Sabine County Hazard Mitigation Action Plan

2024

"Under the Federal Disaster Mitigation Act of 2000 (DMA 2000 or "the Act"), Sabine County (County) is required to have a Federal Emergency Management Agency ("FEMA") - approved Local Hazard Mitigation Plan ("the Plan") in order to be eligible for certain pre- and post-disaster mitigation funds. Adoption of this Plan by the County and approval by FEMA will serve the dual objectives of providing direction and guidance on implementing hazard mitigation in the County, and qualify the County to obtain federal assistance for hazard mitigation. Solely to help achieve these objectives, the Plan attempts to systematically identify and address hazards that can affect the County. Nothing in this Plan is intended to be an admission, either expressed or implied, by or on behalf of the County, of any County obligation, responsibility, duty, fault or liability for any particular hazard or hazardous condition, and no such County obligation, responsibility, duty, fault or liability should be inferred or implied from the Plan, except where expressly stated."

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1. Introduction and Background

1) Participating Jurisdictions

The 2024 Sabine County Hazard Mitigation Action Plan (HMAP) is an update of the County's most recent plan that expired in February 2021. The 2024 Plan update includes three participating jurisdictions: Sabine County, the City of Hemphill, and the City of Pineland.

2) Hazards to be Addressed

Previously, the expired plan identified 11 hazards facing the County: dam failure, drought, earthquake, extreme heat, flood, hazardous materials, hurricane/tropical storm, thunderstorm, tornado, wildfire, and winter storm.

The mitigation planning regulation of the Disaster Mitigation Act[1] requires that mitigation plans be reviewed and updated every five years to maintain eligibility for mitigation grant funding. As part of this plan, Sabine County will develop a schedule to ensure that its hazard mitigation plan is regularly updated.

The 2024 Sabine County Hazard Mitigation Action Plan update will address the following natural hazards listed below in Table 1.

[1] 44 CFR §201.6(d)(3)

Table 1: List of Hazards Addressed

Hazard	Jurisdiction		
	Sabine County	City of Hemphill	City of Pineland
Flooding	x	x	x
Hurricane / Tropical Storms	x	x	x
Wildfire	x	x	x
Tornados	x	x	x
Drought	x	x	x
Extreme Cold	x	x	x
Extreme Heat	x	x	x
Hailstorm	x	x	x
Winter Weather	x	x	x
Windstorms	x	x	x
Lightning	x	x	x
Additional Optional Hazards			
Coastal Erosion			
Riverine Erosion			
Land Subsidence/Sinkhole			
Earthquakes	x	x	x
Expansive Soils			
Dam Failure*	x	x	x

*Dam Failure is profiled in a classified appendix for security reasons.

A) Omission Statements

Sabine County and the participating jurisdictions will not be addressing the following hazards: Expansive Soils, Land Subsidence, and Riverine Erosion. The history of impacts for all the omitted hazards have been negligible (or non-existent), therefore the County and participating jurisdictions expect that future impacts will be negligible as well, nor do the County and participating jurisdictions anticipate applying for grant funding to address any of them.

2. Planning Process

The Sabine County Hazard Mitigation Action Plan (HMAP) is a multi-jurisdiction plan. Representatives of the local planning team were selected by each jurisdiction. Planning team members represented the following offices and departments:

Table 2: Local Planning Team Representatives

Title	Jurisdiction
County Judge	Sabine County
EM Information Technology Coordinator	
Administrative Assistant	
County Treasurer	
City Manager	City of Hemphill
City Administrator	City of Pineland

Once the planning team was established, members developed a schedule with specific goals and proposed meeting dates over the planning period.

Hazard mitigation planning team (HMPT) members contributed to the following activities throughout the planning process:

1. Providing technical assistance and necessary data to the HMPT.
2. Scheduling, coordinating, and facilitating community meetings.
3. Providing necessary materials for public planning meetings.
4. Collecting and analyzing data.
5. Developing mitigation goals and implementation strategies.
6. Preparing the first draft of the plan and providing technical writing assistance for review, editing, and formatting.

Each member of the HMPT participated in the following activities associated with development of the plan:

1. Identifying, contacting, coordinating, and implementing input from stakeholders.
2. Attending, conferencing in, or providing meeting support and information for regular HMPT meetings.
3. Identifying hazards and estimating potential losses from future hazard events.
4. Developing and prioritizing mitigation actions to address identified risks.

5. Coordinating public meetings to develop the plan.
6. Identifying community resources available to support planning effort.
7. Submitting proposed plan to all appropriate departments for review and comment and working with the County to incorporate the resulting comments into the proposed plan.

Table 3: Plan Schedule

TIMELINE										
Planning Tasks	**2023 - 2024**									**Completed**
	Sep	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	
Organize Resources and Identify Planning Team										
Create Outreach Strategy										
Review Community Capabilities										
Conduct Risk Assessment										
Identify Mitigation Goals and Actions										
Develop Action Plan for Implementation										
Identify Plan Maintenance Procedures										
Review Plan Draft										
Submit Plan to State and FEMA										
Adopt Plan										TBD
MEETINGS / OUTREACH										
Planning Team Meetings	9/27/23	10/25/23								
Public Outreach										
Stakeholder Outreach										

1) Existing Plans, Reports, Ordinances, and Technical Information Sources

Each planning team member worked to collect and provide the input and information necessary to develop the hazard mitigation strategy. Research was coordinated and conducted by local planning team members. The local planning team reviewed the following documents during the planning process:

Table 4: Planning Team Data Sources

Data Source	Data Incorporation	Purpose
National Centers for Environmental Information (NCEI)	Hazard occurrences	Previous event occurrences, damage dollars, and mapping for all hazards
National Oceanic and Atmospheric Administration (NOAA)	Historic Weather Data	Previous event occurrences, damage dollars, and mapping for all hazards
Texas A&M Forest Service	Historical Fire Data	Previous even occurrences
Sabine County Hazard Mitigation Plan, 2016-2021	Previous planning approach, hazards addressed, and mitigation actions	Previous planning team representatives, plan maintenance, hazard histories, and mitigation actions
State of Texas Hazard Mitigation Plan 2023 Update	Hazard Descriptions	Official descriptions of hazards and their potential impacts
Estimated Base Flood Elevation – Federal Emergency Management (FEMA)	Flood Zones maps	GIS mapping of flood zones and potential flooding risk areas
TCEQ Dam Safety Program	Dam information	Identity high-hazard or significant risk dams
City of Hemphill Flood Damage Prevention Ordinance	Flood damage prevention requirements	Identifying building requirements and restrictions for structures in the floodplain
City of Hemphill Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact
City of Pineland Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact

Additional information sources included: USDA Census of Agriculture, United States Geological Survey, Vaisala, and specific details about previous natural hazard events from planning team participants. Sources are noted throughout the document. Report titles and links to the most recently accessed websites hosting the related information are also noted, where appropriate.

Area stakeholders contacted to participate in the planning process included the following offices and departments within the participating jurisdictions and neighboring jurisdictions. In many cases of non-participation, the title listed is reflective of the office the planning team tried to contact.

Table 5: Local Stakeholders Contacted

Stakeholder	Title	Participated
Shelby County	Emergency Management Coordinator	Y
San Augustine County	Emergency Management Coordinator	N
Jasper County	Emergency Management Coordinator	N
Newton County	Emergency Management Coordinator	N
Sabine County Chamber of Commerce	President	N
Texas A&M AgriLife	County Extension Agent – Agriculture and Natural Resources	Y
Pineland Housing Authority	Executive Director	Y
Sabine County Food Pantry	Director	N
Sabine County Rainbow Room	Director	N

Area stakeholders were contacted by phone and email. In an effort to increase participation, each stakeholder was contacted at least twice. Local academia, businesses, community based- and/or non-profit organizations were contacted in order to reach a diverse group of stakeholders. Those organizations included the Texas A&M AgriLife Extension, the Pineland Housing Authority, Sabine County Chamber of Commerce, Sabine County Food Pantry, and the Sabine County Rainbow Room. These organizations focus on multiple community needs such as education, food, health and safety, and financial stability. Area stakeholders who chose to participate provided important supplemental input and information that helped shape mitigation strategies for each hazard, in particular by making the planning team aware of actions neighboring communities were successful in implementing, and what actions they think

should take priority. Drought, extreme heat, and extreme cold was of particular concern amongst respondents.

2) Project Meetings

The planning team met on two separate occasions. Additional communication was regularly carried out via email and over the phone.

The first planning team meeting was held virtually on September 27, 2023. During this meeting, the planning team decided which hazards needed to be addressed in the mitigation plan and which were not relevant. To make these decisions, a hazard handout was produced to show previous occurrences of each hazard, associated deaths and injuries, and total dollar damages. The team agreed to use the collected hazard data, as the foundation for its hazard risk assessment and ongoing research into hazard extent, impact, and vulnerability. At the end of the meeting, planning team members were tasked with compiling relevant data, including city ordinances; identifying critical facilities; providing a status update on previous actions, and completing a capability assessment.

The second planning team meeting was held virtually on October 25, 2023. To stay on schedule, the planning team needed to meet the following objectives: review and refine the critical facilities list, identify stakeholders, and review possible mitigation actions and potential eligible projects for each participant. The planning team discussed and identified new mitigation actions, discussed changes to the plan drafts, and agreed to work on completing all deliverables for the plan. Additional work was done over email in preparation for submitting the plan for official review in March 2024.

3) Public Input

Members of the public were invited to participate in two public comment periods to provide input and feedback during the planning process. The public comment periods were held virtually. The first public comment period took place in November 2023. A Microsoft Form survey was posted to the County website and Facebook page for a period of two weeks for members of the public to fill out. A newspaper ad was placed to announce to the public for the opportunity to provide input via online survey. In an effort to reach the widest audience possible, especially socially vulnerable populations, the County and participating jurisdictions actively announced the online survey through newspaper ads, on their own websites, social media, and through the County text message notification system. Stakeholders who support vulnerable populations were also provided with a link to the survey and encouraged to share it with their community. The planning team appreciated receiving responses to the survey which helped inform them when identifying and prioritizing new mitigation actions for this plan update. The survey received 94 anonymous responses.

The survey asked nine questions:

1. Where do you live?
2. Do you own or rent?
3. Sabine County is looking at addressing the following hazards. Which hazards do you believe impact the County and/or participating cities the most? Please select all that apply (multiple choice answer).
4. Which of the above hazards have affected you directly within the past five years? Please select all that apply (multiple choice answer).
5. How have you been affected by the hazards selected above? (Open-ended question)
6. Have you taken any actions to reduce your risk to these hazards? If so, what actions have you taken? (Open-ended question)
7. Which of the following mitigation project types do you believe local government agencies should focus on to reduce disruptions of services and to strengthen the community? Please check all that apply (multiple choice answer).
8. What is the best means of communication for you? Please select all that apply (multiple choice answer).
9. Do you have any other thoughts or concerns relating to the Hazard Mitigation Plan? (Open-ended question).

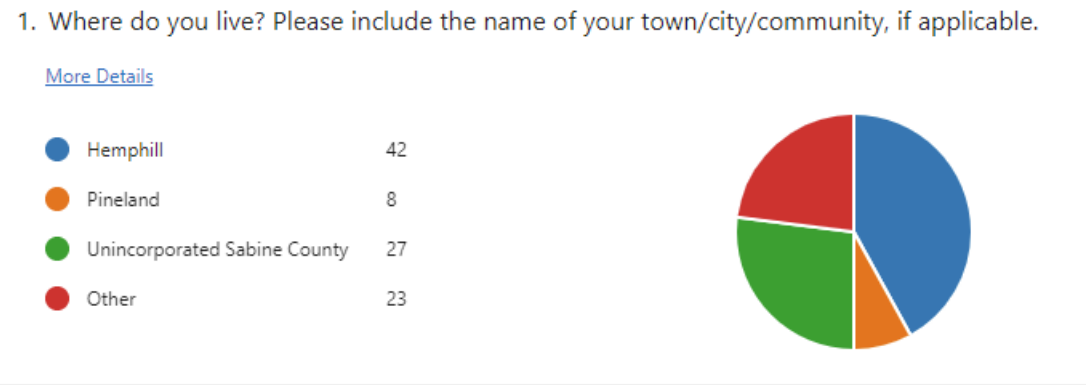

Figure 1: Survey Responses for Question 1

Figure 2: Survey Responses for Question 2

As Figure 1 above shows, the majority of the respondents live in the City of Hemphill. About 93% of respondents own their home as shown in Figure 2.

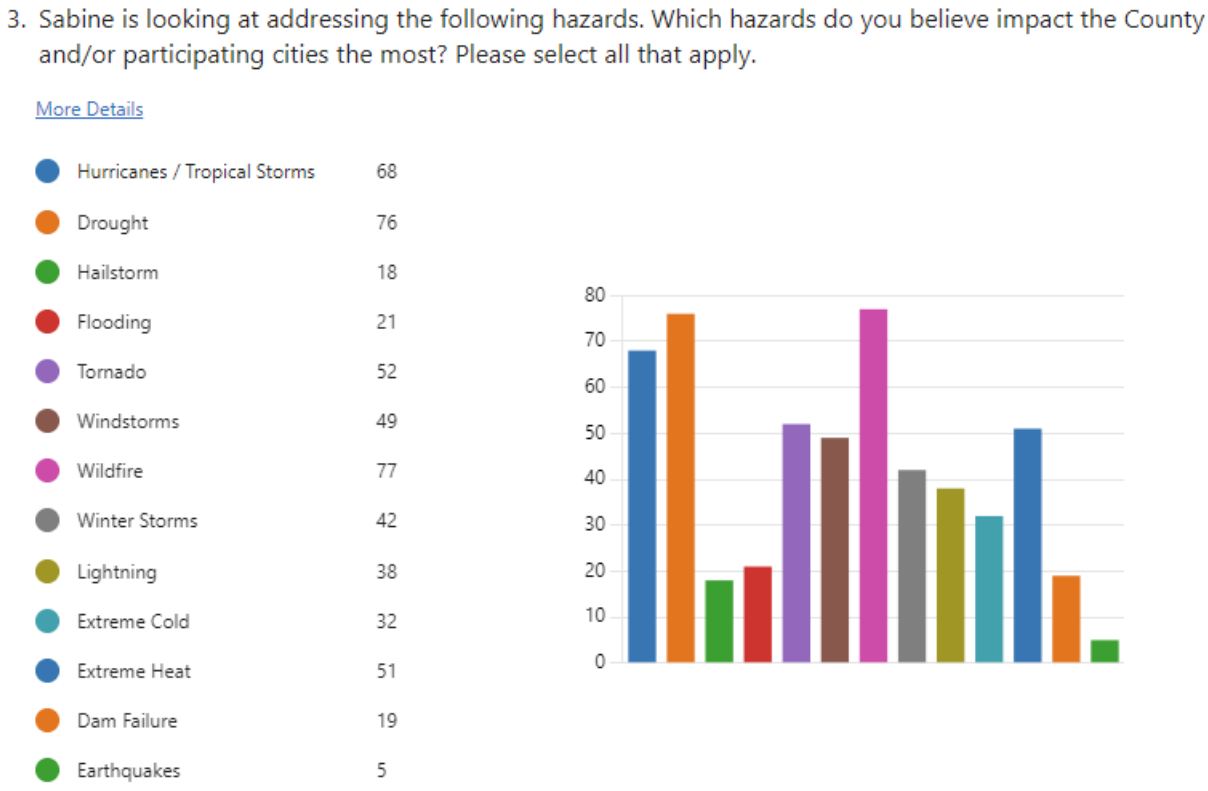

Figure 3: Survey Response for Question 3

The chart in Figure 3 above shows the breakdown of responses for survey question three. The answer choices were Hurricane / Tropical Storms, Drought, Hailstorm, Flooding, Tornados,

Windstorms, Wildfire, Winter Storms, Lightning, Extreme Cold, Extreme Heat, Dam Failure, and Earthquakes. Hurricane, Drought, and Wildfire ranked the highest out of all the hazards addressed in the plan, with each choice getting more than 50% of the votes.

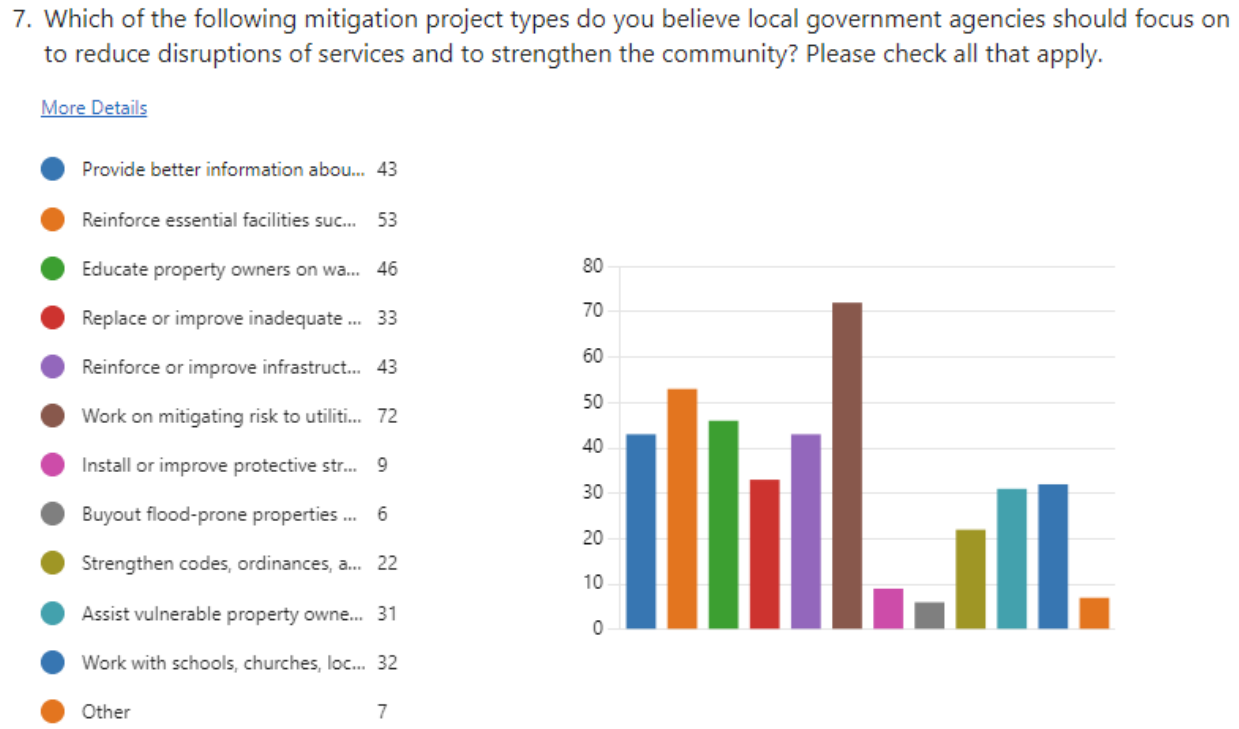

Figure 4: Survey Choices for Question 7

Figure 4 shows the choices for Question 7: Which of the following mitigation project types do you believe local government agencies should focus on to reduce disruptions of services and to strengthen the community? Please check all that apply. Respondents could choose from 11 answers such as "Provide better information about hazard risk and high-hazard areas," "Reinforce or improve infrastructure, such as elevating roadways and improving drainage systems," "Install or improve protective structures, such as floodwalls or levees," or input their own answer. The most popular answer was "Work on mitigating risk to utilities," with 77% of respondents voting for it.

The second public comment period took place in March 2024. A copy of the in-progress plan draft was posted to the County website for two weeks for the public to review and comment or provide suggestions. This public comment period was advertised in the newspaper and shared on social media. No responses were received.

4) Plan Maintenance

The hazard mitigation plan is not a static document. As conditions change and mitigation actions are implemented, the plan will need to be updated to reflect new and changing conditions in each jurisdiction.

The planning team has identified specific departments to oversee action implementation in each jurisdiction. The planning team has also identified potential funding sources and an implementation timeframe for each mitigation action. The expected timeframes will be an important component in determining whether actions are implemented efficiently. The departments or persons identified for each jurisdiction include but are not limited to:

Table 6: Maintenance Responsibility

Title	Jurisdiction	Agency or Department
County Judge	Sabine County	County Judge
EM Information Technology Coordinator	Sabine County	Office of Emergency Management
City Manager	Hemphill	City Administration
City Administrator	Pineland	City Administration

Within one year of adoption of this plan, each department or agency will review and, as appropriate, integrate implementation of their respective mitigation actions with their existing internal plans and policies relating to capital improvements, land use, design and construction, and emergency management.

On a biannual basis, representatives from each jurisdiction serving as the planning team will evaluate progress on implementing the plan's mitigation actions. The planning team will review departmental / agency findings, public input, and future development plans to evaluate the effectiveness and appropriateness of the plan.

Considering changing funding sources, hazard vulnerability, and local mitigation priorities, the planning team will identify changes to plan goals and priorities for their respective jurisdictions, and they will report their findings to the rest of the planning team. It will be the planning team's responsibility to identify relevant reasons for delay or obstacles to completing the plan's mitigation actions, along with recommended strategies to overcome any deficiencies.

Any significant change to the plan will require the County and participating jurisdictions to provide opportunities for the public to make its views and concerns known. Sabine County and the participating jurisdictions will provide notice to the public through announcements in the local paper, fliers posted at City and County offices, and on the County's website and/or social media accounts.

5) Plan Monitoring

The Sabine County Emergency Management Information Technology Coordinator (ITC) will be responsible for the overall continued coordination and monitoring of the mitigation plan in its entirety, including but not limited to the planning process, risk assessment, strategy, and the actions assigned for each hazard. The agency or department identified above in Table 6 shall serve as the responsible party for each respective jurisdiction. The plan monitoring worksheet outlined below will serve as the basis for revision of the plan.

At a minimum, the mitigation plan will be reviewed by the ITC and planning team representatives from each jurisdiction quarterly, during budget workshops, and as other plans are being developed or revised including comprehensive plans, capital improvement project plans, and emergency plans.

Regularly monitoring the plan implementation process in each participating jurisdiction will ensure that every component of the plan gets reviewed for potential amendments.

After adoption of this plan, it will be posted to each participating jurisdiction's website or Facebook page, and a printed copy will be available for review in the Office of Emergency Management. The goal is to create the opportunity for constant and continued feedback from local officials, stakeholders, and the public.

6) Plan Evaluation

Proper evaluation will measure the progress and effectiveness of the mitigation actions identified in the plan. On a bi-annual basis the ITC along with the planning team representatives from each jurisdiction will use the following criteria, along with additional metrics as necessary, to assess the effectiveness of the plan in its entirety, including but not limited to the planning process, risk assessment, strategy, and the actions:

- Do the specified goals and objectives still address current and expected conditions?
- Has the nature, magnitude, and/or risk of any hazard changed?
- Have there been changes in land development that the plan needs to address?
- Are available resources suitable for implementing the plan?
- Is funding budgeted or available to successfully implement prioritized mitigation actions?
- Are there opportunities in the local budgeting process or local, state, and national grant funding cycles to increase funding to implement mitigation actions?

Other steps will include site visits to completed mitigation projects in each jurisdiction to measure and ensure their success. The planning team will evaluate the causes of the shortcoming in the event that a mitigation project fails to meet its goal. The planning team will use their assessment to amend the project and related projects in other jurisdictions, allocate

additional resources to achieve the desired outcome for the project and related projects in other jurisdictions, or replace the project and similar projects in other jurisdictions with better projects.

The ITC and planning team members will also work to implement any additional revisions required to ensure that the plan and their respective jurisdiction is in full compliance with federal regulations and state statutes.

The approved plan will be hosted on the County website to allow the public to view and provide feedback during the 5-year lifespan of the plan.

7) Plan Update

The plan is designed to address a five-year period. In accordance with 44CFR Section 201.6, it will be updated every five years to maintain compliance with State and Federal regulations. However, at least every two years from the date of approval, and quarterly on the fifth and final year of the plan, the ITC and planning team representatives from each participating jurisdiction will thoroughly review any significant changes in their respective jurisdictions that might impact the plan update.

During the update process, planning team representatives will do the following for their respective jurisdictions: collect data on recent occurrences of each natural hazard identified in the plan, record how each natural hazard impacted their jurisdiction during the preceding years, determine whether or not implemented mitigation actions produced the desired outcomes in their jurisdiction, and determine whether or not to modify their jurisdiction's list of hazards to be addressed in the update.

Additional considerations to address on a jurisdictional level include but are not limited to changes in local development, changes in exposure to natural hazards, the development of new mitigation capabilities or techniques, and revisions to state or federal legislation.

The update process will provide continued opportunity for the public and elected officials to determine which actions succeeded, failed, or are no longer relevant. It is also an opportunity for each jurisdiction to identify recent losses due to natural hazards and to consider whether any of those losses could have been avoided.

3. Determining Risk

1) Risk Assessment

Throughout the plan, each hazard addressed will be considered in light of its history, likelihood of future events, extent, jurisdictional vulnerability, location and impact.

Likelihood of Future Events is measured based on a hazard's expected frequency of occurrence in terms of previous frequency. Each hazard's likelihood of future events will be considered using the following standardized parameters:

- **Highly likely** – event probable in the next year
- **Likely** – event probable in the next three years
- **Occasional** – event possible in the next five years
- **Unlikely** – event possible in the next 10 years

Given this plan's five-year duration, hazards likely to occur during that period will be given priority when selecting and prioritizing mitigation actions.

The population of Sabine County, and the Cities of Hemphill and Pineland have stayed relatively the same over the last five years, yet housing and commercial development has increased slightly, which increases the risk of natural hazards. Additionally, the effects of climate change have increased the frequency and intensity of hazard events. Climate change is expected to exacerbate hazard events in the future. Climate change may also affect population migration and land use development in the future. As climate change exacerbates hazards, habitability of certain areas may be impacted. It is unclear how these effects will intersect with population migration patterns and land use changes. In the case of Sabine County, the severity and frequency of hurricanes and wildfire may necessitate construction of appropriate infrastructure to address these threats as well as related land use changes. Additionally, population may consider relocation if appropriate measures are not taken.

A) Major Disaster Declarations

The following table outlines all major disaster declarations that have occurred in Sabine County since the 2016 HMAP.

Table 7: Major Disaster Declarations Since 2016

Sabine County Major Disaster Declarations		
Disaster	**Incident Period**	**Declaration Date**
DR-4266 Texas Severe Storms, Tornados, and Flooding	March 7, 2016 – March 29, 2016	March 19, 2016
DR-4332 Texas Hurricane Harvey	August 23, 2017 – September 15, 2017	August 25, 2017
DR-4485 Texas Covid-19 Pandemic	January 20, 2020 - Present	March 25, 2020
DR-4586 Texas Severe Winter Storms	February 11, 2021 – February 21, 2021	February 19, 2021

2) Distribution of Property by Housing Density and Potential Damage Values

Table 8: Estimated Values by Location[2]

Category	Sabine County	City of Hemphill	City of Pineland
Total Housing Units[3]	7,638	609	537
Housing Unit Density (per square mile)	13 units/sq. mi	239 units/sq. mi	255 units/sq. mi
Median Housing Value[4]	$114,300	N/A*	N/A*
Estimated Value of Housing Units[5]	$873 million	N/A*	N/A*

[2] Source: U.S. Census 2021 American Community Survey 5-Year Estimates.
[3] Table B25001 2021 ACS Housing unit information for Sabine County includes totals for cities and unincorporated areas.
[4] Table B25077 2021 ACS
[5] Total value of housing units derived from median value multiplied by number of units
* Data Not Available

3) Distribution of Vulnerable Populations

The planning team identified a set of indicators it could use to identify each jurisdiction's vulnerable population. The indicators include demographic data like age and income, as well as geographic data including the location of low income or subsidized housing units, concentrations of manufactured and mobile homes, and concentrations of homes in substandard condition.

A) Age, Disability, and Income

The populations of each jurisdiction were broken down into four categories: young residents, elderly residents, disabled residents, and low-income residents. Residents falling into these categories were deemed most likely to suffer disproportionate losses due to natural hazards because of their potentially limited means to prepare for and recover from a hazard event.

Table 9: Age, Disability, and Poverty Level Percentages by Jurisdiction[6]

Demographic Category	Sabine County	City of Hemphill	City of Pineland	Texas	U.S.
Population Under Age 5[7]	4.9%	14.1%	6.7%	6.8%	5.9%
Population Over Age 65	30.2%	11.6%	16.4%	12.5%	16%
Disability Status[8]	27.3%	18.4%	20.7%	11.4%	12.6%
Individuals Below Poverty Level[9]	19.5%	30.9%	41.2%	14%	12.6%

[6] Source: U.S. Census 2021 American Community Survey 5-Year Estimates
[7] Table S0101, Age and Sex, 2021 ACS 5-Year Estimates
[8] Table S1810, Disability Characteristics. The U.S. Census defines a person as having a work disability if one or more of the following conditions are met:

1. Persons with a health problem or disability which prevents them from working or which limits the kind or amount of work they can do
2. Persons who have retired or left a job for health reasons
3. Persons currently not in the labor force because of a disability.
4. Persons who did not work at all in the previous year because of illness or disability
5. Under 65 years old and covered by Medicare in previous year.
6. Under 65 years old and received Supplemental Security Income (SSI) in previous year.
7. Received VA disability income in previous year.

[9] Table DP03, Selected Economic Characteristics, 2021 5-Year Estimates

B) Distribution of Vulnerable Populations

The following vulnerable populations map is based on a social vulnerability index created specifically for the planning area. The index considers six relevant Census Block Group-level factors: poverty rate, population of residents 65 years old and older, population of residents younger than 18, the population of residents without a high school diploma or GED, the population of residents with a low English proficiency, and the number of homes constructed before 1980.

To create the index, each factor is re-scaled by assigning the largest population in each category a score of 1. The remaining population counts for each category are then given a score based the ratio of the relevant population to the largest population. Once each factor has a re-scaled score, the scores for each factor are totaled to create an overall index number for each Census Block Group. The vulnerable populations map is representative of each Census Block Group's overall vulnerability, based on the six factors outlined above, relative to the other Census Block Groups in the planning area.

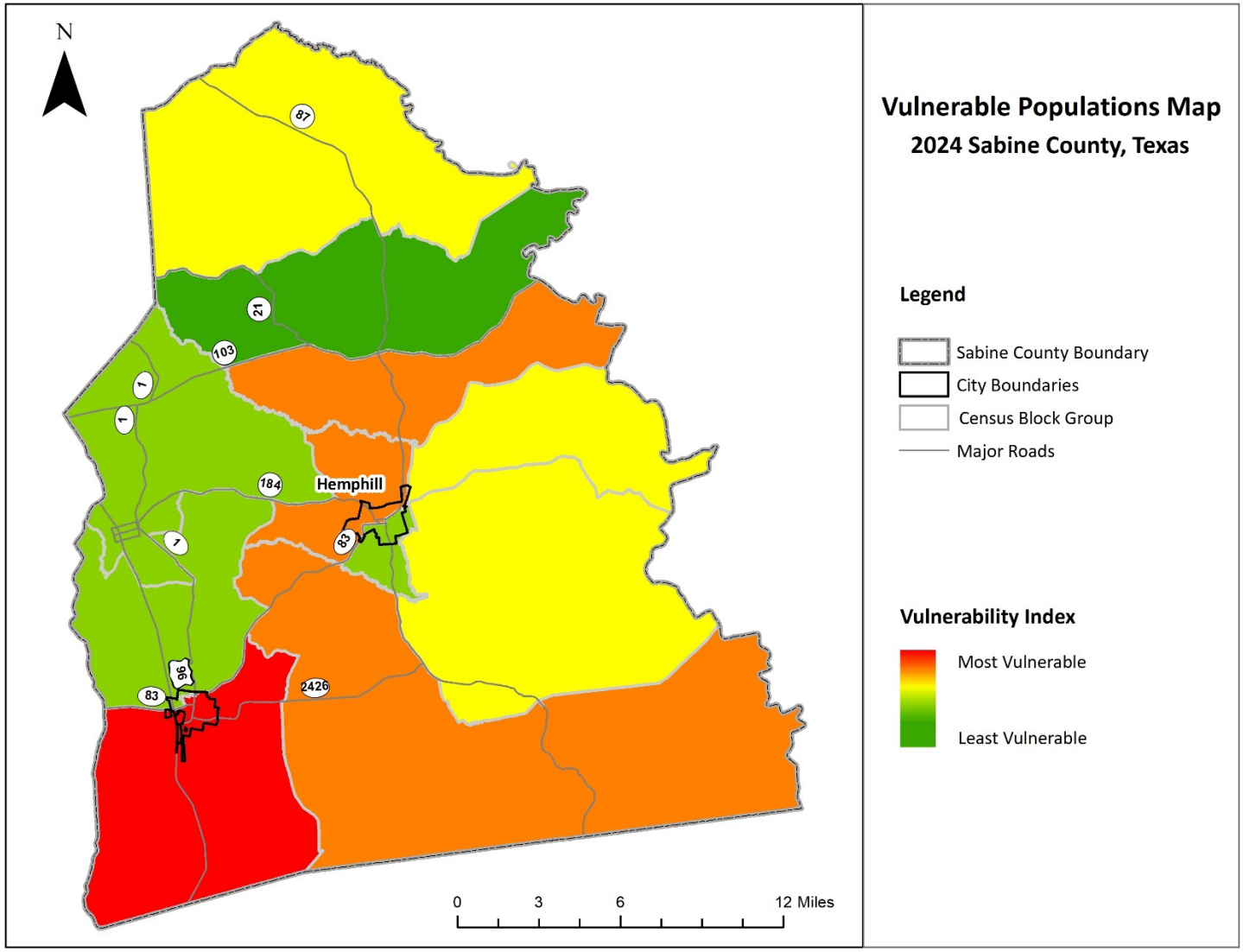

Figure 5: Sabine County Social Vulnerability Index

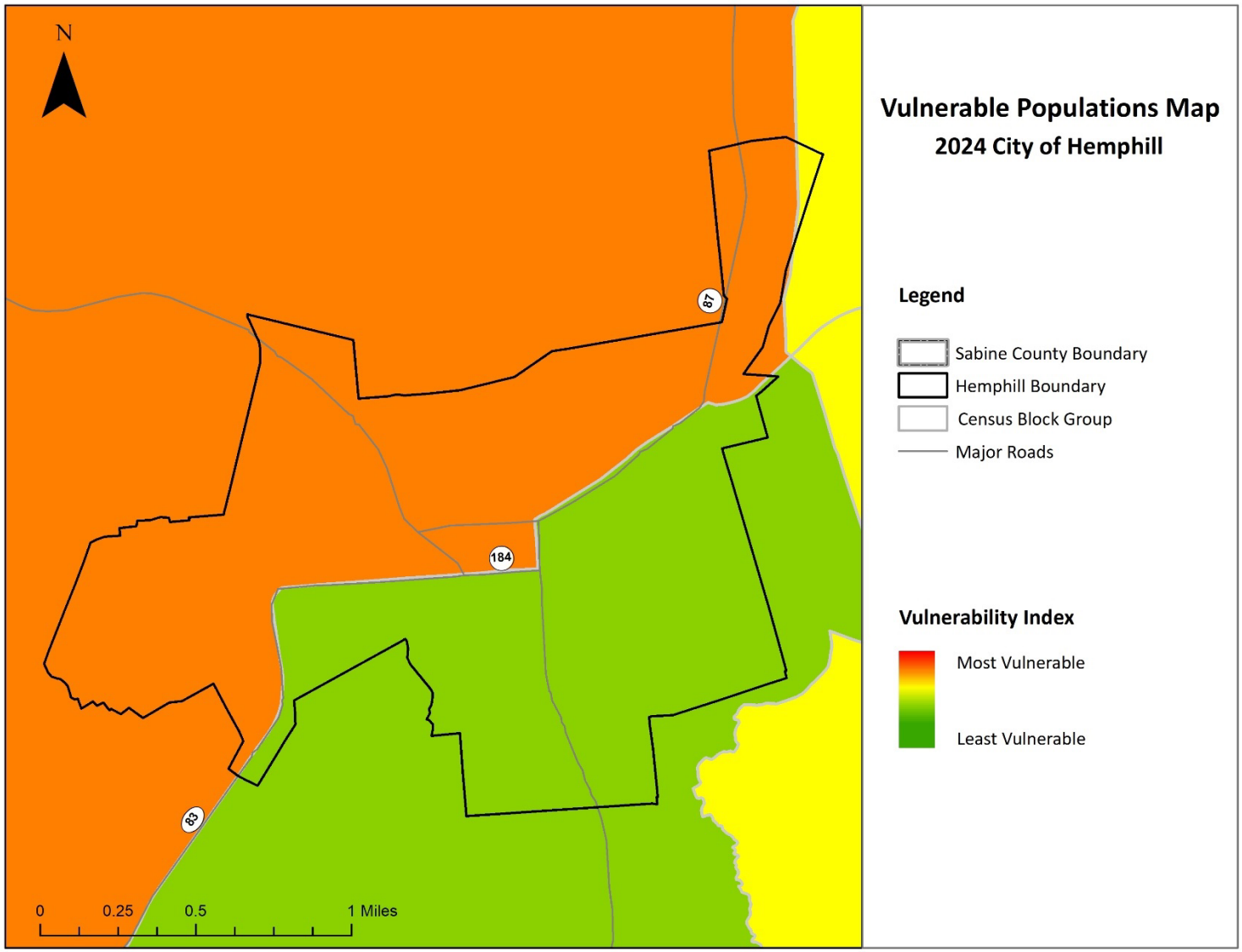

Figure 6: City of Hemphill Social Vulnerability Index

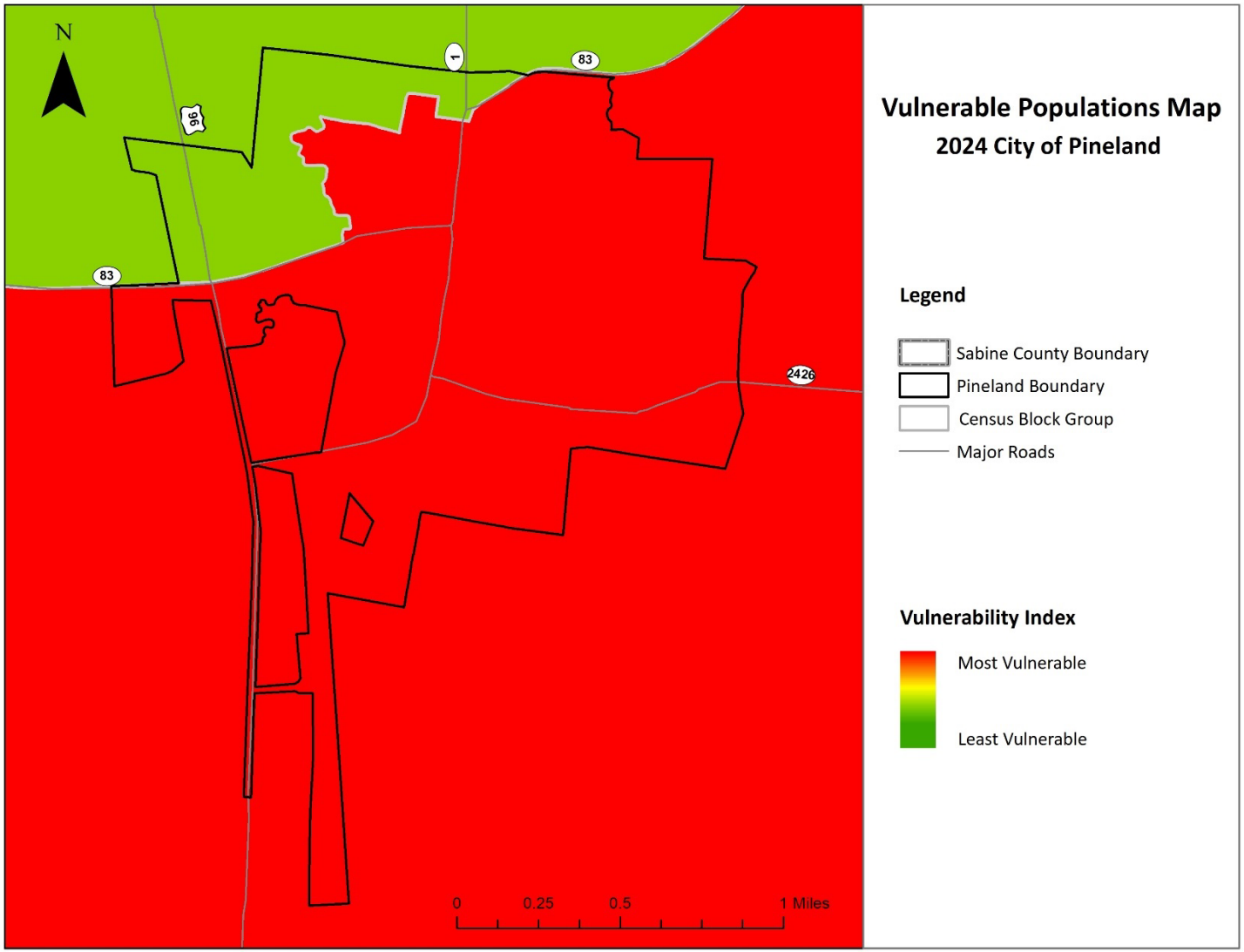

Figure 7: City of Pineland Social Vulnerability Index

C) Low Income and Subsidized Housing

Low-income residents in Sabine County are primarily served through rental assistance programs and low-income housing. The Deep East Texas Regional Housing Authority is the primary operator of low-income housing in the County[10]. There are 32 affordable apartment communities in Sabine County.

Residents of low-income housing and/or subsidized housing facilities are expected to suffer disproportionate losses due to natural hazards because of their potentially limited means to prepare for and recover from a hazard event.

D) Housing Type and Condition

The participating jurisdictions have used housing type and housing conditions to identify additional vulnerable areas and concentrations of vulnerable residents.

I. Manufactured / Mobile Homes

In particular, the jurisdictions have identified areas with large numbers of mobile/manufactured housing as being disproportionately vulnerable to certain hazards including but not limited to hurricanes and tropical storms, floods, tornados, winter storms, and windstorms.

Mobile and manufactured homes can be found throughout Sabine County, including several RV parks. These parks' populations fluctuate on a seasonal basis. Due to the express portability of RVs, most of these structures are expected to evacuate ahead of hazard events with significant warning times. However, RVs may not have enough time to evacuate ahead of less predictable hazard events like tornados.

Locations with clusters of three or more mobile / manufactured homes, including named mobile home parks, are shown in the figure below.

[10] https://affordablehousingonline.com/housing-search/Texas/Sabine-County#summary

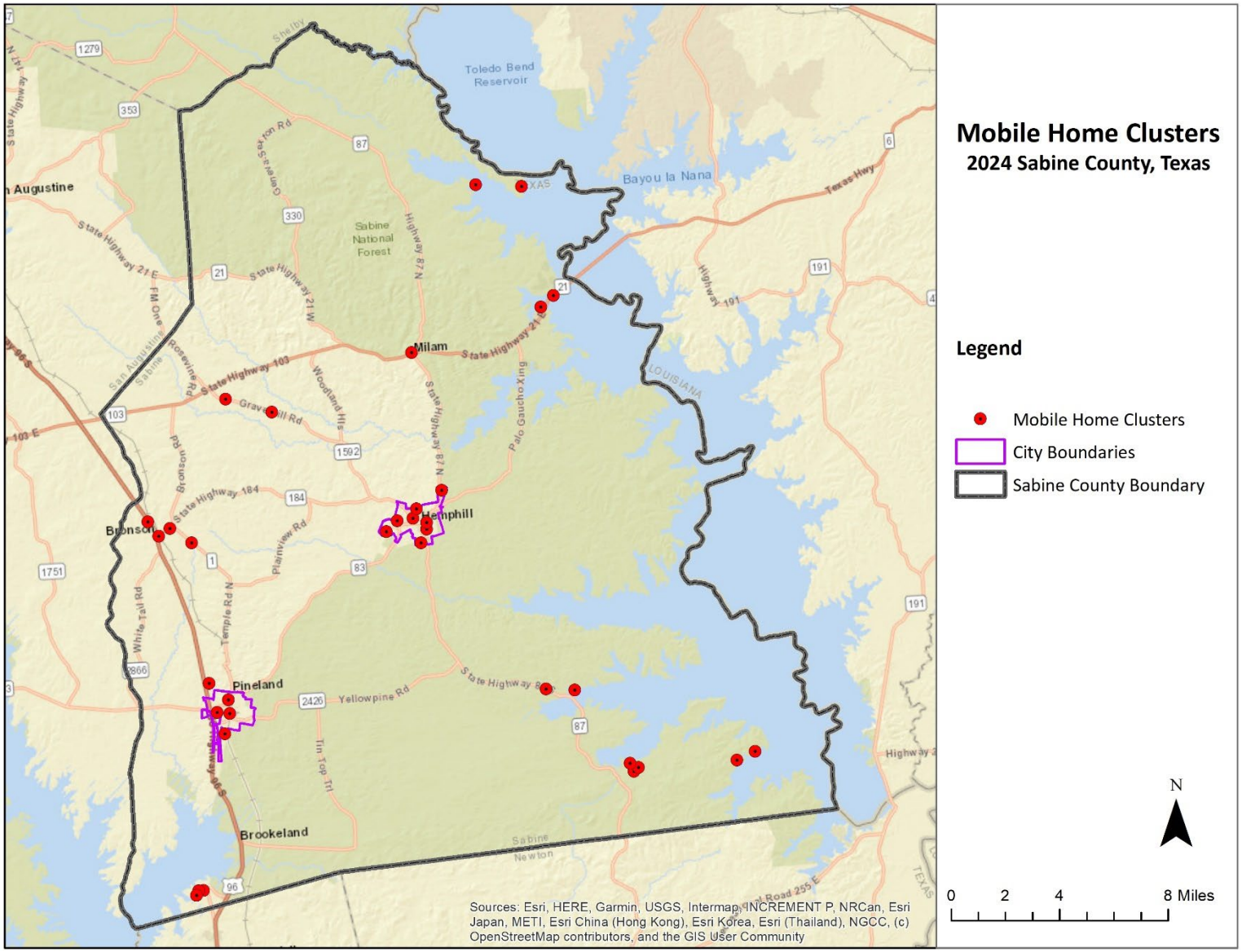

Figure 8: Mobile and Manufacturing Clusters in Sabine County and the Participating Jurisdictions

II. Homes in Substandard Condition

The jurisdictions have determined that homes in sub-standard condition, regardless of structure type, may indicate that residents are low-income or otherwise means-limited and thus more vulnerable to certain hazards.

To be considered standard condition, a home must show few or no minor visible exterior defects such as:

- cracked, peeling, or missing paint
- cracked, sagging, rotting, or missing siding, steps, porch planks, or other wooden surfaces
- cracked or broken windowpanes
- cracked masonry, brick, or mortar surfaces
- missing or damaged roof shingles
- small rust spots on mobile homes

Structures in sub-standard condition may provide less protection to residents during certain hazard events like tropical storms, tornados, or hurricanes. Furthermore, because they're already in a state of disrepair, additional damages due to hazard events may compound existing ones and potentially make these homes uninhabitable.

4. Floods

According to the National Oceanic and Atmospheric Administration, flood is defined as an overflow of water onto normally dry land. The inundation of a normally dray area caused by rising water in an existing waterway, such as a river, stream, or drainage ditch. Ponding of the water at or near the point where the rain fell. Flooding is a longer-term event than flash flooding: it may last days or weeks.

Flash flood is defined as a flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through riverbeds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam.[11]

1) Flood History

The planning team relied on data from the National Centers for Environmental Information (NCEI) to develop a flood history for the County and each participating jurisdiction.

According to the 2016 Sabine County HMAP, the County and jurisdictions addressing the hazard recorded 16 flood events between 1999 and 2012. The 2016 plan recorded about $2.5 million in property damages during that time, adjusted to $2024. The following tables represent all recorded flood events between 2016 – 2023.

Table 10: Sabine County Flood History

Location	Date Range	Number of Floods	Flood Type	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	3/9/2016 – 1/9/2022	15	Flash Flood	0	0	$0	$0

Table 11: City of Hemphill Flood History

Location	Date Range	Number of Floods	Flood Type	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Hemphill	8/30/2017 – 5/9/2019	2	Flash Flood	0	0	$0	$0

[11] https://www.weather.gov/mrx/flood_and_flash

Table 12: City of Pineland Flood History

Location	Date Range	Number of Floods	Flood Type	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Pineland	8/30/2017 – 5/9/2019	5	Flash Flood	0	0	$0	$0

A) National Flood Insurance Program

The National Flood Insurance Program (NFIP) is administered by FEMA to provide flood insurance coverage to the nation. Sabine County, and the Cities of Hemphill and Pineland are participating NFIP communities in the FEMA Community Status Book Report.

The City of Hemphill has adopted and enforced a flood damage prevention ordinance in their jurisdiction and adopted their current FIRM on 11/5/2010. The City of Hemphill's Flood Damage Prevention Ordinance designates the City Manager as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements. Floodplain management ordinances and any future updates will guide the jurisdiction as it continues to comply with NFIP requirements through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction (i.e. substantially damaged repairs). The permitting process, presented to the floodplain administrator, may include plans showing location, dimension, and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of the special flood hazard. Additionally, information including elevation of new and substantially improved structures, nonresidential structures, floodproofing, certificates from registered professional engineers, watercourse or natural drainage alterations, and records are required. Permitting also requires the costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilizes and facilities such as sewer, gas, electrical and water systems. Variances may be issued for the repair or rehabilitation of historic structures. General standards for all new construction or substantial improvements require prevention of floatation, collapse or lateral movement and practices that minimize flood damage.

The City of Pineland has adopted and enforced a flood damage prevention ordinance in their jurisdiction and adopted their current FIRM on 5/18/2010. The City of Hemphill's Flood Damage Prevention Ordinance designates the City Administrator as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements. Floodplain management ordinances and any future updates will guide the jurisdiction as it continues to comply with NFIP requirements

through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction (i.e. substantially damaged repairs). The permitting process, presented to the floodplain administrator, may include plans showing location, dimension, and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of the special flood hazard. Additionally, information including elevation of new and substantially improved structures, nonresidential structures, floodproofing, certificates from registered professional engineers, watercourse or natural drainage alterations, and records are required. Permitting also requires the costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilizes and facilities such as sewer, gas, electrical and water systems. Variances may be issued for the repair or rehabilitation of historic structures. General standards for all new construction or substantial improvements require prevention of floatation, collapse or lateral movement and practices that minimize flood damage.

Sabine County does not have current Flood Damage Prevention Ordinances in place. Mitigation actions have been added to Chapter 16 to address this deficiency.

The flood mitigation actions outlined in Chapter 16 below were developed with flood mitigation and NFIP compliance in mind. Public engagement will be an ongoing effort in each participating jurisdiction to reduce future losses due to flooding and will continue even after recommended corrective actions have been implemented.

A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling ten-year period, since 1978. According to the best information available, there are no RL properties in any of the participating jurisdictions.

A severe repetitive loss (SRL) property is: a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000 and with cumulative amount of such claims payments exceeding $20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property. According to the best information available, there are no SRL properties in any of the participating jurisdictions.

2) Likelihood of Future Events

In the case of the FEMA 100-year floodplain there is a 1% annual chance, while in the 500-year floodplain there is a 0.02% annual chance. Thus, the likelihood of a 100-year flood event is occasional and the likelihood of a 500-year flood event is unlikely. However, based on the

frequency of previous flood events, every jurisdiction can expect to experience some type of flooding that may or may not meet the definition of a 100-year or 500-year event on a more regular basis.

The local planning team determined it is probable that Sabine County and the participating jurisdictions will experience a flood event in the next year, meaning an event is highly likely.

3) Extent

Flood magnitude is generally measured by depth of flood waters in feet or inches. Throughout Sabine County and the participating jurisdictions, the worst flood events have resulted in up to 16” of rainfall over a four-day period and 7’ flood depths.

Future worst-case flood events in Sabine County and the participating jurisdictions may meet or exceed previous worst-case 7’ flood depths.

4) Location and Impact

Roughly 28% (97,632 acres out of 349,440) of Sabine County is in the FEMA 100-year floodplain (Zone A). In contrast, about 2% (6,104 acres out of 349,440) of Sabine County is in the FEMA 500-year floodplain (Zone X).

A) Location

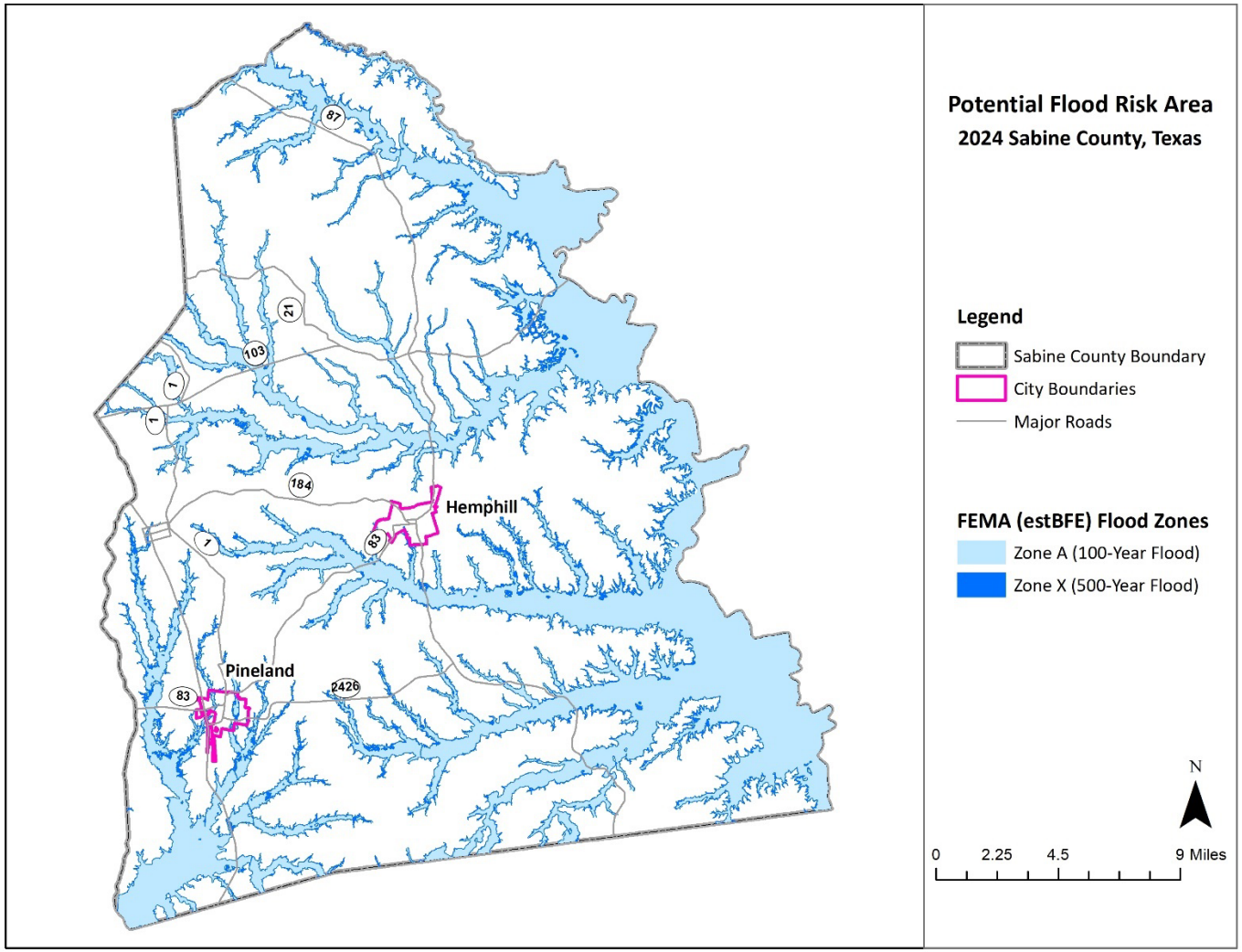

Figure 9: Sabine County FEMA (estBFE) Potential Flood Risk

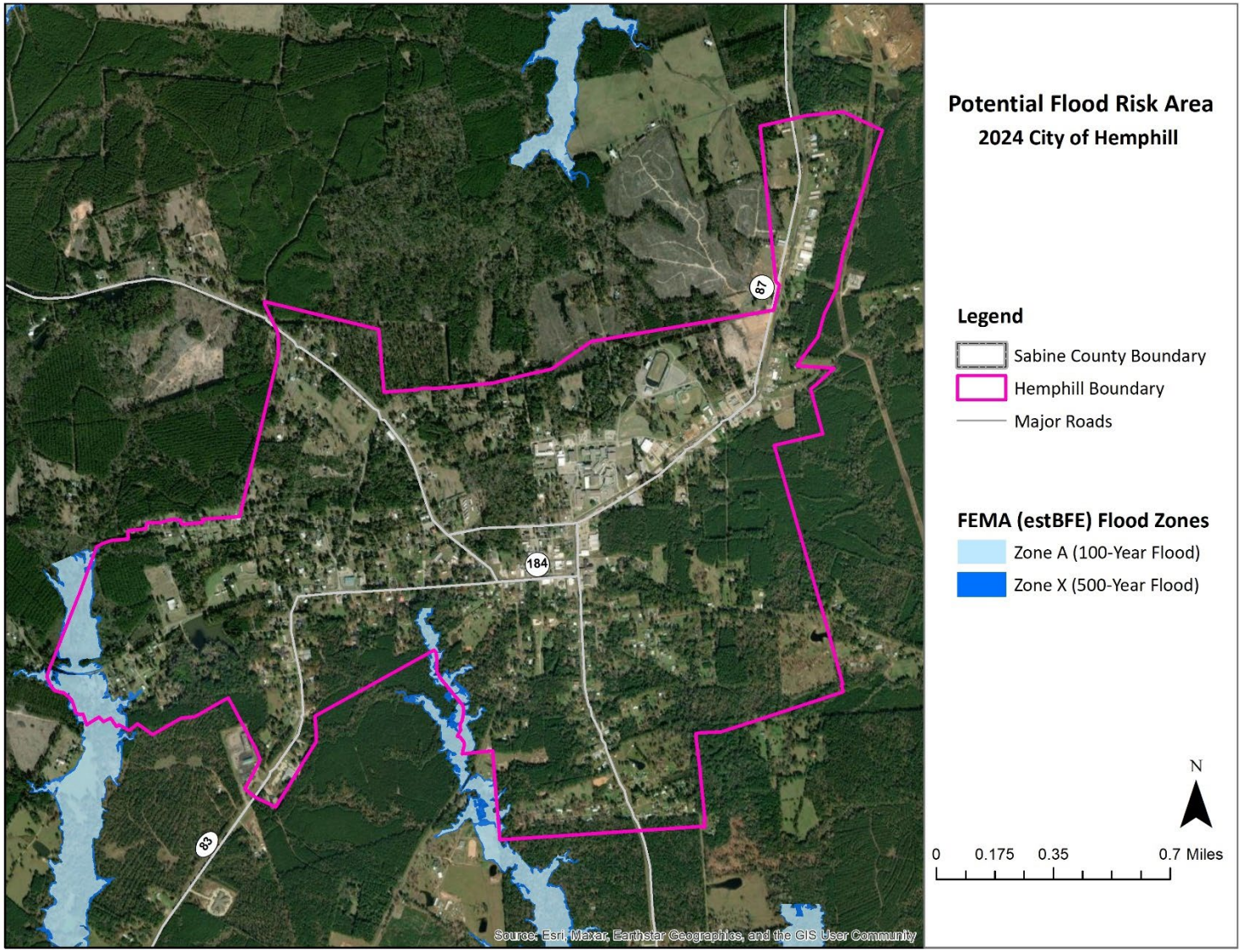

Figure 10: City of Hemphill FEMA (estBFE) Potential Flood Risk

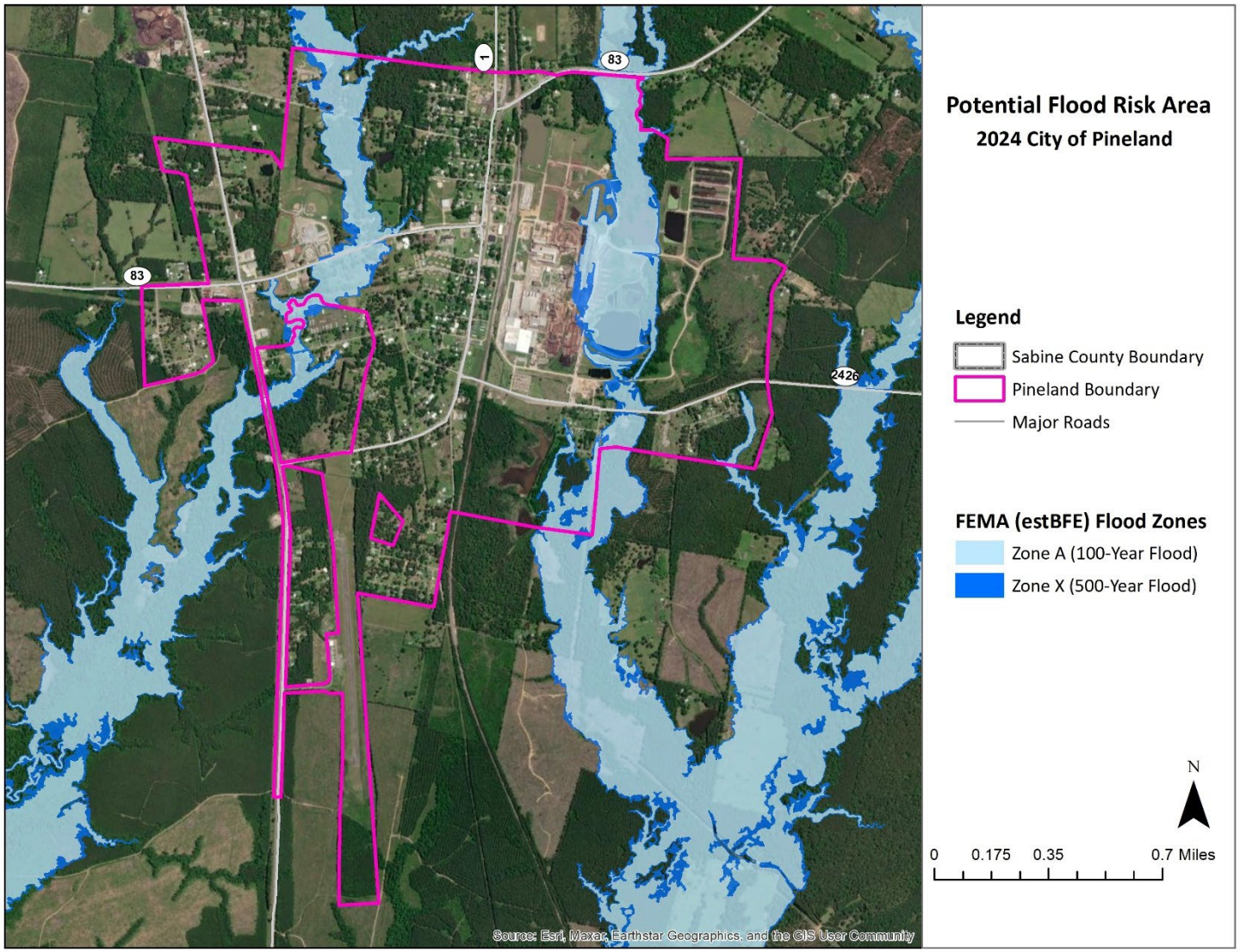

Figure 11: City of Pineland FEMA (estBFE) Potential Flood Risk

B) Impact

Residents in the participating jurisdictions may temporarily lose power due to downed power lines. Motorists and residents may be left stranded and needing rescue. Affected structures may be flooded, damaged by foodborne contaminants, damaged by debris flow, or even completely washed away. Crops may be damaged or destroyed. Estimated damage totals to vulnerable parcels affected during a 100-year flood event may meet the totals outlined in Tables 14 through 16.

Despite the unlikely probability of a so-called 500-year flood, 0.02% in any given year, the danger is not negligible. Similar to 100-year flood events, parts of the County may temporarily lose power due to downed power lines; motorists and residents may be left stranded and needing rescue; affected structures may be flooded, damaged by flood borne contaminants, damaged by debris flow, or even completely washed away; crops may be damaged or destroyed. Estimated damage totals to vulnerable parcels affected during a 500-year flood event may meet the totals outlined in Tables 14 through 16.

In addition to flooding's direct effects, the participating jurisdictions may be subject to indirect effects. These may include but aren't limited to loss of power, limited travel due to flooded and/or washed-out roads, and limited access to nearby emergency care centers.

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Sabine County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a flood.

Residents of mobile / manufactured housing are of particular concern. These structures are never considered safe during a flood, and depending on tie-down methods, may threaten surrounding structures.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a flood, whether due to structural damage, missing windows or doors, holes in exterior walls or the roof, may be less safe during a flood than structures in standard condition. Existing structural weaknesses may mean increased damage, injuries, or loss of life.

B) Critical Facilities

The planning team identified 63 critical facilities spread across the County and participating jurisdictions. Of the 63 critical facilities, 18 are located in some variation of a flood zone.

Table 13: Sabine County Critical Facilities Vulnerable to Flooding

Sabine County Critical Facilities
Fairmount Volunteer Fire Dept.
Shamrock Shores Volunteer Fire Dept.
City of Hemphill Critical Facilities
Beckcom Rd. Wastewater Treatment Plant
City of Pineland Critical Facilities
Pineland Sewer Plant Office
Sewer Plant Generator
Sewer Plant Chlorinator
Main Lift
Katherine Sage Temple City Park
City Park Concession Bldg
Pineland City Pool
Bath House Building
Bath House Covered Patio
City Park Picnic Shelter
City Park Caretaker Dwelling
City Playground Equipment
City Basketball Pavilion
City Baseball Cages
Stage at City Park

C) Vulnerable Parcels[12]

The planning team developed a parcel inventory to identify estimated damage values during a flood event. Parcels vulnerable to flooding have been identified by their complete or partial location within the FEMA 100-year floodplain and the FEMA 500-year floodplain. Actual damages will vary based on the location and extent of flooding.

Table 14: Vulnerable Parcels by Flood Zone in Sabine County

Jurisdiction	Total Parcels	Estimated Potential Damage Value
FEMA 100-Year Flood Zone A		
Sabine County	**1,270**	**$190,157,314**
FEMA 500-Year Flood Zone		
Sabine County	**1,166**	**$129,502,292**

Table 15: Vulnerable Parcels by Flood Zone in the City of Hemphill

Jurisdiction	Total Parcels	Estimated Potential Damage Value
FEMA 100-Year Flood Zone A		
Hemphill	**13**	**$286,500**
FEMA 500-Year Flood Zone		
Hemphill	**1**	**$14,300**

[12] County Parcel Count Includes All Parcels in Sabine County

Table 16: Vulnerable Parcels by Flood Zone in the City of Pineland

Jurisdiction	Total Parcels	Estimated Potential Damage Value
FEMA 100-Year Flood Zone A		
Pineland	**16**	**$1,714,184**
FEMA 500-Year Flood Zone		
Pineland	**4**	**$47,910**

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"Climate change may cause river floods to become larger or more frequent than they used to be in some places yet become smaller and less frequent in other places. As warmer temperatures cause more water to evaporate from the land and oceans, changes in the size and frequency of heavy precipitation events may in turn affect the size and frequency of river flooding."[13]

[13] https://www.epa.gov/climate-indicators/climate-change-indicators-river-flooding

5. Hurricane / Tropical Storms

Once a tropical depression has intensified to the point where its maximum sustained winds are between 35-64 knots (39 – 73 mph), it becomes a tropical storm. At these wind speeds the storm becomes more organized and begins to become more circular in shape – resembling a hurricane. The rotation of a tropical storm is more recognizable than for a tropical depression. Tropical storms can cause many problems without becoming a hurricane. However, most of the problems a tropical storm causes stem from heavy rainfall and high winds.

According to National Oceanic and Atmospheric Administration (NOAA)[14], a hurricane is an intense tropical weather system of strong thunderstorms with a well-defined surface circulation and maximum sustained winds of 74 mph or higher. Hurricanes are categorized according to the strength of their winds using the Saffir-Simpson Hurricane Scale. A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the highest.

1) Hurricanes / Tropical Storms History

Using data from NOAA's National Centers for Environmental Information, local news reports, and data from the National Climatic Data Center, the planning team created the following table to illustrate Sabine County and the participating jurisdictions' hurricane and tropical storm history between 2016 - 2023. The 2016 Sabine County HMAP recorded 2 hurricane/tropical storm events between 2005 – 2016 that impacted Sabine County – Hurricane Ike and Hurricane Rita. Since the 2016 HMAP, Sabine County has been impacted by Hurricane Harvey in 2017 and Hurricane Laura in 2020. Dollar amount damage was not reported; however, it was reported that during Hurricane Laura, the roof of a business collapsed in Hemphill. Additionally, there was one fatality during Hurricane Laura. There have been no impacts since Hurricane Laura in 2020.

[14] https://www.noaa.gov/education/resource-collections/weather-atmosphere/hurricanes

Table 17: Historical Hurricanes & Tropical Storms that affected Sabine County and the Participating Jurisdictions

Location	Date	Hurricane & Tropical Storm Events	Hurricane Category	Maximum Wind Speed	Local Fatalities	Local Injuries	Local Property Damage $2024	Local Crop Damage $2024
Countywide	8/30/2017 – 8/27/2020	2	TS	35 – 47 mph	1	0	$0	$0

2) Likelihood of Future Occurrence

Hurricanes occur in seasonal patterns between June 1 and November 30. Based on the historical frequency of hurricane events in Sabine County and the participating jurisdictions outlined above, the likelihood of a future event affecting any of the participating jurisdictions is occasional, that is a hurricane/tropical storm is possible in the next five years.

3) Extent

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential. Wind, pressure, and surge are combined to estimate potential damage. Categories 3, 4 and 5 are classified as “major” hurricanes. Major hurricanes comprise only 20 percent of total tropical cyclone landfalls but they account for over 70 percent of the damage in the United States. Damage from hurricanes can result from spawned tornados, coastal flooding from storm surge, and inland flooding from heavy rainfall.

Table 18: Saffir-Simpson Scale

Category	Maximum Sustained Wind Speed (MPH)	Minimum Surface Pressure (Millibars)	Storm Surge (Feet)
1	74-95	Greater than 980	3-5
2	96-110	979-965	6-8
3	111-130	964-945	9-12
4	131-155	944-920	13-18
5	155+	Less than 920	19+

Due to Sabine County's inland location, the worst storms known to have affected Sabine County and the participating jurisdictions generally weaken to tropical storms with sustained wind gusts exceeding 47 mph.

Future hurricanes/tropical storms affecting the participating jurisdictions may meet or exceed previous worst-case Tropical Storm events with 47 mph wind gusts.

4) Location and Impact

A) Location

Location is often referred to in terms of Tier I, II, and III counties, designated by the Texas State Office of Risk Management[15] for property insurance purposes, to represent differing levels of loss exposure to coastal counties and adjacent counties. Tier I counties are those adjacent to the Gulf of Mexico and Tier II counties are those typically adjacent to Tier I counties. Tier III counties are typically those adjacent to Tier II counties. Sabine County is neither a Tier I nor Tier II county, however, the County and participating jurisdictions can experience indirect impacts from hurricanes as they weaken to tropical storms and move inland.

B) Impact

Impacts from a tropical storm or hurricane in Sabine County and the participating jurisdictions may include but are not limited to: loss of power due to downed lines caused by flying debris or fallen trees, flooding, flooding due to damaged or destroyed roofs, damaged or broken windows, damage due to flying debris, wind damage, escaped livestock and pets, injured or killed livestock and pets, crop damage or destruction. In the worst storms, residents may be injured or even killed.

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Sabine County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a hurricane or tropical storm.

[15] https://www.sorm.state.tx.us/insurance-services/statewide-property-insurance-program

Residents of mobile / manufactured housing are of particular concern. These structures are never considered safe during a hurricane, and depending on tie-down methods, may also be unsafe during strong tropical storms.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a tropical storm or hurricane, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may be less safe during a hurricane or tropical storm than structures in standard condition. Existing structural weaknesses may mean increased damage, injuries, or loss of life.

B) Critical Facilities

The planning team identified 63 critical facilities spread across Sabine County and participating jurisdictions. The following critical facilities and infrastructure are vulnerable to hurricane/tropical storm events.

Table 19: Sabine County Critical Facilities Vulnerable to Hurricanes and Tropical Storms

Jurisdiction	Critical Facilities	Potential Hurricane Impacts								
		Loss of Power	Flying Debris	Uprooted Trees	Flooding Due to Physical Damages	Damaged or Destroyed Roofs	Damaged or Broken Windows	Wind Damage	Injuries	Death
Sabine County	County Court House	X	X	X	X	X	X	X	X	X
	County Admin Building	X	X	X	X	X	X	X	X	X
	Sheriff's Office	X	X	X	X	X	X	X	X	X
	Pct 1 Commissioner Barn	X	X	X	X	X	X	X		
	Pct 2 Commissioner Barn	X	X	X	X	X	X	X		
	Pct 3 Commissioner Barn	X	X	X	X	X	X	X		
	Pct 4 Commissioner Barn	X	X	X	X	X	X	X		
	South Sabine Water Supply	X	X	X	X	X	X	X	X	X
	Beechwood Water Supply	X	X	X	X	X	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Pineland Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Six Mile Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Bronson Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Pendleton Harbor Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Shamrock Shores Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Rosevine Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Fairmount Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
Hemphill	Water Plant Intake Facility	X	X	X	X	X	X	X		
	Palo Gaucho Crossing Water Treatment Plant	X	X	X	X	X	X	X	X	X
	Water Distribution Facility	X	X	X	X	X	X	X	X	X
	Beckom Rd. Wastewater Treatment Plant	X	X	X	X	X	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	City Hall Campus	X	X	X	X	X	X	X	X	X
Pineland	City Hall/Police Station	X	X	X	X	X	X	X	X	X
	Pineland Fire Station	X	X	X	X	X	X	X	X	X

	City of Pineland Utility Shop	X	X	X	X	X	X	X	X	X
	Katherine Sage Temple City Park	X	X	X	X	X	X	X	X	X
	City Park Concession Bldg.	X	X	X	X	X	X	X	X	X
	Pineland City Pool	X	X	X	X	X	X	X	X	X
	Bath House Building	X	X	X	X	X	X	X		
	Bath House Covered Patio	X	X	X	X	X	X	X		
	City Park Picnic Shelter	X	X	X	X	X	X	X		
	City Park Caretaker Dwelling	X	X	X	X	X	X	X		
	City Playground Equipment	X	X	X	X	X	X	X		
	City Basketball Pavilion	X	X	X	X	X	X	X		
	City Baseball Cages	X	X	X	X	X	X	X		
	Stage at City Park	X	X	X	X	X	X	X		
	Elm St. Elevated Water Well	X	X	X	X	X	X	X		
	Elm St. Water Pump and Chlorine Bldg.	X	X	X	X	X	X	X		
	Elm St. Outside Deep Well Unit	X	X	X	X	X	X	X		
	Pineland City Library	X	X	X	X	X	X	X	X	X
	Pineland Early Learning Center	X	X	X	X	X	X	X	X	X
	Pineland Sewer Plant Office Bldg.	X	X	X	X	X	X	X	X	X
	Sewer Plant Generator	X	X	X	X	X	X	X		
	Sewer Plant Chlorinator	X	X	X	X	X	X	X		
	Transmission St. Main Lift	X	X	X	X	X	X	X		
	Mulberry St. Well Pump Unit #3	X	X	X	X	X	X	X		
	Mulberry St. 105 KW Generator	X	X	X	X	X	X	X		
	Airport Dwelling/Pilot Lounge	X	X	X	X	X	X	X	X	X
	Airport Lighting Control Unit	X	X	X	X	X	X	X	X	X
	Timberland Hwy Office Buildings	X	X	X	X	X	X	X	X	X
	Bear Creek Club House	X	X	X	X	X	X	X	X	X
	West Sabine Elem School	X	X	X	X	X	X	X	X	X
	West Sabine High School	X	X	X	X	X	X	X	X	X
	Timberland Hwy Gas Pipeline – Purchase Point	X	X	X	X	X	X	X		

	Dogwood St. SGO60 60KW Natural Gas Generator	X	X	X	X	X	X	X		
	Dogwood St. 203 AMP Transfer	X	X	X	X	X	X	X		
	Elm St. Generator	X	X	X	X	X	X	X		
	Temple St. Generator	X	X	X	X	X	X	X		
	Generator W of Library	X	X	X	X	X	X	X		
	Mulberry St. 105 KW Generator	X	X	X	X	X	X	X		
	Maple St. SD025 25KW Diesel Generator	X	X	X	X	X	X	X		
	Timberland Hwy SD025 25 KW Diesel Generator	X	X	X	X	X	X	X		

C) Vulnerable Parcels

Central Appraisal District data was used to estimate potential damage values for each participating jurisdiction. Given the broad nature of vulnerability, damage values were calculated on the jurisdictional level.

Table 20: Estimated Potential Damage Values by Jurisdiction

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Sabine County	**22,717**	**$2,092,700,668**
City of Hemphill	997	$83,873,808
City of Pineland	577	$36,539,228

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"Climate change is expected to affect tropical cyclones by increasing sea surface temperatures, a key factor that influences cyclone formation and behavior. The U.S. Global Change Research Program and the Intergovernmental Panel on Climate Change[16] project that tropical cyclones will become more intense over the 21st century, with higher wind speeds and heavier rains."[17]

[16] https://science2017.globalchange.gov
www.ipcc.ch/report/ar5/wg1
[17]https://www.epa.gov/climate-indicators/climate-change-indicators-tropical-cyclone-activity#ref1

6. Wildfire

Wildfire is defined as an unplanned wildland fire, including unauthorized human-caused fires, escaped wildland fire use events, and escaped prescribed fire projects. A wildfire event can rapidly spread out of control and occurs most often in the summer, when the brush is dry, and flames can move unchecked through a highly vegetative area. Wildfires can start as a slow burning fire along the forest floor, killing and damaging trees. The fires often spread more rapidly as they reach the tops of trees, with wind carrying the flames from tree to tree. Usually, dense smoke is the first indication of a wildfire. A wildfire event often begins unnoticed and spreads quickly, lighting brush, trees and homes on fire. For example, a wildfire may be started by a campfire that was not doused properly, tossed cigarette, burning debris, or arson.[18]

1) Wildfire History

The Texas A&M Forest Service Wildfire Risk Assessment Portal provides wildfire data on fires that occurred as recently as 2021. Additional data came from local planning team members.

The 2016 Sabine County HMAP reported 37 "other" fires – defined as including "rubbish, trees, brush, and grass fire."

The following table represents all events recorded in the National Centers for Environmental Information (NCEI) and Texas A&M Forest Service databases between 2016 – 2023.

Table 21: Sabine County Wildfire History

Location	Date Range	Wildfire Events	Acres Burned
Countywide	1/1/2016 – 12/31/2021	134	524

2) Likelihood of Future Events

Based on the frequency of recorded events in Sabine County, the probability of a future event is considered highly likely, meaning an event is probable in the next year.

3) Extent

The Texas A&M Forest Service's Characteristic Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist. The FIS is a fire behavior output, which is influenced by three environmental factors - fuels,

[18] 2023 State of Texas Hazard Mitigation Plan

weather, and topography. According to Texas A&M Forest Service data, Sabine County and the participating jurisdictions are rated between Class 1 and Class 5.

Table 22: Characteristic Fire Intensity Scale[19]

Class 1 Very Low	Very small, discontinuous flames, usually less than one foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
Class 2 Low	Small flames, usually less than two feet long; small amount of very short-range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
Class 3 Moderate	Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
Class 4 High	Large flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
Class 5 Very High	Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

Future fire events in Sabine County and the participating jurisdictions may meet previous worst-case Class 5 (FIS) wildfires in terms of intensity, acreage burned, and inflicted damage. Sabine County maintains a Community Wildfire Protection Plan (CWPP) and will utilize the CWPP along with this HMAP to better protect the planning area from wildfire.

4) Location and Impact

A) Location

Due to wildfire's ability to inflict damage to both structures and landscapes, wildfire location has been assessed by parcel, rather than by structure. Parcels have been determined to be either partially or completely vulnerable to wildfire based on TxWRAP's Wildland Urban Interface boundaries.

[19] https://www.texaswildfirerisk.com

Because wildfires are dynamically unpredictable, the following maps and tables may not be representative of every location and parcel at risk of wildfire.

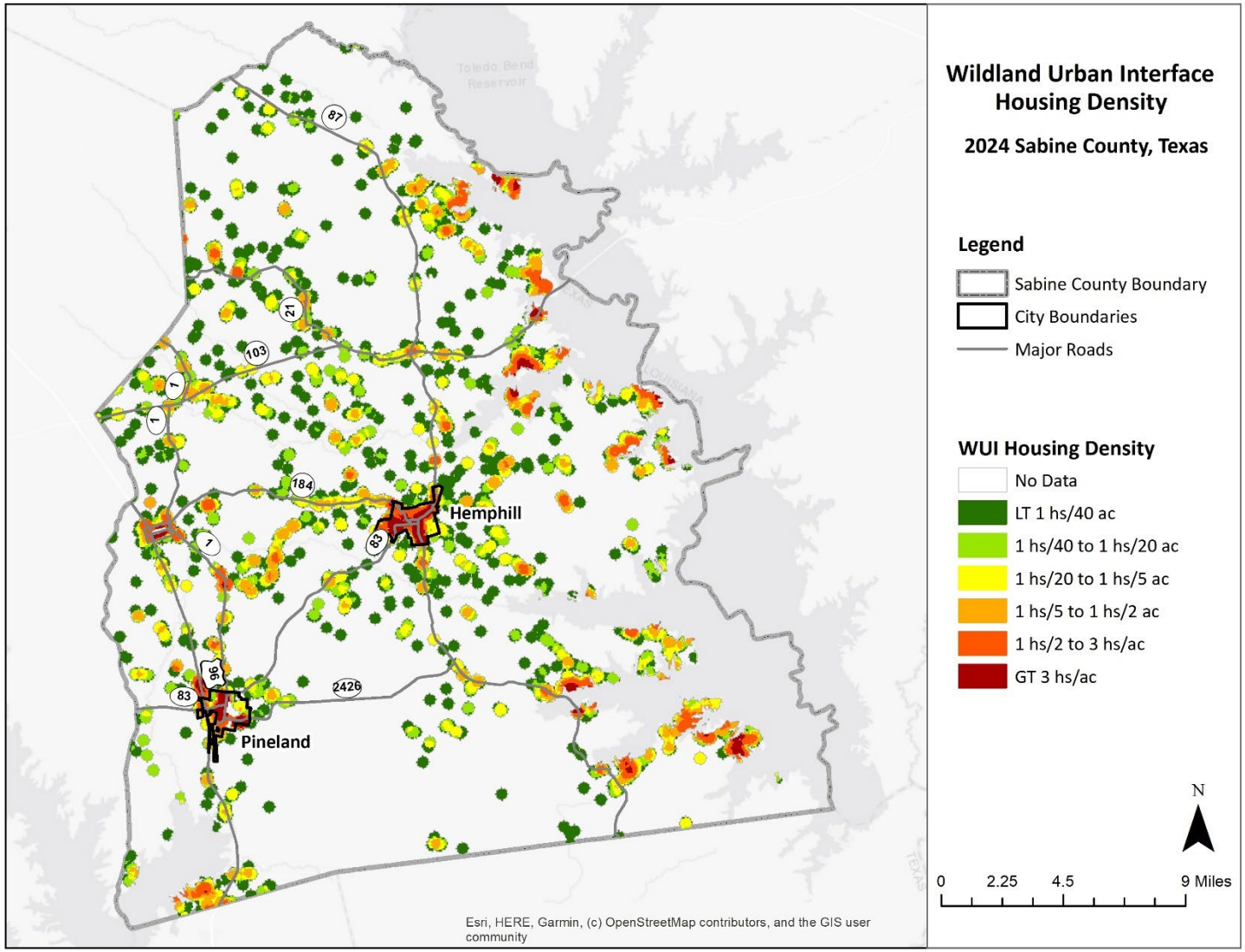

Figure 12: Sabine County Wildland Urban Interface

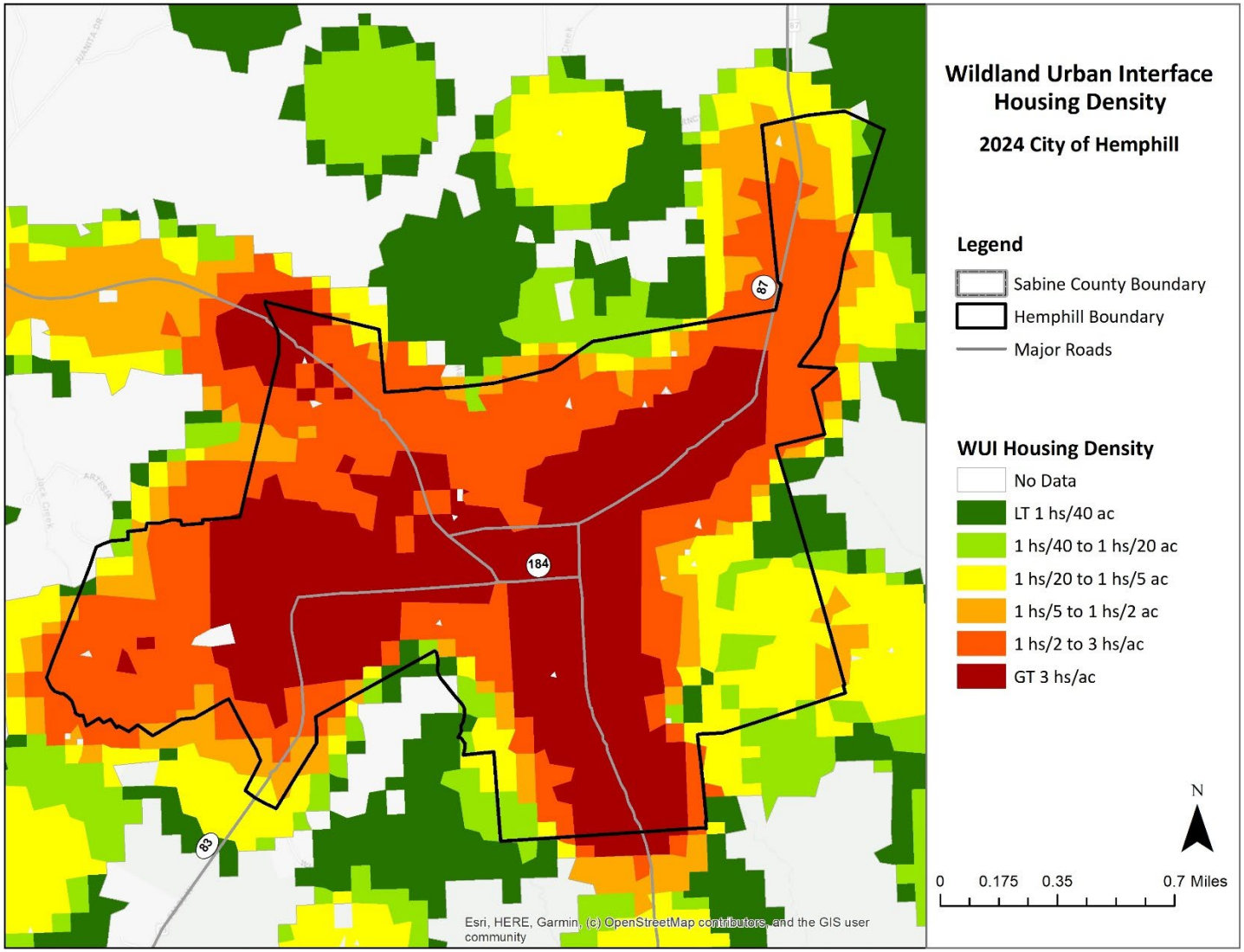

Figure 13: City of Hemphill Wildland Urban Interface

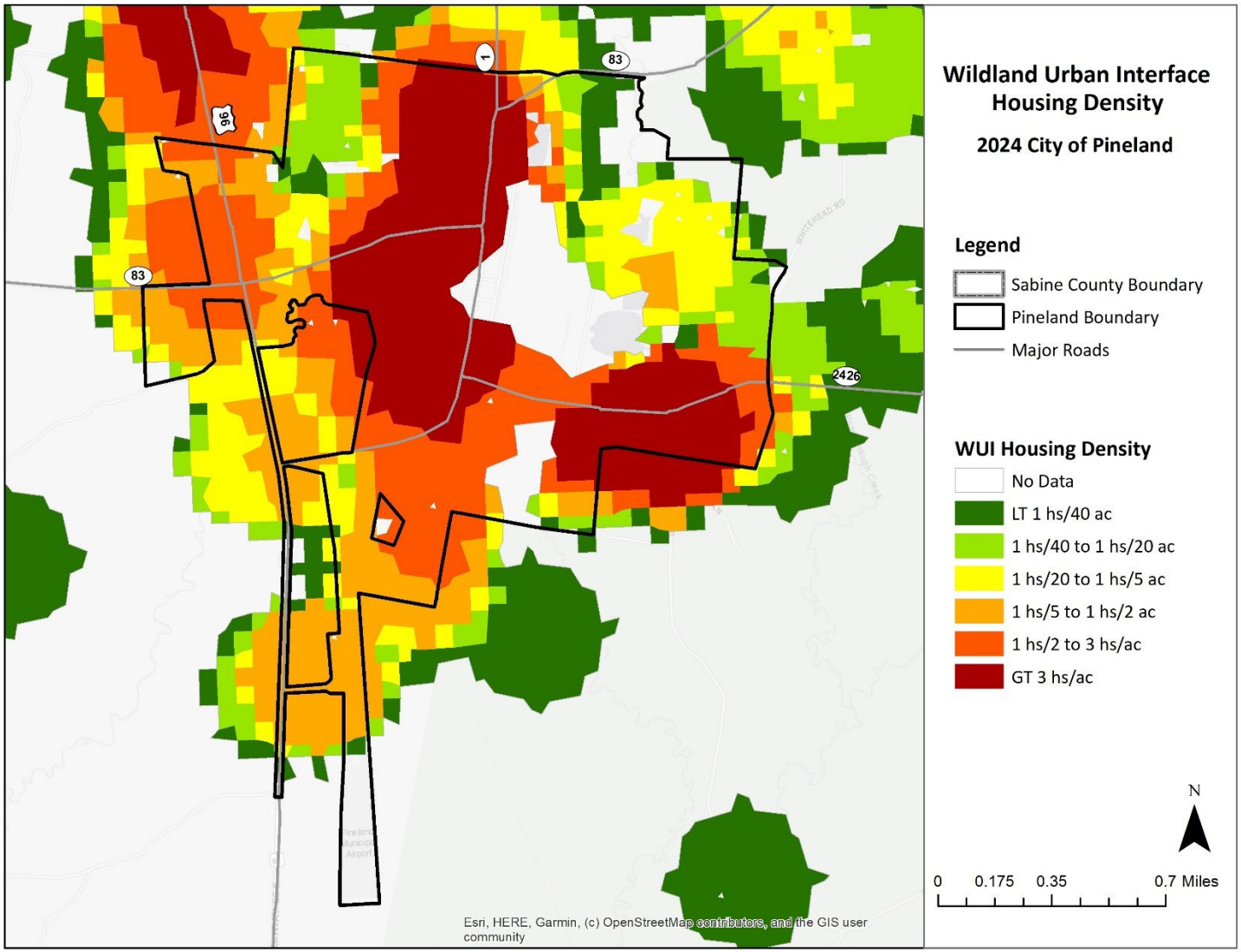

Figure 14: City of Pineland Wildland Urban Interface

B) Impact

Impacts from a wildfire in Sabine County and the participating jurisdictions may include but are not limited to crop damage or destruction; damaged or destroyed agricultural, residential, commercial, and industrial buildings; escaped, lost, injured, or killed livestock and pets. In the worst cases, residents may be injured or killed.

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Sabine County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from wildfire.

Residents of mobile homes, specifically those built before HUD's Manufactured Housing and Standards requirements were introduced in 1976, are of particular concern[20]. These structures are more prone to fire and have a higher incidence of occupant death than modern manufactured homes.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a wildfire, whether due to structural damage, missing windows or doors, holes in exterior walls or the roof, may be less safe during a wildfire than structures in standard condition. Exterior damage may make the homes more prone to fire by more readily exposing flammable materials to flame. Missing windows and other exterior gaps may leave residents and structures prone to smoke inhalation and smoke damage.

All of these issues may increase damages and lead to injuries or loss of life.

B) Critical Facilities

There are 63 critical facilities located throughout the County and participating jurisdictions. Of the 63 critical facilities, 55 are located in the wildland urban interface (WUI), as defined by the Texas A&M Forest Service. Because of their location in the WUI, the density of development, and proximity to wildland areas, these facilities are believed to be particularly susceptible to future wildfire threats.

[20] https://www.usfa.fema.gov/downloads/pdf/statistics/rural.pdf

Table 23: Critical Facilities Vulnerable to Wildfire and Potential Impacts

Jurisdiction	Critical Facilities	Potential Wildfire Impacts			
		Destruction	Partial Destruction	Heat Damage	Smoke Damage
Sabine County	County Court House	X	X	X	X
	County Admin Building	X	X	X	X
	Sheriff's Office	X	X	X	X
	Pct 1 Commissioner Barn	X	X	X	X
	Pct 2 Commissioner Barn	X	X	X	X
	Pct 3 Commissioner Barn	X	X	X	X
	Pct 4 Commissioner Barn	X	X	X	X
	South Sabine Water Supply	X	X	X	X
	Beechwood Water Supply	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X
	Pineland Volunteer Fire Dept.	X	X	X	X
	Six Mile Volunteer Fire Dept.	X	X	X	X
	Pendleton Harbor Volunteer Fire Dept.	X	X	X	X
	Shamrock Shores Volunteer Fire Dept.	X	X	X	X
	Rosevine Volunteer Fire Dept.	X	X	X	X
Hemphill	Water Plant Intake Facility	X	X	X	X
	Palo Gaucho Crossing Water Treatment Plant	X	X	X	X
	Water Distribution Facility	X	X	X	X
	Beckom Rd. Wastewater Treatment Plant	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X
	City Hall Campus	X	X	X	X
Pineland	City Hall/Police Station	X	X	X	X
	City of Pineland Utility Shop	X	X	X	X
	Katherine Sage Temple City Park	X	X	X	X
	City Park Concession Bldg.	X	X	X	X
	Pineland City Pool	X	X	X	X
	Bath House Building	X	X	X	X
	Bath House Covered Patio	X	X	X	X
	City Park Picnic Shelter	X	X	X	X
	City Park Caretaker Dwelling	X	X	X	X
	City Playground Equipment	X	X	X	X
	City Basketball Pavilion	X	X	X	X
	City Baseball Cages	X	X	X	X
	Stage at City Park	X	X	X	X
	Elm St. Elevated Water Well	X	X	X	X
	Elm St. Water Pump and Chlorine Bldg.	X	X	X	X
	Elm St. Outside Deep Well Unit	X	X	X	X
	Pineland City Library	X	X	X	X
	Pineland Early Learning Center	X	X	X	X

	Pineland Sewer Plant Office Bldg.	X	X	X	X
	Sewer Plant Generator	X	X	X	X
	Sewer Plant Chlorinator	X	X	X	X
	Transmission St. Main Lift	X	X	X	X
	Mulberry St. Well Pump Unit #3	X	X	X	X
	Mulberry St. 105 KW Generator	X	X	X	X
	Airport Dwelling/Pilot Lounge	X	X	X	X
	Airport Lighting Control Unit	X	X	X	X
	Timberland Hwy Office Buildings	X	X	X	X
	West Sabine Elem School	X	X	X	X
	West Sabine High School	X	X	X	X
	Timberland Hwy Gas Pipeline – Purchase Point	X	X	X	X
	Elm St. Generator	X	X	X	X
	Generator W of Library	X	X	X	X
	Mulberry St. 105 KW Generator	X	X	X	X
	Maple St. SD025 25KW Diesel Generator	X	X	X	X

C) Vulnerable Parcels

Table 24: Parcels Vulnerable to Wildfire

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Sabine County	**14,161**	**$1,097,104,665**
City of Hemphill	749	$66,039,560
City of Pineland	473	$24,841,322

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"Research shows that changes in climate create warmer, drier conditions, leading to longer and more active fire seasons. Increases in temperatures and the thirst of the atmosphere due to

climate change have increased aridity of forest fuels during the fire season. These drivers were found to be responsible for over half the observed decrease in the moisture content of fuels in western U.S. forests from 1979 to 2015, and the doubling of forest fire burned area over the period 1984 to 2015. For much of the U.S. West, projections show that an average annual 1 degree C temperature increase would increase the median burned area per year by as much as 600%.[21]

[21] https://www.noaa.gov/noaa-wildfire/wildfire-climate-connection#:~:text=Research%20shows%20that%20changes%20in,fuels%20during%20the%20fire%20season. https://www.c2es.org/content/wildfires-and-climate-change/#:~:text=For%20much%20of%20the%20U.S.,in%20some%20types%20of%20forests.

7. Tornado

A tornado is defined as a violently rotating column of air touching the ground, usually attached to the base of a thunderstorm.[22] Most of the time, vortices remain suspended in the atmosphere and are visible as a funnel cloud. However, when the lower tip of a vortex touches the ground, the tornado becomes a force of destruction. Tornado strength is currently measured using the Enhanced Fujita (EF) Scale. Like the previously used Fujita scale, the EF Scale uses damage to estimate tornado wind speeds and assign a number between 0 and 5. A rating of EF0 represents minor to no damage whereas a rating of EF5 represents destruction of buildings.

1) Tornado History

The 2016 Sabine County HMAP reported 18 tornado occurrences throughout the county from 1959-2013, with the worst magnitude recorded at an F3 in 1974. The table below represents all recorded events between 2016 – 2023. There have been no recorded events since 2020.

Table 25: Sabine County Tornado History

Location	Date Range	Number of Tornados	F / EF Magnitude Range	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	7/9/2018 – 3/30/2020	2	EF0 – EF1	0	0	$15,000	$0

2) Likelihood of Future Events

Tornado events in Sabine County are considered a likely hazard given the frequency of previous tornados in the County and participating jurisdictions, meaning one is possible in the next three years.

3) Extent

Before 2007, the Fujita Scale was used for rating tornado strength. The Fujita Scale is based on damage intensity instead of wind speed, with estimated wind speed ranges based on the extent of observed damage.

[22] https://www.weather.gov/phi/TornadoDefinition

Table 26: Fujita Scale

Fujita Scale			
Fujita Category	**Wind Speed (MPH)**	**Character**	**Potential Damage**
F0	40-72	Weak	Light Damage. Some damage to chimneys; branches broken off trees, shallow-rooted trees uprooted, sign boards damaged.
F1	73-112	Weak	Moderate damage. Roof surfaces peeled off; mobile homes pushed foundations or overturned; moving autos pushed off road.
F2	113-157	Strong	Considerable damage. Roofs torn from frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light objects become projectiles.
F3	158-206	Strong	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
F4	207-260	Violent	Devastating damage. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
F5	260-318	Violent	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yds.); high-rise buildings have significant structural deformation; incredible phenomena will occur.

Adopted after 2007, the Enhanced Fujita Scale, or EF Scale, is the scale for rating the strength of tornados via the damage they cause. Six categories from zero to five represent increasing degrees of damage. The scale considers how most structures are designed and is thought to be an accurate representation of the surface wind speeds in the most violent tornados.

Table 27: Enhanced Fujita Scale[23]

Enhanced Fujita (EF) Scale		
Enhanced Fujita Category	**Wind Speed (MPH)**	**Potential Damage**
EF0	65-85	Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	86-110	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	Devastating damage. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	200+	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yds.); high-rise buildings have significant structural deformation; incredible phenomena will occur.

The most recent tornados in Sabine County and the participating jurisdictions have been classified as EF0 – EF1s on the Enhanced Fujita Scale. Sabine County sits within Zone III (200 mph winds) of the IBC's wind speed map[24]. Future tornados in Sabine County and the participating jurisdictions may meet up to EF5 on the Enhanced Fujita Category.

4) Location and Impact

A) Location

Tornados are not constrained by any distinct geographic boundary. Tornados can occur across all participating jurisdictions and may freely cross from one jurisdiction into another.

B) Impact

Impacts from a tornado may include but are not limited to damaged or destroyed personal property including vehicles, damaged or destroyed agricultural, residential, commercial, and industrial buildings, and loss of power. Crops may be damaged or destroyed. Pets and livestock

[23] 2023 State of Texas Hazard Mitigation Plan
[24] https://iibec.org/giving-tornadoes-their-due/

may be injured or killed by tornados or flying debris. Pets and livestock may escape due to damaged or destroyed structures and fences.

In the worst cases, tornados may cause injuries and/or be deadly.

5) Vulnerability

Tornadoes have the potential to impact the entire planning area. All existing and future buildings, critical facilities, critical infrastructure, improved property, and the population of the participating jurisdictions are considered vulnerable to this hazard.

A) Population

As described in Section 3 of Chapter 3 above, Sabine County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a tornado. Residents of mobile / manufactured homes are of particular concern. These structures are never considered safe during a tornado.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a tornado, whether due to structural damage, missing windows or doors, holes in exterior walls or the roof, may be less safe during a tornado than structures in standard condition. Existing structural weaknesses, due to housing type or existing damages, may lead to compounded damages, injuries, or loss of life.

B) Critical Facilities

Certain critical facilities and infrastructure in each jurisdiction may be particularly vulnerable to tornados. These facilities have been identified for reasons including: the number of people who use the facility or infrastructure, the facility's role in providing basic services to begin the cleanup process and get the jurisdictions running again, and the facility's ability to offer goods and materials residents will need to resume normalcy as quickly as possible. The selected critical facilities are built from a variety of materials with varying levels of resistance to tornadic damage. Additionally, their varying ages mean they weren't constructed to uniform building standards. Given tornados' violent nature, these facilities may experience increased levels of vulnerability to the hazards. Damage to any of these facilities may have a disproportionately negative impact on each jurisdiction's recovery from a tornado if that damage affects the facility's ability to reopen and resume normal business right away.

Table 28: Critical Facilities Vulnerable to Tornados and Potential Impacts

Jurisdiction	Critical Facilities	Potential Tornado Impacts								
		Loss of Power	Flying Debris	Uprooted Trees	Flooding Due to Physical Damages	Damaged or Destroyed Roofs	Damaged or Broken Windows	Wind Damage	Injuries	Death
Sabine County	County Court House	X	X	X	X	X	X	X	X	X
	County Admin Building	X	X	X	X	X	X	X	X	X
	Sheriff's Office	X	X	X	X	X	X	X	X	X
	Pct 1 Commissioner Barn	X	X	X	X	X	X	X		
	Pct 2 Commissioner Barn	X	X	X	X	X	X	X		
	Pct 3 Commissioner Barn	X	X	X	X	X	X	X		
	Pct 4 Commissioner Barn	X	X	X	X	X	X	X		
	South Sabine Water Supply	X	X	X	X	X	X	X	X	X
	Beechwood Water Supply	X	X	X	X	X	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Pineland Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Six Mile Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Bronson Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Pendleton Harbor Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Shamrock Shores Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Rosevine Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Fairmount Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
Hemphill	Water Plant Intake Facility	X	X	X	X	X	X	X		
	Palo Gaucho Crossing Water Treatment Plant	X	X	X	X	X	X	X	X	X
	Water Distribution Facility	X	X	X	X	X	X	X	X	X
	Beckom Rd. Wastewater Treatment Plant	X	X	X	X	X	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	City Hall Campus	X	X	X	X	X	X	X	X	X
Pineland	City Hall/Police Station	X	X	X	X	X	X	X	X	X

	Pineland Fire Station	X	X	X	X	X	X	X	X	X
	City of Pineland Utility Shop	X	X	X	X	X	X	X	X	X
	Katherine Sage Temple City Park	X	X	X	X	X	X	X	X	X
	City Park Concession Bldg.	X	X	X	X	X	X	X	X	X
	Pineland City Pool	X	X	X	X	X	X	X	X	X
	Bath House Building	X	X	X	X	X	X	X	X	X
	Bath House Covered Patio	X	X	X	X	X	X	X		
	City Park Picnic Shelter	X	X	X	X	X	X	X		
	City Park Caretaker Dwelling	X	X	X	X	X	X	X	X	X
	City Playground Equipment	X	X	X	X	X	X	X		
	City Basketball Pavilion	X	X	X	X	X	X	X		
	City Baseball Cages	X	X	X	X	X	X	X		
	Stage at City Park	X	X	X	X	X	X	X		
	Elm St. Elevated Water Well	X	X	X	X	X	X	X		
	Elm St. Water Pump and Chlorine Bldg.	X	X	X	X	X	X	X		
	Elm St. Outside Deep Well Unit	X	X	X	X	X	X	X		
	Pineland City Library	X	X	X	X	X	X	X	X	X
	Pineland Early Learning Center	X	X	X	X	X	X	X	X	X
	Pineland Sewer Plant Office Bldg.	X	X	X	X	X	X	X	X	X
	Sewer Plant Generator	X	X	X	X	X	X	X		
	Sewer Plant Chlorinator	X	X	X	X	X	X	X		
	Transmission St. Main Lift	X	X	X	X	X	X	X		
	Mulberry St. Well Pump Unit #3	X	X	X	X	X	X	X		
	Mulberry St. 105 KW Generator	X	X	X	X	X	X	X		
	Airport Dwelling/Pilot Lounge	X	X	X	X	X	X	X	X	X
	Airport Lighting Control Unit	X	X	X	X	X	X	X		
	Timberland Hwy Office Buildings	X	X	X	X	X	X	X	X	X
	Bear Creek Club House	X	X	X	X	X	X	X	X	X
	West Sabine Elem School	X	X	X	X	X	X	X	X	X
	West Sabine High School	X	X	X	X	X	X	X	X	X

	Timberland Hwy Gas Pipeline – Purchase Point	X	X	X	X	X	X	X		
	Dogwood St. SGO60 60KW Natural Gas Generator	X	X	X	X	X	X	X		
	Dogwood St. 203 AMP Transfer	X	X	X	X	X	X	X		
	Elm St. Generator	X	X	X	X	X	X	X		
	Temple St. Generator	X	X	X	X	X	X	X		
	Generator W of Library	X	X	X	X	X	X	X		
	Mulberry St. 105 KW Generator	X	X	X	X	X	X	X		
	Maple St. SD025 25KW Diesel Generator	X	X	X	X	X	X	X		
	Timberland Hwy SD025 25 KW Diesel Generator	X	X	X	X	X	X	X		

C) Vulnerable Parcels

Table 29: Parcels Vulnerable to Tornados

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Sabine County	**22,717**	**$2,092,700,668**
City of Hemphill	997	$83,873,808
City of Pineland	577	$36,539,228

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"Scientists must attempt to predict how climate change might affect the individual weather 'ingredients' that support the development of supercell thunderstorms (the type that produce tornadoes). These weather ingredients are:

- warm, moist air;
- an unstable atmosphere; and
- wind at different levels moving in different directions at different speeds, a phenomenon known as wind shear.

Some studies predict that climate change could provide the opportunity for more severe thunderstorms to form. However, this does not necessarily mean that more tornadoes will occur, especially in light of the fact that only about 20 percent of supercell thunderstorms produce tornadoes."[25]

[25] https://education.nationalgeographic.org/resource/tornadoes-and-climate-change/

8. Drought

Drought is typically defined as a persistent and abnormal moisture deficiency that creates adverse impacts on vegetation, animals, and the human population.[26]

Droughts are one of the most complex natural hazards to identify because it is difficult to determine their precise beginning or end. In addition, droughts can lead to other hazards such as extreme heat and wildfires. Their impact on wildlife and area farming is enormous, often killing crops, grazing land, edible plants and even in severe cases, trees. A secondary hazard to drought is wildfire because dying vegetation serves as a prime ignition source. Therefore, a heat wave combined with a drought is a very dangerous situation.

Table 30: Drought Classifications

Meteorological Drought	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
Hydrologic Drought	The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
Agricultural Drought	Soil moisture deficiencies relative to water demands of plant life, usually crops.
Socioeconomic Drought	The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall.

[26] NOAA, NIDIS. https://www.drought.gov/what-is-drought/drought-basics

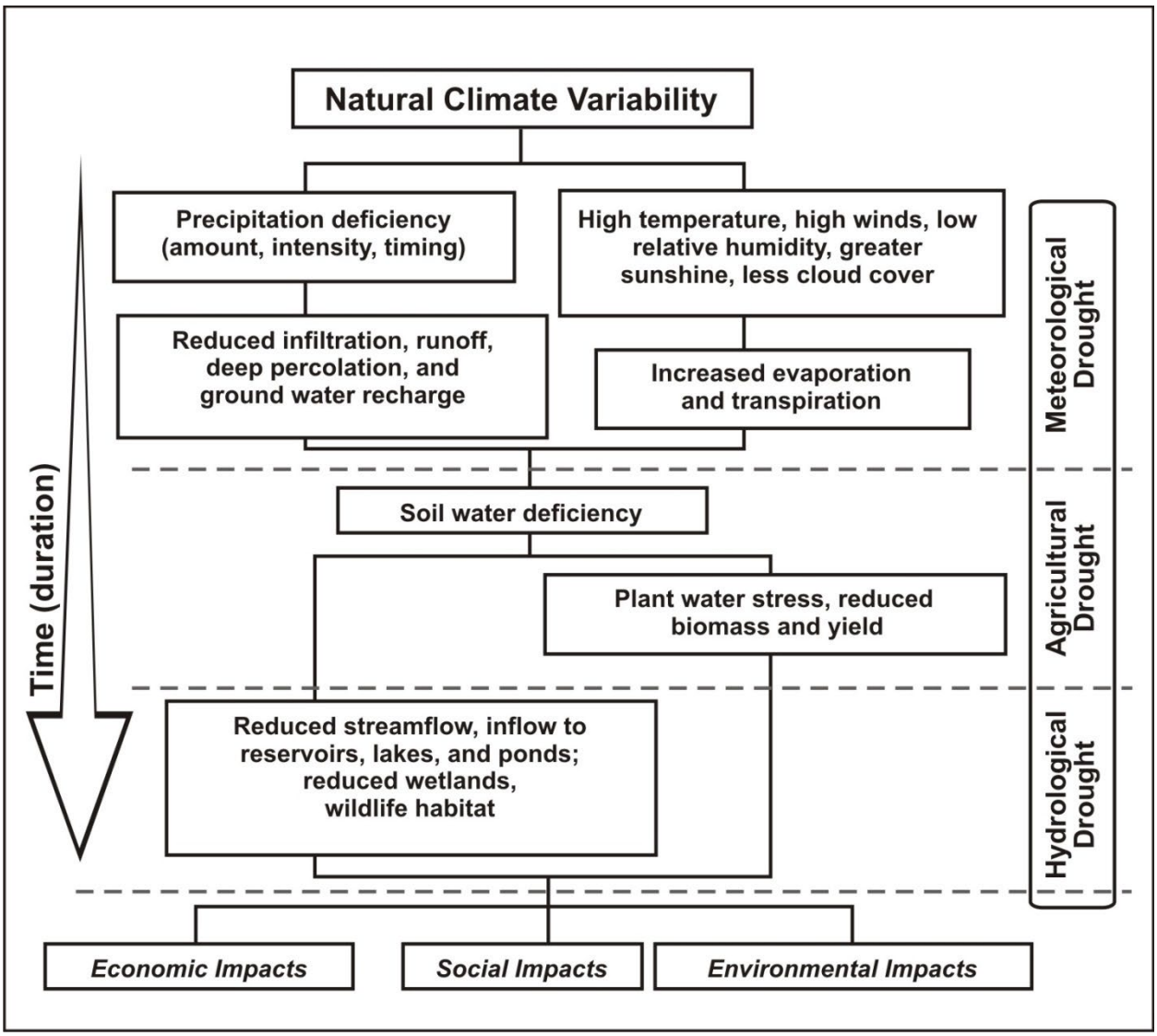

Figure 15: Sequence of Drought Occurrence and Impacts for Commonly Accepted Drought Types[27]

[27] Source: National Drought Mitigation Center, University of Nebraska-Lincoln, http://drought.unl.edu/DroughtBasics/TypesofDrought.aspx

1) Drought History

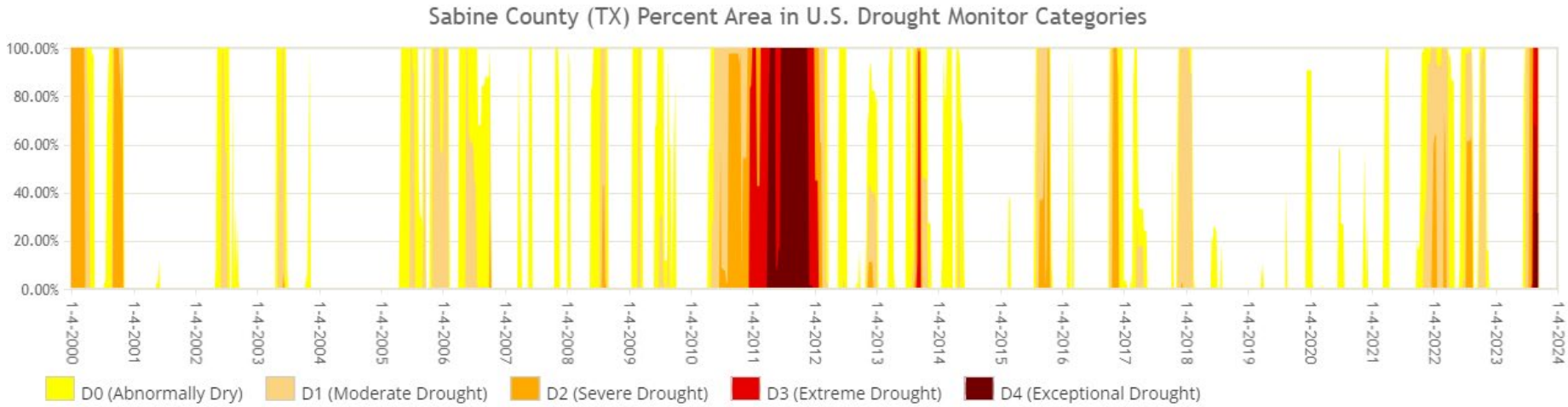

Figure 16: Sabine County Drought History[28]

[28] Source: United States Drought Monitor https://droughtmonitor.unl.edu/Data.aspx

Drought history is recorded at the county level. However, the data is measured by the percentage of the county affected by drought. Although no specific data regarding drought's occurrences in the remaining jurisdictions is available, it's possible to use the data in Figure 16 to infer when the participating jurisdictions addressing the hazard previously experienced drought conditions due to the fact that the conditions impacted 100% of the county. The table below represents events recorded in the NCEI database, however, data from the US Drought Monitor, shown in Figure 16 above, shows more events that were not recorded in the NCEI. According to the data, Sabine County and the participating jurisdictions have regularly experienced drought conditions since 2000.

Table 31: Sabine County Drought History

Location	Date Range	Number of Drought Events	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	12/1/2005 – 8/1/2022	26	0	0	$0	$0

2) Likelihood of Future Events

Based on historical drought in Texas and Sabine County, it is highly likely that a future drought will affect the County and the participating jurisdictions, meaning an event affecting any or all the participating jurisdictions is probable in the next year, and a major drought every 20 years.

3) Extent

Since 2000, Sabine County has regularly experienced county-wide droughts classified as periods ranging from abnormal dryness to exceptional drought. Between 2011 and 2012, the entire County, including all participating jurisdictions, was in a state of extreme or exceptional drought, the most severe drought categories.

The Palmer Drought Index is used to measure the extent of drought by measuring the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, with the intensity of drought during the current month dependent upon the current weather patterns plus the cumulative patterns of previous months. The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop.

Table 32: Palmer Drought Index

Drought Index	Drought Conditions Classifications						
	Extreme	Severe	Moderate	Normal	Mostly Moist	Very Moist	Extremely Moist
Z Index	-2.75 and below	-2.00 to -2.74	-1.25 to -1.99	-1.24 to +.99	+1.00 to +2.49	+2.50 to +3.49	n/a
Meteorological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.00	+3.00 to +3.00	+4.00 and above
Hydrological	-4.00 and below	-3.00 to -3.99	-2.00 to -2.99	-1.99 to +1.99	+2.00 to +2.00	+3.00 to +3.00	+4.00 and above

Table 33: Palmer Drought Category Descriptions[29]

Category	Description	Possible Impacts	Palmer Drought Index
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing, or imminent, voluntary water use restrictions requested.	-2.0 to -2.9
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.	-3.0 to -3.9
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions.	-4.0 to -4.9
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water emergencies.	-5.0 or less

Drought is monitored nationwide by the National Drought Mitigation Center (NDMC). Indicators are used to describe broad scale drought conditions across the U.S. Indicators correspond to the intensity of drought.

Based on the historical occurrences of drought, Sabine County and all participating jurisdictions should anticipate experiencing droughts ranging from abnormally dry to exceptional drought or D0 to D4 based on the Palmer Drought Category. Given varying conditions, droughts may start

[29] www.droughtmonitor.unl.edu

on the low end of the Index but will intensify with duration and ongoing lack of precipitation. Future drought events may reach the intensity of D4 on the Palmer Drought Index.

4) Location and Impact

A) Location

Drought has no distinct geographic boundary. Drought can occur across all participating jurisdictions.

B) Impact

General impacts may include water shortage, risk to public safety due to wildfire risk increases, respiratory impacts to the public due to affected air quality, and degradation of fish and wildlife habitat. Economic impacts may include increased prices for food, unemployment for farm workers and ranch hands, livestock mortality from limited grazing availability, and reduced tax revenues because of reduced supplies of agriculture products and livestock that are dependent on rainfall, along with other supply shortages.

The City of Hemphill adopted its current Drought Contingency Plan in 2015. The plan describes four stages of water restrictions ranging from voluntary conservation to a prohibition of activities and water allocation. Each stage is triggered by changes in the level of water demand relative to the safe operating capacity of the City's water supply facilities or the occurrence of a water supply emergency.

The City of Pineland adopted its current Drought Contingency Plan in 2019. The plan describes five stages of water restrictions ranging from 5% voluntary conservation to 20% voluntary conservation and a prohibition of activities. Each stage is triggered by changes in the level of water demand relative to the safe operating capacity of the City's water supply facilities or the occurrence of a water supply emergency.

Sabine County currently does not have a Drought Contingency Plan.

5) Vulnerability

Because drought has the potential to impact every jurisdiction equally, all improved property and the entire population is exposed to this hazard. General impacts may include water shortage, risk to public safety due to wildfire risk increases, respiratory impacts to the public due to affected air quality, and degradation of fish and wildlife habitat.

Economic impacts may include increased prices for food, unemployment for farm workers and ranch hands, livestock mortality from limited grazing availability, and reduced tax revenues because of reduced supplies of agriculture products and livestock that are dependent on rainfall.

Lower income populations who may not have the resources to buy large quantities of bottled water in the event of a shortage may be more vulnerable than other populations.

A) Population

As described in Section 3 of Chapter 3 above, Sabine County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a drought. Lower income populations who may not have the resources to buy large quantities of bottled water in the event of a shortage may be more vulnerable than other populations.

B) Critical Facilities

In addition to triggering various components of participating jurisdictions' Drought Contingency Plans, drought conditions may affect local critical facilities. Area fire departments may see increased demand for controlling wildland fire due to dry conditions. Drought is likely to require increased output from the local power companies to keep up with electrical demand. Depending on factors like time of year, temperature, and duration, increased electrical demand may cause brownouts that would impact critical facilities.

Table 34: Critical Facilities Vulnerable to Drought and Potential Impacts

Jurisdiction	Critical Facilities	Potential Drought Impacts	
		Increased Demand for Services	Economic Damages
Sabine County	County Court House		X
	County Admin Building		X
	Sheriff's Office		X
	Pct 1 Commissioner Barn		X
	Pct 2 Commissioner Barn		X
	Pct 3 Commissioner Barn		X
	Pct 4 Commissioner Barn		X
	South Sabine Water Supply	X	X
	Beechwood Water Supply	X	X
	Hemphill Volunteer Fire Dept.	X	X
	Pineland Volunteer Fire Dept.	X	X
	Six Mile Volunteer Fire Dept.	X	X
	Bronson Volunteer Fire Dept.	X	X
	Pendleton Harbor Volunteer Fire Dept.	X	X
	Shamrock Shores Volunteer Fire Dept.	X	X
	Rosevine Volunteer Fire Dept.	X	X
	Fairmount Volunteer Fire Dept.	X	X
Hemphill	Water Plant Intake Facility	X	X
	Palo Gaucho Crossing Water Treatment Plant	X	X
	Water Distribution Facility	X	X
	Beckom Rd. Wastewater Treatment Plant	X	X
	Hemphill Volunteer Fire Dept.	X	X
	City Hall Campus		X
Pineland	City Hall/Police Station		X
	Pineland Fire Station	X	X

	City of Pineland Utility Shop	X	X
	Katherine Sage Temple City Park		X
	City Park Concession Bldg.		X
	Pineland City Pool	X	X
	Bath House Building		X
	Bath House Covered Patio		X
	City Park Picnic Shelter		X
	City Park Caretaker Dwelling		X
	City Playground Equipment		X
	City Basketball Pavilion		X
	City Baseball Cages		X
	Stage at City Park		X
	Elm St. Elevated Water Well	X	X
	Elm St. Water Pump and Chlorine Bldg.	X	X
	Elm St. Outside Deep Well Unit	X	X
	Pineland City Library		X
	Pineland Early Learning Center		X
	Pineland Sewer Plant Office Bldg.		X
	Sewer Plant Generator	X	X
	Sewer Plant Chlorinator	X	X
	Transmission St. Main Lift	X	X
	Mulberry St. Well Pump Unit #3	X	X
	Mulberry St. 105 KW Generator	X	X
	Airport Dwelling/Pilot Lounge		X
	Airport Lighting Control Unit		X
	Timberland Hwy Office Buildings		X
	Bear Creek Club House		X
	West Sabine Elem School		X

	West Sabine High School		X
	Timberland Hwy Gas Pipeline – Purchase Point	X	X
	Dogwood St. SGO60 60KW Natural Gas Generator	X	X
	Dogwood St. 203 AMP Transfer	X	X
	Elm St. Generator	X	X
	Temple St. Generator	X	X
	Generator W of Library	X	X
	Mulberry St. 105 KW Generator	X	X
	Maple St. SD025 25KW Diesel Generator	X	X
	Timberland Hwy SD025 25 KW Diesel Generator	X	X

C) Vulnerable Parcels

Given drought's geographic reach, all parcels within the participating jurisdictions are equally vulnerable to the hazard. However, given the limited damage inflicted by previous droughts, future damages are expected to be similarly limited.

Table 35: Parcels Vulnerable to Drought

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Sabine County	**22,717**	**$2,092,700,668**
City of Hemphill	997	$83,873,808
City of Pineland	577	$36,539,228

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"As average temperatures have risen because of climate change, the Earth's water cycle has sped up through an increase in the rate of evaporation from soil and transpiration from plants. An increase in evapotranspiration makes more water available in the air for precipitation, but contributes to drying over some land areas, leaving less moisture in the soil. As the climate continues to change, many historically wet areas are likely to experience increased precipitation and increased risk of flooding, while historically dry areas are likely to experience less precipitation and increased risk of drought."[30]

[30] https://www.epa.gov/climate-indicators/climate-change-indicators-drought

9. Extreme Heat

The National Weather Service criteria for an excessive heat warning is a heat index of 105 °F or greater that will last for 2 hours or more. In extreme heat your body works extra hard to maintain a normal temperature, which can lead to death. Extreme heat is responsible for the highest number of annual deaths among all weather-related hazards.[31] Humid conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground.

Although heat can damage buildings and facilities, it presents a more significant threat to the safety and welfare of citizens. The major human risks associated with severe summer heat include heat cramps; sunburn; dehydration; fatigue; heat exhaustion; and heat stroke. The most vulnerable population to heat casualties are children and the elderly or infirm, who frequently live on low fixed incomes and cannot afford to run air-conditioning on a regular basis. This population is sometimes isolated, with no immediate family or friends to look out for their wellbeing.

Severe summer heat is an invisible killer. Although a heat wave does not happen with the spectacle of other hazards such as tornados and floods, the National Center for Environmental Health reports that extreme heat caused 7,415 heat-related deaths in the United States from 1999 to 2010[32]. Extreme heat kills more people than hurricanes, floods, tornados, and lightning combined, according to the National Weather Service. In 2001, 300 deaths were caused by excessive heat exposure.

[31] https://www.ready.gov/heat
[32] http://www.bt.cdc.gov/disasters/extremeheat/heat_guide.asp

1) Extreme Heat History

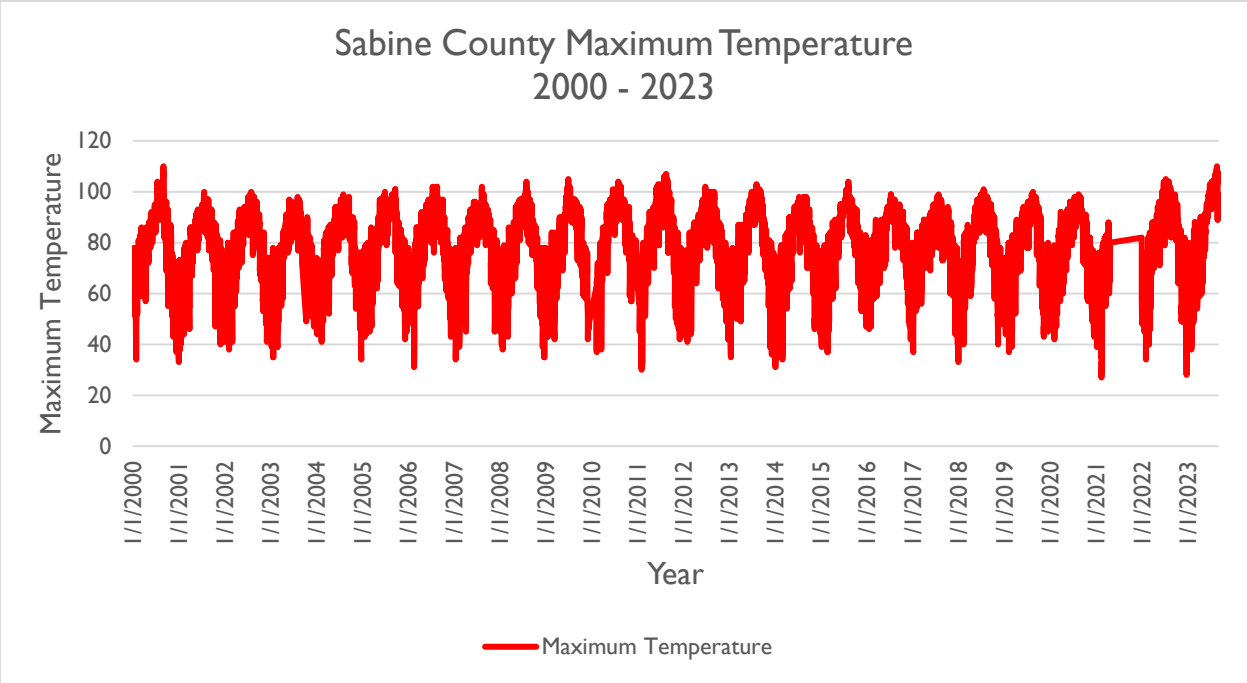

Figure 17: Maximum Recorded Daily Temperature 2000-2022[33]

In the 2016 HMAP, Sabine County and the participating jurisdictions reported over 30 extreme heat events from 1906 – 2016, although there were likely more events that went unrecorded.

Between 2000 to 2023, Sabine County and the participating jurisdictions experienced 249 days with a maximum temperature of 100˚F or hotter and 462 days where the combination of humidity and moderate-to-high temperatures warranted a heat advisory, if not an extreme heat warning.

Extreme heat data is recorded at the county level. However, given the nature of extreme heat and the proximity of all jurisdictions to each other, it is assumed that all jurisdictions experienced the same extreme heat events. The NCEI database recorded 5 events from 2000 – 2023, however based on recorded daily temperatures from the NOAA Climate Data Center, it is clear that many events have gone unreported.

[33] Source: National Centers for Environmental Information, https://www.ncdc.noaa.gov/cdo-web/datasets

2) Likelihood of Future Events

Based on historic weather data, extreme heat in Sabine County and the participating jurisdictions is highly likely, meaning an event affecting any or all of the participating jurisdictions is probable in the next year.

3) Extent

The magnitude or intensity of an extreme heat event is measured according to temperature in relation to the percentage of humidity. According to the National Oceanic Atmospheric Administration (NOAA), this relationship is referred to as the "Heat Index," and is depicted in Figure 18. This index measures how hot it feels outside when humidity is combined with high temperatures.

NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Figure 18: NOAA's NWS Heat Index Chart[34]

The extent scale in Figure 18 displays varying degrees of caution depending on the relative humidity combined with the temperature. For example, when the temperature is below 90˚F, caution should be exercised if the humidity level is at or above 40 percent.

The shaded zones on the chart indicate varying symptoms or disorders that could occur depending on the magnitude or intensity of the event. "Caution" is the first level of intensity where fatigue due to heat exposure is possible. "Extreme Caution" indicates that sunstroke,

[34] http://www.nws.noaa.gov/om/heat/ht-images/heatindexchart.png

muscle cramps or heat exhaustion are possible, whereas a "Danger" level means that these symptoms are likely. "Extreme Danger" indicates that heat stroke is likely.

The National Weather Service (NWS) initiates alerts based on the Heat Index Intensity as shown in Table 36.

Table 36: Heat Index Intensity

Intensity	Description
Heat Advisory	Extreme heat index making it feel hot, typically between 105˚F to 110˚F for 3 hours or more during the day and at or above 75˚F at night.
Excessive Heat Warning	Extreme heat index making it feel very hot, typically above 105˚F for 3 hours or more during the day and at or above 80˚F at night.

Given an estimated daily average relative humidity level of 75%[35], highs as low as 89˚F can produce a heat index temperature of 106˚F. The combination of high humidity and moderate temperatures creates an environment that reaches the Danger Zone on NOAA's Heat Index Chart and may trigger an NWS Heat Advisory.

Between 2000 and 2023 Sabine County and the participating jurisdictions experienced 462 days with highs of 89˚F or hotter and overnight lows of 75˚F or hotter. Based on the NWS descriptions in Table 36 above, and the average daily humidity level, these days likely warranted a heat advisory.

The hottest temperature recorded in Sabine County in the recent past, 110˚F, was reached on September 1, 2000 and again on August 24, 2003. Based on the NWS descriptions in Table 36 above, at least 32 of the 462 heat advisory days warranted an excessive heat warning based on daytime highs, the average daily humidity level, and overnight lows not falling below 80˚F.

Future extreme heat events may meet the heat index requirements for issuing an Excessive Heat Warning as described in the Heat Intensity scale in Table 36 above. The hottest temperatures in Sabine County and the participating jurisdictions may meet or exceed the current record temperature of 110˚F. Future extreme heat events may be as intense, long-lasting, and dangerous as previous ones.

[35] Used Houston Average, closest to County - https://www.currentresults.com/Weather/Texas/humidity-annual.php

4) Location and Impact

A) Location

Extreme heat has no distinct geographic boundary. Extreme heat can occur across the entire planning area and uniformly affect all participating jurisdictions.

B) Impact

The potential impact of excessive summer heat is normally minor, resulting in few, if any, injuries. No property or crop damage specifically tied to extreme heat events has been recorded in any of the participating jurisdictions. No deaths related to extreme heat have ever been reported in the participating jurisdictions. However, based on the hazard's potential, in the worst cases, especially if combined with drought conditions, the hazard may inflict property or crop damage, and it can even be deadly. Electrical grid failure, power outages, and damage to critical roadways are potential impacts. Any shutdown of facilities due to extreme heat is expected to be temporary.

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Sabine County and the participating jurisdictions are home to many vulnerable residents. Vulnerable populations may feel greater impacts from extreme heat due to these populations' limited ability to properly address the hazard due to deficiencies including but not limited to lack of air conditioning in their homes or vehicles, lack of access to air-conditioned public spaces during the hottest part of the day, insufficient numbers of box or ceiling fans, or lack of access to other means of cooling. The consequences for these populations' exposure to extreme heat can include but are not limited to heat cramps, sunburn, dehydration, fatigue, heat exhaustion, heat stroke, or death.

B) Critical Facilities

While all the jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities were historically not considered vulnerable to damages significant enough to interrupt or stop normal operations. However, damage to existing building and infrastructure as a result of extended periods of extreme heat and record high temperatures in recent years has shown exceptions to long held assumptions about the threat of extreme heat. Therefore, all critical facilities are potentially vulnerable to the impacts noted in section 4b.

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time.

Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"Record-setting daily temperatures, heat waves, and cold spells are a natural part of day-to-day variation in weather. As the Earth's climate warms overall, however, heat waves are expected to become more frequent and more intense. Higher heat index values (which combine temperature and humidity to describe perceived temperature) are expected to increase discomfort and aggravate health issues."[36]

[36] https://www.epa.gov/climate-indicators/climate-change-indicators-high-and-low-temperatures
https://science2017.globalchange.gov/

10. Extreme Cold

Extreme cold can happen anywhere in the state, although its levels can range extensively. In the panhandle extreme cold means days below zero Fahrenheit while in the Rio Grande Valley it means reaching temperatures below freezing.[37] Extreme cold is an issue any time winter temperatures drop significantly below normal and make staying warm and safe a challenge.

Extreme cold can accompany winter weather, but it can also be independent of those storms. For that reason, the impacts of extreme cold are presented here separately from the impacts of winter weather.

1) Extreme Cold History

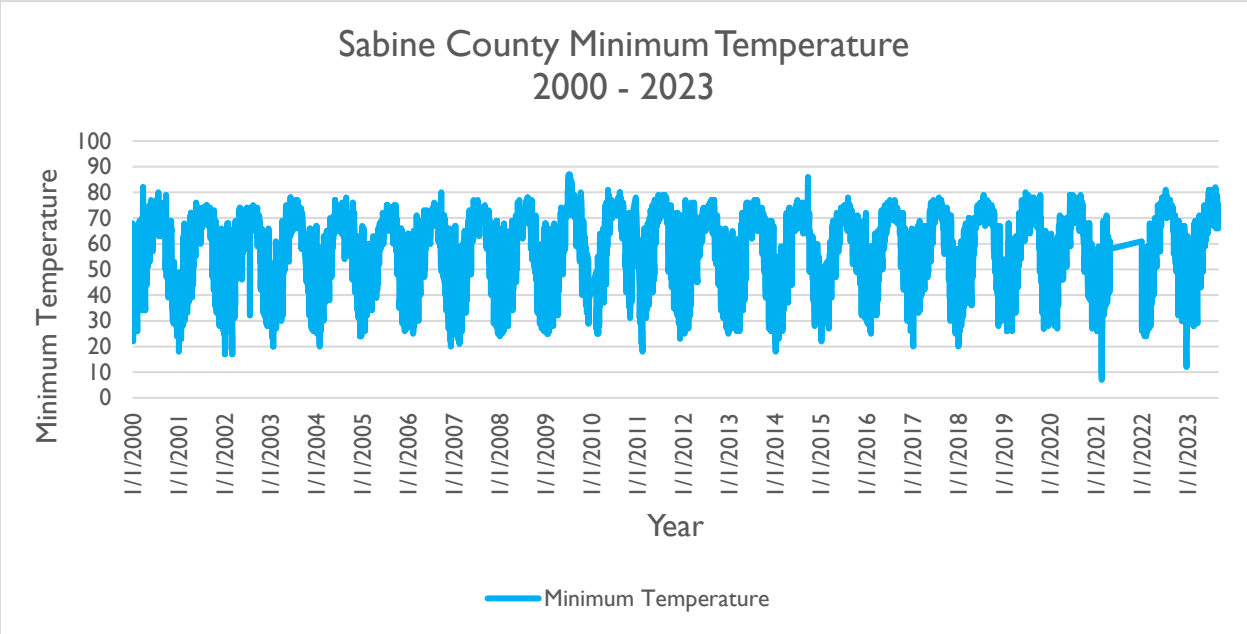

Figure 19: Minimum Recorded Daily Temperature 2000-2023[38]

Sabine County and the jurisdictions addressing the hazard have not previously included extreme cold in their mitigation plan as a standalone hazard.

Between 2000 to 2023, Sabine County experienced 651 days with a minimum temperature of 32˚F or colder. At least 8 of those days had a maximum temperature of 32˚F or below. During the same timeframe, the coldest temperature recorded was 7˚F on February 16, 2021.

Temperature data is recorded at the county level. However, given the nature of extreme cold and the proximity of all jurisdictions to each other, it is assumed that all jurisdictions addressing the hazard experienced the same extreme cold events. The NCEI database recorded 2 events

[37] 2023 State of Texas Hazard Mitigation Plan
[38] Source: National Centers for Environmental Information, https://www.ncdc.noaa.gov/cdo-web/datasets

from 2000 – 2023, however based on recorded daily temperatures from the NOAA Climate Data Center, it is clear that many events have gone unreported.

2) Likelihood of Future Occurrence

Based on historic weather data, extreme cold in Sabine County and the participating jurisdictions is highly likely, meaning an event affecting any or all the participating jurisdictions is probable in the next year.

3) Extent

The magnitude or intensity of an extreme cold event is measured according to temperature in relation to wind speed. The relationship is referred to as the "Wind Chill," and is depicted in Figure 20.

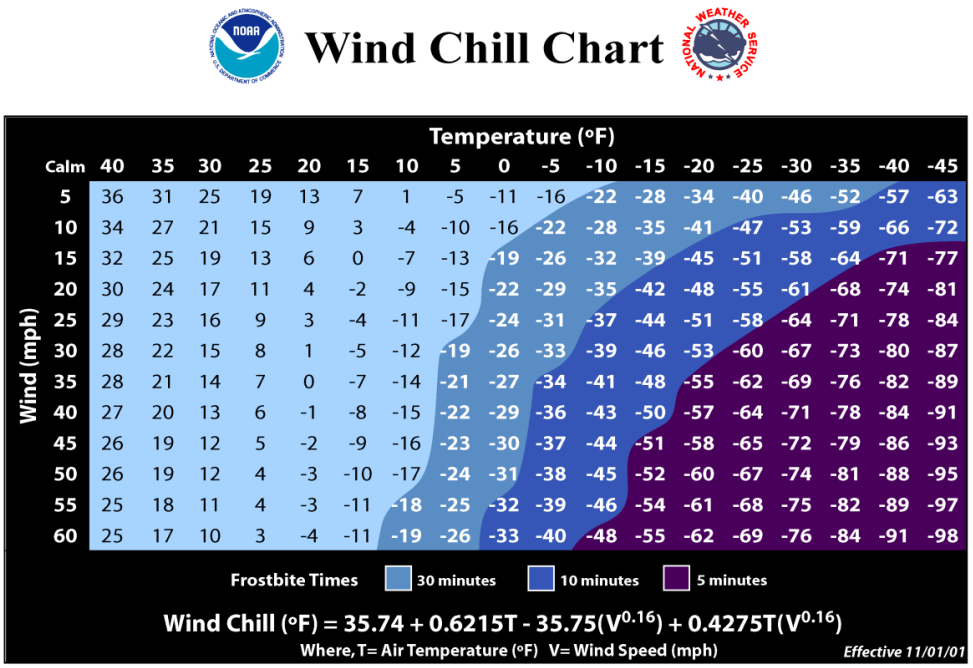

Figure 20: NOAA's NWS Wind Chill Index

As displayed in Figure 20, the wind chill temperature is a measurement of how cold the wind makes the air feel to the human body. Since wind can dramatically accelerate heat loss from the body, a 20° day could feel just as cold as a calm day with 0° temperatures. The Wind Chill Chart factors the wind chill; it is not applicable in calm winds or when the temperature is over 50°.

The coldest temperatures in Sabine County and the participating jurisdictions may meet or exceed the current record temperature of 7˚F. Future extreme cold events may be as intense, long-lasting, and dangerous as previous ones.

4) Location and Impact

A) Location

Extreme cold has no distinct geographic boundary. Extreme cold can occur across the entire planning area and uniformly affect all participating jurisdictions.

B) Impact

The potential impact of extreme cold is normally minor, resulting in few, if any, injuries. No property or crop damage specifically tied to extreme cold events has been recorded in any of the participating jurisdictions. No deaths related to extreme cold have ever been reported in the participating jurisdictions. However, based on the hazard's potential, in the worst cases, especially if combined with winter weather, the hazard may inflict property or crop damage, and it can even be deadly. Electrical grid failure, power outages, impacts to water and sewer infrastructure and pipe damage due to freezes are possible. Any shutdown of facilities due to extreme cold is expected to be temporary.

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Sabine County and the participating jurisdictions are home to many vulnerable residents. Areas with concentrations of young, elderly, and low-income residents may feel greater impacts from extreme cold due to those populations' limited ability to properly address the hazard. Deficiencies may include but aren't limited to lack of heating in their homes or vehicles, lack of access to heated public spaces during the coldest part of the day or night, and frozen pipes that may jeopardize access to drinking water, and in the worst cases, lead to severe structural damage that can render a home unlivable. The consequences for these populations' exposure to extreme cold may include but are not limited to complications for those suffering from hypertension, hypothyroidism, and diabetes, as well as exhaustion, hypothermia, trench foot, or death.

B) Critical Facilities

While all the jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities were historically not considered vulnerable to damages significant enough to interrupt or stop normal operations. However, damage to existing buildings and infrastructure as a result of winter weather and extreme cold in recent years has shown exceptions to long held assumptions about the threat of extreme cold. Therefore, all facilities are potentially vulnerable to the impacts noted in section 4b.

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"Stretching of the Arctic polar vortex—a strong band of winds in the stratosphere surrounding the North Pole— has increased with Arctic amplification, and is linked with extreme cold across parts of Asia and North America. Climate change is favorable for increasing Arctic polar vortex stretching events.[39] When the Arctic polar vortex is strong and stable, the polar air remains in place over the North Pole; when the polar vortex weakens or stretches, extremely cold air can dip south. Results show that stronger Arctic polar vortex conditions are decreasing in frequency, while weaker Arctic polar vortex conditions and stretching disruptions are increasing in frequency for October through February."[40]

[39] https://cpo.noaa.gov/Divisions-Programs/Earth-System-Science-and-Modeling/MAPP

[40] https://cpo.noaa.gov/Divisions-Programs/Communication-Education-and-Engagement/CEE-News/ArtMID/8293/ArticleID/2369/Research-Links-Extreme-Cold-Weather-in-the-United-States-to-Arctic-Warming

11. Hailstorm

Hail is a form of solid precipitation. Hailstones are formed when raindrops are carried upward by thunderstorm updrafts into extremely cold areas of the atmosphere and freeze. Hailstones then grow by colliding with liquid water drops that freeze onto the hailstone's surface. The hail falls when the thunderstorm's updraft can no longer support the weight of the hailstone, which can occur if the stone becomes large enough or the updraft weakens. The fall speed of hail primarily depends on the size of the hailstone, the friction between the hailstone and surrounding air, the local wind conditions (both horizontal and vertical), and the degree of melting of the hailstone. For small hailstones smaller than 1-inch in diameter, the expected fall speed is between 9 and 25 mph. Hailstones 1-inch to 1.75 inches in size typically associated with a severe thunderstorm can have an expected fall speed between 25 and 40 mph. In the strongest supercells 2 to 4-inch hail can be produced with an anticipated fall speed between 44 and 72 mph. However, fall speeds fluctuate due to variations in the hailstone's shape, degree of melting, fall orientation, and the environmental conditions. It is possible for very large hailstones, exceeding 4-inches in diameter, to fall at over 100 mph.[41]

1) Hailstorm History

The 2016 Sabine County HMAP did not profile hail as an individual hazard, it was profiled under "thunderstorm" in combination with severe wind and lightning. For this plan update, hail will be profiled as an individual hazard. The 2016 HMAP recorded 26 thunderstorm events between 1994 – 2012.

The following table identifies the most comprehensive list available of hailstorm events and associated damages in Sabine County and the participating jurisdictions from 2016 -2023. There have been no recorded events for the Cities of Hemphill or Pineland since the 2016 HMAP.

Table 37: Sabine County Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	5/9/2019 – 4/15/2023	6	1 -2 in	0	0	$0	$0

2) Likelihood of Future Events

Based on the history of hailstorms, a hailstorm in Sabine County and each of the participating jurisdictions is likely, meaning that an event is probable within the next three years.

[41] NOAA National Severe Storms Laboratory: https://www.nssl.noaa.gov/education/svrwx101/hail/

3) Extent

The severity of hail events ranges based on the size of the hail, wind speed, and the number and types of structures in the path of the hailstorm. Storms that produce high winds in addition to hail are most damaging and can result in numerous broken windows and damaged siding.

When hail breaks windows, water damage from accompanying rains can also be significant. A major hailstorm can easily cause damage running into the millions of dollars. Nationwide hail is responsible for over $1 billion in property and crop damages per year. The scale showing intensity categories in

Table 38 was developed by combining data from National Climatic Data Center (NCDC) and the Tornado and Storm Research Organization (TORRO).

Table 38: Hailstorm Intensity[42,43]

Size Code	Intensity Category	Size (Diameter in inches)	Descriptive Term	Typical Damage
H0	Hard Hail	Up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33-.060	Mothball	Slight damage to plants and crops
H2	Significant	.060-.080	Penny	Significant damage to fruit, crops, and vegetation
H3	Severe[44]	0.80-1.20	Nickel – Half dollar	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	1.2-1.6	Half dollar – Ping pong ball	Widespread glass damage and vehicle bodywork damage
H5	Destructive	1.6-2.0	Ping pong ball – hen egg	Wholesale destruction of glass, damage to tiled roofs, and significant risk of injuries
H6	Destructive	2.0-2.4	Hen egg – tennis ball	Bodywork of grounded aircraft dented, and brick walls pitted
H7	Destructive	2.4-3.0	Tennis ball – Baseball	Severe roof damage and risk of serious injuries
H8	Destructive	3.0-3.5	Hockey puck	Severe damage to aircraft bodywork

[42] http://www1.ncdc.noaa.gov/pub/data/cmb/extremes/scec/reports/SCEC-Hail-Guide.pdf
[43] http://www.torro.org.uk/hscale.php
[44] Hail must be 1" or larger to be classified as severe.

H9	Super Hailstorms	3.5-4.0	Softball	Extensive structural damage could cause fatal injuries
H10	Super Hailstorms	4.0+	Greater than softball-sized	Extensive structural damage could cause fatal injuries

According to NCEI data, the worst hailstorms in Sabine County and the participating jurisdictions have produced hail up to 2" in diameter, H6 on the Hailstorm Intensity Scale.

Future hailstorms may meet or exceed previous worst-case H6 storms in terms of strength, intensity, hailstone size, damage dollars inflicted, and the number of residents injured or killed.

4) Location and Impact

A) Location

Hailstorms vary in terms of size, location, intensity, and duration but are considered frequent occurrences in the planning area. Each jurisdiction is uniformly exposed to hail events just as each is uniformly exposed to the thunderstorms that typically produce the hail events.

B) Impact

The severity of a hailstorm's impact is considered limited since they generally result in injuries treatable with first aid, shut down critical facilities and services for 24 hours or less, and less than ten percent of affected properties are destroyed or suffer major damage. All existing and future buildings, facilities, and populations in the participating jurisdictions are considered exposed to this hazard and could potentially be impacted.

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Sabine County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

Since hailstorms arise with little to no warning, the participating jurisdictions recognize that vulnerable populations may primarily need additional help recovering from a hailstorm. Residents of sub-standard structures are of particular concern. Structures in sub-standard condition ahead of a hailstorm, whether due to structural damage, missing windows or doors, holes in exterior walls or the roof, may sustain more damage than structures in standard condition.

Existing weaknesses, especially those related to the condition of a structure's roof, due to housing type or existing damages, may lead to compounded damage, injuries, or loss of life.

B) Critical Facilities

The presence of older structures that have not been hardened against hailstorms, and/or the presence of metal buildings that may be more susceptible to hail. Thus, the following critical facilities were determined to be especially vulnerable to hailstorms due to the presence of structures with flat roofs and its increased vulnerability.

Table 39: Critical Facilities Vulnerable to Hailstorms and Potential Impacts

Jurisdiction	Critical Facilities	Potential Hailstorm Impacts		
		Damaged or Destroyed Roof	Damaged Windows	Water damage due to Physical Damages
Sabine County	County Court House	X	X	X
	County Admin Building	X	X	X
	Sheriff's Office	X	X	X
	Pct 1 Commissioner Barn	X	X	X
	Pct 2 Commissioner Barn	X	X	X
	Pct 3 Commissioner Barn	X	X	X
	Pct 4 Commissioner Barn	X	X	X
	South Sabine Water Supply	X	X	X
	Beechwood Water Supply	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X
	Pineland Volunteer Fire Dept.	X	X	X
	Six Mile Volunteer Fire Dept.	X	X	X
	Bronson Volunteer Fire Dept.	X	X	X
	Pendleton Harbor Volunteer Fire Dept.	X	X	X
	Shamrock Shores Volunteer Fire Dept.	X	X	X
	Rosevine Volunteer Fire Dept.	X	X	X
	Fairmount Volunteer Fire Dept.	X	X	X
Hemphill	Water Plant Intake Facility	X	X	X
	Palo Gaucho Crossing Water Treatment Plant	X	X	X
	Water Distribution Facility	X	X	X
	Beckom Rd. Wastewater Treatment Plant	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X
	City Hall Campus	X	X	X
Pineland	City Hall/Police Station	X	X	X
	Pineland Fire Station	X	X	X
	City of Pineland Utility Shop	X	X	X
	Katherine Sage Temple City Park	X	X	X
	City Park Concession Bldg.	X	X	X

	Pineland City Pool			
	Bath House Building	X	X	X
	Bath House Covered Patio	X	X	X
	City Park Picnic Shelter	X	X	X
	City Park Caretaker Dwelling	X	X	X
	City Playground Equipment	X	X	X
	City Basketball Pavilion	X	X	X
	City Baseball Cages	X	X	X
	Stage at City Park	X	X	X
	Elm St. Elevated Water Well			
	Elm St. Water Pump and Chlorine Bldg.	X	X	X
	Elm St. Outside Deep Well Unit			
	Pineland City Library	X	X	X
	Pineland Early Learning Center	X	X	X
	Pineland Sewer Plant Office Bldg.	X	X	X
	Sewer Plant Generator			
	Sewer Plant Chlorinator			
	Transmission St. Main Lift			
	Mulberry St. Well Pump Unit #3			
	Mulberry St. 105 KW Generator			
	Airport Dwelling/Pilot Lounge	X	X	X
	Airport Lighting Control Unit			
	Timberland Hwy Office Buildings	X	X	X
	Bear Creek Club House	X	X	X
	West Sabine Elem School	X	X	X
	West Sabine High School	X	X	X
	Timberland Hwy Gas Pipeline – Purchase Point			
	Dogwood St. SGO60 60KW Natural Gas Generator			
	Dogwood St. 203 AMP Transfer			
	Elm St. Generator			
	Temple St. Generator			
	Generator W of Library			
	Mulberry St. 105 KW Generator			
	Maple St. SD025 25KW Diesel Generator			
	Timberland Hwy SD025 25 KW Diesel Generator			

C) Vulnerable Parcels

Table 40: All Parcels Vulnerable to Hailstorms

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Sabine County	**22,717**	**$2,092,700,668**
City of Hemphill	997	$83,873,808
City of Pineland	577	$36,539,228

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"As a result of anthropogenic warming, it is generally anticipated that low-level moisture and convective instability will increase, raising hailstorm likelihood and enabling the formation of larger hailstones; the melting height will rise, enhancing hail melt and increasing the average size of surviving hailstones."[45]

[45] https://www.nature.com/articles/s43017-020-00133-9

12. Winter Storms

Winter storms include heavy snow and blizzards, sleet, ice storms (or freezing rain), frost/freeze or a mix of these. Winter storms can down trees, cause widespread power outages, damage property, and cause fatalities and injuries. The effect of winter storms on Texas is quite disruptive compared to other regions that normally experience winter storms.

A heavy snowfall for the State is an accumulation of four or more inches of snow in a 12-hour period. This amount of snow accumulation usually occurs in the northern half of the state and in the higher elevations of West Texas. South of the line from Del Rio to Port Arthur snow is rare.

Blizzards are the most perilous of all winter storms, characterized by low temperatures and strong winds in excess of 35 mph, bearing large amounts of blowing or drifting snow. Blizzards take a terrible toll on livestock and people caught in the open. In Texas, blizzards are most likely to occur in the Panhandle and South Plains Regions.

An ice storm occurs when rain falls out of the warm upper layers of the atmosphere into a cold and dry layer near the ground. The rain freezes on contact with the cold ground and accumulates on exposed surfaces. Damage can occur with half an inch of rain freezing on trees and utility wires; the damage increases if there are high winds. Based on this, an icing event is categorized an ice storm at half an inch.[46]

1) Winter Storm History

The 2016 Sabine County HMAP reported 3 winter storms between 1994 – 1998.

NCEI data shows that the participating jurisdictions experienced 7 winter storm events between 2016 – 2023. One of the most significant winter storms in recent history was Winter Storm Uri in February 2021, in which Sabine County received up to 4" of sleet/snow. The table below represents all recorded events since the 2016 HMAP.

Table 41: Sabine County Winter Storm History

Location	Date Range	Number of Winter Storms	Winter Storm Types	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	1/6/2017 – 2/16/2021	7	Winter Weather, Winter Storm	0	0	$3,400,000	$0

[46] 2023 State of Texas Hazard Mitigation Plan

2) Likelihood of Future Events

Future winter storms in Sabine County and the participating jurisdictions are considered likely, meaning an event affecting any or all of the participating jurisdictions is probable in the next three years.

3) Extent

Table 42 below displays the magnitude of winter storms.

Table 42: Winter Storm Extent Scale[47]

Frost Advisory*	Issued when nighttime minimum temperatures are expected to range from 33°F to 36°F in the growing season.
Freeze Warning*	Issued when nighttime minimum temperatures are expected to reach 32°F or lower in the growing season. They are usually issued to highlight the first few freezes of the fall or unusually late freezes in the spring. *A Freeze Watch is issued when these conditions may be met 12 to 48 hours in the future.*
Snow Advisory	Issued when accumulating snow of 2 to 4 inches is expected. An advisory may still be warranted if lesser accumulations will produce travel difficulties, especially early in the winter season.
Blowing Snow Advisory	Issued when blowing snow is expected to occasionally reduce visibilities to 1/4 mile or less with winds generally 25 to 34 mph. The event should last at least 3 hours.
Snow and Blowing Snow Advisory	Issued when winds of 25 to 34 mph are expected to be accompanied by falling snow and blowing snow, occasionally reducing the visibility to 1/4 mile or less. The event should last at least 3 hours
Freezing Rain / Drizzle Advisory	Issued for freezing rain when ice accumulations are expected to cause travel problems, but not exceed 1/4".
Sleet Advisory	Issued for accumulating sleet of 1/4" to 1". Because sleet usually occurs with other precipitation types, a winter weather advisory will almost always be used in such cases.
Winter Weather Advisory	Issued for a winter weather event in which there is more than one hazard present, but all precipitation is expected to remain below warning criteria. For example, it would be issued if 2 inches of snow were expected with a small amount of sleet mixing in at times.
Wind Chill Advisory[48]	Issued when wind chill temperatures are expected to be a significant inconvenience to life with prolonged exposure, and, if caution is not exercised, could lead to hazardous exposure.

[47] Source: National Weather Service Weather Forecast Office; Norman, Oklahoma. http://www.srh.noaa.gov/oun/?n=spotter-wwa-definitions
[48] https://www.osha.gov/dts/weather/winter_weather/windchill.html

Wind Chill Warning[49]	Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure.
Ice Storm Warning	Issued when a period of freezing rain is expected to produce ice accumulations of 1/4" or greater, or cause significant disruptions to travel or utilities.
Heavy Sleet Warning	Issued when a period of sleet is expected to produce ice accumulations of 1" or greater, or cause significant disruptions to travel or utilities.
Heavy Snow Warning	Issued when snow is expected to accumulate 4 inches or more in 12 hours, or 6 inches or more in 24 hours.
Winter Storm Warning	Issued for a winter weather event in which there is more than one hazard present, and one of the warning criteria listed above is expected to be met. For example, it would be issued if 5 inches of snow were expected in 12 hours, with some sleet mixing in at times. It is commonly issued for heavy snow with strong winds of 25-34 mph that will cause blowing and drifting of the snow. *A Winter Storm Watch is issued when these conditions may be met 12 to 48 hours in the future.*
Blizzard Warning	Issued for sustained wind or frequent gusts greater than or equal to 35 mph accompanied by falling and/or blowing snow, frequently reducing visibility to less than 1/4 mile for three hours or more. *A Blizzard Watch is issued when these conditions may be met 12 to 48 hours in the future.*

* - Non-precipitation watch / warning / advisory

Based on previous winter storm events, future events in Sabine County and the participating jurisdictions may see sleet/snow accumulation of up to 4".

4) Location and Impact

A) Location

Winter storms have no distinct geographic boundary. Winter storms can occur across the entire planning area and uniformly affect all participating jurisdictions.

B) Impact

The potential impact of winter storms is normally minor, resulting in few, if any, injuries. Drivers, especially those unfamiliar with or unable to drive in icy conditions, may be at the highest risk of crashing their vehicle and sustaining injuries.

Beyond accidents caused by icy conditions, winter storms have the potential to cause widespread power outages. Trees and other vegetation that grow along or near power lines and utility lines can become overburdened by ice and snow accumulation. Falling limbs or trees can easily take down power and utility lines. Neglected vegetation is especially at risk of failure

[49] https://www.osha.gov/dts/weather/winter_weather/windchill.html

due to increased weight loads. Power outages can create a cascading effect depending on residents' ability to heat their homes without electricity, especially for those young, elderly, and low-income residents as identified in Section 3 of Chapter 3 above. Although no deaths related to winter storms have been reported in the participating jurisdictions, in the worst cases, the hazard has the potential to be deadly.

Winter storms will likely cause only minor property damage and minimal disruption to the quality of life in the participating jurisdictions.

Depending on when the event happens, winter storms may damage or destroy crops.

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Sabine County and the participating jurisdictions are home to many vulnerable residents. Areas with concentrations of young, elderly, and low-income residents may feel greater impacts from winter storms due to those populations' limited ability to properly address the hazard. Deficiencies may include but aren't limited to lack of heating in their homes or vehicles, lack of access to heated public spaces during the coldest part of the day or night, and frozen pipes that may jeopardize access to drinking water, and in the worst cases, lead to severe structural damage that can render a home unlivable. The consequences for these populations' exposure to winter storms can include but are not limited to complications for those suffering from hypertension, hypothyroidism, and diabetes, as well as exhaustion, hypothermia, trench foot, or death.

B) Critical Facilities

Any shutdown of critical facilities due to winter storms is expected to be temporary. However, based on the proximity of trees and powerlines on their properties, the following critical facilities may be at a higher risk of losing power due to falling limbs.

Table 43: Critical Facilities Vulnerable to Winter Storms

Jurisdiction	Critical Facilities	Potential Winter Storm Impacts
		Falling Tree Limbs
Sabine County	County Court House	X
	County Admin Building	X
	Sheriff's Office	X
	Pct 1 Commissioner Barn	X
	Pct 2 Commissioner Barn	X
	Pct 3 Commissioner Barn	X

	Pct 4 Commissioner Barn	X
	South Sabine Water Supply	X
	Beechwood Water Supply	X
	Hemphill Volunteer Fire Dept.	X
	Pineland Volunteer Fire Dept.	X
	Six Mile Volunteer Fire Dept.	X
	Bronson Volunteer Fire Dept.	X
	Pendleton Harbor Volunteer Fire Dept.	X
	Shamrock Shores Volunteer Fire Dept.	X
	Rosevine Volunteer Fire Dept.	X
	Fairmount Volunteer Fire Dept.	X
Hemphill	Water Plant Intake Facility	X
	Palo Gaucho Crossing Water Treatment Plant	X
	Water Distribution Facility	X
	Beckom Rd. Wastewater Treatment Plant	X
	Hemphill Volunteer Fire Dept.	X
	City Hall Campus	X
Pineland	City Hall/Police Station	X
	Pineland Fire Station	X
	City of Pineland Utility Shop	X
	Katherine Sage Temple City Park	X
	City Park Concession Bldg.	X
	Pineland City Pool	X
	Bath House Building	X
	Bath House Covered Patio	X
	City Park Picnic Shelter	X
	City Park Caretaker Dwelling	X
	City Playground Equipment	X
	City Basketball Pavilion	X
	City Baseball Cages	X
	Stage at City Park	X
	Elm St. Elevated Water Well	X
	Elm St. Water Pump and Chlorine Bldg.	X
	Elm St. Outside Deep Well Unit	X
	Pineland City Library	X
	Pineland Early Learning Center	X
	Pineland Sewer Plant Office Bldg.	X
	Sewer Plant Generator	X
	Sewer Plant Chlorinator	X
	Transmission St. Main Lift	X
	Mulberry St. Well Pump Unit #3	X
	Mulberry St. 105 KW Generator	X
	Airport Dwelling/Pilot Lounge	X

	Airport Lighting Control Unit	X
	Timberland Hwy Office Buildings	X
	Bear Creek Club House	X
	West Sabine Elem School	X
	West Sabine High School	X
	Timberland Hwy Gas Pipeline – Purchase Point	X
	Dogwood St. SGO60 60KW Natural Gas Generator	X
	Dogwood St. 203 AMP Transfer	X
	Elm St. Generator	X
	Temple St. Generator	X
	Generator W of Library	X
	Mulberry St. 105 KW Generator	X
	Maple St. SD025 25KW Diesel Generator	X
	Timberland Hwy SD025 25 KW Diesel Generator	X

C) Infrastructure

While all of the participating jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not considered vulnerable to significant damage caused by severe winter storm events. This determination was made based on the expectation that most roofs can support 20 lbs. / square foot of snow[50]. Although it's not impossible[51] for that much snow to cause structural damage, given that the snow weight is well below the threshold where damage is likely, structural damages are not expected. Additionally, 1" of ice is roughly equivalent in weight per square foot to 1" of snow. Considering the worst ice storms in the participating jurisdictions cause snow accumulations of 4", it's unlikely, but not impossible, that a storm causing structural snow accumulations of less than 4" will cause significant structural damages.

However, significant damages may be incurred indirectly. Examples include, but are not limited to, trees and limbs that fall after being overburdened with snow or ice, building strikes due to vehicles losing traction on snow or ice-covered roads, and power outages that affect building temperature regulation and allow pipes to freeze and burst.

[50] https://disastersafety.org/freezing-weather/prevent-roof-collapse-homes/

[51] https://www.fema.gov/media-library-data/7d8c55d1c4f815edf3d7e7d1c120383f/FEMA957_Snowload_508.pdf - The weight of a foot a snow can vary widely based on how wet the snow is, between 3 and 21 lbs. per square foot. However, wet snow primarily affects the East Coast, Pacific Northwest, and southwestern Alaska.

D) Vulnerable Parcels

Table 44: Parcels Vulnerable to Winter Storm

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Sabine County	**22,717**	**$2,092,700,668**
City of Hemphill	997	$83,873,808
City of Pineland	577	$36,539,228

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"Warmer temperatures cause more water to evaporate from the land and oceans, which leads to more precipitation, larger storms, and more variation in precipitation in some areas. In general, a warmer climate causes more of this precipitation to fall in the form of rain instead of snow. Some places, however, could see more snowfall if temperatures rise but still remain below the freezing point, or if storm tracks change. Areas near large lakes might also experience more snowfall as lakes remain unfrozen for longer periods, allowing more water to evaporate. In contrast, other areas might experience less snowfall as a result of wintertime droughts."[52]

[52] https://www.epa.gov/climate-indicators/climate-change-indicators-snowfall

13. Windstorms

Windstorms are classified as any wind that is strong enough to cause at least light damage to trees and buildings, which may or may not be accompanied by precipitation. Wind speeds during a windstorm typically exceed 41 knots. Damage can be attributed to gusts or longer periods of sustained winds. Although tornados and tropical cyclones also produce wind damage, they are usually classified separately.

Windstorms may last for just a few minutes when caused by downbursts from thunderstorms, or they may last for hours (and even several days) when they result from large-scale weather systems. A windstorm that travels in a straight line and is caused by the gust front (the boundary between descending cold air and warm air at the surface) of an approaching thunderstorm is called a derecho. Derechos are capable of causing widespread damage and landscape devastation.[53]

1) Windstorm History

The 2016 Sabine County HMAP did not profile windstorms as an individual hazard, it was profiled under "thunderstorm" in combination with hail and lightning. For this plan update, windstorms will be profiled as an individual hazard. The 2016 HMAP recorded 26 thunderstorm events between 1994 – 2012.

The following tables identify the most comprehensive list available of windstorm events and associated damages in Sabine County and the participating jurisdictions from 2016 - 2023.

Table 45: Sabine County Windstorm History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	5/27/2016 – 3/26/2023	16	52 - 74	0	0	$0	$0

Table 46: City of Hemphill Windstorm History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Hemphill	1/2/2017 – 1/9/2022	8	56 - 61	0	0	$0	$0

[53] https://www.britannica.com/science/windstorm

Table 47: City of Pineland Windstorm History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Pineland	5/27/2016 – 5/9/2021	3	61 - 65	0	0	$0	$0

2) Likelihood of Future Events

Given the frequency of past events in all jurisdictions, a damaging windstorm event in the future is highly likely, meaning that an event is probable in the next year.

3) Extent

The generally accepted extent scale for wind events is the Beaufort Wind Scale. The following table lists categories, measurement, classification, and appearance descriptions.

Table 48: Beaufort Wind Scale[54]

Beaufort Wind Scale				
Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 feet becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 feet taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 feet, whitecaps common, more spray	Larger tree branches moving, whistling in wires

[54] Source: www.spc.noaa.gov/faq/tornado/beaufort.html

7	28-33	Near Gale	Sea heaps up, waves 13-20 feet, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (13-20 feet) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Whole trees in motion, resistance felt walking against wind
9	41-47	Strong Gale	High waves (20 feet), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (20-30 feet) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (30-45 feet) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 feet, sea completely white with driving spray, visibility greatly reduced	

The worst windstorm events in Sabine County and the participating jurisdictions have ranged up to 12 on the Beaufort Wind Scale. No recent windstorm events in any of the participating jurisdictions have caused any injuries, deaths, or crop damage. Future windstorm events may meet previous worst-case Force 12 events in terms of strength and intensity of wind speed.

4) Location and Impact

A) Location

Windstorms are not constrained by any distinct geographic boundary. Windstorms can occur across all participating jurisdictions.

B) Impact

Impacts from a windstorm may include but are not limited to damaged or destroyed personal property including vehicles, damaged or destroyed agricultural, residential, commercial, and industrial buildings. Crops may be damaged or destroyed. Pets and livestock may be injured or killed by flying debris. Pets and livestock may escape due to damaged or destroyed structures and fences.

In the worst cases, windstorms may cause injuries and/or be deadly.

5) Vulnerability

Windstorms have the potential to impact all participating jurisdictions. Therefore, each jurisdiction is equally exposed to the hazard. Improved property, critical facilities, critical infrastructure, and the entire population are considered vulnerable to windstorms.

Based on windstorm data collected for the participating jurisdictions, windstorms primarily damage physical structures. However, there is no uniformity with respect to the type of structures that have been damaged by windstorms in any of the participating jurisdictions. Windstorm damage can be directly caused by the wind itself, flying debris, and falling trees, or indirectly by damages like power outages.

A) Population

As described in Section 3 of Chapter 3 above, Sabine County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a windstorm.

Residents of mobile / manufactured homes are of particular concern. These structures may not be safe during a windstorm.

Residents of sub-standard structures are also of particular concern. Structures in sub-standard condition ahead of a windstorm, whether due to structural damages, missing windows or doors, holes in exterior walls or the roof, may be less safe during a windstorm than structures in standard condition.

Existing structural weaknesses, due to housing type or existing damages, may lead to compounded damages, injuries, or loss of life.

B) Critical Facilities

Certain critical facilities and infrastructure in each jurisdiction may be particularly vulnerable to windstorms, similar to hurricane and tornado events. These facilities have been identified for reasons including: the number of people who use the facility or infrastructure, the facility's role in providing basic services to begin the cleanup process and get the jurisdictions running again, and the facility's ability to offer goods and materials residents will need to resume normalcy as quickly as possible. The selected critical facilities are built from a variety of materials with varying levels of resistance to wind damage. Additionally, their varying ages mean they weren't constructed to uniform building standards. Given wind's potentially violent nature, these facilities may experience increased levels of vulnerability to the hazards. Damage to any of

these facilities may have a disproportionately negative impact on each jurisdiction's recovery from a windstorm if that damage affects the facility's ability to reopen and resume normal business right away.

Table 49: Critical Facilities Vulnerable to Windstorms and Potential Impacts

Jurisdiction	Critical Facilities	Potential Windstorm Impacts								
		Loss of Power	Flying Debris	Uprooted Trees	Flooding Due to Physical Damages	Damaged or Destroyed Roofs	Damaged or Broken Windows	Wind Damage	Injuries	Death
Sabine County	County Court House	X	X	X	X	X	X	X	X	X
	County Admin Building	X	X	X	X	X	X	X	X	X
	Sheriff's Office	X	X	X	X	X	X	X	X	X
	Pct 1 Commissioner Barn	X	X	X	X	X	X	X		
	Pct 2 Commissioner Barn	X	X	X	X	X	X	X		
	Pct 3 Commissioner Barn	X	X	X	X	X	X	X		
	Pct 4 Commissioner Barn	X	X	X	X	X	X	X		
	South Sabine Water Supply	X	X	X	X	X	X	X	X	X
	Beechwood Water Supply	X	X	X	X	X	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Pineland Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Six Mile Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Bronson Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Pendleton Harbor Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Shamrock Shores Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Rosevine Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	Fairmount Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
Hemphill	Water Plant Intake Facility	X	X	X	X	X	X	X		
	Palo Gaucho Crossing Water Treatment Plant	X	X	X	X	X	X	X	X	X
	Water Distribution Facility	X	X	X	X	X	X	X	X	X
	Beckom Rd. Wastewater Treatment Plant	X	X	X	X	X	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X	X	X	X	X	X
	City Hall Campus	X	X	X	X	X	X	X	X	X
Pineland	City Hall/Police Station	X	X	X	X	X	X	X	X	X
	Pineland Fire Station	X	X	X	X	X	X	X	X	X

	City of Pineland Utility Shop	X	X	X	X	X	X	X	X	X
	Katherine Sage Temple City Park	X	X	X	X	X	X	X	X	X
	City Park Concession Bldg.	X	X	X	X	X	X	X	X	X
	Pineland City Pool	X	X	X	X	X	X	X	X	X
	Bath House Building	X	X	X	X	X	X	X		
	Bath House Covered Patio	X	X	X	X	X	X	X		
	City Park Picnic Shelter	X	X	X	X	X	X	X		
	City Park Caretaker Dwelling	X	X	X	X	X	X	X		
	City Playground Equipment	X	X	X	X	X	X	X		
	City Basketball Pavilion	X	X	X	X	X	X	X		
	City Baseball Cages	X	X	X	X	X	X	X		
	Stage at City Park	X	X	X	X	X	X	X		
	Elm St. Elevated Water Well	X	X	X	X	X	X	X		
	Elm St. Water Pump and Chlorine Bldg.	X	X	X	X	X	X	X		
	Elm St. Outside Deep Well Unit	X	X	X	X	X	X	X		
	Pineland City Library	X	X	X	X	X	X	X	X	X
	Pineland Early Learning Center	X	X	X	X	X	X	X	X	X
	Pineland Sewer Plant Office Bldg.	X	X	X	X	X	X	X	X	X
	Sewer Plant Generator	X	X	X	X	X	X	X		
	Sewer Plant Chlorinator	X	X	X	X	X	X	X		
	Transmission St. Main Lift	X	X	X	X	X	X	X		
	Mulberry St. Well Pump Unit #3	X	X	X	X	X	X	X		
	Mulberry St. 105 KW Generator	X	X	X	X	X	X	X		
	Airport Dwelling/Pilot Lounge	X	X	X	X	X	X	X	X	X
	Airport Lighting Control Unit	X	X	X	X	X	X	X	X	X
	Timberland Hwy Office Buildings	X	X	X	X	X	X	X	X	X
	Bear Creek Club House	X	X	X	X	X	X	X	X	X
	West Sabine Elem School	X	X	X	X	X	X	X	X	X
	West Sabine High School	X	X	X	X	X	X	X	X	X
	Timberland Hwy Gas Pipeline – Purchase Point	X	X	X	X	X	X	X		
	Dogwood St. SGO60 60KW Natural Gas Generator	X	X	X	X	X	X	X		

	Dogwood St. 203 AMP Transfer	X	X	X	X	X	X	X		
	Elm St. Generator	X	X	X	X	X	X	X		
	Temple St. Generator	X	X	X	X	X	X	X		
	Generator W of Library	X	X	X	X	X	X	X		
	Mulberry St. 105 KW Generator	X	X	X	X	X	X	X		
	Maple St. SD025 25KW Diesel Generator	X	X	X	X	X	X	X		
	Timberland Hwy SD025 25 KW Diesel Generator	X	X	X	X	X	X	X		

C) Vulnerable Parcels

Table 50: Parcels Vulnerable to Windstorms

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Sabine County	**22,717**	**$2,092,700,668**
City of Hemphill	997	$83,873,808
City of Pineland	577	$36,539,228

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"The Arctic has warmed more than lower latitudes, and as a result the temperature difference between the mid-latitudes and the polar regions has become reduced, which has changed the path of the northern hemisphere jet stream so that it now moves north and south over a greater range of latitudes. As the atmosphere continues to warm, we expect to see much deeper north-south waves, which will cause a slowing down, or even blocking, of the jet stream. This could result in weather systems that persist for much longer than would be considered normal over any particular region."[55]

"Another recent study found that there will be regional and seasonal variability in winds in the United States as carbon dioxide levels increase: by 2100, wind speeds will decrease over most of the western U.S. and the East Coast, but the central U.S. will see an increase."[56]

[55] https://ugc.berkeley.edu/background-content/wind/#:~:text=The%20global%20atmospheric%20circulation%20pattern,by%20transporting%20heat%20and%20water.
[56] https://e360.yale.edu/features/global-stilling-is-climate-change-slowing-the-worlds-wind#:~:text=Another%20recent%20study%20found%20that,U.S.%20will%20see%20an%20increase.

14. Lightning

Lightning occurs as a rapid discharge of electrical energy in the atmosphere between clouds, the air, or the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit, a temperature five times hotter than the sun's surface. Lightning rapidly heats the sky as it flashes, but the surrounding air quickly cools following the bolt. This rapid heating and cooling of the surrounding air causes the thunder which often accompanies lightning strikes. While most often affiliated with severe thunderstorms, lightning often strikes outside of heavy rain and might occur as far as 10 miles away from any rainfall.[57]

Lightning damage can result in electrocution of humans and animals; vaporization of materials along the path of the strike; fire caused by the high temperature produced by the strike; and sudden power surges that can damage electrical and electronic equipment. Millions of dollars of direct and indirect damages result from lightning strikes on electric utility substations and distribution lines. While property damage is the major hazard associated with lightning, it should be noted that lightning strikes kill nearly 49 people [58] each year in the United States.

1) Lightning History

The 2016 Sabine County HMAP did not profile lightning as an individual hazard, it was profiled under "thunderstorm" in combination with hail and severe wind. For this plan update, lightning will be profiled as an individual hazard. The 2016 HMAP recorded 26 thunderstorm events between 1994 – 2012. The following table represents all reported events since the previous plan.

Table 51: Sabine County Lightning History

Location	Date Range	Number of Lightning Events	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	8/13/2016	1	0	0	$0	$0

Although the NCEI only recorded one event since the previous plan, it is safe to say that many events have gone unreported as lightning events are often unreported.

2) Likelihood of Future Events

Lightning is especially associated with thunderstorms. Despite the lack of officially reported instances of lightning-caused damage, a lightning event is highly likely, meaning an event

[57] 2023 State of Texas Hazard Mitigation Plan
[58] https://www.weather.gov/safety/lightning-victims

affecting any of the participating jurisdictions is probable in the next year. According to information from VAISALA[59], most of Sabine County can expect about 7 to 10 lightning flashes per square mile per year.

3) Extent

The extent for lightning can be expressed in terms of the number of strikes within an interval. Given the lack of lightning history data, it is expected that Sabine County and all participating jurisdictions may experience lightning events between LAL 1 and LAL 5. Dry thunderstorms, LAL 6, are not expected.

Table 52: Lightning Activity Levels[60]

Lightning Activity Level (LAL)		
Activity levels are valuable guidance tools to aid in the preparation for possible fire initiation from cloud-to-ground lightning.		
LAL	Cloud and Storm Development	Lightning Strikes per 15 Minutes
1	No thunderstorms.	-
2	Cumulus clouds are common but only a few reaches the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. The clouds produce mainly virga, but light rain will occasionally reach the ground. Lightning is very infrequent.	1-8
3	Towering cumulus covers less than two-tenths of the sky. Thunderstorms are few, but two to three must occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.	9-15
4	Towering cumulus covers two to three-tenths of the sky. Thunderstorms are scattered and more than three must occur within the observation area. Moderate rain is common, and lightning is frequent.	16-25
5	Towering cumulus and thunderstorms are numerous. They cover more than three-tenths and occasionally obscure the sky. Rain is moderate to heavy and lightning is frequent and intense.	25+
6	Similar to LAL 3 except thunderstorms are dry.	

[59] Vaisala Xweather Annual Lightning Report 2023 (adobe.com)
[60] Source: http://www.prh.noaa.gov/hnl/pages/LAL.php

4) Location and Impact

A) Location

Lightning strikes have no distinct geographic boundary. Lightning can occur across each participating jurisdiction.

B) Impact

Impacts from lightning in all jurisdictions may include but are not limited to loss of power due to electrical surges, damaged or destroyed personal property including computers and other electronics, damaged or destroyed agricultural, residential, commercial, and industrial buildings. Crops may be damaged or destroyed. Livestock may be injured or killed by lightning. In the worst cases, lightning may cause injuries or even loss of life.

5) Vulnerability

According to the Lightning Protection Institute, it is a myth[61] that lightning always strikes the tallest objects. Given lightning's indiscriminate nature, it is impossible to identify buildings that are at an increased risk of being struck by lightning. All existing and future buildings, critical facilities, critical infrastructure, improved property, and the population are exposed to this hazard. However, structures without adequate lightning protection and those with large concentrations of electronic equipment like computers, servers, and printers, are most vulnerable, as are locations that may have outside crowds during a lightning event.

A) Critical Facilities

Table 53: Critical Facilities Vulnerable to Lightning and Potential Impacts

Jurisdiction	Critical Facilities	Potential Lightning Impacts			
		Physical Damage	Electrical Damage	Data Damage or Loss	Fire
Sabine County	County Court House	X	X	X	X
	County Admin Building	X	X	X	X
	Sheriff's Office	X	X	X	X
	Pct 1 Commissioner Barn	X	X	X	X
	Pct 2 Commissioner Barn	X	X	X	X
	Pct 3 Commissioner Barn	X	X	X	X
	Pct 4 Commissioner Barn	X	X	X	X
	South Sabine Water Supply	X	X	X	X
	Beechwood Water Supply	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X
	Pineland Volunteer Fire Dept.	X	X	X	X

[61] http://lightning.org/wp-content/uploads/2015/06/LPI_lightning_infographic_2015.jpg

	Six Mile Volunteer Fire Dept.	X	X	X	X
	Bronson Volunteer Fire Dept.	X	X	X	X
	Pendleton Harbor Volunteer Fire Dept.	X	X	X	X
	Shamrock Shores Volunteer Fire Dept.	X	X	X	X
	Rosevine Volunteer Fire Dept.	X	X	X	X
	Fairmount Volunteer Fire Dept.	X	X	X	X
Hemphill	Water Plant Intake Facility	X	X	X	X
	Palo Gaucho Crossing Water Treatment Plant	X	X	X	X
	Water Distribution Facility	X	X	X	X
	Beckom Rd. Wastewater Treatment Plant	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X
	City Hall Campus	X	X	X	X
Pineland	City Hall/Police Station	X	X	X	X
	Pineland Fire Station	X	X	X	X
	City of Pineland Utility Shop	X	X	X	X
	Katherine Sage Temple City Park	X	X	X	X
	City Park Concession Bldg.	X	X	X	X
	Pineland City Pool	X	X		X
	Bath House Building	X	X		X
	Bath House Covered Patio	X	X		X
	City Park Picnic Shelter	X	X		X
	City Park Caretaker Dwelling	X	X	X	X
	City Playground Equipment	X	X		X
	City Basketball Pavilion	X	X		X
	City Baseball Cages	X	X		X
	Stage at City Park	X	X		X
	Elm St. Elevated Water Well	X	X	X	X
	Elm St. Water Pump and Chlorine Bldg.	X	X	X	X
	Elm St. Outside Deep Well Unit	X	X	X	X
	Pineland City Library	X	X	X	X
	Pineland Early Learning Center	X	X	X	X
	Pineland Sewer Plant Office Bldg.	X	X	X	X
	Sewer Plant Generator	X	X	X	X
	Sewer Plant Chlorinator	X	X	X	X
	Transmission St. Main Lift	X	X	X	X
	Mulberry St. Well Pump Unit #3	X	X	X	X
	Mulberry St. 105 KW Generator	X	X	X	X
	Airport Dwelling/Pilot Lounge	X	X	X	X
	Airport Lighting Control Unit	X	X	X	X
	Timberland Hwy Office Buildings	X	X	X	X
	Bear Creek Club House	X	X	X	X
	West Sabine Elem School	X	X	X	X
	West Sabine High School	X	X	X	X

	Timberland Hwy Gas Pipeline – Purchase Point	X	X		X
	Dogwood St. SGO60 60KW Natural Gas Generator	X	X		X
	Dogwood St. 203 AMP Transfer	X	X	X	X
	Elm St. Generator	X	X		X
	Temple St. Generator	X	X		X
	Generator W of Library	X	X		X
	Mulberry St. 105 KW Generator	X	X		X
	Maple St. SD025 25KW Diesel Generator	X	X		X
	Timberland Hwy SD025 25 KW Diesel Generator	X	X		X

B) Vulnerable Parcels

Table 54: Parcels Vulnerable to Lightning

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Sabine County	**22,717**	**$2,092,700,668**
City of Hemphill	997	$83,873,808
City of Pineland	577	$36,539,228

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"New research from the University of California, Berkeley, found warming conditions would result in 50% more lightning strikes by the end of the century. The scientists found lightning strikes would increase by about 12% for every 1C of warming."[62]

[62] https://romps.berkeley.edu/papers/pubdata/2014/lightning/guardian.pdf

15. Earthquake

Earthquake is a term used to describe both a sudden slip on a fault, and the resulting ground shaking and radiated seismic energy caused by the slip. A burst of seismic energy can also be caused by volcanic or magmatic activity, or other sudden stress changes in the earth. Hazards associated with an earthquake that may affect the normal activities of people includes surface faulting, ground shaking, soil liquefaction, landslides, tectonic deformation, tsunamis, and seiches.[63] Earthquakes occur most often along geologic faults, narrow zones where rock masses move in relation to one another. The major fault lines of the world are located at the fringes of the large tectonic plates that make up Earth's crust. About 50,000 earthquakes large enough to be noticed without the aid of instruments occur annually over the entire Earth. Of these, approximately 100 are of sufficient size to produce substantial damage if their locations are near areas of habitation. Very great earthquakes occur on average about once per year. Over the centuries these events have been responsible for millions of deaths and an incalculable amount of damage to property.[64]

1) Earthquake History

The 2016 Sabine County HMAP recorded one earthquake in Hemphill in 1964. The County has elected to address this hazard because of the possibility that earthquakes may become a local issue within the current planning period. The following table represents all recoded events since the previous plan.

Table 55: Sabine County Earthquake History

Location	Date	Earthquake Events	Magnitude (Richter)	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
7km SSW of San Augustine	1/20/2019	1	3.3	0	0	$0	$0

2) Likelihood of Future Events

Given the proximity but infrequency of earthquakes in the surrounding area, an earthquake that could affect any or all of the participating jurisdictions is occasional, meaning that one is possible in the next 5 years.

[63] Earthquake Glossary. United Stated Geological Survey
[64] Earthquakes. Britannica. https://www.britannica.com/science/earthquake-geology/Volcanism

3) Extent

Earthquake strength is generally measured on the Richter Magnitude Scale. The Modified Mercalli Intensity Scale for Earthquakes provides an additional means of describing an earthquake's effects.

Table 56: Richter Magnitude Scale

Richter Magnitude Scale		
Magnitude	**Earthquake Effects**	**Estimated number each year**
2.5 or less	Usually not felt but can be recorded by seismograph	900,000
2.5 to 5.4	Often felt, but only causes minor damage	30,000
5.5 to 6.0	Slight damage to buildings and other structures	500
6.1 to 6.9	May cause a lot of damage in very populated areas	100
7.0 to 7.9	Major earthquake, serious damage	20
8.0 or greater	Great earthquake; can destroy communities near the epicenter	One every 5 to 10 years.

Table 57: Modified Mercalli Intensity Scale for Earthquakes

Modified Mercalli Intensity Scale			
Scale	**Intensity**	**Description of Effects**	**Corresponding Richter Scale Magnitude**
I	Instrumental	Detected only by seismographs	<4.2
II	Feeble	Some people feel it	
III	Slight	Felt by people resting, like a truck rumbling by	
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	<4.8
VI	Strong	Trees sway, suspended objects swing, objects fall off shelves	<5.4
VII	Very Strong	Mild alarm; walls crack; plaster falls	<6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	

IX	Ruinous	Some houses collapse; ground cracks; pipes break open	<6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	<7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes, and cables destroyed; general triggering of other hazards	<8.1
XII	Catastrophic	Total destruction; trees fall or ground rises and falls in waves	>8.1

A future earthquake affecting Sabine County and the participating jurisdictions may meet or exceed previous events up to a 3.3 on the Richter scale or IV on the Modified Mercalli scale.

4) Location and Impact

A) Location

Earthquakes have no distinct geographic boundary in Sabine County. Earthquakes can equally affect all jurisdictions addressing the hazard. Despite the lack of geographic boundary, damage is expected to be negligible in most participating jurisdictions.

B) Impact

Impacts may include structural damage to buildings of all types. Road networks that pass through the participating jurisdictions may be damaged to the point of failure as the ground shifts. Water and wastewater systems may fail due to cracks and breaks in underground tanks and pipe networks.

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Sabine County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to: age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap.

The jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from an earthquake.

Structures in substandard condition ahead of an earthquake may be more likely to suffer additional damages, including irreparable foundation or structural damages as the ground shifts. Depending on their means, these residents may require additional assistance recovering from earthquake-caused damage.

B) Critical Facilities & Infrastructure

The planning team identified the following critical facilities that may be affected by earthquakes which could affect the participating jurisdictions. Because earthquakes don't recognize geographic boundaries, all critical facilities, no matter their jurisdictional location, are equally vulnerable to earthquakes.

Table 58: Sabine County Critical Facilities Vulnerable to Earthquakes

Jurisdiction	Critical Facilities	Potential Earthquake Impacts			
		Structural Damage	Pipe Damages	Increased Demand for Services	Economic Damages
Sabine County	County Court House	X	X	X	X
	County Admin Building	X	X	X	X
	Sheriff's Office	X	X	X	X
	Pct 1 Commissioner Barn	X	X	X	X
	Pct 2 Commissioner Barn	X	X	X	X
	Pct 3 Commissioner Barn	X	X	X	X
	Pct 4 Commissioner Barn	X	X	X	X
	South Sabine Water Supply	X	X	X	X
	Beechwood Water Supply	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X
	Pineland Volunteer Fire Dept.	X	X	X	X
	Six Mile Volunteer Fire Dept.	X	X	X	X
	Bronson Volunteer Fire Dept.	X	X	X	X
	Pendleton Harbor Volunteer Fire Dept.	X	X	X	X
	Shamrock Shores Volunteer Fire Dept.	X	X	X	X
	Rosevine Volunteer Fire Dept.	X	X	X	X
	Fairmount Volunteer Fire Dept.	X	X	X	X
Hemphill	Water Plant Intake Facility	X	X	X	X
	Palo Gaucho Crossing Water Treatment Plant	X	X	X	X
	Water Distribution Facility	X	X	X	X
	Beckom Rd. Wastewater Treatment Plant	X	X	X	X
	Hemphill Volunteer Fire Dept.	X	X	X	X
	City Hall Campus	X	X	X	X
Pineland	City Hall/Police Station	X	X	X	X
	Pineland Fire Station	X	X	X	X
	City of Pineland Utility Shop	X	X	X	X
	Katherine Sage Temple City Park	X	X		X

	City Park Concession Bldg.	X	X		X
	Pineland City Pool	X	X		X
	Bath House Building	X	X		X
	Bath House Covered Patio	X	X		X
	City Park Picnic Shelter	X	X		X
	City Park Caretaker Dwelling	X	X		X
	City Playground Equipment	X	X		X
	City Basketball Pavilion	X	X		X
	City Baseball Cages	X	X		X
	Stage at City Park	X	X		X
	Elm St. Elevated Water Well	X	X	X	X
	Elm St. Water Pump and Chlorine Bldg.	X	X	X	X
	Elm St. Outside Deep Well Unit	X	X	X	X
	Pineland City Library	X	X	X	X
	Pineland Early Learning Center	X	X	X	X
	Pineland Sewer Plant Office Bldg.	X	X	X	X
	Sewer Plant Generator	X	X	X	X
	Sewer Plant Chlorinator	X	X	X	X
	Transmission St. Main Lift	X	X	X	X
	Mulberry St. Well Pump Unit #3	X	X	X	X
	Mulberry St. 105 KW Generator	X	X	X	X
	Airport Dwelling/Pilot Lounge	X	X		X
	Airport Lighting Control Unit	X	X		X
	Timberland Hwy Office Buildings	X	X	X	X
	Bear Creek Club House	X	X		X
	West Sabine Elem School	X	X	X	X
	West Sabine High School	X	X	X	X
	Timberland Hwy Gas Pipeline – Purchase Point	X	X	X	X
	Dogwood St. SGO60 60KW Natural Gas Generator	X	X	X	X
	Dogwood St. 203 AMP Transfer	X	X	X	X
	Elm St. Generator	X	X	X	X
	Temple St. Generator	X	X	X	X

	Generator W of Library	X	X	X	X
	Mulberry St. 105 KW Generator	X	X	X	X
	Maple St. SD025 25KW Diesel Generator	X	X	X	X
	Timberland Hwy SD025 25 KW Diesel Generator	X	X	X	X

C) Vulnerable Parcels

All structures within the participating jurisdictions are equally vulnerable to earthquakes. However, given the minor structural damage inflicted by previous events, future structural damages are expected to be similarly limited.

Table 59: Estimated Potential Damage Values

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Sabine County	**22,717**	**$2,092,700,668**
City of Hemphill	997	$83,873,808
City of Pineland	577	$36,539,228

6) Climate Change

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

"The largest climate variable that could change fault stress loads is surface water in the form of rain and snow. As it turns out, changes in stress loads on Earth's crust from periods of drought can, in fact, be significant. Research by JPL scientist Donald Argus and others in 2017 using data from a network of high-precision GPS stations in California, Oregon and Washington found that alternating periods of drought and heavy precipitation in the Sierra Nevada between 2011 and 2017 actually caused the mountain range to rise by nearly an inch and then fall by half that amount, as the mountain rocks lost water during the drought and then regained it. The study didn't specifically look at potential impacts on faults, but such stress changes could potentially be felt on faults in or near the range."[65]

[65] https://climate.nasa.gov/news/2926/can-climate-affect-earthquakes-or-are-the-connections-shaky/

16. Mitigation Strategy

1) Capability Assessment

Sabine County and the participating jurisdictions have shown themselves to be highly capable, especially in terms of implementing hazard mitigation actions.

In addition to reviewing previous actions and the steps taken to implement them, the planning team reviewed existing regulatory capabilities and opportunities for establishing new capabilities and enhancing existing ones. At this time, all jurisdictions could improve their hazard mitigation capabilities through the following efforts: budgeting for mitigation actions and support, passing policies and procedures to implement mitigation actions, adopting, and implementing stricter mitigation regulations, approving the hiring, and training of staff for mitigation activities, and approving mitigation updates and additions to existing plans as new needs are recognized. The participating cities could further improve their capabilities by creating and adopting regularly updated comprehensive plans.

Table 60: Capability Assessment by Jurisdiction

Sabine County Administrative, Financial, Regulatory, and Technical Abilities
Emergency Management
Subdivision
Road and Bridge Management
Comprehensive Planning
Economic Development
General Budgeting
CDBG Funding
State and Federal Grant Funding

City of Hemphill Administrative, Financial, Regulatory, and Technical Abilities
Floodplain Management
Emergency Management
Drought Contingency Planning
Nuisance Abatement

Substandard Structures Abatement
Water Conservation Planning
Comprehensive Planning
Economic Development
Grant Writing
General Budgeting
CIP Funding
CDBG Funding
State and Federal Grant Funding

City of Pineland **Administrative, Financial, Regulatory, and Technical Abilities**
Floodplain Management
Emergency Management
Drought Contingency Planning
Subdivision
Building Code Ordinance
Nuisance Abatement
Substandard Structures Abatement
Water Conservation Planning
Comprehensive Planning
Economic Development
Grant Writing
General Budgeting
CIP Funding
CDBG Funding
State and Federal Grant Funding

A) Building Codes

Table 61: Building Codes Per Jurisdiction

Jurisdiction	Codes	Description
Sabine County	ICC – International Building Codes	The County defers to the International Building Codes followed by the State of Texas, but does not enforce.
Hemphill	ICC – International Building Codes	The City of Hemphill has adopted the 2012 International Building Codes, including Electrical Code and 2018 Fire Code.
Pineland	Standard Building, Plumbing, and Gas Codes	The City of Pineland has adopted the 1997 Standard Building, Plumbing, and Gas Codes.

2) Incorporation and Integration of Existing Capabilities and Hazard Mitigation

As previously outlined, the planning team reviewed a range of codes, ordinances, and other planning mechanisms that have been adopted by the participating jurisdictions. The planning team's goal was to understand how these existing capabilities might affect mitigation actions in terms of implementation and enforcement as well as to identify opportunities for future plan integration.

Table 62: Plan Integration

Department	All Departments	Commissioners' Court, Road and Bridge, Mayor's Office/Council, Public Works, Economic Development	Planning, Zoning, Economic Development, Public Works, Mayor's Office, Floodplain Manager	Planning	Office of Emergency Management, Mayor's Office, Mayor and Council, Commissioners' Court	Office of Emergency Management, Mayor's Office, Chief of Fire Department	Office of Emergency Management, Mayor's Office, Administrative Office	Floodplain Manager, Mayor's Office
Activity	Annual Budget	Capital Improvement Projects	Comprehensive Master Plan	Community Wildfire Protection Plan	Public Involvement	Emergency Operations	Grant Application	Floodplain Management
Time Frame	Quarterly/ Annual workshops	Bi-annually	Every 10 Years	Annually	As Needed	Annually	Annual Funding Cycles	Annually
Integration Process	Discuss integration of medium and high priority actions with Commissioners' Court, Council, or Schoolboard (as appropriate) concerning feasibility, potential funding sources, and a preliminary cost benefit review.	Discuss inclusion of mitigation actions with CIPs. Ensure CIPs are consistent with mitigation actions, NFIP compliance, and any new land use development.	Review existing floodplain and land use controls to ensure that long term goals are consistent with actions in the HMAP.	Review CWPP in conjunction with the HMAP to integrate findings into each plan.	Utilize jurisdictional web sites, social media, and other forms of advertising to make announcements of any periodic review activities concerning potential amendments or updating of the HMAP	Review prevention and protection projects for continued relevance. Ensure appropriate actions and information are included in the Emergency Operation Plan.	Review and update mitigation actions as necessary based on funding opportunities available through FEMA FMA, FEMA BRIC, FEMA HMGP, and other grant funding sources.	Update and maintain floodplain information including but not limited to: maps, construction practices, permitting, and NFIP compliance.
Jurisdiction								

Sabine County	X			X	X	X	X	X
City of Hemphill	X	X	X	X	X	X	X	X
City of Pineland	X	X	X	X	X	X	X	X

As part of each jurisdiction's commitment to transparency, all relevant information, including but not limited to that described above and in each action's description, will be presented to the public before the action is formally adopted for implementation. After public notification, the integration process will resemble the one outlined in Table 62 below.

Table 63: Integration Process

Jurisdiction	Integration Process
Sabine County	After considering integrating mitigation actions with the activities outlined in Table 62 above, mitigation actions will be presented, considered, and formally adopted by the County Commissioners' Court and County Judge. Sabine County will also use the Sabine County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.
City of Hemphill	After considering integrating mitigation actions with the activities outlined in Table 62 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor. The City of Hemphill will also use the Sabine County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.
City of Pineland	After considering integrating mitigation actions with the activities outlined in Table 62 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor. The City of Pineland will also use the Sabine County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.

A) Past Integration – 2016 Plan

Each jurisdiction has its own established process for integrating new actions, codes, ordinances, plans, and studies into its existing capabilities. The 2016 HMAP was integrated into the County's Community Wildfire Protection Plan as well as various drainage studies. Plan integration also occurred for the City of Hemphill's, City Lake No 2 Dam Emergency Action Plan. No other plan

integration is known to have occurred for the above-mentioned jurisdictions or for the City of Pineland. Therefore, new tracking measures may be implemented to ensure future staff are aware of plan integration moving forward. The planning team will ensure that each jurisdiction's various departments continue to integrate hazard mitigation actions into their day-to-day processes.

3) Goals and Objectives Overview

The hazard analysis has shown that Sabine County and the participating jurisdictions are at risk of multiple natural hazards. The following goals and objectives take a broad approach to improving outcomes before, during, and after these anticipated natural hazard events.

The goals and objectives in this plan reflect the overarching priorities identified by the communities and are similar to the goals listed in the 2016 plan. They have been expanded to include public services, public infrastructure, economic impacts, civic resources, and cultural resources as priorities in addition to reducing loss of life, injury, property damage, and preservation of natural resources. The mitigation actions the County and participating jurisdictions have selected are designed to address specific hazard-related issues in support of achieving the desired goals and objectives.

4) Long-Term Vision

The hazard mitigation plan must strike a balance between identifying long-term goals and objectives and prioritized mitigation actions that may be addressed sooner, depending on funding availability and local priorities. The result is that certain goals and objectives don't have a corresponding mitigation action. Instead, by taking the long view, the local planning team has created a framework that can be developed as the plan is updated over time.

5) Goals

A) Goal 1: To reduce loss of life and injury to persons

Objective 1.1

Improve the delivery and effectiveness of warning messages

Objective 1.2

Preserve public and private emergency response capability (9-1-1, law enforcement, fire services, emergency medical services, hospitals).

Objective 1.3

Utilize available mitigation measures to prevent or reduce life-threatening impacts of natural hazards.

Objective 1.4
Reduce obstacles to timely and safe evacuation of flood hazard areas.

Objective 1.5
Reduce vulnerability of individuals living in mobile homes / manufactured housing.

Objective 1.6
Reduce life or health threatening impacts on individuals with special physical care requirements.

Objective 1.7
Reduce secondary impacts to health and safety from cascading effects.

Objective 1.8
Reduce long-term vulnerabilities from high hazard potential dams that pose an unacceptable risk to the public.

B) Goal 2: To reduce disruptions to essential public services and infrastructure

Objective 2.1
Minimize disruption to and enhance rapid restoration of utilities.

Objective 2.2
Minimize disruption to and enhance rapid restoration of essential transportation infrastructure.

Objective 2.3
Minimize disruption to governmental, educational, and other institutions providing services to the public.

C) Goal 3: To reduce economic impacts to individuals, businesses, and area institutions

Objective 3.1
Increase home and business owner investment in available mitigation measures for private property.

Objective 3.2
Increase home and business owner participation in appropriate insurance programs.

Objective 3.3
Increase public and private sector development and use of operations continuity strategies.

Objective 3.4
Utilize available mitigation measures to prevent or reduce economic losses from natural hazards.

Objective 3.5

Reduce vulnerability of existing development by encouraging property owners to participate in buy-out or flood-proofing opportunities.

Objective 3.6

Reduce vulnerability of future development by utilizing available planning and structural standards.

D) Goal 4: To reduce losses to civic, cultural, and environmental resources

Objective 4.1

Protect public investment in community-owned facilities and infrastructure through appropriate structural, non-structural, and financial methods.

Objective 4.2

Reduce future losses to the non-profit sector through participation in available mitigation opportunities.

Objective 4.3

Reduce vulnerability of historically or culturally significant structures.

Objective 4.4

Minimize environmental impacts from cascading effects.

6) Mitigation Action Plan

A) Mitigation Action Prioritization

The planning team members have identified at least one mitigation action per natural hazard. After review, the planning team has determined that the jurisdiction's priorities remain the same. For this update, action items were identified and prioritized in consideration of the following criteria:

1) Life safety and property protection improvements
2) Cost effectiveness – do the action's future benefits exceed its implementation costs
3) Technical feasibility – is the action reasonable given its technical requirements
4) Political acceptability
5) Administrative capabilities and legal authorities for implementation
6) Funding availability
7) The action's environmental impacts
8) The action's social acceptability
9) The action's ability to reduce risk to more than one hazard
10) The ease of implementation

11) The availability of a local champion
12) The action's relationship to other community objectives

In addition to considering an action's cost effectiveness as described above, the planning team considered TDEM's Cost-Effectiveness, Environmental Soundness and Technical Feasibility requirements as they relate to construction projects. Mitigation actions relating to physical infrastructure will meet the State's standards as outlined below:

A. Any state government construction project, regardless of potential funding source, has to be cost effective, technically feasible and meet all of the appropriate federal, state, and local environmental laws and regulations before it is started.
B. State government projects funded by Federal Mitigation Grant Programs administered by TDEM have to meet specific criteria related to cost effectiveness, environmental soundness and technical feasibility. These are outlined in the applicable FEMA grant program guidance for that particular funding program.

B) Mitigation Action Status – 2016 Plan

In addition to reviewing existing codes, ordinances, and planning studies, the planning team also examined the status of each mitigation action identified in the 2016 plan.

Mitigation actions marked as abandoned are no longer considered relevant as written to the participating jurisdictions. Deferred actions are indicated with an asterisk (*) in the new actions tables in Chapter 16, Part C.

Table 64: Previous Mitigation Actions – All Jurisdictions

Sabine County Mitigation Actions Status		
Hazards Addressed	**Mitigation Actions**	**Status**
Dam Failure, Flood, Hurricane, Thunderstorms (Lightning, Hail, High Wind), Tornados	**Storm-harden and/or retrofit existing and newly constructed critical facilities:** Actions can include but are not limited to installing window screens, storm shutters, window film reinforcements, roof straps, flood proofing, roll-up door reinforcement (i.e. fire stations), fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and extending defensible space.	*Deferred to Plan Update*
Wildfire	**Incorporate Firewise construction methods and materials for future and proposed public facilities:** Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.	*Deferred to Plan Update*
Earthquake, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm, Drought	**Generators:** Install electrical generators for critical facilities and infrastructure.	*Deferred to Plan Update*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	**Elevate and reinforce roadways and bridges prone to inundation from flooding:** Projects may include general road elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc. (Flood, Dam Failure)	*Deferred to Plan Update*
Dam Failure, Flood, Hurricane	**Develop procedures:** where floodplain administrator is notified of proposed development prior to start of construction.	*Deferred to Plan Update*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	**Upgrade stormwater conveyance capacity via drainage improvement projects:** Actions can include but are not limited to	*Deferred to Plan Update*

	installing/upgrading culverts and headwalls; and enlarging storm water ditches and canals.	
Wildfire	**Public Education**: Educate homeowners and builders on the importance of constructing and maintaining defensible space surrounding structures along with methods to improve firefighting access in the Wildland-urban interface.	*Deferred to Plan Update*
Hurricanes, Tornado	**Maintenance:** Upgrade existing debris management procedures and capabilities in coordination with TCEQ requirements and recommendations.	*Deferred to Plan Update*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire, Winter Storm	**Develop-upgrade contact info**: database for 1st responders, volunteers, special needs populations.	*In Progress*
Hurricanes/Tropical Storms	Construct new or retrofit an existing structure to act as a storm-hardened multipurpose facility to act as a staging area and **Emergency Operations Center** during a hazard event.	*Deferred to Plan Update*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials Incidents, Hurricane/Tropical Storm, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire, Winter Storm	**Public Education:** Educate the residents of Sabine County on safety and planning for the hazards identified in this plan, including programs in schools and senior citizen centers, pamphlets, and community meetings.	*Deferred to Plan Update*
Wildfire	Develop a Community Wildfire Protection Plan **(CWPP)**	*Completed*
Hazardous Materials Incidents	Conduct NIMS, ICS and specialized hazardous materials and **training** for fire departments.	*Completed*
Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm	**Install electrical and communications lines underground for future and proposed critical facilities:** Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.	*Deferred to Plan Update*
Tornados	**Retrofit existing or construct new structures to act as safe rooms in critical facilities and public buildings:** in accordance with FEMA	*Deferred to Plan Update*

	Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire	**Install warning sirens:** at strategic locations for use during disaster events.	*Deferred to Plan Update*
Extreme Heat, Winter Storm	Retrofit existing structures to act as **cooling centers** during extreme heat events, and warming centers during winter storms.	*Deferred to Plan Update*
Wildfire, Drought	**Conduct mechanical thinning**: to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.	*Deferred to Plan Update*
Drought	**Public Education**: educate homeowners on methods to reduce water consumption during drought periods and homebuilders on low water use appliances, drought resistant landscaping, and water recycling.	*Deferred to Plan Update*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm (Lightning, Hail, High Winds)	**Acquire flood prone/repetitive loss properties:** and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.	*Deferred to Plan Update*
Hazardous Materials Incidents	Develop **inventory of hazardous materials** handling and transport facilities with the potential to impact public safety if an accident were to occur and conduct periodic inspections of these sites.	*Abandoned: No Longer Profiling Hazard*
Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm	**Install frangible links:** (break away line power line connections) on electrical and telephone poles.	*Deferred to Plan Update*
Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm	**Inventory** and coordinate mitigation projects for trees that present hazardous conditions for homes, facilities, and roadways	*Deferred to Plan Update*
Hurricane/Tropical Storm, Thunderstorm (Lightning, Hail, High Winds), Tornado	**Develop local requirements for mobile home tie-down and anchoring systems and conduct periodic inspections:** Create, fund and staff department of Sabine County Building Inspectors to monitor local requirements.	*Deferred to Plan Update*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	**Elevate existing flood prone structures**: above the base flood elevation to reduce flood losses.	*Deferred to Plan Update*

Hurricanes/Tropical Storms	**Construct new or retrofit appropriate existing structures to act as shelters of last resort**: to be in conformance with FEMA Publication 360 and American Red Cross Guidelines.	*Deferred to Plan Update*
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire, Drought	Acquire **electronic message board** for use during disaster response and recovery operations.	*Deferred to Plan Update*
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire	Acquire and distribute **radios and transmitters** for first responders and volunteers.	*Deferred to Plan Update*
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire	Acquire and distribute **NOAA weather radios** for vulnerable populations.	*Deferred to Plan Update*
Dam Failure	**Perform research:** to gather more refined data depicting dam failure inundation zones or work to generate such data.	*Deferred to Plan Update*

City of Hemphill Mitigation Actions Status		
Hazards Addressed	**Mitigation Actions**	**Status**
Dam Failure, Flood, Hurricane, Thunderstorms (Lightning, Hail, High Wind), Tornados	**Storm-harden and/or retrofit existing and newly constructed critical facilities:** Actions can include but are not limited to installing window screens, storm shutters, window film reinforcements, roof straps, flood proofing, roll-up door reinforcement (i.e. fire stations), fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and extending defensible space.	*Deferred to Plan Update*
Wildfire	**Incorporate Firewise construction methods and materials for future and proposed public facilities:** Actions can include but are not limited to: fire resistant roofing materials, fire	*Deferred to Plan Update*

	resistant exterior walls, data back-up systems, and establishing defensible space.	
Earthquake, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm, Drought	**Generators:** Install electrical generators for critical facilities and infrastructure.	*Completed*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	**Elevate and reinforce roadways and bridges prone to inundation from flooding:** Projects may include general road elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc. (Flood, Dam Failure)	*In Progress*
Dam Failure, Flood, Hurricane	**Develop procedures:** where floodplain administrator is notified of proposed development prior to start of construction.	*Abandoned: No Longer Deemed Relevant*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	**Upgrade stormwater conveyance capacity via drainage improvement projects:** Actions can include but are not limited to installing/upgrading culverts and headwalls; and enlarging storm water ditches and canals.	*Deferred to Plan Update*
Wildfire	**Public Education**: Educate homeowners and builders on the importance of constructing and maintaining defensible space surrounding structures along with methods to improve firefighting access in the Wildland-urban interface.	*Deferred to Plan Update*
Hurricanes, Tornado	**Maintenance:** Upgrade existing debris management procedures and capabilities in coordination with TCEQ requirements and recommendations.	*Abandoned: No Longer Deemed Relevant*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire, Winter Storm	**Develop-upgrade contact info**: database for 1st responders, volunteers, special needs populations.	*Abandoned: No Longer Deemed Relevant*
Hurricanes/Tropical Storms	Construct new or retrofit an existing structure to act as a storm-hardened multipurpose facility to act as a staging area and **Emergency Operations Center** during a hazard event.	*Completed*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials Incidents, Hurricane/Tropical Storm, Thunderstorm	**Public Education:** Educate the residents of Sabine County on safety and planning for the hazards identified in this plan, including programs in schools and senior citizen centers, pamphlets, and community meetings.	*Deferred to Plan Update*

(Lightning, Hail, High Winds), Tornado, Wildfire, Winter Storm		
Wildfire	Develop a Community Wildfire Protection Plan **(CWPP)**	*In Progress*
Hazardous Materials Incidents	Conduct NIMS, ICS and specialized hazardous materials and **training** for fire departments.	*Abandoned: No Longer Profiling Hazard*
Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm	**Install electrical and communications lines underground for future and proposed critical facilities:** Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.	*In Progress*
Tornados	**Retrofit existing or construct new structures to act as safe rooms in critical facilities and public buildings:** in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	*Abandoned: No Longer Deemed Relevant*
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire	**Install warning sirens:** at strategic locations for use during disaster events.	*Deferred to Plan Update*
Extreme Heat, Winter Storm	Retrofit existing structures to act as **cooling centers** during extreme heat events, and warming centers during winter storms.	*Deferred to Plan Update*
Wildfire, Drought	**Conduct mechanical thinning**: to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.	*Deferred to Plan Update*
Drought	**Public Education**: educate homeowners on methods to reduce water consumption during drought periods and homebuilders on low water use appliances, drought resistant landscaping, and water recycling.	*Deferred to Plan Update*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm (Lightning, Hail, High Winds)	**Acquire flood prone/repetitive loss properties:** and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.	*Abandoned: No Longer Deemed Relevant*
Hazardous Materials Incidents	Develop **inventory of hazardous materials** handling and transport facilities with the potential to impact public safety if an accident	*Abandoned: No Longer Profiling Hazard*

	were to occur and conduct periodic inspections of these sites.	
Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm	**Install frangible links:** (break away line power line connections) on electrical and telephone poles.	*Deferred to Plan Update*
Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm	**Inventory** and coordinate mitigation projects for trees that present hazardous conditions for homes, facilities, and roadways	*In Progress*
Hurricane/Tropical Storm, Thunderstorm (Lightning, Hail, High Winds), Tornado	**Develop local requirements for mobile home tie-down and anchoring systems and conduct periodic inspections:** Create, fund and staff department of Sabine County Building Inspectors to monitor local requirements.	*Deferred to Plan Update*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	**Elevate existing flood prone structures**: above the base flood elevation to reduce flood losses.	*In Progress*
Hurricanes/Tropical Storms	**Construct new or retrofit appropriate existing structures to act as shelters of last resort**: to be in conformance with FEMA Publication 360 and American Red Cross Guidelines.	*Deferred to Plan Update*
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire, Drought	Acquire **electronic message board** for use during disaster response and recovery operations.	*Abandoned: No Longer Deemed Relevant*
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire	Acquire and distribute **radios and transmitters** for first responders and volunteers.	*Abandoned: No Longer Deemed Relevant*
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire	Acquire and distribute **NOAA weather radios** for vulnerable populations.	*Abandoned: Have implemented emergency alert / notification system through County Emergency Management Office*
Dam Failure	**Perform research:** to gather more refined data depicting dam failure inundation zones or work to generate such data.	*Completed*
Dam Failure, Flood, Hurricane	**Continue participation in the NFIP:** and development of thorough floodplain administration procedures.	*Abandoned: No Longer Deemed Relevant*

Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	**Upgrade stormwater conveyance capacity via drainage improvement projects:** Actions can include but are not limited to: installing/upgrading culverts and headwalls; and enlarging storm water ditches.	*In Progress*

City of Pineland Mitigation Actions Status		
Hazards Addressed	**Mitigation Actions**	**Status**
Dam Failure, Flood, Hurricane, Thunderstorms (Lightning, Hail, High Wind), Tornados	**Storm-harden and/or retrofit existing and newly constructed critical facilities:** Actions can include but are not limited to installing window screens, storm shutters, window film reinforcements, roof straps, flood proofing, roll-up door reinforcement (i.e. fire stations), fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and extending defensible space.	*Deferred to Plan Update*
Wildfire	**Incorporate Firewise construction methods and materials for future and proposed public facilities:** Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.	*Deferred to Plan Update*
Earthquake, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm, Drought	**Generators:** Install electrical generators for critical facilities and infrastructure.	*Completed*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	**Elevate and reinforce roadways and bridges prone to inundation from flooding:** Projects may include general road elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc. (Flood, Dam Failure)	*Deferred to Plan Update*
Dam Failure, Flood, Hurricane	**Develop procedures:** where floodplain administrator is notified of proposed development prior to start of construction.	*Abandoned: No Longer Deemed Relevant*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	**Upgrade stormwater conveyance capacity via drainage improvement projects:** Actions can include but are not limited to installing/upgrading culverts and headwalls; and enlarging storm water ditches and canals.	*Deferred to Plan Update*

Wildfire	**Public Education**: Educate homeowners and builders on the importance of constructing and maintaining defensible space surrounding structures along with methods to improve firefighting access in the Wildland-urban interface.	*Deferred to Plan Update*
Hurricanes, Tornado	**Maintenance:** Upgrade existing debris management procedures and capabilities in coordination with TCEQ requirements and recommendations.	*Abandoned: No Longer Deemed Relevant*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire, Winter Storm	**Develop-upgrade contact info**: database for 1st responders, volunteers, special needs populations.	*Abandoned: No Longer Deemed Relevant*
Hurricanes/Tropical Storms	Construct new or retrofit an existing structure to act as a storm-hardened multipurpose facility to act as a staging area and **Emergency Operations Center** during a hazard event.	*Deferred to Plan Update*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hazardous Materials Incidents, Hurricane/Tropical Storm, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire, Winter Storm	**Public Education:** Educate the residents of Sabine County on safety and planning for the hazards identified in this plan, including programs in schools and senior citizen centers, pamphlets, and community meetings.	*Deferred to Plan Update*
Wildfire	Develop a Community Wildfire Protection Plan **(CWPP)**	*Deferred to Plan Update*
Hazardous Materials Incidents	Conduct NIMS, ICS and specialized hazardous materials and **training** for fire departments.	*Abandoned: No Longer Profiling Hazard*
Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm	**Install electrical and communications lines underground for future and proposed critical facilities:** Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.	*Deferred to Plan Update*
Tornados	**Retrofit existing or construct new structures to act as safe rooms in critical facilities and public buildings:** in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.	*Deferred to Plan Update*

Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire	**Install warning sirens:** at strategic locations for use during disaster events.	*Deferred to Plan Update*
Extreme Heat, Winter Storm	Retrofit existing structures to act as **cooling centers** during extreme heat events, and warming centers during winter storms.	*Deferred to Plan Update*
Wildfire, Drought	**Conduct mechanical thinning**: to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.	*Deferred to Plan Update*
Drought	**Public Education**: educate homeowners on methods to reduce water consumption during drought periods and homebuilders on low water use appliances, drought resistant landscaping, and water recycling.	*Deferred to Plan Update*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm (Lightning, Hail, High Winds)	**Acquire flood prone/repetitive loss properties:** and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.	*Deferred to Plan Update*
Hazardous Materials Incidents	Develop **inventory of hazardous materials** handling and transport facilities with the potential to impact public safety if an accident were to occur and conduct periodic inspections of these sites.	*Abandoned: No Longer Profiling Hazard*
Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm	**Install frangible links:** (break away line power line connections) on electrical and telephone poles.	*Deferred to Plan Update*
Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Winter Storm	**Inventory** and coordinate mitigation projects for trees that present hazardous conditions for homes, facilities, and roadways	*Deferred to Plan Update*
Hurricane/Tropical Storm, Thunderstorm (Lightning, Hail, High Winds), Tornado	**Develop local requirements for mobile home tie-down and anchoring systems and conduct periodic inspections:** Create, fund and staff department of Sabine County Building Inspectors to monitor local requirements.	*Deferred to Plan Update*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	**Elevate existing flood prone structures**: above the base flood elevation to reduce flood losses.	*Deferred to Plan Update*
Hurricanes/Tropical Storms	**Construct new or retrofit appropriate existing structures to act as shelters of last resort**: to be in conformance with FEMA Publication 360 and American Red Cross Guidelines.	*Deferred to Plan Update*

Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire, Drought	Acquire **electronic message board** for use during disaster response and recovery operations.	*Abandoned: No Longer Deemed Relevant*
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire	Acquire and distribute **radios and transmitters** for first responders and volunteers.	*Abandoned: No Longer Deemed Relevant*
Dam Failure, Earthquake, Hazardous Materials Incidents, Hurricane, Thunderstorm (Lightning, Hail, High Winds), Tornado, Wildfire	Acquire and distribute **NOAA weather radios** for vulnerable populations.	*Deferred to Plan Update*
Dam Failure	**Perform research:** to gather more refined data depicting dam failure inundation zones or work to generate such data.	*Deferred to Plan Update*
Dam Failure, Flood, Hurricane	**Continue participation in the NFIP:** and development of thorough floodplain administration procedures.	*Abandoned: Ordinance Adopted*
Dam Failure, Flood, Hurricane/Tropical Storm, Thunderstorm	**Upgrade stormwater conveyance capacity via drainage improvement projects:** Actions can include but are not limited to: installing/upgrading culverts and headwalls; and enlarging storm water ditches.	*In Progress*

C) Mitigation Actions by Jurisdiction and by Hazard

Each jurisdiction has selected actions that were identified as high, medium or low priority and that are in line with TDEM's recommended mitigation actions. However, many of the mitigation actions below are dependent upon outside grant funding for implementation. For all actions likely to require grant funding, potential sources have been identified. However, grant funding is awarded on a competitive basis, so applying for funding doesn't guarantee that funds will be received. Budget constraints will remain the determining factor for how and when each action is implemented. Each new mitigation action outlines the following requirements: the identified responsible department head or delegate will research all relevant information to confirm the action's feasibility and prioritization, will formulate a plan of action, and will confirm funding sources and identify any fiscal liabilities associated with the mitigation action.

i. Sabine County

The following mitigation action items may indicate an asterisk (*****) in the case that the actions were deferred from the previous 2016 HMAP. Actions marked with a grey heading are not eligible for mitigation funding but are included in the HMAP for the jurisdiction to reference for implementation or future planning endeavors.

Multi-Hazard Actions

Mitigation Action	Educational Outreach*
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	Low
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing and future population

Mitigation Action	Emergency Operations Center*
Objective	Construct new or retrofit an existing structure to act as a storm-hardened multipurpose facility to act as a staging area and Emergency Operations Center during a hazard event.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioners' Court, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure and population

Mitigation Action	Mechanical Thinning*
Objective	Conduct mechanical thinning: to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.
Hazard	Wildfire, Drought
Priority	Medium
Estimated Cost	$10,000 - $500,0000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Road and Bridge Flood Mitigation*
Objective	Elevate and reinforce roadways and bridges prone to inundation from flooding: Projects may include general road elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc.
Hazard	Flood, Hurricane/Tropical Storm, Dam Failure
Priority	Medium

Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioners' Court
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Property Acquisition***
Objective	Acquire flood prone/repetitive loss properties: and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.
Hazard	Flood, Hurricane/Tropical Storm, Dam Failure
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioners' Court
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Elevate Flood Prone Structures***
Objective	Elevate existing flood prone structures: above the base flood elevation to reduce flood losses.
Hazard	Flood, Hurricane/Tropical Storm, Dam Failure
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioners' Court
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Stormwater Conveyance*
Objective	Upgrade stormwater conveyance capacity via drainage improvement projects: Actions can include but are not limited to installing/upgrading culverts and headwalls; and enlarging storm water ditches and canals.
Hazard	Flood, Hurricane/Tropical Storm, Dam Failure
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioners' Court
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Construct Community Safe Rooms and/or Utilize Existing Facilities for Shelter*
Objective	The action's goal is to minimize local population vulnerability to hazards by providing public safe rooms.
Hazard	Hurricane/Tropical Storms, Tornado, Wildfire, Windstorm, Winter Storm
Priority	Medium
Estimated Cost	Greater than $100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court, OEM
Implementation Schedule	2 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Set up Cooling and Heating Centers in Existing Facilities*
Objective	The action's goal is to increase extreme temperature resilience by limiting vulnerable populations' exposure to extreme temperatures by creating new, or opening up existing facilities as cooling centers or warming centers.
Hazard	Extreme Heat & Extreme Cold
Priority	Medium

Estimated Cost	More than $10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court
Implementation Schedule	2 - 5 Years
Target	Existing and future population

Mitigation Action	**Install Back Up Power Generators***
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake
Priority	High
Estimated Cost	More than $100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than $100,000 Each for Portable Generators
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Install and Expand Warning Systems/Sirens***
Objective	Warning systems will help limit local vulnerability to hazards by giving residents an opportunity to take shelter before one occurs.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	$1,000 - $100,000 per device
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Emergency Management

Implementation Schedule	1 - 2 Years
Target	Existing and future population

Mitigation Action	NOAA Weather Radios*
Objective	Acquire and distribute NOAA weather radios for vulnerable populations.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	More than $1,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Emergency Management
Implementation Schedule	1 - 2 Years
Target	Existing and future population

Mitigation Action	Install Lines Underground*
Objective	Install electrical and communications lines underground for future and proposed critical facilities: Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.
Hazard	Hurricane/Tropical Storm, Wildfire, Tornado, Winter Storm, Windstorm
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court, Public Works
Implementation Schedule	3 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Install Frangible Links*
Objective	Install frangible links: (break away line power line connections) on electrical and telephone poles.
Hazard	Hurricane/Tropical Storm, Wildfire, Tornado, Winter Storm, Windstorm
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court, Public Works
Implementation Schedule	3 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement a New Tie-Down Ordinance for Manufactured / Mobile Homes, Temporary Buildings, and Unrestrained Advertisement Signs*
Objective	Re-evaluate all existing tie-down measures to identify strengths and weaknesses in order to develop and enforce a new tie-down ordinance.
Hazard	Windstorm, Tornado, Hurricanes/Tropical Storm
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court
Implementation Schedule	1 - 2 Years
Target	Existing and future population and infrastructure

Mitigation Action	Harden Facilities*
Objective	This action proposes hardening facilities. Hardening will include but is not limited to adding impact and wind-resistant doors, windows; reinforcing building foundations, elevating low-lying structures, upgrading and/or adding shatter-resistant films to all glazing, upgrading thermal insulation, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment, and adding bracing and tie-down clips to building roofs.

Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake
Priority	Medium
Estimated Cost	Greater than $100,000
Potential Funding Source (s)	County, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	Commissioners' Court
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Implement a Tree Trimming Program**
Objective	This action will develop and implement a tree trimming program to reduce loose / dead tree limbs that may cause damage during a hazard event.
Hazard	Wildfire, Tornado, Winter Storm, Windstorm
Priority	Medium
Estimated Cost	$10,000 - $500,0000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Floodplain Administration Procedures***
Objective	Develop procedures: where floodplain administrator is notified of proposed development prior to start of construction.
Hazard	Flood, Hurricane/Tropical Storm, Dam Failure
Priority	Medium
Estimated Cost	Less than $10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioners' Court
Implementation Schedule	1 - 2 Years
Target	Future Infrastructure

Mitigation Action	Debris Management*
Objective	Upgrade existing debris management procedures and capabilities in coordination with TCEQ requirements and recommendations.
Hazard	Hurricane/Tropical Storm, Tornado
Priority	Medium
Estimated Cost	Less than $10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioners' Court
Implementation Schedule	1 - 2 Years
Target	Current and future infrastructure

Mitigation Action	Inventory*
Objective	Inventory and coordinate mitigation projects for trees that present hazardous conditions for homes, facilities, and roadways
Hazard	Hurricane/Tropical Storm, Tornado, Hailstorm, Windstorms, Winter Storm, Lightning
Priority	Medium
Estimated Cost	Less than $10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioners' Court
Implementation Schedule	1 - 2 Years
Target	Current and future infrastructure

Mitigation Action	Electronic Message Boards*
Objective	Acquire electronic message board for use during disaster response and recovery operations.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	More than $10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB

Responsible Department	Commissioners' Court, Emergency Management
Implementation Schedule	1 - 2 Years
Target	Current and future infrastructure

Mitigation Action	**Radios and Transmitters***
Objective	Acquire and distribute radios and transmitters for first responders and volunteers.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	More than $10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioners' Court, Emergency Management
Implementation Schedule	1 - 2 Years
Target	Current and future populations

Single Hazard Actions

Mitigation Action	**NFIP Compliance/Develop and Implement Flood Damage Prevention Ordinance**
Objective	In order to obtain and maintain NFIP eligibility, this action proposes developing and implementing a flood damage prevention ordinance as well as appointing a floodplain administrator.
Hazard	Flood
Priority	High
Estimated Cost	Less than $10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Commissioners' Court
Implementation Schedule	1 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement Flood Damage Prevention Ordinance
Objective	In order to obtain and maintain NFIP eligibility, this action proposes developing and implementing a flood damage prevention ordinance as well as appointing a floodplain administrator.
Hazard	Flood
Priority	High
Estimated Cost	Less than $10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Commissioners' Court
Implementation Schedule	1 Years
Target	Existing and future infrastructure

Mitigation Action	Create Master Drainage Plan
Objective	This action proposes creating a master drainage plan for the County, in conjunction with other jurisdictions, that will provide the County with a comprehensive planning document that provides basic information and necessary guidance for the county-wide drainage system, including but not limited to an H&H study.
Hazard	Flood
Priority	Medium
Estimated Cost	Less than $100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Commissioners' Court
Implementation Schedule	3 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Wildfire Fuels Reduction in WUI
Objective	This action will develop and implement a program to identify and prioritize lands in the Wildland Urban Interface in need of fuels reduction and then reduce or remove wildfire fuels through various methods as appropriate.
Hazard	Wildfire

Priority	Medium
Estimated Cost	$10,000 - $100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court
Implementation Schedule	1 - 2 Years
Target	Existing and future infrastructure

Mitigation Action	Firewise Construction*
Objective	Incorporate Firewise construction methods and materials for future and proposed public facilities: Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.
Hazard	Wildfire
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court
Implementation Schedule	3 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Safe Rooms*
Objective	Retrofit existing or construct new structures to act as safe rooms in critical facilities and public buildings: in accordance with FEMA Publication 320 and/or National Performance Criteria for Tornado Shelters specifications.
Hazard	Tornado
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioners' Court, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure and population

Mitigation Action	Install Surge Protection and Grounding Systems to Protect Electronic Assets
Objective	This action will install surge protection at all County facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Lightning
Priority	Medium
Estimated Cost	$1,000 - $100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Conduct Dam Failure Studies*
Objective	This action proposes conducting dam failure studies to determine potential inundation area and HHPD risks.
Hazard	Dam Failure
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioner's Court, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

ii. City of Hemphill

The following mitigation action items may indicate an asterisk (*) in the case that the actions were deferred from the previous 2016 HMAP. Actions marked with a grey heading are not eligible for mitigation funding but are included in the HMAP for the jurisdiction to reference for implementation or future planning endeavors.

Multi-Hazard Actions

Mitigation Action	Educational Outreach*
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	City Council
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Stormwater Conveyance*
Objective	Upgrade stormwater conveyance capacity via drainage improvement projects: Actions can include but are not limited to installing/upgrading culverts and headwalls; and enlarging storm water ditches and canals.
Hazard	Flood, Hurricane/Tropical Storm, Dam Failure
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Construct Community Safe Rooms and/or Utilize Existing Facilities for Shelter*
Objective	The action's goal is to minimize local population vulnerability to hazards by providing public safe rooms.
Hazard	Hurricane/Tropical Storms, Tornado, Wildfire, Windstorm, Winter Storm
Priority	Medium
Estimated Cost	Greater than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration
Implementation Schedule	2 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Set up Cooling and Heating Centers in Existing Facilities*
Objective	The action's goal is to increase extreme temperature resilience by limiting vulnerable populations' exposure to extreme temperatures by creating new, or opening up existing facilities as cooling centers or warming centers.
Hazard	Extreme Heat & Extreme Cold
Priority	High
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor and Council, Ordinance, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing and future population

Mitigation Action	Install Back Up Power Generators
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure. Water and wastewater treatment facilities, fire dept, and city hall.

Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	High
Estimated Cost	More than $100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than $100,000 Each for Portable Generators
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor and Council, Planning, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Develop and Implement a New Tie-Down Ordinance for Manufactured / Mobile Homes, Temporary Buildings, and Unrestrained Advertisement Signs***
Objective	Re-evaluate all existing tie-down measures to identify strengths and weaknesses in order to develop and enforce a new tie-down ordinance.
Hazard	Hurricane/Tropical Storm, Tornado, Windstorm
Priority	Medium
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor and Council, Ordinance
Implementation Schedule	1 - 2 Years
Target	Existing and future population and infrastructure

Mitigation Action	**Install and Expand Warning Systems/Sirens***
Objective	Warning systems will help limit local vulnerability to hazards by giving residents an opportunity to take shelter before one occurs.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	$1,000 - $100,000 per device
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP

Responsible Department	Emergency Management, City Administrator
Implementation Schedule	2 - 5 Years
Target	Existing and future population

Mitigation Action	Implement a Tree Trimming Program
Objective	This action will develop and implement a tree trimming program to reduce loose / dead tree limbs that may cause damage during a hazard event.
Hazard	Wildfire, Tornado, Winter Storm, Windstorm
Priority	High
Estimated Cost	$10,000 - $500,0000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor and Council, Ordinance, Public Works
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Mechanical Thinning*
Objective	Conduct mechanical thinning: to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.
Hazard	Wildfire, Drought
Priority	Medium
Estimated Cost	$10,000 - $500,0000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Update Building Code Requirements
Objective	The City will re-evaluate current building codes and update where needed to improve building standards to withstand impacts from hazards.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Earthquake, Dam Failure
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration
Implementation Schedule	1 - 2 Years
Target	Existing and future infrastructure

Mitigation Action	Harden Facilities*
Objective	This action proposes hardening facilities. Hardening will include but is not limited to adding impact and wind-resistant doors, windows; reinforcing building foundations, elevating low-lying structures, upgrading and/or adding shatter-resistant films to all glazing, upgrading thermal insulation, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment, and adding bracing and tie-down clips to building roofs.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	Greater than $100,000
Potential Funding Source (s)	City, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	Mayor and Council, Building Code, Ordinance, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Install Frangible Links*
Objective	Install frangible links: (break away line power line connections) on electrical and telephone poles.
Hazard	Hurricane/Tropical Storm, Wildfire, Tornado, Winter Storm, Windstorm
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works
Implementation Schedule	3 - 5 Years
Target	Existing and future infrastructure

Single Hazard Actions

Mitigation Action	Create Master Drainage Plan
Objective	This action proposes creating a master drainage plan for the City, in conjunction with other jurisdictions, that will provide the City with a comprehensive planning document that provides basic information and necessary guidance for the county-wide drainage system, including but not limited to an H&H study.
Hazard	Flood
Priority	High
Estimated Cost	Less than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Public Works, City Administration
Implementation Schedule	3 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement Flood Damage Prevention Ordinance
Objective	The jurisdiction will re-evaluate existing flood damage prevention and reduction measures to identify strengths and weaknesses in order to develop and enforce a new flood damage prevention ordinance.

Hazard	Flood
Priority	Medium
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Mayor and Council, Ordinance, City Administration
Implementation Schedule	1 Year
Target	Existing and future infrastructure

Mitigation Action	**Construct Storm Drainage Infrastructure**
Objective	This action proposes constructing new storm drainage infrastructure to reduce the potential impacts of future flood events.
Hazard	Flood
Priority	High
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor and Council, Planning, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Purchase Portable Pumps**
Objective	This action proposes purchasing portable pumps that can be deployed as needed to reduce the potential impacts of future flood events.
Hazard	Flood
Priority	Low
Estimated Cost	More than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Firewise Construction*
Objective	Incorporate Firewise construction methods and materials for future and proposed public facilities: Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.
Hazard	Wildfire
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Building Code, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement a New Water Conservation Ordinance
Objective	The City will re-evaluate all existing water conservation and reduction measures to identify strengths and weaknesses in order to develop and enforce a new water conservation ordinance.
Hazard	Drought
Priority	Medium
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Mayor and Council, Ordinance
Implementation Schedule	1 - 2 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement a New Drought Contingency Plan
Objective	City will re-evaluate drought contingency plan to identify strengths and weaknesses in order to develop and enforce a new plan.
Hazard	Drought
Priority	High
Estimated Cost	Less than $50,000

Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works, Emergency Management, City Administration
Implementation Schedule	1 - 2 Years
Target	Existing and planned infrastructure

Mitigation Action	**Replace Water Fixtures with Low Flow Units**
Objective	This action's goal is to limit water consumption at jurisdiction-owned and maintained facilities by replacing traditional water fixtures with low flow units on an as-needed basis.
Hazard	Drought
Priority	Low
Estimated Cost	$10,000 - $100,000
Potential Funding Source (s)	Jurisdiction, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works, City Administration
Implementation Schedule	2-5 Years
Target	Existing and Future infrastructure

Mitigation Action	**Install Surge Protection and Grounding Systems to Protect Electronic Assets**
Objective	This action will install surge protection at all City facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Lightning
Priority	High
Estimated Cost	$1,000 - $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Planning, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Conduct Dam Failure Studies
Objective	This action proposes conducting dam failure studies to determine potential inundation area and HHPD risks.
Hazard	Dam Failure
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Restrict Development in High Hazard Areas
Objective	Jurisdiction will re-evaluate all existing floodplain construction restrictions to identify strengths and weaknesses in order to produce a new ordinance that will reduce potential flood impacts due to dam / levee failure by restricting development in areas that may be subject to inundation due to dam / levee failure.
Hazard	Dam Failure
Priority	Medium
Estimated Cost	Under $10,000
Potential Funding Source (s)	Jurisdiction, FEMA BRIC, FEMA HMGP
Responsible Department	Planning, Ordinance, City Administration
Implementation Schedule	2 - 3 Years
Target	Existing and future infrastructure

iii. City of Pineland

The following mitigation action items may indicate an asterisk (*) in the case that the actions were deferred from the previous 2016 HMAP. Actions marked with a grey heading are not eligible for mitigation funding but are included in the HMAP for the jurisdiction to reference for implementation or future planning endeavors.

Multi-Hazard Actions

Mitigation Action	Educational Outreach*
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards, including but not limited to participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, etc.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Police Dept., Fire Dept., Emergency Management, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Emergency Operations Center*
Objective	Construct new or retrofit an existing structure to act as a storm-hardened multipurpose facility to act as a staging area and Emergency Operations Center during a hazard event.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor and Council, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure and population

Mitigation Action	Property Acquisition*
Objective	Acquire flood prone/repetitive loss properties: and convert to open space, parks, boating access, trails, agricultural projects, and/or as a general community asset.
Hazard	Flood, Hurricane/Tropical Storm, Dam Failure
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor and Council, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Elevate Flood Prone Structures*
Objective	Elevate existing flood prone structures: above the base flood elevation to reduce flood losses.
Hazard	Flood, Hurricane/Tropical Storm, Dam Failure
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor and Council, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Construct Community Safe Rooms
Objective	The action's goal is to minimize local population vulnerability to hazards by providing public safe rooms.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Hailstorm, Winter Storm, Windstorms, Lightning, Earthquake, Dam Failure
Priority	Low
Estimated Cost	Greater than $100,000

Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor and Council, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	**Harden Facilities***
Objective	This action proposes hardening facilities. Hardening will include but is not limited to adding impact and wind-resistant doors, windows; reinforcing building foundations, elevating low-lying structures, upgrading and/or adding shatter-resistant films to all glazing, upgrading thermal insulation, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment, and adding bracing and tie-down clips to building roofs.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake
Priority	Low
Estimated Cost	Greater than $100,000
Potential Funding Source (s)	City, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	Public Works, City Administrator
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Install Lines Underground***
Objective	Install electrical and communications lines underground for future and proposed critical facilities: Encourage future commercial, industrial, and residential development to consider underground electric and communications lines.
Hazard	Hurricane/Tropical Storm, Wildfire, Tornado, Winter Storm, Windstorm
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works

Implementation Schedule	3 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Install Frangible Links***
Objective	Install frangible links: (break away line power line connections) on electrical and telephone poles.
Hazard	Hurricane/Tropical Storm, Wildfire, Tornado, Winter Storm, Windstorm
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works
Implementation Schedule	3 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Road and Bridge Flood Mitigation***
Objective	Elevate and reinforce roadways and bridges prone to inundation from flooding: Projects may include general road elevation; upgrading culverts and installing headwalls; upgrades and reinforcement of bridges and bridge footings; etc.
Hazard	Flood, Hurricane/Tropical Storm, Dam Failure
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Stormwater Conveyance***
Objective	Upgrade stormwater conveyance capacity via drainage improvement projects: Actions can include but are not limited to

	installing/upgrading culverts and headwalls; and enlarging storm water ditches and canals.
Hazard	Flood, Hurricane/Tropical Storm, Dam Failure
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Update Building Code Requirements**
Objective	The City will re-evaluate current building codes and update where needed to improve building standards to withstand impacts from hazards.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor and Council, Building Code, Ordinance, City Administrator
Implementation Schedule	3 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Set up Cooling and Heating Centers in Existing Facilities**
Objective	The action's goal is to increase extreme temperature resilience by limiting vulnerable populations' exposure to extreme temperatures by creating new, or opening up existing facilities as cooling centers or warming centers.
Hazard	Extreme Heat & Extreme Cold
Priority	Medium
Estimated Cost	Less than $10,000

Potential Funding Source(s)	City, FEMA BRIC, FEMA HMGP
Responsible Department(s)	Mayor and Council, Emergency Management, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	**Develop and Implement a New Tie-Down Ordinance for Manufactured / Mobile Homes, Temporary Buildings, and Unrestrained Advertisement Signs***
Objective	Re-evaluate all existing tie-down measures to identify strengths and weaknesses in order to develop and enforce a new tie-down ordinance.
Hazard	Hurricane/Tropical Storm, Tornado, Windstorm
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Ordinance, Public Works
Implementation Schedule	1 - 2 Years
Target	Existing and future population and infrastructure

Mitigation Action	**Implement a Tree Trimming Program**
Objective	This action will develop and implement a tree trimming program to reduce loose / dead tree limbs that may cause damage during a hazard event.
Hazard	Wildfire, Tornado, Winter Storm, Windstorm
Priority	Low
Estimated Cost	$10,000 - $500,0000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works
Implementation Schedule	3 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Mechanical Thinning*
Objective	Conduct mechanical thinning: to reduce fuels in the wildland-urban interface and wooded areas surrounding neighborhoods and facilities prone to wildfire impacts.
Hazard	Wildfire, Drought
Priority	Medium
Estimated Cost	$10,000 - $500,0000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Administration
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Purchase Back Up Power Generators
Objective	Installing generators at critical facilities will help ensure physical safety for facility occupants and maintain electronic systems functionality during power outages. Portable generators will maintain additional systems functionality including but not limited to lift stations, pumps, and communications infrastructure.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorm, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	More than $100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than $100,000 Each for Portable Generators
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor and Council, Public Works, City Administrator
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Install and Expand Warning Systems/Sirens
Objective	Warning systems will help limit local vulnerability to hazards by giving residents an opportunity to take shelter before one occurs.

Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Earthquake, Dam Failure
Priority	Medium
Estimated Cost	$1,000 - $100,000 per device
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works, Police Dept., Fire Dept., Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing and future population

Mitigation Action	**Purchase Portable Digital Warning Signs**
Objective	Warning systems will help limit local vulnerability to hazards by giving residents an opportunity to take shelter before one occurs.
Hazard	Flood, Hurricane/Tropical Storm, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Earthquake, Dam Failure
Priority	Low
Estimated Cost	$1,000 - $100,000 per device
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor and Council, Public Works, Police Dept., Fire Dept.
Implementation Schedule	2 - 5 Years
Target	Existing and future population

Mitigation Action	**Mandate Freeboard on Structures to Reduce Flooding Damage**
Objective	The jurisdiction will re-evaluate all existing floodplain construction restrictions to identify strengths and weaknesses in order to produce a new ordinance that will reduce potential flood impacts by instituting a new freeboard requirement.
Hazard	Flood, Dam Failure
Priority	Low
Estimated Cost	Under $10,000
Potential Funding Source (s)	Jurisdiction, FEMA BRIC, FEMA HMGP

Responsible Department	Building Code, Planning, Public Works, City Administration
Implementation Schedule	2 - 3 Years
Target	Existing and future infrastructure

Single Hazard Actions

Mitigation Action	Construct Storm Drainage Infrastructure
Objective	This action proposes constructing new storm drainage infrastructure to reduce the potential impacts of future flood events.
Hazard	Flood
Priority	Low
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor and Council, Public Works, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Create Master Drainage Plan
Objective	This action proposes creating a master drainage plan for the City, in conjunction with the County, that will provide the City with a comprehensive planning document that provides basic information and necessary guidance for the county-wide drainage system, including but not limited to an H&H study.
Hazard	Flood
Priority	Medium
Estimated Cost	Less than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Planning, Public Works
Implementation Schedule	3 - 4 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement a New Flood Damage Prevention Ordinance
Objective	The City will re-evaluate existing flood damage prevention and reduction measures to identify strengths and weaknesses in order to develop and enforce a new flood damage prevention ordinance.
Hazard	Flood
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Planning, Public Works
Implementation Schedule	1 - 2 Years
Target	Existing and future infrastructure

Mitigation Action	Purchase Portable Pumps
Objective	This action proposes purchasing portable pumps to reduce the potential impacts of future flood events.
Hazard	Flood
Priority	Low
Estimated Cost	More than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor and Council, Planning, Public Works, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Wildfire Fuels Reduction in WUI
Objective	This action will develop and implement a program to identify and prioritize lands in the Wildland Urban Interface in need of fuels reduction and then reduce or remove wildfire fuels through various methods as appropriate.
Hazard	Wildfire
Priority	Medium
Estimated Cost	$10,000 - $100,000

Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Planning, Public Works, Fire Dept., City Administration
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Firewise Construction***
Objective	Incorporate Firewise construction methods and materials for future and proposed public facilities: Actions can include but are not limited to: fire resistant roofing materials, fire resistant exterior walls, data back-up systems, and establishing defensible space.
Hazard	Wildfire
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Building Code, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Develop a Community Wildfire Protection Plan***
Objective	Develop and implement a CWPP.
Hazard	Wildfire
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Planning, Fire Dept.
Implementation Schedule	1 - 2 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement a New Water Conservation Ordinance
Objective	City will re-evaluate all existing water conservation and reduction measures to identify strengths and weaknesses in order to develop and enforce a new water conservation ordinance.
Hazard	Drought
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works, City Administration
Implementation Schedule	1 - 2 Years
Target	Existing and future population and infrastructure

Mitigation Action	Develop and Implement a New Drought Contingency Plan
Objective	City will re-evaluate drought contingency plan to identify strengths and weaknesses in order to develop and enforce a new plan.
Hazard	Drought
Priority	Low
Estimated Cost	Less than $50,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works, City Administration
Implementation Schedule	2 - 4 Years
Target	Existing and planned infrastructure

Mitigation Action	Replace Water Fixtures with Low Flow Units
Objective	To limit water consumption at City-owned and maintained facilities, the City of Raymondville will adopt a policy of replacing water fixtures with low flow units.
Hazard	Drought
Priority	Low
Estimated Cost	More than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP

Responsible Department	Planning, Public Works
Implementation Schedule	3 - 5 Years
Target	Existing and Future infrastructure

Mitigation Action	Install Surge Protection and Grounding Systems to Protect Electronic Assets
Objective	This action will install surge protection at all City facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Lightning
Priority	Medium
Estimated Cost	$1,000 - $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works, City Administration
Implementation Schedule	2 - 3 Years
Target	Existing infrastructure

Mitigation Action	Conduct Dam Failure Studies
Objective	This action proposes conducting dam failure studies to determine potential inundation area and HHPD risks.
Hazard	Dam Failure
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Planning, Public Works, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Restrict Development in High Hazard Areas
Objective	Jurisdiction will re-evaluate all existing floodplain construction restrictions to identify strengths and weaknesses in order to produce a new ordinance that will reduce potential flood impacts due to dam / levee failure by restricting development in areas that may be subject to inundation due to dam / levee failure.
Hazard	Dam Failure
Priority	Medium
Estimated Cost	Under $10,000
Potential Funding Source (s)	Jurisdiction, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor and Council, Building Code, Planning, Ordinance, Public Works, City Administration
Implementation Schedule	2 - 3 Years
Target	Existing and future infrastructure