

Central Texas Council of Governments Regional Hazard Mitigation Action Plan

Planning Participants: Bell County, City of Bartlett, City of Belton, City of Harker Heights, City of Holland, City of Killeen, City of Little River Academy, City of Nolanville, City of Rogers, Village of Salado, City of Temple, City of Troy, and CTCOG



Mitigating Risk for a Safe, Secure, and Sustainable Future



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For more information, visit our website at:

www.bellcountytexas.com

Written comments should be forwarded to:

H2O Partners, Inc.

P. O. Box 160130

Austin, Texas 78716

info@h2opartnersusa.com

www.h2opartnersusa.com

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Background

The Central Texas Council of Governments (CTCOG) was established by the Texas Legislature as a sub-region in December 1968 and gained full planning regional status in 1974. CTCOG is a voluntary association that encompasses thirty-seven jurisdictions, including seven counties and thirty cities, and was organized to promote area-wide planning and collaboration among local governments. CTCOG helps local communities work cooperatively to improve the conditions and well-being of citizens. CTCOG addresses concerns that include: economic development, emergency services, 9-1-1 addressing, homeland security, criminal justice, regional planning, regional transportation, regional demographics, GIS & mapping, housing assistance, aging services, and workforce services.

The CTCOG is committed to creating a disaster-resistant area in Central Texas. CTCOG took the lead in sponsoring the development of a comprehensive Hazard Mitigation Plan (“Plan”) for the participating counties and cities. Although CTCOG’s district covers a seven-county area, the Plan consists of three counties and their 19 jurisdictions. Table 1-1 lists the participating jurisdictions.

Table 1-1. Participating Jurisdictions in the Planning Area

Participating Jurisdictions
CTCOG
Bell County
City of Bartlett
City of Belton
City of Harker Heights
City of Holland
City of Killeen
City of Little River Academy
City of Nolanville
City of Rogers
Village of Salado

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Participating Jurisdictions
City of Temple
City of Troy
Hamilton County
City of Hamilton
City of Hico
Milam County
Town of Buckholts
City of Cameron
City of Milano
City of Rockdale
City of Thorndale

In accordance with recent TDEM guidance, hazard mitigation plans are to be developed for each county. The CTCOG Regional Hazard Mitigation Plan was developed as three separate plans, one for each participating county and their jurisdictions. This Plan was developed specifically for Bell County's Plan is a multi-jurisdictional Plan. The participating jurisdictions include Bell County, the City of Bartlett, the City of Belton, the City of Harker Heights, the City of Holland, the City of Killeen, the City of Little River Academy, the City of Nolanville, the City of Rogers, the Village of Salado, the City of Temple, the City of Troy, and the CTCOG. These jurisdictions provided valuable input into the planning process.

Bell County is located in east central Texas, along the Balcones Escarpment, and is approximately forty-five miles north of Austin. Belton, the third largest town in the county serves as the county seat and is sixty-five miles north of Austin.

Bell County is bordered by Coryell, McLennan, and Falls counties on the north, on the east by Falls and Milam counties, on the south by Milam and Williamson counties, and on the west by Lampasa and Burnet counties. Interstate Highway 35 and State highways 195, 95, and 317 are the major north-south roads in the county; U.S. Highway 190 and State Highway 36 cross the county east and west. Bell County is also served by the Burlington Northern Santa Fe and the Union Pacific railroads.

Texas is prone to extremely heavy rains and flooding with half of the world record rainfall rates (48 hours or less).¹ While flooding is a well-known risk, Bell County is susceptible to a wide range of natural hazards, including but not limited to extreme heat, drought, hail, and winter storms. These life-threatening hazards can destroy property, disrupt the economy, and lower the overall quality of life for individuals.

¹ http://floodsafety.com/texas/regional_info/regional_info/austin_zone.htm

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While it is impossible to prevent an event from occurring, the effect from many hazards to people and property can be lessened. This concept is known as hazard mitigation, which is defined by the Federal Emergency Management Agency (FEMA) as *sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects.*² Communities participate in hazard mitigation by developing hazard mitigation plans. The Texas Division of Emergency Management (TDEM) is required to review the plan and FEMA has the authority to review and approve hazard mitigation plans through the Disaster Mitigation Act of 2000.

Hazard mitigation activities are an investment in a community's safety and sustainability. It is widely accepted that the most effective hazard mitigation measures are implemented at the local government level, where decisions on the regulation and control of development are ultimately made. A comprehensive review to a hazard mitigation plan addresses hazard vulnerabilities that exist today and in the foreseeable future. Therefore, it is essential that a plan identify projected patterns of how future development will increase or decrease a community's overall hazard vulnerability.

Scope

The focus of the Plan is to identify activities to mitigate hazards classified as “high” or “moderate” risk, as determined through a detailed hazard risk assessment conducted for Bell County and the participating jurisdictions. The hazard classification enables the County and participating jurisdictions to prioritize mitigation actions based on hazards which can present the greatest risk to lives and property in the geographic scope (i.e., planning area).

Throughout the plan “Bell County planning area” refers to the entire planning area including the unincorporated area of Bell County, the political border of the cities of Bartlett, Belton, Harker Heights, Holland, Killeen, Little River Academy, Nolanville, Rogers, Temple, and Troy, and the Village of Salado. Similarly, the term “countywide” refers to the entire planning area including the unincorporated area of Bell County, the political border of the cities of Bartlett, Belton, Harker Heights, Holland, Killeen, Little River Academy, Nolanville, Rogers, Temple, and Troy, and the Village of Salado.

Purpose

The Plan was prepared by CTCOG, Bell County, participating jurisdictions, and H2O Partners, Inc. The purpose of the Plan is to protect people and structures and to minimize the costs of disaster response and recovery. The goal of the Plan is to minimize or eliminate long-term risks to human life and property from known hazards by identifying and implementing cost-effective hazard mitigation actions. The planning process is an opportunity for Bell County, the participating jurisdictions, stakeholders, and the general public to evaluate and develop successful hazard mitigation actions to reduce future risk of loss of life and damage to property resulting from a disaster in the Bell County planning area.

The Mission Statement of the Plan is, “*Maintaining a secure and sustainable future through the revision and development of targeted hazard mitigation actions to protect life and property.*”

Bell County, participating jurisdictions, and planning participants identified ten natural hazards to be addressed by the Plan. The specific goals of the Plan are to:

² <http://www.fema.gov/hazard-mitigation-planning-resources>

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- Minimize disruption to Bell County and the participating jurisdictions following a disaster;
- Streamline disaster recovery by articulating actions to be taken before a disaster strikes to reduce or eliminate future damage;
- Demonstrate a firm local commitment to hazard mitigation principles;
- Serve as a basis for future funding that may become available through grant and technical assistance programs offered by the State or Federal government. The Plan will enable Bell County and participating jurisdictions to take advantage of rapidly developing mitigation grant opportunities as they arise; and
- Ensure that Bell County and participating jurisdictions maintain eligibility for the full range of future Federal disaster relief.

Authority



The Plan is tailored specifically for Bell County, participating jurisdictions, and plan participants including Planning Team members, stakeholders, and the general public who participated in the Plan development process. The Plan complies with all requirements promulgated by the Texas Division of Emergency Management (TDEM) and all applicable provisions of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000) (P.L. 106-390), and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108-264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al). Additionally, the Plan complies with the Interim Final Rules for the Hazard Mitigation Planning and Hazard Mitigation Grant Program (44 CFR, Part 201), which specify the criteria for approval of mitigation plans required in Section 322 of the DMA 2000 and standards found in FEMA's "Local Mitigation Plan Review Guide" (October 2011), and the "Local Mitigation Planning Handbook" (March 2013). Additionally, the Plan is developed in accordance with FEMA's Community Rating System (CRS) Floodplain Management Plan standards and policies.

Summary of Sections

Sections 1 and 2 of the Plan outline the Plan's purpose and development, including how Planning Team members, stakeholders, and members of the general public were involved in the planning process. Section 3 profiles the planning area's population and economy.

Sections 4 through 15 present a hazard overview and information on individual natural hazards in the planning area. The hazards generally appear in order of priority based on potential losses to life and property, and other community concerns. For each hazard, the Plan presents a description of the hazard, a list of historical hazard events, and the results of the vulnerability and risk assessment process.

Section 16 presents hazard mitigation goals and objectives. Mitigation actions for Bell County and the participating jurisdictions are presented in Section 17, while Section 18 identifies Plan maintenance mechanisms.

The list of planning team members and stakeholders is located in Appendix A. Public survey results are analyzed and presented in Appendix B. Appendix C contains a detailed list of critical facilities for the area, and Appendix D is dam locations. Appendix E contains information regarding workshops

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and meeting documentation. Capability Assessment results for Bell County and participating jurisdictions are located in Appendix F.³

³ Information contained in some of these appendices are exempt from public release under the Freedom of Information Act (FOIA).

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Plan Preparation and Development

Hazard mitigation planning involves coordination with various constituents and stakeholders to develop a more disaster-resistant community. Section 2 provides an overview of the planning process including the identification of key steps and a detailed description of how stakeholders and the public were involved.

Overview of the Plan

The Central Texas Council of Governments (CTCOG) hired H2O Partners, Inc. (Consultant Team), to provide technical support and oversee the development of the Plan for Bell County, including all participating jurisdictions. The Consultant Team used the FEMA “Local Mitigation Plan Review Guide” (October 1, 2011), and the Local Mitigation Planning Handbook” (March 2013) to develop the Plan. The overall planning process is shown in Figure 2-1 below.

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Figure 2-1. Mitigation Planning Process



Bell County, participating jurisdictions, and the Consultant Team met in January 2017 to begin organizing resources, identify Planning Team members, and conduct a Capability Assessment.

Planning Team

Key members of H2O Partners, Inc. developed the Plan in conjunction with the Planning Team. The Planning Team was established using a direct representation model. Some of the responsibilities of the Planning Team included: completing Capability Assessment surveys, providing input regarding the identification of hazards, identifying mitigation goals, and developing mitigation strategies. An Executive Planning Team consisting of key personnel from each of the participating jurisdictions as well as Bell County, shown in Table 2-1, was formed to coordinate planning efforts and request input and participation in the planning process. Table 2-2 reflects the Advisory Planning Team, consisting of additional representatives from area organizations and departments from the participating jurisdictions and Bell County that participated throughout the planning process.

Table 2-1. Executive Planning Team

ORGANIZATION / DEPARTMENT	TITLE
Bell County	Emergency Management Coordinator
City of Bartlett	City Administrator
City of Belton	Fire Chief/EMC
City of Harker Heights	Fire Chief/EMC
City of Holland	Mayor
City of Killeen	Emergency Manager

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ORGANIZATION / DEPARTMENT	TITLE
City of Little River Academy	Mayor
City of Nolanville	City Manager
City of Rogers	City Administrator
Village of Salado	Police Chief
City of Temple	Public Works Director
City of Troy	City Administrator
CTCOG	Director of Planning & Regional Services
CTCOG	Homeland Security/Criminal Justice Coordinator

Table 2-2. Advisory Planning Team

ORGANIZATION / DEPARTMENT	TITLE
City of Bartlett	Mayor
City of Bartlett	Mayor Pro Tem
City of Bartlett	Utilities Clerk
City of Belton	Assistant Fire Chief
City of Harker Heights	Assistant EMC
City of Holland	City Secretary
City of Killeen	Fire Chief
City of Killeen	Training Officer – Killeen FD
City of Killeen	Firefighter/EMT – Killeen FD
City of Nolanville	EMC
City of Rogers	Court Clerk
City of Temple	Fire Chief
CTCOG	Senior Planner

Additionally, a Stakeholder Group was invited to participate in the planning process via e-mail. The Consultant Team, Planning Team, and Stakeholder Group coordinated to identify mitigation goals, and develop mitigation strategies and actions for the Plan. Appendix A provides a complete listing of all participating Planning Team members and stakeholders by organization and title.

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Based on results of completed Capability Assessment, Bell County and participating jurisdictions described methods for achieving future hazard mitigation measures by expanding existing capabilities. For example, many of the participating jurisdictions do not have a Community Wildfire Protection Plan in place. Other options for improving capabilities include the following:

- Establishing Planning Team members with the authority to monitor the Plan and identify grant funding opportunities for expanding staff.
- Identifying opportunities for cross-training or increasing the technical expertise of staff by attending free training available through FEMA and the Texas Division of Emergency Management (TDEM) by monitoring classes and availability through preparingtexas.org.
- Reviewing current floodplain ordinances for opportunities to increase resiliency such as modifying permitting or building codes.
- Developing ordinances that will require all new developments to conform to the highest mitigation standards.

Sample hazard mitigation actions developed with similar hazard risk were shared at the meetings. These important discussions resulted in development of multiple mitigation actions that are included in the Plan to further mitigate risk from natural hazards in the future.

The Planning Team developed hazard mitigation actions for mitigating risk from all of the hazards including potential flooding, hail, and extreme heat. The actions include but are not limited to drainage improvement projects, raising flood-prone low water crossings, installing warning systems at low water crossings, implementing policies for new building construction that encourages the incorporation of hail resistant and heat reflective materials, and educating citizens to practice hazard mitigation techniques.

Planning Process

The process used to prepare the Plan followed the four major steps included at Figure 2-1. After the Planning Team was organized, a capability assessment was developed and distributed at the Kick-Off Workshop. Hazards were identified and assessed, and results associated with each of the hazards were provided at the Risk Assessment Workshop. Based on Bell County's identified vulnerabilities, including all participating jurisdictions, specific mitigation strategies were discussed and developed at the Mitigation Strategy Workshop. Finally, Plan maintenance and implementation procedures were developed and are included in Section 18. Participation of Planning Team members, stakeholders, and the public at each of the workshops is documented in Appendix E.

At the Plan development workshops held throughout the planning process described herein, the following factors were taken into consideration:

- The nature and magnitude of risks currently affecting the community;
- Hazard mitigation goals to address current and expected conditions;
- Whether current resources will be sufficient for implementing the Plan;
- Implementation problems, such as technical, political, legal, and coordination issues that may hinder development;
- Anticipated outcomes; and
- How Bell County, participating jurisdictions, agencies, and partners will participate in implementing the Plan.

Kickoff Workshop

The Kickoff Workshop was held at the Central Texas Council of Governments Building on January 24, 2017. The initial workshop informed County officials and key department personnel about how the

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planning process pertained to their distinct roles and responsibilities and engaged stakeholder groups including, but not limited to the American Red Cross, the Texas Forest Service, Texas A&M Agrilife (Bell County Office), and surrounding Independent School Districts. In addition to the kickoff presentation, participants received the following information:

- Project overview regarding the planning process;
- Public survey access information;
- Hazard Ranking form; and
- Capability Assessment survey for completion.

A risk ranking exercise was conducted at the Kickoff Workshop to get input from the Planning Team and stakeholders pertaining to various risks from a list of natural hazards affecting the planning area. Participants ranked hazards high to low in terms of perceived level of risk, frequency of occurrence, and potential impact.

Hazard Identification

At the Kickoff Workshop, and through e-mail and phone correspondence, the Planning Team conducted preliminary hazard identification. The Planning Team in coordination with the Consultant Team reviewed and considered a full range of natural hazards. Once identified, the teams narrowed the list to significant hazards by reviewing hazards affecting the area as a whole, the 2013 State of Texas Hazard Mitigation Plan Update, and initial study results from reputable sources such as federal and state agencies. Based on this initial analysis, the teams identified a total of eleven natural hazards, one of which is a quasi-technological hazard, dam failure, which pose a threat to the planning area.

Risk Assessment

An initial risk assessment for Bell County and the participating jurisdictions was completed in May 2017 and results were presented to Planning Team members at the Risk Assessment Workshop held on May 11, 2017. At the workshop, the characteristics and consequences of each hazard were evaluated to determine the extent to which the planning area would be affected in terms of potential danger to property and citizens.

Property and crop damages were estimated by gathering data from the National Center for Environmental Information (NCEI) and National Oceanic and Atmospheric Administration (NOAA). The assessment also examined the impact of various hazards on the built environment, including general building stock, critical facilities, lifelines, and infrastructure. The resulting risk assessment profiled hazard events, provided information on previous occurrences, estimated probability of future events, and detailed the spatial extent and magnitude of impact on people and property. Each participant at the Risk Assessment Workshop was provided a risk ranking sheet that asked participants to rank hazards in terms of the probability or frequency of occurrence, extent of spatial impact, and the magnitude of impact. The results of the ranking sheets identified unique perspectives on varied risks throughout the planning area.

The assessments were also used to set priorities for hazard mitigation actions based on potential loss of lives and dollar losses. A hazard profile and vulnerability analysis for each of the hazards can be found in Sections 4 through 15.

Mitigation Review and Development

Developing the Mitigation Strategy for the Plan involved identifying mitigation goals and new mitigation actions. A Mitigation Workshop was held at the Central Texas Council of Governments Building on September 8, 2017 and on September 28, 2017. In addition to the Planning Team, stakeholder groups were invited to attend the workshop. Regarding hazard mitigation actions, Workshop participants emphasized the desire for flood and hurricane projects. Additionally, the County and participating

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jurisdictions were proactive in identifying mitigation actions to lessen the risk of all the identified hazards included in the Plan.

An inclusive and structured process was used to develop and prioritize new hazard mitigation actions for the Plan. The prioritization method was based on FEMA's STAPLE+E criteria and included social, technical, administrative, political, legal, economic, and environmental considerations. As a result, each Planning Team Member assigned an overall priority to each hazard mitigation action. The overall priority of each action is reflected in the hazard mitigation actions found in Section 17.

Planning Team Members then developed action plans identifying proposed actions, costs and benefits, the responsible organization(s), effects on new and existing buildings, implementation schedules, priorities, and potential funding sources.

Specifically the process involved:

- Listing optional hazard mitigation actions based on information collected from previous plan reviews, studies, and interviews with federal, state, and local officials. Workshop participants reviewed the optional mitigation actions and selected actions that were most applicable to their area of responsibility, cost-effective in reducing risk, easily implemented, and likely to receive institutional and community support.
- Workshop participants inventoried federal and state funding sources that could assist in implementing the proposed hazard mitigation actions. Information was collected, including the program name, authority, purpose of the program, types of assistance and eligible projects, conditions on funding, types of hazards covered, matching requirements, application deadlines, and a point of contact.
- Planning Team Members considered the benefits that would result from implementing the hazard mitigation actions compared to the cost of those projects. Although detailed cost-benefit analyses were beyond the scope of the Plan, Planning Team Members utilized economic evaluation as a determining factor between hazard mitigation actions.
- Planning Team Members then selected and prioritized mitigation actions.

Hazard mitigation actions identified in the process were made available to the Planning Team for review. The draft Plan was made available to the general public for review on Bell County's website and the Bell County Office of Emergency Management with the chance to comment via responding to Bell County's Office of Emergency Management's email.

Review and Incorporation of Existing Plans

Review

Background information utilized during the planning process included various studies, plans, reports, and technical information from sources such as FEMA, the United States Army Corps of Engineers (USACE), the U.S. Fire Administration, National Oceanic and Atmospheric Administration (NOAA), the Texas Water Development Board (TWDB), the Texas Commission on Environmental Quality (TCEQ), the Texas State Data Center, Texas Forest Service, the Texas Division of Emergency Management (TDEM), and local hazard assessments and plans. Section 4 and the hazard-specific sections of the Plan (Sections 5-15) summarize the relevant background information.

Specific background documents, including those from FEMA, provided information on hazard risk, hazard mitigation actions currently being implemented, and potential mitigation actions. Previous hazard events, occurrences, and descriptions were identified through NOAA's National Centers for Environmental Information (NCEI). Results of past hazard events were found through searching the

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NCEI. The USACE studies were reviewed for their assessment of risk and potential projects in the region. State Data Center documents were used to obtain population projections. The State Demographer webpages were reviewed for population and other projections and included in Section 3 of the Plan. Information from the Texas Forest Service was used to appropriately rank the wildfire hazard, and to help identify potential grant opportunities. Materials from FEMA and TDEM were reviewed for guidance on Plan development requirements.

Incorporation of Existing Plans into the HMAP Process

A Capability Assessment was completed by key Bell County and participating jurisdictions' departments which provided information pertaining to existing plans, policies, ordinances and regulations to be integrated into the goals and objectives of the Plan. The relevant information was included in a master Capability Assessment, Appendix F.

Existing projects and studies were utilized as a starting point for discussing hazard mitigation actions among Planning and Consultant Team members. For example, several jurisdictions have hydrologic/hydraulic studies that are near completion, so those were discussed during the development of mitigation actions. Once those studies are completed, recommendations of actions can be considered to be included as mitigation actions during a plan update. Additionally, policies and ordinances were reviewed by several of the participating jurisdictions. These jurisdictions have included actions to strengthen zoning ordinance to limit development in known high hazard areas. Other plans were reviewed, such as Emergency Operations Plans and Capital Improvement Plans, to identify any additional mitigation actions. Finally, the 2013 State of Texas Mitigation Plan Update, developed by TDEM, was discussed in the initial planning meeting in order to develop a specific group of hazards to address in the planning effort. The 2013 State Plan Update was also used as a guidance document, along with FEMA materials, in the development of the Bell County Plan.

Incorporation of the HMAP into Other Planning Mechanisms

Planning Team members will integrate implementation of the Plan with other planning mechanisms for Bell County, such as the Emergency Operations Plan. Existing plans for Bell County will be reviewed and incorporated into the Plan, as appropriate. This section discusses how the Plan will be implemented by Bell County and the participating jurisdictions. It also addresses how the Plan will be evaluated and improved over time, and how the public will continue to be involved in the hazard mitigation planning process.

Bell County and the participating jurisdictions will be responsible for implementing hazard mitigation actions contained in Section 17. Each hazard mitigation action has been assigned to a specific County, City and Village department that is responsible for tracking and implementing the action.

A funding source has been listed for each identified hazard mitigation action and may be utilized to implement the action. An implementation time period has also been assigned to each hazard mitigation action as an incentive and to determine whether actions are implemented on a timely basis.

Bell County and the participating jurisdictions will integrate hazard mitigation actions contained in the Plan with existing planning mechanisms such as Storm Water Management Plans and ordinances, Emergency Operations or Management Plans, Transportation Plans, and other local and area planning efforts. Bell County will work closely with area organizations to coordinate implementation of hazard mitigation actions that benefit the planning area in terms of financial and economic impact.

Upon formal adoption of the Plan, Planning Team members from Bell County and the participating jurisdictions will review existing plans along with building codes to guide development and ensure that hazard mitigation actions are implemented. Each of the jurisdictions will be responsible for

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coordinating periodic review of the Plan with members of the Advisory Planning Team to ensure integration of hazard mitigation strategies into these planning mechanisms and codes. The Planning Team will also conduct periodic reviews of various existing planning mechanisms and analyze the need for any amendments or updates in light of the approved Plan. Bell County and the participating jurisdictions will ensure that future long-term planning objectives will contribute to the goals of the Plan to reduce the long-term risk to life and property from moderate and high risk hazards. Within one year of formal adoption of the Plan, existing planning mechanisms will be reviewed and analyzed as they pertain to the Plan.

Planning Team members will review and revise, as necessary, the long-range goals and objectives in its strategic plan and budgets to ensure that they are consistent with the Plan.

Furthermore, Bell County will work with participating jurisdictions to advance the goals of the Plan as it applies to ongoing, long-range planning goals and actions for mitigating risk to natural hazards throughout the planning area.

Table 2-3 identifies types of planning mechanisms and examples of methods for incorporating the Plan into other planning efforts.

Table 2-3. Examples of Methods of Incorporation

Planning Mechanism	Incorporation of Plan
Grant Applications	The Plan will be evaluated by Bell County and participating jurisdictions when grant funding is sought for mitigation projects. If a project is not in the Plan, an amendment may be necessary to include the action in the Plan.
Annual Budget Review	Various departments and key personnel that participated in the planning process for Bell County and participating jurisdictions will review the Plan and mitigation actions therein when conducting their annual budget review. Allowances will be made in accordance with grant applications sought, and mitigation actions that will be undertaken, according to the implementation schedule of the specific action.
Regulatory Plans	Currently, Bell County and participating jurisdictions have regulatory plans in place, such as Emergency Management Plans, Continuity of Operations Plans, and Economic Development Plans. The Plan will be consulted when County and City departments review or revise their current regulatory planning mechanisms, or in the development of regulatory plans that are not currently in place.
Capital Improvement Plans	Bell County and participating jurisdictions have a Capital Improvement Plan (CIP) in place. Prior to any revisions to the CIP, County, City and Village departments will review the risk assessment and mitigation strategy sections of the HMAP, as limiting

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Planning Mechanism	Incorporation of Plan
	public spending in hazardous zones is one of the most effective long-term mitigation actions available to local governments.
Comprehensive Plans	Bell County has a Long-term Comprehensive Development Plan in place. Since comprehensive plans involve developing a unified vision for a community, the mitigation vision and goals of the Plan will be reviewed in the development or revision of a Comprehensive Plan.
Floodplain Management Plans	Floodplain management plans include preventative and corrective actions to address the flood hazard. Therefore, the actions for flooding, and information found in Section 6 of this Plan discussing the people and property at risk to flood, will be reviewed and revised when Bell County updates their management plans or develops new plans.

Appendix F provides an overview of Planning Team members’ existing planning and regulatory capabilities to support implementation of mitigation strategy objectives. Appendix F also provides further analysis of how each intends to incorporate hazard mitigation actions into existing plans, policies, and the annual budget review as it pertains to prioritizing grant applications for funding and implementation of identified hazard mitigation projects.

Plan Review and Plan Update

As with the development of Plan, Bell County will oversee the review and update process for relevance and to necessary make adjustments. At the beginning of each fiscal year, Planning Team Members will meet to evaluate the Plan and review other planning mechanisms to ensure consistency with long-range planning efforts. In addition, the executive planning team participants will also meet once a year, by conference call or presentation, to re-evaluate prioritization of the hazard mitigation actions.

Timeline for Implementing Mitigation Actions

Both the Executive Planning Team (Table A-1, Appendix A) and the Advisory Planning Team (Table A-2, Appendix A) will engage in discussions regarding a timeframe for how and when to implement each hazard mitigation action. Considerations include when the action will be started, how existing planning mechanisms’ timelines affect implementation, and when the action should be fully implemented. Timeframes may be general, and there will be short, medium, and long term goals for implementation based on prioritization of each action, as identified on individual Hazard Mitigation Action worksheets included in the Plan for Bell County and participating jurisdictions.

Both the Executive and Advisory Planning Team will evaluate and prioritize the most suitable hazard mitigation actions for the community to implement. The timeline for implementation of actions will partially be directed by Bell County’s comprehensive planning process, budgetary constraints, and community needs. Bell County and the participating jurisdictions are committed to addressing and implementing hazard mitigation actions that may be aligned with and integrated into the Plan.

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Overall, the Planning Team is in agreement that goals and actions of the Plan shall be aligned with the timeframe for implementation of hazard mitigation actions with respect to annual review and updates of existing plans and policies.

Public and Stakeholder Involvement

An important component of hazard mitigation planning is public participation and stakeholder involvement. Input from individual citizens and the community as a whole provides the Planning Team with a greater understanding of local concerns and increases the likelihood of successfully implemented hazard mitigation actions. If citizens and stakeholders, such as local businesses, non-profits, hospitals, and schools are involved, they are more likely to gain a greater appreciation of the risks that hazards may present in their community and take steps to reduce or mitigate their impact.

The public was involved in the development of Bell County’s Plan at different stages prior to official Plan approval and adoption. Public input was sought using three methods: (1) open public meetings; (2) survey instruments; and (3) making the draft Plan available for public review at Bell County’s website and the Bell County Office of Emergency Management.

The draft Plan was made available to the general public for review and comment on the Bell County’s website and Office of Emergency Management. The public was notified at the public meetings that the draft Plan would be available for review. No feedback was received on the draft Plan, although it was given on the public survey, and all relevant information was incorporated into the Plan.

The Plan will be advertised and posted on Bell County’s website upon approval from FEMA.

Stakeholder Involvement

Stakeholder involvement is essential to hazard mitigation planning since a wide range of stakeholders can provide input on specific topics and from various points of view. Throughout the planning process, members of community groups, local businesses, neighboring jurisdictions, schools, and hospitals were invited to participate in development of the Plan. The Stakeholder Group (Table A-3 in Appendix A, and Table 2-4, below), included a broad range of representatives from both the public and private sector and served as a key component in Bell County’s outreach efforts for development of the Plan. Documentation of stakeholder meetings is found in Appendix E. A list of organizations invited to attend via e-mail is found in Table 2-4.

Table 2-4. Stakeholder Working Group

AGENCY	TITLE
American Red Cross	Executive Director
Bartlett ISD	President
Buckholts ISD	Superintendent
Cameron ISD	Superintendent
Grant Central Texas	Economic Development Corporation
Hamilton County	County Judge
Hamilton ISD	Superintendent

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AGENCY	TITLE
Holland ISD	Superintendent
Killeen ISD	Deputy Superintendent
Milam County	Emergency Management Coordinator
Milano ISD	President
Rockdale ISD	Superintendent
Rogers ISD	Superintendent
Salado ISD	Superintendent
Temple ISD	Superintendent
Thorndale ISD	Superintendent
Troy ISD	Superintendent
Texas A&M Agrilife – Bell County Office	District Extension Administrator
Texas Forest Service	Regional Fire Coordinator I
TX House Representative Hugh Shine	District Director

Stakeholders and participants from neighboring communities that attended the Planning Team and public meetings played a key role in the planning process. For example, tornado was one of the major concerns to stakeholders, so the County and all participating jurisdictions included an action to implement an individual safe room rebate program.

Public Meetings

A series of public meetings were held throughout the CTCOG planning area to collect public and stakeholder input, holding meetings in each of the three counties, Bell, Milam and Hamilton, within the CTCOG. Topics of discussion included the purpose of hazard mitigation, discussion of the planning process, and types of natural hazards. Representatives from area neighborhood associations and area residents were invited to participate. Additionally, Bell County utilized social media sources including Facebook, Twitter, and the local media to increase public participation in the Plan development process. Documentation on the public meetings are found in Appendix E.

Public meetings were held on the following dates and locations:

- January 24, 2017, Central Texas Council of Governments Building, Bell County
- April 12, 2017, Hamilton County Courthouse
- September 8, 2017, Milam County Courthouse

Public Participation Survey

In addition to public meetings, the Planning and Consultant Teams developed a public survey designed to solicit public input during the planning process from citizens and stakeholders and to obtain data regarding the identification of any potential hazard mitigation actions or problem areas. The survey was promoted by local officials and a link to the survey was posted on Bell County's and

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CTCOG's websites. A total of 16 surveys were completed online. The survey results are analyzed in Appendix B. Bell County reviewed the input from the surveys and decided which information to incorporate into the Plan as hazard mitigation actions. For example, many citizens mentioned concerns about flooding and suggested improving the storm water drainage system. In response, several actions were added to the Plan to upgrade undersized drainage channels and culverts in flood prone areas. Additionally, citizens were concerned with wind damage and mentioned keeping trees trimmed. Many jurisdictions included an action to implement a tree trimming program that routinely cleans tree limbs hanging in right-of-ways.

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Overview

Bell County was created from Milam County just five years after Texas entered the Union. County Commissioners chose a county seat on the banks of Nolan Creek and named it Nolanville. Two years later, on January 12, 1852, the town's name became Belton and it was incorporated. The County has a total area of 1,088 square miles, of which 1,051 square miles is land and 37 square miles (3.4%) is water.

The County consists of several cities, and towns, village, census-designated place and some unincorporated communities. The following cities, towns and village are participating within this plan and are considered part of the planning area: the City of Bartlett, the City of Belton, the City of Harker Heights, the City of Holland, the City of Killeen, the City of Little River Academy, the City of Nolanville, the City of Rogers, the Village of Salado, the City of Temple, the City of Troy and Central Texas Council of Governments (CTCOG).

Bell County is divided into regions by the Balcones Escarpment, which runs through the approximate center of the county from southeast to northwest. The eastern part of the county, on the Blackland Prairie, consists of comparatively level prairieland, mainly undulating to gently rolling. The western half of the county belongs to the Grand Prairie region of Texas, and includes undulating to rolling uplands, deeply cut with stream valleys that, in places, have stony slopes and steep bluffs. Bell County ranges in elevation from about 450 feet above sea level in the southeast to about 1,200 feet above sea level on the western boundary.

The County is drained chiefly by the Little River and its tributaries, especially the Leon, Lampasas, and Salado rivers, which come together at historic Three Forks to form the Little River. Vegetation west of the fault is characterized by tall grasses and oak, juniper, pine, and mesquite trees, while the eastern part of the county, which has been extensively utilized for farming, is still wooded along its streams with a variety of hardwood trees.

Figure 3-1 shows the general location of Bell County, along with the Cities that are located within the County. The COG is located within the jurisdictional boundaries of Belton.



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Figure 3-1. Location of Bell County Planning Area

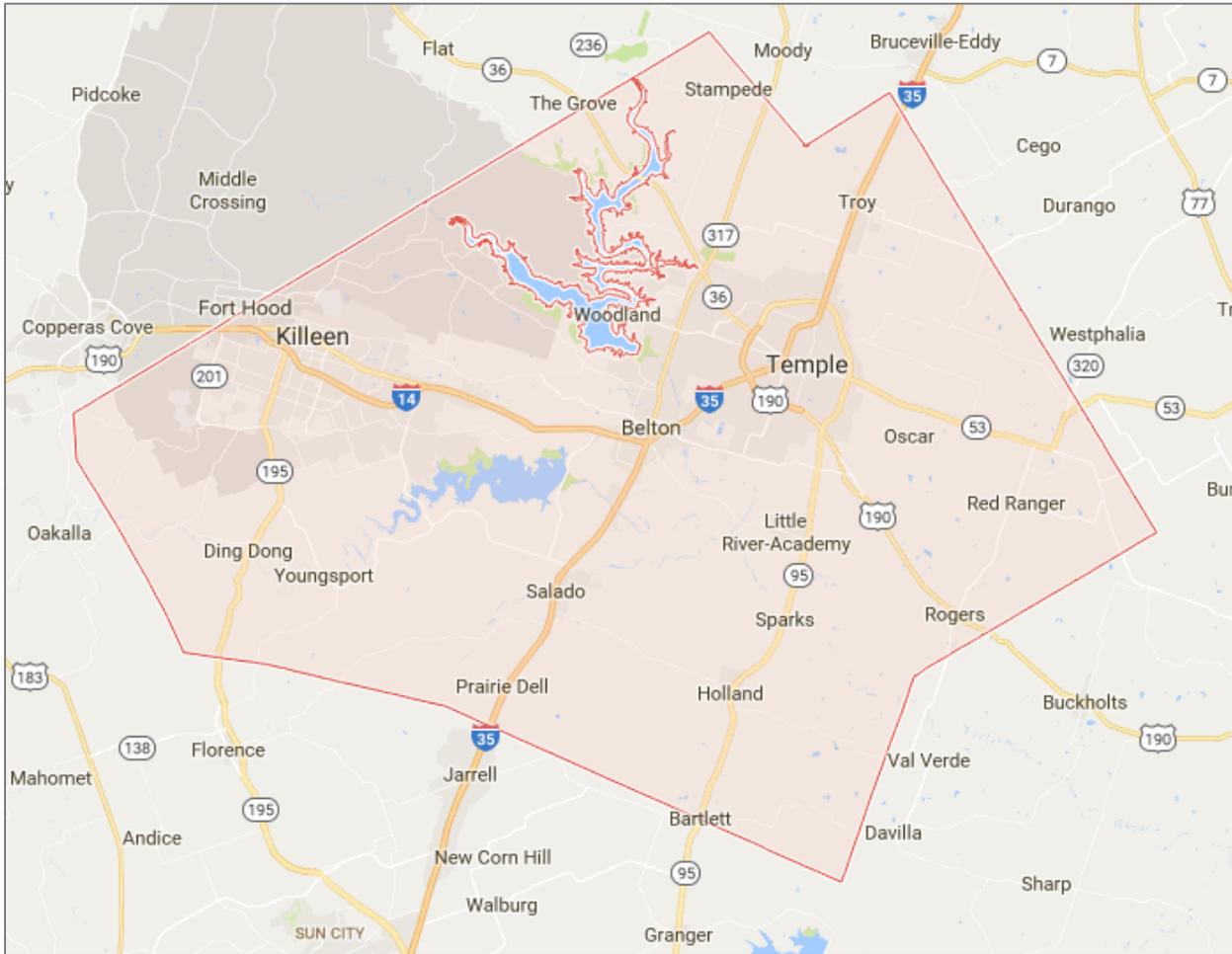
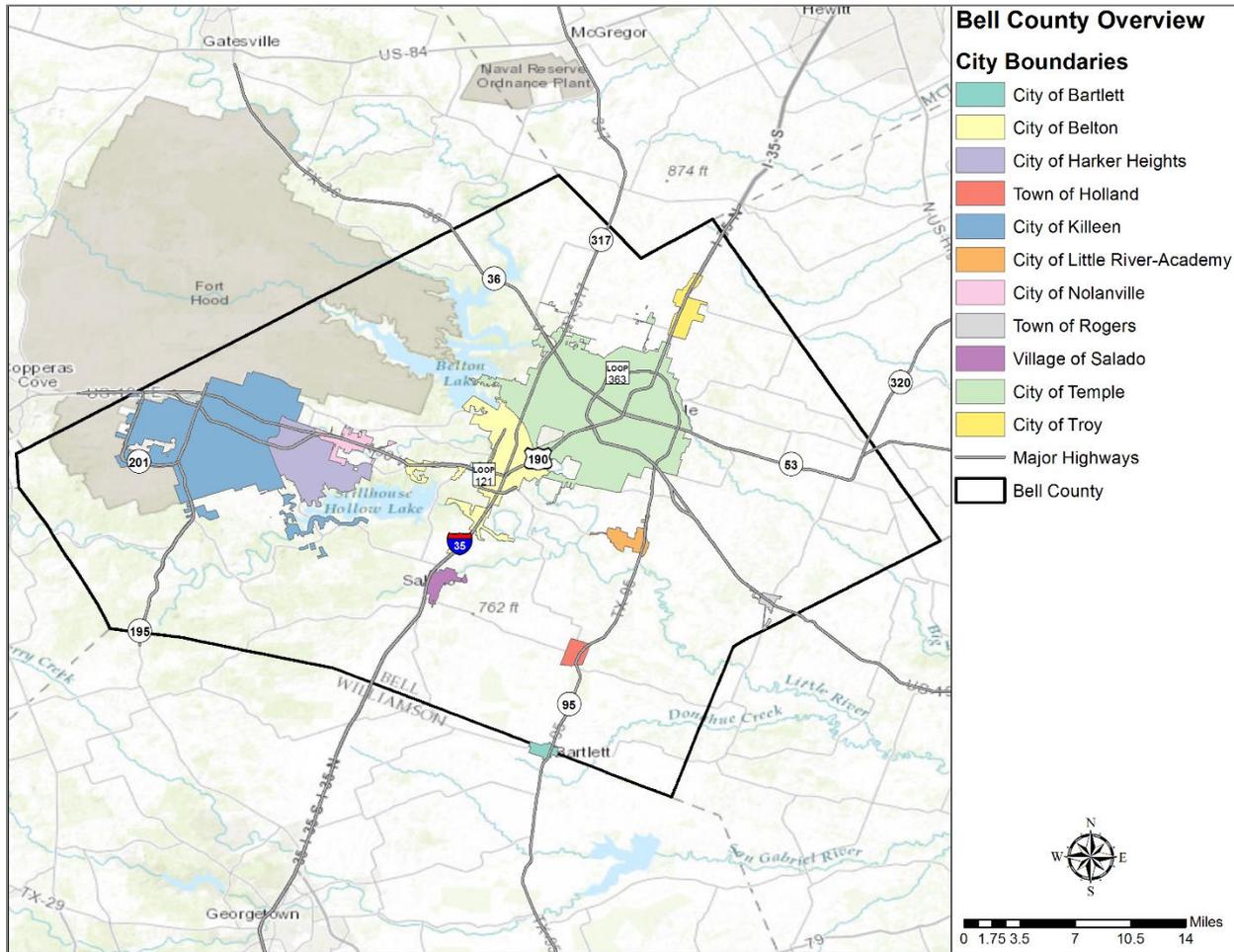


Figure 3-2 shows the Bell County Planning Area, including the participating jurisdictions that are covered in the risk assessment analysis of the Plan.

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Figure 3-2. Bell County Planning Area



Provided in Table 3-1 below is a listing of the jurisdictions in Bell County that participated in the Hazard Mitigation Plan.

Table 3-1. Participating Jurisdictions

PARTICIPATING JURISDICTIONS	
Bell County	City of Nolanville
City of Bartlett	City of Rogers
City of Belton	Village of Salado
City of Harker Heights	City of Temple
City of Holland	City of Troy
City of Killeen	Central Texas Council of Governments (CTCOG)
City of Little River Academy	

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Population and Demographics

In the official Census population count, as of April 1, 2010, Bell County had a population of 310,235 residents. By July 2015, the number had grown to 334,812, and by July 2016, the population was 340,411. Table 3-2 provides the population distribution by jurisdiction within Bell County.¹

Between official U.S. Census population counts, the estimate uses a formula based on new residential building permits and household size. It is simply an estimate and there are many variables involved in achieving an accurate estimation of people living in a given area at a given time.

Table 3-2. Population Distribution by Jurisdiction

JURISDICTION	TOTAL 2010 POPULATION	PERCENTAGE	ESTIMATED VULNERABLE OR SENSITIVE POPULATIONS	
			Elderly (Over 65)	Below Poverty Level
Bartlett	1,623	0.5%	275	205
Belton	18,216	5.9%	1,979	2,895
Harker Heights	26,700	8.6%	1,922	4,786
Holland	1,121	0.4%	133	273
Killeen	127,921	41.2%	6,618	20,609
Little River Academy	1,961	0.6%	216	226
Nolanville	4,259	1.4%	210	1,109
Rogers	1,218	0.4%	116	104
Salado	2,126	0.7%	619	71
Temple	66,102	21.3%	9,129	12,291
Troy	1,645	0.5%	176	192
Unincorporated Bell	57,343	18.5%	4,610	5,782
BELL COUNTY TOTAL	310,235	100%	27,003	48,543

Population Growth

The official 2010 Bell County population is 310,235. Overall, Bell County experienced an increase in population between 1980 and 2010 by 96.58%, or an increase by 152,415 people. The City of Rogers experienced a decrease in their population from 1980 to 2010, while the rest of the jurisdictions experienced a population growth. Between 2000 and 2010, two jurisdictions experienced a decrease in the population, while the rest of the jurisdictions experienced a population growth. Table 3-3 provides historic growth rates in Bell County.

¹ Source: <https://www.census.gov/quickfacts/fact/table/bellcountytexas,US/PST045216>

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Table 3-3. Population for Bell County, 1980-2010

JURISDICTIONS	1980	1990	2000	2010	POP CHANGE 1980-2010	PERCENT OF CHANGE	POP CHANGE 2000-2010	PERCENT OF CHANGE
Bartlett	1,567	1,439	1,675	1,623	56	3.57%	-52	-3.10%
Belton	10,660	12,463	14,623	18,216	7,556	70.88%	3,593	24.57%
Harker Heights	7,343	12,932	17,308	26,700	19,357	263.61%	9,392	54.26%
Holland	863	1,118	1,102	1,121	258	29.90%	19	1.72%
Killeen	46,296	63,535	86,911	127,921	81,625	176.31%	41,010	47.19%
Little River Academy	1,155	1,390	1,645	1,961	806	69.78%	316	19.21%
Nolanville	1,308	1,834	2,150	4,259	2,951	225.61%	2,109	98.09%
Rogers	1,242	1,131	1,117	1,218	-24	-1.98%	101	9.04%
Salado ²	1,035	1,216	3,475	2,126	1,091	105.41%	-1,349	-38.82%
Temple	42,354	46,109	54,514	66,102	23,748	56.07%	11,588	21.26%
Troy	1,353	1,395	1,378	1,645	292	21.58%	267	19.38%
Unincorporated Bell County	42,644	46,511	52,076	57,343	14,699	34.47%	5,267	10.11%
COUNTY TOTAL	157,820	191,073	237,974	310,235	152,415	96.58%	72,261	30.37%

Future Development

To better understand how future growth and development in the planning area might affect hazard vulnerability, it is useful to consider population growth, occupied and vacant land, the potential for future development in hazard areas, and current planning and growth management efforts. This section includes an analysis of the projected population change, the number of permits that have been issued throughout the county, and economic impacts.

Population projections from 2010 to 2040 are listed in Table 3-4, as provided by the Office of the State Demographer, Texas State Data Center, and the Institute for Demographic and Socioeconomic Research. Population projections are based on a 0.5 scenario growth rate, which is 50 percent of the population growth rate that occurred during 2000-2010. This information is only available at the County level; however, the population projection shows an increase in population density for the County, which would mean overall growth for the County.

² The Village of Salado voted in 2000 in favor of re-incorporation, before which point it was a census-designated place (CDP). Populations for 1980, 1990, and 200 are for Salado CDP.

Section 3: County Profile

Table 3-4. Bell County Population Projections

County	LAND AREA (SQ MI)	2010		2020		2030		2040	
		Population							
		Total Number	Density (Land Area, SQ MI)	Total Number	Density (Land Area, SQ MI)	Total Number	Density (Land Area, SQ MI)	Total Number	Density (Land Area, SQ MI)
Bell	1,088	310,235	285.1	371,281	341.3	429,284	394.6	492,019	452.2

Economic Impact

Building and maintaining infrastructure depends on the economy, and therefore, protecting infrastructure from risk due to natural hazards in the planning area is important to Bell County. Whether it's expanding culverts under a road that washes out during flash flooding, shuttering a fire station, or flood-proofing a wastewater facility, infrastructure must be mitigated from natural hazards in order to continue providing essential utility and emergency response services in a fast-growing planning area.

Major employers in the area are critical to the health of the economy, as well as effective transportation connectivity.

Existing and Future Land Use and Development Trends

The City of Belton's Planning Department administers Belton development through Planning, Development Review, Building Permitting, and Building Inspections. They operate as a 'one-stop shop', beginning with initial long-range planning and moving through a process that includes zoning, subdivision, site planning, construction plan review, permitting and inspections. The Department maintains the Comprehensive Plan, Thoroughfare Plan, and administers the Zoning Ordinance, Design Standards and Guidelines, and maintains an updated population estimate.

The City of Harker Heights's Planning and Development Department is responsible for evaluating proposed land developments, preparing the Comprehensive Plan, geographic information systems management, implementing and administering zoning subdivision regulations, inspecting construction activities, and enforcing building and development codes. The comprehensive plan is a working document utilized by the City of Harker Heights to guide it in its decisions making processes regarding the most appropriate land use for all areas of the city.

The City of Killeen's Planning and Development Services Department promotes a positive city image and quality of life. Their Comprehensive Plan and Downtown Plan establishes guidelines for future growth of Killeen by setting in place a framework that will assist the city in future land use and development decisions in a way that will encourage quality development within the city.

The City of Temple's Planning Department provides professional planning services on urban growth and development issues to promote quality of place. The Department maintains an updated Comprehensive Plan and Unified Development Code to provide policy recommendations and regulations related to land development. The staff works cooperatively with design professions, property owners, and developers from the concept stage to completion of the project.

Section 3: County Profile

The Comprehensive Plan for the City of Troy analyzes the strengths, weaknesses, opportunities, and threats of the community and then looked toward the future with a vision, goals and objectives. The vision is a small-town community that provides an exceptional quality of life, values and supports quality education and provides a safe environment for its residents. Three goals include supporting the rural landscape; helping existing places to thrive; and creating great new places.

Building Permits

Building permits indicate what types of buildings are being constructed and their relative uses. Table 3-5 lists the number of residential building permits for Bell County that have been granted between 1996 and 2015. The data includes all sizes of family homes for reported permits, as well as the construction costs, to show the potential increase in vulnerability of structures to the various hazards reviewed in the risk assessment. The increase in vulnerability can be attributed to the higher construction costs that would be factored into repairing or replacing a structure using current market values. Permits are reported annually in September; data reflects permits for consecutive years from 2010 to 2015 to demonstrate growth rates.

Table 3-5. County Residential Building Permits³

Bell County			
Year	Buildings	Units	Construction Cost
2000	1,466	1,795	\$165,675,313
2005	3,207	3,669	\$415,245,033
2010	1,798	1,914	\$265,210,713
2011	1,725	2,025	\$277,814,303
2012	1,997	2,330	\$336,177,670
2013	1,927	2,107	\$326,466,147
2014	1,917	1,989	\$326,072,752
2015	1,860	2,042	\$314,516,460
2016	1,714	2,107	\$309,542,593

³ Source: <http://censtats.census.gov/cgi-bin/bldgprmt/bldgdisp.pl>

Section 4: Risk Overview

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Hazard Description

Section 4 is the first phase of the Risk Assessment, providing background information for the hazard identification process and descriptions for the hazards identified. The Risk Assessment continues with Sections 5 through 15, which include hazard descriptions and vulnerability assessments.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, Bell County and the participating jurisdictions identified eleven natural hazards that are addressed in the Hazard Mitigation Plan. Of the hazards identified, ten natural hazards and one quasi-technological hazard (dam failure) were identified as significant, as shown in Table 4-1. The hazards were identified through input from Planning Team members and a review of the current 2013 State of Texas Hazard Mitigation Plan Update (State Plan Update). Readily available online information from reputable sources such as federal and state agencies were also evaluated and utilized to supplement information as needed.

In general, there are three main categories of hazards: atmospheric, hydrologic, and technological. Atmospheric hazards are events or incidents associated with weather generated phenomenon. Atmospheric hazards that have been identified as significant for the Bell County Planning area include extreme heat, hail, hurricane, lightning, thunderstorm wind, tornado, and winter storm (Table 4-1).

Hydrologic hazards are events or incidents associated with water related damage and account for over 75 percent of Federal disaster declarations in the United States. Hydrologic hazards identified as significant for the planning area include flood and drought.

Technological hazards refers to the origins of incidents that can arise from human activities, such as the construction and maintenance of dams. They are distinct from natural hazards primarily because they originate from human activity. The risks presented by natural hazards may be increased or decreased as a result of human activity, however they are not inherently human-induced. Therefore, dam failure is classified as a quasi-technological hazard and referred to as “technological,” in Table 4-1 for purposes of description. It is important to note that not all jurisdictions can be impacted by dam failure in the planning area. Only Bell County unincorporated, the Cities of Belton and Killeen, and the CTCOG are the only jurisdictions profiling dam failure as a hazard.

For the Risk Assessment, the wildfire hazard is considered “other,” since a wildfire may be natural or human-caused, and is not considered atmospheric or hydrologic.

Section 4: Risk Overview

Table 4-1. Hazard Descriptions

HAZARD	DESCRIPTION
ATMOSPHERIC	
Extreme Heat	Extreme heat is the condition whereby temperatures hover ten degrees or more above the average high temperature in a region for an extended period of time.
Hail	Hailstorms are a potentially damaging outgrowth of severe thunderstorms. Early in the developmental stages of a hailstorm, ice crystals form within a low- pressure front due to the rapid rising of warm air into the upper atmosphere and subsequent cooling of the air mass.
Hurricane	A hurricane is an intense tropical weather system of strong thunderstorms with a well-defined surface circulation and maximum sustained winds of 74 mph or higher.
Lightning	Lightning is a sudden electrostatic discharge that occurs during an electrical storm. This discharge occurs between electrically charged regions of a cloud, between two clouds, or between a cloud and the ground.
Thunderstorm Wind	A thunderstorm occurs when an observer hears thunder. Radar observers use the intensity of the radar echo to distinguish between rain showers and thunderstorms. Lightning detection networks routinely track cloud-to-ground flashes, and therefore thunderstorms.
Tornado	A tornado is a violently rotating column of air that has contact with the ground and is often visible as a funnel cloud. Its vortex rotates cyclonically with wind speeds ranging from as low as 40 mph to as high as 300 mph. The destruction caused by tornadoes ranges from light to catastrophic, depending on the location, intensity, size, and duration of the storm.
Winter Storm	Severe winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Blizzards, the most dangerous of all winter storms, combine low temperatures, heavy snowfall, and winds of at least 35 miles per hour, reducing visibility to only a few yards. Ice storms occur when moisture falls and freezes immediately upon impact on trees, power lines, communication towers, structures, roads, and other hard surfaces. Winter storms and ice storms can down trees, cause widespread power outages, damage property, and cause fatalities and injuries to human life.
HYDROLOGIC	
Drought	A prolonged period of less than normal precipitation such that the lack of water causes a serious hydrologic imbalance. Common effects of drought include crop failure, water supply shortages, and fish and wildlife mortality.

Section 4: Risk Overview

HAZARD	DESCRIPTION
Flood	The accumulation of water within a body of water, which results in the overflow of excess water onto adjacent lands, usually floodplains. The floodplain is the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that is susceptible to flooding. Most floods fall into the following three categories: riverine flooding, coastal flooding, and shallow flooding.
OTHER	
Wildfire	A wildfire is an uncontrolled fire burning in an area of vegetative fuels such as grasslands, brush, or woodlands. Heavier fuels with high continuity, steep slopes, high temperatures, low humidity, low rainfall, and high winds all work to increase the risk for people and property located within wildfire hazard areas or along the urban/wildland interface. Wildfires are part of the natural management of forest ecosystems, but most are caused by human factors.
TECHNOLOGICAL	
Dam Failure	Dam failure is the collapse, breach, or other failure of a dam structure resulting in downstream flooding. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and severe property damage if development exists downstream of the dam.

Hazards that weren't considered significant and were not included in the Plan are located in Table 4-2, along with the evaluation process used for determining the significance of each of these hazards. Hazards not identified for inclusion at this time may be addressed during future evaluations and updates.

Table 4-2. Hazard Identification Process

HAZARD CONSIDERED	REASON FOR DETERMINATION
Coastal Erosion	The planning area is not located on the coast, therefore coastal erosion does not pose a risk.
Earthquakes	According to the State Plan, an earthquake occurrence for the planning area is considered exceedingly rare. Earthquake events are not considered to pose a risk to the planning area. There is no history of impact to critical structures, systems, populations or other community assets or vital services as a result of earthquakes and none is expected in the future.
Expansive Soils	There is no history of impact to critical structures, systems, populations or other community assets or vital services as a result of expansive soils and none is expected in the future.

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HAZARD CONSIDERED	REASON FOR DETERMINATION
Land Subsidence	There are no historical occurrences of land subsidence for the planning area and it is located in an area where occurrences are considered rare. There is no history of impact to critical structures, systems, populations or other community assets or vital services as a result of land subsidence and none is expected in the future.

Natural Hazards and Climate Change

Climate change is defined as a long-term hazard which can increase or decrease the risk of other weather hazards. It directly endangers property due to sea level rise and biological organisms due to habitat destruction.

Global climate change is expected to exacerbate the risks of certain types of natural hazards impacted through rising sea levels, warmer ocean temperatures, higher humidity, the possibility of stronger storms, and an increase in wind and flood damages due to storm surges. While sea level rise is a natural phenomenon and has been occurring for several thousand years, the general scientific consensus is that the rate has increased in the past 200 years, from 0.5 millimeters per year to 2 millimeters per year.

Texas is considered one of the more vulnerable states in the U.S. to both abrupt climate changes and to the impact of gradual climate changes to the natural and built environments. Mega-droughts can trigger abrupt changes to regional ecosystems and the water cycle, drastically increase extreme summer temperature and fire risk, and reduce availability of water resources, as Texas experienced during 2011-2012.

Paleoclimate records also show that the climate over Texas had large changes between periods of frequent mega-droughts and the periods of mild droughts that Texas is currently experiencing. While the cause of these fluctuations is unclear, it would be wise to anticipate that such changes could occur again, and may even be occurring now.

Overview of Hazard Analysis

The methodologies utilized to develop the Risk Assessment are a historical analysis and a statistical approach. Both methodologies provide an estimate of potential impact by using a common, systematic framework for evaluation.

Records retrieved from the National Centers for Environmental Information (NCEI) and National Oceanic and Atmospheric Administration (NOAA) were reported for the Bell County Planning Area, including the participating jurisdictions. Remaining records identifying the occurrence of hazard events in the planning area and the maximum recorded magnitude of each event were also evaluated.

The use of geographic information system (GIS) technology to identify and assess risks for the Houston planning area, and evaluate community assets and their vulnerability to the hazards.

The four general parameters that are described for each hazard in the Risk Assessment include frequency of return, approximate annualized losses, a description of general vulnerability, and a statement of the hazard's impact.

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Frequency of return was calculated by dividing the number of events in the recorded time period for each hazard by the overall time period that the resource database was recording events. Frequency of return statements are defined in Table 4-3, and impact statements are defined in Table 4-4 below.

Table 4-3. Frequency of Return Statements

PROBABILITY	DESCRIPTION
Highly Likely	Event is probable in the next year.
Likely	Event is probable in the next three years.
Occasional	Event is probable in the next five years.
Unlikely	Event is probable in the next ten years.

Table 4-4. Impact Statements

POTENTIAL SEVERITY	DESCRIPTION
Substantial	Multiple deaths. Complete shutdown of facilities for 30 days or more. More than 50 percent of property destroyed or with major damage.
Major	Injuries and illnesses resulting in permanent disability. Complete shutdown of critical facilities for at least two weeks. More than 25 percent of property destroyed or with major damage.
Minor	Injuries and illnesses do not result in permanent disability. Complete shutdown of critical facilities for more than one week. More than 10 percent of property destroyed or with major damage.
Limited	Injuries and illnesses are treatable with first aid. Shutdown of critical facilities and services for 24 hours or less. Less than 10 percent of property destroyed or with major damage.

Each of the hazard profiles includes a description of a general Vulnerability Assessment. Vulnerability is the total of assets that are subject to damages from a hazard, based on historic recorded damages. Assets in the region were inventoried and defined in hazard zones where appropriate. The total amount of damages, including property and crop damages, for each hazard is divided by the total number of assets (building value totals) in that community to determine the percentage of damage that each hazard can cause to the community.

Hazard Vulnerability for Bell County was reviewed based on recent development changes that occurred throughout the County. To better understand how future growth and development in the County might affect hazard vulnerability, it is useful to consider population growth, occupied and vacant land, the potential for future development in hazard areas, and current planning and growth management efforts.

Once loss estimates and vulnerability were known, an impact statement was applied to relate the potential impact of the hazard on the assets within the area of impact.

Section 4: Risk Overview

Hazard Ranking

Table 4-5 portrays the results of the County's self-assessment for hazard ranking, based on the preliminary results of the risk assessment presented at the Risk Assessment Workshop. This table also takes into account local knowledge regarding frequency of occurrence and the potential impact of each hazard.

Table 4-5. Hazard Risk Ranking

HAZARD	FREQUENCY OF OCCURENCE	POTENTIAL SEVERITY	RANKING
Thunderstorm Wind	Highly Likely	Minor	High
Flood	Highly Likely	Substantial ¹	High
Extreme Heat	Highly Likely	Substantial	High
Tornado	Highly Likely	Substantial	High
Hail	Highly Likely	Minor	High
Wildfire	Highly Likely	Minor	Moderate
Drought	Highly Likely	Limited	Moderate
Lightning	Highly Likely	Limited	Moderate
Winter Storm	Highly Likely	Limited	Low
Hurricane	Unlikely	Major	Low
Dam Failure	Unlikely	Substantial	Low

¹ The following jurisdictions have a Limited potential severity: Bartlett, Belton, Harker Heights, Holland, Little River Academy, Rogers, Salado, Temple, Troy and CTCOG. The following jurisdictions have a Substantial potential severity: Bell County, Killeen, and Nolanville.

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Hazard Description

Thunderstorms create extreme wind events which includes straight line winds. Wind is the horizontal motion of the air past a given point, beginning with differences in air pressures. Pressure that is higher at one place than another sets up a force pushing from the high toward the low pressure; the greater the difference in pressures, the stronger the force. The distance between the area of high pressure and the area of low pressure also determines how fast the moving air is accelerated.

Thunderstorms are created when heat and moisture near the Earth's surface are transported to the upper levels of the atmosphere. By-products of this process are the clouds, precipitation, and wind that become the thunderstorm.



According to the National Weather Service (NWS), a thunderstorm occurs when thunder accompanies rainfall. Radar observers use the intensity of radar echoes to distinguish between rain showers and thunderstorms.

Straight line winds are responsible for most thunderstorm wind damages. One type of straight line wind, the downburst, is a small area of rapidly descending air beneath a thunderstorm. A downburst can cause damage equivalent to a strong tornado and make air travel extremely hazardous.

Location

Thunderstorms wind events can develop in any geographic location, and are considered a common occurrence in Texas. Therefore a thunderstorm wind event could occur at any location within Bell County's planning area, including the CTCOG and all participating jurisdictions, as these storms develop randomly and are not confined to any geographic area within the County. It is assumed that the entire Bell County planning area is uniformly exposed to the threat of thunderstorms winds.

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Extent

The extent or magnitude of a thunderstorm wind event is measured by the Beaufort Wind Scale. Table 5-1 describes the different intensities of wind in terms of speed and effects, from calm to violent and destructive.

Table 5-1. Beaufort Wind Scale¹

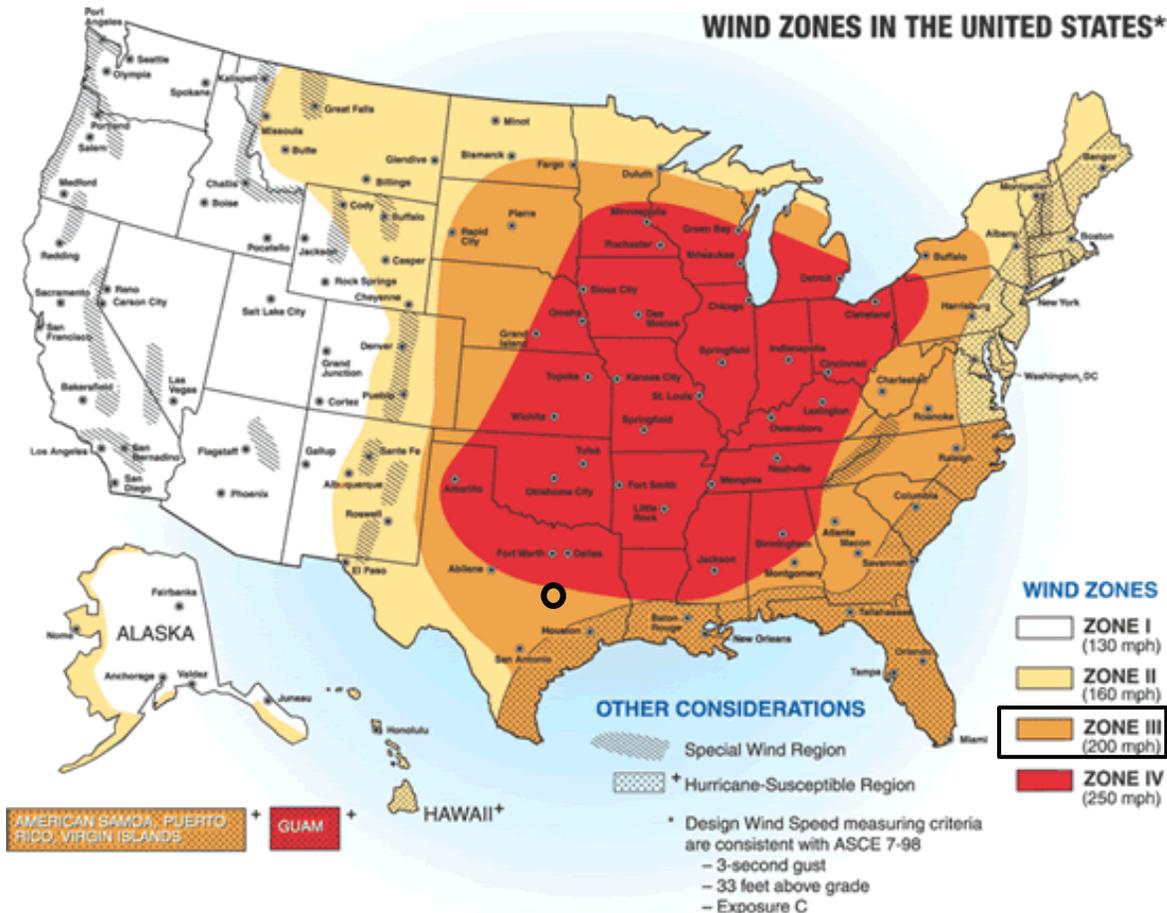
FORCE	WIND (KNOTS)	WMO CLASSIFICATION	APPEARANCE OF WIND EFFECTS
0	Less than 1	Calm	Calm, smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	13-18	Moderate Breeze	Dust, leaves and loose paper lifted, small tree branches move
5	19-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-31	Strong Breeze	Larger tree branches moving, whistling in wires
7	32-38	Near Gale	Whole trees moving, resistance felt walking against wind
8	39-46	Gale	Whole trees in motion, resistance felt walking against wind
9	47-54	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	55-63	Storm	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	64-72	Violent Storm	If experienced on land, widespread damage
12	73+	Hurricane	Violence and destruction

Figure 5-1 displays the wind zones as derived from NOAA.

¹ Source: World Meteorological Organization

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Figure 5-1. Wind Zones in the United States²



On average, the planning area experiences four to five thunderstorm wind events every year. The County is located in Zone III, meaning they can experience winds up to 200 mph. Bell County has experienced a significant wind event or an event with winds in the range of “Force 12” on the Beaufort Wind Scale with winds above 73 knots.

Historical Occurrences

Tables 5-2, 5-3, and 5-4 depict historical occurrences of thunderstorm wind events for the Bell County planning area according to the National Centers for Environmental Information (NCEI) data. From January 1955 to August 2017, 263 thunderstorm wind events are known to have impacted the Bell County planning area, based upon NCEI records. Table 5-3 presents information on known historical events impacting the Bell County planning area with resulting damages. It is important to note that high wind events associated with other hazards, such as tornadoes, are not accounted for in this section.

The NCEI is a national data source organized under the National Oceanic and Atmospheric Administration. The NCEI is the largest archive available for climate data; however, it is important to note that the only incidents recorded are those that are reported to the NCEI that have been factored

² Bell County is indicated by the circle.

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into this risk assessment. In the tables that follow throughout this section, some occurrences seem to appear multiple times in one table. This is due to reports from various locations throughout the County. In addition, property damage estimates are not always available. When this occurs, estimates are provided. Where an estimate has been provided in a table for losses, the dollar amounts have been altered to indicate the damage in 2017 dollars.

Historical thunderstorm wind data for the following are provided within a City-wide basis per the NCEI database: Bell County, the CTCOG and all participating jurisdictions. It should be noted that the CTCOG facility is located in the City of Belton. While the CTCOG has no reported damages due to thunderstorm wind events, the historic events posing a threat to the CTCOG are reported on a city-wide basis.

Table 5-2. Historical Thunderstorm Wind Events with Reported Damages, 1955-2017

MAXIMUM WIND SPEED RECORDED (MPH)	NUMBER OF REPORTED EVENTS
0-30	67
31-40	5
41-50	37
51-60	80
61-70	29
71-80	7
81-90	2
91-100	0
Unknown	36

Table 5-3. Historical Thunderstorm Wind Events, 1955-2017³

JURISDICTION	DATE	TIME	MAGNITUDE (MPH)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Harker Heights	4/17/1993	7:54 PM	0	0	0	\$84,027	\$0
Nolanville	4/17/1993	7:46 PM	0	0	0	\$84,027	\$0
Killeen	4/29/1993	3:30 AM	0	0	0	\$84,027	\$0
Killeen	5/13/1994	2:40 AM	0	0	0	\$8,193	\$0
Nolanville	5/13/1994	2:40 AM	0	0	0	\$81,929	\$0
Bell County	5/26/1994	4:45 PM	70	0	0	\$81,929	\$0

³ Only recorded events with fatalities, injuries or damages are listed. Magnitude is listed when available. Damage values are in 2017 dollars.

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JURISDICTION	DATE	TIME	MAGNITUDE (MPH)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Killeen	5/29/1994	10:05 PM	0	0	0	\$8,193	\$0
Killeen	7/13/1994	11:00 PM	0	0	0	\$81,929	\$0
Killeen	6/10/1995	11:30 PM	0	0	0	\$55,770	\$0
Nolanville	6/10/1995	11:00 PM	0	0	0	\$31,869	\$0
Bell County	6/27/1995	12:00 AM	0	0	0	\$2,390,148	\$0
Belton	6/27/1995	7:35 PM	85	0	0	\$398,358	\$0
Belton	6/27/1995	7:47 PM	79	0	0	\$318,686	\$0
Temple	6/27/1995	7:45 PM	0	0	0	\$119,507	\$0
Temple	6/27/1995	8:10 PM	90	0	1	\$517,865	\$0
Killeen	8/30/1995	6:52 PM	0	0	0	\$239,015	\$0
Belton	9/7/1995	5:42 PM	0	0	0	\$3,187	\$0
Bell County	4/19/1996	7:50 PM	Unknown	0	0	\$15,477	\$0
Belton	5/30/1996	12:42 AM	Unknown	0	0	\$7,739	\$0
Killeen	5/30/1996	12:58 AM	Unknown	0	0	\$4,643	\$0
Bell County	9/18/1996	3:30 PM	85	0	0	\$7,739	\$0
Rogers	9/18/1996	3:18 PM	Unknown	0	0	\$3,095	\$0
Bell County	11/7/1996	12:30 AM	Unknown	0	3	\$232,160	\$0
Killeen	11/7/1996	12:23 AM	92	0	0	\$696,479	\$0
Killeen	11/24/1996	3:30 AM	Unknown	0	0	\$7,739	\$0
Temple	3/1/1997	10:30 PM	Unknown	0	0	\$75,651	\$0
Belton	4/4/1997	7:15 PM	Unknown	0	0	\$3,026	\$0
Temple	4/4/1997	6:40 PM	Unknown	0	0	\$1,513	\$0
Belton	4/20/1997	8:30 PM	Unknown	0	0	\$3,026	\$0
Nolanville	5/30/1997	5:30 PM	Unknown	0	0	\$37,825	\$0
Bartlett	7/6/1997	7:45 PM	Unknown	0	0	\$6,052	\$0
Bartlett	2/25/1998	10:00 PM	Unknown	0	0	\$29,796	\$0
Killeen	2/25/1998	10:00 PM	Unknown	0	0	\$111,736	\$0
Belton	4/26/1998	7:15 PM	Unknown	0	0	\$1,490	\$0

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JURISDICTION	DATE	TIME	MAGNITUDE (MPH)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	7/14/1998	4:45 PM	Unknown	0	0	\$22,347	\$0
Troy	7/14/1998	5:02 PM	Unknown	0	0	\$1,490	\$0
Killeen	7/17/1998	3:15 PM	Unknown	0	0	\$2,980	\$0
Belton	8/29/1998	3:30 PM	Unknown	0	0	\$2,980	\$0
Temple	8/29/1998	4:00 PM	Unknown	0	0	\$14,898	\$0
Bell County	10/17/1998	8:25 AM	Unknown	0	0	\$74,490	\$0
Killeen	10/17/1998	9:05 AM	Unknown	0	0	\$148,981	\$0
Killeen	10/17/1998	9:15 AM	Unknown	0	0	\$148,981	\$0
Holland	5/10/1999	9:35 AM	Unknown	0	0	\$146	\$0
Bell County	8/28/1999	6:15 PM	Unknown	0	0	\$1,458	\$0
Belton	3/10/2000	6:45 PM	Unknown	0	0	\$2,820	\$0
Bell County	3/26/2000	6:15 PM	Unknown	0	0	\$70,511	\$0
Killeen	3/28/2000	7:20 PM	Unknown	0	0	\$2,820	\$0
Bell County	5/6/2001	3:30 PM	Unknown	0	0	\$13,712	\$0
Bell County	5/6/2001	5:20 PM	Unknown	0	0	\$13,712	\$0
Rogers	5/6/2001	5:30 PM	60	0	0	\$2,742	\$0
Salado	5/6/2001	5:00 PM	Unknown	0	0	\$2,742	\$0
Salado	5/6/2001	5:00 PM	Unknown	0	0	\$34,280	\$0
Rogers	8/26/2001	4:36 PM	69	0	0	\$4,114	\$0
Salado	11/15/2001	3:55 PM	Unknown	0	0	\$34,280	\$0
Temple	8/3/2002	5:15 PM	60	0	0	\$34,280	\$0
Killeen	3/4/2004	2:15 PM	70	0	0	\$38,566	\$0
Killeen	6/4/2004	9:42 PM	60	0	0	\$2,571	\$0
Killeen	6/4/2004	10:04 PM	60	0	0	\$2,571	\$0
Nolanville	6/4/2004	10:29 PM	60	0	0	\$6,428	\$0
Temple	11/23/2004	6:49 PM	60	0	0	\$1,286	\$0
Temple	5/8/2005	6:15 AM	60	0	0	\$93,256	\$0
Nolanville	5/28/2005	10:48 PM	58	0	0	\$6,217	\$0

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JURISDICTION	DATE	TIME	MAGNITUDE (MPH)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Belton	6/1/2005	2:00 AM	58	0	0	\$6,217	\$0
Temple	6/1/2005	1:42 AM	69	0	0	\$49,737	\$0
Bell County	7/11/2005	3:35 PM	58	0	0	\$12,434	\$0
Troy	7/12/2005	5:00 PM	58	0	0	\$24,868	\$0
Temple	10/31/2005	12:45 PM	58	0	0	\$18,651	\$0
Bell County	4/18/2006	7:25 PM	58	0	0	\$6,023	\$0
Bell County	4/18/2006	8:03 PM	58	0	0	\$6,023	\$0
Bell County	4/18/2006	10:08 PM	58	0	0	\$12,046	\$0
Bell County	4/20/2006	7:05 PM	85	0	4	\$1,204,559	\$0
Belton	4/20/2006	6:30 PM	70	0	0	\$24,091	\$0
Temple	4/20/2006	6:39 PM	58	0	0	\$12,046	\$0
Temple	4/28/2006	11:01 PM	75	0	0	\$72,274	\$0
Bell County	6/17/2006	6:30 AM	40	0	0	\$12,046	\$0
Bell County	6/18/2006	12:18 AM	36	0	0	\$1,205	\$0
Belton	7/22/2006	1:15 PM	58	0	0	\$84,319	\$0
Temple	10/18/2006	6:32 PM	58	0	0	\$3,614	\$0
Bell County	11/15/2006	11:00 AM	48	0	0	\$24,091	\$0
Bell County	3/12/2007	6:30 AM	47	0	0	\$1,171	\$0
Killeen	5/24/2007	4:49 PM	59	0	0	\$29,280	\$0
Bell County	1/6/2008	11:15 AM	32	0	0	\$1,128	\$0
Temple	4/10/2008	3:13 AM	64	0	0	\$84,592	\$0
Bell County	5/13/2008	11:18 PM	64	0	0	\$16,918	\$0
Belton	5/14/2008	5:35 AM	64	0	0	\$28,197	\$0
Little River Academy	5/14/2008	5:40 AM	75	0	0	\$394,763	\$0
Rogers	5/14/2008	5:50 AM	64	0	0	\$33,837	\$0
Salado	5/14/2008	5:26 AM	75	0	0	\$56,395	\$0
Salado	5/14/2008	5:29 AM	64	0	0	\$33,837	\$0
Salado	5/14/2008	6:05 AM	70	0	0	\$112,789	\$0

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JURISDICTION	DATE	TIME	MAGNITUDE (MPH)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Salado	5/14/2008	6:10 AM	58	0	0	\$56,395	\$0
Salado	5/14/2008	8:30 PM	70	0	0	\$22,558	\$0
Salado	7/8/2008	3:05 PM	60	0	0	\$13,535	\$0
Belton	7/14/2008	1:30 PM	58	0	0	\$22,558	\$0
Bell County	7/31/2008	7:00 PM	58	0	0	\$1,128	\$0
Troy	2/10/2009	9:30 PM	81	0	0	\$56,596	\$0
Bell County	4/2/2009	8:00 AM	41	0	0	\$7,923	\$0
Bartlett	4/27/2009	4:00 AM	60	0	0	\$3,396	\$0
Killeen	7/31/2009	3:31 PM	58	0	0	\$1,132	\$0
Bell County	8/12/2009	2:30 PM	58	0	0	\$2,264	\$0
Belton	8/12/2009	2:30 PM	58	0	0	\$11,319	\$0
Holland	3/24/2010	8:07 PM	58	0	0	\$557	\$0
Bell County	4/23/2010	10:40 PM	62	0	0	\$4,455	\$0
Temple	4/23/2010	11:10 PM	72	0	0	\$5,568	\$0
Bell County	4/26/2010	4:25 PM	60	0	0	\$1,114	\$0
Bell County	4/26/2010	4:59 PM	60	0	0	\$1,114	\$0
Troy	4/26/2010	4:45 PM	64	0	0	\$6,682	\$0
Killeen	5/17/2010	3:53 PM	63	0	0	\$5,568	\$0
Temple	5/17/2010	5:17 PM	60	0	0	\$33,410	\$0
Bell County	2/1/2011	2:00 AM	54	0	0	\$12,955	\$0
Bell County	5/11/2011	4:20 PM	60	0	0	\$10,796	\$0
Bell County	5/11/2011	4:55 PM	64	0	0	\$2,159	\$0
Temple	5/11/2011	5:02 PM	64	0	0	\$16,194	\$0
Belton	9/26/2011	7:02 PM	60	0	0	\$5,398	\$0
Temple	9/26/2011	7:12 PM	64	0	0	\$16,194	\$0
Temple	9/26/2011	7:15 PM	67	0	0	\$2,159	\$0
Bell County	6/12/2012	3:55 PM	60	0	0	\$9,519	\$0
Temple	6/12/2012	4:00 PM	49	0	0	\$5,288	\$0

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JURISDICTION	DATE	TIME	MAGNITUDE (MPH)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Rogers	6/20/2012	1:50 PM	58	0	0	\$7,404	\$0
Bell County	2/10/2013	3:10 AM	55	0	0	\$5,212	\$0
Bell County	2/10/2013	3:17 AM	64	0	0	\$3,127	\$0
Temple	2/10/2013	3:15 AM	75	0	0	\$52,121	\$0
Bell County	2/25/2013	10:00 AM	54	0	0	\$78,181	\$0
Bell County	5/9/2013	1:38 PM	72	0	0	\$20,848	\$0
Bell County	5/10/2013	6:30 PM	60	0	0	\$5,212	\$0
Belton	5/21/2013	3:45 PM	64	0	0	\$31,273	\$0
Belton	10/26/2013	9:20 PM	60	0	0	\$1,042	\$0
Belton	10/26/2013	10:15 PM	63	0	0	\$10,424	\$0
Bell County	3/28/2014	2:02 PM	67	0	0	\$3,077	\$0
Belton	3/28/2014	2:39 PM	64	0	0	\$15,387	\$0
Temple	3/28/2014	2:42 PM	60	0	0	\$5,129	\$0
Bell County	5/8/2014	5:03 PM	59	0	0	\$6,155	\$0
Belton	10/2/2014	7:42 PM	58	0	0	\$1,026	\$0
Bell County	6/18/2015	4:10 PM	59	0	0	\$512	\$0
Bell County	6/18/2015	4:10 PM	59	0	0	\$1,025	\$0
Bell County	8/25/2015	11:40 AM	46	0	0	\$7,172	\$0
Temple	8/25/2015	11:40 AM	46	0	0	\$8,197	\$0
Bell County	3/8/2016	10:24 AM	49	0	0	\$7,083	\$0

Table 5-4. Summary of Historical Thunderstorm Wind Events, 1955-2017

JURISDICTION	NUMBER OF EVENTS	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	140	102	0	7	\$4,412,358	\$0
Bartlett	5	66	0	0	\$39,244	\$0
Belton ⁴	26	85	0	0	\$982,563	\$0

⁴ CTCOG events are reported on a city-wide basis under the City of Belton

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JURISDICTION	NUMBER OF EVENTS	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Harker Heights	1	0	0	0	\$84,027	\$0
Holland	3	70	0	0	\$703	\$0
Killeen	26	92	0	0	\$1,681,174	\$0
Little River Academy	1	75	0	0	\$394,763	\$0
Nolanville	7	60	0	0	\$248,295	\$0
Rogers	6	69	0	0	\$51,192	\$0
Salado	11	75	0	0	\$366,811	\$0
Temple	32	90	0	1	\$1,243,430	\$0
Troy	5	81	0	0	\$89,636	\$0
TOTAL LOSSES	263	(Max Extent)	0	8	\$9,594,196	

Significant Events

June 27, 1995 – Bell County

During the early evening hours on the 27th, severe thunderstorms developed across the south-central portion of north Texas along an outflow boundary. One of these severe storms moved across Fort Hood and into Bell County producing large hail and up to 90 mph winds resulting in extensive wind damage.

November 7, 1996 – City of Killeen

During the late evening hours on the 7th, severe thunderstorms developed across Bell County. Wind gusts estimated at 80 mph damaged homes, lifted the roof off one home, and blew down trees and power lines. Wind gusts measured at 92 mph at the Killeen Municipal Airport destroyed a hangar and two planes within the hangar.

April 20, 2006 – Bell County

During the early evening hours on the 20th, severe thunderstorms developed in Bell County. At least 20 mobile homes were damaged or destroyed. Several were rolled off their foundations and virtually disintegrated. Numerous barns and outbuildings were destroyed. Four people were injured. Winds were estimated at 80 MPH.

June 20, 2012 – City of Rogers

Scattered afternoon thunderstorms developed in a moisture rich and unstable environment. Penny and nickel sized hail was reported in Robertson County, and thunderstorm winds damaged a manufactured home in Bell County. Strong thunderstorm winds damaged a manufactured home near Rogers. Part of the siding of the home was ripped off and part of the metal roof was peeled back.

October 26, 2013 – City of Belton

Severe thunderstorms developed as a strong shortwave and cold front moved into the region. Approximately half of the trees in Yettie Polk State Park were uprooted or heavily damaged by

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thunderstorm winds, and the park had to be closed. Crews from the public works department worked overnight to remove debris from roadways. Power lines were also knocked down in the park.

Probability of Future Events

Most thunderstorm winds occur during the months of March, April, May, and September. Based on available records of historic events, there have been 263 events in a 63 year reporting period, which provides a probability of occurrence of four to five events every year. Even though the intensity of thunderstorm wind events is not always damaging for the Bell County planning area, the frequency of occurrence for a thunderstorm wind event is highly likely. This means that an event is probable within the next year for the Bell County planning area, including the CTCOG and all participating jurisdictions.

Vulnerability and Impact

Vulnerability is difficult to evaluate since thunderstorm wind events can occur at different strength levels, in random locations, and can create relatively narrow paths of destruction. Due to the randomness of these events, all existing and future structures and facilities in the Bell County planning area could potentially be impacted and remain vulnerable to possible injury and property loss from thunderstorm winds.

Trees, power lines and poles, signage, manufactured housing, radio towers, concrete block walls, storage barns, windows, garbage receptacles, brick facades, and vehicles, unless reinforced, are vulnerable to thunderstorm wind events. More severe damage involves windborne debris; in some instances, patio furniture and other lawn items have been reported to have been blown around by wind and, very commonly, debris from damaged structures in turn have caused damage to other buildings not directly impacted by the event. In numerous instances roofs have been reported as having been torn off of buildings. Portable buildings typically used at commercial properties and schools would be more vulnerable to thunderstorm wind events than typical site built structures and could potentially pose a greater risk for wind-blown debris.

The US Census data indicates a total of 4,903 manufactured homes (approximately 3.7%) located in the Bell County planning area including all participating jurisdictions (Table 5-5). In addition, 35.7% (approximately 46,993 structures) of the residential structures in the Bell County planning area were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant wind events. While the CTCOG does not have any manufactured homes or portable buildings, the facility was built prior to 1980 and may be more vulnerable.

Table 5-5. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Bell County ⁵	4,903	46,993
Bartlett	34	445
Belton	614	3,438

⁵ County totals includes all jurisdictions and unincorporated areas within the county.

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JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
CTCOG	0	1
Harker Heights	1,414	2,480
Holland	48	290
Killeen	1,371	17,117
Little River Academy	128	403
Nolanville	518	500
Rogers	84	298
Salado	10	157
Temple	907	14,607
Troy	36	354

The following critical facilities would be vulnerable to thunderstorm wind events in each participating jurisdiction:

Table 5-6. Critical Facilities at Risk by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Bell County	Government Facility, OEM
Bartlett	Government Facility, Police Station, Fire Station, 2 Schools
Belton	Government Facility, Police Station, 2 Fire Stations, EOC, School, Shelter
CTCOG	CTCOG Office Building
Harker Heights	Government Facility, Police Station, 2 Fire Stations, Shelter, Hospital, Nursing Home, 13 Lift Stations, 9 Pump Stations, Communications Tower
Holland	Government Facility, Police Station, Fire Station, School, Community Center
Killeen	11 Government Facilities, 2 Police Stations, 8 Fire Stations, EOC, OEM, Public Works Facility, Shelter, Water Department Facility, Oncor Electric Services, Solid Waste Facility
Little River Academy	Government Facility, Police Station, Fire Station
Nolanville	Government Facility, Police Station, Fire Station, EMS, Public Works Facility, 2 Schools
Rogers	Government Facility, Police Station, Fire Station, School, 2 Water Towers, Wastewater Treatment Facility, Community Center
Salado	2 Government Facilities, Police Station, Wastewater Treatment Facility, 4 Schools, Transportation Facility (Bus Maintenance), Communications Facilities, Water Tower

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JURISDICTION	CRITICAL FACILITIES
Temple	Government Facility, Police Station, 8 Fire Stations, Public Works Facility, 4 Water Treatment Facilities, 3 Hospitals, Convention Center, 2 Dams, Panda Power Plant, 11 Water Towers, Ground Storage Tank, 7 Pump Stations, 22 Schools, Interstate, 2 Highways
Troy	Government Facility, Police Station, Water Well, Water Storage Facility and Pump, Water Tower, Wastewater Treatment Facility, 4 Schools

A thunderstorm wind event can also result in traffic disruptions, injuries and in rare cases, fatalities. Impact of thunderstorms winds experienced in the Bell County planning area has resulted in eight injuries and no fatalities. Impact of thunderstorm wind events experienced in the Bell County planning area, including the CTCOG and all participating jurisdictions, would be “Minor,” and injuries and illnesses would not result in permanent disability, the quality of life lost would be minor, and facilities would be shut down for more than 1 week. Overall, the average loss estimate (in 2017 dollars) is \$9,594,196, having an approximate annual loss estimate of \$152,289 (Table 5-7).

Table 5-7. Potential Annualized Losses for Bell County

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
Bell County	\$4,412,358	\$70,037
Bartlett	\$39,244	\$623
Belton	\$982,563	\$15,596
CTCOG	\$0	\$0
Harker Heights	\$84,027	\$1,334
Holland	\$703	\$11
Killeen	\$1,681,174	\$26,685
Little River Academy	\$394,763	\$6,266
Nolanville	\$248,295	\$3,941
Rogers	\$51,192	\$813
Salado	\$366,811	\$5,822
Temple	\$1,243,430	\$19,737
Troy	\$89,636	\$1,423
Planning Area	\$9,594,196	\$152,289

Assessment of Impacts

Thunderstorm wind events have the potential to pose a significant risk to people and can create dangerous and difficult situations for public health and safety officials. Impacts to the planning area can include:

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- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.
- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- During exceptionally heavy wind events, first responders may be prevented from responding to calls, as the winds may reach a speed in which their vehicles and equipment are unsafe to operate.
- Thunderstorm wind events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning, as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions.
- Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.
- Critical staff may be unable to report for duty, limiting response capabilities.
- City or county departments may be damaged, delaying response and recovery efforts for the entire community.
- Private sector entities that the County and all participating jurisdictions and their residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Some businesses not directly damaged by thunderstorm wind events may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.
- Older structures built to less stringent building codes may suffer greater damage as they are typically more vulnerable to thunderstorm winds.
- Large scale wind events can have significant economic impact on the affected area, as it must now fund expenses such as infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, and normal day-to-day operating expenses.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.
- Miller Springs Nature Center in a 360 acre park that runs along both sides of the Leon River that attracts tourism throughout the year. Belton Lake is also a popular tourist area. A large thunderstorm wind event could impact recreational activities, placing visitors in imminent danger, potentially requiring emergency services or evacuation.
- Recreational areas and parks may be damaged or inaccessible due to downed trees or debris, causing temporary impacts to area businesses.

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- While the COG has not had any physical or loss of life impacts, it is important to understand that resources and personnel are allocated, and financial resources are utilized to recover from the COG. This makes the budget smaller for and spreads personnel thin and makes it difficult to perform other necessary tasks for the jurisdictions it serves.

The economic and financial impacts of thunderstorm winds on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the community, local businesses, and citizens will also contribute to the overall economic and financial conditions in the aftermath of any thunderstorm wind event.

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Hazard Description

Floods generally result from excessive precipitation. The severity of a flood event is determined by a combination of several major factors, including: stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing and impervious surface. Typically, floods are long-term events that may last for several days.

The primary types of general flooding are inland and coastal flooding. Due to Bell County’s inland location, only inland flooding is profiled in this section. Inland or riverine flooding is a result of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Inland or riverine flooding is overbank flooding of rivers and streams, typically resulting from large-scale weather systems that generate prolonged rainfall over a wide geographic area, thus it is a naturally occurring and inevitable event. Some river floods occur seasonally when winter or spring rainfalls fill river basins with too much water, too quickly. Torrential rains from decaying hurricanes or tropical systems can also produce riverine flooding.

Location

The Digital Flood Insurance Rate Map (DFIRM) data provided by FEMA for Bell County shows the following flood hazard areas:

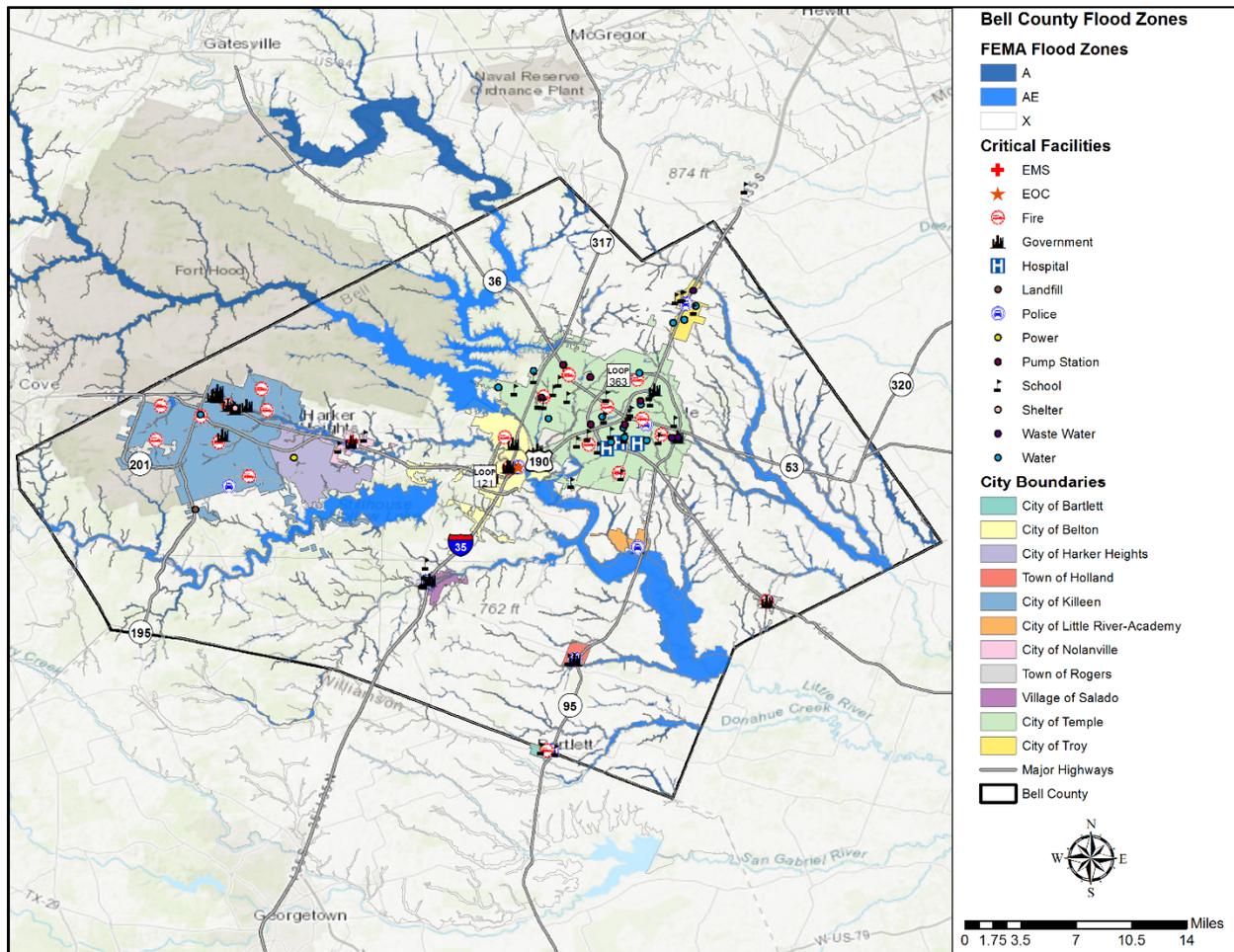
- Zone A: Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance requirements and floodplain management standards apply.
- Zone AE: Areas subject to inundation by 1-percent-annual-chance shallow flooding. It is the base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1-30 zones.

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- Zone X: Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones.

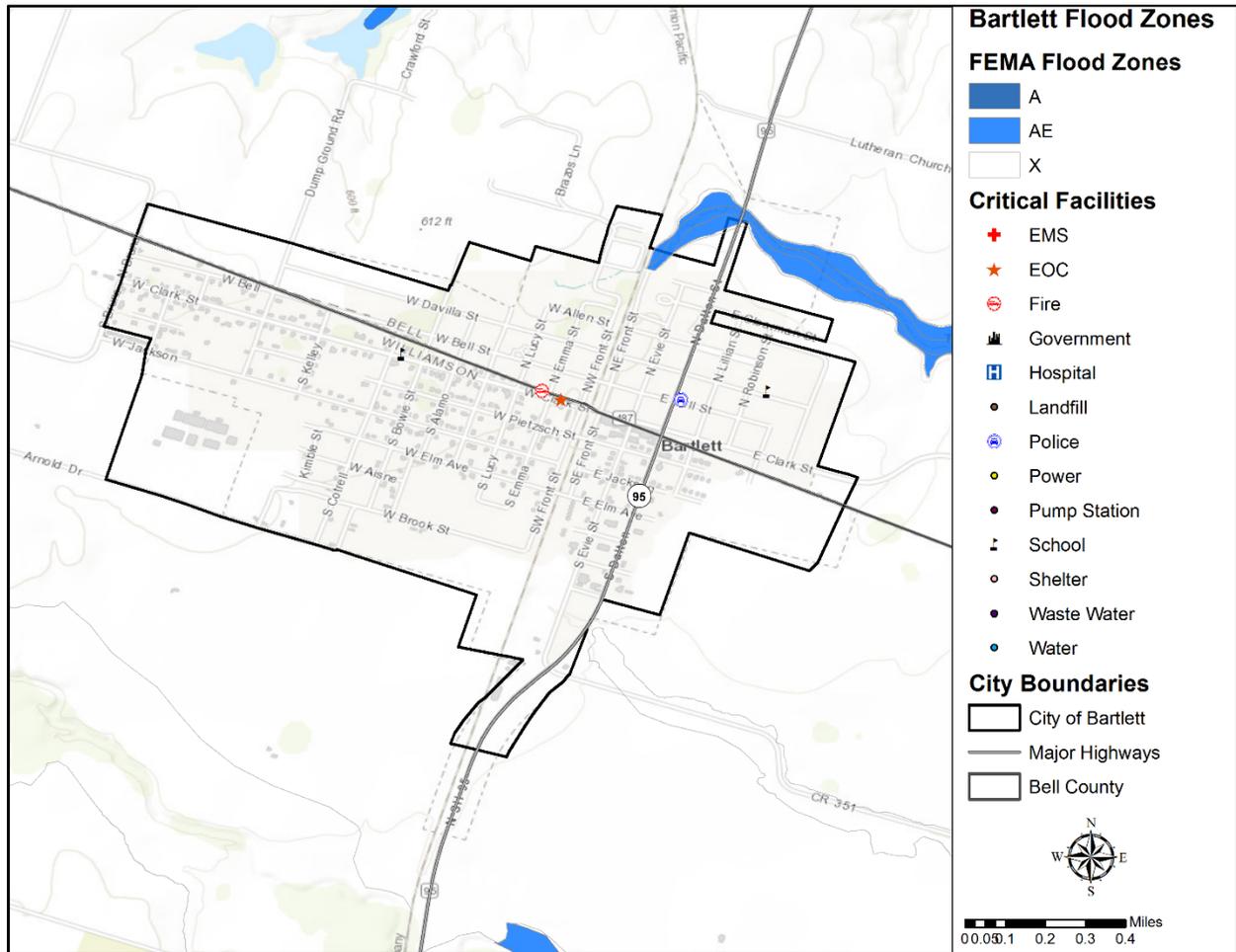
Locations of flood zones in Bell County based on the digital Flood Insurance Rate Map (DFIRM) from FEMA are illustrated in Figures 6-1 to 6-12.

Figure 6-1. Estimated Flood Zones in Bell County



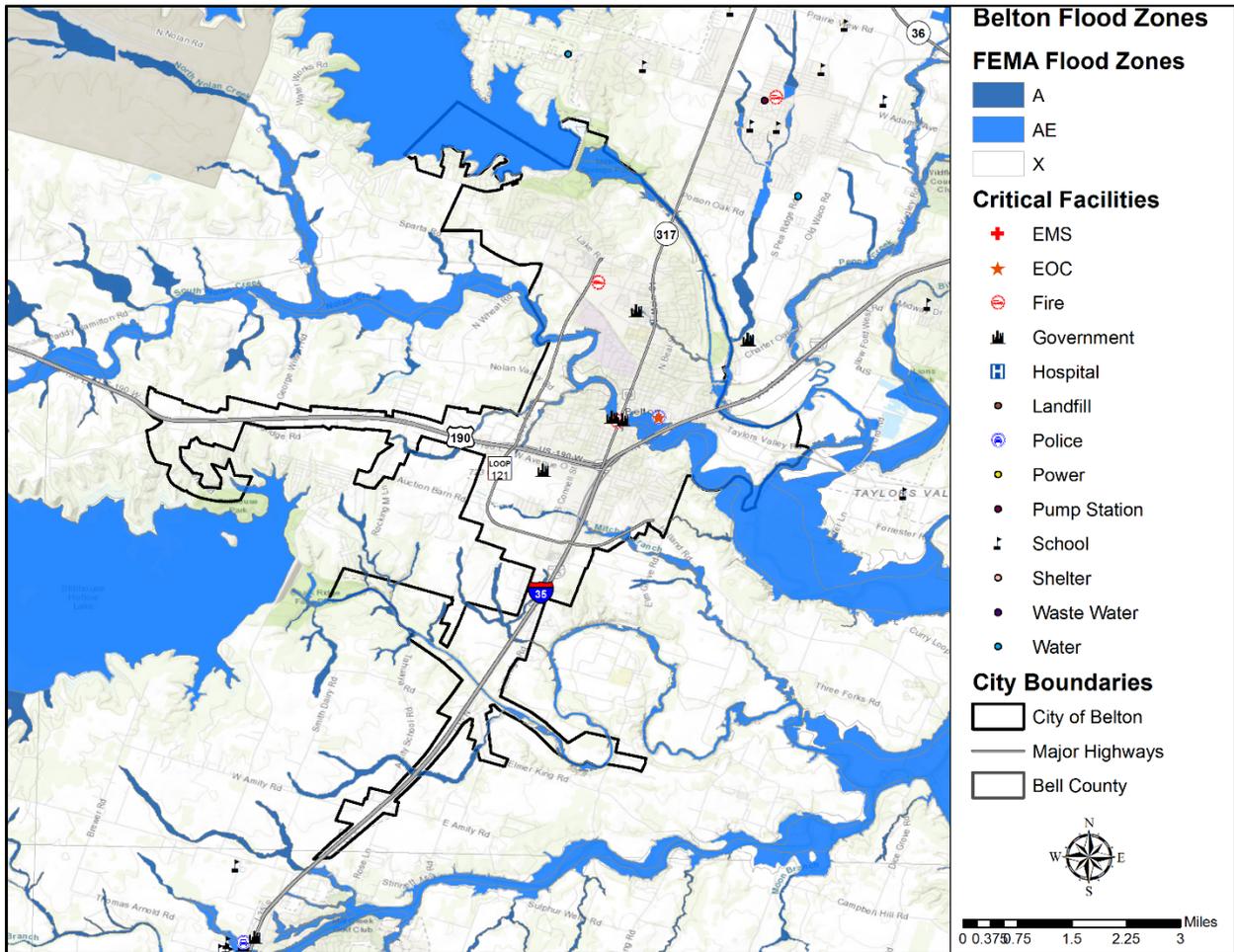
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Figure 6-2. Estimated Flood Zones in the City of Bartlett



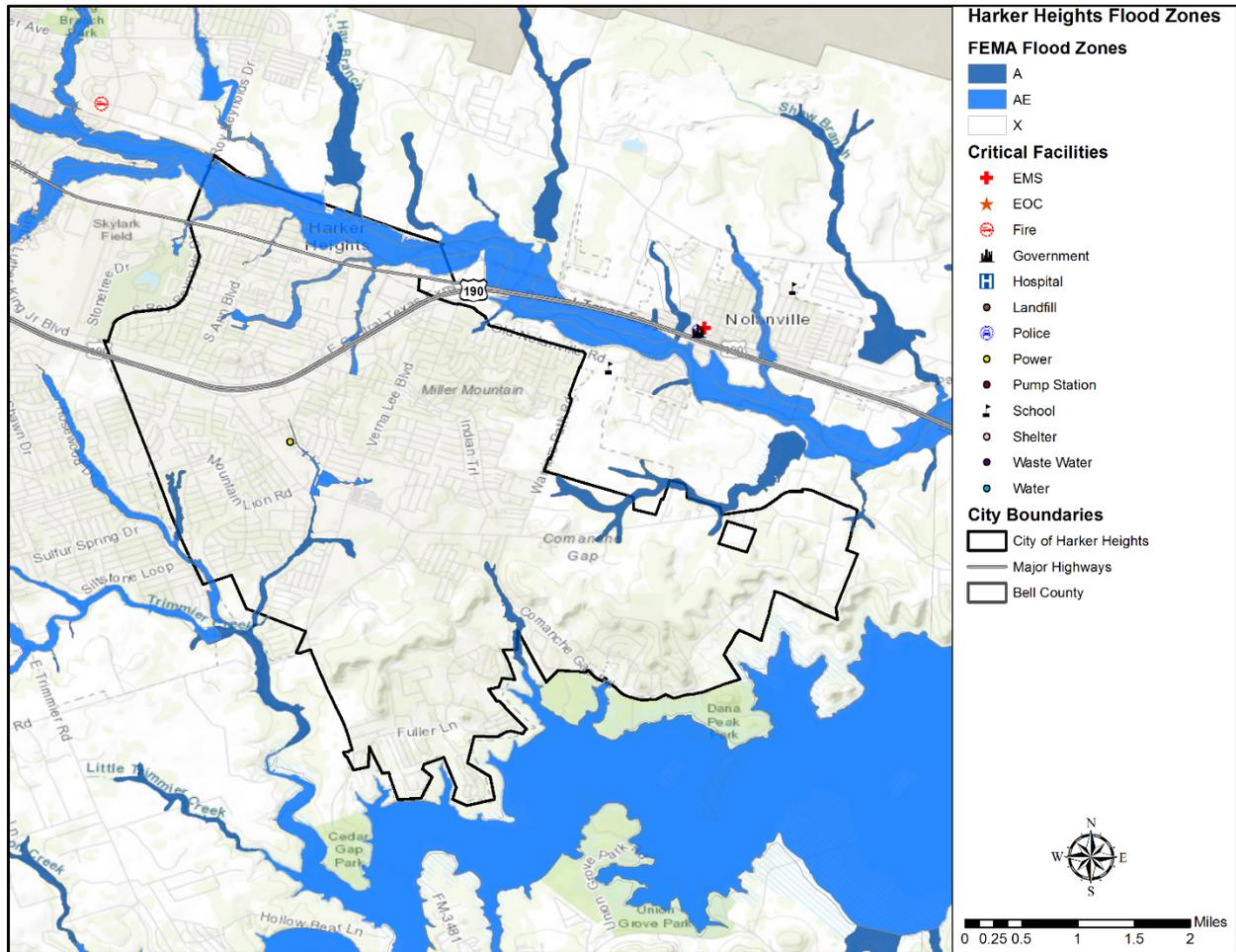
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Figure 6-3. Estimated Flood Zones in the City of Belton and CTCOG



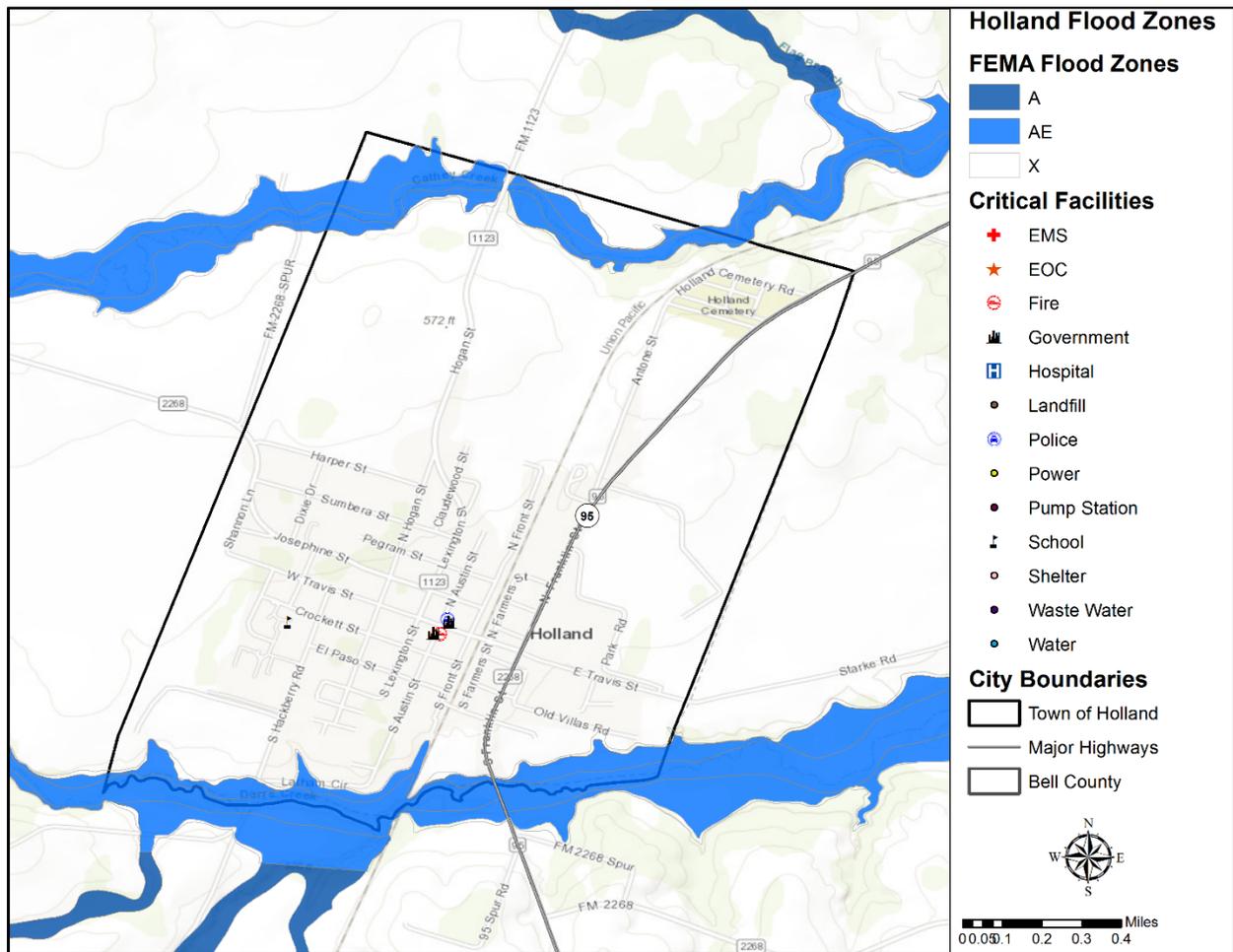
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Figure 6-4. Estimated Flood Zones in the City of Harker Heights



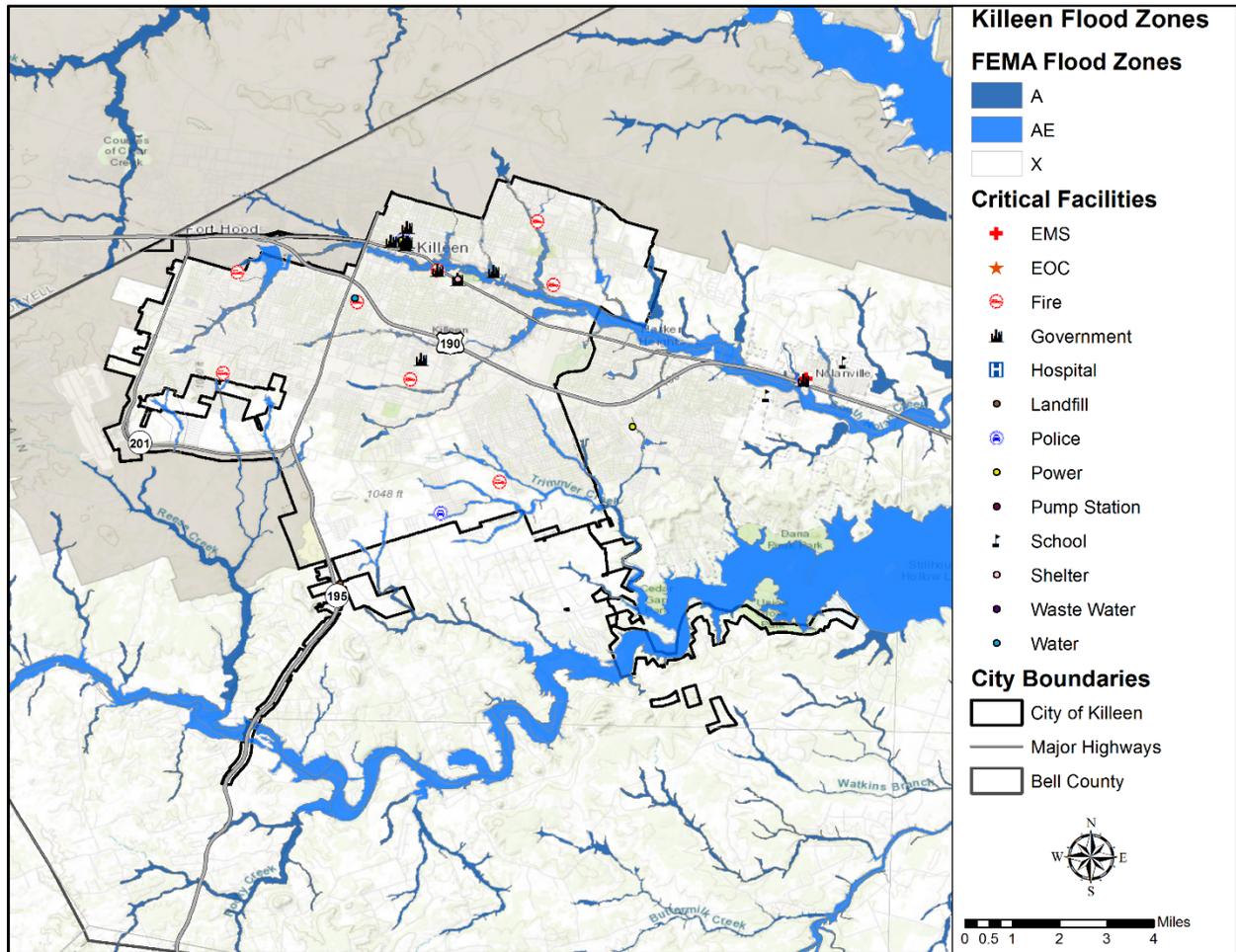
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Figure 6-5. Estimated Flood Zones in the Town of Holland



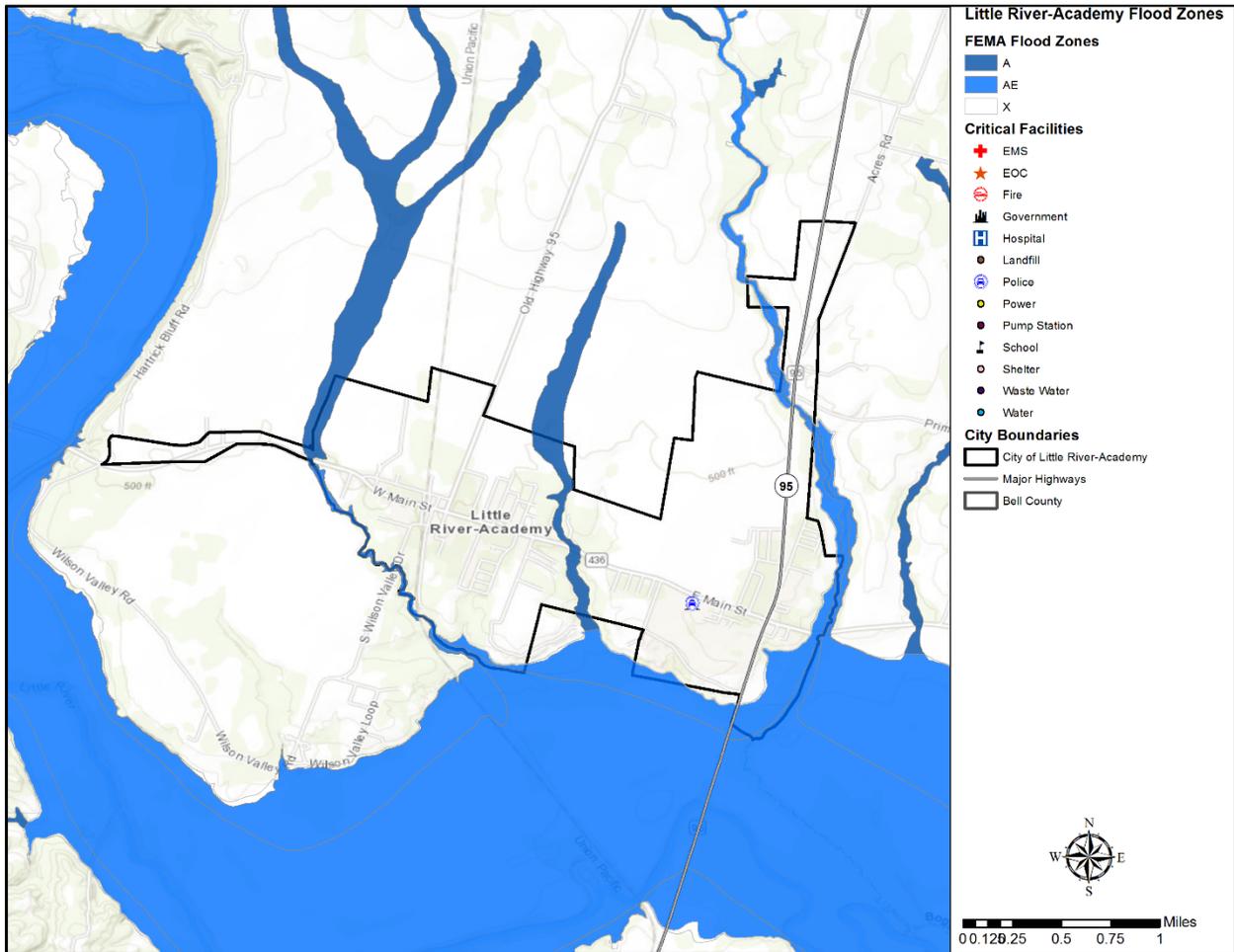
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Figure 6-6. Estimated Flood Zones in the City of Killeen



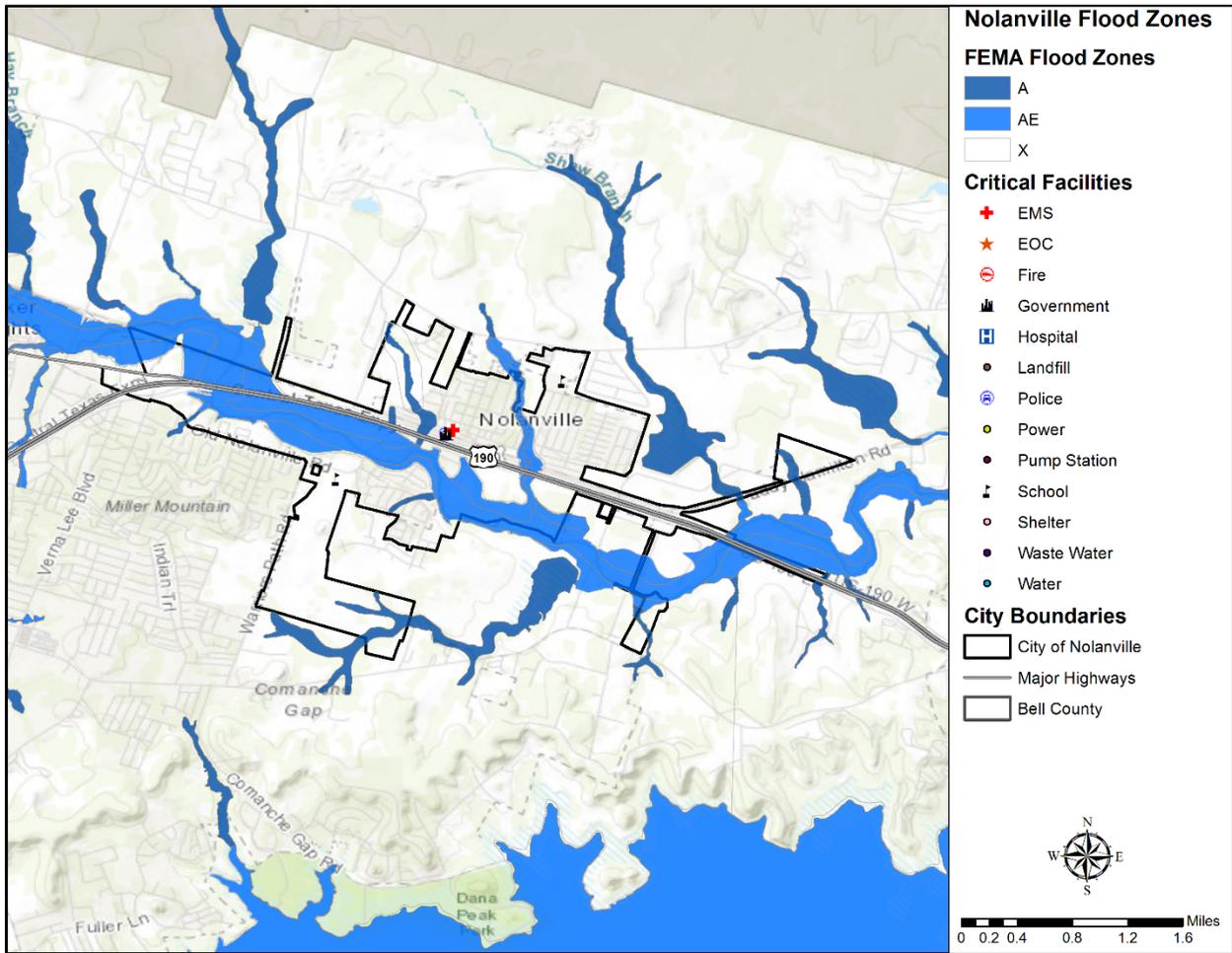
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Figure 6-7. Estimated Flood Zones in the Town of Little River Academy



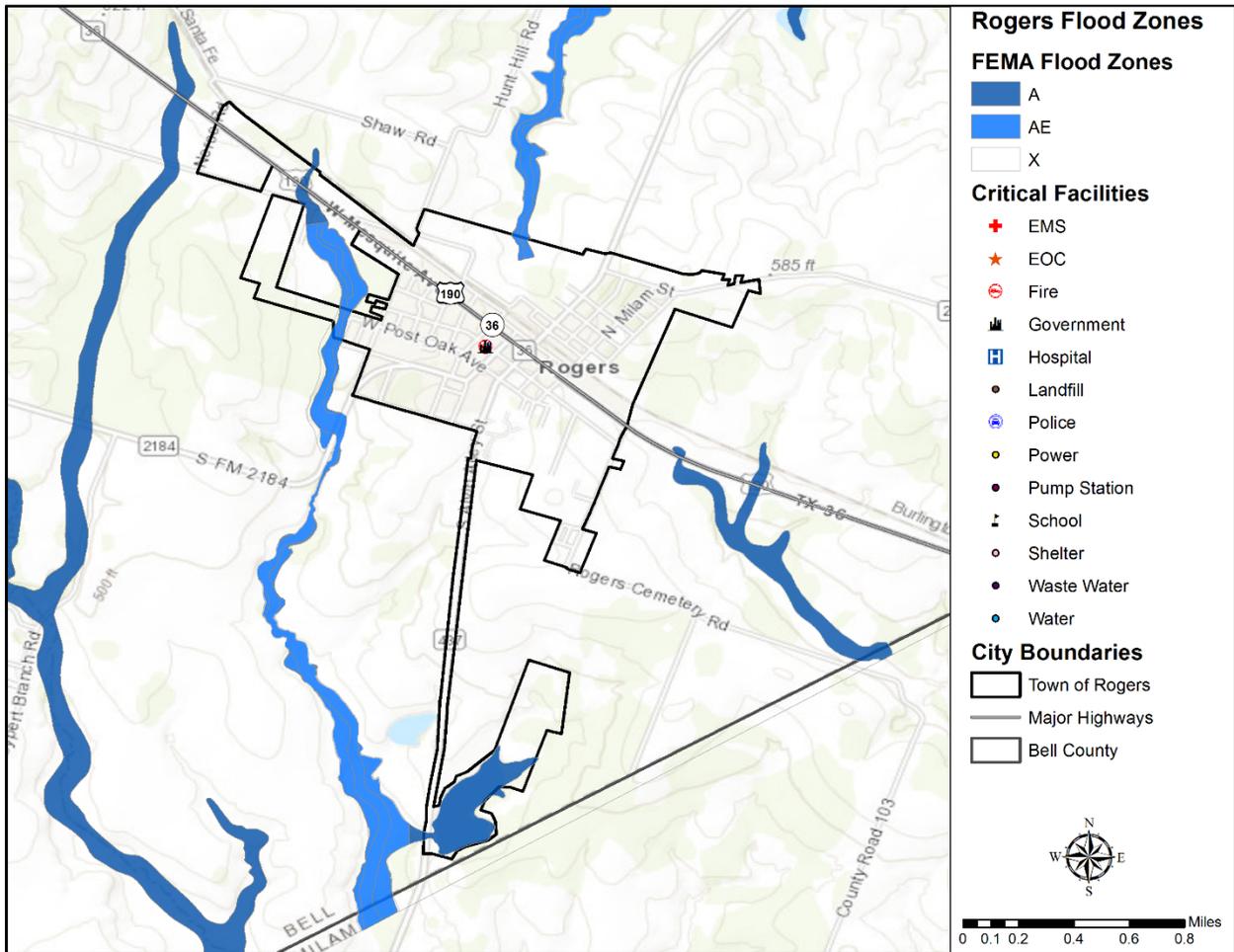
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Figure 6-8. Estimated Flood Zones in the City of Nolanville



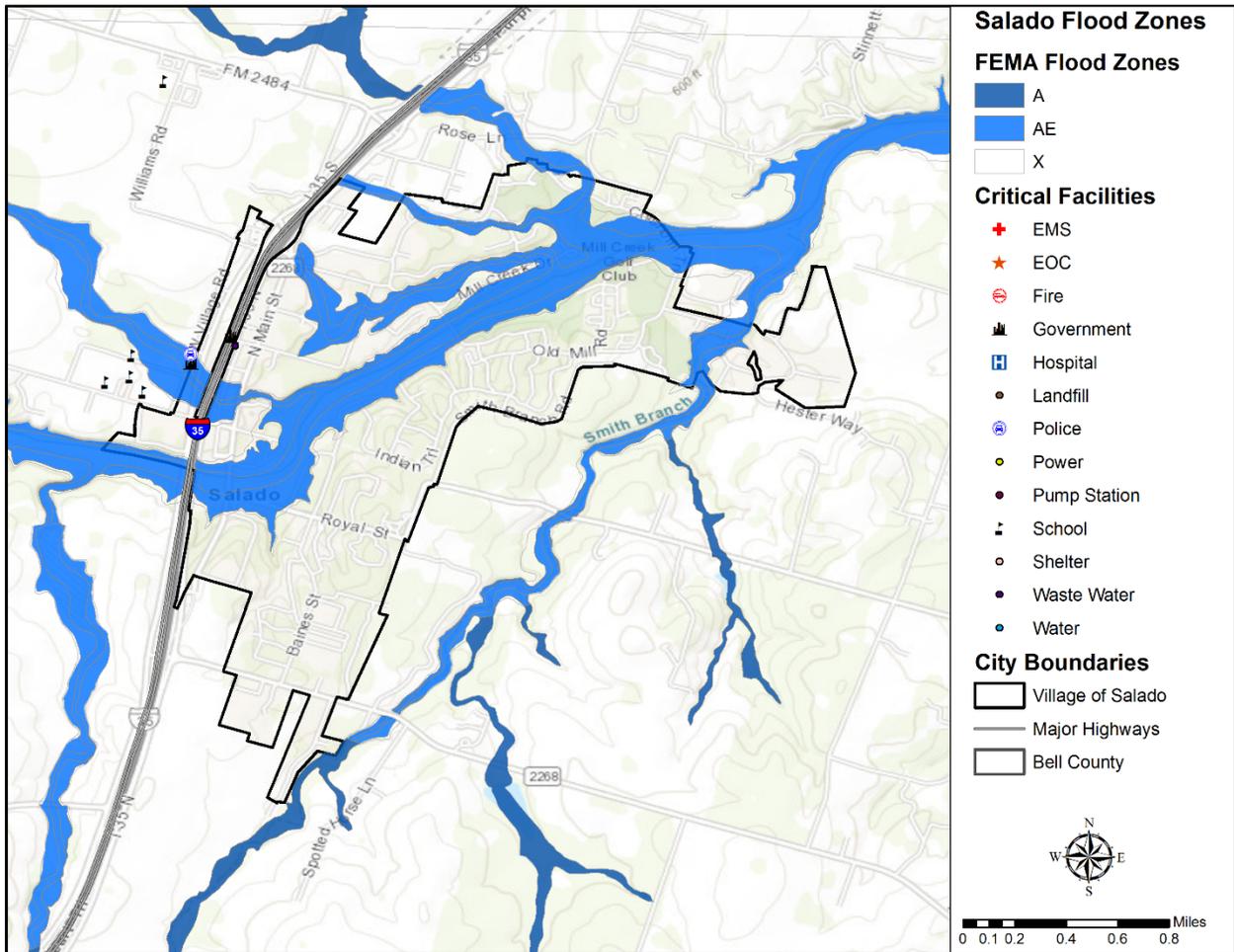
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Figure 6-9. Estimated Flood Zones in the City of Rogers



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Figure 6-10. Estimated Flood Zones in the City of Salado



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Figure 6-11. Estimated Flood Zones in the City of Temple

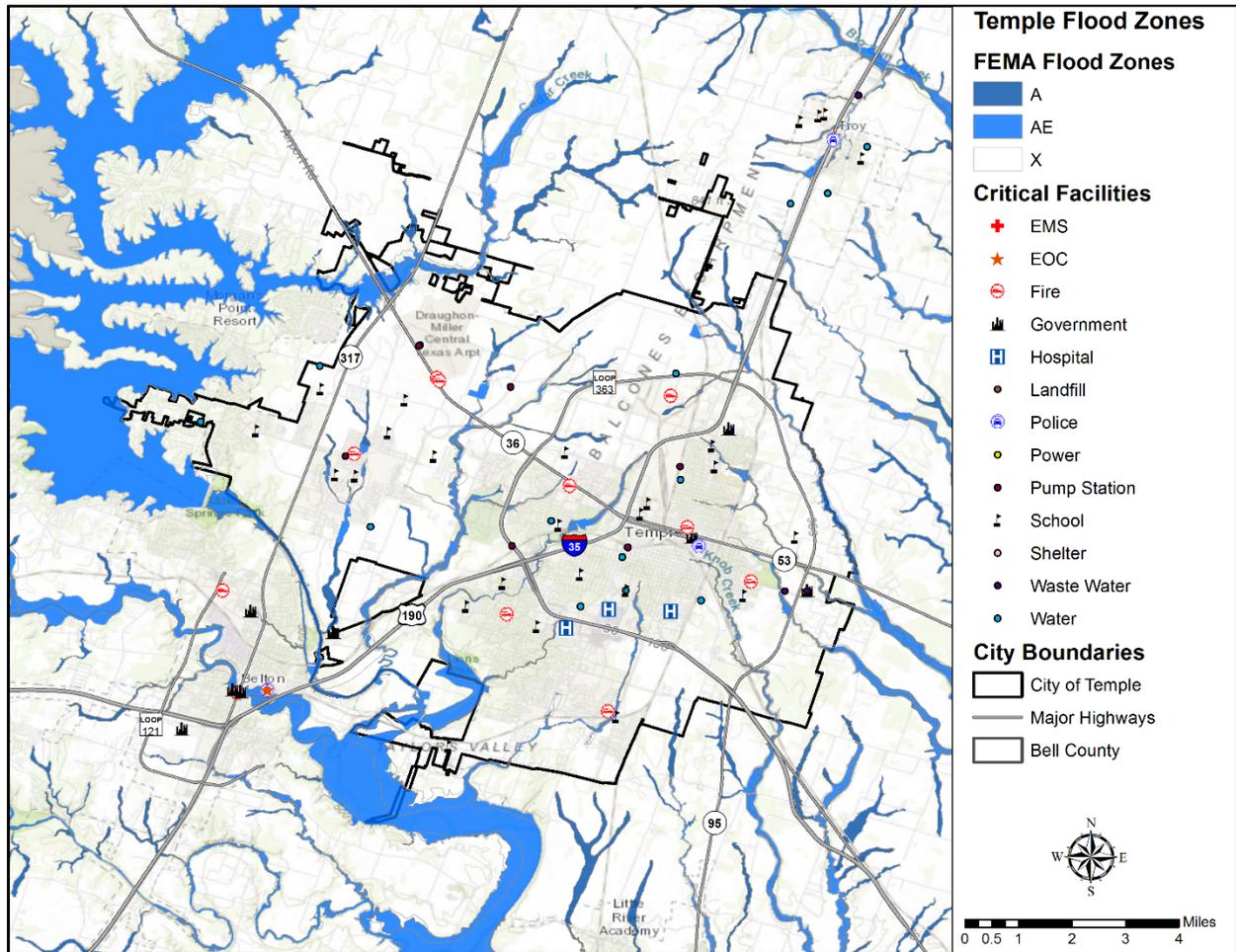
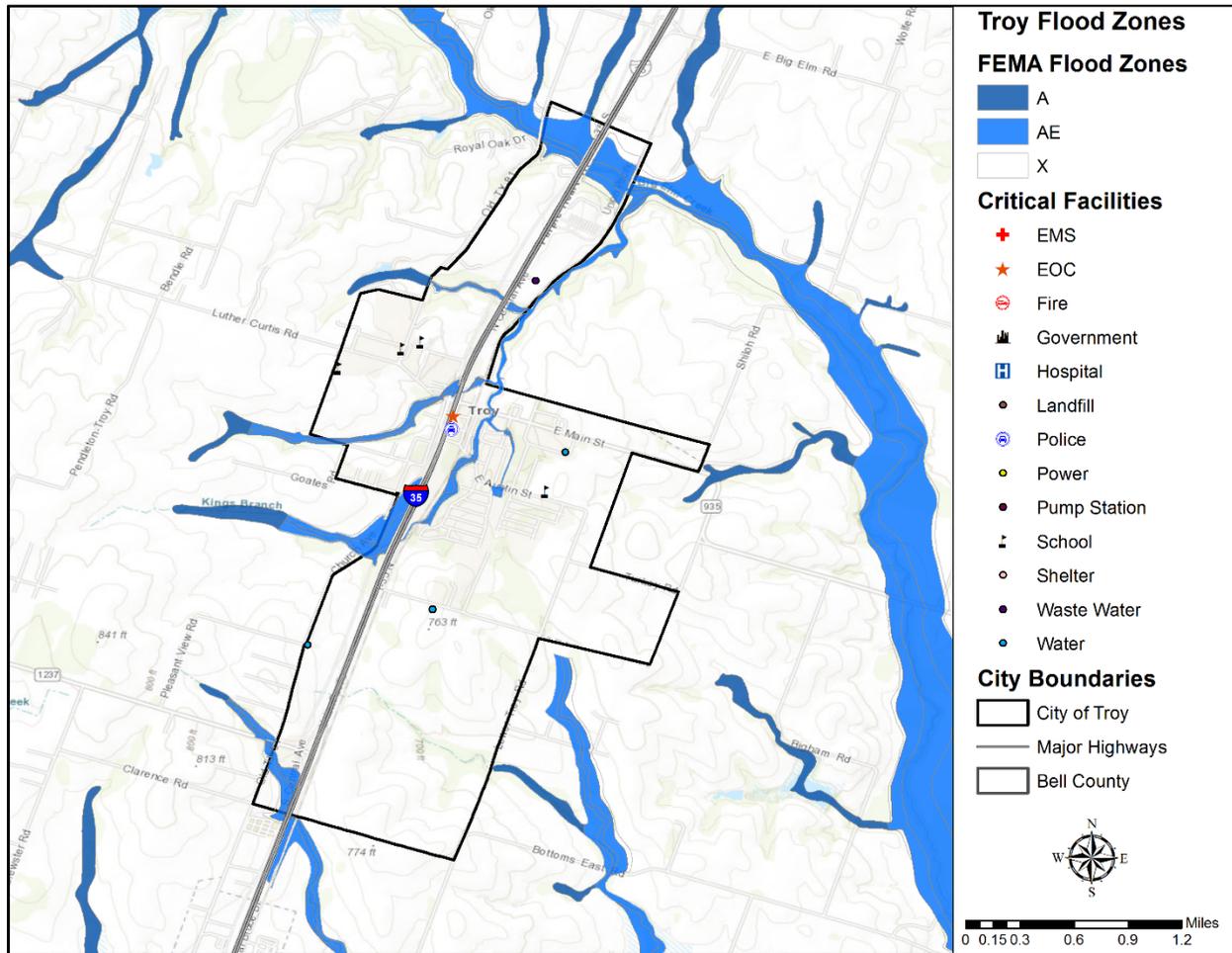


Figure 6-12. Estimated Flood Zones in the City of Troy



Extent

The severity of a flood event is determined by a combination of several factors including: stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and degree of vegetative clearing and impervious surface. Typically, floods are long-term events that may last for several days.

Determining the intensity and magnitude of a flood event is dependent upon the flood zone and location of the flood hazard area in addition to depths of flood waters. Extent of flood damages can be expected to be more damaging in the areas that will convey a base flood. FEMA categorizes areas on the terrain according to how the area will convey flood water. Flood zones are the categories that are mapped on Flood Insurance Rate Maps. Table 6-1 provides a description of FEMA flood zones and the flood impact in terms of severity or potential harm. Flood Zones A, AE, and X are the only hazard areas mapped in the region. Figures 6-1 through 6-12 should be read in conjunction with the extent for flooding in Tables 6-1, 6-2, and 6-3 to determine the intensity of a potential flood event.

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Table 6-1. – Flood Zones

INTENSITY	ZONE	DESCRIPTION
HIGH	ZONE A	Areas with a one percent annual chance of flooding and a 26 percent chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones.
	ZONE A1-30	These are known as numbered A Zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a Base Flood Elevation (BFE) (old format).
	ZONE AE	The base floodplain where base flood elevations are provided. AE Zones are now used on the new format FIRMs instead of A1-A30 Zones.
	ZONE AO	River or stream flood hazard areas and areas with a one percent or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from one to three feet. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones.
	ZONE AH	Areas with a one percent annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from one to three feet. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
	ZONE A99	Areas with a one percent annual chance of flooding that will be protected by a federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.
	ZONE AR	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
MODERATE to LOW	ZONE X 500	An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than one foot or with drainage areas less than one square mile; or an area protected by levees from 100-year flooding.

Zone A is interchangeably referred to as the 100-year flood, the one-percent-annual chance flood, the Special Flood Hazard Area (SFHA), or more commonly, the base flood. This is the area that will convey the base flood and constitutes a threat to the planning area. The impact from a flood event can be more damaging in areas that will convey a base flood.

Structures built in the SFHA are subject to damage by rising waters and floating debris. Moving flood water exerts pressure on everything in its path and causes erosion of soil and solid objects. Utility

Section 6: Flood

systems, such as heating, ventilation, air conditioning, fuel, electrical systems, sewage maintenance systems and water systems, if not elevated above base flood elevation, may also be damaged.

The intensity and magnitude of a flood event is also determined by the depth of flood waters. Table 6-2 below describes the category of risk and potential magnitude of an event in correlation to water depth. The water depths depicted in Table 6-2 are an approximation based on elevation data. Table 6-3 describes the extent associated with stream gauge data provided by the United States Geological Survey (USGS).

Table 6-2. Extent Scale – Water Depth

SEVERITY	DEPTH (in feet)	DESCRIPTION
BELOW FLOOD STAGE	0 to 15	Water begins to exceed low sections of banks and the lowest sections of the floodplain.
ACTION STAGE	16 to 23	Flow is well into the floodplain, minor lowland flooding reaches low areas of the floodplain. Livestock should be moved from low lying areas.
FLOOD STAGE	24 to 28	Homes are threatened and properties downstream of river flows or in low lying areas begin to flood.
MODERATE FLOOD STAGE	29 to 32	At this stage the lowest homes downstream flood. Roads and bridges in the floodplain flood severely and are dangerous to motorists.
MAJOR FLOOD STAGE	33 and above	Major flooding approaches homes in the floodplain. Primary and secondary roads and bridges are severely flooded and very dangerous. Major flooding extends well into the floodplain, destroying property, equipment, and livestock.

Table 6-3. Extent for Bell County¹

JURISDICTION ²	ESTIMATED SEVERITY PER FLOOD EVENT	PEAK FLOOD EVENT
Bell County	Action Stage, 16 to 23 feet	Major Flood Stage: Lampasas River at Youngsfort, reached an overflow elevation of 45.25 feet in September of 1873, and 37.7 feet in May of 1965.
Bell County	Below Flood Stage, 0 to 15 feet	Major Flood Stage: Lampasas River near the City of Belton reached an overflow

¹ Severity estimated by averaging floods at certain stage level over the history of flood events. Severity and peak events are based on U.S. Geological Survey data.

² Severity is provided for jurisdictions where peak data was provided.

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JURISDICTION ²	ESTIMATED SEVERITY PER FLOOD EVENT	PEAK FLOOD EVENT
		elevation of 45.01 feet in September of 1921 and 44.4 in May of 1957.
Bell County	Below Flood Stage, 0 to 15 feet	Leon River near Belton, Bell County, TX reached an overflow elevation of 25.05 in 1913 and 24.41 in April 1945.
Killeen	Action Stage, 16 to 23 feet	Moderate Flood Stage: Cowhouse Creek near the City of Killeen reached an overflow elevation of 30.5 feet in April of 1942.

The range of flood intensity that the Bell County planning area can experience is high, or Zone A. Based on reporting from the USGS, a flood event can place the County and all participating jurisdictions at the extent of “Action Flood Stage” as shown in Tables 6-2 and 6-3. However, the Bell County planning area has experienced flooding over 45 feet. Based on historical occurrences the planning area, including all participating jurisdictions, could typically expect to experience up to 9 inches of rainfall within a 15 hour period, resulting in flash flooding.

The data described in Tables 6-1 through 6-3, together with Figures 6-1 through 6-3, and historical occurrences for the area, provides an estimated potential magnitude and severity for the County. For example the City of Killeen, as shown in Figure 6-6, has areas designated as Zone A and Zone AE. Reading this figure in conjunction with Table 6-1 means the area is an area of high risk for flood. It is noted that the CTCOG is not located in a special flood hazard area and has no known localized flood risk.

Historical Occurrences

Historical evidence indicates that areas within the County and all participating jurisdictions are susceptible to flooding, especially in the form of flash flooding. It is important to note that only flood events that have been reported have been factored into this risk assessment, therefore it is likely that additional flood occurrences have gone unreported before and during the recording period. Table 6-4 identifies historical flood events that resulted in damages, injuries, or fatalities within the Bell County planning area, including all participating jurisdictions. Table 6-5 provides the historical flood event summary by jurisdiction. Historical Data is provided by the Storm Prediction Center (NOAA), NCEI database for Bell County.

Table 6-4. Historical Flood Events, 1996-2017³

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Killeen	12/20/1997	5:23 PM	0	0	\$416,079	\$0
Killeen	12/20/1997	6:00 PM	2	1	\$0	\$0
Killeen	12/20/1997	8:30 PM	0	0	\$60,521	\$0

³ Only recorded events with fatalities, injuries, and/or damages are listed, values are in 2017 dollars.

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JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Nolanville	12/20/1997	5:23 PM	0	0	\$45,390	\$0
Killeen	5/6/2001	5:00 PM	0	0	\$27,424	\$0
Killeen	7/1/2001	8:18 AM	0	0	\$4,114	\$0
Bell County	7/2/2002	4:00 PM	0	0	\$2,742	\$0
Rogers	5/13/2004	7:21 AM	0	0	\$6,428	\$0
Killeen	7/7/2004	5:04 PM	0	0	\$12,855	\$0
Killeen	8/9/2005	6:53 AM	0	0	\$24,868	\$0
Troy	8/10/2005	5:00 AM	0	0	\$12,434	\$0
Belton	4/20/2006	7:12 PM	0	0	\$18,068	\$0
Belton	10/18/2006	8:00 PM	0	0	\$3,614	\$0
Killeen	3/30/2007	3:00 PM	1	0	\$0	\$0
Killeen	5/22/2007	3:40 AM	0	0	\$117,120	\$0
Killeen	5/24/2007	5:34 PM	4	0	\$128,832	\$0
Temple	5/26/2007	8:20 AM	0	0	\$4,685	\$0
Belton	6/27/2007	12:00 AM	0	0	\$11,712	\$0
Salado	6/27/2007	12:00 AM	0	0	\$878,400	\$0
Bell County	9/11/2009	11:11 AM	0	0	\$169,788	\$0
Salado	10/13/2009	10:45 AM	0	0	\$16,979	\$0
Salado	10/13/2009	12:15 PM	0	0	\$3,396	\$0
Bell County	10/26/2009	5:25 AM	0	0	\$3,396	\$0
Bell County	6/28/2010	7:20 PM	0	0	\$33,410	\$0
Bell County	9/7/2010	9:03 PM	1	0	\$3,340,963	\$0
Bell County	5/11/2011	8:30 PM	0	0	\$26,989	\$0
Killeen	5/11/2011	7:22 PM	0	0	\$269,894	\$0
Bell County	1/25/2012	6:00 AM	0	0	\$1,058	\$0
Holland	10/30/2013	8:52 PM	0	0	\$41,697	\$0
Bell County	10/31/2013	3:00 AM	0	0	\$5,212	\$0

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JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Little River Academy	10/31/2013	12:25 AM	0	0	\$41,697	\$0
Holland	6/17/2015	2:00 PM	0	0	\$153,685	\$0
Nolanville	6/17/2015	5:50 PM	1	0	\$30,737	\$0
Bell County	10/24/2015	3:13 AM	0	0	\$102,456	\$0
Bell County	10/24/2015	6:58 AM	0	0	\$102,456	\$0
Belton	10/24/2015	9:04 AM	0	0	\$204,913	\$0
Bell County	10/30/2015	1:25 PM	0	0	\$1,025	\$0
Bell County	10/30/2015	2:55 PM	0	0	\$2,049	\$0
Temple	10/30/2015	2:25 PM	0	0	\$5,123	\$0
Temple	10/30/2015	3:26 PM	0	0	\$2,049	\$0
Bell County	11/7/2016	10:30 PM	0	0	\$1,012	\$0

Table 6-5. Summary of Historical Flood Events, 1996-2017

JURISDICTION	Number of Events	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	36	1	0	\$3,792,556	\$0
Bartlett	1	0	0	\$0	\$0
Belton	14	0	0	\$238,307	\$0
Harker Heights	0	0	0	\$0	\$0
Holland	4	0	0	\$195,382	\$0
Killeen	28	7	0	\$1,061,707	\$0
Little River Academy	1	0	0	\$41,697	\$0
Nolanville	9	1	0	\$76,127	\$0
Rogers	3	0	0	\$6,428	\$0
Salado	5	0	0	\$898,775	\$0
Temple	25	0	0	\$11,857	\$0
Troy	9	0	0	\$12,434	\$0
Total Losses	135	9	1	\$6,335,270	

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Significant Events

Flash Flood on May 24, 2007 – Bell County, Killeen, Harker Heights

A cold front stalled across north Texas creating afternoon thunderstorms across the area. There were several reports of hail and flash flooding. Several roads were flooded in Killeen and Harker Heights. The Killeen Police Department urged residents to stay off flooded roadways. Mobile home parks were flooded, and one permanent residence near Nolan Creek had four feet of water inside. A mobile home was washed into Nolan Creek and caught fire when the gas line hit a bridge. At least two cars were swept away into the creek. A man who was near a culvert when the rain began was swept away. A total of 4 fatalities were directly attributed to the flood.

Flash Flood on September 7, 2010 – Bell County

Significant flooding occurred in Bell County from the remnants of Tropical Storm Hermine. In Killeen, Highway 190 was closed due to flood waters. Residents were evacuated from an apartment complex on Watercrest Drive due to rising waters, and numerous cars with occupants were submerged in Killeen. There was one fatality in the city of Killeen when a 19 year old female's vehicle was submerged in flood waters on Reese Creek Road. Homes near the towns of Elms and Robinette had to be evacuated by boat. In Nolanville, a car was swept away, and a mobile home park was evacuated resulting in the rescue of 35 to 40 people. Salado Creek in Salado flooded the access roads of Interstate 35 and destroyed several businesses and residential structures along the creek. A bridge on Armstrong Road which crossed Salado Creek was washed away. Numerous roads were also flooded in the City of Temple. There were 17 businesses and 26 residences affected by the flood waters in the City of Belton.

Flash Flood on June 17, 2015 – Nolanville

Heavy rainfall in remnant bands from Tropical Storm Bill resulted in flooding in Nolanville. An 11 year old boy was swept into a drainage culvert near Avenue H and 10th Street after losing his footing when approaching whirling high waters in the culvert. He died the next day as a result of his injuries.

Probability of Future Events

Based on recorded historical occurrences and extent within the Bell County planning area, including all participating jurisdictions, flooding is highly likely and an event is likely to occur within the next year. The CTCOG facility has no history of flood events and an event impacting the CTCOG is unlikely.

Vulnerability and Impact

A property's vulnerability to a flood depends on its location and proximity to the floodplain. Structures that lie along banks of a waterway are the most vulnerable and are often repetitive loss structures. The County and all participating jurisdictions encourage development outside of the floodplain. The property damage impact for flood for the entire planning area is limited as facilities and services would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or suffer major damage. However, the historical number of fatalities indicate a substantial impact with multiple deaths possible for some participating jurisdictions, depending on the scale of the storm.

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Table 6-6. Critical Facilities in the Floodplain by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Bell County	Government Facility
Bartlett	No critical facilities located in the floodplain
Belton	Fire Station
CTCOG	No critical facilities located in the floodplain
Harker Heights	No critical facilities located in the floodplain
Holland	No critical facilities located in the floodplain
Killeen	Government Facility
Little River Academy	No critical facilities located in the floodplain
Nolanville	No critical facilities located in the floodplain
Rogers	No critical facilities located in the floodplain
Salado	Government Facility, Police Station
Temple	School
Troy	No critical facilities located in the floodplain

Historic loss estimates due to flood are presented in Table 6-7 below. Considering 135 flood events over a 22-year period, frequency is approximately six to seven events every year.

Table 6-7. Potential Annualized Losses by Jurisdiction, 1996-2017

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
Bell County	\$3,792,556	\$172,389
Bartlett	\$0	\$0
Belton	\$238,307	\$10,832
CTCOG	\$0	\$0
Harker Heights	\$0	\$0
Holland	\$195,382	\$8,881
Killeen	\$1,061,707	\$48,260
Little River Academy	\$41,697	\$1,895
Nolanville	\$76,127	\$3,460
Rogers	\$6,428	\$292

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JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
Salado	\$898,775	\$40,854
Temple	\$11,857	\$539
Troy	\$12,434	\$565
Planning Area	\$6,335,270	\$287,967

The severity of a flooding event varies depending on the relative risk to citizens and structures located within each jurisdiction. Table 6-8 depicts the level of impact for Bell County and each participating jurisdiction.

Table 6-8. Impact by Jurisdiction

JURISDICTION	IMPACT	DESCRIPTION
Bell County	Substantial	Bell County could have limited property damage with critical facilities typically shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged. However, the historical death resulting from flood indicates a substantial impact with multiple fatalities possible depending on the scale of the storm.
Bartlett	Limited	The City of Bartlett could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged.
Belton	Limited	The City of Belton could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged.
CTCOG	Limited	Facilities are unlikely to be impacted. If critical facilities are shut down it would be for 24 hours or less, and it is expected that less than 10 percent of property would be destroyed or damaged at the CTCOG.
Harker Heights	Limited	The City of Harker Heights could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged.
Holland	Limited	The Town of Holland could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged.
Killeen	Substantial	The City of Killeen could have limited property damage with critical facilities typically shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged. However, the historical death resulting from flood indicates a substantial impact with multiple fatalities possible depending on the scale of the storm.
Little River Academy	Limited	The Town of Little River Academy could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged.
Nolanville	Substantial	The City of Nolanville could have limited property damage with critical facilities typically shut down for 24 hours or less, and less than 10

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JURISDICTION	IMPACT	DESCRIPTION
		percent of property would be destroyed or damaged. However, the historical death resulting from flood indicates a substantial impact with multiple fatalities possible depending on the scale of the storm.
Rogers	Limited	The Town of Rogers could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged.
Salado	Limited	The Village of Salado could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged.
Temple	Limited	The City of Temple could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged.
Troy	Limited	The City of Troy could have injuries that would be treatable with first aid. Critical facilities would be shut down for 24 hours or less, and less than 10 percent of property would be destroyed or damaged.

Assessment of Impacts

Flooding is the deadliest natural disaster that occurs in the U.S. each year, and it poses a constant and significant threat to the health and safety of the people in the entire Bell County planning area. Impacts to the planning area can include:

- Recreation activities at places such as Belton Lake may be unavailable and tourism can be unappealing for years following a large flood event, devastating directly related local businesses and negatively impacting economic recovery.
- Flood-related rescues may be necessary at swift and low water crossings or in flooded neighborhoods where roads have become impassable, placing first responders in harm's way.
- Evacuations may be required for entire neighborhoods because of rising floodwaters, further taxing limited response capabilities and increasing sheltering needs for displaced residents.
- Health risks and threats to residents are elevated after the flood waters have receded due to contaminated flood waters (untreated sewage and hazardous chemicals) and mold growth typical in flooded buildings and homes.
- Significant flood events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage can result in an increase in structure fires and/or carbon monoxide poisoning as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- Floods can destroy or make residential structures uninhabitable, requiring shelter or relocation of residents in the aftermath of the event.
- First responders are exposed to downed power lines, contaminated and potentially unstable debris, hazardous materials, and generally unsafe conditions, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Emergency operations and services may be significantly impacted due to damaged facilities.
- Significant flooding can result in the inability of emergency response vehicles to access areas of the community.

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- Critical staff may suffer personal losses or otherwise impacted by a flood event and unable to report for duty, limiting response capabilities.
- City, town, village or county departments may be flooded, delaying response and recovery efforts for the entire community.
- Private sector entities that the jurisdiction and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Damage to infrastructure may slow economic recovery since repairs may be extensive and lengthy.
- Some businesses not directly damaged by the flood may be negatively impacted while utilities are being restored or water recedes, further slowing economic recovery.
- When the community is affected by significant property damage it is anticipated that funding would be required for infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, and normal day-to-day operating expenses.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Residential structures substantially damaged by a flood may not be rebuilt for years and uninsured or underinsured residential structures may never be rebuilt, reducing the tax base for the community.
- Large floods may result in a dramatic population fluctuation, as people are unable to return to their homes or jobs and must seek shelter and/or work outside of the affected area.
- Businesses that are uninsured or underinsured may have difficulty reopening, which results in a net loss of jobs for the community and a potential increase in the unemployment rate.
- Flooding may cause significant disruptions of clean water and sewer services, elevating health risks and delaying recovery efforts.
- The psycho-social effects on flood victims and their families can traumatize them for long periods of time, creating long term increases in medical treatment and services.
- Extensive or repetitive flooding can lead to decreases in property value for the affected community.
- Flood poses a potential catastrophic risk to annual and perennial crop production and overall crop quality leading to higher food costs.
- Flood related declines in production may lead to an increase in unemployment.
- Large floods may result in loss of livestock, potential increased livestock mortality due to stress and water borne disease, and increased cost for feed.

The overall extent of damages caused by floods is dependent on the extent, depth and duration of flooding, and the velocities of flows in the flooded areas. The level of preparedness and pre-event planning done by government, businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of a flood event.

National Flood Insurance Program (NFIP) Participation

Flood insurance offered through the National Flood Insurance Program (NFIP) is the best way for home and business owners to protect themselves financially against the flood hazard. Bell County and all participating jurisdictions participate in the NFIP and are in good standing. The CTCOG is not an eligible entity for participating in the NFIP and is not located in a special flood hazard area.

The following jurisdictions currently have in place minimum NFIP standards for new construction and substantial improvements of structures: Bartlett, Belton, Holland, Little River Academy, Nolanville,

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Rogers, and Troy. These jurisdictions are considering adopting additional higher regulatory NFIP standards to limit floodplain development. Several participating communities in the Bell County planning area have adopted higher NFIP standards, such as freeboard or additional subdivision requirements, to further minimize flood losses including: Bell County, Harker Heights, Killeen, Salado, and Temple. These communities are also considering adopting additional measures to further regulate floodplain development and limit future losses.

The flood hazard areas throughout the Bell County planning area are subject to periodic inundation, which may result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, of which adversely affect public safety.

These flood losses are created by the cumulative effect of obstructions in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, flood-proofed or otherwise protected from flood damage. Mitigation actions are included to address flood maintenance issues as well, including routinely clearing debris from drainage systems and bridges and expanding drainage culverts and storm water structures to more adequately convey flood waters.

It is the purpose of Bell County and all participating jurisdictions to continue to promote the public health, safety and general welfare by minimizing public and private losses due to flood conditions in specific areas. All of the NFIP participating jurisdictions in the Plan are guided by their local Flood Damage Prevention Ordinance. These communities will continue to comply with NFIP requirements through their local permitting, inspection, and record-keeping requirements for new and substantially developed construction. Further, the NFIP program for both of the participating jurisdictions promotes sound development in floodplain areas and includes provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets, and bridges located in floodplains;
- Help maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas; and
- Ensure that potential buyers are notified that property is in a flood area.

In order to accomplish these tasks, the Bell County planning area, including all participating jurisdictions, seek to follow these guidelines to achieve flood mitigation by:

- Restrict or prohibit uses that are dangerous to health, safety, or property in times of flood, such as filling or dumping, that may cause excessive increases in flood heights and/or velocities;
- Require that uses vulnerable to floods, including facilities, which serve such uses, be protected against flood damage at the time of initial construction as a method of reducing flood losses;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers, which are involved in the accommodation of floodwaters;
- Control filling, grading, dredging, and other development, which may increase flood damage; and

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- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.

NFIP Compliance and Maintenance

As mentioned, the Bell County planning area, including all participating jurisdictions, have developed mitigation actions that relate to either NFIP maintenance or compliance. Compliance and maintenance actions can be found in Section 17.

Flooding was identified by the majority of the participating jurisdictions as a high risk hazard during hazard ranking activities at the Risk Assessment Workshop. As such, many of the mitigation actions were developed with flood mitigation in mind. A majority of these flood actions address compliance with the NFIP and implementing flood awareness programs. All jurisdictions recognize the need and are working towards adopting higher NFIP regulatory standards to further minimize flood risk in their community. In addition, all jurisdictions are focusing on NFIP public awareness activities. This includes promoting the availability of flood insurance by placing NFIP brochures and flyers in public libraries or public meeting places.

All participating jurisdictions in the NFIP have a designated floodplain administrator. The floodplain administrators in the planning area will continue to maintain compliance with the NFIP including continued floodplain administration, zoning ordinances, and development regulation. The floodplain ordinance adopted by each participating jurisdiction outlines the minimum requirements and regulations for development in special flood hazard areas.

Repetitive Loss

The Severe Repetitive Loss (SRL) Grant Program under FEMA provides federal funding to assist states and communities in implementing mitigation measures to reduce or eliminate the long-term risk of flood damage to severe repetitive loss residential structures insured under the NFIP. The Texas Water Development Board (TWDB) administers the SRL grant program for the State of Texas. One of the goals of the FMA program is to reduce the burden of repetitive loss and severe repetitive loss properties on the NFIP through mitigation activities that significantly reduce or eliminate the threat of future flood damages.

Repetitive Loss properties are defined as structures that are:

- Any insurable building for which 2 or more claims of more than \$1,000 each, paid by the National Flood Insurance Program (NFIP) within any 10-year period, since 1978;
- May or may not be currently insured under the NFIP.

Severe Repetitive Loss properties are defined as residential properties that are:

- Covered under the NFIP and have at least four flood related damage claim payments (building and contents) over \$5,000.00 each, and the cumulative amount of such claims payments exceed \$20,000; or
- At least two separate claim payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

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In either scenario, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.⁴ Table 6-9 shows repetitive loss and severe repetitive loss properties for the Bell County planning area, including all participating jurisdictions.

Table 6-9. Repetitive Loss and Severe Repetitive Loss Properties

JURISDICTION	BUILDING TYPE	NUMBER OF STRUCTURES	NUMBER OF LOSSES
Bell County	Single Family	10	24
Bell County	Non-Residential	7	15
Bartlett	N/A	0	0
Belton	Single Family	1	2
CTCOG	N/A	0	0
Harker Heights	Single Family	6	16
Harker Heights	Non-Residential	1	2
Holland	N/A	0	0
Killeen	Single Family	7	15
Killeen	Non-Residential	1	2
Killeen	2-4 Family	1	2
Little River Academy	N/A	0	0
Nolanville	N/A	0	0
Rogers	N/A	0	0
Salado	Single Family	3	6
Temple	Single Family	3	6
Troy	Single Family	1	2

⁴ Source: Texas Water Development Board

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Hazard Description

Extreme heat is a prolonged period of excessively high temperatures and exceptionally humid conditions. Extreme heat during the summer months is a common occurrence throughout the State of Texas, and Bell County is no exception. The Bell County planning area, including the CTCOG and all participating jurisdictions, typically experience extended heat waves. A heat wave is an extended period of extreme heat and is often accompanied by high humidity.



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 even heat stroke. The most vulnerable population to heat casualties are children and the elderly or infirmed 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 well-being.

Location

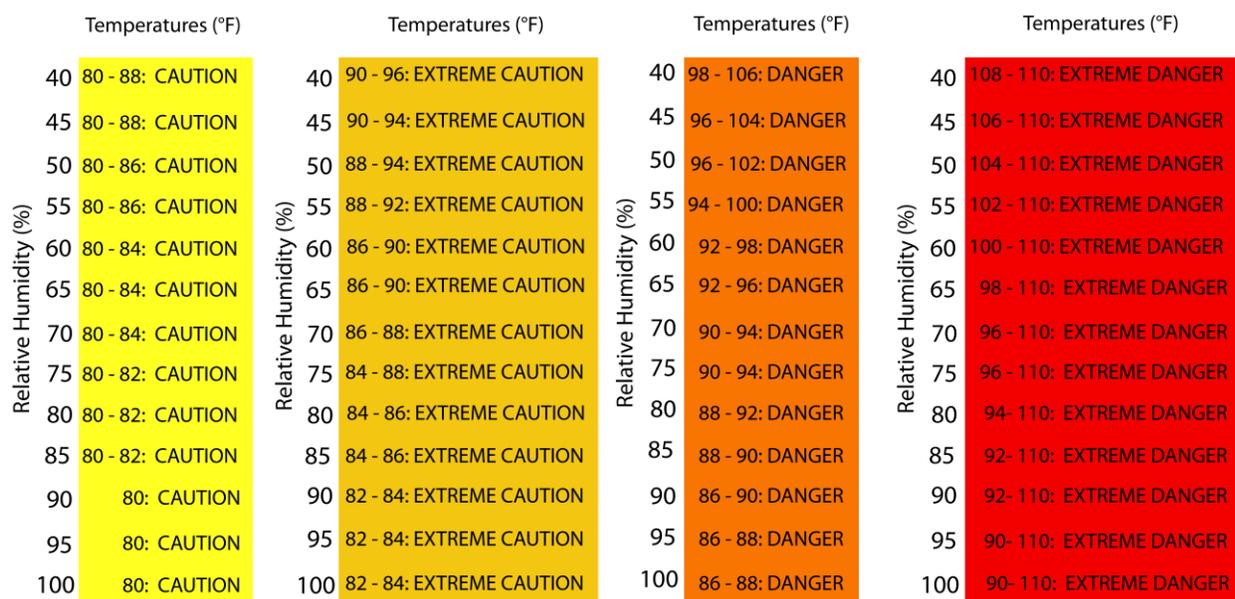
Though three deaths from extreme heat have been recorded at specific locations in the County, there is no specific geographic scope to the extreme heat hazard. Extreme heat could occur anywhere within the Bell County planning area, including the CTCOG and all participating jurisdictions.

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 7-1. This index measures how hot it feels outside when humidity is combined with high temperatures.

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Figure 7-1. Extent Scale for Extreme Summer Heat¹



Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

The Extent Scale in Figure 7-1 displays varying categories of caution depending on the relative humidity combined with the temperature. For example, when the temperature is at 88 degrees Fahrenheit (°F) or lower, 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 category of intensity, and it indicates when fatigue due to heat exposure is possible. “Extreme Caution” indicates that sunstroke, muscle cramps, or heat exhaustion are possible, and 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 as shown in Table 7-1.

Table 7-1. Heat Index and Warnings

CATEGORY	HEAT INDEX	POSSIBLE HEAT DISORDERS	WARNING TYPE
Extreme Danger	125°F and higher	Heat stroke or sun stroke likely.	A heat advisory will be issued to warn that the Heat Index may exceed 105°F.
Danger	103 – 124°F	Sunstroke, muscle cramps, and/or heat exhaustion are likely. Heatstroke possible with prolonged exposure and/or physical activity.	
Extreme Caution	90 – 103°F	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.	An Excessive Heat Warning is issued if the Heat Index rises above 105°F at least 3

¹ Source: NOAA

Section 7: Extreme Heat

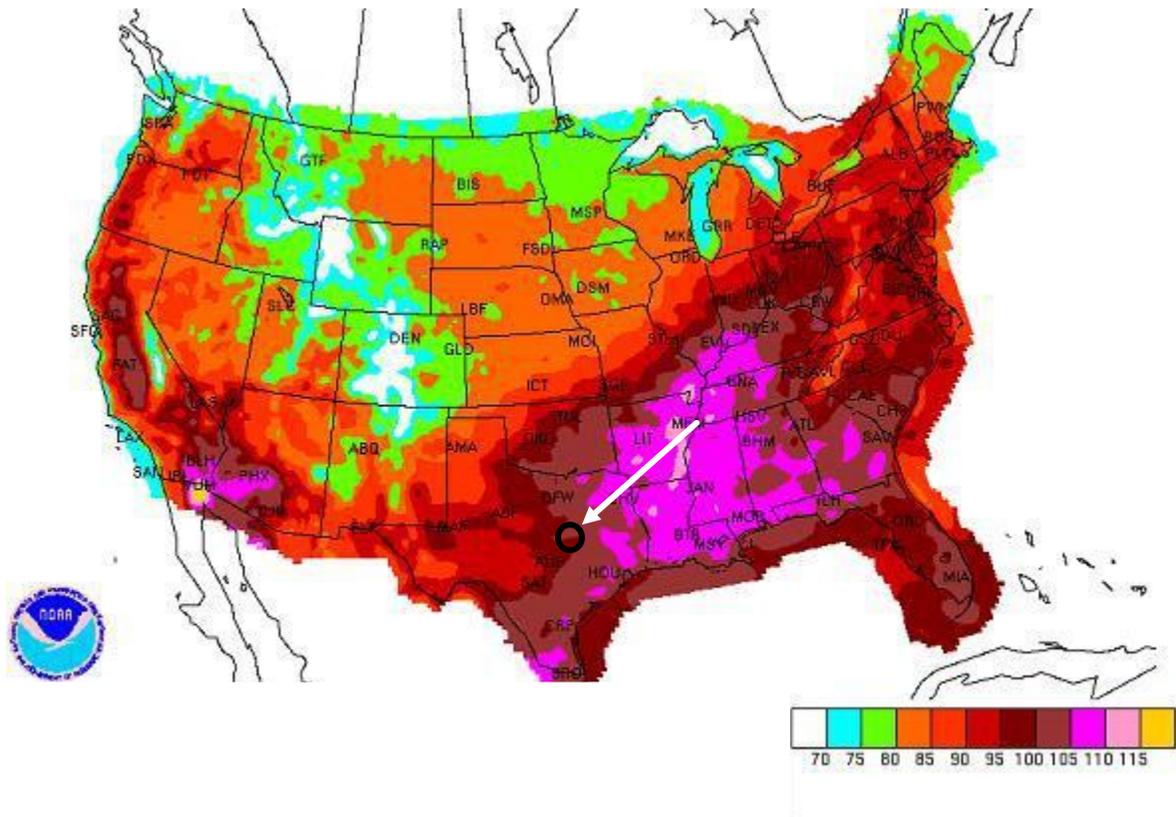
CATEGORY	HEAT INDEX	POSSIBLE HEAT DISORDERS	WARNING TYPE
Caution	80 – 90°F	Fatigue is possible with prolonged exposure and/or physical activity.	hours during the day or above 80°F at night.

The eastern part of Bell County, on the Blackland Prairie, consists of comparatively level prairieland. The western half of the county includes undulating to rolling uplands, deeply cut with stream valleys that, in places, have stony slopes and steep bluffs. Bell County ranges in elevation from about 450 feet above sea level in the southeast to about 1,200 feet above sea level on the western boundary. The county is drained chiefly by the Little River and its tributaries, especially the Leon, Lampasas, and Salado rivers, which come together at Three Forks to form the Little River. Due to its geography, and its warm, sunny, humid subtropical climate, the Bell County planning area, including the CTCOG and all participating jurisdictions, can expect an extreme heat event each summer. Citizens, especially children and the elderly should exercise caution by staying out of the heat for prolonged periods when a heat advisory or excessive heat warning is issued. Also at risk are those working or remaining outdoors.

Figure 7-2 displays the daily maximum heat index as derived from NOAA based on data compiled from 1838 to 2015. The black circle shows the Bell County area. The colors brown and dark red indicate a daily maximum heat index of 95° to 105°F. Bell County, including the CTCOG and all participating jurisdictions, could experience extreme heat from 90° to 111°F for the future. However, because loss of life has occurred within the planning area extreme danger should be mitigated against for all future planning.

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Figure 7-2. Average Daily Maximum Heat Index Days²



Historical Occurrences

Every summer, the hazard of heat-related illness becomes a significant public health issue throughout much of the United States. Mortality from all causes increases during heat waves, and excessive heat is an important contributing factor to deaths from other causes, particularly among the elderly. Table 7-2 depicts historical occurrences of mortality from heat from 1994 to 2008 from the Texas Department of State Health Services and 2009 through August 2017 from the NCEI database.

Table 7-2. Extreme Heat Related Deaths in Texas

YEAR	DEATHS
1994	1
1995	12
1996	10
1997	2
1998	66

² Source: NRDC and the black circle indicates the Bell County planning area.

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YEAR	DEATHS
1999	22
2000	71
2001	20
2002	1
2003	62
2004	53
2005	111
2006	104
2007	43
2008	66
2009	6
2010	4
2011	46
2012	3
2013	2
2014	0
2015	5
2016	6
2017	2

Because the Texas Department of State Health Services reports on total events statewide, previous occurrences for extreme heat are derived from the NCEI database. According to heat related incidents located solely within Bell County, there are eight heat waves³ on record for Bell County, including the CTCOG and all participating jurisdictions (Table 7-3). Historical extreme heat information, as provided by the NCEI, shows extreme heat activity across a multi-county forecast area for each event, the appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each county impacted by the event. Historical extreme heat data for the CTCOG and all participating jurisdictions are provided on a County-wide basis per the NCEI database. Only extreme heat events that have been reported have been factored into this Risk Assessment. It is likely additional extreme heat occurrences have gone unreported before and during the recording period.

³ Even though the entire planning area experiences heat waves each summer, NCEI data only records events reported. Based on reports, only eight events are on record.

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Table 7-3. Historical Extreme Heat Events, 1996-2017

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	7/1/1998	0	0	\$0	\$0
Bell County	8/1/1999	0	0	\$0	\$0
Bell County	7/1/2000	0	0	\$0	\$0
Bell County	8/1/2000	0	0	\$0	\$0
Bell County	9/1/2000	0	0	\$0	\$0
Bell County	8/1/2011	1	0	\$0	\$0
Bell County	6/26/2012	1	0	\$0	\$0
Bell County	7/10/2016	1	0	\$0	\$0
TOTALS		3	0	\$0	\$0

Significant Events

August 1, 2011

An Excessive Heat Warning was issued across the Central Texas region August 1st through the 5th. In Bell County, daytime high temperatures ranged from approximately 102 to 108 degrees with overnight lows in the upper 70s and low 80s. The afternoon heat index values were as high as 110 and 111 degrees in several locations. There was one fatality in Bell County on August 4th as a result of the heat.

Probability of Future Events

According to historical records, the Bell County planning area, including the CTCOG and all participating jurisdictions, have experienced eight events in a 21 year reporting period. While this provides a probability of one event every three years, average high temperatures for the planning area through the summer months indicate a probability of one event or more every year. This frequency supports a highly likely probability of future events.

Vulnerability and Impact

There is no defined geographic boundary for extreme heat events. While the entire Bell County planning area, including the CTCOG and all participating jurisdictions, is exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not likely to sustain significant damage from extreme heat events. Therefore, any estimated property losses associated with the extreme heat hazard are anticipated to be minimal across the area.

Extreme temperatures do however present a significant threat to life and safety for the population of the planning area as a whole. Heat casualties for example are typically caused by a lack of adequate air-conditioning or heat exhaustion. The most vulnerable population to heat casualties are the elderly or infirmed who frequently live on low fixed incomes and cannot afford to run air-conditioning on a

Section 7: Extreme Heat

regular basis. This population is sometimes isolated, with no immediate family or friends to look out for their well-being. Children under 5 cannot seek air conditioning or shelter during extreme heat events and can be left in areas such as vehicles making them especially vulnerable populations.

Those participating in athletic events or physical activity in the planning area are also susceptible as sporting events and practices are often held outside during early fall or late spring when temperatures are at the highest. Another segment of the population at risk are those whose jobs consist of strenuous labor outdoors. Additionally, livestock and crops can become stressed, decreasing in quality or in production, during times of extreme heat.

The CTCOG employees may be at risk during extreme heat events, particularly those whose jobs consist of outdoor activities such as maintenance. The CTCOG employs 115 people.

The population over 65 in the Bell County planning area is estimated at 9.5% of the total population and children under the age of 5 are estimated at 8.9%, or an estimated total of 60,046⁴ potentially vulnerable residents in the planning area based on age (Table 7-4).

Table 7-4. Populations at Greatest Risk by Jurisdiction

JURISDICTION	POPULATION 65 AND OLDER	POPULATION UNDER 5
Bell County ⁵	31,060	28,986
Bartlett	248	155
Belton	2,372	1,444
Harker Heights	2,189	1,901
Holland	108	59
Killeen	7,737	14,130
Little River Academy	262	113
Nolanville	195	755
Rogers	154	28
Salado	539	83
Temple	10,012	5,668
Troy	212	145

Extreme high temperatures can have significant secondary impacts, leading to droughts, water shortages, increased fire danger, and prompt excessive demands for energy. The possibility of rolling blackouts increases with unseasonably high temperatures in what is a normally mild month with low power demands.

⁴ U.S. Census Bureau 2015 data for Bell County

⁵ County totals includes all incorporated jurisdictions and unincorporated areas.

Section 7: Extreme Heat

Typically more than 12 hours of warning time would be given before the onset of an extreme heat event. Only minor property damage would result. The potential impact of excessive summer heat is considered “Substantial” resulting in multiple potential deaths for the Bell County planning area, including all participating jurisdictions.

In terms of vulnerability to structures, the impact from extreme heat would be negligible. It is possible that critical facilities and infrastructure, including the CTCOG facility, could be shut down for 24 hours if cooling units are running constantly, leading to a temporary power outage. Less than ten percent of residential and commercial property could be damaged if extreme heat events lead to structure fires. Based on historical records over a 21-year period, annualized losses for the Bell County planning area are negligible.

Assessment of Impacts

The greatest risk from extreme heat is to public health and safety. Potential impacts the community may include:

- Vulnerable populations, particularly the elderly and children under 5, can face serious or life-threatening health problems from exposure to extreme heat including hyperthermia, heat cramps, heat exhaustion, and heat stroke (or sunstroke).
- Response personnel, including utility workers, public works personnel, and any other professions where individuals are required to work outside, are more subject to extreme heat related illnesses since their exposure would typically be greater.
- High energy demand periods can outpace the supply of energy, potentially creating the need for rolling brownouts which would elevate the risk of illness to vulnerable residents.
- Highways and roads may be damaged by excessive heat causing asphalt roads to soften and concrete roads to shift or buckle.
- Vehicles engines and cooling systems typically run harder during extreme heat events resulting in increases in mechanical failures.
- Extreme heat events during times of drought can exacerbate the environmental impacts associated with drought, decreasing water and air quality and further degrading wildlife habitat.
- Extreme heat increases ground-level ozone (smog), increasing the risk of respiratory illnesses.
- Tourism and recreational activities predominant in Belton Lake area may be negatively impacted during extreme heat events, reducing seasonal revenue.
- Food suppliers can anticipate an increase in food costs due to increases in production costs and crop and livestock losses.
- Fisheries may be negatively impacted by extreme heat, suffering damage to fish habitats (either natural or man-made) and a loss of fish and/or other aquatic organisms due to decreased water flows or availability.
- Negatively impacted water suppliers may face increased costs resulting from the transport of water resources or development of supplemental water resources.
- Outdoor activities, such as runners or athletic activities may see an increase in injury or illness during extreme heat events.
- The COG also has maintenance workers that could be exposed to the heat while doing strenuous work outside potentially causing injury.

The economic and financial impacts of extreme heat on the community will depend on the duration of the event, demand for energy, drought associated with extreme heat, and many other factors. The level of preparedness and the amount of planning done by the jurisdiction, local businesses, and

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citizens will impact the overall economic and financial conditions before, during, and after an extreme heat event.

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Hazard Description



Tornadoes are among the most violent storms on the planet. A tornado is a rapidly rotating column of air extending between, and in contact with, a cloud and the surface of the earth. The most violent tornadoes are capable of tremendous destruction and have wind speeds of 250 miles per hour or more. In extreme cases, winds may approach 300 miles per hour. Damage paths can be in excess of one mile wide and 50 miles long.

The most powerful tornadoes are produced by “Supercell Thunderstorms.” These thunderstorms are created when horizontal wind shears (winds moving in different directions at different altitudes) begin to rotate the storm. This horizontal rotation can be tilted vertically by violent updrafts, and the rotation radius can shrink, forming a vertical column of very quickly swirling air. This rotating air can eventually reach the ground, forming a tornado.

Table 8-1. Variations Among Tornadoes

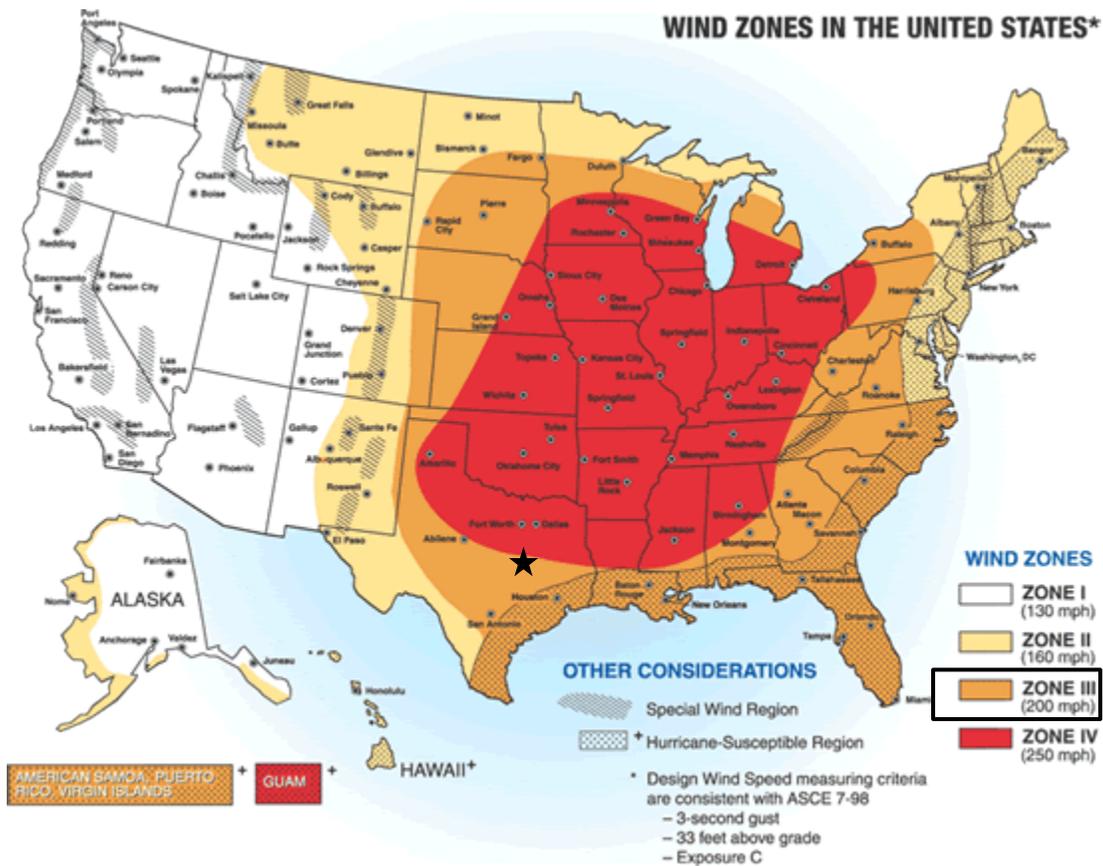
WEAK TORNADOES	STRONG TORNADOES	VIOLENT TORNADOES
<ul style="list-style-type: none"> ➤ 69% of all tornadoes ➤ Less than 5% of tornado deaths ➤ Lifetime 1-10+ minutes ➤ Winds less than 110 mph 	<ul style="list-style-type: none"> ➤ 29% of all tornadoes ➤ Nearly 30% of all tornado deaths ➤ May last 20 minutes or longer ➤ Winds 110 – 205 mph 	<ul style="list-style-type: none"> ➤ 2% of all tornadoes ➤ 70% of all tornado deaths ➤ Lifetime can exceed one hour ➤ Winds greater than 205 mph

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Location

Tornadoes do not have any specific geographic boundary and can occur throughout the County uniformly. It is assumed that the entire Bell County planning area, including the CTCOG and all participating jurisdictions, are uniformly exposed to tornado activity. The entire Bell County planning area is located in Wind Zone III (Figure 8-1), where tornado winds can be as high as 200 mph.

Figure 8-1. FEMA Wind Zones in the United States¹



Extent

The destruction caused by tornadoes ranges from light to inconceivable, depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, such as residential homes (particularly mobile homes).

¹ Bell County is indicated by the star.

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Table 8-2. The Fujita Tornado Scale²

F-SCALE NUMBER	INTENSITY	WIND SPEED (MPH)	TYPE OF DAMAGE DONE	PERCENT OF APPRAISED STRUCTURE VALUE LOST DUE TO DAMAGE
F0	Gale Tornado	40 – 72	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.	None Estimated
F1	Moderate Tornado	73 – 112	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads; attached garages may be destroyed.	0% – 20%
F2	Significant Tornado	113 – 157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.	50% – 100%
F3	Severe Tornado	158 – 206	Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.	100%
F4	Devastating Tornado	207 – 260	Well-constructed homes leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	100%
F5	Incredible Tornado	261 – 318	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles flying through the air in excess of 330 yards; trees debarked; steel reinforced concrete badly damaged.	100%

Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita Scale (Table 8-2). Since February 2007, the Fujita Scale has been replaced by the Enhanced Fujita Scale (Table 8-3), which retains the same basic design and six strength categories as the previous scale. The newer scale reflects more refined assessments of tornado damage surveys, standardization, and damage consideration to a wider range of structures.

² Source: <http://www.tornadoproject.com/fscale/fscale.htm>

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Table 8-3. Enhanced Fujita Scale for Tornadoes

STORM CATEGORY	DAMAGE LEVEL	3 SECOND GUST (MPH)	DESCRIPTION OF DAMAGES	PHOTO EXAMPLE
EF0	Gale	65 – 85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.	
EF1	Weak	86 – 110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads; attached garages may be destroyed.	
EF2	Strong	111 – 135	Considerable damage; roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.	
EF3	Severe	136 – 165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.	
EF4	Devastating	166 – 200	Well-constructed homes leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	
EF5	Incredible	200+	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles flying through the air in excess of 330 yards; trees debarked; steel reinforced concrete badly damaged.	

Both the Fujita Scale and Enhanced Fujita Scale should be referenced in reviewing previous occurrences since tornado events prior to 2007 will follow the original Fujita Scale. The largest magnitude reported within the planning area is F3 on the Fujita Scale, a “Severe Tornado.” Based on the planning areas location in Wind Zone III, the planning area could experience anywhere from an EF0 to EF5 depending on the wind speed.

The events in Bell County have been between EF0 and EF3 (Table 8-4). Therefore, the range of intensity that the Bell County planning area, including the CTCOG and all participating jurisdictions, would be expected to mitigate is a tornado event that would be a low to severe risk, an EF0 to EF3.

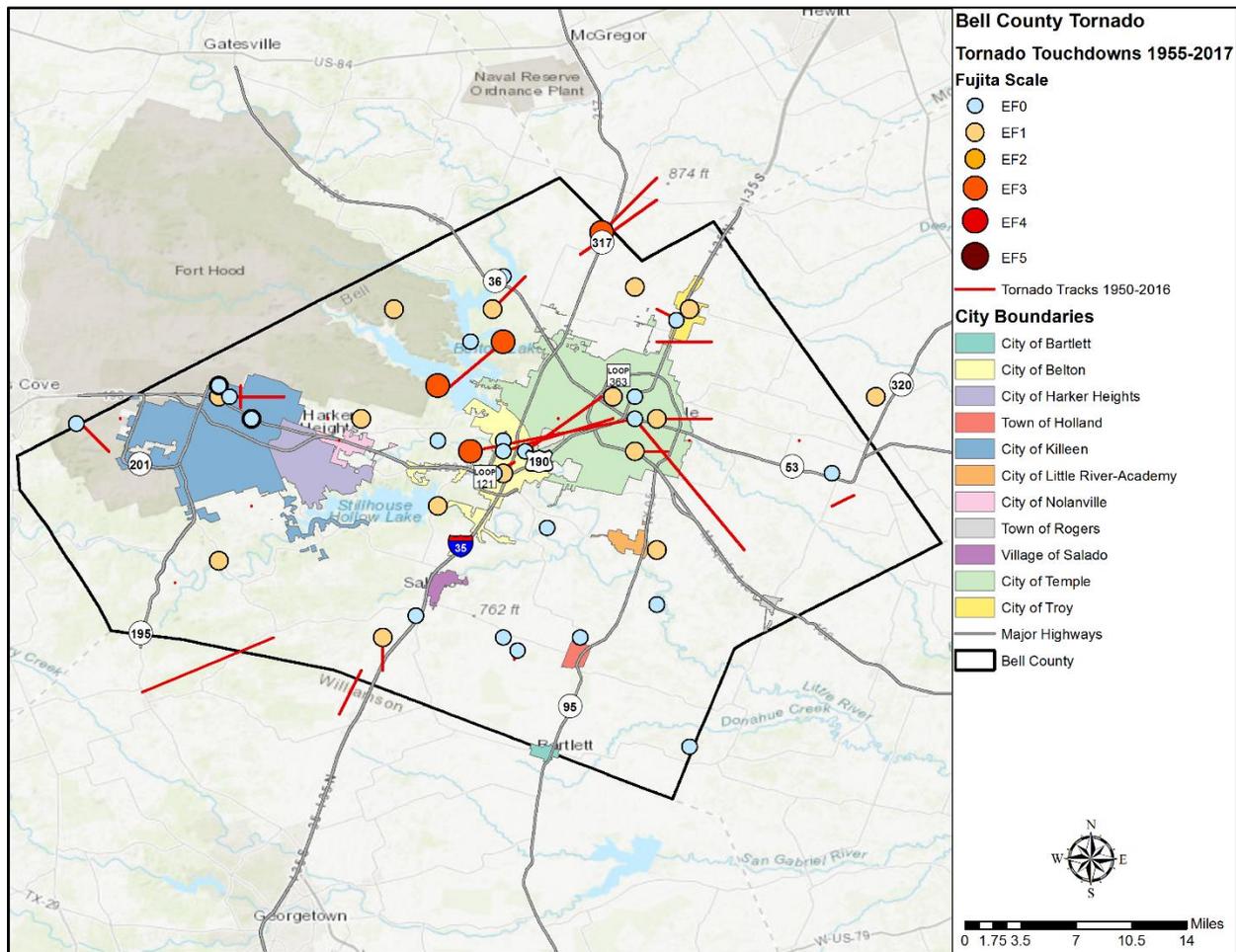
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Historical Occurrences

Only reported tornadoes were factored into the Risk Assessment. It is likely that a high number of occurrences have gone unreported over the past 63 years.

Figure 8-2 identifies the locations of previous occurrences in the Bell County planning area from 1955 through 2017. A total of 63 events have been recorded by the Storm Prediction Center (NOAA) and NCEI databases for the entire planning area. The most significant event reported occurred in Bell County on May 26, 1976. The F3 tornado and associated storm system caused substantial damage in the county, exceeding more than \$10,669,000 in damages in 2017 dollars. The tornado resulted in 2 fatalities and 7 injuries.

Figure 8-2. Spatial Historical Tornado Events, 1955–2017³



³ Source: NOAA Records

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Only those incidents that have had death, injury, property or crop damage reported have been listed in Table 8-4. The dollar amounts are estimated in 2017 dollars. There have been no recorded events in all participating jurisdictions since the year 2008 on the NOAA database. It should be noted that the CTCOG facility is located in the City of Belton. While the City of Belton has experienced 7 tornado events, none have directly impacted the CTCOG facility.

Table 8-4. Historical Tornado Events, 1955-2017

JURISDICTION	DATE	TIME	MAGNITUDE	DEATH	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	3/20/1955	4:15 PM	F1	0	1	\$0	\$0
Bell County	3/21/1955	3:00 PM	F2	0	0	\$22,653	\$0
Bell County	5/6/1955	6:15 PM	F2	1	1	\$2,265,289	\$0
Bell County	3/21/1956	3:25 PM	F1	0	0	\$22,320	\$0
Bell County	4/24/1957	4:12 PM	F0	0	0	\$21,605	\$0
Bell County	8/3/1958	6:10 AM	F1	0	0	\$252	\$0
Bell County	4/28/1963	8:30 PM	F2	0	3	\$198,398	\$0
Bell County	4/13/1967	2:30 AM	F2	0	0	\$18,177	\$0
Bell County	8/14/1969	6:00 PM	F1	0	0	\$165,422	\$0
Bell County	8/14/1969	6:30 PM	F2	0	0	\$1,654,217	\$0
Bell County	8/14/1969	6:45 PM	F2	0	0	\$1,654,217	\$0
Bell County	4/16/1971	2:15 PM	F1	0	0	\$14,990	\$0
Bell County	8/26/1971	4:00 PM	F1	0	0	\$1,499	\$0
Bell County	5/1/1972	6:15 PM	F1	0	0	\$145,239	\$0
Bell County	10/21/1972	10:00 PM	F2	0	0	\$145,239	\$0
Bell County	5/23/1973	6:46 PM	F2	0	0	\$136,734	\$0
Bell County	5/7/1975	5:30 PM	F2	0	2	\$1,128,434	\$0
Bell County	5/5/1976	7:50 PM	F2	0	0	\$10,670	\$0
Bell County	5/26/1976	6:08 PM	F3	2	7	\$10,669,552	\$0
Bell County	5/9/1981	12:45 PM	F1	0	0	\$66,787	\$0
Bell County	11/13/1981	12:50 AM	F1	0	2	\$66,787	\$0
Bell County	5/17/1986	9:45 AM	F1	0	0	\$5,539	\$0
Bell County	11/15/1987	12:08 PM	F1	0	0	\$534,417	\$0
Bell County	1/25/1989	1:00 PM	F1	0	3	\$489,595	\$0

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JURISDICTION	DATE	TIME	MAGNITUDE	DEATH	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	3/14/1990	9:45 AM	F3	0	0	\$464,497	\$0
Bell County	4/12/1996	6:46 PM	F2	0	0	\$92,864	\$0
Temple	3/1/1997	10:30 PM	F1	0	0	\$60,521	\$0
Bell County	5/27/1997	2:07 PM	F1	0	0	\$30,260	\$0
Belton	5/27/1997	1:27 PM	F3	0	0	\$1,361,714	\$0
Belton	9/22/1997	7:30 AM	F0	0	0	\$30,260	\$0
Killeen	2/22/2000	9:53 PM	F0	0	0	\$21,153	\$0
Salado	5/6/2001	5:00 PM	F0	0	0	\$20,568	\$0
Killeen	3/25/2003	4:30 PM	F0	0	0	\$105,582	\$0
Holland	11/23/2004	7:32 PM	F0	0	0	\$13,283	\$0
Troy	1/12/2007	4:35 PM	F0	0	0	\$46,848	\$0
Killeen	5/25/2007	4:00 PM	EF1	0	0	\$58,560	\$0
Belton	4/10/2008	3:05 AM	EF0	0	0	\$563,947	\$0

Table 8-5. Summary of Historical Tornado Events, 1955-2017

JURISDICTION	Number of Events	MAGNITUDE	FATALITIES	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	46	F3	3	19	\$20,025,653	\$0
Bartlett	0	N/A	N/A	N/A	N/A	N/A
Belton	7	F3	0	0	\$1,955,921	\$0
CTCOG	0	N/A	0	0	\$0	\$0
Harker Heights	0	N/A	N/A	N/A	N/A	N/A
Holland	2	F0	0	0	\$13,283	\$0
Killeen	4	EF1	0	0	\$185,295	\$0
Little River Academy	0	N/A	N/A	N/A	N/A	N/A
Nolanville	0	N/A	N/A	N/A	N/A	N/A
Rogers	0	N/A	N/A	N/A	N/A	N/A
Salado	1	F0	0	0	\$20,568	\$0
Temple	1	F1	0	0	\$60,521	\$0

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JURISDICTION	Number of Events	MAGNITUDE	FATALITIES	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Troy	2	F3	0	0	\$46,848	\$0
TOTAL LOSSES	63	(Max Extent)	3	19	\$22,308,089	

Significant Events

May 26, 1976 – Bell County

A large tornado touched down in Bell County at the Westcliff Park residential area on the south side of Lake Belton shortly after 6:00PM. The tornado damaged or destroyed 41 houses, 27 manufactured homes, and one business. Two residents at the Lakeview Mobile Home Park were killed when their trailer was struck. Seven injuries were also attributed to the tornado.

May 27, 1997 – Bell County

A tornado that was produced by a large supercell thunderstorm developed on the north side of Lake Belton, near Morgans Point where a marina was destroyed. Over 100 boats at the marina were destroyed by the strong tornado that moved slowly south-southwest. Ten homes along the lakeshore also sustained severe damage and damage to trees. The tornado dissipated just northeast of Woodland.

April 10, 2008 – Belton

Several rounds of storms moved across north Texas on April 8th through 10th. Numerous reports of large hail were received on Tuesday evening. A lone supercell evolved during the afternoon hours of the 9th, producing tornadoes and large hail along its path. Later that evening and into Thursday morning a squall line tracked across north Texas, producing damaging winds and tornadoes into the morning hours.

In Belton, amateur radio operators reported power flashes and a few downed trees. In and around Temple, power flashes were reported and numerous roofs, fences, and signs were damaged. One fence which was knocked down was anchored with cement pillars. Guests at a motel which lost a roof were temporarily trapped in their rooms due to their doors being barricaded by debris. Vehicles were damaged by tree limbs and other debris. A duplex also lost a roof and suffered water damage. A golf course lost its scoreboard which was supported by several 4-inch metal poles. An estimated forty trees were uprooted or damaged.

Probability of Future Events

Tornadic storms can occur at any time of year and at any time of day, but they are typically more common in the spring months during the late afternoon and evening hours. A smaller, high frequency period can emerge in the fall during the brief transition between the warm and cold seasons. According to historical records, the planning area can experience a tornado touchdown approximately once every year. This frequency supports a highly likely probability of future events for Bell County, including the CTCOG and all participating jurisdictions.

Vulnerability and Impact

Because tornadoes often cross jurisdictional boundaries, all existing and future buildings, facilities, and populations in planning area are considered to be exposed to this hazard and could potentially be

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impacted. The damage caused by a tornado is typically a result of high wind velocity, wind-blown debris, lightning, and large hail.

The average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. Consequently, vulnerability of humans and property is difficult to evaluate since tornadoes form at different strengths, in random locations, and create relatively narrow paths of destruction. Although tornadoes strike at random, making all buildings vulnerable, three types of structures are more likely to suffer damage:

- Manufactured Homes;
- Homes on crawlspaces (more susceptible to lift); and
- Buildings with large spans, such as shopping malls, gymnasiums, and factories.

Tornadoes can cause a significant threat to people as they could be struck by flying debris, falling trees/branches, utility lines, and poles. Blocked roads could prevent first responders to respond to calls. Tornadoes commonly cause power outages which could cause health and safety risks to residents, as well as to patients in hospitals.

The Bell County planning area features multiple mobile or manufactured home parks throughout the planning area, including all participating jurisdictions. These parks are typically more vulnerable to tornado events than typical site built structures. In addition, manufactured homes are located sporadically throughout the planning area including participating jurisdictions and unincorporated county which would also be more vulnerable. The US Census data indicates a total of 4,903 manufactured homes located in the Bell County planning area (3.7%), including participating jurisdictions and unincorporated county (Table 8-6). In addition, 35.7% (approximately 46,996 structures) of the single family residential (SFR) structures in the entire planning area were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant tornado events. While the CTCOG does not have any manufactured homes or portable buildings, the facility was built prior to 1980 and may be more vulnerable.

Table 8-6. Structures at Greatest Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Bell County ⁴	4,903	46,993
Bartlett	34	445
Belton	614	3,438
CTCOG	0	1
Harker Heights	1,414	2,480
Holland	48	290
Killeen	1,371	17,117

⁴ County totals includes all jurisdictions and unincorporated areas within the county.

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JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Little River Academy	128	403
Nolanville	518	500
Rogers	84	298
Salado	10	157
Temple	907	14,607
Troy	36	354

The following critical facilities would be vulnerable to tornado events in each participating jurisdiction:

Table 8-7. Critical Facilities at Risk by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Bell County	Government Facility, OEM
Bartlett	Government Facility, Police Station, Fire Station, 2 Schools
Belton	Government Facility, Police Station, 2 Fire Stations, EOC, School, Shelter
CTCOG	CTCOG Office Building
Harker Heights	Government Facility, Police Station, 2 Fire Stations, Shelter, Hospital, Nursing Home, 13 Lift Stations, 9 Pump Stations, Communications Tower
Holland	Government Facility, Police Station, Fire Station, School, Community Center
Killeen	11 Government Facilities, 2 Police Stations, 8 Fire Stations, EOC, OEM, Public Works Facility, Shelter, Water Department Facility, Oncor Electric Services, Solid Waste Facility
Little River Academy	Government Facility, Police Station, Fire Station
Nolanville	Government Facility, Police Station, Fire Station, EMS, Public Works Facility, 2 Schools
Rogers	Government Facility, Police Station, Fire Station, School, 2 Water Towers, Wastewater Treatment Facility, Community Center
Salado	2 Government Facilities, Police Station, Wastewater Treatment Facility, 4 Schools, Transportation Facility (Bus Maintenance), Communications Facilities, Water Tower
Temple	Government Facility, Police Station, 8 Fire Stations, Public Works Facility, 4 Water Treatment Facilities, 3 Hospitals, Convention Center, 2 Dams, Panda Power Plant, 11 Water Towers, Ground Storage Tank, 7 Pump Stations, 22 Schools, Interstate, 2 Highways
Troy	Government Facility, Police Station, Water Well, Water Storage Facility and Pump, Water Tower, Wastewater Treatment Facility, 4 Schools

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The average loss estimate of property and crop is \$22,308,089 (in 2017 dollars), having an approximate annual loss estimate of \$354,097 (Table 8-8). Based on historic loss and damages, the impact of tornado on the Bell County planning area, including all participating jurisdictions, can be considered “Minor,” with more than 10 percent of property expected to be destroyed. However, the number of injuries and fatalities indicates a “Substantial” impact.

Table 8-8. Potential Annualized Losses by Jurisdiction, 1955-2017

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
Bell County	\$20,025,653	\$317,868
Bartlett	\$0	\$0
Belton	\$1,955,921	\$31,046
CTCOG	\$0	\$0
Harker Heights	\$0	\$0
Holland	\$13,283	\$211
Killeen	\$185,295	\$2,941
Little River Academy	\$0	\$0
Nolanville	\$0	\$0
Rogers	\$0	\$0
Salado	\$20,568	\$326
Temple	\$60,521	\$961
Troy	\$46,848	\$744
Planning Area	\$22,308,089	\$354,097

Assessment of Impacts

Tornadoes have the potential to pose a significant risk to the population and can create dangerous situations. Often times, providing and preserving public health and safety is difficult. Impacts to the planning area can include:

- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Manufactured homes may suffer substantial damage as they would be more vulnerable than typical site built structures.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.

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- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- Tornadoes often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outages can result in an increase in structure fires and/or carbon monoxide poisoning as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- Tornadoes can destroy or make residential structures uninhabitable, requiring shelter or relocation of residents in the aftermath of the event.
- First responders must enter the damage area shortly after the tornado passes to begin rescue operations and to organize cleanup and assessments efforts, therefore they are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Emergency operations and services may be significantly impacted due to damaged facilities, loss of communications, and damaged emergency vehicles and equipment.
- City or county departments, municipalities and government services may be damaged or destroyed, delaying response and recovery efforts for the entire community.
- Private sector entities that the participating jurisdictions and their residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Damage to infrastructure may slow economic recovery since repairs may be extensive and lengthy.
- Some businesses not directly damaged by the tornado may be negatively impacted while roads and utilities are being restored, further slowing economic recovery.
- When the community is affected by significant property damage it is anticipated that funding would be required for infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, and normal day-to-day operating expenses.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Residential structures destroyed by a tornado may not be rebuilt for years, reducing the tax base for the community.
- Large or intense tornadoes may result in a dramatic population fluctuation, as people are unable to return to their homes or jobs and must seek shelter and/or work outside of the affected area.
- Businesses that are uninsured or underinsured may have difficulty reopening, which results in a net loss of jobs for the community and a potential increase in the unemployment rate.
- Recreation activities may be unavailable and tourism can be unappealing for years following a large tornado, devastating directly related local businesses.

The economic and financial impacts of a tornado event on the community will depend on the scale of the event, what is damaged, costs of repair or replacement, lost business days in impacted areas, and how quickly repairs to critical components of the economy can be implemented. The level of

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preparedness and pre-event planning done by government, businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of a tornado event.

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Hazard Description



Hailstorm events are a potentially damaging outgrowth of severe thunderstorms. During the developmental stages of a hailstorm, ice crystals form within a low pressure front due to the rapid rising of warm air into the upper atmosphere, and the subsequent cooling of the air mass. Frozen droplets gradually accumulate into ice crystals until they fall as precipitation that is round or irregularly shaped masses of ice typically greater than 0.75 inches in diameter. The size of hailstones is a direct result of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a by-product of heating on the Earth's surface. Higher temperature gradients above Earth's surface result in increased suspension time and hailstone size.

Location

Hailstorms are an extension of severe thunderstorms that could potentially cause severe damage. As a result, they are not confined to any specific geographic location and can vary greatly in size, location, intensity, and duration. Therefore, the Bell County planning area, including the CTCOG and all participating jurisdictions, are equally at risk to the hazard of hail.

Extent

The National Weather Service (NWS) classifies a storm as "severe" if there is hail three-quarters of an inch in diameter (approximately the size of a penny) or greater, based on radar intensity or as seen by observers. The intensity category of a hailstorm depends on hail size and the potential damage it could cause, as depicted in the National Centers for Environmental Information (NCEI) Intensity Scale in Table 9-1.

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Table 9-1. Hail Intensity and Magnitude¹

SIZE CODE	INTENSITY CATEGORY	SIZE (Diameter Inches)	DESCRIPTIVE TERM	TYPICAL DAMAGE
H0	Hard Hail	Up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33 – 0.60	Marble	Slight damage to plants and crops
H2	Potentially Damaging	0.60 – 0.80	Dime	Significant damage to plants and crops
H3	Severe	0.80 – 1.20	Nickel	Severe damage to plants and crops
H4	Severe	1.2 – 1.6	Quarter	Widespread glass and auto damage
H5	Destructive	1.6 – 2.0	Half Dollar	Widespread destruction of glass, roofs, and risk of injuries
H6	Destructive	2.0 – 2.4	Ping Pong Ball	Aircraft bodywork dented and brick walls pitted
H7	Very Destructive	2.4 – 3.0	Golf Ball	Severe roof damage and risk of serious injuries
H8	Very Destructive	3.0 – 3.5	Hen Egg	Severe damage to all structures
H9	Super Hailstorms	3.5 – 4.0	Tennis Ball	Extensive structural damage, could cause fatal injuries
H10	Super Hailstorms	4.0 +	Baseball	Extensive structural damage, could cause fatal injuries

The intensity scale in Table 9-1 ranges from H0 to H10, with increments of intensity or damage potential in relation to hail size (distribution and maximum), texture, fall speed, speed of storm translation, and strength of the accompanying wind. Based on available data regarding the previous occurrences for the area, the Bell County planning area may experience hailstorms ranging from an H0 to an H7. The County can mitigate a storm from low risk or hard hail to a very destructive hailstorm with golf ball size hail that leads to severe roof damage and risk of serious injuries.

Historical Occurrences

Historical evidence shown in Figure 9-1 demonstrates that the planning area is vulnerable to hail events overall, which typically result from severe thunderstorm activity. Historical events with reported damages (2017 dollars), injuries, or fatalities are shown in Table 9-2. A total of 287 reported historical hail events impacted the Bell County planning area between 1956 and 2017 (Summary Table 9-3). These events were reported to NCEI and NOAA databases and may not represent all hail events to

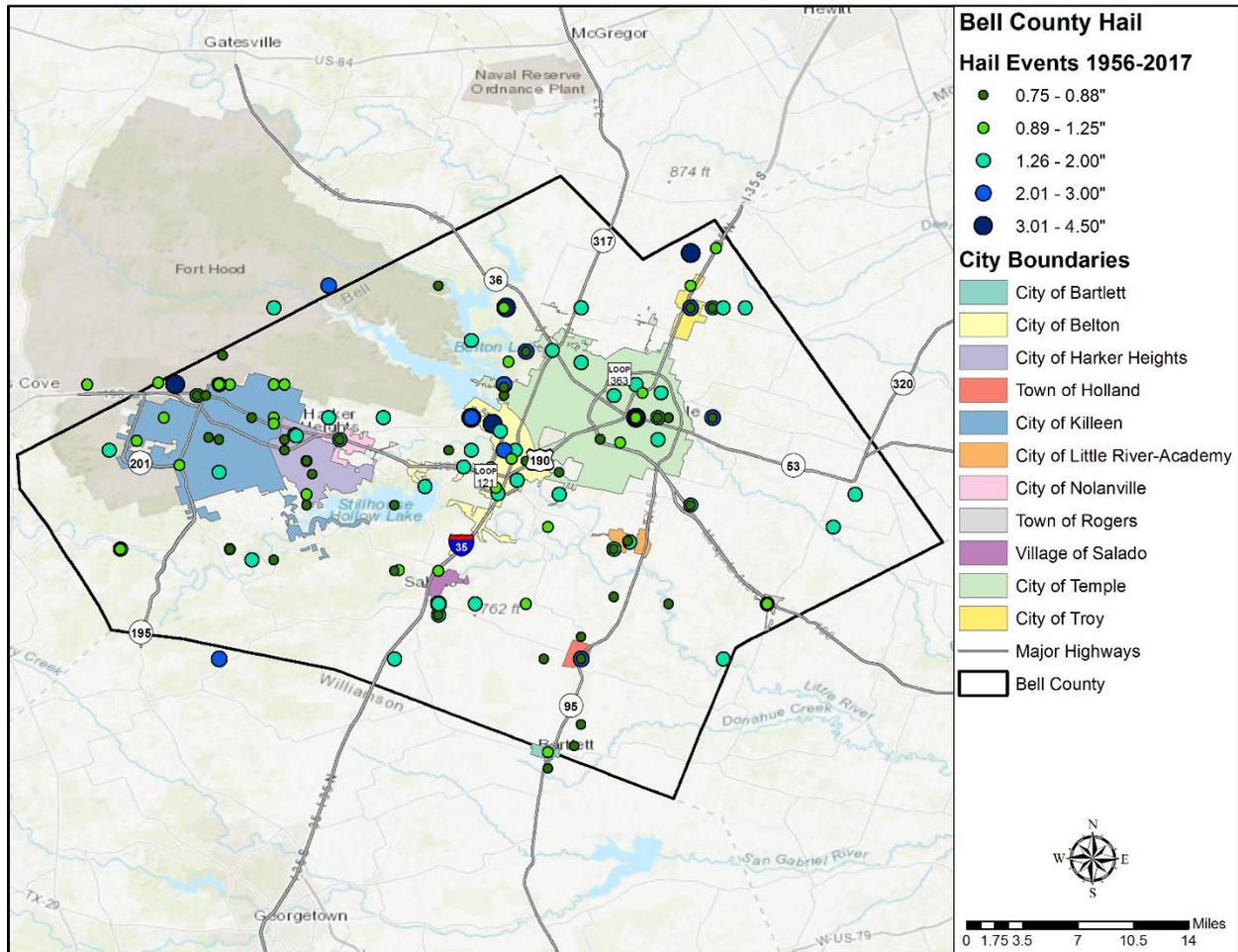
¹ NCEI Intensity Scale, based on the TORRO Hailstorm Intensity Scale.

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have occurred during the past 62 years. Only those events for the Bell County planning area with latitude and longitude available were plotted (Figure 9-1).

Historical hail data for the following are provided within a City-wide basis per the NCEI database. It should be noted that the CTCOG facility is located in the City of Belton. While the City of Belton has experienced 40 hail events, none have directly impacted the CTCOG facility.

Figure 9-1. Spatial Historical Hail Events, 1956-2017



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Table 9-2. Historical Hail Events, 1956-2017

JURISDICTION	Date	MAGNITUDE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE
Temple	6/27/1995	1.75	0	0	\$478,030	\$0
Temple	4/19/1996	4.5	0	0	\$309,546,208	\$0
Killeen	4/20/2006	1.75	0	0	\$6,023	\$0
Killeen	5/5/2006	2.75	0	0	\$12,046	\$0
Salado	6/3/2007	1.25	0	0	\$1,171	\$0
Bell County	4/25/2008	1.75	0	0	\$5,639	\$0
Bell County	4/25/2008	4.25	0	0	\$33,837	\$0
Bell County	4/25/2008	2.75	0	0	\$28,197	\$0
Bell County	4/25/2008	2.5	0	0	\$28,197	\$0
Bell County	4/25/2008	1.75	0	0	\$5,639	\$0
Belton	4/25/2008	1.75	0	0	\$5,639	\$0
Belton	4/25/2008	1.75	0	0	\$45,116	\$0
Belton	4/25/2008	2.75	0	0	\$22,558	\$0
Belton	4/25/2008	1.75	0	0	\$5,639	\$0
Little River Academy	4/25/2008	1.75	0	0	\$5,639	\$0
Salado	4/25/2008	1.75	0	0	\$5,639	\$0
Temple	4/25/2008	1.75	0	0	\$5,639	\$0
Temple	4/25/2008	1.75	0	0	\$5,639	\$0
Temple	5/9/2013	1.75	0	0	\$5,212	\$0
Bell County	3/28/2014	1.5	0	0	\$4,103	\$0
Belton	3/28/2014	1.75	0	0	\$12,309	\$0
Belton	3/28/2014	1.75	0	0	\$20,516	\$0
Belton	3/28/2014	4.25	0	0	\$15,387	\$0
Belton	3/28/2014	2.75	0	0	\$102,578	\$0
Killeen	3/28/2014	1.5	0	0	\$4,103	\$0
Nolanville	3/28/2014	1.75	0	0	\$15,387	\$0
Salado	3/28/2014	1.5	0	0	\$4,103	\$0

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JURISDICTION	Date	MAGNITUDE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE
Belton	5/8/2014	1.75	0	0	\$20,516	\$0
Bell County	4/28/2016	2	0	0	\$20,236	\$0
Belton	4/28/2016	2	0	0	\$20,415	\$0
Belton	4/28/2016	1.75	0	0	\$50,590	\$0
Temple	4/29/2016	1.75	0	0	\$20,236	\$0
Temple	4/29/2016	1.75	0	0	\$20,415	\$0
Belton	3/26/2017	1	0	0	\$10,000	\$0
Nolanville	3/26/2017	1.75	0	0	\$5,000	\$0

Table 9-3. Historical Hail Events Summary, 1956-2017

JURISDICTION	Number of Events	MAGNITUDE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	116	4.5 inches	0	0	\$125,848	\$0
Bartlett	3	0.88 inches	0	0	\$0	\$0
Belton ²	40	4.25 inches	0	0	\$331,263	\$0
Harker Heights	0	N/A	N/A	N/A	N/A	N/A
Holland	5	2.75 inches	0	0	\$0	\$0
Killeen	37	4.5 inches	0	0	\$22,172	\$0
Little River Academy	5	1.75 inches	0	0	\$5,639	\$0
Nolanville	10	2.0 inches	0	0	\$20,387	\$0
Rogers	7	1.25 inches	0	0	\$0	\$0
Salado	21	2.75 inches	0	0	\$10,913	\$0
Temple	36	4.5 inches	0	0	\$310,081,379	\$0
Troy	7	4.5 inches	0	0	\$0	\$0
TOTAL LOSSES		(Max Extent)	0	0	\$310,597,601	

² CTCOG events are reported on a city-wide basis under the City of Belton.

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Significant Events

April 15, 2012 – Bell County

On April 15th, a large supercell thunderstorm moved across the area producing widespread hail up to softball size. Substantial damage was done at the Temple Airport and across the northern half of the city. Cooperate buildings sustained major hail damage, residential and commercial windows were broken throughout the city, and a substantial number of roofs were damaged.

March 28, 2014 – Bell County/Belton

A strong shortwave trough and a cold front combined to produce a complex of severe thunderstorms primarily across the southern and eastern counties of the Fort Worth CWA. The main threat with these storms was hail, which was reported mainly as golf ball size or small. However, in Belton hail was reported to be up to softball size. The softball sized hail smashed out windows in several homes in a residential subdivision near the high school.

Probability of Future Events

Based on available records of historic events, 279 events in a 62 year reporting period for Bell County provides a probability of four to five events every year. This frequency supports a highly likely probability of future events for the Bell County planning area, including the CTCOG and all participating jurisdictions.

Vulnerability and Impact

Damage from hail approaches \$1 billion in the U.S. each year. Much of the damage inflicted by hail is to crops. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are most commonly damaged by hail.

Utility systems on roofs at school districts and critical facilities would be vulnerable. Hail could cause a significant threat to people as they could be struck by hail and falling trees or branches. Outdoor activities such as student activities and events may elevate the risk to students, faculty and residents when a hailstorm strikes with little warning.

The Bell County planning area features multiple mobile or manufactured home parks throughout the planning area including all participating jurisdictions. These parks are typically more vulnerable to hail events than typical site built structures. In addition, manufactured homes are located sporadically throughout the planning area in unincorporated portions of the county as well as within all participating jurisdictions.

The U.S. Census data indicates a total of 4,903 manufactured homes located in the Bell County planning area, including all participating jurisdictions (Table 9-4), totaling approximately 3.7% of the residential structures in the planning area. In addition, 35.7% (approximately 46,993 structures) of the single family residential (SFR) structures in the Bell County planning area were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant hail events. While the CTCOG does not have any manufactured homes or portable buildings, the facility was built prior to 1980 and may be more vulnerable.

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Table 9-4. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	STRUCTURES BUILT BEFORE 1980
Bell County ³	4,903	46,993
Bartlett	34	445
Belton	614	3,438
CTCOG	0	1
Harker Heights	1,414	2,480
Holland	48	290
Killeen	1,371	17,117
Little River Academy	128	403
Nolanville	518	500
Rogers	84	298
Salado	10	157
Temple	907	14,607
Troy	36	354

The following critical facilities would be most vulnerable to hail events in each participating jurisdiction:

Table 9-5. Critical Facilities at Risk by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Bell County	Government Facility, OEM
Bartlett	Government Facility, Police Station, Fire Station, 2 Schools
Belton	Government Facility, Police Station, 2 Fire Stations, EOC, School, Shelter
CTCOG	CTCOG Office Building
Harker Heights	Government Facility, Police Station, 2 Fire Stations, Shelter, Hospital, Nursing Home, 13 Lift Stations, 9 Pump Stations, Communications Tower
Holland	Government Facility, Police Station, Fire Station, School, Community Center

³ County totals includes all incorporated jurisdictions and unincorporated areas.

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JURISDICTION	CRITICAL FACILITIES
Killeen	11 Government Facilities, 2 Police Stations, 8 Fire Stations, EOC, OEM, Public Works Facility, Shelter, Water Department Facility, Oncor Electric Services, Solid Waste Facility
Little River Academy	Government Facility, Police Station, Fire Station
Nolanville	Government Facility, Police Station, Fire Station, EMS, Public Works Facility, 2 Schools
Rogers	Government Facility, Police Station, Fire Station, School, 2 Water Towers, Wastewater Treatment Facility, Community Center
Salado	2 Government Facilities, Police Station, Wastewater Treatment Facility, 4 Schools, Transportation Facility (Bus Maintenance), Communications Facilities, Water Tower
Temple	Government Facility, Police Station, 8 Fire Stations, Public Works Facility, 4 Water Treatment Facilities, 3 Hospitals, Convention Center, 2 Dams, Panda Power Plant, 11 Water Towers, Ground Storage Tank, 7 Pump Stations, 22 Schools, Interstate, 2 Highways
Troy	Government Facility, Police Station, Water Well, Water Storage Facility and Pump, Water Tower, Wastewater Treatment Facility, 4 Schools

Hail has been known to cause injury to humans and occasionally has been fatal. Overall, the average loss estimate of property and crops (in 2017 dollars) is \$310,597,601, having an approximate annual loss estimate of \$5,009,638. Based on historic loss and damages, the impact of hail damages on the entire Bell County planning area, including the CTCOG and all participating jurisdictions, can be considered “Minor” severity of impact meaning injuries and illness do not result in permanent disability, County area facilities shut down for more than one week, and more than ten percent of property destroyed or with major damage.

Table 9-6. Potential Annualized Losses for Bell County

JURISDICTION	PROPERTY & CROP DAMAGE	ANNUAL LOSS ESTIMATE
Bell County	\$125,848	\$2,030
Bartlett	\$0	\$0
Belton	\$331,263	\$5,343
CTCOG	\$0	\$0
Harker Heights	\$0	\$0
Holland	\$0	\$0
Killeen	\$22,172	\$358
Little River Academy	\$5,639	\$91
Nolanville	\$20,387	\$329
Rogers	\$0	\$0
Salado	\$10,913	\$176

Section 9: Hail

JURISDICTION	PROPERTY & CROP DAMAGE	ANNUAL LOSS ESTIMATE
Temple	\$310,081,379	\$5,001,313
Troy	\$0	\$0
Planning Area	\$310,597,601	\$5,009,638

Assessment of Impacts

Hail events have the potential to pose a significant risk to people and can create dangerous situations. Impacts to the planning area can include:

- Hail may create hazardous road conditions during and immediately following an event, delaying first responders from providing for or preserving public health and safety.
- Individuals and first responders who are exposed to the storm may be struck by hail, falling branches, or downed trees resulting in injuries or possible fatalities.
- Residential structures can be damaged by falling trees, which can result in physical harm to occupants.
- Large hail events will likely cause extensive roof damage to residential structures along with siding damage and broken windows, creating a spike in insurance claims and a rise in premiums.
- Automobile damage may be extensive depending on the size of the hail and length of the storm.
- Hail events can result in power outages over widespread areas increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage can result in an increase in structure fires and/or carbon monoxide poisoning, as individuals attempt to cook or heat their home with alternate, unsafe cooking or heating devices, such as grills.
- First responders are exposed to downed power lines, damaged structures, hazardous spills, and debris that often accompany hail events, elevating the risk of injury to first responders and potentially diminishing emergency response capabilities.
- Downed power lines and large debris, such as downed trees, can result in the inability of emergency response vehicles to access areas of the community.
- Hazardous road conditions may prevent critical staff from reporting for duty, limiting response capabilities.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Some businesses not directly damaged by the hail event may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.
- Hazardous road conditions will likely lead to increases in automobile accidents, further straining emergency response capabilities.
- Depending on the severity and scale of damage caused by large hail events, damage to power transmission and distribution infrastructure can require days or weeks to repair.
- A significant hail event could significantly damage agricultural crops, resulting in extensive economic losses for the community and surrounding area.

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- Hail events may injure or kill livestock and wildlife.
- A large hail event could impact the accessibility of recreational areas and parks due to extended power outages or debris clogged access roads.

The economic and financial impacts of hail will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning conducted by the community, local businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of any hail event.

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Hazard Description

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, a tossed cigarette, burning debris, or arson.

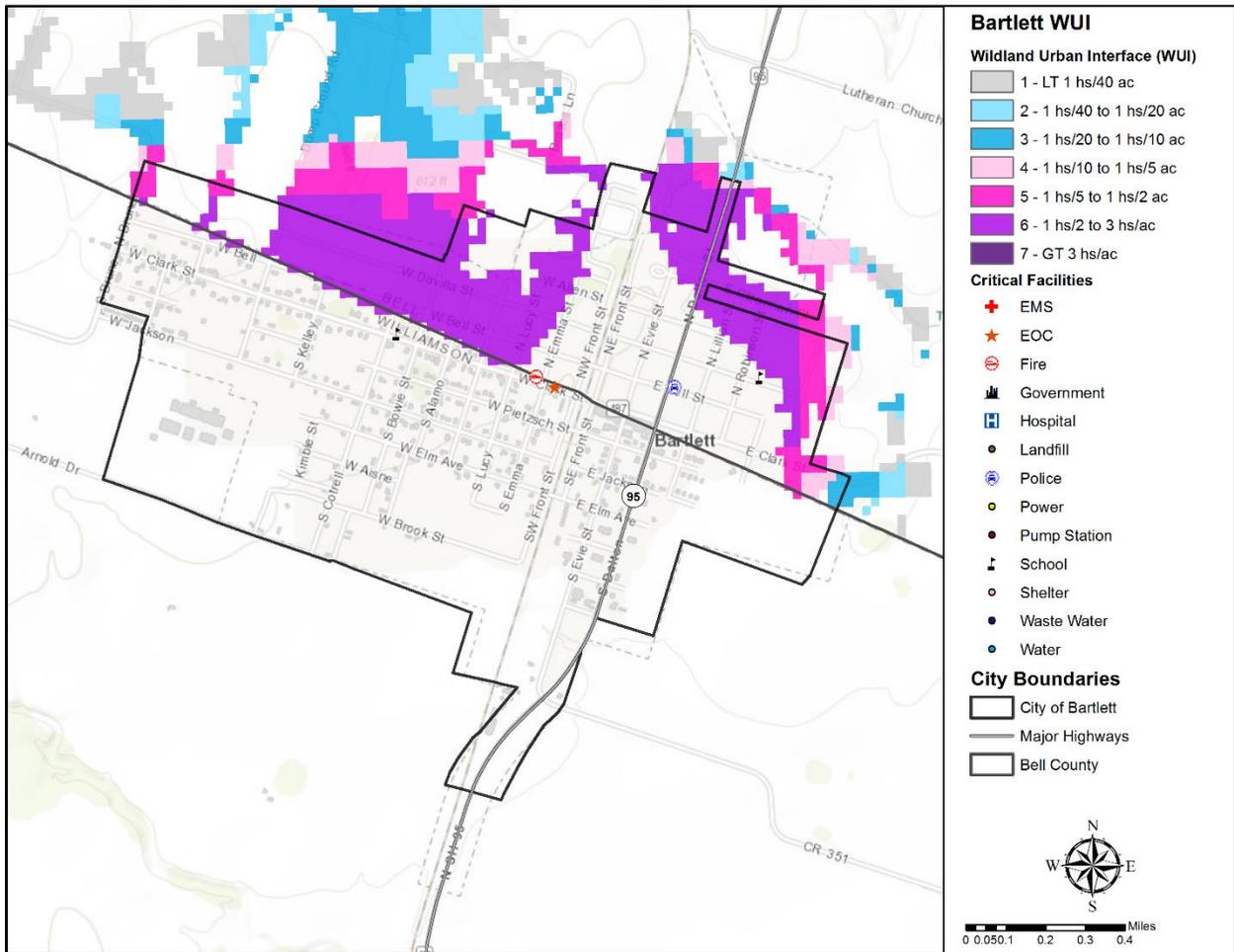
Texas has seen a significant increase in the number of wildfires in the past 30 years, which included wildland, interface, or intermix fires. Wildland fires are fueled almost exclusively by natural vegetation, while interface or intermix fires are urban/wildland fires in which vegetation and the built-environment provide the fuel.

Location and Historical Occurrences

A wildfire event can be a potentially damaging consequence of drought. Wildfires can vary greatly in terms of size, location, intensity, and duration. While wildfires are not confined to any specific geographic location, they are most likely to occur in open grasslands. The threat to people and property from a wildfire event is greater in the fringe areas where developed areas meet open grass lands, such as the Wildland Urban Interface (WUI). (Figures 10-1 through 10-12). It is estimated that 52 percent of the total population in Bell County live within the WUI. However, the entire Bell County planning area is at risk for wildfires.

Section 10: Wildfire

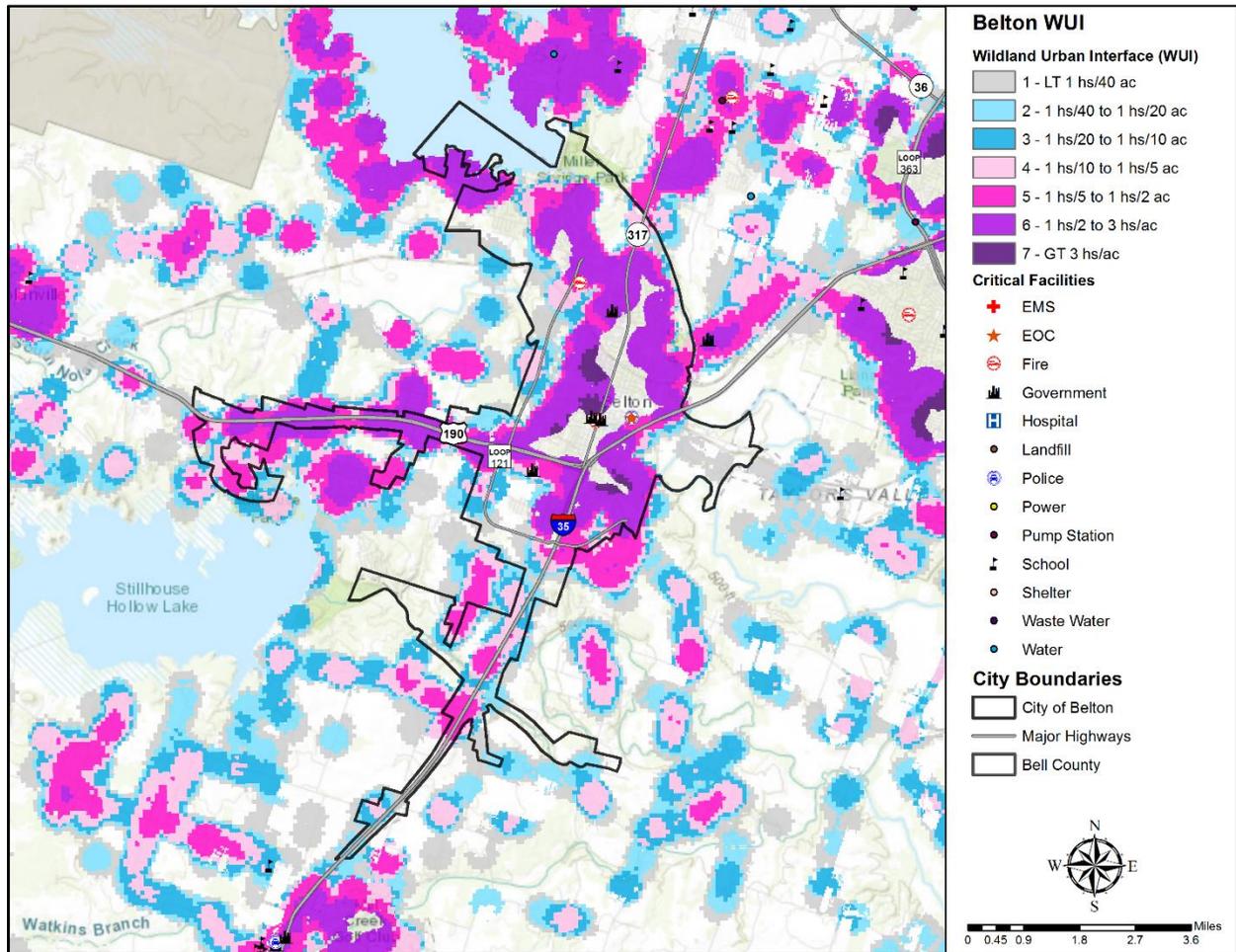
Figure 10-2. Wildland Urban Interface Map – City of Bartlett



It is estimated that 14 percent of the total population in the City of Bartlett live within the WUI. However, the entire City of Bartlett is at risk for wildfires.

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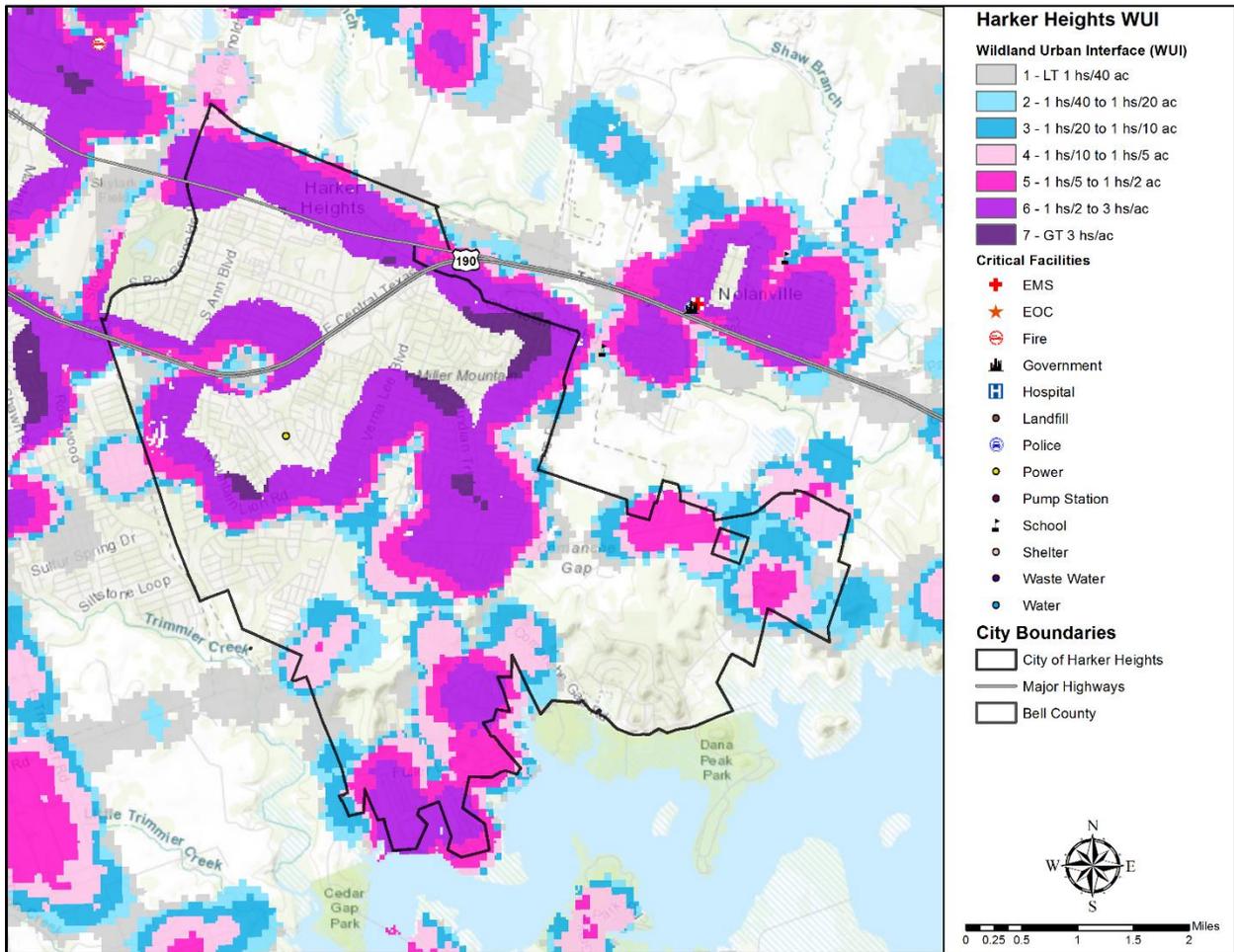
Figure 10-3. Wildland Urban Interface Map – City of Belton and CTCOG



It is estimated that 78 percent of the total population in the City of Belton live within the WUI. However, the entire City of Belton is at risk for wildfires. The CTCOG facility is located in the WUI.

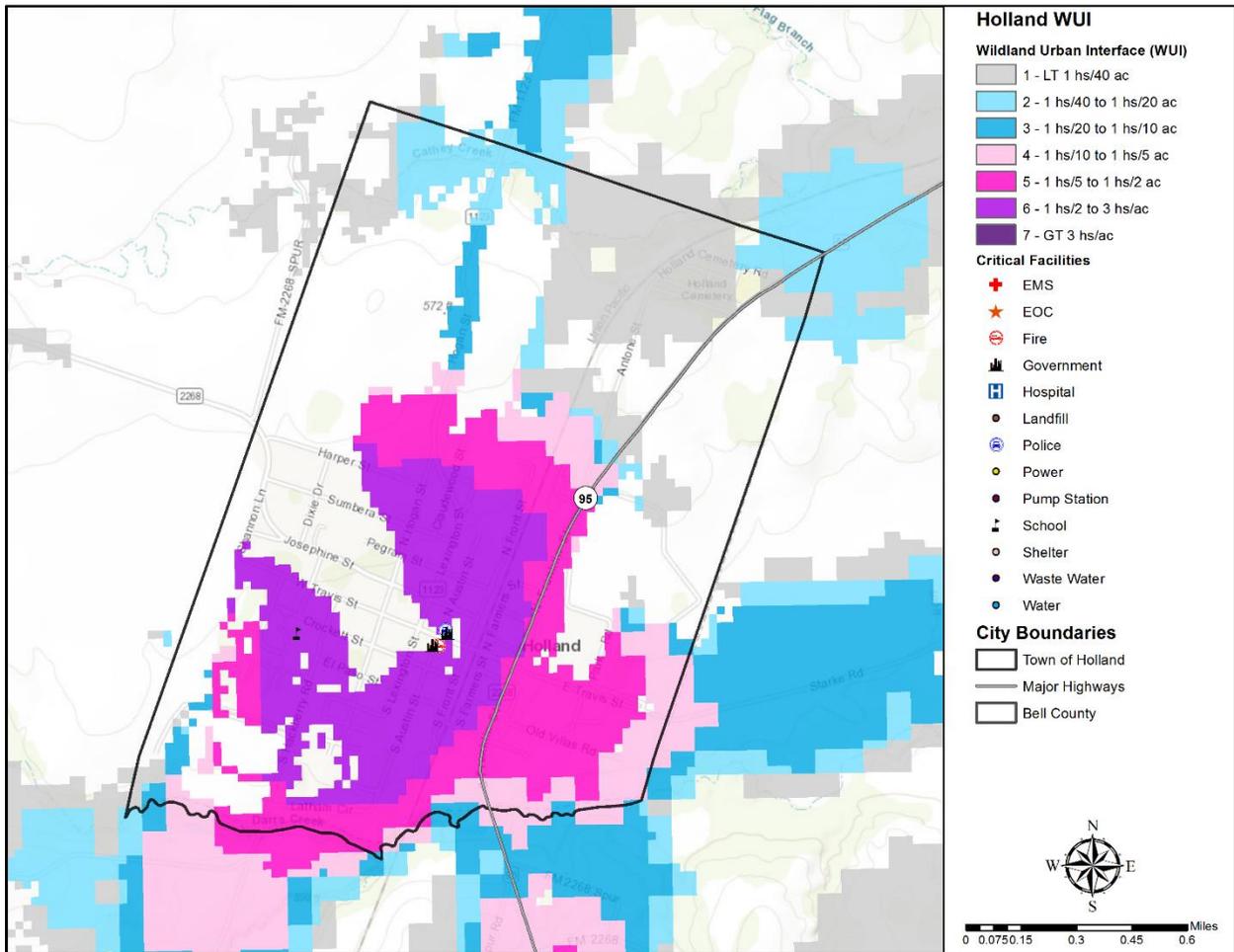
Section 10: Wildfire

Figure 10-4. Wildland Urban Interface Map – City of Harker Heights



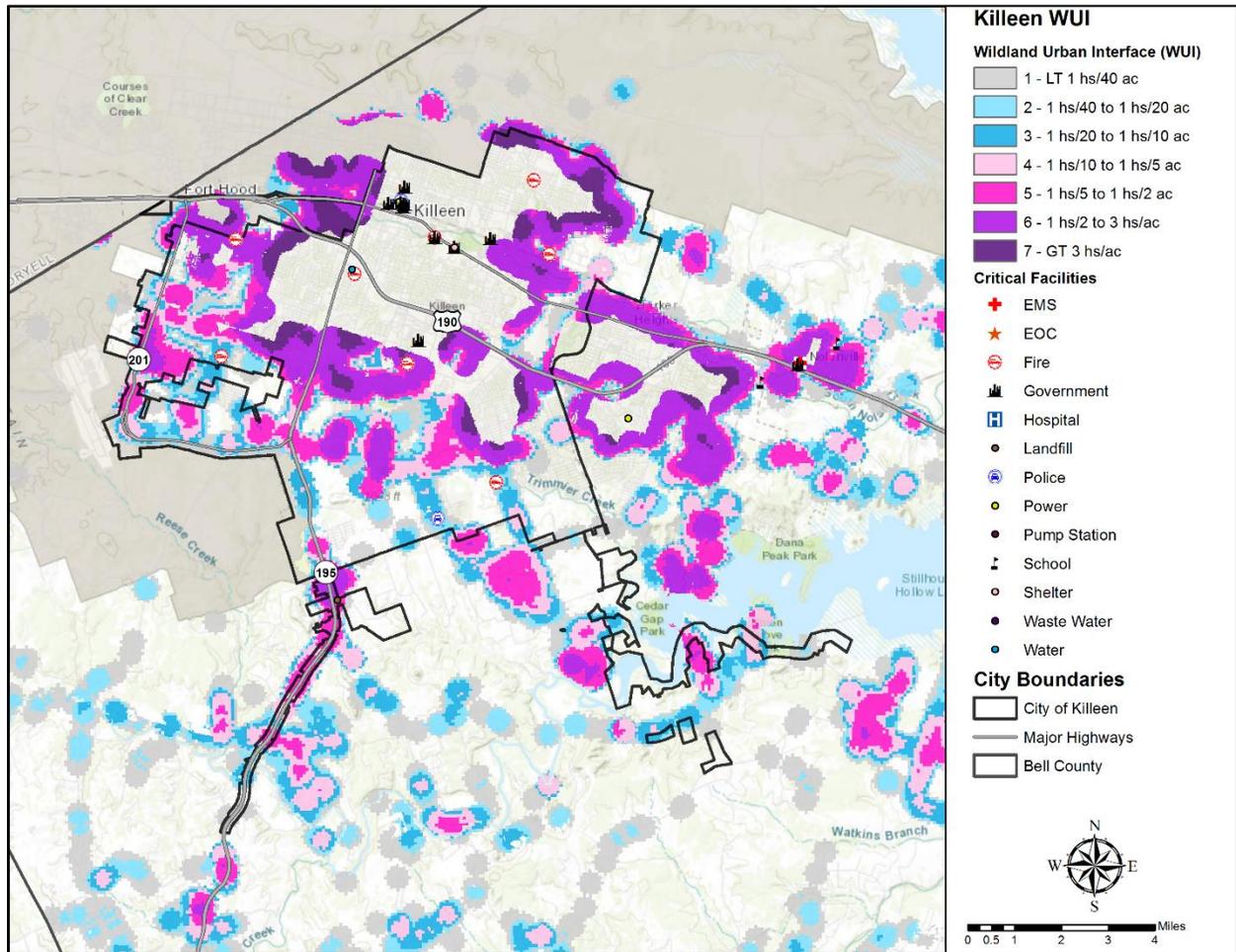
It is estimated that 52 percent of the total population in the City of Harker Heights live within the WUI. However, the entire City of Harker Heights is at risk for wildfires.

Figure 10-5. Wildland Urban Interface Map – Town of Holland



It is estimated that 55 percent of the total population in the Town of Holland live within the WUI. However, the entire Town of Holland is at risk for wildfires.

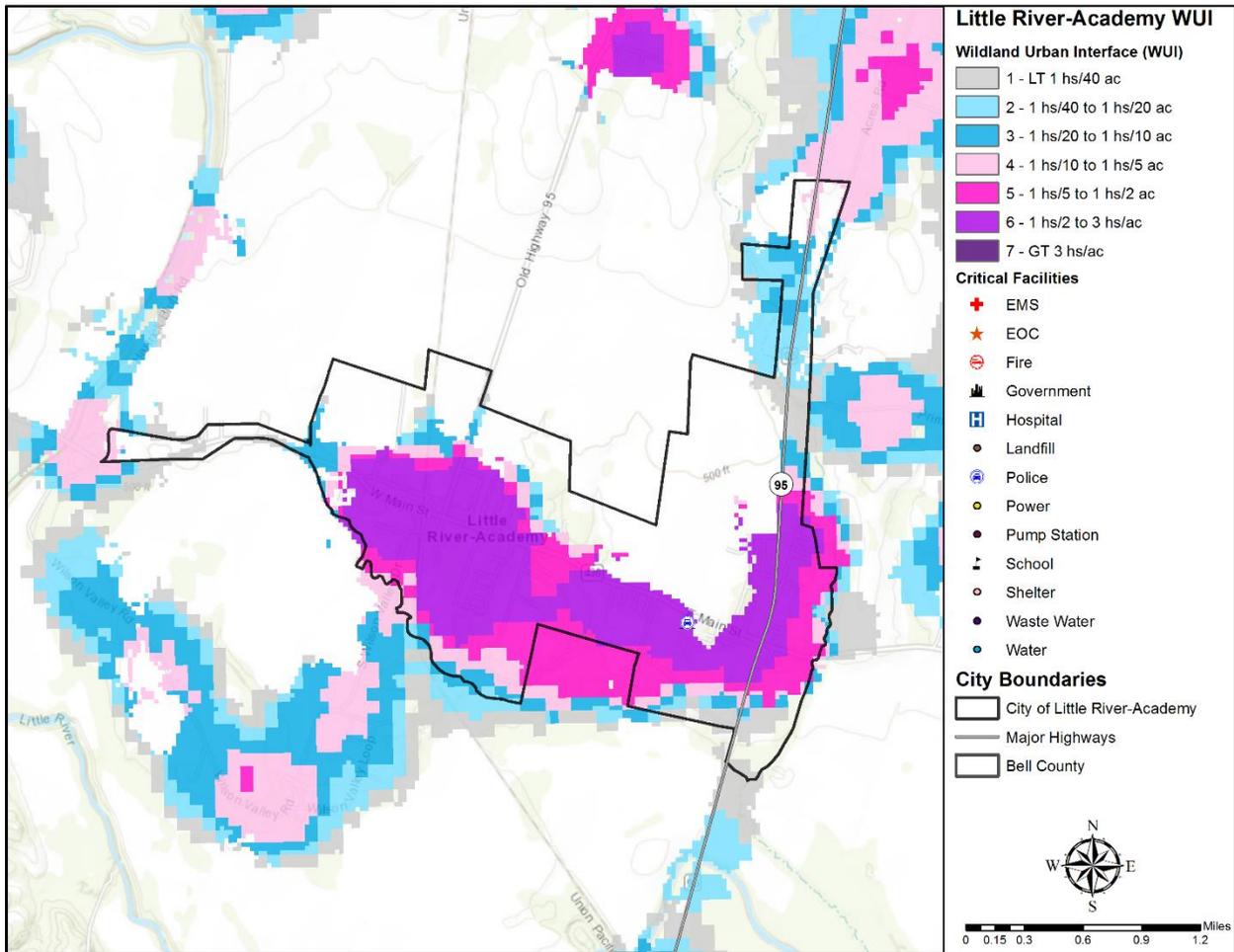
Figure 10-6. Wildland Urban Interface Map – City of Killeen



It is estimated that 34 percent of the total population in the City of Killeen live within the WUI. However, the entire City of Killeen is at risk for wildfires.

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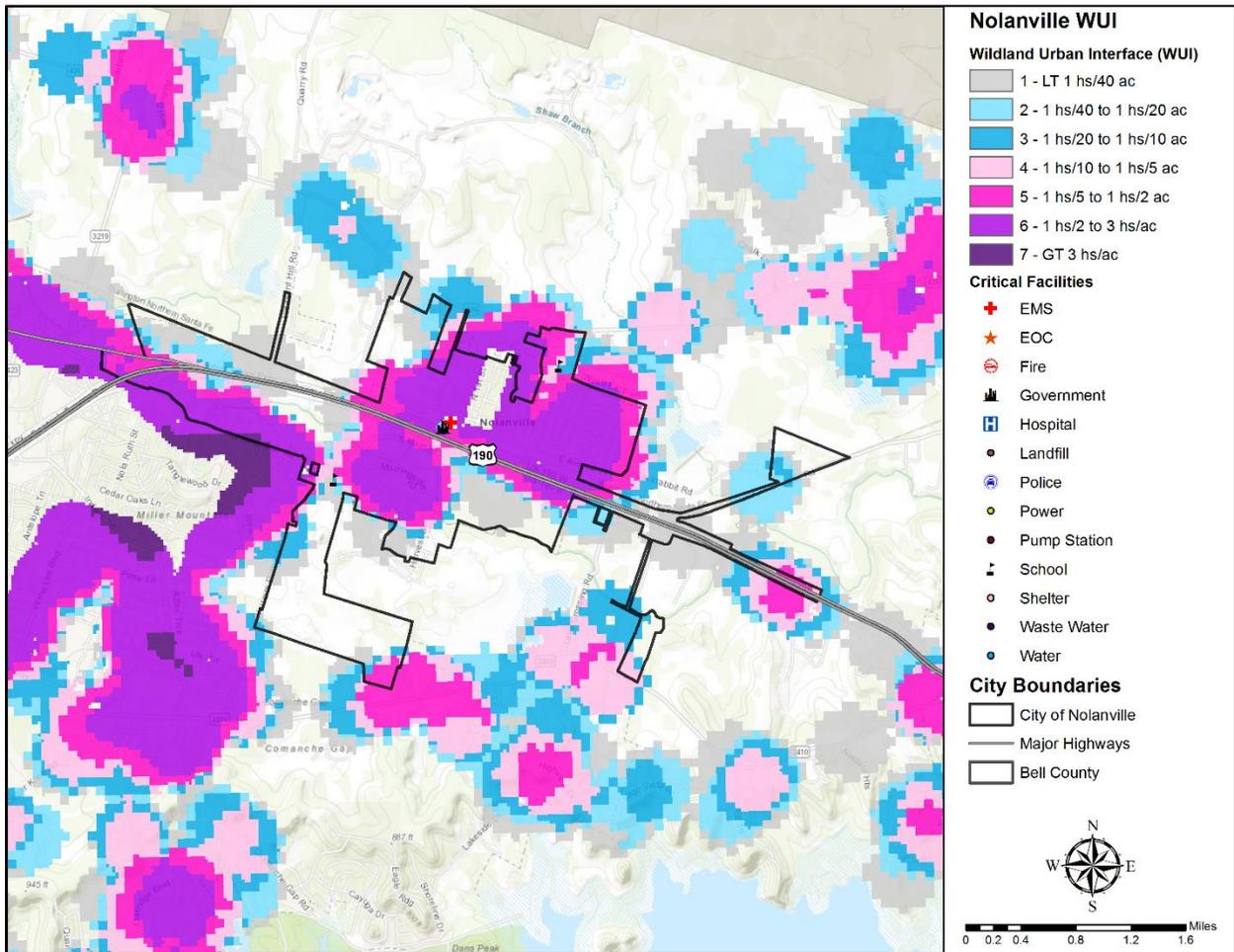
Figure 10-7. Wildland Urban Interface Map – City of Little River Academy



It is estimated that 94 percent of the total population in the City of Little River Academy live within the WUI. However, the entire City of Little River Academy is at risk for wildfires.

Section 10: Wildfire

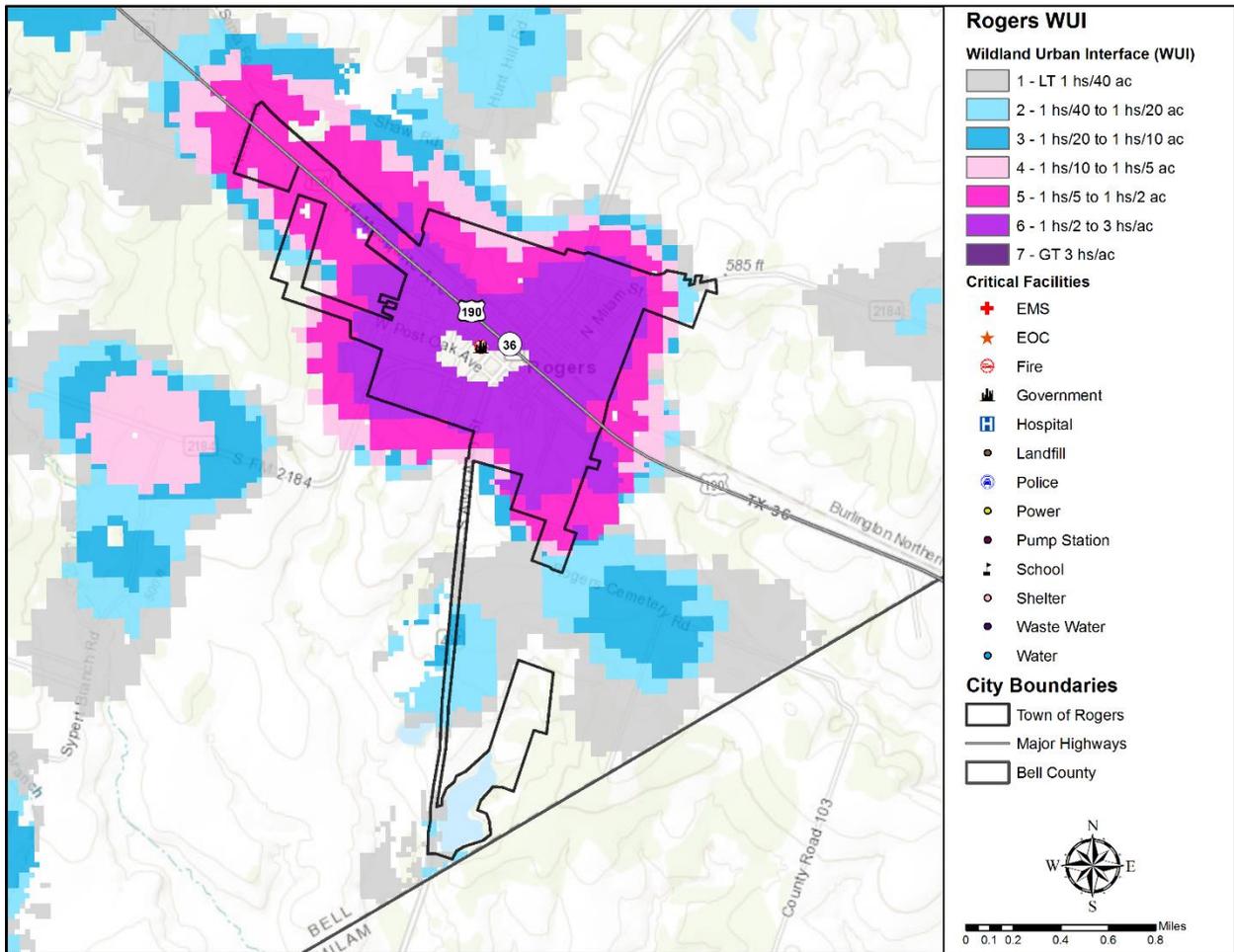
Figure 10-8. Wildland Urban Interface Map – City of Nolanville



It is estimated that 93 percent of the total population in the City of Nolanville live within the WUI. However, the entire City of Nolanville is at risk for wildfires.

Section 10: Wildfire

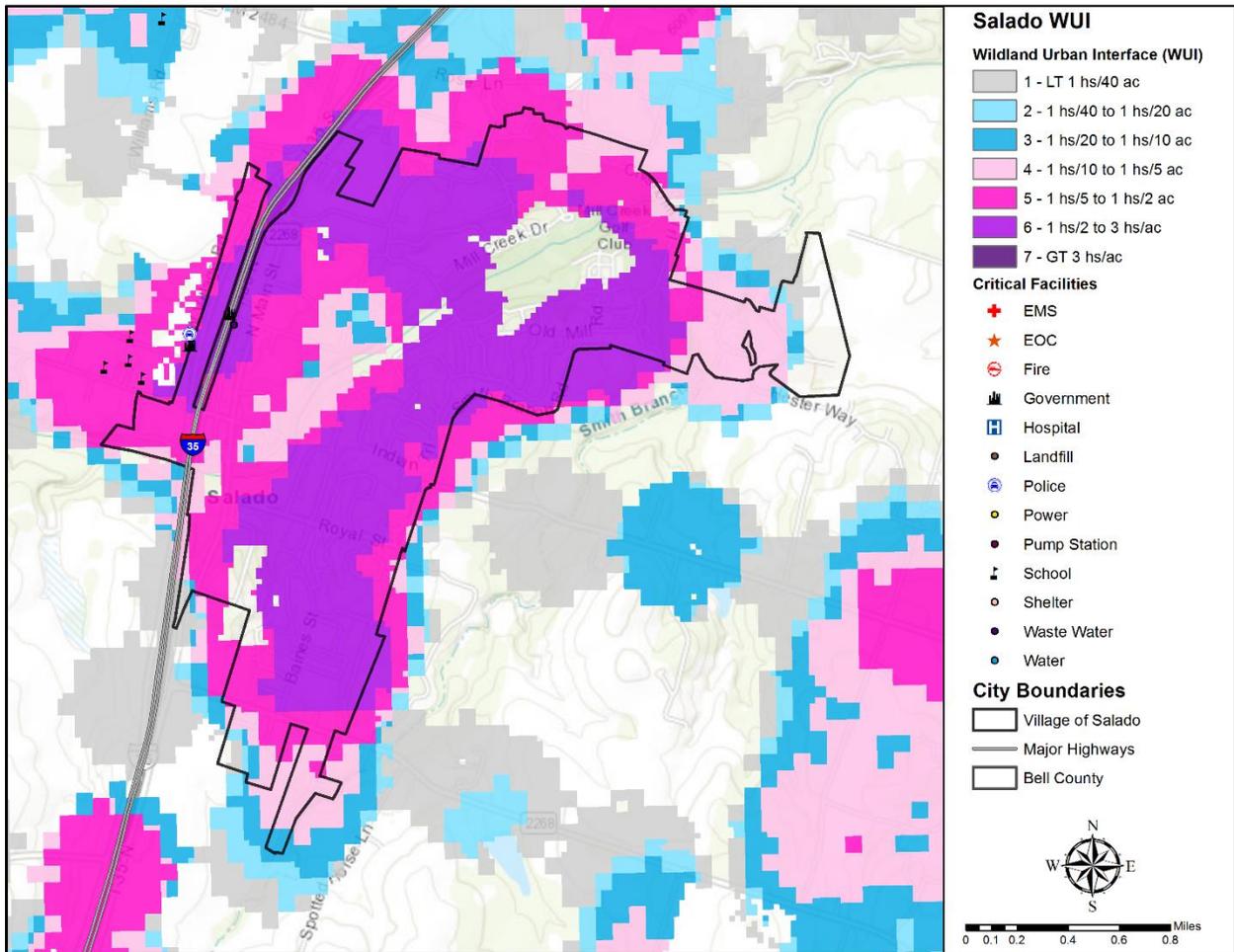
Figure 10-9. Wildland Urban Interface Map – Town of Rogers



It is estimated that 90 percent of the total population in the Town of Rogers live within the WUI. However, the entire Town of Rogers is at risk for wildfires.

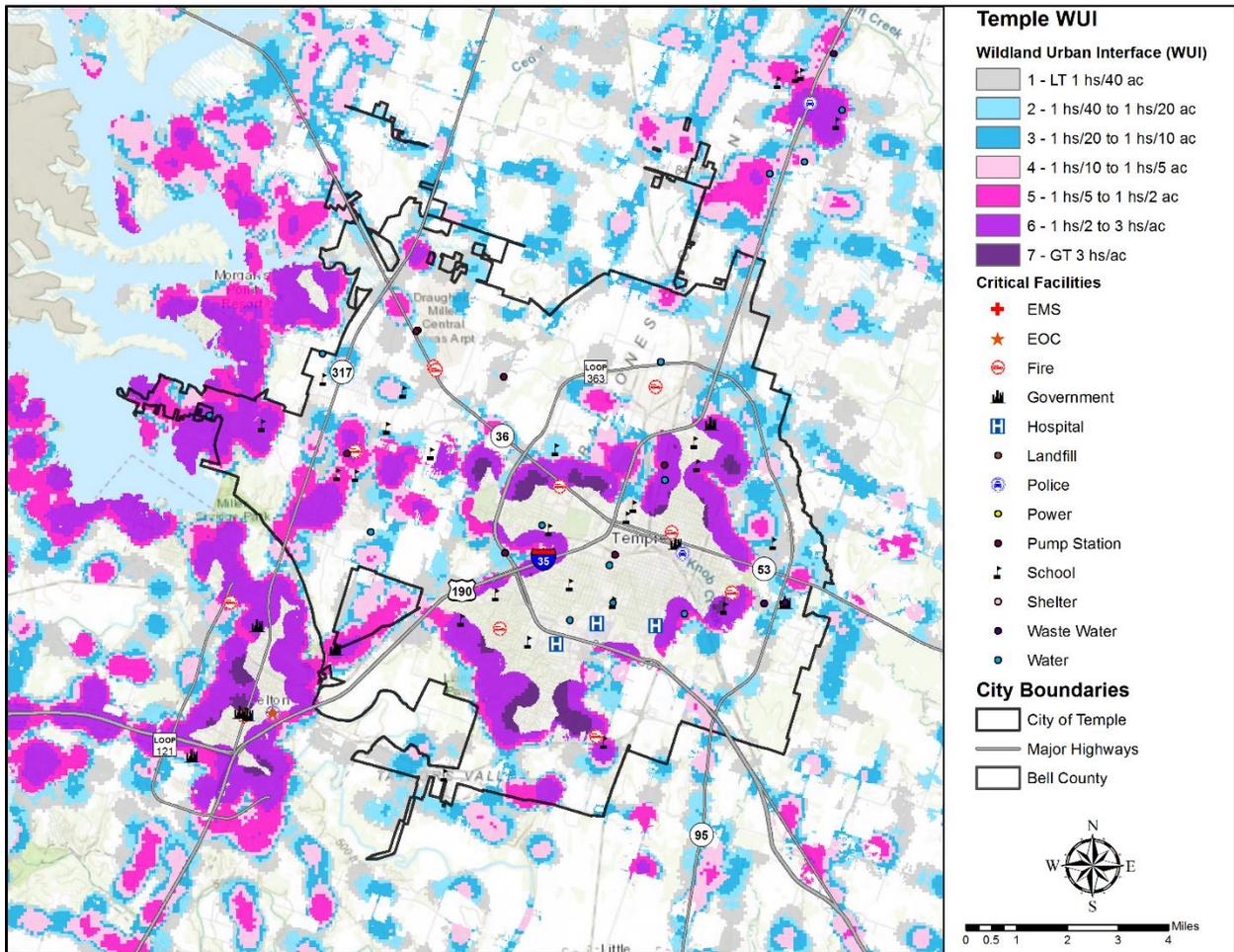
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Figure 10-10. Wildland Urban Interface Map – Village of Salado



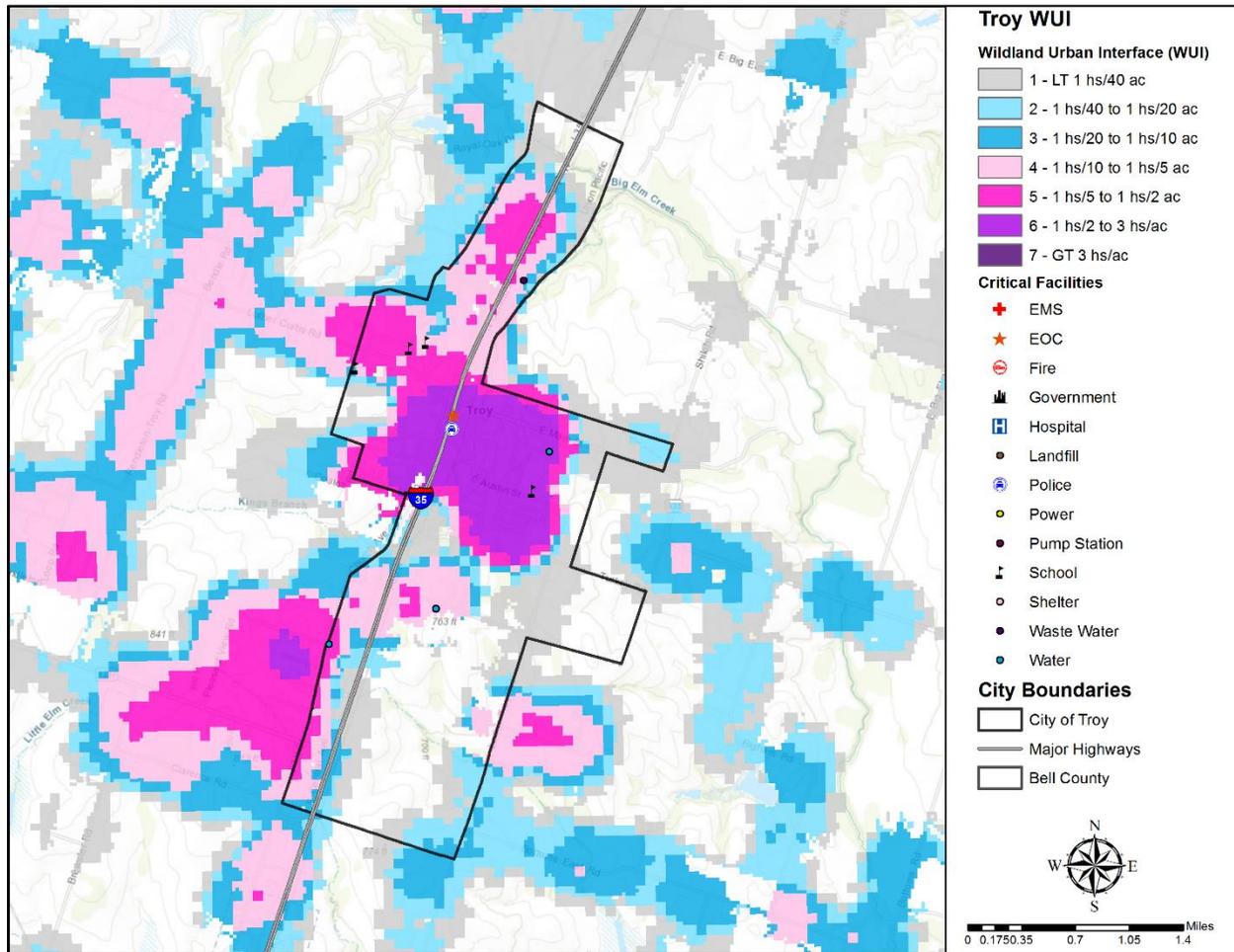
It is estimated that 95 percent of the total population in the Village of Salado live within the WUI. However, the entire Village of Salado is at risk for wildfires.

Figure 10-11. Wildland Urban Interface Map – City of Temple



It is estimated that 43 percent of the total population in the City of Temple live within the WUI. However, the entire City of Temple is at risk for wildfires.

Figure 10-12. Wildland Urban Interface Map – City of Troy



It is estimated that 99 percent of the total population in the City of Troy live within the WUI. However, the entire City of Troy is at risk for wildfires.

The Texas Forest Service reported 3,128 wildfire events between 2005 and 2015. The National Center for Environmental Information (NCEI) includes eight reported events from 1996 through 2017 for the planning area. Each of these events were accounted for in the Texas Forest Service (TFS) data. The TFS started collecting wildfire data in 1985, however, volunteer fire departments did not start reporting events until 2005. Due to a lack of recorded data for wildfire events prior to 2005, frequency calculations are based on an eleven-year period using only data from recorded years. The map below shows approximate locations of wildfires, which can be grass or brushfires of any size (Figure 10-13). Table 10-1 identifies the number of wildfires by jurisdiction and total acreage burned. It should be noted that the CTCOG facility is located in the City of Belton. The CTCOG has no reported damages due to wildfire.

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Figure 10-13. Location and Historic Wildfire Events for Bell County Planning Area

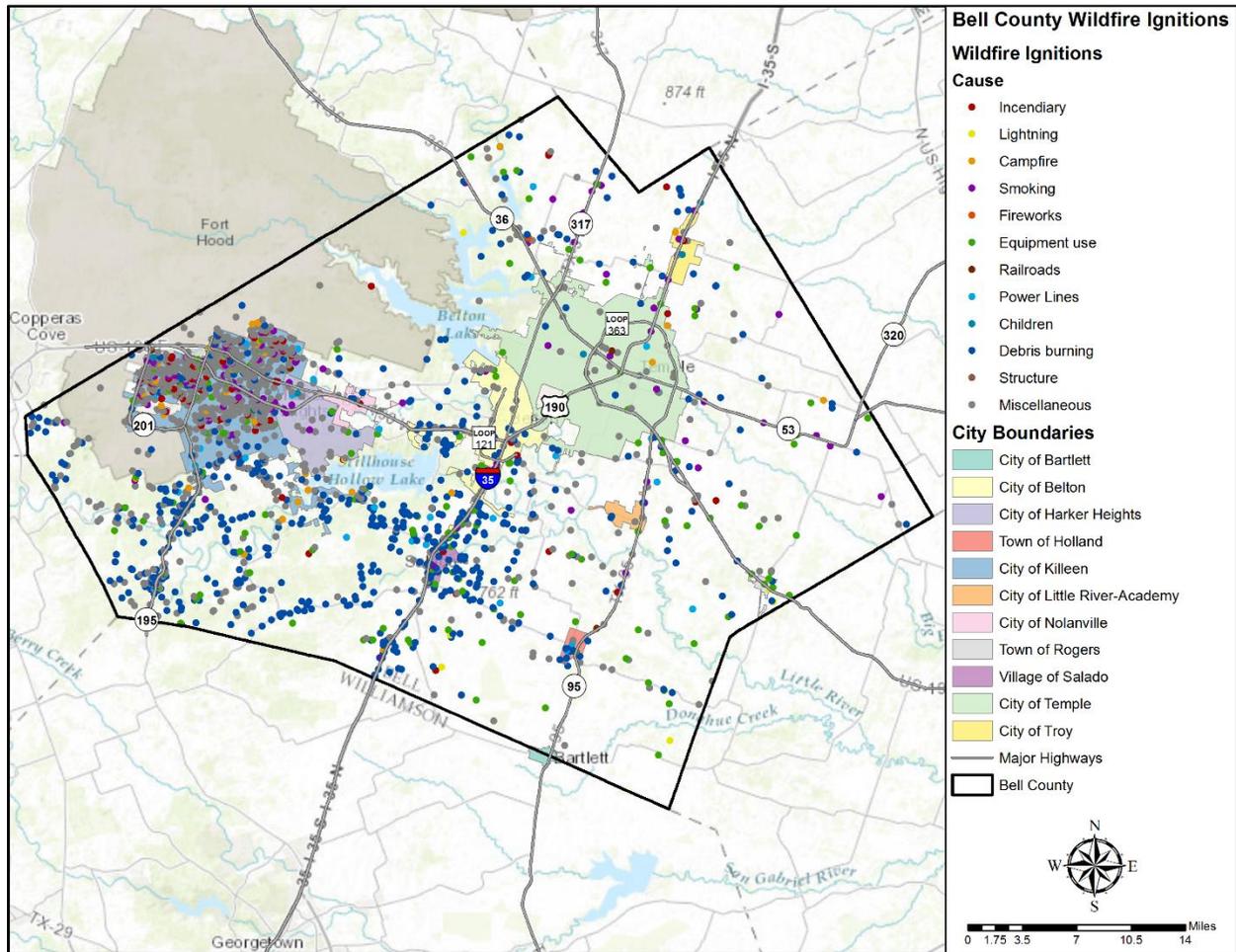


Table 10-1. Historical Wildfire Events Summary

JURISDICTION	NUMBER OF EVENTS	ACRES BURNED
Bell County	1,964	19,797
Bartlett	3	1
Belton	75	461
CTCOG	0	0
Harker Heights	41	243
Holland	14	137
Killeen	947	2,504
Little River Academy	8	21
Nolanville	9	1,030

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JURISDICTION	NUMBER OF EVENTS	ACRES BURNED
Rogers	7	168
Salado	9	64
Temple	41	519
Troy	10	10

Table 10-2. Acreage of Suppressed Wildfire by Year

JURISDICTION	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bell County	1,652	4,410	127	3,594	4,710	91	3,529	427	711	196	350
Bartlett	0	0	0	0	0	1	0	0	0	0	0
Belton	1	28	0	5	205	2	220	0	0	0	0
CTCOG	0	0	0	0	0	0	0	0	0	0	0
Harker Heights	0	8	0	104	0	1	9	100	0	16	5
Holland	1	25	0	5	0	1	100	5	0	0	0
Killeen	1	604	72	1,380	196	16	74	42	16	22	81
Little River Academy	1	0	0	16	0	0	0	0	0	4	0
Nolanville	1,002	17	0	0	0	0	0	0	0	0	11
Rogers	0	8	0	0	5	0	155	0	0	0	0
Salado	0	60	0	1	0	0	0	3	0	0	0
Temple	100	5	0	2	38	1	369	2	0	2	0
Troy	2	3	0	0	5	0	0	0	0	0	0

Extent

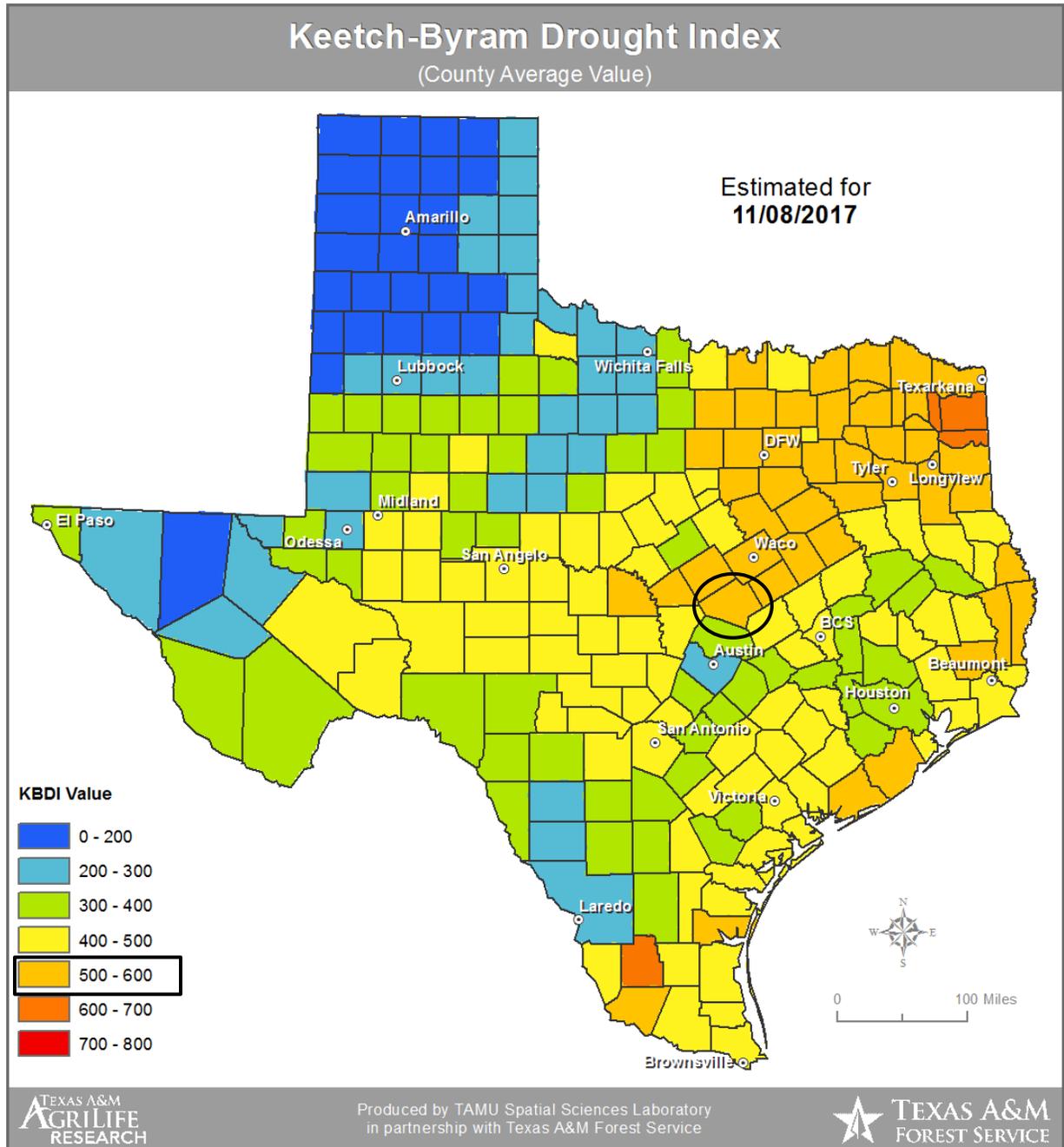


Risk for a wildfire event is measured in terms of magnitude and intensity using the Keetch Byram Drought Index (KBDI), a mathematical system for relating current and recent weather conditions to potential or expected fire behavior. The KBDI determines forest fire potential based on a daily water balance, derived by balancing a drought factor with precipitation and soil moisture (assumed to have a maximum storage capacity of eight inches), and is expressed in hundredths of an inch of soil moisture depletion.

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Each color in Figure 10-14 represents the drought index at that location. The drought index ranges from 0 to 800. A drought index of 0 represents no moisture depletion, and a drought index of 800 represents absolutely dry conditions.

Figure 10-14. Keetch-Byram Drought Index (KBDI) for the State of Texas, 2017¹



¹ Bell County is located within the black circle.

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Fire behavior can be categorized at four distinct levels on the KBDI:

- **0 -200:** Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in spots and patches.
- **200 -400:** Fires more readily burn and will carry across an area with no gaps. Heavier fuels will not readily ignite and burn. Expect smoldering and the resulting smoke to carry into and possibly through the night.
- **400 -600:** Fires intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.
- **600 -800:** Fires will burn to mineral soil. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

The KBDI is a good measure of the readiness of fuels for a wildfire event. It should be referenced as the area experiences changes in precipitation and soil moisture, while caution should be exercised in dryer, hotter conditions.

The range of intensity for the Bell County planning area in a wildfire event is within 500 to 600. The average extent to be mitigated for the Bell County planning area, including the CTCOG and all participating jurisdictions, is a KBDI of 555. At this level fires intensity begins to significantly increase and fires readily burn in all directions, exposing mineral soils in some locations.

The Texas Forest Service's Fire Intensity Scale identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on weighted average of four percentile weather categories. Bell County is between a potential moderate to high wildfire intensities. Figures 10-15 through 10-26 identify the wildfire intensity for the Bell County planning area.

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Figure 10-15. Fire Intensity Scale Map – Bell County

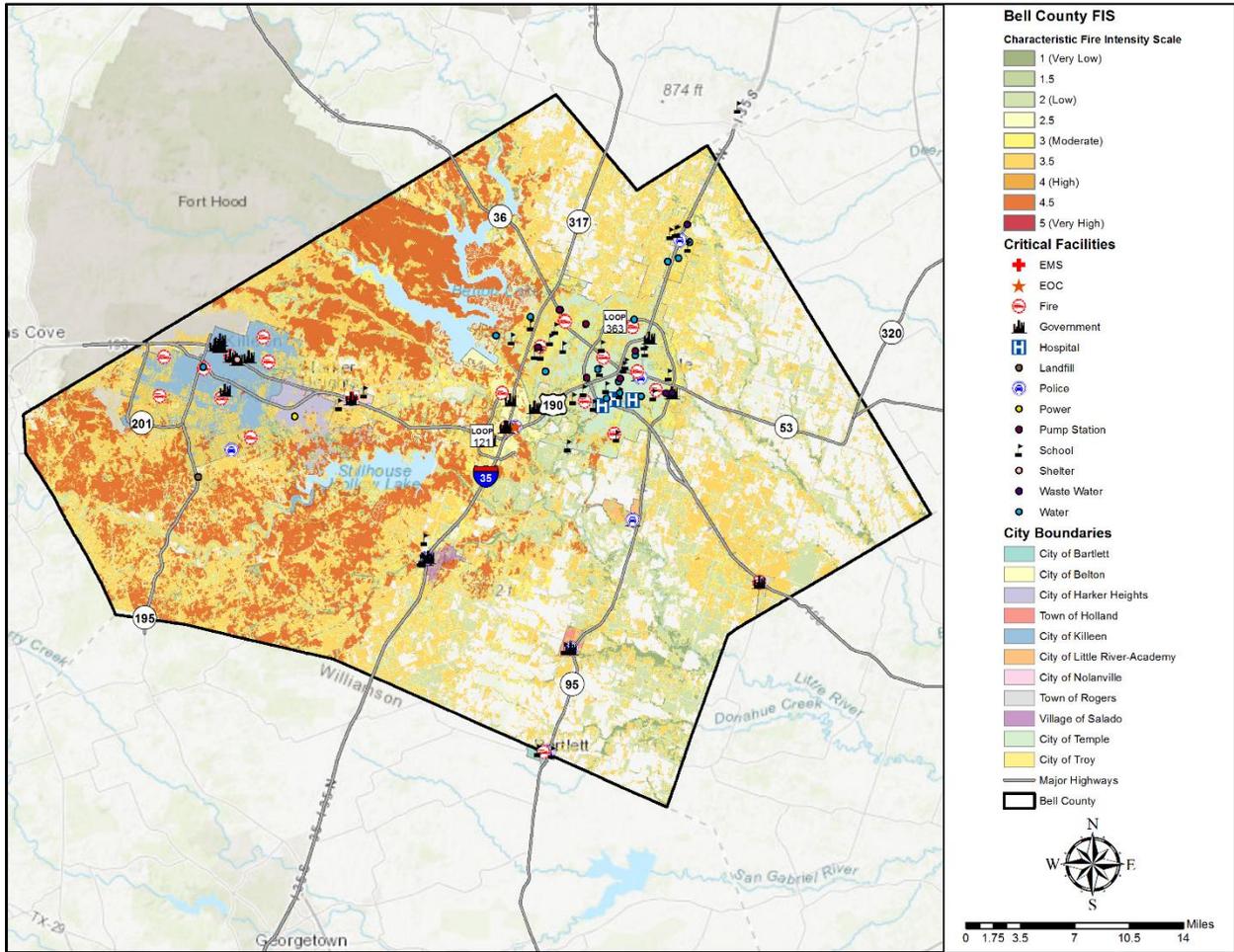


Figure 10-16. Fire Intensity Scale Map – City of Bartlett

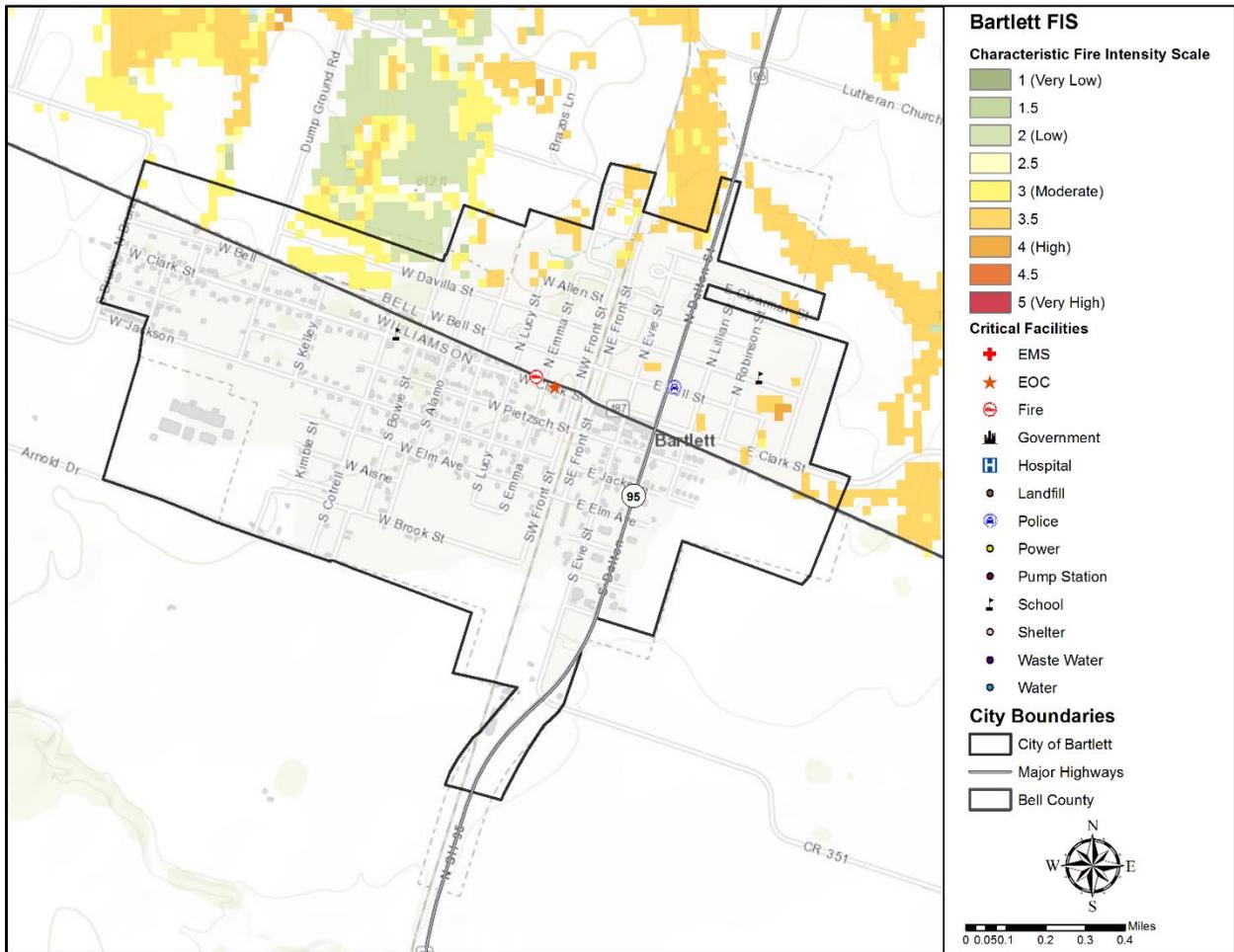
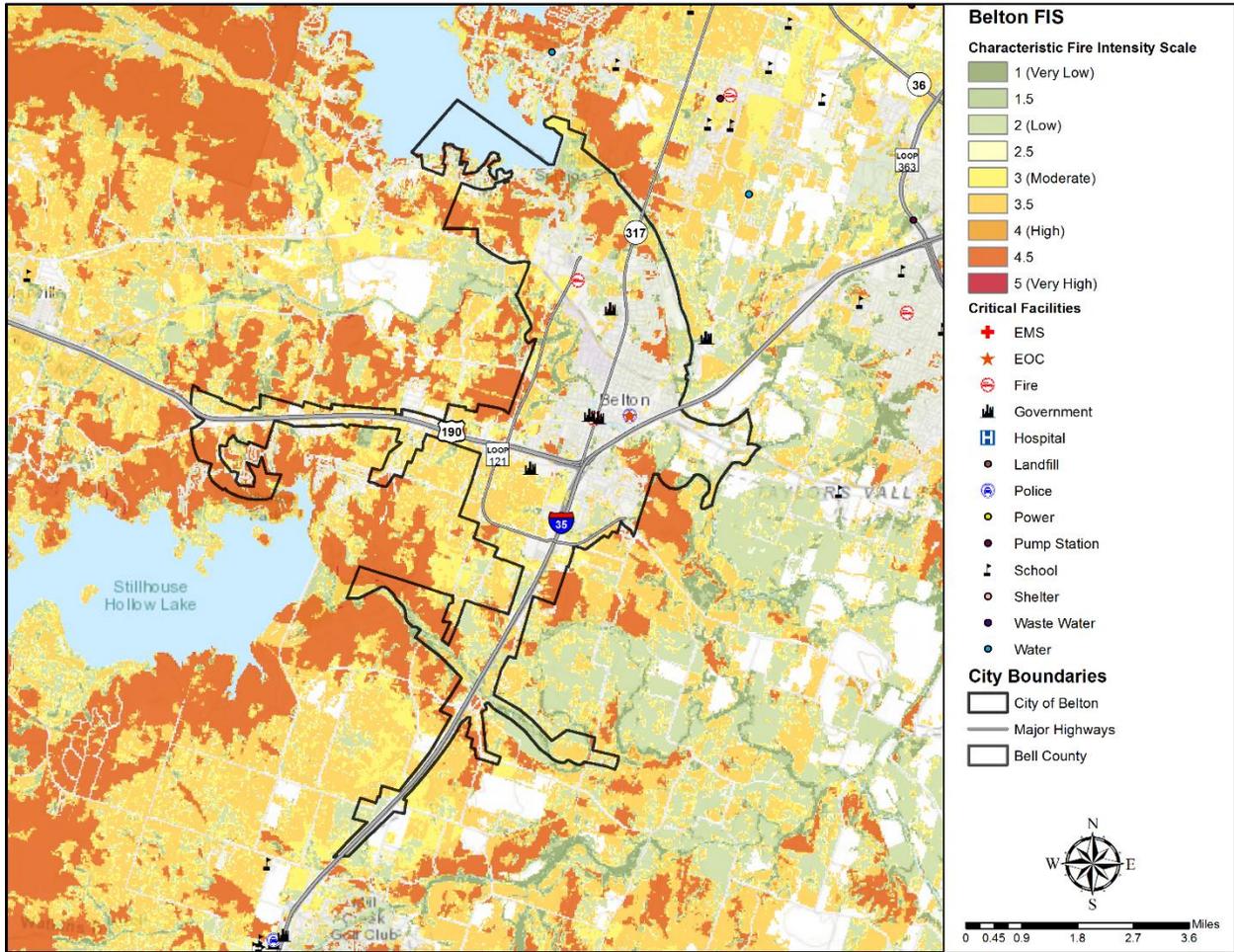


Figure 10-17. Fire Intensity Scale Map – City of Belton and CTCOG



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Figure 10-18. Fire Intensity Scale Map – City of Harker Heights

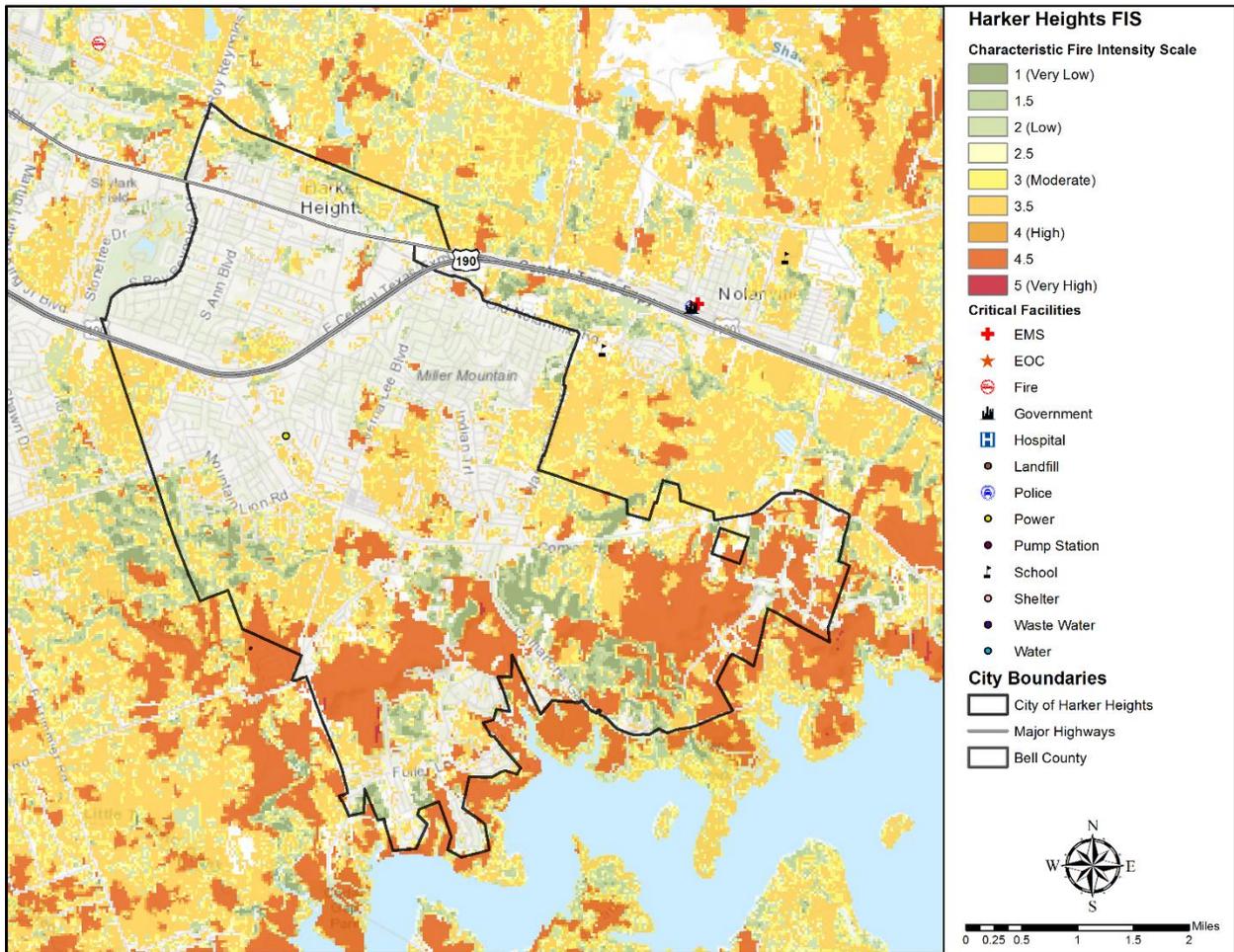


Figure 10-19. Fire Intensity Scale Map – Town of Holland

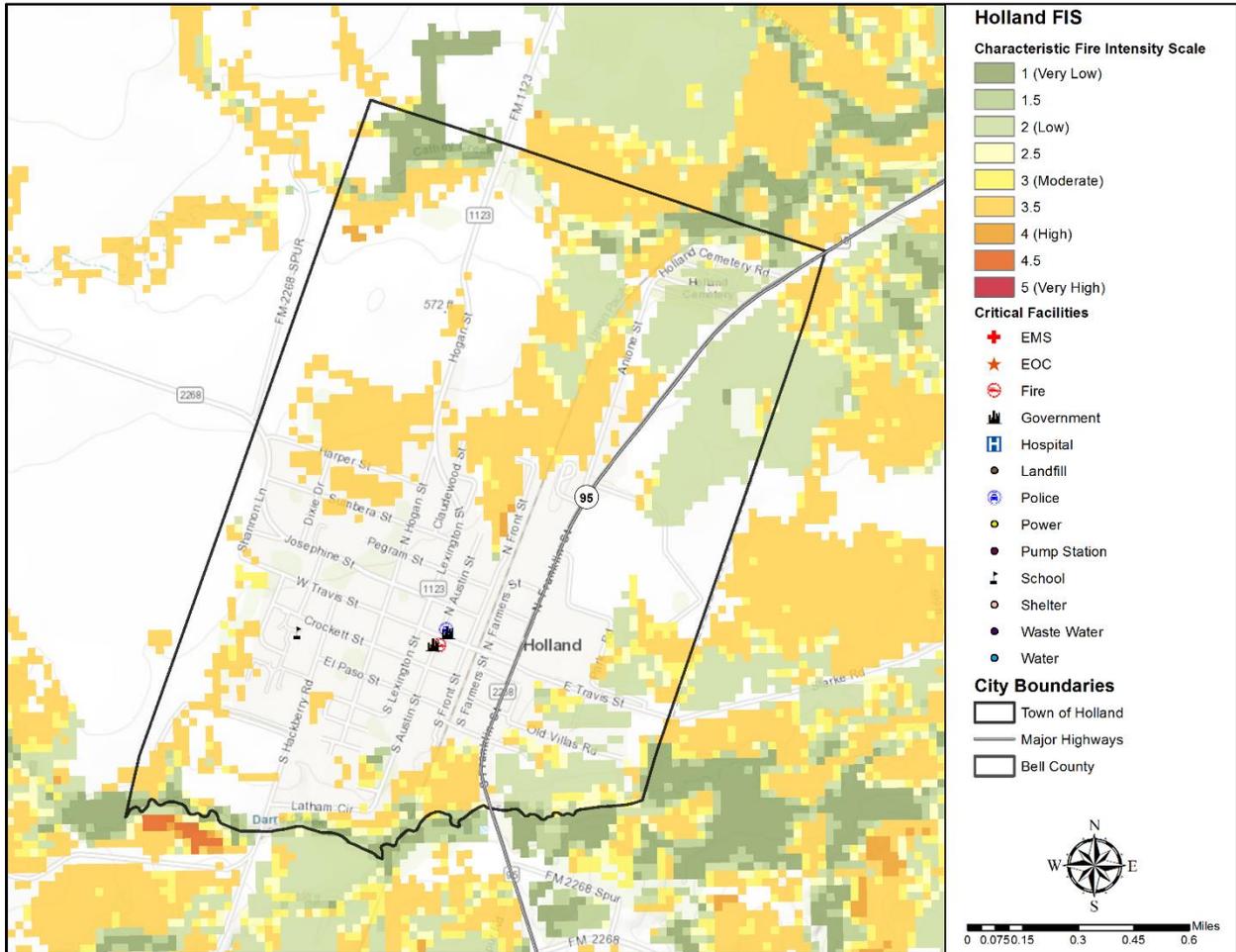


Figure 10-20. Fire Intensity Scale Map – City of Killeen

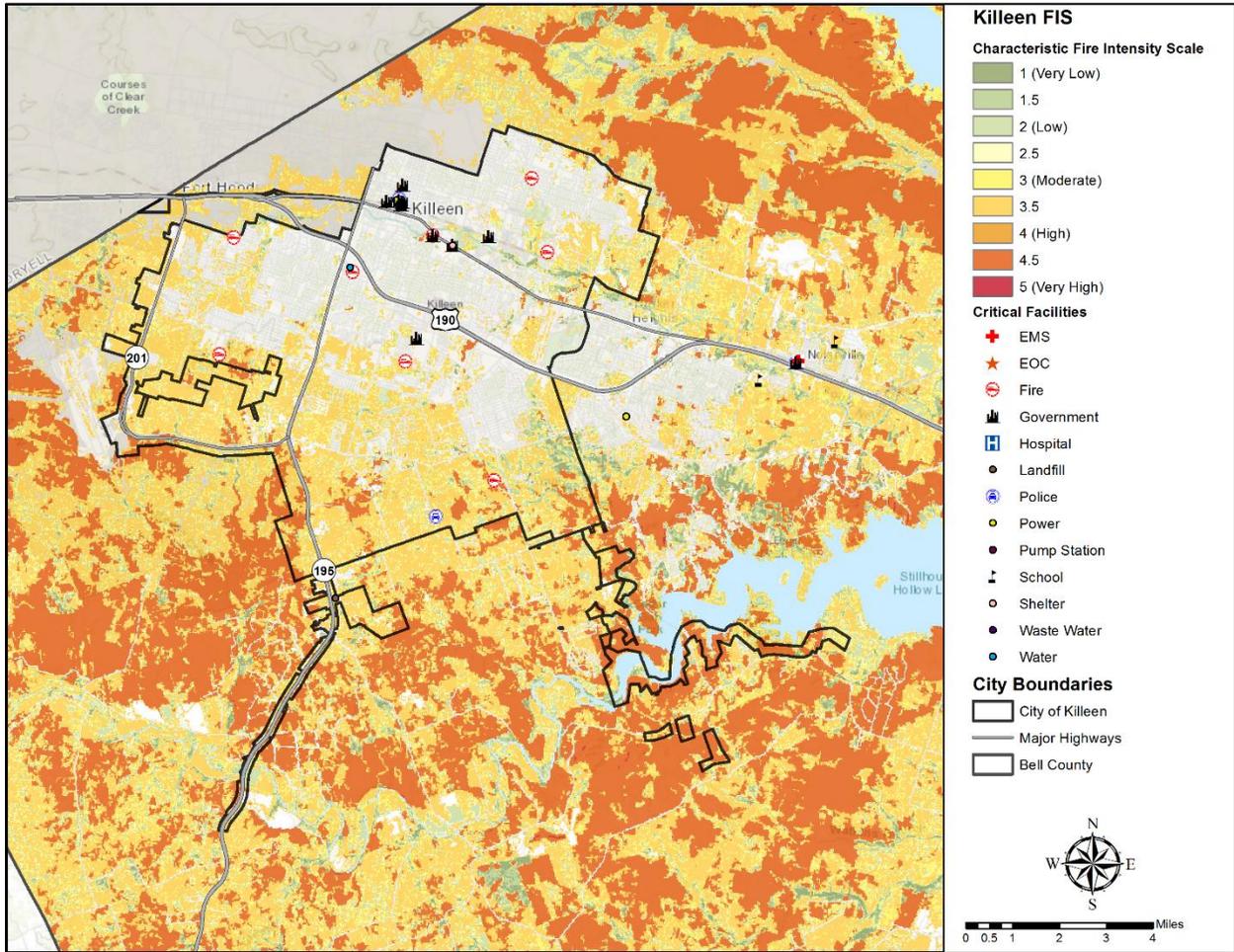
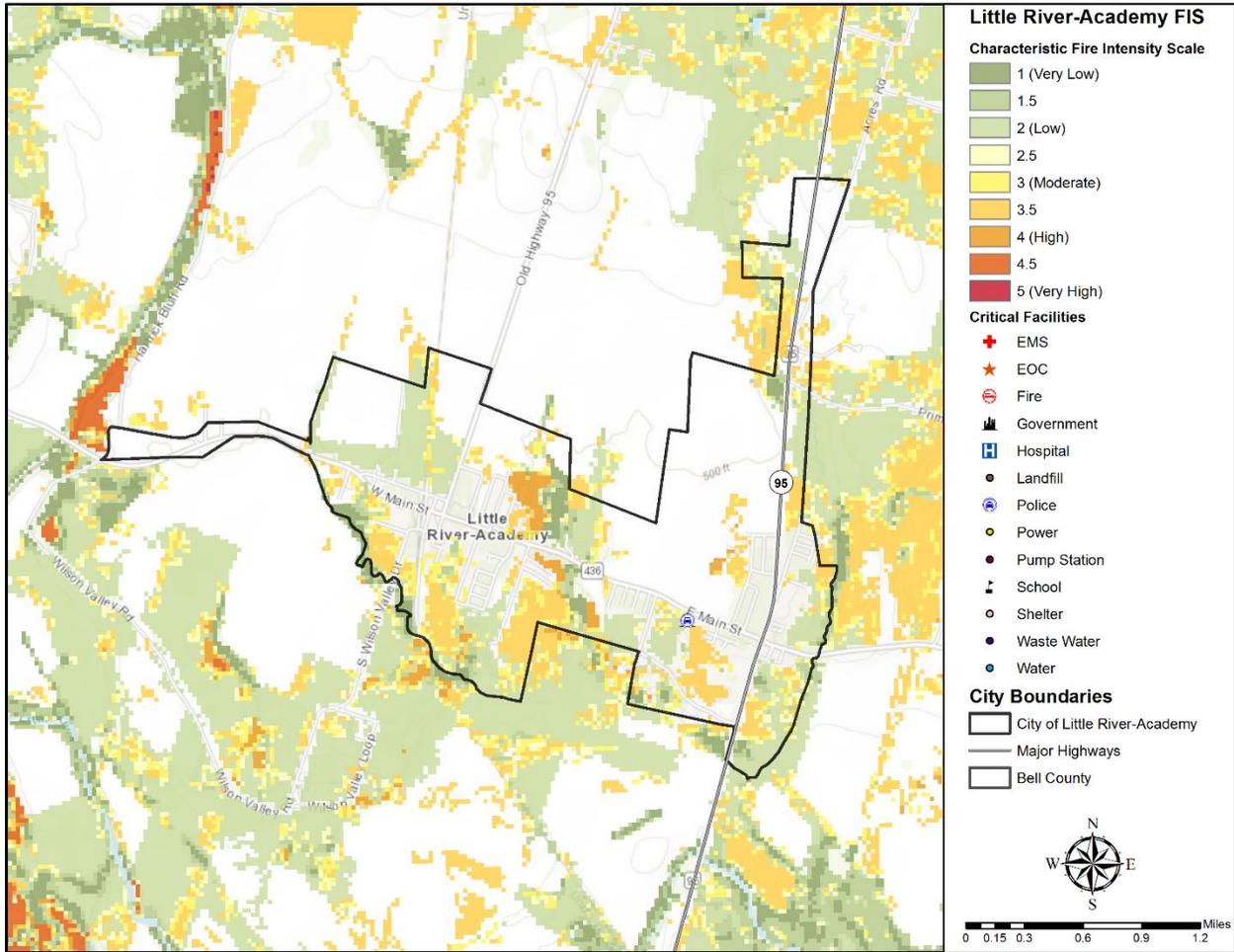
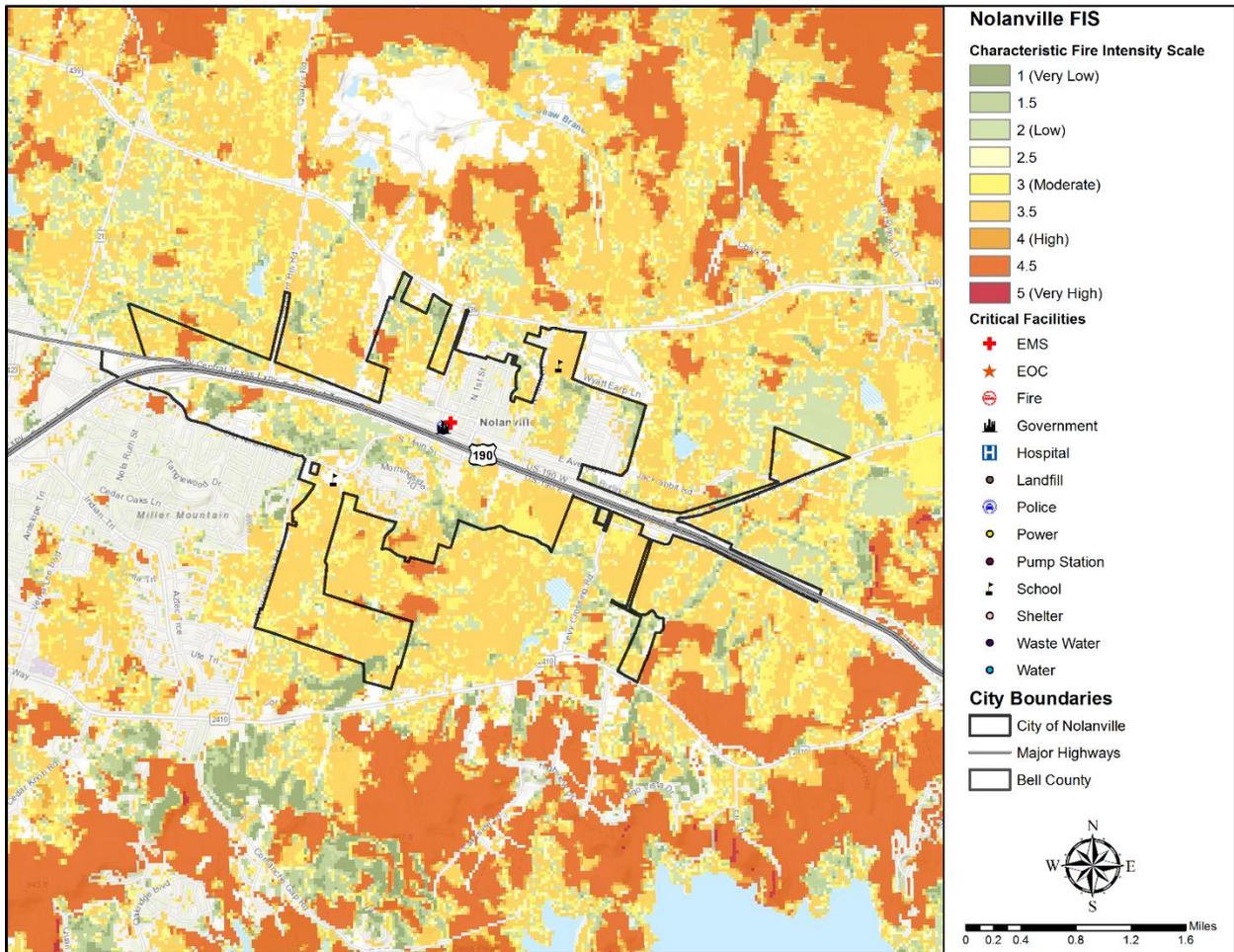


Figure 10-21. Fire Intensity Scale Map – City of Little River Academy



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Figure 10-22. Fire Intensity Scale Map – City of Nolanville



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Figure 10-23. Fire Intensity Scale Map – Town of Rogers

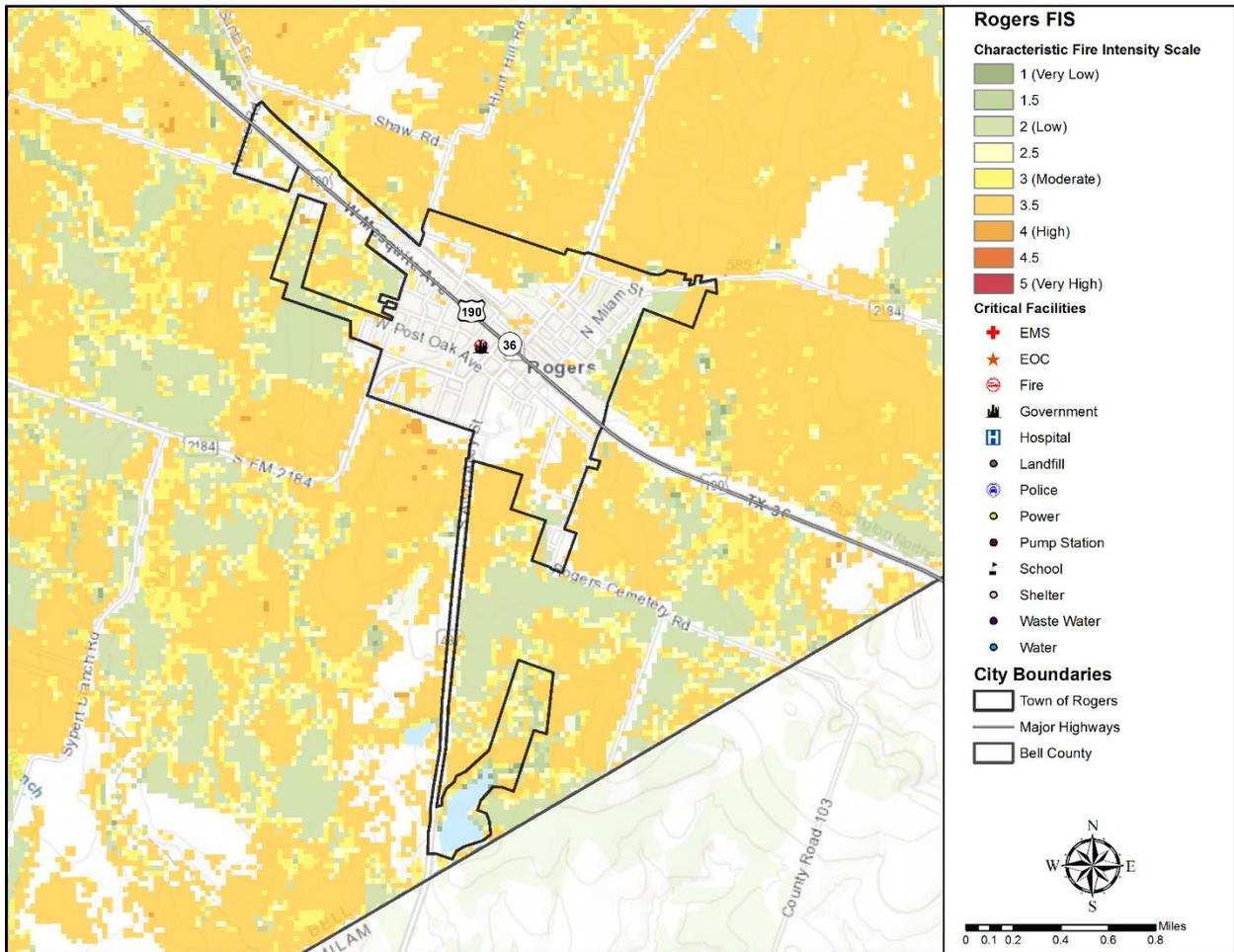


Figure 10-24. Fire Intensity Scale Map – Village of Salado

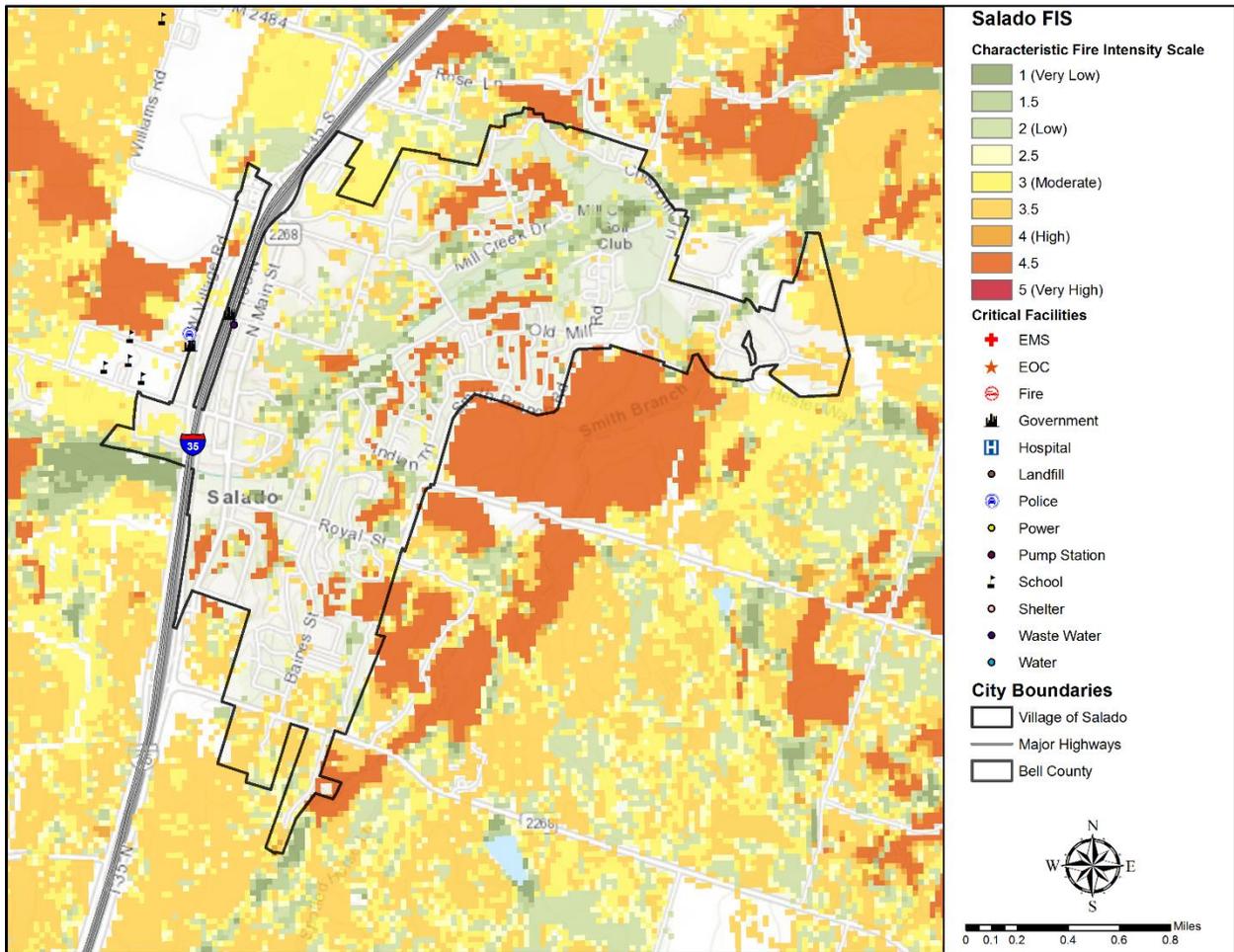


Figure 10-25. Fire Intensity Scale Map – City of Temple

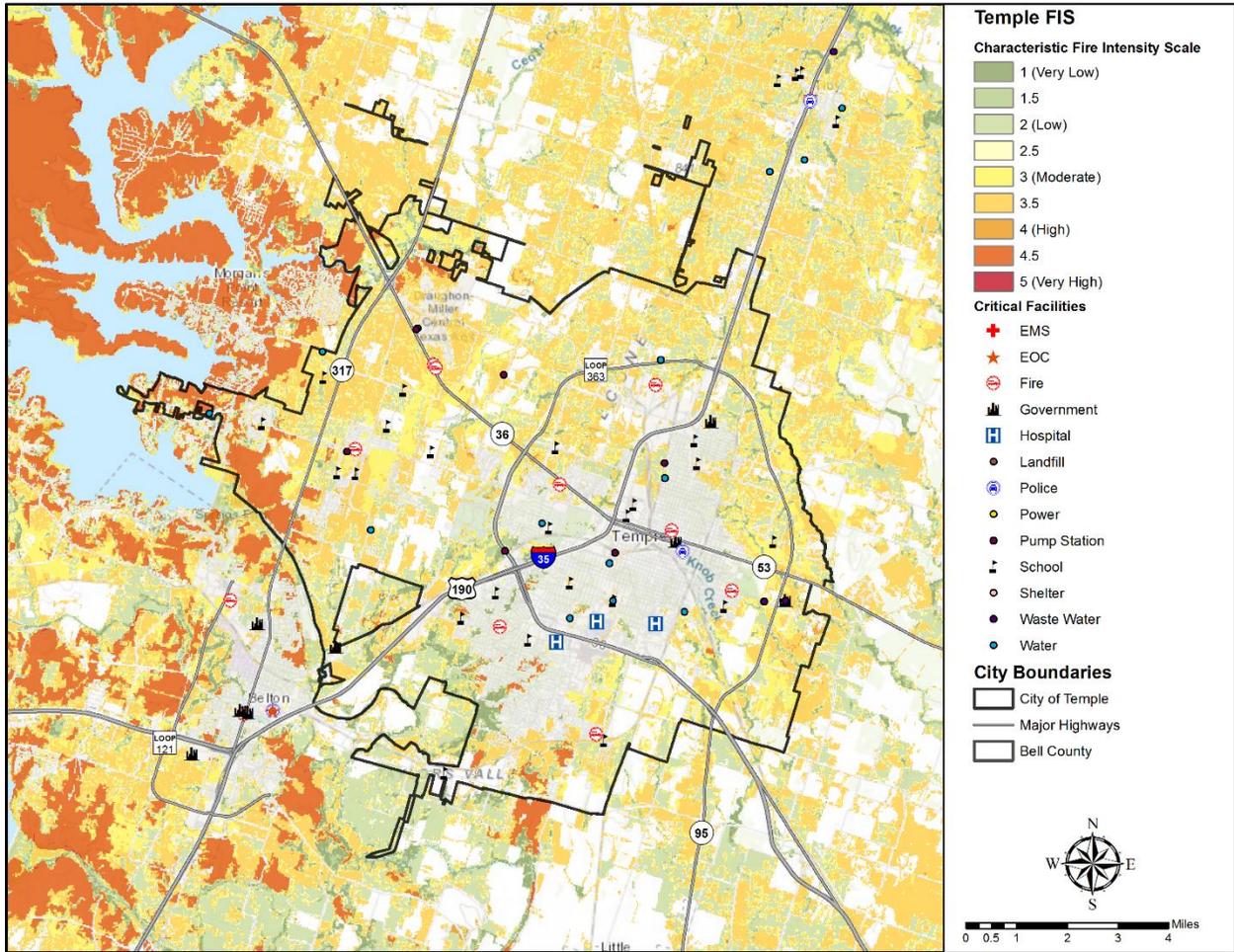
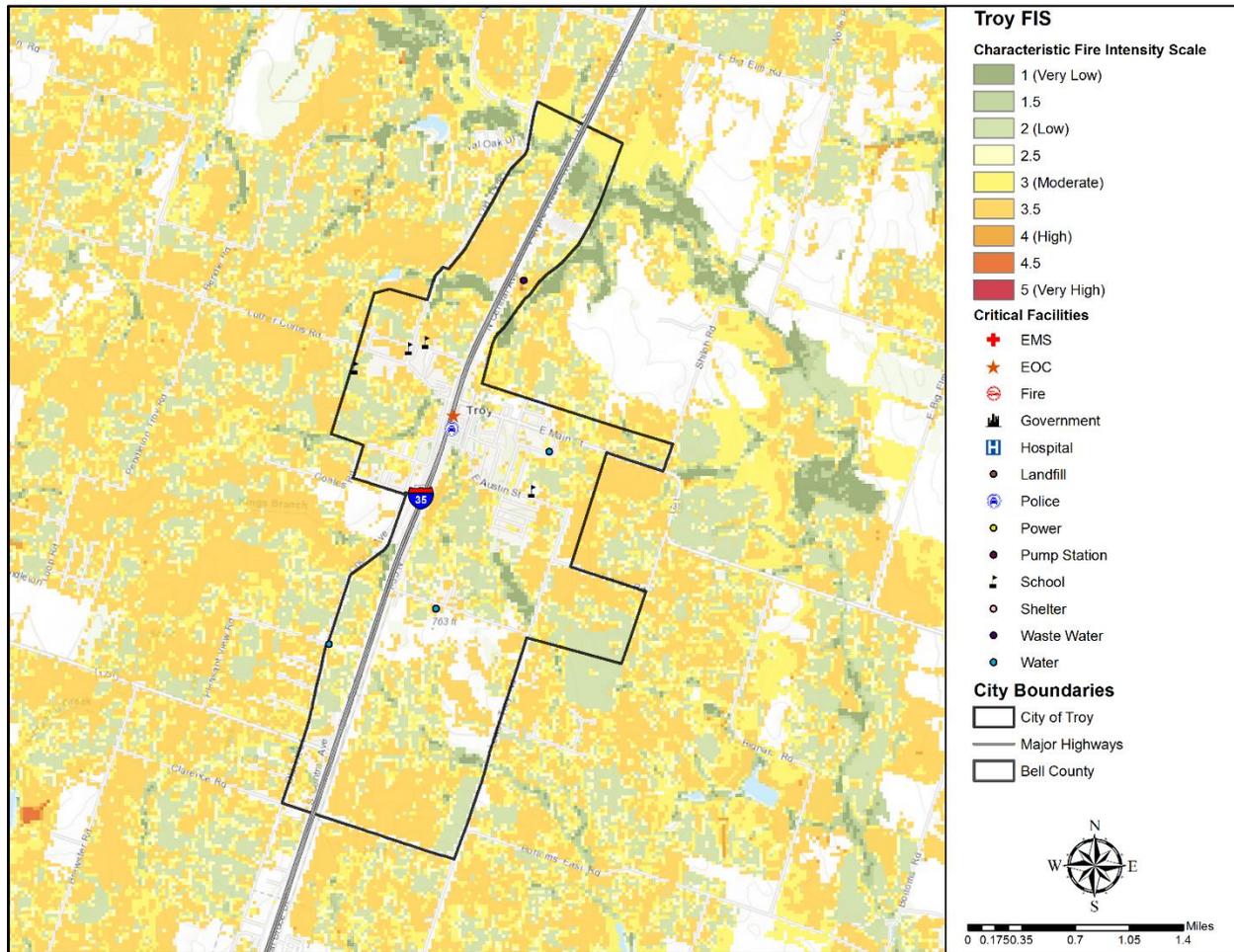


Figure 10-26. Fire Intensity Scale Map – City of Troy



Probability of Future Events

Wildfires can occur at any time of the year. As the jurisdictions within the county move into wildland, the potential area of occurrence of wildfire increases. With 3,128 events in an 11 year period, an event within Bell County, including all participating jurisdictions, is highly likely, meaning an event is probable within the next year.

Vulnerability and Impact

Periods of drought, dry conditions, high temperatures, and low humidity are factors that contribute to the occurrence of a wildfire event. Areas along railroads and people whose homes are in woodland settings have an increased risk of being affected by wildfire.

The heavily populated, urban areas of Bell County are not likely to experience large, sweeping fires. Areas outside of city limits and in the unincorporated areas of Bell County are vulnerable. Unoccupied buildings and open spaces that have not been maintained have the greatest vulnerability to wildfire. The overall level of concern for wildfires is located mostly along the perimeter of the study area where

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wildland and urban areas interface. Figures 10-1 through 10-12 illustrate the areas that are the most vulnerable to wildfire throughout the planning area.

The following critical facilities are located in the WUI and are more susceptible to wildfire in each participating jurisdiction: No critical facilities located in WUI

Table 10-3. Critical Facilities Located in WUI by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Bell County	OEM
Bartlett	No critical facilities located in WUI
Belton	Fire Station
CTCOG	CTCOG Office Building
Harker Heights	No critical facilities located in WUI
Holland	Government Facility, Police Station, School
Killeen	Police Station, 5 Fire Stations, EOC, Solid Waste Facility
Little River Academy	Government Facility, Police Station, Fire Station
Nolanville	Government Facility, Police Station, EMS, Public Works Facility, 2 Schools
Rogers	No critical facilities located in WUI
Salado	2 Government Facilities, Police Station, Wastewater Treatment Facility, 4 Schools, Transportation Facility (Bus Maintenance)
Temple	5 Fire Stations, Public Works Facility, 4 Water Treatment Facilities, Convention Center, 4 Water Towers, 4 Pump Stations, 11 Schools
Troy	Government Facility, Police Station, Water Well, Water Storage Facility and Pump, Water Tower, Wastewater Treatment Facility, 4 Schools

Within the Bell County planning area, a total of 3,128 fire events were reported from 2005 to 2015. All of these events were suspected wildfires. Historic loss and annualized estimates due to wildfires are presented in Table 10-4 below. The frequency is approximately 284 events every year.

Table 10-4. Historic Loss Estimates Due to Wildfire²

JURISDICTION	NUMBER OF EVENTS	ACRES BURNED	ANNUAL ACRE LOSSES
Bell County	1,964	19,797	1,799.7
Bartlett	3	1	0.1
Belton	75	461	41.9

² Events divided by 11 years of data.

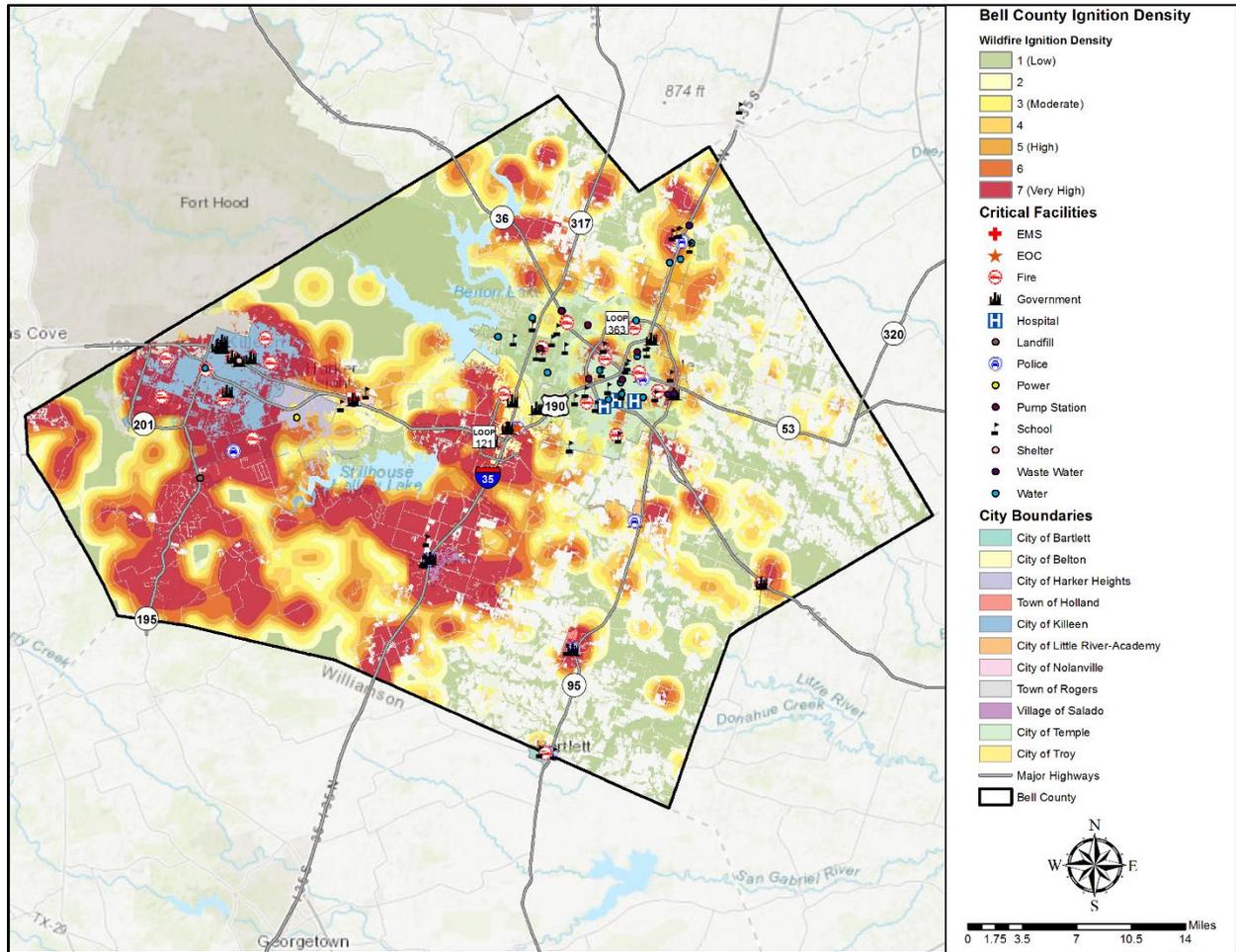
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JURISDICTION	NUMBER OF EVENTS	ACRES BURNED	ANNUAL ACRE LOSSES
CTCOG	0	0	0
Harker Heights	41	243	22.1
Holland	14	137	12.5
Killeen	947	2,504	227.6
Little River Academy	8	21	1.9
Nolanville	9	1,030	93.6
Rogers	7	168	15.3
Salado	9	64	5.8
Temple	41	519	47.2
Troy	10	10	0.9

Figures 10-27 and 10-38 show Bell County and the threat of wildfire to the County and participating jurisdictions.

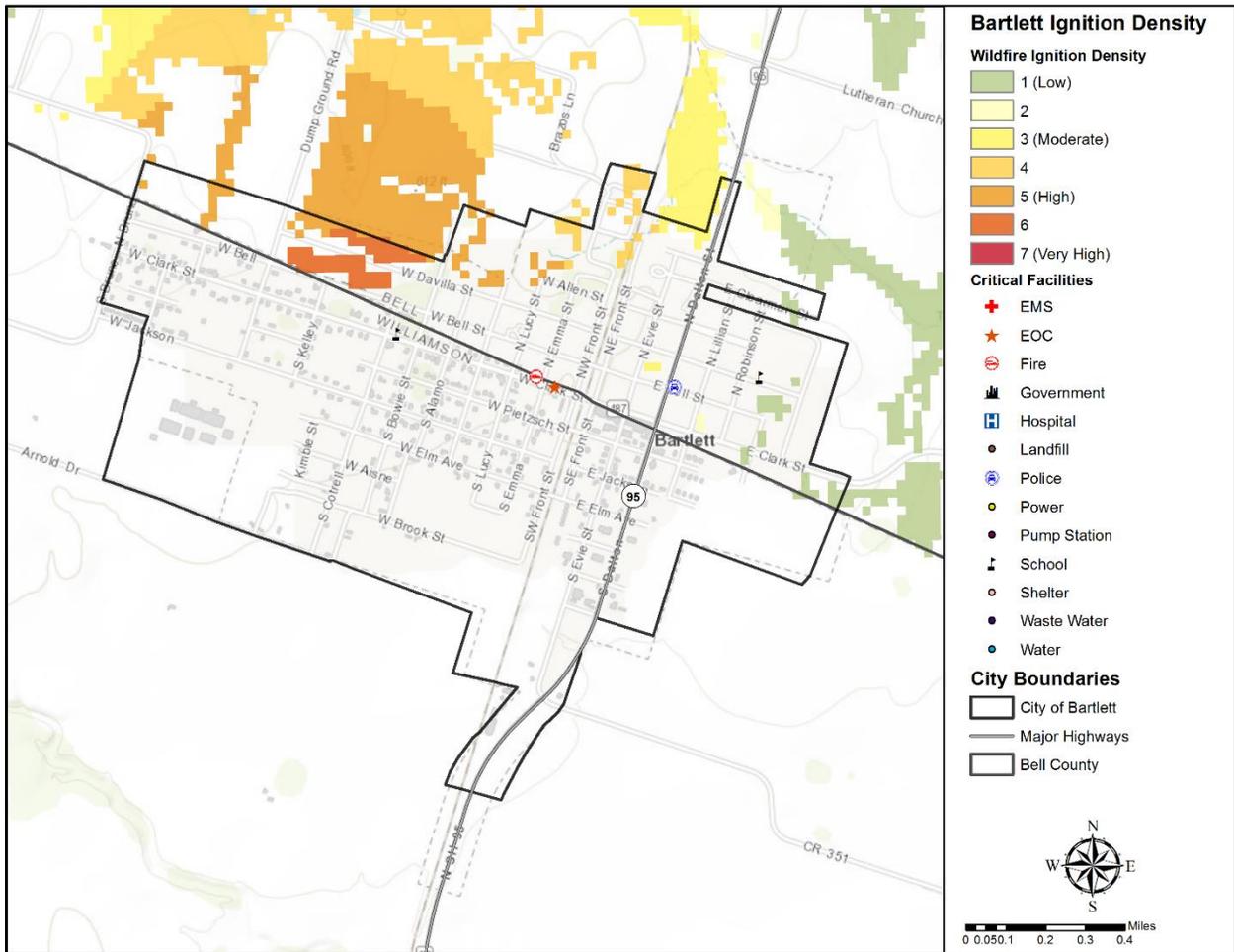
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Figure 10-27. Wildfire Ignition Density – Bell County



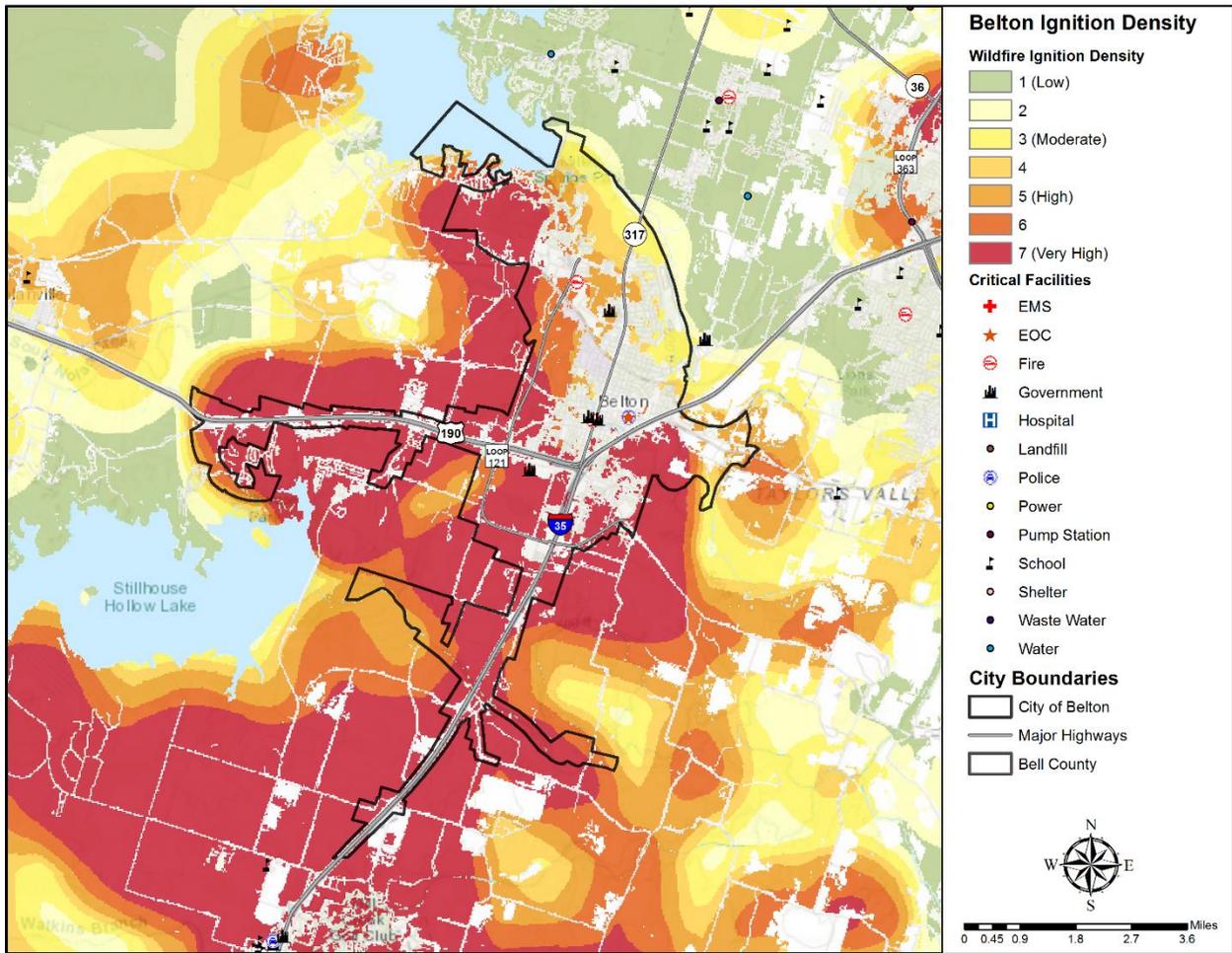
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Figure 10-28. Wildfire Ignition Density – City of Bartlett



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Figure 10-29. Wildfire Ignition Density – City of Belton and CTCOG



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Figure 10-30. Wildfire Ignition Density – City of Harker Heights

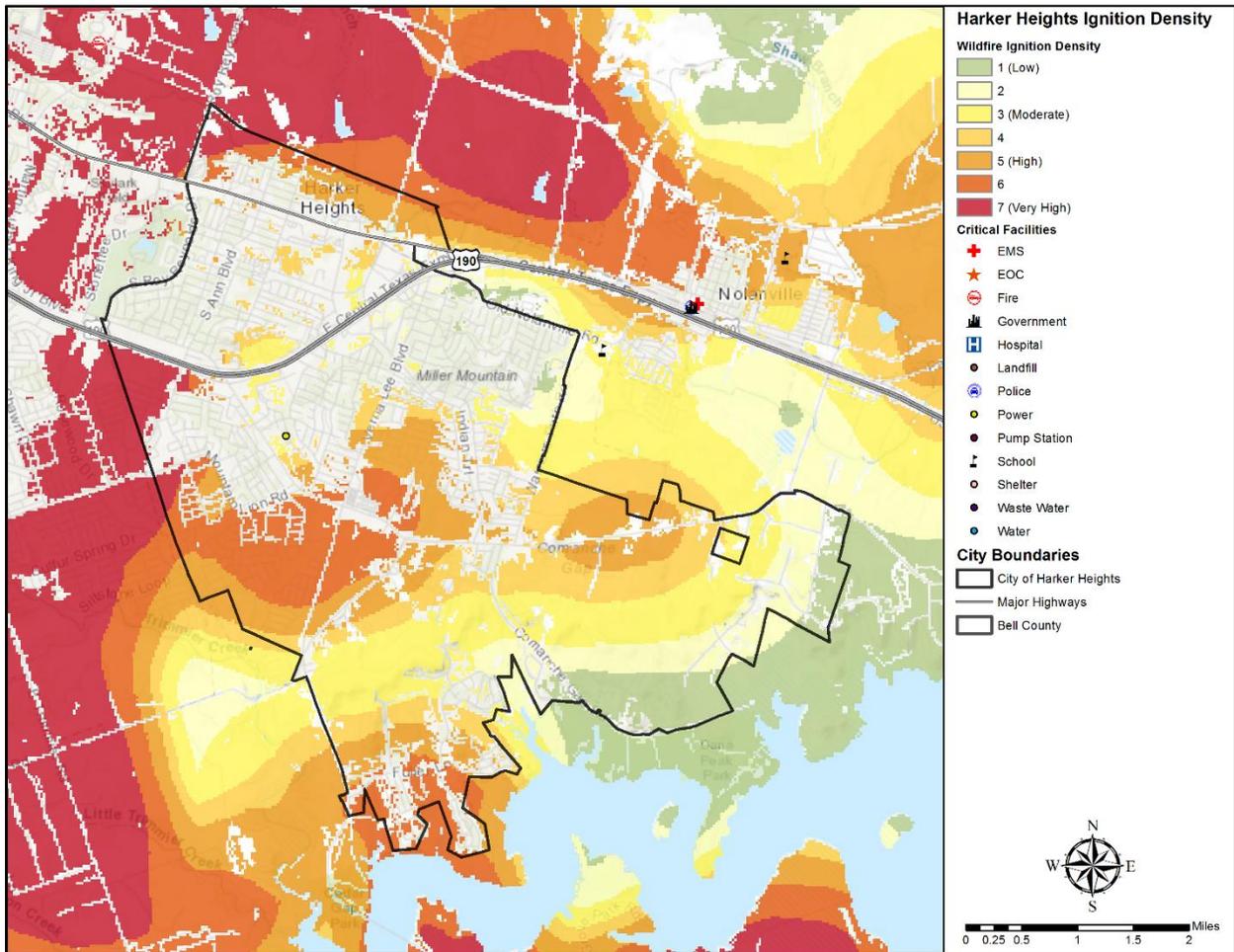


Figure 10-31. Wildfire Ignition Density – Town of Holland

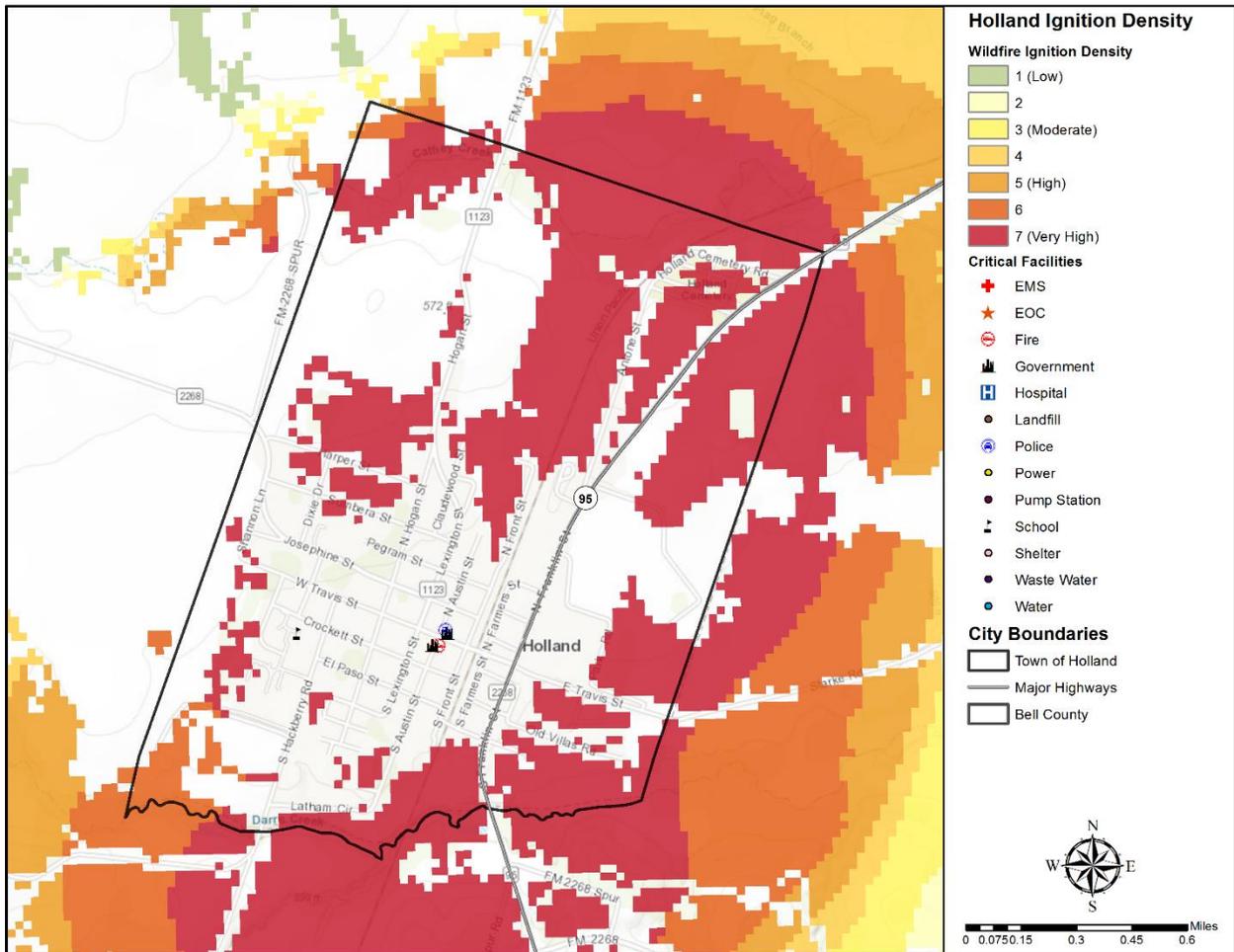
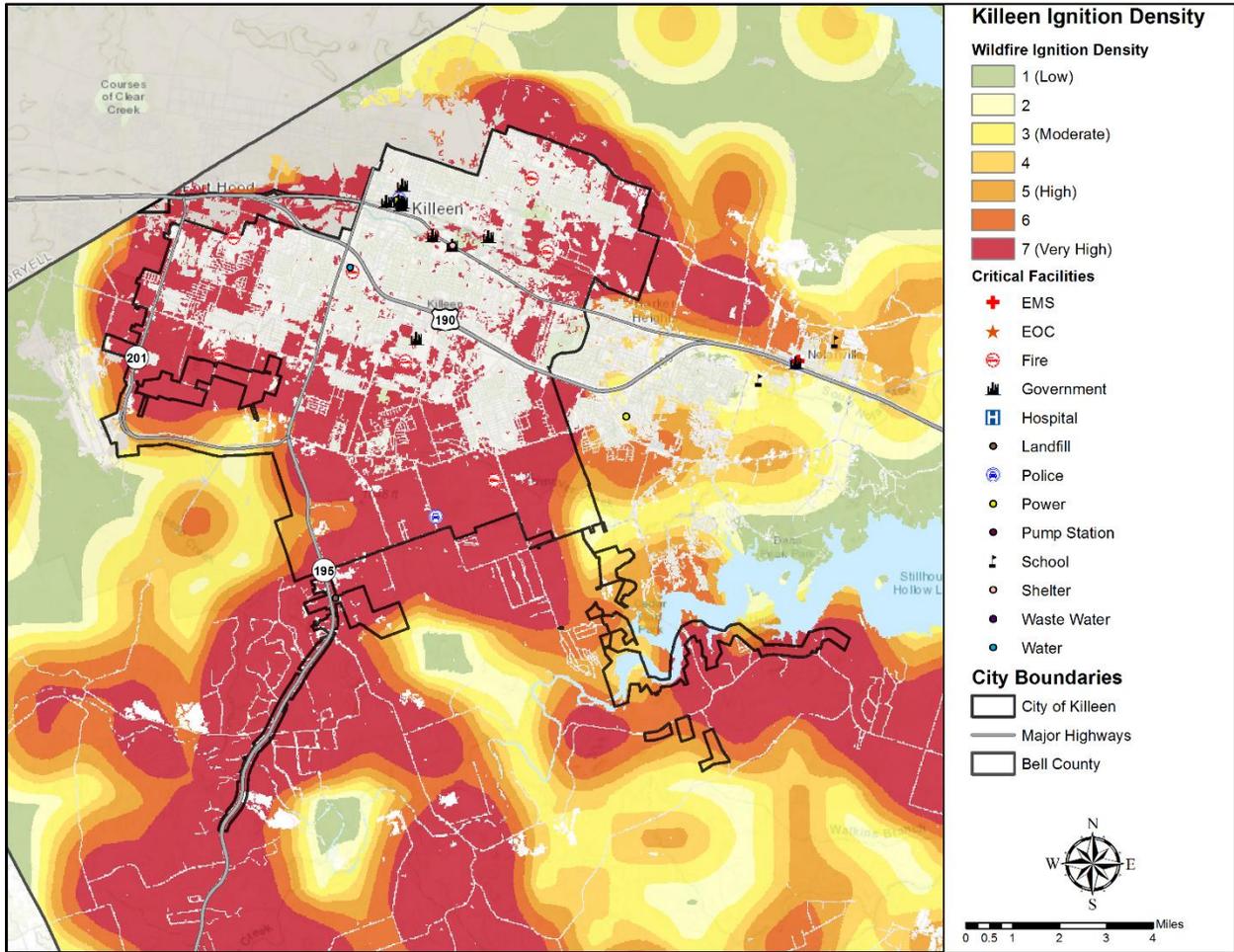


Figure 10-32. Wildfire Ignition Density – City of Killeen



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Figure 10-33. Wildfire Ignition Density – City of Little River Academy

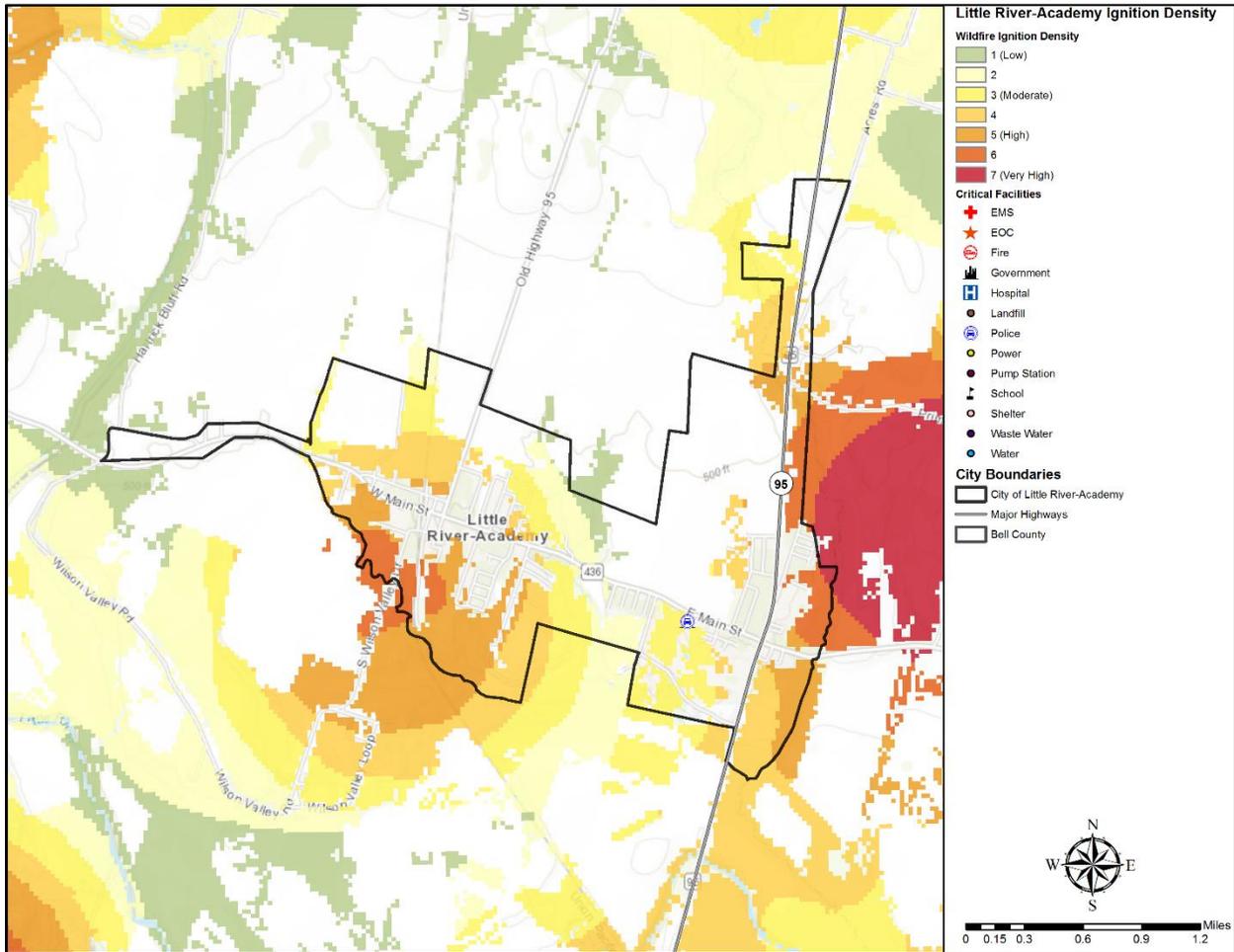
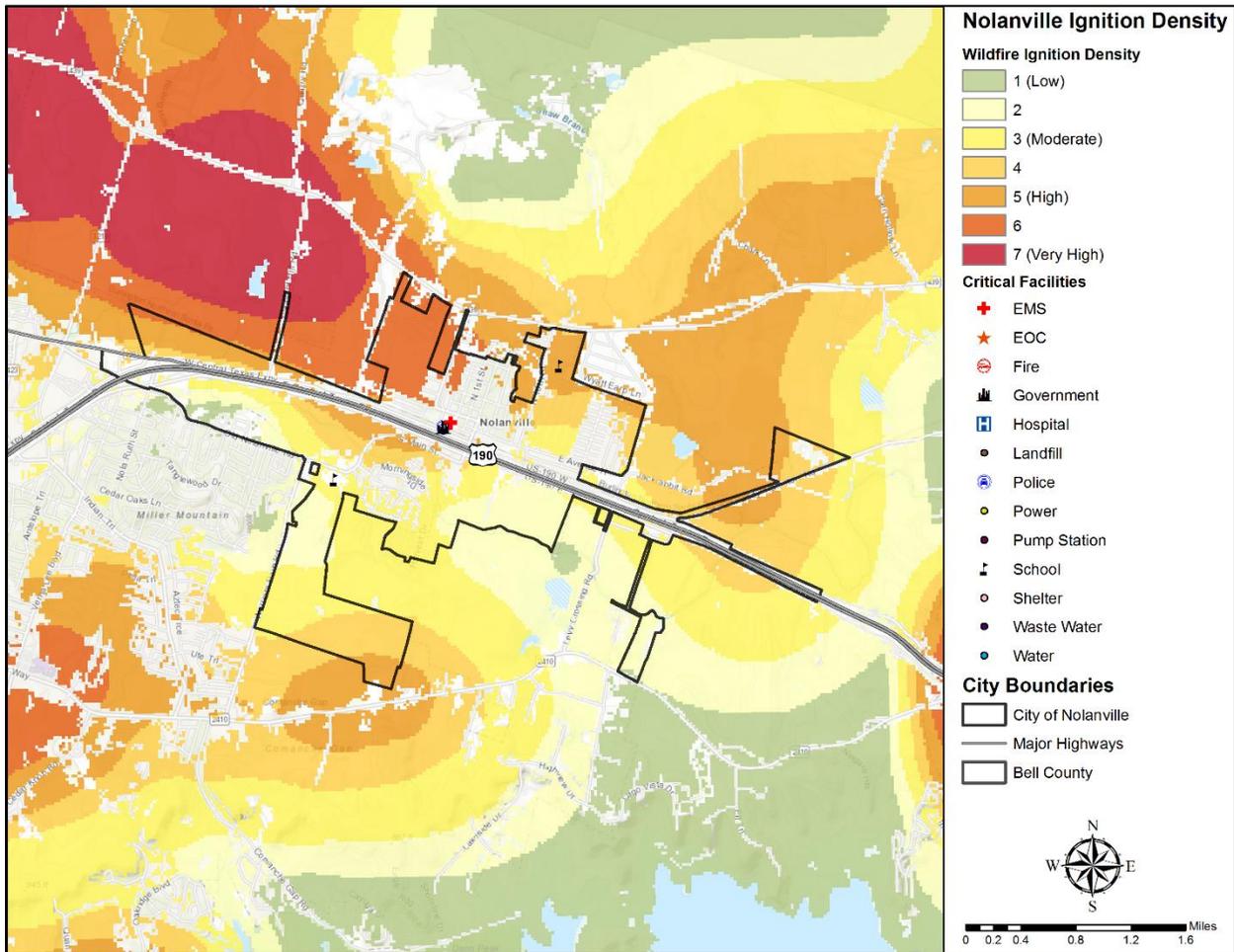


Figure 10-34. Wildfire Ignition Density – City of Nolanville



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Figure 10-35. Wildfire Ignition Density – Town of Rogers

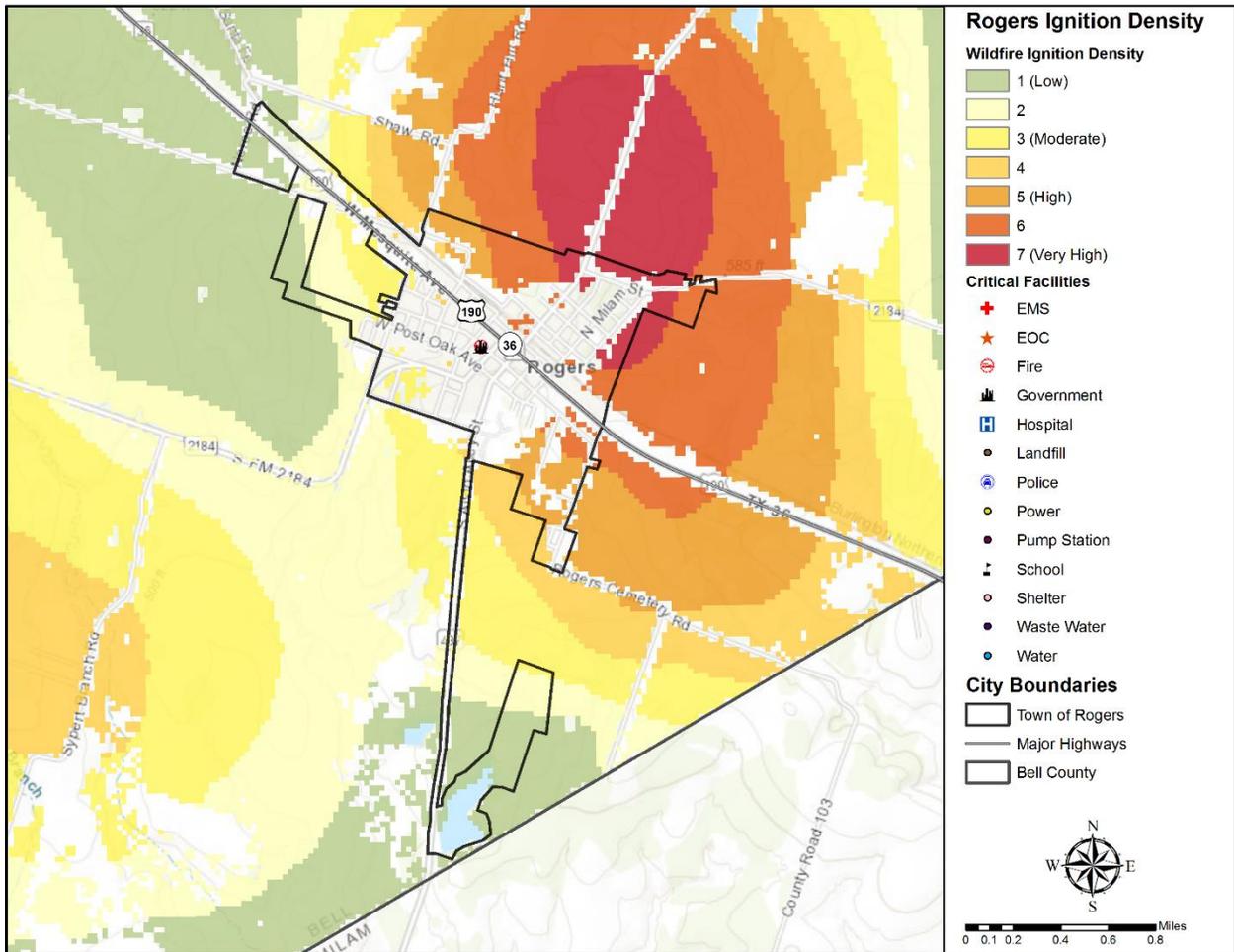


Figure 10-36. Wildfire Ignition Density – Village of Salado

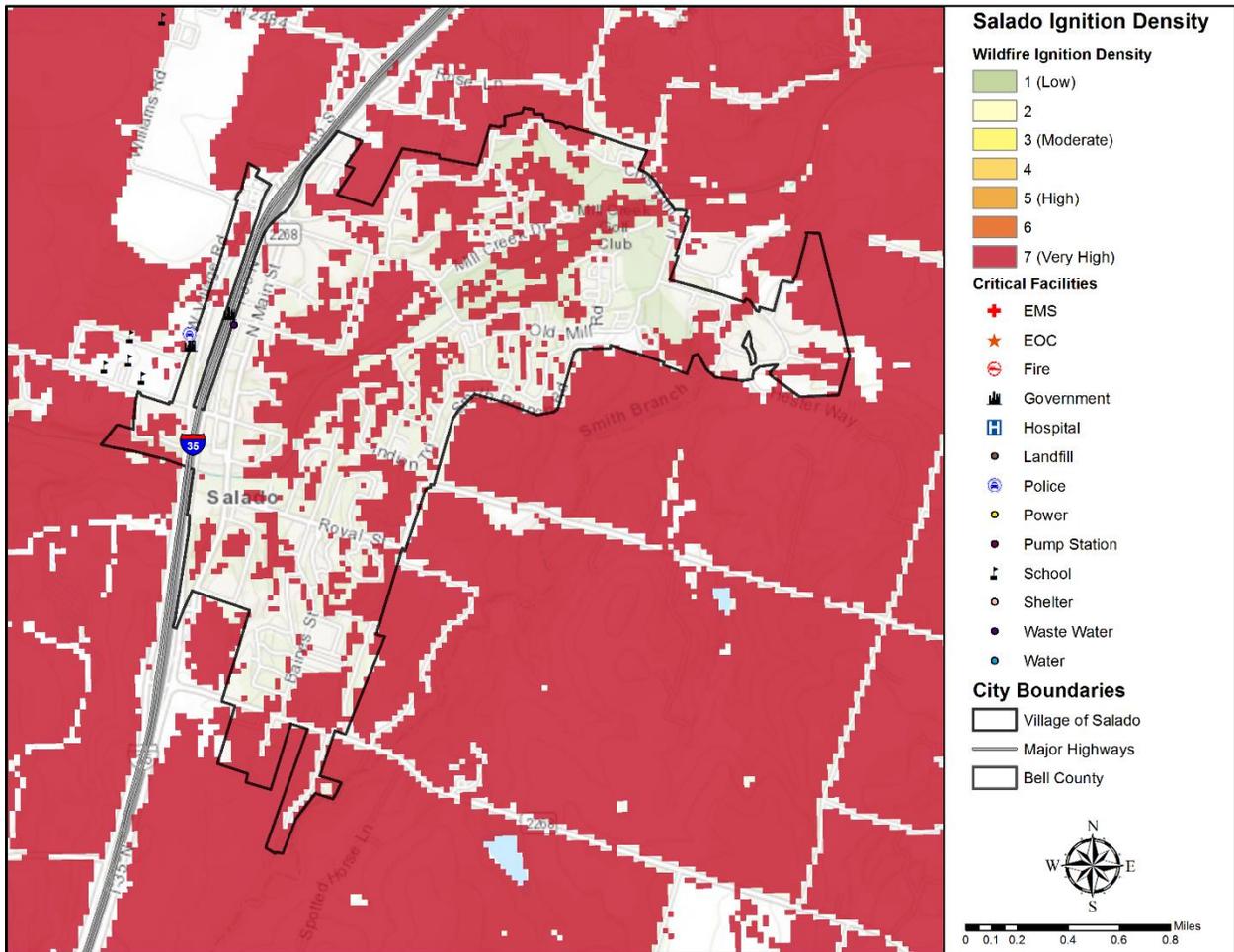


Figure 10-37. Wildfire Ignition Density – City of Temple

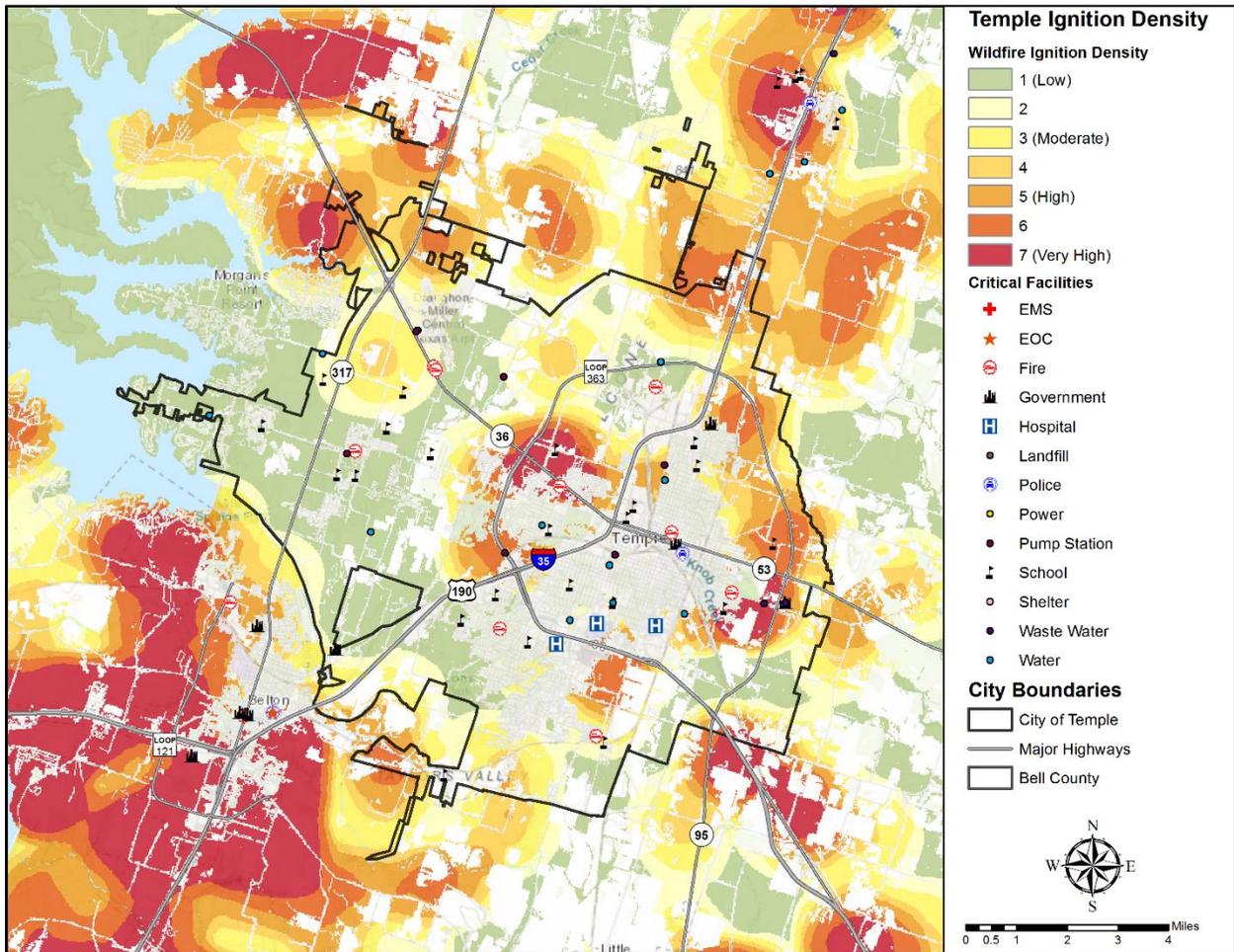
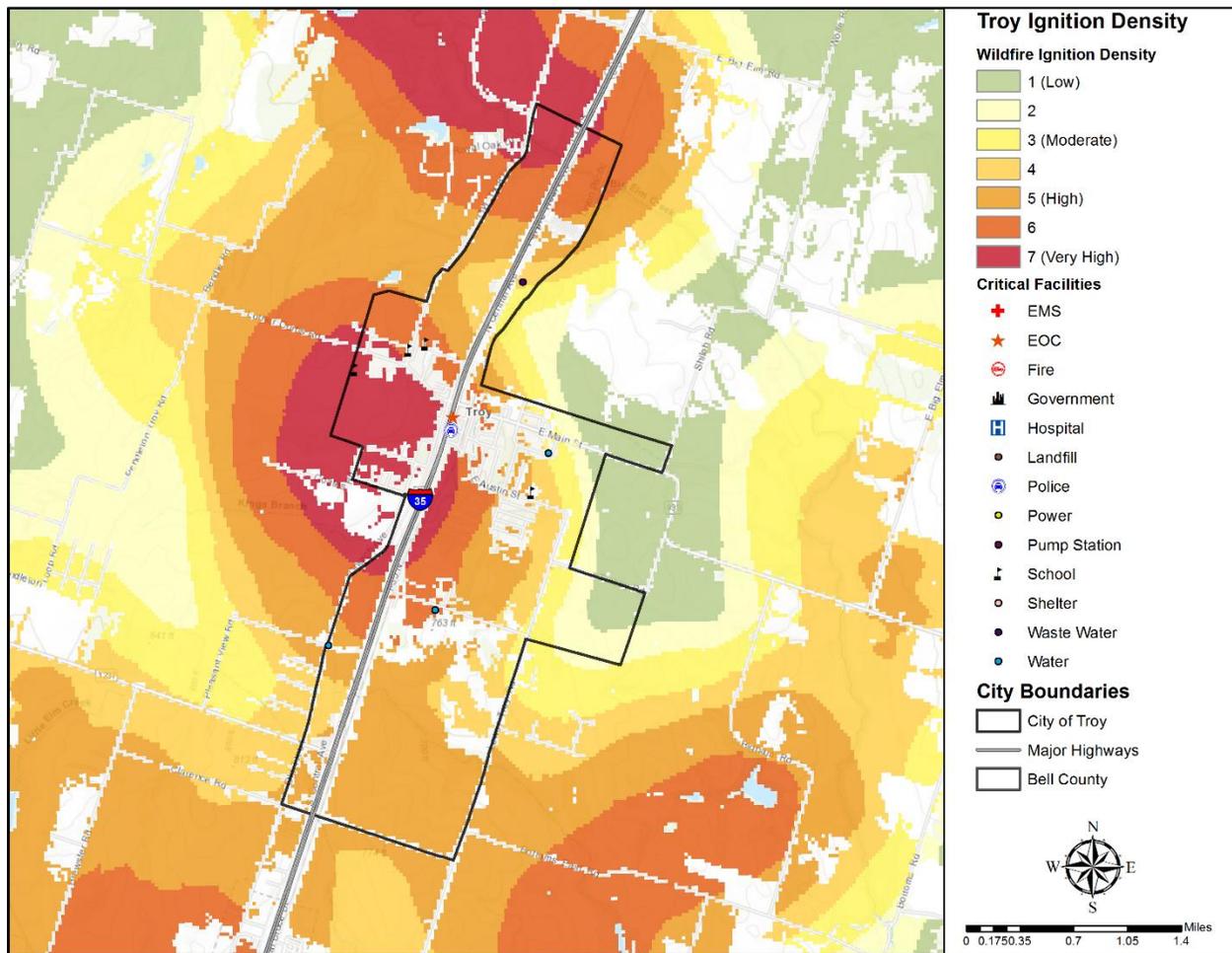


Figure 10-38. Wildfire Ignition Density – City of Troy



Diminished air quality is an environmental impact that can result from a wildfire event and pose a potential health risk. The smoke plumes from wildfires can contain potentially inhalable carcinogenic matter. Fine particles of invisible soot and ash that are too small for the respiratory system to filter can cause immediate and possibly long term health effects. The elderly or those individuals with compromised respiratory systems may be more vulnerable to the effects of diminished air quality after a wildfire event.

Climatic conditions such as severe freezes and drought can significantly increase the intensity of wildfires since these conditions kill vegetation, creating a prime fuel source for wildfires. The intensity and rate at which wildfires spread are directly related to wind speed, temperature, and relative humidity.

The severity of impact from major wildfire events can be substantial. Such events can cause multiple deaths, shut down facilities for 30 days or more, and cause more than 50 percent of affected properties to be destroyed or suffer major damage. Severity of impact is gauged by acreage burned, homes and structures lost, and the number of resulting injuries and fatalities.

For the Bell County planning area the impact from a wildfire event can be considered “Minor,” meaning injuries and/or illnesses are treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10% of property is destroyed or with major damage. Severity of impact is gauged

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by acreage burned, homes and structures lost, injuries and fatalities. Based on this, impact for each participating jurisdiction are listed below in Table 10-5.

Table 10-5. Impact by Jurisdiction

JURISDICTION	IMPACT	DESCRIPTION
Bell County	Minor	Bell County has an estimated 169,541 people or 52% of the total population that live within the Wildland Urban Interface (WUI). Bell County, including citizens in unincorporated areas, could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.
Bartlett	Minor	The City of Bartlett has an estimated 329 people or 14% of the total population that live in the WUI, and the city has a low wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.
Belton	Minor	The City of Belton has an estimated 19,773 people or 78% of the total population that live in the WUI, and the city has a moderate to high wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.
CTCOG	Minor	The CTCOG facility is located in the City of Belton and within the WUI. The threat of wildfire to the facility is moderate due to its location. In the event of a wildfire the facility could be shut down for a week, and 10 percent of total property could be damaged.
Harker Heights	Minor	The City of Harker Heights has an estimated 11,785 people or 52% of the total population that live in the WUI, and the city has a moderate wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.
Holland	Minor	The Town of Holland has an estimated 1,254 people or 55% of the total population that live in the WUI, and the town has a moderate wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.
Killeen	Minor	The City of Killeen has an estimated 38,629 people or 34% of the total population that live in the WUI, and the city has a low to moderate wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.

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JURISDICTION	IMPACT	DESCRIPTION
Little River Academy	Minor	The City of Little River Academy has an estimated 1,879 people or 94% of the total population that live in the WUI, and the city has a high wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.
Nolanville	Minor	The City of Nolanville has an estimated 2,320 people or 93% of the total population that live in the WUI, and the city has a high wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.
Rogers	Minor	The Town of Rogers has an estimated 1,109 people or 90% of the total population that live in the WUI, and the town has a high wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.
Salado	Minor	The Village of Salado has an estimated 2,417 people or 95% of the total population that live in the WUI, and the village has a high wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.
Temple	Minor	The City of Temple has an estimated 27,590 people or 43% of the total population that live in the WUI, and the city has a low to moderate wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.
Troy	Minor	The City of Troy has an estimated 1,605 people or 99% of the total population that live in the WUI, and the city has a high wildfire threat. Citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for a week, and 10 percent of total property could be damaged.

Assessment of Impacts

A Wildfire event poses a potentially significant risk to public health and safety, particularly if the wildfire is initially unnoticed and spreads quickly. The impacts associated with a wildfire are not limited to the direct damages. Potential impacts for the planning area include:

- Persons in the area at the time of the fire are at risk for injury or death from burns and/or smoke inhalation.

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- First responders are at greater risk of physical injury since they are in close proximity to the hazard while extinguishing flames, protecting property or evacuating residents in the area.
- First responders can experience heart disease, respiratory problems, and other long term related illnesses from prolonged exposure to smoke, chemicals, and heat.
- Emergency services may be disrupted during a wildfire if facilities are impacted, roadways are inaccessible, or personnel are unable to report for duty.
- Critical city and/or county departments, including municipalities and other government services, may not be able to function and provide necessary services depending on the location of the fire and the structures or personnel impacted.
- Non-critical businesses may be directly damaged, suffer loss of utility services, or be otherwise inaccessible, delaying normal operations and slowing the recovery process.
- Displaced residents may not be able to immediately return to work, further slowing economic recovery.
- Roadways in or near the WUI could be damaged or closed due to smoke and limited visibility.
- Older homes are generally exempt from modern building code requirements, which may require fire suppression equipment in the structure.
- Some high density neighborhoods feature small lots with structures close together, increasing the potential for fire to spread rapidly.
- Air pollution from smoke may exacerbate respiratory problems of vulnerable residents.
- Charred ground after a wildfire cannot easily absorb rainwater, increasing the risk of flooding and potential mudflows.
- Wildfires can cause erosion, degrading stream water quality.
- Wildlife may be displaced or destroyed.
- Historical or cultural resources may be damaged or destroyed.
- Tourism can be significantly disrupted, further delaying economic recovery for the area.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Fire suppression costs can be substantial, exhausting the financial resources of the community.
- Residential structures lost in a wildfire may not be rebuilt for years, reducing the tax base for the community.
- Belton Lake recreation and tourism can be unappealing for years following a large wildfire, devastating directly related businesses.
- Direct impacts to municipal water supply may occur through contamination of ash and debris during the fire, destruction of aboveground delivery lines, and soil erosion or debris deposits into waterways after the fire.

The economic and financial impacts of a wildfire event on local government will depend on the scale of the event, what is damaged, costs of repair or replacement, lost business days in impacted areas, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by government, businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of a wildfire event.

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Hazard Description

Drought is a period of time without substantial rainfall that persists from one year to the next. Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of anticipated natural precipitation reduction over an extended period of time, usually a season or more in length. Droughts can be classified as meteorological, hydrologic, agricultural, and socioeconomic. Table 11-1 presents definitions for these different types of drought.



Droughts are one of the most complex of all natural hazards as 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.

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Table 11-1. Drought Classification Definitions¹

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.

Location

Droughts occur regularly throughout Texas and the Bell County planning area and are a normal condition. However, they can vary greatly in their intensity and duration. The Drought Monitor shows the planning area is currently experiencing normal conditions throughout most of the county with the southeast portion of the county experiencing abnormally dry conditions (Figure 11-1). However, the planning area has experienced abnormally dry to exceptional drought conditions over the last ten years (Figure 11-2). There is no distinct geographic boundary to drought; therefore, it can occur throughout the Bell County planning area equally, including the CTCOG and all participating jurisdictions.

¹ Source: Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, FEMA

Figure 11-1. U.S. Drought Monitor, August 2017

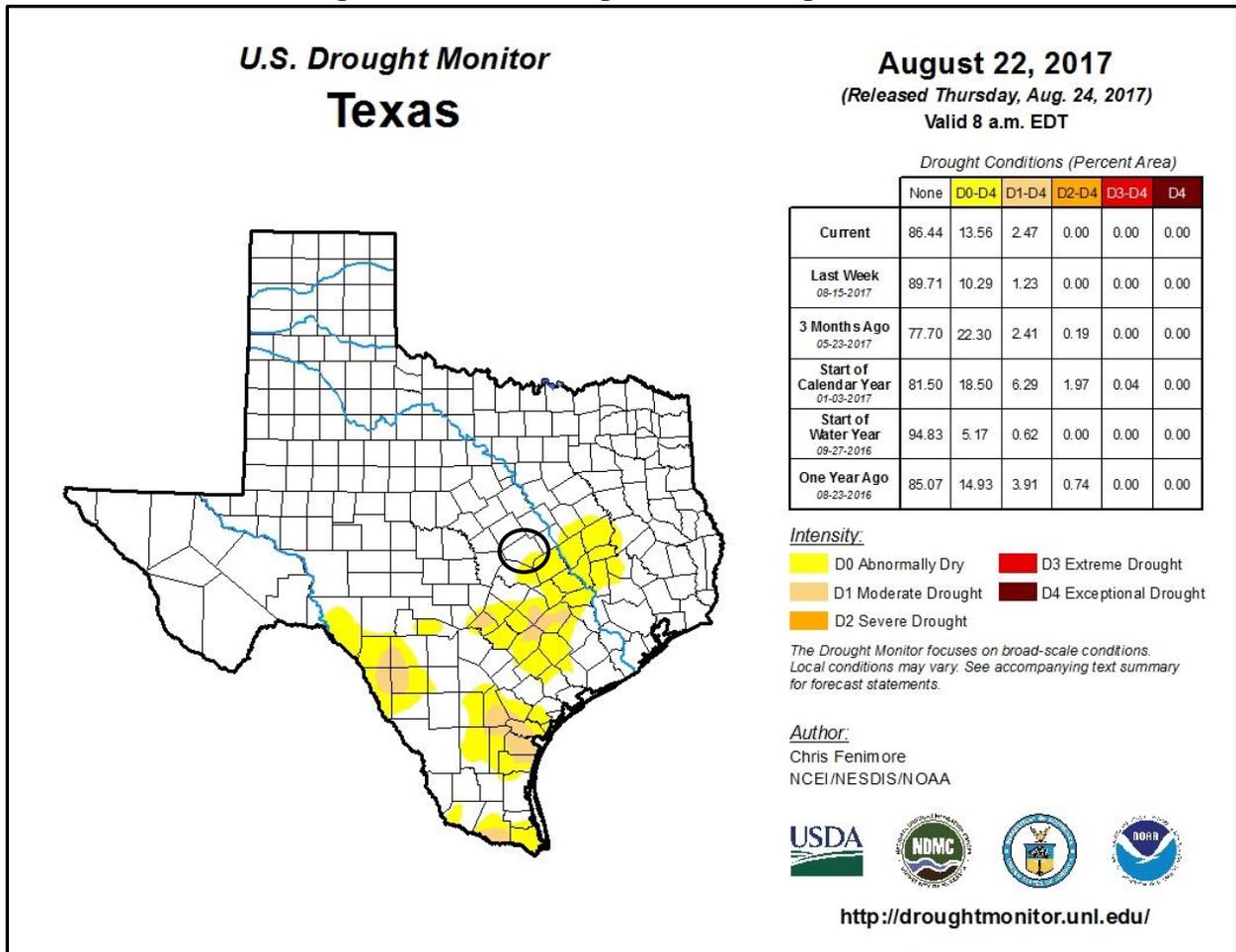
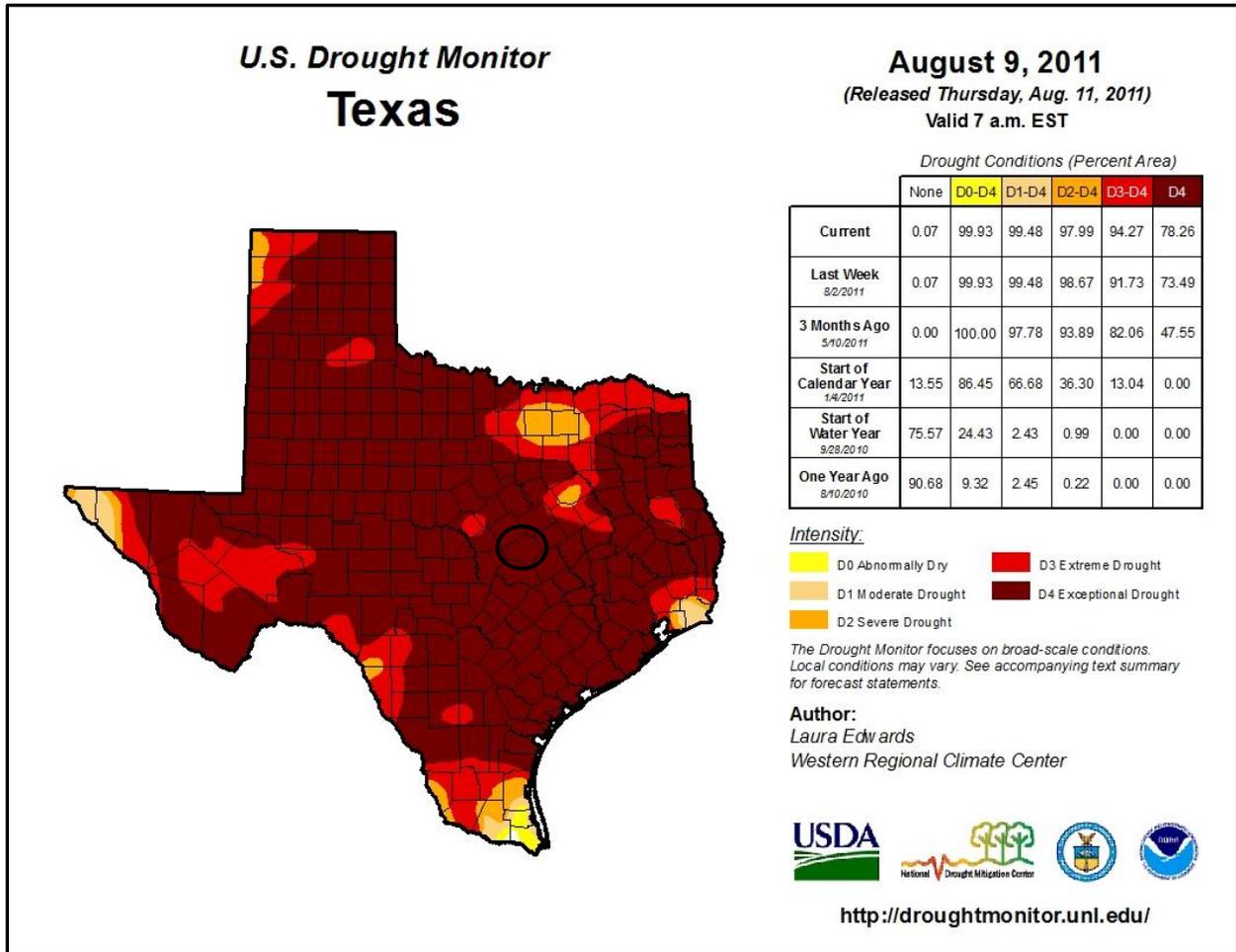


Figure 11-2. U.S. Drought Monitor, August 2011



Extent

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 11-2 depicts magnitude of drought, while Table 11-3 describes the classification descriptions.

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Table 11-2. Palmer Drought Index

DROUGHT INDEX	DROUGHT CONDITION CLASSIFICATIONS						
	Extreme	Severe	Moderate	Normal	Moderately 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 +2.99	+3.00 to +3.99	+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 +2.99	+3.00 to +3.99	+4.00 and above

Table 11-3. Palmer Drought Category Descriptions²

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. and correspond to the intensity of drought.

Based on the historical occurrences for drought and the location of the Bell County planning area, including the CTCOG and all participating jurisdictions, the area can anticipate a range of drought from abnormally dry to exceptional, or D0 to D4, based on the Palmer Drought Category.

² Source: National Drought Mitigation Center

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Historical Occurrences

The Bell County planning area may typically experience a severe drought. Table 11-4 and 11-5 list historical events that have occurred in the planning area as reported in the National Centers for Environmental Information (NCEI). Historical drought information shows drought activity across a multi-county forecast area for each event, the appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each county impacted by the event. Historical drought data for the CTCOG and all participating jurisdictions in the Bell County planning area are provided on a county-wide basis per the NCEI database.

Table 11-4. Historical Drought Years, 1996-2017

DROUGHT YEAR
1996
1998
2000
2005
2006
2006
2008
2011
2012
2012
2014
2014
2015
13 unique events

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Table 11-5. Historical Drought Events, 1996-2017³

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	8/1/1996	0	0	\$0	\$0
Bell County	7/1/1998	0	0	\$0	\$0
Bell County	8/1/2000	0	0	\$0	\$0
Bell County	9/1/2000	0	0	\$0	\$0
Bell County	11/1/2005	0	0	\$0	\$0
Bell County	12/1/2005	0	0	\$0	\$0
Bell County	1/1/2006	0	0	\$0	\$0
Bell County	2/1/2006	0	0	\$0	\$0
Bell County	3/1/2006	0	0	\$0	\$0
Bell County	6/6/2006	0	0	\$0	\$0
Bell County	7/1/2006	0	0	\$0	\$0
Bell County	8/1/2006	0	0	\$0	\$0
Bell County	9/1/2006	0	0	\$0	\$0
Bell County	11/1/2006	0	0	\$0	\$963,647
Bell County	12/1/2006	0	0	\$30,114	\$30,114
Bell County	1/1/2007	0	0	\$0	\$35,136
Bell County	2/1/2007	0	0	\$0	\$35,136
Bell County	6/24/2008	0	0	\$0	\$0
Bell County	7/1/2008	0	0	\$0	\$28,197
Bell County	8/1/2008	0	0	\$0	\$28,197
Bell County	9/1/2008	0	0	\$0	\$16,918
Bell County	10/1/2008	0	0	\$0	\$16,918
Bell County	11/1/2008	0	0	\$0	\$39,476
Bell County	12/1/2008	0	0	\$0	\$281,974
Bell County	1/1/2009	0	0	\$0	\$282,980

³ Damages are reported in 2017 dollar values.

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JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	2/1/2009	0	0	\$0	\$339,576
Bell County	3/1/2009	0	0	\$0	\$28,298
Bell County	4/1/2009	0	0	\$0	\$28,298
Bell County	5/1/2009	0	0	\$0	\$16,979
Bell County	6/9/2009	0	0	\$0	\$6,792
Bell County	7/1/2009	0	0	\$0	\$11,319
Bell County	8/1/2009	0	0	\$0	\$28,298
Bell County	9/1/2009	0	0	\$0	\$5,660
Bell County	3/21/2011	0	0	\$0	\$5,398
Bell County	4/1/2011	0	0	\$0	\$26,989
Bell County	5/1/2011	0	0	\$0	\$26,989
Bell County	6/1/2011	0	0	\$0	\$37,785
Bell County	7/1/2011	0	0	\$0	\$43,183
Bell County	8/1/2011	0	0	\$0	\$53,979
Bell County	9/1/2011	0	0	\$0	\$32,387
Bell County	10/1/2011	0	0	\$0	\$21,592
Bell County	11/1/2011	0	0	\$0	\$16,194
Bell County	12/1/2011	0	0	\$0	\$16,194
Bell County	1/1/2012	0	0	\$0	\$10,577
Bell County	2/1/2012	0	0	\$0	\$4,231
Bell County	3/1/2012	0	0	\$0	\$0
Bell County	6/19/2012	0	0	\$2,115	\$0
Bell County	7/1/2012	0	0	\$0	\$2,115
Bell County	8/1/2012	0	0	\$0	\$0
Bell County	9/11/2012	0	0	\$0	\$2,115
Bell County	11/20/2012	0	0	\$0	\$2,115
Bell County	12/1/2012	0	0	\$0	\$5,288
Bell County	1/1/2013	0	0	\$0	\$3,127

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JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	2/1/2013	0	0	\$0	\$2,085
Bell County	3/1/2013	0	0	\$2,085	\$0
Bell County	4/1/2013	0	0	\$0	\$3,127
Bell County	5/1/2013	0	0	\$0	\$3,127
Bell County	6/1/2013	0	0	\$0	\$4,170
Bell County	7/1/2013	0	0	\$0	\$3,127
Bell County	8/1/2013	0	0	\$0	\$3,127
Bell County	9/1/2013	0	0	\$0	\$3,127
Bell County	2/25/2014	0	0	\$0	\$1,026
Bell County	4/1/2014	0	0	\$0	\$1,026
Bell County	5/1/2014	0	0	\$0	\$1,026
Bell County	6/1/2014	0	0	\$0	\$1,026
Bell County	9/1/2015	0	0	\$0	\$512
Bell County	10/1/2015	0	0	\$2,049	\$0
TOTALS		0	0	\$36,363	\$2,560,680

Significant Events

June 2006 – February 2007

Persistent drought conditions continued across portions of north and central Texas. Hydrologic deficits remained extremely high, with almost every lake well below conservation levels. Stage 1 water restrictions remained in effect in most impacted counties. The Drought Impact Reporter indicated hay prices in Texas were approximately twice what they were before the drought began and crops continued to suffer, with the cotton production about half the size of the previous year. Bell County reported just under one million (2017 dollars) in crop losses as a direct result of the drought.

June 2008 – September 2009

In June 2008, Bell County was considered to be in a Severe Drought (D2) according to the U.S. Drought Monitor. The western portion of Bell County reported oat and wheat crops were stressed from the lack of rain by September 2008. By the end of the year about two-thirds of the county was considered to be in a severe to extreme drought according to the U.S. Drought Monitor. Vegetation and livestock continued to suffer consequences due to the lack of rain. One half of the winter wheat crop was in poor to very poor condition, while 75% of the winter oat crop was rated poor to very poor. Grazing land was also considered to be in poor condition, which affected the cattle industry.

Bell County experienced an exceptional drought by February 2009 and the impacts were starting to affect the southern border of the county. While conditions improved slightly through the spring due to sporadic rainfall, drought conditions quickly worsened in June across southern Bell County. Rainfall

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totals continued to be below normal with less than an inch of rain in June. By the end of August 2009, conditions worsened and most of the entire county was experiencing an exceptional drought. Heavy rainfall in the middle of September 2009 substantially eased drought conditions, and the county was classified as abnormally dry (D0) by the end of the month. Bell County reported losses in excess of 1.1 million (2017 dollars) through the duration of the drought.

Probability of Future Events

Based on available records of historic events, there have been thirteen extended time periods of drought (ranging in length from approximately 30 days to over 480 days) within a 22 year reporting period, which provides a probability of one event every year. This frequency supports a highly likely probability of future events for the Bell County planning area, including the CTCOG and all participating jurisdictions.

Vulnerability and Impact

Drought impacts large areas and crosses jurisdictional boundaries. All existing and future buildings, facilities, and populations are exposed to this hazard and could potentially be impacted. However, drought impacts are mostly experienced in water shortages and crop/livestock losses on agricultural lands and typically have no impact on buildings.

In terms of vulnerability, population, agriculture, property, and environment are all vulnerable to drought in the Bell County planning area, including all participating jurisdictions. The average person will survive only a few days without water, and this timeframe can be drastically shortened for those people with more fragile health – typically children, the elderly, and the ill. Population over 65 in the Bell County planning area is estimated at 9.5% of the total population, and children under the age of 5 are estimated at 8.9% or an estimated total of 60,046⁴ potentially vulnerable residents in the planning area based on age (Table 11-6).

Table 11-6. Populations at Greater Risk by Jurisdiction

JURISDICTION	POPULATION 65 AND OLDER	POPULATION UNDER 5
Bell County ⁵	31,060	28,986
Bartlett	248	155
Belton	2,372	1,444
Harker Heights	2,189	1,901
Holland	108	59
Killeen	7,737	14,130
Little River Academy	262	113

⁴ US Census Bureau 2015 data for Bell County

⁵ County totals includes all incorporated jurisdictions and unincorporated areas.

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JURISDICTION	POPULATION 65 AND OLDER	POPULATION UNDER 5
Nolanville	195	755
Rogers	154	28
Salado	539	83
Temple	10,012	5,668
Troy	212	145

The population is also vulnerable to food shortages when drought conditions exist, and potable water is in short supply. Potable water is used for drinking, sanitation, patient care, sterilization, equipment, heating and cooling systems, and many other essential functions in medical facilities. All residents in the Bell County planning area could be adversely affected by drought conditions, which could limit water supplies and present health threats. During summer drought, or hot and dry conditions, elderly persons, small children, infants and the chronically ill who do not have adequate cooling units in their homes may become more vulnerable to injury and/or death.

Due to the nature and function of the CTCOG, drought is not considered to pose a risk to employees. Impacts to the CTCOG facility resulting from drought are considered negligible.

The economic impact of droughts can be significant as they produce a complex web of impacts that spans many sectors of the economy and reach well beyond the area experiencing physical drought. This complexity exists because water is integral to our ability to produce goods and provide services. If droughts extend over a number of years, the direct and indirect economic impact can be significant.

Habitat damage is a vulnerability of the environment during periods of drought for both aquatic and terrestrial species. Fish and wildlife in and near Belton Lake and the Miller Springs Nature Center may be negatively impacted by prolonged drought. The environment also becomes vulnerable during periods of extreme or prolonged drought due to severe erosion and land degradation.

Loss estimates were based on 22 years of statistical data from the NCEI. A drought event frequency-impact was then developed to determine an impact profile on agriculture products and estimate potential losses due to drought in the area. Table 11-7 shows annualized exposure for Bell County, including all participating jurisdictions.

Table 11-7. Drought Event Damage Totals, 1996-2017

JURISDICTION	PROPERTY & CROP LOSS	ANNUALIZED LOSS ESTIMATES
Bell County	\$2,597,043	\$118,047

Impact of droughts experienced in the Bell County planning area, including the CTCOG and all participating jurisdictions, has resulted in no injuries or fatalities supporting a limited severity of impact meaning injuries and/or illnesses are treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10% of property is destroyed or with major damage. Annualized loss over the 22-year reporting period in the Bell County planning area, including all participating jurisdictions is \$118,047 annually.

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Assessment of Impacts

The Drought Impact Reporter was developed in 2005 by the University of Nebraska-Lincoln to provide a national database of drought impacts. Droughts can have an impact on: the agriculture; business and industry; energy; fire; plants and wildlife; relief, response, and restrictions; society and public health; tourism and recreation; and water supply and quality. Table 11-8 lists the drought impacts to the Bell County planning area from 2005 to 2017 based on reports received by the Drought Impact Reporter.

Table 11-8. Drought Impacts, 2005-2017

DROUGHT IMPACTS 2005-2015	
Agriculture	34
Business & Industry	2
Energy	1
Fire	21
Plants & Wildlife	15
Relief, Response & Restrictions	17
Society & Public Health	3
Tourism & Recreation	0
Water Supply & Quality	11

Drought has the potential to impact people in the Bell County planning area. While it is rare that drought, in and of itself, leads to a direct risk to the health and safety of people in the U.S., severe water shortages could result in inadequate supply for human needs. Drought also is frequently associated with a variety of impacts, including:

- Recreational activities that rely on water may be curtailed, such as hunting and fishing in or near the Belton Lake, resulting in fewer tourists and lower revenue.
- The number of health-related low-flow issues (e.g., diminished sewage flows, increased pollution concentrations, reduced firefighting capacity, and cross-connection contamination) will increase as the drought intensifies.
- Public safety from forest/range/wildfires will increase as water availability and/or pressure decreases.
- Respiratory ailments may increase as the air quality decreases.
- There may be an increase in disease due to wildlife concentrations (e.g., rabies, Rocky Mountain spotted fever, Lyme disease).
- Jurisdictions and residents may disagree over water use/water rights, creating conflict.
- Political conflicts may increase between municipalities, counties, states, and regions.
- Water management conflicts may arise between competing interests.
- Increased law enforcement activities may be required to enforce water restrictions.

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- Severe water shortages could result in inadequate supply for human needs as well as lower quality of water for consumption.
- Firefighters may have limited water resources to aid in firefighting and suppression activities, increasing risk to lives and property.
- During drought there is an increased risk for wildfires and dust storms.
- The community may need increased operational costs to enforce water restriction or rationing.
- Prolonged drought can lead to increases in illness and disease related to drought.
- Utility providers can see decreases in revenue as water supplies diminish.
- Utilities providers may cut back energy generation and service to their customers to prioritize critical service needs.
- Hydroelectric power generation facilities and infrastructure would have significantly diminished generation capability. Dams simply cannot produce as much electricity from low water levels as they can from high water levels.
- Fish and wildlife food and habitat will be reduced or degraded over time during a drought and disease will increase, especially for aquatic life.
- Wildlife will move to more sustainable locations creating higher concentrations of wildlife in smaller areas, increasing vulnerability and further depleting limited natural resources.
- Severe and prolonged drought can result in the reduction of a species, or cause the extinction of a species altogether.
- Plant life will suffer from long-term drought. Wind and erosion will also pose a threat to plant life as soil quality will decline.
- Dry and dead vegetation will increase the risk of wildfire.
- Land subsidence threat increases as groundwater is depleted.
- Drought poses a significant risk to annual and perennial crop production and overall crop quality leading to higher food costs.
- Drought related declines in production may lead to an increase in unemployment.
- Drought may limit livestock grazing resulting in decreased livestock weight, potential increased livestock mortality, and increased cost for feed.
- Negatively impacted water suppliers may face increased costs resulting from the transport water or develop supplemental water resources.
- Long term drought may negatively impact future economic development.

The overall extent of damages caused by periods of drought is dependent on its extent and duration. The level of preparedness and pre-event planning done by government, businesses, and citizens will contribute to the overall economic and financial conditions in the aftermath of a drought event.

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Hazard Description

Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a “bolt” when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes but the surrounding air 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.

According to FEMA, an average of 300 people are injured and 80 people are killed in the United States each year by lightning. Direct lightning strikes also have the ability to cause significant damage to buildings, critical facilities, and infrastructure. Lightning is also responsible for igniting wildfires that can result in widespread damages to property before firefighters have the ability to contain and suppress the resultant fire.

Location

Lightning can strike in any geographic location and is considered a common occurrence in Texas. The Bell County planning area, including the CTCOG and all participating jurisdictions, is located in a region of the country that is moderately susceptible to a lightning strike. Therefore, lightning could occur at any location within the entire planning area. It is assumed that the entire Bell County planning area is uniformly exposed to the threat of lightning.

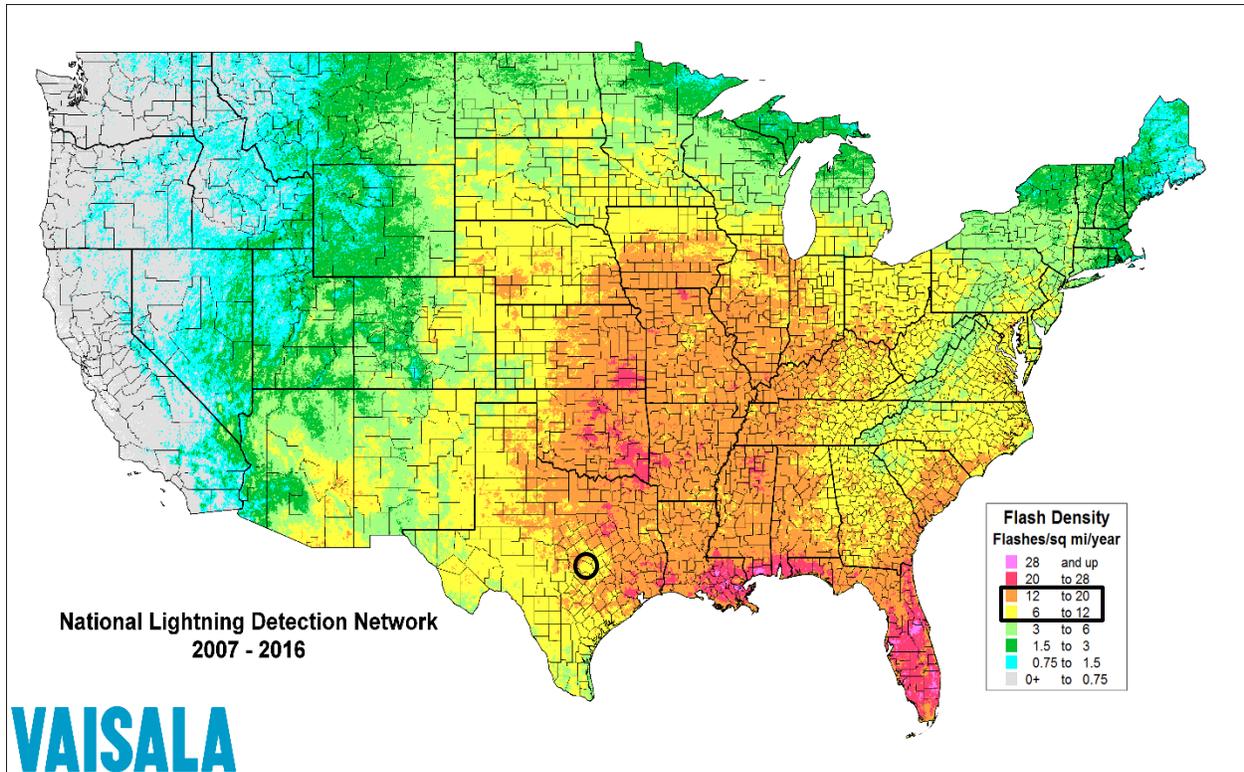
Extent

According to NOAA, the average number of cloud-to-ground flashes for the State of Texas between 2007 and 2016 was 11.3 flashes per square mile. Vaisala’s U.S. National Lightning Detection Network lightning flash density map (Figure 12-1) shows a range of six to twenty cloud-to-ground lightning flashes per square mile per year for the entire Bell County planning area. The black circle indicates

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the Bell Planning area on Figure 12-1. This rate equates to approximately 6,528 to 21,760 flashes per year for the entire planning area.

Figure 12-1. Lightning Flash Density, 2007-2016



The extent for lightning can be expressed in terms of the number of strikes in an interval. NOAA utilizes lightning activity levels (LALs) on a scale from 1-6. LAL rankings reflect the frequency of cloud-to-ground lightning either forecast or observed (Table 12-1).

Table 12-1. NOAA Lightning Activity Levels (LAL)

LAL	CLOUD & STORM DEVELOPMENT	LIGHTNING STRIKES/ 15 MIN
1	No thunderstorms.	-
2	Cumulus clouds are common but only a few reach 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

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LAL	CLOUD & STORM DEVELOPMENT	LIGHTNING STRIKES/ 15 MIN
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.	

The NCEI does not include the LAL for historical lightning events, therefore in order to determine the extent of lightning strikes, the yearly average range of estimated number of lightning strikes within the planning area (6,528 to 21,760 flashes) and a cloud-to-ground flash density of six to twenty per square mile were divided by the number¹ of thunderstorm events that occur annually in the planning area. Flash density is reported as a range of cloud-to-ground strikes at a county-wide level. Bell County, including the CTCOG and all participating jurisdictions, should expect an average range of 23 to 75 lightning strikes within 15 minutes at any given time during a lightning or combined lightning and thunderstorm event, indicating lightning strikes have an average LAL range of 2 to 3.

Historical Occurrences

Table 12-2 depicts historical occurrences of lightning for the Bell County planning area, including all participating jurisdictions, with associated damages according to the National Centers for Environmental Information (NCEI) data. Since January 1996, only eleven recorded lightning events are known to have impacted Bell County, based upon NCEI records. It is likely additional lightning occurrences have gone unreported before and during the recording period. It should be noted that the CTCOG facility is located in the City of Belton. While the CTCOG has no reported damages due to lightning events, the historic events posing a threat to the CTCOG are reported on a city-wide basis.

The NCEI is a national data source organized under the National Oceanic and Atmospheric Administration. The NCEI is the largest archive available for climate data; however, it is important to note that the only incidents factored into this risk assessment are those that are reported to the NCEI for the entire Bell County planning area. Damage estimates provided in a table for losses have been modified to reflect the damage in 2017 dollars.

Table 12-2. Historical Lightning Events, with Reported Damages, 1996-2017²

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Temple	8/29/1998	4:15 PM	0	0	\$37,245	\$0
Belton	9/2/1999	9:30 PM	0	0	\$14,576	\$0
Belton	3/28/2006	9:35 AM	0	0	\$156,593	\$0
Belton	6/28/2006	8:00 PM	0	0	\$60,228	\$0
Temple	12/29/2006	7:30 PM	0	0	\$72,274	\$0

¹ Analysis includes the highest number of events recorded in a given year during the reporting period in order to account for typical under reporting of thunderstorm and lightning events.

² Damage values are in 2017 dollars.

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JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	7/31/2009	3:30 PM	0	0	\$1,132	\$0
Bell County	7/31/2009	4:00 PM	0	0	\$452,769	\$0
Bell County	11/1/2010	10:53 PM	0	0	\$111,365	\$0
Bell County	6/18/2015	5:00 PM	0	0	\$8,197	\$0
Bell County	8/30/2015	4:00 PM	0	1	\$0	\$0
Bell County	4/27/2016	12:30 AM	0	0	\$12,142	\$0
TOTALS			0	1	\$926,521	\$0

Significant Events

July 31, 2009 – Bell County

Afternoon thunderstorms developed on July 31st near a stalled frontal boundary across the central portions of Texas with isolated events of damaging winds occurring in Bell County. A house on Jewel Lane near Stillhouse Hollow Lake was destroyed by a fire started by lightning.

August 30, 2015 – Bell County

On August 30th, a 10-year-old girl was struck by lightning on Landfill Road in the City of Holland in Bell County while playing under a tree. She was hospitalized for several days.

Probability of Future Events

Based on historical records and input from the planning team the probability of occurrence for future lightning events in the Bell County planning area, including the CTCOG and all participating jurisdictions, is considered highly likely, or an event probable in the next year. The planning team stated that lightning occurs regularly in the area. According to NOAA, Bell County is located in an area of the country that experiences six to twenty lightning flashes per square mile per year (approximately 6,528 to 21,760 flashes per year). Given this estimated probability, it can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the planning area, including the CTCOG and all participating jurisdictions.

Vulnerability and Impact

Vulnerability is difficult to evaluate since lightning events can occur at different strength levels, in random locations, and can create a broad range of damages depending on the strike location. Due to the randomness of these events, all existing and future structures and facilities in the Bell County planning area could potentially be impacted and remain vulnerable to possible injury and property loss from lightning strikes. The Bell County planning area has had only eleven reported lightning events, however the entire planning area, including the CTCOG and all participating jurisdictions, are vulnerable and could be impacted by lightning.

The direct and indirect losses associated with these events include injury and loss of life, damage to structures and infrastructure, agricultural losses, utility failure (power outages), and stress on community resources. The entire population of the Bell County planning area, including the CTCOG

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and all participating jurisdictions, is considered exposed to the lightning hazard. The peak lightning season in the State of Texas is from June to August; however, the most fatalities occur in July. Fatalities occur most often when people are outdoors and/or participating in some form of recreation. Population located outdoors is considered at risk and more vulnerable to a lightning strike compared to being inside a structure. Moving to a lower risk location will decrease a person’s vulnerability.

The entire general building stock and all infrastructure of the Bell County planning area are considered exposed to the lightning hazard. Lightning can be responsible for damages to buildings, cause electrical, forest and/or wildfires, and damage infrastructure such as power transmission lines and communication towers. Agricultural losses can be extensive due to lightning and resulting fires.

The following critical facilities would be vulnerable to lightning events in each participating jurisdiction:

Table 12-3. Critical Facilities at Risk by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Bell County	Government Facility, OEM
Bartlett	Government Facility, Police Station, Fire Station, 2 Schools
Belton	Government Facility, Police Station, 2 Fire Stations, EOC, School, Shelter
CTCOG	CTCOG Office Building
Harker Heights	Government Facility, Police Station, 2 Fire Stations, Shelter, Hospital, Nursing Home, 13 Lift Stations, 9 Pump Stations, Communications Tower
Holland	Government Facility, Police Station, Fire Station, School, Community Center
Killeen	11 Government Facilities, 2 Police Stations, 8 Fire Stations, EOC, OEM, Public Works Facility, Shelter, Water Department Facility, Oncor Electric Services, Solid Waste Facility
Little River Academy	Government Facility, Police Station, Fire Station
Nolanville	Government Facility, Police Station, Fire Station, EMS, Public Works Facility, 2 Schools
Rogers	Government Facility, Police Station, Fire Station, School, 2 Water Towers, Wastewater Treatment Facility, Community Center
Salado	2 Government Facilities, Police Station, Wastewater Treatment Facility, 4 Schools, Transportation Facility (Bus Maintenance), Communications Facilities, Water Tower
Temple	Government Facility, Police Station, 8 Fire Stations, Public Works Facility, 4 Water Treatment Facilities, 3 Hospitals, Convention Center, 2 Dams, Panda Power Plant, 11 Water Towers, Ground Storage Tank, 7 Pump Stations, 22 Schools, Interstate, 2 Highways
Troy	Government Facility, Police Station, Water Well, Water Storage Facility and Pump, Water Tower, Wastewater Treatment Facility, 4 Schools

Impact of lightning experienced in the Bell County planning area has resulted in one injury and no fatalities. Impact of lightning events experienced in the Bell County planning area, including the CTCOG and all participating jurisdictions, would be “Limited,” and injuries and illnesses would be treatable with first aid. The quality of life lost would be minor, and facilities would be shut down for 24 hours or less. Overall, the average loss estimate for the Bell County area, including all participating

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jurisdictions, (in 2017 dollars) is \$926,521, having an approximate annual loss estimate of \$44,115 (Table 12-4).

Table 12-4. Potential Annualized Losses for Bell County³

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATE
Bell County	\$585,605	\$26,619
Bartlett	\$0	\$0
Belton	\$231,397	\$10,518
CTCOG	\$0	\$0
Harker Heights	\$0	\$0
Holland	\$0	\$0
Killeen	\$0	\$0
Little River Academy	\$0	\$0
Nolanville	\$0	\$0
Rogers	\$0	\$0
Salado	\$0	\$0
Temple	\$109,519	\$4,978
Troy	\$0	\$0
Planning Area	\$926,521	\$44,115

Assessment of Impacts

Lightning events have the potential to pose a significant risk to people and can create dangerous and difficult situations for public health and safety officials. Impacts to the planning area can include:

- Individuals exposed to the storm can be directly struck, posing significant health risks and potential death.
- Structures can be damaged or crushed by falling trees damaged by lightning, which can result in physical harm to the occupants.
- Lightning strikes can result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.

³ Damage values are in 2017 dollars.

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- Lightning strikes can be associated with structure fires and wildfires, creating additional risk to residents and first responders.
- Emergency operations and services may be significantly impacted due to power outages and/or loss of communications.
- City, county departments or other government services may be damaged, delaying response and recovery efforts for the entire community.
- Economic disruption due to power outages and fires negatively impacts the programs and services provided by the community due to short and long term loss in revenue.
- Some businesses not directly damaged by lightning events may be negatively impacted while utilities are being restored, further slowing economic recovery.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.

The economic and financial impacts of lightning on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the county, communities, local businesses, and citizens will also contribute to the overall economic and financial conditions in the aftermath of any lightning event.

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Hazard Description



A severe winter storm event is identified as a storm with snow, ice, or freezing rain. This type of storm can cause significant problems for area residents. Winter storms are associated with freezing or frozen precipitation such as freezing rain, sleet, snow, and the combined effects of winter precipitation and strong winds. Wind chill is a function of temperature and wind. Low wind chill is a product of high winds and freezing temperatures.

Winter storms that threaten the Bell County planning area usually begin as powerful cold fronts that push south from central Canada. Although the county is at risk to ice hazards, extremely cold temperatures, and snow, the effects and frequencies of winter storm events are generally mild and short-lived. As indicated in Figure 13-1, on average, the Bell County planning area, including the CTCOG and all participating jurisdictions, typically does not experience extreme cold days every year. However, winter storms are possible in the planning area. During times of ice and snow accumulation, response times will increase until public works road crews are able to make major roads passable. Table 13-1 describes the types of winter storms possible to occur in the Bell County planning area, including the CTCOG and all participating jurisdictions.

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Figure 13-1. Extreme Cold Days, 1960-2003¹

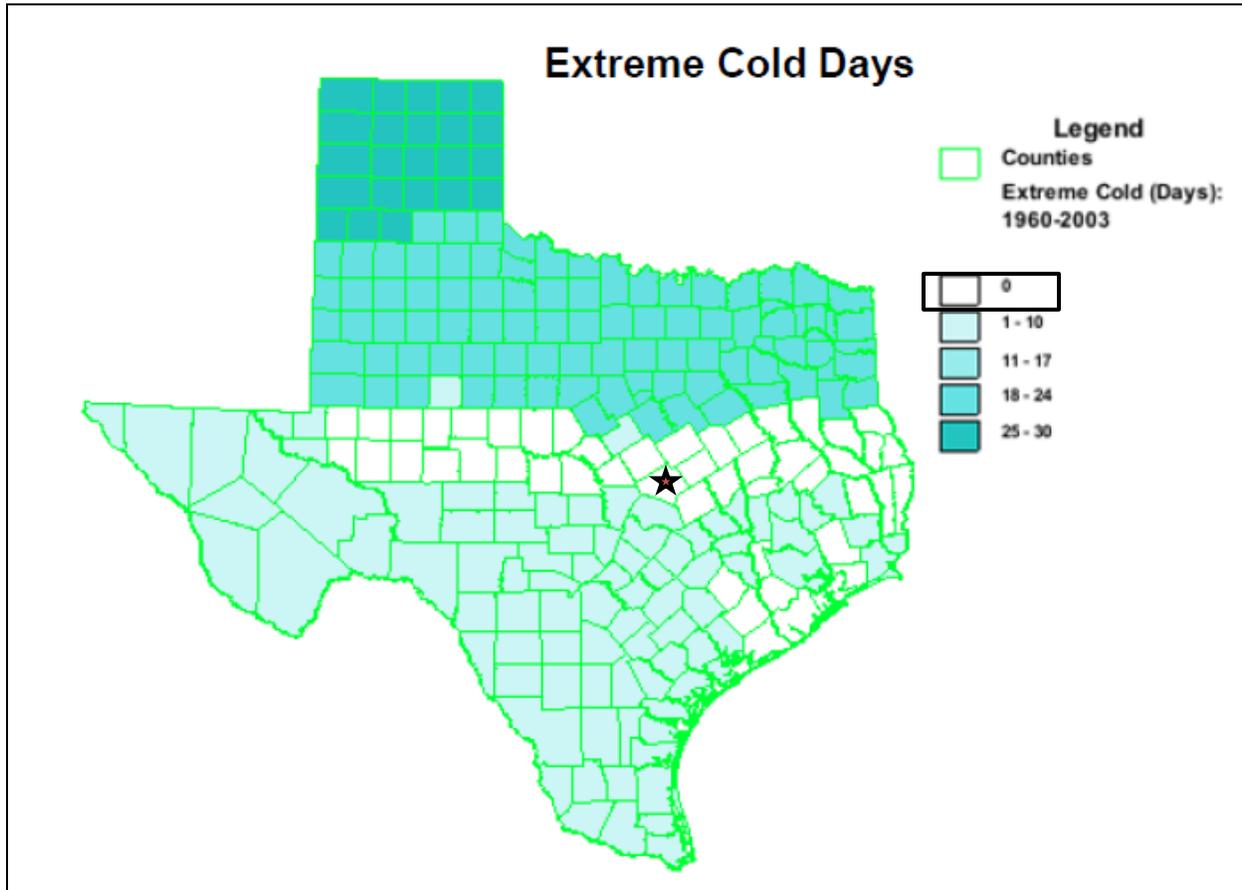


Table 13-1. Types of Winter Storms

TYPE OF WINTER STORM	DESCRIPTION
Winter Weather Advisory	This alert may be issued for a variety of severe conditions. Weather advisories may be announced for snow, blowing or drifting snow, freezing drizzle, freezing rain, or a combination of weather events.
Winter Storm Watch	Severe winter weather conditions may affect your area (freezing rain, sleet, or heavy snow may occur separately or in combination).
Winter Storm Warning	Severe winter weather conditions are imminent.
Freezing Rain or Freezing Drizzle	Rain or drizzle is likely to freeze upon impact, resulting in a coating of ice glaze on roads and all other exposed objects.
Sleet	Small particles of ice usually mixed with rain. If enough sleet accumulates on the ground, it makes travel hazardous.

¹ Source: National Weather Service. Bell County indicated by star.

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TYPE OF WINTER STORM	DESCRIPTION
Blizzard Warning	Sustained wind speeds of at least 35 mph are accompanied by considerable falling or blowing snow. This alert is the most perilous winter storm with visibility dangerously restricted.
Frost/Freeze Warning	Below freezing temperatures are expected and may cause significant damage to plants, crops, and fruit trees.
Wind Chill	A strong wind combined with a temperature slightly below freezing can have the same chilling effect as a temperature nearly 50 degrees lower in a calm atmosphere. The combined cooling power of the wind and temperature on exposed flesh is called the wind-chill factor.

Location

Winter storm events are not confined to specific geographic boundaries. Therefore, all existing and future buildings, facilities, and populations in the Bell County planning area, including the CTCOG and all participating jurisdictions, are considered to be exposed to a winter storm hazard and could potentially be impacted.

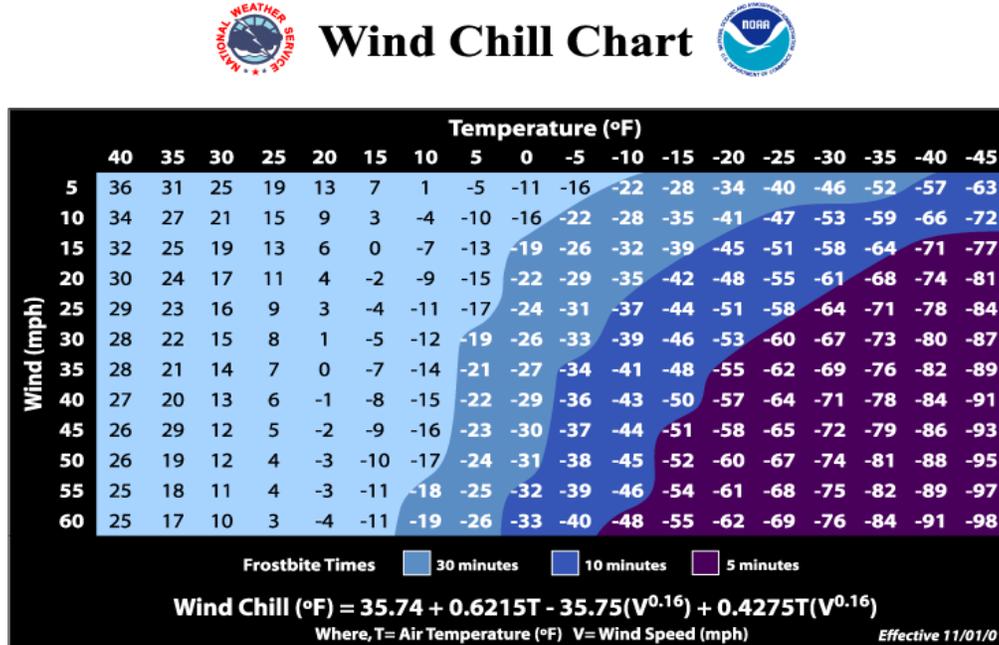
Extent

The extent or magnitude of a severe winter storm is measured in intensity based on the temperature and level of accumulations as shown in Table 13-2. Table 13-2 should be read in conjunction with the wind-chill factor described in Figure 13-2 to determine the intensity of a winter storm. The chart is not applicable when temperatures are over 50°F or winds are calm. This is an index developed by the National Weather Service.

Table 13-2. Magnitude of Severe Winter Storms

INTENSITY	TEMPERATURE RANGE (Fahrenheit)	EXTENT DESCRIPTION
Mild	40° – 50°	Winds less than 10 mph and freezing rain or light snow falling for short durations with little or no accumulations
Moderate	30° – 40°	Winds 10 – 15 mph and sleet and/or snow up to 4 inches
Significant	25° – 30°	Intense snow showers accompanied with strong gusty winds between 15 and 20 mph with significant accumulation
Extreme	20° – 25°	Wind driven snow that reduces visibility, heavy winds (between 20 to 30 mph), and sleet or ice up to 5 millimeters in diameter
Severe	Below 20°	Winds of 35 mph or more and snow and sleet greater than 4 inches

Figure 13-2. Wind Chill Chart



Wind chill temperature is a measure of how cold the wind makes real air temperature feel to the human body. Since wind can dramatically accelerate heat loss from the body, a blustery 30°F day would feel just as cold as a calm day with 0°F temperatures. The Bell County planning area, including the CTCOG and all participating jurisdictions, has never experienced a blizzard, but based on 27 previous occurrences recorded from 1996 through 2017, it has been subject to winter storm watches, warnings, freezing rain, sleet, snow, and wind chill.

The average number of cold days is similar for the entire planning area, including the county, cities, towns, villages and the CTCOG. Therefore, the intensity or extent of a winter storm event to be mitigated for the area ranges from mild to significant according to the definitions at Table 13-2. Bell County planning area, including the CTCOG and all participating jurisdiction, can expect anywhere between 0.1 to 4.0 inches of ice and snow during a winter storm event and temperatures between 25 and 50 degrees with winds ranging from 0 to 20 mph.

Historical Occurrences

Table 13-3 shows historical occurrences for Bell County from 1996 through 2017 provided by the NCEI database. There have been 27 recorded winter storm events in the planning area. Historical winter storm information, as provided by the NCEI, identifies winter storm activity across a multi-county forecast area for each event. The appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each county impacted by the event. Historical winter storm data for the county, all participating jurisdictions and the CTCOG are provided on a County-wide basis per the NCEI database. Table 13-3 shows historical incident information for the planning area.

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Table 13-3. Historical Winter Storm Events, 1996-2017²

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	11/24/1996	0	0	\$0	\$0
Bell County	1/7/1997	0	0	\$0	\$0
Bell County	1/12/1997	0	0	\$0	\$0
Bell County	12/22/1998	0	0	\$0	\$0
Bell County	1/25/2000	0	0	\$0	\$0
Bell County	12/12/2000	0	0	\$0	\$0
Bell County	12/25/2000	0	0	\$0	\$0
Bell County	12/31/2000	0	0	\$0	\$0
Bell County	1/1/2001	0	0	\$0	\$0
Bell County	11/28/2001	0	0	\$0	\$0
Bell County	2/24/2003	0	0	\$0	\$0
Bell County	12/22/2004	0	0	\$0	\$0
Bell County	12/7/2005	0	0	\$0	\$0
Bell County	2/18/2006	0	0	\$0	\$0
Bell County	1/14/2007	0	0	\$35,136	\$0
Bell County	1/17/2007	0	0	\$11,712	\$0
Bell County	4/7/2007	0	0	\$40,992	\$0
Bell County	12/15/2008	0	0	\$0	\$0
Bell County	1/5/2009	0	0	\$5,660	\$0
Bell County	1/27/2009	0	0	\$0	\$0
Bell County	12/24/2009	0	0	\$11,319	\$0
Bell County	1/7/2010	0	0	\$0	\$0
Bell County	2/23/2010	0	0	\$278,414	\$0
Bell County	12/6/2013	0	0	\$10,424	\$0
Bell County	1/23/2014	0	0	\$0	\$0

² Values are in 2017 dollars.

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JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Bell County	2/7/2014	0	0	\$102,578	\$0
Bell County	1/10/2015	0	0	\$0	\$0
TOTALS		0	0	\$496,235	

Significant Events

February 2, 2010 – Bell County

An upper level disturbance moved through north Texas with the best lift south of Interstate 20. The precipitation initially began as rain, but as colder temperatures filtered into the region, the rain transitioned to snow. An average of 3 to 5 inches of snow fell across Bell County. The local COOP observer in the City of Troy recorded 4 inches of snow. There were more than 20 vehicle accidents in the county due to the hazardous driving conditions. About 2,000 customers in the City of Belton lost power for a brief period of time. Almost all flights at the Killeen-Ft. Hood Regional airport were canceled, and several streets and bridges in the county were briefly closed before sand trucks were able to treat the roadways.

Probability of Future Events

According to historical records, the planning area experiences approximately one winter storm event per year. Hence, the probability of a future winter storm event affecting the Bell County planning area, including the CTCOG and all participating jurisdictions, is highly likely, with a winter storm likely to occur within the next year.

Vulnerability and Impact

During periods of extreme cold and freezing temperatures, water pipes can freeze and crack, and ice can build up on power lines, causing them to break under the weight or causing tree limbs to fall on the lines. These events can disrupt electric service for long periods.

An economic impact may occur due to increased consumption of heating fuel, which can lead to energy shortages and higher prices. House fires and resulting deaths tend to occur more frequently from increased and improper use of alternate heating sources. Fires during winter storms also present a greater danger because water supplies may freeze and impede firefighting efforts.

All populations, buildings, critical facilities, and infrastructure in the entire Bell County planning area are vulnerable to severe winter events.

The following critical facilities would be vulnerable to Winter Storm events in each participating jurisdiction:

Table 13-4. Critical Facilities at Risk by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Bell County	Government Facility, OEM

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JURISDICTION	CRITICAL FACILITIES
Bartlett	Government Facility, Police Station, Fire Station, 2 Schools
Belton	Government Facility, Police Station, 2 Fire Stations, EOC, School, Shelter
CTCOG	CTCOG Office Building
Harker Heights	Government Facility, Police Station, 2 Fire Stations, Shelter, Hospital, Nursing Home, 13 Lift Stations, 9 Pump Stations, Communications Tower
Holland	Government Facility, Police Station, Fire Station, School, Community Center
Killeen	11 Government Facilities, 2 Police Stations, 8 Fire Stations, EOC, OEM, Public Works Facility, Shelter, Water Department Facility, Oncor Electric Services, Solid Waste Facility
Little River Academy	Government Facility, Police Station, Fire Station
Nolanville	Government Facility, Police Station, Fire Station, EMS, Public Works Facility, 2 Schools
Rogers	Government Facility, Police Station, Fire Station, School, 2 Water Towers, Wastewater Treatment Facility, Community Center
Salado	Government Facility, Police Station, 8 Fire Stations, Public Works Facility, 4 Water Treatment Facilities, 3 Hospitals, Convention Center, 2 Dams, Panda Power Plant, 11 Water Towers, Ground Storage Tank, 7 Pump Stations, 22 Schools, Interstate, 2 Highways
Temple	Government Facility, Police Station, Water Well, Water Storage Facility and Pump, Water Tower, Wastewater Treatment Facility, 4 Schools
Troy	2 Government Facilities, Police Station, Wastewater Treatment Facility, 4 Schools, Transportation Facility (Bus Maintenance), Communications Facilities, Water Tower

People and animals are subject to health risks from extended exposure to cold air. Elderly people are at greater risk of death from hypothermia during these events, especially in the rural areas of the county where populations are sparse, icy roads may impede travel, and there are fewer neighbors to check in on the elderly. According to the U.S. Center for Disease Control, every year hypothermia kills about 600 Americans, half of whom are 65 years of age or older.

The CTCOG employees may be at risk during winter storm events, particularly those whose jobs consist of outdoor activities such as maintenance. The CTCOG employs 115 people.

Population over 65 in the Bell County planning area is estimated at 9.5% of the total population or an estimated total of 31,060³ potentially vulnerable residents in the planning area based on age (Table 13-5).

³ US Census Bureau 2015 data for Bell County

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Table 13-5. Population at Greater Risk by Jurisdiction

JURISDICTION	POPULATION 65 AND OLDER
Bell County ⁴	31,060
Bartlett	248
Belton	2,372
Harker Heights	2,189
Holland	108
Killeen	7,737
Little River Academy	262
Nolanville	195
Rogers	154
Salado	539
Temple	10,012
Troy	212

Historic loss, in 2017 dollars, is estimated at \$496,235 in damages over the 22-year recording period giving an approximate loss of \$22,556 in damages annually (Table 13-6). The potential severity of impact for the Bell County planning area, including the CTCOG and all participating jurisdictions, are limited meaning injuries are treatable with first aid, shutdown of facilities and services for 24 hours or less, and less than 10% of property destroyed or with major damage.

Table 13-6. Winter Storm Event Damage Totals, 1996-2017

JURISDICTION	PROPERTY & CROP LOSS	ANNUALIZED LOSS ESTIMATES
Bell County	\$496,235	\$22,556

Assessment of Impacts

The greatest risk from a winter storm hazard is to public health and safety. Potential impacts for the planning area may include:

- Vulnerable populations, particularly the elderly and infants, can face serious or life-threatening health problems from exposure to extreme cold including hypothermia and frostbite.
- Loss of electric power or other heat source can result in increased potential for fire injuries or hazardous gas inhalation because residents burn candles for light or use fires or generators to stay warm.

⁴ County totals includes all incorporated jurisdictions and unincorporated areas.

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- Response personnel, including utility workers, public works personnel, debris removal staff, tow truck operators, and other first responders, are subject to injury or illness resulting from exposure to extreme cold temperatures.
- Response personnel would be required to travel in potentially hazardous conditions, elevating the life safety risk due to accidents and potential contact with downed power lines.
- Operations or service delivery may experience impacts from electricity blackouts due to winter storms.
- Power outages are possible throughout the planning area due to downed trees and power lines and/or rolling blackouts.
- Critical facilities without emergency backup power may not be operational during power outages.
- Emergency response and service operations may be impacted by limitations on access and mobility if roadways are closed, unsafe, or obstructed.
- Hazardous road conditions will likely lead to increases in automobile accidents, further straining emergency response capabilities.
- Depending on the severity and scale of damage caused by ice and snow events, damage to power transmission and distribution infrastructure can require days or weeks to repair.
- A winter storm event could lead to tree, shrub, and plant damage or death.
- Severe cold and ice could significantly damage agricultural crops.
- Schools may be forced to shut early due to treacherous driving conditions.
- Exposed water pipes may be damaged by severe or late season winter storms at both residential and commercial structures, causing significant damages.

The economic and financial impacts of winter weather on the community will depend on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by businesses and citizens will also contribute to the overall economic and financial conditions in the aftermath of a winter storm event.

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Hazard Description

According to the National Oceanic and Atmospheric Administration (NOAA), a hurricane is an intense tropical weather system of strong thunderstorms with well-defined surface circulation and maximum sustained winds of 74 miles per hour (mph) or higher. In the Northern Hemisphere, circulation of winds near the Earth’s surface is counterclockwise.

As a hurricane develops, the barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. Tropical depressions intensify into tropical storms when maximum sustained winds increase to between 35-46 knots (39-73 mph). At these wind speeds, the storm becomes more organized and circular in shape and begins to resemble a hurricane. Tropical storms can be equally problematic without ever becoming a hurricane, resulting in heavy rainfall, high winds and tidal surge in coastal communities. When maximum sustained winds reach or exceed 39 mph, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 mph, the storm is deemed a hurricane.

The intensity of a land falling hurricane is expressed in categories relating wind speeds and potential damage. Tropical storm-force winds are strong enough to be dangerous to those caught in them. For this reason, emergency managers plan to have evacuations completed and personnel sheltered before winds of tropical storm-force arrive, which precedes the arrival of hurricane-force winds.

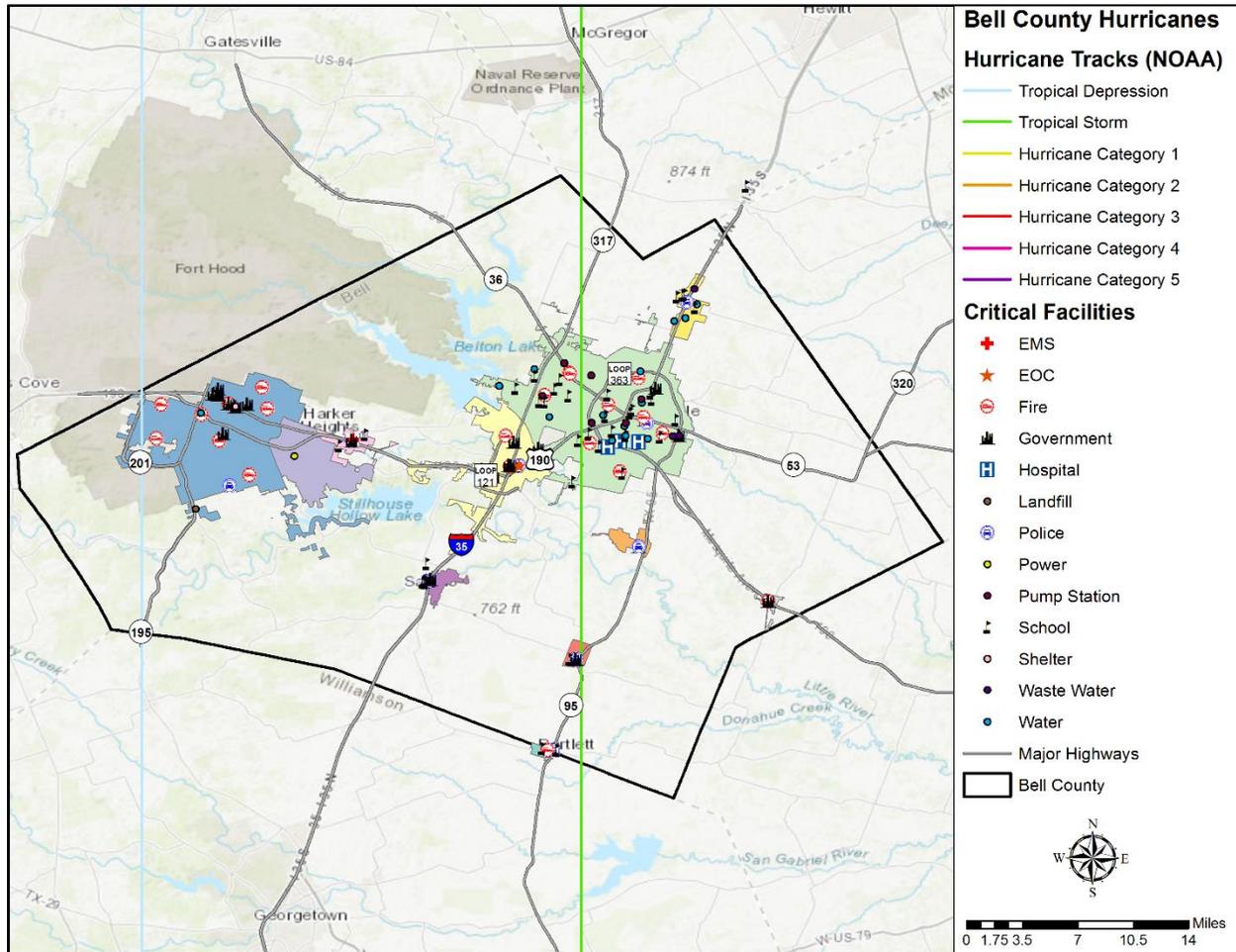
According to the National Hurricane Center, the greatest potential for loss of life related to a hurricane is from storm surge. This happens when low pressure and high circular winds “pile” the water into a dome shape that can be 50-100 miles wide. The surge travels with the storm and is most severe on the right side of the storm, relative to the direction the storm travels. The surge can be 15 feet deep, topped by waves, and make landfall ahead of the center, or “eye”, of the hurricane. Wind-driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with normal high tides.

Section 14: Hurricane/Tropical Storm

Location

The Bell County planning area is located inland from the coast and is outside of the hurricane wind speed hazard areas. However, the entire planning area is susceptible to the indirect threats of a hurricane, including high winds and flooding. Thus, the Bell County planning area, including the CTCOG and all participating jurisdictions, is in a low risk area for hurricane wind speeds of 90 miles per hour (mph) or less as shown in Figure 14-1. Hurricanes and/or tropical storms can impact the planning area from June 1 to November 30, the official Atlantic U.S. hurricane season.

Figure 14-1. Location of Hurricane Tracks



Extent

Hurricanes are categorized according to the strength and intensity of their winds using the Saffir-Simpson Hurricane Scale (See Table 14-1). A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the highest. This scale only ranks wind speed, but lower category storms can inflict greater damage than higher category storms depending on where they strike, other weather they interact with, and how slow they move.

Section 14: Hurricane/Tropical Storm

Table 14-1. Extent Scale for Hurricanes

<i>CATEGORY</i>	MAXIMUM SUSTAINED WIND SPEED (Mph)	MINIMUM SURFACE PRESSURE (Millibars)	STORM SURGE (Feet)
1	74 – 95	Greater than 980	3 – 5
2	96 – 110	979 – 965	6 – 8
3	111 – 130	964 – 945	9 – 12
4	131 – 155	944 – 920	13 – 18
5	155 +	Less than 920	19 +

Based on the historical storm tracks for hurricanes and the location of the Bell County planning area, which is outside of the hurricane wind hazard area, the average extent to be mitigated is for a Category 1 storm for the entire planning area. This data is based on the design wind speeds for a 100-year event.

Historical Occurrences

Previous occurrences include storms that had a direct path through Bell County and the tracks near the county. Table 14-2 below lists the storms that have impacted the Bell County planning area, including the CTCOG and all participating jurisdictions, during the years of 1960-2017.

Table 14-2. Historical Hurricane Events for Bell County Planning Area, 1960-2017

JURISDICTION	DATE	MAGNITUDE	FATALITIES	INJURIES	PROPERTY DAMAGE (2017 Value)	CROP DAMAGE (2017 Value)
Countywide	9/3/1961	Tropical Storm Carla	0	0	\$0	\$0
Countywide	6/22/1968	Tropical Depression Candy	0	0	\$0	\$0
Countywide	6/16/2015	Tropical Depression Bill	1	0	\$194,843	\$0
Totals			1	0	\$194,843	

Significant Events

Tropical Depression Bill on June 17, 2015

Tropical Depression Bill brought flooding to parts of Texas. Heavy rainfall fell in many counties along the storm's path including Bell County. The ground in many areas was still saturated from heavy rainfall from April and May, and the heavy rainfall from Tropical Depression Bill quickly overflowed creeks, streams, lakes, and roads. In some areas it took over 24 hours for the water to drain. Flooding was reported in the Holland and Nolanville areas as well. The local newspaper reported streets were impassable and some homes flooded. Flooded structures included City Hall, the Police Station, Fire Department and a recording studio. An 11 year old boy was swept into a drainage culvert near Avenue H and 10th Street after losing his footing when approaching whirling high waters in the culvert. He passed away on the 18th.

Section 14: Hurricane/Tropical Storm

Probability of Future Events

Based on historical occurrences of hurricane/tropical storm events, the probability of future events is unlikely, with a probability of one event every ten years for the entire Bell County planning area, including the CTCOG and all participating jurisdictions.

Vulnerability and Impact

Hurricane-force winds can cause major damage to large areas; hence all existing buildings, facilities, and populations are equally exposed and vulnerable to this hazard and could potentially be impacted. Warning time for hurricanes has lengthened due to modern and early warning technology. Hurricane-force winds can easily destroy poorly constructed buildings and mobile homes, as well as debris such as signs, roofing materials, and small items left outside become extremely hazardous in hurricanes and tropical storms. Extensive damage to trees, towers, and underground utility lines (from uprooted trees) and fallen poles cause considerable civic disruption.

The Bell County planning area features multiple mobile or manufactured home parks throughout the planning area including all participating jurisdictions. These parks are typically more vulnerable to thunderstorm wind events than typical site built structures. In addition, manufactured homes are located sporadically throughout the planning area in unincorporated portions of the county as well as within all participating jurisdictions.

The U.S. Census data indicates a total of 4,903 manufactured homes located in the Bell County planning area, including all participating jurisdictions (Table 14-3), totaling approximately 3.7% of the residential structures in the planning area. In addition, 35.7% (approximately 46,993 structures) of the single family residential (SFR) structures in the Bell County planning area were built before 1980. These structures would typically be built to lower or less stringent construction standards than newer construction and may be more susceptible to damages during significant Hurricane or Tropical Storm events. While the CTCOG does not have any manufactured homes or portable buildings, the facility was built prior to 1980 and may be more vulnerable.

Table 14-3. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	STRUCTURES BUILT BEFORE 1980
Bell County ¹	4,903	46,993
Bartlett	34	445
Belton	614	3,438
CTCOG	0	1
Harker Heights	1,414	2,480
Holland	48	290
Killeen	1,371	17,117
Little River Academy	128	403
Nolanville	518	500

¹ County totals includes all incorporated jurisdictions and unincorporated areas.

Section 14: Hurricane/Tropical Storm

JURISDICTION	MANUFACTURED HOMES	STRUCTURES BUILT BEFORE 1980
Rogers	84	298
Salado	10	157
Temple	907	14,607
Troy	36	354

The following critical facilities would be vulnerable to hurricane events in the Bell County planning area, by jurisdiction:

Table 14-4. Critical Facilities by Jurisdiction

JURISDICTION	CRITICAL FACILITIES
Bell County	Government Facility, OEM
Bartlett	Government Facility, Police Station, Fire Station, 2 Schools
Belton	Government Facility, Police Station, 2 Fire Stations, EOC, School, Shelter
CTCOG	CTCOG Office Building
Harker Heights	Government Facility, Police Station, 2 Fire Stations, Shelter, Hospital, Nursing Home, 13 Lift Stations, 9 Pump Stations, Communications Tower
Holland	Government Facility, Police Station, Fire Station, School, Community Center
Killeen	11 Government Facilities, 2 Police Stations, 8 Fire Stations, EOC, OEM, Public Works Facility, Shelter, Water Department Facility, Oncor Electric Services, Solid Waste Facility
Little River Academy	Government Facility, Police Station, Fire Station
Nolanville	Government Facility, Police Station, Fire Station, EMS, Public Works Facility, 2 Schools
Rogers	Government Facility, Police Station, Fire Station, School, 2 Water Towers, Wastewater Treatment Facility, Community Center
Salado	2 Government Facilities, Police Station, Wastewater Treatment Facility, 4 Schools, Transportation Facility (Bus Maintenance), Communications Facilities, Water Tower
Temple	Government Facility, Police Station, 8 Fire Stations, Public Works Facility, 4 Water Treatment Facilities, 3 Hospitals, Convention Center, 2 Dams, Panda Power Plant, 11 Water Towers, Ground Storage Tank, 7 Pump Stations, 22 Schools, Interstate, 2 Highways
Troy	Government Facility, Police Station, Water Well, Water Storage Facility and Pump, Water Tower, Wastewater Treatment Facility, 4 Schools

Damages in Table 14-2 are reported on a county-wide basis and are not independently available for each participating jurisdiction. The annual loss estimates for the entire planning area were considered negligible based on the 58 year reporting period for damages (Table 14-5).

Section 14: Hurricane/Tropical Storm

Table 14-5. Potential Annualized Losses, 1960-2017

JURISDICTION	NUMBER OF EVENTS	PROPERTY & CROP LOSS (2017 DOLLARS)	ANNUAL LOSS ESTIMATES (2017 DOLLARS)
Bell County	3	\$194,843	\$3,359

While the potential severity of impact from a hurricane for the Bell County planning area, including all participating jurisdictions, is considered minor, the historical fatalities support a major severity of impact; meaning injuries or illnesses result in permanent disability, complete shutdown of critical facilities and services for at least two weeks, and more than 25 percent of property would be destroyed or have major damage.

Assessment of Impacts

Hurricane events have the potential to pose a significant risk to people and can create dangerous and difficult situations for public health and safety officials. Impacts to the planning area can include:

- Individuals exposed to the storm can be struck by flying debris, falling limbs, or downed trees causing serious injury or death.
- Structures can be damaged or crushed by falling trees, which can result in physical harm to the occupants.
- Residential structures may suffer substantial damage, requiring immediate shelter and long-term displacement assistance for residents.
- Driving conditions in the planning area may be dangerous during a hurricane event, especially over elevated bridges, elevating the risk of injury and accidents during evacuations if not timed properly.
- Additional resources may be required for emergency preparedness and response during the summer months due to increases in populations.
- Emergency evacuations may be necessary prior to a hurricane landfall, requiring emergency responders, evacuation routing, and temporary shelters.
- Significant debris and downed trees can result in emergency response vehicles being unable to access areas of the community.
- Downed power lines may result in roadways being unsafe for use, which may prevent first responders from answering calls for assistance or rescue.
- Hurricane events often result in widespread power outages increasing the risk to more vulnerable portions of the population who rely on power for health and/or life safety.
- Extended power outage often results in an increase in structure fires and carbon monoxide poisoning, as individuals attempt to cook or heat their homes with alternate, unsafe cooking or heating devices, such as grills.
- Extreme hurricane events may rupture gas lines and down trees and power lines, increasing the risk of structure fires during and after a storm event.
- Extreme hurricane events may lead to prolonged evacuations during search and rescue, and immediate recovery efforts requiring additional emergency personnel and resources to prevent entry, and protect citizens and property.
- First responders are exposed to downed power lines, unstable and unusual debris, hazardous materials, and generally unsafe conditions.
- Emergency operations and services may be significantly impacted due to damaged facilities and/or loss of communications.

Section 14: Hurricane/Tropical Storm

- Critical staff may be unable to report for duty, limiting response capabilities.
- City, county departments or other government services may be damaged, delaying response and recovery efforts for the entire community.
- Private sector entities that the County and City and its residents rely on, such as utility providers, financial institutions, and medical care providers may not be fully operational and may require assistance from neighboring communities until full services can be restored.
- Economic disruption negatively impacts the programs and services provided by the community due to short and long- term loss in revenue.
- Some businesses not directly damaged by the hurricane may be negatively impacted while roads are cleared and utilities are being restored, further slowing economic recovery.
- Older structures built to less stringent building codes may suffer greater damage as they are typically more vulnerable to hurricane damage.
- Large scale hurricanes can have significant economic impact on the affected area, as it must now fund expenses such as infrastructure repair and restoration, temporary services and facilities, overtime pay for responders, as well as normal day-to-day operating expenses.
- Businesses that are more reliant on utility infrastructure than others may suffer greater damages without a backup power source.

The economic and financial impacts of a hurricane on the area will depend entirely on the scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the county, community, local businesses and citizens will also contribute to the overall economic and financial conditions in the aftermath of any hurricane event.

Section 15: Dam Failure

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Hazard Description

Dams are water storage, control, or diversion structures that impound water upstream in reservoirs. Dam failure can take several forms, including a collapse of or breach in the structure. While most dams have storage volumes small enough that failures have few or no repercussions, dams storing large amounts can cause significant flooding downstream. Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding, which cause most failures;
- Inadequate spillway capacity, resulting in excess overtopping of the embankment;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, or maintain gates, valves, and other operational components;
- Improper design or use of improper construction materials;
- Failure of upstream dams in the same drainage basin;
- Landslides into reservoirs, which cause surges that result in overtopping;
- High winds, which can cause significant wave action and result in substantial erosion;
- Destructive acts of terrorism; and,

Benefits provided by dams include water supplies for drinking; irrigation and industrial uses; flood control; hydroelectric power; recreation; and navigation. At the same time, dams also represent a risk to public safety. Dams require ongoing maintenance, monitoring, safety inspections, and sometimes even rehabilitation to continue safe service.

In the event of a dam failure, the energy of the water stored behind the dam is capable of causing rapid and unexpected flooding downstream, resulting in loss of life and substantial property damage. A devastating effect on water supply and power generation could be expected as well. The terrorist attacks of September 11, 2001 generated increased focus on protecting the country’s infrastructure, including ensuring the safety of dams.

One major issue with the safety of dams is their age. The average age of America’s 84,000 dams is 52 years. According to statistics released in 2009 by the Association of State Dam Safety Officials¹, more than 2,000 dams near population centers are in need of repair. In addition to the continual aging

¹ Association of State Dam Safety Officials, Journal of Dam Safety

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of dams, there have not been significant increases in the number of safety inspectors resulting in haphazard maintenance and inspection.

The Association of State Dam Safety Officials estimate that \$16 billion will be needed to repair all high-hazard dams, but the total for all state dam-safety budgets is less than \$60 million². The current maintenance budget does not match the scale of America's long-term modifications of its watersheds. Worse still, more people are moving into risky areas. As the American population grows, dams that once could have failed without major repercussions are now upstream of cities and development.



Location

The State of Texas has 7,413 dams, all regulated by the Texas Commission on Environmental Quality (TCEQ). The National Dam Safety Review Board (in coordination with FEMA) and the National Inventory of Dams (NID) lists a total of 68 dams in the entire Bell County planning area, including all participating jurisdictions. Each of these dams were analyzed individually by location, volume, elevation, and condition (where available) when determining the risk, if any, for each dam. Each dam site was further analyzed for potential risks utilizing FEMA's National Flood Hazard Layer to map locations and fully understand development near the dam and topographical variations that may increase risk. Most of the dams listed were embankments for typically small or dry detention drainage areas or shored up stream embankments. These types of structures are utilized for flood control and do not pose a dam failure risk. Other dams in the planning area feature such limited storage capacity that they pose no risk to structures, infrastructure, or citizens. Dams that were deemed to pose no past, current, or future risk to the planning area are not profiled in the plan as no loss of life or impact to critical facilities or infrastructure is expected in the event of a breach or a failure. Based on this detailed analysis, the planning team was able to determine that only 4 of the 68 dams pose a risk to

² Source: www.damsafety.org

Section 15: Dam Failure

the planning area. These dams, listed in Table 15-1, are profiled in detail below. Figure 15-1, illustrates the general location for the critical dams in the planning area.

Figure 15-1. Critical Dam Locations in Bell County

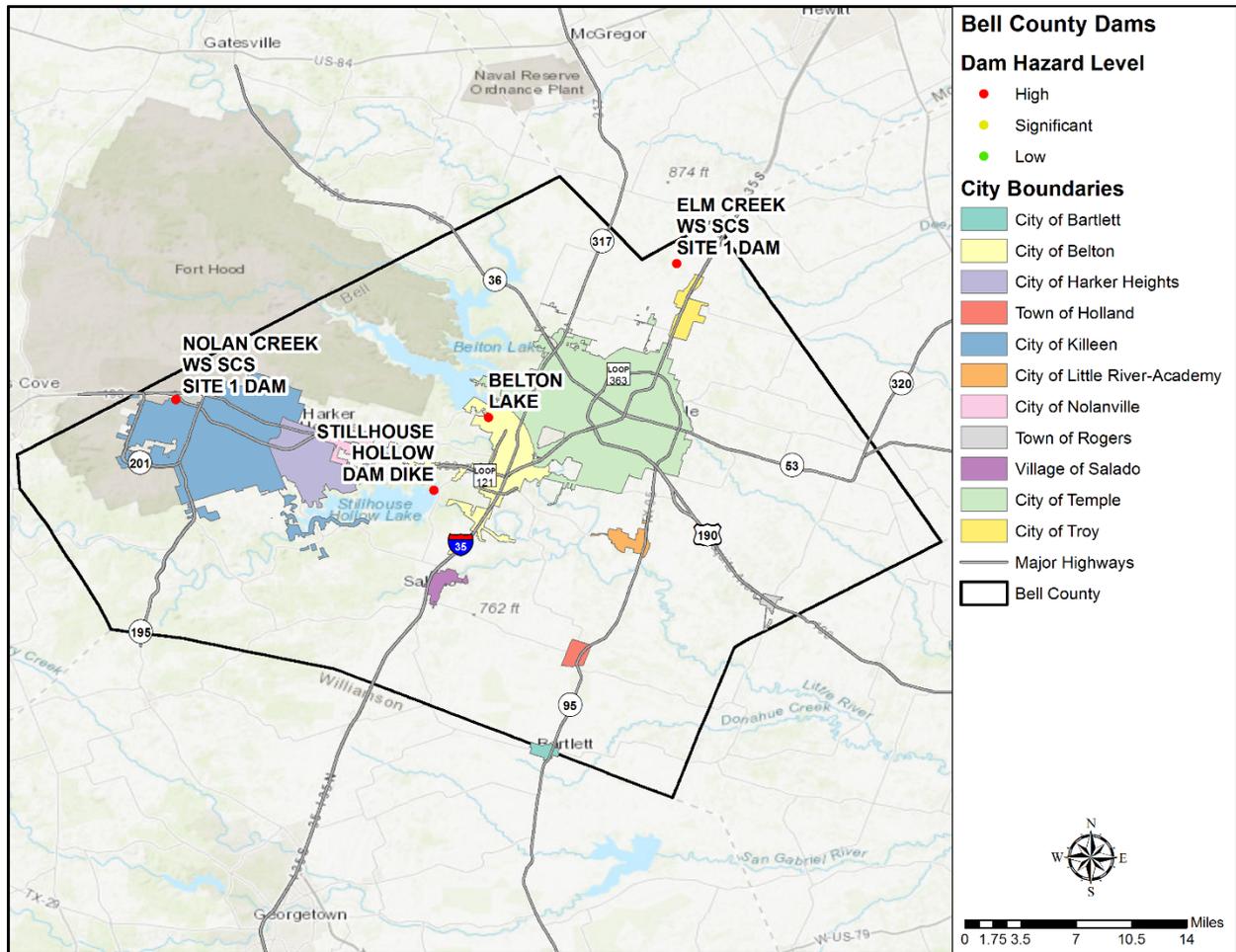


Table 15-1. Bell County Dam Survey

JURISDICTION	DAM NAME	HEIGHT (Ft.)	STORAGE (Acre Ft.)	CONDITION ³	PROFILED
Belton	Belton Lake	192	1,876,700	Fair	Yes
Bell County	Elm Creek WS SCS Site 1 Dam	74	18,300	Not Rated	Yes
Killeen	Nolan Creek WS SCS Site 1 Dam	56	5,000	Not Rated	Yes
Bell County	Stillhouse Hollow Dam Dike	200	1,013,800	Fair	Yes

³ Condition provided if available.

Section 15: Dam Failure

Extent

The extent or magnitude of a dam failure event is described in terms of the classification of damages that could result from a dam's failure, not the probability of failure. For dams with a maximum storage capacity of 100,000 acre-feet or more, all structures within five miles are considered to be at risk to potential dam failure hazards. For dams with a maximum storage capacity between 10,000 and 100,000 acre-feet, all structures within three miles are considered to be at risk to potential dam failure hazards. For dams with a maximum storage capacity of less than 10,000 acre-feet, all structures within one mile are considered to be at risk to potential dam failure hazards.

Belton Lake Dam:

Belton Lake Dam is located in Bell County on the Leon River. The dam was constructed in 1954 and is used for recreational purposes. It is owned by the U.S. Army Corps of Engineers. The area located near the dam is densely populated with residential and commercial development. While the flow of the breach is anticipated to follow the designated floodplain area, a catastrophic breach could impact approximately 2,000 residential structures within five miles of the dam as well as multiple commercial structures including a Super Walmart, waterpark, Walgreens, Goodwill, HEB, the University of Mary Hardin-Baylor, Heritage Park, Lakewood Elementary School, and multiple restaurants. The CTCOG facility is also located in the estimated inundation zone and could be impacted by a dam breach. Little River Academy may experience flooding from a substantial breach. The jurisdiction is not considering dam failure as a hazard since the flood impact is profiled under a different profile (Section 6). A dam failure could cause substantial infrastructure damages, power outages, and utility systems disruptions. In the event of a breach, it is estimated the average breach width would be 1,308.9 feet with a maximum breach flow of 5,195,402 cubic feet per second according to the National Weather Service (NWS) Dam Break Equation. A dam breach could result in an estimated depth up to 25 feet with the highest depth in the immediate area of the dam.

Elm Creek WS SCS Site 1 Dam:

Elm Creek WS SCS Site 1 Dam is located on Big Elm Creek in Bell County. The dam was constructed in 1984. The dam is owned by the Central Texas Soil and Water Conservation District. The reservoir is used for flood control purposes. The area located near the dam is rural with limited residential development. The area near the dam is limited rolling terrain with relatively limited changes in elevations. Approximately 48 residential structures and some limited infrastructure within three miles of the dam may be impacted in the event of a breach. A dam failure could also cause limited infrastructure damages, minor power outages, and utility systems disruptions. In the event of a breach, it is estimated the average breach width would be 324.1 feet with a maximum breach flow of 4,047 cubic feet per second according to the National Weather Service (NWS) Dam Break Equation. A dam breach could result in an estimated depth of zero to 15 feet with the highest depth in the immediate area of the dam.

Nolan Creek WS SCS Site 1 Dam:

Nolan Creek WS SCS Site 1 Dam is located in Killeen in Bell County on the South Nolan Creek. The dam was constructed in 1967 and is owned by the Nolan Creek Water Control District. The area located near the dam is rural with limited residential development. While the capacity of the dam is very limited, the area near the dam is densely populated. Approximately 200 residential structures and 10 commercial structures within one mile of the dam may be impacted in the event of a breach as well as infrastructure including Highway I-10. A dam failure could also cause limited infrastructure damages, minor power outages, and utility systems disruptions. In the event of a breach, it is estimated the average breach width would be 218.5 feet with a maximum breach flow of 15,166 cubic feet per

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second according to the National Weather Service (NWS) Dam Break Equation. A dam breach could result in an estimated depth of zero to 15 feet with the highest depth in the immediate area of the dam.

Stillhouse Hollow Dam:

Stillhouse Hollow Dam is located in Bell County on the Lampasas River. The dam was constructed in 1968. The Dam is owned by the U.S. Corps of Engineers and is used for recreational purposes. The area near the dam is rolling terrain with relatively limited changes in elevations. Approximately 300 residential structures and 10 commercial structures within three miles of the dam may be impacted in the event of a breach. In addition, there is a UPS Service Center, RV center and park, Central Texas State Fair Grounds, 2 gas stations, hotel, and a veterinary clinic. A dam failure could also cause limited infrastructure damages, minor power outages, and utility systems disruptions. In the event of a breach, it is estimated the average breach width would be 1,133.6 feet with a maximum breach flow of 4,161,539 cubic feet per second according to the National Weather Service (NWS) Dam Break Equation. A dam breach could result in an estimated depth up to 25 feet with the highest depth in the immediate area of the dam.

Table 15-2 represents the extent or magnitude of a dam failure event that could be expected for the Bell County planning area for the profiled dam. There are no dams posing a risk to the following participating jurisdictions: Bartlett, Harker Heights, Holland, Little River Academy, Nolanville, Rogers, Salado, Temple, and Troy. Any secondary flooding caused by a dam failure for these jurisdictions is covered under flood in Section 6. Therefore, these jurisdictions will not be profiling dam failure as a hazard.

Table 15-2. Extent by Jurisdiction

JURISDICTION	PROFILED DAM	EXTENT (FLOW DEPTH)	LEVEL OF INTENSITY TO MITIGATE
Bell County	Elm Creek WS SCS Site 1 Dam	0-15 Feet	Dam failure presents a low threat for the County. Loss of life is not expected, no critical facilities or infrastructure would be impacted, and economic loss would be minimal in the event of a dam failure.
Bell County	Stillhouse Hollow Dam Dike	0-25 Feet	Dam failure presents a substantial threat for the County. Significant loss of life is expected. Extensive residential and commercial structures would be impacted as well as critical facilities, infrastructure, and utilities. Economic loss would be catastrophic in the event of a dam failure.
Belton and CTCOG	Belton Lake	0-25 Feet	Dam failure presents a substantial threat for the County. Significant loss of life is expected. Extensive residential and commercial structures would be impacted as well as critical facilities, infrastructure, and utilities. The CTCOG facility could also be impacted. Economic loss would be catastrophic in the event of a dam failure.

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JURISDICTION	PROFILED DAM	EXTENT (FLOW DEPTH)	LEVEL OF INTENSITY TO MITIGATE
Killeen	Nolan Creek WS SCS Site 1 Dam	0-15 Feet	Dam failure presents a low threat for the City. Loss of life is not expected, no critical facilities or infrastructure would be impacted, and economic loss would be minimal in the event of a dam failure.

Historical Occurrences

There are approximately 84,000 dams in the United States today.⁴ Catastrophic dam failures have occurred frequently throughout the past century. Between 1918 and 1958, 33 major U.S. dam failures caused 1,680 deaths. From 1959 to 1965, nine major dams failed worldwide. Some of the largest disasters in the U.S. have resulted from dam failures. More than 90 dam incidents, including 23 dam failures, were reported in the past ten years to the National Performance of Dams Program, which collects and archives information on dam performance from state and federal regulatory agencies and dam owners.

The State of Texas has not experienced loss of life or extensive economic damage due to a dam failure since the first half of the twentieth century. However, there may be many incidents that are not reported and, therefore, the actual number of incidents is likely to be greater.

There has not been a recorded dam failure event for any of the participating jurisdictions in the Bell County planning area.

Probability of Future Events

No historical events of dam failure have been recorded in the Bell County planning area, though the risk of dam failure is monitored closely. Due to the lack of historical occurrences, the probability of a future event is unlikely for those jurisdictions profiling dam failure as a hazard, meaning an event is possible in the next ten years.

Vulnerability and Impact

There are 68 dams in the Bell County planning area. All dams were evaluated in-depth to determine the risk, if any, associated with each dam. This analysis indicated 4 dams in the planning area that present a risk to structures or infrastructure in the planning area.

Flooding is the most prominent effect of dam failure. If the dam failure is extensive, a large amount of water would enter the downstream waterways forcing them out of their banks. There may be significant environmental effects, resulting in flooding that could disperse debris and hazardous materials downstream that can damage local ecosystems. If the event is severe, debris carried downstream can block traffic flow, cause power outages, and disrupt local utilities, such as water and wastewater, which could result in school closures. For specific vulnerability, please refer to the narratives below each hazardous dam in this section.

⁴ Federal Emergency Management Agency, Dam Safety Program, available at: <http://www.fema.gov/hazards/damsafety/>

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Annualized loss-estimates for dam failure are not available; neither is there a breakdown of potential dollar losses for critical facilities, infrastructure and lifelines, or hazardous-materials facilities. If a major dam should fail, however, the severity of impact could be substantial. The following participating jurisdictions are not located in any areas at risk for dam failure: Bartlett, Harker Heights, Holland, Nolanville, Rogers, Salado, Temple, and Troy.

A dam breach could result in possible injuries and fatalities with facilities being shut down for more than 30 days, and more than fifty percent of property in the path of the breach destroyed or damaged. For these reasons, creating mitigation actions to remove or protect people and structures from the path of destruction is necessary in order to minimize impact from dam failure.

Assessment of Impacts

Any individual dam has a very specific area that will be impacted by a catastrophic failure. Dams identified as high or significant hazard can directly threaten the lives of individuals living or working in the inundation zone below the dam. The impact from any catastrophic failure would be similar to that of a flash flood. Potential impacts for the planning area include:

- Lives could be lost.
- A dam breach at Belton Lake could devastate the local economy, destroying recreational activities such as boating and camping for years. Tourism may be unavailable or unappealing, slowing economic recovery.
- There could be injuries from impacts with debris carried by the flood.
- Swift-water rescue of individuals trapped by the water puts the immediate responders at risk for their own lives.
- Individuals involved in the cleanup may be at risk from the debris left behind.
- Continuity of operations for any jurisdiction outside the direct impact area could be very limited.
- Roads and bridges could be destroyed.
- Homes and businesses could be damaged or destroyed.
- Emergency services may be temporarily unavailable.
- Disruption of operations and the delivery of services in the impacted area.
- A large dam with a high head of water could effectively scour the terrain below it for miles, taking out all buildings and other infrastructure.
- Scouring force could erode soil and any buried pipelines.
- Scouring action of a large dam will destroy all vegetation in its path.
- Wildlife and wildlife habitat caught in the flow will likely be destroyed.
- Fish habitat will likely be destroyed.
- Topsoil will erode, slowing the return of natural vegetation.
- The destructive high velocity water flow may include substantial debris and hazardous materials, significantly increasing the risks to life and property in its path.
- Debris and hazardous material deposited downstream may cause further pollution of areas far greater than the inundation zone.
- Destroyed businesses and homes may not be rebuilt, reducing the tax base and impacting long term economic recovery.
- Historical or cultural resources may be damaged or destroyed

The economic and financial impacts of dam failure on the area will depend entirely on the location of the dam, scale of the event, what is damaged, and how quickly repairs to critical components of the economy can be implemented. The level of preparedness and pre-event planning done by the

Section 15: Dam Failure

community, local businesses, and citizens will also contribute to the overall economic and financial conditions in the aftermath of any dam failure event.

Section 16: Mitigation Strategy

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Mitigation Goals

Based on the results of the risk and capability assessments, the Planning Team developed and prioritized the mitigation strategy which includes all participating jurisdictions. At the Mitigation Workshop in September 2017, Planning Team members refined the Plan’s mitigation strategy. The following goals and objectives were identified.

Goal 1

Protect public health and safety.

Objective 1.1

Advise the public about health and safety precautions to guard against injury and loss of life from hazards.

Objective 1.2

Maximize utilization of the latest technology to provide adequate warning, communication, and mitigation of hazard events.

Objective 1.3

Reduce the danger to, and enhance protection of, high risk areas during hazard events.

Objective 1.4

Protect critical facilities and services.

Goal 2

Build and support local capacity and commitment to continuously become less vulnerable to hazards.

Objective 2.1

Build and support local partnerships to continuously become less vulnerable to hazards.

Objective 2.2

Build a cadre of committed volunteers to safeguard the community before, during, and after a disaster.

Objective 2.3

Build hazard mitigation concerns into county planning and budgeting processes.

Section 16: Mitigation Strategy

Goal 3

Increase public understanding, support, and demand for hazard mitigation.

Objective 3.1

Heighten public awareness regarding the full range of natural and man-made hazards the public may face.

Objective 3.2

Educate the public on actions they can take to prevent or reduce the loss of life or property from all hazards and increase individual efforts to respond to potential hazards.

Objective 3.3

Publicize and encourage the adoption of appropriate hazard mitigation measures.

Goal 4

Protect new and existing properties.

Objective 4.1

Reduce repetitive losses to the National Flood Insurance Program (NFIP).

Objective 4.2

Use the most cost-effective approach to protect existing buildings and public infrastructure from hazards.

Objective 4.3

Enact or enforce regulatory measures to ensure that future development will not put people in harm's way or increase threats to existing properties.



Goal 5

Maximize the resources for investment in hazard mitigation.

Objective 5.1

Maximize the use of outside sources of funding

Objective 5.2

Maximize participation of property owners in protecting their properties.

Objective 5.3

Maximize insurance coverage to provide financial protection against hazard events.

Objective 5.4

Prioritize mitigation projects, based on cost-effectiveness and sites facing the greatest threat to life, health, and property.

Goal 6

Promote growth in a sustainable manner.

Objective 6.1

Incorporate hazard mitigation activities into long-range planning and development activities.

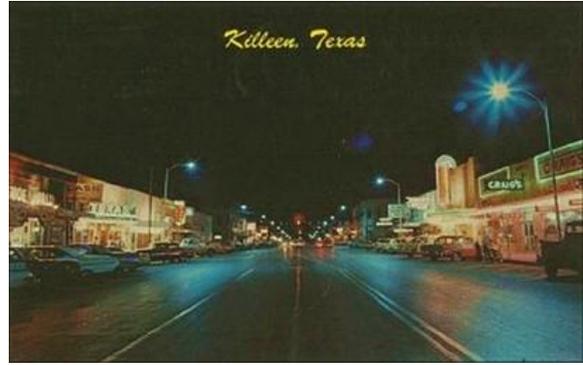
Section 16: Mitigation Strategy

Objective 6.2

Promote beneficial uses of hazardous areas while expanding open space and recreational opportunities.

Objective 6.3

Utilize regulatory approaches to prevent creation of future hazards to life and property.



Section 17: Mitigation Actions

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Summary

As discussed in Section 2, at the mitigation workshop the planning team and stakeholders met to develop mitigation actions for each of the natural hazards included in the Plan. Each of the actions in this section were prioritized based on FEMA’s Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) criteria necessary for the implementation of each action. As a result of this exercise, an overall priority was assigned to each mitigation action.

As part of the economic evaluation of the STAPLEE analysis, jurisdictions analyzed each action in terms of the overall costs, measuring whether the potential benefit to be gained from the action outweighed costs associated with it. As a result of this exercise, priority was assigned to each mitigation action by marking them as High (H), Moderate (M), or Low (L). An action that is ranked as “High” indicates that the action will be implemented as soon as funding is received. A “Moderate” action is one that may not be implemented right away depending on the cost and number of citizens served by the action. Actions ranked as “Low” indicate that they will not be implemented without first seeking grant funding and after “High” and “Moderate” actions have been completed.

All mitigation actions created by Planning Team members are presented in this section in the form of Mitigation Action Worksheets. More than one hazard is sometimes listed for an action, if appropriate. Actions presented in this section represent a comprehensive range of mitigation actions per current State and FEMA Guidelines, including two actions, per hazard, and of two different types for each participating jurisdiction. It should be noted that county-wide actions #8-18 refers to Bell County and all participating jurisdictions.

Section 17: Mitigation Actions

Table 17-1. Bell County and Participating Jurisdictions Mitigation Action Matrix

TYPE OF ACTION	
Action #1 – Plans/Regulations (Blue)	Action #4 – Structural (Orange)
Action #2 – Education/Awareness (Red)	Action #5 – Preparedness/Response (Black)
Action #3 – Natural Resources (Green)	

Jurisdiction	Thunderstorm Wind	Flood	Extreme Heat	Tornado	Hail	Wildfire	Drought	Lightning	Winter Storm	Hurricane	Dam Failure
Bell County	XX	XXXX	XX	XX	XX	XXX	XXX	XX	XX	XX	XX
City of Bartlett	XXX	XXX	XX	XXX	XXX	XXX	XXXX	XX	XX	XXX	XXX
City of Belton	XX	XXX	XX	XX	XX	XXX	XXX	XX	XX	XX	XX
City of Harker Heights	XX	XXXX	XX	XX	XX	XXX	XXX	XX	XX	XXX	XXX
City of Holland	XX	XXX	XX	XX	XX	XXX	XXX	XX	XX	XX	N/A
City of Killeen	XX	XXX	XX	XX	XX	XXXX	XXX	XX	XX	XX	XXX
City of Little River Academy	XX	XXX	XX	XX	XX	XXXX	XXX	XX	XX	XX	N/A
City of Nolanville	XX	XXX	XX	XX	XX	XXX	XXX	XX	XX	XX	N/A
City of Rogers	XX	XXXX	XX	XX	XX	XXX	XXX	XX	XX	XX	N/A
Village of Salado	XXX	XXXX	XX	XXX	XXX	XXXX	XXX	XXX	XXXX	XXX	N/A
City of Temple	XXX	XXXX	XX	XX	XX	XXX	XXX	XX	XX	XX	N/A
City of Troy	XX	XXX	XX	XX	XX	XXXX	XXX	XX	XX	XX	N/A
CTCOG	XXX	XXXX	XXXX	XX	XX	XXX	XXXX	XX	XX	XX	XX

Section 17: Mitigation Actions

Bell County

Bell County – Action #1	
Proposed Action:	Acquire and install early warning system for Dam Failure.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Bell County Unincorporated, Belton, Killeen, & CTCOG
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and property through early warning.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	County Emergency Management
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Bell County – Action #2	
Proposed Action:	Create a drainage ditch and channel maintenance program to maintain maximum flow capacity.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flood damages through maintained capacity of drainage system.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure (only Bell County, Belton, Killeen, & CTCOG), Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	County Public Works
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Bell County – Action #3	
Proposed Action:	Identify households in the floodplain and dam inundation zones to include in Code Red notification system.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents through early notification.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure (only Bell County, Belton, Killeen, & CTCOG), Flood
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$2,000
Potential Funding Sources:	Local Revenue
Lead Agency/Department Responsible:	County Emergency Management
Implementation Schedule:	Within 36-48 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Bell County – Action #4	
Proposed Action:	Build community safe rooms; Utilize safe rooms as local community center as well as cooling and heating center during extreme temperatures; Educate public of the safe room locations and operating procedures.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Countywide: Build site near the Expo Center
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents by providing shelter during extreme events.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure (Tornado, Hurricane) Education and Awareness (Extreme Heat, Winter Storm)

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Hurricane, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to new structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$4,000,000
Potential Funding Sources:	Bonds, HMGP, PDM
Lead Agency/Department Responsible:	County Emergency Management
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Bell County – Action #5	
Proposed Action:	Harden/retrofit Justice Complex against impacts from wind, lightning, hail, and wildfire.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Bell County Unincorporated: Bell County Justice Center
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages to Justice Center; Ensure continuity of emergency services; Protect lives.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Potential Funding Sources:	Bonds, HMGP, PDM
Lead Agency/Department Responsible:	County Emergency Management
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Bell County – Action #6	
Proposed Action:	Review and update the Bell County MS4 Permit 5 Year Plan.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide
Risk Reduction Benefit (<i>Current Cost/Losses Avoided</i>):	Establish guidance for stormwater conveyance and discharge into US waters without combined sewer conveyance.
Type of Action (<i>Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness</i>)	Local Plans and Regulations - Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$20,000
Potential Funding Sources:	Bonds, State and Federal Grants
Lead Agency/Department Responsible:	County Engineer Office
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Stormwater Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Bell County – Action #7	
Proposed Action:	Review and update the basin-wide stormwater drainage plan (expires in 2019).
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Promote low impact development in the drainage basin.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations - Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$50,000
Potential Funding Sources:	Bonds, State and Federal Grants
Lead Agency/Department Responsible:	County Engineer Office
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	MS4 Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Bell County – Action #8	
Proposed Action:	Revise/update flood drainage prevention ordinance to include higher standards above minimum NFIP requirements; Join the Community Rating System.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide (including all participating jurisdictions)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flood damages through building restrictions and safer development standards; Reduce flood insurance premiums.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to new and existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$2,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	County and City Administration
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Flood Damage Prevention Ordinance

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Bell County – Action #9	
Proposed Action:	Install culverts at low water crossings; upgrade undersized culverts; Install bridges as needed to increase flow capacity and improve ingress/ egress routes.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide (including all participating jurisdictions)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flood damages through improved damage capacity; Reduce road damages at low water crossings; Protect lives; Ensure access of emergency services; Reduce structure and infrastructure flood damages due to inadequate drainage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$5,000,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	County and City Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Drainage Plans

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Bell County – Action #10	
Proposed Action:	Install generators with hard wired quick connects at all critical facilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide: Critical Facilities including but not limited to wastewater treatment plants, Police Stations, Fire Stations, and EMS (including all participating jurisdictions)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages and protect lives through continuity of emergency services.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure (Dam Failure (only Bell County, Belton, Killeen, & CTCOG), Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$75,000 (per location)
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	County and City Public Works
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Bell County – Action #11	
Proposed Action:	Acquire and install flood gauges throughout the county to provide early flood warning.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide (including all participating jurisdictions)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Protect lives and property through early warning systems.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$1,000 (per site)
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	County and City Public Works
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 5; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Bell County – Action #12	
Proposed Action:	Implement education and awareness program utilizing media, social media, bulletins, mail flyers, etc. to educate citizens of hazards that can threaten the area, flood insurance availability, and mitigation measures to reduce injuries, fatalities, and property damages.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide (including all participating jurisdictions)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and property through education and awareness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure (Dam Failure (only Bell County, Belton, Killeen, & CTCOG), Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000 (per jurisdiction)
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	County and City Public Works
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Bell County – Action #13	
Proposed Action:	Implement a hazardous fuels reduction program in high hazard areas with emphasis on the Wildland Urban Interface (WUI); Partner with USACE for Fuels reduction around area lakes.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide (including all participating jurisdictions)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and property through fuels reduction in high risk areas.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	Reduce risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$2,000,000
Potential Funding Sources:	Local Revenue, Texas Forest Service, Federal Grants
Lead Agency/Department Responsible:	County and City Fire Department, USACE
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Community Wildfire Protection Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Bell County – Action #14	
Proposed Action:	Become a Stormready community.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide (including all participating jurisdictions)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and property through education and awareness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hurricane, Lightning, Thunderstorm Wind, Tornado
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$2,000 (per jurisdiction)
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	County and City Emergency Management
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Bell County – Action #15	
Proposed Action:	Adopt and implement water conservation measures at public facilities; Plant drought tolerant landscaping at public facilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide (including all participating jurisdictions)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce water usage during periods of drought.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000 (per jurisdiction)
Potential Funding Sources:	Local Revenue
Lead Agency/Department Responsible:	County and City Public Works
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Local Ordinances

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Bell County – Action #16	
Proposed Action:	Install or improve lightning protection devices on radio towers and emergency communication systems.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide locations (including all participating jurisdictions)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce damages to infrastructure; Maintain emergency communication systems to aid in emergency response and protect residents.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Lightning
Effect on New/Existing Buildings:	Reduce risk to existing critical equipment
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	County and City Emergency Management
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Bell County – Action #17	
Proposed Action:	Construct covered parking structure for emergency vehicles.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide locations (including all participating jurisdictions)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce damages to emergency response vehicles and equipment.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing critical equipment
Priority (High, Moderate, Low):	High
Estimated Cost:	\$50,000 (per jurisdiction)
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	County and City Emergency Management
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Bell County – Action #18	
Proposed Action:	Implement an individual safe room rebate program.
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide (including all participating jurisdictions)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of injury or loss of life to area residents through safe room construction at residential structures and small businesses.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Tornado
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$4,000-\$8,000 (per safe room)
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	County and City Emergency Management
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

City of Bartlett

Bartlett – Action #1	
Proposed Action:	Develop/enhance cooperation agreements with Donahoe Watershed Conservation District.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce loss of life and property.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations - Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	Bartlett City Administration in coordination with Water Conservation District
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Action Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Bartlett – Action #2	
Proposed Action:	Develop MOUs with other agencies who might be affected by dam failure (Bell County, Belton, Killeen, and CTCOG)
BACKGROUND INFORMATION	
Jurisdiction/Location:	Bell County, Belton, Killeen, CTCOG: Bell County dam sites at risk
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce loss of life and property
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations - Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	Bartlett City Administration in coordination with Bell County and local jurisdictions
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Action Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Bartlett – Action #3	
Proposed Action:	Develop and implement a water conservation plan; Adopt and implement water restrictions at public facilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce aquifer depletion and ensure continuity of critical services during periods of drought.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	Bartlett Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Action Plan; Water Conservation Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Bartlett – Action #4	
Proposed Action:	Upgrade water supply infrastructure to prevent leaks; Implement water monitoring program for early warning.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce water loss through leaks; Improve water quality; Provide early warning for proactive conservation.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Potential Funding Sources:	Local Revenues, State and Federal Grants
Lead Agency/Department Responsible:	Bartlett Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Water Contingency Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 3; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Bartlett – Action #5	
Proposed Action:	Assist vulnerable populations during extreme temperatures; Collect and distribute fans and electric heaters to vulnerable populations ahead of extreme heat events or winter storms.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide vulnerable populations
Risk Reduction Benefit (Current Cost/Losses Avoided):	Prevent illness or loss of life among vulnerable populations during extreme temperatures.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	Bartlett City Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

Section 17: Mitigation Actions

Bartlett – Action #6	
Proposed Action:	Implement education and awareness program utilizing media, social media, bulletins, etc. to educate citizens of hazards that can threaten the area and mitigation measures to reduce injuries, fatalities, and property damages.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and property through education and awareness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000
Potential Funding Sources:	Local Revenue (staff time), State and Federal Grants
Lead Agency/Department Responsible:	Bartlett City Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Bartlett – Action #7	
Proposed Action:	Adopt higher NFIP standards in the Bartlett Flood Damage Prevention Ordinance to reduce flood damages.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flood damages through improved construction requirements.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to new or substantially improved structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	Bartlett City Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Floodplain Ordinance

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Bartlett – Action #8	
Proposed Action:	Upgrade undersized drainage channels and culverts in flood prone areas.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide flood hazard areas
Risk Reduction Benefit (Current Cost/Losses Avoided):	Increase flow capacity; Reduce risk of damages to structures and infrastructure through improved drainage; Reduce risk to residents.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to new or existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Bartlett Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Bartlett – Action #9	
Proposed Action:	Harden critical facilities to protect against damages; Acquire and install an emergency back-up generator with permanent quick connections for city critical facilities to ensure the continuity of emergency services.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide Critical Facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to critical structures; Ensure continuity of emergency services.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Hail, Lightning, Flood, Hurricane, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$1,000,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Bartlett City Administration
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Bartlett – Action #10	
Proposed Action:	Implement a safe room rebate program for residential structures.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents through storm shelter construction program.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail, Hurricane, Thunderstorm Wind, Tornado
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000-\$8,000 (per safe room)
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	Bartlett City Administration
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Bartlett – Action #11	
Proposed Action:	Adopt and enforce ordinance to ensure regulations for tie-downs on installation of mobile homes.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents through storm shelter construction program.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail, Hurricane, Thunderstorm Wind, Tornado
Effect on New/Existing Buildings:	Reduce risk of existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	Bartlett City Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

City of Belton

Belton – Action #1	
Proposed Action:	Upgrade/expand early warning system for natural hazards such as flood; Update and implement early warning protocols and procedures.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Provide early notification to residents in known hazard areas so they have sufficient time to protect property and if necessary evacuate. Reduces the cost of personal losses and insurance claims as well as risk of injuries or fatalities.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Flood, Hail, Hurricane, Lightning, Thunderstorm Win, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$10,000
Potential Funding Sources:	General Budget Funds, State and Federal Grants
Lead Agency/Department Responsible:	Belton Fire Department
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Belton – Action #2	
Proposed Action:	Utilize media and social media outlets to educate citizens on risks to the community, mitigation measures to reduce property damages, and health and safety tips to reduce injuries or illness due to natural hazards.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to lives and property through all hazards education and awareness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$5,000
Potential Funding Sources:	General Budget Funds, State and Federal Grants
Lead Agency/Department Responsible:	Belton Fire Department
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

City of Harker Heights

Harker Heights – Action #1	
Proposed Action:	Evaluate current Mutual Aid Agreements and develop MOU where absent with the City of Belton in an effort to outline a response plan from the City of Harker Heights in the event of a Dam Failure.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Stillhouse Lake Dam – 3740 FM 1670, Belton, TX 76513 Belton Lake Dam – Temples Lake Park, Belton, TX 76513
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce disaster response times.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations - Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	Believed to be less than \$500 to develop agreements
Potential Funding Sources:	Local General Fund
Lead Agency/Department Responsible:	Harker Heights Emergency Management
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Hazard Mitigation Plan

COMMENTS
While the City of Harker Heights would not be directly affected by downstream flooding in the event of a dam failure of Stillhouse Lake or Lake Belton dams, it would be prudent upon Harker Heights to be prepared to assist those communities that would be affected.
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Harker Heights – Action #2	
Proposed Action:	Partner with City of Belton and/or other local agencies for the development of a consortium to address potential response to a dam failure or flooding.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Stillhouse Lake Dam – 3740 FM 1670, Belton, TX 76513 Belton Lake Dam – Temples Lake Park, Belton, TX 76513
Risk Reduction Benefit (Current Cost/Losses Avoided):	An effort to identify impact locations as well as response to dam failure and flooding as well as how regions could be impacted when these types of events occur. In addition, to identify the need for calling for evacuations.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations - Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Flooding
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	Less than \$500
Potential Funding Sources:	Local General Fund
Lead Agency/Department Responsible:	Harker Heights Emergency Management
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Hazard Mitigation Plan

COMMENTS
While the City of Harker Heights would not be directly affected by downstream flooding in the event of a dam failure of Stillhouse Lake or Lake Belton dams, it would be prudent upon Harker Heights to be prepared to assist those communities that would be affected.
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Harker Heights – Action #3	
Proposed Action:	Implement a public education program to inform citizens on the Code Red program and the services it provides during emergencies; Educate citizens on mitigation measures that can reduce damages and prevent injury or illness during hazard events.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	When citizens are enrolled in Code Red, they stand a greater chance of knowing when a significant event is potentially going to occur. This in turn gives them the opportunity to lessen their exposure to the elements during these events. Furthermore, it can provide details of water or utility outages occurring in our city and potential durations.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	Less than \$1,000
Potential Funding Sources:	HMGP, Local General Fund
Lead Agency/Department Responsible:	Harker Heights Emergency Management
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Harker Heights – Action #4	
Proposed Action:	Educate the citizens on the city’s drought contingency plan in preparation for extended periods of limited or no rainfall; Provide public with mitigation measures to reduce water usage during drought.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Understanding processes for the citizens assists them in reducing water usage during droughts and will also provide them with materials to know what areas become more important during these times.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Less than \$1,000
Potential Funding Sources:	Local General Fund
Lead Agency/Department Responsible:	Harker Heights Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Harker Heights – Action #5	
Proposed Action:	Identify vulnerable population as it pertains to extreme heat and winter storm events. Establish cooling center locations such as the public library or other community oriented locations to utilize during events. Collect and distribute fans and electric heaters to vulnerable populations.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	The citizens that are typically affected by extreme temperature situations are the elderly who have limited family and/or resources to assist them during these times. This program will provide a database of potential citizens and assist in taking preemptive measures to mitigate these types of emergencies and the need for medical assistance.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000
Potential Funding Sources:	Local General Fund, HMGP
Lead Agency/Department Responsible:	Police Department Health Homes Program
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

Section 17: Mitigation Actions

Harker Heights – Action #6	
Proposed Action:	Acquire and install an emergency back-up generator with permanent quick connections for critical facilities including (but not limited to) the water pump station (North Mary Jo Drive) and city evacuation shelters to ensure continuity of emergency services.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide Critical Facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Continue the essential services including providing shelter services in the event of a power outage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Hail, Lightning, Flood, Thunderstorm Wind, Tornado, Wildfire, Hurricane, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Potential Funding Sources:	HMGP, Local General Fund
Lead Agency/Department Responsible:	Harker Heights Emergency Management
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Harker Heights – Action #7	
Proposed Action:	Update and/or enhance current agreement with Bell County as it pertains to the sheltering of our sister community, Brazoria County’s, citizens.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	An event such as a hurricane is disruptive to say the least but when the requirement arises to evacuate your home and community to a different city it is imperative that we as hosts be prepared to handle the masses that are likely to be coming to our community. This will in-turn provide a friendlier atmosphere for those evacuating once they arrive.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations - Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	Less than \$500
Potential Funding Sources:	Local General Funds if necessary
Lead Agency/Department Responsible:	Harker Heights Emergency Management
Implementation Schedule:	Within 6 months of plan adoption
Incorporation into Existing Plans:	Evacuation Plan

COMMENTS
Our City in conjunction with our County are a host location for a sister county that is located along the Gulf Coast of Texas in the event of a hurricane where they are required to evacuate. In addition, we have areas within the city that have flooded in the recent past that have called for the need to shelter local residents during these events.
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Harker Heights – Action #8	
Proposed Action:	Implement public education program regarding the dangers of lightning and its effects to homes and business locations. Educate citizens on mitigation measures to reduce loss of life and safety tips to avoid injury or loss of life.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	This measure will provide valuable information to the public through the data provided from NOAA and their lightning safety tips and resources. This will better prepare citizens in the protection of themselves and their homes during these events thus lessening their exposure.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Lightning
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	Less than \$500
Potential Funding Sources:	HMGP, Local General Fund
Lead Agency/Department Responsible:	Harker Heights Emergency Management
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Our region is prone to weather events such as these and the need for public education is warranted.
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Harker Heights – Action #9	
Proposed Action:	Implement a tree trimming program that routinely cleans tree limbs hanging in right-of-ways.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Throughout City proper
Risk Reduction Benefit (Current Cost/Losses Avoided):	The creation of this program will assist in keeping tree limbs from being affected during severe weather events that cause limbs to fall onto power lines and create hazardous conditions and subsequent power outages.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Thunderstorm Wind, Tornado, Hurricane, Lightning, Hail, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$2,000
Potential Funding Sources:	Local General Fund
Lead Agency/Department Responsible:	Harker Heights Public Works
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Harker Heights – Action #10	
Proposed Action:	Increase risk awareness of hail and tornado through education systems as NWS Skywarn through City Emergency Management webpage as well as during public relations events. Educate public on mitigation measures to reduce damages as well as health and safety tips to prevent injury.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	The awareness of the educational opportunities prepares our citizens up-to-date and pertinent information that can and will bring about a reduction of loss of life and injury during such weather events.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail, Tornado
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	Less than \$500
Potential Funding Sources:	HMGP, Local General Fund
Lead Agency/Department Responsible:	Harker Heights Emergency Management
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Harker Heights – Action #11	
Proposed Action:	Conduct a public education program on fire risks and wildfire mitigation with the assistance of the Texas A&M Forest Services.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Wildfire prone subdivisions within the City – the Ridge and Comanche Hills Utility District
Risk Reduction Benefit (Current Cost/Losses Avoided):	The education of citizens in these areas will provide an enhanced understanding to the dangers of wildland fires and the need to create natural breaks between their homes and wildland urban interfaces. This will in-turn reduce the potential for their homes catching on fire in the event of a wildland fire in those areas.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	Less than \$1,000
Potential Funding Sources:	HMGP, Local General Fund, Texas A&M Forest Service Grant, Army Corp of Engineers
Lead Agency/Department Responsible:	Harker Heights Fire Department
Implementation Schedule:	Within 6 months of plan adoption
Incorporation into Existing Plans:	Community Wildfire Protection Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

City of Holland

Holland – Action #1	
Proposed Action:	Utilize media and social media on a regular schedule to educate citizens with information about mitigation activities to reduce risk to property and life from all hazards that pose a risk to the city.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to citizens and property through education and awareness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Funds (staff time)
Lead Agency/Department Responsible:	City of Holland Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Holland – Action #2	
Proposed Action:	Develop and implement a program to regularly clean and clear drainage ditches and culverts to maintain drainage capacity and reduce flooding.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flooding in high risk areas by maintaining maximum drainage capacity.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$10,000
Potential Funding Sources:	Local Funds (staff time), State and Federal Grants
Lead Agency/Department Responsible:	City of Holland Public Works
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Drainage Maintenance Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Holland – Action #3	
Proposed Action:	Acquire and install back-up generators with permanent quick connection wiring for critical facilities (including police, fire, water and sewer services).
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide Critical Facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages and injuries; Ensure continuity of critical services.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Funds, State and Federal Grants
Lead Agency/Department Responsible:	City of Holland Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Holland – Action #4	
Proposed Action:	Expand early warning system to include sirens or reverse 911 system to reach citizens without internet access.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages and injuries through comprehensive early warning system.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$2,000
Potential Funding Sources:	Local Funds, State and Federal Grants
Lead Agency/Department Responsible:	City of Holland Administration
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Holland – Action #5	
Proposed Action:	Upgrade/improve undersized drainage system to increase capacity and reduce flooding.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flood damages and injuries through increased drainage capacity and reduction in flood events.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$200,000
Potential Funding Sources:	Local Funds, State and Federal Grants
Lead Agency/Department Responsible:	City of Holland Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Holland – Action #6	
Proposed Action:	Implement tree trimming program around power lines.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of power outages resulting from downed trees or limbs.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$50,000
Potential Funding Sources:	Local Funds, State and Federal Grants
Lead Agency/Department Responsible:	City of Holland Public Works
Implementation Schedule:	Within 36 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Holland – Action #7	
Proposed Action:	Install drought tolerant landscaping at all public buildings.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide public buildings
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce water usage at public facilities during periods of drought.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Funds, State and Federal Grants
Lead Agency/Department Responsible:	City of Holland Public Works
Implementation Schedule:	Within 36 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

City of Killeen

Killeen – Action #1	
Proposed Action:	Implement education and awareness program utilizing media, social media, bulletins, etc. to educate citizens of hazards that can threaten the area and mitigation measures to reduce injuries, fatalities, and property damages.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and property through education and awareness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Killeen City Administration
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Killeen – Action #2	
Proposed Action:	Implement a fuels reduction program within city right-of-way and other high risk areas such as the Wildland Urban Interface (WUI).
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of wildfire and wildfire spread through fuels reduction program in high risk areas.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$250,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Killeen Fire Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Community Wildfire Protection Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Killeen – Action #3	
Proposed Action:	Adopt and implement program for planting of native, drought-tolerant plants at city parks and public buildings.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce water usage during periods of drought through drought tolerant landscaping.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural Systems Protection Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$2,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Killeen Public Works
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Killeen – Action #4	
Proposed Action:	Upgrade undersized drainage system throughout the city to increase storm water capacity and reduce flooding.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide (where needed)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flooding through increase/improved storm water capacity in high risk areas.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Killeen Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Killeen – Action #5	
Proposed Action:	Acquire and install an emergency back-up generator with permanent quick connections for city critical facilities to ensure continuity of emergency services.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide Critical Facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Continue essential services in the event of a power outage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Hail, Lightning, Flood, Hurricane, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$250,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Killeen Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Killeen – Action #6	
Proposed Action:	Install covered parking structures to protect emergency vehicles and equipment during severe weather events.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce damages to emergency vehicles and equipment.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Hail, Lightning, Thunderstorm Wind, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing emergency vehicles and equipment
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Killeen Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Killeen – Action #7	
Proposed Action:	Strengthen zoning ordinance to limit development in known high hazard areas.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents through improved construction practices.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Flood, Wildfire
Effect on New/Existing Buildings:	Reduce risk to new structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000
Potential Funding Sources:	Local Revenue
Lead Agency/Department Responsible:	Killeen Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Killeen – Action #8	
Proposed Action:	Purchase and install Automated High-Water warning signs at known flood areas.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide (where needed) – there are many areas in the City that intersect with low water crossings where this would be utilized
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of loss of life to residents. City staff can be notified of the high-water and close the road early.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$225,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Killeen Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Public Affairs Office/Public Works/Flood Response

COMMENTS
Early warning is imperative, these areas are flood prone and early notification would help deter motorist and pedestrians from crossing.
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 3; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 3; and Environmentally Sound = 4

Section 17: Mitigation Actions

Killeen – Action #9	
Proposed Action:	Purchase and install combined stream/rain gauges along South Nolan Creek and its tributaries.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide (where needed)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flood impacts with a stream monitoring and notification system.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$250,000
Potential Funding Sources:	Local Revenue, State and Federal Grants, Private Partnerships
Lead Agency/Department Responsible:	Killeen Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Public Works

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 3; Politically Acceptable = 5; Legal = 3; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Killeen – Action #10	
Proposed Action:	Develop and implement an ordinance requiring all new subdivisions to install outdoor warning sirens to cover new developed areas.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide – primarily the southern half which is heavy with new developments extending beyond the current siren system
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents with access to an Early Warning System (sirens).
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail, Lightning, Flood, Hurricane, Thunderstorm Wind, Tornado, Wildfire, Dam Failure
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$300,000
Potential Funding Sources:	Local Revenue, State and Federal Grants, Private Partnerships
Lead Agency/Department Responsible:	Planning and Development
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Public Information & Warning Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 3; Economically Sound = 5; and Environmentally Sound = 4

Section 17: Mitigation Actions

City of Little River Academy

Little River Academy – Action #1	
Proposed Action:	Implement education and awareness program utilizing media, social media, bulletins, etc. to educate citizens of hazards that can threaten the area and mitigation measures to reduce injuries, fatalities, and property damages.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and property through education and awareness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Little River Academy Administration
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Little River Academy – Action #2	
Proposed Action:	Implement a fuels reduction program within city right-of-way and other high risk areas such as the Wildland Urban Interface (WUI).
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of wildfire and wildfire spread through fuels reduction program in high risk areas.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$250,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Little River Academy Fire Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Community Wildfire Protection Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Little River Academy – Action #3	
Proposed Action:	Adopt and implement program for planting of native, drought-tolerant plants at city parks and public buildings.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce water usage during periods of drought through drought tolerant landscaping.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural Systems Protection Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$2,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Little River Academy Administration
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Little River Academy – Action #4	
Proposed Action:	Upgrade undersized drainage system throughout the city to increase storm water capacity and reduce flooding.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide (where needed)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flooding through increased/improved storm water capacity in high risk areas.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Little River Academy Administration
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Little River Academy – Action #5	
Proposed Action:	Acquire and install an emergency back-up generator with permanent quick connections for city critical facilities to ensure continuity of emergency services.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Community Critical Facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Continue essential services in the event of a power outage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Hail, Lightning, Flood, Hurricane, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$250,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Little River Academy Administration
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Little River Academy – Action #6	
Proposed Action:	Install covered parking structures to protect emergency vehicles and equipment during severe weather events.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Community-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce damages to emergency vehicles and equipment.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Hail, Lightning, Thunderstorm Wind, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing emergency vehicles and equipment
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Little River Academy Administration
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Little River Academy – Action #7	
Proposed Action:	Strengthen zoning ordinance to limit development in known high hazard areas.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents through improved construction practices.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Wildfire
Effect on New/Existing Buildings:	Reduce risk to new structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000
Potential Funding Sources:	Local Revenue
Lead Agency/Department Responsible:	Little River Academy Administration
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

City of Nolanville

Nolanville – Action #1	
Proposed Action:	Purchase and install early (weather) warning system to enhance city’s ability to notify the public during extreme weather events.
BACKGROUND INFORMATION	
Jurisdiction/Location:	At the EOC (100 N Main Street, Nolanville TX 76559) and specified locations throughout the city
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and provide additional warning of hazardous events.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hurricane, Flood, Tornado, Wildfire, Thunderstorm Wind
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$65,000
Potential Funding Sources:	HMGP, PDM, Local Revenue
Lead Agency/Department Responsible:	Nolanville Emergency Management
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
City has no type of static warning system. This will enable city to provide early warning to the citizens and reduce possible loss of life.
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Nolanville – Action #2	
Proposed Action:	Implement education and awareness program utilizing media, social media, bulletins, etc. to educate citizens of hazards that can threaten the area and mitigation measures to reduce injuries, fatalities, and property damages.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and property through education and awareness
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$20,000
Potential Funding Sources:	HMGP, PDM, Local Revenue
Lead Agency/Department Responsible:	Nolanville Emergency Management
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Will be used to education residents by helping them understand what to do in the case of an emergency; also will be used to reach out to non-English speaking areas of the community.
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Nolanville – Action #3	
Proposed Action:	Purchase and install emergency generators with permanent wired quick connections to critical facilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	101 N Main Street (EOC), and 100 N Main Street (Fire Department)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and ensure continuity of emergency services.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$80,000
Potential Funding Sources:	HMGP, PDM, Local Revenue
Lead Agency/Department Responsible:	Nolanville Emergency Management and City Manager
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
This action is essential for continuing operations of the city in case of any type of event where the city loses power.
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Nolanville – Action #4	
Proposed Action:	Upgrade/replace bridges over main roadways including Levi Crossing, and Old Nolanville Road.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Levi Crossing and Old Nolanville Road
Risk Reduction Benefit (Current Cost/Losses Avoided):	Increase flow capacity at these critical roadways; Reduce damages at these sites due to inadequate or undersized bridges; Ensure emergency access to isolated parts of the city.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$20,000,000
Potential Funding Sources:	HMGP, PDM, Local Revenue
Lead Agency/Department Responsible:	Nolanville City Manager and Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan; Land Use Plan

COMMENTS
The two bridges are critical for the continuity of operations in the city limits. These bridges are the only way to access parts of the city.
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Nolanville – Action #5	
Proposed Action:	Purchase and install Automated High-Water Warning Signs at known flood areas.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Old Nolanville Road and Levi's Crossing
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk or loss of life to residents; Alerts emergency services that water is about to wash over roadway; Emergency services can close roads prior to loss of life.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$15,000
Potential Funding Sources:	HMGP, PDM, Local Revenue
Lead Agency/Department Responsible:	Nolanville City Manager and Public Works
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Early warning is imperative, these areas are flood prone and early control would help deter motorists from crossing, thus potentially saving lives.
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Nolanville – Action #6	
Proposed Action:	Expand retention pond.
BACKGROUND INFORMATION	
Jurisdiction/Location:	10 th Street inside the city limits
Risk Reduction Benefit (<i>Current Cost/Losses Avoided</i>):	Increase retention capacity of flood waters; Reduce flooding damages to city streets, structures and infrastructure; Protect residents from injury or potential loss of life and property.
Type of Action (<i>Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness</i>)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structure and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000,000
Potential Funding Sources:	HMGP, PDM, Local Revenue
Lead Agency/Department Responsible:	Nolanville City Manager and Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Nolanville – Action #7	
Proposed Action:	Reroute, clean and clear existing drainage system to restore maximum flow capacity.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Numerous areas within the city and the surrounding area.
Risk Reduction Benefit (Current Cost/Losses Avoided):	Re-direct runoff from entering city streets and reduce potential loss of roadway during flood event; Increase flow capacity within drainage system to reduce flood damages.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structure and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$4,000,000
Potential Funding Sources:	HMGP, PDM, Local Revenue
Lead Agency/Department Responsible:	Nolanville City Manager and Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Nolanville – Action #8	
Proposed Action:	Purchase and install warning signs for high water, flood, and other caution signage.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Numerous areas within the city and the surrounding area
Risk Reduction Benefit (Current Cost/Losses Avoided):	Early warning and possible prevention of potential loss of life at high risk areas.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$19,000
Potential Funding Sources:	HMGP, PDM, Local Revenue
Lead Agency/Department Responsible:	Nolanville City Manager and Public Works
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Nolanville – Action #9	
Proposed Action:	Purchase and installation of culvert.
BACKGROUND INFORMATION	
Jurisdiction/Location:	FM 439 Spur
Risk Reduction Benefit (Current Cost/Losses Avoided):	Improve availability of emergency and public services due to non-evacuation requirements; Reduce loss of life and property due to inaccessibility; Reduce infrastructure damages.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$19,000
Potential Funding Sources:	HMGP, PDM, Local Revenue
Lead Agency/Department Responsible:	Nolanville City Manager and Public Works
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Nolanville – Action #10	
Proposed Action:	Adopt ordinance to require drought tolerant landscaping at public buildings.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide public buildings
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce water usage at public buildings through drought tolerant landscaping techniques.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$2,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	Nolanville City Manager
Implementation Schedule:	Within 36 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

City of Rogers

Rogers – Action #1	
Proposed Action:	Update, expand and improve (current) drought management and water conservation plans. Adopt water restriction measure to implement during significant drought events.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Improve water conservation during periods of drought.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Funding (staff time), State and Federal Grants if needed
Lead Agency/Department Responsible:	City of Rogers Administration
Implementation Schedule:	Within 36 months of plan adoption
Incorporation into Existing Plans:	Local Ordinances

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Rogers – Action #2	
Proposed Action:	Adopt and implement drainage ordinance to review and require permits for culverts and other drainage work.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Improve drainage capacity while protecting downstream development; ensure adequate drainage improvement/capacity; reduce flood damages.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Funding (staff time)
Lead Agency/Department Responsible:	City of Rogers Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance

COMMENTS
Residents/developers are currently installing culverts without engineering assessment. The City of Rogers can use nearby City's drainage ordinance for guidance.
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Rogers – Action #3	
Proposed Action:	Adopt and enforce 2' freeboard in existing Flood Damage Prevention Ordinance.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to life and property through improved floodplain management regulations.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing and future structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Funds (staff time)
Lead Agency/Department Responsible:	City of Rogers Administration
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Flood Damage Prevention Ordinance

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Rogers – Action #4	
Proposed Action:	Construct covered parking facilities or garage to house/protect public works and police vehicles and equipment.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City police and public works facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Vehicle damage reduced.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail, Extreme Heat, Hurricane, Lightning, Thunderstorm Wind, Tornado, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	City of Rogers Public Works and Police Department
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Rogers – Action #5	
Proposed Action:	Clear debris from drainage systems and upgrade undersized culverts with new culverts and necessary repaving as a result of culvert work.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide drainage system
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce flooding to structures through improved drainage capacity; Protect lives and property.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$250,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	City of Rogers Public Works
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Rogers – Action #6	
Proposed Action:	Install surge protectors at local critical facilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City critical facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of structure fire or equipment damage due to lightning.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Lightning
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Funding, HMA Grants
Lead Agency/Department Responsible:	City of Rogers Administration
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Rogers – Action #7	
Proposed Action:	Update City Webpage on a regular schedule with education information about mitigation activities to reduce risk to property and life from all hazards that pose a risk to the City.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide (city website)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to citizens and property through education and awareness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Funds (staff time)
Lead Agency/Department Responsible:	City of Rogers Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Rogers – Action #8	
Proposed Action:	Implement a hazardous fuels reduction program for schools and local critical facilities at risk for wildfire.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide including schools and City critical facilities at risk for wildfire
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of wildfires as well as the spread of wildfires through fuels reduction near critical facilities; Ensure continuity of services.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$50,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	City of Rogers Fire Department
Implementation Schedule:	Within 36 months of plan adoption
Incorporation into Existing Plans:	Community Wildfire Protection Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Rogers – Action #9	
Proposed Action:	Construct/designate or retrofit structures for Winter Storm and Extreme Heat (cooling and heating centers), as well as Tornado and Hurricane Shelters.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide, various locations as deemed appropriate/feasible
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to citizens by designating locations for relief from extreme temperatures as well as shelter from extreme storms.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Winter Storm, Extreme Heat, Tornado, Hurricane
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$200,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	City of Rogers Administration
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Rogers – Action #10	
Proposed Action:	Develop inter-local agreements between the City of Rogers and Bell County for repair and regular maintenance of water lines.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City of Rogers Extra-Territorial Areas
Risk Reduction Benefit (<i>Current Cost/Losses Avoided</i>):	Reduce risk of flood damages and water loss during and after flood events through inter-local agreement.
Type of Action (<i>Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness</i>)	Local Plans and Regulations - Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	County and City of Rogers Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Rogers – Action #11	
Proposed Action:	Bury power lines.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of power outages and infrastructure damage during extreme weather events through improved power grid development.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to new and existing infrastructure
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$10,000,000
Potential Funding Sources:	Local Revenue, Bonds, State and Federal Grants
Lead Agency/Department Responsible:	City of Rogers Public Works
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	Capital Improvement Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Rogers – Action #12	
Proposed Action:	Expand and improve wastewater retention pond.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Rogers wastewater treatment facility
Risk Reduction Benefit (Current Cost/Losses Avoided):	Current retention pond overflows into the nearby creek. Improvements will prevent environmental contamination of water during flood events.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,500,000
Potential Funding Sources:	Local Revenue, Bonds, TWDB, State and Federal Grants
Lead Agency/Department Responsible:	City of Rogers Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Village of Salado

Salado – Action #1	
Proposed Action:	Adopt a landscape ordinance (selection and planting guidelines) that include drought tolerant landscaping to reduce the demand on groundwater supply.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Village-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce water usage and impacts to groundwater supply during an event through drought tolerant landscaping techniques.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	None
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Department of Development Services
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Local Ordinances

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Salado – Action #2	
Proposed Action:	Adopt land use regulations including development restrictions in high risk areas, as well as density controls throughout the city.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Village-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages in high risk areas including floodplains and Wildland Urban Interface; Minimize risk of wildfire and imposition of water use restrictions in times of drought.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Wildfire, Flood
Effect on New/Existing Buildings:	Reduce risk to future structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Funding (staff time)
Lead Agency/Department Responsible:	Department of Development Services
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Local Ordinances

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Salado – Action #3	
Proposed Action:	Implement education and awareness program utilizing media, social media, bulletins, mail flyers, etc. to educate citizens of hazards that can threaten the area, flood insurance availability, and mitigation measures to reduce injuries, fatalities, and property damages.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Village-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and property through education and awareness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$2,000
Potential Funding Sources:	Local Funding (staff time)
Lead Agency/Department Responsible:	Village Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Salado – Action #4	
Proposed Action:	Organize outreach to vulnerable populations and establish and promote accessible heating/cooling centers in the community.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Salado Community Center & Salado ISD Junior High School
Risk Reduction Benefit (Current Cost/Losses Avoided):	Ensure vulnerable populations are protected from impacts of extreme temperatures.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Funding (staff time)
Lead Agency/Department Responsible:	Village Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Salado – Action #5	
Proposed Action:	Identify and install stream and rain gauges at critical sites; Upgrade gauges at established sites where necessary; Coordinate installation requests.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Salado Creek Watershed
Risk Reduction Benefit (Current Cost/Losses Avoided):	Provide early warning so as to protect life and property from the impact of flooding; Improve vulnerability assessment.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$100,000
Potential Funding Sources:	USGS, TWDB, Bell County and Village of Salado
Lead Agency/Department Responsible:	Village Administration
Implementation Schedule:	Within 36 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 5; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Salado – Action #6	
Proposed Action:	Revise floodplain ordinance to incorporate freeboard requirements and cumulative substantial damage requirements.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Village-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of property damage and loss of life from flooding.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Funding (staff time)
Lead Agency/Department Responsible:	Department of Development Services
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Flood Damage Prevention Ordinance

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Salado – Action #7	
Proposed Action:	Elevate low lying bridges.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Low water crossings on Main Street and Old Mill Road
Risk Reduction Benefit (Current Cost/Losses Avoided):	Enhance emergency access during times of flood to allow for the protection of life and property; Reduce damage to infrastructure; Increase flow capacity at crossings and reduce scour.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to new and existing infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$5,000,000
Potential Funding Sources:	Local Funding, HMGP, State and Federal Grants
Lead Agency/Department Responsible:	Village Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan; Capital Improvement Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Salado – Action #8	
Proposed Action:	Revise and update regulatory floodplain maps.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Village-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Minimize the risk of life and property loss from flooding; Enhance vulnerability assessment.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations - Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to new and existing infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$200,000
Potential Funding Sources:	USGS, TWDB, Bell County and Village of Salado
Lead Agency/Department Responsible:	Department of Development Services
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Flood Damage Prevention Ordinance

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Salado – Action #9	
Proposed Action:	Revise building requirements to include measures such as structural bracing, shutters, laminated glass in window panes, and hail-resistant roof coverings or flashing in building design to minimize damage; Require manufactured housing be securely anchored to permanent foundations; Develop and implement a Wildland Urban Interface Code.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Village-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Minimize the risk of property damages during extreme weather events.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail, Hurricane, Thunderstorm Wind, Tornado, Wildfire
Effect on New/Existing Buildings:	Reduce risk to new structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$2,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	Department of Development Services
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Building Codes; Subdivision Ordinance

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Salado – Action #10	
Proposed Action:	Adopt and implement a tree trimming program along electrical power lines and right-of-ways.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Village-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce the risk of power outages due to downed trees or limbs during extreme weather events; Reduce risk of roadway blockage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Revenue; State and Federal Grants
Lead Agency/Department Responsible:	Village of Salado
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Salado – Action #11	
Proposed Action:	Install lightning detection systems, lightning rods, and warning signage at local parks.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Pace Park and Sirena Park
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce the risk to individuals of lightning strikes.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Lightning
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$15,000
Potential Funding Sources:	Local Revenue
Lead Agency/Department Responsible:	Department of Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Salado – Action #12	
Proposed Action:	Participate in Firewise Program.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Village-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce the risk of property damage and loss of life from wildfire.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	Village Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Community Wildfire Protection Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Salado – Action #13	
Proposed Action:	Planning for and maintaining adequate road and debris clearing capabilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Village-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Minimize risk of road blockage and ensuring emergency access.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations - Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000
Potential Funding Sources:	Local Revenue (staff time)
Lead Agency/Department Responsible:	Village Administration
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Salado – Action #14	
Proposed Action:	Purchase and install emergency generators with permanent wired quick connections to critical facilities.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Village-wide Critical Facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and ensure continuity of emergency services.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Revenue (staff time); HMGP, PDM
Lead Agency/Department Responsible:	Village Administration
Implementation Schedule:	Within 36 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

City of Temple

Temple – Action #1	
Proposed Action:	Implement education and awareness program utilizing media, social media, bulletins, mail flyers, etc. to educate citizens of hazards that can threaten the area, flood insurance availability, and mitigation measures to reduce injuries, fatalities, and property damages.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Numerous locations within city to be determined
Risk Reduction Benefit (Current Cost/Losses Avoided):	Educate our citizens on the emergency situations and preparedness actions which can be taken prior to events to minimize loss of life, injuries, damage to property as well as facilitate recovery.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	, Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000
Potential Funding Sources:	City budget process, HMA, PDM, State or Federal Grants
Lead Agency/Department Responsible:	Fire Department / Emergency Management
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Temple – Action #2	
Proposed Action:	Increase/expand tree trimming program near public right-of-ways and utility lines to reduce falling limbs during severe weather events.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce cost of repairs; Increase safety of citizens and utility workers; Decrease the number of calls/response for utility line issues.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Thunderstorm Wind, Winter Storm, Flood, Tornado, Hail, Hurricane, Lightning
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$75,000
Potential Funding Sources:	HMGP, Utility company, Budgeting process
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Utilities services operating procedures

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Temple – Action #3	
Proposed Action:	Upgrade drainage channels within the city to reduce flooding to residential and commercial structures.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide drainage channels
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce intermediate flooding to residents living next to drainage channels; Reduce property damage; Prevent soil erosion, Reduce health and safety risks to area residents.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to new and existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$250,000
Potential Funding Sources:	HMGP, PDM, Budgeting process
Lead Agency/Department Responsible:	Public Works
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Temple – Action #4	
Proposed Action:	Upgrade and coordinate technology and communications equipment used by fire, police, EMS, and public works to be compatible and uniform; Install lightning devices to protect upgraded equipment.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide critical facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Increase the ability to communicate during disaster operations, meeting the federal P25 requirement; Reduce loss of communications equipment due to lightning.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project (Lightning) Preparedness (Thunderstorm Wind, Winter Storm, Flood, Tornado, Hail, Hurricane)

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Lightning, Thunderstorm Wind, Winter Storm, Flood, Tornado, Hail, Hurricane
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,200,000
Potential Funding Sources:	Budgeting process, AFG
Lead Agency/Department Responsible:	Fire Department and Information Technologies
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations / Response Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

Temple – Action #5	
Proposed Action:	Develop and implement a Community Wildfire Protection Plan with local and state assistance; Implement fuels reduction program based on identified risk.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to citizens and first responders; Allow for cooperative efforts from many entities; Minimize cost of recovery.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural Systems Protection Local Plan and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$400,000
Potential Funding Sources:	Texas Forest Service, TEEK
Lead Agency/Department Responsible:	Fire Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations; Response Plan; CWPP

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

Section 17: Mitigation Actions

City of Troy

Troy – Action #1	
Proposed Action:	Implement education and awareness program utilizing media, social media, bulletins, etc. To educate citizens of hazards that can threaten the areas and mitigation measures to reduce injuries, fatalities, and property damages.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents and property through education and awareness.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Troy City Administration
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Troy – Action #2	
Proposed Action:	Implement a fuels reduction program within city right-of-way and other high risk areas such as the Wildland Urban Interface (WUI).
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of wildfire and wildfire spread through fuels reduction program in high risk areas.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural Systems Protection

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$250,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Troy Fire Department
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Community Wildfire Protection Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Troy – Action #3	
Proposed Action:	Adopt and implement program for planting of native, drought-tolerant plants at city parks and public buildings.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce water usage during periods of drought through drought tolerant landscaping.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural Systems Protection Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$2,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Troy Public Works
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Troy – Action #4	
Proposed Action:	Upgrade undersized drainage system throughout the city to increase storm water capacity and reduce flooding.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide (where needed)
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of flooding through increase/improved storm water capacity in high risk areas.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	\$1,000,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Troy Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Drainage Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

Troy – Action #5	
Proposed Action:	Acquire and install an emergency back-up generator with permanent quick connections for city critical facilities to ensure continuity of emergency services.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide Critical Facilities
Risk Reduction Benefit (Current Cost/Losses Avoided):	Continue essential services in the event of a power outage.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Hail, Lightning, Flood, Hurricane, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing emergency vehicles and equipment
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$250,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Troy Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Management Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

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Troy – Action #6	
Proposed Action:	Install covered parking structures to protect emergency vehicles and equipment during severe weather events.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce damages to emergency vehicles and equipment.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Extreme Heat, Hail, Lightning, Thunderstorm Wind, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing emergency vehicles and equipment
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Troy Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

Section 17: Mitigation Actions

Troy – Action #7	
Proposed Action:	Strengthen zoning ordinance to limit development in known high hazard areas.
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk to residents through improved construction practices.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Wildfire
Effect on New/Existing Buildings:	Reduce risk to new structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$5,000
Potential Funding Sources:	Local Revenue
Lead Agency/Department Responsible:	Troy Public Works
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

Central Texas Council of Governments (CTCOG)

CTCOG – Action #1	
Proposed Action:	Provide public education and risk disaster awareness / preparedness to the CTCOG seven county region; Educate employees and citizens on mitigation measures to reduce property damages or potential injury or illness.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Central Texas Council of Governments: Bell County, Milam County, Coryell County, Lampasas County, Hamilton County, Mills County, San Saba County
Risk Reduction Benefit (Current Cost/Losses Avoided):	Avoid loss of life and property through all hazards mitigation education.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Education and Awareness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Drought, Extreme Heat, Flood, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$30,000
Potential Funding Sources:	HMA Grants, Local Funding
Lead Agency/Department Responsible:	CTCOG Homeland Security Coordinator
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5</p>

Section 17: Mitigation Actions

CTCOG – Action #2	
Proposed Action:	Implement a Home Shelter (Safe Room Rebate) program for the 7-county COG Region based on 50/50 match.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Central Texas Council of Governments
Risk Reduction Benefit (Current Cost/Losses Avoided):	Avoid loss of life.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Tornado, Thunderstorm Wind, Hurricane
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$100,000
Potential Funding Sources:	Local Funds, State and Federal Grants
Lead Agency/Department Responsible:	CTCOG Homeland Security Coordinator
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4</p>

Section 17: Mitigation Actions

CTCOG – Action #3	
Proposed Action:	Improve wildfire fighting water delivery capabilities by the purchase of one large, mobile fifth-wheel water trailer to be strategically placed around the region.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Central Texas Council of Governments: Bell County, Milam County, Coryell County, Lampasas County, Hamilton County, Mills County, San Saba County
Risk Reduction Benefit (Current Cost/Losses Avoided):	Avoid loss of life.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire, Drought
Effect on New/Existing Buildings:	Minimize fire damages to all structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$150,000 - \$175,000
Potential Funding Sources:	State and Federal Grants
Lead Agency/Department Responsible:	VFD and Regular Fire Departments within CTCOG region
Implementation Schedule:	Within 12 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

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CTCOG – Action #4	
Proposed Action:	Assist communities in implementing development of a plan to relocate repetitive flood loss structures out of Special Flood Hazard Areas (SFHAs) to minimize flooding of structures and restore natural floodplain areas.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Central Texas Council of Governments: Bell County, Milam County, Coryell County, Lampasas County, Hamilton County, Mills County, San Saba County
Risk Reduction Benefit (Current Cost/Losses Avoided):	Avoid loss of life.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Dam Failure
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	\$500,000
Potential Funding Sources:	State and Federal Grants
Lead Agency/Department Responsible:	CTCOG Homeland Security Coordinator and County EMCs
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 3; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 5

Section 17: Mitigation Actions

CTCOG – Action #5	
Proposed Action:	Purchase a mobile recovery trailer for first responders to utilize during regional disasters. Trailer will disseminate first aid, water and other supplies.
BACKGROUND INFORMATION	
Jurisdiction/Location:	Central Texas Council of Governments: Bell County, Milam County, Coryell County, Lampasas County, Hamilton County, Mills County, San Saba County
Risk Reduction Benefit (Current Cost/Losses Avoided):	Avoid loss of life.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Preparedness

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Tornado, Thunderstorm Wind, Drought, Flood, Hail, Wildfire, Extreme Heat, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	\$300,000
Potential Funding Sources:	State and Federal Grants
Lead Agency/Department Responsible:	CTCOG Homeland Security Coordinator
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Operations Plan

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

Section 17: Mitigation Actions

CTCOG – Action #6	
Proposed Action:	Harden/retrofit CTCOG facility to protect against natural hazards; Acquire and install generator with permanent hard wired quick connections to facility.
BACKGROUND INFORMATION	
Jurisdiction/Location:	CTCOG Facility
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce risk of damages to facility and protect employees.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Structure and Infrastructure Project

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Extreme Heat, Hail, Hurricane, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$100,000
Potential Funding Sources:	HMA Grants, Local Funding
Lead Agency/Department Responsible:	CTCOG Homeland Security Coordinator
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies) Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

Section 17: Mitigation Actions

CTCOG – Action #7	
Proposed Action:	Plant drought tolerant landscaping around CTCOG facility; Plant additional trees near building, sidewalk and parking lot to reduce heat island effect on facility and provide shade for employees.
BACKGROUND INFORMATION	
Jurisdiction/Location:	CTCOG Facility
Risk Reduction Benefit (Current Cost/Losses Avoided):	Reduce water usage through drought tolerant landscaping; Reduce risk to employees by providing shaded areas; Reduce extreme heat impacts on building and infrastructure.
Type of Action (Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)	Natural Systems Protection (Drought) Local Plans and Regulations (Extreme Heat)

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$3,000
Potential Funding Sources:	General Funds
Lead Agency/Department Responsible:	CTCOG Homeland Security Coordinator
Implementation Schedule:	Within 48 months of plan adoption
Incorporation into Existing Plans:	N/A

COMMENTS
<p>Additional Considerations: The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5</p>

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Plan Maintenance Procedures

The following is an explanation of how Bell County, participating jurisdictions, and the general public will be involved in implementing, evaluating, and enhancing the Plan over time. The sustained hazard mitigation planning process consists of four main parts:

- Incorporation
- Monitoring and Evaluation
- Updating
- Continued Public Involvement

Incorporation

Bell County and participating jurisdictions will be responsible for further development and implementation of mitigation actions. Each action has been assigned to a specific department within the County and participating jurisdictions. The following describes the process by which Bell County will incorporate elements of the mitigation plan into other planning mechanisms.

Process of Incorporation

Once the Plan is adopted, Bell County and participating jurisdictions will implement actions based on priority and the availability of funding. The County currently implements policies and programs to reduce loss to life and property from hazards. The mitigation actions developed for this Plan enhance this ongoing effort and will be implemented through other program mechanisms where possible.

The potential funding sources listed for each identified action may be used when the jurisdiction seeks funds to implement actions. An implementation time period or a specific implementation date has been assigned to each action as an incentive for completing each task and gauging whether actions are implemented in a timely manner.

Bell County and participating jurisdictions will integrate implementation of their mitigation actions with other plans and policies such as construction standards and emergency management plans, and

Section 18: Plan Maintenance

ensure that these actions, or proposed projects, are reflected in other planning efforts. Coordinating and integrating components of other plans and policies into goals and objectives of the Plan will further maximize funding and provide possible cost-sharing of key projects, thereby reducing loss of lives and property and mitigating hazards affecting the area.

Upon formal adoption of the Plan, planning team members from each participating jurisdiction will work to integrate the hazard mitigation strategies into other plans and codes as they are developed. Participating team members will conduct periodic reviews of plans and policies, once per year at a minimum, and analyze the need for amendments in light of the approved Plan. The planning team will review all comprehensive land use plans, capital improvement plans, annual budget reviews, emergency operations or management plans, transportation plans, and any building codes to guide and control development. Participating jurisdictions will ensure that capital improvement planning in the future will also contribute to the goals of this hazard mitigation Plan to reduce the long-term risk to life and property from all hazards. Within one year of formal adoption of the hazard mitigation Plan, existing planning mechanisms will be reviewed by each jurisdiction.

Bell County is committed to supporting the cities, communities, and participating jurisdictions as they implement their mitigation actions. Bell County and participating planning team members will review and revise, as necessary, the long-range goals and objectives in strategic plan and budgets to ensure that they are consistent with this mitigation action plan. Additionally, the County will work to advance the goals of this hazard mitigation plan through its routine, ongoing, long-range planning, budgeting, and work processes.

Table 18-1 identifies types of planning mechanisms and examples of methods for incorporating the Plan into other planning efforts. The team members, listed in Table 18-2 below, will be responsible for the review of these planning mechanisms and their incorporation of the plan, with the exception of the Floodplain Management Plans; the jurisdictions who have a Floodplain Administrator on staff will be responsible for incorporating the plan when floodplain management plans are updated or new plans are developed.

Table 18-1. Methods of Incorporation of the Plan

Planning Mechanism	Department/Title Responsible	Incorporation of Plan
Grant Applications	Bell County: Emergency Management Coordinator Bartlett: City Administrator Belton: Fire Chief/EMC Harker Heights: Fire Chief/EMC Holland: Mayor Killeen: Emergency Management Coordinator Little River Academy: Mayor Nolanville: City Manager Rogers: City Administrator Salado: Police Chief Temple: Public Works Director Troy: City Administrator	The Plan will be evaluated by Bell County and participating jurisdictions when grant funding is sought for mitigation projects. If a project is not in the Plan, an amendment may be necessary to include the action in the Plan.

Section 18: Plan Maintenance

Planning Mechanism	Department/Title Responsible	Incorporation of Plan
	CTCOG: Director of Planning & Regional Services	
Annual Budget Review	Bell County: Emergency Management Coordinator Bartlett: City Administrator Belton: Fire Chief/EMC Harker Heights: Fire Chief/EMC Holland: Mayor Killeen: Emergency Management Coordinator Little River Academy: Mayor Nolanville: City Manager Rogers: City Administrator Salado: Police Chief Temple: Public Works Director Troy: City Administrator CTCOG: Director of Planning & Regional Services	Various departments and key personnel that participated in the planning process for Bell County and participating jurisdictions will review the Plan and mitigation actions therein when conducting their annual budget review. Allowances will be made in accordance with grant applications sought, and mitigation actions that will be undertaken, according to the implementation schedule of the specific action.
Regulatory Plans	Bell County: Emergency Management Coordinator Bartlett: City Administrator Belton: Fire Chief/EMC Harker Heights: Fire Chief/EMC Holland: Mayor Killeen: Emergency Management Coordinator Little River Academy: Mayor Nolanville: City Manager Rogers: City Administrator Salado: Police Chief Temple: Public Works Director Troy: City Administrator CTCOG: Director of Planning & Regional Services	Currently, Bell County and participating jurisdictions have regulatory plans in place, such as Emergency Management Plans, Continuity of Operations Plans, and Economic Development Plans. The Plan will be consulted when County, City, and Village departments review or revise their current regulatory planning mechanisms, or in the development of regulatory plans that are not currently in place.
Capital Improvement Plans	Bell County: Emergency Management Coordinator Bartlett: City Administrator Belton: Fire Chief/EMC Harker Heights: Fire Chief/EMC Holland: Mayor	Bell County and participating jurisdictions have a Capital Improvement Plan (CIP) in place. Prior to any revisions to the CIP, County, City, and Village departments will review the risk assessment and mitigation strategy sections of the HMAP, as limiting

Section 18: Plan Maintenance

Planning Mechanism	Department/Title Responsible	Incorporation of Plan
	Killeen: Emergency Management Coordinator Little River Academy: Mayor Nolanville: City Manager Rogers: City Administrator Salado: Police Chief Temple: Public Works Director Troy: City Administrator CTCOG: Director of Planning & Regional Services	public spending in hazardous zones is one of the most effective long-term mitigation actions available to local governments.
Comprehensive Plans	Bell County: Emergency Management Coordinator Bartlett: City Administrator Belton: Fire Chief/EMC Harker Heights: Fire Chief/EMC Holland: Mayor Killeen: Emergency Management Coordinator Little River Academy: Mayor Nolanville: City Manager Rogers: City Administrator Salado: Police Chief Temple: Public Works Director Troy: City Administrator CTCOG: Director of Planning & Regional Services	Bell County has a Long-term Comprehensive Development Plan in place. Since comprehensive plans involve developing a unified vision for a community, the mitigation vision and goals of the Plan will be reviewed in the development or revision of a Comprehensive Plan.
Floodplain Management Plans	Bell County: Floodplain Manager Bartlett: Floodplain Manager Belton: Floodplain Manager Harker Heights: Floodplain Manager Holland: Floodplain Manager Killeen: Floodplain Manager Little River Academy: Floodplain Manager Nolanville: Floodplain Manager Rogers: Floodplain Manager Salado: Floodplain Manager Temple: Floodplain Manager Troy: Floodplain Manager CTCOG: Director of Planning & Regional Services	Floodplain management plans include preventative and corrective actions to address the flood hazard. Therefore, the actions for flooding, and information found in Section 6 of this Plan discussing the people and property at risk to flood, will be reviewed and revised when Bell County updates their management plans or develops new plans.

Section 18: Plan Maintenance

Monitoring and Evaluation

Periodic revisions of the Plan are required to ensure that goals, objectives, and mitigation actions are kept current. When the plan is discussed in these sections it includes the risk assessment and mitigation actions as a part of the monitoring, evaluating, updating and review process. Revisions may be required to ensure the Plan is in compliance with federal and state statutes and regulations. This section outlines the procedures for completing Plan revisions, updates, and review. Table 18-2 indicates the department and title of the party responsible for Plan monitoring, updating, and review of the Plan.

Section 18: Plan Maintenance

Table 18-2. Team Members Responsible for Plan Monitoring, Evaluating, Updating, and Review of the Plan

JURISDICTION	TITLE
Bell County	Emergency Management Coordinator (Lead)
City of Bartlett	City Administrator
City of Belton	Fire Chief/EMC
City of Harker Heights	Fire Chief/EMC
City of Holland	Mayor
City of Killeen	Emergency Manager
City of Little River Academy	Mayor
City of Nolanville	City Manager
City of Rogers	City Administrator
Village of Salado	Police Chief
City of Temple	Public Works Director
City of Troy	City Administrator
CTCOG	Director of Planning & Regional Services

Monitoring

Designated Planning Team members are responsible for monitoring, evaluating, updating, and reviewing the Plan, as shown in Table 18-2. Individuals holding the title listed in Table 18-2 will be responsible for monitoring the Plan on an annual basis. Plan monitoring includes reviewing the Plan and incorporating into the Plan other existing planning mechanisms that relate or support goals and objectives of the Plan; monitoring the incorporation of the Plan into future updates of other existing planning mechanisms as appropriate; monitoring team members to maintain updated contact information and ensure availability throughout the planning cycle; reviewing mitigation actions submitted and coordinating with various County, City, and Village departments to determine if mitigation actions need to be re-evaluated and updated; evaluating the hazards that pose a risk to the planning area and updating the risk assessment when warranted; evaluating and updating the Plan as necessary; and monitoring plan maintenance to ensure that the process described is being followed, on an annual basis, throughout the planning process. The Planning Team will develop a brief report that identifies policies and actions in the plan that have been successfully implemented

Section 18: Plan Maintenance

and any changes in the implementation process needed for continued success. Team meetings for monitoring the plan will include a sign-in sheet to record attendance and a written summary of meeting notes will report the particulars involved in developing an action into a project. In addition to the annual monitoring, the Plan will be similarly reviewed immediately after extreme weather events including but not limited to state and federally declared disasters.

Evaluation

As part of the evaluation process, the Planning Team will assess changes in risk; determine whether the implementation of mitigation actions is on schedule; determine whether there are any implementation problems, such as technical, political, legal, or coordination issues; and identify changes in land development or programs that affect mitigation priorities for each respective department or organization.

The Planning Team will meet on an annual basis to evaluate the Plan, identify any needed changes, and assess the effectiveness of the plan achieving its stated purposes and goals. The Team Lead, along with key team members (Table 18-2) will evaluate the team participants in the last planning cycle to determine if additional participants can contribute further areas of expertise during the current planning cycle and future updates. The team will evaluate the number of mitigation actions implemented along with the loss-reduction associated with each action. Actions that have not been implemented will be evaluated to determine if any social, political or financial barriers are impeding implementation and if any changes are necessary to improve the viability of an action. The team will evaluate changes in land development and/or programs that affect mitigation priorities in their respective areas of authority. This annual evaluation process will include an annual meeting with a sign-in sheet to record attendance and a brief report that identifies any changes that may be necessary. In addition, the Plan will be similarly evaluated immediately after extreme weather events including but not limited to state and federally declared disasters.

Updating

Plan Amendments

At any time, minor technical changes may be made to update the Bell County Hazard Mitigation Plan. Material changes to mitigation actions or major changes in the overall direction of the Plan or the policies contained within it, must be subject to formal adoption by the County and participating jurisdictions.

The County will review proposed amendments and vote to accept, reject, or amend the proposed change. Upon ratification, the amendment will be transmitted to TDEM.

In determining whether to recommend approval or denial of a Plan amendment request, the County will consider the following factors:

- Errors or omissions made in the identification of issues or needs during the preparation of the Plan;
- New issues or needs that were not adequately addressed in the Plan; and
- Changes in information, data, or assumptions from those on which the Plan was based.

Five (5) Year Review

The Plan will be thoroughly reviewed by the Planning Team at the end of three years from the approval date, to determine whether there have been significant changes in the planning area that necessitate changes in the types of mitigation actions proposed. Factors that may affect the content of the Plan

Section 18: Plan Maintenance

include new development in identified hazard areas, increased exposure to hazards, disaster declarations, increase or decrease in capability to address hazards, and changes to federal or state legislation.

The Plan review process provides the County and participating jurisdictions an opportunity to evaluate mitigation actions that have been successful, identify losses avoided due to the implementation of specific mitigation measures, and address mitigation actions that may not have been successfully implemented as assigned.

It is recommended that the full Executive and Advisory Planning Team (Section 2, Tables 2-1 and 2-2) meet to review the Plan at the end of three years because grant funds may be necessary for the development of a five-year update. Reviewing planning grant options in advance of the five-year Plan update deadline is recommended considering the timelines for grant and planning cycles can be in excess of a year.

Following the Plan review, any revisions deemed necessary will be summarized and implemented according to the reporting procedures and Plan amendment process outlined herein. Upon completion of the review, update, and amendment process the revised Plan will be submitted to TDEM for final review and approval in coordination with FEMA.

Continued Public Involvement

Public input was an integral part of the preparation of this Plan and will continue to be essential for Plan monitoring, evaluations and updates. The Public will be directly involved in the annual monitoring, evaluation and cyclical updates. Changes or suggestions to improve or update the Plan will provide opportunities for additional public input.

The public can review the Plan on Bell County's website where officials and the public are invited to provide ongoing feedback, via email to the County's Office of Emergency Management.

The Planning Team may also designate voluntary citizens from the Bell County planning area or willing stakeholder members from the private sector businesses that were involved in the Plan's development to provide feedback on an annual basis. It is important that stakeholders and the immediate community maintain a vested interest in preserving the functionality of the planning area as it pertains to the overall goals of the mitigation plan. The Planning team is responsible for notifying stakeholders and community members on an annual basis and maintaining the Plan.

Media, including local newspaper and radio stations, will be used to notify the public of any maintenance or periodic review activities during the implementation, monitoring, and evaluation phases. Additionally, local news media will be contacted to cover information regarding Plan updates, status of grant applications, and project implementation. Local and social media outlets, such as Facebook and Twitter, will keep the public and stakeholders apprised of potential opportunities to fund and implement mitigation projects identified in the Plan.

Appendix A: Planning Team

Planning Team Members..... 1
 Stakeholders 2

Planning Team Members

The Bell County Plan was organized using a direct representative model. An Executive Planning Team from Bell County and participating jurisdictions, shown in Table A-1, was formed to coordinate planning efforts and request input and participation in the planning process. Table A-2 reflects the Advisory Planning Team, consisting of area organizations and departments that participated throughout the planning process. Table A-3 is comprised of stakeholders who were invited to provide Plan input. Public outreach efforts and meeting documentation is provided in Appendix E.

Table A-1. Executive Planning Team

ORGANIZATION / DEPARTMENT	TITLE
Bell County	Emergency Management Coordinator
City of Bartlett	City Administrator
City of Belton	Fire Chief/EMC
City of Harker Heights	Fire Chief/EMC
City of Holland	Mayor
City of Killeen	Emergency Manager
City of Little River Academy	Mayor
City of Nolanville	City Manager
City of Rogers	City Administrator
Village of Salado	Police Chief
City of Temple	Public Works Director
City of Troy	City Administrator
CTCOG	Director of Planning & Regional Services
CTCOG	Homeland Security/Criminal Justice Coordinator

Appendix A: Planning Team

Table A-2. Advisory Planning Team

ORGANIZATION / DEPARTMENT	TITLE
City of Bartlett	Mayor
City of Bartlett	Mayor Pro Tem
City of Bartlett	Utilities Clerk
City of Belton	Assistant Fire Chief
City of Harker Heights	Assistant EMC
City of Holland	City Secretary
City of Killeen	Fire Chief
City of Killeen	Training Officer – Killeen FD
City of Killeen	Firefighter/EMT – Killeen FD
City of Nolanville	EMC
City of Rogers	Court Clerk
City of Temple	Fire Chief
CTCOG	Senior Planner

Stakeholders

The following groups listed in Table A-3 represent a list of organizations invited to stakeholder meetings, public meetings, and workshops throughout the planning process and include: non-profit organizations, private businesses, universities, and legislators. The public were also invited to participate via e-mail throughout the planning process. Many of the invited organizations and stakeholders participated and were integral to providing comments and data for the Plan. For a list of attendees at meetings, please see Appendix E¹.

Table A-3. Stakeholders

AGENCY	TITLE
American Red Cross	Executive Director
Bartlett ISD	President
Buckholts ISD	Superintendent
Cameron ISD	Superintendent

¹ Information contained in Appendix E is exempt from public release under the Freedom of Information Act (FOIA).

Appendix A: Planning Team

AGENCY	TITLE
Grant Central Texas	Economic Development Corporation
Hamilton County	County Judge
Hamilton ISD	Superintendent
Holland ISD	Superintendent
Killeen ISD	Deputy Superintendent
Milam County	Emergency Management Coordinator
Milano ISD	President
Rockdale ISD	Superintendent
Rogers ISD	Superintendent
Salado ISD	Superintendent
Temple ISD	Superintendent
Thorndale ISD	Superintendent
Troy ISD	Superintendent
TX house Representative Hugh Shine	District Director
TX A&M Agrilife – Bell County Office	District Extension Administrator
TX Forest Service	Regional Fire Coordinator I

Appendix B: Public Survey Results

Overview	1
Public Survey Results	2

Overview

The CTCOG prepared a public survey that requested public opinion on a wide range of questions relating to natural hazards. The survey was made available to the three counties: Milam, Hamilton and Bell County, on websites, including Bell County’s website. This survey link was also distributed at public meetings and stakeholder events throughout the planning process.

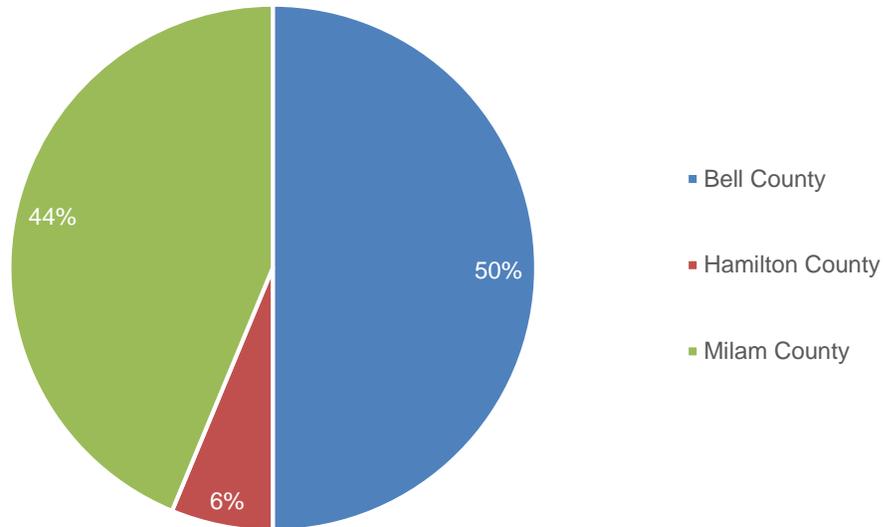
A total of 16 surveys were collected, the results of which are analyzed in Appendix B. The purpose of the survey was twofold: 1) to solicit public input during the planning process, and 2) to help the jurisdictions identify any potential actions or problem areas.

The following survey results depict the percentage of responses for each answer. Similar responses have been summarized for questions that did not provide a multiple-choice answer or that required an explanation.

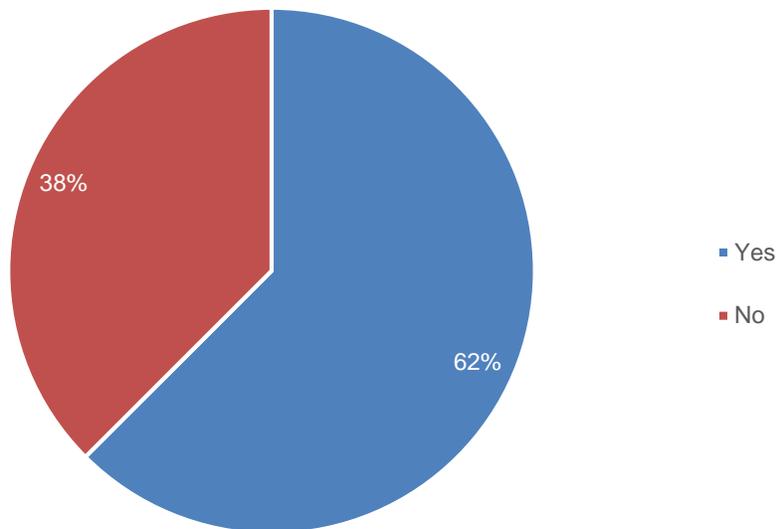
Appendix B: Public Survey Results

Public Survey Results

1. Please state the jurisdiction (city and community) where you reside.

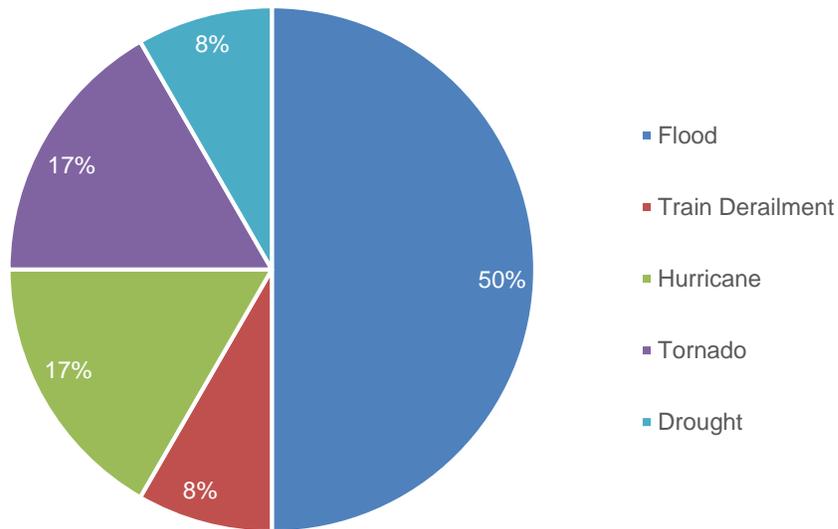


2. A. Have you ever experienced or been impacted by a disaster?

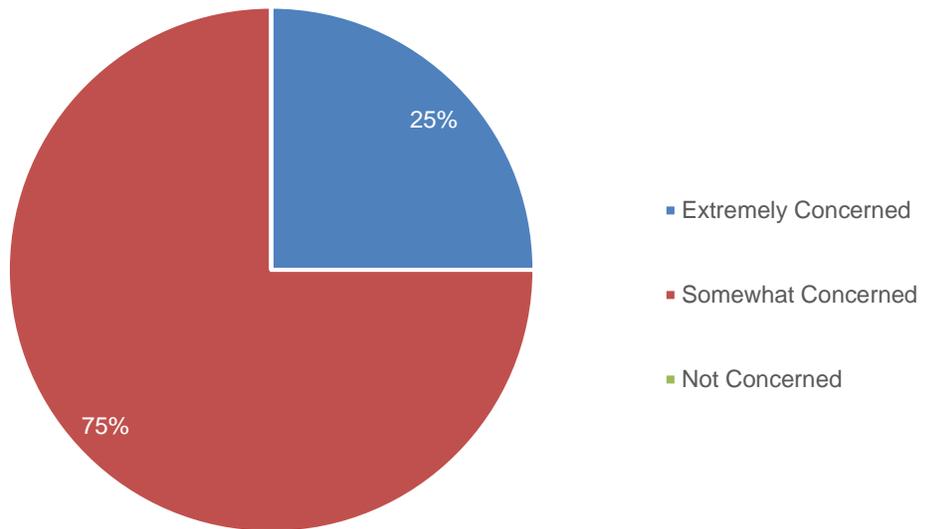


Appendix B: Public Survey Results

2. B. If “Yes”, please explain:

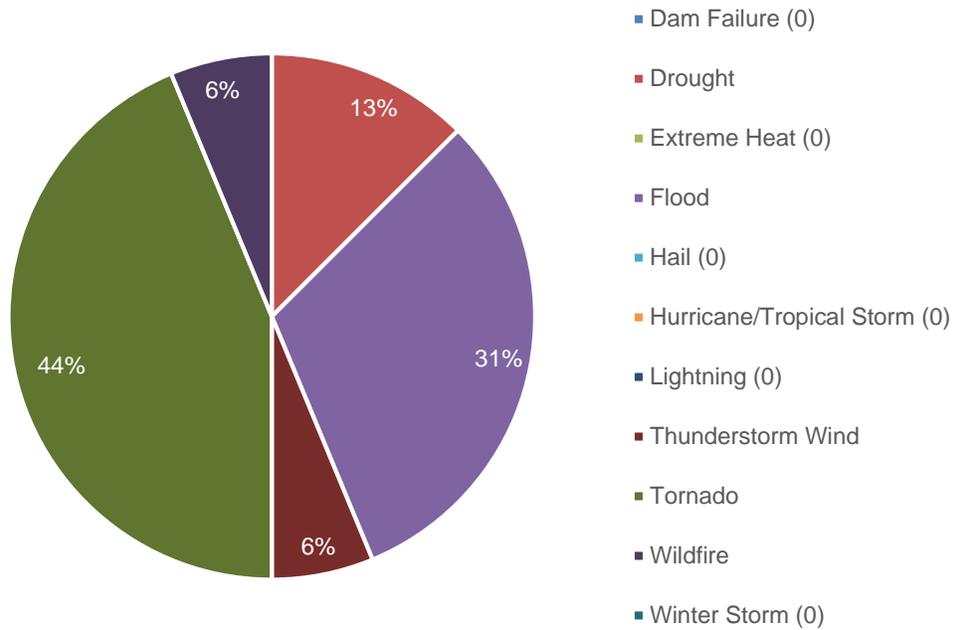


3. How concerned are you about the possibility of your community being impacted by a disaster?

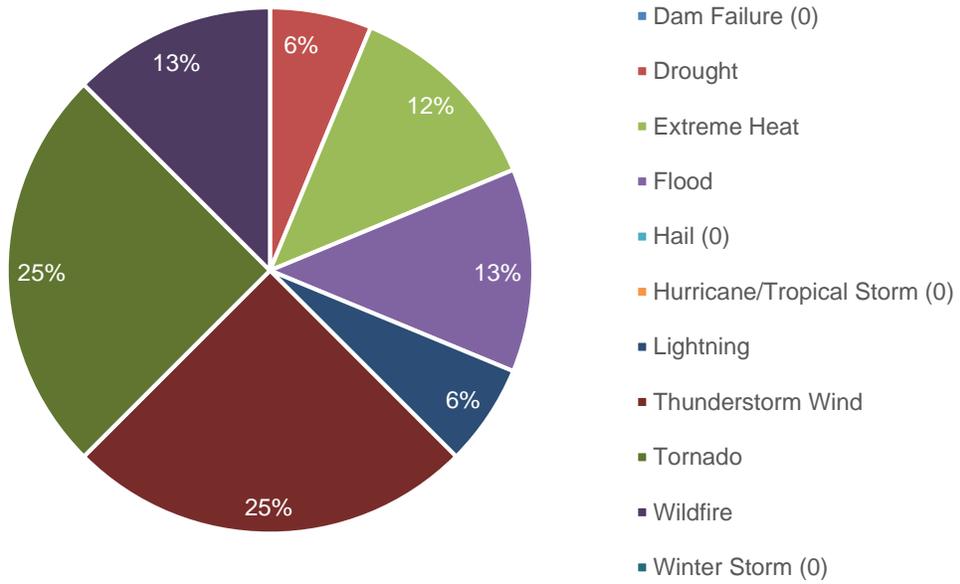


Appendix B: Public Survey Results

4. Please select the one hazard you think is the highest threat to your neighborhood:

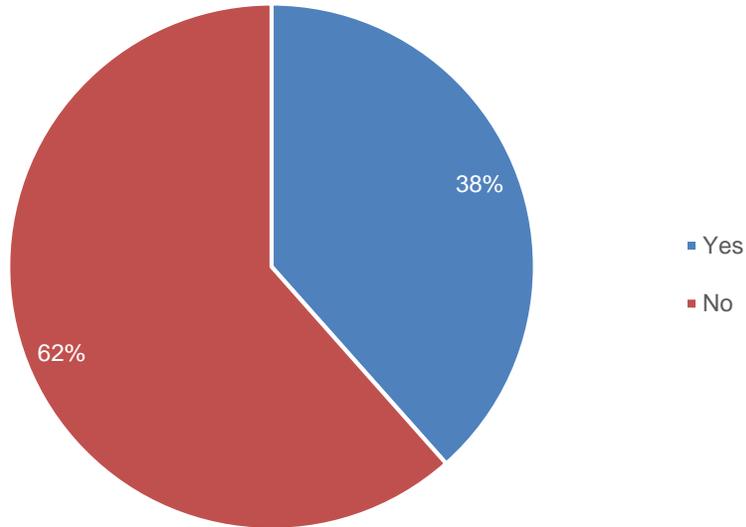


5. Please select the one hazard you think is the second highest threat to your neighborhood:

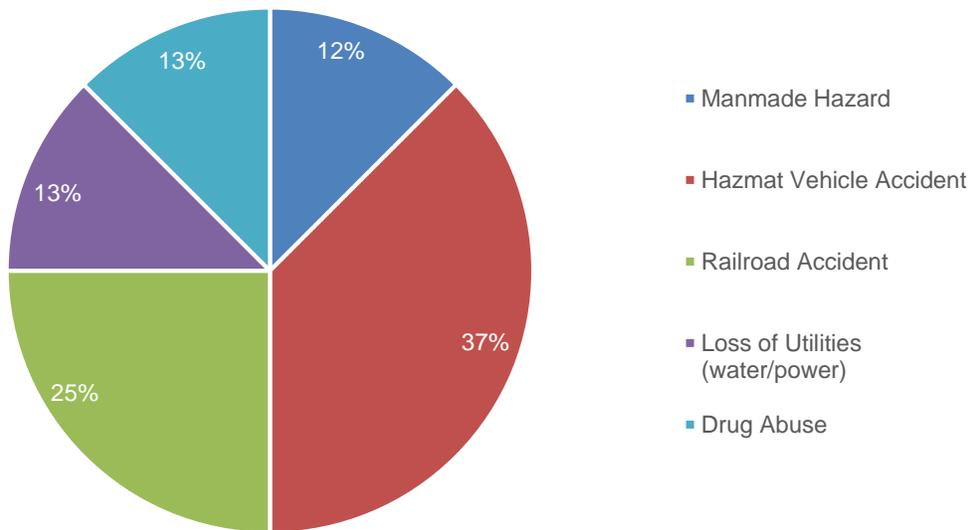


Appendix B: Public Survey Results

6. A. Are there hazards not listed above that you think is a wide-scale threat to your neighborhood?

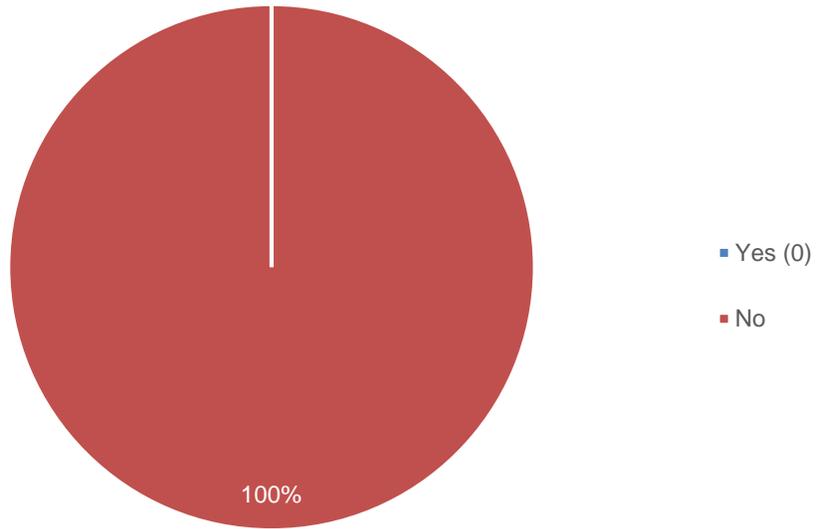


6. B. If "Yes", please explain:

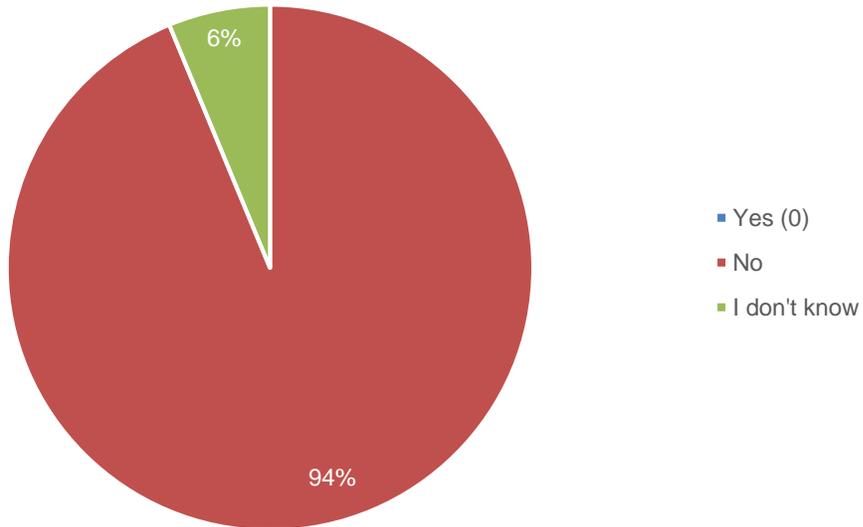


Appendix B: Public Survey Results

7. Is your home located in a floodplain?

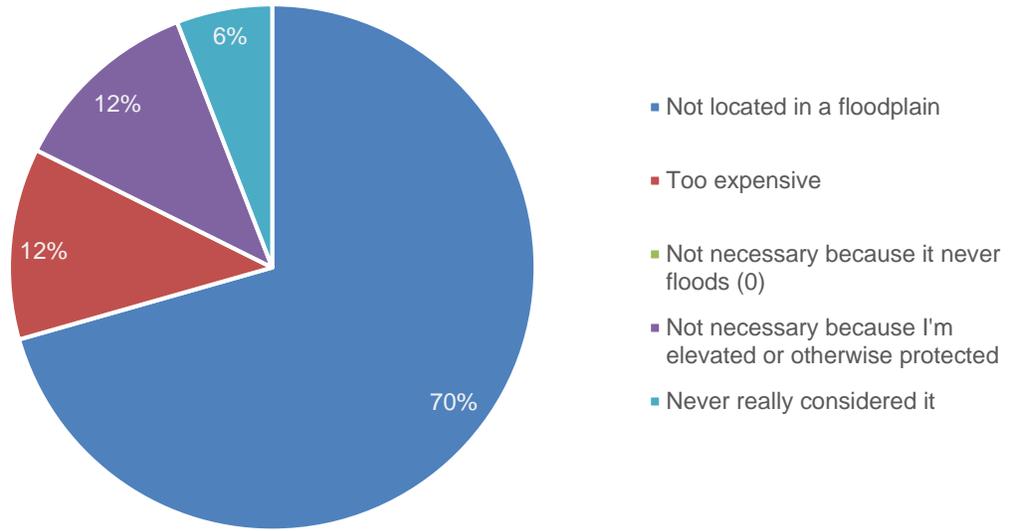


8. Do you have flood insurance?

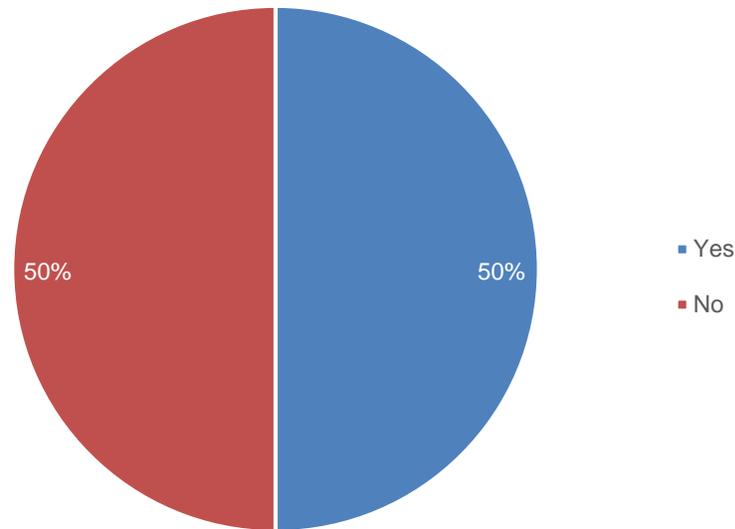


Appendix B: Public Survey Results

9. If you do not have flood insurance, why not?

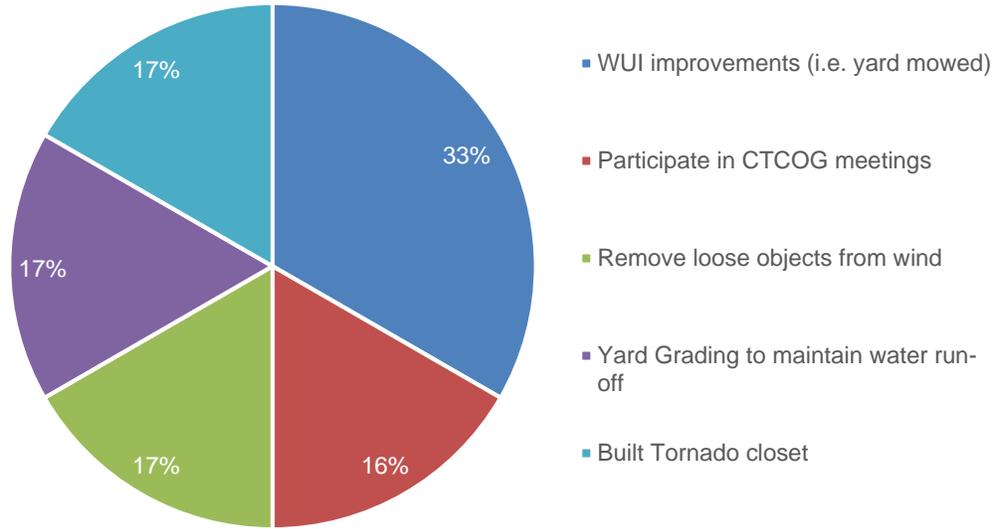


10. A. Have you taken any actions to make sure your home or neighborhood is more resistant to hazards?

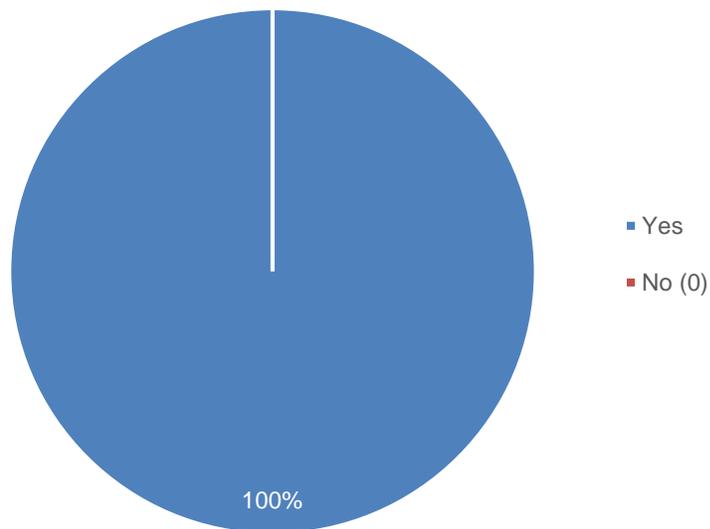


Appendix B: Public Survey Results

10. B. What have you done?

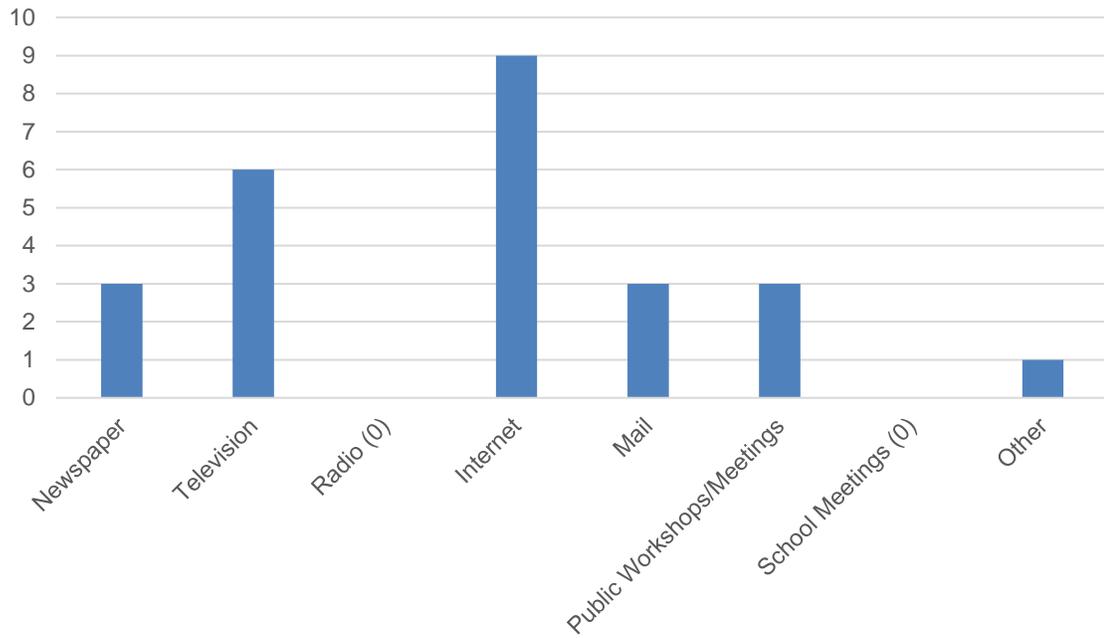


11. Are you interested in making your home or neighborhood more resistant to hazards?

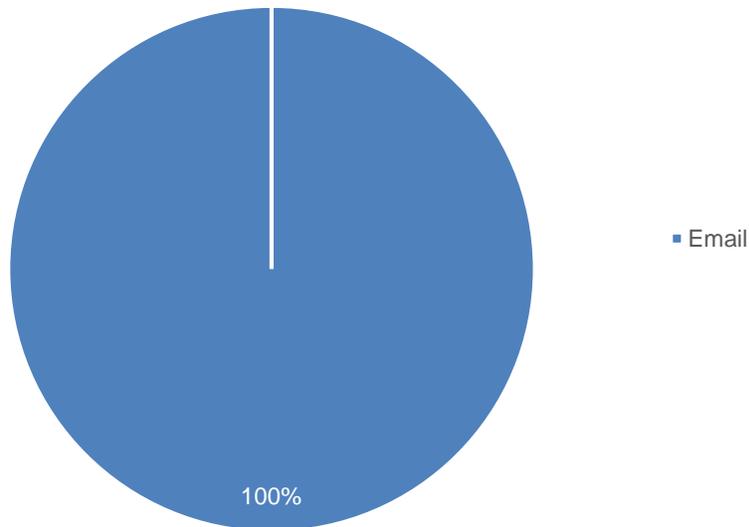


Appendix B: Public Survey Results

12. A. What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?

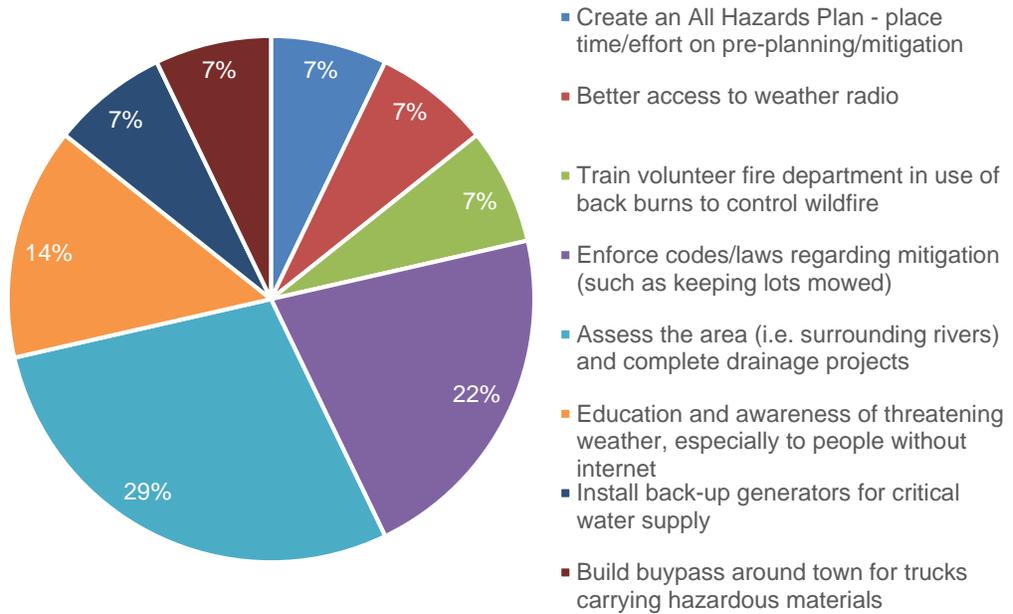


12. B. If "Other", please specify.

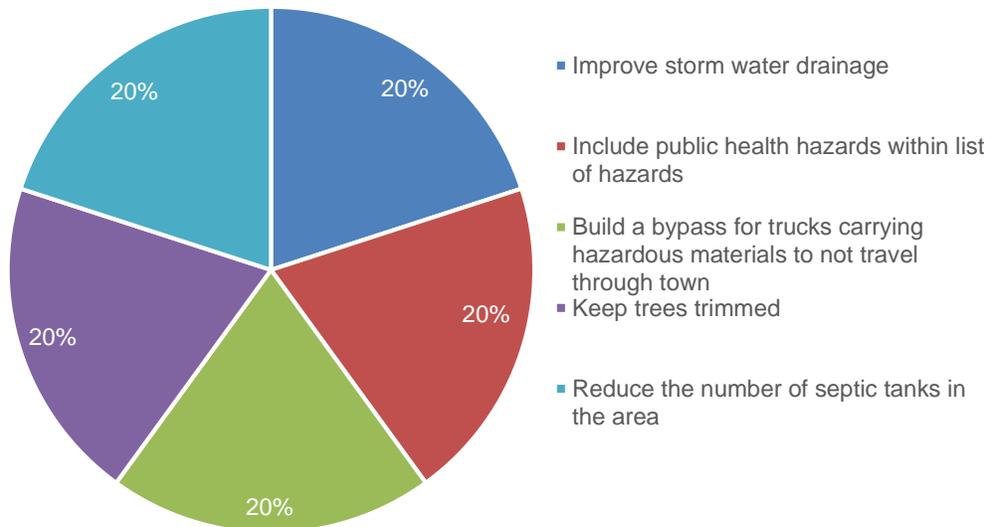


Appendix B: Public Survey Results

13. If your opinion, what are some steps your local government could take to reduce or eliminate the risk of future hazard damages in your neighborhood?

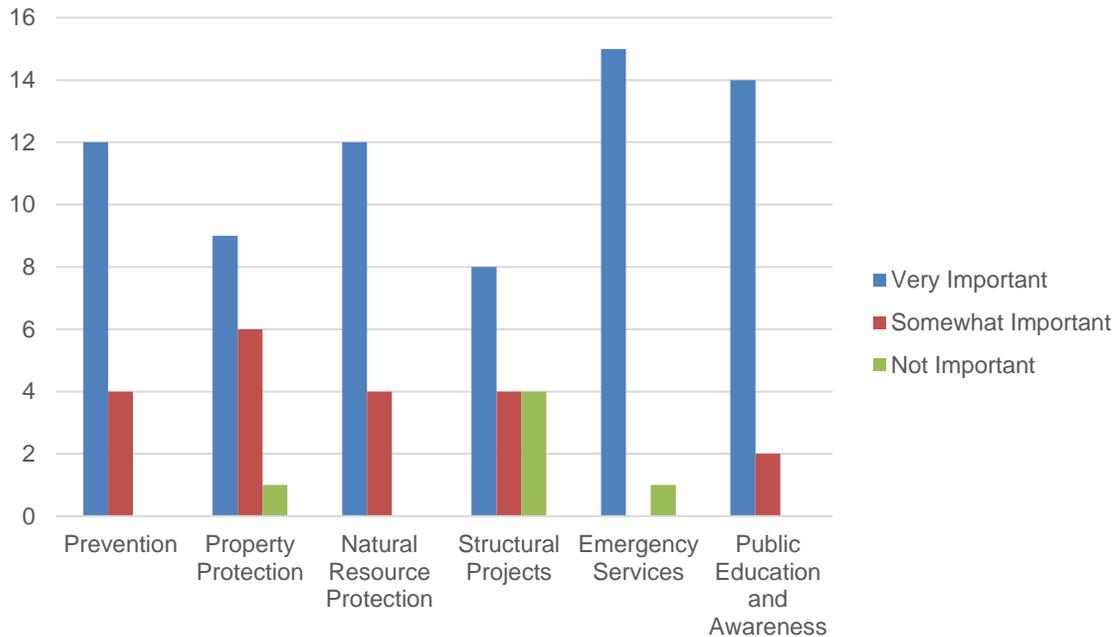


14. Are there any other issues regarding the reduction of risk and loss associated with hazards or disasters in the community that you think are important?



Appendix B: Public Survey Results

15. A number of community-wide activities can reduce the risk from hazards. In general, these activities fall into one of the following six broad categories. Please tell us how important you think each one is for your community to consider pursuing.



Prevention / Local Plans & Regulations - Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.

Property Protection - Actions that involve the modification of existing buildings to protect them from a hazard or removal from the hazard area. Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.

Natural Resource Protection - Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. Examples include floodplain protection, habitat preservation, slope stabilization, riparian buffers, and forest management.

Structural Projects - Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include dams, levees, seawalls detention / retention basins, channel modification, retaining walls, and storm sewers.

Emergency Services - Actions that protect people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of critical facilities or systems.

Public Education and Awareness - Actions to inform citizens about hazards and techniques they can use to protect themselves and their property. Examples include outreach projects, school education programs, library materials, and demonstration events.

Appendix C: Critical Facilities

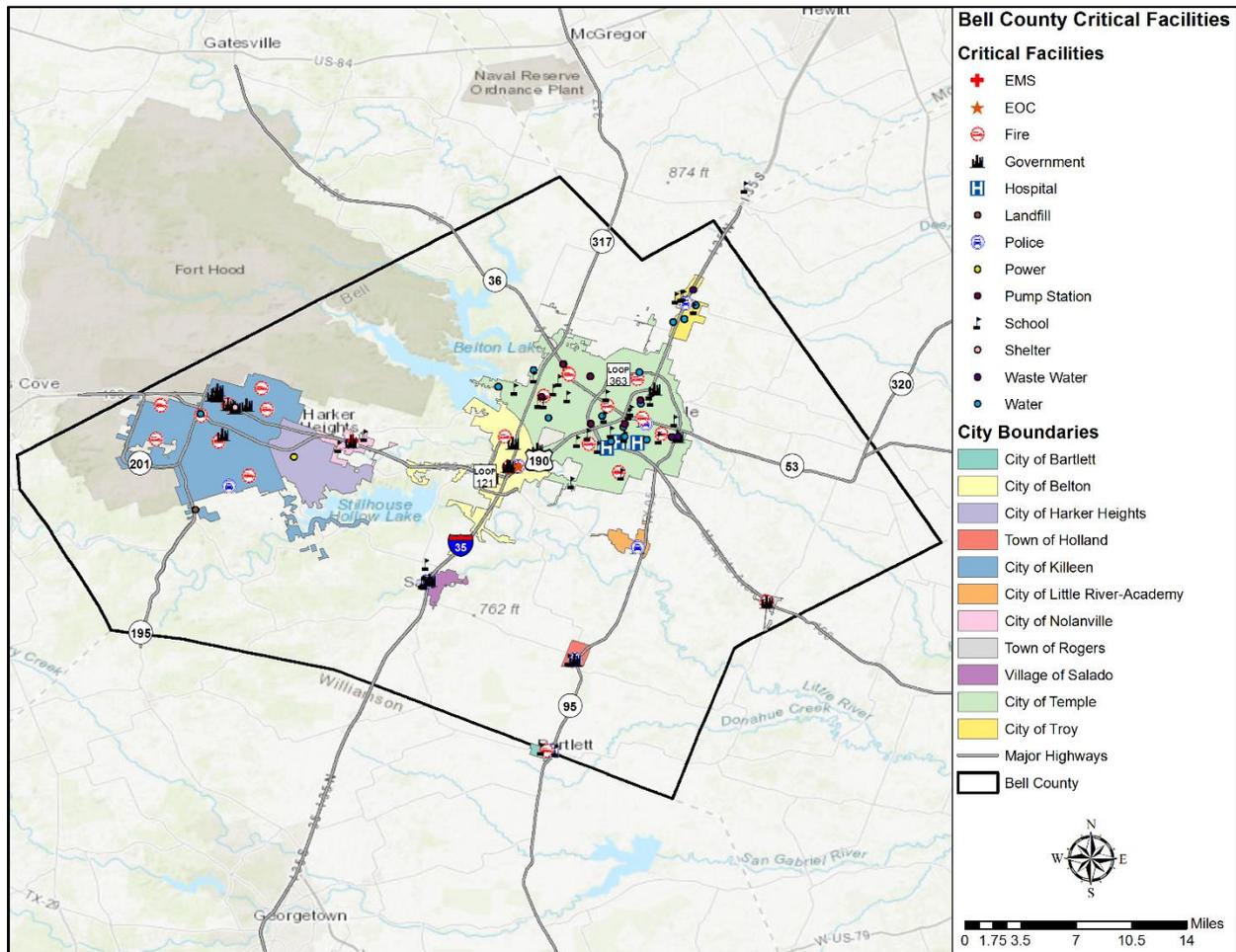
Overview 1
 Critical Facilities 1

Overview

This Appendix is **For Official Use Only (FOUO)** and may be exempt from public release under FOIA. Figures C-1 through C-12 locate all critical facilities that were included in the risk assessment. Mapped facilities were provided by Bell County Planning Team members. Tables C-1 through C-12 note the critical facilities by type.

Critical Facilities

Figure C-1. Critical Facilities in Bell County



Appendix C: Critical Facilities

Table C-1. Critical Facilities by Type in Bell County

TYPE	NUMBER
County Offices	1
OEM	1

Figure C-2. Critical Facilities in the City of Bartlett

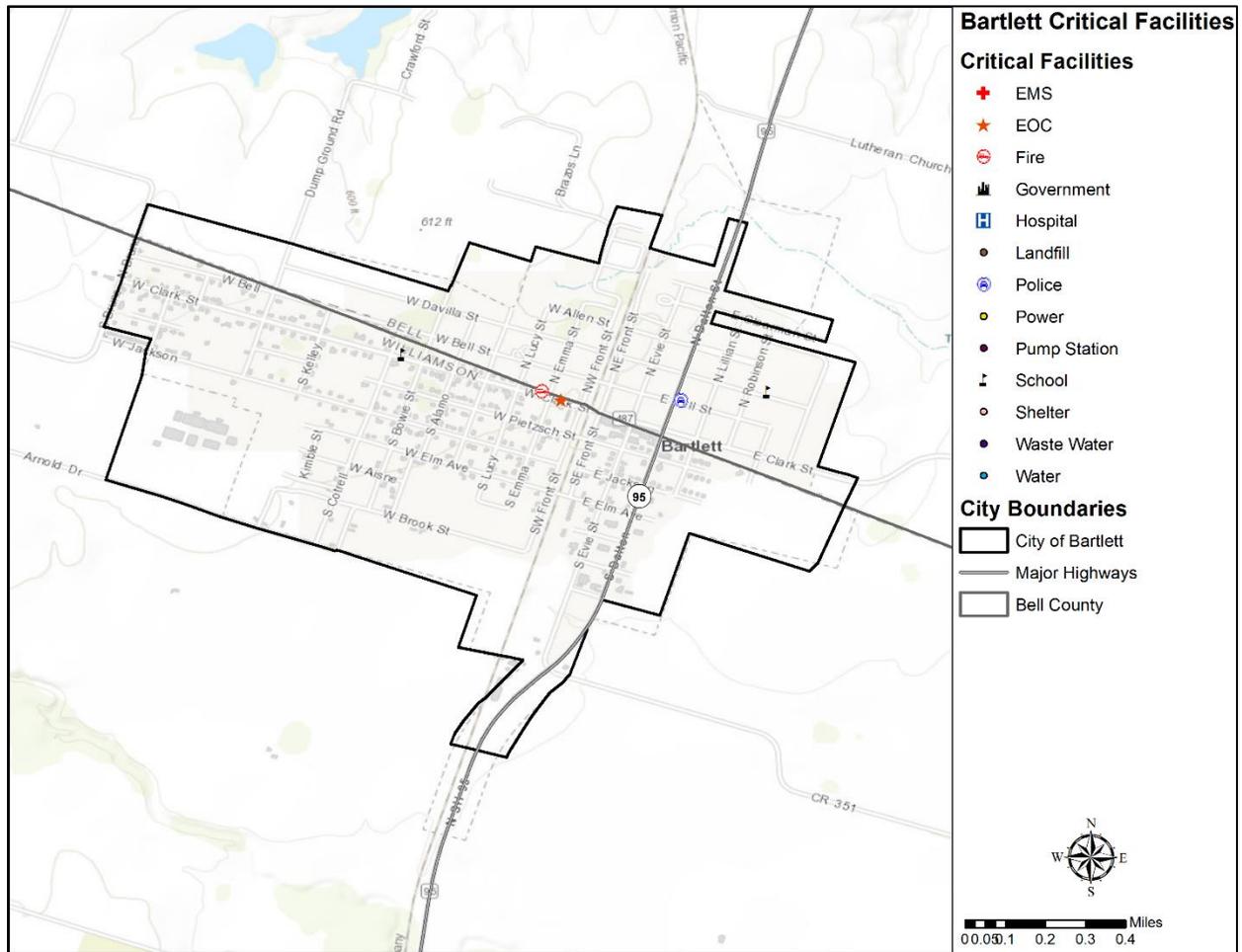


Table C-2. Critical Facilities by Type in the City of Bartlett

TYPE	NUMBER
City Hall/EOC/EVAC	1
Fire Station	1
Police Station	1
School	2

Figure C-3. Critical Facilities in the City of Belton, CTCOG

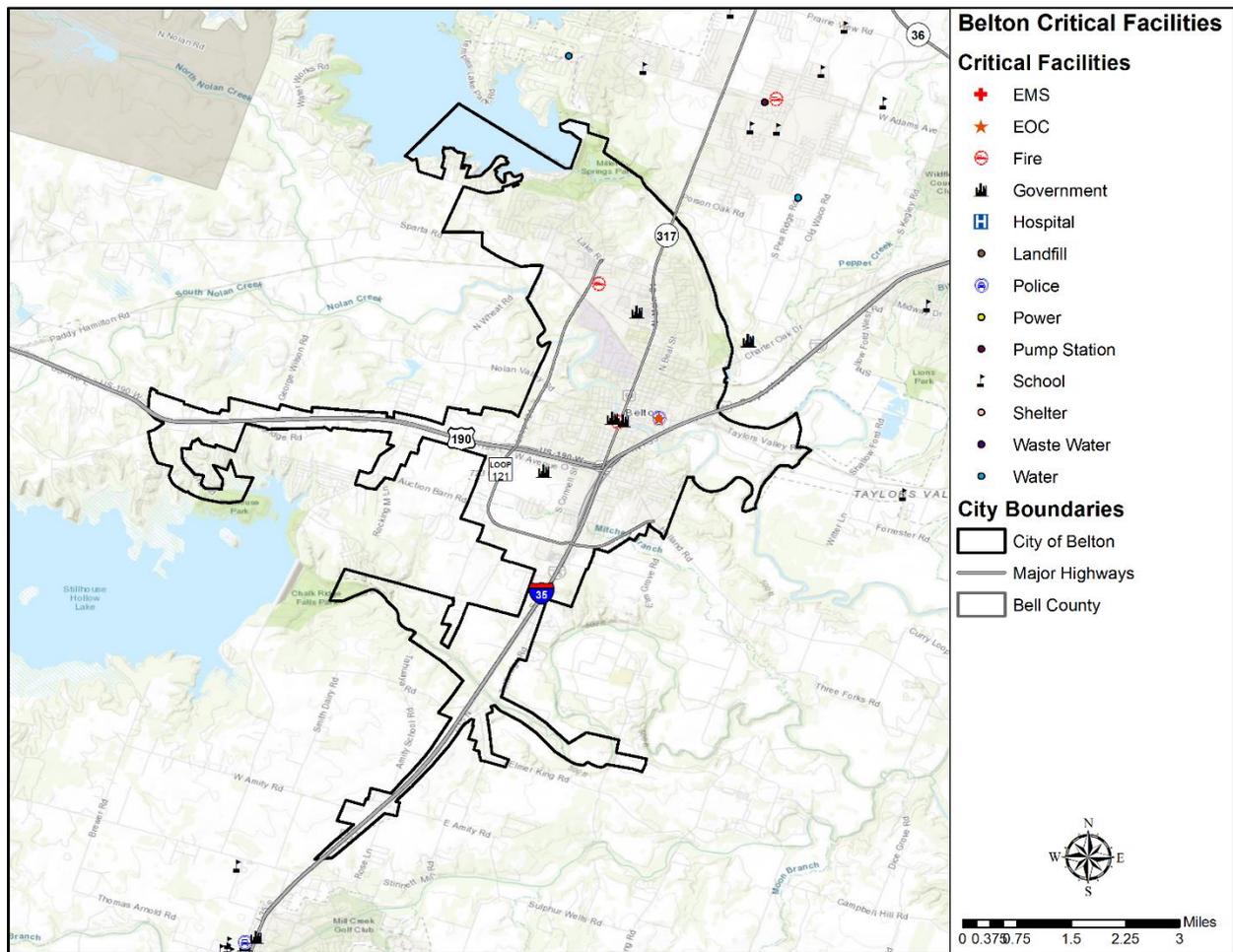


Table C-3. Critical Facilities by Type in the City of Belton

TYPE	NUMBER
City Hall	1
CTCOG	1
EOC	1
Fire Station	2
Police Station	1
School	1
Shelter	1

Appendix C: Critical Facilities

Figure C-4. Critical Facilities in the City of Harker Heights

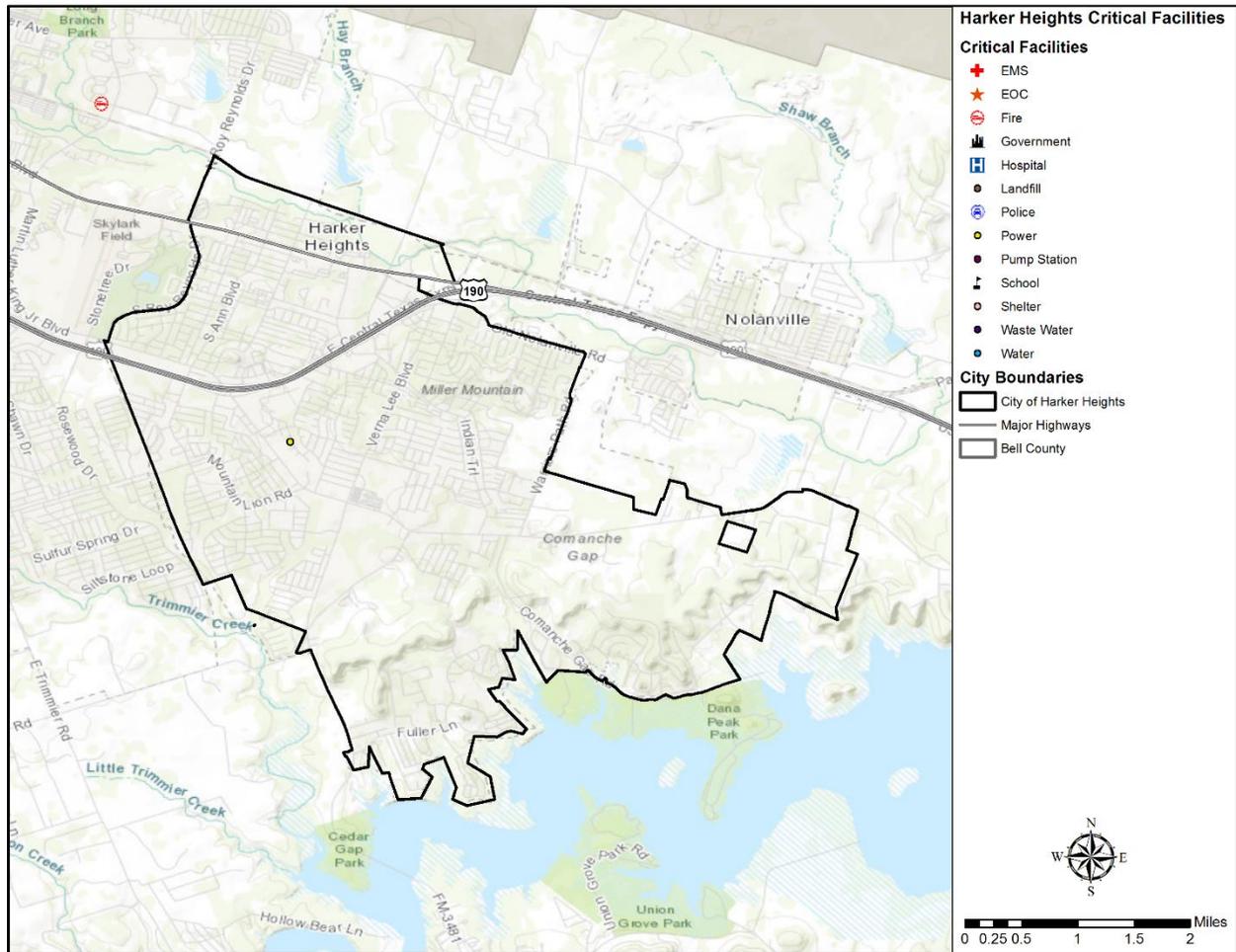


Table C-4. Critical Facilities by Type in the City of Harker Heights

TYPE	NUMBER
City Hall	1
Communications Tower	1
Emergency Shelter	1
Fire Station	2
Hospital	1
Lift Station	13
Nursing Home	1
Police Station	1
Pump Station	9

Figure C-5. Critical Facilities in the City of Holland

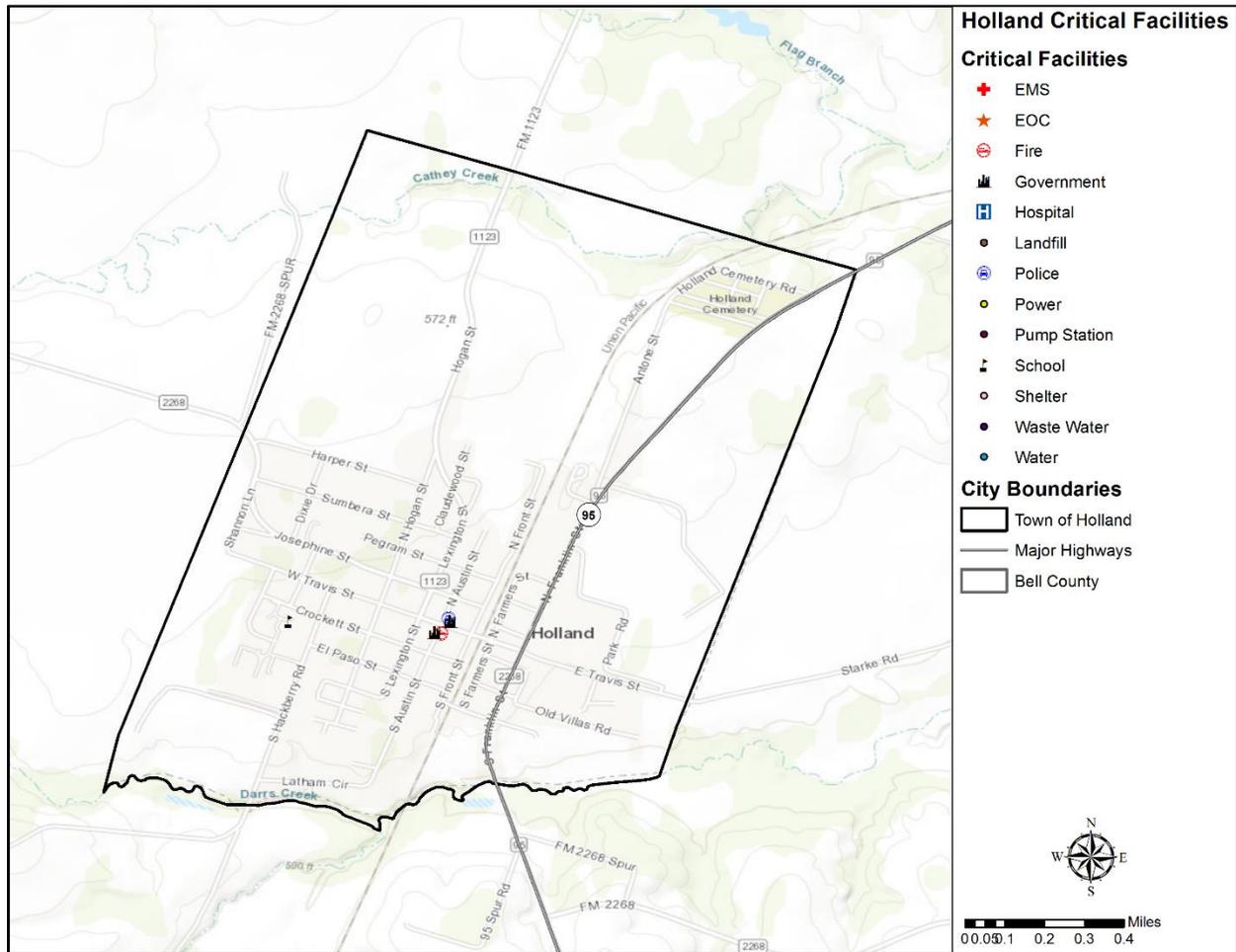


Table C-5. Critical Facilities by Type in the City of Holland

TYPE	NUMBER
City Hall	1
Community Center	1
Fire Department	1
Police Department	1
School	1

Figure C-6. Critical Facilities in the City of Killeen

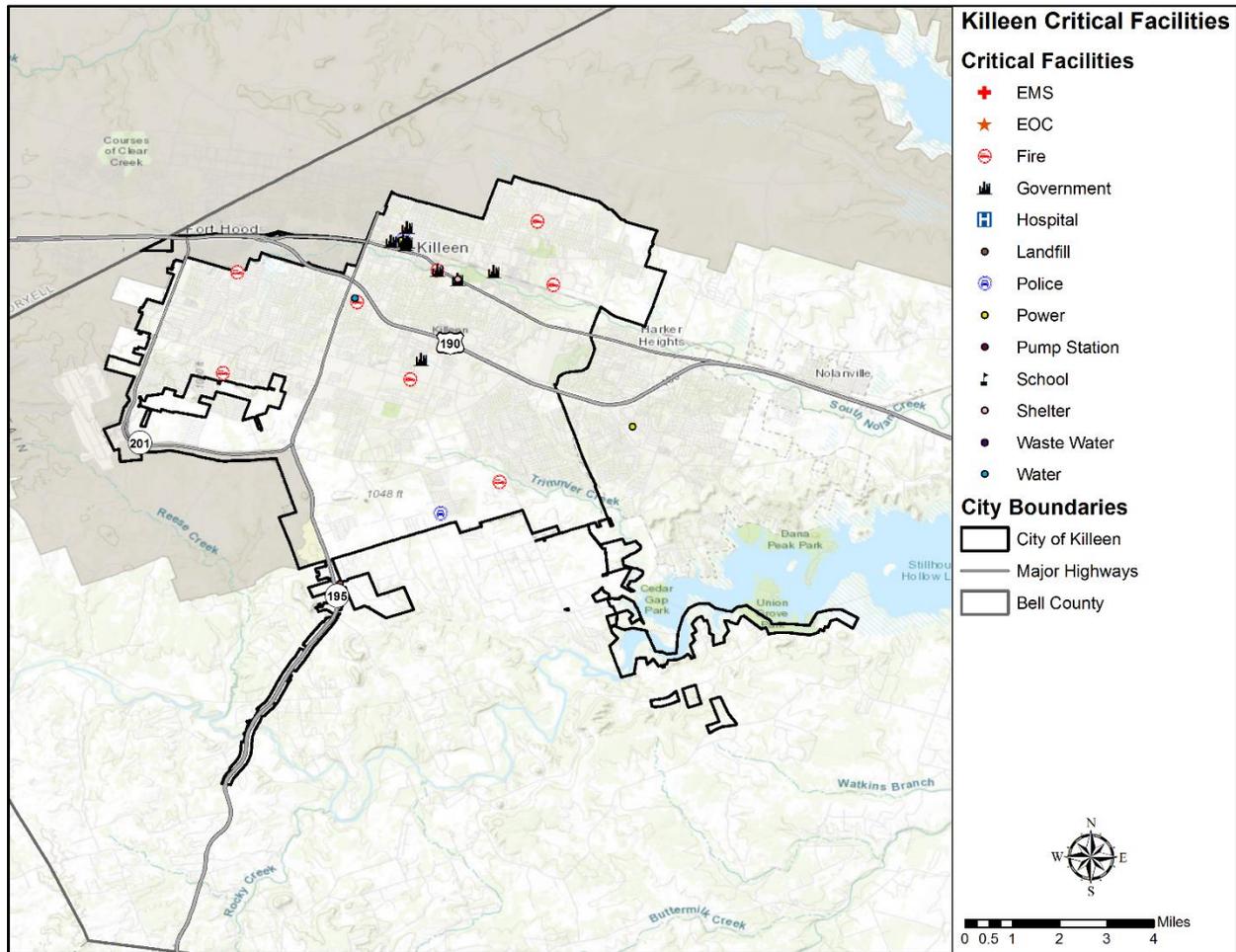


Table C-6. Critical Facilities by Type in the City of Killeen

TYPE	NUMBER
EOC	1
Fire Department	8
Government Building / Office	12
Police Department	2
Solid Waste / Landfill	1

Appendix C: Critical Facilities

Figure C-7. Critical Facilities in the City of Little River Academy

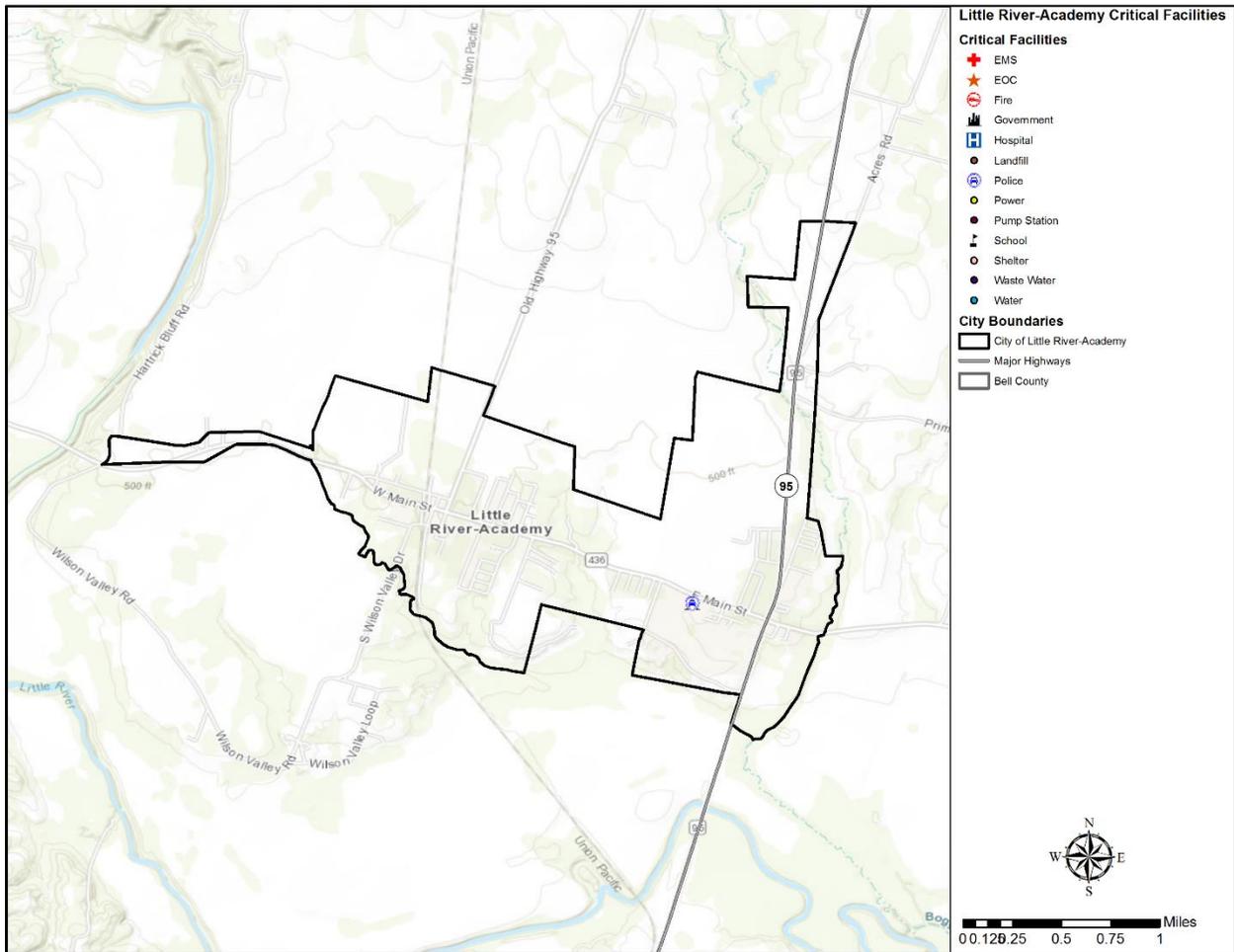


Table C-7. Critical Facilities by Type in the City of Little River Academy

TYPE	NUMBER
City Offices	1
Fire Department	1
Police Department	1

Appendix C: Critical Facilities

Figure C-8. Critical Facilities in the City of Nolanville

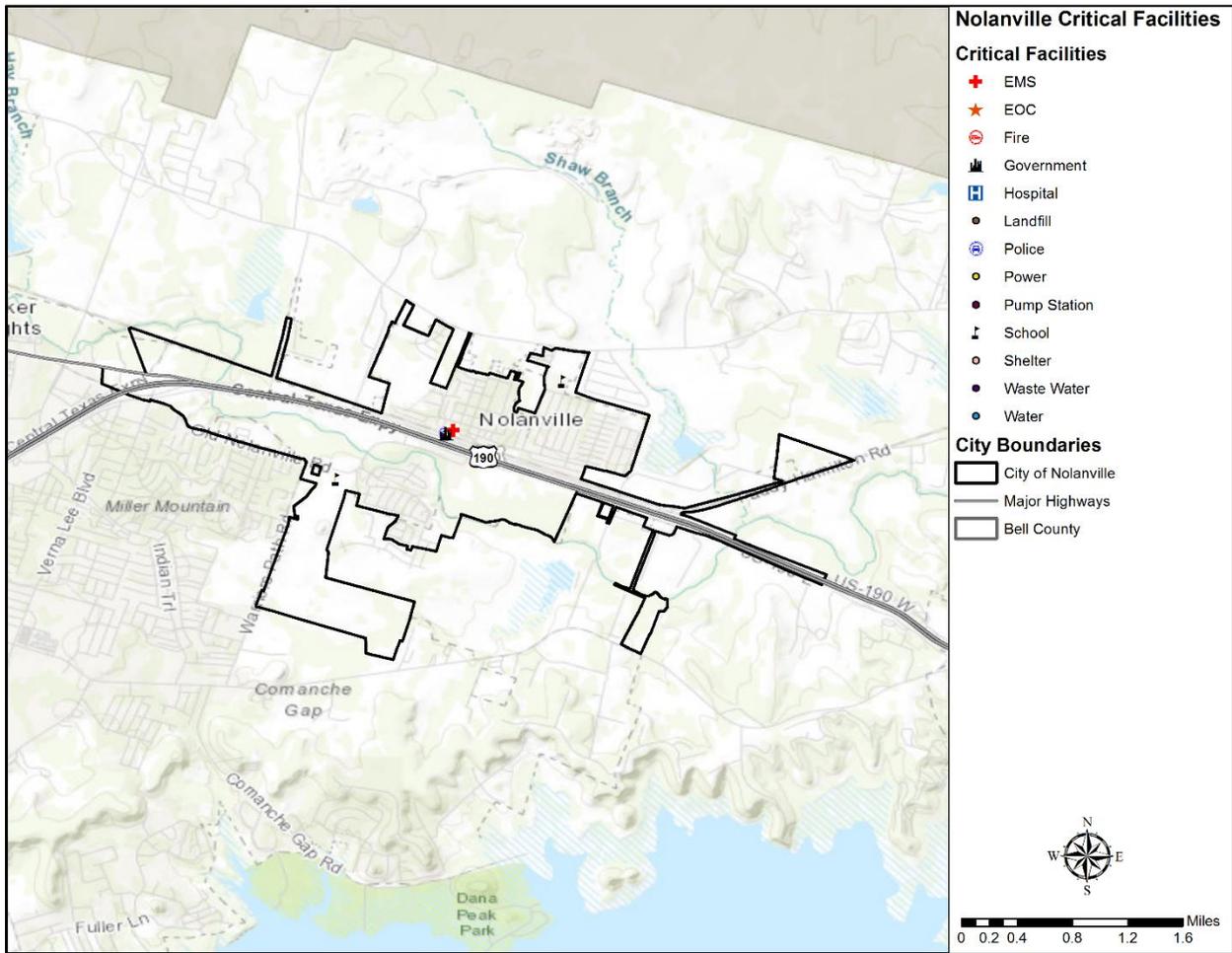


Table C-8. Critical Facilities by Type in the City of Nolanville

TYPE	NUMBER
City Hall	1
EMS Public Safety	1
Fire Department	1
Police Department	1
Public Works Department	1
School	2

Appendix C: Critical Facilities

Figure C-9. Critical Facilities in the City of Rogers

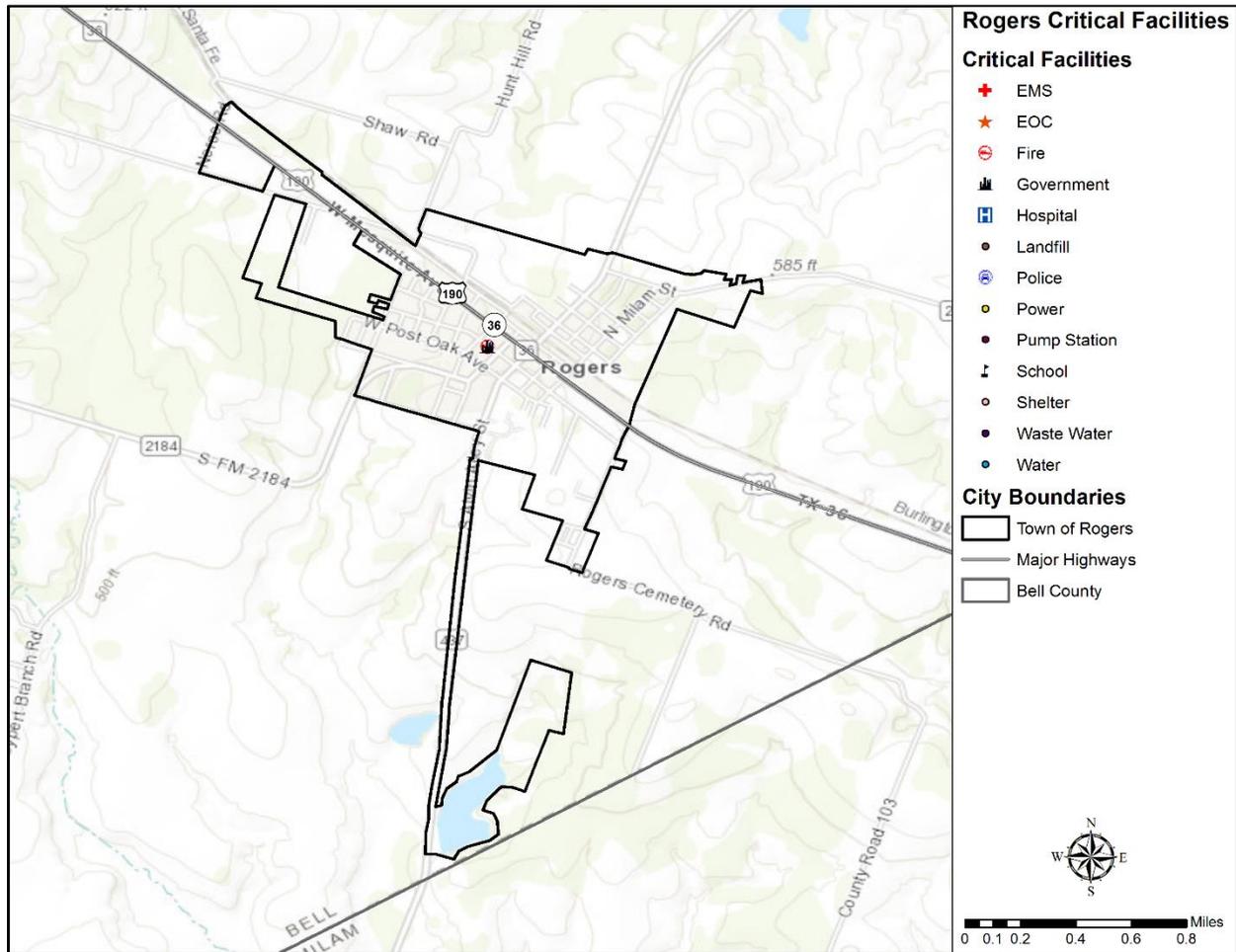


Table C-9. Critical Facilities by Type in the City of Rogers

TYPE	NUMBER
City Hall	1
Community Center	1
Fire Department	1
Police Department	1
School	1
Wastewater Plant	1
Water Distribution Tower	2

Figure C-10. Critical Facilities in the Village of Salado

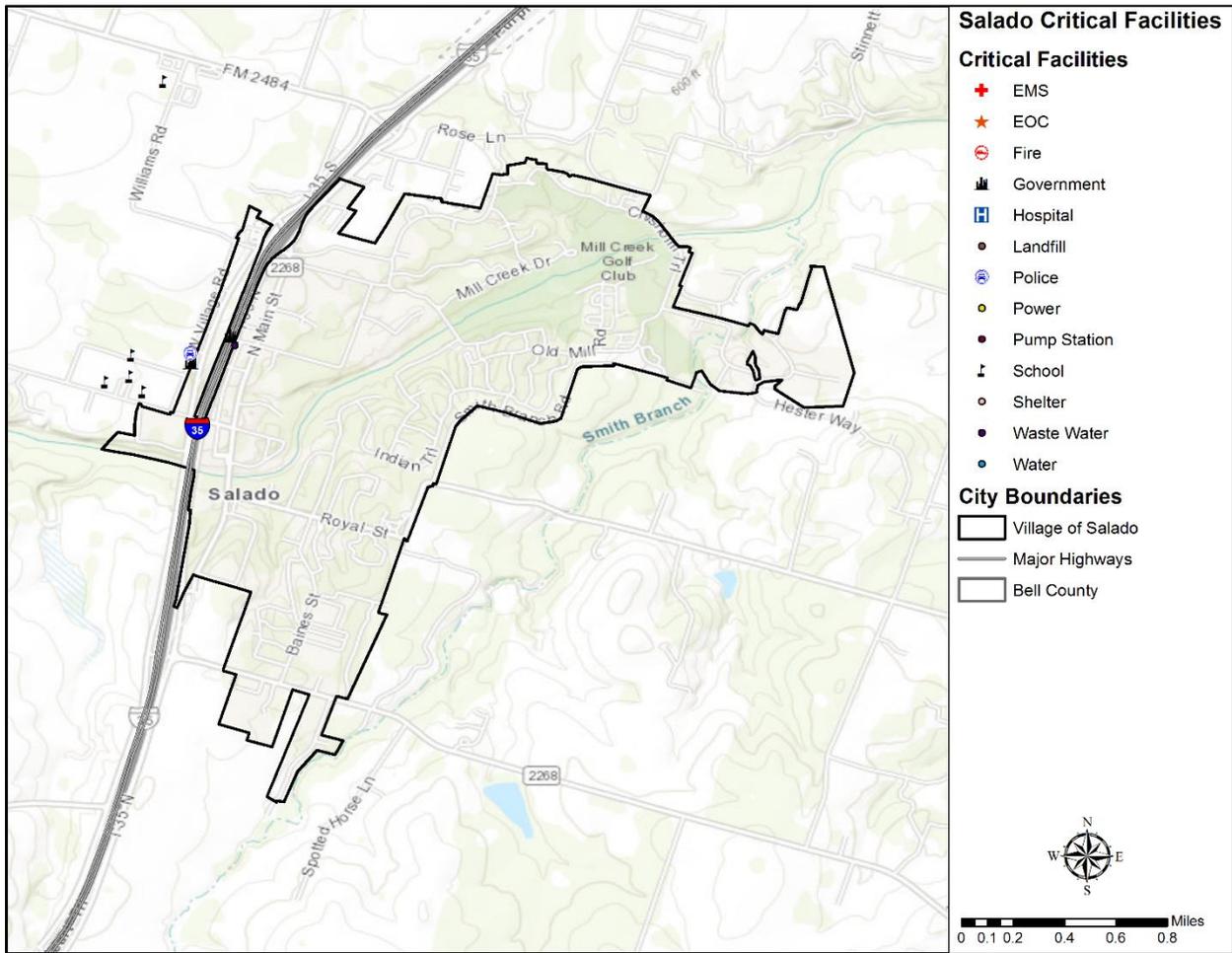


Table C-10. Critical Facilities by Type in the Village of Salado

TYPE	NUMBER
Bus Maintenance	1
Government Building	3
Public Water Supply	1
Public WW Plant	1
School	4

Appendix C: Critical Facilities

Figure C-11. Critical Facilities in the City of Temple

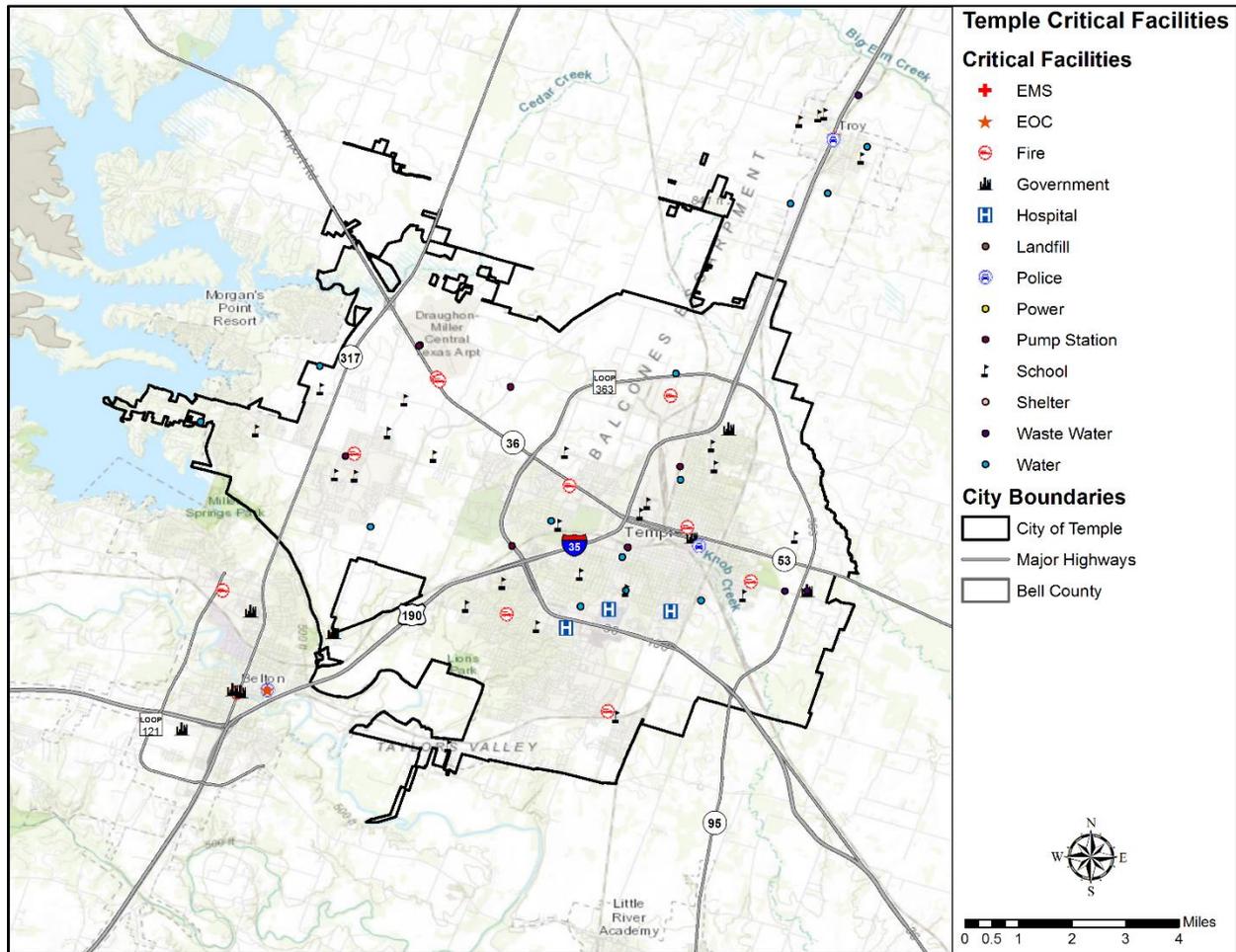


Table C-11. Critical Facilities by Type in the City of Temple

TYPE	NUMBER
Booster Pump Station	7
Convention Center	1
Fire Station	8
Ground Storage Tanks	1
HI Tank	11
Medical Facility	3
Municipal Building	2
Police Station	1
School	22

Appendix C: Critical Facilities

TYPE	NUMBER
Waste Water Treatment Plant	2
Water Treatment Plant	2

Appendix C: Critical Facilities

Figure C-12. Critical Facilities in the City of Troy

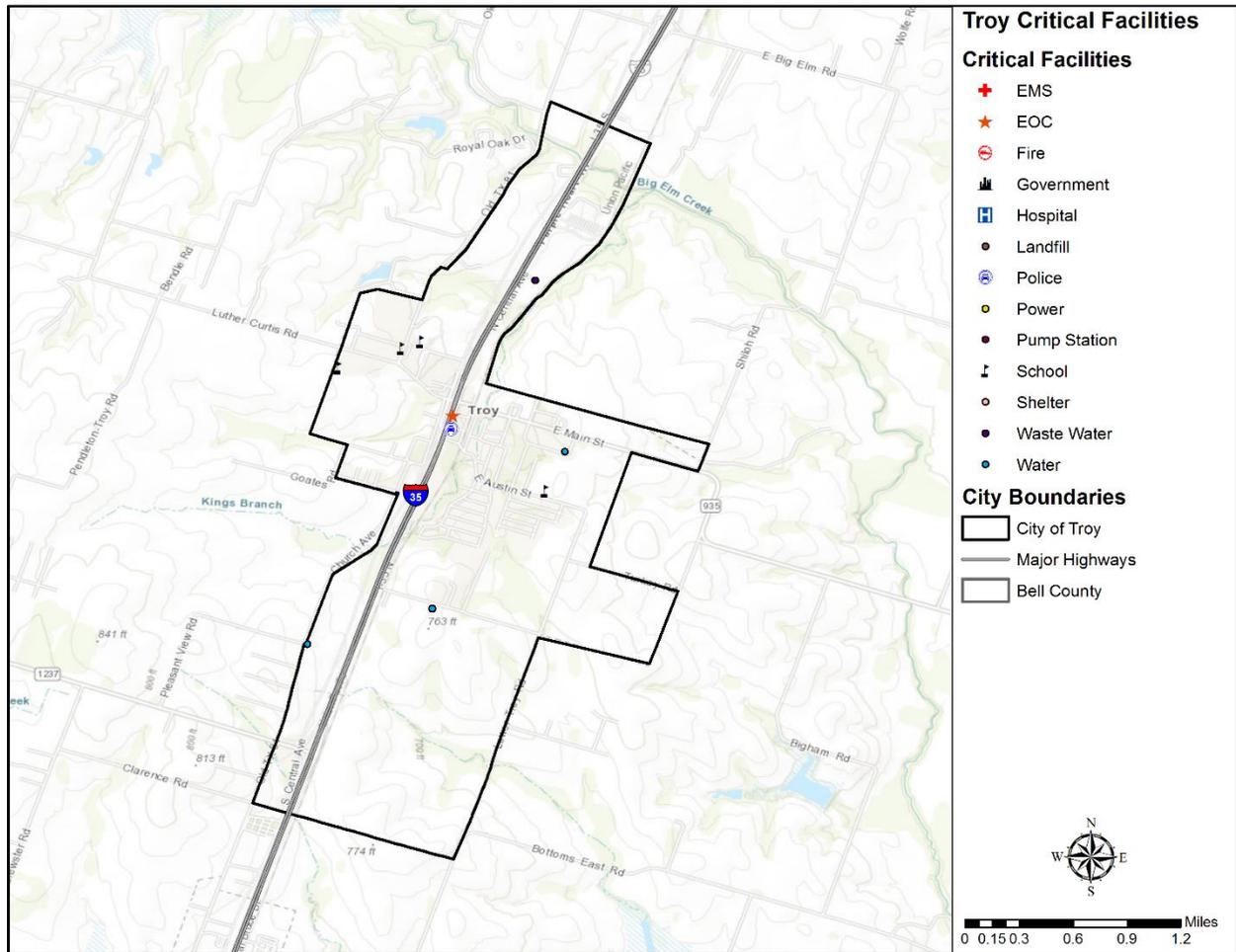


Table C-12. Critical Facilities by Type in the City of Troy

TYPE	NUMBER
City Hall / EOC	1
Police Department	1
School	4
Wastewater Treatment Plant	1
Water Well	1
Water Storage & Pumps	1
Water Tower	1

Appendix D: Dam Locations

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Dam Locations	1

Overview

Appendix D is **For Official Use Only (FOUO)** and may be exempt from public release under the Freedom of Information Act (FOIA).

Dam Locations

Table D-1 below reflects all dams that are located in Bell County. This list includes High, Significant, and Low Hazard Dams. Section 15 of the Plan doesn't profile dams that were deemed to pose no past, current, or future risk to the planning area as no loss of life or impact to critical facilities or infrastructure is expected in the event of a breach. The asterisk denotes those that were profiled in the hazard assessment.

Table D-1. List of Bell County Dam Locations and Storage Capacities

JURISDICTION	LATITUDE	LONGITUDE	HEIGHT (Feet)	STORAGE (Acre Feet)
Bell County	30.983366	-97.249392	28	1,832
Bell County	30.890483	-97.285402	20	165
Bell County	31.245983	-97.53406	31	211
Bell County	30.96083	-97.250437	20	80
Bell County	30.840508	-97.319232	39	3,009
Bell County	30.953058	-97.20574	25	183
Bell County	31.024547	-97.24715	28	796
Bell County	31.121228	-97.192587	21	220
Bell County	30.950411	-97.212782	25	271
Bell County	31.163356	-97.312382	39	1,126.7
Bell County	31.158616	-97.284031	28	1,813
Bell County	31.229477	-97.303475	49	716
Bell County	31.759	-97.074	17	223
Bell County	31.065863	-97.442462	11	480

Appendix D: Dam Locations

JURISDICTION	LATITUDE	LONGITUDE	HEIGHT (Feet)	STORAGE (Acre Feet)
Bell County	30.963116	-97.245458	18	187
Bell County	30.812527	-97.302666	36	981
Bell County	31.106343	-97.599711	16	53
Bell County	30.837342	-97.331893	38	2,998
Bell County	30.970316	-97.256077	24	336
Bell County	30.793146	-97.371758	31	20
Bell County	31.098517	-97.213031	27	1,650
Bell County	31.073968	-97.339576	20	160
Bell County	31.092893	-97.173196	23	350.5
Bell County	31.056415	-97.164877	34	841
Bell County	31.091801	-97.191048	23.3	2,750
Bell County	31.128628	-97.201951	24	1,110
Bell County	31.172431	-97.345717	41	488
Bell County*	31.240385	-97.311635	74	18,300
Bell County	31.139436	-97.31449	24	259
Bell County	30.979216	-97.268836	18	83
Bell County	31.174472	-97.272826	42	715
Bell County	30.926732	-97.522506	24	76
Bell County	31.05386	-97.150658	14	64
Bell County	31.148025	-97.373788	19	120
Bell County	30.99405	-97.223392	35	704
Bell County	31.071506	-97.171733	29	894
Bell County	31.031838	-97.150658	39	1,105
Bell County	30.997642	-97.127811	39	1,818.5
Bell County	31.157655	-97.329318	48	856
Bell County	30.978243	-97.21073	28	312
Bell County	30.906481	-97.231746	20	216

Appendix D: Dam Locations

JURISDICTION	LATITUDE	LONGITUDE	HEIGHT (Feet)	STORAGE (Acre Feet)
Bell County	31.19628	-97.226375	7	56
Bell County	30.810022	-97.324525	39	2,003
Bell County	30.95675	-97.185478	17	91
Belton	31.06968	-97.540218	33	485
Belton	31.128542	-97.564658	62	6,025
Belton	31.1483143	-97.7454131	17	204
Belton	31.076117	-97.582382	44	1,421
Belton	31.1576326	-97.6631215	27	700
Belton*	31.1	-97.48333	192	1,876,700
Belton	31.1333044	-97.6100754	32	230
Belton	31.157547	-97.615416	56.5	2,839
Belton	31.067721	-97.506162	52	730
Belton	31.082373	-97.554365	51	721
Belton	31.062668	-97.595432	40	1,543
Belton	31.079841	-97.563067	33	1,229
Cameron*	31.033331	-97.533333	200	1,013,800
Cameron	31.024972	-97.261316	23	863
Killeen	31.085462	-97.678787	19	243
Killeen*	31.116202	-97.768905	56	5,000
Killeen	31.141491	-97.700887	37	1,470
Nolanville	31.10776	-97.670847	31	1,211
Nolanville	31.89865	-97.628485	47	1,543
Nolanville	31.097337	-97.652988	46	1,953
Salado	30.94122	-97.547276	31	383
Temple	31.101205	-97.373337	30	778.5

Appendix E: Meeting Documentation

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Workshop Documentation

Appendix E is **For Official Use Only (FOUO)** and may be exempt from public release under the Freedom of Information Act (FOIA).

Bell County held a series of Planning Team workshops: a Kickoff Workshop on January 24, 2017, a Risk Assessment Workshop on May 11, 2017, and a Mitigation Strategy Workshop on September 8, 2017 and September 28, 2017. At each of these workshops members of the Planning Team were informed of the planning process, expressed opinions, and volunteered information. CTCOG hosted three public meetings; one in each of the counties, but all counties and jurisdictions were invited to all of the public meetings. The sign-in sheets for each workshop and public meeting are included below. For more details on the workshops and planning process, see Section 2.

Appendix E: Meeting Documentation

Figure E-1. Bell County Kickoff Workshop, 1/24/17



CTCOG
Central Texas Council of Governments



H₂O PARTNERS

CTCOG and BELL COUNTY HAZARD MITIGATION PLAN UPDATE
 Kick Off Workshop
 CTCOG, Belton, TX
 January 24, 2017

Please print clearly.

Name	Title	Department	Phone	Email
Rachel Andrews	Mitigation Specialist	H2O Partner	512-983-0092	rachol@h2opartners.us
Paul Sims	Fire Chief / EMT	Harker Heights	254-699-2688	psims@ci.harker-heights.tx.us
Bob Harrell	EMT	Harker Heights	254-699-2688	psims@ci.harker-heights.tx.us
Trisha Dutton	Court Clerk	City of Rogers	254-642-3312	trishadutton@cityofrogers.us
Brett Peckham	Fire Chief	Belton	933-5825	bpeckham@belton-texas.gov
Beth Correy	Grant Coordinator	CTCOG Planning	254-770-2365	bethcorrey@ctcog.org
Mark Collier	Emergency Services Director	CTCOG	254-770-2381	mark.collier@ctcog.org
Michael Harmon	Bell Co EMT	Bell Co	254-931-3170	michael.harmon@bellcountytexas.gov
Nicole Tomalva	Public Works Director	Temple	254-298-5621	ntomalva@temple-texas.gov
Randy Pearson	Training Officer	Killeen FD	254-501-7876	rpearson@killeentexas.gov
Christopher Walker	FF-EMT	Killeen FD	254-501-7876	cwalker@killeentexas.gov

1

Appendix E: Meeting Documentation

Figure E-2. Bell County Risk Assessment Workshop, 5/11/17

CTCOG and BELL COUNTY HAZARD MITIGATION PLAN UPDATE
Risk Assessment Workshop
CTCOG, Belton, TX
May 11, 2017

Please print clearly.

Name	Title	Department	Phone	Email
Rachel Andrews	Mitigation Specialist	H2O Partners	512-983-0092	rachel@h2opartnersusa.com
Mark E. Collier	Emr. Serv. Director	CTCOG	254-770-2381	mark.collier@ctcog.org
Hadi Watson	Mitigation Specialist	H2O Partners	512-568-2259	hadi@h2opartnersusa.com
Stanley J. Koons	Mayor	Holland	254-657-2460	
Paul Sims	Fire Chief	Harker Heights	254-699-2688	psims@ci.harker-heights.tx.us
My Vuong	EMC	Killeen	254-226-1127	emcordinator@killeentexas.gov
Rick Ashe	Chief	SALADO P.D.	254-997-5661	rashe@saladotx.gov
Brian Brank	Chief	Killeen Fire	254-466-5500	bbrank@killeentexas.gov
Kara Escobar	CM	Nolanville	254-698-6355	
Michael Hemen	EMC	Bell County	254-931-3170	michael.hemen@bellcountytx.gov
Stacey Allen	Emergency Services Manager	CTCOG	254-250-2367	stacey.allen@ctcog.org
Kendal Coufal	Senior Planner	CTCOG	254-770-2363	kendal.coufal@ctcog.org

Appendix E: Meeting Documentation

Figure E-3. Bell County Mitigation Strategy Workshop, 9/8/17

BELL COUNTY HAZARD MITIGATION PLAN
Mitigation Strategy Workshop
 Central Texas Council of Governments, Belton, TX
 September 8, 2017

Please print clearly.

Name	Title	Department	Phone	Email
Erin Capps		H2O Partners	512-769-5883	ecapps@h2opartners.com
Mitch Ruffles	Fire Chief/EMC	Temple	254-298-5652	mfruffles@templetx.gov
JAMES M. MAYOR	MAYOR	BARTLETT	254 527 3269	mayor@bartlett-tx.us
Wesley Giraldo	ASSISTANT FIRE CHIEF	BELTON	254-933-5884	WGIRALDO@BELLCO.TX.GOV
Jesse Hanning	CI/OLA		254-410-9424	jesse.hanning@ctcog.org
Brian Alty	Asst EMC/EM	HHFD	254-699-2688	balt@ci.harker-heights.tx.us
Paul Sims	Fire Chief/EMC	HHFD	254-699-2400	psims@ci.harker-heights.tx.us
My Vuong	EMC	City of Killeen	254-226-1127	emcoordinator@killeen-tx.gov

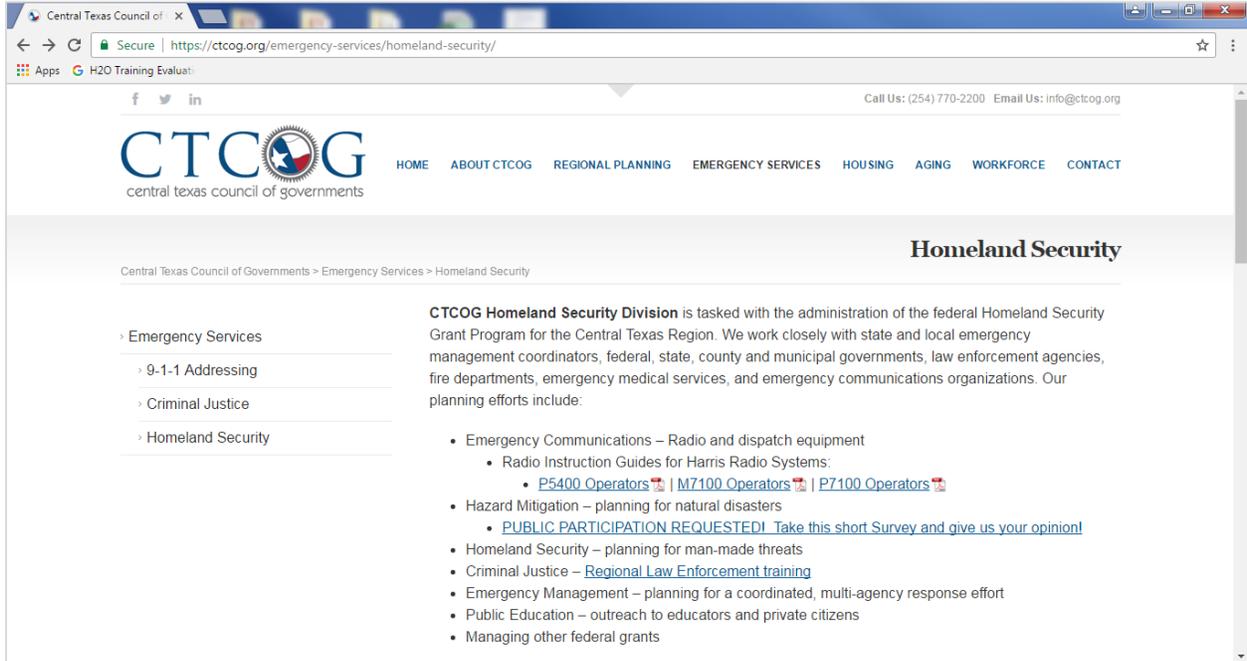
1



Public Notices

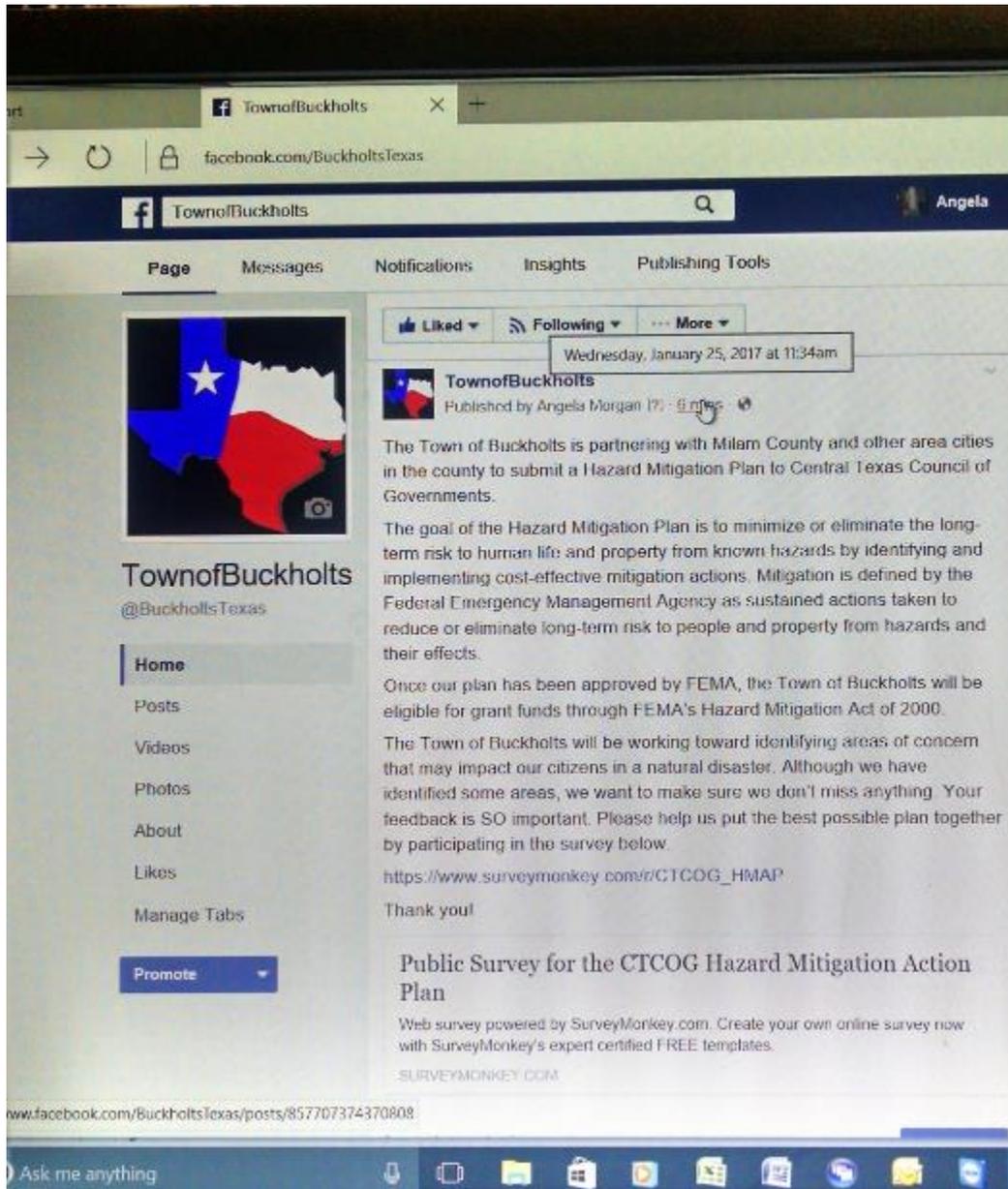
Public notices to announce Bell County's participation in the Plan development process were posted on various websites and Facebook, as shown in Figures E-8 through E-12. Additionally, as seen in the following figures, the County and participating jurisdictions invited the public to participate in the survey.

Figure E-8. Public Notice, CTCOG Web Posting, Survey Invitation



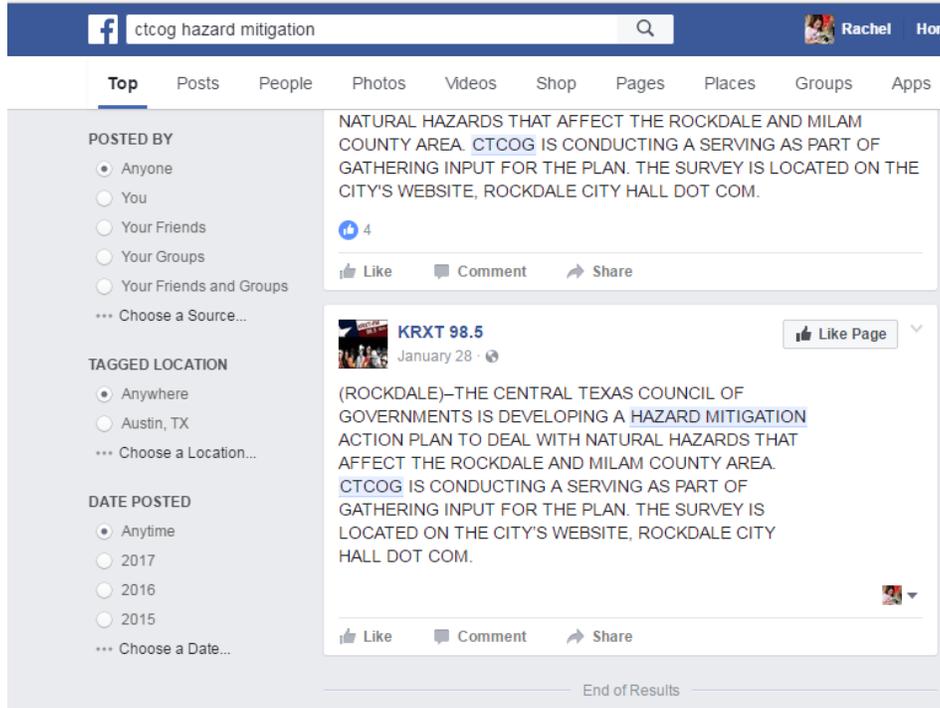
Appendix E: Meeting Documentation

Figure E-9. Public Notice, the Town of Buckholts Facebook Page, 1/25/17 Survey Invitation



Appendix E: Meeting Documentation

Figure E-10. Public Notice, KRXT 98.5 Facebook Page, 1/28/17 Survey Invitation



Appendix E: Meeting Documentation

Figure E-11. Public Notice, CTCOG Facebook Posting, 5/17/17 Public Meeting and Survey Invitation

The image is a screenshot of a Facebook page for the Central Texas Council of Governments. At the top, there is a search bar with the text "Central Texas Council of Governments" and a magnifying glass icon. Below the search bar, there are buttons for "Like", "Follow", "Share", and a three-dot menu. The profile picture of the page is a circular logo with a star and a map of Texas. The page name is "Central Texas Council of Governments" with a verified checkmark and the handle "@CentralTexasCouncilOfGovernments". Below the name are navigation links: "Home", "Services", "Photos", and "Posts". The main content area shows a post from "Central Texas Council of Governments" dated "May 17". The post text reads "CTCOG/Bell County Hazard Mitigation Plan Mitigation Strategy Workshop" followed by a truncated URL: "https://ctcog.org/.../ctcogbell-county-hazard-mitigation-pla.../". Below the text is a large image placeholder for a video or image that failed to load. The placeholder contains a large blue "C" and the text "Central Texas Council of Governments – Page not found". Below the placeholder is a message: "Sorry but we couldn't find the page you are looking for. Please check to make sure you've typed the URL correctly. You may also want to search for what you are looking for." and the URL "CTCOG.ORG". At the bottom of the post are buttons for "Like", "Comment", and "Share".

Appendix E: Meeting Documentation

Figure E-12. Public Notice, CTCOG Web Posting, 7/28/17 Workshop Meeting

The screenshot shows the CTCOG website's "Calendar of Events" page. At the top, there are social media icons for Facebook, Twitter, and LinkedIn, along with contact information: "Call Us: (254) 770-2200" and "Email Us: info@ctcog.org". The CTCOG logo is prominently displayed, with the text "central texas council of governments" underneath. A navigation menu includes links for HOME, ECONOMIC DEVELOPMENT, REGIONAL PLANNING, HOUSING ASSISTANCE, AGING, WORKFORCE, and CONTACT. The page title is "Calendar of Events", and the breadcrumb trail reads "Central Texas Council of Governments >Resources >Calendar of Events". A link for "« All Events" is visible. A light blue banner states "This event has passed." The main heading is "CTCOG/Bell County Hazard Mitigation Plan Mitigation Strategy Workshop", followed by the date and time: "July 28 @ 3:00 pm - 4:30 pm". Navigation links "« CTCOG/Milam County Hazard Mitigation Plan Mitigation Strategy Workshop" and "Criminal Justice Training Advisory Board »" are present. The body text describes the workshop's purpose in developing a FEMA-mandated Hazard Mitigation Action Plan for Bell County. It notes that H2O Partners, Inc. is facilitating the workshop and lists several planning team members from CTCOG, Bell County, and various cities (Bartlett, Belton, Harker Heights, Holland, Killeen, Little River Academy, Nolanville, Rogers, Salado, Temple, and Troy) who are invited to attend.

Appendix F: Capability Assessment

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Overview

The Planning Team completed a Capability Assessment Survey at the beginning of the planning process. The completed Capability Assessment Checklist, included in Appendix F, provides information on existing policies, plans, and regulations for Bell County and the participating jurisdictions.

A Capability Assessment is an integral component of the Plan development process. The Capability Assessment serves to evaluate a community’s existing planning and regulatory capabilities to support implementation of the Plan’s Mitigation Strategy Objectives.

Each community has a unique set of capabilities including policies, programs, staff, funding, and other resources available to accomplish hazard mitigation objectives and reduce long-term vulnerability. The Planning Team identified existing capabilities in each jurisdiction that currently reduce disaster losses or could be used to reduce losses in the future, and capabilities that inadvertently increase risks in the community.

Bell County Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code		
Capital Improvements Plan	X	
Community Wildfire Protection Plan		
Comprehensive/Master Plan		
Continuity of Operations Plan		
Economic Development Plan		
Emergency Operations Plan		
Evacuation Plan		
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance	X	
Hazard Mitigation Plan		X
Historic Preservation Plan		
Land Use Plan		
Local Waterfront Protection Plan		
Open Space Plan		
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)	X	
Real Estate Disclosure Requirements		
Redevelopment Plan		
Site Plan Review Requirements		

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		
Stormwater Management Plan	X	
Stormwater Ordinance		
Subdivision Regulations	X	
Transportation Plan	X	
Watershed Protection Plan	X	
Zoning Ordinance/Land Use Restrictions		
Administrative and Technical Capability		
Planners		
Engineers		X
Emergency Manager		X
Floodplain Manager		X
Personnel skilled in Geographic Information Systems (GIS)		X
Resource development staff or grant writers		
Financial Resources		
Capital Improvement Programming		
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		

City of Bartlett Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code	X	
Capital Improvements Plan		X
Community Wildfire Protection Plan		X
Comprehensive/Master Plan		X
Continuity of Operations Plan		X
Economic Development Plan		X
Emergency Operations Plan		X
Evacuation Plan		X
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance	X	
Hazard Mitigation Plan		X
Historic Preservation Plan		X
Land Use Plan		X
Local Waterfront Protection Plan		X
Open Space Plan		X
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)	X	
Real Estate Disclosure Requirements		X
Redevelopment Plan		X
Site Plan Review Requirements	X	

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		X
Stormwater Management Plan		X
Stormwater Ordinance		X
Subdivision Regulations		X
Transportation Plan		X
Watershed Protection Plan		X
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Planners		X
Engineers		X
Emergency Manager		X
Floodplain Manager		
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers		
Financial Resources		
Capital Improvement Programming		
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		

City of Belton Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code	X	
Capital Improvements Plan	X	
Community Wildfire Protection Plan		
Comprehensive/Master Plan	X	
Continuity of Operations Plan	X	
Economic Development Plan	X	
Emergency Operations Plan	X	
Evacuation Plan	X	
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance	X	
Hazard Mitigation Plan		X
Historic Preservation Plan		
Land Use Plan		
Local Waterfront Protection Plan		
Open Space Plan		
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)		
Real Estate Disclosure Requirements		
Redevelopment Plan		
Site Plan Review Requirements	X	

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		
Stormwater Management Plan		
Stormwater Ordinance	X	
Subdivision Regulations	X	
Transportation Plan	X	
Watershed Protection Plan		
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Planners		X
Engineers		X
Emergency Manager		X
Floodplain Manager		X
Personnel skilled in Geographic Information Systems (GIS)		X
Resource development staff or grant writers		X
Financial Resources		
Capital Improvement Programming		X
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		X
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		

City of Harker Heights Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code	X	
Capital Improvements Plan	X	
Community Wildfire Protection Plan		X
Comprehensive/Master Plan	X	
Continuity of Operations Plan	X	
Economic Development Plan	X	
Emergency Operations Plan	X	
Evacuation Plan	X	
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance	X	
Hazard Mitigation Plan		X
Historic Preservation Plan		
Land Use Plan	X	
Local Waterfront Protection Plan		
Open Space Plan		
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)	X	
Real Estate Disclosure Requirements		
Redevelopment Plan		
Site Plan Review Requirements	X	

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		
Stormwater Management Plan	X	
Stormwater Ordinance	X	
Subdivision Regulations	X	
Transportation Plan	X	
Watershed Protection Plan	X	
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Planners		X
Engineers		X
Emergency Manager		X
Floodplain Manager		X
Personnel skilled in Geographic Information Systems (GIS)		X
Resource development staff or grant writers		
Financial Resources		
Capital Improvement Programming		X
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		X
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		X

City of Holland Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code	X	
Capital Improvements Plan	X	
Community Wildfire Protection Plan	X	
Comprehensive/Master Plan	X	
Continuity of Operations Plan		
Economic Development Plan		
Emergency Operations Plan	X	
Evacuation Plan	X	
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance	X	
Hazard Mitigation Plan		X
Historic Preservation Plan		
Land Use Plan		
Local Waterfront Protection Plan		
Open Space Plan		
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)	X	
Real Estate Disclosure Requirements		
Redevelopment Plan		
Site Plan Review Requirements	X	

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		
Stormwater Management Plan		
Stormwater Ordinance		
Subdivision Regulations	X	
Transportation Plan		
Watershed Protection Plan		
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Planners		
Engineers		X
Emergency Manager		X
Floodplain Manager		
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers		X
Financial Resources		
Capital Improvement Programming		
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		X

City of Killeen Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code	X	
Capital Improvements Plan	X	
Community Wildfire Protection Plan		X
Comprehensive/Master Plan	X	
Continuity of Operations Plan	X	
Economic Development Plan		X
Emergency Operations Plan	X	
Evacuation Plan	X	
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance	X	
Hazard Mitigation Plan		X
Historic Preservation Plan	X	
Land Use Plan	X	
Local Waterfront Protection Plan		X
Open Space Plan	X	
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)		
Real Estate Disclosure Requirements		X
Redevelopment Plan	X	
Site Plan Review Requirements	X	

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		
Stormwater Management Plan	X	
Stormwater Ordinance		
Subdivision Regulations	X	
Transportation Plan	X	
Watershed Protection Plan		X
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Planners		X
Engineers		X
Emergency Manager		X
Floodplain Manager		X
Personnel skilled in Geographic Information Systems (GIS)		X
Resource development staff or grant writers		X
Financial Resources		
Capital Improvement Programming		X
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		X
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		X

City of Little River Academy Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code		
Capital Improvements Plan		
Community Wildfire Protection Plan		
Comprehensive/Master Plan		
Continuity of Operations Plan		
Economic Development Plan		
Emergency Operations Plan		
Evacuation Plan		
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance	X	
Hazard Mitigation Plan		X
Historic Preservation Plan		
Land Use Plan		
Local Waterfront Protection Plan		
Open Space Plan		
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)	X	
Real Estate Disclosure Requirements		
Redevelopment Plan		
Site Plan Review Requirements		

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		
Stormwater Management Plan		
Stormwater Ordinance		
Subdivision Regulations	X	
Transportation Plan		
Watershed Protection Plan		
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Planners		
Engineers		X
Emergency Manager		X
Floodplain Manager		X
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers		
Financial Resources		
Capital Improvement Programming		
Community Development Block Grants (CDBG)		
Stormwater Utility Fees		
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		

City of Nolanville Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code	X	
Capital Improvements Plan	X	
Community Wildfire Protection Plan		
Comprehensive/Master Plan	X	
Continuity of Operations Plan		
Economic Development Plan		
Emergency Operations Plan	X	
Evacuation Plan		
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance		X
Hazard Mitigation Plan		X
Historic Preservation Plan		
Land Use Plan	X	
Local Waterfront Protection Plan		
Open Space Plan		
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)		
Real Estate Disclosure Requirements		
Redevelopment Plan		
Site Plan Review Requirements	X	

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance	X	
Stormwater Management Plan	X	
Stormwater Ordinance	X	
Subdivision Regulations	X	
Transportation Plan		
Watershed Protection Plan	X	
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Planners		
Engineers		
Emergency Manager		X
Floodplain Manager		
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers		
Financial Resources		
Capital Improvement Programming		X
Community Development Block Grants (CDBG)		
Stormwater Utility Fees		
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		X

City of Rogers Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code	X	
Capital Improvements Plan	X	
Community Wildfire Protection Plan		X
Comprehensive/Master Plan		X
Continuity of Operations Plan	X	
Economic Development Plan		X
Emergency Operations Plan	X	
Evacuation Plan	X	
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance	X	
Hazard Mitigation Plan		X
Historic Preservation Plan		
Land Use Plan		X
Local Waterfront Protection Plan		X
Open Space Plan		X
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)	X	
Real Estate Disclosure Requirements	X	
Redevelopment Plan		X
Site Plan Review Requirements		X

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		X
Stormwater Management Plan		X
Stormwater Ordinance		X
Subdivision Regulations		X
Transportation Plan		X
Watershed Protection Plan		X
Zoning Ordinance/Land Use Restrictions		X
Administrative and Technical Capability		
Planners		
Engineers		X
Emergency Manager		X
Floodplain Manager		
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers		X
Financial Resources		
Capital Improvement Programming		
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		X

Village of Salado Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code	X	
Capital Improvements Plan		X
Community Wildfire Protection Plan		
Comprehensive/Master Plan	X	
Continuity of Operations Plan		X
Economic Development Plan		X
Emergency Operations Plan		X
Evacuation Plan		X
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance	X	
Hazard Mitigation Plan		X
Historic Preservation Plan		
Land Use Plan	X	
Local Waterfront Protection Plan		
Open Space Plan	X	
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)	X	
Real Estate Disclosure Requirements		
Redevelopment Plan		
Site Plan Review Requirements	X	

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		
Stormwater Management Plan		
Stormwater Ordinance		
Subdivision Regulations	X	
Transportation Plan		
Watershed Protection Plan		
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Planners		X
Engineers		X
Emergency Manager		X
Floodplain Manager		X
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers		X
Financial Resources		
Capital Improvement Programming		
Community Development Block Grants (CDBG)		
Stormwater Utility Fees		
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		X

City of Temple Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code	X	
Capital Improvements Plan	X	
Community Wildfire Protection Plan		X
Comprehensive/Master Plan	X	
Continuity of Operations Plan		X
Economic Development Plan	X	
Emergency Operations Plan	X	
Evacuation Plan		X
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance	X	
Hazard Mitigation Plan		X
Historic Preservation Plan	X	
Land Use Plan	X	
Local Waterfront Protection Plan		
Open Space Plan	X	
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)	X	
Real Estate Disclosure Requirements		
Redevelopment Plan	X	
Site Plan Review Requirements	X	

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		
Stormwater Management Plan	X	
Stormwater Ordinance	X	
Subdivision Regulations	X	
Transportation Plan	X	
Watershed Protection Plan	X	
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Planners		X
Engineers		X
Emergency Manager		X
Floodplain Manager		X
Personnel skilled in Geographic Information Systems (GIS)		X
Resource development staff or grant writers		X
Financial Resources		
Capital Improvement Programming		X
Community Development Block Grants (CDBG)		X
Stormwater Utility Fees		X
Development Impact Fees		X
Partnering Agreements or Intergovernmental Agreements		X

City of Troy Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code	X	
Capital Improvements Plan		X
Community Wildfire Protection Plan		
Comprehensive/Master Plan	X	
Continuity of Operations Plan		
Economic Development Plan		
Emergency Operations Plan	X	
Evacuation Plan		
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance		
Hazard Mitigation Plan		X
Historic Preservation Plan		
Land Use Plan	X	
Local Waterfront Protection Plan		
Open Space Plan		
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)	X	
Real Estate Disclosure Requirements		
Redevelopment Plan		
Site Plan Review Requirements	X	

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		
Stormwater Management Plan		
Stormwater Ordinance		
Subdivision Regulations	X	
Transportation Plan		
Watershed Protection Plan	X	
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Planners		
Engineers		X
Emergency Manager		X
Floodplain Manager		X
Personnel skilled in Geographic Information Systems (GIS)		
Resource development staff or grant writers		X
Financial Resources		
Capital Improvement Programming		X
Community Development Block Grants (CDBG)		
Stormwater Utility Fees		X
Development Impact Fees		X
Partnering Agreements or Intergovernmental Agreements		

Appendix F: Capability Assessment

Central Texas Council of Governments (CTCOG) Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	In Place	Under Development
Building Code		
Capital Improvements Plan		
Community Wildfire Protection Plan		
Comprehensive/Master Plan		
Continuity of Operations Plan		
Economic Development Plan		
Emergency Operations Plan		
Evacuation Plan		
Flood Response Plan		
Floodplain Management Plan		
Floodplain Ordinance		
Hazard Mitigation Plan		X
Historic Preservation Plan		
Land Use Plan		
Local Waterfront Protection Plan		
Open Space Plan	X	
Post-Disaster Recovery Plan		
Real Estate Disclosure Requirements		
Redevelopment Plan		
Regional Mass Fatality Plan	X	

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Site Plan Review Requirements		
Steep Slope Ordinance		
Stormwater Management Plan		
Stormwater Ordinance		
Subdivision Regulations		
THIRA		X
Transportation Plan		
Watershed Protection Plan		
Zoning Ordinance/Land Use Restrictions		
Administrative and Technical Capability		
Planners		X
Engineers		
Emergency Manager		
Floodplain Manager		
Personnel skilled in Geographic Information Systems (GIS)		X
Resource development staff or grant writers		
Financial Resources		
Capital Improvement Programming		
Community Development Block Grants (CDBG)		
Stormwater Utility Fees		
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		