364	4066.90	4067.40	4,068.76	4068.15	1.36	0.75	-0.60
	261576	4024.32	4024.82	4,026.28	4025.59	1.47	0.78	-0.69
	240832	4066.39	4066.89	4,068.75	4068.15	1.86	1.26	-0.60
	653540	4066.48	4066.98	4,068.75	4068.15	1.78	1.17	-0.60
	201380	4025.19	4025.69	4,027.41	0.00	1.73	0.00	-1.73
	448893	4075.72	4076.22	4,081.43	4080.72	5.21	4.50	-0.71
	606847	4066.58	4067.08	4,068.75	4068.15	1.67	1.06	-0.60
	73429	4066.75	4067.25	4,068.75	4068.15	1.50	0.90	-0.60
	631844	4074.39	4074.89	4,081.43	4080.72	6.54	5.83	-0.71
	74818	4025.33	4025.83	4,027.33	0.00	1.50	0.00	-1.50
	119435	4080.45	4080.95	4,081.44	4080.73	0.50	0.00	-0.50
	1968	4066.97	4067.47	4,068.74	4068.15	1.27	0.68	-0.60
	504663	4066.91	4067.41	4,068.74	4068.14	1.32	0.73	-0.59
	670864	4074.28	4074.78	4,081.44	4080.72	6.65	5.94	-0.71
	202095	4066.70	4067.20	4,068.73	4068.14	1.54	0.94	-0.59
	74277	4066.79	4067.29	4,068.73	4068.14	1.44	0.85	-0.59
	627860	4066.75	4067.25	4,068.72	4068.14	1.48	0.89	-0.58
	27390	4066.64	4067.14	4,068.72	4068.14	1.58	0.99	-0.58
	653478	4074.17	4074.67	4,075.81	4074.82	1.14	0.15	-0.99
	589138	4066.69	4067.19	4,068.72	4068.14	1.53	0.94	-0.58
	261452	4066.68	4067.18	4,068.72	4068.14	1.54	0.96	-0.58
	73996	4066.62	4067.12	4,068.72	4068.14	1.60	1.02	-0.58
	299686	4066.51	4067.01	4,068.71	4068.14	1.70	1.13	-0.58
	671009	4066.44	4066.94	4,068.71	4068.14	1.77	1.20	-0.57
	346153	4077.95	4078.45	4,081.43	4080.71	2.98	2.27	-0.71
	44778	4074.11	4074.61	4,075.14	4074.09	0.52	0.00	-0.52
	397564	4066.47	4066.97	4,068.70	4068.14	1.73	1.16	-0.57
	27780	4073.16	4073.66	4,074.68	4073.67	1.02	0.01	-1.02
	73997	4066.62	4067.12	4,068.70	4068.13	1.58	1.01	-0.56
	529927	4075.35	4075.85	4,076.14	4074.99	0.29	0.00	-0.29
	239737	4074.43	4074.93	4,076.08	0.00	1.14	0.00	-1.14
	120125	4203.60	4204.10	4,204.72	4204.58	0.62	0.48	-0.14
	423287	4207.60	4208.10	4,208.13	4208.10	0.03	0.00	-0.03
	517295	4115.96	4116.46	4,116.83	4116.83	0.37	0.37	0.00
	423208	4115.61	4116.11	4,117.14	4117.13	1.03	1.03	0.00
	397389	4115.85	4116.35	4,116.87	4116.81	0.51	0.45	-0.06
	201691	4052.58	4053.08	4,054.90	4054.44	1.82	1.35	-0.47
	2473	4052.71	4053.21	4,055.20	4054.69	1.99	1.48	-0.51
	654736	4053.35	4053.85	4,054.95	4054.46	1.10	0.61	-0.49
	504665	4053.69	4054.19	4,056.54	4056.34	2.35	2.15	-0.21
	239414	4054.35	4054.85	4,056.54	4056.34	1.69	1.49	-0.21
	239417	4054.73	4055.23	4,056.54	4056.34	1.32	1.11	-0.21
	563497	4055.24	4055.74	4,056.53	4056.40	0.79	0.66	-0.13
	239418	4054.73	4055.23	4,056.51	4056.51	1.28	1.28	0.00
	320646	4055.53	4056.03	4,056.94	4056.94	0.91	0.91	0.00

Appendix 5H

MON3 (FMP ID: 143000024) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Commercial Buildings	73998	4056.02	4056.52	4,056.90	4056.90	0.38	0.38	0.00
	671012	4053.68	4054.18	4,056.23	4056.21	2.05	2.04	-0.02
	1967	4052.83	4053.33	4,056.23	4056.21	2.90	2.89	-0.02
	73434	4052.29	4052.79	4,056.23	4056.21	3.44	3.42	-0.02
	239464	4042.34	4042.84	4,056.23	4056.21	13.40	13.38	-0.02
	398018	4049.97	4050.47	4,056.23	4056.21	5.76	5.75	-0.02
	653543	4050.60	4051.10	4,056.23	4056.21	5.13	5.11	-0.02

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	568680	3639.03	3639.53	3639.88	3639.42	0.35	0.00	-0.35
	123037	3638.50	3639.00	3639.88	3639.41	0.88	0.41	-0.47
	398344	3643.23	3643.73	3643.77	3643.54	0.04	0.00	-0.04
	451120	3652.65	3653.15	3653.52	3653.33	0.37	0.18	-0.19
	492701	3652.55	3653.05	3653.52	3653.32	0.47	0.28	-0.19
	166442	3652.58	3653.08	3653.52	3653.33	0.44	0.25	-0.19
	76960	3653.67	3654.17	3654.41	3654.17	0.24	0.00	-0.24
	77779	3766.47	3766.97	3769.53	0.00	2.56	0.00	-2.56
	30575	3765.83	3766.33	3770.70	0.00	4.38	0.00	-4.38
	679498	3780.01	3780.51	3781.74	0.00	1.22	0.00	-1.22
	701113	3780.34	3780.84	3783.13	0.00	2.29	0.00	-2.29
1% Annual Chance Commercial Buildings	425531	3754.56	3755.06	3755.22	3754.58	0.16	0.00	-0.16
	701110	3774.23	3774.73	3777.94	0.00	3.21	0.00	-3.21
	701111	3790.29	3790.79	3791.27	0.00	0.48	0.00	-0.48
	679516	3795.34	3795.84	3796.73	0.00	0.89	0.00	-0.89
	77892	3803.52	3804.02	3805.21	0.00	1.19	0.00	-1.19
	77768	3807.43	3807.93	3808.52	0.00	0.59	0.00	-0.59
0.2% Annual Chance Residences	75658	3639.88	3640.38	3640.59	3640.56	0.21	0.18	-0.03
	568680	3639.03	3639.53	3640.61	3640.58	1.07	1.04	-0.03
	28170	3643.78	3644.28	3644.37	3644.33	0.10	0.06	-0.04
	399236	3643.67	3644.17	3644.39	3644.35	0.22	0.18	-0.04
	589672	3643.86	3644.36	3644.39	3644.35	0.03	0.00	-0.03
	203019	3643.74	3644.24	3644.45	3644.39	0.21	0.16	-0.05
	492381	3644.11	3644.61	3644.67	3644.62	0.06	0.01	-0.05
	589968	3653.59	3654.09	3654.41	3654.23	0.31	0.13	-0.18
	633160	3653.27	3653.77	3654.40	3654.22	0.63	0.45	-0.18
	126183	3830.28	3830.78	3831.50	3831.50	0.72	0.72	0.00
	348053	3648.84	3649.34	3650.19	3649.72	0.85	0.38	-0.47
	633025	3648.87	3649.37	3650.26	3649.72	0.89	0.35	-0.54
	671745	3648.29	3648.79	3650.19	3649.72	1.40	0.93	-0.47
	124126	3649.37	3649.87	3650.18	3649.72	0.31	0.00	-0.31
	322978	3649.63	3650.13	3650.19	3649.72	0.06	0.00	-0.06
	164642	3649.14	3649.64	3650.19	3649.72	0.55	0.08	-0.47
	424811	3653.81	3654.31	3654.38	3654.19	0.07	0.00	-0.07
	3407	3639.66	3640.16	3640.58	3640.55	0.41	0.39	-0.03
	123037	3638.50	3639.00	3640.58	3640.55	1.58	1.55	-0.03
	204029	3643.81	3644.31	3644.37	3644.33	0.07	0.03	-0.04
	399262	3643.71	3644.21	3644.37	3644.33	0.16	0.13	-0.04
	283301	3642.28	3642.78	3643.43	3643.37	0.65	0.60	-0.06
	398344	3643.23	3643.73	3644.37	3644.33	0.64	0.61	-0.04
	240339	3643.84	3644.34	3644.36	3644.32	0.02	0.00	-0.02
	374724	3643.75	3644.25	3644.34	3644.31	0.09	0.05	-0.04
	399849	3653.73	3654.23	3654.42	3654.24	0.18	0.01	-0.18
	203037	3653.84	3654.34	3654.42	3654.25	0.08	0.00	-0.08
	75347	3653.72	3654.22	3654.42	3654.24	0.20	0.02	-0.17
	399848	3653.61	3654.11	3654.42	3654.24	0.30	0.13	-0.17
	654546	3653.58	3654.08	3654.42	3654.24	0.33	0.16	-0.17
	607764	3653.46	3653.96	3654.42	3654.25	0.45	0.28	-0.17
	243447	3653.74	3654.24	3654.42	3654.24	0.18	0.01	-0.17
	451120	3652.65	3653.15	3654.42	3654.24	1.27	1.10	-0.17
	492701	3652.55	3653.05	3654.42	3654.24	1.37	1.20	-0.17
	166442	3652.58	3653.08	3654.42	3654.25	1.34	1.16	-0.17
	300625	3655.27	3655.77	3655.85	3655.26	0.09	0.00	-0.09
	76960	3653.67	3654.17	3655.46	3655.33	1.29	1.16	-0.13
	4201	3761.27	3761.77	3762.46	0.00	0.68	0.00	-0.68
	77779	3766.47	3766.97	3770.53	0.00	3.56	0.00	-3.56
	30575	3765.83	3766.33	3770.94	0.00	4.61	0.00	-4.61
	679498	3780.01	3780.51	3781.88	0.00	1.37	0.00	-1.37
	701113	3780.34	3780.84	3783.27	3783.27	2.43	2.43	0.00
0.2% Annual Chance Commercial Buildings	425531	3754.56	3755.06	3,755.35	3754.82	0.28	0.00	-0.28
	701110	3774.23	3774.73	3,778.12	0.00	3.39	0.00	-3.39
	701111	3790.29	3790.79	3,791.52	0.00	0.74	0.00	-0.74
	679516	3795.34	3795.84	3,797.00	0.00	1.16	0.00	-1.16
	77892	3803.52	3804.02	3,805.55	3803.78	1.54	0.00	-1.54
	77768	3807.43	3807.93	3,808.89	3807.24	0.96	0.00	-0.96

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	9482	3699.92	3700.42	3700.98	0.00	0.55	0.00	-0.55
	9736	3704.69	3705.19	3705.37	0.00	0.18	0.00	-0.18
	9759	3705.15	3705.65	3705.92	0.00	0.27	0.00	-0.27
	34666	3704.43	3704.93	3705.37	0.00	0.44	0.00	-0.44
	35166	3703.89	3704.39	3704.44	0.00	0.05	0.00	-0.05
	35212	3704.65	3705.15	3705.37	0.00	0.23	0.00	-0.23
	48396	3701.32	3701.82	3702.09	0.00	0.27	0.00	-0.27
	48400	3701.34	3701.84	3702.12	0.00	0.28	0.00	-0.28
	48494	3704.20	3704.70	3705.37	0.00	0.67	0.00	-0.67
	83636	3704.24	3704.74	3705.37	0.00	0.63	0.00	-0.63
	84795	3700.01	3700.51	3700.93	0.00	0.41	0.00	-0.41
	84803	3700.33	3700.83	3700.96	0.00	0.13	0.00	-0.13
	85097	3702.31	3702.81	3703.38	0.00	0.57	0.00	-0.57
	85208	3704.54	3705.04	3705.37	0.00	0.34	0.00	-0.34
	131411	3699.24	3699.74	3699.90	0.00	0.16	0.00	-0.16
	132315	3702.77	3703.27	3703.33	0.00	0.06	0.00	-0.06
	132334	3704.02	3704.52	3705.37	0.00	0.85	0.00	-0.85
	134719	3700.06	3700.56	3700.59	0.00	0.03	0.00	-0.03
	134958	3700.04	3700.54	3700.78	0.00	0.24	0.00	-0.24
	135595	3704.85	3705.35	3705.37	0.00	0.03	0.00	-0.03
	173165	3700.28	3700.78	3700.95	0.00	0.17	0.00	-0.17
	173600	3702.58	3703.08	3703.43	0.00	0.35	0.00	-0.35
	173824	3705.45	3705.95	3705.96	0.00	0.01	0.00	-0.01
	174286	3700.32	3700.82	3700.86	0.00	0.05	0.00	-0.05
	211410	3700.00	3700.50	3700.59	0.00	0.09	0.00	-0.09
	211641	3701.23	3701.73	3702.08	0.00	0.35	0.00	-0.35
	211648	3701.50	3702.00	3702.13	0.00	0.14	0.00	-0.14
	211861	3703.98	3704.48	3704.62	0.00	0.14	0.00	-0.14
	211989	3702.08	3702.58	3702.62	0.00	0.04	0.00	-0.04
	212147	3704.05	3704.55	3704.59	0.00	0.04	0.00	-0.04
	212933	3704.04	3704.54	3705.37	0.00	0.83	0.00	-0.83
	212942	3708.48	3708.98	3709.04	0.00	0.06	0.00	-0.06
	249505	3701.80	3702.30	3702.62	0.00	0.33	0.00	-0.33
	249667	3703.37	3703.87	3703.95	0.00	0.08	0.00	-0.08
	249854	3704.06	3704.56	3705.37	0.00	0.82	0.00	-0.82
	249857	3704.82	3705.32	3705.37	0.00	0.06	0.00	-0.06
	250662	3704.33	3704.83	3705.87	0.00	1.04	0.00	-1.04
	265055	3699.89	3700.39	3700.88	0.00	0.49	0.00	-0.49
	265160	3701.73	3702.23	3702.32	0.00	0.09	0.00	-0.09
	265249	3705.20	3705.70	3705.96	0.00	0.26	0.00	-0.26
	289066	3700.02	3700.52	3700.58	0.00	0.06	0.00	-0.06
	289653	3704.75	3705.25	3705.32	0.00	0.07	0.00	-0.07
	289664	3704.12	3704.62	3705.37	0.00	0.75	0.00	-0.75
	289670	3704.58	3705.08	3705.37	0.00	0.29	0.00	-0.29
	289852	3704.48	3704.98	3705.37	0.00	0.39	0.00	-0.39
	289864	3705.05	3705.55	3705.91	0.00	0.36	0.00	-0.36
	302956	3697.86	3698.36	3698.54	0.00	0.17	0.00	-0.17
	303424	3701.54	3702.04	3702.67	0.00	0.63	0.00	-0.63
	303478	3705.19	3705.69	3705.86	0.00	0.18	0.00	-0.18
	303512	3704.32	3704.82	3705.37	0.00	0.55	0.00	-0.55
	327984	3704.31	3704.81	3705.85	0.00	1.04	0.00	-1.04
	353420	3700.17	3700.67	3700.78	0.00	0.11	0.00	-0.11
	353835	3701.69	3702.19	3702.25	0.00	0.06	0.00	-0.06
	353864	3702.70	3703.20	3703.41	0.00	0.21	0.00	-0.21
	353964	3704.19	3704.69	3705.37	0.00	0.68	0.00	-0.68
	377303	3697.84	3698.34	3698.54	0.00	0.19	0.00	-0.19
	378058	3701.92	3702.42	3703.29	0.00	0.87	0.00	-0.87
	379656	3698.88	3699.38	3699.90	0.00	0.53	0.00	-0.53
	380183	3704.75	3705.25	3705.37	0.00	0.12	0.00	-0.12
	404516	3700.41	3700.91	3700.95	0.00	0.03	0.00	-0.03
	404971	3708.36	3708.86	3709.02	0.00	0.16	0.00	-0.16
	405292	3701.27	3701.77	3702.03	0.00	0.26	0.00	-0.26
	430113	3699.96	3700.46	3700.58	0.00	0.12	0.00	-0.12
	430512	3701.50	3702.00	3702.23	0.00	0.23	0.00	-0.23
	430524	3701.75	3702.25	3702.60	0.00	0.36	0.00	-0.36
	456546	3702.59	3703.09	3703.29	0.00	0.20	0.00	-0.20
	456608	3704.20	3704.70	3705.37	0.00	0.67	0.00	-0.67
	481449	3701.44	3701.94	3702.13	0.00	0.19	0.00	-0.19
	481455	3701.63	3702.13	3702.24	0.00	0.11	0.00	-0.11
	481693	3708.52	3709.02	3709.09	0.00	0.07	0.00	-0.07

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	481890	3699.61	3700.11	3700.58	0.00	0.47	0.00	-0.47
	482226	3704.50	3705.00	3705.35	0.00	0.35	0.00	-0.35
	482264	3708.00	3708.50	3708.91	0.00	0.42	0.00	-0.42
	495408	3700.32	3700.82	3700.89	0.00	0.07	0.00	-0.07
	495601	3705.17	3705.67	3706.19	0.00	0.51	0.00	-0.51
	521043	3701.64	3702.14	3702.18	0.00	0.04	0.00	-0.04
	533760	3705.48	3705.98	3706.29	0.00	0.31	0.00	-0.31
	566765	3697.28	3697.78	3698.54	0.00	0.76	0.00	-0.76
	567022	3700.32	3700.82	3700.98	0.00	0.16	0.00	-0.16
	567111	3701.61	3702.11	3702.17	0.00	0.06	0.00	-0.06
	571751	3699.03	3699.53	3699.90	0.00	0.37	0.00	-0.37
	572037	3702.07	3702.57	3702.63	0.00	0.06	0.00	-0.06
	592909	3701.97	3702.47	3703.27	0.00	0.81	0.00	-0.81
	592988	3704.38	3704.88	3705.37	0.00	0.49	0.00	-0.49
	592993	3704.26	3704.76	3705.37	0.00	0.61	0.00	-0.61
	597385	3698.86	3699.36	3699.90	0.00	0.54	0.00	-0.54
	597752	3704.54	3705.04	3705.37	0.00	0.33	0.00	-0.33
	635999	3700.27	3700.77	3700.92	0.00	0.15	0.00	-0.15
	636137	3702.34	3702.84	3703.32	0.00	0.48	0.00	-0.48
	660199	3704.81	3705.31	3705.39	0.00	0.08	0.00	-0.08
	661189	3702.15	3702.65	3702.67	0.00	0.02	0.00	-0.02
	661266	3702.57	3703.07	3703.30	0.00	0.23	0.00	-0.23
	661277	3704.71	3705.21	3705.37	0.00	0.16	0.00	-0.16
	661286	3704.86	3705.36	3705.37	0.00	0.01	0.00	-0.01
	674539	3700.13	3700.63	3700.93	0.00	0.31	0.00	-0.31
	674550	3700.38	3700.88	3700.96	0.00	0.08	0.00	-0.08
	674693	3702.16	3702.66	3703.29	0.00	0.63	0.00	-0.63
	674760	3704.13	3704.63	3705.37	0.00	0.74	0.00	-0.74
	677856	3697.01	3697.51	3698.54	0.00	1.03	0.00	-1.03
	677875	3697.02	3697.52	3698.54	0.00	1.02	0.00	-1.02
	697077	3702.01	3702.51	3702.69	0.00	0.18	0.00	-0.18
	705104	3697.58	3698.08	3698.54	0.00	0.46	0.00	-0.46
	705521	3700.04	3700.54	3700.97	0.00	0.43	0.00	-0.43
	710277	3704.53	3705.03	3705.31	0.00	0.28	0.00	-0.28
	710325	3702.82	3703.32	3703.48	0.00	0.16	0.00	-0.16
	710374	3708.41	3708.91	3709.22	0.00	0.30	0.00	-0.30
	710393	3706.24	3706.74	3707.34	0.00	0.60	0.00	-0.60
	714435	3704.63	3705.13	3705.40	0.00	0.27	0.00	-0.27
	714445	3704.73	3705.23	3705.42	0.00	0.20	0.00	-0.20
	714462	3704.82	3705.32	3705.37	0.00	0.05	0.00	-0.05
	4865835	3697.94	3698.44	3698.54	0.00	0.10	0.00	-0.10
1% Annual Chance	9730	3703.99	3704.49	3705.37	0.00	0.88	0.00	-0.88
	35202	3705.32	3705.82	3706.00	0.00	0.19	0.00	-0.19
	83432	3703.73	3704.23	3704.30	0.00	0.07	0.00	-0.07
	85031	3702.12	3702.62	3702.63	0.00	0.01	0.00	-0.01
	132342	3706.76	3707.26	3707.41	0.00	0.15	0.00	-0.15
	135605	3705.52	3706.02	3706.57	0.00	0.55	0.00	-0.55
	173822	3705.87	3706.37	3706.40	0.00	0.03	0.00	-0.03
	174068	3704.00	3704.50	3705.37	0.00	0.87	0.00	-0.87
	174080	3706.11	3706.61	3707.08	0.00	0.47	0.00	-0.47
	211811	3702.03	3702.53	3702.68	0.00	0.15	0.00	-0.15
	212234	3704.30	3704.80	3705.37	0.00	0.57	0.00	-0.57
	289780	3701.84	3702.34	3702.64	0.00	0.29	0.00	-0.29
	289854	3706.23	3706.73	3707.34	0.00	0.61	0.00	-0.61
	289858	3705.60	3706.10	3706.20	0.00	0.09	0.00	-0.09
	303516	3705.52	3706.02	3706.39	0.00	0.37	0.00	-0.37
	327992	3705.93	3706.43	3706.80	0.00	0.37	0.00	-0.37
	353806	3704.19	3704.69	3704.76	0.00	0.07	0.00	-0.07
	353950	3704.47	3704.97	3705.55	0.00	0.57	0.00	-0.57
	378165	3705.73	3706.23	3706.57	0.00	0.34	0.00	-0.34
	404916	3704.92	3705.42	3707.51	3704.76	2.09	0.00	-2.09
	431185	3705.75	3706.25	3706.40	0.00	0.16	0.00	-0.16
	455949	3703.80	3704.30	3705.37	0.00	1.07	0.00	-1.07
	456622	3706.72	3707.22	3707.89	0.00	0.67	0.00	-0.67
	495591	3703.64	3704.14	3705.37	0.00	1.23	0.00	-1.23
	508465	3705.76	3706.26	3706.36	0.00	0.10	0.00	-0.10
	521123	3703.26	3703.76	3704.60	0.00	0.85	0.00	-0.85
	521146	3705.57	3706.07	3706.29	0.00	0.22	0.00	-0.22
	572103	3704.65	3705.15	3705.37	0.00	0.23	0.00	-0.23
	636193	3703.97	3704.47	3705.37	0.00	0.91	0.00	-0.91

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
Commercial Buildings	636196	3704.33	3704.83	3705.37	0.00	0.54	0.00	-0.54
	674761	3706.52	3707.02	3707.46	0.00	0.44	0.00	-0.44
	674763	3705.28	3705.78	3706.40	0.00	0.61	0.00	-0.61
	682963	3704.85	3705.35	3705.85	0.00	0.51	0.00	-0.51
	682993	3705.37	3705.87	3705.92	0.00	0.05	0.00	-0.05
	683004	3704.81	3705.31	3705.38	0.00	0.07	0.00	-0.07
	683009	3706.72	3707.22	3707.58	0.00	0.37	0.00	-0.37
	705101	3698.01	3698.51	3698.54	0.00	0.03	0.00	-0.03
	705108	3697.26	3697.76	3698.54	0.00	0.78	0.00	-0.78
	710269	3704.35	3704.85	3704.90	0.00	0.04	0.00	-0.04
	710273	3704.17	3704.67	3704.77	0.00	0.10	0.00	-0.10
	710297	3704.73	3705.23	3705.54	0.00	0.31	0.00	-0.31
	710366	3708.18	3708.68	3708.90	3708.33	0.22	0.00	-0.22
	710371	3707.95	3708.45	3708.90	3708.33	0.45	0.00	-0.45
	710373	3708.50	3709.00	3709.20	0.00	0.20	0.00	-0.20
	710375	3706.77	3707.27	3707.77	0.00	0.51	0.00	-0.51
	710376	3706.54	3707.04	3707.62	0.00	0.59	0.00	-0.59
	710377	3706.17	3706.67	3707.42	0.00	0.75	0.00	-0.75
	710378	3705.71	3706.21	3706.44	0.00	0.22	0.00	-0.22
	710387	3706.78	3707.28	3707.29	0.00	0.01	0.00	-0.01
	710392	3706.43	3706.93	3707.33	0.00	0.40	0.00	-0.40
	714419	3706.16	3706.66	3707.29	0.00	0.63	0.00	-0.63
	714421	3705.58	3706.08	3706.23	0.00	0.15	0.00	-0.15
	714425	3705.34	3705.84	3705.90	0.00	0.07	0.00	-0.07
	714437	3704.94	3705.44	3705.46	0.00	0.02	0.00	-0.02
	714443	3704.50	3705.00	3705.37	0.00	0.37	0.00	-0.37
	714444	3704.73	3705.23	3705.37	0.00	0.14	0.00	-0.14
	714449	3705.18	3705.68	3705.89	0.00	0.21	0.00	-0.21
	714454	3704.79	3705.29	3706.05	0.00	0.76	0.00	-0.76
	8798	3700.63	3701.13	3701.17	3700.54	0.04	0.00	-0.04
	8881	3700.75	3701.25	3701.37	3700.60	0.12	0.00	-0.12
	9054	3701.59	3702.09	3702.55	3701.86	0.46	0.00	-0.46
	9463	3700.40	3700.90	3701.40	3700.62	0.50	0.00	-0.50
	9482	3699.92	3700.42	3701.49	3700.70	1.07	0.28	-0.79
	9512	3700.89	3701.39	3701.72	3701.27	0.33	0.00	-0.33
	9541	3701.05	3701.55	3701.72	3701.27	0.17	0.00	-0.17
	9714	3703.47	3703.97	3704.20	0.00	0.22	0.00	-0.22
	9736	3704.69	3705.19	3705.82	3704.90	0.63	0.00	-0.63
	9759	3705.15	3705.65	3706.29	3705.11	0.64	0.00	-0.64
	34155	3700.51	3701.01	3701.18	3700.51	0.17	0.00	-0.17
	34445	3702.02	3702.52	3702.66	3702.00	0.14	0.00	-0.14
	34574	3703.49	3703.99	3704.31	0.00	0.33	0.00	-0.33
	34666	3704.43	3704.93	3705.82	3704.90	0.89	0.00	-0.89
	35020	3700.86	3701.36	3701.72	3701.27	0.36	0.00	-0.36
	35099	3701.78	3702.28	3702.56	3701.91	0.28	0.00	-0.28
	35104	3701.87	3702.37	3702.64	3701.91	0.27	0.00	-0.27
	35166	3703.89	3704.39	3704.61	3704.39	0.22	0.00	-0.22
	35212	3704.65	3705.15	3705.82	3704.90	0.67	0.00	-0.67
	48396	3701.32	3701.82	3702.55	3701.86	0.73	0.04	-0.69
	48400	3701.34	3701.84	3702.59	3701.88	0.75	0.04	-0.72
	48407	3701.67	3702.17	3702.59	3701.98	0.42	0.00	-0.42
	48412	3702.09	3702.59	3702.77	3702.22	0.18	0.00	-0.18
	48446	3703.05	3703.55	3703.74	3702.67	0.19	0.00	-0.19
	48477	3705.04	3705.54	3705.67	3704.79	0.13	0.00	-0.13
	48494	3704.20	3704.70	3705.82	3704.90	1.11	0.20	-0.91
	83192	3700.58	3701.08	3701.22	3700.55	0.14	0.00	-0.14
	83219	3700.85	3701.35	3701.43	3700.64	0.08	0.00	-0.08
	83636	3704.24	3704.74	3705.82	3704.90	1.07	0.16	-0.91
	84574	3700.47	3700.97	3701.20	3700.53	0.22	0.00	-0.22
	84722	3700.86	3701.36	3701.50	3700.71	0.14	0.00	-0.14
	84795	3700.01	3700.51	3701.44	3700.65	0.93	0.14	-0.79
	84803	3700.33	3700.83	3701.48	3700.69	0.65	0.00	-0.65
	84907	3702.03	3702.53	3702.60	3702.31	0.07	0.00	-0.07
	84964	3701.92	3702.42	3702.44	0.00	0.02	0.00	-0.02
	85097	3702.31	3702.81	3703.56	3703.32	0.75	0.52	-0.24
	85154	3703.72	3704.22	3704.28	3703.39	0.06	0.00	-0.06
	85196	3704.91	3705.41	3705.67	3704.79	0.26	0.00	-0.26
	85208	3704.54	3705.04	3705.82	3704.90	0.78	0.00	-0.78
	131411	3699.24	3699.74	3700.09	3699.79	0.35	0.05	-0.30
	132315	3702.77	3703.27	3704.09	3702.99	0.82	0.00	-0.82

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	132334	3704.02	3704.52	3705.82	3704.90	1.30	0.38	-0.91
	132343	3705.08	3705.58	3705.83	3705.04	0.25	0.00	-0.25
	134194	3699.51	3700.01	3700.11	3699.80	0.10	0.00	-0.10
	134719	3700.06	3700.56	3700.93	3700.44	0.37	0.00	-0.37
	134852	3701.81	3702.31	3702.34	3701.63	0.03	0.00	-0.03
	134870	3701.80	3702.30	3702.58	3701.87	0.28	0.00	-0.28
	134871	3702.02	3702.52	3702.55	3702.16	0.03	0.00	-0.03
	134958	3700.04	3700.54	3701.24	3700.55	0.70	0.01	-0.68
	134972	3700.53	3701.03	3701.31	3700.57	0.27	0.00	-0.27
	135018	3701.81	3702.31	3702.56	3701.87	0.26	0.00	-0.26
	135247	3703.33	3703.83	3704.10	3702.91	0.27	0.00	-0.27
	135325	3701.54	3702.04	3702.45	3701.79	0.41	0.00	-0.41
	135542	3702.87	3703.37	3704.12	3702.91	0.75	0.00	-0.75
	135595	3704.85	3705.35	3705.82	3704.90	0.47	0.00	-0.47
	173165	3700.28	3700.78	3701.46	3700.67	0.69	0.00	-0.69
	173540	3700.75	3701.25	3701.47	3700.68	0.21	0.00	-0.21
	173600	3702.58	3703.08	3703.61	3703.37	0.53	0.29	-0.24
	173609	3702.95	3703.45	3703.63	3702.60	0.18	0.00	-0.18
	173746	3701.06	3701.56	3701.72	3701.27	0.16	0.00	-0.16
	173811	3705.04	3705.54	3705.69	0.00	0.14	0.00	-0.14
	173824	3705.45	3705.95	3706.29	3705.43	0.34	0.00	-0.34
	173906	3701.75	3702.25	3702.58	3701.87	0.33	0.00	-0.33
	173935	3702.41	3702.91	3703.14	3702.50	0.24	0.00	-0.24
	174261	3700.47	3700.97	3701.22	3700.55	0.25	0.00	-0.25
	174286	3700.32	3700.82	3701.37	3700.60	0.55	0.00	-0.55
	174384	*3701.32*	*3701.82*	*3701.95*	*3701.31*	*0.13*	*0.00*	*-0.13*
	174464	3701.69	3702.19	3702.63	3701.90	0.43	0.00	-0.43
	174502	3702.43	3702.93	3703.09	3702.36	0.15	0.00	-0.15
	211410	3700.00	3700.50	3700.93	3700.44	0.43	0.00	-0.43
	211474	3701.06	3701.56	3701.72	3701.27	0.15	0.00	-0.15
	211485	3700.87	3701.37	3701.72	3701.27	0.35	0.00	-0.35
	211607	3700.54	3701.04	3701.47	3700.68	0.43	0.00	-0.43
	211638	3701.66	3702.16	3702.53	3701.84	0.37	0.00	-0.37
	211641	3701.23	3701.73	3702.54	3701.85	0.81	0.12	-0.69
	211648	3701.50	3702.00	3702.57	3701.94	0.57	0.00	-0.57
	211752	3700.58	3701.08	3701.51	3700.73	0.43	0.00	-0.43
	211755	3701.00	3701.50	3701.52	3700.75	0.03	0.00	-0.03
	211816	3702.62	3703.12	3703.25	3702.86	0.13	0.00	-0.13
	211861	3703.98	3704.48	3704.98	0.00	0.50	0.00	-0.50
	211989	3702.08	3702.58	3703.14	3702.38	0.56	0.00	-0.56
	212098	3702.80	3703.30	3703.46	3702.50	0.16	0.00	-0.16
	212100	3703.05	3703.55	3703.58	3703.44	0.03	0.00	-0.03
	212147	3704.05	3704.55	3704.94	0.00	0.39	0.00	-0.39
	212933	3704.04	3704.54	3705.82	3704.90	1.27	0.36	-0.91
	212942	3708.48	3708.98	3709.41	0.00	0.43	0.00	-0.43
	249505	3701.80	3702.30	3703.14	3702.38	0.85	0.09	-0.76
	249667	3703.37	3703.87	3704.08	3703.91	0.21	0.03	-0.18
	249691	3703.90	3704.40	3704.79	3703.98	0.39	0.00	-0.39
	249854	3704.06	3704.56	3705.82	3704.90	1.26	0.35	-0.91
	249857	3704.82	3705.32	3705.82	3704.90	0.50	0.00	-0.50
	249874	3708.49	3708.99	3709.31	0.00	0.33	0.00	-0.33
	249997	3696.81	3697.31	3697.42	0.00	0.11	0.00	-0.11
	250662	3704.33	3704.83	3706.04	3705.81	1.21	0.98	-0.23
	265055	3699.89	3700.39	3701.39	3700.61	1.00	0.23	-0.77
	265063	3700.82	3701.32	3701.46	3700.67	0.14	0.00	-0.14
	265077	3700.89	3701.39	3701.50	3700.72	0.11	0.00	-0.11
	265160	3701.73	3702.23	3702.84	3702.07	0.61	0.00	-0.61
	265249	3705.20	3705.70	3706.29	3705.43	0.59	0.00	-0.59
	289066	3700.02	3700.52	3700.92	3700.43	0.40	0.00	-0.40
	289182	3700.21	3700.71	3701.07	3700.46	0.36	0.00	-0.36
	289600	3701.04	3701.54	3701.57	3700.84	0.03	0.00	-0.03
	289653	3704.75	3705.25	3705.57	3705.16	0.32	0.00	-0.32
	289664	3704.12	3704.62	3705.82	3704.90	1.19	0.28	-0.91
	289670	3704.58	3705.08	3705.82	3704.90	0.74	0.00	-0.74
	289706	3701.77	3702.27	3702.54	3701.86	0.28	0.00	-0.28
	289852	3704.48	3704.98	3705.82	3704.90	0.84	0.00	-0.84
	289864	3705.05	3705.55	3706.28	0.00	0.73	0.00	-0.73
	302956	3697.86	3698.36	3699.41	3697.92	1.05	0.00	-1.05
	303298	3700.97	3701.47	3701.52	3700.78	0.05	0.00	-0.05
	303424	3701.54	3702.04	3702.73	3702.61	0.69	0.57	-0.12

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	303469	3705.32	3705.82	3705.95	3705.75	0.14	0.00	-0.14
	303478	3705.19	3705.69	3706.03	3705.81	0.34	0.13	-0.22
	303512	3704.32	3704.82	3705.82	3704.90	0.99	0.08	-0.91
	327696	3700.82	3701.32	3701.59	3700.88	0.27	0.00	-0.27
	327822	3702.00	3702.50	3702.51	3701.91	0.01	0.00	-0.01
	327851	3702.17	3702.67	3702.78	3702.04	0.11	0.00	-0.11
	327984	3704.31	3704.81	3706.01	3705.79	1.21	0.98	-0.23
	328107	3700.12	3700.62	3700.89	3700.43	0.28	0.00	-0.28
	328254	3700.79	3701.29	3701.51	3700.73	0.22	0.00	-0.22
	328447	3703.09	3703.59	3704.10	3702.91	0.51	0.00	-0.51
	353400	3700.42	3700.92	3701.06	3700.46	0.14	0.00	-0.14
	353420	3700.17	3700.67	3701.23	3700.55	0.56	0.00	-0.56
	353442	3700.42	3700.92	3701.25	3699.58	0.33	0.00	-0.33
	353498	3700.38	3700.88	3701.22	3700.55	0.34	0.00	-0.34
	353689	3702.02	3702.52	3702.64	3702.02	0.12	0.00	-0.12
	353697	3702.23	3702.73	3702.76	0.00	0.03	0.00	-0.03
	353745	3701.35	3701.85	3702.27	3701.55	0.42	0.00	-0.42
	353819	3704.42	3704.92	3705.10	3704.69	0.19	0.00	-0.19
	353835	3701.69	3702.19	3702.72	3702.13	0.53	0.00	-0.53
	353864	3702.70	3703.20	3703.63	3703.34	0.43	0.14	-0.29
	353884	3703.45	3703.95	3704.06	3703.61	0.11	0.00	-0.11
	353964	3704.19	3704.69	3705.82	3704.91	1.13	0.22	-0.91
	353972	3705.13	3705.63	3705.82	3704.90	0.18	0.00	-0.18
	377303	3697.84	3698.34	3699.42	3697.92	1.07	0.00	-1.07
	377806	3700.61	3701.11	3701.19	3700.52	0.08	0.00	-0.08
	377830	3700.87	3701.37	3701.37	3700.60	0.00	0.00	0.00
	378058	3701.92	3702.42	3703.48	3703.23	1.05	0.81	-0.25
	378143	3703.18	3703.68	3704.16	3702.92	0.48	0.00	-0.48
	378155	3704.92	3705.42	3705.82	3705.04	0.40	0.00	-0.40
	379656	3698.88	3699.38	3700.09	3699.79	0.72	0.42	-0.30
	380183	3704.75	3705.25	3705.82	3704.90	0.57	0.00	-0.57
	404335	3700.27	3700.77	3700.93	3700.43	0.16	0.00	-0.16
	404508	3700.60	3701.10	3701.43	3700.64	0.33	0.00	-0.33
	404516	3700.41	3700.91	3701.47	3700.67	0.55	0.00	-0.55
	404763	3702.05	3702.55	3702.67	3702.33	0.11	0.00	-0.11
	404765	3702.03	3702.53	3702.74	3702.16	0.21	0.00	-0.21
	404777	3702.43	3702.93	3703.14	3702.39	0.21	0.00	-0.21
	404896	3703.33	3703.83	3704.26	3703.13	0.43	0.00	-0.43
	404971	3708.36	3708.86	3709.38	0.00	0.52	0.00	-0.52
	405184	3700.47	3700.97	3701.31	3700.58	0.34	0.00	-0.34
	405290	3701.62	3702.12	3702.49	3701.77	0.38	0.00	-0.38
	405292	3701.27	3701.77	3702.49	3701.80	0.72	0.03	-0.69
	405328	3701.96	3702.46	3702.70	3702.03	0.24	0.00	-0.24
	405437	3708.80	3709.30	3709.64	0.00	0.34	0.00	-0.34
	430113	3699.96	3700.46	3700.92	3700.43	0.45	0.00	-0.45
	430475	3701.21	3701.71	3701.72	3701.27	0.01	0.00	-0.01
	430512	3701.50	3702.00	3702.74	3701.98	0.74	0.00	-0.74
	430524	3701.75	3702.25	3703.12	3702.37	0.87	0.12	-0.75
	430934	3700.92	3701.42	3701.48	3700.68	0.07	0.00	-0.07
	431047	3702.04	3702.54	3702.57	3701.87	0.03	0.00	-0.03
	431084	3702.55	3703.05	3703.13	3702.37	0.07	0.00	-0.07
	455391	3700.22	3700.72	3700.90	3700.43	0.18	0.00	-0.18
	456290	3700.34	3700.84	3700.99	3700.44	0.15	0.00	-0.15
	456507	3702.03	3702.53	3702.57	3702.18	0.03	0.00	-0.03
	456546	3702.59	3703.09	3703.47	3703.22	0.39	0.13	-0.25
	456608	3704.20	3704.70	3705.82	3704.90	1.12	0.20	-0.91
	481168	3700.63	3701.13	3701.19	3700.54	0.06	0.00	-0.06
	481214	3700.95	3701.45	3701.50	3700.71	0.05	0.00	-0.05
	481447	3701.92	3702.42	3702.60	3701.88	0.18	0.00	-0.18
	481448	3701.72	3702.22	3702.61	3701.89	0.39	0.00	-0.39
	481449	3701.44	3701.94	3702.61	3701.89	0.67	0.00	-0.67
	481455	3701.63	3702.13	3702.69	3702.12	0.57	0.00	-0.57
	481472	3702.18	3702.68	3703.14	3702.39	0.46	0.00	-0.46
	481568	3704.31	3704.81	3704.98	3704.73	0.17	0.00	-0.17
	481693	3708.52	3709.02	3709.48	0.00	0.46	0.00	-0.46
	481890	3699.61	3700.11	3700.92	3700.44	0.81	0.32	-0.49
	482057	3701.06	3701.56	3701.72	3701.27	0.16	0.00	-0.16
	482165	3702.91	3703.41	3703.47	3703.28	0.05	0.00	-0.05
	482192	3702.94	3703.44	3703.67	3703.17	0.23	0.00	-0.23
	482226	3704.50	3705.00	3705.62	3705.17	0.62	0.17	-0.45

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	482264	3708.00	3708.50	3709.29	0.00	0.80	0.00	-0.80
	495408	3700.32	3700.82	3701.41	3700.62	0.59	0.00	-0.59
	495533	3702.95	3703.45	3703.55	3703.28	0.10	0.00	-0.10
	495546	3703.82	3704.32	3704.34	3704.12	0.02	0.00	-0.02
	495569	3702.87	3703.37	3704.15	3702.92	0.78	0.00	-0.78
	495601	3705.17	3705.67	3706.52	3705.83	0.85	0.16	-0.69
	508255	3700.53	3701.03	3701.45	3700.66	0.42	0.00	-0.42
	508386	3702.51	3703.01	3703.14	3702.38	0.13	0.00	-0.13
	508457	3704.97	3705.47	3705.82	3704.90	0.35	0.00	-0.35
	521043	3701.64	3702.14	3702.66	3701.96	0.52	0.00	-0.52
	521094	3704.21	3704.71	3704.75	3704.51	0.04	0.00	-0.04
	521115	3703.47	3703.97	3704.15	0.00	0.19	0.00	-0.19
	533712	3703.23	3703.73	3703.83	3703.35	0.09	0.00	-0.09
	533732	3703.33	3703.83	3704.13	0.00	0.30	0.00	-0.30
	533735	3703.32	3703.82	3704.15	3702.91	0.33	0.00	-0.33
	533742	3705.00	3705.50	3705.67	3704.79	0.17	0.00	-0.17
	533760	3705.48	3705.98	3706.61	3705.97	0.63	0.00	-0.63
	546395	3700.54	3701.04	3701.52	3700.75	0.48	0.00	-0.48
	546534	3704.20	3704.70	3704.86	3704.47	0.17	0.00	-0.17
	566765	3697.28	3697.78	3699.42	3697.93	1.63	0.15	-1.49
	566971	3700.54	3701.04	3701.14	3700.53	0.10	0.00	-0.10
	567022	3700.32	3700.82	3701.50	3700.70	0.68	0.00	-0.68
	567023	3701.00	3701.50	3701.51	3700.72	0.00	0.00	0.00
	567037	3700.81	3701.31	3701.54	3700.81	0.23	0.00	-0.23
	567111	3701.61	3702.11	3702.68	3701.93	0.57	0.00	-0.57
	567174	3703.36	3703.86	3704.25	3703.27	0.40	0.00	-0.40
	571751	3699.03	3699.53	3700.08	3699.79	0.55	0.26	-0.29
	571896	3700.88	3701.38	3701.47	3700.69	0.10	0.00	-0.10
	571952	3701.03	3701.53	3701.72	3701.27	0.19	0.00	-0.19
	572037	3702.07	3702.57	3703.15	3702.43	0.58	0.00	-0.58
	592783	3701.05	3701.55	3701.55	3700.82	0.00	0.00	0.00
	592909	3701.97	3702.47	3703.45	3703.21	0.99	0.75	-0.24
	592988	3704.38	3704.88	3705.82	3704.90	0.93	0.02	-0.91
	592993	3704.26	3704.76	3705.82	3704.90	1.06	0.14	-0.91
	597385	3698.86	3699.36	3700.09	3699.79	0.73	0.43	-0.30
	597752	3704.54	3705.04	3705.82	3704.90	0.78	0.00	-0.78
	610076	3696.88	3697.38	3697.43	0.00	0.05	0.00	-0.05
	610383	3700.32	3700.82	3700.93	3700.44	0.11	0.00	-0.11
	610643	3704.94	3705.44	3705.82	3705.03	0.38	0.00	-0.38
	631273	3700.66	3701.16	3701.28	3700.56	0.11	0.00	-0.11
	631423	3702.02	3702.52	3702.68	3701.94	0.16	0.00	-0.16
	635996	3700.48	3700.98	3701.42	3700.63	0.45	0.00	-0.45
	635999	3700.27	3700.77	3701.43	3700.64	0.66	0.00	-0.66
	636026	3700.75	3701.25	3701.54	3700.82	0.29	0.00	-0.29
	636057	3701.19	3701.69	3701.72	3701.27	0.03	0.00	-0.03
	636089	3701.60	3702.10	3702.52	3701.93	0.42	0.00	-0.42
	636137	3702.34	3702.84	3703.50	3703.27	0.66	0.43	-0.23
	660008	3701.88	3702.38	3702.80	3702.03	0.42	0.00	-0.42
	660122	3703.40	3703.90	3704.17	0.00	0.28	0.00	-0.28
	660199	3704.81	3705.31	3705.83	3705.11	0.52	0.00	-0.52
	661105	3701.08	3701.58	3701.72	3701.27	0.14	0.00	-0.14
	661189	3702.15	3702.65	3702.74	3702.61	0.09	0.00	-0.09
	661266	3702.57	3703.07	3704.14	3702.92	1.06	0.00	-1.06
	661277	3704.71	3705.21	3705.82	3704.95	0.61	0.00	-0.61
	661286	3704.86	3705.36	3705.82	3704.90	0.45	0.00	-0.45
	674489	3700.57	3701.07	3701.15	3700.53	0.08	0.00	-0.08
	674511	3700.42	3700.92	3701.24	0.00	0.32	0.00	-0.32
	674539	3700.13	3700.63	3701.45	3700.66	0.83	0.03	-0.79
	674550	3700.38	3700.88	3701.48	3700.69	0.60	0.00	-0.60
	674657	3702.06	3702.56	3702.68	3702.10	0.11	0.00	-0.11
	674693	3702.16	3702.66	3703.48	3703.23	0.82	0.57	-0.25
	674760	3704.13	3704.63	3705.82	3704.90	1.19	0.28	-0.91
	677802	3698.55	3699.05	3699.42	3697.95	0.37	0.00	-0.37
	677833	3698.26	3698.76	3699.42	3697.92	0.65	0.00	-0.65
	677856	3697.01	3697.51	3699.42	3691.63	1.91	0.00	-1.91
	677873	3698.44	3698.94	3699.42	3697.92	0.47	0.00	-0.47
	677875	3697.02	3697.52	3699.42	3697.92	1.90	0.40	-1.50
	692377	3698.84	3699.34	3699.42	0.00	0.07	0.00	-0.07
	697077	3702.01	3702.51	3703.14	3702.51	0.63	0.00	-0.63
	705104	3697.58	3698.08	3699.42	3697.92	1.34	0.00	-1.34

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	705511	3700.26	3700.76	3701.03	3700.45	0.27	0.00	-0.27
	705521	3700.04	3700.54	3701.49	3700.69	0.95	0.15	-0.80
	710228	3701.16	3701.66	3701.72	3701.27	0.07	0.00	-0.07
	710230	3700.99	3701.49	3701.72	3701.27	0.23	0.00	-0.23
	710231	3701.12	3701.62	3701.72	3701.27	0.10	0.00	-0.10
	710238	3701.16	3701.66	3701.73	3701.27	0.07	0.00	-0.07
	710277	3704.53	3705.03	3705.40	3705.33	0.37	0.30	-0.06
	710325	3702.82	3703.32	3703.63	3703.42	0.31	0.10	-0.21
	710337	3703.02	3703.52	3703.56	3703.42	0.04	0.00	-0.04
	710367	3708.53	3709.03	3709.23	3709.06	0.19	0.03	-0.16
	710374	3708.41	3708.91	3709.64	0.00	0.73	0.00	-0.73
	710382	3706.21	3706.71	3706.89	3706.48	0.17	0.00	-0.17
	710386	3706.88	3707.38	3707.66	3707.16	0.28	0.00	-0.28
	710393	3706.24	3706.74	3707.68	3707.14	0.95	0.40	-0.54
	710394	3706.96	3707.46	3707.68	3707.15	0.23	0.00	-0.23
	710395	3706.66	3707.16	3707.16	3706.75	0.00	0.00	0.00
	714435	3704.63	3705.13	3705.83	3705.11	0.70	0.00	-0.70
	714445	3704.73	3705.23	3705.84	3705.13	0.61	0.00	-0.61
	714462	3704.82	3705.32	3705.82	3704.90	0.50	0.00	-0.50
	750506	3698.31	3698.81	3699.42	3697.92	0.60	0.00	-0.60
	750513	3698.27	3698.77	3699.41	3697.92	0.65	0.00	-0.65
	4865835	3697.94	3698.44	3699.42	3697.95	0.98	0.00	-0.98
	4865842	3700.87	3701.37	3701.51	3700.71	0.14	0.00	-0.14
	4865843	3700.89	3701.39	3701.52	3700.73	0.13	0.00	-0.13
	4865844	3700.66	3701.16	3701.43	3700.64	0.27	0.00	-0.27
	9730	3703.99	3704.49	3,705.82	3704.90	1.33	0.42	-0.91
	34571	3705.05	3705.55	3,705.67	3704.79	0.12	0.00	-0.12
	34582	3704.95	3705.45	3,705.81	3704.90	0.36	0.00	-0.36
	34825	3699.47	3699.97	3,700.10	3699.80	0.14	0.00	-0.14
	35202	3705.32	3705.82	3,706.32	3705.67	0.50	0.00	-0.50
	83136	3700.31	3700.81	3,701.02	3700.45	0.20	0.00	-0.20
	83432	3703.73	3704.23	3704.41	3704.28	0.2	0.0	-0.125977
	85031	3702.12	3702.62	3703.17	3702.39	0.5	0.0	-0.54292
	85184	3705.52	3706.02	3706.33	3705.67	0.3	0.0	-0.301122
	85201	3705.14	3705.64	3705.82	3704.90	0.2	0.0	-0.17974
	132342	3706.76	3707.26	3707.77	3707.21	0.5	0.0	-0.511125
	134770	3700.14	3700.64	3700.94	3700.44	0.3	0.0	-0.302637
	135273	3706.84	3707.34	3707.38	3706.87	0.0	0.0	-0.036162
	135558	3706.04	3706.54	3706.79	3706.29	0.2	0.0	-0.244972
	135592	3705.04	3705.54	3706.02	3704.93	0.5	0.0	-0.48602
	135605	3705.52	3706.02	3706.91	3706.26	0.9	0.2	-0.653321
	135606	3705.89	3706.39	3706.60	3706.00	0.2	0.0	-0.204893
	173822	3705.87	3706.37	3706.72	3706.07	0.4	0.0	-0.353272
	174068	3704.00	3704.50	3705.82	3704.90	1.3	0.4	-0.914062
	174080	3706.11	3706.61	3707.48	3706.63	0.9	0.0	-0.849853
	211811	3702.03	3702.53	3703.19	3702.46	0.7	0.0	-0.657226
	212234	3704.30	3704.80	3705.82	3704.90	1.0	0.1	-0.913818
	251025	3702.48	3702.98	3703.18	3702.50	0.2	0.0	-0.199275
	289536	3701.97	3702.47	3702.80	3702.04	0.3	0.0	-0.332142
	289780	3701.84	3702.34	3703.17	3702.39	0.8	0.0	-0.781982
	289854	3706.23	3706.73	3707.69	3707.11	1.0	0.4	-0.57544
	289858	3705.60	3706.10	3706.51	3705.89	0.4	0.0	-0.40528
	303516	3705.52	3706.02	3706.74	3706.06	0.7	0.0	-0.68164
	327474	3696.00	3696.50	3697.44	0.00	0.9	0.0	-0.938615
	327992	3705.93	3706.43	3706.99	3706.70	0.6	0.3	-0.28711
	328075	3708.92	3709.42	3709.51	0.00	0.1	0.0	-0.095848
	352758	3696.44	3696.94	3697.44	0.00	0.5	0.0	-0.500038
	353806	3704.19	3704.69	3704.95	3704.70	0.3	0.0	-0.251464
	353821	3704.90	3705.40	3705.67	3704.79	0.3	0.0	-0.267995
	353950	3704.47	3704.97	3706.02	3705.26	1.0	0.3	-0.759522
	378165	3705.73	3706.23	3706.92	3706.24	0.7	0.0	-0.68457
	404900	3705.46	3705.96	3705.99	3705.64	0.0	0.0	-0.035222
	404916	3704.92	3705.42	3707.92	3707.28	2.5	1.9	-0.639893
	405412	3704.89	3705.39	3705.48	3705.11	0.1	0.0	-0.089761
	430182	3696.57	3697.07	3697.44	0.00	0.4	0.0	-0.363148
	431098	3702.27	3702.77	3703.14	3702.47	0.4	0.0	-0.373474
	431161	3703.38	3703.88	3704.36	3703.45	0.5	0.0	-0.480878
	431165	3705.07	3705.57	3705.67	3704.79	0.1	0.0	-0.097046
	431185	3705.75	3706.25	3706.74	3706.07	0.5	0.0	-0.489516
	455949	3703.80	3704.30	3705.82	3704.90	1.5	0.6	-0.913574

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Commercial Buildings	456622	3706.72	3707.22	3708.24	3707.56	1.0	0.3	-0.683838
	482254	3704.88	3705.38	3705.83	3704.90	0.4	0.0	-0.441821
	495591	3703.64	3704.14	3705.82	3704.90	1.7	0.8	-0.913574
	495607	3705.53	3706.03	3706.30	3705.43	0.3	0.0	-0.26305
	508465	3705.76	3706.26	3706.67	3706.05	0.4	0.0	-0.411449
	521123	3703.26	3703.76	3704.93	3704.19	1.2	0.4	-0.741943
	521146	3705.57	3706.07	3706.61	3705.96	0.5	0.0	-0.537334
	533752	3706.55	3707.05	3707.08	3706.61	0.0	0.0	-0.028361
	546287	3700.16	3700.66	3701.04	3700.46	0.4	0.0	-0.379139
	546541	3705.10	3705.60	3706.16	3705.31	0.6	0.0	-0.560285
	567187	3706.73	3707.23	3707.28	3706.90	0.1	0.0	-0.052588
	572103	3704.65	3705.15	3705.82	3704.90	0.7	0.0	-0.671689
	592964	3703.44	3703.94	3704.16	3702.92	0.2	0.0	-0.224151
	593006	3705.96	3706.46	3706.69	3706.17	0.2	0.0	-0.232402
	597766	3705.46	3705.96	3706.29	3705.17	0.3	0.0	-0.334407
	610638	3705.45	3705.95	3706.00	3704.92	0.1	0.0	-0.051023
	631504	3706.45	3706.95	3707.01	3706.57	0.1	0.0	-0.057431
	631512	3706.81	3707.31	3707.44	3706.82	0.1	0.0	-0.135363
	636162	3704.81	3705.31	3705.67	3704.79	0.4	0.0	-0.365113
	636185	3705.14	3705.64	3705.80	3705.00	0.2	0.0	-0.163471
	636193	3703.97	3704.47	3705.82	3704.90	1.4	0.4	-0.914795
	636196	3704.33	3704.83	3705.82	3704.90	1.0	0.1	-0.914062
	636205	3708.76	3709.26	3709.46	0.00	0.2	0.0	-0.203341
	674567	3701.03	3701.53	3701.65	3701.26	0.1	0.0	-0.124206
	674663	3702.09	3702.59	3702.83	3702.06	0.2	0.0	-0.240512
	674753	3706.80	3707.30	3707.60	3707.12	0.3	0.0	-0.299141
	674761	3706.52	3707.02	3707.83	3707.20	0.8	0.2	-0.634033
	674763	3705.28	3705.78	3706.75	3706.06	1.0	0.3	-0.692871
	679340	3698.48	3698.98	3699.41	0.00	0.4	0.0	-0.435881
	682893	3696.60	3697.10	3697.44	0.00	0.3	0.0	-0.336767
	682963	3704.85	3705.35	3706.17	3705.54	0.8	0.2	-0.627441
	682993	3705.37	3705.87	3706.23	3705.63	0.4	0.0	-0.359294
	683004	3704.81	3705.31	3705.83	3705.04	0.5	0.0	-0.519416
	683009	3706.72	3707.22	3707.97	3707.31	0.7	0.1	-0.655274
	683038	3705.71	3706.21	3706.35	3705.71	0.1	0.0	-0.139343
	705101	3698.01	3698.51	3699.42	3697.93	0.9	0.0	-0.902113
	705107	3698.52	3699.02	3699.41	0.00	0.4	0.0	-0.390108
	705108	3697.26	3697.76	3699.41	3697.92	1.7	0.2	-1.490479
	710269	3704.35	3704.85	3704.97	3704.78	0.1	0.0	-0.114119
	710273	3704.17	3704.67	3704.85	3704.70	0.2	0.0	-0.148682
	710276	3704.56	3705.06	3705.08	3704.99	0.0	0.0	-0.022027
	710280	3705.14	3705.64	3705.70	3705.54	0.1	0.0	-0.06075
	710294	3705.23	3705.73	3705.74	3705.57	0.0	0.0	-0.008337
	710297	3704.73	3705.23	3705.98	3705.26	0.8	0.0	-0.720703
	710305	3704.46	3704.96	3705.17	3704.75	0.2	0.0	-0.204629
	710328	3703.51	3704.01	3704.11	3703.97	0.1	0.0	-0.100779
	710340	3704.47	3704.97	3705.67	3704.79	0.7	0.0	-0.698244
	710342	3704.94	3705.44	3705.67	3704.79	0.2	0.0	-0.236203
	710346	3704.92	3705.42	3705.91	3704.85	0.5	0.0	-0.489564
	710348	3705.77	3706.27	3706.36	0.00	0.1	0.0	-0.085792
	710350	3705.43	3705.93	3706.31	3705.35	0.4	0.0	-0.377974
	710353	3705.06	3705.56	3706.29	3705.38	0.7	0.0	-0.735519
	710354	3706.44	3706.94	3707.05	3706.25	0.1	0.0	-0.11376
	710355	3706.81	3707.31	3707.38	3706.28	0.1	0.0	-0.063527
	710366	3708.18	3708.68	3709.26	3709.13	0.6	0.4	-0.13501
	710369	3708.14	3708.64	3708.69	3708.82	0.0	0.2	0.126709
	710371	3707.95	3708.45	3709.27	3709.13	0.8	0.7	-0.142579
	710372	3708.50	3709.00	3709.24	3709.09	0.2	0.1	-0.149902
	710373	3708.50	3709.00	3709.63	0.00	0.6	0.0	-0.624739
	710375	3706.77	3707.27	3708.15	3707.41	0.9	0.1	-0.739502
	710376	3706.54	3707.04	3707.99	3707.29	1.0	0.3	-0.699951
	710377	3706.17	3706.67	3707.79	3707.07	1.1	0.4	-0.722901
	710378	3705.71	3706.21	3706.74	3706.25	0.5	0.0	-0.48999
	710381	3706.08	3706.58	3706.80	3706.33	0.2	0.0	-0.213062
	710383	3706.55	3707.05	3707.34	3706.88	0.3	0.0	-0.28525
	710387	3706.78	3707.28	3707.61	3707.10	0.3	0.0	-0.327177
	710389	3706.80	3707.30	3707.50	3707.03	0.2	0.0	-0.206512
	710392	3706.43	3706.93	3707.67	3707.13	0.7	0.2	-0.542969
	710399	3706.43	3706.93	3706.98	3706.60	0.1	0.0	-0.056411
	714406	3705.22	3705.72	3705.84	3704.90	0.1	0.0	-0.117479

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	714417	3706.21	3706.71	3706.75	3705.80	0.0	0.0	-0.043114
	714419	3706.16	3706.66	3707.73	3706.91	1.1	0.2	-0.819336
	714420	3705.94	3706.44	3706.50	3705.99	0.1	0.0	-0.069856
	714421	3705.58	3706.08	3706.56	3706.03	0.5	0.0	-0.477189
	714425	3705.34	3705.84	3706.21	3705.62	0.4	0.0	-0.374861
	714432	3705.38	3705.88	3706.04	3705.71	0.2	0.0	-0.162016
	714437	3704.94	3705.44	3705.84	3705.16	0.4	0.0	-0.392261
	714439	3705.04	3705.54	3705.81	3705.11	0.3	0.0	-0.268895
	714443	3704.50	3705.00	3705.82	3705.02	0.8	0.0	-0.79541
	714444	3704.73	3705.23	3705.82	3704.99	0.6	0.0	-0.587411
	714449	3705.18	3705.68	3706.16	3705.62	0.5	0.0	-0.48184
	714452	3705.59	3706.09	3706.38	3705.72	0.3	0.0	-0.285189
	714454	3704.79	3705.29	3706.36	3705.71	1.1	0.4	-0.651367
	714459	3705.13	3705.63	3705.83	3705.09	0.2	0.0	-0.198173

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	8892	3702.86	3703.36	3703.90	0.00	0.54	0.00	-0.54
	9025	3702.83	3703.33	3705.27	0.00	1.94	0.00	-1.94
	9037	3704.60	3705.10	3705.22	0.00	0.12	0.00	-0.12
	9577	3703.65	3704.15	3705.20	0.00	1.05	0.00	-1.05
	34317	3702.06	3702.56	3703.90	0.00	1.33	0.00	-1.33
	34421	3704.30	3704.80	3705.19	0.00	0.39	0.00	-0.39
	34435	3702.94	3703.44	3705.06	0.00	1.62	0.00	-1.62
	35040	3703.31	3703.81	3705.26	0.00	1.45	0.00	-1.45
	48298	3704.43	3704.93	3705.27	0.00	0.35	0.00	-0.35
	48301	3702.91	3703.41	3705.27	0.00	1.87	0.00	-1.87
	48331	3703.81	3704.31	3705.27	0.00	0.96	0.00	-0.96
	48343	3702.96	3703.46	3705.27	0.00	1.81	0.00	-1.81
	48363	3702.96	3703.46	3705.26	0.00	1.80	0.00	-1.80
	48370	3702.42	3702.92	3705.24	0.00	2.31	0.00	-2.31
	48374	3704.36	3704.86	3705.22	0.00	0.36	0.00	-0.36
	48394	3703.46	3703.96	3705.11	0.00	1.15	0.00	-1.15
	83218	3701.89	3702.39	3703.90	0.00	1.50	0.00	-1.50
	83322	3703.71	3704.21	3705.27	0.00	1.06	0.00	-1.06
	83324	3704.07	3704.57	3705.27	0.00	0.70	0.00	-0.70
	83330	3702.08	3702.58	3703.90	0.00	1.32	0.00	-1.32
	83373	3703.18	3703.68	3705.03	0.00	1.35	0.00	-1.35
	83378	3701.85	3702.35	3703.98	0.00	1.63	0.00	-1.63
	84863	3702.55	3703.05	3705.24	0.00	2.18	0.00	-2.18
	84870	3702.66	3703.16	3705.20	0.00	2.04	0.00	-2.04
	84887	3701.98	3702.48	3703.90	0.00	1.42	0.00	-1.42
	84888	3704.19	3704.69	3705.15	0.00	0.46	0.00	-0.46
	131927	3701.74	3702.24	3705.27	0.00	3.03	0.00	-3.03
	132092	3704.04	3704.54	3705.01	0.00	0.47	0.00	-0.47
	134652	3704.63	3705.13	3705.27	0.00	0.14	0.00	-0.14
	134819	3703.72	3704.22	3705.27	0.00	1.05	0.00	-1.05
	135109	3704.20	3704.70	3705.27	0.00	0.58	0.00	-0.58
	135130	3701.96	3702.46	3703.90	0.00	1.43	0.00	-1.43
	135330	3701.79	3702.29	3703.90	0.00	1.61	0.00	-1.61
	173173	3703.09	3703.59	3705.27	0.00	1.69	0.00	-1.69
	173207	3701.93	3702.43	3703.90	0.00	1.47	0.00	-1.47
	173384	3701.42	3701.92	3703.90	0.00	1.98	0.00	-1.98
	173584	3702.90	3703.40	3704.26	0.00	0.86	0.00	-0.86
	173773	3703.63	3704.13	3705.19	0.00	1.06	0.00	-1.06
	173783	3702.04	3702.54	3703.90	0.00	1.36	0.00	-1.36
	174346	3703.49	3703.99	3705.27	0.00	1.29	0.00	-1.29
	174374	3702.13	3702.63	3703.90	0.00	1.27	0.00	-1.27
	174377	3704.18	3704.68	3705.27	0.00	0.59	0.00	-0.59
	174440	3701.72	3702.22	3703.90	0.00	1.68	0.00	-1.68
	174450	3703.07	3703.57	3705.04	0.00	1.47	0.00	-1.47
	174500	3703.25	3703.75	3704.26	0.00	0.50	0.00	-0.50
	211621	3702.05	3702.55	3703.90	0.00	1.35	0.00	-1.35
	211666	3702.83	3703.33	3704.24	0.00	0.91	0.00	-0.91
	211785	3704.39	3704.89	3705.26	0.00	0.38	0.00	-0.38
	212649	3703.16	3703.66	3705.27	0.00	1.62	0.00	-1.62
	212658	3701.86	3702.36	3705.27	0.00	2.91	0.00	-2.91
	212742	3703.98	3704.48	3705.22	0.00	0.74	0.00	-0.74
	212761	3703.35	3703.85	3704.96	0.00	1.12	0.00	-1.12
	249105	3702.48	3702.98	3703.90	0.00	0.92	0.00	-0.92
	249448	3703.89	3704.39	3705.16	0.00	0.77	0.00	-0.77
	250380	3704.16	3704.66	3705.27	0.00	0.60	0.00	-0.60
	250930	3702.24	3702.74	3703.90	0.00	1.16	0.00	-1.16
	250933	3702.21	3702.71	3703.90	0.00	1.19	0.00	-1.19
	250946	3702.50	3703.00	3705.25	0.00	2.25	0.00	-2.25
	250993	3703.98	3704.48	3705.10	0.00	0.62	0.00	-0.62
	265123	3704.44	3704.94	3705.26	0.00	0.32	0.00	-0.32
	289276	3702.27	3702.77	3703.90	0.00	1.12	0.00	-1.12
	289307	3701.95	3702.45	3703.90	0.00	1.45	0.00	-1.45
	289388	3701.98	3702.48	3703.90	0.00	1.42	0.00	-1.42
	289623	3703.08	3703.58	3705.27	0.00	1.69	0.00	-1.69
	289718	3702.53	3703.03	3704.23	0.00	1.20	0.00	-1.20
	303356	3702.80	3703.30	3705.25	0.00	1.95	0.00	-1.95
	327821	3701.79	3702.29	3703.90	0.00	1.61	0.00	-1.61
	328354	3701.79	3702.29	3703.90	0.00	1.61	0.00	-1.61
	328358	3702.79	3703.29	3705.04	0.00	1.75	0.00	-1.75

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	353557	3703.88	3704.38	3705.27	0.00	0.89	0.00	-0.89
	353585	3704.45	3704.95	3705.26	0.00	0.31	0.00	-0.31
	353664	3703.09	3703.59	3705.20	0.00	1.61	0.00	-1.61
	353727	3702.94	3703.44	3705.26	0.00	1.82	0.00	-1.82
	377858	3701.82	3702.32	3703.90	0.00	1.58	0.00	-1.58
	377923	3704.22	3704.72	3705.27	0.00	0.55	0.00	-0.55
	377931	3702.18	3702.68	3703.90	0.00	1.21	0.00	-1.21
	377947	3704.50	3705.00	3705.26	0.00	0.26	0.00	-0.26
	377949	3702.42	3702.92	3705.24	0.00	2.32	0.00	-2.32
	377973	3701.69	3702.19	3703.90	0.00	1.71	0.00	-1.71
	379937	3704.58	3705.08	3705.27	0.00	0.19	0.00	-0.19
	379939	3701.94	3702.44	3703.90	0.00	1.46	0.00	-1.46
	379941	3701.96	3702.46	3703.90	0.00	1.44	0.00	-1.44
	380026	3703.91	3704.41	3705.19	0.00	0.78	0.00	-0.78
	404531	3701.96	3702.46	3705.27	0.00	2.81	0.00	-2.81
	404619	3701.83	3702.33	3703.90	0.00	1.57	0.00	-1.57
	404634	3703.76	3704.26	3705.27	0.00	1.00	0.00	-1.00
	404645	3703.65	3704.15	3705.26	0.00	1.11	0.00	-1.11
	405297	3702.45	3702.95	3703.90	0.00	0.95	0.00	-0.95
	430371	3704.18	3704.68	3705.27	0.00	0.59	0.00	-0.59
	430390	3703.27	3703.77	3705.27	0.00	1.51	0.00	-1.51
	430500	3702.94	3703.44	3705.06	0.00	1.63	0.00	-1.63
	430504	3703.87	3704.37	3705.09	0.00	0.72	0.00	-0.72
	430951	3702.17	3702.67	3703.90	0.00	1.23	0.00	-1.23
	430961	3702.49	3702.99	3705.27	0.00	2.28	0.00	-2.28
	430965	3702.66	3703.16	3705.27	0.00	2.11	0.00	-2.11
	431037	3704.03	3704.53	3705.16	0.00	0.63	0.00	-0.63
	455575	3702.44	3702.94	3705.27	0.00	2.33	0.00	-2.33
	455695	3703.51	3704.01	3705.22	0.00	1.21	0.00	-1.21
	455716	3702.58	3703.08	3703.90	0.00	0.82	0.00	-0.82
	455783	3703.30	3703.80	3703.90	0.00	0.11	0.00	-0.11
	456421	3702.30	3702.80	3705.27	0.00	2.47	0.00	-2.47
	456431	3704.16	3704.66	3705.27	0.00	0.61	0.00	-0.61
	456506	3703.24	3703.74	3704.91	0.00	1.17	0.00	-1.17
	481318	3702.94	3703.44	3705.27	0.00	1.84	0.00	-1.84
	481335	3703.76	3704.26	3705.26	0.00	1.00	0.00	-1.00
	481438	3703.31	3703.81	3705.08	0.00	1.27	0.00	-1.27
	481451	3702.86	3703.36	3704.82	0.00	1.46	0.00	-1.46
	482110	3703.80	3704.30	3705.17	0.00	0.87	0.00	-0.87
	482115	3703.81	3704.31	3705.13	0.00	0.82	0.00	-0.82
	495459	3703.32	3703.82	3705.25	0.00	1.43	0.00	-1.43
	508277	3701.81	3702.31	3703.90	0.00	1.59	0.00	-1.59
	508356	3704.27	3704.77	3705.01	0.00	0.24	0.00	-0.24
	521036	3702.14	3702.64	3703.90	0.00	1.26	0.00	-1.26
	533635	3703.69	3704.19	3705.16	0.00	0.97	0.00	-0.97
	533661	3702.98	3703.48	3704.18	0.00	0.69	0.00	-0.69
	533680	3703.16	3703.66	3704.26	0.00	0.60	0.00	-0.60
	546468	3702.91	3703.41	3704.70	0.00	1.30	0.00	-1.30
	567032	3703.63	3704.13	3705.27	0.00	1.14	0.00	-1.14
	567117	3702.59	3703.09	3704.25	0.00	1.16	0.00	-1.16
	567131	3703.60	3704.10	3704.26	0.00	0.16	0.00	-0.16
	571964	3702.78	3703.28	3705.25	0.00	1.97	0.00	-1.97
	592762	3702.69	3703.19	3705.27	0.00	2.09	0.00	-2.09
	597647	3703.66	3704.16	3704.63	0.00	0.47	0.00	-0.47
	610476	3701.68	3702.18	3703.90	0.00	1.72	0.00	-1.72
	610490	3702.30	3702.80	3705.27	0.00	2.47	0.00	-2.47
	610512	3703.49	3703.99	3705.27	0.00	1.28	0.00	-1.28
	610537	3702.44	3702.94	3703.90	0.00	0.96	0.00	-0.96
	631294	3702.56	3703.06	3703.90	0.00	0.83	0.00	-0.83
	631330	3701.95	3702.45	3703.90	0.00	1.45	0.00	-1.45
	631403	3703.37	3703.87	3705.14	0.00	1.27	0.00	-1.27
	631420	3702.58	3703.08	3704.86	0.00	1.78	0.00	-1.78
	636110	3703.50	3704.00	3704.49	0.00	0.50	0.00	-0.50
	659895	3704.24	3704.74	3705.27	0.00	0.53	0.00	-0.53
	660004	3702.81	3703.31	3704.25	0.00	0.93	0.00	-0.93
	661069	3701.75	3702.25	3703.90	0.00	1.65	0.00	-1.65
	661164	3702.76	3703.26	3704.15	0.00	0.89	0.00	-0.89
	674565	3701.80	3702.30	3705.27	0.00	2.98	0.00	-2.98
	674605	3704.03	3704.53	3705.27	0.00	0.74	0.00	-0.74

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	674654	3704.18	3704.68	3704.93	0.00	0.24	0.00	-0.24
	705414	3701.57	3702.07	3703.90	0.00	1.83	0.00	-1.83
	705497	3702.19	3702.69	3703.90	0.00	1.21	0.00	-1.21
	4865846	3704.34	3704.84	3705.26	0.00	0.42	0.00	-0.42
1% Annual Chance Commercial Buildings	9549	3701.87	3702.37	3705.27	0.00	2.90	0.00	-2.90
	34441	3702.57	3703.07	3704.93	0.00	1.86	0.00	-1.86
	83409	3703.22	3703.72	3704.24	0.00	0.51	0.00	-0.51
	84918	3701.64	3702.14	3703.90	0.00	1.76	0.00	-1.76
	135009	3701.78	3702.28	3703.90	0.00	1.61	0.00	-1.61
	173174	3701.55	3702.05	3703.90	0.00	1.85	0.00	-1.85
	173554	3701.86	3702.36	3703.90	0.00	1.53	0.00	-1.53
	211307	3701.06	3701.56	3703.90	0.00	2.34	0.00	-2.34
	211445	3701.72	3702.22	3703.90	0.00	1.67	0.00	-1.67
	211612	3702.36	3702.86	3705.27	0.00	2.41	0.00	-2.41
	212681	3701.98	3702.48	3703.90	0.00	1.41	0.00	-1.41
	249264	3702.28	3702.78	3703.90	0.00	1.12	0.00	-1.12
	250866	3701.31	3701.81	3703.90	0.00	2.09	0.00	-2.09
	250965	3702.89	3703.39	3705.13	0.00	1.74	0.00	-1.74
	265161	3702.78	3703.28	3704.22	0.00	0.95	0.00	-0.95
	289618	3701.43	3701.93	3703.90	0.00	1.97	0.00	-1.97
	289620	3702.20	3702.70	3703.90	0.00	1.19	0.00	-1.19
	303334	3701.66	3702.16	3703.90	0.00	1.74	0.00	-1.74
	303417	3703.43	3703.93	3704.41	0.00	0.48	0.00	-0.48
	327844	3702.37	3702.87	3704.21	0.00	1.34	0.00	-1.34
	327845	3702.62	3703.12	3704.25	0.00	1.13	0.00	-1.13
	353522	3702.06	3702.56	3703.90	0.00	1.34	0.00	-1.34
	353618	3702.57	3703.07	3705.27	0.00	2.21	0.00	-2.21
	377853	3701.93	3702.43	3703.90	0.00	1.47	0.00	-1.47
	377926	3701.65	3702.15	3703.90	0.00	1.75	0.00	-1.75
	380039	3701.85	3702.35	3703.90	0.00	1.55	0.00	-1.55
	430940	3701.77	3702.27	3703.90	0.00	1.63	0.00	-1.63
	481430	3703.15	3703.65	3705.11	0.00	1.46	0.00	-1.46
	481435	3702.78	3703.28	3705.10	0.00	1.83	0.00	-1.83
	481998	3700.42	3700.92	3703.90	0.00	2.98	0.00	-2.98
	495485	3702.49	3702.99	3703.90	0.00	0.91	0.00	-0.91
	495518	3703.02	3703.52	3704.25	0.00	0.74	0.00	-0.74
	520988	3701.50	3702.00	3703.90	0.00	1.90	0.00	-1.90
	521065	3703.44	3703.94	3704.25	0.00	0.31	0.00	-0.31
	533590	3702.27	3702.77	3703.90	0.00	1.13	0.00	-1.13
	533657	3702.42	3702.92	3704.14	0.00	1.22	0.00	-1.22
	546412	3701.90	3702.40	3703.90	0.00	1.49	0.00	-1.49
	571897	3701.24	3701.74	3703.90	0.00	2.16	0.00	-2.16
	571932	3701.49	3701.99	3703.90	0.00	1.91	0.00	-1.91
	597624	3702.48	3702.98	3705.20	0.00	2.22	0.00	-2.22
	631413	3702.95	3703.45	3704.02	0.00	0.58	0.00	-0.58
	636041	3701.78	3702.28	3703.90	0.00	1.62	0.00	-1.62
	636081	3701.61	3702.11	3703.90	0.00	1.79	0.00	-1.79
	659885	3701.97	3702.47	3703.90	0.00	1.43	0.00	-1.43
	660002	3703.41	3703.91	3704.80	0.00	0.89	0.00	-0.89
	705388	3703.79	3704.29	3704.33	0.00	0.04	0.00	-0.04
	705391	3701.76	3702.26	3704.23	0.00	1.97	0.00	-1.97
	705412	3701.93	3702.43	3703.90	0.00	1.47	0.00	-1.47
	705415	3702.24	3702.74	3703.90	0.00	1.16	0.00	-1.16
	705416	3702.02	3702.52	3703.90	0.00	1.38	0.00	-1.38
	705418	3701.35	3701.85	3703.90	0.00	2.05	0.00	-2.05
	705419	3700.89	3701.39	3703.90	0.00	2.51	0.00	-2.51
	705420	3700.97	3701.47	3703.90	0.00	2.43	0.00	-2.43
	705421	3701.30	3701.80	3703.90	0.00	2.10	0.00	-2.10
	705477	3701.56	3702.06	3703.90	0.00	1.84	0.00	-1.84
	705480	3702.48	3702.98	3703.90	0.00	0.92	0.00	-0.92
	705482	3702.80	3703.30	3703.90	0.00	0.60	0.00	-0.60
	705483	3703.13	3703.63	3703.90	0.00	0.27	0.00	-0.27
	705484	3703.12	3703.62	3703.90	0.00	0.28	0.00	-0.28
	705485	3703.35	3703.85	3703.90	0.00	0.05	0.00	-0.05
	705493	3702.94	3703.44	3703.90	0.00	0.46	0.00	-0.46
	705494	3702.89	3703.39	3703.90	0.00	0.51	0.00	-0.51
	705499	3701.51	3702.01	3703.90	0.00	1.89	0.00	-1.89
	705501	3701.49	3701.99	3703.90	0.00	1.91	0.00	-1.91
	8798	3700.60	3701.10	3701.21	0.00	0.11	0.00	-0.11

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	8881	3700.75	3701.25	3701.48	0.00	0.23	0.00	-0.23
	8892	3702.86	3703.36	3705.15	3703.39	1.79	0.04	-1.75
	9025	3702.83	3703.33	3706.48	0.00	3.15	0.00	-3.15
	9037	3704.60	3705.10	3706.41	3705.28	1.31	0.19	-1.13
	9042	3705.57	3706.07	3706.43	3705.28	0.36	0.00	-0.36
	9463	3700.44	3700.94	3701.53	0.00	0.58	0.00	-0.58
	9482	3699.91	3700.41	3701.56	0.00	1.16	0.00	-1.16
	9485	3701.04	3701.54	3701.56	0.00	0.02	0.00	-0.02
	9512	3700.89	3701.39	3702.42	0.00	1.03	0.00	-1.03
	9541	3701.05	3701.55	3702.41	0.00	0.86	0.00	-0.86
	9577	3703.65	3704.15	3706.38	3705.29	2.24	1.14	-1.10
	34155	3700.58	3701.08	3701.34	0.00	0.26	0.00	-0.26
	34282	3705.62	3706.12	3706.49	3705.29	0.37	0.00	-0.37
	34317	3702.06	3702.56	3705.17	3703.39	2.61	0.83	-1.78
	34330	3705.26	3705.76	3706.48	3705.25	0.72	0.00	-0.72
	34419	3701.86	3702.36	3702.51	0.00	0.16	0.00	-0.16
	34421	3704.30	3704.80	3706.38	3705.28	1.57	0.48	-1.10
	34435	3702.94	3703.44	3706.23	3705.16	2.79	1.72	-1.07
	34918	3700.63	3701.13	3701.18	0.00	0.05	0.00	-0.05
	35020	3700.87	3701.37	3702.42	0.00	1.05	0.00	-1.05
	35040	3703.31	3703.81	3706.48	3705.29	2.66	1.47	-1.19
	35041	3705.48	3705.98	3706.48	3705.28	0.49	0.00	-0.49
	48278	3700.77	3701.27	3701.49	0.00	0.22	0.00	-0.22
	48298	3704.43	3704.93	3706.49	3705.29	1.56	0.36	-1.20
	48301	3702.91	3703.41	3706.49	3705.29	3.08	1.88	-1.20
	48326	3701.43	3701.93	3702.46	0.00	0.52	0.00	-0.52
	48331	3703.81	3704.31	3706.49	3705.29	2.18	0.97	-1.20
	48343	3702.96	3703.46	3706.49	3705.29	3.03	1.82	-1.20
	48363	3702.96	3703.46	3706.47	3705.29	3.01	1.83	-1.19
	48370	3702.42	3702.92	3706.44	0.00	3.51	0.00	-3.51
	48374	3704.36	3704.86	3706.41	3705.28	1.55	0.42	-1.13
	48394	3703.46	3703.96	3706.28	3705.21	2.32	1.24	-1.08
	83192	3700.55	3701.05	3701.25	0.00	0.20	0.00	-0.20
	83218	3701.89	3702.39	3705.15	3703.39	2.75	1.00	-1.75
	83219	3700.85	3701.35	3701.54	0.00	0.19	0.00	-0.19
	83322	3703.71	3704.21	3706.49	3705.29	2.28	1.07	-1.20
	83324	3704.07	3704.57	3706.49	3705.29	1.92	0.71	-1.20
	83330	3702.08	3702.58	3705.17	3703.39	2.59	0.81	-1.78
	83334	3701.61	3702.11	3702.53	0.00	0.42	0.00	-0.42
	83346	3701.98	3702.48	3702.59	0.00	0.11	0.00	-0.11
	83373	3703.18	3703.68	3706.19	3705.13	2.51	1.45	-1.06
	83378	3701.85	3702.35	3705.23	3703.93	2.88	1.59	-1.29
	84574	3700.53	3701.03	3701.34	0.00	0.31	0.00	-0.31
	84722	3700.86	3701.36	3701.57	0.00	0.21	0.00	-0.21
	84795	3700.04	3700.54	3701.54	0.00	1.00	0.00	-1.00
	84803	3700.33	3700.83	3701.56	0.00	0.73	0.00	-0.73
	84863	3702.55	3703.05	3706.43	0.00	3.38	0.00	-3.38
	84870	3702.66	3703.16	3706.38	3705.29	3.22	2.12	-1.10
	84887	3701.98	3702.48	3705.19	3703.52	2.71	1.04	-1.67
	84888	3704.19	3704.69	3706.33	3705.24	1.64	0.55	-1.09
	84907	3702.02	3702.52	3702.56	0.00	0.04	0.00	-0.04
	85073	3702.65	3703.15	3703.56	0.00	0.41	0.00	-0.41
	131411	3699.20	3699.70	3700.10	0.00	0.40	0.00	-0.40
	131793	3701.72	3702.22	3702.42	0.00	0.20	0.00	-0.20
	131927	3701.74	3702.24	3706.49	3705.29	4.25	3.04	-1.20
	131935	3701.23	3701.73	3702.47	0.00	0.73	0.00	-0.73
	131947	3701.41	3701.91	3702.48	0.00	0.56	0.00	-0.56
	132092	3704.04	3704.54	3706.19	3705.11	1.65	0.57	-1.09
	132095	3704.51	3705.01	3705.79	3704.78	0.78	0.00	-0.78
	134194	3699.45	3699.95	3700.18	0.00	0.22	0.00	-0.22
	134652	3704.63	3705.13	3706.49	3705.29	1.36	0.15	-1.20
	134719	3700.03	3700.53	3700.93	0.00	0.40	0.00	-0.40
	134819	3703.72	3704.22	3706.49	3705.29	2.27	1.07	-1.20
	134958	3700.05	3700.55	3701.34	0.00	0.80	0.00	-0.80
	134972	3700.55	3701.05	3701.49	0.00	0.44	0.00	-0.44
	135003	3701.03	3701.53	3701.59	0.00	0.05	0.00	-0.05
	135109	3704.20	3704.70	3706.49	3705.29	1.79	0.59	-1.20
	135130	3701.96	3702.46	3705.16	3703.39	2.69	0.93	-1.76
	135157	3701.43	3701.93	3702.45	0.00	0.52	0.00	-0.52

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	135172	3701.32	3701.82	3702.44	0.00	0.62	0.00	-0.62
	135197	3701.72	3702.22	3702.45	0.00	0.24	0.00	-0.24
	135207	3705.92	3706.42	3706.45	3705.28	0.03	0.00	-0.03
	135225	3705.57	3706.07	3706.29	3705.19	0.22	0.00	-0.22
	135330	3701.79	3702.29	3705.19	3703.57	2.90	1.28	-1.62
	173165	3700.26	3700.76	3701.54	0.00	0.78	0.00	-0.78
	173173	3703.09	3703.59	3706.49	3705.29	2.90	1.70	-1.20
	173207	3701.93	3702.43	3705.17	3703.39	2.75	0.97	-1.78
	173384	3701.42	3701.92	3705.18	3703.42	3.26	1.50	-1.76
	173392	3704.82	3705.32	3706.34	3705.23	1.02	0.00	-1.02
	173395	3702.07	3702.57	3702.79	0.00	0.23	0.00	-0.23
	173540	3700.73	3701.23	3701.54	0.00	0.31	0.00	-0.31
	173577	3703.11	3703.61	3703.75	0.00	0.14	0.00	-0.14
	173584	3702.90	3703.40	3705.31	3704.27	1.91	0.87	-1.05
	173728	3701.56	3702.06	3702.45	0.00	0.39	0.00	-0.39
	173746	3701.21	3701.71	3702.43	0.00	0.72	0.00	-0.72
	173773	3703.63	3704.13	3706.37	3705.27	2.24	1.14	-1.09
	173783	3702.04	3702.54	3705.19	3703.50	2.65	0.96	-1.69
	173910	3705.03	3705.53	3706.18	3705.08	0.64	0.00	-0.64
	174261	3700.58	3701.08	3701.33	0.00	0.25	0.00	-0.25
	174286	3700.33	3700.83	3701.48	0.00	0.65	0.00	-0.65
	174346	3703.49	3703.99	3706.49	3705.29	2.50	1.30	-1.20
	174374	3702.13	3702.63	3705.17	3703.39	2.54	0.77	-1.78
	174377	3704.18	3704.68	3706.49	3705.29	1.80	0.60	-1.20
	174440	3701.72	3702.22	3705.19	3703.43	2.97	1.21	-1.76
	174450	3703.07	3703.57	3706.21	3705.14	2.64	1.57	-1.07
	174500	3703.25	3703.75	3705.31	3704.27	1.56	0.52	-1.05
	211410	3700.00	3700.50	3700.93	0.00	0.42	0.00	-0.42
	211474	3701.05	3701.55	3702.45	0.00	0.90	0.00	-0.90
	211485	3700.85	3701.35	3702.53	0.00	1.17	0.00	-1.17
	211607	3700.56	3701.06	3701.55	0.00	0.48	0.00	-0.48
	211621	3702.05	3702.55	3705.15	3703.39	2.61	0.84	-1.76
	211648	3701.48	3701.98	3702.05	0.00	0.07	0.00	-0.07
	211666	3702.83	3703.33	3705.30	3704.24	1.97	0.92	-1.06
	211752	3700.61	3701.11	3701.59	0.00	0.48	0.00	-0.48
	211755	3701.06	3701.56	3701.57	0.00	0.01	0.00	-0.01
	211767	3701.35	3701.85	3702.44	0.00	0.58	0.00	-0.58
	211781	3705.23	3705.73	3706.49	3705.28	0.75	0.00	-0.75
	211785	3704.39	3704.89	3706.48	3705.28	1.60	0.39	-1.21
	211801	3701.85	3702.35	3702.42	0.00	0.07	0.00	-0.07
	212649	3703.16	3703.66	3706.49	3705.29	2.83	1.63	-1.20
	212658	3701.86	3702.36	3706.49	3705.29	4.13	2.92	-1.20
	212742	3703.98	3704.48	3706.41	3705.28	1.93	0.80	-1.13
	212761	3703.35	3703.85	3706.13	3705.06	2.28	1.21	-1.07
	249081	3700.63	3701.13	3701.34	0.00	0.21	0.00	-0.21
	249105	3702.48	3702.98	3705.15	3703.39	2.17	0.42	-1.75
	249278	3701.65	3702.15	3702.41	0.00	0.26	0.00	-0.26
	249448	3703.89	3704.39	3706.33	3705.25	1.94	0.85	-1.09
	250380	3704.16	3704.66	3706.48	3705.29	1.82	0.62	-1.19
	250516	3704.94	3705.44	3706.32	3705.21	0.87	0.00	-0.87
	250930	3702.24	3702.74	3705.17	3703.39	2.43	0.65	-1.77
	250933	3702.21	3702.71	3705.17	3703.39	2.46	0.69	-1.78
	250946	3702.50	3703.00	3706.45	0.00	3.45	0.00	-3.45
	250993	3703.98	3704.48	3706.26	3705.19	1.78	0.71	-1.07
	265055	3699.84	3700.34	3701.52	0.00	1.18	0.00	-1.18
	265063	3700.82	3701.32	3701.54	0.00	0.22	0.00	-0.22
	265077	3700.88	3701.38	3701.56	0.00	0.18	0.00	-0.18
	265123	3704.44	3704.94	3706.48	3705.28	1.53	0.34	-1.19
	289066	3700.08	3700.58	3700.92	0.00	0.33	0.00	-0.33
	289182	3700.25	3700.75	3701.14	0.00	0.40	0.00	-0.40
	289276	3702.27	3702.77	3705.15	3703.39	2.37	0.62	-1.75
	289307	3701.95	3702.45	3705.16	3703.39	2.71	0.94	-1.76
	289388	3701.98	3702.48	3705.17	3703.39	2.69	0.92	-1.77
	289600	3701.04	3701.54	3701.62	0.00	0.08	0.00	-0.08
	289611	3701.76	3702.26	3702.42	0.00	0.15	0.00	-0.15
	289623	3703.08	3703.58	3706.48	3705.29	2.91	1.71	-1.20
	289718	3702.53	3703.03	3705.30	3704.24	2.26	1.21	-1.06
	302956	3697.85	3698.35	3698.87	0.00	0.53	0.00	-0.53
	303245	3700.78	3701.28	3701.43	0.00	0.14	0.00	-0.14

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	303298	3700.98	3701.48	3701.60	0.00	0.12	0.00	-0.12
	303350	3701.31	3701.81	3702.40	0.00	0.59	0.00	-0.59
	303356	3702.80	3703.30	3706.45	0.00	3.15	0.00	-3.15
	303424	3701.65	3702.15	3703.65	0.00	1.50	0.00	-1.50
	327696	3700.84	3701.34	3701.69	0.00	0.35	0.00	-0.35
	327821	3701.79	3702.29	3705.19	3703.47	2.90	1.17	-1.72
	328107	3700.14	3700.64	3700.90	0.00	0.27	0.00	-0.27
	328254	3700.75	3701.25	3701.57	0.00	0.32	0.00	-0.32
	328296	3701.40	3701.90	3702.51	0.00	0.61	0.00	-0.61
	328337	3704.88	3705.38	3706.42	3705.28	1.04	0.00	-1.04
	328354	3701.79	3702.29	3705.19	3703.52	2.90	1.23	-1.67
	328358	3702.79	3703.29	3706.21	3705.14	2.92	1.85	-1.07
	353400	3700.41	3700.91	3701.14	0.00	0.22	0.00	-0.22
	353420	3700.36	3700.86	3701.34	0.00	0.49	0.00	-0.49
	353442	3700.49	3700.99	3701.33	0.00	0.34	0.00	-0.34
	353498	3700.38	3700.88	3701.34	0.00	0.46	0.00	-0.46
	353557	3703.88	3704.38	3706.49	3705.29	2.11	0.90	-1.20
	353570	3701.79	3702.29	3702.48	0.00	0.19	0.00	-0.19
	353585	3704.45	3704.95	3706.48	3705.28	1.53	0.33	-1.20
	353664	3703.09	3703.59	3706.38	3705.29	2.79	1.69	-1.10
	353727	3702.94	3703.44	3706.47	3705.29	3.04	1.85	-1.19
	353835	3701.68	3702.18	3702.35	0.00	0.17	0.00	-0.17
	377303	3697.79	3698.29	3698.87	0.00	0.58	0.00	-0.58
	377806	3700.69	3701.19	3701.34	0.00	0.14	0.00	-0.14
	377830	3700.98	3701.48	3701.49	0.00	0.01	0.00	-0.01
	377858	3701.82	3702.32	3705.15	3703.39	2.83	1.07	-1.76
	377923	3704.22	3704.72	3706.49	3705.29	1.77	0.57	-1.20
	377931	3702.18	3702.68	3705.17	3703.39	2.49	0.71	-1.78
	377947	3704.50	3705.00	3706.48	3705.28	1.48	0.28	-1.19
	377949	3702.42	3702.92	3706.44	0.00	3.52	0.00	-3.52
	377973	3701.69	3702.19	3705.18	3703.40	2.99	1.21	-1.78
	379656	3698.85	3699.35	3700.09	0.00	0.75	0.00	-0.75
	379937	3704.58	3705.08	3706.49	3705.29	1.41	0.20	-1.20
	379939	3701.94	3702.44	3705.16	3703.39	2.72	0.95	-1.76
	379941	3701.96	3702.46	3705.16	3703.39	2.70	0.93	-1.76
	380003	3701.37	3701.87	3702.44	0.00	0.58	0.00	-0.58
	380006	3701.51	3702.01	3702.41	0.00	0.40	0.00	-0.40
	380026	3703.91	3704.41	3706.38	3705.28	1.97	0.87	-1.10
	404508	3700.63	3701.13	3701.53	0.00	0.40	0.00	-0.40
	404516	3700.35	3700.85	3701.55	0.00	0.70	0.00	-0.70
	404531	3701.96	3702.46	3706.49	3705.29	4.03	2.82	-1.20
	404619	3701.83	3702.33	3705.16	3703.39	2.83	1.07	-1.76
	404634	3703.76	3704.26	3706.48	3705.29	2.22	1.02	-1.20
	404645	3703.65	3704.15	3706.48	3705.29	2.33	1.14	-1.19
	404648	3701.63	3702.13	3702.42	0.00	0.28	0.00	-0.28
	404661	3705.24	3705.74	3706.43	3705.28	0.68	0.00	-0.68
	405184	3700.46	3700.96	3701.49	0.00	0.53	0.00	-0.53
	405241	*3701.35*	*3701.85*	*3702.46*	*0.00*	*0.61*	*0.00*	*-0.61*
	405292	3701.19	3701.69	3701.78	0.00	0.09	0.00	-0.09
	405297	3702.45	3702.95	3705.19	3703.56	2.24	0.61	-1.63
	430113	3699.97	3700.47	3700.92	0.00	0.45	0.00	-0.45
	430371	3704.18	3704.68	3706.49	3705.29	1.81	0.61	-1.20
	430390	3703.27	3703.77	3706.49	3705.29	2.72	1.52	-1.20
	430468	3701.56	3702.06	3702.41	0.00	0.35	0.00	-0.35
	430475	3701.20	3701.70	3702.59	0.00	0.89	0.00	-0.89
	430477	3701.82	3702.32	3702.42	0.00	0.10	0.00	-0.10
	430500	3702.94	3703.44	3706.23	3705.17	2.80	1.73	-1.06
	430504	3703.87	3704.37	3706.25	3705.18	1.88	0.81	-1.07
	430934	3700.89	3701.39	3701.55	0.00	0.16	0.00	-0.16
	430951	3702.17	3702.67	3705.15	3703.39	2.49	0.73	-1.76
	430954	3705.23	3705.73	3706.49	3705.28	0.76	0.00	-0.76
	430961	3702.49	3702.99	3706.49	3705.29	3.50	2.30	-1.20
	430965	3702.66	3703.16	3706.49	3705.29	3.33	2.13	-1.20
	431037	3704.03	3704.53	3706.34	3705.25	1.80	0.72	-1.09
	455391	3700.20	3700.70	3700.91	0.00	0.20	0.00	-0.20
	455575	3702.44	3702.94	3706.49	3705.29	3.55	2.35	-1.20
	455675	3705.08	3705.58	3706.48	3705.28	0.90	0.00	-0.90
	455685	3701.57	3702.07	3702.46	0.00	0.38	0.00	-0.38
	455695	3703.51	3704.01	3706.42	3705.28	2.40	1.27	-1.13

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	455716	3702.58	3703.08	3705.19	3703.48	2.11	0.40	-1.71
	455783	3703.30	3703.80	3705.20	3703.73	1.40	0.00	-1.40
	456290	3700.35	3700.85	3700.98	0.00	0.13	0.00	-0.13
	456421	3702.30	3702.80	3706.49	3705.29	3.69	2.48	-1.20
	456431	3704.16	3704.66	3706.49	3705.29	1.83	0.62	-1.20
	456437	3701.33	3701.83	3702.42	0.00	0.59	0.00	-0.59
	456449	3701.54	3702.04	3702.42	0.00	0.38	0.00	-0.38
	456506	3703.24	3703.74	3706.05	3705.00	2.31	1.26	-1.05
	481084	3700.68	3701.18	3701.18	0.00	0.00	0.00	0.00
	481168	3700.61	3701.11	3701.21	0.00	0.10	0.00	-0.10
	481202	3705.53	3706.03	3706.49	3705.29	0.46	0.00	-0.46
	481213	3705.69	3706.19	3706.49	3705.29	0.30	0.00	-0.30
	481214	3700.93	3701.43	3701.57	0.00	0.15	0.00	-0.15
	481318	3702.94	3703.44	3706.49	3705.29	3.05	1.85	-1.20
	481335	3703.76	3704.26	3706.48	3705.29	2.22	1.02	-1.19
	481438	3703.31	3703.81	3706.25	3705.17	2.44	1.37	-1.07
	481451	3702.86	3703.36	3705.91	3704.90	2.55	1.54	-1.00
	481455	3701.65	3702.15	3702.23	0.00	0.07	0.00	-0.07
	481890	3699.63	3700.13	3700.93	0.00	0.80	0.00	-0.80
	482057	3701.02	3701.52	3702.47	0.00	0.95	0.00	-0.95
	482110	3703.80	3704.30	3706.34	3705.25	2.04	0.95	-1.09
	482115	3703.81	3704.31	3706.29	3705.22	1.98	0.91	-1.08
	495408	3700.35	3700.85	3701.53	0.00	0.68	0.00	-0.68
	495459	3703.32	3703.82	3706.45	3705.29	2.63	1.46	-1.17
	508255	3700.47	3700.97	3701.53	0.00	0.56	0.00	-0.56
	508277	3701.81	3702.31	3705.16	3703.39	2.85	1.08	-1.76
	508356	3704.27	3704.77	3706.20	3705.11	1.44	0.34	-1.09
	521036	3702.14	3702.64	3705.20	3703.69	2.55	1.04	-1.51
	533635	3703.69	3704.19	3706.33	3705.25	2.14	1.06	-1.08
	533661	3702.98	3703.48	3705.28	3704.18	1.80	0.70	-1.10
	533680	3703.16	3703.66	3705.31	3704.27	1.66	0.61	-1.05
	546395	3700.52	3701.02	3701.59	0.00	0.57	0.00	-0.57
	546399	3701.02	3701.52	3701.60	0.00	0.08	0.00	-0.08
	546405	3705.15	3705.65	3706.49	3705.28	0.84	0.00	-0.84
	546418	3701.51	3702.01	3702.48	0.00	0.47	0.00	-0.47
	546420	3701.25	3701.75	3702.44	0.00	0.70	0.00	-0.70
	546424	3701.26	3701.76	3702.46	0.00	0.70	0.00	-0.70
	546455	3705.02	3705.52	3706.34	3705.25	0.82	0.00	-0.82
	546468	3702.91	3703.41	3705.72	3704.77	2.32	1.37	-0.95
	566765	3697.30	3697.80	3698.88	0.00	1.08	0.00	-1.08
	566971	3700.54	3701.04	3701.19	0.00	0.15	0.00	-0.15
	567003	3700.91	3701.41	3701.50	0.00	0.09	0.00	-0.09
	567022	3700.28	3700.78	3701.57	0.00	0.79	0.00	-0.79
	567023	3700.97	3701.47	3701.58	0.00	0.11	0.00	-0.11
	567032	3703.63	3704.13	3706.49	3705.29	2.35	1.15	-1.20
	567037	3700.87	3701.37	3701.60	0.00	0.23	0.00	-0.23
	567117	3702.59	3703.09	3705.31	3704.26	2.22	1.17	-1.05
	567131	3703.60	3704.10	3705.31	3704.27	1.22	0.17	-1.05
	571751	3699.01	3699.51	3700.08	0.00	0.57	0.00	-0.57
	571896	3700.81	3701.31	3701.55	0.00	0.24	0.00	-0.24
	571949	3704.88	3705.38	3706.49	3705.29	1.10	0.00	-1.10
	571952	3700.97	3701.47	3702.44	0.00	0.97	0.00	-0.97
	571958	3701.77	3702.27	3702.53	0.00	0.25	0.00	-0.25
	571964	3702.78	3703.28	3706.46	0.00	3.18	0.00	-3.18
	571991	3705.44	3705.94	3706.37	3705.28	0.43	0.00	-0.43
	592762	3702.69	3703.19	3706.49	3705.29	3.30	2.10	-1.20
	592783	3701.04	3701.54	3701.61	0.00	0.07	0.00	-0.07
	592789	3701.40	3701.90	3702.44	0.00	0.54	0.00	-0.54
	592827	3704.84	3705.34	3706.48	3705.28	1.14	0.00	-1.14
	597385	3698.90	3699.40	3700.09	0.00	0.69	0.00	-0.69
	597578	3701.44	3701.94	3702.47	0.00	0.53	0.00	-0.53
	597591	3701.58	3702.08	3702.44	0.00	0.37	0.00	-0.37
	597610	3701.74	3702.24	3702.59	0.00	0.35	0.00	-0.35
	597647	3703.66	3704.16	3705.64	3704.69	1.48	0.53	-0.94
	610383	3700.34	3700.84	3700.94	0.00	0.09	0.00	-0.09
	610476	3701.68	3702.18	3705.15	3703.39	2.97	1.22	-1.75
	610490	3702.30	3702.80	3706.49	3705.29	3.69	2.48	-1.20
	610512	3703.49	3703.99	3706.48	3705.29	2.49	1.30	-1.19
	610531	3704.74	3705.24	3706.38	3705.28	1.13	0.04	-1.10

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	610537	3702.44	3702.94	3705.19	3703.46	2.24	0.52	-1.72
	631273	3700.66	3701.16	3701.45	0.00	0.28	0.00	-0.28
	631294	3702.56	3703.06	3705.15	3703.39	2.09	0.33	-1.75
	631301	3702.15	3702.65	3702.83	0.00	0.18	0.00	-0.18
	631330	3701.95	3702.45	3705.16	3703.39	2.71	0.94	-1.76
	631403	3703.37	3703.87	3706.31	3705.23	2.44	1.36	-1.08
	631420	3702.58	3703.08	3705.97	3704.95	2.89	1.87	-1.02
	631424	3704.63	3705.13	3706.01	3704.91	0.88	0.00	-0.88
	635996	3700.42	3700.92	3701.53	0.00	0.61	0.00	-0.61
	635999	3700.30	3700.80	3701.53	0.00	0.73	0.00	-0.73
	636026	3700.74	3701.24	3701.61	0.00	0.37	0.00	-0.37
	636057	3701.19	3701.69	3702.47	0.00	0.78	0.00	-0.78
	636089	3701.61	3702.11	3702.35	0.00	0.24	0.00	-0.24
	636110	3703.50	3704.00	3705.51	3704.53	1.51	0.54	-0.97
	659895	3704.24	3704.74	3706.49	3705.29	1.75	0.54	-1.20
	660004	3702.81	3703.31	3705.31	3704.26	1.99	0.94	-1.05
	661069	3701.75	3702.25	3705.17	3703.39	2.92	1.15	-1.78
	661105	3701.10	3701.60	3702.44	0.00	0.84	0.00	-0.84
	661112	3701.71	3702.21	3702.54	0.00	0.33	0.00	-0.33
	661164	3702.76	3703.26	3705.27	3704.15	2.01	0.89	-1.12
	661189	3702.22	3702.72	3703.67	0.00	0.95	0.00	-0.95
	674489	3700.56	3701.06	3701.21	0.00	0.15	0.00	-0.15
	674511	3700.46	3700.96	3701.33	0.00	0.38	0.00	-0.38
	674539	3700.08	3700.58	3701.54	0.00	0.96	0.00	-0.96
	674550	3700.42	3700.92	3701.56	0.00	0.64	0.00	-0.64
	674565	3701.80	3702.30	3706.49	3705.29	4.19	2.99	-1.20
	674570	3701.68	3702.18	3702.25	0.00	0.07	0.00	-0.07
	674605	3704.03	3704.53	3706.48	3705.29	1.95	0.75	-1.20
	674630	3701.63	3702.13	3702.59	0.00	0.47	0.00	-0.47
	674654	3704.18	3704.68	3706.10	3705.03	1.41	0.34	-1.07
	677833	3698.26	3698.76	3698.88	0.00	0.11	0.00	-0.11
	677856	3696.98	3697.48	3698.87	0.00	1.39	0.00	-1.39
	677875	3697.12	3697.62	3698.87	0.00	1.25	0.00	-1.25
	705104	3697.58	3698.08	3698.87	0.00	0.79	0.00	-0.79
	705393	3702.81	3703.31	3703.48	0.00	0.16	0.00	-0.16
	705414	3701.57	3702.07	3705.20	3703.73	3.13	1.67	-1.46
	705424	3701.36	3701.86	3702.42	0.00	0.56	0.00	-0.56
	705490	3703.94	3704.44	3705.13	0.00	0.69	0.00	-0.69
	705491	3704.04	3704.54	3705.14	3703.32	0.60	0.00	-0.60
	705497	3702.19	3702.69	3705.15	3703.39	2.46	0.71	-1.76
	705511	3700.26	3700.76	3701.11	0.00	0.35	0.00	-0.35
	705512	3700.61	3701.11	3701.17	0.00	0.07	0.00	-0.07
	705521	3700.05	3700.55	3701.56	0.00	1.01	0.00	-1.01
	710163	3701.37	3701.87	3701.88	0.00	0.01	0.00	-0.01
	710178	3701.37	3701.87	3701.92	0.00	0.05	0.00	-0.05
	710209	3701.83	3702.33	3702.52	0.00	0.19	0.00	-0.19
	710212	3701.79	3702.29	3702.74	0.00	0.44	0.00	-0.44
	710214	3702.02	3702.52	3702.72	0.00	0.21	0.00	-0.21
	710215	3701.76	3702.26	3702.75	0.00	0.50	0.00	-0.50
	710219	3701.90	3702.40	3702.70	0.00	0.30	0.00	-0.30
	710224	3701.67	3702.17	3702.58	0.00	0.40	0.00	-0.40
	710225	3701.28	3701.78	3702.59	0.00	0.81	0.00	-0.81
	710227	3701.46	3701.96	3702.43	0.00	0.47	0.00	-0.47
	710228	3701.15	3701.65	3702.43	0.00	0.78	0.00	-0.78
	710229	3701.29	3701.79	3702.43	0.00	0.64	0.00	-0.64
	710230	3700.98	3701.48	3702.50	0.00	1.01	0.00	-1.01
	710231	3701.09	3701.59	3702.55	0.00	0.96	0.00	-0.96
	710232	3701.74	3702.24	3702.51	0.00	0.27	0.00	-0.27
	710233	3701.66	3702.16	3702.58	0.00	0.42	0.00	-0.42
	710236	3701.66	3702.16	3702.65	0.00	0.48	0.00	-0.48
	710238	3701.19	3701.69	3702.60	0.00	0.91	0.00	-0.91
	750506	3698.32	3698.82	3698.87	0.00	0.06	0.00	-0.06
	750513	3698.28	3698.78	3698.87	0.00	0.09	0.00	-0.09
	4865835	3697.81	3698.31	3698.97	0.00	0.65	0.00	-0.65
	4865842	3700.82	3701.32	3701.58	0.00	0.26	0.00	-0.26
	4865843	3700.83	3701.33	3701.59	0.00	0.26	0.00	-0.26
	4865844	3700.58	3701.08	3701.53	0.00	0.45	0.00	-0.45
	4865846	3704.34	3704.84	3706.48	3705.28	1.64	0.44	-1.19
	9549	3701.87	3702.37	3,706.48	0.00	4.11	0.00	-4.11

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Commercial Buildings	34441	3702.57	3703.07	3,706.08	3705.02	3.01	1.95	-1.06
	34825	3699.47	3699.97	3,700.12	0.00	0.15	0.00	-0.15
	83136	3700.32	3700.82	3,701.04	0.00	0.22	0.00	-0.22
	83409	3703.22	3703.72	3,705.30	3704.25	1.58	0.52	-1.05
	84918	3701.64	3702.14	3,705.17	3703.39	3.03	1.25	-1.78
	134770	3700.16	3700.66	3,700.94	0.00	0.28	0.00	-0.28
	135009	3701.78	3702.28	3,705.16	3703.39	2.87	1.11	-1.76
	135171	3701.78	3702.28	3,702.56	0.00	0.28	0.00	-0.28
	173174	3701.55	3702.05	3,705.15	3703.39	3.10	1.35	-1.75
	173554	3701.86	3702.36	3,705.15	3703.39	2.78	1.03	-1.75
	211307	3701.06	3701.56	3,705.15	3703.39	3.59	1.83	-1.75
	211445	3701.72	3702.22	3,705.15	3703.39	2.93	1.17	-1.76
	211612	3702.36	3702.86	3,706.49	3705.29	3.63	2.42	-1.20
	212681	3701.98	3702.48	3,705.17	3703.39	2.69	0.91	-1.78
	249264	3702.28	3702.78	3,705.15	3703.39	2.37	0.61	-1.76
	250866	3701.31	3701.81	3,705.15	3703.39	3.34	1.58	-1.76
	250965	3702.89	3703.39	3,706.30	3705.24	2.91	1.85	-1.06
	265161	3702.78	3703.28	3,705.29	3704.23	2.02	0.96	-1.06
	289322	3701.53	3702.03	3,702.42	0.00	0.39	0.00	-0.39
	289618	3701.43	3701.93	3,705.17	3703.39	3.24	1.47	-1.78
	289620	3702.20	3702.70	3,705.17	3703.39	2.47	0.69	-1.78
	303334	3701.66	3702.16	3,705.16	3703.39	3.00	1.23	-1.77
	303417	3703.43	3703.93	3,705.43	3704.44	1.49	0.50	-0.99
	303423	3702.64	3703.14	3,703.19	0.00	0.05	0.00	-0.05
	327844	3702.37	3702.87	3,705.29	3704.22	2.42	1.35	-1.07
	327845	3702.62	3703.12	3,705.31	3704.26	2.19	1.14	-1.05
	353522	3702.06	3702.56	3,705.15	3703.39	2.59	0.84	-1.76
	353618	3702.57	3703.07	3,706.49	3705.29	3.42	2.22	-1.20
	377853	3701.93	3702.43	3,705.15	3703.39	2.73	0.97	-1.76
	377922	3701.23	3701.73	3,702.46	0.00	0.72	0.00	-0.72
	377926	3701.65	3702.15	3,705.17	3703.39	3.02	1.24	-1.78
	380039	3701.85	3702.35	3,705.19	3703.48	2.84	1.13	-1.71
	430357	3701.12	3701.62	3,701.63	0.00	0.01	0.00	-0.01
	430940	3701.77	3702.27	3,705.15	3703.39	2.89	1.13	-1.76
	481430	3703.15	3703.65	3,706.29	3705.22	2.64	1.57	-1.06
	481435	3702.78	3703.28	3,706.28	3705.22	3.00	1.94	-1.06
	481998	3700.42	3700.92	3,705.15	3703.39	4.23	2.48	-1.75
	495485	3702.49	3702.99	3,705.20	3703.68	2.21	0.70	-1.51
	495518	3703.02	3703.52	3,705.31	3704.26	1.79	0.75	-1.05
	520988	3701.50	3702.00	3,705.16	3703.39	3.16	1.40	-1.77
	521065	3703.44	3703.94	3,705.30	3704.26	1.37	0.32	-1.05
	533388	3699.06	3699.56	3,699.82	0.00	0.26	0.00	-0.26
	533529	3703.71	3704.21	3,705.14	3703.37	0.93	0.00	-0.93
	533590	3702.27	3702.77	3,705.16	3703.39	2.40	0.63	-1.77
	533657	3702.42	3702.92	3,705.26	3704.14	2.35	1.22	-1.12
	546287	3700.15	3700.65	3,701.12	0.00	0.47	0.00	-0.47
	546412	3701.90	3702.40	3,705.16	3703.39	2.75	0.99	-1.76
	567116	3704.56	3705.06	3,705.57	3704.66	0.50	0.00	-0.50
	571897	3701.24	3701.74	3,705.15	3703.39	3.41	1.66	-1.75
	571932	3701.49	3701.99	3,705.16	3703.39	3.17	1.40	-1.76
	592802	3701.88	3702.38	3,702.47	0.00	0.09	0.00	-0.09
	597624	3702.48	3702.98	3,706.38	3705.29	3.40	2.31	-1.10
	631345	3701.78	3702.28	3,702.48	0.00	0.20	0.00	-0.20
	631413	3702.95	3703.45	3,705.23	3704.00	1.78	0.55	-1.23
	636017	3701.69	3702.19	3,702.51	0.00	0.32	0.00	-0.32
	636041	3701.78	3702.28	3,705.17	3703.39	2.90	1.12	-1.78
	636042	3701.52	3702.02	3,702.42	0.00	0.40	0.00	-0.40
	636081	3701.61	3702.11	3,705.19	3703.40	3.08	1.30	-1.78
	659885	3701.97	3702.47	3,705.16	3703.39	2.69	0.93	-1.76
	660002	3703.41	3703.91	3,705.88	3704.88	1.97	0.97	-0.99
	674567	3701.03	3701.53	3,702.12	0.00	0.59	0.00	-0.59
	705101	3698.02	3698.52	3,698.88	0.00	0.36	0.00	-0.36
	705108	3697.28	3697.78	3,698.87	0.00	1.10	0.00	-1.10
	705385	3704.80	3705.30	3,705.39	3704.35	0.09	0.00	-0.09
	705387	3704.73	3705.23	3,705.37	3704.34	0.13	0.00	-0.13
	705388	3703.79	3704.29	3,705.37	3704.34	1.08	0.06	-1.02
	705391	3701.76	3702.26	3,705.29	3704.24	3.03	1.98	-1.05
	705392	3704.00	3704.50	3,704.67	0.00	0.17	0.00	-0.17
	705398	3701.98	3702.48	3,702.50	0.00	0.02	0.00	-0.02

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	705410	3702.30	3702.80	3,703.34	0.00	0.54	0.00	-0.54
	705411	3702.73	3703.23	3,703.48	0.00	0.26	0.00	-0.26
	705412	3701.93	3702.43	3,705.20	3703.72	2.77	1.29	-1.47
	705415	3702.24	3702.74	3,705.17	3703.39	2.43	0.66	-1.78
	705416	3702.02	3702.52	3,705.17	3703.39	2.65	0.87	-1.78
	705418	3701.35	3701.85	3,705.17	3703.39	3.33	1.55	-1.78
	705419	3700.89	3701.39	3,705.16	3703.39	3.78	2.01	-1.77
	705420	3700.97	3701.47	3,705.16	3703.39	3.69	1.92	-1.76
	705421	3701.30	3701.80	3,705.15	3703.39	3.35	1.59	-1.76
	705422	3701.55	3702.05	3,702.42	0.00	0.36	0.00	-0.36
	705425	3701.61	3702.11	3,702.40	0.00	0.29	0.00	-0.29
	705454	3701.21	3701.71	3,701.76	0.00	0.06	0.00	-0.06
	705477	3701.56	3702.06	3,705.15	3703.39	3.09	1.33	-1.76
	705480	3702.48	3702.98	3,705.15	3703.39	2.17	0.41	-1.75
	705482	3702.80	3703.30	3,705.15	3703.39	1.85	0.09	-1.75
	705483	3703.13	3703.63	3,705.15	3703.39	1.52	0.00	-1.52
	705484	3703.12	3703.62	3,705.15	3703.39	1.53	0.00	-1.53
	705485	3703.35	3703.85	3,705.14	3703.37	1.29	0.00	-1.29
	705486	3703.82	3704.32	3,705.14	3703.38	0.82	0.00	-0.82
	705487	3703.88	3704.38	3,705.14	3703.33	0.76	0.00	-0.76
	705492	3703.77	3704.27	3,705.15	3703.39	0.87	0.00	-0.87
	705493	3702.94	3703.44	3,705.15	3703.39	1.71	0.00	-1.71
	705494	3702.89	3703.39	3,705.15	3703.39	1.76	0.01	-1.76
	705499	3701.51	3702.01	3,705.15	3703.39	3.13	1.38	-1.75
	705501	3701.49	3701.99	3,705.15	3703.39	3.16	1.41	-1.75
	705520	3700.98	3701.48	3,701.51	0.00	0.03	0.00	-0.03
	710187	3701.70	3702.20	3,702.30	0.00	0.10	0.00	-0.10
	710192	3701.87	3702.37	3,702.41	0.00	0.04	0.00	-0.04
	710204	3701.56	3702.06	3,702.43	0.00	0.37	0.00	-0.37
	710205	3701.75	3702.25	3,702.44	0.00	0.19	0.00	-0.19
	710216	3701.80	3702.30	3,702.72	0.00	0.42	0.00	-0.42
	710218	3701.84	3702.34	3,702.56	0.00	0.22	0.00	-0.22
	710234	3702.01	3702.51	3,702.75	0.00	0.24	0.00	-0.24
	710239	3703.77	3704.27	3704.76	0.00	0.5	0.0	-0.48962

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	10554	4013.43	4013.93	4014.61	0.00	0.67	0.00	-0.67
	10595	4002.14	4002.64	4003.95	0.00	1.31	0.00	-1.31
	10599	3998.64	3999.14	4000.32	3998.91	1.18	0.00	-1.18
	10858	4010.41	4010.91	4010.92	0.00	0.01	0.00	-0.01
	10873	3998.02	3998.52	4000.76	3999.14	2.24	0.62	-1.62
	10920	3986.04	3986.54	3986.93	0.00	0.40	0.00	-0.40
	11122	3865.46	3865.96	3866.94	0.00	0.98	0.00	-0.98
	11260	3805.97	3806.47	3806.54	0.00	0.07	0.00	-0.07
	11264	3797.89	3798.39	3799.24	3797.85	0.85	0.00	-0.85
	11277	3791.11	3791.61	3791.98	3790.77	0.37	0.00	-0.37
	36251	3868.15	3868.65	3870.02	0.00	1.37	0.00	-1.37
	36253	3863.01	3863.51	3864.10	0.00	0.59	0.00	-0.59
	36273	3849.81	3850.31	3852.01	3850.17	1.69	0.00	-1.69
	36344	3817.34	3817.84	3819.67	0.00	1.83	0.00	-1.83
	36364	3815.55	3816.05	3817.03	3815.71	0.98	0.00	-0.98
	36421	3996.29	3996.79	3996.87	0.00	0.08	0.00	-0.08
	36667	3826.18	3826.68	3827.33	3826.43	0.66	0.00	-0.66
	36693	3811.05	3811.55	3812.33	3810.22	0.78	0.00	-0.78
	49067	4005.33	4005.83	4008.73	4006.75	2.90	0.92	-1.98
	49072	4000.62	4001.12	4003.52	4001.76	2.40	0.64	-1.76
	49080	3989.81	3990.31	3991.21	0.00	0.90	0.00	-0.90
	49100	3970.68	3971.18	3971.24	0.00	0.05	0.00	-0.05
	49210	3843.64	3844.14	3845.28	3843.91	1.13	0.00	-1.13
	49231	3833.38	3833.88	3834.43	3833.44	0.55	0.00	-0.55
	49242	3825.95	3826.45	3826.81	3826.07	0.36	0.00	-0.36
	49243	3826.70	3827.20	3827.93	0.00	0.73	0.00	-0.73
	49262	3810.26	3810.76	3811.26	3810.16	0.50	0.00	-0.50
	49266	3815.11	3815.61	3816.04	3814.91	0.42	0.00	-0.42
	49280	3808.68	3809.18	3810.37	3808.96	1.19	0.00	-1.19
	49304	3793.42	3793.92	3794.51	0.00	0.58	0.00	-0.58
	86183	3998.39	3998.89	4000.49	3998.77	1.60	0.00	-1.60
	86186	3993.02	3993.52	3995.82	3993.69	2.30	0.17	-2.13
	86194	3981.12	3981.62	3982.25	0.00	0.63	0.00	-0.63
	86249	3964.69	3965.19	3965.43	0.00	0.24	0.00	-0.24
	86592	3837.60	3838.10	3838.63	0.00	0.53	0.00	-0.53
	86594	3836.42	3836.92	3837.96	0.00	1.04	0.00	-1.04
	86650	3821.93	3822.43	3823.21	3822.52	0.78	0.09	-0.69
	86660	3819.42	3819.92	3820.90	3819.50	0.98	0.00	-0.98
	86747	3795.19	3795.69	3796.86	0.00	1.16	0.00	-1.16
	86922	3987.60	3988.10	3988.74	0.00	0.64	0.00	-0.64
	86923	3987.51	3988.01	3989.67	3988.08	1.66	0.07	-1.59
	86924	3982.41	3982.91	3982.96	0.00	0.04	0.00	-0.04
	87025	3873.46	3873.96	3874.42	0.00	0.45	0.00	-0.45
	87090	3841.24	3841.74	3842.45	0.00	0.72	0.00	-0.72
	87123	3837.61	3838.11	3838.32	0.00	0.21	0.00	-0.21
	87212	3811.88	3812.38	3812.52	3811.86	0.14	0.00	-0.14
	87355	3813.42	3813.92	3813.96	0.00	0.04	0.00	-0.04
	87369	3800.68	3801.18	3801.36	3800.54	0.18	0.00	-0.18
	136975	3833.73	3834.23	3835.27	3834.22	1.03	0.00	-1.03
	137042	3827.47	3827.97	3828.12	3827.53	0.15	0.00	-0.15
	137045	3832.97	3833.47	3833.50	0.00	0.04	0.00	-0.04
	137049	3824.12	3824.62	3825.72	3824.39	1.11	0.00	-1.11
	137059	3818.64	3819.14	3819.69	0.00	0.55	0.00	-0.55
	137225	3797.90	3798.40	3798.92	0.00	0.51	0.00	-0.51
	137627	4013.62	4014.12	4015.17	0.00	1.05	0.00	-1.05
	137643	3997.45	3997.95	3998.29	0.00	0.34	0.00	-0.34
	137708	3995.69	3996.19	3996.21	0.00	0.03	0.00	-0.03
	137767	4006.89	4007.39	4007.41	0.00	0.03	0.00	-0.03
	137772	3995.82	3996.32	3998.11	3996.48	1.79	0.15	-1.64
	137806	3999.27	3999.77	4002.08	4000.26	2.31	0.49	-1.82
	137819	3991.38	3991.88	3991.93	0.00	0.05	0.00	-0.05
	138047	3867.35	3867.85	3867.95	0.00	0.10	0.00	-0.10
	138124	3852.07	3852.57	3854.40	0.00	1.83	0.00	-1.83
	138141	3836.68	3837.18	3838.53	3837.11	1.35	0.00	-1.35
	138360	3789.90	3790.40	3791.74	3789.98	1.33	0.00	-1.33
	138389	3801.26	3801.76	3802.01	0.00	0.25	0.00	-0.25
	138410	3807.39	3807.89	3808.85	3807.50	0.96	0.00	-0.96
	138459	3789.79	3790.29	3790.99	0.00	0.70	0.00	-0.70
	175802	4013.04	4013.54	4016.37	4014.24	2.83	0.70	-2.13

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	175918	3992.27	3992.77	3994.16	3992.38	1.39	0.00	-1.39
	175963	4032.02	4032.52	4032.55	0.00	0.03	0.00	-0.03
	175980	4003.92	4004.42	4004.48	0.00	0.06	0.00	-0.06
	176038	3994.94	3995.44	3996.41	3995.32	0.96	0.00	-0.96
	176219	4015.43	4015.93	4016.14	0.00	0.21	0.00	-0.21
	176220	4013.50	4014.00	4014.44	0.00	0.45	0.00	-0.45
	176280	3837.51	3838.01	3838.09	0.00	0.08	0.00	-0.08
	176284	4002.43	4002.93	4002.99	0.00	0.05	0.00	-0.05
	176288	3998.50	3999.00	4000.89	3999.46	1.89	0.46	-1.43
	176325	3873.68	3874.18	3875.88	0.00	1.70	0.00	-1.70
	176349	3826.68	3827.18	3827.22	0.00	0.04	0.00	-0.04
	176407	3841.15	3841.65	3842.89	3841.57	1.24	0.00	-1.24
	176416	3813.91	3814.41	3814.73	3813.53	0.31	0.00	-0.31
	176462	3831.00	3831.50	3833.31	0.00	1.81	0.00	-1.81
	176516	3819.53	3820.03	3820.78	3819.73	0.75	0.00	-0.75
	176585	3808.84	3809.34	3810.15	0.00	0.81	0.00	-0.81
	176655	3777.85	3778.35	3778.51	0.00	0.16	0.00	-0.16
	176684	3842.51	3843.01	3843.72	3842.77	0.71	0.00	-0.71
	176692	3836.26	3836.76	3838.36	3836.82	1.61	0.06	-1.54
	176755	3816.23	3816.73	3817.22	0.00	0.49	0.00	-0.49
	176794	3805.59	3806.09	3806.46	3804.93	0.37	0.00	-0.37
	213974	4013.05	4013.55	4015.74	4013.97	2.19	0.42	-1.77
	214021	3998.54	3999.04	3999.42	3997.99	0.38	0.00	-0.38
	214026	3990.16	3990.66	3992.24	3990.75	1.59	0.09	-1.50
	214119	4013.92	4014.42	4014.67	0.00	0.26	0.00	-0.26
	214120	4015.84	4016.34	4017.39	0.00	1.05	0.00	-1.05
	214122	4010.51	4011.01	4011.41	0.00	0.40	0.00	-0.40
	214167	4007.30	4007.80	4010.56	4008.11	2.76	0.32	-2.45
	214175	3994.10	3994.60	3995.07	0.00	0.47	0.00	-0.47
	214180	3990.40	3990.90	3991.07	0.00	0.17	0.00	-0.17
	214331	3871.34	3871.84	3872.02	0.00	0.18	0.00	-0.18
	214343	3868.99	3869.49	3871.26	0.00	1.77	0.00	-1.77
	214428	3836.32	3836.82	3838.38	0.00	1.56	0.00	-1.56
	214442	4041.82	4042.32	4044.35	0.00	2.03	0.00	-2.03
	214501	3815.16	3815.66	3816.03	0.00	0.37	0.00	-0.37
	214506	3822.23	3822.73	3823.20	0.00	0.46	0.00	-0.46
	214514	4014.32	4014.82	4015.04	0.00	0.23	0.00	-0.23
	214516	4008.78	4009.28	4009.93	0.00	0.65	0.00	-0.65
	214569	3819.19	3819.69	3820.62	3819.33	0.93	0.00	-0.93
	214624	3837.73	3838.23	3838.33	0.00	0.10	0.00	-0.10
	214654	3795.29	3795.79	3796.39	0.00	0.60	0.00	-0.60
	214664	3792.92	3793.42	3794.08	3792.94	0.66	0.00	-0.66
	214666	3790.87	3791.37	3791.44	0.00	0.08	0.00	-0.08
	215088	3792.72	3793.22	3793.76	0.00	0.54	0.00	-0.54
	251982	4022.24	4022.74	4023.00	0.00	0.26	0.00	-0.26
	252036	3996.10	3996.60	3997.20	3996.65	0.59	0.04	-0.55
	252047	3987.01	3987.51	3987.86	0.00	0.35	0.00	-0.35
	252103	3979.52	3980.02	3980.83	0.00	0.81	0.00	-0.81
	252111	3973.26	3973.76	3974.51	0.00	0.75	0.00	-0.75
	252482	3843.41	3843.91	3845.06	0.00	1.14	0.00	-1.14
	252512	4015.12	4015.62	4015.88	0.00	0.26	0.00	-0.26
	252539	3837.20	3837.70	3838.56	3837.02	0.87	0.00	-0.87
	252543	3833.28	3833.78	3834.57	3833.03	0.79	0.00	-0.79
	252548	3826.84	3827.34	3827.90	3826.79	0.56	0.00	-0.56
	252569	3995.47	3995.97	3996.31	0.00	0.34	0.00	-0.34
	252574	3993.55	3994.05	3994.87	0.00	0.81	0.00	-0.81
	252620	3807.40	3807.90	3808.13	0.00	0.24	0.00	-0.24
	252758	3989.60	3990.10	3991.79	3990.46	1.70	0.36	-1.34
	252763	3982.59	3983.09	3983.62	0.00	0.53	0.00	-0.53
	252791	3875.11	3875.61	3875.97	0.00	0.36	0.00	-0.36
	252895	3847.78	3848.28	3848.91	0.00	0.63	0.00	-0.63
	253023	3811.05	3811.55	3812.34	0.00	0.78	0.00	-0.78
	253035	3804.90	3805.40	3805.54	3804.65	0.14	0.00	-0.14
	253060	3865.56	3866.06	3866.93	0.00	0.87	0.00	-0.87
	253119	3843.51	3844.01	3845.80	0.00	1.78	0.00	-1.78
	253189	3811.52	3812.02	3812.79	3811.36	0.77	0.00	-0.77
	253242	3788.23	3788.73	3789.66	3787.39	0.93	0.00	-0.93
	265772	4012.28	4012.78	4013.70	0.00	0.92	0.00	-0.92
	265777	4012.51	4013.01	4013.82	4012.18	0.81	0.00	-0.81

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	265787	3998.05	3998.55	4000.32	3998.51	1.77	0.00	-1.77
	265789	3993.50	3994.00	3996.07	3994.61	2.07	0.61	-1.46
	265790	3989.84	3990.34	3990.50	0.00	0.16	0.00	-0.16
	265968	3817.86	3818.36	3819.08	3817.94	0.72	0.00	-0.72
	265983	3810.68	3811.18	3811.45	0.00	0.28	0.00	-0.28
	265994	3803.52	3804.02	3804.24	0.00	0.22	0.00	-0.22
	265995	3799.70	3800.20	3800.96	3799.79	0.75	0.00	-0.75
	266006	3794.03	3794.53	3795.13	0.00	0.60	0.00	-0.60
	290801	4022.94	4023.44	4024.73	0.00	1.28	0.00	-1.28
	290836	4010.46	4010.96	4012.30	4010.56	1.34	0.00	-1.34
	290838	4006.33	4006.83	4008.81	4007.11	1.99	0.28	-1.70
	290863	4010.88	4011.38	4013.22	4011.58	1.85	0.20	-1.65
	290870	4005.66	4006.16	4007.99	4005.56	1.83	0.00	-1.83
	290877	3982.95	3983.45	3983.86	0.00	0.40	0.00	-0.40
	291039	3865.83	3866.33	3868.60	0.00	2.27	0.00	-2.27
	291056	3868.52	3869.02	3869.08	0.00	0.06	0.00	-0.06
	291098	3842.73	3843.23	3843.72	0.00	0.48	0.00	-0.48
	291126	3846.73	3847.23	3848.97	3847.23	1.74	0.00	-1.74
	291199	3825.06	3825.56	3826.12	3825.14	0.56	0.00	-0.56
	291231	3804.44	3804.94	3805.85	3804.49	0.90	0.00	-0.90
	291241	3820.45	3820.95	3821.73	3820.38	0.78	0.00	-0.78
	291244	3818.80	3819.30	3819.80	0.00	0.50	0.00	-0.50
	291301	3796.49	3796.99	3797.46	3796.81	0.47	0.00	-0.47
	291305	3796.52	3797.02	3797.16	0.00	0.14	0.00	-0.14
	291310	3797.28	3797.78	3797.87	0.00	0.09	0.00	-0.09
	304082	4007.29	4007.79	4009.10	0.00	1.30	0.00	-1.30
	304091	3997.18	3997.68	3999.90	3998.45	2.22	0.77	-1.45
	304095	3988.63	3989.13	3990.51	0.00	1.39	0.00	-1.39
	304206	3867.94	3868.44	3868.78	0.00	0.34	0.00	-0.34
	304263	3821.94	3822.44	3822.91	3822.10	0.47	0.00	-0.47
	304302	3800.42	3800.92	3801.69	3800.57	0.77	0.00	-0.77
	304316	3793.53	3794.03	3794.33	0.00	0.31	0.00	-0.31
	329295	4026.61	4027.11	4028.05	0.00	0.93	0.00	-0.93
	329329	4012.62	4013.12	4013.78	0.00	0.66	0.00	-0.66
	329532	4032.34	4032.84	4036.27	0.00	3.43	0.00	-3.43
	329715	3812.31	3812.81	3813.55	3812.55	0.74	0.00	-0.74
	329842	3853.87	3854.37	3855.07	0.00	0.69	0.00	-0.69
	329850	3844.88	3845.38	3846.25	0.00	0.87	0.00	-0.87
	329874	3838.49	3838.99	3839.87	0.00	0.88	0.00	-0.88
	329875	3836.06	3836.56	3837.74	3836.89	1.18	0.33	-0.85
	329921	3815.90	3816.40	3816.73	0.00	0.33	0.00	-0.33
	329924	3815.66	3816.16	3816.17	3815.45	0.01	0.00	-0.01
	329973	3790.10	3790.60	3791.11	3789.91	0.51	0.00	-0.51
	329980	3788.19	3788.69	3789.20	0.00	0.51	0.00	-0.51
	355050	4050.18	4050.68	4050.91	0.00	0.22	0.00	-0.22
	355161	3990.26	3990.76	3991.29	0.00	0.53	0.00	-0.53
	355198	3982.73	3983.23	3983.44	0.00	0.21	0.00	-0.21
	355199	3981.39	3981.89	3983.14	0.00	1.25	0.00	-1.25
	355201	3980.20	3980.70	3982.30	0.00	1.60	0.00	-1.60
	355378	3870.14	3870.64	3872.04	0.00	1.40	0.00	-1.40
	355525	3810.66	3811.16	3812.33	0.00	1.17	0.00	-1.17
	355541	3824.61	3825.11	3825.89	3824.79	0.77	0.00	-0.77
	355549	3819.80	3820.30	3820.39	3820.05	0.09	0.00	-0.09
	355592	3805.95	3806.45	3807.91	3805.93	1.46	0.00	-1.46
	380069	4002.05	4002.55	4005.13	4003.46	2.58	0.91	-1.67
	380337	3871.90	3872.40	3874.02	0.00	1.61	0.00	-1.61
	380369	3851.73	3852.23	3854.22	3852.38	1.99	0.15	-1.84
	380378	3839.44	3839.94	3841.94	3840.48	2.00	0.54	-1.46
	380460	3804.30	3804.80	3805.34	0.00	0.53	0.00	-0.53
	380492	3793.37	3793.87	3794.68	3793.26	0.81	0.00	-0.81
	380973	4006.97	4007.47	4007.50	0.00	0.03	0.00	-0.03
	380983	4003.58	4004.08	4004.94	0.00	0.86	0.00	-0.86
	381143	3833.83	3834.33	3835.71	3834.16	1.38	0.00	-1.38
	381173	3815.87	3816.37	3818.03	3816.39	1.66	0.02	-1.64
	381188	3808.36	3808.86	3809.79	3808.41	0.92	0.00	-0.92
	406574	3866.40	3866.90	3867.02	0.00	0.12	0.00	-0.12
	406610	4004.11	4004.61	4005.10	0.00	0.49	0.00	-0.49
	406645	3836.26	3836.76	3836.77	0.00	0.00	0.00	0.00
	406653	3825.94	3826.44	3827.20	3826.41	0.76	0.00	-0.76

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	406710	3818.94	3819.44	3820.25	3819.12	0.81	0.00	-0.81
	406721	3812.11	3812.61	3813.86	3812.35	1.26	0.00	-1.26
	406747	3808.17	3808.67	3809.43	3808.01	0.77	0.00	-0.77
	406761	3801.51	3802.01	3802.49	0.00	0.48	0.00	-0.48
	406913	3840.65	3841.15	3841.56	0.00	0.41	0.00	-0.41
	406947	3839.23	3839.73	3841.24	3839.56	1.51	0.00	-1.51
	407012	3808.61	3809.11	3809.57	0.00	0.46	0.00	-0.46
	407038	3791.83	3792.33	3792.39	3791.52	0.06	0.00	-0.06
	432052	3991.01	3991.51	3992.06	0.00	0.55	0.00	-0.55
	432312	3999.48	3999.98	4000.78	0.00	0.80	0.00	-0.80
	432314	3993.81	3994.31	3997.66	3995.83	3.35	1.52	-1.83
	432332	3835.59	3836.09	3836.29	0.00	0.20	0.00	-0.20
	432351	3823.66	3824.16	3825.72	3824.42	1.56	0.26	-1.30
	432375	3954.48	3954.98	3955.39	0.00	0.41	0.00	-0.41
	432385	3823.44	3823.94	3824.92	0.00	0.98	0.00	-0.98
	432515	3871.55	3872.05	3872.97	0.00	0.92	0.00	-0.92
	432519	3865.01	3865.51	3866.18	0.00	0.67	0.00	-0.67
	432654	3813.88	3814.38	3815.59	3813.61	1.20	0.00	-1.20
	432711	3791.02	3791.52	3791.72	0.00	0.20	0.00	-0.20
	457431	3997.07	3997.57	3999.58	3997.72	2.01	0.15	-1.86
	457819	3988.86	3989.36	3989.39	0.00	0.03	0.00	-0.03
	457820	3985.74	3986.24	3986.71	0.00	0.47	0.00	-0.47
	457840	3803.24	3803.74	3804.60	0.00	0.86	0.00	-0.86
	457842	3796.73	3797.23	3797.42	3796.76	0.19	0.00	-0.19
	483065	3993.98	3994.48	3995.57	0.00	1.09	0.00	-1.09
	483287	3847.46	3847.96	3850.86	3849.15	2.90	1.19	-1.71
	483381	3820.47	3820.97	3821.60	3820.40	0.62	0.00	-0.62
	483387	3815.46	3815.96	3816.63	3815.48	0.67	0.00	-0.67
	483392	3815.48	3815.98	3816.32	0.00	0.34	0.00	-0.34
	483397	3998.60	3999.10	3999.99	3998.63	0.89	0.00	-0.89
	483398	3994.77	3995.27	3995.76	3994.83	0.49	0.00	-0.49
	483467	3947.85	3948.35	3948.45	0.00	0.10	0.00	-0.10
	483485	3779.75	3780.25	3781.07	0.00	0.82	0.00	-0.82
	483643	3827.14	3827.64	3828.47	3827.48	0.83	0.00	-0.83
	483713	3797.44	3797.94	3798.03	0.00	0.09	0.00	-0.09
	496175	4007.71	4008.21	4009.94	4008.51	1.73	0.30	-1.43
	496176	4006.03	4006.53	4007.40	0.00	0.87	0.00	-0.87
	496185	4003.06	4003.56	4003.61	0.00	0.06	0.00	-0.06
	496186	3995.05	3995.55	3997.07	3995.51	1.52	0.00	-1.52
	496276	3868.67	3869.17	3869.84	0.00	0.67	0.00	-0.67
	496317	3832.00	3832.50	3833.02	0.00	0.52	0.00	-0.52
	496327	3826.78	3827.28	3827.80	0.00	0.52	0.00	-0.52
	496339	3818.86	3819.36	3819.87	3818.89	0.51	0.00	-0.51
	496348	3811.53	3812.03	3812.38	3811.30	0.35	0.00	-0.35
	496389	3793.14	3793.64	3793.77	3792.83	0.14	0.00	-0.14
	509048	3956.18	3956.68	3956.69	0.00	0.01	0.00	-0.01
	509204	3818.05	3818.55	3818.61	3817.16	0.06	0.00	-0.06
	509220	3808.63	3809.13	3809.45	0.00	0.32	0.00	-0.32
	509228	3799.72	3800.22	3800.74	3799.78	0.52	0.00	-0.52
	509229	3803.09	3803.59	3804.59	0.00	1.00	0.00	-1.00
	509233	3797.56	3798.06	3798.47	0.00	0.40	0.00	-0.40
	521775	3825.62	3826.12	3826.79	3826.06	0.66	0.00	-0.66
	521822	3795.85	3796.35	3797.00	3795.82	0.65	0.00	-0.65
	534260	4006.50	4007.00	4007.62	0.00	0.62	0.00	-0.62
	534273	3993.66	3994.16	3995.17	3993.32	1.01	0.00	-1.01
	534277	3992.44	3992.94	3993.89	3992.91	0.95	0.00	-0.95
	534366	3872.80	3873.30	3875.00	0.00	1.69	0.00	-1.69
	534467	3802.81	3803.31	3804.48	3802.58	1.18	0.00	-1.18
	534468	3801.41	3801.91	3802.57	0.00	0.67	0.00	-0.67
	534498	3783.39	3783.89	3784.08	0.00	0.20	0.00	-0.20
	547212	3853.16	3853.66	3854.89	0.00	1.23	0.00	-1.23
	547231	3849.33	3849.83	3850.57	3849.24	0.74	0.00	-0.74
	547234	3847.40	3847.90	3849.27	0.00	1.38	0.00	-1.38
	547248	3837.23	3837.73	3838.75	0.00	1.02	0.00	-1.02
	547252	3832.73	3833.23	3833.61	0.00	0.38	0.00	-0.38
	547275	3816.98	3817.48	3818.57	3816.91	1.09	0.00	-1.09
	547290	3808.59	3809.09	3809.50	0.00	0.41	0.00	-0.41
	547313	3789.30	3789.80	3790.34	3789.17	0.54	0.00	-0.54
	567730	4013.65	4014.15	4015.11	0.00	0.96	0.00	-0.96

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	567735	4004.56	4005.06	4007.59	4005.51	2.52	0.45	-2.07
	567746	3991.87	3992.37	3992.58	0.00	0.22	0.00	-0.22
	567888	3832.35	3832.85	3834.62	3833.27	1.77	0.42	-1.35
	567901	3826.60	3827.10	3827.57	0.00	0.46	0.00	-0.46
	567923	3813.50	3814.00	3815.58	3813.58	1.58	0.00	-1.58
	567924	3811.51	3812.01	3813.01	3811.64	1.00	0.00	-1.00
	567929	3809.65	3810.15	3810.95	3809.44	0.79	0.00	-0.79
	567952	3791.53	3792.03	3792.34	3791.54	0.31	0.00	-0.31
	572795	3834.62	3835.12	3836.26	0.00	1.14	0.00	-1.14
	572822	3812.20	3812.70	3812.90	3811.94	0.20	0.00	-0.20
	572845	3798.22	3798.72	3799.58	0.00	0.86	0.00	-0.86
	572848	3797.73	3798.23	3798.40	0.00	0.18	0.00	-0.18
	594852	3996.66	3997.16	3997.16	0.00	0.00	0.00	0.00
	594858	3990.64	3991.14	3993.15	3991.49	2.01	0.36	-1.66
	594859	3990.81	3991.31	3993.13	3991.60	1.82	0.28	-1.53
	595269	3862.78	3863.28	3864.10	0.00	0.82	0.00	-0.82
	595277	3854.75	3855.25	3856.43	3851.94	1.18	0.00	-1.18
	595363	3835.07	3835.57	3836.10	3834.77	0.53	0.00	-0.53
	595419	3823.57	3824.07	3826.09	3824.64	2.02	0.57	-1.45
	595518	3812.73	3813.23	3813.77	3812.34	0.54	0.00	-0.54
	595607	3791.79	3792.29	3792.62	3791.58	0.33	0.00	-0.33
	598335	3995.97	3996.47	3997.25	3996.02	0.78	0.00	-0.78
	598336	3992.88	3993.38	3993.81	3993.07	0.42	0.00	-0.42
	598440	3869.55	3870.05	3870.81	0.00	0.76	0.00	-0.76
	598489	3833.94	3834.44	3834.92	0.00	0.48	0.00	-0.48
	598505	3823.33	3823.83	3824.74	3823.45	0.91	0.00	-0.91
	598552	3793.06	3793.56	3794.50	3793.09	0.94	0.00	-0.94
	611355	3834.63	3835.13	3836.68	0.00	1.55	0.00	-1.55
	611391	3812.32	3812.82	3813.84	0.00	1.02	0.00	-1.02
	611401	3813.86	3814.36	3815.22	0.00	0.86	0.00	-0.86
	611404	3811.92	3812.42	3813.21	3811.67	0.79	0.00	-0.79
	632431	4000.46	4000.96	4001.97	4000.51	1.01	0.00	-1.01
	632438	3986.11	3986.61	3986.86	0.00	0.25	0.00	-0.25
	632442	3984.33	3984.83	3985.10	0.00	0.27	0.00	-0.27
	632513	3977.94	3978.44	3978.98	0.00	0.54	0.00	-0.54
	633102	3823.53	3824.03	3824.40	3823.35	0.37	0.00	-0.37
	633202	3813.83	3814.33	3814.94	0.00	0.60	0.00	-0.60
	633316	3795.18	3795.68	3796.28	3795.01	0.61	0.00	-0.61
	636733	4013.16	4013.66	4014.85	4013.32	1.19	0.00	-1.19
	636915	3836.95	3837.45	3837.74	0.00	0.29	0.00	-0.29
	636918	3832.99	3833.49	3835.04	0.00	1.55	0.00	-1.55
	636924	3828.46	3828.96	3829.51	3828.54	0.54	0.00	-0.54
	636933	3820.50	3821.00	3821.24	0.00	0.24	0.00	-0.24
	636958	3804.69	3805.19	3805.96	3804.84	0.78	0.00	-0.78
	636980	3795.03	3795.53	3795.87	0.00	0.34	0.00	-0.34
	661842	4000.11	4000.61	4001.00	0.00	0.39	0.00	-0.39
	662069	3874.66	3875.16	3876.11	0.00	0.95	0.00	-0.95
	662166	3837.09	3837.59	3839.51	3837.86	1.92	0.27	-1.66
	662238	3817.02	3817.52	3817.86	0.00	0.35	0.00	-0.35
	662264	3813.42	3813.92	3814.58	3813.49	0.66	0.00	-0.66
	662320	3793.42	3793.92	3794.65	3793.10	0.73	0.00	-0.73
	662339	3788.87	3789.37	3789.99	3788.70	0.62	0.00	-0.62
	662485	4004.69	4005.19	4005.32	0.00	0.13	0.00	-0.13
	662503	3987.56	3988.06	3988.22	0.00	0.16	0.00	-0.16
	662519	3984.67	3985.17	3986.11	0.00	0.94	0.00	-0.94
	662657	3839.51	3840.01	3841.32	3839.94	1.32	0.00	-1.32
	662687	3821.88	3822.38	3823.39	3821.81	1.01	0.00	-1.01
	662693	3821.26	3821.76	3822.20	0.00	0.45	0.00	-0.45
	675301	4001.39	4001.89	4002.62	0.00	0.73	0.00	-0.73
	675302	4002.87	4003.37	4003.77	4002.28	0.40	0.00	-0.40
	675312	3986.63	3987.13	3987.26	0.00	0.13	0.00	-0.13
	4865922	3857.48	3857.98	3858.53	0.00	0.55	0.00	-0.55
	10957	3824.88	3825.38	3826.21	0.00	0.82	0.00	-0.82
	11145	3847.51	3848.01	3849.13	0.00	1.12	0.00	-1.12
	11292	3788.36	3788.86	3789.25	3787.90	0.40	0.00	-0.40
	36355	3818.66	3819.16	3820.45	0.00	1.29	0.00	-1.29
	49177	3861.28	3861.78	3861.92	0.00	0.14	0.00	-0.14
	86524	3855.74	3856.24	3858.74	3856.99	2.50	0.75	-1.75
	86526	3857.35	3857.85	3858.51	0.00	0.66	0.00	-0.66

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Commercial Buildings	86528	3854.17	3854.67	3855.07	0.00	0.40	0.00	-0.40
	86534	3850.23	3850.73	3851.33	0.00	0.60	0.00	-0.60
	86584	3844.79	3845.29	3846.17	0.00	0.88	0.00	-0.88
	87044	3858.23	3858.73	3859.22	0.00	0.49	0.00	-0.49
	87083	3844.11	3844.61	3845.83	0.00	1.22	0.00	-1.22
	87221	3804.45	3804.95	3805.37	3804.03	0.42	0.00	-0.42
	87229	3860.51	3861.01	3862.66	0.00	1.65	0.00	-1.65
	87251	3854.29	3854.79	3855.02	0.00	0.23	0.00	-0.23
	87281	3790.01	3790.51	3790.80	0.00	0.28	0.00	-0.28
	87282	3848.20	3848.70	3849.13	0.00	0.42	0.00	-0.42
	87356	3804.01	3804.51	3805.74	3804.10	1.23	0.00	-1.23
	87386	3792.76	3793.26	3794.42	0.00	1.16	0.00	-1.16
	137058	3814.98	3815.48	3815.80	3814.79	0.32	0.00	-0.32
	138055	3859.52	3860.02	3860.84	0.00	0.82	0.00	-0.82
	138145	3841.67	3842.17	3843.77	0.00	1.60	0.00	-1.60
	138250	3846.21	3846.71	3847.01	0.00	0.30	0.00	-0.30
	138300	3804.20	3804.70	3805.42	3804.22	0.71	0.00	-0.71
	176134	3891.84	3892.34	3894.41	3892.64	2.07	0.29	-1.77
	176189	3864.36	3864.86	3867.25	3864.90	2.39	0.04	-2.35
	176272	3841.56	3842.06	3842.48	0.00	0.42	0.00	-0.42
	176392	3851.24	3851.74	3853.49	0.00	1.76	0.00	-1.76
	176487	3787.98	3788.48	3788.89	3787.89	0.41	0.00	-0.41
	176651	3791.32	3791.82	3792.37	0.00	0.55	0.00	-0.55
	176793	3802.53	3803.03	3803.61	0.00	0.59	0.00	-0.59
	214695	3826.31	3826.81	3827.42	0.00	0.62	0.00	-0.62
	214697	3824.72	3825.22	3825.79	0.00	0.57	0.00	-0.57
	214822	3786.59	3787.09	3787.33	0.00	0.24	0.00	-0.24
	214856	3892.39	3892.89	3894.23	0.00	1.34	0.00	-1.34
	214952	3842.31	3842.81	3843.98	0.00	1.17	0.00	-1.17
	214980	3826.80	3827.30	3827.98	0.00	0.68	0.00	-0.68
	215074	3800.03	3800.53	3800.88	0.00	0.35	0.00	-0.35
	252412	3862.01	3862.51	3863.91	0.00	1.40	0.00	-1.40
	252637	3951.12	3951.62	3952.19	0.00	0.56	0.00	-0.56
	252848	3858.64	3859.14	3859.52	0.00	0.38	0.00	-0.38
	252960	3828.88	3829.38	3830.16	0.00	0.78	0.00	-0.78
	265963	3823.09	3823.59	3824.23	0.00	0.64	0.00	-0.64
	291066	3860.95	3861.45	3861.70	0.00	0.25	0.00	-0.25
	291084	3852.63	3853.13	3853.27	0.00	0.14	0.00	-0.14
	291108	3860.05	3860.55	3860.56	0.00	0.01	0.00	-0.01
	291111	3857.75	3858.25	3859.10	0.00	0.85	0.00	-0.85
	291279	3792.19	3792.69	3792.99	0.00	0.31	0.00	-0.31
	291326	3790.30	3790.80	3790.93	0.00	0.13	0.00	-0.13
	291328	3791.06	3791.56	3792.69	0.00	1.12	0.00	-1.12
	329783	3791.00	3791.50	3791.89	0.00	0.39	0.00	-0.39
	329827	3857.63	3858.13	3859.66	3857.10	1.53	0.00	-1.53
	355243	3952.24	3952.74	3952.97	0.00	0.22	0.00	-0.22
	355392	3849.09	3849.59	3849.68	0.00	0.09	0.00	-0.09
	355471	3842.74	3843.24	3844.08	0.00	0.84	0.00	-0.84
	355582	3791.66	3792.16	3792.61	0.00	0.45	0.00	-0.45
	380500	3787.91	3788.41	3789.27	3787.72	0.86	0.00	-0.86
	380512	3787.92	3788.42	3789.41	3787.75	0.99	0.00	-0.99
	381114	3855.04	3855.54	3856.04	0.00	0.51	0.00	-0.51
	381235	3789.60	3790.10	3791.04	0.00	0.95	0.00	-0.95
	406583	3856.05	3856.55	3857.03	0.00	0.49	0.00	-0.49
	406859	3870.89	3871.39	3871.85	0.00	0.45	0.00	-0.45
	407043	3788.91	3789.41	3789.55	3788.10	0.14	0.00	-0.14
	432288	3852.73	3853.23	3854.10	0.00	0.87	0.00	-0.87
	432535	3857.12	3857.62	3857.63	0.00	0.01	0.00	-0.01
	432613	3824.98	3825.48	3826.03	0.00	0.55	0.00	-0.55
	457696	3845.10	3845.60	3846.21	0.00	0.62	0.00	-0.62
	457753	3829.14	3829.64	3830.89	0.00	1.25	0.00	-1.25
	458016	3845.65	3846.15	3847.05	0.00	0.90	0.00	-0.90
	458022	3840.91	3841.41	3842.10	0.00	0.69	0.00	-0.69
	483440	3791.50	3792.00	3792.92	0.00	0.92	0.00	-0.92
	483613	3851.19	3851.69	3851.76	0.00	0.07	0.00	-0.07
	496300	3846.94	3847.44	3847.68	0.00	0.25	0.00	-0.25
	496326	3828.22	3828.72	3829.26	0.00	0.54	0.00	-0.54
	496393	3790.29	3790.79	3790.82	0.00	0.03	0.00	-0.03
	521786	3824.81	3825.31	3825.73	0.00	0.42	0.00	-0.42

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	534381	3858.00	3858.50	3859.01	0.00	0.51	0.00	-0.51
	547120	3969.33	3969.83	3969.90	0.00	0.07	0.00	-0.07
	547222	3852.03	3852.53	3853.06	0.00	0.53	0.00	-0.53
	567868	3851.54	3852.04	3852.84	0.00	0.80	0.00	-0.80
	595354	3844.07	3844.57	3845.26	0.00	0.69	0.00	-0.69
	598472	3848.02	3848.52	3849.17	0.00	0.65	0.00	-0.65
	611305	3865.27	3865.77	3867.24	0.00	1.47	0.00	-1.47
	611317	3858.02	3858.52	3860.82	0.00	2.30	0.00	-2.30
	611335	3849.39	3849.89	3851.53	0.00	1.65	0.00	-1.65
	611350	3840.59	3841.09	3842.32	0.00	1.23	0.00	-1.23
	636884	3853.82	3854.32	3855.50	0.00	1.18	0.00	-1.18
	675331	3961.69	3962.19	3962.49	0.00	0.30	0.00	-0.30
	677385	3946.65	3947.15	3947.59	3946.34	0.44	0.00	-0.44
	678091	3790.93	3791.43	3792.89	0.00	1.47	0.00	-1.47
	678092	3796.53	3797.03	3797.75	3796.08	0.72	0.00	-0.72
	678093	3785.80	3786.30	3788.00	3785.61	1.70	0.00	-1.70
	4865923	3853.91	3854.41	3855.55	3854.27	1.15	0.00	-1.15
	10554	4013.43	4013.93	4015.52	4012.46	1.59	0.00	-1.59
	10595	4002.14	4002.64	4004.64	0.00	2.01	0.00	-2.01
	10597	3998.07	3998.57	3998.96	0.00	0.39	0.00	-0.39
	10599	3998.64	3999.14	4001.00	3999.25	1.86	0.11	-1.75
	10858	4010.41	4010.91	4011.70	4010.54	0.78	0.00	-0.78
	10873	3998.02	3998.52	4001.62	3999.34	3.10	0.82	-2.28
	10920	3986.04	3986.54	3987.03	0.00	0.50	0.00	-0.50
	11040	3795.48	3795.98	3796.14	0.00	0.16	0.00	-0.16
	11122	3865.46	3865.96	3867.33	3864.69	1.37	0.00	-1.37
	11218	3822.90	3823.40	3823.70	3822.17	0.30	0.00	-0.30
	11260	3805.97	3806.47	3806.86	0.00	0.39	0.00	-0.39
	11264	3797.89	3798.39	3799.61	3798.30	1.22	0.00	-1.22
	11277	3791.11	3791.61	3792.52	3791.15	0.91	0.00	-0.91
	36251	3868.15	3868.65	3870.63	3868.70	1.98	0.05	-1.93
	36253	3863.01	3863.51	3864.62	0.00	1.11	0.00	-1.11
	36273	3849.81	3850.31	3852.32	3850.98	2.00	0.66	-1.34
	36344	3817.34	3817.84	3819.79	0.00	1.95	0.00	-1.95
	36364	3815.55	3816.05	3817.68	3816.16	1.64	0.11	-1.53
	36365	3815.93	3816.43	3816.47	3815.63	0.04	0.00	-0.04
	36421	3996.29	3996.79	3997.35	0.00	0.56	0.00	-0.56
	36667	3826.18	3826.68	3827.86	3826.68	1.18	0.00	-1.18
	36693	3811.05	3811.55	3812.90	3810.97	1.36	0.00	-1.36
	49067	4005.33	4005.83	4009.52	4006.95	3.69	1.12	-2.57
	49072	4000.62	4001.12	4004.26	4002.13	3.14	1.02	-2.13
	49080	3989.81	3990.31	3992.35	0.00	2.04	0.00	-2.04
	49100	3970.68	3971.18	3971.30	0.00	0.11	0.00	-0.11
	49210	3843.64	3844.14	3846.22	3844.25	2.08	0.11	-1.96
	49231	3833.38	3833.88	3834.84	3833.86	0.96	0.00	-0.96
	49242	3825.95	3826.45	3827.20	3826.25	0.75	0.00	-0.75
	49243	3826.70	3827.20	3828.51	3826.80	1.31	0.00	-1.31
	49262	3810.26	3810.76	3811.67	3810.52	0.91	0.00	-0.91
	49266	3815.11	3815.61	3816.57	3815.30	0.96	0.00	-0.96
	49280	3808.68	3809.18	3810.79	3809.32	1.61	0.14	-1.46
	49304	3793.42	3793.92	3794.83	3793.79	0.91	0.00	-0.91
	86183	3998.39	3998.89	4001.22	3998.99	2.32	0.09	-2.23
	86186	3993.02	3993.52	3996.53	3994.10	3.01	0.58	-2.43
	86194	3981.12	3981.62	3982.62	3981.32	1.00	0.00	-1.00
	86249	3964.69	3965.19	3965.46	0.00	0.26	0.00	-0.26
	86592	3837.60	3838.10	3839.03	0.00	0.93	0.00	-0.93
	86594	3836.42	3836.92	3838.38	3836.87	1.46	0.00	-1.46
	86650	3821.93	3822.43	3823.76	3822.79	1.33	0.36	-0.97
	86660	3819.42	3819.92	3821.47	3819.97	1.55	0.05	-1.50
	86747	3795.19	3795.69	3797.05	3795.13	1.35	0.00	-1.35
	86793	3792.68	3793.18	3793.44	0.00	0.26	0.00	-0.26
	86892	3998.16	3998.66	4000.45	0.00	1.79	0.00	-1.79
	86894	3992.71	3993.21	3994.31	0.00	1.10	0.00	-1.10
	86922	3987.60	3988.10	3989.08	3987.98	0.98	0.00	-0.98
	86923	3987.51	3988.01	3990.21	3988.66	2.20	0.66	-1.55
	86924	3982.41	3982.91	3983.27	0.00	0.35	0.00	-0.35
	87025	3873.46	3873.96	3874.80	0.00	0.83	0.00	-0.83
	87090	3841.24	3841.74	3842.92	3841.86	1.18	0.13	-1.06
	87123	3837.61	3838.11	3838.83	3837.32	0.72	0.00	-0.72

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	87137	3827.56	3828.06	3828.59	0.00	0.52	0.00	-0.52
	87212	3811.88	3812.38	3813.08	3811.93	0.70	0.00	-0.70
	87355	3813.42	3813.92	3814.25	0.00	0.33	0.00	-0.33
	87369	3800.68	3801.18	3801.72	3801.06	0.54	0.00	-0.54
	136399	4012.52	4013.02	4013.48	0.00	0.45	0.00	-0.45
	136975	3833.73	3834.23	3835.74	3834.45	1.51	0.21	-1.30
	137042	3827.47	3827.97	3828.60	3827.68	0.64	0.00	-0.64
	137045	3832.97	3833.47	3833.85	3832.92	0.38	0.00	-0.38
	137049	3824.12	3824.62	3825.74	3824.83	1.13	0.21	-0.92
	137059	3818.64	3819.14	3820.22	3818.59	1.09	0.00	-1.09
	137225	3797.90	3798.40	3799.27	3797.82	0.86	0.00	-0.86
	137627	4013.62	4014.12	4016.08	4013.71	1.97	0.00	-1.97
	137643	3997.45	3997.95	3998.81	0.00	0.86	0.00	-0.86
	137708	3995.69	3996.19	3996.26	0.00	0.08	0.00	-0.08
	137767	4006.89	4007.39	4007.54	0.00	0.16	0.00	-0.16
	137772	3995.82	3996.32	3998.71	3997.27	2.39	0.95	-1.44
	137806	3999.27	3999.77	4002.89	4000.71	3.12	0.94	-2.18
	137813	3986.63	3987.13	3987.32	0.00	0.19	0.00	-0.19
	137819	3991.38	3991.88	3992.71	0.00	0.84	0.00	-0.84
	138047	3867.35	3867.85	3868.13	0.00	0.28	0.00	-0.28
	138124	3852.07	3852.57	3855.37	3852.91	2.80	0.34	-2.46
	138141	3836.68	3837.18	3839.44	3837.55	2.26	0.37	-1.89
	138360	3789.90	3790.40	3792.25	3790.48	1.84	0.08	-1.76
	138389	3801.26	3801.76	3802.32	0.00	0.56	0.00	-0.56
	138410	3807.39	3807.89	3809.39	3807.74	1.49	0.00	-1.49
	138459	3789.79	3790.29	3791.46	3789.76	1.18	0.00	-1.18
	175802	4013.04	4013.54	4017.25	4014.75	3.71	1.21	-2.50
	175918	3992.27	3992.77	3994.80	3993.08	2.03	0.31	-1.73
	175963	4032.02	4032.52	4032.61	0.00	0.09	0.00	-0.09
	175980	4003.92	4004.42	4004.60	0.00	0.18	0.00	-0.18
	176038	3994.94	3995.44	3997.09	3995.79	1.65	0.35	-1.30
	176220	4013.50	4014.00	4014.62	0.00	0.62	0.00	-0.62
	176280	3837.51	3838.01	3838.49	0.00	0.48	0.00	-0.48
	176283	4000.63	4001.13	4001.62	0.00	0.49	0.00	-0.49
	176284	4002.43	4002.93	4003.15	0.00	0.22	0.00	-0.22
	176288	3998.50	3999.00	4001.70	3999.72	2.70	0.72	-1.98
	176294	3996.32	3996.82	3996.97	0.00	0.14	0.00	-0.14
	176325	3873.68	3874.18	3876.45	0.00	2.27	0.00	-2.27
	176349	3826.68	3827.18	3827.93	0.00	0.75	0.00	-0.75
	176407	3841.15	3841.65	3843.71	3841.88	2.06	0.23	-1.83
	176416	3813.91	3814.41	3815.16	3813.82	0.75	0.00	-0.75
	176462	3831.00	3831.50	3833.85	0.00	2.35	0.00	-2.35
	176516	3819.53	3820.03	3821.21	3820.12	1.19	0.09	-1.09
	176585	3808.84	3809.34	3810.49	3809.20	1.15	0.00	-1.15
	176655	3777.85	3778.35	3778.83	0.00	0.48	0.00	-0.48
	176684	3842.51	3843.01	3844.01	3843.12	1.00	0.11	-0.89
	176692	3836.26	3836.76	3838.99	3837.02	2.23	0.26	-1.98
	176755	3816.23	3816.73	3817.65	3815.72	0.92	0.00	-0.92
	176794	3805.59	3806.09	3806.90	3805.37	0.81	0.00	-0.81
	213974	4013.05	4013.55	4016.62	4014.39	3.07	0.84	-2.23
	213977	4009.83	4010.33	4011.14	4009.82	0.81	0.00	-0.81
	214021	3998.54	3999.04	4000.21	3998.64	1.17	0.00	-1.17
	214026	3990.16	3990.66	3992.92	3990.91	2.26	0.26	-2.00
	214119	4013.92	4014.42	4015.64	0.00	1.22	0.00	-1.22
	214120	4015.84	4016.34	4018.19	0.00	1.84	0.00	-1.84
	214122	4010.51	4011.01	4012.04	0.00	1.03	0.00	-1.03
	214132	3942.77	3943.27	3943.55	0.00	0.29	0.00	-0.29
	214167	4007.30	4007.80	4011.51	4008.60	3.71	0.80	-2.91
	214175	3994.10	3994.60	3995.67	3994.19	1.07	0.00	-1.07
	214180	3990.40	3990.90	3991.42	0.00	0.52	0.00	-0.52
	214331	3871.34	3871.84	3872.98	0.00	1.14	0.00	-1.14
	214343	3868.99	3869.49	3871.59	3869.78	2.10	0.29	-1.81
	214428	3836.32	3836.82	3838.96	3837.10	2.14	0.29	-1.85
	214442	4041.82	4042.32	4044.40	0.00	2.07	0.00	-2.07
	214501	3815.16	3815.66	3816.15	3815.83	0.49	0.17	-0.33
	214506	3822.23	3822.73	3823.69	3822.07	0.95	0.00	-0.95
	214514	4014.32	4014.82	4015.13	0.00	0.31	0.00	-0.31
	214516	4008.78	4009.28	4010.58	0.00	1.30	0.00	-1.30
	214569	3819.19	3819.69	3821.18	3819.51	1.50	0.00	-1.50

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	214599	3988.42	3988.92	3989.30	3987.99	0.38	0.00	-0.38
	214624	3837.73	3838.23	3838.58	3837.85	0.35	0.00	-0.35
	214654	3795.29	3795.79	3796.93	3795.30	1.14	0.00	-1.14
	214664	3792.92	3793.42	3794.62	3793.20	1.20	0.00	-1.20
	214666	3790.87	3791.37	3791.92	3790.78	0.55	0.00	-0.55
	215088	3792.72	3793.22	3794.10	0.00	0.88	0.00	-0.88
	251982	4022.24	4022.74	4023.06	0.00	0.31	0.00	-0.31
	252036	3996.10	3996.60	3998.09	3996.71	1.49	0.11	-1.38
	252047	3987.01	3987.51	3988.53	0.00	1.02	0.00	-1.02
	252103	3979.52	3980.02	3981.58	3979.90	1.56	0.00	-1.56
	252111	3973.26	3973.76	3974.60	0.00	0.84	0.00	-0.84
	252482	3843.41	3843.91	3845.67	3843.27	1.75	0.00	-1.75
	252483	3832.18	3832.68	3833.30	0.00	0.62	0.00	-0.62
	252486	3829.34	3829.84	3829.87	0.00	0.03	0.00	-0.03
	252512	4015.12	4015.62	4016.05	0.00	0.43	0.00	-0.43
	252539	3837.20	3837.70	3839.27	3837.34	1.58	0.00	-1.58
	252543	3833.28	3833.78	3835.15	3833.30	1.37	0.00	-1.37
	252548	3826.84	3827.34	3828.45	3827.19	1.11	0.00	-1.11
	252569	3995.47	3995.97	3997.40	0.00	1.43	0.00	-1.43
	252574	3993.55	3994.05	3995.49	3993.71	1.44	0.00	-1.44
	252620	3807.40	3807.90	3808.52	3807.36	0.62	0.00	-0.62
	252758	3989.60	3990.10	3992.50	3990.88	2.40	0.78	-1.62
	252763	3982.59	3983.09	3984.38	3983.00	1.29	0.00	-1.29
	252791	3875.11	3875.61	3876.27	0.00	0.66	0.00	-0.66
	252873	3923.96	3924.46	3924.57	0.00	0.11	0.00	-0.11
	252895	3847.78	3848.28	3849.69	3848.01	1.41	0.00	-1.41
	253023	3811.05	3811.55	3812.91	3810.97	1.36	0.00	-1.36
	253035	3804.90	3805.40	3805.88	3804.74	0.48	0.00	-0.48
	253060	3865.56	3866.06	3867.19	3865.24	1.13	0.00	-1.13
	253119	3843.51	3844.01	3846.07	3845.01	2.06	1.00	-1.05
	253189	3811.52	3812.02	3813.24	3811.76	1.22	0.00	-1.22
	253191	3811.45	3811.95	3812.12	0.00	0.17	0.00	-0.17
	253242	3788.23	3788.73	3790.28	3788.57	1.54	0.00	-1.54
	265772	4012.28	4012.78	4014.57	4012.23	1.79	0.00	-1.79
	265777	4012.51	4013.01	4014.37	4012.88	1.36	0.00	-1.36
	265787	3998.05	3998.55	4001.36	3998.87	2.81	0.32	-2.49
	265789	3993.50	3994.00	3996.81	3994.86	2.81	0.86	-1.95
	265790	3989.84	3990.34	3991.19	0.00	0.85	0.00	-0.85
	265968	3817.86	3818.36	3819.56	3818.28	1.19	0.00	-1.19
	265983	3810.68	3811.18	3811.86	0.00	0.68	0.00	-0.68
	265994	3803.52	3804.02	3804.59	0.00	0.57	0.00	-0.57
	265995	3799.70	3800.20	3801.37	3800.04	1.17	0.00	-1.17
	266006	3794.03	3794.53	3795.59	3793.92	1.06	0.00	-1.06
	290801	4022.94	4023.44	4024.81	0.00	1.37	0.00	-1.37
	290836	4010.46	4010.96	4013.05	4010.84	2.10	0.00	-2.10
	290838	4006.33	4006.83	4009.63	4007.29	2.80	0.46	-2.34
	290863	4010.88	4011.38	4013.93	4011.94	2.56	0.56	-2.00
	290870	4005.66	4006.16	4008.86	4006.34	2.70	0.18	-2.52
	290877	3982.95	3983.45	3984.36	3983.00	0.90	0.00	-0.90
	291039	3865.83	3866.33	3869.09	3866.45	2.77	0.12	-2.65
	291056	3868.52	3869.02	3869.66	0.00	0.64	0.00	-0.64
	291098	3842.73	3843.23	3844.39	0.00	1.15	0.00	-1.15
	291126	3846.73	3847.23	3849.89	3847.54	2.66	0.31	-2.35
	291199	3825.06	3825.56	3826.45	3825.27	0.89	0.00	-0.89
	291231	3804.44	3804.94	3806.18	3804.99	1.24	0.05	-1.19
	291241	3820.45	3820.95	3822.12	3820.86	1.18	0.00	-1.18
	291244	3818.80	3819.30	3820.35	3818.98	1.05	0.00	-1.05
	291301	3796.49	3796.99	3797.74	3797.10	0.74	0.11	-0.64
	291305	3796.52	3797.02	3797.58	3796.19	0.56	0.00	-0.56
	291310	3797.28	3797.78	3798.14	0.00	0.35	0.00	-0.35
	304082	4007.29	4007.79	4009.76	4007.82	1.97	0.03	-1.94
	304091	3997.18	3997.68	4000.73	3998.68	3.06	1.00	-2.05
	304095	3988.63	3989.13	3990.66	0.00	1.53	0.00	-1.53
	304206	3867.94	3868.44	3869.17	0.00	0.73	0.00	-0.73
	304263	3821.94	3822.44	3823.25	3822.41	0.81	0.00	-0.81
	304302	*3800.42*	*3800.92*	*3802.13*	*3800.80*	*1.21*	*0.00*	*-1.21*
	304316	3793.53	3794.03	3794.70	3793.55	0.68	0.00	-0.68
	329295	4026.61	4027.11	4028.39	0.00	1.28	0.00	-1.28
0.2% Annual	329329	4012.62	4013.12	4014.73	0.00	1.61	0.00	-1.61

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
Chance Residences	329532	4032.34	4032.84	4036.35	0.00	3.51	0.00	-3.51
	329696	3821.80	3822.30	3822.44	3821.93	0.13	0.00	-0.13
	329715	3812.31	3812.81	3813.91	3812.65	1.11	0.00	-1.11
	329842	3853.87	3854.37	3855.26	3854.42	0.89	0.05	-0.84
	329850	3844.88	3845.38	3846.82	0.00	1.44	0.00	-1.44
	329874	3838.49	3838.99	3840.08	3838.75	1.09	0.00	-1.09
	329875	3836.06	3836.56	3838.21	3837.15	1.65	0.59	-1.05
	329883	3834.11	3834.61	3834.92	0.00	0.31	0.00	-0.31
	329921	3815.90	3816.40	3817.17	3815.96	0.77	0.00	-0.77
	329924	3815.66	3816.16	3816.65	3815.71	0.49	0.00	-0.49
	329973	3790.10	3790.60	3791.52	3790.18	0.92	0.00	-0.92
	329980	3788.19	3788.69	3789.77	3788.23	1.08	0.00	-1.08
	355050	4050.18	4050.68	4050.91	0.00	0.23	0.00	-0.23
	355132	3995.37	3995.87	3996.03	0.00	0.17	0.00	-0.17
	355161	3990.26	3990.76	3991.73	0.00	0.98	0.00	-0.98
	355198	3982.73	3983.23	3983.57	0.00	0.34	0.00	-0.34
	355199	3981.39	3981.89	3983.81	3981.61	1.92	0.00	-1.92
	355201	3980.20	3980.70	3982.76	3981.05	2.06	0.35	-1.72
	355312	3878.51	3879.01	3879.57	0.00	0.56	0.00	-0.56
	355378	3870.14	3870.64	3872.91	0.00	2.27	0.00	-2.27
	355525	3810.66	3811.16	3812.90	3810.96	1.74	0.00	-1.74
	355541	3824.61	3825.11	3826.36	3825.11	1.24	0.00	-1.24
	355549	3819.80	3820.30	3820.80	3820.23	0.50	0.00	-0.50
	355592	3805.95	3806.45	3808.54	3806.60	2.09	0.16	-1.93
	355597	3804.52	3805.02	3805.24	3804.44	0.22	0.00	-0.22
	380069	4002.05	4002.55	4005.88	4003.62	3.33	1.07	-2.26
	380337	3871.90	3872.40	3874.68	0.00	2.28	0.00	-2.28
	380369	3851.73	3852.23	3855.02	3853.09	2.79	0.86	-1.93
	380378	3839.44	3839.94	3842.81	3840.82	2.87	0.89	-1.99
	380460	3804.30	3804.80	3805.75	3804.11	0.94	0.00	-0.94
	380492	3793.37	3793.87	3795.17	3793.63	1.31	0.00	-1.31
	380973	4006.97	4007.47	4007.63	0.00	0.16	0.00	-0.16
	380983	4003.58	4004.08	4005.54	4003.33	1.46	0.00	-1.46
	381143	3833.83	3834.33	3836.50	3834.66	2.17	0.33	-1.83
	381173	3815.87	3816.37	3818.91	3817.09	2.54	0.71	-1.83
	381188	3808.36	3808.86	3810.29	3808.77	1.43	0.00	-1.43
	406352	3999.85	4000.35	4000.81	0.00	0.47	0.00	-0.47
	406574	3866.40	3866.90	3867.26	0.00	0.37	0.00	-0.37
	406591	3844.04	3844.54	3845.11	0.00	0.57	0.00	-0.57
	406610	4004.11	4004.61	4005.65	4003.93	1.04	0.00	-1.04
	406631	3830.25	3830.75	3830.87	0.00	0.12	0.00	-0.12
	406645	3836.26	3836.76	3837.11	0.00	0.34	0.00	-0.34
	406653	3825.94	3826.44	3827.84	3826.64	1.40	0.20	-1.20
	406710	3818.94	3819.44	3820.72	3819.53	1.27	0.09	-1.18
	406721	3812.11	3812.61	3814.28	3812.95	1.68	0.35	-1.33
	406747	3808.17	3808.67	3809.84	3808.21	1.18	0.00	-1.18
	406761	3801.51	3802.01	3802.91	3801.35	0.89	0.00	-0.89
	406913	3840.65	3841.15	3841.98	3840.73	0.83	0.00	-0.83
	406947	3839.23	3839.73	3841.26	3840.01	1.53	0.28	-1.25
	407012	3808.61	3809.11	3809.74	0.00	0.63	0.00	-0.63
	407038	3791.83	3792.33	3792.74	3791.76	0.41	0.00	-0.41
	432052	3991.01	3991.51	3992.33	3990.62	0.83	0.00	-0.83
	432276	4007.52	4008.02	4008.06	4005.49	0.05	0.00	-0.05
	432312	3999.48	3999.98	4001.46	3999.57	1.48	0.00	-1.48
	432314	3993.81	3994.31	3998.53	3996.21	4.22	1.90	-2.32
	432332	3835.59	3836.09	3836.37	3835.87	0.28	0.00	-0.28
	432351	3823.66	3824.16	3826.16	3824.96	2.00	0.79	-1.21
	432375	3954.48	3954.98	3955.51	0.00	0.53	0.00	-0.53
	432385	3823.44	3823.94	3825.54	3823.42	1.60	0.00	-1.60
	432455	3800.76	3801.26	3801.54	3800.23	0.28	0.00	-0.28
	432515	3871.55	3872.05	3873.49	0.00	1.44	0.00	-1.44
	432519	3865.01	3865.51	3866.77	0.00	1.25	0.00	-1.25
	432534	3857.26	3857.76	3858.03	0.00	0.27	0.00	-0.27
	432654	3813.88	3814.38	3816.01	3814.07	1.63	0.00	-1.63
	432711	3791.02	3791.52	3791.80	0.00	0.28	0.00	-0.28
	457431	3997.07	3997.57	4000.43	3998.14	2.86	0.57	-2.30
	457819	3988.86	3989.36	3989.94	0.00	0.58	0.00	-0.58
	457820	3985.74	3986.24	3987.43	3985.30	1.20	0.00	-1.20
	457840	3803.24	3803.74	3805.15	0.00	1.41	0.00	-1.41

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	457842	3796.73	3797.23	3797.97	3796.59	0.74	0.00	-0.74
	483065	3993.98	3994.48	3996.30	3994.69	1.83	0.22	-1.61
	483106	3956.39	3956.89	3956.93	0.00	0.04	0.00	-0.04
	483287	3847.46	3847.96	3851.62	3849.76	3.66	1.80	-1.86
	483381	3820.47	3820.97	3822.10	3820.77	1.13	0.00	-1.13
	483387	3815.46	3815.96	3817.15	3815.94	1.19	0.00	-1.19
	483392	3815.48	3815.98	3816.72	3815.54	0.74	0.00	-0.74
	483397	3998.60	3999.10	4000.81	3998.87	1.71	0.00	-1.71
	483398	3994.77	3995.27	3996.10	3995.04	0.83	0.00	-0.83
	483429	3801.44	3801.94	3802.19	0.00	0.25	0.00	-0.25
	483439	3793.93	3794.43	3794.53	3793.90	0.10	0.00	-0.10
	483467	3947.85	3948.35	3948.50	0.00	0.15	0.00	-0.15
	483485	3779.75	3780.25	3781.42	0.00	1.17	0.00	-1.17
	483643	3827.14	3827.64	3829.01	3827.73	1.37	0.09	-1.28
	483713	3797.44	3797.94	3798.26	0.00	0.32	0.00	-0.32
	496175	4007.71	4008.21	4010.65	4008.81	2.43	0.59	-1.84
	496176	4006.03	4006.53	4008.47	4005.85	1.94	0.00	-1.94
	496185	4003.06	4003.56	4003.62	0.00	0.06	0.00	-0.06
	496186	3995.05	3995.55	3997.68	3995.94	2.13	0.39	-1.74
	496276	3868.67	3869.17	3870.23	3868.33	1.06	0.00	-1.06
	496304	3832.18	3832.68	3832.74	0.00	0.06	0.00	-0.06
	496317	3832.00	3832.50	3833.33	3831.88	0.83	0.00	-0.83
	496327	3826.78	3827.28	3828.30	3826.79	1.03	0.00	-1.03
	496339	3818.86	3819.36	3820.27	3819.26	0.91	0.00	-0.91
	496348	3811.53	3812.03	3812.88	3811.66	0.84	0.00	-0.84
	496389	3793.14	3793.64	3794.05	3793.10	0.41	0.00	-0.41
	509026	3982.99	3983.49	3983.58	0.00	0.09	0.00	-0.09
	509048	3956.18	3956.68	3956.81	0.00	0.13	0.00	-0.13
	509204	3818.05	3818.55	3819.08	3817.73	0.53	0.00	-0.53
	509220	3808.63	3809.13	3809.88	3808.79	0.75	0.00	-0.75
	509228	3799.72	3800.22	3801.13	3800.00	0.90	0.00	-0.90
	509229	3803.09	3803.59	3805.16	3803.13	1.57	0.00	-1.57
	509233	3797.56	3798.06	3798.93	3797.46	0.87	0.00	-0.87
	521634	4010.56	4011.06	4011.57	0.00	0.51	0.00	-0.51
	521775	3825.62	3826.12	3827.37	3826.30	1.24	0.18	-1.07
	521822	3795.85	3796.35	3797.51	3796.17	1.16	0.00	-1.16
	534260	4006.50	4007.00	4008.31	0.00	1.31	0.00	-1.31
	534273	3993.66	3994.16	3995.75	3994.14	1.60	0.00	-1.60
	534277	3992.44	3992.94	3994.41	3993.09	1.47	0.15	-1.32
	534366	3872.80	3873.30	3875.66	0.00	2.36	0.00	-2.36
	534467	3802.81	3803.31	3804.93	3803.41	1.62	0.10	-1.52
	534468	3801.41	3801.91	3803.38	3801.42	1.48	0.00	-1.48
	534498	3783.39	3783.89	3784.31	0.00	0.43	0.00	-0.43
	547212	3853.16	3853.66	3855.49	3852.94	1.83	0.00	-1.83
	547231	3849.33	3849.83	3850.80	3849.94	0.97	0.11	-0.86
	547234	3847.40	3847.90	3849.64	3848.31	1.74	0.41	-1.33
	547248	3837.23	3837.73	3839.20	3837.57	1.47	0.00	-1.47
	547252	3832.73	3833.23	3834.09	3832.88	0.87	0.00	-0.87
	547275	3816.98	3817.48	3819.06	3817.49	1.57	0.00	-1.57
	547290	3808.59	3809.09	3809.57	3808.55	0.48	0.00	-0.48
	547313	3789.30	3789.80	3790.73	3789.57	0.93	0.00	-0.93
	567730	4013.65	4014.15	4016.02	0.00	1.87	0.00	-1.87
	567735	4004.56	4005.06	4008.42	4005.91	3.36	0.85	-2.51
	567746	3991.87	3992.37	3993.27	0.00	0.90	0.00	-0.90
	567888	3832.35	3832.85	3835.45	3833.51	2.59	0.65	-1.94
	567901	3826.60	3827.10	3827.97	3826.67	0.87	0.00	-0.87
	567923	3813.50	3814.00	3816.01	3814.04	2.01	0.04	-1.97
	567924	3811.51	3812.01	3813.37	3812.17	1.37	0.16	-1.20
	567929	3809.65	3810.15	3811.44	3809.79	1.29	0.00	-1.29
	567952	3791.53	3792.03	3792.61	3791.82	0.58	0.00	-0.58
	572795	3834.62	3835.12	3836.54	3835.25	1.42	0.12	-1.29
	572816	3816.38	3816.88	3816.96	3815.89	0.07	0.00	-0.07
	572822	3812.20	3812.70	3813.46	3812.13	0.77	0.00	-0.77
	572845	3798.22	3798.72	3800.31	3798.16	1.59	0.00	-1.59
	572848	3797.73	3798.23	3798.70	3797.61	0.48	0.00	-0.48
	594852	3996.66	3997.16	3998.32	0.00	1.16	0.00	-1.16
	594858	3990.64	3991.14	3993.75	3991.81	2.62	0.67	-1.94
	594859	3990.81	3991.31	3993.81	3991.88	2.50	0.57	-1.93
	595269	3862.78	3863.28	3864.60	3862.86	1.32	0.00	-1.32

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	595277	3854.75	3855.25	3857.39	3855.41	2.14	0.16	-1.98
	595363	3835.07	3835.57	3836.44	3835.23	0.87	0.00	-0.87
	595419	3823.57	3824.07	3826.58	3825.21	2.51	1.14	-1.37
	595518	3812.73	3813.23	3814.15	3812.94	0.92	0.00	-0.92
	595606	3794.02	3794.52	3794.58	3793.79	0.06	0.00	-0.06
	595607	3791.79	3792.29	3793.03	3791.77	0.75	0.00	-0.75
	598326	4005.84	4006.34	4007.13	4005.04	0.78	0.00	-0.78
	598335	3995.97	3996.47	3997.93	3996.10	1.46	0.00	-1.46
	598336	3992.88	3993.38	3994.41	3993.18	1.03	0.00	-1.03
	598440	3869.55	3870.05	3871.41	0.00	1.36	0.00	-1.36
	598489	3833.94	3834.44	3835.36	0.00	0.92	0.00	-0.92
	598505	3823.33	3823.83	3825.27	3823.84	1.44	0.01	-1.43
	598521	3816.30	3816.80	3817.04	3815.98	0.24	0.00	-0.24
	598552	3793.06	3793.56	3795.01	3793.50	1.46	0.00	-1.46
	611355	3834.63	3835.13	3836.93	3835.35	1.80	0.22	-1.58
	611391	3812.32	3812.82	3814.34	3812.65	1.52	0.00	-1.52
	611401	3813.86	3814.36	3815.70	3813.86	1.34	0.00	-1.34
	611404	3811.92	3812.42	3813.81	3812.09	1.40	0.00	-1.40
	632431	4000.46	4000.96	4002.98	4000.68	2.02	0.00	-2.02
	632438	3986.11	3986.61	3987.29	3985.91	0.68	0.00	-0.68
	632442	3984.33	3984.83	3985.85	0.00	1.01	0.00	-1.01
	632513	3977.94	3978.44	3979.70	3977.94	1.26	0.00	-1.26
	633102	3823.53	3824.03	3824.94	3823.57	0.91	0.00	-0.91
	633202	3813.83	3814.33	3815.60	3813.89	1.27	0.00	-1.27
	633316	3795.18	3795.68	3796.78	3795.33	1.10	0.00	-1.10
	636733	4013.16	4013.66	4015.58	4013.59	1.92	0.00	-1.92
	636915	3836.95	3837.45	3838.21	0.00	0.76	0.00	-0.76
	636918	3832.99	3833.49	3835.55	3833.17	2.06	0.00	-2.06
	636924	3828.46	3828.96	3829.84	3828.75	0.88	0.00	-0.88
	636933	3820.50	3821.00	3821.63	3820.46	0.63	0.00	-0.63
	636958	3804.69	3805.19	3806.35	3805.18	1.16	0.00	-1.16
	636967	3800.55	3801.05	3801.17	3800.59	0.11	0.00	-0.11
	636980	3795.03	3795.53	3796.24	3794.96	0.70	0.00	-0.70
	661841	3998.37	3998.87	3999.60	0.00	0.73	0.00	-0.73
	661842	4000.11	4000.61	4001.67	3999.91	1.07	0.00	-1.07
	661846	3999.83	4000.33	4000.35	0.00	0.02	0.00	-0.02
	662064	3876.20	3876.70	3877.64	0.00	0.94	0.00	-0.94
	662069	3874.66	3875.16	3876.68	0.00	1.52	0.00	-1.52
	662166	3837.09	3837.59	3840.44	3838.28	2.85	0.69	-2.16
	662238	3817.02	3817.52	3818.30	3817.20	0.78	0.00	-0.78
	662264	3813.42	3813.92	3814.96	3813.84	1.04	0.00	-1.04
	662320	3793.42	3793.92	3795.10	3793.51	1.18	0.00	-1.18
	662339	3788.87	3789.37	3790.67	3788.89	1.30	0.00	-1.30
	662485	4004.69	4005.19	4005.64	0.00	0.45	0.00	-0.45
	662503	3987.56	3988.06	3988.73	0.00	0.68	0.00	-0.68
	662519	3984.67	3985.17	3986.79	3984.83	1.63	0.00	-1.63
	662657	3839.51	3840.01	3842.19	3840.13	2.18	0.13	-2.06
	662687	3821.88	3822.38	3823.98	3822.20	1.60	0.00	-1.60
	662693	3821.26	3821.76	3822.45	3821.26	0.70	0.00	-0.70
	675301	4001.39	4001.89	4003.56	0.00	1.66	0.00	-1.66
	675302	4002.87	4003.37	4004.44	4002.76	1.08	0.00	-1.08
	675312	3986.63	3987.13	3987.50	0.00	0.37	0.00	-0.37
	4865922	3857.48	3857.98	3858.84	3858.01	0.87	0.03	-0.84
	10957	3824.88	3825.38	3,826.47	3824.97	1.09	0.00	-1.09
	11145	3847.51	3848.01	3,849.69	3847.66	1.68	0.00	-1.68
	11292	3788.36	3788.86	3,789.81	3788.29	0.95	0.00	-0.95
	36355	3818.66	3819.16	3,820.67	3819.42	1.51	0.26	-1.25
	49114	3951.16	3951.66	3,952.04	0.00	0.38	0.00	-0.38
	49177	3861.28	3861.78	3,862.38	0.00	0.59	0.00	-0.59
	86524	3855.74	3856.24	3,859.44	3857.66	3.20	1.42	-1.78
	86526	3857.35	3857.85	3,858.75	3857.31	0.90	0.00	-0.90
	86528	3854.17	3854.67	3,855.40	3853.81	0.73	0.00	-0.73
	86531	3852.26	3852.76	3,852.78	0.00	0.02	0.00	-0.02
	86534	3850.23	3850.73	3,851.53	0.00	0.81	0.00	-0.81
	86584	3844.79	3845.29	3,846.50	3845.42	1.21	0.13	-1.09
	87044	3858.23	3858.73	3,859.46	0.00	0.73	0.00	-0.73
	87083	3844.11	3844.61	3,846.32	3844.23	1.71	0.00	-1.71
	87221	3804.45	3804.95	3,805.98	3804.58	1.03	0.00	-1.03
	87229	3860.51	3861.01	3,863.77	0.00	2.77	0.00	-2.77

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Commercial Buildings	87251	3854.29	3854.79	3,855.39	3854.18	0.60	0.00	-0.60
	87281	3790.01	3790.51	3,791.30	3789.55	0.79	0.00	-0.79
	87282	3848.20	3848.70	3,849.42	3848.72	0.72	0.02	-0.70
	87356	3804.01	3804.51	3,806.06	3804.50	1.55	0.00	-1.55
	87386	3792.76	3793.26	3,794.82	3792.68	1.56	0.00	-1.56
	137058	3814.98	3815.48	3,815.98	3815.33	0.50	0.00	-0.50
	138055	3859.52	3860.02	3,861.41	3859.46	1.39	0.00	-1.39
	138145	3841.67	3842.17	3,844.12	3842.44	1.95	0.26	-1.69
	138250	3846.21	3846.71	3,847.33	3846.11	0.61	0.00	-0.61
	138300	3804.20	3804.70	3,806.06	3804.59	1.36	0.00	-1.36
	176093	3969.84	3970.34	3,970.51	0.00	0.17	0.00	-0.17
	176134	3891.84	3892.34	3,895.32	3892.64	2.98	0.30	-2.69
	176189	3864.36	3864.86	3,868.41	3864.92	3.55	0.06	-3.50
	176257	3851.92	3852.42	3,852.92	0.00	0.50	0.00	-0.50
	176272	3841.56	3842.06	3,842.91	3841.49	0.85	0.00	-0.85
	176392	3851.24	3851.74	3,854.10	3851.54	2.36	0.00	-2.36
	176487	3787.98	3788.48	3,789.47	3788.09	0.99	0.00	-0.99
	176651	3791.32	3791.82	3,792.75	3790.79	0.92	0.00	-0.92
	176793	3802.53	3803.03	3,803.90	3802.91	0.87	0.00	-0.87
	214695	3826.31	3826.81	3,827.69	0.00	0.88	0.00	-0.88
	214697	3824.72	3825.22	3,826.06	3824.63	0.84	0.00	-0.84
	214822	3786.59	3787.09	3,787.48	0.00	0.39	0.00	-0.39
	214856	3892.39	3892.89	3,894.98	0.00	2.09	0.00	-2.09
	214952	3842.31	3842.81	3,844.34	3842.49	1.53	0.00	-1.53
	214980	3826.80	3827.30	3,828.29	0.00	0.99	0.00	-0.99
	215074	3800.03	3800.53	3,801.21	3800.17	0.67	0.00	-0.67
	252412	3862.01	3862.51	3,865.44	0.00	2.94	0.00	-2.94
	252466	3852.76	3853.26	3,853.58	0.00	0.31	0.00	-0.31
	252637	3951.12	3951.62	3,952.57	0.00	0.94	0.00	-0.94
	252848	3858.64	3859.14	3,860.04	3858.56	0.89	0.00	-0.89
	252960	3828.88	3829.38	3,830.55	3828.83	1.17	0.00	-1.17
	253140	3785.44	3785.94	3,785.99	0.00	0.05	0.00	-0.05
	265963	3823.09	3823.59	3,824.51	3823.20	0.92	0.00	-0.92
	291066	3860.95	3861.45	3,861.86	3860.24	0.41	0.00	-0.41
	291084	3852.63	3853.13	3,853.41	0.00	0.28	0.00	-0.28
	291108	3860.05	3860.55	3,860.76	3858.43	0.21	0.00	-0.21
	291111	3857.75	3858.25	3,859.61	0.00	1.37	0.00	-1.37
	291279	3792.19	3792.69	3,793.35	3792.06	0.66	0.00	-0.66
	291326	3790.30	3790.80	3,791.38	0.00	0.58	0.00	-0.58
	291328	3791.06	3791.56	3,793.14	3791.30	1.57	0.00	-1.57
	329783	3791.00	3791.50	3,792.30	3790.93	0.81	0.00	-0.81
	329827	3857.63	3858.13	3,861.09	3857.79	2.96	0.00	-2.96
	355243	3952.24	3952.74	3,954.00	0.00	1.25	0.00	-1.25
	355392	3849.09	3849.59	3,849.91	3849.42	0.32	0.00	-0.32
	355471	3842.74	3843.24	3,844.68	3842.42	1.44	0.00	-1.44
	355582	3791.66	3792.16	3,793.06	3791.75	0.90	0.00	-0.90
	355626	3788.87	3789.37	3,789.79	3788.77	0.42	0.00	-0.42
	380500	3787.91	3788.41	3,789.79	3788.20	1.39	0.00	-1.39
	380512	3787.92	3788.42	3,790.00	3788.26	1.58	0.00	-1.58
	381114	3855.04	3855.54	3,856.52	3855.02	0.98	0.00	-0.98
	381235	3789.60	3790.10	3,791.51	3789.92	1.41	0.00	-1.41
	406583	3856.05	3856.55	3,857.52	0.00	0.98	0.00	-0.98
	406859	3870.89	3871.39	3,872.41	0.00	1.02	0.00	-1.02
	407043	3788.91	3789.41	3,790.14	3788.32	0.72	0.00	-0.72
	432288	3852.73	3853.23	3,854.49	3852.81	1.26	0.00	-1.26
	432535	3857.12	3857.62	3,858.02	3856.96	0.40	0.00	-0.40
	432613	3824.98	3825.48	3,826.41	3824.91	0.93	0.00	-0.93
	457696	3845.10	3845.60	3,846.60	3845.28	1.00	0.00	-1.00
	457753	3829.14	3829.64	3,831.27	3829.37	1.63	0.00	-1.63
	458016	3845.65	3846.15	3,847.58	0.00	1.42	0.00	-1.42
	458022	3840.91	3841.41	3,842.58	0.00	1.18	0.00	-1.18
	483407	3979.69	3980.19	3,980.53	0.00	0.34	0.00	-0.34
	483440	3791.50	3792.00	3,793.37	3791.78	1.37	0.00	-1.37
	483613	3851.19	3851.69	3,851.95	3851.21	0.26	0.00	-0.26
	496300	3846.94	3847.44	3,847.96	3847.17	0.52	0.00	-0.52
	496326	3828.22	3828.72	3,829.55	3828.17	0.83	0.00	-0.83
	496393	3790.29	3790.79	3,791.29	3790.09	0.50	0.00	-0.50
	509155	3853.36	3853.86	3,853.88	0.00	0.02	0.00	-0.02
	521786	3824.81	3825.31	3,826.01	3824.70	0.70	0.00	-0.70

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	534381	3858.00	3858.50	3,859.45	3857.79	0.96	0.00	-0.96
	547120	3969.33	3969.83	3,970.20	0.00	0.36	0.00	-0.36
	547133	3955.94	3956.44	3,956.58	0.00	0.14	0.00	-0.14
	547222	3852.03	3852.53	3,853.39	3852.22	0.86	0.00	-0.86
	567868	3851.54	3852.04	3,853.17	3851.55	1.14	0.00	-1.14
	595354	3844.07	3844.57	3,845.57	3844.31	1.00	0.00	-1.00
	595609	3790.63	3791.13	3,791.42	0.00	0.29	0.00	-0.29
	598472	3848.02	3848.52	3,849.35	3848.20	0.83	0.00	-0.83
	611305	3865.27	3865.77	3,868.61	0.00	2.84	0.00	-2.84
	611317	3858.02	3858.52	3,861.38	3857.98	2.86	0.00	-2.86
	611335	3849.39	3849.89	3,852.17	3850.27	2.29	0.38	-1.91
	611350	3840.59	3841.09	3,842.72	3841.03	1.63	0.00	-1.63
	636884	3853.82	3854.32	3,856.08	3854.12	1.76	0.00	-1.76
	675331	3961.69	3962.19	3,962.82	0.00	0.63	0.00	-0.63
	677382	3946.20	3946.70	3,947.25	0.00	0.55	0.00	-0.55
	677383	3946.33	3946.83	3,947.24	0.00	0.40	0.00	-0.40
	677385	3946.65	3947.15	3,948.14	3946.53	0.99	0.00	-0.99
	678091	3790.93	3791.43	3,793.05	3791.38	1.63	0.00	-1.63
	678092	3796.53	3797.03	3,798.04	3796.56	1.01	0.00	-1.01
	678093	3785.80	3786.30	3,788.37	3786.02	2.07	0.00	-2.07
	4865923	3853.91	3854.41	3856.17	3854.56	1.8	0.2	-1.610596

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	717101	3873.81	3874.31	3875.38	0.00	1.07	0.00	-1.07
	717102	3868.99	3869.49	3870.58	0.00	1.09	0.00	-1.09
	717103	3869.08	3869.58	3870.51	0.00	0.94	0.00	-0.94
	717104	3873.98	3874.48	3875.00	0.00	0.52	0.00	-0.52
	717107	3879.10	3879.60	3880.46	0.00	0.85	0.00	-0.85
	717109	3881.38	3881.88	3882.03	0.00	0.15	0.00	-0.15
	717110	3877.76	3878.26	3879.30	0.00	1.04	0.00	-1.04
	717111	3864.33	3864.83	3870.27	0.00	5.45	0.00	-5.45
	717112	3868.75	3869.25	3871.10	0.00	1.85	0.00	-1.85
	717113	3859.04	3859.54	3870.27	0.00	10.73	0.00	-10.73
	717114	3873.01	3873.51	3873.99	0.00	0.48	0.00	-0.48
1% Annual Chance Commercial Buildings	678286	3900.24	3900.74	3901.10	0.00	0.36	0.00	-0.36
	717117	3906.41	3906.91	3907.06	0.00	0.15	0.00	-0.15
	717152	3911.60	3912.10	3913.66	0.00	1.57	0.00	-1.57
	717153	3911.93	3912.43	3912.85	0.00	0.42	0.00	-0.42
0.2% Annual Chance Residences	717101	3873.81	3874.31	3875.67	0.00	1.36	0.00	-1.36
	717102	3868.99	3869.49	3870.95	0.00	1.46	0.00	-1.46
	717103	3869.08	3869.58	3870.88	0.00	1.31	0.00	-1.31
	717104	3873.98	3874.48	3875.17	0.00	0.69	0.00	-0.69
	717107	3879.10	3879.60	3880.85	0.00	1.25	0.00	-1.25
	717109	3881.38	3881.88	3882.48	0.00	0.60	0.00	-0.60
	717110	3877.76	3878.26	3879.36	0.00	1.10	0.00	-1.10
	717111	3864.33	3864.83	3870.55	0.00	5.72	0.00	-5.72
	717112	3868.75	3869.25	3871.21	0.00	1.96	0.00	-1.96
	717113	3859.04	3859.54	3870.55	0.00	11.01	0.00	-11.01
	717114	3873.01	3873.51	3874.70	0.00	1.19	0.00	-1.19
0.2% Annual Chance Commercial Buildings	678286	3900.24	3900.74	3,901.46	0.00	3900.74	0.00	-0.72
	717116	3904.48	3904.98	3,905.44	0.00	3904.98	0.00	-0.46
	717117	3906.41	3906.91	3,907.27	0.00	3906.91	0.00	-0.36
	717118	3907.45	3907.95	3,908.08	0.00	3907.95	0.00	-0.13
	717152	3911.60	3912.10	3,913.87	0.00	3912.10	0.00	-1.78
	717153	3911.93	3912.43	3912.98	0.00	3912.4	0.0	-0.540758

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	717104	3874.01	3874.51	3875.03	3874.17	0.52	0.00	-0.52
	717103	3869.07	3869.57	3870.13	0.00	0.56	0.00	-0.56
	717102	3869.11	3869.61	3870.14	3868.92	0.52	0.00	-0.52
	717101	3873.95	3874.45	3875.44	3874.13	0.99	0.00	-0.99
	717107	3879.14	3879.64	3880.82	3879.38	1.18	0.00	-1.18
	717113	3859.39	3859.89	3870.13	3861.20	10.24	1.31	-8.93
	717111	3864.55	3865.05	3870.13	3863.47	5.08	0.00	-5.08
	717112	3869.00	3869.50	3870.49	0.00	0.99	0.00	-0.99
	717110	3877.94	3878.44	3878.90	3876.83	0.46	0.00	-0.46
	717109	3881.66	3882.16	3882.27	3880.82	0.11	0.00	-0.11
	717039	3906.93	3907.43	3909.08	3907.11	1.65	0.00	-1.65
	717080	3917.39	3917.89	3918.20	3917.45	0.31	0.00	-0.31
	717069	3907.44	3907.94	3910.06	3908.67	2.13	0.73	-1.39
	717068	3907.42	3907.92	3909.78	3908.22	1.86	0.30	-1.56
	717067	3901.89	3902.39	3904.61	3903.37	2.21	0.98	-1.24
	593407	3946.80	3947.30	3947.88	3946.88	0.58	0.00	-0.58
	213354	3952.65	3953.15	3953.45	3952.60	0.31	0.00	-0.31
	631641	3945.21	3945.71	3946.53	3945.22	0.82	0.00	-0.82
	405697	3956.05	3956.55	3957.01	3952.95	0.46	0.00	-0.46
	136051	3939.03	3939.53	3939.72	3938.74	0.19	0.00	-0.19
	717051	3936.08	3936.58	3939.57	0.00	2.99	0.00	-2.99
	133815	3962.61	3963.11	3963.37	0.00	0.26	0.00	-0.26
	593408	3945.02	3945.52	3946.32	3945.21	0.80	0.00	-0.80
	378505	3957.25	3957.75	3958.10	3957.26	0.35	0.00	-0.35
	405457	3949.17	3949.67	3949.83	3949.28	0.15	0.00	-0.15
	683073	3968.07	3968.57	3968.94	3967.98	0.37	0.00	-0.37
	85580	3965.20	3965.70	3966.25	3965.21	0.56	0.00	-0.56
	174588	3944.32	3944.82	3945.13	3944.29	0.30	0.00	-0.30
	378502	3978.21	3978.71	3978.89	3978.19	0.18	0.00	-0.18
	85566	3960.02	3960.52	3961.37	3960.34	0.85	0.00	-0.85
	683087	3957.27	3957.77	3957.95	3957.30	0.18	0.00	-0.18
	683096	3955.47	3955.97	3956.16	3955.43	0.19	0.00	-0.19
	303642	3952.28	3952.78	3953.12	3952.31	0.35	0.00	-0.35
	431206	3976.17	3976.67	3977.18	3976.29	0.51	0.00	-0.51
	636344	3944.28	3944.78	3944.87	3944.27	0.08	0.00	-0.08
	661605	3972.23	3972.73	3973.38	0.00	0.65	0.00	-0.65
	85528	3983.55	3984.05	3985.32	0.00	1.27	0.00	-1.27
	683116	3969.06	3969.56	3970.17	0.00	0.61	0.00	-0.61
	660791	3967.31	3967.81	3968.22	0.00	0.41	0.00	-0.41
	303641	3958.95	3959.45	3959.56	0.00	0.11	0.00	-0.11
	521255	3965.27	3965.77	3966.11	0.00	0.34	0.00	-0.34
	661608	3962.02	3962.52	3962.85	0.00	0.32	0.00	-0.32
	174578	3980.25	3980.75	3981.28	0.00	0.52	0.00	-0.52
	533877	3943.57	3944.07	3944.54	0.00	0.47	0.00	-0.47
	495736	3988.95	3989.45	3989.92	0.00	0.47	0.00	-0.47
	84673	3988.87	3989.37	3989.68	0.00	0.31	0.00	-0.31
	136105	3944.72	3945.22	3945.43	0.00	0.22	0.00	-0.22
	328679	3968.77	3969.27	3969.35	0.00	0.08	0.00	-0.08
	661603	3985.00	3985.50	3985.82	0.00	0.32	0.00	-0.32
	674892	3995.44	3995.94	3996.04	0.00	0.10	0.00	-0.10
	683110	3980.38	3980.88	3980.99	0.00	0.10	0.00	-0.10
	405445	4000.21	4000.71	4001.21	0.00	0.50	0.00	-0.50
	290012	4004.83	4005.33	4005.59	0.00	0.26	0.00	-0.26
	567301	3997.51	3998.01	3998.39	0.00	0.39	0.00	-0.39
	133613	4008.35	4008.85	4009.08	0.00	0.23	0.00	-0.23
	250755	4002.19	4002.69	4002.93	0.00	0.24	0.00	-0.24
	533859	3997.28	3997.78	3998.07	0.00	0.29	0.00	-0.29
	572224	3990.20	3990.70	3991.24	0.00	0.54	0.00	-0.54
	431423	3997.40	3997.90	3998.30	0.00	0.40	0.00	-0.40
	328674	4011.13	4011.63	4011.78	0.00	0.15	0.00	-0.15
	482180	4001.59	4002.09	4002.92	0.00	0.83	0.00	-0.83
	9754	4018.51	4019.01	4019.48	0.00	0.47	0.00	-0.47
	674894	3997.57	3998.07	3998.41	0.00	0.34	0.00	-0.34
	380469	4008.13	4008.63	4008.80	0.00	0.17	0.00	-0.17
	328529	4015.40	4015.90	4016.04	0.00	0.13	0.00	-0.13
	174694	4002.03	4002.53	4002.56	0.00	0.02	0.00	-0.02
	593406	4002.13	4002.63	4002.65	0.00	0.03	0.00	-0.03
	405692	4019.37	4019.87	4020.63	0.00	0.76	0.00	-0.76
	212792	4023.67	4024.17	4025.47	0.00	1.30	0.00	-1.30

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	136147	4019.04	4019.54	4019.97	0.00	0.43	0.00	-0.43
	328518	4033.55	4034.05	4034.09	0.00	0.04	0.00	-0.04
	354226	4033.55	4034.05	4034.08	0.00	0.03	0.00	-0.03
	546668	4027.55	4028.05	4029.43	0.00	1.38	0.00	-1.38
	354227	4031.99	4032.49	4032.90	0.00	0.41	0.00	-0.41
	456859	4028.08	4028.58	4028.68	0.00	0.10	0.00	-0.10
	354207	4038.10	4038.60	4038.85	0.00	0.26	0.00	-0.26
	133611	4040.82	4041.32	4041.70	0.00	0.37	0.00	-0.37
	482469	4046.41	4046.91	4048.73	0.00	1.82	0.00	-1.82
	136141	4032.34	4032.84	4033.37	0.00	0.53	0.00	-0.53
	405446	4046.27	4046.77	4047.81	0.00	1.04	0.00	-1.04
	482179	4041.69	4042.19	4043.61	0.00	1.41	0.00	-1.41
	174498	4038.20	4038.70	4039.34	0.00	0.64	0.00	-0.64
	174643	4051.98	4052.48	4052.53	0.00	0.05	0.00	-0.05
	303627	4057.41	4057.91	4058.26	0.00	0.35	0.00	-0.35
	660787	4042.97	4043.47	4043.52	0.00	0.05	0.00	-0.05
	174856	4051.72	4052.22	4053.65	0.00	1.43	0.00	-1.43
	661604	4031.00	4031.50	4031.56	0.00	0.06	0.00	-0.06
	631633	4047.29	4047.79	4048.66	0.00	0.87	0.00	-0.87
	546666	4080.31	4080.81	4081.80	0.00	0.99	0.00	-0.99
	533854	4085.71	4086.21	4086.86	0.00	0.65	0.00	-0.65
	636330	4090.88	4091.38	4091.95	0.00	0.58	0.00	-0.58
	174853	4113.31	4113.81	4113.84	0.00	0.02	0.00	-0.02
	674888	4114.47	4114.97	4114.98	0.00	0.01	0.00	-0.01
	251197	4125.18	4125.68	4126.13	0.00	0.45	0.00	-0.45
	717050	3935.64	3936.14	3939.55	3931.72	3.42	0.00	-3.42
1% Annual Chance Commercial Buildings	717045	3920.10	3920.60	3920.61	0.00	0.01	0.00	-0.01
	717047	3923.17	3923.67	3923.69	3922.69	0.02	0.00	-0.02
	717163	3920.65	3921.15	3921.90	3920.84	0.74	0.00	-0.74
	683101	3923.65	3924.15	3924.65	3923.71	0.51	0.00	-0.51
	717162	3920.92	3921.42	3921.68	3920.68	0.26	0.00	-0.26
	684651	3918.49	3918.99	3919.98	3918.94	0.99	0.00	-0.99
	675772	3924.12	3924.62	3924.73	3923.58	0.12	0.00	-0.12
	684652	3919.96	3920.46	3921.65	3920.51	1.19	0.05	-1.14
	717164	3930.15	3930.65	3931.43	3929.92	0.78	0.00	-0.78
	684650	3917.86	3918.36	3919.72	3918.65	1.36	0.29	-1.07
	684653	3918.79	3919.29	3920.78	3919.70	1.49	0.40	-1.08
	684654	3920.70	3921.20	3922.71	3921.52	1.50	0.32	-1.18
	679245	3929.20	3929.70	3930.26	3928.96	0.56	0.00	-0.56
	717053	3930.39	3930.89	3930.94	3930.03	0.05	0.00	-0.05
	717054	3929.71	3930.21	3930.75	0.00	0.53	0.00	-0.53
	9750	4089.60	4090.10	4090.30	4090.30	0.20	0.20	0.00
	717104	3874.01	3874.51	3875.20	3874.79	0.69	0.28	-0.41
	717103	3869.07	3869.57	3870.88	3869.07	1.31	0.00	-1.31
	717102	3869.11	3869.61	3870.90	3869.58	1.29	0.00	-1.29
	717101	3873.95	3874.45	3875.57	3875.04	1.12	0.59	-0.53
	717107	3879.14	3879.64	3881.25	3880.15	1.61	0.51	-1.10
	717113	3859.39	3859.89	3870.88	3866.53	10.99	6.64	-4.35
	717108	3884.33	3884.83	3885.12	0.00	0.29	0.00	-0.29
	717111	3864.55	3865.05	3870.88	3866.72	5.83	1.68	-4.16
	717112	3869.00	3869.50	3871.09	3867.73	1.59	0.00	-1.59
	717114	3873.18	3873.68	3874.62	3872.00	0.94	0.00	-0.94
	717110	3877.94	3878.44	3879.53	3877.01	1.08	0.00	-1.08
	717109	3881.66	3882.16	3882.36	3881.63	0.20	0.00	-0.20
	717039	3906.93	3907.43	3909.27	3908.81	1.84	1.37	-0.47
	717043	3919.81	3920.31	3920.38	3919.85	0.07	0.00	-0.07
	717080	3917.39	3917.89	3918.46	3917.94	0.57	0.05	-0.52
	717079	3917.11	3917.61	3917.71	3917.31	0.11	0.00	-0.11
	717078	3916.66	3917.16	3917.33	3916.87	0.17	0.00	-0.17
	717069	3907.44	3907.94	3910.49	3909.17	2.55	1.23	-1.32
	717068	3907.42	3907.92	3910.12	3909.04	2.20	1.12	-1.08
	717067	3901.89	3902.39	3905.05	3904.08	2.66	1.68	-0.97
	593407	3946.80	3947.30	3948.00	3947.72	0.70	0.41	-0.29
	213354	3952.65	3953.15	3953.48	3953.36	0.33	0.22	-0.12
	631641	3945.21	3945.71	3946.60	3946.26	0.89	0.55	-0.34
	405697	3956.05	3956.55	3957.08	3956.80	0.53	0.24	-0.29
	136051	3939.03	3939.53	3939.85	3939.29	0.32	0.00	-0.32
	717051	3936.08	3936.58	3939.70	3939.16	3.12	2.58	-0.54
	133815	3962.61	3963.11	3963.46	3963.14	0.35	0.03	-0.32

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Residences	593408	3945.02	3945.52	3946.35	3946.26	0.82	0.74	-0.08
	378505	3957.25	3957.75	3958.19	3957.95	0.44	0.20	-0.23
	405457	3949.17	3949.67	3949.85	3949.75	0.18	0.08	-0.10
	213356	3954.56	3955.06	3955.11	3954.68	0.05	0.00	-0.05
	683073	3968.07	3968.57	3969.09	3968.67	0.52	0.11	-0.42
	213361	3939.04	3939.54	3939.65	3938.89	0.11	0.00	-0.11
	174588	3944.32	3944.82	3945.25	3944.58	0.43	0.00	-0.43
	717055	3936.13	3936.63	3937.73	0.00	1.10	0.00	-1.10
	378502	3978.21	3978.71	3979.00	3978.70	0.29	0.00	-0.29
	85566	3960.02	3960.52	3961.48	3961.21	0.96	0.69	-0.27
	85584	3948.72	3949.22	3949.24	3948.88	0.03	0.00	-0.03
	683087	3957.27	3957.77	3958.06	3957.72	0.30	0.00	-0.30
	683096	3955.47	3955.97	3956.22	3955.75	0.25	0.00	-0.25
	303642	3952.28	3952.78	3953.36	3952.71	0.58	0.00	-0.58
	431206	3976.17	3976.67	3977.30	3977.04	0.63	0.37	-0.26
	636344	3944.28	3944.78	3944.87	3944.69	0.09	0.00	-0.09
	717057	3939.11	3939.61	3939.61	3938.36	0.00	0.00	0.00
	661605	3972.23	3972.73	3973.50	3973.27	0.77	0.54	-0.23
	85528	3983.55	3984.05	3985.57	3984.96	1.52	0.91	-0.61
	683116	3969.06	3969.56	3970.39	3969.92	0.83	0.36	-0.47
	212635	3956.45	3956.95	3956.95	3956.87	0.00	0.00	0.00
	660791	3967.31	3967.81	3968.40	3967.98	0.59	0.17	-0.42
	303641	3958.95	3959.45	3959.62	3959.45	0.17	0.00	-0.17
	521255	3965.27	3965.77	3966.44	3965.66	0.67	0.00	-0.67
	661608	3962.02	3962.52	3962.96	3962.70	0.44	0.18	-0.26
	174578	3980.25	3980.75	3981.59	3981.03	0.84	0.27	-0.57
	533877	3943.57	3944.07	3944.64	3943.99	0.57	0.00	-0.57
	495736	3988.95	3989.45	3990.24	3989.69	0.79	0.24	-0.55
	84673	3988.87	3989.37	3989.79	3989.55	0.41	0.18	-0.23
	136105	3944.72	3945.22	3945.57	3944.94	0.35	0.00	-0.35
	328679	3968.77	3969.27	3969.41	3969.13	0.14	0.00	-0.14
	661603	3985.00	3985.50	3985.92	3985.64	0.43	0.15	-0.28
	674892	3995.44	3995.94	3996.31	3995.86	0.36	0.00	-0.36
	431430	3952.16	3952.66	3953.33	0.00	0.67	0.00	-0.67
	683133	3959.55	3960.05	3960.15	0.00	0.10	0.00	-0.10
	683110	3980.38	3980.88	3981.13	0.00	0.25	0.00	-0.25
	405445	4000.21	4000.71	4001.41	4000.91	0.70	0.20	-0.50
	631640	3976.79	3977.29	3977.30	3976.99	0.01	0.00	-0.01
	35149	3992.62	3993.12	3993.15	3992.66	0.03	0.00	-0.03
	290012	4004.83	4005.33	4006.01	4005.16	0.68	0.00	-0.68
	567301	3997.51	3998.01	3999.14	3998.08	1.13	0.07	-1.06
	133613	4008.35	4008.85	4009.28	4008.57	0.43	0.00	-0.43
	250755	4002.19	4002.69	4003.09	4002.20	0.40	0.00	-0.40
	533859	3997.28	3997.78	3998.15	3997.93	0.36	0.15	-0.22
	48614	4011.46	4011.96	4012.06	4011.60	0.10	0.00	-0.10
	572224	3990.20	3990.70	3991.27	3991.10	0.57	0.41	-0.16
	431423	3997.40	3997.90	3998.34	3998.08	0.44	0.18	-0.26
	251296	3993.42	3993.92	3993.92	3993.43	0.00	0.00	0.00
	328674	4011.13	4011.63	4011.80	4011.54	0.17	0.00	-0.17
	482180	4001.59	4002.09	4002.95	4002.77	0.86	0.67	-0.18
	9754	4018.51	4019.01	4019.64	4019.45	0.63	0.44	-0.19
	495731	4020.73	4021.23	4021.37	4020.62	0.14	0.00	-0.14
	674894	3997.57	3998.07	3998.92	3997.86	0.85	0.00	-0.85
	136151	3991.56	3992.06	3992.09	0.00	0.04	0.00	-0.04
	380469	4008.13	4008.63	4008.82	4008.67	0.20	0.04	-0.16
	328529	4015.40	4015.90	4016.09	4015.84	0.18	0.00	-0.18
	174694	4002.03	4002.53	4002.60	4002.25	0.06	0.00	-0.06
	593406	4002.13	4002.63	4002.69	4002.29	0.07	0.00	-0.07
	405692	4019.37	4019.87	4020.71	4020.36	0.84	0.49	-0.35
	212792	4023.67	4024.17	4025.58	4025.11	1.42	0.94	-0.48
	290047	4030.01	4030.51	4030.73	4029.88	0.22	0.00	-0.22
	136147	4019.04	4019.54	4020.05	4019.83	0.50	0.28	-0.22
	328518	4033.55	4034.05	4034.23	4033.49	0.18	0.00	-0.18
	354226	4033.55	4034.05	4034.16	4033.99	0.11	0.00	-0.11
	546668	4027.55	4028.05	4029.50	4029.34	1.45	1.30	-0.16
	354227	4031.99	4032.49	4032.97	4032.80	0.48	0.31	-0.17
	456859	4028.08	4028.58	4028.69	4028.65	0.12	0.07	-0.05
	354207	4038.10	4038.60	4038.96	4038.74	0.36	0.14	-0.22
	133611	4040.82	4041.32	4041.72	4041.67	0.39	0.35	-0.05

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
	482469	4046.41	4046.91	4049.04	4043.44	2.12	0.00	-2.12
	136141	4032.34	4032.84	4033.37	4033.36	0.54	0.53	-0.01
	405446	4046.27	4046.77	4047.93	4047.65	1.16	0.88	-0.28
	482179	4041.69	4042.19	4043.71	4043.54	1.51	1.35	-0.16
	174498	4038.20	4038.70	4039.46	4039.38	0.76	0.68	-0.08
	174643	4051.98	4052.48	4052.68	4052.13	0.19	0.00	-0.19
	303627	4057.41	4057.91	4058.71	4057.70	0.80	0.00	-0.80
	660787	4042.97	4043.47	4043.65	4043.44	0.18	0.00	-0.18
	174856	4051.72	4052.22	4054.01	4053.40	1.79	1.18	-0.62
	661604	4031.00	4031.50	4031.57	4030.63	0.07	0.00	-0.07
	631633	4047.29	4047.79	4048.72	4048.62	0.93	0.83	-0.10
	9981	4072.95	4073.45	4074.47	4074.47	1.01	1.01	0.00
	546666	4080.31	4080.81	4082.06	4082.05	1.24	1.24	0.00
	533854	4085.71	4086.21	4087.31	4087.31	1.10	1.10	0.00
	636330	4090.88	4091.38	4092.26	4092.26	0.88	0.88	0.00
	174853	4113.31	4113.81	4114.17	4114.17	0.36	0.35	-0.01
	674888	4114.47	4114.97	4115.22	4115.22	0.25	0.24	0.00
	9749	4114.45	4114.95	4115.19	4115.19	0.24	0.24	0.00
	251197	4125.18	4125.68	4126.69	4126.67	1.01	0.99	-0.02
	717050	3935.64	3936.14	3939.60	3939.33	3.46	3.20	-0.26
0.2% Annual Chance Commercial Buildings	717046	3918.29	3918.79	3,919.58	3917.89	0.79	0.00	-0.79
	717045	3920.10	3920.60	3,920.88	3919.87	0.28	0.00	-0.28
	717047	3923.17	3923.67	3,923.70	3923.64	0.04	0.00	-0.04
	717163	3920.65	3921.15	3,922.16	3921.58	1.01	0.43	-0.58
	683101	3923.65	3924.15	3,924.83	3924.23	0.68	0.09	-0.60
	482508	3923.99	3924.49	3,924.56	3924.08	0.07	0.00	-0.07
	717162	3920.92	3921.42	3,921.93	3920.92	0.50	0.00	-0.50
	684651	3918.49	3918.99	3,920.29	3919.74	1.30	0.75	-0.55
	675772	3924.12	3924.62	3,924.96	3924.22	0.34	0.00	-0.34
	684652	3919.96	3920.46	3,922.00	3921.31	1.54	0.85	-0.69
	717164	3930.15	3930.65	3,931.47	3931.35	0.82	0.70	-0.11
	684650	3917.86	3918.36	3,920.05	3919.42	1.69	1.06	-0.63
	684653	3918.79	3919.29	3,921.20	3920.48	1.91	1.19	-0.73
	684654	3920.70	3921.20	3,923.13	3922.36	1.93	1.15	-0.77
	679245	3929.20	3929.70	3,930.58	3929.96	0.88	0.26	-0.62
	717065	3910.47	3910.97	3,911.31	3910.55	0.34	0.00	-0.34
	85618	3923.10	3923.60	3,923.60	3922.90	0.00	0.00	0.00
	717053	3930.39	3930.89	3,931.04	3930.61	0.15	0.00	-0.15
	717061	3918.15	3918.65	3,918.87	3918.36	0.22	0.00	-0.22
	717054	3929.71	3930.21	3930.87	3930.36	0.7	0.2	-0.508545

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	4971535	2598.25	2598.75	2598.82	2598.52	0.07	0.00	-0.07
	4971427	2598.48	2598.98	2599.04	2598.77	0.06	0.00	-0.06
	4908783	2577.66	2578.16	2578.17	2578.05	0.01	0.00	-0.01
	4926654	2600.52	2601.02	2601.33	2600.50	0.31	0.00	-0.31
	4945738	2604.25	2604.75	2604.92	0.00	0.17	0.00	-0.17
	4932443	2617.70	2618.20	2618.43	0.00	0.23	0.00	-0.23
	4895301	2625.12	2625.62	2626.27	0.00	0.65	0.00	-0.65
	4904355	2629.45	2629.95	2631.43	0.00	1.47	0.00	-1.47
	4872254	2564.50	2565.00	2565.16	2565.15	0.16	0.15	-0.01
	4957532	2596.23	2596.73	2596.73	0.00	0.01	0.00	-0.01
1% Annual Chance Commercial Buildings	No Structures							
0.2% Annual Chance Residences	4971535	2598.25	2598.75	2598.87	2598.65	0.12	0.00	-0.12
	4971427	2598.48	2598.98	2599.39	2598.92	0.40	0.00	-0.40
	4908783	2577.66	2578.16	2578.26	2578.05	0.10	0.00	-0.10
	4926654	2600.52	2601.02	2601.44	2600.55	0.41	0.00	-0.41
	4945738	2604.25	2604.75	2605.11	0.00	0.36	0.00	-0.36
	4948646	2604.67	2605.17	2605.19	2604.55	0.02	0.00	-0.02
	4938394	2608.45	2608.95	2609.27	0.00	0.32	0.00	-0.32
	4899827	2610.40	2610.90	2611.00	0.00	0.10	0.00	-0.10
	4932476	2616.17	2616.67	2616.80	0.00	0.13	0.00	-0.13
	4932443	2617.70	2618.20	2619.19	0.00	0.98	0.00	-0.98
	4895301	2625.12	2625.62	2627.47	0.00	1.85	0.00	-1.85
	4904355	2629.45	2629.95	2632.85	0.00	2.90	0.00	-2.90
	4872254	2564.50	2565.00	2565.17	2565.16	0.17	0.15	-0.01
	4957532	2596.23	2596.73	2596.77	0.00	0.04	0.00	-0.04
	4895408	2597.53	2598.03	2598.12	0.00	0.10	0.00	-0.10
	4945739	2606.62	2607.12	2607.14	2606.84	0.02	0.00	-0.02
0.2% Annual Chance Commercial Buildings	4904261	2614.45	2614.95	2,615.47	0.00	0.53	0.00	-0.53

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
1% Annual Chance Residences	517199	2613.57	2614.07	2614.58	2614.19	0.51	0.13	-0.38
	653167	2618.27	2618.77	2619.31	2618.94	0.54	0.17	-0.37
	529770	2623.15	2623.65	2624.55	2624.02	0.89	0.37	-0.52
	397258	2618.72	2619.22	2619.72	2619.37	0.51	0.15	-0.35
	588781	2623.18	2623.68	2624.57	2624.03	0.89	0.36	-0.53
	44607	2623.26	2623.76	2624.56	2624.03	0.80	0.27	-0.53
	563262	2623.20	2623.70	2624.55	2624.03	0.85	0.33	-0.52
	423003	2623.32	2623.82	2624.46	2623.98	0.64	0.17	-0.47
	1677	2623.26	2623.76	2624.54	2624.04	0.78	0.28	-0.50
	26987	2623.72	2624.22	2624.94	2624.45	0.72	0.23	-0.49
	239066	2623.72	2624.22	2624.90	2624.43	0.68	0.22	-0.47
	474200	2623.51	2624.01	2624.89	2624.43	0.87	0.41	-0.46
	423093	2623.39	2623.89	2624.86	2624.39	0.96	0.50	-0.46
	448529	2623.47	2623.97	2624.82	2624.39	0.85	0.43	-0.43
	397271	2623.57	2624.07	2624.76	2624.37	0.69	0.30	-0.39
1% Annual Chance Commercial Buildings	678220	2575.79	2576.29	2582.26	0.00	5.97	0.00	-5.97
	670726	2592.59	2593.09	2593.65	0.00	0.56	0.00	-0.56
	371507	2576.86	2577.36	2582.26	0.00	4.90	0.00	-4.90
	678221	2576.13	2576.63	2582.26	0.00	5.63	0.00	-5.63
	685794	2580.63	2581.13	2582.27	0.00	1.14	0.00	-1.14
	72746	2579.24	2579.74	2582.26	0.00	2.52	0.00	-2.52
	119008	2579.83	2580.33	2582.26	0.00	1.92	0.00	-1.92
0.2% Annual Chance Residences	529770	2623.15	2623.65	2624.73	2624.32	1.08	0.66	-0.42
	588781	2623.18	2623.68	2624.75	2624.33	1.08	0.65	-0.42
	44607	2623.26	2623.76	2624.74	2624.32	0.98	0.57	-0.42
	563262	2623.20	2623.70	2624.73	2624.32	1.03	0.62	-0.41
	423003	2623.32	2623.82	2624.63	2624.26	0.81	0.44	-0.37
	1677	2623.26	2623.76	2624.72	2624.33	0.96	0.57	-0.40
	26987	2623.72	2624.22	2625.14	2624.72	0.92	0.50	-0.42
	239066	2623.72	2624.22	2625.10	2624.71	0.88	0.49	-0.39
	474200	2623.51	2624.01	2625.09	2624.70	1.07	0.69	-0.39
	423093	2623.39	2623.89	2625.06	2624.67	1.17	0.78	-0.39
	448529	2623.47	2623.97	2625.02	2624.66	1.05	0.69	-0.36
	491623	2601.75	2602.25	2,602.39	2602.13	0.13	0.00	-0.13
	200670	2600.44	2600.94	2,601.12	2600.81	0.18	0.00	-0.18
	670754	2600.55	2601.05	2,601.45	2601.38	0.40	0.33	-0.07
	239036	2601.46	2601.96	2,602.27	2602.19	0.31	0.24	-0.07
	281907	2598.29	2598.79	2,599.20	2599.14	0.42	0.35	-0.06
	588747	2598.30	2598.80	2,599.28	2599.23	0.47	0.42	-0.05
	588875	2597.68	2598.18	2,598.92	2598.86	0.74	0.68	-0.05
	345902	2598.30	2598.80	2,599.16	2599.10	0.36	0.31	-0.06
	119142	2596.25	2596.75	2,597.49	2597.44	0.73	0.69	-0.05
	27069	2596.01	2596.51	2,597.90	2597.85	1.39	1.34	-0.05
	685000	2597.14	2597.64	2,598.97	2598.93	1.33	1.28	-0.05
	474193	2610.85	2611.35	2,611.57	2611.63	0.22	0.28	0.05
	684999	2597.40	2597.90	2,599.10	2599.05	1.20	1.15	-0.05
	764043	2598.56	2599.06	2,599.86	2599.81	0.80	0.75	-0.05
	261220	2602.10	2602.60	2,603.82	2603.81	1.22	1.21	0.00
	345884	2601.72	2602.22	2,602.52	2602.52	0.30	0.30	0.00
	72986	2601.89	2602.39	2,603.16	2603.15	0.76	0.76	0.00
	44588	2602.00	2602.50	2,604.01	2604.01	1.51	1.51	0.00
	653162	2610.85	2611.35	2,612.40	2612.49	1.05	1.13	0.09
	761443	2606.25	2606.75	2,607.19	2607.23	0.45	0.48	0.03
	504416	2610.25	2610.75	2,611.32	2611.39	0.57	0.64	0.07
	1663	2610.05	2610.55	2,611.67	2611.75	1.12	1.20	0.08
	397193	2597.96	2598.46	2,598.51	2598.53	0.05	0.07	0.02
	345942	2610.26	2610.76	2,612.37	2612.47	1.61	1.70	0.10
	371730	2610.04	2610.54	2,612.13	2612.22	1.58	1.68	0.09
	119120	2597.68	2598.18	2,598.39	2598.41	0.22	0.23	0.02
	504386	2596.59	2597.09	2,597.37	2597.39	0.28	0.30	0.02
	200755	2596.80	2597.30	2,597.38	2597.40	0.08	0.10	0.02
	320316	2596.52	2597.02	2,597.32	2597.34	0.30	0.32	0.02
	200752	2596.23	2596.73	2,597.23	2597.25	0.49	0.52	0.02
	677556	2578.40	2578.90	2,583.99	2583.98	5.09	5.09	0.00
	517184	2600.65	2601.15	2,601.58	2601.62	0.43	0.48	0.04
	677554	2576.72	2577.22	2,583.99	2583.98	6.76	6.76	0.00
	677555	2578.85	2579.35	2,583.99	2583.98	4.64	4.63	0.00
	448505	2600.61	2601.11	2,601.33	2601.38	0.22	0.27	0.05
	371572	2595.04	2595.54	2,595.75	2595.79	0.21	0.26	0.04

Appendix 5H

EA9A (FMP ID: 143000116) Hydraulic Model Depth Results at Buildings Analyzed

Flood Frequency and Structure Type	Building_ID	Terrain Elevation	Finished Floor Elev. (FFE)	Existing WSE	Proposed WSE	Existing Depth Above FFE	Proposed Depth Above FFE	Depth Difference
		ft	ft	ft	ft	ft	ft	ft
0.2% Annual Chance Commercial Buildings	1615	2596.15	2596.65	2,597.23	2597.28	0.58	0.63	0.05
	162311	2596.19	2596.69	2,597.18	2597.24	0.50	0.55	0.05
	422955	2596.15	2596.65	2,597.03	2597.08	0.38	0.43	0.05
	281911	2596.35	2596.85	2,597.52	2597.57	0.67	0.73	0.06
	200758	2596.59	2597.09	2,597.44	2597.50	0.35	0.41	0.05
	760008	2574.96	2575.46	2,583.99	2583.98	8.53	8.52	0.00
	760010	2574.93	2575.43	2,583.99	2583.98	8.56	8.56	0.00
	760009	2574.04	2574.54	2,583.99	2583.98	9.44	9.44	0.00
	685796	2575.42	2575.92	2,583.99	2583.98	8.06	8.06	0.00
	685795	2572.43	2572.93	2,583.99	2583.98	11.06	11.06	0.00
	678218	2574.61	2575.11	2,583.99	2583.98	8.87	8.87	0.00
	685797	2576.16	2576.66	2,583.99	2583.98	7.33	7.32	0.00
	685798	2575.38	2575.88	2,583.99	2583.98	8.11	8.10	0.00
	27071	2594.31	2594.81	2,595.04	2595.11	0.23	0.30	0.06
	239013	2593.86	2594.36	2,594.72	2594.79	0.36	0.43	0.07
	72851	2593.87	2594.37	2,594.85	2594.92	0.48	0.55	0.07
	678220	2575.79	2576.29	2,583.99	2583.98	7.70	7.70	0.00
	670726	2592.59	2593.09	2,593.82	2593.87	0.73	0.79	0.06
	371507	2576.86	2577.36	2,583.99	2583.98	6.63	6.63	0.00
	200495	2583.53	2584.03	2,584.03	2584.03	0.00	0.01	0.01
	678221	2576.13	2576.63	2,583.99	2583.98	7.35	7.35	0.00
	685794	2580.63	2581.13	2,583.99	2583.98	2.86	2.85	0.00
	627457	2603.05	2603.55	2,603.50	2603.58	0.00	0.03	0.03
	162252	2585.51	2586.01	2,586.08	2586.13	0.07	0.12	0.05
	397120	2585.36	2585.86	2,585.90	2585.96	0.04	0.09	0.06
	72746	2579.24	2579.74	2,583.99	2583.98	4.24	4.24	0.00
	27028	2585.34	2585.84	2,585.95	2586.00	0.11	0.16	0.05
	72767	2585.22	2585.72	2,585.67	2585.75	0.00	0.02	0.02
	238750	2585.23	2585.73	2,585.79	2585.85	0.05	0.11	0.06
	653094	2585.20	2585.70	2,585.85	2585.91	0.15	0.21	0.06
	627554	2585.21	2585.71	2,585.85	2585.91	0.14	0.20	0.06
	588707	2585.14	2585.64	2,585.83	2585.89	0.20	0.26	0.06
	119008	2579.83	2580.33	2,583.99	2583.98	3.65	3.65	0.00
	588840	2585.13	2585.63	2,585.85	2585.91	0.22	0.29	0.06
	448327	2585.22	2585.72	2,585.86	2585.92	0.14	0.20	0.06
	200630	2585.12	2585.62	2,585.95	2586.01	0.32	0.38	0.06
	517124	2585.32	2585.82	2,585.88	2585.94	0.06	0.12	0.06
	320184	2590.72	2591.22	2,591.31	2591.36	0.09	0.15	0.06
	200625	2585.30	2585.80	2,585.93	2585.98	0.12	0.18	0.06
	345842	2585.26	2585.76	2,585.95	2586.01	0.19	0.24	0.05
	371539	2585.40	2585.90	2,585.97	2586.02	0.07	0.12	0.05
	162270	2590.01	2590.51	2590.62	2590.67	0.1	0.2	0.04834

Chapter 6: Impacts and Contribution of Regional Flood Plan

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6. Impacts and Contribution of Regional Flood Plan

This chapter summarizes the overall impacts of the Regional Flood Plan (RFP), considering the potential for both positive and negative outcomes related to flood risk and multiple other considerations. Other resources which are not directly related to flood planning, but which can be strongly influenced by flood-related actions include water supply, the environment, agriculture, recreation, water quality, and navigation. It is important to consider all aspects of flood solutions that were evaluated and are recommended as part of the RFP. That way, any potential negative outcomes can be addressed early in the planning phase, and the opportunities for synergy with multiple other potential benefits can be explored and optimized.

6.1 Impacts of Regional Flood Plan

This section includes an overview of potential impacts associated with recommended Flood Management Evaluations (FMEs), Flood Management Strategies (FMSs), and Flood Mitigation Projects (FMPs). The Regional Flood Planning Group (RFPG) evaluated each recommended flood solution to identify direct and indirect potential outcomes to each flood solution that are both positive and negative.

This section includes:

- A statement that the plan, when implemented, will not negatively affect neighboring areas located within or outside of the Flood Planning Region (FPR).
- A general description of the types of potential positive and negative socioeconomic or recreational impacts of the recommended FMPs and FMSs within the FPR.
- A general description of the overall impacts of the recommended FMPs and FMSs in the Regional Flood Plan on the environment, agriculture, recreational resources, water quality, erosion, sedimentation, and navigation.
- A region-wide summary of the relative reduction in flood risk that implementation of the Regional Flood Plan would achieve within the region, including with regard to life, injuries, and property.

6.1.1 FME Impacts

The RFPG identified and recommends a broad range of FMEs to lay the foundation for increased flood awareness and management of both flood-related and environmental issues. While the specific benefits associated with each FME cannot be quantifed until certain studies have been completed, the FME evaluation table presented in **Appendix 4A** of *Chapter 4* does quantify the existing risk in the general areas affected by each FME. A summary of the total count for each evaluated flood risk exposure indicator, which would be benefitted by completing all of the FMEs, is provided in **Table 6-1**. These reported quantities are not based on sum totals from the full evaluation table in **Appendix 4A.** Instead, significantly overlapping areas were removed from the totals to avoid double-counting in certain areas.

Table 6-1. Summary of Potential 1% Annual Chance Event Exposure within FME Areas

Exposure Type	Quantity for Existing Conditions*
Structures (count)	37,989
Habitable Structures (count)	27,611
Population (count)	127,887
Critical Facilities (count)	102
Low Water Crossings (count)	260
Road Length (miles)	1,170
Agricultural Land (acres)	86,770

*Quantities are approximate and may contain overlapping between some FMEs.

The general types of FMEs recommended include the following:

- Project planning;
- Storm water master plans (SWMPs);
- Dam Safety and Emergency Needs;
- Preparedness and riverine risk related to sediment or levees; and
- Irrigation and stormwater interaction.

Most of the recommended FMEs actually fall into more than one of the categories above. The specific FMEs associated with each of the general types above are listed in Section 4.3 of *Chapter 4*. The potential positive and negative impacts of each of these general FME types are provided in this section.

Project Planning FME Impacts

The primary benefit associated with FMEs that identify and evaluate flood infrastructure projects is that conceptual projects can be refined and modeled to quantify potential flood benefits, costs, and negative impacts. In addition, after these project planning FMEs are completed (up to the 30% design level), each project will have a greater chance of being funded through a future grant or funding opportunity. Potential negative impacts to project planning include the possibility that a project may be categorized infeasible as a result of the study, for a variety of reasons. In which, case Project sponsors would have paid for a study that ultimately resulted in no action being taken. However, this is still an important and necessary step in all flood mitigation planning.

SWMP FME Impacts

The recommendation of SWMP FMEs was based upon communities with the greatest number of structures at risk of 1% annual chance flooding, using best available risk mapping. In most cases, the cursory Fathom floodplain mapping was the most reliable source available to assess existing flood risk, which indicates a need for updated detailed flood mapping throughout the region. El Paso is an exception; since it has recent Preliminary Federal Emergency Management Agency (FEMA) mapping and recently updated City and County SWMPs. SWMPs are highly beneficial for each community where they are recommended because they not only identify potential flood mitigation projects, but they also establish detailed floodplain mapping and identify/quantify areas of high flood risk.

Potential negative effects of SWMPs are that they may identify significant areas of flood risk, which could effect the market value of certain properties. Since mapping developed from SWMPs are not regulatory, there is not an over-arching entity (such as FEMA) standardizing the quality and methods used for identifying and mitigating flood risk. This means the quality standards can vary significantly, depending on the firm completing the study and the amount of funding available for the study. If approximate flood risk mapping identifies specific areas at risk, and the study becomes publicly available information, there is the potential for the real estate market to react in a negative way toward areas thought to be at risk of flooding.

All SWMPs involve stakeholder coordination to identify flood-related projects and needs most important to each community. For example, FME IDs: 141000002 and 141000023 specify the consideration of nature based solutions and stream restoration for the cities of Presidio and Alpine, respectively. The RFPG identified issues related to incised channels and diminished storage capacity in Alpine and Moss Creeks upstream of the City of Alpine and in Cibolo Creek upstream of the City of Presidio. "Channel and floodplain restoration can enhance the ability of a channelized or incized reach to temporarily store the flow and dissipate the energy of passing flood waves"[1]. In addition, nature-based enhancements in area streams that slow flood waters and increase recharge would provide benefits for the environment (habitat), sedimentation/erosion issues (geomorphology), as well as water supply (aquifer recharge).

Dam Safety and Emergency Needs Impacts

Dams upstream of populated areas which are identified by the Texas Commission on Environmental Quality (TCEQ) as being hydraulically inadequate were considered an emergency need in the RFP. Studies to rehabilitate such dams are recommended in six different FMEs. These FMEs are beneficial because they address the need to rehabilitate flood control infrastructure that may have reached its design life. Potential negative aspects of dam rehabilitiation or decommissioning projects is that they can take a relatively long time to complete due to several federal and state regulations and requirements, and they can be expensive if state or federal funding is not acquired.

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[1] Sholts, Joel. Hydraulic analysis of stream restoration on flood wave propagation. University of North Carolina at Chapel Hill. 2009, pp. 43.

Impacts of FMEs for Preparedness and Riverine Risk Related to Sediment or Levees

FMEs related to riverine flooding or levees are important and beneficial in areas where significant populations are at risk of flooding on the landward side of a levee, such as in the El Paso region. In these cases, the build-up of sediment or vegetation in the channel floodway due to lack of maintenance can significantly increase flood risk to populated areas. Establishing minimum flood conveyance capacities and methods for consistently measuring/monitoring flood capacity would help alert the responsible parties when maintenance is needed for flood safety purposes. It also benefits the agricultural community, since the ability of the irrigation system to drain into the Rio Grande can be significantly affected by sediment build-up in the river.

A potential negative impact associated with these types of studies is that they may identify areas which are important to maintain from a flood safety perspective, but which may be restricted from typical vegetation clearing methods due to the presence of a protected species or habitat. In these stream reaches, it can be a much more expensive process, and can take much longer to establish the desired flood capacity.

Impacts of Irrigation and Stormwater Interaction

Particularly in El Paso County, an extensive irrigation system woven through both urban and rural areas can play a critical role in stormwater conveyance; and thus, requires coordination between multiple entities such as El Paso County Water Improvement District No. 1 (EPCWID1), El Paso Water, El Paso County, and the U.S. Section of the International Boundary and Water Commission (USIBWC). It is important to facilitate stormwater planning coordination between these different entities, as they all may benefit or be negatively impacted by potential issues that can arise related to maintenance, communication, or emergency response activities.

For example, El Paso has the potential to convey stormwater through segments of the irrigation system, if necessary, during extreme flood events. While it would be a benefit to the areas relieved of flooding, there is potential risk to downstream agricultural property when diverting stormwater through the system, as it was not designed for that specific purpose. This is why it is recommended to perform modeling and design increased capacities for culvert crossings in the Lower Mesa Drain (FME ID: 141000004). This study and design would provide the information needed to allow El Paso Water and EPCWID1 to decide how much stormwater can be diverted through the system during pre-project and post-project conditions without causing downstream negative impacts.

Potential negative impacts of performing studies related to the irrigation and stormwater system interactions is that there are many stakeholders involved with highly sensitive and political issues. This can complicate the decision on which entity will fund associated studies or implementation resulting from studies. For these reasons, most FMEs involving complex coordination between multiple entities on politically charged subjects are recommended as strategies, as they can involve multiple studies or steps before implementation can actually occur. However, FME ID: 141000001 was recommended as an FME and not an FMS, because an initial study has already been performed (Study ID 4), which identifies and quantifies both flood risk and maintenance issues, paving the way for recommended actions to be implemented. The recommended FME would leverage knowledge gained from Study ID 4, as well as from updated hydrologic and hydraulic modeling that is expected to be available in 2022 from an ongoing USIBWC study within the same river reach of the Rio Grande.

6.1.2 FMP Impacts

FMPs were analyzed using best available hydrologic and hydraulic modeling, which was refined as part of the RFP in some instances, to quantify positive and potential negative impacts. The potentially feasible FMP evaluation table included in **Appendix 4C** documents these impacts based on pre-project and post-project flood risk indicators. **Table 6-2** summarizes the results of the analyses performed, and quantifies the overall impact of all recommended FMPs in the RFP.

Table 6-2. Summary of Impacts from FMPs in 1% Annual Chance Event

Exposure Type	Pre-Project Conditions	Post-Project Conditions	Difference (Exposure Reduction from FMPs)
Structures (count)	3,905	2,438	1,467
Habitable Structures (count)	2,016	916	1,100
Population (count)	13,386	5,989	7,291
Critical Facilities (count)	19	14	5
Low Water Crossings (count)	153	144	9
Road Length (miles)	463	408	55
Agricultural Land (acres)	1,784	1591	193

In addition to the 1% annual chance flood benefits noted above, the recommended FMPs are estimated to remove a total of 2002 structures from the 0.2% annual chance flood risk inundation boundary.

No Negative Impact Statement

The TWDB has a statutory requirement to "…not negatively affect a neighboring area," particularly as a result of structural flood mitigation projects. This requirement is base on Texas Water Code 16.062(h) and (i). Additionally, the TWDB rules include a definition of "Negative Effect" to mean, "An increase in flood-related risks to life and property, either upstream or downstream of the proposed project." 31 TAC 361.10.

For the purposes of the RFP, each recommended FME, FMP, and FMS was reviewed to investigate potential negative impacts to surrounding properties. Since all of the FMEs and FMSs include non-structural recommendations (studies, program development, coordination, early warning systems, etc.), there is not a potential for direct negative flooding impacts. However, for FMPs involving proposed flood control infrastructure, analyses were performed using project-specific models and mapping, considering proposed project intentions, infrastructure components, and model results. *Chapter 5* documents the project-specific methodologies and results of these “no negative impact” assessments for each FMP in **Appendix 5B**. In addition, **Appendix Table 5D** (“Flood Mitigation Projects Recommended by RFPG”) includes a column entitled, “How No Negative Impact was Determined,” which specifies the method and/or models used to assess pre-project vs. post-project conditions to confirm that no negative flood impacts are anticipated on neighboring areas to FMPs.

The overall result of the reviews and analyses performed is that when implemented, the recommended FMPs are estimated not to negatively affect neighboring areas located within or outside of Region 14. Project sponsors will ultimately be responsible for ensuring the final project designs of each project will have no negative impact prior to construction.

Impacts Related to Proposed Project Scoring

To develop a single ranked list for the State Flood Plan, the TWDB must collect data by which to rank projects across the state. The intent of the project ranking is to reflect the State Flood Plan primary objective of protecting against loss of life and property while also accommodating a sufficiently wide range of project types and project geographies. To aid in the ranking process, quantitative and qualitative data were used by the RFPG to score each recommended FMP in 15 categories specified in TWDB’s Technical Guidelines for Regional Flood Planning (2021). These categories include assessment and scoring related to potential impacts and benefits from the FMP to flood risk, life and safety, the environment, agriculture, recreational resources, navigation, water quality, erosion, sedimentation, and implementation/permitting. This information is presented in **Appendix 5F** of *Chapter 5,* “Data Entry Table for TWDB Scoring of Flood Mitigation Projects”.

Detailed methods were specified in the RFP Technical Guidelines for assigning scores to each category; however, the method weighting each score to calculate a combined total score has not been specified at this time. As part of the scoring process, desktop analyses were performed to identify potential environmental and cultural resources impacts for each FMP. Any environmental benefits or potential permitting/implementation impacts associated with protected species/habitat or cultural resources in the area were identified Scoring Notes 12, 13, and 14 of the table in **Appendix 5F**.

Cultural Resources Background Reviews

Projects in Texas can come under the purview of the National Historic Preservation Act (NHPA) and the Antiquities Code of Texas (ACT). Both are administered by the Texas Historical Commission (THC), the State Historic Preservation Office in Austin, Texas. If an undertaking is federally permitted, licensed, or partially funded, the project must comply with Section 106 of the NHPA. The ACT requires projects on land owned or operated by a political subdivision of the State of Texas to assess whether the project will impact cultural resources that meet the requirements for listing as a State Antiquities Landmark (SAL). Projects under control of political subdivisions of the State of Texas, such as water agencies, counties, and city-owned entities, must comply with the ACT.

As part of the RFP impacts assessment for each recommended FMP, a cultural resources records review was performed to determine if any cultural resources were recorded within or immediately adjacent to the proposed project areas. To conduct this review, an archaeologist reviewed the relevant U.S. Geological Survey (USGS) 7.5-minute quadrangle maps on the Texas Archeological Sites Atlas (Atlas), the THC's archaeological database. This source provided information on the nature and location of previously recorded archaeological sites, locations of National Register of Historic Places (NRHP) districts and properties, sites designated as SAL, Official Texas Historical Markers, Recorded Texas Historic Landmarks, linear historic features, and cemeteries.

The results of the cultural resources background review are reflected in Scoring Note 14 of **Appendix 5F** as well as in the narratives for each FMP included in **Appendix 4D**. These cultural resources background reviews were based on preliminary project boundaries. Any future changes to project area boundaries, project impact footprints, and more detailed project designs may require additional background review that could result in changes to regulatory requirements.

Post Project and Future Risks Associated with FMPs

Flood recovery activities most often include debris removal from culvert entrances and bridges by cities, counties, and the Texas Department of Transportation (TxDOT), who maintain employees to perform assessment of damages and debris removal. The recommended FMPs for proposed detention/retention sediment basins will reduce this maintenance burden in downstream areas in addition to reducing or eliminating significant expenses associated with floodwater depositing sediment on agricultural land.

Six recommended FMPs, listed at the beginning of **Appendix 5B** of *Chapter 5*, include detention/retention storage basins with earthen embankments. Sediment storage capacity is included as a design criteria for structures expecting high sediment loads. The design of sediment storage capacity is a requirement for Natural Resources and Conservation Service (NRCS) dams, but it is not a Texas Commission on Environmental Quality (TCEQ) design requirment for dams.

Regular maintenance and inspections are required to maintain the intended minimum storage capacity and to identify potential risks associated with erosion, integrity, or performance of the structure. An annual maintenance cost of $10,000 was considered in the Benefit Cost Analysis (BCA) performed for each of these structures.

An Operation and Maintenance Manual and an Emergency Action Plan (EAP) with breach inundation hydraulic modeling and mapping will be required for any proposed structure classified as a dam per TCEQ regulations. These requirements will define the risk of potential catastrophic failure due to a dam breach and the potential for future increases to these risks due to lack of maintenance.

6.1.3 FMS Impacts

Each recommended FMS was reviewed to identify the potential for both positive and negative impacts. While the specific benefits associated with most FMSs cannot be quantifed until certain studies or designs have been completed, the FMS evaluation table presented in **Appendix 4E** of *Chapter 4* does quantify the existing risk in the general areas affected by each FMS, as well as flood risk benefits estimated for three of the FMSs which had relevant project-specific models or mapping available. The project-specific analyses performed for each of these three FMSs (including assessment of no negative impacts) is documented in **Appendix 5A** of *Chapter 5*. **Appendix 5A** also includes discussions on the remaining FMSs, explaining why they were not analyzed for project-specific benefits and why they are also estimated to have no negative impact to neighboring areas.

Based on results from the FMS evaluations documented in Appendix 4E, a summary of the overall flood risk indicators for existing conditions are provided in Table 6-3. These results summarize just the FMSs which were not analyzed for project-specific flood benefits and may contain overlapping areas. However, significantly overlapping areas and region wide FMEs were not included in the totals to avoid double counting certain areas, where possible.

Table 6-3. 1% Annual Chance Exposure for FMSs not Analyzed with Models or Mapping

Exposure Type	Quantity for Existing Conditions*
Structures (count)	34,830
Habitable Structures (count)	23,927
Population (count)	107,451
Critical Facilities (count)	71
Low Water Crossings (count)	822
Road Length (miles)	2207
Agricultural Land (acres)	77829

*Quantities are approximate and may contain overlapping between some FMSs

Results from the three project-specific FMS analyses documented in **Appendix 5A** have significant flood benefits, for the 1% annual chance event. These FMSs include two levee certification FMSs (one on the Rio Grande in El Paso County and one on Cibolo Creek in the City of Presidio). The third FMS analyzed includes complex coordination between EPWater and The U.S. Army to construct two flood control structures and maintain two existing dams on Fort Bliss Military base property. Combined results from these three FMSs are reported in **Table 6-4**.

Table 6-4. 1% Annual Chance Impacts for Analyzed FMSs (142000001, 142000004, 142000008)

Exposure Type	Pre-Project Conditions for Only Project-Specific FMSs	Post-Project Conditions for Only Project-Specific FMSs	Difference (Exposure Reduction from Only Project-Specific FMSs)
Structures (count)	12,082	1,121	10,961
Habitable Structures (count)	10,488	862	9,626
Population (count)	32,365	2,801	29,564
Critical Facilities (count)	38	8	30
Low Water Crossings (count)	39	7	32
Road Length (miles)	240	58	183
Agricultural Land (acres)	23,486	5,622	17,864

In general, FMSs do not typically fit into the FME or FMP categories for a variety of reasons. Below is a list of criteria that led to the decision to list a flood reduction action as an FMS rather than an FME or FMP:

- Studies, projects, and/or program development involving complex coordination between multiple entities (local, state, federal, or international);
- Associated with other FMEs, FMSs, or FMPs requiring a specified sequence of actions as part of a larger plan;
- Involve multiple projects with varying statuses of design/construction; and
- Include recurring costs.

Positive and negative impacts associated with these aspects of FMSs are discussed in this section.

Impacts of FMSs for Complex Coordination Between Entities

Potential negative impacts associated with complex coordination between multiple entities is the overalll strategies can be expensive and take a long time to implement. This could be related to the time needed to gain permits and approvals from multiple entities, or due to politically sensitive issues affecting international, federal, state, or local agreements.

Benefits to facilitating this type of coordination between entities are associated with a more holistic approach to flood planning. If all the necessary stakeholders are involved early on in making planning decisions that affect not only flood risk, but sometimes environmental and water supply issues, the overall plan is more likely to be successful and leverage the necessary resources to optimize benefits in multiple scoring categories that are documented in **Appendix 5F** of *Chapter 5,* “Data Entry Table for TWDB Scoring of Flood Mitigation Projects”.

For these reasons, FMSs typically include a significant amount of budget for stakeholder coordination. In addition, scopes of work specified in the FMS narratives included in

Appendix 4F include analyses of a strategy from differet stakeholder perspectives. For example, Presidio County Emergency Management identified drainage issues related to vegetation and sediment for communities located adjacent to the Rio Grande and FM 170, between the City of Presidio and Candelaria. This strategy involves coordination with TXDOT (FM170 drainage), local stakeholders (communities draining to the Rio Grande), and USIBWC (who has jurisdiction over projects affecting the Rio Grande).

Positive benefits of this strategy include improved roadway and local drainage for communities as well as reduced riverine flood risk for communities if sedimentation issues are identified and resolved. However, the RFPG has noted that this area is a protected habitat for birds, and a tourist attraction, which must be considered when evaluating alternatives for vegetative clearing. In addition, there are numerous wells in the floodplain between Candelaria and Presidio. These are anticipated to be shallow wells in unconfined riparian aquifers. Any effort to increase conveyance velocities could potentially negatively impact some of these wells. These potential issues are identified in the scope of the FMS to ensure these potential risks are identified in the data collection phase.

Impacts of FMSs with Multiple Phases and Associated FMEs, FMPs, or FMSs

If not carefully planned and monitored, potential negative impacts can result from FMSs that require associated studies, strategies, or projects to be completed prior to implementation, or which have different phases of design and construction on multiple project components of a larger plan. Either of these circumstances introduce complexities to the planning process, which is why it is important to clearly identify which phases should be constructed or studied sequentially. This can have cost saving benefits by avoiding re-work or investigation of solutions to a problem that has already been studied. For these reasons, associated FMEs, FMS, or FMPs are included in all evaluation tables, and are discussed within the applicable narratives. If not carefully planned and tracked, there could be the potential for negative impacts associated with increased costs or increased flood risk to neighboring areas. An example would be implementing a solution in one area before flood mitigation measures could be implemented that would prevent negative impacts to neighboring areas.

Impacts of FMSs with Recurring Costs

Most of the FMSs which include recurring costs are associated with flood early warning systems. These FMSs are also identified as emergency needs by the RFPG. While early warning has clear safety benefits associated with emergency response, significant recurring costs can be a financial burden too great for some of the small communities that need these services the most. For these reasons, multiple FMSs and FMPs are recommended for early warning systems or devices, which include a variety of options.

For example, FMP ID: 143000007 and FMS ID: 142000025 both address early warning in Marfa, where a death from a vehicle swept away at a low water crossing occurred in 2021. One option proposed for early warning includes a fixed cost (the FMP), and another includes a more robust system with recurring service fees (the FMS). Alternatively, FMS ID: 142000014 is recommended to apply a region-wide planning approach to select the optimum locations for new flood gages throughout Region 14. While recurring costs would still be necessary, if multiple entities are involved and benefit from the system, there are opportunities for cost sharing amongst larger groups or over-arching entities, making the strategy more affordable for all involved.

6.1.4 Summary of RFP Impacts

The methods applied to estimate potential increases in future conditions flood risk are documented in *Chapter 2 ("Flood Risk Analyses")*. The anticipated increased flood risk was modeled and mapped in the RFP based on the following:

- Best available flood risk modeling and mapping data;
- Future precipitation projections based on recent studies (for El Paso County watersheds only);
- Future land use planning documents (for El Paso County watersheds only); and
- Population projections throughout the region.

Based on these methods, a future 1% annual chance and 0.2% annual chance floodplain was developed for Region 14 and compared to the existing conditions inundation areas for corresponding flood frequency boundaries. The extent of increased 1% annual chance risk inundation area from existing to future conditions is **242** square miles (sq. mi.). The extent of increased 0.2% annual chance risk inundation area from existing to future conditions (separate from the 1% annual chance risk inundation area) is **181** sq. mi. These anticipated increases in flood risk are estimated to be reduced if the FMEs, FMSs, and FMPs recommended in the RFP are performed.

As noted in *Chapter 4*, there are 20 out of the 23 counties within Region 14 that are in need of flood risk identification or in need of updated flood risk mapping. The exceptions are El Paso, Ector, and Val Verde Counties, which have recent flood risk mapping. Out of these 20 counties which need current floodplain mapping, there are 39 cities or Census Designated Places (CDPs) within Region 14, which have a combined jurisdictional area of 175 sq. mi. To address this need, there are 9 FMEs recommended for cities with outdated or no floodplain mapping. These 9 cities have a combined total jurisdictional area of **110 sq. mi**. These cities were selected for SWMP FMEs based on an assessment of cities within the region with the greatest number of structures at risk of 1% annual chance flooding.

As noted in *Chapter 2*, there are approximately 40,121 structures at risk of 1% annual chance flooding in the region with a total population of 115,530. There are an additional 14,290 structures within the 0.2% annual chance flood risk inundation area (separate from the 1% annual chance risk inundation area) with a population of 47,985. The recommended FMPs and project-specific FMSs analyzed for flood risk benefits are estimated to remove **12,908** structures from the 1% annual chance flood risk boundary with a combined population of approximately **36,855**. The recommended FMPs are estimated to remove **2002** structures from the 0.2% annual chance flood risk boundary with an approximate population of **2,400**. Furthermore, the recommended FMPs and FMS are estimated to remove **50** low water crossings from the 1% annual chance flood risk boundary.

6.2 Contributions to and Impacts on Water Supply Development and the State Water Plan

Flood management and water supply management are fundamentally interrelated. Strategies and projects which reduce flood risk may also augment or diminish water availability. To address this, the RFP included an evaluation of potential impacts from the recommended FMSs and FMPs on water supply development or the State Water Plan (SWP).

This effort included:

- A region-wide summary and description of the contribution that the RFP would have to water supply development including a list of the specific FMSs and FMPs that would contribute to water supply; and
- A description of any anticipated impacts that the RFP FMSs and FMPs may have on water supply, water availability, or projects in the SWP.

6.2.1 Contributions to Water Supply Development

There are no recommended FMPs that would measurably contribute to water supply. However, there is one recommended FMS which is estimated to contribute to water supply (FMS ID: 142000002). In the RFP, this FMS is named, “Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine.” It is also recommended in the adopted State Water Plan (TWDB, 2022) as well as in the current Far West Texas Water Plan (TWDB, 2021) for Region E, where it is identified as Strategy E-2, “Irrigation and Recharge Application of Captured Rainwater Runoff.”

This nature-based solution in the City of Alpine involves three rainwater catchment basins centered around Kokernot Park to accomplish a shared goal of reducing stormwater in roadways while improving water quality, groundwater infiltration, and saving water supply costs associated with landscaping irrigation systems. The stormwater is proposed to be diverted from roadways to a natural swale that runs parallel to the road at a lower elevation using curb cuts. A series of basins with designed native plantings and excavated 16 inches (in.) to 24 in. deep are proposed to capture and infiltrate runoff.

While no hydrologic or hydraulic models or proposed drawings are currently available, runoff calculations and estimates of impervious cover were used to estimate total volume of water drained to each collection point in average and drought years. These estimates were based upon the following assumptions:

- 33% of the watershed area is impervious;
- 66% of the watershed area is permeable;
- < 0.2 in. rainfall event will not produce runoff;

- By design the system for high frequency (low intensity) events, the average annual effective rainfall is 7.2";
- 80% of the water falling on impervious surfaces will run off;
- 30% of the water falling on permeable surfaces will run off;
- A drought year is defined as 75% of average annual rainfall;
- A square foot of surface will shed 0.6 gallons per inch of rain; and
- Catchment areas were delineated for the three project locations based on Interferometric Synthetic Aperture Radar (IFSAR), with the following areas associated with each project location (project locations are provided in a figure included with the FMS narrative in **Appendix 4F**):
  - Location 1: 25 acres (ac.).
  - Location 2: 8.75 ac.
  - Location 3: 312.5 ac.

Based on the assumptions above, **Table 6-5** shows the expected volume of water that will drain to each of the 3 proposed catchment locations.

Table 6-5. Estimated Runoff Volume Drained to Each Basin in Average and Drought Years

Basin Location	Gallons (Average Year)	Gallons (Drought Year)	Acre-ft (Average Year)	Acre-ft (Drought Year)
1	2,187,583	1,640,687	6.7	5.0
2	765,654	574,241	2.3	1.8
3	27,344,790	20,508,593	83.9	62.9

The Water User Group identified for this strategy in the Region E Water Plan is the City of Alpine. State Water Plan identified the City of Alpine as the Sponsor of the recommended strategy. Based on the information provided by the project planners and the Far West Texas Water Plan (TWDB, 2021) for Region E, this strategy is expected to directly increases water supply volume available during droughts of record for the City of Alpine.

6.2.2 Impacts on the State Water Plan

The RFPG is required to list recommended FMSs or FMPs that, if implemented, would negatively impact and/or measurably reduce:

- Water availability volumes that are the basis for the most recently adopted SWP; and
- Water supply volumes if implemented.

For example, an FMS or FMP that involves reallocating a portion of reservoir storage that is currently designated for water supply purposes to be used, instead, for flood storage, would measurably reduce the water availability at that water source in the most recently adopted state water plan.

Sections 16.051 and 16.055 of the Texas Water Code direct the Executive Administrator of the TWDB to prepare and maintain a comprehensive State Water Plan. The overall goal of the State Water Plan is to address water supply needs at the local level with the consideration of balancing affordable water supply availability and conserving the State's natural resources. The State Water Plan serves as a flexible guide for the development and management of all water resources in Texas.

In February 1998, the TWDB adopted rules establishing 16 regional water planning areas. Similar to the regional flood planning process, each planning area is responsible for preparing a consensus-based Regional Water Plan (RWP) that will provide for the water needs of its region for the next 50 years. The TWDB incorporates the results of each RWP into the State Water Plan, which is updated in 5-year cycles. The most recent State Water Plan was published in 2022, incorporating results from the 2021 Regional Water Plans.

Of the 16 Regional Water Planning Regions in Texas, three regions – Regions E, F, and J – are within the bounds of the Upper Rio Grande Flood Planning Region, as shown in **Figure 6.1**.

Water Planning Region E

Region E ("Far West Texas") consists of seven counties from the Upper Rio Grande Flood Planning Region (URGFPR), including the Counties of Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, Presidio, and Terrell. Within the URGFPR, Region E overlaps three major aquifers (most notably the Hueco-Mesilla Bolson aquifer along the Rio Grande in El Paso and Hudspeth Counties) and six minor aquifers (including the Igneous aquifer in Jeff Davis, Brewster, and Presidio Counties). Due to the limited availability of surface water, a majority of the region relies on groundwater sources for water, while only a small portion of the water supply is sourced from controlled flows in the Rio Grande and direct reuse water. None of the recommended FMSs or FMPs are anticipated to negatively impact or measurably reduce the yield or operation of these existing aquifers or direct use sources in Region E.

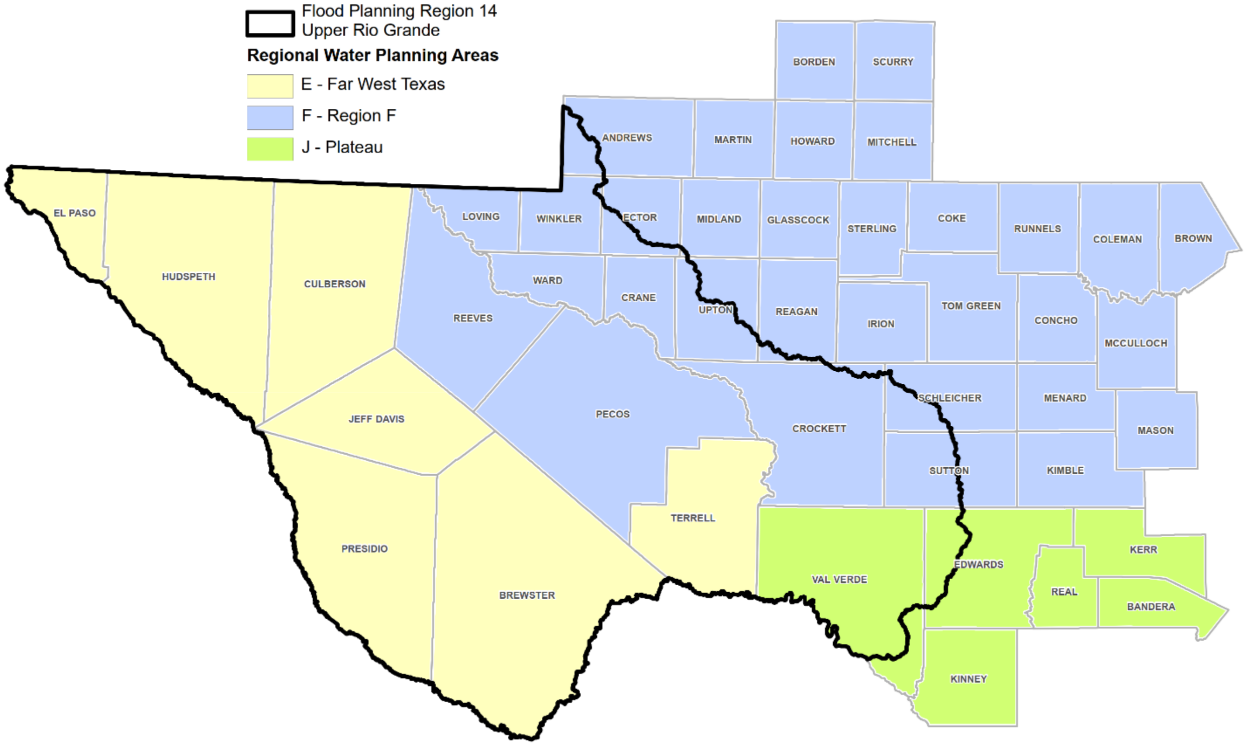

Figure 6.1 Region 14 Overlap with Water Planning Regions

Water Planning Region F

Region F consists of 14 counties from the URGFPR, including the Counties of Andrews, Crane, Crockett, Ector, Loving, Midland, Pecos, Reagan, Reeves, Schleicher, Sutton, Upton, Ward, and Winkler. Within the URGFPR, Region F overlaps two major aquifers – the Pecos Valley and Edwards-Trinity aquifers – as well as four other minor aquifers. The region also includes the 279,000 acre-foot Red Bluff Reservoir along the Pecos River in Loving and Reeves Counties and Lake Balmorhea along Toyah Creek in Reeves County. Based on historical water use data from the 2021 Regional Water Plan, approximately 75% of the region's water is supplied by groundwater, while approximately 15% of the water supply is sourced from surface water reservoirs and less than 10% comes from direct water reuse. None of the recommended FMSs or FMPs are anticipated to negatively impact or measurably reduce the yield or operation of these existing aquifers, reservoirs, or direct use sources in Region F.

Water Planning Region J

Region J ("Plateau") consists of two counties from the URGFPR, including the Counties of Edwards and Val Verde. Within the URGFPR, Region J overlaps with parts of the Edwards-Trinity aquifer. The region also includes the 3.4 million acre-foot Amistad Reservoir along the Rio Grande, which is managed jointly by the United States and Mexico in accordance with international treaties through the International Boundary and Water Commission (IBWC). Flows of the mainstream Rio Grande and Pecos and Devils Rivers provide only limited amounts of water for irrigation, livestock, and wildlife. None of the recommended FMSs or FMPs are anticipated to negatively impact or measurably reduce the yield or operation of the Amistad Reservoir or Region J aquifers.

Ecologically Unique River and Stream Segments

In addition, as part of the water planning process, each water planning group has the option to include recommendations for the designation of Ecologically Unique River and Stream Segments in their adopted regional water plan (31 TAC 357.43). Based on these recommendations, the Texas Legislature may then designate a river or stream segment to be of unique ecological value, restricting state financing for the construction of a reservoir along the segment. In the 2021 Region E RWP, ten stream segments within the boundaries of state-managed properties were recommended for the ecologically unique designation, eight of which have received designation by the Texas Legislature.[2]

In particular, two of the recommended ecologically unique stream segments overlap with one FME and one FMS in the Regional Flood Plan, including the Alamito Creek segment (FME ID: 141000008) and the Rio Grande Wild and Scenic River segment (FMS ID: 142000006). The segment of Alamito Creek that is protected is within the boundaries of Big Bend Ranch State Park, and the Rio Grande Wild and Scenic River segment is within Big Bend National Park. Since both of these flood solutions are associated with initial studies and not the implementation of projects, neither is estimated to be affected by the ecologically unique designation, which restricts financing for the construction of reservoirs along protected segments.

While the Alamito Creek study will investigate potential locations for sediment basins, the protected stream segment will be eliminated from consideration due to this restriction. The recommended FMS involving the study of binational streamflow recommendations for the Big Bend Reach of Rio Grande/Rio Bravo will not consider any alternatives associated with constructing a reservoir on the Rio Grande.

Overall Impact on the State Water Plan

Based on the evaluations of recommended FMSs and FMPs previously discussed in *Chapter 5*, no measurable negative impacts are anticipated on water supply, water availability, or projects in the State Water Plan.

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[2] In the 2021 Regional Water Plans, both Region F and Region J decided to not recommend any river or stream segments as ecologically unique.

Chapter 7: Flood Response Information and Activities

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7. Flood Response Information and Activities

This chapter provides a summary of emergency management activities across the Upper Rio Grande Region, addressing the preparedness, response, and recovery phases of flood emergencies. Information was gathered based on agency coordination, survey responses, and hazard mitigation planning documents. Survey responses were obtained from the RFP stakeholder survey discussed in *Chapter 10 ("Public Participation and Plan Adoption"),* through which stakeholders and participants were asked to share the emergency response measures that their jurisdiction currently uses or plans to implement for flood events.

Chapter 8 ("Administrative, Regulatory, and Legislative Recommendations") included in this Flood Plan offers recommendations by the URGRFPG for consideration by the Texas Legislature, TWDB, TCEQ, other water planning regions and all stakeholders and participants in Texas' regional and state flood planning efforts which propose new recommendations that could potentially be incorporated as a flood response activity.

7.1 Flood Emergency Management Overview

Emergency management, as defined by FEMA, addresses disasters as recurring events with four phases: Mitigation, Preparedness, Response, and Recovery. Definitions and examples of each phase are listed in the TWDB *Technical Guidelines for Regional Flood Planning* document, as shown in **Table 7-1**.

Table 7-1. Flood Emergency Management Phases

Phase	General Definition	Example Activities (not an exhaustive list)
Flood mitigation	"The implementation of actions, including both structural and non-structural solutions, to reduce flood risk to protect against the loss of life and property." (Title 31 Texas Administrative Code §361.10(k))	See *Technical Guidelines for Regional Flood Planning* Section 3.2(2-3) examples of structural and non-structural Flood Mitigation Projects.
Flood preparedness	Actions, aside from mitigation, that are taken before flood events to prepare for flood response activities	Developing emergency management and evacuation plans, preparing staging areas, and building flood early warning systems
Flood response	Actions taken during and in the immediate aftermath of a flood event	Conducting evacuations, providing shelters, closing flooded roads, and operating flood warning systems
Flood recovery	Actions taken after a flood event involving repairs or other actions necessary to return to pre-event conditions	Repairs to damaged infrastructure, storm event debris removal

Flood mitigation is the primary focus of the regional flood planning process with the outcome of identifying and recommending FMEs, FMSs, and FMPs by the RFPG. As discussed in *Chapter 5 ("Evaluation and Recommendation of Flood Solutions")*, several FMSs and FMPs were also recommended pertaining to flood preparedness, such as the installation of early warning systems and automatic low water crossing road closure gates. The remainder of this chapter focuses on existing regional activities related to the latter three phases of flood emergency management – preparedness, response, and recovery.

The figure below provides a visual summary on the responses received from the entities regarding the coordination happening before, during and after flood events, which correspond to the preparedness, response, and recovery activities, respectively.

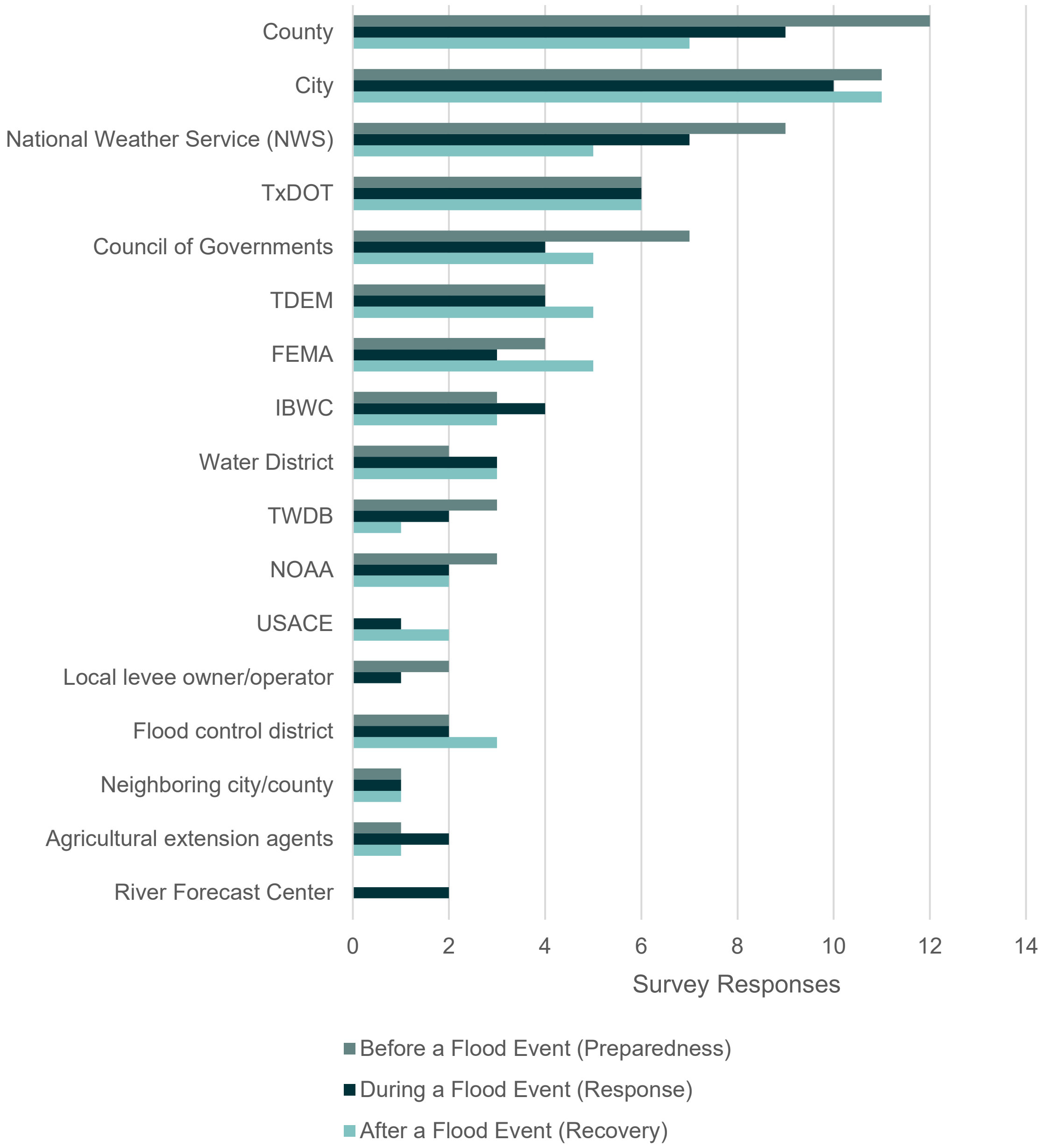

Figure 7-1. Entity Coordination Before, During, and After Flood Event

7.2 Relevant Planning Documents

Chapter 1 Section 1.9 and Appendix 1D of the RFP include a summary of existing planning documents pertaining to the Region 14 flood plan. Several of these documents are relevant to flood preparedness activities, including:

- Rio Grande Council of Governments (RGCOG) Multi-Action Hazard Mitigation Planning (Counties of Brewster, Ector, El Paso, Hudspeth, Jeff Davis, and Presidio)
- El Paso County Hazard Mitigation Action Plan
- City of El Paso High Hazard Dams Emergency Action Plan (EAP)
- Elephant Butte & Caballo Dams EAP
- Federal Flood Assessment Conference Recommendations and Proceedings
- Emergency Action Plan, City of El Paso High Hazard Dams

7.3 Flood Preparedness Activities

Flood emergency preparedness activities include the development of emergency management and action plans, hazard mitigation plans, and the building of flood early warning and alert systems, flood gages, or automatic low water crossings.

Several Emergency Action Plans (EAPs) have been developed for dams throughout the region including the City of El Paso High Hazard Dams EAP (2008), the Red Bluff Dam EAP (2021), and the Elephant Butte & Caballo Dams EAP (2018).

In addition, Hazard Mitigation Plans (HMPs) have been developed for the Counties of Brewster, Ector, El Paso, Hudspeth, Jeff Davis, and Presidio. These HMPs, while primarily mitigation-focused, encourage interregional coordination with key flood planning stakeholders and assist with flood preparedness by reducing emergency response demands during a flood.

In addition to these planning documents, El Paso currently utilizes a flood early warning system based on early warnings provided by a dedicated meteorologist with coordination between EPWater, EPCWID1, and the operators of Caballo Dam in New Mexico. To manage flows along the Rio Grande, the UIBWC has a Water Accounting Division to oversee flow data and assist with reservoir operation criteria during flood events. The U.S. Army Corps of Engineers (USACE) informs communities of the risks of living behind levees by maintaining levee information in the National Levee Database, performing Levee Risk Screening, and communicating the results to sponsors and owners of levee systems as well as the community.

Chapter 5 ("Evaluation and Recommendation of Flood Solutions") of this RFP includes six recommended FMPs to develop or improve flood early warning systems for the City/County of El Paso and the Cities of Pecos, Alpine, Presidio, Fort Stockton, and Marfa. A general FMS is also recommended for the entire region to prioritize, fund, and develop new flood gages (rainfall and/or stream gages) to support flood warning system improvements. Lastly, an FMP is recommended to install automatic low water crossing gates along Alamito Creek in Marfa, including the installation of a monitoring and early detection gage.

A summary of region-specific flood preparedness activities reported through the RFP stakeholder survey is provided in **Figure 7-2**. The majority of the respondents currently use social media as a measure to prepare for flood events, whereas the largest preparedness measure planned to be implemented by respondents is to implement automatic low water crossings.

Communication between entities across the region is essential before, during, and after storm events. While many counties have a Reverse 9-1-1 emergency text system for county residents to receive flood warning messages, there is interest in advancing communication and cooperation across the region to improve the safety of residents of the region and improve the accessibility of emergency response during storm events.

In the City of El Paso, residents at risk of flooding are offered the resource of free sandbags to fortify their properties from flooding when storm events are anticipated for the city. While this is a temporary solution to their need for infrastructure improvements, it has served as a tangible community education activity. Public understanding of flood risk is an important component of increasing the resiliency of the community from the risks of flood related injuries.

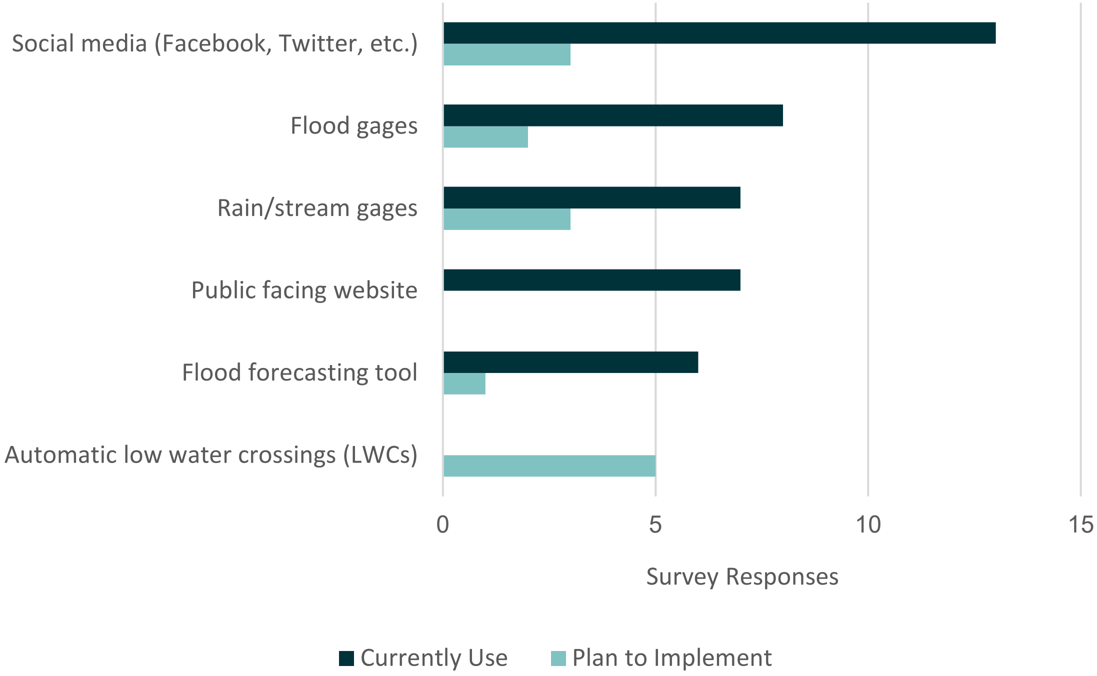

Figure 7-2. Flood Preparedness Measures Used by Survey Respondents

Additional information is provided below regarding the National Weather Service (NWS), National Oceanic and Atmospheric Administration (NOAA), and the El Paso County Hazard Mitigation Plan.

National Weather Service (NWS) and NOAA

The NWS is currently in the process of implementing Flood Early Warning System (FEWS) flood forecast system, called the Community Hydrologic Prediction System (CHPS). NOAA/NWS RFCs are emphasizing development of improved streamflow routing with the use of dynamic, unsteady streamflow routing, including near real-time event-based flood inundation mapping, within CHPS. This is a more reliable and accurate way to understand the behavior of flood patterns to anticipate when these will occur.

NOAA Flood Safety Awareness Safety and Preparedness

The NOAA‘s page includes information about safety awareness and preparedness. Good preparation and knowing what to do in a flood will increase people’s safety and chances of survival. It can also help minimize potential flood damage and accelerate recovery efforts. The Flood Safety Brochure offers information to public on what to do before, during, and after a flood.

El Paso County Hazard Mitigation Action Plan

The El Paso County Hazard Mitigation Action Plan identifies several flood hazards throughout the county and has developed mitigation actions. These actions are listed in **Table 7-2** and provide additional information related to the county’s flood preparedness goals and current activities.

Table 7-2. El Paso County Hazard Mitigation Plan – Major Actions

Type	Action
Dam Failure	Implement education and awareness program utilizing media, social media, bulletins, flyers, etc. to educate citizens of hazards that can threaten the area and mitigation measures to reduce injuries, fatalities, and property damages.
Dam Failure	Acquire and install generators with hard wired quick connections at all critical facilities.
Dam Failure	Harden/retrofit critical facilities to hazard-resistant levels.
Dam Failure	Create a map of inundation for the County operated Dams.
Dam Failure	Create an alert system for residents notifying them of potential dam failure.
Dam Failure	Implement the recommendations of the El Paso City / County EAP regarding dam safety.
Dam Failure	Enhance the area-wide Emergency Notification System (Everbridge).

Type	Action
Dam Failure	Install and update EZInet at the 911 Communication Center. It will allow for the organization upgrade from Enhanced 911 (E911) to Next Generation 911 (NG911).
Dam Failure	Develop alternative evacuation routes/plans and designate emergency thoroughfares, particularly in areas with limited capacity. Educate citizens on evacuation routes and procedures.
Dam Failure	Distribute NOAA bulletins.
Flood, Dam Failure	Inspect and implement building requirements for critical infrastructure buildings to be protected from natural hazards. Harden/retrofit critical facilities to hazard-resistant levels.
Flood, Dam Failure	Create an evacuation plan in case of dam failure or flooding condition
Flood, Dam Failure	Acquire/relocate new public buildings to be out of high hazard areas.
Flood	Create a comprehensive map with identified hazards and potential alert zones.
Flood	Inspect, monitor, and educate owners of arroyos (drywashes) to prevent illegal dumping, remove overgrown vegetation and re-establish flow paths within private property.
Flood	Update 2010 Storm Water Master Plan.
Flood	Implement/construct projects identified by storm water master plan.
Flood	Upgrade alert systems and notification to the public at low water crossings.
Flood	Improve current programs for clearing debris from drains, culverts, and ponds by purchasing new equipment.
Flood	Increase drainage capacity, add stormwater detention and/or retention basins as deemed necessary to reduce flood risk.
Flood	Reduce urbanized flooding conditions by creating channels and upgrading pump stations to remove standing water.
Flood	Require that electric utility lines be buried when new roads are constructed or reconstructed.

Type	Action
Flood	Adopt and enforce ordinance that meet minimum Federal and state requirements to comply with NFIP.
Flood	Stabilize arroyos in steep locations and that show signs of erosion with native vegetation.
Flood	Acquire and demolish repetitive loss properties. Acquire high risk vacant land and maintain as open space.
Flood	Excavate stormwater detention basins to increase capacity.
Flood	Increase capacity for conveyance of stormwater away from areas of ponding.
Flood	Update Flood Damage Prevention Ordinances when new FIRMs are adopted (new preliminary FIRMS are currently under review).
Flood	Adopt and implement a routine tree trimming program that clears tree limbs near power lines and/or hanging in right-of-way; Remove dead trees from right-of way and drainage systems on a scheduled basis.
Flood	Acquire and install generators with hard wired quick connections at all critical facilities.
Flood	Maintain certification in the National Weather Service Storm Ready Program
Flood	Remove dead trees from right-of way and drainage systems on a scheduled basis. Maintain Ponding area for proper drainage.
Flood	Educate community on the dangers of low water crossings through the installation of warning signs and promotion of "Turn Around, Don't Drown" Program.
Flood	Undertake a comprehensive drainage study for the Socorro/San Antonio St. area
Flood	Upgrade stormwater system in high-risk areas throughout the city.
Flood	Construct regional pond in a portion of 1445 San Antonio St. Implement drainage improvements such as drainage inlets, approximately 740-ft of 30-inch reinforced concrete pipe (RCP) storm sewer system, pavement replacement, perimeter fencing, and an access driveway. The capacity of this public regional pond is 11.54 Ac-ft, which completely retains the total expected storm water flow of 10.4-Ac-ft from a 100-year storm event.

Type	Action
Flood	Update Flood Damage Prevention Ordinances when new FIRMs are adopted (new preliminary FIRMS are currently under review).
Flood	Implement education and awareness program utilizing media, social media, bulletins, flyers, etc. to educate citizens of hazards that can threaten the area and mitigation measures to reduce injuries, fatalities, and property damages.
Flood	Incorporate higher standards for hazard resistance in local application of the building code.
Flood	Implement a flood awareness program by providing FEMA/NFIP materials to mortgage lenders, real estate agents and insurance agents and place them in local libraries.
Flood	Adopt regulations to limit amount of impervious cover in conjunction with new development.
Flood	Incorporate requirements to ensure stormwater infrastructure is added to all roadway projects.
Flood	Increase drainage capacity; add stormwater detention and/or retention basins as deemed necessary to reduce flood risk.
Flood	Add requirement to Building Permit application that applicant signify whether the location is part of a Special Flood Hazard Area.
Flood	Require that electric utility lines be buried when new roads are constructed or reconstructed.
Flood	Improve stormwater drainage through enhanced maintenance.
Flood	Trim or prune trees along roadways to prevent interference with power lines during high winds.

7.4 Flood Response Activities

In response to flooding emergencies, several communities in the region reported using a public alert or alarm system to broadcast alarms via an outdoor siren or send notifications via text messaging, website, or social media. Based on information provided through the RFP stakeholder survey, the City of Pyote uses a public alert system, Crockett County utilizes alarms and texting notifications, City of Sonora uses the Nixle Alert system, and the Town of Horizon Town of Horizon uses a flood warning system through notifications on the City website and social media.

Cities and counties coordinate with the Texas Department of Transportation (TxDOT) on road closures and traffic message boards. Emergency managers rely on publicly available information from the National Oceanic and Atmospheric Administration (NOAA), the National Weather Service (NWS), and the United States Geologic Survey (USGS). The Bureau of Reclamation El Paso Field Division (EPFD) works with offices and divisions from New Mexico to regulate releases from the Elephant Butte and Caballo Dams to minimize flows during a flood event.

A summary of region-specific flood response activities reported through the RFP stakeholder survey is provided in **Figure 7-3**.

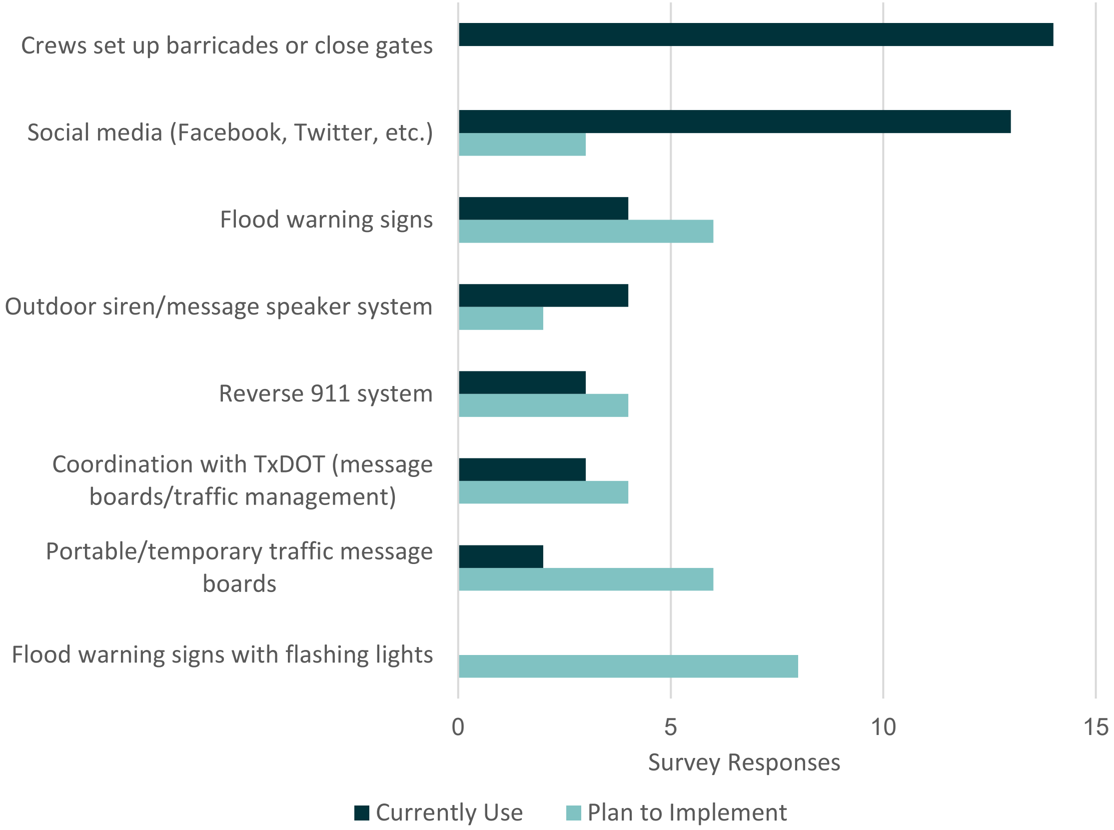

Figure 7-3. Flood Response Measures Used by Survey Respondents

7.5 Flood Recovery Activities

Flood recovery activities most often include debris removal from culvert entrances and bridges by cities, counties, and TxDOT. Due to the region’s arid landscape, sedimentation from arroyos is a common issue after floods, especially in El Paso where arroyos from the Franklin Mountains frequently deposit sediment impacting downstream culverts, roadways, agricultural land, and irrigation system infrastructure. In the event of significant flood damages, flood damage assessment and recovery efforts are supported with assistance and resources by FEMA Region VI and the Texas Division of Emergency Management (TDEM) Region 4. The roles of each of these agencies are described in further detail below.

FEMA National Disaster Recovery Framework

The National Disaster Recovery Framework (NDRF) enables effective recovery support to disaster-impacted states, tribes, territorial and local jurisdictions. The primary value of the NDRF is its emphasis on preparing for recovery in advance of disaster. It is always in effect, and elements can be implemented at any time. They focus on the following factors that can help ensure a more effective recovery process:

- Comprehensive Scope
- Effective Decision-Making and Coordination
- Integration of Community Recovery Planning Processes
- Well-Managed Recovery
- Proactive Community Engagement, Public Participation, and Public Awareness
- Effective Financial and Program Management
- Organizational Flexibility
- Resilient Rebuilding
- Health Integration

The FEMA Region VI Mitigation Division’s role includes the following items:

- To assist the local governing bodies in recording and assessing the location and extent of damages from the extreme weather event in the declared disaster area(s).
- To provide recommendations for actions to take following a storm event. As part of their recommendations as part of recent Federal Flood Assessment Conference Recommendations and Proceedings (documented in Chapter 1 Appendix Table 1D), FEMA Region VI’s assessment team made the following recommendations:
    - That horizontal vertical control data be gathered and complied for identified high water mark locations.
    - That a flood inundation map or a map indicating the areas that received flood damage be developed.
    - That areas that received severe flooding damage, and especially areas that are experiencing growth and development and/or re-development, be studied using technical hydrology and hydraulic floodplain analysis to determine appropriate velocities, potential flooding problem locations and flooding depths.
    - That flood frequencies be determined by damage center location or drainage basin for approximately 10 locations, based on the most intense storm of that area.

Texas Division of Emergency Management (TDEM)

The Texas Division of Emergency Management (TDEM) coordinates the state emergency management program, which ensures the state and its local governments respond to and recover from emergencies and disasters and implement plans and programs to help prevent or lessen the impact of emergencies and disasters. TDEM implements programs to increase public awareness about threats and hazards, coordinates emergency planning, provides an extensive array of specialized training for emergency responders and local officials, and administers disaster recovery and hazard mitigation programs in the State of Texas. Some of the response and short term activities provided are as follows:

- EOC support upon request;
- Assist EMC with short/long-term recovery needs;
- DSO development assistance;
- Debris management guidance;
- Disaster finance guidance;
- Procurement and contract guidance;
- LTRG, COAD and VOAD engagement;
- Volunteer and donations management support;
- Mass Care (evacuation/sheltering);
- Road assessment and repair prioritization assistance;
- Damage assessments (rapid/self-reporting survey);
- Facilitate collection of damage data through multiple platforms; and
- Facilitate transfer of damage data to TDEM Recovery Coordinators to streamline potential Joint Preliminary Damage Assessments with federal partners post-disaster.

Chapter 8: Administrative, Regulatory, and Legislative Recommendations

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8. Administrative, Regulatory, and Legislative Recommendations

This chapter outlines recommendations developed by the Regional Flood Planning Group (RFPG) for the following items required for Task 8:

1. Legislative recommendations that the RFPG considers necessary to facilitate floodplain management and flood mitigation planning and implementation.
2. Other regulatory or administrative recommendations that the RFPG considers necessary to facilitate floodplain management and flood mitigation planning and implementation.
3. Any other recommendations that the RFPG believes are needed and desirable to achieve its regional flood mitigation and floodplain management goals. F
4. Recommendations regarding potential, new revenue-raising opportunities, including potential new municipal drainage utilities or regional flood authorities, that could fund the development, operation, and maintenance of floodplain management or flood mitigation activities in the region.

In this regard, the Upper Rio Grande Regional Flood Planning Group (URGRFPG) established Subcommittee 4 to develop recommendations for consideration by the URGRFPG.

The following recommendations are offered by the URGRFPG for consideration by the Texas Legislature, TWDB, TCEQ, other water planning regions and all stakeholders and participants in Texas’ regional and state flood planning efforts. Each policy includes background information, policy statement(s), and action(s) the URGRFPG recommends.

8.1 Development of Recommendations

8.1.1 Regional Flood Risk

Per the risk analysis results presented in Chapter 2 and 4, by far the largest risks of flood impact in the Upper Rio Grande Flood Planning Region (URGFPR) are located in El Paso County. Map 15 ("Greatest Flood Risk") in Chapter 4 depicts the location of the 31 cities/ CDPs in the URGFPR with the highest numbers of buildings estimated to be at risk of inundation in the 1% AC flood. Eight of these 31 (City of El Paso, City of Socorro, Fort Bliss CDP, Canutillo CDP, City of San Elizario, Homestead Meadows North CDP, Fabens CDP, and Prado Verde CDP) are located within El Paso County and have in aggregate approximately 18,000 buildings estimated to be at risk of inundation in the 1% AC flood. The remaining 23 cities/ CDPs in the URGFPR have in aggregate approximately 11,000 buildings estimated to be at risk of inundation in the 1% AC flood. El Paso County also is differentiated from the broader region by a unique combination of issues described in Section 8.2.1 and 8.2.2.

8.1.2 Formation of Subcommittee 4

The Upper Rio Grande Regional Flood Planning Group (URGRFPG) established Subcommittee 4 to develop recommendations for this chapter for consideration by the URGRFPG. Subcommittee 4 includes these members of the RFPG:

- Gilbert Saldana, Voting Member, Counties
- Anita Keese, Non-Voting Member, Texas Commission on Environmental Quality
- Omar Martinez, Voting Member, Water Districts, Chairman
- Gisela Dagnino, Voting Member, Water Utilities
- Levi Bryand, Voting Member, Water Utilities

8.1.3 Subcommittee 4 Activities

Initial Development

The initial engagement with the RFPG on Task 8 occurred during the identification of FMEs and FMSs during execution of Task 4B(a-b). During the third meeting of Subcommittee 3 on November 10, 2021, a series of presentations were made by regional stakeholders (El Paso Water Utility/ City of El Paso, EPCWID1, USIBWC1) that related experience in recent major floods, occurring in 2006 and 2021 in El Paso County, and occurring in 2008 in Presidio. Hudspeth County also related the needs of that county. The meeting developed a consensus list of needs arising from the related experiences, to include needs associated with agency coordination, regulatory shortfalls, and jurisdiction-specific floodplain management resource (staffing, regulatory) shortfalls. The FMEs and FMSs developed to meet these needs provided the starting inputs to these Task 8 recommendations. Input from the broader URGRFPR (beyond Hudspeth County and City of Presidio) was notably absent from this initial list of identified needs and associated recommended FMEs/FMS.

Preparation for Subcommittee 4 Meetings

In order to improve input from stakeholders across the broader region, there were several parallel efforts on the part of the RFPG.

Individual Meetings with Stakeholders. Direct approaches were made to the cities/ CDPs with over 400 buildings-at-risk in the 1% AC flood (see Map 15, Chapter 4). Meetings were held with smaller cities/ CDPs absent from the Subcommittee 3 meetings (Socorro, Pecos, Alpine, Kermit, Sonora, San Elizario, Presidio). These meetings provided context and prompts for effective participation in the regional Subcommittee 4 meetings.

Data Collection Meeting with Large Stakeholder. A meeting with held with Milton Rahman, Harris County Engineer on March 29, 2022, to solicit general input on regulatory strategies used by the County and their legal basis. This information was relayed to Gilbert Saldana, El Paso County in Subcommittee 4.

Data Collection meetings with Small Stakeholders. Prior to the Subcommittee 4 meetings, interviews were conducted with state-wide entities of similar population size to those invited to attend from the URGRFPG to get their feedback on Task 8. A summary of those entities interviewed along with their 2020 Census population noted in parentheses for comparison purposes is provided below:

- City of Marlin (5,551)
- Falls County (16,968)
- Nueces County (353,178)
- City of Alvin (27,140)
- Bordon County (631)
- Martin County (5,676)
- Mitchell County (8,685)

Although the population of Nueces County and City of Alvin, respectively, is greater than the entities targeted for this meeting, they provided an interesting perspective and additional feedback for the subcommittee to consider.

8.1.4 Subcommittee 4 Meetings (June 16, 2022)

Two Subcommittee 4 meetings were held on June 16, 2022; one for stakeholders located within El Paso County, and one for stakeholders representing the broader region. The agenda specified discussion for four Task 8 areas for recommendation: (1) legislative action, (2) administrative/ regulatory action, (3) other related actions, and (4) procedural funding actions/ ideas. During the discussion with the meeting attendees, each of the three categories for action (floodplain management, flood mitigation planning, and flood mitigation implementation) were addressed within each of the four Task 8 areas.

Subcommittee 4: El Paso County-Focused Meeting

Stakeholder attendees at the first meeting (including Subcommittee 4 members) are noted below.

- Annette Gutierrez, Rio Grande Council of Governments, Executive Director
- Omar Martinez, Water Districts, Chair RFPG Subcommittee 4
- Gilbert Saldana, Counties, Voting Member
- Gisela Dagnino, Water utilities, Voting Member
- Anita Keese, Texas Commission on Environmental Quality, Non-Voting Member
- Peggy O'Brien, Rio Grande Council of Governments, Local Governments Manager
- Levi Bryand, Water utilities, Voting Member
- Richard Bagans, Texas Water Development Board, Planner

These attendees include representatives from these El Paso County jurisdictions: El Paso Water, El Paso County, Rio Grande COG, and EPCWID1. Reference **Appendix 8A** for a copy of the presentation slides from the first meeting of Subcommittee 4.

Subcommittee 4: Broader Planning Region (outside El Paso County)-Focused Meeting

To obtain feedback from the broader planning region, a number of rural counties (Hudspeth, Presidio, Reeves, Brewster, and Winkler) and cities (Pecos, Kermit, Sonora, Alpine, Marfa, Fort Stockton, and Presidio) were invited to attend the second meeting; individual emails were sent out in advance by the COG along with follow up phone calls prior to the meeting. Stakeholder attendees to the meeting (including Subcommittee 4 members) are noted below.

- Annette Gutierrez, Rio Grande Council of Governments, Executive Director
- Omar Martinez, Water Districts, Chair RFPG Subcommittee 4
- Jeff Bennett, Environmental Interests, Voting Member
- Richard Bagans, Texas Water Development Board, Planner
- Taylor Nordstrom, AECOM Engineering Consultant,
- Anita Kreese, Texas Commission on Environmental Quality, Non-voting member
- Leo Hung (Guest), Reeves County, Judge
- Jerry D. Bullard (Guest), Reeves County, Emergency Management Coordinator
- Arturo Fuentes (Guest), City of Sonora, City Manager
- Elijah Casas, Texas General Land Office, Community Outreach Coordinator
- Judy Lucio, Texas Division of Emergency Management, Chief for Disaster Finance
- Peggy O'Brien, Rio Grande Council of Governments, Local Governments Manager
- Cinderela Guevara, Presidio County, Judge
- Joanna Mackenzie, Hudspeth County, County Administrator
- Marci Tuck, City of Alpine, Grant Writer

Reference **Appendix 8B** for a copy of the presentation slides from the second meeting of Subcommittee 4.

8.2 Recommendations

As noted above, the administrative, regulatory, and legislative issues within the Upper Rio Grande Flood Planning Region (URGFPR) can be best understood by separating the jurisdictions geographically: those within El Paso County, and those outside El Paso County. Regional Flood Planning Group (RFPG) recommendations to address administrative, regulatory, and legislative issues are therefore provided separately for these two geographic regions.

8.2.1 Recommendations from Stakeholders Within El Paso County

Those jurisdictions located within El Paso County have a unique combination of these flood-related issues:

- Large dense urban area with a large associated population-at-risk.
- A wide range of property values.
- Risk from flooding of the Rio Grande. This risk is jointly managed: from the riverine side by the US International Boundary Water Commission (IBWC); and from the interior drainage side (i.e., the side of river levee intercepting drainage into the river).
- Risks uniquely associated with drainage from steep mountainous terrain (sediment/ debris transport).
- Risks uniquely associated with federal management of the US Army at Fort Bliss (i.e., unexploded ordinance on firing ranges), which includes a large portion of the tributary watershed of the city/ county.
- Risks uniquely associated with “mesa” terrain: large, very flat, sparsely vegetated watersheds that drain to steep arroyos that drop into the Rio Grande terrace.
- Risks uniquely associated with an historically (and currently) irrigated riverine terrace. This terrace is traversed by feeder canals that interrupt and divert stormwater, and irrigation drains designed for irrigation return flows but also intercept and convey stormwater. Addressing flood risks associated with these structures involves close coordination between the El Paso County Water Improvement District No. 1 (EPCWID1) and the cities in El Paso County, and El Paso County itself.
- Risks associated with continuous new development.

In this area, the variety of terrain creates challenges to floodplain management and setting appropriate drainage standards, and the unique combination of involved agencies (the usual range of permit agencies, plus USIBWC, US Army and EPCWID1) creates challenges to providing the necessary multi-agency planning, permitting, and implementation. The recommendations provided in **Table 8.1** through **Table 8.4** below are primarily focused on addressing the above unique challenges. These recommendations are largely in the form of recommendations for future, more detailed action by the RFPG, involving the collective actions of stakeholders to develop specific language to address the identified issue.

Table 8.1 Legislative Recommendations (El Paso County Area Stakeholders)

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Floodplain Management	-	Burden on sponsors for levee certification is excessive	Communicate with the federal government about lessening the burden for levee certification
Floodplain Management	-	Counties perceive lack of ability to regulate drainage outside of FEMA floodplains	Counties to consider adoption of drainage requirements beyond areas that are in flood zone (e.g., within County Road ROWs outside floodplains)
Flood Mitigation Implementation	-	Revolving state funds are not self-sustaining	Create specific revolving state funds to provide matching to federal dollars for FMPs

Table 8.2 Regulatory/Administrative Recommendations (El Paso County Area Stakeholders)

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Floodplain Management	FMS15	Identified potential design standard improvements	Develop recommendations for inlets, curb cuts, on-site storage, sediment controls at inlets, discharges into irrigation drains, 2D modeling (include freeboard requirements)
Floodplain Management	FMS16	Erosion in natural channels	Develop recommendations for design guidelines for erosion mitigation in arroyos
Floodplain Management	FMS17	Issues with outfalls into Rio Grande	Develop guidelines for design of outfalls
Floodplain Management	-	EPCWID1 is concerned with the risk of loss of Clean Water Act exemptions associated with stormwater accumulated in irrigation drains	Recommend that USACE develop clear guidance relevant to situation in El Paso County to ensure exemption is retained
Floodplain Management	-	There are uncertainties in El Paso County associated with the capture of stormwater with the potential for reuse	Investigate permitting issues and develop clear guidance to ensure compliance and optimize opportunities for capture/blend
Floodplain Management	-	Improve coordination with other jurisdictions to facilitate floodplain management (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate floodplain management involving multiple jurisdictions. (e.g., create consensus requiring no adverse impact)
Floodplain Management	-	Codify use of most restrictive standard where conflicts exist	Revise local standards to codify this requirement and address adverse impact

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Floodplain Management	-	Drainage component is not part of certificate of compliance (In Ector County there is no review of any building or development permit, no component for flood mitigation)	Counties should have the option to be empowered to enforce drainage requirements within the requirements for a certificate of compliance
Flood Mitigation Planning	FMS9	ATV-induced erosion on state lands	Review existing regulatory/ admin controls and effectiveness. Recommend changes
Flood Mitigation Planning	-	Improve coordination with other jurisdictions to facilitate (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate flood mitigation planning involving multiple jurisdictions.
Flood Mitigation Implementation	-	Improve coordination with other jurisdictions to facilitate (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate flood mitigation implementation involving multiple jurisdictions.
Flood Mitigation Implementation	-	Coordinate with State Historic Preservation Office to develop acceptable mitigation practices for the El Paso region	Develop county-wide procedures for accelerating compliance, reducing delays in projects due to interaction with the historic preservation office.
Flood Mitigation Implementation	-	Shortfalls with use of existing El Paso area MOUs with State Historic Preservation Office	Negotiate with the State Historic Preservation Office to address shortfalls

Table 8.3 Fundraising Recommendations (El Paso County Area Stakeholders)

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Flood Mitigation Implementation	FMS1	Certification of Levees in El Paso County	Establish formal involvement of relevant El Paso County Stakeholders
Floodplain Management	-	Lack of fees for County Drainage	Provide regional support to interested counties to investigate feasibility of forming a county stormwater utility
Floodplain Management	-	Federal grants have a monetary-based threshold requirement that puts areas such as El Paso (with comparatively low property values in flood-prone areas) at a disadvantage to compete with federal flood mitigation funds.	Develop regional recommendation to FEMA to reconsider monetary-based damage threshold requirements to compete for federal flood mitigation grants.

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Flood Mitigation Planning	-	Collect appropriate data to present a complete plan to obtain HUD funds for flood planning. Prepare documentation for post-disasters	Increase coordination between City-County-and HUD to develop procedures and databases which meet HUDs requirements
Flood Mitigation Implementation	-	Lack of regional assistance to available resources to apply for funds identifying funding sources	TWDB should create an online resource so that regions have assistance to apply for funds and identifying funding sources

Table 8.4 Other Recommendations (El Paso County Area Stakeholders)

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Floodplain Management	FME1	Maintenance of Rio Grande Channel in El Paso County	Formal involvement of El Paso County Stakeholders
Floodplain Management	-	Coordinate with TxDOT to get clarity on maintenance at specific locations within jurisdictions	Create an MOU to clarify maintenance responsibilities at specified crossings
Floodplain Management	--	Coordinate grading plan/other permit approvals with consideration of flood risk	No permits shall be issued unless grading plans have been approved
Flood Mitigation Planning	FME6, FMS4	Control of sediment from Franklin Mtns in areas with UXO	Control of sediment from Franklin Mountains from Eastern El Paso County
Flood Mitigation Planning	-	No systematic data collection post-flood event	State should create a repository for post flood data (e.g., high water marks, photos)

8.2.2 Recommendations from Stakeholders Outside El Paso County

Those jurisdictions representing the broader planning region outside of El Paso County have a few similar flood-related issues; however, they also have unique flood-related issues associated with their rural classification:

- Large rural region comprised of communities having lower populated areas.
- Lack of resources and services available to support floodplain management and flood mitigation planning for rural areas located outside of El Paso County.
- Need for improving coordination with other jurisdictions and organizations (i.e., TxDOT, IBWC, TPW, Private Entities) to facilitate floodplain management and flood mitigation planning.
- Need for updated maps, resources to join/maintain NFIP, and support for securing funding to update master drainage plans.

- Risks uniquely associated with drainage from steep mountainous terrain (sediment/ debris transport).
- Risks uniquely associated with "mesa" terrain: large, very flat, sparsely vegetated watersheds that drain to steep arroyos that drop into the Rio Grande terrace.
- Risk from flooding of the Rio Conchos in Presidio County, including binational planning needed to address this issue.
- Risks associated with unregulated and/or minimally regulated new development, especially in Hudspeth County.

The primary theme of the feedback received from the stakeholders located outside of El Paso County focused on the general lack of resources, technical staff, training, funding, etc. for small communities and low populated counties to address floodplain management and flood mitigation planning. The recommendations provided in **Table 8.5** through **Table 8.8** below are primarily focused on addressing the above unique challenges. These recommendations are largely in the form of recommendations for future, more detailed action by the RFPG, involving the collective actions of stakeholders to develop specific language to address the identified issue.

Table 8.5 Legislative Recommendations (Flood Planning Area Outside of El Paso County)

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Flood Mitigation Implementation	-	New federal requirements addressing historic preservation	Develop a set of regional comments on new requirements to be provided to the federal agency
Floodplain Management	-	Counties perceive lack of ability to regulate drainage outside of FEMA floodplains	Counties to consider adoption of drainage requirements beyond areas that are in flood zone (e.g., within County Road ROWs outside floodplains)

Table 8.6 Regulatory/Administrative Recommendations (Flood Planning Area Outside of El Paso County)

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Floodplain Management	FME14	Unregulated/ minimally regulated development in Hudspeth County	Develop program to regulate drainage from development in Hudspeth County and similar counties that elect to participate
Floodplain Management	-	No technical personnel on staff nor funds to develop drainage criteria/standards	Provide regional coordination for technical assistance and/or funding to update drainage criteria and development standards

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Floodplain Management	-	Improve coordination with other jurisdictions to facilitate floodplain management (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate floodplain management involving multiple jurisdictions. (e.g., create consensus requiring no adverse impact)
Floodplain Management	-	Codify use of most restrictive standard where conflicts exist	Revise local standards to codify this requirement and address adverse impact
Floodplain Management	-	Drainage component is not part of certificate of compliance (In Ector County there is no review of any building or development permit, no component for flood mitigation)	Counties should have the option to be empowered to enforce drainage requirements within the requirements for a certificate of compliance
Flood Mitigation Planning	-	Improve flood mitigation planning coordination with other jurisdictions to facilitate (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate flood mitigation planning involving multiple jurisdictions.
Flood Mitigation Implementation	-	Improve flood mitigation implementation coordination with other jurisdictions to facilitate (TxDOT, IBWC, TPW, RRC, TCEQ, Private Entities)	Coordinate regional protocols to facilitate flood mitigation implementation involving multiple jurisdictions.
Flood Mitigation Implementation	-	Coordinate with State Historic Preservation Office to develop acceptable mitigation practices for the Upper Rio Grande Flood Planning region outside of El Paso County	Develop regional procedures for accelerating compliance, reducing delays in projects due to interaction with the historic preservation office.

Table 8.7 Fundraising Recommendations (Flood Planning Area Outside of El Paso County)

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Flood Mitigation Planning	-	Collect appropriate data to present a complete plan to obtain HUD funds for flood planning. Prepare documentation for post-disasters	Increase coordination between City-County-and HUD to develop procedures and databases which meet HUDs requirements
Floodplain Management	-	Lack of fees for County Drainage	Provide regional support to interested counties to investigate feasibility of forming a county stormwater utility

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Flood Mitigation Implementation	-	Small community/ low population counties have a disadvantage in obtaining FEMA post-disaster flood mitigation funding due to $3M damage threshold. Low property values and limited infrastructure at risk disqualify small communities/ low population counties from grant eligibility.	RFPG to convey recommendation to FEMA to change thresholds to address small city disadvantage in grant funding
Flood Mitigation Implementation	-	HUD CDBG grant application success for small communities/ low population counties is inhibited by a lack of local resources	Convey recommendation to HUD to set aside a fixed percentage of grant funding to address small community/ low population county needs; or by adding ranking points favoring small communities/ low population counties
Flood Mitigation Implementation	-	TWDB Flood Infrastructure Fund grant application success is limited by the lack of local resources and technical expertise within small communities to assemble technical requirements of the application	Region to take action to create a partial staff position to provide a regional resource within the RFPG to assist small communities/ low population counties in seeking support for grant preparation
Flood Mitigation Implementation	-	Lack of regional assistance to available resources to apply for funds identifying funding sources	Create an online resource so that regions have assistance to apply for funds and identifying funding sources

Table 8.8 Other Recommendations (Flood Planning Area Outside of El Paso County)

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Floodplain Management	FMS13	Need for resources to join/ maintain NFIP	Plan solution for lack of staff resources within areas with small populations, but with significant risk.
Floodplain Management	FMS8	Certification of Cibolo Creek Levees in Presidio County	Support certification of this levee by City of Presidio
Floodplain Management	-	Small communities lack resources for these services/ resources needed for floodplain management: funding for badly needed new floodplain maps, training of staff in NFIP requirements, development and technical oversight of local	Region to take action to create a partial staff position to provide a regional resource within the RFPG to assist small communities/ low population counties in seeking support for these issues; staff position could be potentially funded by

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
		drainage design criteria for new development, education of local populace in importance of floodplain management.	additional TWDB RFP allocations; RFPG to request TWDB support in development of web portals to facilitate communication, relevant data collection/ tracking of queries, and document network of available support.
Floodplain Management	-	Low population counties lack resources for these services/ resources needed for floodplain management: funding for badly needed new floodplain maps, training of staff in NFIP requirements, education of local populace in importance of floodplain management, support in developing a stormwater utility.	Region to take action to create a partial staff position to provide a regional resource within the RFPG to assist small communities/ low population counties in seeking support for these issues; staff position could be potentially funded by additional TWDB RFP allocations; RFPG to request TWDB support in development of web portals to facilitate communication, relevant data collection/ tracking of queries, and document network of available support.
Floodplain Management	-	Coordinate with TxDOT to get clarity on maintenance at specific locations within jurisdictions	Create an MOU to clarify maintenance responsibilities at specified crossings
Flood Mitigation Planning	FMS6	Flooding in Presidio County	Binational Planning to Address Rio Conchos flooding
Flood Mitigation Planning	-	Small communities lack resources for these services/ resources needed for flood mitigation planning: funding for strategic growth plan essential for planning future drainage infrastructure, training of staff in FEMA disaster programs (e.g., post-disaster Public Assistance), funding for storm water master planning, education of local populace in importance of storm water master planning.	Region to take action to create a partial staff position to provide a regional resource within the RFPG to assist small communities/ low population counties in seeking support for these issues; staff position could be potentially funded by additional TWDB RFP allocations; RFPG to request TWDB support in development of web portals to facilitate communication, relevant data collection/ tracking of queries, and document network of available support.
Flood Mitigation Planning	-	Need updated maps and funding to have updated master drainage plans	Funding needed to provide updated floodplain maps.

Flood Mitigation Category	Related FME/FMS	Need to Address	Recommendation
Flood Mitigation Planning	-	No systematic data collection post-flood event (high water marks, damages)	Initiate and maintain a State-created repository for post flood data needed to refine local flood risk assessments
Flood Mitigation Implementation	-	Low population counties lack resources for these services/ resources needed for flood mitigation implementation: training in USACE Section 404 permitting of channel maintenance, training in selection of grant opportunities across the full spectrum of available grants, technical support for the associated grant application data requirements and processes, education of local populace in importance of implementation of priority flood mitigation actions.	Region to take action to create a partial staff position to provide a regional resource within the RFPG to assist small communities/ low population counties in seeking support for these issues; staff position could be potentially funded by additional TWDB RFP allocations; RFPG to request TWDB support in development of web portals to facilitate communication, relevant data collection/ tracking of queries, and document network of available support.
Flood Mitigation Implementation	-	Small communities lack resources for these services/ resources needed for flood mitigation implementation: training in USACE Section 404 permitting of channel maintenance, training in selection of grant opportunities across the full spectrum of available grants, technical support for the associated grant application data requirements and processes, education of local populace in importance of implementation of priority flood mitigation actions.	Region to take action to create a partial staff position to provide a regional resource within the RFPG to assist small communities/ low population counties in seeking support for these issues; staff position could be potentially funded by additional TWDB RFP allocations; RFPG to request TWDB support in development of web portals to facilitate communication, relevant data collection/ tracking of queries, and document network of available support.
Floodplain Management	-	Coordinate phasing of grading plan/other permit approvals with flood risk	Provide guidance on order of permit approvals to ensure continuity of drainage protection

Appendix 8A
Subcommittee 4 June 16, 2022, Meeting #1 Presentation Slides

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Region 14 – Upper Rio Grande Regional Flood Plan

Task 8: Legislative and Regulatory Recommendations

June 16, 2022
Virtual Workshop (for areas in City of El Paso and El Paso County)

Meeting 1 Discussion Items

- Review TWDB Guidance for Task 8
- Discuss legislative recommendations concerning City of El Paso (COEP) and El Paso County (EPC)
- Discuss regulatory or administrative recommendations concerning COEP and EPC
- Discussion of any other recommendations concerning COEP and EPC
- Discuss recommendations for potential new revenue-raising opportunities in COEP and EPC
- Vote on Potential Subcommittee Recommendations to RFPG regarding COEP and EPC
- Discuss if there is a need to set another potential Subcommittee 4 meeting date

Review TWDB Guidance for Task 8

This task includes developing in accordance with TWDB rules and guidance for floodplain management and flood mitigation planning/implementation:

1. Legislative recommendations.
2. Other regulatory or administrative recommendations.
3. Any other recommendations that the RFPG believes are needed and desirable to achieve its regional flood mitigation and floodplain management goals.
4. Recommendations regarding potential, new revenue-raising opportunities.

Recommendations are to facilitate the following areas: (1) *floodplain management, (2) flood mitigation planning, and (3) implementation of planning.*

TWDB Definitions

1. **Floodplain management** – federal flood insurance program, development permitting
2. **Flood mitigation planning:**
    - identify and define risks;
    - identify, define, and evaluate alternatives; and
    - prioritize alternatives.
3. **Implementation of mitigation measures** – fund and implement

Legislative Recommendations

- Floodplain Management
- Flood Mitigation Planning
- Implementation of Mitigation Measures

Legislative Recommendations: Floodplain Management

What areas of concern or issues related to **floodplain management** are a priority that might be **addressed by changes to State Legislation**? Here's some topics that might be discussed

- Counties have difficulty funding drainage and stormwater infrastructure in unincorporated areas.
- The Harris County Road Law
- Interactions with FEMA, USIBWC
- Interactions with TDEM, TCEQ, TPWD, TXDOT
- Establishing a levee safety program similar to dams.

Legislative Recommendations: Flood Mitigation Planning

What areas of concern or issues related to **flood mitigation planning** are a priority that might be **addressed by changes to State Legislation**? Here's some topics that might be discussed

a. identify and define risks

- Statewide support on early warning?
- Statewide support on post-flood high water marks? damage assessments?

b. identify, define, and evaluate alternatives

- Addressing risks with multi-agency components

c. prioritize alternatives

- Formalizing communication on priority projects to state agencies

Legislative Recommendations: Implementation of Mitigation Measures

What areas of concern or issues related to **implementation of mitigation measures** are a priority that might be **addressed by changes to State Legislation**? Here's some topics that might be discussed:

Issues with administration of state funds

- Timing of state funds

State agency permitting needs

- TCEQ dam safety
- Historic preservation office
- Threatened species
- State rules restricting implementation?

Regulatory or Administrative Recommendations

- Floodplain Management
- Flood Mitigation Planning
- Implementation of Mitigation Measures

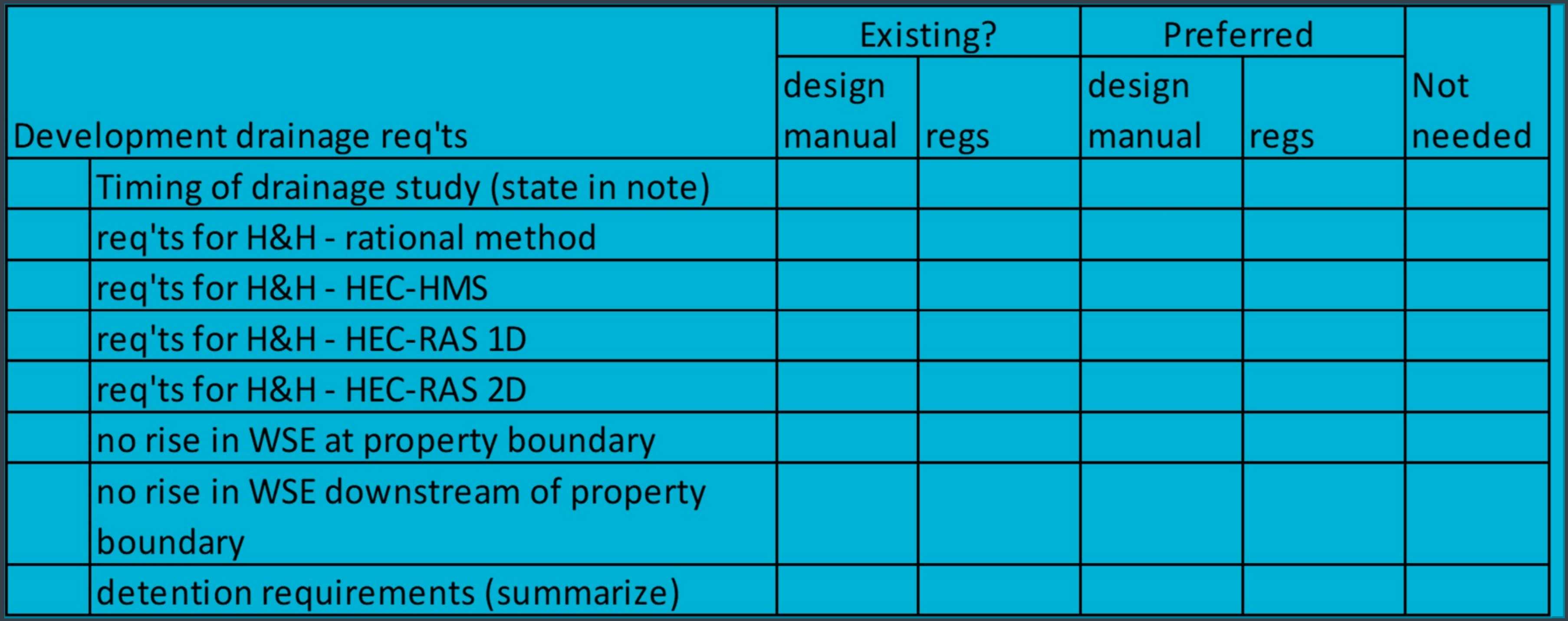
Regulatory or Administrative Recommendations: Floodplain Management

What areas of concern or issues related to **floodplain management** are a priority that might be **addressed by regulatory or administrative changes**? Here's some topics that might be discussed:

- State entities need to comply with local regulations, especially those that are more stringent than the State minimum criteria.
- Local and regional officials are often unaware of their authority to establish and enforce stormwater regulations.

Regulatory or Administrative Recommendations: Floodplain Management

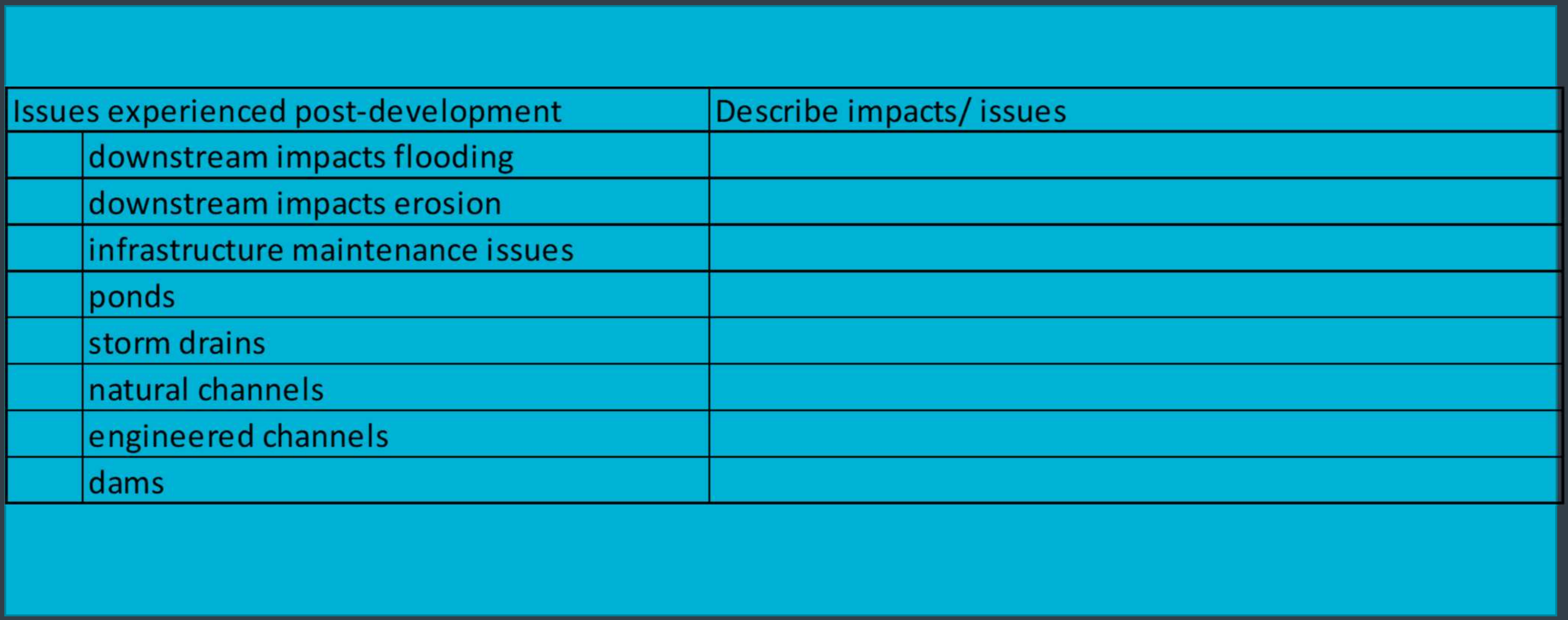
What areas of concern or issues related to **floodplain management** are a priority that might be **addressed by regulatory or administrative changes**? Here's some topics that might be discussed:



Development drainage req'ts		Existing?		Preferred		Not needed
		design manual	regs	design manual	regs	
	Timing of drainage study (state in note)					
	req'ts for H&H - rational method					
	req'ts for H&H - HEC-HMS					
	req'ts for H&H - HEC-RAS 1D					
	req'ts for H&H - HEC-RAS 2D					
	no rise in WSE at property boundary					
	no rise in WSE downstream of property boundary					
	detention requirements (summarize)					

Regulatory or Administrative Recommendations: Floodplain Management

What areas of concern or issues related to **floodplain management** are a priority that might be **addressed by regulatory or administrative changes**? Here's some topics that might be discussed:



Issues experienced post-development		Describe impacts/ issues
	downstream impacts flooding	
	downstream impacts erosion	
	infrastructure maintenance issues	
	ponds	
	storm drains	
	natural channels	
	engineered channels	
	dams	

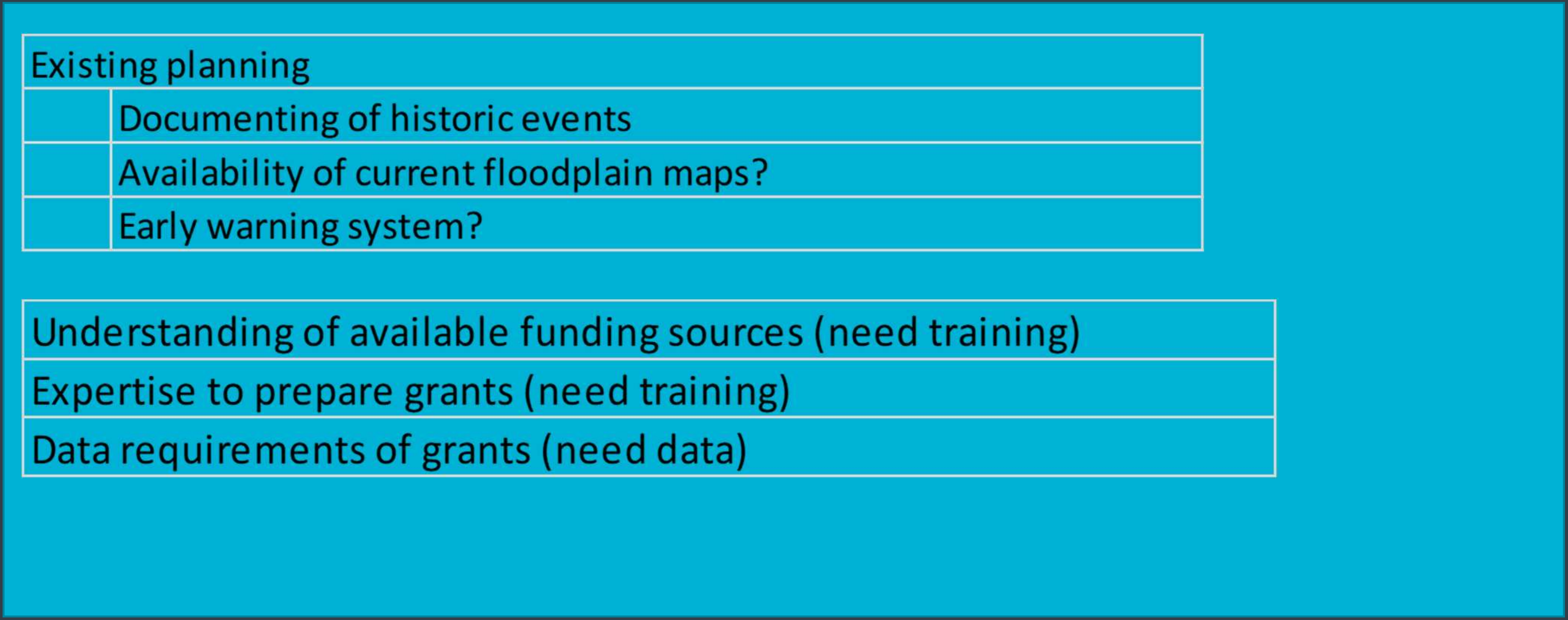
Regulatory or Administrative Recommendations: Flood Mitigation Planning

What areas of concern or issues related to **flood mitigation planning** are a priority that might be **addressed by regulatory or administrative changes**? Here's some topics that might be discussed:

- Encourage entities to work together towards regional flood mitigation solutions; drainage does not recognize jurisdictional boundaries.
- Create a State/Federal government agency collaboration similar to TWICC (Texas Water Infrastructure Coordination Committee) for one-stop shop information on funding eligibility or technical assistance for entities facing drainage and flooding issues.
- A state-wide database/tracking system should be developed to document flood-related fatalities and injuries.

Regulatory or Administrative Recommendations: Flood Mitigation Planning

What areas of concern or issues related to **flood mitigation planning** are a priority that might be **addressed by regulatory or administrative changes**? Here's some topics that might be discussed:



Existing planning	
	Documenting of historic events
	Availability of current floodplain maps?
	Early warning system?

Understanding of available funding sources (need training)
Expertise to prepare grants (need training)
Data requirements of grants (need data)

Regulatory or Administrative Recommendations: Implementation of Mitigation Measures

What areas of concern or issues related to **implementation of mitigation measures** are a priority that might be **addressed by regulatory or administrative changes**? Here's some topics that might be discussed:

Expertise in grant administrative requirements

Regulatory programs with respect to (wrt) project implementation

- Federal (USACE, FEMA, USFWS)
- State (TWDB, TPWD, TCEQ, Water Districts [e.g. EPWID1], TSSWCB)
- Local (City of El Paso, El Paso County, Other incorporated [Vinton, Socorro, San Elizario, etc]

State entities need to comply with local regulations, especially those that are more stringent than the State minimum criteria.

Local and regional officials are often unaware of their authority to establish and enforce stormwater regulations.

Regulatory or Administrative Recommendations: Implementation of Mitigation Measures

What areas of concern or issues related to **implementation of mitigation measures** are a priority that might be **addressed by regulatory or administrative changes**? Here's some topics that might be discussed:

State entities need to comply with local regulations, especially those that are more stringent than the State minimum criteria.

Local and regional officials are often unaware of their authority to establish and enforce stormwater regulations.

Any Other Flood Planning Recommendations

- Floodplain Management
- Flood Mitigation Planning
- Implementation of Mitigation Measures

Any Other Flood Planning Recommendations

Please share any feedback or recommendations for TWDB to consider to help improve the regional flood planning process during future planning cycles. Here's some topics that might be discussed:

- Request for additional outreach and publicity of the State Flood Plan and Regional Flood Planning efforts.
- Concern that amending the State/Regional Flood Plan will be an expensive and lengthy process for an entity to add new FMPs.
- Providing information about the functionality and deficiency of an entity's infrastructure requires extensive field work since most entities do not have these data readily available.

Funding Opportunity Recommendations

- Federal funds
  - FEMA Hazard Mitigation Funds
  - HUD Small Business Administration Planning
- State Planning Funds
  - Texas Water Development Board (TWDB)
  - Texas General Land Office (GLO)
  - Texas State Soil and Water Conservation Board (TSSWCB)
- Development Fees
- Utility Fees

RFPG Action to Vote

- Vote on Potential Subcommittee Recommendations to RFPG regarding COEP and EPC (if needed)

Future Subcommittee 4 Meetings

- Discuss if there is a need to set another potential Subcommittee 4 meeting date

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Appendix 8B
Subcommittee 4 June 16, 2022, Meeting #2 Presentation Slides

Region 14 – Upper Rio Grande Regional Flood Plan

Task 8: Legislative and Regulatory Recommendations

June 16, 2022
Virtual Workshop 2 (for areas outside of El Paso County)

Meeting 2 Discussion Items

- Review TWDB Guidance for Task 8
- Discuss legislative recommendations concerning counties outside of EPC
- Discuss regulatory or administrative recommendations concerning counties outside of EPC
- Discussion of any other recommendations concerning counties outside of EPC
- Discuss recommendations for potential new revenue-raising opportunities outside of EPC
- Vote on Potential Subcommittee Recommendations to RFPG regarding counties outside of EPC
- Discuss if there is a need to set another potential Subcommittee 4 meeting date

Review TWDB Guidance for Task 8

This task includes developing in accordance with TWDB rules and guidance for floodplain management and flood mitigation planning/implementation:

1. Legislative recommendations.
2. Other regulatory or administrative recommendations.
3. Any other recommendations that the RFPG believes are needed and desirable to achieve its regional flood mitigation and floodplain management goals.
4. Recommendations regarding potential, new revenue-raising opportunities.

Recommendations are to facilitate the following areas: (1) *floodplain management, (2) flood mitigation planning, and (3) implementation of planning.*

TWDB Definitions

1. **Floodplain management** – federal flood insurance program, development permitting
2. **Flood mitigation planning:**
    - identify and define risks;
    - identify, define, and evaluate alternatives; and
    - prioritize alternatives.
3. **Implementation of mitigation measures** – fund and implement

Legislative Recommendations

- Floodplain Management
- Flood Mitigation Planning
- Implementation of Mitigation Measures

Legislative Recommendations: Floodplain Management

What areas of concern or issues related to **floodplain management** are a priority of your city/county that might be **addressed by changes to State Legislation**? Here's feedback received from similar size entities:

- Counties have difficulty funding drainage and stormwater infrastructure in unincorporated areas.
- Privately-owned dams originally constructed in rural areas are now surrounded by increased development; these owners lack the resources to maintain, repair and upgrade the dam structures.
- Providing technical assistance and/or funding to update drainage criteria and development standards.
- Counties need the authority to regulate land use, especially in unincorporated and flood prone areas located downstream of dams.
- Establishing a levee safety program similar to dams.

Legislative Recommendations: Flood Mitigation Planning

What areas of concern or issues related to **flood mitigation planning** are a priority of your city/county that might be **addressed by changes to State Legislation**? Here's feedback received from similar size entities:

- Several entities have outdated regulatory floodplain maps or no mapping at all (funding needed).
- Many communities do not have updated drainage master plans that reflect the growth of the area or uses updated rainfall data (funding needed).

Legislative Recommendations: Implementation of Mitigation Measures

What areas of concern or issues related to **implementation of mitigation measures** are a priority of your city/county that might be **addressed by changes to State Legislation**? Here's feedback received from similar size entities:

- Strategies needed to increase opportunities for communities to apply for federal funding (i.e. FEMA BRIC Grant requires statewide building codes to improve application score).
- Allow Counties the opportunity to establish and collect stormwater/drainage utility fees in unincorporated areas.

Regulatory or Administrative Recommendations

- Floodplain Management
- Flood Mitigation Planning
- Implementation of Mitigation Measures

Regulatory or Administrative Recommendations: Floodplain Management

What areas of concern or issues related to **floodplain management** are a priority of your city/county that might be **addressed by regulatory or administrative changes**? Here's feedback received from similar size entities:

- State entities need to comply with local regulations, especially those that are more stringent than the State minimum criteria.
- Local and regional officials are often unaware of their authority to establish and enforce stormwater regulations.
- Entities should be allowed to regulate development in a responsible manner that reduces flood risk without being in fear of legal action by property owners.

Regulatory or Administrative Recommendations: Flood Mitigation Planning and/or Implementation

What areas of concern or issues related to **flood mitigation planning and/or implementation** are a priority of your city/county that might be **addressed by regulatory or administrative changes**? Here's feedback received:

- Encourage entities to work together towards regional flood mitigation solutions; drainage does not recognize jurisdictional boundaries.
- Create a State/Federal government agency collaboration similar to TWICC (Texas Water Infrastructure Coordination Committee) for one-stop shop information on funding eligibility or technical assistance for entities facing drainage and flooding issues.
- A state-wide database/tracking system should be developed to document flood-related fatalities and injuries.
- Provide financial or technical assistance to smaller/rural jurisdictions since the Office of Rural Affairs/Texas Department of Rural Affairs was disbanded.
- Some communities decide to not pursue funding due to the management and reporting requirements.

Any Other Flood Planning Recommendations

- Floodplain Management
- Flood Mitigation Planning
- Implementation of Mitigation Measures

Any Other Flood Planning Recommendations

Please share any feedback or recommendations for TWDB to consider to help improve the regional flood planning process during future planning cycles. Here's feedback received from similar size entities:

- Request for additional outreach and publicity of the State Flood Plan and Regional Flood Planning efforts.
- Concern that amending the State/Regional Flood Plan will be an expensive and lengthy process for an entity to add new FMXs.
- Providing information about the functionality and deficiency of an entity's infrastructure requires extensive field work since most entities do not have this data readily available.

Funding Opportunity Recommendations

- Federal funds
  - FEMA Hazard Mitigation Funds
  - HUD Small Business Administration Planning
- State Planning Funds
  - Texas Water Development Board (TWDB)
  - Texas General Land Office (GLO)
  - Texas State Soil and Water Conservation Board (TSSWCB)
- Development Fees
- Utility Fees

RFPG Action to Vote

- Vote on Potential Subcommittee Recommendations to RFPG regarding counties outside of EPC (if needed)

Future Subcommittee 4 Meetings

- Discuss if there is a need to set another potential Subcommittee 4 meeting date

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Chapter 9: Flood Infrastructure Financing Analysis

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9. Flood Infrastructure Financing Analysis

The Region 14 RFPG has recommended a total of 58 flood mitigation actions to address flood risk across the planning region. Combined, these flood mitigation actions are anticipated to cost $160.3 million to implement. The summary of recommended flood mitigation by action type are summarized in **Table 9.1**.

Table 9.1 Total Cost of Recommended Flood Mitigation Actions

Flood Mitigation Action Type	Number of Recommended Actions	Anticipated Total Cost of Implementation
FME	23	$7,587,400
FMP	21	$507,789,826
FMS	22	$3,586,100
Total	66	$518,963,326

TWDB requires that each RFPG assess and report on how local sponsors propose to finance recommended FMEs, FMSs, and FMPs. To determine the capabilities of the local sponsors to finance the projects, the RFPG conducted a survey for local sponsors to determine the funding needs of local sponsors and propose what role the state should have in financing the recommended FMEs, FMSs, and FMPs. **Section 9.1** presents an overview of common sources of funding for flood mitigation planning, projects, and other management efforts. The methodology and results of the financing survey are presented in **Section 9.2**.

9.1 Sources of Funding for Flood Management Activities

Stormwater infrastructure and floodplain management activities are historically underfunded programs compared to other infrastructure types, and this is a continued challenge that local entities documented in written and verbal communications throughout the planning process. Lack of local funding was indicated as a leading cause of inadequate or deficient drainage infrastructure faced by municipalities. Given the challenges of funding flood management activities, local sponsors will likely be required to use a combination of funding sources to implement flood mitigation actions, including local, state, and federal sources. This section discusses some of the most common avenues of generating local funding and overviews various state and federal financial assistance programs available to entities for flood management. **Table 9.2** summarizes the local, state, and federal funding opportunities that may be available for flood management activities and characterizes each by the following three key parameters: (1) which state and federal agencies are involved, if applicable; (2) whether each funding opportunity offers grants, loans, or both; and (3) whether each funding opportunity is regularly occurring or is only available after a disaster.

Table 9.2 Sources of Funding for Flood Management Activities in Texas

Source	Federal Agency	State Agency	Program Name	Grant (G)	Loan (L)	Post-Disaster (D)
Federal	EPA	TCEQ/ TSSWCB	Nonpoint Source Grant Program 319(h) (NPS)	G	-	-
		TWDB	Clean Water State Revolving Fund (CWSRF)	G[1]	L	-
	FEMA		Cooperating Technical Partners (CTP)	G	-	-
		TBD	Safeguarding Tomorrow through Ongoing Risk Mitigation Program (STORM)	-	L	-
		TCEQ	Rehabilitation of High Hazard Potential Dam Program (HHPD)	G	-	-
		TDEM	Building Resilient Infrastructure and Communities (BRIC)[2]	G	-	-
		TDEM	Hazard Mitigation Grant Program (HMGP)	G	-	D
		TDEM	Public Assistance (PA)	G	-	D
		TWDB	Flood Mitigation Assistance Program (FMA)	G	-	-
	HUD	GLO	Community Development Block Grant-Disaster Recovery (CDBG-DR)	G	-	D
		GLO/ TDEM	Community Development Block Grant-Local Hazard Mitigation Plan Program (LHMPP)	G	-	-
		GLO	Community Development Block Grant-Mitigation (CDBG-MIT)	G	-	D
		TDA	Texas Community Development Block Grant (TxCDBG) Program for Rural Texas	G	-	-
	NRCS		Emergency Watershed Protection Program (EWP)	G	-	D
			Watershed and Flood Prevention Operations Program (WFPO)	G	L	-
			Watershed Rehabilitation Program (REHAB)	G	-	-
	USACE		Continuing Authorities Program (CAP)[3]	-	-	-
			Partnerships with USACE, funded through WRDA or other legislative vehicles[3]	-	-	-
State	N/A	TWDB	Flood Infrastructure Fund (FIF)	G	L	-
		TWDB	Texas Water Development Fund (DFund)	G	L	-
		TWDB	Rural Water Assistance Fund (RWAF)	-	L	-
		TSSWCB	Structural Dam Repair Grant Program	G	-	-
		TSSWCB	Flood Control Operation and Maintenance (O&M) Grant Program	G	-	-
		TSSWCB	Flood Control Dam Infrastructure Projects - Supplemental Funding	G	-	-
Local	Not Applicable		General Fund	Not Applicable		
			Stormwater or Drainage Utility Fee			
			Tax Applications			
			Bonds			
			Special-Purpose Districts			

[1] The CWSRF program offers principal forgiveness, which is similar to grant funding.

[2] At the time of this report, Texas projects may see limited success with BRIC applications, given that the state has not adopted the latest building codes. This status may change in the future.

[3] Opportunities to partner with USACE are not considered grant or loan opportunities, but shared participation projects where USACE performs planning work and shares in the cost of construction.

9.1.1 Local Funding

The communities in Region 14 are primarily rural and less impacted by urban development, as described in **Chapter 1** of this RFP. The total population in the region is just over 1 million. Of the counties in this region, El Paso County has a population greater than 900,000 people, three others (Pecos, Reeves, and Ward counties) have populations greater than 10,000, and the remaining 19 counties have populations of less than 10,000. The vast majority (89%) of the population in Region 14 reside in El Paso County. In addition, the western part of the region is highly vulnerable overall with typical Social Vulnerability Index (SVI) values of 0.8 or greater.

Some of the communities in Region 14 have dedicated or regular funding sources for stormwater infrastructure or flood management activities; however, as the majority of the communities in this region tend to be rural and socioeconomically disadvantaged, many communities do not. These communities face an uphill battle to fund community initiatives and improvement projects.

Entities that do have sources of local funding generally rely on the following: general funds, dedicated revenues in the form of stormwater or drainage utility fees, tax applications, and bonds. These funding sources are typically not sufficient to fully fund a community's total need. Entities indicated that the local match percentage they would expect to supply for future funding opportunities for flood management activities would range from 5% to 50% of the total funding need, including both cash and in-kind services. Each potential local funding source presents its own unique challenges and considerations, described in the following sections.

9.1.1.1 General Fund

A community's general fund revenue stems from sales, property, and other taxes and is typically the primary fund used by a governmental entity to support most of its departments and services such as police, fire, parks, trash collection, and local government administration. Due to the high demands on this fund for many local needs, there is often not a significant amount available for funding flood projects out of the general fund. Similarly, general funds are not dedicated for flood management activities but are instead allocated on a case-by-case basis. General funds are commonly used to fund flood management activities in Region 14.

9.1.1.2 Stormwater or Drainage Utility Fee

Dedicated fees such as stormwater or drainage fees are an increasingly popular tool for local flood-related funding. Municipalities can establish a stormwater utility (sometimes called a drainage utility), which is a legal mechanism used to generate revenue to finance a city's cost to provide stormwater services. To provide these services, municipalities assess fees to users of the stormwater utility system. Multiple entities in Region 14 indicated using utility fees to fund flood management activities.

It is important to note that while Texas municipalities have the authority to implement utility fees for stormwater and drainage, the State Legislature has not granted that same authority to counties.

Impact fees, which are necessitated by and collected from new development to cover a portion of expenses to expand stormwater systems, can also be used as a source of local funding for flood-related efforts. None of the entities in Region 14 indicated via the survey that they use impact fees to fund drainage projects.

9.1.1.3 Tax Applications

Tax applications include sales and property taxes, sales tax reallocations, and special tax districts, including Tax Increment Financing (TIF). Taxes are not a dedicated source of funding for stormwater and increasing taxes or diverting revenue away from other programs is generally not politically popular. Special tax districts can be a useful financing method to allow local governments to invest in public infrastructure improvements in areas that are expected to develop by diverting future tax revenue from these areas to pay for the cost of improvements. This mechanism localizes the cost to fund projects to the area receiving the benefit; however, it relies on the development in the district to occur as expected in order to finance the project and also diverts future tax revenue away from other programs or needs that may arise. Multiple entities in Region 14 indicated using tax notes to fund flood management activities.

9.1.1.4 Bonds

Municipalities and counties also have the option to issue debt through bonds which are typically paid back using any of the previously mentioned local revenue raising mechanisms. There are several types of applicable bonds, including general obligation bonds, revenue bonds, or certificates of obligation. Multiple entities in Region 14 indicated that they would use bonds to fund flood management activities.

Revenue bonds typically are not used to finance drainage infrastructure, since they are used to finance municipal projects that generate revenue (which is not typical of drainage infrastructure) that is then used to make payments to bond holders.

In addition to revenue bonds, general obligation bonds and certificates of obligation can provide alternate sources of funding. Between these two alternatives, general obligation bonds are more common. While these bonds typically have a high bond rating and low interest rates, there are a handful of constraints. First, different city programs are typically competing with each other for funding through a given bond program. Second, debt obligations contribute to a lack of flexibility in future financing applications. Lastly, general obligation bonds require voter approval.

Certificates of obligation, conversely, do not require voter approval and can therefore provide flexibility when projects need to be funded quickly. However, they can be controversial and unpopular when not used in emergency applications. Like general obligation bonds, they contribute to a community's debt obligations and may impact future funding decisions.

9.1.1.5 Special-Purpose Districts and Other Local and Regional Entities

Another source for local funding to support flood management efforts includes special-purpose districts. A special-purpose district is a political subdivision established to provide a single public service (such as water supply, drainage, or sanitation) within a specific geographic area. Examples of these special districts include Water Control and Improvement Districts (WCID), Municipal Utility Districts (MUD), Drainage Districts (DD), and Flood Control Districts (FCD). Each of the different types of districts are governed by different state laws that specify the authorities and process for creation of one such district. Districts can be created by various entities, from the Texas Legislature or the TCEQ to county commissioners' courts or city councils. Depending on the type of district, the districts may have the ability to raise revenue through taxes, fees, or issuing bonds to fund flood and drainage-related improvements within a district's jurisdiction.

There may be opportunities to create special-purpose districts in the region as future growth occurs for the purposes of generating revenue from district taxes and fees. Funding avenues for other types of local and regional entities, such as river authorities, are not discussed in this Chapter. These special-purpose districts and other local and regional entities may represent potential future funding sources for Region 14, as no survey respondents indicated using special-purpose districts to fund flood management activities.

9.1.2 State Funding

The availability of local funding for flood management activities is generally much lower than the need, leading communities to seek out and apply for state and federal financial assistance programs. Today, communities have a broader range of state funding sources and programs available due to new grant and loan programs that did not exist five years ago.

There are two primary state agencies currently involved in providing state funding for flood projects: the TWDB and the TSSWCB. State and federal financial assistance programs discussed herein are not directly available to homeowners nor the general public. Local governments apply on behalf of their communities to receive and implement funding for flood projects in their jurisdiction.

9.1.2.1 Texas Water Development Board (TWDB)

The TWDB has three state-funded programs for flood management activities.

The TWDB's Flood Infrastructure Fund (FIF) was passed by the Texas Legislature and approved by Texas voters through a constitutional amendment in 2019. The program provides financial assistance in the form of low or no interest loans and grants (cost match varies) to eligible political subdivisions for flood control, flood mitigation, and drainage projects. FIF rules allow for a wide range of flood projects, including structural and nonstructural projects, planning studies, and preparedness efforts such as flood early warning systems. Only projects included in the most recently adopted State Flood Plan will be eligible for funding from the FIF. FMEs, FMSs, and FMPs recommended in this RFP will be included in the overall State Flood Plan and will therefore be eligible for funding.

The TWDB also manages the Texas Water Development Fund (DFund) program, which is a state-funded, streamlined loan program that provides financing for several types of infrastructure projects to eligible political subdivisions. This program enables the TWDB to fund projects with multiple eligible components (water supply, wastewater, or flood control) in one loan at low market rates. Financial assistance for flood management activities may include structural and nonstructural projects, planning efforts, and flood warning systems.

The Rural Water Assistance Fund (RWAF) assists small rural utilities to obtain low-cost financing for water and wastewater projects in the form of tax-exempt equivalent interest rate loans with long-term finance options. Rural political subdivisions are eligible, which include water supply corporations, districts, and municipalities serving populations for 10,000 or less, and counties in which no urban area has a population exceeding 50,000. Several Region 14 municipalities and counties may be eligible for this funding source. Financial assistance for flood management activities may include planning, design, and construction for pumping facilities, storage reservoirs, acquiring groundwater and surface water rights, and collection systems, among others.

9.1.2.2 Texas State Soil & Water Conservation Board (TSSWCB)

The TSSWCB has three state-funded programs specifically for flood control dams.

The O&M Grant Program is a grant program for local Soil and Water Conservation Districts (SWCD) and certain co-sponsors of flood control dams. This program reimburses SWCDs 90% of the cost of an eligible operation and maintenance activity as defined by the program rules; the remaining 10% must be paid with non-state funding.

The Flood Control Dam Infrastructure Projects - Supplemental Funding Program was created and funded in 2019 by the Texas Legislature. Grants are provided to local sponsors of flood control dams, including SWCDs, to fund the repair and rehabilitation of the flood control structures, to ensure dams meet safety criteria to adequately protect lives downstream.

The Flood Control Structural Repair Grant Program provides state grant funds to provide 95% of the cost of allowable repair activities and up to 98.25% of the cost of dam upgrade projects on dams constructed by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS). The program includes match funding for federal projects through the Dam Rehabilitation Program and the Emergency Watershed Protection Program of the Texas NRCS.

9.1.3 Federal Funding

Federal funding currently accounts for a large share of total available funding for flood projects throughout the state, as federal funding programs offer greater access and availability to large funding amounts from the federal government as appropriated by Congress. There are 18 federal funding programs discussed in this section, administered by several federal agencies and organizations. The funding for these programs originates from the federal government; however, for 13 of the 18 funding programs, a state agency partner plays a key role in management of the program, including assembling and submitting state application packages and administering federally awarded grant funding. Each federal funding opportunity is unique in its eligible applicants, eligible project types, requirements, and application and award timelines. The federal funding opportunities are discussed below by federal agency.

9.1.3.1 Environmental Protection Agency (EPA)

The EPA has two federal funding programs for flood management activities.

The Nonpoint Source (NPS) Grant Program Section 319(h) provides funds to prevent or reduce urban and non-agricultural nonpoint source pollution. The program funds are primarily for implementing watershed protection plans, but may also be used for education and outreach, projects to protect unimpaired waters, and management measures to address NPS pollution. Projects that implement Municipal Separate Storm Sewer System (MS4) permit requirements are not eligible for funding. The NPS Grant Program is administered in Texas by the Texas Commission on Environmental Quality (TCEQ) and the TSSWCB.

The Clean Water State Revolving Fund (CWSRF) provides financial assistance in the form of loans with subsidized interest rates and opportunities for partial principal forgiveness for planning, acquisition, design, and construction of wastewater, reuse, and stormwater mitigation infrastructure projects. Projects can be structural or non-structural. Low Impact Development (LID) projects are also eligible. The CWSRF is administered in Texas by the TWDB.

9.1.3.2 Federal Emergency Management Agency (FEMA)

FEMA has seven federal funding programs for flood management activities.

The Cooperating Technical Partners (CTP) Program is an effort launched by FEMA in 1999 to increase local involvement in developing and maintain up-to-date Flood Insurance Rate Maps (FIRMs), Flood Insurance Study (FIS) reports, and associated geospatial data in support of FEMA's National Flood Insurance Program (NFIP). To participate in the program, interested NFIP-participating communities, state or regional agencies, universities, territories, tribes, or nonprofits must complete training and execute a partnership agreement. Working with the FEMA regions, a program participant can develop business plans and apply for grants to perform eligible activities.

Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) is a new revolving loan program enacted through federal legislation in 2021 to provide sustainable funding for hazard mitigation projects, including water, infrastructure, and disaster recovery projects. The program is designed to provide capitalization grants to states to establish revolving loan funds for hazard mitigation projects. In November 2021, the Infrastructure Investment and Jobs Act (IIJA) appropriated $500 million in funds to the STORM program, or $100 million per year for five years. At the time of the publication of this RFP, the STORM program is not yet operational and has not yet been implemented in Texas.

The Rehabilitation of High Hazard Potential Dam (HHPD) Grant Program, administered in Texas by the TCEQ, provides technical, planning, design, and construction assistance in the form of grants for rehabilitation of eligible high hazard potential dams. The cost share requirement is typically no less than 35% state or local share.

The Building Resilient Infrastructure and Communities (BRIC) is a new pre-disaster funding program implemented in 2020 that replaces FEMA's previously longstanding Pre-Disaster Mitigation Grant Program. The program supports states, local communities, tribes, and territories as they undertake hazard mitigation projects to reduce the risks they face from disasters and natural hazards. Funding is typically a 75% federal grant with a 25% local match. However, eligible small, impoverished communities and U.S. island territories may be funded through a 90% or 100% federal grant, respectively. BRIC is administered in Texas by the Texas Division of Emergency Management (TDEM).

Under the Hazard Mitigation Grant Program (HMGP), FEMA provides funding to state, local, tribal, and territorial governments so they can rebuild from a recent disaster in a way that reduces, or mitigates, future disaster losses in their communities. Funding is typically a 75% federal grant with a 25% local match. While the program is associated with Presidential Disaster Declarations, the HMGP is not a disaster relief program for individual disaster victims or a recovery program that funds repairs to public property damaged during a disaster. The key purpose of the HMGP is to ensure that the community's opportunity to take critical mitigation measures to reduce the risk of loss of life and property from future disasters is not lost during the reconstruction process following a federally declared disaster. The HMGP program is administered in Texas by TDEM.

The Public Assistance (PA) Program provides supplemental grants to state, tribal, territorial, and local governments, and certain types of private non-profits following a declared disaster so communities can quickly respond to and recover through actions such as debris removal, life-saving emergency protective measures, and restoring public infrastructure. Funding cost share levels are determined for each disaster and the local match requirement is typically between 10% and 25%. In Texas, the FEMA PA program is administered by TDEM.

The Flood Mitigation Assistance (FMA) Grant is a nationally competitive program that provides funding to states, local communities, federally recognized tribes, and territories. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the NFIP. Funding is typically a 75% federal grant with a 25% local match. Projects mitigating Repetitive Loss and Severe Repetitive Loss properties may be funded through a 90% or 100% federal grant, respectively. FMA is administered in Texas by the TWDB.

9.1.3.3 U.S. Department of Housing and Urban Development (HUD)

The U.S. Department of Housing and Urban Development has four federal funding programs for flood management activities.

Following a major disaster, Congress may appropriate funds to HUD under the Community Development Block Grant-Disaster Recovery (CDBG-DR) Program when there are significant unmet needs for long-term recovery. Appropriations for CDBG-DR are frequently very large, and the program provides 100% grants in most cases. The special federal appropriation provides funds to the most impacted and distressed areas for disaster relief, long-term recovery, restoration of infrastructure, housing, and economic revitalization. The CDBG-DR program is administered in Texas by the Texas General Land Office (GLO).

The Community Development Block Grant-Local Hazard Mitigation Plans (LHMPP) Program assists entities by providing grants to develop or update local hazard mitigation plans. It can also be used to provide cost share for hazard mitigation planning activities funded through other federal sources. LHMPP funds are administered by HUD through the CDBG-MIT program, described below, and are implemented by the GLO and/or TDEM, depending on the activity being funded.

The Community Development Block Grant-Mitigation (CDBG-MIT) Program allows eligible grantees to use assistance in areas impacted by recent disasters to carry out strategic and high-impact activities to mitigate disaster risks. The primary feature differentiating CDBG-MIT from CDBG-DR is that, unlike CDBG-DR, which funds recovery from a recent disaster to restore damaged services, systems, and infrastructure, CDBG-MIT funds are intended to support mitigation efforts to rebuild in ways that will lessen the impact of future disasters. CDBG-MIT defines such mitigation activities as those that increase resilience to disasters or reduce or eliminate the long-term risk of loss of life, injury, damage to and loss of property, and suffering or hardship resulting from the disaster. The CDBG-MIT program is administered in Texas by the GLO.

The Community Development Block Grant (TxCDBG) Program for Rural Texas provides annual grants on a formula basis to small, rural cities and counties to develop viable communities by providing decent housing and suitable living environments and expanding economic opportunities principally for persons of low- to moderate-income. Funds can be used for public facilities such as water and wastewater infrastructure, street and drainage improvements, and housing. The TxCDBG program is administered by the Texas Department of Agriculture (TDA).

9.1.3.4 U.S. Department of Agriculture Natural Resources Conservation Service (NRCS)

The U.S. Department of Agriculture's Natural Resources Conservation Service has three federal funding programs for flood management activities.

The Emergency Watershed Protection (EWP) Program is a federal emergency recovery grant program that helps local communities recover after a natural disaster by offering technical and financial assistance to relieve imminent threats to life and property caused by floods and other natural disasters that impair a watershed. The EWP Program does not require an official disaster declaration for program assistance to begin and can include projects like removing debris from stream channels, road culverts, and bridges; reshaping and protecting eroded stream banks; and repairing damaged or destroyed facilities.

The Watershed Protection and Flood Prevention Operations (WFPO) Program offers grants and loans to help federal, state, local and tribal governments protect and restore watersheds up to 250,000 acres. Funding can be used to prevent erosion, floodwater, and sediment damage; to further the conservation development, use and disposal of water; and to further the conservation and proper use of land in authorized watersheds. The program requires public sponsorship and that at least 20% of project benefits be directly related to agriculture, including rural communities.

Lastly, the Watershed Rehabilitation (REHAB) Program offers grants to help local sponsors rehabilitate aging dams that are reaching the end of their design lives and/or no longer meet federal or state standards. The program targets rehabilitation projects that address critical public health and safety concerns. Costs associated with additional or new water supply storage purposes may be added to the rehabilitation project and cost-shared with REHAB funds. Local cost share is typically 35% of the total construction cost.

9.1.3.5 U.S. Army Corps of Engineers (USACE)

The USACE works with non-federal partners (states, tribes, counties, or local governments) throughout the country to investigate water resources and related land problems and opportunities and, if warranted, develop civil works projects that would otherwise be beyond the sole capability of the non-federal partners. Partnerships are typically initiated or requested by the local community to their local USACE District office. Before any project or study can begin, USACE determines whether there is an existing authority under which the project could be considered, such as the Continuing Authorities Program (CAP), or whether Congress must establish study or project authority and appropriate specific funding for the activity.

New study or project authorizations are typically provided through periodic **Water Resource Development Acts (WRDA)** or via another legislative vehicle. Congress will not provide project authorization until a completed feasibility study results in a recommendation to Congress of a water resources project, conveyed via a Report of the Chief of Engineers (Chief’s Report) or Report of the Director of Civil Works (Director’s Report). Opportunities to partner with USACE are not considered grant or loan opportunities, but rather are shared participation projects where USACE performs planning work and shares in the cost of construction with the non-federal sponsor. Additionally, USACE has other technical assistance opportunities, including Floodplain Management Services and the **Planning Assistance to States Program,** that are available to local entities.

9.1.3.6 Special Appropriations

On occasion and when the need is large enough, Congress may appropriate funds for special circumstances such as natural disasters or pandemics. A few examples of special appropriations from the federal government that can be used to fund flood-related activities are discussed below.

In 2021, the American Rescue Plan Act (ARPA) provided for a substantial infusion of resources to eligible state, local, territorial, and tribal governments to support their response to and recovery from the COVID-19 pandemic. The Coronavirus State and Local Fiscal Recovery Funds (SLFRF) Program, a part of ARPA, delivers $350 billion directly to state, local, and tribal governments across the country. Some of the authorized uses include improving stormwater facilities and infrastructure. Although not a direct appropriation to local governments like ARPA, the 2021 Infrastructure Investment and Jobs Act (IIJA), also called the Bipartisan Infrastructure Law (BIL), authorizes over $1 trillion for infrastructure spending across the U.S. and provides for a significant infusion of resources over the next several years into existing federal financial assistance programs as well as creating new programs. In April 2022, the Biden Administration issued a Bipartisan Infrastructure Law Rural Playbook as a “roadmap for delivering opportunity and investments in rural America.”

9.1.4 Barriers to Funding

Local entities encounter barriers to accessing or seeking funding sources for flood management activities, including lack of knowledge of funding sources, lack of expertise to apply for funding, and lack of local funds available for match requirements. As opposed to some other types of infrastructure, flood projects do not typically generate revenue and many entities do not have steady revenue streams to fund flood projects, as discussed in **Section 9.1.1**. Consequently, entities struggle to generate funds for local match requirements or loan repayment. Multiple of the entities responding to the survey indicated that their financial capacity to provide local match funds for a given project would be 10% or less, including cash and in-kind services. Complex or burdensome application or program requirements, as well as prolonged implementation timelines also act as barriers to entities being equipped to access state and federal financial assistance. Of those entities able to overcome those barriers, apply for funding, and generate local resources for match requirements, the competitiveness of state and federal grant/loan funding opportunities still leave many local entities without the resources they need to address flood risks.

9.2 Flood Infrastructure Financing Survey

To assist local entities with acquiring funding for the flood mitigation actions identified in this plan, the Upper Rio Grande Flood Planning Group developed a Flood Infrastructure Financing (FIF) survey for potential local sponsors to gain an understanding of the funding needs in the region and to characterize what role the RFPG proposes for the state in financing the recommended FME, FMS, and FMP action types.

9.2.1 Survey Methodology

The FIF survey was a short, 9-question online survey with a table listing each flood mitigation action for which an entity was identified as a sponsor or co-sponsor in the RFP and instructing the respondent to indicate which funding sources, if any, had been identified to complete the mitigation action. The survey included a link to a SharePoint folder that contained project summary spreadsheets for each flood mitigation action listed in the plan as a resource for sponsors. A copy of the questions from the Funding Survey sent to sponsors of FMEs, FMPs, and FMSs is included in **Appendix 9A**.

The survey was sent via email to community representatives from 29 entities on a rolling basis between the dates of June 15, 2022 and July 4, 2022 requesting responses between June 27, 2022 and July 15, 2022. The contact list was compiled from various sources, including contact information collected through the initial flood planning survey for community officials and available online data. At least one point of contact was able to be identified from each community. A summary of the entities contacted for the FIF survey is provided in **Table 9.3**.

Where no response was received by the deadline, it was assumed that the action would need 100% funding from the state. Similarly, some respondents did not indicate whether or not they would be able to provide a match or what funding source would be used; in those cases, it was assumed the action would need 100% funding from the state.

Table 9.3 Region 14 Entities Contacted for FIF Survey

County or Municipality	Date Survey Sent	Date Response Requested	Response Received?
Brewster County	July 4, 2022	July 15, 2022	No
City of Alpine	July 1, 2022	July 8, 2022	Yes
City of Kermit	June 15, 2022	June 27, 2022	No
City of Marfa	June 15, 2022 July 1, 2022	June 27, 2022 July 8, 2022	Yes
City of Monahans	June 15, 2022 July 1, 2022 July 4, 2022	June 27, 2022 July 8, 2022 July 15, 2022	Yes
City of Ozona	June 15, 2022	June 27, 2022	No
City of Pecos	June 15, 2022	June 27, 2022	No
City of Presidio	July 1, 2022	July 8, 2022	Yes
City of San Elizario	June 15, 2022	June 27, 2022	Yes
City of Socorro	June 15, 2022	June 27, 2022	Yes
City of Sonora	June 15, 2022	June 27, 2022	No
Crocket County WCID	July 1, 2022	July 8, 2022	No
Dona Ana County	July 4, 2022	July 15, 2022	No
El Paso County	June 15, 2022 July 1, 2022	June 27, 2022 July 8, 2022	Yes
El Paso Water	June 15, 2022	June 27, 2022	Yes
EPCWID #1	June 15, 2022 July 1, 2022	June 27, 2022 July 8, 2022	Yes
Fort Hancock WCID	July 4, 2022	July 15, 2022	No
Fort Stockton	June 15, 2022	June 27, 2022	No
Hudspeth County	June 15, 2022	June 27, 2022	Yes
Hudspeth County CRD1	July 1, 2022	July 8, 2022	Yes
National Park Service	July 4, 2022	July 15, 2022	No
Pecos County	July 1, 2022 July 4, 2022	July 8, 2022 July 15, 2022	No
Presidio County	July 1, 2022	July 8, 2022	No
Reeves County	July 4, 2022	July 15, 2022	No
Rio Grande Joint Ventures	July 4, 2022	July 15, 2022	No
Texas Department of Transportation	July 1, 2022	July 8, 2022	No
Texas General Land Office	July 1, 2022	July 8, 2022	No
U.S. Army Corps of Engineers	July 1, 2022	July 8, 2022	No
U.S. IBWC	July 1, 2022	July 8, 2022	No

9.2.2 Survey Results

Table 9B in **Appendix 9B** presents the results of the Sponsor Financing survey for each FME, FMS, and FMP. Of the 29 entities contacted, 11 responded to the survey, an overall response rate of 37.9%.

While the overall response rate appears low, there is significant interest and continued participation demonstrated by major regional stakeholders. The entities that responded to the survey are listed as sponsors for a combined 46 of the 58 flood mitigation actions (79%) accounting for $156.5 million (97.6%) of the total implementation cost needed. As a result, even with a low overall response rate, the information received provides a representative picture of total funding needs across the basin.

Of the 11 entities that responded to the survey, the likely sources of funding indicated to implement flood management activities included general or dedicated revenues, bonds, tax notes, or utility fees. Just under half (5 of 11) of the respondents had not applied for grant funding in the past 5 years (one respondent left this blank). Of the remaining six respondents that had applied for grant funding, three had been successful in receiving a grant and loan, one had been unsuccessful, one had received an invitation for a full application but decided not to pursue the project, and one application was still under further review.

The communities in Region 14 have demonstrated a strong commitment to funding regional flood management activities. El Paso County, for instance, issued two certificates of obligation in the amounts of $1.61 million and $20.7 million to finance construction of detention ponds, channel improvements, and flood mitigation projects throughout the county. El Paso County is also seeking a $2.37 million loan from the TWDB for similar improvements. Similarly, EPWater authorized the issuance of $25 million to pay off a line of credit used for Capital Improvement Program drainage projects for fiscal year (FY) 2022-23 and issued revenue bonds in 2022 for $9.49 million to pay for flood mitigation actions. In total, the drainage capital improvement projects undertaken by EPWater for FY 2022-23 will be $70 million.

9.3 Proposed Role of State in Financing

Overall, there is an estimated $155.7 million needed to implement the recommended FMEs, FMSs, and FMPs in this RFP beyond what is anticipated to be funded by local sponsors. This figure represents 97% of the total cost of the flood mitigation actions identified in this plan. There may be other sources of funding available through other local, state, and federal programs outlined previously in this section, or future revenue sources, but these have not been acquired to date for the actions listed in the RFP.

This estimate does not represent the amount of funding needed to mitigate all risks in the region nor to solve known regional flooding problems in their totality. Rather, this estimate only represents the funding needs for the specific, identified studies, strategies, and projects in this cycle of regional flood planning. Future cycles of regional flood planning will continue to identify more projects and studies needed to further flood mitigation efforts in the Upper Rio Grande Flood Planning Group (Region 14).

For planning purposes, the RFPG recommends using this figure to estimate the need for funding from the state. While certain entities may choose to adjust their expenditure priorities or find ways to generate additional revenue for drainage projects, the RFPG anticipates that a significant gap will remain between the cost to implement the RFP and the funding that can be generated by local jurisdictions. The RFPG also recognizes that it is unlikely, if not impossible, for enough money to be appropriated to the FIF to be able to fill the funding gap across the region and the state as a whole.

The RFPG recommends that the TWDB utilize the information generated by these RFPs to assist entities with identifying and leveraging existing funding sources that are available for FMPs, such as by providing assistance to small and underserved communities with grant funding applications and simplifying and streamlining TWBD program and application requirements, when possible. This RFP also provides recommendations to help identify other potential revenue-raising opportunities for flood mitigation in the state, as can be found in **Chapter 8.**

Appendix 9A
Sponsor Funding Survey Questions

Upper Rio Grande Flood Planning Group (URGFPG) - facilitated by Rio Grande COG for El Paso

The URGFPG is asking for your help. Through the work of our technical consultant, AECOM, we have estimated scope and costs for flood-related studies, infrastructure projects, and strategies affecting your entity. We would greatly appreciate your feedback and confirmation on whether we can include your entity as a sponsor for the proposed flood improvement actions that we are planning to include in the Draft Upper Rio Grande Regional Flood Plan (Flood Plan), due to the Texas Water Development Board (TWDB) on August 1, 2022. The purpose of our work is to submit a list of Flood Mitigation Projects (FMPs), Flood Management Evaluations (FMEs), and Flood Management Strategies (FMSs) as part of our Flood Plan. If future funding opportunities are available through the state of Texas, as a prerequisite to apply for the funding, your project or study must be included in the Regional Flood Plan.

Projects recommended in the Flood Plan as FMPs or FMSs will be eligible to apply for grant funding related to final design and construction. Studies included in the Flood Plan as FMEs or FMSs will be eligible to apply for grant funding related to the development of H&H modeling/mapping, alternative feasibility studies, or other studies defined in the specified FMEs or FMSs.

While the survey is very short (only 9 questions), the background and importance of these questions are critical, as they will allow us to provide the most comprehensive Flood Pan for our region and your entity: TWDB requires that each FME/ FMS/ FMP included in the Flood Plan be labeled with the information requested in Question 4 (the sponsor name) and Question 9 (estimated percent match by the sponsor).   Your entity’s answers to these questions incur no financial obligation on the part of your community, as these answers simply enable a future state funding opportunity for the FME/ FMS/ FMP in question. A potential scenario is described below, explaining how your answers to these questions could benefit your entity in the event that a future grant or funding opportunity becomes available through the State of Texas:

•The state requests applications for grant funding under a new program, which may be structured similar to the Flood Infrastructure Fund. If the FME/ FMS/ FMP is included in the Regional Flood Plan, the study / strategy/ project will meet the minimum requirements to apply for state funding through this future program.
•Your community decides whether to submit an application for state funding.

•If your entity decides to submit an application, your entity then commits to a percent match which will depend on the specific category or type of funding requested for that future grant program. Note, since the terms of this future grant program have not been set, the percent match (cash or in-kind) does not have to agree with your original estimate provided as an answer to Question No. 9 in this survey.

General guidance on available percent matches for state funding from the recent TWDB Flood Infrastructure Fund program is provided by clicking on the link below, and the then clicking the drop-down menu which states, “3. What type of assistance is available?”.
Link to details on the Flood Infrastructure Fund example funding program:
https://www.twdb.texas.gov/financial/programs/FIF/index.asp

1. What is the name of your entity?

Enter your answer

2. Have you applied for any grant funding related to flood related projects, studies, or equipment purchased in the last five years? If yes, can you tell us the project, its cost, and indicate how you covered the expenses (ie-grant, loan, general funds, bonds)?

Enter your answer

3. Are there additional flood-related issues your community might consider applying for future grants to study or address towards flood mitigation?

Enter your answer

4. The URGFPG has identified potential evaluations/strategies/projects in your community. As a requirement of the Regional Flood Plan, we must list a sponsor. May we list you as a sponsor for the specified FME/FMS/FMP in the link below?

   Please click on the link below
   https://riocogorg-my.sharepoint.com/:x:/g/personal/annetteg_riocog_org/Ea1ruzKB49tGgV8c_sbyPX4BuNg25LBAgnEFQ7hyHYA9Mw?e=RSmAqx

   ○ Yes

   ○ No

5. If you answered no to being a sponsor, would you like to provide a reason?

   Enter your answer

6. Do you have any edits/revisions or any additional information you would like considered in the documentation of the specified FME/FMS/FMP from the link provided in Question No. 4? If yes, please click on the link, download the file and provide your edits. You may send the file to chris.wright@aecom.com.

   ○ Yes

   ○ No

7. Does the estimated cost for the specified FME/FMS/FMP from the link provided in Question No. 4 seem accurate? If not, please provide revised costs or additional information you would like to be considered in the cost estimate. Our Technical Consultant, AECOM, developed the cost estimates with the available information, and they can set up a phone call to explain the details of the scope and cost estimate if you request it in your response.

   Enter your answer

8. Does the target year for the completion of the specified FME/FMS/FMP from the link provided in Question No. 4 seem accurate? If not, please provide a revised target year or additional information you would like to be considered in the proposed timeline.

Enter your answer

9. In the event that your entity chooses to apply for a future funding opportunity through the state of Texas, what is likely to be the percent match of the total cost that your entity would be willing to provide for the specified FME/FMS/FMP from the link provided in Question No. 4? Also, please specify which percentages of the match may be cash or in-kind.

Enter your answer

10. What is the source of funding your entity would typically utilize to pay for a flood-related project, study, or strategy (e.g., taxes; general revenue; dedicated revenue such as fees; etc.)

Enter your answer

Submit

Appendix 9B
Funding Survey Summary Table for FMEs, FMPs, and FMSs

Table 9B. Funding Survey Summary Table for FMEs, FMPs, and FMSs

						Estimated costs in plan				Estimated percent (share) of total FMS, FMP, or FME estimated cost			
										Sponsor Funding			
RFPG #	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Regional plan's unique FMS/FMP/FME identification number	Target year of full implementation	Non-construction costs	Construction-related costs	Total estimated fixed cost	Recurring cost (annually)	ANTICIPATED SOURCE OF Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)	Unknown Funding Needed (including state, federal and/ or Unknown funding)	TOTAL (auto) sum must = 100%
14	San Elizario city	FMP	Small pond at San Elizario	143000003	2023	$112,000	$ 113,000	$ 224,000	$ -	General Revenue	**20%**	**80%**	**100%**
14	TXDOT, El Paso Water	FMP	SH20 Drainage Improvements from Doniphan Drive to Texas Avenue	143000005	2025	$1,297,000	$ 2,448,000	$ 3,745,000	$ -	Revenue bonds, Cash Revenues, Credit	**0%**	**100%**	**100%**
14	Marfa city	FMP	Install Flood Gates in Marfa and Monitoring Gage on North Alamito Creek and Highway 17	143000007	2024	$232,000	$ 126,000	$ 358,000	$ -	General Funds	**20%**	**80%**	**100%**
14	Hudspeth County	FMP	Develop and Implement Floodplain Ordinance to Regulate Development at Hudspeth County	143000009	2023	$50,000	$ -	$ 50,000	$ -	General Revenue	**0%**	**100%**	**100%**
14	El Paso County	FMP	SSA4 Detention Basin	143000011	2027	$5,523,000	$ 9,221,000	$ 14,744,000	$ -	General Funds, Bonds, Tax Notes	**5%**	**95%**	**100%**
14	El Paso County, EPCWID1	FMP	SOC4 Sediment/ Detention Basin	143000021	2027	$966,000	$ 1,418,000	$ 2,384,000	$ -	Taxes, water use fees	**55%**	**45%**	**100%**
14	El Paso County	FMP	MON3 Sediment/ Detention Basin	143000024	2027	$9,364,000	$ 17,669,000	$ 27,033,000	$ -	General Funds, Bonds, Tax Notes	**5%**	**95%**	**100%**
14	El Paso County	FMP	HAC3 Sediment/ Detention Basin	143000025	2027	$1,622,000	$ 2,997,000	$ 4,619,000	$ -	General Funds, Bonds, Tax Notes	**5%**	**95%**	**100%**
14	El Paso Water	FMP	NW16 Channel Expansion	143000097	2025	$544,000	$ 1,026,000	$ 1,570,000	$ -	Revenue bonds, Cash Revenues, Credit	**0%**	**100%**	**100%**
14	El Paso Water	FMP	NE3B Catch Basin	143000100	2025	$7,355,000	$ 13,878,000	$ 21,233,000	$ -	Revenue bonds, Cash Revenues, Credit	**0%**	**100%**	**100%**
14	El Paso Water	FMP	EA10A Sediment/ Detention Basin	143000105	2024	$3,396,000	$ 6,251,000	$ 9,647,000	$ -	Revenue bonds, Cash Revenues, Credit	**0%**	**100%**	**100%**
14	El Paso Water	FMP	NW3 Catch Basin / Pump Station	143000111	2025	$5,588,000	$ 10,544,000	$ 16,132,000	$ -	Revenue bonds, Cash Revenues, Credit	**0%**	**100%**	**100%**
14	El Paso Water	FMP	NW26 Wetland/ Pump Stations	143000113	2025	$12,321,000	$ 23,247,000	$ 35,568,000	$ -	Revenue bonds, Cash Revenues, Credit	**0%**	**100%**	**100%**
14	El Paso Water	FMP	EA9A Sediment/ Detention Basin	143000116	2024	$4,121,280	$ 7,776,000	$ 11,897,280	$ -	Revenue bonds, Cash Revenues, Credit	**0%**	**100%**	**100%**
14	El Paso Water, El Paso County, EPCWID1	FME	Develop a plan for a Sediment and Vegetation Control Program in the Rio Grande at El Paso	141000001	2025	$107,000	$ -	$ 107,000	$ -	Taxes, Water Use Fees	**50%**	**50%**	**100%**
14	Presidio city, Presidio County	FME	Develop H&H Models for Cibolo Creek and arroyos through the City of Presidio, and develop an FMP for flood reduction of buildings and emergency access roadways.	141000002	2024	$183,000	$ -	$ 183,000	$ -	General Revenue	**20%**	**80%**	**100%**
14	El Paso County, EPCWID1, TXDOT	FME	Arroyo Siphon at SH20 near Tornillo	141000003	2024	$38,000	$ -	$ 38,000	$ -	Taxes, Water Use Fees	**50%**	**50%**	**100%**
14	El Paso Water, El Paso County, EPCWID1	FME	Lower Mesa Drain Improvements at El Paso	141000004	2024	$689,000	$ -	$ 689,000	$ -	Taxes, Water Use Fees	**50%**	**50%**	**100%**
14	San Elizario city, El Paso County	FME	Develop solution for flooding of San Elizario historic district, and localized flooding in San Elizario and adjacent communities	141000005	2023	$73,000	$ -	$ 73,000	$ -	General Revenue / General Funds or Bonds or Tax notes	**25%**	**75%**	**100%**
14	El Paso Water	FME	Increase Storage Capacity of Fort Bliss Sump	141000006	2023	$30,000	$ -	$ 30,000	$ -	Revenue bonds, Cash Revenues, Credit	**0%**	**100%**	**100%**
14	Presidio County	FME	Sediment Control at Alamito and Terneros Creek	141000008	2025	$111,000	$ -	$ 111,000	$ -	Unknown	**0%**	**100%**	**100%**
14	Pecos city, Lindsay CDP, Reeves County, TXDOT	FME	Develop city-wide drainage study and stormwater master plan for Pecos	141000010	2024	$92,000	$ -	$ 92,000	$ -	Unknown	**0%**	**100%**	**100%**
14	Fort Stockton city, Pecos County	FME	Dam Improvements at Comanche Creek Reservoir at Fort Stockton	141000012	2024	$68,000	$ -	$ 68,000	$ -	Unknown	**0%**	**100%**	**100%**
14	Hudspeth County	FME	Develop a Colonia-wide Drainage System at Fort Hancock	141000014	2024	$795,000	$ -	$ 795,000	$ -	General Revenue	**0%**	**100%**	**100%**
14	El Paso Water, El Paso County, EPCWID1	FME	Prioritize arroyos on their likelihood of producing sediment/ debris flows	141000015	2023	$70,000	$ -	$ 70,000	$ -	Taxes, Water Use Fees	**50%**	**50%**	**100%**
14	El Paso Water, El Paso County	FME	Conduct flood risk assessment at El Paso locations where drainage is controlled by river stage, and there are significant flood risks on the non-river side of the levee.	141000018	2024	$70,000	$ -	$ 70,000	$ -	Revenue bonds, Cash Revenues, Credit	**0%**	**100%**	**100%**
14	El Paso Water, EPCWID1	FME	Plan for mitigation of drainage controls where ground water reduces storm water conveyance capacity in the Montoya Drain	141000019	2024	$130,000	$ -	$ 130,000	$ -	Taxes, Water Use Fees	**50%**	**50%**	**100%**
14	Kermit city, Winkler County	FME	Develop city-wide drainage study and stormwater master plan for the City of Kermit.	141000021	2024	$75,000	$ -	$ 75,000	$ -	Unknown	**0%**	**100%**	**100%**

Table 9B. Funding Survey Summary Table for FMEs, FMPs, and FMSs

RFPG #	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Regional plan's unique FMS/FMP/FME identification number	Target year of full implementation	Estimated costs in plan				Estimated percent (share) of total FMS, FMP, or FME estimated cost			
										Sponsor Funding			
						Non-construction costs	Construction-related costs	Total estimated fixed cost	Recurring cost (annually)	ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)	Unknown Funding Needed (including state, federal and/ or Unknown funding)	TOTAL (auto) sum must = 100%
14	Hudspeth County	FME	Develop solutions for flooding near Sierra Blanca	141000022	2024	$76,000	$ -	$ 76,000	$ -	General Revenue	0%	100%	100%
14	Alpine city, Brewster County	FME	Develop city-wide drainage study and stormwater master plan for Alpine	141000023	2024	$250,000	$ -	$ 250,000	$ -	Unknown	0%	100%	100%
14	Sonora city, Sutton County	FME	Develop Supplemental Watershed Plans for flood control dams protecting Sonora	141000024	2024	$1,456,000	$ -	$ 1,456,000	$ -	Unknown	0%	100%	100%
14	Ozona CDP, Crockett County	FME	Develop Supplemental Watershed Plans for flood control dams protecting Ozona	141000025	2024	$1,456,000	$ -	$ 1,456,000	$ -	Unknown	0%	100%	100%
14	Monahans city, Southwest Sandhill CDP, Ward County	FME	Develop city-wide drainage study and stormwater master plan for Monahans/ Southwest Sandhill	141000026	2024	$104,000	$ -	$ 104,000	$ -	Dedicated Revenue	10%	90%	100%
14	Socorro city, El Paso County	FME	Develop city-wide drainage study and stormwater master plan for City of Socorro	141000033	2024	$73,000	$ -	$ 73,000	$ -	General Funds or Bonds or Tax notes	55%	45%	100%
14	El Paso Water	FME	Develop FMPs for additional projects in City of El Paso/El Paso Water Stormwater Master Plan	141000034	2025	$1,288,000	$ -	$ 1,288,000	$ -	Revenue bonds, Cash Revenues, Credit	0%	100%	100%
14	El Paso County	FME	Develop FMPs for additional projects from the El Paso County Stormwater Master Plan	141000035	2025	$276,000	$ -	$ 276,000	$ -	General Funds or Bonds or Tax notes	5%	95%	100%
14	USIBWC, El Paso Water, El Paso County, Doña Ana County, Hudspeth County	FMS	FEMA Levee Accreditation for All Rio Grande Levees at El Paso	142000001	2030	$482,000	$ -	$ 482,000	$ -	General Funds or Bonds or Tax notes	5%	95%	100%
14	Alpine city, Brewster County	FMS	Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine	142000002	2030	$1,282,000	$ -	$ 1,282,000	$ -	Unknown	0%	100%	100%
14	Fort Hancock city, Hudspeth County	FMS	Implement Colonia-wide Drainage System and Maintenance and Outreach Program for Roadside Swales and Driveway Culverts at Fort Hancock	142000003	2023	$58,000	$ 342,900	$ 400,900	$ 3,500	General Revenue	0%	100%	100%
14	El Paso Water, El Paso County, U.S. Army	FMS	Coordination with Ft. Bliss for FMP Permitting and Maintenance Access	142000004	2025	$49,000	$ -	$ 49,000	$ -	General Funds or Bonds or Tax notes	5%	95%	100%
14	RGCOG, Presidio County, TXDOT, USIBWC, USACE	FMS	Maintenance Program to control Salt Cedar vegetation along Rio Grande upstream of Presidio	142000005	2024	$97,000	$ -	$ 97,000	$ -	General Revenue	20%	80%	100%
14	Presidio County, USIBWC, RG/B Basin Flows Collaboration, Rio Grande Joint Venture	FMS	Study Binational Streamflow Recommendations for Big Bend Reach of Rio Grande/Rio Bravo	142000006	2030	$63,000	$ -	$ 63,000	$ -	General Revenue	20%	80%	100%
14	USACE, Pecos Compact Commission	FMS	Study to plan the management of saltcedar growth and debris in channels in/adjacent to City of Pecos	142000007	2025	$73,000	$ -	$ 73,000	$ -	Unknown	0%	100%	100%
14	USACE, Presidio County, City of Presidio	FMS	Develop Certification Package for Cibolo Creek Channel and Levee	142000008	2030	$79,000	$ -	$ 79,000	$ -	General Revenue	20%	80%	100%
14	EPCWID1, El Paso County, Texas GLO	FMS	Regulatory Review of Off-Road Traffic on State Lands	142000009	2025	$99,000	$ -	$ 99,000	$ -	Taxes, Water Use Fees	50%	50%	100%
14	EPCWID1, El Paso County, Texas GLO	FMS	Regulatory Review of Impervious Cover on New Development in El Paso County	142000010	2024	$64,000	$ -	$ 64,000	$ -	Taxes, Water Use Fees	50%	50%	100%
14	RGCOG	FMS	Staff augmentation support or funding for at risk communities to join and/or enforce the NFIP	142000013	2024	$44,000	$ -	$ 44,000	$ 700	Unknown	0%	100%	100%
14	RGCOG	FMS	Develop new flood gages throughout the region	142000014	2025	$240,000	$ -	$ 240,000	$ 7,000	Unknown	0%	100%	100%
14	El Paso Water, El Paso County	FMS	Develop and design standard options for addressing identified development-related flooding in El Paso	142000015	2024	$35,000	$ -	$ 35,000	$ -	General Funds or Bonds or Tax notes	5%	95%	100%
14	RGCOG	FMS	Develop regional solutions to address erosion issues in natural channels affecting stormwater conveyance	142000016	2024	$57,000	$ -	$ 57,000	$ -	Unknown	0%	100%	100%
14	El Paso Water, El Paso County	FMS	Develop solutions to address city/county stormwater conveyance into the Rio Grande (El Paso County)	142000017	2026	$99,000	$ -	$ 99,000	$ -	General Funds or Bonds or Tax notes	5%	95%	100%
14	El Paso Water, El Paso County, EPCWID1	FMS	Initiate program to develop integrated solutions to improve irrigation system/ stormwater conveyance system interaction in El Paso area	142000019	2025	$21,000	$ -	$ 21,000	$ -	Taxes or Water Use Fees	50%	50%	100%
14	El Paso Water, El Paso County, EPCWID1	FMS	Develop and Improve Early Warning System for El Paso City/ County interior drainage	142000020	2024	$95,000	$ 15,000	$110,000	$30,000	Taxes, Water Use Fees	50%	50%	100%
14	Pecos city, Reeves County	FMS	Develop and Improve Early Warning System for City of Pecos	142000021	2024	$37,000	$ 1,000	$ 38,000	$ 12,000	Unknown	0%	100%	100%
14	Alpine city, Brewster County	FMS	Develop and Improve Early Warning System for City of Alpine	142000022	2024	$37,000	$ 1,000	$ 38,000	$ 12,000	Unknown	0%	100%	100%
14	Presidio city, Presidio County	FMS	Develop and Improve Early Warning System for City of Presidio, Presidio County	142000023	2024	$37,000	$ 1,000	$ 38,000	$ 12,000	General Revenue	20%	80%	100%

Table 9B. Funding Survey Summary Table for FMEs, FMPs, and FMSs

						Estimated costs in plan				Estimated percent (share) of total FMS, FMP, or FME estimated cost			
										Sponsor Funding			
RFPG #	Sponsor Entity Name	FMS or FMP or FME	FMS FMP FME - Name	Regional plan's unique FMS/FMP/FME identification number	Target year of full implementation	Non-construction costs	Construction-related costs	Total estimated fixed cost	Recurring cost (annually)	ANTICIPATED SOURCE of Sponsor funding (e.g., taxes; general revenue; dedicated revenue incl. fees)	FUNDING TO BE FINANCED BY SPONSOR (incl. those local, county, or regional mechanisms available but not yet fully utilized)	Unknown Funding Needed (including state, federal and/ or Unknown funding)	TOTAL (auto) sum must = 100%
14	Fort Stockton city, Pecos County	FMS	Develop and Improve Early Warning System for City of Fort Stockton	142000024	2024	$37,000	$ 1,000	$ 38,000	$ 12,000	Unknown	0%	100%	100%
14	Marfa city, Presidio County	FMS	Develop and Improve Early Warning System for City of Marfa, Presidio County	142000025	n/a	$37,000	$ 1,000	$ 38,000	$ 12,000	General Funds	20%	80%	100%

Chapter 10: Public Participation and Plan Adoption

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Appendices

10. Public Participation and Plan Adoption

This chapter summarizes the role of the Upper Rio Grande RFPG in the flood planning process and the various public participation, information, and outreach activities conducted by the RFPG during the development of the RFP. These activities demonstrate the RFPG's commitment to engaging with the public and other flood planning stakeholders and providing as many opportunities as possible for public input.

The chapter also describes the flood plan adoption process, including information on the submittal of the Draft RFP, the required public hearing, addressing public comments, and the adoption of the Final RFP.

10.1 RFPG Organization and Role in Flood Planning Process

The Upper Rio Grande RFPG is one of the 15 RFPGs formed by the TWDB on October 1, 2020, as a result of the passage of Texas Senate Bill 8 in 2019, which established the state and regional flood planning process. The RFPG's role and functions are defined in Texas Water Code (TWC) Chapter 16 and in Title 31 of the TAC Chapters 361 and 362. Among these functions, the Upper Rio Grande RFPG's primary responsibility is to identify and manage flood risks across the region to reduce the impacts of flooding to life, property, and infrastructure.

Voting members within the Upper Rio Grande RFPG represent ten interest groups (shown in **Table 10.1**), while non-voting members represent state agencies or other neighboring regional planning groups (shown in **Table 10.2**). All RFPG members are recognized for their important contributions to the 2023 Upper Rio Grande Regional Flood Plan.

Table 10.1 Upper Rio Grande Flood Planning Voting Members

Interest Group	Name	Entity	County	Alternate Member
Agriculture	Dr. Zhuping Sheng	Sheng Engineering PLLC	El Paso	N/A
Counties	Gilbert Saldana, Jr.	El Paso County	El Paso	N/A
Electric generating utilities	Vacant	N/A	N/A	N/A
Environmental Interests	Jeff Bennett	Rio Grande Joint Venture	Brewster	N/A
Industries	Sal Masoud	Del Rio Engineering	El Paso	N/A
Municipalities	Javier Acosta	FXSA	El Paso	N/A
Public	Dave Hall	N/A	El Paso	N/A
Public	Carlos Arturo Velarde Fernandez	Val Verde County	Val Verde	N/A
Small Business	Rene Rodriguez	N/A	El Paso	N/A
Water Districts	Omar L. Martinez	EPCWID #1	El Paso	N/A
Water Utilities	Gisela Dagnino	El Paso Water	El Paso	Enrique Ochoa, Marvin Gomez
Water Utilities	Levi Bryand	LCA, Inc.	Ector	N/A

Table 10.2 Upper Rio Grande Flood Planning Non-Voting Members

Non-Voting Member	Agency/Organization
James Weaver	Texas Parks and Wildlife Department
Judy Lucio	Texas Division of Emergency Management
Larissa Place	Texas Department of Agriculture
Elijah Casas	Texas General Land Office
Richard Bagans	Texas Water Development Board (TWDB)
Anita Keese	Texas Commission on Environmental Quality (TCEQ)
Vanessa Rosales-Herrera	Region 15 Liaison
Delbert Humberson	U.S. International Boundary and Water Commission (IBWC)
Ben Wilde	Texas State Soil and Water Conservation Board (TSSWCB)

Throughout the planning process, the RFPG formed several committees to focus on different aspects of the flood plan and provide recommendations to the overall planning group at general RFPG meetings. These committees included an executive committee and four topic-based subcommittees to examine specific parts of the RFP scope of work as listed below and summarized in **Table 10.3**:

- Subcommittee 1: Evaluation and Recommendations on Floodplain Management Practices/Flood Mitigation and Floodplain Management Goals (Tasks 3A and 3B, Chapter 3), shown in
- Subcommittee 2: Identification & Evaluation of Potential FMPs (Task 4, Chapter 4)
- Subcommittee 3: Identification & Evaluation of Potential FMEs and FMSs (Task 4, Chapter 4)
- Subcommittee 4: Administrative, Regulatory, and Legislative Recommendations (Task 8, Chapter 8)

The four subcommittees were formed by the RFPG on September 7, 2021, and included both voting and non-voting members from the RFPG. Subcommittee members are listed in **Table 10.4** through **Table 10.7**. General RFPG meetings and subcommittee meetings were all held in accordance with Open Meetings Act (OMA) requirements, as described in Section 10.2.2.

Table 10.3 Upper Rio Grande Flood Planning Group Committees

Committee	Number of Meetings
Executive Committee	1
Subcommittee 1 – Evaluation and Recommendations on Floodplain Management Practices/Flood Mitigation and Floodplain Management Goals (Task 3)	4
Subcommittee 2 – Identification & Evaluation of Potential FMPs (Task 4)	6
Subcommittee 3 – Identification & Evaluation of Potential FMEs and FMSs (Task 4)	4
Subcommittee 4 – Administrative, Regulatory, and Legislative Recommendations (Task 8)	3

Table 10.4 Subcommittee 1 Members (Evaluation and Recommendations on Floodplain Management Practices/Flood Mitigation and Floodplain Management Goals, Task 3)

Member	Interest Category	Member Type
Dave Hall, *Subcommittee 1 Chair*	Public	RFPG Voting Member
Carlos Arturo Velarde Fernandez	Public	RFPG Voting Member
Gilbert Saldana, Jr.	Counties	RFPG Voting Member
Gisela Dagnino	Water Utilities	RFPG Voting Member
Javier Acosta	Municipalities	RFPG Voting Member
Levi Bryand	Water Utilities	RFPG Voting Member
Omar L. Martinez	Water Districts	RFPG Voting Member

Table 10.5 Subcommittee 2 Members (Identification & Evaluation of Potential FMPs, Task 4)

Member	Interest Category	Member Type
Javier Acosta, *Subcommittee 2 Chair*	Municipalities	RFPG Voting Member
Carlos Arturo Velarde Fernandez	Public	RFPG Voting Member
Dave Hall	Public	RFPG Voting Member
Gilbert Saldana, Jr.	Counties	RFPG Voting Member
Gisela Dagnino	Water Utilities	RFPG Voting Member
Jeff Bennett	Environmental Interests	RFPG Voting Member
Levi Bryand	Water Utilities	RFPG Voting Member
Omar L. Martinez	Water Districts	RFPG Voting Member
Delbert Humberson	U.S. IBWC	RFPG Non-Voting Member

Table 10.6 Subcommittee 3 Members (Identification & Evaluation of Potential FMEs and FMSs, Task 4)

Member	Interest Category	Member Type
Sal Masoud, *Subcommittee 3 Chair*	Industries	RFPG Voting Member
Gisela Dagnino	Water Utilities	RFPG Voting Member
Jeff Bennett	Environmental Interests	RFPG Voting Member
Levi Bryand	Water Utilities	RFPG Voting Member
Omar L . Martinez	Water Districts	RFPG Voting Member
Delbert Humberson	U.S. IBWC	RFPG Non-Voting Member

Table 10.7 Subcommittee 4 Members (Administrative, Regulatory, and Legislative Recommendations, Task 8)

Member	Interest Category	Member Type
Omar L . Martinez, *Subcommittee 4 Chair*	Water Districts	RFPG Voting Member
Gilbert Saldana, Jr.	Counties	RFPG Voting Member
Gisela Dagnino	Water Utilities	RFPG Voting Member
Levi Bryand	Water Utilities	RFPG Voting Member
Sal Masoud	Industries	RFPG Voting Member
Anita Keese	TCEQ	RFPG Non-Voting Member
Delbert Humberson	U.S. IBWC	RFPG Non-Voting Member

The RFPG represents the interests of stakeholders throughout the flood planning region and functions in support of and in coordination with the TWDB to deliver the draft and final Regional Flood Plans. The RFPG responsibilities are outlined in 31 TAC §361.12 and include the following activities for every planning cycle:

1. Designate a political subdivision as a Planning Group Sponsor – in this planning cycle, the Planning Group sponsor was RGCOG.
2. Select a technical consultant(s) to be procured by the Planning Group Sponsor – in this planning cycle, the technical consultant was AECOM.
3. Hold at least one public meeting, to determine what, if any, additional public notice the RFPG determines is necessary to ensure adequate public notice in its own FPR. This meeting was held on November 5, 2020.
4. Hold public meetings at central locations readily accessible to the public within the FPR to gather general suggestions and recommendations from the public. These meetings are discussed further in Section 10.2.2.
5. Approve the contract(s) and any subsequent amendments thereto between the Planning Group Sponsor and the technical consultant or TWDB Scope(s) of Work or budgets in open

meetings. The original contract was approved and executed on June 11, 2021, and the contract amendment was approved and executed on March 25, 2022.

10.2 Public Information and Engagement

The Upper Rio Grande RFPG encouraged broad, regionwide public participation throughout the flood planning process. All RFPG activities and RFP updates were posted and accessible to the public with opportunities for public feedback. Flood planning stakeholders and the public were engaged throughout the process across several modes of outreach as described in the following section. The RFPG met all requirements under the Texas Open Meetings Act and Public Information Act.

10.2.1 Media Releases and Online Access

Media releases about the flood planning process were produced and distributed to local media organizations across the region. These media releases resulted in an estimated media reach of nearly 3 million through print, digital, and broadcast media stories, targeting the areas of El Paso, Pecos, Presidio, Alpine, Marfa, and Fort Davis. Additional public outreach was conducted by state media outlets.

The Upper Rio Grande RFPG maintains a flood planning website (www.urgfpg.org) with information for the public regarding past and upcoming RFPG meetings, open house events, planning documents, RFPG members, and public comment submission. Interested parties are encouraged to sign up to receive public meeting notices and other flood planning updates by email. Additional information regarding the state flood planning process is also available at the TWDB's flood planning website (www.twdb.texas.gov/flood/planning/index.asp).

10.2.2 Public Meetings

RFPG Meetings

The Upper Rio Grande RFPG held several meetings between November 2020 and January 2023 to discuss relevant RFP topics, conduct pre-planning and administrative activities, receive updates from the technical consultant, and vote on specific measures. All meetings were posted and held in accordance with the Texas Open Meetings Act (OMA) with a copy of all materials presented or discussed available for public inspection prior to and following public meetings.

Due to the COVID-19 pandemic, selected OMA provisions were temporarily suspended by the Office of the Texas Governor, and public meetings were initially held fully online via GoToWebinar and Microsoft Teams. Once these temporary suspensions were lifted, RFPG meetings were conducted in-person at the RGCOG office in El Paso with a virtual option for the convenience and safety of attendees. Public attendance was encouraged, and each meeting included a scheduled time for public comments or questions. In addition, all meetings were recorded and posted online on the RFPG website along with the associated meeting minutes for public access following the meetings. **Table 10.8** provides an overview of all general RFPG meetings conducted during the first planning cycle. Meeting minutes from the RFPG general meetings and subcommittee meetings are provided in **Appendix 10A**.

Table 10.8 Upper Rio Grande Flood Planning Meetings

Meeting Number	Date	Meeting Location	Agenda Highlights
0.1	November 5, 2020	GoToWebinar Virtual Meeting	Pre-Planning Meeting
0.2	January 21, 2021	GoToWebinar Virtual Meeting	Pre-Planning Meeting
0.3	March 16, 2021	GoToWebinar Virtual Meeting	Pre-Planning Meeting
0.5	April 9, 2021	GoToWebinar Virtual Meeting	Executive Committee Meeting
0.5	April 15, 2021	GoToWebinar Virtual Meeting	Pre-Planning Meeting
0.6	May 20, 2021	GoToWebinar Virtual Meeting	Pre-Planning Meeting
1	August 5, 2021	RGCOG, El Paso, TX / Microsoft Teams	Introduction to Consultant Team; Flood Plan Outline; Discussion of Tasks 1-2
2	September 7, 2021	RGCOG, El Paso, TX / Microsoft Teams	Discussion of Tasks 1-2; RFPG Approval of Subcommittees 1-4
3	October 15, 2021	RGCOG, El Paso, TX / Microsoft Teams	Discussion of Tasks 1-4; Stakeholder Coordination; El Paso Open House Meeting Preview; Updates from Subcommittee 1-3 Meetings
4	November 2, 2021	RGCOG, El Paso, TX / Microsoft Teams	Discussion of Tasks 1-4; Stakeholder Coordination Results; El Paso Open House Meeting Recap; Updates from Subcommittee 1 and 3 Meetings
5	November 30, 2021	El RGCOG, Paso, TX / Microsoft Teams	Discussion of Tasks 1-4; RFPG Approval of (1) Recommendations on Floodplain Management Standards, (2) Adoption of Flood Mitigation and Floodplain Management Goals, and (3) Process to Identify and Evaluate Potential FMEs, FMSs, and FMPs
6	December 16, 2021	RGCOG, El Paso, TX / Microsoft Teams	Updates from Subcommittee 2 Meeting; RFPG Adoption of Technical Memo and Authorization of Consultant to submit Technical Memo to TWDB
7	February 2, 2022	RGCOG, El Paso, TX / Microsoft Teams	Discussion of Tasks 4-5; Pecos and Presidio Open House Meeting Preview; Updates from Subcommittee 2-3 Meetings; RFPG Approval of (1) Refinements to list of Identified FMEs and FMSs and (2) Refinements to FMP Prioritization Method
8	February 28, 2022	RGCOG, El Paso, TX / Microsoft Teams	Discussion of Tasks 4-5 and 8 focusing on evaluation of FMEs and FMSs; Pecos and Presidio Open House Meeting Recap; RFPG Approval of Technical Memo March 7th Deliverables and Authorization of Consultant to submit Deliverables to TWDB
9	March 15, 2022	RGCOG, El Paso, TX / Microsoft Teams	Discussion of Tasks 4-5 focusing on evaluations of FMPs
10	April 21, 2022	RGCOG, El Paso, TX / Microsoft Teams	Discussion of Tasks 4-5 focusing on evaluations of FMEs, FMSs, and FMPs; RFPG Approval of Recommendations for FMPs

Meeting Number	Date	Meeting Location	Agenda Highlights
11	May 25, 2022	RGCOG, El Paso, TX / Microsoft Teams	Discussion of Tasks 4-5 and 8; RFPG Approval of (1) Recommendations for FMPs and (2) Revision of Flood Mitigation and Floodplain Management Goals
12	June 30, 2022	RGCOG, El Paso, TX / Microsoft Teams	Review of Draft RFP Chapters
13	July 13, 2022	RGCOG, El Paso, TX / Microsoft Teams	Review of Draft RFP Chapters
14	July 20, 2022	RGCOG, El Paso, TX / Microsoft Teams	Review of Draft RFP Chapters; RFPG Approval of (1) Draft RFP Deliverables and Authorization of Consultant to Submit Deliverables to TWDB and (2) Recommendations for FMEs, FMSs, and FMPs
15	July 26, 2022	RGCOG, El Paso, TX / Microsoft Teams	Review of Draft RFP Chapters
16	July 28, 2022	RGCOG, El Paso, TX / Microsoft Teams	Review of Draft RFP Chapters; RFPG Approval of Chapter 8 Administrative, Regulatory, and Legislative Recommendations
17	September 14, 2022	RGCOG, El Paso, TX / Microsoft Teams	Discussion on potential FMEs to perform during Task 12 RFP amendment phase
18	November 15, 2022	RGCOG, El Paso, TX / Microsoft Teams	Initial discussion of TWDB and public comments on Draft RFP; Discussion of Stakeholder Coordination for Task 12 (FMEs for Amended RFP); RFPG Approval of FMEs to study in Task 12
19	December 6, 2022	RGCOG, El Paso, TX / Microsoft Teams	Review of TWDB/public comments and draft responses to comments on Draft RFP; Discussion of Task 12; RFPG Approval of changes to Task 12 FMEs
20	December 15, 2022	RGCOG, El Paso, TX / Microsoft Teams	RFPG Adoption of Final RFP and Authorization of Consultant to Submit Final Deliverables to TWDB
21	February 7, 2023	RGCOG, El Paso, TX / Microsoft Teams	Discussion on Task 12 (Performing FMEs for Amended RFP)
22	March 8, 2023	RGCOG, El Paso, TX / Microsoft Teams	Discussion and potential action regarding administrative expenses; Digital Infrastructure Program; Discussion on Task 12 (Performing FMEs for Amended RFP)
23	April 12, 2023	RGCOG, El Paso, TX / Microsoft Teams	Discussion and potential action regarding administrative expenses; Digital Infrastructure Program; Discussion on Task 12 (Performing FMEs for Amended RFP)
24	May 9, 2023	RGCOG, El Paso, TX / Microsoft Teams	Discussion on Task 12 (Performing FMEs for Amended RFP)
25	June 7, 2023	RGCOG, El Paso, TX / Microsoft Teams	Vote to acknowledge and approve additional FMEs, FMPs, and funding sources
26	June 21, 2023	RGCOG, El Paso, TX / Microsoft Teams	Discussion and action to vote for approval of Final Amended RFP Deliverables as presented by AECOM with Authorization of Consultant/Political Subdivision to make edits finalizing responses to Draft Amended RFP comments submitted by the Public and to submit the Final Amended RFP Deliverables to TWDB; Consideration for the 2nd cycle of regional flood planning

Open House Meetings and Hearings

In addition to the regular RFPG and committee meetings, several public open house meetings were held throughout the region to facilitate engagement with the public and other flood planning stakeholders. Due to the region's large size, three locations relatively central to the region were identified to host these public open house meetings, including the Cities of El Paso, Pecos, and Presidio.

An initial pre-planning meeting was held in El Paso on July 25, 2021, to receive preliminary feedback from the public on important issues to be considered as part of the RFP. In addition, over the course of the flood planning process, four open house meetings were conducted on the following dates:

- Open House Meeting in El Paso: October 27, 2021
- Open House Meeting in Pecos: February 9, 2022
- Open House Meeting in Presidio: February 10, 2022
- Open House Meeting in El Paso: June 8, 2022

At each of these open house meetings, flood maps from the region were shared to allow community members the opportunity to identify any potential flood risks that had not previously been captured on the maps. Public feedback from these meetings was used during the development of flood prone areas discussed in *Chapter 2 ("Flood Risk Analyses").* These meetings were also utilized to gather general suggestions and recommendations from the public as to issues, provisions, and types of FMSs, FMPs, and FMEs that should be considered for potential inclusion in the first-cycle RFP. The final open house meeting in El Paso was utilized to gather public feedback on the potential recommended FMSs, FMPs, and FMEs discussed in *Chapter 5 ("Evaluation and Recommendation of Flood Solutions").* Public notifications for each open house meeting were advertised in local newspapers and on social media.

A Public Hearing was held in El Paso on September 14, 2022, to receive public feedback on the Draft RFP. Details of this public hearing are included with **Appendix 10C**.

10.2.3 Surveys

The RFPG conducted a stakeholder survey from September to October 2021 to obtain flood-related information from the public and other flood planning stakeholders. The survey was posted on the RFPG website and emailed directly to stakeholders, who were also contacted by the RFPG and technical consultant and encouraged to participate in the survey. In addition to stakeholder-specific questions, the survey included general flood-related questions to solicit feedback from the public related to overall flood experiences and issues of concern. A copy of the survey results is provided for reference in **Appendix 10B**.

In addition, an interactive web map was developed to collect feedback from the public regarding flood prone areas, critical infrastructure or resources, existing infrastructure, and existing or proposed flood mitigation projects. The interactive web map was shared as part of the stakeholder survey and at public open house meetings.

10.2.4 Draft RFP Review, Final Adoption, and Amendment

The Draft RFP was approved by the RFPG on July 20, 2022, and submitted to the TWDB for review. The Draft RFP was released for public review with a 60-day comment period between August 14, 2022, and October 14, 2022. In addition, a Public Hearing was held on September 14, 2022, to receive public comments. Printed copies of the Draft RFP were located in three publicly accessible locations in the region including the cities of El Paso, Pecos, and Presidio. The Draft RFP was also posted to the RFPG website for public review, and public comments were accepted electronically during the public review and comment period.

All comments from the TWDB on the Draft RFP are provided in **Appendix 10D** followed by RFPG responses to these comments. Public comments received during the 60-day comment period are summarized (along with responses) in **Appendix 10E**, including comments from the Rio Grande Council of Governments (RGCOG) and the U.S. Army Corps of Engineers (USACE). During the Public Hearing on September 14, 2022, the RFPG met with members of the public to clarify the purpose and content included in the RFP; however, no additional formal comments requiring changes to the RFP were received from the public during this meeting.

The Final RFP was adopted by the RFPG on December 15, 2022, and submitted to the TWDB along with supporting materials on January 10, 2023. The RFP was submitted in accordance with the contractual, statute, and rule requirements.

The Amended RFP was subsequently approved by the RFPG on June 21, 2023. AECOM submitted the Amended RFP to TWDB along with supporting materials on July 14, 2023.

10.3 Flood Planning Guidance Principles

The state and regional flood planning process is guided by 39 principles adopted in Title 31 Texas Administrative Code (TAC) §362.3. This RFP conforms with each of these flood planning guidance principles, including the requirement that the plan will not negatively affect any neighboring areas. Specifically, each of the principles are aligned with one or more of the RFP report sections as outlined in **Table 10.9**. In addition, the RFP adequately provides for the preservation of life and property in the region.

Table 10.9 Alignment of RFP with Guidance Principles

Guidance Principle (“The regional and state flood plans: …”)		RFP Section(s)
1	shall be a guide to state, regional, and local flood risk management policy;	Chapter 3, Chapter 8
2	shall be based on the best available science, data, models, and flood risk mapping;	Chapter 1, Chapter 2, Chapter 4/5
3	shall focus on identifying both current and future flood risks, including hazard, exposure, vulnerability and residual risks; selecting achievable flood mitigation goals, as determined by each RFPG for their region; and incorporating strategies and projects to reduce the identified risks accordingly;	Chapter 2, Chapter 3, Chapter 4/5
4	shall, at a minimum, evaluate flood hazard exposure to life and property associated with 0.2 percent annual chance flood event (the 500-year flood) and, in these efforts, shall not be limited to consideration of historic flood events;	Chapter 2

Guidance Principle ("The regional and state flood plans: …")		RFP Section(s)
5	shall, when possible and at a minimum, evaluate flood risk to life and property associated with 1.0 percent annual chance flood event (the 100-year flood) and address, through recommended strategies and projects, the flood mitigation goals of the RFPG (per item 2 above) to address flood events associated with a 1.0 percent annual chance flood event (the 100-year flood); and, in these efforts, shall not be limited to consideration of historic flood events;	Chapter 2, Chapter 4/5
6	shall consider the extent to which current floodplain management, land use regulations, and economic development practices increase future flood risks to life and property and consider recommending adoption of floodplain management, land use regulations, and economic development practices to reduce future flood risk;	Chapter 3
7	shall consider future development within the planning region and its potential to impact the benefits of flood management strategies (and associated projects) recommended in the plan;	Chapter 1, Chapter 2
8	shall consider various types of flooding risks that pose a threat to life and property, including, but not limited to, riverine flooding, urban flooding, engineered structure failures, slow rise flooding, ponding, flash flooding, and coastal flooding, including relative sea level change and storm surge;	Chapter 1, Chapter 2
9	shall focus primarily on flood management strategies and projects with a contributing drainage area greater than or equal to 1.0 (one) square miles except in instances of flooding of critical facilities or transportation routes or for other reasons, including levels of risk or project size, determined by the RFPG;	Chapter 4/5
10	shall consider the potential upstream and downstream effects, including environmental, of potential flood management strategies (and associated projects) on neighboring areas. In recommending strategies, RFPGs shall ensure that no neighboring area is negatively affected by the regional flood plan;	Chapter 4/5, Chapter 6
11	shall include an assessment of existing, major flood mitigation infrastructure and will recommend both new strategies and projects that will further reduce risk, beyond what existing flood strategies and projects were designed to provide, and make recommendations regarding required expenditures to address deferred maintenance on or repairs to existing flood infrastructure;	Chapter 1, Chapter 4/5
12	shall include the estimate of costs and benefits at a level of detail sufficient for RFPGs and sponsors of flood mitigation projects to understand project benefits and, when applicable, compare the relative benefits and costs, including environmental and social benefits and costs, between feasible options;	Chapter 4/5
13	shall provide for the orderly preparation for and response to flood conditions to protect against the loss of life and property and reduce injuries and other flood-related human suffering;	Chapter 7
14	shall provide for an achievable reduction in flood risk at a reasonable cost to protect against the loss of life and property from flooding;	Chapter 4/5
15	shall be supported by state agencies, including the TWDB, General Land Office, Texas Commission on Environmental Quality, Texas State Soil and Water Conservation Board, Texas Parks and Wildlife Department, and the Texas Department of Agriculture, working cooperatively to avoid duplication of effort and to make the best and most efficient use of state and federal resources;	Chapter 10
16	shall include recommended strategies and projects that minimize residual flood risk and provide effective and economical management of flood risk to people, properties, and communities, and associated environmental benefits;	Chapter 4/5
17	shall include strategies and projects that provide for a balance of structural and nonstructural flood mitigation measures, including projects that use nature-based features, that lead to long-term mitigation of flood risk;	Chapter 4/5

Guidance Principle ("The regional and state flood plans: …")		RFP Section(s)
18	shall contribute to water supply development where possible;	Chapter 6
19	shall also follow all regional and state water planning guidance principles (31 TAC 358.3) in instances where recommended flood projects also include a water supply component;	Chapter 6
20	shall be based on decision-making that is open to, understandable for, and accountable to the public with full dissemination of planning results except for those matters made confidential by law;	Chapter 10
21	shall be based on established terms of participation that shall be equitable and shall not unduly hinder participation;	Chapter 10
22	shall include flood management strategies and projects recommended by the RFPGs that are based upon identification, analysis, and comparison of all flood management strategies the RFPGs determine to be potentially feasible to meet flood mitigation and floodplain management goals;	Chapter 4/5
23	shall consider land-use and floodplain management policies and approaches that support short- and long-term flood mitigation and floodplain management goals;	Chapter 3
24	shall consider natural systems and beneficial functions of floodplains, including flood peak attenuation and ecosystem services;	Chapter 3, Chapter 4/5
25	shall be consistent with the National Flood Insurance Program (NFIP) and shall not undermine participation in nor the incentives or benefits associated with the NFIP;	Chapter 2, Chapter 3
26	shall emphasize the fundamental importance of floodplain management policies that reduce flood risk;	Chapter 3
27	shall encourage flood mitigation design approaches that work with, rather than against, natural patterns and conditions of floodplains;	Chapter 3, Chapter 4/5
28	shall not cause long-term impairment to the designated water quality as shown in the state water quality management plan as a result of a recommended flood management strategy or project;	Chapter 6
29	shall be based on identifying common needs, issues, and challenges; achieving efficiencies; fostering cooperative planning with local, state, and federal partners; and resolving conflicts in a fair, equitable, and efficient manner;	Chapter 10
30	shall include recommended strategies and projects that are described in sufficient detail to allow a state agency making a financial or regulatory decision to determine if a proposed action before the state agency is consistent with an approved regional flood plan;	Chapter 4/5
31	shall include ongoing flood projects that are in the planning stage, have been permitted, or are under construction;	Chapter 1
32	shall include legislative recommendations that are considered necessary and desirable to facilitate flood management planning and implementation to protect life and property;	Chapter 8
33	shall be based on coordination of flood management planning, strategies, and mitigation projects with local, regional, state, and federal agencies projects and goals;	Chapter 10
34	shall be in accordance with all existing water rights laws, including but not limited to, Texas statutes and rules, federal statutes and rules, interstate compacts, and international treaties;	Chapter 6
35	shall consider protection of vulnerable populations;	Chapter 2, Chapter 4/5
36	shall consider benefits of flood management strategies to water quality, fish and wildlife, ecosystem function, and recreation, as appropriate;	Chapter 4/5, Chapter 6
37	shall minimize adverse environmental impacts and be in accordance with adopted environmental flow standards;	Chapter 4/5, Chapter 6

Guidance Principle (“The regional and state flood plans: …”)		RFP Section(s)
38	shall consider how long-term maintenance and operation of flood strategies will be conducted and funded; and	Chapter 9
39	shall consider multi-use opportunities such as green space, parks, water quality, or recreation, portions of which could be funded, constructed, and or maintained by additional, third-party project participants.	Chapter 4/5

Appendix 10A
RFPG Meeting Minutes

Appendix 10A.1
RFPG General Meeting Minutes

Meeting Minutes
Region 14 Upper Rio Grande Flood Planning Group Meeting
Thursday, November 5, 2020
9:00 AM
GoToWebinar Virtual Meeting

Roll Call:

Voting Member	Interest Category	Present (x) /Absent ( ) / Alternate Present (*)
Oscar D. "Jay" Ornelas	*Agricultural interests*	
Gilberto Saldana Jr.	*Counties*	x
Jessica Christianson	*Electric generating utilities*	x
Jeff Bennett	*Environmental interests*	x
Vacant	*Flood districts*	
Sal Masoud	*Industries*	X (arrived at 9:20am)
Javier Acosta	*Municipalities*	x
David "Dave" Hall	*Public*	x
Vacant	*River authorities*	
Rene Rodriguez	*Small business*	X (arrived at 9:50am)
Omar L. Martinez	*Water districts*	x
Vacant	*Water utilities*	

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	x
Tim Frere	Texas Division of Emergency Management	x
Larissa Place	Texas Department of Agriculture	x
Ben Wilde	Texas State Soil and Water Conservation Board	x
Sarah Douglas	General Land Office	x
Richard Bagans	Texas Water Development Board (TWDB)	x
Anita Keese	Texas Commission on Environmental Quality	x

Quorum:

Quorum: **Yes**
Number of voting members or alternates representing voting members present: **8**
Number required for quorum per current voting positions of 11: 6

Other Meeting Attendees: **

Matt Nelson, TWDB (Meeting Facilitator)
Kathleen Jackson, TWDB Board Member
Reem Zoun, TWDB
James Bronikowski, TWDB
Morgan White, TWDB
Annette Mass, TWDB
Hayley Gillespie, TWDB
Ron Ellis, TWDB
Jennifer White, TWDB
Chad Ballard

Phil Bullock
Ramesh Chintala
Stephanie Castillo
Gisela Dagnino
Kelly Dillard
Rene Franks
Alem Gebriel
Annette Gutierrez
Scott Hubley
Anita Keese
Amin Kiaghadi
Justin Lennon
Gabby Ramos
Art Reinhardt
Paul Robinson
Gustavo Sosa
Rodrigo Vizcaino
Jeff Henson

**Meeting attendee names were gathered from those who entered information for joining the GoToWebinar meeting.

All meeting materials are available for the public at:
http://www.twdb.texas.gov/flood/planning/regions/schedule.asp.

1. **AGENDA ITEM NO. 1: Call to Order**

Matt Nelson called the meeting to order at 9:06 AM. A roll call of the planning group members was taken to record attendance and a quorum was established prior to calling the meeting to order.

2. **AGENDA ITEM NO. 2: Welcome, Meeting Facilitation Information and Instructions**

Matt Nelson and Director Kathleen Jackson welcomed members to the meeting. Matt Nelson provided meeting facilitation information and instructions.

3. **AGENDA ITEM NO. 3: Member Introductions**

Each present voting and non-voting member of the Region 14 Upper Rio Grande RFPG introduced themselves.

4. **AGENDA ITEM NO. 4: Regional Flood Planning Overview Presentation**

Matt Nelson and Reem Zoun presented an overview of the regional flood planning process.

5. **AGENDA ITEM NO. 5: Discussion of group bylaws and consider adopting group bylaws**

Matt Nelson presented the model bylaws provided by the TWDB for the RFPG to consider adopting and opened discussion on adopting group bylaws.

The members discussed and made edits to the model bylaws regarding the following topics: replacing "Model RFPG" with "Region 14 Upper Rio Grande RFPG" throughout the document, voting membership attendance, selecting initial officers, the selection of regular officers starting in 2022, regular meeting frequency, and amending the bylaws.

The members discussed total voting membership and forming subcommittees. No changes were made regarding these topics.

A motion was made by Omar Martinez to adopt the bylaws, as amended.
The motion was seconded by Dave Hall.
The vote to adopt the group bylaws passed by a vote of 7 Ayes and 0 Nays.

6. **AGENDA ITEM NO. 6: Consider nominating and electing regional flood planning group Chair or Interim Chair**

Matt Nelson described the Chair/Interim Chair election process and opened the floor to nominations for the Chair or Interim Chair position.

A nomination of Omar Martinez as the Chair was made by Dave Hall.

Omar Martinez discussed his willingness to serve as Chair and familiarity with the flood planning region and other members.

Dave Hall made a motion to select Omar Martinez as the Chair by acclimation.
The motion was seconded by Jessica Christianson.

The nomination of Omar Martinez as the Chair was approved by unanimous consent.

The group then took a 5-minute recess.

7. **AGENDA ITEM NO. 7: Consider selecting a planning group sponsor to act on behalf of the regional flood planning group**

Matt Nelson listed the entities that had expressed interest in serving as the Region 14 Upper Rio Grande RFPG's planning group sponsor. These interested entities included:
Rio Grande Council of Governments (COG)

Matt Nelson opened the floor to public comments. No public comments were given.

Matt Nelson asked if any there was anyone in the audience that represented a political subdivision that was interested in acting as the planning group sponsor. No additional interested entities came forward to express interest.

Omar Martinez opened discussion on selecting a planning group sponsor to act on behalf of the RFPG.

The members discussed selecting Rio Grande COG as the planning group sponsor.

A motion was made by Jeff Bennett to select Rio Grande COG as the designated planning group sponsor for Region 14 Upper Rio Grande RFPG.
Sal Masoud seconded the motion.
The vote to select Rio Grande COG as the planning group sponsor to act on behalf of the RFPG passed by unanimous consent.

8. **AGENDA ITEM NO. 8: Consider additional, region-specific public notice requirements, if any, that might be necessary to ensure adequate public notice in the region per 31 Texas Administrative Code §361.12(3).**

Matt Nelson described existing notice requirements and opened discussion on identifying additional, region-specific public notice requirements.

Matt Nelson opened the floor to public comments. No public comments were given.

No points nor comments/concerns were brought forth during open discussion.

No action was taken. Omar Martinez closed discussion on AGENDA ITEM NO. 8.

9. **AGENDA ITEM NO. 9: Consider authorizing the RFPG sponsor to apply for grant funds and enter into a contract with the TWDB on behalf of the RFPG**

Omar Martinez opened discussion on authorizing the RFPG sponsor to apply for grant funds and to enter into a contract with the TWDB on behalf of the RFPG.

No points nor comments/concerns were brought forth during open discussion.

A motion was made by Dave Hall to authorize the RFPG sponsor to apply for grant funds and enter into a contract with the TWDB on behalf of the RFPG.
The motion was seconded by Gilberto Saldana.
The vote to authorize the RFPG sponsor to apply for grant funds and enter into a contract with the TWDB on behalf of the RFPG passed by unanimous consent.

10. **AGENDA ITEM NO. 10: Discussion of necessary additional voting and non-voting positions that may be needed to ensure adequate representation from the interest in the region**

Matt Nelson opened the floor to public comments.
Rodrigo Vizcaino with HDR questioned if the International Boundary and Water Commission (IBWC) would have membership representation.

Omar Martinez opened discussion additional voting and non-voting positions that may be needed to ensure adequate representation from the interest in the region.

The members discussed IBWC having representation and discussed concerns with adding too many members.

No actions were taken. Omar Martinez closed discussion on AGENDA ITEM NO. 10.

11. **AGENDA ITEM NO. 11: Consider initiating RFPG solicitation process for individuals to fill vacant required voting member positions**

Matt Nelson opened the floor to public comments. No public comments were given.

Omar Martinez opened the floor to discussion on initiating RFPG solicitation processes for individuals to fill the vacant required voting member position. The current vacant, required voting positions for Region 14 Upper Rio Grande RFPG are:
Currently Vacant: *River authorities, Water utilities*

Members discussed potential IBWC representation within river authorities.

Gilbert Saldana made a motion to initiate the solicitation process for individuals to fill the vacant required voting member position.
The motion was seconded by Jeff Bennett.
The vote to initiate the RFPG solicitation process passed by unanimous consent.

12. **AGENDA ITEM NO. 12: Receive general public comments (Public comments limited to 3 minutes per speaker)**

Omar Martinez opened the floor to public comments. No public comments were given.

13. **AGENDA ITEM NO. 13: Consider date and agenda items for next meeting**

Omar Martinez opened discussion to consider the date and agenda items for the next meeting.

After discussion, Omar Martinez stated that the next meeting will be the week of December 17, 2020. The group decided to disseminate a survey to establish the best time for scheduling the next meeting. Potential agenda items include selecting remaining officers and members of the executive committee, status update on flood maps available in the region, and speakers engaged with stormwater in the region and the IBWC.

14. Adjourn

Sal Masoud made a motion to adjourn.
The motion was seconded by Jeff Bennett.
The vote to adjourn passed by unanimous consent.
The meeting adjourned at 11:36 AM by Omar Martinez.
Approved by the Region 14 Upper Rio Grande RFPG at a meeting held during the week of December 17, 2020 on a date and location to be determined.

____
FIRST AND LAST NAME, SECRETARY

____
Omar Martinez, CHAIR

Meeting Minutes
Region 14 Upper Rio Grande Flood Planning Group Meeting
Thursday, January 21, 2021
9:00 AM MST/10:00 CST
GoToWebinar Virtual Meeting

Roll Call:

Voting Member	Interest Category	Present (x) /Absent ( ) / Alternate Present (*)
Oscar D. "Jay" Ornelas	*Agricultural interests*	X
Gilberto Saldana Jr.	*Counties*	X
Jessica Christianson	*Electric generating utilities*	
Jeff Bennett	*Environmental interests*	X
Vacant	*Flood districts*	
Sal Masoud	*Industries*	X
Javier Acosta	*Municipalities*	X
David "Dave" Hall	*Public*	X
Vacant	*River authorities*	
Rene Rodriguez	*Small business*	
Omar L. Martinez	*Water districts*	X
Vacant	*Water utilities*	

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Tim Frere	Texas Division of Emergency Management	X
Larissa Place	Texas Department of Agriculture	
Ben Wilde	Texas State Soil and Water Conservation Board	X
Sarah Douglas	General Land Office	X
Richard Bagans	Texas Water Development Board (TWDB)	X
Anita Keese	Texas Commission on Environmental Quality	X

Quorum:

Quorum: **Yes**

Number of voting members or alternates representing voting members present: **7**

Number required for quorum per current voting positions of 11: 6

Other Meeting Attendees: **

James Bronikowski (TWDB)
Morgan White (TWDB)
Reem Zoun (TWDB)
Annette Gutierrez (RGCOG)
Allison Wood
Andrew Smith
Anita Machiavello
Art Reinhardt
Ben Wilde
G Martinez
Gisela Dagnino
Guillermo Martinez
Gustavo Sosa
Heather Harris
James Weaver
Jennifer Herrera
Justin Lennon
Kelly Dillard
Michael Ramirez
Rene Franks
Rohit Goswami
Sarah Douglas, G
Sara Eatman
Scott Hubley
Stephanie Castillo
Steve Gonzales
Tiffany Cartwright
Tony Smith
Wade Barnes

**Meeting attendee names were gathered from those who entered information for joining the GoToWebinar meeting.

1. **AGENDA ITEM NO. 1: Call to Order**
   Omar Martinez called the meeting to order at 9:06 AM. A roll call of the planning group members was taken to record attendance and a quorum was established prior to calling the meeting to order.

2. **AGENDA ITEM NO. 2: Recognition of guests and designated alternates**
   Matt Nelson and Director Kathleen Jackson welcomed members to the meeting. Matt Nelson provided meeting facilitation information and instructions.

3. **AGENDA ITEM NO. 3: Member Updates**
   Each present voting and non-voting member of the Region 14 Upper Rio Grande RFPG introduced themselves.

4. **AGENDA ITEM NO. 4: Review and approve the minutes for the meeting held on November 5, 2020.**
   Dave Hall made a motion to accept the Minutes from November 5, 2021. Sal Massoud seconded the motion.

5. **AGENDA ITEM NO. 5: Texas Water Development Board (TWDB) Updates**

Matt Nelson presented the model bylaws provided by the TWDB for the RFPG to consider adopting and opened discussion on adopting group bylaws.

6. **AGENDA ITEM NO. 6: Consider nominating and electing Vice Chair and Secretary**

   Matt Nelson described the Chair/Interim Chair election process and opened the floor to nominations for the Chair or Interim Chair position.

   A nomination of Omar Martinez as the Chair was made by Dave Hall.

   Omar Martinez discussed his willingness to serve as Chair and familiarity with the flood planning region and other members.

   Dave Hall made a motion and Omar Martinez seconded the motion. Sal Massoud made a motion and Gilbert Saldaña seconded the motion.

7. **AGENDA ITEM NO. 7: Consider nominating and electing member(s)-at-large to serve on the Executive Committee**

   Matt Nelson listed the entities that had expressed interest in serving as the Region 14 Upper Rio Grande RFPG's planning group sponsor. These interested entities included:
   Rio Grande Council of Governments (COG)

   Matt Nelson opened the floor to public comments. No public comments were given.

   Matt Nelson asked if any there was anyone in the audience that represented a political subdivision that was interested in acting as the planning group sponsor. No additional interested entities came forward to express interest.

   Dave Hall made a motion and Omar Martinez seconded the motion. Sal Massoud made a motion and Gilbert Saldaña seconded the motion.

8. **AGENDA ITEM NO. 8: Discussion on required member training on the Open Meetings Act and Public Information Act. Matt Nelson described existing notice** requirements and opened discussion on

9. **AGENDA ITEM NO. 9: Update on URGFPG solicitation process for individuals to fill required member positions (River authorities, Water utilities) Omar** Martinez opened discussion on authorizing the RFPG sponsor to apply for grant funds and to enter into a contract with the TWDB on behalf of the RFPG.

10. **AGENDA ITEM NO. 10: Update on the status of Regional Flood Planning Grant contract with TWDB Matt Nelson opened the floor to public comments.**

Rodrigo Vizcaino with HDR questioned if the International Boundary and Water Commission (IBWC) would have membership representation.

Omar Martinez opened discussion additional voting and non-voting positions that may be needed to ensure adequate representation from the interest in the region.

The members discussed IBWC having representation and discussed concerns with adding too many members.

No actions were taken. Omar Martinez closed discussion on AGENDA ITEM NO. 10.

11. AGENDA ITEM NO. 11: Consider a means by which the URGFPG will develop and host a public website (required **per §361.21(b)**
    Omar Martinez opened the floor to discussion on initiating RFPG solicitation processes for individuals to fill the vacant required voting member position. The current vacant, required voting positions for Region 14 Upper Rio Grande RFPG are:
    Currently Vacant: *River authorities, Water utilities*

12. **AGENDA ITEM NO. 12: Discussion and consider taking action on group policies for handling public comments Omar Martinez** opened the floor to public comments. No public comments were given.

13. **AGENDA ITEM NO. 13: Consider a means by which the URGFPG will accept written public comment prior to and after meetings (required per §361.21(c)).**
    Omar Martinez opened discussion to consider the date and agenda items for the next meeting. After discussion, Omar Martinez stated that the next meeting will be the week of December 17, 2020. The group decided to disseminate a survey to establish the best time for scheduling the next meeting. Potential agenda items include selecting remaining officers and members of the executive committee, status update on flood maps available in the region, and speakers engaged with stormwater in the region and the IBWC.

14. **AGENDA ITEM NO. 14: Discussion of the required solicitation for persons or entities who request to be notified of URGFPG activities (required per §361.21(e)).**

15. **AGENDA ITEM NO. 15: Discussion and consider taking action on allowing the RGCOG to accept annual supplemental funds for the URGFPG from willing local entities.**
16. **AGENDA ITEM NO. 16: General public comments**
17. **AGENDA ITEM NO. 17: Consider date and agenda items for next meeting**
18. **AGENDA ITEM NO. 18: Adjourn**

Sal Masoud made a motion to adjourn.
The motion was seconded by Jeff Bennett.
The vote to adjourn passed by unanimous consent.

The meeting adjourned at 11:36 AM by Omar Martinez.

Approved by the Region 14 Upper Rio Grande RFPG at a meeting held during the week of December 17, 2020 on a date and location to be determined.

Javier Acosta, Secretary

March 16, 2021
Date

Meeting Minutes
Region 14 Upper Rio Grande Flood Planning Group Meeting
Tuesday, March 16, 2021
10:30 AM
GoToWebinar Virtual Meeting

Voting Member	Interest Category	Present (x) /Absent ( ) / Alternate Present (*)
Oscar D. "Jay" Ornelas	*Agricultural interests*	X
Gilberto Saldana Jr.	*Counties*	X
Jessica Christianson	*Electric generating utilities*	
Jeff Bennett	*Environmental interests*	X
Vacant	*Flood districts*	
Sal Masoud	*Industries*	X
Javier Acosta	*Municipalities*	X
David "Dave" Hall	*Public*	X
Vacant	*River authorities*	
Rene Rodriguez	*Small business*	X
Omar L. Martinez	*Water districts*	X
Vacant	*Water utilities*	

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Tim Frere	Texas Division of Emergency Management	
Larissa Place	Texas Department of Agriculture	
Ben Wilde	Texas State Soil and Water Conservation Board	x
Sarah Douglas	General Land Office	X
Richard Bagans	Texas Water Development Board (TWDB)	X
Anita Keese	Texas Commission on Environmental Quality	X

Others Present:	
Annette Gutierrez (RGCOG)	Heather Harris, Carollo Engineers
James Bronkowski (TWDB)	Karen Perez - Freese and Nichols
Rick Prieto - CONSOR	Kelly Dillard
Allison Wood - Huitt-Zollars	Rene Franks/Parkhill
Art Reinhardt (WSP)	Rick Prieto - CONSOR
Gustavo Sosa - Parkhill	Ross Gordon - CONSOR

1. **Welcome and call to order**
   Chairman Omar Martinez welcomed the group and confirmed that a quorum was present. The meeting started at 10:33 am.

2. **Recognition of guests and designated alternates**
   Chairman Martinez recognized voting, non-voting members, and guests.

3. **Member updates**
   Chairman Martinez provided an update to the group. He participated in a meeting where all the regions' Chairs' met with Texas Water Development Board's (TWDB) staff. They exchanged information with each other stating where they were in the planning cycle. He said some regions are farther along than others. He also said that no group has chosen a consultant yet as well as getting more representation from rural areas. He concluded by saying that they will be having more Chairs meetings throughout the year and he will update the group.

4. **Review and approve the minutes for the meeting held on January 21, 2021.**
   Jay Ornelas made a motion to accept the Minutes except for revising item 14. The word listserv replaced the previous misspelled word. Secondly, item 15, added an "s" to the word due. Sal Mousad seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously. Dave Hall also noted the Minutes reflect there would be an update on the website but it is not listed on the current agenda.

5. **Review and approve recommendations from the Executive Committee members for the required member positions for River Authorities and Water Utilities.**
   The Executive Committee recommended to the general membership Gisela Dagnino, P.E., to serve as the representative for Water Utilities. Dave Hall made a motion to have Gisela Dagnino, P.E., serve as the representative for Water Utilities. Gilbert Saldaña seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

6. **TWDB- Updates and Presentation**
   Richard Bagans, Planner, TWDB Regional Flood Planning, provided updates to the general membership. Mr. Bagans mentioned TWDB is working with RGCOG in executing their grant agreement. It is in the final stages of edits and is being routed internally. It will then be sent to RGCOG for execution. He also mentioned TWDB's guidance document is forthcoming. This document, which is over 100 pages long, will provide explicit instructions on how each of the ten tasks will be accomplished. It will be available in the next week for public comment. He mentioned the document is technical and is geared more for the Technical Consultant. He also said members who are not as well versed in this arena may look to the Scope of Work to understand.

   Richard also discussed how flood planning groups are selecting their liaisons to attend meetings for other regions. He mentioned the Upper Rio Grande Flood Planning Group (URGFPG) will be choosing a liaison for Region 15 and how they have already selected someone to serve as a liaison for the URGFPG. He said a liaison's main purpose is to listen and advocate.

7. **Consider designating a Liaison from Region 15 – Lower Rio Grande Regional Flood Planning Group to serve as a non-voting member as required per §361.11(f)(8) of the Texas Administrative Code.**
   As required, the URGFPG is required to select a member from the group to serve a liaison to Region 15. Sarah Douglas, who is a non-voting member, self-nominated herself as the Liaison to Region 15-

Lower Rio Grande Flood Planning Group. Sal Masoud made a motion to appoint Sarah Douglas to Region 15. Jay Ornelas seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

8. **Consideration of appropriate changes to the Region 14 Bylaws.**
Dave Hall made a motion to remove the sentence, "no sooner than ten calendar days after the deadline for submitting nominations", from Section 4 Selection of Members, 4.1 Filling Vacancies, second paragraph. The motion was seconded by Sal Masoud. Chairman Martinez called for a vote and the motion was approved unanimously.

9. **Update Schedule Pre-Planning Meeting as required by TWDB**
Annette Gutierrez, RGCOG, informed the group that a Pre-Planning meeting geared toward the public is required of the TWDB. She mentioned the meeting can take place within a Flood Planning meeting as an agenda item. Richard Bagans has a short presentation available to present to the group. Chairman Martinez said he was fine with the meeting being placed as an agenda item and the rest of the group agreed as well.

10. **Update on Request for Qualifications for Technical Consultant**
Annette Gutierrez, RGCOG, informed the group that proposals are due March 19th, 2021, at 5:00 pm, Mountain Time. She also explained that the Executive Committee will be scoring the proposals on April 6, 2021, at 9:30 am, Mountain Time. She also mentioned that she would be working with TWDB in determining TWDB's timeline in securing the technical consultant.

11. **General public comments**
Rick Prieto with Consor Engineering, informed the group they will be submitting a proposal.

12. **Consider date and agenda items for next meeting**
The group decided to set the next meeting on April 20, 2021, at 10:30 AM, Mountain Time, and an Executive Committee meeting at 9:30 am. The agenda items include the pre-planning meeting, extending the membership, and repost the River Authority vacancy, TWDB Scope of Work presentation, website update, and old business for discussion, and updates from both liaisons. Sarah Douglas also mentioned to the group if they want anything for her to discuss with the other group, please let her know.

13. **Adjournment**
Sal Masoud made a motion to adjourn the meeting at 11:46 am, Mountain Time. Jeff Bennet seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

______________________________ April 9,2021

Javier Acosta, Secretary Date

Meeting Minutes
Region 14 Upper Rio Grande Flood Planning Group Meeting
Thursday, 4.15.2021
9:00 AM
GoToWebinar Virtual Meeting

Voting Member	Interest Category	Present (x) /Absent ( ) / Alternate Present (*)
Oscar D. "Jay" Ornelas	*Agricultural interests*	X
Gilberto Saldana Jr.	*Counties*	X
Jessica Christianson	*Electric generating utilities*	
Jeff Bennett	*Environmental interests*	X
Sal Masoud	*Industries*	X
Javier Acosta	*Municipalities*	X
David "Dave" Hall	*Public*	X
Rene Rodriguez	*Small business*	X
Omar L. Martinez	*Water districts*	X
Gisela Dagnino	*Water utilities*	X
Vacant	*Flood districts*	
Vacant	*River authorities*	

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	
Tim Frere	Texas Division of Emergency Management	X
Larissa Place	Texas Department of Agriculture	
Ben Wilde	Texas State Soil and Water Conservation Board	X
Sarah Douglas	General Land Office/Region 14 Liaison	X
Richard Bagans	Texas Water Development Board	X
Anita Keese	Texas Commission on Environmental Quality	
Vanessa Rosales-Herrrera	Region 15 Liaison	X

Others Present:	
Annette Gutierrez (RGCOG)	Jeff Irvin
Morgan White (TWDB)	Heather Harris (Carollo)
Delbert Humberson (IBWC)	Matt Hiland (APPGEO)
Levi Bryand	Gilbert Andujo (AECOM)
Art Reinhardt (WSP)	Daniel Zell (AECOM)
Atri Sen (WSP)	Ross Gordon (CONSOR)
Justin Lennon (WSP)	Zina Schwartz (CONSOR)
Rohit Goswami (WSP)	Trudi Garrett (CONSOR)

1. **Welcome and call to order**
   Chairman Omar Martinez welcomed the group and confirmed that a quorum was present. The meeting started at 9:08 am.

2. **Recognition of guests and designated alternates**
   Chairman Martinez recognized voting, non-voting members, and guests.

3. **Member updates**
   There were no member updates provided.

4. **Review and approve the minutes for the meeting held on March 16, 2021.**
   Dave Hall made a motion to accept the Minutes from March 16, 2021, with the request to add the Liasion titles to the individuals who are holding these titles. Jay Ornelas seconded the motion. Chairman Martinez called for a vote and the motion was approved except for Gisela Dagnino who abstained because she was not present at the meeting.

5. **Review, discuss and take action on the recommendation from the Executive Committee members for the proposed Technical Consultant finalist.**
   The Executive Committee recommended to the general membership that AECOM serves as the Technical Consultant to the Flood Planning Group based on the scoring and ranking from Executive Committee. Gisela Dagnino made a motion to accept the recommendation for AECOM. Dave Hall seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

6. **Texas Water Development Board (TWDB)- Updates and Presentation**
   Richard Bagans, Planner, TWDB Regional Flood Planning, provided a presentation about the Regional Flood Planning Group's Responsibilities through the Scope of Work. Mr. Bagans covered Tasks 1 through Task 10. Annette Gutierrez, Rio Grande Council of Governments (RGCOG), informed Mr. Bagans that RGCOG is updating the Hazard Mitigation Plan for five of their six counties. She mentioned the City and County of El Paso are updating their Plan. She asked if he had discussions with the other regions that he covers about how collaboration will be conducted between the two. Mr. Bagans said to be sure there is no duplication of efforts being made and all sources of information are identified to allow the Technical Consultant can work on other items. Chairman Martinez asked to invite every participant possible to our meetings because he explained how difficult it is to tap into FEMA funding if you are not included in the plan. Ms. Gutierrez said she would check with the City/County of El Paso to see where they are in the process of updating their Hazard Mitigation Plan.

7. **Pre-Planning Public Input – Public input regarding suggestions and recommendations as to issues, provisions, projects, and strategies that should be considered during the flood planning cycle and/or input on the development of the regional flood plan (as required per Texas Water Code §16.062(d) and 31 Texas Administrative Code §361.12(a)(4))**

   Richard Bagans covered this item. He informed the group for every cycle moving forward the group will be required to have pre-planning public meetings to allow the public to comment on what items they would like the group to consider moving forward. He provided a general overview of what the flood planning process is about.

Dave Hall asked if the group wants to ensure there is public participation from the entire region, can TWDB make presentations at different locations, such as Alpine? Mr. Bagans said that initiative will be determined by the planning sponsor and the group but TWDB will assist in determining who is the best person to speak on this item. He said it is appropriate and suggested moving the meetings to different locations but it is contingent on what is most feasible. Post pandemic there will be opportunities to have a hybrid meeting allowing for in-person and virtual.

Dave Hall raised concern that the group should do as much as they can to inform the public of this process to ensure they are aware and engaged soon. However, TWDB staff is the best suited to inform these groups because of their expertise. Mr. Bagans reminded the group they will still need to conduct a second pre-planning meeting as requires, so they could look at having the meeting in a different location. Annette was tasked by the group to look at possible locations to include Alpine, Ft. Stockton, or somewhere further east in late May or early June.

Gisela Dagnino asked Annette Gutierrez how soon could the RGCOG secure a contract with AECOM because she is concerned about getting the public on board soon. Annette explained it will be at the May board meeting but the date is not solidified yet. Dave Hall raised concern about the need to secure the contract soon since they are due dates coming up from TWDB based on the conceptual schedule. Richard Bagans mentioned the dates identified are target dates and they are flexible except for the technical memo and the FInal Plan. Annette Gutierrez said she would aim for a May 7th board meeting.

Rene Rodriguez mentioned the community of Socorro has had difficulty participating in virtual meetings because of technology. Jay Ornelas suggested the group could utilize Sul Ross University as a possible venue.

8. **Consideration of appropriate changes to the Region 14 Bylaws.**
Annette Gutierrez asked for the general membership to consider amending the bylaws to 4.1 Filling Vacancies and reduce the deadline for submission of nominations between thirty and forty-five calendar days from the date that public notice was posted to fifteen days. Dave Hall made a motion to reduce the time from thirty and forty-five days to fifteen days. Rene Rodriguez seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

9. **Take action to consider adding additional members from interest categories**
Annette Gutierrez, RGCOG, informed the group there is an opportunity for them to increase their membership base. She mentioned in the previous meeting the group expressed interest in adding another position for Water Utilities. Rene Rodriguez mentioned his only concern is that the membership does not become lop-sided. Dave Hall made a motion to increase the membership for Water Utilities and the Public. Rene Rodriguez seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

10. **Take action to consider adding the International Water Boundary Commission as a non-voting member.** Dave Hall made a motion to add the International Water Boundary Commission (IBWC) as a non-voting member as a non-voting member representing the International Water Boundary Commission. Jay Ornelas seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously. Chairman Martinez informed the group that IBWC internally decided to appoint Delbert Humberson as their representative.

11. **Consider posting the River Authority vacancy.**
Gisela Dagnino made a motion to post the River Authority vacancy. Rene Rodriguez seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

12. **Update from Liaisons from both Region 15 – Lower Rio Grande Regional Flood Planning Group, Vanessa Rosales-Herrera, and Region 14-Upper Rio Grande Regional Flood Planning Group, Sarah Douglas.** Vanessa Rosales-Herrera, who serves as the Liaison to Region 14 from Region 15, mentioned her region is in the same timeline as ours where they just recently approved their technical consultant. Dave Hall asked if our group should be also coordinating with other surrounding planning besides Region 15. Richard Bagans explained we are only required to liaise with Region 15 since there is an Upper and Lower to the region.

    Ms. Sarah Douglas, who serves as the Liasion to Region 15 from Region 14, was unable to attend the most recent meeting but mentioned she will be able to attend future meetings.

13. **Update to the Region 14-Upper Rio Grande Flood Planning Group website.**
Annette Gutierrez informed the group that she was able to secure a quote from the Rio Grande Council of Governments' web developer. She mentioned the quote is for $5,500. When including the indirect cost rate the total cost for this effort is $7,219.90. Ms. Gutierrez explained the contributions that will be made from El Paso County Water Improvement District #1 and El Paso Water Utilities will cover these costs, based on her understanding that the website creation was unallowable. Chairman Martinez reminded the group that contributions like the ones made by these two entities will allow the Rio Grande Council of Governments to administer the program. Gisela asked how often would they make the contributions. Chairman Martinez mentioned if this group is to follow the Water Planning Group, the dues would be yearly. Ms. Dagnino also mentioned that part of AECOM's proposal included public relations activities from Barracuda Public Relations firm. Chairman Martinez agreed they would be doing this function but also mentioned it would be good for the RGCOG to have some of their equipment if needed. Ms. Gutierrez also mentioned to the group she would work with the Chair to see what kind of dues structure can be created for the future. Richard Bagans informed the group that this cost is an allowable expense. Annette Gutierrez then informed the group that she will not be asking El Paso Water Utilities for the previously mentioned funding. Gisela Dagnino asked Annette to still send an invoice to them to assist in starting the fund.

14. **Discussion of Old Business**
Dave Hall requested that AECOM should be made aware of the suggested dates from TWDB for the tasks mentioned in the Scope of Work. Dave reminded the group Tasks 1-3 should be completed by July of 2021. Gisela Dagnino informed the group that El Paso Water Utilities has worked with AECOM previously and said they always stay on task on finish the work on time.

15. **General public comments**
There were no public comments.

16. **Consider date and agenda items for next meeting**
The group decided to set the next meeting on May 20, 2021, at 9:00 AM, Mountain Time, and an Executive Committee meeting on May 18, 2021, at 9:00 am. The agenda items include voting on the

vacancies for the positions mentioned, pre-planning, discuss any old business, receive updates from both liaisons and have AECOM present to the group.

17. Adjourn

Gisela Dagnino made a motion to adjourn the meeting at 10:50 am, Mountain Time. Javier Acosta seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

5/20/2021
Date

Javier A. Acosta
Javier Acosta, Secretary

Meeting Minutes
Region 14 Upper Rio Grande Flood Planning Group Meeting
Thursday, 5.20.2021
9:03 AM
GoToWebinar Virtual Meeting

Voting Member	Interest Category	Present (x) /Absent ( ) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	X
Oscar D. "Jay" Ornelas	*Agricultural interests*	X
Gilberto Saldana Jr.	*Counties*	X
Jessica Christianson	*Electric generating utilities*	
Jeff Bennett	*Environmental interests*	X
Sal Masoud	*Industries*	X
Javier Acosta	*Municipalities*	X
David "Dave" Hall	*Public*	X
Rene Rodriguez	*Small business*	
Gisela Dagnino	*Water utilities*	X
Vacant	*Flood districts*	
Levi Bryand	*Water Utilities*	X
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	X

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Tim Frere	Texas Division of Emergency Management	
Larissa Place	Texas Department of Agriculture	
Ben Wilde	Texas State Soil and Water Conservation Board	X
Sarah Douglas	General Land Office/Region 14 Liaison	
Richard Bagans	Texas Water Development Board	X
Anita Keese	Texas Commission on Environmental Quality	X
Vanessa Rosales-Herrera	Region 15 Liaison	X
Delbert Humberson	International Boundary Water Commission	X

Others Present:	
Annette Gutierrez, RGCOG	Chris Wright, AECOM
Matt Nelson, TWDB	Steve Ainsa, AECOM
James Bronikowski, TWDB	Jeff Irvin - AECOM, PIC
Gilbert Andujo, AECOM	Marina Monsisvais, Barracuda Communications
Bryan Blaisdell, AECOM	Martin Bartlett, Barracuda Communications

1. **Welcome and call to order**

   Chairman Omar Martinez welcomed the group and confirmed that a quorum was present. The meeting started at 9:03 am.

2. **Recognition of guests and designated alternates**
   Chairman Martinez recognized voting, non-voting members, and guests.

3. **Member updates**
   Chairman Omar Martinez started the updates. He first recognized the current flooding the Lower Rio Grande Valley was dealing with and offered any assistance. He also mentioned that on April 22, 2021, the Texas Water Development Board (TWDB) approved 3.2 million dollars in funding of which 1.6 million is in grant funds from the state flood infrastructure fund that will be used for design planning, acquisition, design, and construction of a detention ponds and channel improvements projects in El Paso County. He congratulated El Paso County and AECOM for their success in receiving the grant. He also mentioned the National Fish and Wildlife Foundation awarded the Pecos Watershed Conservation Initiative 1.45 million to restore and sustain the Pecos River, its streams and grassland systems that provide important wildlife habitat in the Pecos Watershed and adjacent areas of New Mexico and Texas. He reminded the group part of the Flood Plan is to include environmental concerns in our region and the project mentioned goes to that initiative. Chairman Martinez also informed the group that TWDB is having a webinar from 2:00pm to 3:30pm for the Planning Group Sponsors, Chairs, and technical consultants from the Regional Flood Planning Groups. TWDB will present on the technical guidelines for regional flood planning and regional flood planning data. A significant portion of the webinar will be devoted to questions and answers. Finally, Chairman Martinez mentioned to the group that on June 24, 2021, the International Water Boundary Commission will host the Rio Grande Citizens Forum via webinar. He said these meetings are focused on work related to the Rio Grande River.

4. **Review and approve the minutes for the meeting held on April 15, 2021.**
   Gisela Dagnino made a motion to accept the Minutes from April 15, 2021 with the changes noted. Sal Masoud seconded the motion. Chairman Martinez called for a vote and the motion was approved.

5. **Review and approve recommendations from the Executive Committee members for the member positions for Water Utilities, Public and River Authority.**
   Jeff Benett made a motion to accept Rick Tate as the representative for Flood River Authority. Gisela Dagnino seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

   Gisela Dagnino made a motion to accept Levi Bryand as the representative for Water Utilities. Jay Ornelas seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

   Sal Masoud made a motion to accept Carlos Velarde as the representative for the Public. Gisela Dagnino seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

6. **Texas Water Development Board (TWDB)- Updates and Presentation**
   Richard Bagans, Planner, TWDB Regional Flood Planning, provided an update to the group.

7. **Update from Liaisons from both Region 15 – Lower Rio Grande Regional Flood Planning Group, Vanessa Rosales-Herrera, and Region 14-Upper Rio Grande Regional Flood Planning Group, Sarah Douglas.**

Vanessa Rosales-Herrera from the Lower Rio Grande Regional Flood Planning Group did not have any updates to provide to the group.

8. **Introduction and presentation from AECOM-Technical Consultants to the Region 14-Upper Rio Grande Flood Planning Group**

Annette Gutierrez informed the group it was the Rio Grande Council of Governments (RGCOG) intention to present the contract between RGCOG and AECOM at its board of directors' meeting on May 14, 2021. However, based on discussions between TWDB and RGCOG and the need to revise some of the language in the contract, RGCOG will not present the document until its June board meeting.

Members asked if the group will be able to meet the deliverables considering the contract delay. Mr. Bagans informed them all parties are working to get the contract finalized and reminded them all technical work is reimbursable to the contractor prior to signature. Jeff Irvin, AECOM, requested for RGCOG to send an email stating AECOM could commence work on Task 1. Ms. Gutierrez stated that she would do so.

Ms. Gutierrez, next introduced the Project Manager, Gilbert Andujo, PE, CFM, AECOM. Mr. Andujo provided some background on his professional experience and then introduced the team and asked for each of the team members to explain what their experience is and what role they will be playing. The team includes Steve Ainsa, PE, Principal in Charge, Jeff Irvin, PE, Quality Assurance/Quality Control, PE, Chris Wright, Assistant Project Manager, PE, CFM, Bryan Blaisdell, PE, and Baracuda Public Relations, that includes Martin Bartlett and Marina Monsisvais, who will be doing the public outreach. Mr. Andujo also informed the group that AECOM will also be using nine subcontractors for this plan. The Chairman as well as several others complimented AECOM on the team and were in agreement they will be able to get the work done.

Annette Gutierrez asked Richard Bagans if TWDB is going to allow future meeting to be conducted in a hybrid manner where members may be in person or virtual if the suspensions to the Open Meetings Act as is lifted. Mr. Bagans stated the TWDB has not provided any direction as of yet. It would depend on any future legislative action and the RGCOG's Legal Counsel's interpretation.

9. **Discussion of Old Business**

Chairman Martinez asked Annette Gutierrez if there was any old business to discuss. Ms. Gutierrez mentioned the developers are working on the flood website and she anticipates that it will be ready soon to allow the flood members and the public a place to where they can get their information. Dave Hall mentioned there was a discussion on having the Pre-Planning meeting in the eastern area. He suggested that perhaps Baracuda could assist with this meeting and Ms. Gutierrez stated she would contact them. Gisela Dagnino asked Ms. Gutierrez if there was any activity with the discussion of the group paying dues similar to the water planning group. Ms. Gutierrez mentioned she will not know if funding is needed until she submits the first request for payment to TWDB. She said will keep the group informed. Mr. Hall also asked if the Bylaws were signed and Mr. Gutierrez said they were.

10. **General public comments**

There were no comments made.

11. **Consider date and agenda items for next meeting**

Chairman Martinez asked when do we have to have the next meeting. Ms. Gutierrez mentioned the Pre-Planning meeting can be next for the group and that it can be in the Tri-County area since it will need to be a hyrbrid. She told the group she did not want to commit to a date until she has more information on the location. In terms of having a flood planning group meeting, she asked the group if she can coordinate with AECOM to determine the next meeting date. However, Richard Bagans did confirm there is no deadline to have the Pre-Planning meeting but it should be early in the cycle. He also reminded the group it requires a fourteen-day notice. She mentioned she will look at the June 25th week to schedule the meeting in Alpine.

12. Adjourn

Dave Hall made a motion to adjourn. Jay Ornelas seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

9/7/2021
Date

Javier Acosta, Secretary

Meeting Minutes
Region 14 Upper Rio Grande Flood Planning Group Meeting
Thursday, 8.05.2021
9:04 AM
GoToWebinar Virtual Meeting

Voting Member	Interest Category	Present (x) /Absent ( ) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	X
Oscar D. "Jay" Ornelas	*Agricultural interests*	
Gilberto Saldana Jr.	*Counties*	X
Jeff Bennett	*Environmental interests*	X
Sal Masoud	*Industries*	X
Javier Acosta	*Municipalities*	X
David "Dave" Hall	*Public*	X
Rene Rodriguez	*Small business*	
Gisela Dagnino	*Water utilities*	X
Vacant	*Flood districts*	
Levi Bryand	*Water Utilities*	X
Rick Tate	*River authorities*	
Carlos Velarde	*Public*	X

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present(*)
James Weaver	Texas Parks and Wildlife Department	
Tim Frere	Texas Division of Emergency Management	
Larissa Place	Texas Department of Agriculture	
Ben Wilde	Texas State Soil and Water Conservation Board	
Sarah Douglas	General Land Office/Region 14 Liaison	X
Richard Bagans	Texas Water Development Board	X
Anita Keese	Texas Commission on Environmental Quality	X
Vanessa Rosales-Herrera	Region 15 Liaison	X
Delbert Humberson	International Boundary Water Commission	

Others Present:	
Annette Gutierrez, RGCOG	Chris Wright, AECOM
Matt Nelson, TWDB	Jeff Irvin - AECOM, PIC
James Bronikowski, TWDB	Marina Monsisvais, Barracuda Communications
Gilbert Andujo, AECOM	Martin Bartlett, Barracuda Communications
Bryan Blaisdell, AECOM	

1. **Welcome and call to order**
   Chairman Omar Martinez welcomed the group and confirmed that a quorum was present. The meeting started at 9:04 am.

2. **Recognition of guests and designated alternates**
Chairman Martinez recognized voting and non-voting members.

3. **Member updates**
Chairman Omar Martinez asked the members if there were any updates to make. Dave Hall mentioned to the flood group that the Pre-Planning meeting was held in Marfa, Texas on July 15, 2021. He said the pubic mentioned flood maps were out of date and there was a discussion of LIDAR data. He also said the local community wanted opportunities to provide input to update these maps. Chairman Martinez also said the communities are hard pressed to get the data the need to get the funding for flood mitigation projects. He also mentioned in Marfa there was a loss of life due to a recent flooding that swept away a man in his vehicle while crossing a low road. Annette Gutierrez mentioned she would be composing Minutes from the meeting.

4. **Review and approve the minutes for the meeting held on May 20, 2021.**
Dave Hall made a motion to accept the Minutes from May 20, 2021. Gisela Dagnino seconded the motion. Chairman Martinez called for a vote and the motion was approved.

5. **Texas Water Development Board (TWDB)- Updates and Presentation**
Richard Bagans, Planner, TWDB Regional Flood Planning, provided an update to the group. He informed the group the Legislature appropriated an additional 10 million dollars to the flood planning effort that may become available after September 1, 2021. TWDB sent a survey to all the regions asking their thoughts about the additional funding and have received them back and now are in the process of determining how to allocate the funds to the regions. Contract amendments will be issued once they are available. He also mentioned there were errors in TWDB's building datasets that were identified by Bryan Blaisdell from AECOM, which are now being corrected and there is another dataset based on LIDAR that is set to come out soon, so please be on the lookout for it in Mid-August. Gisela Dagnino asked about the additional funding if it is to go towards the current tasks or if new contracts will need to be issued. Richard said the additional funds will go to Rio Grande Council of Governments (RGCOG) through an amendment but was not sure if the funds will be utilized by AECOM or if another contractor will be utilized. Dave Hall also asked how much funding was available to AECOM currently because he was trying to determine what tasks they should be working on. Annette Gutierrez told the group she would send out AECOM's Task Budget for everyone to review. Richard Bagans also mentioned to the group the funding may go towards additional flood management evaluations.

6. **Update from Liaisons from both Region 15 – Lower Rio Grande Regional Flood Planning Group, Vanessa Rosales-Herrera, and Region 14-Upper Rio Grande Regional Flood Planning Group, Sarah Douglas.**
Sarah Douglas summarized Region 15's meeting to the group. She mentioned Commissioner David Garza asked how all we would reach communities that are not involved in order to include their input. Kristina from HALFF explained that they would share their contact list to find those not included. Commissioner Garza stressed a strong emphasis on outreach. They also discussed between the Flood Planning Group and the GLO's flood studies, which covers their area.

   There was no report from Vanessa Rosales-Herrera from the Lower Rio Grande Regional Flood Planning Group because she was not on the call. Annette Gutierrez mentioned she is not with the City of Eagle Pass anymore and it now with Texas Department of Transportation. Ms. Rosales-Herrera did inform Annette that she wanted to continue serving on the flood planning group.

7. **AECOM-Progress to Task 1 – Planning Area Description & 8. AECOM-Progress to Task 10 – Public Participation as it relates to Task 1 of the Region 14 URGRFPG Regional Flood Plan**

Gilbert Andujo led the discussion. He discussed both agenda items seven and eight. He introduced the AECOM team. He then turned the presentation over to Chris Wright, Deputy Project Manager. Chris Wright outlined the presentation. He covered the following:

- General Overview of the AECOM Team
- Tasks as they relate to the Scope of Work
- Maps with relevant data that they will be using in the study
- Deeper Dive with Tasks 1 & 2
- Stakeholder community survey, which will be going out in the next couple of weeks
- General Schedule
- Wrap up with meetings they will be having to include setting up subcommittees

8. **Discussion of Old Business**

Chairman Martinez asked Annette Gutierrez if there was any old business to discuss. Ms. Gutierrez informed the group the flood planning website will be going live on August 6, 2021. She also stated she would be sending an email to inform them of the web address.

9. **General public comments**

There were no comments made.

10. **Consider date and agenda items for next meeting**

The group decided Annette Gutierrez would take a doodle poll to determine when the next meeting will be.

11. **Adjourn**

Sal Masoud made a motion to adjourn. Dave Hall seconded the motion. Chairman Martinez called for a vote and the motion was approved unanimously.

9/7/2021

Date

Javier A. Acosta

Javier Acosta, Secretary

Meeting Minutes
Region 14 Upper Rio Grande Flood Planning Group Meeting
Thursday, 9.7.2021

Voting Member	Interest Category	Present (x) /Absent ( ) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓
Oscar D. "Jay" Ornelas	*Agricultural interests*	✓
Gilberto Saldana Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small business*	✓
Gisela Dagnino	*Water utilities*	✓
Vacant	*Flood districts*	
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	✓
Sarah Douglas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	✓
Delbert Humberson	International Boundary Water Commission	✓
Tim Frere	Texas Division of Emergency Management	
Larissa Place	Texas Department of Agriculture	
Ben Wilde	Texas State Soil and Water Conservation Board	

Others Present:	
Annette Gutierrez, RGCOG	Gilbert Andujo, AECOM
Matt Nelson, TWDB	Bryan Blaisdell, AECOM
Reem Zoun,TWDB	Chris Wright, AECOM
Morgan White, TWDB	Jeff Irvin - AECOM, PIC
Ty Edwards, MPGCD	Alejandra Marco - AECOM
Ashlyn Bain	Lily Cartwright - AECOM
	Martin Bartlett, Barracuda Communications

1. **Welcome and call to order**
   Chairman Omar Martinez welcomed the group and confirmed that a quorum was present. The meeting started at 9:09 am.

2. **Recognition of guests**
   Chairman Martinez recognized voting, non-voting members, AECOM members and the public.

3. **Member updates**
   Chairman Omar Martinez mentioned El Paso County experienced severe rain and flooding recently and also said that El Paso Water Utilities experienced a sewer line beak and the sewage is being diverted into the American Canal. Jeff Bennett asked how soon it should be resolved. Chairman Martinez did not have an estimated timeline for completion.

4. **Review and approve the minutes for the meeting held on August 5, 2021.**
   Sal Masoud made a motion to accept the Minutes from August 5, 2021. Rene Rodriguez seconded he motion. Chairman Martinez called for a vote and the motion was approved.

5. **Texas Water Development Board (TWDB)- Updates and Presentation**
   Richard Bagans informed the group that the Governor’s emergency declaration expired and the Texas Open Meetings Act is in effect. He explained the requirements. The flood planning groups met virtually to discuss what options were available to them. He also mentioned the state legislature appropriated additional funding to this initiative. TWDB sent a survey in July to determine how the allocation should be distributed. They have reviewed and compiled the requests and are taking these items to the board in late September. More news will be shared around that time. He also said Task 2 is being extended to allow the data collection modeling future conditions request from all regions a longer time period needed to run the model only once. All other deliverables are due January 7th. Last, later this month there will be a payment request webinar for the flood planning groups. Dave Hall asked if the extension for all three deliverables received a two-month extension. Richard Bagans mentioned all others are due January 7th; including the Tech Memo.

6. **Update from Liaisons from both Region 15 – Lower Rio Grande Regional Flood Planning Group, Vanessa Rosales-Herrera, and Region 14-Upper Rio Grande Regional Flood Planning Group, Sarah Douglas.**

Sarah Douglas reported the group received a presentation from Half Associates and discussed flood plain maps.

7. **AECOM General RFP Updates**
   AECOM presented the following items:
   Task 1 (Planning Area Description)

   - Overview of recent El Paso flooding
   - Local floodplain regulation and development codes
   - Agricultural and natural resources
   - Socioeconomic characteristics
   - Previously identified flood mitigation projects (existing local/regional flood plans)

   –Task 2

   - Evaluating best available floodplain data
   - Exposure/vulnerability analysis

   –Subcommittee Meetings

   –Road Show Meetings

   –Public Outreach Survey & Stakeholder Coordination

8. **AECOM Road Show Planning**
   Jeff Bennett made a motion to have the El Paso Roadshow in October and in February have the others in Pecos and Presidio. Martin Bartlett mentioned the El Paso meeting will more than likely be the week of October 18th or the 25th. Dave Hall seconded the motion. Chairman Martinez called for a vote and the motion was approved.
9. **AECOM Subcommittee Meeting Planning Subcommittee 1-Tasks 3A/3B**

Dave Hall made a motion to appoint the members below to Subcommittee 1. Gilbert Saldana seconded the motion. Chairman Martinez called for a vote and the motion was approved.

- Omar Martinez-Voting Member
- Javier Acosta-Voting Member
- Gilbert Saldana-Voting Member
- Carlos Velarde-Voting Member
- Dave Hall-Voting Member
- Levi Bryand-Voting Member
- Gisela Dagnino-Voting Member
- Rick Tate-Voting Member

Subcommittee 2-Tasks 4B (c)

Sal Masoud made a motion to appoint the members below to Subcommittee 2. Gisela Dagnino seconded the motion. Chairman Martinez called for a vote and the motion was approved.

- Omar Martinez-Voting Member
- Javier Acosta-Voting Member
- Jeff Bennett-Voting Member
- Gilbert Saldana-Voting Member

- Carlos Velarde-Voting Member
- Dave Hall-Voting Member
- Levi Bryand-Voting Member
- Gisela Dagnino-Voting Member
- Jay Ornelas-Voting Member

Sal Masoud made a motion to rescind the group approved by the group. Dave Hall seconded the motion. Chairman Martinez called for a vote and the motion was approved.

Sal Masoud made a motion to appoint the members below to Subcommittee 2. Dave Hall seconded the motion. Chairman Martinez called for a vote and the motion was approved.

- Omar Martinez-Voting Member
- Javier Acosta-Voting Member
- Jeff Bennett-Voting Member
- Gilbert Saldana-Voting Member
- Carlos Velarde-Voting Member
- Dave Hall-Voting Member
- Levi Bryand-Voting Member
- Gisela Dagnino-Voting Member
- Jay Ornelas-Voting Member
- Delbert Humberson-Non-Voting

Subcommittee 3-Task 4B (a-b)

Gisela Dagnino made a motion to appoint the members below to Subcommittee 3. Jay Ornelas seconded the motion. Chairman Martinez called for a vote and the motion was approved.

- Delbert Humberson-Non-Voting Member
- Omar Martinez-Voting Member
- Sal Masoud-Voting Member
- Jeff Bennett-Voting Member
- Levi Bryand-Voting Member
- Gisela Dagnino-Voting Member

Subcommittee 4-Task 8

Gilbert Saldana made a motion to appoint the members below to Subcommittee 4. Jeff Bennett seconded the motion. Chairman Martinez called for a vote and the motion was approved.

- Gilbert Saldana-Voting Member
- Anita Keese-Non-Voting Member
- Omar Martinez-Voting Member
- Sal Masoud-Voting Member
- Levi Bryand-Voting Member
- Gisela Dagnino-Voting Member
- Delbert Humberson-Non-Voting Member

10. AECOM Survey & Stakeholder Coordination

AECOM covered the coordination information in the general updates.

11. **Discussion of Old Business**
    Chairman Martinez asked Annette Gutierrez to review the website with the group. She presented where the members can access the information.

12. **General public comments**
    There were no public comments from the general public.

13. **Consider date and agenda items for next meeting**
    October 5th will be the next meeting date and if any member wants to attend physically, they may do so at the El Paso County Water Improvement District; if not they can attend virtually. The Fathom dataset was asked aqua strategies is preparing it. A draft memo will be available to the group for review. It will be included in Chapter 1. Adding subcommittee section.
14. **Chair Adjourn**
    Jeff Bennett made a motion to adjourn at 11:09 am. Gilbert Saldana seconded the motion. Chairman Martinez called for a vote and the motion was approved.

1/31/22
Date

Javier Acosta
Secretary

Meeting Minutes
Region 14 Upper Rio Grande Flood Planning Group Meeting
Friday, October 15.2021

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	X
Oscar D. "Jay" Ornelas	*Agricultural interests*	✓
Gilberto Saldana Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small business*	X
Gisela Dagnino	*Water utilities*	✓
Vacant	*Flood districts*	
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Sarah Douglas	General Land Office/Region 14 Liaison	X
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Delbert Humberson	International Boundary Water Commission	✓
Tim Frere	Texas Division of Emergency Management	X
Larissa Place	Texas Department of Agriculture	X
Ben Wilde	Texas State Soil and Water Conservation Board	X

Others Present:	
Annette Gutierrez, RGCOG	Gilbert Andujo, AECOM
Matt Nelson, TWDB	Bryan Blaisdell, AECOM
Reem Zoun,TWDB	Chris Wright, AECOM
Morgan White, TWDB	Jeff Irvin - AECOM, PIC
Ty Edwards, MPGCD Ashlyn Bain	Alejandra Marco - AECOM Lily Cartwright - AECOM
	Martin Bartlett, Barracuda Communications

1. **Welcome and call to order**
   Dave Hall chaired the meeting on behalf of Chairman Martinez who could not attend. He welcomed the group and received confirmation that a quorum was present. The meeting started at 12:06 am.

2. **Recognition of guests**
   Dave Hall asked if there were any guests who would like to be recognized at this time. Gisela Dagnino informed the group that Enrique Ochoa will be serving as her proxy for these meetings if she cannot attend. Annette Gutierrez, Rio Grande Council of Governments (RGCOG) informed Gisela that an agenda item that will request for proxies will be forthcoming in a future meeting.

3. **Member updates**
   Dave Hall asked if there were any updates from the members. There were no updates from the group and Mr. Hall moved onto the next agenda item.

4. **Review and approve the minutes for the meeting held on September 7 2021.**
   Sal Masoud made a motion to accept the Minutes from September 7, 2021. Gisela Dagnino seconded the motion. Dave Hall called for a vote and the motion was approved.

5. **Texas Water Development Board (TWDB)- Updates and Presentation**
   Richard Bagans provided the group with some updates. He mentioned the additional funding that was allocated by TWDB, is in draft contract form and will be available to the sponsors next week for their review. He also mentioned the Tech Memo's will still be due January with the exception of the geodatabase files that have been extended. Therefore, the group still has an opportunity to approve the Tech Memo deliverables at a late November meeting or early December, to allow the Consultants enough time to submit. Richard also reminded the group if they are going to vote on determining flood mitigation and floodplain management goals or to approve a process for identifying potential FMEs and potentially feasible FMSs and FMPs, it will require a fourteen-day notice. Therefore, he recommended the group table agenda items eleven and twelve. He recommended discussion can still happen, but no vote. The group discussed the possibility of having their next meeting on November 2nd and still being able to post with to meet the fourteen-day requirement. Finally, Richard also informed the group that TWDB can now approve the AECOM contract once the group votes on agenda item #7.

6. **Update from Sarah Douglas, Liaison for Region 15 Upper Rio Grande Regional Flood Planning Group.**

   There was no report from Sarah Douglas.

7. **Discussion and potential action regarding the updated task budget and expense budget to submitted to the Texas Water Development Board in a budget memo**
   Annette Gutierrez presented the group with the budget memo that was submitted to the TWDB. The purpose of the memo was to request permission to revise the allocations per task as requested by AECOM to Rio Grande Council of Governments. Gisela Dagnino made a motion to accept the updated

task budget and expense budget that was submitted to TWDB in a budget memo. Jeff Bennett seconded the motion. Dave Hall called for a vote and the motion was approved.

8. **Discussion and potential action regarding administrative expenses to be submitted to the Texas Water Development Board for reimbursement**
   Annette Gutierrez requested to table this agenda item because RGCOG was not prepared to submit the documentation.

9. **AECOM GENERAL UPDATES**
   AECOM provided updates on the Stakeholder Survey Outreach, Task 1, 2, 3, and 4. They also provided a summary on some of the "Threatened and Endangered Species".
10. **Consider, discuss and take action for Adoption of Specific, Minimum Floodplain Management or Land Use Standards based on recommendation from Subcommittee 1**
    Based on clarification provided by Richard Bagans, the agenda item was tabled because it requires a 14-day public notice.

11. **Consider, discuss and take action for Adoption of Flood Mitigation and Floodplain Management Goals based on recommendation from Subcommittee 1**
    Based on clarification provided by Richard Bagans, the agenda item was tabled because it requires a 14-day public notice.

12. **Consider, discuss and take action to confirm general FMEs and FMS evaluation method proposed during Subcommittee 3 meeting**
    Gisela Dagnino made a motion to confirm the general FMes and FMS evaluation method proposed during Subcommittee 3 meeting. Levi Bryand seconded the motion.

13. **Update from Subcommittee 2 meeting**
    AECOM provided an update from Subcommittee 2 but no action was taken.

14. **Road Show Dates & Public Participation**
    Martin Bartlett, Barracuda Communications, reminded the group of the Flood Planning Group's Open House that will be held at the El Paso TecH20 Center. He thanked El Paso Water for their support with this effort. He also informed the group the Open House will also be conducted in February of 2022 in Pecos and Presidio, then finally wrapping up one last public hearing in El Paso in early summer.

15. **Survey & Stakeholder Coordination**
    Martin Bartlett, Barracuda Communications, stated there will be a shift in focus from the survey to the Open House that will be on October 27. Barracuda sent correspondence to all municipalities in Hudspeth and El Paso County. He also showed how much media coverage there was covering the flood planning group, the surveys and the Open House. He also mentioned the team has now received over one-hundred surveys. The planning group has now received survey responses from every county within its service area.

16. **Updated Roadmap, Schedule reminder/Goals for next Meeting**

Gilbert Andujo provided an updated roadmap for the group. He provided the following information:

Upcoming RFPG General Meetings (Tuesdays at 9am MST/10am CST)

- November 2
- November 30

Upcoming Subcommittee meetings

- Subcommittee 1 –Task 3A/3B -Evaluation and Recommendations on Floodplain Management/Flood Mitigation and Floodplain Measurement Goals: October 21
- Subcommittee 3 –Task 4B(a-b) -Identification and Evaluation of Potential Flood Management Evaluations and Flood Management Strategies (FMEs and FMSs): October 22
- Continue contacting community representatives and stakeholders to collect survey responses
- Continue publicizing the survey response opportunity
- Consolidate data collection results from survey and map viewer (extended survey closing date to October 15)
- Organize/hold El Paso Open House: October 27
- Continue existing and future condition flood risk analyses (Task 2)

Identify/outline potential minimum RFPG standards + flood mitigation, floodplain management goals, and recommendations based on Subcommittee 1 feedback and community survey responses (Task 3)

Identify/outline flood mitigation needs by subregion for Needs Analysis (Task 4A)

Identify/outline potential flood solutions (FMEs, FMSs, FMPs) (Task 4B)

Dave Hall asked if AECOM could provide the planning group a draft memo by November 30. Gilbert Andujo from AECOM stated they could try but if is not possible the group will receive it in early December. Annette Gutierrez, RGCOG reminded the group they could go to www.urpfpg.org, under meeting notices or calendar. Bryan Baisdell and Chris Wright proposed several dates to the group. Bryan stated that all subcommittees should meet for a final time prior to November 15th. Once the subcommittees have met and taken action on what items to recommend, the agenda for the November 30, 2021, general membership meeting will be posted.

The two also stated the draft Tech Memo will be distributed by December 3, 2021, for the group to review. The general membership will then meet either December 16th or 17th to vote on the memo. If the group identifies that more work needs to be done for the memo, the group can reconvene the first week of January. Once approved, AECOM will submit the Tech Memo by January 7, 2021.

17. Discussion of Old Business

There was no old business discussed.

18. General public comments

There were no public comments.

19. **Consider date and agenda items for next meeting**
This item was previously discussed by the group.

20. **Adjourn**
Gisela Dagnino made a motion to adjourn and seconded by Jeff Bennett. The meeting adjourned at 2:04 pm. Dave Hall called for a vote and the motion was approved. The meeting adjourned at 2:04 pm.

Nov 2, 2021
Date

Javier Acosta
Secretary

Meeting Minutes
Region 14 Upper Rio Grande Flood Planning Group Meeting
Tuesday, November 2, 2021

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓
Oscar D. "Jay" Ornelas	*Agricultural interests*	X
Gilberto Saldana Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small business*	✓
Gisela Dagnino	*Water utilities*	✓
Vacant	*Flood districts*	
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	✓
Sarah Douglas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Delbert Humberson	International Boundary Water Commission	✓
Tim Frere	Texas Division of Emergency Management	X
Larissa Place	Texas Department of Agriculture	✓
Ben Wilde	Texas State Soil and Water Conservation Board	X

Others Present:

Annette Gutierrez, RGCOG	Jeff Irvin - AECOM, PIC
Morgan White, TWDB	Lily Cartwright - AECOM
Matt Nelson, TWDB	Susan Roth, P.E.
James Bronikowski, TWDB	Judy Albus, Texas State Soli and Water Conservation District
Gilbert Andujo, AECOM	Enrique Ochoa, EPW
Bryan Blaisdell, AECOM	Lisa McCracken Mairs -USACE SWG
Chris Wright, AECOM	

1. **Welcome and call to order**
   Chairman Martinez welcomed the group and received confirmation that a quorum was present. The meeting started at 9:16 am.

2. **Recognition of guests**
   Chairman Martinez asked if there were any guests who would like to be recognized at this time. There were none.

3. **Member updates**
   Chairman Martinez asked if there were any updates from the members. Dave Hall mentioned the there was a Citizens Forum on October 28th, hosted by the International Water Boundary Commission (IBWC). He said there was a lot of discussion about levees and projects, so the work the flood planning group is doing is complementary of what others are talking about. Chairman Martinez mentioned the group said there will be openings if anyone is interested in joining. Delbert Humberson provided a link to the presentations from the event in case anyone wanted to view the information.

4. **Review and approve the minutes for the meeting held on October 15, 2021.**
   Dave Hall made a motion to accept the Minutes from October 15, 2021 with the correction of the utilization of the appropriate symbol to indicate what members were present at the meeting. Levi Bryand seconded the motion. Omar L. Martinez called for a vote and the motion was approved. Chairman Martinez abstained from the vote because he was not present at the meeting.

5. **Texas Water Development Board (TWDB)- Updates and Presentation**
   Richard Bagans provided the group with some updates. He mentioned the additional funding that was allocated by TWDB, is in draft contract form and Rio Grande Council of Governments (RGCOG) and AECOM should be able to bring the contract amendment to the group at the November 30th meeting. He also reminded the group there are several items in the Tech Memo that will not be due until March but through an email that was sent out recently, TWDB provided clarification on which items are due in January for the Tech Memo. Richard also mentioned the AECOM team has brought forward several questions to TWDB about projects that overlap state boundaries, accreditation of levees, and modeling of different dams along with the Rio Grande. Reem Zoun, James Bronikowski, along with Ricard Bagans, are working with them and will provide some responses soon.

6. **Update from Sarah Douglas, Liaison for Region 15 Upper Rio Grande Regional Flood Planning Group.**

   Sarah Douglas informed the group Region 15 has a new TDEM representative to the group, Bryan Hertech. The group also reviewed Tasks 1, 3b, and 4. The group also worked towards identifying their goals. They are six of them. They included, education, outreach, flood warning readiness, flood studies and analysis, and structure elevation/flood proofing.

7. **Discussion and potential action regarding administrative expenses to be submitted to the Texas Water Development Board for reimbursement**
   Annette Gutierrez requested to table this agenda item because RGCOG was not prepared to submit the documentation.

8. **AECOM GENERAL UPDATES**

AECOM provided some general updates to the group. Bryan Blaisdell informed the group that AECOM has been holding several subcommittee meetings, to include Subcommittee 1 –Task 3A/3B - Evaluation and Recommendations on Floodplain Management/Flood Mitigation and Floodplain Measurement Goals and Subcommittee 3 – Task 4B(a-b) - Identification and Evaluation of Potential Flood Management Evaluations and Flood Management Strategies (FMEs and FMSs). AECOM also continues to conduct public/stakeholder outreach that includes the El Paso Open House Meeting on October 27, verifying responses from key stakeholders and reaching out to fill remaining data gaps for Task 1, they have performed existing and future condition flood risk analyses for Task 2. AECOM has been drafting flood mitigation and floodplain management goals/recommendations for vote by Subcommittee 1 for Task 3, as well as identifying/outlining flood mitigation needs by subregion for Needs Analysis Task 4A and identifying/outlining potential flood solutions (FMEs, FMSs, FMPs) (Task 4B). He also a preliminary draft Tech Memo will be available for the November 30th meeting and the official draft Tech Memo will be available on December 3rd to allow for public comment and discussion on it for a general meeting in the middle of December.

Jeff Bennett asked if the flood management projects, evaluations and strategies will be identified this month. Bryan said they will be identifying them but this is not the only opportunity to identify these items. The group will still be able to identify them after the submittal of the Tech Memo.

Bryan also mentioned there will be upcoming URGFPG General Meetings on Tuesday, at 9am MST/10am CST on November 30. In addition, there will several upcoming Subcommittee meetings for Subcommittee 1 –Task 3A/3B - Evaluation and Recommendations on Floodplain Management/Flood Mitigation and Floodplain Measurement Goals on November 4 and potential 4th meeting between November 10-12. For Subcommittee 2 – Task 4B(c) - Identification and Evaluation of Potential Flood Mitigation Projects (FMPs), there will also be a meeting on November 4 and November 15. Subcommittee 3 – Task 4B(a-b) - Identification and Evaluation of Potential Flood Management Evaluations and Flood Management Strategies (FMEs and FMSs) will be on November 10. He also outlined the actions to vote for the next November 30 URGFPG meeting. He stated what items for review need to be posted for public review by November 15. The items will show the minimum URGFPG standards (Task 3A), flood mitigation, floodplain management goals (Task 3B), and formalize a process for identifying FMEs, FMSs, and FMPs (Task 4B).

Gilbert Andujo from AECOM, provided an update on the budget progress to date. He showed a chart outlining the percentage of completion per task. In total, AECOM will be requesting update to $364,000 in reimbursement from TWDB.

9. **AECOM – SUBCOMMITTEE UPDATES**

Bryan provided an update on Subcommittee 1 and Chris Wright updated the group on Subcommittees 3. They both He summarized the presentation slides that were previously presented to the group.

10. AECOM - EL PASO OPEN HOUSE MEETING UPDATE

Marina Monsisvais from Barracuda Public Relations provided the update. She summarized the events of the Open House. She sated thirty people attended the event. There was lot of activity on the Roll plots and with people updating their flood information on the laptops. Chairman Martinez provided several interviews to new media outlets. The next round of meetings will be in Presidio and Pecos. Chairman Martinez asked for Barracuda Public Relations to inform the group how they are going to do the outreach for the next two meetings. Marina said she would.

11. Consider date and agenda items for next meeting

The next meeting set was for November 30, 2021, at 9:00 am.

12. Adjourn

Gisela Dagnino made a motion to adjourn and seconded by Jeff Bennett. Chairman Martinez called for a vote and the motion was approved. The meeting adjourned at 10:03 am.

1/31/22
Date

Javier A. Acosta
Javier Acosta, Secretary

AMENDED AGENDA
REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING

Tuesday, November 30, 2021
9:00 A.M. (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓, present for agenda items 1-7
Oscar D. "Jay" Ornelas	*Agricultural interests*	X
Gilberto Saldana Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓, physically present-Chair
Rene Rodriguez	*Small business*	✓
Gisela Dagnino	*Water utilities*	✓
Vacant	*Flood districts*	X
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Sarah Douglas	General Land Office/Region 14 Liaison	X
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Delbert Humberson	International Boundary Water Commission	✓
Judy Lucio	Texas Division of Emergency Management	✓
Larissa Place	Texas Department of Agriculture	✓
Ben Wilde	Texas State Soil and Water Conservation Board	X

Others Present:	
Annette Gutierrez, RGCOG	Jeff Irvin - AECOM, PIC
Morgan White, TWDB	Lily Cartwright - AECOM
Matt Nelson, TWDB	Alejandra Marcos - AECOM
James Bronikowski, TWDB	Judy Albus, Texas State Soli and Water Conservation District
Gilbert Andujo, AECOM	Gonzalo Cedillos
Bryan Blaisdell, AECOM	Lisa McCracken Mairs -USACE SWG
Chris Wright, AECOM	

1. Welcome and call to order
   Dave Hall chaired the meeting on behalf of Chairman Martinez. He welcomed the group and received confirmation that a quorum was present. The meeting started at 9:04 am.

2. Recognition of guests
   Dave Hall asked if there were any guests who would like to be recognized at this time. There were none.

3. Member updates
   Dave Hall asked if there were any updates from the members. There were none.

4. Review and approve the minutes for the meeting held on November 2, 2021.
   Jeff Bennett made a motion to accept the Minutes from November 2, 2021. Sal Masoud seconded the motion. Dave Hall called for a vote and the motion was approved.

4. Update from Sarah Douglas, Liaison for Region 15 Upper Rio Grande Regional Flood Planning Group.
   Sarah Douglas was not present at the meeting. Therefore, there was no update provided.

5. Flood Planning Members assignment of Proxies
   Omar Martinez made a motion for each voting and non-voting member to assign up to two proxies on behalf of themselves and send that information to Annette Gutierrez, Rio Grande Council of Governments (RGCOG). Gisela Dagnino seconded the motion. Dave Hall called for a vote and the motion was approved.

6. Texas Water Development Board (TWDB) - Update
   Richard Bagans provided the group with some updates. He discussed the contract amendments with the group. He said Region 14 was allocated an additional $660,400 that is to go to additional outreach, data collection, and to perform Flood Mitigation Evaluations. The flood planning group will still be required to submit their regional plan by 2022. However, the group will be able to incorporate an amendment to include the additional tasks. He also reminded the group they will be voting on approving the Tech Memo at the December meeting and if approved it will then be sent on to TWDB by the January 7th deadline.

7. "Discussion and potential action to authorize the Planning Group Sponsor to negotiate and execute an amendment to the Regional Flood Planning Grant contract with the TWDB, to incorporate additional funding for the first cycle of regional flood planning, including necessary revisions to the contract scope of work and budget."

   Jeff Bennett made a motion to authorize the RGCOG to negotiate and execute an amendment to the Regional Flood Planning Grant contract with the TWDB, to incorporate additional funding for the first cycle of regional flood planning, including necessary revisions to the contract scope of work and budget. Gisela Dagnino seconded the motion. Dave Hall called for a vote and the motion was approved.

8. "Discussion and potential action to authorize the Planning Group Sponsor to negotiate and execute an amendment to the Regional Flood Planning Grant subcontract with the technical consultant, AECOM, to incorporate additional funding for the first cycle of regional flood planning, including necessary revisions to the contract scope of work and budget."

Gisela Dagnino made a motion to authorize the RGCOG to negotiate and execute an amendment to the Regional Flood Planning Grant subcontract with the technical consultant, AECOM, to incorporate additional funding for the first cycle of regional flood planning, including necessary revisions to the contract scope of work and budget." Rene Rodriguez seconded the motion. Dave Hall called for a vote and the motion was approved.

9. Discussion and potential action regarding administrative expenses to be submitted to the Texas Water Development Board for reimbursement.

   Gisela Dagnino made a motion to accept the administrative expenses as presented to the Texas Water Development Board. Gilbert Saldana seconded the motion. Dave Hall called for a vote and the motion was approved.

10. AECOM provided general updates and information related to the Technical Memorandum.

11. Discussion and action to vote for recommendations on floodplain management standards per §361.35

    Levi Bryand made a motion to approve to adopt a region-specific minimum standards and recommendations along with a specific list defining standards or recommendations. Sal Masoud seconded the motion. Dave Hall called for a vote and the motion was not approved.

    Levi Bryand then made a motion to approve region-specific recommendations for floodplain management standards. Sal Masoud seconded the motion. Dave Hall called for a vote and the motion was approved.

12. Discussion and action to vote for adoption of the overarching flood mitigation and floodplain management goals for the Region 14 regional flood plan per §361.36. b

    Rene Rodriguez made a motion to adopt the short-term and long-term goals as presented. Gisela Dagnino seconded the motion. Dave Hall called for a vote and the motion was approved.

13. Discussion and action to vote for approval of the documented process used by the UFGRFPG to identify and evaluate potential Flood Management Evaluation (FME)s, and potentially feasible Flood Mitigation Project (FMP)s and Flood Management Strategy (FMS)s per §361.38.

    Rene Rodriguez made a motion for the approval of process to identify and evaluate potential FMEs, FMSs, and FMPs as described in the 11/16/21 Technical Memorandum. The motion was seconded by Jeff Bennett. Dave Hall called for a vote and the motion was approved.

14. Adjourn
    Jeff Bennett made a motion to adjourn and was seconded by Rene Rodriguez. Dave Hall called for a vote and the motion was approved. The meeting adjourned at 10:45 am.

1/31/22
Date

Secretary, Javier Acosta

AMENDED AGENDA
REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING
Thursday, December 16, 2021
9:00 A.M. (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓, physically present-Chair
Vacant	*Agricultural interests*	X
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓, physically present
Rene Rodriguez	*Small business*	X
Marvin Gomez for Gisela Dagnino	*Water utilities*	✓
Vacant	*Flood districts*	X
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Sarah Douglas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Delbert Humberson	International Boundary Water Commission	✓
Judy Lucio	Texas Division of Emergency Management	✓
Larissa Place	Texas Department of Agriculture	X
Judy Albus for Ben Wilde	Texas State Soil and Water Conservation Board	✓

Others Present:	
Annette Gutierrez, RGCOG	Jeff Irvin - AECOM, PIC
Gilbert Andujo, AECOM	Patricia Garcia-Barracuda PR
Bryan Blaisdell, AECOM	Alejandra Marco - AECOM
Chris Wright, AECOM	

1. Welcome and call to order
   Chairman Omar Martinez welcomed the group and received confirmation that a quorum was present. The meeting started at 9:05 am.

2. Recognition of guests
   Chairman Martinez asked if there were any guests who would like to be recognized at this time. There were none.

3. Member updates
   Chairman Martinez asked if there were any updates from the members. There were none.

4. Public Comments
   Chairman Martinez asked if there were any public comments from the public. There were none.

5. Review and approve the minutes for the meeting held on November 30, 2021.
   Sal Masoud made a motion to accept the Minutes from November 30, 2021. Jeff Bennett seconded the motion. Chairman Martinez called for a vote and the motion was approved.

6. Update from Sarah Douglas, Liaison for Region 15 Upper Rio Grande Regional Flood Planning Group.
   Sarah Douglas informed the group she was not able to attend Region 15's meeting but requested a summary of the meeting. She stated she would pass along the information as soon as it is available.

7. Update
   Annette Gutierrez, Rio Grande Council of Governments (RGCOG) asked for Richard Bagans, Texas Water Development Board (TWDB), to provide an update on behalf of the agency. He mentioned the contract amendment for additional funds is being processed by the Board. Also reminded the group the Tech Memo is due January 7, 2022 and the group will need to vote on their approval today. He also said there will be an email to be distributed by the Board providing the Technical Consultants how to submit the Tech Memo and how to access their OneDrive. There were also two conference calls held recently, one for Technical Consultants and one for Chairs. The Board covered technical guidelines and clarifications for Technical Consultants and the presentation can be found on their website. The Chairs Call covered what is going on across the State. Both calls are being held quarterly. He mentioned many regions are having meetings this week as well. Finally, he reminded the group, as stated by their bylaws, at their next meeting, they will need to vote on officers for the new year.

8. Discussion and potential action regarding administrative expenses to be submitted to the Texas Water Development Board for reimbursement.
   Annette Gutierrez requested to table the agenda item because there were no reimbursement requests at this time.

9. AECOM General RFP Updates
   Gilbert Andujo, introduced the AECOM and Barracuda Public Relations to the group. Patricia Garcia informed the group of the status of their Open House meetings in Pecos and Presidio on February 9th and 10th. Gilbert next asked Chris Wright to present on the final

recommendations from the previous meeting of Subcommittee 2. Sal Masoud made a motion to submit the recommendations from Subcommittee 2 as follows:

1) Approval of refinement of screening process for selection of potentially feasible regional FMPs for Projects not included in the City of El Paso/El Paso Water Stormwater Master Plan, or the El Paso County Stormwater Master Plan, including all process refinements discussed during the subcommittee meeting held 12/14/21. AECOM will have the opportunity to review approximately how many of the 9 currently identified projects, plus other additional projects yet to be considered, can be evaluated based on time/budget to reduce the number of projects further.

2) Approval of selection of 25 potentially feasible FMPs from the 2021 City of El Paso/El Paso Water SWMP, including all refinements to the screening process discussed during the subcommittee meeting held 12/14/21. EPWater will have the opportunity to submit a revised list before the next Subcommittee 2 meeting. AECOM will have the opportunity to review approximately how many of the 25 projects can be evaluated based on time/budget to reduce the number of projects further.

3) Approval of selection of 19 potentially feasible FMPs from the 2021 El Paso County SWMP, including all refinements to the screening process discussed during the subcommittee meeting held 12/14/21. El Paso County will have the opportunity to submit a revised list before the next Subcommittee 2 meeting. AECOM will have the opportunity to review approximately how many of the 19 projects can be evaluated based on time/budget to reduce the number of projects further.

The motion was seconded by Dave Hall. Chairman Martinez called for a vote and the motion was approved.

10. AECOM Discussion and adoption of the Technical Memo as presented by AECOM with authorization of Consultant/Political Subdivision to make non-substantial edits and submittal of the final Tech Memo to the TWDB.

    Jeff Bennett made a motion to approve the Technical Memo as presented by AECOM with authorization of Consultant/Political Subdivision to make non-substantial edits and submittal of the final Tech Memo to the TWDB. Gilbert Saldaña seconded the motion. Chairman Martinez called for a vote and the motion was approved.

11. AECOM Discussion of TWDB responses to AECOM questions regarding levees
    Chris Wright provided the update to the group.

12. Chair Set next meeting date
    As recommended by AECOM, the group will be meeting sometime between January 24 thru 27. Annette Gutierrez stated she would also send out a doodle poll to determined meetings for subcommittee 2 and 3.
13. Chair Adjourn
    Jeff Bennett made a motion second by Dave Hall adjourned at 10:22.

2/28/22
Date

Javier A. Acosta
Secretary, Javier Acosta

AGENDA
REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING
Wednesday, February 2, 2022
9:00 A.M. (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓
Vacant	*Agricultural interests*	
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓, physically present-served as Chair
Rene Rodriguez	*Small business*	X
Marvin Gomez for Gisela Dagnino	*Water Utilities*	✓
Vacant	*Flood districts*	X
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent(✓)/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	✓
Sarah Douglas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Delbert Humberson	International Boundary Water Commission	✓
Judy Lucio	Texas Division of Emergency Management	✓
Larissa Place	Texas Department of Agriculture	X
Judy Albus for Ben Wilde	Texas State Soil and Water Conservation Board	✓

Others Present:	
Annette Gutierrez, RGCOG	Jeff Irvin - AECOM, PIC
Gilbert Andujo, AECOM	Lily Cartwright, AECOM
Bryan Blaisdell, AECOM	Susan Roth, PE, Susan Roth Consulting
Chris Wright, AECOM	Patricia Garcia-Barracuda PR
Alejandra Marco, AECOM	James Bronikowski

1. Welcome and call to order
   Dave Hall served as Chair for Omar Martinez. He welcomed the group and received confirmation that a quorum was present. The meeting started at 9:02 am.

2. Recognition of guests
   Dave Hall asked if there were any guests who would like to be recognized at this time. There were none.

3. Member updates
   Dave Hall asked if there were any updates from the members. There were none.

4. Public Comments
   Dave Hall asked if there were any public comments from the public. There were none.

5. Review and approve the minutes for the meeting held on December 16, 2021.
   Levi Bryand made a motion to accept the Minutes from December 16, 2021. Gilbert Saldaña seconded the motion. Dave Hall called for a vote and the motion was approved.

6. Update from Sarah Douglas, Liaison for Region 15 Upper Rio Grande Regional Flood Planning Group.
   Sarah Douglas informed the group there was no update at this time.

7. Discussion on membership from subcommittees as it relates to a potential quorum of the flood planning group.
   Annette Gutierrez, Rio Grande Council of Governments (RGCOG) asked for Richard Bagans, Texas Water Development Board (TWDB), to provide an update on behalf of the agency before the group discussed the membership of subcommittees. He mentioned AECOM submitted their tech memo to TWDB prior to the deadline. TWDB has deemed it administratively complete and has allowed AECOM to move forward with Task 5. He also reminded the group the next deadline is March 7th where extension deliverables are due pertaining to geo-database files. He mentioned the contract amendment for additional funds is being processed by the Board. The Officers election will happen at the second meeting, part of bylaws. Last, he mentioned there will be a Chairs Conference Call in March. The Legal Division will provide an Open Meetings Act overview to the group.

   Richard Bagans next discussed the membership from subcommittees as they relate to a potential quorum of the flood planning group. Richard stated, after receiving guidance from TWDB, during subcommittee meetings, the number of planning group members participating may be so many that a quorum of the flood planning group may be established. He noted our region has a large number of members participating but they are being posted as subcommittees. He offered two options. First, if the group wants to continue having subcommittees, they may do so but limit the number of participants so that a quorum of the full membership does not exist. Secondly, the group may forego the subcommittees, have a flood planning group meeting and limit the agenda to specific items related to the topics identified from the subcommittees. Annette Gutierrez asked if the group if they would be open to having their March meeting be a General Flood Planning Meeting rather than a Subcommittee 2 meeting. The group conferred with AECOM and they agreed it would be appropriate to move forward in this manner.

Next they discussed Subcommittee 1,3, & 4. AECOM stated there would no longer be meetings for Subcommittee 1 since the goals were met. AECOM stated they anticipated having a meeting for Subcommittee 3 in late February and Subcommittee 2 in the middle of March. There focus over the next several months will be for those two subcommittees. He also mentioned the thought for Subcommittee 4 was to do away with it and treat the process as a workgroup where AECOM will reach out to individuals separately to gather the information and then present it to the group.

Annette summarized to the group that the February 28th meeting will focus on subcommittee 3 primarily and the next general meeting will be between March 14-18 to focus on Subcommittee 2.

Dave Hall asked for AECOM to consider forming a small group for Subcommittee 4 if they are in need of gathering more responses, then convening a small group may be beneficial.

8. Discussion and potential action regarding administrative expenses to be submitted to the Texas Water Development Board for reimbursement.
   Jeff Bennett made a motion to approve the expenses as presented. The total amount requested from AECOM was $154,247.71, for the period of October 1, 2021-December 31, 2021. Omar Martinez seconded the motion. Dave Hall called for a vote and the motion was approved.

9. AECOM General RFP Updates
   - Upcoming Open House Meetings in Pecos and Presidio
   - Update on Region 14 Fathom 3m Flood Risk Data
   - 2022 RFP Road Map/upcoming meeting schedule

Bryan presented agenda items 9 through 11 to the planning group.

12. Discussion and action to vote for approval of recommendations from Subcommittee 3 (FMEs/FMSs)

Sal Masoud made a motion to approve any refinements to the list of FMEs and FMSs included in the 1/7/22 Tech Memo resulting from discussions in this subcommittee meeting to recommend to the URG Regional Flood Planning Group. Omar Martinez seconded the motion. Dave Hall called for a vote and the motion was approved.

13. Discussion and action to vote for approval of recommendations from Subcommittee 2 (FMPs)

Omar Martinez made a motion for the following:

- Approval of the creation of tiers according to 5 projects in each category
- Approval of refined prioritization tables and overall method for prioritization of potentially feasible FMP evaluations (as shown in Alt 3) discussed during this meeting for recommendation to RFPG.

- Approval of applying additional funding of $58,000 toward Task 4, as needed for recommendation to RFPG.

Levi Bryand seconded the motion. Dave Hall called for a vote and the motion was approved.

14. Chair Set next meeting date

The group agreed to set the next flood planning meeting for February 28, 2022, at 9:00 am., MST. March 14-18 poll.

15. Chair Adjourn

Levi Bryand made a motion to adjourn. Sal Masoud seconded the motion. Dave Hall called for a vote and the motion was approved. The meeting adjourned at 10:42.

2/28/22

Date

Javier A. Acosta

Secretary, Javier Acosta

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING MINUTES
Monday, February 28, 2022
9:00 A.M. (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓, physically present
Vacant	*Agricultural interests*	
Vacant	*Generating Electric Utilities*	
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓, physically present
Rene Rodriguez	*Small business*	✓
Gisela Dagnino	*Water Utilities*	✓
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(✓)/Absent(X)/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	✓
Vacant	General Land Office/Region 14 Liaison	
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Delbert Humberson	International Boundary Water Commission	X
Judy Lucio	Texas Division of Emergency Management	X
Larissa Place	Texas Department of Agriculture	✓
Judy Albus for Ben Wilde	Texas State Soil and Water Conservation Board	✓

Others Present:	
Annette Gutierrez, RGCOG	Alejandra Marco, AECOM
Gilbert Andujo, AECOM	Jeff Irvin - AECOM, PIC
Bryan Blaisdell, AECOM	Dr. Apurba Boarh, IBWC
Chris Wright, AECOM	Patricia Garcia-Barracuda PR

1. **Welcome and call to order**

   Chairman Omar Martinez welcomed the group and received confirmation that a quorum was present. The meeting started at 9:02 am.

2. **Public Comments**

   There were no public comments.

3. **Review and approve the Minutes for the meeting held on February 2, 2022, & December 16, 2022**

   Annette Gutierrez explained that only February 2, 2022, Minutes needed to be approved and the December 16, 2021 Minutes had already been approved. Dave Hall made a motion to accept the Minutes from February 2, 2022. Sal Masoud seconded the motion. Chairman Martinez called for a vote and the motion was approved.

4. **Review and approve the Minutes for the 4th Subcommittee 3 meeting held on January 12, 2022**

   Sal Masound made a motion to accept the Minutes from Subcommittee 3 meeting held on January 12, 2022. Dave Hall seconded the motion. Chairman Martinez called for a vote and the motion was approved.

5. **Review and approve the Minutes for the 5th Subcommittee 2 meeting held on January 27, 2022**

   Gisela Dagnino made a motion to accept the Minutes from Subcommittee 2 meeting held on January 27, 2022. Jeff Bennett seconded the motion. Chairman Martinez called for a vote and the motion was approved.

6. **Liaison for Region 15 Lower Rio Grande Regional Flood Planning Group**

   Annette Gutierrez informed the group that Sarah Douglas is no longer working for the General Land Office and submitted her resignation from the Flood Planning Group and as the Liaison for Region 15. Dave Hall made a motion to nominate Jeff Bennett to serve as the Liaison for Region 15. Omar Martinez seconded the motion. Chairman Martinez called for a vote and the motion was approved.

7. **Election of Officers for Calendar Year 2022 (Chair, Vice-Chair, Secretary)**

   Annette Gutierrez informed the group that in addition to the positions noted in the agenda, two at-large positions also need to be voted on. However, since it was not posted, Ms. Gutierrez will post these items on the next agenda. Dave Hall made a motion to nominate the current Officers for Calendar Year 2022. Levi Bryand seconded the motion. Chairman Martinez called for a vote and the motion was approved.

8. Discussion and potential action regarding administrative expenses to be submitted to the Texas Water Development Board for reimbursement

Gisela Dagnino made a motion to accept the administrative expenses presented. Dave Hall seconded the motion. Chairman Martinez called for a vote and the motion was approved.

9. Take action on vacancies for Agriculture and Generating Utilities

Jeff Bennett made a motion to accept Kenton Martin as the member representing Electric Generating Utilities and Dr. Zhuping Sheng as the member representing Agriculture. Gisela Dagnino seconded the motion. Chairman Martinez called for a vote and the motion was approved.

10. Updates from Richard Bagans

Richard Bagans informed the group that the Tech Memorandum has deliverables that are due March 7th. He said the deliverables are GIS based. He also mentioned for the Tech Memorandum that was submitted in January, it is going under content review by the Board and informal comments should be provided to the group and the consultants in late April. He also said the contract amendments for additional funding for the tasks that were included is currently in DocuSign, where several TWDB staff need to sign. Once this is completed, it will be sent to RGCOG for execution. He said the RGCOG can then amend its subcontract with AECOM. He also said that payment requests have been slower to complete but the Board is working with RGCOG to get expenses paid. He mentioned the Board will be having a conference call with the technical consultants later this afternoon and there will be a Chairs conference call on Wednesday, March 2nd. Richard also praised AECOM for seeking clarification and presenting questions to the Board.

11. Pecos/Presidio Open House Meeting Updates

Patricia Garcia from Barracuda PR, informed the group that a total of five people signed up for the Pecos meeting at Odessa the College Center. The average attendee stayed for 1 to 1.5 hours. This allowed for ample time for engagement in conversation, input and completing the comment cards. Most of the respondents were concerned about safety issues related to flooding and those that had been affected by flooding in the last 5 years said they sustained $10,000 to $20,000 of flood-related damage to their business or property. She also reported on the media coverage for the event.

In Presidio, eight people signed in for the Presidio public meeting. The average attendee stayed for 1 hour to 1.5 hours. As in the previous meeting, this provided ample time for engagement in conversation, input and completing comment cards. Five comment cards were completed and received. While most attendees indicated they had not been directly affected by flood damage, they did indicate that their commute had been interrupted by flooding. Of those who did indicate flood damage, the financial costs were $10,000 or below. There was also media coverage provided for this event.

12. Discussion of in-progress Technical Memorandum (March 7) deliverables as presented by AECOM with authorization of Consultant to submit completed draft deliverables to the TWDB

Gisela Dagnino made a motion to give the authorization of the consultant to submit the completed draft deliverables to Texas Water Development Board. Rene Rodriguez seconded the motion. Chairman Martinez called for a vote and the motion was approved.

13. Discussion related to Subcommittee 3 (FMEs/FMSs)

Chris Wright provided an overview of what was discussed in the last Subcommittee 3 meeting.

14. Discussion related to Task 8 – Administrative, Regulatory, and Legislative Recommendations

Jeff Irvin covered this agenda item. He explained what items are included in Task 8. These items included 1) Legislative recommendations, 2) Other regulatory/ admin recommendations 3) Any other recommendations, and 4) Recommendations regarding potential, new revenue-raising opportunities. He also discussed the approach AECOM wants to take that includes an initial workshop.

15. Set next meeting date

Annette Gutierrez informed the group the next meeting will be between March 14-18, 2022, based on the group's availability.

16. Adjourn

Gisela Dagnino made a motion to adjourn. Sal Masoud seconded the motion. Chairman Martinez called for a vote and the motion was approved. The meeting concluded at 11:11.

Secretary, Javier Acosta

3/16/22

Date

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING MINUTES

Tuesday, March 15, 2022
9:00 A.M. (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓
Zhuping Sheng	*Agricultural interests*	X
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	X
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small business*	
Gisela Dagnino	*Water utilities*	✓
Vacant	*Flood districts*	
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	X

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Vacant	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Delbert Humberson	International Boundary Water Commission	✓
Judy Lucio	Texas Division of Emergency Management	✓
Larissa Place	Texas Department of Agriculture	X
Judy Albus for Ben Wilde	Texas State Soil and Water Conservation Board	✓

Others Present:	
Annette Gutierrez, RGCOG	Jeff Irvin - AECOM, PIC
Gilbert Andujo, AECOM	Patricia Garcia-Barracuda PR
Bryan Blaisdell, AECOM	Alejandra Marco - AECOM
Chris Wright, AECOM	Joanna McKenzie
Dr. Apura Borah	Marvin Gomez
Alderman David Cantu	

1. Welcome and call to order
   Chairman Omar Martinez welcomed the group and received confirmation that a quorum was present. The meeting started at 9:03.

2. Public Comments
   Chairman Martinez asked if there were any public comments from the public. There were none.

3. Review and approve the minutes for the meeting held on February 28, 2022.
   Zhuping Sheng made a motion to accept the Minutes from Upper Rio Grande Flood Planning Group meeting held on February 28, 2022. Gisela Dagnino seconded the motion. Chairman Martinez called for a vote and the motion was approved.

4. Selection of two members-at-large for the Executive Committee.

   Zhuping Sheng made a motion to appoint Gisela Dagnino, Gilbert Saldana, and David Hall as the At-Large members. Gilbert Saldana seconded the motion. Chairman Martinez called for a vote and the motion was approved.

5. Update from Richard Bagans.
   Annette Gutierrez, Rio Grande Council of Governments (RGCOG) asked for Richard Bagans, Senior Regional Flood Planner, Texas Water Development Board (TWDB), to provide an update on behalf of the agency.

   Richard Bagans informed the group that AECOM submitted the required March 7th deliverables to TWDB. They are currently being reviewed for administrative completeness. He also mentioned TWDB is still reviewing the January 7th Tech Memo and their comments should be released around mid-April. He also mentioned there was a chairs conference call as well as one for the technical consultants where they discussed in more detail the FMEs and FMPs. The Director of Flood Planning for TWDB, Reem Zoun, presented at the Texas Floodplain Management Association in Houston recently, where she displayed Region 14's public outreach materials. He also mentioned TWDB is still behind in reimbursing payment requests but they continue to work with AECOM and RGCOG. Finally, he informed the group the contract amendment has been executed to allow for the group to get started for the additional tasks.

6. General RFP Updates/Draft Technical Memorandum through agenda item 13.
   Gilbert Andujo led the discussion on behalf of AECOM. He along with Bryan Blaisdell and Chris Wright presented these items.

14. Discussion and Action to Vote for Approval of Additional Potentially Feasible FMPs.

    Dave Hall made a motion to approve the potentially feasible FMPs presented. The motion was seconded by Zhuping Sheng. Chairman Martinez called for a vote and the motion was approved.

15. Set next meeting date

    Annette Gutierrez informed the group the next meeting will be between April 19 at 9:00 am or week of 18-22, 2022, based on the group's availability.

16. Chairman Omar Martinez Adjourn

    Dave Hall made a motion to adjourned. Sal Massoud seconded the motion. Chairman Martinez called for a vote and the motion was approved at 11:58.

4/25/22
Date

Javier A. Acosta
Secretary, Javier Acosta

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING MINUTES

Thursday, April 21, 2022
9:00 A.M. (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓
Zhuping Sheng	*Agricultural interests*	✓
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	X
Sal Masoud	*Industries*	X
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small business*	X
Gisela Dagnino	*Water utilities*	✓
Vacant	*Flood districts*	X
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Elijah Casas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Delbert Humberson	International Boundary Water Commission	X
Judy Lucio	Texas Division of Emergency Management	✓
Larissa Place	Texas Department of Agriculture	X
Ben Wilde	Texas State Soil and Water Conservation Board	✓

Others Present:	
Annette Gutierrez, RGCOG	Jeff Irvin - AECOM, PIC
Gilbert Andujo, AECOM	Patricia Garcia-Barracuda PR
Bryan Blaisdell, AECOM	Alejandra Marco - AECOM
Chris Wright, AECOM	Alderman David Cantu
Dr. Apura Borah	Marvin Gomez
John Gwynn, Doña Ana County	

1. Welcome and call to order
   Chairman Omar Martinez welcomed the group and received confirmation that a quorum was present. The meeting started at 9:03.

2. Recognition of guests
   Chairman Martinez recognized Alderman David Cantu from San Elizario and John Gwynn from Dona Ana County.

3. Public Comments
   Chairman Martinez asked if there were any public comments from the public. There were none.

4. Member updates
   Chairman Martinez announced that the AECOM team, along with RGCOG, and himself, assisted Hudspeth County in submitting an appropriations request to Congressman Tony Gonzales's office to establish floodplain management controls in several colonias in Hudspeth County. He encouraged other small communities to seek the Flood Planning Group's assistance in the future.

   Tressa Olsen from Texas Water Development Board provided an update. She said that TWDB staff provided informal comments on the January Tech Memo deliverables last week and also mentioned the informal comments for the March 7 deliverables will be provided in May. She reminded the group to submit their executed amended subcontract to your Planner as soon as possible. She also stated there would be a Technical Consultants Call on May 24th and a Chairs Conference Call on May 25th. Finally, she mentioned that TWDB sent out a newsletter providing more information on the 60-day public comment requirement and on FMX voting.

5. Review and approve the minutes for the meeting held on March 15, 2022.
   Dave Hall made a motion to accept the Minutes from the Upper Rio Grande Flood Planning Group meeting held on March 15, 2022, except for correcting Dr. Zhuping Sheng's attendance. The Minutes stated he was absent when he was present. Jeff Bennett seconded the motion. Chairman Martinez called for a vote and the motion was approved.

6. General RFP Updates & 7 through 12 Agenda Items
   Gilbert Andujo from AECOM welcomed the flood planning group. He introduced the AECOM team and asked Bryan Blaisdell to provide the updates. He mentioned they would cover the following topics.
   - Upcoming Draft RFP Chapter Target Dates (Submittal to the RFPG)
   - Chapter 1 (Task 1 – Planning Area Description): April 2022
   - Chapter 3 (Task 3 – Floodplain Management Practices/Goals): May 2022
   - Chapter 4 (Task 4 and 5 – FMEs/FMSs/FMPs): June 2022
   - Chapter 5-9 (Task 6 through 10 – all remaining chapters): July 1, 2022
   - El Paso Wrap-Up Public Meeting: June 2022 - Barracuda has tentatively set the meeting for June 8th at the El Paso Independent School District, Central Office
   - Draft RFP due to TWDB by August 1, 2022

- El Paso Public Hearing to Obtain Public Feedback on Draft RFP: September 2022
- Incorporate TWDB & Public Input and Adopt Final RFP by January 2023

13. Action to Vote for Recommended FMEs, FMSs, and FMPs
Zhuping Sheng made a motion to approve the 5 FMPs proposed. Gisela seconded the motion. Chairman Martinez called for a vote and the motion was approved.

FMP Name	Description	Project Type	Estimated Project Cost ($)
HAC3	Sediment/Retention Basin	Sediment/Retention Basin	$3,000,000
SOC4	Sediment/Detention Basin at "Mankato Arroyo"	Sediment/Retention Basin	$1,660,000
FAB1	Sediment/Retention Basin	Sediment/Retention Basin	$3,660,000
MON3	Sediment/Retention Basin	Sediment/Retention Basin	$29,750,000
SSA4	Detention Basin SSA4	Detention Basin	$13,900,000
CAN1	Reconstruction of the channel with concrete lining	Channel Improvement	$1,960,000
EA 10	Detention Basin	Detention/Sediment Basin	$6,100,000

Jeff Bennett made a motion to accept all the changes presented by AECOM during the presentation (Click here to see revised information). The motion was seconded by Dave Hall. Chairman Martinez called for a vote and the motion was approved.

14. Next Potential General RFPG Meeting Date May 25th will be the next meeting.

15. Adjourn
Jeff Bennett made a motion to adjourn. Dave Hall seconded the motion. Chairman Martinez called for a vote and the motion was approved. The meeting adjourned at 11:07.

5/27/22
Date

Secretary, Javier Acosta

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING MINUTES

Wednesday, May 25, 2022
1:30 PM (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓
Zhuping Sheng	*Agricultural interests*	✓
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small business*	X
Gisela Dagnino	*Water utilities*	✓
Vacant	*Flood districts*	X
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	✓
Elijah Casas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Delbert Humberson	International Boundary Water Commission	X
Judy Lucio	Texas Division of Emergency Management	✓
Larissa Place	Texas Department of Agriculture	X
Judy Albus for Ben Wilde	Texas State Soil and Water Conservation Board	✓

Others Present:

Annette Gutierrez, RGCOG	Alderman David Cantu, City of San Elizario
Reem Zoun, TWDB – in person	Liz Cassin, American Flood Coalition
James Bronikowski, TWDB	Chase Krozner, American Flood Coalition
Gilbert Andujo, AECOM	Carlos Gallinar, City of Socorro
Bryan Blaisdell, AECOM	Alejandra Valadez, City of Socorro
Chris Wright, AECOM	Marvin Gomez
Jeff Irvin, AECOM, PIC	Isela Canava

Alejandra Marco, AECOM	Carolyn E. Donnelly
Patricia Garcia-Barracuda PR	

1. Welcome and call to order
   Chairman Omar Martinez welcomed the group and received confirmation that a quorum was present. The meeting started at 1:34.

2. Public Comments
   Chairman Martinez asked if there were any public comments from the public. There were none.

3. Local Flood Projects
   Chairman Martinez announced three items. The first was a grant/loan of 10 million dollars that was awarded to the City of Socorro by the Texas Water Development Board through the Flood Infrastructure Fund program. City Development Director, Alejandra Valadez, explained the funding will go to address the Sparks/Arroyo storm drainage project, as well as for channel improvements, and a basin for the onion field area.

   Chairman Martinez also announced that Hudspeth County received approval from Congressman Tony Gonzales through his appropriations request for FY 23. For Hudspeth County, the funding would be used to establish a county floodplain management program to address the flood risks associated with rapid urbanization, provide detailed engineering planning and construction funds for addressing current flood risks identified in a 2019 Colonia Area Plan. He thanked AECOM for all of their assistance for Hudspeth County's request.

   Also, through Congresswoman Escobar's office, through their appropriations request, EPCWID#1's project was selected to concrete line 1 mile of the Franklin Canal.

   Finally, Chairman Martinez mentioned that through the Far West Texas Water Planning Group and Flood Planning Group, these groups are assisting smaller communities to apply for funding. He mentioned many of these communities are limited in their building capacity. Dave Hall asked Reem Zoun, Flood Planning Director, to consider additional funding for communities to tap into technical assistance from other organizations who can assist in preparing applications.

4. Review and approve the minutes for the meeting held on April 21, 2022.
   Dave Hall made a motion to accept the Minutes from the Upper Rio Grande Flood Planning Group meeting held on April 21, 2022. Gisela Dagnino seconded the motion. Chairman Martinez called for a vote and the motion was approved.

5. Discussion and potential action regarding administrative expenses to be submitted to the Texas Water Development Board for reimbursement
   Gisela Dagnino made a motion to accept the administrative expenses of $231,824.42, from AECOM for the period of January 1, 2022 through March 4, 2022, to the Texas Water

Development Board. Dr. Zhuping Sheng seconded the motion. Chairman Martinez called for a vote and the motion was approved.

6. Updates from Richard Bagans, Texas Water Development Board (TWDB)
   Richard reminded the group that TWDB has submitted their second set of informal comments for the Tech Memo, to the regions. He stated the comments are merely suggestions on how to the regions can make the plans better. He also said that on May 24, TWDB held a Technical Consultants Call. During their discussions, it was suggested the group meet one more time in late June to discuss any pending final items prior to submitting the draft plan. Richard also said there would also be a Chair's Call on May 26, where the regions will be discussing what is occurring in their groups. He reminded everyone, the Chairs Call is held quarterly.

   He also informed the group that TWDB has executed the contract amendment with RGCOG for the $666,400, to pay for the additional tasks. He said depending on what the group decides, TWDB will assist RGCOG in submitting a budget memo to identify the revised amounts dedicated to the additional tasks.

   Finally, he reminded the group, when scheduling upcoming planning group meetings, the group must have a public meeting where public comments will be accepted on the draft plan. The notice requirement for this meeting is 30 days prior and public comments must be accepted up to 30 days after it is presented. The plan must be located in three physical locations. The group can vote to submit the draft plan before August 1st, 2022. However, it is suggested the public comment meeting should happen either in August or September to allow for any of these comments to be incorporated into the final Plan. These next two months will be the most content-heavy months where the Technical Consultant will be releasing the Chapters for the group to review.

   Chairman Martinez asked TWDB is already looking at starting up the flood planning process. Richard said it will start up quickly after the State Plan is approved.

7. Presentation from American Flood Coalition
   Liz Cassin, Senior Outreach Associate, started the presentation. She thanked the flood planning group for allowing the American Flood Coalition (AFC) to present. She then turned over the presentation to Chase Kronzer, Texas Director for the American Flood Coalition. Mr. Krozner informed the group that the AFC is a 501 (C) 3 nonprofit organization and nonpartisan coalition advancing solutions to flooding and sea level rises. The organization has over 280 members nationwide. They are active in 21 states, including Texas. He mentioned the AFC has identified four pillars for coastal and inland solutions. These solutions include the economy, communities, rebuilding, and the military. Mr. Krozner also said that AFC's offers its members education guides, tools for effective communication, networks of leaders on flooding, competitive local resilience pilots, and offers a platform for advocacy and education. Most importantly, he mentioned on the AFC's website is the flood funding finder. This tool breaks down federal grant and technical assistance programs best suited for flooding and se

level rise initiatives. He encouraged everyone to review their information and be prepared to apply for funding that is going to be made available through the infrastructure bill. Finally, he informed the group that any city, county or water district can join the AFC and become a member at no cost. Chairman Martinez inquired if the flood planning group can become a member and Mr. Krozner said he would investigate if that is possible.

8. Request to re-allocate funds within Tasks 11 and 12 for AECOM
   Dave Hall made a motion to allow RGCOG to reallocate funds from Task 12 to 11. The revised amounts will be $292,996 for Task 11 and $176,596, for Task 12. Gisela Dagnino seconded the motion. Chairman Martinez called for a vote and the motion was approved.

9. The AECOM team provided the general RFP Updates to the group.

10. Discussion and action to vote on Task 8 – Administrative, Regulatory, and Legislative Recommendations
    Gisela Dagnino made a motion to allow subcommittee 4 to meet on June 16, 2022, for Task 8. Levi Bryand seconded the motion. Chairman Martinez called for a vote and the motion was approved.

11. Discussion and action to vote on Potential Changes to FMEs, FMSs, and FMPs
    Dave Hall made a motion to approve the changes presented to FMEs, FMSs, and FMPs. Dr. Zhuping Sheng seconded the motion. Chairman Martinez called for a vote and the motion was approved.

12. Discussion and action to vote on Task 5 – Recommendation of FMEs and FMSs and Associated FMPs
    Jeff Bennett made a motion to take action on Task 5. Levi Bryand seconded the motion. Chairman Martinez called for a vote and the motion was approved.

13. Discussion and action to vote for the adoption of Revision 2 of the overarching flood mitigation and floodplain management goals for Region 14 Regional Flood Plan per §361.36
    Dr. Zhuping Sheng made a motion to approve the adoption of Revision 2 of the overarching flood mitigation and floodplain management goals for Region 14 Regional Flood Plan per §361.36. Jeff Bennett seconded the motion. Chairman Martinez called for a vote and the motion was approved.

14. Next Potential General RFPG Meeting Date
    Annette Gutierrez stated she would send out a poll to determine what is the most optimal date for the next flood planning meeting between July 19-21. Dave Hall asked for Annette to query the group about meeting sometime between June 20-22 to discuss Chapters 1, 2, and 3, and look at July 13-14, for Chapters 5,6,7,8, and 9.

15. Adjourn

Dave Hall made a motion to adjourn. Jeff Bennett seconded the motion. Chairman Martinez called for a vote and the motion was approved. The meeting adjourned at 4:07 pm.

9/15/22

Date

Javier Acosta, Secretary

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING MINUTES
Thursday, June 30, 2022
9:00 AM (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	X
Zhuping Sheng	*Agricultural interests*	✓
Sal Alonzo for Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	X
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small business*	X
Marvin Gomez for Gisela Dagnino	*Water utilities*	✓
Vacant	*Flood districts*	
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	X

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Elijah Casas	General Land Office/Region 14 Liaison	X
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Dr. Apora Borah	International Boundary Water Commission	✓
Judy Lucio	Texas Division of Emergency Management	✓
Lauren Mayes	Texas Department of Agriculture	X
Judy Albus for Ben Wilde	Texas State Soil and Water Conservation Board	X

Others Present:

Annette Gutierrez, RGCOG	Alejandra Marco, AECOM
James Bronikowski, TWDB	Alderman David Cantu, City of San Elizario
Gilbert Andujo, AECOM	Lisa McCracken
Alejandra Marco, AECOM	
Patricia Garcia-Barracuda PR	

1. Welcome and call to order
   Dave Hall served as Chair for Chairman Omar Martinez. He welcomed the group and received confirmation that a quorum was present. The meeting started at 10:00 AM MDT.

2. Public Comments
   Mr. Hall asked if there were any public comments from the public. There were none.

3. Review of Chapters 1 and 2
   The group reviewed Chapters 1 and 2. The group did not take any action on the chapters.

4. Adjourn
   Dr. Zhuping Sheng made a motion to adjourn. Sal Masoud seconded the motion. Mr. Hall called for a vote and the motion was approved. The meeting adjourned at 10:47 a.m.

9/15/22
Date

Javier Acosta, Secretary

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING MINUTES

Wednesday, July 13, 2022
9:30 AM (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water Districts*	X
Zhuping Sheng	*Agricultural Interests*	✓
Gilberto Saldaña Jr.	*Counties*	X
Jeff Bennett	*Environmental Interests*	✓
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small Business*	X
Gisela Dagnino	*Water Utlities*	X
Vacant	*Flood Districts*	
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River Authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Elijah Casas	General Land Office/Region 14 Liaison	X
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Dr. Apurba Borah	International Boundary Water Commission	✓
Judy Lucio	Texas Division of Emergency Management	✓
JD Lawrence	Texas Department of Agriculture	✓
Judy Albus for Ben Wilde	Texas State Soil and Water Conservation Board	✓

Others Present:

Annette Gutierrez, RGCOG	Jeff Irvin, AECOM
James Bronikowski, TWDB	Alderman David Cantu, City of San Elizario
Reem Zoun, TWDB	Joanna McKenzie, Hudspeth County

1. Welcome and call to order
   Dave Hall served as Chair for Chairman Omar Martinez. He welcomed the group and received confirmation that a quorum was present. The meeting started at 9:30 AM MDT.

2. Public Comments
   Mr. Hall asked if there were any public comments from the public. There were none.

3. Review of Chapters 3, partial of 4, and 7.
   The group reviewed Chapters 1, 3, partial of 4, and 7. The group did not review Chapter 8. The group did not take any action on the chapters.

4. Adjourn
   Jeff Bennett made a motion to adjourn. Dr. Zhuping Sheng seconded the motion. Mr. Hall called for a vote and the motion was approved. The meeting adjourned at 11:37 a.m.

9/15/22
Date

Javier Acosta, Secretary

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING MINUTES
Wednesday, July 20, 2022
9:00 AM (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water Districts*	✓
Zhuping Sheng	*Agricultural Interests*	✓
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental Interests*	✓
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small Business*	X
Gisela Dagnino	*Water Utlities*	✓
Vacant	*Flood Districts*	
Levi Bryand	*Water Utilities*	X
Rick Tate	*River Authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	
Elijah Casas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	
Vanessa Rosales-Herrera	Region 15 Liaison	
Dr. Apurba Borah	International Boundary Water Commission	✓
Judy Lucio	Texas Division of Emergency Management	✓
JD Lawrence	Texas Department of Agriculture	✓
Judy Albus for Ben Wilde	Texas State Soil and Water Conservation Board	✓

Others Present:	
Joanna McKenzie	
Ramon Macias	
Alejandra Marco	

1. Welcome and call to order
   Chairman Omar Martinez received confirmation that a quorum was present. The meeting started at 9:04 AM MDT.

2. Public Comments
   Chairman Martinez asked if there were any public comments from the public. There were none.

3. Review and approve the minutes for the meeting held on May 25, 2022, June 30, 202, and July 13, 2022.
   Dr. Zhuping Sheng made a motion to approve the Minutes with the changes noted by Dave Hall for May 25, 2022. Gisela Dagnino seconded the motion. Chairman Martinez called for a vote and the motion was approved.

4. Discussion and potential action regarding administrative expenses to be submitted to the Texas Water Development Board for reimbursement The Administrative Expenses were tabled because no expenses were presented.

5. Updates were providedfrom Richard Bagans, Texas Water Development Board.

6. General RFP Updates provided were provided by AECOM.

7. Review of Chapters 9 and 10.
   The group reviewed Chapters 9 and 10. The group did not take any action on the chapters.

8. Discussion and action to vote on RFPG Recommendations for FMEs, FMSs, and FMPs
   Dr. Zhuping Sheng made a motion to accept the RFPG recommendations for FMEs, FMSs, and FMPs. The motion was seconded by Dave Hall. Chairman Martinez called for a vote and the motion was approved.

9. Discussion and action to vote on RFPG Chapter 8 Administrative, Regulatory, and Legislative Recommendations from Subcommittee 4. No action was taken.

10. Discussion and action to vote for approval of Draft RFP Deliverables as presented by AECOM with authorization of Consultant/Political Subdivision to make non-substantial edits and submit the Draft RFP Deliverables to TWDB
    Dr. Zhuping Sheng made a motion to approve the draft RFP deliverables as presented by AECOM with authorization of Consultant/Political Subdivision to make non-substantial edits and submit the Draft RFP Deliverables to TWDB. The motion was seconded by Dave Hall. Chairman Martinez called for a vote and the motion was approved.

    Dave Hall made a motion to void the motion and adopt the new motion as presented made a motion to approve the draft RFP deliverables as presented by AECOM with authorization of Consultant/Political Subdivision to submit the Draft RFP Deliverables to TWDB including all chapters and digital geodatabases. This assumes there are no significant comments the RFPG will make, which they may request for chapters yet to be submitted. Dr. Zhuping Sheng seconded the motion. Chairman Martinez called for a vote and the motion was approved.

11. Next Potential General RFPG Meeting Date
    No action was taken on this agenda item.

12. Adjourn
    Jeff Bennett made a motion to adjourn. Levi Bryand seconded the motion. Mr. Hall called for a vote and the motion was approved. The meeting adjourned at 9:30 a.m.

9/19/22
Date

Javier Acosta, Secretary

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING MINUTES
Tuesday, July 26, 2022
9:00 AM (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water Districts*	✓
Zhuping Sheng	*Agricultural Interests*	✓
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental Interests*	X
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small Business*	X
Gisela Dagnino	*Water Utlities*	X
Vacant	*Flood Districts*	
Levi Bryand	*Water Utilities*	X
Rick Tate	*River Authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	
Elijah Casas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	
Vanessa Rosales-Herrera	Region 15 Liaison	
Dr. Apurba Borah	International Boundary Water Commission	✓
Judy Lucio	Texas Division of Emergency Management	✓
JD Lawrence	Texas Department of Agriculture	✓
Judy Albus for Ben Wilde	Texas State Soil and Water Conservation Board	✓

Others Present:	
Dr. Al Blair	Jeff Irwin, AECOM
Alderman David Cantu	Bryan Blaidsdell, AECOM
Gilbert Andujo, AECOM	Chris Wright, AECOM

1. Welcome and call to order
   Chairman Omar Martinez received confirmation that a quorum was present. The meeting started at 9:01 AM MDT.

2. Public Comments
   Chairman Martinez asked if there were any public comments from the public. There were none.

3. Review and approve the minutes for the meeting held on July 20, 2022.
   The Minutes will be tabled and presented at the next meeting.

4. Discussion and potential action regarding administrative expenses to be submitted to the Texas Water Development Board for reimbursement
   The Administrative Expenses were tabled because no expenses were presented in the backup materials.

5. Review of remaining RFP chapters (Chapters 4, 5, 6, and Executive Summary)
   The group reviewed Chapter 4. The group did not review Chapters 5, 6, or the Executive Summary. The group did not take any action on the chapters.

6. Adjourn
   Dr. Sheng Zhuping made a motion to adjourn. Gilbert Saldaña seconded the motion. Mr. Hall called for a vote and the motion was approved. The meeting adjourned at 9:30 a.m.

9/19/22
Date

Javier A. Acosta
Javier Acosta, Secretary

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING MINUTES

Thursday, July 28, 2022
9:00 AM (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (✓)
Omar L. Martinez, Chair	*Water Districts*	✓
Zhuping Sheng	*Agricultural Interests*	✓
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental Interests*	X
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	X
Rene Rodriguez	*Small Business*	✓
Gisela Dagnino	*Water Utlities*	X
Vacant	*Flood Districts*	
Levi Bryand	*Water Utilities*	X
Rick Tate	*River Authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	
Elijah Casas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	
Vanessa Rosales-Herrera	Region 15 Liaison	
Dr. Apurba Borah	International Boundary Water Commission	✓
Judy Lucio	Texas Division of Emergency Management	✓
JD Lawrence	Texas Department of Agriculture	✓
Judy Albus for Ben Wilde	Texas State Soil and Water Conservation Board	✓

Others Present:	
	Jeff Irvin
Maria Jayni Saenz	Bryan Blaisdell
Gilbert Anaya	Gilbert Anaya, TWDB
Reem Zoun	

1. Welcome and call to order
   Chairman Omar Martinez received confirmation that a quorum was present. The meeting started at 9:19 AM MDT.

2. Public Comments
   Chairman Martinez asked if there were any public comments from the public. There were none.

3. Review and approve the minutes for the meeting held July 26, 2022.
   The Minutes will be tabled and will be presented at the next meeting.

4. Update from TWDB, Richard Bagans
   Last major push by the consultants and group before submitting the draft plan, that is due August 1st. He reminded the group to post the public meeting and has a requirement for thirty days prior and thirty days after to receive comments. He also reminded the group that at their next meeting they can have Task 12 on the agenda to discuss potential FMEs.

5. Review of remaining RFP chapters
   Jeff Irvin, AECOM, discussed the outcome of the subcommittee 4 meeting.

6. Discussion and action to vote on RFPG Chapter 8 Administrative, Regulatory, and Legislative Recommendations from Subcommittee 4
   Gilbert Saldaña made a motion Rene Rodriguez seconded the motion. Chairman Martinez called for a vote and the motion passed unanimously.

7. Next Potential General RFPG Meeting Date
   The group discussed having the public meeting the week of September 12th to determine the best day the group is available.

8. Adjourn
   Rene Rodriguez made a motion to adjourn. Sal Massoud seconded the motion. Chairman Martinez called for a vote and the motion was approved. The meeting adjourned at 9:52 a.m.

9/19/22

Date

Javier Acosta, Secretary

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING MINUTES
Wednesday, September 14, 2022
1:00 PM (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (✓)
Omar L. Martinez, Chair	*Water Districts*	✓
Zhuping Sheng	*Agricultural Interests*	
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental Interests*	✓
Sal Masoud	*Industries*	
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small Business*	
Gisela Dagnino	*Water Utilities*	✓
Vacant	*Flood Districts*	
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River Authorities*	
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	
Elijah Casas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	
Anita Keese	Texas Commission on Environmental Quality	
Vanessa Rosales-Herrera	Region 15 Liaison	
Dr. Apurba Borah	International Boundary Water Commission	
Judy Lucio	Texas Division of Emergency Management	✓
JD Lawrence	Texas Department of Agriculture	
Judy Albus for Ben Wilde	Texas State Soil and Water Conservation Board	✓

Others Present:	
Annette Gutierrez, RGCOG	Jeff Irvin
Patricia Garcia	Bryan Blaisdell
Gilbert Andujo	Chris Wright

1. Welcome and call to order
   Chairman Omar Martinez received confirmation that a quorum was present. The meeting started at 1:06 pm MDT.

2. Public Comments
   Chairman Martinez asked if there were any public comments from the public. There were none.

3. Review and approve the minutes for the meeting held July 20, 26, 28, 2022.
   The Minutes will be tabled and will be presented at the next meeting. Dave Hall made a motion to approve all of the Minutes. Jeff Bennett seconded the motion. Chairman Martinez called for a vote and the motion was approved.

4. Discussion and potential action regarding administrative expenses to be submitted to the Texas Water Development Board for reimbursement
   No action was taken on this item.

5. Update from TWDB, Richard Bagans
   Richard provided reminders of what is happening at the TWDB currently. He said all plans are at the TWDB right now for review. He stated they will provide level 1 comments, which are remarks that require the contractor to revise and level 2, which are suggestions to the contractor. The comments will be provided at the end of October. He also informed the group that TWDB has received received the contract amendment between RGCOG and AECOM and is under TWDB review right now. He also reminded the group to look out for their newsletters to keep up to date on what is happening.

   Dave Hall asked Richard Bagans if level 1 comments are submitted as soon as they are recognized to the contractors or are they being submitted at the end of October. Richard said they anticipate submitting their comments that are level 1 in the next few weeks and all other comments by the end of October.

6. General RFP Updates
   AECOM provided general updates to the group.

7. Review of RFPG-approved transfer of RFP Contract Amendment funding from Task 12 to Task 11 for additional data collection (in support of Tasks 1-9) based on previous discussions to include highest priority FMPs in the August 2021 Draft RFP.
   AECOM provided recap of how the additional $666,400 has been reallocated per task.

8. Discussion and possible action to approve Task 12: Perform Identified FMEs, Evaluate and Recommend Additional FMPs and vote to select which FMEs to perform. Dave Hall made a motion to accept the recommendations from AECOM as presented (see slide 26) and Levi Bryand seconded the motion. Chairman Martinez called for a vote and the motion passed unanimously.

9. Next Potential General RFPG Meeting Date
   AECOM suggested the group may be able to meet in early November (October 31st – November 4th) for the next general meeting and December 5-9 to adopt the Regional Flood Plan. Annette will send out poll.

10. Adjourn

Gisela Dagnino made a motion to adjourn. Dave Hall seconded the motion. Chairman Martinez called for a vote and the motion was approved. The meeting adjourned at 2:20 pm.

12/9/22
Date

Javier A. Acosta
Javier Acosta, Secretary

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
PUBLIC MEETING MINUTES

Tuesday, November 15, 2022
9:00 AM (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (✓)
Omar L. Martinez, Chair	*Water Districts*	✓
Zhuping Sheng	*Agricultural Interests*	✓
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental Interests*	X
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small Business*	X
Marvin Gomez for Gisela Dagnino	*Water Utilities*	✓
Vacant	*Flood Districts*	
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River Authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Elijah Casas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	X
Vanessa Rosales-Herrera	Region 15 Liaison	X
Dr. Apurba Borah	International Boundary Water Commission	✓
Juan Alaniz	Texas Division of Emergency Management	✓
JD Lawrence	Texas Department of Agriculture	✓
Judy Albus	Texas State Soil and Water Conservation Board	✓

Others Present:	
Annette Gutierrez, RGCOG	Chris Wright, AECOM
David Cantu, City of San Elizario	Lisa McCracken
Alejandra Marco, AECOM	Jeff Irvin, AECOM
John Gwynne	Joanna McKenzie, Hudspeth County
Clinton Kimball, AECOM	

1. Welcome and call to order
   Dave Hall served as Chairman for the meeting on behalf of Omar Martinez. He received confirmation that a quorum was present. The meeting started at 9:04 MST.

2. Public Comments
   Dave Hall asked if there were any public comments from the public. There were none.

3. Review and approve the minutes for the meeting held September 14, 2022.
   Dr. Sheng made a motion to approve the Minutes. Levi Bryand seconded the motion. Dave Hall called for a vote and the motion was approved.

4. Discussion and potential action regarding administrative expenses to be submitted to the Texas Water Development Board for reimbursement
   Sal Massoud made a motion to approve the administrative expenses as presented, to the Texas Water Development Board. Gilbert Saldaña seconded the motion. Dave Hall called for a vote and the motion was approved.

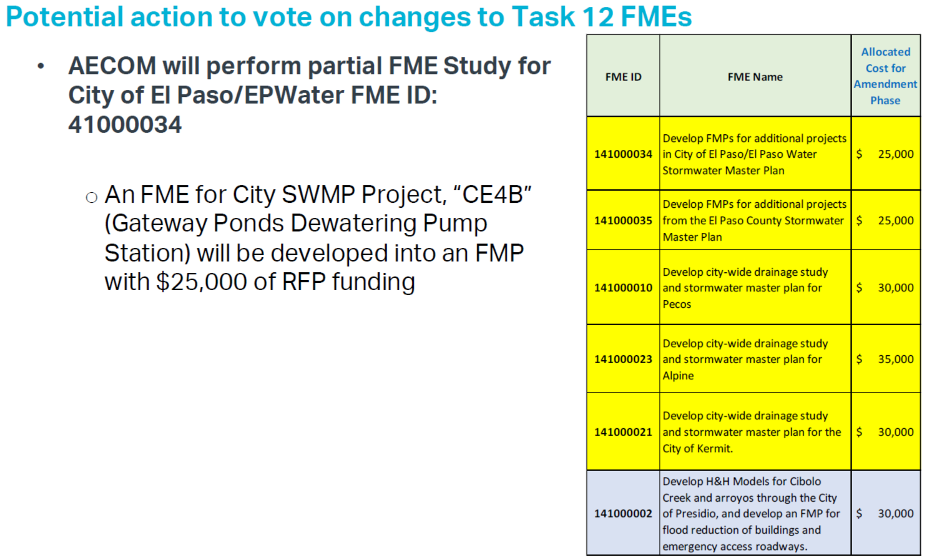
5. Update from TWDB, Richard Bagans
   Richard Bagans updated the group on TWDB activities.

6. General RFP Updates
   The AECOM Team provided updates to the group on RFPG activities.

7. Discussion of TWDB and public comments on Draft RFP
   AECOM presented all of the comments received by RGCOG on the Draft Plan.

8. Discussion of coordination with cities for Task 12 (performing FMEs for Amended RFP)
   AECOM informed the group of what cities were identified for Task 12.

9. Potential action to vote for approval of changes to Task 12 FMEs to be performed (pending discussion)
   Dr. Sheng made a motion to approve the changes to Task 12 FMEs to be performed as presented. Levi Bryand seconded the motion. Dave Hall called for a vote and the motion was approved. The changes are as follows:



Potential action to vote on changes to Task 12 FMEs

- **AECOM will perform partial FME Study for City of El Paso/EPWater FME ID: 41000034**
  - An FME for City SWMP Project, "CE4B" (Gateway Ponds Dewatering Pump Station) will be developed into an FMP with $25,000 of RFP funding

FME ID	FME Name	Allocated Cost for Amendment Phase
141000034	Develop FMPs for additional projects in City of El Paso/El Paso Water Stormwater Master Plan	$ 25,000
141000035	Develop FMPs for additional projects from the El Paso County Stormwater Master Plan	$ 25,000
141000010	Develop city-wide drainage study and stormwater master plan for Pecos	$ 30,000
141000023	Develop city-wide drainage study and stormwater master plan for Alpine	$ 35,000
141000021	Develop city-wide drainage study and stormwater master plan for the City of Kermit.	$ 30,000
141000002	Develop H&H Models for Cibolo Creek and arroyos through the City of Presidio, and develop an FMP for flood reduction of buildings and emergency access roadways.	$ 30,000

10. Next potential General RFPG meeting date

    The group decided to meet at the first part of December and then once again prior to submission

11. Adjourn

    Levi Bryand made a motion to adjourn. Sal Massoud seconded the motion. Dave Hall called for a vote and the motion was approved. The meeting adjourned at 10:04 am.

If you wish to provide written comments prior to or after the meeting, please email your comments to annetteg@riocog.org and include “Region 14 Upper Rio Grande Flood Planning Group Meeting” in the subject line of the email.

ADDITIONAL INFORMATION
For Additional information or to be notified of future Planning Group meetings, please contact: Region 14 Planning Group Sponsor, at: 915-533-4688, Annette Gutierrez, annetteg@riocog.org, or Rio Grande Council of Governments: Upper Rio Grande Regional Flood Planning Group Sponsor, 8037 Lockheed, Suite 100, El Paso, Texas, 79925.

12/9/22
Date

Javier A. Acosta
Javier Acosta, Secretary

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
GENERAL MEETING MINUTES
Tuesday, December 6, 2022
9:00 AM (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (✓)
Omar L. Martinez, Chair	*Water Districts*	✓
Zhuping Sheng	*Agricultural Interests*	X
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental Interests*	✓
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small Business*	X
Gisela Dagnino	*Water Utilities*	✓
Vacant	*Flood Districts*	
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River Authorities*	X
Carlos Velarde	*Public*	

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Elijah Casas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	✓
Vanessa Rosales-Herrera	Region 15 Liaison	X
Dr. Apurba Borah	International Boundary Water Commission	✓
Juan Alaniz	Texas Division of Emergency Management	X
JD Lawrence	Texas Department of Agriculture	✓
Judy Albus	Texas State Soil and Water Conservation Board	

Others Present:	
Annette Gutierrez, RGCOG	Chris Wright, AECOM
David Cantu, City of San Elizario	Jeff Irvin, AECOM
Alejandra Marco, AECOM	Joanna McKenzie, Hudspeth County
Bryan Blaidell	Marvin Gomez

1. Welcome and call to order
   Dave Hall served as Chairman for the meeting on behalf of Omar Martinez. He received confirmation that a quorum was present. The meeting started at 9:05 MST.

2. Public Comments
   Dave Hall asked if there were any public comments from the public. There were none.

3. Review and approve the minutes of the meeting held on November 15, 2022.
   Omar Martinez made a motion to approve the Minutes. Gilbert Saldaña seconded the motion. Dave Hall called for a vote and the motion was approved.

4. Update from TWDB, Richard Bagans
   Richard Bagans updated the group on TWDB activities. He provided confirmation that TWDB will only require two hard copies of the Plan and that Consultants must submit the final Plan by January 10. He also reminded the group that for the December 15th meeting, materials must be posted seven days prior to the meeting. He also said that payment requests submitted by RGCOG has been approved by TWDB staff and all that is left is for the Accounting staff to release the funds. In terms of rolling over excess funds from the current budget, an email will be sent out explaining how to proceed with that moving those funds.

5. General RFP Updates
   The AECOM Team provided updates to the group on RFPG activities.

6. Review of TWDB and public comments on Draft RFP AECOM

7. Discussion of coordination with stakeholders for Task 12 (performing FMEs for Amended RFP)
   No action was taken on this item.

8. Potential action to vote for approval of changes to Task 12 FMEs to be performed
   Gilbert Saldaña made a motion to select El Paso County project VIN1 as modified in this meeting as the project from FME 141000035 to be studied and defined as an FMP per TWDB guidance. Levi Bryand seconded the motion. Dave Hall called for a vote and the motion was approved.

9. Potential action to vote for approval of responses to TWDB and public comments
   Jeff Bennett made a motion to approve the responses to TWDB and public comments with changes discussed during the meeting. Gisela Dagnino seconded the motion. Dave Hall called for a vote and the motion was approved.

10. Next potential General RFPG meeting date
    RGCOG will inform the group of when the next meeting will be after the December 15th meeting.

11. Adjourn

    Levi Bryand made a motion to adjourn. Gilbert Saldaña seconded the motion. Dave Hall called for a vote and the motion was approved. The meeting adjourned at 10:33 am.

Note - Final RFP submited prior to RFPG approval of 12/6/2022 meeting minutes

____
Date

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Javier Acosta, Secretary

REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
PUBLIC MEETING MINUTES

Thursday, December 15, 2022
9:00 AM (MDT)
8037 Lockheed, Suite 100 TX 79925

Voting Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (✓)
Omar L. Martinez, Chair	*Water Districts*	✓
Zhuping Sheng	*Agricultural Interests*	✓
Gilberto Saldaña Jr.	*Counties*	✓
Jeff Bennett	*Environmental Interests*	X
Sal Masoud	*Industries*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Rene Rodriguez	*Small Business*	X
Marvin Gomez for Gisela Dagnino	*Water Utilities*	✓
Vacant	*Flood Districts*	
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River Authorities*	X
Carlos Velarde	*Public*	✓

Non-voting Member	Agency	Present(x)/Absent( )/ Alternate Present (*)
James Weaver	Texas Parks and Wildlife Department	X
Elijah Casas	General Land Office/Region 14 Liaison	✓
Richard Bagans	Texas Water Development Board	✓
Anita Keese	Texas Commission on Environmental Quality	X
Vanessa Rosales-Herrera	Region 15 Liaison	X
Dr. Apurba Borah	International Boundary Water Commission	✓
Juan Alaniz	Texas Division of Emergency Management	✓
JD Lawrence	Texas Department of Agriculture	✓
Judy Albus	Texas State Soil and Water Conservation Board	✓

Others Present:	
Annette Gutierrez, RGCOG	Chris Wright, AECOM
David Cantu, City of San Elizario	Lisa McCracken
Alejandra Marco, AECOM	Jeff Irvin, AECOM
John Gwynne	Joanna McKenzie, Hudspeth County
Clinton Kimball, AECOM	

1. Welcome and call to order
   Dave Hall served as Chairman for the meeting on behalf of Omar Martinez. He received confirmation that a quorum was present. The meeting started at 9:04 MST.

2. Public Comments
   Dave Hall asked if there were any public comments from the public. There were none.

3. Review and approve the minutes of the meeting held on December 6, 2022.
   The Minutes were not presented. Jeff Bennett made a motion to table. Omar Martinez seconded the motion. Dave Hall called for a vote and the motion was approved.

4. Update from TWDB, Richard Bagans
   Richard Bagans updated the group on TWDB activities. Mr. Bagans congratulated the group on their impending approval and submittal of the plan. Two hard copies will be due by January 10th to the TWDB. Newsletters will be going out soon explaining how to continue on with the existing tasks. He noted there is one pending payment to be reviewed by TWDB that has been submitted by RGCOG. He also mentioned there is an upcoming Water For Texas Conference. The date is January 23rd-January 25, 2023.

5. Discussion and action to vote for approval of Final RFP Deliverables as presented by AECOM with authorization of Consultant/Political Subdivision to make edits finalizing responses to Draft RFP comments submitted by TWDB and the Public and to submit the Final RFP Deliverables to TWDB
   Omar Martinez made a motion to adopt the final RFP deliverables as presented by AECOM with authorization of Consultant/Political Subdivision to make non-substantial edits finalizing responses to Draft RFP comments and submit the Final RFP Deliverables to TWDB. Levi Bryand seconded the motion. Dave Hall called for a vote and the motion was approved.

6. Next potential General RFPG meeting date

   The group decided RGCOG will communicate with AECOM to present potential dates for the next meeting.

7. Adjourn

   Levi Bryand made a motion to adjourn. Sal Massoud seconded the motion. Dave Hall called for a vote and the motion was approved. The meeting adjourned at 10:31 am.

Note - Final RFP submitted prior to RFPG approval of 12/15/22 meeting minutes

Date

Javier Acosta, Secretary

Appendix 10A.2
Subcommittee 1 Meeting Minutes

(Evaluation and Recommendations on Floodplain Management Practices/Flood Mitigation and Floodplain Management Goals, Task 3)

AGENDA
REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
SUBCOMMITTEE 1
MEETING MINUTES

Thursday, September 30, 2021
10:00 A.M. (MDT)
13247 Alameda Ave., Clint, TX 79836

Subcommittee 1 – Tasks 3A/3B – Evaluation and Recommendations on Floodplain Management Practices/Flood Mitigation and Floodplain Management Goals

1) Introductions of Subcommittee Members and Interests

   Javier Acosta-Professional Engineer-Frank Spencer and Associates in El Paso, Texas, Gilbert Saldana-Senior Civil Engineer for El Paso County, Dave Hall, Carlos Velarde-Civil Engineer for Val Verde County, Levi Bryand-Civil Engineer with LCA in Odessa Texas

Also present were AECOM-Jeff Irvin, Lily Cartwright, Chris Wright, Gilbert Andujo, Bryan Blaisdell, and Tatum Lau

2) Objective of Subcommittee

Bryan Blaisdell lead the discussion. He covered this agenda item. He mentioned the subcommittee will be discussing Tasks 3A/3B – Evaluation and Recommendations on Floodplain Management Practices/Flood Mitigation and Floodplain Management Goals.

3) AECOM provided a presentation of the technical issues.

   Bryan Blaisdell presented the following items:

   a) Review Regional Floodplain Management and Land Use Practices (Task 3A)
      i) NFIP Requirements
      ii) TFMA Higher Standards
      iii) Subdivision Regulations/Model Subdivision Rules
      iv) Future Development Conditions
      v) **Subcommittee Recommendations to RFPG**: RFPG Path to Adoption of Region-Specific, Minimum Floodplain Management or Land Use Standards (optional)

   b) Review Flood Mitigation and Floodplain Management Goals (Task 3B)
      i) Example short-term/long-term goals
      ii) Discussion of region-specific goals
      iii) **Subcommittee Recommendations to RFPG:** RFPG Path to Adoption of Flood Mitigation and Floodplain Management Goals

4) Confirm chair of subcommittee
Gilbert Saldana made a motion to have Dave Hall serve as the Chair for Subcommittee 1. Javier Acosta seconded the motion. Chairman Martinez called the vote and the motion was approved.

5) Tentative future meeting dates for subcommittee
Bryan Blaisdell suggested the subcommittee meet every three to four weeks. The subcommittee agreed they would meet again on October 21st at 10:00 am. Omar Martinez made a motion to adjourn and Javier Acosta seconded. Chairman Martinez called the vote and the motion was approved.

10/21/2021

Date

Subcommittee 1 Chairman, Dave Hall

Meeting Minutes
Region 14 Subcommittee 1 Meeting
Thursday, October 21, 2021

Subcommittee Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	X
Oscar D. "Jay" Ornelas	*Agricultural interests*	✓
Gilberto Saldana Jr.	*Counties*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Gisela Dagnino	*Water utilities*	✓
Levi Bryand	*Water Utilities*	✓
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	✓

Others Present:	
Annette Gutierrez, RGCOG	Chris Wright, AECOM
Richard Bagans, TWDB	Jeff Irvin - AECOM, PIC
Gilbert Andujo, AECOM	Lily Cartwright-AECOM
Bryan Blaisdell, AECOM	Tatum Lau-AECOM

1) Subcommittee 1 Chairman Dave Hall welcomed the group.

2) Approval of Minutes from September 30, 2021. Omar Martinez made a motion and Levi seconded. Subcommittee 1 Chairman Hall called for a vote and the motion was approved.

3) Bryan Blaisdell provided Subcommittee 1 with a roadmap for the group where he highlighted all items that he would discuss. He mentioned the subcommittee could decide on recommendations today for minimum standards and that would give RGCOG enough time to post by October 25 and have the URGFPG vote on November 2nd. He also mentioned the Goals could be recommended by the subcommittee at the next meeting, post the notification by November 15, then have the URGFPG vote on November 30.

4) Bryan next presented on the differences between the URGFPG Minimum Standards vs. Goals. Subcommittee 1 Chairman asked Bryan what will happen to communities that do not meet the standards in terms of future funding. Bryan explained there are a number of flood funding sources that do not require communities to meet the standards. This requirement will only affect those who are interested in submitting projects to the TWDB after adoption of the plan. Bryan also laid out that communities who don't meet the standards today could use that as an incentive to adopt and apply next go around. Chairman Omar Martinez asked if the group adopts the minimum standards and communities who do not meet the minimum but apply to the Flood Infrastructure Fund (FIF), will that preclude them from receiving funding? Bryan stated it was his understanding that it would. Richard Bagans, TWDB, provided more clarification to the question. He said the group can adopt the minimum standards and the communities could then use this information as a resource to them when considering flood ordinances or if you choose to adopt the minimum flood standards, all Flood

Management Projects (FMPs) will have to adopt those standards to be included in the plan. The FIF is a potential future financial vehicle that may fund FMPs from the plan. He could answer how competitive a project would be if submitted without adoption of minimum standards.

Bryan also reminded the group of the pros and cons of adopting and not adopting the minimum standards. Bryan stated AECOM would like to get a recommendation from the subcommittee whether the minimum standards should be adopted or not. AECOM would also like a recommendation from the subcommittee chooses not to recommend minimum standards that they recommend standards that do not tie anything to the projects serve as a way for the group to serve as a resource and state what they would recommend.

5) Bryan next covered a review of the National Flood Insurance Program (NFIP) Requirements/CRS Program. He mentioned about 78% of counties in the region participate in the program. He explained the NFIP could be used as a source for the minimum standards. NFIP is a way for residents to access federal flood insurance. If incorporated communities participate but the County does not, there will not be considered as participating. He mentioned what communities would be impacted if minimum standards were incorporated. He went on to explain more information about the NFIP. Subcommittee 1 Chairman Hall asked how is the SFHA designated? Bryan explained they are approved by FEMA ultimately. He referenced the process El Paso County is going through right now with FEMA is what other communities will experience and how an SFHA will be designated.

6) Bryan next covered the stakeholder survey results. As of last week, one hundred surveys were received. Forty percent of the surveys came from community representatives. The survey asked if the minimum standards should be adopted and 77% of the community representatives. He then covered other items within the survey as presented in the slides that highlighted support of following minimum standards and identified potential flood-related issues of concern. They were:
   i. Insufficient land use standards
   ii. Development within or near flood prone areas
   iii. Increased runoff due to development

7) Bryan next gave an overview of the Subcommittee Survey Results. He highlighted the three top responses to the question of evaluating potential flood-related needs as they pertain to Region 14. The top answers were:
   i. Communities need better defined floodplain or land use standards
   ii. Counties need authority to regulate land use
   iii. Region-wide need for minimum floodplain standards

8) Finally, Bryan laid out discussion topics for the subcommittee that included:
   - URGFPG Minimum Floodplain Management or Land Use Standards – Including Subcommittee Recommendations to RFPG during November 2 RFPG General Meeting

   - URGFPG Flood Mitigation and Floodplain Management Goals (ShortTerm/Long-Term) – Draft goals to be posted on URGFPG website by November 16 and voted on by RFPG during November 30 General Meeting

9) The group agreed to meet on November 4, 2021, at 1:30 pm for its 3rd meeting.

8) Prior to making a motion to adjourn, Chairman Dave Hall asked if anyone from the public had any comment to make. There being none, he asked for a motion to adjourn. Omar Martinez made a motion to adjourn at 11:46 am. Gisela Dagnino seconded the motion. Dave Hall called for a vote and the motion was approved.

11/04/2021

Date

Subcommittee 1 Chairman, Dave Hall

Meeting Minutes
Region 14 Subcommittee 1 Meeting
Thursday, November 4, 2021

Subcommittee Member	**Interest Category**	**Present (✓)/Absent (X) / Alternate Present (*)**
Omar L. Martinez, Chair	*Water districts*	✓
Oscar D. "Jay" Ornelas	*Agricultural interests*	X
Gilberto Saldana Jr.	*Counties*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Gisela Dagnino	*Water utilities*	✓
Levi Bryand	*Water Utilities*	X
Rick Tate	*River authorities*	X
Carlos Velarde	*Public*	✓

Others Present:	
Annette Gutierrez, RGCOG	Chris Wright, AECOM
Richard Bagans, TWDB	Jeff Irvin - AECOM, PIC
Gilbert Andujo, AECOM	Lily Cartwright-AECOM
Bryan Blaisdell, AECOM	Tatum Lau-AECOM

1) Subcommittee 1 Chairman Dave Hall welcomed the group at 1:35.

2) Approval of Minutes from September 30, 2021.
Gisela Dagnino made a motion to approve with the correction of the previous minutes being noted as September 30, 2021. Javier Acosta seconded the motion. Subcommittee 1 Chairman Hall called for a vote and the motion was approved.

3) Bryan Blaisdell provided Subcommittee 1 with an overview of the technical issues the subcommittee discussed at the last meeting, as presented in slide 2. He next provided an updated roadmap highlighting important dates. These dates include:
   - Adopted RFPG minimum standards/goals to be included in Technical Memorandum (due to RFPG on Dec 3rd)
   - Goals + Recommendations for Minimum Standards/Adoption of Minimum Standards
   - Subcommittee 1 recommendation – Nov 4 + Nov 11
   - Public notification – Nov 15
   - RFPG adoption - Nov 30

   Bryan next presented the updated draft of the Short-Term/Long Term Goals. He asked the subcommittee if there was any additional feedback they wanted to give at this time. Bryan next discussed the yellow highlighted items shown on the document. He explained they would be defined by the next subcommittee meeting and they will go to a vote. The focus of today's meeting is to complete the list of goals and next week the subcommittee will define the criteria used to measure those goals. He then covered agenda items 4-8. Prior to participating in a series of polls to verify the preference of goals from the subcommittee, Subcommittee Chairman Hall made some statements about Region 15's Goals. He cross walked their goals against Region 14's. Nearly all of the goals were similar with the exception of the standards. He also said he will be inquiring with the group if they want to make any changes. Bryan next presented the group with the new goals that included Goal 20 to 25. For Each goal, Bryan polled the subcommittee whether they should consider the goal and what the time-frame for the goal should be. Bryan made the changes to the goals as suggested by the subcommittee members.

The group next talked about the potential recommendations for minimum standards/adoption of minimum standards. He asked the subcommittee if the group should require specific minimum standards. When polled, the majority of the subcommittee voted yes. Bryan then explained what the implications are if standards were adopted, the communities who could not meet them, would not be able to submit FMEs, FMPs or FMSs, at least in the first cycle. Gilbert Saldaña then asked if the group could go forward with recommendations only for this first cycle. Bryan said they could. A second poll was conducted and the subcommittee unanimously were in favor of recommendation. When polled the majority of the subcommittee voted the recommendation of selecting NFIP minimum standards and the adoption of higher than NFIP-minimum, standards. Based on Bryan's presentation and comments from the subcommittee, Bryan stated he would put together the updated document.

4) Gisela Dagnino made a motion to adjourn at 2:59 pm. Gilbert Saldana seconded the motion. Subcommittee 1 Dave Hall called for a vote and the motion was approved.

11/11/2021

Date

Subcommittee 1 Chairman, Dave Hall

Appendix 10A.3
Subcommittee 2 Meeting Minutes

(Identification & Evaluation of Potential FMPs, Task 4)

Meeting Minutes
Region 14 URFPG-Subcommittee 2 Meeting
Wednesday, October 13, 2021 at 10:00 am

Subcommittee Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	X
Oscar D. "Jay" Ornelas	*Agricultural interests*	X
Gilberto Saldana Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Gisela Dagnino	*Water utilities*	✓
Levi Bryand	*Water Utilities*	✓
Carlos Velarde	*Public*	✓
Delbert Humberson	International Boundary Water Commission	X
Others Present:		
Annette Gutierrez, RGCOG	Jeff Irvin - AECOM, PIC	
Richard Bagans	Alejandra Marco - AECOM	
Gilbert Andujo, AECOM	Lily Cartwright - AECOM	
Bryan Blaisdell, AECOM	Dr. Apurba Borah, IBWC	
Chris Wright, AECOM		

1. Chris Wright, AECOM, welcomed the members of Subcommittee 2 and asked if any of them had any interests in any specific Flood Mitigation Projects (FMP). Jeff Bennett mentioned he had interest in two FMPs. He reminded everyone of the 2008 flooding in Presidio and Ojinaga, Mexico out of the Rio Conchos. He explained the flooding occurred due to sediment, infilling and loss of conveyance capacity. He said he was interested in an environmental flows program. The second category of strategies would be nature based solutions that lifts the stream functions such as recharge and habit maintenance floodplain connectivity. AECOM asked if Jeff Bennett could provide them with any studies that he may have to assist them. Jeff Irvin also mentioned these concerns should get cross referenced in Subcommittee 3 as well. Jeff Bennett also mentioned the National Park Service has conducted many studies for over fourteen years. He also said he could send Steven Lance’s contact information from the Park Service.

2. Chris Wright provided the objective of the Subcommittee. He stated this committee is for task 4B(c) – Identification and Evaluation of Potential Flood Management Projects, which will cover the following:
    - Representative of entire region
    - Some meetings will focus on just the Rio Grande Main Stem
    - Meeting topics can be identified from agendas
    - Members can introduce any related topics from throughout region

3. Chris Wright next provided a presentation of technical issues. He provided a definition of Flood Mitigation Projects (FMPs) with examples, stakeholder coordination for FMPs in the planning stage, summary of selected planning documents to be used for El Paso County FMPs, and to have a discussion of planned flood projects that potentially have multiple benefits.

4. Christine Westermen from SWCA provided an overview of the Jurisdictional Waters of the U.S. and how it applies to the planning group's projects. She reminded the group as they begin to do the environmental review for flood strategies, they will need to review impacts to jurisdictional waters, primarily waters wetlands. As part of the natural resources review, projects will be evaluated for their potential to affect jurisdictional wetlands/waters that is GIS-based. The projects will also be reviewed to determine potential U.S. Army Corps of Engineers (USACE) permitting requirements. The USACE permitting may be affected by impacts to other sensitive resources (e.g., federal endangered species or significant cultural resources). She also provided an explanation on the 2020 Navigable Waters Protection Rule that significantly reduced waters protections (exception for ephemeral streams), that was remanded in August 2021. She said this rule change was particularly significant in arid environments and affected status of arroyos. In June 2021, there was a proposed Intention to revise the definition of "Waters of the U.S." and is likely to revert to pre-2015 regulations. She said this regulatory environment will continue to evolve over the course of the flood planning cycle.

5. Confirm chair of subcommittee
   Dave Hall made a motion to have Javier Acosta serve as the Chair for Subcommittee 2. Gisela Dagnino seconded the motion. All voted in favor and the motion carried.

6. Tentative future meeting dates for subcommittee
   The subcommittee agreed to meet November 4, 2021, at 10:00 am for the second meeting.

7. Javier Acosta made a motion to adjourn the meeting and Gilbert Saldana seconded. All voted in favor and the motion carried.

11/04/2021
Date

Subcommittee 2 Chairman, Javier Acosta

Meeting Minutes
Region 14 URFPG-Subcommittee 2 Meeting
Wednesday, November 4, 2021 at 10:00 am

Subcommittee Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓
Oscar D. "Jay" Ornelas	*Agricultural interests*	X
Gilberto Saldana Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Gisela Dagnino	*Water utilities*	✓
Levi Bryand	*Water Utilities*	✓
Carlos Velarde	*Public*	X
Delbert Humberson	International Boundary Water Commission	✓
Others Present:		
Annette Gutierrez, RGCOG	Chris Wright, AECOM	
Jeff Irvin - AECOM, PIC	Clint Kimball - AECOM	
Bryan Blaisdell, AECOM	Dr. Apurba Borah, IBWC	

1. Subcommittee Chairman Javier Acosta welcomed the group at 10:05 am.

2. RGCOG- Approval of Minutes from October 13, 2021
Jeff Bennett made a motion to accept the Minutes from October 13, 2021. Gilbert Saldaña seconded the motion. Subcommittee 2 Chairman Acosta called for a vote and the motion was approved.

3. AECOM- Introductions of Subcommittee Members and their interests in any specific FMPs
Chris Wright started the presentation. He asked if anyone from the public could introduce themselves if they hadn't already. Joanna McKenzie, County Administrator for Hudspeth County introduced herself.

4. AECOM- Objective of Subcommittee
Chris Wright, AECOM next outlined what items were going to be covered during the meeting. He then turned the presentation over to Jeff Irvin, AECOM. First, Jeff explained to the subcommittee what the proposed process was through a flowchart highlighting where they could obtain potential projects, what entities do they get them from, determine if there is a negative impact, and determine if the project is feasible.

Dave Hall asked if the project is not fully defined, can the group still submit the projects to Texas Water Development Board (TWDB). Jeff Irvin stated they can still be submitted but they will not be as competitive as other projects that are complete when TWDB is considering who to fund. Jeff Irvin said that one way to address this issue is to state that a Flood Management Evaluation (FME) can be requested. Gilbert Saldaña asked if there was funding for that to occur. AECOM stated there may be opportunities to conduct some with the additional funding that is coming to the region.

Jeff Irvin next talked about the process that was used for the City and County of El Paso. From this discussion, AECOM next posed a set of questions to the subcommittee to consider for selecting potentially feasible projects. Gisela Dagnino asked if there may be a consideration to take into account the heavy burden placed on residents during construction. Jeff mentioned this concern would be covered under the permit complexity with street utilities. The subcommittee agreed to go forward with the three questions presented.

Clint Kimball next provided a recap of the County's Storm water Master Plan. Chris Wright then presented potential projects from USIBWC, EPCWID #1, TXDOT and other parts of the region. Jeff Irvin recapped for the subcommittee what conclusions were made for coming to a process. He requested for the subcommittee to consider voting on the process for projects for the City of El Paso's Master Plan, El Paso County's Master Plan and for other projects as presented by the AECOM team. Omar Martinez made a motion to accept the process for all three categories mentioned. Jeff Bennett seconded the motion. Subcommittee 2 Chairman Acosta called for a vote and the motion was approved.

5. Tentative future meeting dates for subcommittee

Dave Hall asked how many of the city and county projects have already been funded through other sources. Gisela Dagnino and Gilbert Saldaña confirmed there were a few that are funded for this fiscal year. Gisela Dagnino asked for all other projects to be left on the list. Dave Hall asked for them to get together with AECOM to confirm which projects to take off the list. The subcommittee confirmed that a date was already set for the next meeting based on previous polling. The meeting will be on November 15, 2021, at 3:00 pm. Jeff Irvin reminded everyone the bulk of the work has already been completed by the subcommittee in terms of developing the process. However, the subcommittee will still need to figure out what scoring system will be implemented for the other projects.

11. Adjourn

Omar Martinez made a motion to adjourn at 11:48 am. Jeff Bennett seconded the motion. Subcommittee 2 Chairman Acosta called for a vote and the motion was approved.

11/15/2021
Date

Subcommittee 2 Chairman, Javier Acosta

Meeting Minutes
Region 14 URFPG-Subcommittee 2 Meeting
Wednesday, November 15, 2021 at 3:00 pm

Subcommittee Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓
Oscar D. "Jay" Ornelas	*Agricultural interests*	X
Gilberto Saldana Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Gisela Dagnino	*Water utilities*	✓
Levi Bryand	*Water Utilities*	✓
Carlos Velarde	*Public*	X
Delbert Humberson	International Boundary Water Commission	X
Others Present:		
Annette Gutierrez, RGCOG	Chris Wright, AECOM	
Jeff Irvin - AECOM, PIC		
Bryan Blaisdell, AECOM		

1. Subcommittee Chairman Javier Acosta welcomed the group at 3:05 pm.

2. RGCOG- Approval of Minutes from October 13, 2021
Dave Hall made a motion to accept the Minutes from November 4, 2021. Jeff Bennett seconded the motion. Subcommittee 2 Chairman Acosta called for a vote and the motion was approved.

3. AECOM- Introductions of Subcommittee Members and their interests in any specific FMPs
Annette Gutierrez, RGCOG, informed AECOM who was present at the subcommittee meeting.

4. AECOM- Objective of Subcommittee through Agenda Item 10
Chris Wright, AECOM next outlined what items were going to be covered during the meeting. He then turned the presentation over to Jeff Irvin, AECOM. First, Jeff explained to the subcommittee what the proposed process was through a flowchart highlighting where they could obtain potential projects, what entities do they get them from, determine if there is a negative impact, and determine if the project is feasible. Jeff Irvin next covered agenda items five through 10 with his presentation.

For agenda item 10. Omar Martinez made a motion to recommend the following the following action to the flood planning group:
Process for Projects Other than in Storm Water Master Plans:

- Scoring Categories per list on Revised Slide
- Point score per decision made in next subcommittee meeting
- Each Project scored in subcommittee workshop
- Projects recommended to evaluate based upon scores and committee decision

Levi Bryand seconded the motion. Subcommittee 2 Chairman Acosta called for a vote and the motion was approved.

11. Potential Committee Actions -

a) Committee vote on recommended process for selection of potentially feasible regional FMPs from stakeholders other than COEP, EPW and El Paso County (for evaluation only)

No action was taken on this agenda item.

12. Tentative future meeting dates for subcommittee

The group agreed to meeting on December 14th, 2021, at 1:00 pm.

13. Adjourn

Levi Bryand made a motion to adjourn at 4:37 pm. Jeff Bennett seconded the motion. Subcommittee 2 Chairman Acosta called for a vote and the motion was approved.

12/14/2021

Date

Subcommittee 2 Chairman, Javier Acosta

Meeting Minutes
Region 14 URFPG-Subcommittee 2 Meeting
Wednesday, December 14, 2021 at 1:00 pm

Subcommittee Member	**Interest Category**	**Present (✓)/Absent (X) / Alternate Present (*)**
Omar L. Martinez, Chair	*Water districts*	✓
Oscar D. "Jay" Ornelas	*Agricultural interests*	X
Gilberto Saldana Jr.	*Counties*	X
Jeff Bennett	*Environmental interests*	X
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Gisela Dagnino	*Water utilities*	✓
Levi Bryand	*Water Utilities*	✓
Carlos Velarde	*Public*	✓
Delbert Humberson	International Boundary Water Commission	X
Others Present:		
Annette Gutierrez, RGCOG	Chris Wright, AECOM	
Jeff Irvin - AECOM, PIC	Gilbert Andujo	
Bryan Blaisdell, AECOM		

Subcommittee Chairman Javier Acosta welcomed the group at 1:13 pm.

1. Approval of meeting minutes for the November 15, 2021 Subcommittee 2 meeting (Meeting No. 3) Omar Martinez made a motion to accept the Minutes from November 15, 2021. Dave Hall seconded the motion. Subcommittee 2 Chairman Acosta called for a vote and the motion was approved.

3-12. Chris Wright and Jeff Irvin presented agenda items 3-12 to the subcommittee.

13. Committee vote on selection of potentially feasible FMPs from El Paso City and County SWMPs

Gisela Dagnino made a motion to approve the following:

- Approval of refinement of screening process for selection of potentially feasible regional FMPs for Projects not included in the City of El Paso/El Paso Water Stormwater Master Plan, or the El Paso County Stormwater Master Plan, including all process refinements discussed during the subcommittee meeting held 12/14/21. AECOM will have the opportunity to review approximately how many of the 9 currently identified projects, plus other additional projects yet to be considered, can be evaluated based on time/budget to reduce the number of projects further.

- Approval of selection of 25 potentially feasible FMPs from the 2021 City of El Paso/El Paso Water SWMP, including all refinements to the screening process discussed during the subcommittee meeting held 12/14/21. EPWater will have the opportunity to submit a revised list before the next Subcommittee 2 meeting. AECOM will have the opportunity to review approximately how many of the 25 projects can be evaluated based on time/budget to reduce the number of projects further.

- Approval of selection of 19 potentially feasible FMPs from the 2021 El Paso County SWMP, including all refinements to the screening process discussed during the subcommittee meeting held 12/14/21. El Paso County will have the opportunity to submit a revised list before the next Subcommittee 2 meeting. AECOM will have the opportunity to review approximately how many of the 19 projects can be evaluated based on time/budget to reduce the number of projects further.

The motion was seconded by Dave Hall. Subcommittee 2 Chairman Acosta called for a vote and the motion was approved.

13. The subcommittee agreed to participate in a doodle poll for future meeting dates between January 17-20, 2022, at 1:00 pm.

Gisela Dagnino made a motion to adjourn. Levi Bryand seconded the motion. Subcommittee 2 Chairman Acosta called for a vote and the motion was approved. The meeting adjourned at 3:11 pm.

1/31/22
Date

Subcommittee 2 Chairman, Javier Acosta

Meeting Minutes
Region 14 URFPG-Subcommittee 2 Meeting
January 18, 2022 at 1:00 pm

Subcommittee Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	X
Gilberto Saldana Jr.	*Counties*	✓
Jeff Bennett	*Environmental interests*	✓
Javier Acosta	*Municipalities*	✓
David "Dave" Hall	*Public*	✓
Gisela Dagnino	*Water utilities*	✓
Levi Bryand	*Water Utilities*	X
Carlos Velarde	*Public*	X
Delbert Humberson	International Boundary Water Commission	X
Others Present:		
Annette Gutierrez, RGCOG	Chris Wright, AECOM	
Jeff Irvin - AECOM, PIC	Gilbert Andujo	
Bryan Blaisdell, AECOM		

1. Subcommittee Chairman Javier Acosta welcomed the group at 1:04 pm.

2. Approval of meeting minutes for the December 14, 2021 Subcommittee 2 meeting (Meeting No. 4)
Dave Hall made a motion to accept the Minutes from December 14, 2021. Gilbert Saldana seconded the motion. Subcommittee 2 Chairman Acosta called for a vote and the motion was approved.

3-10. Chris Wright and Jeff Irvin presented agenda items 3-10 to the subcommittee.

11. Potential Subcommittee Recommendations for vote:
    a. Approval of refinements to list of prioritized projects in City of El Paso/EPWater SWMP
    b. Approval of refinements to list of prioritized projects in El Paso County SWMP
    c. Approval of overall order for FMP evaluation resulting from discussions in this subcommittee meeting

    Tabled 12 A and B for the next subcommittee 2 meeting.

12. Tentative date for next Subcommittee 2 meeting
The subcommittee agreed to participate in a doodle poll for future meeting dates between January 17-20, 2022, at 1:00 pm. Dave Hall and GIlert seconded
Thursday, January 27th at 2:00 pm

13. Gisela Dagnino made a motion to adjourn. Dave Hall seconded seconded the motion. Subcommittee 2 Chairman Acosta called for a vote and the motion was approved. The meeting adjourned at 3:13 pm.

1/27/2022
Date

Subcommittee 2 Chairman, Javier Acosta

Appendix 10A.4
Subcommittee 3 Meeting Minutes

(Identification & Evaluation of Potential FMEs and FMSs, Task 4)

AGENDA
REGION 14. UPPER RIO GRANDE FLOOD PLANNING GROUP
SUBCOMMITTEE 3
MEETING MINUTES

Thursday, September 30, 2021
1:00 P.M. (MDT)
13247 Alameda Ave., Clint, TX 79836

Subcommittee 3 – Tasks 3A/3B – Evaluation and Recommendations on Floodplain Management Practices/Flood Mitigation and Floodplain Management Goals

1) Introductions of Subcommittee Members and Interests
   Flood Planning Group members included: Javier Acosta-Professional Engineer-Frank Spencer and Associates in El Paso, Texas
   Gilbert Saldana-Senior Civil Engineer for El Paso County
   Dave Hall-Public
   Carlos Velarde-Civil Engineer for Val Verde County
   Levi Bryand-Civil Engineer with LCA in Odessa Texas
   Sal Masoud with Del Rio Engineers

   Also present were AECOM-Jeff Irvin, Lily Cartwright, Chris Wright, Gilbert Andujo, Bryan Blaisdell, and Annette Gutierrez from RGCOG.

2) Objective of Subcommittee
   Bryan Blaisdell presented the objective of the subcommittee to the members. He covered the following information.
   - Task 3A: Evaluation and Recommendations on Floodplain Management Practices
     - Subcommittee Recommendation: RFPG Path to Adoption of Region-Specific, Minimum Floodplain Management or Land Use Standards (optional)

   - Task 3B: Flood Mitigation and Floodplain Management Goals
     - Subcommittee Recommendation: RFPG Path to Adoption of Flood Mitigation and Floodplain Management Goals

3) AECOM gave a presentation on the technical issues to the members and covered the items listed below.

   a) Review Regional Floodplain Management and Land Use Practices (Task 3A)
      i) NFIP Requirements
      ii) TFMA Higher Standards
      iii) Subdivision Regulations/Model Subdivision Rules
      iv) Future Development Conditions
      v) **Subcommittee Recommendations to RFPG**: RFPG Path to Adoption of Region-Specific, Minimum Floodplain Management or Land Use Standards (optional)

b) Review Flood Mitigation and Floodplain Management Goals (Task 3B)
   i) Example short-term/long-term goals
   ii) Discussion of region-specific goals
   iii) **Subcommittee Recommendations to RFPG:** RFPG Path to Adoption of Flood Mitigation and Floodplain Management Goals

Based on the presentation from AECOM, Sal Masoud made a motion to present the recommendation to the flood planning group as shown on the slide presentation. Levi Bryand seconded the motion and it was approved.

4) Confirm chair of subcommittee

Levi Bryand made the motion to have Sal serve as the Chair for Subcommittee 3. Sal Masoud seconded the motion and it was approved.

5) Tentative future meeting dates for subcommittee

The subcommittee decided on the next meeting for October 22, 2021 at 10:00 am and set the following meeting for November 10, 2021, at 10:00 am. The meeting adjourned at 2:39 pm.

1.12.2022

Date

Sal Masoud

Subcommittee 3 Chairman, Sal Masoud

Meeting Minutes
Region 14 URFPG-Subcommittee 3 Meeting
Friday, October 22, 2021 at 10:00 am

Subcommittee Member	Interest Category	Present (✓)/Absent (X) / Alternate Present (*)
Omar L. Martinez, Chair	*Water districts*	✓
Sal Masoud, Subcommittee Chair	*Industries*	✓
Jeff Bennett	*Environmental interests*	X
Gisela Dagnino	*Water utilities*	✓
Levi Bryand	*Water Utilities*	✓
Delbert Humberson	International Boundary Water Commission	✓

Others Present:	
Annette Gutierrez, RGCOG	Jeff Irvin - AECOM, PIC
Richard Bagans, TWDB	Dr. Apurba Borah, IBWC
Gilbert Andujo, AECOM	Gabe Duran, IBWC
Bryan Blaisdell, AECOM	Gonzaleo Cedillos, IBWC
Chris Wright, AECOM	

1. Subcommittee 3 Chair Sal Masoud welcomed the group.

2. Recent progress related to issues discussed in previous Subcommittee 3 meeting
3. Discussion of Potential FMEs and FMS
   Chris Wright provided the agenda to the group and covered what would be discussed the meeting. These topics included the following:
   - Recent Progress Concerning Previous Subcommittee 3 Meeting
   - Discussion of Potential FMEs and FMSs
   - Communities at risk of flooding with outdated or no FEMA Floodplain Mapping
   - EPCWID1 issues related to flooding
   - FMSs related to Environmental Flows, Floodplain Connectivity, & ASR
   - Discussion of experience in recent historic flood events
   - Other?
   - Tentative future meeting dates for subcommittee

   Chris reminded the group the previous meeting covered the Rio Grande but for this meeting, they would not be discussing it. He next covered what the goals of the meeting is. He said they were twofold. The first one is to talk about the process for selecting FMEs and FMS. He said at the next meeting the subcommittee will need to vote on them to recommend to the full group. The agenda needs to be posted by November 15, 2021 and the general membership meeting will be November 30, 2021. These items need to be voted on to allow for the Tech Memo to be completed. The second is to learn more about the important flood issues that have occurred in the region. Today AECOM will focus on some of the storm events that happened in El Paso since it is one of the most populated areas but also will focus on other places as well. The subcommittee will need to think about establishing the process and to be learning about the issues.

   Chris Wright of the following:

- Rio Grande H&H modeling FME
- FMS modeling approach related to levees
- Coordination call with Fathom
- Levee modeling assumptions
- Refined “cursory floodplain dataset” expected end of October per TWDB Coordination with TWDB
- Levee modeling criteria
- USIBWC provided hydraulic model downstream of American Dam (under review)USIBWC provided river and upstream reservoir gage data (under review)

Next he discussed the potential of FMEs and FMSs. He reminded the group, an FME is a flood study of a specific, flood-prone area that is needed in order to assess flood risk and/or determine whether there are potentially feasible FMSs or FMPs. A strategy is a plan to reduce flood risk or mitigate flood hazards to life or property but it may or may not require associated FMPs to be implemented.

He suggested the subcommittee may want to consider those counties where they do not have FEMA data; there are four in our region. He walked the subcommittee through the steps that AECOM will use to select where they may need a study out of the four, with the main criteria being heavily populated. Chris asked the group if they want to focus on the 100 or 500-year flood. Chairman Martinez said he would be fine keeping with the 100-year flood for the rural areas with the exception of the City of Presidio. He would prefer for Presidio to utilize the 500-year flood. There was discussion on whether it is financially feasible to construct projects with the 500-year flood. Dr. Borah also mentioned that the project would also trigger IBWC to notify Mexico that they are not deflecting water to Mexico for anything over 25 years. Gabe Duran agreed that Presidio is a unique area due to the two nearby rivers and mentioned how effective the palm method was during the 2008 flooding. The subcommittee agreed that a study should be done on the coincidence analysis. Gisela also asked for AECOM to look at the 100 but also analysis the 500 to see how high the water level gets for bridges, culverts and so on. Chairman Martinez also mentioned TXDOT made recent improvements to the port of entry bridge and rail. Flood capacity may have been addressed. Dr. Borah mentioned the TXDOT bridges were protected for a 100-year flood. Chris asked Dr. Borah if he could provide them the process IBWC uses to define the process for projects along the levee. Dr. Borah stated the participating agency will provide the design document and hydraulic study to IBWC. IBWC will then share it with Mexico. The same process is taken on the Mexican side.

Chris next covered future condition analysis. Chairman Martinez mentioned the EPCWID #1 is experiencing increased flows coming from the northern side of the County to the lower valley. This does have a direct impact on the surrounding communities. It goes beyond what the normal subdivision ponding accounts for. He would consider a future condition analysis for the areas mentioned. Joanna McKenzie mentioned there is increased growth in Ft. Hancock, Hudspeth County. Chris asked if the two could provide a rough map of the general area they are concerned with. Chairman Subcommittee 3 Masoud agrees with comments made from Omar. Gisela states the same is occurring in El Paso in the mountainous areas. Sal suggested perhaps different kinds of Inlets can be considered for the City of El Paso as well. Chris suggested the review of Inlets would be a strategy. Dr. Borah also mentioned the creeks along the river brings a lot of sediment to the river. Chris asked Dr. Borah to provide a map of where sediment is being brought to the river. Chris then covered the rest of the slides that highlighted resources for developing FMSs. Delbert reminded the group that some strategies created along the river may affect the treaty with Mexico, so the group should take that into consideration.

Chairman Masoud asked Chris Wright if the group always shoots for higher standards than Mexico, it will always flood on the Mexican side and not affect the U.S., how do we make that assumption? Chris said they have asked those questions to the TWDB. Chris said the subcommittee could have a separate meeting to discuss the items presented to TWDB. Chairman Masoud asked Gabe Duran if he recalled if there was a breach of the Mexican side of the levees in 2006 and he confirmed there were but Mexico had to mitigate the situation by setting up a bypass to pump water out of the retaining basins nearby. He said if this would not have occurred, downtown El Paso may have been flooded. Gabe Duran provided several other examples and made referenced to several areas managed by the El Paso County Water Improvement District 1 (EPCWID #1). Chairman Martinez stepped in and agreed with Mr. Duran's listing but also noted that he and Dr. Blair have identified five specific areas and mentioned he would email the subcommittee about them. Delbert Humberson stated the IBWC should be able to provide elevations and coordinates of the high water marks.

Chris mentioned Dr. Blair was going to cover flood issues for EPCWID #1 and Jeff Bennett was going to discuss FMSs as they relate to environmental flows, but because neither was able to attend and for the sake of time, Chris jumped into the discussion of experience in recent historic flood events. He reminded the group of the flooding in El Paso in 2006, the flooding in Presidio and Ojinaja in 2008, and El Paso flooding in 2021.

He provided the group with a list of potential dates that they should all be aware of in terms of recommendations to the group, voting, posting and preparing for the Tech Memo. He inquired if Gonzalo Cedillos was in attendance and he confirmed he was. There were also others from El Paso Water as well as other organizations as well. However, since the meeting was nearly over, the group of presenters would speak at the next meeting. Jeff Irvin presented the list of questions AECOM will be asking at the next meeting.

4. Approval of Minutes from September 30, 2021
Annette Gutierrez requested to table this agenda item because the heading of the Minutes states subcommittee 1. Ms. Gutierrez requested to present these Minutes at the next meeting. Gisela Dagnino made a motion to table this agenda item. Omar Martinez Seconded the motion. Subcommittee 1 Chairman Masoud called for a vote and the motion was approved.

5. Tentative date for next meeting
The group decided to meet again on November 10, 2021 at 10:00 am. Chris Wright explained the meeting would take at least three hours to conduct.

6. Gisela Dagnino made a motion to adjourn the meeting and Omar Martinez seconded the motion. All voted in favor and the motion carried.

1/12/2022

Date

Sal Masoud

Subcommittee 3 Chairman, Sal Masoud

Meeting Minutes
Region 14 URFPG-Subcommittee 3 Meeting
Wednesday, November 10, 2021 at 10:00 am

Subcommittee Member	**Interest Category**	**Present (✓)/Absent (X) / Alternate Present (*)**
Omar L. Martinez, Chair	*Water districts*	✓
Sal Masoud, Subcommittee Chair	*Industries*	✓
Jeff Bennett	*Environmental interests*	X
Levi Bryand	*Water Utilities*	✓
Enrique Ochoa for Gisela Dagnino	*Water Utilities*	✓
Delbert Humberson	International Boundary Water Commission	X

Others Present:	
Annette Gutierrez, RGCOG	Eric Bangs, EPW
Richard Bagans, TWDB	Dr. Apurba Borah, IBWC
Bryan Blaisdell, AECOM	Gabe Duran, formerly IBWC
Chris Wright, AECOM	Gonzaleo Cedillos, formerly EPW
Jeff Irvin - AECOM, PIC	Joanna McKenzie, Hudspeth County
Alejandra Marco, AECOM	Alderperson David Cantu, City of San Elizario
Lily Carwright, AECOM	

1) Subcommittee Chairman Sal Masoud –Welcome
Chairman Sal Masoud welcomed the members and guests.

2) Levi Bryand made a motion to table both sets of Minutes from September 30 and October 22, 2021. Omar Martinez seconded the motion. Subcommittee 3 Chairman Masoud called a vote and the motion was approved.

3) AECOM- Introductions of Subcommittee Members and their interests in any specific FMEs or FMSs
Chris Wright provided this item. He recapped what was going to be on the agenda for the meeting.

4) – 8) Jeff Irvin presented items 4-9 to the subcommittee.

9) AECOM- Potential Committee Actions
A. Vote on future action for each FME and FMS identified during the meeting
B. Vote on process to identify other “potentially feasible FMEs and FMSs”
Omar Martinez made a motion to accept the process as listed below for FMEs & FMSs. Levi Bryand seconded the motion. Subcommittee Masoud called for a vote and the motion carried.

- A stakeholder will cite experience that identifies a problem
- The need associated with the problem will be discussed and defined
- FMEs and/or FMSs will be proposed to address the need

- The subcommittee members will vote on future action for each FME and FMS identified.

10) Tentative future meeting dates for subcommittee
Chris Wright suggested that a poll be sent out to determine the next Subcommittee 3 meeting. He mentioned the meeting should occur sometime after January 7th, 2022.

11) Adjourn
Levi Bryand made a motion to adjourn the meeting and Enrique Ochoa seconded the motion. Subcommittee Masoud called for a vote and the motion carried. The meeting adjourned at 1:06 pm.

1/12/2022 Sal Masoud

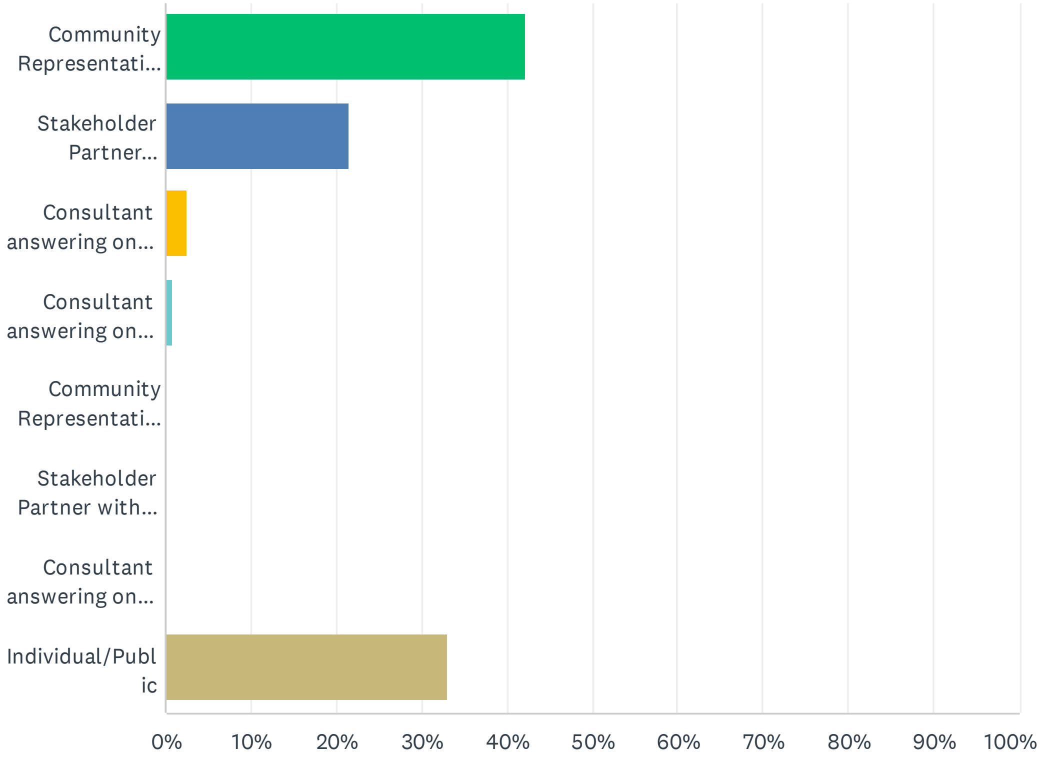
Date Subcommittee 3 Chairman, Sal Masoud

Appendix 10B
Survey Results

Note: Q1 responses (containing names, phone numbers, and email addresses of respondents) omitted for privacy

Q2 Are you responding to the survey as a Community Representative, as a Stakeholder Partner, as a Consultant answering on behalf of a Community/Stakeholder Partner, or as an individual member of the Public?

Answered: 121 Skipped: 0



ANSWER CHOICES	RESPONSES	
Community Representative including County Government or Municipal Government	42.15%	51
Stakeholder Partner including River Authorities, Flood Districts, Water Districts, Groundwater Districts, Irrigation Districts, Levee Districts, Dam Owners, Water Utilities, Electric Generating Utilities, or other interest groups (Small Business, Agricultural, Environmental, Industries, etc.)	21.49%	26
Consultant answering on behalf of a Community	2.48%	3
Consultant answering on behalf of a Stakeholder Partner	0.83%	1
Community Representative without Flood Responsibilities, including County Government or Municipal Government	0.00%	0
Stakeholder Partner without Flood Responsibilities, including River Authorities, Flood Districts, Water Districts, Groundwater Districts, Irrigation Districts, Levee Districts, Dam Owners, Water Utilities, Electric Generating Utilities, or other interest groups (Small Business, Agricultural, Environmental, Industries, etc.)	0.00%	0
Consultant answering on behalf of a Stakeholder Partner	0.00%	0
Individual/Public	33.06%	40
TOTAL		121

Note: Q3 responses have been partially redacted to omit phone numbers and email addresses for privacy

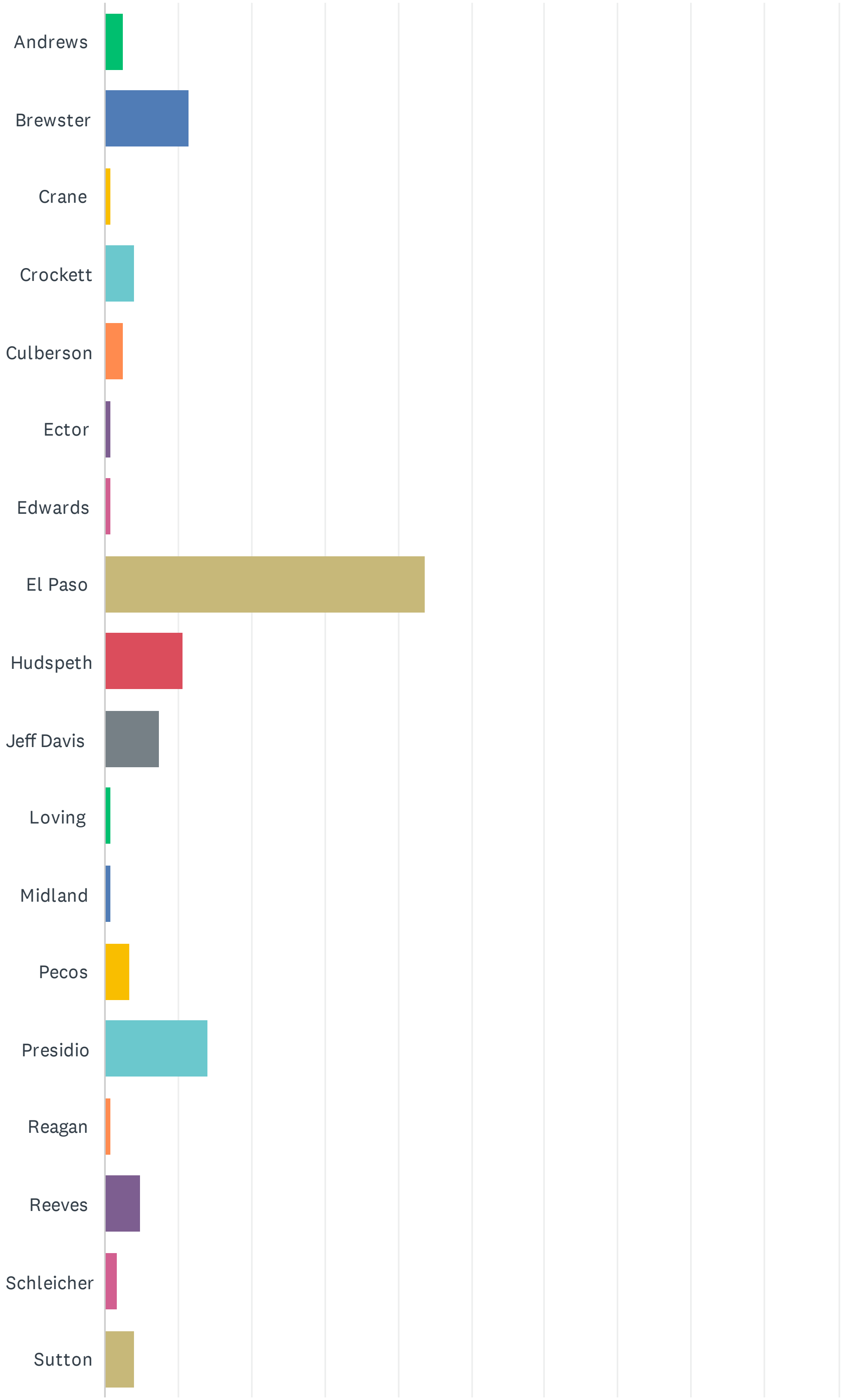
Q3 If you are responding on behalf of another community or organization, please provide the name of the organization and a primary point of contact including phone number and email address.

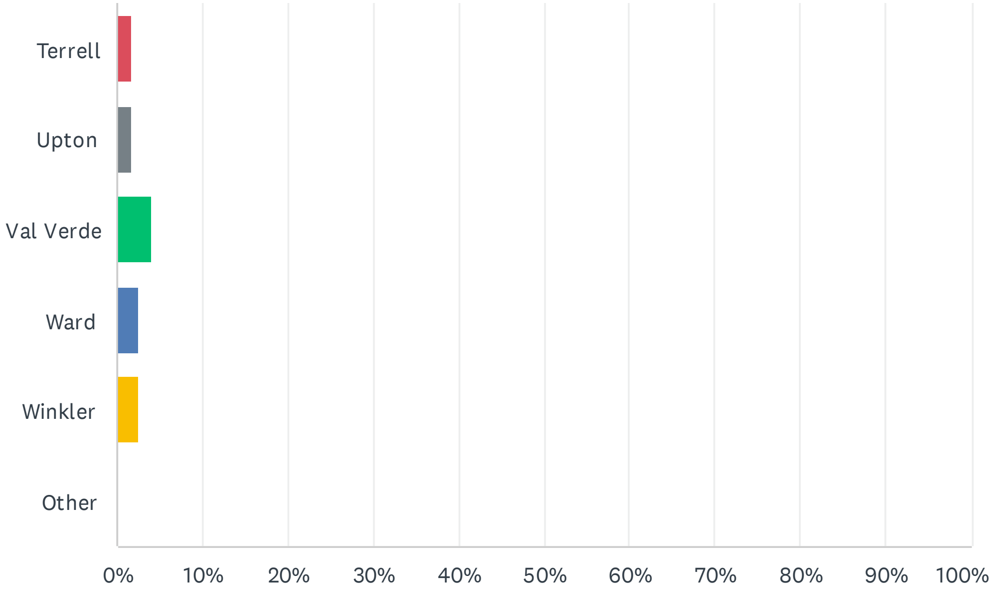
Answered: 18 Skipped: 103

#	RESPONSES	DATE
1	Terlingua Community Garden Zoey Sexton [redacted] 501c3 Big Bend Citizens Alliance	3/1/2022 1:33 PM
2	Rio Grande - Pecos River SWCD #237	11/2/2021 2:43 PM
3	Pecos County	10/19/2021 12:03 PM
4	International Boundary and Water Commission	10/15/2021 5:05 PM
5	PASEO DEL ESTE MUNICIPAL DISTRICT #1 DANIEL MARTINEZ [redacted] ; [redacted]	10/14/2021 12:12 PM
6	I am responding representing The University of Texas at El Paso.	10/14/2021 9:48 AM
7	Village of Vinton [redacted]	10/14/2021 9:28 AM
8	Town of Pecos City	10/14/2021 8:08 AM
9	Andrews County Office of Emergency Management Michael Cook - [redacted]	10/13/2021 1:09 PM
10	83rd District Attorney district covering Pecos, Brewster, Presidio and Jeff Davis Counties	10/5/2021 9:59 AM
11	N/A	10/5/2021 8:36 AM
12	Sierra Blanca Independent School District Glenn Nathan - Superintendent [redacted]	10/4/2021 9:29 AM
13	[redacted]	10/1/2021 5:24 PM
14	Hudspeth County	10/1/2021 3:24 PM
15	Dell City ISD Carlos A. Contreras Superintendent	10/1/2021 3:19 PM
16	City of Sonora [redacted] Sonora, Texas	9/30/2021 11:17 AM
17	The University of Texas at El Paso	9/28/2021 10:47 AM
18	n/a	9/20/2021 10:42 AM

Q4 In which of the following counties do you live, work or routinely travel to?

Answered: 121 Skipped: 0



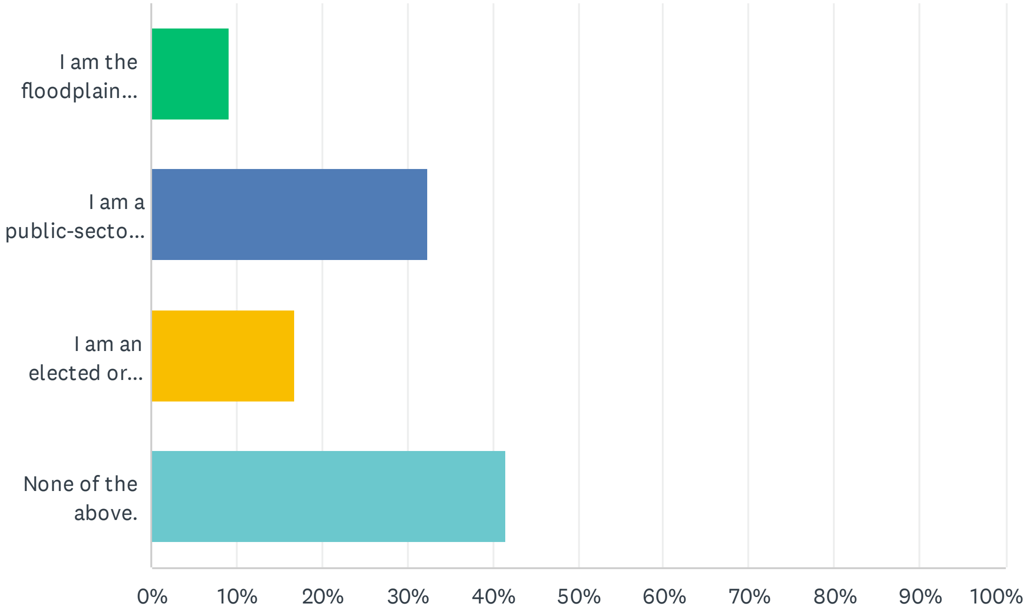

Terrell
Upton
Val Verde
Ward
Winkler
Other
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
Andrews	2.48%	3
Brewster	11.57%	14
Crane	0.83%	1
Crockett	4.13%	5
Culberson	2.48%	3
Ector	0.83%	1
Edwards	0.83%	1
El Paso	43.80%	53
Hudspeth	10.74%	13
Jeff Davis	7.44%	9
Loving	0.83%	1
Midland	0.83%	1
Pecos	3.31%	4
Presidio	14.05%	17
Reagan	0.83%	1
Reeves	4.96%	6
Schleicher	1.65%	2
Sutton	4.13%	5
Terrell	1.65%	2
Upton	1.65%	2
Val Verde	4.13%	5
Ward	2.48%	3
Winkler	2.48%	3
Other	0.00%	0
Total Respondents: 121		

#	OTHER	DATE
	There are no responses.	

Q5 Which of the following best describes your level of flood-related responsibilities?

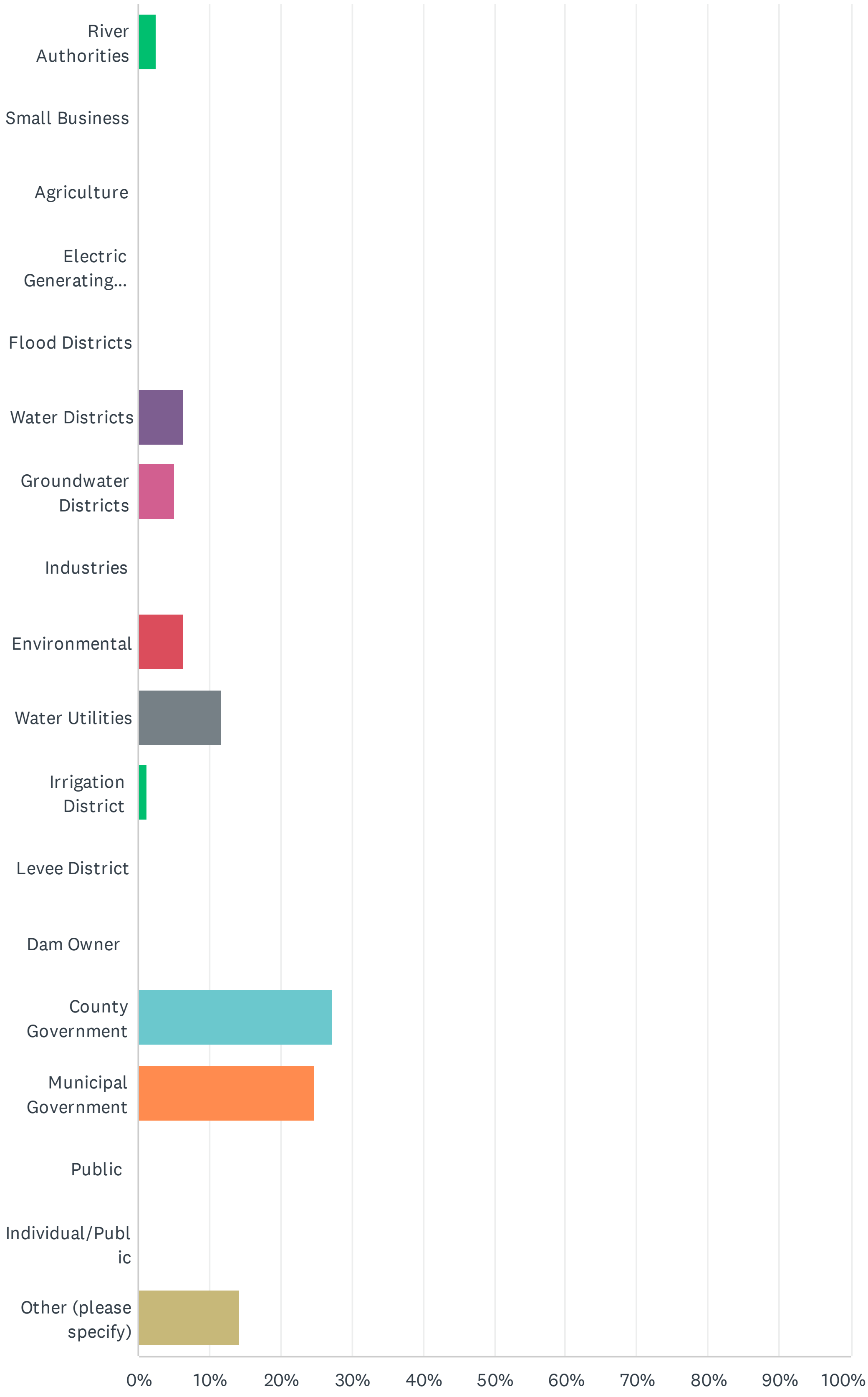
Answered: 77 Skipped: 44



ANSWER CHOICES	RESPONSES	
I am the floodplain administrator for a community participating in the National Flood Insurance Program (NFIP).	9.09%	7
I am a public-sector employee with flood-related experience.	32.47%	25
I am an elected or appointed official with flood related experience.	16.88%	13
None of the above.	41.56%	32
TOTAL		77

Q6 Into which of the following interest groups do you fall?

Answered: 77 Skipped: 44

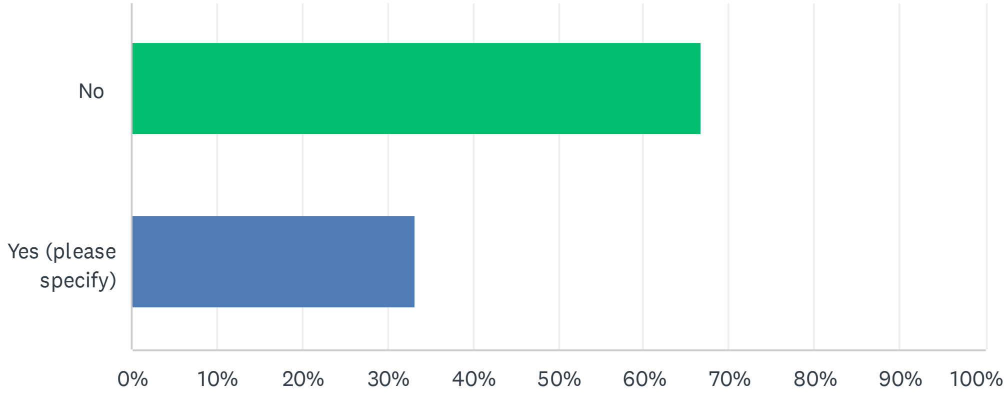

River Authorities
Small Business
Agriculture
Electric Generating...
Flood Districts
Water Districts
Groundwater Districts
Industries
Environmental
Water Utilities
Irrigation District
Levee District
Dam Owner
County Government
Municipal Government
Public
Individual/Public
Other (please specify)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
River Authorities	2.60%	2
Small Business	0.00%	0
Agriculture	0.00%	0
Electric Generating Utilities	0.00%	0
Flood Districts	0.00%	0
Water Districts	6.49%	5
Groundwater Districts	5.19%	4
Industries	0.00%	0
Environmental	6.49%	5
Water Utilities	11.69%	9
Irrigation District	1.30%	1
Levee District	0.00%	0
Dam Owner	0.00%	0
County Government	27.27%	21
Municipal Government	24.68%	19
Public	0.00%	0
Individual/Public	0.00%	0
Other (please specify)	14.29%	11
TOTAL		77

#	OTHER (PLEASE SPECIFY)	DATE
1	Sustainable community gardening	3/1/2022 1:35 PM
2	State Government - Texas Department of Transportation	10/19/2021 5:02 PM
3	Federal Government/ levee and dam owner, operator	10/15/2021 5:08 PM
4	WATER, WASTEWATER AND STORM SEWER UTILITIES	10/15/2021 9:24 AM
5	Facility Management Administrator for The University of Texas at El Paso	10/14/2021 9:49 AM
6	Federal Government	10/7/2021 2:24 PM
7	Federal Government, with Flood Risk Reduction and River Authorities	10/7/2021 1:58 PM
8	Federal	10/7/2021 11:58 AM
9	School District	10/4/2021 9:31 AM
10	RGCOG	9/29/2021 11:16 AM
11	Facility Management Administrator for The University of Texas at El Paso	9/28/2021 10:50 AM

Q7 Do you participate in routine regional flood related coordination? If so, list partners in this coordination (e.g. IBWC, Water Districts, Water Utilities, Counties, Municipalities).

Answered: 72 Skipped: 49



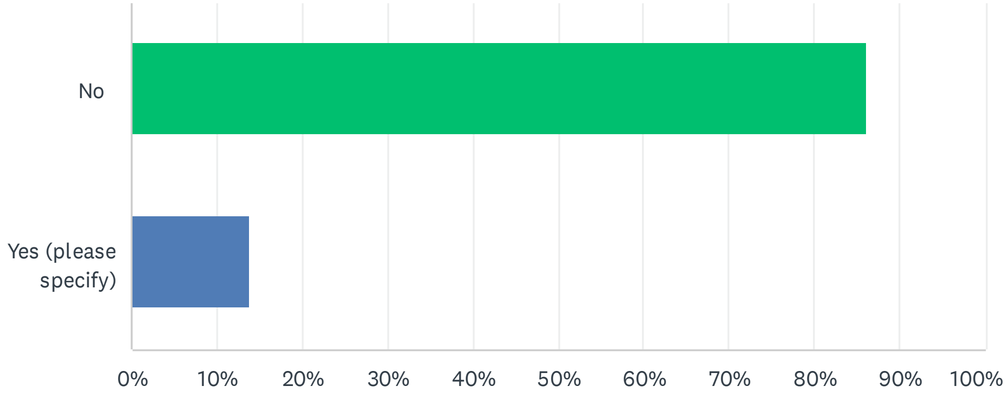
ANSWER CHOICES	RESPONSES	
No	66.67%	48
Yes (please specify)	33.33%	24
TOTAL		72

#	YES (PLEASE SPECIFY)	DATE
1	EPCWID#1, El Paso Water	10/19/2021 3:20 PM
2	EPW, EPCWID#1, EBID,	10/15/2021 5:08 PM
3	IBWC, El Paso County Water Irrigation Distric #1, County, City	10/15/2021 4:43 PM
4	IBWC, USACE, FEMA, City, Counties	10/15/2021 3:56 PM
5	All	10/15/2021 1:52 PM
6	IBWC, Irrigation District, OEM, EPEC, TGS	10/15/2021 1:40 PM
7	Work with EPWU	10/14/2021 9:49 AM
8	municpalities	10/14/2021 9:37 AM
9	hudspeth county	10/13/2021 3:43 PM
10	Non-voting member of Upper Rio Grande Regional Flood Planning Committee	10/12/2021 9:05 AM
11	IBWC, City of El Paso, EPW	10/7/2021 2:24 PM
12	USIBWC and City of El Paso, EPW	10/7/2021 1:58 PM
13	I participate in IBWC flood workshops as a representative of IBWC's Water Accounting Division, which manages IBWC flow data and assists with reservoir operations criteria during a flood.	10/7/2021 11:58 AM
14	Counties	10/6/2021 10:47 AM
15	County	10/5/2021 9:31 PM

16	El Paso Water Utility, IBWC and County	10/5/2021 8:38 AM
17	Hudspeth County, Sierra Blanca Water District	10/4/2021 9:31 AM
18	County	10/4/2021 8:29 AM
19	All stakeholders	10/2/2021 8:08 AM
20	RGCOG	9/29/2021 11:16 AM
21	El Paso Water Utility	9/28/2021 10:50 AM
22	Water and Wastewater Utility	9/24/2021 12:39 PM
23	El Paso County, TWDB	9/20/2021 10:45 AM
24	IBWC, El Paso Water	9/9/2021 12:37 PM

Q8 Are you part of a formal regional flood coordination committee? If so, provide committee name and participating organizations (e.g. IBWC, Water Districts, Water Utilities, Counties, Municipalities).

Answered: 72 Skipped: 49

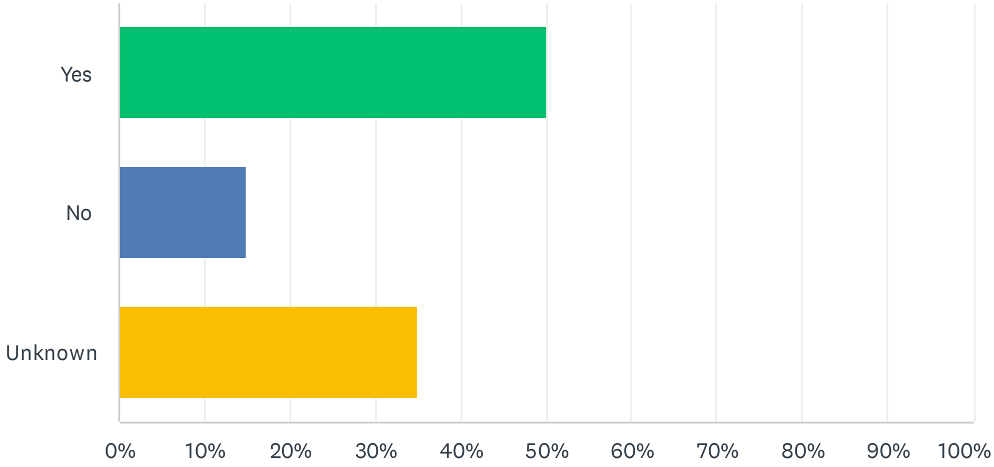


ANSWER CHOICES	RESPONSES	
No	86.11%	62
Yes (please specify)	13.89%	10
TOTAL		72

#	YES (PLEASE SPECIFY)	DATE
1	EPCWID#!, El Paso Water	10/19/2021 3:20 PM
2	Rio Grande Flood Control- IBWC, EPCWID#1, EBID, EPW, City of El Paso	10/15/2021 5:08 PM
3	Water Utilities	10/15/2021 3:56 PM
4	IBWC, Irrigation District, OEM, EPEC, TGS	10/15/2021 1:40 PM
5	Val Verde County	10/15/2021 1:24 PM
6	Far West Texas Water Planning	10/13/2021 2:32 PM
7	IBWC	10/7/2021 11:58 AM
8	County	10/5/2021 9:31 PM
9	Hudspeth County, Sierra Blanca Water District	10/4/2021 9:31 AM
10	Board Member	9/29/2021 11:16 AM

Q9 Is your community a participant in the National Flood Insurance Program (NFIP)?

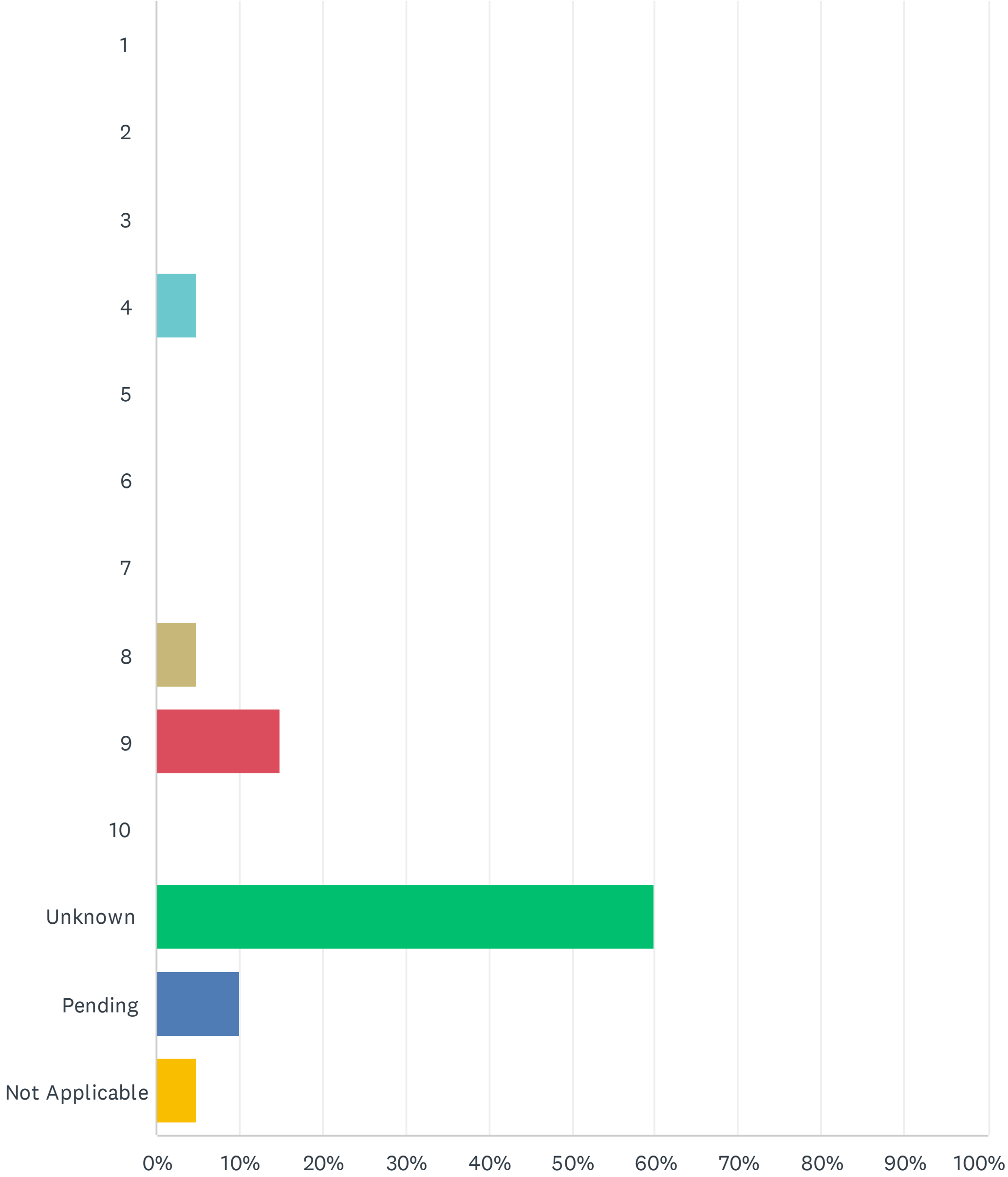
Answered: 40 Skipped: 81



ANSWER CHOICES	RESPONSES	
Yes	50.00%	20
No	15.00%	6
Unknown	35.00%	14
TOTAL		40

Q10 What is your community's CRS rating?

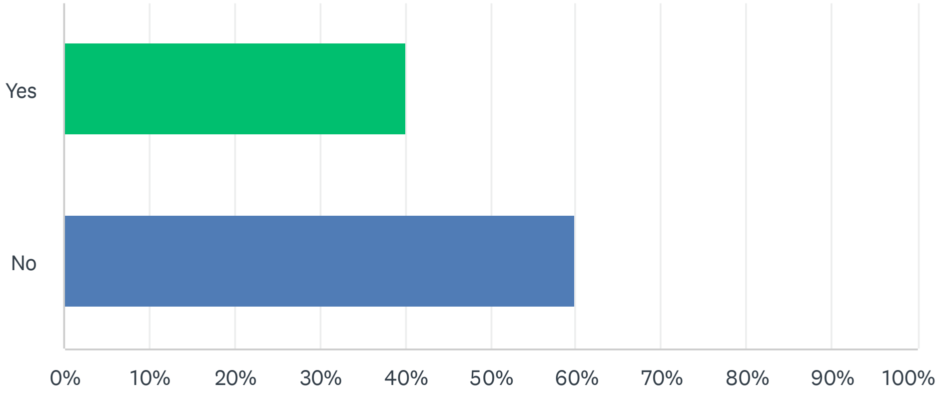
Answered: 20 Skipped: 101



ANSWER CHOICES	RESPONSES	
1	0.00%	0
2	0.00%	0
3	0.00%	0
4	5.00%	1
5	0.00%	0
6	0.00%	0
7	0.00%	0
8	5.00%	1
9	15.00%	3
10	0.00%	0
Unknown	60.00%	12
Pending	10.00%	2
Not Applicable	5.00%	1
TOTAL		20

Q11 Are you aware of any Letters of Map Revisions (LOMRs or Conditional Letters of Map Revisions (CLOMRs) in your community.

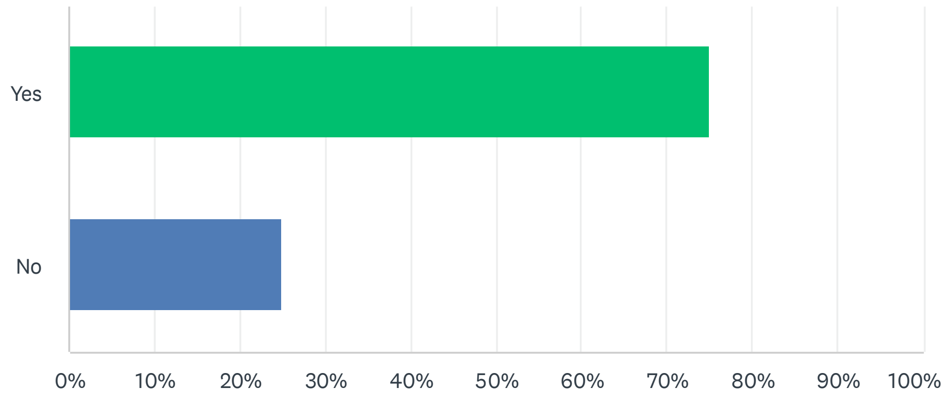
Answered: 40 Skipped: 81



ANSWER CHOICES	RESPONSES	
Yes	40.00%	16
No	60.00%	24
TOTAL		40

Q12 Is your community listed in the community contacts list (linked here), and is the information correct? This list was assembled from data sets ranging from current to 5-years old and may likely include out of date information. There will be an opportunity to update information in the following question of the survey.

Answered: 40 Skipped: 81



ANSWER CHOICES	RESPONSES	
Yes	75.00%	30
No	25.00%	10
TOTAL		40

Q13 If your community contact list is out of date, please provide updated names and contact information to the community contact list using the fields below:

Answered: 20 Skipped: 101

ANSWER CHOICES	RESPONSES	
CEO (Mayor or Judge)	80.00%	16
Floodplain Administrator	65.00%	13
Additional Contact 1 (Flood Planning, Emergency Coordination, Digital Flood Files):	45.00%	9
Additional Contact 2 (Flood Planning, Emergency Coordination, Digital Flood Files):	15.00%	3
Additional Contact 3 (Flood Planning, Emergency Coordination, Digital Flood Files):	0.00%	0
Additional Contact 4 (Flood Planning, Emergency Coordination, Digital Flood Files):	0.00%	0
Additional Contact 5 (Flood Planning, Emergency Coordination, Digital Flood Files):	0.00%	0

#	CEO (MAYOR OR JUDGE)	DATE
1	LEWIS G. OWENS JR	10/15/2021 1:26 PM
2	Judge Jeanette Duer	10/14/2021 9:45 AM
3	David Flores	10/14/2021 8:09 AM
4	County Judge Charlie Falcon cfalcon@co.andrews.tx.us (432) 524-1401	10/13/2021 1:14 PM
5	Eric Hawkins	10/6/2021 3:47 PM
6	Jerry Philips	10/5/2021 9:32 AM
7	Mayor Oscar Leeser	10/5/2021 8:47 AM
8	Bruno Lozano	10/4/2021 8:34 AM
9	Leo Hung judge	10/2/2021 8:13 AM
10	Thomas D. Neely	10/1/2021 9:48 PM
11	Mayor Juanita Gomez	9/30/2021 11:24 AM
12	Rachel Chavez Duran	9/30/2021 11:16 AM
13	President Wilson	9/28/2021 11:06 AM
14	Leo Hung, County Judge 432-287-0222, leo.hung@co.reeves.tx.us	9/21/2021 12:20 PM
15	Manuel Baeza- Mayor	9/16/2021 9:36 PM
16	Ricardo A. Samaniego	8/17/2021 12:24 PM

#	FLOODPLAIN ADMINISTRATOR	DATE
1	Kareem Dallo, P.E. (915)212-1560 ; dallokf@elpasotexas.gov	10/15/2021 4:00 PM
2	CARLOS VELARDE, COUNTY ENGINER	10/15/2021 1:26 PM
3	Gregory McNicol	10/14/2021 9:52 AM
4	Megan Antrim - Interim City Manager	10/13/2021 2:40 PM

5	Richard Kyle	10/6/2021 3:47 PM
6	Kareem Dallo P.E. CFM	10/5/2021 8:47 AM
7	Alberto Quintanilla - City Engineer	10/4/2021 8:34 AM
8	Leo Hung	10/2/2021 8:13 AM
9	City Manager Arturo Fuentes	9/30/2021 11:24 AM
10	Rachel Chavez Duran	9/30/2021 11:16 AM
11	Gilbert Saldana	9/29/2021 11:18 AM
12	Gregory McNicol	9/28/2021 11:06 AM
13	Gilberto Saldana Jr.	8/17/2021 12:24 PM

#	ADDITIONAL CONTACT 1 (FLOOD PLANNING, EMERGENCY COORDINATION, DIGITAL FLOOD FILES):	DATE
1	JOANNA MONTEMAYOR, ASSISTANT HEALTH DEPT.	10/15/2021 1:26 PM
2	Emilio Rodriguez	10/14/2021 9:52 AM
3	Jerry Bullard	10/2/2021 8:13 AM
4	Joanna MacKenzie	10/1/2021 9:48 PM
5	Art Fuentes	9/30/2021 11:16 AM
6	Emilio Rodriguez	9/28/2021 11:06 AM
7	Curtis Wilson, Reeves County Road and Bridge Engineer, 432-755-4339, cwilson@reevescounty.org	9/21/2021 12:20 PM
8	Charles Salgado- Public Utilities Superintendent City of Marfa 432-295-0179	9/16/2021 9:36 PM
9	Fernando Hernandez	8/17/2021 12:24 PM

#	ADDITIONAL CONTACT 2 (FLOOD PLANNING, EMERGENCY COORDINATION, DIGITAL FLOOD FILES):	DATE
1	ROWLAND GARZA, COUNTY EMERGENCY MANAGEMENT	10/15/2021 1:26 PM
2	Jerry Ballard, Reeves County Emergency Management Director, 432-287-4125, jerry.bullard@co.reeves.tx.us	9/21/2021 12:20 PM
3	Norma R. Palacios	8/17/2021 12:24 PM

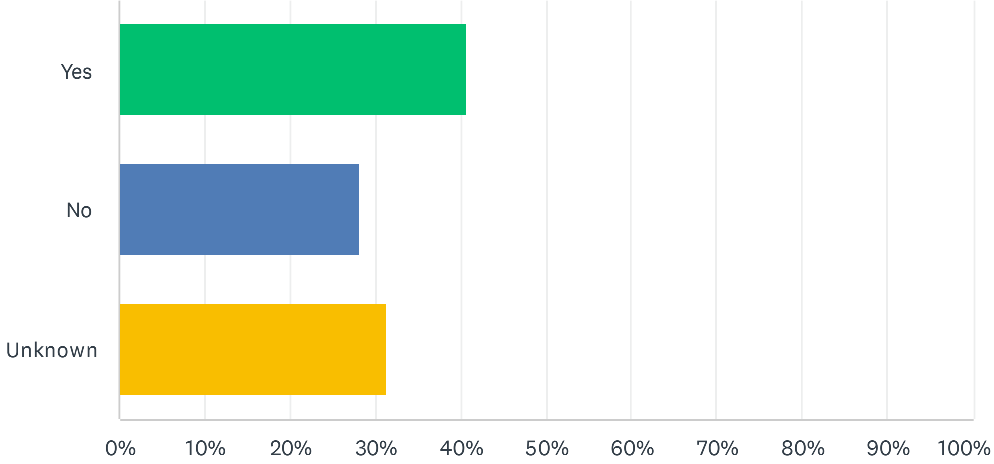
#	ADDITIONAL CONTACT 3 (FLOOD PLANNING, EMERGENCY COORDINATION, DIGITAL FLOOD FILES):	DATE
	There are no responses.	

#	ADDITIONAL CONTACT 4 (FLOOD PLANNING, EMERGENCY COORDINATION, DIGITAL FLOOD FILES):	DATE
	There are no responses.	

#	ADDITIONAL CONTACT 5 (FLOOD PLANNING, EMERGENCY COORDINATION, DIGITAL FLOOD FILES):	DATE
	There are no responses.	

Q14 Does your entity have floodplain management regulations?

Answered: 32 Skipped: 89



ANSWER CHOICES	RESPONSES	
Yes	40.63%	13
No	28.13%	9
Unknown	31.25%	10
TOTAL		32

Q15 If you answered yes and your jurisdiction willing to share a copy of regulations and/or development codes, please upload them below.

Answered: 5 Skipped: 116

#	FILE NAME	FILE SIZE	DATE
1	DDM.pdf	9.9MB	10/15/2021 1:58 PM
2	FLOOD DAMAGE PREVENTION ORDER.pdf	7.4MB	10/15/2021 1:29 PM
3	20210930_155930_725135_ARTICLE_II.___FLOOD_DAMAGE_PREVENTION.docx	34.2KB	9/30/2021 1:35 PM
4	Flood_hazard_reduction_ORDINANCE section 3.03.005.pdf	260.7KB	9/20/2021 11:20 AM
5	County Flood Damage Prevention Order.pdf	1.2MB	8/17/2021 12:43 PM

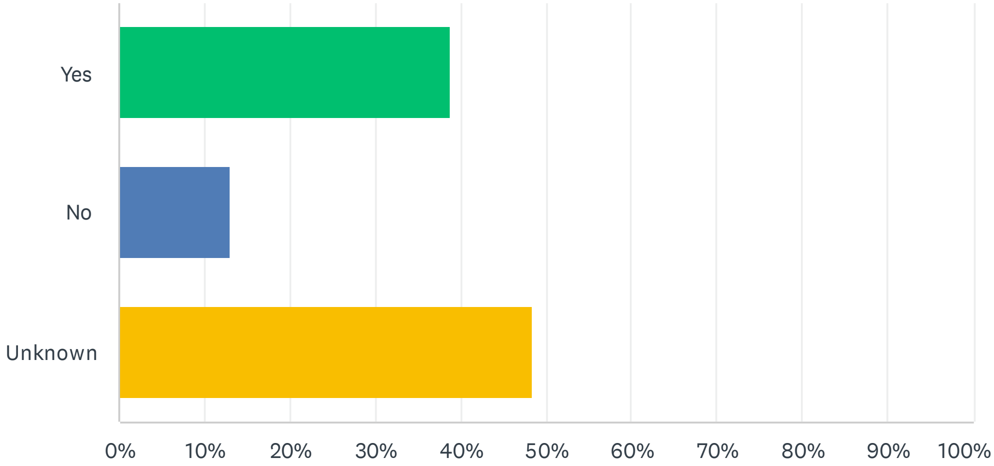
Q16 If you have additional files or files pertaining to regulations and/or development codes, (including files that are incompatible with the required survey file formats) please provide contact information so we can coordinate on how best to receive your files.

Answered: 2 Skipped: 119

#	RESPONSES	DATE
1	See City of El Paso's DDM and DSC	10/15/2021 4:04 PM
2	Open Records Request	10/15/2021 1:59 PM

Q17 Has your entity adopted the minimum regulations to be eligible to participate in the National Flood Insurance Program (pursuant to Texas Water Code Section 16.3145)?

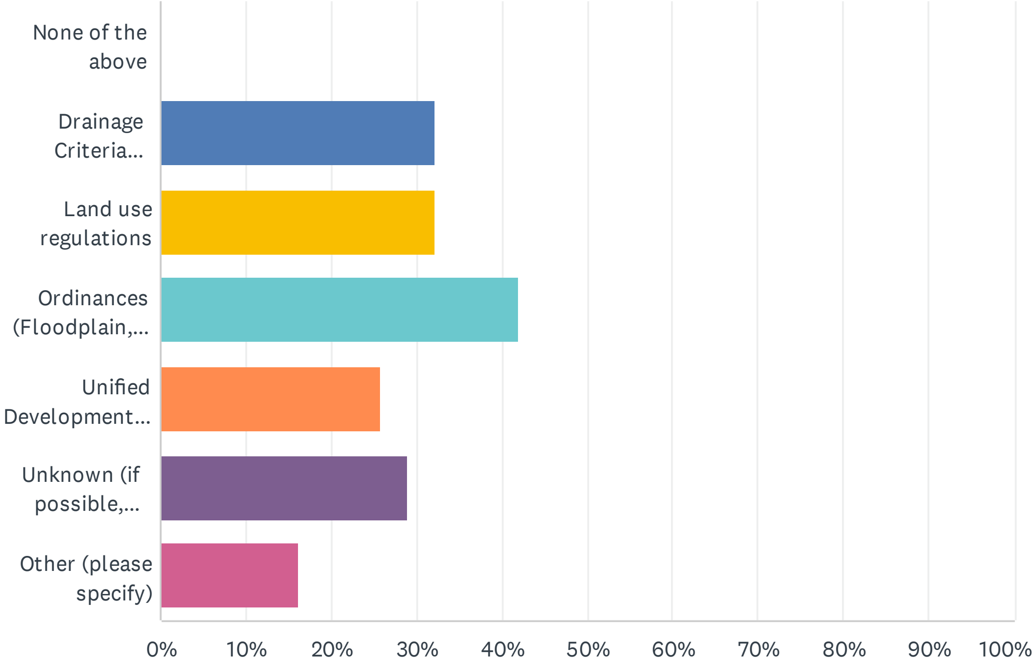
Answered: 31 Skipped: 90



ANSWER CHOICES	RESPONSES	
Yes	38.71%	12
No	12.90%	4
Unknown	48.39%	15
TOTAL		31

Q18 What regulations and/or development codes does your jurisdiction have in place to manage existing and future flood risk for development? Select all that apply.

Answered: 31 Skipped: 90

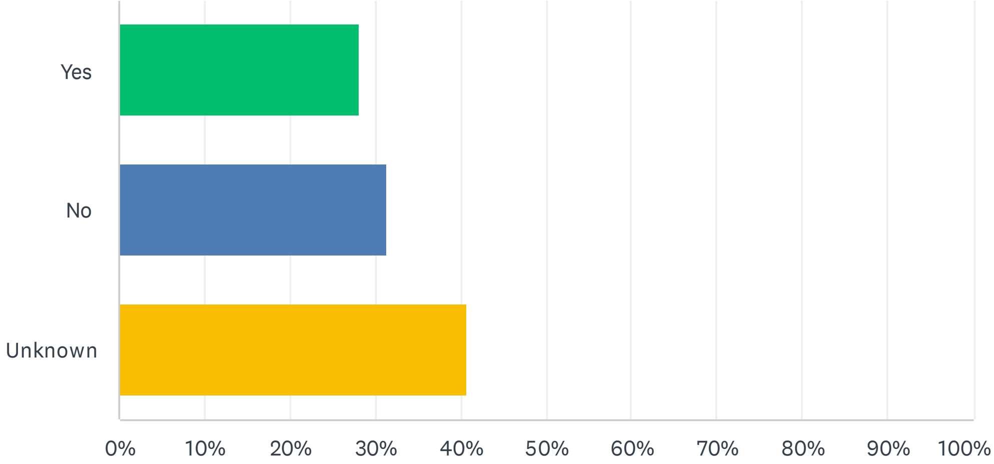


ANSWER CHOICES	RESPONSES	
None of the above	0.00%	0
Drainage Criteria Manual/Design Manual	32.26%	10
Land use regulations	32.26%	10
Ordinances (Floodplain, Drainage, Stormwater, etc.)	41.94%	13
Unified Development Code (UDC) and/or Zoning Ordinances with map	25.81%	8
Unknown (if possible, please provide point of contact for follow up in the "Other" comment box below)	29.03%	9
Other (please specify)	16.13%	5
Total Respondents: 31		

#	OTHER (PLEASE SPECIFY)	DATE
1	Best Practices	10/14/2021 9:58 AM
2	NA, Federal Government	10/7/2021 2:17 PM
3	Campus Best Practices	9/28/2021 2:31 PM
4	N/A	9/24/2021 12:46 PM
5	Subdivision Regulations and Design Standards	8/17/2021 12:44 PM

Q19 Does your jurisdiction have an existing land use plan?

Answered: 32 Skipped: 89



ANSWER CHOICES	RESPONSES	
Yes	28.13%	9
No	31.25%	10
Unknown	40.63%	13
TOTAL		32

Q20 If you answered yes to the question above and your jurisdiction willing to share a copy of your existing condition land use plan, please upload the file below.

Answered: 2 Skipped: 119

#	FILE NAME	FILE SIZE	DATE
1	Subdivision Regulations (PDF).pdf	11.3MB	10/13/2021 1:26 PM
2	ZONINGMAP_Rev 8-9-2013 ZoneMap (1).pdf	1.5MB	9/20/2021 11:20 AM

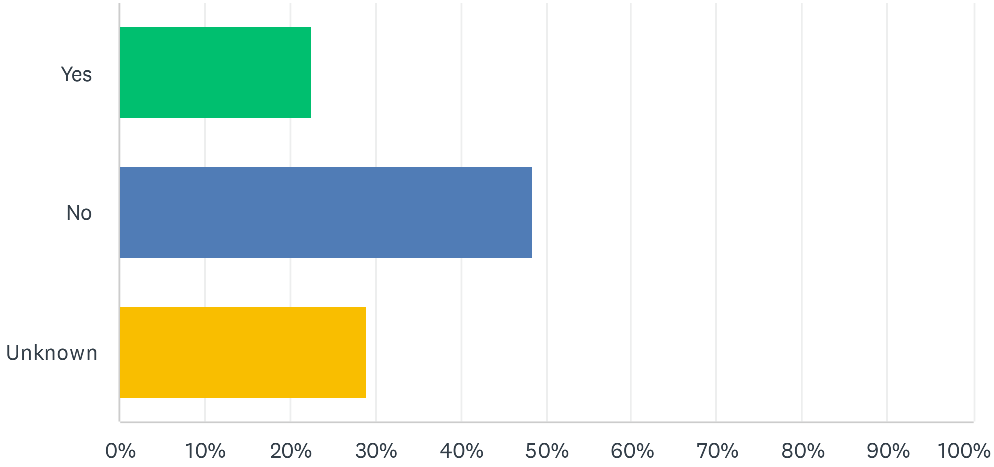
Q21 If you answered "Unknown" to the existing land use plan question above or have additional files (including files incompatible with the required survey format), please provide contact information so we can coordinate on how best to receive your files.

Answered: 3 Skipped: 118

#	RESPONSES	DATE
1	Kareem Dallo, City of El Paso's Floodplain Administrator	10/15/2021 4:04 PM
2	Leo Hung	10/2/2021 8:21 AM
3	Included within the City of El Paso land use and zoning plan. Unincorporated areas are not included within such plan.	9/29/2021 11:34 AM

Q22 Does your jurisdiction have a future land use plan or future zoning plan?

Answered: 31 Skipped: 90



ANSWER CHOICES	RESPONSES	
Yes	22.58%	7
No	48.39%	15
Unknown	29.03%	9
TOTAL		31

Q23 If you answered yes and your jurisdiction willing to share a copy of your future condition land use plan, please upload it below.

Answered: 0 Skipped: 121

#	FILE NAME	FILE SIZE	DATE
	There are no responses.		

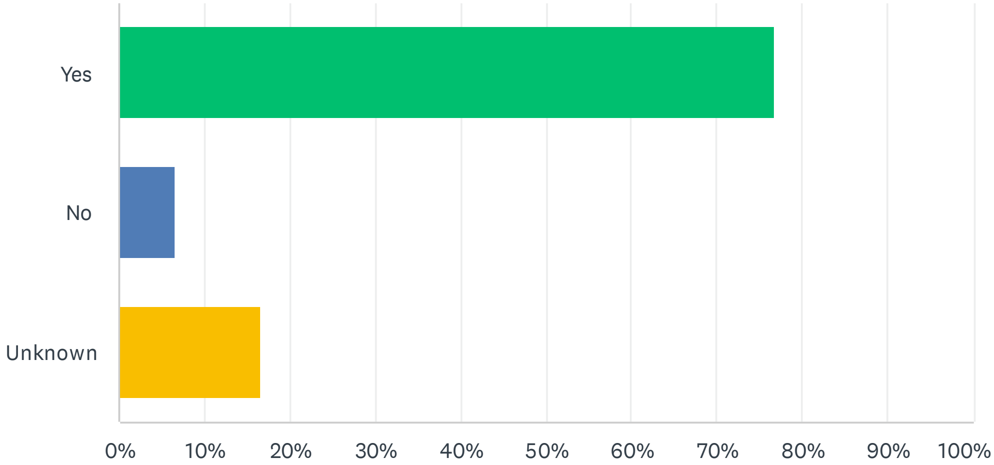
Q24 If you answered "Unknown" to the future land use plan question above or have additional files (including files incompatible with the required survey format), please provide contact information so we can coordinate on how best to receive your files.

Answered: 1 Skipped: 120

#	RESPONSES	DATE
1	Included within the City of El Paso land use and zoning plan. Unincorporated areas are not included within such plan.	9/29/2021 11:34 AM

Q25 In your opinion, should the RFPG recommend consistent minimum standards across the entire region?

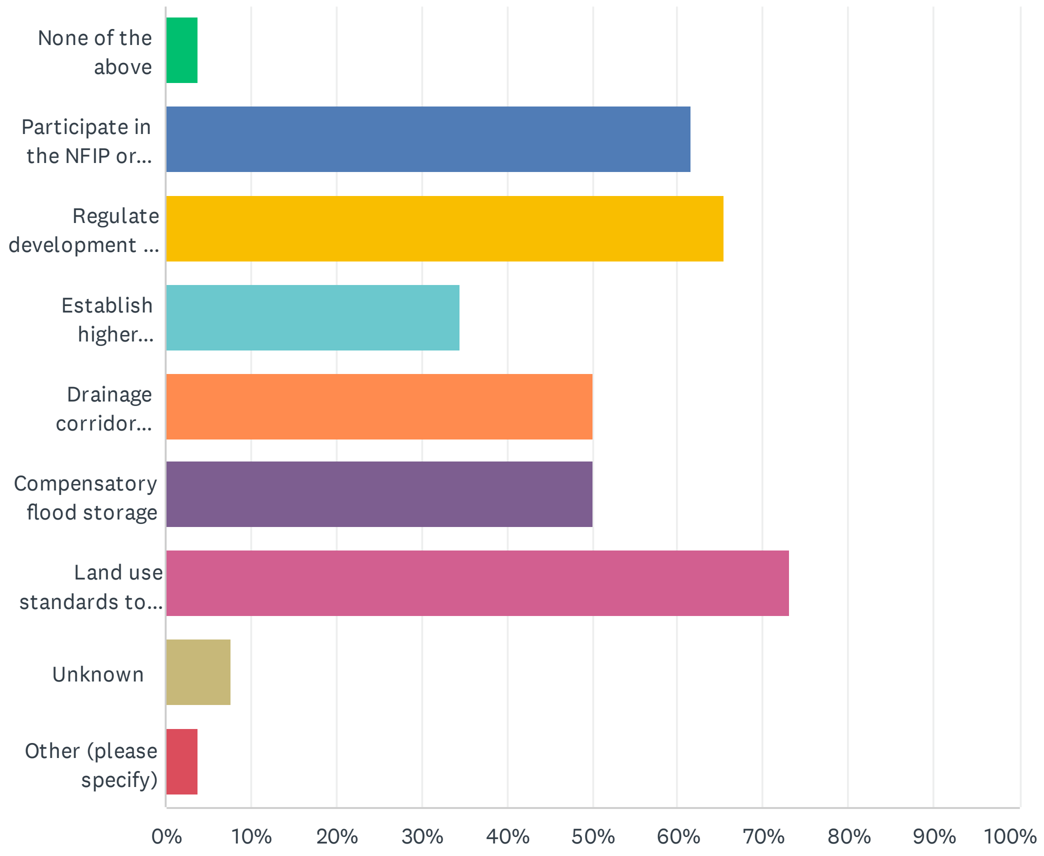
Answered: 30 Skipped: 91



ANSWER CHOICES	RESPONSES	
Yes	76.67%	23
No	6.67%	2
Unknown	16.67%	5
TOTAL		30

Q26 If you selected yes to the question above, what are the minimum standards the RFPG should recommend for all jurisdictions within the region? Select all that apply. This question pertains to RFPG recommendations only (in a following question, we will also ask for your feedback regarding minimum requirements).

Answered: 26 Skipped: 95

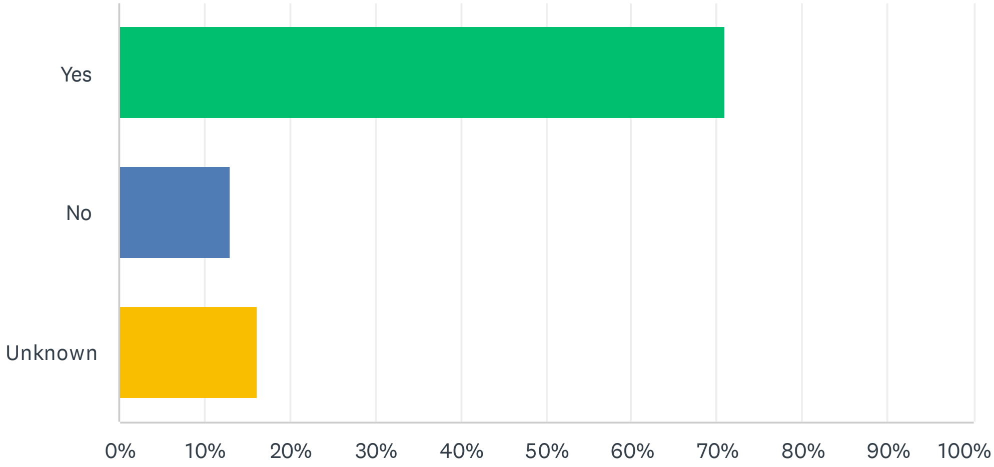


ANSWER CHOICES	RESPONSES	
None of the above	3.85%	1
Participate in the NFIP or adapt the equivalent standards	61.54%	16
Regulate development in the FEMA floodplain or other local floodplains established by local jurisdictions	65.38%	17
Establish higher standards (more stringent than the NFIP) for development or freeboard above the floodplain	34.62%	9
Drainage corridor preservation	50.00%	13
Compensatory flood storage	50.00%	13
Land use standards to reduce future flood risk	73.08%	19
Unknown	7.69%	2
Other (please specify)	3.85%	1
Total Respondents: 26		

#	OTHER (PLEASE SPECIFY)	DATE
1	Require coordination between all affected floodplain jurisdictions	8/17/2021 12:44 PM

Q27 In your opinion, should the RFPG require consistent minimum standards across the entire region?

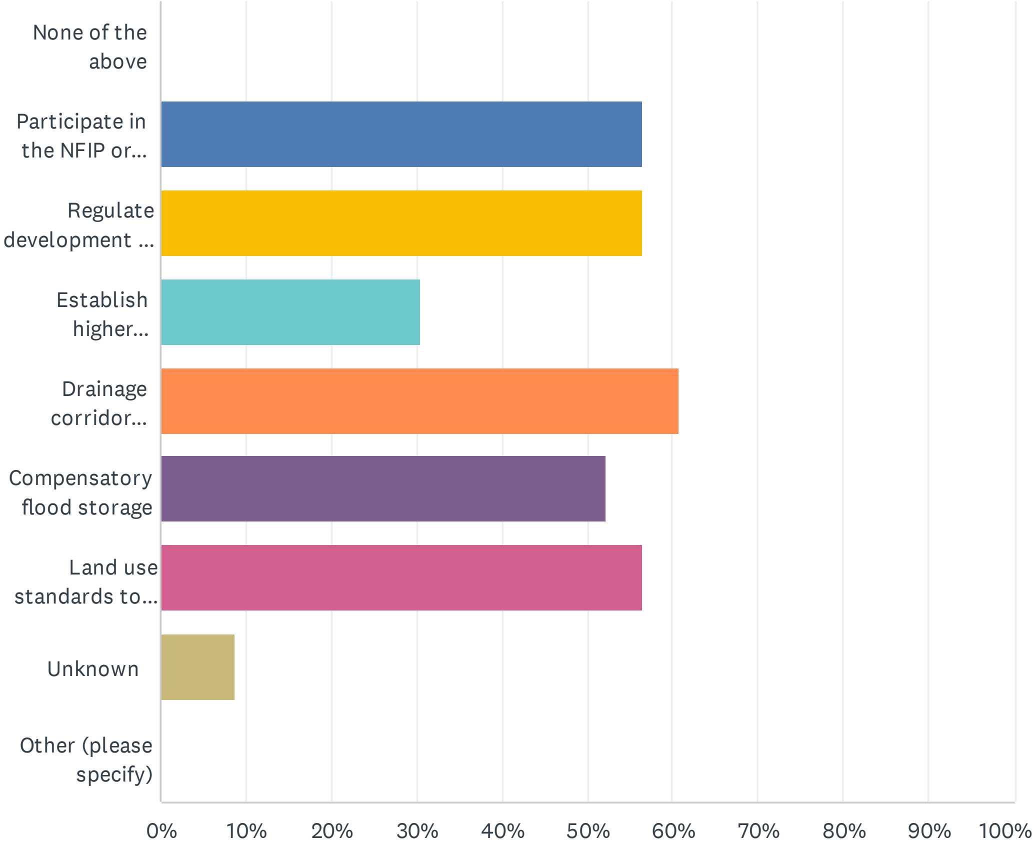
Answered: 31 Skipped: 90



ANSWER CHOICES	RESPONSES	
Yes	70.97%	22
No	12.90%	4
Unknown	16.13%	5
TOTAL		31

Q28 If you selected yes to the question above, what are the minimum standards the RFPG should require for all jurisdictions within the region? Select all that apply.

Answered: 23 Skipped: 98

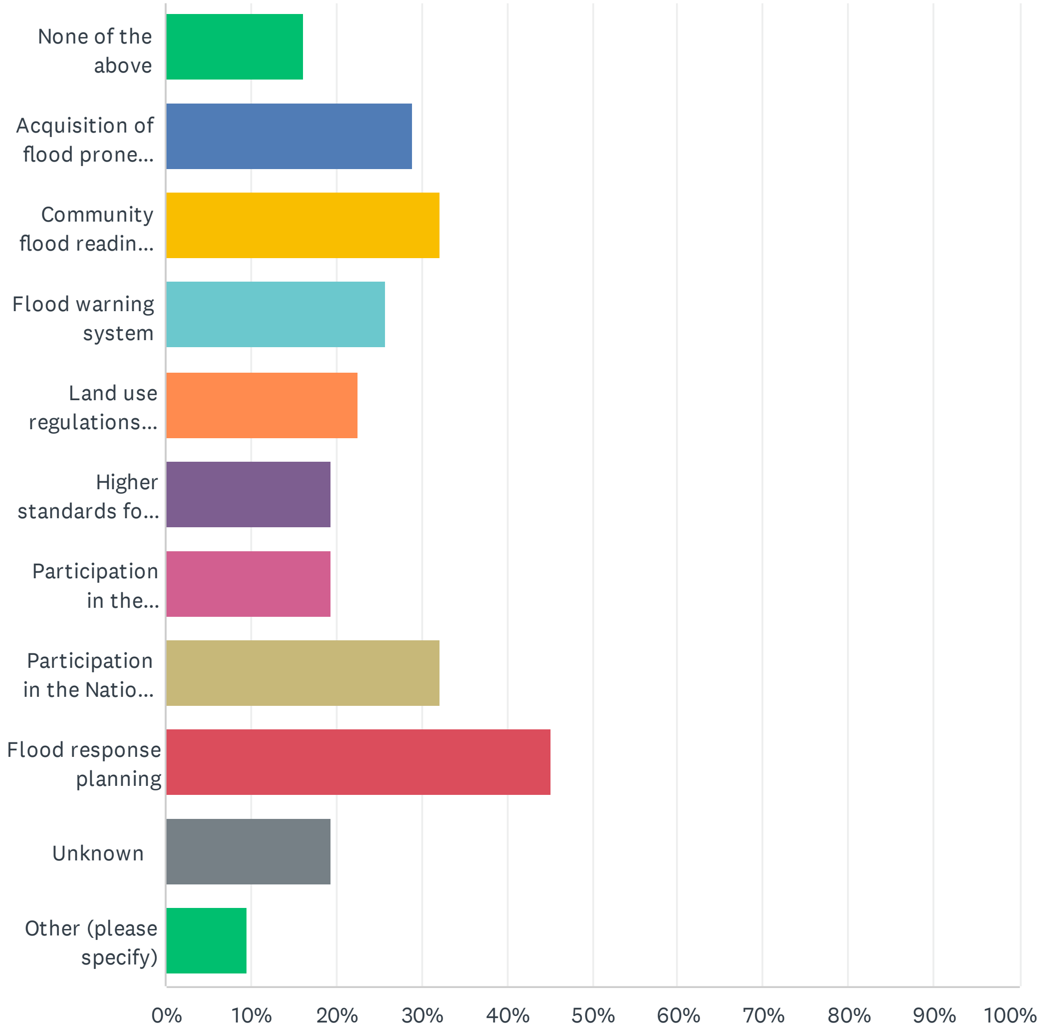


ANSWER CHOICES	RESPONSES	
None of the above	0.00%	0
Participate in the NFIP or adapt the equivalent standards	56.52%	13
Regulate development in the FEMA floodplain or other local floodplains established by local jurisdictions	56.52%	13
Establish higher standards (more stringent than the NFIP) for development or freeboard above the floodplain	30.43%	7
Drainage corridor preservation	60.87%	14
Compensatory flood storage	52.17%	12
Land use standards to reduce future flood risk	56.52%	13
Unknown	8.70%	2
Other (please specify)	0.00%	0
Total Respondents: 23		

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

Q29 Select the measures your jurisdiction is taking to promote resilience within flood-prone areas. Select all that apply.

Answered: 31 Skipped: 90

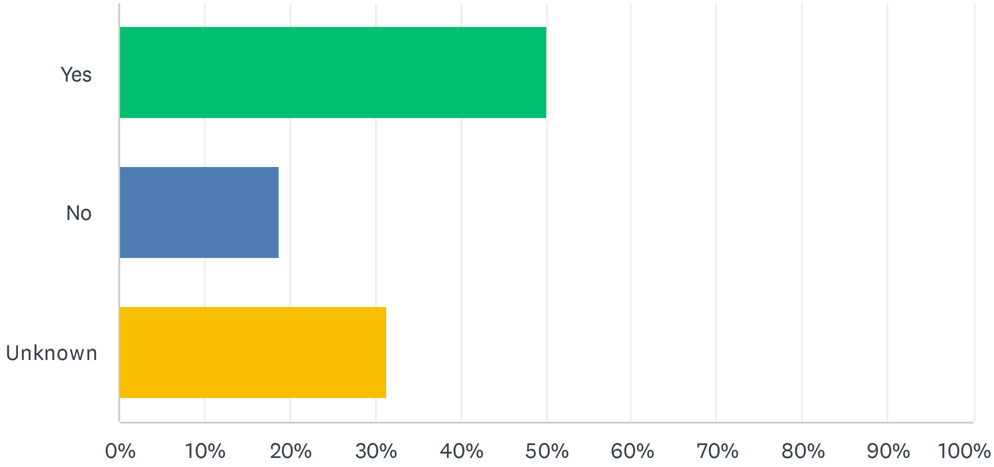


ANSWER CHOICES	RESPONSES	
None of the above	16.13%	5
Acquisition of flood prone properties	29.03%	9
Community flood readiness education and training	32.26%	10
Flood warning system	25.81%	8
Land use regulations that limit future flood risk	22.58%	7
Higher standards for floodplain management	19.35%	6
Participation in the Community Rating System (CRS)	19.35%	6
Participation in the National Flood Insurance Program (NFIP)	32.26%	10
Flood response planning	45.16%	14
Unknown	19.35%	6
Other (please specify)	9.68%	3
Total Respondents: 31		

#	OTHER (PLEASE SPECIFY)	DATE
1	FLOOD MITIGATION	10/15/2021 1:29 PM
2	USACE is informing communities of the risks of living behind a levee by updating Levee Inventory in the National Levee Database(https://levees.sec.usace.army.mil/#/), performing Levee Risk Screening,and communicating the result to sponsors and owner of the levee sytem. Will help sponsors communicate risk to communities.	10/7/2021 2:17 PM
3	Learning the process of mitigation and engagement	10/1/2021 9:50 PM

Q30 Does your jurisdiction wish to include floodplain management goals in the regional flood plan?

Answered: 32   Skipped: 89



ANSWER CHOICES	RESPONSES	
Yes	50.00%	16
No	18.75%	6
Unknown	31.25%	10
TOTAL		32

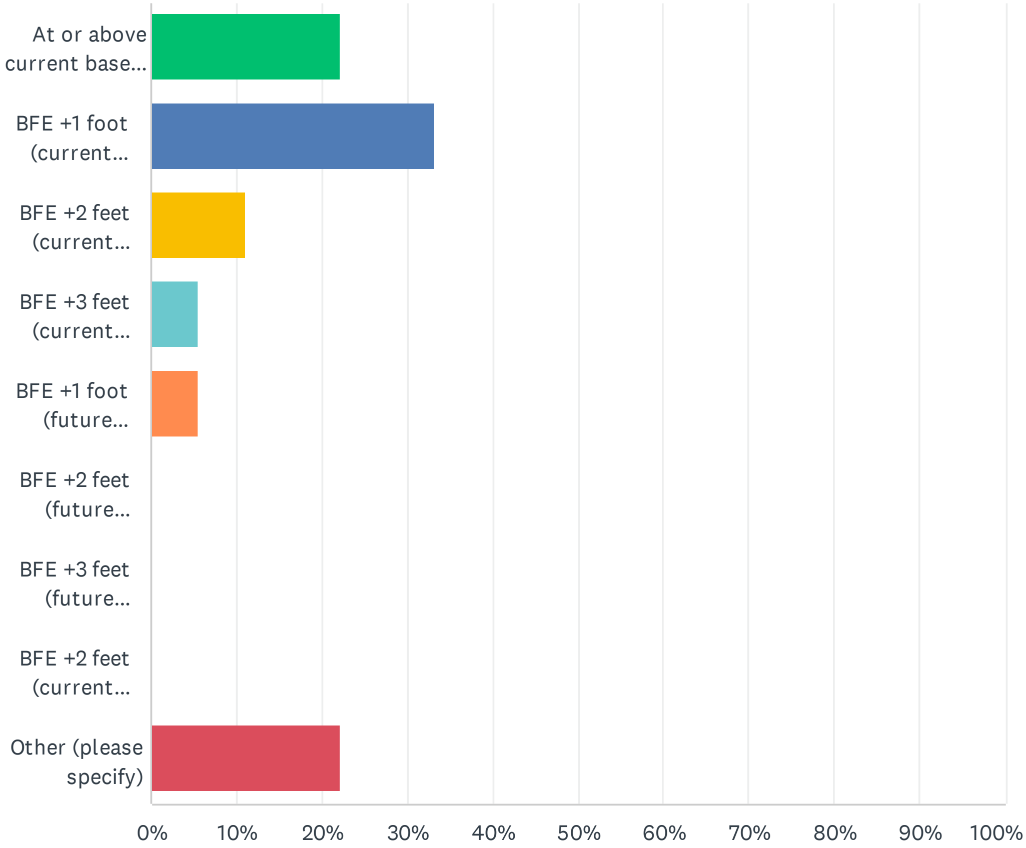
Q31 If you selected yes to the question above, please provide your desired goals, including whether it is a short term (10-year) or long term (30-year) goal, the location or other applicability of goal (i.e., local or regional), flood risk reduction of goal (i.e., structures at risk), as well as the method to measure the goal. Please also include a point of contact for follow-up.

Answered: 8 Skipped: 113

#	RESPONSES	DATE
1	FLOOD MITIGATION PLAN	10/15/2021 1:29 PM
2	Controlling the flooding of our town because of drainage issues on private property	10/14/2021 9:54 AM
3	Short term. Many houses and streets in the community that flood and create some sort of hazard.	10/5/2021 9:37 PM
4	About 300 homes were affect during the flood of 2018. Short term goal is work on storm water drainage. Long term goal is to acquire all property within the flood plain.	9/30/2021 1:36 PM
5	long term, flood risk reduction	9/30/2021 11:21 AM
6	Continuous investment in flood control infrastructure throughout the County	9/29/2021 11:34 AM
7	Particular goals are not determined to-date.	9/21/2021 12:29 PM
8	TBD	8/17/2021 12:44 PM

Q32 Which of the following described the higher standards required by your jurisdiction?

Answered: 18 Skipped: 103



ANSWER CHOICES	RESPONSES	
At or above current base flood elevation (BFE)	22.22%	4
BFE +1 foot (current 100-year conditions)	33.33%	6
BFE +2 feet (current 100-year conditions)	11.11%	2
BFE +3 feet (current 100-year conditions)	5.56%	1
BFE +1 foot (future 100-year conditions)	5.56%	1
BFE +2 feet (future 100-year conditions)	0.00%	0
BFE +3 feet (future 100-year conditions)	0.00%	0
BFE +2 feet (current 500-year conditions)	0.00%	0
Other (please specify)	22.22%	4
TOTAL		18

#	OTHER (PLEASE SPECIFY)	DATE

1	Need more information before responding	10/14/2021 9:58 AM
2	Unknown	10/14/2021 9:54 AM
3	USACE conducts a feasibility study and evaluates the Federal Interest to determine the National Economic Development Plan based on a benefits versus costs analysis for Flood Risk Reduction projects.	10/7/2021 2:17 PM
4	N/A	9/24/2021 12:46 PM

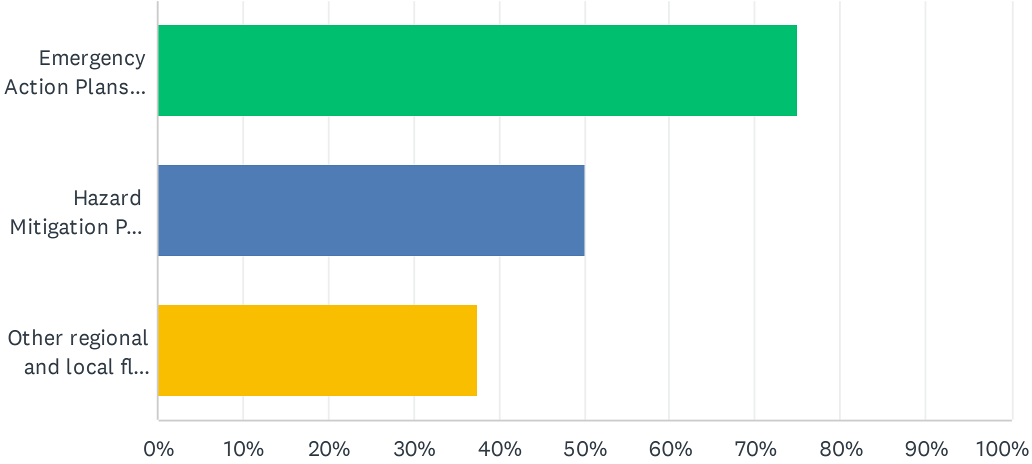
Q33 If you have any suggestions for improved legislative authority for increased floodplain management standards, please note them below.

Answered: 4 Skipped: 117

#	RESPONSES	DATE
1	State Legislation involvement with making bridge on HWY 277 South wider. This was a major choke point during our last flood.	9/30/2021 1:36 PM
2	Provide Texas Counties with the authority to institute land use and zoning regulations.	9/29/2021 11:34 AM
3	None at this time. Reeves County must have a County-wide floodplain study for any legislative authority.	9/21/2021 12:29 PM
4	TBD	8/17/2021 12:44 PM

Q34 Which of the following planning documents or information does your jurisdiction have that you would like to provide to the regional flood planning group? Select all that apply.

Answered: 8 Skipped: 113



ANSWER CHOICES	RESPONSES	
Emergency Action Plans (flood-related portions)	75.00%	6
Hazard Mitigation Plan (HMP)	50.00%	4
Other regional and local flood planning studies	37.50%	3
Total Respondents: 8		

Q35 If you selected one of planning document types above and your jurisdiction is willing to provide a copy, please upload it below.

Answered: 0 Skipped: 121

#	FILE NAME	FILE SIZE	DATE
	There are no responses.		

Note: Q36 responses have been partially redacted to omit phone numbers and email addresses for privacy

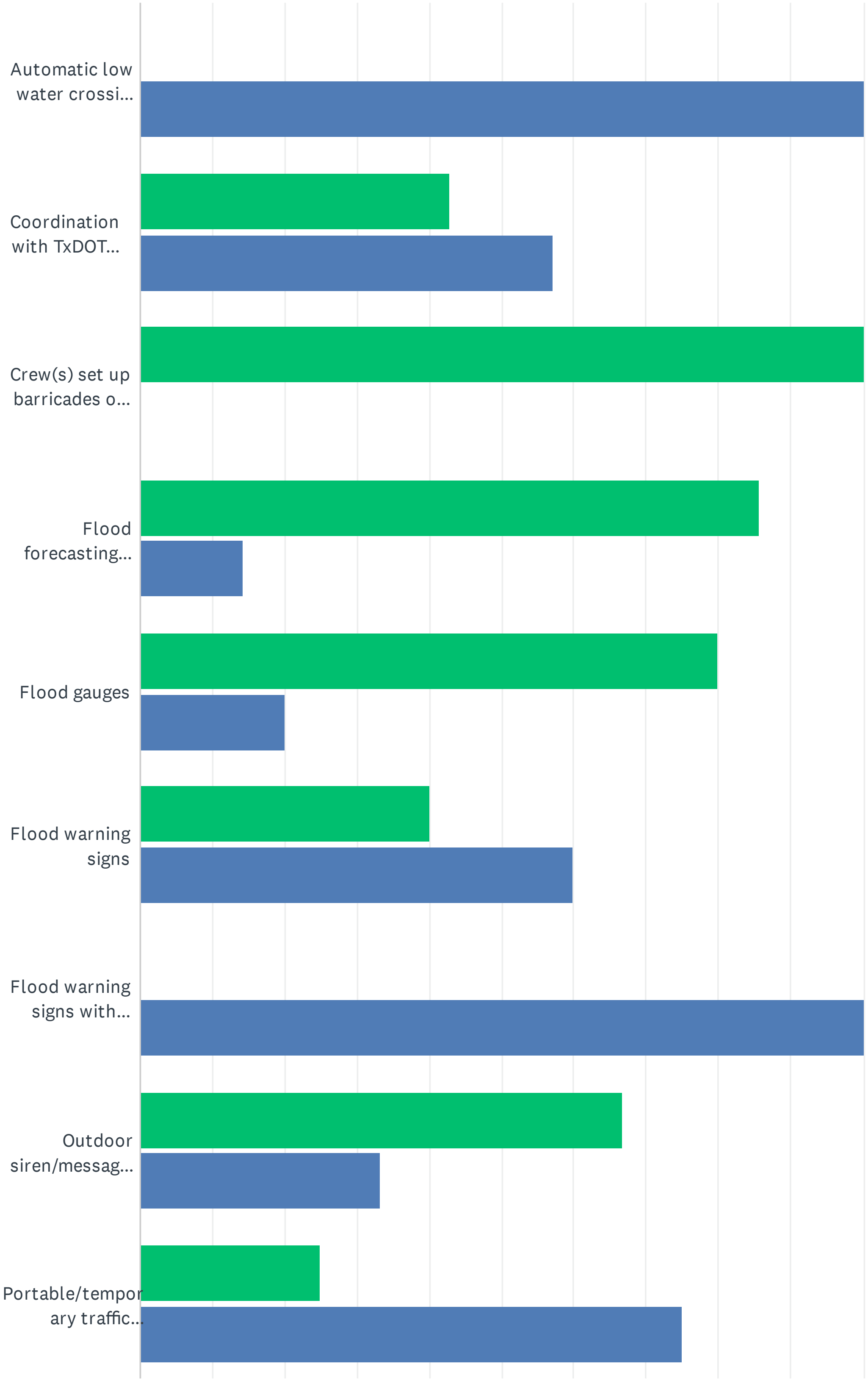
Q36 If you have additional files or files related to hazard mitigation and emergency planning, (including files that are incompatible with the required survey file formats) please provide contact information so we can coordinate on how best to receive your files.

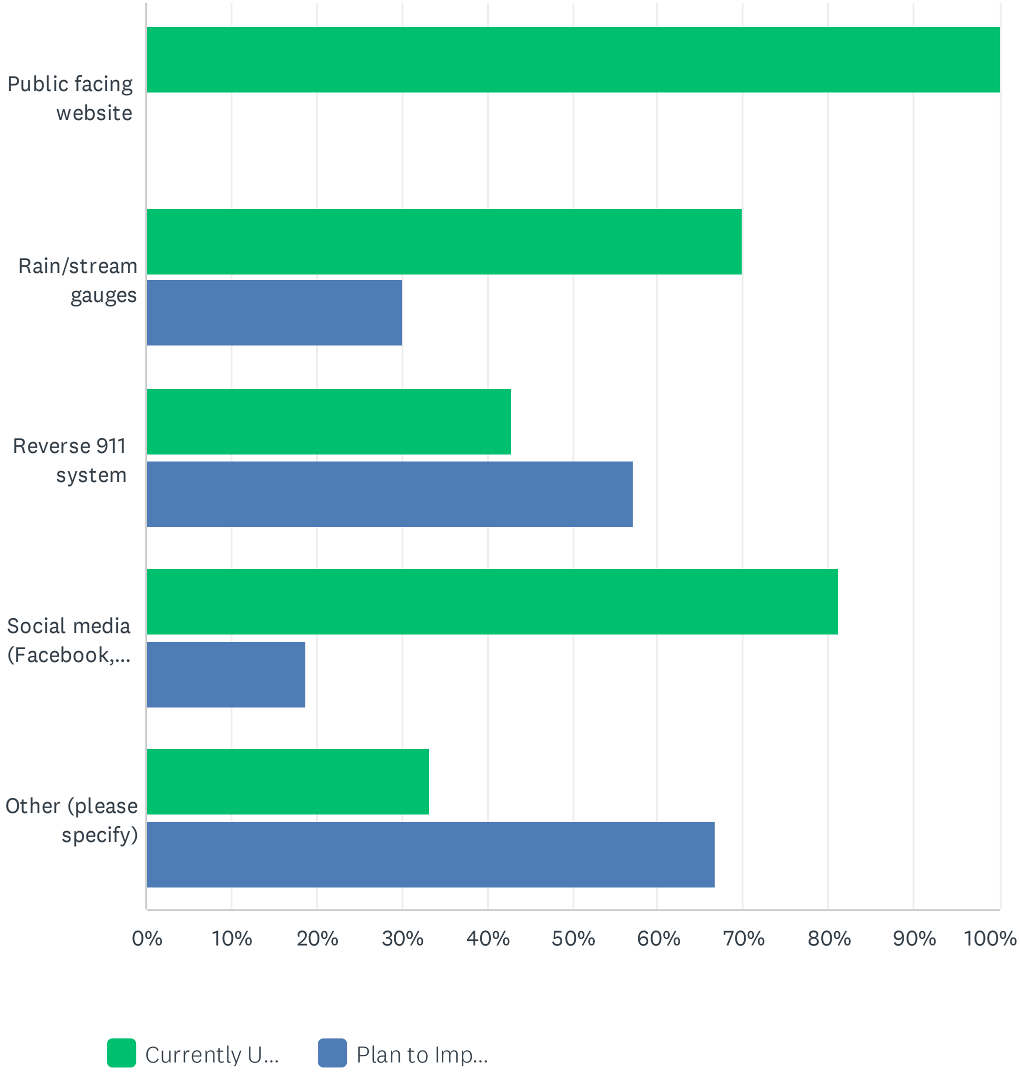
Answered: 3 Skipped: 118

#	RESPONSES	DATE
1	Gisela Dagnino [redacted]	10/15/2021 4:07 PM
2	N/A	9/24/2021 12:50 PM
3	City of El Paso/County Office of Emergency Management	8/17/2021 12:56 PM

Q37 Select the emergency response measures your jurisdiction currently uses or plans to implement for flood events. Select all that apply.

Answered: 20 Skipped: 101

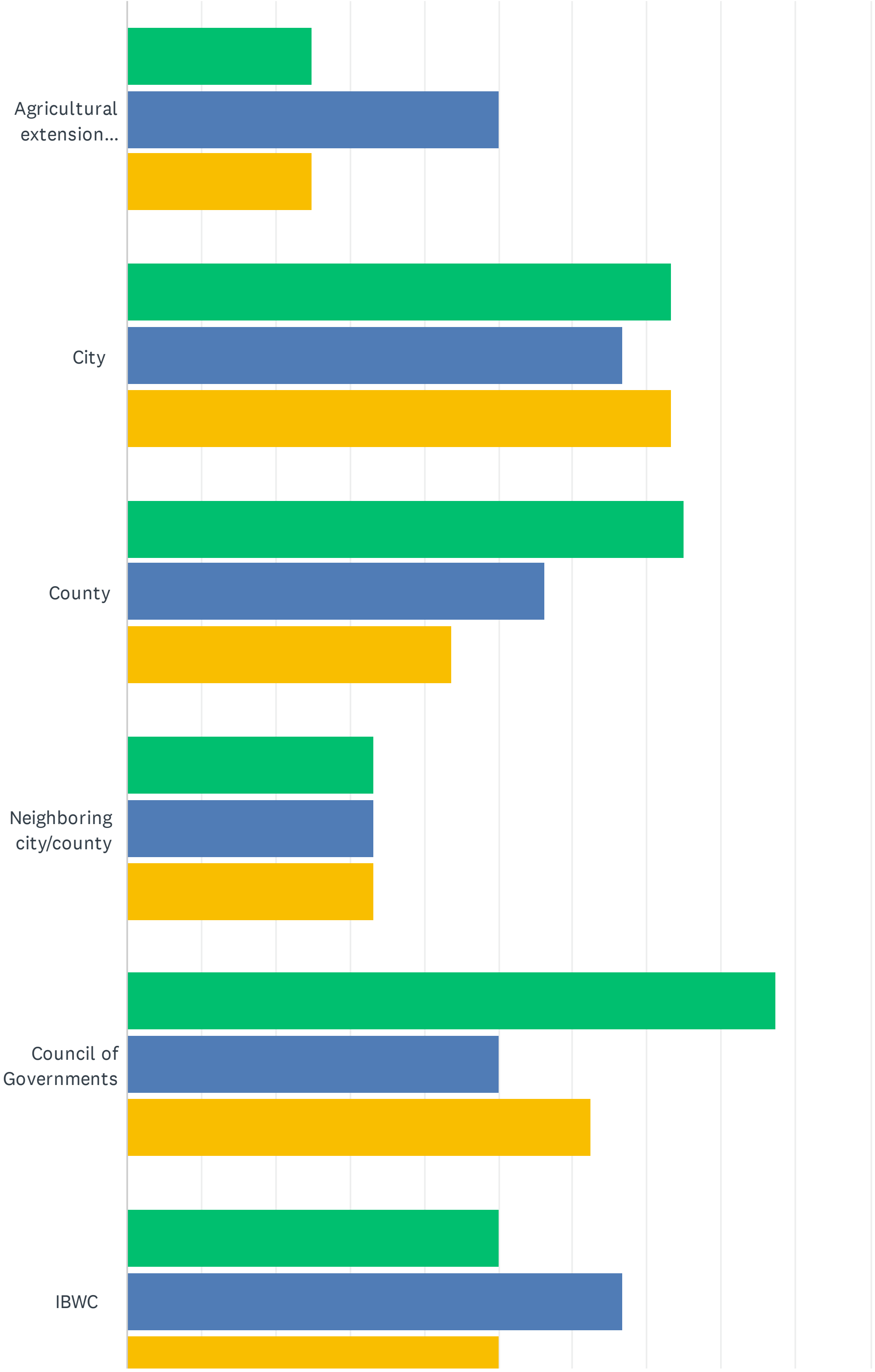


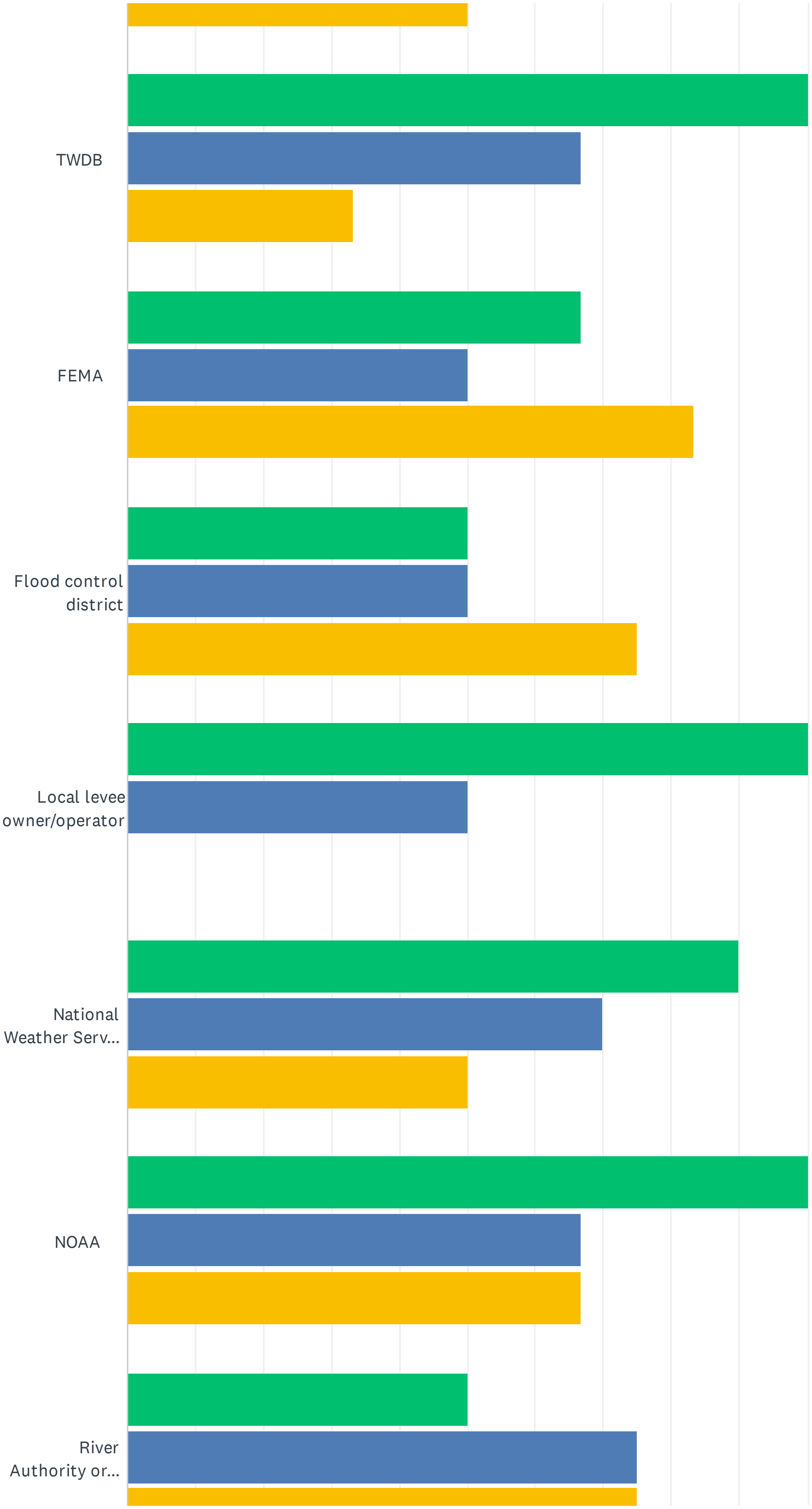

Public facing website
Rain/stream gauges
Reverse 911 system
Social media (Facebook,...
Other (please specify)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Currently U...
Plan to Imp...

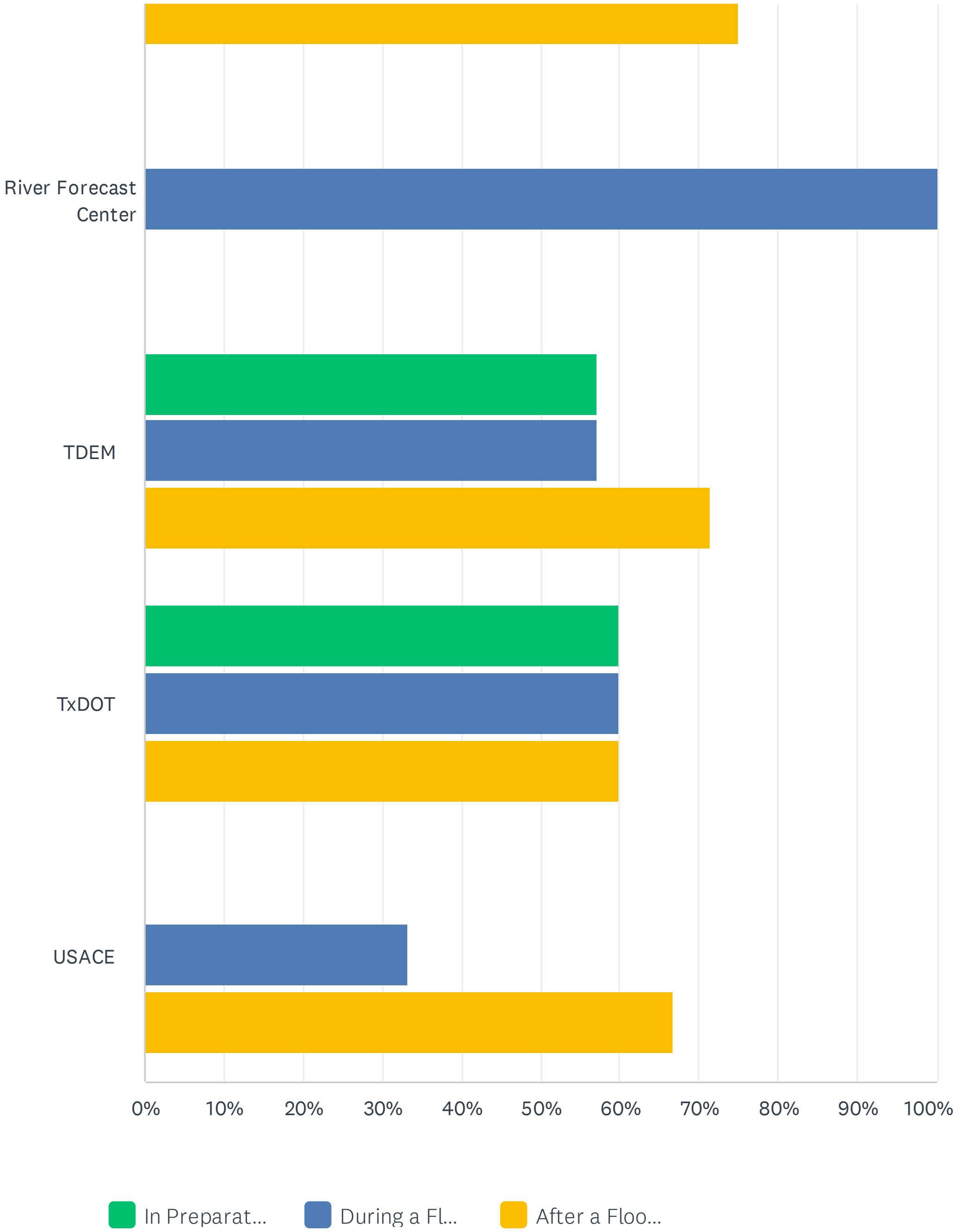
	CURRENTLY USE	PLAN TO IMPLEMENT	TOTAL	WEIGHTED AVERAGE
Automatic low water crossings (LWCs)	0.00% 0	100.00% 5	5	2.00
Coordination with TxDOT (message boards or real-time traffic control management)	42.86% 3	57.14% 4	7	1.57
Crew(s) set up barricades or close gates	100.00% 14	0.00% 0	14	1.00
Flood forecasting tool	85.71% 6	14.29% 1	7	1.14
Flood gauges	80.00% 8	20.00% 2	10	1.20
Flood warning signs	40.00% 4	60.00% 6	10	1.60
Flood warning signs with flashing lights	0.00% 0	100.00% 8	8	2.00
Outdoor siren/message speaker system	66.67% 4	33.33% 2	6	1.33
Portable/temporary traffic message boards	25.00% 2	75.00% 6	8	1.75
Public facing website	100.00% 7	0.00% 0	7	1.00
Rain/stream gauges	70.00% 7	30.00% 3	10	1.30
Reverse 911 system	42.86% 3	57.14% 4	7	1.57
Social media (Facebook, Twitter, etc.)	81.25% 13	18.75% 3	16	1.19
Other (please specify)	33.33% 1	66.67% 2	3	1.67

Q38 Indicate the entities with whom you coordinate to improve flood response in preparation for a flood event, during a flood event and after a flood event. Please select all that apply.

Answered: 23 Skipped: 98



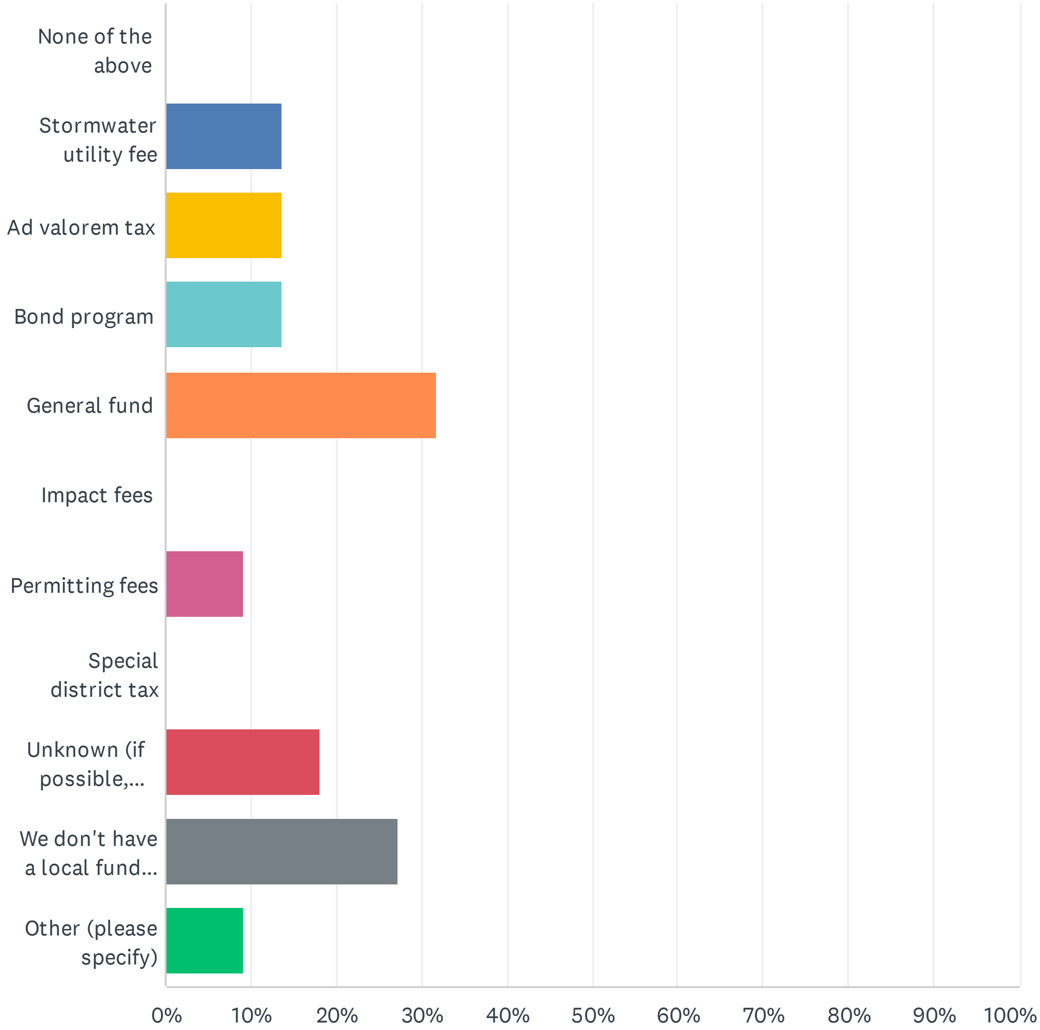

TWDB
FEMA
Flood control district
Local levee owner/operator
National Weather Serv...
NOAA
River Authority or...


River Forecast Center
TDEM
TxDOT
USACE
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
In Preparat...
During a Fl...
After a Floo...

	IN PREPARATION FOR A FLOOD EVENT	DURING A FLOOD EVENT	AFTER A FLOOD EVENT	TOTAL RESPONDENTS
Agricultural extension agents	25.00% 1	50.00% 2	25.00% 1	4
City	73.33% 11	66.67% 10	73.33% 11	15
County	75.00% 12	56.25% 9	43.75% 7	16
Neighboring city/county	33.33% 1	33.33% 1	33.33% 1	3
Council of Governments	87.50% 7	50.00% 4	62.50% 5	8
IBWC	50.00% 3	66.67% 4	50.00% 3	6
TWDB	100.00% 3	66.67% 2	33.33% 1	3
FEMA	66.67% 4	50.00% 3	83.33% 5	6
Flood control district	50.00% 2	50.00% 2	75.00% 3	4
Local levee owner/operator	100.00% 2	50.00% 1	0.00% 0	2
National Weather Service (NWS)	90.00% 9	70.00% 7	50.00% 5	10
NOAA	100.00% 3	66.67% 2	66.67% 2	3
River Authority or Water District	50.00% 2	75.00% 3	75.00% 3	4
River Forecast Center	0.00% 0	100.00% 2	0.00% 0	2
TDEM	57.14% 4	57.14% 4	71.43% 5	7
TxDOT	60.00% 6	60.00% 6	60.00% 6	10
USACE	0.00% 0	33.33% 1	66.67% 2	3

Q39 Which of the following describes your local funding sources for flood management activities within the last five years. Select all that apply.

Answered: 22   Skipped: 99



ANSWER CHOICES	RESPONSES	
None of the above	0.00%	0
Stormwater utility fee	13.64%	3
Ad valorem tax	13.64%	3
Bond program	13.64%	3
General fund	31.82%	7
Impact fees	0.00%	0
Permitting fees	9.09%	2
Special district tax	0.00%	0
Unknown (if possible, please provide point of contact for follow up in the "Other" comment box below)	18.18%	4
We don't have a local funding source for flood management activities	27.27%	6
Other (please specify)	9.09%	2
Total Respondents: 22		

#	OTHER (PLEASE SPECIFY)	DATE
1	federal funding	10/15/2021 5:15 PM
2	TWDB FIF grants/loan	8/17/2021 1:06 PM

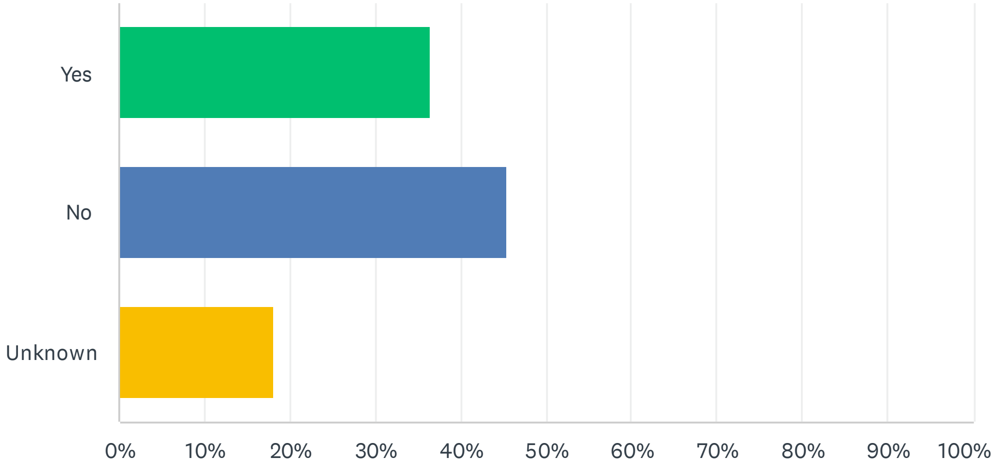
Q40 If your community has received funding for storm-water related infrastructure projects in the last 5 years or has been selected to receive funding in the near term future, can you please provide a list of projects funded with outside sources and the funding sources utilized for each? If you would prefer that we follow up with you via email following the survey, please indicate so in the question response field.

Answered: 4 Skipped: 117

#	RESPONSES	DATE
1	USACE - Central Dams Feasibility Study TWDB - Will Ruth Pond and Conveyance Improvements	10/15/2021 4:11 PM
2	NOT RECENTLY	10/15/2021 1:32 PM
3	N/A	9/24/2021 12:52 PM
4	HAC7 - TWDB FIF program SSA1 - TWDB FIF program	8/17/2021 1:06 PM

Q41 Does your organization maintain a list of future stormwater related projects for future implementation, regardless of whether funding is currently available (e.g., capital expenditure plan, etc.)?

Answered: 22 Skipped: 99



ANSWER CHOICES	RESPONSES	
Yes	36.36%	8
No	45.45%	10
Unknown	18.18%	4
TOTAL		22

Q42 If you answered yes and your jurisdiction is willing to provide further information, please upload.

Answered: 0 Skipped: 121

#	FILE NAME	FILE SIZE	DATE
	There are no responses.		

Q43 If you have additional files or files related to funding for future stormwater infrastructure, (including files that are incompatible with the required survey file formats) please provide contact information so we can coordinate on how best to receive your files.

Answered: 3 Skipped: 118

#	RESPONSES	DATE
1	N/A	10/2/2021 8:30 AM
2	N/A	9/24/2021 12:52 PM
3	2020 Stormwater Master Plan - AECOM	8/17/2021 1:06 PM

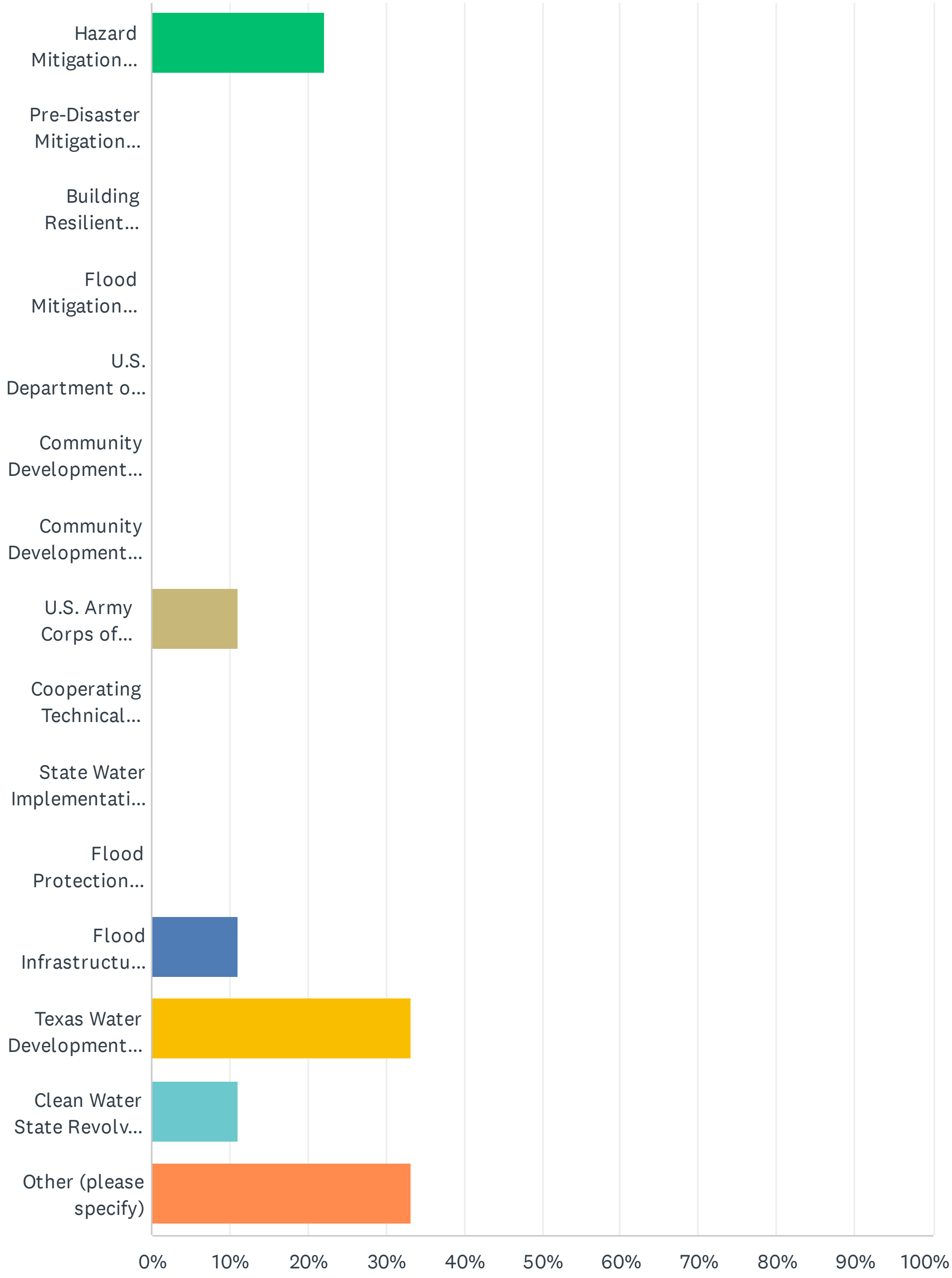
Q44 If you have a stormwater utility fee, what is the rate?

Answered: 5 Skipped: 116

#	RESPONSES	DATE
1	Refer to EPWater's website	10/15/2021 4:11 PM
2	4.51	10/12/2021 3:25 PM
3	N/A	10/2/2021 8:30 AM
4	N/A	9/24/2021 12:52 PM
5	N/A	8/17/2021 1:06 PM

Q45 In addition to local resources, if any, what other funding sources have you obtained to pay for implementation of your flood management activities? Select all that apply.

Answered: 9 Skipped: 112

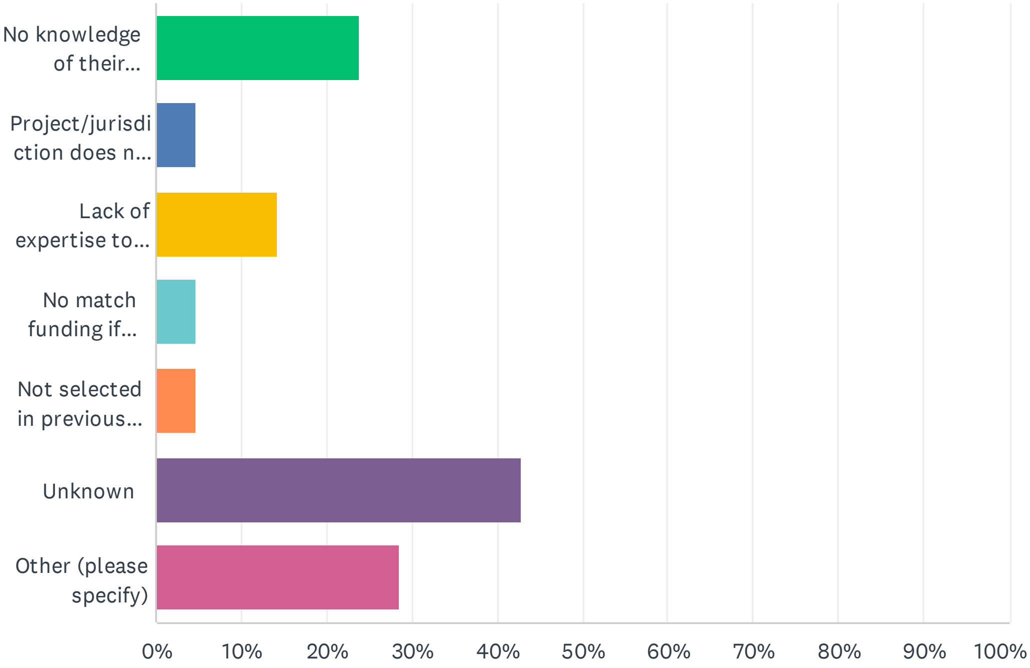


ANSWER CHOICES	RESPONSES	
Hazard Mitigation Grant Program (HMGP) [FEMA, TDEM]	22.22%	2
Pre-Disaster Mitigation (PDM) [FEMA, TDEM]	0.00%	0
Building Resilient Infrastructure and Communities (BRIC) [FEMA, TDEM]	0.00%	0
Flood Mitigation Agriculture (FMA) [FEMA, TDEM]	0.00%	0
U.S. Department of Agriculture - National Resources Conservation Service (NRCS)	0.00%	0
Community Development Block Grant - Disaster Recovery (CDNG-DR) [HUD, GLO]	0.00%	0
Community Development Block Grant - Mitigation (CDNG-DMIT) [HUD, GLO]	0.00%	0
U.S. Army Corps of Engineers Small Continuing Authorities Program (USACE CAP)	11.11%	1
Cooperating Technical Partners (CTP) [TWDB]	0.00%	0
State Water Implementation Fund for Texas (SWIFT) [TWDB]	0.00%	0
Flood Protection Planning Grant [TWDB]	0.00%	0
Flood Infrastructure Funding (FIF) [TWDB]	11.11%	1
Texas Water Development Board (DFund) [TWDB]	33.33%	3
Clean Water State Revolving Fund (CWSRF) [TWDB]	11.11%	1
Other (please specify)	33.33%	3
Total Respondents: 9		

#	OTHER (PLEASE SPECIFY)	DATE
1	Best Practices	10/14/2021 10:01 AM
2	nadb	10/12/2021 3:25 PM
3	N/A	9/24/2021 12:52 PM

Q46 Are there reasons why your jurisdiction does not seek other funding sources to pay for implementation of your flood management activities? Select all that apply?

Answered: 21 Skipped: 100



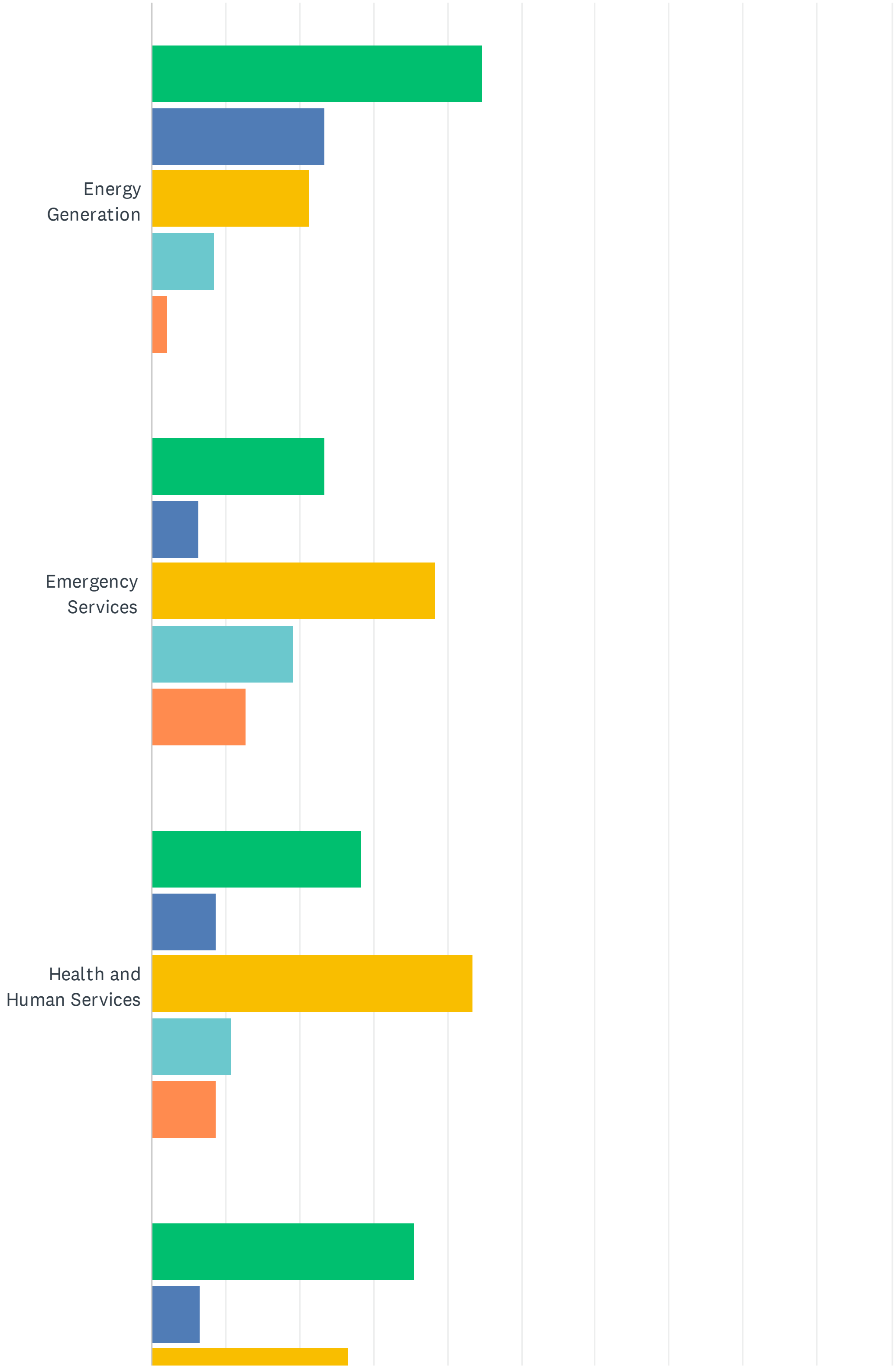
ANSWER CHOICES	RESPONSES	
No knowledge of their funding sources	23.81%	5
Project/jurisdiction does not meet requirements	4.76%	1
Lack of expertise to apply for funding	14.29%	3
No match funding if required local share	4.76%	1
Not selected in previous submissions by funding agents	4.76%	1
Unknown	42.86%	9
Other (please specify)	28.57%	6
Total Respondents: 21		

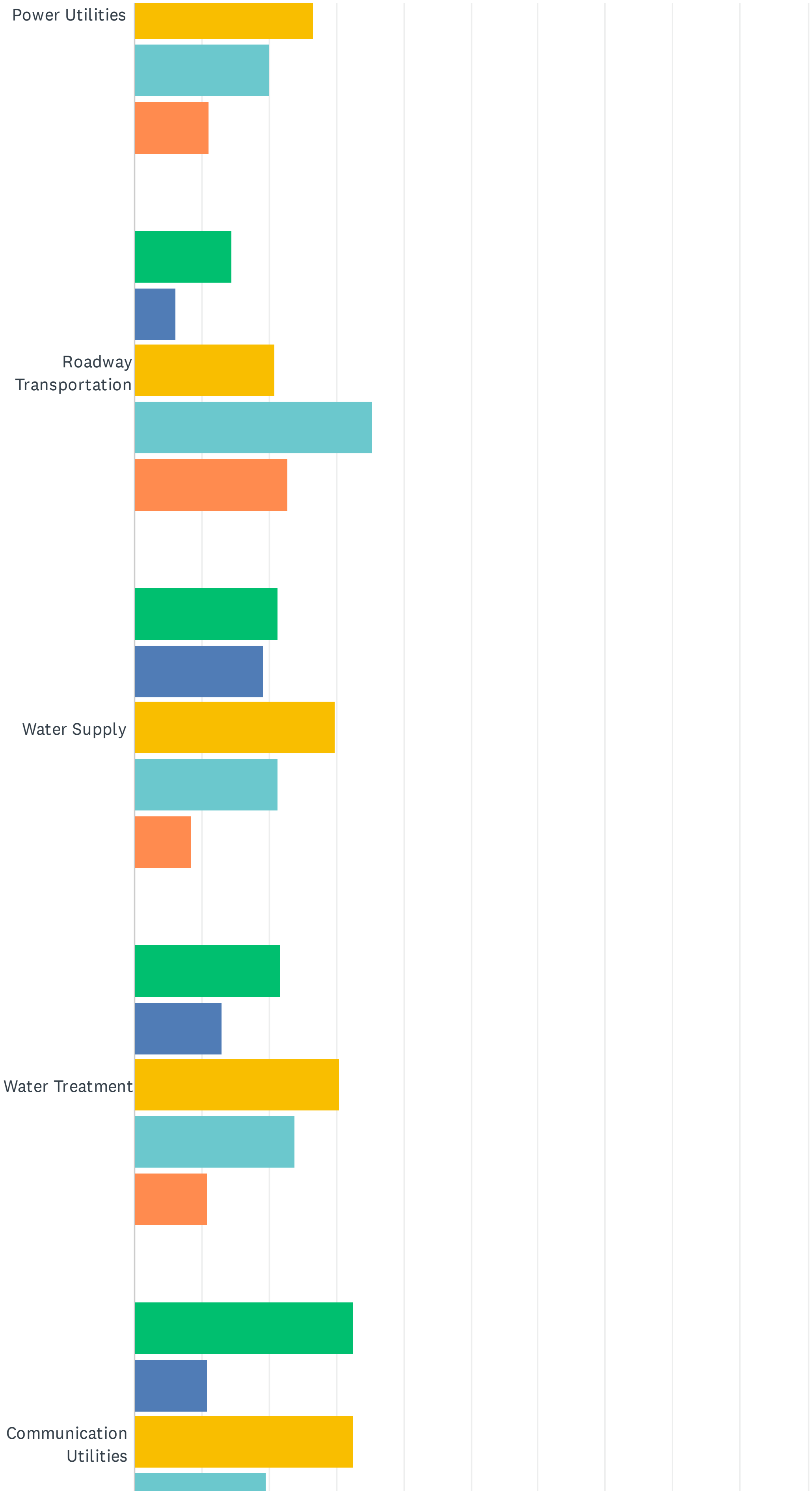
#	OTHER (PLEASE SPECIFY)	DATE
1	federally-funded projects cannot be augmented with local funds	10/15/2021 5:15 PM
2	We are always seeking other funding opportunities	10/15/2021 4:11 PM
3	Have applied and not been awarded	10/13/2021 2:50 PM
4	Counties resposobility	9/24/2021 12:52 PM
5	Obtained differnt type of funding	9/20/2021 11:43 AM

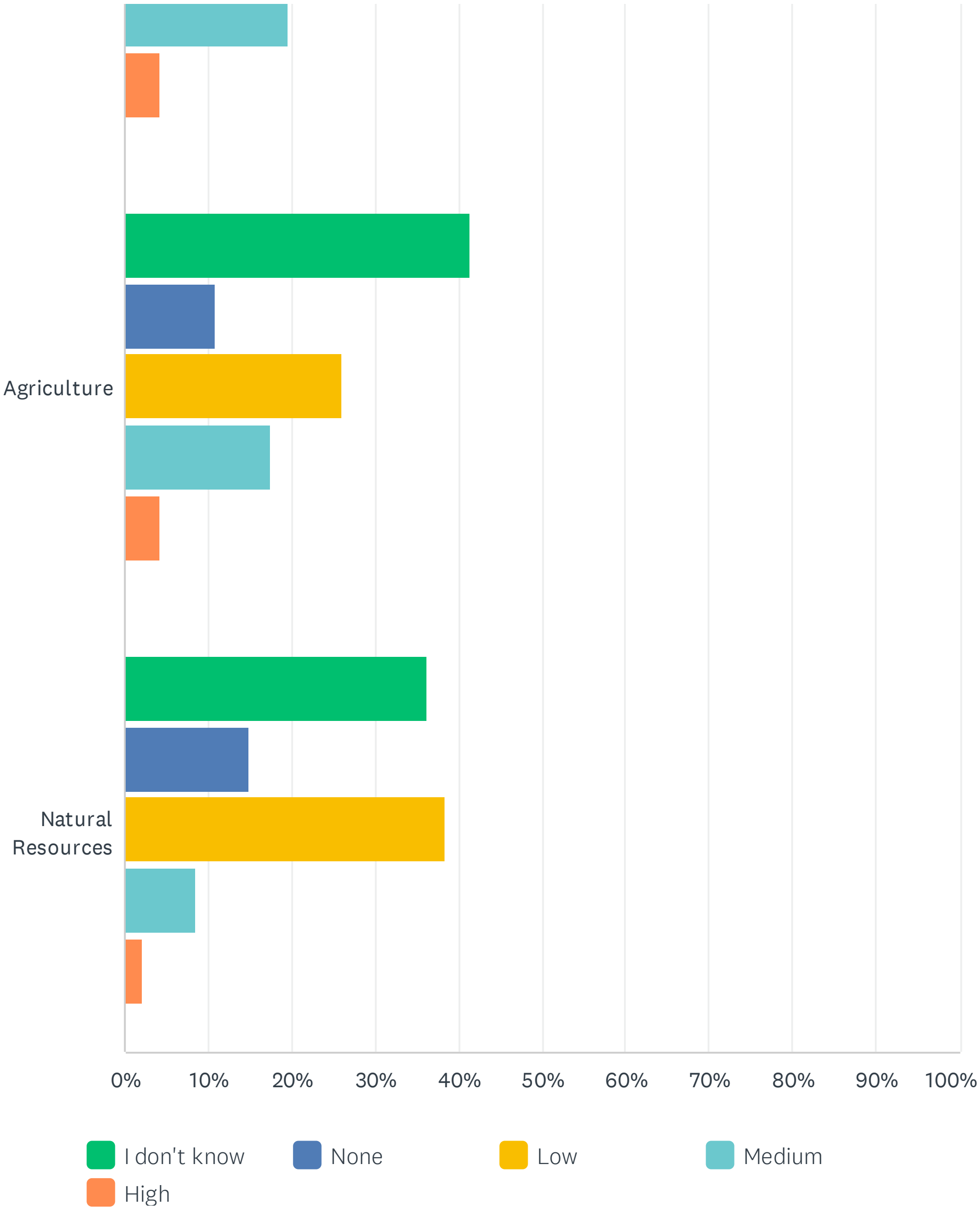
6	Not selected in previous submissions	8/17/2021 1:06 PM

Q47 Based upon experience with the past floods and findings from studies, please indicate the anticipated exposure to flooding for the following assets/service categories within your jurisdiction.

Answered: 50 Skipped: 71



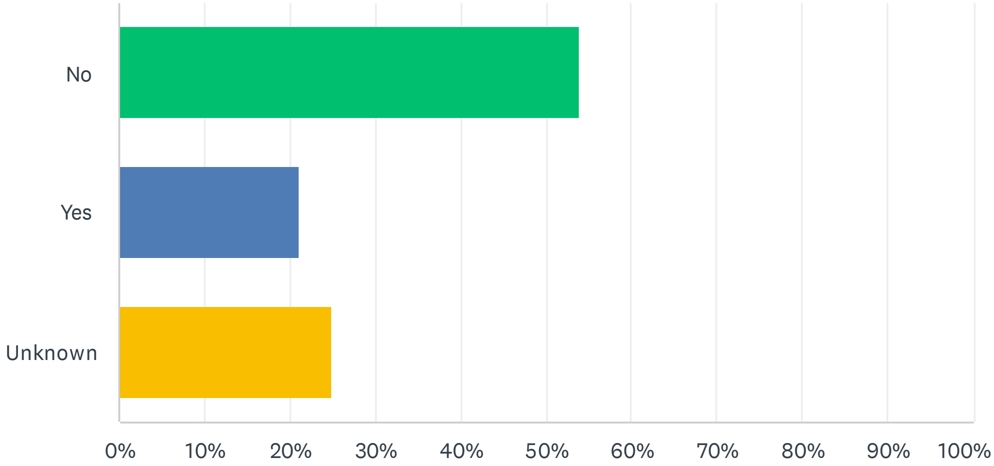

Power Utilities
Roadway Transportation
Water Supply
Water Treatment
Communication Utilities


Agriculture
Natural Resources
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
I don't know
None
Low
Medium
High

	I DON'T KNOW	NONE	LOW	MEDIUM	HIGH	TOTAL
Energy Generation	44.68% 21	23.40% 11	21.28% 10	8.51% 4	2.13% 1	47
Emergency Services	23.40% 11	6.38% 3	38.30% 18	19.15% 9	12.77% 6	47
Health and Human Services	28.26% 13	8.70% 4	43.48% 20	10.87% 5	8.70% 4	46
Power Utilities	35.56% 16	6.67% 3	26.67% 12	20.00% 9	11.11% 5	45
Roadway Transportation	14.58% 7	6.25% 3	20.83% 10	35.42% 17	22.92% 11	48
Water Supply	21.28% 10	19.15% 9	29.79% 14	21.28% 10	8.51% 4	47
Water Treatment	21.74% 10	13.04% 6	30.43% 14	23.91% 11	10.87% 5	46
Communication Utilities	32.61% 15	10.87% 5	32.61% 15	19.57% 9	4.35% 2	46
Agriculture	41.30% 19	10.87% 5	26.09% 12	17.39% 8	4.35% 2	46
Natural Resources	36.17% 17	14.89% 7	38.30% 18	8.51% 4	2.13% 1	47

Q48 Does your organization maintain a database of stormwater related complaints, gauge data, high-water marks, and/or estimated damages for historical flood events?

Answered: 52 Skipped: 69



ANSWER CHOICES	RESPONSES	
No	53.85%	28
Yes	21.15%	11
Unknown	25.00%	13
TOTAL		52

Note: Q49 responses have been partially redacted to omit phone numbers and email addresses for privacy

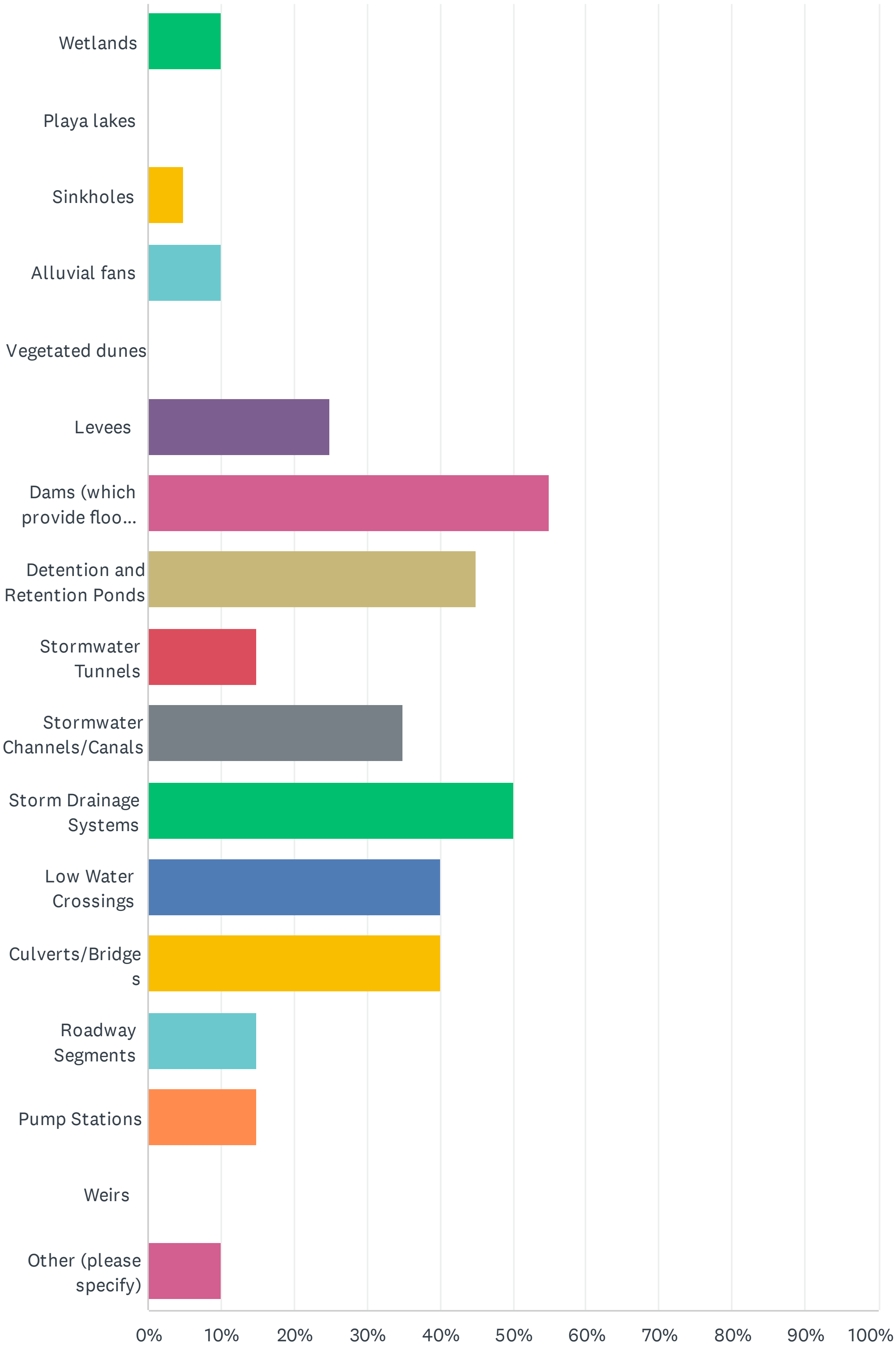
Q49 If your community is willing to provide further information on historical flood events (such as complaints, gauge data, high-water marks, or estimated damages), please provide a point of contact.

Answered: 15 Skipped: 106

#	RESPONSES	DATE
1	We hold conservation easements on City of El Paso Lands and own a nature preserve, all urban. Happy to share what we know. Janae Reneaud Field: [redacted]	1/13/2022 5:17 PM
2	Antonio Santana	10/19/2021 5:03 PM
3	Gisela Dagnino [redacted]	10/15/2021 4:13 PM
4	County Offices	10/15/2021 10:28 AM
5	N/A	10/15/2021 9:25 AM
6	Yes	10/15/2021 9:11 AM
7	N/A	10/14/2021 9:29 AM
8	Stephanie N. Elmore EMC [redacted]	10/6/2021 10:47 AM
9	Charles Wolf	10/4/2021 10:59 AM
10	Joanna (Jojo) MacKenzie, NRP Emergency Management Coordinator/County Administrator [redacted]www.co.hudspeth.tx.us	10/4/2021 9:34 AM
11	Cecil Lee. Water board president	10/2/2021 8:34 AM
12	Meredith, [redacted]- we have rainfall data with computerized tipping buckets and water level data taken monthly.	9/29/2021 2:05 PM
13	Jose Ramirez [redacted]	9/24/2021 12:54 PM
14	Honorable Fred Deaton Crockett County Judge PO Box 1857 Ozona, TX 76943 [redacted]	9/17/2021 10:24 AM
15	Superintendent Jaquez [redacted]	9/16/2021 10:20 AM

Q50 Does your organization maintain any geospatial (GIS) files for any of the following natural flood mitigation features or constructed major flood infrastructure types? If yes, select all that apply. If no, please leave blank.

Answered: 20 Skipped: 101

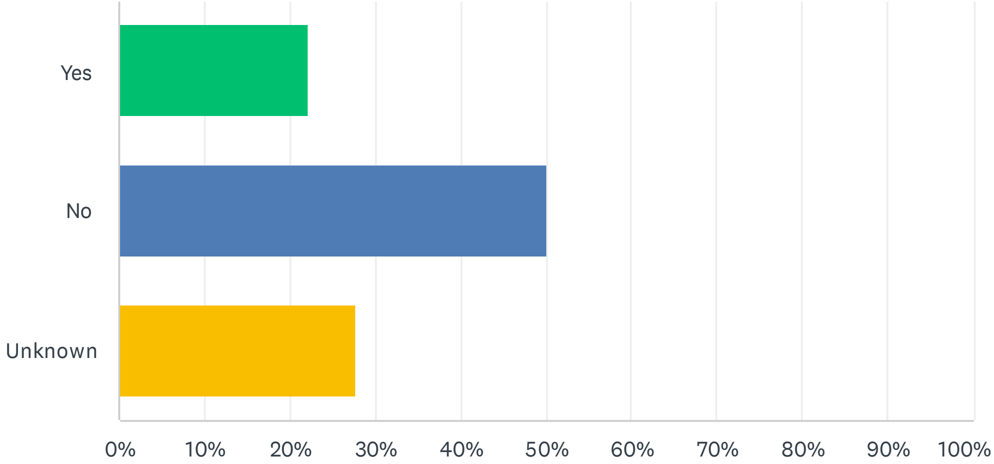

Wetlands
Playa lakes
Sinkholes
Alluvial fans
Vegetated dunes
Levees
Dams (which provide floo...
Detention and Retention Ponds
Stormwater Tunnels
Stormwater Channels/Canals
Storm Drainage Systems
Low Water Crossings
Culverts/Bridges
Roadway Segments
Pump Stations
Weirs
Other (please specify)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
Wetlands	10.00%	2
Playa lakes	0.00%	0
Sinkholes	5.00%	1
Alluvial fans	10.00%	2
Vegetated dunes	0.00%	0
Levees	25.00%	5
Dams (which provide flood protection)	55.00%	11
Detention and Retention Ponds	45.00%	9
Stormwater Tunnels	15.00%	3
Stormwater Channels/Canals	35.00%	7
Storm Drainage Systems	50.00%	10
Low Water Crossings	40.00%	8
Culverts/Bridges	40.00%	8
Roadway Segments	15.00%	3
Pump Stations	15.00%	3
Weirs	0.00%	0
Other (please specify)	10.00%	2
Total Respondents: 20		

#	OTHER (PLEASE SPECIFY)	DATE
1	No GIS files on record.	10/15/2021 9:23 AM
2	Please look in the National Levee Database (https://levees.sec.usace.army.mil/#/) and National Inventory of Dams(https://nid.usace.army.mil/ords/f?p=105:1::::::)	10/7/2021 2:37 PM

Q51 Does your organization maintain any geospatial (GIS) files for any critical infrastructures features (examples include fire stations, police stations, emergency shelters, water and wastewater treatment plants, power generating facilities, power transmitting facilities, assisted living facilities, nursing homes)?

Answered: 54   Skipped: 67



ANSWER CHOICES	RESPONSES	
Yes	22.22%	12
No	50.00%	27
Unknown	27.78%	15
TOTAL		54

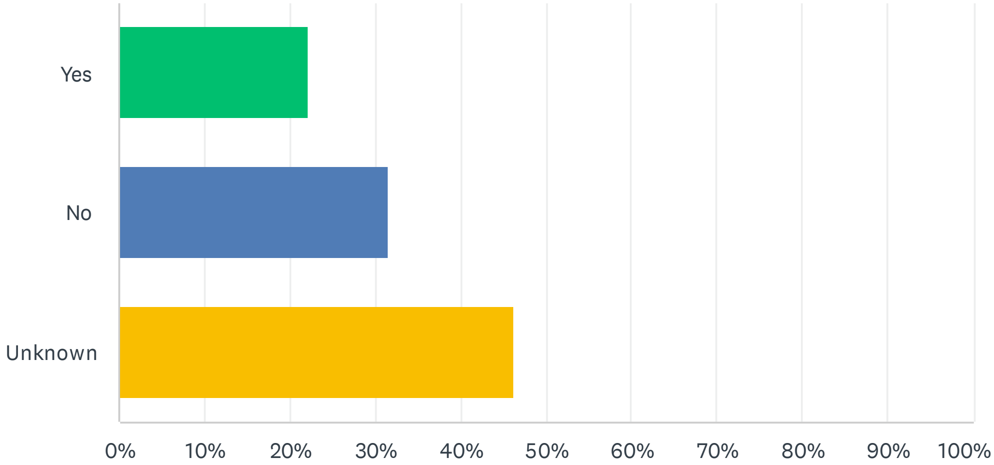
Q52 If your jurisdiction is willing to share geospatial files for existing infrastructure, please provide a point of contact below including a phone number or email for us to reach out for this information.Note: For adding a small number of geospatial features, you may also add your data using the GIS data collection app linked at the end of this survey.

Answered: 6 Skipped: 115

#	RESPONSES	DATE
1	county offices	10/15/2021 10:30 AM
2	N/A	10/15/2021 9:23 AM
3	Can be downloaded from databases	10/7/2021 2:37 PM
4	Jerry D Bullard	10/2/2021 8:39 AM
5	Norma Rivera-Palacios	9/29/2021 2:41 PM
6	please contact later as the gis is currently under construction.	9/17/2021 10:25 AM

Q53 Does your jurisdiction have flood infrastructure that provides water quality benefits?

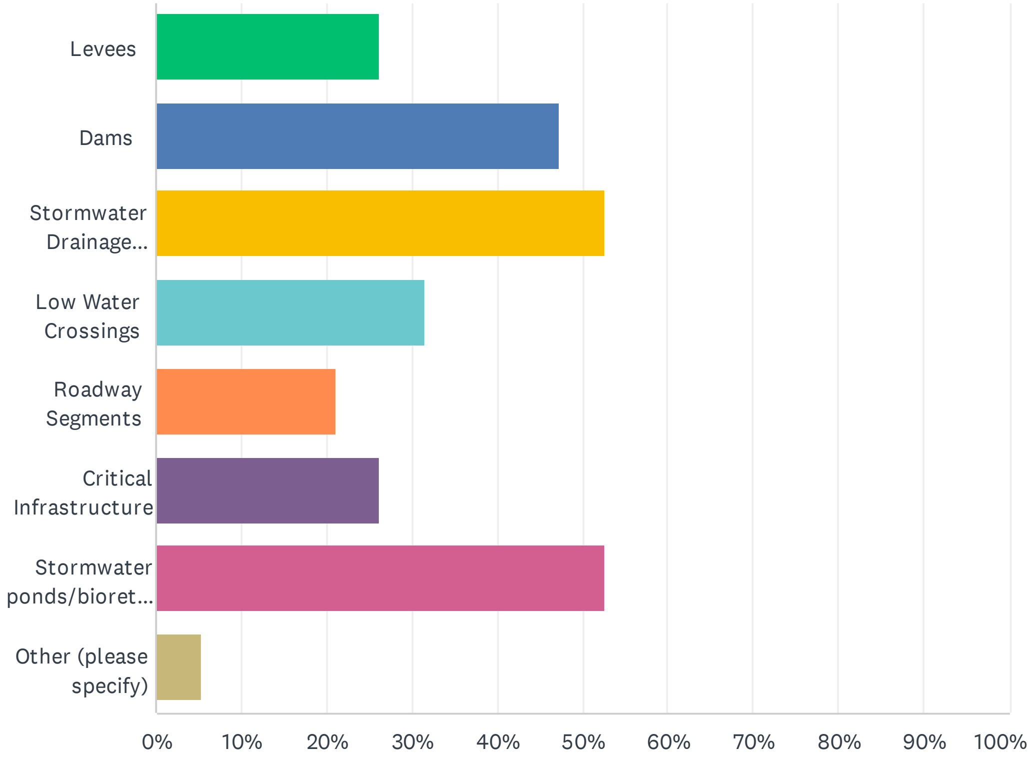
Answered: 54 Skipped: 67



ANSWER CHOICES	RESPONSES	
Yes	22.22%	12
No	31.48%	17
Unknown	46.30%	25
TOTAL		54

Q54 If so, which of the features provide water quality benefit? Select all that apply.

Answered: 19 Skipped: 102



ANSWER CHOICES	RESPONSES	
Levees	26.32%	5
Dams	47.37%	9
Stormwater Drainage Systems	52.63%	10
Low Water Crossings	31.58%	6
Roadway Segments	21.05%	4
Critical Infrastructure	26.32%	5
Stormwater ponds/bioretention	52.63%	10
Other (please specify)	5.26%	1
Total Respondents: 19		

#	OTHER (PLEASE SPECIFY)	DATE
1	yes, if you consider open natural lands with arroyos	1/13/2022 5:18 PM

Note: Q55 responses have been partially redacted to omit phone numbers and email addresses for privacy

Q55 Does your organization maintain a database of the condition and/or age of stormwater infrastructure in your community. If so, please provide a point of contact below including a phone number or email for us to reach out for this information.

Answered: 10 Skipped: 111

#	RESPONSES	DATE
1	NO	10/15/2021 1:34 PM
2	No	10/15/2021 10:30 AM
3	No	10/15/2021 9:23 AM
4	Yes	10/14/2021 10:07 AM
5	N/A	10/14/2021 9:29 AM
6	National Levee Database and National Inventory of Dams, see question 50.	10/7/2021 2:37 PM
7	Unknown	10/4/2021 9:38 AM
8	N/A	10/2/2021 8:39 AM
9	Albert Valle, CFM Public Works Director Town of Horizon City 14999 Darrington Road Horizon City, TX 79928 Cell Number: [redacted]	9/20/2021 11:49 AM
10	Jorge Morales [redacted]	8/17/2021 1:17 PM

Note: Q56 responses have been partially redacted to omit phone numbers and email addresses for privacy

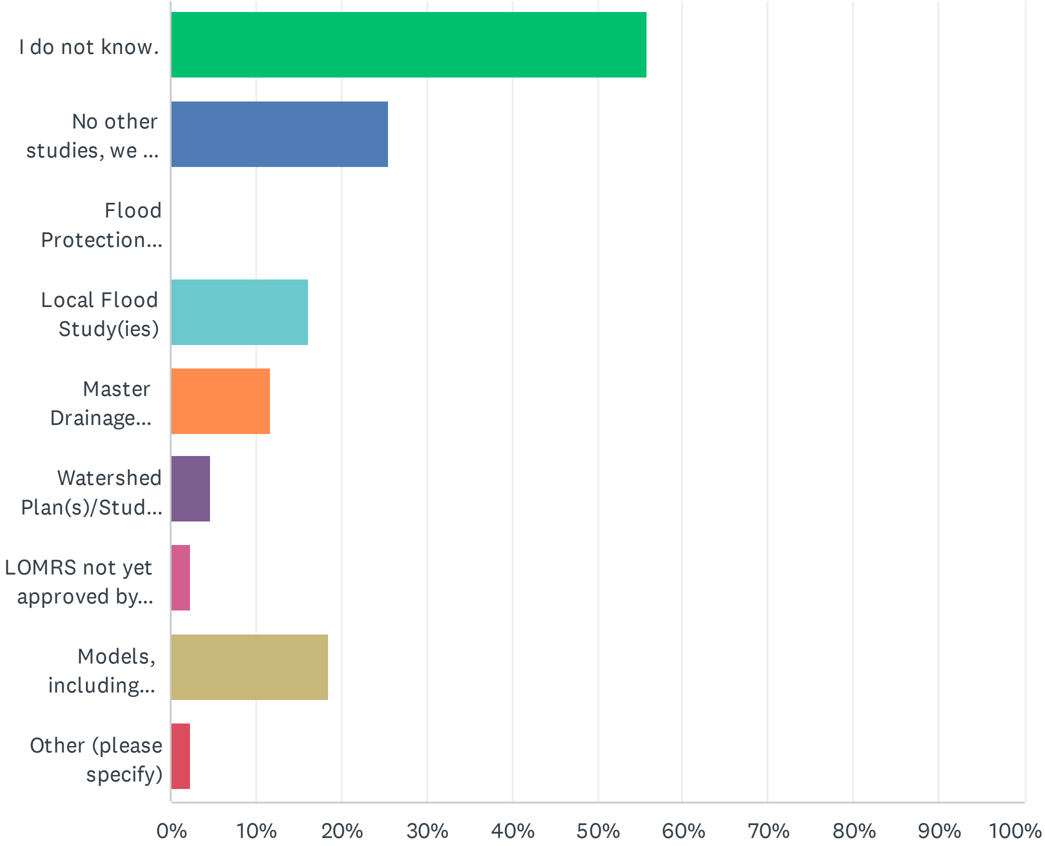
Q56 Does your organization maintain a library of as-built plans for construction stormwater infrastructure in your community. If so, please provide a point of contact below including a phone number or email for us to reach out for this information.

Answered: 12 Skipped: 109

#	RESPONSES	DATE
1	NO	10/15/2021 1:34 PM
2	No	10/15/2021 10:30 AM
3	DANIEL MARTINEZ [redacted]	10/15/2021 9:30 AM
4	No at the City. But local TxDot may have maps.	10/15/2021 9:23 AM
5	Yes	10/14/2021 10:07 AM
6	N/A	10/14/2021 9:29 AM
7	myself	10/7/2021 2:37 PM
8	County Clerk [redacted]	10/4/2021 10:47 AM
9	Unknwon	10/4/2021 9:38 AM
10	N/A	10/2/2021 8:39 AM
11	Albert Valle, CFM Public Works Director Town of Horizon City 14999 Darrington Road Horizon City, TX 79928 [redacted]	9/20/2021 11:49 AM
12	Jorge Morales [redacted]Gilbert Saldana [redacted]	8/17/2021 1:17 PM

Q57 Which of the following is used to define best available flood risk (floodplains) in your community or jurisdiction in addition to FEMA studies and Base Level Engineering? Select all that apply.

Answered: 43 Skipped: 78

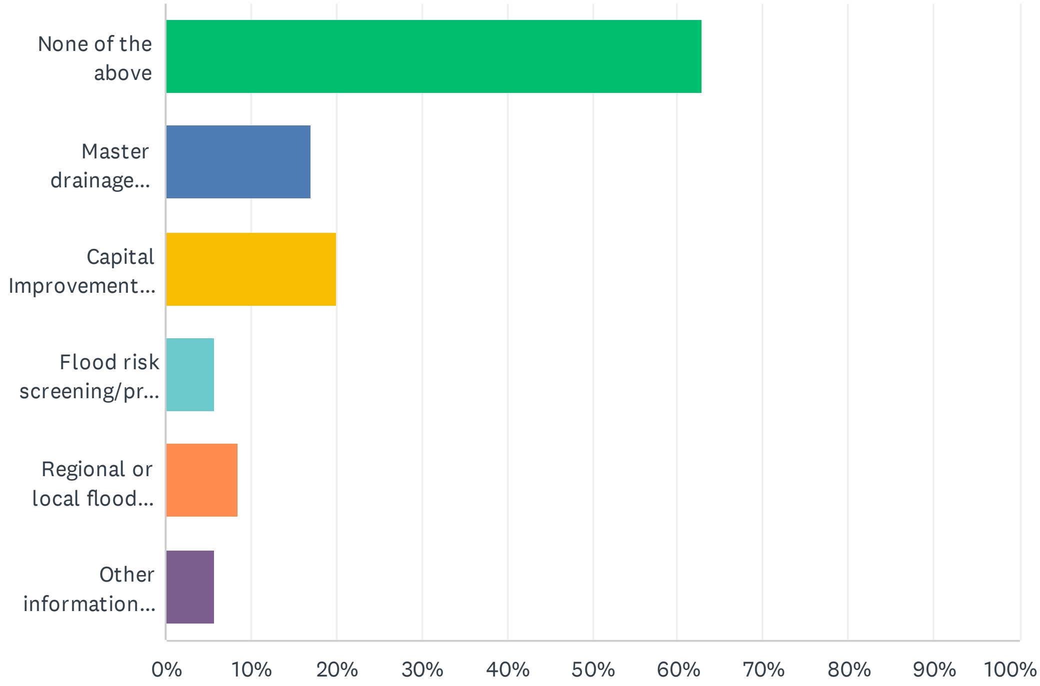


ANSWER CHOICES	RESPONSES	
I do not know.	55.81%	24
No other studies, we use FEMA maps, studies or Base Level Engineering (no need to upload these)	25.58%	11
Flood Protection Plan(s)	0.00%	0
Local Flood Study(ies)	16.28%	7
Master Drainage Plan(s)/Stormwater Drainage Plan(s)	11.63%	5
Watershed Plan(s)/Study(ies)	4.65%	2
LOMRS not yet approved by FEMA	2.33%	1
Models, including hydrology, hydraulics and or any available screening level models (H&H models) that you consider to be the best available data for your jurisdiction.	18.60%	8
Other (please specify)	2.33%	1
Total Respondents: 43		

#	OTHER (PLEASE SPECIFY)	DATE
1	ISD has had surveying and considered flood zones for new construction.	10/4/2021 9:45 AM

Q58 Which of the following planning documents or information does your jurisdiction have that identify flood risk reduction activities (these may include evaluations, strategies, and/or projects) for consideration by the regional flood planning group? Select all that apply.

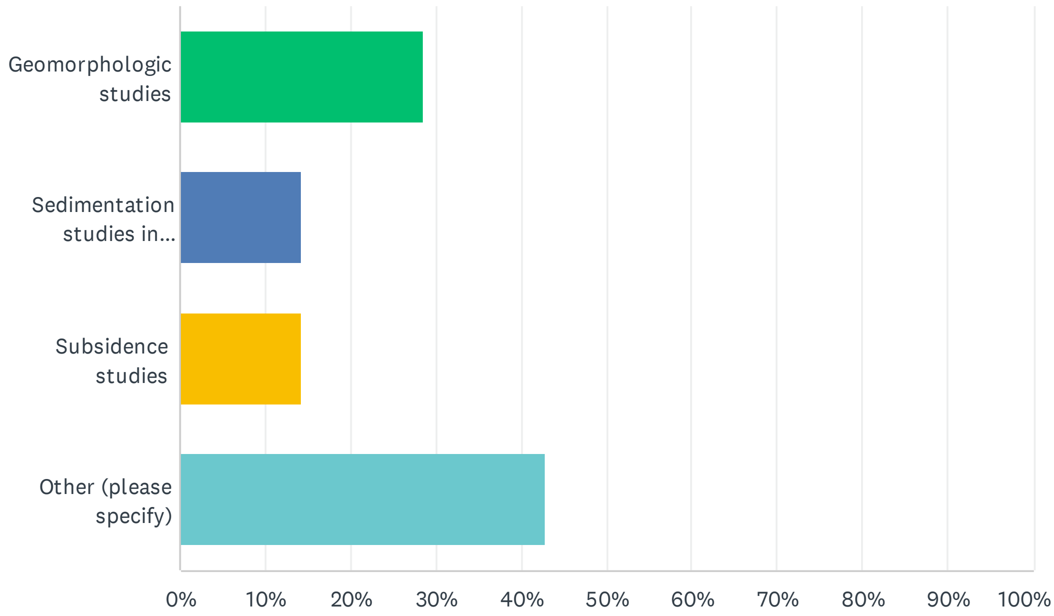
Answered: 35 Skipped: 86



ANSWER CHOICES	RESPONSES	
None of the above	62.86%	22
Master drainage plan(s)	17.14%	6
Capital Improvement Projects to reduce flood risk	20.00%	7
Flood risk screening/prioritization tools	5.71%	2
Regional or local flood risk reduction studies	8.57%	3
Other information relevant to the RFPG	5.71%	2
Total Respondents: 35		

Q59 Which of the following flood planning documents or information does your jurisdiction have that you would like to provide to the regional flood planning group? Select all that apply?

Answered: 7 Skipped: 114

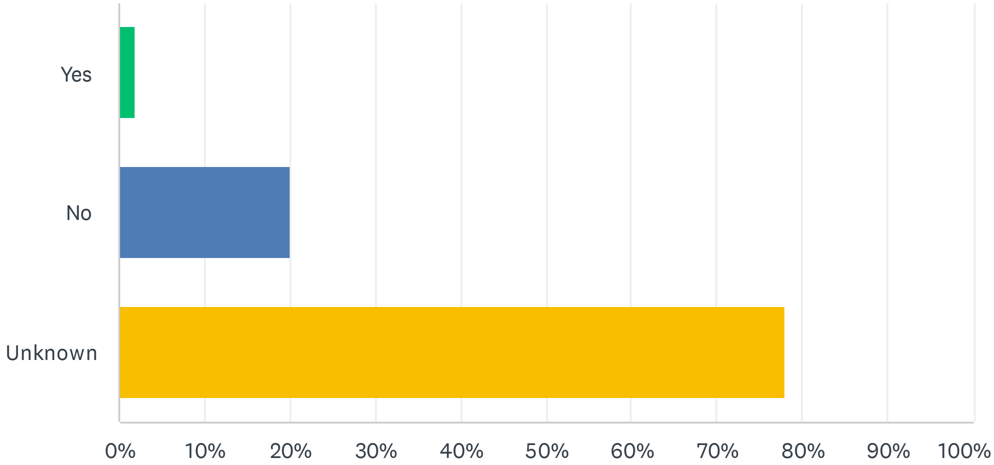


ANSWER CHOICES	RESPONSES	
Geomorphologic studies	28.57%	2
Sedimentation studies in flood control structures	14.29%	1
Subsidence studies	14.29%	1
Other (please specify)	42.86%	3
Total Respondents: 7		

#	OTHER (PLEASE SPECIFY)	DATE
1	TBD	10/14/2021 10:17 AM
2	Geotechnical testing reports along with drainage plans available.	10/4/2021 9:45 AM
3	2020 Stormwater Master Plan	8/17/2021 1:38 PM

Q60 Do any flood studies in your community include a future impervious cover analysis?

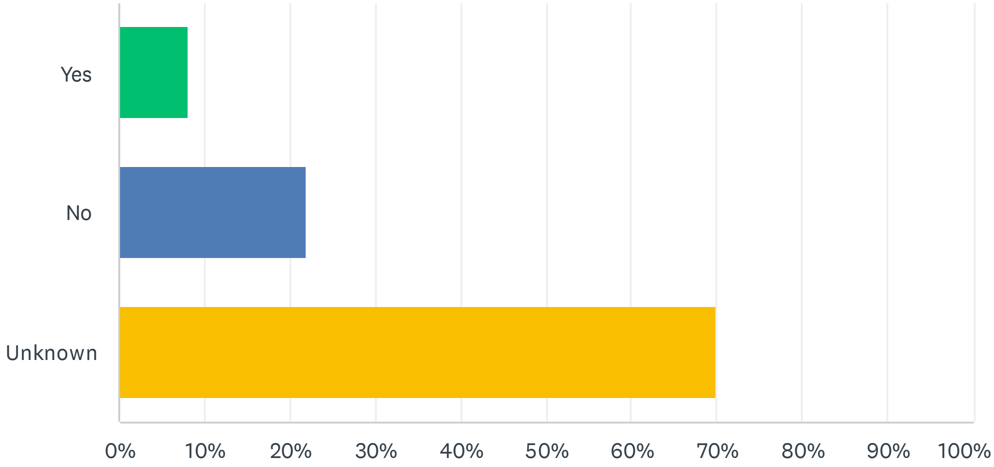
Answered: 50 Skipped: 71



ANSWER CHOICES	RESPONSES	
Yes	2.00%	1
No	20.00%	10
Unknown	78.00%	39
TOTAL		50

Q61 Do any flood studies in your community include a future precipitation analysis?

Answered: 50 Skipped: 71



ANSWER CHOICES	RESPONSES	
Yes	8.00%	4
No	22.00%	11
Unknown	70.00%	35
TOTAL		50

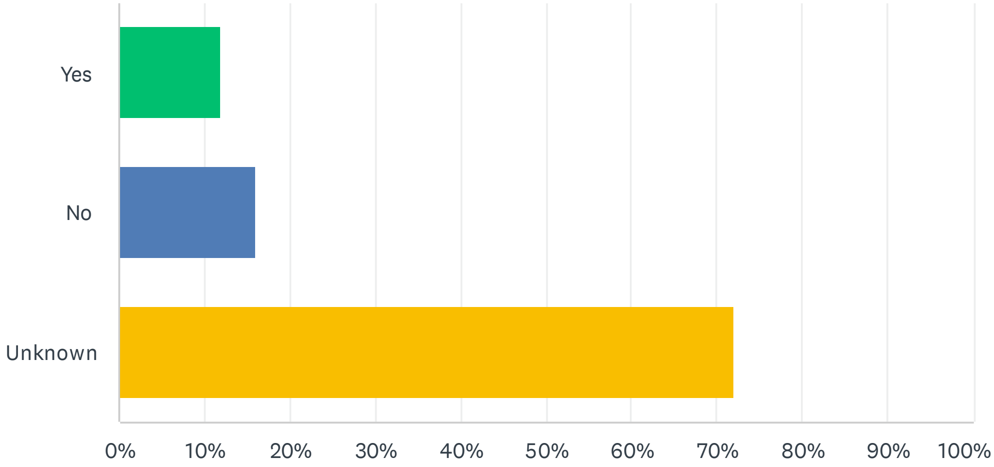
Q62 If your jurisdiction is willing to share the best available flood risk or flood mitigation studies that you would like considered for inclusion in the plan, please provide contact information including a phone number or email address for us to reach out for this information.

Answered: 5 Skipped: 116

#	RESPONSES	DATE
1	None	10/15/2021 10:34 AM
2	[redacted]	10/14/2021 10:17 AM
3	Sutton County Water District	10/9/2021 2:00 PM
4	[redacted]	10/5/2021 9:46 PM
5	Greg Velasquez [redacted]	9/16/2021 9:38 AM

Q63 Do any flood studies in your community identify opportunities for further flood evaluations (FMEs), strategies (FMSs), or projects (FMPs)?

Answered: 50 Skipped: 71



ANSWER CHOICES	RESPONSES	
Yes	12.00%	6
No	16.00%	8
Unknown	72.00%	36
TOTAL		50

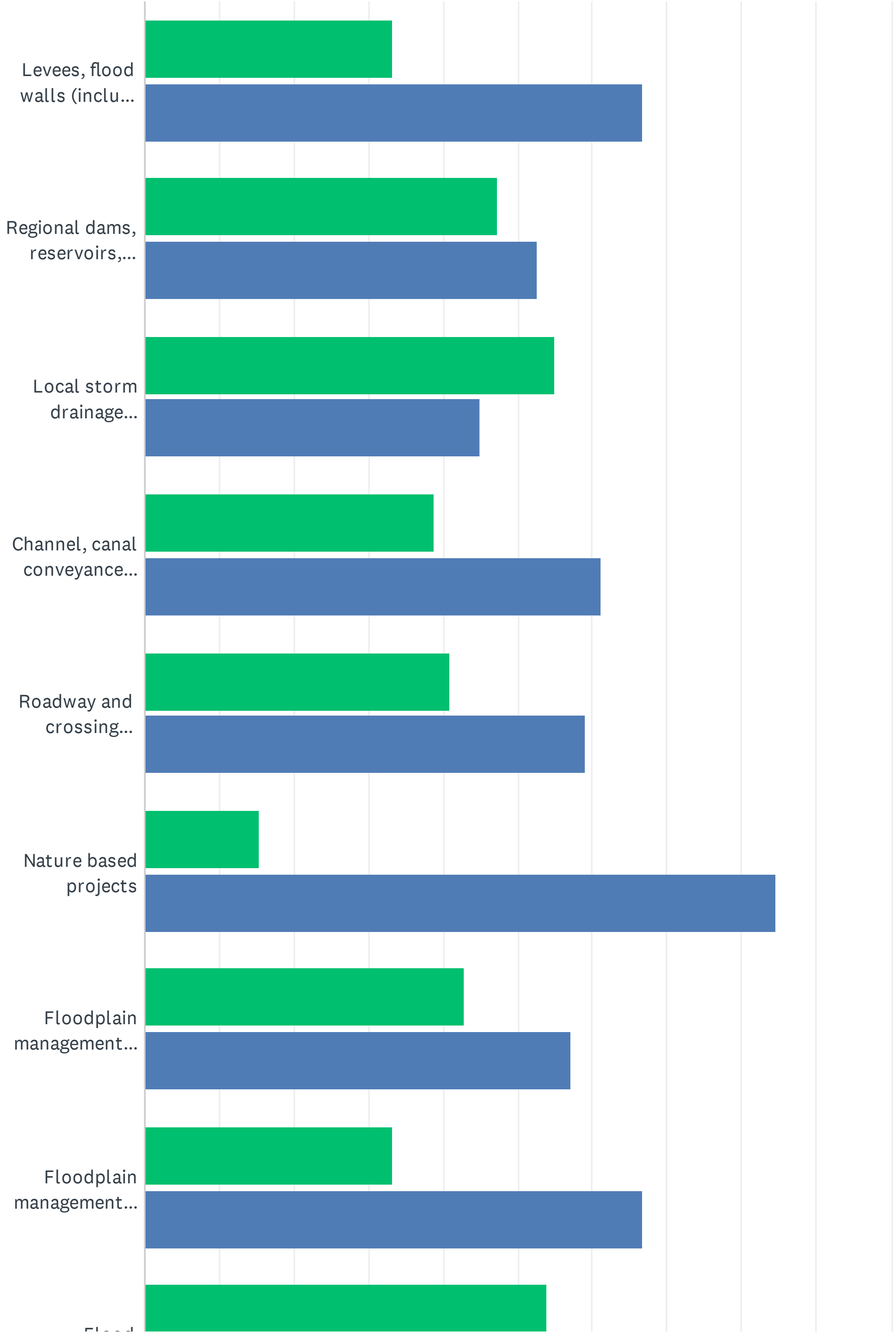
Q64 If you have any other comments or notes to add related to the flood studies provided or other flood studies, please note them below:

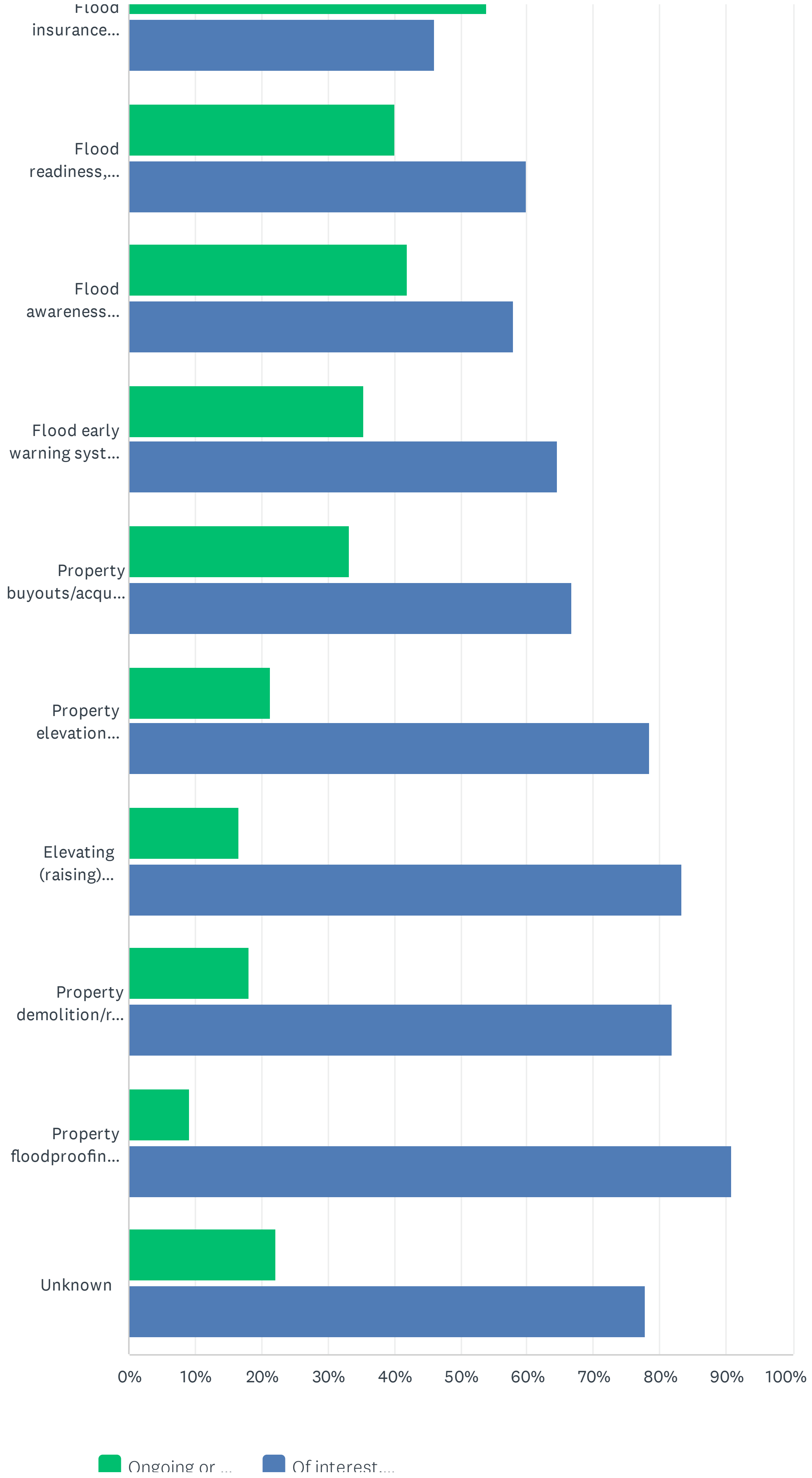
Answered: 7 Skipped: 114

#	RESPONSES	DATE
1	None	10/15/2021 10:34 AM
2	UTEP is already working with EPWU to address the flood concern that the campus has related to Flow Path 23	10/14/2021 10:17 AM
3	Have never seen a flood map for this county, Have been told it never has been done.	10/14/2021 9:52 AM
4	A community lack of storm water drainage creates major flooding. The impact is quite disasterous as most roads are unpaved resulting in families being unable to drive to school.	10/4/2021 9:45 AM
5	Johny R Sheets Commissioner PCT 3 915 2509925	10/2/2021 2:20 PM
6	El Paso County Public Works Strategic Plan includes updating flood evaluations.	9/29/2021 11:42 AM
7	2020 Stormwater Master Plan	8/17/2021 1:38 PM

Q65 What, if any, flood management strategies or flood mitigation projects are currently ongoing or proposed or are not currently utilized or proposed for your community but would potentially be of interest for further evaluation? Select all that apply.

Answered: 37 Skipped: 84




Flood
insurance...
Flood
readiness,...
Flood
awareness...
Flood early
warning syst...
Property
buyouts/acqu...
Property
elevation...
Elevating
(raising)...
Property
demolition/r...
Property
floodproofin...
Unknown
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Ongoing or ...
Of interest....

	ONGOING OR PROPOSED	OF INTEREST, BUT NOT ONGOING OR PROPOSED	TOTAL
Levees, flood walls (include levee certification)	33.33% 5	66.67% 10	15
Regional dams, reservoirs, detention, retention basins	47.37% 9	52.63% 10	19
Local storm drainage systems, tunnels	55.00% 11	45.00% 9	20
Channel, canal conveyance improvements	38.89% 7	61.11% 11	18
Roadway and crossing improvements, bridges, culverts	40.91% 9	59.09% 13	22
Nature based projects	15.38% 2	84.62% 11	13
Floodplain management ordinances	42.86% 6	57.14% 8	14
Floodplain management orders	33.33% 4	66.67% 8	12
Flood insurance (participation in the NFIP)	53.85% 7	46.15% 6	13
Flood readiness, resilience	40.00% 6	60.00% 9	15
Flood awareness outreach and/or education	42.11% 8	57.89% 11	19
Flood early warning system, stream/rain gauge	35.29% 6	64.71% 11	17
Property buyouts/acquisition and/or relocations	33.33% 4	66.67% 8	12
Property elevation surveys	21.43% 3	78.57% 11	14
Elevating (raising) existing properties	16.67% 2	83.33% 10	12
Property demolition/reconstruction	18.18% 2	81.82% 9	11
Property floodproofing and/or flood retrofits	9.09% 1	90.91% 10	11
Unknown	22.22% 2	77.78% 7	9

#	OTHER (PLEASE SPECIFY)	DATE
1	Unknown	10/15/2021 10:34 AM
2	TDOT drainage in urban area is not sufficient to avoid property damage along Dry Devils River.	10/9/2021 2:00 PM

Q66 If your community has any specific experience or interest utilizing stormwater capture and reuse (e.g., surface reservoirs) or aquifer recharge strategies for flood mitigation, please provide more information.

Answered: 4 Skipped: 117

#	RESPONSES	DATE
1	None at this time	10/15/2021 10:34 AM
2	Land improvement project completed in 2014/15 included retention features including a pond	10/14/2021 10:17 AM
3	Unknown however a way to capture stormwater would be extremely valuable due to extreme water shortages.	10/4/2021 9:45 AM
4	N/A	8/17/2021 1:38 PM

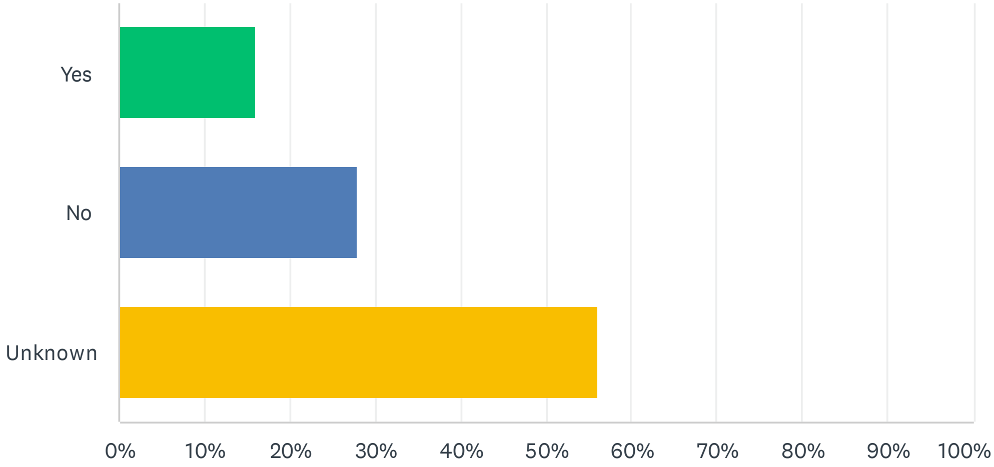
Q67 If your community maintains or has access to any flood early warning system, please provide more information (description, website, lead contact information for more details).

Answered: 7 Skipped: 114

#	RESPONSES	DATE
1	we have a public alert system	11/5/2021 10:21 AM
2	None	10/15/2021 10:34 AM
3	Alarms and texting information/internet.	10/9/2021 2:00 PM
4	Not aware of early warning systems.	10/4/2021 9:45 AM
5	Nixle Alert system	9/30/2021 1:50 PM
6	Flood early warning system may be provided on City website and City Facebook page.	9/20/2021 11:59 AM
7	N/A	8/17/2021 1:38 PM

Q68 Are any of the ongoing or proposed infrastructure or flood mitigation projects at or above a level of 30% of design?

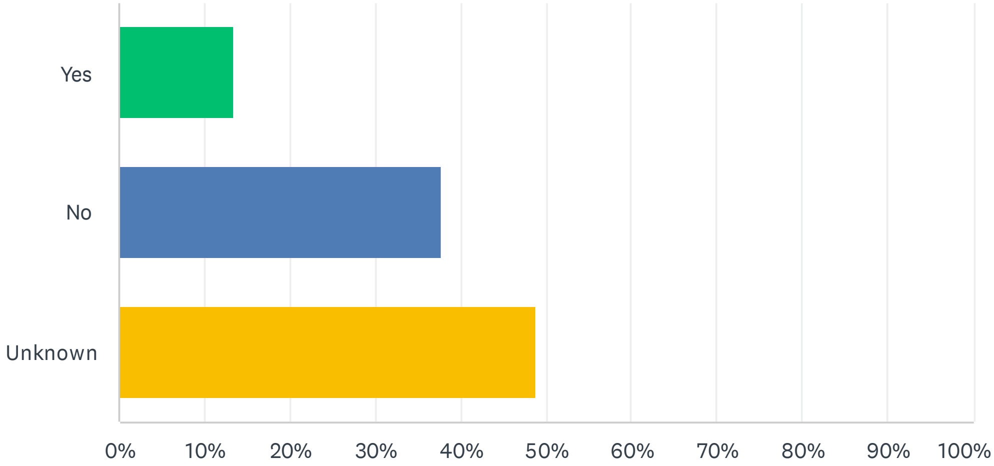
Answered: 50 Skipped: 71



ANSWER CHOICES	RESPONSES	
Yes	16.00%	8
No	28.00%	14
Unknown	56.00%	28
TOTAL		50

Q69 Are any of the ongoing or proposed infrastructure or flood mitigation projects ready for construction or under construction (with or without funding)?

Answered: 45 Skipped: 76



ANSWER CHOICES	RESPONSES	
Yes	13.33%	6
No	37.78%	17
Unknown	48.89%	22
TOTAL		45

Note: Q70 responses have been partially redacted to omit phone numbers and email addresses for privacy

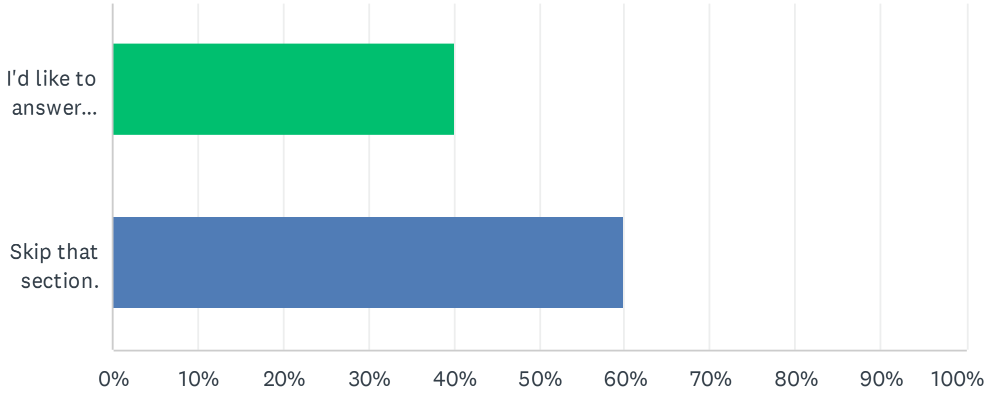
Q70 If you answered yes on the previous question, please provide contact information for more information.

Answered: 1 Skipped: 120

#	RESPONSES	DATE
1	Fernando Hernandez [redacted]	8/17/2021 1:38 PM

Q71 Earlier in this survey, you indicated your profession includes responsibility directly or indirectly related to flood management. Please indicate if you would like to answer a series of non-technical questions about your experience as a member of the community. If not, you can skip this section.

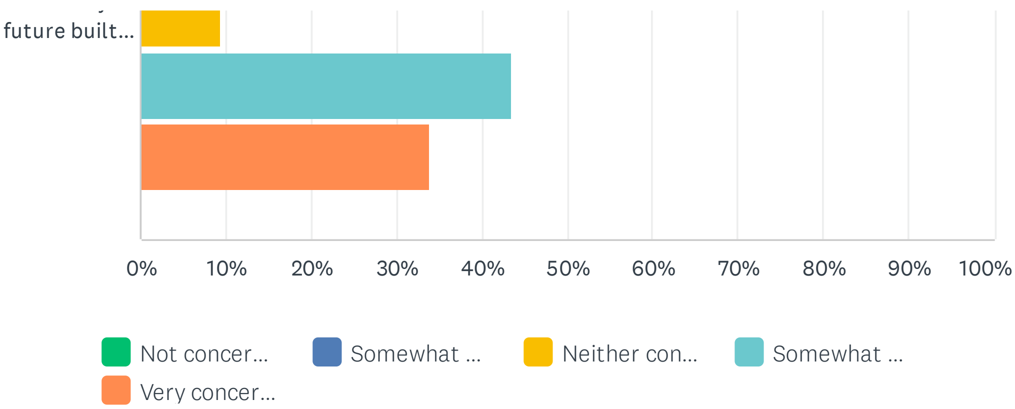
Answered: 50 Skipped: 71



ANSWER CHOICES	RESPONSES	
I'd like to answer non-technical community questions	40.00%	20
Skip that section.	60.00%	30
TOTAL		50

Q72 Considering flooding within the counties in which you live, work or travel, how concerned are you about the following aspects of flood control infrastructure?

Answered: 53 Skipped: 68

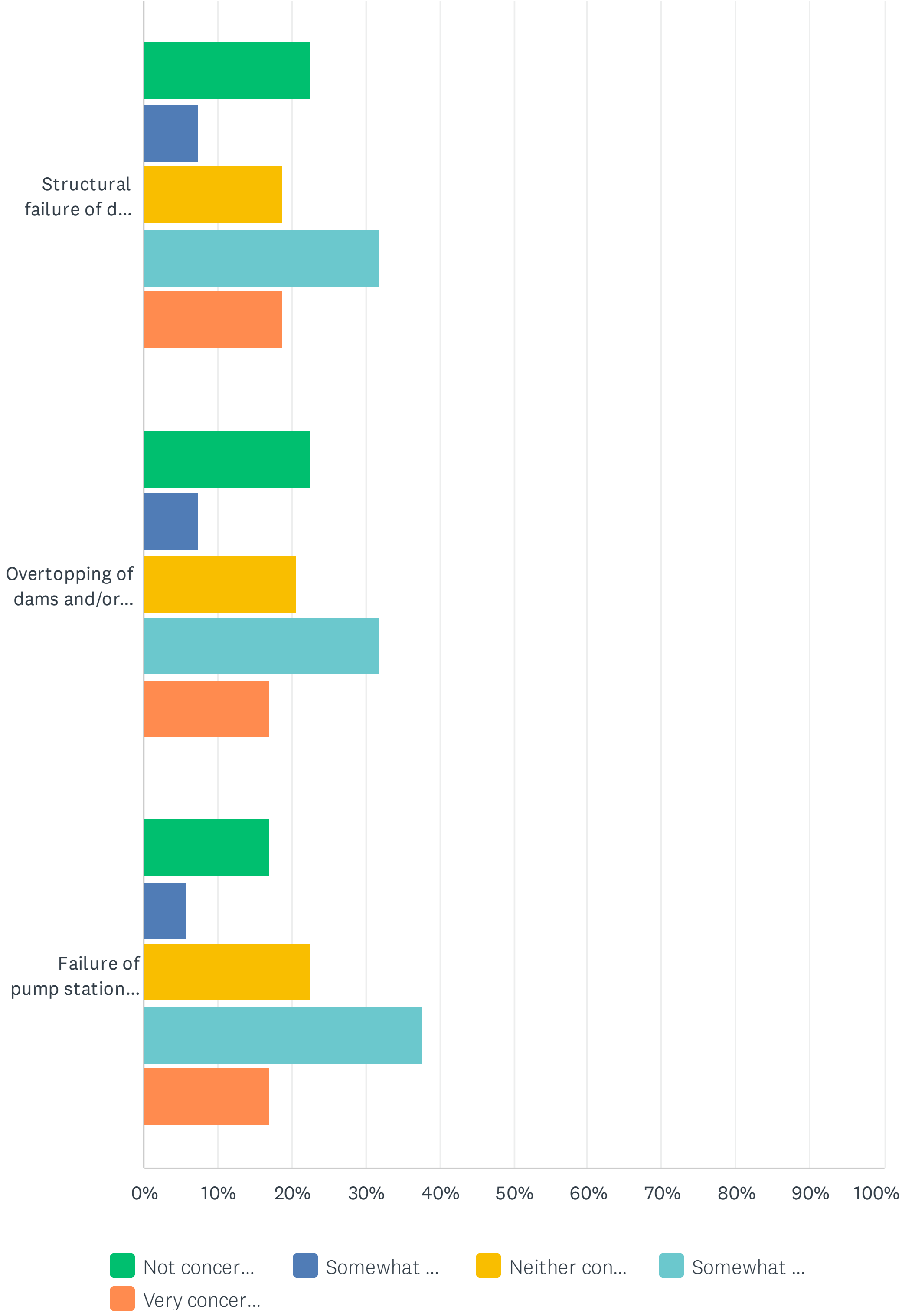


	NOT CONCERNED	SOMEWHAT UNCONCERNED	NEITHER CONCERNED NOR UNCONCERNED	SOMEWHAT CONCERNED	VERY CONCERNED	TOTAL	WEIGHTED AVERAGE
Effectiveness of existing infrastructure	1.89% 1	9.43% 5	5.66% 3	41.51% 22	41.51% 22	53	4.11
Quantity of existing infrastructure	3.77% 2	7.55% 4	9.43% 5	45.28% 24	33.96% 18	53	3.98
Resilience of existing infrastructure during high intensity storms	3.77% 2	7.55% 4	5.66% 3	33.96% 18	49.06% 26	53	4.17
Reliability of future built infrastructure	5.66% 3	7.55% 4	9.43% 5	43.40% 23	33.96% 18	53	3.92

#	OTHER (PLEASE SPECIFY)	DATE
1	There is no infrastructure.	10/9/2021 4:31 PM
2	Lack of local expertise in rural / small communities that limit them from addressing flood concerns	10/4/2021 10:33 AM
3	System maintenance is as critical as the projects or maybe more important	10/1/2021 2:39 PM
4	We need to pay more attention to the natural flow of water down the mountain. It has been hampered by inadequate construction and poor planning.	9/17/2021 12:36 AM

Q73 Considering riverine flooding (i.e. flooding from the Rio Grande or Pecos River caused by upstream precipitation or snowmelt), how concerned are you about each of the potential scenarios?

Answered: 53 Skipped: 68

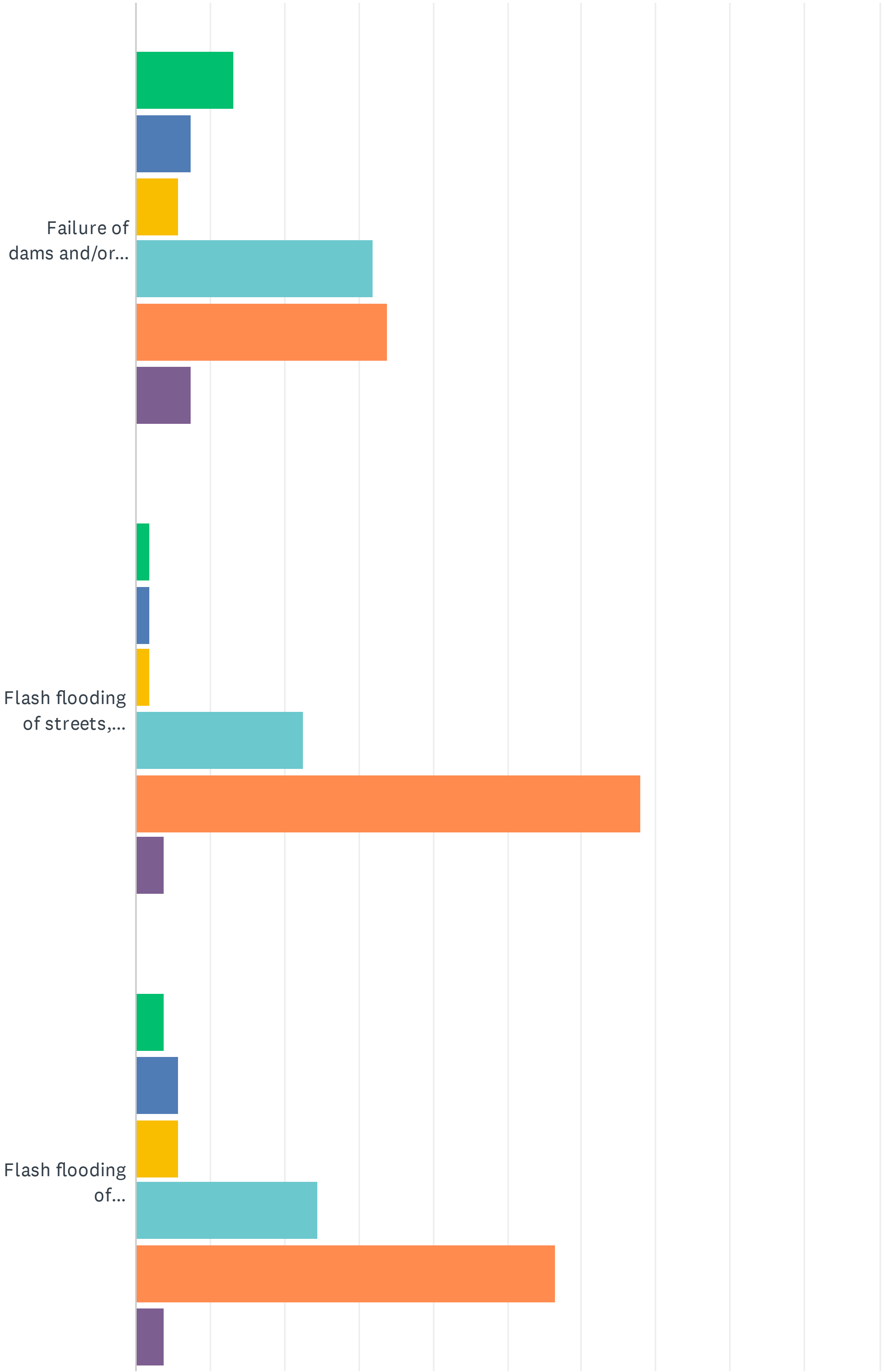


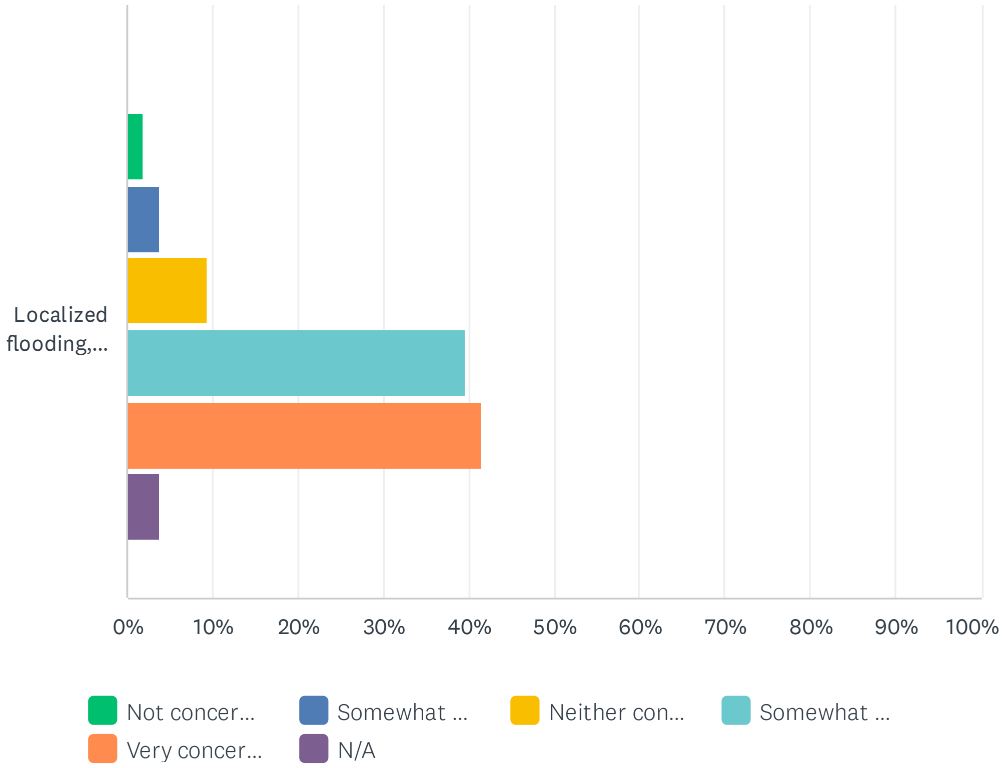
	NOT CONCERNED	SOMEWHAT UNCONCERNED	NEITHER CONCERNED NOR UNCONCERNED	SOMEWHAT CONCERNED	VERY CONCERNED	TOTAL	WEIGHTED AVERAGE
Structural failure of dams and/or levees.	22.64% 12	7.55% 4	18.87% 10	32.08% 17	18.87% 10	53	3.17
Overtopping of dams and/or levees.	22.64% 12	7.55% 4	20.75% 11	32.08% 17	16.98% 9	53	3.13
Failure of pump stations, floodgates or other infrastructure intended to be resilient against extreme flooding and power outages.	16.98% 9	5.66% 3	22.64% 12	37.74% 20	16.98% 9	53	3.32

#	OTHER (PLEASE SPECIFY)	DATE
1	structural failure of rural bridges	10/4/2021 12:57 PM
2	Flooding in low-lying areas, difficult to drain (esp. low income areas). Farm dam in NM flooded/broke (upstream) during this last Aug 2021 rainfall, news is saying it may be 10yr repair. May be similar concerns locally	8/24/2021 2:49 PM

Q74 Considering localized flooding (i.e. from local storms/precipitation events only), how concerned are you about each of the potential scenarios?

Answered: 53 Skipped: 68



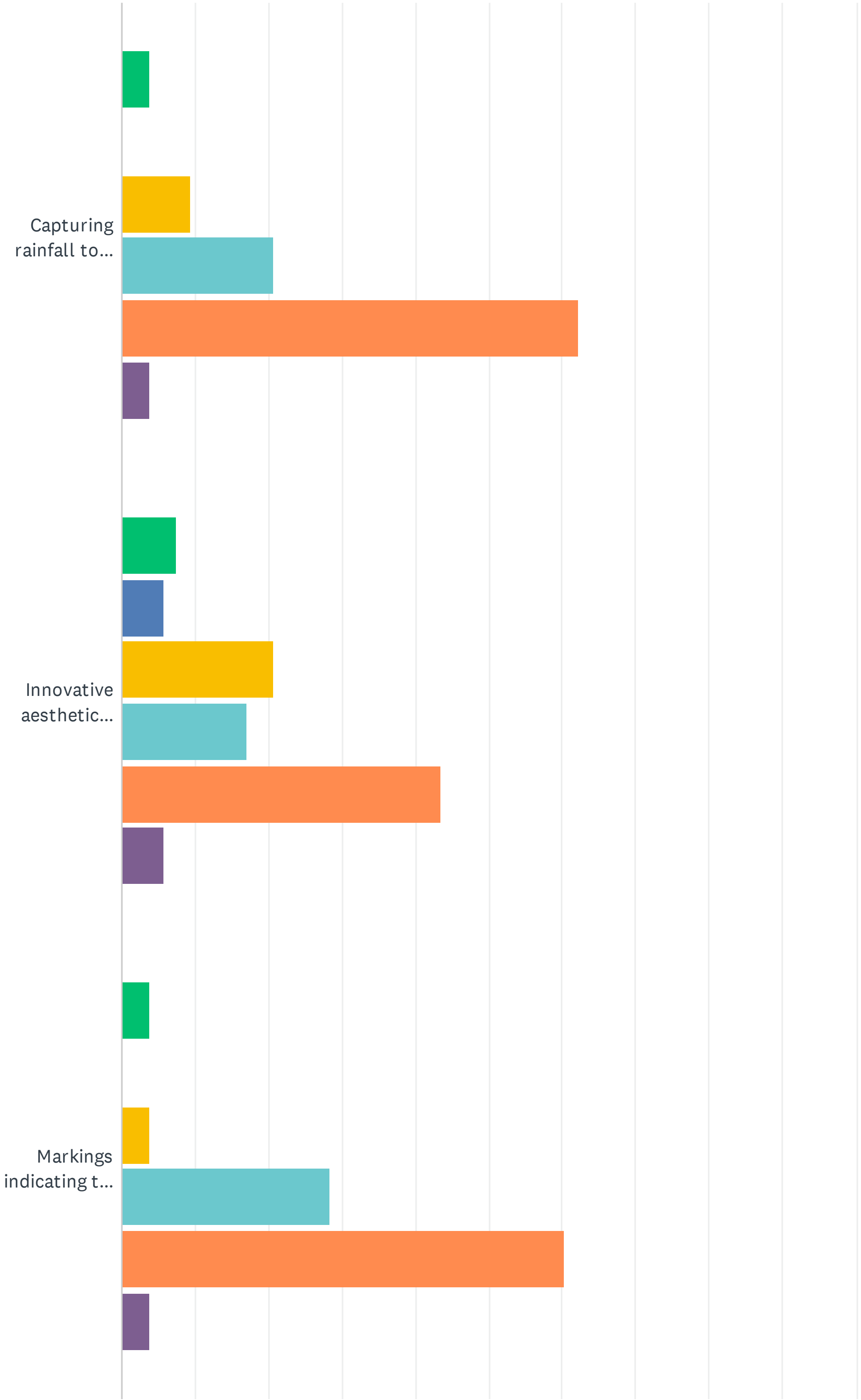

Localized flooding,...
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Not concer...
Somewhat ...
Neither con...
Somewhat ...
Very concer...
N/A

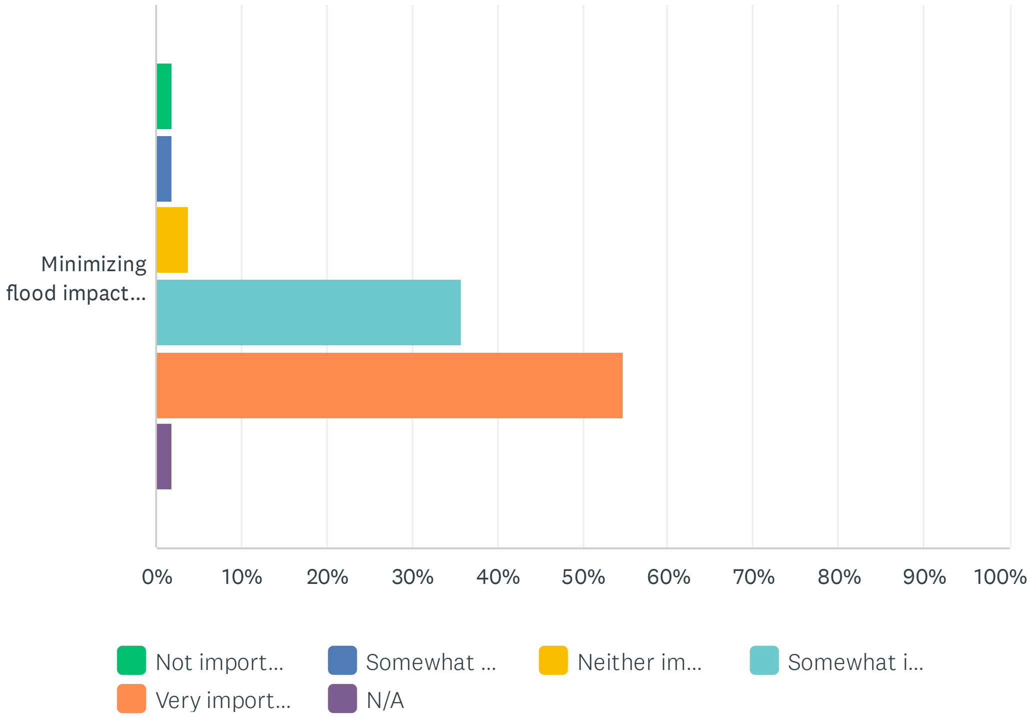
	NOT CONCERNED	SOMEWHAT UNCONCERNED	NEITHER CONCERNED NOR UNCONCERNED	SOMEWHAT CONCERNED	VERY CONCERNED	N/A	TOTAL	WEI AVE
Failure of dams and/or levees during extreme events.	13.21% 7	7.55% 4	5.66% 3	32.08% 17	33.96% 18	7.55% 4	53	
Flash flooding of streets, roads and highways which blocks routes for emergency vehicles, motorists, pedestrians and cyclists.	1.89% 1	1.89% 1	1.89% 1	22.64% 12	67.92% 36	3.77% 2	53	
Flash flooding of neighborhoods, commercial districts, agricultural spaces and industrial facilities.	3.77% 2	5.66% 3	5.66% 3	24.53% 13	56.60% 30	3.77% 2	53	
Localized flooding, ponding or standing water after a rain event.	1.89% 1	3.77% 2	9.43% 5	39.62% 21	41.51% 22	3.77% 2	53	

#	OTHER (PLEASE SPECIFY)	DATE
1	Ponding of water causing mosquitoes	10/7/2021 4:59 PM
2	structural failure of rural bridges	10/4/2021 12:57 PM
3	Lack of capacity in Rio grande an levees due to silt build up and lack of maintenance	10/1/2021 2:45 PM
4	Concerned about levee certification	8/24/2021 2:49 PM

Q75 Thinking about the functionality of flood control infrastructure, please rank how important each of the following is to you.

Answered: 53 Skipped: 68



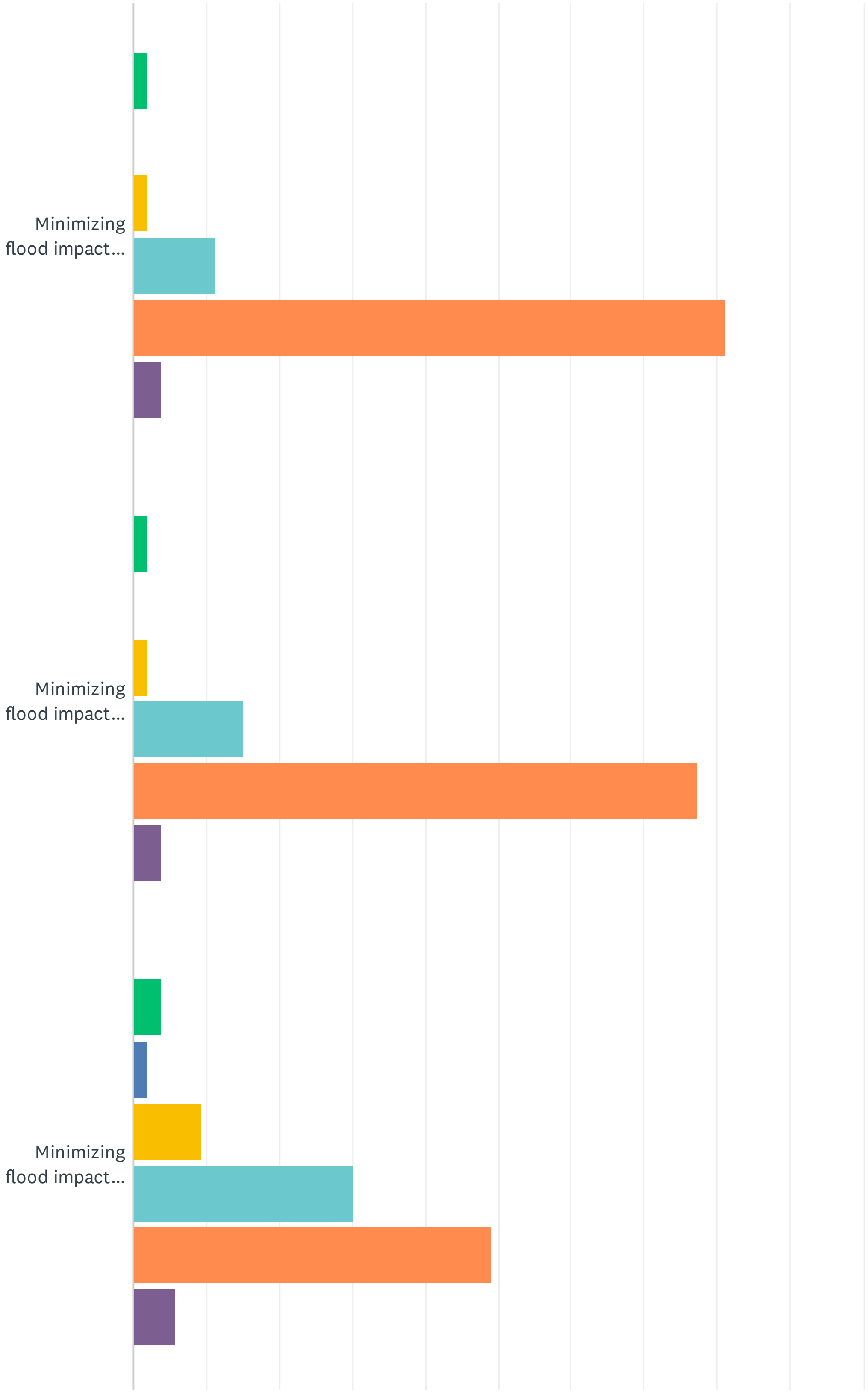


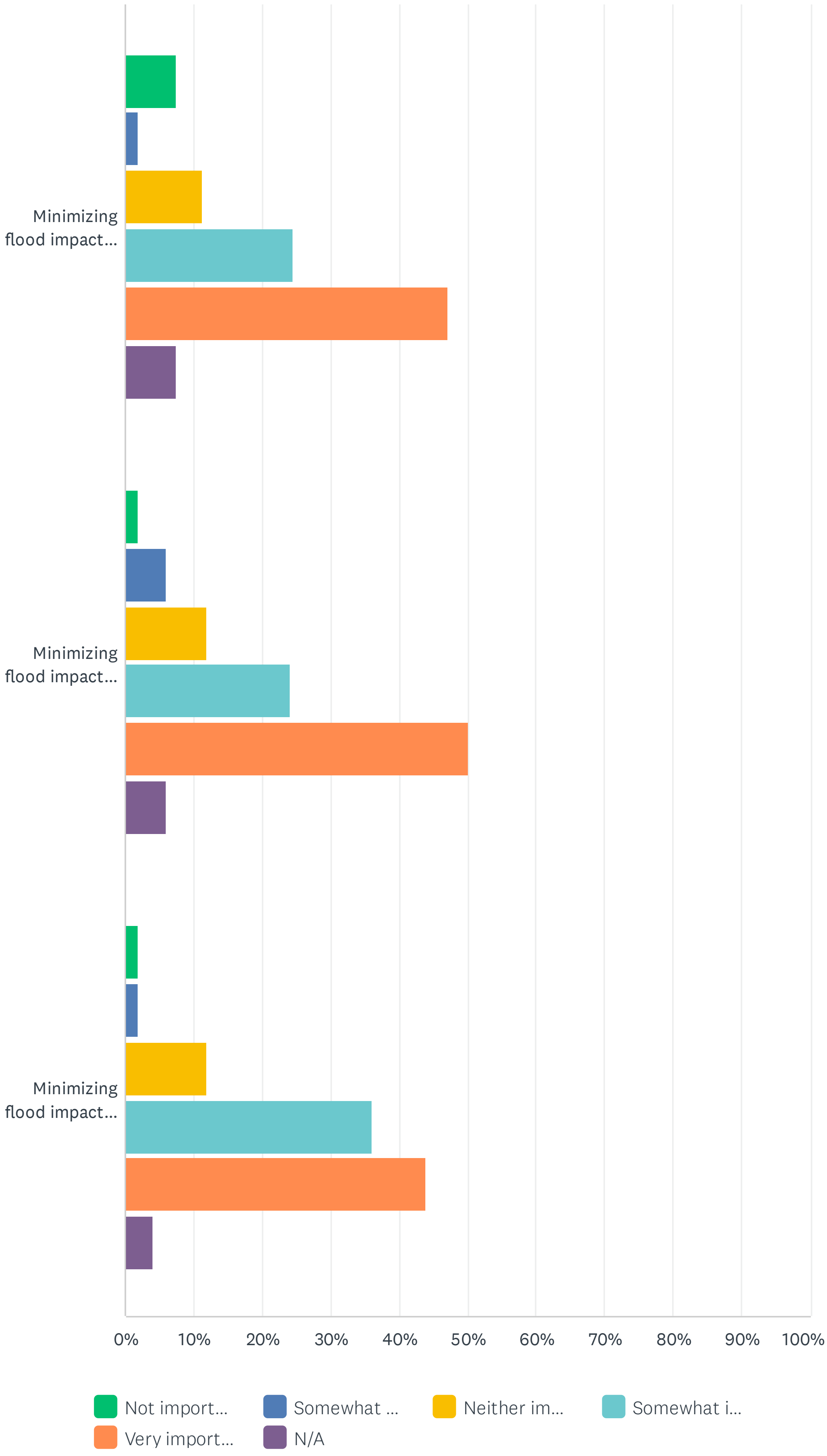
	NOT IMPORTANT	SOMEWHAT UNIMPORTANT	NEITHER IMPORTANT NOR UNIMPORTANT	SOMEWHAT IMPORTANT	VERY IMPORTANT	N/A	TOTAL	WEIGHTE AVERAGE
Capturing rainfall to recharge area aquifers.	3.77% 2	0.00% 0	9.43% 5	20.75% 11	62.26% 33	3.77% 2	53	4.4
Innovative aesthetic improvements and/or dual use designs like skate parks and/or park-ponds.	7.55% 4	5.66% 3	20.75% 11	16.98% 9	43.40% 23	5.66% 3	53	3.8
Markings indicating the location of low-water crossings and not to cross them while flooded.	3.77% 2	0.00% 0	3.77% 2	28.30% 15	60.38% 32	3.77% 2	53	4.4
Minimizing flood impacts to publicly-owned infrastructure such as highways, government buildings, and schools.	1.89% 1	1.89% 1	3.77% 2	35.85% 19	54.72% 29	1.89% 1	53	4.4

#	OTHER (PLEASE SPECIFY)	DATE
1	Low water crossing near home does not have depth gauge (only signs indicating LWC)	8/24/2021 2:49 PM

Q76 How important should flood planning decision-makers view each of the following?

Answered: 53 Skipped: 68




Minimizing flood impact...
Minimizing flood impact...
Minimizing flood impact...
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Not import...
Somewhat ...
Neither im...
Somewhat i...
Very import...
N/A

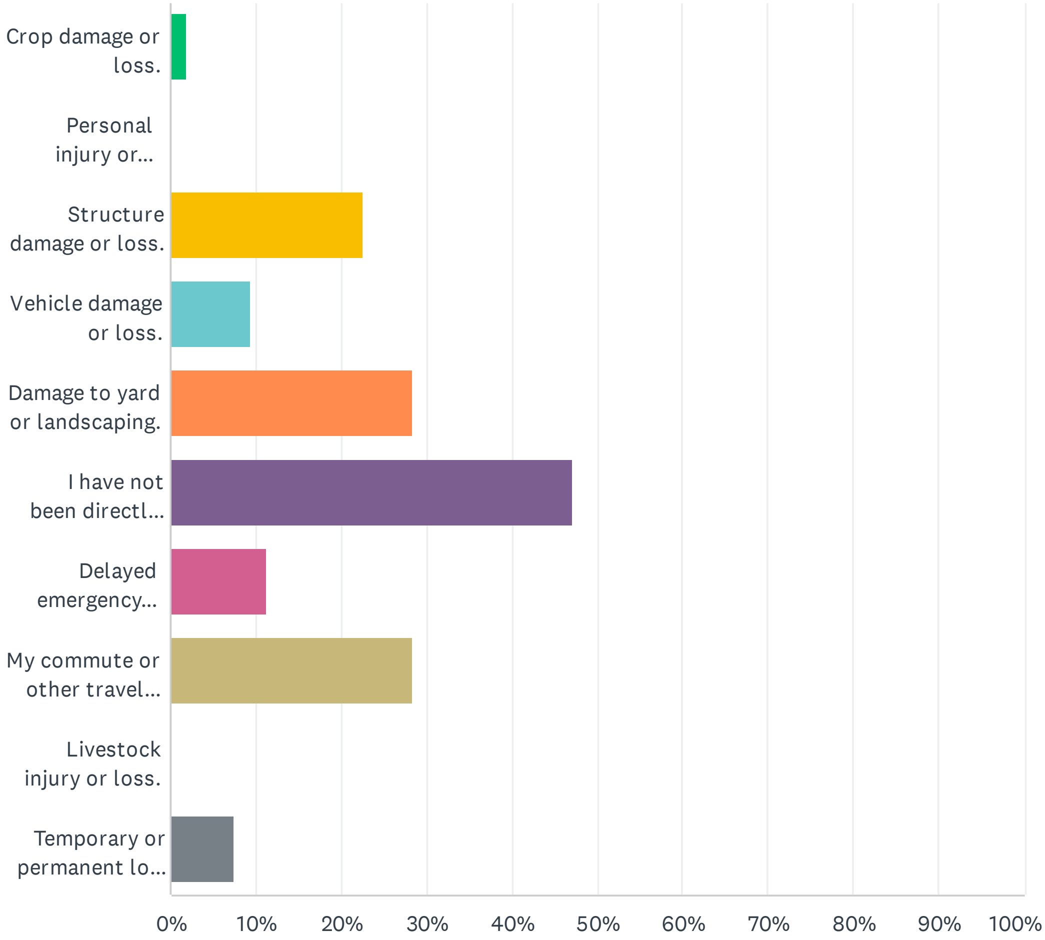
	NOT IMPORTANT	SOMEWHAT UNIMPORTANT	NEITHER IMPORTANT NOR UNIMPORTANT	SOMEWHAT IMPORTANT	VERY IMPORTANT	N/A	TOTAL	WEIGHTED AVERAGE
Minimizing flood impacts to residential areas.	1.89% 1	0.00% 0	1.89% 1	11.32% 6	81.13% 43	3.77% 2	53	4.76
Minimizing flood impacts to publicly-owned infrastructure such as highways, government buildings, and schools.	1.89% 1	0.00% 0	1.89% 1	15.09% 8	77.36% 41	3.77% 2	53	4.73
Minimizing flood impacts to farms, ranches, and other agricultural businesses.	3.77% 2	1.89% 1	9.43% 5	30.19% 16	49.06% 26	5.66% 3	53	4.26
Minimizing flood impacts to traditional energy services (e.g., solar, wind turbines).	7.55% 4	1.89% 1	11.32% 6	24.53% 13	47.17% 25	7.55% 4	53	4.10
Minimizing flood impacts to renewable energy services (e.g., oil, natural gas).	2.00% 1	6.00% 3	12.00% 6	24.00% 12	50.00% 25	6.00% 3	50	4.21
Minimizing flood impacts to other businesses (separate from agriculture or energy).	2.00% 1	2.00% 1	12.00% 6	36.00% 18	44.00% 22	4.00% 2	50	4.23

#	IF YOU WOULD LIKE TO PROVIDE ADDITIONAL INFORMATION PERTAINING TO THE TYPES OF FLOOD IMPACTS YOU HAVE EXPERIENCED, PLEASE PROVIDE IT BELOW.	DATE
1	renewable energy is known as solar and wind- not oil and natural gas.	2/17/2022 12:24 PM

2	Overflow of arroyo and reservoirs	10/11/2021 8:08 PM
3	In El Paso, the levees have been rebuilt and flooding has been somewhat controlled as nobody can do anything about a “freak rainstorm event. This has all been done yet flood maps have not been adjusted and our flood insurance continues to increase. Why?	10/11/2021 8:15 AM
4	Oil etc are not renewable energy	10/8/2021 12:08 AM
5	It appears that the “e.g.” are reversed. Renewable vs. traditional. Midland does not have traditional storm drains.	10/7/2021 9:28 PM
6	Flood water damage to my house.	9/30/2021 1:58 PM

Q77 What types of flood-related damage has your home sustained in the last five years (including structure and personal property damage)? Check all that apply.

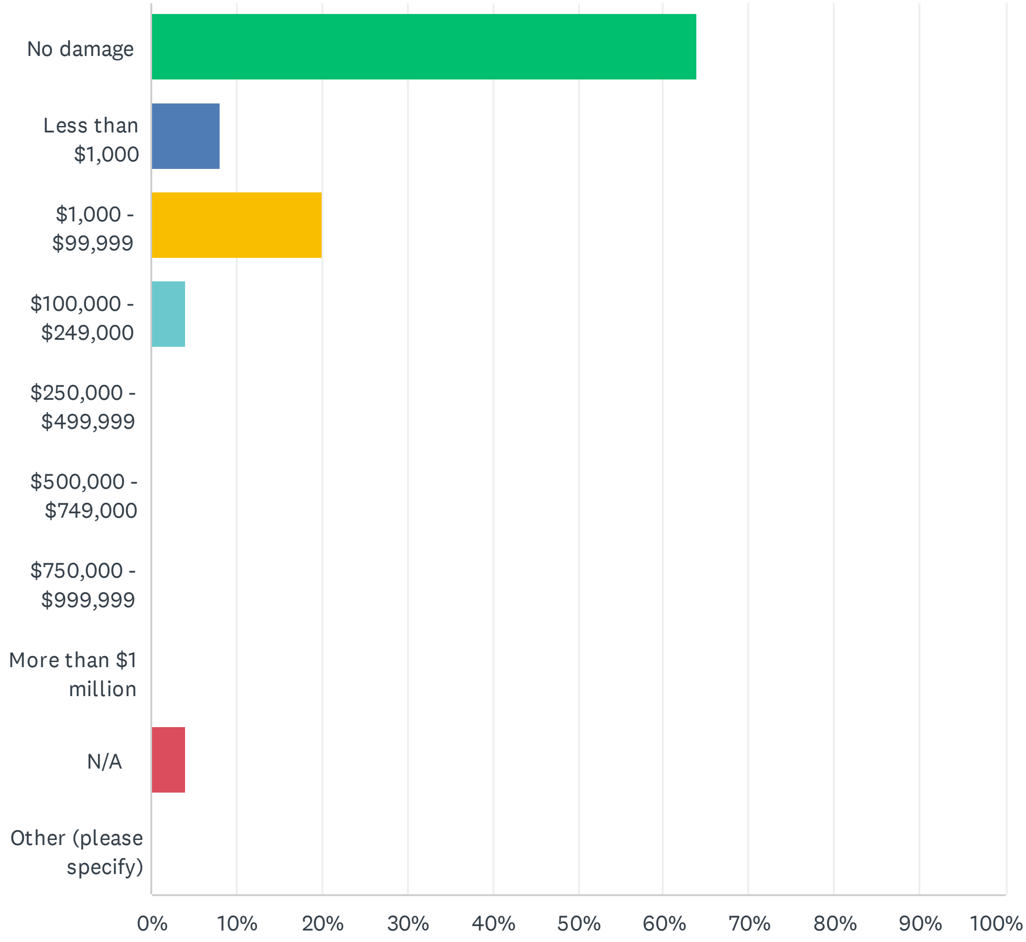
Answered: 53 Skipped: 68



ANSWER CHOICES	RESPONSES	
Crop damage or loss.	1.89%	1
Personal injury or fatality.	0.00%	0
Structure damage or loss.	22.64%	12
Vehicle damage or loss.	9.43%	5
Damage to yard or landscaping.	28.30%	15
I have not been directly impacted.	47.17%	25
Delayed emergency response.	11.32%	6
My commute or other travel has been delayed or obstructed.	28.30%	15
Livestock injury or loss.	0.00%	0
Temporary or permanent loss of business.	7.55%	4
Total Respondents: 53		

Q78 How much flood-related damage has your home sustained in the last five years (including property damage and loss of function)?

Answered: 50 Skipped: 71

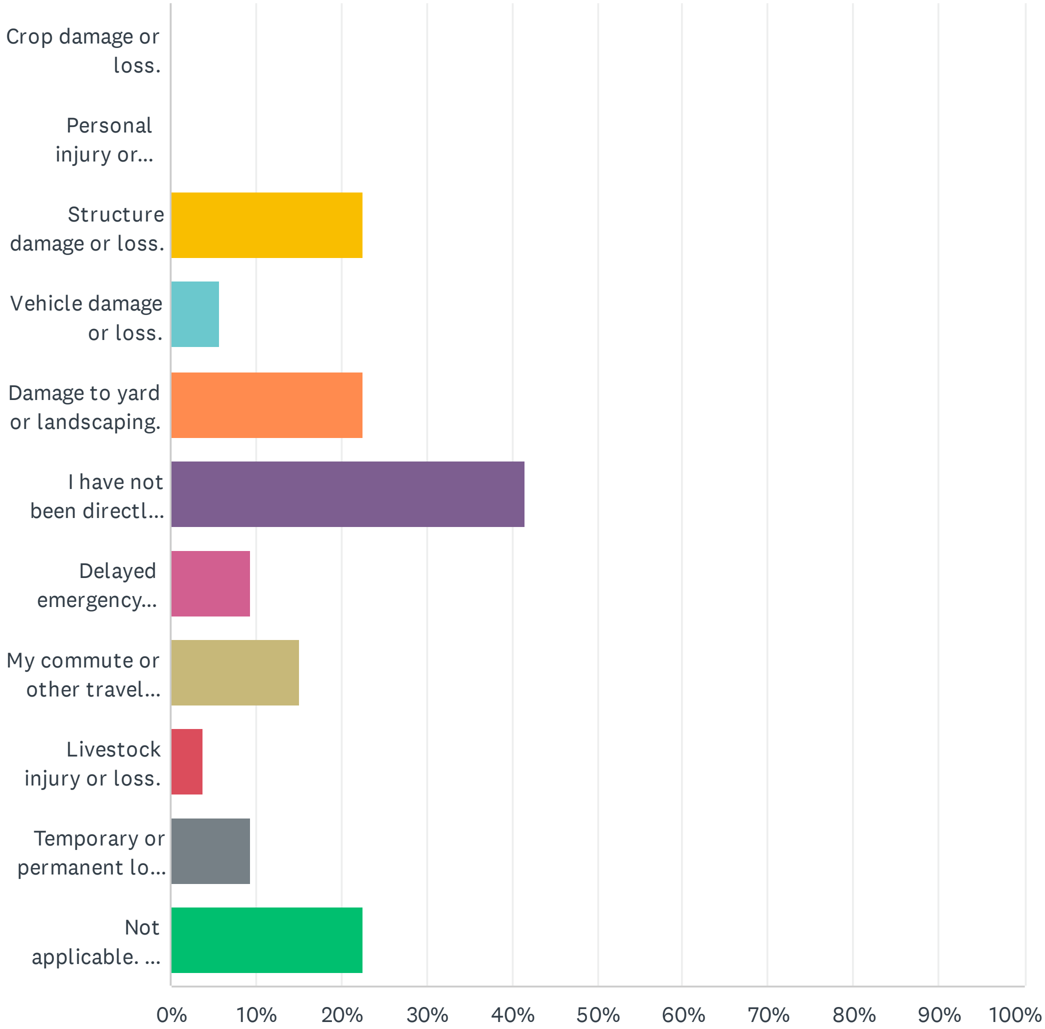


ANSWER CHOICES	RESPONSES	
No damage	64.00%	32
Less than $1,000	8.00%	4
$1,000 - $99,999	20.00%	10
$100,000 - $249,000	4.00%	2
$250,000 - $499,999	0.00%	0
$500,000 - $749,000	0.00%	0
$750,000 - $999,999	0.00%	0
More than $1 million	0.00%	0
N/A	4.00%	2
Other (please specify)	0.00%	0
TOTAL		50

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

Q79 What types of flood-related damage has your business or organization sustained in the last five years (including property damage and loss of function)? Check all that apply.

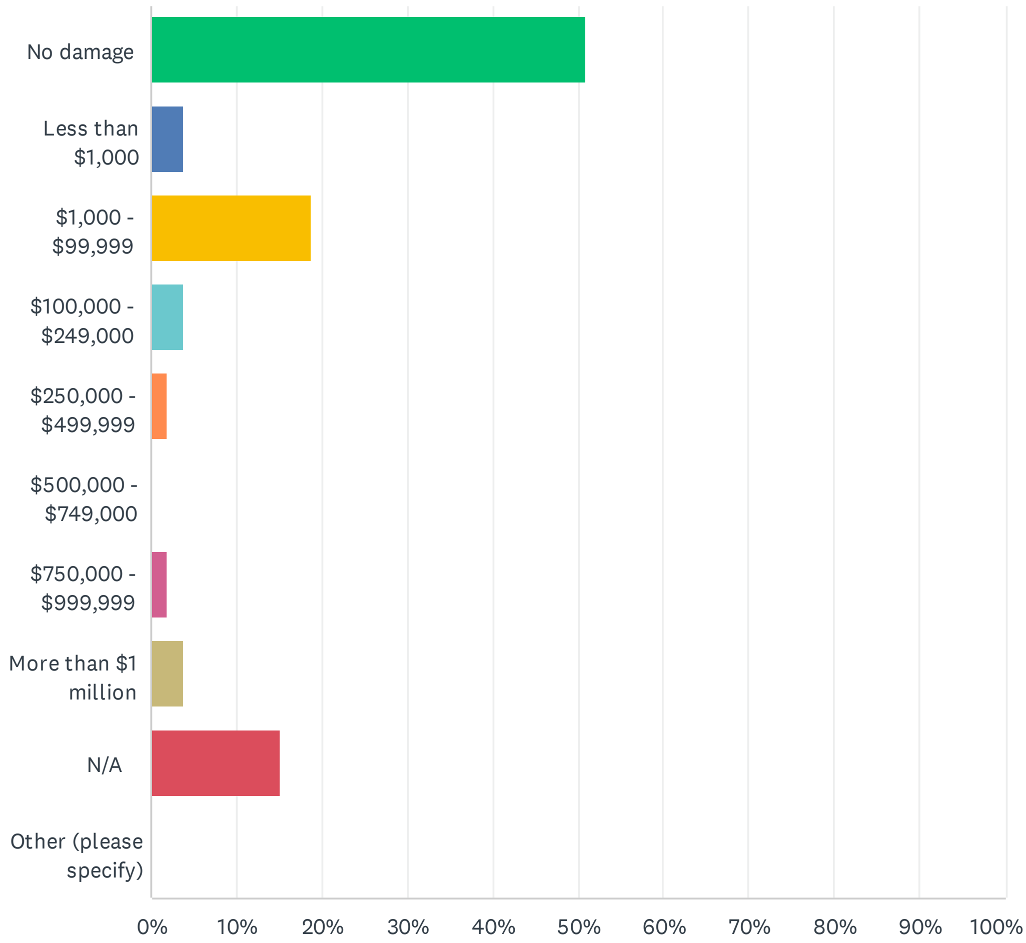
Answered: 53 Skipped: 68



ANSWER CHOICES	RESPONSES	
Crop damage or loss.	0.00%	0
Personal injury or fatality.	0.00%	0
Structure damage or loss.	22.64%	12
Vehicle damage or loss.	5.66%	3
Damage to yard or landscaping.	22.64%	12
I have not been directly impacted.	41.51%	22
Delayed emergency response.	9.43%	5
My commute or other travel has been delayed or obstructed.	15.09%	8
Livestock injury or loss.	3.77%	2
Temporary or permanent loss of business.	9.43%	5
Not applicable. (No business or organization)	22.64%	12
Total Respondents: 53		

Q80 How much flood-related damage has your business or organization sustained in the last five years (including property damage and loss of function)?

Answered: 53   Skipped: 68



ANSWER CHOICES	RESPONSES	
No damage	50.94%	27
Less than $1,000	3.77%	2
$1,000 - $99,999	18.87%	10
$100,000 - $249,000	3.77%	2
$250,000 - $499,999	1.89%	1
$500,000 - $749,000	0.00%	0
$750,000 - $999,999	1.89%	1
More than $1 million	3.77%	2
N/A	15.09%	8
Other (please specify)	0.00%	0
TOTAL		53

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

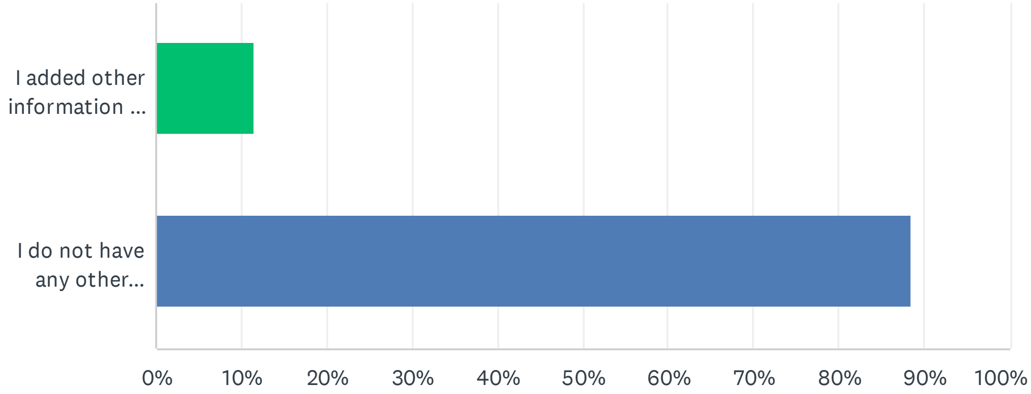
Q81 If you would like to provide additional information pertaining specifically to the damages your home, business, and/or organization have sustained, please provide it in the section below.

Answered: 12 Skipped: 109

#	RESPONSES	DATE
1	See statement and question above.	10/11/2021 8:15 AM
2	My house has not sustain damage because of the preservation of a natural arroyo. We need to work with nature not try to control it. Nature always wins.	10/8/2021 12:08 AM
3	The occasional deputy driving patrol cars into high water.	10/7/2021 9:28 PM
4	I have lived in my home for 38 years and have never had my property flood, even though I live just blocks from the Rio Grande River. Levees in the area are built well above the river. Streets may sometimes have ponding water, but it has never come on to my yard or near my home.	10/7/2021 4:59 PM
5	when flash floods stop fire department responses because volunteers can't get to the firehouse due to washed out community roads...	10/4/2021 12:57 PM
6	Flooding has damaged the school district facilities and caused damage that is high -dollar. Flooding events coincide with storms that also create structural damage and the need for a new roof.	10/4/2021 9:58 AM
7	PSB lack of involvement	10/1/2021 4:00 PM
8	We would need to assemble data if needed	10/1/2021 2:45 PM
9	Sheet flooding from paved areas at SRSU above our home.	9/30/2021 3:38 PM
10	My personal home took about 2 feet of water in it. House was declared a total loss.	9/30/2021 1:58 PM
11	I had to have my roof replaced last year due to damage and leaking into the home.	9/17/2021 12:41 AM
12	Answering Q12 as "personal impacts" Neighbors to the west added sandbags to keep property from being flooded. 6-8" deep water in the yard. House is elevated (mobile home), so no structure impacts. Housing area is in the recent FEMA floodplain map but unlikely to flood due to walls/fences.	8/24/2021 2:49 PM

Q82 When you are done, please return to this survey and click the drop down menu below to indicate whether or not you have completed using the map tool.

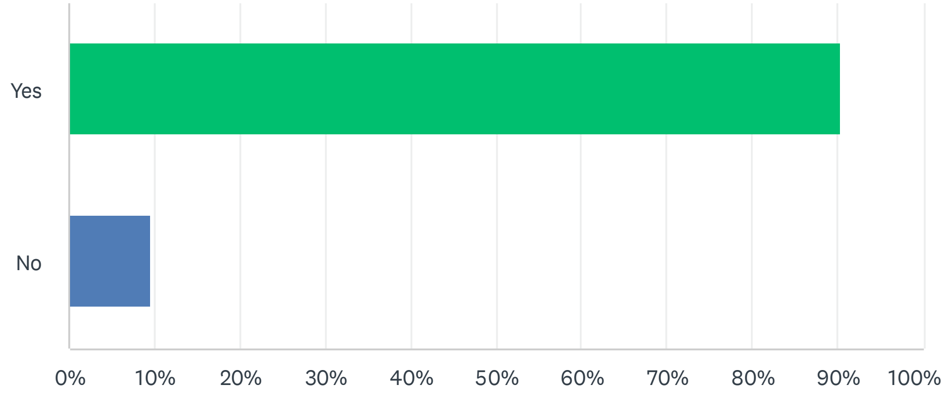
Answered: 52 Skipped: 69



ANSWER CHOICES	RESPONSES	
I added other information via the interactive mapping tool	11.54%	6
I do not have any other information to add to the interactive mapping tool	88.46%	46
TOTAL		52

Q83 Can we reach out to you for additional information on your responses or during future surveys?

Answered: 52 Skipped: 69



ANSWER CHOICES	RESPONSES	
Yes	90.38%	47
No	9.62%	5
TOTAL		52

Q84 Do you have any additional feedback or comments related to flood issues, the survey or other relevant topics? If so, please let us know in the comment box below.

Answered: 12 Skipped: 109

#	RESPONSES	DATE
1	None	10/18/2021 5:54 PM
2	None. I really don't have anything to do with flood related issues.	10/15/2021 10:35 AM
3	The PDEMUD1 can readily provide information on the location and type of drainage structures within its boundaries but this process might take 2 to 3 weeks.	10/15/2021 10:12 AM
4	Will the information being obtained for the Hazardous Mitigation Plan be incorporated with flood plan management?	10/13/2021 3:09 PM
5	Reservoir and arroyo by my home have not been maintained in the 20 years I have lived here	10/11/2021 8:10 PM
6	Thanks for reaching out	10/8/2021 7:43 PM
7	Desert Haven, Loma Linda, Deer Mountain...residents would sure appreciate some attention to basic roads being passable during/after monsoon events!	10/4/2021 1:02 PM
8	It would be nice to discuss flooding issues in Sierra Blanca in person or through a phone call.....while Sierra Blanca is a desert and receives minimal rainfall, the monsoon season can produce flash floods, and the bigger issue is an accumulation of flooding events creating larger damage.	10/4/2021 10:03 AM
9	there are no flooding items we are being placed into the Migration Plan. Desert Haven Hudspeth County	10/2/2021 3:01 PM
10	Please help.	10/1/2021 2:23 PM
11	n/a	9/20/2021 12:01 PM
12	This organization is a local government that provides water, wastewater and sanitation services for the community of Ozona, TX. The Crockett County Judge will be more knowledgeable and have more input for this particular survey.	9/17/2021 10:32 AM

Appendix 10C
Draft RFP Public Hearing Documentation

UPPER RIO GRANDE
FLOOD PLANNING

Draft Regional Flood Plan Available for Public Comment

Region14 – Upper Rio Grande Flood Planning Group

Texas Water Development Board (TWDB) is administering a new state and regional flood planning process with flood planning regions based on river basins. The initial regional flood planning groups were formed on October 1, 2020; the first regional flood plans will be due in January 2023, and the first state flood plan will be due September 1, 2024. The Upper Rio Grande Regional Flood Plan identifies existing and future flood risks, as wells strategies for flood mitigation and identification of areas for future study. The Upper Rio Grande Regional Flood Planning Group (RFPG) has unanimously approved the draft Upper Rio Grande Regional Flood Plan. The TWDB will approve the final Upper Rio Grande Regional Flood Plan by December 2023 and will prepare the statewide flood plan by September 2024.

In accordance with state law, the Upper Rio Grande RFPG is providing the public with the opportunity to comment on the draft plan. The 60-day comment period will begin on August 14, 2022 and will end on October 14, 2022. The draft plan is available on the Upper Rio Grande RFPG website:

Upper Rio Grande Regional Flood Planning Group Regional Draft Plan

Public can view the plan in person at three locations from August 14, 2022 through October 14, 2022:

- *Rio Grande Council of Governments - (Contact: Annette Gutierrez, Executive Director)*
  8037 Lockheed, Suite 100
  El Paso, Texas 79925
  915-533-0998

- *Reeves County - (Contact: Jeff Bullard, Director, Emergency Management – Reeves County)*
  County Courthouse
  1714 Schmidt Dr RM 326
  Pecos, Texas 79772
  432-287-0242

- *Rio Grande Council of Governments - (Contact: Peggy O'Brien, Local Governments Manager)*
  Marfa Activity Center
  105 N. Mesa
  Marfa, Texas 79843

Opportunity for public comment will include a public meeting held as outline below:

- September 14, 2022 at 5:00 PM, MDT *at the Rio Grande Council of Governments (8037 Lockheed, Suite 100 El Paso, TX 79925)*
- *Phone participation is available for public and non-voting representatives by the conference call information: Call In: (877) 286-5733; Passcode / ID: 35631928#*
  Video participation is available by clicking here on this hyperlink: Click here to join the meeting
- *The meeting will allow the public to provide oral or written comments.*

Written comments can be submitted via U.S. mail, email, or the Upper Rio Grande RFPG website:

- *U.S. Mail – Rio Grande Council of Governments, ATTN: Annette Gutierrez, 8037 Lockheed, Suite 100, El Paso, TX 79925*
- *Email –* annetteg@riocog.org

While the Upper Rio Grande RFPG is responsible for developing the draft plan, implementation of the specific recommendations and flood mitigation actions included in the plan will require action by local communities throughout Region 14.

UPPER RIO GRANDE
FLOOD PLANNING

The Region 14 Upper Rio Grande RFPG is administered by the Rio Grande Council of Governments and the following members appointed by the TWDB:

Voting Member	**Interest Category**
Dr. Zhuping Sheng	Agricultural interests
Gilberto Saldana Jr.	Counties
Vacant	Electric generating utilities
Jeff Bennett	Environmental interests
Sal Masoud	Industries
Javier Acosta	Municipalities
David “Dave” Hall	Public
Carlos Arturo Velarde Fernandez	Public
Rene Rodriguez	Small business
Omar L. Martinez	Water districts
Gisela Dagnino	Water utilities
Levi Bryand	Water utilities
Rick Tate	River authorities

Non-voting Member	**Agency**
James Weaver	Texas Parks and Wildlife Department
Judy Lucio	Texas Division of Emergency Management
Larissa Place	Texas Department of Agriculture
Vacant	General Land Office/Region 14 Liaison
Richard Bagans	Texas Water Development Board
Anita Keese	Texas Commission on Environmental Quality
Vanessa Rosales-Herrrera	Region 15 Liaison
Delbert Humberson	International Boundary Water Commission
Ben Wilde	Texas State Soil and Water Conservation Board

AECOM Delivering a better world

Region 14 Upper Rio Grande Flood Plan

Draft Regional Flood Plan (RFP)

Public Feedback

09.14.2022

Agenda

- Welcome (Introductions to Planning Team)
- Brief Overview of Regional Flood Planning Process and Draft Upper Rio Grande Regional Flood Plan
- Draft RFP Comments

Welcome

- *Thank you for joining us!*

Upper Rio Grande
Flood Planning

The Rio Grande
Council of Governments

AECOM

Welcome

- *Meet our planning team*

Omar Martinez
Upper Rio Grande Flood Planning Group (URGRFPG) Chair
El Paso County Water Improvement District No. 1

Annette Gutierrez
Executive Director
Rio Grande Council of Governments (RGCOG) – RFP Sponsor

Gilbert Andujo, PE, CFM
Technical Consultant Project Manager
AECOM

Chris Wright, PE, CFM
Technical Consultant Lead Planner
AECOM

Bryan Blaisdell, PE, GISP, CFM
Technical Consultant Lead Planner
AECOM

Welcome

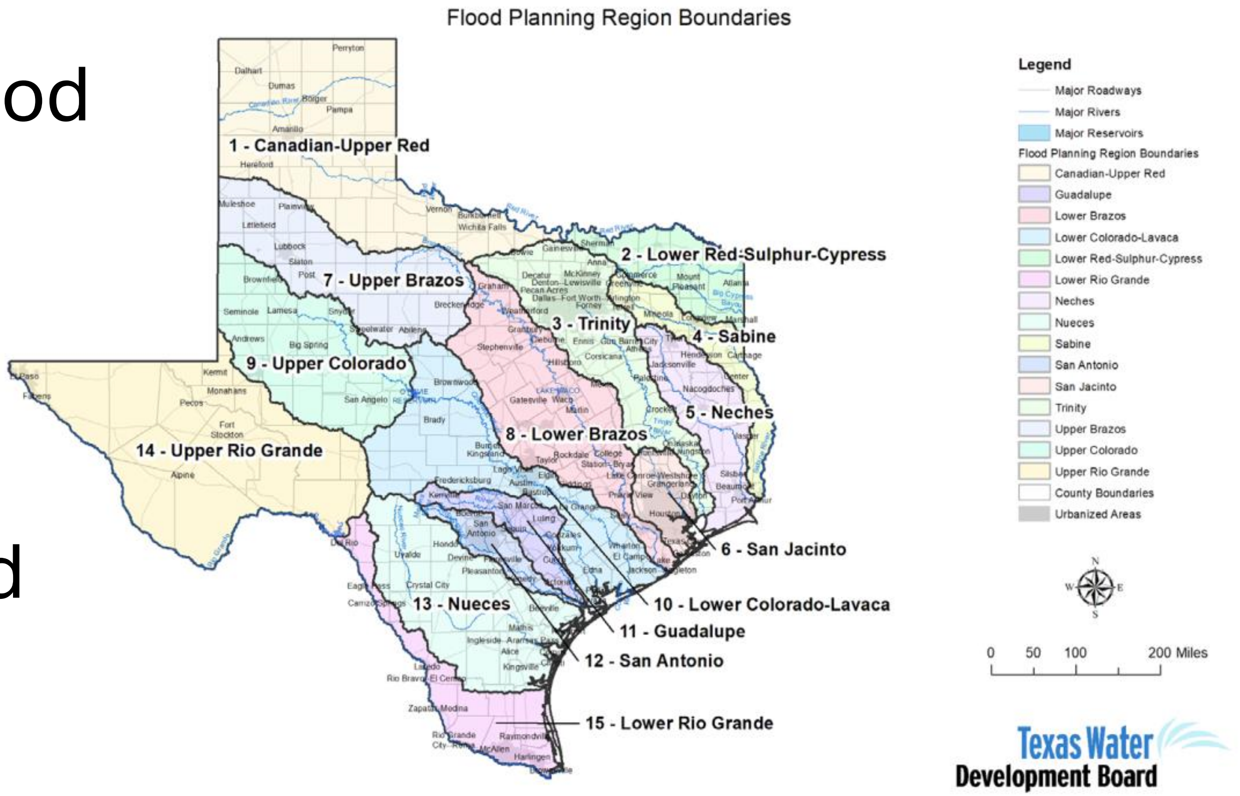
– *Meet our planning team (Upper Rio Grande Flood Planning Group Members)*

- ***Agriculture:*** *Dr. Zhuping Sheng (Sheng Engineering PLLC)*
- ***Counties:*** *Gilbert Saldana, Jr. (El Paso County)*
- ***Environmental Interests:*** *Jeff Bennett (Rio Grande Joint Venture)*
- ***Industries:*** *Sal Masoud (Del Rio Engineering)*
- ***Municipalities:*** *Javier Acosta (FXSA)*
- ***Public:*** *Dave Hall*
- ***Public:*** *Carlos Arturo Velarde Fernandez (Val Verde County)*
- ***Small Business:*** *Rene Rodriguez*
- ***Water Districts:*** *Omar Martinez (EPCWID #1)*
- ***Water Utilities:*** *Gisela Dagnino (El Paso Water) (with Enrique Ochoa and Marvin Gomez as alternate members)*
- ***Water Utilities:*** *Levi Bryand (LCA, Inc.)*

Overview of Regional Flood Planning Process

Overview of Regional Flood Planning Process

- Texas Senate Bill 8 (2019) established regional and state flood plans
- State organized into 15 flood planning groups
- Flood plans will be updated based on a five-year planning cycle



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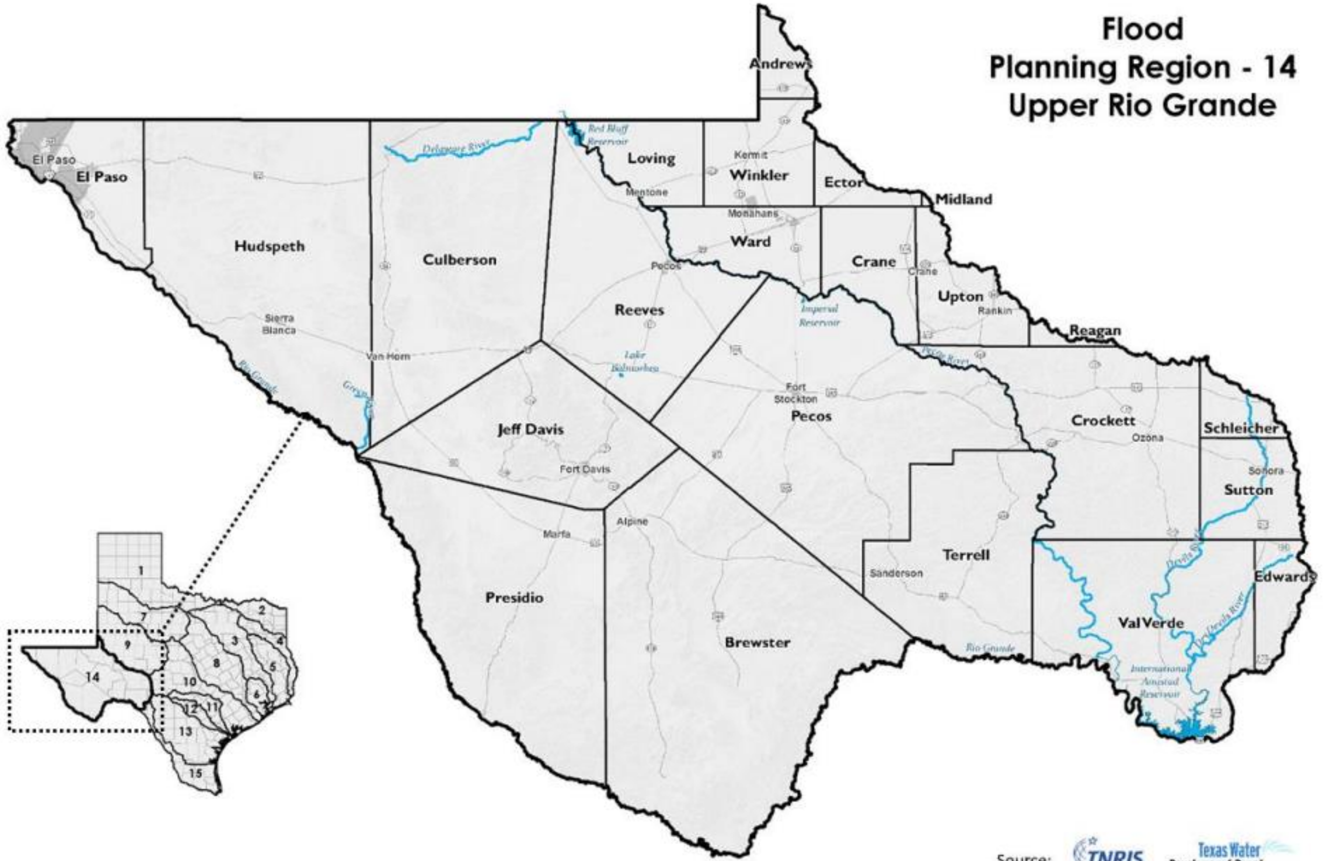
Overview of Regional Flood Planning Process



Source: TNRIS Texas Water Development Board

- Flood Planning Region 14 (Upper Rio Grande)
- 23 Counties in West Texas
  - Rio Grande from El Paso County to Amistad Reservoir
  - Pecos River from New Mexico border (Red Bluff Reservoir) to the Rio Grande

AECOM

Overview of Regional Flood Planning Process

Flood Management Evaluation (FME)

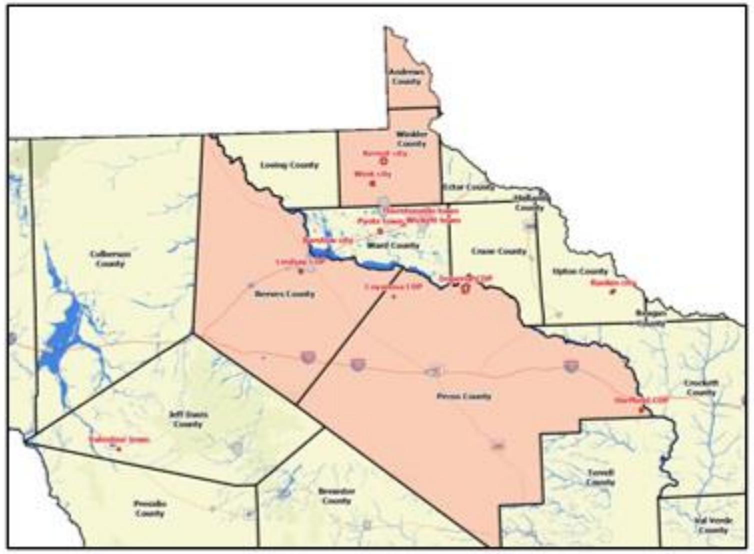
- A proposed flood study of a specific, flood-prone area that is needed in order to assess flood risk and/or determine whether there are potentially feasible FMSs or FMPs.

Flood Mitigation Project (FMP)

- A proposed project (structural and non-structural) that when implemented will reduce flood risk, mitigate flood hazards to life or property.

Flood Management Strategy (FMS)

- A proposed plan to reduce flood risk or mitigate flood hazards to life or property (may or may not require associated FMPs to be implemented).



Four counties in Region 14 do not have FEMA floodplains, and may need an FME to develop detailed floodplain models

Image: Upper Rio Grande Regional Flood Planning Group General Meeting

El Paso Stormwater Project at Gateway East Pond

Image: AECOM presentation for El Paso County Stormwater Master Plan

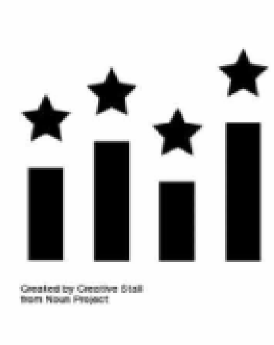
Vegetated Sandbar Limiting Flow Capacity in the Rio Grande

Image: *"Evaluation of Reduced Flow Capacity of the Rio Grande and the Impacts on the Operations of the Rio Grande Project Leasburg Dam to American Dam"* (Joint Committee on Rio Grande Project Flood Risk (2019)

Overview of Regional Flood Planning Process

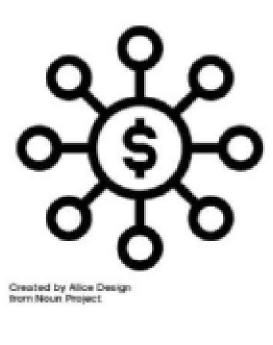
Created by Andrejs Kirma
from Noun Project

Regional Flood Plans will identify flood risk and recommend FMEs, FMSs, and FMPs within regions.



Created by Creative Stall
from Noun Project

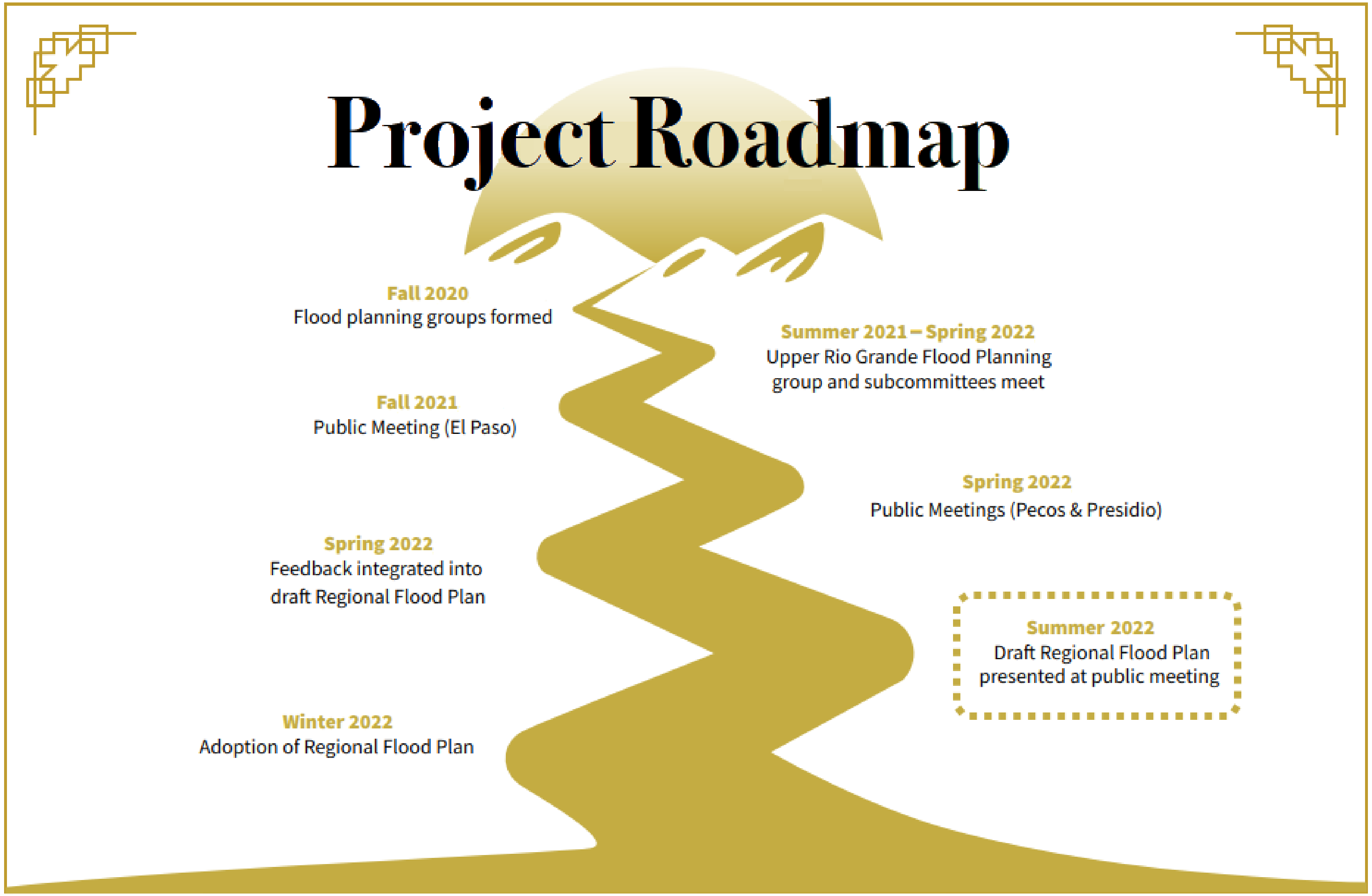
State Flood Plan will rank recommended FMEs, FMSs, and FMPs statewide



Created by Alice Design
from Noun Project

Future state financial assistance may be allocated using a to-be-determined prioritization criteria.*

Overview of Regional Flood Planning Process



Project Roadmap

Fall 2020
Flood planning groups formed

Summer 2021 – Spring 2022
Upper Rio Grande Flood Planning group and subcommittees meet

Fall 2021
Public Meeting (El Paso)

Spring 2022
Public Meetings (Pecos & Presidio)

Spring 2022
Feedback integrated into draft Regional Flood Plan

Summer 2022
Draft Regional Flood Plan presented at public meeting

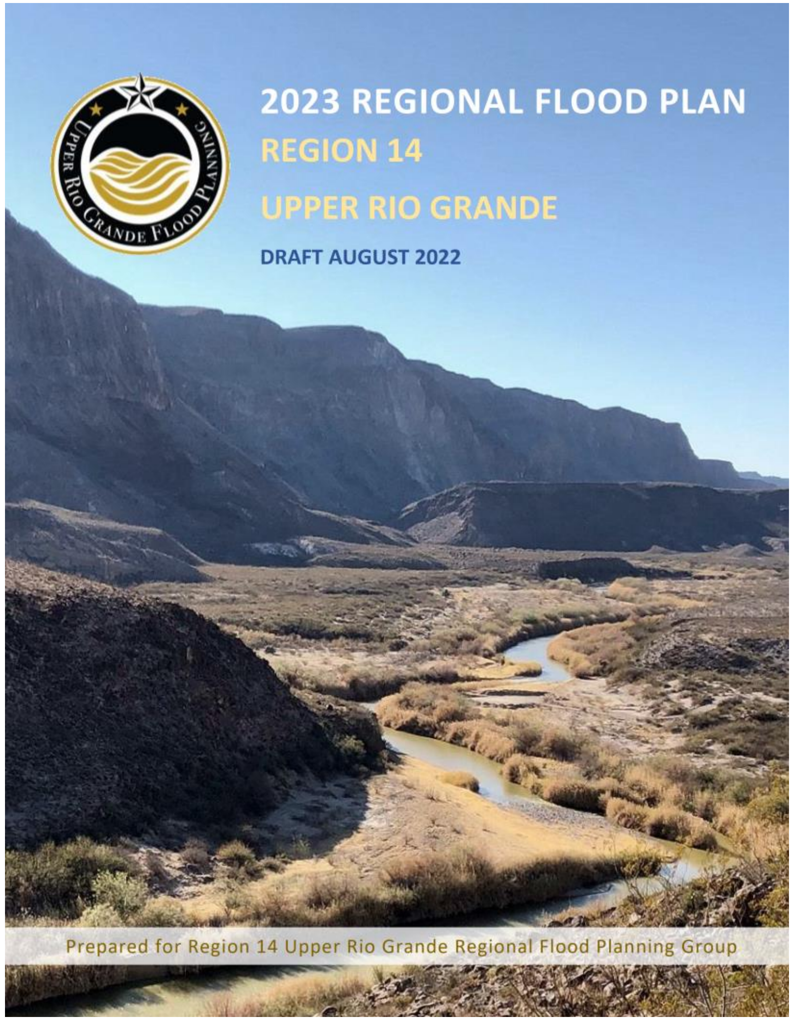
Winter 2022
Adoption of Regional Flood Plan

AECOM

Overview of Draft Upper Rio Grande Regional Flood Plan

Overview of Draft Upper Rio Grande Regional Flood Plan

- Draft RFP submitted to Texas Water Development Board on August 1, 2022
- Posted on URGFP.org for public review online with physical copies available in three locations across the region (El Paso, Pecos, and Marfa)
- Public comment period is from August 14, 2022 to October 14, 2022
- Comments can be submitted during public meeting on September 14, 2022, or via U.S. mail and email:
  - U.S. Mail – Rio Grande Council of Governments, ATTN: Annette Gutierrez, 8037 Lockheed, Suite 100, El Paso, TX 79925
  - Email – annetteg@riocog.org



2023 REGIONAL FLOOD PLAN
REGION 14
UPPER RIO GRANDE
DRAFT AUGUST 2022

Prepared for Region 14 Upper Rio Grande Regional Flood Planning Group

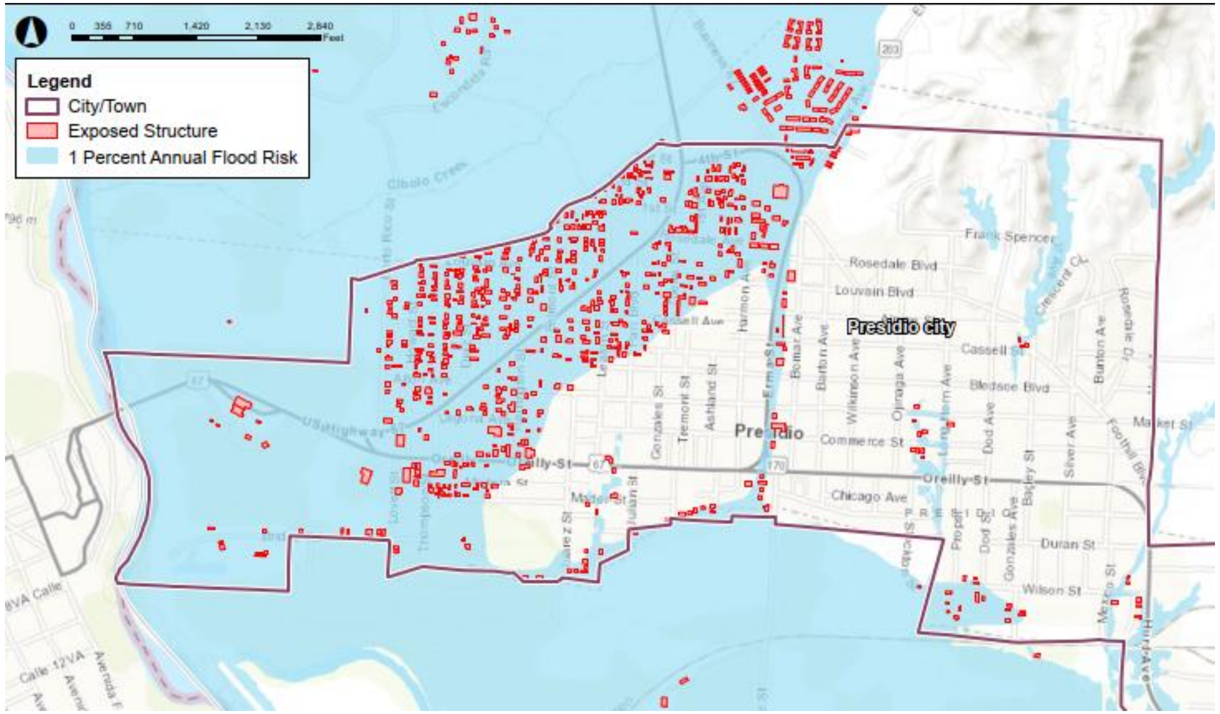
Chapter 1 – Introduction and Description of the Upper Rio Grande Flood Planning Region

- Social and Economic Characteristics
- Agricultural & Natural Resources
- Historical Flooding
- Flood-Related Authorities & Regulation
- Existing Natural Flood Mitigation Features
- Constructed Major Flood Infrastructure
- Proposed or Ongoing Major Flood Infrastructure and Mitigation Projects
- Relevant Existing Planning Documents

pril 2004 flood caused this I-20 bridge over Salt Draw to collapse, located between Toyah and Pecos. Source: AA and NWS; https://www.weather.gov/maf/2004_04_02_SevereWeather

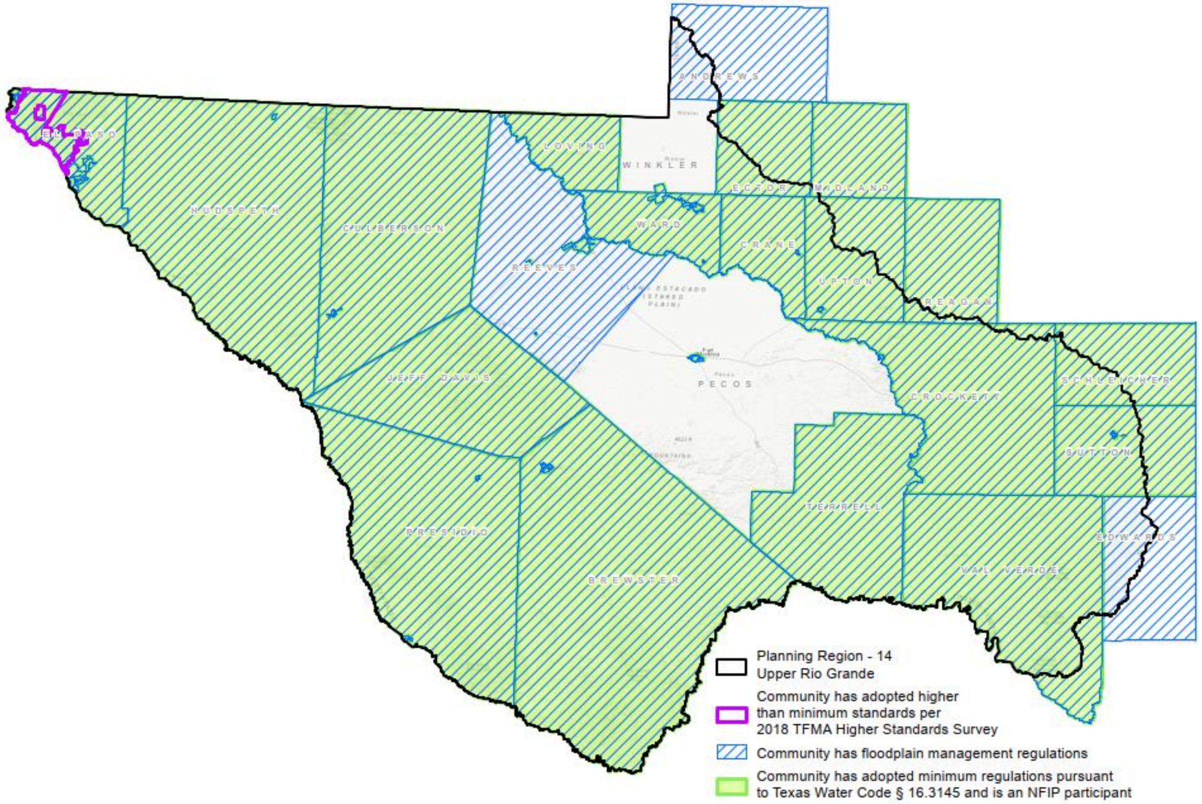
Chapter 2 – Flood Risk Analyses

- Available Hydrologic and Hydraulic Models
- Existing and Future Conditions Analyses
  - 1% and 0.2% annual chance flood events evaluated using best available flood data
  - Flood hazards *(location, magnitude, frequency)*
  - Flood exposure *(who and what might be harmed)*
  - Flood vulnerabilities *(areas most at risk to flooding including communities and critical facilities)*
- Expected Loss of Function



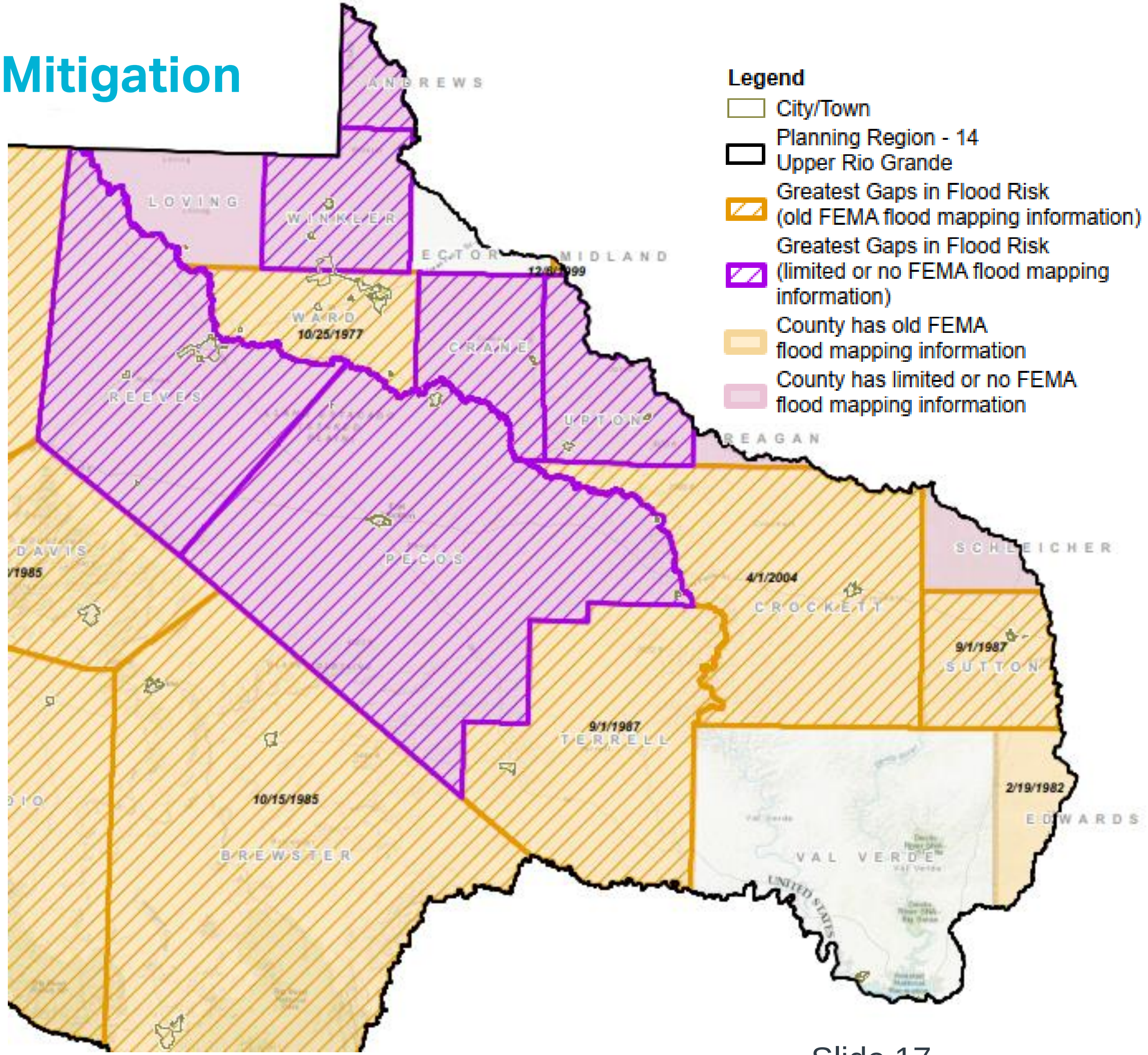
Chapter 3 – Floodplain Management Practices and Goals

- Evaluation of Floodplain Management Practices
  - 75% of all eligible communities participate in the National Flood Insurance Program (NFIP)
  - City of El Paso is recognized for higher than minimum floodplain standards
- Recommendations for Minimum Standards and Best Practices
- Flood Mitigation and Floodplain Management Goals
  - Includes 21 short-term (10-year) goals and 7 long-term (30-year) goals for the region covering a wide range of flood mitigation and floodplain management needs



Chapter 4 – Identification of Flood Mitigation Needs and Solutions

- Flood Mitigation Needs Analysis
  - *Map 14: Greatest Gaps in Flood Risk Information*
  - *Map 15: Greatest Flood Risk*
- Process for Identifying Flood Mitigation Solutions
- Identification of FMEs
  - *Map 16: Extent of Potential FMEs and Mapping Needs*
- Identification of FMPs
  - *Map 17: Extent of Potential FMPs*
- Identification of FMSs
  - *Map 18: Extent of Potential FMSs*
- *Appendices* include evaluation tables and narratives for all identified FMEs, FMSs, and FMPs



Chapter 5 – Evaluation and Recommendation of Flood Solutions

- Evaluation & Recommendation of Flood Solutions
  - Summary of Evaluation Process for FMEs and FMSs without Project Specific Data
  - Methods for Evaluation of FMSs and FMPs with Project-Specific Data
- Summary of Recommendation Process
- *Exhibit Maps* include mapbooks with individual maps of each FME, FMP, and FMS
- *Appendices* include:
  - Narratives of analyses performed on project-specific FMSs and FMPs
  - “No negative impact” assessments
  - Recommendations tables for FMEs, FMSs, and FMPs
  - Comprehensive FMP impact summary table

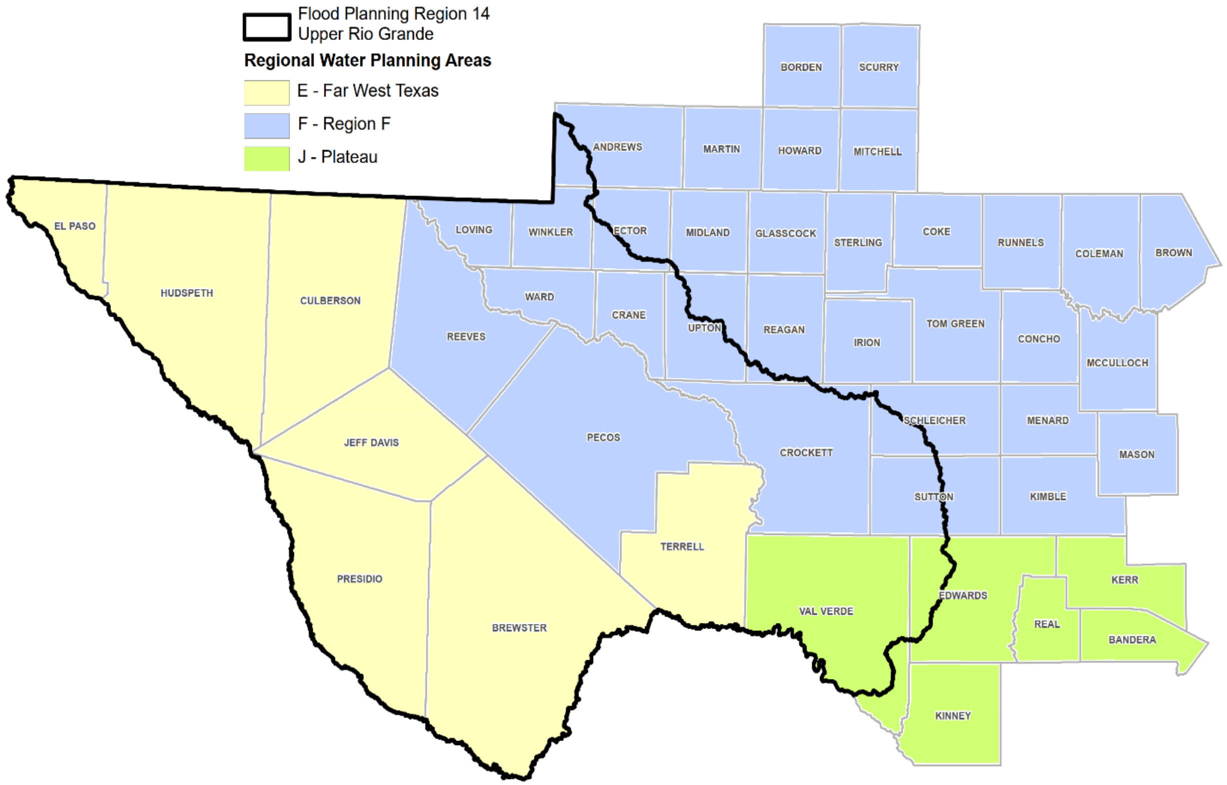
Chapter 6 – Impacts and Contribution of Regional Flood Plan

Impacts of Regional Flood Plan

- FMPs and FMSs expected to remove **11,964** structures (population of **31,233**) from the 1% AC Floodplain
- Recommended FMPs expected to remove **936** structures (population of **2,400**) from the 0.2% AC Floodplain
- FMPs and FMSs expected to remove **41** Low Water Crossings from the 1% AC Floodplain

Contributions to and Impacts on Water Supply Development and the State Water Plan

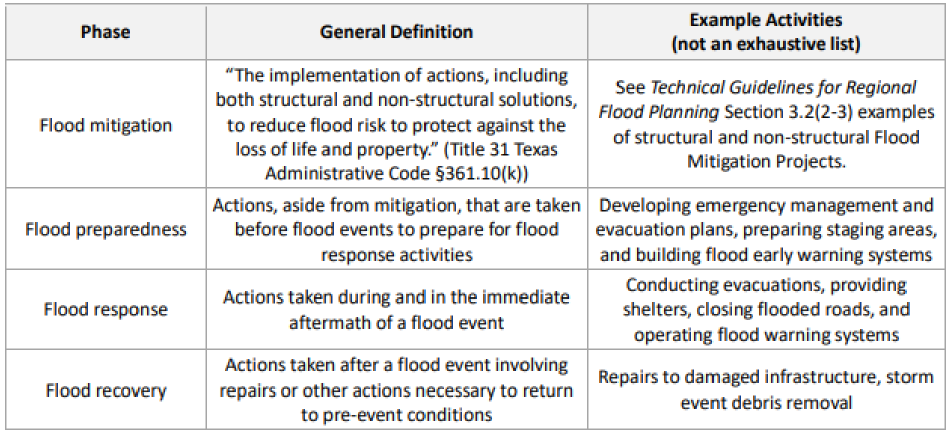
- There are no recommended FMPs that would measurably contribute to water supply.
- There is one recommended FMS which is estimated to contribute to water supply:
  - FMS ID: 142000002 - "Irrigation and Recharge Application of Captured Rainwater Runoff at Alpine."
  - Recommended in the State Water Plan and the Far West Texas (Region E) Water Plan (Strategy E-2)
- There are no FMPs or FMPs that are estimated to negatively impact water supply



Chapter 7 – Flood Response Information and Activities

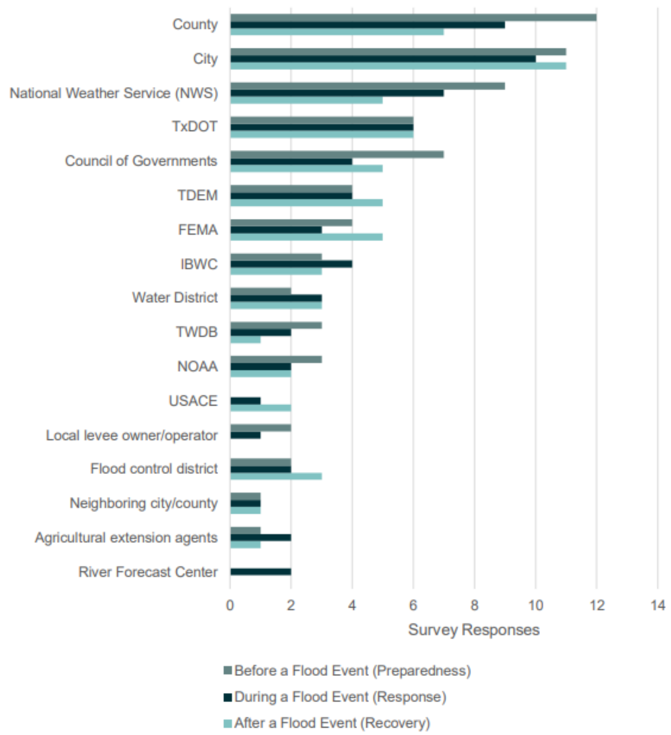
- Summary of documents and activities related to three stages of flood emergency management including:
  - Flood preparedness
  - Flood response
  - Flood recovery

Table 7.1 Flood Emergency Management Phases



Phase	General Definition	Example Activities (not an exhaustive list)
Flood mitigation	"The implementation of actions, including both structural and non-structural solutions, to reduce flood risk to protect against the loss of life and property." (Title 31 Texas Administrative Code §361.10(k))	See *Technical Guidelines for Regional Flood Planning* Section 3.2(2-3) examples of structural and non-structural Flood Mitigation Projects.
Flood preparedness	Actions, aside from mitigation, that are taken before flood events to prepare for flood response activities	Developing emergency management and evacuation plans, preparing staging areas, and building flood early warning systems
Flood response	Actions taken during and in the immediate aftermath of a flood event	Conducting evacuations, providing shelters, closing flooded roads, and operating flood warning systems
Flood recovery	Actions taken after a flood event involving repairs or other actions necessary to return to pre-event conditions	Repairs to damaged infrastructure, storm event debris removal

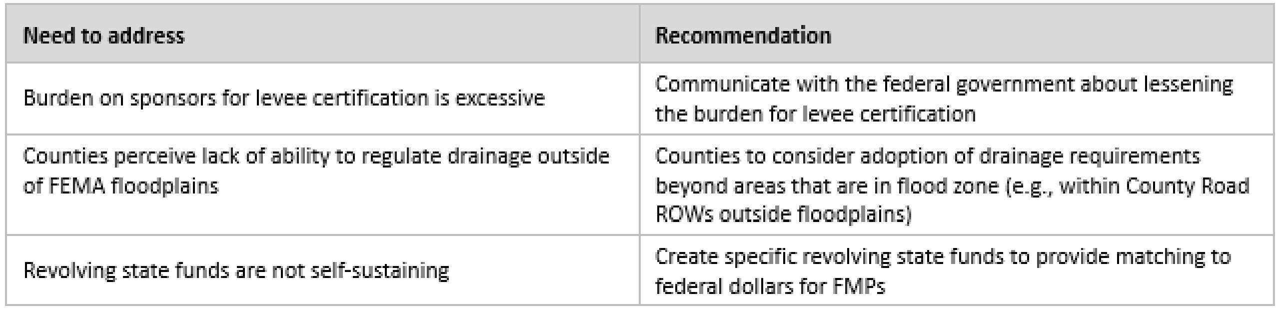
Figure 7.1 Entity Coordination Before, During, and After Flood Event



Chapter 8 – Administrative, Regulatory, and Legislative Recommendations

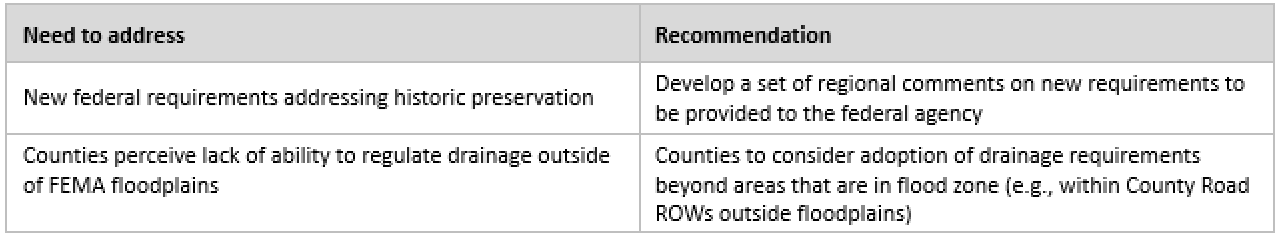
- Legislative Recommendations
  - El Paso County Area Stakeholders
    - 3 recommendations
  - Flood Planning Area Outside of El Paso County
    - 2 recommendations
- Regulatory/Administrative Recommendations
  - El Paso County Area Stakeholders
    - 13 recommendations
  - Flood Planning Area Outside of El Paso County
    - 8 recommendations

Table ES.5 Legislative Recommendations (El Paso County Area Stakeholders)



Need to address	Recommendation
Burden on sponsors for levee certification is excessive	Communicate with the federal government about lessening the burden for levee certification
Counties perceive lack of ability to regulate drainage outside of FEMA floodplains	Counties to consider adoption of drainage requirements beyond areas that are in flood zone (e.g., within County Road ROWs outside floodplains)
Revolving state funds are not self-sustaining	Create specific revolving state funds to provide matching to federal dollars for FMPs

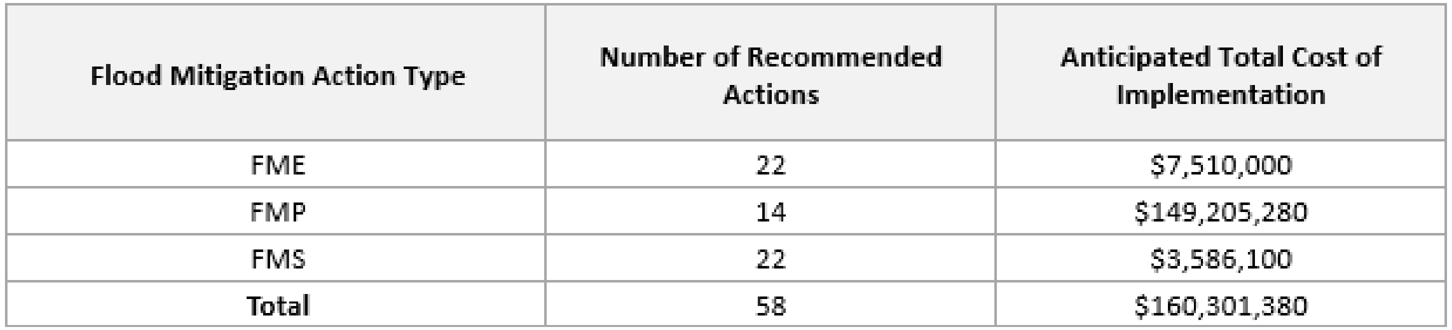
Table ES.7 Legislative Recommendations (Flood Planning Area Outside of El Paso County)



Need to address	Recommendation
New federal requirements addressing historic preservation	Develop a set of regional comments on new requirements to be provided to the federal agency
Counties perceive lack of ability to regulate drainage outside of FEMA floodplains	Counties to consider adoption of drainage requirements beyond areas that are in flood zone (e.g., within County Road ROWs outside floodplains)

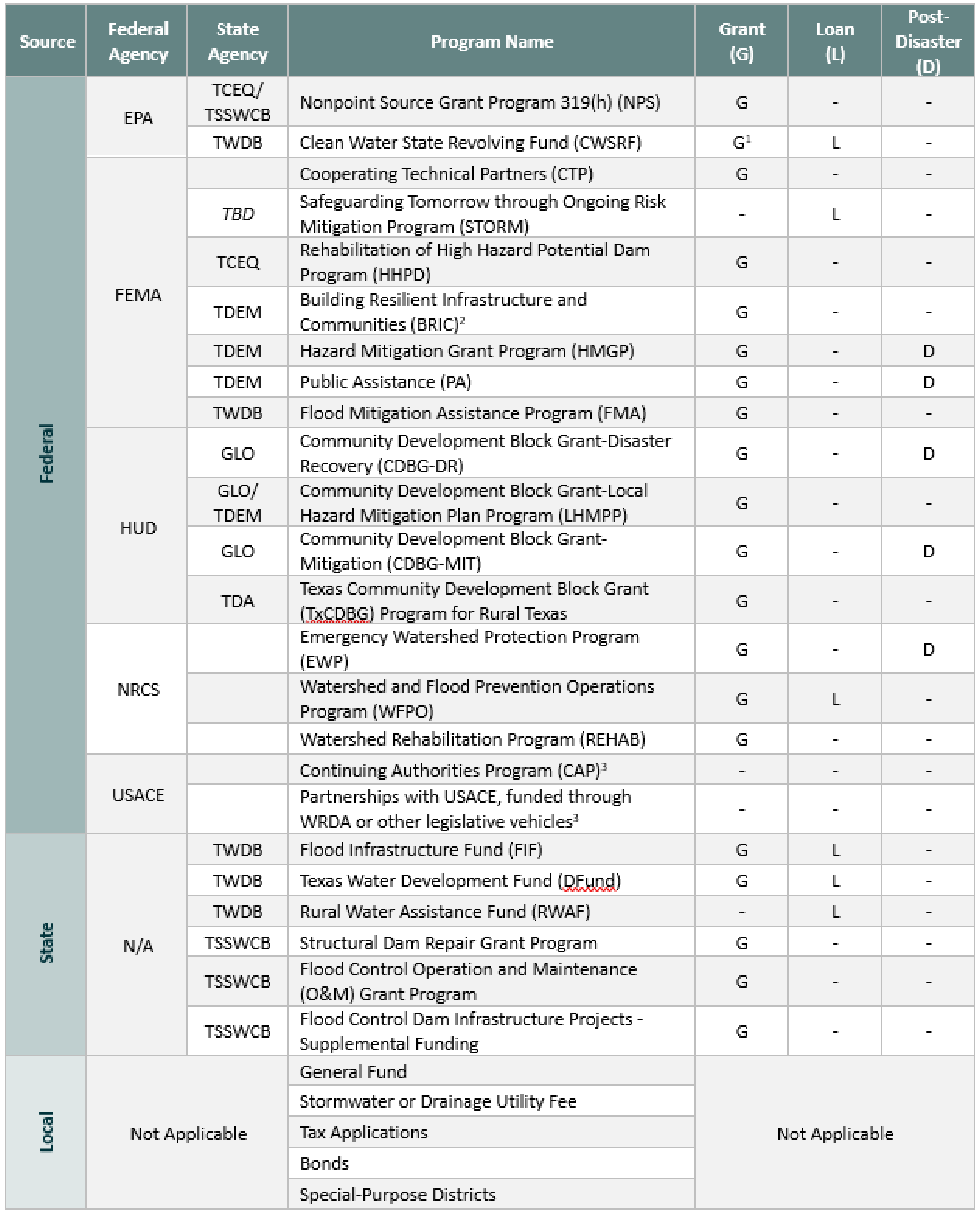
Chapter 9 – Flood Infrastructure Financing Analysis

- Sources of Funding for Flood Management Activities
  - 58 Flood Mitigation Actions recommended ($160.3M)
  - Local, State, and Federal funding sources described
  - Barriers to funding discussed



Flood Mitigation Action Type	Number of Recommended Actions	Anticipated Total Cost of Implementation
FME	22	$7,510,000
FMP	14	$149,205,280
FMS	22	$3,586,100
Total	58	$160,301,380

- Flood Infrastructure Financing Survey
  - Online survey with 9 funding questions sent to all sponsors
  - 29 entities contacted, 11 responses (38% response)
  - Responses received for 46 of 58 (79%) FMEs/FMPs/FMSs
- Proposed Role of State in Financing
  - $153.8M (96% of funding needed) not anticipated to be local



Source	Federal Agency	State Agency	Program Name	Grant (G)	Loan (L)	Post-Disaster (D)
Federal	EPA	TCEQ/ TSSWCB	Nonpoint Source Grant Program 319(h) (NPS)	G	-	-
		TWDB	Clean Water State Revolving Fund (CWSRF)	G[1]	L	-
	FEMA		Cooperating Technical Partners (CTP)	G	-	-
		TBD	Safeguarding Tomorrow through Ongoing Risk Mitigation Program (STORM)	-	L	-
		TCEQ	Rehabilitation of High Hazard Potential Dam Program (HHPD)	G	-	-
		TDEM	Building Resilient Infrastructure and Communities (BRIC)[2]	G	-	-
		TDEM	Hazard Mitigation Grant Program (HMGP)	G	-	D
		TDEM	Public Assistance (PA)	G	-	D
		TWDB	Flood Mitigation Assistance Program (FMA)	G	-	-
	HUD	GLO	Community Development Block Grant-Disaster Recovery (CDBG-DR)	G	-	D
		GLO/ TDEM	Community Development Block Grant-Local Hazard Mitigation Plan Program (LHMPP)	G	-	-
		GLO	Community Development Block Grant-Mitigation (CDBG-MIT)	G	-	D
		TDA	Texas Community Development Block Grant (TxCDBG) Program for Rural Texas	G	-	-
	NRCS		Emergency Watershed Protection Program (EWP)	G	-	D
			Watershed and Flood Prevention Operations Program (WFPO)	G	L	-
			Watershed Rehabilitation Program (REHAB)	G	-	-
	USACE		Continuing Authorities Program (CAP)[3]	-	-	-
			Partnerships with USACE, funded through WRDA or other legislative vehicles[3]	-	-	-
State	N/A	TWDB	Flood Infrastructure Fund (FIF)	G	L	-
		TWDB	Texas Water Development Fund (DFund)	G	L	-
		TWDB	Rural Water Assistance Fund (RWAF)	-	L	-
		TSSWCB	Structural Dam Repair Grant Program	G	-	-
		TSSWCB	Flood Control Operation and Maintenance (O&M) Grant Program	G	-	-
		TSSWCB	Flood Control Dam Infrastructure Projects - Supplemental Funding	G	-	-
Local	Not Applicable		General Fund	Not Applicable		
			Stormwater or Drainage Utility Fee			
			Tax Applications			
			Bonds			
			Special-Purpose Districts			

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Chapter 10 – Public Participation and Plan Adoption

- Summary of flood planning public participation activities including:
    - RFPG General Meetings
    - Open House Events
    - Media Releases and Online Access
    - Surveys
- Alignment of Draft RFP with Texas Administrative Code (TAC) Flood Planning Guidance Principles §362.3

Discussion of Draft RFP Comments

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Appendix 10D
Draft RFP Comments and Responses – TWDB

October 25, 2022

TWDB Comments on Region 14 Upper Rio Grande Regional Flood Planning Group's Draft Regional Flood Plan

Level 1: Comments and questions must be satisfactorily addressed to meet statutory, agency rule, and/or contract requirements.

General Comments

1. Please ensure that all "Submittal requirements" identified in each of the Exhibit C Guidance document sections are submitted in the final flood plan.

SOW Task 1

2. Entities GIS Feature Class, *Entities*: Several required fields appear to contain invalid entries such as "Unknown", including the 'ACTIVE' field. Please ensure all required fields are populated with valid entries per Exhibit D Table 5 [31 TAC §361.31].
3. Watershed GIS Feature Class, Watersheds: Much of the flood planning region does not appear to have any features in this feature class. Please include additional HUC-10 watersheds to layer across rural areas of regions while keeping smaller local watersheds already included [Exhibit D Section 3.2].
4. Existing Flood Infrastructure Table (Exhibit C Table 1): It appears that some fields are missing from the table, including 'Level of Service', 'Condition', 'Deficiency', and 'Owning Entity'. Please ensure all required fields are populated with valid entries per Exhibit C Table 1 [31 TAC §361.31].
5. Existing Flood Infrastructure GIS Feature Class, *ExFldInfraPol*: It appears that some fields contain invalid or missing entries, including 'CONDITION' and 'DESCR'. Please ensure all required fields are populated with valid entries per Exhibit D Table 5. Please utilize NULL to represent either "not applicable" or "unknown". [31 TAC §361.31, Exhibit D Section 3.3].
6. Existing Flood Infrastructure GIS Feature Classes, *ExFldInfraLn* and *ExFldInfraPt*: It appears that some fields contain invalid or missing entries, including and 'OPER_ENT", 'OWN_ENT', 'CONDITION', and 'DEF_TYPE'. For 'OWN_ENT' and 'OPER_ENT', leave as "999999" if there is no data. Please ensure all required fields are populated with valid entries per Exhibit D Tables 6 and 7, respectively [31 TAC §361.31].
7. Existing Flood Projects GIS Feature Class, *ExFldProjs*: Several required fields appear to contain invalid entries, including, ''EXPRJDESC', 'HUC8', 'STATUS', and 'FUNDING'. Please ensure all required fields are populated with valid entries per Exhibit D Table 8. [31 TAC §361.32].

SOW Task 2A

8. Existing Condition Flood Hazard GIS Feature Class, *ExFldHazard:* It appears that the total hazard area for "Unknown" risk entries within 'FLOOD_FREQ' do not appear to match the "Possible Flood Prone Areas" in Exhibit C Table 3. Please reconcile data, as necessary, across all related deliverables [31 TAC §361.33(b)].

9. Existing Condition Flood Hazard Analysis: Please include total land areas (square miles) of each flood risk by flood risk type, county, region, and frequency as per guidance document (Exhibit C page 24): Submittal requirement number 2.
10. Existing Gaps GIS Feature Class, *Ex_Map_Gaps*: Please update the field, ‘GAPS_ID’ to ‘EXGAPS_ID’ per the Summary of Updates to Exhibit D document available on the TWDB website.
11. Existing Condition Flood Exposure Table (Exhibit C Table 3): There appear to be inconsistencies between Table 3 and the *ExFldExpAll* feature class. For example, counts for Residential Structures and Total Structures do not appear to match. Please ensure data consistency between all related deliverables [31 TAC §361.33, Exhibit C Section 2.2.A.3].
12. Existing Condition Flood Exposure GIS Feature Class, *ExFldExpAll*: There appear to be inconsistencies between Table 3 and the *ExFldExpAll* feature class. For example, counts for Residential Structures and Total Structures do not appear to match. Please ensure data consistency between all related deliverables [31 TAC §361.33, Exhibit C Section 2.2.A.3].

SOW Task 2B

13. Future Condition Flood Hazard Analysis: Please include total land areas (square miles) of each flood risk by flood risk type, county, region, and frequency as per guidance document (Exhibit C page 33): Submittal requirement number 3.
14. Future Condition Flood Exposure Table (Exhibit C Table 5): There appear to be inconsistencies between Table 5 and the Fut*FldExpAll* feature class. For example, counts for Residential Structures and Total Structures do not appear to match. Please ensure data consistency between all related deliverables [31 TAC §361.34, Exhibit C Section 2.2.B.3].
15. Future Condition Map Gaps GIS Feature Class, *Fut_Map_Gaps*:
    a. Please update the field ‘GAPS_ID’ to ‘EXGAPS_ID’ per the Summary of Updates to Exhibit D document available on the TWDB website.
    b. It appears that some fields are missing entries, including 'HUC8'. Please ensure all required fields are populated with valid entries per Exhibit D Table 10, *Flood_Map_Gaps* GIS feature class [Exhibit D Section 3.5.1.1].
16. Future Condition Flood Exposure GIS Feature Classes, *FutFldExpPol* and *FutFldExpLn*: It appears that some fields are missing entries, including 'COUNTY' and 'HUC8'. Please ensure all required fields are populated with valid entries per Exhibit D Tables 16 and 17, respectively [31 TAC §361.34(c), Exhibit D Section 3.6.2].
17. Future Condition Flood Exposure GIS Feature Class: *FutFldExpAll*:
    a. It appears that some fields are missing entries, including 'COUNTY', 'HUC8', and 'CRIT_TYPE'. Please ensure all required fields are populated with valid entries per Exhibit D Table 19 [31 TAC §361.34(c), Exhibit D Section 3.6.2].
    b. There appear to be inconsistencies between Table 5 and the *FutFldExpAll* feature class. For example, counts for Residential Structures and Total Structures do not appear to match. Please ensure data consistency between all related deliverables [31 TAC §361.34, Exhibit C Section 2.2.B.3]

SOW Task 4B

18. Streams GIS Feature Class, *Streams*: It appears that some fields are missing entries, including 'LEN_MILES'. Please ensure all required fields are populated with valid entries per Exhibit D Table 22 [Exhibit D Section 3.9].

19. Flood Management Evaluations (FME) GIS Feature Class, FME: Please populate the 'ENTITY_ID' field with ENTITY_IDs from the *Entities* feature class rather than with the names of entities.
20. Flood Management Evaluations (FME) Table (Exhibit C Table 12): It appears that FME_ID 1410000007 is included in the *FME* feature class, but not in the Appendix 4A table. Please ensure data consistency between all related deliverables [§361.38(i), Exhibit C Section 2.4.B].
21. Flood Management Strategies (FMS) GIS Feature Class, *FMS*:
    a. It appears that some fields contain invalid or missing entries, including 'HUC8' and 'NRNC_COST'. For 'NRNC_COST', please confirm NULL is utilized to represent either "not applicable" or "unknown". Please ensure all required fields are populated with valid entries per Exhibit D Table 26. [31 TAC §361. 38(d)].
    b. Flood Mitigation Strategies GIS Feature Class, *FMS*: Please populate the 'ENTITY_ID' field with ENTITY_IDs from the *Entities* feature class rather than with the names of entities.

<u>SOW Task 5</u>

22. Flood Mitigation Project (FMP) Recommendations, Text: Each recommended FMP must be accompanied with an associated model or supporting documentation to show no negative impact. Please confirm that this was done and provide reference to supporting materials. As per the draft report (Appendix 5B page 3), "*The hydraulic analyses performed as part of the RFP demonstrated that post-project downstream water surface elevations extracted at building footprints are lower than or equal to pre-project water surface elevations. Similar positive benefits were observed throughout the study area, as would be expected since the projects add storage volume to reduce downstream flows. Therefore, there are no negative impacts estimated for the four FMPs listed above, from the El Paso County SWMP.*" For each recommended FMP, please identify in the plan how no negative impact was determined as required by Exhibit C Section 3.6.A (page 108), either via a model, a study or engineering judgement, and submit the associated model, include the model name, study name, or engineering judgement in tabular format. Please ensure this is clearly described for all FMPs [31 TAC §361.39 & Exhibit C 2.5.B]

Level 2: Comments and suggestions for consideration that may improve the readability and overall understanding of the regional flood plan.

<u>General Comments</u>

23. For maps that display large amounts of data (e.g., Maps 4, 6, 8, and 10), please consider a region-wide map and accompanying map index as well as inset maps, as appropriate.

<u>SOW Task 1</u>

24. Entities GIS Feature Class, *Entities*: Please consider reviewing the list of entities with respect to National Parks. For example, "Amistad National Park" should be "Amistad National Recreation Area" and "Chamizal National Park" should be "Chamizal National Memorial". This may affect the count of National Parks in Section 1.3 text.
25. Existing Flood Infrastructure, Text:

   a. Please provide a description of how Low Water Crossings were identified within the text of Chapter 1.
   b. Please consider expanding on why the unaccredited levees do not meet accreditation requirements.
26. Existing Flood Infrastructure GIS Feature Class, *ExFldInfraPol*:
    a. It appears that NULL data is entered in different fields as "0", "Null", or blank strings. Please consider keeping NULL data consistent across fields.
    b. Please consider clipping this feature class to the flood planning region.
    c. Please consider ensuring that provided layers are incorporated, such as Major Reservoirs. Relevant data can be accessed through the Flood Planning Data Hub: https://twdb-flood-planning-resources-twdb.hub.arcgis.com. Please incorporate data provided by HUB in this layer (i.e., major reservoirs).
27. Existing Flood Infrastructure GIS Feature Class, *ExFldInfraLn*: It appears that NULL data is entered in different fields as "0", "Null", or blank strings. Please consider keeping NULL data consistent across fields.
28. Existing Flood Infrastructure Map (Exhibit C Map 1): Please consider including a note describing what is included as "Misc. Infrastructure".
29. Existing Flood Projects, Text: In Section 1.8 of the plan, please consider expanding on the summary provided for "Proposed or Ongoing Major Flood Infrastructure and Mitigation Projects."
30. Existing Flood Projects Map (Exhibit C Map 2): Please consider revising the map to help identify the locations and extents of proposed or ongoing projects more easily.

<u>SOW Task 2A</u>

31. Existing Condition Flood Exposure Map (Exhibit C Map 6): Please consider including additional maps with separate categories of exposed features depicted as appropriate. Please consider further specification by differentiating between points, lines, and polygons on this map.
32. Existing Condition Flood Vulnerability Map (Exhibit C Map 7):
    a. It appears Map 7 depicts all features within the SVI range of 0 to 1. Please consider only including features with SVI scores above 0.75 as described in the guidance document (Exhibit C page 27): Submittal requirement number 3.
    b. Please consider adding a separate point symbology class for LWCs.

<u>SOW Task 2B</u>

33. Future Condition Flood Hazard GIS Feature Class, *FutFldHazard*: If it is necessary to mark the ENTITY_ID as not applicable or unknown, please leave NULL or use '999999' rather than a blank string (e.g. "" or " ").
34. Future Condition Flood Exposure text: In Section 2.3.6 of the plan, please consider updating the sentence "In addition, the complete existing conditions flood exposure results are summarized at the regionwide level in Table 2.21..." to reflect Table 2.21 depicting future condition flood exposure.
35. Future Condition Flood Exposure Map (Exhibit C Map 11): Please consider including additional maps with separate categories of exposed features depicted as appropriate. Please consider further specification by differentiating between points, lines, and polygons on this map.

36. Future Condition Vulnerability Map (Exhibit C Map 12):
    a. It appears Map 12 depicts all features within the SVI range of 0 to 1. Please consider only including features with SVI scores above 0.75 as described in the guidance document (Exhibit C page 35): Submittal requirement number 3.
    b. Please consider adding a separate point symbology class for LWCs.

SOW Task 3A

37. Floodplain Management Practices Map (Exhibit C Map 13): Please consider revising the map to distinguish between levels of floodplain management practices such as Strong, Moderate, Low, or None.

SOW Task 4B

38. Flood Mitigation Projects (FMP), Text: Please consider including a written list of FMPs that were identified but determined by the RFPG to be infeasible, including the primary reason for it being infeasible.
39. Flood Management Strategy (FMS), Text: Please consider including a written list of FMSs that were identified but determined by the RFPG to be infeasible, including the primary reason for it being infeasible.
40. Flood Management Evaluations (FME) GIS Feature Class, *FME*: It appears that the field 'ASSOCIATED' is missing from the *FME* feature class. Please consider adding and populating this field with valid entries per the TWDB broadcast email sent on June 3, 2022.
41. Post-Project Flood Hazard GIS Feature Class, *FMP_HazPost*: Please consider developing a *FMP_HazPost* feature class showing an updated hazard area that accounts for the impact of recommended FMPs.

SOW Task 5

42. Flood Mitigation Project (FMP) Details Geodatabase Table, *FMP_Details*: The table appears to be missing entries. Please consider populating as many fields as possible with valid entries [31 TAC §361.39, Exhibit D Section 3.11.3, Exhibit C Section 3.10.C].

RESPONSE TO TWDB COMMENTS

LEVEL 1:

General Comments

1. All "submittal requirements" were checked for inclusion, and the following changes were made to ensure the requirements are fulfilled: (1) Chapter 2 Section 2.2.4 [Existing Vulnerability] was updated to add language regarding the locations of high SVI areas within the region, (2) the "ExFldHazard" and "FutFldHazard" feature classes were updated to specify source and date of publicly-provided flood prone areas, and (3) a summary of flood risks by county and type of flooding (e.g., riverine, local, playa) was added in Sections 2.2.3 and 2.3.6.

Scope of Work (SOW) Task 2A

2. Invalid entries in the "ACTIVE" field were updated to valid "Yes" or "No" values.
3. Added all 187 HUC10 features in FPR14.
4. Required fields were added and populated with valid entries to Appendix Table 1B (Existing Flood Infrastructure Summary).
5. Changed 'Non-Functional' to 'Non-functional'; added a description to the "DESCR" field where NULL (3 entries).
6. Fixed missing/invalid attributes; ExFldInfraLn: Deleted 5 features with zero length: 14009554,14009557,14010083,14010485,14010488.
7. Appendix Table 1C has been revised to only include valid entries based upon Exhibit D, Table 8. Also, the ExFldProjs has been updated to reflect the information in the revised Appendix Table 1C.
8. There are 89 polygons for FLOOD_FREQ ='Unknown' (SOURCE ='Public'). Portions of the originally drawn 'Public' polygons are in Mexico. Total hazard areas have been updated in the Exhibit C Table 3 with portions located in Mexico noted as a footnote below the table.
9. A summary of the region's existing condition total land area of flood risks by flood risk type, county, and frequency has been added to Chapter 2 Sections 2.2.3.
10. The fields ‘GAPS_ID’ and ‘EXGAPS_ID’ have been updated per the “Summary of Updates to Exhibit D” document.
11. Cumulative values (for 1% AC and 0.2% events) were used for the 0.2% in the initial summary tables. Appendix Table 2A (Existing Condition Flood Risk Summary) has been updated to report results for the 1% and 0.2% storm events separately.

12. Cumulative values (for 1% AC and 0.2% events) were used for the 0.2% in the initial summary tables. The “ExFldExpAll” feature class has been updated to report results for the 1% and 0.2% storm events separately.

SOW Task 2B

13. A summary of the region's future condition total land area of flood risks by flood risk type, county, and frequency has been added to Chapter 2 Sections 2.3.6
14. Cumulative values (for 1% AC and 0.2% events) were used for the 0.2% in the intial summary tables. Appendix Table 2B (Future Condition Flood Risk Summary) has been updated to report results for the 1% and 0.2% storm events separately. In addition, small features outside of the region boundary were deleted: for Deleted 43 features (County='') from "FutFldExpPol" feature class; Deleted 2 features (County='') from "FutFldExpLn" feature class; Two buildings outside the region boundary, partially in the FP adjacent to El Paso County, were added to the building total.
15. Field has been changed to 'FUTGAPS_ID' per the Summary of Updated to Exhibit D.
16. Missing entries have been added to "COUNTY" and "HUC8" fields.
17. Small features outside of the county boundary were deleted: Deleted 43 features (County='') from "FutFldExpPol" feature class; Deleted 2 features (County='') from "FutFldExpLn" feature class.

SOW Task 4B

18. Populated 'LEN_MILES'. All other required fields have been checked to ensure valid entries.
19. Values in the "ENTITY_ID" field have been updated to reflect ENTITY_IDs from the Entities feature class rather than the names of the entities. In the process, additional nonspatial entity records were added to the “Entities_Table” table in the geodatabase to ensure all entities were captured in either the “Entities” feature class or the “Entities_Table” table (no additional spatial records were added to the “Entities” feature class).
20. FME ID 1410000007 has been removed from the feature class which is consistent with the FME tables in Appendices 4A, 4B, and 5C.
21. Two-part response:
    a. Due to some FMSs extending across a large portion of the region, the list of associated HUC8 names is longer than can fit in the 255 character limit for the "HUC8" field. TWDB confirmed that "HUC8" values longer than 255 characters should be changed to NULL (email 12/5/22). For "NRNC_COST" field, NULL is utilized to represent "not applicable" or "unknown".
    b. Values in the "ENTITY_ID" field have been updated to reflect ENTITY_IDs from the Entities feature class rather than the names of the entities. In the process, additional nonspatial entity records were added to the “Entities_Table” table in the geodatabase to ensure all entities were captured in either the “Entities” feature class or the

“Entities_Table” table (no additional spatial records were added to the “Entities” feature class).

SOW Task 5

22. A column named, "How No Negative Impact was Determined" has been added to Appendix Table 5D: "Flood Mitigation Projects Recommended by RFPG". This column documents whether models, previous studies, or engineering judgment were utilized to determine no negative impact. Additional information has also been added to Appendix 5B to clarify which method was used to determine no negative impact. In addition, a new Appendix 5H was added to Chapter 5 to document existing and proposed flood depths at buildings to demonstrate no negative impact where models were used.

LEVEL 2:

General Comments

23. Maps 4 & 8 have index and multi-pages; Map 6 has insets. Added insets to Map 10.

SOW Task 1

24. The following names were changed: “Chamizal National Park" to "Chamizal National Memorial"; "Amistad National Park" to "Amistad National Recreation Area"; and "Rio Grande National Park" to "Rio Grande Wild and Scenic River"
25. Two-part response:
    a. A description of how Low Water Crossings is provided in Section 1.7.1 "Stream Crossings". The section has been renamed to "Stream and Low Water Crossings" for clarity.
    b. A paragraph has been added to section 1.7.2.5 discussing potential reasons for unaccredited levees in El Paso County (note that FMS 142000001 is included to develop full coordination among stakeholders to inventory and address non-accreditation issues).
26. Two-part response:
    a. Zeros ("0") and blank strings were converted to NULL values;
    b. Features are clipped to flood planning region; c. Added 4 Major Reservoirs, IDs 14064579 - 14064583.
27. NULL data for the “ExFldInfraLn” feature class has been corrected for consistency.
28. Map 1 has been updated with the additional information.
29. The summary has been expanded with additional information in Section 1.8.
30. Symbology for the Existing Flood Projects Map was revised for better clarity.

SOW Task 2A

31. Symbology for the Existing Condition Flood Exposure Map was revised for better clarity.
32. The SVI was adjusted for >0.75 and LWC were added to the Existing Condition Flood Vulnerability Map.

SOW Task 2B

33. This issue has been corrected.
34. The sentence has been corrected to reflect Table 2.21 depicting future condition flood exposure.
35. Symbology for the Future Condition Flood Exposure Map was revised for better clarity.
36. The SVI was adjusted for >0.75 and LWC were added to the Future Condition Flood Vulnerability Map.

SOW Task 3A

37. No changes were made to the map since data pertaining to levels of floodplain management practices are not currently available for the region.

SOW Task 4B

38. As stated in Section 5.2 of Chapter 5, "There were no potential FMEs or potentially feasible FMSs or FMPs that were evaluated and found to be infeasible by the RFPG."
39. As stated in Section 5.2 of Chapter 5, "There were no potential FMEs or potentially feasible FMSs or FMPs that were evaluated and found to be infeasible by the RFPG."
40. Values have been populated for 'ASSOCIATED'.
41. Due to budget and time constraints, this Post-Project Flood Hazard GIS Feature Class, FMP_HazPost has not been included in this first cycle of the RFP. This feature class is specified by TWDB as optional.

SOW Task 5

42. The geodatabase has been populated with the information from Appendix Table 5F.

Appendix 10E
Draft RFP Comments and Responses – Public

The following table of comments on the Draft RFP was received from the Rio Grande Council of Governments (RGCOG) on October 13, 2022. Responses have been added next to each of the comments in **Appendix Table 10E.1** below.

Appendix Table 10E.1: Rio Grande Council of Governments (RGCOG) Comments and Responses

Comment #	Chapter/Section or Page # (if applicable)	Comment	Response
1	Ch 1, PDF page 22	Remove redundant references to NFIP participation of communities in Section 1.3 (both the text and table) since this information is duplicated later in Chapter 3	Section 1.3 (Chapter 1) and Section 3.1.1 (Chapter 3) have each been updated to improve clarity based on this comment.
2	Ch 2, PDF page 48	Add bold emphasis to critical facilities in Table 2.23 (Summary of Future Conditions Vulnerability – Critical Facilities) that are unique to the future conditions table and do not appear in Table 2.15 (Summary of Existing Conditions Vulnerability – Critical Facilities)	Emphasis has been added (using bolded text) to Table 2.23 to clarify differences between Table 2.15 and Table 2.23
3	Ch 2, PDF page 27	Add clarification explaining the method used to identify critical routes in Section 2.2.4	Additional clarification regarding the method used to identify critical routes has been added.
4	Ch 2, PDF page 44	Add clarification explaining the differences between the existing and future flood hazard areas shown in Table 2.20 Section 2.3.4	Additional clarification explaining the differences between existing and future flood hazard areas has been added.
5	Ch 3, PDF page 7	Confirm with City of El Paso or El Paso Water that the TFMA Higher Standards are reportedly correctly for City of El Paso	Edits have been made to Chapter 3, Section 3.1.1 to delete documentation of specific higher standards for City of El Paso, as the higher standards for City of El Paso that are listed in the Higher Standards Survey (TFMA, 2018) do not match the City of El Paso Drainage Design Manual (City of El Paso Engineering Department, 2008). El Paso Water has reviewed the relevant edits made to Chapter 3.
6	Ch 4 Appendix 4D, PDF page 35	General comment: If project is within the City of El Paso limits, just state the City of El Paso for “Affected Jurisdiction” and not El Paso County. If project affects unincorporated areas within El Paso County, then include El Paso County. If project affects both, then include both.	Edits have been made to the "Affected Jurisdictions" sections of Appendix 4D for multiple FMPs. FMPs which are entirely contained within incorporated city limits no longer list El Paso County as an affected jurisdiction.

Comment #	Chapter/Section or Page # (if applicable)	Comment	Response
7	Ch 9, Appendix 9B, Table 9B, PDF page 1	In Table 9B of Appendix 9B, change 50% match to 0% match in "Funding to be Financed by Sponsor" column for FMP ID: 143000009. This correction is based on clarification from Hudspeth County and Hudspeth County Conservation and Reclamation District 1 (HCCRD1), who confirmed there was a miscommunication in HCCRD1's response to the funding survey.	This correction has been made.
8	Ch. 9, PDF page 16 and Executive Summary, PDF page 21	After any potential changes occur to Sponsor Financing survey results in Table 9B of Appendix 9B, confirm/update statement in Section 9.2.2 of Chapter 9 and Section ES.9 of the Executive Summary which states that survey responses account for $156.5 M in funding (97.6% of total implementation cost), and any other reported totals affected by potential changes to Table 9B.	Corrections were not needed to the data referenced in the comments. However, a review of the Appendix Table 9B compared to funding survey responses resulted in the following additional changes to Appendix Table 9B which were not associated with any other public comments: 1) Total Estimated Fixed Cost of FMP ID 143000003 changed from $225,000 to $224,000 to account for a rounding issue; 2) Unknown Funding Needed for FMP ID 143000005 changed from 80% to 100% due to a typo; 3) Unknown Funding Needed for FMP ID 143000021 changed from 0% to 45% due to misinterpreting a survey response in the draft RFP; 4) Funding to be Financed by Sponsor for FMP ID 143000021 changed from 100% to 55% due to misinterpreting a survey response in the draft RFP. The above changes resulted in the need to change the total estimated funding needed from $153.8M (95.9%) to $155.7M (97%) in the first paragraph of Section 9.3. There were no changes necessary to the Executive Summary.

Comment #	Chapter/Section or Page # (if applicable)	Comment	Response
9	Ch 4, Appendix 4A, PDF pages 5-6	Update “Table 4A. Potential Flood Management Evaluations Identified by RFPG” (in Appendix 4A of Chapter 4) to correct a copy/paste issue causing 10 of the data columns (all columns to the right of “Potential Funding Sources and Amount”) to include data one row higher than they are supposed to be for all except the last three rows.	This correction has been made to Table 4A. This correction was not necessary in the FME geodatabase.
10	Ch 4, Appendix 4F, PDF page 15	In Appendix 4F (FMS Narratives), correct or delete an incomplete sentence at the end of the 1st paragraph of SOW section of FMS 142000006	The incomplete sentence has been edited.
11	Ch 4, Appendix 4B, PDF pages 13-14	In Appendix 4B (FME Narratives), the FME 141000006 narrative appears to be a duplicate of the FME 141000005 narrative. Insert the correct narrative for FME 141000006.	The narrative for FME 141000006 has been corrected in Appendix 4B (FME Narratives)
12	Ch 4, Appendix 4B, PDF pages 15-48	In Appendix 4B (FME Narratives), add a narrative for FME 141000008, which is missing.	A narrative for FME 141000008 has been added to Appendix 4B (FME Narratives).
13	Ch 4, Appendix 4B, PDF page 16, 18	In Appendix 4B (FME Narratives), the cost estimates for FME Nos. 141000010 and 141000012 do not match latest costs for the same FMEs in “Table 4A. Potential Flood Management Evaluations Identified by RFPG” from Appendix 4A.	In Appendix 4B, the FME Nos. 141000010 and 141000012 cost tables entitled, "Estimated Cost for FME" have been updated to match the latest cost estimates, which are consistent with Table 4A and the remainder of the RFP document.
14	Ch 2	Update the model coverage map and geodatabase to be consistent with the data included in the TDIS model upload tool’s metadata files	The model coverage GDB and Map 22 (Availability of Existing Hydrologic and Hydraulic Models Needed to Evaluate FMSs and FMPs) has been updated to match the data uploaded to the TDIS model upload tool
15	Ch 1, PDF page 3	Replace table references in Chapter 1 Table of Contents (they are currently showing Figure references instead)	Table references in the Chapter 1 Table of Contents have been corrected.
16	Ch 1, PDF page 3	Rename Figures 1.5 and Figure 1.6 to distinguish between the two figures	The figures have been renamed and the table of contents has been updated.

The following table of Chapter 8 recommendations was received from the U.S. Army Corps of Engineers (USACE) as a comment on the Draft RFP (in addition, the same table was provided to other planning groups across the state for reference). A response for Region 14 follows **Appendix Table 10E.2** below.

Appendix Table 10E.2: USACE Recommendations

#	Recommendations	Comments
Legislative Recommendations		
1	Non regulatory regional flood control or drainage districts should be established and funded for rapidly growing urban areas such as DFW, Houston, San Antonio, etc. Responsibility would be to provide consistency, technical resources, funding and reviews in support of FME's, FMS's. These organizations would also implement or support implementation of FMP's. These organizations would augment communities and counties that just don't have the resources and expertise to manage flooding.	Rapidly developing areas surrounding larger urban centers are at greater risk of having runoff patterns increasing because of development. These urban areas are comprised of many communities and unincorporated county areas. Many of the smaller communities are not funded or resourced to deal with the complexities of floodplain management and therefore there is a lack of or inconsistencies in floodplain management practices.
2	Clarify the early 2000's state legislation that provide counties the authority to regulate floodplains to explicitly allow and encourage activities associated with floodplain management such as development of land use plans, regulatory authorities, e.g. permitting.	Although state legislation was passed in the early 2000's which gave counties the ability to regulate floodplains, interpretation of these regulations varies widely from county to county. The legislate bill lacks implementation guidance in the form of administrative rules. If development is occurring in unincorporated areas, this development can dynamically impact flood risk.
Regulatory Recommendations		
3	Require the use of n-values and channel conditions which would likely result if the channel or project were not maintained. Exceptions would be golf courses or other areas where an organization exists which would maintain the channel in perpetuity. Disallow maintenance by marginal organizations such as home owners associations to justify acceptance of lower n-values as this is an unrealistic expectation.	When channels are constructed, most often channel bed, banks and overbanks are cleared; however; with many miles of these channels, it is often difficult for communities to maintain those beds, banks and overbanks at their design conditions. Generally, there is a lack of channel maintenance to ensure flood conveyance areas, established as part of a development or improvement projects, to retain their design level n-values. This results in unexpected changes in channel conveyance and increased flooding. Channel maintenance is very expensive activity that can trigger environmental permitting requirements.

#	Recommendations	Comments
4	No loss of valley storage to the 500-year level. Communities could allow redistribution of valley storage to allow interactions with natural areas but no loss of storage.	Land development in upstream areas increases runoff in downstream areas. This happens because of increased impervious cover and decreased tree cover, and therefore less ability to absorb rainfall. Additionally, development, in most communities, encroaches into riparian areas and decreases the amount of storage available to accommodate flood waters. Just the main thread of the Trinity River though DFW stores more flood waters during of flood than any three of the USACE reservoirs that provide flood protection for DFW. The many other streams provide even more storage than the main stem. There is limited capacity in rivers and streams to convey floodwaters. This means that all areas above any given conveyance point have to store flood water until sufficient time has laps to pass the water away from the impacted area. The streams are where this water is stored and depleting these storage areas will impact DS areas.
5	Establish future land use plans for unincorporated areas associated with rapidly growing urban areas.	"
6	Use of ultimate development land use conditions in the development of future flows. Require use of future flows for regulation of floodplains and development of FMP’s.	"
State Flood Planning Recommendations		
7	Encourage storm shifting to validate 100-yr estimates and to provide a broader understanding of communities actual flood risk Storms identified and cataloged as part of the GLO funded USACE led Texas Storm Study could be the primary source of storms to be shifted.	Notes: Great deal of uncertainty in 100-yr estimates. Use of observed storms that approximately match depth duration data from NOAA Atlas 14 or other precipitation frequency sources validates 100-yr estimates. Additionally wet, dry and average conditions as well as conditions at the time the storm occurred can be presented. Additionally, communities have and can experience storms that exceed the 100-yr. While not regulatory, this information will provide additional hazard mitigation data so communities can address critical infrastructure impacts and be better prepared.
8	Add detail to Watershed Hydrology Assessments (WHA) for communities within basins with completed WHA's. The WHA for the Trinity has been completed.	The WHA's, funded by FEMA, are considered the best available flood flow frequency estimates, e.g. 100-yr. These estimates consider the latest precipitation frequencies, the variations in watershed response and determine critical flood drivers by employing a wide range of sensitivity analysis for each computation point.
9	Update WHA's when future precipitation frequency estimates become available. Efforts to develop future precipitation frequency estimates for Texas are starting.	-
10	Establish regional efforts, for large urban centers to develop future land use data for all developing areas, not just incorporated areas, for use in developing future flood flow frequency estimates and future 100-yr (and other recurrence interval) hazard boundaries.	-

Response to USACE Comments:

USACE has provided comments on Flood Plan Recommendations in the Trinity River Regional Flood Plan (RFP) and made a general statement that these comments should be considered as potentially applicable to similar recommendations in other Texas RFPs. Two of these comments appear particularly relevant to the Upper Rio Grande RFP (URGRFP). Comments #7 and #8 from **Appendix Table 10E.2**, including in particular the phrases from the "Comments" column quoted below, appear particularly relevant to the Upper Rio Grande RFP (URGRFP):

- *"Use of observed storms that approximately match depth duration data from NOAA Atlas 14 or other precipitation frequency sources validates 100-yr estimates."* and
- *"These estimates consider the latest precipitation frequencies, the variations in watershed response and determine critical flood drivers by employing a wide range of sensitivity analysis for each computation point."*

There is an ongoing USIBWC project updating hydrologic and hydraulic modeling of the Rio Grande between Caballo Dam (in New Mexico) and American Dam (in El Paso, Texas). The USACE comments provided above suggesting "use of observed storms" and "employing a wide range of sensitivity analysis" will be cited as part of the review of the revised USIBWC Rio Grande models included in the Scope of Work for Flood Management Evaluation 141000001 (FME1): "Develop a plan for a Sediment and Vegetation Control Program in the Rio Grande at El Paso".

These comments will also be considered for application in refined scoping and execution of numerous proposed FMEs in the URGRFP that include development of hydrologic and hydraulic models for defining flood risk. These comments are particularly relevant to the development of storm water master plans, the focus of FME10 (City of Pecos), FME21 (City of Kermit), FME23 (City of Alpine), FME26 (Monahans/ Southwest Sandhill), and FME33 (City of Socorro).

The following comments were received by the RFPG from Phillip Newberry on 9/15/22 and 9/16/22:

> *9/15/22 10:51 PM Hi I am wondering if I can see a map of the area or any maps and information you have so that I can offer a suggestion. My dad's an engineer and I'm a bit creative myself.*
>
> *9/15 10:57PM Depending on the geography of the area you're talking about, and the direction of the flow of water, I might be able to help with the idea. If I had to guess off the top of my head, I would imagine that redirecting water is going to be your best bet because although the ground absorbs water very well, it becomes saturated very quickly. So if I had to take a guess, you're going to want to divert water. I'd guess you would divert the water based on geography to save costs. If you can divert flowing water you don't have to move it anywhere.*
>
> *9/15 10:58 PM You're going to want to break your area up into geographic regions based on water flow, and go from there.*
>
> *9/16 9:06 AM Make the pharmaceutical industries do the research on how to get everything out.*
>
> *9/16 9:13 AM Hold them accountable under international law. Human rights.*
>
> *9/16 9:18 AM There's something in there about poisoning people or mass population control or something.*
>
> *9/16 9:40 AM Nikola tesla had the greatest ideas. Smartest guy ever. Didn't care enough about money though. I won't make the same mistake. So help me and I help you lmao. Just a little credit. Throw my name on there somewhere.*
>
> *9/16 9:59 AM I'm gunna patent that if I can. Poor mans patent. Lol.*

URGRFPG Response – The provided comments lack specificity and relevancy to the RFP to take action or incorporate them as changes to the RFP. Maps of estimated flood risk by geography along with potential flood risk solutions are provided with RFP Chapters 2 and 4.