Central Texas Council of Governments Regional Hazard Mitigation Action Plan

Planning Participants: Hamilton County, City of Hamilton, and City of Hico

Mitigating Risk for a Safe, Secure, and Sustainable Future

DRAFT: March 2018

H2O PARTNERS
PLAN YOUR RECOVERY

CTCOG
central texas council of governments

For more information, visit our website at:

www.hamiltoncountytx.org

Written comments should be forwarded to:

H2O Partners, Inc.
P. O. Box 160130
Austin, Texas 78716
info@h2opartnersusa.com
www.h2opartnersusa.com

Table of Contents

Section 1 – Introduction

Section 2 – Planning Process

Section 3 – County Profile

Section 4 – Risk Overview

Section 5 – Thunderstorm Wind

Table of Contents

Section 6 – Flood

Section 7 – Extreme Heat

Section 8 – Tornado

Section 9 – Hail

Table of Contents

Section 10 – Wildfire

Section 11 – Drought

Section 12 – Lightning

Section 13 – Winter Storm

Section 14 – Dam Failure

Table of Contents

Section 15 – Mitigation Strategy

Section 16 – Mitigation Actions

Section 17 – Plan Maintenance

Table of Contents

Section 1: Introduction

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 in the three individual plans being overseen by CTCOG.

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

Participating Jurisdictions
Village of Salado
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 Hamilton County as multi-jurisdictional Plan. The participating jurisdictions include Hamilton County, the City of Hamilton, and the City of Hico. These jurisdictions provided valuable input into the planning process.

Hamilton County is located in Central Texas and is bounded on the north by Comanche, Erath, and Johnson counties, on the west by Mills County and on the south by Lampasas and Coryell counties. Its center lies 114 miles north of Austin. The county seat is City of Hamilton.

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, Hamilton 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.

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.

[1] http://floodsafety.com/texas/regional_info/regional_info/austin_zone.htm
[2] http://www.fema.gov/hazard-mitigation-planning-resources

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 Hamilton 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 "Hamilton County planning area" refers to the entire planning area including the unincorporated area of Hamilton County, and the political border of the cities of Hamilton and Hico. Similarly, the term "countywide" refers to the entire planning area including the unincorporated area of Hamilton County and the political border of the cities of Hamilton and Hico.

Purpose

The Plan was prepared by CTCOG, Hamilton 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 Hamilton 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 Hamilton 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.*"

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

- Minimize disruption to Hamilton 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 Hamilton County and participating jurisdictions to take advantage of rapidly developing mitigation grant opportunities as they arise; and
- Ensure that Hamilton County and participating jurisdictions maintain eligibility for the full range of future Federal disaster relief.

Authority

The Plan is tailored specifically for Hamilton 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 14 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 15 presents hazard mitigation goals and objectives. Mitigation actions for Hamilton County and the participating jurisdictions are presented in Section 16, while Section 17 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 and meeting documentation. Capability Assessment results for Hamilton 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).

Section 2: Planning Process

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 Hamilton 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.

Figure 2-1. Mitigation Planning Process

Hamilton 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 Hamilton 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 representatives from the Central Texas Council of Governments that participated throughout the planning process.

Table 2-1. Executive Planning Team

ORGANIZATION / DEPARTMENT	TITLE
Hamilton County	County Judge
City of Hamilton	Chief of Police
City of Hico	Marshal
CTCOG	Homeland Security/Criminal Justice Coordinator

Table 2-2. Advisory Planning Team

ORGANIZATION / DEPARTMENT	TITLE
Hamilton County	Administrative Assistant
Hamilton County	Emergency Management Coordinator
City of Hamilton	City Administrator
City of Hamilton	Lieutenant
City of Hico	City Administrator
CTCOG	Director of Planning & Regional Services
CTCOG	Senior Planner
CTCOG	Grant Coordinator
CTCOG	Emergency Services Director

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.

Based on results of completed Capability Assessment, Hamilton 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 Drought Contingency 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, installing warning systems at low water crossings, implementing policies for local building codes to include additional development restrictions and construction techniques to reduce damages from hazards, 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 Hamilton 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 Hamilton County, participating jurisdictions, agencies, and partners will participate in implementing the Plan.

Kickoff Workshop

The Kickoff Workshop was held at the Hamilton County Courthouse on January 25, 2017. The initial workshop informed County officials and key department personnel about how the 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, 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 ten natural hazards, one of which is a quasi-technological hazard, dam failure, which pose a threat to the planning area.

Section 2: Planning Process

Risk Assessment

An initial risk assessment for Hamilton County and the participating jurisdictions was completed in April 2017 and results were presented to Planning Team members at the Risk Assessment Workshop held on April 12, 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 Hamilton County Courthouse on September 7, 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 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 16.

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 Hamilton County's website and the County Clerk's office with the chance to comment via responding to the County Judge'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 5-14) 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 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 Hamilton 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, 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 Hamilton County Plan.

Incorporation of the HMAP into Other Planning Mechanisms

Planning Team members will integrate implementation of the Plan with other planning mechanisms for Hamilton County, such as the Emergency Operations Plan. Existing plans for Hamilton County will be reviewed and incorporated into the Plan, as appropriate. This section discusses how the Plan will be implemented by Hamilton 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.

Hamilton County and the participating jurisdictions will be responsible for implementing hazard mitigation actions contained in Section 16. Each hazard mitigation action has been assigned to a specific County and City 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.

Hamilton County and the participating jurisdictions will integrate hazard mitigation actions contained in the Plan with existing planning mechanisms such as subdivision regulations, Emergency Operation Plans, and other local and area planning efforts. Hamilton 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 Hamilton 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 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. Hamilton 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, Hamilton 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
Annual Budget Review	Various departments and key personnel that participated in the planning process for Hamilton 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.
Capital Improvement Plans	Hamilton County and participating jurisdictions have a Capital Improvement Plan (CIP) in place. Prior to any revisions to the CIP, County and City departments will review the risk assessment and mitigation strategy sections of the HMAP, as limiting public spending in hazardous zones is one of the most effective long-term mitigation actions available to local governments.
Comprehensive Plans	Hamilton 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 Hamilton County updates their management plans or develops new plans.
Grant Applications	The Plan will be evaluated by Hamilton 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.
Regulatory Plans	Currently, Hamilton 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.

Appendix F provides an overview of Planning Team members' existing planning and regulatory capabilities to support implementation of mitigation strategy objectives.

Plan Review and Plan Update

As with the development of Plan, Hamilton 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 Hamilton 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 Hamilton County's comprehensive planning process, budgetary constraints, and community needs. Hamilton County and the participating jurisdictions are committed to addressing and implementing hazard mitigation actions that may be aligned with and integrated into the Plan.

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 Hamilton 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 Hamilton County's website and the County Clerk's Office.

The draft Plan was made available to the general public for review and comment on the Hamilton County's website and County Clerk's Office. 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 Hamilton 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 Hamilton 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
Bell County	Emergency Management Coordinator
Buckholts ISD	Superintendent
Cameron ISD	Superintendent
Grant Central Texas	Economic Development Corporation
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

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 revise and enhance local building codes to include additional development restrictions and construction techniques to reduce damages from natural hazard events, including tornadoes.

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, Hamilton 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 Hamilton County's and CTCOG's websites. A total of 16 surveys were completed online. The survey results are analyzed in Appendix B. Hamilton 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 improve drainage and to design and implement flood control retention structures. 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.

Section 3: County Profile

Overview

Hamilton County was formed in 1858, when the Sixth Texas Legislature formed the county from parts of Comanche, Bosque, and Lampasas counties. The county was named for James Hamilton Jr., a former governor of South Carolina who gave financial aid to the Republic of Texas. The City of Hamilton is the county seat.

The County consists of several cities, towns, and unincorporated communities. The following cities are participating within this plan and are considered part of the planning area: the City of Hamilton, and the City of Hico.

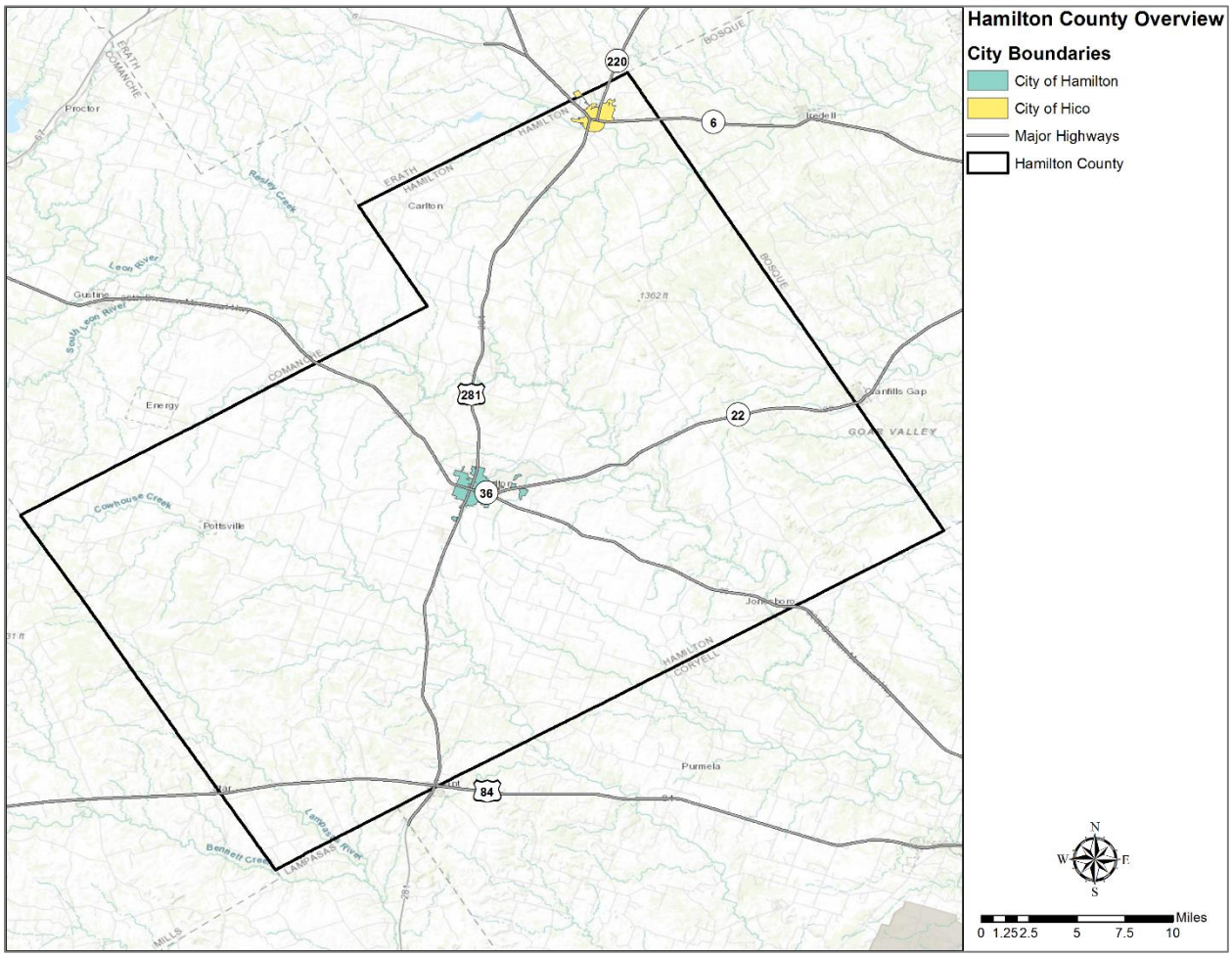
Hamilton County covers 836 square miles wooded with pecan, live oak, elm, cedar, and post oak. Soils range from the sandy loams and sands and the dark, limy, crumbly clays of the prairie, to the rich alluvial bottoms of the river valleys. The elevation of the county ranges between 900 and 1,600 feet above sea level. Except for the northwestern part, which lies in the Western Cross Timbers region, the county is rolling prairie marked by numerous flat-topped buttes that rise abruptly to stand on the divides between the county's many streams. The county is drained by the Leon, Lampasas, and Bosque rivers. Many of its deep, wide stream valleys are bordered by limestone cliffs that abut the intervening flat divides.

Figure 3-1 shows the general location of Hamilton County, along with the Cities that are located within the County.

Figure 3-1. Location of Hamilton County Planning Area

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

Figure 3-2. Hamilton County Planning Area



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

Table 3-1. Participating Jurisdictions

PARTICIPATING JURISDICTIONS
Hamilton County
City of Hamilton
City of Hico

Population and Demographics

In the official Census population count, as of April 1, 2010, Hamilton County had a population of 8,517 residents. By July 2015, the number had decreased to 8,266, and by July 2016, the population was 8,232. Table 3-2 provides the population distribution by jurisdiction within Hamilton 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
Hamilton	3,095	36.3%	817	494
Hico	1,379	16.2%	288	188
Unincorporated Hamilton County	4,043	47.5%	1,000	492
HAMILTON COUNTY TOTAL	**8,517**	**100%**	**2,105**	**1,174**

Population Growth

The official 2010 Hamilton County population is 8,517. Overall, Hamilton County experienced an increase in population between 1980 and 2010 by 3.5%, or an increase by 288 people. All of the participating jurisdictions experienced an increase in their population from 1980 to 2010. Between 2000 and 2010, the City of Hamilton experienced a decrease in population, while the rest of the jurisdictions experienced a population growth. Table 3-3 provides historic growth rates in Hamilton County.

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

JURISDICTIONS	1980	1990	2000	2010	POP CHANGE 1980-2010	PERCENT OF CHANGE	POP CHANGE 2000-2010	PERCENT OF CHANGE
Hamilton	2,977	2,937	3,189	3,095	118	3.96%	-94	-2.95%
Hico	1,341	1,342	1,375	1,379	38	2.83%	4	0.29%
Unincorporated Hamilton County	3,911	3,454	3,733	4,043	132	3.38%	310	8.30%
COUNTY TOTAL	**8,229**	**7,733**	**8,297**	**8,517**	**288**	**3.50%**	**220**	**2.65%**

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

[1] Source: https://www.census.gov/quickfacts/fact/table/hamiltoncountytexas,US/PST045216

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.

Table 3-4. Hamilton 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)
Hamilton	836	8,517	10.19	8,528	10.20	8,616	10.30	8,593	10.28

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 Hamilton 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.

The mission of the Hico Economic Development Corporation is to enrich the quality of life of the citizens by promoting and enhancing the economic vitality of the community through promoting the retention and expansion of existing businesses while also devoting an appropriate amount of resources toward attracting new businesses. They do this through maintaining and expanding the current business base through low or no interest loans and/or grants; attracting new businesses and industries which complement the City's existing business operations and community assets by developing incentive packages tailored to their needs; and, developing a plan to leverage local funding with grants to improve the City's park and recreation system.

Existing and Future Land Use and Development Trends

The City of Hico has a comprehensive master plan in place, while the City of Hamilton has a plan under development. These plans are part of a continuous process to provide an environment for the citizens and to consider the general desire of the community to conserve, preserve, and protect the natural environment. These plans are used to guide individuals in making decisions which affect the community with the understanding of the long- term effects.

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 Hamilton County that have been granted between 2000 and 2016. 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 2016 to demonstrate growth rates.

Table 3-5. County Residential Building Permits[2]

Hamilton County			
Year	Buildings	Units	Construction Cost
2000	6	8	$460,000
2005	3	3	$320,000
2010	0	0	-
2011	1	1	$200,000
2012	2	2	$710,000
2013	1	1	$154,000
2014	1	1	$150,000
2015	6	6	$598,000
2016	6	6	$425,000

[2] Source: http://censtats.census.gov/cgi-bin/bldgprmt/bldgdisp.pl

Section 4: Risk Overview

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 14, which include hazard descriptions and vulnerability assessments.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, Hamilton County and the participating jurisdictions identified ten natural hazards that are addressed in the Hazard Mitigation Plan. Of the hazards identified, nine natural hazards and one quasi-technological[1] 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 Hamilton County Planning area include extreme heat, hail, 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. Hamilton County unincorporated and the City of Hamilton 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.

[1] While dam failure is generally considered a quasi-technological hazard, it is profiled in the Plan as a natural hazard, i.e. a breach caused by extensive rainfall or flooding.

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.
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.

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. Hazards Deferred

HAZARD CONSIDERED	REASON FOR DETERMINATION
Coastal Erosion	The planning area is not located on the coast, therefore coastal erosion does not pose a risk.
Earthquake	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.

HAZARD CONSIDERED	REASON FOR DETERMINATION
Hurricane	The planning area is not located on the coast, therefore hurricanes do not pose a direct risk to the area. The planning team discussed and determined that the risks associated with a hurricane passing through the planning area are addressed within the flooding hazard and thunderstorm wind hazard profiles in this Plan. Historically, there have been no direct impacts to the planning area as a result of a hurricane and none are anticipated in the future.
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 Hamilton 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.

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 occurrence statements are defined in Table 4-3, and impact statements are defined in Table 4-4 below.

Table 4-3. Frequency of Occurrence 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 Hamilton 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.

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. Wildfire has minor severity in the county and limited severity in the cities of Hamilton and Hico.

Table 4-5. Hazard Risk Ranking

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

Section 5: Thunderstorm Wind

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 Hamilton County's planning area, including 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 Hamilton County planning area is uniformly exposed to the threat of thunderstorms winds.

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.

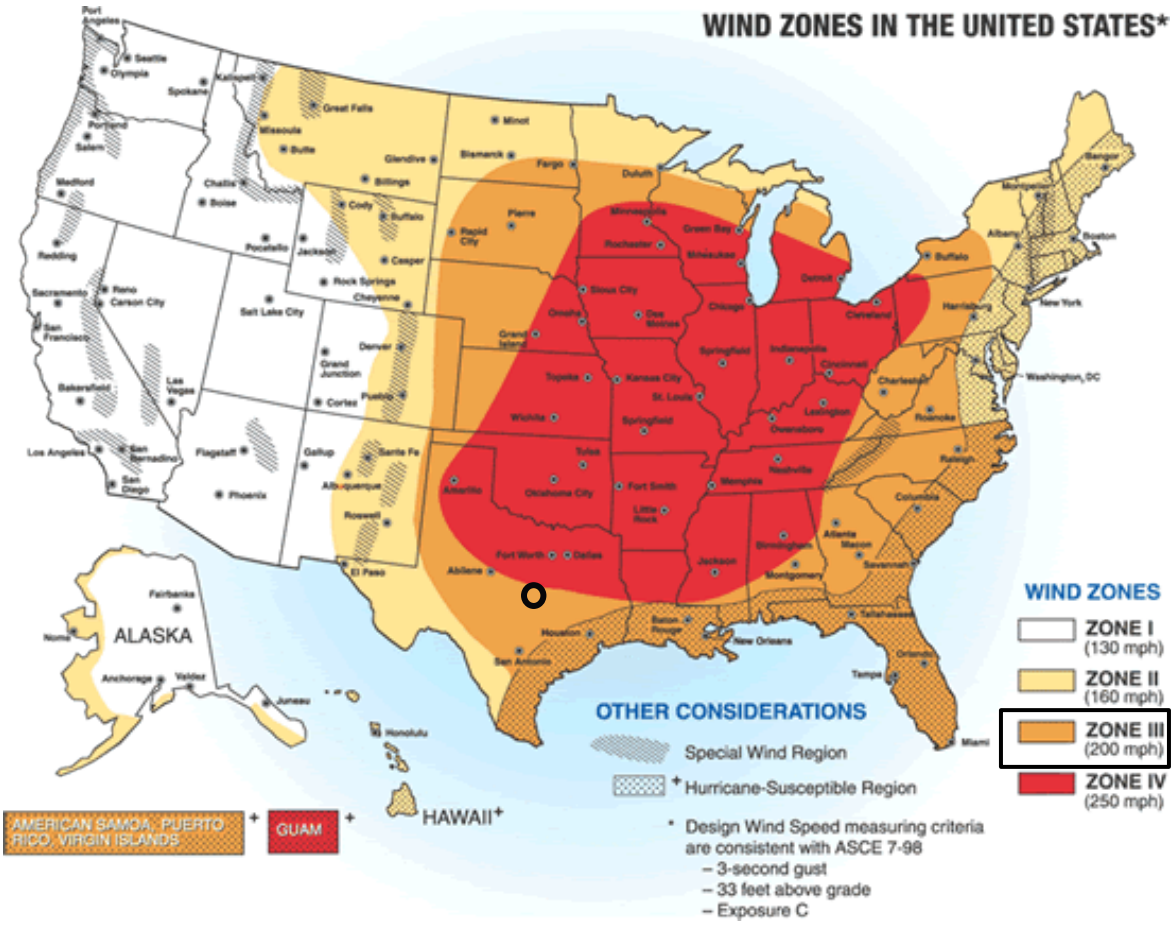
Table 5-1. Beaufort Wind Scale[1]

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

Figure 5-1. Wind Zones in the United States[2]



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. Hamilton 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. Although the average measurement of severe winds with a thunderstorm in the Hamilton County planning area is a "Force 10," with winds at 55-63 knots. Therefore, planning participants on average could experience and would be expected to mitigate a range of wind speeds of "Force 9" to "Force 10."

Historical Occurrences

Tables 5-2, 5-3, and 5-4 depict historical occurrences of thunderstorm wind events for the Hamilton County planning area according to the National Centers for Environmental Information (NCEI) data. From 1955 to 2017, 107 thunderstorm wind events are known to have impacted the Hamilton County planning area, based upon NCEI records. Table 5-3 presents information on known historical events

[2] Hamilton County is indicated by the circle.

impacting the Hamilton 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 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: Hamilton County, and all participating jurisdictions.

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

MAXIMUM WIND SPEED RECORDED (MPH)	NUMBER OF REPORTED EVENTS
0-30	0
31-40	0
41-50	1
51-60	39
61-70	15
71-80	6
81-90	3
91-100	0
Unknown	43

Table 5-3. Historical Thunderstorm Wind Events, 1955-2017[3]

JURISDICTION	DATE	TIME	MAGNITUDE (MPH)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	4/29/1993	2:30 AM	0	0	0	$8,403	$0
City of Hamilton	4/29/1993	2:36 AM	0	0	0	$84,027	$0
Hamilton County	10/12/1993	10:05 PM	0	0	0	$84,027	$0
City of Hamilton	10/12/1993	10:05 PM	0	0	0	$84,027	$0
City of Hico	4/26/1994	6:10 PM	0	0	0	$8,193	$0

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

Section 5: Thunderstorm Wind

JURISDICTION	DATE	TIME	MAGNITUDE (MPH)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	5/27/1994	5:30 AM	60	0	0	$819	$0
Hamilton County	6/9/1994	5:30 PM	0	0	0	$8,193	$0
City of Hico	6/9/1994	5:10 PM	0	0	0	$8,193	$0
City of Hamilton	4/19/1995	7:45 PM	0	0	0	$11,154	$0
Hamilton County	5/29/1995	8:45 PM	0	0	0	$191,212	$0
City of Hamilton	5/29/1995	7:59 PM	79	0	0	$31,869	$0
Hamilton County	5/6/1996	3:40 AM	Unknown	0	0	$3,095	$0
Hamilton County	5/29/1996	11:30 PM	Unknown	0	0	$3,095	$0
City of Hamilton	4/8/1998	12:40 AM	Unknown	0	0	$1,490	$0
City of Hamilton	7/16/1998	2:19 PM	Unknown	0	0	$1,490	$0
City of Hamilton	7/17/1998	2:15 PM	Unknown	0	0	$22,347	$269,894
City of Hamilton	12/2/1999	3:00 AM	Unknown	0	0	$2,915	$0
Hamilton County	3/19/2002	6:50 PM	Unknown	0	0	$1,371	$0
City of Hamilton	3/19/2002	8:00 PM	Unknown	0	0	$1,371	$0
City of Hamilton	7/13/2002	4:24 PM	60	0	0	$2,742	$0
City of Hico	8/14/2002	6:10 PM	60	0	0	$4,114	$0
City of Hamilton	6/11/2003	9:53 PM	60	0	0	$6,599	$0
City of Hamilton	8/22/2003	12:50 PM	58	0	0	$2,640	$0
City of Hamilton	8/22/2003	2:35 PM	60	0	0	$6,599	$0
Hamilton County	3/4/2004	1:45 PM	70	0	0	$19,283	$0
Hamilton County	3/4/2004	1:45 PM	58	0	0	$19,283	$0
City of Hamilton	3/4/2004	1:35 PM	60	0	0	$19,283	$0
City of Hamilton	3/4/2004	1:45 PM	58	0	0	$6,428	$0
City of Hamilton	6/1/2004	5:30 PM	70	0	0	$2,571	$0
Hamilton County	5/9/2005	6:04 PM	58	0	0	$3,730	$0
City of Hico	5/2/2007	4:05 PM	58	0	1	$35,136	$0
City of Hico	4/10/2008	2:00 AM	64	0	0	$33,837	$0
City of Hamilton	6/20/2008	12:50 AM	58	0	0	$1,128	$0

JURISDICTION	DATE	TIME	MAGNITUDE (MPH)	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	2/10/2009	8:20 PM	70	0	0	$9,055	$0
Hamilton County	2/10/2009	8:20 PM	70	0	0	$56,596	$0
City of Hamilton	2/10/2009	8:20 PM	70	0	0	$5,560	$0
City of Hamilton	5/26/2009	10:00 PM	60	0	0	$3,396	$0
Hamilton County	6/10/2009	7:45 PM	85	0	0	$33,958	$0
Hamilton County	6/11/2009	4:33 PM	63	0	0	$4,528	$0
Hamilton County	4/10/2011	11:00 PM	75	0	0	$323,873	$0
Hamilton County	4/10/2011	11:15 PM	81	0	0	$8,637	$0
Hamilton County	4/10/2011	11:37 PM	70	0	0	$53,979	$0
City of Hamilton	4/10/2011	11:35 PM	64	0	0	$215,915	$0
City of Hamilton	6/21/2011	8:24 PM	70	0	0	$10,796	$0
City of Hamilton	3/9/2013	7:43 PM	72	0	0	$104,242	$0
City of Hamilton	8/16/2013	7:00 AM	45	0	0	$1,042	$0
City of Hamilton	8/18/2014	7:25 PM	60	0	0	$1,026	$0
Hamilton County	5/25/2015	1:11 PM	58	0	0	$5,123	$0
City of Hamilton	6/29/2015	6:30 PM	60	0	0	$512	$0
City of Hamilton	6/29/2015	6:44 PM	63	0	0	$512	$0
City of Hamilton	3/30/2016	4:55 PM	60	0	0	$2,024	$0
Hamilton County	5/10/2016	5:06 PM	60	0	0	$2,024	$0

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

JURISDICTION	NUMBER OF EVENTS	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	55	85	0	0	$840,284	$0
City of Hamilton	42	79	0	0	$633,805	$269,894
City of Hico	10	69	0	1	$89,473	$0
TOTAL LOSSES	**107**	**(Max Extent)**	**0**	**1**	**$1,833,456**	

Significant Events

April 10, 2011 – Hamilton County

A strong upper level low pressure system over the southern Rockies aided in the late evening development of severe thunderstorms along a dry-line across north central and central Texas. One of these storms was a strong linear mesoscale convective system which produced a swath of wind damage from Goldthwaite northeast into southern portions of the Dallas/Fort Worth Metroplex and continued northeast to near Sulphur Springs. A swath of wind damage consistent with 70 to 80 mph winds was associated with this storm. Other supercell thunderstorms in the area produced brief tornadoes and large hail. Severe thunderstorm winds damaged barns, outbuildings, and trees across Hamilton County. Some trees were fully uprooted. The combination of severe winds and large hail damaged oat and wheat fields that were already suffering from the ongoing drought.

March 9, 2013 – City of Hamilton

A line of thunderstorms moved through northern and central Texas on March 9th. The storms began as discrete cells in the early afternoon, before becoming a squall line by sunset. In the city of Hamilton, a microburst caused damage to several buildings. The Hamilton Police Department reported a supermarket roof collapsed and several trees were blown down in the city of Hamilton.

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 107 events in a 63 year reporting period, which provides a probability of occurrence of one to two events every year. Even though the intensity of thunderstorm wind events is not always damaging for the Hamilton 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 Hamilton County planning area, including 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 Hamilton 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 recepticles, 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 370 manufactured homes (approximately 8.1%) located in the Hamilton County planning area including all participating jurisdictions (Table 5-5). In addition, 69.1% (approximately 3,156 structures) of the residential structures in the Hamilton 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.

Table 5-5. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Hamilton County[4]	370	3,156
City of Hamilton	26	1,249
City of Hico	47	540

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
Hamilton County	Government Facility, Hospital, Airport, County Sheriff's Office
City of Hamilton	Government Facility, Police Station, Fire Station, EMS, 2 Shelters, School, Water Treatment Facility, Waste Water Treatment Facility, 3 Water Towers, 3 Lift Stations, Water Boost Pump, Electrical Substation, Natural Gas Distribution Station, 4 Flood Control Dams, 2 Nursing Homes
City of Hico	Government Facility, Fire Station, EMS, 2 Schools, Medical Facility, Water Treatment Facility, 3 Water Wells, Water Tower, Water Storage Facility, 2 Bridges, 3 Lift Stations, Electrical Substation, 2 Nursing Homes

A thunderstorm wind event can also result in traffic disruptions, injuries and in rare cases, fatalities. Impact of thunderstorms winds experienced in the Hamilton County planning area has resulted in one injury and no fatalities. Impact of thunderstorm wind events experienced in the Hamilton County planning area, including all participating jurisdictions, would be "Limited," with minor quality of life lost, facilities would be shut down for 24 hours or less and less than ten percent of property destroyed or with major damage. Overall, the average loss estimate (in 2017 dollars) is $1,833,456, having an approximate annual loss estimate of $29,102 (Table 5-7).

Table 5-7. Potential Annualized Losses for Hamilton County

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
Hamilton County	$840,284	$13,338
City of Hamilton	$903,699	$14,344
City of Hico	$89,473	$1,420

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

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
Planning Area	$1,833,456	$29,102

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:

- 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.
- Popular tourist areas such as White River and Strawtown Koteewi Park could be impacted by large thunderstorm wind events, 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.

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.

Section 6: Flood

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 Hamilton 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 Flood Insurance Rate Map (FIRM) data provided by FEMA for Hamilton 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.

- 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 Hamilton County based on the Flood Insurance Rate Map (FIRM) from FEMA are illustrated in Figures 6-1 to 6-2. No flood zone maps are currently available for Hamilton County unincorporated as the jurisdiction is not currently mapped. A narrative is below to describe the known local flood hazard areas. The data deficiency for Hamilton County is addressed in the mitigation action section of this plan (Section 16). Full flood zone delineations with elevations are only available in the City of Hamilton. The City of Hico has limited flood hazard boundary maps where base flood elevations have not been determined.

Hamilton County has several locally identified flood hazard areas that have been inundated in the past including: Farm-to-Market Road 218 near Pottsville, Highway 22 west of Cranfils Gap, FM 1702 in Indian Gap, Highway 218 at Indian Gap and Pottsville, CR 219 near Carlton, intersection of Highways 6 and 220, Highway 84 near Evant, Highway 281 south of Hamilton, CRs 519,524, and 530, CRs 225 and 226 at Meridian Creek, and CR 313 near CR 1602.

Figure 6-1. Estimated Flood Zones in the City of Hamilton – North Central

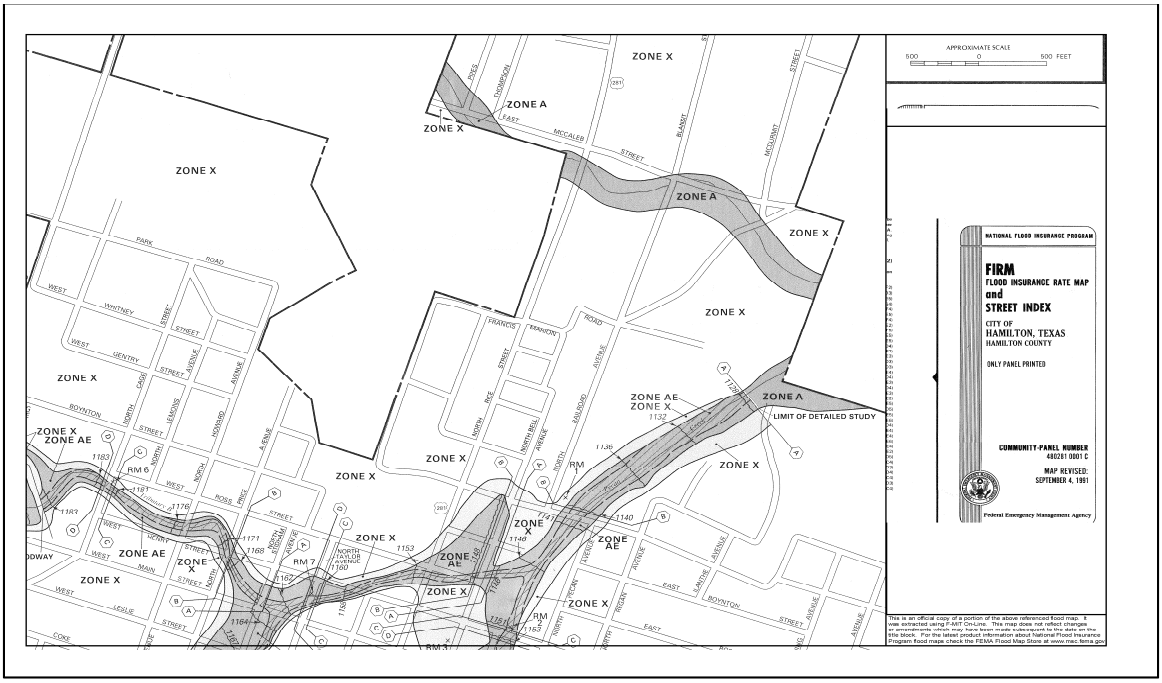


Figure 6-2. Estimated Flood Zones in the City of Hamilton – South West

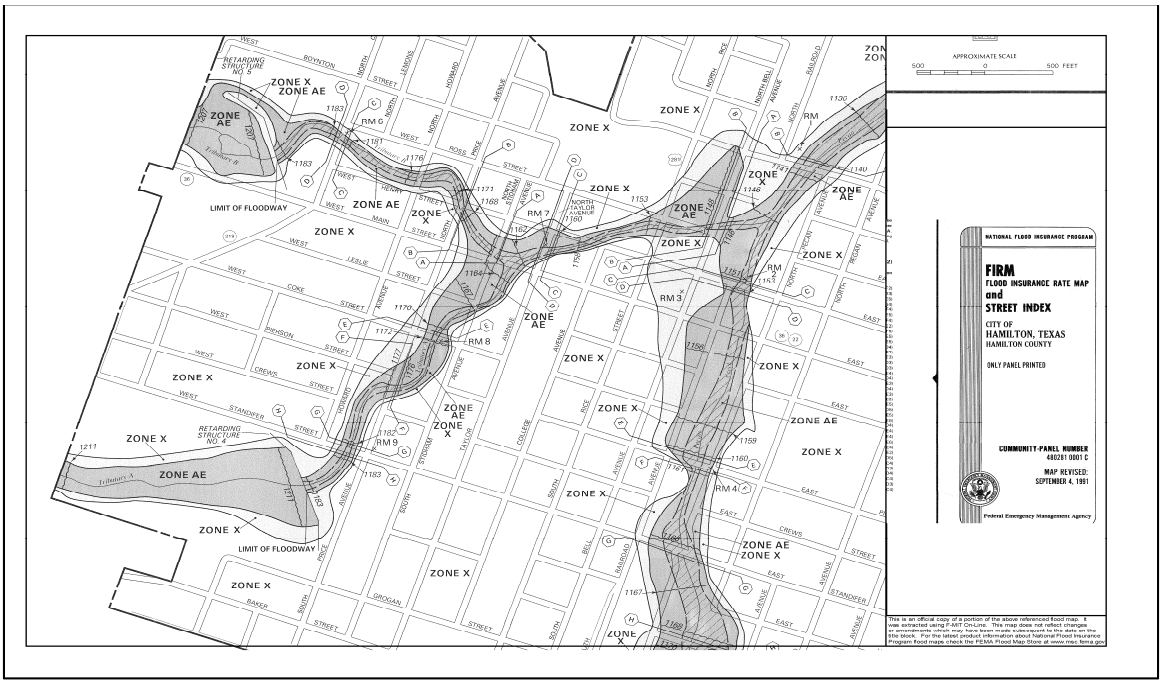


Figure 6-3. Estimated Flood Zones in the City of Hamilton – South

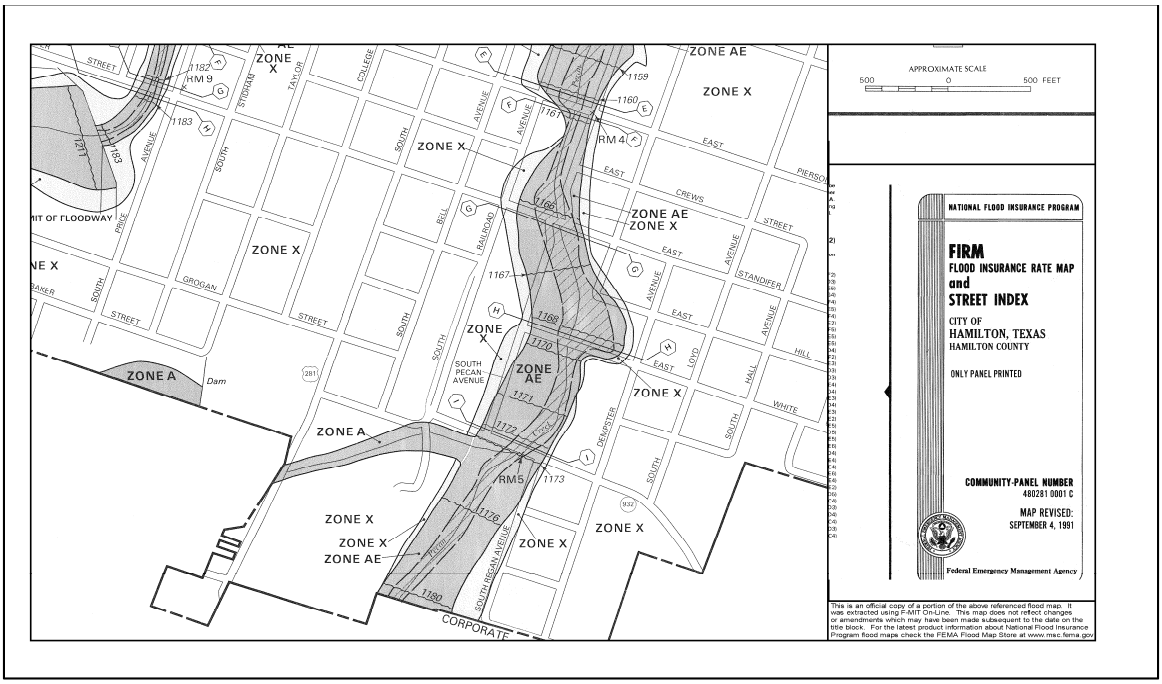
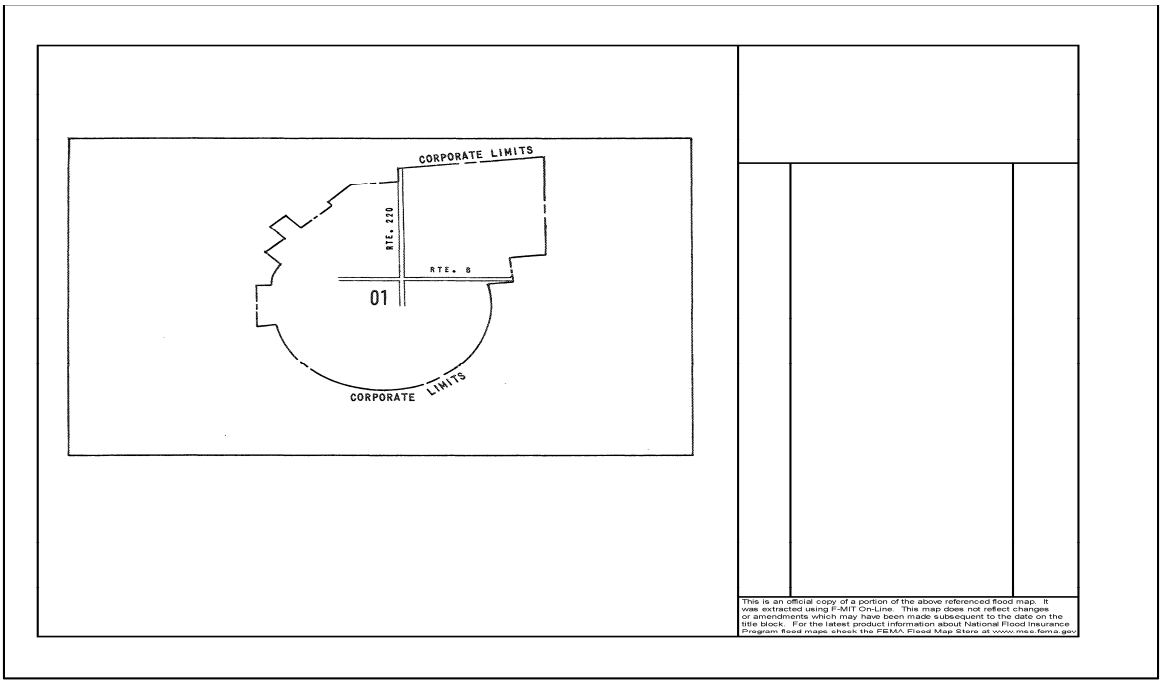


Figure 6-4. Estimated Flood Zones in the City of Hico[1]



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 and 6-2 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.

[1] The City of Hico FEMA FIRM panels are not available in the map service center as there are no known Special Flood Hazard Areas (SFHA) identified within the corporate limits. The Hico index panel has an effective date of August 22, 1975.

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

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 Hamilton County[2]

JURISDICTION[3]	ESTIMATED SEVERITY PER FLOOD EVENT	PEAK FLOOD EVENT
Hamilton County	Action Stage, 16 to 23 feet	Major Flood Stage: Leon River near the City of Hamilton reached an overflow elevation of 35.02 feet in December 1992 and 33.42 in February 1997.

[2] 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.
[3] Severity is provided for jurisdictions where peak data was provided.

JURISDICTION[3]	ESTIMATED SEVERITY PER FLOOD EVENT	PEAK FLOOD EVENT
City of Hico	Below Flood Stage, 0 to 15 feet	Flood Stage: North Bosque River at Hico reached an overflow elevation of 27.60 feet in May 1952 and 24.44 in May of 2015.

The range of flood intensity that the Hamilton 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 Hamilton County planning area has experienced flooding over 35 feet. Based on historical occurrences the planning area, including all participating jurisdictions, could typically expect to experience up to 7 inches of rainfall within a 15 hour period, resulting in flash flooding. With 35 feet of flood being recorded in the planning area the Major Flood Stage could be anticipated for all participating jurisdictions in the future.

The data described in Tables 6-1 through 6-3, together with Figures 6-1 and 6-2, and historical occurrences for the area, provides an estimated potential magnitude and severity for the County. For example the City of Hamilton, as shown in Figure 6-1, 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.

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 Hamilton 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 Hamilton County.

Table 6-4. Historical Flood Events, 1996-2017[4]

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
City of Hamilton	2/20/1997	8:35 AM	0	0	$3,479,936	$0
City of Hamilton	6/3/2000	2:30 AM	0	0	$141,021	$0
Hamilton County	4/24/2004	6:07 AM	0	0	$2,571	$0
City of Hamilton	6/26/2007	6:00 PM	0	0	$2,342,400	$0
City of Hico	6/26/2007	5:24 PM	0	0	$2,342,400	$0
City of Hamilton	6/27/2007	3:11 PM	0	0	$702,720	$0

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

JURISDICTION	DATE	TIME	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	7/8/2007	4:05 PM	0	0	$702,720	$0
Hamilton County	4/27/2009	6:30 AM	0	0	$56,596	$0
Hamilton County	5/20/2013	9:40 PM	0	0	$0	$6,255
Hamilton County	6/2/2016	10:30 AM	0	0	$10,118	$0

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

JURISDICTION	Number of Events	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	17	0	0	$772,005	$6,255
City of Hamilton	18	0	0	$6,666,077	$0
City of Hico	3	0	0	$2,342,400	$0
Total Losses	**38**	**0**	**0**	**$9,786,737**	

Significant Events

Flash Flood on February 20, 1997 – Hamilton County

Pecan Creek was out of its banks and all low-lying areas throughout the county remained flooded. Two bridges, one over the Lampasas River and the other over Cowhouse Creek, were washed out. One home sustained severe damage from flooding and several others received minor damage. Numerous livestock were lost to the flood waters. A cooperative observer measured 9.66 inches of rain in Hamilton since early on the 19th.

Flash Flood on June 26, 2007 – Hamilton County/City of Hico/City of Hamilton

An upper low formed over the planning area triggering several rounds of showers and thunderstorms. A very moist environment encouraged flash flooding. Access roadway FM 1602 between Highway 281 and Highway 22 was flooded northeast of Hamilton, and Highway 218 was flooded between Hamilton and Pottsville. Damages for the planning area were estimated in excess of $5 million in 2017 dollars.

Probability of Future Events

Based on recorded historical occurrences and extent within the Hamilton County planning area, including all participating jurisdictions, flooding is highly likely and an event is likely to occur within the next year.

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 or known flood hazard areas. 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

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

JURISDICTION	CRITICAL FACILITIES
Hamilton County	None
City of Hamilton	Government Facility, Police Station, Fire Station, Shelter, Waste Water Treatment Facility, Electrical Substation
City of Hico	None

Historic loss estimates due to flood are presented in Table 6-7 below. Considering 38 flood events over a 22-year period, frequency is approximately one to two events every year.

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

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
Hamilton County	$778,260	$35,375
City of Hamilton	$6,666,077	$303,004
City of Hico	$2,342,400	$106,473
Planning Area	**$9,786,737**	**$444,852**

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 Hamilton County and each participating jurisdiction.

Table 6-8. Impact by Jurisdiction

JURISDICTION	IMPACT	DESCRIPTION
Hamilton County	Limited	Hamilton County 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.
City of Hamilton	Limited	The City of Hamilton 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.
City of Hico	Limited	The City of Hico 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 Hamilton County planning area. Impacts to the planning area can include:

- Recreation activities at places such as White River 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.
- Critical staff may suffer personal losses or otherwise impacted by a flood event and unable to report for duty, limiting response capabilities.
- City, 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. The City of Hamilton and the City of Hico participate in the NFIP and are in good standing. Hamilton County does not currently participate in the NFIP. It should be noted that the county has not been mapped for special flood hazard areas.

Both Hamilton and Hico have in place minimum NFIP standards for new construction and substantial improvements of structures. Both jurisdictions are considering adopting additional higher regulatory NFIP standards to limit floodplain development. Hamilton County is considering joining the National Flood Insurance Program and have identified floodplain mapping as a priority mitigation action in this plan (Section 16).

The flood hazard areas throughout the Hamilton 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 Hamilton 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 Hamilton 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
- 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 Hamilton County planning area, including all participating jurisdictions, have developed mitigation actions that relate to either NFIP maintenance, compliance or participation. Compliance, maintenance, and participation actions can be found in Section 16.

Flooding was identified by the majority of the participating jurisdictions as a moderate risk hazard during hazard ranking activities at the Risk Assessment Workshop. As such, some of the mitigation actions were developed with flood mitigation in mind. A majority of these flood actions address participation or compliance with the NFIP and implementing flood awareness programs. Participating jurisdictions recognize the need and are working towards adopting higher NFIP regulatory standards to further minimize flood risk in their community. In addition, participating jurisdictions are focusing on NFIP and 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 in the Special Flood Hazard Area. 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.

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.[5] There are no repetitive loss or severe repetitive loss properties for the Hamilton County planning area, including all participating jurisdictions.

[5] Source: Texas Water Development Board

Section 7: Extreme Heat

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 Hamilton County is no exception. The Hamilton County planning area, including 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 under five 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.

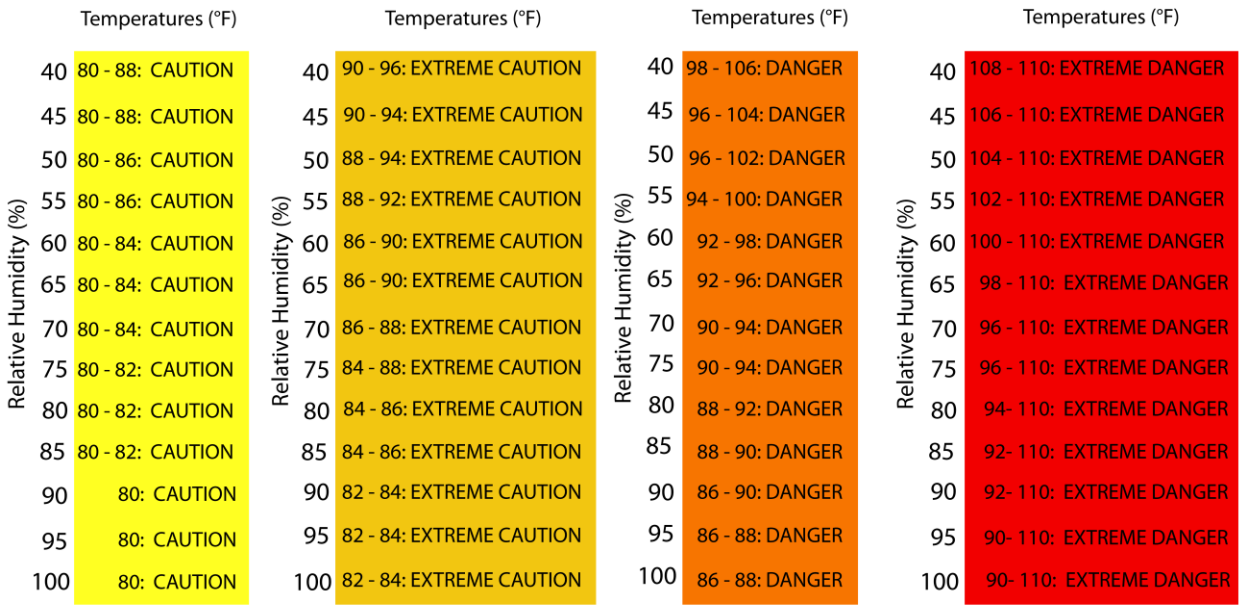
Location

There is no specific geographic scope to the extreme heat hazard. Extreme heat could occur anywhere within the Hamilton County planning area, including 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.

Figure 7-1. Extent Scale for Extreme Summer Heat[1]



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 (ºF) 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

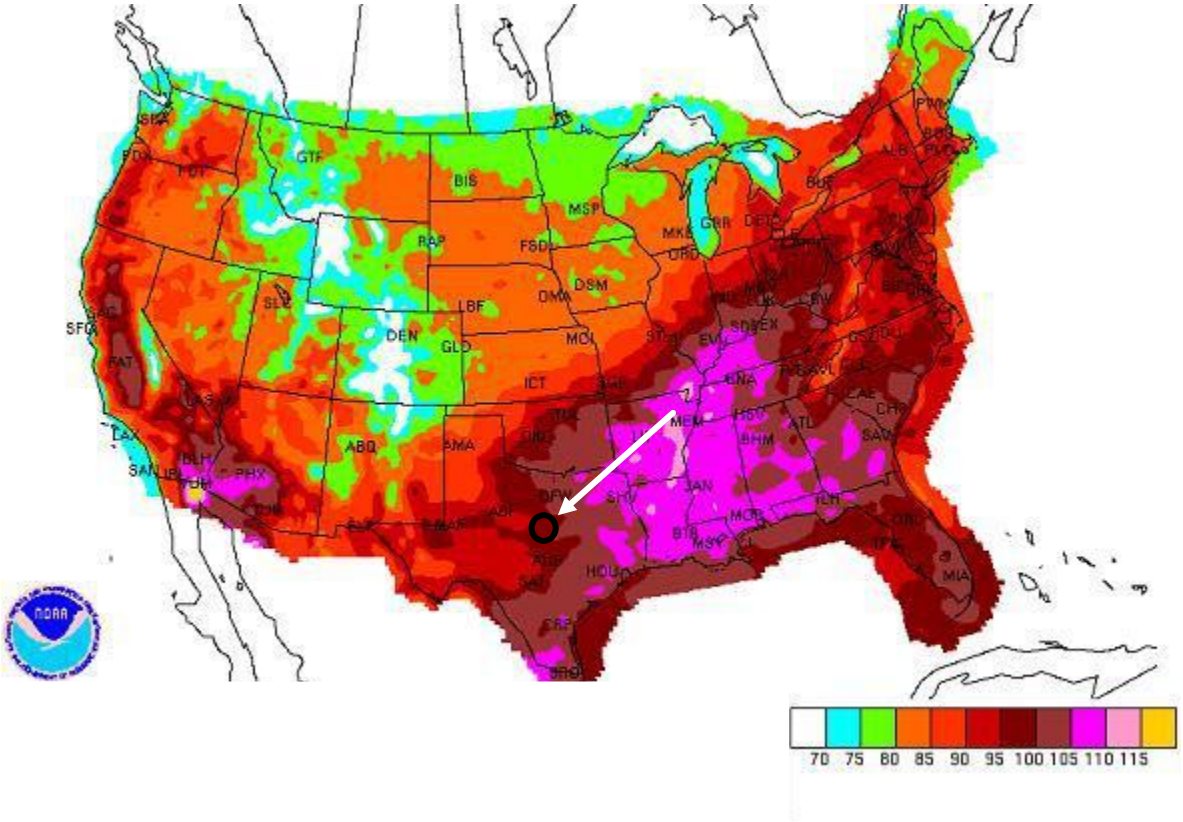
CATEGORY	HEAT INDEX	POSSIBLE HEAT DISORDERS	WARNING TYPE
Caution	80 – 90°F	Fatigue is possible with prolonged exposure and/or physical activity.	hours during the day or above 80°F at night.

The elevation of Hamilton County ranges between 900 and 1,600 feet above sea level. Except for the northwestern part, which lies in the Western Cross Timbers region, the county is rolling prairie marked by numerous flat-topped buttes that rise abruptly to stand on the divides between the county's many streams. The county is drained by the Leon, Lampasas, and Bosque rivers. The average maximum temperature for the planning area is 96°, typically in July.[2] Due to its geography, and its warm, sunny, humid subtropical climate, the Hamilton County planning area, including 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 Hamilton County area. The colors red and dark red indicate a daily maximum heat index of 90° to 100°F. Hamilton County, including all participating jurisdictions, could experience extreme heat from 90° to 100°F and should mitigate to the extent of "extreme caution," which can include sunstroke, muscle cramps, and heat exhaustion in the future.

[2] Source: Texas State Historical Association, https://tshaonline.org/handbook/online/articles/hch03

Figure 7-2. Average Daily Maximum Heat Index Days[3]



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 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

[3] Source: NRDC and the black circle indicates the Hamilton County planning area.

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 Hamilton County, there are five heat waves[4] on record for Hamilton County, including 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 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.

[4] 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.

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

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	7/1/1998	0	0	$0	$0
Hamilton County	8/1/1999	0	0	$0	$0
Hamilton County	7/1/2000	0	0	$0	$0
Hamilton County	8/1/2000	0	0	$0	$0
Hamilton County	9/1/2000	0	0	$0	$0
TOTALS		**0**	**0**	**$0**	**$0**

Significant Events

September 1, 2000

A strong ridge of high pressure over the region brought record heat to Texas for the month of September, and the hottest weather of the summer. Temperatures reached 111 degrees at DFW Airport on September 4, which set the all-time record for the month of September. Daily records were set over north Texas during the first 4 days of September. The cooperative stations had September high temperatures ranging from 108 degrees at Emory to 114 degrees at Possum Kingdom Lake.

Probability of Future Events

According to historical records, the Hamilton County planning area, including all participating jurisdictions, have experienced five events in a 22 year reporting period. While this provides a probability of one event every four to five 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 Hamilton County planning area, including 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 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 population over 65 in the Hamilton County planning area is estimated at 26.1% of the total population and children under the age of 5 are estimated at 4.1%, or an estimated total of 2,486[5] 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
Hamilton County[6]	2,146	340
City of Hamilton	791	160
City of Hico	343	66

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.

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 “Limited” resulting in minor injuries or illness for the Hamilton 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 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 22-year period, annualized losses for the Hamilton 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.

[5] U.S. Census Bureau 2016 data for Hamilton County

[6] County totals includes all incorporated jurisdictions and unincorporated areas.

- 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 at the White River or Strawtown Koteewi Park 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 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 citizens will impact the overall economic and financial conditions before, during, and after an extreme heat event.

Section 8: Tornado

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.

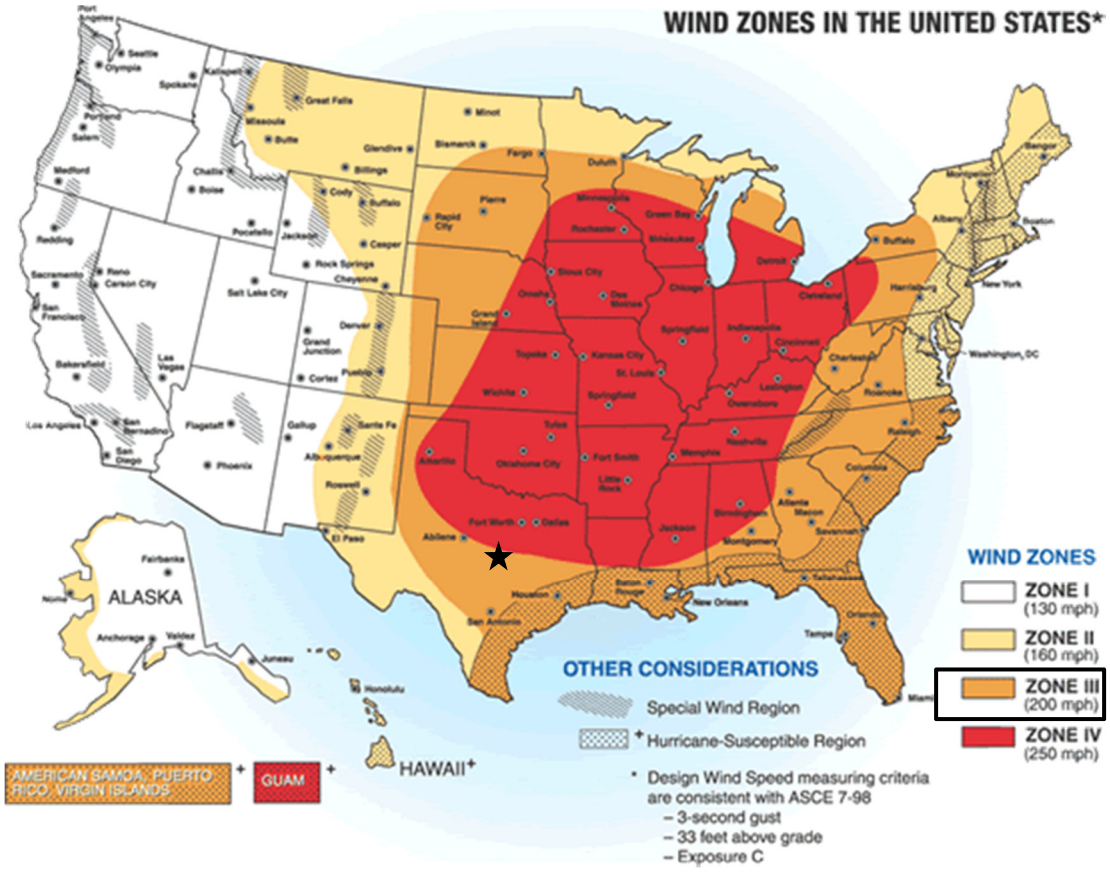
Table 8-1. Variations Among Tornados

WEAK TORNADOES	STRONG TORNADOES	VIOLENT TORNADOES
➢ 69% of all tornadoes ➢ Less than 5% of tornado deaths ➢ Lifetime 1-10+ minutes ➢ Winds less than 110 mph	➢ 29% of all tornadoes ➢ Nearly 30% of all tornado deaths ➢ May last 20 minutes or longer ➢ Winds 110 – 205 mph	➢ 2% of all tornadoes ➢ 70% of all tornado deaths ➢ Lifetime can exceed one hour ➢ Winds greater than 205 mph

Location

Tornadoes do not have any specific geographic boundary and can occur throughout the County uniformly. It is assumed that the entire Hamilton County planning area, including all participating jurisdictions, are uniformly exposed to tornado activity. The entire Hamilton 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 States[1]



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] Hamilton County is indicated by the star.

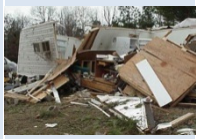
Table 8-2. The Fujita Tornado Scale[2]

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

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.	

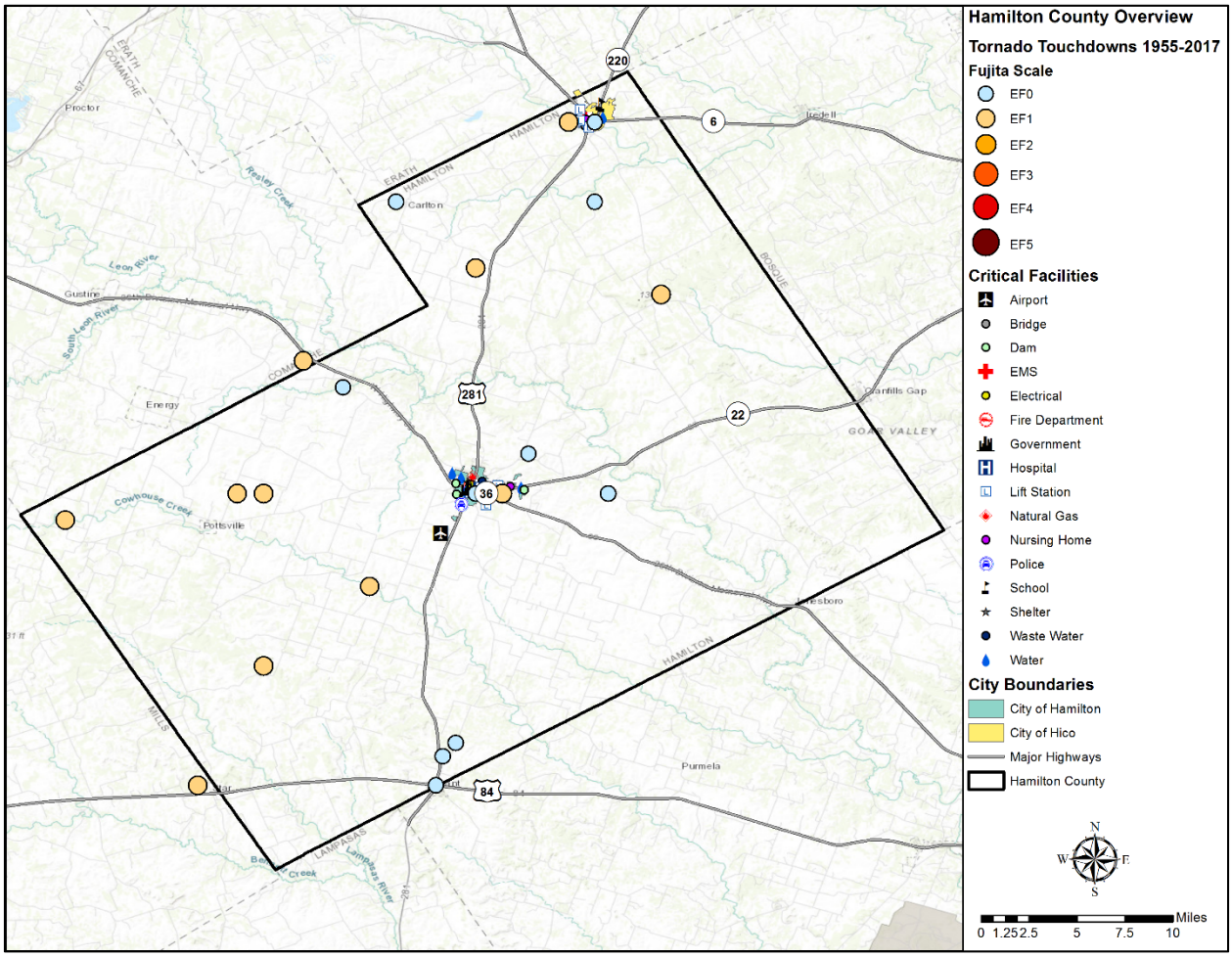
Both the Fujita Scale and Enhanced Fujita Scale should be referenced in reviewing previous occurrences since tornado events prior to 2007 will follow the original Fujita Scale. The largest magnitude reported within the planning area is F2 on the Fujita Scale, a “Significant Tornado.” Based on the planning areas location in Wind Zone III, the planning area could experience anywhere from an EF0 to EF5, in the future, depending on the wind speed. The events in Hamilton County have been between F0 and F2 (Table 8-4). Therefore, the range of intensity that the Hamilton County planning area, including all participating jurisdictions, would be expected to mitigate is a tornado event that would be a low to severe risk, an EF0 to EF3.

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 Hamilton County planning area from 1955 through 2017. A total of 24 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 Hamilton County on April 11, 1979. The F2 tornado and associated storm system caused damages in excess of $835,000 in 2017 dollars. The tornado resulted in three injuries.

Figure 8-2. Spatial Historical Tornado Events, 1955–2017[3]



[3] Source: NOAA Records

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 2015 on the NOAA database.

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

JURISDICTION	DATE	TIME	MAGNITUDE	DEATH	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	8/29/1955	5:00 PM	F1	0	0	$2,265	$0
Hamilton County	4/24/1964	3:00 PM	F1	0	3	$19,584	$0
Hamilton County	4/16/1971	9:00 AM	F1	0	0	$14,990	$0
Hamilton County	4/11/1979	12:10 AM	F2	0	3	$836,222	$0
Hamilton County	5/12/1982	4:47 PM	F1	0	0	$62,912	$0
Hamilton County	5/27/1987	7:05 PM	F0	0	4	$0	$0
Hamilton County	4/28/1991	11:27 AM	F1	0	0	$445,740	$0
Hamilton County	4/28/1991	11:30 AM	F2	0	0	$445,740	$0
Hamilton County	3/30/2002	3:52 PM	F0	0	0	$6,856	$0
City of Hico	3/30/2002	4:05 PM	F0	0	0	$102,840	$0
Hamilton County	5/15/2013	7:34 PM	EF0	0	0	$0	$10,424
Hamilton County	5/15/2013	7:35 PM	EF0	0	0	$0	$20,848
Hamilton County	5/10/2015	3:45 PM	EF1	0	0	$102,456	$0

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

JURISDICTION	Number of Events	MAGNITUDE	FATALITIES	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	20	F2	0	10	$1,936,765	$31,272
City of Hamilton	2	F0	0	0	$0	$0
City of Hico	2	F0	0	0	$102,840	$0
TOTAL LOSSES	**24**	**(Max Extent)**	**0**	**10**	**$2,070,877**	

Significant Events

April 11, 1979 – Hamilton County

A significant tornado touched down in Hamilton County between Carlton and Olin shortly after midnight. The tornado was estimated at 200 yards wide and stayed on the ground for approximately

nine miles. Multiple roofs were damaged and trees were downed. Three people were injured as a direct result of the tornado. Damages estimates exceeded $835,000 in 2017 dollars.

April 28, 1991 – Hamilton County
A significant tornado touched down in southwest Hamilton County, destroying several barns. The tornado again briefly touched down 2 miles south of the City of Hamilton, destroying ten turkey houses. Damages estimates exceeded $445,000 in 2017 dollars.

May 10, 2015 – Hamilton County
A National Weather Service damage survey team found evidence of EF-1 tornado damage near the Shive community in Hamilton County. The tornado began southeast of the town center, damaging a house, several trees, and several farm buildings. The tornado occurred over mainly open land over its five mile path, but damaged four houses. Several Hamilton County roads needed to be cleared of debris and downed trees.

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 three years. This frequency supports a likely probability of future events for Hamilton County, including all participating jurisdictions.

Vulnerability and Impact

Because tornadoes often cross jurisdictional boundaries, all existing and future buildings, facilities, and populations in the planning area are considered to be exposed to this hazard and could potentially be 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 Hamilton 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 370 manufactured homes located in the Hamilton County planning area (8.1%), including participating jurisdictions and unincorporated county (Table 8-6). In addition, 69.1% (approximately 3,156 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.

Table 8-6. Structures at Greatest Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	SFR STRUCTURES BUILT BEFORE 1980
Hamilton County[4]	370	3,156
City of Hamilton	26	1,249
City of Hico	47	540

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
Hamilton County	Government Facility, Hospital, Airport, County Sheriff's Office
City of Hamilton	Government Facility, Police Station, Fire Station, EMS, 2 Shelters, School, Water Treatment Facility, Waste Water Treatment Facility, 3 Water Towers, 3 Lift Stations, Water Boost Pump, Electrical Substation, Natural Gas Distribution Station, 4 Flood Control Dams, 2 Nursing Homes
City of Hico	Government Facility, Fire Station, EMS, 2 Schools, Medical Facility, Water Treatment Facility, 3 Water Wells, Water Tower, Water Storage Facility, 2 Bridges, 3 Lift Stations, Electrical Substation, 2 Nursing Homes

The average loss estimate of property and crop is $2,296,564 (in 2017 dollars), having an approximate annual loss estimate of $32,871 (Table 8-8). Based on historic loss and damages, the impact of tornado on the Hamilton County planning area, including all participating jurisdictions, can be considered "Limited," with less than 10 percent of property expected to be destroyed and critical facilities shut down for 24-hours or less. However, the number of injuries indicates a "Major" impact.

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

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
Hamilton County	$1,968,037	$31,239
City of Hamilton	$0	$0
City of Hico	$102,840	$1,632

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

JURISDICTION	PROPERTY & CROP LOSS	ANNUAL LOSS ESTIMATES
Planning Area	$2,070,877	$32,871

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.
- 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 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.

Section 9: Hail

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 Hamilton County planning area, including 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.

Table 9-1. Hail Intensity and Magnitude[1]

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 Hamilton County planning area may experience hailstorms ranging from an H0 to an H7. The county, including all participating jurisdictions, 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 160 reported historical hail events impacted the Hamilton County planning area between 1968 and 2017 (Summary Table 9-3). These events were reported to NCEI and NOAA databases and may not represent all hail events

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

to have occurred during the past 49 years. Only those events for the Hamilton 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.

Figure 9-1. Spatial Historical Hail Events, 1968-2017

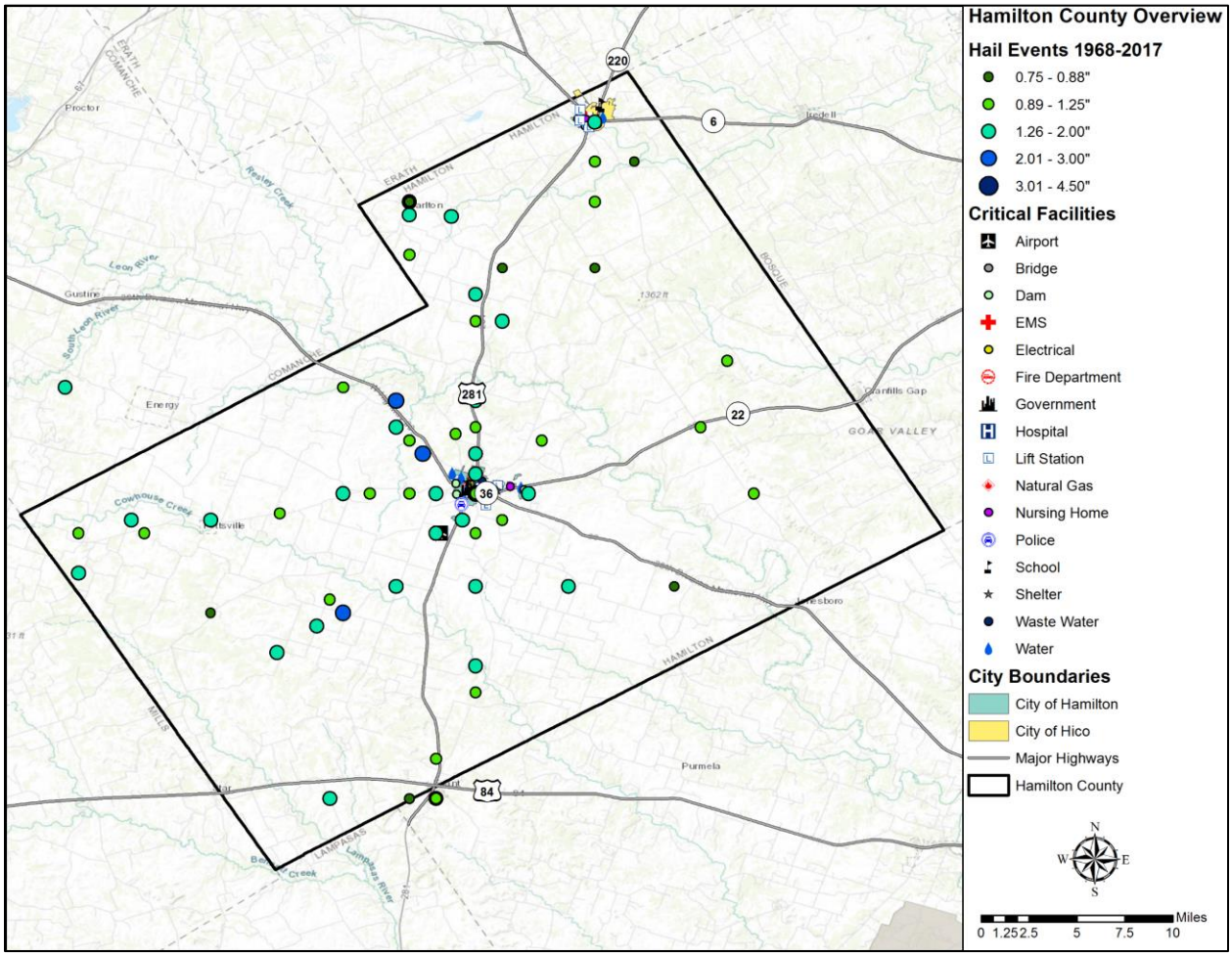


Table 9-2. Historical Hail Events, 1968-2017

JURISDICTION	Date	TIME	MAGNITUDE	FATALITIES	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	4/26/1994	12:00 AM	0	0	0	$8,192,949[2]	$0
City of Hamilton	4/10/2005	7:20 PM	2.75	0	0	$12,434	$0
Hamilton County	5/5/2006	10:17 PM	1.75	0	0	$6,023	$0
City of Hamilton	2/10/2009	8:20 PM	1.75	0	0	$11,319	$0
Hamilton County	4/10/2011	11:15 PM	1.75	0	0	$26,989	$0
City of Hamilton	4/10/2011	11:35 PM	1.75	0	0	$269,894	$0
City of Hamilton	5/21/2011	2:08 PM	1.75	0	0	$5,398	$0
City of Hamilton	5/21/2011	4:59 PM	2.75	0	0	$7,557	$0
City of Hamilton	5/9/2013	11:57 AM	1.75	0	0	$7,297	$0
Hamilton County	5/15/2013	6:17 PM	1.75	0	0	$3,127	$5,212
Hamilton County	5/15/2013	7:05 PM	1.75	0	0	$5,212	$10,424
Hamilton County	5/15/2013	7:12 PM	2.75	0	0	$10,424	$0
Hamilton County	5/20/2013	8:10 PM	1.75	0	0	$3,127	$0
Hamilton County	5/20/2013	9:35 PM	1.5	0	0	$10,424	$0
City of Hamilton	5/20/2013	7:40 PM	1.5	0	0	$3,127	$0

Table 9-3. Historical Hail Events Summary, 1968-2017

JURISDICTION	Number of Events	MAGNITUDE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	93	2.75 inches	0	0	$4,895,086	$15,636
City of Hamilton	48	2.75 inches	0	0	$317,026	$0
City of Hico	19	2.75 inches	0	0	$3,363,189	$0
TOTAL LOSSES	**160**	**(Max Extent)**	**0**	**0**	**$8,590,937**	

[2] This event is recorded as a countywide event, however $3,363,189 in damages occurred in the City of Hico.

Significant Events

April 26, 1994 – Hamilton County/Hico

On April 26th, a large supercell thunderstorm moved across the area producing widespread hail up to golf ball size. Damage was widespread with the most significant damages in the City of Hico. Damage estimates for the planning area exceeded 8.1 million 2017 dollars.

April 10, 2011 – City of Hamilton

A strong upper level low pressure system over the southern Rockies aided in the late evening development of severe thunderstorms along a dry line across north central and central Texas. One of these storms was a strong linear mesoscale convective system which produced a swath of wind damage from Goldthwaite northeast into southern portions of the Dallas/Fort Worth Metroplex and continued northeast to near Sulphur Springs. A swath of wind damage consistent with 70 to 80 mph winds was associated with this storm. Other supercell thunderstorms in the area produced brief tornadoes and large hail. Golf ball size hail impacted the city of Hamilton damaging roofs, siding, automobiles, and windows. The hail left holes in the siding of many homes. The windows at City Hall and the post office were broken by the hail.

Probability of Future Events

Based on available records of historic events, 160 events in a 49 year reporting period for Hamilton County provides a probability of three to four events every year. This frequency supports a highly likely probability of future events for the Hamilton County planning area, including 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 Hamilton 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 370 manufactured homes located in the Hamilton County planning area, including all participating jurisdictions (Table 9-4), totaling approximately 8.1% of the residential structures in the planning area. In addition, 69.1% (approximately 3,156 structures) of the single family residential (SFR) structures in the Hamilton 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.

Table 9-4. Structures at Greater Risk by Jurisdiction

JURISDICTION	MANUFACTURED HOMES	STRUCTURES BUILT BEFORE 1980
Hamilton County[3]	370	3,156
City of Hamilton	26	1,249
City of Hico	47	540

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
Hamilton County	Government Facility, Hospital, Airport, County Sheriff's Office
City of Hamilton	Government Facility, Police Station, Fire Station, EMS, 2 Shelters, School, Water Treatment Facility, Waste Water Treatment Facility, 3 Water Towers, 3 Lift Stations, Water Boost Pump, Electrical Substation, Natural Gas Distribution Station, 4 Flood Control Dams, 2 Nursing Homes
City of Hico	Government Facility, Fire Station, EMS, 2 Schools, Medical Facility, Water Treatment Facility, 3 Water Wells, Water Tower, Water Storage Facility, 2 Bridges, 3 Lift Stations, Electrical Substation, 2 Nursing Homes

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 $8,590,937, having an approximate annual loss estimate of $175,325. Based on historic loss and damages, the impact of hail damages on the entire Hamilton County planning area, including all participating jurisdictions, can be considered "Limited" severity of impact meaning minor quality of life lost, critical facilities shut down for 24-hours or less, and less than ten percent of property destroyed or with major damage.

Table 9-6. Potential Annualized Losses for Hamilton County

JURISDICTION	PROPERTY & CROP DAMAGE	ANNUAL LOSS ESTIMATE
Hamilton County	$4,910,722	$100,219
City of Hamilton	$317,026	$6,470
City of Hico	$3,363,189	$68,637
Planning Area	**$8,590,937**	**$175,325**

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:

[3] County totals includes all jurisdictions and unincorporated areas within the county.

- 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.
- 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.

Section 10: Wildfire

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 10-3). It is estimated that 84 percent of the total population in Hamilton County live within the WUI. However, the entire Hamilton County planning area is at risk for wildfires.

Figure 10-1. Wildland Urban Interface Map – Hamilton County

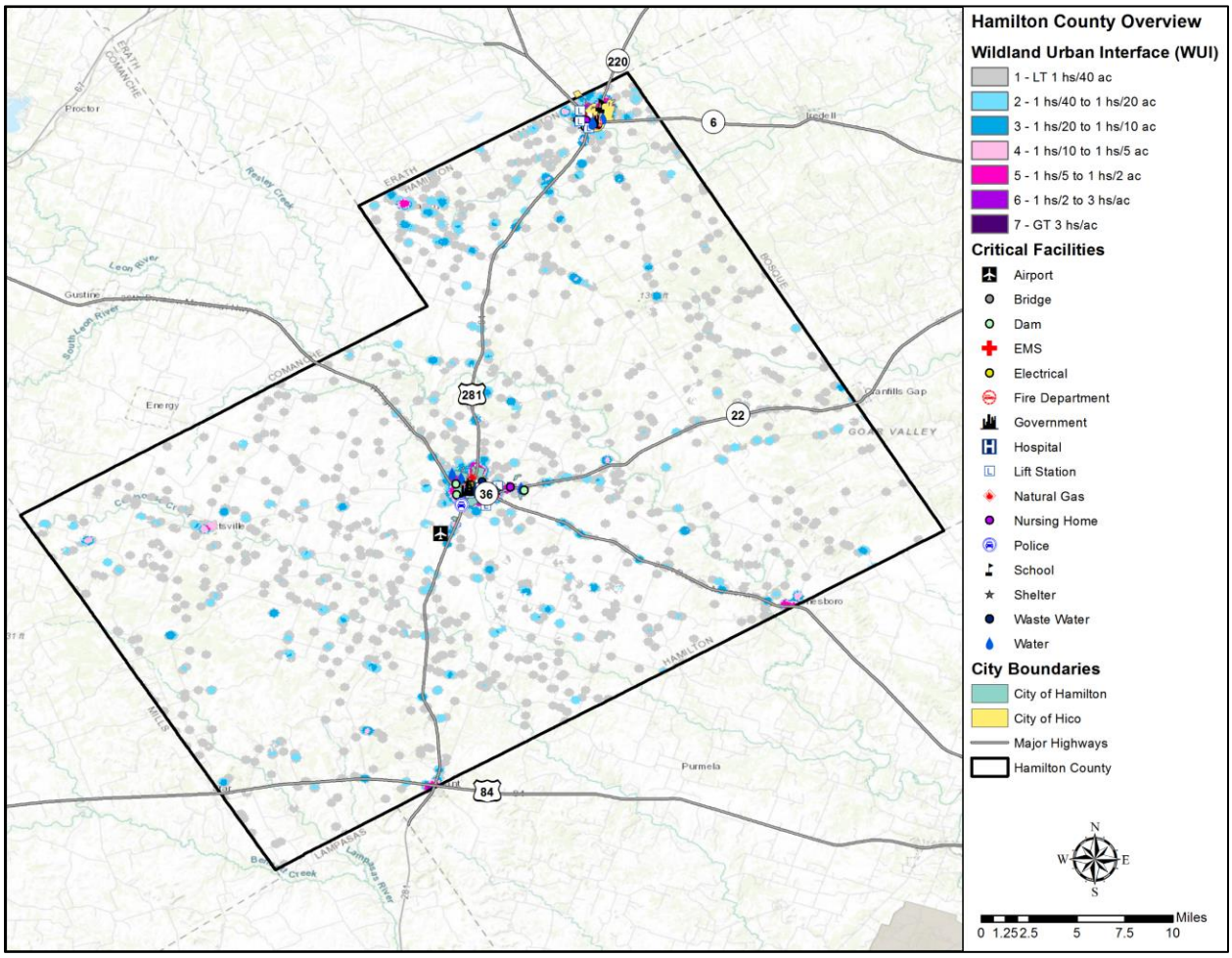
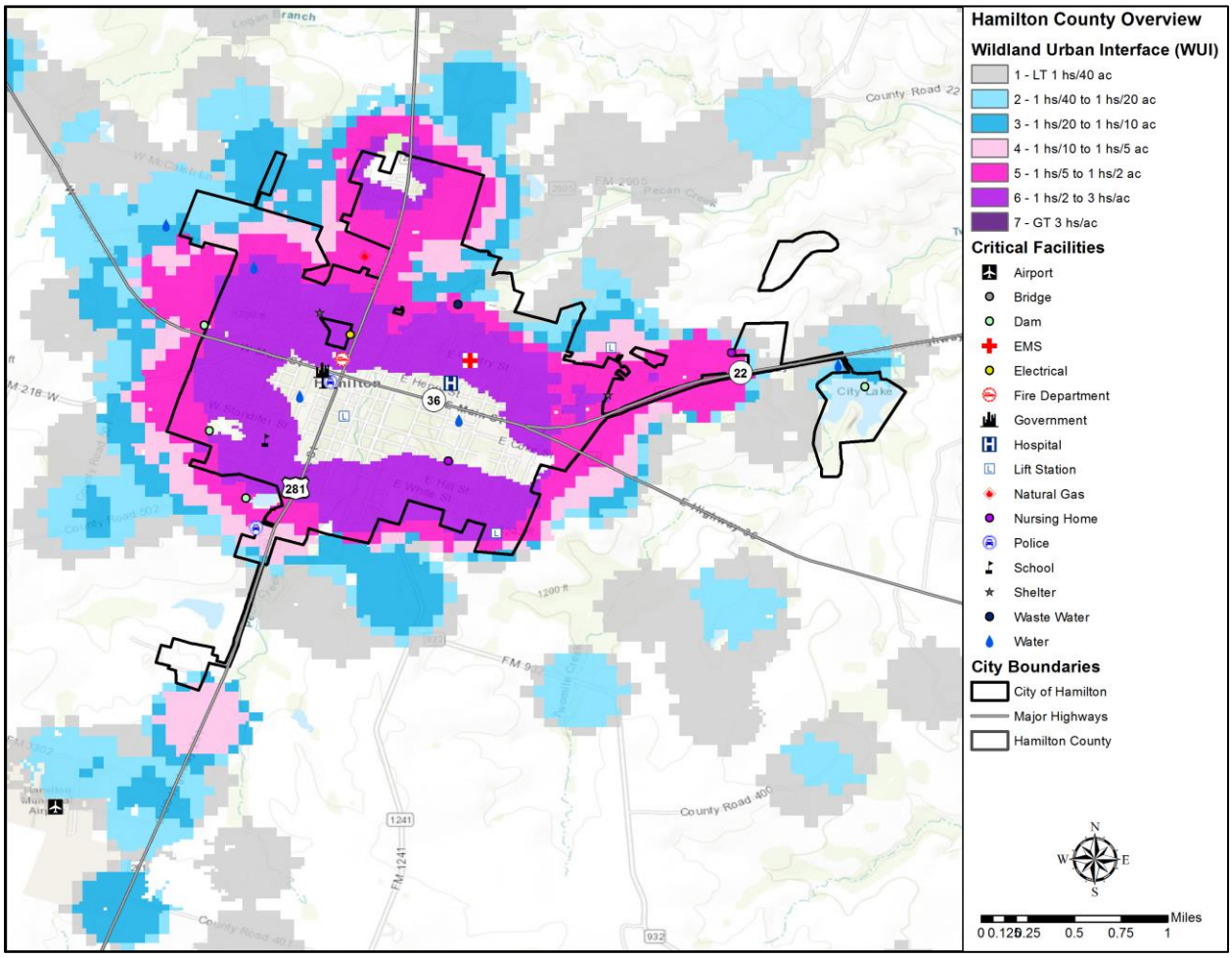
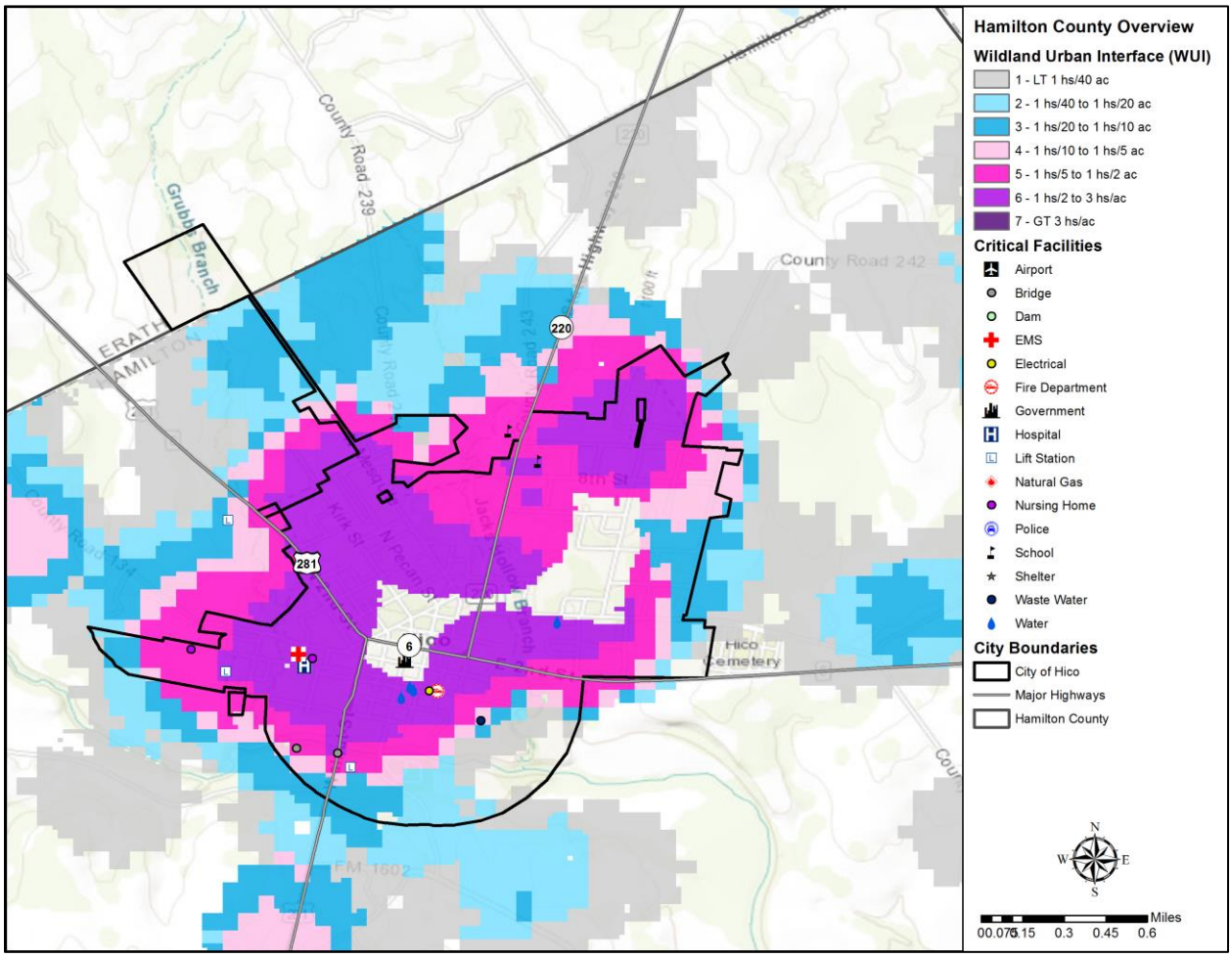


Figure 10-2. Wildland Urban Interface Map – City of Hamilton



It is estimated that 65 percent of the total population in the City of Hamilton live within the WUI. However, the entire City of Hamilton is at risk for wildfires.

Figure 10-3. Wildland Urban Interface Map – City of Hico



It is estimated that 87 percent of the total population in the City of Hico live within the WUI. However, the entire City of Hico is at risk for wildfires.

The Texas Forest Service reported 665 wildfire events between 2005 and 2015. The National Center for Environmental Information (NCEI) includes two reported events from 1996 through 2017 for the planning area. Each of these events were accounted for in the Texas Forest Service (TFS) data. Due to a lack of recorded data for wildfire events prior to 2005 and after 2015[1], 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 10-4). Table 10-1 identifies the number of wildfires by jurisdiction and total acreage burned.

[1] While the data is continuing to be reported, at this time the TFS website data is only available through 2015.

Figure 10-4. Location and Historic Wildfire Events for Hamilton County Planning Area

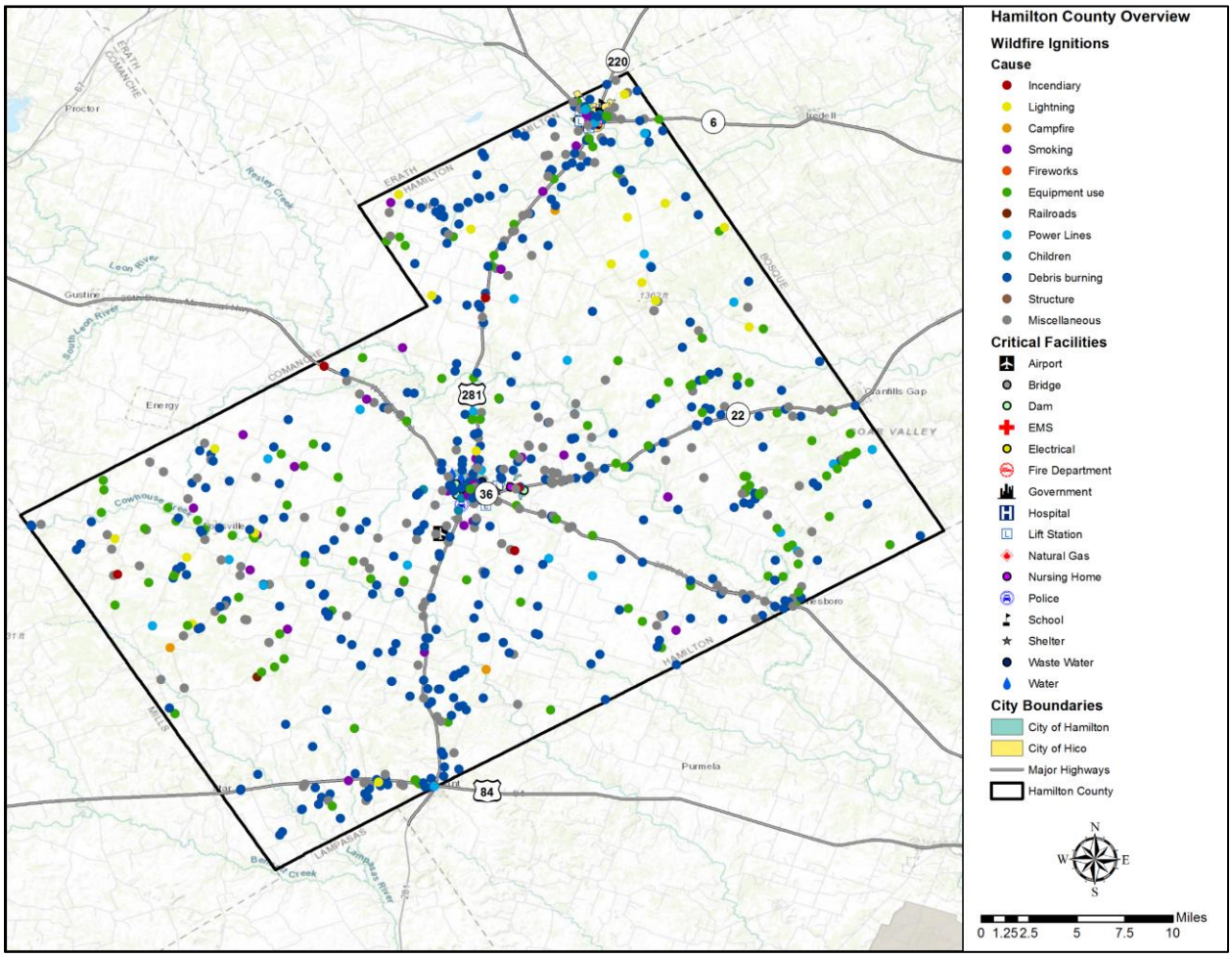


Table 10-1. Historical Wildfire Events Summary

JURISDICTION	NUMBER OF EVENTS	ACRES BURNED
Hamilton County	665[2]	18,002
City of Hamilton	8	533
City of Hico	14	37

Table 10-2. Acreage of Suppressed Wildfire by Year

JURISDICTION	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Hamilton County	2,964	3,048	404	3,856	4,115	690	1,514	837	73	161	340
City of Hamilton	280	1	0	102	0	0	0	150	0	0	0

[2] Total county events includes the Cities of Hamilton and Hico.

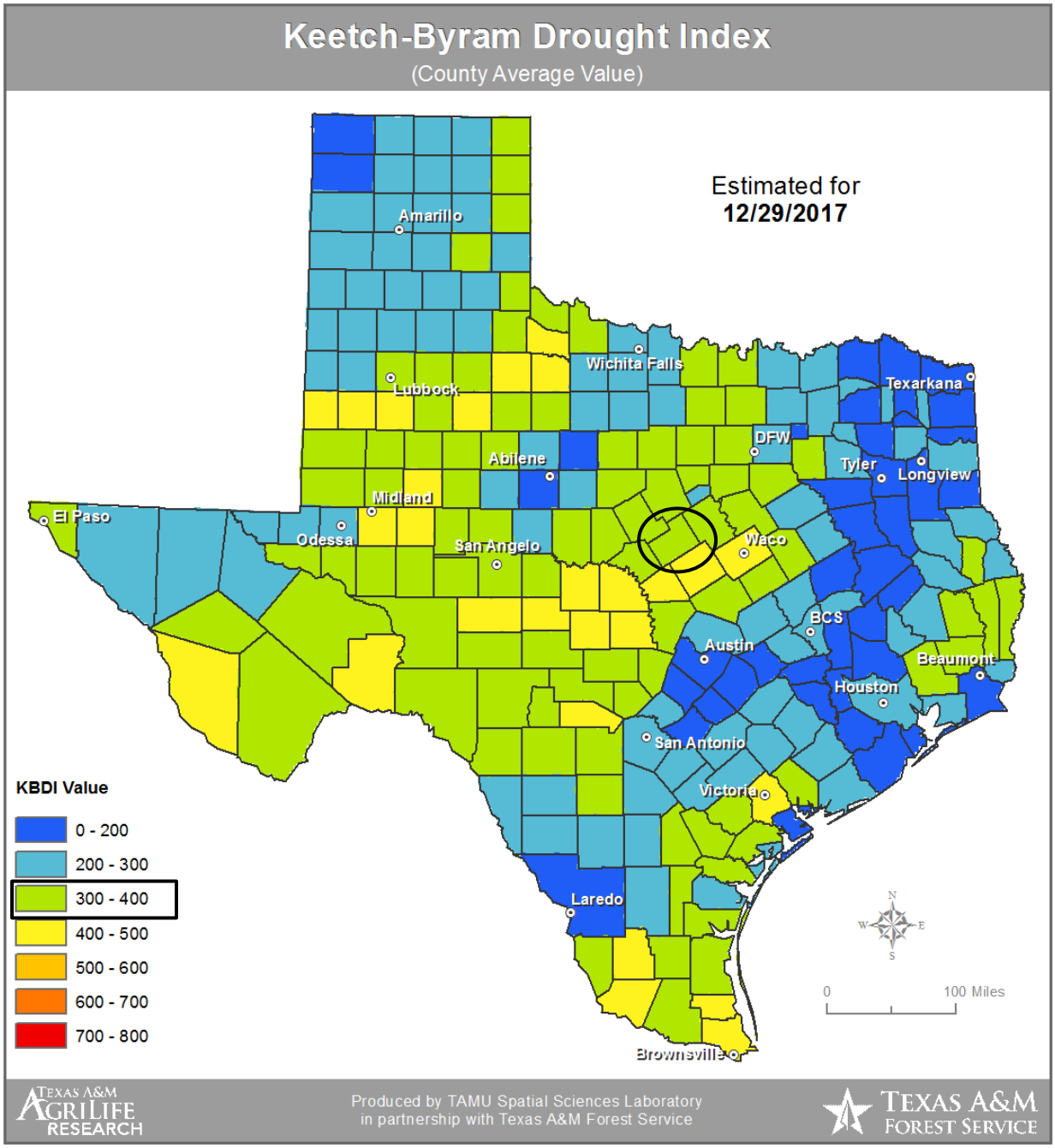
JURISDICTION	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
City of Hico	0	0	0	2	3	3	29	0	0	0	0

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.

Each color in Figure 10-5 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 10-5. Keetch-Byram Drought Index (KBDI) for the State of Texas, 2017[3]



[3] Hamilton County is located within the black circle.

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 Hamilton County planning area in a wildfire event is within 300 to 400. The average extent to be mitigated for the Hamilton County planning area, including the CTCOG and all participating jurisdictions, is a KBDI of 455. Therefore a KBDI 400-600 can be anticipated for all participating jurisdictions. 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. Hamilton County is between a potential moderate to high wildfire intensities. Figures 10-6 through 10-8 identify the wildfire intensity for the Hamilton County planning area.

Figure 10-6. Fire Intensity Scale Map – Hamilton County

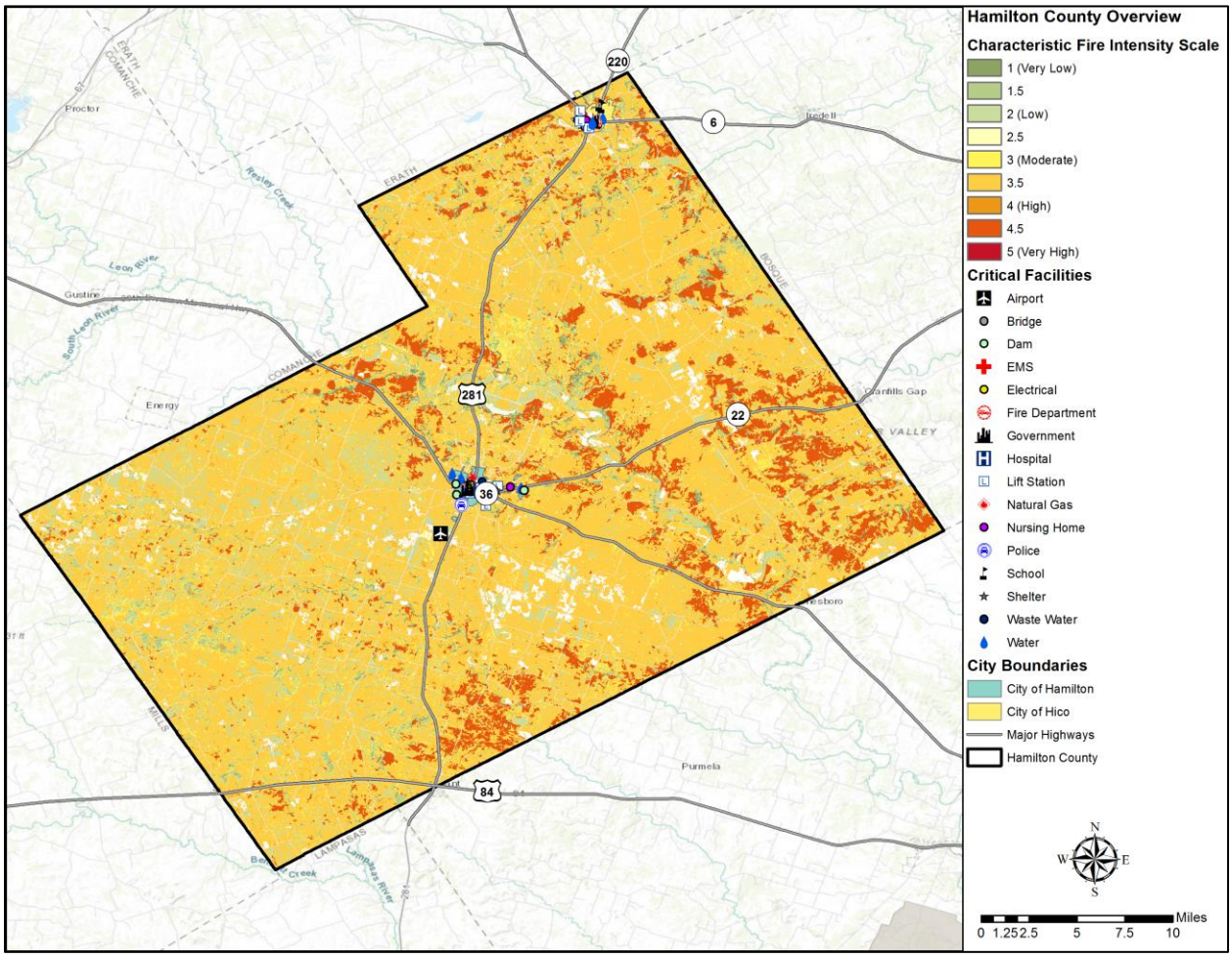


Figure 10-7. Fire Intensity Scale Map – City of Hamilton

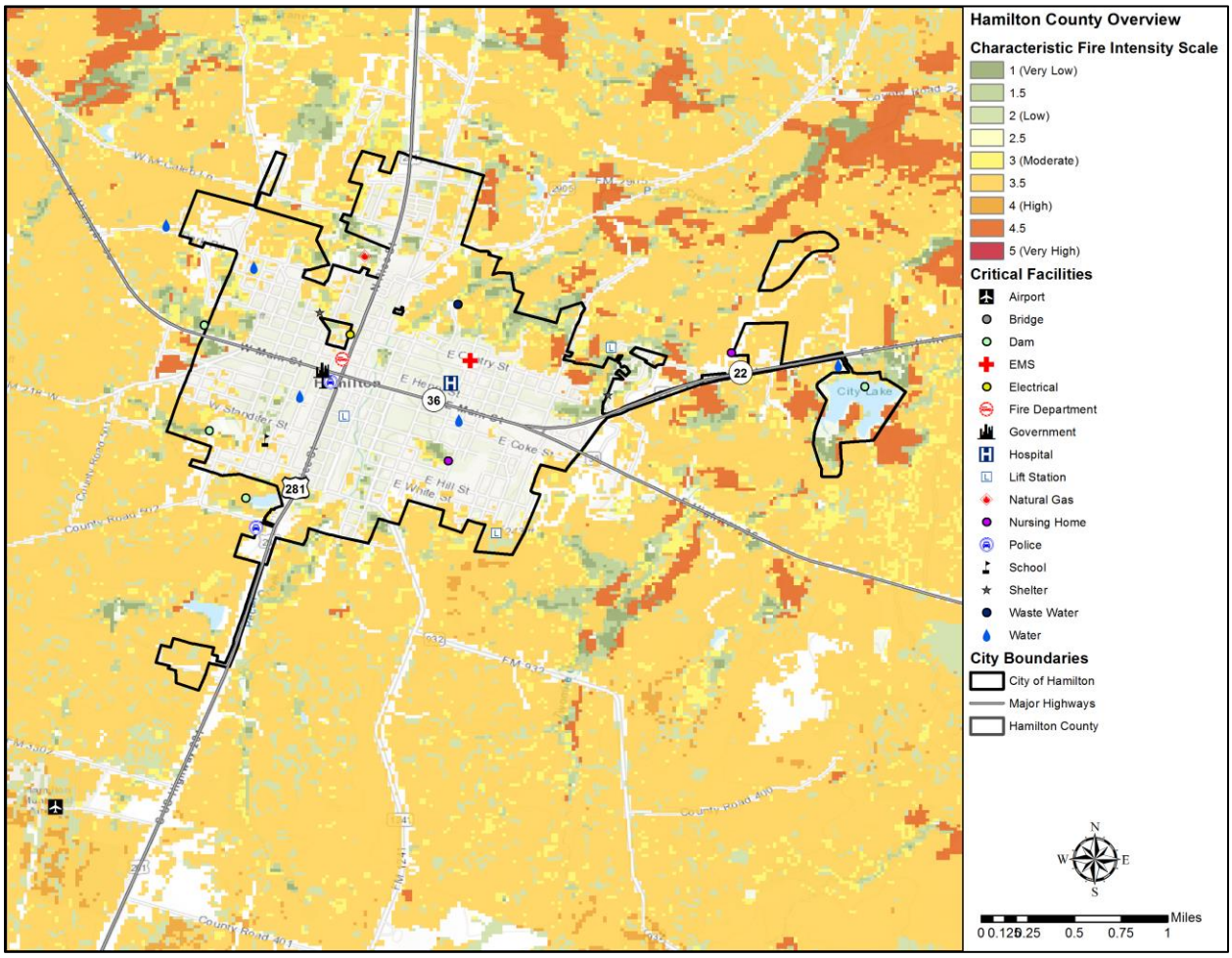
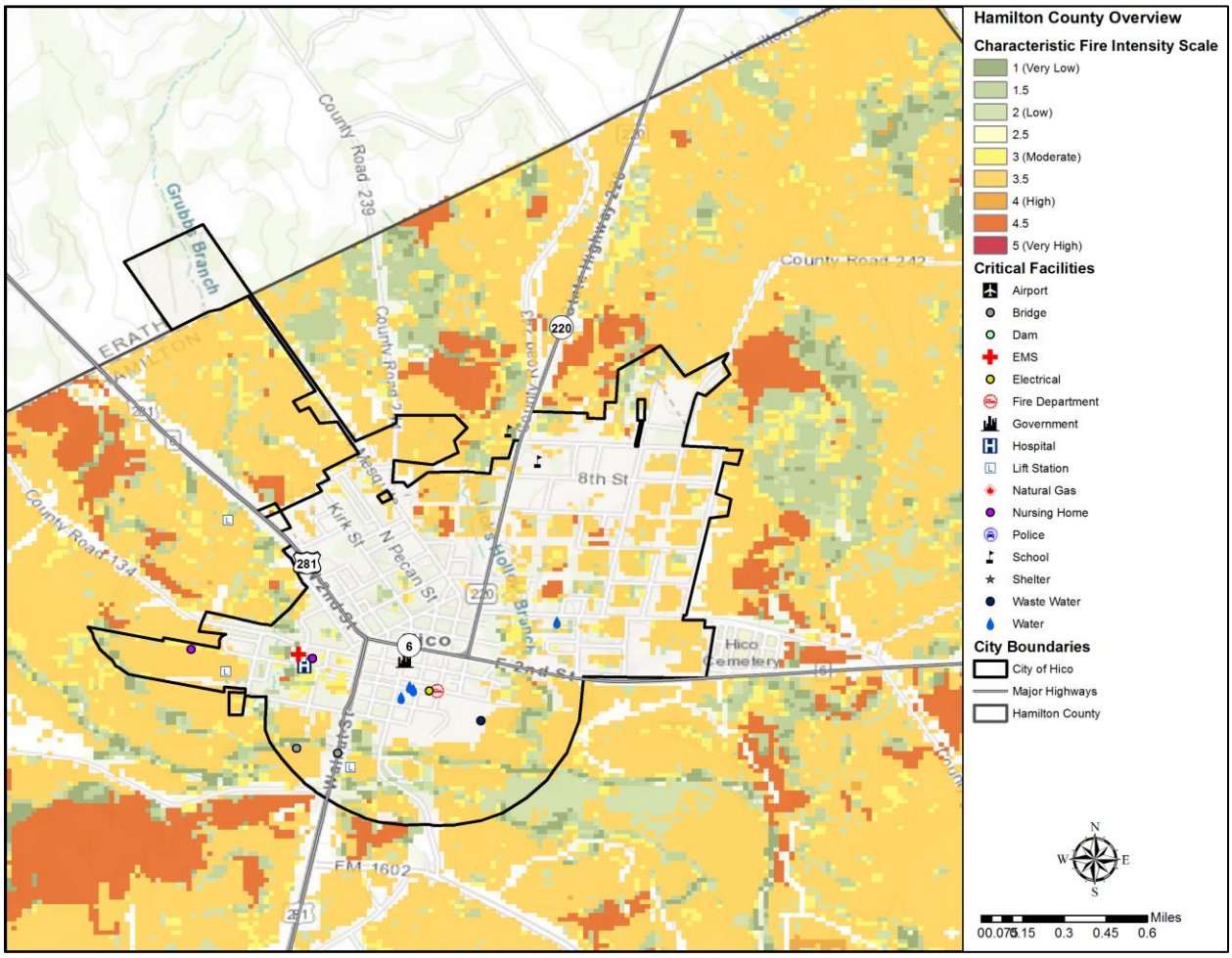


Figure 10-8. Fire Intensity Scale Map – City of Hico



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 665 events in an 11 year period, an event within Hamilton 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 Hamilton County are not likely to experience large, sweeping fires. Areas outside of city limits and in the unincorporated areas of Hamilton 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 wildland and urban areas interface. Figures 10-1 through 10-3 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:

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

JURISDICTION	CRITICAL FACILITIES
Hamilton County	Airport, County Sheriff's Office
City of Hamilton	Fire Station, EMS, 2 Shelters, School, Water Treatment Facility, Waste Water Treatment Facility, Water Tower, 2 Lift Stations, Water Boost Pump, Electrical Substation, Natural Gas Distribution Station, 2 Flood Control Dams, Nursing Home
City of Hico	Fire Station, EMS, 2 Schools, Medical Facility, Water Treatment Facility, 2 Water Wells, Water Tower, Water Storage Facility, 2 Bridges, 3 Lift Stations, Electrical Substation, 2 Nursing Homes

Within the Hamilton County planning area, a total of 665 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 62 events every year.

Table 10-4. Historic Loss Estimates Due to Wildfire[4]

JURISDICTION	NUMBER OF EVENTS	ACRES BURNED	ANNUAL ACRE LOSSES
Hamilton County	665	18,002	1,636.5
City of Hamilton	8	533	48.5
City of Hico	14	37	3.4

Figures 10-9 through 10-11 show Hamilton County and the threat of wildfire to the County and participating jurisdictions.

[4] Events divided by 11 years of data.

Figure 10-9. Wildfire Ignition Density – Hamilton County

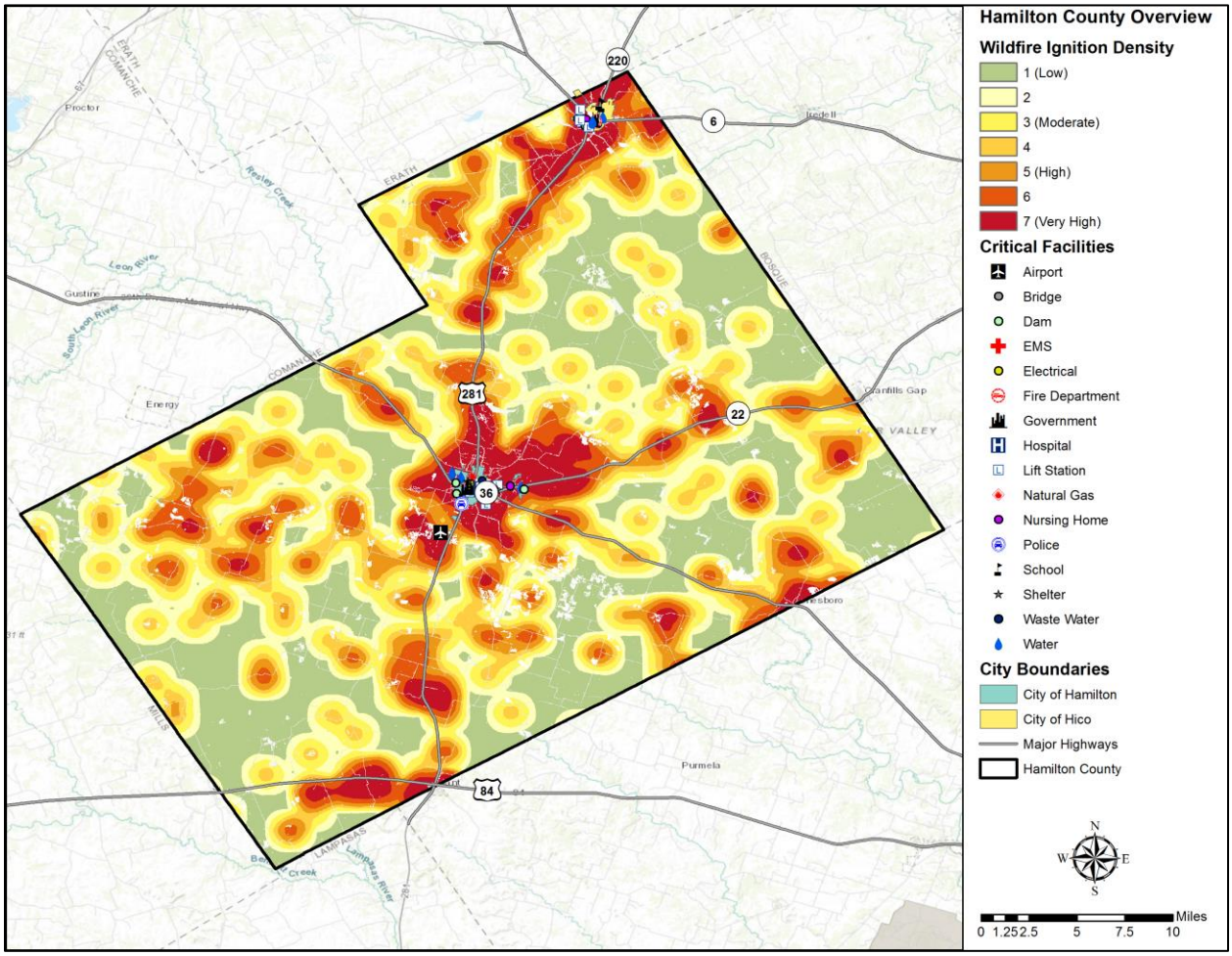


Figure 10-10. Wildfire Ignition Density – City of Hamilton

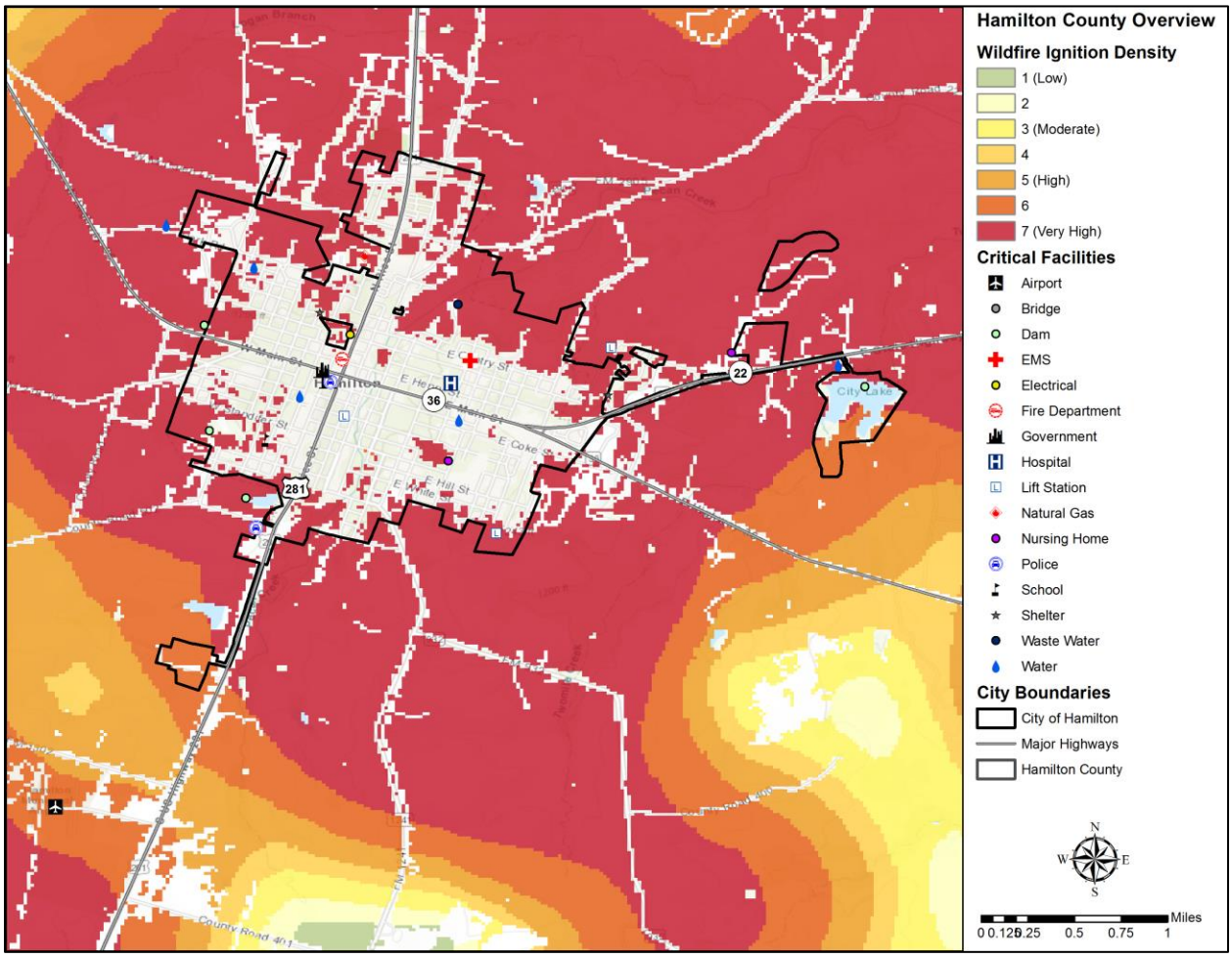
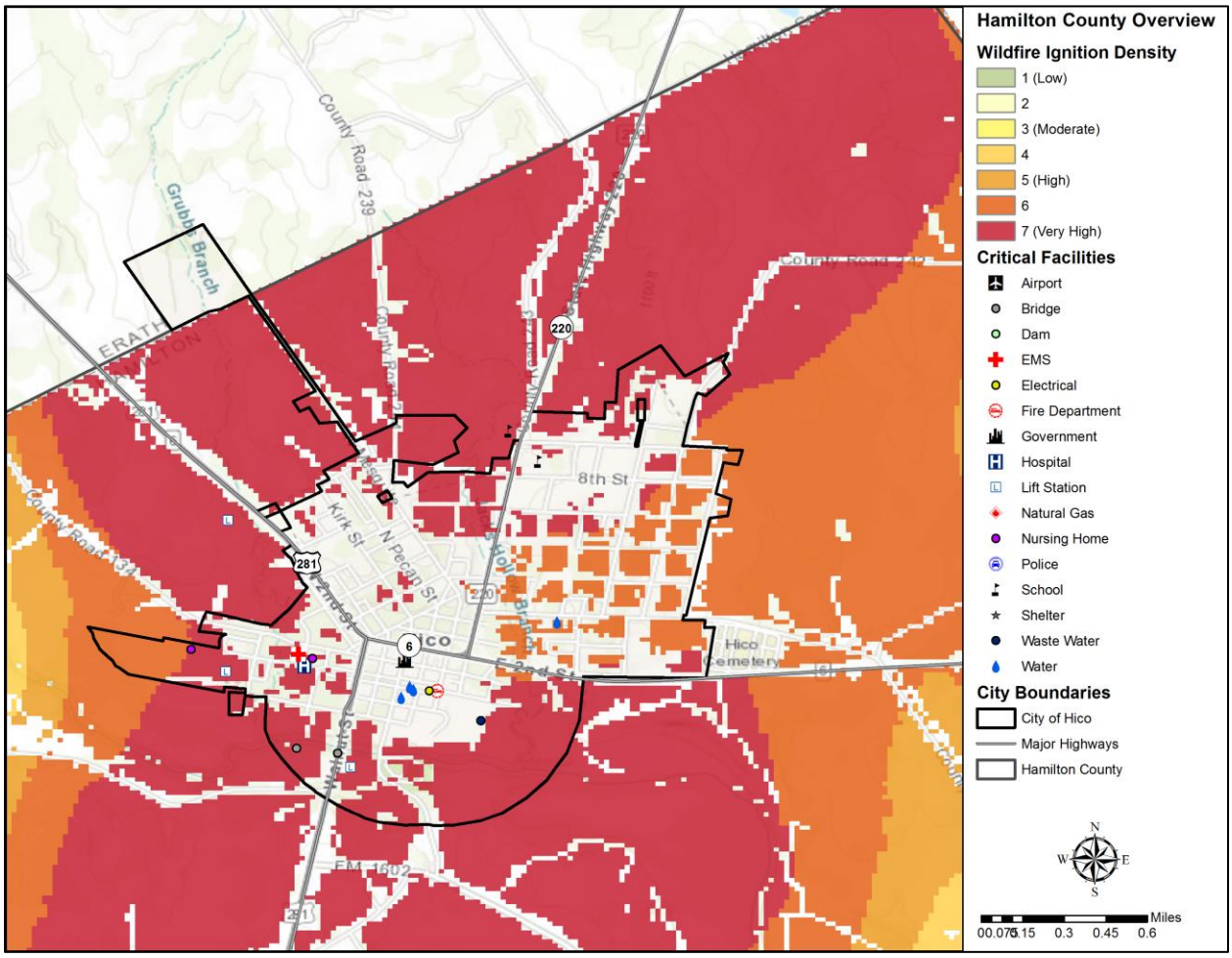


Figure 10-11. Wildfire Ignition Density – City of Hico



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 Hamilton County 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 more than one week,

and more than 10% of property is destroyed or with major damage. Severity of impact is gauged 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
Hamilton County	Minor	Hamilton County has an estimated 6,784 people or 84% of the total population that live within the Wildland Urban Interface (WUI). The largest population in Hamilton County live in an area that is a semi-dense (1 house per 2 acres to 3 houses per 1 acre) in the WUI, and the county has a moderate to high wildfire threat. Hamilton 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.
City of Hamilton	Limited	The largest population in the City of Hamilton live in an area that is a semi-dense (1 house per 2 acres to 3 houses per 1 acre) in the WUI, and the City has a moderate wildfire threat. Although there is a moderate wildfire risk, there has only been 8 wildfire events in the past 11 years. Therefore, citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for 24 hours or less and less than 10 percent of total property could be damaged.
City of Hico	Limited	The largest population in the City of Hico live in an area that is a semi-dense (1 house per 2 acres to 3 houses per 1 acre) in the WUI, and the City has a moderate wildfire threat. Although there is a moderate wildfire risk, there has only been 14 wildfire events in the past 11 years. Therefore, citizens could be injured or suffer illnesses, but not permanent disability. Critical facilities could be shut down for 24 hours or less and less than 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.
- 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.
- 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.
- White River and Strawtown Koteewi Park 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 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.

Section 11: Drought

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.

Table 11-1. Drought Classification Definitions[1]

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 Hamilton 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 moderate drought conditions throughout most of the county with the norther most portion of the county experiencing abnormally dry conditions (Figure 11-1). However, the planning area has experienced extreme 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 Hamilton County planning area equally, including 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, December 2017

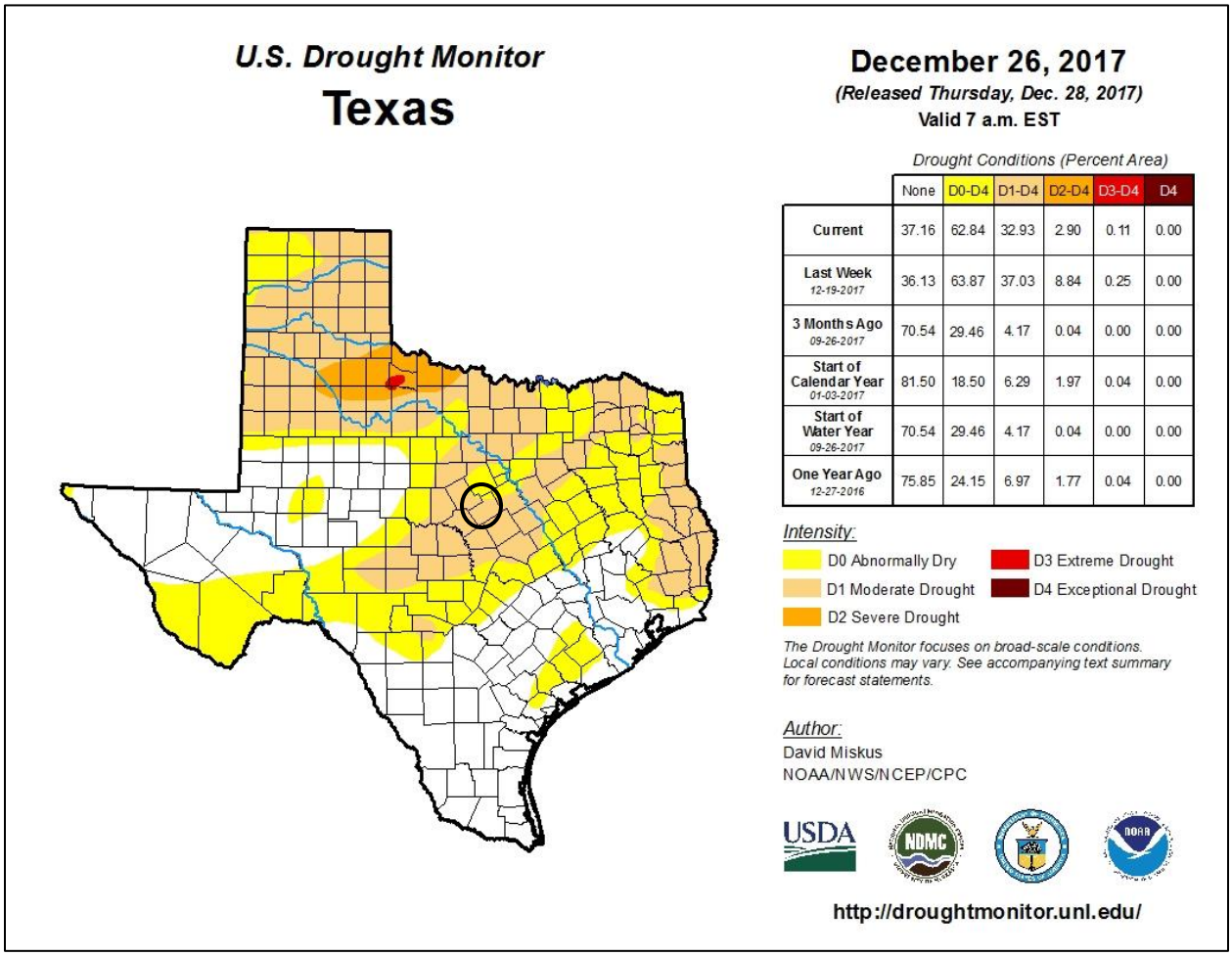
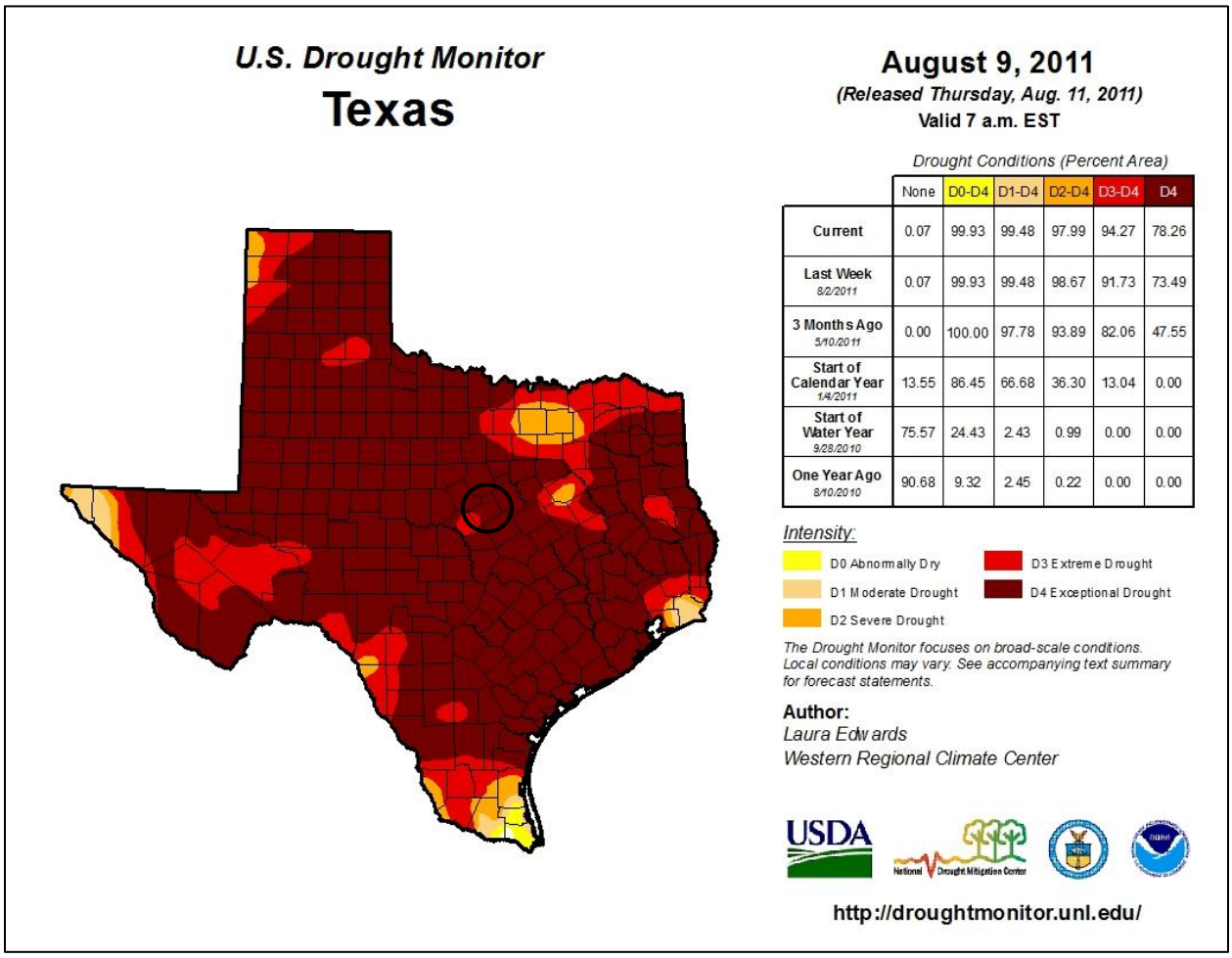


Figure 11-2. U.S. Drought Monitor, August 2011



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.

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

DROUGHT INDEX	DROUGHT CONDITION CLASSIFICATIONS						
	Extreme	Severe	Moderate	Normal	Moderately Moist	Very Moist	Extremely Moist
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 Descriptions[2]

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 Hamilton County planning area, including 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.

Historical Occurrences

The Hamilton 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

[2] Source: National Drought Mitigation Center

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 all participating jurisdictions in the Hamilton 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
2007
2010
2011
2012
2013
2014
2015
12 unique events

Table 11-5. Historical Drought Events, 1996-2017[3]

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	8/1/1996	0	0	$0	$0
Hamilton County	7/1/1998	0	0	$0	$0
Hamilton County	8/1/2000	0	0	$0	$0
Hamilton County	9/1/2000	0	0	$0	$0
Hamilton County	7/1/2005	0	0	$0	$0
Hamilton County	11/1/2005	0	0	$0	$0
Hamilton County	12/1/2005	0	0	$0	$0

[3] Damages are reported in 2017 dollar values.

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	1/1/2006	0	0	$0	$0
Hamilton County	2/1/2006	0	0	$0	$0
Hamilton County	3/1/2006	0	0	$0	$0
Hamilton County	4/1/2006	0	0	$0	$0
Hamilton County	5/1/2006	0	0	$0	$0
Hamilton County	6/6/2006	0	0	$0	$0
Hamilton County	7/1/2006	0	0	$0	$0
Hamilton County	8/1/2006	0	0	$0	$0
Hamilton County	9/1/2006	0	0	$0	$0
Hamilton County	11/1/2006	0	0	$0	$963,947
Hamilton County	12/1/2006	0	0	$30,114	$30,114
Hamilton County	1/1/2007	0	0	$0	$35,136
Hamilton County	2/1/2007	0	0	$0	$35,136
Hamilton County	12/5/2010	0	0	$0	$11,137
Hamilton County	1/1/2011	0	0	$0	$3,239
Hamilton County	2/1/2011	0	0	$0	$6,477
Hamilton County	3/1/2011	0	0	$0	$4,318
Hamilton County	4/1/2011	0	0	$0	$26,989
Hamilton County	5/1/2011	0	0	$0	$21,592
Hamilton County	6/1/2011	0	0	$0	$24,830
Hamilton County	7/1/2011	0	0	$0	$21,592
Hamilton County	8/1/2011	0	0	$0	$53,979
Hamilton County	9/1/2011	0	0	$0	$32,387
Hamilton County	10/1/2011	0	0	$0	$10,796
Hamilton County	11/1/2011	0	0	$0	$5,398
Hamilton County	12/1/2011	0	0	$0	$5,398
Hamilton County	1/1/2012	0	0	$0	$4,231
Hamilton County	11/13/2012	0	0	$0	$2,115

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	12/1/2012	0	0	$0	$5,288
Hamilton County	1/1/2013	0	0	$0	$5,212
Hamilton County	2/1/2013	0	0	$0	$2,085
Hamilton County	3/1/2013	0	0	$2,085	$0
Hamilton County	4/1/2013	0	0	$0	$3,127
Hamilton County	5/1/2013	0	0	$0	$2,085
Hamilton County	6/1/2013	0	0	$0	$2,085
Hamilton County	7/1/2013	0	0	$0	$1,042
Hamilton County	8/27/2013	0	0	$0	$2,085
Hamilton County	9/1/2013	0	0	$0	$3,127
Hamilton County	3/11/2014	0	0	$0	$4,103
Hamilton County	4/1/2014	0	0	$0	$4,103
Hamilton County	5/1/2014	0	0	$0	$2,052
Hamilton County	6/1/2014	0	0	$0	$1,026
Hamilton County	9/28/2014	0	0	$0	$0
Hamilton County	10/1/2014	0	0	$0	$1,026
Hamilton County	12/26/2014	0	0	$0	$0
Hamilton County	1/1/2015	0	0	$0	$512
Hamilton County	2/1/2015	0	0	$0	$1,025
Hamilton County	3/1/2015	0	0	$0	$1,025
Hamilton County	4/1/2015	0	0	$0	$2,049
Hamilton County	10/13/2015	0	0	$1,025	$0
TOTALS		**0**	**0**	**$33,224**	**$1,341,868**

Significant Events

November 2005 – September 2006

Drought conditions worsened across portions of north and central Texas in the final months of 2005. During January 2006, all of north Texas was classified in either extreme drought (D3) or exceptional drought (D4) as classified by the U.S. Drought Monitor. Every county in north Texas was eligible for federal disaster relief due to the drought. The weather continued to be unseasonable warm. The

average high temperature in January was 68.3 degrees, a full 14.2 degrees above normal. This figure broke an 83-year-old record.

Hydrologic deficits remained high through the spring months despite the intermittent rainfall. By June, much of the area was again in extreme or exceptional drought conditions with all area lakes well below normal.

Crops continued to suffer during September. Cotton was especially hard hit, suffering over a billion dollars in losses for the year statewide. Other crops, such as soybeans, corn, and sorghum were also decimated. Hay continued to cost more than twice its usual cost...as pastures did not offer enough sustenance for cattle. The selling of cattle continued as ranchers could not afford to feed them. Occasional rainfall at the end of the month and into the following month began to relieve much of the extreme drought conditions.

November 2012 - September 2013
With little to no rainfall across the area throughout the month of November counties that were not classified in drought at the beginning of the month were downgraded to severe drought (D2) by the end of the month. According to the U.S. Drought Monitor Hamilton County began the month in normal conditions. With little to no rainfall throughout the month conditions worsened and by the end of the month the county was classified in severe drought (D2). According to the U.S. Drought Monitor, Hamilton County began December in the midst of extreme/D3 drought. By December 18 the county had deteriorated to D4/exceptional drought conditions due to on-going below-normal rainfall. These conditions persisted through the end of the month. After 4-5 inches of rainfall in the month of January 2013, conditions in the planning area improved to severe drought (D2). Drought conditions in Hamilton persisted throughout the remainder of spring and majority of summer months, ranging from D1 to D3 conditions and changing sporadically with small rainfall events. Drought conditions improved by the end of September due to adequate rainfall.

Probability of Future Events

Based on available records of historic events, there have been twelve extended time periods of drought (ranging in length from approximately 30 days to over 420 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 Hamilton County planning area, including 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 Hamilton 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 Hamilton County planning area is estimated at 26.1% of the total population, and children under

the age of 5 are estimated at 4.1% or an estimated total of 2,486[4] 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
Hamilton County[5]	2,146	340
City of Hamilton	791	160
City of Hico	343	66

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 Hamilton 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.

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 the White River and the Hamilton City Lake 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 Hamilton County, including all participating jurisdictions.

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

JURISDICTION	PROPERTY & CROP LOSS	ANNUALIZED LOSS ESTIMATES
Hamilton County	$1,375,092	$62,504

Impact of droughts experienced in the Hamilton County planning area, including 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-

[4] US Census Bureau 2016 data for Hamilton County

[5] County totals includes all incorporated jurisdictions and unincorporated areas.

year reporting period in the Hamilton County planning area, including all participating jurisdictions is $62,504 annually.

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 Hamilton 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	6
Plants & Wildlife	12
Relief, Response & Restrictions	13
Society & Public Health	2
Tourism & Recreation	0
Water Supply & Quality	11

Drought has the potential to impact people in the Hamilton 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 White River and Hamilton City 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.
- 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.
- 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.

Section 12: Lightning

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.

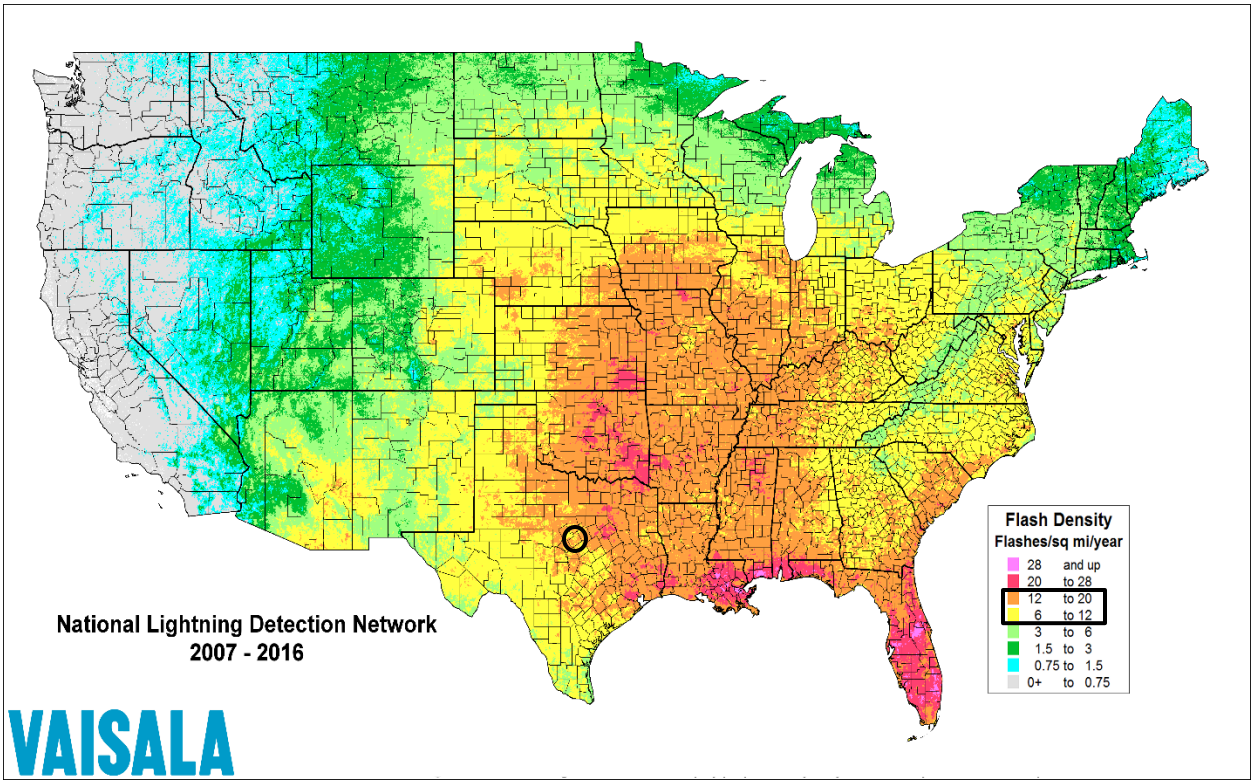
Location

Lightning can strike in any geographic location and is considered a common occurrence in Texas. The Hamilton County planning area, including 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 Hamilton County planning area is uniformly exposed to the threat of lightning.

Extent

According to the 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 Hamilton County planning area. This rate equates to approximately 5,016 to 16,720 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
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

LAL	CLOUD & STORM DEVELOPMENT	LIGHTNING STRIKES/ 15 MIN
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 (5,016 to 16,720 flashes) and a cloud-to-ground flash density of six to twenty per square mile were divided by the number[1] of thunderstorm events that occur annually in the planning area. Hamilton County, including all participating jurisdictions, should expect an average range of 6 to 19 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 4.

Historical Occurrences

Lightning occurrences and damages are not well documented for the planning area. Two events with damages were reported by the planning team. Since January 1996, there have been no recorded lightning events known to have impacted Hamilton County, based upon NCEI records. However, team members indicate that lightning events are a regular occurrence for the planning area based on local knowledge and experience.

Table 12-2. Historical Lightning Events, 1996-2017

JURISDICTION	DATE	PROPERTY DAMAGE	CROP DAMAGE
City of Hamilton	2/27/2017	$9,366	$0
Hamilton County	4/1/2017	$3,070	$0

According to NOAA, Hamilton County is located in an area of the country that experiences six to twenty lightning flashes per square mile per year (approximately 5,016 to 16,720 flashes per year). Due to the lack of reported events to the NCEI, the planning team has relied on team input and local knowledge to determine the history of events as well as NOAA statistical data to determine estimates of past occurrences as well as associated probability of future events in this analysis.

Probability of Future Events

Based on NOAA historical statistical data and input from the planning team the probability of occurrence for future lightning events in the Hamilton County planning area is considered highly likely, or an event probable in the next year. The planning team stated that lightning occurs regularly in the planning area. According to NOAA, Hamilton County is located in an area of the country that experiences six to twenty lightning flashes per square mile per year (approximately 5,016 to 16,720 flashes per year). Given this estimated probability of events, it can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the planning area, including all participating jurisdictions.

[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.

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 Hamilton County planning area could potentially be impacted and remain vulnerable to possible injury and property loss from lightning strikes. The Hamilton County planning area has not had any reported lightning events, however the entire planning area, including 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 Hamilton County 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 Hamilton County 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
Hamilton County	Government Facility, Hospital, Airport, County Sheriff's Office
City of Hamilton	Government Facility, Police Station, Fire Station, EMS, 2 Shelters, School, Water Treatment Facility, Waste Water Treatment Facility, 3 Water Towers, 3 Lift Stations, Water Boost Pump, Electrical Substation, Natural Gas Distribution Station, 4 Flood Control Dams, 2 Nursing Homes
City of Hico	Government Facility, Fire Station, EMS, 2 Schools, Medical Facility, Water Treatment Facility, 3 Water Wells, Water Tower, Water Storage Facility, 2 Bridges, 3 Lift Stations, Electrical Substation, 2 Nursing Homes

Impact of lightning experienced in the Hamilton County planning area has resulted in no injuries or fatalities. Damages as a result of lightning are considered negligible for the entire planning area, including all participating jurisdiction. The overall impact of lightning events experienced in the Hamilton County planning area, including all participating jurisdictions, would be considered "Limited" with less than ten percent of structures destroyed or damaged and facilities shut down for 24 hours or less and limited quality of life lost. Overall, the average loss estimate for Hamilton County, including all participating jurisdictions, is considered negligible.

Section 12: Lightning

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.
- 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 or county departments 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.

Section 13: Winter Storm

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 Hamilton 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 Hamilton County planning area, including all participating jurisdictions, typically experiences between one and ten extreme cold days every year. 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 Hamilton County planning area, including all participating jurisdictions.

Figure 13-1. Extreme Cold Days, 1960-2003[1]

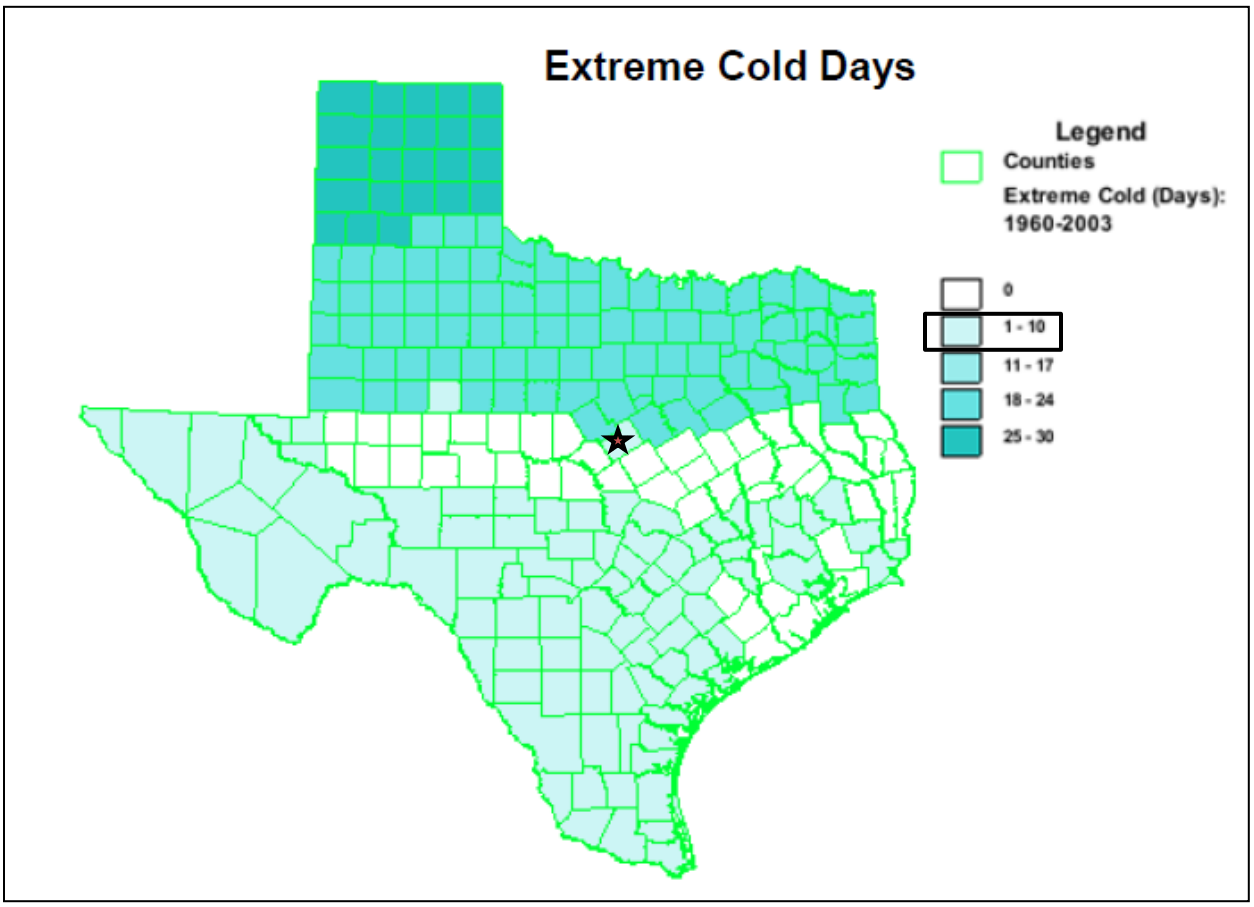


Table 13-1. Types of Winter Storms

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. Hamilton County indicated by star.

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 Hamilton County planning area, including all participating jurisdictions, are considered to be exposed to a winter storm hazard and could potentially be impacted.

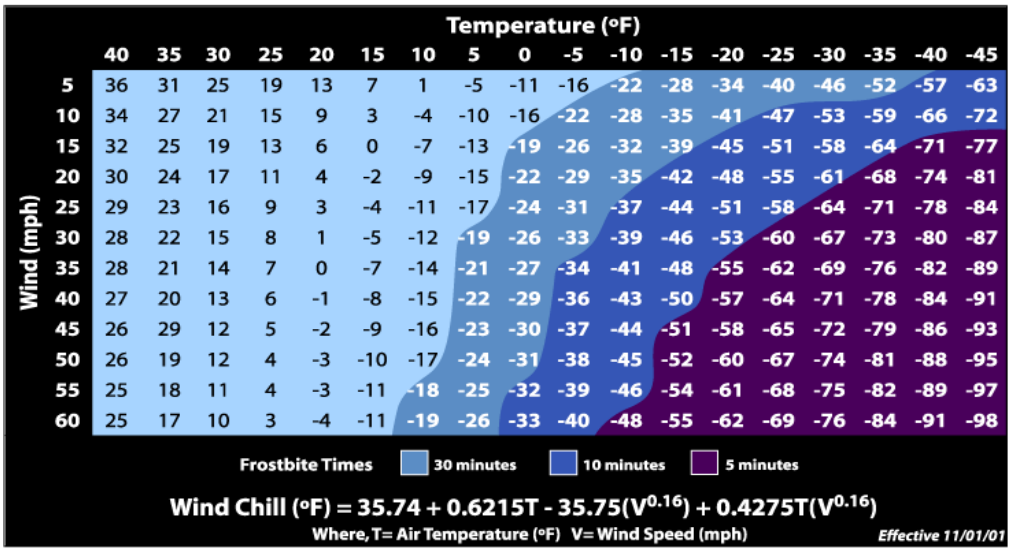
Extent

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 Hamilton County planning area, including all participating jurisdictions, has never experienced a blizzard, but based on 19 previous occurrences recorded from 1996 through 2017, it has been subject to winter storm watches, warnings, freezing rain, and wind chill.

The average number of cold days is similar for the entire planning area. 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. Hamilton County planning area, including all participating jurisdictions, can expect anywhere in the future 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 the entire Hamilton County planning area from 1996 through 2017 provided by the NCEI database. There have been 19 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, including all participating jurisdictions, are provided on a County-wide basis per the NCEI database.

Table 13-3. Historical Winter Storm Events, 1996-2017[2]

JURISDICTION	DATE	DEATHS	INJURIES	PROPERTY DAMAGE	CROP DAMAGE
Hamilton County	11/24/1996	0	0	$0	$0
Hamilton County	1/6/1997	0	0	$0	$0
Hamilton County	1/12/1997	0	0	$0	$0
Hamilton County	12/22/1998	0	0	$0	$0
Hamilton County	1/25/2000	0	0	$0	$0
Hamilton County	12/12/2000	0	0	$0	$0
Hamilton County	12/25/2000	0	0	$0	$0
Hamilton County	12/31/2000	0	0	$0	$0
Hamilton County	1/1/2001	0	0	$0	$0
Hamilton County	1/18/2001	0	0	$0	$0
Hamilton County	11/28/2001	0	0	$0	$0
Hamilton County	2/24/2003	0	0	$0	$0
Hamilton County	12/22/2004	0	0	$0	$0
Hamilton County	1/17/2007	0	0	$0	$0
Hamilton County	4/7/2007	0	0	$0	$0
Hamilton County	12/24/2009	0	0	$11,319	$0
Hamilton County	2/11/2010	0	0	$3,341	$0
Hamilton County	2/1/2011	0	0	$107,958	$0
Hamilton County	12/5/2013	0	0	$521,210	$0
TOTALS		**0**	**0**	**$643,828**	

Significant Events

February 1, 2011 – Hamilton County

The first week of February 2011 was plagued with two winter weather events and persistent cold temperatures. The first winter storm began late on January 31st and ended during the morning hours of February 1st. A strong cold front blew through the region ushering in very cold air ahead of an approaching upper level system. Before the snow began, periods of rain, freezing rain, and sleet provided a sheet of ice underneath the snow. At times, thunder-sleet was observed. Freezing rain, heavy sleet, and a few inches of snow fell across Hamilton County. The sleet and ice made travel treacherous around the county. Many trucks got stuck on parts of Highway 281. Most of the vehicle

[2] Values are in 2017 dollars.

incidents reported were due to stuck vehicles or vehicles that had slid off the roadway. The prolonged cold that occurred after the winter storm kept the roads treacherous for the next four days and many schools and businesses were closed for just as long.

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 Hamilton County planning area, including 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 Hamilton 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
Hamilton County	Government Facility, Hospital, Airport, County Sheriff's Office
City of Hamilton	Government Facility, Police Station, Fire Station, EMS, 2 Shelters, School, Water Treatment Facility, Waste Water Treatment Facility, 3 Water Towers, 3 Lift Stations, Water Boost Pump, Electrical Substation, Natural Gas Distribution Station, 4 Flood Control Dams, 2 Nursing Homes
City of Hico	Government Facility, Fire Station, EMS, 2 Schools, Medical Facility, Water Treatment Facility, 3 Water Wells, Water Tower, Water Storage Facility, 2 Bridges, 3 Lift Stations, Electrical Substation, 2 Nursing Homes

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.

Population over 65 in the Hamilton County planning area is estimated at 26.1% of the total population or an estimated total of 2,146[3] potentially vulnerable residents in the planning area based on age (Table 13-5).

Table 13-5. Population at Greater Risk by Jurisdiction

JURISDICTION	POPULATION 65 AND OLDER
Hamilton County[4]	2,146
City of Hamilton	791
City of Hico	343

Historic loss, in 2017 dollars, is estimated at $643,828 in damages over the 22-year recording period giving an approximate loss of $29,265 in damages annually (Table 13-6). The potential severity of impact for the Hamilton County planning area, including 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
Hamilton County	$643,828	$29,265

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.
- 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.

[3] US Census Bureau 2016 data for Hamilton County

[4] County totals includes all incorporated jurisdictions and unincorporated areas.

- 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 or shut down completely 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.

Section 14: Dam Failure

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 Officials[1], 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

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 million[2]. 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 16 dams in the entire Hamilton 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 5 of the 16 dams pose a risk to the planning area. These dams, listed in Table 14-1, are profiled in detail below. Figure 14-1, illustrates

[2] Source: www.damsafety.org

the general location for the critical dams in the planning area. It should be noted that the City of Hico has no dam failure risks.

Figure 14-1. Critical Dam Locations in Hamilton County

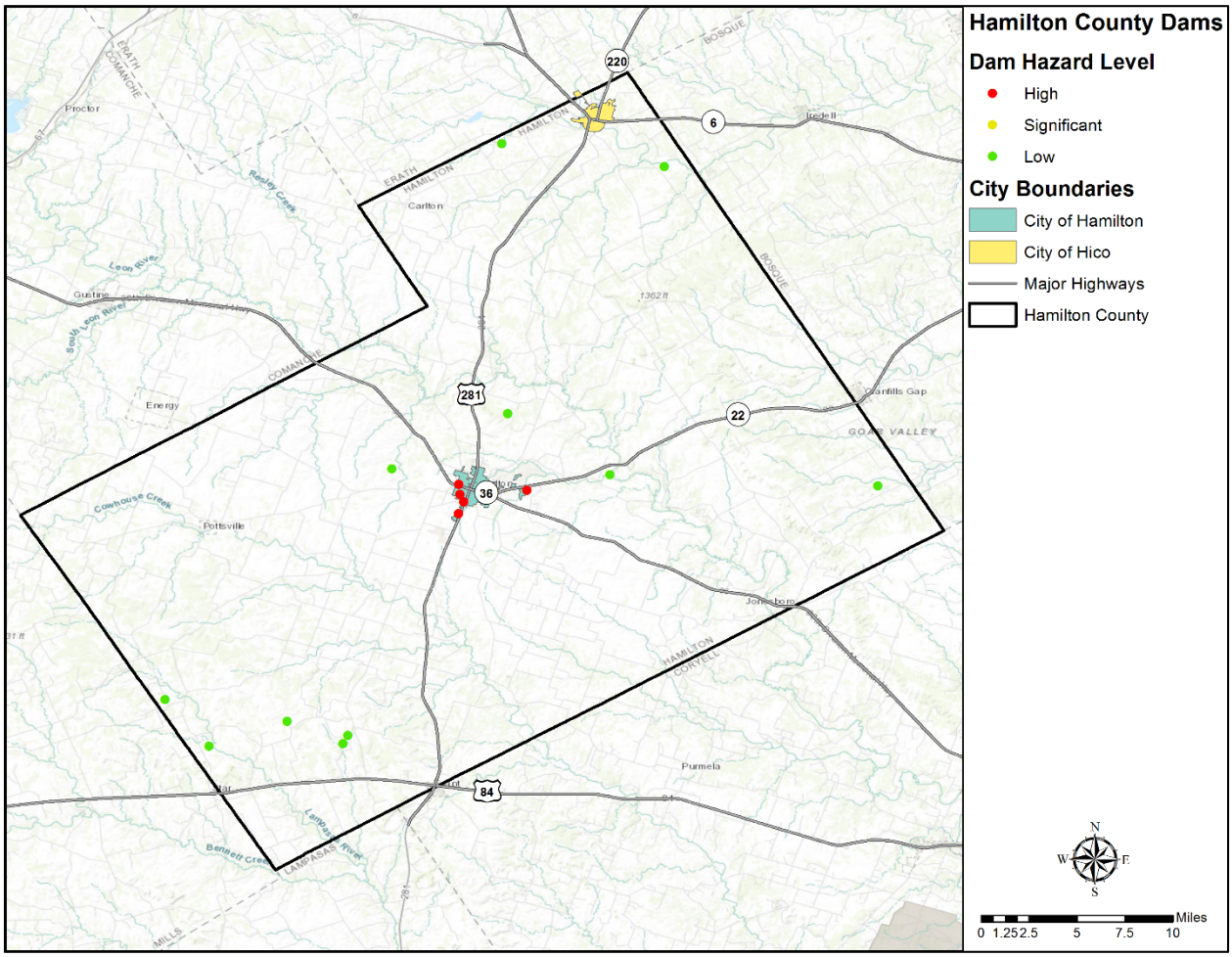


Table 14-1. Hamilton County Dam Survey

JURISDICTION	DAM NAME	HEIGHT (Ft.)	STORAGE (Acre Ft.)	CONDITION[3]	PROFILED
Hamilton County	Hamilton City Lake Dam	45	1104	Not Rated	Yes
City of Hamilton	Pecan Creek Ws Scs Site 2 Dam	39	1100	Not Rated	Yes
City of Hamilton	Pecan Creek Ws Scs Site 3 Dam	32	147	Not Rated	Yes
City of Hamilton	Pecan Creek Ws Scs Site 4 Dam	44	568	Satisfactory	Yes
City of Hamilton	Pecan Creek Ws Scs Site 5 Dam	26	206	Satisfactory	Yes

[3] Condition provided if available.

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.

Hamilton City Lake Dam Flood Risk Areas

Hamilton City Lake Dam is located in Hamilton County on the Two Mile Creek. The dam was constructed in 1923 and is used for flood control purposes. It is owned by the City of Hamilton. The area located near the dam is rural with limited development. While the flow of the breach is anticipated to follow the designated floodplain area, a catastrophic breach could impact approximately 25 residential structures, a church and a rehabilitation center, within one mile of the dam. A dam failure could cause some limited infrastructure damages, power outages, and utility systems disruptions. However, the minimal capacity of the dam does not indicate a significant threat to the structures or infrastructure near the dam. In the event of a breach, it is estimated the average breach width would be 141.8 feet with a maximum breach flow of 68,015 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 10 feet with the highest depth in the immediate area of the dam.

Pecan Creek WS SCS Site 2 Dam Flood Risk Areas

Pecan Creek WS SCS Site 2 Dam is located in the City of Hamilton on a tributary of Pecan Creek. The dam was constructed in 1975 and is used for flood control purposes. It is owned by the City of Hamilton. The area located near the dam is rural with limited development. While the flow of the breach is anticipated to follow the designated floodplain area, a catastrophic breach could impact approximately 15 residential structures, ten commercial structures including a propane dealer and Highway 281, within one mile of the dam. A dam failure could also cause limited infrastructure damages, minor power outages, and utility systems disruptions. However, the minimal capacity of the dam does not indicate a significant threat to the structures or infrastructure near the dam. In the event of a breach, it is estimated the average breach width would be 136.7 feet with a maximum breach flow of 5,960 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 10 feet with the highest depth in the immediate area of the dam.

Pecan Creek WS SCS Site 3 Dam Flood Risk Areas

Pecan Creek WS SCS Site 3 Dam is located in the City of Hamilton on a tributary of Pecan Creek. The dam was constructed in 1977 and is used for flood control purposes. It is owned by the City of Hamilton. The area located near the dam is rural with limited development. While the flow of the breach is anticipated to follow the designated floodplain area, a catastrophic breach could impact approximately 24 residential structures, 4 commercial structures, and the Hamilton County Sheriff's Office, within one mile of the dam. A dam failure could also cause limited infrastructure damages, minor power outages, and utility systems disruptions. However, the minimal capacity of the dam does not indicate a significant threat to the structures or infrastructure near the dam. In the event of a breach, it is estimated the average breach width would be 78.7 feet with a maximum breach flow of 2,328 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 10 feet with the highest depth in the immediate area of the dam.

Pecan Creek WS SCS Site 4 Dam Dike Flood Risk Areas

Pecan Creek WS SCS Site 4 Dam is located in the City of Hamilton on a tributary of Pecan Creek. The dam was constructed in 1980 and is used for flood control purposes. It is owned by the City of Hamilton. The area located near the dam is semi-densely populated. While the flow of the breach is anticipated to follow the designated floodplain area, a catastrophic breach could impact approximately 400 residential structures, 10 commercial structures, and two schools, within one mile of the dam. A dam failure could also cause moderate infrastructure damages, minor power outages, and utility systems disruptions. However, the minimal capacity of the dam does not indicate a significant threat to the structures or infrastructure near the dam. In the event of a breach, it is estimated the average breach width would be 119.4 feet with a maximum breach flow of 3,642 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 10 feet with the highest depth in the immediate area of the dam.

Pecan Creek WS SCS Site 5 Dam Dike Flood Risk Areas

Pecan Creek WS SCS Site 5 Dam is located in the City of Hamilton on a tributary of Pecan Creek. The dam was constructed in 1975 and is used for flood control purposes. It is owned by the City of Hamilton. The area located near the dam is semi-densely populated. While the flow of the breach is anticipated to follow the designated floodplain area, a catastrophic breach could impact approximately 150 residential structures, a church and a funeral home, within one mile of the dam. A dam failure could also cause moderate infrastructure damages, minor power outages, and utility systems disruptions. However, the minimal capacity of the dam does not indicate a significant threat to the structures or infrastructure near the dam. In the event of a breach, it is estimated the average breach width would be 81.3 feet with a maximum breach flow of 421 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 5 feet with the highest depth in the immediate area of the dam.

Table 14-2 represents the extent or magnitude of a dam failure event that could be expected for the Hamilton County planning area for the profiled dam. There are no dams posing a risk to the city of Hico. Any secondary flooding caused by a dam failure for this jurisdiction is covered under flood in Section 6. Therefore, this jurisdiction will not be profiling dam failure as a hazard.

Table 14-2. Extent by Jurisdiction

JURISDICTION	PROFILED DAM	EXTENT (FLOW DEPTH)	LEVEL OF INTENSITY TO MITIGATE
Hamilton County	Hamilton City Lake Dam	0-10 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.
City of Hamilton	Pecan Creek WS SCS Site 2 Dam	0-10 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.
City of Hamilton	Pecan Creek WS SCS Site 3 Dam	0-10 Feet	Dam failure presents a low threat for the City. Loss of life is not expected, no critical facilities or infrastructure would be

JURISDICTION	PROFILED DAM	EXTENT (FLOW DEPTH)	LEVEL OF INTENSITY TO MITIGATE
			impacted, and economic loss would be minimal in the event of a dam failure.
City of Hamilton	Pecan Creek WS SCS Site 4 Dam	0-10 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.
City of Hamilton	Pecan Creek WS SCS Site 5 Dam	0-5 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 Hamilton County planning area.

Probability of Future Events

No historical events of dam failure have been recorded in the Hamilton 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 16 dams in the Hamilton County planning area. All dams were evaluated in-depth to determine the risk, if any, associated with each dam. This analysis indicated 5 dams in the planning area that present a risk to structures or infrastructure in the planning area.

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

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.

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 City of Hico is not located in any area at risk for dam failure.

A dam breach in the planning area could result in minor quality of life lost with facilities being shut down for 24-hours or less and less than ten percent of property in the path of the breach destroyed or damaged. The impact of dam failure on the Hamilton County planning area including the City of Hamilton is considered “Limited”.

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:

- 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

Section 14: Dam Failure

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

Section 15: Mitigation Strategy

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.

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

Objective 4.2
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.

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 16: Mitigation Actions

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. The term county-wide refers to Hamilton County and all participating jurisdictions.

Table 16-1. Hamilton 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	Dam Failure
Hamilton County	XXX	XXX	XX	XXX	XXX	XXXX	XX	XXX	XXX	XXXX
City of Hamilton	XXX	XXX	XXX	XXX	XXX	XXXX	XX	XXX	XXXX	XXX
City of Hico	XXX	XXX	XXX	XXX	XXX	XXXX	XXX	XXX	XXX	n/a

Hamilton County

	Hamilton County – Action #1
Proposed Action:	**Drainage improvements in the Pottsville neighborhood to reduce flood risk to structures and infrastructure.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	Pottsville neighborhood
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce flood risk to previously flooded structures in the neighborhood.
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure

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:	$100,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton 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 = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

		Hamilton County – Action #2
	Proposed Action:	**Design and implement flood control retention structure for the Cow House Creek.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	Cow House Creek
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce flood risk to downstream structures and infrastructure through drainage retention and controlled release.
	Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Low
Estimated Cost:	$1,000,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County Public Works
Implementation Schedule:	Within 36-48 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 = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

	Hamilton County – Action #3
Proposed Action:	**Developing a dam failure study and emergency action plan for Hamilton City Lake Dam.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	Hamilton City Lake Dam
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce flood risk structures in inundation zone through improved risk analysis and emergency preparedness.
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:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Low
Estimated Cost:	$100,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County Public Works in coordination with the City of Hamilton
Implementation Schedule:	Within 36-48 months of plan adoption
Incorporation into Existing Plans:	Emergency Action Plan (EAP)

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

	Hamilton County – Action #4
Proposed Action:	**Develop and implement plan to control brush and vegetation on county maintained flood control structures.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide flood control structures
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce flood risk through maintaining maximum flow capacity.
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure

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:	$20,000
Potential Funding Sources:	Local Funding
Lead Agency/Department Responsible:	Hamilton County Public Works
Implementation Schedule:	Within 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

	Hamilton County – Action #5
Proposed Action:	**Install high water signage and flood gates in high risk areas.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide flood-prone areas
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk of residents entering or driving through high floodwaters.
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:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County 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 = 4; Technically Feasible = 4; Administratively Possible = 4; Politically Acceptable = 4; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

	Hamilton County – Action #6
Proposed Action:	**Train firefighters in use of back burns; provide support and financial assistance to local fire departments for training and equipment.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide wildfire-prone areas
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce spread of wildfire through training and preparedness.
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Education and Awareness (Preparedness)

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
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:	Hamilton County Fire Marshall
Implementation Schedule:	Within 12-24 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 = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 4

	Hamilton County – Action #7
Proposed Action:	**Acquire and install reinforced electric gates at Pecan Creek Dam.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	Pecan Creek Dam
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	The current gates along top of the dam do not prevent residents from circumventing the gates and driving along the dam which compromises the integrity of the dam structure, leading to future dam breach. Reinforced electric gates would prevent future access and associated damage to the dam.
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure
Effect on New/Existing Buildings:	Reduce risk to critical infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	$100,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County Public Works in coordination with the City of Hamilton
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	Emergency Action Plan (EAP)

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

	Hamilton County – Action #8
Proposed Action:	**Complete flood study for the unincorporated areas of the county and develop floodplain maps. Participate in the NFIP.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	Hamilton County unincorporated areas
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Improve risk assessment; Reduce flood losses through regulated development; Ensure access to flood insurance for county residents.
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):	High
Estimated Cost:	$500,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County Public Works
Implementation Schedule:	Within 12-24 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 = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

	Hamilton County – Action #9
Proposed Action:	**Develop and implement an education and awareness program to provide residents with mitigation measures to reduce property losses as well as health and safety tips to protect residents from all hazards that can impact the community.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide (including all participating jurisdictions)
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce property loss and risk of injuries through risk awareness and 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(where applicable), Drought, Extreme Heat, Flood, Hail, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$10,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County Agrilife Extension Service in cooperation with all jurisdictions
Implementation Schedule:	Within 24-36 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

		Hamilton County – Action #10
	Proposed Action:	**Upgrade low water crossings to prevent erosion and mitigate damages during flood events.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	County-wide low water crossings (including all participating jurisdictions)
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce flood damages as low water crossings 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

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:	$100,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County and Local Jurisdiction Public Works
Implementation Schedule:	Within 12-24 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 = 4; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

		Hamilton County – Action #11
	Proposed Action:	**Develop and implement fuels reduction program in the Wildland Urban Interface.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	County-wide Wildland Urban Interface (including all participating jurisdictions)
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce wildfire risk to structures and infrastructure through proactive fuels reduction program.
	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 and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$250,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County and Local Fire Departments
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 = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

		Hamilton County – Action #12
	Proposed Action:	**Adopt and implement program to regularly clean and clear debris from bridges, streams and culverts.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	County-wide drainage systems (including all participating jurisdictions)
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce flood damages by maintaining full drainage capacity.
	Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure

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:	$50,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County and Local Jurisdiction Public Works
Implementation Schedule:	Within 12-24 months of plan adoption
Incorporation into Existing Plans:	County Maintenance 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

	Hamilton County – Action #13
Proposed Action:	**Adopt and implement tree trimming program along right-of-way; Remove dead and downed trees from drainage system.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide right-of-way and drainage systems (including all participating jurisdictions)
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk of power outages and damages due to downed trees and limbs; Reduce flood damages by maintaining full drainage capacity.
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Hail, Lightning, Thunderstorm Wind, Tornado, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	High
Estimated Cost:	$50,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County and Local Jurisdiction Public Works
Implementation Schedule:	Within 12-24 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 = 5; Legal = 4; Economically Sound = 4; and Environmentally Sound = 4

	Hamilton County – Action #14
Proposed Action:	**Install flood gauges in flood prone areas.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide flood hazard areas (including all participating jurisdictions)
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Improve risk assessment; Reduce risk to residents through improved monitoring and early warning.
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk of injury to residents
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$10,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County and Local Jurisdiction Public Works
Implementation Schedule:	Within 24-36 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 = 5; and Environmentally Sound = 5

	Hamilton County – Action #15
Proposed Action:	**Adopt and implement burn bans during periods of drought or other high wildfire risk periods.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	County-wide (including all participating jurisdictions)
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk of wildfires through 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:	Wildfire
Effect on New/Existing Buildings:	Reduce risk to existing structures and infrastructure
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$2,500
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County and Local Jurisdiction Administration
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Local Ordinances, 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 = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

		Hamilton County – Action #16
	Proposed Action:	**Plant additional trees in parks and common areas near public buildings and parking lots to reduce heat island effect in developed areas and to provide shade for residents and visitors.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	County-wide (including all participating jurisdictions)
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk of heat island effect in developed areas; Provide shaded rest areas for residents.
	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:	Extreme Heat
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	$1,000
Potential Funding Sources:	Local Funding, State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County and Local Jurisdiction Administration
Implementation Schedule:	Within 36-48 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 = 5; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

	Hamilton County – Action #17
Proposed Action:	**Designate public facilities as heating and cooling centers for vulnerable populations during extreme temperatures; Educate residents on the location of designated centers and the operating procedures.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	Locations to be determined per jurisdiction
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk of illness or loss of life by designating public centers to provide relief to residents 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
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	$1,000
Potential Funding Sources:	Local Funding (staff time)
Lead Agency/Department Responsible:	Hamilton County and Local Jurisdiction Administration
Implementation Schedule:	Within 36-48 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 = 4; Politically Acceptable = 5; Legal = 4; Economically Sound = 5; and Environmentally Sound = 5

		Hamilton County – Action #18
	Proposed Action:	**Develop drought contingency plan; Develop and adoption regulations for water conservation during periods of drought.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	County-wide (including all participating jurisdictions)
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce water consumption through water conservation measures during drought 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:	Drought
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	$5,000
Potential Funding Sources:	Local Funding; TWDB; State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County and Local Jurisdiction Administration
Implementation Schedule:	Within 36-48 months of plan adoption
Incorporation into Existing Plans:	Drought 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 = 4; Technically Feasible = 5; Administratively Possible = 4; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

		Hamilton County – Action #19
	Proposed Action:	**Revise and enhance local building codes to include additional development restrictions and construction techniques to reduce damages from natural hazard events.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	County-wide (including all participating jurisdictions)
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk of damages to structures through improved construction practices; Reduce or eliminate damages to structures and infrastructure through development restrictions in high risk areas.
	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 (where applicable), Flood, Hail, Lightning, Thunderstorm Wind, Tornado, Wildfire
Effect on New/Existing Buildings:	Reduce risk to new and existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$20,000
Potential Funding Sources:	Local Funding; State and Federal Grants
Lead Agency/Department Responsible:	Hamilton County and Local Jurisdiction Administration
Implementation Schedule:	Within 24-36 months of plan adoption
Incorporation into Existing Plans:	Local Building Codes and 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

City of Hamilton

	City of Hamilton – Action #1
Proposed Action:	**Adopt and implement a program for cleaning debris from bridges, drains and culverts. Include provisions for trimming trees near power lines and along right-of-ways.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Maintain and/or improve drainage capacity. Reduce the risk of power outages due to downed trees and branches.
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

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood, Tornado, Thunderstorm Wind, Hail, Lightning, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structure and infrastructure
Priority (High, Moderate, Low):	Low
Estimated Cost:	$50,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Emergency Management Division
Implementation Schedule:	Within 36 months of plan adoption
Incorporation into Existing Plans:	Local Ordinance, Operations and Maintenance 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 = 4; and Environmentally Sound = 4

	City of Hamilton – Action #2
Proposed Action:	**Adopt and enforce ordinance that regulates dumping in streams and ditches. Install signs prohibiting dumping in creeks, ditches, waterways and flood plain areas.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to property and residents during a flooding event by effectively maintaining drainage capacity.
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):	Low
Estimated Cost:	$5,000
Potential Funding Sources:	Local Revenue
Lead Agency/Department Responsible:	Emergency Management Division
Implementation Schedule:	Within 36 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 = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

	City of Hamilton – Action #3
Proposed Action:	**Distribute pamphlets with information on pre-disaster mitigation ideas, health and safety tips and local risk for all natural hazards.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to property and residents during natural hazard 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, Dam Failure, Drought, Extreme Heat, Flood, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Low
Estimated Cost:	$5,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Emergency Management Division
Implementation Schedule:	Within 36 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

	City of Hamilton – Action #4
Proposed Action:	**Incorporate higher standards for natural hazard resilience in local application of building codes including but not limited to:** • **Mandate the use of steel connectors in new and existing construction** • **Require manufactured housing be securely anchored to permanent foundations** • **Require fire-resistant roofing materials when re-roofing**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to property and residents during hazard events through improved construction standards.
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, Flood, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to new or substantially improved structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$5,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Emergency Management Division
Implementation Schedule:	Within 24 months of plan adoption
Incorporation into Existing Plans:	Local Building Codes

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 = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

		City of Hamilton – Action #5
	Proposed Action:	**Purchase and install a back-up generator with permanent quick connections at the public safety building.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	City Hall / Police Department
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce loss of City services and reduce disaster response time.
	Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Dam Failure, Extreme Heat, Flood, Hail, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	High
Estimated Cost:	$100,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Emergency Management Division
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 = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

	City of Hamilton – Action #6
Proposed Action:	**Upgrade the City's Emergency Notification System to provide faster and more detailed information on all natural hazard events. Expand and upgrade the Tornado Warning System. Purchase and distribute NOAA "all hazard" radios for early warning and post-event information and place in area schools, businesses and critical facilities.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to residents and property.
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, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	High
Estimated Cost:	$100,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	Emergency Management Division
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 = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

City of Hamilton – Action #7	
Proposed Action:	**Adopt and implement program for routine fire hydrant maintenance to ensure functionality during wildfire events.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk to residents and property.
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure Local Plans and Regulations

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Wildfire
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:	Emergency Management Division
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 = 5; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

		City of Hamilton – Action #8
	Proposed Action:	**Regularly apprise local governing body of new mitigation measures.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	City-wide
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Keep city government updated on mitigation efforts.
	Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Education and Awareness (Preparedness)

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Winter Storm
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Low
Estimated Cost:	Negligible / Staff Time
Potential Funding Sources:	Local Revenue
Lead Agency/Department Responsible:	Emergency Management Division
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

	City of Hamilton – Action #9
Proposed Action:	**Adopt and enforce drought tolerant practices and regulations.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce impacts of drought on structures, infrastructure and natural environment.
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:	Reduce impact to existing structures and infrastructure
Priority (High, Moderate, Low):	Low
Estimated Cost:	$5,000
Potential Funding Sources:	Local Funds
Lead Agency/Department Responsible:	Emergency Management Division
Implementation Schedule:	Within 48 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 = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

City of Hamilton – Action #10	
Proposed Action:	**Develop diversion channel around wastewater treatment plant.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	Hamilton wastewater treatment facility
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	The wastewater treatment plant was built near Pecan Creek. During long rainfall events the creek rises and the plant must be shut down (relocation of plant is not an option).
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure

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:	$2,000,000
Potential Funding Sources:	Local Revenue, Bonds, TWDB, State and Federal Grants
Lead Agency/Department Responsible:	City Public Works
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 = 4; Technically Feasible = 4; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

City of Hamilton – Action #11	
Proposed Action:	**Update and upgrade community pool and install splash pads.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	Hamilton community pool on Pecan Street
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	The current pool leaks and needs to be resurfaced to prevent water loss; Splash pads will provide cooling center for residents during extreme heat events.
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure (Drought) Education and Awareness (Extreme Heat)

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Drought, Extreme Heat
Effect on New/Existing Buildings:	N/A
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$200,000
Potential Funding Sources:	Local Revenue, Bonds, TX Parks and Wildlife
Lead Agency/Department Responsible:	City 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 = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

City of Hico

	City of Hico – Action #1
Proposed Action:	**Utilize social media and/or distribute pamphlets with information on pre-disaster mitigation ideas, health and safety tips and local risk for all natural hazards.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide
Risk Reduction Benefit *(Current Cost/Losses Avoided)*:	Reduce risk to property and residents during natural hazard 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, Drought, Extreme Heat, Flood, 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 Revenue, State and Federal Grants
Lead Agency/Department Responsible:	City 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

		City of Hico – Action #2
	Proposed Action:	**Harden critical facilities; Install back-up generators with permanent hard wiring for all critical facilities.**
	BACKGROUND INFORMATION	
	Jurisdiction/Location:	City-wide critical facilities
	Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk of damages to critical facilities; 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

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Hail, Extreme Heat, Flood, Lightning, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Effect on New/Existing Buildings:	Reduce risk to existing structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$100,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	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 = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 5; and Environmentally Sound = 5

City of Hico – Action #3	
Proposed Action:	**Adopt and implement program to clean and clear debris from drainage ditches and culverts; Upgrade undersized culverts to increase capacity.**
BACKGROUND INFORMATION	
Jurisdiction/Location:	City-wide drainage system
Risk Reduction Benefit *(Current Cost/Losses Avoided)***:**	Reduce risk of damages to structures and infrastructure through maintaining or improving drainage capacity throughout the city.
Type of Action *(Local Plans and Regulations, Structure and Infrastructure projects, Natural System Protection, or Education and Awareness)*	Structure and Infrastructure

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	Flood
Effect on New/Existing Buildings:	Reduce risk to existing and future structures
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	$250,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	City Administration
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 = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 4

City of Hico – Action #4	
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 times of drought; Increase water conservation.
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:	$5,000
Potential Funding Sources:	Local Revenue, State and Federal Grants
Lead Agency/Department Responsible:	City Administration
Implementation Schedule:	Within 36-48 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 = 4; Technically Feasible = 5; Administratively Possible = 5; Politically Acceptable = 5; Legal = 5; Economically Sound = 4; and Environmentally Sound = 5

Section 17: Plan Maintenance

Plan Maintenance Procedures

The following is an explanation of how Hamilton 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

Hamilton 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 Hamilton County will incorporate elements of the mitigation plan into other planning mechanisms.

Process of Incorporation

Once the Plan is adopted, Hamilton 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.

Hamilton 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

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.

Hamilton County is committed to supporting the cities, communities, and participating jurisdictions as they implement their mitigation actions. Hamilton 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 17-1 identifies types of planning mechanisms and examples of methods for incorporating the Plan into other planning efforts. The team members, listed in Table 17-2 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 17-1. Methods of Incorporation of the Plan

PLANNING MECHANISM	DEPARTMENT / TITLE RESPONSIBLE	INCORPORATION OF PLAN
Annual Budget Review	Hamilton County: County Judge City of Hamilton: City Administrator City of Hico: City Administrator	Various departments and key personnel that participated in the planning process for Hamilton 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. The planning team will recommend funding in the annual budget to be allocated as potential matching funds in accordance with grant applications

PLANNING MECHANISM	DEPARTMENT / TITLE RESPONSIBLE	INCORPORATION OF PLAN
		sought and HMAP mitigation actions that will be undertaken per the implementation schedule of the specific action.
Capital Improvement Plans	Hamilton County: County Judge City of Hamilton: City Administrator City of Hico: City Administrator	Hamilton County and participating jurisdictions have a Capital Improvement Plan (CIP) in place. Prior to any revisions to the CIP, County, and City departments will review the risk assessment and mitigation strategy sections of the HMAP, as limiting public spending in hazardous zones is one of the most effective long-term mitigation actions available to local governments. The planning team will include information from the risk assessment in the updated plan and enhance identified projects to include mitigation elements where natural hazards pose a risk. The team establish goals in the updated plan to site new projects outside of known hazard areas as identified in the HMAP when possible.
Comprehensive Plans	Hamilton County: County Judge City of Hamilton: City Administrator City of Hico: City Administrator	Hamilton 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. The planning team will include information on natural hazards in the updated comprehensive plan and enhance identified capital improvement projects to include mitigation elements where natural hazards pose a risk. The planning team will work with local officials when zoning ordinance updates are in progress to ensure that development regulations include mitigation measures that

PLANNING MECHANISM	DEPARTMENT / TITLE RESPONSIBLE	INCORPORATION OF PLAN
		enhance capital improvements and build resiliency.
Floodplain Management Plans	Hamilton County: Floodplain Manager City of Hamilton: Floodplain Manager City of Hico: Floodplain Manager	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 included in the new or updated plan. The goals and objectives of the new or updated plan will be developed to be consistent with the goals and objectives of the HMAP with regard to floodplain management.
Grant Applications	Hamilton County: County Judge City of Hamilton: City Administrator City of Hico: City Administrator	The Plan will be evaluated by Hamilton 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.
Regulatory Plans	Hamilton County: County Judge City of Hamilton: City Administrator City of Hico: City Administrator	Currently, Hamilton 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. The planning team will include information on natural hazards in the updated plan and enhance identified projects to include mitigation elements where natural hazards pose a risk. The planning team will work with local officials when Building code or ordinance updates are in progress to ensure that development

PLANNING MECHANISM	DEPARTMENT / TITLE RESPONSIBLE	INCORPORATION OF PLAN
		regulations include mitigation measures.

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 17-2 indicates the department and title of the party responsible for Plan monitoring, evaluating, updating, and review of the Plan.

Table 17-2. Team Members Responsible for Plan Monitoring, Evaluating, Updating, and Review of the Plan

JURISDICTION	TITLE
Hamilton County	County Judge (Lead)
City of Hamilton	City Administrator
City of Hico	City Administrator

Monitoring

Designated Planning Team members are responsible for monitoring, evaluating, updating, and reviewing the Plan, as shown in Table 17-2. Individuals holding the title listed in Table 17-2 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, and City 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 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 17-2) 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 Hamilton 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 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 implementation, monitoring, evaluations and updates. The Public will be directly involved in the annual monitoring, evaluation, implementation 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 Hamilton County's website or at the County Clerk's office where officials and the public are invited to provide ongoing feedback, via email to the County Judge.

The Planning Team may also designate voluntary citizens from the Hamilton 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

The Hamilton County Plan (Plan), was organized using a direct representative model. An Executive Planning Team from Hamilton 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 representatives from the Central Texas Council of Governments 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	TITLE
Hamilton County	County Judge
City of Hamilton	Chief of Police
City of Hico	Marshal
CTCOG	Homeland Security/Criminal Justice Coordinator

Table A-2. Advisory Planning Team

ORGANIZATION	TITLE
Hamilton County	Administrative Assistant
Hamilton County	Emergency Management Coordinator
City of Hamilton	City Administrator
City of Hamilton	Lieutenant
City of Hico	City Administrator
CTCOG	Director of Planning & Regional Services
CTCOG	Senior Planner
CTCOG	Grant Coordinator
CTCOG	Emergency Services Director

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 stakeholders were invited via e-mail. 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 E[1].

Table A-3. Stakeholders

AGENCY	TITLE
American Red Cross	Executive Director
Bartlett ISD	President
Bell County	Emergency Management Coordinator
Buckholts ISD	Superintendent
Cameron ISD	Superintendent
Grant Central Texas	Economic Development Corporation
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

[1] Information contained in Appendix E is exempt from public release under the Freedom of Information Act (FOIA).

Appendix A: Planning Team

Appendix B: Public Survey Results

Overview

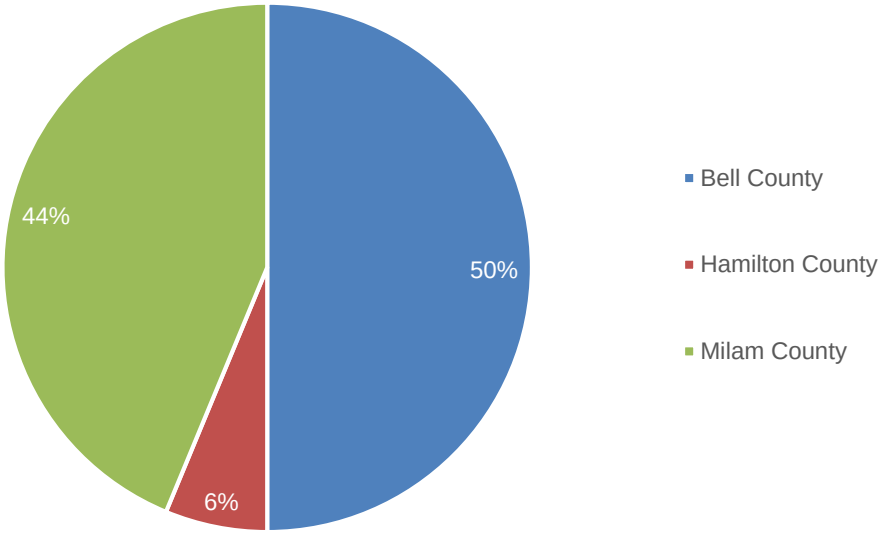
The CTCOG prepared a public survey that requested public opinion on a wide range of questions relating to natural hazards. The survey was made available to the three counties, including Hamilton County, on websites, including Hamilton County's website. This survey link was also distributed at public 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.

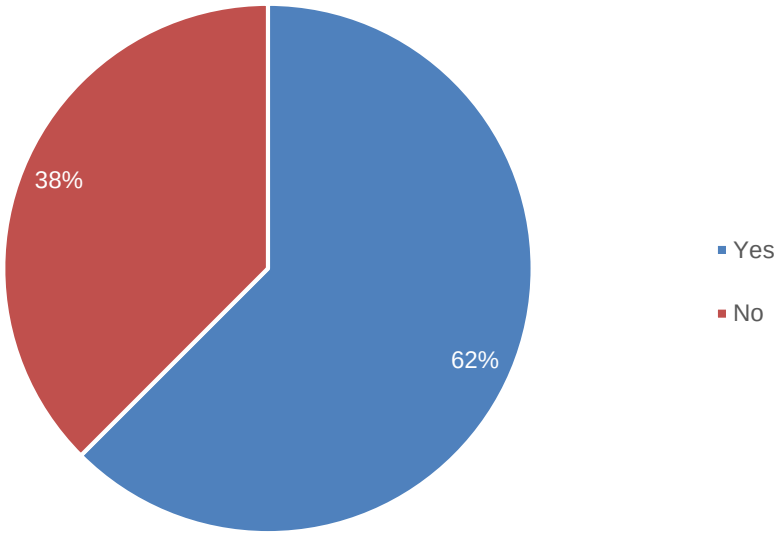
The following survey results depict the percentage of responses for each answer. Similar responses have been summarized for questions that did not provide a multiple-choice answer or that required an explanation.

Public Survey Results

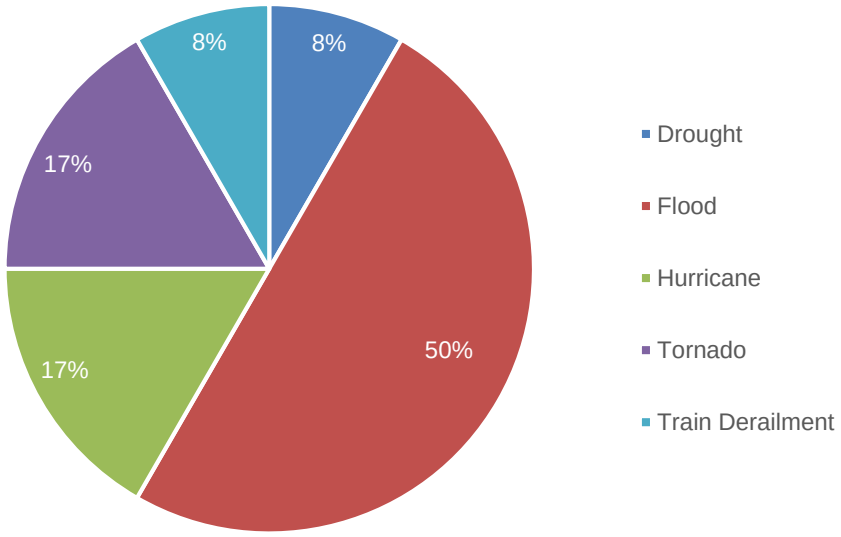
1. Please state the jurisdiction (city and community) where you reside.



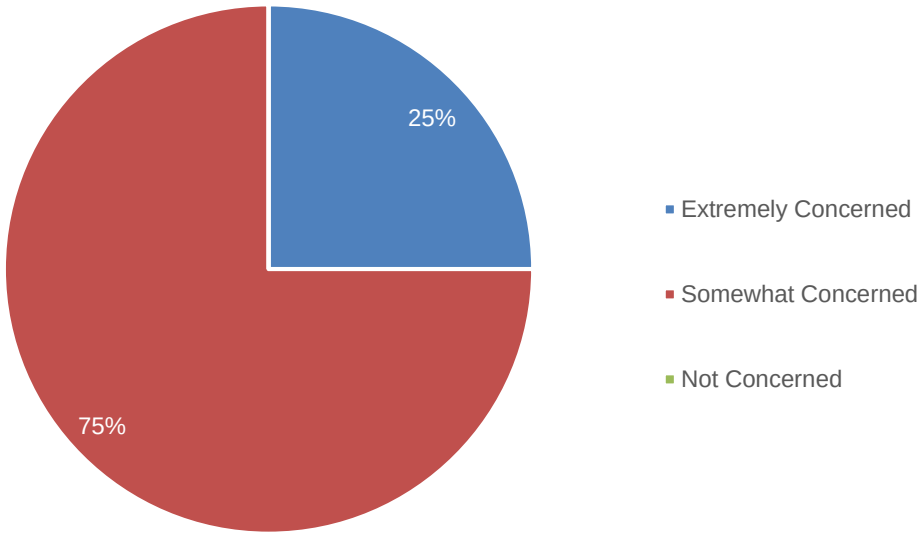
2. A. Have you ever experienced or been impacted by a disaster?



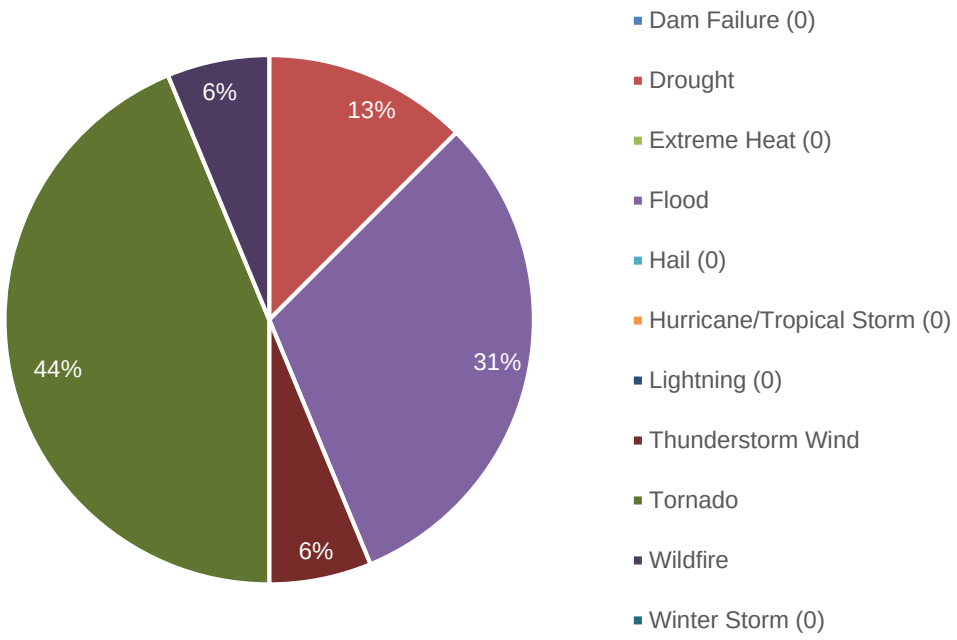
2. B. If “Yes”, please explain:



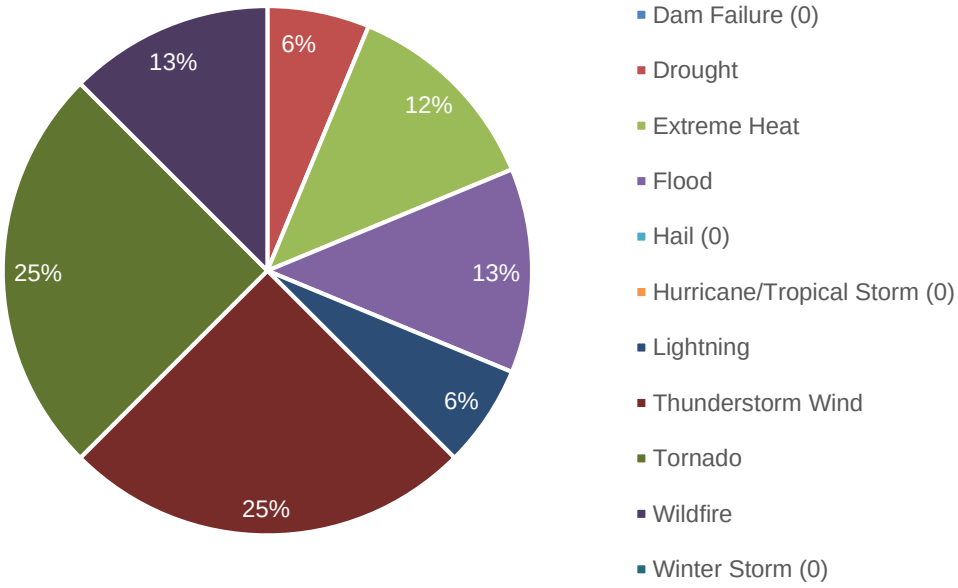
3. How concerned are you about the possibility of your community being impacted by a disaster?



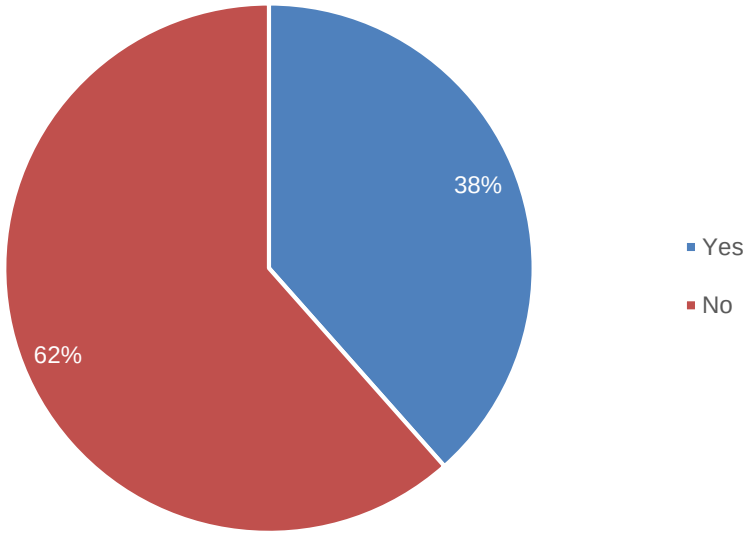
4. Please select the one hazard you think is the highest threat to your neighborhood:



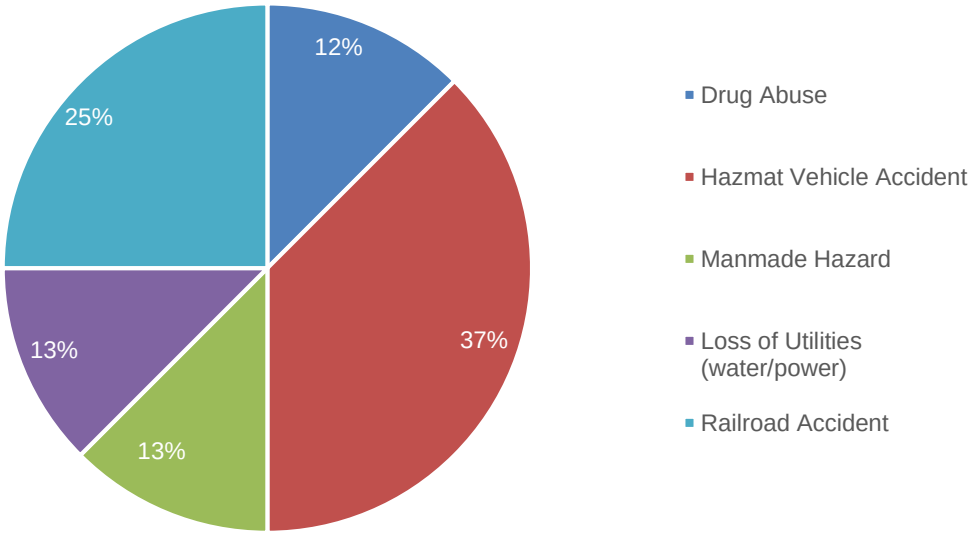
5. Please select the one hazard you think is the second highest threat to your neighborhood:



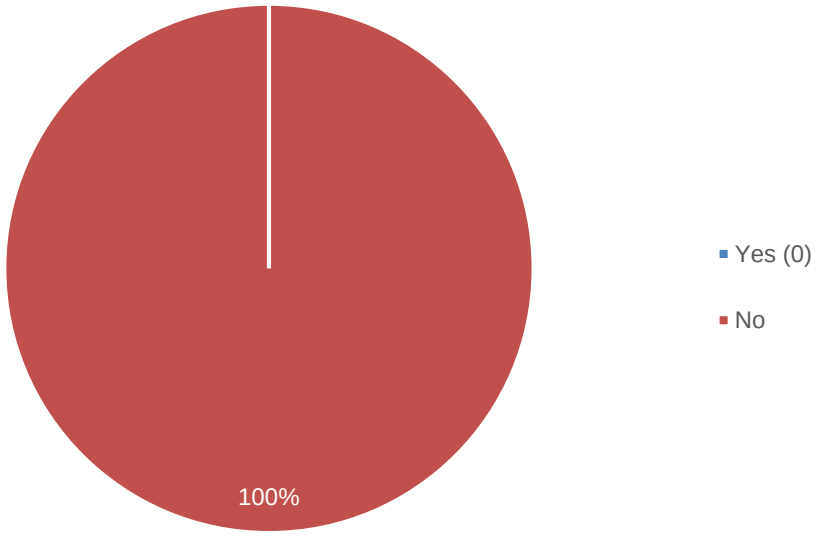
6. A. Are there hazards not listed above that you think is a wide-scale threat to your neighborhood?



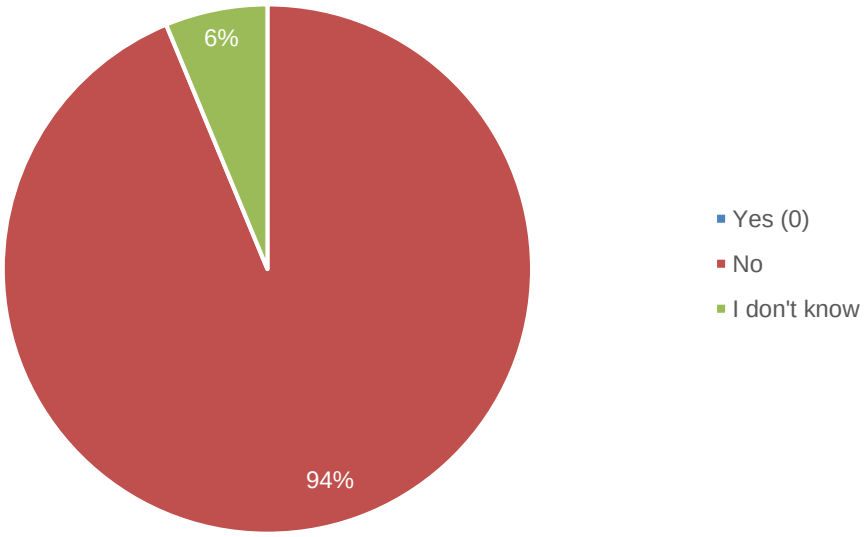
6. B. If “Yes”, please explain:



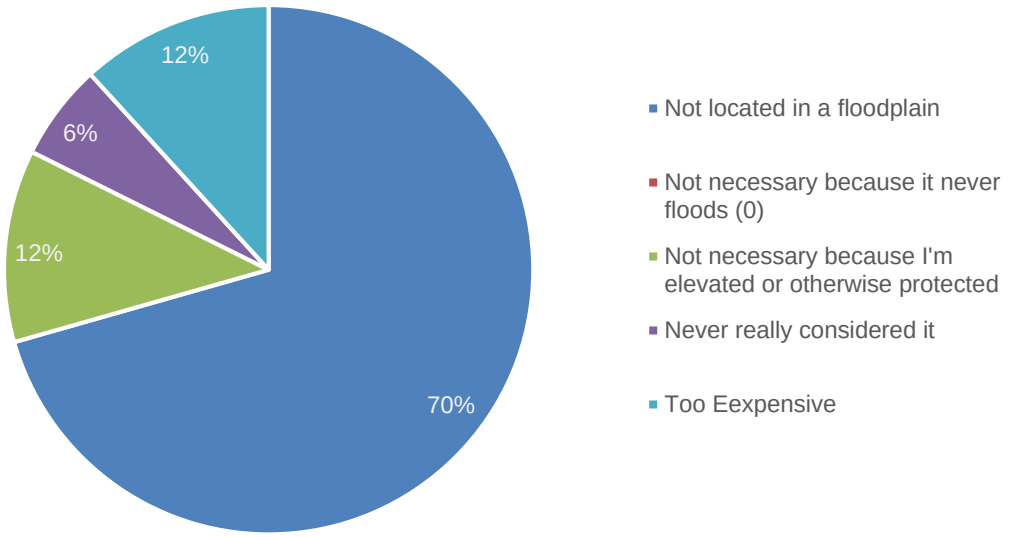
7. Is your home located in a floodplain?



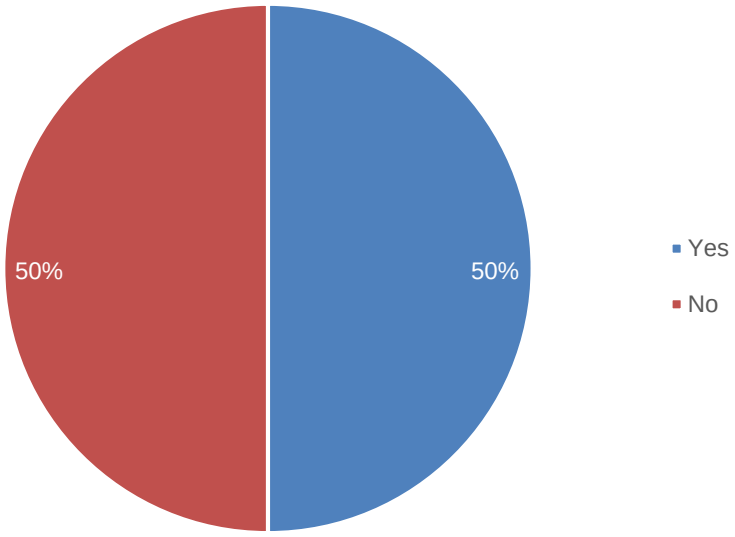
8. Do you have flood insurance?



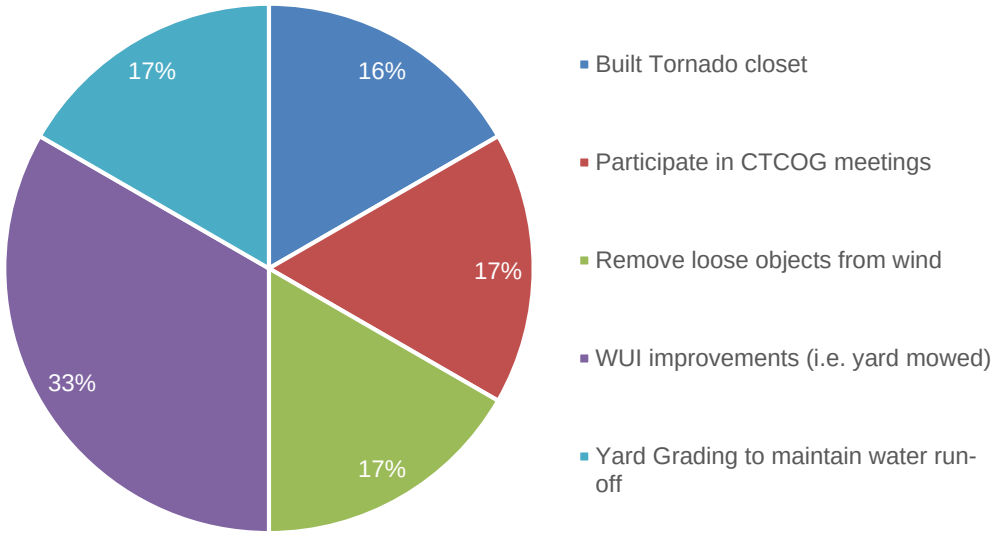
9. If you do not have flood insurance, why not?



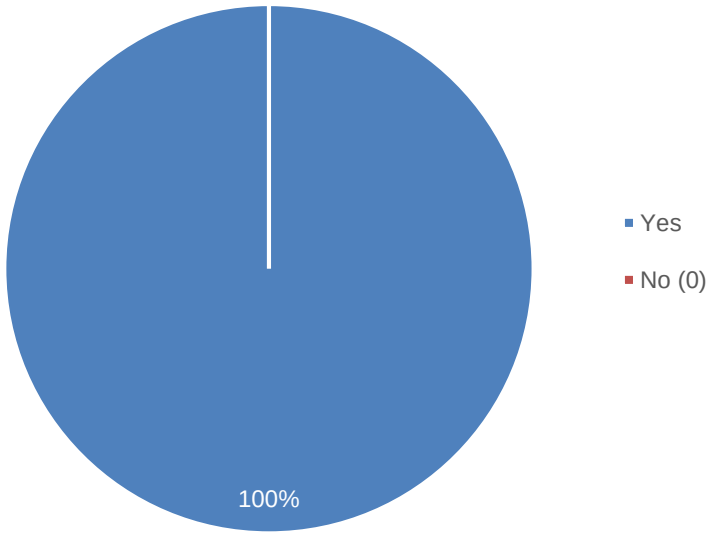
10. A. Have you taken any actions to make sure your home or neighborhood is more resistant to hazards?



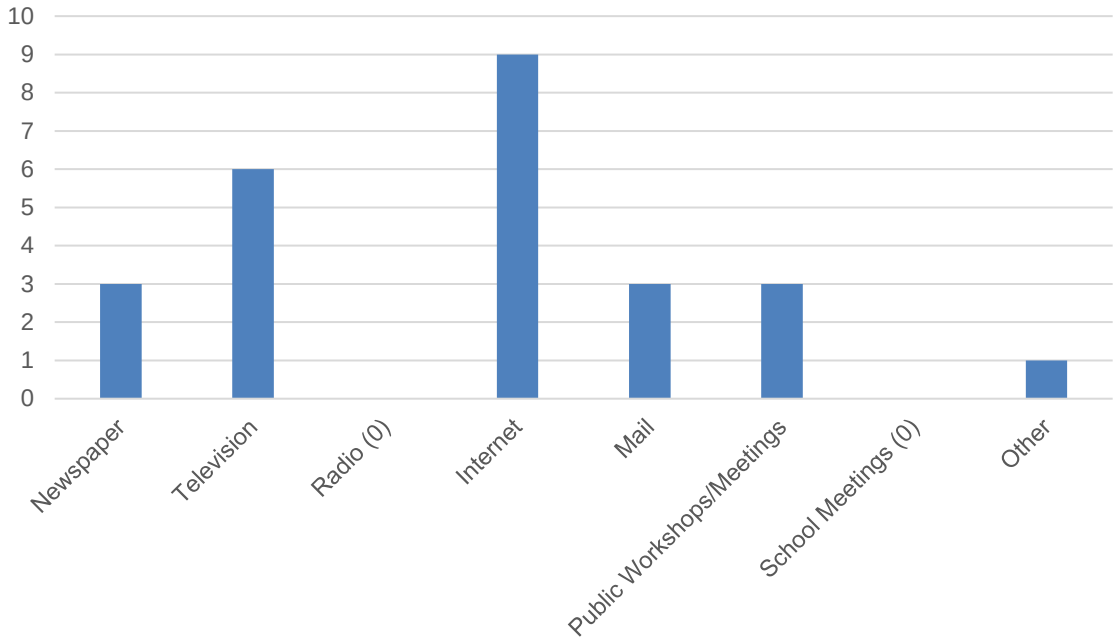
10. B. What have you done?



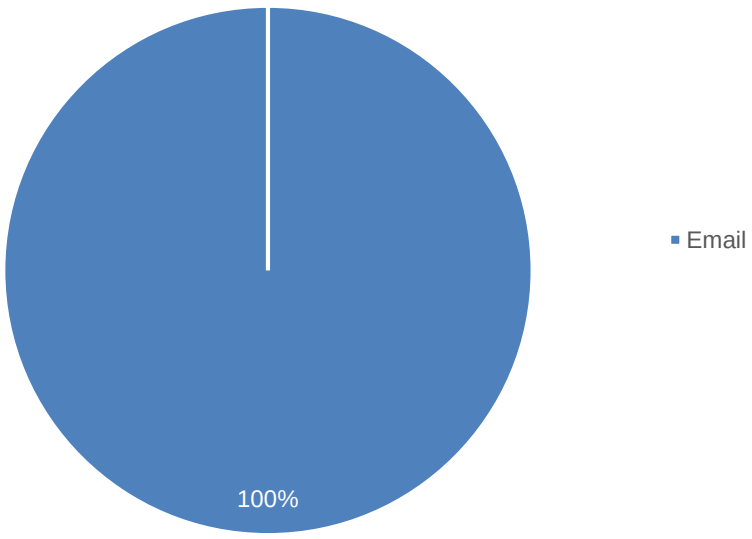
11. Are you interested in making your home or neighborhood more resistant to hazards?



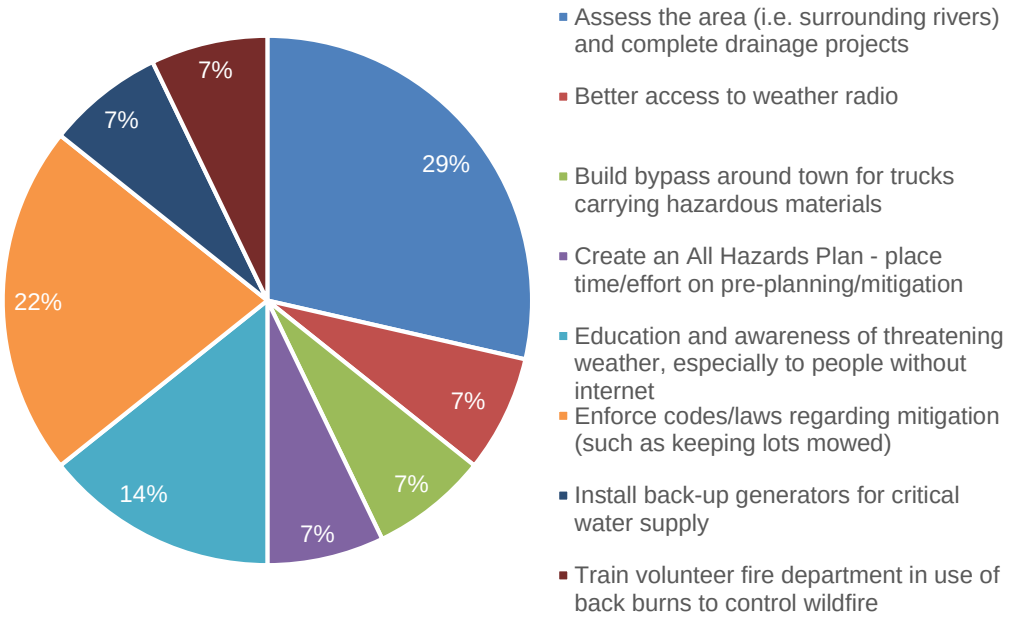
12. A. What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to hazards?



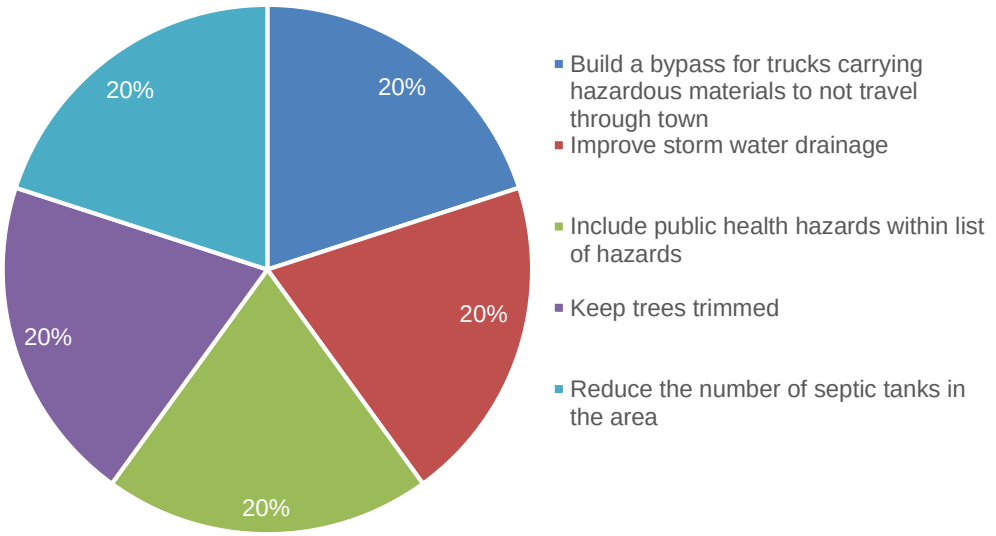
12. B. If “Other”, please specify.



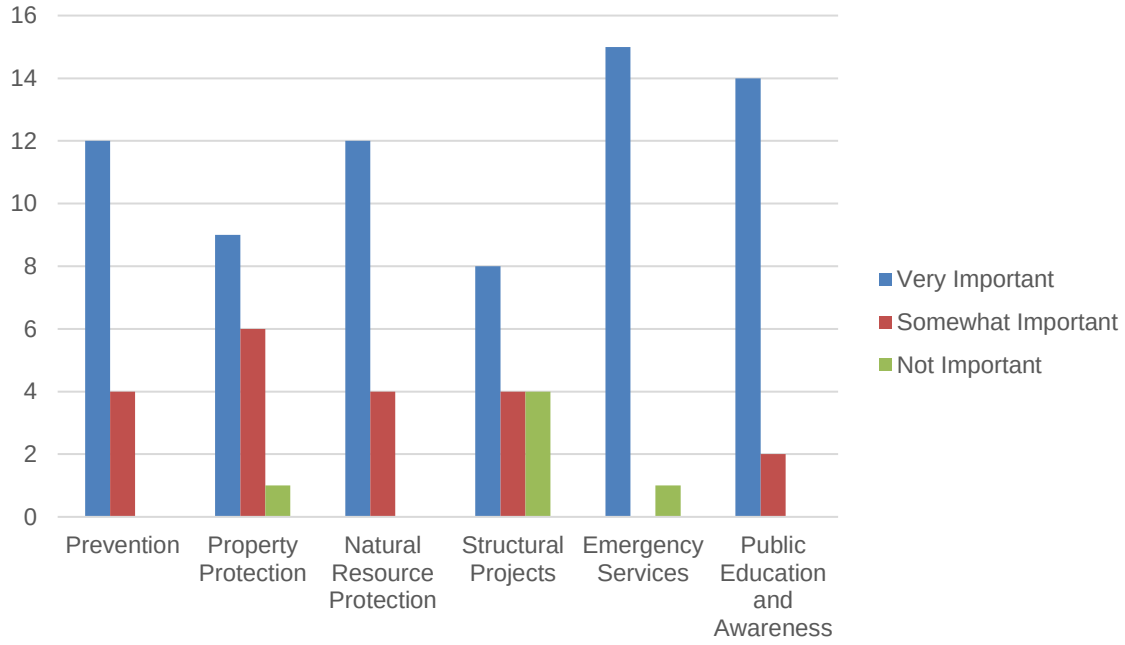
13. If your opinion, what are some steps your local government could take to reduce or eliminate the risk of future hazard damages in your neighborhood?



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?



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.

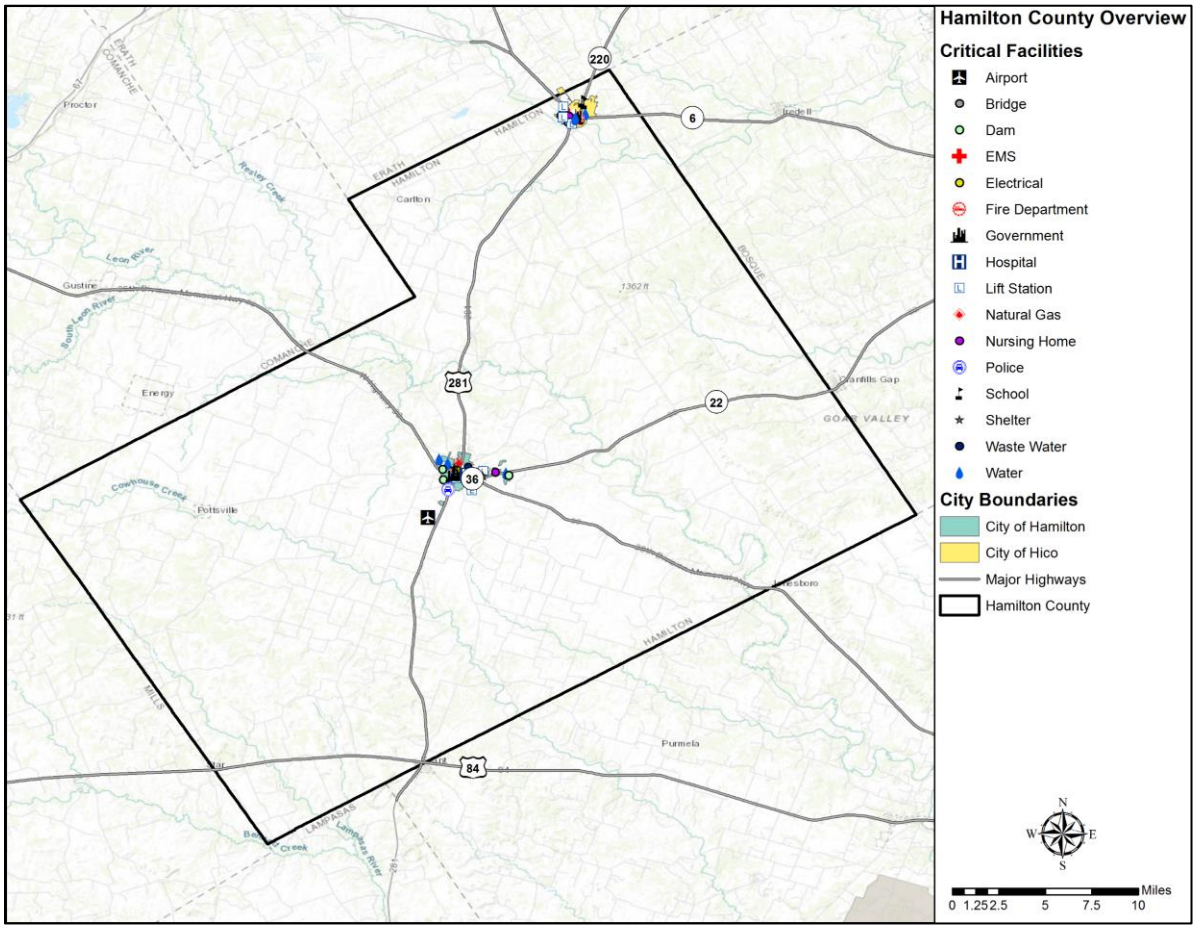
Appendix C: Critical Facilities

Overview

This Appendix is **For Official Use Only (FOUO)** and may be exempt from public release under FOIA. Figures C-1 through C-3 locate all critical facilities that were included in the risk assessment. Mapped facilities were provided by Hamilton County Planning Team members. Tables C-1 through C-3 note the critical facilities by type.

Critical Facilities

Figure C-1. Critical Facilities in Hamilton County



Appendix C: Critical Facilities

Table C-1. Critical Facilities by Type in Hamilton County

TYPE	NUMBER
Airport	1
Courthouse	1
Hospital	1
Sheriff Office	1

Figure C-2. Critical Facilities in the City of Hamilton

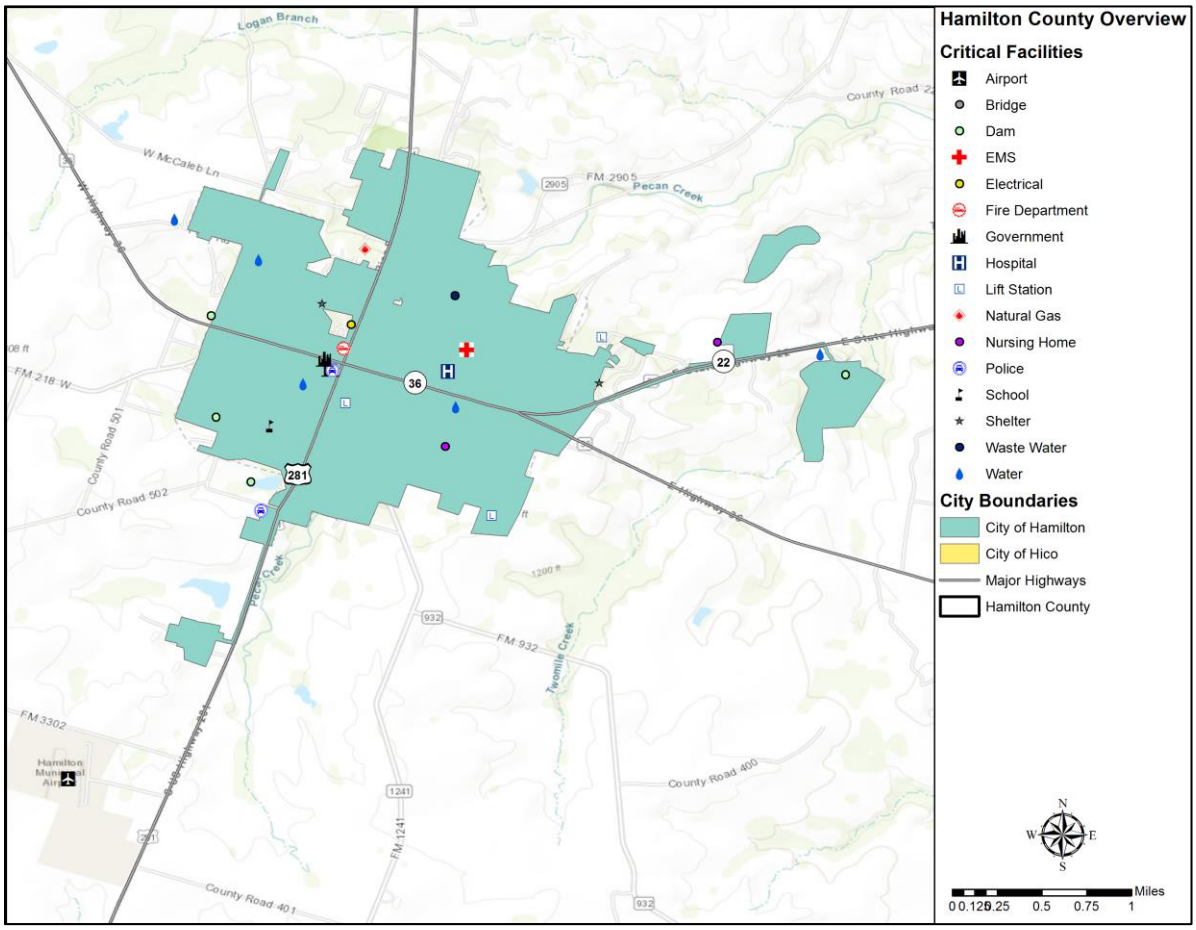


Table C-2. Critical Facilities by Type in the City of Hamilton

TYPE	NUMBER
Administrative / EOC / EMS	2
City Flood Control	4
City Infrastructure	12
Fire Service	1
Hospital	1
Law Enforcement	1
Nursing Home	2
Pre-School/Shelter	1
School District	1
Shelter	1

Figure C-3. Critical Facilities in the City of Hico

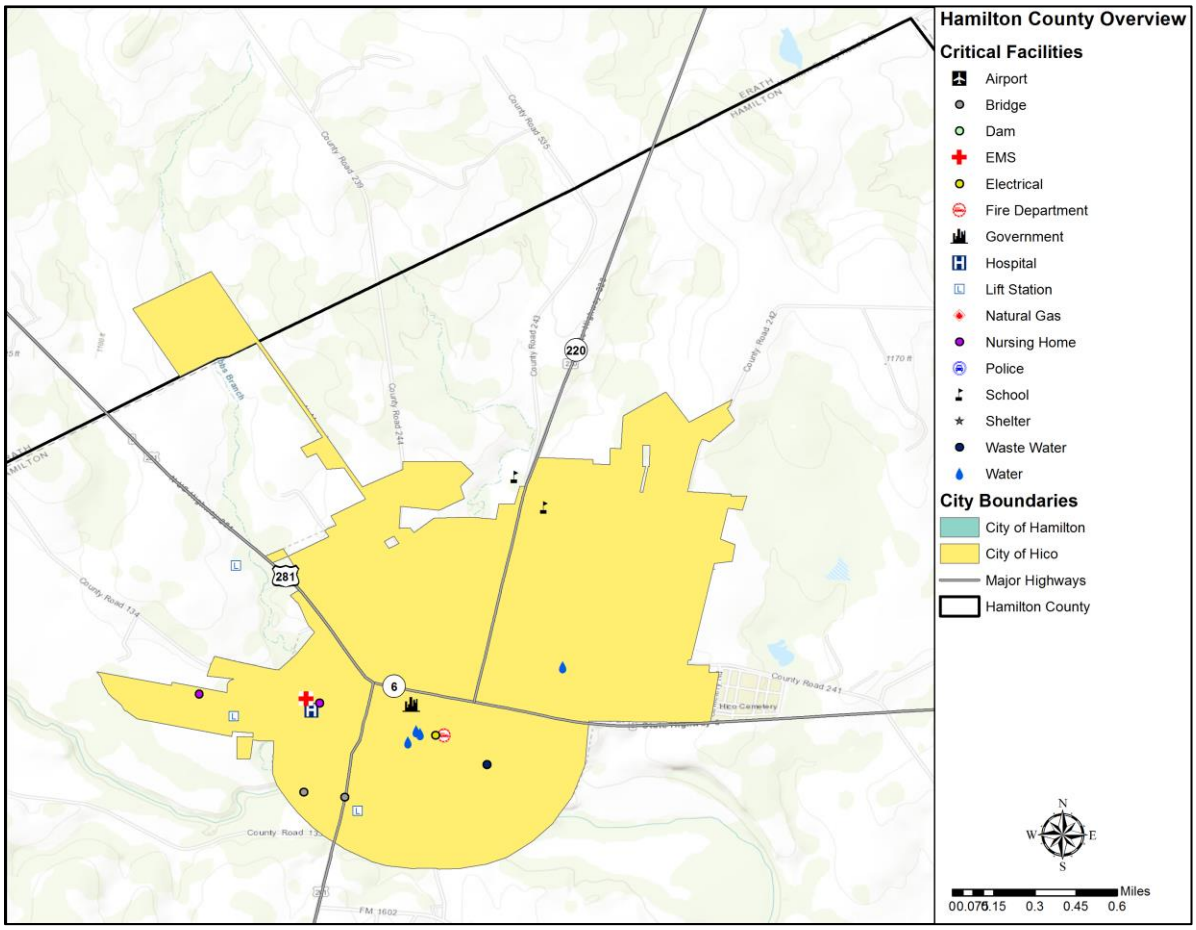


Table C-3. Critical Facilities by Type in the City of Hico

TYPE	NUMBER
Bridge	2
City Infrastructure	9
Emergency Services	3
Medical Facility	1
Nursing Home	2
School	2

Appendix D: Dam Locations

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 Hamilton 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. It is important to note that only Hamilton County and the City of Hamilton are profiling dam failure as a hazard.

Table D-1. List of Hamilton County Dam Locations and Storage Capacities

JURISDICTION	LATITUDE	LONGITUDE	HEIGHT (Feet)	STORAGE (Acre Feet)
Hamilton County	31.70276	-98.08106	45	1,104
Hamilton County	31.96442	-98.10017	49	2,319
Hamilton County	31.71894	-98.18313	26	132
Hamilton County	31.50983	-98.32135	27	64
Hamilton County	31.70624	-97.81634	32	93
Hamilton County	31.54481	-98.35451	22	73
Hamilton County	31.76073	-98.09574	14	2,000
Hamilton County	31.52852	-98.26227	33	277
Hamilton County	31.51154	-98.22012	23	80
Hamilton County	31.94712	-97.97741	32	125
Hamilton County	31.51783	-98.21652	31	120
Hamilton County	31.71463	-98.01866	12	90
City of Hamilton	31.69962	-98.13178	44	568
City of Hamilton	31.69418	-98.12904	32	147

Appendix D: Dam Locations

JURISDICTION	LATITUDE	LONGITUDE	HEIGHT (Feet)	STORAGE (Acre Feet)
City of Hamilton	31.6853	-98.13297	39	1,100
City of Hamilton	31.70742	-98.13263	26	206

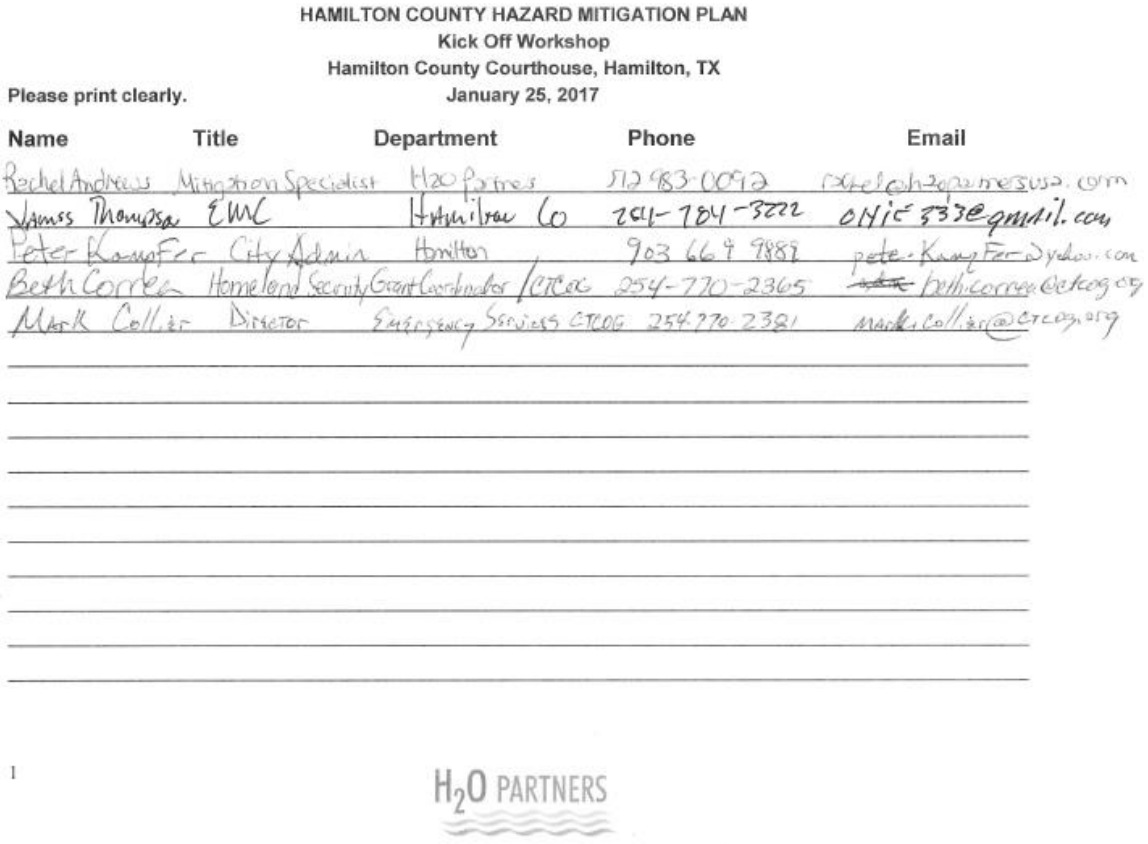
Appendix E: Meeting Documentation

Workshop Documentation

Appendix E is **For Official Use Only (FOUO)** and may be exempt from public release under the Freedom of Information Act (FOIA).

Hamilton County held a series of Planning Team workshops: a Kickoff Workshop on January 25, 2017, a Risk Assessment Workshop on April 12, 2017, and a Mitigation Strategy Workshop on September 7, 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.

Figure E-1. Hamilton County Kickoff Workshop, 1/25/17



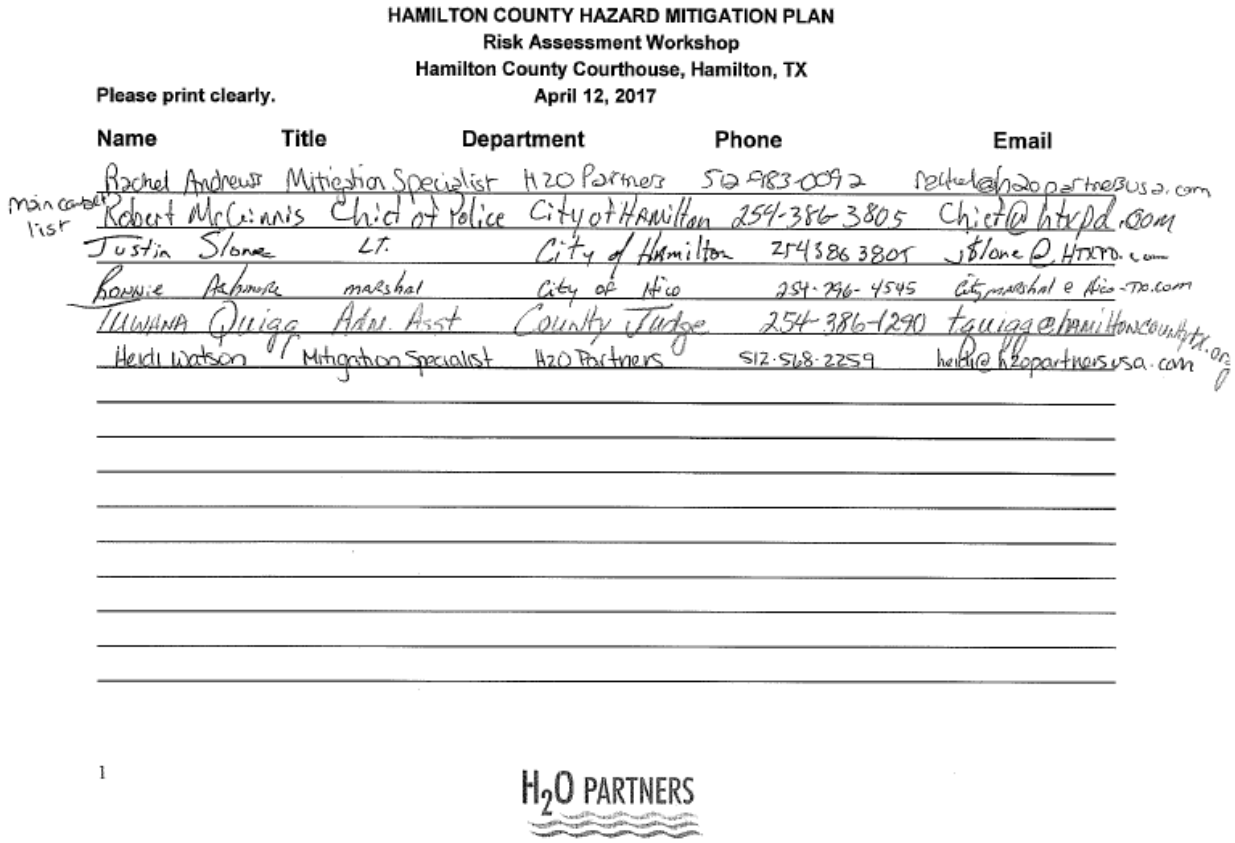
HAMILTON COUNTY HAZARD MITIGATION PLAN
Kick Off Workshop
Hamilton County Courthouse, Hamilton, TX
Please print clearly. January 25, 2017

Name	Title	Department	Phone	Email
Rachel Andrews	Mitigation Specialist	H2O Partners	512 963 0092	rachel@h2opartnersusa.com
James Thomas	EMC	Hamilton Co	254-784-3222	ohic333@gmail.com
Peter Kamfer	City Admin	Hamilton	903 669 9889	pete.kamfer@yahoo.com
Beth Correa	Homeland Security Grant Coordinator	CTCOG	254-770-2365	beth.correa@ctcog.org
Mark Collier	Director	Emergency Services CTCOG	254.770.2381	mark.collier@ctcog.org

1

H2O PARTNERS

Figure E-2. Hamilton County Risk Assessment Workshop, 4/12/17



HAMILTON COUNTY HAZARD MITIGATION PLAN
Risk Assessment Workshop
Hamilton County Courthouse, Hamilton, TX
April 12, 2017

Please print clearly.

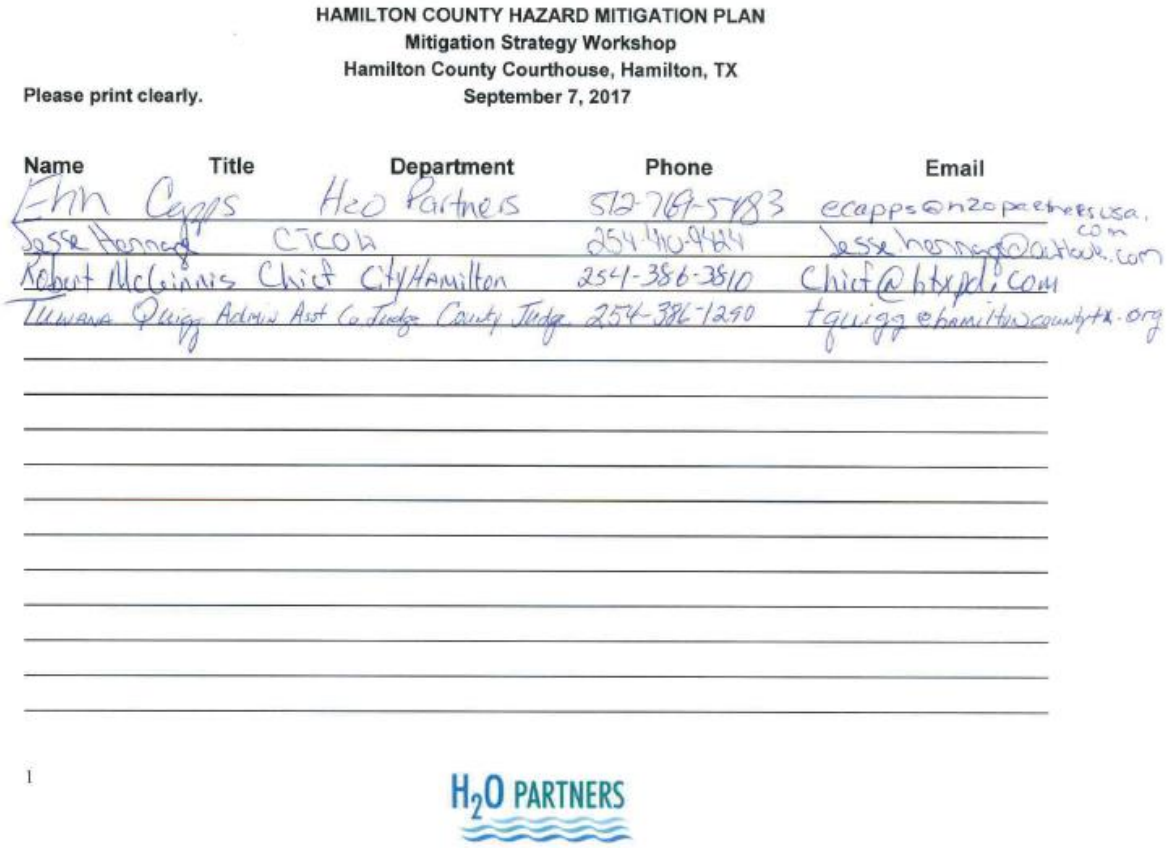
Name	Title	Department	Phone	Email
Rachel Andrews	Mitigation Specialist	H2O Partners	512 983-0092	rachel@h2opartnersusa.com
Robert McGinnis	Chief of Police	City of Hamilton	254-386-3805	Chief@htxpd.com
Justin Sloane	LT.	City of Hamilton	2543863805	JSloane@HTXPD.com
Ronnie Ashmore	marshal	City of Hico	254-796-4545	citymarshal@hico-tx.com
Tiffany Quigg	Adm. Asst	County Judge	254-386-1290	tquigg@hamiltoncountytx.org
Heidi Watson	Mitigation Specialist	H2O Partners	512-568-2259	heidi@h2opartnersusa.com

Main contact list

1

H2O PARTNERS

Figure E-3. Hamilton County Mitigation Strategy Workshop, 9/7/17



HAMILTON COUNTY HAZARD MITIGATION PLAN
Mitigation Strategy Workshop
Hamilton County Courthouse, Hamilton, TX
September 7, 2017

Please print clearly.

Name	Title	Department	Phone	Email
Erin Capps		H2O Partners	512-769-5783	ecapps@h2opartnersusa.com
Jesse Hennagé		CTCOG	254-770-2384	jesse.hennage@ctcog.com
Robert McGinnis	Chief	City Hamilton	254-386-3810	Chief@htxpd.com
Tamara Quigg	Admin Asst to Co Judge	County Judge	254-386-1250	tquigg@hamiltoncountytx.org

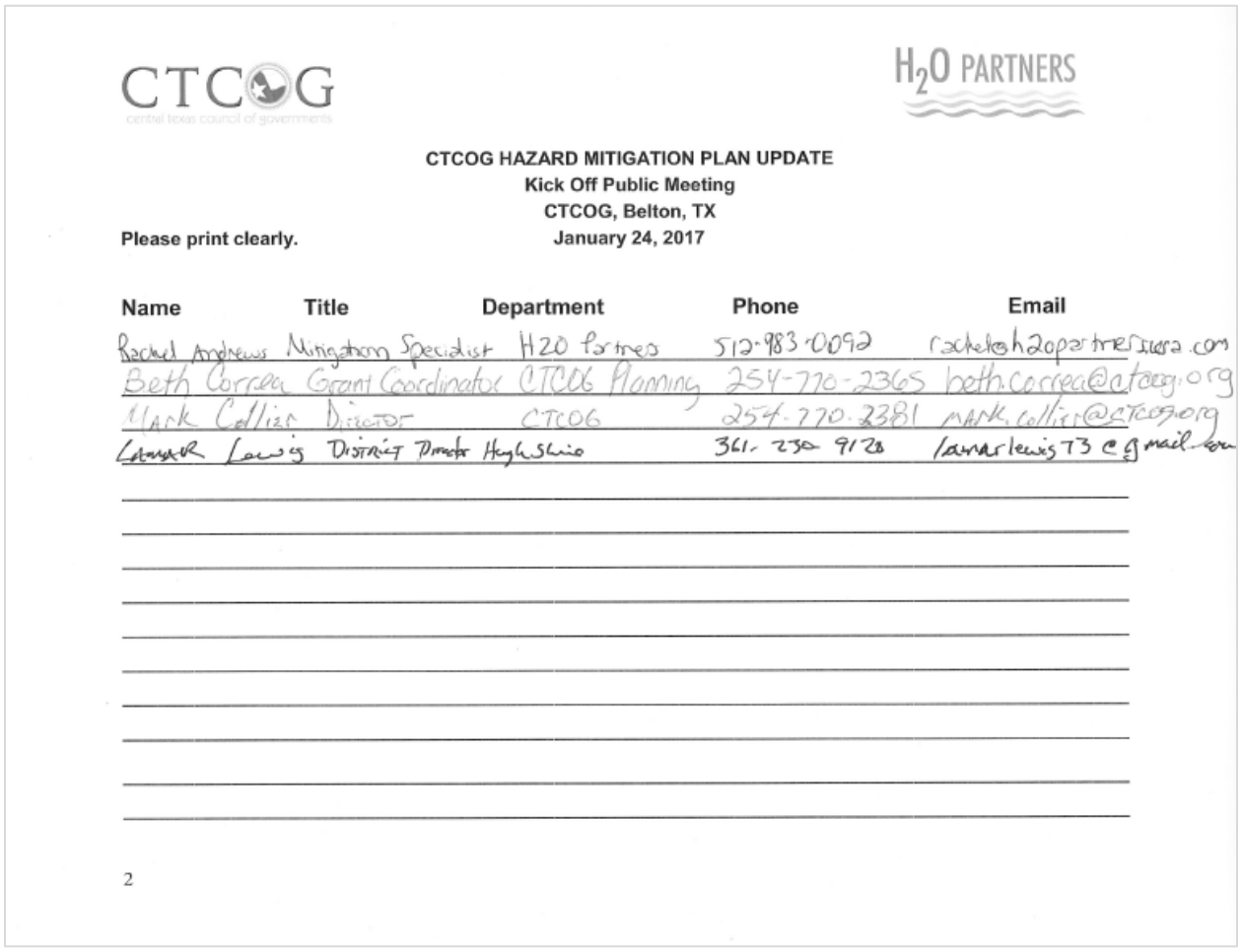
1

H2O PARTNERS

Public Meeting Documentation

As discussed in Section 2, a series of public meetings were held in conjunction with each of the workshops. Documentation in the form of sign-in sheets for each of the meetings follows.

Figure E-4. CTCOG Kickoff Public Meeting, 1/24/17



CTCOG central texas council of governments

H2O PARTNERS

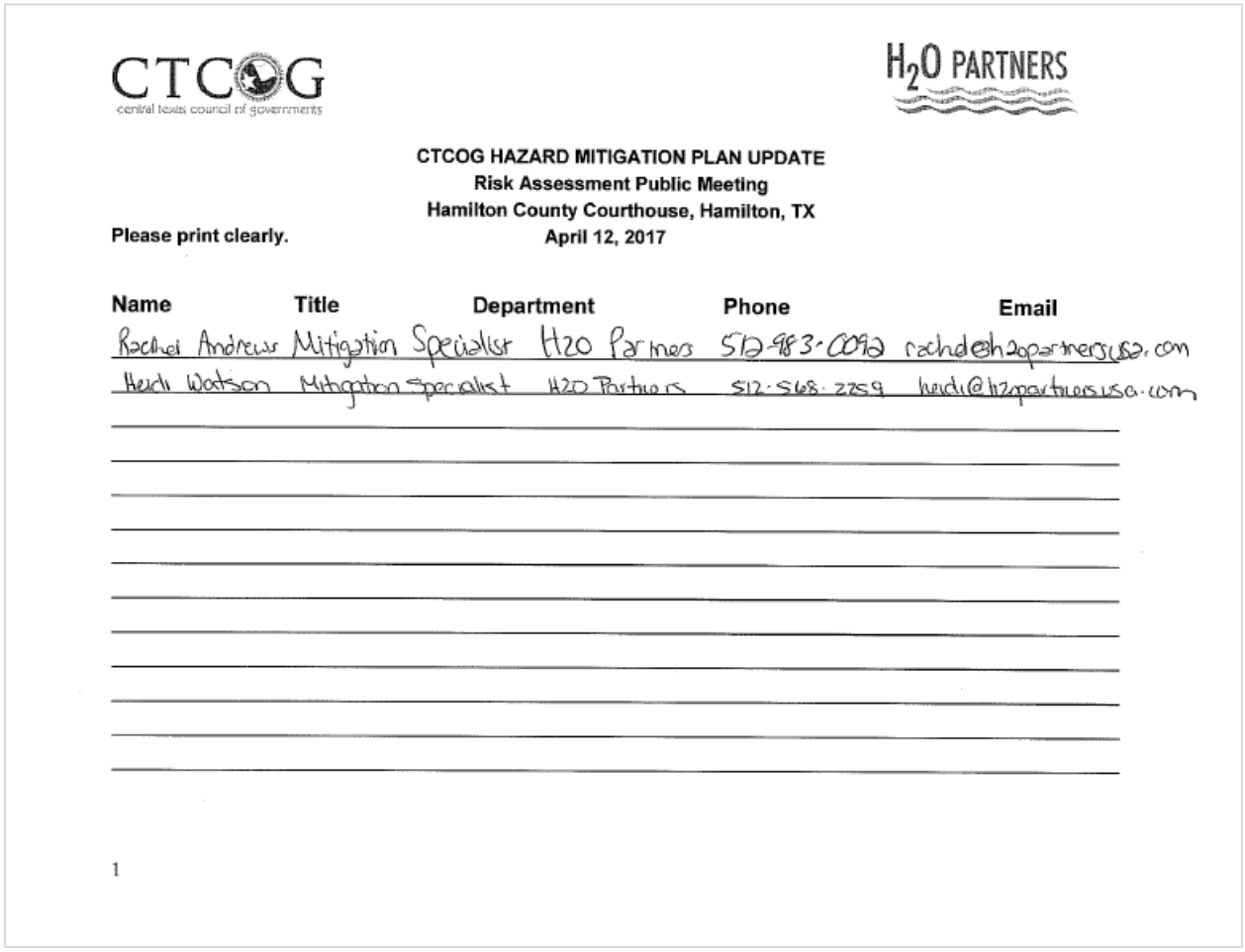
CTCOG HAZARD MITIGATION PLAN UPDATE
Kick Off Public Meeting
CTCOG, Belton, TX
January 24, 2017

Please print clearly.

Name	Title	Department	Phone	Email
Rachel Andrews	Mitigation Specialist	H2O Partners	512-983-0092	rachelah2opartnersiera.com
Beth Correa	Grant Coordinator	CTCOG Planning	254-770-2365	beth.correa@ctcog.org
Mark Collier	Director	CTCOG	254-770-2381	mark.collier@ctcog.org
Lamar Lewis	District Director	Hughston	361-739-9128	lamarlewis73@gmail.com

2

Figure E-5. CTCOG Risk Assessment Public Meeting, 4/12/17



CTCOG
central texas council of governments

H2O PARTNERS

CTCOG HAZARD MITIGATION PLAN UPDATE
Risk Assessment Public Meeting
Hamilton County Courthouse, Hamilton, TX
April 12, 2017

Please print clearly.

Name	Title	Department	Phone	Email
Rachel Andrews	Mitigation Specialist	H2O Partners	512-983-0092	rachel@h2opartnersusa.com
Heidi Watson	Mitigation Specialist	H2O Partners	512-568-2259	heidi@h2opartnersusa.com

1

Figure E-6. CTCOG Mitigation Strategy Public Meeting, 9/8/17

CTCOG central texas council of governments

H2O PARTNERS

HAZARD MITIGATION PLAN FOR CTCOG REGION
Public Meeting
Milam County Courthouse, Cameron, TX
September 8, 2017

Please print clearly.

Name	Title	Department	Phone	Email
Susan Reinders		Milam County	254.697-7060	sreinders@milamcounty.net
Erin Cagle		H2O	512-769-5403	
Laura Cervantes		Milam County	254-697-7017	
Lydia Cervantes		Milam County	254-697-7017	

1

Public Notices

Public notices to announce Hamilton County's participation in the Plan development process were posted on various websites and Facebook, as shown in Figures E-7 through E-11. Additionally, as seen in the following figures, the County and participating jurisdictions invited the public to participate in the survey.

Figure E-7. Public Notice, CTCOG Web Posting, Survey Invitation

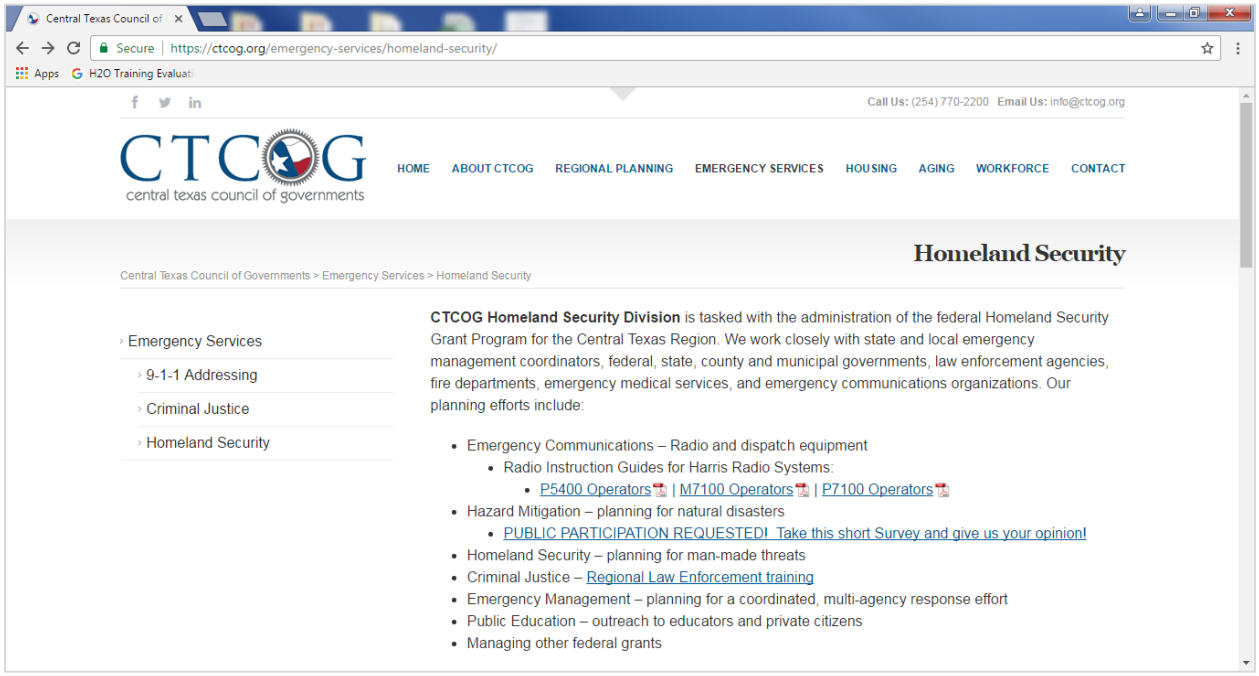


Figure E-8. Public Notice, the Town of Buckholts Facebook Page, 1/25/17 Survey Invitation

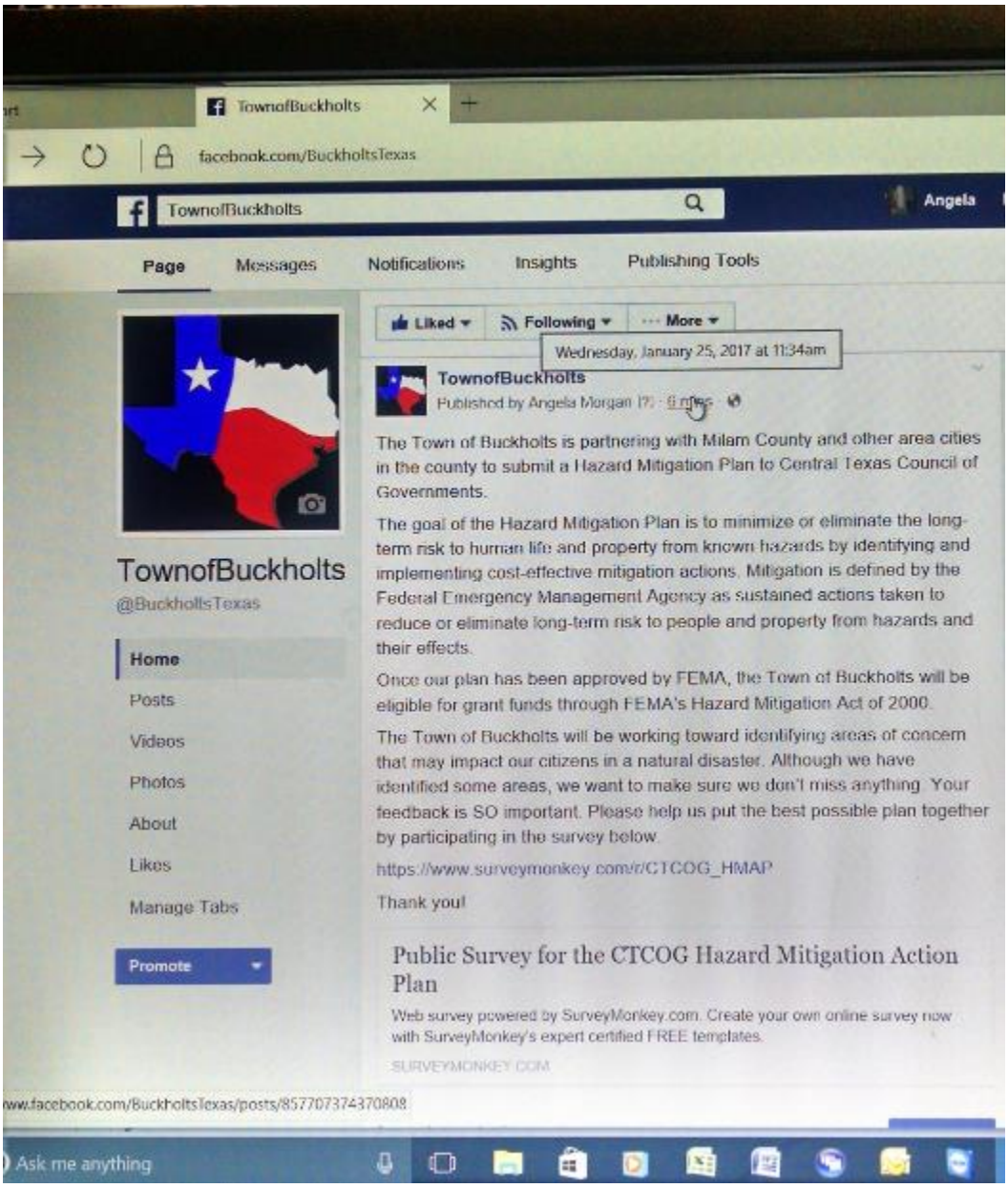


Figure E-9. Public Notice, KRXT 98.5 Facebook Page, 1/28/17 Survey Invitation

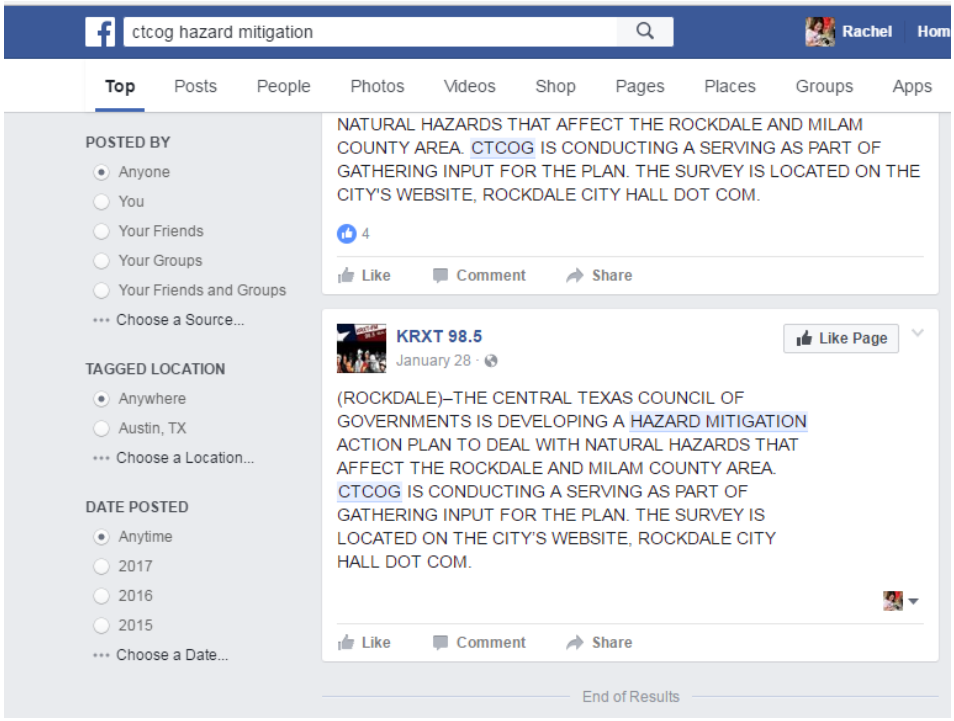


Figure E-10. Public Notice, CTCOG Facebook Posting, 5/17/17 Public Meeting and Survey Invitation

Figure E-11. Public Notice, CTCOG Web Posting, 7/27/17 Workshop Meeting

Call Us: (254) 770-2200 Email Us: info@ctcog.org

CTCOG central texas council of governments

HOME ECONOMIC DEVELOPMENT REGIONAL PLANNING HOUSING ASSISTANCE AGING WORKFORCE CONTACT

Calendar of Events

Central Texas Council of Governments >Resources >Calendar of Events

« All Events

This event has passed.

CTCOG/Hamilton County Hazard Mitigation Plan Mitigation Strategy Workshop

July 27 @ 2:00 pm - 3:30 pm

« Crisis Intervention Training (CIT) Update

CTCOG/Milam County Hazard Mitigation Plan Mitigation Strategy Workshop »

CTCOG and Hamilton County are hosting a Mitigation Strategy Workshop in conjunction with development of a FEMA- mandated Hazard Mitigation Action Plan for the Hamilton County planning area. The Mitigation Strategy Workshop is the third phase of the project's planning process and an opportunity for the planning team members to write mitigation actions to be included in the Plan. The overall goal of the Plan is to minimize or eliminate the long-term risk to human life and property from natural hazards by identifying and implementing cost-effective mitigation actions in the planning area.

H2O Partners, Inc. will be facilitating the workshop. Planning Team Members, including key personnel from Hamilton County, the City of Hamilton and the City of Hico, are asked to attend.

Appendix F: Capability Assessment

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 Hamilton 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.

Hamilton 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	X	
Evacuation Plan	X	
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		
Post-Disaster Recovery Plan		
Property set-back Ordinance (water/wildfire/other hazard)		
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		
Administrative and Technical Capability		
Emergency Manager	X	
Engineers		
Floodplain Manager		
Personnel skilled in Geographic Information Systems (GIS)		
Planners	X	
Resource development staff or grant writers		
Financial Resources		
Capital Improvement Programming		
Community Development Block Grants (CDBG)		
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		
Stormwater Utility Fees		

City of Hamilton Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	**In Place**	**Under Development**
Building Code	X	
Capital Improvements Plan		
Community Wildfire Protection Plan		
Comprehensive/Master Plan		X
Continuity of Operations Plan		
Economic Development Plan		X
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	X	

Appendix F: Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Steep Slope Ordinance		
Stormwater Management Plan		
Stormwater Ordinance	X	
Subdivision Regulations	X	
Transportation Plan		
Watershed Protection Plan		
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Emergency Manager	X	
Engineers	X	
Floodplain Manager		
Personnel skilled in Geographic Information Systems (GIS)		
Planners		
Resource development staff or grant writers		
Financial Resources		
Capital Improvement Programming		
Community Development Block Grants (CDBG)	X	
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements	X	
Stormwater Utility Fees		

City of Hico Capability Assessment

COMMUNITY CAPABILITY CHECKLIST		
Planning/Regulatory Tools/Policies	**In Place**	**Under Development**
Building Code	X	
Capital Improvements Plan		
Community Wildfire Protection Plan		
Comprehensive/Master Plan	X	
Continuity of Operations Plan		
Economic Development Plan	X	
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	X	
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		
Subdivision Regulations	X	
Transportation Plan		
Watershed Protection Plan		
Zoning Ordinance/Land Use Restrictions	X	
Administrative and Technical Capability		
Emergency Manager	X	
Engineers		
Floodplain Manager		
Personnel skilled in Geographic Information Systems (GIS)		
Planners		
Resource development staff or grant writers		
Financial Resources		
Capital Improvement Programming		
Community Development Block Grants (CDBG)	X	
Development Impact Fees		
Partnering Agreements or Intergovernmental Agreements		
Stormwater Utility Fees		