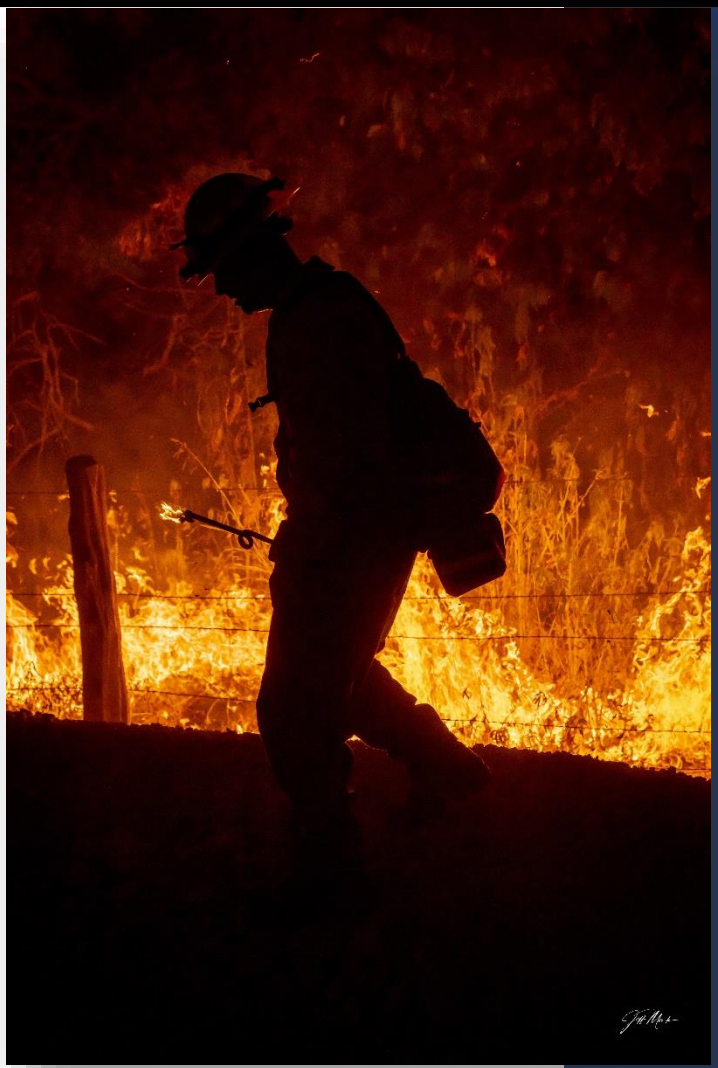
Johnson County Hazard Mitigation Plan 2024



North Central Texas Council of Governments

Executive Summary

We cannot control when or where a tornado or other natural hazard will strike, but we can save lives and reduce property damage by understanding the risks and taking action to address those risks. In the process, we can increase resilience in our community, environment, and economy. Participating jurisdictions in the Johnson County Hazard Mitigation Plan (HMP) are dedicated to the protection of local citizens and their property, and to the improvement of the quality of life for all residents.

Mitigation has been defined as "sustained action to reduce or eliminate long-term risk to human life and property from natural, human-caused, and technological hazards."[1] It is fundamentally a loss-prevention function characterized by planned, long-term alteration of the built environment to ensure resilience against natural and human-caused hazards. This loss-prevention function has been illustrated by the Multi-Hazard Mitigation Council study of the Federal Emergency Management Agency (FEMA) mitigation projects, which shows that for every dollar invested in mitigation, six dollars of disaster losses were avoided.[2]

Mitigation should form the foundation of every emergency management agency's plans and procedures. Emergency management agencies should adopt mitigation practices to reduce, minimize, or eliminate hazards in their community. The Johnson County Hazard Mitigation Plan identifies the hazards faced by participating jurisdictions, vulnerabilities to these hazards, and mitigation strategies for the future. The plan fulfills the requirements of the Federal Disaster Mitigation Act as administered by the Texas Division of Emergency Management (TDEM) and the Federal Emergency Management Agency (FEMA).

This plan is not legally binding but instead is a tool for the jurisdiction to use to become more resilient to natural hazards. Mitigation actions will be implemented as capabilities and funding allow.

[1] State of Texas Mitigation Handbook, page 1-1.

[2] Natural Hazard Mitigation Saves: 2017 Interim Report, page 1.

Common Acronyms

EMC- Emergency Management Coordinator

EOC- Emergency Operations Center

FEMA- Federal Emergency Management Agency

HMP- Hazard Mitigation Plan

HMPT- Hazard Mitigation Planning Team

LPT- Local Planning Team

N/A- Not Applicable

NCEI- National Centers for Environmental Information

NCTCOG- North Central Texas Council of Governments

NFIP- National Flood Insurance Program

NFPA- National Fire Protection Association

NWS- National Weather Service

OWS- Outdoor Warning Siren

RLP- Repetitive Loss Properties

SRLP- Severe Repetitive Loss Properties

TDEM- Texas Division of Emergency Management

TFS- Texas A&M Forest Service

TPW- Texas Parks & Wildlife Department

TxDOT- Texas Department of Transportation

UTA- University of Texas at Arlington

WUI- Wildland-Urban Interface

Contents

Chapter 1: Introduction

1.1 Overview

This plan identifies natural hazards that could threaten life and property in the communities. The scope of this plan includes both short and long-term mitigation strategies, implementation, strategies, and possible sources of project funding to mitigate identified hazards.

The Johnson County Hazard Mitigation Plan (HMP) was previously referred to as the Hazard Mitigation Action Plan and fulfills the requirements of the Disaster Mitigation Act of 2000 (DMA 2000), which is administered by the Federal Emergency Management Agency (FEMA). The Disaster Mitigation Act provides federal assistance to state and local emergency management entities to mitigate the effects of disasters. The HMP also encourages cooperation among various organizations across political subdivisions.

This HMP is an update of the 2015 FEMA-approved HMP. With each update, new challenges are identified, new strategies proposed, and when incorporated, the updated plan grows in complexity, but not necessarily in utility.

This HMP is the result of two years of study, data collection, analysis, and community feedback. Representatives and citizens from participating jurisdictions attended public meetings to discuss the hazards their communities face and the vulnerabilities those hazards present.

All participants involved in this plan understand the benefits of developing and implementing mitigation plans and strategies. Elected officials, public safety organizations, planners, and many others have worked together to develop and implement this HMP, displaying that they have the vision to implement mitigation practices and therefore reduce the loss of life and property in their communities.

There is also understanding that the participating jurisdictions in this HMP are not liable to completing the actions their identified in their mitigation strategy. The actions are suggestions, and the jurisdictions will strive to implement the actions as fundings, staffing, and time allows.

Information was collected up to 2021.

1.2 Authority

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended by the Disaster Mitigation Act of 2000, provides the legal basis for state, tribal, and local governments to undertake risk-based approaches to reducing natural hazard risks through mitigation planning. Specifically, the Stafford Act requires state, tribal, and local governments to develop and adopt FEMA-approved hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance.

The Stafford Act authorizes the following grant programs:

- Hazard Mitigation Grant Program (HMGP), which helps communities implement hazard mitigation measures following a Presidential major disaster declaration. This program also funds development and update of hazard mitigation plans.

- Pre-Disaster Mitigation Grant Program (PDM), which awards planning and project grants to assist states, territories, federally-recognized tribes, and local communities in implementing sustained pre-disaster natural hazard mitigation programs. Such efforts may include development or update of hazard mitigation plans.
- Public Assistance Grant Program (PA), which provides assistance to state, tribal, and local governments, and certain types of private nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.
- Fire Management Assistance Grant Program (FMAG), which provides assistance to state, tribal, and local governments for the mitigation, management, and control of fires on publicly or privately-owned forests or grasslands that threaten such destruction as would constitute a major disaster.

Title 44, Chapter 1, Part 201 (44 CFR Part 201) of the Code of Federal Regulations (CFR) contains requirements and procedures to implement the hazard mitigation planning provisions of the Stafford Act.

The purpose of the Stafford Act, as amended by the Disaster Mitigation Act of 2000, is "to reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters." Chapter 322 of the act specifically addresses mitigation planning and requires state and local governments to prepare multi-hazard mitigation plans as a precondition for receiving FEMA mitigation grants.

This Johnson County Hazard Mitigation Plan was developed by the Johnson County Hazard Mitigation Planning Team (HMPT) under the direction and guidance of the North Central Texas Council of Governments (NCTCOG) Emergency Preparedness Department. The plan represents collective efforts of citizens, elected and appointed government officials, business leaders, non-profit organizations, and other stakeholders. This plan, and updating the plan, and timely future updates of this plan, will allow Johnson County and participating jurisdictions to comply with the Disaster Mitigation Act of 2000 and its implementation 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. The update will also prioritize potential risks and vulnerabilities in an effort to minimize the effects of disasters in the participating communities.

1.3 Purpose

This HMP is intended to enhance and complement federal and state recommendations for the mitigation of natural hazards in the following ways:

- Substantially reduce the risk of loss of life, injuries, and hardship from the destruction of natural and technological disasters.
- Improve public awareness of the need for individual preparedness and building safer, more disaster resilient communities.
- Develop strategies for long-term community sustainability during community disasters.
- Develop governmental and business continuity plans that will continue essential private sector and governmental operations during disasters.

Johnson 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, their impact on people and property can be lessened through hazard mitigation measures.

Mitigation planning is imperative to lessen the impact of disasters in Johnson County. This plan is an excellent method by which to organize Johnson County's mitigation strategies. The implementation of the plan and its components is vital to preparing a community that is resilient to the effects of a disaster. The implementation of this HMP can reduce loss of life and property and allow the participating communities to operate with minimal disruption of vital services to citizens. This HMP provides a risk assessment of the hazards Johnson County is exposed to and puts forth several mitigation goals and objectives that are based on that risk assessment.

Chapter 2: Planning Process

2.1 Planning Area

The planning area for this plan is for Johnson County, Texas (marked in red on the Texas map) and includes the following jurisdictions:

- City of Alvarado
- City of Burleson
- City of Cleburne*
- City of Godley*
- City of Joshua
- City of Keene
- Johnson County Unincorporated

The cities of Cleburne and Godley are new to the Johnson County HMP. Cleburne had their own plan in 2015. The following map shows a more detailed look of the county.

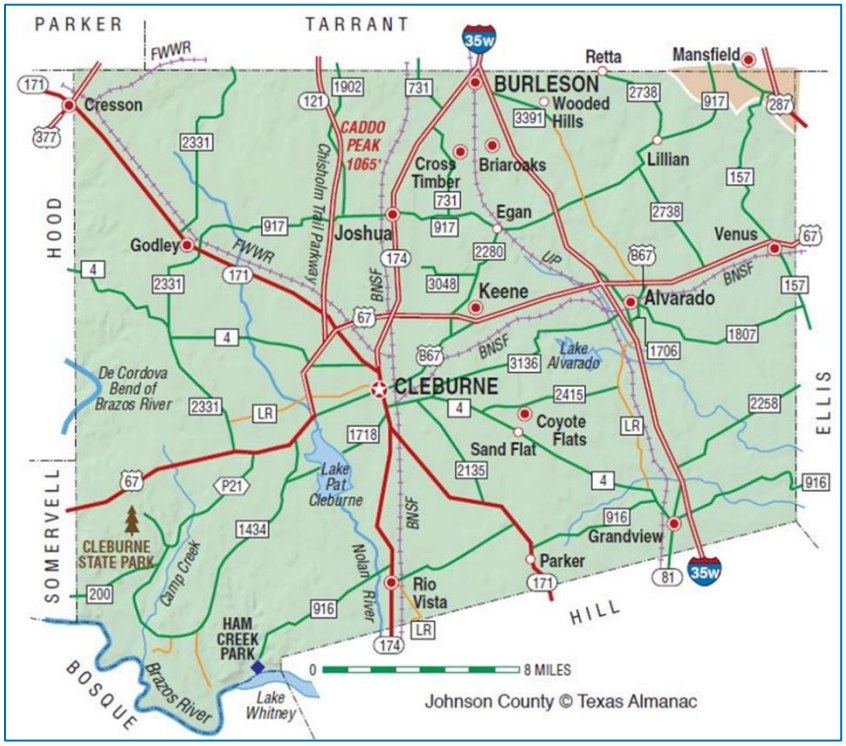


Figure 1: Johnson County[3]

[3] Johnson County (tshaonline.org)

2.2 Collaborative Process

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 city websites and social media pages.

Each jurisdiction is responsible for completing mitigation activities by providing the capabilities and authorities needed to carry out activities. Participating jurisdictions completed an analysis of their current legal, staffing, and fiscal capabilities as they relate to hazard mitigation planning. Jurisdictional capabilities and authorities identified to ensure successful mitigation planning are located within the jurisdictional annexes.

The North Central Texas Council of Governments was responsible for plan facilitation and coordination with participants throughout the process.

2.2.1 Hazard Mitigation Planning Team

Each participating jurisdiction in the planning area gathered information using a Local Planning Team (LPT), comprised of local staff that could contribute to development of this mitigation plan. The leader from each jurisdiction's LPT joined together to form the Johnson County Hazard Mitigation Planning Team (HMPT). The HMPT met regularly with the North Central Texas Council of Governments to submit individual assessments and data into one multi-jurisdictional hazard mitigation plan.

The following table lists the members of the Johnson County Hazard Mitigation Planning Team (HMPT).

Table 1: Johnson County HMPT Members

Jurisdiction	Job Title	Role in the HMPT
Alvarado	City Manager/Emergency Management Coordinator	Jurisdictional information and LPT Lead
Burleson	Emergency Management Coordinator	Jurisdictional information and LPT Lead
Cleburne	Emergency Management Coordinator	Jurisdictional information and LPT Lead
Godley	Emergency Management Coordinator	Jurisdictional information and LPT Lead
Joshua	Emergency Management Coordinator	Jurisdictional information and LPT Lead
Keene	Fire Chief	Jurisdictional information and LPT Lead
Johnson County Unincorporated	Emergency Management Coordinator	Jurisdictional information and HMPT Lead

Each HMPT member led their respective jurisdiction's Local Planning Team (LPT). The LPT members are listed in Appendix B.

2.2.2 Stakeholders

Stakeholders were invited to participate in the planning process, via email, and included local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, and neighboring communities. While the stakeholders declined to participate, information was gathered from their organizations when needed via publicly available resources.

Table 2: Invited Stakeholders

Organization Represented	Position
Somervell County	Emergency Management Coordinator
Hill County	Emergency Management Coordinator
Bosque County	Emergency Management Coordinator
Tarrant County	Emergency Management Coordinator
Ellis County	Emergency Management Coordinator
Parker County	Emergency Management Coordinator
Hood County	Emergency Management Coordinator
U.S. Army Corps of Engineers	Director – Civil Works
Dams in Participating Jurisdictions	Owners
Independent School Districts of Participating Jurisdictions	Superintendents
Texas Department of Transportation	Emergency Operations
Oncor	Emergency Operations
Local Emergency Planning Committee	Emergency Management Coordinator
Texas Division of Emergency Management	District Coordinator, Field Response
Texas Division of Emergency Management	Hazard Mitigation Planner
State Fire Marshal's Office	District 6, Inspector
National Weather Service – Fort Worth	Warning & Coordination Meteorologist
NCTCOG's Emergency Preparedness Planning Council	Chair
NCTCOG's Regional Emergency Preparedness Advisory Council	Chair
Local City Councils	Local elected officials
Brazos River Authority	Project Manager
Community Foundation of Johnson County	Administration
United Way of Johnson County	Administration

The goal for the next HMP is to involve a more robust and active stakeholder audience, including more representatives from non-governmental organizations.

2.2.3 Public Involvement

In order to meet the needs of the whole community, the Hazard Mitigation Planning Team (HMPT) used public involvement an opportunity to educate the public about hazards and risks in the community, types of activities to mitigate those risks, and how these activities impact them.

All meetings were open to the public and participation was highly encouraged. A virtual survey was also used as a way for the public to participate. This survey was the most equitable outreach capability available, as the survey could also be translated to Spanish by survey respondents, when needed, and removed the physical, social, temporal, and accessible barriers typically associated with a whole community outreach strategy.

The HMPT with look for more outreach strategies to use when maintaining this plan, once adopted, and pre-plan their strategy for the next update in order to garner more valuable feedback and reach more socially vulnerable populations and underserved communities.

The link to the survey was shared via jurisdiction's official websites and social media platforms and input from the public was heavily considered in the update of this plan. The public was also given an opportunity to review the final draft of this plan. The planning team carefully considered their feedback and made edits to the draft as necessary.

The HMPT with look for more outreach strategies to use when maintaining this plan, once adopted, and pre-plan their strategy for the next update in order to garner more valuable feedback and reach more socially vulnerable populations and underserved communities that are identified further on in this plan.

2.3 Existing Data and Plans

Existing hazard mitigation information and other relevant hazard mitigation plans were reviewed during the development of this plan. Data was gathered through numerous sources, including Geographic Information Systems (GIS). The intent of reviewing existing material was to identify existing data and information, shared objectives, and past and ongoing activities that can help inform the mitigation plan. It also helps identify the existing capabilities and planning mechanisms to implement the mitigation strategy. The table below outlines the sources used to collect data for the plan:

Table 3: Data Sources Used

Data Source	Data Incorporation	Purpose
County appraisal data, census data, city land use data	Population and demographics	Population counts, parcel data, and land use data
National Centers for Environmental Information (NCEI)	Hazard occurrences	Previous event occurrences and mapping for hazards
Texas A&M Forest Service/Texas Wildfire Risk Assessment Summary Report	Wildfire threat and urban interface	Mapping and wildfire vulnerability
U.S. Army Corps of Engineers National Dam Inventory	Dam information	Dam list
Federal Emergency Management Agency (FEMA) Digital Flood Insurance Rate Map (DFIRM) Flood Zones, National Flood Insurance Program (NFIP) studies	Flood zone maps and NFIP information	GIS mapping of flood zones and NFIP data
October 2017 NFIP Flood Insurance Manual Change Package	NFIP Information	Repetitive Loss Properties and Community Rating System (CRS) ratings

Data Source	Data Incorporation	Purpose
State of Texas Hazard Mitigation Plan, 2018	Hazards and mitigation strategy	Support the goals of the state
Previous Johnson County HMP	All Chapters	This is an update of that plan
Hazard Mitigation: Integrating Best Practices into Planning	Planning process	Use proven techniques in developing the HMP
Environmental Protection Agency (EPA) Superfund National Priority List	Protected sites	Risk assessment- identify critical areas
National Register of Historic Places	Historic districts	Risk assessment
Texas Parks & Wildlife List of Rare Species	Endangered or protected species	Risk assessment
Texas Water Development Board	Lake information	Vulnerabilities
U.S. Department of Agriculture	Soil type	Expansive Soils description
TxDOT Annual Reports	Roads & Bridges	Vulnerabilities

2.4 Timeframe & Planning Meetings

The planning process for the update of the Johnson County Hazard Mitigation Plan took approximately two years (see Table 4).

Table 4: Planning Timeframe

Activity	Time Period
Kickoff meeting	July 2021
Created planning teams	July 2021
Conduct capability assessments	September 2021
Conduct risk assessments	September 2021
Update mitigation strategy	February 2022
Create and review HMP Draft	May 2022-September 2023*
Send HMP to TDEM/make revisions as needed	October 2023-January 2024
Send to FEMA/ make revisions as needed	To be determined
Adoption & signatures	Once “Approved Pending Adoption” designated received.

**Please note that due to staff changes and miscommunication between NCTCOG and TDEM, the Draft had to be updated to meet the new 2023 FEMA Local Mitigation Planning Policy Guide.*

These activities were completed in order to update every section of the 2015 HMP with current information, address current priorities, and to meet FEMA planning requirements. The public was invited to participate in every activity.

Chapter 3: Hazard Identification and Risk Assessment

3.1 Major Disaster Declarations

The following table lists the major disaster declarations between 2013-2021 that Johnson County has been a declared area, beginning with most recent.

Table 5: Major Disaster Declarations[4]

Declaration String	Declaration Type	FY Declared	Incident Type	Declaration Title
DR-4586-TX	DR	2021	Severe Ice Storm	SEVERE WINTER STORMS
EM-3554-TX	EM	2021	Severe Ice Storm	SEVERE WINTER STORM
DR-4485-TX	DR	2020	Biological	COVID-19 PANDEMIC
EM-3458-TX	EM	2020	Biological	COVID-19
DR-4223-TX	DR	2015	Severe Storm	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS AND FLOODING

3.2 Natural Hazard Profiles

Through an assessment of previous federally declared disasters in Texas, the State of Texas Hazard Mitigation Plan, historical and potential events in Johnson County, and a review of available local mitigation plans, it was determined that this Hazard Mitigation Plan (HMP) will address the risks associated with the following nine natural hazards:

- Drought
- Earthquakes
- Expansive Soils
- Extreme Heat
- Flooding (including dam failure)
- Thunderstorms (including hail, wind, and lightning)
- Tornadoes
- Wildfires
- Winter Storms

Each of these hazards has impacted, or can potentially impact, all participating jurisdictions. Due to the low probability and history of occurrence of coastal erosion, land subsidence, and hurricane/tropical storm, they will not be profiled in this plan.

[4] Declared Disasters | FEMA.gov

There are no natural hazards unique to any one jurisdiction.

Since the adoption of the 2015 HMP, the definition of a thunderstorm now includes hail, high winds, and lightning. These individual hazards within a thunderstorm will not be listed nor categorized separately.

Around 2013, areas of North Central Texas began experiencing earthquakes. It is suspected that dormant fault lines have been disturbed. Earthquakes have been added to the list of natural hazards profiled in this update for jurisdictions that feel they could be potentially impacted by them.

For this HMP, dam failure is considered a technological hazard and the effects of dam failure will be addressed in the flooding portion of this plan when applicable. Dam failure is an accidental or unintentional collapse, breach, or other failure of an impoundment structure that results in downstream flooding.

Along with a general description and historical occurrences, each participating jurisdiction described the location, probability of a future event, and the maximum probable extent of each hazard. The following terms were used to describe the categories:

Table 6: Hazard Summary Descriptions

Location: Location is the geographic area within the planning area that is affected by the hazard. The planning area refers to each individual jurisdiction.
• **Negligible**- Less than 10% of planning area would be impacted by a single event.
• **Limited**- 10 to 25% of planning area would be impacted by a single event.
• **Significant**- 26 to 99% of planning area would be impacted by a single event.
• **Extensive**- 100% of planning area would be impacted by a single event, or the event has no boundary and could occur anywhere within the planning area.
Probability of Future Events: This information was based on historic events and changing climate.
• **Unlikely**- Less than 1% annual probability.
• **Possible**- Between 1 and 10% annual probability.
• **Likely**- Between 10 and 100% annual probability.
• **Highly Likely**- 100% annual probability.
Level of Possible Damage: Based on historic events and future probability.
• **Minor**- Only minor property damage and minimal disruption of life. Temporary shutdown of critical facilities. Very few injuries, if any.
• **Limited**- More than 10% of property in affected area damaged/destroyed. Complete shutdown of critical facilities for more than one day. Minor injuries possible.
• **Critical**- More than 25% of property in affected area damaged/destroyed. Complete shutdown of critical facilities for more than one week. Multiple deaths/injuries.
• **Catastrophic**- More than 50% of property in affected area damaged/destroyed. Complete shutdown of critical facilities for 30 days or more. High number of deaths/injuries possible.
Maximum Probable Extent: Based on historic events and future probability.
• **Minor**- Minor classification on the scientific scale.
• **Medium**- Medium classification on the scientific scale.
• **Major**- Major classification on the scientific scale.

Hazard & Scale	Maximum Probable Extent
Drought (National Drought Mitigation Center)	• Minor: D0 • Medium: D1 • Major: D2-D4
Earthquakes (Modified Mercalli Intensity Scale; Richter Scale)	• Minor: I-IV; 3-4.9 magnitude • Medium: V-VII; 5-6.9 magnitude • Major: VIII-X; >7.0 magnitude
Expansive Soils (Expansion Index Test)	• Minor: EI 0-50 • Medium: EI 51-90 • Major: EI >91
Extreme Heat (NWS Heat Index)	• Minor: Heat Index <91°F • Medium: Heat Index 91-103°F • Major: Heat Index > 103°F
Flooding & Dam Failure Flooding (Estimated Base Flood Elevation)	• Minor: < 2 feet • Medium: 3-5 feet • Major: > 5 feet
Thunderstorms (Extreme Weather Madness Chart)	• Minor: TS1 • Medium: TS2-TS3 • Major: Moderate-High, TS4-5
Tornadoes (Enhanced Fujita (EF) Scale)	• Minor: EF0-EF1 • Medium: EF2-EF3 • Major: EF4-EF5
Wildfires (Fire Intensity Scale (FIS))	• Minor: FIS Class 1-2 • Medium: FIS Class 3 • Major: FIS Class 4-5
Winter Storms (Winter Storm Severity Index (WSSI); SPIA Index)	• Minor: WSSI Minor, SPIA 0-1 • Medium: WSSI Moderate, SPIA 2-3 • Major: WSSI Major-Extreme, SPIA 4-5

In this chapter, historical events are analyzed. Storm data was collected by the NOAA National Centers for Environmental Information (NCEI) database. This database contains data entered by the National Weather Service (NWS). NWS receives their information from a variety of sources, which include but are not limited to: county, state and federal emergency management officials, local law enforcement officials, SkyWarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry, and the general public, among others. NWS Storm Data is geographically categorized by county or by NWS Forecast Zone. Localized events such as a tornado, thunderstorm winds, flash floods, and hail are categorized using the *Johnson Co.* (County) designation. More widespread events that can impact the entire county equally, such as heat, cold, drought, floods, and winter weather, are categorized using the *Johnson (Zone)*.

Below are the hazard summaries, in alphabetical order.

3.2.1 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. The county's climate is characterized by hot and dry summers, which can lead to water scarcity and increased wildfire risk. This type of hazard has no geographic boundaries.

Johnson County is part of the Region G Water Planning Group (RCWPG), one of 16 regional water planning groups created by the Texas Water Development Board (TWDB) to help develop a comprehensive water plan for Texas through 2070. Region G is made up of voting members representing a variety of interest groups, including agriculture, counties, electric-generating utilities, environment, groundwater management areas, industry, municipalities, public, river authorities, small business, water districts and water utilities. Region G adopted a 2021 Regional Water Plan that provides regional information and data into the 2022 State Water Plan.

County residents purchase water from the Johnson County Special Utility District, which enforces a Drought Contingency Plan. When thresholds are met, a notice will be provided to the public on the District website and via text and/or email alerts. The District water supply comes from Lake Granbury, the City of Mansfield, the City of Grand Prairie, and well water. JCSUD accounts for an ample total water supply capacity of 39.7 MGD.[5]

Figure 2 describes the drought monitoring indices and a description of the possible impacts of the severity of drought.

[5] Water Supply and Distribution | JCSUD, TX

Drought Severity	Return Period (years)	Description of Possible Impacts	Drought Monitoring Indices		
			Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Minor Drought	3 to 4	Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-0.5 to -0.7	D0	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme Drought	18 to 43	Major crop and pasture losses; extreme fire danger; widespread water shortages or restrictions.	-1.6 to -1.9	D3	-4.0 to -4.9
Exceptional Drought	44+	Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies.	less than -2	D4	-5.0 or less

*NDMC - National Drought Mitigation Center

Figure 2: Drought Intensity Scale

Drought can impact the economy, environment, and society by limiting food and drinking water, destroying habitat, and triggering health and safety problems due to poor water quality and increased wildfires. Drought can also have a major impact on the environment, as it can lead to the loss of vegetation and wildlife habitat and increase the risk of wildfires.

Besides major crop damage, these extreme drought conditions have the potential to put Johnson County in extreme fire danger and could cause widespread water shortage and restrictions, creating a water emergency. In Texas, local governments are empowered to take action on behalf of those they serve. When drought conditions exist, a burn ban can be put in place by a county judge or county Commissioners Court, prohibiting or restricting outdoor burning for public safety.[6]

Prolonged drought can also lead to increased food prices, as well as other economic impacts such as job losses and reduced tax revenues.

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.

[6] Fire Danger: Texas Burn Bans. Texas A&M Forest Service. 2018. http://texasforestservice.tamu.edu/TexasBurnBans/

Drought can impact the economy, environment, and society by limiting food and drinking water, destroying habitat, and triggering health and safety problems due to poor water quality and increased wildfires.

In Texas, local governments are empowered to act on behalf of those they serve. When drought conditions exist, a burn ban can be put in place by a county judge or county Commissioners Court prohibiting or restricting outdoor burning for public safety.[7]

As shown in the following graph from the United States Drought Monitor , the years 2011-2012 and 2014-2015 had the greatest severity and longest time period of extreme drought conditions in Johnson County.

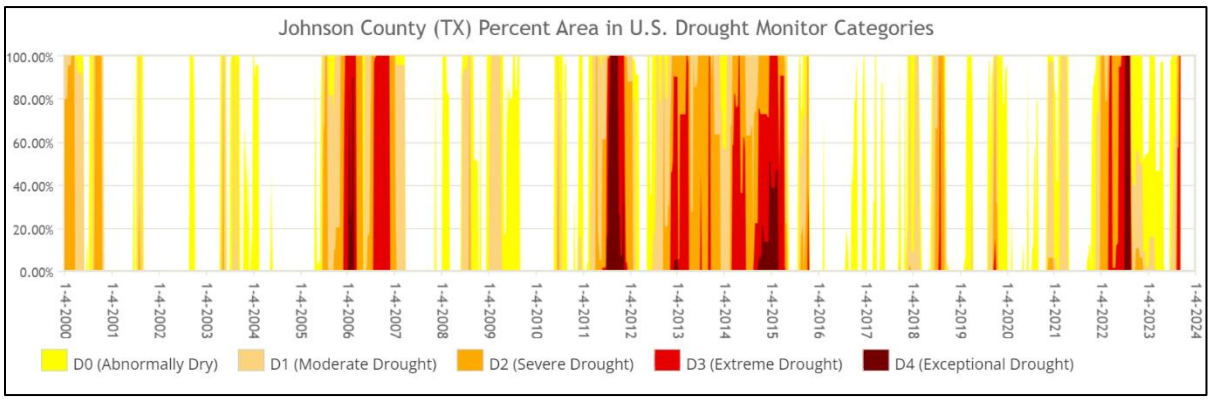


Figure 3: Historical Events- Drought

Due to the nature of drought, the Texas climate, and the effects of climate change, drought is expected to be a continual threat to the planning area.

The Long-Term Multi-Indicator Drought Index (MIDI) approximates drought impacts from changes in precipitation and moisture over a long-term timeframe (up to 5 years), such as impacts to irrigated agriculture, groundwater, and reservoir levels. Reflected in Figure 4 below, drought is predicted to have a lasting effect on Johnson County.

[7] Fire Danger: Texas Burn Bans. Texas A&M Forest Service. 2018. http://texasforestservice.tamu.edu/TexasBurnBans/

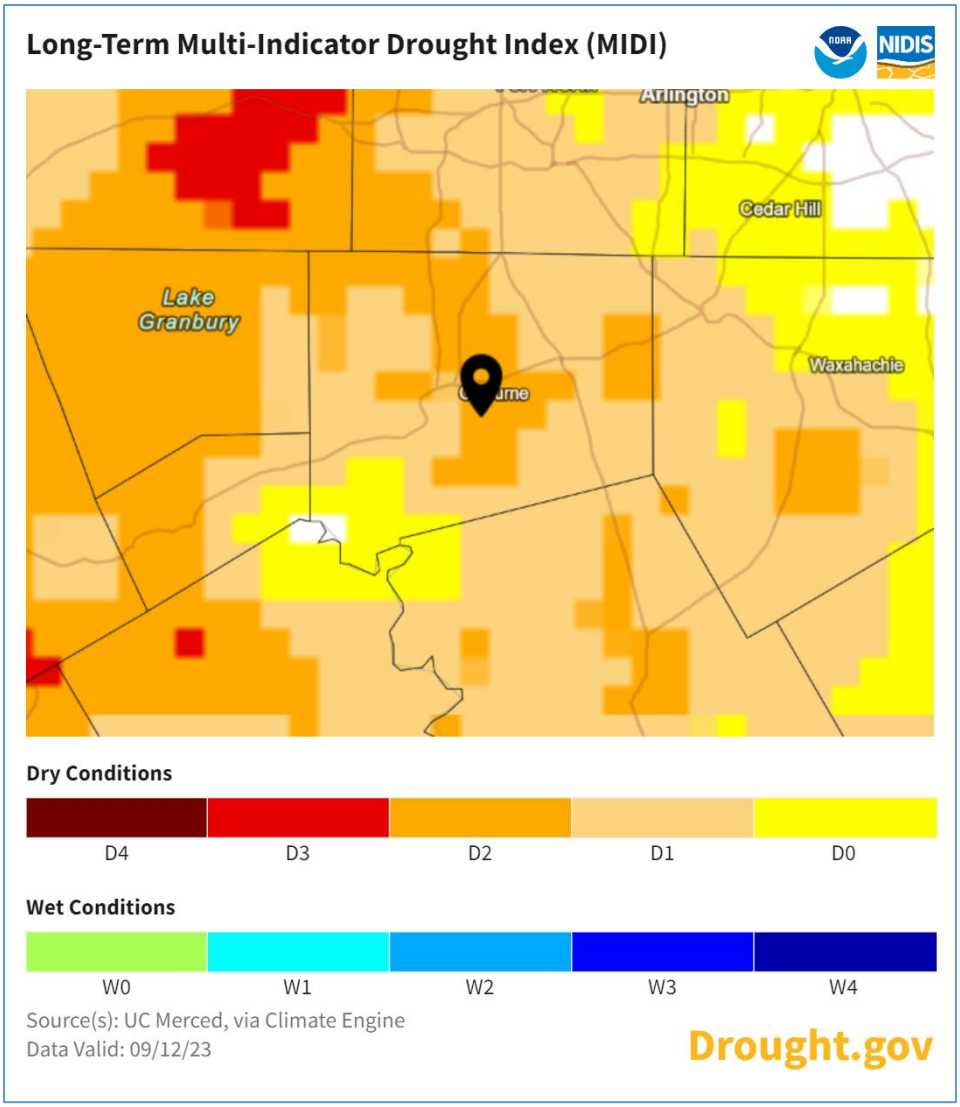


Figure 4: Long-Term MIDI[8]

Hazard Summary

The following table reflects the profile summary for drought within the planning area.

Table 7: Drought Profile Summary

Drought				
Jurisdiction	**Location**	**Probability of Future Events**	**Level of Possible Damage**	**Maximum Probable Extent/Strength**
Alvarado	Extensive	Highly Likely	Critical	Major
Burleson	Extensive	Highly Likely	Critical	Major
Cleburne	Extensive	Highly Likely	Critical	Major

[8] Johnson County Conditions | Drought.gov

Drought				
Jurisdiction	**Location**	**Probability of Future Events**	**Level of Possible Damage**	**Maximum Probable Extent/Strength**
Godley	Extensive	Highly Likely	Critical	Major
Joshua	Extensive	Highly Likely	Critical	Major
Keene	Extensive	Highly Likely	Critical	Major
Johnson County Unincorporated	Extensive	Highly Likely	Critical	Major

3.2.2 Earthquakes

An earthquake is a sudden motion or trembling of the earth, either caused by an abrupt release of accumulated strain on the tectonic plates that comprise the earth's crust or from human activities. Scientific studies have tied the quakes in North Central Texas to the disposal of wastewater from oil and gas production.

Earthquakes are measured by both magnitude and intensity.

Magnitude measures the energy released at the source of the earthquake and is determined from measurements on seismographs, as represented in Figure 5. From 1935 until 1970, the earthquake magnitude scale was the Richter Scale. Today, earthquake magnitude measurement is based on the Moment Magnitude Scale (MMS). MMS measures the movement of rock along the fault. It accurately measures larger earthquakes, which can last for minutes, affect a much larger area, and cause more damage.

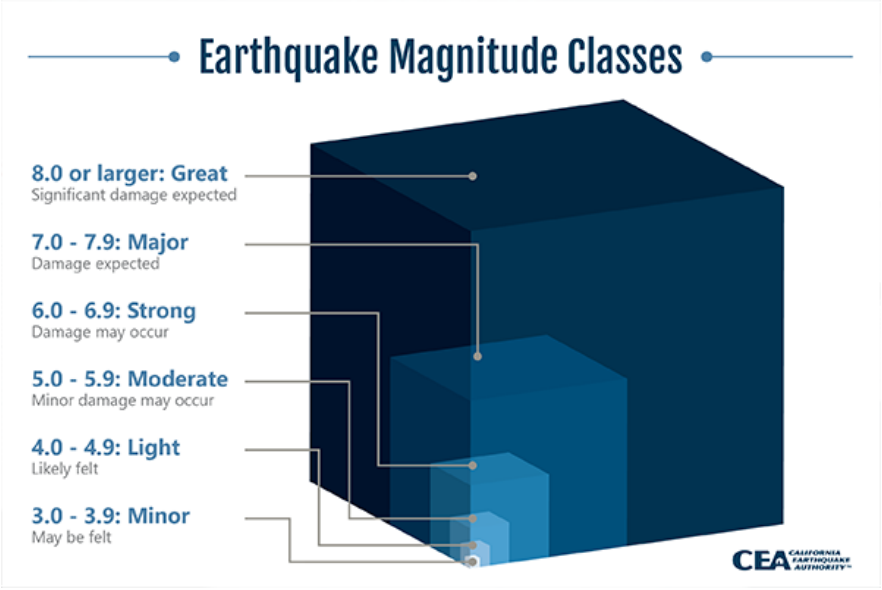


Figure 5: Earthquake Magnitude Classes[9]

[9] How are Earthquakes Measured? Magnitude & Intensity Scales | CEA (earthquakeauthority.com)

Intensity is determined from on-the-ground description and the effects on people and the environment. An earthquake intensity scale consists of a series of key responses that includes people awakening, movement of furniture, damage to chimneys and total destruction. The Modified Mercalli Intensity Scale (see Figure 6) classifies earthquakes by the amount of damage inflicted.

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Figure 6: Modified Mercalli Intensity Scale[10]

Earthquakes can have a significant impact on the local economy. They can cause extensive damage to property and infrastructure, as well as loss of life. They can lead to reduced productivity and increased absenteeism, as well as increased demand for emergency services and disaster relief. Additionally, earthquakes can lead to power outages, landslides, and fires.

According to the United States Geological Survey (USGS) Earthquake Catalog, there was a M2.4 earthquake 10 km WSW of Cleburne, Texas in 2018 and a M2.4 earthquake 2 km SSW of Joshua, Texas in 2020. No injuries or damage were reported. The following maps show the intensity of the two earthquakes.

[10] The Modified Mercalli Intensity Scale | U.S. Geological Survey (usgs.gov)

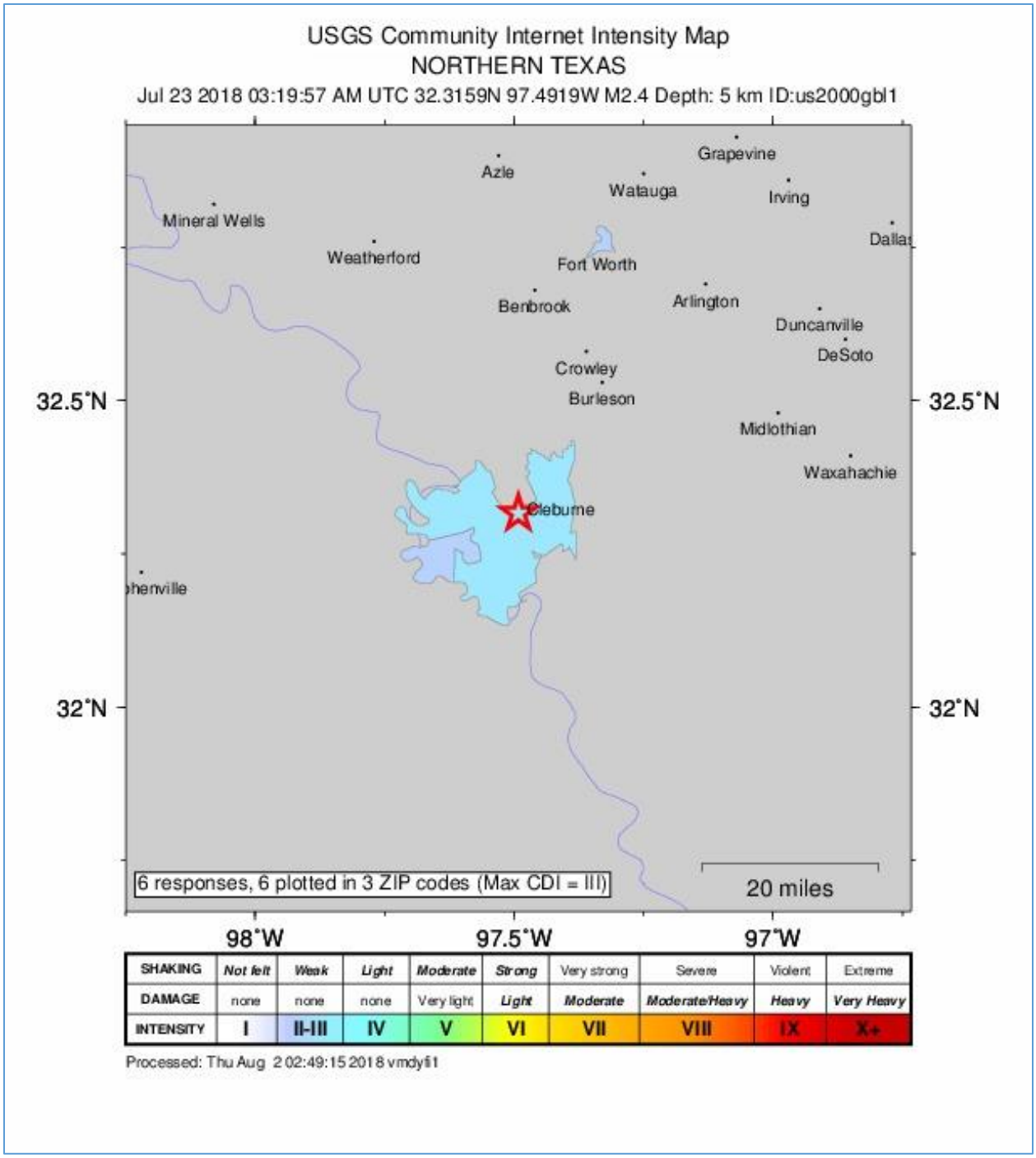


Figure 7: 2018 Earthquake Near Cleburne

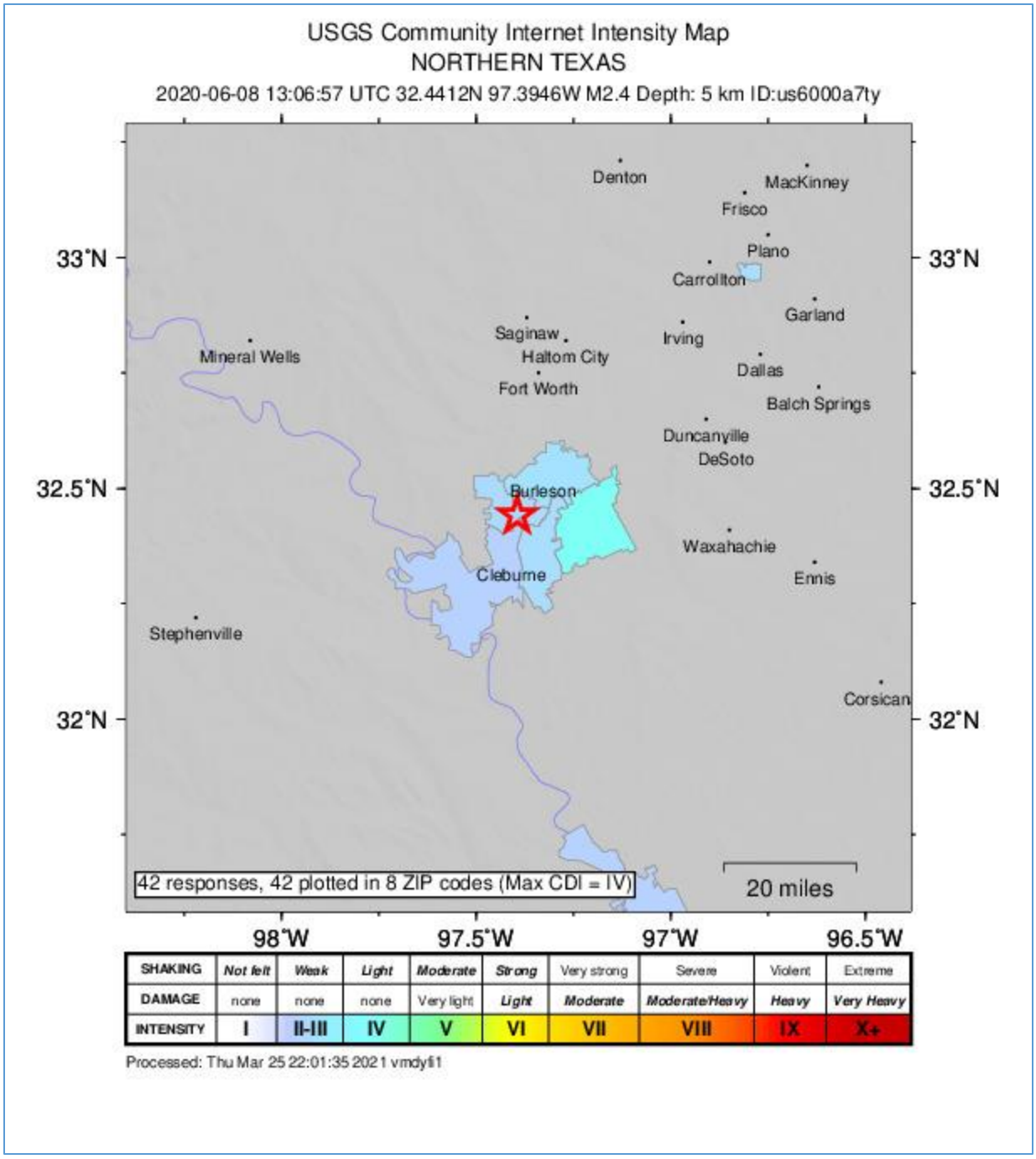


Figure 8: 2020 Earthquake Near Joshua

The map in Figure 9 shows the prediction of damaging earthquake shaking around the U.S. over the next 10,000 years; in which Johnson County is in the grey area. According to the U.S. Geological Survey (USGS), damaging shaking is possible in all fifty states. The cooler color areas, like grey, are low hazard but not *no* hazard.

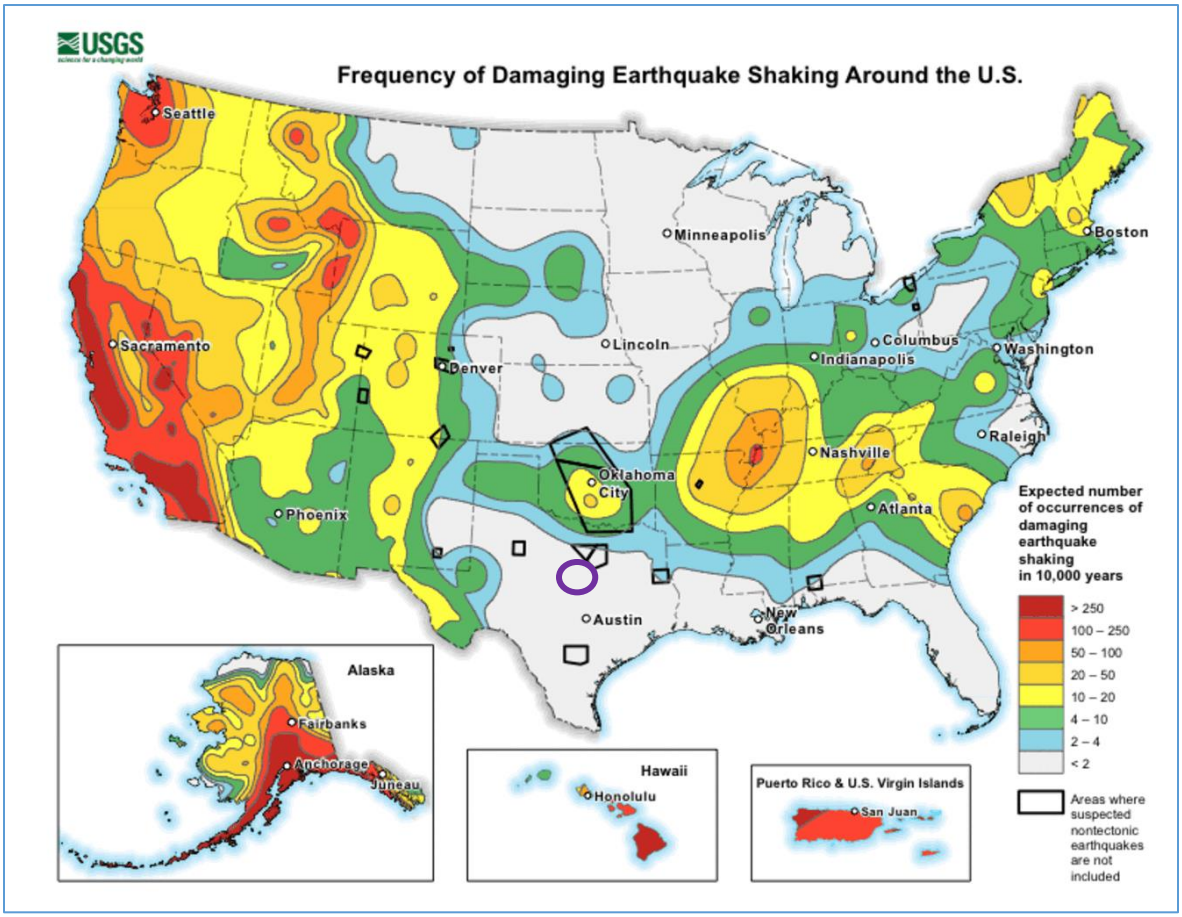


Figure 9: Future Probability Map- Johnson County

Hazard Summary

The following table reflects the profile summary for earthquakes within the planning area.

Table 8: Earthquake Profile Summary

Earthquakes				
Jurisdiction	**Location**	**Probability of Future Events**	**Level of Possible Damage**	**Maximum Probable Extent/Strength**
Alvarado	Extensive	Possible	Minor	Minor
Burleson	Extensive	Possible	Minor	Minor
Cleburne	Extensive	Possible	Minor	Minor
Godley	Extensive	Possible	Minor	Minor
Joshua	Extensive	Possible	Minor	Minor
Keene	Extensive	Possible	Minor	Minor
Johnson County Unincorporated	Extensive	Possible	Minor	Minor

3.2.3 Expansive Soils

Expansive soils are soils that expand when water is added and shrink when they dry out. It contains large percentages of swelling clays that may experience volume changes of up to 40% in the absence or presence of water. This continuous change in soil volume can cause structures built on this soil to move unevenly and crack.

Most of Johnson County is in the Cross Timbers ecoregion. This ecoregion is further subdivided into four ecological or vegetative sub-regions: East Cross Timbers, Fort Worth Prairie, Lampasas Cut Plain, and West Cross Timbers. As a member of the Eastern Cross Timbers, the area has sandy to loam soils that are acidic to neutral. This dramatically affects what plants grow in each area. The sandy acidic soils of the Eastern Cross Timbers are in sharp contrast to the heavy fertile soils of the Blacklands and Grand Prairie and Plains.[11] Based on the Expansive Soils Map (Figure 10)and the various limestone formations, the planning area is prone to expansion.

Over 50 percent of these areas are underlain by soils with abundant clays of high swelling potential.

Less than 50 percent of these areas are underlain by soils with clays of high swelling potential.

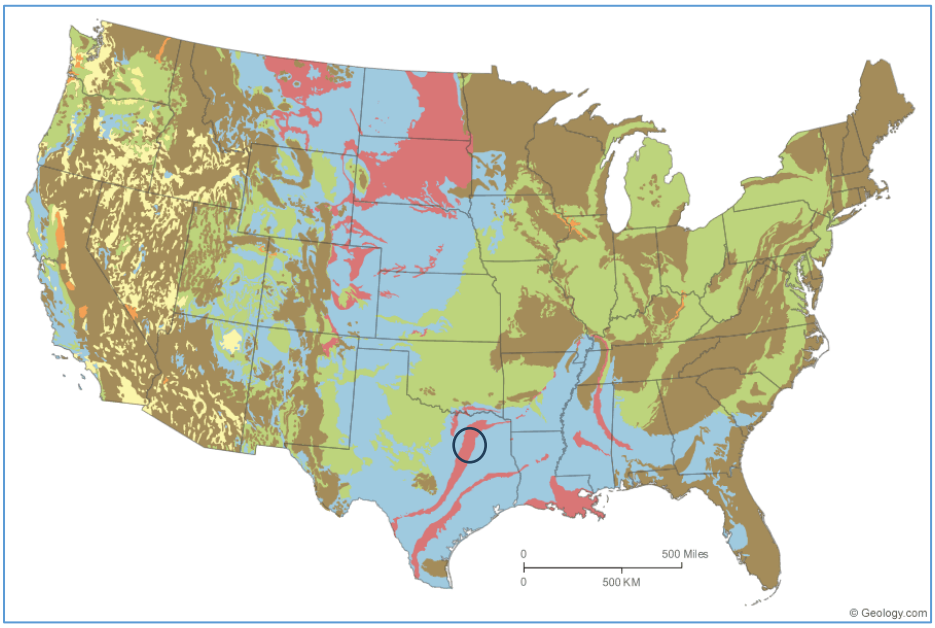


Figure 10: Expansive Soils Map[12]

[11] Texas A&M Forest Service - Trees of Texas - Eco-Regions - Texas Ecoregions (tamu.edu)

[12] *The map is based upon "Swelling Clays Map of the Conterminous United States" by W. Olive, A. Chleborad, C. Frahme, J. Shlocker, R. Schneider and R. Schuster. It was published in 1989 as Map I-1940 in the USGS Miscellaneous Investigations Series. Land areas were assigned to map soil categories based upon the type of bedrock that exists beneath them as shown on a geologic map. In most areas, where soils are produced "in situ," this method of assignment was reasonable. However, some areas are underlain by soils which have been transported by wind, water or ice. The map soil categories would not apply for these locations.*

Expansive soils are one of the more problematic soils and it causes damage to various civil engineering structures. Expansive soils behave differently from other soils due to their tendency to swell and shrink. Both the International Building Code and International Residential code adopted the Expansion Index (EI) (Table 9) to identify expansive soils and its swilling potential.[13]

Table 9: Expansion Potential Based on Expansion Index

Expansion Index (EI)	EI Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

The county's climate is characterized by hot and dry summers, which can lead to changes in moisture content and cause the soil to expand and contract, leading to damage.

Expansive soils can lead to increased flooding and landslides as well as other environmental hazards. Because of this swelling and shrinking behavior, expansive soils may also cause the following problems in structures or construction projects:

- Structural damage to lightweight structures such as sidewalks and driveways
- Lifting of buildings, damage to basements, and building settlement
- Cracks in walls and ceilings
- Damage to pipelines and other public utilities
- Lateral movement of foundations and retaining walls due to pressure exerted on vertical walls
- Loss of residual shear strength causing instability of slopes, etc.

Damage to these structures can lead to costly repairs and can cause major disruptions to transportation and communication. Therefore, it is essential to check for the presence of expansive soil and a suitable treatment method should be adopted before commencing any construction projects. In some cases, postconstruction treatment of expansive soil may be required if the situation has not been dealt with before construction.

While cracks in land, roads, and foundations are present, due to the slow-moving nature of expansive soils effects, there is no method of tracking damages within the county.

Due to the existing soil type in the planning area, and the current methods of engineering and structure development, expansive soils is expected to be a continual threat to the planning area.

[13] *Soil expansion index chart*. (n.d.). Bing. https://www.bing.com/search?q=soil+expansion+index+chart&FORM=HDRSC1

Hazard Summary

The following table reflects the profile summary for expansive soils within the planning area.

Table 10: Expansive Soils Profile Summary

Expansive Soils				
Jurisdiction	**Location**	**Probability of Future Events**	**Level of Possible Damage**	**Maximum Probable Extent/Strength**
Alvarado	Extensive	Highly Likely	Minor	Medium
Burleson	Extensive	Highly Likely	Minor	Medium
Cleburne	Extensive	Highly Likely	Minor	Medium
Godley	Extensive	Highly Likely	Minor	Medium
Joshua	Extensive	Highly Likely	Minor	Medium
Keene	Extensive	Highly Likely	Minor	Medium
Johnson County Unincorporated	Extensive	Highly Likely	Minor	Medium

3.2.4 Extreme Heat

Extreme heat is characterized by a combination of very high temperatures and exceptionally humid conditions. When persisting over a period of time, it is called a heat wave.

The National Weather Service (NWS) measure how hot weather feels on the body by utilizing the Heat Index values (Figure 11). The values in this index are for SHADE only. You can add up to 15°F to these values if you are in direct sunlight. To read the NWS Heat Index, look for the temperature across the top, then find the relative humidity on the left. The point where they intersect on the chart tells you the Heat Index, color-coded by likelihood of a heat disorder. For example, look at an air temperature of 100°F and Relative Humidity of 40%. The chart shows the Heat Index (*how hot it feels*) as 109°F, which is in the orange range for DANGER.

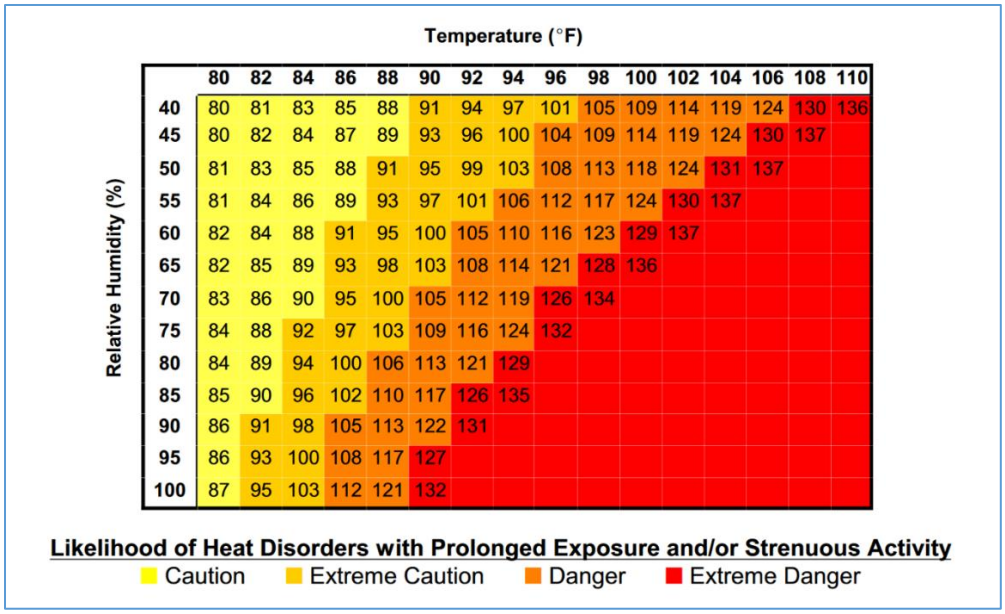


Figure 11: NWS Heat Index

Extreme heat can be a factor that drastically impacts drought conditions, as high temperatures lead to an increased rate of evaporation. The total number of days per year with maximum temperature above various thresholds is an indicator of how often very hot conditions occur. Depending upon humidity, wind, and physical workload, people who work outdoors or don't have access to air conditioning may feel very uncomfortable or experience heat stress or illness on very hot days. Hot days also stress plants, animals, and human infrastructure such as roads, railroads, and electric lines. Increased demand for electricity to cool homes and buildings can place additional stress on energy infrastructure. Potential impacts from extreme heat include:

- Heatstroke or death. Elderly people who cannot afford air conditioning are at greatest risk
- Property damage
- Loss of water supply
- Increases in grassfire potential and intensity
- Impact on logistics
- Power outages
- Road and train track buckling
- Disruption in critical infrastructure operations
- Vehicle engine failure
- Damage to crops

Throughout the summer there are various sporting events, festivals, and park activities held outside throughout the planning area, which can make attendees vulnerable to the effects of extreme heat. Luckily there have been no reports of heat casualties up to this point.

The following table lists excessive heat events and impacts from 2012-2021 recorded by the National Weather Service. During this time, one death occurred. The NWS Event Narrative stated that a soon to be two-year old toddler was found unresponsive after spending nearly five hours in a car seat in the back of the family's car. The child was later pronounced dead at the hospital.[14]

Table 11: Historical Events- Extreme Heat

Location	Date	Type	Death	Injury	Property Damage	Crop Damage
JOHNSON (ZONE)	04/14/2017	Excessive Heat	1	0	0.00K	0.00K
JOHNSON (ZONE)	06/20/2019	Excessive Heat	0	0	0.00K	0.00K
JOHNSON (ZONE)	08/13/2020	Excessive Heat	0	0	0.00K	0.00K
JOHNSON (ZONE)	08/28/2020	Excessive Heat	0	0	0.00K	0.00K
JOHNSON (ZONE)	06/12/2022	Excessive Heat	0	0	0.00K	0.00K
JOHNSON (ZONE)	07/07/2022	Excessive Heat	0	0	0.00K	0.00K
JOHNSON (ZONE)	07/17/2022	Excessive Heat	0	0	0.00K	0.00K

Throughout the summer there are various sporting events, festivals, and park activities held outside throughout the planning area, which can make attendees vulnerable to the effects of extreme heat. Luckily there have been no reports of heat casualties up to this point, though people need to be prepared for extreme heat events in the future.

From the graph made by the U.S. Climate Resilience Toolkit , Johnson County can expect a gradual increase in the number of extreme heat days over time.

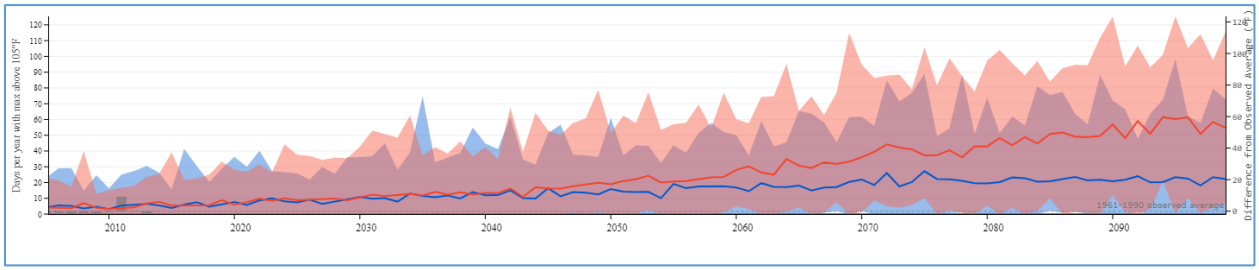


Figure 12: Predicted Number of Days with a Maximum Temperature Over 105°F in Johnson County

The trend shows how global emissions have a major role in climate change and an impact on extreme heat.

- The blue band (lower emissions) shows projections for 2006–2100 based on a future in which humans stop increasing global emissions of heat-trapping gases by 2040 and then dramatically reduce them through 2100. The top edge of the band represents the maximum value modeled at each time step; the bottom edge of the band represents the minimum. The darker blue line shows the weighted mean of projections for lower emissions.

[14] Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov)

- The red band (higher emissions) shows projections for 2006–2100 based on a future in which global emissions of heat-trapping gases continue increasing through 2100. The top edge of the band represents the maximum value modeled at each time step; the bottom edge of the band represents the minimum. The red line shows the weighted mean of all projections for higher emissions.

Hazard Summary

The following table reflects the profile summary for extreme heat within the planning area.

Table 12: Extreme Heat Profile Summary

Extreme Heat				
Jurisdiction	**Location**	**Probability of Future Events**	**Level of Possible Damage**	**Maximum Probable Extent/Strength**
Alvarado	Extensive	Highly Likely	Minor	Major
Burleson	Extensive	Highly Likely	Minor	Major
Cleburne	Extensive	Highly Likely	Minor	Major
Godley	Extensive	Highly Likely	Minor	Major
Joshua	Extensive	Highly Likely	Minor	Major
Keene	Extensive	Highly Likely	Limited	Major
Johnson County Unincorporated	Extensive	Highly Likely	Minor	Major

3.2.5 Flooding

Flooding is defined as *the accumulation of water within a water body and the overflow of excess water onto adjacent floodplain lands*. A floodplain (or flood zone) 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 "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" or "flood zone" most often refers to an area that is subject to inundation by a flood that has a 1% chance of occurring in any given year (commonly referred to as the 100-year floodplain).

Flooding can occur anywhere in the planning area with low-lying areas, clogged drains, and/or intense rain. Common flooding hazards within the planning area include flood hazards from flash flooding and new development.

A flash flood occurs when stormwater rapidly floods and inundates low-lying areas in less than six hours. Construction and development can change the natural drainage and create brand new flood risks as the concrete that comes with new buildings, parking lots, and roads create less land that can absorb excess precipitation from heavy rains. Johnson County's storm drainage system in the unincorporated areas is mostly comprised of grass-lined ditches. This type of ditch allows for more absorption of stormwater runoff while also filtering pollutants.

Dam failure flooding is flooding from an accidental or unintentional collapse, breach, or other failure of an impoundment structure that results in downstream flooding. Dam failure is a technological/man-made hazard that leads to a natural hazard, flooding. According to the Association of State Dam Safety Officials, dam failures are most likely to happen for one of five reasons:

1. **Overtopping** caused by water spilling over the top of a dam. Overtopping of a dam is often a precursor of dam failure. The occasional overtopping of the spillway from major rainfall is the main cause of flooding from dam failure within North Central Texas.

2. **Foundation Defects**, including settlement and slope instability.

3. **Cracking** caused by movements like the natural settling of a dam.

4. **Inadequate maintenance and upkeep.**

5. **Piping** is internal erosion caused by seepage of soil particles that continue to progress and form sink holes in the dam. Seepage often occurs around hydraulic structures, such as pipes and spillways; through animal burrows; around roots of woody vegetation; and through cracks in dams, dam appurtenances, and dam foundations.

The Flood Hazard Boundary Map (FHBM) and Flood Insurance Rate Map (FIRM) show Flood Insurance Risk Zones that indicate the magnitude of the flood hazard in specific areas of a community. The Flood Zones range from Zone AE, A, and X in the participating jurisdictions.

The zone categories are below:

Table 13: Flood Insurance Risk Zones

High Risk Area	Description
In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones.	
Zone A	Special flood hazard areas inundated by the 100-year flood; base flood elevations are not determined. Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
Zone AE	Special flood hazard areas inundated by the 100-year flood; base flood elevations are determined. The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
Zone A1-30	Special flood hazard areas inundated by the 100-year flood; base flood elevations are determined. 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).
Zone AO	Special flood hazard areas inundated by the 100-year flood; with flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
Zone AH	Special flood hazard areas inundated by the 100-year flood; flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations are determined. Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year

High Risk Area	Description
In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones.	
	mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
Zone A99	Special flood hazard areas inundated by the 100-year flood to be protected from the 100-year flood by a Federal flood protection system under construction; no base flood elevations are determined. Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.
Moderate to Low Risk Area	**Description**
In communities that participate in the NFIP, flood insurance is available to all property owners and renters in these zones.	
Zone B and Zone X (shaded)	Areas of 500-year flood; areas subject to the 100-year flood with average depths of less than 1 foot or with contributing drainage area less than 1 square mile; and areas protected by levees from the base flood. Area of moderate flood hazard, usually the area between the limits of the 100- year and 500-year floods. B Zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from 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 (un-shaded)	Areas determined to be outside the 500-year floodplain. Area of minimal flood hazard usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that don't warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100- year flood.
Undetermined Risk Area	**Description**
Zone D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk.

Dams have three different levels of classification from low to high potential. The colors on each classification below help show where these dams are on the map in Figure 13.

Dam Classifications:[15]

- **Low (Green)**
  - No loss of life expected (based off surrounding populated area)
  - Minimal economic impact

- **Significant (Yellow)**
  - Loss of life possible (1-2 homes based off surrounding populated area)
  - Appreciable economic impact
- **High (Red)**
  - Loss of life expected (>3 homes based off surrounding populated area)

[15] Session. "2022 Dam Safety Workshop." *Texas.gov*, https://www.tceq.texas.gov/downloads/compliance/enforcement/dam-safety/workshop-session-1.pdf.

- Excessive economic impact

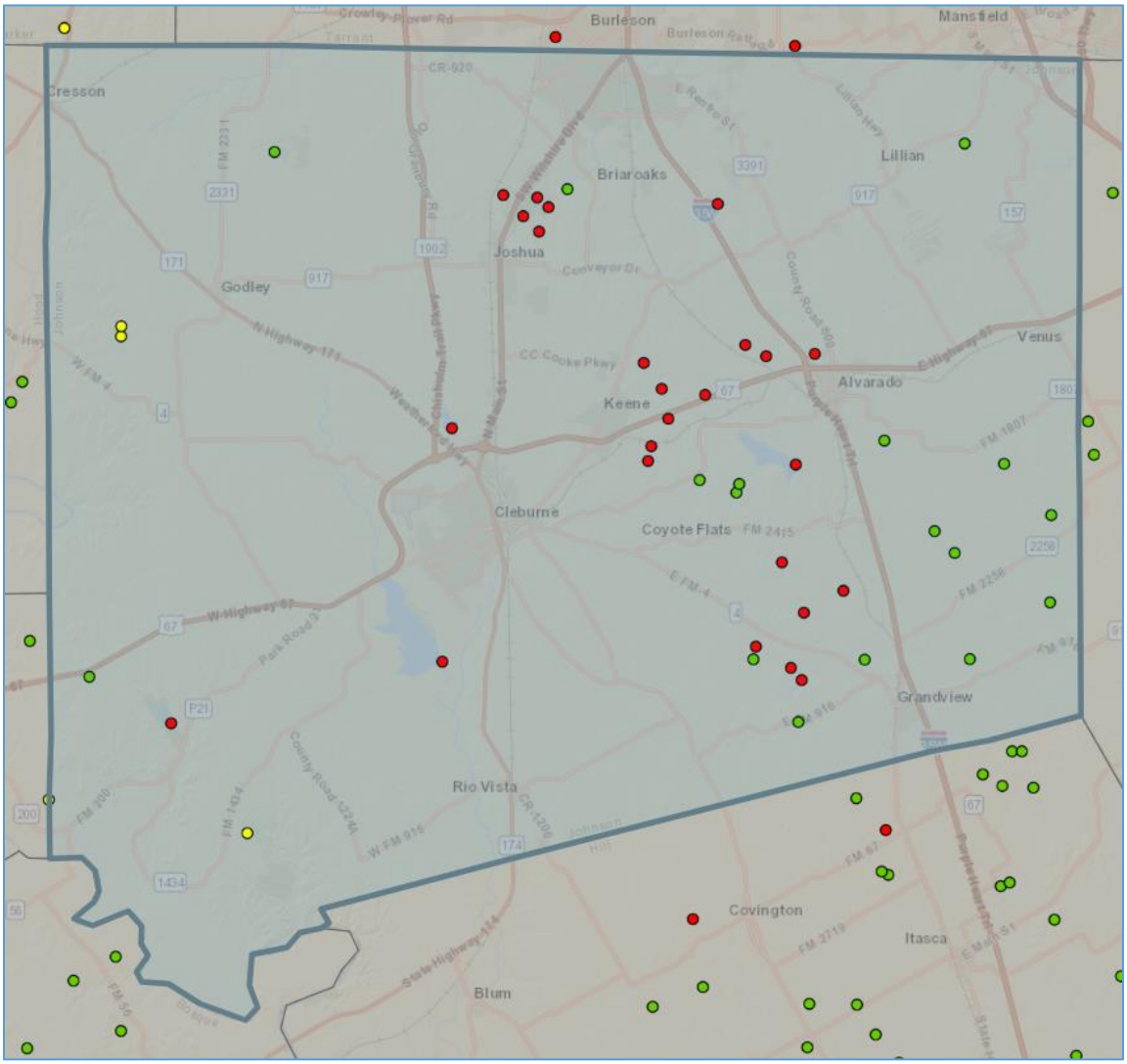


Figure 13: Dams in Johnson County

Of the 45 dams in the County, 25 are high-hazard potential dams (HHPDs). These HHPDs are all earth-type dams, regulated by TCEQ, and are required to have an Emergency Actions Plans (EAP), which include log sheets of changes, annual review checklists, plan review and update pages, and training records. The EAP should be the go-to document during a dam emergency. Further details about these HHPDs, including drainage area, are in Table 14. The drainage area listed in the table would be the areas of the County flooded in the event of a dam failure.

Table 14: HHPDs in Johnson County

Dam Name	NID ID	Owner Names	City	River or Stream Name	Dam Height (Ft)	Dam Length (Ft)	Volume (Cubic Yards)	Drainage Area (Sq Miles)
Rosenauer Dam	TX09691	RODNEY ROSENAUER			11			
Chambers Creek WS SCS Site 42 Dam	TX03612	CITY OF ALVARADO; JOHNSON COUNTY; JOHNSON COUNTY SWCD		TURKEY CREEK	49	3500	253920	15.3
Cleburne State Park Lake Dam	TX03591	TEXAS PARKS AND WILDLIFE DEPARTMENT	NEW HOPE	WEST FORK CAMP CREEK	62	1300	0	4.42
Chambers Creek WS SCS Site 35 Dam	TX03599	JOHNSON COUNTY; JOHNSON COUNTY SWCD		TR-TURKEY CREEK	22	1350	47142	0.78
Chambers Creek WS SCS Site 31 Dam	TX03613	JOHNSON COUNTY; JOHNSON COUNTY SWCD	ALVARADO	TR-NORTH FORK CHAMBERS CREEK	28	3884	158597	2
O Connor Dam	TX09559	LLOYD FOSTER	JOSHUA	TR-VILLAGE CREEK	12	1300	0	0.2
Mountain Valley Dam No 1	TX04797	MOUNTAIN VALLEY COUNTRY CLUB INC	BURLESON	VILLAGE CREEK	18	1850	0	2.07
Mountain Valley Lake No 3 Dam	TX09005	JOHNSON COUNTY PUBLIC WORKS; PARAMOUNT PLACE INC	JOSHUA	TR-VILLAGE CREEK	14	650	0	0.12
Martin Dam	TX09558	STEVEN N MARTIN MD PA	JOSHUA	TR-WILLOW CREEK	8		0	0
Mountain Valley Dam 2	TX04798	HOMES BY TOWNE	BURLESON	TR-VILLAGE CREEK	23	900	0	1.4
Chambers Creek WS SCS Site 33a Dam	TX03601	JOHNSON COUNTY; JOHNSON COUNTY SWCD		TURKEY CREEK	41	1021	78260	3.27
Chambers Creek WS SCS Site 57 Dam	TX03610	JOHNSON COUNTY; JOHNSON COUNTY SWCD		MIDDLE FORK CHAMBERS CREEK	47	1560	112269	3.51
Chambers Creek WS SCS Site 33 Dam	TX03595	JOHNSON COUNTY; JOHNSON COUNTY SWCD		TURKEY CREEK	28	2300	91951	3.82
Chambers Creek WS SCS Site 61a Dam	TX03593	JOHNSON COUNTY; JOHNSON COUNTY SWCD		N FORK S FORK CHAMBERS CREEK	29	967	45803	0.87
Chambers Creek WS SCS Site 58 Dam	TX03609	JOHNSON COUNTY; JOHNSON COUNTY SWCD NO 541		TR-MIDDLE FORK CHAMBERS CREEK	36	1408	84200	2.27
Chambers Creek WS SCS Site 59 Dam	TX03608	JOHNSON COUNTY; JOHNSON COUNTY SWCD NO 541		ROCK TANK CREEK	48	1991	105630	3.1
Chambers Creek WS SCS Site 36 Dam	TX03597	JOHNSON COUNTY; JOHNSON COUNTY SWCD NO 541		TR-TURKEY CREEK	30	1632	61179	1.1

Dam Name	NID ID	Owner Names	City	River or Stream Name	Dam Height (Ft)	Dam Length (Ft)	Volume (Cubic Yards)	Drainage Area (Sq Miles)
Chambers Creek WS SCS Site 37 Dam	TX03596	JOHNSON COUNTY; JOHNSON COUNTY SWCD NO 541		TR-TURKEY CREEK	38	1122	58766	2
Chambers Creek WS SCS Site 62 Dam	TX03607	JOHNSON COUNTY; JOHNSON COUNTY SWCD NO 541	GRANDVIEW	SOUTH FORK CHAMBERS CREEK	44	1813	118330	6.4
Lake Pat Cleburne Dam	TX03594	CITY OF CLEBURNE	BLUM	NOLAN RIVER	78	5190	0	100
Chambers Creek WS SCS Site 30 Dam	TX03600	JOHNSON COUNTY; JOHNSON COUNTY SWCD	ALVARADO	TR-NORTH FORK CHAMBERS CREEK	28	2750	105890	1.1
Chambers Creek WS SCS Site 61 Dam	TX03605	JOHNSON COUNTY; JOHNSON COUNTY SWCD NO 541		N FORK S FORK CHAMBERS CREEK	36	1700	96200	3.2
Chambers Creek WS SCS Site 34 Dam	TX03598	DALWORTH SWCD; JOHNSON COUNTY		TR-TURKEY CREEK	36	1784	95741	1.26
Chambers Creek WS SCS Site 32 Dam	TX03614	CITY OF ALVARADO; JOHNSON COUNTY; JOHNSON COUNTY SWCD NO 541	ALVARADO	TR-NORTH FORK CHAMBERS CREEK	31	1825	65277	1
West Buffalo Creek WS SCS Site 1 Dam	TX06303	CITY OF CLEBURNE	CLEBURNE	WEST BUFFALO CREEK	35	8720	321130	7

Based on this table, only the participating jurisdictions of Alvarado, Burleson, Cleburne, Joshua would be impacted by dam failure flooding.

Maps of flood areas and dam inundation zones are in Appendix C. As far at the maximum extent of flooding within the planning area, the Estimated Base Flood Elevation was used.

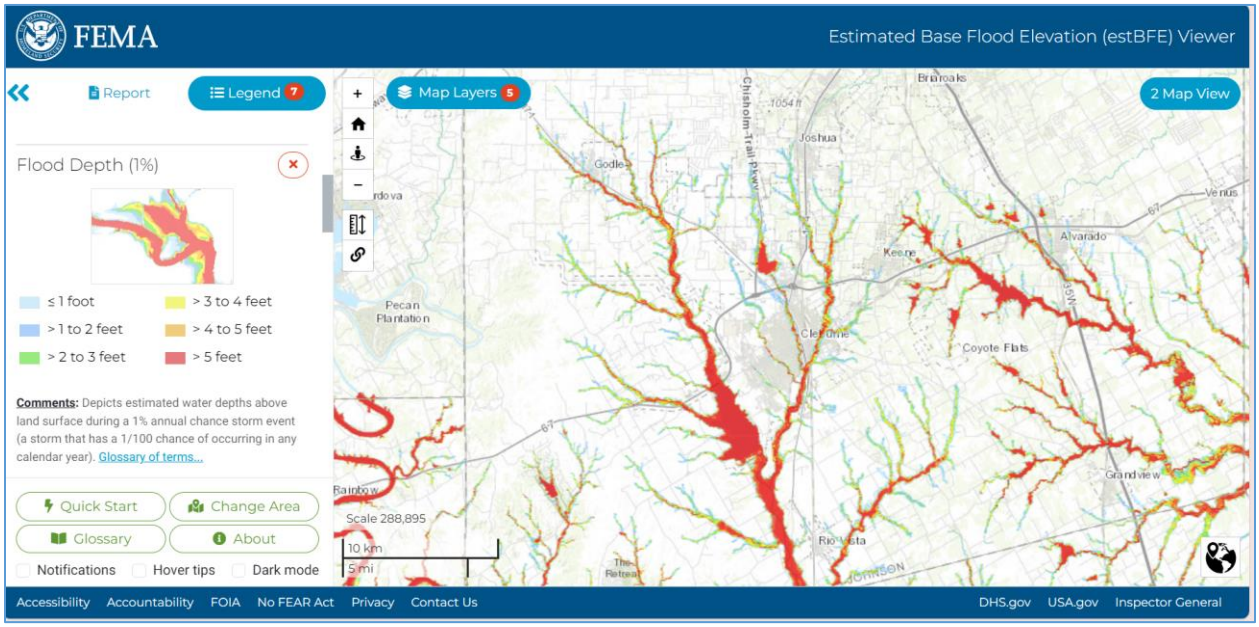


Figure 14: Estimated Base Flood Elevation Viewer

Floodwater can disguise many dangerous obstacles, like uncovered manholes or debris that can cause someone to fall over. Standing water, or water that isn't flowing, can also become a breeding ground for insects that can make people very ill. Another risk can be downed power lines which may still be live.

Potential impacts from flooding include:

- Loss of electricity
- Loss of, or contamination of, water supply
- Loss of property
- Structure and infrastructure damage – flooded structures and eroded roads
- Misplaced residents
- Snakes migrate and number of mosquitoes increase
- Fire – as a result of loss of water supply
- Debris in transportation paths
- Emergency response delays
- Disruption of traffic can lead to impacts to the economy
- Natural environment damage, to include protected species and critical habitats

The following table lists the historical flood events and impacts from 2012-2021 recorded by the National Weather Service.

Table 15: Historical Events- Flooding

Location	Date	Type	Death	Injury	Property Damage	Crop Damage
CLEBURNE	07/17/2014	Flash Flood	0	0	0.00K	0.00K
CLEBURNE	05/10/2015	Flash Flood	0	0	0.00K	0.00K
CLEBURNE MUNI ARPT	05/10/2015	Flash Flood	0	0	0.00K	0.00K
ALVARADO	05/19/2015	Flash Flood	0	0	180.00K	0.00K
LAKE ALVARADO	05/19/2015	Flash Flood	0	0	5.00K	0.00K
ALVARADO	05/20/2015	Flash Flood	0	0	5.00K	0.00K
ALVARADO	05/20/2015	Flash Flood	0	0	20.00K	0.00K
BURLESON	05/20/2015	Flash Flood	0	0	0.00K	0.00K
BURLESON	06/17/2015	Flash Flood	0	0	50.00K	0.00K
ALVARADO	03/07/2016	Flash Flood	0	0	500.00K	0.00K
BURLESON	03/07/2016	Flood	0	0	200.00K	0.00K
ALVARADO	04/17/2017	Flood	0	0	0.00K	0.00K
ALVARADO MUNI ARPT	04/17/2017	Flood	0	0	0.00K	0.00K
BURLESON	05/01/2019	Flash Flood	0	0	0.00K	0.00K
CLEBURNE	01/10/2020	Flood	0	0	0.00K	0.00K
BURLESON	08/18/2021	Flood	0	0	5.00K	0.00K
Total Flash Floods:			0	0	1627.00K	0.00K
Total Floods:			0	0	205.00K	0.00K

Based on the forecast in Figure 15, Headwater Economics predicts a 33% increase in days with heavy precipitation within 10 years. The increased precipitation could increase the chances of a flood event.

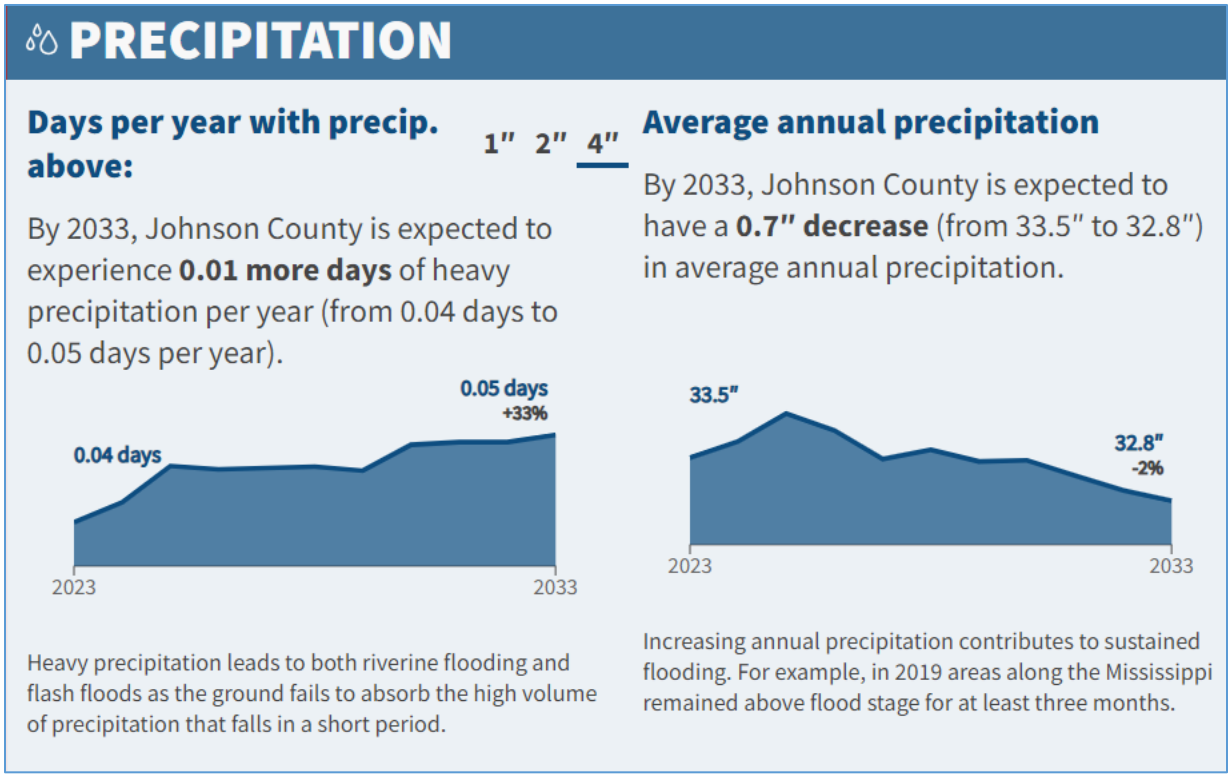


Figure 15: 10 YR Precipitation Forecast

Hazard Summary

The following tables reflect the profile summary for flooding and dam failure flooding within the planning area.

Table 16: Flooding Profile Summary

Flooding				
Jurisdiction	**Location**	**Probability of Future Events**	**Level of Possible Damage**	**Maximum Probable Extent/Strength**
Alvarado	Limited	Likely	Critical	Major
Burleson	Limited	Likely	Critical	Major
Cleburne	Limited	Likely	Critical	Major
Godley	Limited	Likely	Critical	Major
Joshua	Limited	Likely	Limited	Major
Keene	Limited	Highly Likely	Critical	Major
Johnson County Unincorporated	Limited	Likely	Critical	Major

Table 17: Dam Failure Flooding Profile Summary

Dam Failure Flooding				
Jurisdiction	**Location**	**Probability of Future Events**	**Level of Possible Damage**	**Maximum Probable Extent/Strength**
Alvarado	Negligible	Unlikely	Minor	Major
Burleson	Negligible	Unlikely	Minor	Major
Cleburne	Negligible	Unlikely	Minor	Major
Joshua	Negligible	Unlikely	Minor	Major
Johnson County Unincorporated	Negligible	Unlikely	Minor	Major

3.2.6 Thunderstorms

A thunderstorm is a storm that consists of rain-bearing clouds and has the potential to produce hail, high winds, and lightning.

- **Hail:** Hail occurs when, at the outgrowth of a severe thunderstorm, balls or irregularly shaped lumps of ice greater than 19.05 mm (0.75 inches) in diameter fall with rain. Evidence indicates maximum hailstone size is the most important parameter relating to structural damage, especially towards the more severe end of the scale. It must be noted that hailstone shapes are also an important feature, especially as the "effective" diameter of non-spheroidal specimens should ideally be an average of the coordinates. Spiked or jagged hail can also increase some aspects of damage.
- **Wind:** Straight-line winds are often responsible for the wind damage associated with a thunderstorm. 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.
- **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°F.

Thunderstorms are not confined by geographic boundaries and can occur anywhere in the county.

The Thunderstorm Criteria in the Extreme Weather Madness Chart (Figure 16), created by Senior Meteorologist Henry Margusity, describes the rainfall, maximum wind gust, hail size, and lightning frequency. This chart was used by the Local Planning Team to determine the maximum probably intensity in the planning area.

THUNDERSTORM TYPES	Rainfall Rate/hr	MAX WIND GUST	HAIL SIZE	PEAK TORNADO Possibility	LIGHTNING FREQUENCY (5 min Intervals)
T-1 – Weak thunderstorms or Thundershowers	.03-.10	< 25 MPH	None	None	Only a few strikes during the storm.
T-2 – Moderate Thunderstorms.	.10"-.25"	25-40 MPH	None	None	Occasional 1-10
T-3 – Heavy Thunderstorms 1. Singular or lines of storms.	.25"-.55"	40-57 MPH	1/4 " to ¾"	EF0	Occasional to Frequent 10-20
T-4 – Intense Thunderstorms 1. Weaker supercells 2. Bow Echos or lines of Storms	.55" – 1.25"	58 to 70 MPH	1" to 1.5"	EF0 to EF2	Frequent 20-30
T-5 – Extreme Thunderstorms 1. Supercells with familty of tornadoes. 2. Derecho Windstorms	1.25" – 4"	Over 70 Mph	Over 1.5" to 4"	EF3 to EF5	Frequent to Continuous. > 30
Copyright 2010 AccuWeather.com by Sr. Meteorologist Henry Margusity					

Figure 16: Extreme Weather Madness Chart- Thunderstorm Criteria

Thousands of homes and vehicles can be damaged by high winds, hail, and lightning in a single storm, causing millions of dollars in damage.

Direct lightning strikes have the power to cause significant damage to buildings, critical facilities, infrastructure, and the ignition of wildfires which can result in widespread damage to property and persons. Lightning is the most significant natural contributor to fires affecting the built environment.

Severe thunderstorms can have a significant impact on the local economy. It can lead to reduced productivity and increased absenteeism, as well as increased demand for emergency services and disaster relief. Damage from wind, hail, and lightning can lead to the loss of property and infrastructure and can disrupt transportation and communication infrastructure. Additionally, thunderstorms can lead to power outages and can create hazardous conditions for outdoor activities.

The following table lists the historical thunderstorm events and impacts from 2012-2021 recorded by the National Weather Service, in order of year. Hail, lightning, and thunderstorm wind events were compiled.

Table 18: Historical Events- Thunderstorms

Location	Date	Type	Mag	Death	Injury	Property Damage	Crop Damage
ALVARADO	03/19/2012	Hail	0.88 in.	0	0	0.00K	0.00K
CLEBURNE	03/19/2012	Hail	0.75 in.	0	0	0.00K	0.00K
LAKE ALVARADO	06/06/2012	Hail	1.00 in.	0	0	0.00K	0.00K
CLEBURNE	06/11/2012	Thunderstorm Wind	56 kts. MG	0	0	2.00K	0.00K
CLEBURNE	06/11/2012	Thunderstorm Wind	56 kts. EG	0	0	2.00K	0.00K
ALVARADO	08/12/2012	Thunderstorm Wind	52 kts. EG	0	0	5.00K	0.00K
ALVARADO MUNI ARPT	08/12/2012	Thunderstorm Wind	52 kts. EG	0	0	30.00K	0.00K
CLEBURNE	01/29/2013	Hail	1.00 in.	0	0	0.00K	0.00K
CLEBURNE	01/29/2013	Hail	0.88 in.	0	0	0.00K	0.00K
ALVARADO	03/09/2013	Hail	1.00 in.	0	0	0.00K	0.00K
BURLESON	03/09/2013	Hail	1.00 in.	0	0	0.00K	0.00K
BURLESON	03/09/2013	Hail	0.88 in.	0	0	0.00K	0.00K
CLEBURNE	03/09/2013	Hail	0.75 in.	0	0	0.00K	0.00K
CLEBURNE MUNI ARPT	03/09/2013	Hail	1.75 in.	0	0	2.00K	0.00K
CLEBURNE MUNI ARPT	03/09/2013	Hail	2.00 in.	0	0	5.00K	0.00K
CLEBURNE MUNI ARPT	03/09/2013	Hail	2.75 in.	0	0	0.00K	0.00K
GODLEY	10/26/2013	Hail	1.00 in.	0	0	0.00K	0.00K
LAKE ALVARADO	10/26/2013	Hail	1.50 in.	0	0	5.00K	0.00K
ALVARADO	04/03/2014	Hail	0.88 in.	0	0	0.00K	0.00K
CLEBURNE	04/03/2014	Hail	0.88 in.	0	0	0.00K	0.00K
CLEBURNE	04/03/2014	Hail	1.25 in.	0	0	0.00K	0.00K
CLEBURNE	04/03/2014	Hail	1.00 in.	0	0	0.00K	0.00K
CLEBURNE	04/03/2014	Hail	1.50 in.	0	0	2.00K	0.00K
CLEBURNE	04/03/2014	Hail	0.75 in.	0	0	0.00K	0.00K
GODLEY	04/03/2014	Hail	0.88 in.	0	0	0.00K	0.00K
CLEBURNE	04/27/2014	Hail	1.00 in.	0	0	0.00K	0.00K
CLEBURNE MUNI ARPT	04/27/2014	Hail	1.00 in.	0	0	0.00K	0.00K
ALVARADO MUNI ARPT	05/12/2014	Lightning		0	0	4.00K	0.00K
CLEBURNE	05/12/2014	Hail	0.75 in.	0	0	0.00K	0.00K

Location	Date	Type	Mag	Death	Injury	Property Damage	Crop Damage
CLEBURNE	10/02/2014	Hail	0.88 in.	0	0	0.00K	0.00K
CLEBURNE	10/02/2014	Hail	0.88 in.	0	0	0.00K	0.00K
ALVARADO MUNI ARPT	05/07/2015	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
CLEBURNE	11/05/2015	Hail	1.00 in.	0	0	0.00K	0.00K
CLEBURNE	11/05/2015	Hail	1.75 in.	0	0	0.00K	0.00K
CLEBURNE	11/05/2015	Hail	2.75 in.	0	0	20.00K	0.00K
CLEBURNE	11/05/2015	Hail	2.00 in.	0	0	0.00K	0.00K
CLEBURNE	11/05/2015	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
ALVARADO	03/17/2016	Hail	1.00 in.	0	0	0.00K	0.00K
ALVARADO	04/26/2016	Hail	0.75 in.	0	0	0.00K	0.00K
ALVARADO MUNI ARPT	05/11/2016	Hail	0.75 in.	0	0	0.00K	0.00K
LAKE ALVARADO	05/29/2016	Hail	0.75 in.	0	0	0.00K	0.00K
ALVARADO	07/15/2016	Hail	0.75 in.	0	0	0.00K	0.00K
CLEBURNE	07/15/2016	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
CLEBURNE	07/15/2016	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
ALVARADO	03/26/2017	Hail	1.00 in.	0	0	0.00K	0.00K
ALVARADO MUNI ARPT	03/26/2017	Hail	1.75 in.	0	0	5.00K	0.00K
CLEBURNE	03/26/2017	Hail	1.50 in.	0	0	0.00K	0.00K
CLEBURNE	03/26/2017	Hail	0.88 in.	0	0	0.00K	0.00K
CLEBURNE	03/26/2017	Hail	2.00 in.	0	0	75.00K	0.00K
GODLEY	04/13/2018	Hail	0.88 in.	0	0	0.00K	0.00K
ALVARADO MUNI ARPT	11/30/2018	Hail	1.00 in.	0	0	0.00K	0.00K
BURLESON	04/17/2019	Hail	2.00 in.	0	0	10.00K	0.00K
BURLESON	04/17/2019	Hail	1.00 in.	0	0	0.00K	0.00K
ALVARADO	03/18/2020	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
BURLESON	03/18/2020	Thunderstorm Wind	64 kts. EG	0	0	3.00K	0.00K
GODLEY	04/11/2020	Hail	0.88 in.	0	0	0.00K	0.00K
CLEBURNE MUNI ARPT	04/28/2020	Hail	1.50 in.	0	0	0.00K	0.00K
LAKE ALVARADO	04/28/2020	Hail	1.00 in.	0	0	0.00K	0.00K

Location	Date	Type	Mag	Death	Injury	Property Damage	Crop Damage
ALVARADO	05/22/2020	Thunderstorm Wind	61 kts. EG	0	0	0.00K	0.00K
GODLEY	05/03/2021	Hail	1.75 in.	0	0	100.00K	0.00K
GODLEY	05/03/2021	Hail	1.00 in.	0	0	0.00K	0.00K
BURLESON	05/28/2021	Thunderstorm Wind	74 kts. EG	0	0	500.00K	0.00K
ALVARADO	07/27/2021	Thunderstorm Wind	52 kts. EG	0	0	0.00K	0.00K
ALVARADO	07/27/2021	Thunderstorm Wind	70 kts. EG	0	0	75.00K	0.00K
Total Hail:				0	0	214.00K	0.00K
Total Lightning:				0	0	4.00K	0.00K
Total Thunderstorm Wind:						644.00K	0.00K

Source: NOAA National Centers for Environmental Information

Due to the history of thunderstorms and the presence of climate change, thunderstorms are expected to be a continual threat to the planning area.

Hazard Summary

The following table reflects the profile summary for thunderstorms within the planning area.

Table 19: Thunderstorm Profile Summary

Thunderstorms				
Jurisdiction	**Location**	**Probability of Future Events**	**Level of Possible Damage**	**Maximum Probable Extent/Strength**
Alvarado	Extensive	Highly Likely	Critical	Major
Burleson	Extensive	Highly Likely	Critical	Major
Cleburne	Extensive	Highly Likely	Critical	Major
Godley	Extensive	Highly Likely	Critical	Major
Joshua	Extensive	Highly Likely	Critical	Major
Keene	Extensive	Highly Likely	Critical	Major
Johnson County Unincorporated	Extensive	Highly Likely	Critical	Major

3.2.7 Tornadoes

A tornado is a narrow, violently rotating column of air that makes contact with the ground. A tornado can either be suspended from, or occur underneath, a cumuliform cloud. It is often, but not always, visible as a condensation funnel.

As part of “Tornado Alley,”which encompasses much of northern Texas northward through Oklahoma, Kansas, Nebraska and parts of New Mexico, South Dakota, Iowa, and eastern Colorado. Johnson County faces a high potential for tornado development. It’s important to keep in mind that tornadoes are not confimed by geographic boundaries and can occure anywhere in the country.

The map below shows the averal annual frequency of tornadoes in the United States between 1950-1995. According to the map. Johnson County averages 5-7 tornadoes per year.

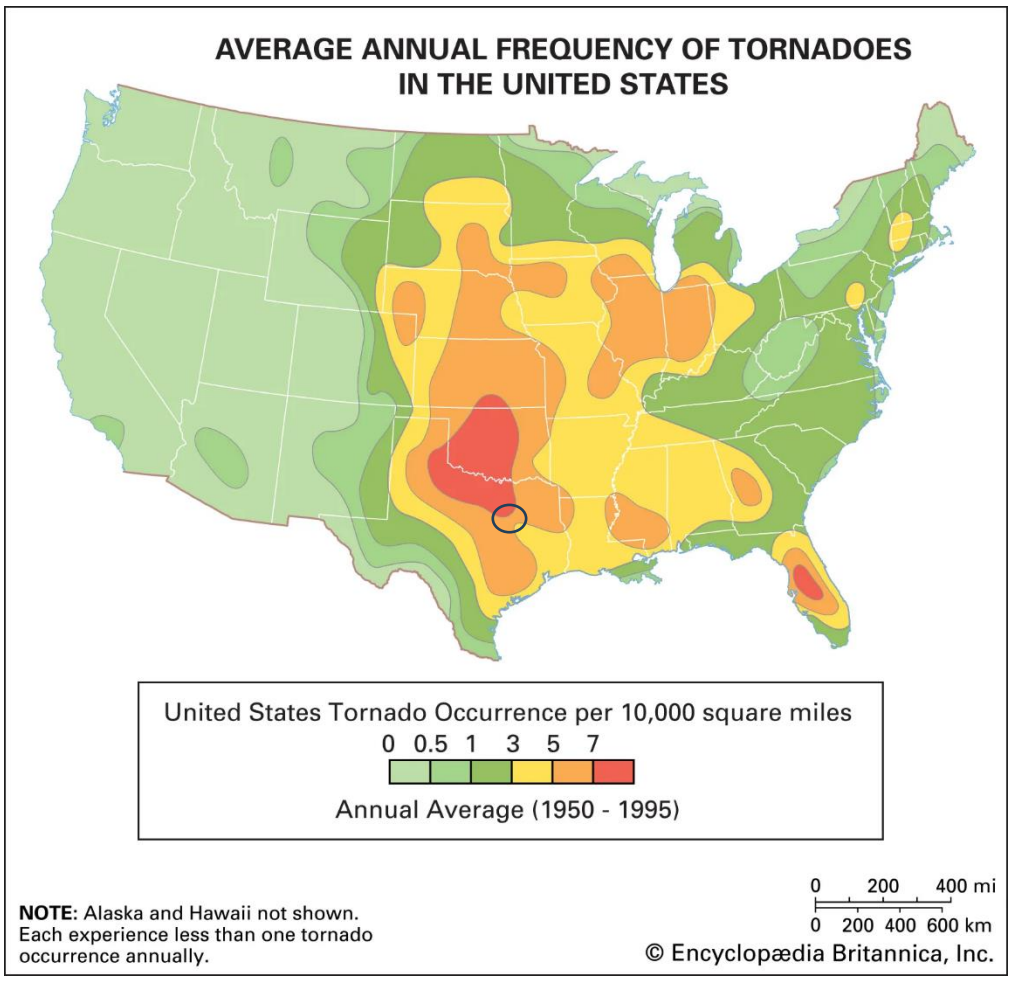


Figure 17: Average Annual Frequency of Tornadoes

The Enhanced Fujita (EF) Scale (Table 20) is used by the National Weather Service to determine the highest wind speed that occurred within the damage path. The NWS is the only federal agency with authority to provide 'official' tornado EF Scale ratings.

Table 20: EF Scale

FUJITA SCALE			DERIVED EF SCALE		**OPERATIONAL EF SCALE**	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	**EF Number**	**3 Second Gust (mph)**
0	40-72	45-78	0	65-85	**0**	**65-85**
1	73-112	79-117	1	86-109	**1**	**86-110**

FUJITA SCALE			DERIVED EF SCALE		OPERATIONAL EF SCALE	
2	113-157	118-161	2	110-137	**2**	**111-135**
3	158-207	162-209	3	138-167	**3**	**136-165**
4	208-260	210-261	4	168-199	**4**	**166-200**
5	261-318	262-317	5	200-234	**5**	**Over 200**

After the NWS evaluator matches the construction or description of the building with the appropriate damage indicator (Table 21).

Table 21: EF Scale Damage Indicators

NUMBER *(Details Linked)*	DAMAGE INDICATOR	ABBREVIATION
1	Small barns, farm outbuildings	SBO
2	One- or two-family residences	FR12
3	Single-wide mobile home (MHSW)	MHSW
4	Double-wide mobile home	MHDW
5	Apt, condo, townhouse (3 stories or less)	ACT
6	Motel	M
7	Masonry apt. or motel	MAM
8	Small retail bldg. (fast food)	SRB
9	Small professional (doctor office, branch bank)	SPB
10	Strip mall	SM
11	Large shopping mall	LSM
12	Large, isolated ("big box") retail bldg.	LIRB
13	Automobile showroom	ASR
14	Automotive service building	ASB
15	School - 1-story elementary (interior or exterior halls)	ES
16	School - jr. or sr. high school	JHSH
17	Low-rise (1-4 story) bldg.	LRB
18	Mid-rise (5-20 story) bldg.	MRB
19	High-rise (over 20 stories)	HRB
20	Institutional bldg. (hospital, govt. or university)	IB
21	Metal building system	MBS
22	Service station canopy	SSC
23	Warehouse (tilt-up walls or heavy timber)	WHB
24	Transmission line tower	TLT
25	Free-standing tower	FST
26	Free standing pole (light, flag, luminary)	FSP
27	Tree - hardwood	TH
28	Tree - softwood	TS

For each DI, there are eight degrees of damage (Table 22).

Table 22: Degree of Damage (DOD)

DOD	Damage Description	EXP	LB	UB
1	Threshold of visible damage	62	53	78
2	Loss of wood or metal roof panels	74	61	91
3	Collapse of doors	83	68	102
4	Major loss of roof panels	90	78	110
5	Uplift or collapse of roof structure	93	77	114
6	Collapse of walls	97	81	119
7	Overturning or sliding of entire structure	99	83	118
8	Total destruction of building	112	94	131

Potential impacts from tornadoes include:

- Injury or death
- Power outage
- Blocked roadways from trees and damaged property
- Natural gas pipeline breaks – fire injuries, possible deaths
- Transportation disruption
- Rerouting traffic
- Loss of property
- Structure and infrastructure damage
- Misplaced residents
- Natural environment damage, to include protected species and critical habitats

Since 2012, the National Weather Service has reported EF0-EF2 tornadoes in jurisdictions in Johnson County, totaling a combined estimated loss of $1.940M in property damage. The most costly tornado events were E1 in 2012 and E2 in 2022 ($1.600M). In both cases several manufactured homes and metal buildings were damaged, roofs lost, and large trees uprooted.

Table 23: Historical Events- Tornadoes

Location	Date	Type	Mag	Death	Injury	Property Damage	Crop Damage
JOSHUA ARPT	4/3/2012	Tornado	EF1	0	0	600.00K	0.00K
BURLESON	4/3/2012	Tornado	EF0	0	0	0.00K	2.00K
GODLEY	5/15/2013	Tornado	EF1	0	0	260.00K	0.00K
GODLEY	5/15/2013	Tornado	EF0	0	0	10.00K	0.00K
GODLEY	1/10/2020	Tornado	EF1	0	0	20.00K	0.00K
JOSHUA ARPT	4/4/2022	Tornado	EF2	0	1	1.000M	0.00K
KEENE	4/4/2022	Tornado	EF0	0	0	50.00K	0.00K
Totals:				0	1	1.940M	2.00K

The following figures from the National Weather Service (NWS) Fort Worth Tornado Climatology reflect historical tornado events in the county.

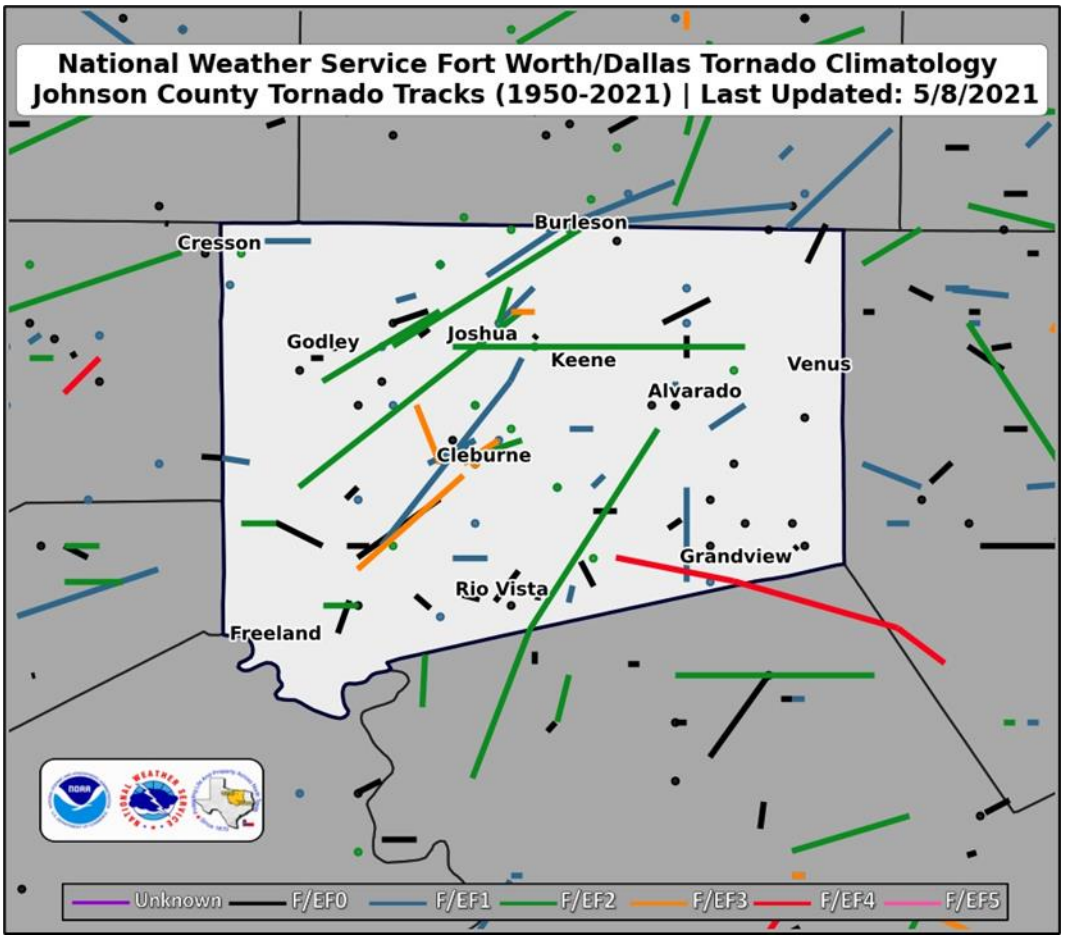


Figure 18: Tornado Tracks from 1950-2021

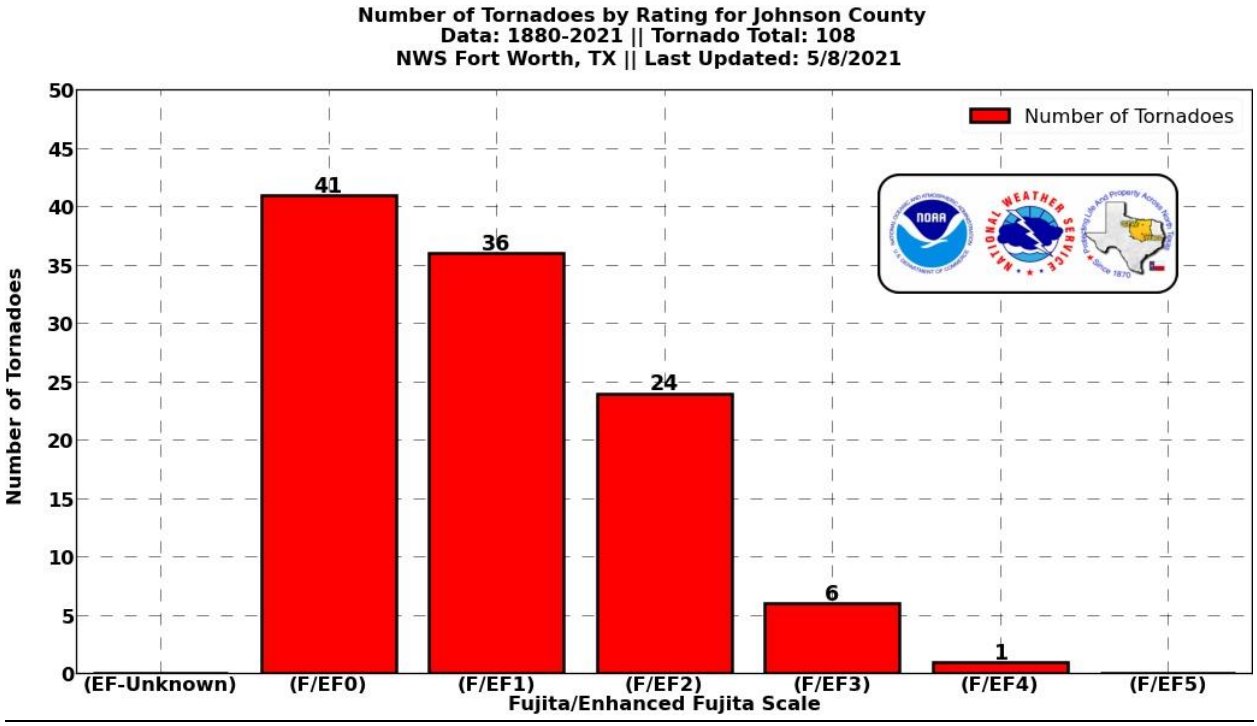


Figure 19: Number of Tornadoes by Rating

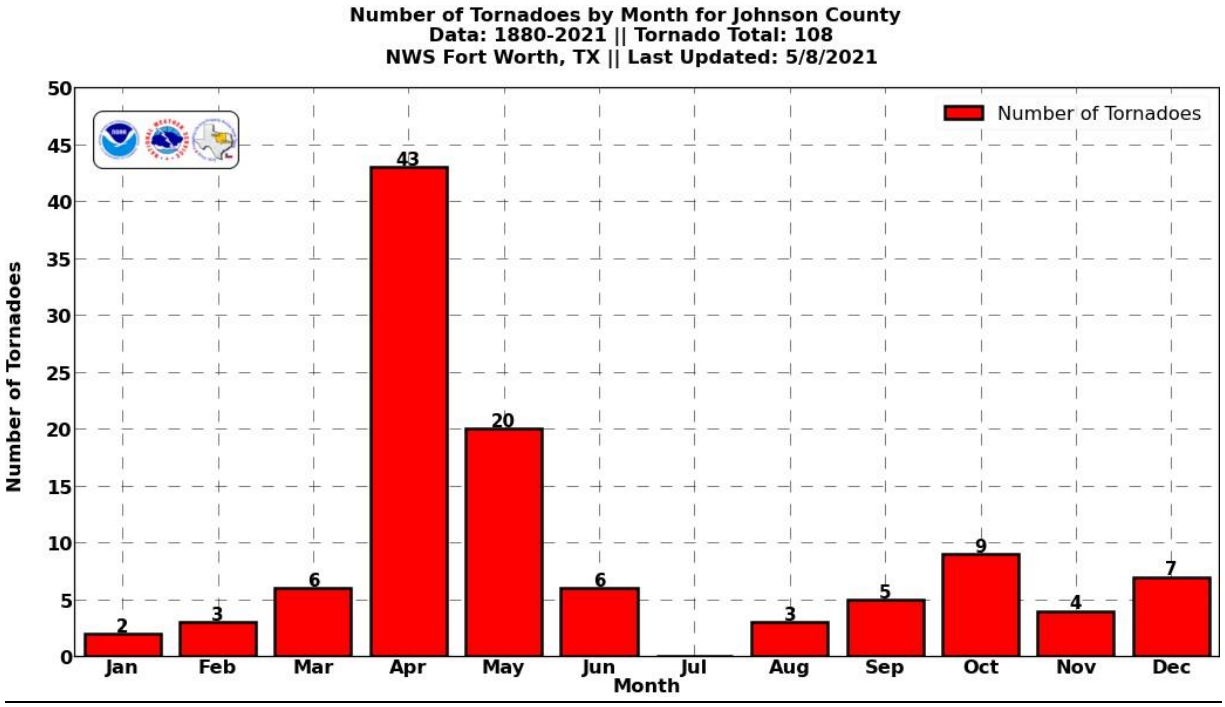


Figure 20: Number of Tornadoes by Month

Using this historical data, we can predict that there will be similar future tornado events and losses in the county.

Hazard Summary

The following table reflects the profile summary for tornadoes within the planning area.

Table 24: Tornado Profile Summary

Tornadoes				
Jurisdiction	**Location**	**Probability of Future Events**	**Level of Possible Damage**	**Maximum Probable Extent/Strength**
Alvarado	Extensive	Highly Likely	Catastrophic	Medium
Burleson	Extensive	Highly Likely	Catastrophic	Medium
Cleburne	Extensive	Highly Likely	Catastrophic	Medium
Godley	Extensive	Highly Likely	Catastrophic	Medium
Joshua	Extensive	Highly Likely	Catastrophic	Medium
Keene	Extensive	Highly Likely	Catastrophic	Medium
Johnson County Unincorporated	Extensive	Highly Likely	Critical	Medium

3.2.8 Wildfires

The profile data for wildfires was provided by the Texas A&M Forest Service, the leading state agency to respond to wildfires. Environmental weather parameters needed to compute fire behavior characteristics include 1-hour, 10-hour, and 100-hour timelag fuel moistures, herbaceous fuel moisture, woody fuel moisture, and the 20-foot 10-minute average wind speed. There are two primary fire types if wildfire – surface fire and canopy fire. Canopy fire can be further subdivided into passive canopy fire and active canopy fire. A short description of each of these is provided below:

Surface Fire
A fire that spreads through surface fuel without consuming any overlying canopy fuel. Surface fuels include grass, timber litter, shrub/brush, slash and other dead or live vegetation within about 6 feet of the ground.

Passive Canopy Fire
A type of crown fire in which the crowns of individual trees or small groups of trees burn, but solid flaming in the canopy cannot be maintained except for short periods (Scott & Reinhardt, 2001).

Active Canopy Fire
A crown fire in which the entire fuel complex (canopy) is involved in flame, but the crowning phase remains dependent on heat released from surface fuel for continued spread (Scott & Reinhardt, 2001).

In Johnson County, residents are most threatened by surface fires except for the very southwest corner of the county.

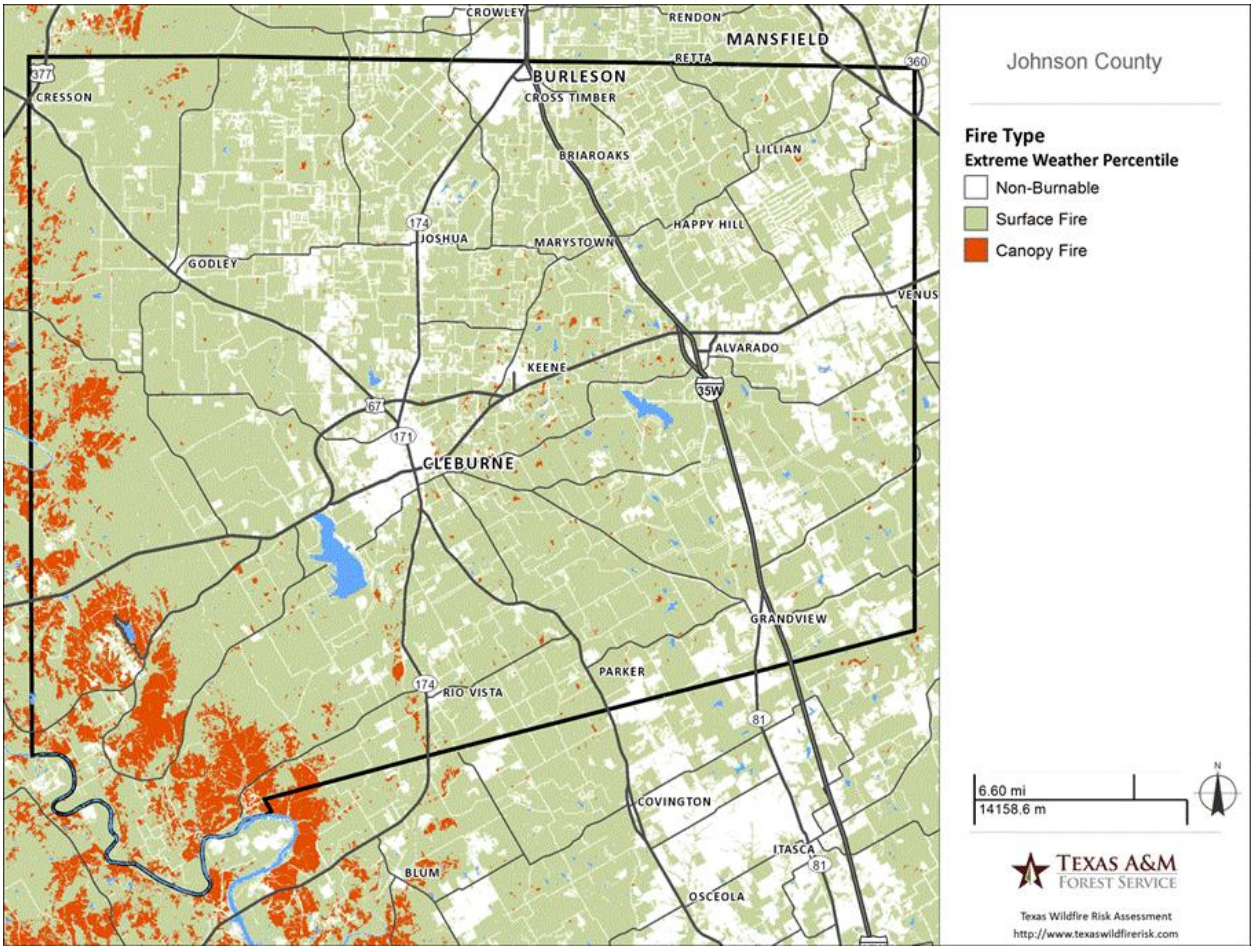


Figure 21: Fire Type

Wildfires are fueled almost exclusively by natural vegetation. Interface or intermix fires are urban/wildland fires in which vegetation and the built environment provide fuel. The following chart shows the vegetation, and thus the amount of fuel sources, in Johnson County. Grassland is the most common class compared to other vegetation classes and it can be used for grazing.

Table 25: Johnson County Vegetation

	Class	Description	Acres	Percent
	Open Water	All areas of open water, generally with < 25% cover of vegetation or soil	4,279	0.9 %
	Developed Open Space	Impervious surfaces account for < 20% of total cover (i.e. golf courses, parks, etc…)	26,181	5.5 %
	Developed Low Intensity	Impervious surfaces account for 20-49% of total cover	24,727	5.2 %
	Developed Medium Intensity	Impervious surfaces account for 50-79% of total cover	3,101	0.7 %
	Developed High Intensity	Impervious surfaces account for 80-100%of total cover	1,628	0.3 %
	Barren Land (Rock/Sand/Clay)	Vegetation generally accounts for <15% of total cover	675	0.1 %
	Cultivated Crops	Areas used for the production of annual crops, includes land being actively tilled	37,313	7.9 %
	Pasture/Hay	Areas of grasses and/or legumes planted for livestock grazing or hay production	46,322	9.8 %
	Grassland/Herbaceous	Areas dominated (> 80%) by grammanoid or herbaceous vegetation, can be grazed	248,212	52.5 %
	Marsh	Low wet areas dominated (>80%) by herbaceous vegetation	14	0.0 %
	Shrub/Scrub	Areas dominated by shrubs/trees < 5 meters tall, shrub canopy > than 20% of total vegetation	539	0.1 %
	Floodplain Forest	> 20% tree cover, the soil is periodically covered or saturated with water	8,133	1.7 %
	Deciduous Forest	> 20% tree cover, >75% of tree species shed leaves in response to seasonal change	40,040	8.5 %
	Live Oak Forest	> 20% tree cover, live oak species represent >75% of the total tree cover	3,492	0.7 %
	Live Oak/Deciduous Forest	> 20% tree cover, neither live oak or deciduous species represent >75% of the total tree cover	0	0.0 %
	Juniper or Juniper/Live Oak Forest	> 20% tree cover, juniper or juniper/live oak species represent > 75% of the total tree cover	8,208	1.7 %
	Juniper/Deciduous Forest	> 20% tree cover, neither juniper or deciduous species represent > 75% of the total tree cover	19,884	4.2 %
	Pinyon/Juniper Forest	> 20% tree cover, pinyon or juniper species represent > 75% of the total tree cover	0	0.0 %
	Eastern Redcedar Forest	> 20% tree cover, eastern redcedar represents > 75% of the total tree cover	0	0.0 %
	Eastern Redcedar/Deciduous Forest	> 20% tree cover, neither eastern redcedar or deciduous species represent > 75% of the total tree cover	0	0.0 %
	Pine Forest	> 20% tree cover, pine species represent > 75% of the total tree cover	0	0.0 %
	Pine Regeneration	Areas of pine forest in an early successional or transitional stage	0	0.0 %
	Pine/Deciduous Forest	> 20% tree cover, neither pine or deciduous species represent > 75% of the total tree cover	0	0.0 %
	Pine/Deciduous Regeneration	Areas of pine or pine/deciduous forest in an early	0	0.0 %

	Class	Description	Acres	Percent
		successional or transitional stage		
	Total		**472,748**	**100.0 %**

Source: Texas Wildfire Risk Assessment Portal Professional Viewer.

While wildfires know no boundaries, the Characteristic Fire Intensity Scale (FIS) identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on a weighted average of four percentile weather categories. Similar to the Richter scale for earthquakes, FIS provides a standard scale to measure potential wildfire intensity. FIS consists of 5 classes where the order of magnitude between classes is ten-fold. The minimum class, Class 1, represents very low wildfire intensities and the maximum class, Class 5, represents very high wildfire intensities. Refer to descriptions below.

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

The Characteristic FIS does not incorporate historical occurrence information. It only evaluates the potential fire behavior for an area, regardless if any fires have occurred there in the past. This additional information allows mitigation planners to quickly identify areas where dangerous fire behavior potential exists in relationship to nearby homes or other valued assets.

The FIS Map in Figure 22 shows that most of the county has an FIS score of Class 3-4.

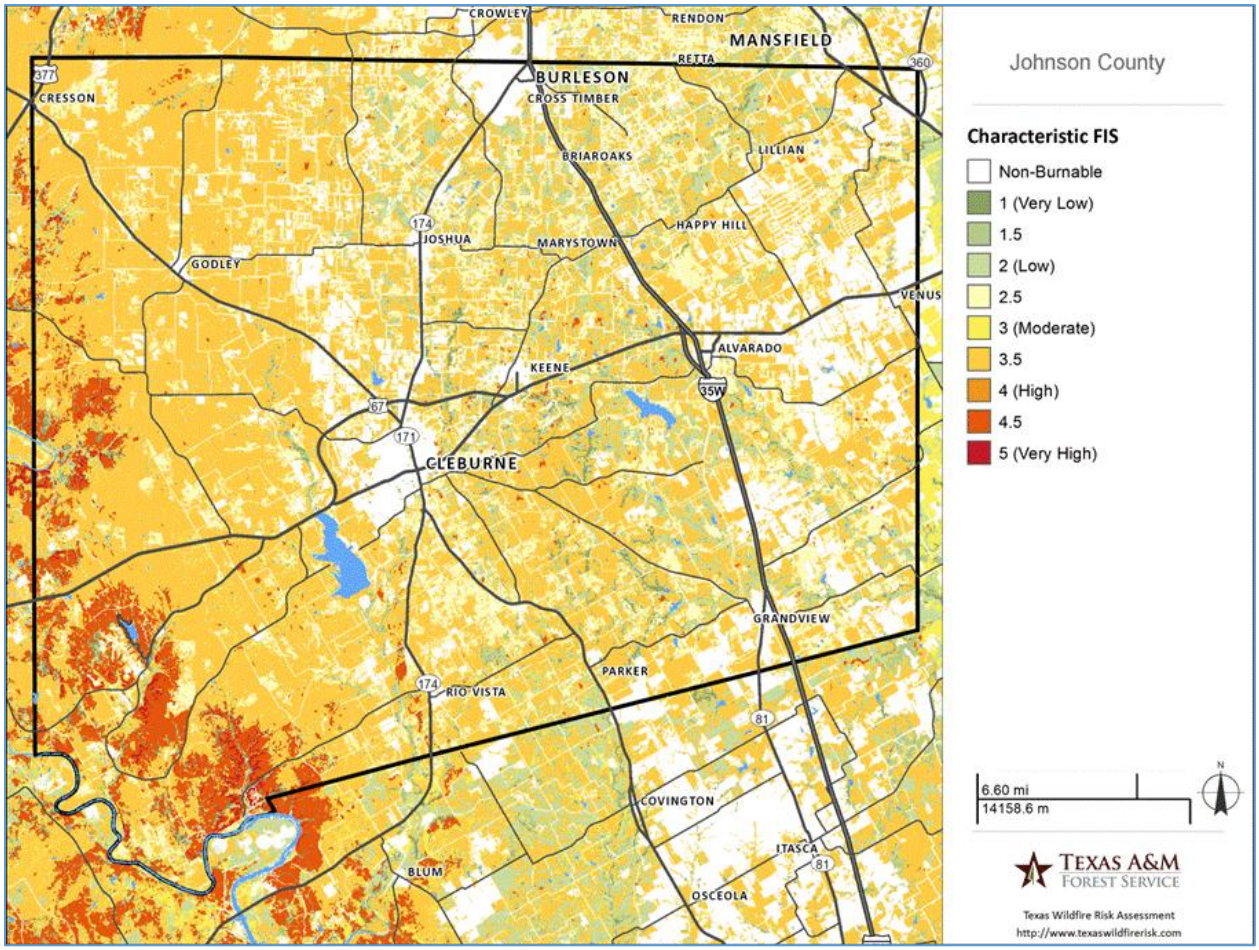


Figure 22: Fire Intensity Scale

The following graphs better reflect the FIS Class within each participating jurisdiction.

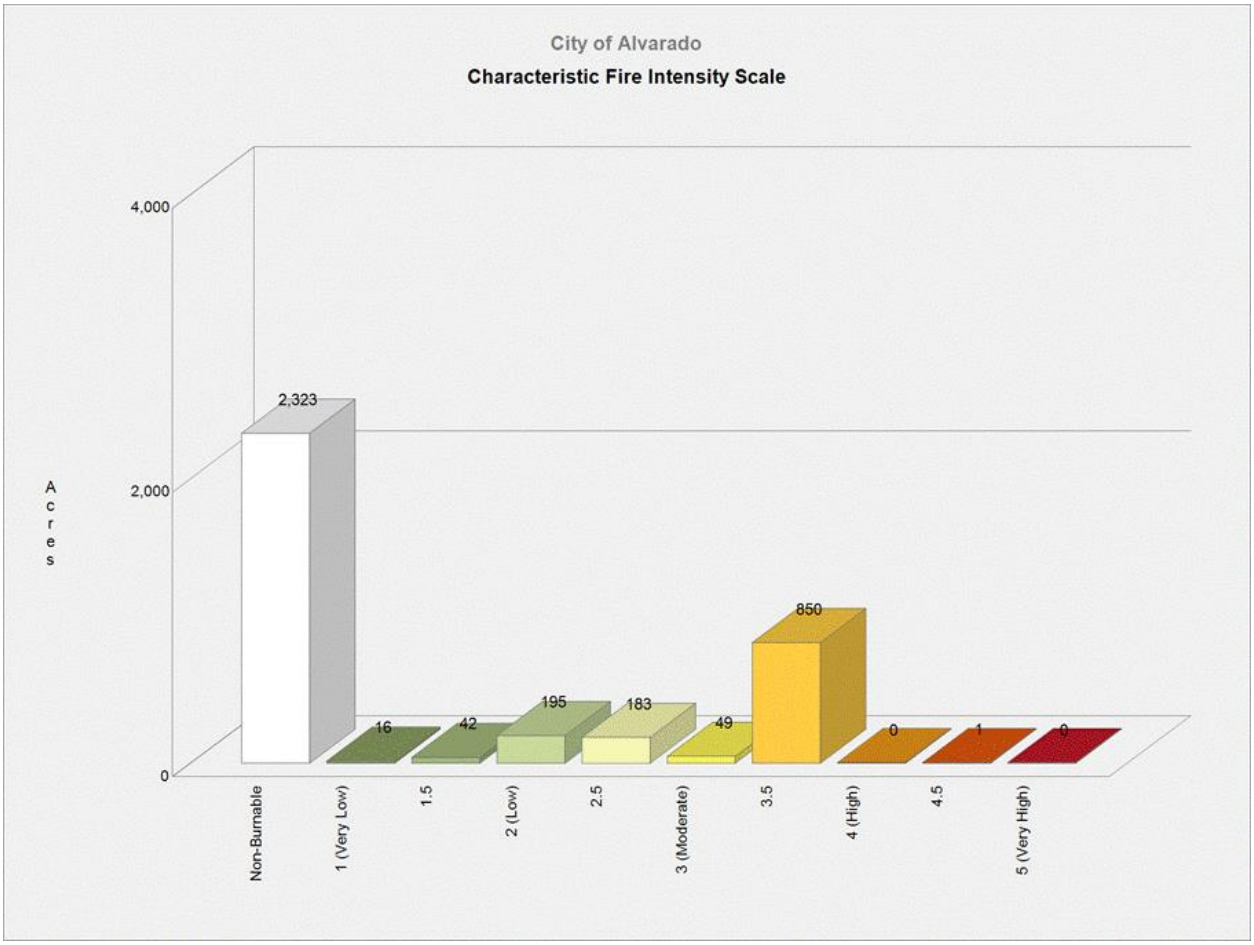


Figure 23: Alvarado FIS

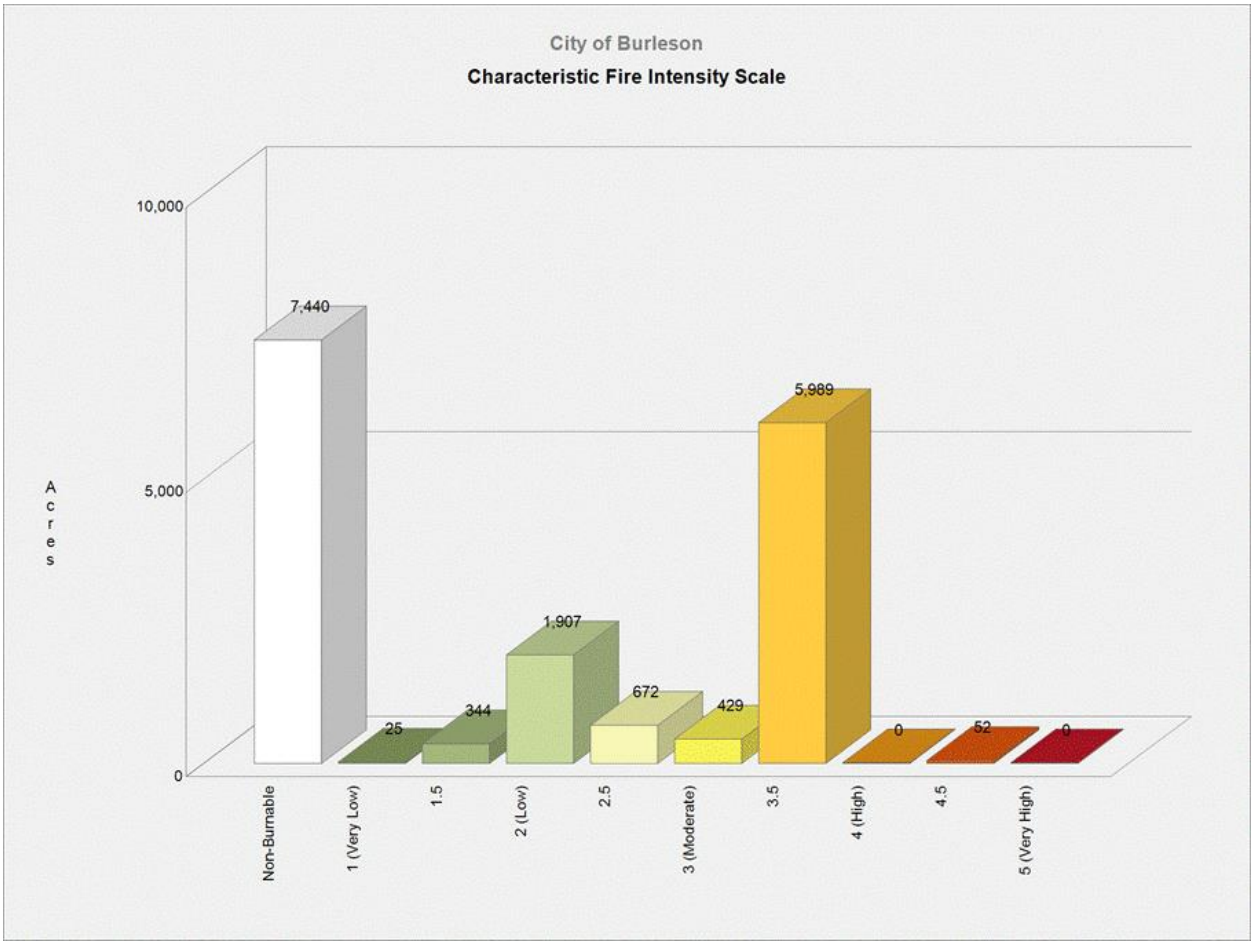


Figure 24: Burleson FIS

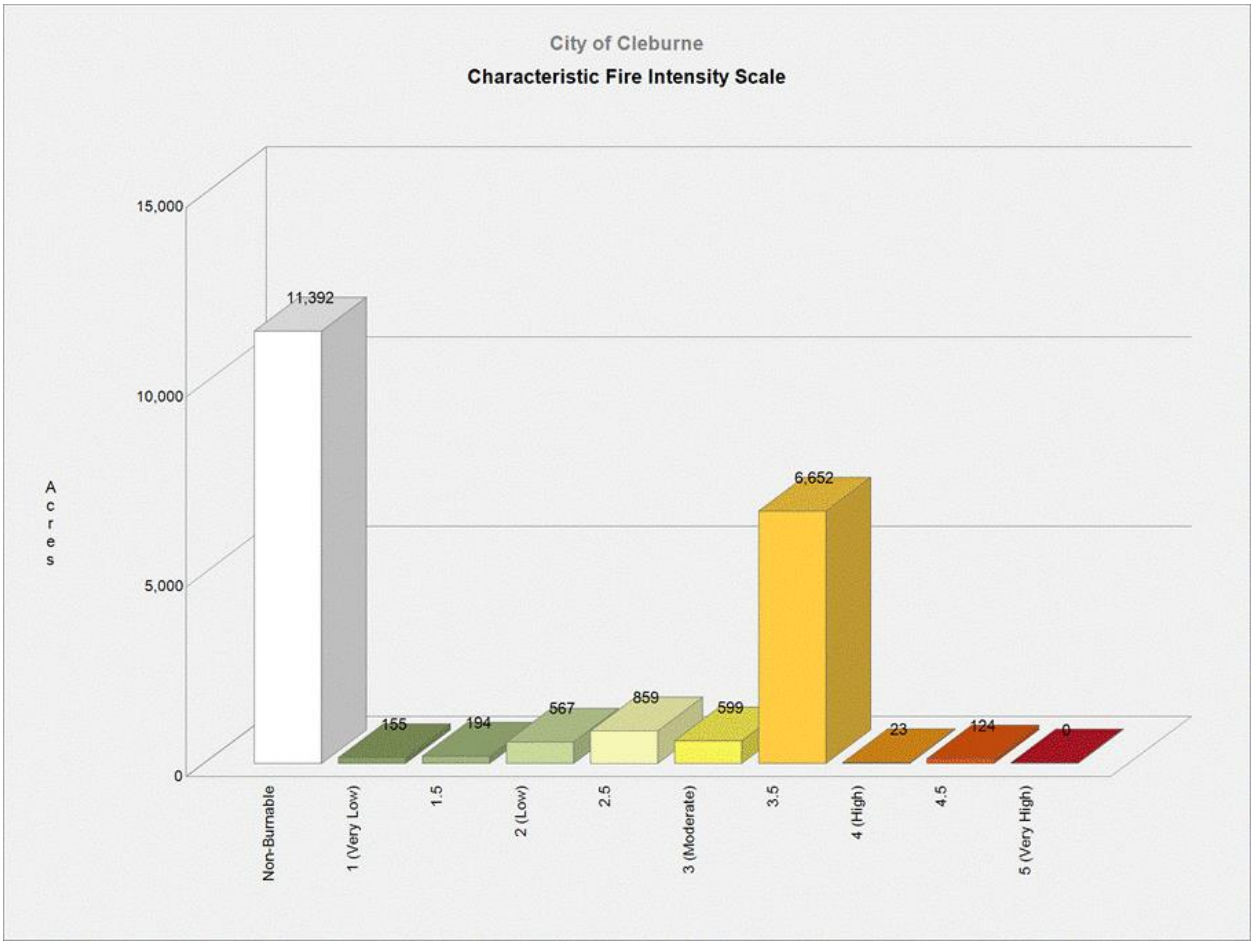


Figure 25: Cleburne FIS

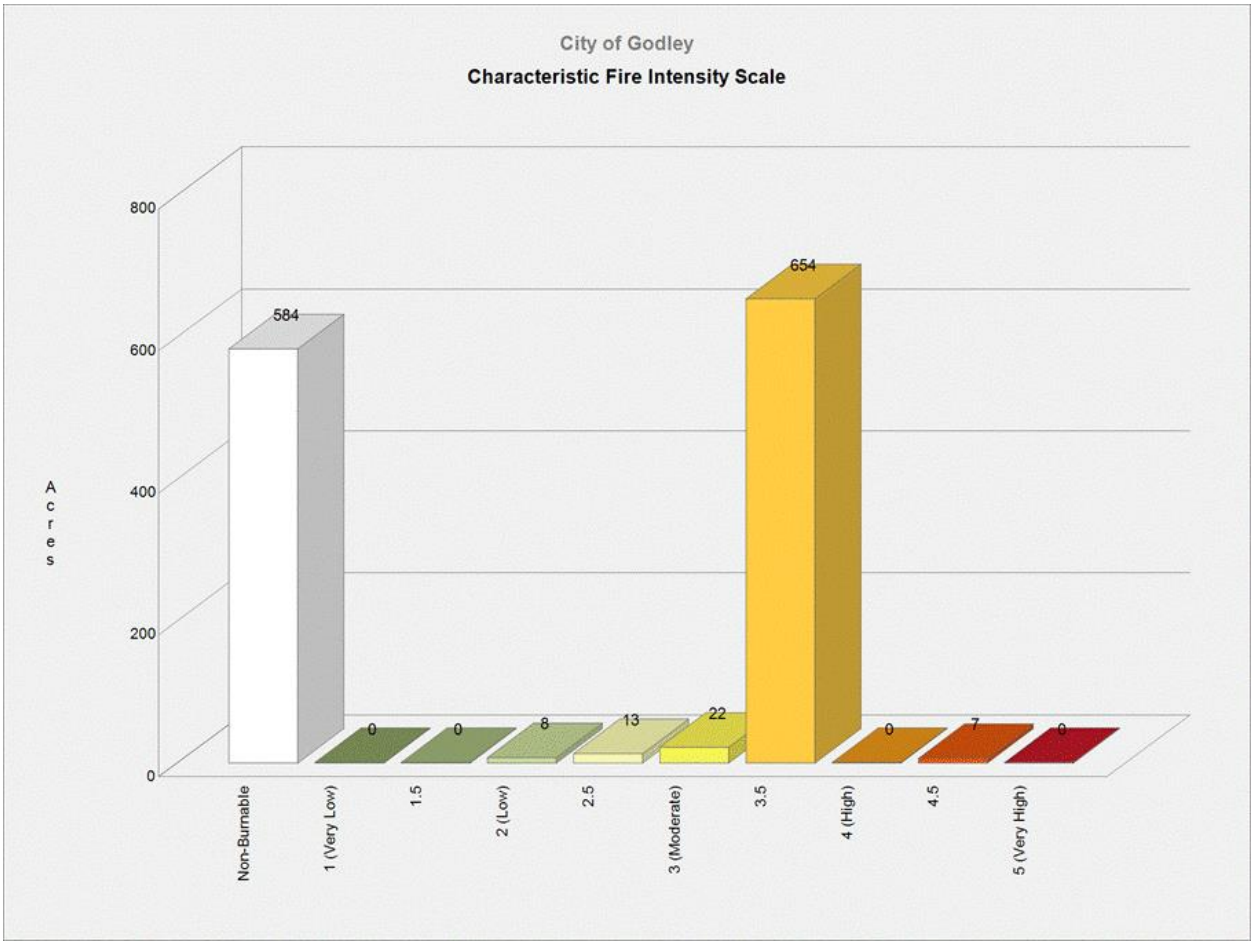


Figure 26: Godley FIS

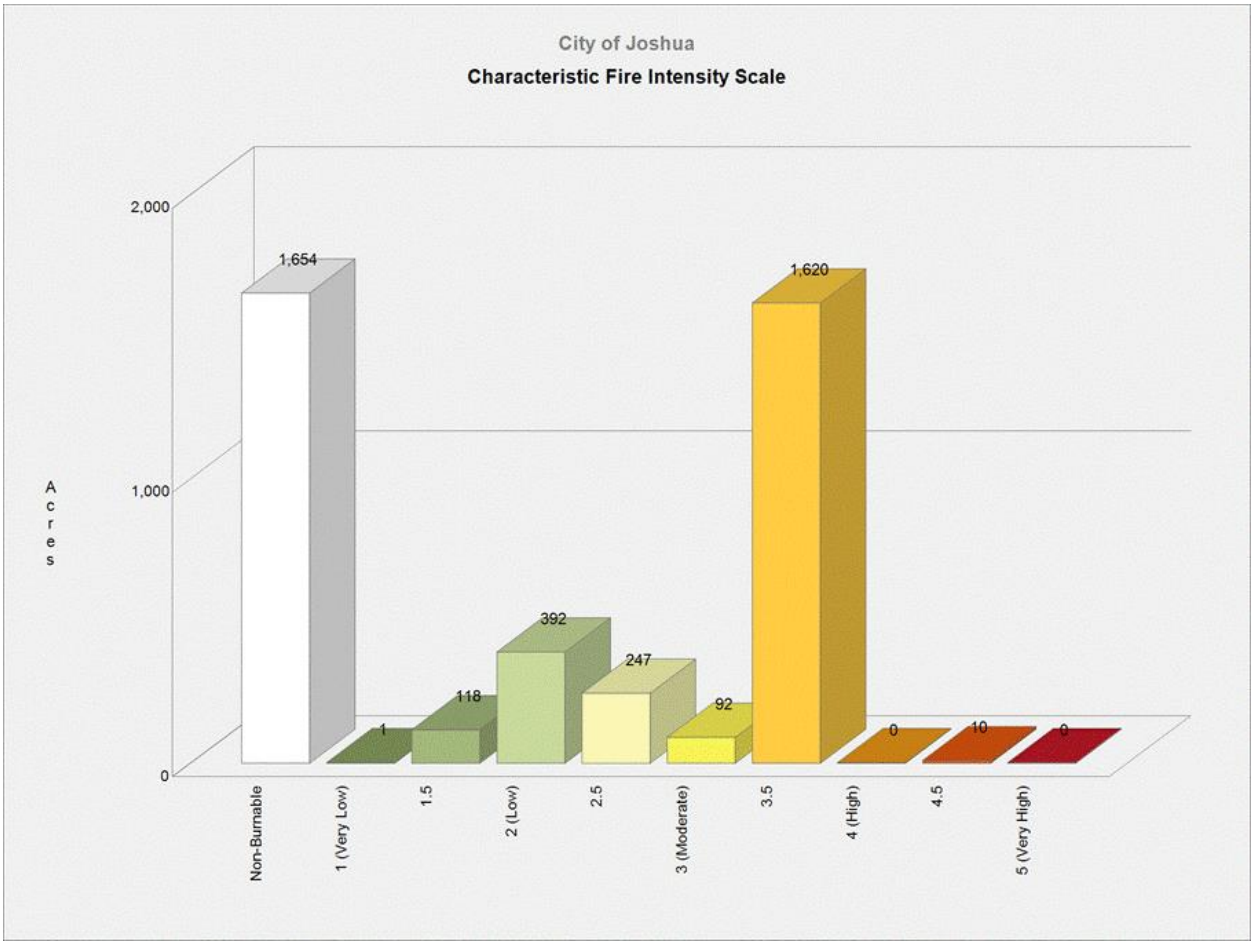


Figure 27: Joshua FIS

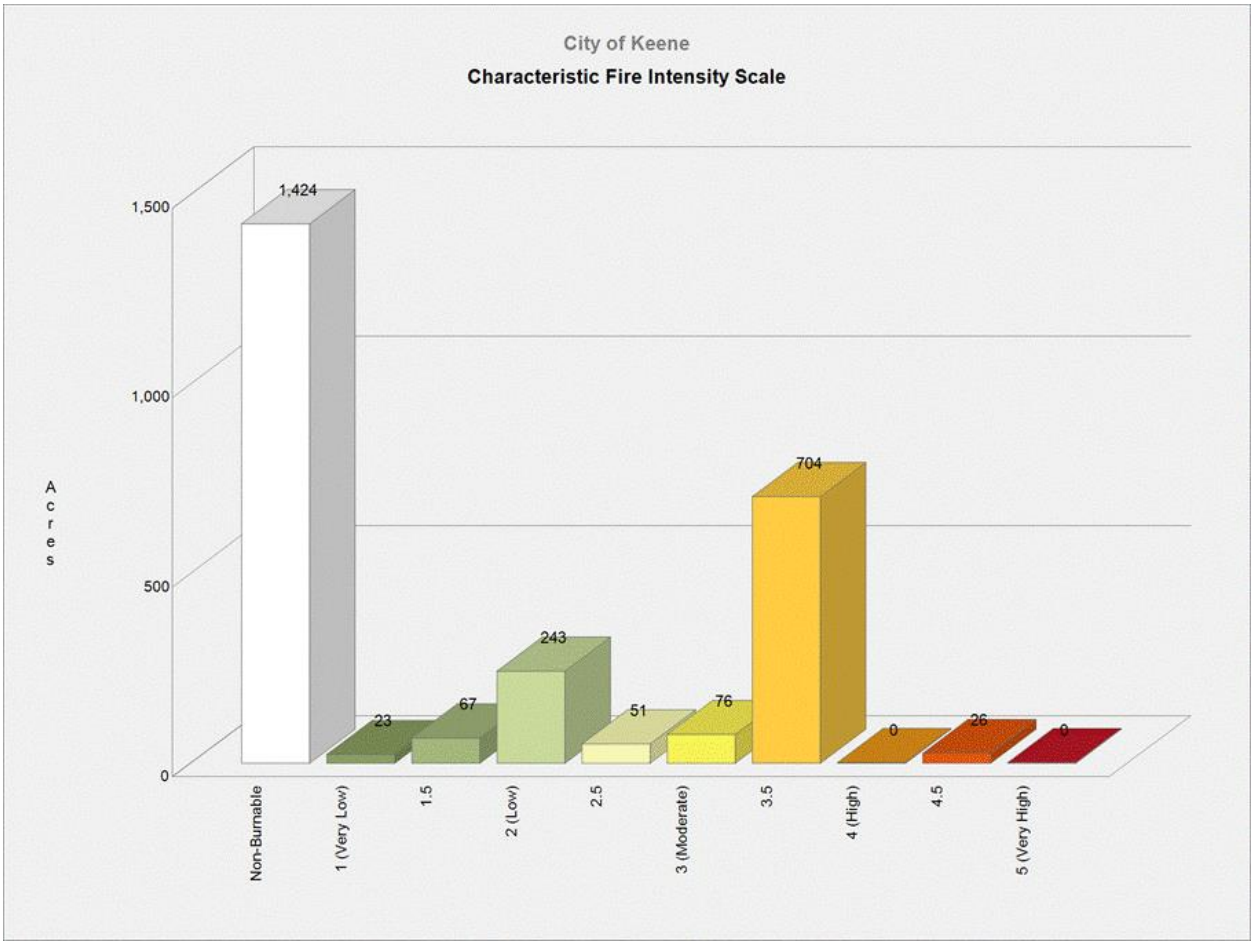


Figure 28: Keene FIS

One of the unique vulnerabilities to wildfires is the wildland-urban interface (WUI). The WUI is an area of development that is susceptible to wildfires due to the number of structures located in an area with vegetation that can act as fuel for a wildfire. 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. The WUI Map in Figure 29 reflects housing density depicting where humans and their structures meet or intermix with wildland fuels and shows that all participating jurisdictions in this plan have highly populated WUI areas in their communities.

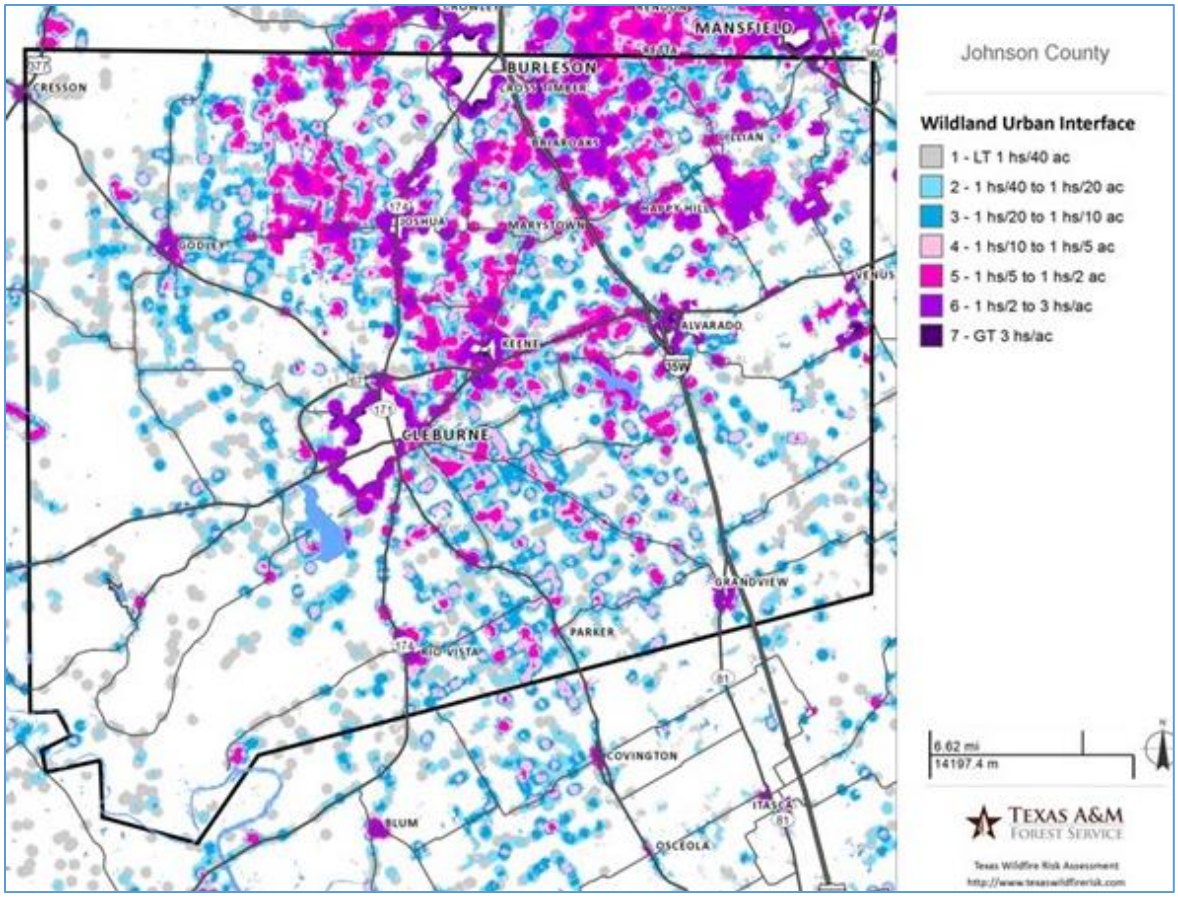


Figure 29: WUI Map

Potential impacts from wildfires include:

- Injury or death
- Property and fence damage
- Road closure
- Loss of power – burning utility poles
- Loss of property
- Loss of crops and livestock
- Structure and infrastructure damage
- Misplaced residents
- Loss of resources
- Natural environments damage, to include protected species and critical habitats

Common practices to minimize the spread of wildfire are fuel breaks and fire breaks. A **fuel break** is the thinning of vegetation, or fuels, over a specific area of land. They are most commonly used to surround a community and slow the spread of a wildfire. By decreasing the amount of vegetation that the fire has to travel through, the risk of extreme fire behavior greatly depreciates.

Types of fuel breaks include:

- **Mechanical Treatments**- A mechanical treatment removes fuels by cutting shrubs, small trees and ladder fuels that make up the understory of a forested area. Materials are either taken from the site or chipped into smaller pieces. Fuels are selected for removal based on how they would contribute to a wildfire. For example, a thick patch of cedar could readily ignite and release significant heat and embers. This fuel type contributes to the rapid spread of a wildfire and would need to be removed.

The objective of mechanical treatment is to reduce the intensity of wildfire. If there is less fuel to burn the fire stays low to the ground giving firefighters a safer condition in which to work.

- **Mulching**- A mulching operation is intended to break fuels into smaller pieces and spread them within the fuel break. While the smaller pieces will still carry fire, they will significantly reduce the intensity of it. The goal is to reduce ladder fuels like tall brush that could carry a ground fire into the top of a tree.

Mulching equipment is classified as either traditional mowers or mulchers that grind the material. Heavy duty mowers are useful when fuels are small enough to be pushed over. However, for sites with an established woody mid-story, or ladder fuels, other equipment may be needed.

- **Herbicide Treatment**- Herbicides are used to control invasive species of plants that will “take over” an area. Invasive plant species can also be reduced with mechanical thinning.

The effectiveness of herbicide treatments depends on existing vegetation, topography, and other local restrictions. Thick underbrush may require mechanical treatments prior to the use of herbicides.

- **Grazing**- Removing fuels by grazing relies on the consumption of plants by animals. Various types of livestock are used in this way across the state, including Johnson County.

- **Prescribed Burning**- Prescribed or controlled, burning is the most commonly used tool for managing hazardous fuel buildups because of its relatively low cost per acre. Prescribed fire improves natural habitats and reduces heavy fuels. It is important to use a certified prescribe burn manager to improve fire safety and reduce smoke management issues.

Fuel breaks are most effective when placed along a natural fire break like a road. Choosing a site along a road also allows easy access for equipment. Regular maintenance of breaks increases their effectiveness in preventing wildfires. To maintain a fuel break, the use of herbicides as a follow up treatment to mulching will help reduce the amount of weed sprouts. Grazing is also an option to maintain a fuel break.

When creating a fuel break, these tips should be used:

- Follow a natural fire break or contour lines.
- Prune large trees to 10 feet from ground.
- Remove ladder fuels such as tall brush and small trees.
- Thin trees to create a crown spacing of 25 to 30 feet.
- Break up thick areas of brush.
- Maintain a minimum wiDeath of 60 feet on flat land and 100 feet on slopes.

A **fire break** is a break in vegetation. In some cases, it may be a gravel road, a river, or a clearing made by a bulldozer. A 'green' fire break uses grasses with high moisture content, such as winter rye or winter wheat to provide a break in the continuity of the fuel. If wide enough, a fire break will stop the spread of direct flame. However, embers can still be lofted into the air and travel across the line.

Considering the various types of fuel and fire breaks, the participating jurisdictions who have identified wildfires as a threat have listed wildfire mitigation actions in Chapter 4, along with actions for all the other identified hazards.

Seventeen years of historic fire report data was used to create the Fire Occurrence Summary Chart below. Data was obtained from state and local fire department report data sources for the years 2005 to 2021.

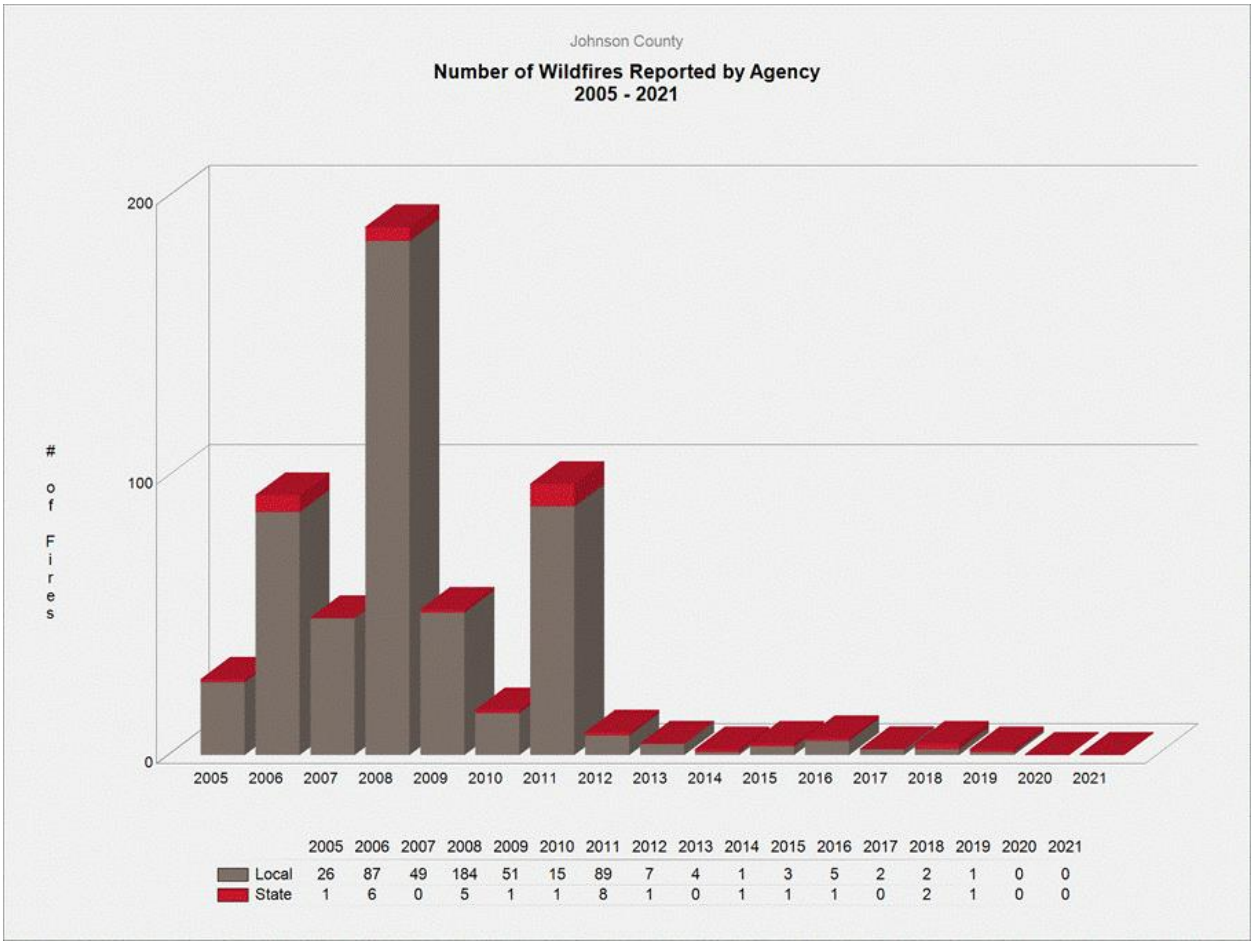
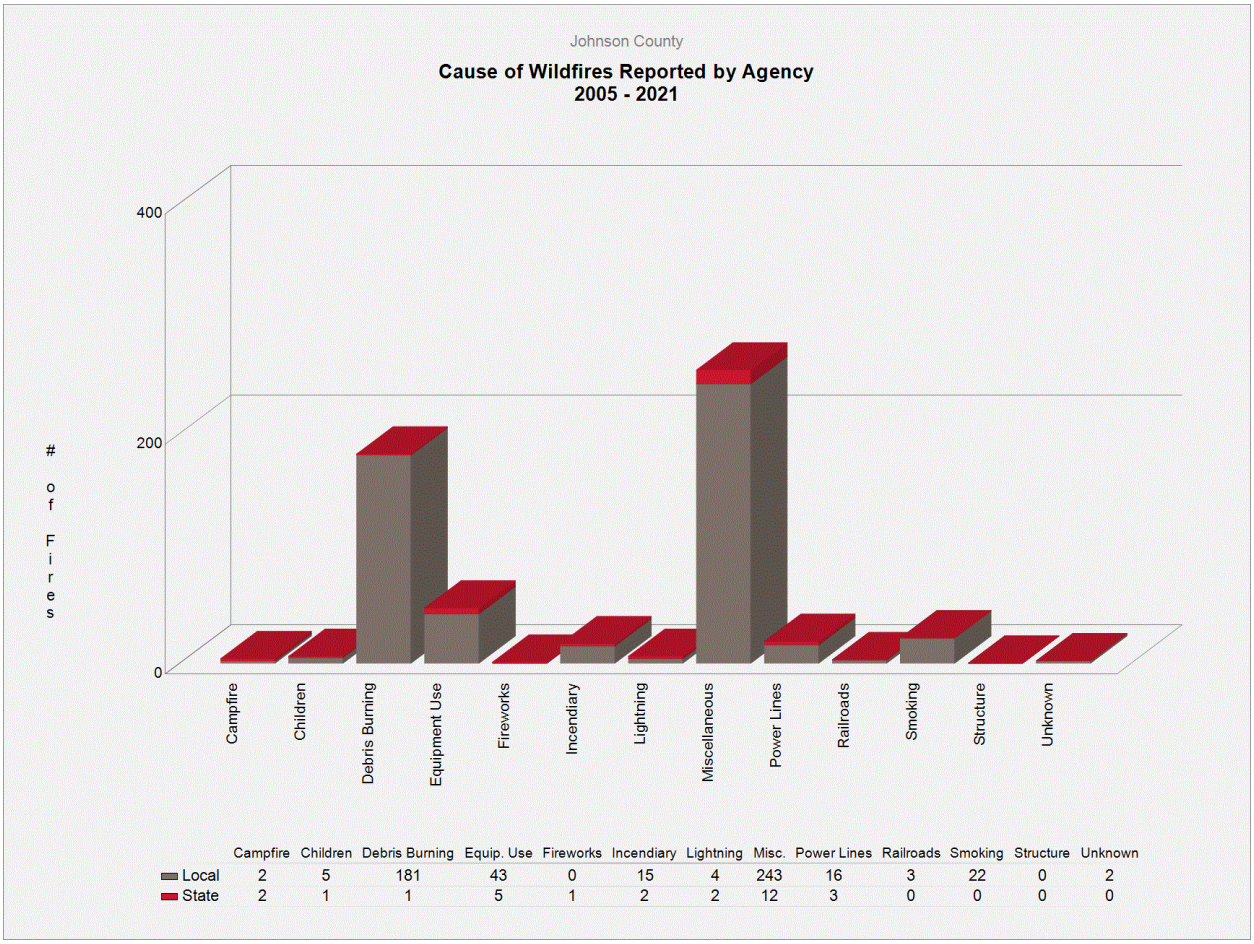


Figure 30: 2005-2021 Fire Occurrence Summary Chart

Debris burning, equipment use, and miscellaneous were the three primary causes of wildfires, with over 200 fires started by each (see Figure 31).



	Campfire	Children	Debris Burning	Equip. Use	Fireworks	Incendiary	Lightning	Misc.	Power Lines	Railroads	Smoking	Structure	Unknown
Local	2	5	181	43	0	15	4	243	16	3	22	0	2
State	2	1	1	5	1	2	2	12	3	0	0	0	0

Figure 31: Cause of Fires

We can determine the possibility of wildfires by looking at Wildfire Threat in Figure 32. Wildfire Threat is the likelihood of a wildfire occurring or burning into an area. Threat is derived by combining several landscape characteristics including surface fuels and canopy fuels, resultant fire behavior, historical fire occurrence, percentile weather derived from historical weather observations, and terrain conditions. These inputs are combined using analysis techniques based on established fire science.

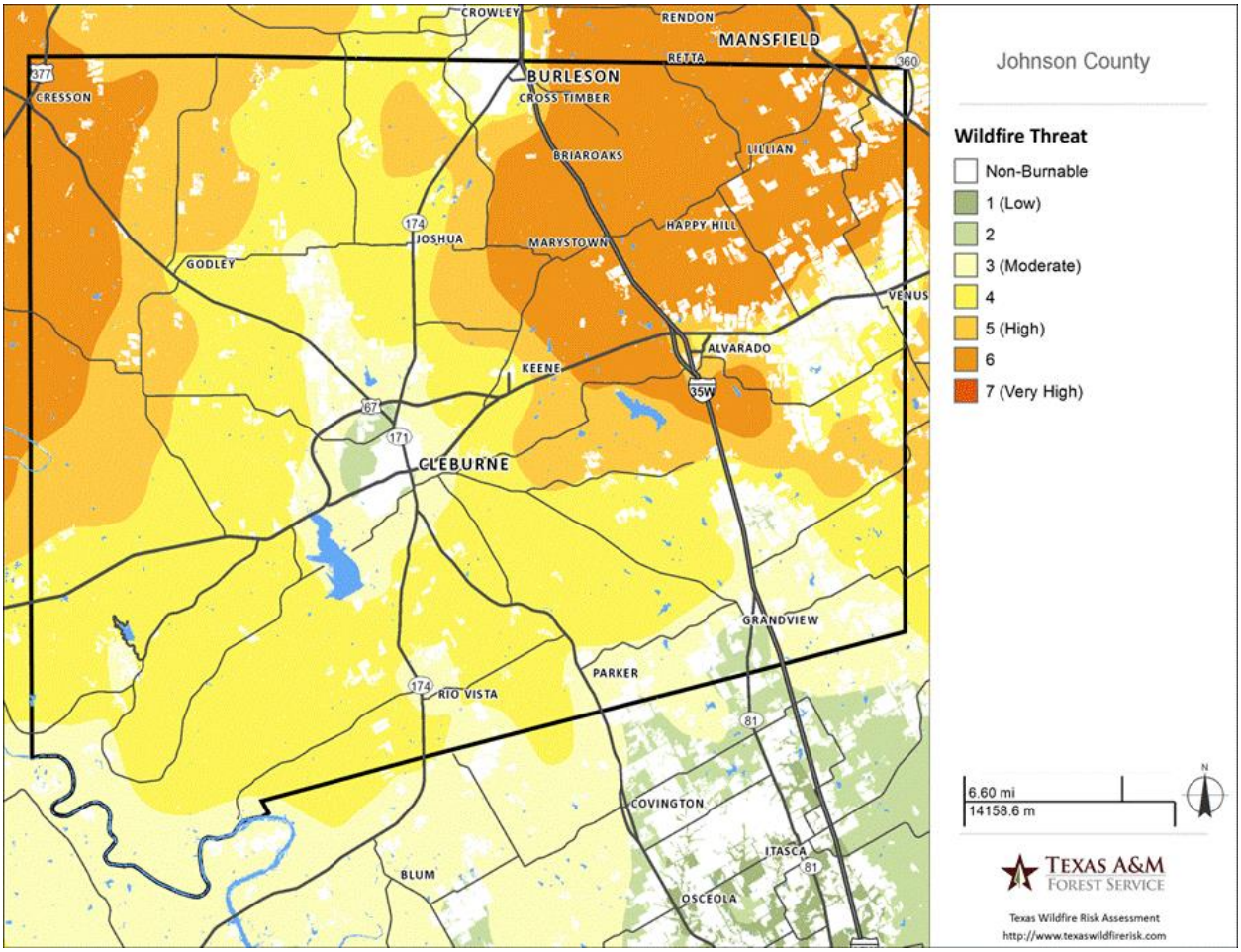


Figure 32: Wildfire Threat

The following maps show a more detailed outlook at the Wildfire Threat for each participating jurisdiction.

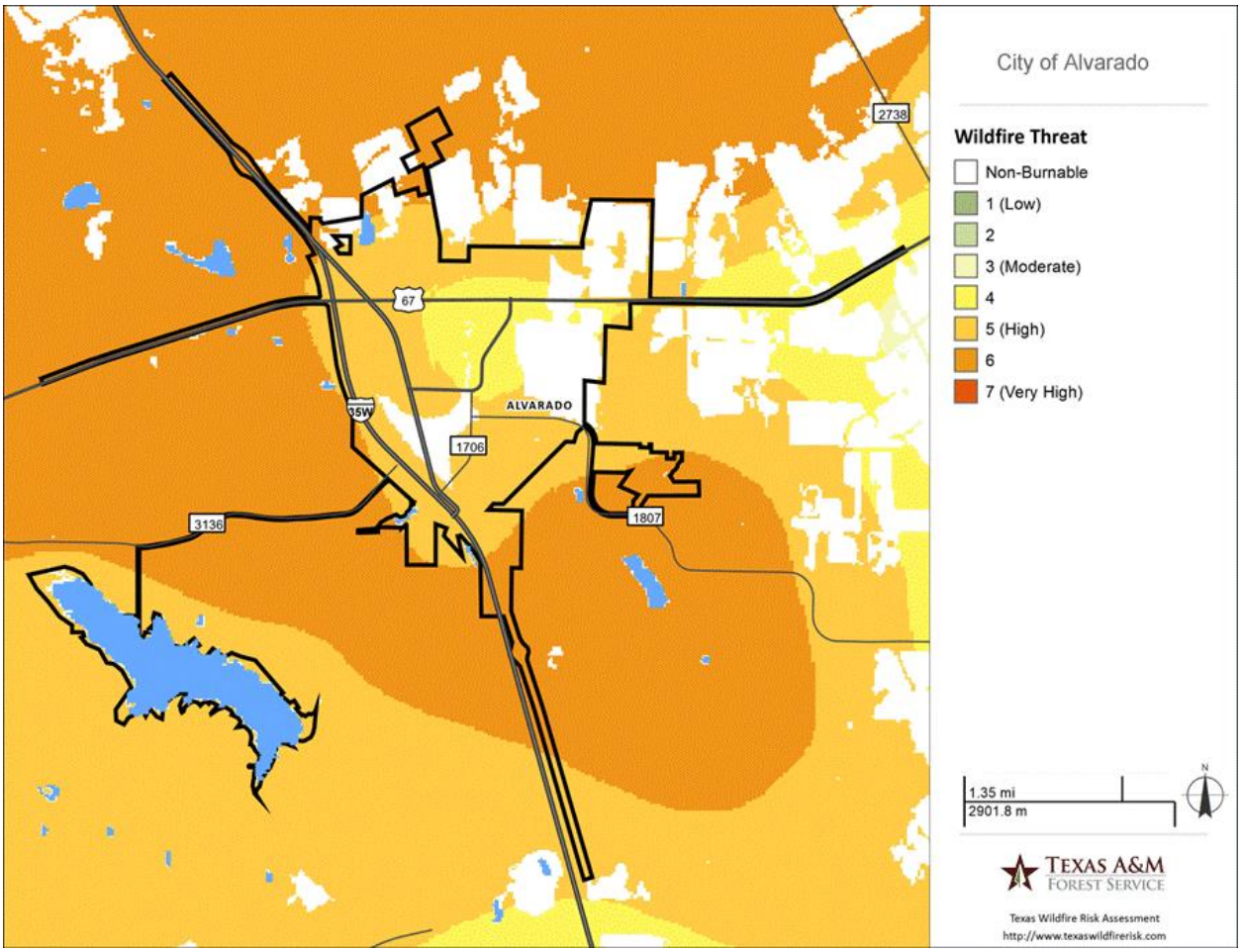


Figure 33: Alvarado Wildfire Threat

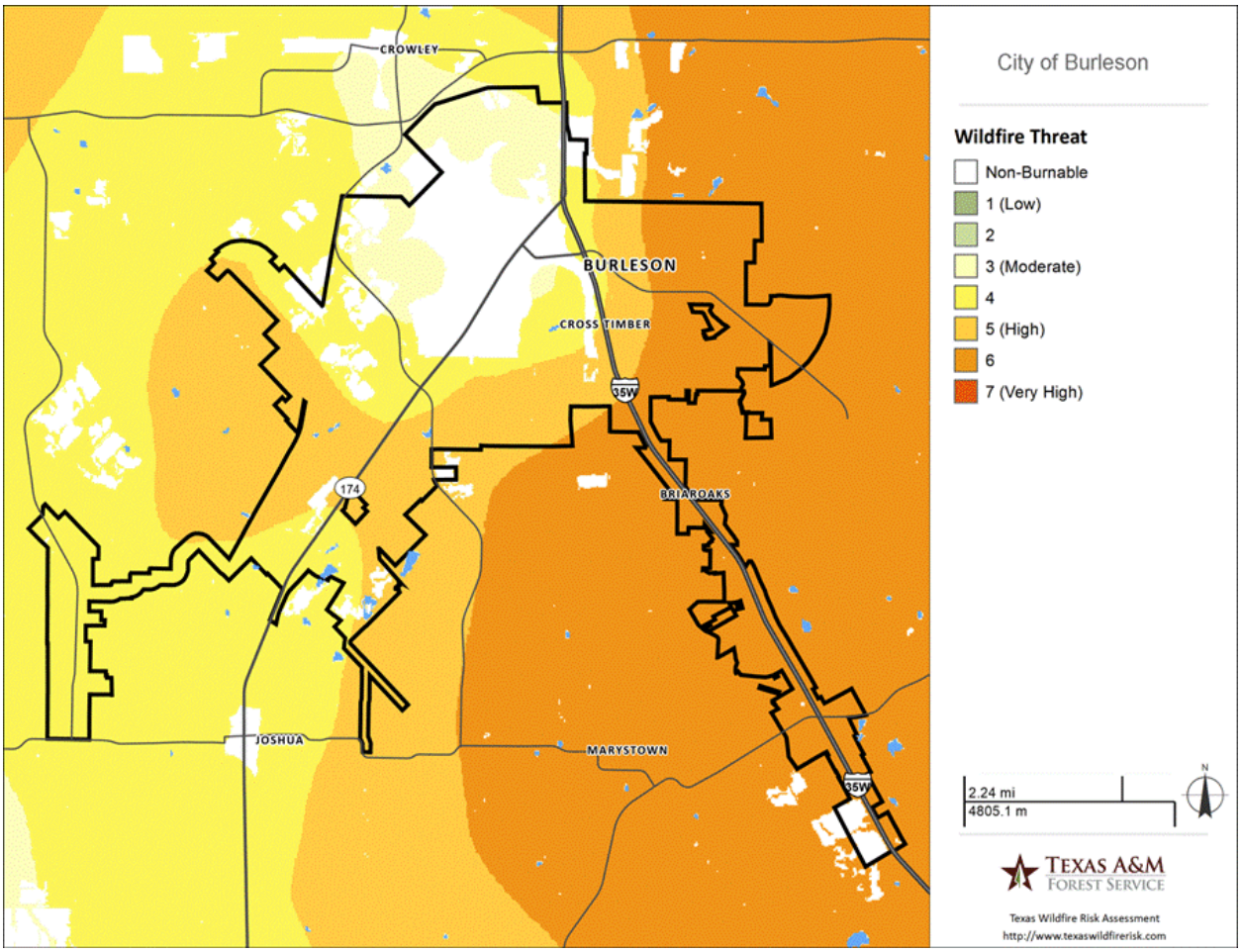


Figure 34: Burleson Wildfire Threat

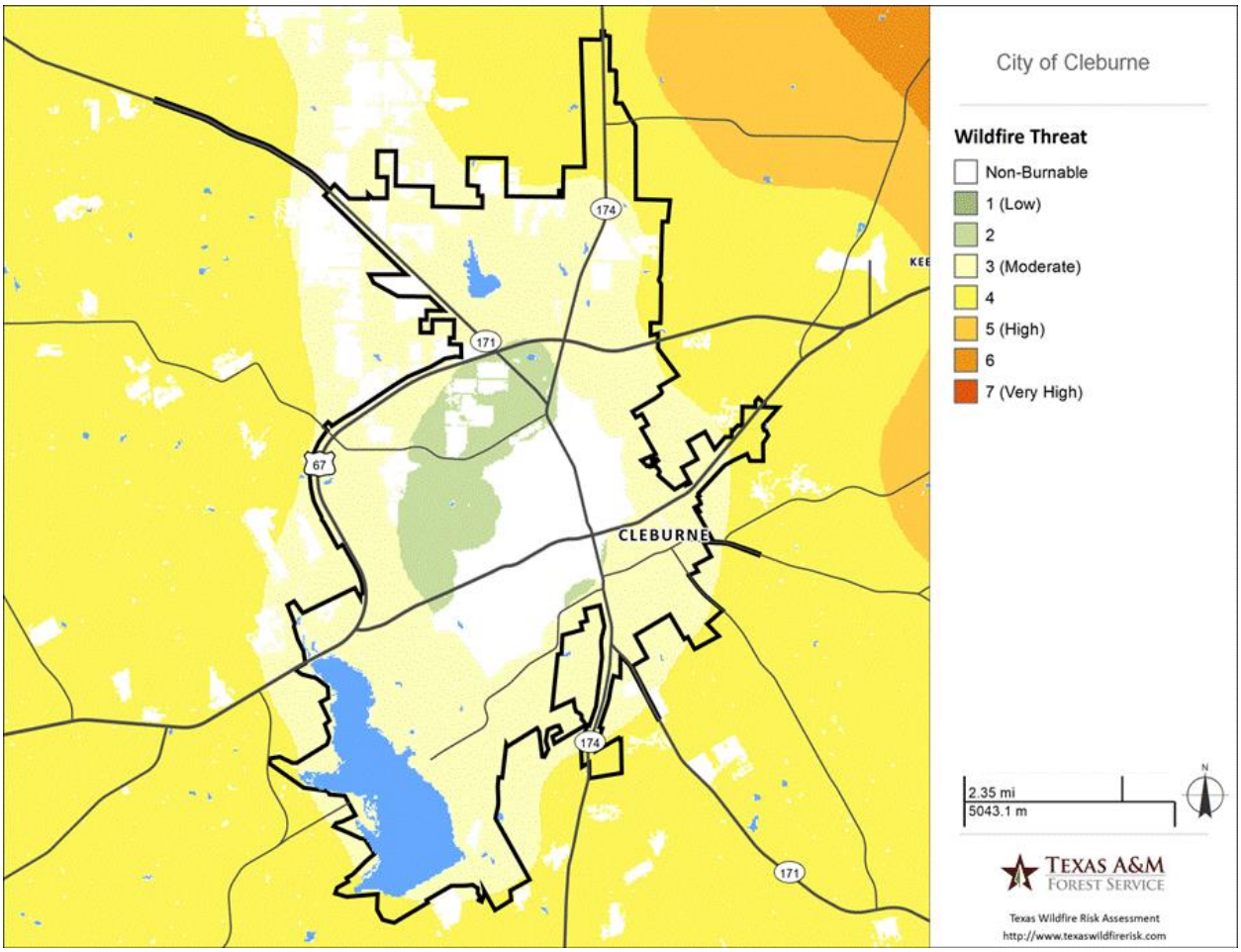


Figure 35: Cleburne Wildfire Threat

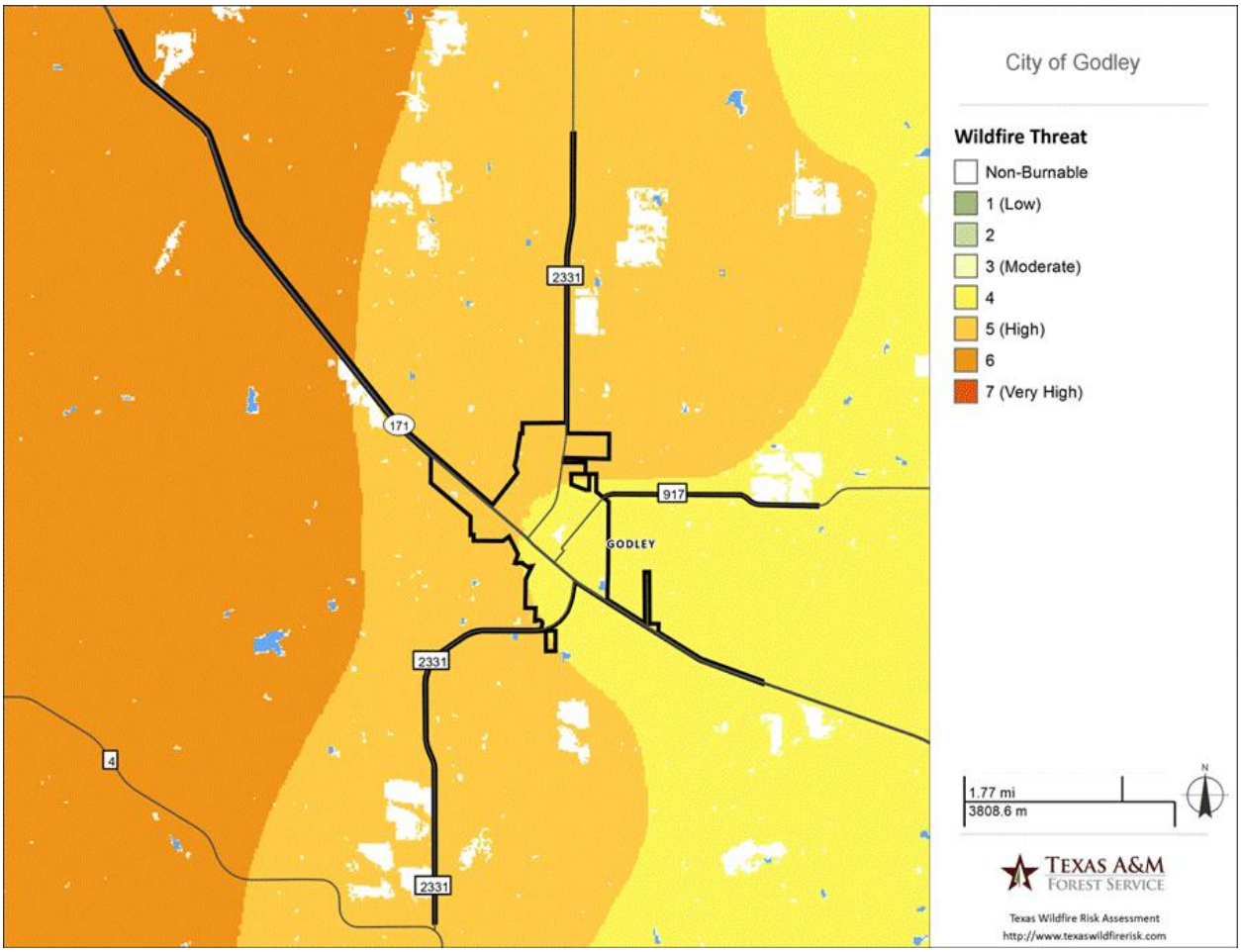


Figure 36: Godley Wildfire Threat

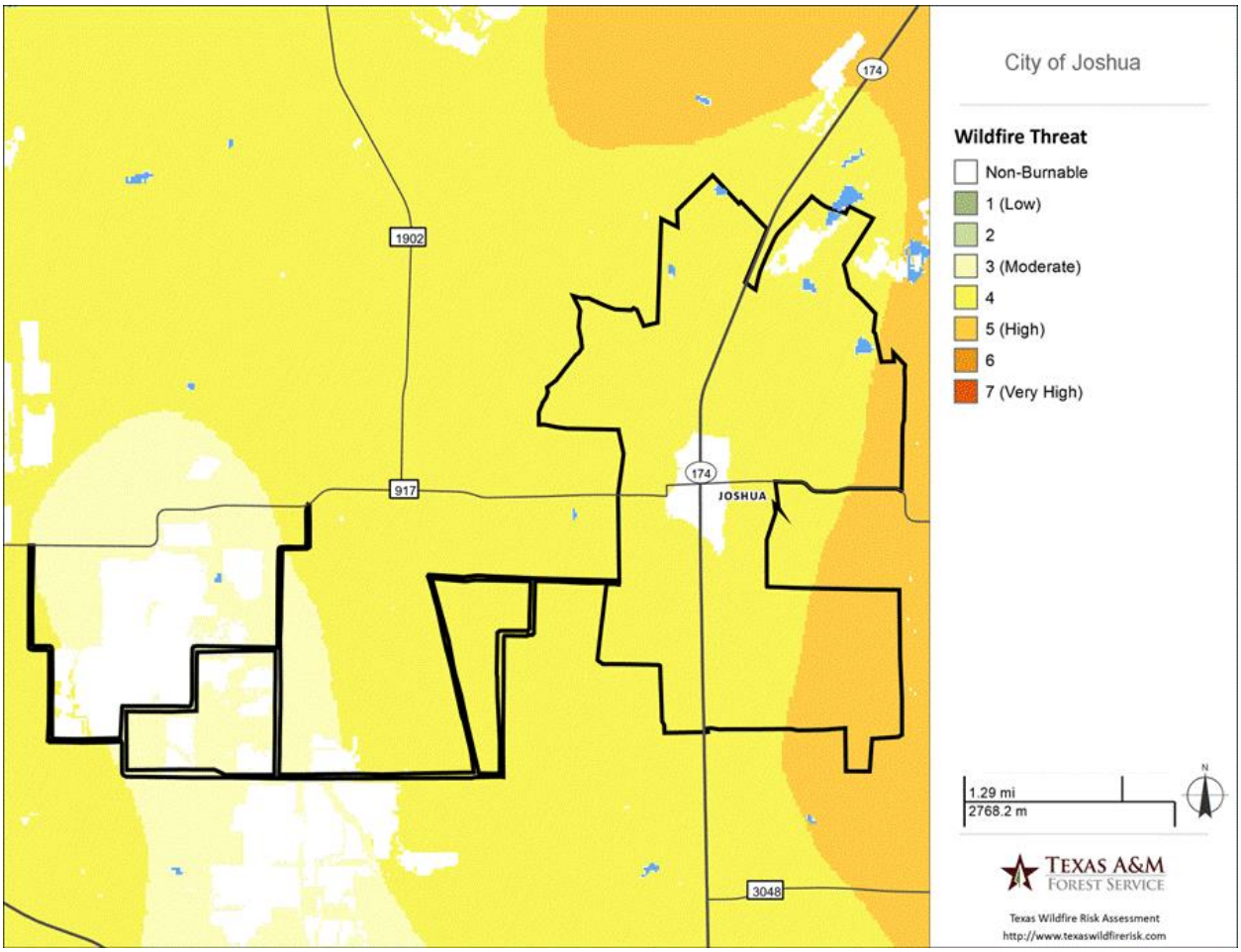


Figure 37: Joshua Wildfire Threat

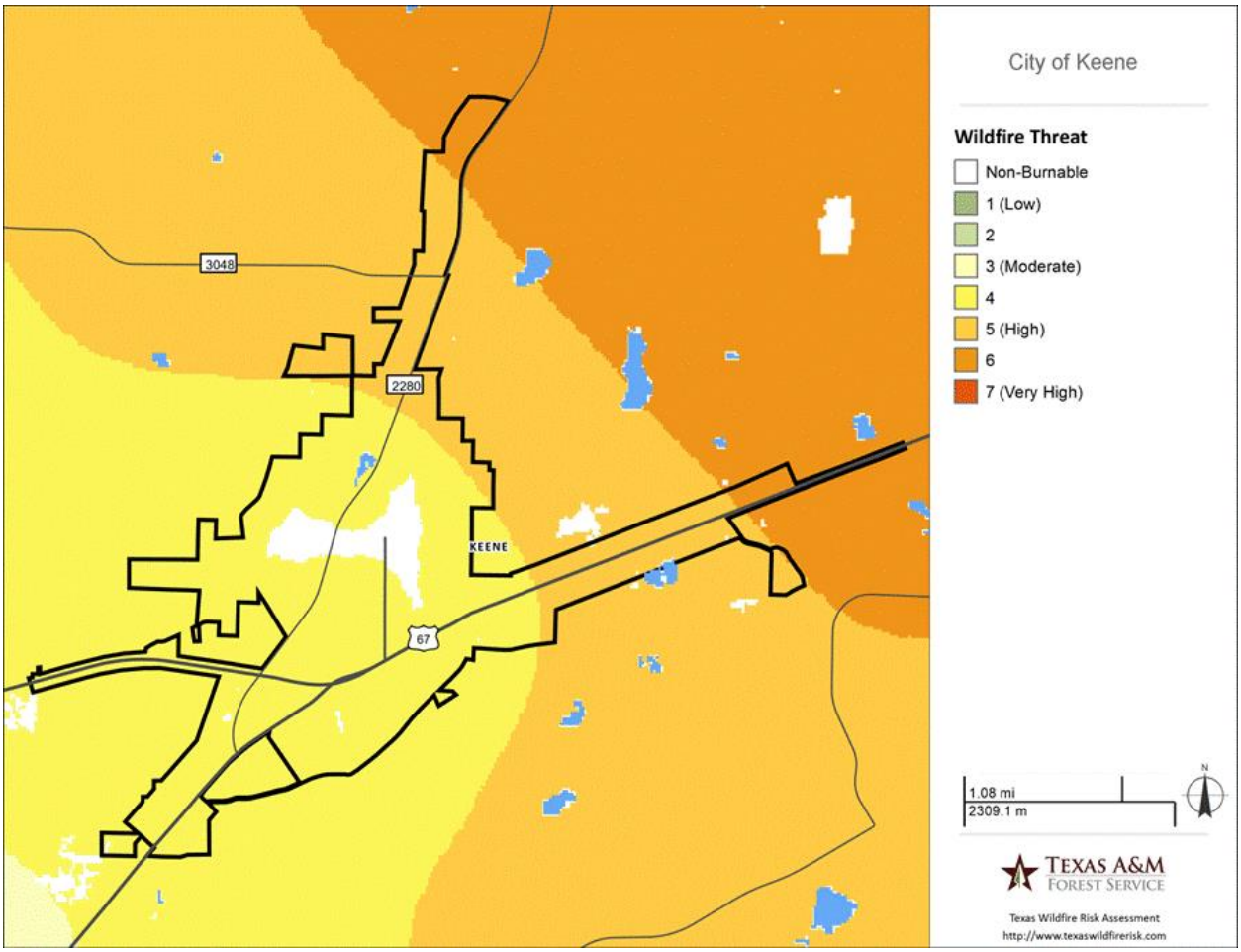


Figure 38: Keene Wildfire Threat

Hazard Summary

The following table reflects the profile summary for wildfires within the planning area.

Table 26: Wildfire Profile Summary

Wildfires				
Jurisdiction	**Location**	**Probability of Future Events**	**Level of Possible Damage**	**Maximum Probable Extent/Strength**
Alvarado	Significant	Highly Likely	Critical	Major
Burleson	Significant	Likely	Critical	Major
Cleburne	Significant	Likely	Critical	Major
Godley	Extensive	Likely	Critical	Major
Joshua	Extensive	Likely	Critical	Major
Keene	Extensive	Likely	Critical	Major
Johnson County Unincorporated	Significant	Highly Likely	Critical	Major

3.2.9 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. The timeframe of most winter weather is expected to be during the winter season, between November and March.

Winter storms affect the entire planning area equally.

The National Weather Service now uses the Winter Storm Severity Index (WSSI) (Figure 39) to forecast potential impacts of winter storms. The WSSI provides a classification of the overall expected severity of winter weather using the following terminology: “Minor,” “Moderate,” “Major,” and “Extreme.” The “Winter Weather Area” pertains to areas where winter weather conditions are expected, but are not anticipated to impact daily life. The WSSI consists of a series of component algorithms, each of which use meteorological and non-meteorological data to model predicted severity of six specific characteristics of winter weather. Each of the components produce a 0 to 5 output scale value that equates to the potential severity based on the winter weather hazards (0 = no winter weather, 1 = winter weather area, 2 = minor, 3 = moderate, 4 = major, and 5 = extreme). The final WSSI value is the maximum value from all the sub-components. The 4 impact levels are given the following descriptors: Minor, Moderate, Major, and Extreme.

The six sub-components of the WSSI are:

- Snow Load Index
    - Indicates potential infrastructure impacts due to the weight of the snow. This index accounts for the land cover type. For example, more forested and urban areas will show increased severity versus the same snow conditions in grasslands.
- Snow Amount Index
    - Indicates potential impacts due to the total amount of snow or the snow accumulation rate. This index also normalizes for climatology, such that regions of the country that experience, on average, less snowfall will show a higher level of severity for the same amount of snow that is forecast across a region that experiences more snowfall on average. Designated urban areas are also weighted a little more than non-urban areas.
- Ice Accumulation
    - Indicates potential infrastructure impacts (e.g. roads/bridges) due to combined effects and severity of ice and wind. Designated urban areas are also weighted a little more than non-urban areas. Please note that not all NWS offices provide ice accumulation information into the National Digital Forecast Database (NDFD). In those areas, the ice accumulation is not calculated.
- Blowing Snow Index
    - Indicates the potential disruption due to blowing and drifting snow. This index accounts for land use type. For example, more densely forested areas will show less blowing snow than open grassland areas.

- Flash Freeze Index
    - Indicates the potential impacts of flash freezing (temperatures starting above freezing and quickly dropping below freezing) during or after precipitation events.
- Ground Blizzard
    - Indicates the potential travel-related impacts of strong winds interacting with pre-existing snow cover. This is the only sub-component that does not require snow to be forecast in order for calculations to be made. The NWS National Operational Hydrologic Remote Sensing Center (NOHRSC) snow cover data along with forecast winds are used to model the ground blizzard. Adjustments are made based upon the land cover type. For example, heavily forested areas will have a lower ground blizzard severity than the same conditions occurring across open areas.

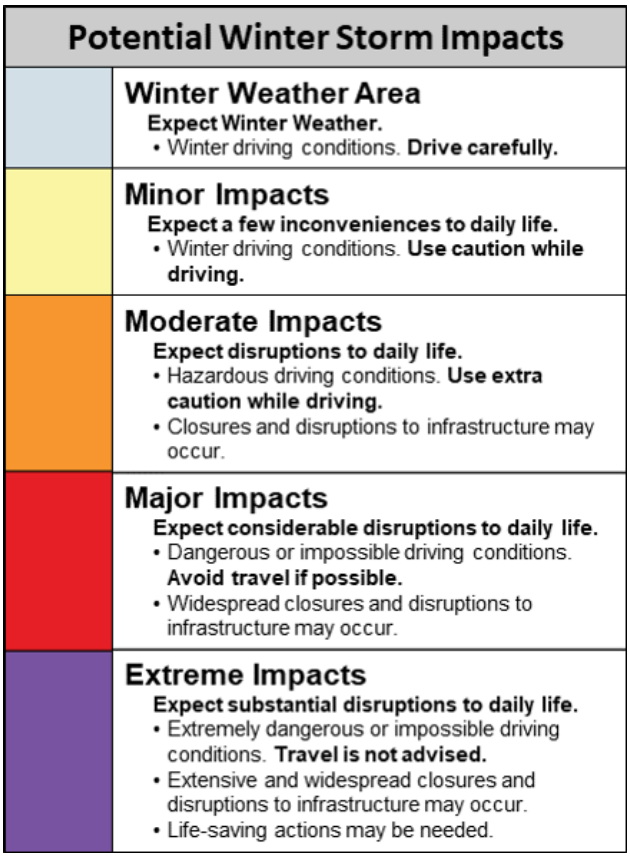


Figure 39: WSSI Impact Scale with Descriptions

The planning team compared the WSSI and the Sperry–Piltz Ice Accumulation Index to determine the maximum potential extent for winter storms.

During periods of extreme cold and freezing temperatures, water pipes can freeze and crack, roads and bridges can become unpassable, and critical services could be paralyzed. Ice can build up, causing power lines to break under the weight or causing tree limbs to fall on the lines. These events can disrupt electric service for long periods of time. Potential impacts from winter storms also include:

- Structure and infrastructure damage

- Injury or death
- Power outages
- Loss of ability to use roads for driving
- Increased traffic accidents
- Loss of heat
- Stranded travelers / motels at full capacity
- Tree debris create fuel load for fire hazard
- Delayed emergency response time
- Frozen/ busted pipes leading to loss of water
- Disruption of traffic
- Impacts to the economy
- Communication capabilities decrease

An economic impact may occur due to increased consumption of heating fuel, which can lead to energy shortages and higher prices. Schools often close when severe winter weather is forecasted, and it becomes a logistical burden for parents who then have to miss work or find alternative childcare. House fires and resulting deaths tend to occur more frequently from increased and improper use of alternate heating sources. Fires during winter storms also present a greater danger because water supplies may freeze and impede firefighting efforts.

An economic impact may occur due to increased consumption of heating fuel, which can lead to energy shortages and higher prices. Schools often close when severe winter weather is forecasted, and it becomes a logistical burden for parents who then have to miss work or find alternative childcare. House fires and resulting deaths tend to occur more frequently from increased and improper use of alternate heating sources. Fires during winter storms also present a greater danger because water supplies may freeze and impede firefighting efforts.

One of the most recent disaster declarations in the County, and the whole State, was for a winter storm. Johnson County was a designated county for Individual Assistance AND Public Assistance Category B. As a result of the disaster, lawmakers passed a sweeping piece of legislation to require power plants to "weatherize" their facilities against extreme weather conditions. They left the details of how to do that up to the Public Utility Commission of Texas, which regulates utilities and is designing the weatherization requirements for power plants, and the Texas Railroad Commission, which regulates the state's oil and gas industry."[16]

Disaster	Event	Incident Period	Declared
DR-4586	Texas Severe Winter Storms	February 11-21, 2021	February 19, 2021

DR-4586 showed how the effect of no power resulted in lack of heat and lack of water, causing hypothermia and death in many vulnerable populations.

[16] By Erin Douglas, The Texas Tribune. https://www.texastribune.org/2021/10/21/texas-power-companies-winter-weather-rule/

The following table lists the historical winter storm events and impacts in Johnson County from 2012-2021 recorded by the National Weather Service.

Table 27: Historical Events- Winter Storms

Location	Date	Type	Death	Injury	Property Damage	Crop Damage
JOHNSON (ZONE)	12/5/2013	Winter Storm	0	0	400.00K	0.00K
JOHNSON (ZONE)	2/22/2015	Winter Storm	0	0	6.00K	0.00K
JOHNSON (ZONE)	12/7/2017	Winter Weather	0	0	0.00K	0.00K
JOHNSON (ZONE)	2/11/2018	Winter Weather	0	0	0.00K	0.00K
JOHNSON (ZONE)	2/13/2021	Winter Storm	0	0	0.00K	0.00K

The Event Narrative for the 2013 Winter Storm that caused an estimated $400K in property damage reported that many tree branches were broken and power lines were knocked down due to the weight of the ice. The Burleson police reported 65 minor vehicle accidents and 3 major accidents.[17]

Hazard Summary

The following table reflects the profile summary for winter storms within the planning area.

Table 28: Winter Storm Profile Summary

Winter Storms				
Jurisdiction	**Location**	**Probability of Future Events**	**Level of Possible Damage**	**Maximum Probable Extent/Strength**
Alvarado	Extensive	Likely	Critical	Medium
Burleson	Extensive	Likely	Critical	Medium
Cleburne	Extensive	Likely	Critical	Medium
Godley	Extensive	Likely	Critical	Medium
Joshua	Extensive	Likely	Critical	Medium
Keene	Extensive	Likely	Catastrophic	Major
Johnson County Unincorporated	Extensive	Likely	Critical	Major

[17] Storm Events Database - Event Details | National Centers for Environmental Information (noaa.gov)

3.3 Assets

The following information is an overview of assets within the planning that could be negatively impacted by the identified hazards. Community assets include people, the built environment, economic assets, and the natural environment.

3.3.1 People

According to the Census Reporter, in 2021 it was estimated that 195,506 people resided within the 725 square miles of Johnson County. The following figure further breaks out the demographics of the County.

Figure 40: Johnson County Demographics[18]

The following table provides population and demographic information from the Census Reporter for the participating municipalities.

Table 29: City Demographics

Jurisdiction	2021 Population	Median Age	Sex		Race & Ethnicity							
			Male	Female	White	Black	Native	Asian	Islander	Other	Two +	Hispanic
Alvarado[19]	46,575	37.5	51%	49%	62%	6%	0%	1%	0%	0%	2%	29%
Burleson[20]	47,230	35.4	49%	51%	72%	5%	0%	2%	0%	0%	4%	16%
Cleburne[21]	30,984	35.6	52%	48%	60%	6%	0%	1%	0%	0%	2%	31%

[18] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Johnson County, TX* http://censusreporter.org/profiles/05000US48251-johnson-county-tx/
[19] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Alvarado, TX* http://censusreporter.org/profiles/16000US4802260-alvarado-tx/
[20] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Burleson, TX* http://censusreporter.org/profiles/16000US4811428-burleson-tx/
[21] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Cleburne, TX* http://censusreporter.org/profiles/16000US4815364-cleburne-tx/

Jurisdiction	2021 Population	Median Age	Sex		Race & Ethnicity							
			Male	Female	White	Black	Native	Asian	Islander	Other	Two +	Hispanic
Godley[22]	1,680	35.1	51%	49%	71%	1%	0%	0%	0%	0%	1%	26%
Joshua[23]	7,722	31.9	45%	55%	93%	0%	1%	0%	0%	0%	1%	6%
Keene[24]	6,346	30.2	45%	55%	87%	2%	1%	3%	0%	0%	5%	31%

3.3.2 Built Environment

If earthquakes, expansive soils, floods, thunderstorms, tornadoes, or winter storms occur with the maximum intensity predicted, the entire built environment and all structures could be impacted.

Drought would impact all water-related infrastructure listed and wildfire would impact facilities closest to an ignition source.

The 2021 property values documented by the Johnson County Appraisal District provide a picture of the values of structures in the County and the potential dollar loss if a catastrophic event occurs.

[22] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Godley, TX* http://censusreporter.org/profiles/16000US4829972-godley-tx/

[23] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Joshua, TX* <http://censusreporter.org/profiles/16000US4838080-joshua-tx/>

[24] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Keene, TX* http://censusreporter.org/profiles/16000US4838548-keene-tx/

2021 PROPERTY VALUES					
TAX ENTITIES	TOTAL VALUE LESS TOTAL EXEMPT	TAXABLE VALUE	M & O	I & S	TOTAL
Alvarado ISD	$2,351,791,603	$1,679,378,521	0.872000	0.500000	1.372000
Burleson ISD *	$4,872,614,239	$3,888,857,510	0.994600	0.500000	1.494600
Cleburne ISD	$4,278,737,338	$3,208,132,684	0.994200	0.454400	1.448600
Crowley ISD *	$90,622,913	$57,057,119	0.984100	0.500000	1.484100
Godley ISD *	$1,673,232,156	$1,058,584,798	0.992000	0.500000	1.492000
Granbury ISD *	$100,311,679	$81,245,447	0.943800	0.145000	1.088800
Grandview ISD *	$734,497,043	$420,835,872	0.872000	0.306100	1.178100
Joshua ISD	$2,848,853,357	$2,105,871,353	0.960300	0.329700	1.290000
Keene ISD	$268,532,116	$214,534,135	1.008700	0.222570	1.231270
Mansfield ISD *	$1,603,692,385	$1,287,678,316	1.058300	0.360000	1.418300
Rio Vista ISD *	$586,868,461	$371,339,697	0.967200	0.355790	1.322990
Venus ISD	$732,571,607	$510,548,036	0.953500	0.430000	1.383500
Alvarado City	$474,205,022	$412,643,685	0.589013	0.223683	0.812696
Burleson City *	$4,196,686,573	$3,747,264,263	0.497400	0.188500	0.685900
Cleburne City	$3,018,292,434	$2,580,531,695	0.629748	0.060750	0.690498
Crowley City *	$3,190,135	$2,924,637	0.526103	0.203442	0.729545
Godley City	$188,795,845	$169,064,477	0.490390	0.000000	0.490390
Grandview City	$121,897,646	$106,604,452	0.465969	0.294597	0.760566
Joshua City	$606,831,947	$494,232,796	0.535994	0.175499	0.711493
Keene City	$335,531,191	$301,484,923	0.747134	0.097000	0.844134
Mansfield City *	$1,149,951,451	$946,168,300	0.465001	0.224999	0.690000
Rio Vista City	$56,180,150	$53,638,657	0.388269	0.114472	0.502741
Venus City *	$266,390,708	$246,989,608	0.628408	0.178816	0.807224
Johnson County	$20,160,025,375	$15,810,596,892	0.370153	0.009547	0.379700
Johnson Cty Lat Rd	$20,160,025,375	$16,038,477,246	0.040300	0.000000	0.040300
Emergency Service Dist. 1	$11,785,188,872	$8,793,946,117	0.060000	0.000000	0.060000
Hill College Alvarado	$2,351,791,603	$1,796,780,480	0.050000	0.000000	0.050000
Hill College Cleburne	$4,278,737,338	$3,390,173,740	0.050000	0.000000	0.050000
Hill College Godley	$1,673,232,156	$1,097,115,974	0.026092	0.000000	0.026092
Hill College Grandview *	$734,497,043	$443,971,974	0.050000	0.000000	0.050000
Hill College Joshua	$2,848,853,357	$2,194,938,291	0.049928	0.000000	0.049928
Hill College Keene	$268,532,116	$226,368,673	0.049548	0.000000	0.049548
Hill College Rio Vista *	$586,868,461	$389,575,572	0.033478	0.000000	0.033478
Hill College Venus	$732,571,607	$546,346,259	0.047245	0.000000	0.047245

* Johnson County Portion

Based on 2021 Certified Values

Figure 41: 2021 Property Values

Critical Facilities & Infrastructure

Critical facilities and infrastructure provide services and functions essential to a community, especially during and after a disaster. For a critical facility to function, building systems and equipment must remain operational. Furthermore, it must be supplied with essential utilities (typically power, water, waste disposal, and communications, but occasionally natural gas and steam).

When critical infrastructure fails, it becomes nearly impossible to aid those who lack the means of evacuating on their own. This results in rescue operations that take longer to plan and execute and pose increased risks to first responders and residents due to the lack of information on the number of affected residents or the location of those who need additional assistance.

Resilience Analysis and Planning Tool Generation

The Planning Team used FEMA's Resilience Analysis and Planning Tool (RAPT) to generate an inventory of the critical facilities within the jurisdictions.

Table 30: Fire Stations

NAME	ADDRESS	CITY
Blue Water Oaks Volunteer Fire Department	295 Chambers Drive	Alvarado
Alvarado Volunteer Fire Department	205 South Friou Street	Alvarado
Briaroaks Volunteer Fire Station	515 Ward Lane	Burleson
Burleson Fire Department Station 2	650 Memorial Plaza	Burleson
Burleson Fire Department Station 1	828 Southwest Alsbury Boulevard	Burleson
Cleburne Fire Department and Ambulance Station 1	801 East Henderson Street	Cleburne
Liberty Chapel Volunteer Fire Department	3336 County Road 312	Cleburne
Cleburne Fire Department and Ambulance Station 3	901 West Kilpatrick Avenue	Cleburne
Cleburne Fire Department and Ambulance Station 2	606 South Nolan River Road	Cleburne
Bono Volunteer Fire Department	5536 US Highway 67 West	Cleburne
Godley Fire Department	200 South Main Street	Godley
Mid North Johnson County Fire Department	6317 Sky Road	Godley
Joshua Fire Department	770 North Main Street	Joshua
Keene Fire Rescue	213 West Hillcrest Street	Keene

Table 31: Local Law Enforcement Locations

Name	Address	City	Type
Alvarado Police Department	104 West College Street	Alvarado	Local Police Department
Burleson Police Department	225 West Renfro Street	Burleson	Local Police Department
Burleson Fire Marshals Office	141 West Renfro Street	Burleson	Constable/Marshal
Cleburne Police Department	302 West Henderson Street	Cleburne	Local Police Department
Johnson County Sheriff's Office	1102 East Kilpatrick Street	Cleburne	Sheriff's Office
Texas Department of Public Safety - Highway Patrol Region 6 District A Sergeant 0 Area 5	600 West Kilpatrick Street	Cleburne	Primary State Agency
Godley Police Department	125-A South Main Street	Godley	Local Police Department
Joshua Police Department	102 South Main Street	Joshua	Local Police Department
Keene Police Department	213 West Hillcrest Street	Keene	Local Police Department

Table 32: Mobile Home Parks

Name	Address	City	Type	Size
Not Available	99 Breezy Meadows Ln	Alvarado	Mobile Home Park	Small (<50)
Not Available	300 I 35-Br	Alvarado	Mobile Home Park	Small (<50)
Not Available	8031 Lopez Dr	Alvarado	Mobile Home Park	Small (<50)
Not Available	1118 Wildwood Dr	Alvarado	Mobile Home Park	Medium (51-100)
Walnut Creek MHP	3600 County Road 600	Alvarado	Mobile Home Park	Medium (51-100)
Not Available	4617 County Road 616	Alvarado	Mobile Home Park	Small (<50)
Oakridge Square MHP	248 East Bethesda Road	Burleson	Mobile Home Park	Medium (51-100)
Not Available	2335 I 35w N	Burleson	Recreational Vehicle Park	Medium (51-100)
Not Available	2307 I 35w N	Burleson	Recreational Vehicle Park	Medium (51-100)
Williams Trailer Park	2050 South Burleson Boulevard	Burleson	Mobile Home Park	Medium (51-100)
Little Corral MHP	2000 S Burleson Blvd	Burleson	Mobile Home Park	Small (<50)
Mockingbird Hill Mobile Home	1990 South Burleson Boulevard	Burleson	Mobile Home Park	Medium (51-100)
Not Available	9625 County Road 528	Burleson	Mobile Home Park	Small (<50)
Not Available	209 Cr 316a	Cleburne	Mobile Home Park	Small (<50)
Not Available	1905 E Henderson St	Cleburne	Mobile Home Park	Small (<50)
Not Available	2023 E Henderson St	Cleburne	Mobile Home Park	Small (<50)
Not Available	72 El Campo Rd	Cleburne	Mobile Home Park	Small (<50)
Not Available	2633 Us 67-Br	Cleburne	Mobile Home Park	Small (<50)
Not Available	112 W Kilpatrick Ave	Cleburne	Mobile Home Park	Medium (51-100)
Not Available	3010 Tx 174	Cleburne	Mobile Home Park	Small (<50)
Not Available	3901 County Road 317	Cleburne	Mobile Home Park	Small (<50)
North Park	800 Old Betsy Rd	Cleburne	Mobile Home Park	Small (<50)
Not Available	4208 Us 67	Cleburne	Mobile Home Park	Small (<50)
Not Available	4208 Us 67	Cleburne	Mobile Home Park	Small (<50)
Not Available	817 Barnes Rd	Cleburne	Mobile Home Park	Small (<50)
Not Available	3309 Fm 2280	Cleburne	Mobile Home Park	Medium (51-100)
Not Available	4801 W Country Rd	Cleburne	Mobile Home Park	Small (<50)
Not Available	112 W Links Dr	Godley	Mobile Home Park	Small (<50)
Not Available	5864 Blackburn Dr	Joshua	Mobile Home Park	Small (<50)
4-J Mobile Home Park	N Main St	Joshua	Mobile Home Park	Small (<50)
Joshua Ranchettes	811 Ranchette Drive	Joshua	Mobile Home Park	Medium (51-100)

Name	Address	City	Type	Size
Not Available	6128 Cr 1022	Joshua	Mobile Home Park	Small (<50)
Timber Ridge Mobile Home Park	398 Gregory St	Joshua	Mobile Home Park	Small (<50)
Pecan Village Mobile Home Park	88 Oak Hill Dr	Joshua	Mobile Home Park	Medium (51-100)
Oak Hill MHP	229 Oak Hill Drive #100	Joshua	Mobile Home Park	Small (<50)
Ranches Of Joshua MHP	424 N Broadway Street	Joshua	Mobile Home Park	Small (<50)
Western Inn Mobile Home Park	Western Inn Mobile Home Park	Joshua	Mobile Home Park	Medium (51-100)
Not Available	7112 Walden Dr	Joshua	Mobile Home Park	Medium (51-100)
Not Available	31 Lee St	Keene	Mobile Home Park	Medium (51-100)
Not Available	29 Blue Star Dr	Keene	Recreational Vehicle Park	Medium (51-100)
Not Available	311 Stoner Way	Keene	Recreational Vehicle Park	Large (>100)
Not Available	612 Iowa St	Keene	Mobile Home Park	Medium (51-100)
Not Available	109 Stoner Way	Keene	Mobile Home Park	Small (<50)
Not Available	122 Us 67	Keene	Mobile Home Park	Small (<50)
Not Available	410 N Fairview St	Keene	Mobile Home Park	Small (<50)
Happy Hollow	511 East Oakdale Street	Keene	Mobile Home Park	Medium (51-100)

Table 33: Nursing Homes

Name	Address	City
Alvarado LTC Partners Inc	101 N Parkway	Alvarado
Advanced Rehabilitation & Healthcare of Burleson	275 Se John Jones Drive	Burleson
Elk Creek Senior Living Community	301 Elk Drive	Burleson
Burleson Nursing and Rehabilitation Center	600 Maple Ave.	Burleson
Mustang Creek Estates Burleson House A	1155 NW John Jones Drive	Burleson
Mustang Creek Estates Burleson House C&D	1155 NW John Jones Drive	Burleson
Mustang Creek Estates Burleson House F	1155 John Jones Drive	Burleson
Mustang Creek Estates Burleson House B	1155 NW John Jones Drive	Burleson
Mustang Creek Estates Burleson House E	1155 NW John Jones Drive	Burleson
Wren House	814 Woodard Ave	Cleburne
Heritage Trails Nursing and Rehabilitation Center	301 Lincoln Park Dr	Cleburne
Colonial Manor Nursing Center	2035 N Granbury St	Cleburne
Santa Fe Trails Assisted Living and Memory Care Community	402 Colonial Dr	Cleburne
Ridgeview Rehabilitation and Skilled Nursing	206 Walls Dr	Cleburne
Heartis Cleburne	902 Walter Holiday Drive	Cleburne

Name	Address	City
The Gardens at Chisholm Trail	513 Old Betsy Rd.	Keene
Town Hall Estates Keene Inc	207 S Old Betsy Rd	Keene

Table 34: Places of Worship

Name	Street	City
Five Points Church	5525 E Highway 67	Alvarado
Alvarado Worship Center	Po Box 313	Alvarado
I-35 Church of Christ	Po Box 1269	Alvarado
Paula Rayburn Ministries	Po Box 12	Alvarado
Valley Educational Foundation Inc	Po Box 800	Alvarado
Cedar Cross Country Church	4664 S Ih - 35w	Alvarado
Texas Conference of Seventh Day Adventists	Po Box 800	Alvarado
Alvarado New Life Ministries Inc	Po Box 488	Alvarado
Church of God	Po Box 1095	Alvarado
Episcopal Diocese of Fort Worth	Po Box 447	Alvarado
Living Word Baptist Church	Po Box 1857	Alvarado
Shepherds Valley Cowboy Church	8901 E Highway 67	Alvarado
David Salinas Ministries Inc	8625 Marthas Way	Alvarado
San Gabriel Lutheran Church	4029 County Road 610	Alvarado
St Paul Missionary Baptist Church	Po Box 1481	Avarado
Mid Cities Family Baptist Church	3175 Collins Rd	Burleson
G B North Ministries International	2249 Etta Ln	Burleson
John Patton Ministries Intl	300 Emerald Ct	Burleson
New Life Christian Fellowship	167 Stella St	Burleson
Northpointe First Baptist Church	2450 SW Wilshire Blvd	Burleson
Bethesda Gospel Tabernacle Inc	2505 S I-35	Burleson
Vass Ministries of Burleson Texas	565 E Bethesda Rd	Burleson
Ken Dornhecker Ministries Inc	119 Woodbine Dr	Burleson
Recovery Impact	2716 Ranchview Dr	Burleson
Grace Church	880 W County Road 714	Burleson
Global Evangel Ministries	8612 Fm 1902	Burleson
Burleson Commons Church of Christ	305 Se John Jones Dr	Burleson
Brian Paul Jennings Project	233 Woodbine Dr	Burleson
Charity Lutheran Church	1101 SW Wilshire Blvd	Burleson
Charity Lutheran Preschool	1101 SW Wilshire Blvd	Burleson
Victory Family Church	455 NW John Jones Dr	Burleson
Fort Worth TX Group	218 NW Suzanne Ter	Burleson
By Grace International Inc	917 Monticello Dr	Burleson
Jeff A Grove Ministries	9001 County Road 1019	Burleson
Impact Family Church Burleson	1320 Gayle St	Burleson
Redemption Evangelical Church	621 SW Johnson Ave Ste B	Burleson

Name	Street	City
Cana Baptist Church	2309 E Renfro St	Burleson
Hallelujah Honduras Ministries	857 Huebner Way	Burleson
Amputee Basketball Invigorated	904 Willow Cir S	Burleson
Lifegate Assembly of God Church	601 SW Thomas St	Burleson
Student Discipleship Ministries	510 SW Wilshire Blvd	Burleson
National Fellowship of Ministries Inc	388 SW Johnson Ave	Burleson
National Fellowship of Ministries Inc	388 SW Johnson Ave	Burleson
Compassion In Action Inc	620 Gracie Ln	Burleson
Open Door Fellowship Ministries Inc	301 S Dobson St	Burleson
Spark Worldwide	301 S Dobson St	Burleson
Brazos Christian Church	939 Joshua Dr	Burleson
First Christian Church	Po Box 57	Burleson
Different World Christian Cathedral & Complex Inc	Po Box 2094	Burleson
Southwestern Union Conference of Seventh Day Adventists	Po Box 4000	Burleson
Southwest Estate Services Inc	Po Box 4000	Burleson
Lighthouse Church of Burleson	Po Box 1403	Burleson
Labor of Love Fellowship Church	Po Box 369	Burleson
Faith Christian Fellowship of Fort Worth	Po Box 983	Burleson
Faith Christian Fellowship of Fort Worth	Po Box 983	Burleson
Alliance of Free Grace Leaders Inc	Po Box 2439	Burleson
Hope For Albania Inc	Po Box 983	Burleson
Be Gotten by His Word Inc	Po Box 1761	Burleson
Word Of Life Church Center Inc	Po Box 517	Burleson
Dmitry Bodyu Ministries International Inc	Po Box 2121	Burleson
Burleson Church Of Christ Inc	1150 NW John Jones Dr	Burleson
Southwest Christian Fellowship Inc	251 Wilshire Blvd Ste 124 434	Burleson
Burleson Bible Church	260 S Hurst Rd	Burleson
Pathway Cumberland Presbyterian Church of Burleson	380 NW Tarrant Ave	Burleson
Tu Hieu Buddhist Temple	275 Fox Ln	Burleson
Burleson Church of The Nazarene	127 SW Thomas St	Burleson
3 King Ranch	124 N Dobson St	Burleson
Church of God Proclaiming the Kingdom Inc	845 NW Summercrest Blvd Apt A	Burleson
Faith To Faith Ministries	336 SW Rand Dr	Burleson
Bloodlove Worldwide	501 NW Renfro St	Burleson
Living Water Church of Burleson	342 SW Alsbury Blvd	Burleson
Crestmont Baptist Church of Burleson Texas Inc	640 NW Tarrant Ave	Burleson
Burleson Adventist School	1635 Fox Ln	Burleson
Victory Life Outreach	205 William Wallace Dr	Burleson
Rophe Ranches Inc	2724 Dave Angel Rd	Burleson

Name	Street	City
Prayer Chapel	1615 Fm 3136	Cleburne
Faith Fellowship of Cleburne Inc	1108 County Road 314	Cleburne
Christian Methodist Episcopal Church	507 Royal St	Cleburne
Royal Street Church of Christ Inc	505 Royal St	Cleburne
Emmanuel Temple Outreach Church	501 Robbins St	Cleburne
Centro Cristiano Bethel	1924 E Henderson St	Cleburne
Soldiers For Christ Chapter D	906 W Chambers	Cleburne
Cleburne Christian Center	104 S Robinson St	Cleburne
Episcopal Diocese of Fort Worth	209 E Wardville St	Cleburne
Little Church Fellowship	504 Chase Ave	Cleburne
Bridgeway Family Fellowship	504 Chase Ave	Cleburne
Iglesia Christiana El Camino	502 W Wardville St	Cleburne
Grace Worship Center	118 Williams Ave	Cleburne
Open Heart Ministries Inc of Cleburne Texas	801 Boone St	Cleburne
National Fellowship of Ministries Inc	1101 N Wilhite St	Cleburne
Full Gospel Pentecostal Church	1312 N Robinson St	Cleburne
Exodus Missions	3501 Fm 2415	Cleburne
Crossroads Church of Cleburne Texas	111 N Pendell Ave	Cleburne
Highpoint Church of God	Po Box 815	Cleburne
Gotel Ministries Inc	Po Box 655	Cleburne
Cleburne Bible Church	Po Box 1522	Cleburne
Clowns For Christ Incorporated	Po Box 643	Cleburne
Believers Word Center Incorporated	Po Box 79	Cleburne
Marshallese First Assembly	Po Box 1094	Cleburne
House Of Wisdom Inc	Po Box 2543	Cleburne
Zona Maya Mission Ministries	Po Box 487	Cleburne
Hill Church Cleburne	Po Box 3113	Cleburne
Compelling Church of Anointed Ministries	Po Box 654	Cleburne
Central Fellowship Church Incorporated	1509 County Road 700	Cleburne
Bethel Temple Assembly of God	600 S Colonial Dr	Cleburne
Cleburne Family Fellowship Ag	710 W Kilpatrick St	Cleburne
Cleburne Christian Business Club Inc	904 Jennifer Ct	Cleburne
Menorah Fellowship Church	1635 Robin Pl	Cleburne
Stonelake Church	1655 W Henderson St	Cleburne
First Christian Church	200 S Nolan River Rd	Cleburne
Hope Church of The Ag Of Cleburne	2125 N Nolan River Rd	Cleburne
Church Of St John Vianney Catholic Congregation Inc	501 N Nolan River Rd	Cleburne
Faith Temple Church Inc	1440 Kilpatrick Ct	Cleburne
Cleburne Adventist Christian School	111 Meadow View Dr	Cleburne
Peak Ministries Inc	3224 Dove Creek Rd	Cleburne
Vibrant Life Foundation Inc	1109 Snowberry St	Cleburne

Name	Street	City
Cherrywood Resources	910 W Bethesda Rd	Cleburne
Georges Creek Baptist Church	9901 W Highway 67	Cleburne
Corner Point Church	Po Box 241	Godley
Godley Church of Christ Inc	Po Box 6	Godley
Amandas Wishes	4609 Thomas Acres Rd	Joshua
Lane Prairie Baptist Church Inc	412 County Road 704	Joshua
Carpenters Church Of Joshua	1524 S Broadway St	Joshua
Race Track Chaplaincy Of Texas Inc	326 Eddy Ave	Joshua
TLC Ministries Inc	301 S Main St	Joshua
Ladies Praise	Po Box 784	Joshua
First Assembly of God	Po Box 543	Joshua
Joshua Adventist Multigrade School	Po Box 329	Joshua
Grace Connection Church Joshua	Po Box 838	Joshua
Covenant Church of Burleson	Po Box 95	Joshua
Hampton Evangelistic Assn	7001 Reservoir Rd	Joshua
Abundant Life Church Burleson	5821 Thousand Oaks Dr	Joshua
Joshua Baptist Church	3231 SW Wilshire Blvd	Joshua
Bible Talk Radio	1115 Honeysuckle Dr	Keene
Bible Clarity	1115 Honeysuckle Dr	Keene
Town Hall Estates-Keene Inc	207 S Old Betsy Rd	Keene
Southwestern Adventist University	100 W Hillcrest St	Keene
Seminars Unlimited	Po Box 66	Keene
Chisholm Trail Academy	Po Box 717	Keene
New Discovery Bible Schools	Po Box 614	Keene
Faith Fm Plus Inc	200 N Fairview St Unit B	Keene
Keene Adventist Elementary School	302 Pecan St	Keene

Table 35: Public Schools

Name	Address	City	Level	Enrollment
Alvarado H S	1301 S Pkwy	Alvarado	Not Reported	1121
Alvarado J H	1000 N Cummings	Alvarado	Elementary	591
Alvarado EL -South	1000 E Davis	Alvarado	Middle	387
Alvarado EL -North	1500 N Cummings	Alvarado	Elementary	363
Alvarado Int	1401 E Davis	Alvarado	Middle	824
Alvarado Int	1401 E Davis	Alvarado	Middle	756
Lillian EL	5001 Fm 2738	Alvarado	High	345
Tom And Nita Nichols Middle	2845 Fm 731	Burleson	Middle	564
North Joshua EL	100 S Ranchway	Burleson	High	586
Johnson County JJAEP	1160 SW Wilshire Blvd	Burleson	Elementary	-999
Norwood EL	619 Evelyn Ln	Burleson		404

Name	Address	City	Level	Enrollment
Burleson H S	100 Elk Dr	Burleson	Elementary	1649
Crossroads H S	505 Pleasant Manor	Burleson	Elementary	92
Irene Clinkscale EL	600 Blayke St	Burleson	High	546
Richard Bransom EL	820 S Hurst	Burleson	Elementary	580
Frazier EL	1125 NW Summercrest Blvd	Burleson	High	587
Steam Middle	900 S W Hillside Dr	Burleson	Elementary	564
Realm	517 SW Johnson Ave Ste 200	Burleson		367
Nick Kerr Middle	1320 E Hidden Creek Pkwy	Burleson	Middle	1184
William Stribling El	1881 E Renfro	Burleson	Elementary	509
Academy At Nola Dunn	201 S Dobson St	Burleson	Elementary	660
Hughes Middle	316 S W Thomas St	Burleson	Other	1060
Mound EL	205 S W Thomas St	Burleson	Elementary	483
Mound EL	205 S W Thomas St	Burleson	Not Reported	428
Burleson Centennial H S	201 S Hurst Rd	Burleson	Secondary	2003
Burleson Collegiate H S	517 SW Johnson Ste 100	Burleson	Elementary	241
Adams EL	1492 Is Grove Rd	Cleburne	Elementary	407
Santa Fe EL	1601 E Henderson	Cleburne	Middle	347
Juvenile Justice Alternative	1102 E Kilpatrick Ste C	Cleburne	Elementary	2
Rio Vista ISD JJAEP	1102 E Kilpatrick Ste C	Cleburne	High	-999
Team Sch	1005 S Anglin	Cleburne	Pre-K	47
Kauffman Leadership Academy	1108 N Anglin	Cleburne	Other	-999
Irving EL	345 Hix Rd	Cleburne	High	506
Coleman EL	920 W Westhill Dr	Cleburne	Middle	525
Coleman EL	920 W Westhill Dr	Cleburne	Elementary	521
Johnson County JJAEP	1102 E Kilpatrick St	Cleburne	High	-999
Cooke EL	902 Phillips St	Cleburne	Not Reported	559
JJAEP	505 N Ridgeway Ste 100	Cleburne		-999
Lowell Smith Jr Middle	1710 Country Club	Cleburne	High	859
Gerard EL	1212 Hyde Park	Cleburne	Middle	488
Ad Wheat Middle	810 N Colonial	Cleburne	High	701
Cleburne H S	850 N Nolan River Rd	Cleburne	Elementary	1960
Marti EL	2020 W Kilpatrick	Cleburne	Middle	460
Godley JJAEP	313 N Pearson	Godley	Elementary	0
Godley Middle	9401 N Hwy 171	Godley	Elementary	390
Godley Links Academy	401 Bruce Rd	Godley		23
Godley EL	604 N Pearson	Godley	Not Applicable	460
Godley Int	309 N Pearson	Godley	Elementary	905
Godley H S	9501 N Hwy 171	Godley	Elementary	665

Name	Address	City	Level	Enrollment
Plum Creek EL	500 Plum St	Joshua	Elementary	412
R C Loflin Middle	6801 Cr 1902	Joshua	Elementary	748
New Horizon H S	603 Plum St	Joshua	Other	34
Joshua H S	909 S Broadway	Joshua	Other	1128
A G Elder EL	513 Henderson St	Joshua	High	553
H D Staples EL	505 S Main	Joshua	High	450
Joshua H S Ninth Grade Campus	1035 S Broadway	Joshua	Middle	464
Caddo Grove EL	7301 Fm 1902	Joshua	Elementary	551
Keene EL	300 Hwy 67 E	Keene	Elementary	470
Alter Learning Ctr	3625 Hwy 67 E Bldg A	Keene	Elementary	8
Keene H S	404 Charger Dr	Keene	Elementary	331
Keene JJAEP	3625 C Hwy 67 E	Keene	Elementary	-999
Keene J H	401 Charger Dr	Keene	Middle	273

The afore-mentioned facilities and infrastructure are identified in the following RAPT-generated map. According to the map, they're predominantly located in or near a floodplain.

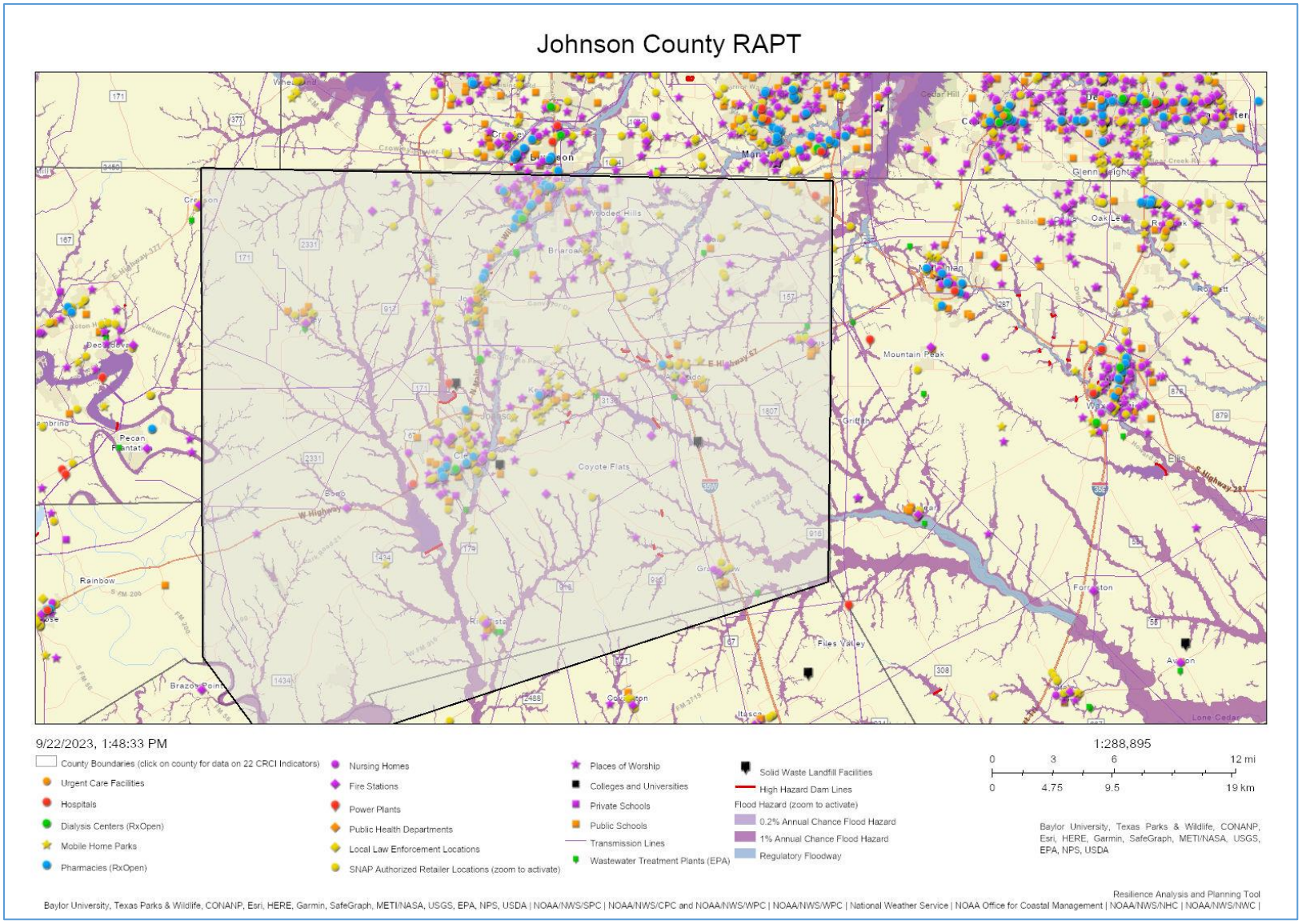


Figure 42: RAPT Map

Dams

There are also 45 total dams within Johnson County according to the U.S. Army Corps of Engineers. The primary purpose of these dams is flood risk reduction, irrigation, water supply, or recreation.

Table 36: Dams

Hazard Potential Classification	Dam Name	NID ID	Owner Types	Dam Height (Ft)	Dam Length (Ft)	Drainage Area (Sq Miles)	Condition Assessment
High	Chambers Creek WS SCS Site 57 Dam	TX03610	Local Government	47	1560	3.51	Fair
High	Chambers Creek WS SCS Site 31 Dam	TX03613	Local Government	28	3884	2	Unsatisfactory
High	Chambers Creek WS SCS Site 33a Dam	TX03601	Local Government	41	1021	3.27	Fair
High	Chambers Creek WS SCS Site 61a Dam	TX03593	Local Government	29	967	0.87	Fair
High	Chambers Creek WS SCS Site 58 Dam	TX03609	Local Government	36	1408	2.27	Fair
High	Chambers Creek WS SCS Site 33 Dam	TX03595	Local Government	28	2300	3.82	Fair
High	Chambers Creek WS SCS Site 42 Dam	TX03612	Local Government	49	3500	15.3	Unsatisfactory
High	Chambers Creek WS SCS Site 35 Dam	TX03599	Local Government	22	1350	0.78	Fair
High	Cleburne State Park Lake Dam	TX03591	State	62	1300	4.42	Poor
High	Chambers Creek WS SCS Site 59 Dam	TX03608	Local Government	48	1991	3.1	Fair
High	Chambers Creek WS SCS Site 30 Dam	TX03600	Local Government	28	2750	1.1	Fair
High	Chambers Creek WS SCS Site 62 Dam	TX03607	Local Government	44	1813	6.4	Fair
High	Chambers Creek WS SCS Site 36 Dam	TX03597	Local Government	30	1632	1.1	Fair
High	Chambers Creek WS SCS Site 61 Dam	TX03605	Local Government	36	1700	3.2	Fair
High	Chambers Creek WS SCS Site 37 Dam	TX03596	Local Government	38	1122	2	Fair
High	Chambers Creek WS SCS Site 32 Dam	TX03614	Local Government	31	1825	1	Fair

Hazard Potential Classification	Dam Name	NID ID	Owner Types	Dam Height (Ft)	Dam Length (Ft)	Drainage Area (Sq Miles)	Condition Assessment
High	Chambers Creek WS SCS Site 34 Dam	TX03598	Local Government	36	1784	1.26	Fair
High	Rosenauer Dam	TX09691	Private	11			Not Rated
High	Mountain Valley Lake No 3 Dam	TX09005	Private	14	650	0.12	Not Rated
High	Martin Dam	TX09558	Private	8		0	Not Rated
High	O Connor Dam	TX09559	Private	12	1300	0.2	Poor
High	Lake Pat Cleburne Dam	TX03594	Local Government	78	5190	100	Fair
High	Mountain Valley Dam 2	TX04798	Private	23	900	1.4	Not Rated
High	Mountain Valley Dam No 1	TX04797	Private	18	1850	2.07	Unsatisfactory
High	West Buffalo Creek WS SCS Site 1 Dam	TX06303	Local Government	35	8720	7	Satisfactory
Low	Chambers Creek WS SCS Site 38 Dam	TX03592	Local Government	36	2545	3.35	Not Rated
Low	Chambers Creek WS SCS Gss 12	TX06725	Local Government	34	950	602	Not Rated
Low	Chambers Creek WS SCS Site 63 Dam	TX03604	Local Government	42	1480	2.5	Not Rated
Low	Chambers Creek WS SCS Site 43a Dam	TX03615	Local Government	35	1508	3.49	Not Rated
Low	Chambers Creek WS SCS Site 60 Dam	TX03606	Local Government	33	2544	2.08	Not Rated
Low	Chambers Creek WS SCS Site 44a Dam	TX03603	Local Government	39	2582	1.04	Not Rated
Low	Chambers Creek WS SCS Site 46a Dam	TX06726	Local Government	30	1900	927	Not Rated
Low	Chambers Creek WS SCS Site 44 Dam	TX03611	Local Government	45	3470	2.37	Not Rated
Low	Chambers Creek WS SCS Site 64a Dam	TX03602	Local Government	38	2295	2.98	Not Rated
Low	Relvea Gss No 1	TX06198	Private	29	420	0	Not Rated
Low	Mcnaughto Gss No 1	TX06200	Private	25	1080	0	Not Rated
Low	K D Livestock Dam	TX09560	Private	7		0	Not Rated
Low	Lanman Gss No 1	TX06199	Private	21	652	0	Not Rated
Low	Clark Dam	TX03617	Private	22	854	0	Not Rated
Low	Young Lake Dam	TX04792	Private	23	650	0	Not Rated
Low	Carousel Farms Lake Dam	TX03616	Private	24	580	0	Not Rated

Hazard Potential Classification	Dam Name	NID ID	Owner Types	Dam Height (Ft)	Dam Length (Ft)	Drainage Area (Sq Miles)	Condition Assessment
Low	Buck Ranch Lake No 4 Dam	TX04336	Private	16	1000	0	Not Rated
Significant	Lake Charca Dam	TX04407	Private	39	860	1.15	Not Rated
Significant	Retreat Boulevard Dam	TX07431	Private	28	500	0.06	Not Rated
Significant	Duggins Lake Dam	TX07313	Private	30	660	0	Not Rated

Local emergency management is only responsible for the *impact* of flooding from dam failure on surrounding areas. The responsibility for maintaining a safe dam rests with its owner. The table below further assigns the responsible parties to dam related safety activities.

Table 37: Responsible Parties for Dam Related Safety Activities

Responsible Parties	Dam Related Safety Activities
Dam Owners/Operators	• Identification of emergency at dam • Initial notifications • Implementation of repairs • Security and technical assistance on site
Local Emergency Management and Local Responders	• Public warning • Possible evacuation • Shelter plan activated • Rescue and recovery • State of Emergency declaration • Termination of emergency status
State Emergency Management	• Aid affected area when requested • Coordinate specialized assistance • Notify appropriate state agencies • Determine who does what in an emergency

Transportation System

A community's transportation system is vital to its ability to grow in a positive manner. Transportation is inherently linked to land use. The type of roadway dictates the use of adjacent land, and conversely, the type of land use dictates the size, capacity and flow of the roadway.

Roads are another aspect of the built environment that make a crucial contribution to economic development and growth and bring important social benefits. They are of vital importance to make a community grow and develop. In addition, providing access to employment, social, health and education services makes a road network crucial in fighting against poverty. Roads open more areas and stimulate economic and social development.

Bridges are also immensely important to everyday travel. Bridges allow safe passage where previously it was not possible or much more difficult. Bridges allow people go to school, seek medical help, and go to work without having to negotiate a busy road, a dangerous railway line, or a fast-flowing river. As extreme weather events become more common, transport infrastructure is increasingly being tested by these events.

The following thoroughfare maps came from the Comprehensive Plans and/or Transportation Plans in participating cities.

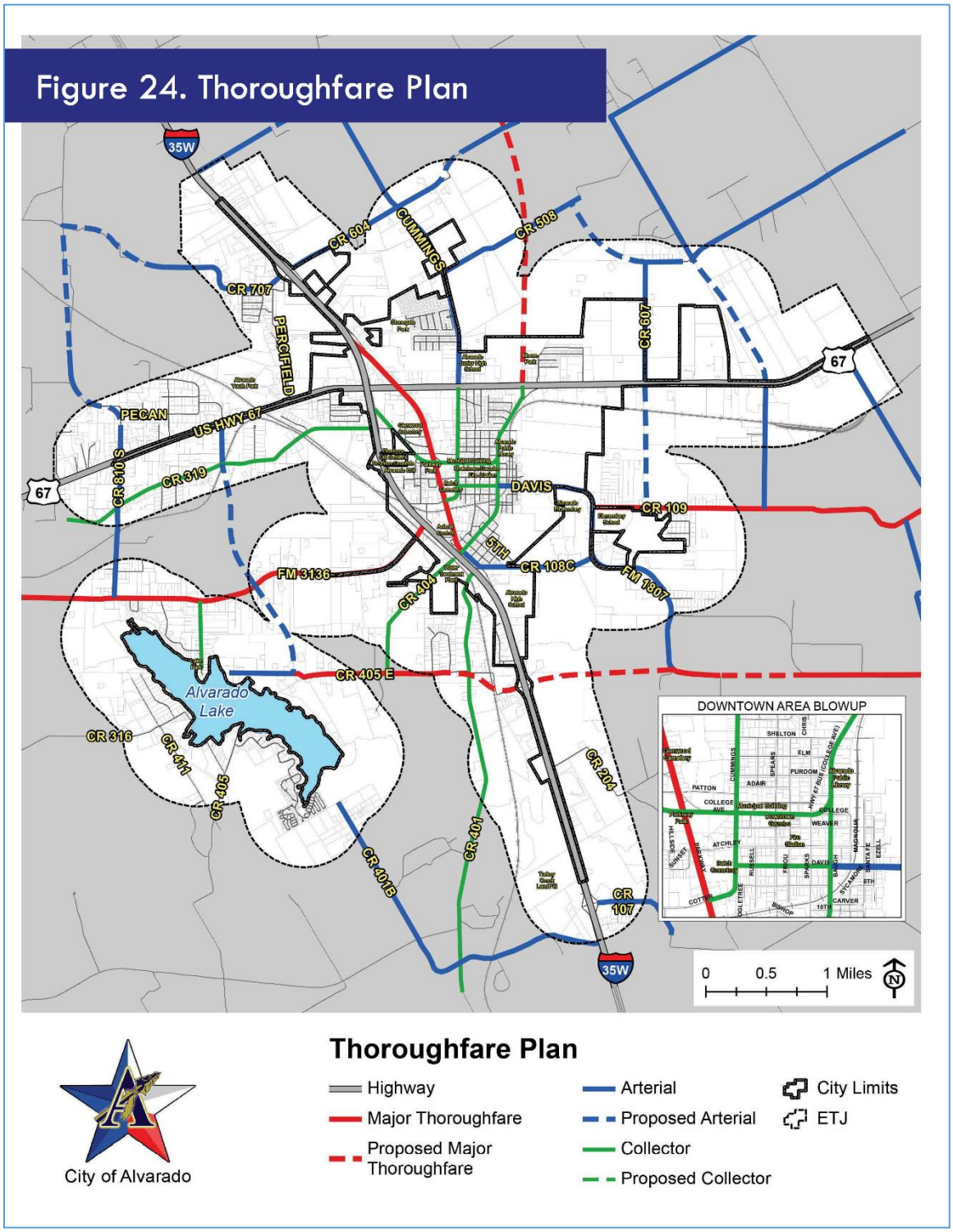


Figure 43: Alvarado Thoroughfare Map

91

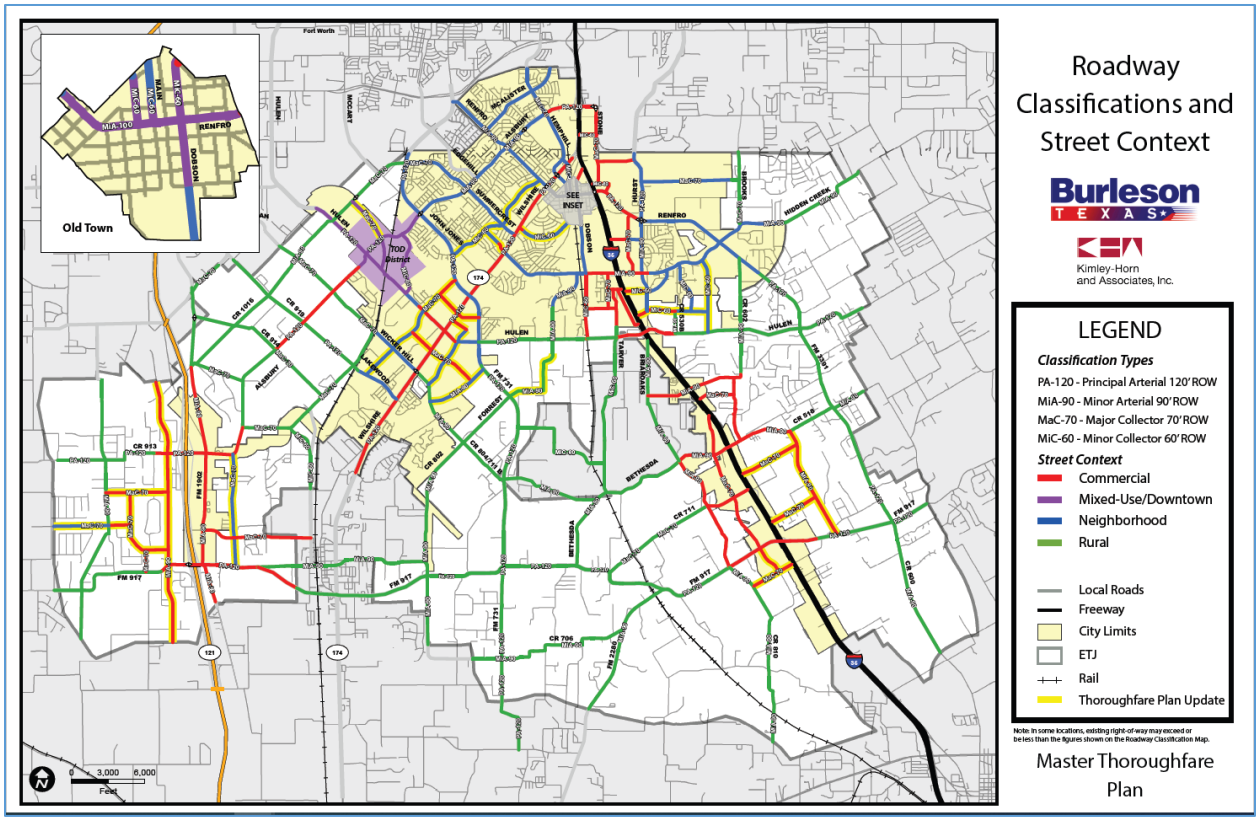
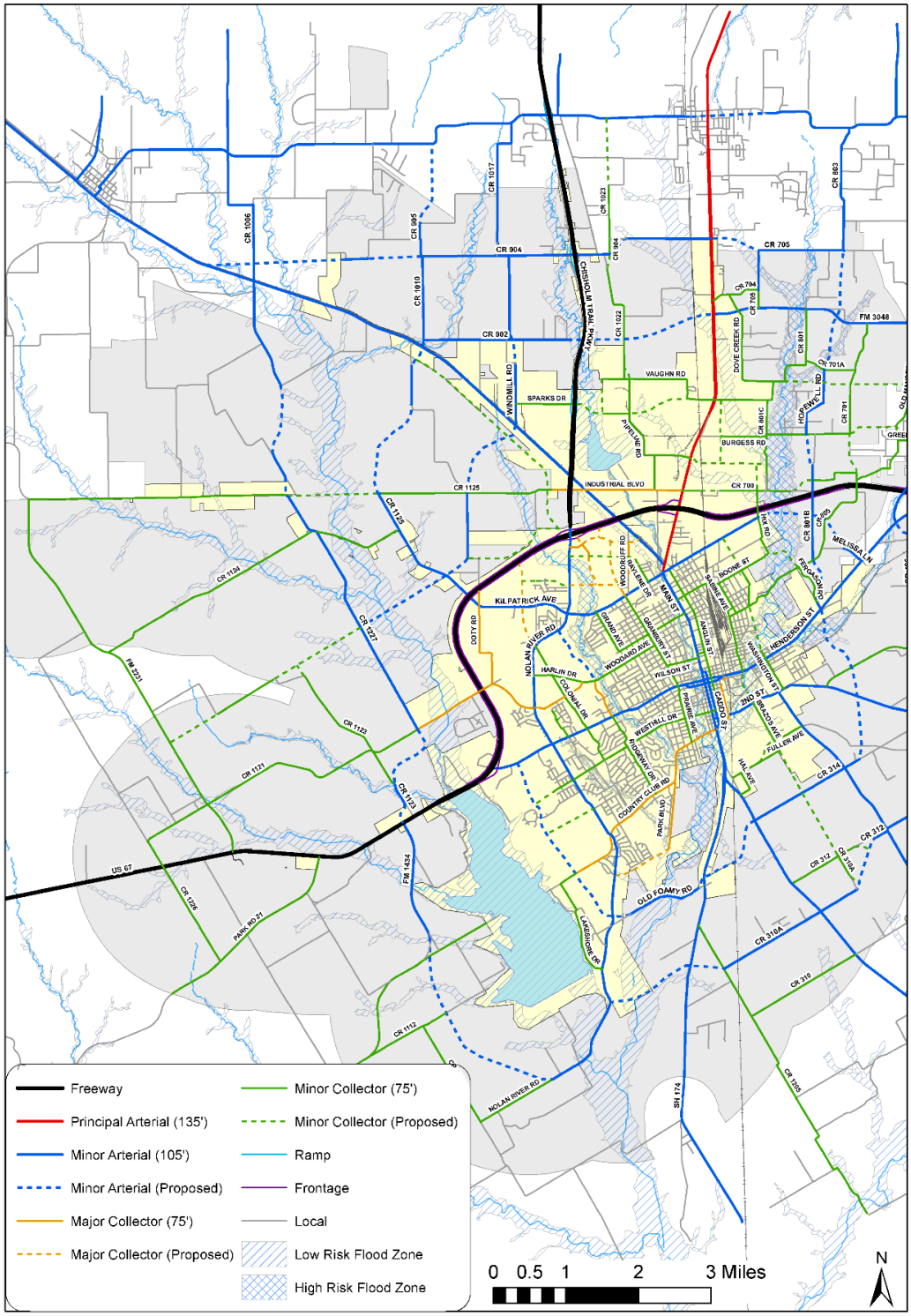


Figure 44: Burleson Thoroughfare Map

92



CITY OF CLEBURNE, TEXAS
January 2022 Thoroughfare Plan Map

Figure 45: Cleburne Thoroughfare Map

93

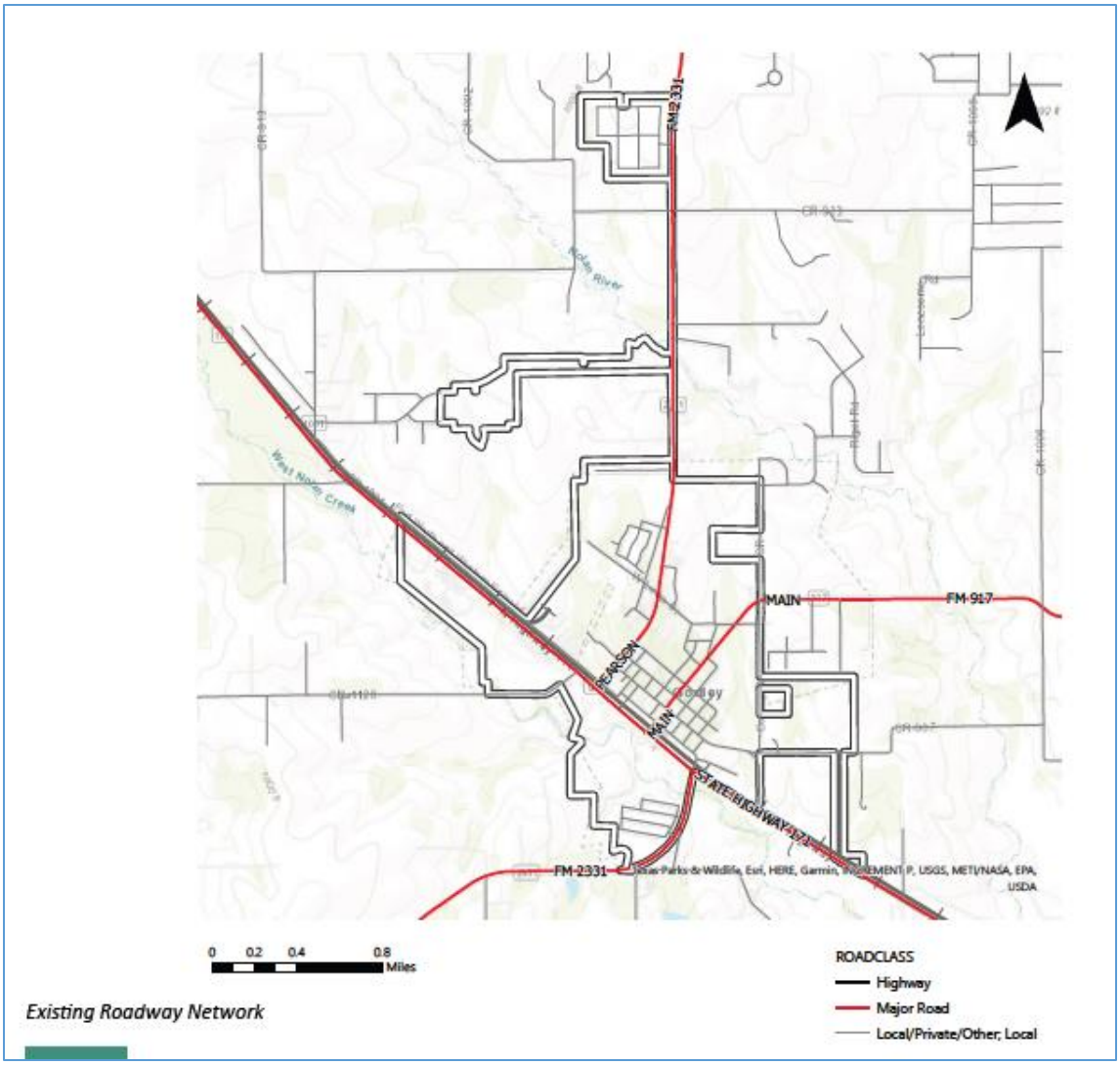


Figure 46: Godley Thoroughfare Map

94

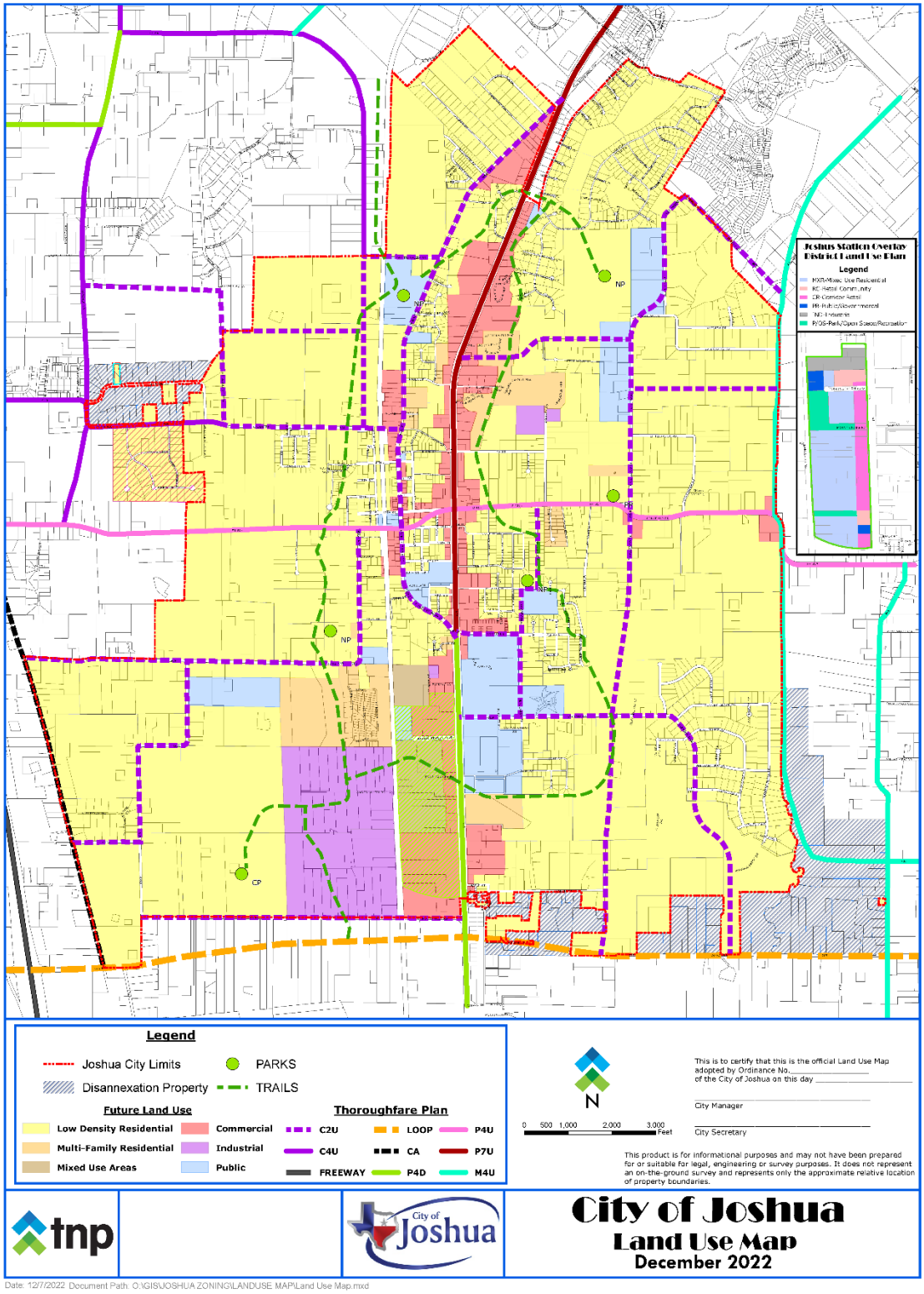


Figure 47: Joshua Thoroughfare Map

95

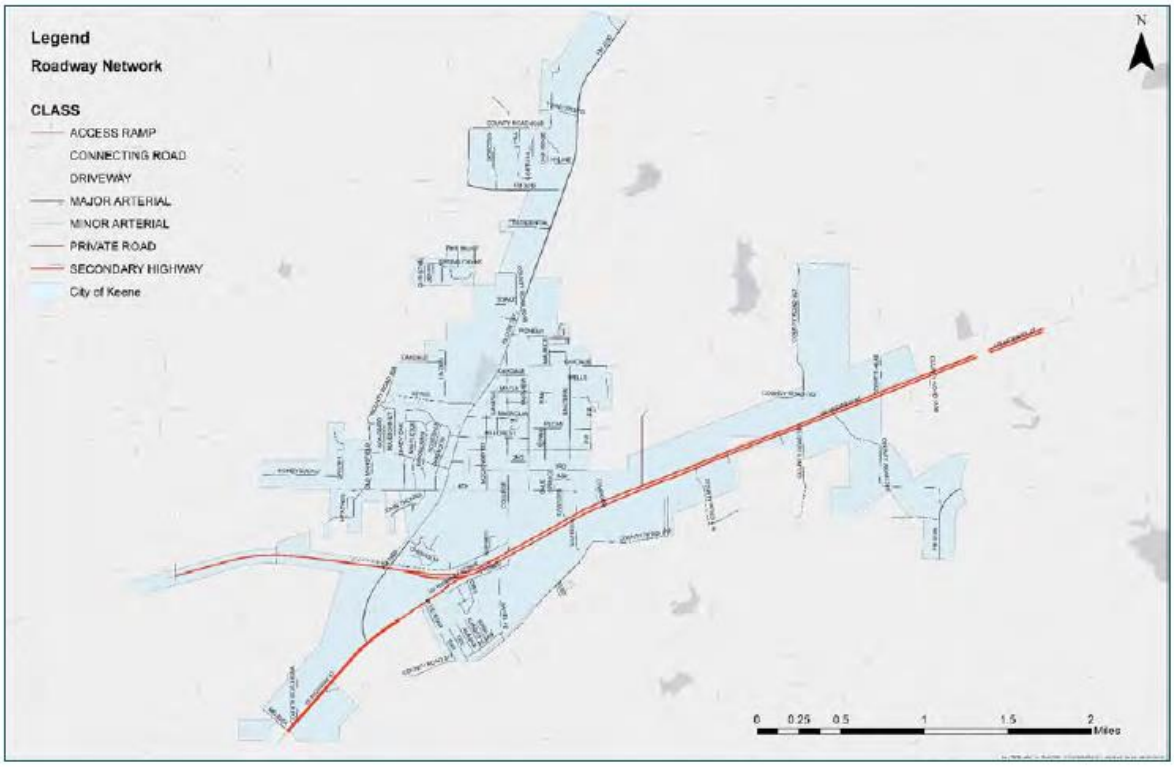


Figure 48: Keene Road Network Map

Roads and bridges that are not owned by jurisdictions fall under the responsibility of the Texas Department of Transportation (TxDOT). TxDOT uses the following terminology when describing their roadways.

- **On-System**: Under the jurisdiction of TxDOT.
- **Off-System**: Not under the jurisdiction of TxDOT.
- **Centerline Mileage**: Mileage of a segment of roadway, regardless of the number of through lanes. Unless otherJohnson specified, "mileage" in this document is by default centerline mileage. Centerline mileage for mainlanes is calculated separately from centerline mileage for frontage roads, which are considered distinct roadways. For instance, a 1-mile segment of highway with left and right roadbeds, each with four lanes, would be represented as 1 centerline mile. If that segment contained right and left frontage roads, the mainlanes and frontage roads would be represented in the data as 3 unique roadways, 1 centerline mile each, for a total of 3 miles.
- **Lane Mileage**: Mileage of all through lanes of a segment of roadway. For instance, a 1-mile segment of highway with left and right roadbeds, each with four through lanes, would be represented as 8 lane miles. As with centerline mileage, frontage road lane mileage is calculated separately from the lane mileage of mainlanes.
- **Daily Vehicle Miles of Travel (DVMT)**: Daily number of miles traveled by all vehicles. Inclusive of Truck DVMT.

- **Truck Daily Vehicle Miles of Travel (Truck DVMT)**: Daily number of miles traveled by trucks only. Unlike other data types, Truck DVMT values are not rounded before aggregation. Therefore, aggregating Truck DVMT by different combinations of subtotal values may result in a negligible discrepancy from the Statewide Total, especially regarding Rural / Urban subtotals.
- **Roadway Data Tables**: The data for many of these reports are also available in tabular format in the MultiYear Roadway Data Tables. This document also contains extensive annotations regarding data criteria and calculations and is intended as a companion to these Annual Reports. The Roadway Data Tables can be found at the following URL: https://www.txdot.gov/inside-txdot/division/transportation-planning/roadway-inventory.html

The road inventory listed in Table 38 below was obtained from the County Information Program's on-line database, which compiled road information from the Texas Department of Transportation 2021 Annual Roadway Inventory Reports

Table 38: Road Inventory Within Johnson County (TxDOT)[25]

ROAD INVENTORY WITHIN JOHNSON COUNTY (TXDOT)	
Centerline Miles - 2021	
IH Highways:	23.164
US Highways:	39.660
State Highways, Spurs, Loops, Business Routes:	68.230
Farm or Ranch to Market Roads and Spurs:	217.518
Pass, Park and Recreation Roads:	9.473
Frontage Roads:	56.560
On-System Subtotal:	414.605
City Streets:	616.688
Certified County Roads:	915.630
Toll Road Authority Roads:	12.202
Federal Roads:	2.842
Off-System Subtotal:	1,547.362
Center Line Miles: County Total:	**1,961.967**
Lane Miles - 2021	
IH Highways:	92.656
US Highways:	134.539
State Highways, Spurs, Loops, Business Routes:	199.491
Farm or Ranch to Market Roads and Spurs:	446.796
Pass, Park and Recreation Roads:	18.946
Frontage Roads:	113.120

[25] Johnson County Profile (txcip.org): *The data contained in the CID database are obtained from official sources and are not the product of the CIP. The CIP, therefore, does not expressly or impliedly warrant the accuracy of the data.*

ROAD INVENTORY WITHIN JOHNSON COUNTY (TXDOT)	
On-System Subtotal:	1,005.548
City Streets:	1,251.476
Certified County Roads:	1,831.260
Toll Road Authority Roads:	28.643
Federal Roads:	5.684
Off-System Subtotal:	3,117.063
County Total:	**4,122.611**

The State's 55,000 bridges connect communities and commerce alike, allowing citizens to experience a quality of life unique to Texas. As we face unprecedented mobility demands from the state's rapid growth, increased traffic on our bridges can impact their performance and the funding needed to maintain them in a state of good repair. According to TxDOT's Report on Texas Bridges 2020, there are 379 on & off system bridges open to public traffic within the County. *On-system bridges* are located on the designated state highway system, are maintained by TxDOT, and are typically funded with a combination of federal and state or state-only funds. *Off-system bridges* are not part of the designated state highway system and are under the direct jurisdiction of the local government such as a county, city, other political subdivision of the state, or special district with authority to finance a highway improvement project. Based on the minimum condition rating of its primary components, each bridge is assigned a numeric score from 50 to 95. The Bridge Condition Score is the average of these numeric values, weighted by deck area, making the Bridge Condition Score in Johnson County 90.75.

Utilities

Oncor, Atmos Energy, and TXU Energy are the main electric providers in the planning area.

Water & wastewater services are provided by the municipalities or Johnson County Special Utility District (JCSUC). The Johnson County Special Utility District (JCSUC) is a very important component of providing clean drinking water to the residents of Johnson County. Their system has about 900 miles of distribution pipeline and 50 miles of transmission lines and is divided into 15 separate pressure planes. JCSUD operates 7 elevated storage tanks with a combined total of 5 million gallons of water in the system. The water CCN (certificate of convenience and necessity) service area of the District is approximately 320 square miles; predominately in Johnson County, but also serving in Tarrant and Hill County.

JCSUD began construction on approximately 28 miles of infrastructure within their system starting in June 2020. These projects will improve the supply of water in some areas of the system, while also providing fire hydrants that will benefit the local area. The installation of these lines will also improve the District's service capacity.

Historic Buildings and Districts

Historic landmarks and districts are important to consider when evaluating vulnerabilities to hazards. What is historic, and worth saving, varies with the beholder. "Historic" applies to a building that is part of a community's tangible past. Due to the advanced age of these structures, they are highly susceptible to cracking, leaning, and total destruction caused by any of the hazards. The Johnson County Historical Commission is responsible for identifying and preserving Johnson County's historic resources.

According to the Texas Historic Sites Atlas, there are 6 courthouses, 93 cemeteries, 5 museums, 79 historical markers within Johnson County.[26] In addition to the THSA, the National Register of Historic Places listed four place in the planning area that have local or state historical significance.

Table 39: NRHP in Johnson County[27]

Property Name	City	Street & Number	Area of Significance	Level of Significance - Local	Level of Significance - State
Cleburne Carnegie Library	Cleburne	201 N. Caddo St.	ARCHITECTURE	True	False
Cleburne Downtown Historic District	Cleburne	Roughly bounded by Brown, Border, Harrell & Buffalo Sts.	ARCHITECTURE; COMMUNITY PLANNING AND DEVELOPMENT	True	False
Johnson County Courthouse	Cleburne	1 Public Sq.	POLITICS/GOVERNMENT; ARCHITECTURE	False	True
Joiner-Long House	Cleburne	604 Prairie Av.	ARCHITECTURE	True	False
Wright Building	Cleburne	1 E. James St.	COMMERCE; ARCHITECTURE	True	False

3.3.3 Economy

According to the Census Reporter, the 2021 average income per capita in Johnson County was $32,362, 9.9% of the population is living below the poverty line, and the mean travel time to work is 31.6 minutes. There are roughly 70,869 housing units in the County with a median value of $284,500 for owner-occupied housing units. Additional profiles of the planning area are reflected in the table below.

Table 40: 2021 Economic Profile of Planning Area[28]

Jurisdiction	Per Capita Income	Persons Below Poverty Line	Mean Travel Time to Work	Number of Housing Units	Median Value of Owner-Occupied Housing Units
Alvarado[29]	$22,621	9.8%	26.9 minutes	1,632	$136,100
Burleson[30]	$34,084	6.5%	30 minutes	16,843	$219,200

[26] Texas Historical Sites Atlas. 2015. Texas Historical Commission. https://atlas.thc.state.tx.us/

[27] National Register Database and Research - National Register of Historic Places (U.S. National Park Service) (nps.gov)

[28] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Johnson County, TX* http://censusreporter.org/profiles/05000US48251-johnson-county-tx/

[29] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Alvarado, TX* http://censusreporter.org/profiles/16000US4802260-alvarado-tx/

[30] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Burleson, TX* http://censusreporter.org/profiles/16000US4811428-burleson-tx/

Jurisdiction	Per Capita Income	Persons Below Poverty Line	Mean Travel Time to Work	Number of Housing Units	Median Value of Owner-Occupied Housing Units
Cleburne[31]	$25,392	13.6%	28 minutes	11,626	$139,200
Godley[32]	$28,622	16.2%	30.2 minutes	666	$225,600
Joshua[33]	$31,199	7.8%	31.9 minutes	3,126	$217,500
Keene[34]	$20,757	11.4%	25.8 minutes	2,275	$162,600

According to the U.S. Census Bureau's 2021 County Business Patterns, there are 3,177 establishments for selected industries in the County. The following graph separates these industries by their 2-digit NAICS sector levels.

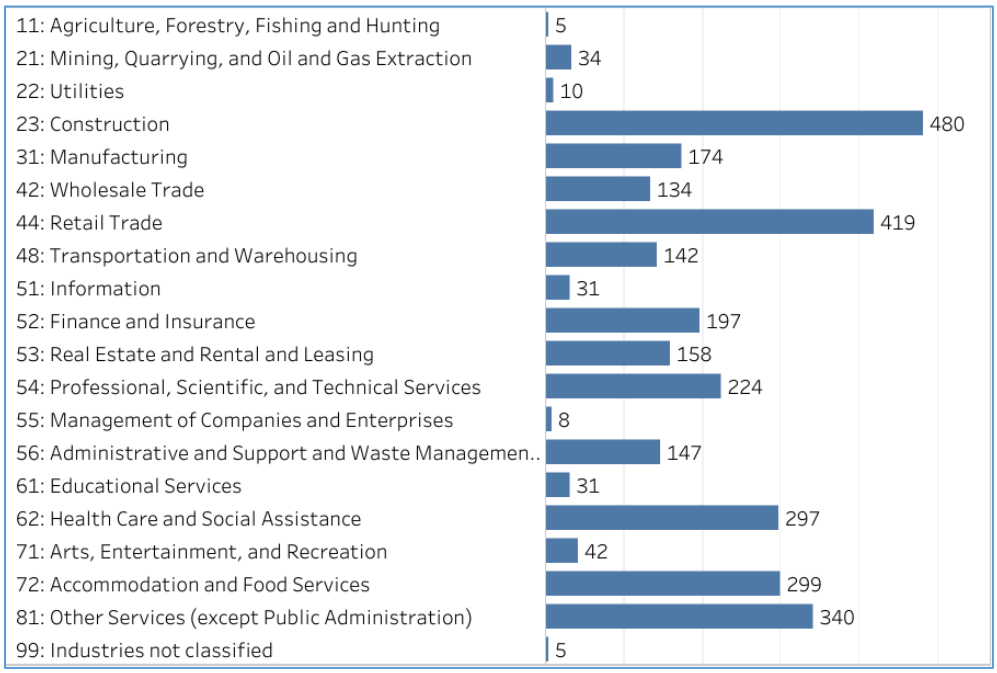


Figure 49: Number of Establishment for Selected Industries[35]

[31] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Cleburne, TX* http://censusreporter.org/profiles/16000US4815364-cleburne-tx/
[32] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Godley, TX* http://censusreporter.org/profiles/16000US4829972-godley-tx/
[33] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Joshua, TX* <http://censusreporter.org/profiles/16000US4838080-joshua-tx/>
[34] U.S. Census Bureau (2021). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Keene, TX* http://censusreporter.org/profiles/16000US4838548-keene-tx/
[35] 2021 County Business Patterns, https://www.census.gov/programs-surveys/cbp.html

CEDS SWOT Analysis

To tie the risk assessment into the region's economic development strategy, a review of the Comprehensive Economic Development Strategy SWOT (Strengths, Weaknesses, Opportunities, and Threats) Analysis is beneficial. The SWOT analysis is an in-depth analysis of regional strengths, weaknesses, opportunities and threats, as the name suggests. It identifies what makes the region special or competitive in larger economies. These strengths are compared with factors that could keep a region from realizing its potential. Knowing a region's capacity for growth is critical to choose how to promote economic vitality. It is affected by cultural, economic, technological, intellectual and physical assets. A region can use the activities and engagement of business, government leaders and others to maximize its economic potential.

Being a member of the NCTCOG Region, Johnson County participated in the 2022 NCTCOG Comprehensive Economic Development Strategy (CEDS), in which the 16-country region broke up into clusters to conduct a Strength, Weakness, Opportunities, and Threats (SWOT) Analysis. The results from the Cluster 3 SWOT analysis that Johnson County participated in are provided below.

SWOT ANALYSIS BY CLUSTER — CLUSTER 3

Cluster 3 includes the following counties: **JOHNSON, ELLIS, AND NAVARRO**

STRENGTHS

- Power Grid
- Transportation Infrastructure: I-35E, I-35W, I-45, Highway 287, Highway 67, Highway 77, Chisholm Trail Parkway
- Water availability and low cost
- Skilled workforce (need a better-skilled one to compete, however)
- Access to job training
- Plenty of land
- Proximity to markets
- Higher education availability (highest return on investment)
- Competitive tax burden
- Strong pro-business climate
- Local infrastructure and capacity
- Access to airports
- High quality of life and lower cost of living
- Growing arts & entertainment
- Access to outdoor recreation: lakes and parks
- Rail (BNSF & Union Pacific)
- Proximity to ports
- Growing healthcare options
- Growing population

WEAKNESSES

- Low median household incomes (good for manufacturing)

- Limited rail spurs
- Limited incentive options & funding for incentives
- Destination retail (commerce)
- Lack of social services
- Education attainment
- Broadband access

OPPORTUNITIES

- Reshoring/onshoring/offshoring (some companies are coming back)
- Foreign direct investment (opportunities for FDIs who want to invest/buy a piece of the action in the region)
- Power Grid
- Expand diverse housing options
- Take advantage of metro business industry leakage
- Retail opportunities
- The southern region of DFW Metroplex growth opportunities
- Expansion of utility infrastructure
- Utilization of federal infrastructure funds

THREATS

- Weather (tornadoes)
- Increased incentives from other states
- A decline in standard manufacturing base (being replaced with automation)
- Offshoring (financial and manufacturing)
- Tighter environmental regulations (i.e., air quality)
- Poorly educated workforce
- Aging infrastructure
- Uncertainty in the future of electrical infrastructure
- Housing bubble
- Financial market volatility
- Construction materials cost and availability
- Disruption of retail due to e-commerce
- Diverse housing options
- Lack of water for manufacturing and all development

3.3.4 Natural Environment

Land

The E.P.A. defines ecoregions as areas where ecosystems (and the type, quality, and quantity of environmental resources) are generally similar. According to the Texas Parks and Wildlife Department (TPWD), Texas is divided into 10 natural regions or ecoregions: the Piney Woods, the Gulf Prairies and marshes, the Post Oak Savanah, the Blackland Prairies, the Cross Timbers, the South Texas Plains, the Edwards Plateau, the Rolling Plains, the High Plains, and the Trans-Pecos. According to the following map, most of Johnson County is in the Cross Timbers Ecoregion, with a sliver of the eastern portion of the county in the Blackland Prairies.

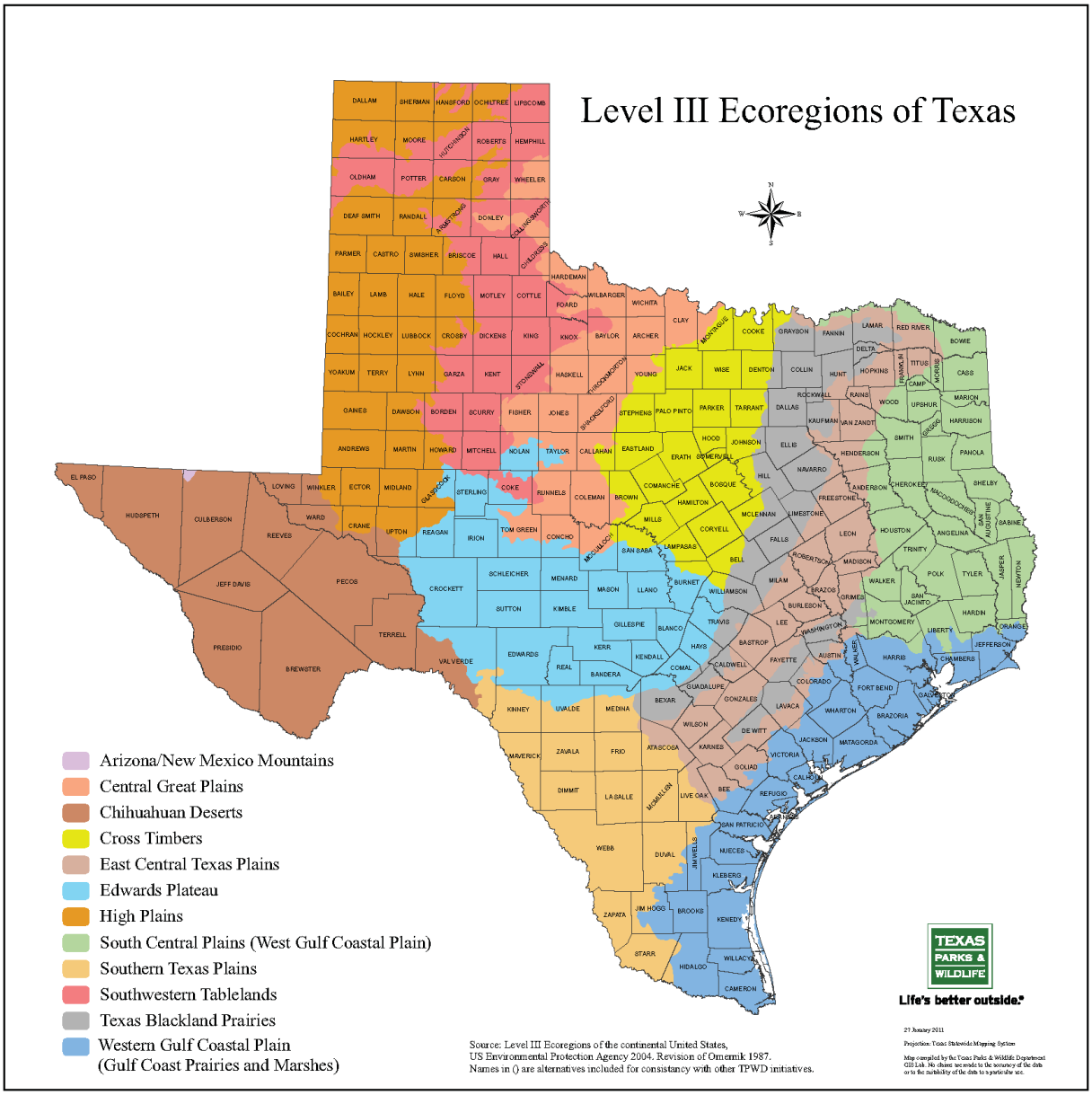


Figure 50: TPWD Ecoregions

103

The Cross Timbers Ecoregion, in north and central Texas, includes areas with high density of trees and irregular plains and prairies. Soils are primarily sandy to loamy. Rainfall can be moderate, but somewhat erratic, therefore moisture is often limiting during part of the growing season. Also known as the Osage Plains, it is the southernmost of three tallgrass prairies. It varies from savannah and woodland to the east and south, into shorter mixed-grass prairie to the west.

As in the rest of the Great Plains, fire, topography, and drought-maintained prairie and established the location of woodlands.[36] Giant dinosaurs once roamed this region and the neighboring county, Somervell, is home to Dinosaur Valley State Park with the largest collection of dinosaur footprints.

Wildlife

TPWD is the steward of the Texas Conservation Action Plan, a conservation plan for species most at risk with a primary purpose to bring people together to realize conservation benefits, prevent species listings, and preserve our natural heritage for future generations.

Johnson County is one of the 43 counties in the Cross Timbers Wildlife District. Cross Timbers Handbook contains information on Species of Greatest Conservation Need, regionally important habitats, local conservation goals and projects, regional and statewide activities, contact information for conservation partners, and maps that could help County officials better protect and improve its natural assets.[37]

There are 47 documented species of greatest conservation need (SGCN) within Johnson County (see Table 41). All species on the county list are tracked in the Texas Natural Diversity Database (TXNDD).

Table 41: SGCN Species in Johnson County

Taxon	Common Name	State Rank
Amphibians	Woodhouse's toad	SU
Amphibians	Strecker's chorus frog	S3
Birds	white-faced ibis	S4B
Birds	bald eagle	S3B,S3N
Birds	black rail	S2
Birds	whooping crane	S1S2N
Birds	piping plover	S2N
Birds	mountain plover	S2
Birds	rufa red knot	S2N
Birds	Franklin's gull	S2N
Birds	western burrowing owl	S2
Birds	Sprague's pipit	S3N
Birds	black-capped vireo	S3B
Birds	golden-cheeked warbler	S2S3B
Birds	lark bunting	S4B
Birds	chestnut-collared longspur	S3
Fish	Mississippi silvery minnow	S4

[36] Texas Ecoregions — Texas Parks & Wildlife Department

[37] Texas Conservation Action Plan. Texas Parks & Wildlife. https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/nongame/tcap/

Taxon	Common Name	State Rank
Mammals	cave myotis bat	S2S3
Mammals	tricolored bat	S2
Mammals	big brown bat	S5
Mammals	eastern red bat	S4
Mammals	hoary bat	S3
Mammals	swamp rabbit	S5
Mammals	black-tailed prairie dog	S3
Mammals	muskrat	S5
Mammals	long-tailed weasel	S5
Mammals	eastern spotted skunk	S1S3
Mammals	western hog-nosed skunk	S4
Mammals	mountain lion	S2S3
Reptiles	eastern box turtle	S3
Reptiles	western box turtle	S3
Reptiles	smooth softshell	S3
Reptiles	slender glass lizard	S3
Reptiles	Texas horned lizard	S3
Reptiles	prairie skink	S2
Reptiles	Brazos water snake	S1
Reptiles	Texas garter snake	S1
Reptiles	western massasauga	S3
Insects	American bumblebee	SNR
Insects	No accepted common name	S1
Mollusks	Brazos heelsplitter	SNR
Mollusks	Texas fawnsfoot	S2
Plants	tree dodder	S3
Plants	Texas milk vetch	S3
Plants	Hall's prairie clover	S2
Plants	Comanche Peak prairie clover	S2S3
Plants	Reverchon's scurfpea	S3

Water

Part of the Prairies & Lakes Region of TPWD, the planning area consists of Alvarado Park Lake, Lake Pat Cleburne, and Cleburne State Park lake.

Lake Pat Cleburne (Pat Cleburne Reservoir) is the only water reservoir from the Brazon-G Planning Region in Johnson County. The Reservoir is a 1,568-acre impoundment located on the Nolan, owned and operated by the City of Cleburne, and primary used for municipal water supply and recreation. The reservoir has a drainage area of 100 square miles, a storage capacity of 26,008 acre-feet, and a shoreline length of 15.3 miles. Water level has been within 4 feet of conservation pool (733.5 above mean sea level [MSL]) since 2016.

Johnson County is also a part of the Trinity River Basin (TWDB Flood Planning Region – 3) and Lower Brazos River Basin (TWDB Flood Planning Region – 8).

Groundwater comes from the Trinity Aquifer (Subcrop) major aquifer and there are an estimated 584 wells within the county.

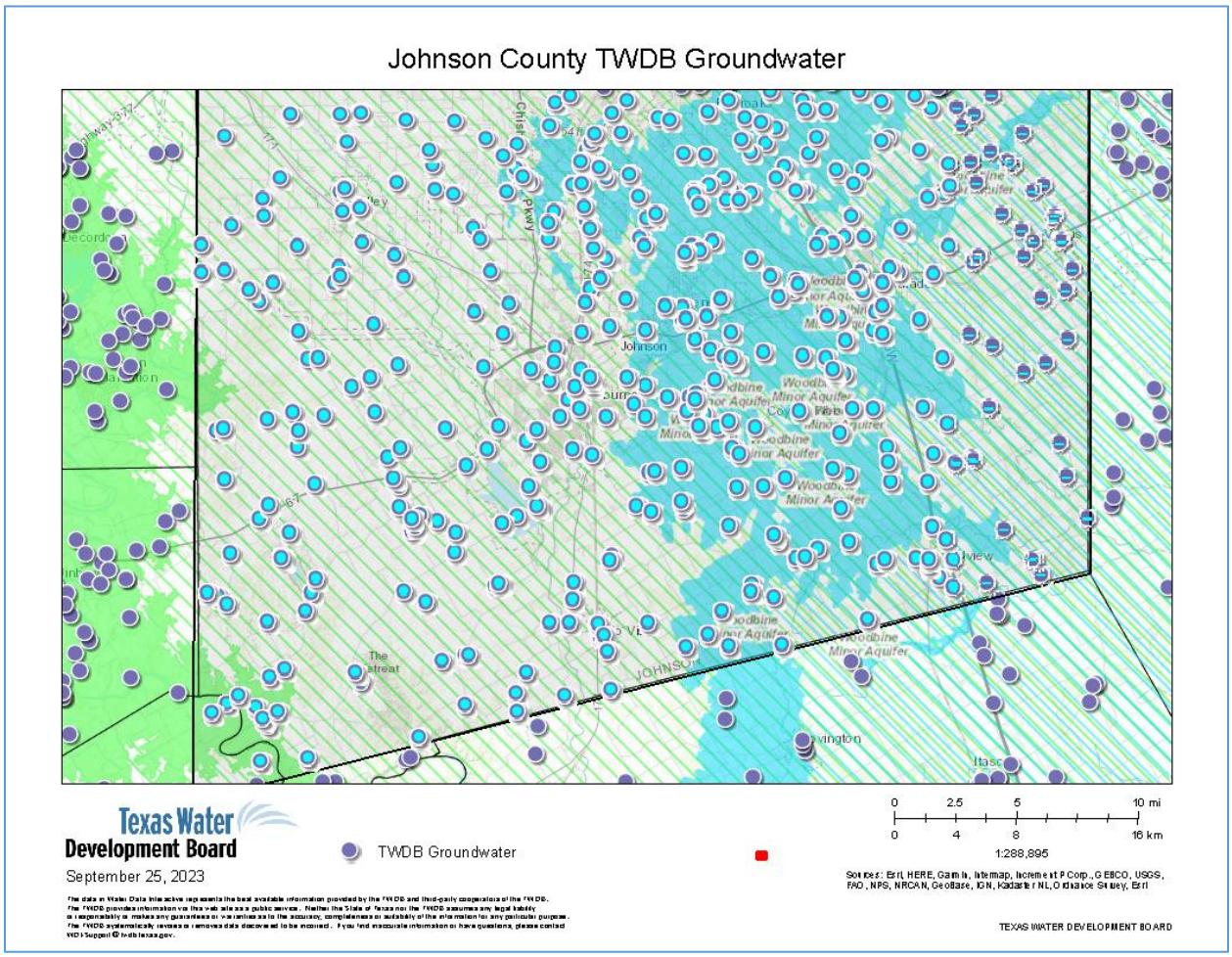


Figure 51: Wells in Johnson County

Bodies of water, such as lakes, reservoirs, and rivers, are vulnerable to severe weather and natural hazards, and the level of water has a dramatic effect on drought and flooding impacts on people and property in the participating jurisdictions.

106

3.4 Changes in Development

FEMA's defines changes in development as "recent development, potential development, or conditions that may affect the risks and vulnerabilities of the jurisdictions (for example, climate change, declining populations or projected increases in population, or foreclosures) or shifts in the needs of underserved communities or gaps in social equity. This can also include changes in local policies, standards, codes, regulations, land use regulations and other conditions."

While the overall vulnerability level and priorities of the participants have remained the same since the previous mitigation plan, the following changes in development require local officials to be prepared to take action when necessary.

3.4.1 Changes that Increase Vulnerability

Future Land Use and Zoning

New development in hazard-prone areas increases the risk of damage and injury from that hazard. All future development is vulnerable to severe weather events. Local planning mechanisms have identified planned development projects, such as road expansions, downtown revitalizations, and capital improvement projects in the participating jurisdictions that could be impacted by hazards.

Climate Change

A key factor to an increase in vulnerability is climate change. According to the United States Environmental Protection Agency (EPA),

> Texas's climate is changing. Most of the state has warmed between one-half and one-degree Fahrenheit (°F) in the past century. In the eastern two-thirds of the state, average annual rainfall is increasing, yet the soil is becoming drier. Rainstorms are becoming more intense, and floods are becoming more severe... In the coming decades, storms are likely to become more severe, deserts may expand, and summers are likely to become increasingly hot and dry, creating problems for agriculture and possibly human health. Our climate is changing because the earth is warming. People have increased the amount of carbon dioxide in the air by 40% since the late 1700s. Other heat-trapping greenhouse gases are also increasing. These gases have warmed the surface and lower atmosphere of our planet about one degree during the last 50 years. Evaporation increases as the atmosphere warms, which increases humidity, average rainfall, and the frequency of heavy rainstorms in many places—but contributes to drought in others…[38]

According to Headwater Economics, Johnson County is expected to experience a 11% increase in extremely hot days and a 4% decrease in days with heavy precipitation within ten years in a higher emissions scenario (Figure 52).

[38] What Climate Change Means for Texas. August 2016. EPA 430-F-16-045. United States Environmental Protection Agency. https://archive.epa.gov/epa/sites/production/files/2016-09/documents/climate-change-tx.pdf

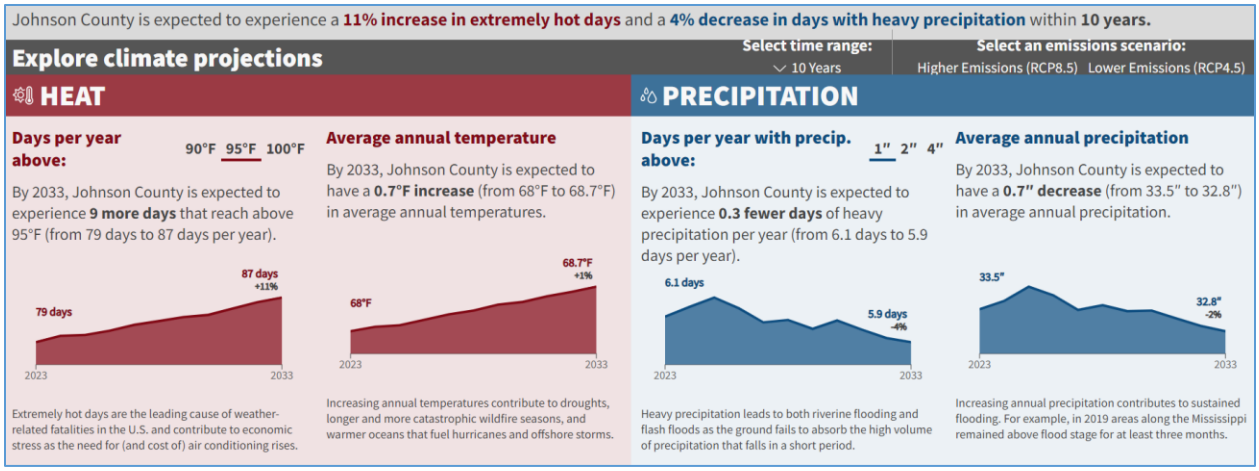


Figure 52: 10 Year Climate Projection

The following is an article from the Dallas Morning News that describes the effects of climate change in North Central Texas and the impacts on the existing natural hazards:

> The United States has just come off a record year for weather and climate disasters and, by most accounts, it's only going to get worse.
>
> Last year hurricanes Harvey, Irma, and Maria; the wildfires and floods in California; and tornado outbreaks in the Midwest and the South delivered $306.2 billion in damages, more than any year in history when adjusted for inflation.
>
> Texas is particularly vulnerable to a changing climate. It has had more costly weather-related disasters than any other state, and those events will happen more often as air and ocean temperatures climb, scientists say.
>
> "Climate change is not just about polar bears," said Katharine Hayhoe, a climate scientist at Texas Tech University with an impressive YouTube following. "It will affect North Texas profoundly."
>
> Between 2041 and 2050, Dallas-Fort Worth may see August temperatures rise from a mean of 86 °F at the end of the 20th century to 94 °F, with extremes rising above 120, reports one study by scientists at the University of Texas at Arlington.
>
> Longer droughts and more extreme rainstorms will pose a challenge for those who manage drinking water supplies, those who raise cattle, and those who oversee our roads and railways.
>
> The changes may also have unexpected effects on people's daily lives, including jobs. Intense heat can imperil cars and airplanes, evaporate drinking water supplies, and halt outdoor labor such as farm work and construction.
>
> Adam Smith, a scientist with the federal government's main climate agency, the National Oceanic and Atmospheric Administration, calls Texas "the disaster capital of the United States."
>
> As Smith explains, Texas is susceptible to almost every kind of weather and climate hazard, from extreme cold to extreme heat, from severe drought and wildfires to torrential floods. Texas is also home to a booming population and critical infrastructure, including the petrochemical plants that were damaged in Hurricane Harvey.

108

"Texas is a hot-spot for a wide range of extreme natural events due to its geography," said Smith. "We expect many of these extremes to become more frequent and intense as time moves forward."

While uncertainty is built into climate models, scientists have a high degree of confidence in many of the changes they observe and predict.

The bigger, longer and more common an event is, the greater the accuracy with which scientists can project how climate change will impact it, said Hayhoe, a lead author of a November 2017 climate change report overseen by scientists at 13 federal agencies. Larger events have more data associated with them and can be easier to model.

Researchers are very confident that climate change will increase both average and extreme temperatures. They are also confident that climate change is likely to increase the risk of heavy precipitation in many areas and may bring stronger droughts to the south-central and southwestern parts of the U.S.

Projected impacts on smaller-scale events like tornadoes and hailstorms are less well understood.

One area of consensus is the cause of climate change. "It is extremely likely that human activities, especially emissions of greenhouse gases, are the dominant cause of the observed warming since the mid-20th century," note the authors of the Fourth National Climate Assessment, a Congressionally mandated review that scientists conduct every four years. They add that there are no convincing alternative explanations.

Below is how these changes will affect our area, the evidence behind the projections, and how confident scientists are in each of these findings.

Heat

More record-setting heat in North Texas is a virtual certainty. Already, we are living through the warmest period in the history of modern civilization, the federal report found, and that warming will accelerate.

Climate science contrarians often attack the models on which climate projections are based. Myron Ebell, who led President Donald Trump's transition team at the Environmental Protection Agency, accepts that humans are most likely responsible for warming, but he says models have exaggerated the outcome. Ebell is director of the Center for Energy and Environment at the Competitive Enterprise Institute, a libertarian advocacy group based in Washington, D.C. He acknowledges that he is not a scientist.

In fact, researchers have used models to predict global temperature changes for more than 50 years, and the models' projections have been fairly accurate over the long term. In the early 21st century, a discrepancy appeared between observed and modeled temperatures-a period dubbed the "global warming slowdown" or "hiatus."

Scientists have published scores of studies on the mismatch and tied it to several factors that contributed to lower-than-expected observed temperatures. Those factors include a series of small volcanic eruptions, the cooling effects of which scientists had underestimated, and lower than expected solar output.

Findings from those studies are helping to improve climate model simulations and helping scientists better understand why there are differences between simulations and observations in the early 21st century, said Ben Santer, a climate scientist at the Lawrence Livermore National Laboratory.

Global average temperatures increased about 1.8 degrees Fahrenheit in the last 115 years. In Dallas, they climbed from about 65 °F during the early part of the 20th century to 68 °F during the most recent decade. If nothing is done to reduce emissions of carbon dioxide and other greenhouse gases, average temperatures in the city may reach the low 70s by 2050 and surpass 75°F by the end of the century.

Earlier this year, Amir Jina and colleagues published a study in the journal *Science* that estimated economic damage from climate change in each county of the United States.

Once temperatures reach the high 90s, equal to or above body temperature, fatality rates go up.

Besides people, heat also affects roads. A 2015 study by the University of Texas at Arlington (UTA) that focused on the impact of climate change on transportation predicted "an increase in wildfires along paved highways, heat-induced stress on bridges and railroads, air-conditioning problems in public transport vehicles and heat-related accidents by failure of individual vehicles and heat-related stress."

The study concluded, "These impacts can be translated into substantial mobility and economic loss."

Drought

Along with heat will come stronger drought, which "has profound economic impacts," said Hayhoe.

The prediction that North Texas will have longer and more severe droughts is based on multiple factors, including the relationship between high temperatures and soil dryness and the presence of more frequent and longer lasting high-pressure systems in summer that suppress rainfall and deflect storms away from our area.

Hayhoe points to Texas' 2010-2013 drought as a probable sign of things to come. Although this drought occurred naturally, as a result of a strong La Niña event that typically brings dry conditions to our area, it was exacerbated by extreme heat. That event created severe hay shortages for cattle farmers and led some ranchers to prematurely slaughter their herds or export them out of state.

"Cotton can be drought-resistant, but not cattle," said Hayhoe.

The 2015 UTA study predicts a reduction in soil moisture of 10% to 15% in all seasons by 2050, which can also lead to cracked pavement and the premature loss of roads, railways, and other infrastructure.

Heat and drought also pose a problem for drinking water supplies, which North Texas sources from surface reservoirs that will be increasingly prone to evaporation. Hayhoe says some water managers are considering pumping the reservoirs underground during exceptionally hot and dry conditions, or covering them with polymer "blankets."

The blankets are an invisible layer of organic molecules that can help reduce evaporation.

110

Floods

While it's not likely that annual precipitation totals will change in North Texas, rainfall patterns likely will. Hayhoe and Nielsen-Gammon both say we will likely see enhanced "feast or famine" cycles with torrential rainstorms in the spring followed by longer than usual dry periods.

These predictions carry a high degree of certainty, because climatologists have already recorded this trend playing out.

"Rainfall becoming more extreme is something we expect because we've observed this not just in North Texas but throughout the United States, and models consistently predict it will continue to happen," said Nielsen-Gammon.

Severe rainstorms, the UTA scientists predict, will have the capacity to flood highway exit and service roads in the Federal Emergency Management Agency (FEMA) 100-year floodplain.

"While the state highway system was built above flooding levels, the connector roads may be easily flooded," said Arne Winguth, a climate scientist at UTA who co-authored the report.

Tornadoes and hail

Two events climate scientists cannot reliably project are hailstorms and tornadoes. "A lot of the things we care about are too small-scale to predict with more confidence," said Nielsen-Gammon. "The historical record is not large enough for longer-term forecasts."

There is some evidence that tornadoes, like rainstorms, are becoming more concentrated on fewer days and that their season has become less predictable.

The same is true with hail. "One thing we expect to happen with a warming climate is that the average humidity in the lower atmosphere may decrease, and if that happens it's easier for hail to stay frozen," said Nielsen-Gammon. "That factor might increase hailstorms, but that's just one of many factors that do affect hail."

Economy

Jina of the University of Chicago predicted in his study that climate change would decrease Dallas County's annual income by 10% to 20% in the coming decades unless emissions are reduced. "North Texas is one of the worst-affected places in the country," he said. Much of the loss comes from higher mortality rates, soaring air-conditioning costs, and reduced labor productivity.

To track labor productivity, Jina and his colleagues examined national time-use surveys, diaries kept by thousands of volunteers across the country, and compared them with local weather data. He found that on extremely hot days, people tended to stop working about 30 minutes early.

"There's direct evidence that people concentrate less well, make more mistakes and their brain just functions less efficiently if it's too hot," he said. Heat also disrupts sleep. "The general lack of productivity leads to them saying, 'No more work today.'"

The good news is that many climate-change effects are manageable. They do require local and federal authorities to plan ahead and take action, said Smith of the National Oceanic and Atmospheric Administration.

111

"It is important," he said, "to address where we build, how we build and also to build protections for populations already exposed in vulnerable areas."[39]

All participating jurisdictions are experiencing the effects of climate change.

Aging Structure and Infrastructure

The age of this infrastructure ties into its level of vulnerability. The older the infrastructure, the more likely it is to fail due to the impacting hazards.

The participating jurisdictions provided an inventory of critical facilities and infrastructure that did not list the age of the facilities. This deficiency will be included as a mitigation action item in each jurisdiction.

Population Increase

Population growth and distribution, especially increased population density and urbanization, increases vulnerability to disasters.[40]

The following table reflects the estimated changes in participating jurisdictions' demographics since the adoption of the 2015 HMP.

Table 42: Population Increase[41]

Name	Status	Population Census 2000-04-01	Population Census 2010-04-01	Population Census 2020-04-01	Population Estimate 2022-07-01
Alvarado	City	3,007	3,302	3,864	4,898
Burleson	City	16,296	21,755	36,876	47,633
Cleburne	City	22,775	26,371	29,634	31,293
Godley	City	679	930	1,006	1,457
Joshua	City	4,226	5,031	6,413	7,918
Keene	City	4,302	5,650	6,117	6,419
Johnson	County	126,811	150,934	179,927	195,506

Socially Vulnerable Populations

Socially Vulnerable Populations include those who have special needs, such as, but not limited to, people without vehicles, people with disabilities, older adults, and people with limited English proficiency. For these populations, emergency response failures can have catastrophic consequences, including loss of the ability to work or live independently, permanent injury, and death. Without appropriate preparation, vulnerable individuals may not be able to evacuate as instructed, reach points of distribution for medical countermeasures, understand written or verbal communications during an emergency, or find suitable housing if their residences are destroyed during a disaster.

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[39] Climate change to bring North Texas longer droughts, heavy rains, 120-degree temps within 25 years. Kuchment, Anna. 2018, February 15. https://www.dallasnews.com/news/climate-change-1/2018/02/15/climate-change-to-bring-texas-longer-droughts-heavy-rains-120-temps-august-within-25-years

[40] Ben Wisner et al., At Risk: Natural Hazards, People's Vulnerability, and Disasters, 2d ed. (London: Routledge, 2004).

[41] USA: States, Counties, Cities, Places, Urban Areas & Metropolitan Areas - Population Statistics in Maps and Charts (citypopulation.de)

To help public health officials and emergency response planners meet the needs of socially vulnerable populations in emergency response and recovery efforts, the Geospatial Research, Analysis, and Services Program (GRASP) created and maintains the CDC/ATSDR Social Vulnerability Index (CDC/ATSDR SVI).

The CDC/ATSDR SVI uses U.S. Census data to determine the social vulnerability of every census tract. Census tracts are subdivisions of counties for which the Census collects statistical data. The SVI ranks each tract on 16 social factors, including poverty, lack of vehicle access, and crowded housing, and groups them into four related themes. Maps of the four themes and overall SVI are shown in Figure 53 on the following page.

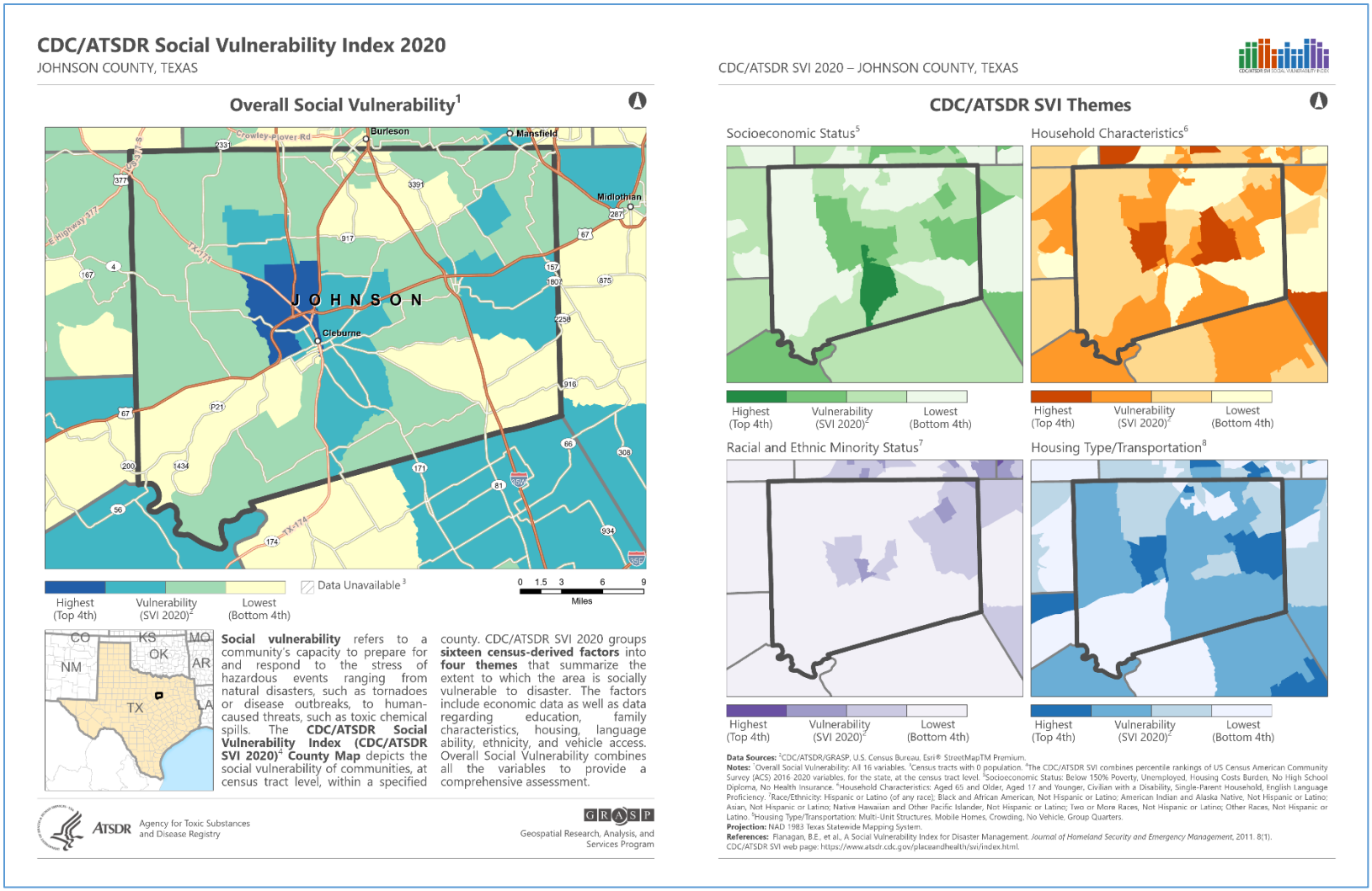


Figure 53: CDC /ATSDR Social Vulnerability Index of Johnson County

114

Repetitive Loss Properties

Among the National Flood Insurance Policy (NFIP) policyholders are thousands whose properties have flooded multiple times. Called “repetitive loss properties,” these are buildings and/or contents for which the NFIP has paid at least two claims of more than $1,000 in any 10-year period since 1978. “Severe repetitive loss properties” are those for which the program has either made at least four payments for buildings and/or contents of more than $5,000 or at least two building-only payments that exceeded the value of the property. These two kinds of properties are the biggest draw on the NFIP Fund. They not only increase the NFIP’s annual losses and the need for borrowing; but they drain funds needed to prepare for catastrophic events. Community leaders and residents should also be concerned with the Repetitive Loss problem because residents’ lives are disrupted and may be threatened by the continual flooding.

The tables below provide information about the repetitive loss and severe repetitive loss properties within the participating jurisdictions, as provided by the Federal Emergency Management Agency. The primary objective of identifying these properties is to eliminate or reduce the damage to property and the disruption to life caused by repeated flooding of the same properties.

Table 43: NFIP Repetitive Loss Properties

Community Name	Mitigated	NFIP Insured	Occupancy 1	Total Losses	Total Paid	As Of Date
ALVARADO, CITY OF	NO	SDF	SINGLE FMLY (OLD METHODOLOGY)	3	$134,182.87	9/10/2023
BURLESON, CITY OF	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	3	$53,370.19	9/10/2023
BURLESON, CITY OF	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$2,367.09	9/10/2023
BURLESON, CITY OF	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	2	$24,141.38	9/10/2023
BURLESON, CITY OF	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$16,579.52	9/10/2023
BURLESON, CITY OF	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	2	$48,907.47	9/10/2023
BURLESON, CITY OF	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	3	$109,486.27	9/10/2023
BURLESON, CITY OF	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	2	$71,815.55	9/10/2023
CLEBURNE, CITY OF	YES	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$16,110.79	9/10/2023
CLEBURNE, CITY OF	YES	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$10,761.16	9/10/2023
CLEBURNE, CITY OF	YES	NO	SINGLE FMLY (OLD METHODOLOGY)	3	$20,075.54	9/10/2023
CLEBURNE, CITY OF	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	4	$70,050.70	9/10/2023
CLEBURNE, CITY OF	NO	NO	2-4 FAMILY (OLD METHODOLOGY)	2	$19,785.65	9/10/2023
CLEBURNE, CITY OF	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	3	$60,935.08	9/10/2023
CLEBURNE, CITY OF	YES	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$18,443.95	9/10/2023
CLEBURNE, CITY OF	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	5	$59,421.46	9/10/2023

115

Community Name	Mitigated	NFIP Insured	Occupancy 1	Total Losses	Total Paid	As Of Date
CLEBURNE, CITY OF	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	3	$134,195.40	9/10/2023
CLEBURNE, CITY OF	NO	NO	OTHER RESID (OLD METHODOLOGY)	2	$61,997.81	9/10/2023
CLEBURNE, CITY OF	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$15,500.00	9/10/2023
JOHNSON COUNTY*	NO	SDF	SINGLE FMLY (OLD METHODOLOGY)	5	$191,151.92	9/10/2023
JOHNSON COUNTY*	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	3	$12,288.33	9/10/2023
JOHNSON COUNTY*	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$18,502.31	9/10/2023
JOHNSON COUNTY*	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	5	$249,234.77	9/10/2023
JOHNSON COUNTY*	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$34,588.26	9/10/2023
JOHNSON COUNTY*	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	2	$94,597.42	9/10/2023
JOHNSON COUNTY*	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	2	$24,704.52	9/10/2023
JOHNSON COUNTY*	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$23,533.97	9/10/2023
JOHNSON COUNTY*	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	2	$24,219.36	9/10/2023
JOHNSON COUNTY*	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	3	$38,078.66	9/10/2023
JOHNSON COUNTY*	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$320,760.51	9/10/2023
JOHNSON COUNTY*	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$52,645.63	9/10/2023
JOHNSON COUNTY*	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	2	$118,546.55	9/10/2023
JOHNSON COUNTY*	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	2	$30,152.16	9/10/2023
JOHNSON COUNTY*	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$18,891.79	9/10/2023
JOHNSON COUNTY*	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	2	$98,563.19	9/10/2023
JOHNSON COUNTY*	NO	YES	OTHR-NONRES (OLD METHODOLOGY)	2	$173,220.26	9/10/2023
JOHNSON COUNTY*	NO	YES	SINGLE FMLY (OLD METHODOLOGY)	2	$50,978.14	9/10/2023
JOHNSON COUNTY*	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$17,813.60	9/10/2023
KEENE, CITY OF	NO	NO	SINGLE FMLY (OLD METHODOLOGY)	2	$35,030.84	9/10/2023

Wildland-Urban Interface

The Wildland-Urban Interface (WUI) layer of a map reflects housing density depicting where humans and their structures meet or intermix with wildland fuels. WUI housing density is categorized based on the standard Federal Register and United States Forest Service (USFS) Silvis data set categories. The number of housing density categories is extended to provide a better gradation of housing distribution to meet specific requirements of the states for their fire protection planning activities. While units of the data set are in houses per square kilometer, which is consistent with other data such as USFS SILVIS, the data is presented as the number of houses per acre to aid with interpretation and use in Texas.

Wildfires can cause significant damage to property and threaten the lives of people who are unable to evacuate WUI areas. All improved property, critical facilities, and critical structures and infrastructure located in these wildfire-prone areas are considered vulnerable and can be exposed to this hazard. The following map reflects the WUI areas in Johnson County.

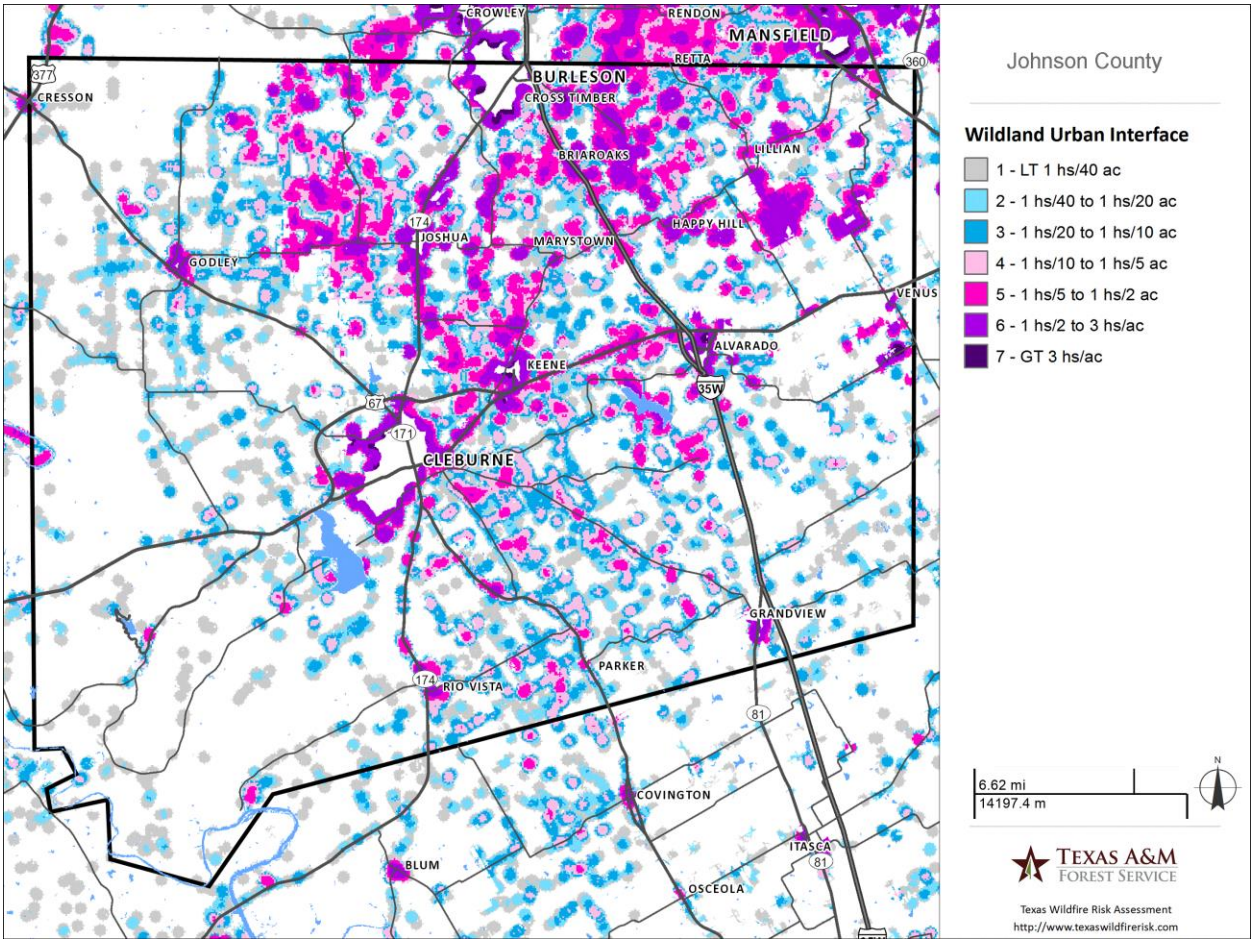


Figure 54: WUI Area

3.4.2 Changes that can Decrease Vulnerability

Factors that decrease vulnerability to hazards include the mitigation actions that have previously been implemented, the adoption of new codes and policies, and the participation in regional projects sponsored by the North Central Texas Council of Governments (NCTCOG) and other governing agencies.

Local Mitigation Activities

The participating jurisdictions have not taken advantage of FEMA's non-disaster grants to fund and implement mitigation actions. One of the goals following the approval and adoption of this HMP is to prioritize the mitigation strategy as a focus for the local governing bodies.

Regional Projects

Johnson County is a member of the North Central Texas Council of Governments (NCTCOG), which is a voluntary association established to assist in regional planning. NCTCOG consists of many departments that implement programs and projects that address the mitigation goals of the participating jurisdictions.

The Environment & Development Department at NCTCOG plays a major role in regional coordination and management of reports and projects that improve regional resilience to natural hazards through the following programs:

- **The Corridor Development Certificate (CDC)** – The CDC process aims to stabilize flood risk along the Trinity River. The CDC process does not prohibit floodplain development but ensures that any development that does occur in the floodplain will not raise flood water levels or reduce flood storage capacity. A CDC permit is required to develop land within a specific area of the Trinity floodplain called the Regulatory Zone, which is similar to the 100-year floodplain.
    - Under the CDC process, local governments retain ultimate control over floodplain permitting decisions, but other communities along the Trinity River Corridor are given the opportunity to review and comment on projects in their neighbor's jurisdiction. As the Metroplex economy continues to grow and develop, the CDC process will prevent increased flood risks.
- **NCTCOG-OneRain Contrail Flood Warning Software**- Contrail software that delivers automated real-time data collection, processing, validation, analysis, archiving and visualization of hydrometeorological and environmental sensor data.
- **The *integrated* Stormwater Management (iSWM) Program**- The iSWM™ Program for Construction and Development is a cooperative initiative that assists cities and counties to achieve their goals of water quality protection, streambank protection, and flood mitigation, while also helping communities meet their construction and post-construction obligations under state stormwater permits.
    - Development and redevelopment by their nature increase the amount of imperviousness in our surrounding environment. This increased imperviousness translates into loss of natural areas, more sources for pollution in runoff, and heightened flooding risks. To help mitigate these impacts, more than 60 local governments are cooperating to proactively create sound stormwater management guidance for the region through the *integrated* Stormwater Management (iSWM) Program.
- **16-County Watershed Management Initiative**- Communities from across the region come together to collaborate on how to reduce the risks of flooding in their communities.
- **Texas Smartscape**- Texas SmartScape™ is a landscape program crafted to be "smart" for North Central Texas. Based on water-efficient landscape principles, it promotes the use of plants suited to our region's soil, climate, and precipitation that don't require much—if any—additional irrigation, pesticides, fertilizer, or herbicides to thrive.

- The two main goals of the program are to:
  - Improve stormwater runoff quality
  - Conserve local water supplies

The Transportation Department promotes the following programs:

- **Bicycle-Pedestrian-** The passage of the 1991 Intermodal Surface Transportation Efficiency Act prompted NCTCOG to include non-motorized transportation network improvements in regional planning efforts. NCTCOG established the Bicycle and Pedestrian program in 1992 to address the various activities related to implementing bicycle and pedestrian facilities as an alternative mode of regional transportation.
- **Sustainable Development**- As land uses influence regional travel patterns and demand on the transportation system, and transportation connects land uses and provides access to developments, both need to be planned in conjunction with one another. NCTCOG supports Sustainable Development: mixed-use, infill, and transit-oriented developments that reduce vehicle miles traveled, enable the use of alternative modes of transportation, promote economic development, and improve air quality.

State Programs

State programs can increase the resiliency of communities in Texas. The Hazard Mitigation Section of the Texas Division of Emergency Management (TDEM) supports Texas communities as they reduce their risk and increase their resilience. The section is comprised of two units, the Plans Unit and the Grants Unit. The two units provide a comprehensive program to support local jurisdictions as they assess the risks they face, plan to mitigate them, and fund those plans to implement mitigation projects that reduce risk across the state.

Federal Policies & Programs

On October 5, 2018, President Trump signed the Disaster Recovery Reform Act of 2018 (DRRA) into law as part of the Federal Aviation Administration Reauthorization Act of 2018. These reforms acknowledge the shared responsibility of disaster response and recovery, aim to reduce the complexity of FEMA and build the nation's capacity for the next catastrophic event. The law contains more than 50 provisions that require FEMA policy or regulation changes for full implementation, as they amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act. It has yet to be seen how the DRRA will be implemented and how it will impact state and local agencies, but highlights from the DRRA include:

Highlights from the DRRA include:

- **Greater investment in mitigation, before a disaster:** Authorizing the National Public Infrastructure Pre-Disaster Hazard Mitigation Grant Program, which will be funded through the Disaster Relief Fund as a six percent set aside from disaster expenses.
  - This program will focus on funding public infrastructure projects that increase community resilience before a disaster occurs.

- Previously, funding for pre-disaster mitigation grants relied on congressional appropriations which varied from year to year. Now, with a reliable stream of sufficient funding, communities will be able to plan and execute mitigation programs to reduce disaster risk nationwide.
- According to a 2017 National Institute of Building Sciences report, the nation saves six dollars in future disaster costs for every one dollar invested in mitigation activities.

- **Reducing risk from future disasters after fire:** Providing hazard mitigation grant funding in areas that received Fire Management Assistance Grants as a result of wildfire. Adding fourteen new mitigation project types associated with wildfires and windstorms.
- **Increasing state capacity to manage disaster recovery:** Allowing for higher rates of reimbursement to state, local and tribal partners for their administrative costs when implementing public assistance (12 percent) and hazard mitigation projects (15 percent). Additionally, the legislation provides flexibility for states and tribes to administer their own post-disaster housing missions, while encouraging the development of disaster housing strategies.
  - States, tribes, territories and local governments bear significant administrative costs implementing disaster recovery programs. Often these costs can be high and substantially burdensome for the impacted entity to meet. Increasing the funding for administrative costs will enable faster, more effective delivery of vital recovery programs to communities.
  - State and tribal officials have the best understanding of the temporary housing needs for survivors in their communities. This provision incentivizes innovation, cost containment and prudent management by providing general eligibility requirements while allowing them the flexibility to design their own programs.
- **Providing greater flexibility to survivors with disabilities:** Increasing the amount of assistance available to individuals and households affected by disasters, including allowing accessibility repairs for people with disabilities, without counting those repairs against their maximum disaster assistance grant award.
- **Retaining skilled response and recovery personnel:** Authorizing FEMA to appoint certain types of temporary employees who have been with the agency for three continuous years to full time positions in the same manner as federal employees with competitive status. This allows the agency to retain and promote talented, experienced emergency managers.

In 2021, President Biden approved more than $3.46 billion to increase resilience to the potential impacts of climate change nationwide. This significant investment will be available for natural hazard mitigation measures across the 59 major disaster declarations issued due to the COVID-19 global pandemic.

With the growing climate change crisis facing the nation, FEMA's Hazard Mitigation Grant Program will provide funding to states, tribes, and territories for mitigation projects to reduce the potential impacts of climate change. Every state, tribe, and territory that received a major disaster declaration in response to the COVID-19 pandemic will be eligible to receive 4% of those disaster costs to invest in mitigation projects that reduce risks from natural disasters.

This influx of funding will help communities prioritize mitigation needs for a more resilient future, including underserved communities that are most vulnerable to the potential impacts of climate change. These projects can help address the effects of climate change and other unmet mitigation needs, including using funds to promote equitable outcomes in underserved communities.

As dollar losses increase along with the number of disaster declarations, it is expected that national policy will continue playing a huge part in community resilience.

Justice40 Initiative

A national commitment to environmental justice of this magnitude has never been made before. To meet the goal of the Justice40 Initiative, the Administration is transforming hundreds of Federal programs across the government to ensure that disadvantaged communities receive the benefits of new and existing Federal investments in these categories. Through the President's Inflation Reduction Act, Bipartisan Infrastructure Law, and the American Rescue Plan, Federal agencies are making historic levels of investment to advance environmental justice. This investment will help confront decades of underinvestment in disadvantaged communities and bring critical resources to communities that have been overburdened by legacy pollution and environmental hazards.[42]

Federal agencies will use the Climate and Economic Justice Screening Tool (CEJT) to help identify disadvantaged communities that will benefit from programs included in the Justice40 Initiative. The tool has an interactive map and uses datasets that are indicators of burdens in eight categories: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. Communities that are disadvantaged live in tracts that experience burdens. These tracts are highlighted in blue, informing the user of what a disadvantaged community is depicted as on the map (see Figure 55 for example). These are the communities that are disadvantaged because they are overburdened and underserved.

[42] Justice40 Initiative | Environmental Justice | The White House

Figure 55: Climate and Economic Justice Screening Tool[43]

National Flood Insurance Program

The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically. When a community participates in the NFIP, it participates in one of two phases: the Emergency Program or the Regular Program.

Emergency Program: Entry-level participation phase.

- Limited coverage
- Flat rates
- Basic Flood Hazard Boundary Map (FHBM)*

**Initial flood hazard identification*

Regular Program: Most participating communities are in this phase.

- Full participation
- Detailed Flood Insurance Rate Map (FIRM)
- NFIP's full limits of insurance

The following table lists the jurisdictions participating in the NFIP.

Table 44: Communities Participating in the National Flood Program[44]

[43] Explore the map - Climate & Economic Justice Screening Tool (geoplatform.gov)

[44] FEMA. *Communities Participating in the National Flood Program*. 2023, https://www.fema.gov/cis/TX.html.

CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
480397#	ALVARADO, CITY OF	JOHNSON COUNTY	08/09/74	05/04/82	12/04/12	05/04/82	No
485459B	BURLESON, CITY OF	TARRANT COUNTY/JOHNSON COUNTY	11/02/73	11/02/73	09/21/23	11/02/73	No
485462C	CLEBURNE, CITY OF	JOHNSON COUNTY	07/13/72	07/13/72	09/21/23	06/23/72	No
480880C	GODLEY, CITY OF	JOHNSON COUNTY	08/22/75	09/27/91	09/21/23	02/18/11	No
480882C	JOSHUA, CITY OF	JOHNSON COUNTY	06/27/75	09/27/91	09/21/23	09/27/91	No
481107#	KEENE, CITY OF	JOHNSON COUNTY	06/04/76	09/27/91	12/04/12	02/21/01	No
480879C	JOHNSON COUNTY*	JOHNSON COUNTY	05/17/77	09/27/91	09/21/23	09/27/91	No

Community Rating System

Going beyond the minimum flood standards, the Community Rating System (CRS) is a voluntary program for communities that participate in the National Flood Insurance Program (NFIP). 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. The CRS has been developed to provide incentives in the form of premium discounts for communities to go beyond the minimum floodplain management requirements to develop extra measures to provide protection from flooding. For a community to be eligible, it must be in full compliance with the NFIP.

All communities start out with a Class 10 rating, which provides no discount. There are 10 CRS classes: Class 1 requires the most credit points and gives the greatest premium discount; Class 10 identifies a community that does not apply for the CRS or does not obtain a minimum number of credit points and receives no discount. There are 18 activities recognized as measures for eliminating exposure to floods. Credit points are assigned to each activity. The activities are organized under 4 main categories:

- Public Information
- Mapping and Regulation
- Flood Damage Reduction
- Flood Preparedness

Premium discounts ranging from 5% to a maximum of 45% are applied to eligible policies written in a community as recognition of the floodplain management activities instituted.

All CRS communities must maintain completed FEMA elevation and floodproofing certificates for all new and substantially improved construction in the Special Flood Hazard Area (SFHA) after the date of application for CRS classification. These certificates must be available upon request. Therefore, in writing a policy, an agent/producer should be able to get these certificates from any CRS community. In addition, some CRS communities receive credit for having completed certificates for Post-Flood Insurance Rate Map (FIRM) buildings constructed prior to the CRS application date. If they do receive this credit, these certificates should also be available to agents/producers writing flood insurance.

Table 45: CRS Participants

Community Name	CRS Entry Date	Current Effective Date	Current Class	% Discount for SFHA	% Discount for Non- SFHA	Status
Burleson	10/1/1991	10/1/2021	10	0	0	R
Cleburne	10/1/1992	5/1/2013	8	10	5	C

3.3.5 Greatest Vulnerabilities

The overall vulnerability level of the participants has remained the same since the previous mitigation plan, yet can increase with the aging infrastructure, increase in population, and presence of climate change.

Below is a list of the participating jurisdictions greatest vulnerabilities in relation to natural hazards.

Table 46: Greatest Vulnerabilities

Jurisdiction	Vulnerabilities
Alvarado	• Any substantial event would be devastating to the financial capabilities of the city. • Any major event would overwhelm the local resources.
Burleson	• Any substantial event would be devastating to the financial capabilities of the city. • Any major event would overwhelm the local resources.
Cleburne	• Any substantial event would be devastating to the financial capabilities of the city. • Any major event would overwhelm the local resources.
Godley	• Any substantial event would be devastating to the financial capabilities of the city. • Any major event would overwhelm the local resources.
Joshua	• Any substantial event would be devastating to the financial capabilities of the city. • Any major event would overwhelm the local resources.
Keene	• Any substantial event would be devastating to the financial capabilities of the city. • Any major event would overwhelm the local resources. • The city has a lot of parcels with unmaintained and dilapidated properties, which affects the overall appearance of the city. • The infrastructure such as streets, sewer lines, water lines, gas lines and sidewalks need to be updated and maintained. • Accessibility to health services such as hospitals/county hospitals, EMR response time, healthy food, sidewalks, parks and trails and bike lanes. Food desert is an issue in Keene.
Johnson County Unincorporated	• Any substantial event would be devastating to the financial capabilities of the county.

Jurisdiction	Vulnerabilities
	• Any major event would overwhelm the local resources.

3.6. National Risk Index

According to FEMA's National Risk Index, the Risk Index rating is **relatively moderate** for Johnson County, TX when compared to the rest of the U.S. The Risk Index leverages available source data for natural hazard and community risk factors to develop a baseline risk measurement for each United States county and Census tract.

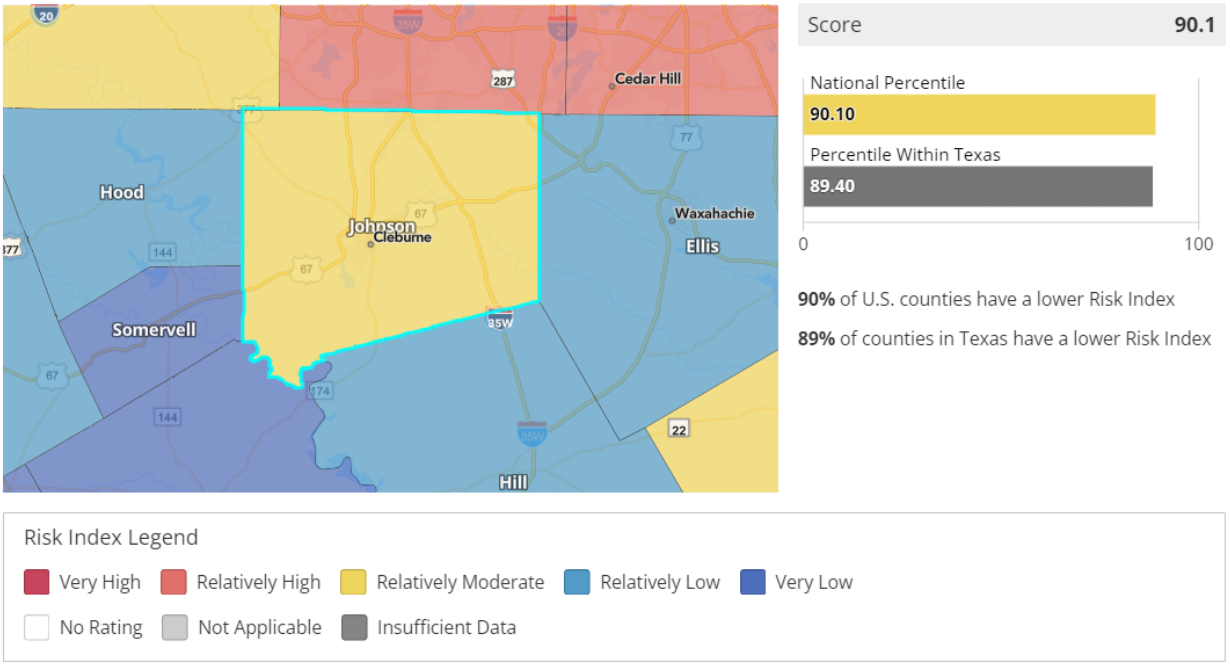


Figure 56: Risk Index Comparison

The risk equation behind the Risk Index includes three components: a *natural hazards component* (**Expected Annual Loss**), a *consequence enhancing component* (**Social Vulnerability**), and a *consequence reduction component* (**Community Resilience**). The summary of each of these comments in provided in Figure 57 below.

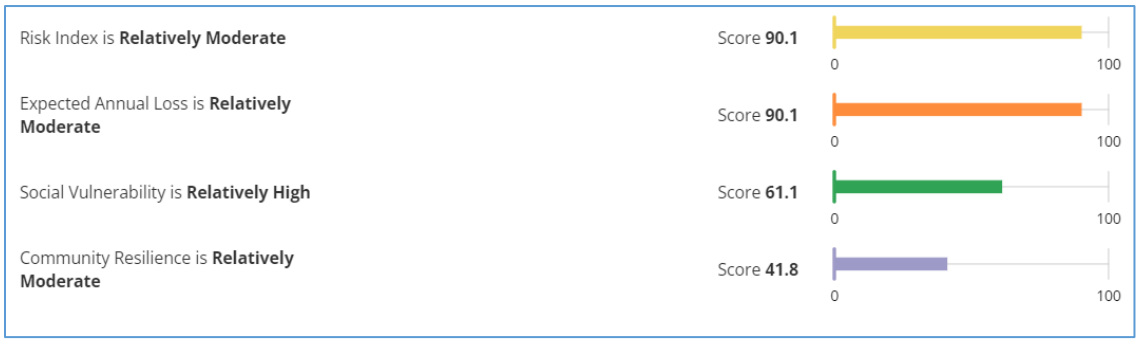


Figure 57: Risk Index Summary

3.6.1 Hazard Type Risk Index

Hazard Type Risk Index Scores (Table 47) are calculated using data for only a single hazard type and reflect a community's Expected Annual Loss (EAL) value, community risk factors, and the adjustment factor used to calculate the risk value. Please note that the hazards identified in this National Risk Index are slightly different from how the hazards are identified in this hazard mitigation plan.

Table 47: Hazard Type Risk Index Scores

Hazard Type	EAL Value	Social Vulnerability	Community Resilience	Risk Value	Score
Tornado	$24,415,786	Relatively High	Relatively Moderate	$28,818,886	98.4
Wildfire	$4,252,803	Relatively High	Relatively Moderate	$4,776,818	95.7
Heat Wave	$3,784,202	Relatively High	Relatively Moderate	$4,463,341	97.3
Strong Wind	$2,104,989	Relatively High	Relatively Moderate	$2,489,162	93.9
Riverine Flooding	$1,491,852	Relatively High	Relatively Moderate	$1,745,923	78.2
Hail	$593,929	Relatively High	Relatively Moderate	$702,115	84.8
Winter Weather	$591,001	Relatively High	Relatively Moderate	$697,136	94.8
Cold Wave	$527,236	Relatively High	Relatively Moderate	$621,529	87.4
Lightning	$282,949	Relatively High	Relatively Moderate	$331,667	79.9
Earthquake	$175,301	Relatively High	Relatively Moderate	$210,795	56
Ice Storm	$107,572	Relatively High	Relatively Moderate	$127,103	63.4
Drought	$17,034	Relatively High	Relatively Moderate	$20,814	47.2

Chapter 4: Mitigation Strategy

4.1 Mitigation Goals

The goals from the previous plan are listed in the following box.

2015 Mitigation Goals and Objectives

- ***Goal 1 Reduce or eliminate loss of life and property damage resulting from severe weather events.***
    - *Objective 1-A Provide adequate warning and communication before, during, and after a hazard event.*
    - *Objective 1-B Expand and coordinate Early Warning Systems currently in use.*
    - *Objective 1-C Reduce or eliminate loss of life and property damage from tornados through the construction and use of safe rooms or shelter areas.*
- ***Goal 2 Protect existing and new properties from the effects of all natural hazards.***
    - *Objective 2-A Conduct studies to determine hazard and vulnerability threat assessment for all natural hazards.*
    - *Objective 2-B Rehabilitate or retrofit identified high hazard critical infrastructure.*
    - *Objective 2-C Enact and enforce regulatory measures that enforce hazard mitigation measures.*
    - *Objective 2-D Construct enhancements or additions to current and new facilities which mitigate the effects of natural hazards.*
    - *Objective 2-E Maintain NFIP compliance, storm water management, and implement drainage projects.*
- ***Goal 3 Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.***
    - *Objective 3-A Conduct a hazard/vulnerability assessment of personal properties and structures located in flood zones within Johnson County.*
    - *Objective 3-B Develop and implement a buyout program for those personal properties and structures located in high hazard flood zones starting with those that are most vulnerable to life and property loss.*
    - *Objective 3-C Develop and execute new programs which identify and reduce threats from natural hazards.*
- ***Goal 4 Develop Public Education Campaigns to educate the public on what actions they can take to mitigate the effects of loss of life or property damage resulting from all natural hazards.***
    - *Objective 4-A Educate the public on risks, threats, and vulnerability from all natural hazards.*
    - *Objective 4-B Educate the public on actions they can take to prevent or reduce the loss of life or property from all natural hazards.*
    - *Objective 4-C Develop and implement a community education campaign to heighten public awareness about chronic flooding and options for insurance coverage to protect their personal properties as well as long term benefits from a buyout program.*

The Johnson County Hazard Mitigation Planning Team reviewed the previous Johnson County mitigation goals and unanimously agreed to forego these goals and adopt the following hazard mitigation goals:

Goal 1: Protect lives and reduce bodily harm from hazards.

Goal 2: Lessen the impacts of hazards on property and the community.

Every mitigation action listed in this strategy supports these goals and the natural hazards that could impact the planning area:

- Drought
- Earthquakes
- Expansive Soils
- Extreme Heat
- Flooding (including dam failure)
- Thunderstorms (including hail, wind, and lightning)
- Tornadoes
- Wildfires
- Winter Storms

4.2 Mitigation Strategy

The mitigation strategy serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The Stafford Act directs hazard mitigation plans to describe hazard mitigation actions and establish a strategy to implement those actions. Therefore, each participating jurisdiction in this plan recommended strategies and actions that would support the mitigation goals, then went through a ranking process to determine which actions they would prioritize for completion.

4.2.1 Implementation Priority

Priority of mitigation actions will go toward projects that are most cost-effective with 1) the highest positive impact on vulnerable populations and 2) the highest impact on overall community resilience by using the STAPLEE method to evaluate and prioritize actions when applying for funding.

The STAPLEE evaluation method uses seven criteria for evaluating a mitigation action: Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Within each of those criteria are additional considerations. Actions with the highest score will be considered to have higher success potential.

Prioritization may change over time in response to changes in community characteristics and risks and to take advantage of available resources.

4.2.2 Funding

As necessary, participating jurisdictions will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. Potential funding sources, both internal and external, have been identified for proposed actions listed in the mitigation strategies.

Sources of local funding may include the general fund, general operating budget, capital improvement budgets, staff time, impact fees, special assessment districts, and more. The Mitigation Funding Resource Guides | FEMA.gov identifies potential state and federal resources.

The planning teams that recorded “Grants” as a potential funding source for their actions intend to apply to any grants in which the action is eligible for and are not limiting themselves to one source. Under FEMA Hazard Mitigation Assistance (HMA) Grants , there is funding through the Hazard Mitigation Grant Program (HMGP), HMGP-Post Fire, Building Resilient Infrastructure and Communities (BRIC), and Flood Mitigation Assistance (FMA) programs.

These funding streams may be matched to pre- and post-disaster conditions for mitigation projects, the development or update of hazard mitigation plans, and management costs.

HMA Grants also provide funding for Climate Resilient Mitigation Activities, which support communities in reducing risks associated with climate change. There are four eligible activities: Aquifer Storage and Recovery, Floodplain and Stream Restoration, Flood Diversion and Storage, and Green Infrastructure Methods. While focused on addressing the long-term impacts of flooding and drought, these activities can mitigate any natural hazard.

Two other prominent federal funding programs include the Department of Housing and Urban Development’s (HUD) Community Development Block Grant (CDBG) program and the EPA’s Smart Growth program. The CDBG program aims to develop viable communities through an annual block grant to states, cities, and urban counties, but additional disaster recovery (DR) funds can also be appropriated following a Presidentially declared disaster for the purpose of recovery and mitigation. CDBG-DR prioritizes low- and moderate-income persons, but funding is fairly flexible and can be used to supplement other programs.

Many other agencies and organizations support hazard mitigation and community resilience through funding and technical assistance. The planning team will also consider opportunities for private sector funding and partnerships, as well as resources that may be provided by academic institutions.

4.2.3 Mitigation Action Items

A comprehensive range of action types (Figure 58) have been identified in this mitigation strategy, including plans and regulations, structure and infrastructure projects, natural systems protection, and education and awareness programs.

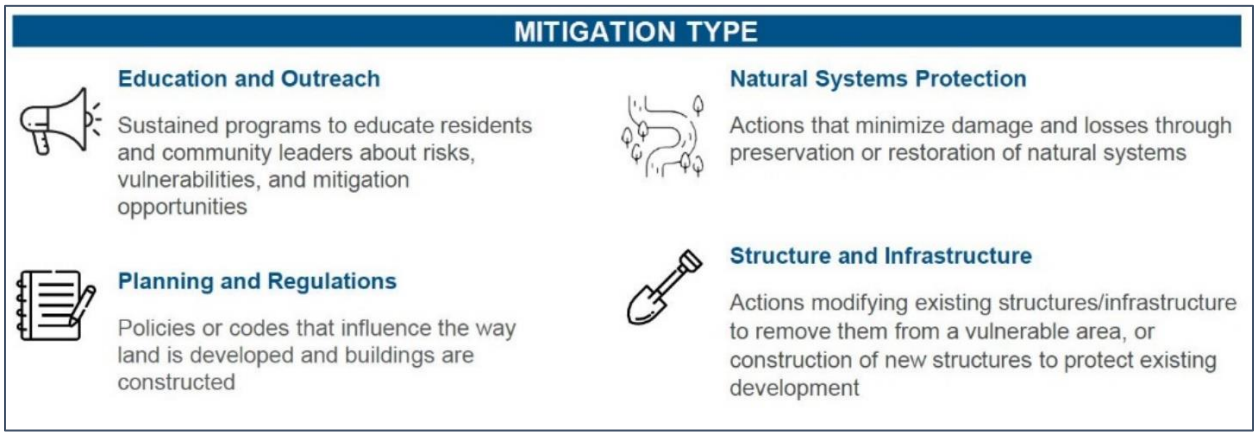


Figure 58: Mitigation Action Types

Previous Mitigation Action Items

The action items in the 2015 Johnson County HMP were determined by the 2015 Local Planning Team (LPT) in each jurisdiction. Below are the action items from each participating jurisdiction from the 2015 plan and the status of each action. Actions deferred were deferred to this edition of the HMP and actions deleted were deleted because they are no longer a priority. Due to competing priorities and limited capabilities over the last five years, many jurisdictions did not complete any actions.

Table 48: Status of Previous Mitigation Actions

Jurisdiction	Status	2015 Mitigation Actions
Alvarado	Deferred	Expand and coordinate early warning systems to new developments and populations.
Alvarado	Deferred	Purchase and install a CASA WX Radar System.
Alvarado	Deferred	Implement Individual Tornado Safe Room Rebate Program.
Alvarado	Deferred	Purchase NOAA weather radios for distribution to residents.
Alvarado	Deferred	Adopt codes requiring hail resistant roofing on all new construction and roof replacements.
Alvarado	Deferred	Educate builders and residents about “hail resistant” roofing in new construction and roof replacements.
Alvarado	Deferred	Educate builders and residents about mitigating wind damage.
Alvarado	Deferred	Develop and implement public education concerning winter storm mitigation.
Alvarado	Deferred	Develop and implement public education programs on the dangers of excessive heat.
Alvarado	Deferred	Improve water supply and delivery systems to save water by designing water delivery systems to accommodate drought events and developing new or upgrading existing water delivery systems to eliminate breaks and leaks.
Alvarado	Deferred	Design and implement specific water conservation public education efforts to complement existing programs.
Alvarado	Deferred	Increase public education on how to reduce the risks from wildfires.
Alvarado	Deferred	Partner with the Texas A&M Forest Service to become a “Firewise” Community.
Alvarado	Deferred	Adopt debris management and flood abatement ordinances to prevent buildup of debris and materials that could cause flooding.
Alvarado	Deferred	Raise the road level of Atchley Street at creek.
Alvarado	Deferred	Incorporate flood mitigation into local planning.
Alvarado	Deferred	Develop an Emergency Plan for drought.
Alvarado	Deferred	Develop and implement public education programs on the dangers of severe thunderstorms.
Alvarado	Deferred	Hire a consultant to complete inundation studies of all high and moderate hazard dams that threaten the city.
Burleson	In- Progress	Develop and implement comprehensive public education program for natural hazards.
Burleson	Deferred	Purchase NOAA weather radios for distribution to residents.
Burleson	Complete	Purchase and install CASA WX Weather Radar.

Jurisdiction	Status	2015 Mitigation Actions
Burleson	In-Progress	Implement individual tornado safe room rebate program.
Burleson	In- Progress	Purchase and install outdoor warning sirens to encompass new developments and populations.
Burleson	Complete	Develop annual program for inspection, prevention, and trimming of tree limbs next to high voltage power lines.
Burleson	Complete	Require underground high voltage power lines for new developments.
Burleson	Complete	Adopt, implement, and enforce debris management and flood abatement ordinances to prevent buildup of debris and materials that could cause flooding.
Burleson	In- Progress	Identify and implement capital improvements to municipal utility distribution system.
Burleson	Deleted	Hire a consultant to complete inundation studies of all high and moderate hazard dams that threaten the City.
Burleson	Complete	Increase conservation of water by developing and implementing drought contingency plan.
Cleburne	Deferred	Implement codes for underground high voltage power lines for new developments.
Cleburne	Deferred	Develop program for inspection and trimming of tree limbs next to high voltage power lines.
Cleburne	Deferred	Develop and implement comprehensive public education program for natural hazards.
Cleburne	Deferred	Increase conservation of water by developing and implementing a drought contingency plan.
Cleburne	Deferred	Establish a secondary water supply from Lake Whitney to Lake Pat Cleburne.
Cleburne	Deferred	Administer grant programs to install safe rooms to reduce the injuries and deaths to citizens associated with high winds and debris from a tornado or severe weather event.
Cleburne	Deferred	Purchase and install CASA WX Weather Radar.
Cleburne	Deferred	Mitigate the effects of severe weather to citizens through early warning systems.
Cleburne	Deferred	Identify and implement capital improvements to municipal utility distribution system.
Cleburne	Deferred	Develop a flood threat recognition system.
Cleburne	Deferred	Adopt debris management and flood abatement ordinances to prevent buildup of debris and materials that could cause flooding.
Cleburne	Deferred	Hire a consultant to complete inundation studies of all high and moderate hazard dams that threaten the City.
Godley	Deferred	Purchase NOAA weather radios for distribution to vulnerable populations.
Godley	Deferred	Purchase and install a CASA WX Radar System.
Godley	Deferred	Implement Individual Tornado Safe Room Rebate Program.
Godley	Deferred	Develop, implement, and enforce water restriction ordinances.
Godley	Deferred	Create and implement a natural hazard public education program for residents.

Jurisdiction	Status	2015 Mitigation Actions
Godley	Deferred	Identify and implement capital improvements to municipal utility distribution system.
Godley	Deferred	Hire a consultant to complete inundation studies of all high and moderate hazard dams that threaten the City.
Joshua	Deferred	Mitigate the effects of severe weather to citizens through early warning systems.
Joshua	Deferred	Install and maintain a CASA WX Weather Radar System.
Joshua	Deferred	Adopt debris management and flood abatement ordinances to prevent buildup of debris and materials that could cause flooding.
Joshua	Deferred	Mitigate effects of extreme heat through installation of covered patios in public parks.
Joshua	Deferred	Develop Community Wildfire Protection Plan (CWPP) and implement fuels reduction programs.
Joshua	Deferred	Hire a consultant to complete inundation studies of all high and moderate hazard dams within the City.
Joshua	Deferred	Identify and implement capital improvements to municipal utility distribution system.
Joshua	Deferred	Create and implement a natural hazard public education program for residents.
Keene	Deferred	Develop and implement comprehensive public education program for natural hazards.
Keene	Deferred	Mitigate the effects of severe weather to citizens through early warning systems.
Keene	Deferred	Purchase and install a CASA WX Weather Radar system.
Keene	Deferred	Implement an Individual Tornado Safe Room Rebate Program.
Keene	Deferred	Adopt debris management and flood abatement ordinances to prevent buildup of debris and materials that could cause flooding.
Keene	Deferred	Mitigate effects of extreme heat through installation of covered patios in public parks.
Keene	Deferred	Create temporary public cooling centers to mitigate the effects of extreme heat.
Keene	Deferred	Develop Community Wildfire Protection Plan (CWPP) and Implement Fuels Reduction Programs.
Keene	Deferred	Identify and implement capital improvements to municipal utility distribution system.
Keene	Deferred	Hire a consultant to complete inundation studies of all high and moderate hazard dams within the City.
Johnson County	Deferred	Purchase and distribute NOAA all-hazard radios to provide the residents and commercial businesses.
Johnson County	Deferred	Purchase and install a CASA Weather Radar System.
Johnson County	Deferred	Implement Individual Tornado Safe Room Rebate Program.
Johnson County	Deferred	Mitigate effects of extreme heat through installation of covered patios in public parks.

Jurisdiction	Status	2015 Mitigation Actions
Johnson County	Deferred	Identify, equip, and open heating and cooling centers across Johnson County to prevent special populations from temperature injury.
Johnson County	Deferred	Develop an emergency plan for drought.
Johnson County	Deferred	Develop Community Wildfire Protection Plan (CWPP) and implement fuels reduction programs.
Johnson County	Deferred	Hire a consultant to complete inundation studies of all high and moderate hazard dams within the County.
Johnson County	Deferred	Adopt debris management and flood abatement ordinances to prevent buildup of debris and materials that could cause flooding.
Johnson County	Deferred	Develop and implement a comprehensive public education program for natural hazards.

New Mitigation Action Items

In addition to their previous actions, new actions were identified by the Planning Team after reviewing their risk and capability assessments. Actions that would take longer than FEMA's three-year period of performance to implement would be broken into phases when seeking grant funding.

Many of the actions have a "primary" community lifeline they could impact, though multiple lifelines could be impacted. Community Lifelines can be a powerful tool for state, local, tribal, and territorial governments to use in evaluating risk and developing strategies to reduce hazard impacts.

To determine the estimated benefit of each action item, data from the 2017 Interim Report was used to develop a cost-benefit analysis [*Estimated Cost x 6 = Estimated Benefit*], as it reports that $1 spent in mitigation saves a community an average of $6 in recovery.[45]

The following tables identify the new mitigation actions for jurisdictions in this hazard mitigation plan.

Table 49: City of Alvarado Mitigation Actions

Hazard(s) Addressed	All Hazards
Action: Implement the deferred 2015 mitigation actions (listed in the previous section) when capabilities and priorities allow.	
Participating Jurisdiction	City of Alvarado
Priority:	1
Estimated Cost:	TBD
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grants, General Fund
Lead Agency/Department Responsible:	City Council
Implementation Schedule:	36 months

[45] Natural Hazard Mitigation Saves: 2017 Interim Report. National Institute of Building Science. https://www.nibs.org/page/mitigationsaves

Hazard(s) Addressed	All Hazards
Action: Install quick-connect emergency generator hook-ups, generators, generator bracing, generator security, on-site fuel storage, and all other necessary equipment to protect and maintain power for critical facilities in the event of a natural disaster.	
Participating Jurisdiction	City of Alvarado
Priority:	2
Estimated Cost:	$50M
Estimated Benefit:	$300M
Potential Funding Source(s):	Grants, General Fund, Capital Improvement Budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**Flooding**
Action: Use minor structural projects that are smaller and more localized (e.g., floodwalls or small berms) around facilities critical to the wellbeing of city residents, in areas that cannot be mitigated through non-structural activities, or where structural activities are not feasible due to low densities.	
Participating Jurisdiction	City of Alvarado
Priority:	3
Estimated Cost:	$25,000
Estimated Benefit:	$150,000
Potential Funding Source(s):	Grants, General Fund, Capital Improvement Budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	18 months
Hazard(s) Addressed	**All Hazards**
Action: Protect visitors and natural assets at city parks from severe weather by implementing any mitigation actions necessary and feasible, such as outdoor tornado shelters, hazard-conscious landscaping, lightning prediction and notification systems, hydration stations, splash pads, covered rest areas, covered playgrounds, covered parking, and educational signage. *(Covered areas could be covered by solar panels that power security lights and charging ports, green roofs that absorb stormwater, shade clothes, tree canopy, or traditional roofing material.)*	
Participating Jurisdiction	City of Alvarado
Priority:	4
Estimated Cost:	$6M
Estimated Benefit:	$36M
Potential Funding Source(s):	Grants, General Fund, Capital Improvement Budget
Lead Agency/Department Responsible:	Parks & Recreation, Public Works
Implementation Schedule:	36 months

Hazard(s) Addressed	Extreme Heat, Winter Storm
Action: Establish cooling and warming centers at select city buildings and Alvarado ISD schools, staff the centers with qualified volunteers or staff, and supply centers with proper warming and heating supplies, hydration products, first aid supplies, comfort items, and hazard educational material to protect citizens, especially vulnerable populations, from extreme temperatures and educate them on personal protective measures.	
Participating Jurisdiction	City of Alvarado
Priority:	5
Estimated Cost:	$200,000
Estimated Benefit:	$1,200,000
Potential Funding Source(s):	Grants, General Fund
Lead Agency/Department Responsible:	Fire
Implementation Schedule:	12 months
Hazard(s) Addressed	**All Hazards**
Action: Conduct a study to prioritize existing government facilities and critical facilities needing to be retrofitted from natural hazards.	
Participating Jurisdiction	City of Alvarado
Priority:	6
Estimated Cost:	$300,000
Estimated Benefit:	$1.8M
Potential Funding Source(s):	Grants, General Funds, Capital Improvement Budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Retrofit existing government facilities and critical facilities to withstand all hazards and more efficiently use their power supplies.	
Participating Jurisdiction	City of Alvarado
Priority:	7
Estimated Cost:	$30M
Estimated Benefit:	$180M
Potential Funding Source(s):	Grants, General Funds, Capital Improvement Budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months

Hazard(s) Addressed	Winter Storms
Action: Winterize all public utilities.	
Participating Jurisdiction	City of Alvarado
Priority:	8
Estimated Cost:	$4
Estimated Benefit:	$24M
Potential Funding Source(s):	Grants, General Funds, Water & Sewage Fund,
Lead Agency/Department Responsible:	Utilities
Implementation Schedule:	6 months
Hazard(s) Addressed	**Drought, Expansive Soils, Extreme Heat, Flooding, Thunderstorms, Wildfires, Winter Storms**
Action: Create a list of city-approved plants to support a landscape ordinance that promotes the use of native, drought-friendly, water-absorbing, fire-resistant, high evapotranspiration (ET)-rated plants throughout the city (including private property) to naturally mitigate potential hazard impacts.	
Participating Jurisdiction	City of Alvarado
Priority:	9
Estimated Cost:	$5,000
Estimated Benefit:	$30,000
Potential Funding Source(s):	Grants, General Fund, department budget
Lead Agency/Department Responsible	City Council, Public Works
Implementation Schedule:	12 months
Hazard(s) Addressed	**All Hazards**
Action: Create an incentive program to encourage business owners and residents to implement hazard mitigation measures, purchase NFIP insurance, and follow city mitigation recommendations.	
Participating Jurisdiction	City of Alvarado
Priority:	10
Estimated Cost:	$1M
Estimated Benefit:	$6M
Potential Funding Source(s):	Grants, General Fund
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	24 months

Hazard(s) Addressed	All Hazards
Action: Mitigate water supply impacts from hazards using various mitigation measures, such as building back-up water tanks and wells, upgrading existing water delivery systems to eliminate breaks and leaks, insulating pipes, installing water- conservative appliances and irrigation equipment, installing shutoff valves and emergency connector hoses on water mains, and upgrading fire hydrants.	
Participating Jurisdiction	City of Alvarado
Priority:	11
Estimated Cost:	$700,000
Estimated Benefit:	$4.2M
Potential Funding Source(s):	Grants, Water & Sewage Fund, Capital Improvement Budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Approve the use of impact fees to help fund public projects to mitigate impacts of land development.	
Participating Jurisdiction	City of Alvarado
Priority:	12
Estimated Cost:	$500
Estimated Benefit:	$3,000
Potential Funding Source(s):	General Fund
Lead Agency/Department Responsible:	City Council
Implementation Schedule:	12 months
Hazard(s) Addressed	**Flooding**
Action: Elevate roads and bridges above base flood elevation to maintain dry access.	
Participating Jurisdiction	City of Alvarado
Priority:	13
Estimated Cost:	$500M
Estimated Benefit:	$3B
Potential Funding Source(s):	Grants, General Fund, Capital Improvement Budget
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	36 months

Hazard(s) Addressed	All Hazards
Action: Develop and maintain a database to track community vulnerability and members of the underserved population.	
Participating Jurisdiction	City of Alvarado
Priority:	14
Estimated Cost:	$10,000
Estimated Benefit:	$60,000
Potential Funding Source(s):	General Fund
Lead Agency/Department Responsible:	Fire
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Obtain local data including tax parcels, building values, critical facility locations, storm damage, changes to local assets mentioned in the plan, and other information for use in hazard risk analysis.	
Participating Jurisdiction	City of Alvarado
Priority:	15
Estimated Cost:	$20,000
Estimated Benefit:	$120,000
Potential Funding Source(s):	General Fund
Lead Agency/Department Responsible:	Fire
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Fund activities by local artists, students, volunteer organizations, and interest groups that increases community awareness of the local hazards, historical events, and the City's hazard education program.	
Participating Jurisdiction	City of Alvarado
Priority:	16
Estimated Cost:	$200,000
Estimated Benefit:	$1.2M
Potential Funding Source(s):	General Fund
Lead Agency/Department Responsible:	Fire
Implementation Schedule:	36 months

Table 50: City of Burleson Mitigation Actions

Hazard(s) Addressed:	Flooding, Thunderstorms, Tornadoes, Wildfire
Action: Purchase and install outdoor warning sirens to encompass new developments and populations.	
Participating Jurisdiction	City of Burleson
Priority:	1
Estimated Cost:	$650,000
Estimated Benefit:	$3.9 M
Potential Funding Source(s):	City Funds
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	36 Months
Hazard(s) Addressed:	**All Hazards**
Action: Enhance the city's comprehensive public education program for natural hazards to incorporate education about various mitigation techniques.	
Participating Jurisdiction	City of Burleson
Priority:	2
Estimated Cost:	$20,000
Estimated Benefit:	$120,000
Potential Funding Source(s):	City Funds, In-Kind, Donations
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	Ongoing
Hazard(s) Addressed:	**Winter Storm, Flooding, Thunderstorms, Tornadoes, Extreme Heat**
Action: Purchase and install generator(s) in existing and future city owned or operated facilities.	
Participating Jurisdiction	City of Burleson
Priority:	3
Estimated Cost:	$1.5 M
Estimated Benefit:	$9 M
Potential Funding Source(s):	HMPG, City Funds
Lead Agency/Department Responsible:	Emergency Management, Parks and Recreation
Implementation Schedule:	36 Months

Hazard(s) Addressed:	Drought, Earthquakes, Expansive Soils, Extreme Heat, Flooding, Winter Storms
Action: Ensure new and existing utilities are strengthened and reinforced with insulation and flex piping to prevent disruption in services.	
Participating Jurisdiction	City of Burleson
Priority:	4
Estimated Cost:	$ 500 K
Estimated Benefit:	$ 3 M
Potential Funding Source(s):	General Funds, Property Owners
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	24 Months
Hazard(s) Addressed:	**Earthquake, Extreme Heat, Flooding, Thunderstorms, Tornadoes, Wildfires, Winter Storms**
Action: Install quick-connect emergency generator hook-ups for critical facilities.	
Participating Jurisdiction	City of Burleson
Priority:	5
Estimated Cost:	$300 K
Estimated Benefit:	$1.8 M
Potential Funding Source(s):	HMGP, City Funds
Lead Agency/Department Responsible:	Emergency Management- Public Works
Implementation Schedule:	36 Months
Hazard(s) Addressed:	**Earthquake, Thunderstorms, Tornadoes**
Action: Incorporate tornado shelters into existing and future government-owned facilities to withstand severe hazards.	
Participating Jurisdiction	City of Burleson
Priority:	6
Estimated Cost:	$200 K
Estimated Benefit:	$1.2 M
Potential Funding Source(s):	HMGP, City Funds
Lead Agency/Department Responsible:	Emergency Management- Public Works
Implementation Schedule:	36 Months

Hazard(s) Addressed:	Flooding, Thunderstorms, Tornadoes, Wildfire, Winter Storms
Action: Purchase NOAA Weather Radios and Basic Emergency Preparedness Kits for distribution to residents at public events.	
Participating Jurisdiction	City of Burleson
Priority:	7
Estimated Cost:	$ 4,000
Estimated Benefit:	$ 24,000
Potential Funding Source(s):	HMGP, City Funds
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	36 Months

Table 51: City of Cleburne Mitigation Actions

Hazard(s) Addressed	All Hazards
Action: Purchase four generators to ensure continued operation of critical infrastructure during and after severe weather events and other disasters.	
Participating Jurisdiction	City of Cleburne
Priority:	1
Estimated Cost:	$250,000
Estimated Benefit:	$1.5M
Potential Funding Source(s):	HMGP, city budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	24 months
Hazard(s) Addressed	**Extreme Heat, Thunderstorms, Tornadoes, Winter Storms**
Action: Install covered parking to protect government vehicle and critical equipment from severe weather.	
Participating Jurisdiction	City of Cleburne
Priority:	2
Estimated Cost:	$500,000
Estimated Benefit:	$1.5M
Potential Funding Source(s):	HMGP, General Fund
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**Thunderstorms, Tornadoes**
Action: Install weather stations, including CASA Radar, in appropriate locations to aid in early warning of severe weather in the immediate area and increase public safety.	
Participating Jurisdiction	City of Cleburne
Priority:	3
Estimated Cost:	$25,000
Estimated Benefit:	$150,000
Potential Funding Source(s):	HMGP, General Fund
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	18 months

Hazard(s) Addressed	Thunderstorms
Action: Install a combined technology of structural protection devices (lightning rods), arrestors, and grounding minimize lightning damage to critical facilities and emergency communications infrastructure.	
Participating Jurisdiction	City of Cleburne
Priority:	4
Estimated Cost:	$200,000
Estimated Benefit:	$1.2M
Potential Funding Source(s):	HMGP, General Fund
Lead Agency/Department Responsible	Public Works
Implementation Schedule:	18 months
Hazard(s) Addressed	**Thunderstorms**
Action: Install lightning prediction and notification systems in city parks to provide early warning of the possibility of lightning in the immediate area and increase public safety during outdoor activities.	
Participating Jurisdiction	City of Cleburne
Priority:	5
Estimated Cost:	$200,000
Estimated Benefit:	$1.2M
Potential Funding Source(s):	HMGP, General Fund
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	18 months
Hazard(s) Addressed	**Extreme Heat, Winter Storm**
Action: Establish and supply select city buildings and Cleburne ISD schools as cooling and warming centers to allow citizens, especially vulnerable populations, to seek refuge from extreme temperatures.	
Participating Jurisdiction	City of Cleburne
Priority:	6
Estimated Cost:	$20,000
Estimated Benefit:	$120,000
Potential Funding Source(s):	FEMA grants
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	36 months

Hazard(s) Addressed	All Hazards
Action: Installing quick-connect emergency generator hook-ups for critical facilities.	
Participating Jurisdiction	City of Cleburne
Priority:	7
Estimated Cost:	$300,000
Estimated Benefit:	$1.8M
Potential Funding Source(s):	HMGP, General Funds
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	24 months
Hazard(s) Addressed	**All Hazards**
Action: Add grant management/mitigation staff to ensure hazard mitigation actions are carried out.	
Participating Jurisdiction	City of Cleburne
Priority:	8
Estimated Cost:	$65,000
Estimated Benefit:	$390,000
Potential Funding Source(s):	HMGP, General Funds
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	6 months
Hazard(s) Addressed	**Extreme Heat**
Action: Reduce heat island effect by installing cool roof products for city facilities that reflect sunlight and heat away from buildings.	
Participating Jurisdiction	City of Cleburne
Priority:	9
Estimated Cost:	$1M
Estimated Benefit:	$6M
Potential Funding Source(s):	HMGP, General Fund, Capital Improvement
Lead Agency/Department Responsible	Engineering
Implementation Schedule:	36 months
Hazard(s) Addressed	**Earthquake, Extreme Heat, Flooding, Thunderstorms, Tornadoes, Wildfires, Winter Storms**
Action: Create an emergency shelter for citizens.	
Participating Jurisdiction	City of Cleburne
Priority:	10
Estimated Cost:	$1M
Estimated Benefit:	$6M
Potential Funding Source(s):	HMGP, General Fund
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	24 months

Hazard(s) Addressed	Drought, Earthquakes, Expansive Soils, Wildfires
Action: Mitigate water supply impacts from hazards by upgrading water lines with enhanced pipes and improving fire hydrants and water delivery systems.	
Participating Jurisdiction	City of Cleburne
Priority:	11
Estimated Cost:	$700,000.00
Estimated Benefit:	$4.2M
Potential Funding Source(s):	75% FEMA Grants, 25% General operating budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**Drought, Earthquakes, Expansive Soils, Extreme Heat, Flooding, Winter Storms**
Action: Ensure new and existing utilities are strengthened and reinforced with insulation and flex piping to prevent disruption in services.	
Participating Jurisdiction	City of Cleburne
Priority:	12
Estimated Cost:	$500,000
Estimated Benefit:	$3M
Potential Funding Source(s):	HMGP, General Funds, Property Owners
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	24 months
Hazard(s) Addressed	**Flooding**
Action: Adopt, implement, participate, and promote the National Flood Insurance Program.	
Participating Jurisdiction	City of Cleburne
Priority:	13
Estimated Cost:	$2,000
Estimated Benefit:	$12,000
Potential Funding Source(s):	HMGP, General Fund
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	36 months
Hazard(s) Addressed	**Extreme Heat, Winter Storm**
Action: Create a weatherization assistance program to assist the vulnerable population and protect them from extreme temperatures.	
Participating Jurisdiction	City of Cleburne
Priority:	14
Estimated Cost:	$150,000.00
Estimated Benefit:	$900,000.00
Potential Funding Source(s):	75% FEMA Grants, 25% General operating budget
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	36 months

Hazard(s) Addressed	All Hazards
Action: Increase ability of Cleburne residents to receive early warning and special information about natural hazards by purchasing and distributing NOAA All Hazard Radios to each household and business in Cleburne.	
Participating Jurisdiction	City of Cleburne
Priority:	15
Estimated Cost:	$25,000
Estimated Benefit:	$150,000
Potential Funding Source(s):	HMGP, city budget
Lead Agency/Department Responsible:	Emergency Management
Implementation Schedule:	24 months

Table 52: City of Godley Mitigation Actions

Hazard(s) Addressed	All Hazards
Action: Implement the deferred 2015 mitigation actions (listed in the previous section) when capabilities and priorities allow.	
Participating Jurisdiction	City of Godley
Priority:	1
Estimated Cost:	TBD
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grants, General Fund
Lead Agency/Department Responsible:	City Council
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Install quick-connect emergency generator hook-ups, generators, generator bracing, generator security, on-site fuel storage, and all other necessary equipment to protect and maintain power for critical facilities in the event of a natural disaster.	
Participating Jurisdiction	City of Godley
Priority:	2
Estimated Cost:	$50M
Estimated Benefit:	$300M
Potential Funding Source(s):	Grants, General Fund, Capital Improvement Budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**Flooding**
Action: Use minor structural projects that are smaller and more localized (e.g., floodwalls or small berms) around facilities critical to the wellbeing of city residents, in areas that cannot be mitigated through non-structural activities, or where structural activities are not feasible due to low densities.	
Participating Jurisdiction	City of Godley
Priority:	3
Estimated Cost:	$25,000
Estimated Benefit:	$150,000
Potential Funding Source(s):	Grants, General Fund, Capital Improvement Budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	18 months

Hazard(s) Addressed	Extreme Heat, Flooding, Thunderstorms, Tornadoes, Winter Storms
Action: Purchase and install NOAA weather radios in schools, government buildings, parks, nursing homes, and other vulnerable facilities.	
Participating Jurisdiction	City of Godley
Priority:	4
Estimated Cost:	$10,000
Estimated Benefit:	$60,000
Potential Funding Source(s):	Grants, General Fund
Lead Agency/Department Responsible	Fire
Implementation Schedule:	18 months
Hazard(s) Addressed	**All Hazards**
Action: Protect visitors and natural assets at city parks from severe weather by implementing any mitigation actions necessary and feasible, such as outdoor tornado shelters, hazard-conscious landscaping, lightning prediction and notification systems, hydration stations, splash pads, covered rest areas, covered playgrounds, covered parking, and educational signage. *(Covered areas could be covered by solar panels that power security lights and charging ports, green roofs that absorb stormwater, shade clothes, tree canopy, or traditional roofing material.)*	
Participating Jurisdiction	City of Godley
Priority:	5
Estimated Cost:	$6M
Estimated Benefit:	$36M
Potential Funding Source(s):	Grants, General Fund, Capital Improvement Budget
Lead Agency/Department Responsible:	Parks & Recreation, Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**Extreme Heat, Winter Storm**
Action: Establish cooling and warming centers at select city buildings and Godley ISD schools, staff the centers with qualified volunteers or staff, and supply centers with proper warming and heating supplies, hydration products, first aid supplies, comfort items, and hazard educational material to protect citizens, especially vulnerable populations, from extreme temperatures and educate them on personal protective measures.	
Participating Jurisdiction	City of Godley
Priority:	6
Estimated Cost:	$200,000
Estimated Benefit:	$1,200,000
Potential Funding Source(s):	Grants, General Fund
Lead Agency/Department Responsible:	Fire
Implementation Schedule:	12 months

Hazard(s) Addressed	All Hazards
Action: Conduct a study to prioritize existing government facilities and critical facilities needing to be retrofitted from natural hazards.	
Participating Jurisdiction	City of Godley
Priority:	7
Estimated Cost:	$300,000
Estimated Benefit:	$1.8M
Potential Funding Source(s):	Grants, General Funds, Capital Improvement Budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Retrofit existing government facilities and critical facilities to withstand all hazards and more efficiently use their power supplies.	
Participating Jurisdiction	City of Godley
Priority:	8
Estimated Cost:	$30M
Estimated Benefit:	$180M
Potential Funding Source(s):	Grants, General Funds, Capital Improvement Budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**Winter Storms**
Action: Winterize all public utilities.	
Participating Jurisdiction	City of Godley
Priority:	9
Estimated Cost:	$4
Estimated Benefit:	$24M
Potential Funding Source(s):	Grants, General Funds, Water & Sewage Fund,
Lead Agency/Department Responsible:	Utilities
Implementation Schedule:	6 months

Hazard(s) Addressed	Drought, Expansive Soils, Extreme Heat, Flooding, Thunderstorms, Wildfires, Winter Storms
Action: Create a list of city-approved plants to support a landscape ordinance that promotes the use of native, drought-friendly, water-absorbing, fire-resistant, high evapotranspiration (ET)-rated plants throughout the city (including private property) to naturally mitigate potential hazard impacts.	
Participating Jurisdiction	City of Godley
Priority:	10
Estimated Cost:	$5,000
Estimated Benefit:	$30,000
Potential Funding Source(s):	Grants, General Fund, department budget
Lead Agency/Department Responsible	City Council, Public Works
Implementation Schedule:	12 months
Hazard(s) Addressed	**All Hazards**
Action: Create an incentive program to encourage business owners and residents to implement hazard mitigation measures, purchase NFIP insurance, and follow city mitigation recommendations.	
Participating Jurisdiction	City of Godley
Priority:	11
Estimated Cost:	$1M
Estimated Benefit:	$6M
Potential Funding Source(s):	Grants, General Fund
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	24 months
Hazard(s) Addressed	**All Hazards**
Action: Mitigate water supply impacts from hazards using various mitigation measures, such as building back-up water tanks and wells, upgrading existing water delivery systems to eliminate breaks and leaks, insulating pipes, installing water- conservative appliances and irrigation equipment, installing shutoff valves and emergency connector hoses on water mains, and upgrading fire hydrants.	
Participating Jurisdiction	City of Godley
Priority:	12
Estimated Cost:	$700,000
Estimated Benefit:	$4.2M
Potential Funding Source(s):	Grants, Water & Sewage Fund, Capital Improvement Budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months

Hazard(s) Addressed	All Hazards
Action: Approve the use of impact fees to help fund public projects to mitigate impacts of land development.	
Participating Jurisdiction	City of Godley
Priority:	13
Estimated Cost:	$500
Estimated Benefit:	$3,000
Potential Funding Source(s):	General Fund
Lead Agency/Department Responsible:	City Council
Implementation Schedule:	12 months
Hazard(s) Addressed	**Flooding**
Action: Elevate roads and bridges above base flood elevation to maintain dry access.	
Participating Jurisdiction	City of Godley
Priority:	14
Estimated Cost:	$500M
Estimated Benefit:	$3B
Potential Funding Source(s):	Grants, General Fund, Capital Improvement Budget
Lead Agency/Department Responsible:	Engineering
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Develop and maintain a database to track community vulnerability and members of the underserved population.	
Participating Jurisdiction	City of Godley
Priority:	15
Estimated Cost:	$10,000
Estimated Benefit:	$60,000
Potential Funding Source(s):	General Fund
Lead Agency/Department Responsible:	Fire
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Obtain local data including tax parcels, building values, critical facility locations, storm damage, changes to local assets mentioned in the plan, and other information for use in hazard risk analysis.	
Participating Jurisdiction	City of Godley
Priority:	16
Estimated Cost:	$20,000
Estimated Benefit:	$120,000
Potential Funding Source(s):	General Fund
Lead Agency/Department Responsible:	Fire
Implementation Schedule:	36 months

Hazard(s) Addressed	All Hazards
Action: Fund activities by local artists, students, volunteer organizations, and interest groups that increases community awareness of the local hazards, historical events, and the City's hazard education program.	
Participating Jurisdiction	City of Godley
Priority:	16
Estimated Cost:	$200,000
Estimated Benefit:	$1.2M
Potential Funding Source(s):	General Fund
Lead Agency/Department Responsible:	Fire
Implementation Schedule:	36 months

Table 53: City of Joshua Mitigation Actions

Hazard(s) Addressed	All Hazards
Action: Purchase generators to ensure continued operation of critical infrastructure during and after severe weather events and other disasters for government facilities, including City Hall, Animal Control, Public Works, Parks & Recreation.	
Participating Jurisdiction	City of Joshua
Priority:	1
Estimated Cost:	$300,000
Estimated Benefit:	$1.8M
Potential Funding Source(s):	City budget
Lead Agency/Department Responsible:	City Management
Implementation Schedule:	24 months
Hazard(s) Addressed	**Thunderstorms, Tornadoes**
Action: Equip City Hall building with a safe room.	
Participating Jurisdiction	City of Joshua
Priority:	2
Estimated Cost:	$200,000
Estimated Benefit:	$1.2M
Potential Funding Source(s):	City budget
Lead Agency/Department Responsible:	City Management
Implementation Schedule:	24 months
Hazard(s) Addressed	**All Hazards**
Action: Develop Damage Assessment Teams utilizing paid staff and citizen volunteer disaster teams.	
Participating Jurisdiction	City of Joshua
Priority:	3
Estimated Cost:	$10,000
Estimated Benefit:	$60,000
Potential Funding Source(s):	City budget
Lead Agency/Department Responsible:	Fire/EMC
Implementation Schedule:	12 months

Hazard(s) Addressed	All Hazards
Action: Upgrade CASA WX weather radar System.	
Participating Jurisdiction	City of Joshua
Priority:	4
Estimated Cost:	$10,000
Estimated Benefit:	$60,000
Potential Funding Source(s):	City budget
Lead Agency/Department Responsible:	Fire/Emergency Management
Implementation Schedule:	Immediate/Ongoing

Hazard(s) Addressed	All Hazards
Action: Upgrade Outdoor Warning Siren system to increase ability to provide warning during severe weather events by adding additional and relocating sirens and upgrading activation software system to automatic activation during tornado warnings.	
Participating Jurisdiction	City of Joshua
Priority:	5
Estimated Cost:	$80,000
Estimated Benefit:	$480,000
Potential Funding Source(s):	City budget
Lead Agency/Department Responsible:	Fire/Emergency Management
Implementation Schedule:	12 months

Hazard(s) Addressed	All Hazards
Action: Ensure maintenance of overhead utility infrastructure through removal of overgrown tree limbs.	
Participating Jurisdiction	City of Joshua
Priority:	6
Estimated Cost:	$20,000
Estimated Benefit:	$120,000
Potential Funding Source(s):	City budget
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	12 months

Hazard(s) Addressed	Wildfires
Action: Require defensible space around existing and future development in the WUI.	
Participating Jurisdiction	City of Joshua
Priority:	7
Estimated Cost:	$20,000
Estimated Benefit:	$120,000
Potential Funding Source(s):	City budget
Lead Agency/Department Responsible:	Code Enforcement
Implementation Schedule:	24 months
Hazard(s) Addressed	**Drought, Extreme Heat, Wildfires**
Action: Utilize drought tolerant, xeriscaping practices and install water-saving equipment in new and existing city facilities.	
Participating Jurisdiction	City of Joshua
Priority:	8
Estimated Cost:	$150,000
Estimated Benefit:	$900,000
Potential Funding Source(s):	City budget
Lead Agency/Department Responsible	Public Works, Parks & Recreation
Implementation Schedule:	36 months
Hazard(s) Addressed	**Earthquake, Extreme Heat, Flooding, Thunderstorms, Tornadoes, Wildfires, Winter Storms**
Action: Create an emergency shelter for citizens.	
Participating Jurisdiction	City of Joshua
Priority:	9
Estimated Cost:	$3M
Estimated Benefit:	$18M
Potential Funding Source(s):	Grants, City issued bonds
Lead Agency/Department Responsible:	Fire/Emergency Management
Implementation Schedule:	36 months

Table 54: City of Keene Mitigation Actions

Hazard(s) Addressed	All Hazards
Action: Use the Capability Assessment to identify existing capabilities to use to implement mitigation measures and identify measures that could improve capabilities.	
Participating Jurisdiction	Keene
Priority:	1
Estimated Cost:	$10,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	OEM
Implementation Schedule:	48 months
Hazard(s) Addressed	**All Hazards**
Action: Acquire and install generators, the generator connections/infrastructure, proper mounting system, security barriers, and fuel reservoirs for existing and future critical facilities to prevent power failure in the event of a disaster and to continue essential duties.	
Participating Jurisdiction	Keene
Priority:	2
Estimated Cost:	$250,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	12 months
Hazard(s) Addressed	**Extreme Heat, Flooding, Thunderstorms, Tornadoes, Wildfires, Winter Storms**
Action: Upgrade road safety elements to improve visibility on roads during severe weather and evacuations. Elements could include reflective guard rails, signs, lane reflectors, and contrasting, high-visibility pavement markings that are wider, more durable, and designed for high visibility and reflectivity, no matter the weather.	
Participating Jurisdiction	Keene
Priority:	3
Estimated Cost:	$800,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months

Hazard(s) Addressed	All Hazards
Action: Upgrade or replace inadequate emergency & public works apparatus' so crews can mitigate property damage or loss of life more efficiently.	
Participating Jurisdiction	Keene
Priority:	4
Estimated Cost:	$850,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Finance
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Upgrade or replace water storage facilities to withstand impacts from natural hazards.	
Participating Jurisdiction	Keene
Priority:	5
Estimated Cost:	$3,500,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Utilities
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Create fuel storage to hold fuel on-site at critical facilities or have multiple ways to obtain fuel for maintaining power during a power outage from an event.	
Participating Jurisdiction	Keene
Priority:	6
Estimated Cost:	$3,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	24 months

Hazard(s) Addressed	Tornadoes
Action: Require tie-downs, with anchors appropriate for soil stabilization, for manufactured housing, outdoor furniture, and propane tanks.	
Participating Jurisdiction	Keene
Priority:	7
Estimated Cost:	$450,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Code Enforcement
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Install more cellular towers to supply adequate emergency notifications to residents.	
Participating Jurisdiction	Keene
Priority:	8
Estimated Cost:	$300,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Economic Development
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Develop and implement a public education program to provide information on natural hazard mitigation measures, including the benefits of flood insurance.	
Participating Jurisdiction	Keene
Priority:	9
Estimated Cost:	$100,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	OEM
Implementation Schedule:	36 months

Hazard(s) Addressed	All Hazards
Action: Work with the power company and emergency management agency to get priority power restoration during and after a disaster.	
Participating Jurisdiction	Keene
Priority:	10
Estimated Cost:	$200,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	OEM
Implementation Schedule:	36 months
Hazard(s) Addressed	**Flooding**
Action: Require porous surface in all future road, sidewalk, and parking lot development to mitigate flash flooding when the benefits are determined to outweigh the costs.	
Participating Jurisdiction	Keene
Priority:	11
Estimated Cost:	$15,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Economic Development
Implementation Schedule:	36 months
Hazard(s) Addressed	**All hazards**
Action: Retrofit existing government-owned facilities to withstand all hazards.	
Participating Jurisdiction	Keene
Priority:	12
Estimated Cost:	$5,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Building Development
Implementation Schedule:	36 months

Hazard(s) Addressed	Earthquakes
Action: Create a Road Maintenance Plan and Debris Removal Priority Plan for critical roads to ensure accessibility during an emergency, help crews proactively plan for damages, and to enforce once impacts are known.	
Participating Jurisdiction	Keene
Priority:	13
Estimated Cost:	$70,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months

Hazard(s) Addressed	Flooding/Thunderstorms/Winter storms
Action: Develop a debris removal program for educate residents and train crews on safe, efficient methods of debris prevention and removal.	
Participating Jurisdiction	Keene
Priority:	14
Estimated Cost:	$5,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months

Hazard(s) Addressed	Extreme Heat
Action: Install public gazebos at public parks and covered seating at sporting events to protect visitors from extreme heat or severe weather.	
Participating Jurisdiction	Keene
Priority:	15
Estimated Cost:	$325,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**Flooding**
Action: Improve drainage system at Elisa Carver Park to include but not limit to retaining walls, drainage ditches, etc.	
Participating Jurisdiction	Keene
Priority:	16
Estimated Cost:	$200,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**All hazards**
Action: Acquire mobile and portable lighting to protect crews and motorists when limited visibility is present due to severe weather or power failure from a natural disaster.	
Participating Jurisdiction	Keene
Priority:	17
Estimated Cost:	$50,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months

Hazard(s) Addressed	Winter Storms
Action: Retrofit and stock an existing facility with winter weather supplies to create a warming station/ shelter for vulnerable populations during winter storms.	
Participating Jurisdiction	Keene
Priority:	18
Estimated Cost:	$3,500,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	OEM
Implementation Schedule:	36 months
Hazard(s) Addressed	**Winter Storms**
Action: Protect power lines from severe weather by either burying overhead power lines, ensuring ordinances for proper vegetation management practices, replacing wood poles with steel or composite ones, or reinforcing utility poles with guy wires.	
Participating Jurisdiction	Keene
Priority:	19
Estimated Cost:	$7,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	OEM
Implementation Schedule:	36 months
Hazard(s) Addressed	**Tornadoes**
Action: Construct safe rooms in existing and future schools, nursing homes, assisted living facilities, hospitals, emergency service buildings, and other critical facilities.	
Participating Jurisdiction	Keene
Priority:	20
Estimated Cost:	$7,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Building Development
Implementation Schedule:	36 months

Hazard(s) Addressed	Expansive Soils
Action: Upgrade roads damaged by expansive soil.	
Participating Jurisdiction	Keene
Priority:	21
Estimated Cost:	$15,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
Hazard(s) Addressed	**Drought**
Action: Place water restrictions designed to reduce or eliminate non-essential uses during a drought.	
Participating Jurisdiction	Keene
Priority:	22
Estimated Cost:	$20,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Utilities
Implementation Schedule:	36 months
Hazard(s) Addressed	**Drought, Expansive Soil, Earthquake**
Action: Implement a leak detection and repair program to reduce lost water.	
Participating Jurisdiction	Keene
Priority:	23
Estimated Cost:	$400,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Utilities
Implementation Schedule:	36 months
Hazard(s) Addressed	**Flooding**
Action: Participate in the Community Rating System (CRS) in the NFIP.	
Participating Jurisdiction	Keene
Priority:	24
Estimated Cost:	$50,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Planning & Zoning Commission
Implementation Schedule:	48 months

Hazard(s) Addressed	Flooding, Thunderstorms
Action: Retrofit waste-water collection system.	
Participating Jurisdiction	Keene
Priority:	25
Estimated Cost:	$20,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Utilities
Implementation Schedule:	36 months
Hazard(s) Addressed	**Wildfires**
Action: Participate in a Community Wildfire Protection Plan.	
Participating Jurisdiction	Keene
Priority:	26
Estimated Cost:	$100,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Fire & Rescue
Implementation Schedule:	36 months
Hazard(s) Addressed	**Flooding, Thunderstorms**
Action: Develop vector control measures to control mosquito populations attracted to standing water after severe rain and mitigate the spread of mosquito-borne illnesses.	
Participating Jurisdiction	Keene
Priority:	27
Estimated Cost:	$250,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	OEM
Implementation Schedule:	36 months

Hazard(s) Addressed	Earthquakes
Action: Use flexible piping and fittings when extending or replacing water, sewer, natural gas service, or other critical services.	
Participating Jurisdiction	Keene
Priority:	28
Estimated Cost:	$1,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Utilities
Implementation Schedule:	36 months
Hazard(s) Addressed	**Expansive Soils, Flooding, Thunderstorms**
Action: Use of porous pavement, pavers, bio swales, rain gardens, tree trenches, smartscape, vegetative buffers, trees, and islands in and around large parking areas, roads, buildings, and public rights-of- way and easements to reduce stormwater runoff and lessen the impact of extreme heat and expansive soils.	
Participating Jurisdiction	Keene
Priority:	29
Estimated Cost:	$15,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Economic Development
Implementation Schedule:	36 months
Hazard(s) Addressed	**All Hazards**
Action: Incorporate nature-based, green infrastructure throughout the city, where applicable.	
Participating Jurisdiction	Keene
Priority:	30
Estimated Cost:	$5,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Economic Development
Implementation Schedule:	36 months

Hazard(s) Addressed	Thunderstorms
Action: Build covered parking for the fire station and City Hall to protect emergency and city vehicles during severe weather.	
Participating Jurisdiction	Keene
Priority:	31
Estimated Cost:	$300,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Building Development
Implementation Schedule:	24 months
Hazard(s) Addressed	**Earthquakes**
Action: Require bracing of generators, elevators, and other vital equipment in existing and future hospitals and critical facilities.	
Participating Jurisdiction	Keene
Priority:	32
Estimated Cost:	$5,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Code Enforcement
Implementation Schedule:	36 months
Hazard(s) Addressed	**Extreme Heat**
Action: Reduce urban heat island effect by planting more trees, utilizing shade clothes, and building green roofs.	
Participating Jurisdiction	Keene
Priority:	33
Estimated Cost:	$400,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months

Hazard(s) Addressed	Flooding
Action: Flooding / Buyout Program – Buyout or relocate SRL, RL, and other vulnerable structures within or near a floodplain or dam spillway.	
Participating Jurisdiction	Keene
Priority:	34
Estimated Cost:	$10,000,000
Estimated Benefit:	Cost x 6
Potential Funding Source(s):	Grant(s)
Lead Agency/Department Responsible:	Planning & Zoning Commission
Implementation Schedule:	48 months

Table 55: Johnson County Unincorporated New Mitigation Actions

Hazard(s) Addressed: All Hazards	
Action: Acquire and install generators, the generator connections/infrastructure, proper mounting system, security barriers, and fuel reservoir for existing and future critical facilities to prevent power failure in the event of a disaster and to continue essential duties.	
Participating Jurisdiction	Johnson County Unincorporated
Priority:	1
Estimated Cost:	$1.25M
Estimated Benefit:	$6M
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Johnson County Commissioners
Implementation Schedule:	36 months

Hazard(s) Addressed: All Hazards

Action: Enhance Johnson County EOC with all possible mitigation measures to ensure operations during any disaster.

Participating Jurisdiction	Johnson County Unincorporated
Priority:	2
Estimated Cost:	$4M
Estimated Benefit:	$15M
Potential Funding Source(s):	Grants, Budget
Lead Agency/Department Responsible:	Johnson County OEM
Implementation Schedule:	36 Months

Hazard(s) Addressed: Flooding

Action: Install automated flood gates and warning signs in critical areas to prevent travelers and residents from entering flooded roadways and crossings.

Participating Jurisdiction	Johnson County Unincorporated
Priority:	4
Estimated Cost:	$400,000
Estimated Benefit:	$2,000,000
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	18-20 months

Hazard(s) Addressed: All Hazards

Action: Create fuel storage at facilities or have multiple ways to obtain fuel for maintaining power during a power outage from an event.

Participating Jurisdiction	Johnson County Unincorporated
Priority:	5
Estimated Cost:	$40,000
Estimated Benefit:	$90,000
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months

Hazard(s) Addressed: All Hazards

Action: Adopt and enforce most current building codes.

Participating Jurisdiction	Johnson County Unincorporated
Priority:	6
Estimated Cost:	$5,000
Estimated Benefit:	$20,000
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	County Commissioners Court
Implementation Schedule:	36 months

Hazard(s) Addressed: All Hazards

Action: Update codes, policies, and regulations to address risks and vulnerabilities to hazards.

Participating Jurisdiction	Johnson County Unincorporated
Priority:	7
Estimated Cost:	$500
Estimated Benefit:	$3,000
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	County Planning and Zoning
Implementation Schedule:	36 months

Hazard(s) Addressed: All Hazards

Action: Retrofit existing government-owned facilities to withstand all hazards.

Participating Jurisdiction	Johnson County Unincorporated
Priority:	8
Estimated Cost:	$4M
Estimated Benefit:	$12M
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months

Hazard(s) Addressed: All Hazards

Action: Assist homeowners with application and implementation of residential mitigation projects.

Participating Jurisdiction	Johnson County Unincorporated
Priority:	9
Estimated Cost:	$10,000
Estimated Benefit:	$70,000
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Johnson County OEM
Implementation Schedule:	36 months

Hazard(s) Addressed: Flooding

Action: Participate in the National Flood Insurance Program (NFIP) Community Rating System.

Participating Jurisdiction	Johnson County Unincorporated
Priority:	10
Estimated Cost:	$10,000
Estimated Benefit:	$50,000
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Floodplain Administrator
Implementation Schedule:	36 months

Hazard(s) Addressed: All Hazards

Action: Educate the public on their risks to local hazards, and mitigation actions to take, using various outreach methods.

Participating Jurisdiction	Johnson County Unincorporated
Priority:	11
Estimated Cost:	$5,000
Estimated Benefit:	$30,000
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Johnson County OEM
Implementation Schedule:	12 months

Hazard(s) Addressed: Flooding

Action: Buyout or relocate SRL, RL, and other vulnerable structures within or near a floodplain or dam spillway.

Participating Jurisdiction	Johnson County Unincorporated
Priority:	12
Estimated Cost:	$1,500,000
Estimated Benefit:	$4M
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	County Planning and Zoning
Implementation Schedule:	36 months

Hazard(s) Addressed: Flooding

Action: Educate the public on NFIP policies and their flood risks from various flood sources (bodies of water, dams, flash flooding).

Participating Jurisdiction	Johnson County Unincorporated
Priority:	13
Estimated Cost:	$500
Estimated Benefit:	$3,000
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Johnson County OEM
Implementation Schedule:	18 months

 **Hazard(s) Addressed: All Hazards**	
Action: Incorporate nature-based, green infrastructure throughout the planning area, where applicable.	
Participating Jurisdiction	Johnson County Unincorporated
Priority:	14
Estimated Cost:	$20,000
Estimated Benefit:	$1.2M
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months
 **Hazard(s) Addressed: Wildfires**	
Action: Create defensible space around existing and future development in the WUI.	
Participating Jurisdiction	Johnson County Unincorporated
Priority:	15
Estimated Cost:	$100,000
Estimated Benefit:	$2,000,000
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Johnson County Commissioners
Implementation Schedule:	36 months
 **Hazard(s) Addressed: All Hazards**	
Action: Work with neighboring communities on multi-jurisdictional mitigation projects and studies.	
Participating Jurisdiction	Johnson County Unincorporated
Priority:	16
Estimated Cost:	$200,000
Estimated Benefit:	$1.2M
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Johnson County OEM
Implementation Schedule:	36 months

Hazard(s) Addressed: All Hazards

Action: Conduct hazard studies in planning area and surrounding jurisdictions, to address data deficiencies and to update our risk assessment.

Participating Jurisdiction	Johnson County Unincorporated
Priority:	17
Estimated Cost:	$70,000
Estimated Benefit:	$420,000
Potential Funding Source(s):	Grants, general fund
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	36 months

Hazard(s) Addressed: Wildfires

Action: Develop a Community Wildfire Protection Plan (CWPP).

Participating Jurisdiction	Johnson County Unincorporated
Priority:	18
Estimated Cost:	$10,000
Estimated Benefit:	$60,000
Potential Funding Source(s):	TFS Grants, general fund
Lead Agency/Department Responsible:	Johnson Count OEM
Implementation Schedule:	12 months

Chapter 5: Plan Maintenance

The Johnson County Emergency Management Coordinator (EMC), or their designee, is responsible for ensuring the HMP and its components are monitored, evaluated, and reviewed on a regular basis.

Members of the Hazard Mitigation Planning Team (HMPT) are responsible for ensuring the mitigation strategies of participating jurisdictions are monitored, evaluated, and reviewed on a regular basis. This will be accomplished by the Johnson County EMC calling an annual meeting of the HMPT, whose members will assist in plan review, evaluation, updates, and monitoring.

5.1 Schedule

Maintenance tasks will take place according to the following table. The Johnson County EMC will use email to request the maintenance task noted below be implemented and changes documented.

Table 56: Maintenance Schedule of Tasks

Responsible Personnel	Tasks	Update Schedule
Johnson County EMC	**Monitor Plan**: integrate into existing mechanisms; track implementation of action items, changes to risk assessment, changes to Local Planning Team (LPT), changes to capabilities, and plan integrations.	Twice a year
	Evaluate Plan during HMP Maintenance Meeting.	Annually
	Update Plan by reviewing and revising the plan to meet requirements**.**	Once every five years

To annually evaluate the HMP, the Johnson County EMC will host a HMP Maintenance Meeting. During this meeting, the members will provide information and updates on the implementation status of each action item included in the plan. The team will assess whether goals address current and expected conditions, whether the nature and/or magnitude of the risks have changed, if there has been a change in local capabilities, if current resources are appropriate for implementing the HMP, whether outcomes have occurred as expected, and if other agencies and partners have information to input.

The Disaster Mitigation Act of 2000 requires that the Johnson County Hazard Mitigation Plan be updated at least once every five years. During this process, the entire plan will be updated with current information, current analyses of risks and capabilities, and new and/or modified mitigation strategies. Public meetings will be hosted for the HMPT and the public to address each section of the plan. The revised plan will be submitted for state and federal review after local public review and presented for approval to the Johnson County Commissioners Court and the respective councils of incorporated cities included in this HMP.

Following formal adoption by the Johnson County's Commissioners Court and the governing council of each participating jurisdiction, the actions outlined in the HMP will be implemented as local capabilities allow.

5.2 Continued Public Participation

Public participation will remain an active component of this plan, even after adoption, to ensure all residents understand what the local government is doing on their behalf, and to provide a chance for input on community vulnerabilities and mitigation activities.

With assistance from NCTCOG, and as local capabilities improve, the HMPT will assess their capabilities and pre-plan their outreach strategy for the next update in order to garner more valuable feedback and reach more socially vulnerable populations and underserved communities.

The HMPT with look for more equitable outreach strategies to use when maintaining this plan, once adopted, including periodic presentations on the plan's progress to elected officials, schools, or other community groups; lunch-n-learns; virtual questionnaires and surveys; public meetings; and postings on social media and interactive websites.

5.3 Incorporation into Existing Planning Mechanisms

The Local Planning Teams will expand their mitigation strategies by incorporating the HMP into other planning mechanisms, such as plan amendments, ordinance revisions, and capital improvement projects. Previously, jurisdictions each listed the following planning mechanisms to incorporate the 2015 HMP:

- Budget meetings, Emergency Action Plan Update, floodplain ordinances, Capital Improvement Plan, Economic Development Plan, Drought Contingency Plan, and Natural Resource Conservation Plan

Incorporation was not accomplished due to limited capabilities and coordination. Also, a Natural Resource Conservation Plan was listed but there is no documentation of this plan.

Planning mechanisms in which this HMP will be integrated are listed below.

Table 57: Local Planning Mechanisms

Jurisdiction	Type of Plan or Activity	Department Responsible	Update Schedule
Alvarado	Capital Improvement Plan	City Administration	Every 10 years
Alvarado	Comprehensive Plan	City Administration and Public Works Departments	Every 5 years
Burleson	Capital Improvement Plan	City Administration	Every 10 years
Burleson	Comprehensive Plan	City Administration and Public Works Departments	Annually
Cleburne	Capital Improvement Plan	City Administration	Every 10 years
Cleburne	Comprehensive Plan	City Administration	Every 5 years

Jurisdiction	Type of Plan or Activity	Department Responsible	Update Schedule
Godley	Capital Improvement Plan	City Administration	Every 10 years
Godley	Comprehensive Plan	City Administration and Public Works Departments	Every 5 years
Joshua	Capital Improvement Plan	City Administration	Every 10 years
Joshua	Comprehensive Plan	City Administration and Public Works Departments	Every 5 years
Keene	Capital Improvement Plan	City Administration	Every 10 years
Keene	Comprehensive Plan	City Administration and Public Works Departments	Every 5 years
Johnson County	Capital Improvement Plan	City Administration	Every 10 years
Johnson County	Comprehensive Plan	County Commissioners, Planning and Zoning, Floodplain Admin, Elected Office Holders and OEM	5 Years
Johnson County	Emergency Operations Plan	OEM	5 years

During the update of each of the identified planning mechanisms, the mechanism's update committee and authors will review this HMP and incorporate plan elements and mitigation actions relevant to the respective mechanism and ensure all goals and strategies of the respective documents are consistent with and support the mitigation goals and will not contribute to increased vulnerability to hazards.

The members of the HMPT will remain charged with ensuring that the goals and strategies of new and updated local planning documents for their jurisdictions are consistent with the goals and actions of the Johnson County HMP and will not contribute to increased hazard vulnerability in Johnson County or its participating jurisdictions.

Participating jurisdictions will provide a copy of the Johnson County HMP to the appropriate parties and recommend that all goals and strategies of new and updated local planning documents are consistent with and support the goals of the Johnson County HMP and will not contribute to increased hazards in the affected jurisdiction(s).

Although it is recognized that there are many possible benefits to integrating components of this Hazard Mitigation Plan (HMP) into other planning mechanisms, the participating jurisdictions consider this HMP, including development and maintenance, to be the primary vehicle to ensure implementation of local hazard mitigation actions.

Chapter 6: Conclusion

Through the development of this plan, Johnson County has developed a thorough hazard history, an inventory of critical facilities, and an assessment of their current capabilities. This data, when used in conjunction with the updated information about hazard threats and vulnerabilities, will prove to be invaluable to Johnson County and its participating jurisdictions.

Natural hazards have been identified county-wide and technological hazards have been listed for selected jurisdictions that opted to include these hazards. Mitigation projects that could reduce the risk of lives and property due to the identified threats have been compiled and prioritized.

The creation of the Johnson County Hazard Mitigation Planning Team (HMPT) brought together stakeholders from communities and organizations onto one planning team. This group has been able to work together effectively and efficiently to produce this document and establish a greater awareness of risks and mitigation strategies.

In addition to the HMPT, the creation of the Local Planning Team (LPT) in each jurisdiction brought together stakeholders and departments within the jurisdiction onto one planning team. This group was able to work together effectively and efficiently to produce jurisdictional data for this document and establish a greater awareness of risks and mitigation strategies.

This plan will continue to evolve as necessary to properly represent the threats and vulnerabilities affecting Johnson County. Continued public participation is encouraged and will continue through the ongoing multijurisdictional hazard mitigation process. The plan, in its entirety (not limited to but including development, public participation, hazard identification, and mitigation actions), will continue to be monitored and evaluated.

Appendix A: Capability Assessments

A.1 NFIP Assessment

The NFIP provides flood insurance to property owners, renters, and businesses, and having this coverage helps them recover faster when floodwaters recede. The NFIP works with communities required to adopt and enforce floodplain management regulations that help mitigate flooding effects.

Flood insurance is available to anyone living in one of the 23,000 participating NFIP communities.

The following tables describe NFIP compliance within the participating jurisdictions.

Table 58: NFIP Policy Information as of 04/30/2022[46]

NFIP Policy Information as of 04/30/2022			
Community Name (Number)	**Policies in Force**	**Total Coverage**	**Total Written Premium + FPF***
ALVARADO, CITY OF (480397)	8	$3,793,000	$16,461
BURLESON, CITY OF (485459)	99	$27,659,800	$79,707
CLEBURNE, CITY OF (485462)	128	$ 26,967,500	$99,342
GODLEY, CITY OF (480880)	2	$660,000	$1,968
JOSHUA, CITY OF (480882)	28	$7,650,600	$9,406
KEENE, CITY OF (481107)	4	$1,330,000	$2,718
Unknown (Unknown)	17	$2,337,000	$10,815
JOHNSON COUNTY* (480879)	248	$30,485,200	$64,430,600

**FPF (Federal Policy Fee) - A flat charge that the policyholder must pay on each new or renewal policy to defray certain administrative expenses incurred in carrying out the NFIP.*

Table 59: Local Floodplain Regulations

Adoption of NFIP minimum floodplain management criteria via local regulation.		
Community	**Description**	**Source**
Alvarado	Code of Ordinances Chapter 18 Flood Hazard Reduction: The city manager is hereby appointed the floodplain administrator to administer and implement the provisions of this chapter and other appropriate sections of 44 CFR (emergency management and assistance—national flood	Website: https://ecode360.com/42203392

[46] | Flood Insurance Data and Analytics (floodsmart.gov)

Adoption of NFIP minimum floodplain management criteria via local regulation.		
Community	**Description**	**Source**
	insurance program regulations) pertaining to floodplain management. (2008 Code, sec. 151.20; Ordinance 2012-025 adopted 9/17/2012)	
Burleson	Code of Ordinances Chapter 42 Floods: In order to accomplish its purposes, this article uses the following methods: (1) Restrict or prohibit uses that are dangerous to health, safety or property in times of flood , or cause excessive increases in flood heights or velocities; (2) Require that uses vulnerable to floods, including facilities which seNe such uses, be protected against flood damage at the time of initial construction; (3) Control the alteration of natural floodplains, stream channels and natural protective barriers, which are involved in the accommodation of floodwaters; (4) Control filing, grading, dredging and other development which may increase flood damage; (5) Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.	Website: https://ecode360.com/39931087
Cleburne	As a participating community, the City has adopted a Floodplain Management Ordinance that limits the development allowed in 100-year floodplains (the area inundated by a storm that has a 1% chance of happening in any year). For property with any portion located within the 100-year floodplain, regardless of structure location, a flood insurance policy may be required by mortgage companies. The City of Cleburne standards require all new structures be constructed two feet above the existing water surface elevation of the 100-year floodplain, or one foot above the "ultimate" water surface elevation. When developing along a major creek within the City of Cleburne, the developer must submit a Flood Study to the	Website: https://www.cleburne.net/1149/Floodplain-Management

Adoption of NFIP minimum floodplain management criteria via local regulation.		
Community	**Description**	**Source**
	city showing the 100-year floodplain and water surface elevation based on both current land-use and future land-use assumptions. [See Building in the Floodplain for more information.]	
Godley	**Code of Ordinances CHAPTER 156: Flood Damage Prevention § 156.01 Statutory Authorization.** The Legislature of the State of Texas has in the Flood Control Insurance Act, Tex. Water Code, § 16.315, delegated the responsibility of local governmental units to adopt regulations designed to minimize flood losses. The City Administrator is hereby appointed the Floodplain Administrator to administer and implement the provisions of this chapter and other appropriate sections of 44 CFR (Emergency Management and Assistance - National Flood Insurance Program Regulations) pertaining to floodplain management. (Ord. OR-10292012-FDP, passed 10-29-2012)	Website: https://codelibrary.amlegal.com/codes/godley/latest/godley_tx/0-0-0-5752#JD_156.01
Joshua	Code of Ordinances Building Regulations ARTICLE 3.07 FLOOD DAMAGE PREVENTION: The city manager is hereby appointed the floodplain administrator to administer and implement the provisions of this article and other appropriate sections of 44 CFR (Emergency Management and Assistance - National Flood Insurance Program regulations) pertaining to floodplain management. (Ordinance 554-2012 adopted 10/18/12)	Website: https://ecode360.com/40359866
Keene	Code of Ordinances TITLE XV. - LAND USAGECHAPTER 152. - FLOOD DAMAGE PREVENTION:	Website: https://library.municode.com/tx/keene/codes/code_of_ordinances?nodeId=TITXVLAUS_CH152FLDAPR
Johnson County	The Johnson County Public Works Director is hereby appointed the floodplain administrator to administer and implement the provisions of this article and other appropriate sections of 44 CFR (Emergency	Website: https://www.johnsoncountytx.org/departments/public-works/floodplain-management

Adoption of NFIP minimum floodplain management criteria via local regulation.		
Community	**Description**	**Source**
	Management and Assistance - National Flood Insurance Program regulations) pertaining to floodplain management.	

Table 60: FIRM Dates[47]

Adoption of the latest effective Flood Insurance Rate Map (FIRM), if applicable.		
CID	**CID**	**Current Effective Map Date**
Alvarado	480397#	12/04/12
Burleson	485459B	09/21/23
Cleburne	485462C	09/21/23
Godley	480880C	09/21/23
Joshua	480882C	09/21/23
Keene	481107#	12/04/12
Johnson County	480879C	09/21/23

Table 61: Floodplain Administrators[48]

Appointment of a designee or agency to implement the addressed commitments and requirements of the NFIP.	
Community	**Floodplain Administrator Title**
Alvarado	City Manager
Burleson	Assistant Director-Engineering
Cleburne	Project Engineer
Godley	City Administrator
Joshua	Development Services Director
Keene	Development Services Coordinator
Johnson County	Director of Public Works

Implementation and enforcement of local floodplain management regulations to regulate and permit development in SFHAs.

The local floodplain administrators (FPAs) in Johnson County serve as the local FPA in addition to their primary position in their respective communities.

When acting as the FPA, duties mainly consist of reviewing permit applications for development in the floodplain to ensure the development will not negatively impact the community's floodplain. They are also responsible for addressing code violations related to the flood damage prevention ordinance and coordinating recovery efforts after a major disaster. More specifically, local ordinance states that the

[47] FEMA. *Communities Participating in the National Flood Program*. 2023, https://www.fema.gov/cis/TX.html.
[48] Floodplain Administrators | Texas Flood

Implementation and enforcement of local floodplain management regulations to regulate and permit development in SFHAs.

duties and responsibilities of the floodplain administrator shall include, but not be limited to, the following:

(1) Maintain and hold open for public inspection all records pertaining to the provisions of this chapter.

(2) Review permit application to determine whether to ensure that the proposed building site project, including the placement of manufactured homes, will be reasonably safe from flooding.

(3) Review, approve or deny all applications for development permits required by adoption of this chapter.

(4) Review permits for proposed development to assure that all necessary permits have been obtained from those federal, state or local governmental agencies (including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334) from which prior approval is required.

(5) Where interpretation is needed as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions) the floodplain administrator shall make the necessary interpretation.

(6) Notify, in riverine situations, adjacent communities and the state coordinating agency which is the Texas Water Development Board (TWDB) and also the Texas Commission on Environmental Quality (TCEQ), prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the federal emergency management agency.

(7) Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained.

(8) When base flood elevation data has not been provided in accordance with the associated section, the floodplain administrator shall obtain, review and reasonably utilize any base flood elevation data and floodway data available from a federal, state or other source, in order to administer the provisions of associated section.

(9) When a regulatory floodway has not been designated, the floodplain administrator must require that no new construction, substantial improvements, or other development (including fill) shall be permitted within zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

(10) Under the provisions of 44 CFR chapter 1, section 65.12, of the National Flood Insurance Program regulations, a community may approve certain development in zones A1-30, AE, AH, on the community's FIRM which increases the water surface elevation of the base flood by more than 1 foot, provided that the community first applies for a conditional firm revision through FEMA and completes all of the provisions required by section 65.12.

(11) The floodplain administrator shall appoint a qualified person to review all permit applications and approve any such permits in the absence of the administrator.

Implementation and enforcement of local floodplain management regulations to regulate and permit development in SFHAs.

(12) Review subdivision proposals and other proposed new development, including manufactured home parks and subdivisions, to determine whether such proposals will be reasonably safe from flooding.

(13) Require within flood hazard areas that new and replacement water supply and sanitary sewerage systems be designed to minimize or eliminate infiltration of flood waters into the systems, and that discharges from the systems into floodwaters and on-site waste disposal systems be located to avoid impairment to them or contamination from them during flooding.

(14) Require proposed developments to obtain a LOMA when appropriate.

(15) Require proposed developments to obtain a conditional letter of map revision (CLOMR) when appropriate prior to any construction. After such construction a formal LOMR shall be required.

Description of how participants implement the substantial improvement/substantial damage provisions of their floodplain management regulations after an event.

For communities participating in the National Flood Insurance Program (NFIP), structures located in the Special Flood Hazard Area (SFHA) that are substantially modified (either damaged or improved) more than 50 percent are required to comply with local building and floodplain requirements. Local community officials (typically floodplain administrators) are responsible for substantial damage and improvement (SI/SD) determinations. These determinations are required to be in compliance for participation in the NFIP.

How a community and FEMA assess the structure owner's compliance with these requirements is part of the process referred to as Substantial Improvement (SI) and Substantial Damage (SD). After a disaster, communities are required to complete damage assessments for structures in the SFHA.

The following describes the responsibilities that specifically apply to administering the SI/SD requirements, as determined by FEMA and implemented by the communities. The local FPAs seek help from the County and State FPA in implementation due to their lack of experience and the overwhelming events during a disaster:

- Review permit applications to determine whether improvements or repairs of buildings in SFHAs constitute substantial improvement or repair of substantial damage.
- Review descriptions of proposed work submitted by applicants to ensure that all requirements are addressed.
- Review cost estimates of the proposed work submitted by applicants and determine if the costs are reasonable for the proposed work or use other acceptable methods to estimate the costs.
- Decide the method to determine market value (including which method to use after an event that damages many buildings) and identify the buildings most likely to have sustained substantial damage.

Description of how participants implement the substantial improvement/substantial damage provisions of their floodplain management regulations after an event.
• Review market value appraisals, if submitted by applicants, to determine if the appraisals reasonably represent the characteristics of the building and the market value of the structures (excluding land value). • Determine if proposed improvements are substantial improvements based on the costs of the proposed work compared to the market value of the building. • Determine if damaged buildings are substantially damaged based on cost estimates for repairs compared to the market value of the building before the damage occurred. • Issue a letter to the property owner to convey the SI/SD determination. • Retain all versions of the Flood Insurance Rate Maps (FIRMs) and allow citizens to access the maps. • Maintain in the permit file specific information on all development that occurs within the SFHA and make this information available for public inspection. The documentation includes the lowest floor elevations, other pertinent elevations such as for machinery and equipment, and flood protection designs. • Conduct periodic field inspections during construction to ensure that development complies with issued permits, work with builders and property owners to correct deficiencies and violations and check for unpermitted development. • Perform assessments after events that cause damage, inform property owners of the requirement to obtain permits for repairs, and determine whether the damage qualifies as substantial damage. • Coordinate with property owners and insurance adjusters regarding NFIP flood insurance claims and ICC coverage.

A.2 Capability Assessment

As FEMA states, reviewing each participant's capabilities helps the planning team find and evaluate resources they can use to reduce disaster losses now or in the future. The assessment encompasses the following types of mitigation capabilities:

1. **Planning and Regulatory:** Plans, policies, statutes or regulations that could affect resilience to future natural hazard events and other future conditions, including the potential effects of climate change.
2. **Administrative and Technical:** Staff, skills, and tools that can reduce the risk of hazards in the planning area.
3. **Financial:** Potential funding resources to support hazard mitigation. These may be local funds and programs, FEMA or other federal programs, and private and non-profit resources.

A.2.1 Results

The Local Planning Team of each jurisdiction reviewed their 2015 Capability Assessments to examine the ability of their jurisdiction to implement and manage a comprehensive mitigation strategy. The capabilities identified have not changed since 2015 and are available pre- and post-disaster. They can be used as mechanisms to implement the mitigation actions identified in this plan

Table 62: Legal and Regulatory Capability Summary

Capability	Alvarado	Burleson	Cleburne	Godley	Joshua	Keene	Johnson County
Building Code	Y	Y	Y	Y	Y	Y	N
Zoning Ordinance	Y	Y	Y	Y	Y	Y	N
Subdivision Ordinance or regulation	Y	Y	Y	Y	Y	Y	N
Special purpose ordinances (floodplain management, storm water management, hillside or steep slope ordinances wildfire ordinances, hazard setback requirements)	Y	Y	Y	Y	Y	Y	Y
Growth management ordinances (also called "smart growth" or anti-sprawl programs)	N	Y	Y	N	N	N	N
Site Plan review requirements	Y	Y	Y	Y	Y	Y	Y
General or comprehensive plan	Y	Y	Y	Y	Y	Y	Y
A capital improvements plan	Y	Y	Y	Y	Y	Y	Y
An economic development plan	N	Y	Y	Y	Y	Y	Y
An emergency response plan	Y	Y	Y	Y	Y	Y	Y
A post-disaster recovery plan	Y	Y	Y	N	Y	N	N
A post-disaster recovery ordinance	Y	Y	N	N	N	N	N
Real estate disclosure requirements	N	Y	Y	N	N	Y	Y
Other	N	N	N	N	N	N	N

186

Table 63: Administrative and Technical Capability Summary

Capability	Alvarado	Burleson	Cleburne	Godley	Joshua	Keene	Johnson County
Planner(s) or engineer(s) with knowledge of land development and land management	N	Y	Y	Y	Y	Y	Y
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	N	Y	Y	Y	Y	Y	Y
Planners or engineer(s) with an understanding of natural and/or human caused hazards	N	Y	Y	Y	Y	Y	Y
Floodplain Administrator	Y	Y	Y	Y	Y	Y	Y
Surveyors	N	N	N	N	N	N	N
Staff with education or expertise to assess the community's vulnerability to hazards	Y	Y	Y	Y	Y	Y	Y
Personnel skilled in GIS	N	Y	Y	Y	Y	Y	N
Scientists familiar with the hazards of the community	N	N	N	N	N	N	N
Emergency Manager	Y	Y	Y	Y	Y	Y	Y
Grant writers	N	Y	Y	Y	Y	Y	N

Table 64: Fiscal Capability Summary

Capability	Alvarado	Burleson	Cleburne	Godley	Joshua	Keene	Johnson County
Community Development Block Grants (CDBG)	Y	N	N	Y	N	Y	N
Capital improvements project funding	Y	Y	Y	Y	Y	Y	Y
Authority to levy taxes for specific purposes	Y	Y	Y	Y	Y	Y	Y
Fees for water, sewer, gas, or electric service	Y	Y	Y	Y	N	Y	N
Impact fees for homebuyers or developers for new developments/homes	N	Y	Y	Y	Y	Y	N
Incur debt through general obligation bonds	Y	Y	Y	Y	Y	Y	Y
Incur debt through special tax bonds	Y	Y	Y	N	Y	Y	Y
Incur debt through private activity bonds	Y	Y	N	N	N	N	Y
Withhold spending in hazard-prone areas	Y	N	Y	N	N	N	Y
Other	N	N	N	N	N	N	N

A.2.2 Gaps & Improvements

After completing the assessments, the Local Planning Teams realized that they each have a few gaps in each type of mitigation capability.

To expand on planning and regulatory capabilities and reduce future risks, jurisdictions could budget and pass policies and procedures for mitigation actions, create more land use ordinances, add mitigation strategies to existing plans and create new plans related to hazard mitigation.

To expand on administrative and technical capabilities, approving the hiring and training of staff for mitigation activities, acquiring data-collecting software, and tracking inventory of assets.

To expand on financial capabilities, jurisdictions could use existing funding resources to implement mitigation activities and work with grant writers to apply to grants.

Appendix B: Local Planning Teams

The following tables identify the members of the Local Planning Team (LPT) from each participating jurisdiction.

Table 65: Alvarado Local Planning Team Members

City of Alvarado		
Agency/Organization	**Position**	**Role in LPT**
City Council	Mayor	General oversight hazard identification, and plan development
City Manager's Office	City Manager	Hazard identification and plan development
Emergency Management	EM Director	Hazard identification and plan development
City Manager's Office	Asst. City Manager	Hazard identification and plan development
Public Works	Director of Public Works	Hazard identification and plan development
Electrical Services	Electric Supt.	Hazard identification and plan development

Table 66: Burleson Local Planning Team Members

City of Burleson		
Agency/Organization	**Position**	**Role in LPT**
City Council	Mayor	General oversight hazard identification, and plan development
Mayor's Office	Public Works Dir.	Hazard identification and plan development
Mayor's Office	Code Enforcement	Hazard identification and plan development
Mayor's Office	Building Insp.	Hazard identification and plan development
Mayor's Office	Street Dept.	Help identify and plan develop with street planning.
Mayor's Office	Animal Control	Hazard Identification and Plan Development

Table 67: Cleburne Local Planning Team Members

City of Cleburne		
Agency/Organization	**Position**	**Role in LPT**
Fire Department	EMC	General oversight hazard identification, and plan development
Public Works	Public Works Director	Hazard identification and plan development
Police Department	Code Enforcer	Hazard identification and plan development
Police Department	Police Chief	Hazard identification and plan development
Fire Department	Fire Chief	Help identify and plan development
Engineer	City Engineer	Hazard Identification and Plan Development

Table 68: Godley Local Planning Team Members

City of Godley		
Agency/Organization	**Position**	**Role in LPT**
City Admin	City Administrator	General oversight hazard identification, and plan development
Fire Department	Fire Chief	Hazard identification and plan development
Public Works	PW Director	Hazard identification and plan development
Police Department	Police Chief	Hazard identification and plan development
Fire Department	Emergency Manager Coordinator	Hazard identification and plan development

Table 69: Joshua Local Planning Team Members

City of Joshua		
Agency/Organization	**Position**	**Role in LPT**
Police Department	Director	General oversight hazard identification, and plan development
City Hall	City Mayor	General oversight hazard identification, and plan development
Fire Department	Chief	Hazard identification and plan development
City Hall	Mayor	Plan development

City of Joshua		
Agency/Organization	**Position**	**Role in LPT**
Police Department	Emergency Management Coordinator	General oversight hazard identification, and plan development
Public Works	Director	Hazard identification and plan development

Table 70: Keene Local Planning Team Members

City of Keene		
Agency/Organization	**Position**	**Role in LPT**
City Council	Mayor	General oversight hazard identification, and plan development
Fire Department	Fire Chief	General oversight, hazard identification, and plan development
Emergency Management Department	Emergency Management Coordinator	General oversight, hazard identification, and plan development
Fire Department	Code Enforcement Officer	Hazard identification and plan development
City Hall	City Manager	Hazard identification and plan development
Development Services	Flood Plain Administrator	Hazard identification and plan development
Public Works	Public Works Director	Hazard identification and plan development
Police Department	Police Chief	Hazard identification and plan development

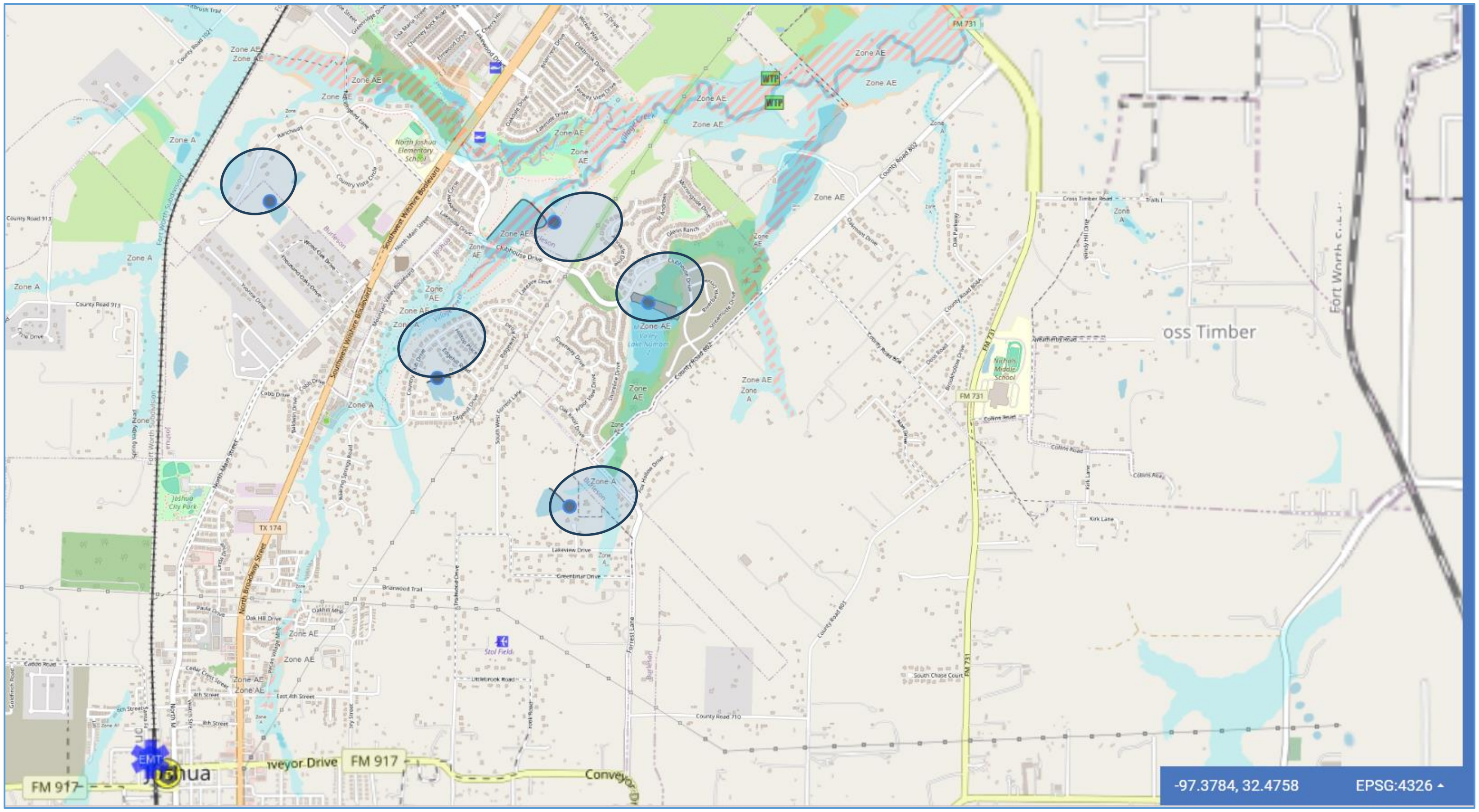
Table 71: Johnson County Local Planning Team Members

Johnson County Unincorporated		
Agency/Organization	**Position**	**Role in LPT**
Emergency Management	EMC	General oversight hazard identification, and plan development
Emergency Management	OEM-Admin	Plan development
Police Department	Director 911 Addressing	Hazard identification and plan development
Public Works	Watershed Ops/Maintenance	Hazard identification and plan development
City Hall	Engineer	Hazard identification and plan development

Johnson County Unincorporated		
Agency/Organization	**Position**	**Role in LPT**
Public Works	Buildings/Maintenance	Hazard identification and plan development
City Hall	Judge	General oversight hazard identification, and plan development

Appendix C: Flood Maps

This Appendix includes estimated maps of the HHPD inundation zones and the Flood Insurance Rate Maps (FIRMs).



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FM 731
TX 174
Conveyor Drive
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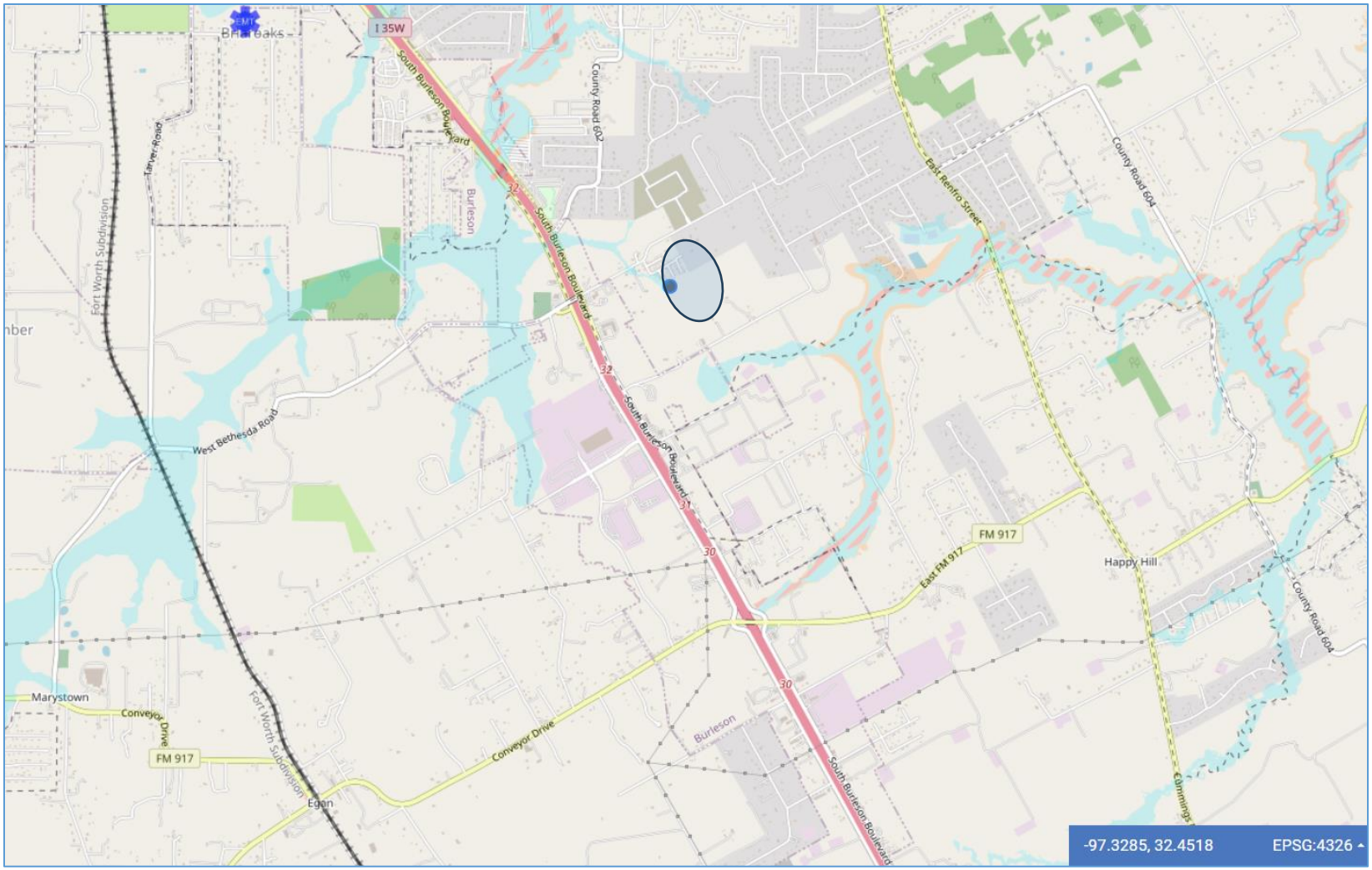
Zone AE
Zone A

195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East Renfro Street
County Road 604
Fort Worth Subdivision
Tarver Road
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East FM 917
Happy Hill
Marystown
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Egan
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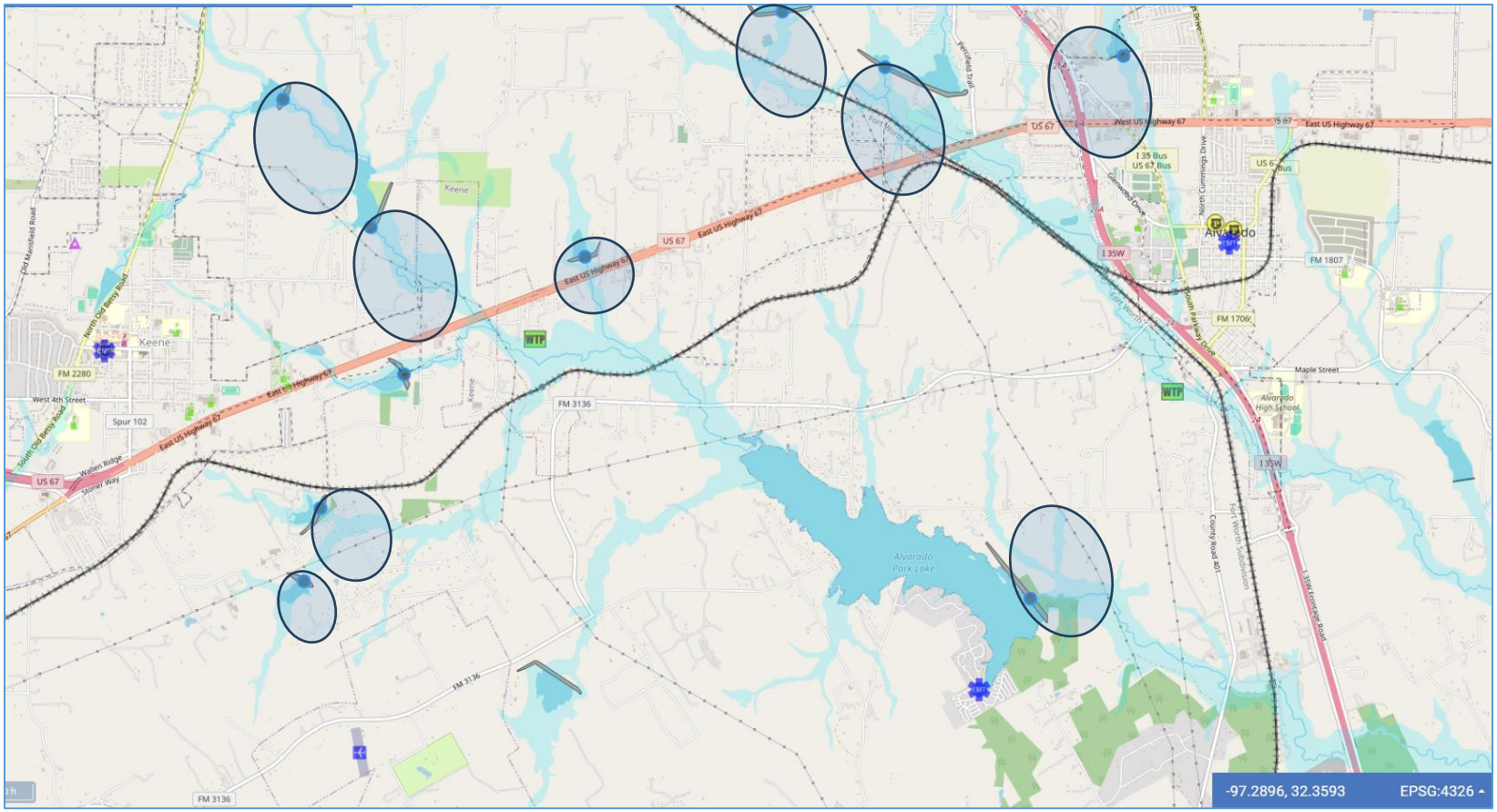
EPSG:4326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Alvarado Park Lake
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West US Highway 67
I 35W
I 35 Bus
US 67 Bus
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FM 3136
FM 1807
FM 1706
Spur 102
West 4th Street
Maple Street
Old Mansfield Road
North Old Betsy Road
South Old Betsy Road
Wallen Ridge
Stoney Way
Fort Worth Subdivision
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Alvarado High School
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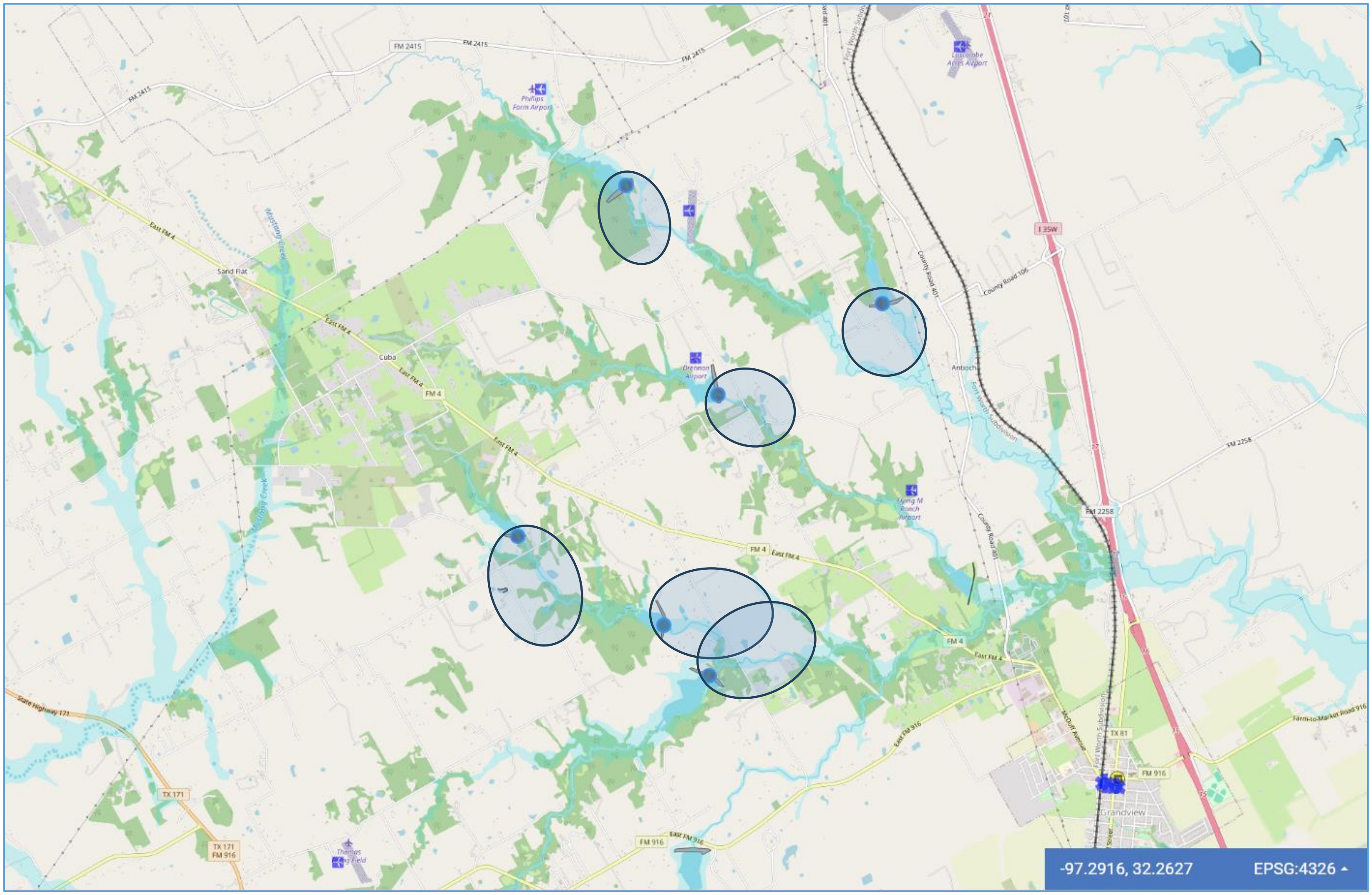
EPSG:4326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Sand Flat
Cuba
FM 4
Grandview
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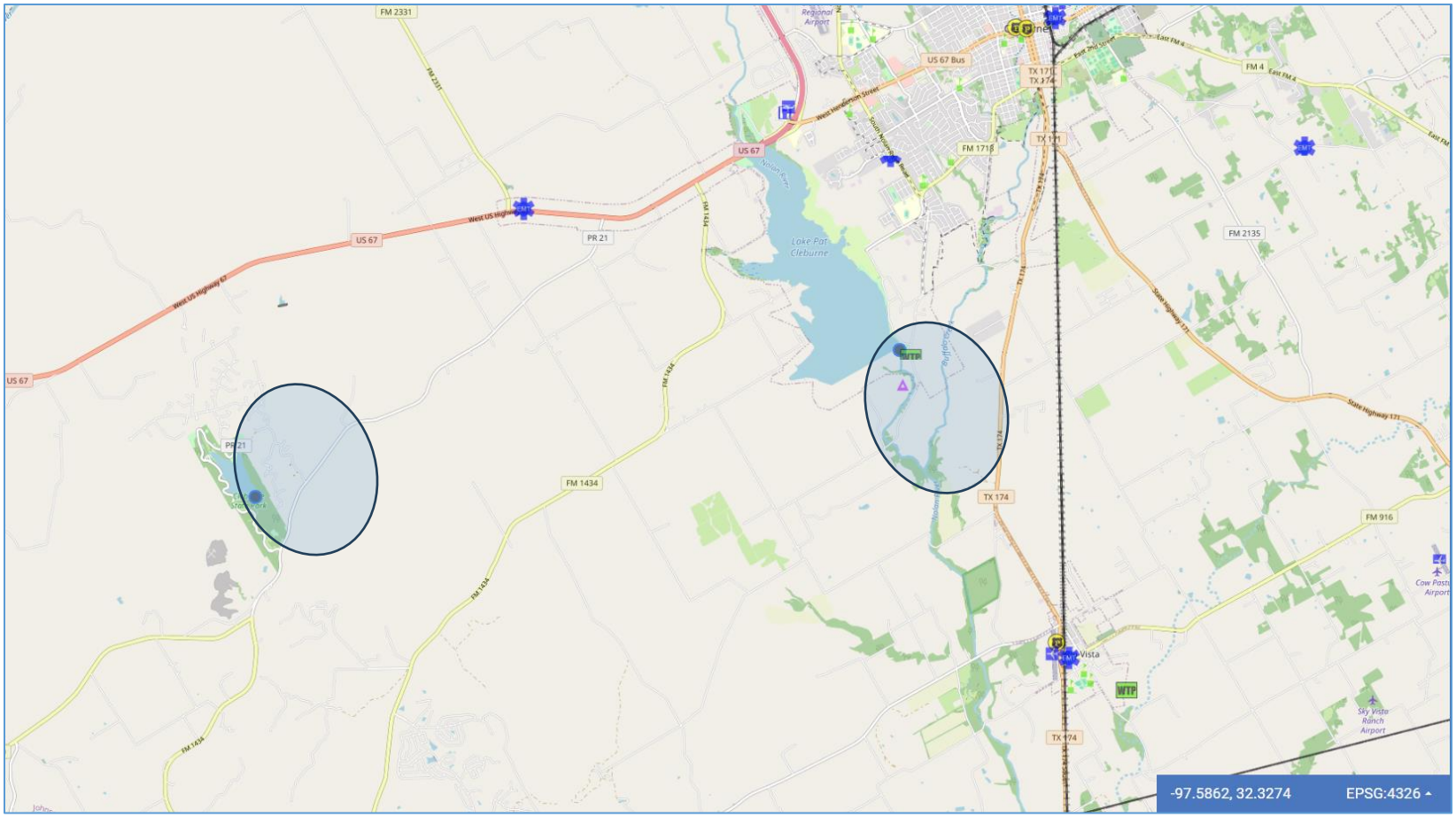
TX 171
FM 2258
TX 81
Antioch
County Road 401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US 67
PR 21
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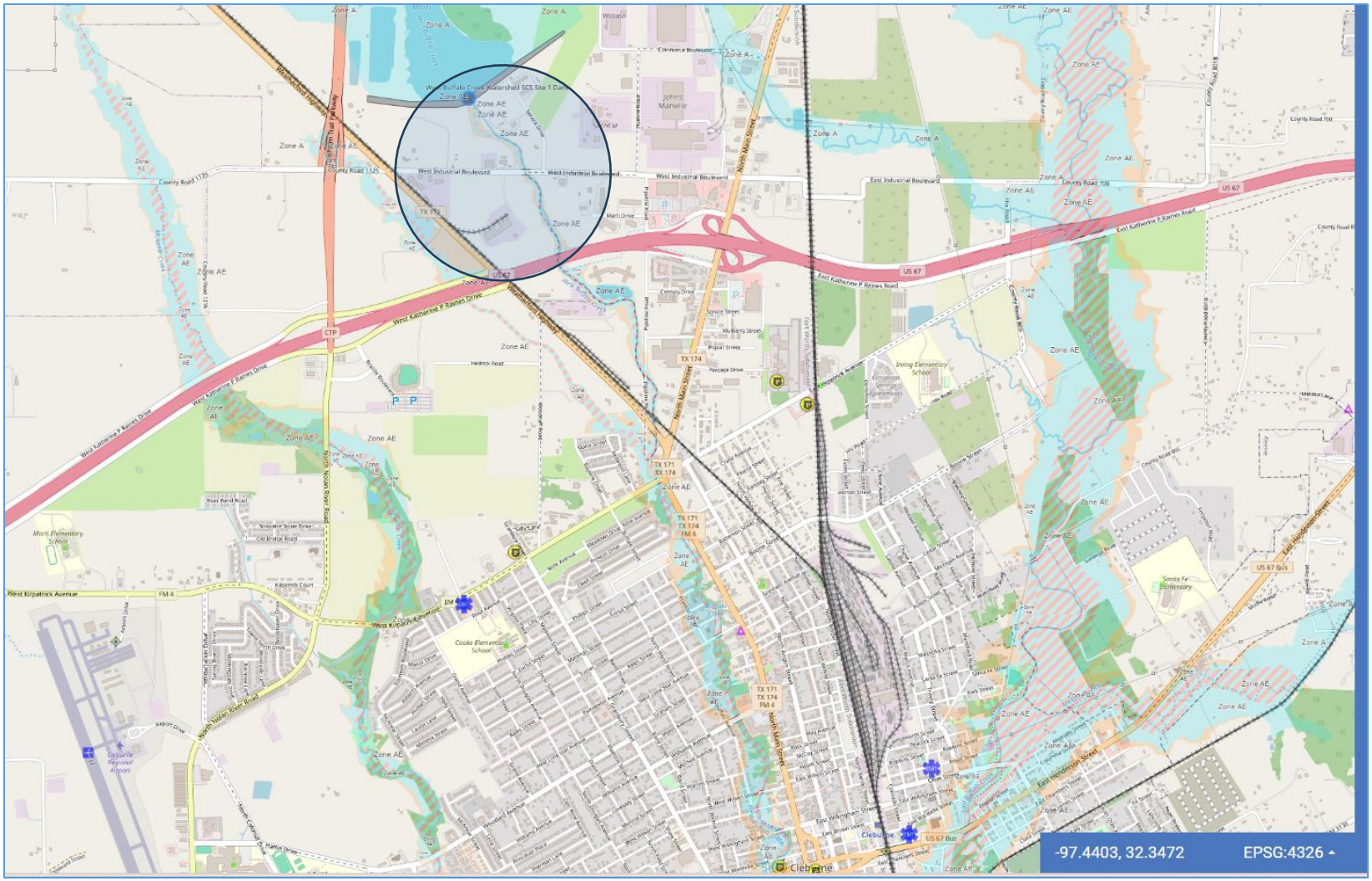
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NOTES TO USERS

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To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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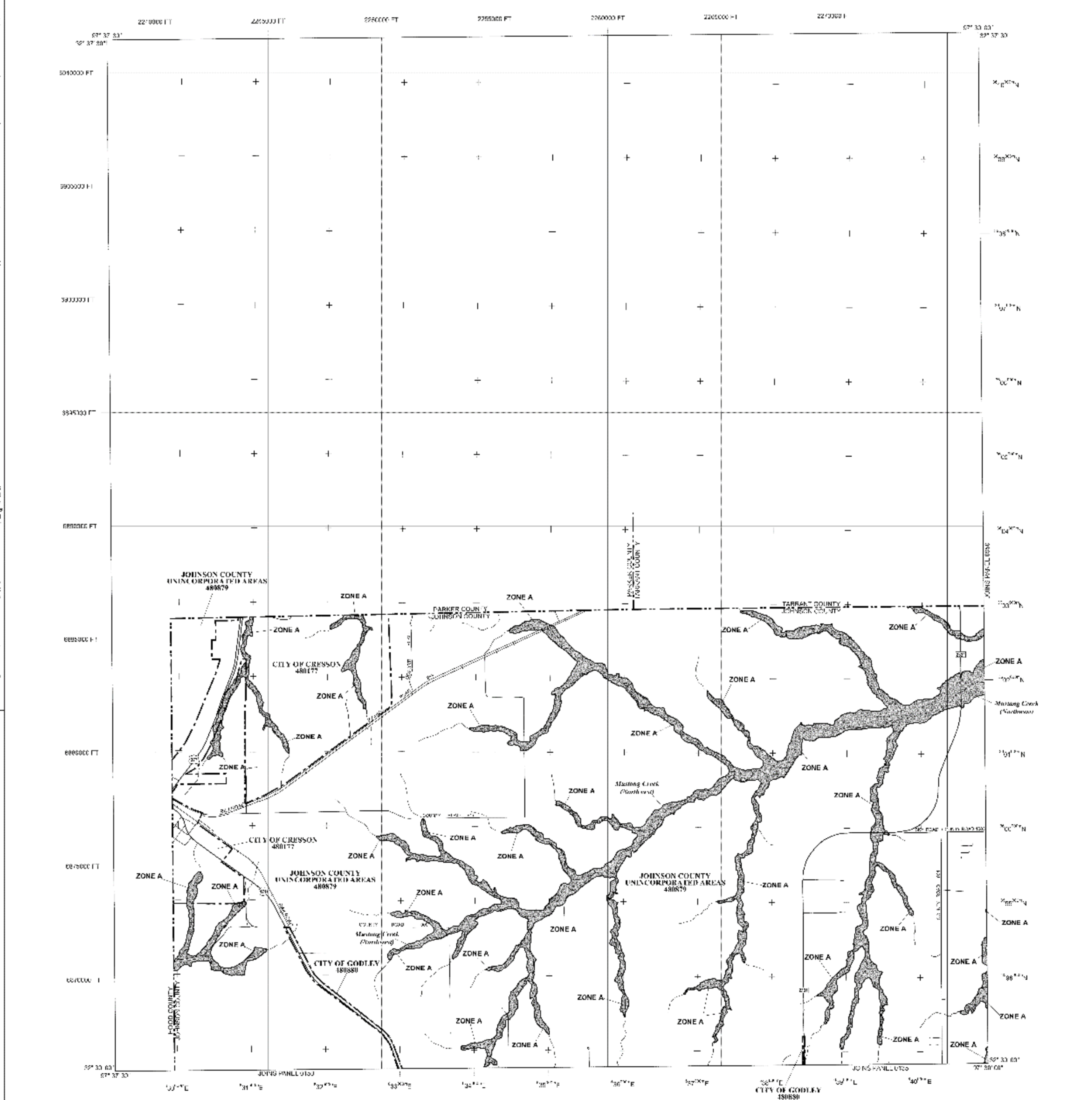
If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

OTHER AREAS

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NFIP

PANEL 0025J

FIRM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 25 OF 475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

NATIONAL FLOOD INSURANCE PROGRAM

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48251C0025J

MAP REVISED
DECEMBER 4, 2012

Federal Emergency Management Agency

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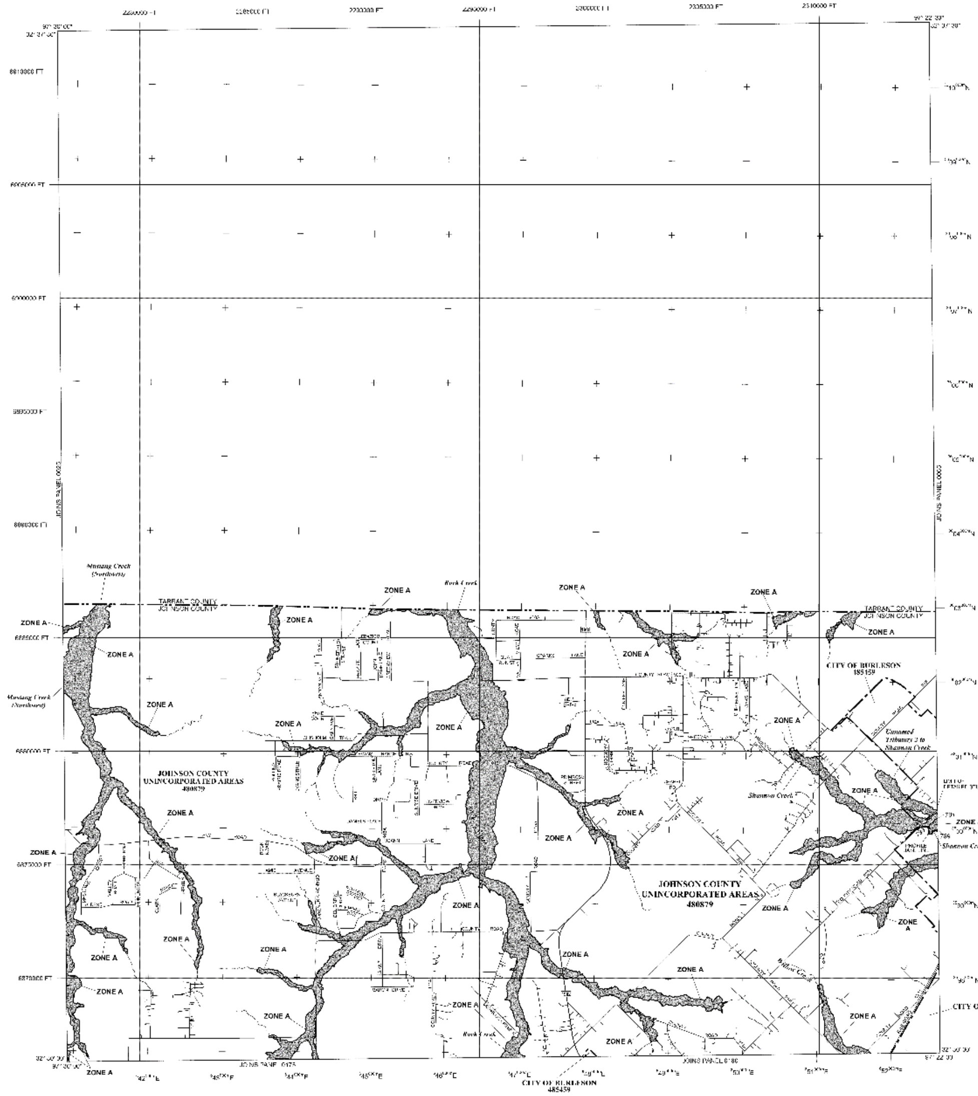


LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

OTHER AREAS

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

NATIONAL FLOOD INSURANCE PROGRAM

NFIP

PANEL 0050J

FIRM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 50 OF 475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BURLESON, CITY OF	485459	0050	J

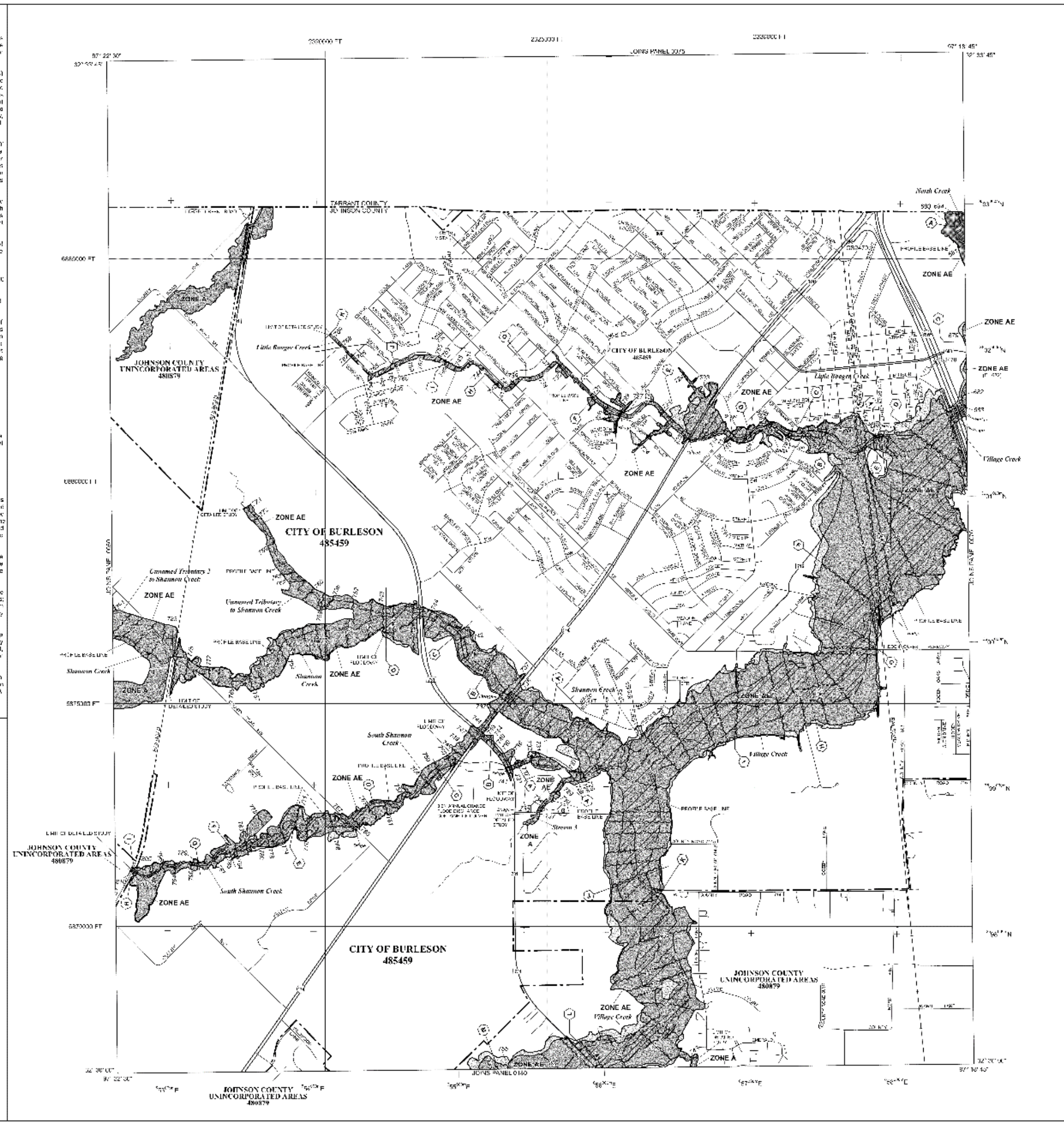
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48251C0050J

MAP REVISED
DECEMBER 4, 2012

Federal Emergency Management Agency

NOTES TO USERS



LEGEND

MAP SCALE 1" = 1000'

PANEL 0065J

FIRM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS

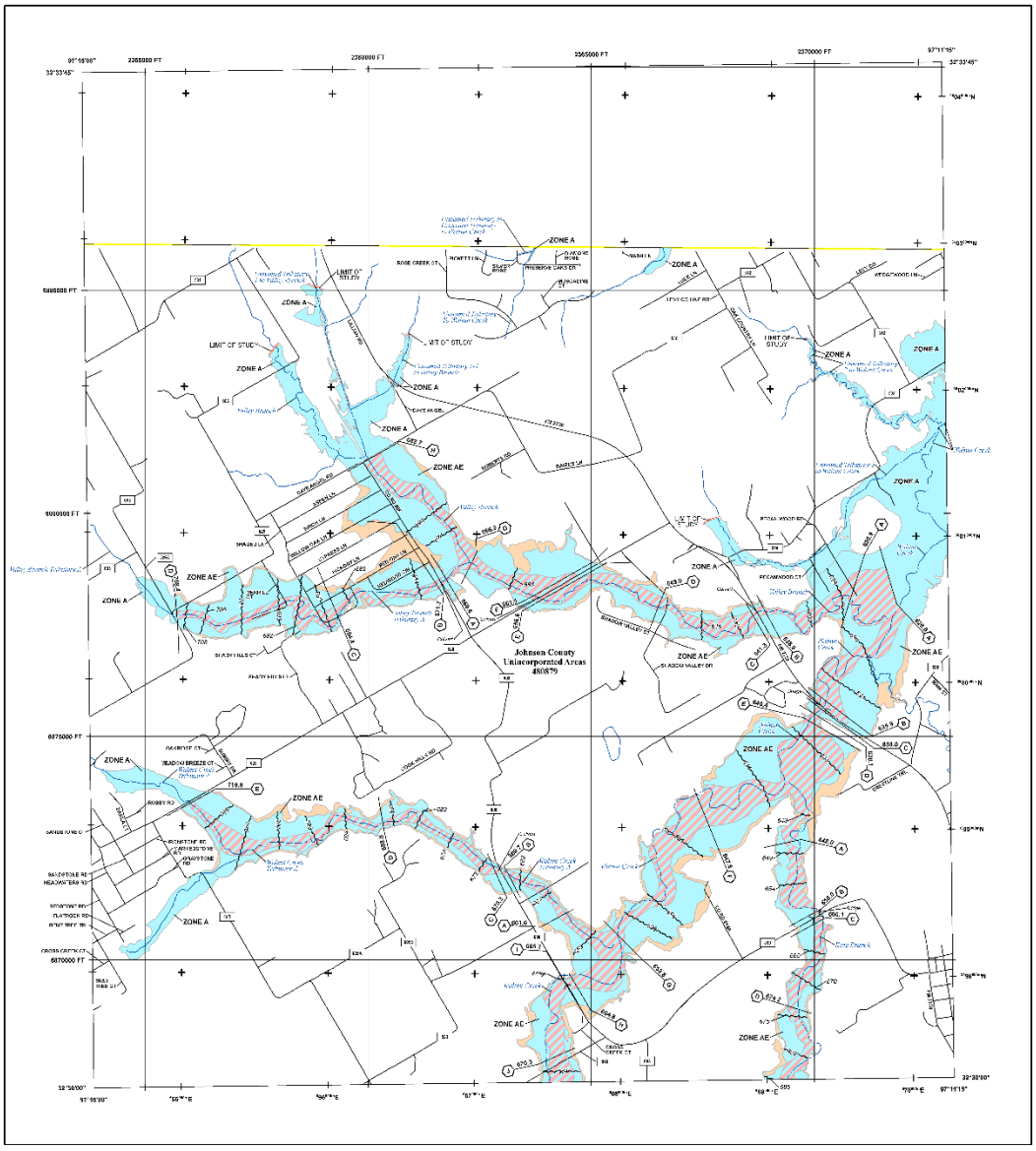
PANEL 65 OF 475

NATIONAL FLOOD INSURANCE PROGRAM

MAP NUMBER 48251C0065J

MAP REVISED DECEMBER 4, 2012

Federal Emergency Management Agency



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) Zone A, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS OF FLOOD HAZARD
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Area of Undetermined Flood Hazard Zone D

OTHER AREAS

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 513 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

SCALE

N

1 inch = 1,000 feet 1:12,000

0 1,000 2,000 4,000 feet

0 250 500 1,000 meters

PANEL LOCATOR

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS and Incorporated Areas

PANEL 90 OF 475

FEMA

Panel Contains:

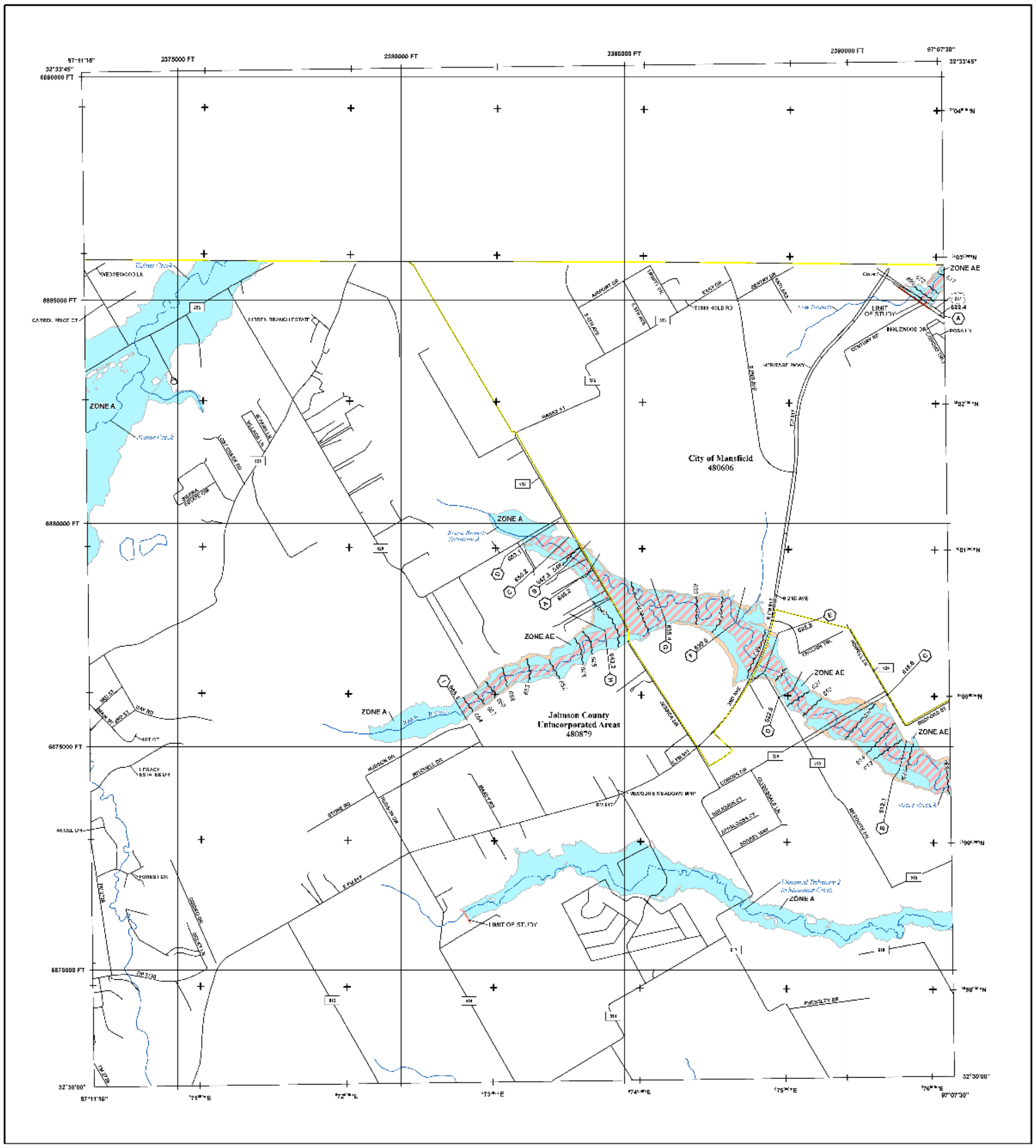
COMMUNITY	NUMBER	PANEL	SUFFIX
JOHNSON COUNTY	480879	0090	K

VERSION NUMBER 2.6.3.0

MAP NUMBER 48251C0090K

MAP REVISED SEPTEMBER 21, 2023

204



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
		Future Conditions 1% Annual Chance Flood Hazard *Zone X*
		Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
		Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
		Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES	E 18.2 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8	Coastal Transect
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
	513	Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary

NOTES TO USERS

SCALE

Map Projection:
State Plane Lambert Conformal Conic Texas North Central Zone 4202; North American Datum 1983
Western Hemisphere; Vertical Datum: NAVD 88

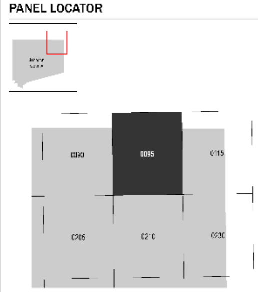
N

1 inch = 1,000 feet 1:12,000

0 1,000 2,000 4,000 feet

0 250 500 1,000 meters

PANEL LOCATOR



FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY,
TEXAS
and Incorporated Areas

PANEL 95 OF 475

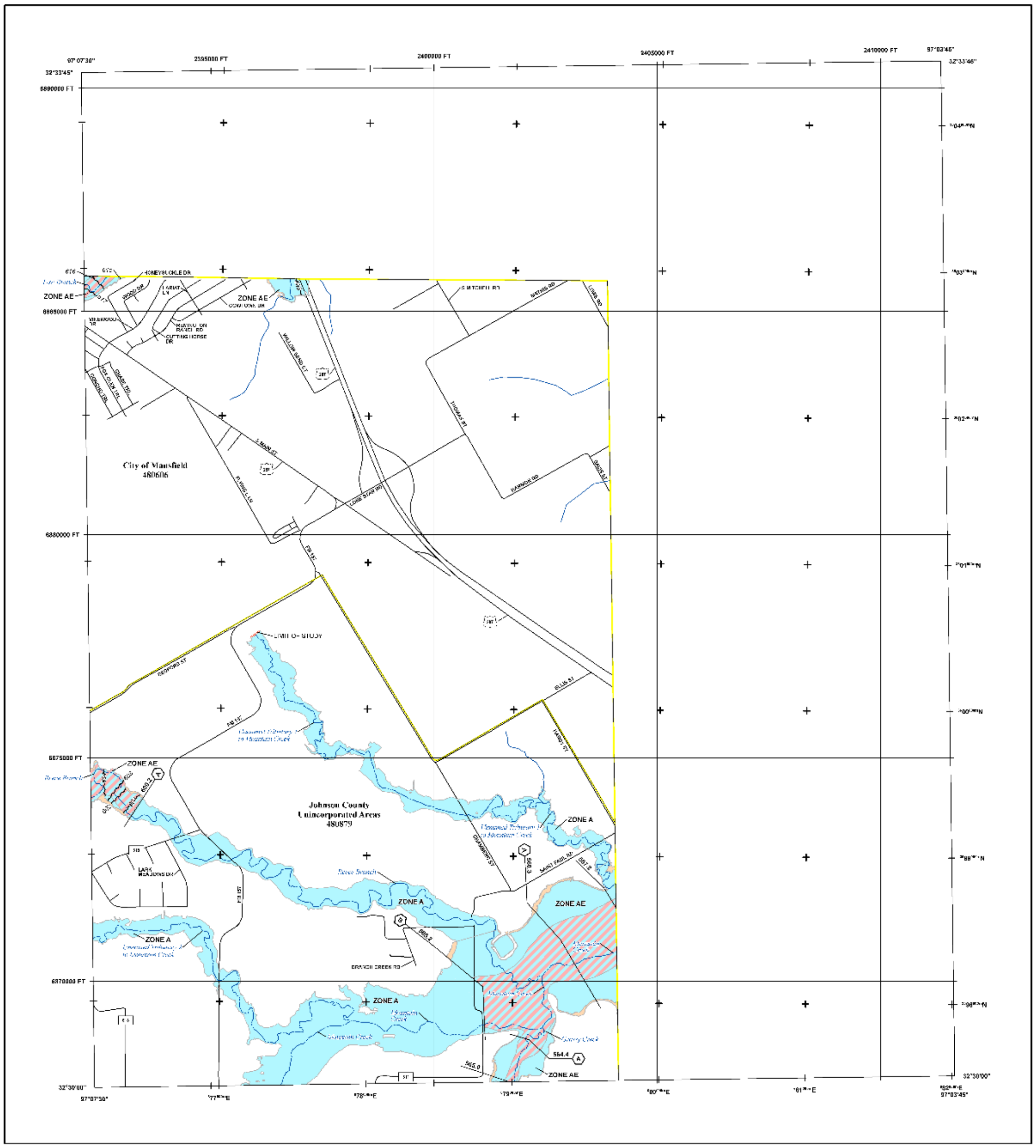
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
JOHNSON COUNTY	480879	0095	K
MANSFIELD, CITY OF	480606	0095	K

VERSION NUMBER
2.6.3.0

MAP NUMBER
48251C0095K

MAP REVISED
SEPTEMBER 21, 2023



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

SCALE

1 inch = 1,000 feet 1:12,000

PANEL LOCATOR

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

JOHNSON COUNTY,
TEXAS
and Incorporated Areas

PANEL 115 OF 475

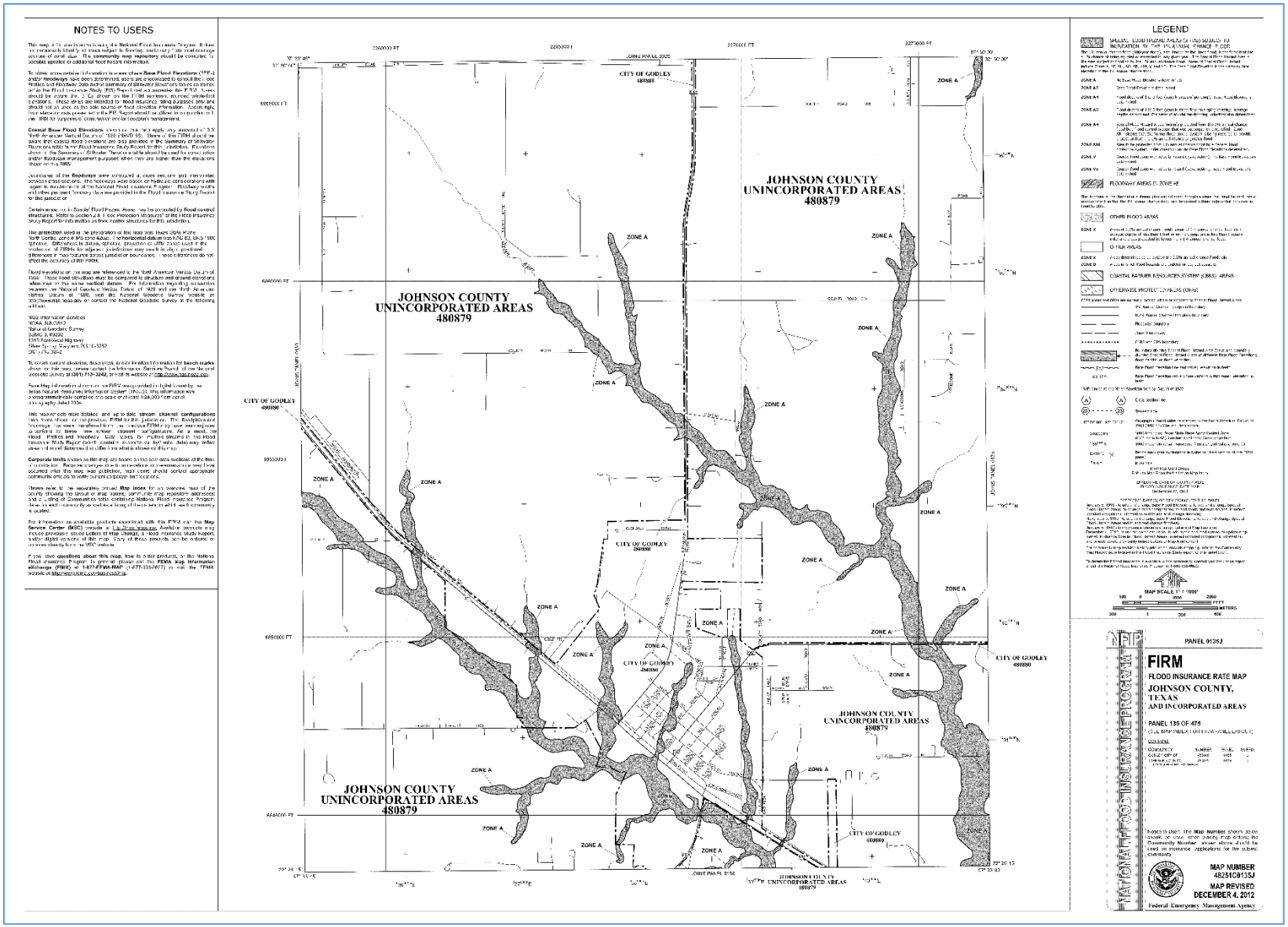
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
JOHNSON COUNTY	480879	0115	K
MANSFIELD, CITY OF	480606	0115	K

VERSION NUMBER
2.6.3.0

MAP NUMBER
48251C0115K

MAP REVISED
SEPTEMBER 21, 2023


NOTES TO USERS
LEGEND
JOHNSON COUNTY UNINCORPORATED AREAS 480879
CITY OF GODLEY 480880
ZONE A
FIRM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS
PANEL 135 OF 475
MAP NUMBER 48251C0135J
MAP REVISED DECEMBER 4, 2012
Federal Emergency Management Agency

207

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane North Central zone (FIPS zone 4202). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base Map information shown on this FIRM was provided in digital format by the Texas Natural Resources Information System (TNRIS). This information was photogrammetrically compiled at a scale of at least 1:24,000 from aerial photography dated 2004.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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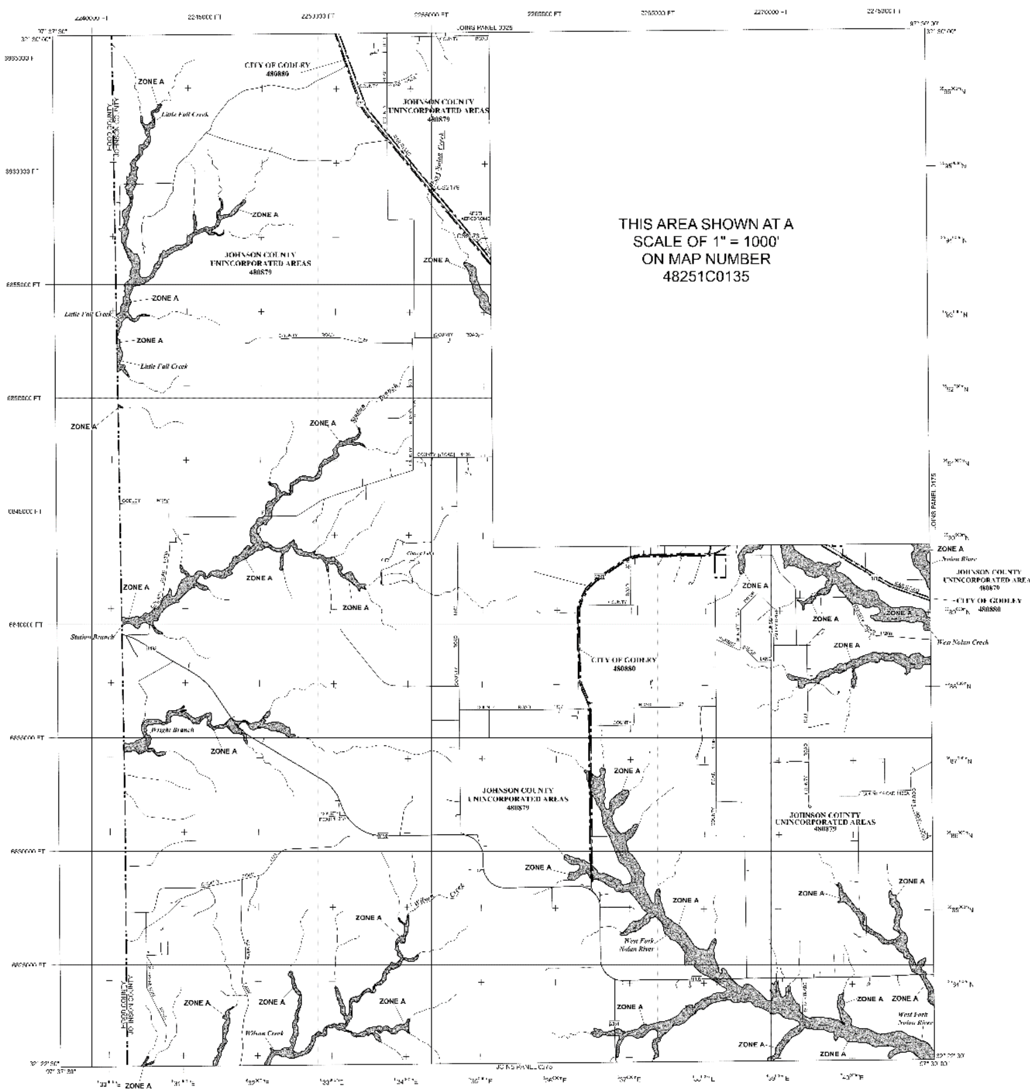


LEGEND

MAP SCALE 1" = 2000'

1000	0	2000	4000 FEET
600	0	600	1200 METERS

NATIONAL FLOOD INSURANCE PROGRAM

NFIP

PANEL 0150J

FIRM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 150 OF 475

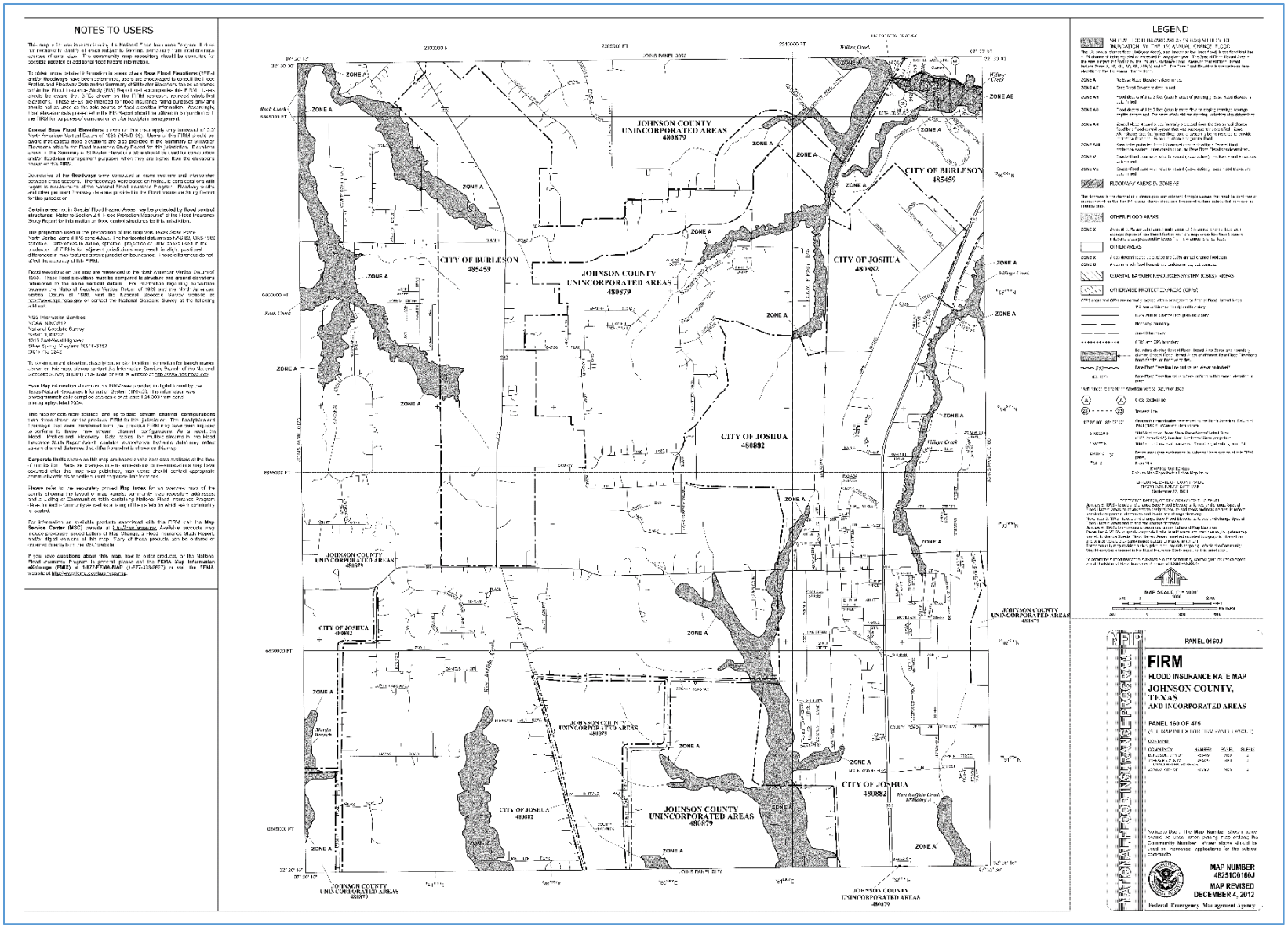
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

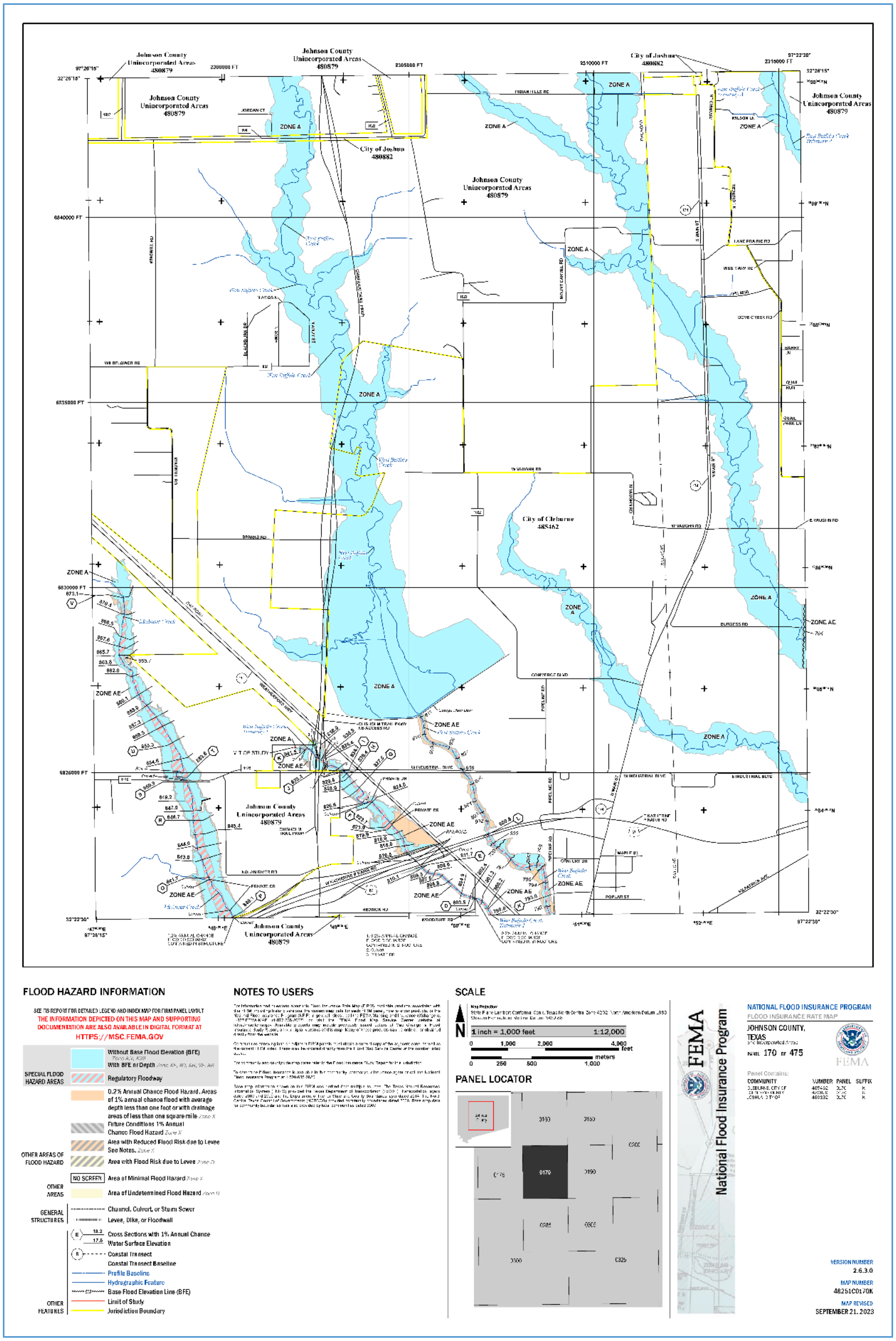
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48251C0150J

MAP REVISED
DECEMBER 4, 2012

Federal Emergency Management Agency


NOTES TO USERS
LEGEND
JOHNSON COUNTY UNINCORPORATED AREAS 480879
CITY OF BURLESON 485459
CITY OF JOSHUA 480882
ZONE A
ZONE AE
FLOODWAY AREAS IN ZONE AE
OTHER FLOOD AREAS
OTHERWISE PROTECTED AREAS (OPAs)
PANEL 0160J
FIRM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS
PANEL 160 OF 475
MAP NUMBER 48251C0160J
MAP REVISED DECEMBER 4, 2012
Federal Emergency Management Agency


Johnson County
Unincorporated Areas
480879
City of Joshua
480882
City of Cleburne
485462
ZONE A
ZONE AE
FLOOD HAZARD INFORMATION
SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT
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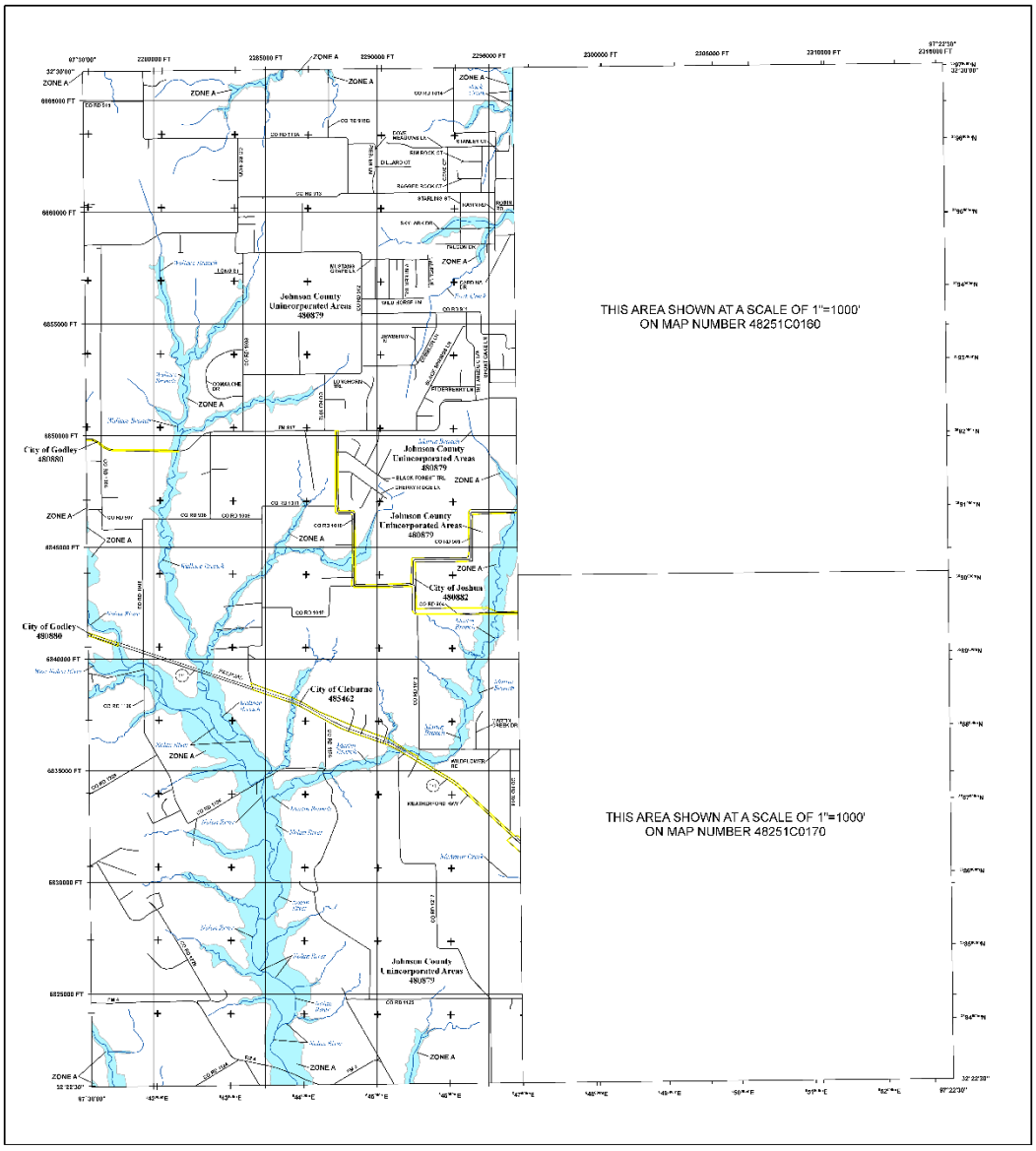
HTTPS://MSC.FEMA.GOV
SPECIAL FLOOD HAZARD AREAS
Without Base Flood Elevation (BFE)
With BFE or Depth
Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD
0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
Future Conditions 1% Annual Chance Flood Hazard Zone X
Area with Reduced Flood Risk due to Levee See Notes. Zone X
Area with Flood Risk due to Levee
OTHER AREAS
NO SCREEN
Area of Minimal Flood Hazard Zone X
Area of Undetermined Flood Hazard
GENERAL STRUCTURES
Channel, Culvert, or Storm Sewer
Levee, Dike, or Floodwall
OTHER FEATURES
Cross Sections with 1% Annual Chance Water Surface Elevation
Coastal Transect
Coastal Transect Baseline
Profile Baseline
Hydrographic Feature
Base Flood Elevation Line (BFE)
Limit of Study
Jurisdiction Boundary
NOTES TO USERS
SCALE
1 inch = 1,000 feet
1:12,000
PANEL LOCATOR
FEMA
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY, TEXAS
PANEL 170 OF 475
Panel Contains:
COMMUNITY NUMBER PANEL SUFFIX
VERSION NUMBER
2.6.3.0
MAP NUMBER
48251C0170K
MAP REVISED
SEPTEMBER 21, 2023

210



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) Zone A, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee See Notes. Zone X

OTHER AREAS OF FLOOD HAZARD
- Area with Flood Risk due to Levee Zone D

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall
- 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)

OTHER FEATURES
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

SCALE

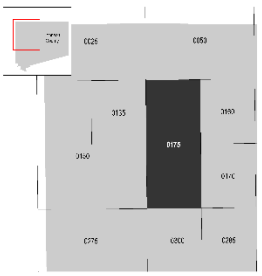
N

1 inch = 2,000 feet 1:24,000

0 2,000 4,000 8,000 feet

0 500 1,000 2,000 meters

PANEL LOCATOR



FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS and Incorporated Areas

PANEL 175 OF 475

FEMA

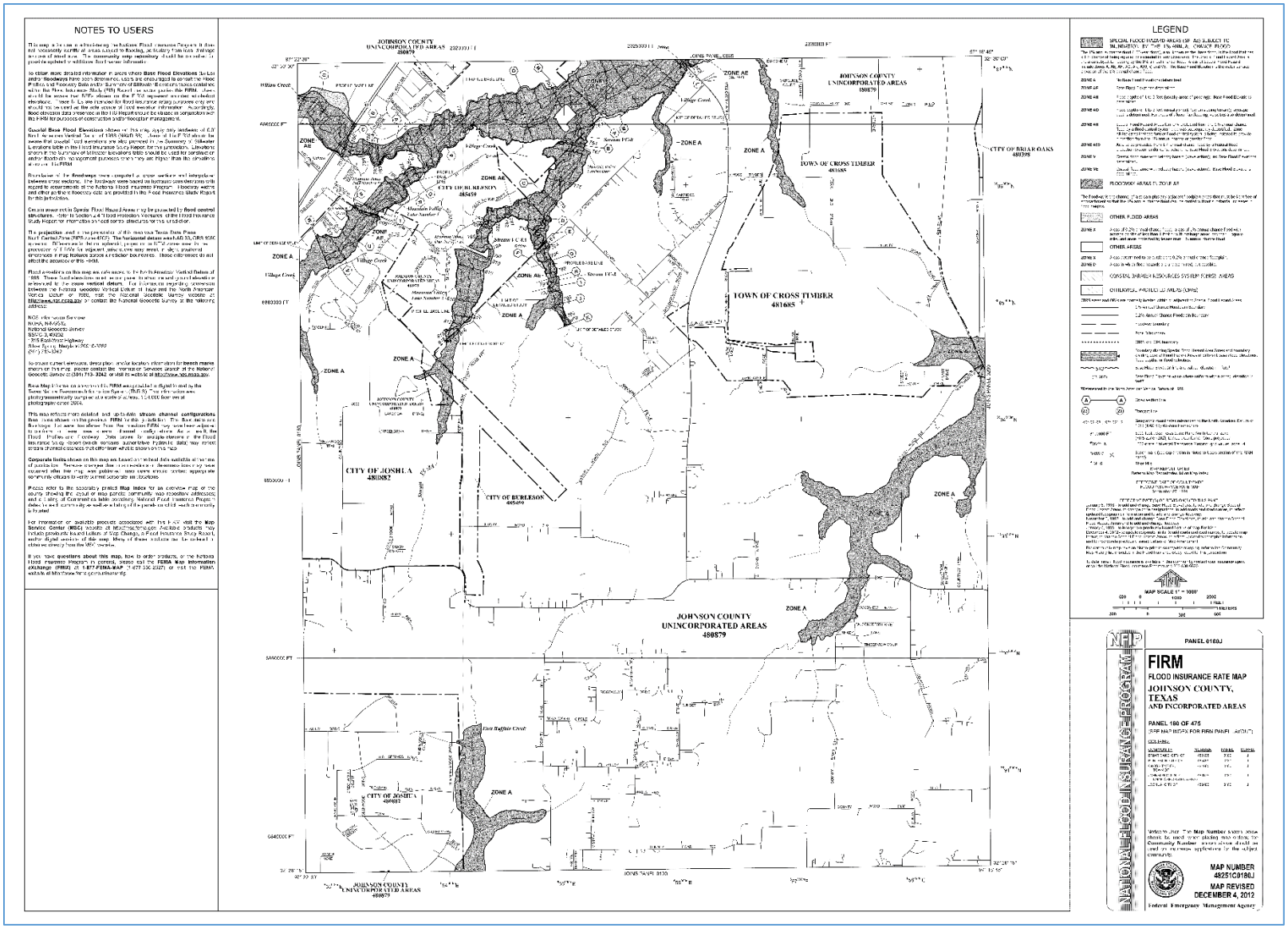
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLEBURNE, CITY OF	485462	0175	K
GODLEY, CITY OF	480880	0175	K
JOHNSON COUNTY	480879	0175	K
JOSHUA, CITY OF	480882	0175	K

VERSION NUMBER 2.6.3.0

MAP NUMBER 48251C0175K

MAP REVISED SEPTEMBER 21, 2023


NOTES TO USERS
LEGEND
FIRM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY, TEXAS
AND INCORPORATED AREAS
PANEL 180 OF 475
PANEL 0180J
MAP NUMBER
48251C0180J
MAP REVISED
DECEMBER 4, 2012
Federal Emergency Management Agency
JOHNSON COUNTY UNINCORPORATED AREAS 480879
CITY OF JOSHUA 480882
CITY OF BURLESON 485459
TOWN OF CROSS TIMBER 481685
CITY OF BRIAR OAKS 480398
ZONE A
ZONE AE
ZONE AH
ZONE X
MAP SCALE 1" = 1000'

212

NOTES TO USERS

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Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross-sections and interpolated between cross-sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.4 Flood Protection Measures of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane North Central zone (FIPS zone 4202). The horizontal datum was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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This map reflects more detailed and up to date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a listing of Communities Participating in the National Flood Insurance Program (NFIP) and their effective date of initial FIRM or most recent revision history.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

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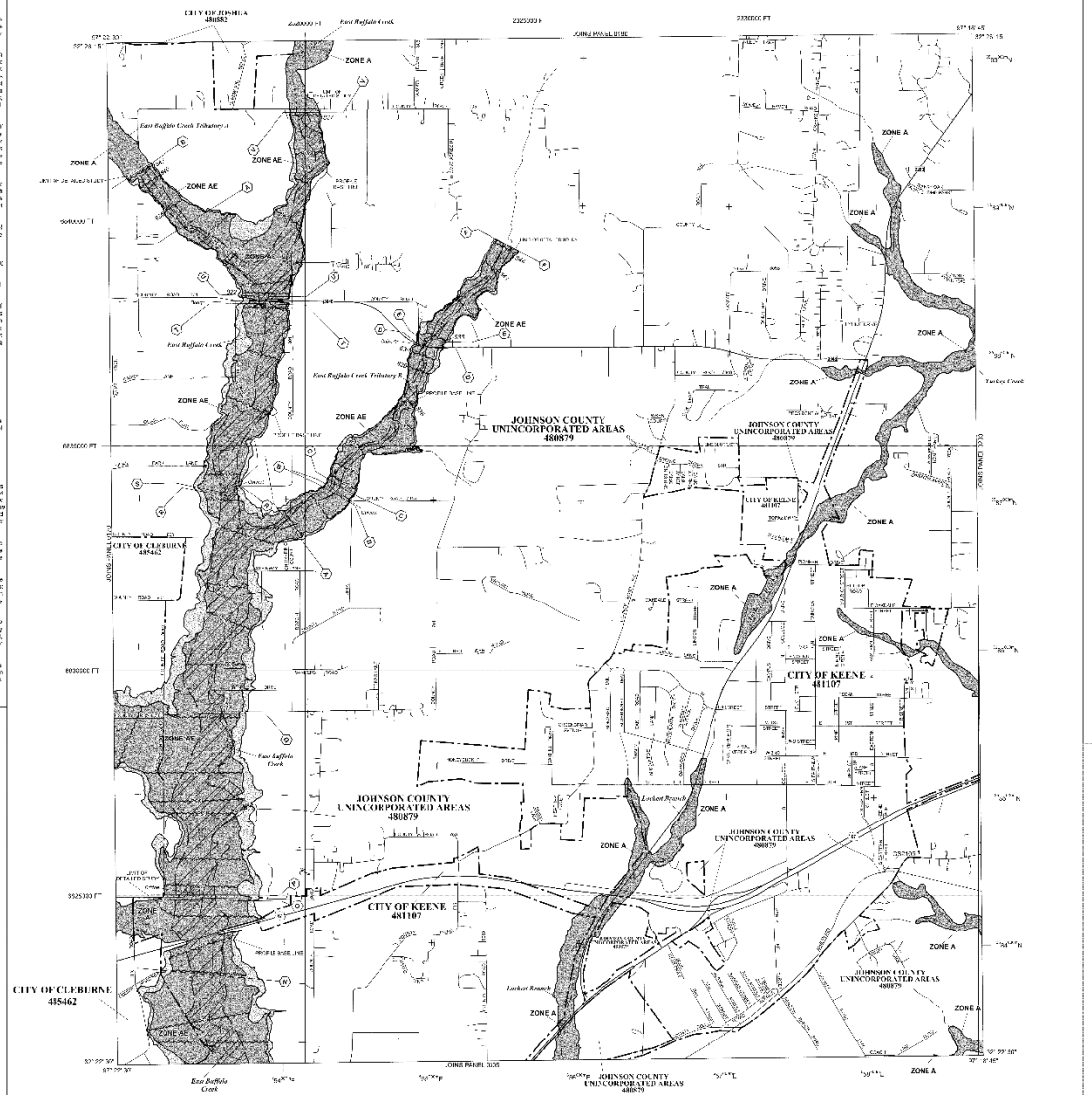

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation line and value; elevation in feet*

Cross section line

Transect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

1000-meter Universal Transverse Mercator grid values, zone 14

5000-foot grid values: Texas State Plane coordinate system, North Central zone (FIPS zone 4202), Lambert Conformal Conic projection

DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 — River mile

* Referenced to the North American Vertical Datum of 1988

SPECIFIC DETAILED GUIDANCE FOR THIS PANEL

Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. Special Flood Hazard Areas may be subject to inundation by the 1% annual chance flood. Mandatory flood insurance purchase requirements and floodplain management standards apply.

Note: Zone A, AO, and AH areas may be protected by flood control structures. Refer to Section 4.4 Flood Protection Measures of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

Zone A: Base Flood Elevations and flood hazard factors determined.

Zone AE: Base Flood Elevations and flood hazard factors determined.

Zone AH: Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations and flood hazard factors determined.

Zone AO: Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

Zone AR: Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

Zone A99: Special Flood Hazard Area to be protected from the 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

Zone V: Special Flood Hazard Area with velocity hazard (wave action); no Base Flood Elevations determined.

Zone VE: Special Flood Hazard Area with velocity hazard (wave action); Base Flood Elevations determined.

Zone X: Areas determined to be outside the 0.2% annual chance floodplain.

Zone D: Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS AND OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Coastal Barrier Resources System Area

Otherwise Protected Area

For more detailed information about the areas inundated during a particular flood event, the reader should refer to the Flood Insurance Study (FIS) report for this jurisdiction. To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
1000 0 1000 2000 FEET
300 0 300 600 METERS

PANEL 0190J

FIRM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 190 OF 475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLEBURNE, CITY OF	485462	0190	J
KEENE, CITY OF	481107	0190	J
JOHNSON COUNTY UNINCORPORATED AREAS	480879	0190	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
48251C0190J
MAP REVISED
DECEMBER 4, 2012

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane North Central zone (FIPS zone 4202). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base Map information shown on this FIRM was provided in digital format by the Texas Natural Resources Information System (TNRIS). This information was photogrammetrically compiled at a scale of at least 1:24,000 from aerial photography dated 2004.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

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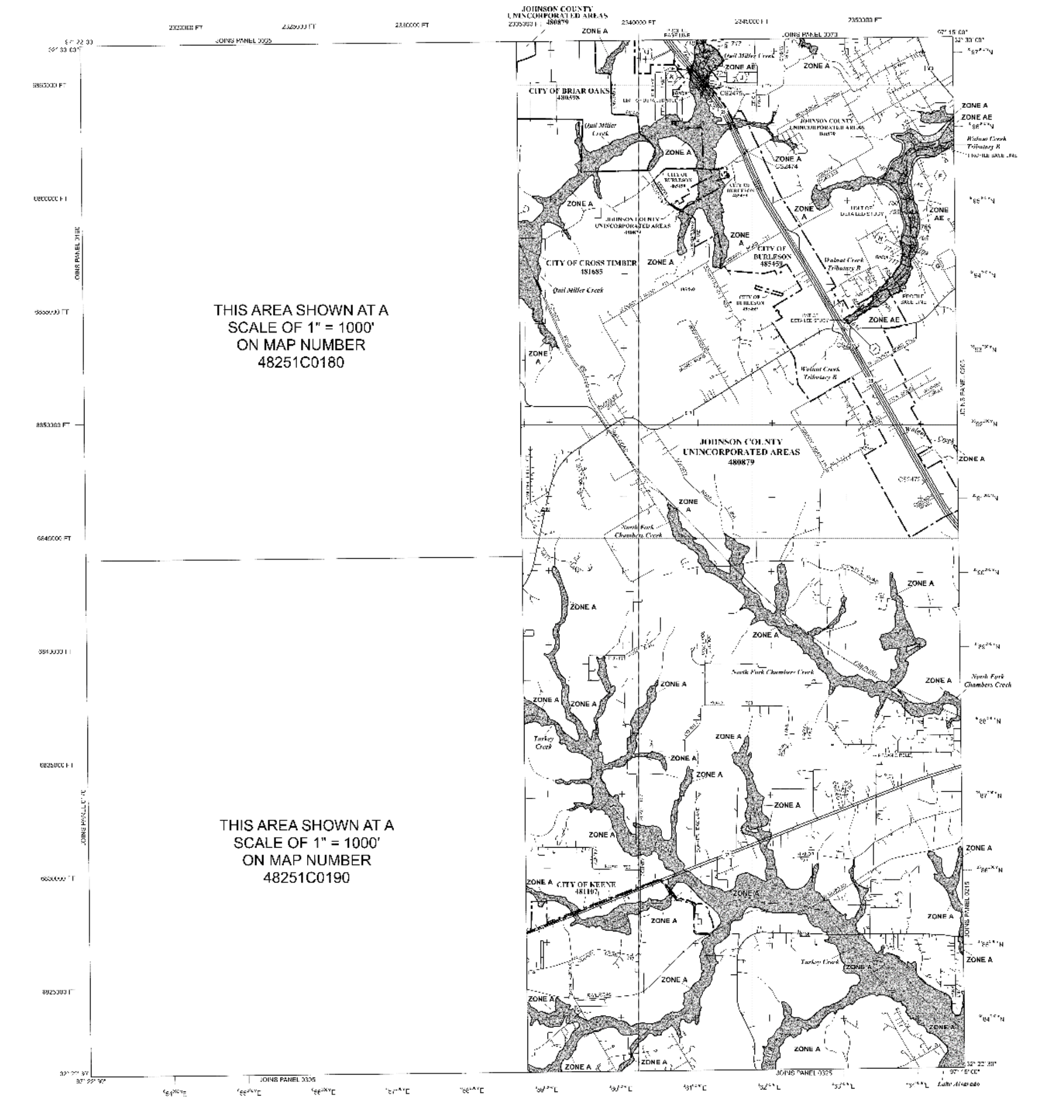
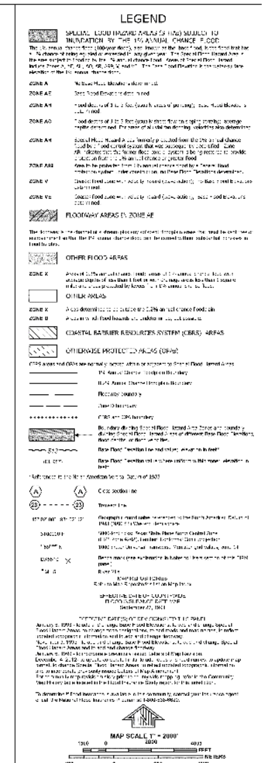




PANEL 0200J

FIRM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 200 OF 475
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BRIAR OAKS, CITY OF	[illegible]	0200	J
BURLESON, CITY OF	[illegible]	0200	J
CROSS TIMBER, TOWN OF	[illegible]	0200	J
JOHNSON COUNTY UNINCORPORATED AREAS	480879	0200	J
KEENE, CITY OF	[illegible]	0200	J

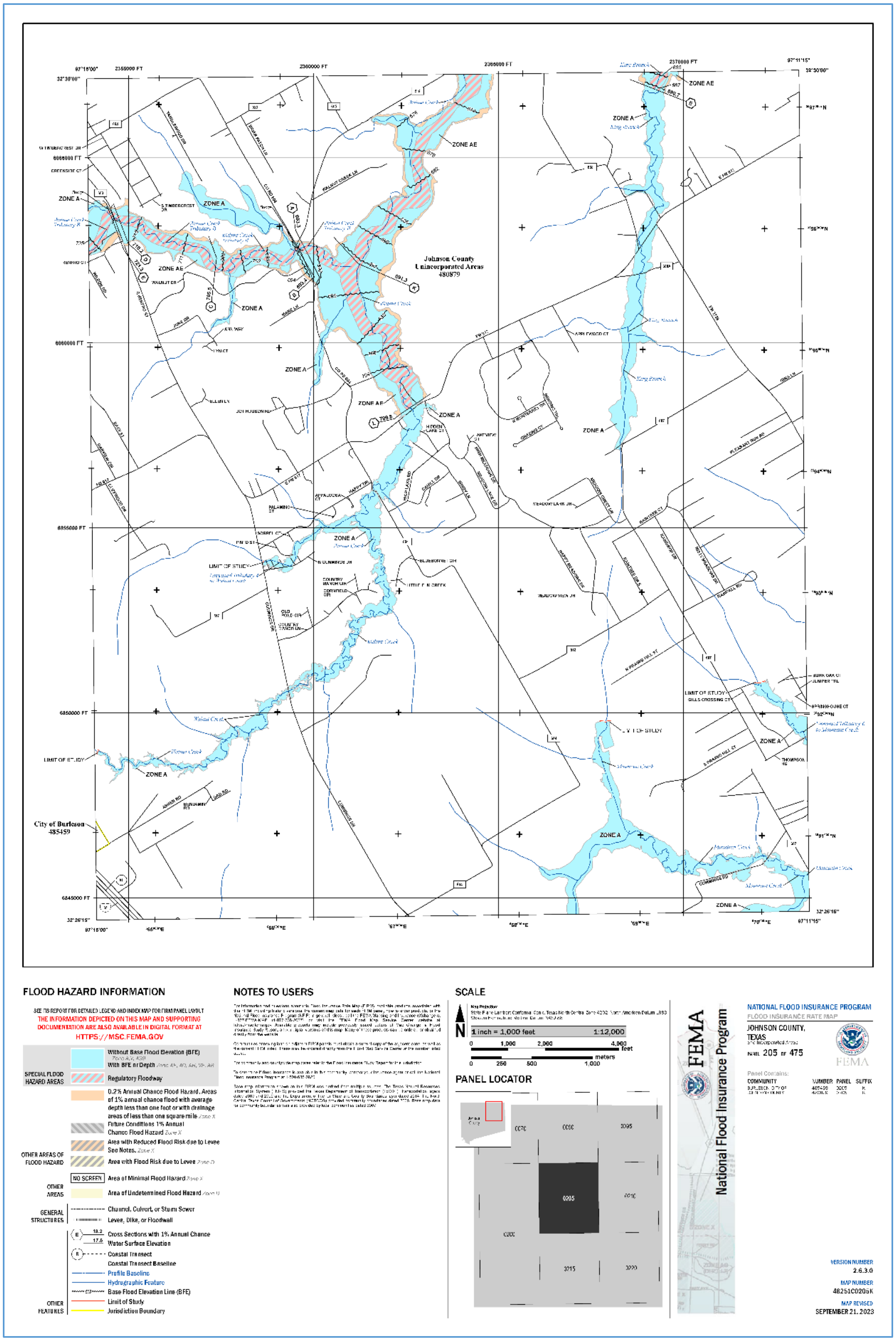
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

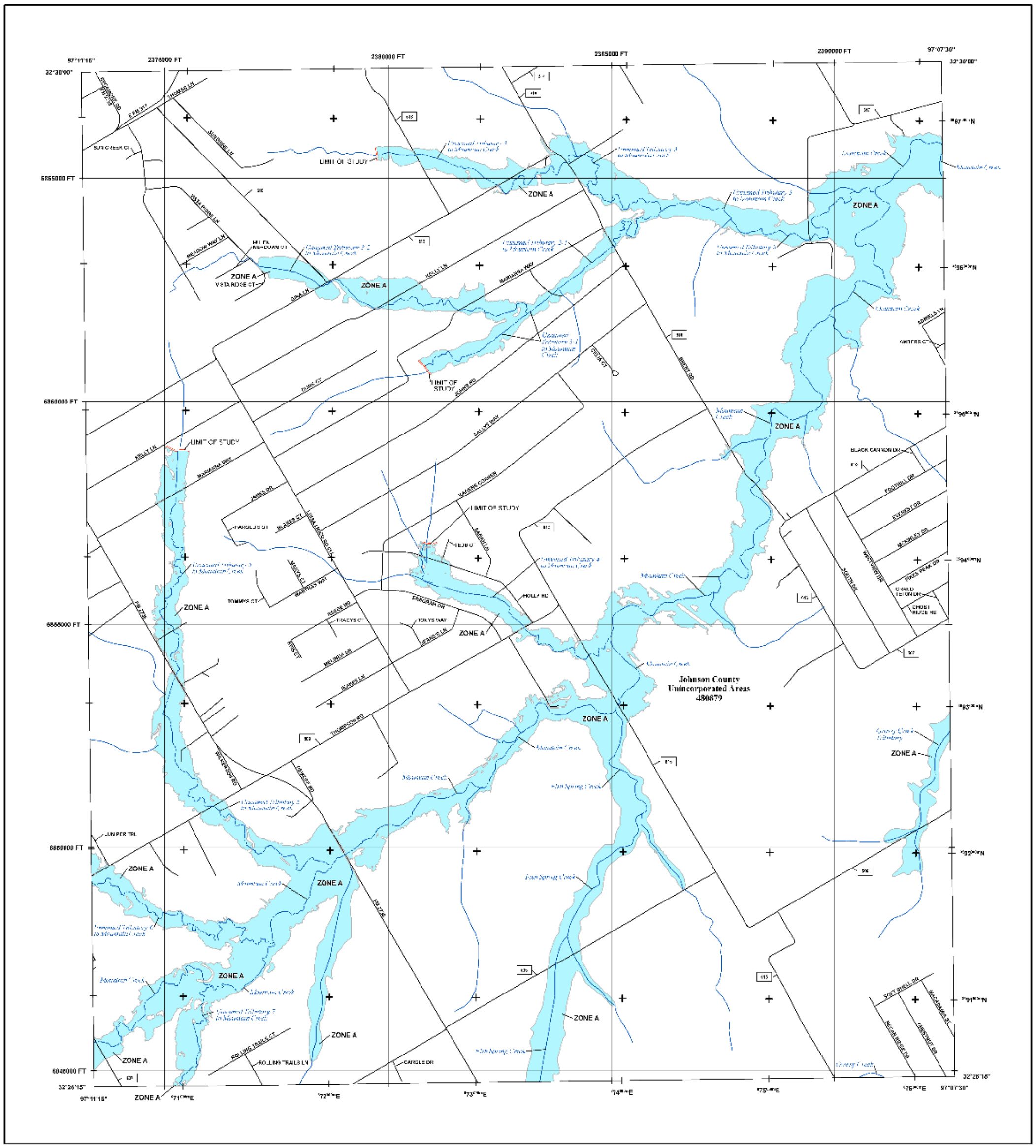
MAP NUMBER
48251C0200J

MAP REVISED
DECEMBER 4, 2012

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM


Johnson County
Unincorporated Areas
480879
City of Burleson
485459
ZONE A
ZONE AE
LIMIT OF STUDY
FLOOD HAZARD INFORMATION
SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT
HTTPS://MSC.FEMA.GOV
SPECIAL FLOOD HAZARD AREAS
Without Base Flood Elevation (BFE)
With BFE or Depth
Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD
0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile
Future Conditions 1% Annual Chance Flood Hazard
Area with Reduced Flood Risk due to Levee See Notes.
Area with Flood Risk due to Levee
OTHER AREAS
NO SCREEN
Area of Minimal Flood Hazard
Area of Undetermined Flood Hazard
GENERAL STRUCTURES
Channel, Culvert, or Storm Sewer
Levee, Dike, or Floodwall
Cross Sections with 1% Annual Chance Water Surface Elevation
Coastal Transect
Coastal Transect Baseline
Profile Baseline
Hydrographic Feature
Base Flood Elevation Line (BFE)
OTHER FEATURES
Limit of Study
Jurisdiction Boundary
NOTES TO USERS
SCALE
1 inch = 1,000 feet
1:12,000
PANEL LOCATOR
FEMA
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY,
TEXAS
PANEL 205 OF 475
VERSION NUMBER
2.6.3.0
MAP NUMBER
48251C0205K
MAP REVISED
SEPTEMBER 21, 2023



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- E 18.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- B Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

SCALE

Map Projection

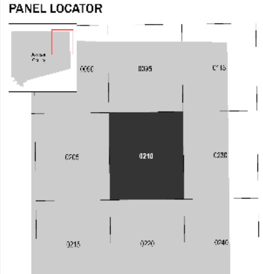
State Plane Lambert Conformal Conic, Texas North Central Zone 4202; North American Datum 1983; Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 1,000 feet 1:12,000

0 1,000 2,000 4,000 feet

0 250 500 1,000 meters

PANEL LOCATOR



FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS

and Incorporated Areas

PANEL 210 OF 475

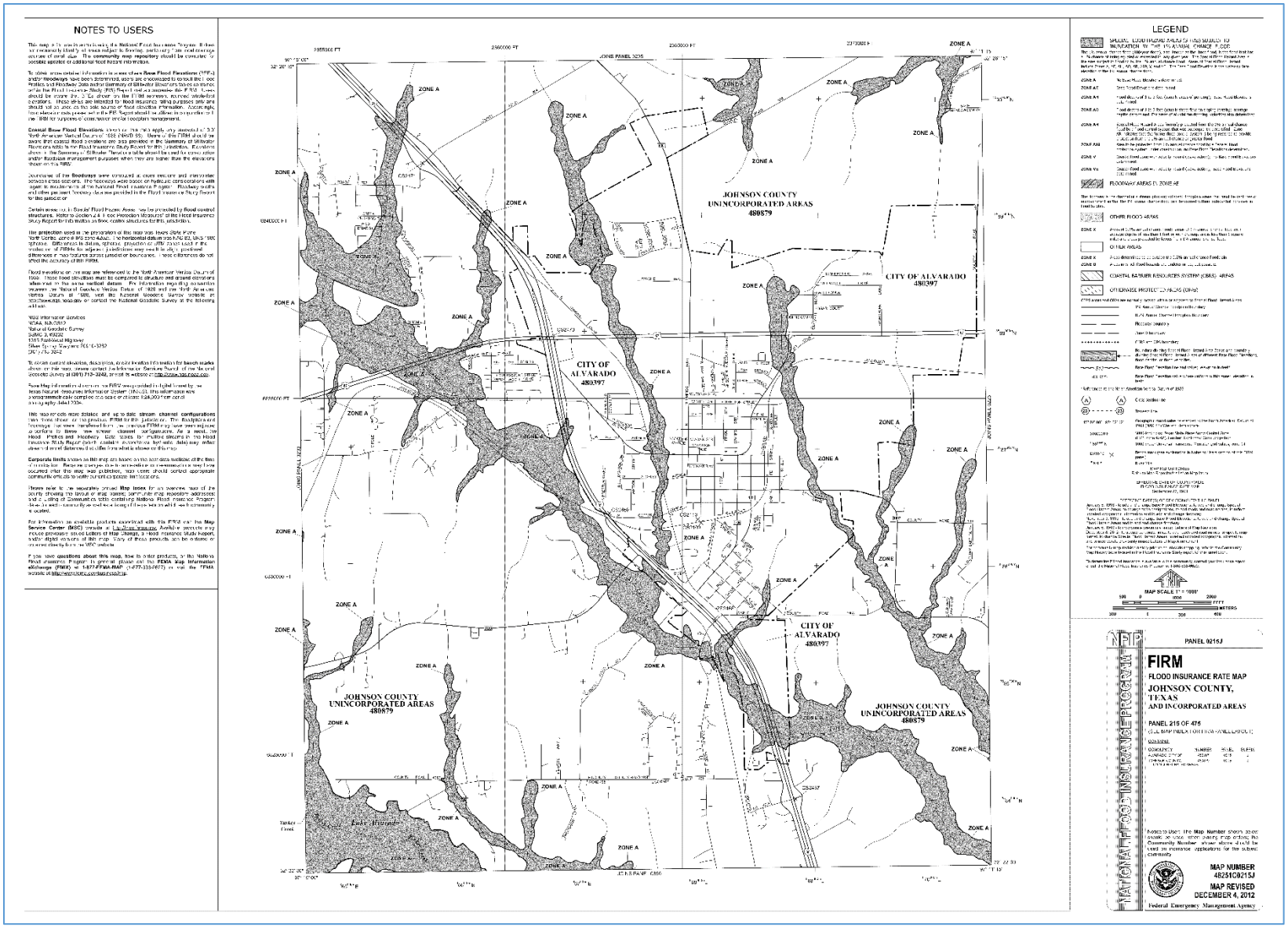
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
JOHNSON COUNTY	480879	0210	K

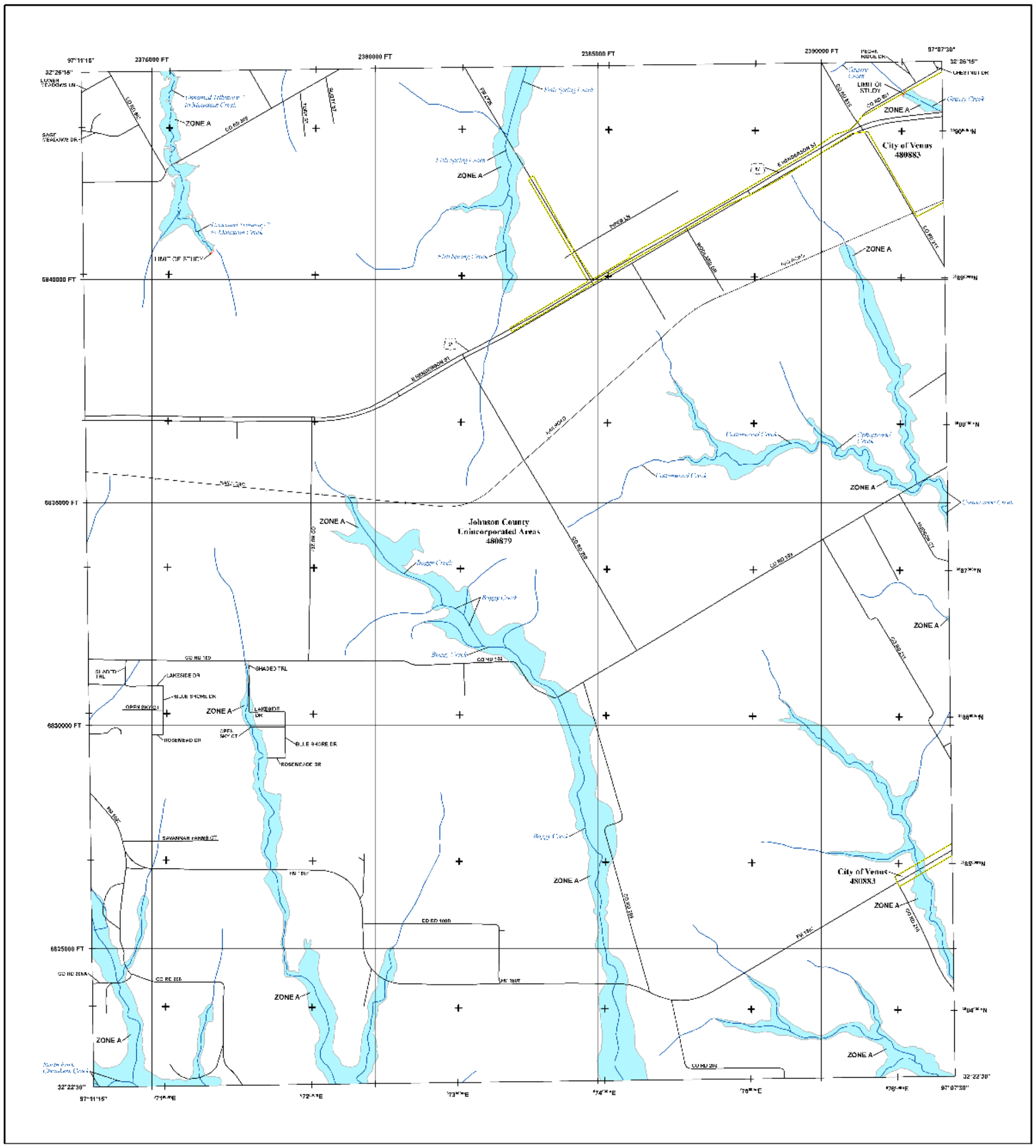
VERSION NUMBER 2.6.3.0

MAP NUMBER 48251C0210K

MAP REVISED SEPTEMBER 21, 2023


NOTES TO USERS
LEGEND
JOHNSON COUNTY UNINCORPORATED AREAS 480879
CITY OF ALVARADO 480397
ZONE A
FLOODWAY AREAS IN ZONE AE
OTHER FLOOD AREAS
OTHERWISE PROTECTED AREAS (OPAs)
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
MAP SCALE 1" = 1000'
PANEL 0215J
FIRM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS
PANEL 215 OF 475
MAP NUMBER 48251C0215J
MAP REVISED DECEMBER 4, 2012
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM

217



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT
HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

SCALE

Map Projection
State Plane Lambert Conformal Conic, Texas North Central Zone 4202; North American Datum 1983

1 inch = 1,000 feet 1:12,000

0 1,000 2,000 4,000 feet
0 250 500 1,000 meters

PANEL LOCATOR

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS
and Incorporated Areas

PANEL 220 OF 475

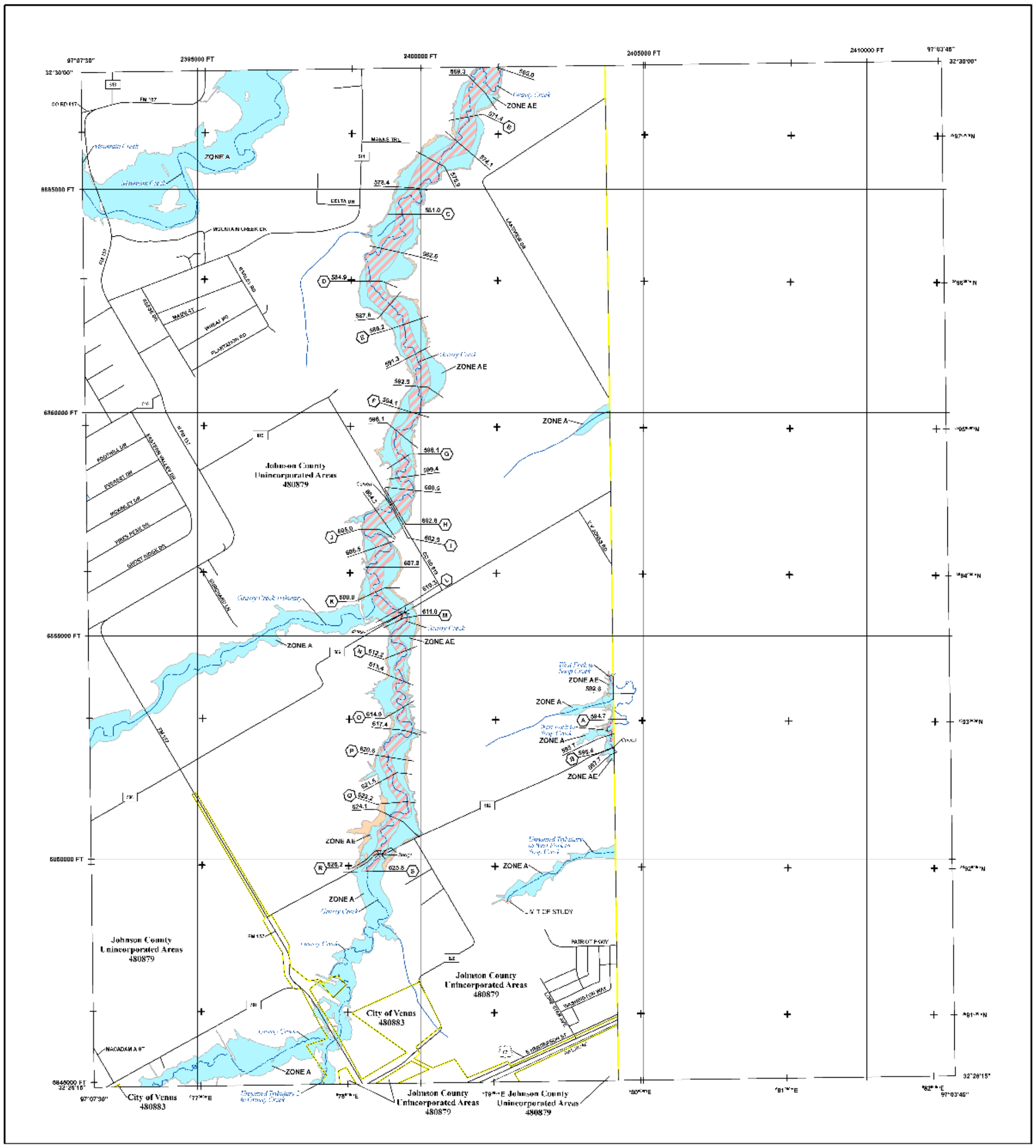
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
JOHNSON COUNTY	480879	0220	K
VENUS, CITY OF	480883	0220	K

VERSION NUMBER
2.6.3.0

MAP NUMBER
48251C0220K

MAP REVISED
SEPTEMBER 21, 2023



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

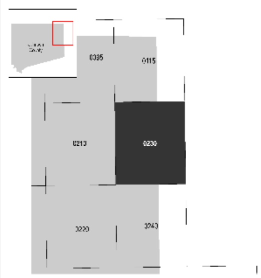
SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	Cross Sections with 1% Annual Chance Water Surface Elevation
	Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

SCALE

1 inch = 1,000 feet 1:12,000

PANEL LOCATOR



FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS
and Incorporated Areas

PANEL 230 OF 475

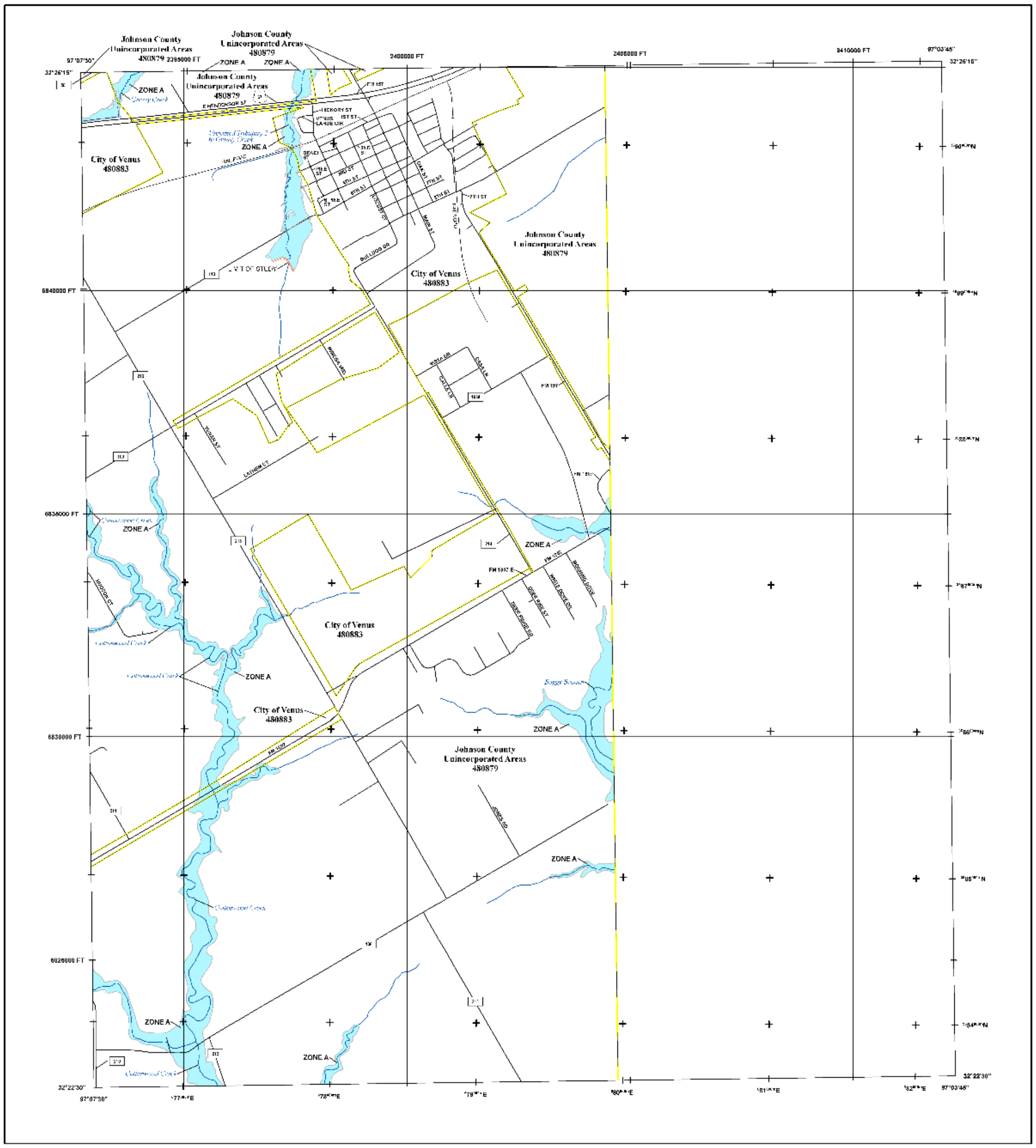
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
JOHNSON COUNTY	480879	0230	K
VENUS, CITY OF	480883	0230	K

VERSION NUMBER
2.6.3.0

MAP NUMBER
48251C0230K

MAP REVISED
SEPTEMBER 21, 2023



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
		Future Conditions 1% Annual Chance Flood Hazard *Zone X*
		Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
		Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
		Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES	E 18.2 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	B	Coastal Transect
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
	513	Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary

NOTES TO USERS

SCALE

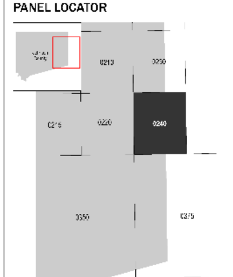
N

1 inch = 1,000 feet 1:12,000

0 1,000 2,000 4,000 feet

0 250 500 1,000 meters

PANEL LOCATOR



FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS

and Incorporated Areas

PANEL 240 OF 475

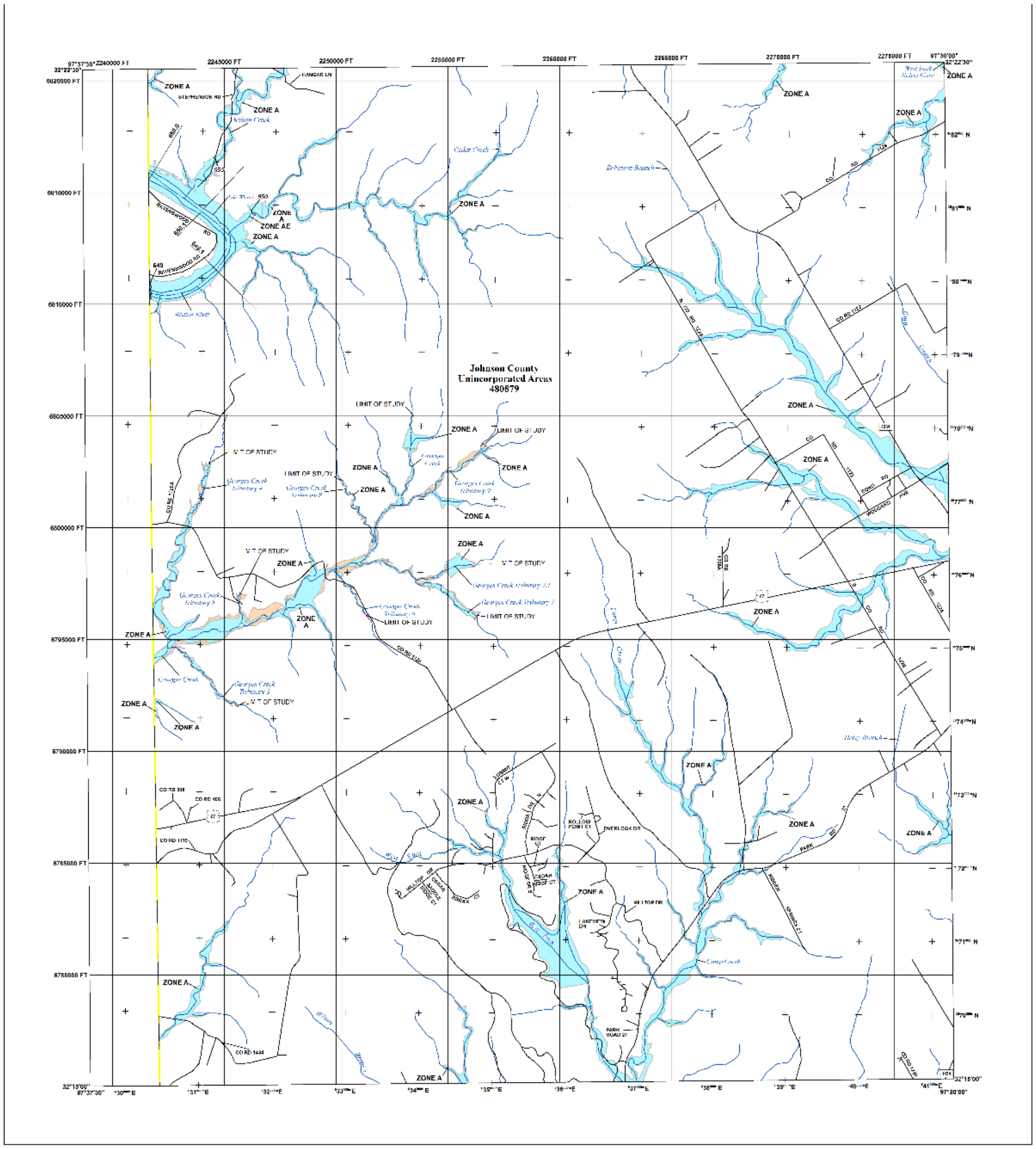
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
JOHNSON COUNTY	480879	0240	K
VENUS, CITY OF	480883	0240	K

VERSION NUMBER
2.6.3.0

MAP NUMBER
48251C0240K

MAP REVISED
SEPTEMBER 21, 2023



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT **HTTP://MSC.FEMA.GOV**

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% Annual Chance Flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
		Future Conditions 1% Annual Chance Flood Hazard *Zone X*
		Area with Reduced Flood Risk due to Levee See Notes *Zone X*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
		Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES	E 18.2 / 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
	8	Coastal Transect
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary

NOTES TO USERS

[illegible]

SCALE

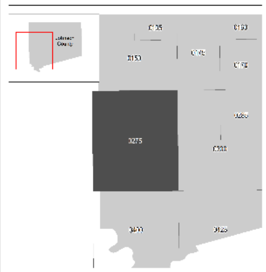
Map Projection:
[illegible]

1 inch = 2,000 feet 1:24,000

0 2,000 4,000 8,000 Feet

0 500 1,000 2,000 Meters

PANEL LOCATOR



FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS
And Incorporated Areas

PANEL 275 OF 475

FEMA

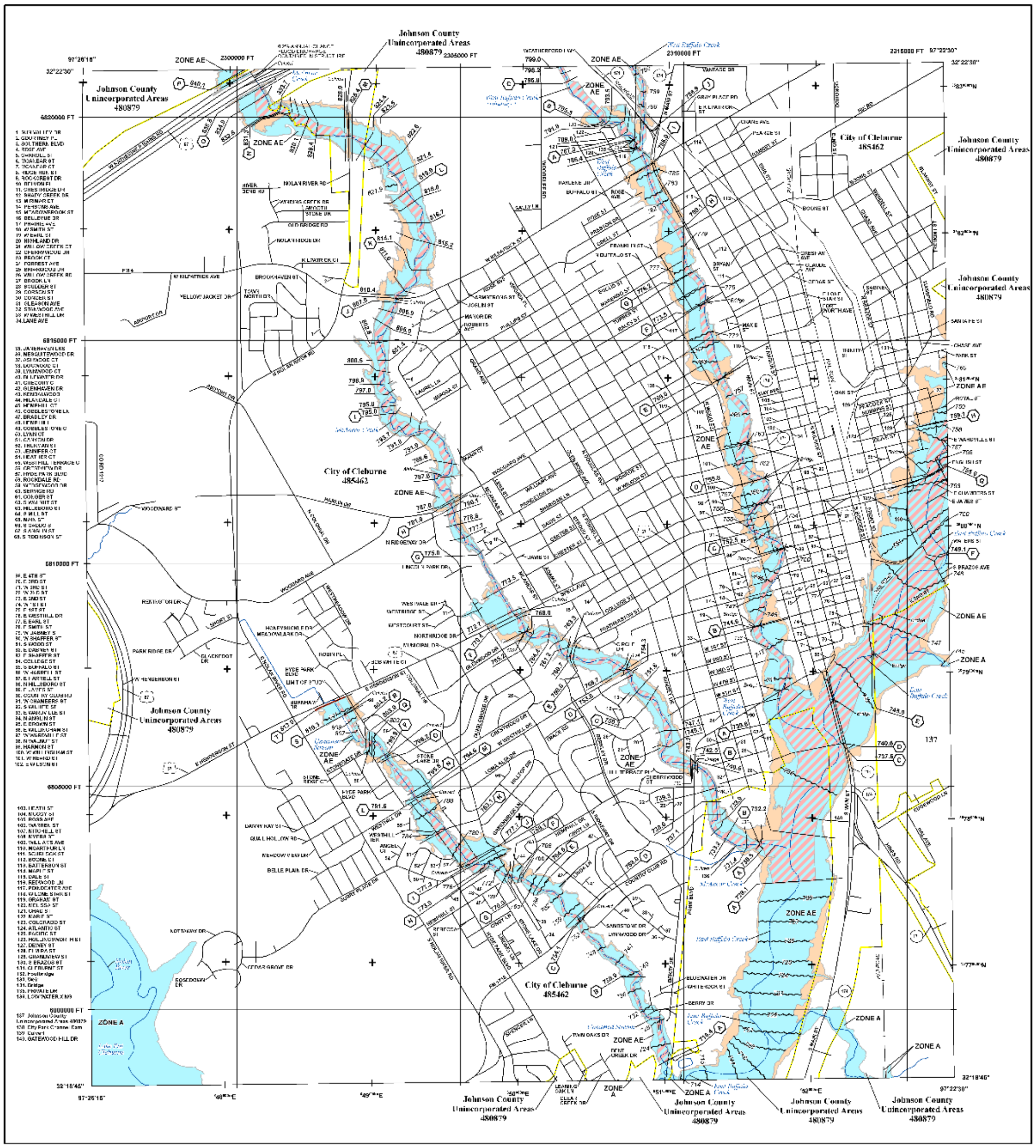
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
JOHNSON COUNTY	480879	0275	K

VERSION NUMBER
2.3.3.2

MAP NUMBER
48251C0275K

MAP REVISED
APRIL 5, 2019



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

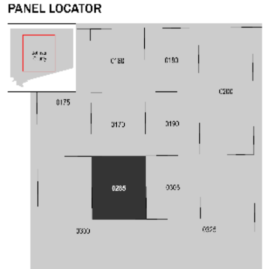
SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A, V, A99
	With BFE or Depth Zone AE, AO, AH, VE, AR
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
	Future Conditions 1% Annual Chance Flood Hazard Zone X
	Area with Reduced Flood Risk due to Levee See Notes. Zone X
	Area with Flood Risk due to Levee Zone D
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard Zone X
	Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	Cross Sections with 1% Annual Chance Water Surface Elevation
	Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

SCALE

1 inch = 1,000 feet 1:12,000

PANEL LOCATOR



FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS
and Incorporated Areas

PANEL 285 OF 475

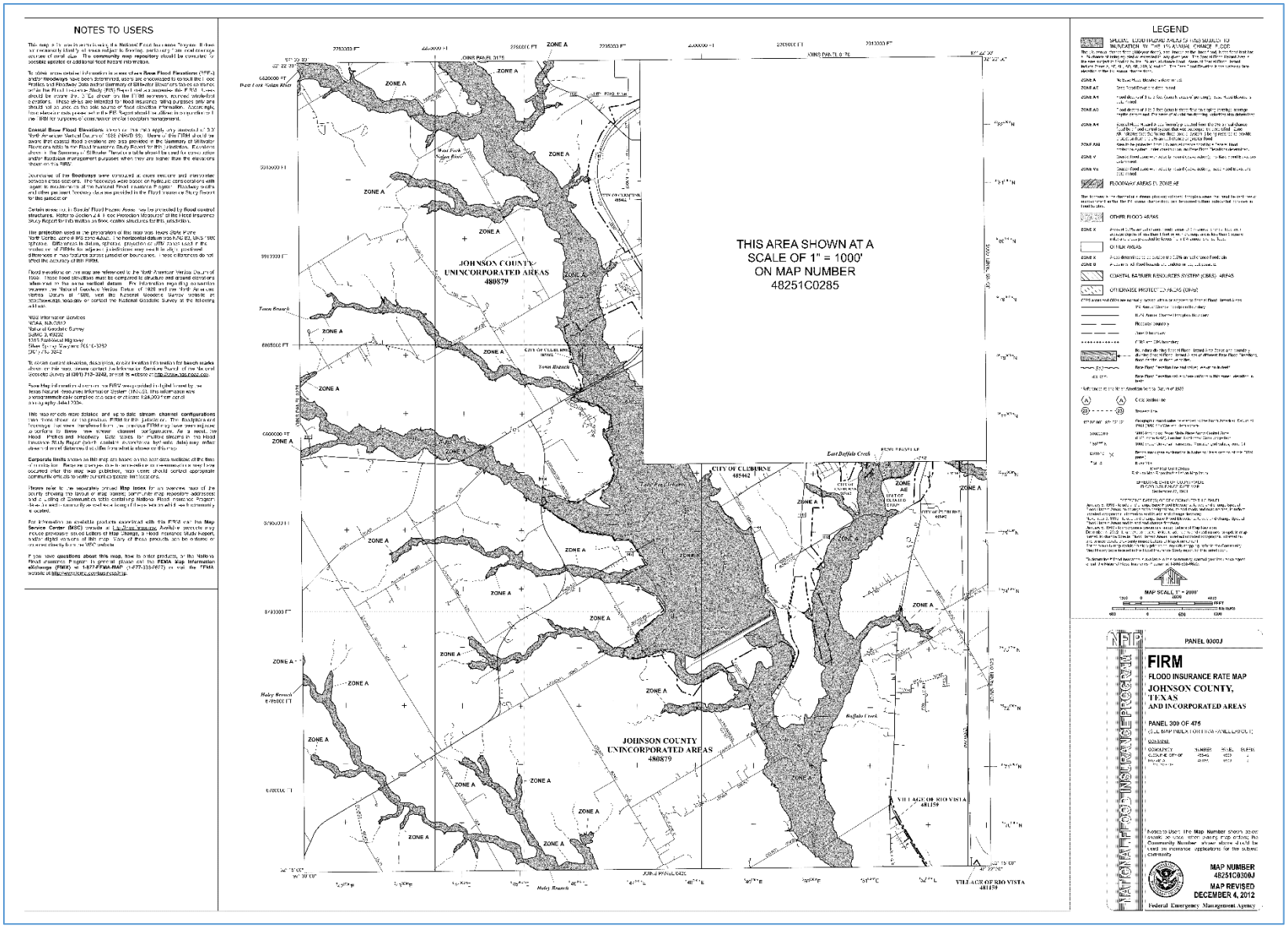
Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLEBURNE, CITY OF	485462	0285	K
JOHNSON COUNTY	480879	0285	K

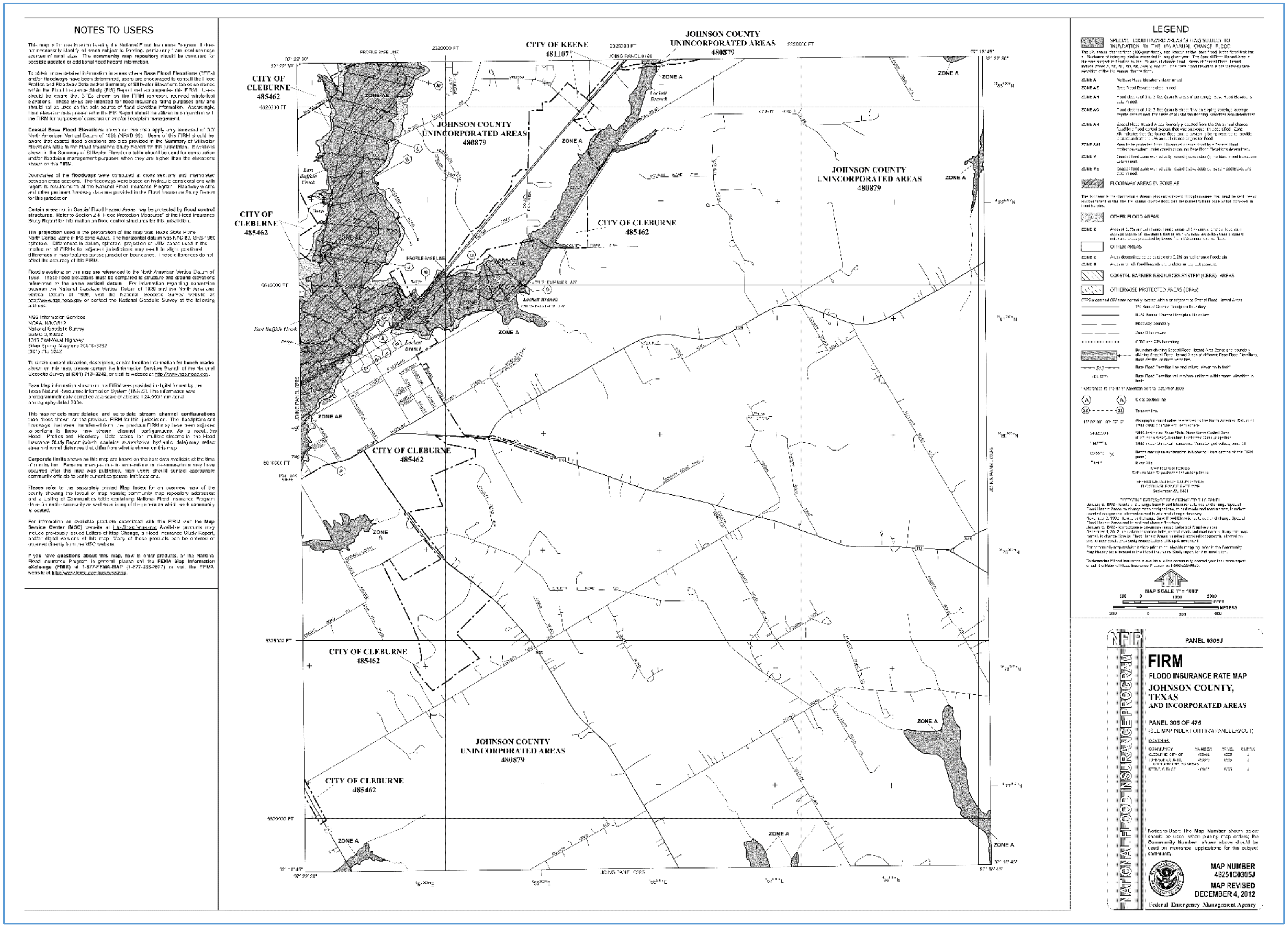
VERSION NUMBER
2.6.3.0

MAP NUMBER
48251C0285K

MAP REVISED
SEPTEMBER 21, 2023


NOTES TO USERS
THIS AREA SHOWN AT A SCALE OF 1" = 1000' ON MAP NUMBER 48251C0285
JOHNSON COUNTY UNINCORPORATED AREAS 480879
CITY OF CLEBURNE 485462
VILLAGE OF RIO VISTA 481159
ZONE A
ZONE AE
LEGEND
FLOODWAY AREAS IN ZONE AE
OTHER FLOOD AREAS
OTHER AREAS
COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
OTHERWISE PROTECTED AREAS (OPAs)
MAP SCALE 1" = 2000'
PANEL 0300J
FIRM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS
PANEL 300 OF 475
MAP NUMBER 48251C0300J
MAP REVISED DECEMBER 4, 2012
Federal Emergency Management Agency

223


NOTES TO USERS
LEGEND
CITY OF KEENE
481107
JOHNSON COUNTY
UNINCORPORATED AREAS
480879
CITY OF CLEBURNE
485462
ZONE A
ZONE AE
PANEL 0305J
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY,
TEXAS
AND INCORPORATED AREAS
PANEL 305 OF 475
MAP NUMBER
48251C0305J
MAP REVISED
DECEMBER 4, 2012
Federal Emergency Management Agency

NOTES TO USERS

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Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.4 Flood Protection Measures of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane North Central zone 4202 (NAD83). The horizontal datum was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at www.ngs.noaa.gov.

Base Map information shown on this FIRM was provided in digital format by the Texas Natural Resources Information System (TNRIS). This information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2008.

This map reflects more detailed and up to date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a listing of Communities Participating in the National Flood Insurance Program (NFIP) and their effective dates (the panel number for each community is located).

For information on available products associated with this FIRM visit the **Map Service Center** (MSC) website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

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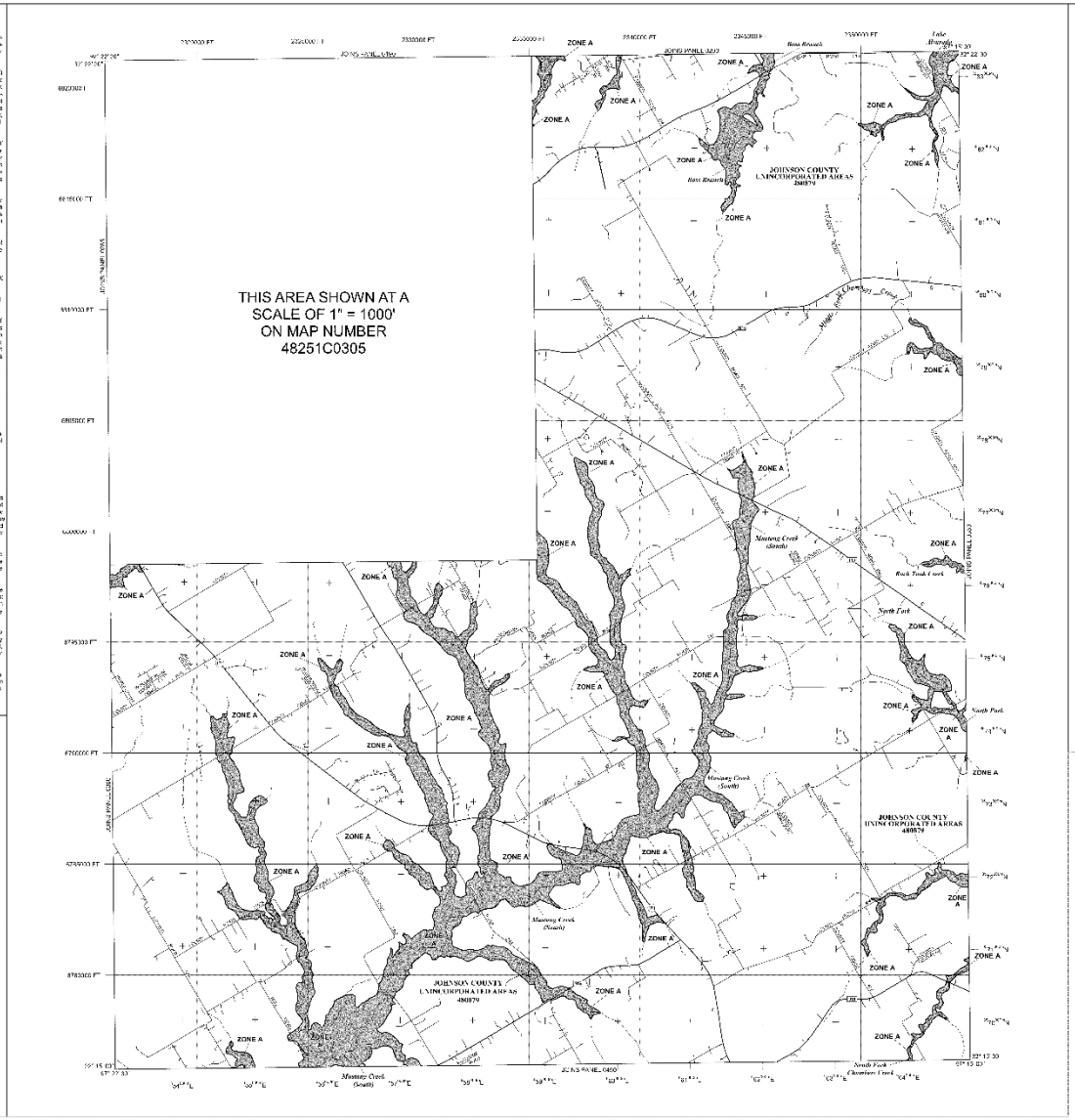

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS and OPA boundary

Floodway boundary

Zone boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation line and value; elevation in feet*

Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A) — Cross section line

(23) — Transect line

97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

3962000 mN — Western Map Zone Texas North Central Zone 4202 Lambert Conformal Conic projection

1°30'000 E — 1000-meter Universal Transverse Mercator grid values, zone 14

5000 000 FT — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 — River mile

Profile Baseline

Hydrographic Feature

Effective Limit of Detailed Study

SPECIFIC DATA FOR JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS
Effective: December 4, 2012

IMPORTANT NOTICE TO USERS OF THIS FLOOD INSURANCE RATE MAP

Notice to Flood Insurance Study Users: Please be aware that the Flood Insurance Study (FIS) report and Flood Insurance Rate Map (FIRM) for your community may have been updated. Communities and maps are periodically updated to incorporate new or revised flood hazard information. Please refer to the Publication Info table in the FIS report for the most recent publication date for your community. Please contact your community officials to determine if updated flood hazard information is available.

The community participates in the National Flood Insurance Program (NFIP).

Users should refer to the Publication Info table in the FIS report to determine if the NFIP is suspended in the community.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
300 0 600 1200 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0325J

FIRM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 325 OF 475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
JOHNSON COUNTY	480879	0325	J
CLEBURNE, CITY OF	480181	0325	J

Notice to User: The Map Number shown below should be used when placing flood insurance applications for this community.

MAP NUMBER
48251C0325J
MAP REVISED
DECEMBER 4, 2012

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane North Central zone (FIPS zone 4202). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base Map information shown on this FIRM was provided in digital format by the Texas Natural Resources Information System (TNRIS). This information was photogrammetrically compiled at a scale of at least 1:24,000 from aerial photography dated 2004.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

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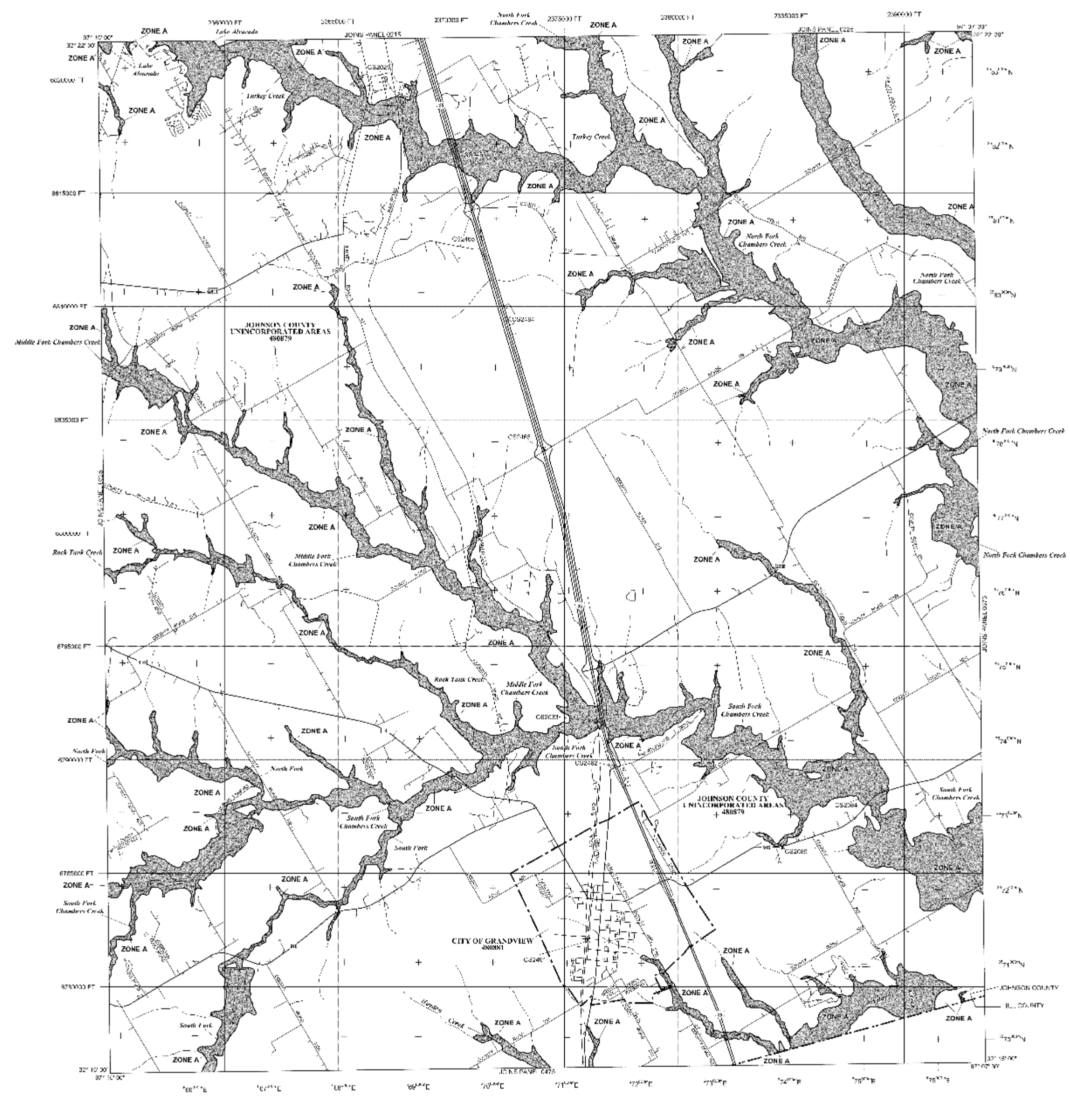

LEGEND

MAP SCALE 1" = 2000'

1000 0 2000 4000 FEET

600 0 600 1200 METERS

PANEL 0350J

FIRM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 350 OF 475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 48251C0350J

MAP REVISED DECEMBER 4, 2012

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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The **projection** used in the preparation of this map was Texas State Plane North Central Zone (FIPS zone 4202). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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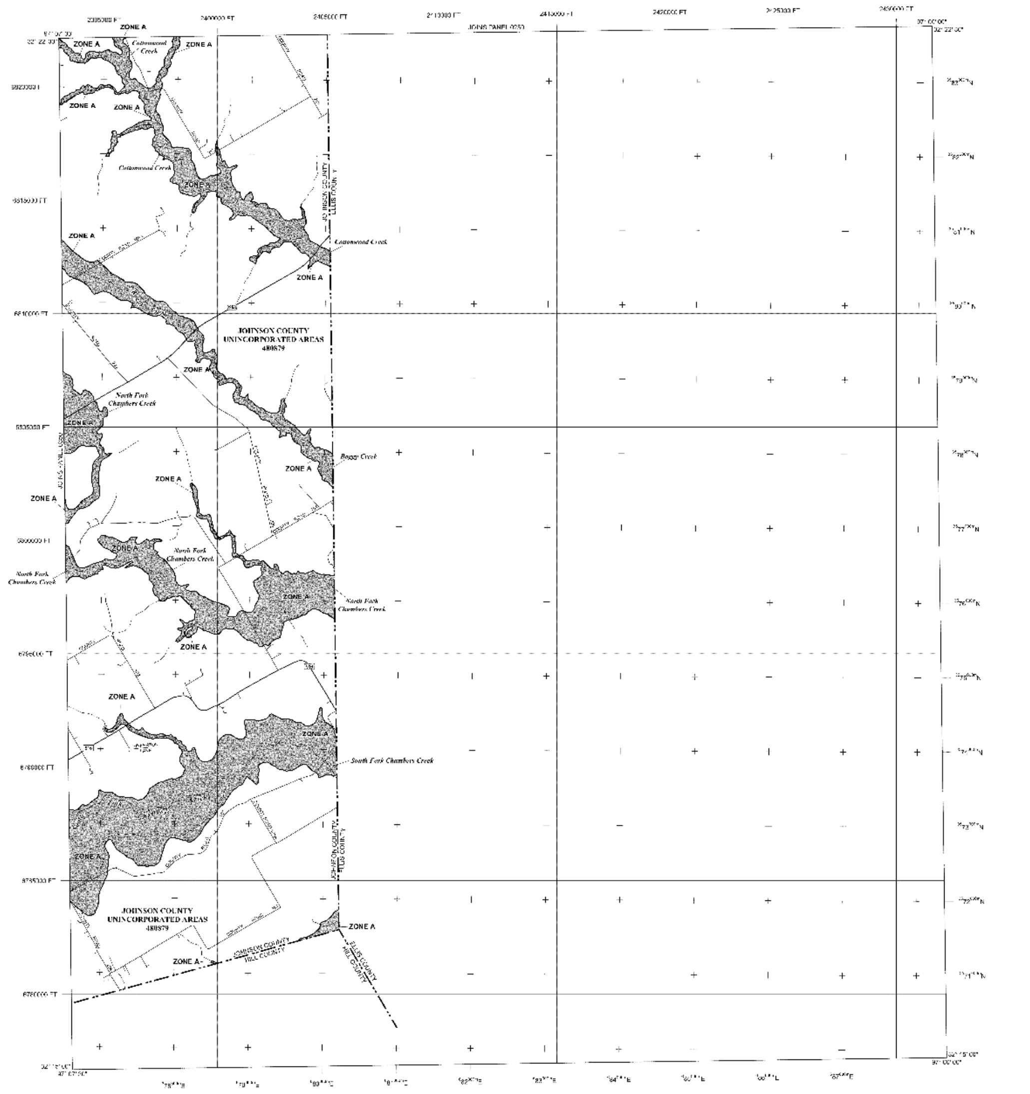
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** [illegible]

[illegible]



LEGEND

[illegible]

MAP SCALE 1" = 2000'

PANEL 0375J

FIRM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 375 OF 475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

NATIONAL FLOOD INSURANCE PROGRAM

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

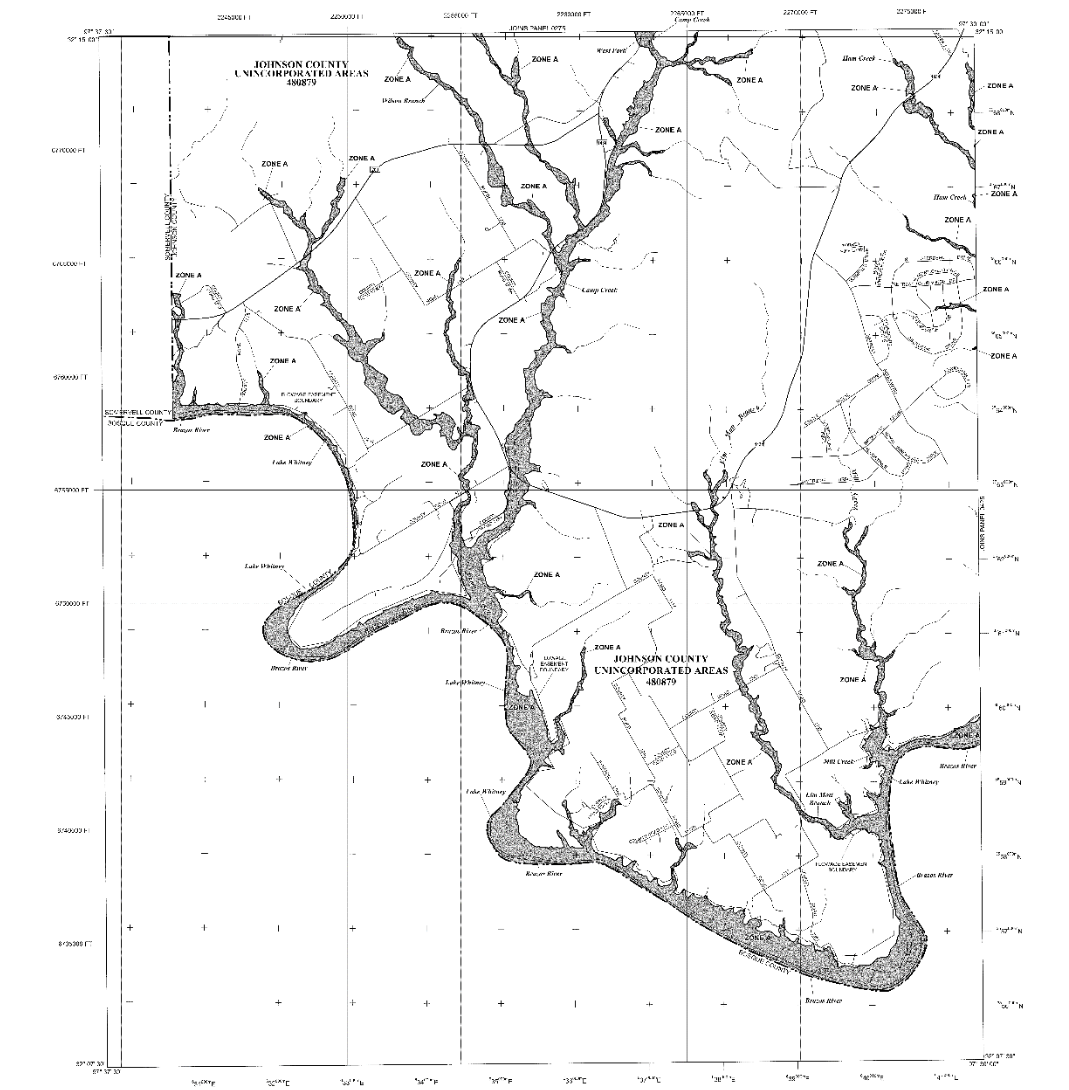
MAP NUMBER 48251C0375J

MAP REVISED DECEMBER 4, 2012

Federal Emergency Management Agency

NOTES TO USERS

LEGEND



MAP SCALE 1" = 2000'

PANEL 0400J

FIRM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 400 OF 475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY NUMBER PANEL SUFFIX

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MAP NUMBER 48251C0400J

MAP REVISED DECEMBER 4, 2012

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

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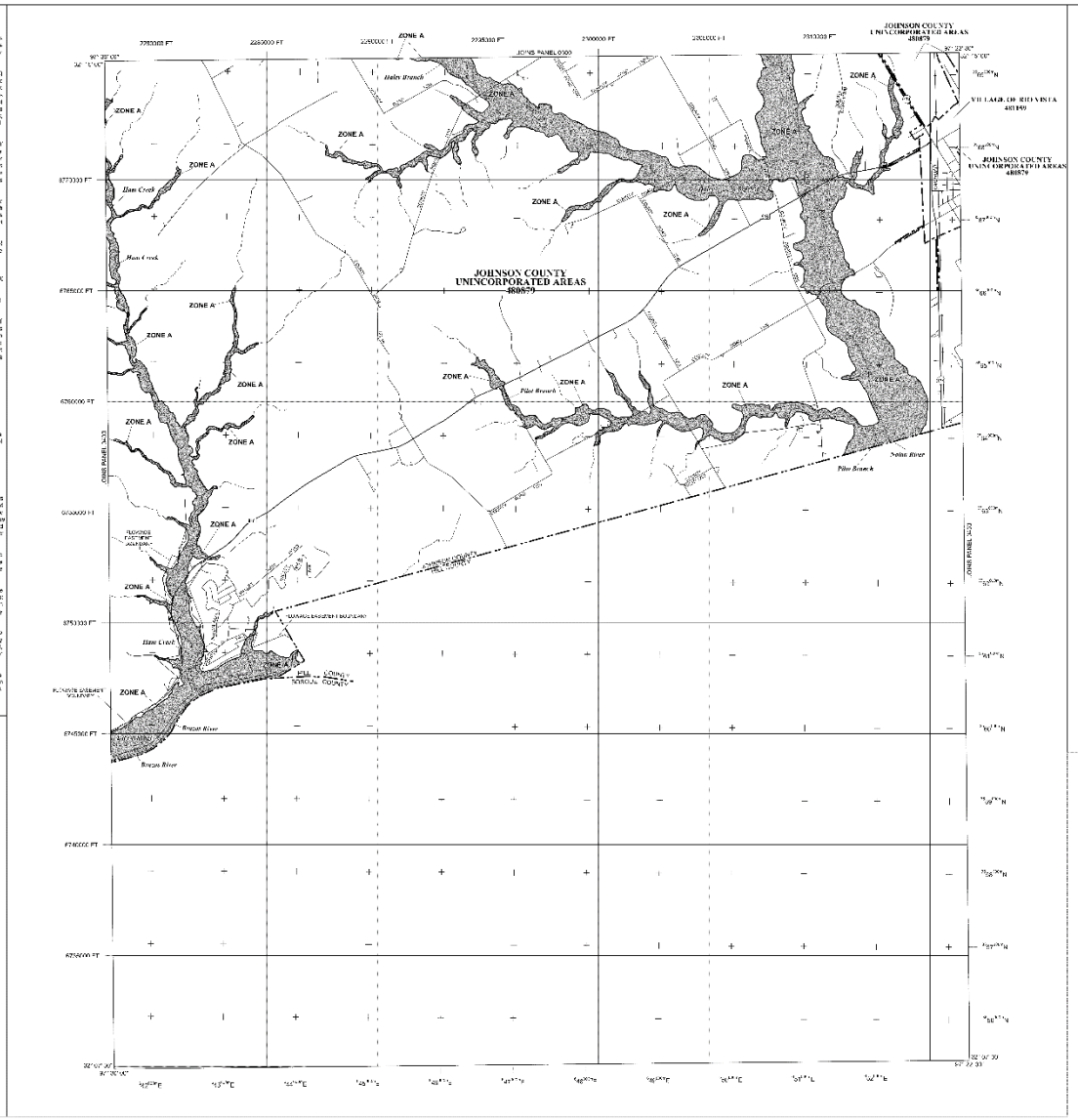


LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be conveyed without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- (A) — (A) Cross section line
- (23) — (23) Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western hemisphere
- 3960000 FT — 1000-meter Universal Transverse Mercator grid values, Texas State Plane North Central Zone (4202) Lambert Conformal Conic projection
- 5000 FT — 1000-meter Universal Transverse Mercator grid values, zone 14
- 600000 FT — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River mile

FLOOD INSURANCE RATE MAP EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
January 6, 1999 - Added Special Flood Hazard Areas, Special Flood Hazard Areas, Base Flood Elevations, Floodway Areas, Zone D, and updated corporate limits and minor planimetric features.
September 29, 1999 - Added Special Flood Hazard Areas, Base Flood Elevations, Floodway Areas, Zone D, and updated corporate limits and minor planimetric features.
December 17, 2003 - Added Special Flood Hazard Areas, Base Flood Elevations, Floodway Areas, Zone D, and updated corporate limits and minor planimetric features.
December 4, 2012 - Updated corporate limits, added Special Flood Hazard Areas, Base Flood Elevations, Floodway Areas, and Zone D, and updated to reflect current topographic conditions.
Effective date of this panel: December 4, 2012

Communities participating in the National Flood Insurance Program for this jurisdiction are listed in the Publication Information table of the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

SPHEROID: CLARKE 1866
DATUM: NORTH AMERICAN DATUM 1983
PROJECTION: LAMBERT CONFORMAL CONIC
ZONE: TEXAS NORTH CENTRAL (4202)
Eastings: 2,000,000.0
Northings: 6,000,000.0

MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
500 0 500 1000 METERS

PANEL 0425J

FIRM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 425 OF 475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
JOHNSON COUNTY	480879	0425	J
VILLAGE OF RIO VISTA	481189	0425	J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
48251C0425J
MAP REVISED
DECEMBER 4, 2012

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane North Central Zone (FIPS zone 4202). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base Map information shown on this FIRM was provided in digital format by the Texas Natural Resources Information System (TNRIS). This information was photogrammetrically compiled at a scale of at least 1:24,000 from aerial photography dated 2004.

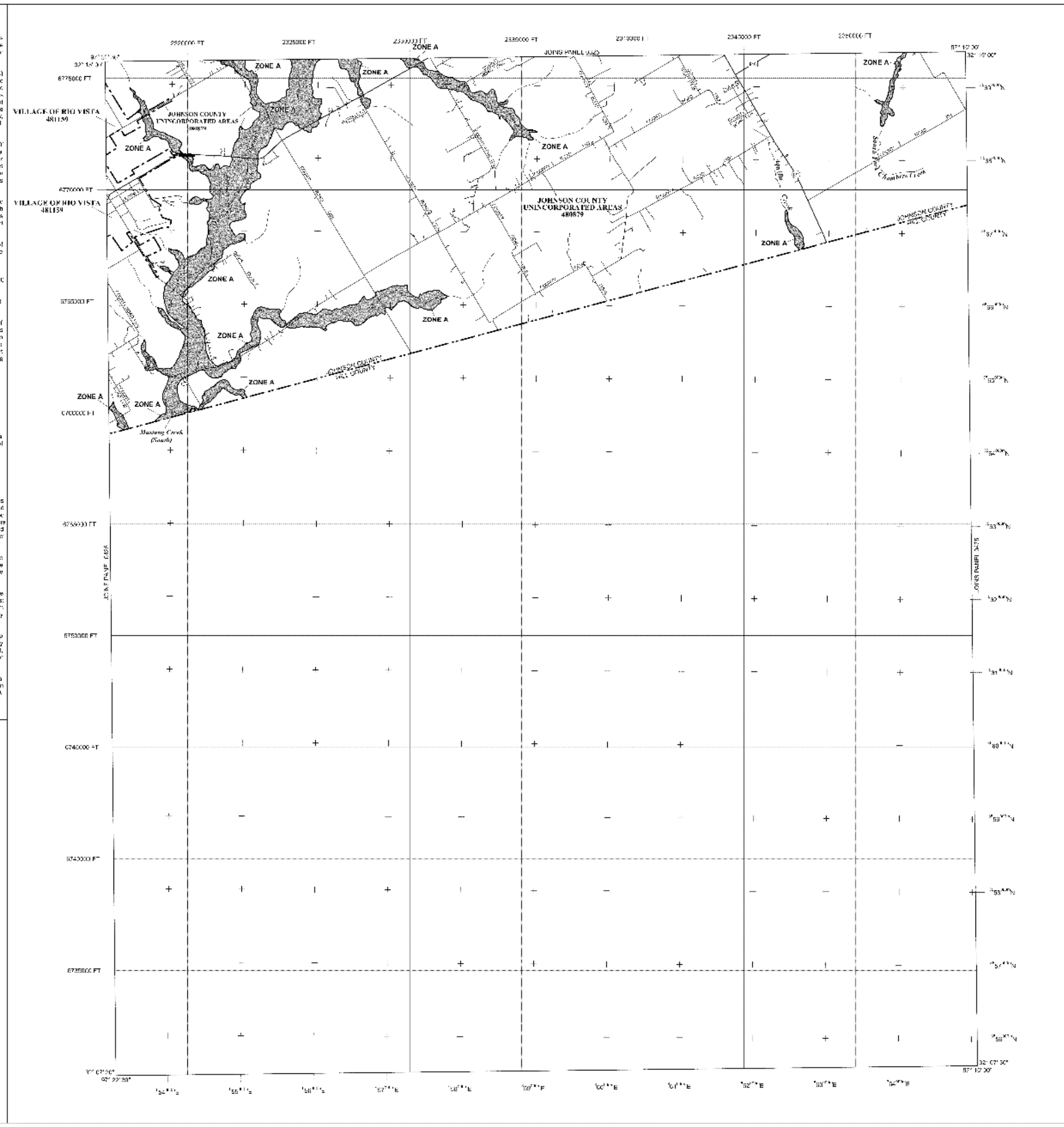
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

OTHER AREAS

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

MAP SCALE 1" = 2000'

PANEL 0450J

FIRM

FLOOD INSURANCE RATE MAP

JOHNSON COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 450 OF 475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
RIO VISTA, VILLAGE OF	481159	0450	J

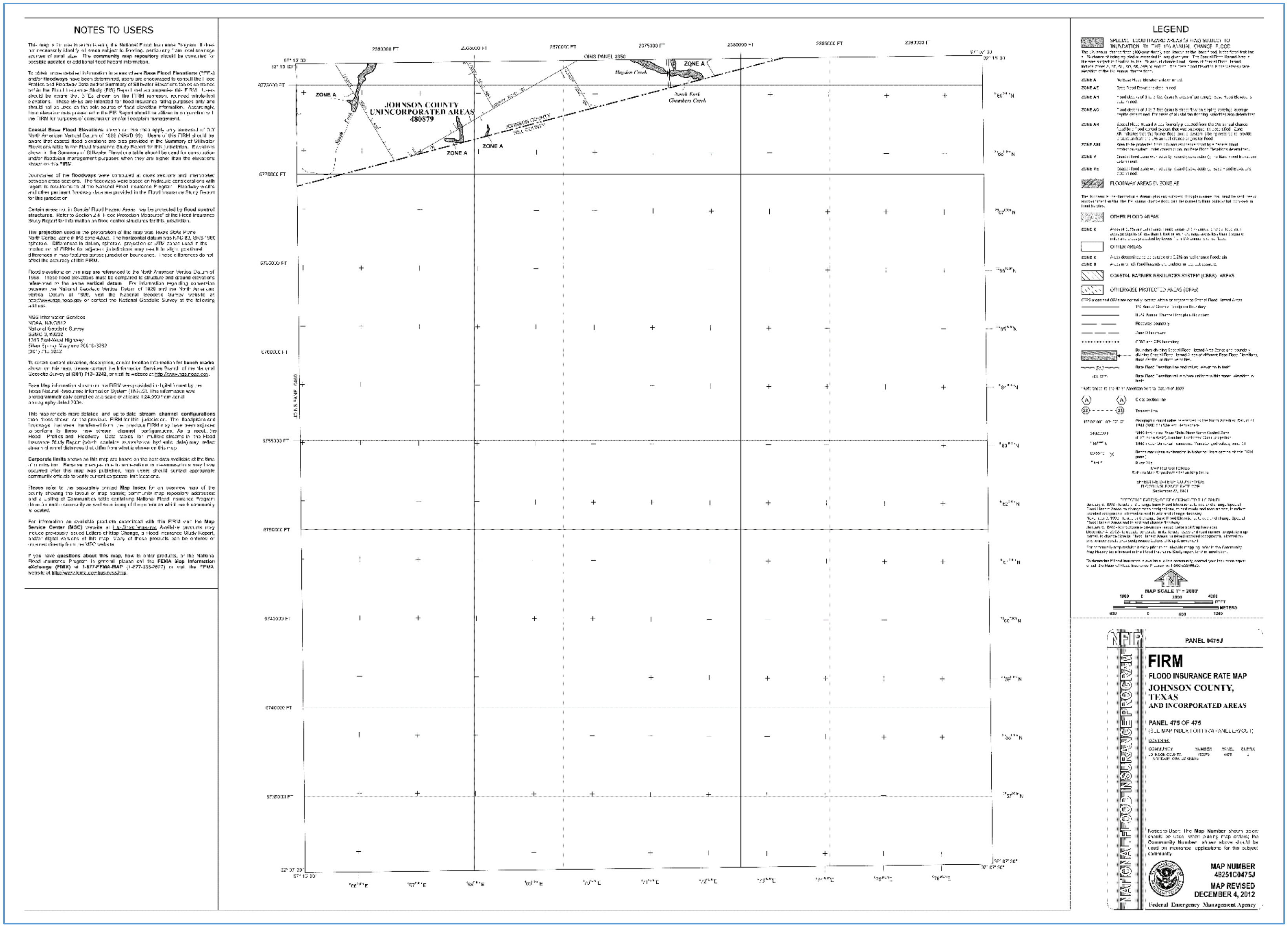
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER 48251C0450J

MAP REVISED DECEMBER 4, 2012

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM


NOTES TO USERS
LEGEND
JOHNSON COUNTY
UNINCORPORATED AREAS
480879
ZONE A
Hayden Creek
North Fork
Chambers Creek
MAP SCALE 1" = 2000'
FEET
METERS
NATIONAL FLOOD INSURANCE PROGRAM
NFIP
PANEL 0475J
FIRM
FLOOD INSURANCE RATE MAP
JOHNSON COUNTY,
TEXAS
AND INCORPORATED AREAS
PANEL 475 OF 475
MAP NUMBER
48251C0475J
MAP REVISED
DECEMBER 4, 2012
Federal Emergency Management Agency

Appendix D: Adoption

A copy of the FEMA approval letter and the adoption resolutions from all participating jurisdictions are provided in this appendix.

{Placeholder for FEMA Approval Letter}

{Placeholder for Alvarado Adoption Resolution}

{Placeholder for Burleson Adoption Resolution}

{Placeholder for Cleburne Adoption Resolution}

{Placeholder for Godley Adoption Resolution}

{Placeholder for Joshua Adoption Resolution}

{Placeholder for Keene Adoption Resolution}

{Placeholder for Johnson County Adoption Resolution}