Navarro County Hazard Mitigation Action Plan

Navarro County, Texas

June 2015

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Chapter One: Introduction

1.1 Purpose

Navarro County is susceptible to a number of different natural hazards that have potential to cause property loss, loss of life, economic hardship, and threats to public health and safety. Occurrence of natural disasters cannot be prevented, however hazard mitigation measures are efforts taken before a disaster happens to minimize the impact that future disasters will have on people and property in the community.

Navarro County Multi-Jurisdictional Natural Hazard Mitigation Plan has been developed by the Navarro County Hazard Mitigation Planning Committee. The plan represents collective efforts of citizens, elected and appointed government officials, business leaders, volunteers of non-profit organizations, and other stakeholders.

Through the development of this plan, the Planning Committee has identified the natural hazards that could affect Navarro County, and has evaluated the risks associated with these hazards. The implementation of this plan will make Navarro County more disaster-resistant because the benefits that can be gained by planning ahead and taking measures to reduce damages before the next disaster strikes have been recognized. The plan will allow Navarro County and participating jurisdictions to comply with the Disaster Mitigation Act of 2000 (DMA 2000) and it's implementing regulations 44 CFR Part 201.6, thus resulting in eligibility to apply for Federal aid for technical assistance and post-disaster hazard mitigation project funding.

1.2 Navarro County Hazard Mitigation Action Plan Planning Process

The Navarro County Hazard Mitigation Action Plan (HazMAP) was created in order comply with current federal and state hazard mitigation plan regulations in compliance with the following rules and regulations:

> Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390)
> Federal Emergency Management Administration's Interim Final Rule, published in the Federal Register on February 26, 2002, at 44 CFR Part 201.

The Navarro County HazMAP is comprised of the following participating jurisdictions:

- Navarro County
- City of Corsicana
- City of Kerens

Each jurisdiction participated by having a Hazard Mitigation Team (HMT). Each HMT participated in the Hazard Mitigation Action Plan. The North Central Texas Council of Governments Emergency Preparedness Department participated in the HazMAP to assist in compiling the jurisdictional information and prepare the plan for submission. Navarro County Hazard Mitigation Action Plan Meetings were held on October 21, 2013.

1.3 HazMAP Planning Process Point of Contact and Demographics

The following are the points of contacts during the HazMAP planning process from October 21, 2013:

Navarro County
Emergency Management Coordinator

City of Corsicana
Fire Chief/Emergency Management Coordinator

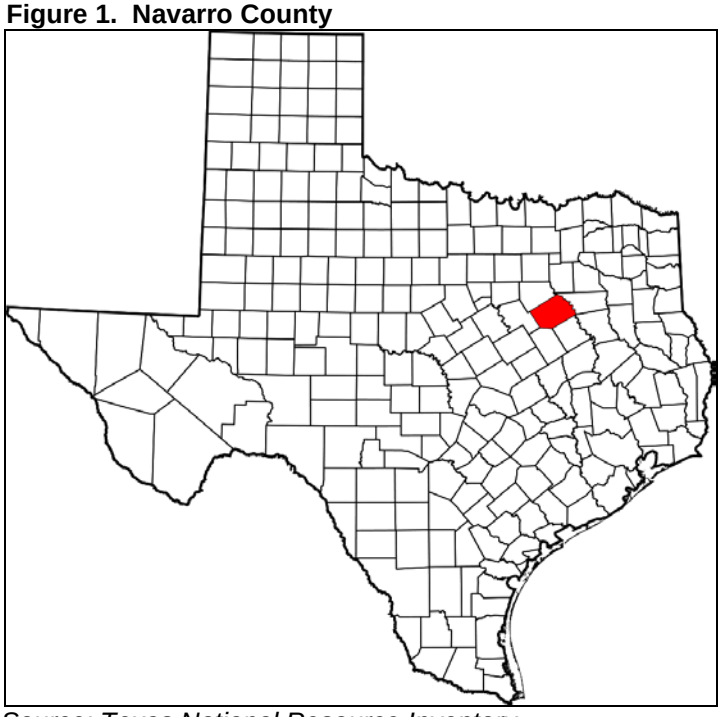
City of Kerens
City Secretary/Administrator

Participating Jurisdiction Population Profiles

Jurisdiction	2010 Population	2012 Population
Navarro County	47,735	48,250
City of Corsicana	23,770	23,790
City of Kerens	1,573	1,620

Source: North Central Texas Council of Governments Research and Information Services 2013 current population estimates, United States Census Bureau

Figure 1. Navarro County



Source: Texas National Resource Inventory

1.4 Navarro County Hazard Mitigation Action Plan Organization

The Navarro County Hazard Mitigation Action Plan is organized into five chapters which satisfy the mitigation requirements in 44 CFR Part 201, with an appendix providing the required supporting documentation.

Chapter One: Introduction

Describes the process and organization of the County Hazard Mitigation Action Plan (Navarro County Hazard Mitigation Action Plan)

Chapter Two: Planning Process

Describes the individual planning process and organization for each participating jurisdiction, satisfying requirements 201.6(c)(1), 201.6(b)(2), 201.6(b)(1), 201.6(b)(3), 201.6(c)(4)(iii), 201.6(c)(4)(i).

Chapter Three: Hazard Identification and Risk Assessment

Describes the hazards identified, known national extent scales, location of hazards, previous events, and jurisdictional profiles, satisfying requirements 201.6(c)(2)(i), 201.6(c)(2)(ii).

Chapter Four: Capabilities Assessment

The capability assessment examines the ability of Navarro County and participating jurisdictions to implement and manage a comprehensive mitigation strategy. The strengths, weaknesses, and resources of these jurisdictions are identified in this assessment as a means to develop an effective Hazard Mitigation Action Plan. 201.6 (c)(1).

Chapter Five: Mitigation Strategy

Describes the county-wide goals established by the County Hazard Mitigation Action Plan and the Mitigation Action Items for each jurisdiction, satisfying requirements 201.6(c)(3), 201.6(c)(3)(i), 201.6(c)(3)(ii), 201.6(c)(3)(iii), 201.6(c)(4)(ii).

Chapter Six: Maintenance Process

Describes the monitoring, evaluating, updating, plan incorporation, and future public updates for each participating jurisdiction, satisfying requirements 201.6(c)(4)(i), 201.6(c)(4)(ii), 201.6(c)(4)(iii).

Appendix A: Documentation from Planning and Public Meetings

1.5 Navarro County Hazard Mitigation Strategy Maintenance Process

The Navarro County Hazard Mitigation Action Plan will continue to collaborate as a planning group in coordination with the North Central Texas Council of Governments (NCTCOG) Emergency Preparedness Department. Primary contact will be through emails and conference calls with strategy meetings to occur at least annually. The Navarro County Office of Emergency Management will lead the plan maintenance and update processes by:

- Assisting jurisdictional Hazard Mitigation Teams in updating their individual contributions to the County HazMAP
- Assisting interested jurisdictions in the County who would like to begin their mitigation planning process
- Facilitating Navarro County HazMAP meetings and disseminating information
- Collaborating data for the county-wide sections
- Requesting updates and status-reports on planning mechanisms
- Requesting updates and status reports on mitigation action projects
- Assisting jurisdictions in mitigation grants
- Assisting jurisdictions in implementing mitigation goals and action projects
- Providing mitigation training opportunities
- Maintaining documentation of local adoption resolutions for the Navarro County Hazard Mitigation Action Plan

1.6 Navarro County Hazard Mitigation Action Plan Adoption

Once the Navarro County Hazard Mitigation Action Plan has received FEMA “Approved Pending Local Adoption” each participating jurisdiction will take the Navarro County HazMAP to their Commissioner’s Courts or City Councils for final public comment and local adoption. A copy of the resolution will be inserted into the Navarro County HazMAP and held on file at the North Central Texas Council of Governments.

Chapter Two: Planning Process

(In compliance with 201.6(c)(1))

Plan Development and Adoption Process

In order to apply for federal aid for technical assistance and post-disaster funding, local jurisdictions must comply with Part 201.3 of the Disaster Mitigation Act of 2000 implemented in the Federal Code of Regulations 44 CRF Part 201.6. While Navarro County has historically implemented measures to reduce their vulnerability to hazards, passage of DMA 2000 helped Navarro County officials to recognize the benefits of a long-term approach to hazard mitigation, which achieves a gradual decrease of impacts associated through the implementation of a Hazard Mitigation Plan. Navarro County's Hazard Mitigation Action Plan represents the collective efforts of all participating jurisdictions, the general public, and stakeholders.

Organizing the Planning Effort

A comprehensive county approach was taken in developing the plan. An open public involvement process was established for the public, neighboring communities, regional agencies, businesses, academia, etc. to provide opportunities for everyone to become involved in the planning process and to make their views known. The meetings were advertised with notices in public places and the local newspaper.

In accordance with Part 201.6(c)(5) of the Disaster Mitigation Act of 2000 (DMA 2000), Navarro County developed this Hazard Mitigation Action Plan. This plan identifies hazards and mechanisms to minimize future damages associated with these hazards, which threaten Navarro County and its jurisdictions.

Existing Data and Plans

Existing hazard mitigation information and other plans were reviewed during the development of the Hazard Mitigation Action Plan. Data was gathered through numerous sources, including GIS, statistical and qualitative. The table below outlines the numerous sources of data for the plan:

Source	Data Incorporation	Purpose
City and County Appraisal Data 2012	Population and demographics in Section 3.5 to 3.7	Population counts, parcel data and land use data
Regional Hazard Assessment Tool	Hazard occurrences in Section 3.2	Mapping for all hazards but wildfire
National Climatic Data Center (NCDC)	Hazard occurrences in Section 3.1 to 3.6	Previous event occurrences and mapping for all hazards
Texas Forest Service/Texas Wildfire Risk Assessment Summary Report	Wildfire Threat and Urban Interface in Section 3.1 to 3.2, 3.6	Mapping and Wildfire Vulnerability data
National Dam Inventory	Dam information in Section 3.1 to 3.3, 3.5, 3.6	High Hazard Dam list
FEMA DFIRM Flood Zones	Flood Zone Maps in Section 3.5	GIS mapping of flood zones

The data in this table was incorporated into Navarro County and all participating jurisdictions.

Planning Committee

This Hazard Mitigation Action Plan was developed by the Navarro County Hazard Mitigation Planning Team, with support of the North Central Texas Council of Governments. The efforts of the Planning Committee were led by the Navarro County Emergency Management Coordinator.

The Planning Committee was assembled in 2013 with representatives from all jurisdictions including, mayors, police chiefs, fire chiefs, and general public. Navarro County acted as the plan development consultant providing hazard mitigation planning services. The Table below provides a list of the primary entity representative for each jurisdiction on the planning team below.

Hazard Mitigation Team – Primary Representatives

Representing	Position	Role
Navarro County	EMC	General oversight & Plan Development
Navarro County	Commissioner	Plan development
Navarro County	Sherriff	Plan development
Navarro County	Chief Deputy	Plan development
Corsicana	City Manager	Plan development
Corsicana	EMC/Fire Chief	Plan development
Corsicana	GIS Technician	GIS & hazard analysis
Corsicana	Parks and Recreation Director	Plan development
Kerens	City Secretary	Plan development

See lists below for details of all jurisdictional participation

Navarro County served as the coordinator and lead agency for all jurisdictions, including the unincorporated areas of Navarro County, by accomplishing the following activities through the planning process:

1. Assigned the County's Emergency Management Coordinator to provide technical assistance and necessary data to the Planning Committee.
2. Scheduled, coordinated, and facilitated community meetings with the assistance of the Planning Committee.
3. Provided any necessary materials, handouts, etc. for public planning meetings.
4. Worked with the Planning Committee to collect and analyze data and develop goals and implementation strategies.
5. Prepared, based on community input and Planning Committee direction, the first draft of the plan and provided technical writing assistance for review, editing and formatting.
6. Coordinated with the stakeholders within the cities and the unincorporated areas of Navarro County during plan development.

Each of the individual jurisdictions participated in accomplishing similar activities associated with development of the plan as follows:

1. Coordinated input from representatives of neighborhood stakeholder groups and provided a representative to the County Planning Committee.
2. Attended regular meetings of the planning team as coordinated by Navarro County.
3. Assisted Navarro County staff with identifying hazards and estimating potential losses from future hazard events.
4. Assisted Navarro County in developing and prioritizing mitigation actions to address the identified risks.
5. Assisted Navarro County in coordinating public meetings to develop the plan.
6. Identified the community resources available to support the planning effort.
7. Worked for the support of neighborhood stakeholders for the recommendations resulting from the planning process.
8. Submitted the proposed plan to all appropriate departments for review and comment and worked with Navarro County to incorporate the resulting comments into the proposed plan.
9. All stakeholders listed above were contacted through email and Public Meeting Notices as shown in Appendix A. Subsequent to the State of Texas and FEMA approval of the plan, each organization is also committed to accomplishing the following activities:

External stakeholders involved in reviewing the Navarro County Hazard Mitigation Action Plan:

Representing	Position	Role
Mildred ISD	Superintendent	Review of plan
ARC Corsicana	Representative	Review of plan
Navarro County ESD	Board Member	Review of plan
LEPC	Chairperson	Review of plan
Corsicana ISD	Superintendent	Review of plan
Immaculate Conception Catholic Church	Friar	Review of plan
Dawson ISD	Superintendent	Review of plan
Navarro County CERT	Coordinator	Review of plan

All stakeholders listed above were contacted through email and Public Meeting Notices as shown in Appendix A. Subsequent to the State of Texas and FEMA approval of the plan, each organization is also committed to accomplishing the following activities:

Subsequent to the State of Texas and FEMA approval of the plan, each organization is also committed to accomplishing the following activities:

1. Appoint members to a Coordinating Committee to monitor and work toward plan implementation.
2. Publicize the plan to neighborhood interests and ensure that new

community members are aware of the plan and its contents.

3. Monitor progress in achieving the plan's goals through regular maintenance and implementation projects.

Planning Meetings

During the planning process, the Planning Committee met to obtain relevant information from the participating jurisdictions and to discuss the objectives and progress of the plan. The objectives of these meetings were to gather information and to provide guidance for each jurisdiction throughout the planning stages.

The following meetings were held by Navarro County and included all jurisdiction's participation:

- Navarro County Hazard Mitigation Kickoff Meeting – October 21, 2013
- Navarro County Hazard Analysis Meeting – November 26, 2013
- Navarro County Mitigation Strategy Meeting – April 2, 2014

Public Involvement

Support from the community is vital for any successful hazard mitigation plan. The Planning Committee provided opportunities, announced through public communication means, for public participation and input throughout the planning process prior to this draft and before approval of the finalized plan. Advertisement and sign in sheets for these meetings are located in Appendix A.

- The first public meeting was held on November 26, 2013 and advertised in the Corsicana Daily Sun and city website inviting the public, neighboring communities, local business, academia, agencies, and nonprofits to comment.

- A second opportunity was provided for public input on April 2, 2013. An advertisement was posted in the Corsicana Daily Sun and city website inviting the public, neighboring communities, local business, academia, agencies, and nonprofits to view and comment on the HazMAP prior to plan submission.

There were no comments received from the citizens, non-profits, businesses, academia, or interested parties. An additional opportunity for the public to comment on the plan will be held prior to formal plan adoption.

This provided all citizens, stakeholders, neighboring communities, agencies, businesses, academia, non-profit organizations, and all interested parties an opportunity to be involved in the planning process and to take part in the decision making process that affects the future of the communities that they live in.

Chapter Three: Hazard Identification and Risk Assessment

(In compliance with 201.6(c)(2)(i), 201.6(c)(2)(ii), 201.6(c)(2)(ii)(A), 201.6(c)(2)(ii)(B), 201.6(c)(2)(ii)(C), & 201.6(c)(2)(iii))

Chapter Three of the Navarro County Hazard Mitigation Action Plan (HazMAP) is a hazard identification and risk assessment that provides the factual basis for the action items described in Chapter Five. This information serves to enable the participating jurisdictions to identify and prioritize the appropriate mitigation action items to reduce losses from the identified hazards. Hazards are identified and profiled to include the location and extent of each hazard, detailed previous occurrences, and probability of future events data.

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3.1 Profiling Hazards and Vulnerabilities

The Hazard Mitigation Action Plan for Navarro County is a tool to assist in the identification and documentation of all the hazards faced in the region.

The Navarro County profile is one of many developed by the North Central Texas Council of Governments (NCTCOG) under the FEMA Hazard Mitigation program. These plans are created by compiling data from NCTCOG regional natural hazards risk assessments, damage assessments, hazard profiling and identification as well as historical data and geographic information. Of the 15 hazards identified in the State of Texas Hazard Mitigation Action Plan, only 11 will be discussed in this plan. The remaining four (expansive soils, land subsidence, coastal erosions, and hurricane/tropical storm) will not be discussed due to their lack of impact on the Navarro County planning area.

Hazards Addressed The Navarro County Hazard Mitigation Action Plan has identified the following 10 natural hazards as having the potential to cause damage in the county. Wildland fire, flooding, and dam failure are the only hazards recognized to have predictable vulnerable areas. All other hazards are equally likely to occur geographically throughout Navarro County and participating jurisdictions. Also identified in this section are areas that may be more vulnerable to each hazard in the event of an occurrence.

Dam Failure A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings. A dam failure is an accidental or unintentional collapse, breach, or other failure of an impoundment structure that results in downstream flooding. Because dams are man-made structures, dam failures are usually considered technological hazards. However, since most dam failures result from prolonged periods of rainfall, they are often cited as secondary or cascading effects of natural flooding disasters and are not named as the primary hazard that causes disaster declarations.

While no record could be found of any previous dam failures in Navarro County, three things are clear: 1) many of the dams in Navarro County are nearing the end of their designed project lives, 2) many of these dams are in desperate need of detailed evaluations and consistent maintenance, and 3) increased development downstream of the dams has put more people, property, and infrastructure at risk.

Based on a quantitative analysis of the dams currently in place in Navarro County and a qualitative analysis of the potential impacts that dam failures would have on the social, economic, and environmental components of the region, the risk of a dam failure hazard is moderate.

There have not been any inundation studies for the dams in Navarro County and the County does not have information from the owners or Emergency Operations Plans for the dams. Therefore, the County has chosen to cite a data deficiency and include an action item to research better inundation data before the next update. In addition, the NCTCOG is applying for mitigation grant funding to complete dam inundation studies for a majority of the high hazard dams in the region, to be complete 1 year from now. The data below is from the National Inventory of Dams (NID):

Jurisdiction	Dam Name	Hazard Potential	Completion Year	Owner Type	Dam Height (Ft.)	Water Supply (acre-feet)	Primary Purpose	River	Distance to a City (Mi.)	Condition Assessment
Corsicana	Chambers Creek Ws Scs Site 139 Dam	High	1961	Not Listed	87	323879	Water Supply	Richland Creek	21	Fair
Navarro County	Chambers Creek Ws Scs Site 129 Dam	High	1962	Not Listed	25	2119	Flood Control	Lockheart Branch	-	Not Rated
Navarro County	Navarro Mills Lake	High	1963	Federal	25	3017	Flood Control	TR-Post Oak Creek	0.5	Satisfactory
Navarro County	Richland Creek Ws Scs Site 108 Dam	High	1971	Not Listed	30	740	Flood Control	Larkin Hill Creek	-	Not Rated
Navarro County	Richland Creek Ws Scs Site 137a Dam	High	1971	Not Listed	28	795	Flood Control	TR-Briar Creek	-	Not Rated
Navarro County	Richland Creek Ws Scs Site 137g Dam	High	1971	Not Listed	29	5380	Flood Control	Briar Creek	-	Not Rated
Navarro County	Richland Creek Ws Scs Site 138 Dam	High	1973	Not Listed	29	2499	Flood Control	TR-Briar Creek	-	Not Rated

Drought Drought can be defined as a water shortage caused by the natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. It can be aggravated by other factors such as high temperatures, high winds, and low relative humidity. Texas experiences a cycle of extended wet and drought conditions that can extend over a period of months even years. Extended periods of drought can have an enormous impact on an area by affecting the abundance of water supply, the agriculture economy, and foundations of structures. Drought may affect the entire planning area equally.

> **Unincorporated Navarro County** Drought conditions may occur at any time throughout the year, and are typically exacerbated by extreme heat. The agriculture industry is typically effected the hardest due to a lack of crops, water for livestock, and feed. As a drought continues, many residents who are on private wells as well as those served by small water utilities begin to experience water shortages. The lack of water can also impact emergency responder capabilities in the form of firefighting efforts.
>
> **City of Corsicana** The City of Corsicana is the primary water supplier for the entire county. Restrictions caused by a drought affects local revenues significantly, can have major impacts on local industry, impacts fire protection and greatly impacts local agriculture.
>
> **City of Kerens** According to the city of Kerens, all property and populations are vulnerable to drought. .

Earthquake An earthquake is a sudden motion or trembling caused by an abrupt release of accumulated strain on the tectonic plates that comprise the Earth's crust. The theory of plate tectonics holds that the Earth's crust is broken into several major plates. These rigid, 50- to 60-mile thick plates move slowly and continuously over the interior of the earth, meeting in some areas and separating in others. As the tectonic plates move together they bump, slide, catch, and hold. Eventually, faults along or near plate boundaries slip abruptly when the stress exceeds the elastic limit of the rock, and an earthquake occurs. The ensuring seismic activity and ground motion provoke secondary hazards: surface faulting, ground failure, and tsunamis. The vibration or shaking of the ground during an earthquake is referred to as ground motion. In general, the severity of ground motion increases with the amount of energy released and decreases with distance from the causative fault or epicenter. When a fault ruptures, seismic waves are propagated in all directions, causing the ground to vibrate at frequencies ranging from 0.1 to 30 Hz. Seismic waves are referred to as P waves, S waves, and surface waves. Due to the risk being associated to a distant quake, earthquakes may affect the entire planning area equally.

There is no history of earthquakes occurring within Navarro County, however, there have been earthquakes measuring up to 3.7 on the Richter scale in nearby counties.

The most likely risk to a significant earthquake event is associated to either a distant larger quake which might occur in Missouri, Tennessee, or Oklahoma, though these earthquakes are probable to occur only once every 500 years.

> **Unincorporated Navarro County** According to unincorporated Navarro County, all property and populations have the potential to be vulnerable to earthquakes.

City of Corsicana According to the city of Corsicana, all property and populations have the potential to be vulnerable to earthquakes.

City of Kerens According to the city of Kerens, all property and populations have the potential to be vulnerable to earthquakes.

Extreme Heat Extreme heat is characterized by a combination of a very high temperatures and exceptionally humid conditions. When persisting over a period of time, it is called a heat wave. Extreme heat can also be a factor that drastically impacts drought conditions as high temperatures lead to an increased rate of evaporation. Extreme heat can also lead to heat stroke and even death in vulnerable populations such as the elderly and the very young if exposed to the high temperatures for an extended period of time. Extreme heat may affect the entire planning area equally.

Unincorporated Navarro County Extreme heat happens regularly and often for extended periods of time during the June through September timeframe. Extended extreme heat can cause a rapid and continual loss of moisture in vegetation leading to an escalation of wildfires. As much of the unincorporated area of the county is considered rural, there exists a large farming and ranching base. Extreme heat leads to cascading effects that typically contribute greatly to losses in these related industries.

City of Corsicana The City of Corsicana has the potential during heat emergencies to exceed capabilities of our local hospital and Emergency Medical System due to a large elderly population and lower income areas that do not have adequate cooling capabilities. Another area of concern is the potential for large grass fires sweeping through older residential areas, mobile home and RV parks.

City of Kerens According to the city of Kerens, all property and populations are vulnerable to extreme heat.

Flooding Flooding is defined as the accumulation of water within a water body and the overflow of excess water onto adjacent floodplain lands. The floodplain is the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that is susceptible to flooding. The statistical meaning of terms like “25-year storm” and “100-year flood” can be confusing. Simply stated, a floodplain can be located anywhere; it just depends on how large and how often a flood event occurs. Floodplains are those areas that are subject to inundation from flooding. Floods and the floodplains associated with them are often described in terms of the percent chance of a flood event happening in any given year. As a community management or planning term, “floodplain” most often refers to an area that is subject to inundation by a flood that has a one percent chance of occurring in any given year (commonly and incorrectly referred to as the 100-year floodplain). Common flooding hazards within the planning area include flood hazards from flash flooding and from new development.

A flash flood is a rapid flood that inundates low-lying areas in less than six hours. This is caused by intense rainfall from a thunderstorm or several thunderstorms. Flash floods can also occur from the collapse of a man-made structure or ice dam. Construction and development can change the natural drainage and create brand new flood risks as new buildings, parking lots, and

roads create less land that can absorb excess precipitation from heavy rains, hurricanes, and tropical storms. Flash floods are a high risk hazard since they can roll boulders, tear out trees, and destroy buildings and bridges.

Unincorporated Navarro County According to Unincorporated Navarro County, all property and populations are vulnerable to flood events.

City of Corsicana According to the city of Corsicana, all property and populations are vulnerable to flood events.

City of Kerens According to the city of Kerens, all property and populations are vulnerable to flood events.

Hail Hail occurs when, at the outgrowth of a severe thunderstorm, balls or irregularly shaped lumps of ice greater than 0.75 inches in diameter fall with rain. Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to warm air rising rapidly into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation. Hail may affect the entire planning area equally.

Unincorporated Navarro County All areas of Navarro County are susceptible to damaging hail. There is variety of structure grades throughout Navarro County, and most will sustain damaged by large hail. A majority of the mobile homes are older and are constructed of lightweight materials. Because of the rural nature of Navarro County, there are limited buildings and shelters available to the public in the event of a severe hail storm.

City of Corsicana City of Corsicana covers a large area with a higher population ratio than the more rural areas in Navarro County. Damage in the city due to hail could result in a much higher loss.

City of Kerens According to the city of Kerens, all property and populations are vulnerable to hail.

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High Winds Wind is defined as the motion of air relative to the earth's surface. The horizontal component of the three-dimensional flow and the near-surface wind phenomenon are the most significant aspects of the hazard. Straight-line winds are often responsible for the wind damage associated with a thunderstorm. These winds are often confused with tornados because of similar damage and wind speeds. However, the strong and gusty winds associated with straight-line winds blow roughly in a straight line unlike the rotating winds of a tornado. Downbursts or micro-bursts are examples of damaging straight-line winds. A downburst is a small area of rapidly descending rain and rain-cooled air beneath a thunderstorm that produces a violent, localized downdraft covering 2.5 miles or less. Wind speeds in some of the stronger downbursts can reach 100 to 150 miles per hour, which is similar to that of a strong tornado. The winds produced from a downburst often occur in one direction, and the worst damage is usually on the forward side of the downburst. High winds may affect the entire planning area equally.

Unincorporated Navarro County High winds are a frequent occurrence with severe thunderstorms and they can affect all areas of Navarro County. With the rural nature of

the county, areas affected may pose access challenges due to fallen trees on roadways. High winds can occur suddenly and without warning during severe weather. There have been instances where mobile homes have been rolled over while occupied. Outside of primary residential structures, there are few locations for the public to seek shelter during high winds.

City of Corsicana The City of Corsicana typically has power outages, fires, damage to roofs, cars, out buildings, and electrical utilities due to high winds. These events create significant planning and recovery issues.

City of Kerens According to the city of Kerens, all property and populations are vulnerable to high winds.

Lightning Lightning results from the buildup and discharge of electrical energy between positively and negatively charged areas within thunderstorms. A “bolt” or brilliant flash of light is created when the buildup becomes strong enough. These bolts of lightning can be seen in cloud-to-cloud or cloud-to-ground strikes.

Bolts of lightning can reach temperatures approaching 50,000° Fahrenheit. While lightning is mostly affiliated with thunderstorms, lighting often strikes outside of these storms, as far as 10 miles away from any rainfall. Federal Emergency Management Agency states that an average of 300 people are injured and 80 people are killed in the United States each year by lighting. Direct strikes have the power to cause significant damage to buildings, critical facilities, infrastructure, and ignition of wildfires which can result in widespread damages to property.

Unincorporated Navarro County Lightning can occur anywhere in Navarro County. Primary threats from lightning include serious injury/death if struck, power loss, and damage to directly affected structures.

City of Corsicana According to the City of Corsicana, lightning affects all populations and property equally.

City of Kerens According to the city of Kerens, all property and populations are vulnerable to lightning.

Tornado A tornado is a violently rotating column of air, in contact with the ground, both pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a condensation funnel. Tornados may affect the entire planning area equally.

Unincorporated Navarro County Tornados are one of the most unpredictable events and have the ability to occur with little warning and no predictable pattern. Throughout the County, there are many developments that are all or nearly all mobile home type structures that will offer little to limited protection. In addition, without the capability for specific zoning or building codes, several permanent structure are prone to severe damage in the event of a direct strike by a tornado. Early detection and warning are key when it comes to this type of hazard. Due to the large area in the unincorporated parts of

Navarro County, radar coverage, spotter operations, warning capabilities and adequate sheltering are key to mitigating effects from a tornado.

City of Corsicana Tornados are likely to occur within the City of Corsicana as they are within any other area in Navarro County. Special issues concerning a tornado incident within the City as due to a larger population of special needs residents within nursing homes. An additional concern is the vast numbers of large trees in the residential areas that could impact power lines and the restriction into areas needing assistance due to trees and limbs blocking roadways.

City of Kerens According to the city of Kerens, all property and populations are vulnerable to tornados.

Wildland Fire Wildland fire is any fire occurring on grassland, forest, or prairie, regardless of ignition source, damages or benefits. Wildland fires are fueled almost exclusively by natural vegetation. They typically occur in national forests and parks, where federal agencies are responsible for fire management and suppression. Interface or intermix fires are urban/wildland fires in which vegetation and the built-environment provide fuel. Firestorms are events of such extreme intensity that effective suppression is virtually impossible. Firestorms occur during extreme weather and generally burn until conditions change or the available fuel is exhausted. Wildland fires affect the entire planning area equally. For the purposes of this hazard analysis, wildland fires are assessed under what is known as the Wildland Urban Interface (WUI). The WUI is an area of development that is susceptible to wildland fires due to the amount of structures located in an area with vegetation that can act a fuel for a wildland fire.

Unincorporated Navarro County 66% of the county's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Corsicana 39% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Kerens 75% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

Winter Storms Winter storms originate as mid-latitude depressions or cyclonic weather systems, sometimes following the path of the jet stream. A winter storm or blizzard combines heavy snowfall, high winds, extreme cold and ice storms. Many winter depressions give rise to exceptionally heavy rain and widespread flooding and conditions worsen if the precipitation falls in the form of snow. The winter storm season varies widely, depending on latitude, altitude and proximity to moderating influences. Winter storms affect the entire planning area equally. Cold snaps in which temperatures fall below the freezing point of 32° Fahrenheit do happen on an annual basis in the planning area and can lead to issues with infrastructure, especially frozen roads and bridges.

Unincorporated Navarro County Winter storms typically effect a majority of the county when they do occur and have multiple impacts including but not limited to travel, power, and exposure for certain age groups. With the potential for freezing precipitation, icing of roadways are of an utmost concern. Major roadways such as Interstate Highway 45,

State Highways 22 and 31, and US 287 would be given priority for surface treatment. Rural roadways are typically not given the same priority and this could potentially strand a large percentage of the population as well as limit first responder access during an emergency. Winter storms have the potential to cause power outages in large portions of the county, especially during heavy icing events. As with any extreme event, extreme cold during winter storms has the potential to effect large portions of county if shelter/warming centers are not available.

City of Corsicana The city has three major highways, IH 45, Hwy 287, and Hwy 31, that can be impacted during winter storms. Areas impacted include local commerce, exceeding the capabilities of our local hospital, over extending local capabilities to shelter stranded motorist, particularly those traveling between Dallas and Ft Worth.

City of Kerens According to the city of Kerens, all property and populations are vulnerable to winter storms.

3.2 Location of Hazards

The following maps illustrate the location of the hazards in Navarro County. Maps concerning tornado and hail incidents are in reverence to previous events as they have the potential to occur equally throughout the county. Winter storms, extreme heat, and drought have the potential to occur equally throughout the county and their previous events data is not represented by a map. Likewise, it is assumed that those hazard listed as having the potential to occur equally throughout the HazMAP planning area will affect the area as described in each city's critical infrastructure and land use maps B.1-B.3, in this section.

Map Series A **Dams and Flood Zones**

Map A.1 Navarro County Dams and Flood Zones
Map A.2 City of Corsicana Dams and Flood Zones
Map A.3 City of Kerens Dams and Flood Zones

Map Series B **Land Use, Critical Infrastructure, and Flood Zones**

Map B.1 Navarro County Land Use, Critical Infrastructure, and Flood Zones
Map B.2 City of Corsicana Land Use, Critical Infrastructure, and Flood Zones
Map B.3 City of Kerens Land Use, Critical Infrastructure, and Flood Zones

Map Series C **Hail Incident**

Map C.1 Navarro County Hail Incidents
Map C.2 City of Corsicana Hail Incidents
Map C.3 City of Kerens Hail Incidents

Map Series D **Tornado Incident**

Map D.1 Navarro County Tornado Incidents
Map D.2 City of Corsicana Tornado Incidents
Map D.3 City of Kerens Tornado Incidents

Map Series E **Wildfire Risk Assessment**

Map E.1 Navarro County Wildfire Risk
Map E.2 City of Corsicana Wildfire Risk
Map E.3 City of Kerens Wildfire Risk

Map Series F **Wildland Urban Interface**

Map F.1 Navarro County Wildland Urban Interface
Map F.2 City of Corsicana Wildland Urban Interface
Map F.3 City of Kerens Wildland Urban Interface

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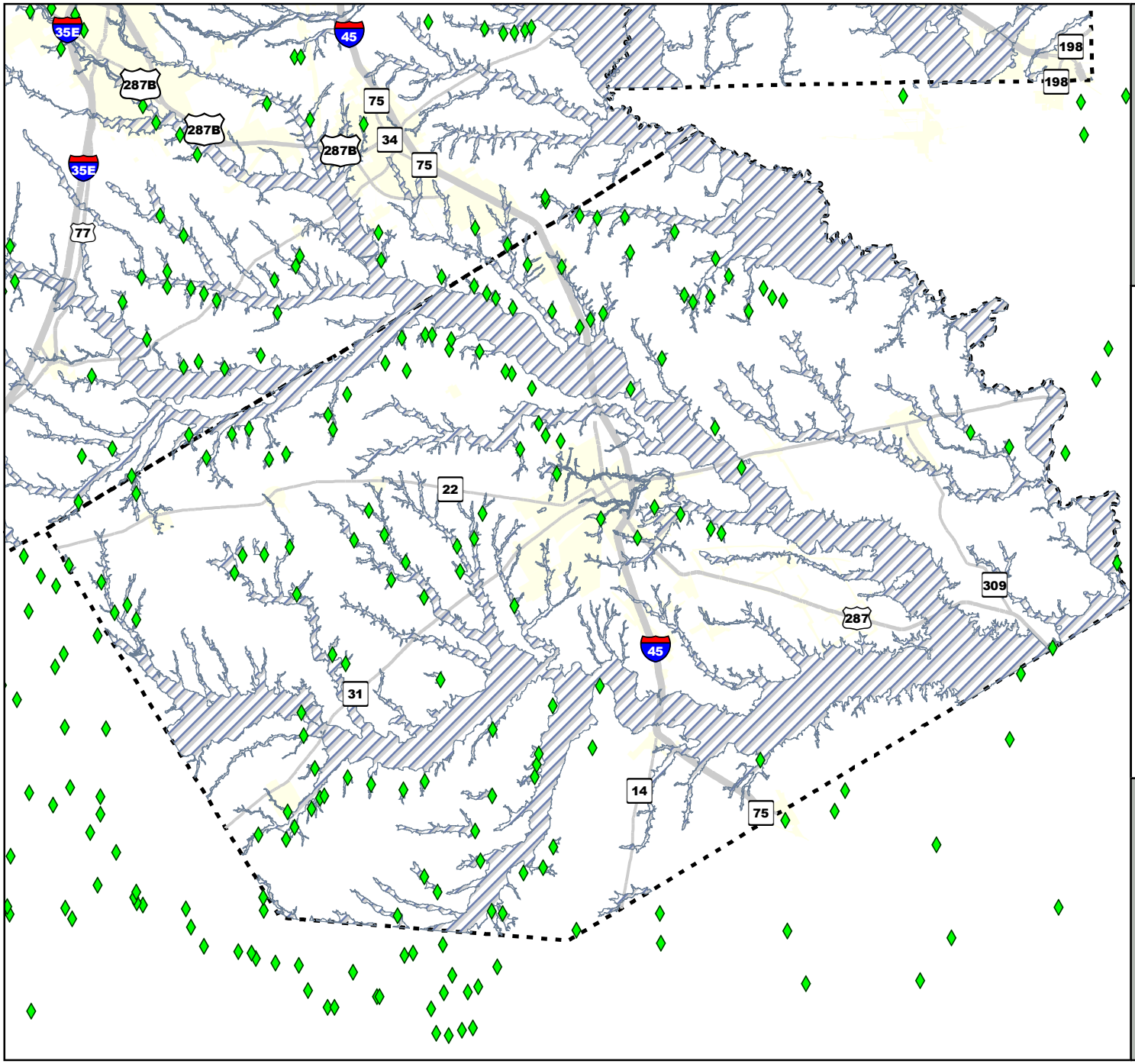

Map A.1

Navarro County

FEMA DFIRM FLOOD ZONES 2012

ZONE

- 100 Year
- 100 Year (Detail)
- 500 Year
- DAMS

4 2 0 4 Miles

N
W E
S

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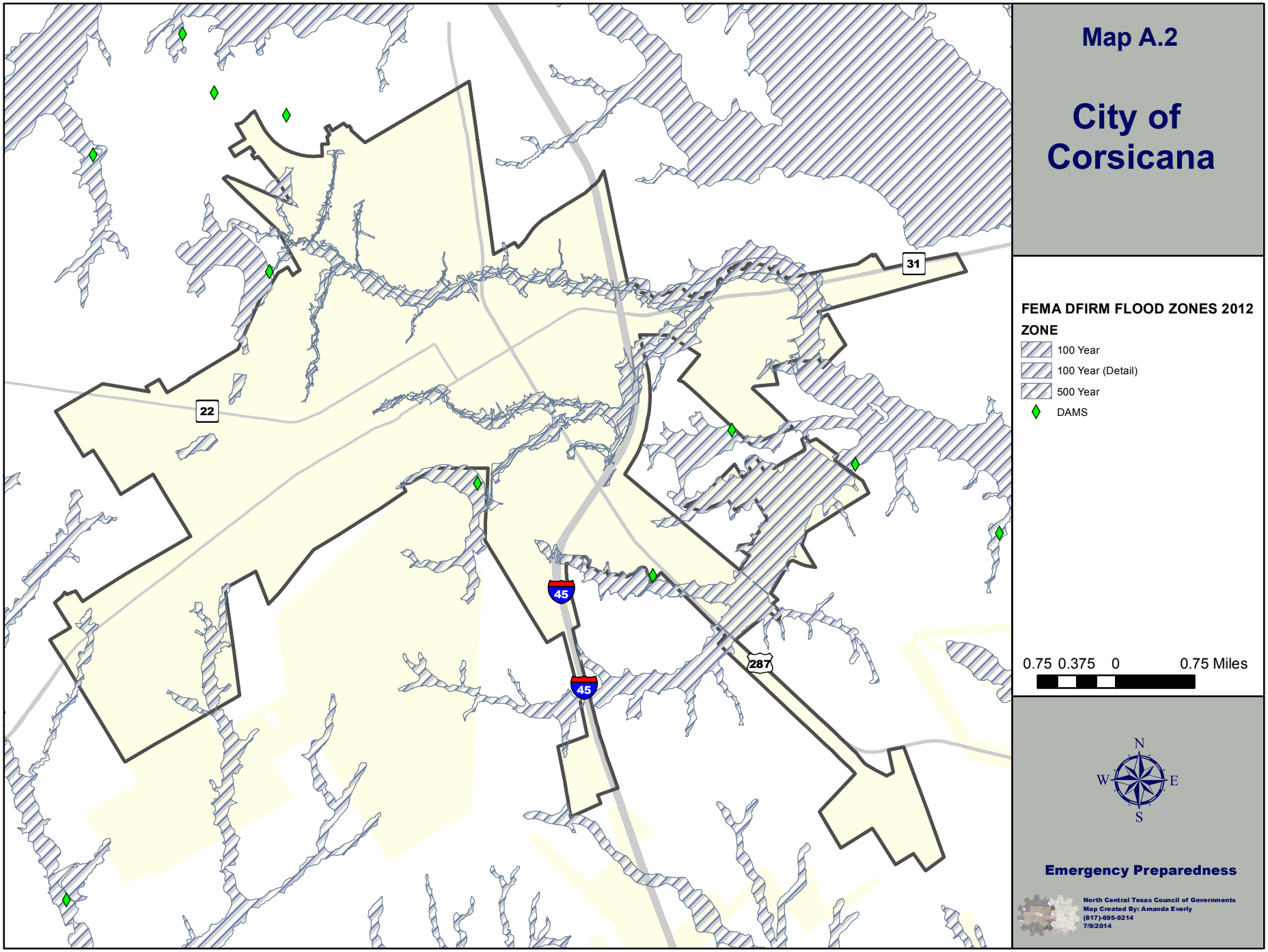
Map A.2
City of Corsicana
FEMA DFIRM FLOOD ZONES 2012
ZONE
100 Year
100 Year (Detail)
500 Year
DAMS
22
31
45
45
287
0.75 0.375 0 0.75 Miles
N
W
E
S
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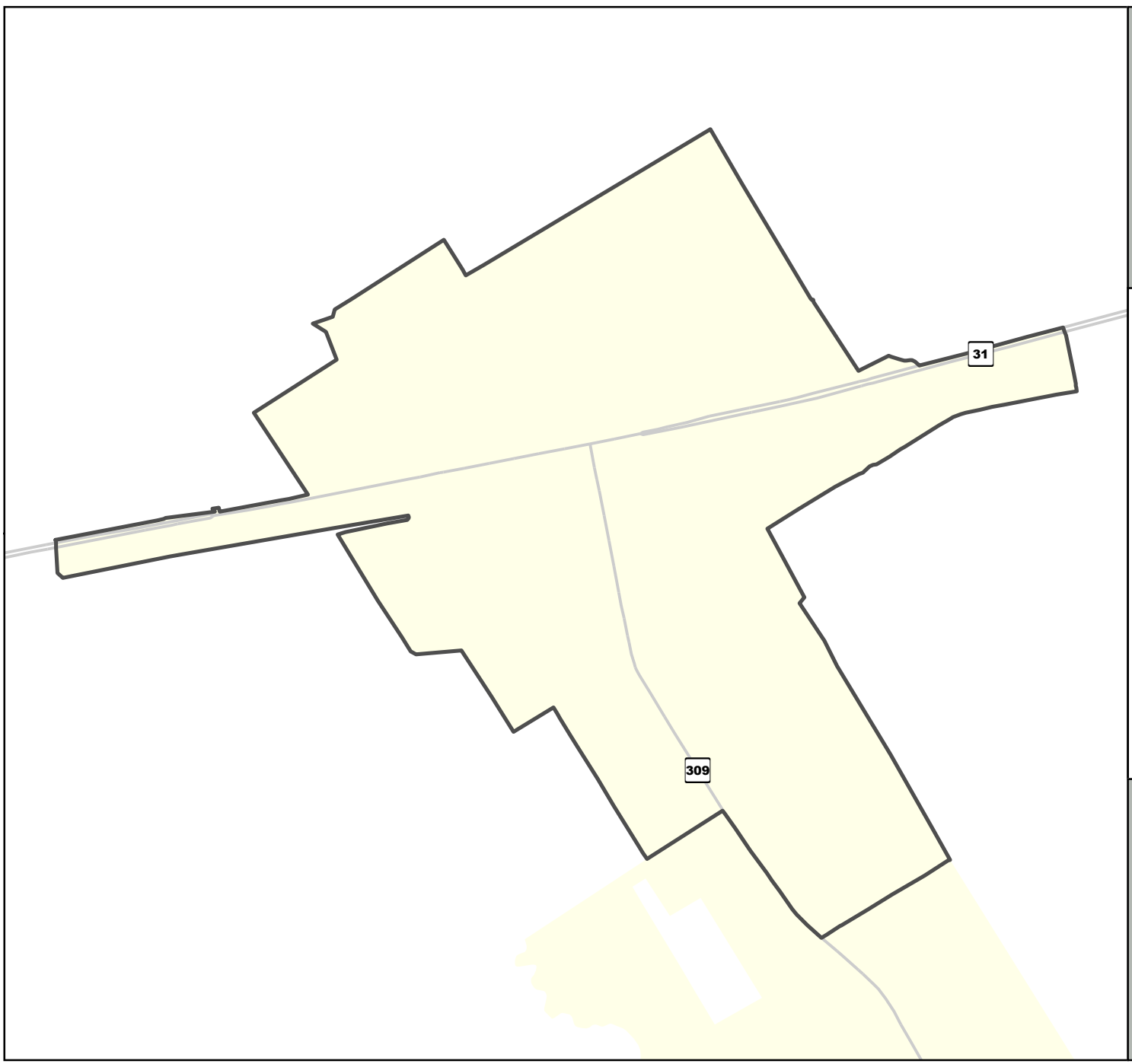
Map A.3

City of Kerens



0.25 0.125 0 0.25 Miles

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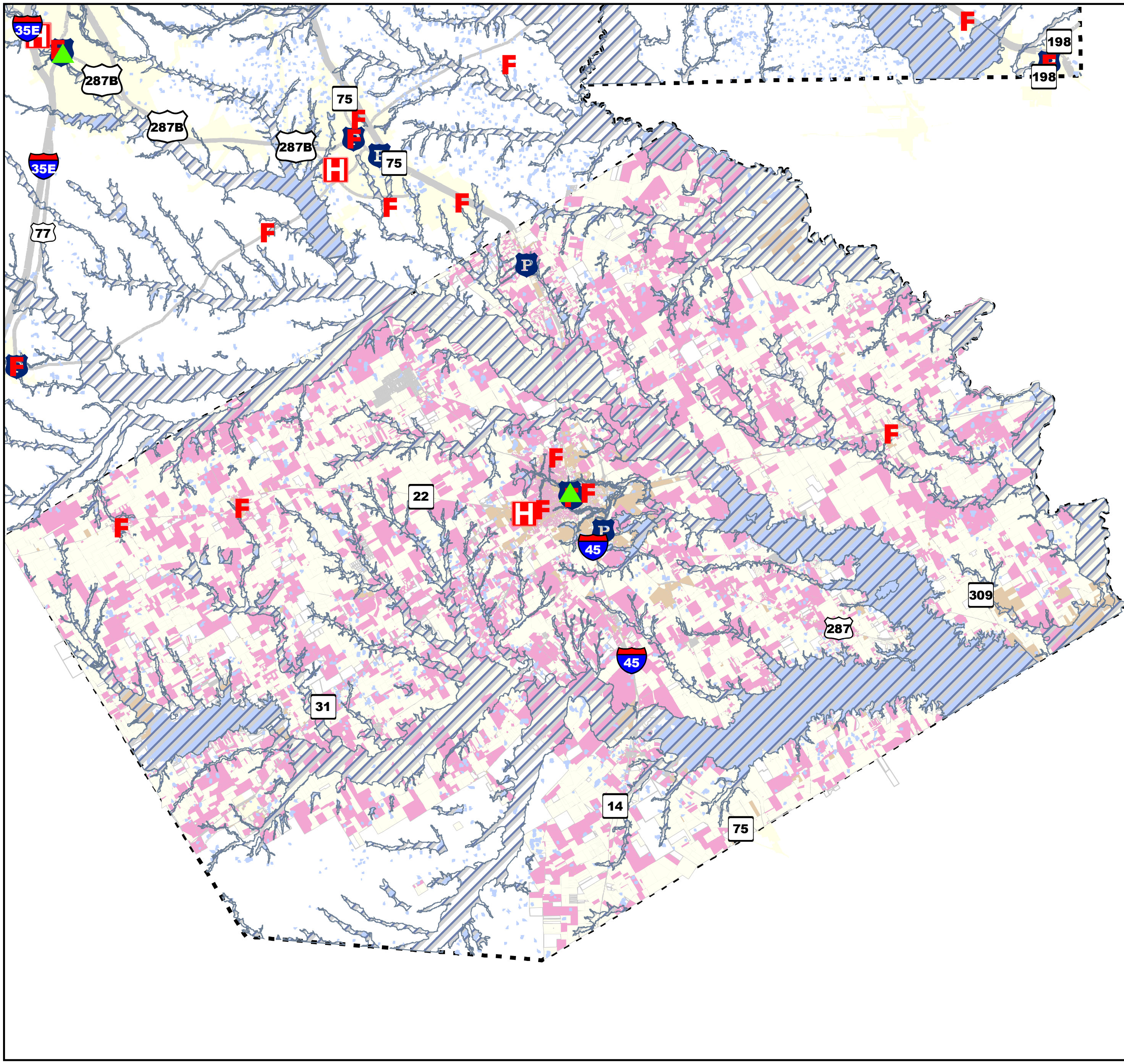
Map B.1

Navarro County



FEMA DFIRM FLOOD ZONES 2012

ZONE

- 100 Year
- 100 Year (Detail)
- 500 Year
- Residential
- Commercial/Utility
- Undeveloped
- No Data Available
- Emergency Management
- Fire
- Police
- Hospital

4 2 0 4 Miles

N W E S

Emergency Preparedness

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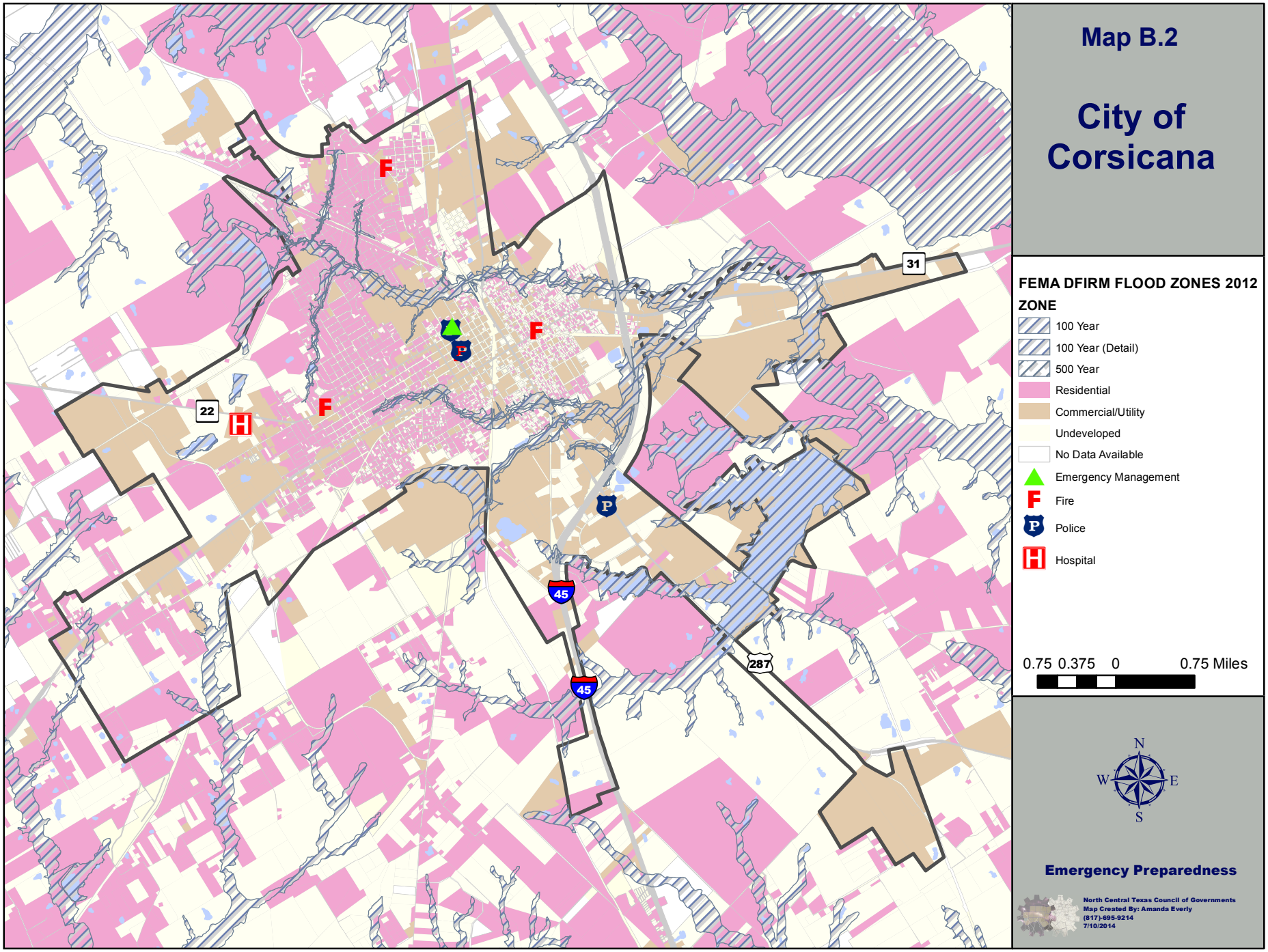
Map B.2
City of Corsicana
FEMA DFIRM FLOOD ZONES 2012
ZONE
100 Year
100 Year (Detail)
500 Year
Residential
Commercial/Utility
Undeveloped
No Data Available
Emergency Management
Fire
Police
Hospital
0.75 0.375 0 0.75 Miles
N
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Emergency Preparedness
North Central Texas Council of Governments
Map Created By: Amanda Everly
(817)-695-9214
7/10/2014
F
F
F
P
P
H
22
31
45
45
287

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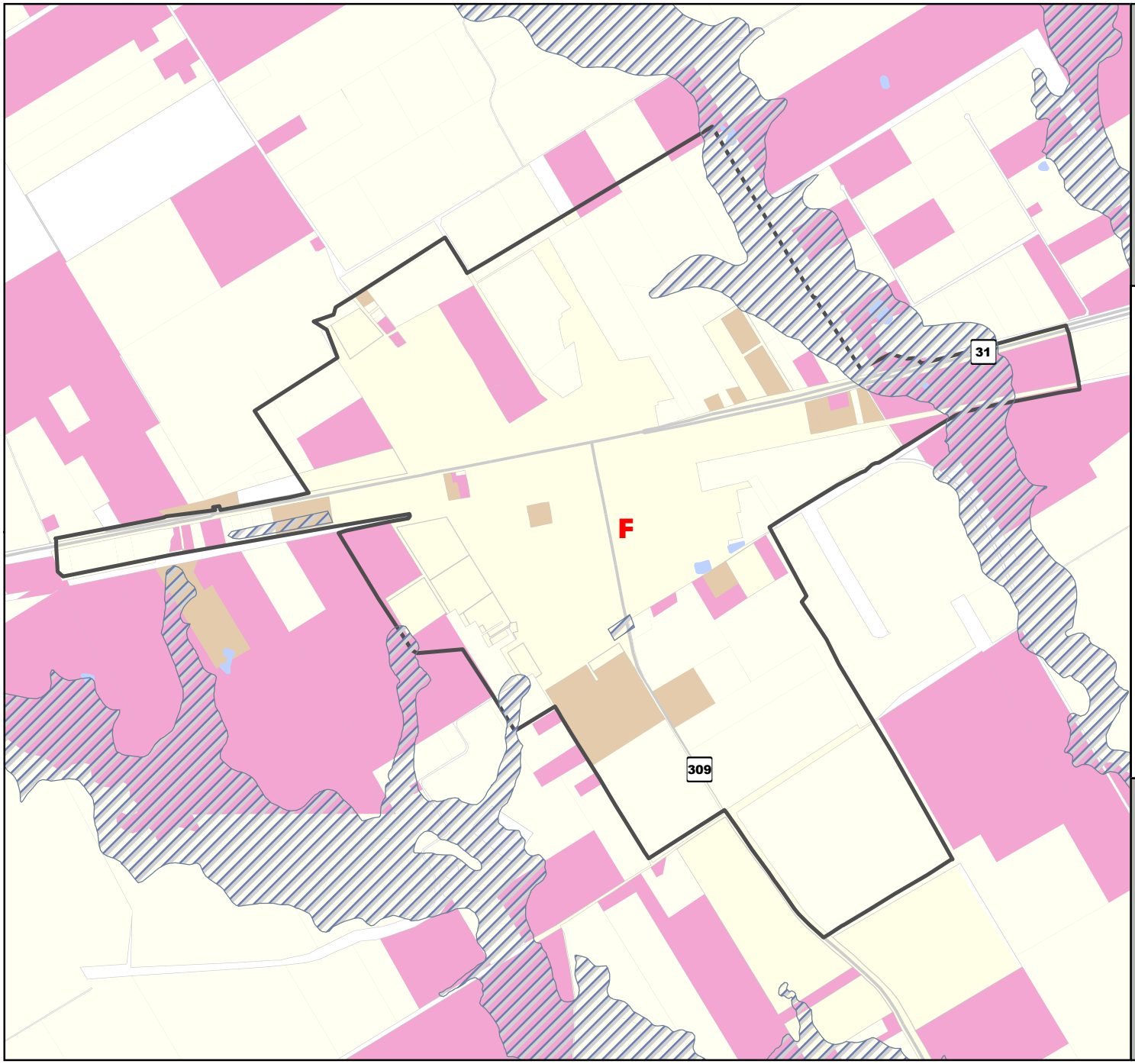

Map B.3

City of Kerens

FEMA DFIRM FLOOD ZONES 2012

ZONE

- 100 Year
- 100 Year (Detail)
- 500 Year
- Residential
- Commercial/Utility
- Undeveloped
- No Data Available
- Emergency Management
- Fire
- Police
- Hospital

0.25 0.125 0 0.25 Miles

N
W E
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Emergency Preparedness

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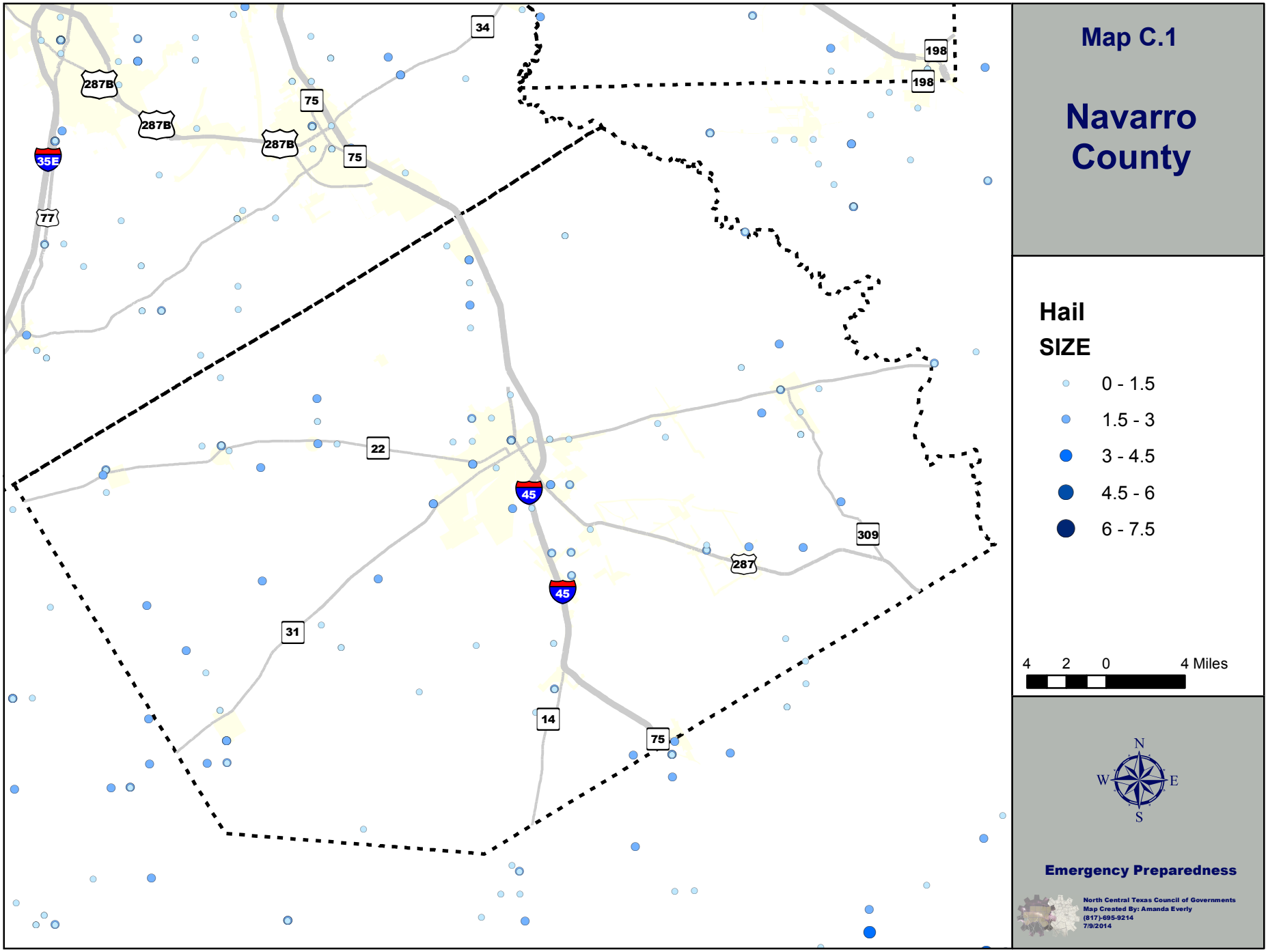
Map C.1
Navarro County
Hail
SIZE
0 - 1.5
1.5 - 3
3 - 4.5
4.5 - 6
6 - 7.5
4 2 0 4 Miles
N
W
E
S
Emergency Preparedness
North Central Texas Council of Governments
Map Created By: Amanda Everly
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7/9/2014
34
198
198
287B
287B
287B
75
75
35E
77
22
45
45
309
287
31
14
75

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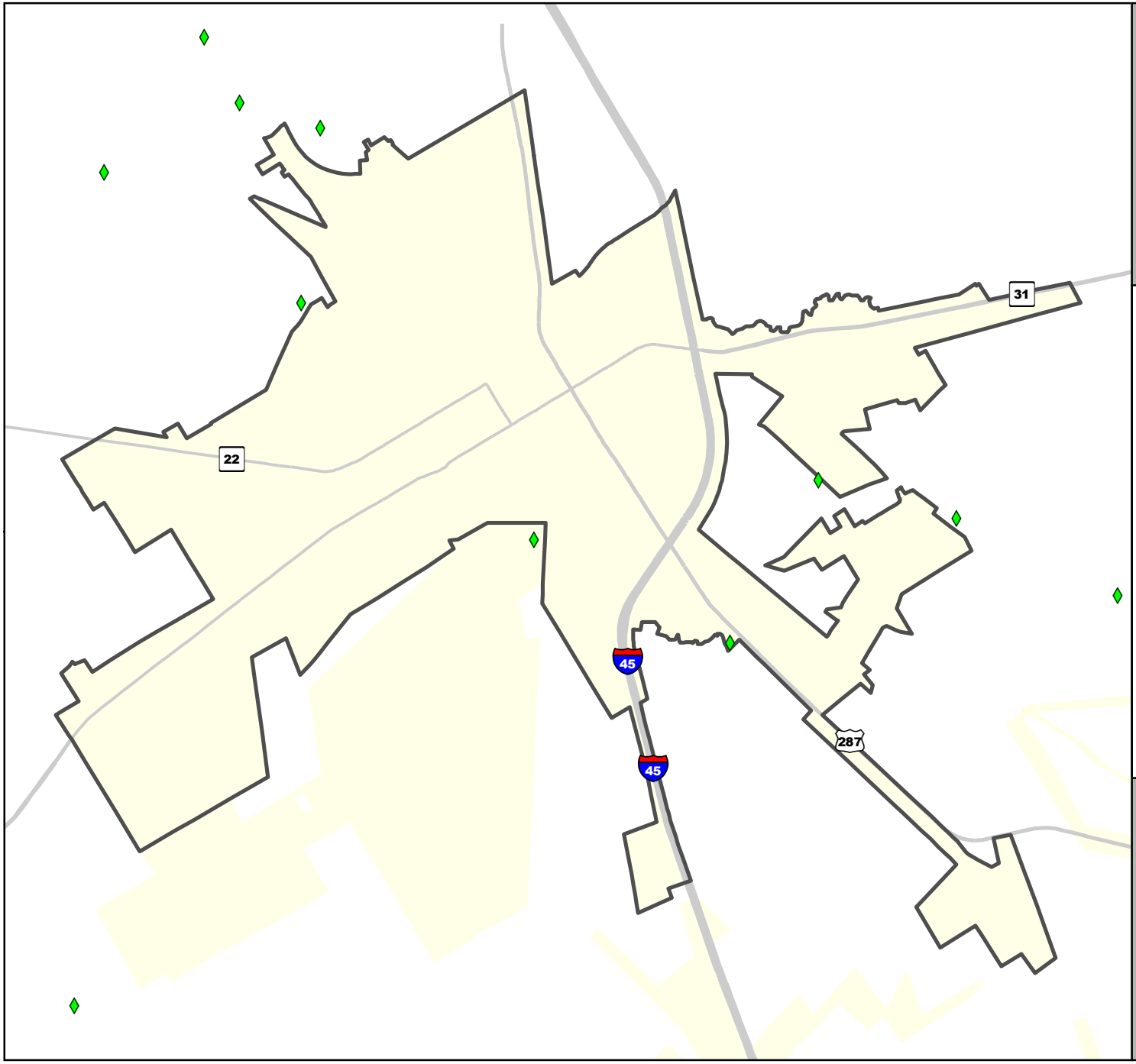

Map C.2

City of Corsicana

0.75 0.375 0 0.75 Miles

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Emergency Preparedness

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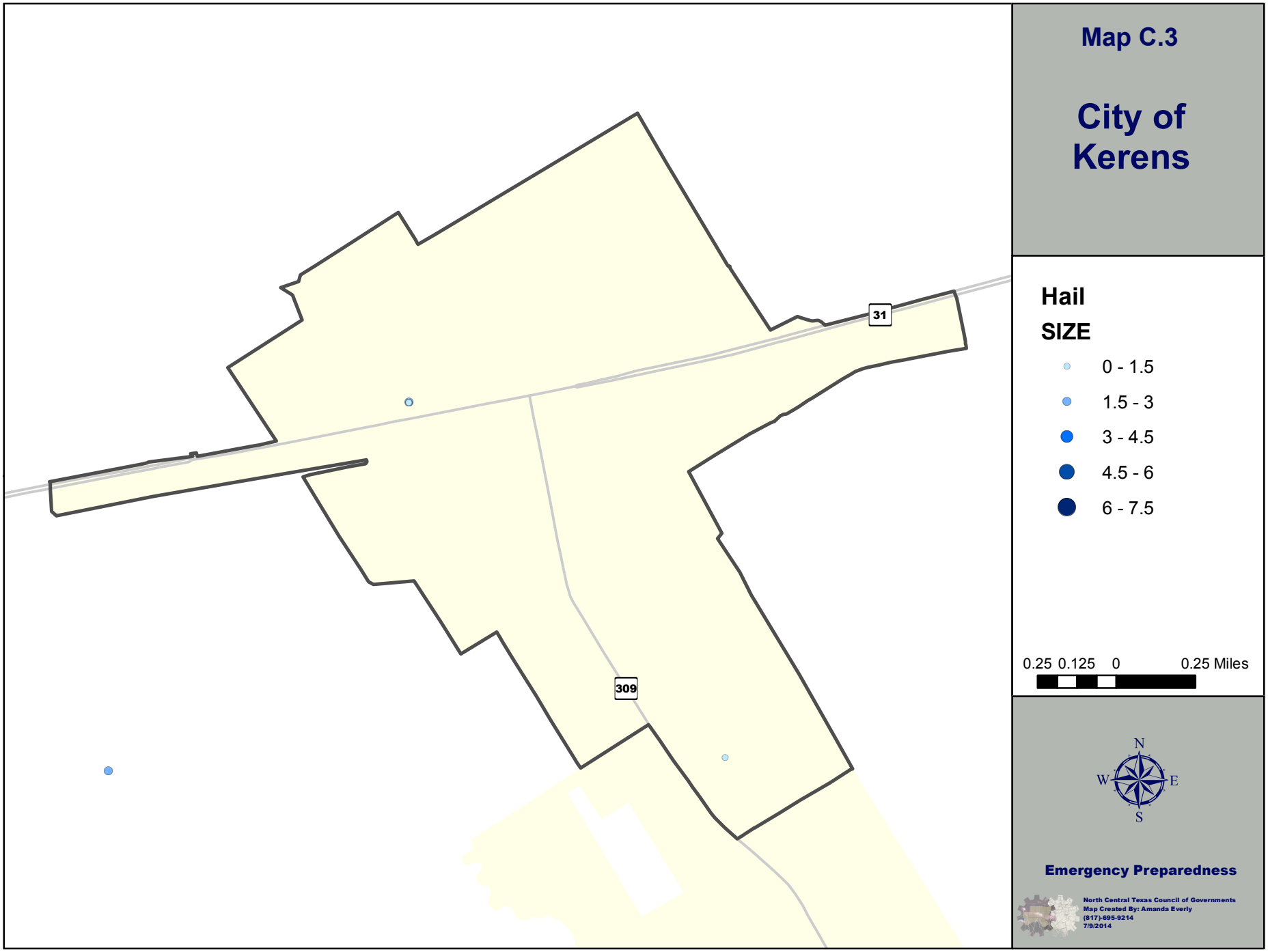
Map C.3
City of Kerens
Hail
SIZE
0 - 1.5
1.5 - 3
3 - 4.5
4.5 - 6
6 - 7.5
31
309
0.25 0.125 0 0.25 Miles
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Emergency Preparedness
North Central Texas Council of Governments
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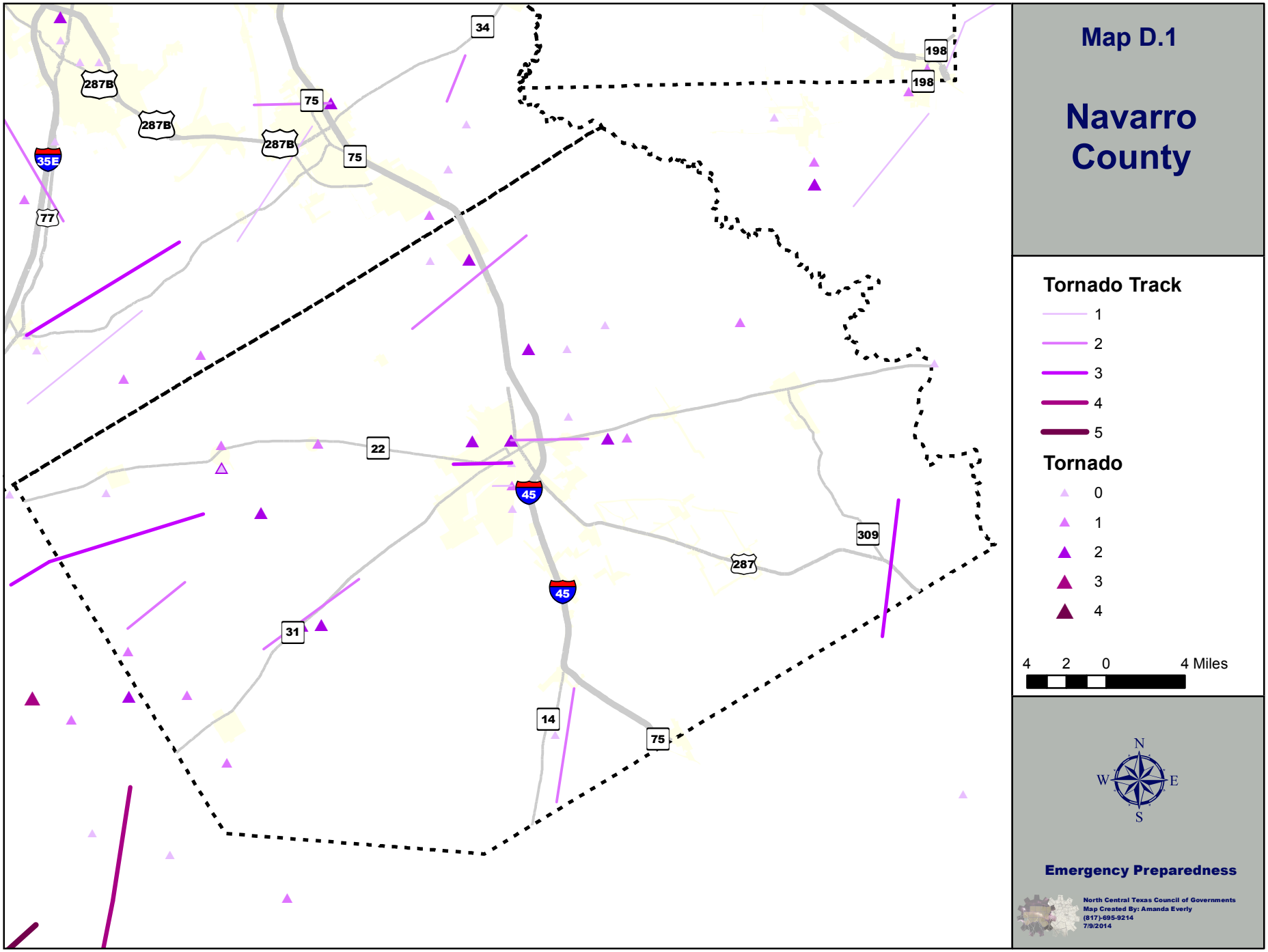
Map D.1
Navarro County
Tornado Track
1
2
3
4
5
Tornado
0
1
2
3
4
4 2 0 4 Miles
N
W
E
S
Emergency Preparedness
North Central Texas Council of Governments
Map Created By: Amanda Everly
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34
198
198
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287B
287B
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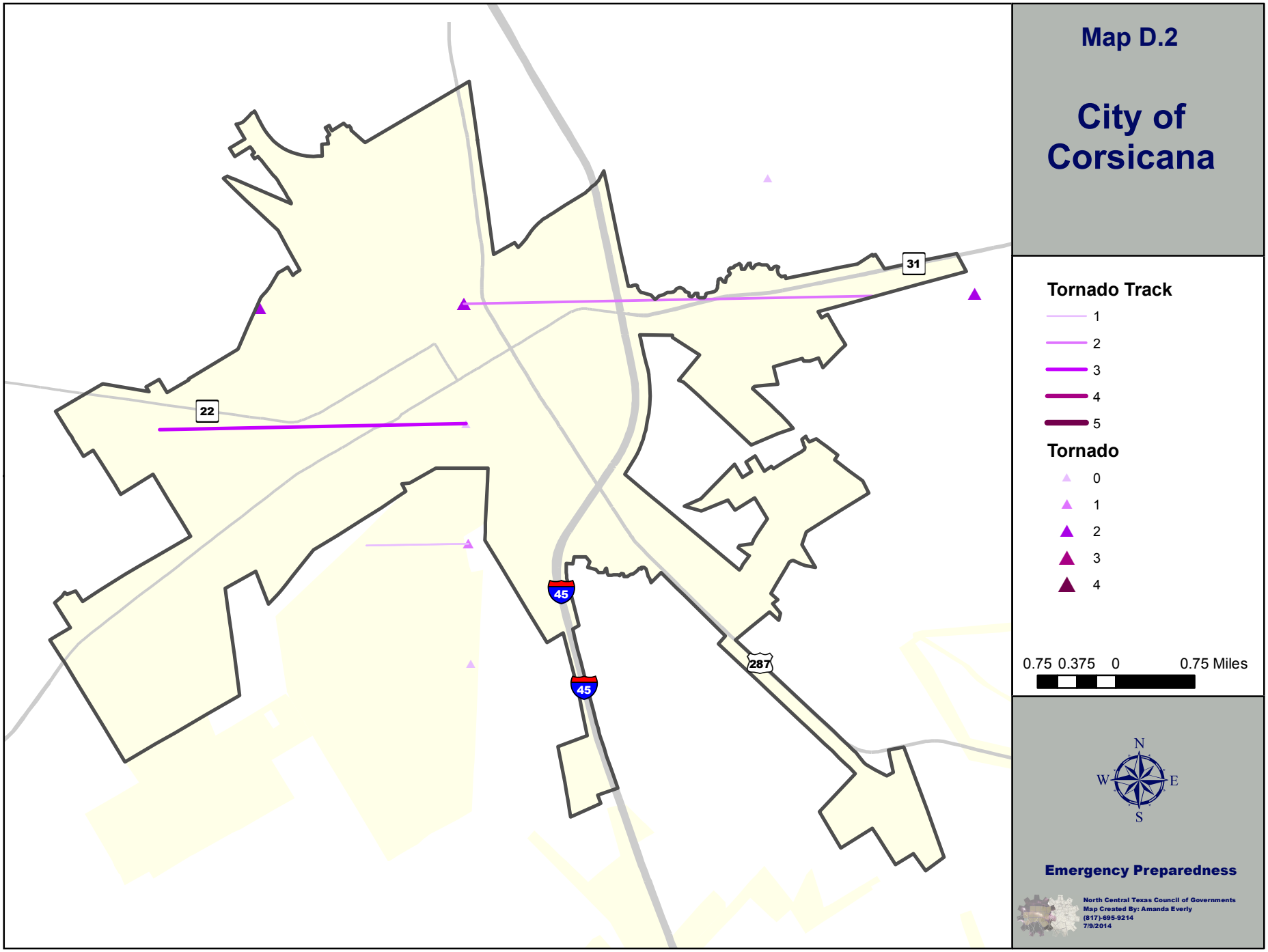
Map D.2
City of Corsicana
Tornado Track
1
2
3
4
5
Tornado
0
1
2
3
4
0.75 0.375 0 0.75 Miles
N
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Emergency Preparedness
North Central Texas Council of Governments
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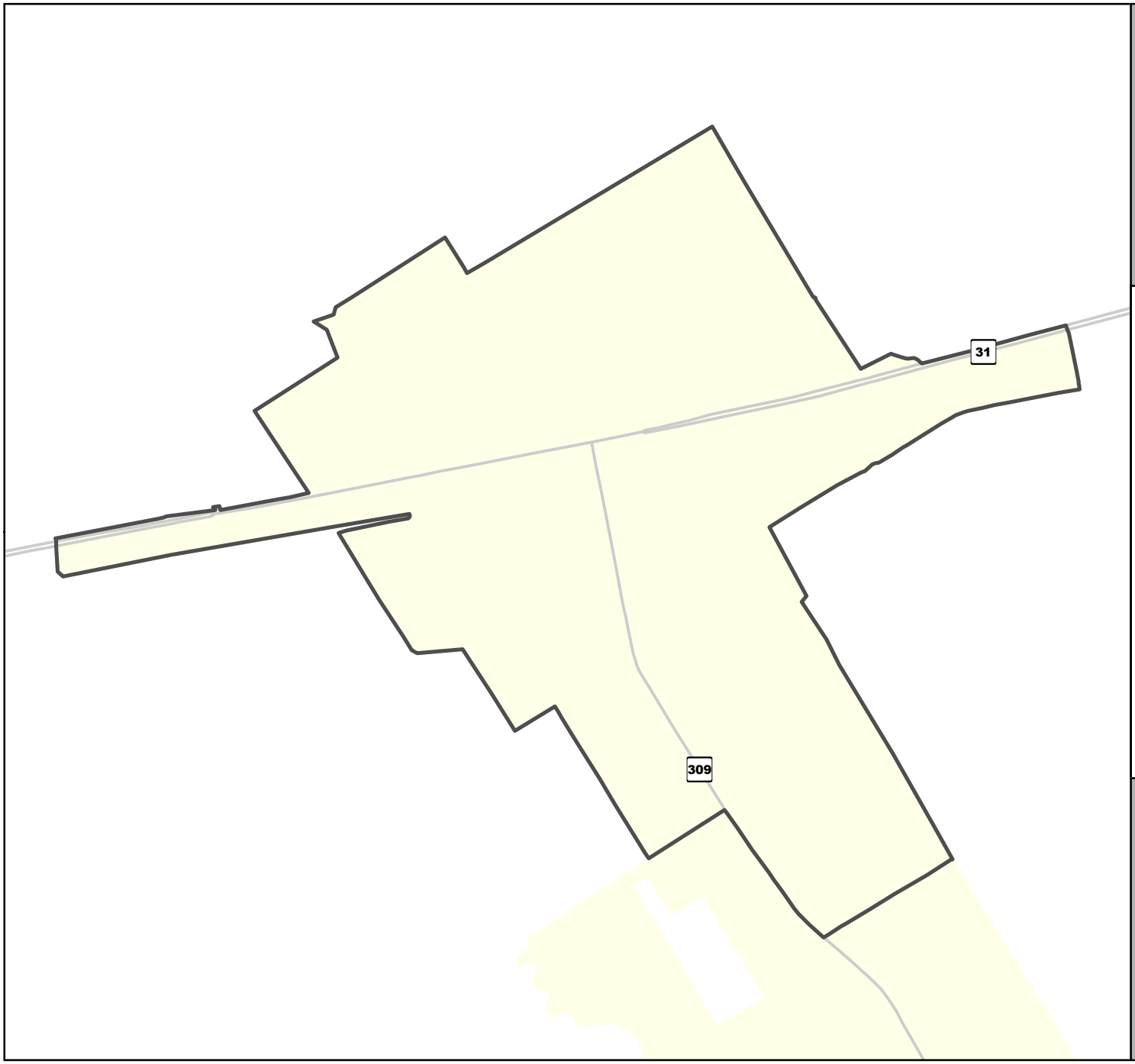

Map D.3

City of Kerens

Tornado Track

1
2
3
4
5

Tornado

0
1
2
3
4

0.25 0.125 0 0.25 Miles

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W E
S

Emergency Preparedness

North Central Texas Council of Governments
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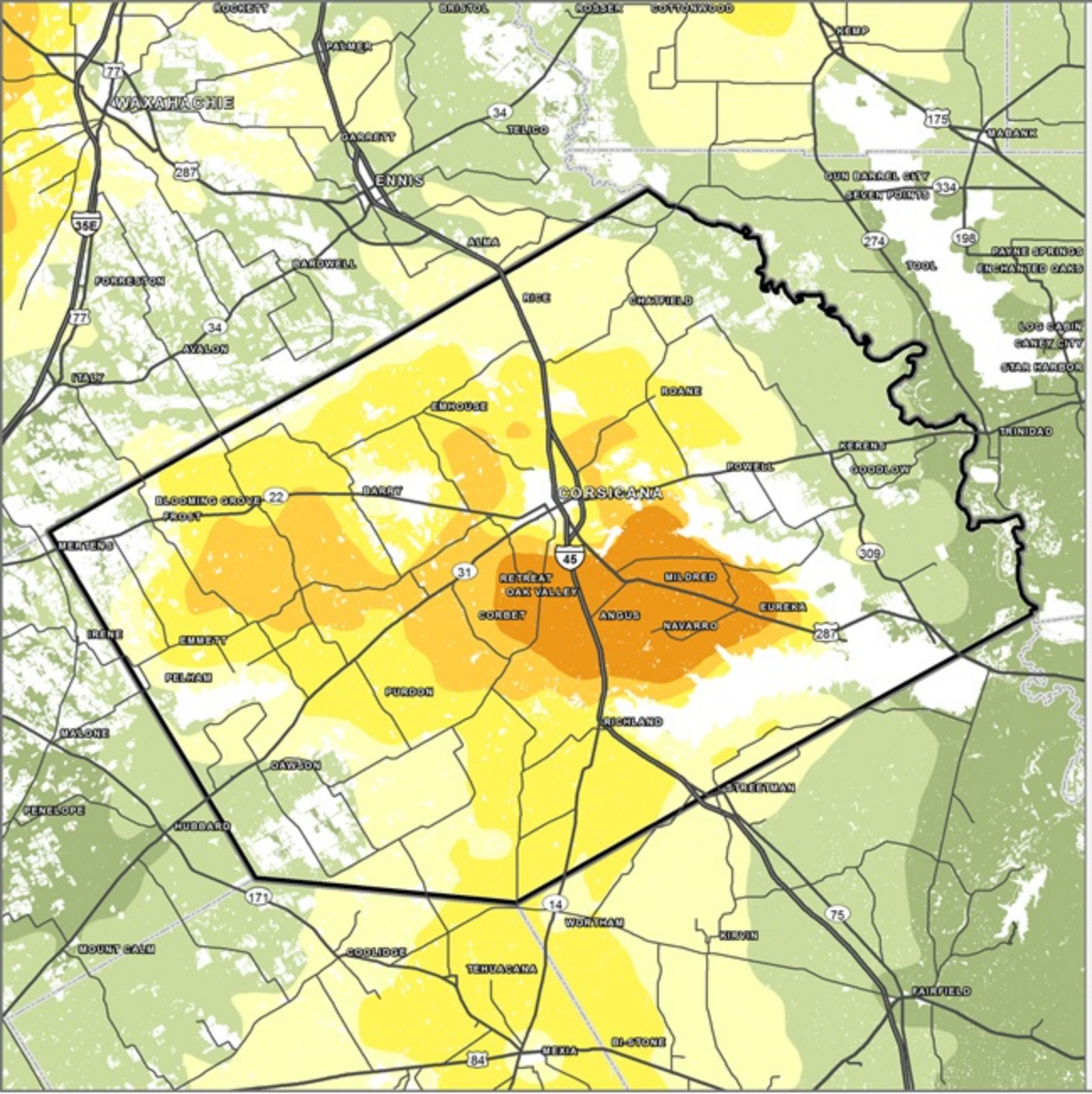

Wildfire Threat

- Non-Burnable
- 1 (Low)
- 2
- 3 (Moderate)
- 4
- 5 (High)
- 6
- 7 (Very High)

0 2.5 5 7.5 10 Miles

N

Date: 3/17/2014

TEXAS A&M FOREST SERVICE

Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

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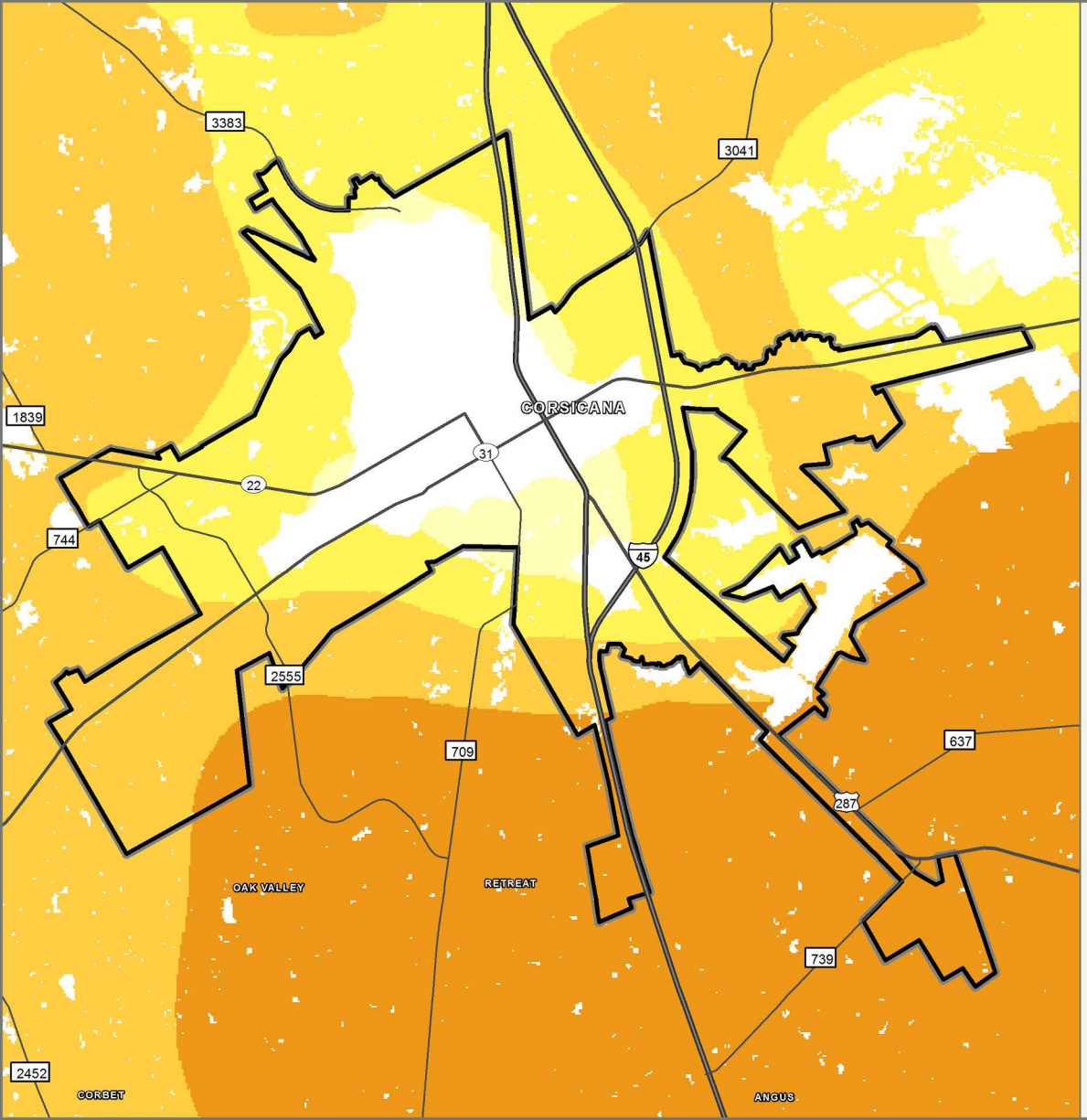

Map E.2
City of Corsicana

Wildfire Threat

- Non-Burnable
- 1 (Low)
- 2
- 3 (Moderate)
- 4
- 5 (High)
- 6
- 7 (Very High)

0 0.4 0.8 1.2 1.6 Miles

N

Date: 12/5/2013

TEXAS A&M FOREST SERVICE

Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

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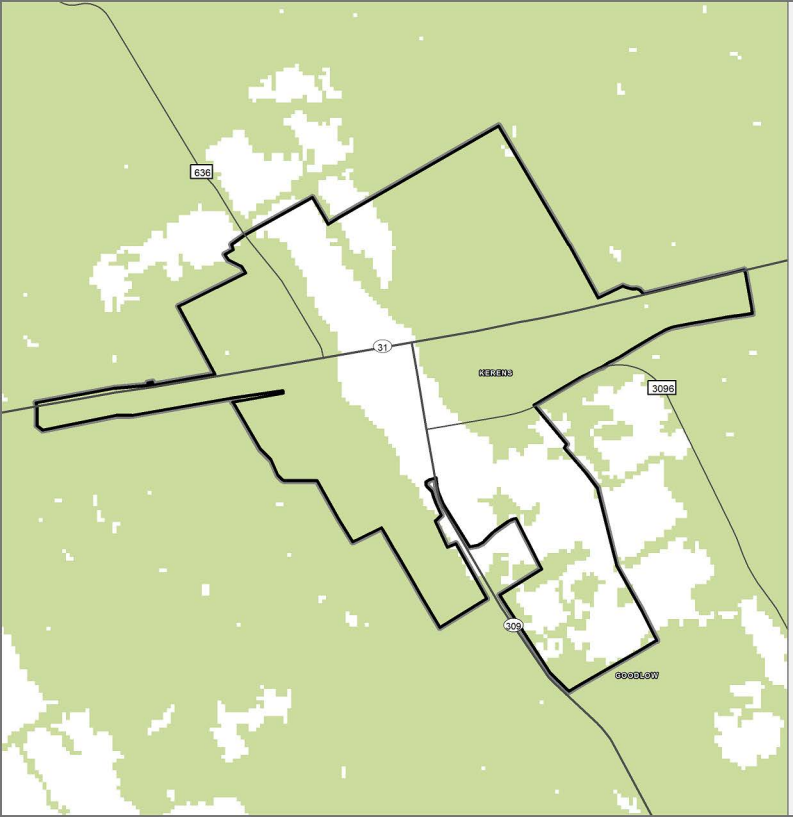

Map E.3
City of Kerens

Wildfire Threat

- Non-Burnable
- 1 (Low)
- 2
- 3 (Moderate)
- 4
- 5 (High)
- 6
- 7 (Very High)

0 0.1 0.2 0.3 0.4 Miles

N

Date: 5/20/2014

Texas A&M Forest Service

Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

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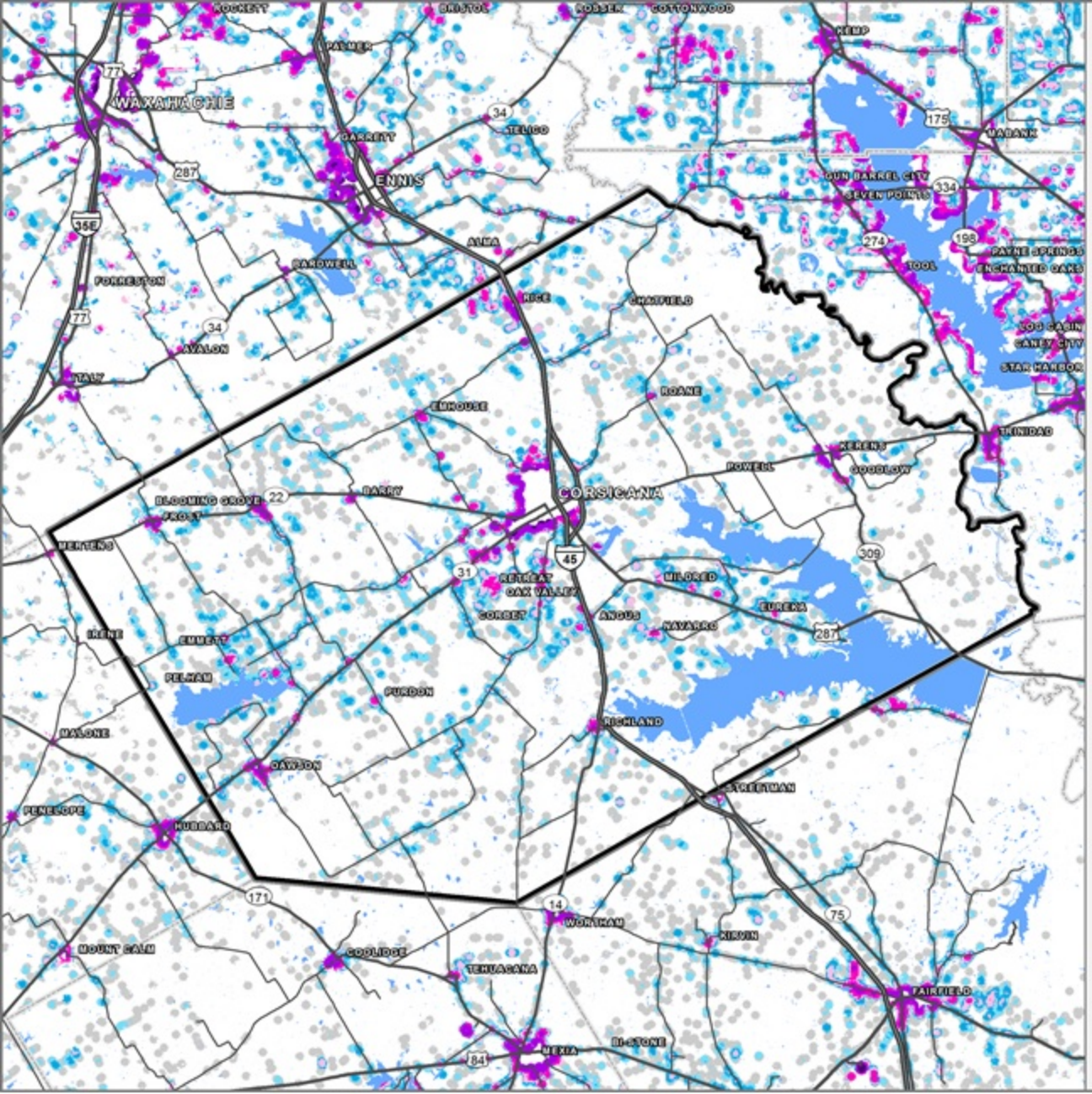

Wildland Urban Interface

- 1 - LT 1 hs/40 ac
- 2 - 1 hs/40 to 1 hs/20 ac
- 3 - 1 hs/20 to 1 hs/10 ac
- 4 - 1 hs/10 to 1 hs/5 ac
- 5 - 1 hs/5 to 1 hs/2 ac
- 6 - 1 hs/2 to 3 hs/ac
- 7 - GT 3 hs/ac

0 2.5 5 7.5 10 Miles

N

Date: 3/17/2014

TEXAS A&M FOREST SERVICE

Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

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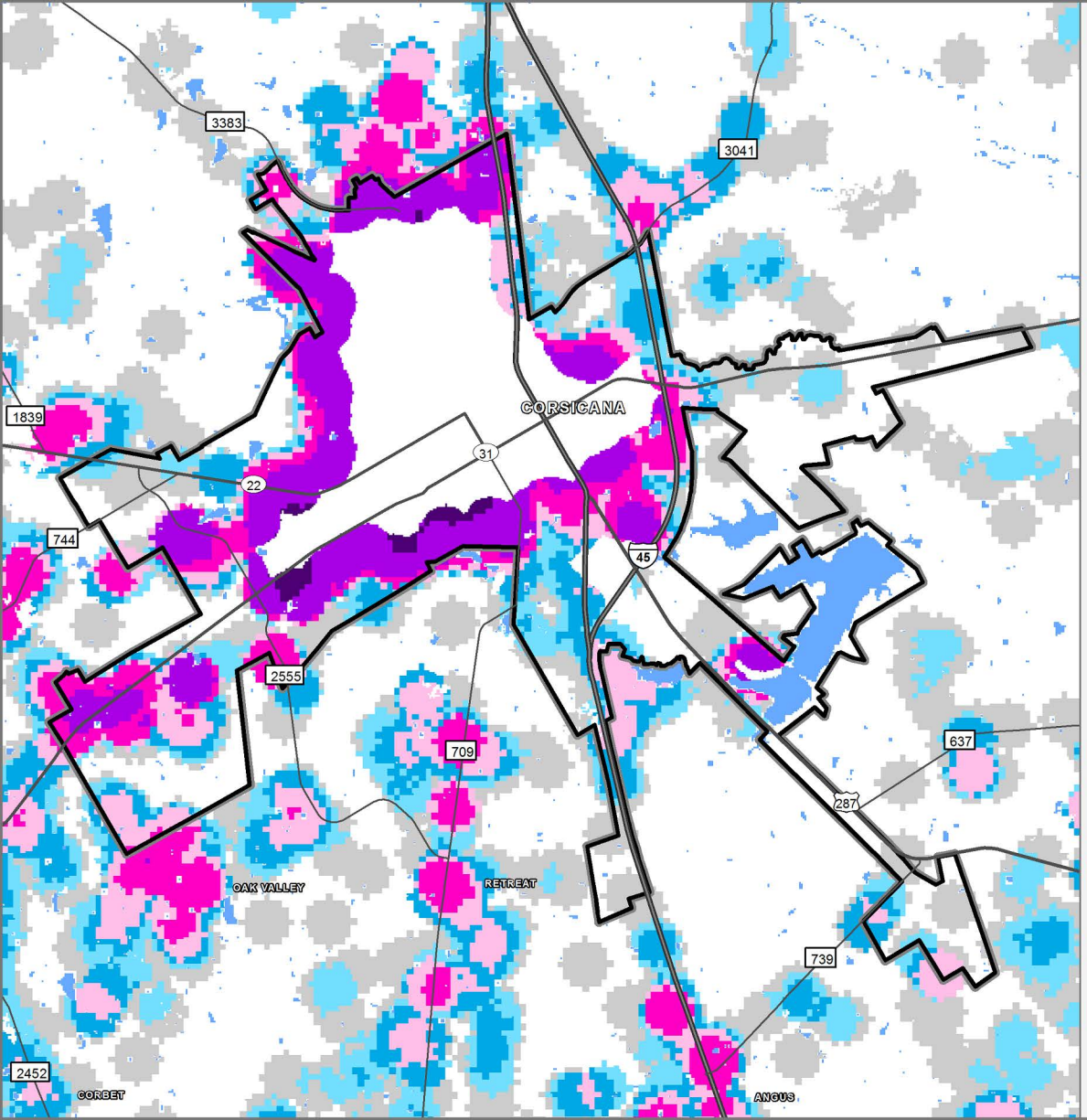

Map F. 2
City of Corsicana

Wildland Urban Interface

- 1 - LT 1 hs/40 ac
- 2 - 1 hs/40 to 1 hs/20 ac
- 3 - 1 hs/20 to 1 hs/10 ac
- 4 - 1 hs/10 to 1 hs/5 ac
- 5 - 1 hs/5 to 1 hs/2 ac
- 6 - 1 hs/2 to 3 hs/ac
- 7 - GT 3 hs/ac

0 0.4 0.8 1.2 1.6 Miles

N

Date: 12/5/2013

TEXAS A&M FOREST SERVICE

Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

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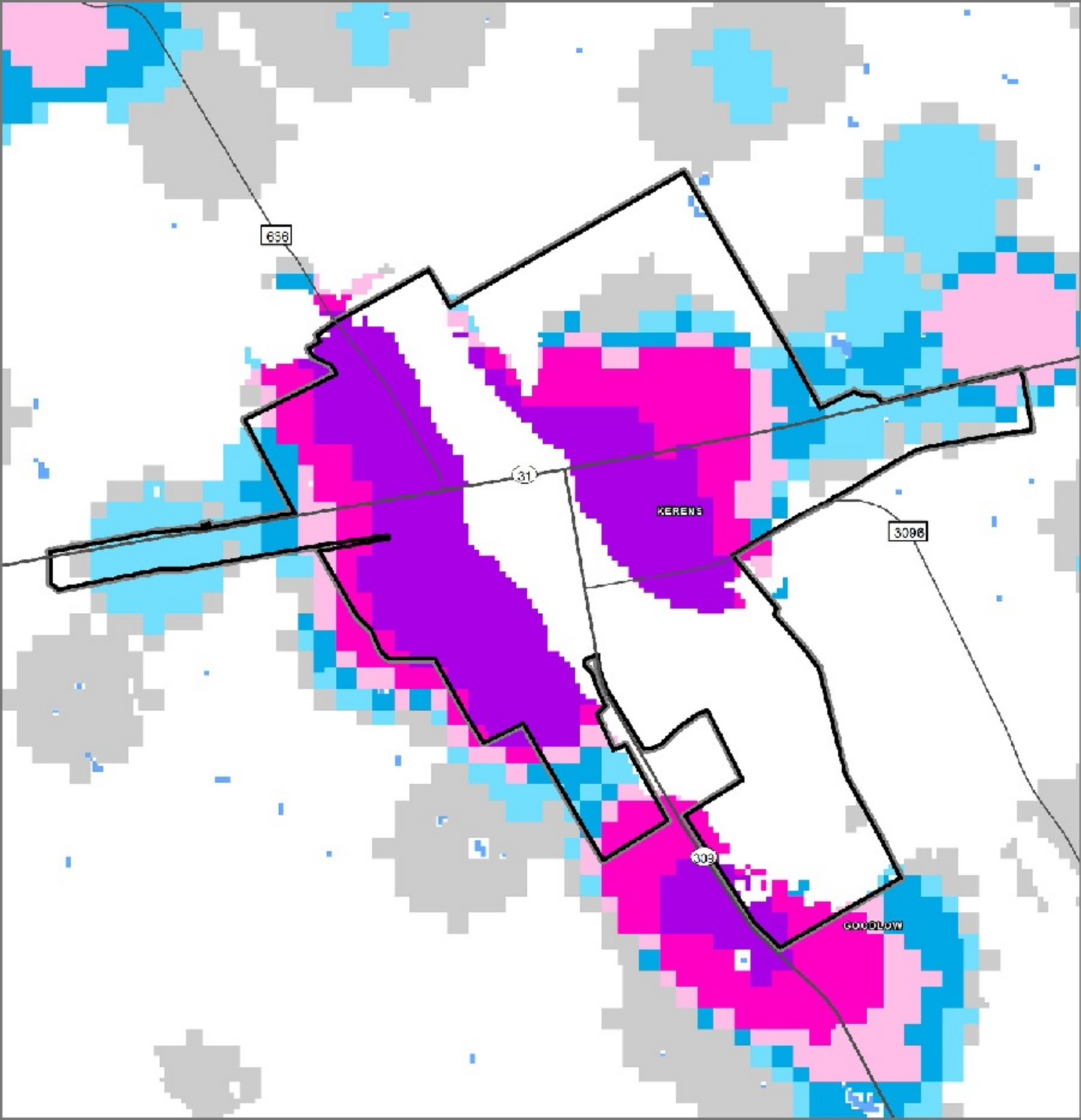

Map F.3
City of Kerens

Wildland Urban Interface

- 1 - LT 1 hs/40 ac
- 2 - 1 hs/40 to 1 hs/20 ac
- 3 - 1 hs/20 to 1 hs/10 ac
- 4 - 1 hs/10 to 1 hs/5 ac
- 5 - 1 hs/5 to 1 hs/2 ac
- 6 - 1 hs/2 to 3 hs/ac
- 7 - GT 3 hs/ac

0 0.1 0.2 0.3 0.4 Miles

N

Date: 5/20/2014

Texas A&M Forest Service

Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

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3.3 Extent

Natural Hazards are judged on specific extent scales. The following are the known extent scales for the natural hazard tornados as addressed in the Navarro County Hazard Mitigation Action Plan.

Drought

In 1965, Palmer developed an index to "measure the departure of the moisture supply". Palmer based his index on the supply-and-demand concept of the water balance equation, taking into account more than only the precipitation deficit at specific locations. The objective of the Palmer Drought Severity Index (PDSI), as this index is now called, was to provide a measurement of moisture conditions that were "standardized" so that comparisons using the index could be made between locations and between months.

The Palmer Drought Index is based on precipitation and temperature. The Palmer Index can therefore be applied to any site for which sufficient precipitation and temperature data is available.

The Palmer Index varies roughly between -4.0 and +4.0. Weekly Palmer Index values are calculated for the Climate Divisions during every growing season and are on the internet from the Climate Prediction Center.

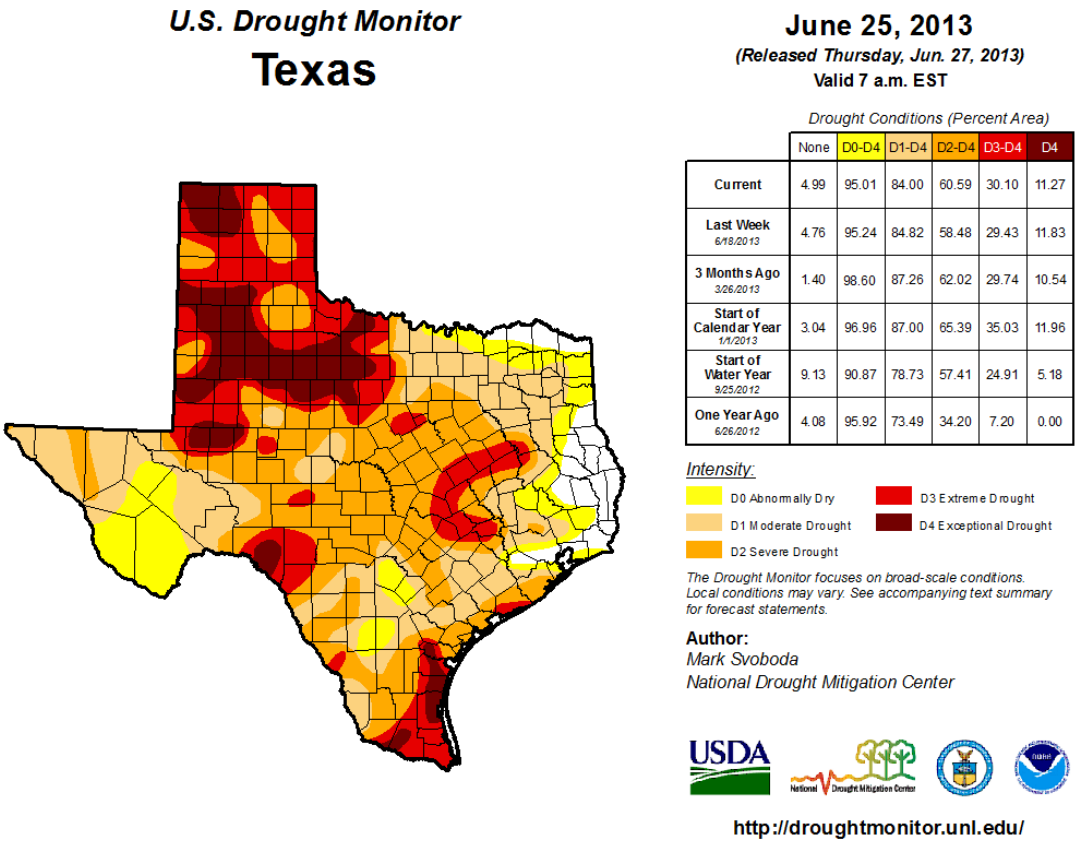
Figure 3.1 PDSI Classifications

PDSI Classifications for Dry and Wet Periods	
4.00 or more	Extremely wet
3.00 to 3.99	Very wet
2.00 to 2.99	Moderately wet
1.00 to 1.99	Slightly wet
0.50 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.50 to -0.99	Incipient dry spell
-1.00 to -1.99	Mild drought
-2.00 to -2.99	Moderate drought
-3.00 to -3.99	Severe drought
-4.00 or less	Extreme drought

Source: http://drought.unl.edu/whatis/indices.htm

Drought conditions do occur in this community. The PDSI Classification allows community planners to anticipate the effects of drought and plan preparedness and mitigation activities for future events as they will likely occur. The last event of widespread drought in Navarro County was in 2013.

Figure 3.2 Drought Monitor



http://droughtmonitor.unl.edu/data/pngs/20130625/20130625_tx_trd.png

Navarro County and participating jurisdictions experienced 29 drought events, ranging from Abnormally Dry (D1) to Exceptional Drought (D4), during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that future drought events will be of similar magnitude.

Earthquake: Mercalli & Richter Scales Comparison

Figure 3.3 Earthquake: Mercalli & Richter Scales Compairson

Mercalli Scale	Richter Scale	
I.	0 – 1.9	Not felt. Marginal and long period effects of large earthquakes.
II.	2.0 -2.9	Felt by persons at rest, on upper floors, or favorably placed.
III.	3.0 – 3.9	Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV.	4.0 - 4.3	Hanging objects swing. Vibration like passing of heavy trucks. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink the upper range of IV, wooden walls and frame creak.
V.	4.4 - 4.8	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Pendulum clocks stop, start.
VI.	4.9 - 5.4	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Books, etc., off shelves. Pictures off walls. Furniture moved. Weak plaster and masonry D cracked. Small bells ring. Trees, bushes shaken.
VII.	5.5 - 6.1	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices. Some cracks in masonry C. Waves on ponds. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.
VIII.	6.2 - 6.5	Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
IX.	6.6 - 6.9	General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations.) Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.
X.	7.0 - 7.3	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.
XI.	.7.4 - 8.1	Rails bent greatly. Underground pipelines completely out of service.
XII.	> 8.1	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

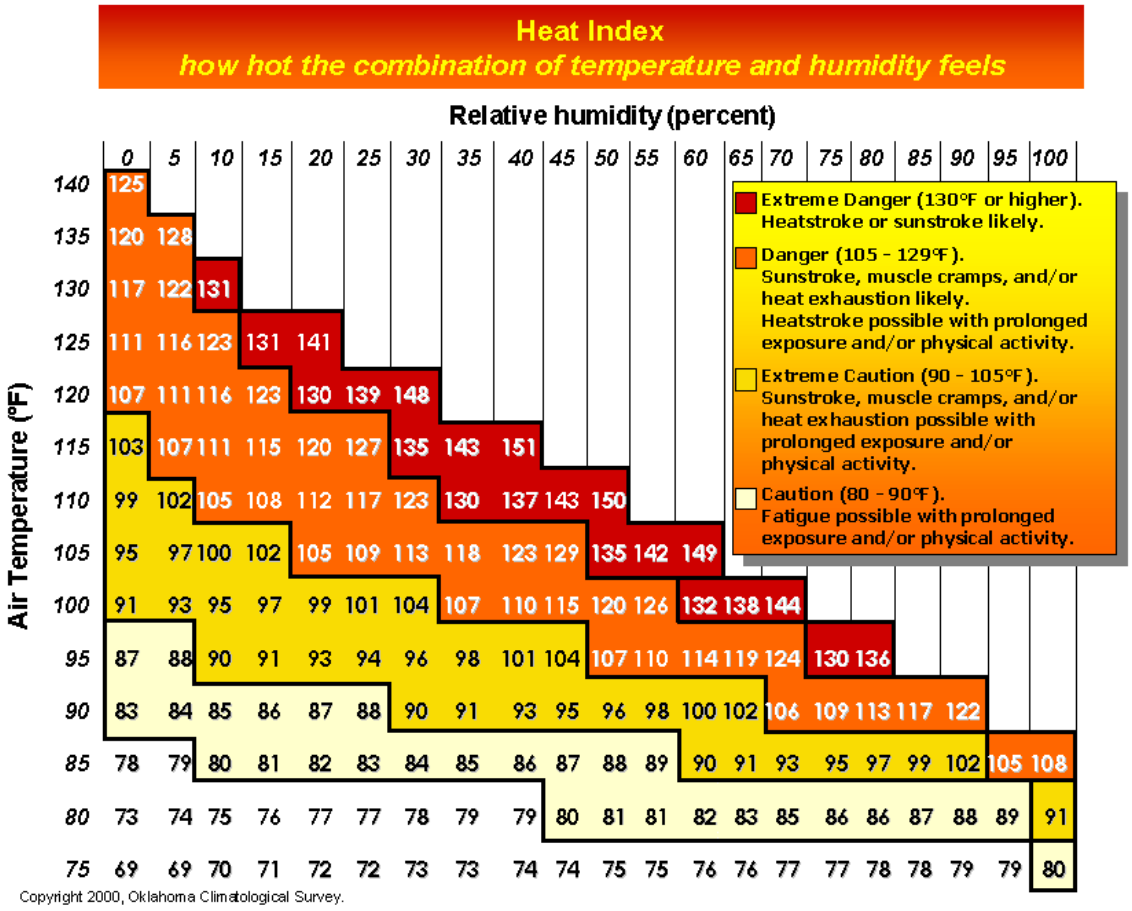
Masonry A: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces. Masonry B: Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces. Masonry C: Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces. Masonry D: Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

Source: http://www.abag.ca.gov/bayarea/eqmaps/doc/mmigif/m10.html

The Mercalli and Richter Scales allow planners to assess the impact earthquakes have. There have been no recorded earthquakes in Navarro County.

Navarro County and participating jurisdictions did not experienced any earthquakes during the time period analyzed for this plan (01/01/2002-06/30/2014). There is the potential for future earthquake events.

Figure 3.4 Heat Index



Source: http://www.ima.army.mil/southwest/sites/divisions/Safety/Heat%20Index.gif

The Heat Index chart displays the relative danger in regards to air temperature and relative humidity. Extreme heat is a hazard this community faces on an annual basis during the summer season. A combination of high temperatures and high humidity prompt heat advisories. This chart allows communities to assess the citizen's danger in regards to heat index. According to the National Climatic Data Center there have been two extreme heat events in Navarro County since 2002. In 2009, the heat event resulted in one fatality.

Navarro County and participating jurisdictions experienced two extreme heat events during a prolonged period of heat at the beginning of August in 2011. The whole North Texas Region experienced over a month of 100-degree plus temperatures around this time. It can be expected that any future heat or excessive heat incidents will be similar in magnitude.

Flood Zones

Figure 3.5 Flood Zone Classification

Zone A	The 100-year or Base Floodplain. There are six types of A zones:	
	A	The base floodplains mapped by approximate methods, i.e., BFEs are not determined. This is often called an unnumbered A zone or an approximate A zone.
	A1-30	These are known as numbered A zones (e.g., A7 or A14). This is the base floodplain where the firm shows a BFE (old format).
	AE	The base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1-30 zones.
	AO	The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided.
	AH	Shallow flooding base floodplain. BFE's are provided.
	A99	Area to be protected from base flood by levees or Federal flood protection systems under construction. BFEs are not determined.
	AR	The base floodplain that results from the de-certification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection
Zone V and VE	**V**	The coastal area subject to velocity hazard (wave action) where BFEs are not determined on the FIRM.
	VE	The coastal area subject to velocity hazard (wave action) where BFEs are provided on the FIRM.
Zone B and Zone X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and the 500-year floods. B zones are also used to designate base floodplains or lesser hazards, such as areas protected by levees from the 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.	
Zone C and Zone X (unshaded)	Area of minimal flood hazard, usually depiction FIRMs as exceeding the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood.	
Zone D	Area of undetermined but possible flood hazards.	

Source: http://www.fema.gov/floodplain-management/flood-zones

Flood hazard areas are identified as a Special Flood Hazard Area (SFHA). SFHAs are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. SFHAs are labeled as Zone A, Zone V, and Zone VE. Moderate flood hazard areas, labeled Zone B or Zone X, are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are defined as Zone C or Zone X. These flood zone identifications allow planners to determine appropriate land use in designated zones.

The planning communities are participants in the National Flood Insurance Program and actively take measures to plan land use. The communities are subject to flash flooding hazards such as the event in 2007 that occurred in the City of Corsicana. According to the National Climatic Data Center, the flash flood event resulted in $19,000,000 worth of property damage.

Navarro County and participating jurisdictions experienced 23 flood and flash flood events during the time period analyzed for this plan (01/01/2002-06/30/2013). Most of the flood and flash flood events were a result of excessive rainfall over a short amount of time. These events resulted mainly in over-the-road flooding, vehicle stranding, road damage, and minor to moderate property damage. Flood waters as high as two feet were reported. It can be expected that any future flood or flash flood events will be similar in magnitude.

Figure 3.6 Combined NOAA/TORRO Hailstorm Intensity Scales

Size Code	Intensity Category	Typical Hail Diameter (inches)	Approximate Size	Typical Damage Impacts
H0	Hard Hail	up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33-0.60	Marble or Mothball	Slight damage to plants, crops
H2	Potentially Damaging	0.60-0.80	Dime or grape	Significant damage to fruit, crops, vegetation
H3	Severe	0.80-1.20	Nickel to Quarter	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	1.2-1.6	Half Dollar to Ping Pong Ball	Widespread glass damage, vehicle bodywork damage
H5	Destructive	1.6-2.0	Silver dollar to Golf Ball	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	2.0-2.4	Lime or Egg	Aircraft bodywork dented, brick walls pitted
H7	Very destructive	2.4-3.0	Tennis ball	Severe roof damage, risk of serious injuries
H8	Very destructive	3.0-3.5	Baseball to Orange	Severe damage to aircraft bodywork
H9	Super Hailstorms	3.5-4.0	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	4+	Softball and up	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: http://www.torro.org.uk/site/hscale.php

The Hailstorm Intensity Scale is representative of the damage from hail storms this community has experienced in the past and will likely experience in the future. The Hailstorm Intensity Scale allows planners to gauge past damage and mitigate for future expected damage. For example, according to the National Climatic Data Center, in 2011 1.75in hail (H5/golf ball) caused $30,000 worth of property damage in the City of Corsicana.

Navarro County and participating jurisdictions experienced 64 hail events ranging from magnitude H2 (.75 inch diameters) to magnitude H7/H8 (3 inch diameters), during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that any future hail events will be similar in magnitude.

Figure 3.7 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 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft. taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft., whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-20 ft., white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (13-20 ft.) 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 ft.), 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 ft.) 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 ft.) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft., sea completely white with driving spray, visibility greatly reduced	

Source: http://www.spc.noaa.gov/faq/tornado/beaufort.html

The Beaufort Wind Scale is representative of the damage from high winds this community may endure. The Beaufort Wind Scale allows planners in the community to assess historical data and mitigate for future high wind events. For example, according to the National Climatic Data Center, in 2012 the City of Corsicana experienced 56 knot winds that caused $5,000 worth of property damage.

Navarro County and participating jurisdictions experienced 61 high wind events ranging from 42 knots to 76 knots (48.3 to 87.5 mph), during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that any future high wind events will be similar in magnitude.

Figure 3.8 Lightning Activity Level Grid

Lightning Activity Level (LAL) A scale which describes lightning activity. Values are labeled 1-6:	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5 minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud to ground strikes in a 5 minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater then 15 cloud to ground strikes in a 5 minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

Source: http://www.nws.noaa.gov/forecasts/wfo/definitions/defineLAL.html

The Lightning Activity Level grid provides a way to gauge the average number of strikes that may accompany a given type of storm. The average number of strikes is given since the density of lightning strikes varies from storm to storm. According to the National Climatic Data Center, there have been no reported instances of damage from lightning in Navarro County.

According to the NCDC, Navarro County and participating jurisdictions recorded zero lightning events during the time period analyzed for this plan (01/01/2002-06/30/2013). There is potential for future lightning events.

Figure 3.9 Fujita Scale

F-Scale Number	Intensity Phrase	Wind Speed	Type of Damage
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; manufactured homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; manufactured homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 mph	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies

Source: http://tornadoproject.com/fscale/fscale.htm

On February 1, 2007, the Fujita scale was decommissioned in favor of the more accurate Enhanced Fujita Scale, which replaced it. None of the tornados recorded on or before January 31, 2007 will be re-categorized. Therefore maintaining the Fujita scale will be necessary when referring to previous events.

Figure 3.10 Enhanced Fujita 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; manufactured 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; manufactured 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 yd.); high-rise buildings have significant structural deformation;

Source: http://www.spc.noaa.gov/efscale/

The Enhanced Fujita Scale is representative of the damage from tornados this community has faced in the past and will no doubt face in the future. The Enhanced Fujita Scale allows planners to prepare and mitigate future potential damage by assessing the historical nature of tornados in the planning community. For example, according to the National Climatic Data Center in 2009, an EF1 tornado occurred in the City of Corsicana. The tornado caused $100,000 worth of property damage and one reported injury.

Navarro County and participating jurisdictions experienced five tornado events ranging from EF0 to EF2, during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that any future tornado events will be similar in magnitude.

Figure 3.11 Keetch-Byrum Drought Index

KBDI	Fire Potential
0-200	Soil moisture and large class fuel moistures are high and do not contribute much to fire intensity. Typical of spring dormant season following winter precipitation.
200-400	Typical of late spring, early growing season. Lower litter and duff layers are drying and beginning to contribute to fire intensity
400-600	Typical of late summer, early fall. Lower litter and duff layers contribute to fire intensity and will burn actively.
600-800	Often associated with more severe drought with increased wildfire occurrence. Intense, deep-burning fires with significant downwind spotting can be expected. Live fuels can also be expected to burn actively at these levels.

Source: http://www.tamu.edu/ticc/KBDI%20Fact%20Sheet.pdf

The index scale ranges from 0 to 800 and represents moisture deficiency in hundredths of an inch. By looking at indicators of moisture deficiency in the soil in this chart, communities are able to assess when they are at a heightened danger for a wildfire. According to the National Climatic Data Center there have been six wildfire events in Navarro County since 2002. In 2011, five wildfires caused a combined total of $340,000 in property damage.

Navarro County and participating jurisdictions experienced six wildfire events ranging from 2 acres to 100 acres, during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that any future wildland fire events will be similar in magnitude.

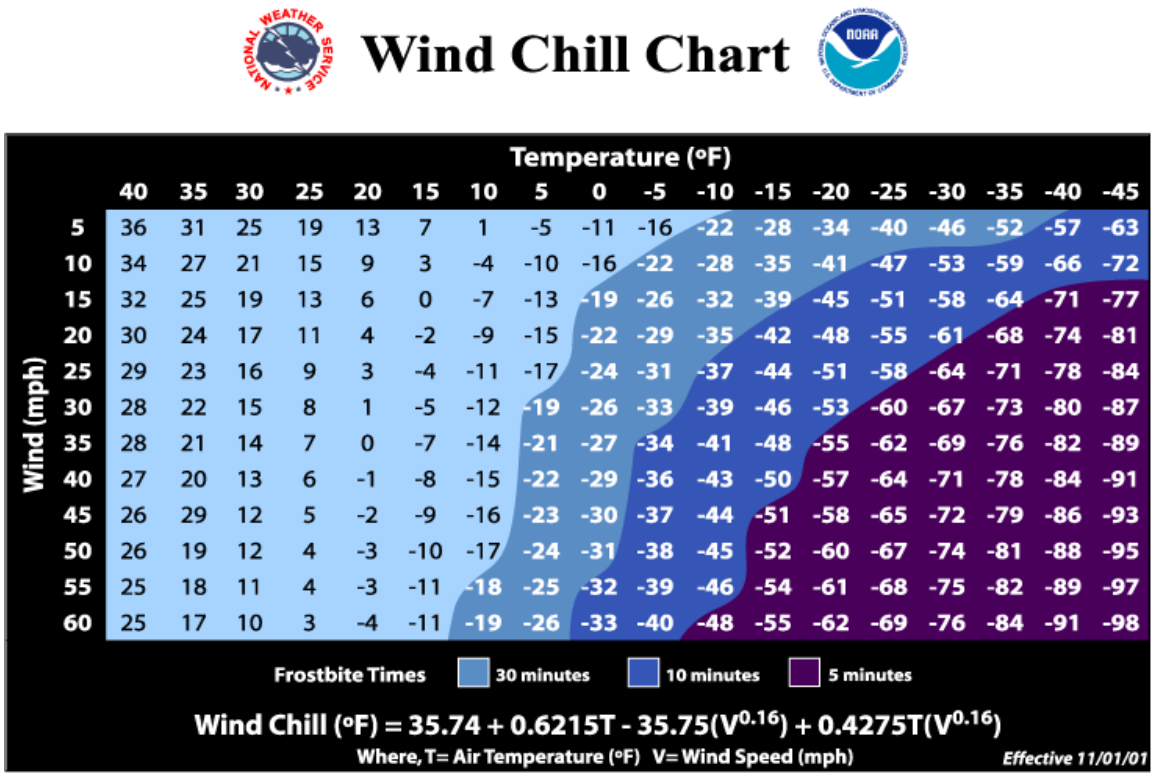
Figure 3.12 Fire Danger

Rating	Basic Description	Detailed Description
CLASS 1: Low Danger (L) COLOR CODE: Green	fires not easily started	Fuels do not ignite readily from small firebrands. Fires in open or cured grassland may burn freely a few hours after rain, but wood fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.
CLASS 2: Moderate Danger (M) COLOR CODE: Blue	fires start easily and spread at a moderate rate	Fires can start from most accidental causes. Fires in open cured grassland will burn briskly and spread rapidly on windy days. Woods fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel – especially draped fuel -- may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
CLASS 3: High Danger (H) COLOR CODE: Yellow	fires start easily and spread at a rapid rate	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuel. Fires may become serious and their control difficult, unless they are hit hard and fast while small.
CLASS 4: Very High Danger (VH) COLOR CODE: Orange	fires start very easily and spread at a very fast rate	Fires start easily from all causes and immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics - such as long-distance spotting - and fire whirlwinds, when they burn into heavier fuels. Direct attack at the head of such fires is rarely possible after they have been burning more than a few minutes.
CLASS 5: Extreme (E) COLOR CODE: Red	fire situation is explosive and can result in extensive property damage	Fires under extreme conditions start quickly, spread furiously and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the Very High Danger class (4). Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks, until the weather changes or the fuel supply lessens.

Source: http://www.wfas.net/index.php/fire-danger-rating-fire-potential--danger-32/class-rating-fire-potential-danger-51?task=view

Wind Chill temperature is simply a measure of how cold the wind makes real air temperature feel to the human body. Since wind can dramatically accelerate heat loss from the body, a blustery 30° day would feel just as cold as a calm day with 0° temperatures. The index was created in 1870, and on November 1, 2001, the National Weather Service released a more scientifically accurate equation, which we use today. Here is a chart for calculating wind chill. (Please note that it is not applicable in calm winds or when the temperature is over 50°.)

Figure 3.13 NOAA Wind Chill Chart



Source: National Weather Service and NOAA

The Wind Chill Chart displays the frostbite times in regards to temperature and wind. This chart allows the communities to prepare for a winter storm or an ice event. These events are infrequent but can cause damage. The primary areas of concern are on bridges and roadways. For example, according to the National Climatic Data Center, in 2010 heavy snow caused $150,000 in property damage across Navarro County.

3.14 Ice Accumulation Index

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009

ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Source: http://www.spia-index.com/SPIAIndexDescription.png

Navarro County and participating jurisdictions experienced eight winter storm events ranging from heavy snow to ice and sleet, during the time period analyzed for this plan (01/01/2002-06/30/2013). The winter storm events ranged from 3-9 inches of snow fall and up to 1/4 an inch of ice accumulation. It can be expected that any future events will be similar in magnitude.

Local Extent Having identified the extent scales by which hazards are ranked, the participating jurisdictions have utilized the following definitions to determine the expected extent/severity for their planning area.

Figure 3.15 Extent Charts

	High	Medium	Low
Dam Failure	• Greater than 50% of city structures are in the inundation zone. • Greater than 50% of the city's critical infrastructure in the identified inundation zone	• 20%-50% of city structures are in the inundation zone. • 20%-50% of the city's critical infrastructure in the inundation zone	• Less than 20% of city structures are in the inundation zone. • Less than 20% of the city's critical infrastructure in the inundation zone
Drought	• PDSI -3.00- -4.00 or less • Severe to extreme drought conditions	• PDSI -1.00- -2.99 • Mild to moderate drought conditions	• PDSI 4.00 or more - -0.99 • Extremely wet to incipient dry spells
Earthquake	• Mercalli Scale: VIII-XII • Richter Scale: 6.2->8.1 • Driving will be difficult, increase in damage to infrastructures and objects can be thrown	• Mercalli Scale: VI-VII • Richter Scale: 4.9-6.1 • All will feel the event, walking will be difficult, glassware will break, irrigation ditches damaged	• Mercalli Scale: I-V • Richter Scale: 0-4.8 • Range of feeling the event is cannot be felt to being felt outdoors.
Flooding	• 100yr Flood Zone, Zone A • The extent of severity in the 100yr Flood Zone will be dependent on the structures and livestock located in the identified area.	• 500yr Flood Zone, Zone B • The extent of severity in the 500yr Flood Zone will be dependent on the structures and livestock located in the identified area.	• Outside of100yr and 500yr Flood Zones, Zone C, F, X • Potential for flooding due to local drainage problems
Hail	• H7-H10, 2.4"->4" • There will be severe damage. Including roof and structural damage and risk of serious injuries to fatalities.	• H5-H6, 1.6"-2.4" • There will be a range of severe damage from well-constructed houses being destroyed to houses being swept away.	• H0-H4, 0"-1.6" • There will be a variance of destruction to vegetation and slight damage to glass.
High Winds	• Force: 8-12 • Knots: 28-64+ • Whole trees moving to considerable structure damage	• Force: 4-6 • Knots: 11-27 • Dust, leaves, and loose paper lifted. Small to Large branches moving.	• Force: 0-3 • Knots: <1-10 • Calm, leaves rustle, light flags extended
Lightning	• LAL 5--Towering cumulus and thunderstorms are numerous, covering more than three-tenths of the sky. Rain is moderate/ heavy, lightning is frequent and intense. • LAL 6--Dry thunderstorms, conditions similar to LAL 3	• LAL 3-- Towering cumulus covering ≤2/10 of the sky. Two to three thunderstorms must occur. Light/ moderate rain, infrequent lightning • LAL 4--Towering cumulus covers 2/10 – 3/10 of the sky. More than three thunderstorms must occur. Moderate rain, lightning is frequent.	• LAL 1-- No thunderstorms. • LAL 2-- Cumulus clouds, only a few towering cumulus. A single thunderstorm must be confirmed. The clouds produce virga and occasional light rain. Infrequent lightning.
Tornado	• EF3-EF5 • There will be a range of severe damage from well-constructed houses being destroyed to houses being swept away	• EF1-EF2 • There will be a range of moderate to considerate damage. Roofs will be severely stripped, manufactured homes overturned, and cars lifted off of the ground	• EF0 • There will be light damage. Roofs will be peeled off, gutters damaged, and branches broken

	High	Medium	Low
Wildland Fire	• KBDI 600-800 • Associated with severe drought. Intense, deep-burning fires with significant downwind spotting.	• KBDI 200-400 • Ranges from lower litter and duff layers are drying and beginning to contribute to fire intensity to them causing the fire to burn actively.	• KBDI 0-200 • Soil moisture and large class fuel moistures are high and do not contribute much to fire intensity.
Winter Storms	• Temperatures 15F- -45F • Wind Chill 7F- -98F • At wind chill of -19 frostbite will occur in 30 minutes increasing in severity to occurrence in 5 minutes.	• Temperatures 30F- 20F • Wind Chill 25F- -4F • Bridges and roadways are at risk to ice.	• Temperatures 40F-35F • Wind Chill 36F-17F • Vulnerable populations and agriculture at risk to lower temperatures and wind chill.

The following are the High, Medium, Low rankings for each of the related extent scales.

Table 3.1 Jurisdictional Extents

	Unincorporated Navarro County	Corsicana	Kerens
Dam Failure	Low	Low	Low
Drought	High	High	High
Earthquake	Low	Low	Low
Extreme Heat	Medium	Medium	Medium
Flooding	High	High	High
Hail	High	High	High
High Winds	High	High	High
Lightning	Medium	Medium	Medium
Tornado	High	High	High
Wildland Fire	High	High	High
Winter Storms	High	High	High

3.4 Priority Risk Index

A Priority Risk Index (PRI) was developed with the purpose of categorizing potential hazards for Navarro County and ranks each hazard as high, moderate, low, or no risk. The hazard classification generated through the use of the PRI allows for the prioritization of those high hazard risks for mitigation planning purposes, and more specifically, the identification of hazard mitigation opportunities for Navarro County jurisdictions to consider as part of their proposed mitigation strategy.

The PRI is used to assist all jurisdictions participating in the Navarro County HazMAP in determining which hazards pose the most significant threat based on a variety of factors. The PRI is not scientifically based, but is rather meant to be utilized as an objective and systematic planning tool for classifying and prioritizing hazard risks in Navarro County based on standardized criteria. The PRI results in numerical values that allow identified hazards to be ranked against one another. The sum of all four categories equals the final PRI value, as shown below:

PRI Value = (Probability x .30) + (Life Impact x .35) + (Property Impact x .25) + (Spatial Extent x .10)

The higher the PRI value, the greater the hazards risk. These values were obtained by assigning varying degrees of risk to four categories for each hazard: Probability, Life Impact, Property Impact, and Spatial Extent. Each category has been assigned an Index Value (0 to 3) and a Weighing Factor (0 – 100%). These values may be adjusted during future plan updates. In order to evaluate the risk of each hazard, the assigned PRI Value for each category is multiplied by the weighing factor. Then, the PRI for each hazard is calculated by adding the product obtained in each category. According to the weighing scheme applied for Navarro County, the highest possible PRI value is 4.0. The PRI calculations are presented in *Tables 3.2 - 3.4*. . A table breaking down the value of each category is below.

Assigned Weighing Factor	PRI Category	Degree of Risk		
		Level	Criteria	Index Value
30%	Probability	Unlikely	Less than 1% annual probability	0
		Possible	Between 1 and 10% annual probability	1
		Likely	Between 10 and 100% annual probability	2
		Highly Likely	100% annual probability	3
35%	Life Impact	Minor	Very few injuries, if at all none	0
		Limited	Minor Injuries	1
		Critical	Multiple deaths/injuries	2
		Catastrophic	High number of deaths/injuries	3
25%	Property Impact	Minor	Only minor property damage and minimal disruption of life. Temporary shutdown of critical facilities.	0
		Limited	More than 10% of property in affected area damaged/destroyed. Complete shutdown of critical facilities for more than one day.	1
		Critical	More than 25% of property in affected area damaged/destroyed. Complete shutdown of critical facilities for more than one week.	2
		Catastrophic	More than 50% of property in affected area damaged/destroyed. Complete shutdown of critical facilities for 30 days or more.	3
10%	Spatial Extent	Negligible	Less than 1% of area affected	0
		Small	Between 1 and 10% of area affected	1
		Moderate	Between 10 and 50% of area affected	2
		Large	Between 50 and 100% of area affected	3

Table 3.2 Priority Risk Index for Unincorporated Navarro County

Hazard	Category/Degree of Risk				
	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	
Dam Failure	0	3	3	3	2.1
Drought	3	0	0	3	1.2
Earthquake	0	0	1	1	0.35
Extreme Heat	2	1	0	3	1.25
Flooding	3	2	2	3	2.4
Hail	3	0	1	2	1.35
High Winds	3	1	1	2	1.7
Lightning	3	1	1	2	1.7
Tornado	1	2	1	1	1.35
Wildfire	3	1	1	2	1.7
Winter Storms	1	1	0	3	0.95

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Table 3.3 Priority Risk Index for the City of Corsicana

Hazard	Category/Degree of Risk				
	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	PRI Value
Dam Failure	0	3	3	3	2.1
Drought	3	0	0	3	1.2
Earthquake	0	0	1	1	0.35
Extreme Heat	2	1	0	3	1.25
Flooding	3	2	2	3	2.4
Hail	3	0	1	2	1.35
High Winds	3	1	1	2	1.7
Lightning	3	1	1	2	1.7
Tornado	1	2	1	1	1.35
Wildfire	3	1	1	2	1.7
Winter Storms	1	1	0	3	0.95

Table 3.4 Priority Risk Index for the City of Kerens

Hazard	Category/Degree of Risk				
	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	PRI Value
Dam Failure	0	0	0	0	0
Drought	3	0	0	3	1.2
Earthquake	0	0	0	0	0
Extreme Heat	3	1	0	3	1.55
Flooding	1	0	0	1	0.4
Hail	3	0	0	3	1.2
High Winds	3	0	0	3	1.2
Lightning	3	1	1	1	1.6
Tornado	2	1	1	1	1.3
Wildfire	2	0	0	1	0.7
Winter Storms	1	0	0	3	0.6

The conclusions drawn from the hazard profiling process for Navarro County jurisdictions, resulted in the classification of risk for each identified hazard according to four categories: High Risk, Moderate Risk, Low Risk, and No Risk *(Tables 3.5 – 3.7).* For purposes of these classifications, risk is expressed in relative terms according to the probability of occurrence and estimated impact that a hazard will have on human life and property in Navarro County.

Table 3.5 Unincorporated Navarro County

High Risk (PRI 2 - 3)	Flooding Dam Failure
Moderate Risk (PRI 1.1 -1.9)	High Wind Lightning Wildfire Tornado Hail Extreme Heat Drought
Low Risk (PRI 0.50 – 1)	Winter Storms
No Risk (PRI 0 – 0.49)	Earthquake

Table 3.6 City of Corsicana

High Risk (PRI 2 - 3)	Flooding Dam Failure
Moderate Risk (PRI 1.1 -1.9)	High Wind Lightning Wildfire Tornado Hail Extreme Heat Drought
Low Risk (PRI 0.50 – 1)	Winter Storms
No Risk (PRI 0 – 0.49)	Earthquake

Table 3.7 City of Kerens

High Risk (PRI 2 - 3)	
Moderate Risk (PRI 1.1 -1.9)	Lightning Extreme Heat Tornado Hail High Wind Drought
Low Risk (PRI 0.50 – 1)	Wildfire Winter Storm
No Risk (PRI 0 – 0.49)	Flooding Earthquake Dam Failure

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Vulnerability Assessment

According to *Requirement 201.6(c)(2)(ii)* “The risk assessment shall include a description of the jurisdiction’s vulnerability to the hazards that can affect the jurisdiction. This description shall include an overall summary of each hazard and its impact on the community.” In compliance with *Requirement 201.6(c)(2)(iii)* the vulnerability assessment was conducted for each jurisdiction as needed to reflect unique or varied risks within the County. This objective was met by analyzing the data on an individual basis to assess each jurisdiction risk.

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3.5 Identification of Assets

An inventory of Navarro County's geo-referenced assets was created in order to identify and characterize property and population potentially at risk to the identified hazards. By understanding the type and number of assets that exist and where they are located in relation to known hazard areas, the relative risk and vulnerability for such assets can be assessed. For this assessment, five categories of assets were evaluated using Geographic Information System and statistical analysis. The five categories of vulnerable assets include:

- **Population**: Includes the number of people residing in Navarro County as delineated by U.S. Census 2010 block data provided by NCTCOG.
- **Improved property**: Includes all developed properties according to local parcel data from the Navarro County Central Appraisal District. The information has been expressed in terms of the total assessed value of improvements that may be exposed to the identified hazards.
- **Emergency facilities**: Includes fire stations, police stations and hospitals, provided by the Regional Hazard Assessment Tool, Navarro County Emergency Management Coordinator, and participating jurisdictions.
- **Critical facilities**: Includes schools and historic places provided by Regional Hazard Assessment Tool, Navarro County Emergency Management Coordinator, and participating jurisdictions. These are non-emergency facilities, but still provide critical services and functions for vulnerable sectors of the population.
- **Critical infrastructure**: Includes airports, natural gas facilities, wastewater facilities, potable water treatment facilities, wastewater treatment facilities, dams, and bridges. Data for all critical facilities was obtained from Regional Hazard Assessment Tool, Navarro County Emergency Management Coordinator, and participating jurisdictions.

The following tables provide a breakdown by municipal jurisdiction of the geo-referenced assets that were used for the vulnerability assessment.

Population

According to the U.S. Census 2010 block data provided by NCTCOG, the total population of Navarro County in 2010 was 22,392 people, with 10,216 households. The count breakdown by municipal jurisdiction is provided in *Table 3.8.*

Table 3.8. Navarro County Population Counts

Jurisdiction*	Population			Households		
	Population	% of County Total	Population Density (Sq. Mile)	Household	% of County Total	Household Density (Sq. Mile)
Navarro County	22,392**	46.9%	21.08	10,216**	50.48%	19.06
Corsicana	23,770	49.8%	1095.39	9,317	46.04%	429.35
Kerens	1,573	3.3%	683.91	705	3.48%	306.52
Total	**47,735****	**100.0%**	**43.95**	**20,238****	**100%**	**18.64**

Source: 2010 Census Data
** County unincorporated areas*

Table 3.9 summarizes population counts and population chance (absolute and percent predications for Navarro County).

Table 3.9 Population Predictions

County	Population 2010 Census	Population 2012 Estimate	Population 2013 Estimate	Absolute Change 2012-2013	Percent (%) Change 2012-2013
Navarro County	47,735	48,250	48,440	190	0.4%

Source: 2010 Census Data, NCTCOG population estimates

Property

There are an estimated 47,735 parcels in Navarro County, with an estimated $ 2,697,520,264 in total assessed value of. *Table 3.10* lists the total number and percentage of parcels by jurisdiction.

Table 3.10 Parcel Counts and Improvements Value

Jurisdiction	Number of Parcels	% of County Total	Total Assessed Value of Improvements (Buildings)[1]
Navarro County**	20,571	64.30%	$1,641,664,906
Corsicana	11,286	35.27%	$1,033,706,758

Jurisdiction	Number of Parcels	% of County Total	Total Assessed Value of Improvements (Buildings)[1]
Kerens	135	.42%	$22,148,600
Total	**31,992**	**-**	**$ 2,697,520,264**

Source: County Data and Regional Hazard Assessment Tool
***Includes totals from incorporated jurisdictions not participating in the plan*

Emergency Facilities

There are 17 identified emergency facilities in Navarro County, including 12 fire stations, four police stations, and one hospital. *Table 3.11* presents the distribution of emergency facilities by jurisdiction. Geographic coordinates were used to determine the location of each facility.

Table 3.11 Emergency Facilities

Jurisdiction	Fire Stations	Police Stations	Hospitals
Navarro County*	7	1	0
Corsicana	4	2	1
Kerens	1	1	0
TOTAL	**12**	**4**	**1**

Source: County Data and Local Jurisdictions
** Navarro County unincorporated areas*

Critical Facilities

There are 65 critical facilities, which are considered non-emergency in Navarro County. The critical facilities include 11 schools and 54 historical property sites (*Table 3.12*). Geographic coordinates (i.e., latitude and longitude) were used to determine the location of each facility.

Table 3.12 Critical Facilities

Jurisdiction	Schools	Historical Property
Navarro County*	0	0
Corsicana	10	54
Kerens	1	0
Total	**11**	**54**

Source: Local jurisdictions
** Navarro County unincorporated areas*

Critical Infrastructure

There are 115 identified critical infrastructure facilities in Navarro County including one airport, one natural gas facility, three water treatment facilities, three wastewater treatment facilities, 99 dams, and eight railway/highway bridges (*Table 3.13*).

Table 3.13 Critical Infrastructure

Jurisdiction	Airports	Natural Gas Facilities	Wastewater Treatment Facilities	Potable Water Treatment Facilities	Dams	Railway/ Highway Bridges
Navarro County*	0	0	1	1	97	2
Corsicana	1	1	1	1	2	6
Kerens	0	0	1	1	0	0
Total	**1**	**1**	**3**	**3**	**99**	**8**

Source: Local jurisdictions

**Navarro County unincorporated areas*

3.6 Methodology

Based on the type of information available for analysis, Navarro County's vulnerability assessment was conducted using two distinct methodologies, a Geographic Information System-based analysis and a statistical risk assessment methodology. Each approach provides estimates for the potential impact of hazards by using a common, systematic framework for evaluation of historical occurrence information provided by National Climatic Data Center, the Texas Forest Service, and NCTCOG Regional Hazard Assessment Tool. The results of the vulnerability assessment are provided by jurisdiction for each hazard analyzed.

Of the 11 hazards evaluated for Navarro County, four were analyzed using a Geographic Information System-based analysis, five using a statistical risk assessment methodology, and the remaining two hazards using a qualitative analysis. The qualitative analysis was limited to two of the hazards due to lack of information, the inability to define specific areas of risk, and/or inexistence of historical records. Additional information regarding these events is unattainable at the present time, but will be an objective in the five-year planning cycle update. *Table 3.14* summarizes the methodology used for each hazard.

Table 3.14 Analysis used for Vulnerability Assessment

Hazard	Geographic Information System-based Analysis	Statistical Analysis	Qualitative Analysis
Dam Failure			√
Drought	√		
Earthquake			√
Extreme Heat		√	
Flood	√		
Hailstorm	√		
High Wind		√	
Lightning		√	
Tornado		√	
Wildfire	√		
Winter Storm		√	

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3.7 Summary of Vulnerably Assessment

A summary of the vulnerability assessment for each hazard using geographic and statistical analysis is presented in the following pages. The detailed assessment is presented in Sections 3.8 and 3.9.

Summary Table 1

Drought	
Population	According to National Climatic Data Center (NCDC) no injuries or fatalities have been recorded for drought events. There are no personal losses expected from drought events.
Improved Property	According to National Climatic Data Center (NCDC), a loss of zero per year can be expected in property loss due to damage from drought. Available historical data indicates that the expected losses from drought correspond to crop losses in the amount of $15,913.04 per year, mostly experienced in water shortages and crop losses on agricultural lands.
Emergency Facilities	Because of the nature of this hazard, there are no losses or direct impacts expected on emergency facilities due to drought events.
Critical Facilities	Because of the nature of this hazard, there are no losses or direct impacts expected on critical facilities due to drought events.
Critical Infrastructure	Because of the nature of this hazard, there are no losses or direct impacts expected on critical infrastructure due to drought events.

Summary Table 2

Extreme Heat	
Population	According to National Climatic Data Center (NCDC), there was one fatality and no injuries recorded due to extreme heat. Navarro County and its population is exposed to this hazard.
Improved Property	According to National Climatic Data Center (NCDC), there is limited impact of extreme heat to developed areas and the improved property in Navarro County is not exposed to this hazard.
Emergency Facilities	According to National Climatic Data Center (NCDC), there is limited impact of extreme heat to buildings and the emergency facilities in Navarro County are not exposed to this hazard.
Critical Facilities	According to National Climatic Data Center (NCDC), there is limited impact of extreme heat to buildings, and the critical facilities in Navarro County are not exposed to this hazard.
Critical Infrastructure	According to National Climatic Data Center (NCDC there is limited impact of extreme heat to critical infrastructure, and exposure to this hazard is considered minimal in Navarro County

Summary Table 3

Flooding	
Population	Flooding produces an expected annualized count of 0.26 fatalities and zero injuries per year.
Improved Property	A loss of $1,933,391.30 per year can be expected in property loss due to flooding, and 31.7% of the total assessed value of improvements in Navarro County is at risk from the 100-year storm event.
Emergency Facilities	There are 0 emergency facilities at imminent risk from the 100-year storm event.
Critical Facilities	There are 61 critical facilities located within the 100-year storm event.
Critical Infrastructure	0% of railways/highways and bridges, 60.6% of dams, 0% of water treatment works, and 100% waste water treatment facilities, are at risk from the 100-year storm event. Many of these structures are designed to traverse or be located within the floodplain due to unavoidable circumstances. Additionally, treated wastewater is typically discharged towards streams, which makes portions of wastewater treatment facilities likely to be located within the floodplain.

Summary Table 4

Hail	
Population	According to National Climatic Data Center (NCDC), no injuries or fatalities have been recorded for hailstorm events. There are no personal losses expected from hailstorm events.
Improved Property	According to National Climatic Data Center (NCDC), a loss of $17,739.13 per year can be expected in property loss due to hailstorm damage, and all improved property is exposed to this hazard. Although some crops are susceptible to hail hazards, available historical data for Navarro County indicates that there are no expected crop losses from this event.
Emergency Facilities	Because of the unpredictability of the geographical location of hailstorms, all emergency facilities in Navarro County are exposed to this hazard.
Critical Facilities	Because of the unpredictability of the geographical location of hailstorms, all critical facilities in Navarro County are exposed to this hazard.
Critical Infrastructure	Because of the unpredictability of the geographical location of hailstorms, all critical infrastructures in Navarro County are exposed to this hazard.

Summary Table 5

High Wind	
Population	According to National Climatic Data Center (NCDC), there were no recorded injuries or fatalities from high wind events. All the population of Navarro County is exposed to this hazard.
Improved Property	According to National Climatic Data Center (NCDC), an average loss of $74,000 per year in property losses is expected from high wind events in Navarro County. No crop losses resulted from this hazard in Navarro County.
Emergency Facilities	Because of the expected geographical widespread nature of high winds, all emergency facilities in Navarro County are exposed to this hazard.
Critical Facilities	Because of the expected geographical widespread nature of high winds, all critical facilities in Navarro County are exposed to this hazard.
Critical Infrastructure	Because of the expected geographical widespread nature of high winds, all critical infrastructures in Navarro County are exposed to this hazard.

Summary Table 6

Lightning	
Population	According to National Climatic Data Center (NCDC), there were no recorded injuries or fatalities from lightning events in Navarro County. All the population of Navarro County is exposed to this hazard.
Improved Property	According to National Climatic Data Center (NCDC), there have been no recorded property or crop losses resulting from lightning in Navarro County.
Emergency Facilities	Because of the expected geographical widespread nature of lightning, all emergency facilities in Navarro County are exposed to this hazard.
Critical Facilities	Because of the expected geographical widespread nature of lightning, all critical facilities in Navarro County are exposed to this hazard.
Critical Infrastructure	Because of the expected geographical widespread nature of lightning, all critical infrastructures in Navarro County are exposed to this hazard.

Summary Table 7

Tornado	
Population	According to National Climatic Data Center (NCDC), there have been five recorded injuries and zero fatalities from tornado events in Navarro County. All the population of Navarro County is exposed and vulnerable to this hazard.
Improved Property	According to National Climatic Data Center (NCDC), an average loss of $99,130.44 per year in property losses is expected to result from tornado events. No crop losses are expected from this hazard in Navarro County.
Emergency Facilities	Because of the impossibility to predict the geographical area of impact for tornados, all emergency facilities in Navarro County are exposed to this hazard.
Critical Facilities	Because of the impossibility to predict the geographical area of impact for tornados, all critical facilities in Navarro County are exposed to this hazard.
Critical Infrastructure	Because of the impossibility to predict the geographical area of impact for tornados, all critical infrastructures in Navarro County are exposed to this hazard.

Summary Table 8

Wildfire	
Population	Based on geographical data, approximately 56.20% of Navarro County is vulnerable to wildfires, with Navarro and the unincorporated areas contributing with the majority of the exposed population.
Improved Property	Based on geographical data, a loss of $33,478.26 per year can be expected in property loss due to wildfires, which is less than 1% of the overall property improvement values across Navarro County.
Emergency Facilities	Based on geographic information there are 5 emergency facilities at risk from wildfire events.
Critical Facilities	Based on geographic information there are 18 schools at risk from wildfire events.
Critical Infrastructure	Based on geographic information there are 0 bridges, 33 dams, 1 airport, 2 wastewater treatment facility, and 1 water treatment facility at risk from wildfire events.

Summary Table 9

Winter Storm	
Population	According to National Climatic Data Center (NCDC), there have been no recorded injuries or fatalities from winter storms. All the population of Navarro County is exposed to this hazard.
Improved Property	According to National Climatic Data Center (NCDC), an average loss of $16,608.70 per year in property losses is expected to result from winter storm events. No crop losses are expected from this hazard in Navarro County.
Emergency Facilities	Because of the expected geographical widespread nature of winter storms, all emergency facilities in Navarro County are exposed to this hazard.
Critical Facilities	Because of the expected geographical widespread nature of winter storms, all critical facilities in Navarro County are exposed to this hazard.
Critical Infrastructure	Because of the expected geographical widespread nature of winter storms, all critical infrastructures in Navarro County are exposed to this hazard.

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3.8 Geographic Information System Based Analysis

For the Geographic Information System-based assessment, digital data was collected from local, state, and national sources. ESRI® ArcMap™ 10.0 was used to assess risk utilizing digital data, which included local tax records for individual parcels and geo-referenced point locations for buildings and critical facilities.

The objective of the Geographic Information System-based analysis was to determine the estimated vulnerability of the five categories of assets to the identified hazards for Navarro County using best available geospatial data. Local databases made available through Navarro County such as local tax assessor records, parcel boundaries, building footprints and critical and emergency facilities data, were used in combination with digital hazard data obtained from the National Climatic Data Center and the Regional Hazard Assessment Tool. The results of the analysis provided an estimated number of people, as well as the numbers and values of buildings and critical facilities determined to be potentially at risk to those hazards with delineable geographic hazard boundaries.

For some of the hazards, the Geographic Information System analysis was supplemented with a statistical analysis conducted on the historical data obtained from National Climatic Data Center and the Texas Forest Service for wildfires. The data included both casualty and property losses from hazard events that occurred in Navarro County from 01/01/2002 – 06/30/2013. Annualized personal and property losses were calculated by dividing the total losses by the number of years for which data was available (i.e. 11.5 years).

Drought

Because drought impacts large areas that cross jurisdictional boundaries, all of the improved property and population in Navarro County are considered to be exposed to this hazard. However, drought impacts are mostly experienced in water shortages and crop losses on agricultural lands, with no impact on buildings.

Since crop losses are expected to be the most vulnerable assets for this hazard, agricultural land acreage was acquired from the USGS land cover classification data to estimate the relative area of Navarro County that would be affected by this event. *Table 3.15* below provides the distribution of agricultural land for each jurisdiction in Navarro County. Navarro County has a total of 340,009 acres of agricultural lands, which represents approximately 58.78% of Navarro County territory, with the vast majority located in the unincorporated areas.

Table 3.15 Agricultural Land in Navarro County

Jurisdiction	Total Acres	Agricultural Land Acres	Percentage (%) of Total Acres
Navarro County*	555,037	332,661	59.93
Corsicana	21,475	6,394	29.77
Kerens	1,882	954	50.69
Total	578,394	340,009	58.78

Sources: U.S. Geological Survey
**: Unincorporated Navarro County*

Based on the available information, vulnerability to drought was assessed using two techniques: (1) to comply with *Requirement 201.6(c)(2)(ii)(B*), historical loss data obtained from the Texas Hazard Mitigation Package was used to predict expected monetary and human losses from the event; (2) in fulfillment of Element A of *Requirement 201.6(c)(2)(ii)(A*), geographical hazard areas identified for drought and the nature of the impacts expected from drought events were used to identify the assets, including existing structures, vulnerable to this hazard. The vulnerability to future structures was not conducted at this time due to unattainable data. Therefore, compliance with Element B of *Requirement 201.6(c)(2)(ii)(A),* describing vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities will be an objective in the five-year planning cycle.

Table 3.16 presents Navarro County's recorded historical losses due to drought events as provided in the hazard events database obtained from the National Climatic Data Center. Property and personal losses in each expected in each jurisdiction are presented in *Table 3.16*.

Table 3.16 Historical Annualized Losses Due to Drought (01/01/2002 – 06/30/2013)

Jurisdiction	Date	Fatalities	Injuries	Property Damage	Crop Damage Including	Annualized Expected Crop Loss	Annualized Expected Crop Loss per Acre
Navarro County Territory	7/1/2005	0	0	$0	$0	$0	$0
	11/1/2005	0	0	$0	$0	$0	$0
	12/1/2005	0	0	$0	$0	$0	$0
	1/1/2006	0	0	$0	$0	$0	$0
	2/1/2006	0	0	$0	$0	$0	$0
	3/1/2006	0	0	$0	$0	$0	$0
	6/6/2006	0	0	$0	$0	$0	$0
	7/1/2006	0	0	$0	$0	$0	$0
	8/1/2006	0	0	$0	$0	$0	$0
	9/1/2006	0	0	$0	$0	$0	$0
	3/10/2009	0	0	$0	$5,000	$434.78	$0.00
	4/1/2009	0	0	$0	$10,000	$1,304.35	$0.00
	1/1/2011	0	0	$0	$2,000	$1,478.26	$0.00
	3/14/2011	0	0	$0	$4,000	$1,826.09	$0.00
	4/1/2011	0	0	$0	$15,000	$3,130.43	$0.01
	5/1/2011	0	0	$0	$15,000	$4,434.78	$0.01
	6/1/2011	0	0	$0	$20,000	$6,173.91	$0.01
	7/1/2011	0	0	$0	$15,000	$7,478.26	$0.01
	8/1/2011	0	0	$0	$20,000	$9,217.39	$0.01
	9/1/2011	0	0	$0	$30,000	$11,826.09	$0.02
	10/1/2011	0	0	$0	$20,000	$13,565.22	$0.02
	11/1/2011	0	0	$0	$10,000	$14,434.78	$0.02
	12/1/2011	0	0	$0	$5,000	$14,869.57	$0.02
	9/25/2012	0	0	$0	$2,000	$15,043.48	$0.02
	11/27/2012	0	0	$0	$1,000	$15,130.43	$0.02
	12/1/2012	0	0	$0	$5,000	$15,565.22	$0.03
	1/1/2013	0	0	$0	$1,000	$15,652.17	$0.03
	2/1/2013	0	0	$0	$1,000	$15,739.13	$0.03
	6/25/2013	0	0	$0	$2,000	$15,913.04	$0.03
Total	**29**	**0**	**0**	**$0**	**$183,000**	**$15,913.04**	**$0.03**

Source: National Climatic Data Center

As described on Section 3.6, calculations of annualized losses due to drought events were conducted using historical data obtained from the National Climatic Data Center (*Table 3.16*). The annualized loss value can be interpreted as the impact expected from drought in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.16*, Navarro County can expect approximately an annual $0 in property losses, and $15,913.04 of crop losses each year as a result of drought, with no injuries or deaths expected from this event.

Since the geographical occurrence of drought is typically regional, the area of potential impacts corresponds to all of Navarro County's territory. However, due to the nature of this event, property losses are more likely related to crop damage. Buildings and infrastructure are not expected to be directly impacted by drought events. Therefore, improved property, emergency and critical facilities, and critical structures are not exposed to this hazard.

In compliance to *Requirement 201.6(c)(2)(ii)*, vulnerability to drought and impacts to assets expected from drought events can be summarized as follows:

- **Population**: According to National Climatic Data Center (NCDC) no recorded injuries or fatalities have been recorded for drought events. There are no personal losses expected from drought events. All the population of Navarro County is exposed to this hazard, but there are no personal losses expected from drought events.
- **Improved Property**: According to National Climatic Data Center (NCDC), a loss of $0 per year can be expected in property loss due to damage from drought. Available historical data indicates that the expected losses from drought correspond to crop losses in the amount of $15,913.04 per year, mostly experienced in water shortages and crop losses on agricultural lands.
- **Emergency Facilities**: Because of the nature of this hazard, there are no losses or direct impacts expected on emergency facilities due to drought events.
- **Critical Facilities**: Because of the nature of this hazard, there are no losses or direct impacts expected on critical facilities due to drought events.
- **Critical Infrastructure**: Because of the nature of this hazard, there are no losses or direct impacts expected on critical infrastructure due to drought events.

Information needed to fulfill *Requirement 201.6(c)(2)(ii*)(C), which addresses land uses and development trends was unattainable during the preparation of this hazard mitigation plan. Compliance with this requirement will be an objective in the five-year planning cycle.

Flood

Floods impact large areas and cross jurisdictional boundaries. All five categories of assets are considered vulnerable and can be exposed to this hazard. Based on the available information, vulnerability to flooding was assessed using two techniques: (1) to comply with *Requirement 201.6(c)(2)(ii)(B*), historical loss data obtained from National Climatic Data Center was used to predict expected monetary and human losses from the event; (2) in fulfillment of Element A of *Requirement 201.6(c)(2)(ii)(A*), geographical data was used to identify the assets, including existing structures, vulnerable to flooding. The vulnerability to future structures was not assessed at this time due to unattainable data. Therefore, compliance with Element B of *Requirement 201.6(c)(2)(ii)(A),* describing vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities will be an objective in the five-year planning cycle.

Table 3.17 presents Navarro County's recorded historical losses due to flooding as provided in the hazard events database obtained by National Climatic Data Center. Although specific data is provided by jurisdiction, the figures presented may reflect the place where the event was more relevant or where it started.

Table 3.17 Historical Annualized Losses Due to Flood Events (01/01/2002 – 06/30/2013)

Location	Date	Time	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Barry	3/20/2012	1:28	Flash Flood		0	0	$500,000	$0
Chatfield	9/8/2010	6:10	Flash Flood		0	0	$40,000	$0
Chatfield	4/28/2009	13:00	Flash Flood		0	0	$750,000	$0
Corsicana	4/25/2011	17:51	Flash Flood		0	0	$0	$0
Corsicana	5/27/2008	13:50	Flash Flood		0	0	$15,000	$0
Corsicana	4/23/2008	21:00	Flash Flood		0	0	$2,000	$0
Corsicana	9/5/2007	8:20	Flash Flood		0	0	$0	$0
Corsicana	3/30/2007	19:00	Flash Flood		0	0	$0	$0
Corsicana	3/29/2007	18:52	Flash Flood		0	0	$19,000,000	$0
Corsicana	5/1/2004	0:30	Flash Flood		1	0	$20,000	$0
Corsicana	5/1/2004	0:45	Flash Flood		2	0	$10,000	$0
Corsicana Arpt	5/14/2010	14:28	Flash Flood		0	0	$0	$0

Location	Date	Time	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Dawson	6/10/2010	6:12	Flash Flood		0	0	$1,850,000	$0
Frost	10/26/2009	8:30	Flood		0	0	$5,000	$0
Frost	6/26/2007	19:55	Flash Flood		0	0	$0	$0
Montfort	3/20/2012	3:00	Flood		0	0	$0	$0
Navarro (Zone)	4/25/2006	19:15	Flood		0	0	$0	$0
Rice	10/13/2009	12:30	Flash Flood		0	0	$3,000	$0
Rice	9/13/2009	20:45	Flash Flood		0	0	$2,000	$0
Rice	9/13/2009	21:45	Flood		0	0	$2,000	$0
Rice	4/24/2004	6:54	Flash Flood		0	0	$0	$0
Richland	3/12/2007	7:00	Flash Flood		0	0	$0	$0
Richland	1/13/2007	13:18	Flash Flood		0	0	$35,000	$0
Totals:					**3**	**0**	**$22,234,000**	**$0**

Source: National Climatic Data Center

As described in Section 3.6 calculations of annualized losses due to flooding events were conducted using historical data obtained from National Climatic Data Center (*Table 3.17*). The annualized loss value can be interpreted as the impact expected from flooding in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.17*, Navarro County can expect a total property loss of $2,210,521.70 each year as a result of flooding, with no injuries, no fatalities, and no crop losses.

In order to assess flood risk and vulnerability of the identified assets, a Geographic Information System-based analysis was conducted to estimate exposure to flood events using Federal Emergency Management Agency's digital 100-year floodplain in combination with Navarro County Central Appraisal District property records and the geo-referenced assets provided by Regional Hazard Assessment Tool. The 100-year floodplain data layer for this analysis is a subset of FAFDS Nationwide Floodmap Database as of May 2007.

By overlaying the geo-referenced assets and the floodplain layers using Geographic Information System, the number of critical infrastructure located within the 100-year floodplain was calculated *(Table 3.18).* Although, having a facility located within the floodplain does not necessarily imply that would be impacted by the 100-year storm event (e.g., the building could be flood-proofed, or the buildings may be

constructed above the 100-year elevation), it provides with a good approximation of potential impacts from flooding.

Table 3.18 Critical Infrastructure Located in 100-year FEMA Floodplain

Jurisdiction	Critical Infrastructure											
	Railway/ Highway Bridges		Dams		Water Treatment Facilities		Waste Water Treatment Facilities		Natural Gas		Airports	
	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)
Navarro County	0	0	60	60.60%	0	0	1	33.33%	0	0	0	0
Total	**0**	**0**	**60**	**60.60%**	**0**	**0**	**1**	**33.33%**	**0**	**0**	**0**	0

Source: Local jurisdictions, County Appraisal Data, GIS

As noted in *Table 3.18*, the total and percentage of critical infrastructure located within the 100-year floodplain corresponds to approximately 0% of railway/highway bridges, 60.6% of dams, 0 water treatment facilities, and 33.33% of waste-water treatment facilities.

Vulnerability to flooding can also be measured by assessing the number of people and buildings exposed to flood events. *Table 3.19* shows Residential Parcels and Improved Property at risk from flooding events.

The determination of residential parcel vulnerability was calculated by adding the total residential parcel counts from 2013 that had at least some portion located within the 100-year floodplain. The determination of commercial and utility property value at-risk (exposure) was calculated adding the total assessed building values for only those parcels that were confirmed to have at least one building located within the 100-year floodplain.

Table 3.19 Residential Parcels and Buildings potentially located within the 100-year floodplain

Jurisdiction	Residential Parcels located in the 100-year Floodplain	Percentage of Total Residential Parcels located in the 100-year Floodplain	Commercial and Utility parcels in the 100-year Floodplain	Percentage of Commercial and Utility Parcels in the 100-year Floodplain
Navarro County*	2,934	52.5%	235	75.07%
Corsicana	734	9.93%	201	13.48%
Kerens	11	25%	4	15.38%
Total	**3679**	**28.25%**	**440**	**24.04%**

Source: Local jurisdictions, County Appraisal Data, GIS

As it can be observed in *Table 3.19*, approximately 28.25% of the residential parcels in Navarro County, and 24.04% of its commercial and utility parcels are located within the 100-year floodplain.

Since Navarro County is composed by large areas used for cropland, an analysis was conducted to determine the vulnerability of the land to flooding relative to the type of land cover (*Table 3.20*). The calculations were made using Geographic Information System. The USGS land cover shapefile was clipped with the 100-year floodplain to calculate the area (acreage) of each land cover type potentially affected by flooding. Reservoirs, streams, and channels were excluded from the calculations.

Table 3.20 Land Cover Types and Acreage located within the 100-year Floodplain

Land Cover Type	Total Areas For Navarro County (Acres)	Total Area Affected By 100-year Flood (Acres)	Percentage of Area Affected By 100-year Flood (%)
Commercial	18,003	12,707	70.6%
Utilities	215	140	65.1%
Residential	202,396	109,755	54.2%
Farmland/Undeveloped	379,013	207,455	54.7%
Total	**599,627**	**330,057**	**55%**

Source: USGS, County Appraisal Data, GIS

As observed, approximately 55% of the total area of Navarro County is located within the 100-year floodplain. The type with the highest percentage of acreage in the floodplain is commercial property (70.6%), followed by utilities (65.1%).

In compliance to *Requirement 201.6(c)(2)(ii)* Navarro County vulnerability from flooding and impacts to assets expected from flooding can be summarized as follows:

- **Population**: Based on historical data, flooding produces an expected annualized zero injuries and fatalities per year. In total, portions of the population of Navarro County is located within the 100-year floodplain.
- **Improved Property**: Based on historical data, a loss of $1,933,391.30 per year can be expected in property loss due to flooding, with no expected crop losses. Based on geographic information and assuming that a facility within the 100-year floodplain is exposed to impact, 55% of the total assessed value of improvements in Navarro County is at risk from the 100-year storm event.
- **Emergency Facilities**: Based on geographic information and assuming that a facility within the 100-year floodplain is exposed to impact, there are no emergency facilities at imminent risk from the 100-year storm event.
- **Critical Facilities**: Based on geographic information and assuming that a facility within the 100-year floodplain is exposed to impact, there are no critical facilities at imminent risk from the 100-year storm event.
- **Critical Infrastructure**: Based on geographic information and assuming that a critical infrastructure within the 100-year floodplain is exposed to impact 0% of railways/highways and bridges, 60.6% of dams, and 16.67% water treatment facilities.

Information needed to fulfill *Requirement 201.6(c)(2)(ii)(C),* which addresses land uses and development trends was unattainable during the preparation of this hazard mitigation plan. Compliance with this requirement will be an objective in the five-year planning cycle.

Repetitive Loss

As per *Requirement 201.6(c)(2)(ii)* "The risk assessments in all plans approved after October 1, 2008 must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods." Repetitive Loss Property information provides local jurisdictions with the properties that had submitted insurance claims due to flooding damage to buildings and its contents. The information provided by Federal Emergency Management Agency included 4 repetitive loss properties in Navarro County as of July 11, 2014 (*Table 3.21*).

Address information available for 4 repetitive loss properties recorded allowed those properties to be geo-referenced using ESRI® ArcMap™ 10.2. The probability of future repetitive losses on those properties was estimated using Geographic Information System by overlying the geo-referenced properties with the 100-year floodplain layer. *Table 3.21* summarizes with the number of properties located within the 100-year floodplain as obtained using this approach.

Table 3.21 Repetitive Loss Properties located within the 100-year Floodplain

Jurisdiction	Total Number of Repetitive Loss Properties	Properties within 100-year Floodplain			Total Number of Repetitive Loss Properties Within 100-year Floodplain	Percent of Repetitive Loss Properties Within 100-year Floodplain
		Single Family	Other Residential	Non Residential		
Navarro County*	0	0	0	0	0	0
City of Corsicana	4	4	0	0	4	100%
City of Kerens	0	0	0	0	0	0
Total	**4**	**4**	0	0	**4**	**100%**

Source: Federal Emergency Management Agency
**Navarro County unincorporated areas*

As noted in *Table 3.21*, all of the repetitive loss properties are located in Corsicana, with 100% of those properties located within the 100-year floodplain. In compliance with *Requirement 201.6(c)(2)(ii)*,*Table 3.22* provides the type (residential, commercial, institutional, etc.) and numbers of repetitive loss properties located in the identified flood hazard zones within Navarro County.

Table 3.22 shows the repetitive loss property statistics for the 4 properties recorded in Navarro County classified by jurisdiction. The numbers provided can be used to estimate the vulnerability to repetitive loss properties in terms of dollar losses. Only cities with repetitive loss properties were included in *Table 3.22.*

Table 3.22 Repetitive Loss Property Statistics

Jurisdiction	Single Family				Other Residential				Non Residential				Total			
	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments
Navarro County	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corsicana	1982-2007	4	11	$130,450	0	0	0	0	0	0	0	0	1982-2007	4	11	$130,450
Kerens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**1982-2007**	**4**	**11**	**$130,450**	0	0	0	0	0	0	0	0	**1982-2007**	**4**	**11**	**$130,450**

Source: Federal Emergency Management Agency
** Navarro County unincorporated areas*

The dollar amounts in the tables represent the payments made for insurance claims due to flood damage to buildings and contents. As can be observed in *Table 3.22* and, consistent with having the greatest number of repetitive loss properties, the City of Corsicana is the only city with repetitive loss claims, with payments totaling $130,450.

Although, both repetitive loss information (*Tables 3.21 and 3.22*) and the historical annualized losses expected from flooding (*Table 3.17*) represent actual historical information, the data cannot be compared or correlated to each other. The repetitive loss information presents insurance claims on properties and buildings, whereas the historical annualized losses represent property losses in the community due to flood events.

Hail

As described in section 3.2, damage from hail events is determined by the intensity of the storm, which, based on the hail diameter, ranges from hard hail to super hailstorm. These events are unpredictable, and all areas of Navarro County can be affected. All five categories of assets are exposed to this hazard and could potentially be impacted. However, the most vulnerable assets are those related to property and infrastructure, particularly roofs and structures. Damages from hail can potentially translate into significant insurance claims and expenses.

Based on the available information, vulnerability to hail was assessed using two techniques: (1) to comply with *Requirement 201.6(c)(2)(ii)(B*), historical loss data obtained from the National Climatic Data Center was used to predict expected monetary and human losses from the event; (2) in fulfillment of Element A of *Requirement 201.6(c)(2)(ii)(A*), geographical hazard areas identified for hail and the nature of the impacts expected from hail were used to identify the assets, including existing structures, vulnerable to this hazard event. The vulnerability to future structures was not conducted at this time due to unattainable data. Therefore, compliance with Element B of *Requirement 201.6(c)(2)(ii)(A),* describing vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities will be an objective in the five-year planning cycle.

Table 3.23 presents Navarro County's recorded historical losses due to hailstorm events as provided in the hazard events database obtained from the National Climatic Data Center. Based on the starting location of the hailstorm event, these events were geo-referenced using ESRI® ArcMap™ 10.2 *(Figure 3.23).* The resulting layer was overlaid with the jurisdiction boundary layer to determine the property and personal losses in each jurisdiction.

Table 3.23 Historical Annualized Losses Due to Hail Events (01/01/2002-6/30/2013)

Location	Date	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Corsicana	12/30/2002	Hail	0.75 in.	0	0	$0	$0
Navarro Mills Lake	5/15/2003	Hail	1.00 in.	0	0	$0	$0
Corsicana	5/16/2003	Hail	1.75 in.	0	0	$0	$0
Corsicana	5/16/2003	Hail	1.75 in.	0	0	$0	$0
Corsicana	5/16/2003	Hail	0.88 in.	0	0	$0	$0
Eureka	5/16/2003	Hail	2.75 in.	0	0	$0	$0
Eureka	5/16/2003	Hail	1.75 in.	0	0	$0	$0
Frost	8/11/2004	Hail	0.88 in.	0	0	$0	$0
Richland	11/23/2004	Hail	1.00 in.	0	0	$0	$0
Barry	4/5/2005	Hail	1.75 in.	0	0	$0	$0
Blooming Grove	4/5/2005	Hail	0.75 in.	0	0	$0	$0
Corsicana	4/5/2005	Hail	0.75 in.	0	0	$0	$0
Frost	4/5/2005	Hail	0.75 in.	0	0	$0	$0
Kerens	4/5/2005	Hail	1.00 in.	0	0	$0	$0

Location	Date	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Kerens	4/25/2005	Hail	1.00 in.	0	0	$0	$0
Rice	4/25/2005	Hail	1.75 in.	0	0	$0	$0
Eureka	5/25/2005	Hail	0.75 in.	0	0	$0	$0
Angus	7/2/2005	Hail	0.75 in.	0	0	$0	$0
Richland	7/2/2005	Hail	1.50 in.	0	0	$0	$0
Barry	3/18/2006	Hail	1.75 in.	0	0	$5,000	$0
Angus	3/29/2007	Hail	1.00 in.	0	0	$0	$0
Corsicana	5/2/2007	Hail	1.75 in.	0	0	$5,000	$0
Corsicana	2/16/2008	Hail	1.75 in.	0	0	$5,000	$0
Dawson	2/16/2008	Hail	1.75 in.	0	0	$5,000	$0
Dawson	4/23/2008	Hail	1.00 in.	0	0	$0	$0
Purdon	4/23/2008	Hail	0.88 in.	0	0	$0	$0
Bazette	4/25/2008	Hail	1.75 in.	0	0	$5,000	$0
Kerens	4/25/2008	Hail	1.75 in.	0	0	$5,000	$0
Round Prairie	4/25/2008	Hail	1.75 in.	0	0	$5,000	$0
Cryer Creek	8/21/2009	Hail	1.00 in.	0	0	$0	$0
Corsicana	5/14/2010	Hail	0.75 in.	0	0	$0	$0
Corsicana	5/14/2010	Hail	0.75 in.	0	0	$0	$0
Angus	5/20/2010	Hail	1.75 in.	0	0	$1,000	$0
Angus	5/20/2010	Hail	2.75 in.	0	0	$10,000	$0
Bazette	5/20/2010	Hail	1.25 in.	0	0	$0	$0
Chatfield	5/20/2010	Hail	1.00 in.	0	0	$0	$0
Corsicana	5/20/2010	Hail	2.75 in.	0	0	$30,000	$0
Corsicana Arpt	5/20/2010	Hail	1.75 in.	0	0	$1,000	$0
Goodlow Park	5/20/2010	Hail	0.88 in.	0	0	$0	$0
Goodlow Park	5/20/2010	Hail	1.00 in.	0	0	$0	$0
Bettys Chapel	10/11/2010	Hail	1.00 in.	0	0	$0	$0
Goodlow Park	10/11/2010	Hail	1.00 in.	0	0	$0	$0
Angus	10/23/2010	Hail	2.00 in.	0	0	$20,000	$0
Purdon	10/23/2010	Hail	1.75 in.	0	0	$12,000	$0
Powell	10/24/2010	Hail	1.00 in.	0	0	$0	$0
Rice	10/24/2010	Hail	3.00 in.	0	0	$50,000	$0
Corsicana	4/25/2011	Hail	1.75 in.	0	0	$30,000	$0

Location	Date	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Eureka	4/25/2011	Hail	1.00 in.	0	0	$0	$0
Blooming Grove	4/26/2011	Hail	1.75 in.	0	0	$2,000	$0
Frost	4/26/2011	Hail	1.75 in.	0	0	$3,000	$0
Blooming Grove	5/20/2011	Hail	0.75 in.	0	0	$0	$0
Corsicana	6/21/2011	Hail	1.00 in.	0	0	$0	$0
Pursley	6/21/2011	Hail	1.00 in.	0	0	$0	$0
Barry	9/18/2011	Hail	1.75 in.	0	0	$3,000	$0
Rice	10/23/2011	Hail	1.00 in.	0	0	$0	$0
Eureka	1/24/2012	Hail	0.75 in.	0	0	$0	$0
Corsicana	4/3/2012	Hail	0.88 in.	0	0	$0	$0
Powell	4/3/2012	Hail	1.00 in.	0	0	$0	$0
Cryer Creek	5/7/2012	Hail	1.00 in.	0	0	$0	$0
Corsicana	6/6/2012	Hail	0.75 in.	0	0	$0	$0
Alliance Hall	5/17/2013	Hail	1.00 in.	0	0	$0	$0
Frost	5/17/2013	Hail	1.75 in.	0	0	$7,000	$0
Frost	5/17/2013	Hail	1.00 in.	0	0	$0	$0
Rice	5/21/2013	Hail	0.75 in.	0	0	$0	$0
Totals:	**-**	**-**	**-**	**0**	**0**	**$204,000**	**$0**

Source: National Climatic Data Center

As described in Section 3.6, calculations of annualized losses due to hail events were conducted using historical data obtained from the National Climatic Data Center (*Table 3.23*). The annualized loss value can be interpreted as the impact expected from hail in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.23*, Navarro County can expect a total property loss of $8,173.91 each year as a result of hail, with no injuries, deaths, or crop losses expected from this event.

The geographical occurrence of hailstorm events cannot be predicted; therefore, the area of potential impacts corresponds to all of Navarro County's territory. Therefore, all improved property, emergency and critical facilities, and critical structures are exposed to this hazard, including 12 fire stations, four police stations, one hospital, 11 schools, and 54 historical properties. As described above, roofs and structures are more vulnerable to this hazard. Therefore, it is expected that building improvements would be most affected.

In compliance to *Requirement 201.6(c)(2)(ii)*, vulnerability to hail and impacts to assets expected from hail events can be summarized as follows:

- **Population**: According to National Climatic Data Center (NCDC), zero recorded injuries or fatalities have been recorded for hailstorm events. All the population of Navarro County is exposed to this hazard, but there are no personal losses expected from hailstorm events.
- **Improved Property**: Based on historical data, a loss of $17,739.13 per year can be expected in property loss due to hailstorm damage. Because of the unpredictability of the geographical location of hailstorms, all improved property in Navarro County is exposed to this hazard. Although some crops are susceptible to hail hazards, available historical data for Navarro County indicates that there are no expected crop losses from this event.
- **Emergency Facilities**: Because of the unpredictability of the geographical location of hailstorms, all emergency facilities in Navarro County are exposed to this hazard.
- **Critical Facilities**: Because of the unpredictability of the geographical location of hailstorms, all critical facilities in Navarro County are exposed to this hazard.
- **Critical Infrastructure**: Because of the unpredictability of the geographical location of hailstorms, all critical infrastructure in Navarro County is exposed to this hazard.

Information needed to fulfill *Requirement 201.6(c)(2)(ii*)(C), which addresses land uses and development trends was unattainable during the preparation of this hazard mitigation plan. Compliance with this requirement will be an objective in the five-year planning cycle

Wildfires

By definition, wildfires are fires occurring in a wildland area (e.g., grassland, forest, brush land) except for fire under prescription. Therefore, impacts from this hazard are related to wildland areas and what is known as Wildland Urban Interface (WUI), which are defined as the area where structures and other human development meet or intermingle with undeveloped wildland. The WUI creates an environment in which fire can move readily between structural and vegetation fuels. The expansion of these areas has increased the likelihood that wildfires will threaten structures and people.

Wildfires can cause significant damage to property and threatens the lives of people who are unable to evacuate WUI areas. All five categories of assets located in these wildfire-prone areas are considered vulnerable and can be exposed to this hazard.

WUI data was obtained from the Texas Forest Service wildfire database. The data provides GIS data for wildfires and households affected. Data from the National Climatic Data Center provided the property and crop damage totals for Navarro County wildfires.

Table 3.24 Wildfire Events (1/1/2002-6/30/2013)

Jurisdiction	Date	Fatalities	Injuries	Property Damage	Annualized Property Losses	Crop Damage
Navarro County Territory	2/14/2006	0	0	$45,000	$3,913.04	$0
	8/18/2011	0	0	$5,000	$4,347.83	$0
	9/4/2011	0	0	$0	$4,347.83	$0
	9/4/2011	0	0	$215,000	$23,043.48	$0
	9/4/2011	0	0	$60,000	$28,260.87	$0
	9/13/2011	0	0	$60,000	$33,478.26	$0
Totals:		0	0	$385,000	$33,478.26	$0

Source: National Climatic Data Center

Table 3.24 provides the date, number of fatalities, property and crop damage caused by fires in the county.

In order to assess wildfire risk and vulnerability of the identified assets, a Geographic Information System-based analysis was conducted to estimate exposure to this event using GIS data in combination with Navarro County Central Appraisal District property records, and the Regional Hazard Assessment Tool.

Wildland fires in Navarro County are highly likely to occur in the next year and will impact the county as a whole. Based on previous occurrences, the extent of wildland fires will be very high. Fires will start easily and spread at a rapid rate, which can result in extensive county wide property damage. According to the

Texas Forest Service Wildfire Summary Report, 66% of Navarro County's population is located in the Wildland Urban Interface. Maps depicting the WUI and wildfire risk can be found in Map Series E and F, respectively.

Table 3.25 Distribution of WUI Interface Communities in Navarro County

Jurisdiction	Area (Sq. Mile)	WUI-Interface Community				
		Low Density (Sq. Mile)	Medium Density (Sq. Mile)	High Density (Sq. Mile)	Total (Sq. Mile)	Percentage of Total Area (%)
Navarro County	969.5	481.99	52.60	11.68	546.27	56.34
Corsicana	33.5	5.46	3.29	8.87	17.62	52.59
Kerens	2.9	.39	.42	.64	1.45	49.31
Total	**1005.9**	**487.84**	**56.31**	**21.19**	**565.34**	**56.20**

Source: Texas Forest Service

Table 3.26 Schools within Wildland Urban Interface

Jurisdiction	Schools	
	Schools Located Within Low/Medium/High Density Interface Communities	Percentage (%) of Schools within WUI Communities
Navarro County	11	100%
Total	**11**	**100%**

Source: Texas Forest Service

Table 3.27 Critical Facilities within Wildland Urban Interface

Jurisdiction	Bridge		Airports		Dams		Water Facilities	
	Facilities Located Within Interface Communities	Percentage (%) of Facilities s	Facilities Located Within Interface Communities	Percentage (%) of Facilities s	Facilities Located Within Interface Communities	Percentage (%) of Facilities	Facilities Located Within Interface Communities	Percentage (%) of Facilities
Navarro County	0	0	1	100%	33	33.33%	3	50%
Total	**0**	**0**	**1**	**100%**	**33**	**33.33%**	**3**	**50%**

Source: Texas Forest Service

Table 3.28 Emergency Facilities within Wildland Urban Interface

Jurisdiction	Hospitals		Fire Stations		Police Stations	
	Facilities Located Within Low/Medium/ High Density Interface Communities	Percentage (%) of Facilities within WUI Communities	Facilities Located Within Low/Medium/ High Density Interface	Percentage (%) of Facilities within WUI Communities	Facilities Located Within Low/Medium/ High Density Interface Communities	Percentage (%) of Facilities within WUI Communities
Navarro County	1	100%	3	25%	1	25%
Total	**1**	100%	**3**	25%	**1**	25%

Source: Texas Forest Service

The determination of population vulnerability to wildfires was calculated by overlaying the population data from the 2000 U.S. Census Block shapefile to the Texas Fire Service data. The determination of assessed value at-risk (exposure) to wildfires was calculated by overlaying the improved property shapefile to the WUI polygons, and adding the total assessed building values within each of the low/medium/high density WUI Interface communities (*Table 3.29*).

Table 3.29 Population and Assessed Value of Improvements

Jurisdiction	Population at Risk	Percentage (%) of Population at Risk	Total Assessed Value of Improvements (Buildings & Contents) at Risk	Percentage (%) of Assessed Value of Improvements (Buildings & Contents) at Risk
Navarro County	20,861	43.06%	$1,801,716,963	66.79%
Corsicana	10,240	43.07%	$0	0
Kerens	1,312	83%	$0	0
Total	**32,413**	**43.93%**	$1,801,716,963	66.79%

Source: Texas Forest Service

As observed in *Table 3.29*, approximately 43.93% of Navarro County is vulnerable to wildfires, with Corsicana and unincorporated areas contributing with the majority of the exposed population. Based on geographical location, a total of $1,801,716,963 worth of property value composed by buildings and its contents are vulnerable to this hazard. This corresponds to a 66.79% of the overall property improvement values across Navarro County. This number is relatively high considering that only 56.20% of Navarro County's area corresponds to Interface community. The reason might be that, once the wildfires occur, the devastating impacts are significant.

In compliance to *Requirement 201.6(c)(2)(ii)* Navarro County's vulnerability to wildfire and impacts to assets expected from this event can be summarized as follows:

- **Population**: Based on geographical data, approximately 66% of Navarro County is vulnerable to wildfires, with the City of Kerens and unincorporated areas contributing with the majority of the exposed population.
- **Improved Property**: Based on geographical data, a loss of $2,697,520,264 worth of buildings and its contents is exposed to wildfires. This corresponds to a 66.79% overall property improvement values across Navarro County.
- **Emergency Facilities**: Based on geographic information and assuming that the facilities located within the WUI polygons is exposed to impact from wildfire, there are 3 fire stations, 1 hospital, and 1 police station at risk from wildfire events.
- **Critical Facilities**: Based on geographic information and assuming that the facilities located within the WUI polygons is exposed to impacts from wildfire, there are 11 schools at risk from wildfire events.
- **Critical Infrastructure**: Based on geographic information and assuming that the infrastructure located within the WUI polygons is exposed to impacts from fire, there are 0 bridges, 33 dams, 2 wastewater and 1 water facilities at risk from wildfire events.

Information needed to fulfill *Requirement 201.6(c)(2)(ii)(C),* which addresses land uses and development trends was unattainable during the preparation of this hazard mitigation plan. Compliance with this requirement will be an objective in the five-year planning cycle.

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3.9 Statistical Risk Assessment

A statistical risk assessment uses statistical and mathematical tools to predict hazard frequency and hazard estimated impacts. Data collected from National Climatic Data Center storm events database (recorded historic hazard events), census block data from the U.S. Census 2010 block data provided by the Texas Forest Service and Regional Hazard Assessment Tool were used to assess vulnerability of the five vulnerable categories of assets: population, improved property, critical facilities, critical infrastructure, and emergency facilities.

The statistical analysis was conducted using the historical data obtained from National Climatic Data Center. The data included both personal and property losses from hazard events that occurred in Navarro County from 01/01/2002 – 06/30/2013. Annualized personal and property losses were calculated by dividing the total losses by the number of years for which data was available (i.e. 11.5 years).

Extreme Heat

Extreme heat impacts large areas and cross jurisdictional boundaries; therefore, all Navarro County is exposed to this hazard. Improved property, emergency facilities, critical infrastructure, and critical facilities are not considered vulnerable to extreme heat or cold events; therefore, estimated vulnerability to these assets is anticipated to be minimal. However, population is significantly vulnerable to extreme heat.

Based on the available information, vulnerability to extreme heat was assessed using two techniques: 1) to comply with *Requirement 201.6(c)(2)(ii)(B*), historical loss data obtained from the National Climatic Data Center was used to predict expected monetary and human losses from the event; 2) in fulfillment of *Requirement 201.6(c)(2)(ii)(A*), geographical hazard areas identified for extreme heat and the nature of the impacts expected from this hazard event were used to identify the vulnerable assets.

Table 3.30 presents Navarro County's recorded historical losses due to extreme heat events as provided in the hazard events database obtained from the National Climatic Data Center. The annualized losses due to extreme events were calculated using the methodology described in Section 3.6.

Table 3.30 Extreme Heat Historical Occurrences (01/01/2002 – 06/30/2013)

Jurisdiction	Date	Type	Fatalities	Annualized Expected Fatalities	Injuries	Property Damage	Crop Damage
Navarro County Territory	8/28/2008	Heat	1	1	0	0	0
	8/1/2011	Excessive heat	0	.5	0	0	0
Total	**0**	**0**	**1**	**.5**	**0**	**0**	**0**

Source: National Climatic Data Center

The annualized loss value can be interpreted as the impact expected from extreme heat in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.30*, Navarro County and the accompanying jurisdictions in the planning area can expect .086 fatalities and no injuries per year, and no property or crop losses expected from extreme heat.

The occurrence of extreme heat is regional; therefore the area of potential impacts corresponds to all Navarro County's territory. However, according to the recorded historical information, extreme heat does not have a significant impact on property value.

In compliance to *Requirement 201.6(c)(2)(ii)*, vulnerability to extreme heat and impacts to assets expected from these events can be summarized as follows:

- **Population**: Based on historical data, extreme heat can be expected to produce an average of .86 fatalities and no injuries per year. All the population of Navarro County is exposed to this hazard.
- **Improved Property**: Based on historical data and the negligible impact of extreme heat to developed areas, the improved property in Navarro County is not exposed to this hazard.
- **Emergency Facilities**: Based on historical data and the negligible impact of extreme heat to buildings, the existing and future emergency facilities in Navarro County are not exposed to this hazard.
- **Critical Facilities**: Based on historical data and the negligible impact of extreme heat to buildings, the existing and future critical facilities in Navarro County are not exposed to this hazard.
- **Critical Infrastructure**: Based on historical data and the negligible impact of extreme heat to existing and future critical infrastructure, exposure to this hazard is considered minimal in Navarro County.

Information needed to fulfill *Requirement 201.6(c)(2)(ii)(C)*, which addresses land uses and development trends was unattainable during the preparation of this hazard mitigation plan. Compliance with this requirement will be an objective in the five-year planning cycle.

High Wind

High wind events impact large areas and cross jurisdictional boundaries; therefore, all of Navarro County is exposed to this hazard. Improved property, emergency facilities, critical infrastructure, and critical facilities, and population are considered vulnerable to this hazard.

Based on the available information, vulnerability to high winds was assessed using two techniques: (1) to comply with *Requirement 201.6(c)(2)(ii)(B*), historical loss data obtained from the National Climatic Data Center was used to predict expected monetary and human losses from the event; (2) in fulfillment of *Requirement 201.6(c)(2)(ii)(A*), geographical hazard areas identified for high winds and the nature of the impacts expected from this hazard event were used to identify the vulnerable assets.

Table 3.32 presents Navarro County's recorded historical losses due to high wind events as provided in the hazard events database obtained from the National Climatic Data Center and the Texas Forest Service

Table 3.32 High Wind Historical Occurrences (01/01/2002 – 06/30/2013)

Location	Date	Time	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Corsicana	3/19/2002	20:30	Thunderstorm Wind		0	0	$1,000	$0
Rice	5/3/2002	5:50	Thunderstorm Wind		0	0	$5,000	$0
Dawson	5/27/2002	17:45	Thunderstorm Wind	52 kts. E	0	0	$0	$0
Corsicana	10/19/2002	2:30	Thunderstorm Wind	60 kts. E	0	0	$30,000	$0
Dawson	12/30/2002	14:50	Thunderstorm Wind	52 kts. E	0	0	$0	$0
Navarro Mills Lake	5/15/2003	1:15	Thunderstorm Wind	52 kts. ES	0	0	$5,000	$0
Frost	6/12/2003	16:55	Thunderstorm Wind	52 kts. ES	0	0	$0	$0
Kerens	7/30/2003	17:00	Thunderstorm Wind	52 kts. ES	0	0	$0	$0
Brushie Prairie	2/29/2004	9:00	Thunderstorm Wind	52 kts. ES	0	0	$10,000	$0
Frost	6/1/2004	21:00	Thunderstorm Wind	61 kts. ES	0	0	$200,000	$0
Corsicana	6/1/2004	21:10	Thunderstorm Wind	56 kts. MS	0	0	$50,000	$0

Location	Date	Time	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Corsicana	6/1/2004	21:27	Thunderstorm Wind	62 kts. MS	0	0	$0	$0
Eureka	12/6/2004	18:00	Thunderstorm Wind	61 kts. ES	0	0	$5,000	$0
Frost	4/5/2005	17:42	Thunderstorm Wind	60 kts. ES	0	0	$25,000	$0
Countywide	4/5/2005	17:50	Thunderstorm Wind	60 kts. ES	0	0	$15,000	$0
Barry	4/5/2005	18:02	Thunderstorm Wind	50 kts. ES	0	0	$0	$0
Countywide	4/5/2005	18:30	Thunderstorm Wind	60 kts. ES	0	0	$10,000	$0
Countywide	4/5/2005	19:00	Thunderstorm Wind	60 kts. ES	0	0	$10,000	$0
Eureka	5/25/2005	14:30	Thunderstorm Wind	61 kts. ES	0	0	$30,000	$0
Eureka	5/25/2005	14:45	Thunderstorm Wind	50 kts. ES	0	0	$0	$0
Blooming Grove	7/14/2005	20:00	Thunderstorm Wind	50 kts. ES	0	0	$0	$0
Corbet	3/29/2007	17:48	Thunderstorm Wind	50 kts. EG	0	0	$10,000	$0
Blooming Grove	4/17/2007	18:40	Thunderstorm Wind	50 kts. EG	0	0	$25,000	$0
Frost	5/2/2007	17:30	Thunderstorm Wind	50 kts. EG	0	0	$2,000	$0
Frost	5/2/2007	18:45	Thunderstorm Wind	52 kts. EG	0	0	$0	$0
Kerens	6/3/2007	9:10	Thunderstorm Wind	50 kts. EG	0	0	$5,000	$0
Richland	6/8/2007	21:27	Thunderstorm Wind	50 kts. EG	0	0	$0	$0
Angus	11/18/2007	3:40	Thunderstorm Wind	50 kts. EG	0	0	$0	$0

Location	Date	Time	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Navarro (Zone)	1/29/2008	10:00	Strong Wind	42 kts. MG	0	0	$2,000	$0
Corsicana	4/10/2008	4:12	Thunderstorm Wind	50 kts. EG	0	0	$8,000	$0
Corsicana	4/23/2008	21:20	Thunderstorm Wind	50 kts. EG	0	0	$3,000	$0
Kerens	4/23/2008	21:40	Thunderstorm Wind	50 kts. EG	0	0	$0	$0
Corsicana	5/27/2008	13:00	Thunderstorm Wind	50 kts. EG	0	0	$2,000	$0
Rural Shade	6/17/2008	12:45	Thunderstorm Wind	50 kts. EG	0	0	$20,000	$0
Corsicana	2/10/2009	22:00	Thunderstorm Wind	70 kts. EG	0	0	$20,000	$0
Corsicana	2/10/2009	22:05	Thunderstorm Wind	60 kts. EG	0	0	$8,000	$0
Corsicana Muni Arpt	2/10/2009	22:09	Thunderstorm Wind	53 kts. MG	0	0	$0	$0
Winkler	2/10/2009	22:25	Thunderstorm Wind	60 kts. EG	0	0	$0	$0
Corsicana	4/27/2009	7:27	Thunderstorm Wind	61 kts. EG	0	0	$25,000	$0
Kerens	6/11/2009	3:35	Thunderstorm Wind	61 kts. EG	0	0	$10,000	$0
Elm Flat	6/11/2009	3:40	Thunderstorm Wind	55 kts. EG	0	0	$1,000	$0
Bazette	6/11/2009	3:45	Thunderstorm Wind	56 kts. MG	0	0	$500	$0
Bazette	6/11/2009	12:23	Thunderstorm Wind	50 kts. EG	0	0	$500	$0
Barry	8/21/2009	6:23	Thunderstorm Wind	56 kts. EG	0	0	$5,000	$0
Corsicana	8/21/2009	6:36	Thunderstorm Wind	61 kts. EG	0	0	$7,000	$0

Location	Date	Time	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Dawson	4/24/2010	0:05	Thunderstorm Wind	65 kts. EG	0	0	$75,000	$0
Corsicana	4/24/2010	0:15	Thunderstorm Wind	74 kts. EG	0	0	$35,000	$0
Corsicana	4/24/2010	0:15	Thunderstorm Wind	74 kts. EG	0	0	$25,000	$0
Corsicana Muni Arpt	4/24/2010	0:19	Thunderstorm Wind	76 kts. MG	0	0	$0	$0
Corsicana Arpt	5/14/2010	14:09	Thunderstorm Wind	50 kts. EG	0	0	$0	$0
Corsicana Muni Arpt	5/20/2010	16:24	Thunderstorm Wind	61 kts. EG	0	0	$5,000	$0
Corsicana Muni Arpt	5/20/2010	16:24	Thunderstorm Wind	61 kts. EG	0	0	$5,000	$0
Eureka	10/24/2010	17:32	Thunderstorm Wind	52 kts. EG	0	0	$0	$0
Kerens	10/24/2010	17:55	Thunderstorm Wind	54 kts. EG	0	0	$7,000	$0
Emhouse	4/25/2011	17:00	Thunderstorm Wind	52 kts. EG	0	0	$20,000	$0
Corsicana	4/25/2011	17:19	Thunderstorm Wind	50 kts. EG	0	0	$7,000	$0
Drane	4/26/2011	17:55	Thunderstorm Wind	65 kts. EG	0	0	$30,000	$0
Corsicana Muni Arpt	4/26/2011	18:15	Thunderstorm Wind	70 kts. EG	0	0	$25,000	$0
Rice	5/20/2011	17:45	Thunderstorm Wind	61 kts. EG	0	0	$45,000	$0
Corsicana	6/21/2011	22:55	Thunderstorm Wind	52 kts. EG	0	0	$10,000	$0
Cheneyboro	7/6/2011	19:00	Thunderstorm Wind	52 kts. EG	0	0	$4,000	$0
Corsicana	9/26/2011	21:42	Thunderstorm Wind	50 kts. MG	0	0	$0	$0

Location	Date	Time	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Corsicana	6/6/2012	17:50	Thunderstorm Wind	56 kts. EG	0	0	$5,000	$0
Rice	12/19/2012	22:05	Thunderstorm Wind	52 kts. EG	0	0	$1,000	$0
Powell	12/19/2012	22:22	Thunderstorm Wind	50 kts. EG	0	0	$0	$0
Rural Shade	1/29/2013	17:37	Thunderstorm Wind	61 kts. EG	0	0	$2,000	$0
Totals:					**0**	**0**	**$851,000**	**$0**

Source: National Climatic Data Center

The annualized losses due to high wind events were calculated using the methodology described previously. The annualized loss value can be interpreted as the impact expected from high wind in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.32*, Navarro County can expect an average of $41,260.86 per year in property losses, with no fatalities, injuries, or crop losses from high wind events.

The occurrence of high winds is regional; therefore the area of potential impacts corresponds to all Navarro County's territory. According to the recorded historical information, high winds impact property. Currently, there is no information available with respect to the type structures that had been historically damaged by high wind events. However, because of the regional character of this hazard event, all improved property, emergency and critical facilities, and critical structures are exposed to this hazard.

In compliance to *Requirement 201.6(c)(2)(ii)*, vulnerability to high wind and impacts to assets expected from this event can be summarized as follows:

- **Population**: Based on historical data, high wind events can be expected to produce an average of zero injuries and fatalities per year. All the population of Navarro County is exposed to this hazard.
- **Improved Property**: Based on historical data, an average loss of $47,450.00 per year in property losses are expected from high wind events in Navarro County. Zero crop losses are expected from this hazard in Navarro County.
- **Emergency Facilities**: Because of the expected geographical widespread nature of high winds, all existing and future emergency facilities in Navarro County are exposed to this hazard.
- **Critical Facilities**: Because of the expected geographical widespread nature of high winds, all existing and future emergency facilities in Navarro County are exposed to this hazard.
- **Critical Infrastructure**: Because of the expected geographical widespread nature of high winds, all existing and future critical infrastructures in Navarro County are exposed to this hazard.

Information needed to fulfill *Requirement 201.6(c)(2)(ii)(C),* which addresses land uses and development trends was unattainable during the preparation of this hazard mitigation plan. Compliance with this requirement will be an objective in the five-year planning cycle.

Lightning

Because the location at which a lightning events cannot be predicted, all existing and future buildings, critical facilities, critical infrastructure, emergency facilities, improved property, and population are considered to be exposed to this hazard.

Based on the available information, vulnerability to lightning was assessed using two techniques: (1) to comply with *Requirement 201.6(c)(2)(ii)(B*), historical loss data obtained from the National Climatic Data Center was used to predict expected monetary and human losses from the event; (2) in fulfillment of *Requirement 201.6(c)(2)(ii)(A*), geographical hazard areas identified for lightning and the nature of the impacts expected from this hazard event were used to identify the vulnerable assets.

Table 3.33 presents Navarro County's recorded historical losses due to lightning events as provided in the hazard events database obtained from the National Climatic Data Center.

Table 3.33 Historical Lightning Occurrences (01/01/2002 – 06/30/2013)

Location	Date	Time	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Navarro County	N/A	N/A	Lightning	0	0	0	$0	$0
Total	**N/A**	**N/A**	**Lightning**	**0**	**0**	**0**	**$0**	**$0**

Source: National Climactic Data Center
** Navarro County unincorporated areas*

The annualized losses due to lightning events were calculated using the methodology described in Section 3.6. The annualized loss value can be interpreted as the impact expected from lightning in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.33*, Navarro County can expect in average an annual $0 in property losses, with no deaths, no injuries, and no losses in crop production from lightning events.

The geographical occurrence of lightning events cannot be predicted; therefore the area of potential impacts corresponds to all Navarro County's territory. According to the recorded historical information, lightning impact property. Because of the regional character of this hazard event, all improved property, emergency and critical facilities, and critical structures are exposed to this hazard.

In compliance to *Requirement 201.6(c)(2)(ii)*, vulnerability to lightning and impacts to assets expected from this event can be summarized as follows:

- **Population**: Based on historical data, lightning events can be expected to cause 0 deaths and 0 injuries in Navarro County. All the population of Navarro County is exposed to this hazard.
- **Improved Property**: Based on historical data, an average loss of $0 per year in property losses are expected from lightning events in Navarro County. no crop losses are expected from this hazard in Navarro County.
- **Emergency Facilities**: Because of the expected geographical widespread nature of lightning, all existing and future emergency facilities in Navarro County are exposed to this hazard.
- **Critical Facilities**: Because of the expected geographical widespread nature of lightning, all existing and future critical facilities in Navarro County are exposed to this hazard.
- **Critical Infrastructure**: Because of the expected geographical widespread nature of lightning, all existing and future critical infrastructures in Navarro County are exposed to this hazard.

Information needed to fulfill *Requirement 201.6(c)(2)(ii)(C,* which addresses land uses and development trends was unattainable during the preparation of this Hazard Mitigation Plan. Compliance with this requirement will be an objective in the five-year planning cycle.

Tornado

The areas of impact from tornado events cannot be predicted, and they can affect extensive areas of a county. All existing and future buildings, critical facilities, critical infrastructure, emergency facilities, improved property, and population are considered to be exposed to this hazard.

Based on the available information, vulnerability to tornados was assessed using two techniques: 1) to comply with *Requirement 201.6(c)(2)(ii)(B*), historical loss data obtained from the National Climatic Data Center, and the Texas Hazard Mitigation Action Plan was used to predict expected monetary and human losses from the event; 2) in fulfillment of *Requirement 201.6(c)(2)(ii)(A*), geographical hazard areas identified for tornados and the nature of the impacts expected from this hazard event were used to identify the vulnerable assets.

Table 3.34 presents Navarro County's recorded historical losses due to tornado events as provided in the hazard events database obtained from the National Climatic Data Center.

Table 3.34 Historical Tornado Occurrences (01/01/2002 – 06/30/2013)

Location	Date	Time	Event	Mag	Fatalities	Injuries	Property Damage	Crop Damage
Richland	9/5/2007	6:42	Tornado	EF0	0	0	$0	$0
Currie	9/5/2007	6:47	Tornado	EF2	0	0	$40,000	$0
Corsicana	4/27/2009	7:30	Tornado	EF1	0	1	$100,000	$0
Emhouse	10/24/2010	16:43	Tornado	EF2	0	4	$1,000,000	$0
Hester	4/26/2011	18:15	Tornado	EF0	0	0	$0	$0
Totals:	**-**	**-**	**-**	**-**	**0**	**5**	**$1,140,000**	**$0**

Source: National Climatic Data Center

The annualized losses due to tornado events were calculated using the methodology described in Section 3.6. The annualized loss value can be interpreted as the impact expected from tornados in terms of annualized human losses and human injuries, and annualized property losses. As observed in Table 3.34, Navarro County can expect an average of zero fatalities and 5 injuries per year. All the population of Navarro County is exposed to this hazard. Also, an expected average of $99,130.43 per year in property losses is expected from tornados, with most of the historical events occurring in the unincorporated areas of Navarro County. Finally, there are no expected crop losses as result of tornado events.

As stated before, the geographical area of impact for tornado events cannot be predicted, the area of potential impacts corresponds to all Navarro County's territory, and all improved property, emergency and critical facilities, and critical structures are exposed to this hazard. According to the recorded historical information, expected casualties and property losses from tornado events are significant.

In compliance to Requirement 201.6(c)(2)(ii), vulnerability to tornados and impacts to assets expected from this event can be summarized as follows:

- **Population**: Based on historical data, tornado events can be expected to cause an average of zero injuries and fatalities per year in Navarro County. All the population of Navarro County is exposed to this hazard.
- **Improved Property**: Based on historical data, an average loss of $99,130.43 per year in property losses are expected to result from tornado events in Navarro County. No crop losses are expected from this hazard in Navarro County.
- **Emergency Facilities**: Because of the impossibility to predict the geographical area of impact for tornados, all existing and future emergency facilities in Navarro County are exposed to this hazard.
- **Critical Facilities**: Because of the impossibility to predict the geographical area of impact for tornados, all existing and future critical facilities in Navarro County are exposed to this hazard.
- **Critical Infrastructure**: Because of the impossibility to predict the geographical area of impact for tornados, all existing and future critical infrastructures in Navarro County are exposed to this hazard.

Information needed to fulfill *Requirement 201.6(c)(2)(ii)(C),* which addresses land uses and development trends was unattainable during the preparation of this hazard mitigation plan. Compliance with this requirement will be an objective in the five-year planning cycle.

Winter Storms

Because winter storm events are large and can affect extensive areas of a county, all existing and future buildings, critical facilities, critical infrastructure, emergency facilities, improved property, and population are considered to be exposed to this hazard.

Based on the available information, vulnerability to winter storms was assessed using two techniques: 1) to comply with *Requirement 201.6(c)(2)(ii)(B*), historical loss data obtained from the National Climatic Data Center was used to predict expected monetary and human losses from the event; 2) in fulfillment of *Requirement 201.6(c)(2)(ii)(A*), geographical hazard areas identified for winter storms and the nature of the impacts expected from this hazard event were used to identify the vulnerable assets.

Table 3.35 presents Navarro County's recorded historical losses due to winter storm events as provided in the hazard events database obtained from the National Climatic Data Center.

Table 3.35 Winter Storm Historical Occurrences (01/01/2002 – 06/30/2013)

Jurisdiction	Date	Fatalities	Injuries	Property Damage	Annualized Expected Property Losses	Crop Damage
Navarro County Territory	2/24/2003	0	0	$0	$0	$0
	12/7/2005	0	0	$0	$0	$0
	1/14/2007	0	0	$15,000	$1304.34	$0
	1/17/2007	0	0	$0	$1304.34	$0
	12/15/2008	0	0	$0	$1304.34	$0
	1/27/2009	0	0	$20,000	$1,853.55	$0
	2/11/2010	0	0	$150,000	$14,896.03	$0
	2/3/2011	0	0	$6,000	$15,417.77	$0
Total	**8**	**0**	**0**	**$191,000**	**$15,417.77**	**$0**

Source: National Climatic Data Center

The annualized losses due to winter storm events were calculated using the methodology described previously. The annualized loss value can be interpreted as the impact expected from winter storm in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.35*, Navarro County can expect in average an annual $15,417.77 in property losses, with zero injuries, fatalities, and crop losses from winter storm events.

The geographical occurrence of winter storm events is widespread; therefore the area of potential impacts corresponds to all Navarro County's territory. According to the recorded historical information, winter storm events impact property. Because of the regional character of this hazard event, all improved property, emergency and critical facilities, and critical structures are exposed to this hazard.

In compliance to *Requirement 201.6(c)(2)(ii)*, vulnerability to winter storm events and impacts to assets expected from this event can be summarized as follows:

- **Population**: Based on historical data, winter storm events can be expected to cause an average of zero injuries and fatalities per year in Navarro County. All the population of Navarro County is exposed to this hazard.
- **Improved Property**: Based on historical data, an average loss of $15,417.77 per year in property losses are expected to result from winter storm events in Navarro County. No crop losses are expected from this hazard in Navarro County.
- **Emergency Facilities**: Because of the expected geographical widespread nature of winter storms, all existing and future emergency facilities in Navarro County are exposed to this hazard.
- **Critical Facilities**: Because of the expected geographical widespread nature of winter storms, all existing and future critical facilities in Navarro County are exposed to this hazard.
- **Critical Infrastructure**: Because of the expected geographical widespread nature of winter storms, all existing and future critical infrastructures in Navarro County are exposed to this hazard.

Information needed to fulfill *Requirement 201.6(c)(2)(ii)©,* which addresses land uses and development trends was unattainable during the preparation of this hazard mitigation plan. Compliance with this requirement will be an objective in the five-year planning cycle.

3.10 Qualitative Analysis

In compliance to *Requirement 201.6(c)(2)(ii)* a qualitative analysis was made for five of the hazards representing low risk to Navarro County. While historical and geographical information regarding these events is unattainable at the present time, conducting a quantitative analysis for these hazards will be an objective in the five-year planning cycle update, should information become available.

Dam Failure

The probability of occurrence for dam and/or levee events in Navarro County is unlikely. However, due to unattainable information regarding this hazard, quantitative predictions are not available at the present time. All five categories, population, improved property, emergency facilities, critical facilities, and critical infrastructure are considered vulnerable to damage caused by dam and/or levee failure. According to the Priority Risk Index analysis presented in Section 3.4, any estimated losses associated with this hazard are anticipated to be of high risk across Navarro County and participating jurisdictions. Action items for new inundation studies can be found in Chapter 5: Mitigation Strategies.

Based on data from the participating jurisdictions a total of 120 dams are located in Navarro County (*Table 3.26).*

Table 3.26 Dams located in Navarro County and Participating Jurisdictions

Jurisdiction	Number of Dams	Dam Classification		
		High	Significant	Low
*Navarro County**	118	6	2	110
Corsicana	2	1	1	0
Kerens	0	0	0	0
Total	**120**	**7**	**3**	**110**

Source: National Inventory of Dams

* *Navarro County unincorporated areas*

The Hazard Mitigation Planning Team provided a list of high hazard dams located in Navarro County. Five of these dams have received federal funds from the Natural Resources Conservation Service to conduct an assessment to determine needs of dam rehabilitation. The Natural Resources Conservation Service considers these seven dams to be of high hazard, thus the need for the assessment (T*able 3.27)*.

Table 3.27 High Hazard Dams

Jurisdiction	Dam Name
Corsicana	Chambers Creek WS SCS Site 139 Dam
Navarro County	Richland Creek WS SCS Site 137a Dam
Navarro County	Chambers Creek WS SCS Site 129 Dam
Navarro County	Richland Creek WS SCS Site 138 Dam
Navarro County	Richland Creek WS SCS Site 137g Dam
Navarro County	Richland Creek WS SCS Site 108 Dam
Navarro County	Navarro Mills Lake

Source: National Inventory of Dams

Earthquake

The probability of occurrence for an earthquake event in Navarro County is extremely low. Due to unattainable information regarding this hazard, quantitative predictions are not available at the present time. All five categories, population, improved property, emergency facilities, critical facilities, and critical infrastructure are considered vulnerable to damage caused by an earthquake. According to the Priority Risk Index analysis presented in Section 3.4, any estimated losses associated with this hazard are anticipated to be of little to no risk for Unincorporated Navarro County, the city of Corsicana, and the city of Kerens.

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3.11 Summary

Table 3.28 provides a summary of annualized losses for each of the nine hazard events for which the quantitative analysis (Geographic Information System and/or statistical) was conducted. *Table 3.29* summarizes the qualitative analysis conducted on the four hazard events.

Table 3.28 Annualized Losses Expected from Hazards Analyzed using a Quantitative Analysis

Hazard Event	Annualized Expected Fatalities	Annualized Expected Injuries	Annualized Expected Property Losses	Annualized Expected Crop Loss	Annualized Expected Crop Loss per Acre
Drought	0	0	0	$15,913.04	$0.02
Extreme Heat	.086	0	0	0	$0
Flood	.26	0	$1,933,391.30	0	$0
Hail	0	0	$17,739.13	0	$0
High Wind	0	0	$74,000	0	$0
Lightning	0	0	0	0	$0
Tornado	0	.43	$99,130.44	0	$0
Wildfire	0	0	$33,478.26	0	$0
Winter Storm	0	0	$16,608.70	0	$0

Table 3.29 Summary of Qualitative Analysis

Hazard Event	Probability of Occurrence According to the Priority Risk Index	Vulnerable Categories				
		Population	Property Damage	Emergency Facilities	Critical Facilities	Critical Infrastructures
Dam Failure	Low Risk	√	√	√	√	√
Earthquake	No Risk	√	√	√	√	√

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Chapter Four: Capabilities Assessment

(In compliance with 201.6 (C1))

The capability assessment examines the ability of Navarro County and participating jurisdictions to implement and manage a comprehensive mitigation strategy. The strengths, weaknesses, and resources of these jurisdictions are identified in this assessment as a means to develop an effective Hazard Mitigation Action Plan. The capabilities identified in this assessment are evaluated collectively to develop feasible recommendations, which support the implementation of effective mitigation activities, given existing conditions throughout the County.

A questionnaire was distributed to the Navarro County Office of Emergency Management and to the Hazard Mitigation Planning Team in order to initiate this assessment. This capability assessment was distributed to the participating jurisdictions to request information pertaining to existing plans, policies, and regulations that contribute to or hinder the ability to implement hazard mitigation activities, including legal and regulatory capabilities, administrative and technical capabilities, and fiscal capabilities. The completed questionnaire was received on 5/23/2014.

Jurisdiction	Chief Administrative Officer	Ability to Implement Capabilities
Navarro County	County Judge	The commissioner's court, including the county judge and Precinct Commissioners (elected by district), addresses the budget; passes laws, regulations, and codes; approves plans; and determines the direction of the county overall. As the governing body, the Commissioner's Court has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the county budget, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
City of Corsicana	City Manager	The city council, including the mayor, mayor pro-tem, and council members, along with the city manager, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
City of Kerens	City Administrator	The city council, including the mayor, mayor pro-tem, and council members, along with the city administrator, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.

Navarro County's legal and regulatory capabilities are associated with the meaningful policies and projects designed to reduce the impacts of future hazard events. The administrative and technical capabilities are assessed by evaluating whether there are an adequate number of personnel to complete mitigation activities, and assessing the level of knowledge and technical expertise of local government employees. The fiscal capabilities are associated with the financial ability of a local government to implement mitigation activities.

Table 4.1, Table 4.2, and *Table 4.3,* each provide a summary of the legal and regulatory capabilities, administrative and technical capabilities, and fiscal capabilities for Navarro County and participating jurisdictions. To assess the capabilities of each participating jurisdiction, the number of "yes" answers is added horizontally in each Table. Then, a percentage is obtained relative to the total number of "yes" answers possible.

To assess the capabilities of Navarro County in each category, the number of "yes" answers is added vertically in each column. Then, a percentage is obtained relative to the number of jurisdictions.

Table 4.1 Legal and Regulatory Capability Summary

Legal and Regulatory Capabilities															
Jurisdiction	**Building Code**	**Zoning Ordinance**	**Subdivision Ordinance or regulation**	**Special purpose ordinances (floodplain management, storm water management, hillside or steep slope ordinances wildfire ordinances, hazard setback requirements)**	**Growth management ordinances (also called "smart Growth" or anti-sprawl programs)**	**Site Plan review requirements**	**General or comprehensive plan**	**A capital improvements plan**	**An economic development plan**	**An emergency response plan**	**A post-disaster recovery plan**	**A post-disaster recovery ordinance**	**Real estate disclosure requirements**	**Other**	**% Yes per Jurisdiction**
Navarro County	N	N	N	Y	N	Y	N	N	Y	Y	Y	N	N	Y	**42%**
Corsicana	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	**79%**
Kerens	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	N	**71%**
Average % Yes Capabilities – 64%															
Y- Yes N- No ?- Don't Know															

Table 4.2 Administrative and Technical Capability Summary

Administrative and Technical Capabilities											
Jurisdiction	**Planner(s) or engineer(s) with knowledge of land development and land management**	**Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure**	**Planners or engineer(s) with an understanding of natural and/or human caused hazards**	**Floodplain manager**	**Surveyors**	**Staff with education or expertise to assess the community's vulnerability to hazards**	**Personnel skilled in GIS**	**Scientists familiar with the hazards of the community**	**Emergency manager**	**Grant writers**	**% Yes per Jurisdiction**
Navarro County	Y	N	Y	Y	N	Y	Y	N	Y	N	**60%**
Corsicana	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	**90%**
Kerens	Y	Y	Y	Y	Y	Y	N	N	Y	Y	**80%**
Average % Yes Capabilities – 77%											
Y- Yes N- No ?- Don't Know											

Table 4.3 Fiscal Capability Summary

Fiscal Capabilities											
Jurisdiction	**Community Development Block Grants (CDBG)**	**Capital improvements project funding**	**Authority to levy taxes for specific purposes**	**Fees for water, sewer, gas, or electric service**	**Impact fees for homebuyers or developers for new developments/homes**	**Incur debt through general obligation bonds**	**Incur debt through special tax bonds**	**Incur debt through private activity bonds**	**Withhold spending in hazard-prone areas**	**Other**	**% Yes per Jurisdiction**
Navarro County	N	Y	Y	N	N	Y	N	N	Y	Y	**50%**
Corsicana	Y	Y	Y	Y	Y	Y	Y	N	Y	N	**80%**
Kerens	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	**100%**
Average % Yes Capabilities – 77%											
Y- Yes N- No ?- Don't Know											

To quantify Navarro County's legal and regulatory capabilities, administrative and technical, and fiscal capabilities, an overall rating system was administered for each category; limited (0-30%), moderate (31-70%), and strong (70-100%). Questionnaire responses indicated that on average, Navarro County and its jurisdictions have 64% of legal and regulatory capabilities, 77% of administrative and technical capabilities of, and 77% fiscal capabilities.

The risk assessment and capabilities assessment serves as the foundation for the development of a meaningful hazard mitigation strategy. During the process of identifying specific mitigation actions to pursue, Navarro County considered not only its level of hazard risk but also the existing capability to minimize or eliminate that risk.

Chapter Five: Mitigation Strategy

Chapter Five of the Navarro County Hazard Mitigation Action Plan (HazMAP) describes each participating jurisdiction's blueprint for reducing the potential losses identified in the risk assessment and its ability to expand and improve on these existing tools. The HazMAP includes mitigation goals and action items which each participating jurisdiction plans to achieve.

The chapter identifies specific and identifiable action items for each participating jurisdiction. The action items are laid out and an explanation of how they will be implemented and administered is given, including: the department responsible, existing and potential funding sources, and the timeframe that each item will be completed in. The action items also present a cost benefit review statement and demonstrate the priority of emphasis on each action item by that particular jurisdiction.

According to the Texas State Mitigation Plan, hazard mitigation is defined as any action taken to eliminate or reduce the long-term risk to life and property from natural and human-caused hazards. This is a long-term, ongoing management process that consists of a variety of both pre-incident and post-incident actions.

According to *Requirement 201.6(c)(3)(i)* the plan shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards. For the development of the mitigation goals, Navarro County took into consideration both state and jurisdictional needs.

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5.1 Goals

The Navarro County Hazard Mitigation Action Plan corporately assessed the mitigation goals of the participating jurisdictions. The following goals and objectives were identified:

Goal 1 Protect existing and new properties from the effects of all natural hazards.

Objective 1-A Conduct studies to determine hazard and vulnerability threat assessment for all natural hazards
Objective 1-B Rehabilitate or retrofit identified high hazard critical infrastructure.
Objective 1-C Construct enhancements or additions to current and new facilities which mitigate the effects of natural hazards
Objective 1-D Maintain NFIP compliance, storm water management, and implement drainage projects

Goal 2 Incorporate new or existing technology into mitigation efforts

Objective 2-A Promote and Support the CASA (WX) Weather Radar System/ install CASA (WX) site in Navarro County.
Objective 2-B Identify and implement new technology that can be used in mitigation

Goal 3 Identify and implement hazard mitigation projects to reduce the impact of hazard events and disaster.

Objective 3-A Identify areas where repetitive damages occur during chronic hazard events.
Objective 3-B Incorporate disaster resistant features in government facilities and infrastructure.
Objective 3-C Expand and coordinate Early Warning Systems currently in use.
Objective 3-D Implement the individual safe room rebate program.

Goal 4 Increase public support and understanding of hazard mitigation and disasters.

Objective 4-A Provide public education materials to residents and private sector
Objective 4-B Encourage public and private sector participation in future mitigation efforts.
Objective 4-C Heighten public awareness for natural and man-made hazards.

Goal 5 Continue to build capacity for hazard mitigation in Navarro County and all participating jurisdictions

Objective 5-A Continue partnerships within the Hazard Mitigation Planning Team and other partners to enhance mitigation planning efforts.
Objective 5-B Identify federal and state programs that provide financial assistance to help attract funds for mitigation projects and programs

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5.2 Action Items

Each participating jurisdiction's Hazard Mitigation Planning Team (HMPT) in the Navarro County Hazard Mitigation Action Plan (HazMAP) collaboratively created Action Items based upon the direction of the city as identified in capital improvement plans and special projects within each city department, as well as identified new mitigation action items within the HazMAP. The mitigation strategy addresses how the actions will be implemented and administered, including the responsible department, existing and potential resources, and the timeframe to complete each action. The format for the Action Items follows this guideline and addresses the following areas:

1. Jurisdiction
2. Action Item Title
3. Hazard(s) Addressed
4. Goal/Objective
5. Priority
6. Estimated Cost
7. Potential Funding Sources
8. Potential Matching Sources
9. Lead Agency/Department Responsible
10. Implementation Schedule
11. Effect on New Buildings
12. Effect on Existing Buildings
13. Cost Effectiveness
14. Discussion

Hazard Mitigation Planning Team representatives collaborated as a Hazard Mitigation Action Plan through the North Central Texas Council of Governments (NCTCOG) to further analyze the mitigation needs as a county.

The comprehensive range of specific mitigation actions and projects being considered in the Navarro County HazMAP has been determined by each of the HMPT. Each mitigation action item for the participating jurisdictions has a priority indicator of high, medium, or low, and the cost-benefit review was conducted as a part of determining the priority based on the evaluation criteria of use in current planning mechanisms, public approval, feasibility, and political implications. The priorities were determined by the Hazard Mitigation Planning Teams by examining available jurisdictional funding, local priorities, economic impact, and comparison to special projects, Capital Improvement Plans, plans and studies, and the benefit of the mitigation action in comparison to another or to no action at all.

Action Item Complete Listing

The complete listing of each participating jurisdiction's action items is detailed below, grouped by participating jurisdiction. Each action item addresses how the actions will be implemented and administered, including the responsible department, existing and potential resources, and the timeframe to complete each action. The action item discussion also includes the jurisdiction's assessed priority according to the prioritization methodology utilized, as well as the results of the cost-benefit review.

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Section 5.2.A – Navarro County Action Items

Navarro County Action Item	Implement Individual Tornado Safe Room Rebate Program
Hazard(s) Addressed	High Wind, Tornadoes, Hail
Goal/Objective	3-D
Priority	High
Estimated Cost	$250,000
Potential Funding Sources	HMGP, PDM, Resident Match
Potential Matching Sources	Local Grants, FEMA
Lead Department	OEM
Implementation Schedule	12 months – 24 months
Effect on Old Buildings	Some buildings modified for shelter retrofit
Effect on New Buildings	Moderate
Cost Effectiveness	Residential safe room shelters potentially decrease personal injuries and death during severe weather, tornadoes or high wind events.
Discussion	Implement Individual Tornado Safe Room Rebate Program

Navarro County Action Item	Adopt and promote public education program.
Hazard(s) Addressed	Flooding, Dam Failure, High Wind, Lightning, Wildfire, Tornado, Hail, Extreme Heat, Drought, Winter Storms, Earthquake
Goal/Objective	4A, 4B
Priority	Medium
Estimated Cost	$15,000
Potential Funding Sources	General fund, HMGP, PDM, other state/federal grants
Potential Matching Sources	Local funds, citizen cost-share, donations
Lead Department	OEM
Implementation Schedule	9-12 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost.
Discussion	The public education program would target hazards identified in this plan, identify ways for the public to take mitigating actions, and distribute mitigation information to residents. Awareness of local natural hazards and how to implement mitigation measures will reduce vulnerabilities and impacts to people and property.

Navarro County Action Item	Increase the ability of residents and businesses to receive early warning from the National Weather Service. This would be accomplished by offering an in kind match program or give away through county schools, hospital, and public safety agencies. With the local NOAA all hazards radio in Corsicana providing excellent coverage, participation would likely be high in this program.
Hazard(s) Addressed	Flooding, Dam Failure, High Wind, Lightning, Wildfire, Tornado, Hail, Extreme Heat, Drought, Winter Storms
Goal/Objective	3-C
Priority	High
Estimated Cost	$60,000
Potential Funding Sources	Grant Funds, HMPG, PDM, Partial payment by receiving party
Potential Matching Sources	Local funds, in-kind, donations, citizen cost-share
Lead Department	OEM, LE, FD
Implementation Schedule	As funding is available, would become an ongoing project
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Advanced warning saves lives, which outweighs the cost of the radios.
Discussion	Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. Navarro County believes that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project would be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program.

Navarro County Action Item	Develop a Community Wildfire Protection Plan (CWPP)
Hazard(s) Addressed	Wildfire, Drought
Goal/Objective	1-A
Priority	Medium
Estimated Cost	$65,000
Potential Funding Sources	HMGP, PDM, General Fund
Potential Matching Sources	Local funds, donations, in-kind, grants
Lead Department	Navarro County Fire Association, OEM
Implementation Schedule	18-36 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	CWPPs show county officials where to redouble their efforts in preventing wildfire, saving time and money. Also work to establish urban wildfire interface around lake development properties.
Discussion	This project will become increasingly needed as development around Richland Chambers (Tarrant County Water Supply) increases.

Navarro County Action Item	Hire consultant to complete new inundation studies of all high and moderate hazard dams within the county.
Hazard(s) Addressed	Dam Failure, Flood
Goal/Objective	1-A
Priority	High
Estimated Cost	$75,000
Potential Funding Sources	HMPG, Water Shed Authorities, Dam Sponsors
Potential Matching Sources	Local Sponsors, In-Kind
Lead Department	Navarro County Planning and Zoning/ NRCS
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Identify all structures and infrastructures that would be impacted by a potential dam failure.

Navarro County Action Item	Develop an extreme temperature program that identified both public and private safe locations for vulnerable residents to go to during periods of extreme temperatures, partnering with non-profit organizations for distribution of fans/air conditioner units/space heaters, checking on vulnerable residents, and notification of shelter locations.
Hazard(s) Addressed	Extreme Heat, Winter Storms
Goal/Objective	3-B
Priority	Medium
Estimated Cost	Current staffing project time/resources
Potential Funding Sources	HMGP, PDM, General Fund
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	OEM/CERT
Implementation Schedule	Within 12 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Cost to implement this program is low compared to the benefits of program.
Discussion	Cooling shelters would allow special populations to reduce their vulnerability to extreme heat, as warming centers would mitigate impacts to residents in extreme cold

Navarro County Action Item	Develop a drought contingency plan
Hazard(s) Addressed	Drought
Goal/Objective	1A
Priority	High
Estimated Cost	15,000
Potential Funding Sources	HMGP, PDM, Local funding
Potential Matching Sources	Local funds, In-kind
Lead Department	Emergency Management
Implementation Schedule	12 months – 24 months
Effect on Old Buildings	n/a
Effect on New Buildings	Include water conservation measures identified in plan: construction considerations, plumbing, fixtures
Cost Effectiveness	Moderate
Discussion	Plan will identify measures to help reduce impacts of drought on people and property through: early warning, crop irrigation, water conservation, identification of/access to alternate water supplies, and/or others as research warrants.

Navarro County Action Item	Develop and maintain voluntary building codes that would prevent building deterioration from structure-impacting hazards.
Hazard(s) Addressed	Floods, High winds, tornado, hail, drought, Earthquake
Goal/Objective	1-A
Priority	Low
Estimated Cost	Current staff time
Potential Funding Sources	General Fund
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Planning and zoning
Implementation Schedule	12 Months
Effect on Old Buildings	New building codes would allow for existing buildings to be retrofitted to mitigate against structure-impacting hazards.
Effect on New Buildings	New building codes would allow for new buildings to be constructed to mitigate against structure-impacting
Cost Effectiveness	Low - Benefits outweigh costs
Discussion	New voluntary building codes would help to promote better building standards throughout Navarro County, especially in the unincorporated areas where there are currently no building codes in place.

Navarro County Action Item	Expand water conservation measures during periods of drought.
Hazard(s) Addressed	Drought
Goal/Objective	4-C
Priority	Medium
Estimated Cost	$1,000
Potential Funding Sources	HMGP, PDM, General Fund
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	County Commissioners, OEM
Implementation Schedule	12 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low cost for effective means of preserving water.
Discussion	Promote water conservation throughout the county and work with local water supplies to increase public education on drought.

Navarro County Action Item	Purchase of a CASA (WX) Weather Radar system
Hazard(s) Addressed	Hail, Tornadoes, High Wind, Wildfire, Flooding, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	$550,000
Potential Funding Sources	Local Funding, Federal Funding, HMPG
Potential Matching Sources	Local Grants
Lead Department	OEM, NCTCOG
Implementation Schedule	12-36 Months
Effect on Old Buildings	n/a
Effect on New Buildings	Increase response decisions by 100%
Cost Effectiveness	Cost effectiveness is low compared to the benefits.
Discussion	The Collaborative Adaptive Sensing of the Atmosphere (CASA WX) project is a multi-sector partnership dedicated to engineering revolutionary weather-sensing networks. The main purpose of the CASA WX project is to save lives and minimize injuries due to severe weather. This is accomplished through the enhancement of data by providing lower atmospheric coverage at faster rates. The CASA WX radars provide jurisdictions more accurate weather data and geographically specific weather data culled from the most active levels of the atmosphere. This data could save lives by providing the public more time to react and prepare appropriately as severe weather affects their location. The more accurate data will also provide a better means to analyze severe weather post event which can also help in the assessment of damage after a severe weather event.

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Section 5.2.B – City of Corsicana Action Items

City of Corsicana Action Item	Clear waterways of debris and prevent further collection of debris in waterways.
Hazard(s) Addressed	Flooding
Goal/Objective	1-B, 1-C, 1-D
Priority	Medium
Estimated Cost	$75,000
Potential Funding Sources	HMGP, General Funds
Potential Matching Sources	Local funds, In-kind match
Lead Department	Public Works
Implementation Schedule	6 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low compared to life safety benefits
Discussion	City of Corsicana needs to clear waterways in order to prevent buildup of debris and materials that could cause flooding.

City of Corsicana Action Item	Stabilize erosion and creek embankments at bridges by developing vegetative management projects on creek waterways
Hazard(s) Addressed	Flooding
Goal/Objective	1-B, 1-C, 1-D
Priority	Medium
Estimated Cost	$534,000
Potential Funding Sources	HMGP, General Funds
Potential Matching Sources	Local funds, In-kind match
Lead Department	Public Works
Implementation Schedule	6 months
Effect on Old Buildings	Could prevent flooding and disruption to transportation
Effect on New Buildings	None
Cost Effectiveness	Low compared to life safety benefits
Discussion	City of Corsicana will use vegetation to stabilize erosion of waterways that can contribute to expansion of the floodplain.

City of Corsicana Action Item	Implement Individual Tornado Safe Room Rebate Program
Hazard(s) Addressed	High Wind, Tornadoes, Hail
Goal/Objective	3-D
Priority	High
Estimated Cost	$250,000
Potential Funding Sources	HMGP, PDM, Resident Match
Potential Matching Sources	Local Grants, FEMA
Lead Department	OEM
Implementation Schedule	12 months – 24 months
Effect on Old Buildings	Some buildings modified for shelter retrofit
Effect on New Buildings	Moderate
Cost Effectiveness	Residential safe room shelters potentially decrease personal injuries and death during severe weather, tornadoes or high wind events.
Discussion	Implement Individual Tornado Safe Room Rebate Program

City of Corsicana Action Item	Adopt and promote public education program.
Hazard(s) Addressed	Flooding, Dam Failure, High Wind, Lightning, Wildfire, Tornado, Hail, Extreme Heat, Drought, Winter Storms, Earthquake
Goal/Objective	4-A, 4-C
Priority	Medium
Estimated Cost	$15,000
Potential Funding Sources	General Fund, HMGP
Potential Matching Sources	Local funds, in-kind
Lead Department	Public Works
Implementation Schedule	9-12 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost.
Discussion	The public education program would target hazards identified in this plan, identify ways for the public to take mitigating actions, and distribute mitigation information to residents. Awareness of local natural hazards and how to implement mitigation measures will reduce vulnerabilities and impacts to people and property.

City of Corsicana Action Item	Increase the ability of residents and businesses to receive early warning from the National Weather Service. This would be accomplished by offering an in kind match program or give away through county schools, hospital, and public safety agencies. With the local NOAA all hazards radio in Corsicana providing excellent coverage, participation would likely be high in this program.
Hazard(s) Addressed	Flooding, Dam Failure, High Wind, Lightning, Wildfire, Tornado, Hail, Extreme Heat, Winter Storms
Goal/Objective	3-C
Priority	High
Estimated Cost	$60,000
Potential Funding Sources	Grant Funds, HMPG, PDM, Partial payment by receiving party
Potential Matching Sources	Local funds, in-kind, donations, citizen cost-share
Lead Department	OEM, LE, FD
Implementation Schedule	As funding is available, would become an ongoing project
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Advanced warning saves lives, which outweighs the cost of the radios.
Discussion	Weather Alert Radios are a proven means to alert and warn citizens about severe weather and civil emergencies. It is impossible to quantify the value of a human life and difficult to quantify the value of an injury. Navarro County believes that the value of a single life saved or injury avoided will offset the cost of this project. An added benefit of this project would be to raise awareness of Weather Alert Radios and severe weather safety throughout the area, thus providing benefits even to citizens who do not participate in this program.

City of Corsicana Action Item	Expand water conservation measures during periods of drought.
Hazard(s) Addressed	Drought
Goal/Objective	4-C
Priority	Medium
Estimated Cost	$1,000
Potential Funding Sources	HMGP, PDM, General Fund
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	City Council, EM
Implementation Schedule	12 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low cost for effective means of preserving water.
Discussion	Promote water conservation throughout the county and work with local water supplies to increase public education on drought.

City of Corsicana Action Item	Hire consultant to complete new inundation studies of all high and moderate hazard dams within the county.
Hazard(s) Addressed	Dam Failure, Flood
Goal/Objective	1-A
Priority	High
Estimated Cost	$75,000
Potential Funding Sources	HMPG, Water Shed Authorities, Dam Sponsors
Potential Matching Sources	Local Sponsors, In-Kind
Lead Department	Planning and Zoning/ NRCS
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low
Discussion	Data deficiency for dam failure identified in Chapter 3. Identify all structures and infrastructures that would be impacted by a potential dam failure.

City of Corsicana Action Item	Installation and maintenance of a CASA (WX) Weather Radar system
Hazard(s) Addressed	Hail, Tornadoes, High Wind, Wildfire, Flooding, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	$550,000
Potential Funding Sources	Local Funding, Federal Funding, HMPG
Potential Matching Sources	Local Grants
Lead Department	Corsicana OEM, NCTCOG
Implementation Schedule	12-36 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Cost effectiveness is low compared to the benefits.
Discussion	The Collaborative Adaptive Sensing of the Atmosphere (CASA WX) project is a multi-sector partnership dedicated to engineering revolutionary weather-sensing networks. The main purpose of the CASA WX project is to save lives and minimize injuries due to severe weather. This is accomplished through the enhancement of data by providing lower atmospheric coverage at faster rates. The CASA WX radars provide jurisdictions more accurate weather data and geographically specific weather data culled from the most active levels of the atmosphere. This data could save lives by providing the public more time to react and prepare appropriately as severe weather affects their location. The more accurate data will also provide a better means to analyze severe weather post event which can also help in the assessment of damage after a severe weather event.

City of Corsicana Action Item	Establish Construction Building Codes
Hazard(s) Addressed	Earthquake
Goal/Objective	3-C
Priority	Low
Estimated Cost	Staff Time
Potential Funding Sources	General Fund
Potential Matching Sources	Local Funds
Lead Department	Development Services
Implementation Schedule	One Year
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Critical to the safety of houses and other structures
Discussion	Establish Construction Building Codes

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Section 5.2.C – City of Kerens Action Items

City of Kerens Action Item	Implement Individual Tornado Safe Room Rebate Program
Hazard(s) Addressed	High Wind, Tornadoes, Hail
Goal/Objective	2-B
Priority	High
Estimated Cost	$250,000
Potential Funding Sources	HMGP, PDM, Resident Match
Potential Matching Sources	Donations, In-kind, payment by receiving party
Lead Department	Emergency Management
Implementation Schedule	As funding is available
Effect on Old Buildings	Some buildings modified for shelter retrofit
Effect on New Buildings	Moderate
Cost Effectiveness	Residential safe room shelters potentially decrease personal injuries and death during severe weather, tornadoes or high wind events.
Discussion	Implement Individual Tornado Safe Room Rebate Program

City of Kerens Action Item	Purchase and distribute NOAA All Hazard Radios to vulnerable households and businesses in the city
Hazard(s) Addressed	High Wind, Lightning, Wildfire, Tornado, Hail, Extreme Heat, Winter Storms
Goal/Objective	2-B
Priority	High
Estimated Cost	$200,000
Potential Funding Sources	Grant Funds, HMPG, PDM, Partial payment by receiving party
Potential Matching Sources	Local funds, in-kind, donations, citizen cost-share
Lead Department	Emergency Management
Implementation Schedule	As funding is available, would become an ongoing project
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Advanced warning saves lives, which outweighs the cost of the radios.
Discussion	Increase the ability of residents and businesses to receive early warning from the National Weather Service.

City of Kerens Action Item	Build covered patios in public parks to protect citizens from extreme weather.
Hazard(s) Addressed	Extreme Heat, Hail, High Winds, Lightning
Goal/Objective	1-C
Priority	Medium
Estimated Cost	$7,500 per covered patio
Potential Funding Sources	HMGP, PDM, Grants, City budget
Potential Matching Sources	General Fund
Lead Department	Parks/Public Works
Implementation Schedule	Within two years of funding
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Cost is low compared to loss of life from heat illnesses and funding spent for Emergency Services responses.
Discussion	Covered patios are an effective means of providing protection in open areas.

City of Kerens Action Item	Adopt and promote public education program.
Hazard(s) Addressed	High Wind, Lightning, Wildfire, Tornado, Hail, Extreme Heat, Drought, Winter Storms, Earthquake
Goal/Objective	4-C
Priority	Medium
Estimated Cost	$10,000
Potential Funding Sources	General fund, HMGP, PDM, other state/federal grants
Potential Matching Sources	Local funds, citizen cost-share, donations
Lead Department	Emergency Management
Implementation Schedule	6-9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost.
Discussion	The public education program would target hazards identified in this plan, identify ways for the public to take mitigating actions, and distribute mitigation information to residents. Awareness of local natural hazards and how to implement mitigation measures will reduce vulnerabilities and impacts to people and property.

City of Kerens Action Item	Develop, Adopt, and Enforce Water Restriction Codes in Times of Drought
Hazard(s) Addressed	Drought
Goal/Objective	4-C
Priority	Medium
Estimated Cost	$1,000
Potential Funding Sources	HMGP, PDM, General Fund
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Facilities management
Implementation Schedule	Within 12 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Water restriction codes preserve precious resources at a very low cost.
Discussion	Water restriction codes preserve water at low cost during times of drought, ensuring a continued water supply for the community. Codes and ordinances will be enacted for watering times and other water restrictions.

City of Kerens Action Item	Develop a Community Wildfire Protection Plan (CWPP)
Hazard(s) Addressed	Wildfire
Goal/Objective	4-C
Priority	Medium
Estimated Cost	$55,000
Potential Funding Sources	HMGP, PDM, General Fund
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	ESD1
Implementation Schedule	Within 24 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	CWPPs show officials where to redouble their efforts in preventing wildfire, saving time and money.
Discussion	This project will become increasingly needed as development around Richland Chambers (Tarrant County Water Supply) increases.

City of Kerens Action Item	Hire consultant to complete new inundation studies of all high and moderate hazard dams within the county.
Hazard(s) Addressed	Dam Failure, Flood
Goal/Objective	1-A
Priority	High
Estimated Cost	$75,000
Potential Funding Sources	HMGP, Water Shed Authorities, Dam Sponsors
Potential Matching Sources	Local Sponsors, In-Kind
Lead Department	Planning and Zoning/ NRCS
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low
Discussion	Data deficiency for dam failure identified in Chapter 3. Identify all structures and infrastructures that would be impacted by a potential dam failure.

City of Kerens Action Item	Establish Construction Building Codes
Hazard(s) Addressed	Earthquake
Goal/Objective	3-C
Priority	Low
Estimated Cost	Staff Time
Potential Funding Sources	General Fund
Potential Matching Sources	Local Funds
Lead Department	Development Services
Implementation Schedule	One Year
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Critical to the safety of houses and other structures
Discussion	These building codes will be written to ensure that new construction in Kerens is built to withstand the recent rise in earthquakes.

5.3 National Flood Insurance Program (NFIP) Compliance

The National Flood Insurance Program (NFIP)

The National Flood Insurance Program is a federally run program which enables property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages.

Community Participation A community applies for participation in the National Flood Insurance Program (NFIP) either as a result of interest in eligibility for flood insurance or as a result of receiving notification from FEMA that it contains one or more Special Flood Hazard Areas (SFHAs). In order for a community to apply for and receive participation in the NFIP, that community must adopt resolutions or ordinances to minimally regulate new construction in identified SFHAs. FEMA works closely with state and local officials to identify flood hazard areas and flood risks. The floodplain management requirements within the SFHA are designed to prevent new development from increasing the flood threat and to protect new and existing buildings from anticipated flood events.

When a community chooses to join the NFIP, it must require permits for all development in the SFHA and ensure that construction materials and methods used will minimize future flood damage. Permit files must contain documentation to substantiate how buildings were actually constructed. In return, the Federal Government makes flood insurance available for almost every building and its contents within the community.

Communities must ensure that their adopted floodplain management ordinance and enforcement procedures meet program requirements. Local regulations must be updated when additional data are provided by FEMA or when Federal or State standards are revised

Navarro County Jurisdiction Participation

Navarro County jurisdictions are participating in the National Flood Insurance Program and have identified their respective areas as vulnerable to flooding. This is incorporated into all current and future planning for dealing with repetitive loss vulnerabilities.

CID	Community Name	County	Initial FHBM Identified	Initial FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
480498#	CORSICANA, CITY OF	NAVARRO COUNTY	12/27/74	08/17/81	06/05/12	08/17/81	NO
480955#	KERENS, CITY OF	NAVARRO COUNTY	08/29/75	06/05/12	06/05/12(M)	05/25/78	NO
480950#	NAVARRO COUNTY*	NAVARRO COUNTY	12/27/77	04/01/04	06/05/12	04/01/04	NO

Source: http://www.fema.gov/cis/TX.html

** - Unincorporated Navarro County*

Jurisdiction Compliance

Once the community applies for the NFIP, FEMA arranges for a study of the community to determine base flood elevations and flood risk zones. Consultation with the community occurs at the start of and during the study, and those communities with minimal flood risk are converted to the Regular Program without a study.

FEMA provides the studied community with a Flood Insurance Rate Map delineating base flood elevations and flood risk zones. The community is then given 6 months to adopt base flood elevations in its local zoning and building code ordinances. Once the community adopts more stringent ordinances, FEMA converts the community to the NFIP's Regular Program. FEMA then authorizes the sale of additional flood insurance in the community up to the Regular Program limits. The community must implement and enforce the adopted floodplain management measures. FEMA provides periodic community assistance visits with local officials to provide technical assistance regarding complying with NFIP floodplain management requirements.

The purchase of flood insurance is mandatory as a condition of receipt of federal or federally-related financial assistance for acquisition and/or construction of buildings in SFHAs of any participating community. Those communities notified as flood-prone which do not apply for participation in the NFIP within 1 year of notification are ineligible for federal or federally-related financial assistance for acquisition, construction, or reconstruction of insurable buildings in the SFHA.

Jurisdiction Activities

In order to maintain eligibility with NFIP, jurisdictions are required to maintain their list of properties that hold a policy with NFIP, along with up-to-date maps of the floodplains in the jurisdictions. Each jurisdiction participating in the Navarro County Hazard Mitigation Action Plan completes this basic requirement and has the information on file with the jurisdiction's designated floodplain manager. Using this plan, participating jurisdictions will be able to continue their compliance with NFIP by implementing damage control measures and take action to minimize the effects of flooding in their respective jurisdictions.

Jurisdiction	Community Floodplain Administrator	NFIP Activity	Activity Description	Enforcement
Navarro County	Navarro County Planning & Zoning Director	Complete and maintain FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Permits are issued through the Navarro County Planning & Zoning Office. Navarro County requires 2 feet of freeboard above the base flood elevation for the top of bottom floor on residential structures and non-residential structures that will be built on properties created or platted after the effective date of the Flood Damage Prevention Order	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and compliance inspections pending approval. Failure to comply with City's flood damage prevention order shall result in fines up to $500 per violation plus court costs.
		Floodplain development permits	Elevation certificate and permits required for any new construction in a floodplain.	

Jurisdiction	Community Floodplain Administrator	NFIP Activity	Activity Description	Enforcement
		Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	Strictly adhere to the Flood Damage Prevention Court Order adopted April 23, 2012 (see attached)	
		Future Mitigation Projects	Navarro County will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	
Corsicana	Engineering Director	Complete and maintain FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Permits are issued through the Engineering Department. The City of Corsicana requires 1 foot of freeboard above the base flood elevation for the top of bottom floor on residential structures and non-residential structures that will be built on properties created or platted after the effective date of the Development and Construction Within the Flood Hazard Area Ordinance.	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and compliance inspections pending approval. Failure to comply with City's flood damage prevention order shall result in fines up to $2000 per violation plus court costs.
		Floodplain development permits	Permits are required for any new construction in a floodplain.	
		Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	The City of Corsicana participated in the last round of SFHA map modification initiated by FEMA.	
		Take action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency	The City Public Works Department monitors creek for debris and clean when necessary.	

Jurisdiction	Community Floodplain Administrator	NFIP Activity	Activity Description	Enforcement
		response, and evacuation planning		
		Future Mitigation Projects	The City Engineering Department will continue to monitor areas for flooding concerns and implement projects when feasible to minimize future flooding.	
Kerens	City Administrator	Complete and maintain FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Permits are issued through the Office of the City Administrator. Kerens requires the lowest floor elevated to or above the base flood on residential structures and non-residential structures that will be built on properties created or platted after the effective date of the Flood Damage Prevention Ordinance	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and compliance inspections pending approval. Failure to comply with City's flood damage prevention order shall result in fines up to $500 per violation plus court costs.
		Floodplain development permits	Permits are required for any new construction in a floodplain.	
		Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	Kerens participates in Risk Assessment, Mapping and Planning Partners (RAMPP) meetings held by FEMA and/or their contractors to better identify areas that are flood prone that are not shown on current Flood Insurance Rate Maps.	
		Future Mitigation Projects	Kerens will continue to monitor for new areas of	

Jurisdiction	Community Floodplain Administrator	NFIP Activity	Activity Description	Enforcement
			flooding that have not been previously identified for mitigation.	

The Community Rating System (CRS)

The Community Rating System (CRS) is a voluntary program for NFIP-participating communities. The goals of the CRS are to reduce flood damages to insurable property, strengthen and support the insurance aspects of the NFIP, and encourage a comprehensive approach to floodplain management. All CRS communities must maintain completed FEMA elevation and flood proofing certificates for all new and substantially improved construction in the Special Flood Hazard Area after the date of application for CRS classification.

The Navarro County Hazard Mitigation Action Plan will apply for and participate in the CRS program to provide discounted insurance premium incentives for communities to go beyond the minimum floodplain management requirements and to analyze and manage future development.

According to the current CRS document located at the following link - http://www.fema.gov/library/viewRecord.do?id=3629 there are no communities in Navarro County that are currently participating.

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Chapter Six: Plan Maintenance Process

(In compliance with 201.6(c)(4)(i))

6.1 Monitoring, Evaluating and Updating the Plan

In Compliance with requirement *§ 201.6(c)(4)(i)*, Navarro County has developed a plan maintenance process which is described in the following paragraphs. Navarro County, along with participating jurisdictions are responsible for monitoring implementation of the plan, executing a yearly evaluation of its effectiveness, and updating the plan within a 5-year cycle.

Following formal adoption by Navarro County Commissioners Court, and formal adoption of the plan by City Council by each participating jurisdiction, the actions outlined in the Navarro County Hazard Mitigation Action Plan would be implemented by the county and participating jurisdictions as described throughout this document.

The Navarro County Emergency Management Coordinator will be responsible for ensuring the mitigation action items and implementation are monitored, evaluated, and reviewed biannually by emailing all the participating jurisdictions for updates on their individual action items. The progress of the action items will be tracked electronically as “in progress”, “deferred” or “completed”. This implementation will be included in the Mitigation Strategies for the 5 year update of the plan.

The Navarro County Emergency Management Coordinator, working in conjunction with the respective jurisdictions, will be responsible for ensuring the mitigation plan is monitored, evaluated, and reviewed on an annual basis. This will be accomplished by calling an annual meeting of the planning committee, whose members will provide assistance and expertise for plan review, evaluating, updating, and monitoring. This meeting will be open to the public and public notices will encourage community participation. During this annual meeting, Navarro County will provide information on the implementation status of each action included in the plan. As part of the evaluation, the planning committee will assess whether goals and objectives address current and expected conditions, whether the nature and/or magnitude of the risks have changed, if current resources are appropriate for implementing the plan, whether outcomes have occurred as expected, and if agencies and other partners participated as originally proposed. These activities will take place according to the timetable presented below:

Jurisdiction	Responsible Personnel	Activity	Update Schedule
Navarro County	Emergency Management Coordinator	Tracking implementation and action items	Biannually
		Evaluate Plan	Annually
		Update Plan	Once every 5 years
City of Corsicana	Fire Chief	Tracking implementation and action items	Biannually
		Evaluate Plan	Annually
		Update Plan	Once every 5 years
City of Kerens	City Secretary	Tracking implementation and action items	Biannually
		Evaluate Plan	Annually
		Update Plan	Once every 5 years

At least once every five (5) years, or more frequently, if such a need is determined by the participating jurisdiction, the multi-jurisdictional plan will undergo a major update. During this process, all sections of the plan will be updated with current information and analyses and new and/or modified mitigation action plans will be developed. The revised plan will be submitted for state and federal review and approval and presented to the Navarro County Commissioner's Court and the respective incorporated cities', included in the Navarro County plan, City Councils for approval. Likewise, each participating jurisdiction will undergo the same process for reviewing, revising and updating their respective plans and submitting same for state, federal and jurisdiction's respective local governing body approval. The plan will be updated every five years in accordance.

6.2 Plan Incorporation into Existing Planning Mechanisms *(In compliance with 201.6(c)(4)(ii))*

Based on the requirements set forth in § *201.6(c)(4(ii)*, the State of Texas Mitigation Plan, the vulnerability and capabilities assessment for each jurisdictions were carefully reviewed and considered when developing the mitigation actions for this plan. The Hazard Mitigation team will establish a process in which the mitigation strategy, goals, objectives and actions outlined in this plan be incorporated into the existing regional and local planning strategies.

Local and regional planning committees currently use comprehensive land use planning, capital improvements planning, and building code ordinances to guide development. The mitigation strategy, goals, objectives and actions outlined in this plan will be integrated in to these existing mechanisms as applicable. Those mechanisms include the following:

Jurisdiction	Responsible Personnel	Jurisdictional Plans	Integration Schedule	Integration Plan
Navarro County	Emergency Management Coordinator	Capital Improvement Plan	Annually	During meetings to create, adopt, update, or otherwise change any documents that have an effect on vulnerability to natural hazards, Navarro County will consult the most recent version of the Hazard Mitigation Action Plan. Provided there is sufficient political, fiscal, and administrative capability, actions detailed in the HazMAP will be brought before the Commissioners Court to be approved, via vote, for integration into the document wherever applicable.
		Economic Development Plan	Annually	
		Emergency Operations Plan	Every five years	
		Drought Contingency plans	As needed	
Corsicana	Fire Chief	Capital Improvement Plan	Annually	During meetings to create, adopt, update, or otherwise change any documents that have an effect on vulnerability to natural hazards, City of Corsicana will consult the most recent version of the
		Economic Development Plan	Annually	

Jurisdiction	Responsible Personnel	Jurisdictional Plans	Integration Schedule	Integration Plan
		Emergency Operations Plan	Every five years	Hazard Mitigation Action Plan. Provided there is sufficient political, fiscal, and administrative capability, actions detailed in the HazMAP will be brought before the City Council to be approved, via vote, for integration into the document wherever applicable.
		Drought Contingency plans	As needed	
Kerens	City Secretary	Capital Improvement Plan	Annually	During meetings to create, adopt, update, or otherwise change any documents that have an effect on vulnerability to natural hazards, City of Kerens will consult the most recent version of the Hazard Mitigation Action Plan. Provided there is sufficient political, fiscal, and administrative capability, actions detailed in the HazMAP will be brought before the City Council to be approved, via vote, for integration into the document wherever applicable.
		Economic Development Plan	Annually	
		Emergency Operations Plan	Every five years	
		Drought Contingency plans	As needed	

Once the plan is adopted the Hazard Mitigation team will coordinate implementation with the engineering and planning and emergency management departments for the county, participating jurisdictions, river authorities, and drainage districts.

6.3 Continued Public Involvement *(In compliance with 201.6(c)(4)(iii))*

As stated in requirement § *201.6(c)(4)(iii)* The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.

To address this requirement, ongoing public participation will be encouraged throughout the entire planning and implementation process. A copy of the plan will be provided on the Navarro County website. The planning committee will continue meeting on a weekly basis to ensure the successful implementation of the plan and to discuss any additional issues regarding the emergency management of Navarro County. The annual meetings for monitoring, evaluating, and updating the plan will be open to the public and public notices will encourage community participation.

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Appendix A: Planning and Public Meeting Documentation

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MEETING SIGN-IN SHEET

Meeting:	Navarro Hazard Mitigation Action Plan Kickoff	**Meeting Date:**	10/21/2013
Facilitator:	Nicholas F. LaGrassa	**Place/Room:**	

Name	Title	Company	Phone	E-Mail
ERIC MEYERS	EMC	NAVARRO CO	903-654-3396	ermeyers@nciw.com
Donald McMullen	EMC	City of Corsicana	903 654-4556	dmcmullen@ci.corsicana.tx.us
Connie Standridge	City Manager	Corsicana	9036544803	cstandridge@ci.corsicana.tx.us
DICK MARTIN	County Comm-Pct 2	Navarro County	903 654 3032	dmartin@navarrocounty.org
Audrey Sloan	P+Z Manager	Corsicana	903 654 4872	asloan@ci.corsicana.tx.us
Debbie Martin	GIS Technician	Corsicana	903 654 4841	dmartin@ci.corsicana.tx.us
Morris Steward	Chief Deputy	Navarro Co. S.O.	903 654-3005	msteward@navarrocounty.org
Elmer Tanner	Sheriff	Navarro Co	903 654 3004	ETANNER@NAVARROCOUNTY.ORG
Kyle Pritchett	Wastewater Supt.	City of Corsicana	903-654-4866	kpritchett@ci.corsicana.tx.us
Jerry Franks	Public Works	City of Corsicana	903-654-4884	jfranks@ci.corsicana.tx.us
Sharla Allen	Parks & Rec Director	City of Corsicana	903-654-4814	~~sallen@ci.corsicana.tx.us~~ sallen@ci.corsicana.tx.us
Ronald McGaha	Asst. Chief	Corsicana Police	903-654-4900	RmcGaha@ci.corsicana.tx.us
Ginger (Virginia) Richardson	Finance Director	City of Corsicana	903-654-4815	grichardson@ci.corsicana.tx.us

MEETING SIGN-IN SHEET

Meeting:	Navarro County HazMAP Meeting	**Meeting Date:**	11/26/2013
Facilitator:	Nicholas F. LaGrassa, NCTCOG	**Place/Room:**	Navarro County Commissioners Conference Room

Name	Title	Company	Phone	E-Mail
Donald McMullen	Corsicana Fire Chief/EMC	City of Corsicana	903-654-2181	dmcmullen@ci.corsicana.tx.us
Kyle Pritchett	Wastewater Supt.	City of Corsicana	903-654-4866	kpritchett@ci.corsicana.tx.us
David "Butch" Warren	Commissioner Pct 3	Navarro County	903-654-3033	dwarren@navarrocounty.org
Cindy Scott	City Administrator	City of Kerens	903-396-2971	cityofkerens@airmail.net
Audrey Sloan	P+Z Manager	City of Corsicana	903-654-4872	asloan@ci.corsicana.tx.us
Connie Standridge	City Manager	City of Corsicana	9036544803	cstandridge@ci.corsicana.tx.us
Terry Franks	Director of Public Works	City of Corsicana	903-654-4878	tfranks@ci.corsicana.tx.us
JAMES OLSEN	County Commissioner	PCT 4 NAVARRO	9036540565	JOlsen@navarrocounty.org
Elmer Tanner	SHERIFF	NAVARRO Co	903 654 3004	ETANNER@NAVARROCOUNTY.ORG
ERIC R MEYERS	NC EMC	NAVARRO Co	903 654 3396	ermeyers@navarrocountyoem.org
Kathy Hollomon	County Auditor	Navarro Co.	9036546675	khollomon@navarrocounty.org
Andrea C Wilson	EP	NCTCOG	9179599791	awilson@nctcog.org

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Waco 1st. #txwx

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Dallas/Fort Worth

Rank	Precipitation	Year
1	0.20	1909
2	0.58	1967
3	0.65	1976
4	0.70	1900
5 (5e)	**0.71**	**2014***
	0.71	1902
	0.71	1943
8	0.87	1907
9	0.92	1963

Waco

Rank	Precipitation	Year
1	**0.76**	**2014***
2	0.80	1936
3	0.85	1917
4	0.93	1967
5	0.96	1963
6	1.06	1996
7	1.11	1943
8	1.12	1914
9	1.22	1918

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Corsicana Daily Sun @TheDailySun · Feb 24
NCTCOG holds HAZMAP public meeting at library bit.ly/1hr3blf

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NWS Fort Worth @NWSFortWorth · Feb 24
Another cold front and upper disturbance Tues give us better chances for light rains. ow.ly/i/4H6S5 #txwx #dfwwx #texoma #ctxwx

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NWS Fort Worth @NWSFortWorth · Feb 21
The year-to-date precipitation total at #Waco is now the driest on record. ow.ly/tSrwV #ctxwx #dfwwx #txwx #drought

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Corsicana Daily Sun @TheDailySun · Feb 16

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NWS Fort Worth @NWSFortWorth · Feb 17

Today: Warm & Windy despite a front arriving this am. High Fire Danger across the west. ow.ly/i/4CB77 #txwx

6

Navarro County OEM @NavarroOEM · Feb 14

HAZMAP Public meeting to be held on 02/24/2014 11:00 AM Corsicana Public Library 100 N 12th St Corsicana, TX.

Navarro County OEM @NavarroOEM · Feb 14

DFW moving forward with advanced radar system for storms | Local | Star-Telegram.com star-telegram.com/2014/02/11/556...

Navarro County OEM @NavarroOEM · Feb 14

George Brozowski, Regional Health Physicist, EPA Region 6, gives the presentation at the Navarro County LEPC meeting.

MEETING SIGN-IN SHEET

Meeting:	Navarro County Public Meeting #1	**Meeting Date:**	2/24/2014
Facilitator:	Nicholas F. LaGrassa	**Place/Room:**	Corsicana Library

Name	Title	Company	Phone	E-Mail
Eric R Meyers	EMC	Navarro County	903-654-3396	ermeyers@navarrocountytexas.org
Jodi Saegesser	Special Projects	Cong. Joe Barton	817-483-4494	Jodi.Saegesser@mail.house.gov
Bobby Wilson	Mgr.	Navarro SWCD	903-874-5131	
Chris Gibbs	Dir. of Opera	CISD	903-229-7766	cgibbs@cisd.org
Donald McMellen	Rio Club / City / EMC	Corsicana Fire	903-654-2181	dmcmellen@ci.corsicana.tx.us
Raymond Linex	Publisher	Cors. Daily Sun	903-229-1422	rllinex@cnhi.com
Sarah Kubishta	AmeriCorps	American Red Cross	903-874-4551	Sarah.Kubishta@redcross.org
Jeannie McCarty	Disaster PM	"	"	jeannie.mccarty@redcross.org
Brett Latta	Comm. Captain	NCSO	903 654 7891	belatta@swbell.net
Ron McGaha	Asst. Chief of Police	Corsicana PD	903-654-4900	RMcGaha@Ci.Corsicana.TX.US
Terry Franks	Director of Public Works	City of Corsicana	903-654-4854	tfranks@ci.corsicana.tx.us
Connie Standridge	City Manager	"	903 654 4803	cstandridge@ci.corsicana.tx.us
Debbie Martin	GIS Technician	"	903 654 4841	dmartin@ci.corsicana.tx.us
Audrey Sloan	P+Z Manager	"	903 654 4872	asloan@ci.corsicana.tx.us
Charles Leist	Dir. of Env. Svcs	City of Corsicana	903 654 4880	cleist@ci.corsicana.tx.us

MEETING SIGN-IN SHEET

Meeting:	Navarro County Public Meeting #1	**Meeting Date:**	2/24/2014
Facilitator:	Nicholas F. LaGrassa	**Place/Room:**	Corsicana Library

Name	Title	Company	Phone	E-Mail
Cassandra Dillon	LEPC Chair	Navarro County	972 804 3410	cassandhamilton@gmail.com
Andrea C Wilson	Intern	NCTCOG	817-695-9291	alwilson@nctcog.org

MEETING SIGN-IN SHEET

Meeting:	Navarro Mitstrat Meeting (Navarro HazMAP)	**Meeting Date:**	4/2/2014
Facilitator:	Nicholas F. LaGrassa, NCTCOG	**Place/Room:**	Navarro County EOC

Name	Title	Company	Phone	E-Mail
Ron McGaha	Asst. Chief	Corsicana Police	903-654-4922	RMcGaha@ci.corsicana.tx.us
Jeannie McCarty	DPM	ARC	214-914-5496	jeannie.mccarty@redcross.org
Connie Standridge	City Manager	Corsicana	9036544803	cstandridge@ci.corsicana.tx.us
Donald McMullan	Fire Chief/EMC	Corsicana	903-654-4954	dmcmullan@ci.corsicana.tx.us
Jodi Saegesser	Special Projects Dir.	Cty. Joe Santa	817-483-4494	Jodi.Saegesser@mail.house.gov
DIANA Robinson	City Secretary	Retreat	903-654-8348	drobinson7@wtf.45.com
Janice Barfknecht	Mayor	Retreat	903-874-4386	jbarf69@hotmail.com
ELMER TANNER	SHERIFF	NC50	903 654 3002	ETANNER@NAVARROCOUNTY.ORG
Cindy Scott	City Sec/Admin	Kerens	903-396-2971	cityofkerens@airmail.net
ERNIE R MEYERS	EMC	NAVARRO COUNTY	903-654-3396	ermeyers0@aol.com
Nicholas LaGrassa	EP Program Assistant	NCTCOG	817 608 2123	NLagrassa@NCTCOG.org

MEETING SIGN-IN SHEET

Meeting:	Navarro County Mitigation Strategies Meeting	**Meeting Date:**	4/17/2014
Facilitator:	Nicholas F. LaGrassa, NCTCOG	**Place/Room:**	Oil City Iron Works/Conference Room

Name	Title	Company	Phone	E-Mail
ERIC R MEYERS	EMC	NAVARRO COUNTY	903-654-3396	crmeyers@navarrocounty-oem.org
[illegible]	EMC/Corsicana	Corsicana	9036544555	dmcmullen@ci.corsicana.tx.us
Andrea L Wilson	INTERN	NCTCOG	8176959991	ALWilson@nctcog.org
Nicholas F. LaGrassa	EP Program Assistant	NCTCOG	8176082323	nlagrassa@nctcog.org

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Corsicana Daily Sun
July 7 at 12:46pm

Sharing information on behalf of the Navarro County Office of Emergency Management.

Navarro County Office of Emergency Management

Notice of Public Meeting

The North Central Texas Council of Governments and Navarro County are seeking public comment on the Navarro County Hazard Mitigation Action Plan. Topics will include potential hazards, severity of hazards, and mitigation strategies.
Participating communities include: the unincorporated county, Corsicana, and Kerens.

Meeting date and location are as follows:
07/08/2014 | 6:00 PM
Corsicana Public Library
100 N 12th Street
Corsicana, TX 75110

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Breeda Evans
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Navarro County Office of Emergency Management
Posted by Eric Ryan Meyers (?) · July 6 at 8:59pm

Notice of Public Meeting

The North Central Texas Council of Governments and Navarro County are seeking public comment on the Navarro County Hazard Mitigation Action Plan. Topics will include potential hazards, severity of hazards, and mitigation strategies.
Participating communities include: the unincorporated county, Corsicana, and Kerens.

Meeting date and location are as follows:
07/08/2014 | 6:00 PM
Corsicana Public Library
100 N 12th Street
Corsicana, TX 75110

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MEETING SIGN-IN SHEET

Meeting:	Navarro County HazMAP: Public Meeting #2	**Meeting Date:**	7/8/2014
Facilitator:	Nicholas F. LaGrassa	**Place/Room:**	Corsicana Public Library

Name	Title	Company	Phone	E-Mail
Connie Standridge	City Manager	City of Corsicana	9036544803	cstandridge@ci.corsicana.tx.us
Donald McMullen	Fire Chief / EMC	City of Corsicana	903-654-4556	dmcmullen@ci.corsicana.tx.us
Eric R Meyers	EMC	Navarro Co	903 654-3396	ermeyers@ocic.com
Jodi Sagesser	Special Projects Coordinator	Cty. Joe Bard	817-543-1000	jodi.sagesser@mail.house.gov
Terry Franks	Public Works Director	City of Corsicana	903-654-4884	tfranks@ci.corsicana.tx.us
Elmer Tanner	Sheriff	Navarro Co	903 654 7916	etanner@navarrocounty.org
H.M. Davenport	Co. Judge	Navarro Co.	903 654 3025	hdavenport@navarrocounty.org