2024 Burnet County

Hazard Mitigation Action Plan

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

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1. Introduction and Background

1) Participating Jurisdictions

The 2024 Burnet County Hazard Mitigation Action Plan (HMAP) is an update of the County's most recent 2017 plan that expired in February 2022. This 2024 Plan Update includes eight participating jurisdictions: Burnet County, the City of Bertram, the City of Burnet, The City of Cottonwood Shores, the City of Granite Shoals, The City of Highland Haven, The City of Marble Falls, and the City of Meadowlakes. The City of Cottonwood Shores did not participate in the 2017 HMAP and is a new participant.

2) Hazards to be Addressed

Previously, the expired 2017 HMAP identified 13 natural hazards facing the County: dam failure, drought, expansive soils, extreme heat, earthquakes, flood, hail, hurricane/tropical storms, lightning, tornado, wildfire, wind, and winter weather.

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

The 2024 Burnet County Hazard Mitigation Action Plan update will address the following 12 natural hazards identified in the State of Texas' 2023 Hazard Mitigation Plan as threats throughout the state. Each participating jurisdiction will address the following natural hazards listed below in Table 1.

[1] 44 CFR §201.6(d)(3)

Table 1: List of Hazards Addressed

Hazard	Jurisdiction							
	Burnet County	City of Bertram	City of Burnet	City of Cottonwood Shores	City of Granite Shoals	City of Highland Haven	City of Marble Falls	City of Meadowlakes
Flooding	X	X	X	X	X	X	X	X
Hurricanes, Tropical Storms, and Depressions								
Wildfire	X	X	X	X	X	X	X	X
Tornados	X	X	X	X	X	X	X	X
Drought	X	X	X	X	X	X	X	X
Extreme Cold	X	X	X	X	X	X	X	X
Extreme Heat	X	X	X	X	X	X	X	X
Hailstorm	X	X	X	X	X	X	X	X
Winter Storm	X	X	X	X	X	X	X	X
Severe Winds	X	X	X	X	X	X	X	X
Lightning	X	X	X	X	X	X	X	X
Additional Optional Hazards								
Coastal Erosion								
Inland Erosion								
Land Subsidence								
Earthquakes								
Expansive Soils	X	X	X	X	X	X		X
Dam Failure*	X		X	X	X		X	X

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

A) Omission Statements

Burnet County and the participating jurisdictions will not be addressing the following hazards: Hurricanes/Tropical Storms, Coastal/Inland Erosion, Land Subsidence, and Earthquakes. Although the previous plan profiled Hurricanes/Tropical Storms and Earthquakes, the previous plan noted limited history and impact of damage, and there has been no history of these hazards since. The history of impacts for all the omitted hazards have been negligible (or non-existent), therefore the County and participating jurisdiction expects that future impacts will be negligible as well. The County and participating jurisdictions do not anticipate applying for grant funding to address any of them.

The City of Bertram and the City of Highland Haven will not be profiling Dam Failure. There is no history of dam failure in the jurisdictions and no high hazard dams nearby that could inundate the jurisdictions.

The City of Marble Falls will not be profiling Expansive Soils. There is no history of impact from expansive soil in the jurisdiction, and no impacts are expected in the future.

2. Planning Process

The Burnet County Hazard Mitigation Action Plan is a multi-jurisdiction plan. Representatives for the local planning team were selected by each participating jurisdiction. Planning team members represented the following offices and departments:

Table 2: Local Planning Team Representatives

Title	Jurisdiction
County Judge	Burnet County
Emergency Management Coordinator	
Mayor	City of Bertram
City Secretary	
Mayor	City of Burnet
City Manager	
Fire Chief	
Deputy Chief	
Mayor	City of Cottonwood Shores
City Administrator	
Mayor	City of Granite Shoals
City Manager	
Mayor	City of Highland Haven
City Secretary	
Mayor	City of Marble Falls
Fire Chief/Emergency Management Coordinator	
Mayor	City of Meadowlakes
City Manager	

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

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

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

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

1. Identifying, contacting, coordinating, and implementing input from stakeholders.
2. Attending, conferencing in, or providing meeting support and information for regular HMPT meetings.
3. Identifying hazards and estimating potential losses from future hazard events.
4. Developing and prioritizing mitigation actions to address identified risks.
5. Coordinating public meetings to develop the plan.
6. Identifying community resources available to support planning efforts.
7. Submitting proposed plan to all appropriate departments for review and comment and working with the County to incorporate the resulting comments into the proposed plan.

Table 3: Plan Schedule

TIMELINE											
Planning Tasks	**2023**							**2024**			**COMPLETED**
	June	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	
Organize Resources and Identify Planning Team											
Create Outreach Strategy											
Review Community Capabilities											
Conduct Risk Assessment											
Identify Mitigation Goals and Actions											
Develop Action Plan for Implementation											
Identify Plan Maintenance Procedures											
Review Plan Draft											
Submit Plan to State and FEMA											
Adopt Plan											TBD
MEETINGS											
Planning Team		7/12/2023	8/16/2023								
Public Outreach – Online Surveys											
Stakeholder Outreach											

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

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

Table 4: Planning Team Data Sources

Data Source	Data Incorporation	Purpose
National Centers for Environmental Information (NCEI)	Hazard occurrences	Previous event occurrences, damage dollars, and mapping for all hazards
National Oceanic and Atmospheric Administration (NOAA)	Historic Weather Data	Previous event occurrences, damage dollars, and mapping for all hazards
Burnet County Hazard Mitigation Action Plan, 2017-2022	Previous planning approach, hazards addressed, and mitigation actions	Previous planning team representatives, plan maintenance, hazard histories, and mitigation actions
State of Texas Hazard Mitigation Plan 2018 Update	Hazard Descriptions	Official descriptions of hazards and their potential impacts
Federal Emergency Management Agency (FEMA) Flood Zones	Flood Zones maps	GIS mapping of flood zones
Burnet County Appraisal District Data	Property values and parcel counts	Population counts, parcel data, and land use data
National Inventory of Dams	Dam information	Identity high-hazard or significant risk dams
TCEQ Dam Safety Program	Dam information	Identity high-hazard or significant risk dams
Burnet County Flood Damage Prevention Ordinance	Flood damage prevention requirements	Identifying building requirements and restrictions for structures in the floodplain
City of Bertram Flood Damage Prevention Ordinance	Flood damage prevention requirements	Identifying building requirements and restrictions for structures in the floodplain
City of Bertram Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact
City of Burnet Flood Damage Prevention Ordinance	Flood damage prevention requirements	Identifying building requirements and restrictions for structures in the floodplain
City of Burnet Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact
City of Cottonwood Shores Flood Damage Prevention Ordinance	Flood damage prevention requirements	Identifying building requirements and restrictions for structures in the floodplain

City of Cottonwood Shores Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact
City of Granite Shoals Flood Damage Prevention Ordinance	Flood damage prevention requirements	Identifying building requirements and restrictions for structures in the floodplain
City of Granite Shoals Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact
City of Highland Haven Flood Damage Prevention Ordinance	Flood damage prevention requirements	Identifying building requirements and restrictions for structures in the floodplain
City of Highland Haven Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact
City of Marble Falls Flood Damage Prevention Ordinance	Flood damage prevention requirements	Identifying building requirements and restrictions for structures in the floodplain
City of Marble Falls Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact
City of Meadowlakes Drought Contingency Plan	Local drought controls	Identify opportunities to increase drought controls and opportunities for water conservation to reduce drought's impact

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

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

Table 5: Local Stakeholders Contacted

Stakeholder	Title	Participated
Bell County	Emergency Management Coordinator	N
Lampasas County	Emergency Management Coordinator	N
Llano County	Emergency Management Coordinator	N
San Saba County	Emergency Management Coordinator	N
Travis County	Emergency Management Coordinator	N
Williamson County	Emergency Management Coordinator	Y
Texas A&M AgriLife Extension	County Extension Agent – Family and Community Health	N

Texas A&M AgriLife Extension	County Extension Agent – Agriculture and Natural Resources	N
Highland Lakes Crisis Network	Director	N
Cassie Volunteer Fire Dept.	Chief Fire Officer	Y
Burnet Volunteer Fire Dept.	Chief Fire Officer	Y
Marble Falls Fire & Rescue	Assistant Chief Fire Officer	N
Community Resource Center	Executive Director	Y
Burnet County Chamber of Commerce	President	N

Area stakeholders were contacted by phone and email. Each stakeholder was contacted at least twice in an effort to increase participation. Local academia, businesses, and community based- and or non-profit organizations were contacted in order to reach a diverse group of stakeholders. Those organizations included the Texas A&M AgriLife Extension, Highland Lakes Crisis Network, Cassie VFD, Burnet VFD, Marble Falls Fire & Rescue, Community Resource Center, and the Burnet County Chamber of Commerce. These organizations focus on multiple community needs such as education, food, health and safety, and financial stability. Area stakeholders who chose to participate provided important supplemental input and information that helped shape mitigation strategies for each hazard, in particular by making the planning team aware of actions neighboring communities were successful in implementing, and what actions they think should take priority.

2) Project Meetings

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

The first local planning team meeting was held virtually on July 12, 2023. During this meeting, the planning team decided which hazards needed to be addressed in the mitigation plan and which were not relevant. To make these decisions, a hazard handout was produced to show previous occurrences of each hazard, associated deaths and injuries, and total dollar damages. The team agreed to use the collected hazard data, as the foundation for its hazard risk assessment and ongoing research into hazard extent, impact, and vulnerability. At the end of the meeting, planning team members were tasked with compiling relevant data, including city ordinances; court orders and regulations; identifying critical facilities; and providing a status update on previous mitigation actions.

The second planning team meeting was held virtually on August 16, 2023. To stay on schedule, the planning team needed to meet the following objectives: Finalize the hazards list, collect relevant ordinances and plans, review and refine the critical facilities list, and identify area stakeholders, as well as review possible mitigation actions and potential eligible projects for each participant. The planning team discussed and identified new mitigation actions, discussed

changes to the plan drafts, and agreed to work on completing all deliverables for the plan. Additional work was done over email in preparation for submitting the plan for official review in February 2024.

3) Public Input

Members of the public were invited to participate in two public comment periods to provide input and feedback during the planning process. The public comment periods were held virtually. The first public comment period took place in August 2023. A Microsoft Form survey was posted to the County website and Facebook page for a period of two weeks for members of the public to fill out. A newspaper ad was placed to announce to the public for the opportunity to provide input via online survey. In an effort to reach the widest audience possible, especially socially vulnerable populations, the County and participating jurisdictions actively announced the online survey through newspaper ads, on their own websites, and social media. Stakeholders who support vulnerable populations were also provided with a link to the survey and encouraged to share it with their community. The planning team appreciated receiving responses to the survey which helped inform them when identifying and prioritizing new mitigation actions for this plan update. The survey received 43 anonymous responses.

The survey asked nine questions:

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

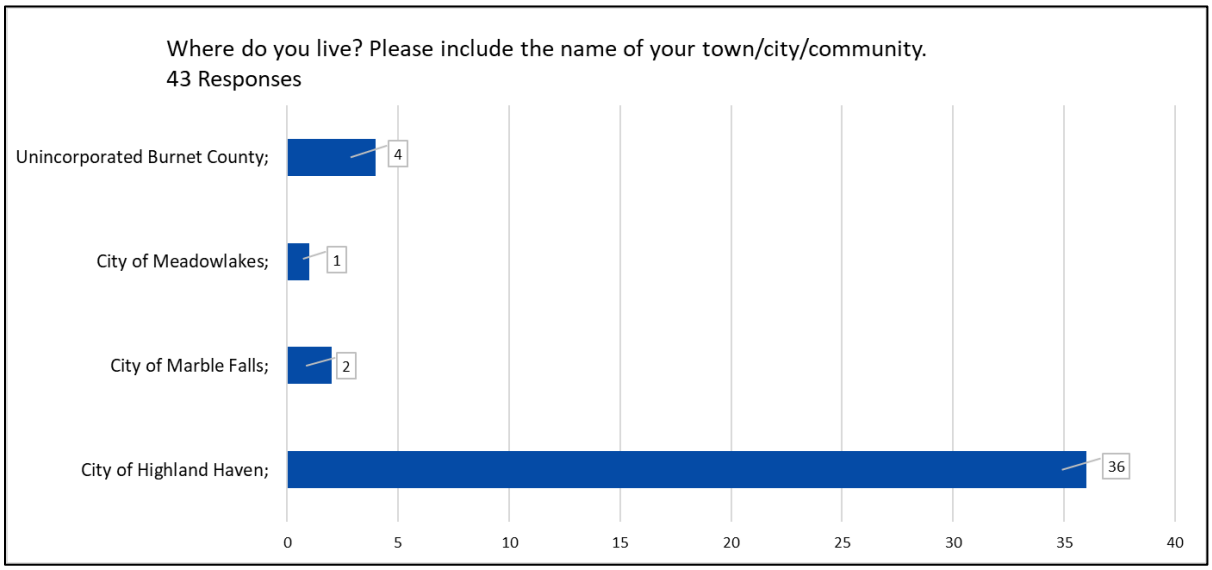

Figure 1: Survey Responses for Question 1

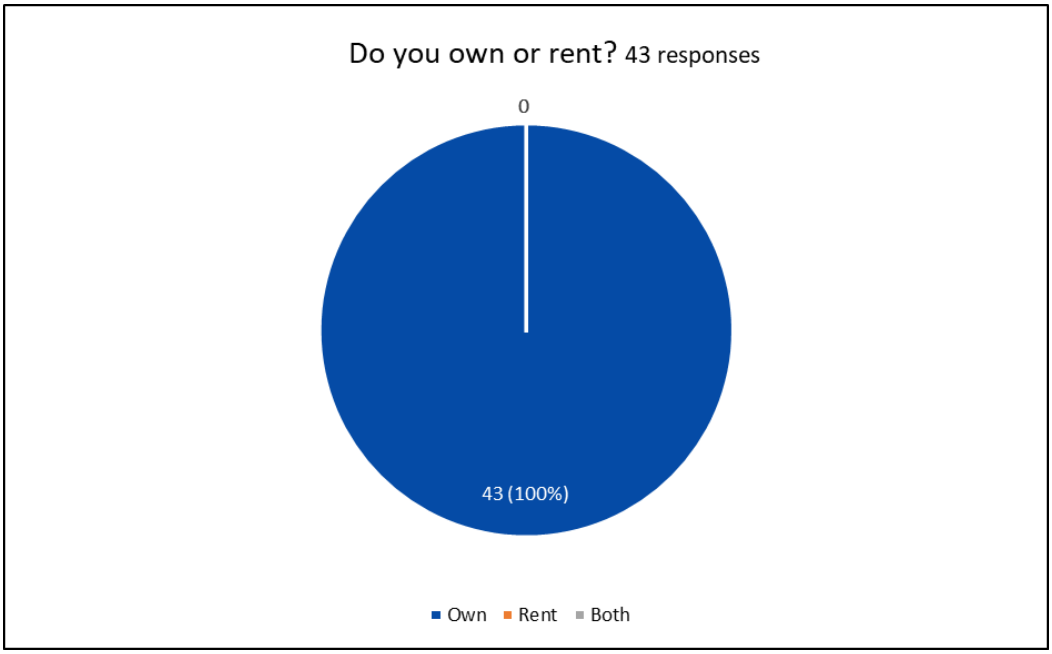

Figure 2: Survey Responses for Question 2

As Figure 1 above shows, the majority of the respondents live in the City of Highland Haven. All of respondents own their home as shown in Figure 2.

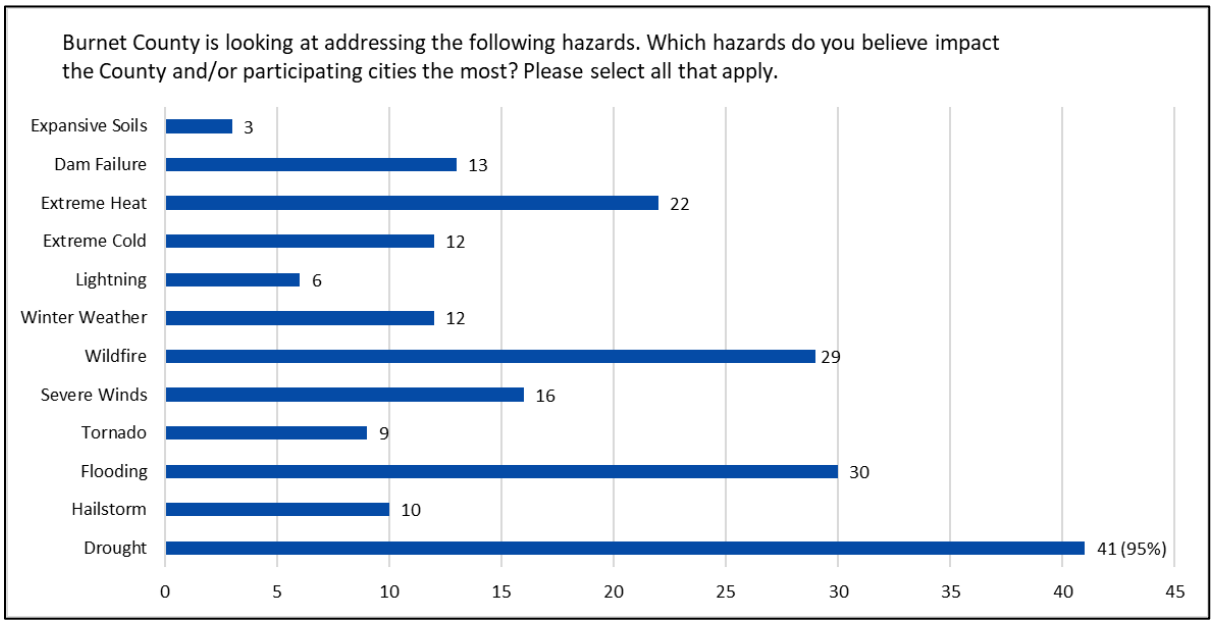

Figure 3: Survey Response for Question 3

The chart in Figure 3 above shows the breakdown of responses for survey question three. The answer choices included Drought, Hailstorm, Flooding, Tornado, Severe Winds, Wildfire, Winter Weather, Lightning, Extreme Cold, Extreme Heat, Expansive Soils, and Dam Failure. Of the 12 hazards addressed, Drought, Flooding, and Wildfire ranked the highest out of all the hazards addressed in the plan, with each choice getting more than or about 50% of the votes.

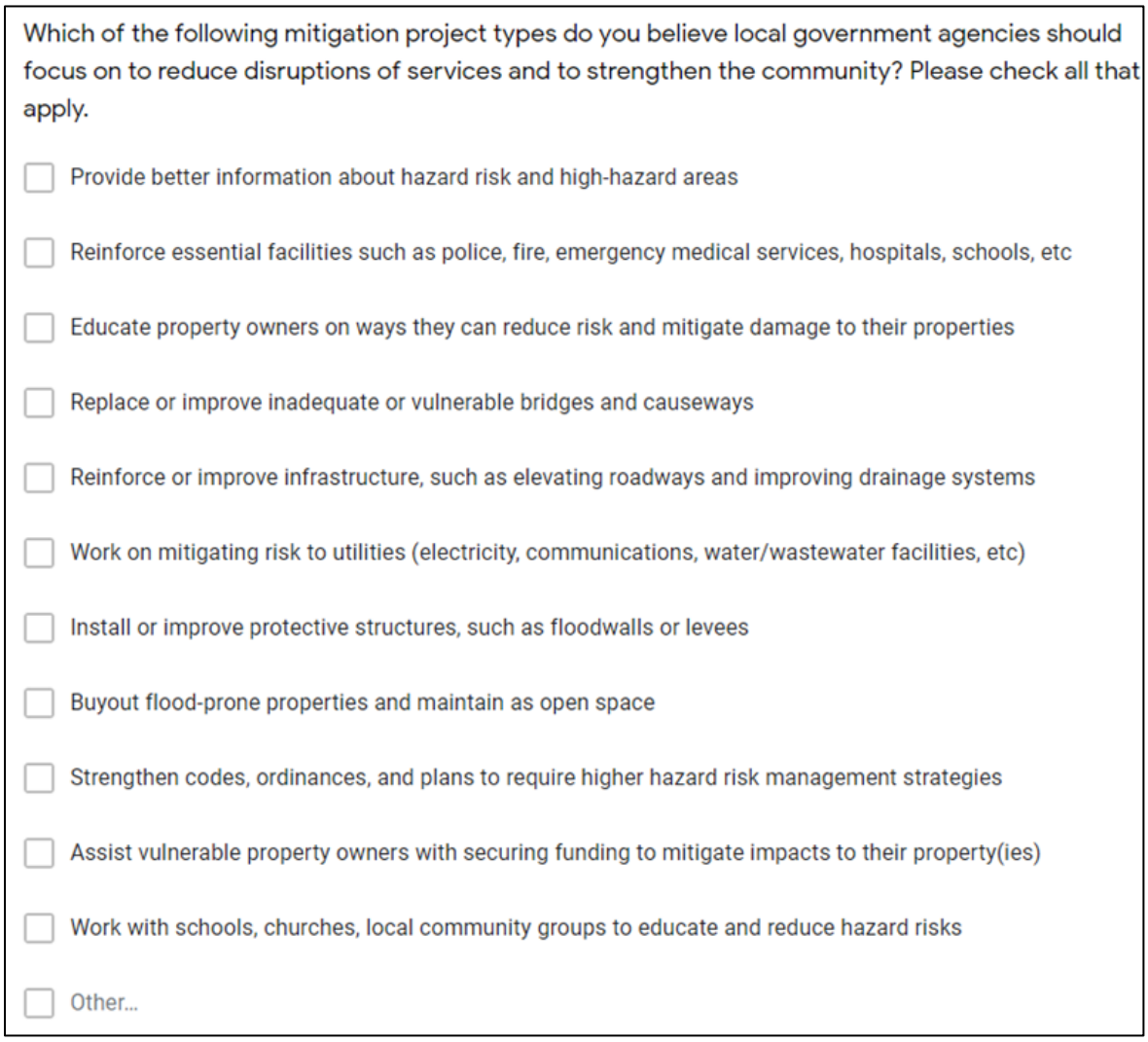

Figure 4: Survey Choices for Question 8

Figure 4 shows the choices for Question 8: Which of the following mitigation project types do you believe local government agencies should focus on to reduce disruptions of services and to strengthen the community? Please check all that apply. Respondents could choose from 11 answers such as “Provide better information about hazard risk and high-hazard areas,” “Reinforce or improve infrastructure, such as elevating roadways and improving drainage systems,” “Install or improve protective structures, such as floodwalls or levees,” or input their own answer.

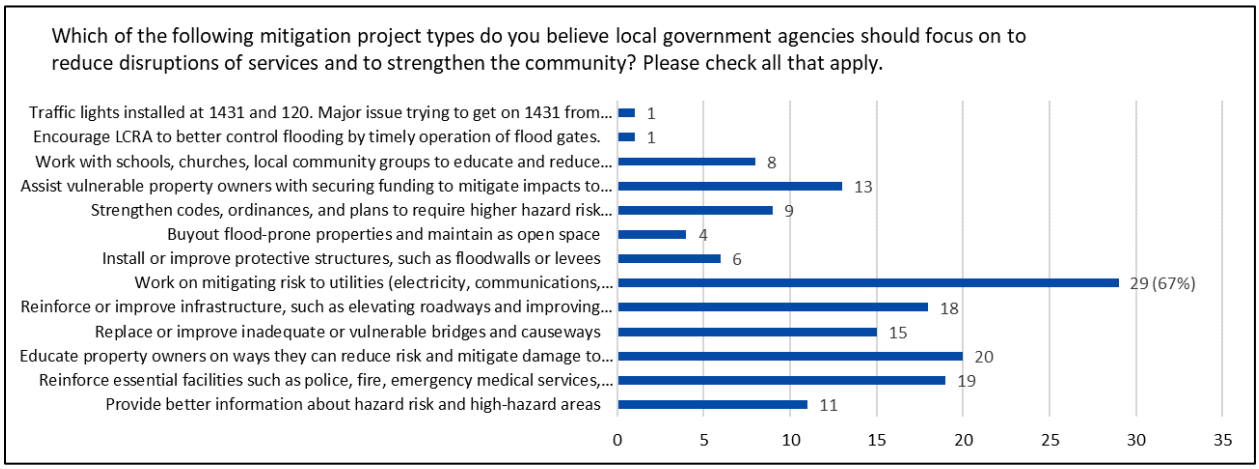

Figure 5: Response Breakdown for Question 8

Figure 5 shows the breakdown of responses to Question 8. The most popular answer was "Work on mitigating risk to utilities (electricity, communications, water/wastewater facilities, etc.)," with 67% of respondents voting for it. Other suggestions that respondents shared in the survey include the need to partner with the Lower Colorado River Authority to mitigate flooding through timely operation of flood gates.

The second public comment period took place in February 2024. A copy of the in-progress plan draft was posted to the County website for two weeks for the public to review and comment or provide suggestions. This public comment period was advertised in the newspaper and shared on social media.

4) Plan Maintenance

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

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

Table 6: Maintenance Responsibility

Title	Jurisdiction
County Judge	Burnet County
Emergency Management Coordinator	
Mayor	City of Bertram
City Secretary	
Mayor	City of Burnet
City Manager	
Fire Chief	
Deputy Chief	
Mayor	City of Cottonwood Shores
City Administrator	
Mayor	City of Granite Shoals
City Manager	
Mayor	City of Highland Haven
City Secretary	
Mayor	City of Marble Falls
Fire Chief/Emergency Management Coordinator	
Mayor	City of Meadowlakes
City Manager	

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

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

Considering changing funding sources, hazard vulnerability, and local mitigation priorities, the planning team will identify changes to plan goals and priorities for their respective jurisdictions,

and they will report their findings to the rest of the planning team. It will be the planning team's responsibility to identify relevant reasons for delay or obstacles to completing the plan's mitigation actions, along with recommended strategies to overcome any deficiencies.

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

5) Plan Monitoring

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

At a minimum, the mitigation plan will be reviewed by the EMC and planning team representatives from each jurisdiction quarterly, during budget workshops, and as other plans are being developed or revised including comprehensive plans, capital improvement project plans, and emergency plans. Regularly monitoring the plan implementation process in each participating jurisdiction will ensure that every component of the plan gets reviewed for potential amendments.

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

6) Plan Evaluation

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

- Do the specified goals and objectives still address current and expected conditions?
- Has the nature, magnitude, and/or risk of any hazard changed?
- Have there been changes in land development that the plan needs to address?
- Are available resources suitable for implementing the plan?

- Is funding budgeted or available to successfully implement prioritized mitigation actions?
- Are there opportunities in the local budgeting process or local, state, and national grant funding cycles to increase funding to implement mitigation actions?

Other steps will include site visits to completed mitigation projects in each jurisdiction to measure and ensure their success. The planning team will evaluate the causes of the shortcoming in the event that a mitigation project fails to meet its goal. The planning team will use their assessment to amend the project and related projects in other jurisdictions, allocate additional resources to achieve the desired outcome for the project and related projects in other jurisdictions, or replace the project and similar projects in other jurisdictions with better projects.

The EMC and planning team members will also work to implement any additional revisions required to ensure that the plan and their respective jurisdiction is in full compliance with federal regulations and state statutes. The approved plan will be hosted on the County website to allow the public to view and provide feedback during the 5-year lifespan of the plan.

7) Plan Update

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

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

Additional considerations to address on a jurisdictional level include but are not limited to changes in local development, changes in exposure to natural hazards, the development of new mitigation capabilities or techniques, and revisions to state or federal legislation. The update process will provide continued opportunity for the public and elected officials to determine which actions succeeded, failed, or are no longer relevant. It is also an opportunity for each jurisdiction to identify recent losses due to natural hazards and to consider whether any of those losses could have been avoided.

3. Determining Risk

1) Risk Assessment

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

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

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

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

Vulnerability to each hazard has risen as population fluctuates in conjunction with new development and growth in the County. Burnet County and the participating jurisdictions experienced moderate population growth between 2017 and 2021. Unfortunately, 2021 is the most recent American Community Survey data available. During this time period the County experienced about 7.5% growth overall with a marked increase in the "Over 60" population. The "Over 60" population increased by 16.5% from 12,977 to 15,128 people, while the "Under 18" population increased by almost 4%. In regards to actual growth, the County has seen mainly residential growth, with about 8.4% growth between 2017 and 2021, and is poised to increase quickly in the not too distant future. The vast majority of housing within the County are single-family homes. However, apartment complexes are planned around the County and participating jurisdictions which will help to drive down housing costs. Additional affordable housing, and housing development in general will hopefully bring more commercial and retail development to the area.

The overall increase in local population and development increases the local vulnerability of the County and its participating jurisdictions to the natural hazards addressed in this Plan update. Furthermore, the effects of climate change have increased the frequency and intensity of hazard events.

Climate change is expected to exacerbate hazard events in the future, which may affect population migration, land use development, and the habitability of certain areas in the future. However, it is not certain how these climatic effects will intersect with population migration patterns and land use changes. In the case of Burnet County and its participating jurisdictions, the increase in flood and winter storm events may prompt construction of appropriate

infrastructure to address these threats as well as related land use changes. Additionally, the population may consider relocation if appropriate measures are not taken.

A) Major Disaster Declarations

The following table outlines all major disaster declarations that have occurred in Burnet County since the 2017 HMAP.

Table 7: Major Disaster Declarations in Burnet County

Burnet County Major Disaster Declarations		
Disaster	**Incident Period**	**Declaration Date**
DR-4705 Texas Severe Winter Storm	January 30, 2023 – February 2, 2023	April 21, 2023
DR-4586 Texas Severe Winter Storm	February 11, 2021 – February 21, 2021	February 19, 2021
DR-4485 Texas Covid-19 Pandemic	January 20, 2020 – May 11, 2023	March 25, 2020
DR-4416 Texas Severe Storms and Flooding	September 10, 2018 – November 2, 2018	February 25, 2019

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

Table 8: Estimated Values by Location[2]

Category	Burnet County[3]	City of Bertram	City of Burnet	City of Cottonwood Shores	City of Granite Shoals	City of Highland Haven	City of Marble Falls	City of Meadowlakes
Total Housing Units	23,127	693	2,235	539	2,305	352	3,250	939
Housing Unit Density (per square mile[4])	23.25 units/sq. mi	577.50 units/sq. mi	214.90 units/sq. mi	269.50 units/sq. mi	326.02 units/sq. mi	651.85 units/sq. mi	266.39 units/sq. mi	1,219.48 units/sq.mi
Median Housing Value[5]	$229,600	$163,600	$186,500	$168,300	$121,400	$338,300	$221,200	$275,900
Estimated Value of Housing Units[6]	$5.31 billion	$113.37 million	$416.82 million	$90.71 million	$279.83 million	$119.08 million	$718.90 million	$259.07 million

[2] Source: U.S. Census 2020 American Community Survey 5-Year Estimates.
[3] Table B25001 2021 5-Year ACS Housing unit information for Burnet County includes totals for cities and unincorporated areas.
[4] Area in square mile respective to each jurisdiction
[5] Table B25077 2021 5-Year ACS
[6] Total value of housing units derived from median value multiplied by number of units.

3) Distribution of Vulnerable Populations

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

A) Age, Disability, and Income

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

Table 9: Age, Disability, and Poverty Level Percentages by Jurisdiction[7]

Demographic Category	Burnet County	City of Bertram	City of Burnet	City of Cottonwood Shores	City of Granite Shoals	City of Highland Haven	City of Marble Falls	City of Meadowlakes	Texas	U.S.
Total Population	48,424	1,852	6,403	1,630	5,086	452	6,892	1,991	28,862,581	329,725,481
Population Under Age 5[8]	5%	5%	5.3%	10.2%	2.2%	0%	3.1%	5.6%	6.8%	5.9%
Population Over Age 65	22.7%	19.6%	16.7%	8.2%	13.8%	66.8%	21.5%	34.3%	12.5%	16%
Disability Status[9]	17.1%	24.3%	23.1%	10.8%	1.5%	20.6%	19.9%	15.0%	11.4%	12.6%
Individuals Below Poverty Level[10]	7.2%	15.9%	2.7%	11.2%	9.9%	7.1%	10.0%	0%	14.0%	12.6%

[7] Source: U.S. Census 2021 American Community Survey 5-Year Estimates
[8] Table S0101, Age and Sex, 2021 ACS 5-Year Estimates
[9] Table S1810, Disability Characteristics. The U.S. Census defines a person as having a work disability if one or more of the following conditions are met:
1. Persons with a health problem or disability which prevents them from working or which limits the kind or amount of work they can do
2. Persons who have retired or left a job for health reasons
3. Persons currently not in the labor force because of a disability.
4. Persons who did not work at all in the previous year because of illness or disability
5. Under 65 years old and covered by Medicare in previous year.
6. Under 65 years old and received Supplemental Security Income (SSI) in previous year.
7. Received VA disability income in previous year.
[10] Table DP03, Selected Economic Characteristics, 2021 ACS 5-Year Estimates

B) Distribution of Vulnerable Populations

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

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

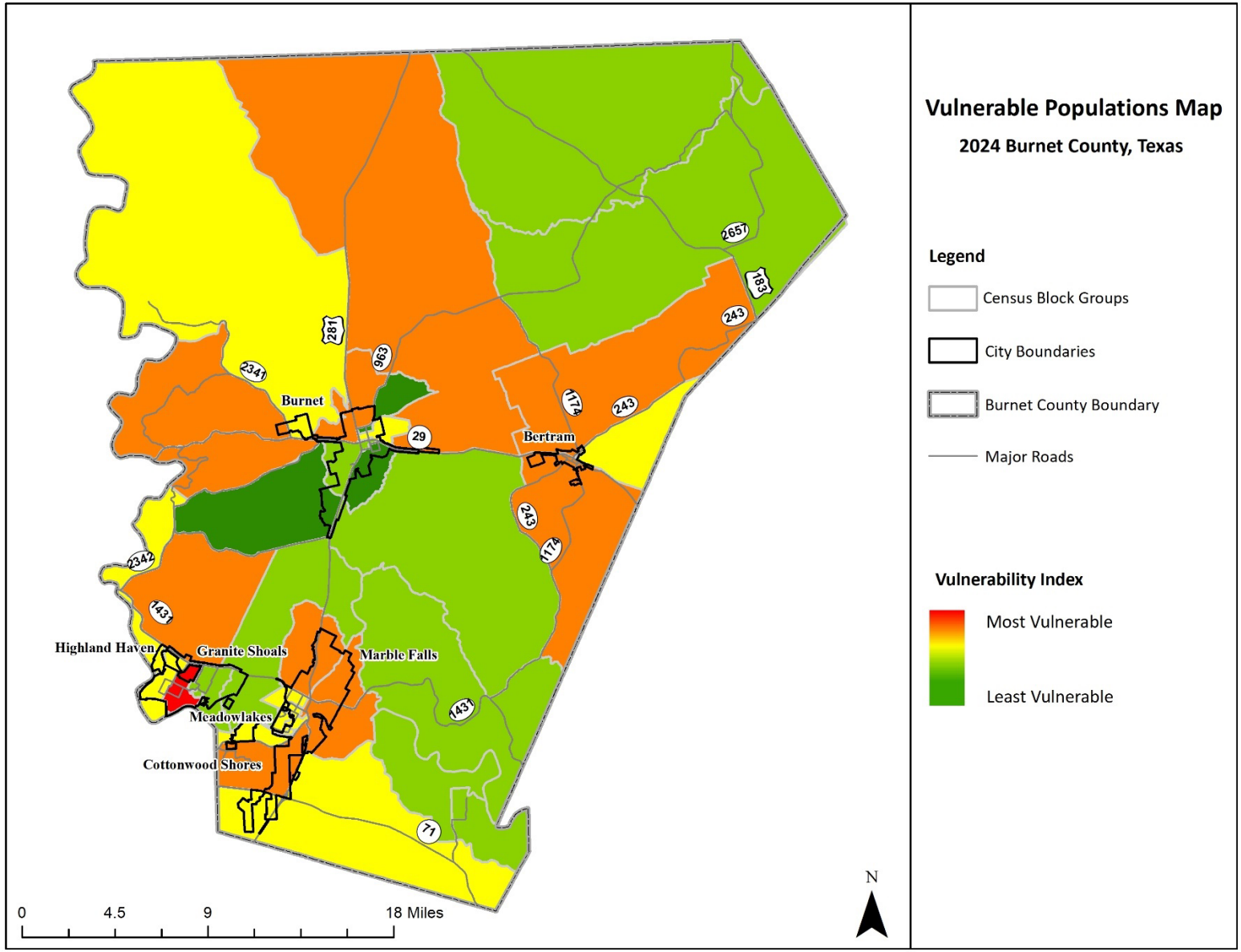

Figure 6: Burnet County Social Vulnerability Index

Figure 7: City of Bertram Social Vulnerability Index

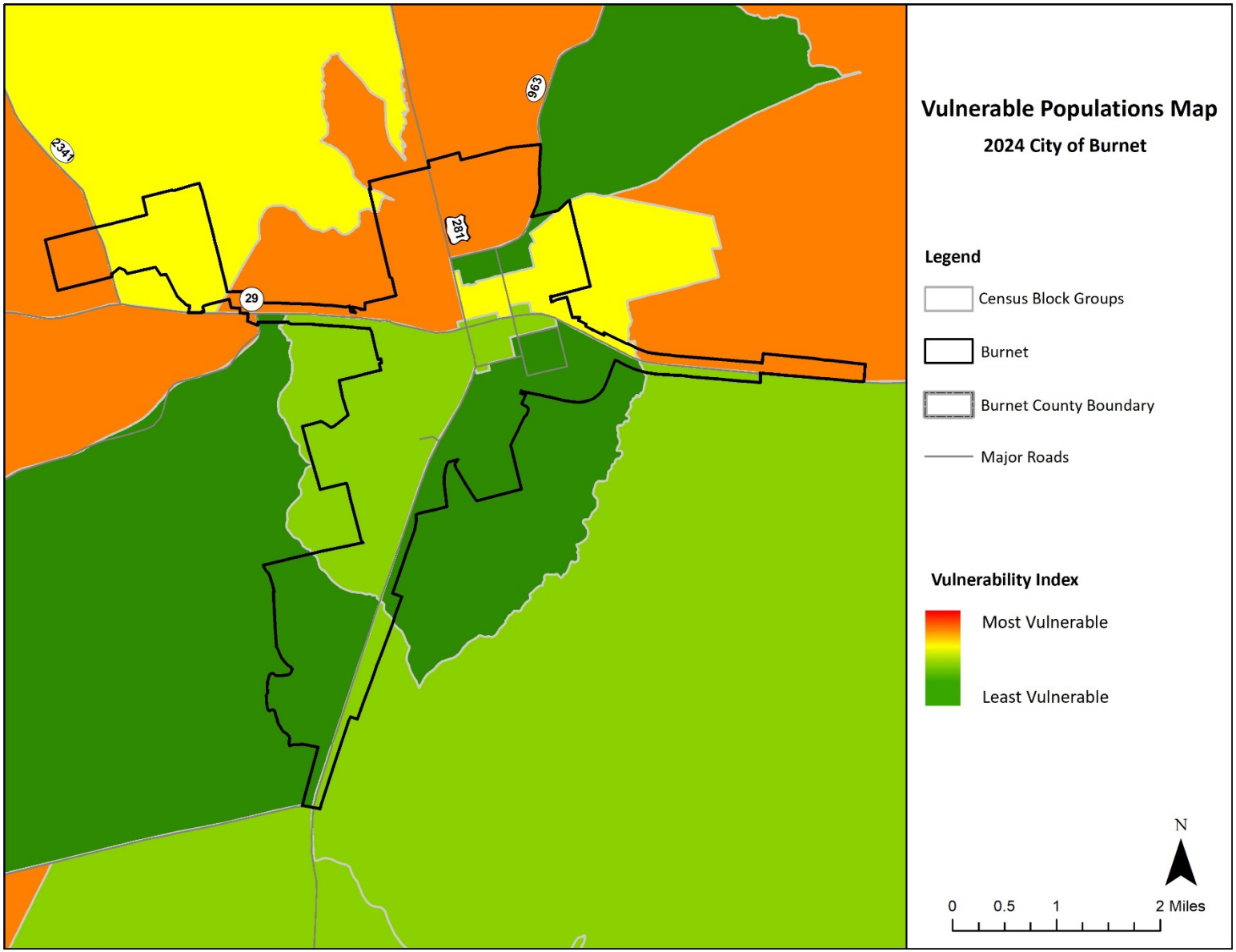

Figure 8: City of Burnet Social Vulnerability Index

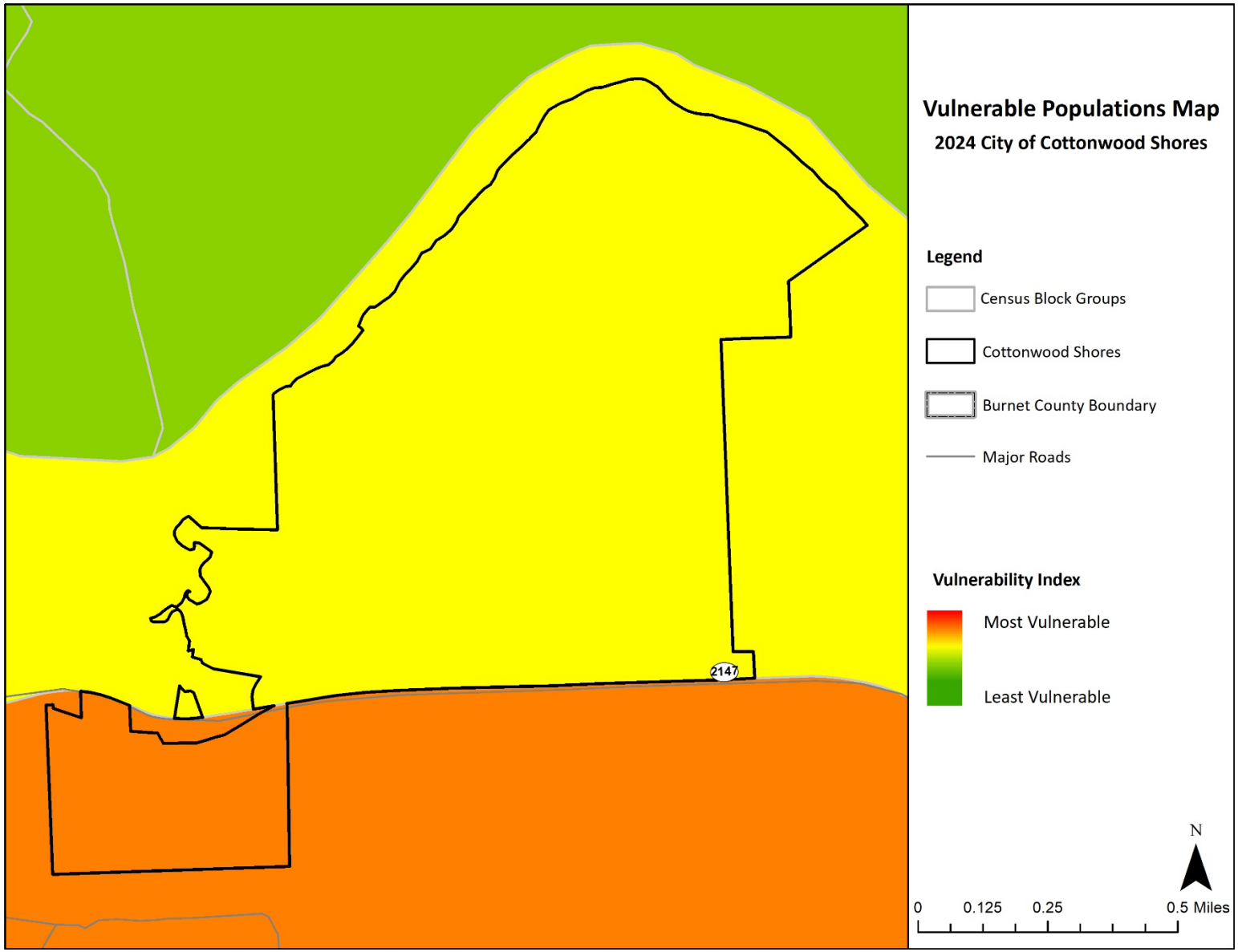

Figure 9: City of Cottonwood Shores Social Vulnerability Index

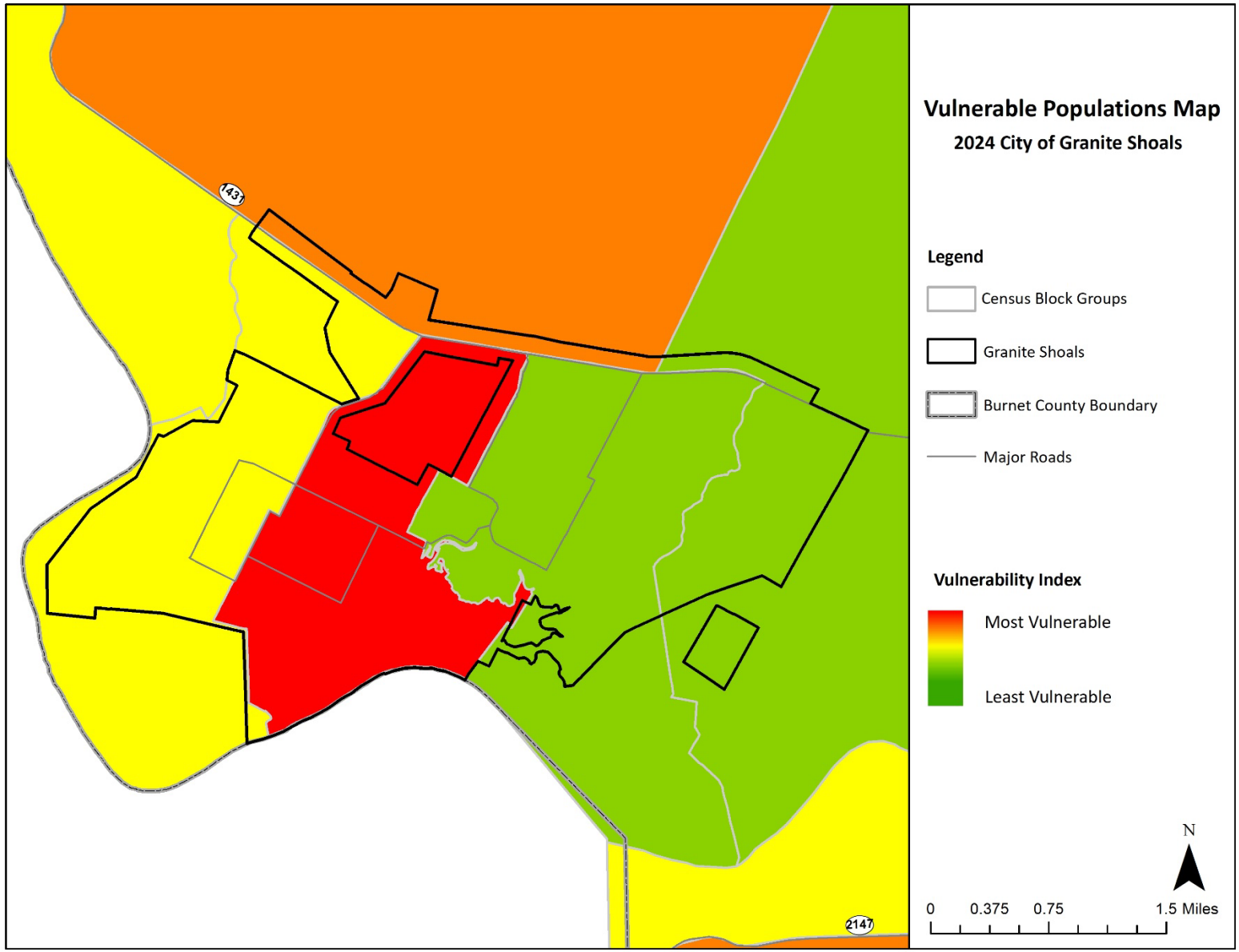

Figure 10: City of Granite Shoals Social Vulnerability Index

Figure 11: City of Highland Haven Social Vulnerability Index

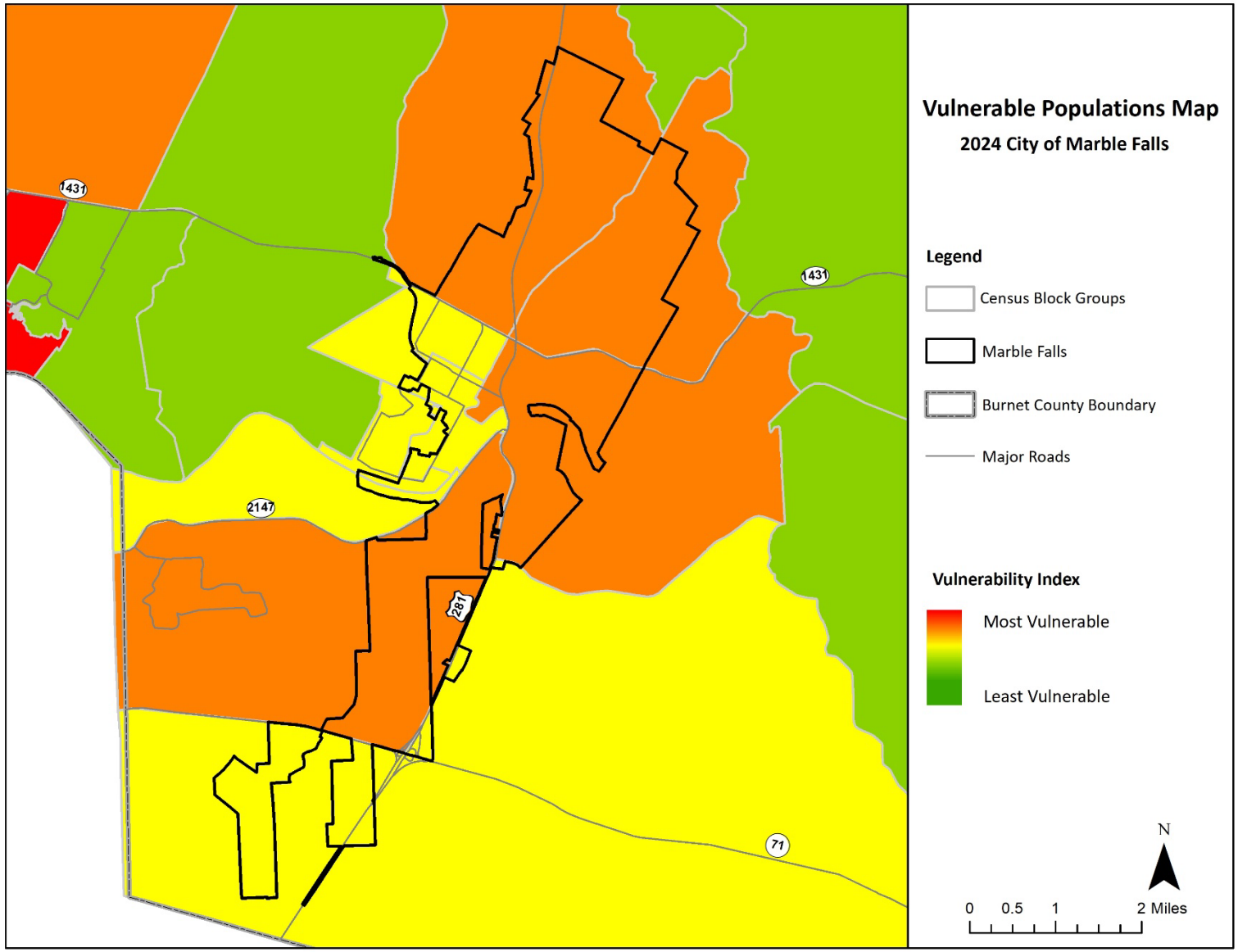

Figure 12: City of Marble Falls Social Vulnerability Index

Figure 13: City of Meadowlakes Social Vulnerability Index

C) Low Income and Subsidized Housing

Low-income residents in Burnet County are primarily served through rental assistance programs and low-income housing. There are 322 income-based apartments in Burnet County, the majority of which are within the City of Burnet and City of Marble Falls. Furthermore, there are 351 low-income apartments that do not offer direct rental assistance but are still considered affordable for low-income families[11].

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

D) Housing Type and Condition

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

I. Manufactured / Mobile Homes

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

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

Locations with clusters of three or more mobile / manufactured homes, including named mobile home parks, are shown in Figure 14 below.

[11] Affordable Housing Online, 2023. https://affordablehousingonline.com/housing-search/Texas/Burnet-County

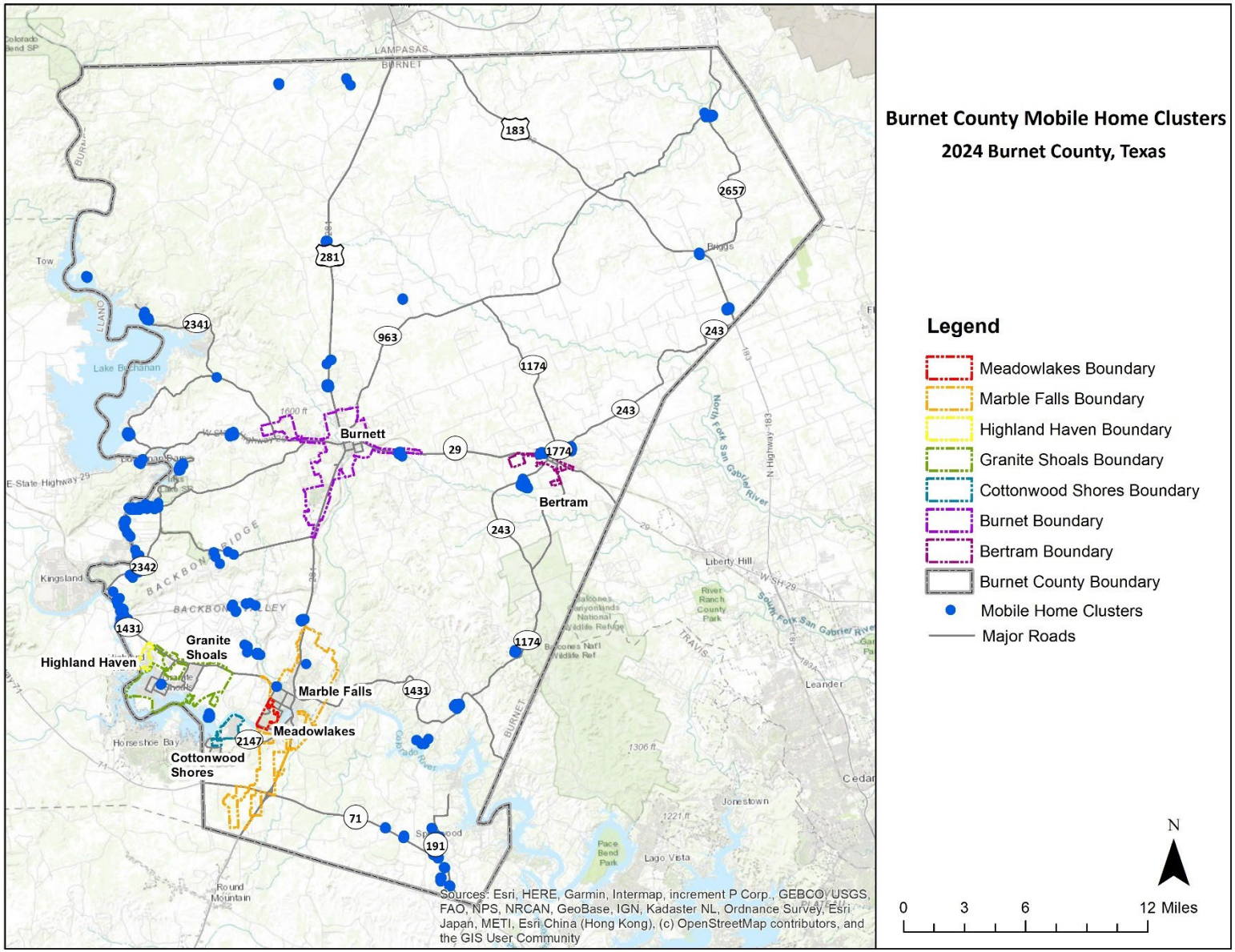

Figure 14: Mobile and Manufacturing Clusters in Burnet County and the Participating Jurisdiction

II. Homes in Substandard Condition

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

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

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

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

4. Floods

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

Flash flood is defined as a flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through riverbeds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam[12].

1) Flood History

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

According to Burnet County's 2017 hazard mitigation action plan (HMAP), the County and jurisdictions addressing the hazard recorded 61 flood events between 1996 and 2015.

The following tables identify the most comprehensive list available of flood events and associated damages in the participating jurisdictions from 2016 to present. There have been no recorded events since the 2017 HMAP for the Cities of Cottonwood Shores, Highland Haven, and Meadowlakes. No participating jurisdiction has recorded a flood event more recently than May 2023.

Table 10: Burnet County Recent Flood History

Location	Date Range	Number of Flood Events	Flood Types	Local Fatalities	Local Injuries	Local Property Damage $2024	Local Crop Damage $2024
Countywide	6/4/2018 – 5/5/2023	3	Flash Flood	0	0	$0	0

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

Table 11: City of Bertram Recent Flood History

Location	Date Range	Number of Flood Events	Flood Types	Local Fatalities	Local Injuries	Local Property Damage $2024	Local Crop Damage $2024
Citywide	8/16/2016 – 9/22/2018	2	Flash Flood	0	0	$0	0

Table 12: City of Burnet Flood History

Location	Date Range	Number of Flood Events	Flood Types	Local Fatalities	Local Injuries	Local Property Damage $2024	Local Crop Damage $2024
Citywide	11/6/2016 – 10/15/2018	2	Flood, Flash Flood	0	0	$0	0

Table 13: City of Granite Shoals Flood History

Location	Date Range	Number of Flood Events	Flood Types	Local Fatalities	Local Injuries	Local Property Damage $2024	Local Crop Damage $2024
Citywide	8/15/2016	1	Flash Flood	0	0	$0	0

Table 14: City of Marble Falls Flood History

Location	Date Range	Number of Flood Events	Flood Types	Local Fatalities	Local Injuries	Local Property Damage $2024	Local Crop Damage $2024
Citywide	5/14/2016 – 10/16/2018	3	Flood, Flash Flood	0	0	$36,334,351	0

A) National Flood Insurance Program

The National Flood Insurance Program (NFIP) is administered by FEMA to provide flood insurance coverage to the nation. Burnet County and the Cities of Bertram, Burnet, Cottonwood Shores, Granite Shoals, Highland Haven, Marble Falls, and Meadowlakes are listed as participating NFIP communities in the FEMA Community Status Book Report.

Burnet County has adopted and enforced a flood damage prevention ordinance in their jurisdiction and adopted their current FIRM on 9/26/2003. The Burnet County Flood Damage Prevention Ordinance designates the County Judge as the Floodplain Administrator responsible

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

The City of Bertram has adopted and enforced a flood damage prevention ordinance in their jurisdiction and adopted their current FIRM on 8/13/2019. The City of Bertram's Flood Damage Prevention Ordinance designates the Mayor as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements. Floodplain management ordinances and any future updates will guide the jurisdiction as it continues to comply with NFIP requirements through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction (i.e. substantially damaged repairs). The permitting process, presented to the floodplain administrator, may include plans showing location, dimension, and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of the special flood hazard. Additionally, information including elevation of new and substantially improved structures, nonresidential structures, floodproofing, certificates from registered professional engineers, watercourse or natural drainage alterations, and records are required. Permitting also requires the costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilizes and facilities such as sewer, gas, electrical and water systems. Variances may be issued for the repair or rehabilitation of historic structures. General standards for all new construction or substantial improvements require prevention of floatation, collapse or lateral movement and practices that minimize flood damage.

The City of Burnet has adopted and enforced a flood damage prevention ordinance in their jurisdiction and adopted their current FIRM on 1/25/2022. The City of Burnet's Flood Damage

Prevention Ordinance designates the Mayor as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements. Floodplain management ordinances and any future updates will guide the jurisdiction as it continues to comply with NFIP requirements through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction (i.e. substantially damaged repairs). The permitting process, presented to the floodplain administrator, may include plans showing location, dimension, and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of the special flood hazard. Additionally, information including elevation of new and substantially improved structures, nonresidential structures, floodproofing, certificates from registered professional engineers, watercourse or natural drainage alterations, and records are required. Permitting also requires the costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilizes and facilities such as sewer, gas, electrical and water systems. Variances may be issued for the repair or rehabilitation of historic structures. General standards for all new construction or substantial improvements require prevention of floatation, collapse or lateral movement and practices that minimize flood damage. The flood mitigation actions outlined in Chapter 15 below were developed with flood mitigation and NFIP compliance in mind. Public engagement will be an ongoing effort in each participating jurisdiction to reduce future losses due to flooding and will continue even after recommended corrective actions have been implemented.

The City of Cottonwood Shores has adopted and enforced a flood damage prevention ordinance in their jurisdiction and adopted their current FIRM on 10/18/2018. The City of Cottonwood Shores's Flood Damage Prevention Ordinance designates the Building Official as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements. Floodplain management ordinances and any future updates will guide the jurisdiction as it continues to comply with NFIP requirements through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction (i.e. substantially damaged repairs). The permitting process, presented to the floodplain administrator, may include plans showing location, dimension, and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of the special flood hazard. Additionally, information including elevation of new and substantially improved structures, nonresidential structures, floodproofing, certificates from registered professional engineers, watercourse or natural drainage alterations, and records are required. Permitting also requires the costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilizes and facilities such as sewer, gas, electrical and water systems. Variances may be issued for the

repair or rehabilitation of historic structures. General standards for all new construction or substantial improvements require prevention of floatation, collapse or lateral movement and practices that minimize flood damage. The flood mitigation actions outlined in Chapter 15 below were developed with flood mitigation and NFIP compliance in mind. Public engagement will be an ongoing effort in each participating jurisdiction to reduce future losses due to flooding and will continue even after recommended corrective actions have been implemented.

The City of Granite Shoals has adopted and enforced a flood damage prevention ordinance in their jurisdiction and adopted their current FIRM on 10/22/2019. The City of Granite Shoals's Flood Damage Prevention Ordinance designates the Building Inspector as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements. Floodplain management ordinances and any future updates will guide the jurisdiction as it continues to comply with NFIP requirements through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction (i.e. substantially damaged repairs). The permitting process, presented to the floodplain administrator, may include plans showing location, dimension, and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of the special flood hazard. Additionally, information including elevation of new and substantially improved structures, nonresidential structures, floodproofing, certificates from registered professional engineers, watercourse or natural drainage alterations, and records are required. Permitting also requires the costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilizes and facilities such as sewer, gas, electrical and water systems. Variances may be issued for the repair or rehabilitation of historic structures. General standards for all new construction or substantial improvements require prevention of floatation, collapse or lateral movement and practices that minimize flood damage. The flood mitigation actions outlined in Chapter 15 below were developed with flood mitigation and NFIP compliance in mind. Public engagement will be an ongoing effort in each participating jurisdiction to reduce future losses due to flooding and will continue even after recommended corrective actions have been implemented.

The City of Highland Haven has adopted and enforced a flood damage prevention ordinance in their jurisdiction and adopted their current FIRM on 3/15/2012. The City of Highland Haven's Flood Damage Prevention Ordinance designates the Mayor as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements. Floodplain management ordinances and any future updates will guide the jurisdiction as it continues to comply with NFIP requirements through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction (i.e. substantially damaged repairs). The permitting process,

presented to the floodplain administrator, may include plans showing location, dimension, and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of the special flood hazard. Additionally, information including elevation of new and substantially improved structures, nonresidential structures, floodproofing, certificates from registered professional engineers, watercourse or natural drainage alterations, and records are required. Permitting also requires the costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilizes and facilities such as sewer, gas, electrical and water systems. Variances may be issued for the repair or rehabilitation of historic structures. General standards for all new construction or substantial improvements require prevention of floatation, collapse or lateral movement and practices that minimize flood damage. The flood mitigation actions outlined in Chapter 15 below were developed with flood mitigation and NFIP compliance in mind. Public engagement will be an ongoing effort in each participating jurisdiction to reduce future losses due to flooding and will continue even after recommended corrective actions have been implemented.

The City of Marble Falls has adopted and enforced a flood damage prevention ordinance in their jurisdiction and adopted their current FIRM on 11/1/2019. The City of Marble Falls's Flood Damage Prevention Ordinance designates the Mayor as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements. Floodplain management ordinances and any future updates will guide the jurisdiction as it continues to comply with NFIP requirements through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction (i.e. substantially damaged repairs). The permitting process, presented to the floodplain administrator, may include plans showing location, dimension, and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of the special flood hazard. Additionally, information including elevation of new and substantially improved structures, nonresidential structures, floodproofing, certificates from registered professional engineers, watercourse or natural drainage alterations, and records are required. Permitting also requires the costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilizes and facilities such as sewer, gas, electrical and water systems. Variances may be issued for the repair or rehabilitation of historic structures. General standards for all new construction or substantial improvements require prevention of floatation, collapse or lateral movement and practices that minimize flood damage. The flood mitigation actions outlined in Chapter 15 below were developed with flood mitigation and NFIP compliance in mind. Public engagement will be an ongoing effort in each participating jurisdiction to reduce future losses due to flooding and will continue even after recommended corrective actions have been implemented.

The City of Meadowlakes has adopted and enforced a flood damage prevention ordinance in their jurisdiction and adopted their current FIRM on 11/6/2007. The City of Meadowlakes's Flood Damage Prevention Ordinance designates the Public Works Director as the Floodplain Administrator responsible for implementing its floodplain management regulations and ensuring regulations meet or exceed the minimum NFIP requirements. Floodplain management ordinances and any future updates will guide the jurisdiction as it continues to comply with NFIP requirements through permitting, inspection, and recordkeeping, especially for new and substantially redeveloped construction (i.e. substantially damaged repairs). The permitting process, presented to the floodplain administrator, may include plans showing location, dimension, and elevation of proposed landscape alterations, existing and proposed structures, and the location of the foregoing in relation to areas of the special flood hazard. Additionally, information including elevation of new and substantially improved structures, nonresidential structures, floodproofing, certificates from registered professional engineers, watercourse or natural drainage alterations, and records are required. Permitting also requires the costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilizes and facilities such as sewer, gas, electrical and water systems. Variances may be issued for the repair or rehabilitation of historic structures. General standards for all new construction or substantial improvements require prevention of floatation, collapse or lateral movement and practices that minimize flood damage. The flood mitigation actions outlined in Chapter 15 below were developed with flood mitigation and NFIP compliance in mind. Public engagement will be an ongoing effort in each participating jurisdiction to reduce future losses due to flooding and will continue even after recommended corrective actions have been implemented.

A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling ten-year period, since 1978. According to the best information available, there are five single-family RL properties, and one multi-family RL property in Burnet County. Additionally, there are two single-family RL properties in Granite Shoals, and four single-family RL properties in Marble Falls. There are no RL properties in the remaining jurisdictions.

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

2) Likelihood of Future Events

In the case of the FEMA 100-year floodplain there is a 1% annual chance, while in the 500-year floodplain there is a 0.02% annual chance. Thus, the likelihood of a 100-year flood event is occasional and the likelihood of a 500-year flood event is unlikely. However, based on the frequency of previous flood events, every jurisdiction can expect to experience some type of flooding that may or may not meet the definition of a 100-year or 500-year event on a more regular basis.

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

3) Extent

Flood magnitude is generally measured by depth of flood waters in feet or inches. Throughout Burnet County and the participating jurisdictions, the worst flood events have been associated with flooding due to combinations of heavy rainfall, flash flooding, and riverine flooding. Based on historical occurrences, Burnet County and the participating jurisdictions could experience up to 10” of water within a 24 hour period.

4) Location and Impact

The maps below were developed to demonstrate potential flood risk areas. Roughly 4% (28,266 acres out of 653,440) of Burnet County is in the FEMA 100-year floodplain. In contrast, about 92% (599,958 acres out of 653,440) of Burnet County is in the FEMA 500-year floodplain.

A) Location

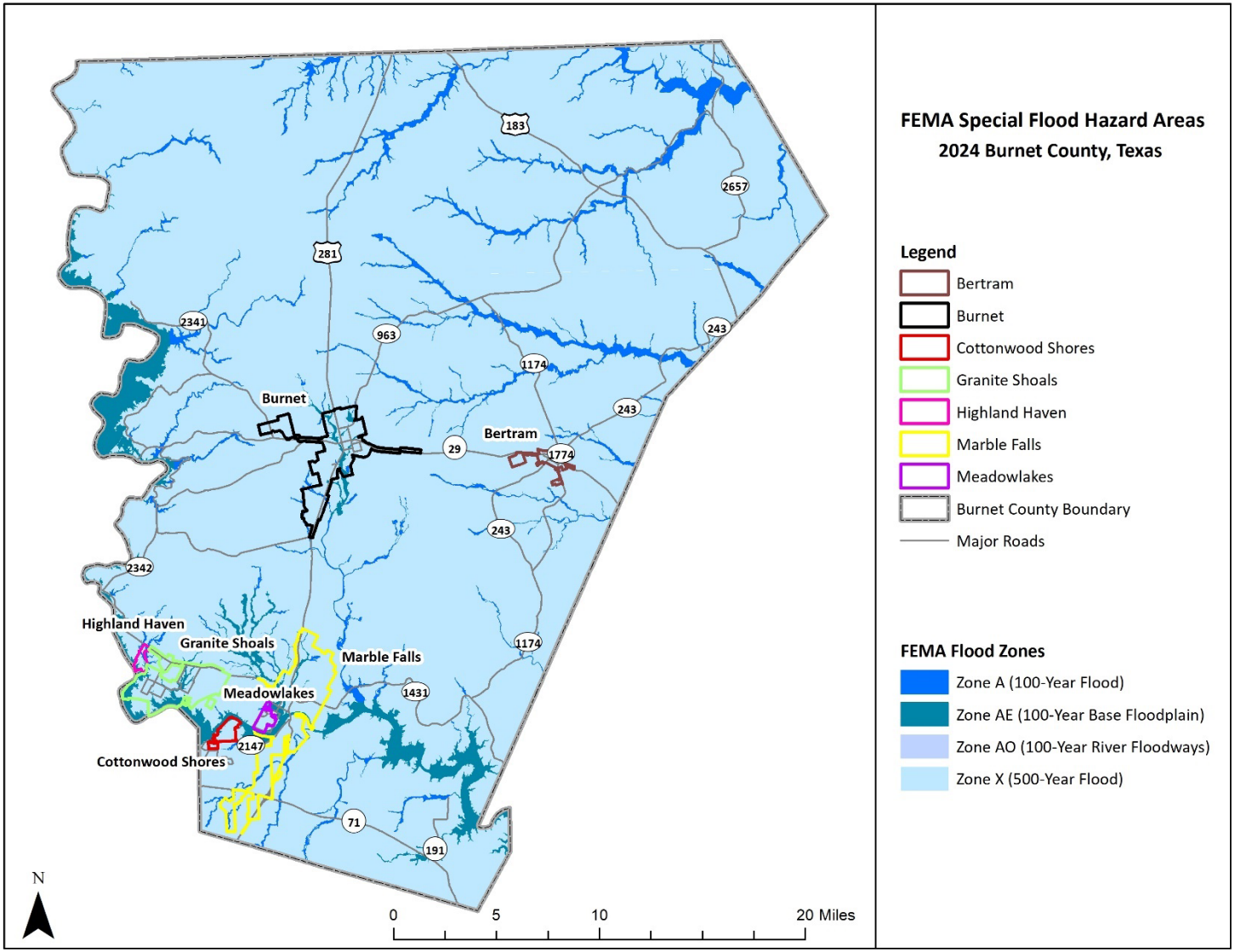

Figure 15: Burnet County FEMA Special Flood Hazard Areas

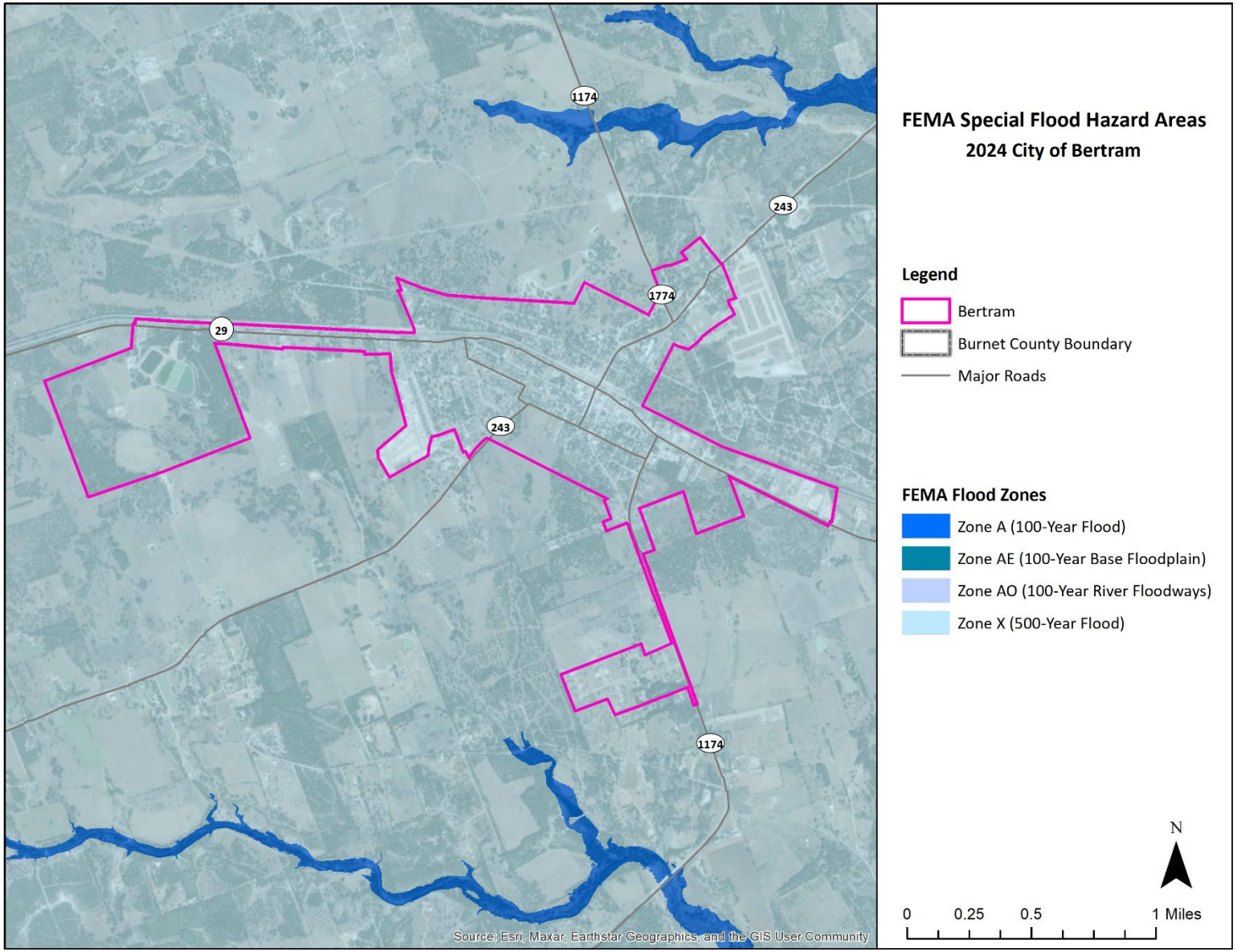

Figure 16: City of Bertram FEMA Special Flood Hazard Areas

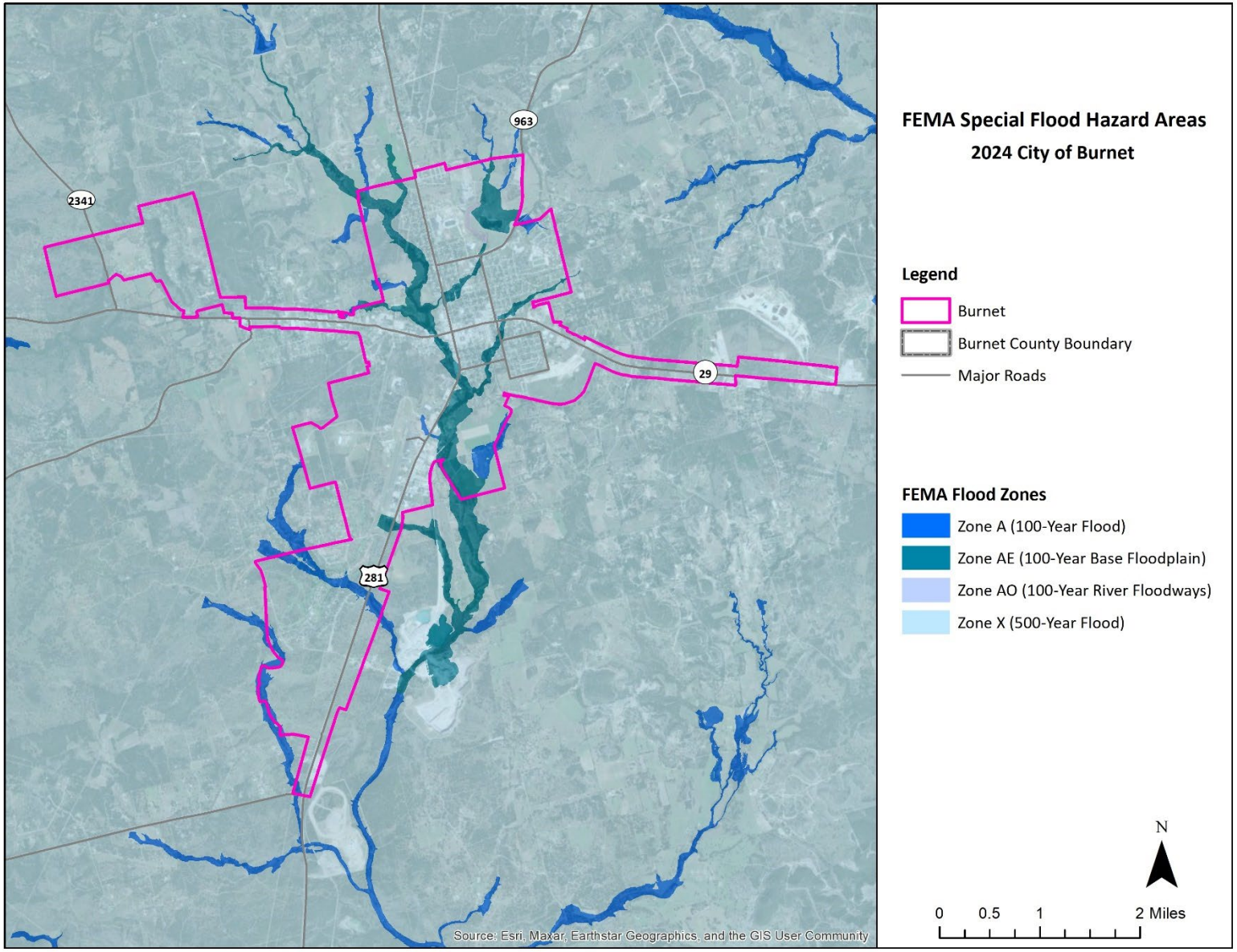

Figure 17: City of Burnet FEMA Special Flood Hazard Areas

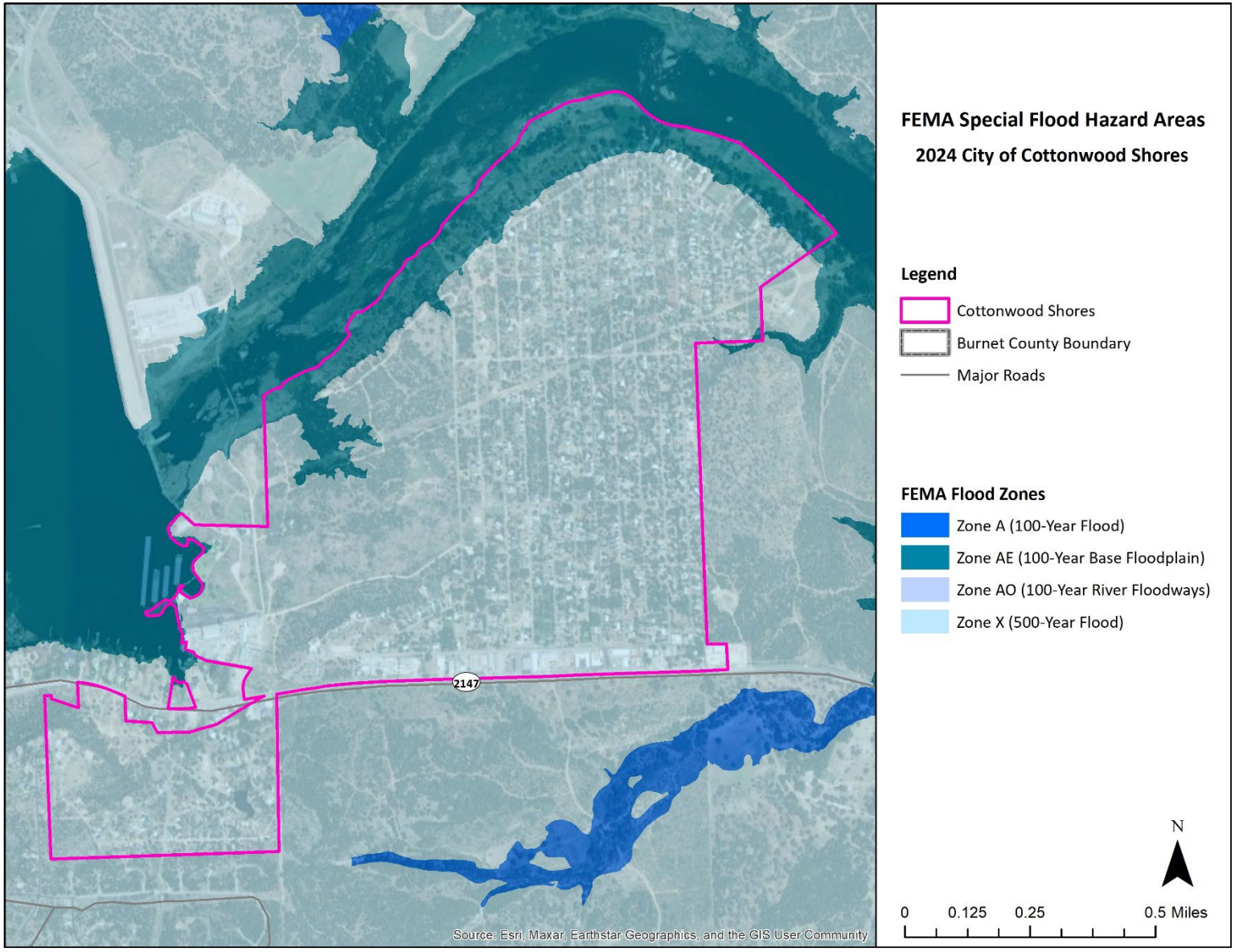

Figure 18: City of Cottonwood Shores FEMA Special Flood Hazard Areas

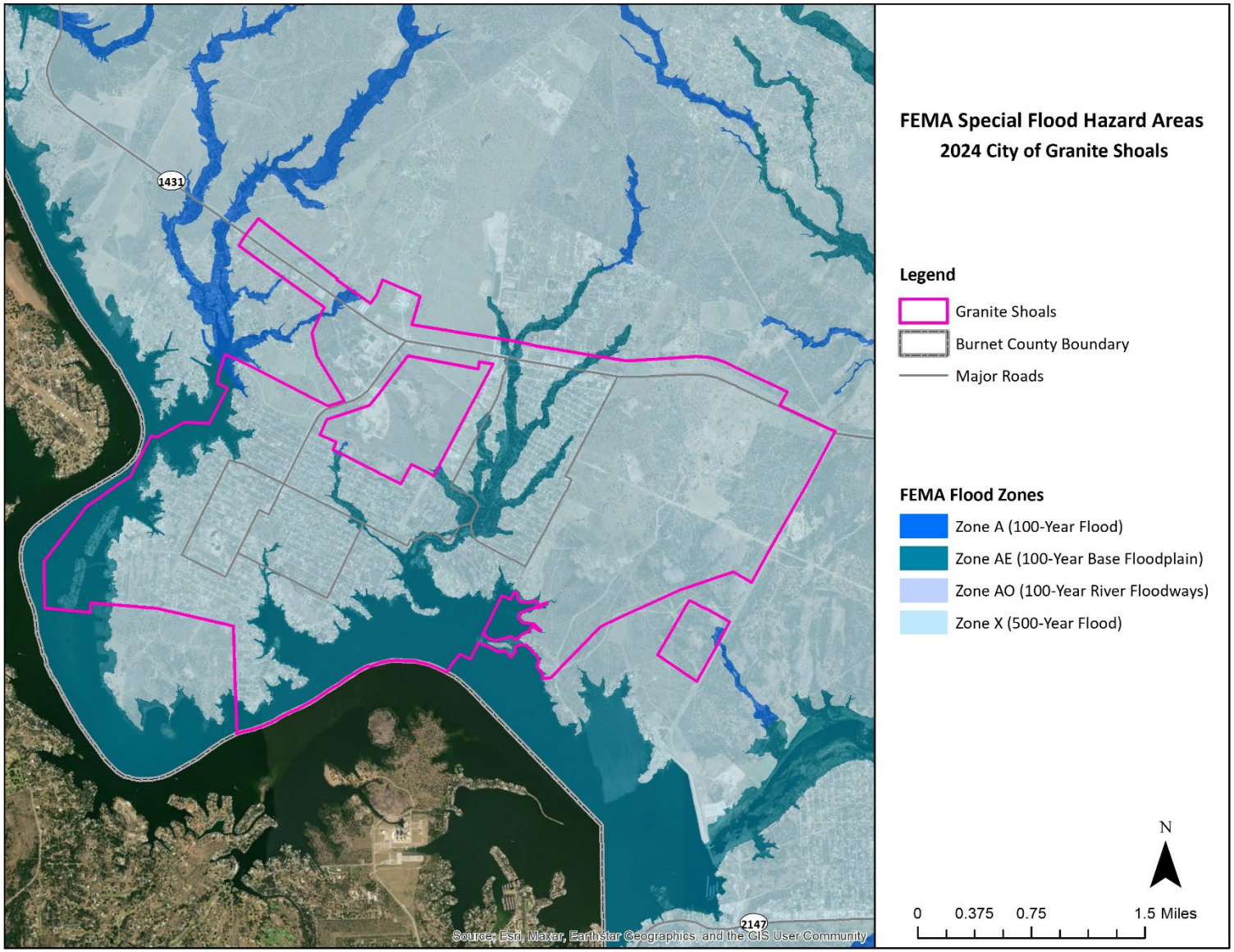

Figure 19: City of Granite Shoals FEMA Special Flood Hazard Areas

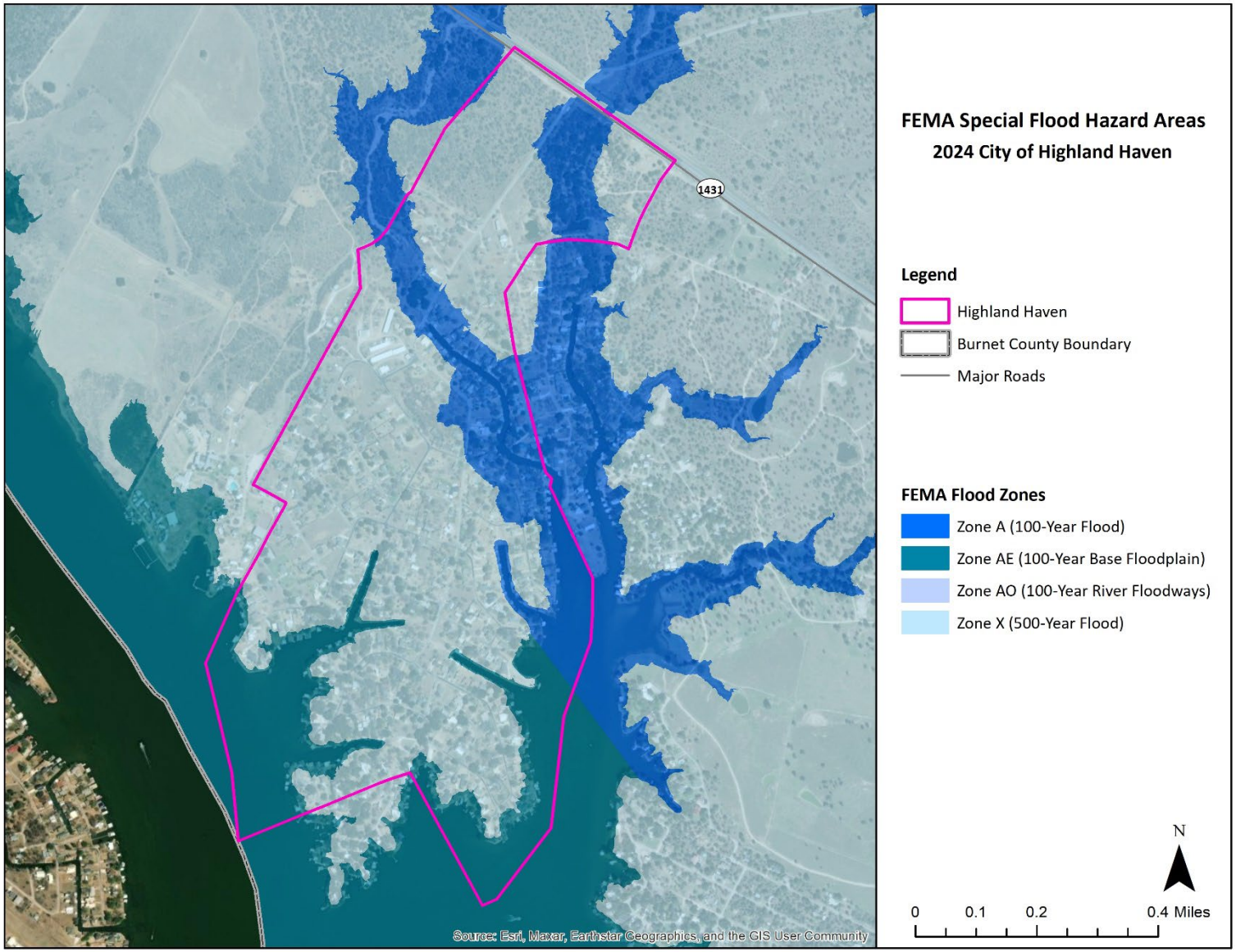

Figure 20: City of Highland Haven FEMA Special Flood Hazard Areas

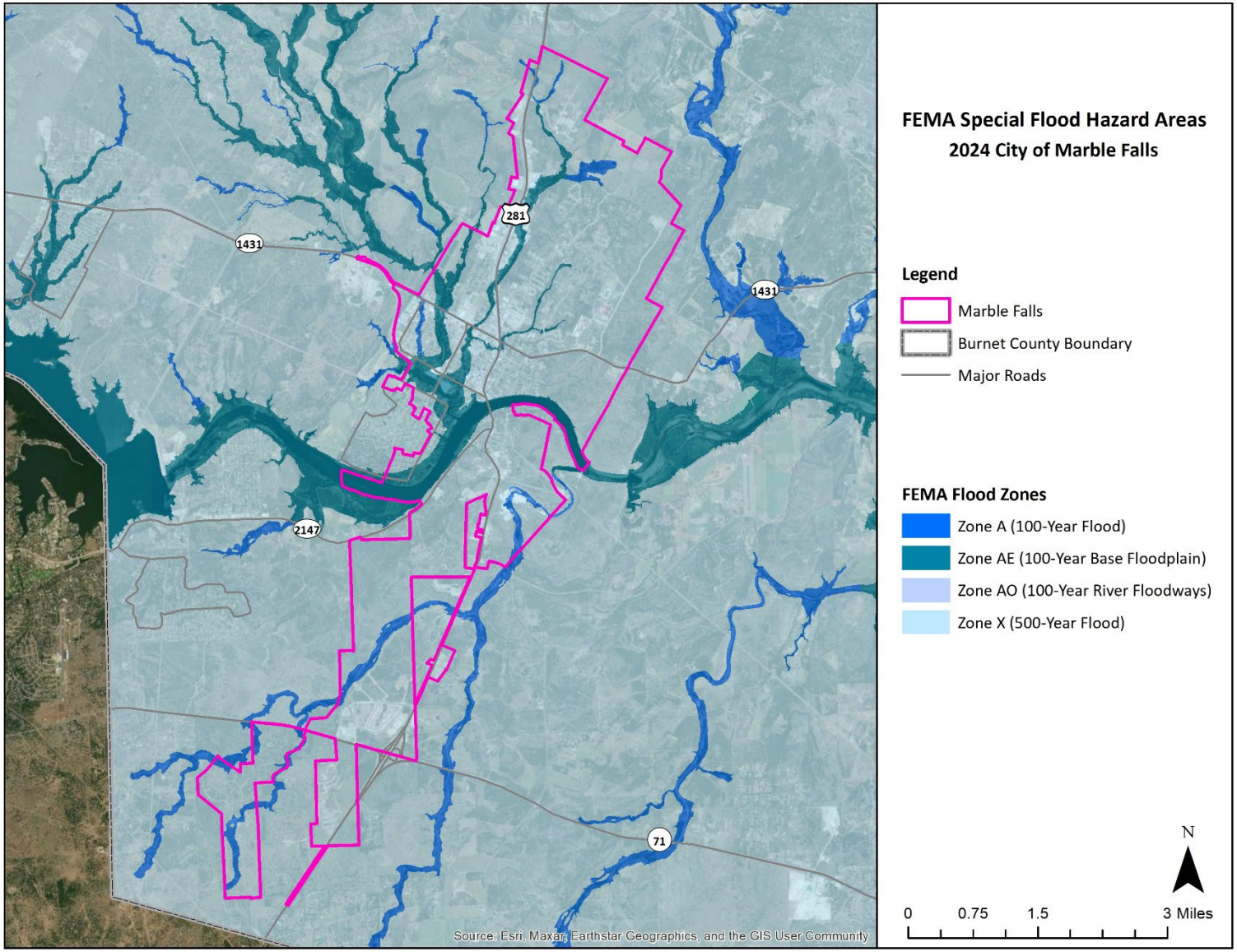

Figure 21: City of Marble Falls FEMA Special Flood Hazard Areas

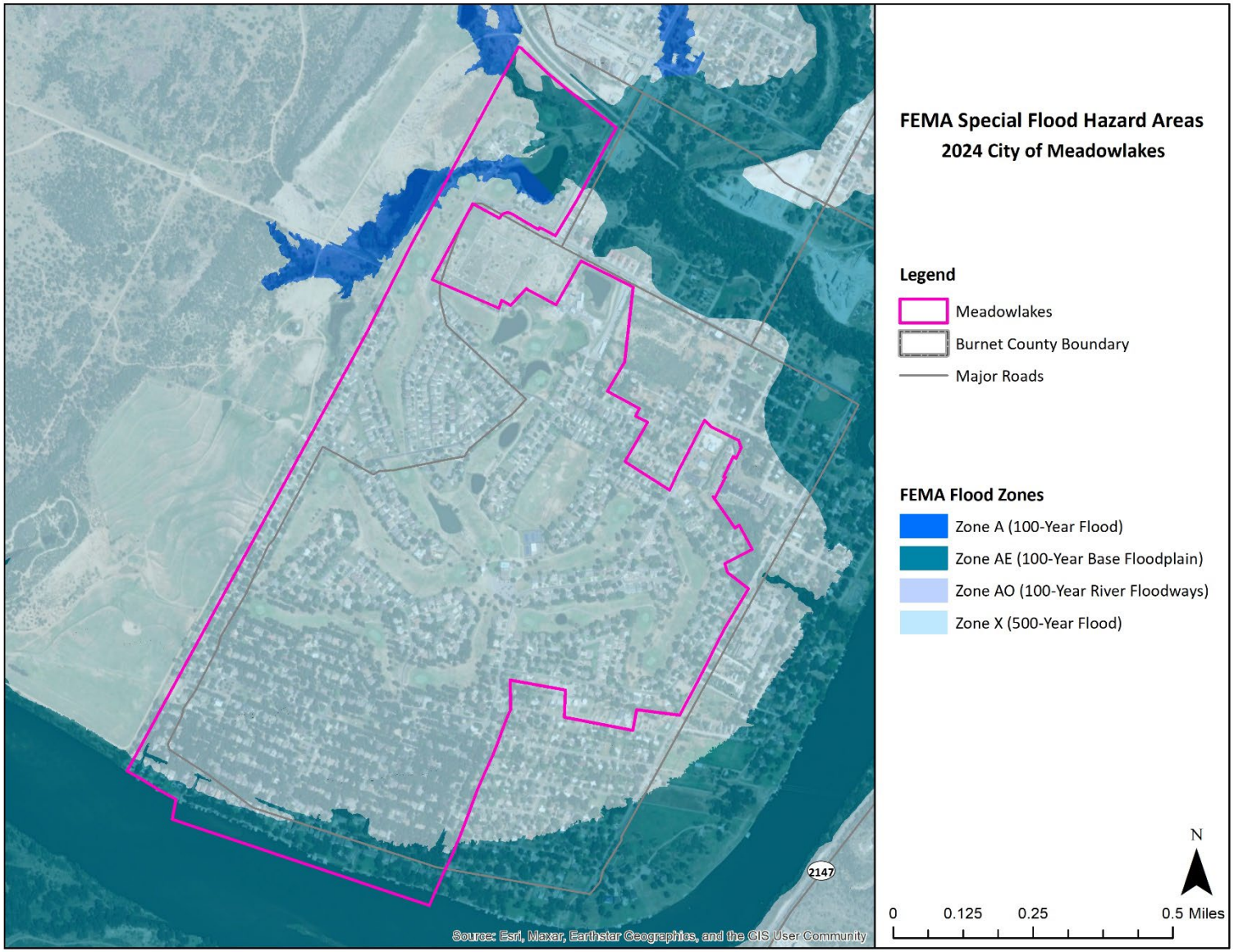

Figure 22: City of Meadowlakes FEMA Special Flood Hazard Areas

B) Impact

Flood impact in Burnet County and the participating jurisdictions will vary depending on the location, size of the affected area, and number of structures affected. Although the likelihood of a FEMA 100-year flood event remains occasional, 1% in any given year, the floodplain crosses all of Burnet County's major thoroughfares, potentially limiting travel across, within, and around the County.

Residents in the participating jurisdictions may temporarily lose power due to downed power lines. Motorists and residents may be left stranded and needing rescue. Affected structures may be flooded, damaged by foodborne contaminants, damaged by debris flow, or even completely washed away. Crops may be damaged or destroyed. Estimated damage totals to vulnerable parcels affected during a 100-year flood event may meet the totals outlined in Tables 16 through 23.

Despite the unlikely probability of a so-called 500-year flood, 0.02% in any given year, the danger is not negligible. Moreover, the relatively limited information on the 500-year flood zone should not be interpreted to mean that a 500-year flood will only occur in the areas depicted within the 500-year flood zones. Similar to 100-year flood events, parts of the County may temporarily lose power due to downed power lines; motorists and residents may be left stranded and needing rescue; affected structures may be flooded, damaged by flood borne contaminants, damaged by debris flow, or even completely washed away; crops may be damaged or destroyed. Estimated damage totals to vulnerable parcels affected during a 500-year flood event may meet the totals outlined in Tables 16 through 23.

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

5) Vulnerability

A) Population

As described in Section 3 of Chapter 3 above, Burnet County and the participating jurisdictions are home to many vulnerable residents. Increased vulnerability may be due to many factors including but not limited to age, physical ability, financial means, housing type, and housing condition. Many of these vulnerabilities often overlap. The participating jurisdictions recognize that vulnerable populations may need additional help preparing for and recovering from a flood.

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

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

B) Critical Facilities

The planning team identified 143 critical facilities spread across the County and participating jurisdictions. All 143 critical facilities were located in a known FEMA Special Flood Hazard Area (SFHA); therefore, all critical facilities are considered vulnerable to flooding and have been listed below.

Table 15: Critical Facilities Vulnerable to Flooding

Jurisdiction	Critical Facilities
Burnet County	1 Courthouse, 3 Courthouse Annexes, 1 Sheriff's Office, 1 County Jail, 1 Health Center, 4 Precinct Barns, 1 EOC, 1 Community Center
Bertram	1 City Hall, 1 Police Dept., 1 VFD, 1 Utility Office, 1 School, 1 Library, 4 Lift Stations, 4 Wells, 1 Sewer Treatment Plant
Burnet	1 City Hall, 1 Police Dept., 2 Fire Depts., 4 Schools, 1 Library, 1 Public Works, 1 Hospital, 1 Community Center, 1 Wastewater Plant
Cottonwood Shores	1 City Hall, 1 Police Dept., 1 VFD, 1 Civic Center, 1 Water Treatment Plant, 1 Water Tower, 5 Lift Stations, 1 Raw Water Pump
Granite Shoals	1 City Hall, 1 Police Dept., 1 Fire Dept., 1 School, 1 Water Plant, 1 Water Intake, 2 Water Towers
Highland Haven	1 City Hall, 1 Community Center, 1 Water Plant, 3 Wells
Marble Falls	1 City Hall, 1 EMS, 1 EOC, 1 Police Dept., 2 Fire Dept., 5 Assisted Living Centers, 1 Church Shelter, 4 Daycares, 1 Hospital, 12 Lift Stations, 3 Medical Care Centers, 1 Post Office, 1 Public Works, 1 Constable Office, 8 Schools, 1 ISD Bus Storage, 1 Electrical Substation, 1 Booster Station, 3 Grinder Pumps, 5 Water Pump Stations, 1 Raw Water Pump, 2 WW Raw Water Farms, 1 Water Treatment Plant, 1 Wastewater Treatment Plant, 7 Water Towers/Water Storage
Meadowlakes	1 City Hall, 1 Water Treatment Plant, 1 Raw Water Intake, 1 Water Storage Tank, 5 Lift Stations, 1 Sewer Treatment Plant

C) Vulnerable Parcels[13]

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

[13] County Parcel Count Includes All Parcels in Burnet County

Table 16: Vulnerable Parcels by Flood Zone in Burnet County

Jurisdiction	Total Parcels	Estimated Potential Damage Value
FEMA 100-Year Flood Zone A		
Countywide	**828**	**$514,320,800**
FEMA 500-Year Flood Zone X		
Countywide	**44,566**	**$17,881,744,127**

Table 17: Vulnerable Parcels by Flood Zone in the City of Bertram

Jurisdiction	Total Parcels	Estimated Potential Damage Value
FEMA 100-Year Flood Zone A		
Citywide	**0**	**$0**
FEMA 500-Year Flood Zone X		
Citywide	**879**	**$247,151,780**

Table 18: Vulnerable Parcel by Flood Zone for the Burnet

Jurisdiction	Total Parcels	Estimated Potential Damage Value
FEMA 100-Year Flood Zone A		
Citywide	**12**	**$4,506,618**
FEMA 500-Year Flood Zone X		
Citywide	**3,015**	**$1,109,581,815**

Table 19: Vulnerable Parcels by Flood Zone for the City of Cottonwood Shores

Jurisdiction	Total Parcels	Estimated Potential Damage Value
FEMA 100-Year Flood Zone A		
Citywide	**0**	**$0**
FEMA 500-Year Flood Zone X		
Citywide	**1,716**	**$210,972,775**

Table 20: Vulnerable Parcels by Flood Zone for the City of Granite Shoals

Jurisdiction	Total Parcels	Estimated Potential Damage Value
FEMA 100-Year Flood Zone A		
Citywide	**2**	**$416,700**
FEMA 500-Year Flood Zone X		
Citywide	**6,696**	**$1,072,351,577**

Table 21: Vulnerable Parcels by Flood Zone for the City of Highland Haven

Jurisdiction	Total Parcels	Estimated Potential Damage Value
FEMA 100-Year Flood Zone A		
Citywide	**44**	**$34,656,624**
FEMA 500-Year Flood Zone X		
Citywide	**321**	**$223,465,806**

Table 22: Vulnerable Parcels by Flood Zone for the City of Marble Falls

Jurisdiction	Total Parcels	Estimated Potential Damage Value
FEMA 100-Year Flood Zone A		
Citywide	**42**	**$6,954,684**
FEMA 500-Year Flood Zone X		
Citywide	**3,061**	**$1,589,677,889**

Table 23: Vulnerable Parcels by Flood Zone for the City of Meadowlakes

Jurisdiction	Total Parcels	Estimated Potential Damage Value
FEMA 100-Year Flood Zone A		
Citywide	**1**	**$543,593**
FEMA 500-Year Flood Zone X		
Citywide	**907**	**$399,804,443**

6) Climate Change

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

"Climate change may cause river floods to become larger or more frequent than they used to be in some places yet become smaller and less frequent in other places. As warmer temperatures cause more water to evaporate from the land and oceans, changes in the size and frequency of heavy precipitation events may in turn affect the size and frequency of river flooding."[14]

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

5. Wildfire

Wildfire is defined as an unplanned wildland fire, including unauthorized human-caused fires, escaped wildland fire use events, and escaped prescribed fire projects. A wildfire event can rapidly spread out of control and occurs most often in the summer, when the brush is dry, and flames can move unchecked through a highly vegetative area. Wildfires can start as a slow burning fire along the forest floor, killing and damaging trees. The fires often spread more rapidly as they reach the tops of trees, with wind carrying the flames from tree to tree. Usually, dense smoke is the first indication of a wildfire. A wildfire event often begins unnoticed and spreads quickly, lighting brush, trees and homes on fire. For example, a wildfire may be started by a campfire that was not doused properly, tossed cigarette, burning debris, or arson. [15]

1) Wildfire History

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

The 2017 Burnet County HMAP reported 65 wildfire events throughout the County between 1980 and 2014. According to the NOAA, there were three reports of wildfire events in 2018 since the previous plan. There were no reports of deaths, injuries, nor property or crop damage.

The tables below list data provided through the Texas A&M Forest Service Wildfire Risk Assessment Portal. There were no wildfire events reported within the Cities of Cottonwood Shores, Highland Haven, and Meadowlakes since the previous 2017 HMAP.

Table 24: Burnet County Recent Wildfire History

Location	Date Range	Number of Wildfire Events	Range of Acres Burned	Total Acres Burned
Countywide	1/8/2015 – 11/20/2021	273	.01 - 800	5,341.92

Table 25: City of Bertram Recent Wildfire History

Location	Date Range	Number of Wildfire Events	Range of Acres Burned	Total Acres Burned
Citywide	1/20/2015 – 1/24/2015	2	2 - 15	17

[15] 2023 State of Texas Hazard Mitigation Plan

Table 26: City of Burnet Recent Wildfire History

Location	Date Range	Number of Wildfire Events	Range of Acres Burned	Total Acres Burned
Citywide	1/25/2016 – 10/19/2019	6	.01 - 50	67.61

Table 27: City of Granite Shoals Recent Wildfire History

Location	Date Range	Number of Wildfire Events	Range of Acres Burned	Total Acres Burned
Citywide	7/20/2015 – 7/8/2020	7	.25 - 5	8.5

Table 28: City of Marble Falls Recent Wildfire History

Location	Date Range	Number of Wildfire Events	Range of Acres Burned	Total Acres Burned
Citywide	1/14/2015 – 8/2/2020	19	.25 - 8	21.25

2) Likelihood of Future Events

Although the County and participating jurisdictions have not recorded a wildfire since 2021, given the prior frequency of wildfire events, a wildfire event in any of the jurisdictions addressing the hazard is likely, meaning an event is probable within the next three years.

3) Extent

The Texas A&M Forest Service's Characteristic Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist. The FIS is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. According to Texas A&M Forest Service data, Anderson County and the participating jurisdictions are rated between Class 1 and Class 3.

Table 29: Characteristic Fire Intensity Scale[16]

Class 1 Very Low	Very small, discontinuous flames, usually less than one foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
Class 2 Low	Small flames, usually less than two feet long; small amount of very short-range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.

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

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 National Wildfire Coordinating Group (NWCG) provides an additional way to measure extent by accounting for fire size. Based on Texas A&M Forest Service data, the average fire in Anderson County and the participating jurisdictions is a Class D event.

Table 30: National Wildfire Coordinating Group Size Class of Fire[17]

Class A	¼ acre or less
Class B	More than ¼ acre, but less than 10 acres
Class C	10 acres or more, but less than 100 acres
Class D	100 acres or more, but less than 300 acres
Class E	300 acres or more, but less than 1,000 acres
Class F	1,000 acres or more, but less than 5,000 acres
Class G	5,000 acres or more

Future fire events in Burnet County and the participating jurisdictions may meet previous worst-case Class E (NWCGSCF) and Class 5 (FIS) wildfires in terms of intensity, acreage burned, and inflicted damage.

[17] http://www.nwcg.gov/term/glossary/size-class-of-fire

4) Location and Impact

A) Location

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

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

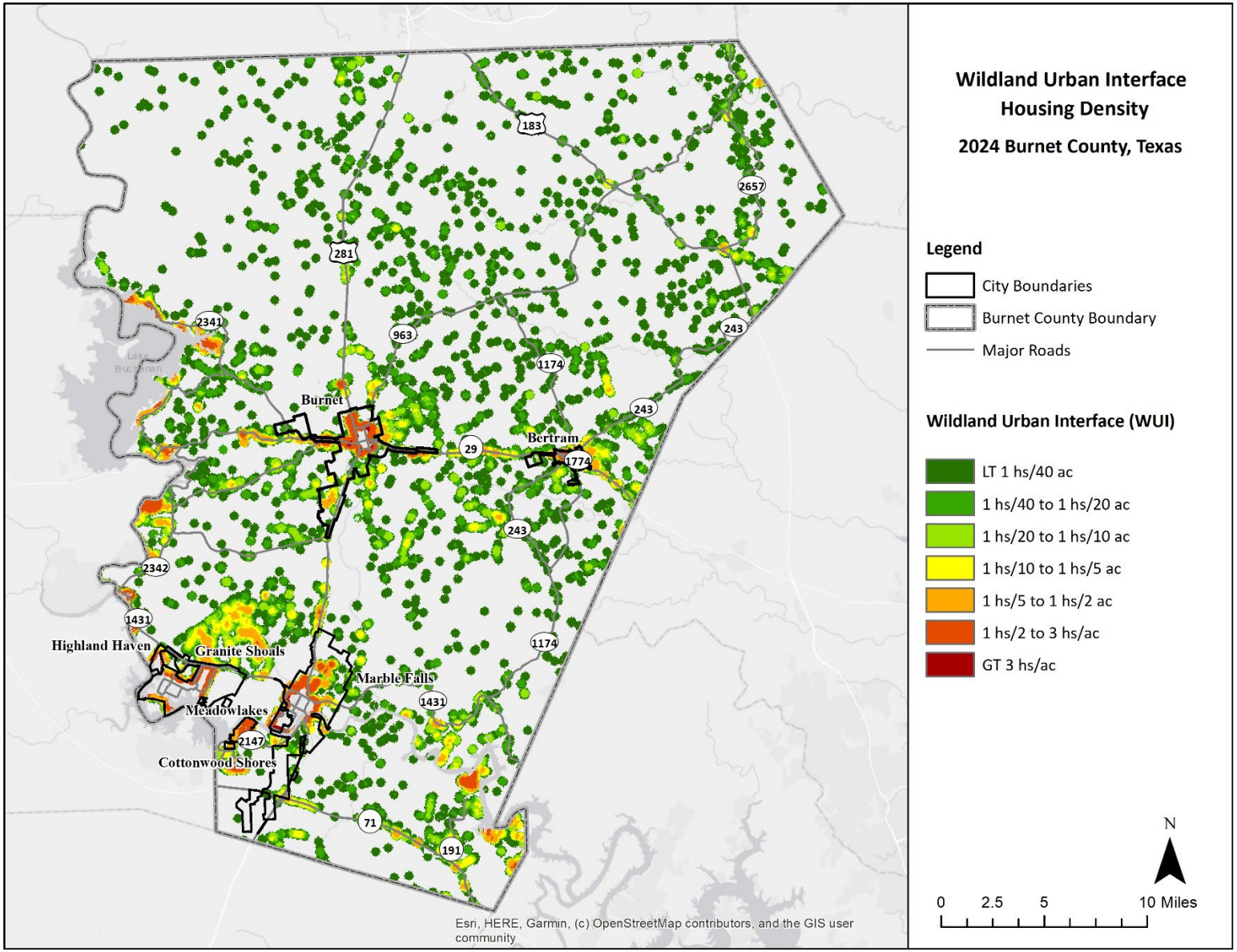

Figure 23: Burnet County Wildland Urban Interface

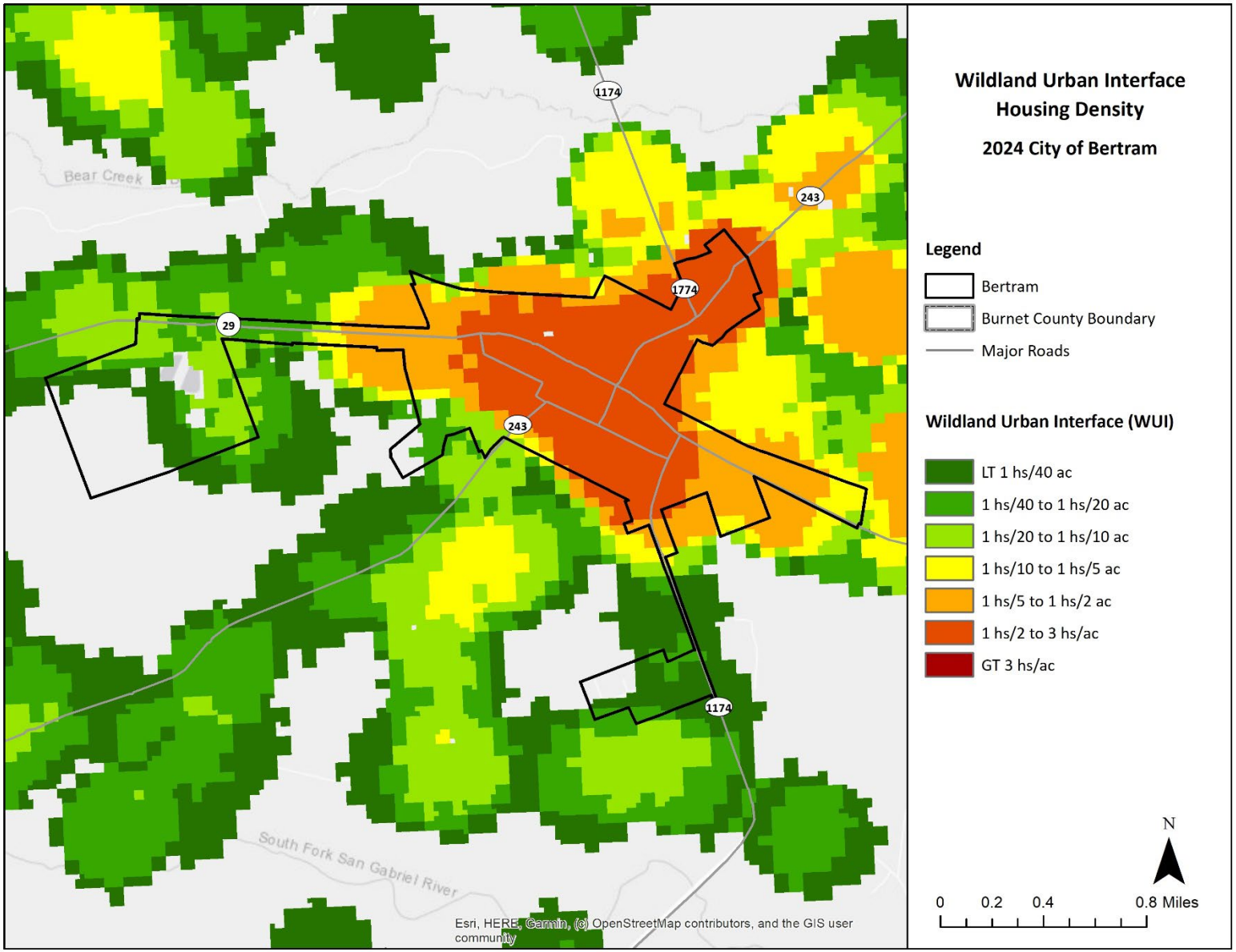

Figure 24: City of Bertram Wildland Urban Interface

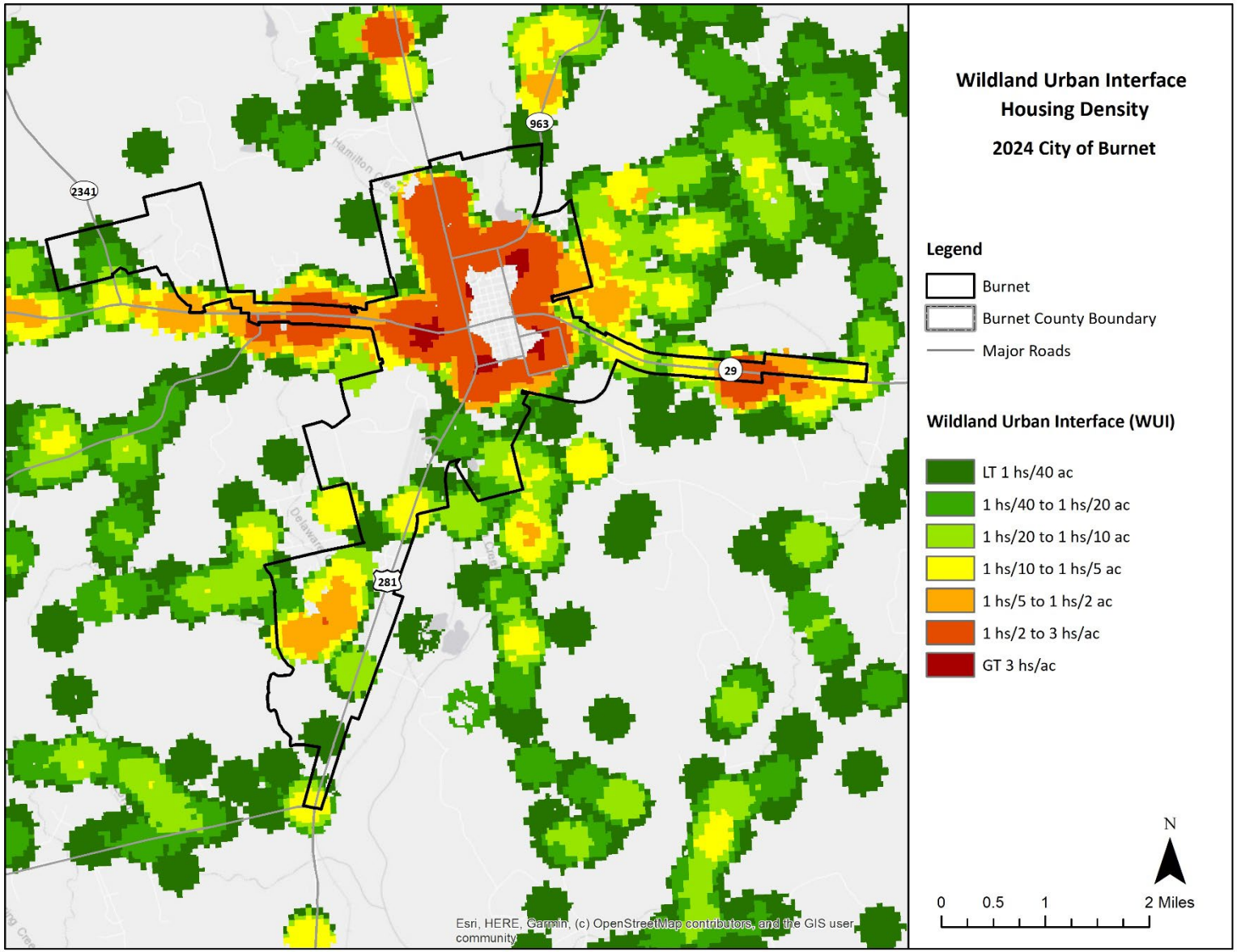

Figure 25: City of Burnet Wildland Urban Interface

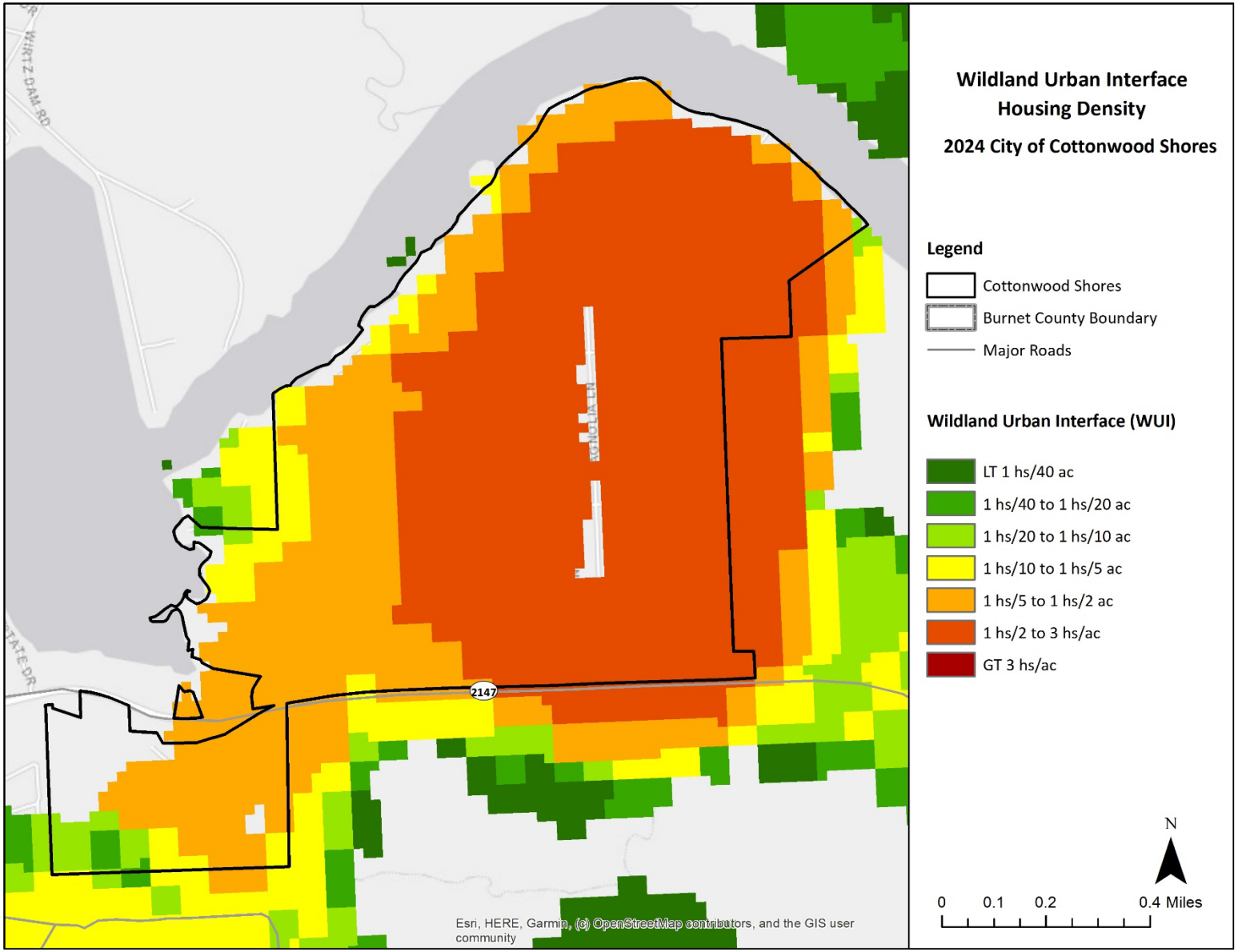

Figure 26: City of Cottonwood Shores Wildland Urban Interface

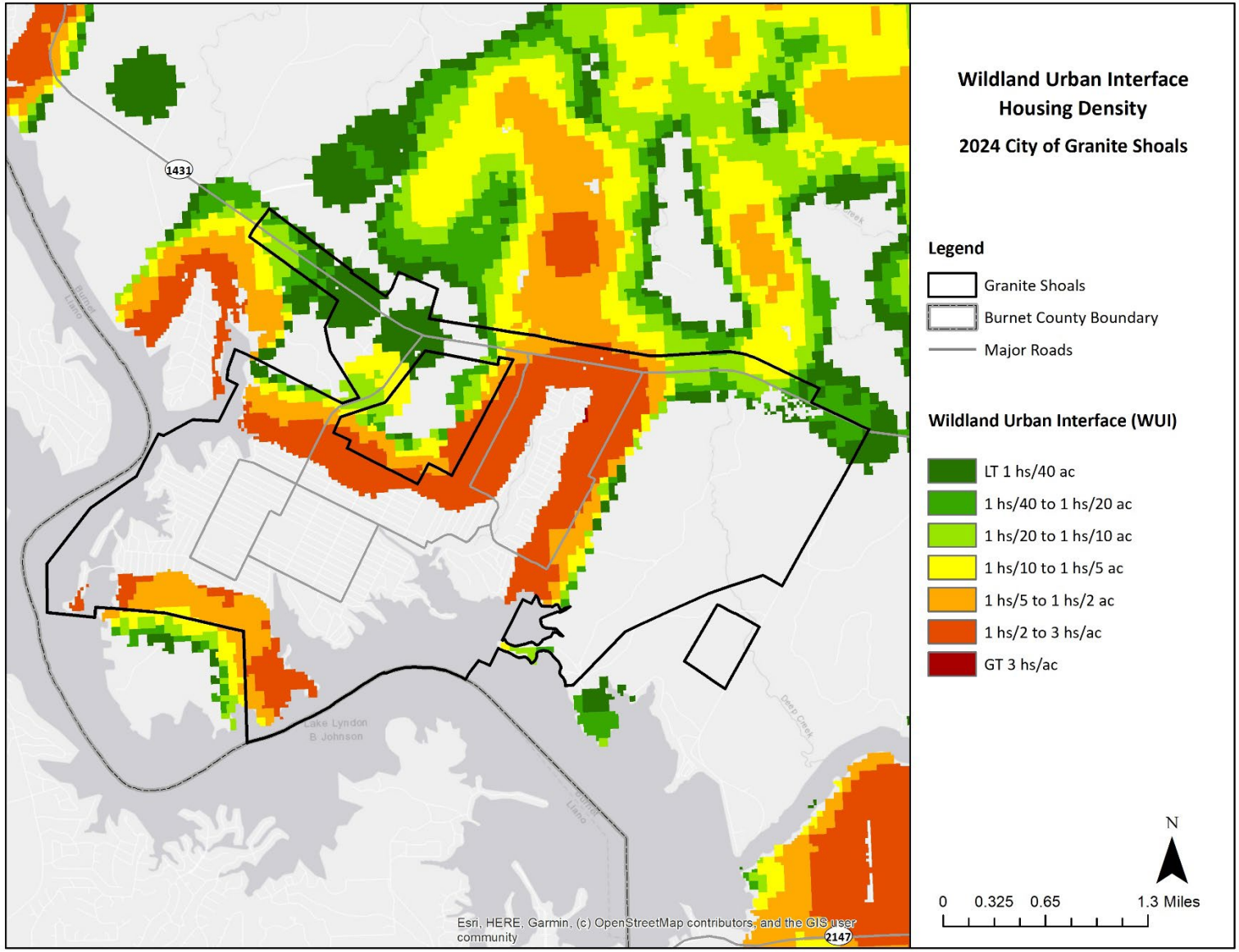

Figure 27: City of Granite Shoals Wildland Urban Interface

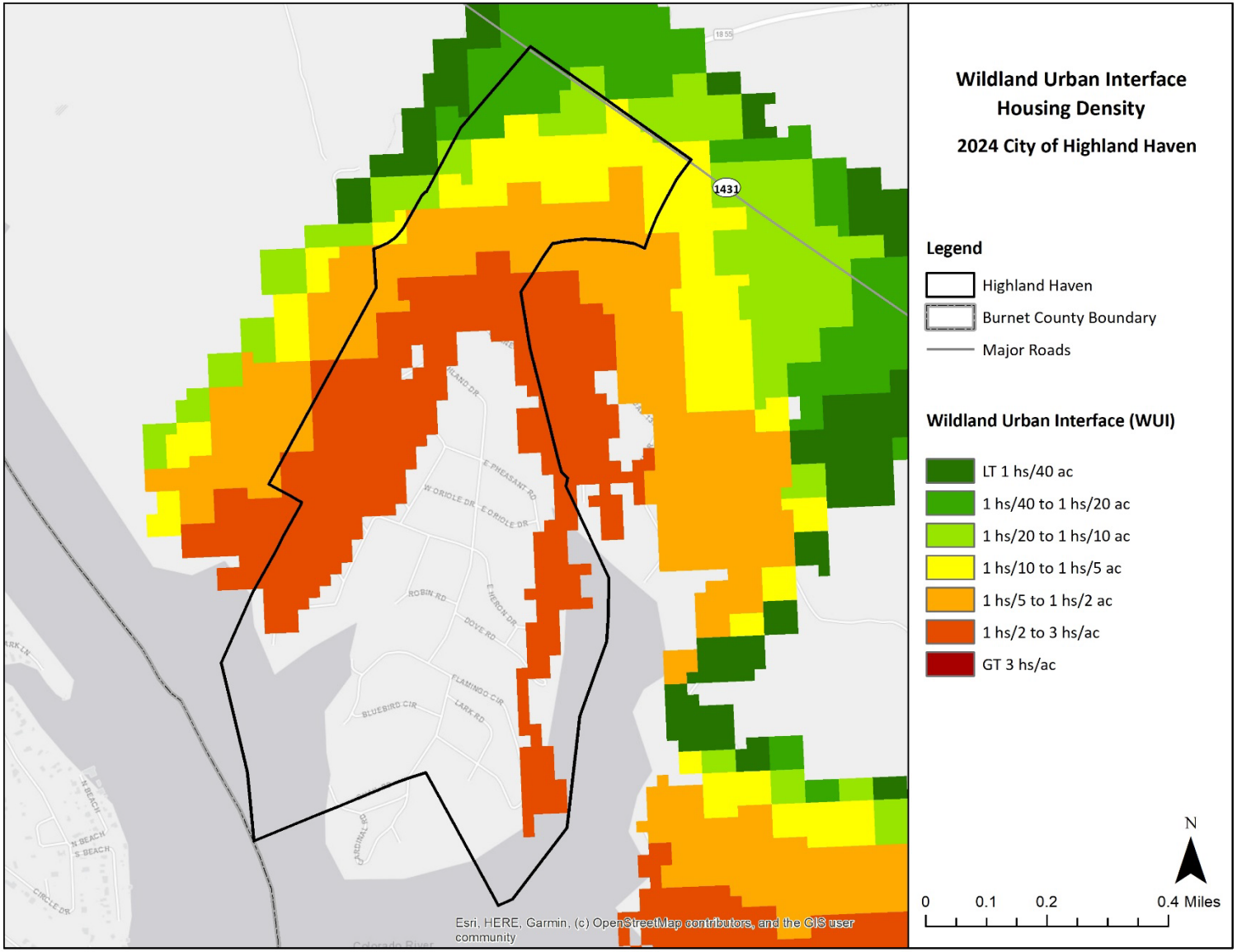

Figure 28: City of Highland Haven Wildland Urban Interface

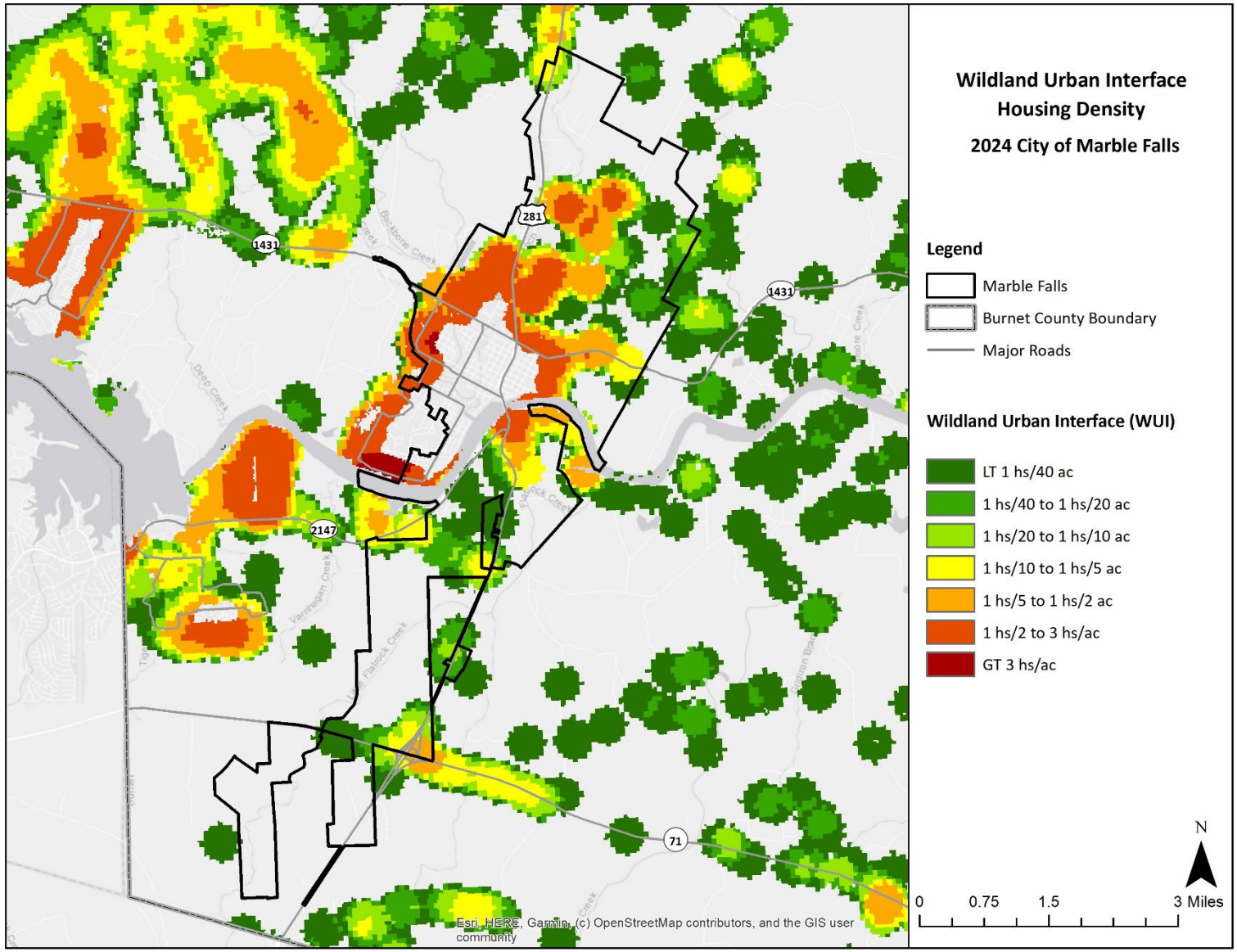

Figure 29: City of Marble Falls Wildland Urban Interface

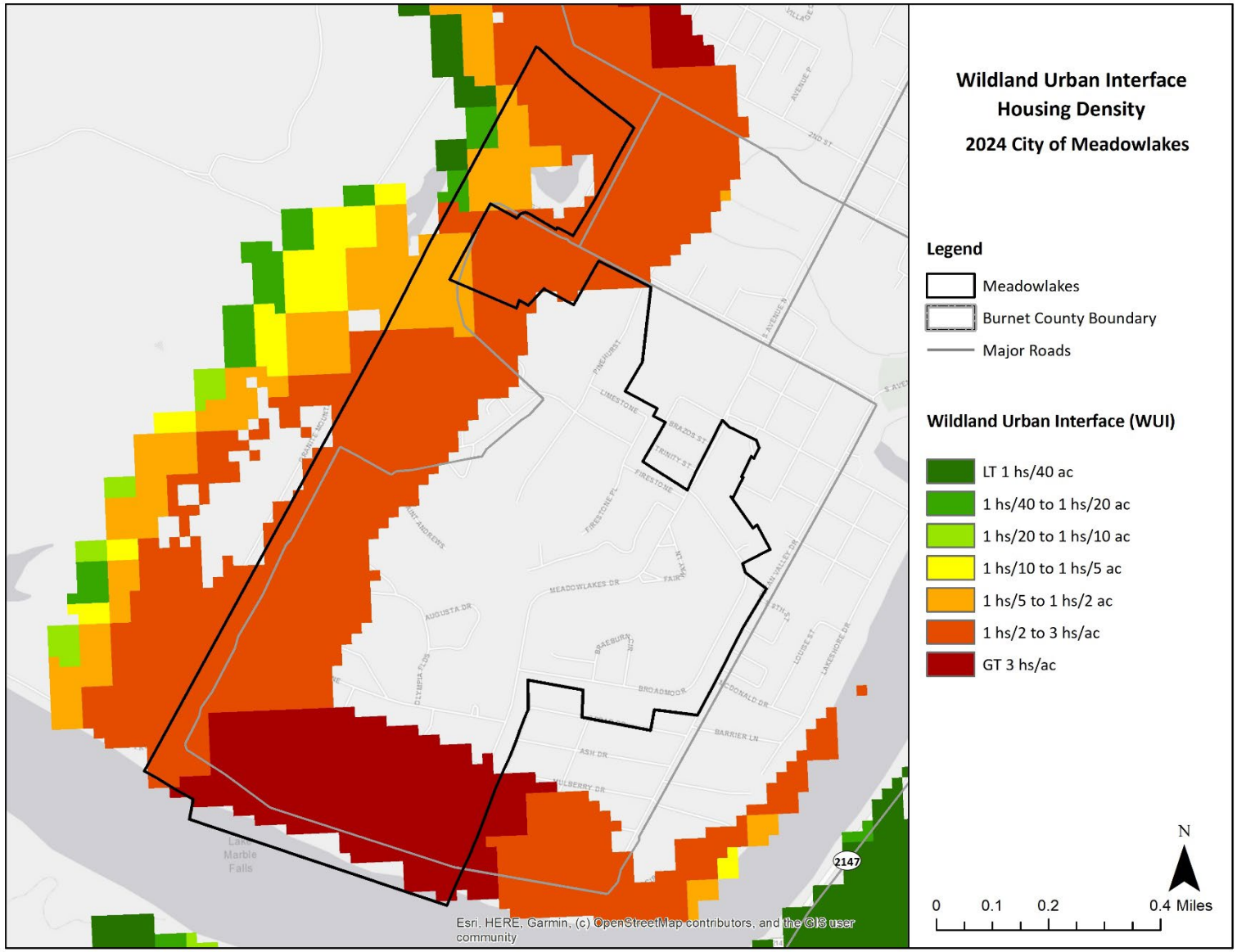

Figure 30: City of Meadowlakes Wildland Urban Interface

B) Impact

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

5) Vulnerability

A) Population

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

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

Residents of mobile homes, specifically those built before HUD's Manufactured Housing and Standards requirements were introduced in 1976, are of particular concern[18]. These structures are more prone to fire and have a higher incidence of occupant death than modern manufactured homes.

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

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

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

B) Critical Facilities

There are 143 critical facilities located throughout the County and participating jurisdictions. 112 of the 143 critical facilities are located within the wildland urban interface (WUI), as defined by the Texas A&M Forest Service. Because of their location in the WUI, the density of development, and proximity to wildland areas, these facilities are believed to be particularly susceptible to future wildfire threats.

Table 31: Critical Facilities Vulnerable to Wildfire

Jurisdiction	Critical Facilities
Burnet County	3 Courthouse Annexes, 1 Sheriff's Office, 3 Precinct Barns
Bertram	1 City Hall, 1 Police Dept., 1 VFD, 1 Utility Office, 1 School, 1 Library, 3 Lift Stations, 3 Wells, 1 Sewer Treatment Plant
Burnet	1 City Hall, 1 Police Dept., 1 Fire Depts., 3 Schools, 1 Public Works, 1 Hospital, 1 Wastewater Plant
Cottonwood Shores	1 City Hall, 1 Police Dept., 1 VFD, 1 Civic Center, 1 Water Treatment Plant, 1 Water Tower, 5 Lift Stations, 1 Raw Water Pump
Granite Shoals	1 City Hall, 1 Water Towers
Highland Haven	1 City Hall, 1 Community Center, 1 Water Plant, 3 Wells
Marble Falls	1 City Hall, 1 EMS, 1 Fire Dept., 5 Assisted Living Centers, 3 Daycares, 1 Hospital, 12 Lift Stations, 2 Medical Care Centers, 1 Post Office, 1 Public Works, 1 Constable Office, 6 Schools, 1 ISD Bus Storage, 1 Electrical Substation, 1 Booster Station, 3 Grinder Pumps, 5 Water Pump Stations, 1 Raw Water Pump, 2 WW Raw Water Farms, 1 Water Treatment Plant, 1 Wastewater Treatment Plant, 7 Water Towers/Water Storage
Meadowlakes	1 Water Storage Tank, 4 Lift Stations

C) Vulnerable Parcels

Table 32: Parcels Vulnerable to Wildfire

Jurisdiction	Total	Estimated Potential Damage Value
Burnet County	**29,188**	**$ 9,738,124,167**
City of Bertram	836	$231,585,445
City of Burnet	2,426	$22,999,868

City of Cottonwood Shores	1,738	$224,752,778
City of Granite Shoals	2,750	$365,382,858
City of Highland Haven	130	$85,373,949
City of Marble Falls	2,012	$1,079,345,191
City of Meadowlakes	498	$248,798,922

6) Climate Change

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

"Research shows that changes in climate create warmer, drier conditions, leading to longer and more active fire seasons. Increases in temperatures and the thirst of the atmosphere due to climate change have increased aridity of forest fuels during the fire season. These drivers were found to be responsible for over half the observed decrease in the moisture content of fuels in western U.S. forests from 1979 to 2015, and the doubling of forest fire burned area over the period 1984 to 2015. For much of the U.S. West, projections show that an average annual 1 degree C temperature increase would increase the median burned area per year by as much as 600%.[19]

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

6. Tornado

A tornado is defined as a violently rotating column of air touching the ground, usually attached to the base of a thunderstorm.[20] Most of the time, vortices remain suspended in the atmosphere and are visible as a funnel cloud. However, when the lower tip of a vortex touches the ground, the tornado becomes a force of destruction. Tornado strength is currently measured using the Enhanced Fujita (EF) Scale. Like the previously used Fujita scale, the EF Scale uses damage to estimate tornado wind speeds and assign a number between 0 and 5. A rating of EF0 represents minor to no damage whereas a rating of EF5 represents destruction of buildings.

1) Tornado History

The 2017 Burnet County HMAP recorded 33 tornado events throughout the county from 1950 to 2014. Since then, there have been two tornado events throughout the County. According to the best available information, there have been no recorded tornado events in the Cities of Bertram, Burnet, Cottonwood Shores, Granite Shoals, Highland Haven, Meadowlakes in the last 8 years.

Table 33: Burnet County Tornado History

Location	Date Range	Number of Tornados	F / EF Magnitude Range	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	4/6/2018	1	EFU	0	0	$0	$0

Table 34: City of Marble Falls Tornado History

Location	Date Range	Number of Tornados	F / EF Magnitude Range	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Citywide	4/12/2020	1	EF2	0	0	$11,750	$0

2) Likelihood of Future Events

The likelihood of future tornados will be determined in consideration of all tornados in Burnet County. Tornado events in Burnet County are considered an occasional hazard, meaning one is possible in the next five years.

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

3) Extent

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

Table 35: Fujita Scale

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

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

Table 36: Enhanced Fujita Scale[21]

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

The most recent tornados in Burnet County and the participating jurisdictions have been classified as EF2 on the Enhanced Fujita Scale. Burnet County sits within Zone III (200 mph winds) according to the IIBEC's wind speed map[22]. Future tornados in the County and the participating jurisdictions may meet up to EF4 on the Enhanced Fujita Scale.

4) Location and Impact

A) Location

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

B) Impact

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

[21] 2023 State of Texas Hazard Mitigation Plan
[22] https://iibec.org/giving-tornadoes-their-due/

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

5) Vulnerability

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

A) Population

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

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

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

B) Critical Facilities and Infrastructure

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

Table 37: Critical Facilities Vulnerable to Tornados

Jurisdiction	Critical Facilities
Burnet County	1 Courthouse, 3 Courthouse Annexes, 1 Sheriff's Office, 1 County Jail, 1 Health Center, 4 Precinct Barns, 1 EOC, 1 Community Center
Bertram	1 City Hall, 1 Police Dept., 1 VFD, 1 Utility Office, 1 School, 1 Library, 4 Lift Stations, 4 Wells, 1 Sewer Treatment Plant
Burnet	1 City Hall, 1 Police Dept., 2 Fire Depts., 4 Schools, 1 Library, 1 Public Works, 1 Hospital, 1 Community Center, 1 Wastewater Plant
Cottonwood Shores	1 City Hall, 1 Police Dept., 1 VFD, 1 Civic Center, 1 Water Treatment Plant, 1 Water Tower, 5 Lift Stations, 1 Raw Water Pump
Granite Shoals	1 City Hall, 1 Police Dept., 1 Fire Dept., 1 School, 1 Water Plant, 1 Water Intake, 2 Water Towers
Highland Haven	1 City Hall, 1 Community Center, 1 Water Plant, 3 Wells
Marble Falls	1 City Hall, 1 EMS, 1 EOC, 1 Police Dept., 2 Fire Dept., 5 Assisted Living Centers, 1 Church Shelter, 4 Daycares, 1 Hospital, 12 Lift Stations, 3 Medical Care Centers, 1 Post Office, 1 Public Works, 1 Constable Office, 8 Schools, 1 ISD Bus Storage, 1 Electrical Substation, 1 Booster Station, 3 Grinder Pumps, 5 Water Pump Stations, 1 Raw Water Pump, 2 WW Raw Water Farms, 1 Water Treatment Plant, 1 Wastewater Treatment Plant, 7 Water Towers/Water Storage
Meadowlakes	1 City Hall, 1 Water Treatment Plant, 1 Raw Water Intake, 1 Water Storage Tank, 5 Lift Stations, 1 Sewer Treatment Plant

C) Vulnerable Parcels

Table 38: Parcels Vulnerable to Tornados

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Burnet County	**48,733**	**$20,519,129,353**
City of Bertram	879	$247,151,780
City of Burnet	3,203	$1,155,779,759
City of Cottonwood Shores	1,765	$230,580,085
City of Granite Shoals	7,525	$1,413,336,341
City of Highland Haven	378	$276,946,374
City of Marble Falls	3,642	$1,804,753,818
City of Meadowlakes	954	$452,721,225

6) Climate Change

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

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

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

Some studies predict that climate change could provide the opportunity for more severe thunderstorms to form. However, this does not necessarily mean that more tornadoes will occur, especially since only about 20 percent of supercell thunderstorms produce tornadoes."[23]

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

7. Drought

Drought is typically defined as a persistent and abnormal moisture deficiency that creates adverse impacts on vegetation, animals, and the human population.[24]

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

Table 39: Drought Classifications

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

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

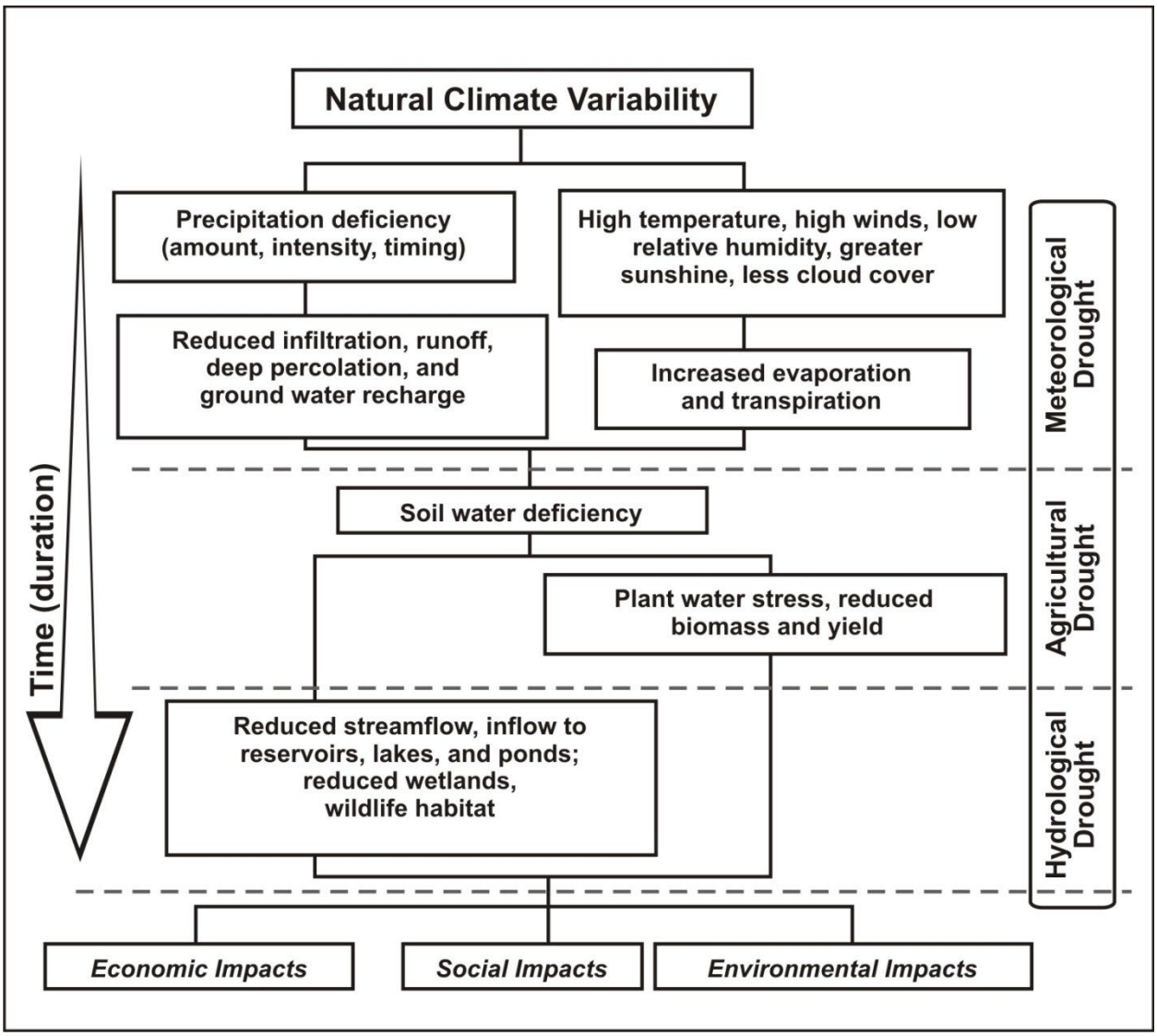

Figure 31: Sequence of Drought Occurrence and Impacts for Commonly Accepted Drought Types[25]

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

1) Drought History[26]

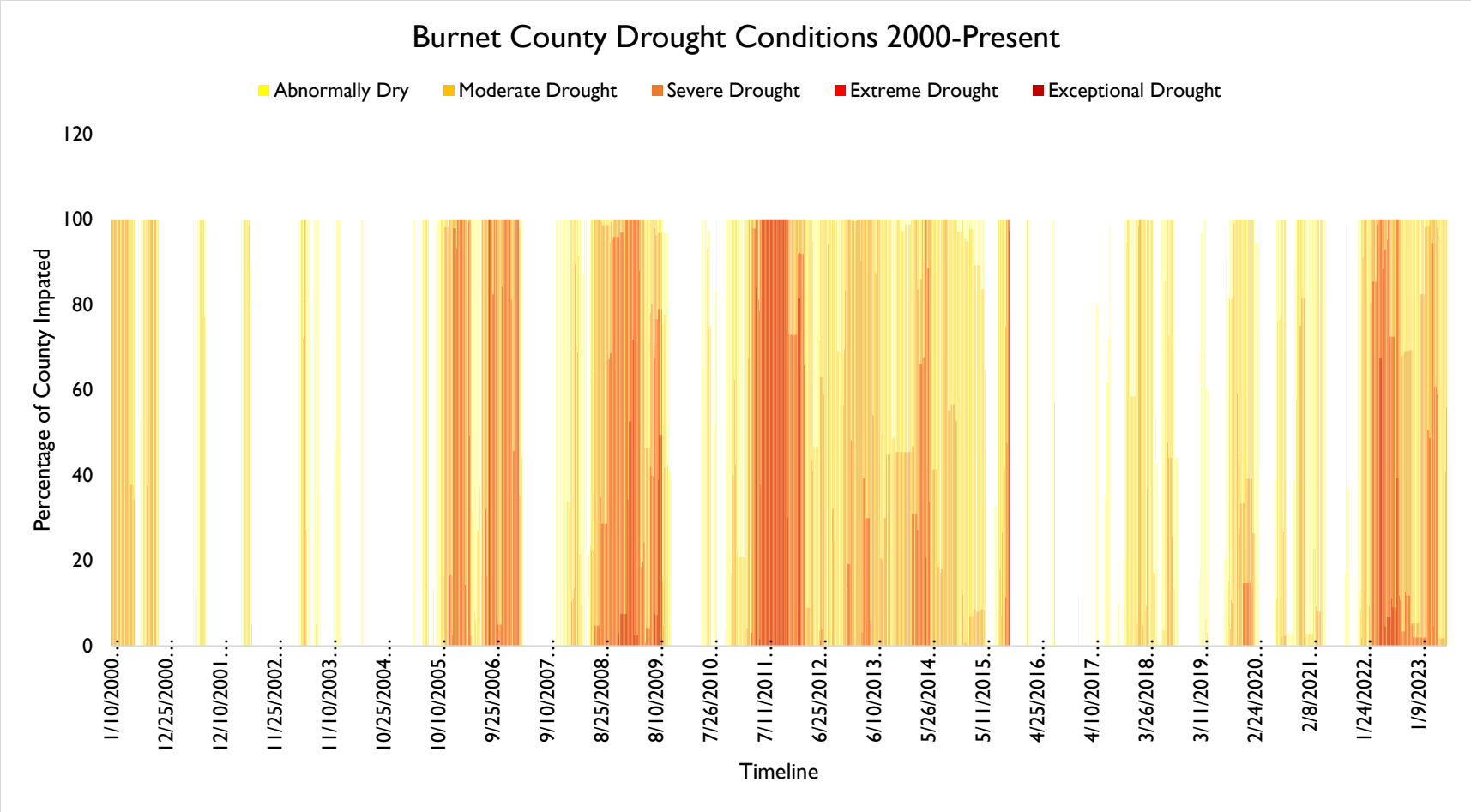

Figure 32: Burnet County Drought History

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

Drought history is recorded at the county level. However, the data is measured by the percentage of the county affected by drought. Although no specific data regarding drought's occurrences in the individual cities is available, it's possible to use the data in Figure 32 to infer when the participating jurisdictions addressing the hazard previously experienced drought conditions due to the fact that the conditions impacted 100% of the county. According to the data, Burnet County and the participating jurisdictions have regularly experienced drought conditions since 2000.

The 2017 Burnet County HMAP previously noted consistent drought occurrences, with severe drought records occurring during 2010-2011 and 2012-2015. Since then, there have been 27 more drought events recorded by the National Oceanic and Atmospheric Administration (NOAA) as seen in the table below. Furthermore, data from the Drought Monitor shows that Burnet County and the participating jurisdictions have experienced drought conditions on a nearly annual basis since 2000.

Table 40: Burnet County Drought History

Location	Date Range	Number of Drought Events	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	1/30/2017 – 3/1/2023	27	0	0	$0	$0

2) Likelihood of Future Events

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

3) Extent

Since 2000, Burnet County has regularly experienced county-wide droughts classified as periods ranging from abnormal dryness to exceptional drought. Between 2010 and 2011, the entire County, including all participating jurisdictions, was in a state of extreme or exceptional drought, the most severe drought categories.

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

Table 41: Palmer Drought Index

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

Table 42: Palmer Drought Category Descriptions[27]

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

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

Based on the historical occurrences of drought, Burnet County and all participating jurisdictions should anticipate experiencing droughts ranging from abnormally dry to exceptional drought or

[27] www.droughtmonitor.unl.edu

D0 to D4 based on the Palmer Drought Category. Given varying conditions, droughts may start on the low end of the Index but will intensify with duration and ongoing lack of precipitation. Future drought events may reach the intensity of D4 on the Palmer Drought Index.

4) Location and Impact

A) Location

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

B) Impact

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

Burnet County does not have a Drought Contingency Plan. The Cities of Bertram, Burnet, Cottonwood Shores, Granite Shoals, Highland Haven, Marble Falls, and Meadowlakes all have adopted and enforced Drought Contingency Plans.

5) Vulnerability

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

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

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

A) Population

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

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

B) Critical Facilities

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

Table 43: Critical Facilities Vulnerable to Drought

Jurisdiction	Critical Facilities
Burnet County	1 Courthouse, 3 Courthouse Annexes, 1 Sheriff's Office, 1 County Jail, 1 Health Center, 4 Precinct Barns, 1 EOC, 1 Community Center
Bertram	1 City Hall, 1 Police Dept., 1 VFD, 1 Utility Office, 1 School, 1 Library, 4 Lift Stations, 4 Wells, 1 Sewer Treatment Plant
Burnet	1 City Hall, 1 Police Dept., 2 Fire Depts., 4 Schools, 1 Library, 1 Public Works, 1 Hospital, 1 Community Center, 1 Wastewater Plant
Cottonwood Shores	1 City Hall, 1 Police Dept., 1 VFD, 1 Civic Center, 1 Water Treatment Plant, 1 Water Tower, 5 Lift Stations, 1 Raw Water Pump
Granite Shoals	1 City Hall, 1 Police Dept., 1 Fire Dept., 1 School, 1 Water Plant, 1 Water Intake, 2 Water Towers
Highland Haven	1 City Hall, 1 Community Center, 1 Water Plant, 3 Wells
Marble Falls	1 City Hall, 1 EMS, 1 EOC, 1 Police Dept., 2 Fire Dept., 5 Assisted Living Centers, 1 Church Shelter, 4 Daycares, 1 Hospital, 12 Lift Stations, 3 Medical Care Centers, 1 Post Office, 1 Public Works, 1 Constable Office, 8 Schools, 1 ISD Bus Storage, 1 Electrical Substation, 1 Booster Station, 3 Grinder Pumps, 5 Water Pump Stations, 1 Raw Water Pump, 2 WW Raw Water Farms, 1 Water Treatment Plant, 1 Wastewater Treatment Plant, 7 Water Towers/Water Storage
Meadowlakes	1 City Hall, 1 Water Treatment Plant, 1 Raw Water Intake, 1 Water Storage Tank, 5 Lift Stations, 1 Sewer Treatment Plant

C) Vulnerable Parcels

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

Table 44: Parcels Vulnerable to Drought

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Burnet County	**48,733**	**$20,519,129,353**
City of Bertram	879	$247,151,780
City of Burnet	3,203	$1,155,779,759
City of Cottonwood Shores	1,765	$230,580,085
City of Granite Shoals	7,525	$1,413,336,341
City of Highland Haven	378	$276,946,374
City of Marble Falls	3,642	$1,804,753,818
City of Meadowlakes	954	$452,721,225

6) Climate Change

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

"As average temperatures have risen because of climate change, the Earth's water cycle has sped up through an increase in the rate of evaporation from soil and transpiration from plants. An increase in evapotranspiration makes more water available in the air for precipitation, but contributes to drying over some land areas, leaving less moisture in the soil. As the climate continues to change, many historically wet areas are likely to experience increased precipitation and increased risk of flooding, while historically dry areas are likely to experience less precipitation and increased risk of drought."[28]

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

8. Extreme Heat

The National Weather Service criteria for an excessive heat warning is a heat index of 105 °F or greater that will last for 2 hours or more. In extreme heat your body works extra hard to maintain a normal temperature, which can lead to death. Extreme heat is responsible for the highest number of annual deaths among all weather-related hazards.[29] Humid conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground.

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

Severe summer heat is an invisible killer. Although a heat wave does not happen with the spectacle of other hazards such as tornados and floods, the National Center for Environmental Health reports that extreme heat caused 7,415 heat-related deaths in the United States from 1999 to 2010[30]. Extreme heat kills more people than hurricanes, floods, tornados, and lightning combined, according to the National Weather Service. In 2001, 300 deaths were caused by excessive heat exposure.

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

1) Extreme Heat History

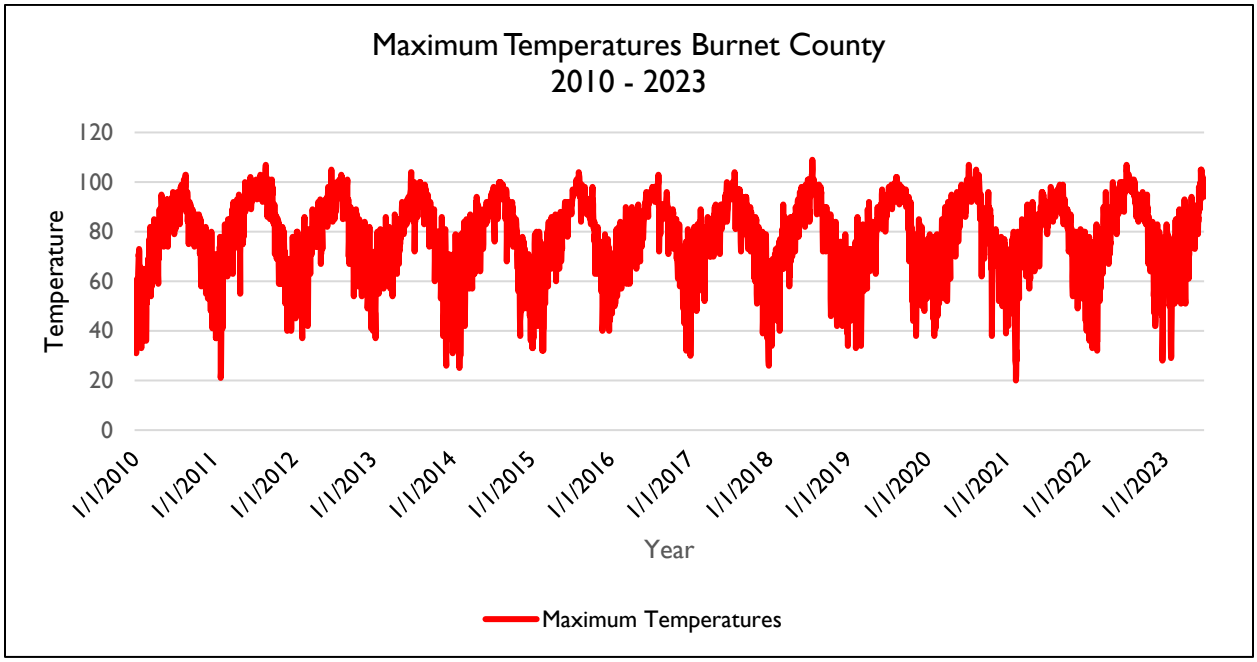

Figure 33: Maximum Recorded Daily Temperature 2000-2023[31]

In the 2017 HMAP, Burnet County did not profile extreme heat as a standalone hazard, rather it was combined with drought.

Between 2010 to 2023, Burnet County and the participating jurisdictions experienced 148 days with a maximum temperature of 100˚F or hotter and 286 days where the combination of humidity and moderate-to-high temperatures warranted a heat advisory, if not an extreme heat warning.

Extreme heat data is recorded at the county level. However, given the nature of extreme heat and the proximity of all jurisdictions to each other, it is assumed that all jurisdictions experienced the same extreme heat events. The NCEI database recorded 3 events from 2010 – 2023, however based on recorded daily temperatures from the NOAA Climate Data Center, it is clear that many events have gone unreported.

Table 45: Burnet County Extreme Heat History

Location	Date Range	Number of Extreme Heat Events	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	8/09/2011 – 7/13/2020	3	1	0	$0	$0

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

2) Likelihood of Future Events

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

3) Extent

The magnitude or intensity of an extreme heat event is measured according to temperature in relation to the percentage of humidity. According to the National Oceanic Atmospheric Administration (NOAA), this relationship is referred to as the "Heat Index," and is depicted in Figure 34. This index measures how hot it feels outside when humidity is combined with high temperatures.

NOAA's National Weather Service

Heat Index

Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Figure 34: NOAA's NWS Heat Index Chart[32]

The extent scale in Figure 34 displays varying degrees of caution depending on the relative humidity combined with the temperature. For example, when the temperature is below 90˚F, caution should be exercised if the humidity level is at or above 40 percent.

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

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

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

The National Weather Service (NWS) initiates alerts based on the Heat Index Intensity as shown in Table 46.

Table 46: Heat Index Intensity

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

Given an estimated daily average relative humidity level of 75%[33], highs as low as 89˚F can produce a heat index temperature of 106˚F. The combination of high humidity and moderate temperatures creates an environment that reaches the Danger Zone on NOAA's Heat Index Chart and may trigger an NWS Heat Advisory.

Between 2010 and 2023 Burnet County and the participating jurisdictions experienced 286 days with highs of 89˚F or hotter and overnight lows of 75˚F or hotter. Based on the NWS descriptions in Table 46 above, and the average daily humidity level, these days likely warranted a heat advisory.

The hottest temperature recorded in Burnet County in the recent past, 109˚F, was reached on July 23, 2018. Based on the NWS descriptions in Table 46 above, at least 10 of the 286 heat advisory days warranted an excessive heat warning based on daytime highs, the average daily humidity level, and overnight lows not falling below 80˚F.

Future extreme heat events may meet the heat index requirements for issuing an Excessive Heat Warning as described in the Heat Intensity scale in Table 46 above. The hottest temperatures in Burnet County and the participating jurisdictions may meet or exceed the current record temperature of 109˚F. Future extreme heat events may be as intense, long-lasting, and dangerous as previous ones.

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

4) Location and Impact

A) Location

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

B) Impact

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

5) Vulnerability

A) Population

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

B) Critical Facilities

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

Table 47: Critical Facilities Vulnerable to Extreme Heat

Jurisdiction	Critical Facilities
Burnet County	1 Courthouse, 3 Courthouse Annexes, 1 Sheriff's Office, 1 County Jail, 1 Health Center, 4 Precinct Barns, 1 EOC, 1 Community Center
Bertram	1 City Hall, 1 Police Dept., 1 VFD, 1 Utility Office, 1 School, 1 Library, 4 Lift Stations, 4 Wells, 1 Sewer Treatment Plant
Burnet	1 City Hall, 1 Police Dept., 2 Fire Depts., 4 Schools, 1 Library, 1 Public Works, 1 Hospital, 1 Community Center, 1 Wastewater Plant
Cottonwood Shores	1 City Hall, 1 Police Dept., 1 VFD, 1 Civic Center, 1 Water Treatment Plant, 1 Water Tower, 5 Lift Stations, 1 Raw Water Pump
Granite Shoals	1 City Hall, 1 Police Dept., 1 Fire Dept., 1 School, 1 Water Plant, 1 Water Intake, 2 Water Towers
Highland Haven	1 City Hall, 1 Community Center, 1 Water Plant, 3 Wells
Marble Falls	1 City Hall, 1 EMS, 1 EOC, 1 Police Dept., 2 Fire Dept., 5 Assisted Living Centers, 1 Church Shelter, 4 Daycares, 1 Hospital, 12 Lift Stations, 3 Medical Care Centers, 1 Post Office, 1 Public Works, 1 Constable Office, 8 Schools, 1 ISD Bus Storage, 1 Electrical Substation, 1 Booster Station, 3 Grinder Pumps, 5 Water Pump Stations, 1 Raw Water Pump, 2 WW Raw Water Farms, 1 Water Treatment Plant, 1 Wastewater Treatment Plant, 7 Water Towers/Water Storage
Meadowlakes	1 City Hall, 1 Water Treatment Plant, 1 Raw Water Intake, 1 Water Storage Tank, 5 Lift Stations, 1 Sewer Treatment Plant

6) Climate Change

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

"Record-setting daily temperatures, heat waves, and cold spells are a natural part of day-to-day variation in weather. As the Earth's climate warms overall, however, heat waves are expected to become more frequent and more intense. Higher heat index values (which combine temperature and humidity to describe perceived temperature) are expected to increase discomfort and aggravate health issues."[34]

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

9. Extreme Cold

Extreme cold can happen anywhere in the state, although its levels can range extensively. In the panhandle extreme cold means days below zero Fahrenheit while in the Rio Grande Valley it means reaching temperatures below freezing. [35] Extreme cold is an issue any time winter temperatures drop significantly below normal and make staying warm and safe a challenge.

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

1) Extreme Cold History

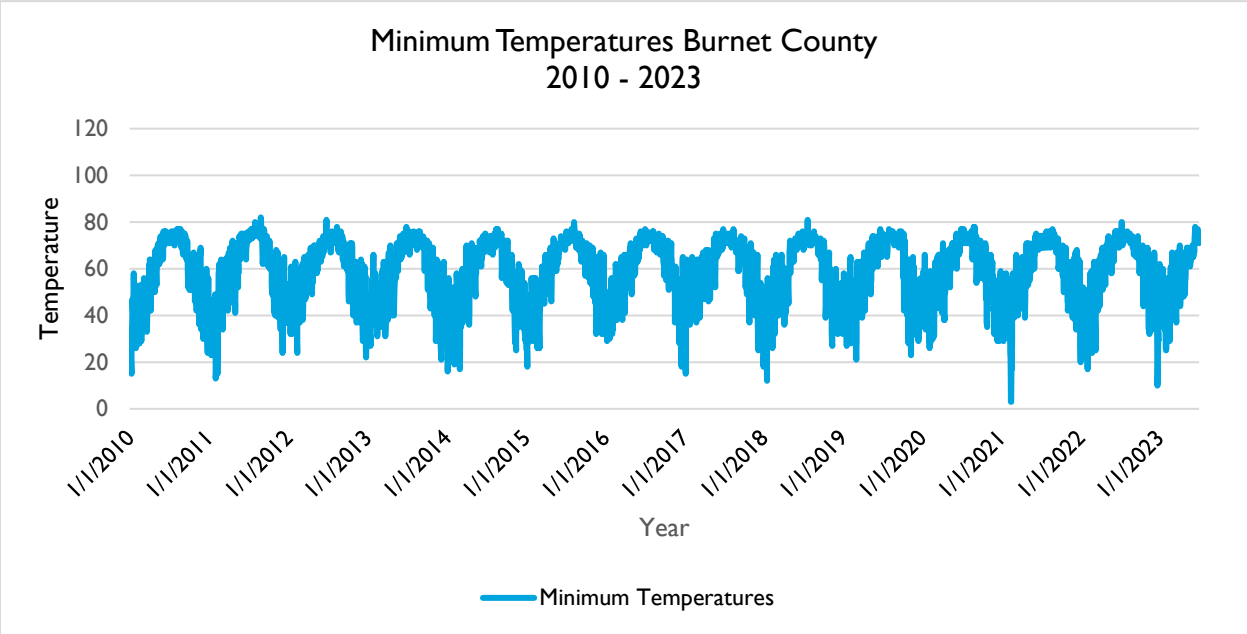

Figure 35: Minimum Recorded Daily Temperature 2000-2023.[36]

Burnet County and the jurisdictions addressing the hazard have not previously included extreme cold in their mitigation plan as a standalone hazard. Prior to the 2018 update of the State of Texas Mitigation Plan, extreme cold was considered part of the severe winter storm hazard.

Between 2010 and 2023, Burnet County experienced 264 days with a minimum temperature of 32˚F or colder. At least 27 of those days had a maximum temperature of 32˚F or below. During the same timeframe, the coldest temperature recorded was 3˚F on February 15 - 16, 2021. Temperature data is recorded at the county level. However, given the nature of extreme cold and the proximity of all jurisdictions to each other, the jurisdictions addressing the hazard

[35] 2023 State of Texas Hazard Mitigation Plan
[36] Source: National Centers for Environmental Information, https://www.ncdc.noaa.gov/cdo-web/datasets

experienced the same extreme cold events. The following table shows the only events recorded in the NCEI database from 2010 – 2023, however based on recorded daily temperatures from the NOAA Climate Data Center, it is clear that many events have gone unreported.

Table 48: Burnet County Extreme Cold History

Location	Date Range	Number of Extreme Cold Events	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	2/15/2021 – 12/22/2022	2	0	0	$0	0

During these extreme cold events, the County and participating jurisdictions experienced freezing temperatures with long durations of cold spells leading to power outages and issues with water pressures. The risk of frozen pipe bursts is high for homes and critical facilities.

2) Likelihood of Future Occurrence

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

3) Extent

The magnitude or intensity of an extreme cold event is measured according to temperature in relation to wind speed. The relationship is referred to as the "Wind Chill," and is depicted in Figure 36.

Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph) *Effective 11/01/01*

Figure 36: NOAA's NWS Wind Chill Index

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

The coldest temperatures in Burnet County and the participating jurisdictions may meet the current record temperature of 3˚F. Future extreme cold events may be as intense, long-lasting, and dangerous as previous ones.

4) Location and Impact

A) Location

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

B) Impact

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

5) Vulnerability

A) Population

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

B) Critical Facilities

While all the jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not considered vulnerable to damages significant enough to interrupt or stop normal operations. However, damage to existing buildings and infrastructure, caused by winter weather and extreme cold in recent years, has shown exceptions to long held assumptions about the threat of these hazards. Therefore, all critical facilities are potentially vulnerable to the impacts noted in Section 4B of this chapter.

Table 49: Critical Facilities Vulnerable to Extreme Cold

Jurisdiction	Critical Facilities
Burnet County	1 Courthouse, 3 Courthouse Annexes, 1 Sheriff's Office, 1 County Jail, 1 Health Center, 4 Precinct Barns, 1 EOC, 1 Community Center
Bertram	1 City Hall, 1 Police Dept., 1 VFD, 1 Utility Office, 1 School, 1 Library, 4 Lift Stations, 4 Wells, 1 Sewer Treatment Plant
Burnet	1 City Hall, 1 Police Dept., 2 Fire Depts., 4 Schools, 1 Library, 1 Public Works, 1 Hospital, 1 Community Center, 1 Wastewater Plant
Cottonwood Shores	1 City Hall, 1 Police Dept., 1 VFD, 1 Civic Center, 1 Water Treatment Plant, 1 Water Tower, 5 Lift Stations, 1 Raw Water Pump
Granite Shoals	1 City Hall, 1 Police Dept., 1 Fire Dept., 1 School, 1 Water Plant, 1 Water Intake, 2 Water Towers
Highland Haven	1 City Hall, 1 Community Center, 1 Water Plant, 3 Wells
Marble Falls	1 City Hall, 1 EMS, 1 EOC, 1 Police Dept., 2 Fire Dept., 5 Assisted Living Centers, 1 Church Shelter, 4 Daycares, 1 Hospital, 12 Lift Stations, 3 Medical Care Centers, 1 Post Office, 1 Public Works, 1 Constable Office, 8 Schools, 1 ISD Bus Storage, 1 Electrical Substation, 1 Booster Station, 3 Grinder Pumps, 5 Water Pump Stations, 1 Raw Water Pump, 2 WW Raw Water Farms, 1 Water Treatment Plant, 1 Wastewater Treatment Plant, 7 Water Towers/Water Storage
Meadowlakes	1 City Hall, 1 Water Treatment Plant, 1 Raw Water Intake, 1 Water Storage Tank, 5 Lift Stations, 1 Sewer Treatment Plant

6) Climate Change

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

"Stretching of the Arctic polar vortex—a strong band of winds in the stratosphere surrounding the North Pole— has increased with Arctic amplification and is linked with extreme cold across parts of Asia and North America. Climate change is favorable for increasing Arctic polar vortex stretching events.[37] When the Arctic polar vortex is strong and stable, the polar air remains in place over the North Pole; when the polar vortex weakens or stretches, extremely cold air can dip south. Results show that stronger Arctic polar vortex conditions are decreasing infrequency, while weaker Arctic polar vortex conditions and stretching disruptions are increased in frequency for October through February." [38]

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

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

10. Hailstorm

Hail is a form of solid precipitation. Hailstones are formed when raindrops are carried upward by thunderstorm updrafts into extremely cold areas of the atmosphere and freeze. Hailstones then grow by colliding with liquid water drops that freeze onto the hailstone's surface. The hail falls when the thunderstorm's updraft can no longer support the weight of the hailstone, which can occur if the stone becomes large enough or the updraft weakens. The fall speed of hail primarily depends on the size of the hailstone, the friction between the hailstone and surrounding air, the local wind conditions (both horizontal and vertical), and the degree of melting of the hailstone. For small hailstones smaller than 1-inch in diameter, the expected fall speed is between 9 and 25 mph. Hailstones 1-inch to 1.75 inches in size typically associated with a severe thunderstorm can have an expected fall speed between 25 and 40 mph. In the strongest supercells 2 to 4-inch hail can be produced with an anticipated fall speed between 44 and 72 mph. However, fall speeds fluctuate due to variations in the hailstone's shape, degree of melting, fall orientation, and the environmental conditions. It is possible for very large hailstones, exceeding 4-inches in diameter, to fall at over 100 mph.[39]

1) Hailstorm History

The 2017 Burnet County HMAP recorded 115 hail events between 1960 and 2014 that ranged from .75" and 2.75" in diameter. According to the best information available, there have been 42 hail events throughout the County since 2014. There have been no hail events in the City of Cottonwood Shores, City of Meadowlakes, or City of Highland Haven since 2016. There have not been any recorded hailstorms in any participating jurisdiction since March 2023.

Table 50: Burnet County Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	3/18/2016 – 3/16/2023	29	.75 – 1.75	0	0	$5,612	$0

Table 51: City of Bertram Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Citywide	5/15/2018 – 4/15/2021	4	.88 – 2.75	0	0	$2,245	$0

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

Table 52: City of Burnet Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Citywide	3/18/2016 – 5/17/2021	7	.88 – 2.5	0	0	$0	$0

Table 53: City of Granite Shoals Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Citywide	4/13/2018	1	1	0	0	$0	$0

Table 54: City of Marble Falls Hailstorm History

Location	Date Range	Number of Hailstorms	Hail Diameter in inches	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Citywide	3/21/2022	1	.75	0	0	$0	$0

2) Likelihood of Future Events

Based on history, a hailstorm in Burnet County and the participating jurisdictions is highly likely, meaning that an event is probable within the next year.

3) Extent

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

When hail breaks windows, water damage from accompanying rains can also be significant. A major hailstorm can easily cause damage running into the millions of dollars. Nationwide hail is responsible for over $1 billion in property and crop damage per year. The scale showing intensity categories in Table 40 was developed by combining data from National Climatic Data Center (NCDC) and the Tornado and Storm Research Organization (TORRO).

Table 55: Hailstorm Intensity[40,41]

Size Code	Intensity Category	Size (Diameter in inches)	Descriptive Term	Typical Damage
H0	Hard Hail	Up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33-.060	Mothball	Slight damage to plants and crops
H2	Significant	.060-.080	Penny	Significant damage to fruit, crops, and vegetation
H3	Severe35F[42]	0.80-1.20	Nickel – Half dollar	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	1.2-1.6	Half dollar – Ping pong ball	Widespread glass damage and vehicle bodywork damage
H5	Destructive	1.6-2.0	Ping pong ball – hen egg	Wholesale destruction of glass, damage to tiled roofs, and significant risk of injuries
H6	Destructive	2.0-2.4	Hen egg – tennis ball	Bodywork of grounded aircraft dented, and brick walls pitted
H7	Destructive	2.4-3.0	Tennis ball – Baseball	Severe roof damage and risk of serious injuries
H8	Destructive	3.0-3.5	Hockey puck	Severe damage to aircraft bodywork
H9	Super Hailstorms	3.5-4.0	Softball	Extensive structural damage could cause fatal injuries
H10	Super Hailstorms	4.0+	Greater than softball-sized	Extensive structural damage could cause fatal injuries

According to NCEI data, the worst hailstorms in Burnet County and the participating jurisdictions have produced hail up to 2.75” in diameter, H7 on the Hailstorm Intensity Scale.

Future hailstorms may meet previous worst-case H7 storms in terms of strength, intensity, hailstone size, damage dollars inflicted, and the number of residents injured or killed.

4) Location and Impact

A) Location

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

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

B) Impact

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

5) Vulnerability

A) Population

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

Since hailstorms arise with little to no warning, the participating jurisdictions recognize that vulnerable populations may primarily need additional help recovering from a hailstorm. Residents of sub-standard structures are of particular concern. Structures in sub-standard condition ahead of a hailstorm, whether due to structural damage, missing windows or doors, holes in exterior walls or the roof, may sustain more damage than structures in standard condition. Existing weaknesses, especially those related to the condition of a structure's roof, due to housing type or existing damages, may lead to compounded damage, injuries, or loss of life.

B) Critical Facilities

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

Table 56: Critical Facilities Vulnerable to Hailstorms

Jurisdiction	Critical Facilities
Burnet County	1 Courthouse, 3 Courthouse Annexes, 1 Sheriff's Office, 1 County Jail, 1 Health Center, 4 Precinct Barns, 1 EOC, 1 Community Center
Bertram	1 City Hall, 1 Police Dept., 1 VFD, 1 Utility Office, 1 School, 1 Library, 4 Lift Stations, 4 Wells, 1 Sewer Treatment Plant
Burnet	1 City Hall, 1 Police Dept., 2 Fire Depts., 4 Schools, 1 Library, 1 Public Works, 1 Hospital, 1 Community Center, 1 Wastewater Plant
Cottonwood Shores	1 City Hall, 1 Police Dept., 1 VFD, 1 Civic Center, 1 Water Treatment Plant, 1 Water Tower, 5 Lift Stations, 1 Raw Water Pump

Granite Shoals	1 City Hall, 1 Police Dept., 1 Fire Dept., 1 School, 1 Water Plant, 1 Water Intake, 2 Water Towers
Highland Haven	1 City Hall, 1 Community Center, 1 Water Plant, 3 Wells
Marble Falls	1 City Hall, 1 EMS, 1 EOC, 1 Police Dept., 2 Fire Dept., 5 Assisted Living Centers, 1 Church Shelter, 4 Daycares, 1 Hospital, 12 Lift Stations, 3 Medical Care Centers, 1 Post Office, 1 Public Works, 1 Constable Office, 8 Schools, 1 ISD Bus Storage, 1 Electrical Substation, 1 Booster Station, 3 Grinder Pumps, 5 Water Pump Stations, 1 Raw Water Pump, 2 WW Raw Water Farms, 1 Water Treatment Plant, 1 Wastewater Treatment Plant, 7 Water Towers/Water Storage
Meadowlakes	1 City Hall, 1 Water Treatment Plant, 1 Raw Water Intake, 1 Water Storage Tank, 5 Lift Stations, 1 Sewer Treatment Plant

C) Vulnerable Parcels

Table 57: All Parcels Vulnerable to Hailstorms

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Burnet County	**48,733**	**$20,519,129,353**
City of Bertram	879	$247,151,780
City of Burnet	3,203	$1,155,779,759
City of Cottonwood Shores	1,765	$230,580,085
City of Granite Shoals	7,525	$1,413,336,341
City of Highland Haven	378	$276,946,374
City of Marble Falls	3,642	$1,804,753,818
City of Meadowlakes	954	$452,721,225

6) Climate Change

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

"As a result of anthropogenic warming, it is generally anticipated that low-level moisture and convective instability will increase, raising hailstorm likelihood and enabling the formation of larger hailstones; the melting height will rise, enhancing hail melt and increasing the average size of surviving hailstones."[43]

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

11. Winter Storm

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

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

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

An ice storm occurs when rain falls out of the warm upper layers of the atmosphere into a cold and dry layer near the ground. The rain freezes on contact with the cold ground and accumulates on exposed surfaces. Damage can occur with half an inch of rain freezing on trees and utility wires; the damage increases if there are high winds. Based on this, an icing event is categorized an ice storm at half an inch.[44]

1) Winter Storm History

In the 2017 HMAP, Burnet County and the participating jurisdictions reported 11 severe winter storm events between 1996 and 2013.

The table below represents all winter storm events reported since the 2017 HMAP. Winter storms were reported at the county level only; however, it is safe to assume the participating jurisdictions also experienced the same events as the County.

Table 58: Burnet County Winter Storm History

Location	Date Range	Number of Severe Winter Storms	Winter Storm Types	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	1/9/2015 – 2/1/2023	15	Winter Weather, Winter Storm	0	0	$1,005,612	$0

[44] 2023 State of Texas Hazard Mitigation Plan

2) Likelihood of Future Events

Future winter storms in Burnet County and the participating jurisdictions are considered likely due to the significant impacts of historic winter storms, meaning an event affecting any or all participating jurisdictions is probable in the next three years.

3) Extent

The table below displays the magnitude of severe winter storms.

Table 59: Winter Weather Extent Scale[45]

Frost Advisory*	Issued when nighttime minimum temperatures are expected to range from 33°F to 36°F in the growing season.
Freeze Warning*	Issued when nighttime minimum temperatures are expected to reach 32°F or lower in the growing season. They are usually issued to highlight the first few freezes of the fall or unusually late freezes in the spring. *A Freeze Watch is issued when these conditions may be met 12 to 48 hours in the future.*
Snow Advisory	Issued when accumulating snow of 2 to 4 inches is expected. An advisory may still be warranted if lesser accumulations will produce travel difficulties, especially early in the winter season.
Blowing Snow Advisory	Issued when blowing snow is expected to occasionally reduce visibilities to 1/4 mile or less with winds generally 25 to 34 mph. The event should last at least 3 hours.
Snow and Blowing Snow Advisory	Issued when winds of 25 to 34 mph are expected to be accompanied by falling snow and blowing snow, occasionally reducing the visibility to 1/4 mile or less. The event should last at least 3 hours
Freezing Rain / Drizzle Advisory	Issued for freezing rain when ice accumulations are expected to cause travel problems, but not exceed 1/4".
Sleet Advisory	Issued for accumulating sleet of 1/4" to 1". Because sleet usually occurs with other precipitation types, a winter weather advisory will almost always be used in such cases.
Winter Weather Advisory	Issued for a winter weather event in which there is more than one hazard present, but all precipitation is expected to remain below warning criteria. For example, it would be issued if 2 inches of snow were expected with a small amount of sleet mixing in at times.
Wind Chill Advisory38F[46]	Issued when wind chill temperatures are expected to be a significant inconvenience to life with prolonged exposure, and, if caution is not exercised, could lead to hazardous exposure.
Wind Chill Warning39F[47]	Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure.
Ice Storm Warning	Issued when a period of freezing rain is expected to produce ice accumulations of 1/4" or greater, or cause significant disruptions to travel or utilities.

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

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

* - Non-precipitation watch / warning / advisory

Based on previous winter storm events, future storms in Burnet County and the participating jurisdictions may see ice accumulation of up to .5”.

4) Location and Impact

A) Location

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

B) Impact

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

Beyond accidents caused by icy conditions, severe winter weather has the potential to cause widespread power outages. Trees and other vegetation that grow along or near power lines and utility lines can become overburdened by ice and snow accumulation. Falling limbs or trees can easily take down power and utility lines. Neglected vegetation is especially at risk of failure due to increased weight loads. Power outages can create a cascading effect depending on residents’ ability to heat their homes without electricity, especially for those young, elderly, and low-income residents as identified in Section 3 of Chapter 3 above. Although no deaths related to severe winter storms have been reported in the participating jurisdictions, in the worst cases, the hazard has the potential to be deadly.

Severe winter storms will likely cause only minor property damage and minimal disruption to the quality of life in the participating jurisdictions. Depending on when the event happens, a severe winter storm may damage or destroy crops.

5) Vulnerability

A) Population

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

B) Critical Facilities

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

Table 60: Critical Facilities Vulnerable to Winter Storms

Jurisdiction	Critical Facilities
Burnet County	1 Courthouse, 3 Courthouse Annexes, 1 Sheriff's Office, 1 County Jail, 1 Health Center, 4 Precinct Barns, 1 EOC, 1 Community Center
Bertram	1 City Hall, 1 Police Dept., 1 VFD, 1 Utility Office, 1 School, 1 Library, 4 Lift Stations, 4 Wells, 1 Sewer Treatment Plant
Burnet	1 City Hall, 1 Police Dept., 2 Fire Depts., 4 Schools, 1 Library, 1 Public Works, 1 Hospital, 1 Community Center, 1 Wastewater Plant
Cottonwood Shores	1 City Hall, 1 Police Dept., 1 VFD, 1 Civic Center, 1 Water Treatment Plant, 1 Water Tower, 5 Lift Stations, 1 Raw Water Pump
Granite Shoals	1 City Hall, 1 Police Dept., 1 Fire Dept., 1 School, 1 Water Plant, 1 Water Intake, 2 Water Towers
Highland Haven	1 City Hall, 1 Community Center, 1 Water Plant, 3 Wells
Marble Falls	1 City Hall, 1 EMS, 1 EOC, 1 Police Dept., 2 Fire Dept., 5 Assisted Living Centers, 1 Church Shelter, 4 Daycares, 1 Hospital, 12 Lift Stations, 3 Medical Care Centers, 1 Post Office, 1 Public Works, 1 Constable Office, 8 Schools, 1 ISD Bus Storage, 1 Electrical Substation, 1 Booster Station, 3 Grinder Pumps, 5 Water Pump Stations, 1

	Raw Water Pump, 2 WW Raw Water Farms, 1 Water Treatment Plant, 1 Wastewater Treatment Plant, 7 Water Towers/Water Storage
Meadowlakes	1 City Hall, 1 Water Treatment Plant, 1 Raw Water Intake, 1 Water Storage Tank, 5 Lift Stations, 1 Sewer Treatment Plant

C) Infrastructure

While all of the participating jurisdictions are exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not considered vulnerable to significant damage caused by severe winter storm events. This determination was made based on the expectation that most roofs can support 20 lbs. / square foot of snow[48]. The worst snowstorm in any participating jurisdiction dropped up to a maximum of 9". Although it's not impossible[49] for that much snow to cause structural damage, given that the snow weight is well below the threshold where damage is likely, structural damages are not expected. Additionally, 1" of ice is roughly equivalent in weight per square foot to 1" of snow. Considering the worst ice storms in the participating jurisdictions cause ice accumulations of .5", it's unlikely, but not impossible, that an ice storm causing structural ice accumulations of less than 4" will cause significant structural damages.

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

D) Vulnerable Parcels

Table 61: All Parcels Vulnerable to Winter Storms

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Burnet County	**48,733**	**$20,519,129,353**
City of Bertram	879	$247,151,780
City of Burnet	3,203	$1,155,779,759
City of Cottonwood Shores	1,765	$230,580,085
City of Granite Shoals	7,525	$1,413,336,341
City of Highland Haven	378	$276,946,374

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

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

City of Marble Falls	3,642	$1,804,753,818
City of Meadowlakes	954	$452,721,225

6) Climate Change

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

"Warmer temperatures cause more water to evaporate from the land and oceans, which leads to more precipitation, larger storms, and more variation in precipitation in some areas. In general, a warmer climate causes more of this precipitation to fall in the form of rain instead of snow. Some places, however, could see more snowfall if temperatures rise but still remain below the freezing point, or if storm tracks change. Areas near large lakes might also experience more snowfall as lakes remain unfrozen for longer periods, allowing more water to evaporate. In contrast, other areas might experience less snowfall as a result of wintertime droughts."[50]

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

12. Windstorms

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

Windstorms may last for just a few minutes when caused by downbursts from thunderstorms, or they may last for hours (and even several days) when they result from large-scale weather systems. A windstorm that travels in a straight line and is caused by the gust front (the boundary between descending cold air and warm air at the surface) of an approaching thunderstorm is called a derecho. Derechos can cause widespread damage and landscape devastation.[51]

1) Windstorm History

The 2017 Burnet County HMAP recorded 40 thunderstorm wind events from 1950 – 2014.

The following tables identify the most comprehensive list available of windstorm events and associated damages in Burnet County and the participating jurisdictions from 2015 to 2023. No participating jurisdiction has recorded a windstorm event more recently than 2022.

Table 62: Burnet County Windstorm History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Countywide	5/18/2015 – 10/24/2022	8	46 - 52	0	0	$17,530	$0

Table 63: City of Bertram Windstorm History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Citywide	5/15/2018 – 3/22/2021	3	56 - 65	0	0	$124,348	$0

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

Table 64: City of Burnet Windstorm History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Citywide	4/18/2019 – 10/24/2022	6	52 - 70	0	0	$6,056	$0

Table 65: City of Granite Shoals Windstorm History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Citywide	5/18/2015 – 5/28/2021	3	52 - 70	0	0	$18,019	$0

Table 66: City of Marble Falls Windstorm History

Incidents	Date Range	Windstorm Events	Windspeed Range (Knots)	Fatalities	Injuries	Property Damage $2024	Crop Damage $2024
Citywide	5/28/2015 – 6/21/2021	3	52 - 65	0	0	$29,300	$0

2) Likelihood of Future Events

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

3) Extent

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

Table 67: Beaufort Wind Scale[52]

Beaufort Wind Scale				
Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move

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

3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 feet becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 feet taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 feet, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-20 feet, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (13-20 feet) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Whole trees in motion, resistance felt walking against wind
9	41-47	Strong Gale	High waves (20 feet), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (20-30 feet) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (30-45 feet) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 feet, sea completely white with driving spray, visibility greatly reduced	

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

4) Location and Impact

A) Location

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

B) Impact

Impacts from a windstorm may include but are not limited to damaged or destroyed personal property including vehicles, damaged or destroyed agricultural, residential, commercial, and

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

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

5) Vulnerability

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

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

A) Population

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

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

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

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

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

B) Critical Facilities

Certain critical facilities and infrastructure in each jurisdiction may be particularly vulnerable to windstorms, similar to hurricane and tornado events. These facilities have been identified for reasons including: the number of people who use the facility or infrastructure, the facility's role

in providing basic services to begin the cleanup process and get the jurisdictions running again, and the facility's ability to offer goods and materials residents will need to resume normalcy as quickly as possible. The selected critical facilities are built from a variety of materials with varying levels of resistance to wind damage. Additionally, their varying ages mean they weren't constructed to uniform building standards. Given wind's potentially violent nature, these facilities may experience increased levels of vulnerability to the hazards. Damage to any of these facilities may have a disproportionately negative impact on each jurisdiction's recovery from a windstorm if that damage affects the facility's ability to reopen and resume normal business right away.

Table 68: Critical Facilities Vulnerable to Windstorm

Jurisdiction	Critical Facilities
Burnet County	1 Courthouse, 3 Courthouse Annexes, 1 Sheriff's Office, 1 County Jail, 1 Health Center, 4 Precinct Barns, 1 EOC, 1 Community Center
Bertram	1 City Hall, 1 Police Dept., 1 VFD, 1 Utility Office, 1 School, 1 Library, 4 Lift Stations, 4 Wells, 1 Sewer Treatment Plant
Burnet	1 City Hall, 1 Police Dept., 2 Fire Depts., 4 Schools, 1 Library, 1 Public Works, 1 Hospital, 1 Community Center, 1 Wastewater Plant
Cottonwood Shores	1 City Hall, 1 Police Dept., 1 VFD, 1 Civic Center, 1 Water Treatment Plant, 1 Water Tower, 5 Lift Stations, 1 Raw Water Pump
Granite Shoals	1 City Hall, 1 Police Dept., 1 Fire Dept., 1 School, 1 Water Plant, 1 Water Intake, 2 Water Towers
Highland Haven	1 City Hall, 1 Community Center, 1 Water Plant, 3 Wells
Marble Falls	1 City Hall, 1 EMS, 1 EOC, 1 Police Dept., 2 Fire Dept., 5 Assisted Living Centers, 1 Church Shelter, 4 Daycares, 1 Hospital, 12 Lift Stations, 3 Medical Care Centers, 1 Post Office, 1 Public Works, 1 Constable Office, 8 Schools, 1 ISD Bus Storage, 1 Electrical Substation, 1 Booster Station, 3 Grinder Pumps, 5 Water Pump Stations, 1 Raw Water Pump, 2 WW Raw Water Farms, 1 Water Treatment Plant, 1 Wastewater Treatment Plant, 7 Water Towers/Water Storage
Meadowlakes	1 City Hall, 1 Water Treatment Plant, 1 Raw Water Intake, 1 Water Storage Tank, 5 Lift Stations, 1 Sewer Treatment Plant

C) Vulnerable Parcels

Table 69: Parcels Vulnerable to Windstorms

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Burnet County	**48,733**	**$20,519,129,353**
City of Bertram	879	$247,151,780
City of Burnet	3,203	$1,155,779,759
City of Cottonwood Shores	1,765	$230,580,085
City of Granite Shoals	7,525	$1,413,336,341
City of Highland Haven	378	$276,946,374
City of Marble Falls	3,642	$1,804,753,818
City of Meadowlakes	954	$452,721,225

6) Climate Change

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

"The Arctic has warmed more than lower latitudes, and as a result the temperature difference between the mid-latitudes and the polar regions has become reduced, which has changed the path of the northern hemisphere jet stream so that it now moves north and south over a greater range of latitudes. As the atmosphere continues to warm, we expect to see much deeper north-south waves, which will cause a slowing down, or even blocking, of the jet stream. This could result in weather systems that persist for much longer than would be considered normal over any particular region."[53]

[53] https://ugc.berkeley.edu/background-content/wind/#:~:text=The%20global%20atmospheric%20circulation%20pattern,by%20transporting%20heat%20and%20water.

"Another recent study found that there will be regional and seasonal variability in winds in the United States as carbon dioxide levels increase: by 2100, wind speeds will decrease over most of the western U.S. and the East Coast, but the central U.S. will see an increase."[54]

[54] https://e360.yale.edu/features/global-stilling-is-climate-change-slowing-the-worlds-wind#:~:text=Another%20recent%20study%20found%20that,U.S.%20will%20see%20an%20increase.

13. Lightning

Lightning occurs as a rapid discharge of electrical energy in the atmosphere between clouds, the air, or the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit, a temperature five times hotter than the sun's surface. Lightning rapidly heats the sky as it flashes, but the surrounding air quickly cools following the bolt. This rapid heating and cooling of the surrounding air causes the thunder which often accompanies lightning strikes. While most often affiliated with severe thunderstorms, lightning often strikes outside of heavy rain and might occur as far as 10 miles away from any rainfall. [55]

Lightning damage can result in electrocution of humans and animals; vaporization of materials along the path of the strike; fire caused by the high temperature produced by the strike; and sudden power surges that can damage electrical and electronic equipment. Millions of dollars of direct and indirect damages result from lightning strikes on electric utility substations and distribution lines. While property damage is the major hazard associated with lightning, it should be noted that lightning strikes kill about 20 people[56] each year in the United States.

1) Lightning History

According to NCEI data, Burnet County and the participating jurisdictions have not experienced any lightning events since the 2017 HMAP. However, lightning events often go unreported, so it is likely that events have occurred since the last plan.

2) Likelihood of Future Events

Lightning is especially associated with thunderstorms. Despite the lack of officially reported instances of lightning-caused damages, a lightning event is highly likely, meaning an event affecting any or all of the participating jurisdictions is probable in the next year. According to information from VAISALA[57], most of Burnet County can expect about 7 to 10 lightning flashes per square miles per year.

3) Extent

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

[55] 2023 State of Texas Hazard Mitigation Plan
[56] https://www.weather.gov/safety/lightning-victims
[57] Vaisala Xweather Annual Lightning Report 2023 (adobe.com)

Table 70: Lightning Activity Levels[58]

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

4) Location and Impact

A) Location

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

B) Impact

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

5) Vulnerability

According to the Lightning Protection Institute, it is a myth[59] that lightning always strikes the tallest objects. Given lightning's indiscriminate nature, it is impossible to identify buildings that are

[58] Source: http://www.prh.noaa.gov/hnl/pages/LAL.php
[59] http://lightning.org/wp-content/uploads/2015/06/LPI_lightning_infographic_2015.jpg

at an increased risk of being struck by lightning. All existing and future buildings, critical facilities, critical infrastructure, improved property, and the population are exposed to this hazard. However, structures without adequate lightning protection and those with large concentrations of electronic equipment like computers, servers, and printers, are most vulnerable, as are locations that may have outside crowds during a lightning event.

A) Critical Facilities

Table 71: Critical Facilities Vulnerable to Lightning

Jurisdiction	Critical Facilities
Burnet County	1 Courthouse, 3 Courthouse Annexes, 1 Sheriff's Office, 1 County Jail, 1 Health Center, 4 Precinct Barns, 1 EOC, 1 Community Center
Bertram	1 City Hall, 1 Police Dept., 1 VFD, 1 Utility Office, 1 School, 1 Library, 4 Lift Stations, 4 Wells, 1 Sewer Treatment Plant
Burnet	1 City Hall, 1 Police Dept., 2 Fire Depts., 4 Schools, 1 Library, 1 Public Works, 1 Hospital, 1 Community Center, 1 Wastewater Plant
Cottonwood Shores	1 City Hall, 1 Police Dept., 1 VFD, 1 Civic Center, 1 Water Treatment Plant, 1 Water Tower, 5 Lift Stations, 1 Raw Water Pump
Granite Shoals	1 City Hall, 1 Police Dept., 1 Fire Dept., 1 School, 1 Water Plant, 1 Water Intake, 2 Water Towers
Highland Haven	1 City Hall, 1 Community Center, 1 Water Plant, 3 Wells
Marble Falls	1 City Hall, 1 EMS, 1 EOC, 1 Police Dept., 2 Fire Dept., 5 Assisted Living Centers, 1 Church Shelter, 4 Daycares, 1 Hospital, 12 Lift Stations, 3 Medical Care Centers, 1 Post Office, 1 Public Works, 1 Constable Office, 8 Schools, 1 ISD Bus Storage, 1 Electrical Substation, 1 Booster Station, 3 Grinder Pumps, 5 Water Pump Stations, 1 Raw Water Pump, 2 WW Raw Water Farms, 1 Water Treatment Plant, 1 Wastewater Treatment Plant, 7 Water Towers/Water Storage
Meadowlakes	1 City Hall, 1 Water Treatment Plant, 1 Raw Water Intake, 1 Water Storage Tank, 5 Lift Stations, 1 Sewer Treatment Plant

B) Vulnerable Parcels

Table 72: Parcels Vulnerable to Lightning

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Burnet County	**48,733**	**$20,519,129,353**
City of Bertram	879	$247,151,780
City of Burnet	3,203	$1,155,779,759
City of Cottonwood Shores	1,765	$230,580,085

City of Granite Shoals	7,525	$1,413,336,341
City of Highland Haven	378	$276,946,374
City of Marble Falls	3,642	$1,804,753,818
City of Meadowlakes	954	$452,721,225

6) Climate Change

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

"New research from the University of California, Berkeley, found warming conditions would result in 50% more lightning strikes by the end of the century. The scientists found lightning strikes would increase by about 12% for every 1C of warming."[60]

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

14. Expansive Soils

Expansive soils are soils and soft rocks with a relatively high percentage of clay minerals that are subject to volume changes as changing moisture conditions cause them to swell and shrink. Expansive soils contain minerals such as smectite clays that are capable of absorbing water. When these clays absorb water, they increase in volume and expand. The change in soil volume, and resulting expansion, can exert enough force on a building or other structure to cause damage. Homes built on expanding smectite clays without due precautions likely will be structurally damaged as the clay absorbs water. Examples of damage can include cracks appearing in walls and floors. Damage can be minor, but it also can be severe enough for the home to be structurally unsafe.[61]

Drought conditions can cause soils to contract in response to a loss of soil moisture, causing them to lose volume and shrink as they dry. A reduction in soil volume can affect the support to buildings or other structures, and result in damaging soil subsidence. Fissures in the soil can also develop and facilitate the deep penetration of water when moist conditions or runoff occurs. This produces a cycle of shrinkage and swelling, placing repetitive stress on structures. The effect of expansive soil is most prevalent in regions prone to prolonged periods of drought followed by periods of moderate to high precipitation.[62]

1) Expansive Soils History

None of the participating jurisdictions has a documented history of damage caused by expansive soils. However, most jurisdictions determined that the hazard is known to affect structures and infrastructure. The City of Marble Falls determined that no known damage has occurred due to expansive soils and will not be profiling the hazard. Moving forward, the jurisdictions will make an effort to track instances of damage due to expansive soils to begin developing a comprehensive history of the hazard and its effects.

2) Likelihood of Future Occurrence

Given the lack of an officially recorded hazard history in the profiling jurisdictions, it's difficult to attempt to estimate the likelihood of future expansive soils hazards events.

However, in light of the jurisdictions' histories of heavy rainfalls and periods of drought, conditions that lead clay-filled soils to expand and contract respectively, it may be fair to say that a future expansive soils event is likely, meaning one is possible in the next 3 years.

[61] https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/16/nrcs143_019308.pdf
[62] 2023 State of Texas Hazard Mitigation Plan

As information on the hazard is gathered more closely moving forward, its likelihood will be revised accordingly.

3) Extent

Expansive soils risk is measured by the degree to which soils may shrink or swell. The jurisdictions have relied on the county-wide soil studies produced by the United States Department of Agriculture (USDA)'s Web Soil Survey[63] data. The Web Soil Survey in particular offers both soil maps and USDA guidance on soil suitability for various types of development. For the purposes of this plan, the jurisdictions have decided to consider the ratings of Burnet County soils for the construction of both residential dwellings on concrete slab and small commercial buildings.

USDA rates soils based on the extent to which the soils are limited by all of the soil features that affect the specified use. Extent ratings are as follows:

Table 73: USDA Soil Ratings for Construction of Dwellings on Concrete Slab

USDA Soil Ratings	
Not Limited	Indicates that the soil has features that are very favorable for the specified use. Good performance and very low, maintenance can be expected.
Somewhat Limited	Indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected.
Very Limited	Indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Burnet County contains the full range of USDA Soil Ratings throughout the County and can expect future conditions and limitations that correlate to this range. USDA Soil Ratings are shown on the maps below:

[63] https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

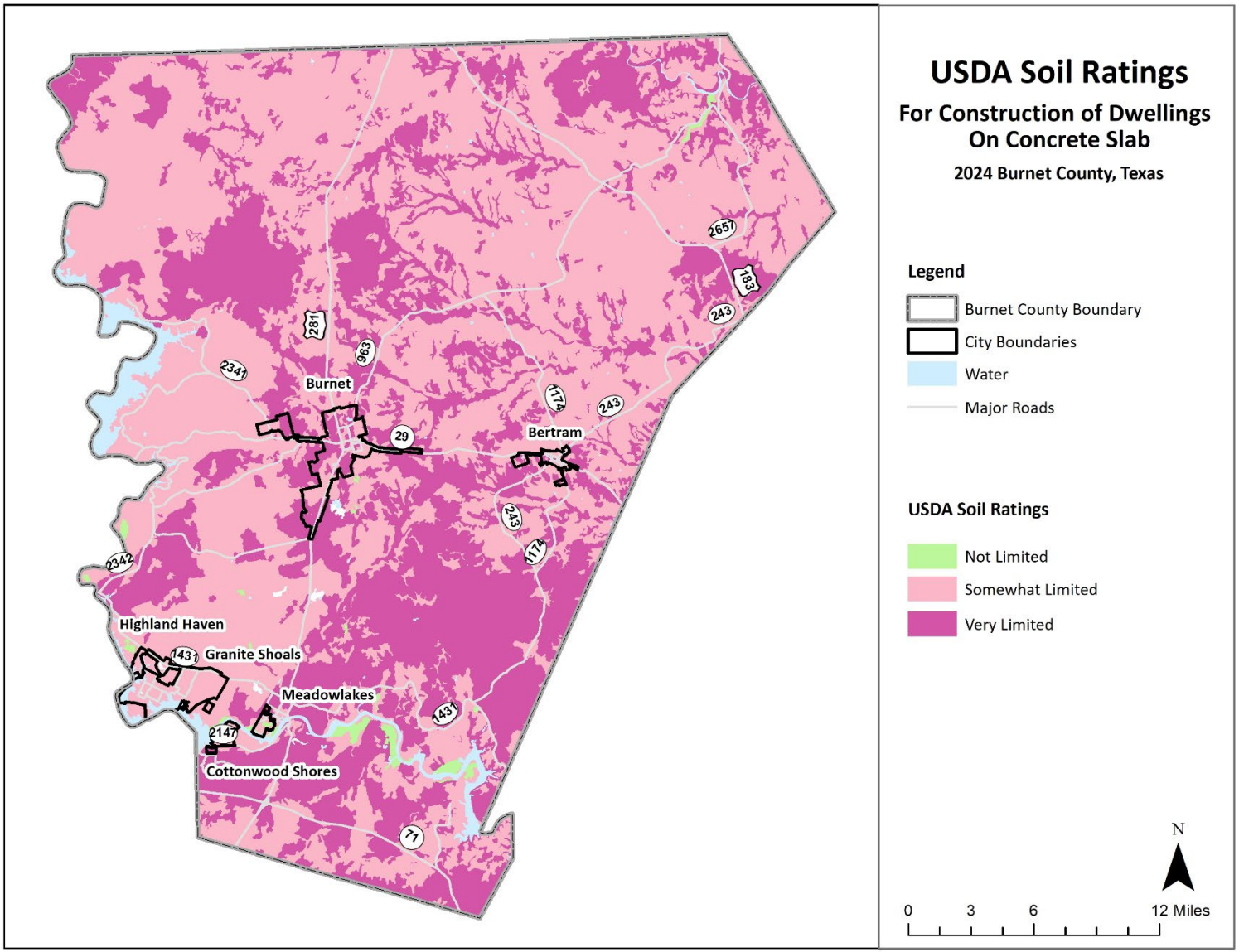

Figure 37: Burnet County Soil Ratings for the Construction of Dwellings on Concrete Slab

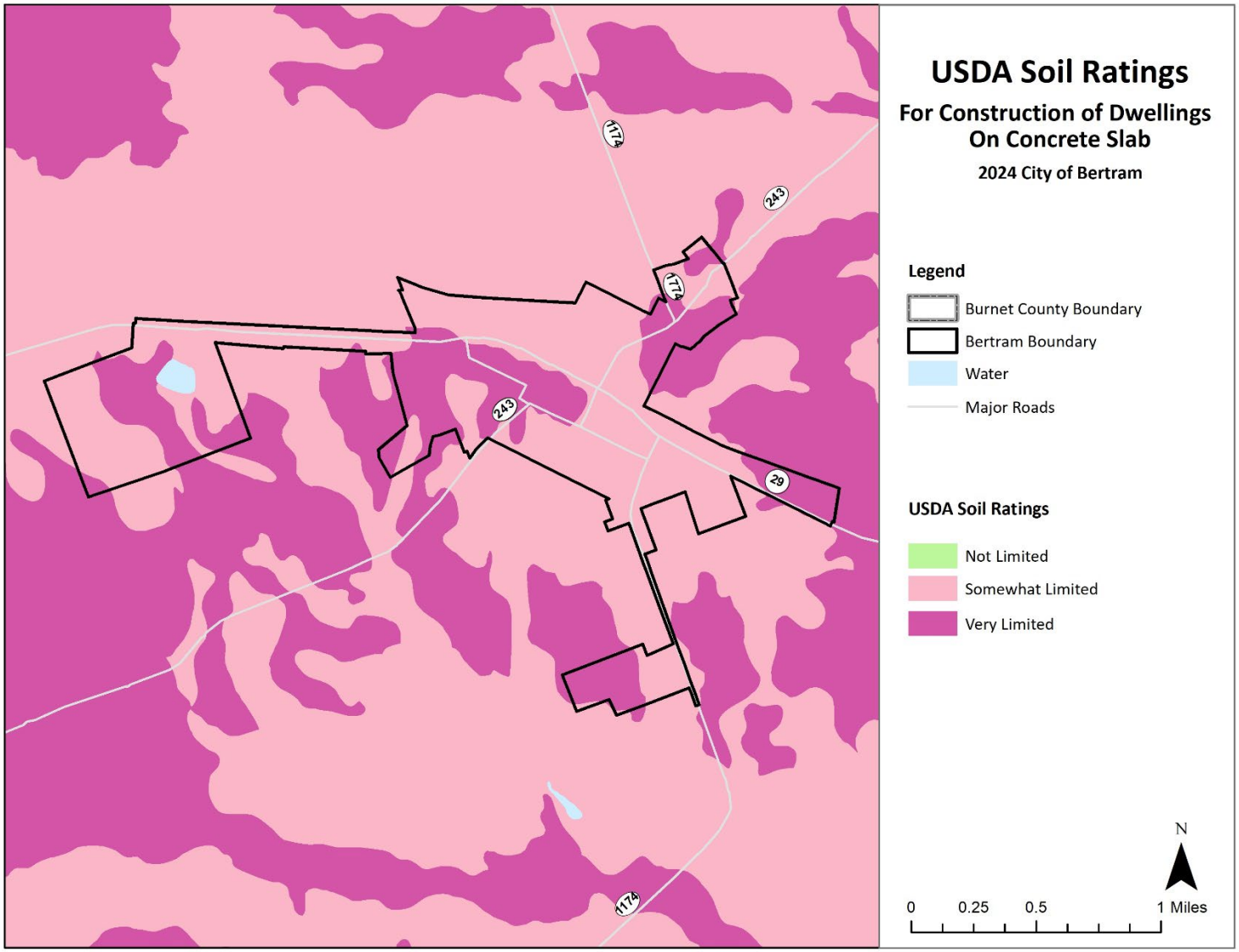

Figure 38: City of Bertram Soil Ratings for the Construction of Dwellings on Concrete Slab

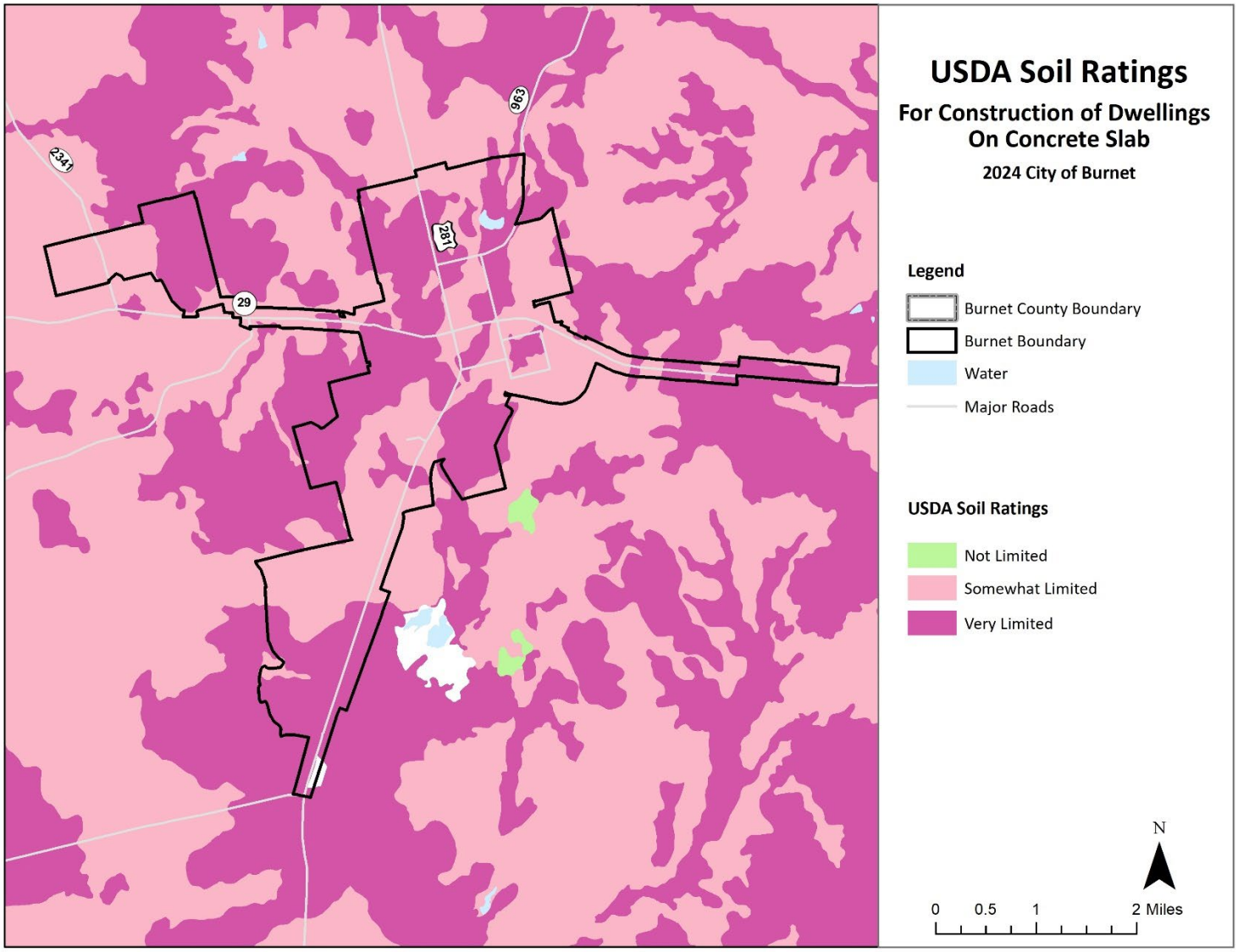

Figure 39: City of Burnet Soil Ratings for the Construction of Dwellings on Concrete Slab

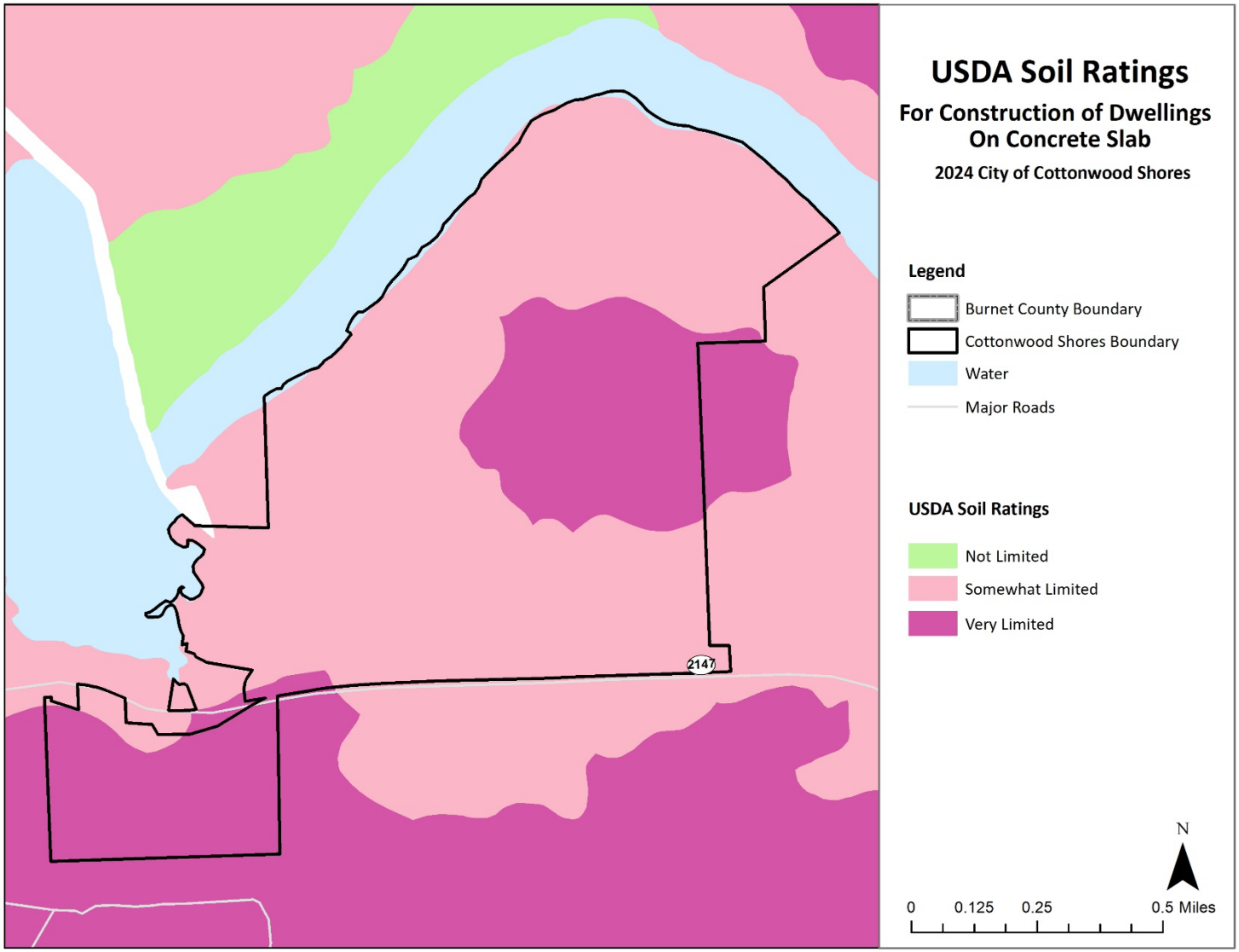

Figure 40: City of Cottonwood Shores Soil Ratings for the Construction of Dwellings on Concrete Slab

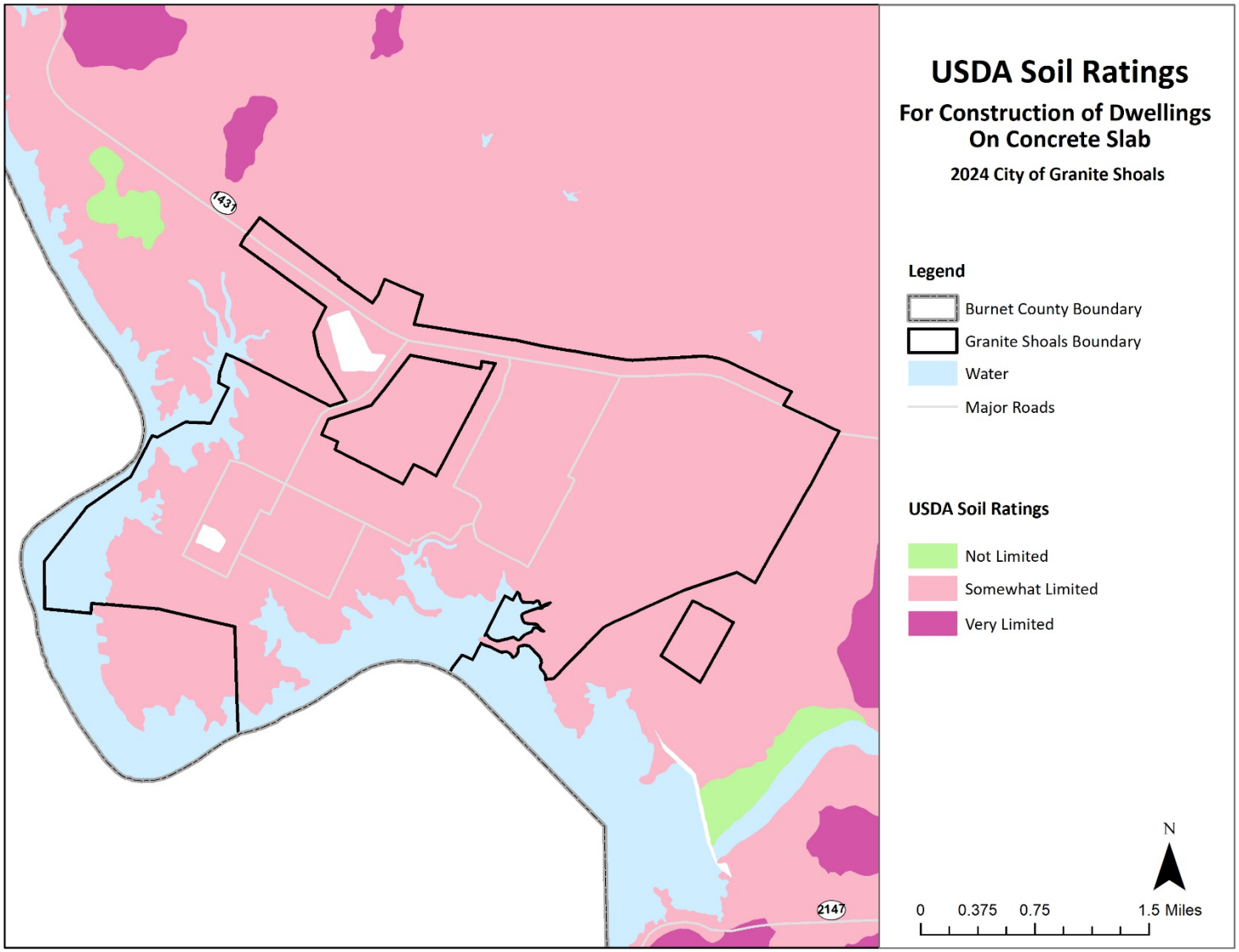

Figure 41: City of Granite Shoals Soil Ratings for the Construction of Dwellings on Concrete Slab

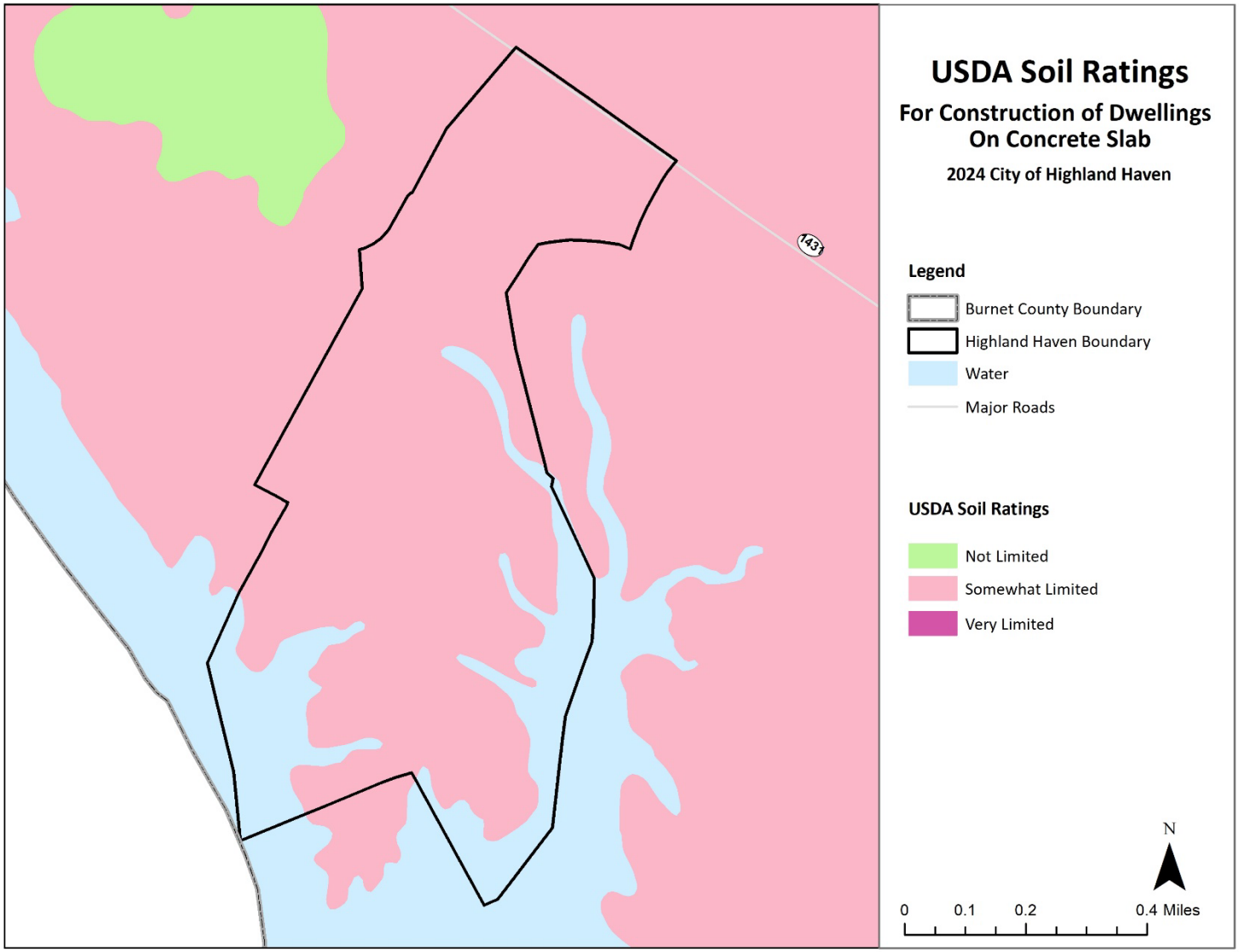

Figure 42: City of Highland Haven Soil Ratings for the Construction of Dwellings on Concrete Slab

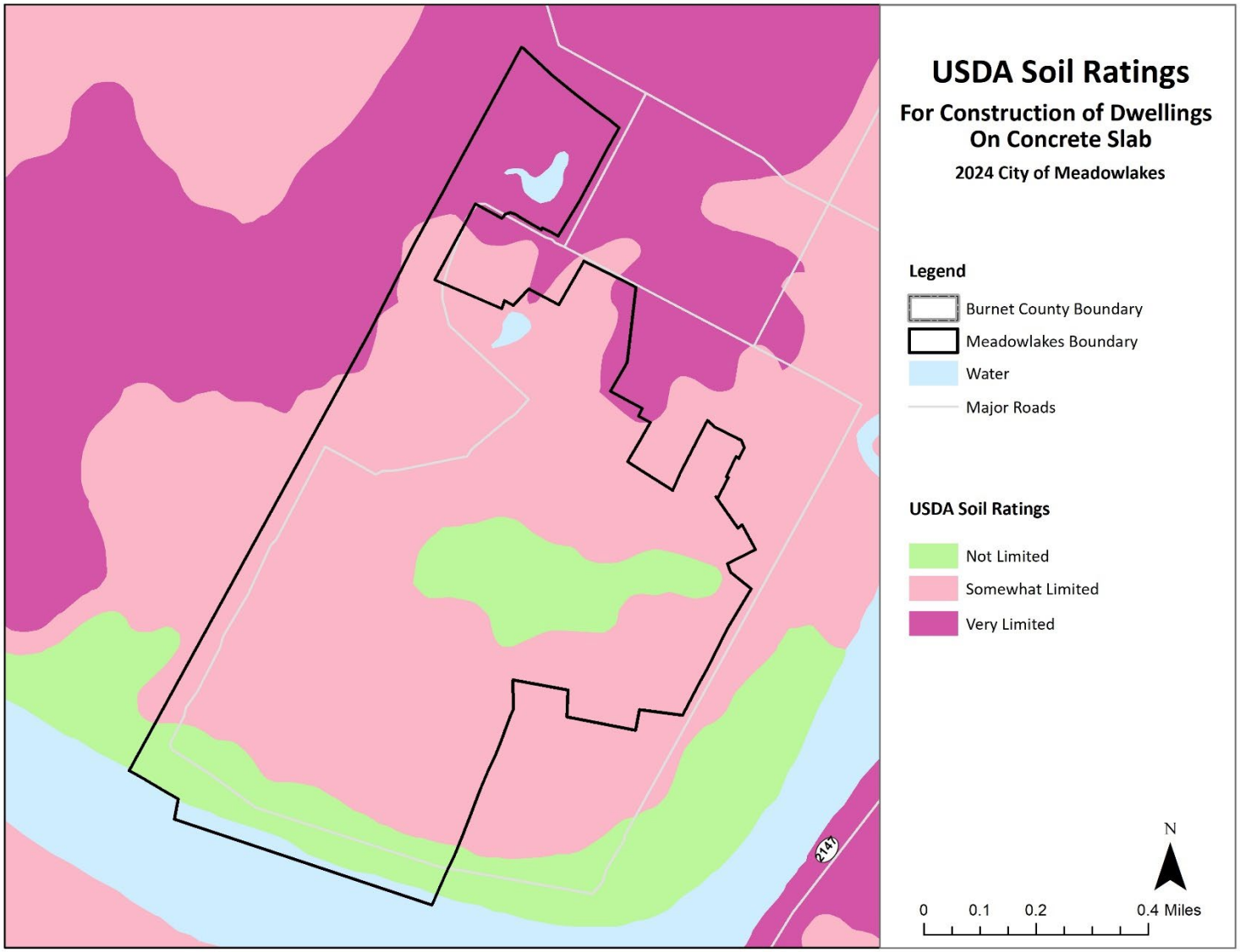

Figure 43: City of Meadowlakes Soil Ratings for the Construction of Dwellings on Concrete Slab

4) Location and Impact

A) Location

As shown in the maps above, expansive soils exist across the County, and have the potential to affect all participating jurisdictions. Areas within each jurisdiction may be more affected by expansive soils depending on both building location and building type.

B) Impact

The potential impact of expansive soils in the jurisdictions is unknown at this time. Future hazard events are expected to result in few, if any, injuries. However, as mentioned in the 2023 State of Texas Hazard Mitigation Plan, the combination of expansive soils and Texas homebuilders' propensity for installing concrete slab foundations, often results in cracked foundations that can literally halve a home's value. In such cases, economic losses are not limited to those borne by the homeowner. Instead, halved property values result in lower property values, and therefore, lower property tax revenues. Typically, houses and one-story commercial infrastructure are likely to incur more damage due to the expansion of clay.

Potential ripple effects make it difficult to estimate how wide-reaching expansive soils' impact could be. Under the right circumstances, expansive soils may wreak havoc on local economies by depleting homeowners' bank accounts and decimating municipal budgets. In the worst cases, building owners may choose to walk away, rather than make costly repairs, thus saddling local governments with abandoned properties and the incumbent challenges they pose.

5) Vulnerability

Burnet County and the participating jurisdictions are exposed to expansive soils to varying degrees based on soil type as shown in Figures 37-43 above. At this time, given the combination of the hazard's ability to inflict unpredictable damages, the lack of officially reported data, and the diversity of building ages, types, and foundations in each participating jurisdiction, it's unfeasible to identify which buildings, infrastructure, and critical facilities are vulnerable to damages significant enough to interrupt or stop normal operations. Therefore, all are considered equally vulnerable to the hazard.

A) Critical Facilities

The planning team identified 143 facilities spread across the County and participating jurisdictions. All are vulnerable to some rating of expansive soils.

Table 74: Critical Facilities Vulnerable to Expansive Soils

Jurisdiction	Critical Facilities
Burnet County	1 Courthouse, 3 Courthouse Annexes, 1 Sheriff's Office, 1 County Jail, 1 Health Center, 4 Precinct Barns, 1 EOC, 1 Community Center
Bertram	1 City Hall, 1 Police Dept., 1 VFD, 1 Utility Office, 1 School, 1 Library, 4 Lift Stations, 4 Wells, 1 Sewer Treatment Plant
Burnet	1 City Hall, 1 Police Dept., 2 Fire Depts., 4 Schools, 1 Library, 1 Public Works, 1 Hospital, 1 Community Center, 1 Wastewater Plant
Cottonwood Shores	1 City Hall, 1 Police Dept., 1 VFD, 1 Civic Center, 1 Water Treatment Plant, 1 Water Tower, 5 Lift Stations, 1 Raw Water Pump
Granite Shoals	1 City Hall, 1 Police Dept., 1 Fire Dept., 1 School, 1 Water Plant, 1 Water Intake, 2 Water Towers
Highland Haven	1 City Hall, 1 Community Center, 1 Water Plant, 3 Wells
Marble Falls	1 City Hall, 1 EMS, 1 EOC, 1 Police Dept., 2 Fire Dept., 5 Assisted Living Centers, 1 Church Shelter, 4 Daycares, 1 Hospital, 12 Lift Stations, 3 Medical Care Centers, 1 Post Office, 1 Public Works, 1 Constable Office, 8 Schools, 1 ISD Bus Storage, 1 Electrical Substation, 1 Booster Station, 3 Grinder Pumps, 5 Water Pump Stations, 1 Raw Water Pump, 2 WW Raw Water Farms, 1 Water Treatment Plant, 1 Wastewater Treatment Plant, 7 Water Towers/Water Storage
Meadowlakes	1 City Hall, 1 Water Treatment Plant, 1 Raw Water Intake, 1 Water Storage Tank, 5 Lift Stations, 1 Sewer Treatment Plant

B) Vulnerable Parcels

Table 75: Parcels Vulnerable to Expansive Soils

Jurisdiction	Parcel Count	Estimated Potential Damage Value
Burnet County	**48,733**	**$20,519,129,353**
City of Bertram	879	$247,151,780
City of Burnet	3,203	$1,155,779,759
City of Cottonwood Shores	1,765	$230,580,085
City of Granite Shoals	7,525	$1,413,336,341
City of Highland Haven	378	$276,946,374
City of Marble Falls	3,642	$1,804,753,818
City of Meadowlakes	954	$452,721,225

6) Climate Change

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

"Soil in nature undergoes variation of moisture content due to cycles of wetting and drying and this causes cyclic swelling and shrinkage.[64] There is overwhelming evidence that climate change leads to a wide range of climatic and weather changes that can affect the performance of built infrastructures. Climate change is likely to have significant impacts on the performance of residential buildings constructed on expansive soils."[65]

[64] https://www.taylorfrancis.com/chapters/edit/10.1201/9780203856918-56/influence-climate-change-foundations-swelling-soils-sh-hazzan
[65]https://www.researchgate.net/publication/320127208_Assessment_of_the_impact_of_climate_change_on_expansive_soil_movements_and_site_classification

15. Mitigation Strategy

1) Capability Assessment

Burnet County and the participating jurisdictions have shown themselves to be highly capable, especially in terms of implementing hazard mitigation actions. Seven of the eight jurisdictions participated in the 2017 HMAP, the City of Cottonwood Shores is a new participant in this plan update. Each of these jurisdictions completed, or is in the process of completing, many of the actions recommended in the 2017 HMAP.

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

Table 76: Capability Assessment by Jurisdiction

Burnet County Administrative, Financial, Regulatory, and Technical Abilities
Floodplain Management
Emergency Management
Subdivision
Nuisance Abatement
Substandard Structures Abatement
Water Conservation Planning
Road and Bridge Management
Comprehensive Planning
Economic Development
Grant Writing
General Budgeting
State and Federal Grant Funding

City of Bertram Administrative, Financial, Regulatory, and Technical Abilities
Floodplain management
Emergency Management
Drought Contingency Planning
Building Code Enforcement
Nuisance Abatement
Water Conservation Planning
General Budgeting

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

City of Cottonwood Shores Administrative, Financial, Regulatory, and Technical Abilities
Floodplain Management
Emergency Management
Drought Contingency Planning
Subdivision
Zoning
Building Code Enforcement
Nuisance Abatement
Substandard Structures Abatement
Water Conservation Planning
Road and Bridge Management
Comprehensive Planning

Grant Writing
General Budgeting
CIP Funding
CDBG Funding
State and Federal Grant Funding

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

City of Highland Haven Administrative, Financial, Regulatory, and Technical Abilities
Floodplain Management
Emergency Management
Drought Contingency Planning
Subdivision
Zoning
Building Code Enforcement
Nuisance Abatement
Substandard Structures Abatement
Water Conservation Planning
Road and Bridge Management
Comprehensive Planning
General Budgeting
CIP Funding
State and Federal Grant Funding

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

City of Meadowlakes Administrative, Financial, Regulatory, and Technical Abilities
Floodplain Management
Emergency Management
Drought Contingency Planning
Building Code Enforcement
Nuisance Abatement
Water Conservation Planning
General Budgeting

A) Building Codes

Table 77: Building Codes Per Jurisdictions

Jurisdiction	Codes	Description
Burnet County	ICC – International Building Codes	The County defers to the State of Texas, which recommends the International Building Codes. The County has no enforcement in place.
Bertram	ICC – International Building Codes	The City of Bertram has adopted the 2018 International Building Codes.

Burnet	ICC – International Building Codes	The City of Burnet has adopted the 2015 International Building Codes and the 2014 National Electrical Code.
Cottonwood Shores	ICC – International Building Codes	The City of Cottonwood Shores has adopted the 2015 International Building Codes.
Granite Shoals	ICC – International Building Codes	The City of Granite Shoals has adopted the 2015 International Building Codes.
Highland Haven	ICC – International Building Codes	The City of Highland Haven has adopted the 2012 International Building Codes.
Marble Falls	ICC – International Building Codes	The City of Marble Falls has adopted the 2018 International Building Codes.
Meadowlakes	ICC – International Building Codes	The City of Meadowlakes has adopted the 2009 International Building Codes.

2) Incorporation and Integration of Existing Capabilities and Hazard Mitigation

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

Table 78: Plan Integration

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

Jurisdiction							
Burnet County	X	X	X	X	X	X	X
City of Bertram	X			X	X	X	X
City of Burnet	X	X	X	X	X	X	X
City of Cottonwood Shores	X	X	X	X	X	X	X
City of Granite Shoals	X	X	X	X	X	X	X
City of Highland Haven	X	X	X	X	X	X	X
City of Marble Falls	X	X	X	X	X	X	X
City of Meadowlakes	X			X	X	X	X

Each new mitigation action below outlines the following requirements: the identified responsible department head or delegate will research all relevant information to confirm the action's feasibility and prioritization, will formulate a plan of action, and will confirm funding sources and identify any fiscal liabilities associated with the mitigation action.

As part of each jurisdiction's commitment to transparency, all relevant information, including but not limited to that described above and in each action's description, will be presented to the public before the action is formally adopted for implementation. After public notification, the integration process will resemble the one outlined in Table 79 below.

Table 79: Integration Process

Jurisdiction	Integration Process
Burnet County	After considering integrating mitigation actions with the activities outlined in Table 78 above, mitigation actions will be presented, considered, and formally adopted by the County Commissioners' Court and County Judge. Burnet County will also use the Burnet County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.
Bertram	After considering integrating mitigation actions with the activities outlined in Table 78 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor. The City of Bertram will also use the Burnet County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.
Burnet	After considering integrating mitigation actions with the activities outlined in Table 78 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor. The City of Burnet will also use the Burnet County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.
Cottonwood Shores	After considering integrating mitigation actions with the activities outlined in Table 78 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor. The City of Cottonwood Shores will also use the Burnet County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.

Granite Shoals	After considering integrating mitigation actions with the activities outlined in Table 78 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor. The City of Granite Shoals will also use the Burnet County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.
Highland Haven	After considering integrating mitigation actions with the activities outlined in Table 78 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor. The City of Highland Haven will also use the Burnet County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.
Marble Falls	After considering integrating mitigation actions with the activities outlined in Table 78 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor. The City of Marble Falls will also use the Burnet County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.
Meadowlakes	After considering integrating mitigation actions with the activities outlined in Table 78 above, mitigation actions will be presented, considered, and formally adopted by the council and mayor. The City of Meadowlakes will also use the Burnet County Hazard Mitigation Plan as a technical reference and data source for identified and future mitigation actions, as well as future planning processes.

A) Past Integration – 2017 Plan

Each jurisdiction has its own established process for integrating new actions, codes, ordinances, plans, and studies into its existing capabilities. The 2017 HMAP was integrated into the County's annual budgets and emergency management operations. No other integration is known to have taken place from the remaining jurisdictions. Therefore, new tracking measures may be implemented to ensure future staff are aware of plan integration moving forward. The planning team will ensure that each jurisdiction's various departments continue to integrate hazard mitigation actions into their day-to-day processes.

3) Goals and Objectives Overview

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

The goals and objectives in this plan reflect the overarching priorities identified by the communities and are similar to the goals listed in the 2017 HMAP. They have been expanded to include public services, public infrastructure, economic impacts, civic resources, and cultural resources as priorities in addition to reducing loss of life, injury, property damage, and preservation of natural resources. The mitigation actions the County and participating jurisdictions have selected are designed to address specific hazard-related issues in support of achieving the desired goals and objectives.

4) Long-Term Vision

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

5) Goals

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

Objective 1.1

Improve the delivery and effectiveness of warning messages

Objective 1.2

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

Objective 1.3

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

Objective 1.4

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

Objective 1.5

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

Objective 1.6

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

Objective 1.7

Reduce secondary impacts to health and safety from cascading effects.

Objective 1.8

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

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

Objective 2.1

Minimize disruption to and enhance rapid restoration of utilities.

Objective 2.2

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

Objective 2.3

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

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

Objective 3.1

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

Objective 3.2

Increase home and business owner participation in appropriate insurance programs.

Objective 3.3

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

Objective 3.4

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

Objective 3.5

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

Objective 3.6

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

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

Objective 4.1

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

Objective 4.2

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

Objective 4.3

Reduce vulnerability of historically or culturally significant structures.

Objective 4.4

Minimize environmental impacts from cascading effects.

6) Mitigation Action Plan

A) Mitigation Action Prioritization

The planning team members have identified at least two mitigation actions per natural hazard. The previous plan had a prioritization process utilizing the STAPLEE criteria and benefit-cost review, their prioritization considered cost effectiveness; technical feasibility; and environmental soundness of each action; project implementation; and administrative barriers. For this update, action items were identified and prioritized in consideration of the following criteria:

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

In addition to considering an action's cost effectiveness as described above, the planning team considered TDEM's Cost-Effectiveness, Environmental Soundness and Technical Feasibility

requirements as they relate to construction projects. Mitigation actions relating to physical infrastructure will meet the State's standards as outlined below:

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

B) Mitigation Action Status – 2017 HMAP

In addition to reviewing existing codes, ordinances, and planning studies, the planning team also examined the status of each mitigation action identified in the 2017 HMAP. The City of Cottonwood Shores was not a participant in the 2017 HMAP and does not have action status updates.

Mitigation actions marked as abandoned are no longer considered relevant as written to the participating jurisdictions. Deferred and in progress actions are indicated with an asterisk (*) in the new actions tables in Chapter 15, Section 6C.

Table 80: Previous Mitigation Actions – All Jurisdictions

Burnet County Mitigation Actions Status		
Hazards Addressed	**Mitigation Actions**	**Status**
Tornado, Windstorm	Saferoom Construction	*Deferred to Plan Update*
Expansive Soils	Use the application of calcium soil stabilizers	*Deferred to Plan Update*
Dam Failure & Flood	LCRA FONS (Floodgate Operations Notification System)	*Completed*
Wildfire	Create defensible space	*Deferred to Plan Update*
Dam Failure, Drought, Extreme Heat, Flood, Hail,	Purchase NOAA All Hazard Radios	*Deferred to Plan Update*

Lightning, Tornado, Wildfire, Wind, Winter Weather		
Flood	Track and record high water marks following a flood event	*Deferred to Plan Update*
Dam Failure, Drought, Extreme Heat, Flood, Hail, Lightning, Tornado, Wildfire, Wind, Winter Weather	Public awareness and Public Education Program(s)	*In Progress*
Flood	Replace approaches to low-water crossing and repair crossing structure on County Road 328 at Cow Creek	*Deferred to Plan Update*
Flood	Undertake drainage improvements at low-water crossings	*Deferred to Plan Update*
Flood	Upgrade single-lane crossings to two-lane crossing	*Deferred to Plan Update*
Flood	Conduct drainage improvements by replacing the single-lane flow through with a two-lane flow through at the low-water crossings	*Deferred to Plan Update*

City of Bertram Mitigation Actions Status		
Hazards Addressed	**Mitigation Actions**	**Status**
Earthquake, Wildfire	Adopt ordinance to control water irrigation use	*Deferred to Plan Update*
Drought, Earthquake, Expansive Soil, Extreme Heat, Flood, Hail, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Educate homeowners with outreach activities to mitigate their homes from hazards	*Deferred to Plan Update*
Earthquake	Develop and distribute guidelines to developers for buildings on seismic hazards	*Abandonded: No Longer Profiling Hazard*
Drought, Earthquake, Expansive Soil, Extreme Heat, Flood, Hail, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Adopt and enforce 2012 building code provisions	*Completed*

Drought, Expansive Soil, Extreme Heat	Create drought and expansive soil contingency plan	*Deferred to Plan Update*
Earthquake, Flood, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Develop a pamphlet/brochure educating the public on emergency evacuation procedures	*Deferred to Plan Update*
Earthquake, Extreme Heat, Flood, Hail, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Purchase and install generator for City Hall	*Deferred to Plan Update*
Expansive Soil, Wildfire	Create and implement comprehensive land use plan	*Deferred to Plan Update*

City of Burnet Mitigation Actions Status		
Hazards Addressed	**Mitigation Actions**	**Status**
Flood, Hurricane/Tropical Storm	Shady Grove Flood Study	*Completed*
Dam Failure, Flood	Dam Emergency Action Plan	*Completed*
Drought	Wastewater reuse	*Completed*
Dam Failure, Drought, Earthquake, Expansive Soil, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Building Code adoption	*Completed*
Drought, Extreme Heat, Winter Weather	Energy Code adoption	*Completed*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Install Code Red Emergency Notification	*Completed*

Drought, Extreme Heat	Promote water and energy conservation to the general public and governmental agencies	*Completed*
Dam Failure, Drought, Earthquake, Expansive Soils, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Educate homeowners on hazards	*In Progress*
Flood	Undertake a comprehensive review of the city's floodplain management ordinance	*Completed*
Dam Failure, Earthquake, Expansive Soils, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Post-disaster debris management plan	*Completed*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Purchase NOAA All Hazards Radio	*In Progress*

City of Granite Shoals Mitigation Actions Status		
Hazards Addressed	**Mitigation Actions**	**Status**
Drought, Expansive Soil, Extreme Heat	Create and implement Drought and Expansive Soils Contingency Plan	*Deferred to Plan Update*
Dam Failure, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Wind, Winter Weather	Implement Reverse 911	*Completed*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Wind, Winter Weather	Purchase NOAA All Hazard Radios	*Abandoned: No Longer Deemed Relevant*

Dam Failure, Drought, Earthquake, Expansive Soil, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Wind, Winter Weather	Public education for homeowners to mitigate their homes from hazards	*In Progress*
Dam Failure, Earthquake, Flood, Hurricane/Tropical Storm, Wildfire	Update evacuation procedures	*In Progress*

City of Highland Haven Mitigation Actions Status		
Hazards Addressed	**Mitigation Actions**	**Status**
Dam Failure, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Wind, Winter Weather	Implement Reverse 911	*Abandoned: No Longer Deemed Relevant*
Drought, Expansive Soil, Extreme Heat	Create and implement Drought and Expansive Soils Contingency Plan	*Abandoned: No Longer Deemed Relevant*
Hail	Install metal roofing	*In Progress*
Dam Failure, Drought, Earthquake, Expansive Soil, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Wind, Winter Weather	Public education for homeowners to mitigate their homes from hazards	*In Progress*
Dam Failure, Flood, Hurricane/Tropical Storm, Wildfire	Provide education for subdivisions regarding flood/fire procedures and the Turn Around Don't Drown Program	*Completed*
Flood	Promote purchasing flood insurance through NFIP	*In Progress*

City of Marble Falls Mitigation Actions Status		
Hazards Addressed	**Mitigation Actions**	**Status**
Flood & Hurricane/Tropical Storm	Creek and Crossings Clearing Project	*In Progress*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Wind, Winter Weather	Public education for homeowners to mitigate their homes from hazards and emergency preparedness kits.	*Deferred to Plan Update*
Hail	Install hail resistant roofing and window coverings	*Deferred to Plan Update*
Flood & Hurricane/Tropical Storm	Backbone Tributary Bypass	*Deferred to Plan Update*
Flood & Hurricane/Tropical Storm	Whitman Branch Bypass	*Deferred to Plan Update*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Wind, Winter Weather	Purchase NOAA All Hazard Radios	*Deferred to Plan Update*
Dam Failure, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Wind, Winter Weather	Install an Alert AM Emergency Advisory Radio System	*Deferred to Plan Update*
wildfire	Create defensible space	*Deferred to Plan Update*
Flood & Hurricane/Tropical Storm	Build bridge at Mission Hills Street creek crossing	*Deferred to Plan Update*
Flood & Hurricane/Tropical Storm	Buyout residential and commercial property	*Deferred to Plan Update*

Flood & Hurricane/Tropical Storm	Install computer-based flood warning system with remote flashers and remote automatic gates	*Deferred to Plan Update*
Dam Failure, Drought, Earthquake, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Wind, Winter Weather	Support Burnet County CERT	*Deferred to Plan Update*

City of Meadowlakes Mitigation Actions Status		
Hazards Addressed	**Mitigation Actions**	**Status**
Expansive Soils	Building foundation requirements	*Completed*
Dam Failure, Drought, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	CERT	*Completed*
Dam Failure, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Install Reverse 911 System	*Completed*
Drought, Expansive Soil, Extreme Heat	Drought and Expansive Soils Contingency Plan	*Completed*
Extreme Heat	Public education	*In Progress*
Drought, Expansive Soils, Extreme Heat	Landscape Information Program	*Deferred to Plan Update*
Dam Failure, Drought, Expansive Soils, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Hazard Communication Program to homeowners	*In Progress*

Dam Failure, Drought, Extreme Heat, Flood, Hail, Hurricane/Tropical Storm, Lightning, Tornado, Wildfire, Windstorm, Winter Weather	Purchase NOAA All Hazards Radio	*Completed*
Expansive Soils	Soils testing requirements	*In Progress*
Wildfire	Wildfire mitigation	*Abandoned: Unclear Purpose*
Hurricane/Tropical Storm, Windstorms, Winter Weather	Develop a plan with POA to work with residents to prune trees and clear tree limbs in the right-of-way	*Completed*

Each jurisdiction has its own established process for integrating new actions, codes, ordinances, plans, and studies into its existing capabilities. Currently, integration of the previous 2017 plan into other planning mechanisms within the County is unknown. Therefore, new tracking measures may be implemented to ensure future staff are aware of plan integration moving forward. The planning team will ensure that each jurisdiction's various departments continue to integrate hazard mitigation actions into their day-to-day processes.

C) Mitigation Actions by Jurisdiction and by Hazard

Each jurisdiction has selected actions that were identified as high or medium priority and that are in line with TDEM's recommended mitigation actions. However, many of the mitigation actions below are dependent upon outside grant funding for implementation. For all actions likely to require grant funding, potential sources have been identified. However, grant funding is awarded on a competitive basis, thus applying for funding doesn't guarantee that funds will be received. Budget constraints will remain the determining factor for how and when each action is implemented.

i. Burnet County

The following mitigation action items may indicate an asterisk (*) in the case that the actions were deferred from the previous 2017 HMAP. Actions marked with a grey heading are not eligible for mitigation funding but are included in the HMAP for the jurisdiction to reference for implementation or future planning endeavors.

Multi-Hazard Actions

Mitigation Action	Educational Outreach
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards; including but not limited to, participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, new publicity campaign to expand enrollment in CODE RED notification system, and new procedures to better use media to publicize burn bans.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure, Expansive Soils
Priority	High
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing and future population

Mitigation Action	Live Weather Stations
Objective	This action proposes developing a County-wide network of live weather stations with cameras. This will provide awareness of current weather conditions and provide warnings.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	High
Estimated Cost	More than $500,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Commissioners' Court, Emergency Management

Implementation Schedule	2 - 5 Years
Target	Existing and future population

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

Mitigation Action	Construct/Establish Community Safe Rooms or Shelters*
Objective	The action's goal is to provide a place of temporary refuge and or supply distribution location for the vulnerable public before and after events. This action proposes constructing new or retrofitting existing structures to serve as a safe room.
Hazard	Flood, Wildfire, Tornado, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms
Priority	Medium
Estimated Cost	Greater than $100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioners' Court, Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Harden Facilities
Objective	This action proposes hardening facilities. Hardening will include but is not limited to increasing thermal insulation, upgrading and/or adding shatter-resistant films to all glazing, installing impact and wind-resistant windows and doors, installing shutters, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment.
Hazard	Wildfire, Tornado, Hailstorm, Winter Storm, Windstorms
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	Commissioners' Court, Emergency Management
Implementation Schedule	3 – 5 Years
Target	Existing infrastructure

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

Mitigation Action	Purchase NOAA All Hazards Radios*

Objective	This action proposes purchasing NOAA All Hazards Radios to be distributed at critical facilities.
Hazard	Flood, Wildfire, Tornado, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source(s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Emergency Management
Implementation Schedule	1 - 2 Years
Target	Existing and future infrastructure

Single Hazard Actions

Mitigation Action	**Construct/Upgrade Storm Drainage Infrastructure**
Objective	This action proposes constructing new and/or widening storm drainage infrastructure to reduce the potential impacts of future flood events. Including but not limited to increasing capacity of ditches, culverts, detention ponds.
Hazard	Flood
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioner's Court, Precinct Office, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Low Water Crossing Improvements**

Objective	This action proposes improving low water crossings through road realignment and replacement. Locations include but are not limited to; County Road 403 (30.483342, -98.294092), County Road 404 (30.538230, -98.223414), County Road 116 (30.715526, -98.380594), and County Road 200 (30.792633, -98.164058).
Hazard	Flood
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioner's Court, Precinct Office, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Low Water Crossing Improvements***
Objective	This action proposes replacing approaches to low water crossings and repairing crossing structures on County Road 328 at Cow Creek. Additionally, this action proposes upgrading single-lane crossings to two-lane crossings and undertaking drainage improvements at various low water crossings throughout the County.
Hazard	Flood
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioner's Court, Precinct Office, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Purchase Portable or Permanent Pumps**

Objective	This action proposes purchasing portable or permanent pumps that can be deployed as needed to reduce the potential impacts of future flood events.
Hazard	Flood
Priority	Low
Estimated Cost	More than $250,000
Potential Funding Source(s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioner's Court, Precinct Office, Emergency Management
Implementation Schedule	0 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Property Buybacks**
Objective	This action proposes assessing and conducting buybacks of repetitive loss and/or high-risk properties.
Hazard	Flood
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Commissioner's Court
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Record High Water Marks***
Objective	This action proposes tracking and recording high water marks after a flood event to maintain a more accurate record of flooding in the jurisdiction.
Hazard	Flood
Priority	Low

Estimated Cost	Less than $10,000
Potential Funding Source(s)	County, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Wildfire Fuels Reduction in Wildland Urban Interface***
Objective	This action will develop and implement a program to identify and prioritize lands in the Wildland Urban Interface (WUI) in need of fuels reduction and then reduce or remove wildfire fuels through various methods as appropriate.
Hazard	Wildfire
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Commissioners' Court, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Develop and Implement a New Drought Contingency Plan**
Objective	Re-evaluate all existing drought control measures to identify strengths and weaknesses in order to develop and enforce a new or updated drought contingency plan.
Hazard	Drought
Priority	Low
Estimated Cost	Less than $100,000

Potential Funding Source(s)	County, FEMA BRIC, FEMA HMGP
Responsible Department(s)	Emergency Management
Implementation Schedule	1 - 2 Years
Target	Existing and future population and infrastructure

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

Mitigation Action	**Conduct Dam Failure Studies**
Objective	This action proposes conducting dam failure studies to determine potential inundation area and HHPD risks.
Hazard	Dam/Levee Failure
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP

Responsible Department	Commissioner's Court, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Mandate Freeboard on Structures to Reduce Flooding Damage**
Objective	The jurisdiction will re-evaluate all existing floodplain construction restrictions to identify strengths and weaknesses in order to produce a new ordinance that will reduce potential flood impacts due to dam / levee failure by instituting a new freeboard requirement.
Hazard	Dam/Levee Failure
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioner's Court
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Restrict Development in High Hazard Areas**
Objective	The jurisdiction will re-evaluate all existing floodplain construction restrictions to identify strengths and weaknesses in order to produce a new ordinance that will reduce potential flood impacts due to dam / levee failure by restricting development in areas that may be subject to inundation due to dam / levee failure.
Hazard	Dam/Levee Failure
Priority	Low
Estimated Cost	Less than $10,000

Potential Funding Source (s)	County, FEMA BRIC, FEMA HMGP
Responsible Department	Commissioner's Court
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Update and/or Implement Building Codes**
Objective	This action will update and/or implement building codes, requirements, and/or ordinances to include techniques and materials that mitigate against expansive soils.
Hazard	Expansive Soils
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source(s)	County, FEMA BRIC, FEMA HMGP
Responsible Department(s)	Commissioners' Court
Implementation Schedule	1 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Application of Calcium Soil Stabilizers***
Objective	This action proposes the application of calcium soil stabilizers to mitigate expansive soils at critical facilities.
Hazard	Expansive Soils
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source(s)	County, FEMA BRIC, FEMA HMGP
Responsible Department(s)	Emergency Management
Implementation Schedule	1 - 5 Years

Target	Existing and future infrastructure

ii. City of Bertram

The following mitigation action items may indicate an asterisk (*) in the case that the actions were deferred from the previous 2017 HMAP. Actions marked with a grey heading are not eligible for mitigation funding but are included in the HMAP for the jurisdiction to reference for implementation or future planning endeavors.

Multi-Hazard Actions

Mitigation Action	Educational Outreach*
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards; including but not limited to, participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, new publicity campaign to expand enrollment in CODE RED notification system, and new procedures to better use media to publicize burn bans throughout the county. Increase visibility on county websites, Facebook and twitter.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Expansive Soils
Priority	Medium
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Emergency Management, City Administration
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Adopt Water Irrigation Ordinance*
Objective	The jurisdiction will adopt an ordinance to control water irrigation use.
Hazard	Drought, Wildfire
Priority	Low
Estimated Cost	Less than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor and Council, City Administration
Implementation Schedule	1 - 2 Years

Target	Existing and future population and infrastructure

Mitigation Action	Develop and Implement New Drought Contingency and Expansive Soils Contingency Plans*
Objective	Re-evaluate all existing drought control measures to identify strengths and weaknesses in order to develop and enforce a new or updated drought contingency plan. Develop and implement a new Expansive Soils Contingency Plan
Hazard	Drought, Expansive Soils
Priority	Medium
Estimated Cost	Less than $100,000
Potential Funding Source(s)	City, FEMA BRIC, FEMA HMGP
Responsible Department(s)	Emergency Management, Public Works
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

Mitigation Action	Develop and Implement a New Comprehensive Land Use Plan*
Objective	Re-evaluate all existing land use measures to identify strengths and weaknesses in order to develop and enforce a new or updated comprehensive land use plan.
Hazard	Flood, Wildfire, Expansive Soils
Priority	Medium
Estimated Cost	Less than $100,000
Potential Funding Source(s)	City, FEMA BRIC, FEMA HMGP
Responsible Department(s)	Emergency Management, Public Works
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

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

iii. City of Burnet

The following mitigation action items may indicate an asterisk (*) in the case that the actions were deferred from the previous 2017 HMAP. Actions marked with a grey heading are not eligible for mitigation funding but are included in the HMAP for the jurisdiction to reference for implementation or future planning endeavors.

Multi-Hazard Actions

Mitigation Action	Educational Outreach
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards; including but not limited to, participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, new publicity campaign to expand enrollment in CODE RED notification system, and new procedures to better use media to publicize burn bans throughout the county. Increase visibility on county websites, Facebook and twitter.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure, Expansive Soils
Priority	Medium
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Set up Cooling and Heating Centers in Existing Facilities
Objective	The action's goal is to increase extreme temperature resilience by limiting vulnerable populations' exposure to extreme temperatures by creating new, or opening up existing facilities as cooling centers or warming centers.
Hazard	Extreme Heat, Extreme Cold, Winter Storm
Priority	Medium
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Emergency Management, Fire Dept., City Administration

Implementation Schedule	2 - 5 Years
Target	Existing and future population

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

Single Hazard Actions

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

iv. City of Cottonwood Shores

Multi-Hazard Actions

Mitigation Action	Educational Outreach
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards; including but not limited to, participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, new publicity campaign to expand enrollment in CODE RED notification system, and new procedures to better use media to publicize burn bans throughout the county. Increase visibility on county websites, Facebook and twitter.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure, Expansive Soils
Priority	Medium
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Police Dept., Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future population

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

Mitigation Action	Harden Facilities
Objective	This action proposes hardening facilities. Hardening will include but is not limited to increasing thermal insulation, upgrading and/or adding shatter-resistant films to all glazing, installing impact and wind-resistant windows and doors, installing shutters, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment.
Hazard	Wildfire, Tornado, Hailstorm, Winter Storm, Windstorms
Priority	Medium
Estimated Cost	Greater than $100,000
Potential Funding Source (s)	City, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	Emergency Management, City Administration
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

Mitigation Action	Purchase Portable Digital Warning Signs
Objective	Warning signs will help limit local vulnerability to multiple hazards by providing residents with information they need where they're likely to see it.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	Low
Estimated Cost	$35,000 per device
Potential Funding Source (s)	City, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Install and Expand Warning Systems/Weather Radios
Objective	Warning systems will help limit local vulnerability to hazards by giving residents an opportunity to take shelter before an event occurs.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	Low
Estimated Cost	$1,000 - $100,000 per device
Potential Funding Source (s)	City, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	Mayor and Council, City Administration

Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

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

Single Hazard Actions

Mitigation Action	Construct/Upgrade Storm Drainage Infrastructure
Objective	This action proposes constructing new and/or widening storm drainage infrastructure to reduce the potential impacts of future flood events. Including but not limited to increasing capacity of ditches, culverts, detention ponds.
Hazard	Flood
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor and Council, Public Works, Emergency Management
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Create Master Drainage Plan
Objective	This action proposes creating a drainage master plan for the jurisdiction that will provide the Jurisdiction with a comprehensive planning document that provides basic information and necessary guidance for the county-wide drainage system, including but not limited to an H&H study.
Hazard	Flood
Priority	Medium
Estimated Cost	Less than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Wildfire Fuels Reduction in Wildland Urban Interface
Objective	This action will develop and implement a program to identify and prioritize lands in the Wildland Urban Interface (WUI) in need of fuels reduction and then reduce or remove wildfire fuels through various methods as appropriate.
Hazard	Wildfire
Priority	Medium
Estimated Cost	More than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Mayor and Council, Planning, Emergency Management, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Install Surge Protection and Grounding Systems to Protect Electronic Assets
Objective	This action will install surge protection and/or grounding systems at all City facilities to prevent damage to critical electronic devices including but not limited to: computers, servers, audio/visual equipment, laboratory equipment, and appliances.
Hazard	Lightning
Priority	Low

Estimated Cost	$1,000 - $50,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Mayor and Council, Emergency Management, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

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

v. City of Granite Shoals

The following mitigation action items may indicate an asterisk (*) in the case that the actions were deferred from the previous 2017 HMAP. Actions marked with a grey heading are not eligible for mitigation funding but are included in the HMAP for the jurisdiction to reference for implementation or future planning endeavors.

Multi-Hazard Actions

Mitigation Action	Educational Outreach
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards; including but not limited to, participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, new publicity campaign to expand enrollment in CODE RED notification system, and new procedures to better use media to publicize burn bans throughout the county. Increase visibility on county websites, Facebook and twitter.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure, Expansive Soils
Priority	Medium
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Police Dept., Fire Dept.
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Update Building Code Requirements
Objective	Re-evaluate all existing building code requirements to identify strengths and weaknesses in order to develop and enforce a new or updated code that reduces structural vulnerability.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure, Expansive Soils
Priority	Medium
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, TWDB, GLO
Responsible Department	Public Works, Police Dept., Fire Dept.

Implementation Schedule	1 - 5 Years
Target	Existing and future population

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

Mitigation Action	Harden Facilities
Objective	This action proposes hardening facilities. Hardening will include but is not limited to increasing thermal insulation, upgrading and/or adding shatter-resistant films to all glazing, installing impact and wind-resistant windows and doors, installing shutters, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment.
Hazard	Wildfire, Tornado, Hailstorm, Winter Storm, Windstorms
Priority	Low
Estimated Cost	Greater than $100,000
Potential Funding Source (s)	City, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	City Administration
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

Mitigation Action	Purchase Portable Digital Warning Signs
Objective	Warning signs will help limit local vulnerability to multiple hazards by providing residents with information they need where they're likely to see it.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	Low
Estimated Cost	$35,000 per device
Potential Funding Source (s)	City, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Develop and Implement a Tree Trimming Program
Objective	This action will develop and implement a tree trimming program to reduce loose / dead tree limbs that may cause damage during a hazard event.
Hazard	Wildfire, Tornado, Winter Storm, Windstorms
Priority	Low
Estimated Cost	$10,000 - $500,000
Potential Funding Source (s)	City, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	City Administration, Building Code
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Develop and Implement a New Tie-Down Ordinance for Manufactured / Mobile Homes, Temporary Buildings, and Unrestrained Advertisement Signs
Objective	The jurisdiction will re-evaluate all existing tie-down measures to identify strengths and weaknesses in order to develop and enforce a new tie-down ordinance.
Hazard	Tornado, Windstorms
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, CDBG-MIT
Responsible Department	City Administration

Implementation Schedule	1 – 2 Years
Target	Existing and future population and infrastructure

Mitigation Action	Develop and Implement New Drought Contingency and Expansive Soils Contingency Plans*
Objective	Re-evaluate all existing drought control measures to identify strengths and weaknesses in order to develop and enforce a new or updated drought contingency plan. Develop and implement a new Expansive Soils Contingency Plan
Hazard	Drought, Expansive Soils
Priority	Medium
Estimated Cost	Less than $100,000
Potential Funding Source(s)	City, FEMA BRIC, FEMA HMGP
Responsible Department(s)	Emergency Management, Public Works
Implementation Schedule	1 - 5 Years
Target	Existing and future population and infrastructure

Single Hazard Actions

Mitigation Action	Construct/Upgrade Storm Drainage Infrastructure
Objective	This action proposes constructing new and/or widening storm drainage infrastructure to reduce the potential impacts of future flood events. Including but not limited to increasing capacity of ditches, culverts, detention ponds.
Hazard	Flood
Priority	Medium
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Create Master Drainage Plan
Objective	This action proposes creating a drainage master plan for the jurisdiction that will provide the Jurisdiction with a comprehensive planning document that provides basic information and necessary guidance for the county-wide drainage system, including but not limited to an H&H study.
Hazard	Flood
Priority	Medium
Estimated Cost	Less than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Public Works, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Wildfire Fuels Reduction in Wildland Urban Interface
Objective	This action will develop and implement a program to identify and prioritize lands in the Wildland Urban Interface (WUI) in need of fuels reduction and then reduce or remove wildfire fuels through various methods as appropriate.
Hazard	Wildfire
Priority	High
Estimated Cost	More than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Planning, Fire Dept.
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	Develop and Implement a New Water Conservation Ordinance
Objective	Jurisdiction will re-evaluate all existing water conservation and reduction measures to identify strengths and weaknesses in order to develop and enforce a new water conservation ordinance.
Hazard	Drought
Priority	Low
Estimated Cost	Less than $100,000

Potential Funding Source(s)	County, FEMA BRIC, FEMA HMGP
Responsible Department(s)	City Administration
Implementation Schedule	1 - 2 Years
Target	Existing and future population and infrastructure

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

vi. City of Highland Haven

Multi-Hazard Actions

Mitigation Action	Educational Outreach
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards; including but not limited to, participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, new publicity campaign to expand enrollment in CODE RED notification system, and new procedures to better use media to publicize burn bans throughout the county. Increase visibility on county websites, Facebook and twitter.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Expansive Soils
Priority	Medium
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Mayor and Council
Implementation Schedule	1 - 5 Years
Target	Existing and future population

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

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

Mitigation Action	Harden Facilities
Objective	This action proposes hardening facilities. Hardening will include but is not limited to increasing thermal insulation, upgrading and/or adding shatter-resistant films to all glazing, installing impact and wind-resistant windows and doors, installing shutters, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment.
Hazard	Wildfire, Tornado, Hailstorm, Winter Storm, Windstorms
Priority	Medium
Estimated Cost	Greater than $100,000
Potential Funding Source (s)	City, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	Mayor and Council
Implementation Schedule	3 - 5 Years
Target	Existing infrastructure

Single Hazard Actions

Mitigation Action	Construct/Upgrade Storm Drainage Infrastructure
Objective	This action proposes constructing new and/or widening storm drainage infrastructure to reduce the potential impacts of future flood events. Including but not limited to increasing capacity of ditches, culverts, detention ponds.

Hazard	Flood
Priority	Low
Estimated Cost	More than $1,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor and Council, Public Works
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Create Master Drainage Plan**
Objective	This action proposes creating a drainage master plan for the jurisdiction that will provide the Jurisdiction with a comprehensive planning document that provides basic information and necessary guidance for the county-wide drainage system, including but not limited to an H&H study.
Hazard	Flood
Priority	Low
Estimated Cost	Less than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor and Council
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Develop and Implement New Water Conservation Ordinance**
Objective	Jurisdiction will re-evaluate all existing water conservation and reduction measures to identify strengths and weaknesses in order to develop and enforce a new water conservation ordinance.
Hazard	Drought
Priority	High
Estimated Cost	Less than $10,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Mayor and Council, City Administration
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

vii. City of Marble Falls

The following mitigation action items may indicate an asterisk (*) in the case that the actions were deferred from the previous 2017 HMAP. Actions marked with a grey heading are not eligible for mitigation funding but are included in the HMAP for the jurisdiction to reference for implementation or future planning endeavors.

Multi-Hazard Actions

Mitigation Action	Educational Outreach*
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards; including but not limited to, participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, new publicity campaign to expand enrollment in CODE RED notification system, and new procedures to better use media to publicize burn bans throughout the county. Increase visibility on county websites, Facebook and twitter.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	Medium
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Mayor and Council
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Mitigation Action	Harden Facilities*
Objective	This action proposes hardening facilities. Hardening will include but is not limited to increasing thermal insulation, upgrading and/or adding shatter-resistant films to all glazing, installing impact and wind-resistant windows and doors, installing shutters, building protective walls around exposed gas tanks and cylinders, shielding roof-mounted equipment.
Hazard	Wildfire, Tornado, Hailstorm, Winter Storm, Windstorms
Priority	Medium
Estimated Cost	Greater than $400,000
Potential Funding Source (s)	City, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	Public Works
Implementation Schedule	3 - 5 Years

Target	Existing infrastructure

Mitigation Action	Relocate Wastewater Treatment Plant
Objective	This action will relocate the Wastewater Treatment Plant out of the 100 and 500-year floodplains.
Hazard	Flood, Dam Failure
Priority	High
Estimated Cost	About $73,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Engineering, Public Works
Implementation Schedule	4 - 5 Years
Target	Existing infrastructure

Mitigation Action	Raise Primary Water Intake and Pumps
Objective	This action will raise the primary water intake system control and pumps will be raised out of floodplain at two locations: Lakeshore and Colorado. Additionally, this action will place emergency raw water intake pump on a motorized operated rail system that can move the pump out of flood waters.
Hazard	Flood, Dam Failure
Priority	High
Estimated Cost	About $5,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Engineering, Public Works
Implementation Schedule	4 - 5 Years
Target	Existing infrastructure

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

	but not limited to generator for Marble Falls ISD schools, VFDs, City Hall, and EMS stations.
Hazard	Flood, Wildfire, Tornado, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	Medium
Estimated Cost	More than $100,000 Each for Fixed Generators, Including Associated Engineering Costs. Less than $100,000 Each for Portable Generators
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Public Works
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Trail System**
Objective	Create creek walk trail system to create linear network of parkland throughout the city that can absorb periodic heavy inundation to help mitigate impacts from flooding.
Hazard	Flood, Dam Failure
Priority	Medium
Estimated Cost	More than $3,000,000
Potential Funding Source (s)	City, FEMA FMA, FEMA BRIC, FEMA HMGP, CDBG MIT
Responsible Department	Parks, Engineering, Public Works
Implementation Schedule	3 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Bridge Construction at Crossings***
Objective	This action will build a bridge at Ave. L at Whitman Branch and at Nature Heights / Whitman and Hwy 281 to remove low water crossings. Build bridge at Mission Hill St, creek crossing to alleviate closures due to flash flooding. Build bridge at 2nd St. and Westside Park to remove low water crossing. Build bridge at Broadway St. between Ave. N and Ave. L.
Hazard	Flood, Dam Failure
Priority	High
Estimated Cost	More than $5,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO

Responsible Department	Engineering, Public Works
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Bridge Elevation
Objective	This action will elevate Ave. J bridge at Johnson Park to alleviate flooding.
Hazard	Flood, Dam Failure
Priority	High
Estimated Cost	More than $1,500,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Engineering, Public Works
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Mobile Flood Control Devices
Objective	This action will protect lift stations from floodwaters by mitigating impacts at Pecan Valley, Westside, RV, 281 at Flatrock Creek by implementing mobile flood control devices.
Hazard	Flood, Dam Failure
Priority	Medium
Estimated Cost	More than $500,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Engineering, Public Works
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Computer-Based Flood Warning Systems*
Objective	This action will install computer-based flood warning systems with remote flashers and automated gates. Locations include but not limited to: Broadway between Ave. N & Ave. L, Commerce St. at Nature Heights, Main Street at Broadway, Ave. L at Broadway, Mission Hill, 2nd St. at Westside Park, 90th Ave. N, 400 Blk. Ave. T, 700

	Blk. Ave. U, 2000 Blk. 7th St., Bluebonnet at Lantana, Lakeshore, Ave. J in Johnson Park, and Nature Heights at Hwy 281.
Hazard	Flood, Dam Failure
Priority	Medium
Estimated Cost	More than $350,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Engineering, Public Works
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Purchase NOAA All Hazards Radios***
Objective	This action proposes purchasing NOAA All Hazards Radios to be distributed at critical facilities.
Hazard	Flood, Wildfire, Tornado, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	Low
Estimated Cost	Less than $10,000
Potential Funding Source(s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB
Responsible Department	Emergency Management
Implementation Schedule	1 - 2 Years
Target	Existing and future infrastructure

Mitigation Action	**Wayfinding Signage**
Objective	This action will introduce wayfinding signage throughout the downtown area to help direct people and drivers during hazardous conditions.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	Medium
Estimated Cost	More than $80,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Planning, Administration
Implementation Schedule	2 - 5 Years

Target	Existing infrastructure

Mitigation Action	Backup Water and Wastewater Services
Objective	This action will study redundancy options considering whether to extend secondary water supply and wastewater lines across Lake Marble Falls or construct a water treatment plant and wastewater treatment plant on the southside of the lake. If the bridge is damaged, water and wastewater supply to the south areas are interrupted.
Hazard	Flood, Dam Failure
Priority	Low
Estimated Cost	More than $150,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Engineering
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Property Buyouts*
Objective	This action will propose a voluntary buyout using Floodplain ordinance, FEMA resources, etc., of residential and commercial properties that are substantially damaged in 100-year floodplains, or if no flood improvement projects are planned or in progress for the area.
Hazard	Flood, Dam Failure
Priority	Medium
Estimated Cost	More than $500,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	City Manager
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	Relocate Animal Control
Objective	This action will relocate the animal control facility out of the floodplain to protect animals and facility from flooding.

Hazard	Flood, Dam Failure
Priority	Low
Estimated Cost	More than $2,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Engineering, Public Works, Police Dept.
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Whitman Branch Bypass***
Objective	Install a 50-foot wide by 5-foot deep bypass channel to the east along Oak Ridge Dr. to increase the water capacity and minimize flooding. This action is identified in the drainage study performed by HALFF.
Hazard	Flood, Dam Failure
Priority	High
Estimated Cost	More than $3,500,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Engineering, Public Works
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Backbone Tributary Bypass***
Objective	Construct three 8-foot wide by 7-foot box culverts along the south side of FM 1431 from 800 feet west of Industrial to Backbone Creek to increase water capacity and minimize flooding.
Hazard	Flood, Dam Failure
Priority	High
Estimated Cost	More than $5,000,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Engineering, Public Works
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Development Code**

Objective	Ensure stormwater retention and remediation is designed in all new development. Require dedication of riparian areas upon subdivision to reduce the impact of flooding to new development while creating a connected urban trail system.
Hazard	Flood, Dam Failure
Priority	Medium
Estimated Cost	More than $5,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Planning
Implementation Schedule	1 - 2 Years
Target	Future infrastructure

Mitigation Action	**Flood Study**
Objective	Study for the south part of the city to establish floodplains and for the base floodplain elevations that are not complete.
Hazard	Flood, Dam Failure
Priority	Medium
Estimated Cost	More than $350,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Engineering
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Update Emergency Preparedness Website**
Objective	This action will update the emergency preparedness page on the city website to provide the latest information on best practices for hazard mitigation and preparedness.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	Medium
Estimated Cost	$5,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Emergency Management
Implementation Schedule	1 - 2 Years

Target	Existing and future infrastructure

Mitigation Action	Update CWPP
Objective	This action will update the Community Wildfire Protection Plan to address new areas of growth since the plan was developed.
Hazard	Wildfire, Drought, Extreme Heat
Priority	Medium
Estimated Cost	$5,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Fire Dept.
Implementation Schedule	2 - 3 Years
Target	Existing and future infrastructure

Mitigation Action	AM Alert Emergency Radio Advisory System*
Objective	This action will create a city operated AM emergency advisory radio station to inform citizens and visitors what to do during incidents that threaten life and property.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	Medium
Estimated Cost	$75,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Emergency Management, Fire Dept.
Implementation Schedule	2 - 3 Years
Target	Existing and future infrastructure

Mitigation Action	Drought Tolerant Landscaping
Objective	Plant drought tolerant trees along public sidewalks, parking lots, and streets.
Hazard	Drought, Extreme Heat
Priority	Low
Estimated Cost	More than $50,000

Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Parks, Planning, Public Works
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

Mitigation Action	**Debris Clearing**
Objective	This action recommends removing trees and other vegetation along the floodway and culvert crossings to increase conveyance.
Hazard	Flood, Wildfire, Dam Failure
Priority	High
Estimated Cost	$500,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Parks Dept.
Implementation Schedule	2 - 5 Years
Target	Existing infrastructure

Mitigation Action	**Burnet County CERT***
Objective	Support the Burnet County CERT to enhance self-sustainability of citizens.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure
Priority	Low
Estimated Cost	$1,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	Emergency Management
Implementation Schedule	1 - 5 Years
Target	Existing and future populations

Mitigation Action	**Create a City Position for a Full Time Public Information Officer**
Objective	Create a city position for a public information officer to be in charge of disseminating information.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure

Priority	Medium
Estimated Cost	$75,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP
Responsible Department	City Council
Implementation Schedule	1 - 5 Years
Target	Existing and future populations

Single Hazard Actions

Mitigation Action	Wildfire Fuels Reduction in Wildland Urban Interface*
Objective	This action will develop and implement a program to identify and prioritize lands in the Wildland Urban Interface (WUI) in need of fuels reduction and then reduce or remove wildfire fuels through various methods as appropriate.
Hazard	Wildfire
Priority	High
Estimated Cost	More than $100,000
Potential Funding Source (s)	City, FEMA BRIC, FEMA FMA, FEMA HMGP, CDBG-MIT
Responsible Department	Planning, Fire Dept.
Implementation Schedule	2 - 5 Years
Target	Existing and future infrastructure

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

viii. City of Meadowlakes

The following mitigation action items may indicate an asterisk (*) in the case that the actions were deferred from the previous 2017 HMAP. Actions marked with a grey heading are not eligible for mitigation funding but are included in the HMAP for the jurisdiction to reference for implementation or future planning endeavors.

Multi-Hazard Actions

Mitigation Action	Educational Outreach*
Objective	This action will create a program to educate the public about specific mitigation actions for all hazards; including but not limited to, participation in Wildfire Fuels Reduction, Tornado Saferooms, Structural Hardening, new publicity campaign to expand enrollment in CODE RED notification system, and new procedures to better use media to publicize burn bans throughout the county. Increase visibility on county websites, Facebook and twitter.
Hazard	Flood, Wildfire, Tornado, Drought, Extreme Heat, Extreme Cold, Hailstorm, Winter Storm, Windstorms, Lightning, Dam Failure, Expansive Soils
Priority	Medium
Estimated Cost	Less than $10,000 per hazard
Potential Funding Source (s)	City, FEMA BRIC, FEMA HMGP, FEMA FMA, TWDB, GLO
Responsible Department	Mayor and Council
Implementation Schedule	1 - 5 Years
Target	Existing and future population

Single Hazard Actions

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

Target	Existing and future infrastructure