

Ellis County Hazard Mitigation Action Plan

Ellis County, Texas



This page intentionally left blank.

Chapter One: Introduction

1.1 Purpose

Ellis County is susceptible to a number of different natural hazards that have potential to cause property loss, loss of life, economic hardship, and threats to public health and safety. Occurrence of natural disasters cannot be prevented; however, their impact on people and property can be lessened through hazard mitigation measures.

The Ellis County Hazard Mitigation Action Plan has been developed by the Ellis County Hazard Mitigation Planning Team (HMPT). The plan represents collective efforts of citizens, elected and appointed government officials, business leaders, non-profit organizations, and other stakeholders.

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

1.2 Ellis County Hazard Mitigation Action Plan Planning Process

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

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

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

- Ellis County
- City of Alma
- City of Bardwell
- City of Ennis
- City of Ferris
- City of Garrett
- City of Italy
- City of Midlothian
- City of Maypearl
- City of Milford
- City of Oak Leaf
- City of Ovilla
- City of Palmer
- City of Red Oak
- City of Waxahachie

Each jurisdiction participated by having a Hazard Mitigation Planning Team. Each HMPT participated in the Hazard Mitigation Action Plan. The North Central Texas Council of Governments (NCTCOG) Emergency Preparedness Department participated in the HazMAP to assist in compiling the jurisdictional information and prepare the plan for submission. Ellis County Hazard Mitigation Action Plan meetings were held on October 22, 2013, November 14th, 2013, and December 3rd, 2013.

1.3 HazMAP Planning Process Point of Contact and Demographics

The following are the points of contacts during the HazMAP planning process:

Ellis County Fire Marshal/Emergency Management Coordinator

City of Alma Mayor

City of Bardwell City Councilman

City of Ennis Fire Marshal/Emergency Management Coordinator

City of Ferris Fire Chief

City of Garrett Mayor

City of Italy City Administrator

City of Maypearl Mayor

City of Midlothian Fire Marshal/Emergency Management Coordinator

City of Milford Fire Chief

City of Oak Leaf City Secretary

City of Ovilla Police Chief

City of Palmer Fire Marshal/Emergency Management Coordinator

City of Red Oak Emergency Management Coordinator

City of Waxahachie Emergency Management Coordinator

Participating Jurisdiction Population Profiles

Jurisdiction	2010 Population	2013 Population (estimation)
Ellis County	58,427	59,720
City of Alma	331	-
City of Bardwell	649	-
City of Ennis	18,513	18,590
City of Ferris	2,436	2,440
City of Garrett	806	-
City of Italy	1,863	1,870
City of Maypearl	934	-
City of Midlothian	18,037	19,330
City of Milford	728	-
City of Oak Leaf	1,298	1,300
City of Ovilla	3,492	3,510
City of Palmer	2,000	2,010
City of Red Oak	10,769	11,230
City of Waxahachie	29,621	31,550

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





Source: Texas National Resource Inventory

1.4 Ellis County Hazard Mitigation Action Plan Organization

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

Chapter One: Introduction

Describes the purpose of the Ellis Hazard Mitigation Action Plan and introduces the mitigation planning process.

Chapter Two: Planning Process

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

Chapter Three: Hazard Identification and Risk Assessment

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

Chapter Four: Capabilities

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

Chapter Five: Mitigation Strategy

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

Chapter Six: Maintenance Process

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

Appendix A: Documentation from Planning and Public Meetings

1.5 Ellis County Hazard Mitigation Strategy Maintenance Process

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

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

1.6 Ellis County Hazard Mitigation Action Plan Adoption

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

1.7 FEMA Disaster Declarations

When a disaster occurs, local government officials may determine that the effort needed for recovery appears to be beyond the combined resources of both the state and local governments and that federal assistance may be required. FEMA then manages the process investigating to determine the need for federal aid and makes a recommendation to the president for supplemental assistance. Disaster declarations are affirmed by the president of the United States under The Robert T. Stafford Disaster relief and Emergency Assistance Act. Forms of assistance include response efforts, emergency resources, and public and individual assistance programs. *Table 1.2* provides a list of previous Presidential Disaster declarations where Ellis County was indicated as part of the declared disaster area.

This page intentionally left blank.

Chapter Two: Planning Process

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

Plan Development and Adoption Process

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

Organizing the Planning Effort

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

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

Existing Data and Plans

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

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

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

Planning Committee

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

The Planning Committee was assembled in 2011 with representatives from all jurisdictions including, mayors, police chiefs, fire chiefs, and general public. Ellis County acted as the plan development consultant providing hazard mitigation planning services. The Table below provides a list of the primary entity representative for each jurisdiction on the planning team below.

Representing	Position	Role
Ellis County	EMC	General oversight
Alma	Mayor	Hazard & Plan development
Bardwell	City Councilman	Hazard & Plan development
Ennis	Fire Marshall/EMC	Hazard & Plan development
Ferris	Fire Chief	Hazard & Plan development
Garrett	Mayor	Hazard & Plan development
Italy	City Administrator	Hazard & Plan development
Maypearl	Mayor	Hazard & Plan development
Midlothian	Fire Marshall/EMC	Hazard & Plan development
Milford	Fire Chief	Hazard & Plan development
Oak Leaf	City Secretary	Hazard & Plan development
Ovilla	Police Chief	Hazard & Plan development
Palmer	Fire Marshall/EMC	Hazard & Plan development
Palmer	City Administrator	Hazard & Plan development
Palmer	Police Sergeant	Hazard & Plan development
Red Oak	EMC	Hazard & Plan development
Waxahachie	EMC	Hazard & Plan development

Hazard Mitigation Team – Primary Representatives

See lists below for details of all jurisdictional participation

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

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

6. Coordinated with the stakeholders within the cities and the unincorporated areas of Ellis County during plan development.

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

- 1. Coordinated input from representatives of neighborhood stakeholder groups and provided a representative to the County Planning Committee.
- 2. Attended, conferenced in, or provided meeting support and information for regular meetings of the planning team as coordinated by Ellis County.
- 3. Assisted Ellis County staff with identifying hazards and estimating potential losses from future hazard events.
- 4. Assisted Ellis County in developing and prioritizing mitigation actions to address the identified risks.
- 5. Assisted Ellis County in coordinating public meetings to develop the plan.
- 6. Identified the community resources available to support the planning effort.
- 7. Worked for the support of neighborhood stakeholders for the recommendations resulting from the planning process.
- 8. Submitted the proposed plan to all appropriate departments for review and comment and worked with Ellis County to incorporate the resulting comments into the proposed plan.
- 9. Capabilities, ordinances, policies and current procedures are listed in the Capability Assessment Table and NFIP Table in Chapter 4 and Chapter 5, and Integration Plan Table in Chapter 6.

Representing	Position	Role
Ellis County ESD#2	Emergency Commissioner	Review of plan
Midlothian Energy	Plant Manager	Review of plan
Holcim, LP	Plant Manager	Review of plan
Ash Grove Cement	Plant Manager	Review of plan
Midlothian ISD	Security Coordinator	Review of plan
Sardis-Lone Elm SUD	General manager	Review of plan
American Red Cross	Disaster Program Manager	Review of plan
Salvation Army	Captain	Review of plan
Red Oak ISD	Assistant Superintendent Chief Operations Officer	Review of plan
Rockett SUD	Operations/General Manager	Review of plan
Glenn Heights Public Works	Director of Public Works/City Manager	Review of plan

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

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

- 1. Appoint members to a coordinating committee to monitor and work toward plan implementation.
- 2. Publicize the plan to neighborhoods interests and ensure that new community members are aware of the plan and its contents.
- 3. Monitor progress in achieving the plan's goals through regular maintenance and implementation projects.

Planning Meetings

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

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

- Ellis County Hazard Mitigation Kickoff Meeting October 22,1013
- Ellis County Hazard Analysis Meeting November 14, 2013
- Ellis County Hazard Mitigation Strategies Meeting March 27,2014

Public Involvement

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

- The first public meeting was held on January 16, 2014 and advertised in the Waxahachie Daily Light and city website inviting the public, neighboring communities, local business, academia, agencies, and nonprofits to comment.
- A second opportunity was provided for public input on July 24, 2014. An advertisement was posted in the Waxahachie Daily Light and city website inviting the public, neighboring communities, local business, academia, agencies, and nonprofits to view and comment on the HazMAP prior to plan submission.

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

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

Chapter Three: Hazard Identification and Risk Assessment

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

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

3.1	Profiling Hazards and Vulnerabilities	3-3
3.2	Location of Hazards	3-25
3.3	Extent	3-239
3.4	Priority Risk Index	3-257
	Vulnerability Assessment	3-271
3.5	Identification of Assets	3-273
3.6	Methodology	3-281
3.7	Summary of Vulnerability Assessment	3-283
3.8	Geographic Information Systems Based Analysis	3-289
3.9	Statistical Risk Assessment	3-315
3.10	Qualitative Analysis	3-331
3.11	Summary	3-335

This page intentionally left blank.

3.1 Profiling Hazards and Vulnerabilities

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

The Ellis County profile is one of many developed by the North Central Texas Council of Governments (NCTCOG) under the FEMA Hazard Mitigation program. These plans are created by compiling data from NCTCOG regional natural hazards risk assessments, damage assessments, hazard profiling and identification as well as historical data and geographic information. Of the 15 hazards identified in the State of Texas Hazard Mitigation Action Plan, only 12 will be discussed in this plan. The remaining three (land subsidence, coastal erosions, and hurricane/tropical storm) will not be discussed due to their lack of impact on the Ellis County planning area.

Hazards Addressed The Ellis County Hazard Mitigation Action Plan has identified the following 12 natural hazards as having the potential to cause damage in the county. Wildland fire, flooding, and dam failure are the only hazards recognized to have predictable vulnerable areas. All other hazards are equally likely to occur throughout the Ellis County jurisdictions. Also identified in this section are areas that may be more vulnerable to each hazard in the event of an occurrence.

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

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

Based on a quantitative analysis of the dams currently in place in Ellis County and a qualitative analysis of the potential impacts that dam failures would have on the social, economic, and environmental components of the region, the risk of a dam failure hazard is little to none.

There have been no inundation studies for the dams in Ellis County and the County does not have information from the owners or emergency operations plans for the dams. Except for the South Prong dam study commissioned to determine natural hazard impacts the on the dam and emergency spillway and to determine appropriate dam mitigation actions for this plan, the County and participating jurisdictions have chosen to cite a data deficiency. This is due to lack of EOPs, information, and the fact that all jurisdictions in the county ranked dam failure as a negligible to no risk hazard on the PRI scale. The data below is from the National Inventory of Dams (NID):

Jurisdiction	Dam Name	Hazard Potential	Completion Year	Owner Type	Dam Height (Ft.)	Water Supply (acre-feet)	Primary Purpose	River	Distance to a City (Mi.)	Condition Assessment
Junjurction	Dani Name	rotentia	real	Owner Type		(acre-reet)	rupose	TR-Waxahachie		Assessment
Corsicana	Bardwell Lake	High	1965	Federal	82	317483	Water Supply	Creek	17	-
	Coment Plant Dam							TR - Waxahachie		
Ellis County	Cement Plant Dam	High	1961	Private	25	500	Other	Creek	-	-
	Chambers Creek Ws							TR -Cummins		
Ellis County	Scs Site 1 Dam	High	1957	Not Listed	52	2853	Flood Control	Creek	6	-
Ellis County	Scs Site 11 Dam	High	1959	Not Listed	42	1342	Flood Control	LONG BRANCH	4	-
	Chambars Graak We									Meets
	Scs Site 111 And 112							Mill Creek		Tolerable
Ellis County	Chambors Crook Ws	High	1960	Not Listed	37	3829	Flood Control		-	Risk Criteria
Ellis County	Scs Site 126 Dam	High	1965	Not Listed	34	3451	Flood Control	CREEK	-	-
	Chambers Creek Ws							TR-NORTH		
Ellis County	Scs Site 2a Dam	High	1960	Not Listed	45	403	Flood Control	PRONG CREEK	4	-
Ellic County	Chambers Creek Ws	High	1060	Notlistad	20	256	Flood Control	TR-NORTH	-	
EIIIS County	Sts Site 20 Dalli	nigii	1960	NOLLISLEU	59	550	FIDDU CONTION	NORTH PRONG	5	
	Chambers Creek Ws							WAXAHACHIE		
Ellis County	Sts Site Zi Dalli	High	1960	Not Listed	46	2722	Flood Control	CREEK	3	-
	Chambers Creek Ws							TR - Waxahachie		
Ellis County	Scs Site 3 Dam	High	1957	Not Listed	32	790	Flood Control	Creek	6	-
			1557	Hot Loted				TR-		
	Chambers Creek Ws							WAXAHACHIE		
Ellis County		High	1958	Not Listed	29	561	Flood Control	CREEK	6	-
	Chambers Creek Ws							TR - Waxahachie		
Ellis County	Scs Site 5 Dam	High	1958	Not Listed	40	1159	Flood Control	Creek	6	-
	Chambers Creek Ws							TR-		
-	Scs Site 6 Dam		1050					WAXAHACHIE		
Ellis County		High	1958	Not Listed	41	801	Flood Control	CREEK TR-	4	-
	Chambers Creek Ws							WAXAHACHIE		
Ellis County	Scs Site 7 Dam	High	1958	Not Listed	50	1181	Flood Control	CREEK	3	-
	Chambers Creek Ws							TR -North Prong		
Ellis County	Scs Site 8 Dam	High	1959	Not Listed	45	1192	Flood Control	Creek	2	-
	Chambers Creek Ws							TR - Waxahachie		
Ellis County	Scs Site 9 Dam	High	1959	Not Listed	52	1425	Flood Control	Creek	-	-
								TR - Waxahachie		
Ellis County	Lake Clark Dam	High	1940	Local	28	3724	Flood Control	Creek	_	_
Ling county			1540	Government		5724	ribbu control	South Prong		
	Mountain Creek Ws							Waxahachie		Deficiency Recognized
Ellis County		High	1956	Not Listed	43	6457	Flood Control	Creek	-	Recognized
Ellis County	Mountain Creek Ws	High	1957	Not Listed	34	2462	Flood Control	COTTONWOOD	_	_
Lins county	Ses site 5 bain		1557	Not Listed		2402		SOUTH PRONG		
	South Prong Dam							WAXAHACHIE		
Ellis County	character caracterity	High	1956	Private	62	22764	Water Supply	CREEK	-	-
Fnnis	Scs Site 20a Dam	High	1987	Not Listed	14	293	Flood Control	Cottonwood		-
	Chambers Creek Ws		1507	Hot Loted				breek		
Milford	Scs Site 97 Dam	High	1960	Not Listed	36	5093	Flood Control	MILL CREEK	5	-
	Chambers Creek Ws							North Prong		
Waxabachie	Scs Site 10 Dam	High	1050	Not Listed	16	10/15	Flood Control	Waxahachie	5	
waxanacine	Chambers Creek Ws	Ingi	1555	Not Listed	40	1545		CIEEK		
Waxahachie	Scs Site 12 Dam	High	1959	Not Listed	35	920	Flood Control	Long Branch	3	-
	Chambers Creek Ws							TR-		
Waxabachio	Scs Site 14 Dam	High	1050	Not Listed		E07	Flood Control	WAXAHACHIE	1	
vvaxandUlle		i ligit	1929	NOLLISLEU	27	507		TR-	1	-
	Chambers Creek Ws							WAXAHACHIE		
Waxahachie	JUS JILE 13 Ddill	High	1959	Not Listed	49	774	Flood Control	CREEK	1	-
Waxabachia	Katy Lake Dam	High	1000	Privato	20.2		Pocroation	TR -North Prong		
waxanachie		rign	1902	rnvale	30.3	87	Recreation	Creek	-	-

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

Unincorporated Ellis County Drought in rural portions of the county continues to raise many difficult issues. The farm and ranch industry is significantly affected the lack of water resources needed for crops and feed. As a drought continues, many residents who are on private wells as well as those served by small water utilities begin to experience water shortages. The lack of water can also affect emergency responder capabilities in the form of firefighting efforts.

City of Alma Drought in rural portions of the county continues to raise many difficult issues. The farm and ranch industry is significantly affected the lack of water resources needed for crops and feed. As a drought continues, many residents who are on private wells as well as those served by small water utilities begin to experience water shortages. The lack of water can also affect emergency responder capabilities in the form of firefighting efforts.

City of Bardwell Drought in rural portions of the county continues to raise many difficult issues. The farm and ranch industry is significantly affected the lack of water resources needed for crops and feed. As a drought continues, many residents who are on private wells as well as those served by small water utilities begin to experience water shortages. The lack of water can also affect emergency responder capabilities in the form of firefighting efforts.

City of Ennis The city of Ennis is located in North Texas and is surrounded with agriculture and farm lands with most of this land outside the jurisdiction of the city. A small portion, less than 1% of land would be effected by drought condition due to agriculture use. The city's drinking water is effected by drought and extreme heating conditions due to the water being drawn from Lake Bardwell.

City of Ferris This year we have seen the drought lessen in our city due to rainfall amounts above average for the year 2014. For the past few years we have experience severe drought conditions which have contributed to our numerous wildfires. With the lake systems getting lower and lower this will impact our need for larger water intake as the drought continues by causing severe water shortages to many small water utilities. The lack of water could also hinder firefighting operations to a large degree.

City of Garrett Drought in rural portions of the county continues to raise many difficult issues. The farm and ranch industry is significantly affected the lack of water resources needed for crops and feed. As a drought continues, many residents who are on private wells as well as those served by small water utilities begin to experience water shortages.

The lack of water can also affect emergency responder capabilities in the form of firefighting efforts.

City of Italy This hazard could cause citywide hardship to taxpayers for alternate water sources. This would impact water plant and waste water plant, pump station, water towers and storage, City Hall, schools, and all residents and businesses throughout the city.

City of Maypearl According to the city of Maypearl, drought affects all populations and property equally.

City of Midlothian According to the city of Midlothian, drought affects all populations and property equally.

City of Milford Drought in rural portions of the county continues to raise many difficult issues. The farm and ranch industry is significantly affected the lack of water resources needed for crops and feed. As a drought continues, many residents who are on private wells as well as those served by small water utilities begin to experience water shortages. The lack of water can also affect emergency responder capabilities in the form of firefighting efforts.

City of Oak Leaf Over 50% of the city, mostly the southern half, is comprised of agricultural land. A cascading effect of drought is the damage to commerce due to the poor farming conditions.

City of Ovilla Drought in rural portions of the county continues to raise many difficult issues. The farm and ranch industry is significantly affected the lack of water resources needed for crops and feed. As a drought continues, many residents who are on private wells as well as those served by small water utilities begin to experience water shortages. The lack of water can also affect emergency responder capabilities in the form of firefighting efforts.

City of Palmer According to the city of Palmer, drought affects all populations and property equally.

City of Red Oak According to the city of Red Oak, drought affects all populations and property equally.

City of Waxahachie Drought continues to affect the city of Waxahachie, which has caused increases in water consumption. Unchecked residential water use, main breaks due to ground movement, and other sources of consumption associated with summer are the primary hazards. The general area continues to be at a Stage 1 water restriction level with probable increase to Stage 2 by late September. This poses a significant threat to citizen health and welfare, government's ability to deliver basic services as well as the local economy.

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

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

Unincorporated Ellis County According to Ellis County, earthquakes affect all populations and property in the unincorporated County equally.

City of Alma According to the city of Alma, earthquakes affect all populations and property equally.

City of Bardwell According to the city of Bardwell, earthquakes affect all populations and property equally.

City of Ennis According to the city of Ennis, earthquakes affect all populations and property equally.

City of Ferris According to the city of Ferris, earthquakes affect all populations and property equally.

City of Garrett According to the city of Garrett, earthquakes affect all populations and property equally.

City of Italy According to the city of Italy, earthquakes affect all populations and property equally.

City of Maypearl According to the city of Maypearl, earthquakes affects all populations and property equally.

City of Midlothian According to the city of Midlothian, drought affects all populations and property equally.

Hazard Mitigation Action Plan

City of Milford According to the city of Milford, earthquakes affect all populations and property equally.

City of Oak Leaf According to the city of Oakleaf, earthquakes affects all populations and property equally.

City of Ovilla According to Ellis County, earthquakes affects all populations and property in the city of Ovilla equally.

City of Palmer According to the city of Palmer, earthquakes affect all populations and property equally.

City of Red Oak According to the city of Red Oak, earthquakes affect all populations and property equally.

City of Waxahachie According to the city of Waxahachie, earthquakes affects all populations and property equally.

Expansive Soils Expansive soils are soils that contain large percentages of swelling clays that may experience volume changes of up to 40% in the absence or presence of water. This type of plastic deformation is common in the North Central Texas region. Over time, expansive soils can be hazardous to buildings and other infrastructure, with the most extensive damage occurring to highways, streets, and building foundations. Expansive soils may affect the entire planning area equally.

Unincorporated Ellis County According to Ellis County, expansive soils affects all populations and property in the unincorporated County equally.

City of Alma According to the city of Alma, expansive soils affect all populations and property equally.

City of Bardwell According to the city of Bardwell, expansive soils affect all populations and property equally.

City of Ennis The city of Ennis is located in an area composed of high clay soil percentages; which tends to cause unfavorable conditions with foundations if they are not properly designed for these conditions. An area in the city's jurisdiction, which has seen a high rate of soil movement, is located near State High 287 and the 287 Bypass. In 2008 one building owned by the Ennis Independent School District was demolished due to these conditions. A bank building located in this area was relocated due to its foundation movement. The bank was relocated and is now privately owned professional building. The owner of the now professional building had to complete work on the foundation which included installing sump pumps to remove water from under the foundation.

City of Ferris Most of the issues which would face the city of Ferris Texas come around the middle of summer or when drought conditions are most prevalent in the summer months. Residual damage or secondary impacts that could occur and have occurred are busted sewage and water pipes.

City of Garrett According to the city of Garrett, expansive soils affect all populations and property equally.

City of Italy According to the city of Italy, expansive soils affects all populations and property equally.

City of Maypearl According to the city of Maypearl, expansive soils affects all populations and property equally.

City of Midlothian Midlothian has a large industrial area consisting mainly of large distribution warehouses located on expansive soil. All of these facilities have issues with foundations settling, creating cracks and faults in the concrete. The settling causes leaks and breaks with underground fire protection mains and piping. Local officials have also seen above ground water tanks for secondary fire water supply settling and breaking piping. Breaks and leaks in the municipal water distribution system are common. Many facilities have had to replace pipe connections and hardware with stainless steel products, as the soil composition causes rapid determination of connections and hardware made of other materials. Deterioration of these components have caused failures of fire protection and other water distribution systems.

City of Milford According to the city of Milford, expansive soils affect all populations and property equally.

City of Oak Leaf At least three homes in the Hampton Acres subdivision have had to fix damage to their foundations associated with expansive soils. Expansive soils are concentrated in the central part of the city.

City of Ovilla According to the city of Ovilla, expansive soils affect all populations and property equally.

City of Palmer According to the city of Palmer, expansive soils affects all populations and property equally.

City of Red Oak According to the city of Red Oak, expansive soils affect all populations and property equally.

City of Waxahachie According to the city of Waxahachie, expansive soils affects all populations and property equally.

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

Hazard Mitigation Action Plan

Extreme heat can also be a factor that drastically impacts drought conditions as high temperatures lead to an increased rate of evaporation. Extreme heat can also lead to heat stroke and even death in vulnerable populations such as the elderly and the very young if exposed to the high temperatures for an extended period of time. Extreme heat may affect the entire planning area equally.

Unincorporated Ellis County Ellis County is often prone to experience lengthy periods of extreme heat in the summer months. These events create an elevated level of needs for cooling stations and heat related medical treatment. Additionally, extended extreme heat events often cause "rolling black outs and brown outs" as the increased demand on electricity providers increase. This is especially problematic as portions of Ellis County are rural and electricity is supplied by small cooperatives that have lower priority on the demand grid.

City of Alma Alma is often prone to experience lengthy periods of extreme heat in the summer months. These events create an elevated level of needs for cooling stations and heat related medical treatment. Additionally, extended extreme heat events often cause "rolling black outs and brown outs" as the increased demand on electricity providers increase. This is especially problematic as portions of Alma are rural and electricity is supplied by small cooperatives that have lower priority on the demand grid.

City of Bardwell Bardwell is often prone to experience lengthy periods of extreme heat in the summer months. These events create an elevated level of needs for cooling stations and heat related medical treatment. Additionally, extended extreme heat events often cause "rolling black outs and brown outs" as the increased demand on electricity providers increase. This is especially problematic as portions of Bardwell are rural and electricity is supplied by small cooperatives that have lower priority on the demand grid.

City of Ennis The city of Ennis is located in North Texas, all areas are vulnerable to extreme heat in the jurisdiction.

City of Ferris Extreme heat is very difficult for this city to deal with. With the schools and day cares and along with a large number of senior citizens it is possible for electrical grids to go down during these times. The city would have issues in being able to provide for cooling stations around town with no back-up generators.

City of Garrett Garrett is often prone to experience lengthy periods of extreme heat in the summer months. These events create an elevated level of needs for cooling stations and heat related medical treatment. Additionally, extended extreme heat events often cause "rolling black outs and brown outs" as the increased demand on electricity providers increase. This is especially problematic as portions of Garrett are rural and electricity is supplied by small cooperatives that have lower priority on the demand grid.

City of Italy This hazard would impact low to moderate income families and the elderly throughout the city. It could impact water plant and waste water plant, water tower, pump

station, City Hall, schools, electric power station, SCADA notification, police and fire emergency notifications, fire, and warning sirens.

City of Maypearl According to the city of Maypearl, extreme heat affects all populations and property equally.

City of Midlothian According to the city of Midlothian, extreme heat affects all populations and property equally.

City of Milford Milford is often prone to experience lengthy periods of extreme heat in the summer months. These events create an elevated level of needs for cooling stations and heat related medical treatment. Additionally, extended extreme heat events often cause "rolling black outs and brown outs" as the increased demand on electricity providers increase. This is especially problematic as portions of Milford are rural and electricity is supplied by small cooperatives that have lower priority on the demand grid.

City of Oak Leaf Half of the population of Oak Leaf is considered to be elderly. The elderly are more vulnerable to heat-related illnesses.

City of Ovilla Ovilla is often prone to experience lengthy periods of extreme heat in the summer months. These events create an elevated level of needs for cooling stations and heat related medical treatment. Additionally, extended extreme heat events often cause "rolling black outs and brown outs" as the increased demand on electricity providers increase. This is especially problematic as portions of Ovilla are rural and electricity is supplied by small cooperatives that have lower priority on the demand grid.

City of Palmer According to the city of Palmer, extreme heat affects all populations and property equally.

City of Red Oak According to the city of Red Oak, extreme heat affects all populations and property equally.

City of Waxahachie According to the city of Waxahachie, extreme heat affects all populations and property equally.

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

100-year floodplain). Common flooding hazards within the planning area include flood hazards from flash flooding and from new development.

A flash flood is a rapid flood that inundates low-lying areas in less than six hours. This is caused by intense rainfall from a thunderstorm or several thunderstorms. Flash floods can also occur from the collapse of a man-made structure or ice dam. Construction and development can change the natural drainage and create brand new flood risks as new buildings, parking lots, and roads create less land that can absorb excess precipitation from heavy rains, hurricanes, and tropical storms. Flash floods are a high risk hazard since they can roll boulders, tear out trees, and destroy buildings and bridges.

Unincorporated Ellis County According to unincorporated Ellis County, flooding has the potential to affect all areas equally.

City of Alma According to the city of Alma, flooding has the potential to affect all populations and property equally.

City of Bardwell According to the city of Bardwelll, flooding has the potential to affect all populations and property equally.

City of Ennis According to the city of Ennis, flooding has the potential to affect all populations and property equally.

City of Ferris Continued growth and development to the north of our city will result in an increase storm water and drainage to the Ten Mile Creek area causing issues, challenging communities to further stabilize flood risks and minimize any future flood losses

City of Garrett According to the city of Garrett, flooding has the potential to affect all populations and property equally.

City of Italy This hazard was identified as having negligible to no risk to the jurisdiction. Heavy rain can impact the waste water facility due to the amount of water flowing into the plant in a short period of time.

City of Maypearl The following areas of the city of Maypearl are prone to flooding: the eastern most block of East Second Street, FM 66 from the South 400 block to the 16000 block of FM 916, the 7000 block of FM 66, the intersection of East Third and Bowers Street, First Street from Main east on Old Maypearl Road for about a mile and a half, and the 300-800 blocks of West First Street. The city of Maypearl has many residences located in the 100-year flood plain which was recently revised.

City of Midlothian According to the city of Midlothian, flooding has the potential to affect all populations and property equally.

City of Milford According to the city of Milford, flooding has the potential to affect all populations and property equally.

City of Oak Leaf According to the city of Oak Leaf, flooding has the potential to affect all populations and property equally.

City of Ovilla According to the city of Ovilla, flooding has the potential to affect all populations and property equally.

City of Palmer According to the city of Palmer, flooding has the potential to affect all populations and property equally.

City of Red Oak According to the city of Red Oak, flooding has the potential to affect all populations and property equally.

City of Waxahachie According to the city of Waxahachie, flooding has the potential to affect all populations and property equally.

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

Unincorporated Ellis County All of Ellis County is susceptible to damaging hail. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older and are constructed of lightweight materials. Because of the rural nature of Ellis County, there are limited hardened buildings and shelters available to the public.

City of Alma All of Alma is susceptible to damaging hail. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older and are constructed of lightweight materials. Because of the rural nature of Alma, there are limited hardened buildings and shelters available to the public.

City of Bardwell All of Bardwell is susceptible to damaging hail. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older and are constructed of lightweight materials. Because of the rural nature of Bardwell, there are limited hardened buildings and shelters available to the public.

City of Ennis Anyone caught outdoors during a hail storm is vulnerable, the city has many parks and outdoor festivals that could put people at risk during a hail storm event.

City of Ferris The last hail damage was April 2014 for the city of Ferris Texas. Current estimates of cost to home owners would be around \$500,000.00 dollars. Special concerns for the city would include I.H 45 running north and south through the city causing a major traffic hazard by a high rate of motor vehicle collisions thus taxing local fire and EMS units.

City of Garrett All of Garrett is susceptible to damaging hail. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older and are constructed of lightweight materials. Because of the rural nature of Garrett, there are limited hardened buildings and shelters available to the public.

City of Italy This hazard could impact low to moderate income families and the elderly throughout the city. Could impact water plant and waste water plant, water tower, pump station, City Hall, schools, electric power station, SCADA notification, emergency notification effecting police, fire, and warning siren and residential neighborhoods.

City of Maypearl According to the city of Maypearl, hail affects all populations and property equally.

City of Midlothian According to the city of Midlothian, hail affects all populations and property equally.

City of Milford All of Milford is susceptible to damaging hail. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older and are constructed of lightweight materials. Because of the rural nature of Milford, there are limited hardened buildings and shelters available to the public.

City of Oak Leaf Currently, City Hall has no covered parking, leaving city vehicles vulnerable to hail damage. All other populations and property in the jurisdiction have the potential to be affected by hail.

City of Ovilla All of Ovilla is susceptible to damaging hail. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older and are constructed of lightweight materials. Because of the rural nature of Ovilla, there are limited hardened buildings and shelters available to the public.

City of Palmer According to the city of Palmer, hail affects all populations and property equally.

City of Red Oak According to the city of Red Oak, hail affects all populations and property equally.

City of Waxahachie According to the city of Waxahachie, hail affects all populations and property equally.

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

Unincorporated Ellis County High winds can have a significant impact throughout Ellis County. With the rural nature of the county, areas affected may pose access challenges and public safety risks due to downed power lines caused by fallen vegetation and blown debris. These winds can occur suddenly and without warning.

City of Alma High winds can have a significant impact throughout Alma. With the rural nature of the county, areas affected may pose access challenges and public safety risks due to downed power lines caused by fallen vegetation and blown debris. These winds can occur suddenly and without warning.

City of Bardwell High winds can have a significant impact throughout Bardwell. With the rural nature of the county, areas affected may pose access challenges and public safety risks due to downed power lines caused by fallen vegetation and blown debris. These winds can occur suddenly and without warning.

City of Ennis There are two manufactured home parks in the city's jurisdiction, both are susceptible to the devastating effects of high winds. One area is located off Interstate 45 on the city's NE quadrant while the second in located in the city's SW area near State High 34.

City of Ferris According to the city of Ferris, high winds affects all populations and property equally.

City of Garrett High winds can have a significant impact throughout Garrett. With the rural nature of the county, areas affected may pose access challenges and public safety risks due to downed power lines caused by fallen vegetation and blown debris. These winds can occur suddenly and without warning.

City of Italy This hazard could impact water plant and waste water plant, water tower, pump station, City Hall, schools, electric power station, SCADA notification, emergency

notification effecting police, fire, and warning siren and all citizens and businesses throughout the city.

City of Maypearl High winds could affect all parts of the city of Maypearl equally.

City of Midlothian According to the city of Midlothian, high winds affects all populations and property equally.

City of Milford High winds can have a significant impact throughout Milford. With the rural nature of the county, areas affected may pose access challenges and public safety risks due to downed power lines caused by fallen vegetation and blown debris. These winds can occur suddenly and without warning.

City of Oak Leaf Oak Leaf is located on a hill, leaving it more vulnerable to high winds.

City of Ovilla High winds can have a significant impact throughout Ovilla. With the rural nature of the county, areas affected may pose access challenges and public safety risks due to downed power lines caused by fallen vegetation and blown debris. These winds can occur suddenly and without warning.

City of Palmer There is a concentration of manufactured homes in the western-half of the city that would be more vulnerable to high winds.

City of Red Oak According to the city of Red Oak, high winds have the potential to affect all populations and property equally.

City of Waxahachie High winds can have a significant impact throughout Waxahachie. With the rural nature of the county, areas affected may pose access challenges and public safety risks due to downed power lines caused by fallen vegetation and blown debris. These winds can occur suddenly and without warning.

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

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

Unincorporated Ellis County All of Ellis County is susceptible to damage caused by lightning. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older

and are constructed of lightweight materials that offer little protection from lightning. Because of the rural nature of Ellis County, there are limited hardened buildings and shelters available to the public.

City of Alma All of Alma is susceptible to damage caused by lightning. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older and are constructed of lightweight materials that offer little protection from lightning. Because of the rural nature of Alma, there are limited hardened buildings and shelters available to the public.

City of Bardwell All of Bardwell is susceptible to damage caused by lightning. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older and are constructed of lightweight materials that offer little protection from lightning. Because of the rural nature of Bardwell, there are limited hardened buildings and shelters available to the public.

City of Ennis 3700 E. Hwy 85 is a multi-family complex with fifteen multi-story apartments that has been struck by lightning over twenty times in the last ten years; with one fire occurring in August 27, 2005 causing over 40,000 dollars damage and displaced over thirty residence.

City of Ferris No data to indicate any recent deaths in the area by lightning. However, citizens are at high risk due to lightning at any outside event and especially at local parks and athletic events. No data could be found to indicate any structure damaged by lightning in the city for the past 10 years. The possibility is very high any time a lightning event takes place for structures to become involved. Most of the time it has created a high demand on responding fire department to answer calls dealing with telephone and electrical poles which have been struck by lightning causing power outages and fire/police units being tied up for extended amounts of time.

City of Garrett All of Garrett is susceptible to damage caused by lightning. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older and are constructed of lightweight materials that offer little protection from lightning. Because of the rural nature of Garrett, there are limited hardened buildings and shelters available to the public.

City of Italy This hazard could impact water plant and waste water plant, water tower, pump station, City Hall, schools, electric power station, SCADA notification, emergency notification effecting police, fire, and warning siren, residential neighborhoods and businesses causing a widespread fire.

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

Hazard Mitigation Action Plan

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

City of Milford All of Milford is susceptible to damage caused by lightning. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older and are constructed of lightweight materials that offer little protection from lightning. Because of the rural nature of Milford, there are limited hardened buildings and shelters available to the public.

City of Oak Leaf Oak Leaf is located on a hill, making it a greater target for lightning. City Hall is frequently struck by lightning during thunderstorms.

City of Ovilla All of Ovilla is susceptible to damage caused by lightning. A significant number of the residential developments are comprised of mobile and/or prefabricated homes. A majority of these mobile/prefabricated homes are older and are constructed of lightweight materials that offer little protection from lightning. Because of the rural nature of Ovilla, there are limited hardened buildings and shelters available to the public.

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

City of Red Oak According to the city of Red Oak, lightning affects all populations and property equally.

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

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

Unincorporated Ellis County Tornados in Ellis County have the ability to occur with little warning and no predictable pattern. Throughout the County, there are many developments that are all or nearly all mobile and/or prefabricated home type structures that will offer little to no protection in a tornado incident. Because of the rural nature of Ellis County, there are limited hardened buildings and shelters available to the public.

City of Alma Tornados in Alma have the ability to occur with little warning and no predictable pattern. Throughout the city, there are many developments that are all or nearly all mobile and/or prefabricated home type structures that will offer little to no protection in a tornado incident. Because of the rural nature of Ellis County, there are limited hardened buildings and shelters available to the public.

City of Bardwell Tornados in Bardwell have the ability to occur with little warning and no predictable pattern. Throughout the city, there are many developments that are all or nearly all mobile and/or prefabricated home type structures that will offer little to no

protection in a tornado incident. Because of the rural nature of Bardwell, there are limited hardened buildings and shelters available to the public.

City of Ennis There are two manufactured home parks in the city's jurisdiction, both are susceptible to the devastating effects of tornados. One area is located off Interstate 45 on the city's NE quadrant while the second in located in the city's SW area near State High 34.

City of Ferris Tornados are as likely to occur within the city of Ferris as they are any place else in the metro area. The city of Ferris Texas population is estimated around 2500 and the city is in both Dallas county and Ellis County. Depending on the size and rating of a tornado, critical injuries and fatalities to our citizens could be very high. In 2011 a tornado came very close to our city which had major damage to the city of Lancaster only several miles from our city. Special issues would include schools and daycares with an older population at hand.

City of Garrett Tornados in Garrett have the ability to occur with little warning and no predictable pattern. Throughout the city, there are many developments that are all or nearly all mobile and/or prefabricated home type structures that will offer little to no protection in a tornado incident. Because of the rural nature of Garrett, there are limited hardened buildings and shelters available to the public.

City of Italy This hazard could be citywide, water plant, water tower, waste water plant, water tower, pump station, City Hall, schools, electric power station, SCADA notification, emergency notification effecting police, fire, and warning siren and all residents and businesses throughout the city.

City of Maypearl Tornados in the city of Maypearl have the ability to occur with little warning and no predictable pattern. There are very few homes with storm cellars.

City of Midlothian According to the city of Midlothian, tornados affect all populations and property equally.

City of Milford Tornados in Milford have the ability to occur with little warning and no predictable pattern. Throughout the city, there are many developments that are all or nearly all mobile and/or prefabricated home type structures that will offer little to no protection in a tornado incident. Because of the rural nature of Milford, there are limited hardened buildings and shelters available to the public.

City of Oak Leaf The last tornado struck in 2010 and hit the center of town.

City of Ovilla Tornados in Ovilla have the ability to occur with little warning and no predictable pattern. Throughout the city, there are many developments that are all or nearly all mobile and/or prefabricated home type structures that will offer little to no protection in a tornado incident. Because of the rural nature of Ovilla, there are limited hardened buildings and shelters available to the public.

Hazard Mitigation Action Plan

City of Palmer There is a concentration of manufactured homes in the western-half of the city that would be more vulnerable to tornados.

City of Red Oak According to the city of Red Oak, tornados affect all populations and property equally.

City of Waxahachie Tornados in Waxahachie have the ability to occur with little warning and no predictable pattern. Throughout the city, there are many developments that are all or nearly all mobile and/or prefabricated home type structures that will offer little to no protection in a tornado incident. Because of the rural nature of Waxahachie, there are limited hardened buildings and shelters available to the public.

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

Unincorporated Ellis County

80% of the county's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Alma

99% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Bardwell

62% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Ennis

57% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Ferris

73% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Garrett

100% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Italy

62% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Maypearl

100% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Midlothian

76% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Milford

92% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Oak Leaf

98% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Ovilla

98% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Palmer

87% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Red Oak

91% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

City of Waxahachie

55% of the city's population lives in the Wildland Urban Interface, according to the Texas Forest Service Wildfire Risk Assessment Summary.

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

annual basis in the planning area and can lead to issues with infrastructure, especially frozen roads and bridges.

Unincorporated Ellis County Ellis County is often prone to experience winter storms in the winter months and leading into the early spring. As ice collects on vegetation, bridges, and roadways, the county experiences periods power outages and hazardous road conditions. This often causes an increase demand for first responders, electricity and natural gas utilities, and warming shelters. There are three U.S. Highways (67, 77, & 287) and two Interstate Highways (35E & 45) that pass through the county, often requiring response and often rescue of stranded drivers.

City of Alma Alma is often prone to experience winter storms in the winter months and leading into the early spring. As ice collects on vegetation, bridges, and roadways, the county experiences periods power outages and hazardous road conditions.

City of Bardwell Bardwell is often prone to experience winter storms in the winter months and leading into the early spring. As ice collects on vegetation, bridges, and roadways, the county experiences periods power outages and hazardous road conditions.

City of Ennis The city of Ennis is located in North Texas, there is no area that is more vulnerable to winter storms in the jurisdiction.

City of Ferris Winter Storms in the past few years have been increasing with snowfall amounts in 2010 reaching 12 inches in some areas around the city. These storms could cause a significant impact on the individual citizen as well as our local economy due to business closings. This will also increase our response times to emergency calls and transports to area hospitals.

City of Garrett Garrett is often prone to experience winter storms in the winter months and leading into the early spring. As ice collects on vegetation, bridges, and roadways, the county experiences periods power outages and hazardous road conditions.

City of Italy This hazard could impact the water plant and waste water plant, water tower, pump station, City Hall, schools, electric power station, SCADA notification, emergency notification effecting police, fire, and warning siren and all residents and businesses throughout the city.

City of Maypearl Winter storms would affect all parts of the city of Maypearl equally.

City of Midlothian Ice is an issue throughout Midlothian, but ice accumulation on overpasses for US Hwy 287, US Hwy 67 and the N. 8th St. Bridge are a significant problem.

City of Milford Milford is often prone to experience winter storms in the winter months and leading into the early spring. As ice collects on vegetation, bridges, and roadways, the county experiences periods power outages and hazardous road conditions.

City of Oak Leaf The vegetation and agriculture in Oak Leaf are most vulnerable to winter storms. In addition, the primary roads that lead to and from town (Westmoreland Road, South Hampton Road, and Locust Drive) are all small roads and may become impassible during and after winter weather events.

City of Ovilla Ovilla is often prone to experience winter storms in the winter months and leading into the early spring. As ice collects on vegetation, bridges, and roadways, the county experiences periods power outages and hazardous road conditions.

City of Palmer According to the city of Palmer, winter storms affect all populations and property equally.

City of Red Oak According to the city of Red Oak, winter storms affect all populations and property equally.

City of Waxahachie The city of Waxahachie is often prone to experience winter storms in the winter months and leading into the early spring. As ice collects on vegetation, bridges, and roadways, the city experiences periods power outages and hazardous road conditions. This often causes an increase demand for first responders, electricity and natural gas utilities, and warming shelters. There are two U.S. Highways (77 & 287) and one Interstate Highway (35E) that pass through the city, often requiring response and often rescue of stranded drivers.

This page intentionally left blank.
3.2 Location of Hazards

The following maps illustrate the location of the hazards in Ellis County. Maps concerning tornado and hail incidents are in reverence to previous events as they have the potential to occur equally throughout the county. Winter storms, extreme heat, and drought have the potential to occur equally throughout the county and their previous events data is not represented by a map. Likewise, it is assumed that those hazards listed as having the potential to occur equally throughout the HazMAP planning area will affect the area as described in each city's critical infrastructure and land use maps B.1-B.15, in this section.

Map Series A Dams and Flood Zones

	Map A.1 Ellis County Dams and Flood Zones
	Map A.2 City of Alma Dams and Flood Zones
	Map A.3 City of Bardwell Dams and Flood Zones
	Map A.4 City of Ennis Dams and Flood Zones
	Map A.5 City of Ferris Dams and Flood Zones
	Map A.6 City of Garrett Dams and Flood Zones
	Map A.7 City of Italy Dams and Flood Zones
	Map A.8 City of Maypearl Dams and Flood Zones
	Map A.9 City of Midlothian Dams and Flood Zones
	Map A.10 City of Milford Dams and Flood Zones
	Map A.11 City of Oak Leaf Dams and Flood Zones
	Map A.12 City of Ovilla Dams and Flood Zones
	Map A.13 City of Palmer Dams and Flood Zones
	Map A.14 City of Red Oak Dams and Flood Zones
	Map A.15 City of Waxahachie Dams and Flood Zones
Map Series B	Land Use, Critical Infrastructure, and Flood Zones
	Map B.1 Ellis County Land Use, Critical Infrastructure, and Flood Zones
	Map B.2 City of Alma Land Use, Critical Infrastructure, and Flood Zones Map B.3 City of Bardwell Land Use, Critical Infrastructure, and Flood
	Zones
	Map B.4 City of Ennis Land Use, Critical Infrastructure, and Flood Zones
	Map B.5 City of Ferris Land Use, Critical Infrastructure, and Flood Zones
	Map B.6 City of Garrett Land Use, Critical Infrastructure, and Flood
	Zones
	Map B.7 City of Italy Land Use, Critical Infrastructure, and Flood Zones
	Map B.8 City of Maypearl Land Use, Critical Infrastructure, and Flood
	Map B.9 City of Midlothian Land Use, Critical Infrastructure, and Flood Zones

	 Map B.10 City of Milford Land Use, Critical Infrastructure, and Flood Zones Map B.11 City of Oak Leaf Land Use, Critical Infrastructure, and Flood Zones Map B.12 City of Ovilla Land Use, Critical Infrastructure, and Flood Zones Map B.13 City of Palmer Land Use, Critical Infrastructure, and Flood Zones Map B.14 City of Red Oak Land Use, Critical Infrastructure, and Flood Zones Map B.15 City of Waxahachie Land Use, Critical Infrastructure, and Flood Zones
Map Series C	Earthquake Incidents
	Map C.1 Ellis County Earthquake Incidents Map C.2 City of Alma Earthquake Incidents Map C.3 City of Bardwell Earthquake Incidents Map C.4 City of Ennis Earthquake Incidents Map C.5 City of Ferris Earthquake Incidents Map C.6 City of Garrett Earthquake Incidents Map C.7 City of Italy Earthquake Incidents Map C.8 City of Maypearl Earthquake Incidents Map C.9 City of Midlothian Earthquake Incidents Map C.10 City of Midlothian Earthquake Incidents Map C.11 City of Oak Leaf Earthquake Incidents Map C.12 City of Ovilla Earthquake Incidents Map C.13 City of Palmer Earthquake Incidents Map C.14 City of Red Oak Earthquake Incidents Map C.15 City of Waxahachie Earthquake Incidents
Map Series D	Hail Incident Map D.1 Ellis County Hail Incidents Map D.2 City of Alma Hail Incidents Map D.3 City of Bardwell Hail Incidents Map D.4 City of Ennis Hail Incidents Map D.5 City of Ferris Hail Incidents Map D.6 City of Garrett Hail Incidents Map D.7 City of Italy Hail Incidents Map D.8 City of Maypearl Hail Incidents Map D.9 City of Midlothian Hail Incidents Map D.10 City of Midlothian Hail Incidents Map D.11 City of Oak Leaf Hail Incidents Map D.12 City of Ovilla Hail Incidents Map D.13 City of Palmer Hail Incidents

	Map D.14 City of Red Oak Hail Incidents Map D.15 City of Waxahachie Hail Incidents
Map Series E	Tornado Incident
	Map E.1 Ellis County Tornado Incidents Map E.2 City of Alma Tornado Incidents Map E.3 City of Bardwell Tornado Incidents Map E.4 City of Ennis Tornado Incidents Map E.5 City of Ferris Tornado Incidents Map E.6 City of Garrett Tornado Incidents Map E.7 City of Italy Tornado Incidents Map E.8 City of Maypearl Tornado Incidents Map E.9 City of Midlothian Tornado Incidents Map E.10 City of Milford Tornado Incidents Map E.11 City of Oak Leaf Tornado Incidents Map E.12 City of Ovilla Tornado Incidents Map E.13 City of Palmer Tornado Incidents Map E.14 City of Red Oak Tornado Incidents Map E.15 City of Waxahachie Tornado Incidents
Map Series F	Wildfire Threat
	Map F.1 Ellis County Wildfire Threat Map F.2 City of Alma Wildfire Threat Map F.3 City of Bardwell Wildfire Threat Map F.4 City of Ennis Wildfire Threat Map F.5 City of Ferris Wildfire Threat Map F.6 City of Garrett Wildfire Threat Map F.7 City of Italy Wildfire Threat Map F.8 City of Maypearl Wildfire Threat Map F.9 City of Midlothian Wildfire Threat Map F.10 City of Milford Wildfire Threat Map F.11 City of Oak Leaf Wildfire Threat Map F.12 City of Ovilla Wildfire Threat Map F.13 City of Palmer Wildfire Threat Map F.14 City of Red Oak Wildfire Threat Map F.15 City of Waxahachie Wildfire Threat
Map Series G	Wildland Urban Interface
	Map G.1 Ellis County Wildland/Urban Interface Distribution Map G.2 City of Alma Wildland/Urban Interface Distribution Map G.3 City of Bardwell Wildland/Urban Interface Distribution Map G.4 City of Ennis Wildland/Urban Interface Distribution Map G.5 City of Ferris Wildland/Urban Interface Distribution

Map G.6 City of Garrett Wildland/Urban Interface Distribution Map G.7 City of Italy Wildland/Urban Interface Distribution Map G.8 City of Maypearl Wildland/Urban Interface Distribution Map G.9 City of Midlothian Wildland/Urban Interface Distribution Map G.10 City of Milford Wildland/Urban Interface Distribution Map G.11 City of Oak Leaf Wildland/Urban Interface Distribution Map G.12 City of Ovilla Wildland/Urban Interface Distribution Map G.13 City of Palmer Wildland/Urban Interface Distribution Map G.14 City of Red Oak Wildland/Urban Interface Distribution Map G.15 City of Waxahachie Wildland/Urban Interface Distribution


















































































































































































Map G.1 Unicorporated Ellis County

Wildland Urban Interface





































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

0 0.25 0.5 0.75 1 Miles Date: 3/3/2014









Wildland Urban Interface











Map G.10 City of Mildford













TEXAS A&M FOREST SERVICE







Map G.14 City of Red Oak

















3.3 Extent

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

Drought

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

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

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

PDSI Classifications for Dry and Wet Periods	
4.00 or more	Extremely wet
3.00 to 3.99	Very wet
2.00 to 2.99	Moderately wet
1.00 to 1.99	Slightly wet
0.50 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.50 to -0.99	Incipient dry spell
-1.00 to -1.99	Mild drought
-2.00 to -2.99	Moderate drought
-3.00 to -3.99	Severe drought
-4.00 or less	Extreme drought
Sourso: http://drought.upl.odu/whatia/indiago.htm	

Figure 3.1 PDSI Classifications

Source: <u>http://drought.unl.edu/whatis/indices.htm</u>

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



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

Ellis County and participating jurisdictions experienced 32 drought events, ranging from Abnormally Dry (D1) to Exceptional Drought (D4), during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that future drought events will be of similar magnitude.
Earthquake

Mercalli Scale	Richter Scale	
1.	0 – 1.9	Not felt. Marginal and long period effects of large earthquakes.
П.	2.0 -2.9	Felt by persons at rest, on upper floors, or favorably placed.
111.	3.0 – 3.9	Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV.	4.0 - 4.3	Hanging objects swing. Vibration like passing of heavy trucks. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink the upper range of IV, wooden walls and frame creak.
V.	4.4 - 4.8	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Pendulum clocks stop, start.
VI.	4.9 - 5.4	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Books, etc., off shelves. Pictures off walls. Furniture moved. Weak plaster and masonry D cracked. Small bells ring. Trees, bushes shaken.
VII.	5.5 - 6.1	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices. Some cracks in masonry C. Waves on ponds. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.
VIII.	6.2 - 6.5	Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
IX.	6.6 - 6.9	General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. (General damage to foundations.) Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.
х	7.0 - 7.3	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.
XI.	.7.4 - 8.1	Rails bent greatly. Underground pipelines completely out of service.
XII.	> 8.1	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

Figure 3.3 Earthquake: Mercalli & Richter Scales Comparison

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

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

The Mercalli and Richter Scales allow planners to assess the impact earthquakes have. For Example, according the United States Geological Survey, a 2.7 magnitude earthquake struck near Midlothian in 2013.

Ellis County and participating jurisdictions experienced seven earthquake events, ranging from magnitude 2.4 to 3.0 on the Richter Scale, during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that future earthquake events will be of similar magnitude.

Expansive Soils





Swelling Clays Map Source: U.S. Geological Survey; Swelling Clays Map of the Conterminous U.S.

The U.S. Geological Survey map above shows the varying types of expansive soils found in Texas. The type of soil that is predominate in Ellis County contains abundant clays that have high swelling potential.

Extreme Heat



Figure 3.5 Heat Index

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

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

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

Flood Zones

Figure 3.6 Flood	Zone Cla	ssification
		The 100-year or Base Floodplain. There are six types of A zones:
	A	The base floodplains mapped by approximate methods, i.e., BFEs are not determined. This is often called an unnumbered A zone or an approximate A zone.
	A1-30	These are known as numbered A zones (e.g., A7 or A14). This is the base floodplain where the firm shows a BFE (old format).
Zone A	AE	The base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1-30 zones.
	AO	The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided.
	AH	Shallow flooding base floodplain. BFE's are provided.
	A99	Area to be protected from base flood by levees or Federal flood protection systems under construction. BFEs are not determined.
	AR	The base floodplain that results from the de-certification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection
Zone V and VE	V	The coastal area subject to velocity hazard (wave action) where BFEs are not determined on the FIRM.
	VE	The coastal area subject to velocity hazard (wave action) where BFEs are provided on the FIRM.
Zone B and	Area of	moderate flood hazard, usually the area between the limits of the 100-year and
Zone X	the 500-	year floods. B zones are also used to designate base floodplains or lesser
(shaded)	hazards	, such as areas protected by levees from the 100-year flood, or shallow flooding
	areas wi mile.	ith average depths of less than one foot or drainage areas less than 1 square
Zone C and	Area of	minimal flood hazard, usually depiction FIRMs as exceeding the 500-year flood
Zone X	level. Zo	one C may have ponding and local drainage problems that do not warrant a
(unshaded)	detailed outside	study or designation as base floodplain. Zone X is the area determined to be the 500-year flood.
Zone D	Area of	undetermined but possible flood hazards.
Courses billion //		

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

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

The planning communities are participants in the National Flood Insurance Program and actively take measures to plan land use. The communities are subject to flash flooding hazards such as the event in 2007 that occurred in the City of Ferris. According to the National Climatic Data Center, the flash flood event resulted in \$200,000 worth of property damage.

Ellis County and participating jurisdictions experienced 27 flood and flash flood events during the time period analyzed for this plan (01/01/2002-06/30/2013). Most of the flood and flash flood events were a result of excessive rainfall over a short amount of time. These events resulted mainly in over-the-road flooding and minor to moderate property damage, but flood waters as high as three-feet were reported. It can be expected that any future flood or flash flood events will be similar in magnitude.

Hail

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

Figure 3	7 Combined	NOAA/TORRO	Hailstorm	Intensity	Scales
i iguic J.			nanstonn	mensicy	ocales

The Hailstorm Intensity Scale is representative of the damage from hail storms this community has experienced in the past and will likely experience in the future. The Hailstorm Intensity Scale allows planners to gauge past damage and mitigate for future expected damage. For example, according to the National Climatic Data Center, in 2012 2.75 inch hail (H7/Tennis ball) caused \$300,000 worth of property damage in the City of Midlothian.

Ellis County and participating jurisdictions experienced 93 hail events ranging from magnitude H2 (.75 inch diameters) to magnitude H7 (2.75 inch diameters), during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that any future hail events will be similar in magnitude.

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

	Wind	WMO	Appearance of	of Wind Effects
Force	(Knots)	Classification	On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft. taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft., whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-20 ft., white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (13-20 ft.) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Whole trees in motion, resistance felt walking against wind
9	41-47	Strong Gale	High waves (20 ft.), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (20-30 ft.) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (30-45 ft.) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft., sea completely white with driving spray, visibility greatly reduced	

High Wind Figure 3.8 Beaufort Wind Scale

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

The Beaufort Wind Scale is representative of the damage from high winds this community may endure. The Beaufort Wind Scale allows planners in the community to assess historical data and mitigate for future high wind events. For example, according to the National Climatic Data Center, in 2011 the city of Waxahachie experienced Force 10 (55 knot) winds that blew down trees and fences and caused \$600,000 worth of damage. Ellis County and participating jurisdictions experienced 92 high wind events ranging from 28 knots to 78 knots (32.2 to 89.8 mph), during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that any future high wind events will be similar in magnitude.

Lightning

Figure 3.9	Lightning Activity Level Grid
Ligl A scale whic	htning Activity Level (LAL) h describes lightning activity. Values are labeled 1-6:
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5 minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud to ground strikes in a 5 minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater then 15 cloud to ground strikes in a 5 minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

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

The Lightning Activity Level grid provides a way to gauge the average number of strikes that may accompany a given type of storm. The average number of strikes is given since the density of lightning strikes varies from storm to storm. According to the National Climatic Data Center, in 2012 Waxahachie experienced \$271,000 worth of property damage from lightning.

Ellis County and participating jurisdictions experienced seven lightning events during the time period analyzed for this plan (01/01/2002-06/30/2013). The lightning events caused damage to apartment buildings, homes, and a barn. Most often the damage caused by fires started by the lightning bolt strike. It can be expected that any future lightning events will be similar in magnitude.

Tornadoes

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

Figure 3.10 Fujita Scale

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

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

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

Figure 3.11 Enhanced Fujita Scale

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

The Enhanced Fujita Scale is representative of the damage from tornadoes this community has faced in the past and will no doubt face in the future. The Enhanced Fujita Scale allows planners to prepare and mitigate future potential damage by assessing the historical nature of tornados in the planning community. For example, according to the National Climatic Data Center in 2013, an EF1 tornado occurred in the city of Ennis. The tornado caused \$650,000 worth of property damage.

Ellis County and participating jurisdictions experienced 14 tornado events ranging from F0 & EF0 to F1 & EF1, during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that any future tornado events will be similar in magnitude.

Wildfire

Figure 3.12 Keetch-Byrum Drought Index

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

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

The index scale ranges from 0 to 800 and represents moisture deficiency in hundredths of an inch. By looking at indicators of moisture deficiency in the soil in this chart, communities are able to assess when they are at a heightened danger for a wildfire. According to the National Climatic Data Center there have been three wildfire events in Ellis County since 2002. In 2011, two wildfires caused a total of \$491,000 in property damage.

Ellis County and participating jurisdictions experienced 3 wildfire events ranging from 200 acres to 600 acres, during the time period analyzed for this plan (01/01/2002-06/30/2013). It can be expected that any future wildland fire events will be similar in magnitude.

Figure 3.13 Fire Danger

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

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

Winter Storms

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

Figure 3.14 NOAA Wind Chill Chart



									Tem	pera	ture	(°F)							
		40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
(ų	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
Ľ,	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
P	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
Wi	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
	45	26	29	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98
					Frostb	ite Tin	nes	3	0 minut	es	10) minut	es	5 m	inutes				
			w	ind (hill	(°F) =	= 35.	74 +	0.62	15T ·	35.7	75(V	0.16) .	+ 0.4	275	(V ^{0.1}	16)		
						Whe	ere, T=	Air Tei	nperat	ure (°	F) V=	Wind S	speed	(mph)			Effe	ctive 1	1/01/01

Source: National Weather Service and NOAA

The Wind Chill Chart displays the frostbite times in regards to temperature and wind. This chart allows the communities to prepare for a winter storm or an ice event. These events are infrequent but can cause damage. The primary areas of concern are on bridges and roadways. For example, according to the National Climatic Data Center, in 2011 an ice storm caused \$150,000 in property damage across Ellis County.

3.15 Ice Accumulation Index

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

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

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

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

Ellis County and participating jurisdictions experienced 10 winter storm events ranging from heavy snow to ice, during the time period analyzed for this plan (01/01/2002-06/30/2013). The winter storm events ranged from 3-5 inches of snow fall, 1-3 inches of sleet, and up to $\frac{3}{4}$ of an inch of ice accumulation. It can be expected that any future events will be similar in magnitude.

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

	High	Medium	Low
Dam Failure	 Greater than 50% of city structures are in the inundation zone. Greater than 50% of the city's critical infrastructure in the identified inundation zone 	 20%-50% of city structures are in the inundation zone. 20%-50% of the city's critical infrastructure in the inundation zone 	 Less than 20% of city structures are in the inundation zone. Less than 20% of the city's critical infrastructure in the inundation zone
Drought	 PDSI "3.00- "4.00 or less Severe to extreme drought conditions 	 PDSI 1.00- 2.99 Mild to moderate drought conditions 	 PDSI 4.00 or more -'0.99 Extremely wet to incipient dry spells
Earthquake	 Mercalli Scale: VIII-XII Richter Scale: 6.2->8.1 Driving will be difficult, increase in damage to infrastructures and objects can be thrown 	 Mercalli Scale: VI-VII Richter Scale: 4.9-6.1 All will feel the event, walking will be difficult, glassware will break, irrigation ditches damaged 	 Mercalli Scale: I-V Richter Scale: 0-4.8 Range of feeling the event is cannot be felt to being felt outdoors. Doors may swing close and liquids may be disturbed.
Expansive Soils	 El Expansion Potential: 91-130 (High) El Expansion Potential: >130 (Very High) 	 El Expansion Potential: 51-90 (Medium) 	 El Expansion Potential: 21-50 (Low) El Expansion Potential: 0-21 (Very Low)
Extreme Heat	 Heat Index >130F Heatstroke or sunstroke likely 	 Heat Index 105F-129F Sunstroke, muscle cramps, and/pr heat exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity. 	 Heat Index 80F-105F Fatigue possible with prolonged exposure and/or physical activity, Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Flooding	 100yr Flood Zone, Zone A The extent of severity in the 100yr Flood Zone will be dependent on the structures and livestock located in the identified area. 	 500yr Flood Zone, Zone B The extent of severity in the 500yr Flood Zone will be dependent on the structures and livestock located in the identified area. 	 Outside of100yr and 500yr Flood Zones, Zone C, F, X Potential for flooding due to local drainage problems.
Hail	 H7-H10, 2.4"->4" There will be severe damage. Including roof and structural damage and risk of serious injuries to fatalities. 	 H5-H6, 1.6"-2.4" There will be a range of severe damage from well-constructed houses being destroyed to houses being swept away. 	 H0-H4, 0"-1.6" There will be a variance of destruction to vegetation and slight damage to glass.
Hīgh Winds	 Force: 8-12 Knots: 28-64+ Whole trees moving to considerable structure damage 	 Force: 4-6 Knots: 11-27 Dust, leaves, and loose paper lifted. Small to Large branches moving. 	 Force: 0-3 Knots: <1-10 Calm, leaves rustle, light flags extended.

Figure 3.16 Extent Charts

	High	Medium	Low
Lightning	 LAL 5Towering cumulus and thunderstorms are numerous, covering more than three-tenths of the sky. Rain is moderate/ heavy, lightning is frequent and intense. LAL 6Dry thunderstorms, conditions similar to LAL 3 	 LAL 3 Towering cumulus covering ≤2/10 of the sky. Two to three thunderstorms must occur. Light/ moderate rain, infrequent lightning LAL 4Towering cumulus covers 2/10 – 3/10 of the sky. More than three thunderstorms must occur. Moderate rain, lightning is frequent. 	 LAL 1 No thunderstorms. LAL 2 Cumulus clouds, only a few towering cumulus. A single thunderstorm must be confirmed. The clouds produce virga and occasional light rain. Infrequent lightning.
Tornado	 EF3-EF5 There will be a range of severe damage from well- constructed houses being destroyed to houses being swept away 	 EF1-EF2 There will be a range of moderate to considerate damage. Roofs will be severely stripped, manufactured homes overturned, and cars lifted off of the ground 	 EF0 There will be light damage. Roofs will be peeled off, gutters damaged, and branches broken
Wildland Fire	 KBDI 600-800 Associated with severe drought. Intense, deep- burning fires with significant downwind spotting. 	 KBDI 200-400 Ranges from lower litter and duff layers are drying and beginning to contribute to fire intensity to them causing the fire to burn actively. 	 KBDI 0-200 Soil moisture and large class fuel moistures are high and do not contribute much to fire intensity.
Winter Storms	 Temperatures 15F- ⁻45F Wind Chill 7F- ⁻98F At wind chill of ⁻19 frostbite will occur in 30 minutes increasing in severity to occurrence in 5 minutes. 	 Temperatures 30F- 20F Wind Chill 25F- ⁻4F Bridges and roadways are at risk to ice 	 Temperatures 40F- 35F Wind Chill 36F-17F Vulnerable populations and agriculture at risk to lower temperatures and wind chill.

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

	Unincorporated	Alma	Bardwell	Ennis	Ferris	Garrett
Dam Failure	Low	Low	Low	Low	Low	Low
Drought	Low	Low	Low	Medium	High	Low
Earthquake	Low	Low	Low	Low	Low	Low
Expansive Soils	Low	Low	Low	Low	Low	Low
Extreme Heat	Medium	Medium	Medium	Low	High	Medium
Flooding	Low	Low	Low	Low	Medium	Low
Hail	Low	Low	Low	High	Medium	Low
High Winds	Medium	Medium	Medium	Medium	Low	Medium
Lightning	Low	Low	Low	Medium	Low	Low
Tornado	Medium	Medium	Medium	High	Medium	Medium
Wildland Fire	Medium	Medium	Medium	Medium	High	Medium
Winter Storms	Medium	Medium	Medium	Low	Low	Medium

Table 3.1 Jurisdictional Extents

	Italy	Maypearl	Midlothian	Milford	Oak Leaf	Ovilla
Dam Failure	Low	Low	Low	Low	Low	Low
Drought	Medium	Medium	Low	High	Medium	Low
Earthquake	Low	Low	Low	Low	Low	Low
Expansive Soils	Low	Medium	Low	High	Low	Low
Extreme Heat	Medium	Medium	Medium	Low	Medium	Medium
Flooding	Medium	Low	Low	Medium	Medium	Low
Hail	Medium	Medium	Low	Medium	Low	Medium
High Winds	Medium	Medium	Low	Medium	Low	Low
Lightning	Medium	Medium	Low	Medium	Low	Low
Tornado	Medium	High	Medium	Medium	Low	Medium
Wildland Fire	Medium	Medium	Medium	Medium	Medium	Medium
Winter Storms	Medium	Medium	Medium	Medium	Medium	Low

	Palmer	Red Oak	Waxahachie
Dam Failure	Low	Low	Low
Drought	High	Med	Low
Earthquake	Low	Low	Low
Expansive Soils	Medium	Low	Low
Extreme Heat	Medium	High	Medium
Flooding	High	Medium	Low
Hail	Low	High	Low
High Winds	Low	High	Medium
Lightning	Low	Low	Low
Tornado	Medium	High	Medium
Wildland Fire	Medium	Medium	Medium
Winter Storms	Medium	Medium	Medium

3.4 Priority Risk Index

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

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

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

The higher the PRI value, the greater the hazards risk. These values were obtained by assigning varying degrees of risk to four categories for each hazard: Probability, Life Impact, Property Impact, and Spatial Extent (*Table 3.2*). Each category has been assigned an Index Value (0 to 3) and a Weighing Factor (0 – 100%). These values may be adjusted during future plan updates. In order to evaluate the risk of each hazard, the assigned PRI Value for each category is multiplied by the weighing factor. Then, the PRI for each hazard is calculated by adding the product obtained in each category. According to the weighing scheme applied for Ellis County, the highest possible PRI value is 3.0. The PRI calculations are presented in *Tables 3.2* through 3.16

A breakdown of the PRI variables and their assigned values can be seen in the chart on the following page.

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

	Category/Degree of Risk					
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value	
Dam Failure	0	0	0	0	0	
Drought	3	0	0	3	1.2	
Earthquake	0	0	0	0	0	
Expansive Soils	0	0	0	0	0	
Extreme Heat	0	0	0	0	0	
Flooding	3	0	0	1	1	
Hail	3	0	0	1	1	
High Winds	0	0	0	2	0.2	
Lightning	0	0	0	0	0	
Tornado	3	0	0	1	1	
Wildfire	2	0	0	1	0.7	
Winter Storms	2	0	0	3	0.9	

Table 3.2 Priority Risk Index for Unincorporated Ellis County

Table 3.3 Priority Risk Index for the City of Alma

	Category/Degree of Risk				
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value
Dam Failure	0	0	0	0	0
Drought	3	0	0	3	1.2
Earthquake	0	0	0	0	0
Expansive Soils	0	0	0	0	0
Extreme Heat	0	0	0	0	0
Flooding	3	0	0	1	1
Hail	3	0	0	1	1
High Winds	0	0	0	2	0.2
Lightning	0	0	0	0	0
Tornado	3	0	0	1	1
Wildfire	2	0	0	1	0.7
Winter Storms	2	0	0	3	0.9

	Category/Degree of Risk					
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value	
Dam Failure	0	0	0	0	0	
Drought	3	0	0	3	1.2	
Earthquake	0	0	0	0	0	
Expansive Soils	0	0	0	0	0	
Extreme Heat	0	0	0	0	0	
Flooding	3	0	0	1	1	
Hail	3	0	0	1	1	
High Winds	0	0	0	2	0.2	
Lightning	0	0	0	0	0	
Tornado	3	0	0	1	1	
Wildfire	2	0	0	1	0.7	
Winter Storms	2	0	0	3	0.9	

Table 3.4 Priority Risk Index for the City of Bardwell

Table 3.5 Priority Risk Index for the City of Ennis

	Category/Degree of Risk					
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value	
Dam Failure	1	0	0	1	0.4	
Drought	1	1	0	1	0.75	
Earthquake	0	1	0	0	0.35	
Expansive Soils	2	1	1	1	1.3	
Extreme Heat	1	0	0	2	0.5	
Flooding	1	1	0	1	0.75	
Hail	2	1	1	2	1.4	
High Winds	2	1	1	2	1.4	
Lightning	1	0	1	1	0.65	
Tornado	2	1	1	2	1.4	
Wildfire	1	1	1	1	1	
Winter Storms	1	0	1	2	0.75	

	Category/Degree of Risk					
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value	
Dam Failure	0	0	0	0	0	
Drought	3	0	2	2	1.6	
Earthquake	0	0	0	0	0	
Expansive Soils	3	1	2	2	1.95	
Extreme Heat	2	2	0	2	1.5	
Flooding	2	1	1	1	1.3	
Hail	2	3	3	2	2.6	
High Winds	1	0	1	1	0.65	
Lightning	1	0	0	0	0.3	
Tornado	3	3	3	3	3	
Wildfire	3	1	2	2	1.95	
Winter Storms	1	1	1	1	1	

Table 3.6 Priority Risk Index for the City of Ferris

Table 3.7 Priority Risk Index for the City of Garrett

	Category/Degree of Risk					
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value	
Dam Failure	0	0	0	0	0	
Drought	3	0	0	3	1.2	
Earthquake	0	0	0	0	0	
Expansive Soils	0	0	0	0	0	
Extreme Heat	0	0	0	0	0	
Flooding	3	0	0	1	1	
Hail	3	0	0	1	1	
High Winds	0	0	0	2	0.2	
Lightning	0	0	0	0	0	
Tornado	3	0	0	1	1	
Wildfire	2	0	0	1	0.7	
Winter Storms	2	0	0	3	0.9	

	Category/Degree of Risk				
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value
Dam Failure	0	0	0	0	0
Drought	2	0	1	2	1.05
Earthquake	0	0	0	0	0
Expansive Soils	0	0	0	0	0
Extreme Heat	1	0	1	2	0.75
Flooding	1	0	2	1	0.9
Hail	3	0	2	3	1.7
High Winds	2	1	2	3	1.75
Lightning	3	0	2	2	1.6
Tornado	2	2	2	3	2.1
Wildfire	2	1	1	2	1.4
Winter Storms	2	1	2	2	1.65

Table 3.8 Priority Risk Index for the City of Italy

Table 3.9 Priority Risk Index for the City of Maypearl

	Category/Degree of Risk				
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value
Dam Failure	0	0	0	0	0
Drought	1	1	1	2	1.1
Earthquake	0	0	1	1	0.35
Expansive Soils	1	0	0	1	0.4
Extreme Heat	3	1	0	3	1.55
Flooding	1	1	1	1	1
Hail	1	1	0	1	0.75
High Winds	2	1	1	3	1.5
Lightning	1	0	0	0	0.3
Tornado	1	2	2	2	1.7
Wildfire	1	0	1	1	0.65
Winter Storms	2	1	1	3	1.5

	Category/Degree of Risk				
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value
Dam Failure	0	0	0	0	0
Drought	2	0	0	3	0.9
Earthquake	0	0	0	2	0.2
Expansive Soils	3	0	1	2	1.35
Extreme Heat	2	0	0	3	0.9
Flooding	0	0	0	0	0
Hail	2	0	1	2	1.05
High Winds	3	0	1	3	1.45
Lightning	1	0	0	0	0.3
Tornado	1	1	1	1	1
Wildfire	2	0	0	1	0.7
Winter Storms	1	0	1	3	0.85

Table 3.10 Priority Risk Index for the City of Midlothian

Table 3.11 Priority Risk Index for the City of Milford

	Category/Degree of Risk				
Hazard	Probability	Life Impact	Property Impact	Spatial Extent Index Value	Index Value
Dam Failure	0	0	0	0	0
Drought	2	0	0	2	0.8
Earthquake	0	0	0	0	0
Expansive Soils	2	0	0	3	0.9
Extreme Heat	2	0	0	3	0.9
Flooding	0	0	0	0	0
Hail	2	0	0	1	0.7
High Winds	2	0	0	1	0.7
Lightning	0	0	0	0	0
Tornado	1	0	0	1	0.4
Wildfire	3	0	0	0	0.9
Winter Storms	1	1	0	3	0.95

	Category/Degree of Risk				
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value
Dam Failure	0	0	0	0	0
Drought	1	0	0	3	0.6
Earthquake	0	0	0	0	0
Expansive Soils	1	0	0	0	0.3
Extreme Heat	0	0	0	3	0.3
Flooding	1	0	1	2	0.75
Hail	0	0	0	3	0.3
High Winds	1	1	1	1	1
Lightning	1	0	0	0	0.3
Tornado	1	0	1	2	0.75
Wildfire	1	0	0	2	0.5
Winter Storms	1	0	0	3	0.6

Table 3.12 Priority Risk Index for the City of Oak Leaf

Table 3.13 Priority Risk Index for the City of Ovilla

	Category/Degree of Risk				
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value
Dam Failure	0	0	0	0	0
Drought	1	0	0	3	0.6
Earthquake	0	0	0	1	0.1
Expansive Soils	0	0	0	0	0
Extreme Heat	1	1	0	3	0.95
Flooding	0	0	0	0	0
Hail	1	1	0	1	0.75
High Winds	1	1	0	1	0.75
Lightning	1	0	0	1	0.4
Tornado	1	1	0	0	0.65
Wildfire	0	0	0	0	0
Winter Storms	0	0	1	2	0.45

	Category/Degree of Risk				
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value
Dam Failure	0	0	0	0	0
Drought	2	0	0	3	0.9
Earthquake	0	0	0	2	0.2
Expansive Soils	2	0	0	3	0.9
Extreme Heat	2	1	0	3	1.25
Flooding	1	0	0	1	0.4
Hail	2	0	0	0	0.6
High Winds	2	0	0	3	0.9
Lightning	2	0	0	0	0.6
Tornado	1	2	3	1	1.85
Wildfire	2	0	0	1	0.7
Winter Storms	3	0	0	3	1.2

Table 3.14 Priority Risk Index for the City of Palmer

Table 3.15 Priority Risk Index for the City of Red Oak

	Category/Degree of Risk				
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value
Dam Failure	0	0	0	0	0
Drought	3	0	0	0	0.9
Earthquake	0	0	0	0	0
Expansive Soils	0	0	0	0	0
Extreme Heat	3	1	0	3	1.55
Flooding	2	1	0	1	1.05
Hail	1	0	0	1	0.4
High Winds	1	0	0	0	0.3
Lightning	0	0	0	0	0
Tornado	1	1	1	1	1
Wildfire	3	1	1	2	1.7
Winter Storms	1	0	0	2	0.5

	Category/Degree of Risk				
Hazard	Probability Index Value	Life Impact Index Value	Property Impact Index Value	Spatial Extent Index Value	Index Value
Coastal Erosion	0	0	0	0	0
Dam Failure	0	0	0	0	0
Drought	3	0	0	1	1
Earthquake	0	0	0	0	0
Expansive Soils	0	0	0	0	0
Extreme Heat	0	0	0	0	0
Flooding	3	0	0	1	1
Hail	3	0	0	1	1
High Winds	0	0	0	2	0.2
Hurricane/Tropical Storm	0	0	0	0	0
Land Subsidence	0	0	0	0	0
Lightning	1	0	1	1	0.65
Tornado	3	0	0	1	1
Wildfire	2	0	0	0	0.6
Winter Storms	2	0	0	3	0.9

Table 3.16 Priority Risk Index for the City of Waxahachie

The conclusions drawn from the hazard profiling process for Ellis County jurisdictions, resulted in the classification of risk for each identified hazard according to four categories: High Risk, Moderate Risk, Low Risk, and Negligible to No Risk *(Tables 3.17 through 3.31)*. For purposes of these classifications, risk is expressed in relative terms according to the probability of occurrence and estimated impact that a hazard will have on human life and property in Ellis County.

Table 3.17 Filis County

Ellis County	
High Risk	
(PRI 2 - 3)	
Moderate Risk	Drought
(PRI 1.1 -1.9)	
Low Risk	Tornado
(PRI 0.50 – 1)	Hail
	Flooding
	Winter Storms
	Wildfire
Negligible to No Risk	High Winds
(PRI 0 – 0.49)	Extreme Heat
	Earthquake
	Expansive Soils
	Lightning
	Dam Failure

Alma **High Risk** (PRI 2 - 3) Moderate Risk Drought (PRI 1.1 -1.9) Low Risk Tornado (PRI 0.50 - 1) Hail Flooding Winter Storms Wildfire Negligible to No High Winds Risk (PRI 0 - 0.49) Extreme Heat Earthquake Expansive Soils Lightning Dam Failure

Table 3.18

Table 3.20

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

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

Table 3.21

Ferris

High Risk	Tornado
(TIGH KISK	Torriado
(PRI 2 - 3)	Hail
Moderate Risk	Expansive Soils
(PRI 1.1 -1.9)	Wildfire
	Drought
	Extreme Heat
	Flooding
Low Risk	Winter Storms
(PRI 0.50 – 1)	
Negligible to No Risk	High Winds
(PRI 0 – 0.49)	Lightning
, , ,	Earthquake
	Dam Failure
	Dani i anule

Table 3.23

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

Garrett	
•••••••	

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

Table 3.24	
Maynearl	

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

Table 3.25

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

Table 3.27

Oak Leaf	
High Risk	
(PRI 2 - 3)	
Moderate Risk	
(PRI 1.1 -1.9)	
Low Risk	High Winds
(PRI 0.50 – 1)	Tornado
	Flooding
	Winter Storms
	Drought
	Wildfire
Negligible to	Hail
No Risk	Expansive Soils
(PRI 0 – 0.49)	Extreme Heat
	Lightning
	Earthquake
	Dam Failure

Table 3.26

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

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

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

Table	3.30
-------	------

Rod	Cal
NEU	Jar

Red Oak	
High Risk	
(PRI 2 - 3)	
Moderate Risk	Wildfire
(PRI 1.1 -1.9)	Extreme Heat
	Flooding
Low Risk	Tornado
(PRI 0.50 – 1)	Drought
	Winter Storms
Negligible to	Hail
No Risk	High Winds
(PRI 0 – 0.49)	Earthquake
	Expansive Soils
	Lightning
	Dam Failure

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

Vulnerability Assessment

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

This page intentionally left blank.

3.5 Identification of Assets

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

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

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

Population

According to the U.S. Census 2010 block data provided by NCTCOG, the total population of Ellis County in 2010 was 149,610 people, with 39,071 households. The count breakdown by municipal jurisdiction is provided in *Table 3.1*.

	Population		Households			
Jurisdiction	Population	% of County Total	Population Density (Sq. Mile)	Household	% of County Total	Household Density (Sq. Mile)
Ellis County*	58,115	38.80	70.75	7,751	19.84	9.44
Alma	331	.22	66.2	112	0.29	22.4
Bardwell	649	.43	194.7	191	0.49	57.3
Ennis	18,531	12.38	1007.12	6,191	15.85	336.47
Ferris	2,436	1.62	508.77	785	2.01	163.95
Garrett	806	.53	214.8	227	0.59	35.1
Italy	1,863	1.24	1035	650	1.66	361.11
Maypearl	934	.62	467	299	0.77	149.5
Midlothian	18,037	12.07	475.91	6,138	15.71	161.95
Milford	728	.49	404.44	272	0.70	151.11
Oak Leaf	1,298	.87	564.35	459	1.17	199.57
Ovilla	3,492	2.33	612.63	1,252	3.20	219.65
Palmer	2,000	1.34	714.29	628	1.61	224.29
Red Oak	10,769	7.20	1380.64	3,659	9.37	469.10
Waxahachie	29,621	19.80	718.96	10,457	26.76	253.81
Total	149,610**	-	157.15	39,071**	-	41.04

Table 3.32 Ellis County Population Counts

Source: 2010 Census Data

* County unincorporated areas

**Includes totals from incorporated jurisdictions not participating in the plan

Table 3.33 summarizes population counts and population chance (absolute and percent predications for Ellis County).

Table 3.33 Population Predictions

County	Population 2010 Census	Population 2012 Estimate	Population 2013 Estimate	Absolute Change 2012-2013	Percent (%) Change 2012- 2013
Ellis	149,610	152,580	154,700	2,120	1.4

Source: 2010 Census Data

Property

There are an estimated 69,899 parcels in Ellis County, with an estimated \$7,348,342,877 in total assessed value of, *Table 3.34* lists the total number and percentage of parcels by jurisdiction.

Table 3.34 Parcel Counts and Improvements value

Jurisdiction	Number of Parcels	% of County Total	Total Assessed Value of Improvements (Buildings) ¹
Ellis County*	25,425	36.37%	\$1,943,569,149
Alma	207	0.30%	\$6,724,569
Bardwell	279	0.40%	\$7,555,960
Ennis	7,753	11.09%	\$897,738,563
Ferris	1,350	1.93%	\$93,063,658
Garrett	301	0.43%	\$9,042,810
Italy	1,097	1.57%	\$53,303,590
Maypearl	539	0.77%	\$77,814,115
Midlothian	8,861	12.68%	\$1,685,544,407
Milford	490	0.70%	\$14,152,552
Oak Leaf	710	1.02%	\$80,111,901
Ovilla	1,547	2.21%	\$208,732,335

Hazard Mitigation Action Plan

Jurisdiction	Number of Parcels	% of County Total	Total Assessed Value of Improvements (Buildings) ¹
Palmer	1,039	1.49%	\$45,266,827
Red Oak	4,851	6.94%	\$525,035,039
Waxahachie	12,458	17.82%	\$1,504,925,759
Total	69,899		\$7,348,342,877

Source: County Data and Regional Hazard Assessment Tool

* Ellis County unincorporated areas

¹ Includes public buildings (residential, commercial, industrial, agricultural, religion, government, education)

Emergency Facilities

There are 49 identified emergency facilities in Ellis County, including 28 fire stations, 15 police stations, and three hospitals. *Table 3.35* presents the distribution of emergency facilities by jurisdiction. Geographic coordinates were used to determine the location of each facility.

Jurisdiction	Fire Stations	Police Stations	Hospitals
Ellis County	7	2	0
Alma	1	0	0
Bardwell	1	1	0
Ennis	2	1	1
Ferris	2	1	0
Garrett	1	1	0
Italy	1	1	0
Maypearl	1	1	0
Midlothian	3	1	0
Milford	1	1	0

Table 3.35 Emergency Facilities
Jurisdiction	Fire Stations	Police Stations	Hospitals
Oak Leaf	0	0	0
Ovilla	1	1	0
Palmer	1	1	0
Red Oak	3	2	0
Waxahachie	3	1	2
TOTAL	28	15	3

Source: County Data and Regional Hazard Assessment Tool

* Ellis County unincorporated areas

Critical Facilities

There are 338 critical facilities, which are considered non-emergency in Ellis County. The critical facilities include 34 schools and 304 historical property sites (*Table 3.36*). Geographic coordinates (i.e., latitude and longitude) were used to determine the location of each facility.

Table 3.36 Critical Facilities

Jurisdiction	Schools	Historical Property
Ellis County	1	122
Alma	0	0
Bardwell	0	22
Ennis	11	487
Ferris	6	35
Garrett	0	0
Italy	2	0
Maypearl	1	0
Midlothian	10	2
Milford	1	2
Oak Leaf	0	0

Hazard Mitigation Action Plan

Jurisdiction	Schools	Historical Property
Ovilla	1	0
Palmer	1	12
Red Oak	7	1
Waxahachie	13	287
Total	34	304

Source: Local jurisdictions

* Ellis County unincorporated areas

Critical Infrastructure

There are 767 identified critical infrastructure facilities in Ellis County including four airports, 25 natural gas facilities, 19 water treatment facilities, 19 potable water treatment facilities, 117 dams, 531 railway/highway bridges, 16 Electrical substations, and 51 water storage facilities. The number of facilities in each jurisdiction is displayed in *Table 3.37*.

Table 3.37 Critical Infrastructure

Jurisdiction	Airports	Natural Gas Facilities	Wastewater Treatment Facilities	Potable Water Treatment Facilities	Dams	Railway/ Highway Bridges	Electrical Substations	Water Storage Facilities
Ellis County	0	5	2	7	103	425	5	17
Alma	0	1	0	0	0	2	1	2
Bardwell	0	1	1	1	0	0	1	2
Ennis	1	11	1	1	1	33	3	2
Ferris	0	0	0	0	0	4	1	5
Garrett	0	0	0	0	0	1	1	2
Italy	0	1	1	1	0	1	1	3
Maypearl	0	1	1	1	3	0	0	2
Midlothian	1	1	1	2	0	31	7	2
Milford	0	1	1	1	3	3	0	1

Jurisdiction	Airports	Natural Gas Facilities	Wastewater Treatment Facilities	Potable Water Treatment Facilities	Dams	Railway/ Highway Bridges	Electrical Substations	Water Storage Facilities
Oak Leaf	0	0	0	0	0	2	0	0
Ovilla	0	0	0	0	0	1	0	0
Palmer	0	1	1	0	0	3	1	2
Red Oak	1	0	0	0	0	1	0	5
Waxahachie	1	2	10	5	7	24	2	8
Total	4	25	19	19	117	531	23	53

Source: NID, Ellis County OEM, Local jurisdictions

* Ellis County unincorporated areas

This page intentionally left blank.

3.6 Methodology

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

Of the 12 hazards evaluated for Ellis County, four were analyzed using a Geographic Information System-based analysis, five using a statistical risk assessment methodology, and the remaining four hazards using a qualitative analysis. The qualitative analysis was limited to three of the hazards due to lack of information, the inability to define specific areas of risk, and/or inexistence of historical records. Additional information regarding these events is unattainable at the present time, but will be an objective in the five-year planning cycle update. *Table 3.38* summarizes the methodology used for each hazard.

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

Table 3.38 Analysis used for Vulnerability Assessment

3.7 Summary of Vulnerably Assessment

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

	Drought
Population	According to National Climatic Data Center (NCDC) there have been zero injuries or fatalities recorded for drought events. There are no personal losses expected from drought events.
Improved Property	According to National Climatic Data Center (NCDC), no loss per year can be expected in property loss due to damage from drought. Available historical data indicates that the expected losses from drought correspond to crop losses in the amount of \$17,043.48 per year, mostly experienced in water shortages and crop losses on agricultural lands.
Emergency Facilities	Because of the nature of this hazard, there are no losses or direct impacts expected on emergency facilities due to drought events.
Critical Facilities	Because of the nature of this hazard, there are no losses or direct impacts expected on critical facilities due to drought events.
Critical Infrastructure	Because of the nature of this hazard, there are no losses or direct impacts expected on critical infrastructure due to drought events.

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

	Flooding
Population	Flooding produces an expected annualized count of 0.17 fatalities and injuries per year.
Improved Property	A loss of \$486,956.5 per year can be expected in property loss due to flooding, and 21.85% of the total assessed value of improvements in Ellis County is at risk from the 100-year storm event.
Emergency Facilities	There are no emergency facilities at imminent risk from the 100- year storm event.
Critical Facilities	There are 66 critical facilities located within the 100-year storm event.
Critical Infrastructure	0% of railways/highways and bridges, 64% of dams, 0% of water treatment works, .05% waste water treatment facilities, and 0% natural gas and 0% airports are at risk from the 100-year storm event. Many of these structures are designed to traverse or be located within the floodplain due to unavoidable circumstances. Additionally, treated wastewater is typically discharged towards streams, which makes portions of wastewater treatment facilities likely to be located within the floodplain.

	Hail
Population	According to National Climatic Data Center (NCDC), zero injuries and fatalities have been recorded for hailstorm events. There are no personal losses expected from hailstorm events.
Improved Property	According to National Climatic Data Center (NCDC), a loss of \$124,173.91 per year can be expected in property damage due to hail, and all improved property is exposed to this hazard. Although some crops are susceptible to hail hazards, available historical data for Ellis County indicates that there are no expected crop losses from this event.
Emergency Facilities	Because of the unpredictability of the geographical location of hailstorms, all emergency facilities in Ellis County are exposed to this hazard.
Critical Facilities	Because of the unpredictability of the geographical location of hailstorms, all critical facilities in Ellis County are exposed to this hazard.
Critical Infrastructure	Because of the unpredictability of the geographical location of hailstorms, all critical infrastructures in Ellis County are exposed to this hazard.

	High Wind
Population	According to National Climatic Data Center (NCDC), there are zero injuries and fatalities from high wind events recorded in Ellis
•	County. All the population of Ellis County is exposed to this hazard.
	According to National Climatic Data Center (NCDC), an average
Improved Property	loss of \$148,434.78 per year in property losses is expected from
Improved Property	high wind events in Ellis County. No crop losses resulted from this
	hazard in Ellis County.
	Because of the expected geographical widespread nature of high
Emergency Facilities	winds, all emergency facilities in Ellis County are exposed to this
	hazard.
Critical Eacilities	Because of the expected geographical widespread nature of high
Critical Facilities	winds, all critical facilities in Ellis County are exposed to this hazard.
Critical Infrastructure	Because of the expected geographical widespread nature of high
	winds, all critical infrastructures in Ellis County are exposed to this
	hazard.

Lightning								
Population	According to National Climatic Data Center (NCDC), there have been zero injuries and fatalities from lightning recorded in Ellis							
	County. All the population of Ellis County is exposed to this hazard.							
Improved Property	According to National Climatic Data Center (NCDC), an average loss of \$52,695.65 per year in property damage from lightning is expected in Ellis County. There have been no crop losses resulting from lightning in Ellis County.							
Emergency Facilities	Because of the expected geographical widespread nature of lightning, all emergency facilities in Ellis County are exposed to this hazard.							
Critical Facilities	Because of the expected geographical widespread nature of lightning, all critical facilities in Ellis County are exposed to this hazard.							
Critical Infrastructure	Because of the expected geographical widespread nature of lightning, all critical infrastructures in Ellis County are exposed to this hazard.							

Tornado								
Population	According to National Climatic Data Center (NCDC), there has been one recorded injuries and no fatalities due to tornado events in Ellis County. All the population of Ellis County is exposed and							
	vulnerable to this hazard.							
Improved Property	According to National Climatic Data Center (NCDC), an average loss of \$96,173.91 per year in property losses is expected to result from tornado events, with \$260.87 per year in crop losses from this hazard in Ellis County.							
Emergency Facilities	Because of the impossibility to predict the geographical area of impact for tornados, all emergency facilities in Ellis County are exposed to this hazard.							
Critical Facilities	Because of the impossibility to predict the geographical area of impact for tornados, all critical facilities in Ellis County are exposed to this hazard.							
Critical Infrastructure	Because of the impossibility to predict the geographical area of impact for tornados, all critical infrastructures in Ellis County are exposed to this hazard.							

Wildfire									
Population	Based on geographical data, approximately 80% of Ellis County is vulnerable to wildfires.								
Improved Property	Based on geographical data, a loss of \$42,695.65 per year can be expected in property loss due to wildfires, which is 74.05% of the overall property improvement values across Ellis County.								
Emergency Facilities	Based on geographic information there are 11 fire stations at risk from wildfire events.								
Critical Facilities	Based on geographic information there are 54 schools at risk from wildfire events.								
Critical Infrastructure	Based on geographic information there are 0 bridges, 117 dams, 11 wastewater treatment facilities, and 0 water treatment facilities at risk from wildfire events.								

	Winter Storm
Population	According to National Climatic Data Center (NCDC), there have been zero injuries or fatalities from winter storms recorded in Ellis
	County. All the population of Ellis County is exposed to this hazard.
Improved Property	According to National Climatic Data Center (NCDC), an average loss of \$21,739.13 per year in property losses is expected to result from winter storm events. No crop losses are expected from this hazard in Ellis County.
Emergency Facilities	Because of the expected geographical widespread nature of winter storms, all emergency facilities in Ellis County are exposed to this hazard.
Critical Facilities	Because of the expected geographical widespread nature of winter storms, all critical facilities in Ellis County are exposed to this hazard.
Critical Infrastructure	Because of the expected geographical widespread nature of winter storms, all critical infrastructures in Ellis County are exposed to this hazard.

This page intentionally left blank.

3.8 Geographic Information System Based Analysis

For the Geographic Information System-based assessment, digital data was collected from local, state, and national sources. ESRI® ArcMap[™] 10.2 was used to assess risk utilizing digital data, which included local tax records for individual parcels and geo-referenced point locations for buildings and critical facilities.

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

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

Drought

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

Since crop losses are expected to be the most vulnerable assets for this hazard, agricultural land acreage was acquired from the USGS land cover classification data to estimate the relative area of Ellis County that would be affected by this event. *Table 3.39* below provides the distribution of agricultural land for each jurisdiction in Ellis County. Ellis County has a total of 565,006 acres of agricultural lands, which represents approximately 44.59% of Ellis County territory, with the vast majority located in the unincorporated areas.

Jurisdiction	Total Acres	Agricultural Land Acres	Percentage (%) of Total Acres
	400 704	400.005	11.000/
Ellis County	408,761	183,365	44.86%
Alma	2,873	2,754	95.86%
Bardwell	511	382	74.76%
Ennis	27,203	11,985	44.06%
Ferris	4,257	449	10.55%
Garrett	1,085	587	54.10%
Italy	3,002	1,481	49.33%
Maypearl	5,956	1,689	28.36%
Midlothian	42,256	17,707	41.90%
Milford	2,739	886	32.35%
Oak Leaf	2,310	906	39.22%
Ovilla	4,274	1,553	36.34%
Palmer	4,311	2,160	50.10%
Red Oak	13,476	7,429	55.13%
Waxahachie	41,992	18,582	44.25%
Total	565,006	251,915	44.59%

Table 3.39 Agricultural Land in Ellis County

Sources: Local jurisdictions; GIS data

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

Table 3.40 presents Ellis County's recorded historical losses due to drought events as provided in the hazard events database obtained from the National Climatic Data Center. Property and personal losses in each expected in each jurisdiction are presented in *Table 3.40*.

Jurisdiction	Date	Fatalities	Injuries	Property Damage	Annualized Expected Property Losses	Crop Damage	Annualized Expected Crop Loss	Annualized Expected Crop Loss per Acre
	7/1/2005	0	0	0	\$0	\$0	\$0	\$0
	8/1/2005	0	0	0	\$0	\$0	\$0	\$0
Ellis	9/1/2005	0	0	0	\$0	\$0	\$0	\$0
County	10/1/2005	0	0	0	\$0	\$0	\$0	\$0
Territory	11/1/2005	0	0	0	\$0	\$0	\$0	\$0
	12/1/2005	0	0	0	\$0	\$0	\$0	\$0
	1/1/2006	0	0	0	\$0	\$0	\$0	\$0
	2/1/2006	0	0	0	\$0	\$0	\$0	\$0
	3/1/2006	0	0	0	\$0	\$0	\$0	\$0
	4/1/2006	0	0	0	\$0	\$0	\$0	\$0
	5/1/2006	0	0	0	\$0	\$0	\$0	\$0
	6/6/2006	0	0	0	\$0	\$0	\$0	\$0
	7/1/2006	0	0	0	\$0	\$0	\$0	\$0
	8/1/2006	0	0	0	\$0	\$0	\$0	\$0
	9/1/2006	0	0	0	\$0	\$0	\$0	\$0

Table 3.40 Historical Annualized Losses Due to Drought (01/01/2002 – 06/30/2013)

Jurisdiction	Date	Fatalities	Injuries	Property Damage	Annualized Expected Property Losses	Crop Damage	Annualized Expected Crop Loss	Annualized Expected Crop Loss per Acre
	4/17/2011	0	0	0	\$0	\$15,000	\$1,304.35	\$0.01
	5/1/2011	0	0	0	\$0	\$15,000	\$2,608.70	\$0.01
	6/1/2011	0	0	0	\$0	\$20,000	\$4,347.83	\$0.01
	7/1/2011	0	0	0	\$0	\$15,000	\$5,652.17	\$0.01
	8/1/2011	0	0	0	\$0	\$50,000	\$10,000	\$0.02
	9/1/2011	0	0	0	\$0	\$30,000	\$12,608.70	\$0.02
	10/1/2011	0	0	0	\$0	\$20,000	\$14,347.83	\$0.02
	11/1/2011	0	0	0	\$0	\$7,000	\$14,956.52	\$0.03
Ellis	12/1/2011	0	0	0	\$0	\$7,000	\$15,565.22	\$0.03
County	1/1/2012	0	0	0	\$0	\$4,000	\$15,913.04	\$0.03
Territory	11/13/2012	0	0	0	\$0	\$2,000	\$16,086.96	\$0.03
	12/1/2012	0	0	0	\$0	\$2,000	\$16,260.87	\$0.03
	1/1/2013	0	0	0	\$0	\$1,000	\$16,347.83	\$0.03
	2/1/2013	0	0	0	\$0	\$2,000	\$16,521.74	\$0.03
	3/19/2013	0	0	0	\$0	\$1,000	\$16,608.70	\$0.03
	4/1/2013	0	0	0	\$0	\$3,000	\$16,869.57	\$0.03
	6/18/2013	0	0	0	\$0	\$2,000	\$17,043.48	\$0.03
Total	33	0	0	0	\$0	\$196,000	\$17,043.48	\$0.03

Source: National Climatic Data Center

As described on Section 3.6, calculations of annualized losses due to drought events were conducted using historical data obtained from the National Climatic Data Center (*Table 3.40*). The annualized loss value can be interpreted as the impact expected from drought in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.40*, Ellis County can expect approximately an annual \$0 in property losses, and \$17,043.48 in crop losses each year as a result of drought, with no injuries or fatalities expected from this event.

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

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

- <u>Population</u>: According to National Climatic Data Center (NCDC) zero injuries or fatalities have been recorded for drought events. There are no personal losses expected from drought events. All the population of Ellis County is exposed to this hazard, but there are no personal losses expected from drought events.
- Improved Property: According to National Climatic Data Center (NCDC), a loss of \$0 per year can be expected in property loss due to damage from drought. Available historical data indicates that the expected losses from drought correspond to crop losses in the amount of \$17,043.48 per year, mostly experienced in water shortages and crop losses on agricultural lands.
- <u>Emergency Facilities</u>: Because of the nature of this hazard, there are no losses or direct impacts expected on emergency facilities due to drought events.
- <u>Critical Facilities</u>: Because of the nature of this hazard, there are no losses or direct impacts expected on critical facilities due to drought events.
- <u>Critical Infrastructure</u>: Because of the nature of this hazard, there are no losses or direct impacts expected on critical infrastructure due to drought events.

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

Flood

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

Table 3.41 presents Ellis County's recorded historical losses due to flooding as provided in the hazard events database obtained by National Climatic Data Center. Although specific data is provided by jurisdiction, the figures presented may reflect the place where the event was more relevant or where it started.

Location	Date	Time	Event	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
Waxahachie	4/16/2002	20:00	Flash Flood	-	0	0	\$0	\$0
Red Oak	6/28/2004	13:07	Flash Flood	-	0	0	\$0	\$0
Waxahachie	6/28/2004	10:05	Flash Flood	-	0	0	\$0	\$0
Waxahachie	6/29/2004	17:35	Flash Flood	-	0	0	\$0	\$0
Ovilla	7/29/2004	4:00	Flash Flood	-	2	0	\$0	\$0
Waxahachie	7/29/2004	0:28	Flash Flood	-	0	0	\$5,000,000	\$0
Avalon	1/2/2005	17:47	Flash Flood	-	0	0	\$25,000	\$0
East Portion	7/14/2005	20:30	Flash Flood	-	0	0	\$O	\$0
Waxahachie	3/19/2006	14:30	Flash Flood	-	0	0	\$0	\$0
Waxahachie	3/29/2007	18:00	Flash Flood	-	0	0	\$100,000	\$0
Ferris	3/30/2007	20:30	Flash Flood	-	0	0	\$200,000	\$0

Table 3.41 Historical Annualized Losses Due to Flood Events (01/01/2002-06/30/2013)

Maypearl	5/27/2007	1:30	Flash Flood	-	0	0	\$0	\$0
Ferris	6/17/2007	12:23	Flash Flood	-	0	0	\$0	\$0
Waxahachie	6/17/2007	12:23	Flash Flood	-	0	0	\$0	\$0
Palmer	6/26/2007	17:32	Flash Flood	-	0	0	\$0	\$0
Waxahachie	7/1/2007	17:00	Flash Flood	-	0	0	\$0	\$0
Ennis	7/5/2007	9:41	Flash Flood	-	0	0	\$0	\$0
Midlothian	9/5/2007	2:00	Flash Flood	-	0	0	\$25,000	\$0
Red Oak	9/5/2007	6:30	Flash Flood	-	0	0	\$20,000	\$0
Ferris	3/18/2008	17:30	Flash Flood	-	0	0	\$0	\$0
Red Oak	3/18/2008	13:05	Flash Flood	-	0	0	\$0	\$0
Ward	3/18/2008	12:12	Flash Flood	-	0	0	\$55,000	\$0
Britton	9/13/2009	8:58	Flash Flood		0	0	\$75,000	\$0
Britton	9/13/2009	12:30	Flood	-	0	0	\$20,000	\$0
Neals lvy	10/13/200 9	8:00	Flash Flood	-	0	0	\$10,000	\$0
Neals Ivy	10/13/200 9	14:30	Flood	-	0	0	\$50,000	\$0
Milford	9/8/2010	9:25	Flash Flood	-	0	0	\$0	\$0
Totals:	-	-	Flood /Flash Flood	-	2	0	\$5,600,000	\$0

Source: National Climatic Data Center

As described in Section 3.6, calculations of annualized losses due to flooding events were conducted using historical data obtained from National Climatic Data Center (*Table 3.41*). The annualized loss value can be interpreted as the impact expected from flooding in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.41*, Ellis County can expect a total property loss of \$486,956.50 each year as a result of flooding, with 0.17 fatalities, no crop losses and no injuries.

In order to assess flood risk and vulnerability of the identified assets, a Geographic Information System-based analysis was conducted to estimate exposure to flood events using Federal Emergency Management Agency's digital 100-year floodplain in combination with Ellis Central Appraisal District property records.

By overlaying the geo-referenced assets and the floodplain layers using Geographic Information System, the number of emergency facilities, critical facilities, and critical infrastructure located within the 100-year floodplain was calculated (*Figures 3.40-3.42*). Although, having a facility located within the floodplain does not necessarily imply that would be impacted by the 100-year storm event (e.g., the building could be flood-proofed, or the buildings may be constructed above the 100-year elevation), it provides with a good approximation of potential impacts from flooding.

According to the analysis conducted, 64.05% emergency or critical facilities are located within the 100-year floodplain. Critical infrastructure located within the 100-year floodplain is presented in *Table 3.42*.

		Critical Infrastructure											
Jurisdiction	Railway/ Highway Bridges		Water Dams Treatment Facilities		Waste Water Treatment Facilities		Natural Gas		Airports				
	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)	Total	Percentage (%)	
Ellis County	0	0%	65	64%	0	0%	1	.05%	0	0%	0	0%	
Total	0	0%	65	64%	0	0%	1	.05%	0	0%	0	0%	

Table 3.42 Critical Infrastructure Located in 100-year FEMA Floodplain

Source: Regional Hazard Assessment Tool, and local jurisdictions

* Ellis County unincorporated areas

As noted in *Table 3.42*, the total and percentage of critical infrastructure located within the 100year floodplain corresponds to approximately 0% of railway/highway bridges, 64% of dams, 0% of water treatment works, 1% wastewater treatment works, 0% of natural gas sites, and 0% of airports.

Vulnerability to flooding can also be measured by assessing the number of people and buildings exposed to flood events. *Table 3.43* shows Population and Improved Property at risk from flooding events.

The determination of population vulnerability was calculated by adding the total population for those 2000 Census blocks that had at least some portion located within the 100-year floodplain. The determination of property value at-risk (exposure) was calculated adding the total assessed building values for only those parcels that were confirmed to have at least one building located within the 100-year floodplain.

Jurisdiction	Residential Parcels located in the 100- year Floodplain	Percentage of Total Residential Parcels located in the 100-year Floodplain	Commercial and Utility parcels in the 100- year Floodplain	Percentage of Commercial and Utility Parcels in the 100-year Floodplain
Ellis County	2025	11.63%	71	20.76%
Alma	23	17.42%	1	9.09%
Bardwell	18	9.05%	5	21.74%

Table 3.43 Residential Parcels and Buildings potentially located within the 100-year floodplain

Jurisdiction	Residential Parcels located in the 100- year Floodplain	Percentage of Total Residential Parcels located in the 100-year Floodplain	Commercial and Utility parcels in the 100- year Floodplain	Percentage of Commercial and Utility Parcels in the 100-year Floodplain
Ennis	210	4.03%	85	12.20%
Ferris	14	1.75%	4	2.90%
Garrett	0	0.00%	0	0.00%
Italy	48	6.79%	9	8.65%
Maypearl	0	0.00%	34	58.62%
Midlothian	0	0.00%	103	28.53%
Milford	0	0.00%	2	6.25%
Oak Leaf	116	21.60%	1	12.50%
Ovilla	0	0.00%	5	15.15%
Palmer	47	6.81%	5	6.33%
Red Oak	0	0.00%	22	6.85%
Waxahachie	0	0.00%	184	19.51%
Total	2,501	5.40%	531	16.80%

Source: Regional Hazard Assessment Tool, National Climatic Data Center, and local jurisdictions

* Ellis County unincorporated areas

As it can be observed in *Table 3.43*, approximately 5.40% of the population of Ellis County, and 16.80% of its buildings are exposed to impacts from flooding events.

Since Ellis County is composed by large areas used for cropland, an analysis was conducted to determine the vulnerability of the land to flooding relative to the type of land cover (*Table 3.44*). The calculations were made using Geographic Information System. The USGS land cover shapefile was clipped with the 100-year floodplain to calculate the area (acreage) of each land cover type potentially affected by flooding. Reservoirs, streams, and channels were excluded from the calculations.

Land Cover Type	Total Areas For Ellis County (Acres)	Total Area Affected By 100- year Flood (Acres)	Percentage of Area Affected By 100- year Flood (%)
Commercial	22,165	12,830	57.88%
Utilities	117	1	0.85%
Residential	49,282	8,838	17.93%
Farmland/Undeveloped	416,561	268,238	64.39%
Total	488,125	289,907	59.39%

Table 3.44 Land Cover 1	vpes and Acreage	located within the	100-year Floodplain
	·)		

Source: Ells County Appraisal District

As observed, on average only approximately 59.39% of the total area of Ellis County is located within the 100-year floodplain. Note, that a higher percentage than the average of the total industrial land (64.39%) and the urban/built-up land (57.88%) is located within the floodplain. Approximately 30.28% of the land cover located within the 100-year floodplain is developed. The remaining 69.72% is undisturbed rangelands, forests, or wetlands.

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

- <u>Population</u>: Based on historical data, flooding produces an expected annualized zero injuries and fatalities per year. In total, 5.4% of the population of Ellis County is located within the 100-year floodplain.
- <u>Improved Property</u>: Based on historical data, a total of \$5,600,000 per year can be expected in property loss due to flooding, with no expected crop losses. Based on geographic information and assuming that a facility is within the 100-year floodplain, \$1,605,532,189 in improved property is exposed to potential impact; 21.85% of the total assessed value of improvements in Ellis County are at risk from the 100-year storm event.
- <u>Emergency Facilities</u>: Based on geographic information and assuming that a facility within the 100-year floodplain is exposed to impact, there are no emergency facilities at imminent risk from the 100-year storm event.
- <u>Critical Facilities</u>: Based on geographic information and assuming that a facility within the 100-year floodplain is exposed to impact, there are no critical facilities at imminent risk from the 100-year storm event.
- <u>Critical Infrastructure</u>: Based on geographic information and assuming that a critical infrastructure within the 100-year floodplain is exposed to impact 0% of railways/highways and bridges, 64% of dams, 0% of water treatment works, .05 % waste water treatment facilities, and 0% hazardous material facilities are at risk from the 100-year storm event. Note that the amount of railway/highway bridges is high, because of the likelihood of these to be located within the floodplain. Additionally, treated wastewater is typically discharged towards streams, which makes portions of wastewater treatment facilities likely to be located within the floodplain.

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

Repetitive Loss

As per Requirement 201.6(c)(2)(ii) "The risk assessments in all plans approved after October 1, 2008 must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods." Repetitive Loss Property information provides local jurisdictions with the properties that had submitted insurance claims due to flooding damage to buildings and its contents. The information provided by Federal Emergency Management Agency and Texas Water Development Board included 4 repetitive loss properties in Ellis County as of 6/1/2013 (Table 3.45).

Table 3.45 summarizes with the number of properties located within the 100-year floodplain as obtained using this approach.

				100			
	Total	Proj	perties within Floodplai	100-year n	Total Number of Repetitive	Percent of Repetitive Loss Properties Within 100-year Floodplain	
Jurisdiction	Number of Repetitive Loss Properties	Single Family	Other Residential	Non Residential	Loss Properties Within 100-year Floodplain		
Ellis County*	0	0	0	0	0	0	
Alma	0	0	0	0	0	0	
Bardwell	0	0	0	0	0	0	
Ennis	0	0	0	0	0	0	
Ferris	0	0	0	0	0	0	
Garrett	0	0	0	0	0	0	
Italy	0	0	0	0	0	0	
Maypearl	0	0	0	0	0	0	
Midlothian	0	0	0	0	0	0	
Milford	0	0	0	0	0	0	
Oak Leaf	0	0	0	0	0	0	
Ovilla	0	0	0	0	0	0	
Palmer	0	0	0	0	0	0	

Table 3.45 Repetitive Loss Properties located within the 100-year Floodplain

	Total	Proj	perties within Floodplai	Total Number of Popotitivo	Percent of Repetitive	
Jurisdiction	Number of Repetitive Loss Properties	Single Family	gle Other Non ^F nily Residential Residential F		Loss Properties Within 100-year Floodplain	Loss Properties Within 100-year Floodplain
Red Oak	3	3	0	0	3	100%
Waxahachie	1	1	0	0	1	100%
Total	4	4	0	0	4	100%

Source: Federal Emergency Management Agency

* Ellis County unincorporated areas

As noted in *Table 3.45* most of the repetitive loss properties are located in Red Oak, with 100% of those properties located within the 100-year floodplain. The city of Waxahachie had 1 recorded repetitive loss property each, located inside the floodplain. All of the properties are located within the 100-year floodplain, which can be interpreted as having a greater probability of future losses resulting from flood events. In compliance with Requirement 201.6(c)(2)(ii),Table 3.46 provides the type (residential, commercial, institutional, etc.) and numbers of repetitive loss properties located in the identified flood hazard zones within Ellis County.

Table 3.46 shows the repetitive loss property statistics for the 4 properties recorded in Ellis County classified by jurisdiction. The numbers provided can be used to estimate the vulnerability to repetitive loss properties in terms of dollar losses.

	Sing	le Fa	mily		Other Residential			Non Residential			Total					
Jurisdiction	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments
Ellis County*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alma	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bardwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3.46	Repetitive	Loss Pro	perty	Statistics

	Sing	le Fa	mily		F	Ot Resid	her denti	al	No	n Re	siden	itial			Tota	al
Jurisdiction	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments	Years	Properties	Number of Losses	Payments
Ennis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ferris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Garrett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maypearl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Midlothian	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Milford	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oak Leaf	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ovilla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red Oak	199 6 - 200 9	3	6	103,092.53	0	0	0	0	0	0	0	0	199 6 - 200 9	3	6	103,092.53
Waxahachie	200 8	1	5	81,981.01	0	0	0	0	0	0	0	0	200 8	1	5	81,981.01
Total	199 6- 200 8	4	11	185,073.54	0	0	0	0	0	0	0	0	199 6- 200 8	4	11	185,073.54

Source: Federal Emergency Management Agency

* Ellis County unincorporated areas

The dollar amounts in the tables represent the payments made for insurance claims due to flood damage to buildings and contents. As can be observed in *Table 3.46* and, consistent with having the greatest number of repetitive loss properties, the city of Red Oak has the greatest value dollar of claims, with mostly residential properties damaged.

Although, both repetitive loss information (*Tables 3.45 and 3.46*) and the historical annualized losses expected from flooding (*Table 3.41*) represent actual historical information, the data cannot be compared or correlated to each other. The repetitive loss information presents insurance claims on properties and buildings, whereas the historical annualized losses represent property losses in the community due to flood events.

Hail

As described in section 3.6, damage from hail events is determined by the intensity of the storm, which, based on the hail diameter, ranges from hard hail to super hailstorm. These events are unpredictable, and all areas of Ellis County can be affected. All five categories of assets are exposed to this hazard and could potentially be impacted. However, the most vulnerable assets are those related to property and infrastructure, particularly roofs and structures. Damages from hail can potentially translate into significant insurance claims and expenses.

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

Table 3.48 presents Ellis County's recorded historical losses due to hailstorm events as provided in the hazard events database obtained from the National Climatic Data Center

Location	Date	Time	Event	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
Ennis	4/16/2002	20:06	Hail	1.75 in.	0	0	\$0	\$0
Ferris	4/16/2002	19:58	Hail	0.88 in.	0	0	\$0	\$0
Midlothian	4/16/2002	18:39	Hail	1.50 in.	0	0	\$0	\$0
Waxahachie	4/16/2002	18:56	Hail	1.75 in.	0	0	\$0	\$0
Maypearl	4/17/2002	18:55	Hail	1.75 in.	0	0	\$0	\$0
Palmer	7/14/2002	19:29	Hail	0.88 in.	0	0	\$0	\$0
Waxahachie	12/23/2002	19:20	Hail	0.88 in.	0	0	\$0	\$0
Ennis	3/25/2003	18:30	Hail	1.50 in.	0	0	\$0	\$0
Forreston	4/19/2003	8:04	Hail	0.75 in.	0	0	\$0	\$0
Waxahachie	4/23/2003	20:00	Hail	1.00 in.	0	0	\$0	\$0
Ferris	5/2/2003	21:18	Hail	1.00 in.	0	0	\$0	\$0

Table 3.48 Historical Annualized Losses Due to Hail Events (01/01/2002-6/30/2013)

Location	Date	Time	Event	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
Red Oak	5/2/2003	21:12	Hail	0.88 in.	0	0	\$0	\$0
Midlothian	5/14/2003	23:05	Hail	1.00 in.	0	0	\$0	\$0
Waxahachie	8/26/2003	14:50	Hail	0.88 in.	0	0	\$0	\$0
Waxahachie	8/26/2003	14:56	Hail	0.75 in.	0	0	\$0	\$0
Red Oak	4/30/2004	21:56	Hail	1.00 in.	0	0	\$0	\$0
Waxahachie	4/30/2004	21:44	Hail	0.75 in.	0	0	\$0	\$0
Milford	8/11/2004	13:15	Hail	1.00 in.	0	0	\$0	\$0
Waxahachie	12/6/2004	17:12	Hail	0.88 in.	0	0	\$0	\$0
Bardwell	4/25/2005	16:45	Hail	0.88 in.	0	0	\$0	\$0
Ennis	4/25/2005	16:35	Hail	1.00 in.	0	0	\$0	\$0
Ferris	4/25/2005	16:21	Hail	1.00 in.	0	0	\$0	\$0
Waxahachie	4/25/2005	16:30	Hail	1.75 in.	0	0	\$0	\$0
Midlothian	6/3/2005	12:40	Hail	1.75 in.	0	0	\$10,000	\$0
Midlothian	7/13/2005	15:15	Hail	0.75 in.	0	0	\$0	\$0
Ennis	7/14/2005	19:23	Hail	1.00 in.	0	0	\$0	\$0
Telico	7/14/2005	19:06	Hail	1.00 in.	0	0	\$0	\$0
Ferris	9/28/2005	20:14	Hail	0.88 in.	0	0	\$0	\$0
Ferris	3/17/2006	22:45	Hail	0.75 in.	0	0	\$0	\$0
Milford	3/18/2006	12:14	Hail	0.75 in.	0	0	\$0	\$0
Milford	4/25/2006	17:50	Hail	0.75 in.	0	0	\$0	\$0
Milford	5/3/2007	8:48	Hail	0.75 in.	0	0	\$0	\$0
Red Oak	4/17/2008	21:02	Hail	1.00 in.	0	0	\$0	\$0
Midlothian	5/13/2008	12:47	Hail	1.00 in.	0	0	\$0	\$0
Bardwell	12/9/2008	0:35	Hail	0.75 in.	0	0	\$0	\$0
Bardwell	2/10/2009	21:45	Hail	0.75 in.	0	0	\$0	\$0

Location	Date	Time	Event	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
Ennis	3/25/2009	14:37	Hail	0.75 in.	0	0	\$0	\$0
Garrett	5/2/2009	21:13	Hail	0.88 in.	0	0	\$0	\$0
Milford	5/2/2009	20:23	Hail	0.88 in.	0	0	\$0	\$0
Nash	6/11/2009	3:48	Hail	0.88 in.	0	0	\$0	\$0
Ovilla	7/8/2009	17:30	Hail	1.00 in.	0	0	\$0	\$0
Ennis	4/23/2010	23:40	Hail	0.88 in.	0	0	\$0	\$0
Ennis	4/23/2010	23:50	Hail	2.00 in.	0	0	\$2,000	\$0
Ennis	5/17/2010	13:27	Hail	0.75 in.	0	0	\$0	\$0
Garrett	5/17/2010	13:31	Hail	1.25 in.	0	0	\$0	\$0
Garrett	5/17/2010	13:39	Hail	1.50 in.	0	0	\$0	\$0
Ennis	5/20/2010	14:37	Hail	1.00 in.	0	0	\$0	\$0
Forreston	5/20/2010	16:20	Hail	0.75 in.	0	0	\$0	\$0
lke	5/20/2010	13:59	Hail	1.00 in.	0	0	\$0	\$0
Italy	5/20/2010	16:30	Hail	0.88 in.	0	0	\$0	\$0
Waxahachie	5/20/2010	13:55	Hail	1.00 in.	0	0	\$0	\$0
Garrett	8/6/2010	16:11	Hail	0.75 in.	0	0	\$0	\$0
Waxahachie	8/24/2010	13:08	Hail	1.00 in.	0	0	\$0	\$0
Avalon	10/24/2010	16:14	Hail	1.75 in.	0	0	\$10,000	\$0
Avalon	10/24/2010	16:23	Hail	2.75 in.	0	0	\$10,000	\$0
Ferris	2/27/2011	23:45	Hail	1.00 in.	0	0	\$0	\$0
Italy	4/25/2011	17:22	Hail	1.00 in.	0	0	\$0	\$0
Nash	4/25/2011	16:24	Hail	1.00 in.	0	0	\$0	\$0
Waxahachie	4/25/2011	10:19	Hail	0.75 in.	0	0	\$0	\$0
Avalon	4/26/2011	16:25	Hail	1.00 in.	0	0	\$0	\$0
Bardwell	4/26/2011	14:40	Hail	1.00 in.	0	0	\$0	\$0

Location	Date	Time	Event	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
Ennis	4/26/2011	14:57	Hail	1.50 in.	0	0	\$15,000	\$0
Ennis	4/26/2011	15:05	Hail	1.00 in.	0	0	\$0	\$0
Garrett	4/26/2011	14:55	Hail	1.75 in.	0	0	\$15,000	\$0
Lone Elm	4/26/2011	15:47	Hail	1.75 in.	0	0	\$3,000	\$0
Lone Elm	4/26/2011	16:07	Hail	1.00 in.	0	0	\$0	\$0
Midlothian	4/26/2011	14:25	Hail	0.75 in.	0	0	\$0	\$0
Midlothian	4/26/2011	15:43	Hail	1.00 in.	0	0	\$0	\$0
Red Oak	4/26/2011	19:35	Hail	1.00 in.	0	0	\$0	\$0
Rockett	4/26/2011	15:55	Hail	1.00 in.	0	0	\$0	\$0
Service	4/26/2011	16:11	Hail	1.00 in.	0	0	\$0	\$0
Waxahachie	4/26/2011	14:39	Hail	1.00 in.	0	0	\$0	\$0
Waxahachie	4/26/2011	14:51	Hail	1.00 in.	0	0	\$0	\$0
Waxahachie	4/26/2011	18:50	Hail	0.88 in.	0	0	\$0	\$0
Ferris	5/1/2011	4:07	Hail	0.88 in.	0	0	\$0	\$0
Midlothian	5/1/2011	3:40	Hail	0.75 in.	0	0	\$0	\$0
Ovilla	5/1/2011	3:45	Hail	1.00 in.	0	0	\$0	\$0
Red Oak	5/1/2011	4:00	Hail	1.00 in.	0	0	\$0	\$0
Ferris	9/18/2011	20:44	Hail	0.75 in.	0	0	\$0	\$0
Bristol	10/23/2011	1:35	Hail	1.00 in.	0	0	\$0	\$0
Garrett	10/23/2011	1:54	Hail	1.00 in.	0	0	\$0	\$0
Red Oak	4/3/2012	11:40	Hail	1.00 in.	0	0	\$0	\$0
Red Oak	4/3/2012	14:39	Hail	1.00 in.	0	0	\$0	\$0
Waxahachie	4/3/2012	13:25	Hail	1.00 in.	0	0	\$0	\$0
Alma	5/7/2012	18:06	Hail	1.75 in.	0	0	\$3,000	\$0
Lone Elm	6/13/2012	19:57	Hail	1.50 in.	0	0	\$300,000	\$0

Location	Date	Time	Event	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
Midlothian	6/13/2012	19:38	Hail	1.25 in.	0	0	\$100,000	\$0
Midlothian	6/13/2012	19:38	Hail	2.75 in.	0	0	\$300,000	\$0
Midlothian	6/13/2012	19:42	Hail	1.75 in.	0	0	\$160,000	\$0
Midlothian	6/13/2012	19:42	Hail	1.50 in.	0	0	\$0	\$0
Red Oak	3/23/2013	7:02	Hail	1.00 in.	0	0	\$0	\$0
Ferris	5/21/2013	15:20	Hail	0.88 in.	0	0	\$0	\$0
Palmer	5/21/2013	15:22	Hail	0.88 in.	0	0	\$0	\$0
Totals:					0	0	\$1,428,000	\$0

Source: National Climatic Data Center

As described in Section 3.6, calculations of annualized losses due to hail events were conducted using historical data obtained from the National Climatic Data Center (*Table 3.48*). The annualized loss value can be interpreted as the impact expected from hail in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.48*, Ellis County can expect a total property loss of \$124,173.91 each year as a result of hail, with no injuries, deaths, or crop losses expected from this event.

The geographical occurrence of hailstorm events cannot be predicted; therefore, the area of potential impacts corresponds to all of Ellis County's territory. Therefore, all improved property, emergency and critical facilities, and critical structures are exposed to this hazard, including 12 fire stations, four police stations, one hospital, 15 schools, and six historical properties. As described above, roofs and structures are more vulnerable to this hazard. Therefore, it is expected that building improvements would be most affected.

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

- <u>Population</u>: According to National Climatic Data Center (NCDC), zero recorded injuries or fatalities have been recorded for hailstorm events. All the population of Ellis County is exposed to this hazard, but there are no personal losses expected from hailstorm events.
- <u>Improved Property</u>: Based on historical data, a loss of \$124,173.91 per year can be expected in property loss due to hailstorm damage. Because of the unpredictability of the geographical location of hailstorms, all improved property in Ellis County is exposed to this hazard. Although some crops are susceptible to hail hazards, available historical data for Ellis County indicates that there are no expected crop losses from this event.
- <u>Emergency Facilities</u>: Because of the unpredictability of the geographical location of hailstorms, all emergency facilities in Ellis County are exposed to this hazard.

- <u>Critical Facilities</u>: Because of the unpredictability of the geographical location of hailstorms, all critical facilities in Ellis County are exposed to this hazard.
- <u>Critical Infrastructure</u>: Because of the unpredictability of the geographical location of hailstorms, all critical infrastructure in Ellis County is exposed to this hazard.

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

Wildfires

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

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

WUI data was obtained from the Texas Forest Service wildfire database. The data provides GIS data for wildfires and households affected. Data from the National Climatic Data Center provided the property and crop damage totals for Ellis County wildfires. *Table 3.47* provides the magnitude, number of fatalities, property and crop damage caused by fires in the county.

Jurisdiction	Date	Time	Fatalities	Injuries	Property Damage	Crop Damage
Ellis	06/18/2011	14:00	0	0	\$461,000	\$0
County	09/05/2011	13:00	0	0	\$0	\$0
Territory	09/13/2011	11:00	0	0	\$30,000	\$0
		TOTALS:	0	0	\$491,000	\$0

Table 3.47 Wildfire Events

Source: National Climatic Data Center

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

Wildland fires in Ellis County are highly likely to occur in the next year and will impact the county as a whole. Based on previous occurrences, the extent of wildland fires will be very high. Fires will start easily and spread at a rapid rate, which can result in extensive county wide property damage. According to the Texas Forest Service Wildfire Summary Report, 80% of Ellis County's population is located in the Wildland Urban Interface. Maps depicting the wildfire risk and WUI can be found in Map Series F and G, respectively.

Table 3.48 describes the distribution of WUI areas within each jurisdiction

		WUI-Interface Community					
Jurisdiction	Area (Sq. Mile)	Low Density (Sq. Mile)	Medium Density (Sq. Mile)	High Density (Sq. Mile)	Total (Sq. Mile)	Percentage of Total Area (%)	
Ellis County*	821.41	264.09	103.92	47.32	415.33	50.56%	
Alma	5	2.38	.80	0	3.18	63.70%	
Bardwell	0.3	0	.005	.13	.138	45.94%	
Ennis	18.4	7.15	3.34	4.01	14.50	78.78%	
Ferris	4.79	.60	.58	.89	2.07	43.22%	
Garrett	0.72	.20	.28	.24	.72	100%	
Italy	1.8	.36	.38	.57	1.31	72.78%	
Maypearl	0.7	.13	.22	.35	.7	100%	
Midlothian	37.9	9.47	6.96	2.82	19.25	50.79%	
Milford	1.8	.71	.51	.30	1.52	84.44%	
Oak Leaf	2.3	.77	.66	.63	2.06	89.57%	
Ovilla	5.7	1.19	2.11	2.08	5.38	94.39%	
Palmer	2.8	.69	.56	.67	1.92	68.57%	
Red Oak	7.8	2.07	2.63	3.2	7.8	100%	
Waxahachie	41.2	9.68	5.45	4.58	19.71	47.84%	
Total	952	299.49	128.41	67.79	495.59	52.05%	

Table 3.48 Distribution of WUI Interface Co	communities in Ellis Count	y
---	----------------------------	---

Source: Texas Forest Service

* Ellis County unincorporated areas

Table 3.49 identifies the number of schools in Ellis County that are located within the WUI.

	Schools				
Jurisdiction	Schools Located Within Low/Medium/High Density Interface Communities	Percentage (%) of Schools within WUI Communities			
Ellis County	50	68.5%			
Total	50	68.5%			

Table 3.49	Schools	within	Wildland	Urban	Interface
1 0010 0.40	00110013	WWILLIIII	Windiana	Unbail	menace

Source: Texas Forest Service

Table 3.50 identifies the number of critical facilities in Ellis County that are located within the WUI.

	Airports		Dams		Water Facilities	
Jurisdiction	Facilities Located Within Interface Communities	Percentage (%) of Facilities	Facilities Located Within Interface Communities	Percentage (%) of Facilities	Facilities Located Within Interface Communities	Percentage (%) of Facilities
Ellis County	3	75%	32	27.4%	10	90.9%
Total	3	75%	32	27.4%	10	90.9%

Table 3.50 Critical Facilities within Wildland Urban Interface

Source: Texas Forest Service

Table 3.51 identifies the number of emergency facilities in Ellis County that located within the WUI.

	Hosp	bitals	Fire Stations		Police Stations	
Jurisdiction	Facilities Located Within Low/Medium/ High Density Interface Communities	Percentage (%) of Facilities within WUI Communities	Facilities Located Within Low/Medium/ High Density Interface Communities	Percentage (%) of Facilities within WUI Communities	Facilities Located Within Low/Medium/ High Density Interface Communities	Percentage (%) of Facilities within WUI Communities
Ellis County	3	100%	13	44.8%	11	73.33%
Total	3	100%	13	44.8%	11	73.33%

Table 3.51 Emergency Facilities within Wildland Urban Interface

Source: Texas Forest Service

The determination of population vulnerability to wildfires was calculated by overlaying the population data from the 2000 U.S. Census Block shapefile to the Texas Fire Service data. (*Table 3.52*).

Jurisdiction	Population at Risk	Percentage (%) of Population at Risk
Ellis County*	121,532	80%
Alma	392	99%
Bardwell	507	62%
Ennis	12,159	57%
Ferris	2,438	73%
Garrett	659	100%
Italy	1,617	62%
Maypearl	1,142	100%
Midlothian	8,567	76%
Milford	791	92%
Oak Leaf	1,643	98%
Ovilla	4,783	98%
Palmer	1,859	87%
Red Oak	6,486	91%
Waxahachie	14,647	55%
Total	179,222	-

Table 3.52 Population at Risk

Source: Texas Forest Service

* Ellis County unincorporated areas

As observed in *Table*, approximately 80% of Ellis County is vulnerable to wildfires, with Waxahachie and unincorporated areas contributing with the majority of the exposed population.

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

- **<u>Population</u>**: Based on geographical data, approximately 50.56% of Ellis County is vulnerable to wildfires, with the city of Waxahachie and unincorporated areas contributing with the majority of the exposed population.
- <u>Improved Property</u>: Based on geographical data, a loss of \$5,441,487,235 worth of buildings and contents are exposed to wildfires. This corresponds to a 74.05% overall property improvement values across Ellis County.
- <u>Emergency Facilities</u>: Based on geographic information and assuming that the facilities located within the WUI polygons are exposed to impact from wildfire, there are 13 fire stations (2: unincorporated Ellis County & Midlothian; 1: Alma, Bardwell, Ferris, Italy, Maypearl, Milford, Ovilla, Red Oak, Waxahachie), 11 police stations (2: Waxahachie; 1: Ennis, Ferris, Italy, Midlothian, Maypearl, Milford, Ovilla, Palmer, Red Oak), and 3 hospitals (2: Waxahachie; 1: Ennis) at risk from wildfire events.
- <u>Critical Facilities</u>: Based on geographic information and assuming that the facilities located within the WUI polygons are exposed to impacts from wildfire, there are 50 schools (10: Midlothian & Waxahachie; 8: Ennis; 6: Red Oak; 5: Ferris; 4: May Pearl & Palmer; 2: unincorporated Ellis County; 1: Milford) at risk from wildfire events.
- <u>Critical Infrastructure</u>: Based on geographic information and assuming that the infrastructure located within the WUI polygons are exposed to impacts from fire, there are 3 airports (2: unincorporated Ellis County; 1: Midlothian), 117 dams (22: unincorporated Ellis County; 5: Waxahachie; 3: Midlothian; 2: Ennis), 10 water facilities (3: Midlothian; 2: Ennis & Waxahachie; 1: unincorporated Ellis County, Milford, Palmer) at risk from wildfire events.

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

This page intentionally left blank.

3.9 Statistical Risk Assessment

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

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

Extreme Heat

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

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

Table 3.53 presents Ellis County's recorded historical losses due to extreme heat events as provided in the hazard events database obtained from the National Climatic Data Center. The annualized losses due to extreme events were calculated using the methodology described in Section 3.6

Jurisdiction	Date	Туре	Fatalities	Injuries	Property Damage	Crop Damage
Ellis County Territory	08/01/2011	Excessive Heat	0	0	\$0	\$0
Total	1	Excessive Heat	0	0	\$0	\$0

Table 3.53 Extreme Heat Historical Occurrences Between 01/01/2002 - 06/30/2013

Source: National Climatic Data Center

The annualized loss value can be interpreted as the impact expected from extreme heat in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.53*, Ellis County can expect zero fatalities and injuries per year, and no property or crop losses expected from extreme heat.

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

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

- **Population**: Based on historical data, extreme heat can be expected to produce an average of zero fatalities and injuries per year. All the population of Ellis County is exposed to this hazard.
- <u>Improved Property</u>: Based on historical data and the negligible impact of extreme heat to developed areas, the improved property in Ellis County is not exposed to this hazard.

- <u>Emergency Facilities</u>: Based on historical data and the negligible impact of extreme heat to buildings, the existing and future emergency facilities in Ellis County are not exposed to this hazard.
- <u>Critical Facilities</u>: Based on historical data and the negligible impact of extreme heat to buildings, the existing and future critical facilities in Ellis County are not exposed to this hazard.
- <u>Critical Infrastructure</u>: Based on historical data and the negligible impact of extreme heat to existing and future critical infrastructure, exposure to this hazard is considered minimal in Ellis County.

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

High Wind

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

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

Table 3.54 presents Ellis County's recorded historical losses due to high wind events as provided in the hazard events database obtained from the National Climatic Data Center and the Texas Forest Service

Location	Date	Time	Event	Magnitude	Fatalities	Inj.	Property Damage	Crop Damage
Ennis	4/7/2002	20:15	Thunder- storm Wind	-	0	0	\$10,000	\$0
Waxahachie	4/7/2002	19:45	Thunder- storm Wind	52 kts. E	0	0	\$3,000	\$0
Midlothian	4/16/2002	16:15	Thunder- storm Wind	52 kts. E	0	0	\$0	\$0
Waxahachie	4/16/2002	18:22	Thunder- storm Wind	-	0	0	\$1,000	\$0
Waxahachie	4/16/2002	19:11	Thunder- storm Wind	52 kts. E	0	0	\$0	\$0
Ennis	5/3/2002	5:50	Thunder- storm Wind	-	0	0	\$2,000	\$0
Countywide	6/16/2002	0:30	Thunder- storm Wind	52 kts. E	0	0	\$10,000	\$0
Palmer	7/14/2002	19:20	Thunder- storm Wind	52 kts. E	0	0	\$2,000	\$0
Forreston	12/30/2002	14:54	Thunder- storm Wind	61 kts. E	0	0	\$0	\$0
Milford	12/30/2002	14:05	Thunder- storm Wind	52 kts. E	0	0	\$0	\$0

Table 3.54 High Wind Historical Occurrences between 01/01/2002 – 06/30/2013

Location	Date	Time	Event	Magnitude	Fatalities	Inj.	Property Damage	Crop Damage
Maypearl	4/23/2003	20:36	Thunder- storm Wind	60 kts. ES	0	0	\$0	\$0
Waxahachie	4/30/2003	1:20	Thunder- storm Wind	52 kts. ES	0	0	\$0	\$0
Waxahachie	8/26/2003	14:56	Thunder- storm Wind	52 kts. ES	0	0	\$0	\$0
Bardwell Lake	3/4/2004	15:30	Thunder- storm Wind	50 kts. ES	0	0	\$5,000	\$0
Boyce	3/4/2004	15:35	Thunder- storm Wind	52 kts. ES	0	0	\$15,000	\$0
Ennis	3/4/2004	15:20	Thunder- storm Wind	50 kts. ES	0	0	\$10,000	\$0
Italy	3/4/2004	15:30	Thunder- storm Wind	61 kts. ES	0	0	\$10,000	\$0
Palmer	3/4/2004	15:40	Thunder- storm Wind	52 kts. ES	0	0	\$3,000	\$0
Ferris	4/30/2004	21:55	Thunder- storm Wind	52 kts. ES	0	0	\$0	\$0
Ennis	6/1/2004	21:30	Thunder- storm Wind	57 kts. ES	0	0	\$50,000	\$0
Maypearl	6/1/2004	20:25	Thunder- storm Wind	61 kts. ES	0	0	\$5,000	\$0
Maypearl	6/1/2004	20:29	Thunder- storm Wind	61 kts. ES	0	0	\$1,000	\$0
Waxahachie	6/1/2004	21:24	Thunder- storm Wind	61 kts. ES	0	0	\$5,000	\$0
Waxahachie	6/1/2004	21:30	Thunder- storm Wind	61 kts. ES	0	0	\$15,000	\$0
Ennis	12/6/2004	17:30	Thunder- storm Wind	61 kts. ES	0	0	\$5,000	\$0
Maypearl	12/6/2004	17:00	Thunder- storm Wind	52 kts. ES	0	0	\$0	\$0

Location	Date	Time	Event	Magnitude	Fatalities	Inj.	Property Damage	Crop Damage
Waxahachie	12/6/2004	17:12	Thunder- storm Wind	52 kts. ES	0	0	\$0	\$0
Midlothian	7/1/2005	12:30	Thunder- storm Wind	50 kts. ES	0	0	\$0	\$0
Garrett	7/11/2005	18:40	Thunder- storm Wind	50 kts. ES	0	0	\$0	\$0
Red Oak	7/11/2005	17:50	Thunder- storm Wind	50 kts. ES	0	0	\$15,000	\$0
Midlothian	7/13/2005	15:18	Thunder- storm Wind	70 kts. MS	0	0	\$0	\$0
Ennis	7/14/2005	19:38	Thunder- storm Wind	60 kts. ES	0	0	\$50,000	\$0
Midlothian	7/14/2005	20:30	Thunder- storm Wind	50 kts. ES	0	0	\$0	\$0
Waxahachie	7/14/2005	20:20	Thunder- storm Wind	65 kts. ES	0	0	\$5,000	\$0
Waxahachie	7/15/2005	18:20	Thunder- storm Wind	61 kts. ES	0	0	\$3,000	\$0
Ovilla	8/22/2006	16:10	Thunder- storm Wind	50 kts. ES	0	0	\$1,000	\$0
Red Oak	8/23/2006	18:00	Thunder- storm Wind	50 kts. ES	0	0	\$0	\$0
Ellis (Zone)	11/30/2006	13:00	Thunder- storm Wind	28 kts. MG	0	0	\$25,000	\$0
Ellis (Zone)	2/24/2007	12:00	Thunder- storm Wind	50 kts. EG	0	0	\$25,000	\$0
Ennis	4/17/2007	18:40	Thunder- storm Wind	50 kts. EG	0	0	\$3,000	\$0
Midlothian	4/17/2007	18:26	Thunder- storm Wind	54 kts. MG	0	0	\$0	\$0
Red Oak	4/17/2007	18:44	Thunder- storm Wind	58 kts. MG	0	0	\$0	\$0

Location	Date	Time	Event	Magnitude	Fatalities	Inj.	Property Damage	Crop Damage
Midlothian	4/24/2007	20:40	Thunder- storm Wind	52 kts. MG	0	0	\$15,000	\$0
Ennis	5/2/2007	18:45	Thunder- storm Wind	50 kts. EG	0	0	\$35,000	\$0
Milford	5/2/2007	17:45	Thunder- storm Wind	61 kts. EG	0	0	\$25,000	\$0
Waxahachie	4/10/2008	3:10	Thunder- storm Wind	61 kts. EG	0	0	\$50,000	\$0
Red Oak	4/17/2008	20:53	Thunder- storm Wind	52 kts. EG	0	0	\$0	\$0
Italy	4/23/2008	20:37	Thunder- storm Wind	50 kts. EG	0	0	\$1,000	\$0
Ovilla	4/23/2008	20:19	Thunder- storm Wind	56 kts. MG	0	0	\$0	\$0
Midlothian	5/14/2008	22:27	Thunder- storm Wind	50 kts. EG	0	0	\$3,000	\$0
Midlothian	5/14/2008	22:27	Thunder- storm Wind	50 kts. EG	0	0	\$3,000	\$0
Palmer	6/17/2008	11:39	Thunder- storm Wind	50 kts. EG	0	0	\$2,000	\$0
Waxahachie	6/17/2008	11:27	Thunder- storm Wind	52 kts. MG	0	0	\$0	\$0
Waxahachie	12/27/2008	9:30	Thunder- storm Wind	52 kts. EG	0	1	\$3,000	\$0
Ennis	6/10/2009	18:55	Thunder- storm Wind	52 kts. EG	0	0	\$3,000	\$0
Waxahachie	6/10/2009	18:46	Thunder- storm Wind	52 kts. EG	0	0	\$6,000	\$0
Palmer	6/11/2009	2:55	Thunder- storm Wind	52 kts. MG	0	0	\$3,000	\$0
Neals Vly	8/21/2009	4:20	Thunder- storm Wind	50 kts. EG	0	0	\$5,000	\$0

Location	Date	Time	Event	Magnitude	Fatalities	Inj.	Property Damage	Crop Damage
Alma	5/20/2010	14:49	Thunder- storm Wind	52 kts. EG	0	0	\$15,000	\$0
Ennis	8/6/2010	16:15	Thunder- storm Wind	56 kts. EG	0	0	\$10,000	\$0
Garrett	8/6/2010	16:11	Thunder- storm Wind	52 kts. EG	0	0	\$0	\$0
Reagor Spgs	9/1/2010	19:10	Thunder- storm Wind	70 kts. EG	0	0	\$250,000	\$0
Lone Elm	4/11/2011	0:50	Thunder- storm Wind	70 kts. EG	0	0	\$25,000	\$0
Mountain Peak	4/11/2011	0:39	Thunder- storm Wind	56 kts. EG	0	0	\$5,000	\$0
Sardis	4/11/2011	0:57	Thunder- storm Wind	53 kts. EG	0	0	\$0	\$0
Service	4/11/2011	0:51	Thunder- storm Wind	78 kts. MG	0	0	\$0	\$0
Waxahachie	4/11/2011	0:43	Thunder- storm Wind	70 kts. EG	0	0	\$600,000	\$0
Bardwell	4/25/2011	16:28	Thunder- storm Wind	87 kts. EG	0	0	\$75,000	\$0
Bardwell	4/26/2011	14:40	Thunder- storm Wind	52 kts. EG	0	0	\$0	\$0
Ennis	4/26/2011	15:05	Thunder- storm Wind	52 kts. EG	0	0	\$0	\$0
Waxahachie	4/26/2011	14:39	Thunder- storm Wind	56 kts. EG	0	0	\$0	\$0
Maypearl	9/18/2011	21:25	Thunder- storm Wind	52 kts. EG	0	0	\$10,000	\$0
Midlothian	9/18/2011	20:35	Thunder- storm Wind	52 kts. EG	0	0	\$0	\$0
Waxahachie	9/18/2011	21:03	Thunder- storm Wind	52 kts. EG	0	0	\$0	\$0

Location	Date	Time	Event	Magnitude	Fatalities	Inj.	Property Damage	Crop Damage
Red Oak	9/29/2011	21:12	Thunder- storm Wind	52 kts. MG	0	0	\$0	\$0
Ellis (Zone)	10/12/2011	4:30	Thunder- storm Wind	35 kts. EG	0	0	\$10,000	\$0
Midlothian	5/4/2012	20:07	Thunder- storm Wind	52 kts. EG	0	0	\$5,000	\$0
Boz	5/31/2012	3:50	Thunder- storm Wind	52 kts. EG	0	0	\$10,000	\$0
Italy	5/31/2012	4:20	Thunder- storm Wind	56 kts. EG	0	0	\$15,000	\$0
Lone Elm	5/31/2012	3:50	Thunder- storm Wind	52 kts. EG	0	0	\$5,000	\$0
Milford	5/31/2012	4:25	Thunder- storm Wind	56 kts. EG	0	0	\$4,000	\$0
Ward	8/12/2012	19:13	Thunder- storm Wind	70 kts. MG	0	0	\$10,000	\$0
Totals	-	-	Thunder -storm Wind	-	0	0	\$1,707,000	\$0

Source: National Climatic Data Center

The annualized losses due to high wind events were calculated using the methodology described previously. The annualized loss value can be interpreted as the impact expected from high wind in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.54*, Ellis County can expect an average of \$148,434.78 per year in property losses, with no fatalities, injuries, or crop losses from high wind events.

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

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

• **<u>Population</u>**: Based on historical data, high wind events can be expected to produce an average of zero injuries and fatalities per year. All the population of Ellis County is exposed to this hazard.

- <u>Improved Property</u>: Based on historical data, an average loss of \$148,434.78 per year in property losses are expected from high wind events in Ellis County. Zero crop losses are expected from this hazard in Ellis County.
- <u>Emergency Facilities</u>: Because of the expected geographical widespread nature of high winds, all existing and future emergency facilities in Ellis County are exposed to this hazard.
- <u>Critical Facilities</u>: Because of the expected geographical widespread nature of high winds, all existing and future emergency facilities in Ellis County are exposed to this hazard.
- <u>Critical Infrastructure</u>: Because of the expected geographical widespread nature of high winds, all existing and future critical infrastructures in Ellis County are exposed to this hazard.

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

Lightning

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

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

Table 3.55 presents Ellis County's recorded historical losses due to lightning events as provided in the hazard events database obtained from the National Climatic Data Center.

Location	Date	Time	Event	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
Maypearl	3/19/2002	20:34	Lightning	-	0	0	\$200,000	\$0
Ovilla	3/30/2002	4:28	Lightning	-	0	0	\$50,000	\$0
Red Oak	4/16/2002	20:02	Lightning	-	0	0	\$10,000	\$0
Midlothian	7/12/2002	16:30	Lightning	-	0	0	\$5,000	\$0
Ovilla	7/17/2002	16:45	Lightning	-	0	0	\$30,000	\$0
Ennis	8/27/2005	17:00	Lightning	-	0	0	\$40,000	\$0
Waxahachie	7/9/2012	19:00	Lightning	-	0	0	\$271,000	\$0
Totals:	-	-	-	-	0	0	\$606,000	\$0

Table 3.55 Historical Lightning Occurrences between 01/01/2002 – 06/30/2013

Source: National Climatic Data Center

The annualized losses due to lightning events were calculated using the methodology described in Section 3.6. The annualized loss value can be interpreted as the impact expected from lightning in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.55*, Ellis County can expect in average an annual \$52,695.65 in property losses, with no fatalities, no injuries, and no losses in crop production from lightning events.

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

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

- **Population**: Based on historical data, lightning events can be expected to cause zero fatalities and injuries in Ellis County. All the population of Ellis County is exposed to this hazard.
- <u>Improved Property</u>: Based on historical data, an average loss of \$52,695.65 per year in property losses are expected from lightning events in Ellis County. No crop losses are expected from this hazard in Ellis County.
- <u>Emergency Facilities</u>: Because of the expected geographical widespread nature of lightning, all existing and future emergency facilities in Ellis County are exposed to this hazard.
- <u>Critical Facilities</u>: Because of the expected geographical widespread nature of lightning, all existing and future critical facilities in Ellis County are exposed to this hazard.
- <u>Critical Infrastructure</u>: Because of the expected geographical widespread nature of lightning, all existing and future critical infrastructures in Ellis County are exposed to this hazard.

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

Tornado

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

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

Table 3.56 presents Ellis County's recorded historical losses due to tornado events as provided in the hazard events database obtained from the National Climatic Data Center.

Location	Date	Time	Event	Mag.	Fatalities	Inj.	Property Damage	Crop Damage
Maypearl	4/16/2002	18:31	Tornado	F1	0	0	\$5,000	\$0
Maypearl	4/16/2002	18:50	Tornado	F0	0	0	\$5,000	\$0
Maypearl	4/16/2002	19:25	Tornado	F0	0	0	\$0	\$0
Waxahachie	4/16/2002	19:01	Tornado	F0	0	0	\$10,000	\$0
Italy	12/30/200 2	14:02	Tornado	F0	0	0	\$0	\$0
Bardwell	3/4/2004	15:25	Tornado	F1	0	0	\$250,000	\$0
Italy	3/4/2004	15:10	Tornado	F1	0	0	\$150,000	\$0
Maypearl	4/25/2005	15:56	Tornado	F0	0	0	\$5,000	\$0
Alma	5/20/2010	14:20	Tornado	EF0	0	0	\$5,000	\$0
Ward	5/20/2010	13:06	Tornado	EF0	0	0	\$0	\$0
India	9/8/2010	16:36	Tornado	EF0	0	0	\$0	\$0
Avalon	4/25/2011	16:20	Tornado	EF0	0	0	\$25,000	\$0
Sterrett	4/3/2012	12:00	Tornado	EF0	0	0	\$3,000	\$3,000
Ennis	5/15/2013	23:05	Tornado	EF1	0	1	\$650,000	\$0
Totals:	-	-	-	-	0	1	\$1,106,000	\$3,000

Table 3.56 Historical Tornado Occurrences between 01/01/2002 – 06/30/2013

Source: National Climatic Data Center

The annualized losses due to tornado events were calculated using the methodology described in Section 3.6. The annualized loss value can be interpreted as the impact expected from tornadoes in terms of annualized human losses and human injuries, and annualized property losses. As observed in Table 3.56, Ellis County can expect an average of zero fatalities and 0.17 injuries per year. All the population of Ellis County is exposed to this hazard. Also, an expected average of \$96,173.91 per year in property losses is expected from tornadoes, with most of the historical events occurring in the unincorporated areas of Ellis County. Finally, there are no expected crop losses as result of tornado events.

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

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

- **<u>Population</u>**: Based on historical data, tornado events can be expected to cause an average of 0.17 injuries and zero fatalities per year in Ellis County. All the population of Ellis County is exposed to this hazard.
- <u>Improved Property</u>: Based on historical data, an average loss of \$96,173.91 per year in property losses and \$269.87 in crop losses are expected to result from tornado events in Ellis County.
- <u>Emergency Facilities</u>: Because of the impossibility to predict the geographical area of impact for tornadoes, all existing and future emergency facilities in Ellis County are exposed to this hazard.
- <u>Critical Facilities</u>: Because of the impossibility to predict the geographical area of impact for tornados, all existing and future critical facilities in Ellis County are exposed to this hazard.
- <u>Critical Infrastructure</u>: Because of the impossibility to predict the geographical area of impact for tornados, all existing and future critical infrastructures in Ellis County are exposed to this hazard.

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

Winter Storms

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

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

Table 3.57 presents Ellis County's recorded historical losses due to winter storm events as provided in the hazard events database obtained from the National Climatic Data Center.

Jurisdiction	Date	Fatalities	Injuries	Property Damage	Annualized Expected Property Losses	Crop Damage
	2/24/2003	0	0	\$0	\$0	\$0
	12/7/2005	0	0	\$0	\$0	\$0
Ellis	1/14/2007	0	0	\$20,000	\$1,739.13	\$0
County	1/17/2007	0	0	\$0	\$1,739.13	\$0
Territory	3/6/2008	0	0	\$0	\$1,739.13	\$0
	12/23/2008	0	0	\$0	\$1,739.13	\$0
	1/5/2009	0	0	\$5,000	\$2,173.91	\$0
	1/27/2009	0	0	\$25,000	\$4,347.83	\$0
	1/7/2010	0	0	\$50,000	\$8,695.65	\$0
	2/1/2011	0	0	\$150,000	\$21,739.13	\$0
Total	_	0	0	\$250,000	\$21,739.13	\$0

Table 3.57 Winter Storm Historical Occurrences between 01/01/2002 – 06/30/2013

Source: National Climatic Data Center

The annualized losses due to winter storm events were calculated using the methodology described previously. The annualized loss value can be interpreted as the impact expected from winter storm in terms of annualized human losses and human injuries, and annualized property losses. As observed in *Table 3.57*, Ellis County can expect in average an annual \$21,739.13 in property losses, with zero injuries, fatalities, and crop losses from winter storm events.

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

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

- **<u>Population</u>**: Based on historical data, winter storm events can be expected to cause an average of zero injuries and fatalities per year in Ellis County. All the population of Ellis County is exposed to this hazard.
- <u>Improved Property</u>: Based on historical data, an average loss of \$21,739.13 per year in property losses are expected to result from winter storm events in Ellis County. No crop losses are expected from this hazard in Ellis County.
- <u>Emergency Facilities</u>: Because of the expected geographical widespread nature of winter storms, all existing and future emergency facilities in Ellis County are exposed to this hazard.
- <u>Critical Facilities</u>: Because of the expected geographical widespread nature of winter storms, all existing and future critical facilities in Ellis County are exposed to this hazard.
- <u>Critical Infrastructure</u>: Because of the expected geographical widespread nature of winter storms, all existing and future critical infrastructures in Ellis County are exposed to this hazard.

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

3.10 Qualitative Analysis

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

Dam Failure

The probability of occurrence for dam and/or levee events in Ellis County is likely. Due to a data deficiency regarding the potential impact and damages from this hazard, quantitative predictions are not available at the present time for the participating jurisdictions in this plan, and further studies are needed. All five categories, population, improved property, emergency facilities, critical facilities, and critical infrastructure are considered vulnerable to damage caused by dam and/or levee failure. According to the Priority Risk Index analysis presented in section 3.4, any estimated losses associated with this hazard are anticipated to be of low risk across Ellis County.

Based on data from the participating jurisdictions a total of 117 dams are located in Ellis County (*Table 3.58*).

Jurisdiction	Number of	Dam Classification					
Varioalotion	Dams	High	Significant	Low			
Ellis County*	103	20	9	74			
Alma	0	0	0	0			
Bardwell	0	0	0	0			
Ennis	1	1	0	0			
Ferris	0	0	0	0			
Garrett	0	0	0	0			
Italy	0	0	0	0			
Maypearl	3	0	0	3			
Midlothian	0	0	0	0			
Milford	3	1	2	0			
Oak Leaf	0	0	0	0			
Ovilla	0	0	0	0			
Palmer	0	0	0	0			
Red Oak	0	0	0	0			
Waxahachie	7	5	2	0			
Total	117	27	13	76			

Table 3.58 Dams located in Ellis County and Participating Jurisdictions

Source: NID

* Ellis County unincorporated areas

The Hazard Mitigation Planning Team provided a list of high hazard dams located in Ellis County. 27 of these dams have received federal funds from the Natural Resources Conservation Service to conduct an assessment to determine needs of dam rehabilitation. The Natural Resources Conservation Service considers these 27 dams to be of high hazard, thus the need for the assessment (Table 3.59).

Table 3.	59 High	Hazard	Dams
----------	---------	--------	------

Jurisdiction	Dam Name
Ellis County	Lake Clark Dam
Ellis County	Cement Plant Dam
Ellis County	South Prong Dam
Ellis County	Bardwell Lake
Ellis County	Chambers Creek Ws Scs Site 111 And 112
Ellis County	Mountain Creek Ws Scs Site 10 Dam
Ellis County	Mountain Creek Ws Scs Site 9 Dam
Ellis County	Chambers Creek Ws Scs Site 126 Dam
Ellis County	Chambers Creek Ws Scs Site 5 Dam
Ellis County	Chambers Creek Ws Scs Site 3 Dam
Ellis County	Chambers Creek Ws Scs Site 8 Dam
Ellis County	Chambers Creek Ws Scs Site 1 Dam
Ellis County	Chambers Creek Ws Scs Site 9 Dam
Ellis County	Chambers Creek Ws Scs Site 4 Dam
Ellis County	Chambers Creek Ws Scs Site 6 Dam
Ellis County	Chambers Creek Ws Scs Site 11 Dam
Ellis County	Chambers Creek Ws Scs Site 2f Dam
Ellis County	Chambers Creek Ws Scs Site 2b Dam
Ellis County	Chambers Creek Ws Scs Site 2a Dam
Ellis County	Chambers Creek Ws Scs Site 7 Dam
Ennis	Chambers Creek Ws Scs Site 20a Dam
Milford	Chambers Creek Ws Scs Site 97 Dam
Waxahachie	Chambers Creek Ws Scs Site 12 Dam
Waxahachie	Chambers Creek Ws Scs Site 10 Dam
Waxahachie	Katy Lake Dam
Waxahachie	Chambers Creek Ws Scs Site 15 Dam
Waxahachie	Chambers Creek Ws Scs Site 14 Dam
Source: NID	•

Earthquake

The probability of occurrence for an earthquake event in Ellis County is extremely low. Due to a data deficiency regarding the potential impact and damages from this hazard, quantitative predictions are not available at the present time, and further studies are needed. However, the table below shows the magnitude of previous occurrences of earthquakes in Ellis County. All five categories, population, improved property, emergency facilities, critical facilities, and critical infrastructure are considered vulnerable to damage caused by an earthquake. According to the Priority Risk Index analysis presented in Section 3.4, any estimated losses associated with this hazard are anticipated to be of negligible to no risk across Ellis County.

Location	Date	Time	Event	Magnitude
Midlothian	12/5/2009	5:30 AM	Earthquake	2.9
Maypearl	6/12/2011	4:51 PM	Earthquake	2.7
Venus	6/25/2011	5:38 AM	Earthquake	2.4
Venus	7/17/2011	6:58 AM	Earthquake	3
Midlothian	2/24/2013	10:35 AM	Earthquake	2.5
Midlothian	2/24/2013	12:56 PM	Earthquake	2.6
Midlothian	2/24/2013	9:07 PM	Earthquake	2.7
Waxahachie	3/17/2013	11:41 PM	Earthquake	2.6

Earthquake Historical Occurrences between 01/01/2002 - 06/30/2013

Source: NCTCOG RHAT, USGS

Expansive Soils

The probability of occurrence for expansive soil events in Ellis County is at a low to moderate risk. Damage from expansive soils is difficult to document, therefore a data deficiency is cited for: unincorporated Ellis County, Alma, Bardwell, Ferris, Garrett, Italy, Maypearl, Midlothian, Milford, Oak Leaf, Ovilla, Palmer, Red Oak, and Waxahachie. However, there are several verbal accounts of structural damage caused by expansive soils in the city of Ennis. A school had to be demolished and two others required plumbing repairs due to expansive soils. According to local sources, the value of the building that had to be demolished and the plumbing repairs totaled around \$10 million dollars. The school, built in 2001, started having issues within 1 year, and was finally torn down in 2008.

Population is not considered vulnerable to damage caused by expansive soils; therefore any estimated population losses associated with this hazard are anticipated to be minimal across Ellis County. Improved property, emergency facilities, critical facilities, and critical Infrastructures are more vulnerable to this event. Ellis County is located in an area which contains abundant clay with high swelling potential. According to the Priority Risk Index analysis presented in Section 3.4, impacts from expansive soils have a low to moderate risk of creating a hazard that could cause extensive damage to highways, streets, as well as other structures

3.11 Summary

Table 3.60 provides a summary of annualized losses for each of the nine hazard events for which the quantitative analysis (Geographic Information System and/or statistical) was conducted. *Table 3.61* summarizes the qualitative analysis conducted on the four hazard events.

Hazard Event	Annualized Expected Fatalities	Annualized Expected Injuries	Annualized Expected Property Losses	Annualized Expected Crop Loss	Annualized Expected Crop Loss per Acre
Drought	0	0	0	\$17,043.48	\$0.03
Extreme Heat	0	0	0	0	0
Flood	0.17	0	\$486,956.52	0	0
Hail	0	0	\$124,173.91	0	0
High Wind	0	0	\$148,434.78	0	0
Lightning	0	0	\$52,695.65	0	0
Tornado	0	0	\$96,173.91	\$269.87	\$0.01
Wildfire	0	0	\$42,695.65	0	0
Winter Storm	0	0	\$21,739.13	0	0

 Table 3.60 Annualized Losses Expected from Hazards Analyzed using a Quantitative

 Analysis

Table 3.61 Summary of Qualitative Analysis

	Probability of	bability Vulnerable Categories of								
Hazard Event	Occurrence According to the Priority Risk Index	Population	Property Damage	Emergency Facilities	Critical Facilities	Critical Infrastructures				
Dam Failure	Low Risk	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark				
Earthquake	Negligible to No Risk	\checkmark	\checkmark	\checkmark	\checkmark	V				
Expansive Soils	Low Risk	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark				

This page intentionally left blank.

Chapter Four: Capability Assessment

(In compliance with 201.6 (C1))

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

A questionnaire was distributed to the Ellis County Office of Emergency Management and to the Hazard Mitigation Planning Team in order to initiate this assessment. This capability assessment was distributed to the participating jurisdictions to request information pertaining to existing plans, policies, and regulations that contribute to or hinder the ability to implement hazard mitigation activities, including legal and regulatory capabilities, administrative and technical capabilities, and fiscal capabilities. The completed questionnaire was received on March 27, 2014.

Jurisdiction	Chief Administrative Officer	Ability to Implement Capabilities
Ellis County	County Judge	The Commissioner's Court, including the County Judge and Precinct Commissioners, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the Commissioner's Court has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the county budget, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Alma	Mayor	The city council, including the mayor, mayor pro-tem, and council members, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Bardwell	Mayor	The city council, including the mayor, mayor pro-tem, and council members, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.

Jurisdiction	Chief Administrative Officer	Ability to Implement Capabilities
Ennis	City Manager	The city council, including the mayor, mayor pro-tem, and council members, along with the city manager, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Ferris	City Manager	The city council, including the mayor, mayor pro-tem, and council members, along with the city manager, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Garrett	Mayor	The city council, including the mayor, mayor pro-tem, and council members, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Italy	Mayor	The city council, including the mayor, mayor pro-tem, and council members, along with the city administrator, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Maypearl	Mayor	The city council, including the mayor, mayor pro-tem, and council members addresses the budget; passes ordinances, regulations, and codes; hires staff; approves plans; and determines the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and

Jurisdiction	Chief Administrative Officer	Ability to Implement Capabilities
		programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Midlothian	City Manager	The city council, including the mayor, mayor pro-tem, and council members, along with the city manager, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Milford	Mayor	The city council, including the mayor, mayor pro-tem, and council members, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Oak Leaf	Mayor	The City Council, including the mayor, mayor pro tempore, and council members address the budget, pass ordinances, resolutions and codes, hire staff, approve plans and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. They have the ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs.
Ovilla	City Administrator	The city council, including the mayor, mayor pro-tem, and council members, along with the city administrator, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Palmer	City Administrator	The city council, including the mayor, mayor pro-tem, and council members, along with the city administrator, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council

Jurisdiction	Chief Administrative Officer	Ability to Implement Capabilities
		has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the city budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Red Oak	City Manager	The city council, including the mayor, mayor pro-tem, and council members, along with the city manager, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the City budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.
Waxahachie	City Manager	The city council, including the mayor, mayor pro-tem, and council members, along with the city administrator, address the budget; pass laws, regulations, and codes; hire staff; approve plans; and determine the direction of the city overall. As the governing body, the City Council has the authority to expand and/or improve mitigation capabilities though hiring additional staff, implementing new taxes, increasing the City budget, adopt new regulations and ordinances, and changing policies and programs. Ability to implement and approve mitigation actions and integrate mitigation into existing policies and programs is a function of this group.

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

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

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

Legal and Regulatory Capabilities															
Jurisdiction	Building Code	Zoning Ordinance	Subdivision Ordinance or regulation	Special purpose ordinances (floodplain management, storm water management, nillside or steep slope ordinances wildfire ordinances, hazard setback requirements)	Growth management ordinances (also called "smart Growth" or anti-sprawl orograms)	Site Plan review requirements	General or comprehensive plan	A capital improvements plan	An economic development plan	An emergency response plan	A post-disaster recovery plan	A post-disaster recovery ordinance	Real estate disclosure requirements	Other	% Yes per Jurisdiction
Ellis County	Ν	N	Y	Ŷ	N	Y	Y	Y	Ν	Y	Ν	Ν	Ν	Y	50%
Alma	Y	Y	Ν	Ν	Ν	Y	Y	Y	Y	Y	Y	Y	Y	Υ	79%
Bardwell	Ν	Y	Y	Y	Ν	Y	Ν	Ν	Ν	Y	Ν	Ν	Ν	Ν	36%
Ennis	Y	Y	Y	Y	Ν	Y	Y	Ν	Y	Y	Y	Y	Ν	Ν	71%
Ferris	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Ν	Ν	79%
Garrett	Y	Y	Y	N	Ν	Y	Y	Y	Y	Y	Ν	Ν	Ν	Y	64%
Italy	Y	Y	Y	N	N	Y	N	N	N	Y	N	N	N	N	36%
Maypearl	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	N	N	N	64%
iviidiothian	Y	Y	Y	Y	N N	Y	Y	Y	Y N	Y	Y	Y NI	Y N		86%
IVIIITOra	Y V	Y V	Y V	Y V	IN N	Y V	Y V	IN N	IN V	Y	IN V	IN NI	IN N	IN N	5U%
Oak Lear	Ϋ́ V	Ϋ́ V	Ϋ́ V	ř V	IN N	Ϋ́ V	Ϋ́ Υ	IN V	Ϋ́ Υ	ř V	Ϋ́ V	IN V	IN V		04%
Dolmor	۱ ۷	۱ ۷	r V	í N		r V	T NI	T N	T N	ı V	r N	I NI	I NI		00% 26%
Red Oak	۱ ۷	۱ ۷	ı ۷	IN V	N	ı ۷				I V					03%
Waxahachie	Y	Y	Y	Ý	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	93%
	vvaxanachie Y <th< td=""></th<>														

Table 4.1 Legal and Regulatory Capability Summary

Administrative and Technical Capabilities											
Jurisdiction	² lanner(s) or engineer(s) with knowledge of land development and land management	Engineer(s) or professional(s) trained in construction practices related to buildings and/or nfrastructure	Planners or engineer(s) with an understanding of natural and/or human caused hazards	Jesignated Floodplain manager	Surveyors	Staff with education or expertise to assess the community's vulnerability to hazards	^o ersonnel skilled in GIS	Scientists familiar with the hazards of the community	Emergency manager	Grant writers	% Yes per Jurisdiction
Ellis County	Y	Y	Y	Y	Y	N	Y	N	Y	Y	80%
Alma	Ν	Ν	Y	Ν	Ν	Ν	Ν	Ν	Ν	Ν	20%
Bardwell	Ν	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Ν	Ν	0%
Ennis	Y	Y	Y	Y	Ν	Y	Ν	Ν	Y	Y	70%
Ferris	Ν	Y	Ν	Y	Y	Y	Ν	Ν	Y	Ν	50%
Garrett	Y	Y	Ν	Ν	Ν	Ν	Ν	Ν	Y	Y	40%
Italy	Y	Y	Y	Y	Ν	Y	Ν	Ν	Y	Y	60%
Maypearl	N	Ν	Ν	Y	Ν	N	Ν	Ν	Y	Ν	10%
Midlothian	Y	Y	Y	Y	Ν	Y	Y	Ν	Y	Y	80%
Milford	N	Y	Ν	Y	Ν	Y	Ν	Ν	Ν	Y	30%
Oak Leaf	Y	Y	Y	Y	Ν	N	Ν	Ν	Y	Y	60%
Ovilla	N	Ν	Ν	Y	Ν	Y	Ν	Ν	Y	Ν	30%
Palmer	Ν	Ν	Ν	Y	Ν	Ν	Ν	Ν	Ν	Ν	0%
Red Oak	Y	Y	Y	Y	Y	Y	Ν	Ν	Y	Y	80%
Waxahachie	Y	Y	Y	Y	Ν	Y	Y	Ν	Y	Y	70%
Average % Yes Capabilities – 46% Y- Yes N- No ?- Don't Know											

Table 4.2 Administrative and Technical Capability Summary

Fiscal Capabilities											
Jurisdiction	Community Development Block Grants (CDBG)	Capital improvements project funding	Authority to levy taxes for specific purposes	Fees for water, sewer, gas, or electric service	Impact fees for homebuyers or developers for new developments/homes	Incur debt through general obligation bonds	Incur debt through special tax bonds	Incur debt through private activity bonds	Withhold spending in hazard-prone areas	Other	% Yes per Jurisdiction
Ellis County	Y	Y	Y	Ν	Ν	Ν	Ν	Ν	Ν	Ν	30%
Alma	Y	Ν	Y	Y	Ν	Υ	Υ	Y	Ν	Ν	60%
Bardwell	Y	Ν	Ν	Y	Ν	Ν	Ν	Ν	Ν	Ν	20%
Ennis	Y	Y	Y	Y	Ν	Y	Ν	Ν	Y	Ν	60%
Ferris	Y	Y	Y	Y	Ν	Y	Y	Ν	Y	Y	80%
Garrett	Y	Y	Y	Y	Ν	Ν	Ν	N	N	Ν	40%
Italy	Y	Ν	N	Y	Ν	Y	Y	Ν	N	Ν	40%
Maypearl	Y	Ν	Y	Y	Y	Y	Ν	Ν	N	Ν	40%
Midlothian	N	Y	Y	Y	Y	Y	Y	N	Y	Y	80%
Milford	Y	Y	Y	Y	Ν	Y	Y	N	Y	Ν	70%
Oak Leaf	Y	Y	Y	N	Ν	Y	Ν	Ν	N	Ν	40%
Ovilla	N	Ν	Y	Y	Y	Y	Ν	N	N	Ν	40%
Palmer	Y	Ν	Ν	Y	Ν	Y	Ν	Ν	Ν	Ν	30%
Red Oak	N	Y	Y	Y	Ν	Y	Y	Y	Ν	Ν	60%
Waxahachie	Y	Y	Y	Y	Y	Y	Y	Y	Y	Ν	90%
Average % Yes Capabilities – 52%											
	Y-	Yes	N	I- No	?- Do	on't Kr	างพ				

Table 4.3 Fiscal Capability Summary

To quantify Ellis County's legal and regulatory capabilities, administrative and technical, and fiscal capabilities, an overall rating system was administered for each category; limited (0-30%), moderate (31-70%), and strong (70-100%). Questionnaire responses indicated that on average, Ellis County and its jurisdictions have 66% of legal and regulatory capabilities, 46% of administrative and technical capabilities of, and 52% fiscal capabilities.

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

This page intentionally left blank.

Chapter Five: Mitigation Strategy

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

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

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

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

5.1 Goals

The hazard mitigation goals describe the overall purpose of the HazMAP, and target specific objectives through which those goals are to be achieved. Each participating jurisdiction aligns their specific action items to these goals through specific and measurable objectives.

5.2 Action Items

The action items are organized by each hazard assessed, are listed in order of the participating jurisdiction. They identify items specific to each jurisdiction and how that particular jurisdiction plans to reduce the potential losses identified in Chapter Three.

Unincorporated Ellis County Action Items	Section 5.2.A
City of Alma Action Items	Section 5.2.B
City of Bardwell Action Items	Section 5.2.C
City of Ennis Action Items	Section 5.2.D
City of Ferris Action Items	Section 5.2.E
City of Garrett Action Items	Section 5.2.F
City of Italy Action Items	Section 5.2.G
City of Maypearl Action Items	Section 5.2.H
City of Midlothian Action Items	Section 5.2.I
City of Milford Action Items	Section 5.2.J
City of Oak Leaf Action Items	Section 5.2.K
City of Ovilla Action Items	Section 5.2.L
City of Palmer Action Items	Section 5.2.M
City of Red Oak Action Items	Section 5.2.N
City of Waxahachie Action Items	Section 5.2.0

5-5

5-3

5.3 National Flood Insurance Program (NFIP) Compliance 5-103 Chapter Five of the Ellis County HazMAP also describes each participating jurisdiction's participation in the National Flood Insurance Program (NFIP). It identifies, analyzes, and prioritizes those action items related to continued compliance with the NFIP.

5.1 Goals

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

Goal 1 Mitigate against hazards exacerbated by extreme conditions in Ellis County

Objective 1-A Develop new or existing programs to mitigate against drought Objective 1-B Develop new or existing programs to mitigate against wildfire Objective 1-C Develop new or existing programs to mitigate against extreme heat Objective 1-D Develop new or existing programs to mitigate against winter storms

Goal 2 Empower citizens to make better informed choices

Objective 2-A Promote a comprehensive public education program Objective 2-B Maintain existing codes and ordinances that require front end mitigation of hazards Objective 2-C Limit fleeding in fleed plain areas and outside of the area

Objective 2-C Limit flooding in flood plain areas and outside of the area.

Goal 3 Promote the use of Early Warning Systems

Objective 3-A Promote and support the CASA Weather Radar System Objective 3-B Promote the use of Outdoor Warning Sirens Objective 3-C Support the distribution of NOAA All-Weather Radios Objective 3-D Support and promote the use of telephone-based information delivery systems

Goal 4 Identify and reduce effects from chronic hazard events.

Objective 4-A Develop and execute new programs which identify and reduce threats from natural hazards Objective 4-B Identify and mitigate city/county-owned structures and/or property that are vulnerable to natural hazards This page intentionally left blank
5.2 Action Items

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

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

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

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

High Priority	First level of project consideration based on evaluation criteria detailed above
Medium Priority	Second level of project consideration based on evaluation criteria detailed above
Low Priority	Third level of project consideration based on evaluation criteria detailed above

Action Item Complete Listing

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

Unincorporated Ellis County Action Items	Section 5.2.A
City of Alma Action Items	Section 5.2.B
City of Bardwell Action Items	Section 5.2.C

City of Ennis Action Items	Section 5.2.D
City of Ferris Action Items	Section 5.2.E
City of Garrett Action Items	Section 5.2.F
City of Italy Action Items	Section 5.2.G
City of Maypearl Action Items	Section 5.2.H
City of Midlothian Action Items	Section 5.2.I
City of Milford Action Items	Section 5.2.J
City of Oak Leaf Action Items	Section 5.2.K
City of Ovilla Action Items	Section 5.2.L
City of Palmer Action Items	Section 5.2.M
City of Red Oak Action Items	Section 5.2.N
City of Waxahachie Action Items	Section 5.2.0

Ellis County Action Item	Develop and implement a comprehensive public education program
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	\$10,000
Potential Funding Sources	General funds, State, federal grant funding
Potential Matching Sources	Local funds, private donations
Lead Department	Emergency Management
Implementation Schedule	6 – 9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost
Discussion	This public education program would be based on the hazards that Ellis County identified. The program will educate residents on the hazards and mitigation actions for each.

Section 5.2.A – Unincorporated Ellis County Action Items

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

Ellis County Action Item	Purchase and distribute hail and wind resistant window coverings to vulnerable populations.
Hazard(s) Addressed	Hail, Tornado, High Winds
Goal/Objective	4-A
Priority	Low
Estimated Cost	Unknown currently, based on current population and vendor
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, in-kind
Lead Department	Emergency Management
Implementation Schedule	12 Months
Effect on Old Buildings	Potentially can reduce damage caused by severe weather
Effect on New Buildings	Potentially can reduce damage caused by severe weather
Cost Effectiveness	Low cost and will provide great benefit to the community
Discussion	Ellis County will purchase window coverings to protect vulnerable residential windows from damage from hail, debris, and wind damage.

Ellis County Action Item	Develop and implement storm water drainage system for new development
Hazard(s) Addressed	Flooding, Drought
Goal/Objective	1-A, 2-C
Priority	High
Estimated Cost	\$50,000
Potential Funding Sources	HMGP, PDM
Potential Matching Sources	General Fund, In-kind
Lead Department	Public Works
Implementation Schedule	1 year
Effect on Old Buildings	Would mitigate flooding, protecting existing structures
Effect on New Buildings	Would allow for public works to plan for new construction
Cost Effectiveness	Potential to save lives
Discussion	Develop and implement storm water management system for new areas of development in the county. Pre-development analysis and considerations to include drainage issues and flooding. System to mitigate identified issues and include measures for collection, storage, and distribution of captured storm water.

Ellis County Action Item	Equip and implement county facilities as "warming and cooling centers" for affected populations.
Hazard(s) Addressed	Winter Storms, Extreme Heat
Goal/Objective	1-D
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	HMGP, PDM
Potential Matching Sources	General Fund, in-kind
Lead Department	Emergency Management
Implementation Schedule	12-18 months
Effect on Old Buildings	Existing structures would be opened to the public to serve as warming shelters.
Effect on New Buildings	New construction of county facilities would be designed with a secondary or tertiary purpose
Cost Effectiveness	The low cost is effective when compared to benefits provided to citizens.
Discussion	This action will mitigate impacts of extreme temperatures or winter storms on vulnerable populations.

Ellis County Action Item	Partner with the Texas Fire Service in creating "Firewise" Communities in Ellis County.
Hazard(s) Addressed	1-B
Goal/Objective	Wildland Fire
Priority	Low
Estimated Cost	\$130,000
Potential Funding Sources	HMGP, PDM, Texas Forest Service grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Fire Marshal
Implementation Schedule	24 months
Effect on Old Buildings	This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures.
Effect on New Buildings	This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures.
Cost Effectiveness	Program cost is low compared to benefits
Discussion	Creating "Firewise" Communities will provide a wider buffer between residential and commercial properties and the wild land environment.

Ellis County Action Item	Conduct earthquake assessment study to determine potential for earthquakes to affect public facilities and utilities.
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects.

Ellis County Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

Ellis County Action Item	Protect Critical Infrastructure by Installing Lightning Rods
Hazard(s) Addressed	Lightning
Goal/Objective	4-B
Priority	High
Estimated Cost	\$15,000
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, In-kind
Lead Department	Public Works
Implementation Schedule	1 year
Effect on Old Buildings	Would mitigate existing structures against lightning
Effect on New Buildings	New construction would include lightning rods on critical facilities
Cost Effectiveness	Potential to protect property
Discussion	Ellis County will purchase and install lightning rods on CI/KR buildings, like government facilities.

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

City of Alma Action Item	Develop and implement a comprehensive public education program.
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	\$10,000
Potential Funding Sources	General funds, State, federal grant funding
Potential Matching Sources	Local funds, private donations
Lead Department	Emergency Management
Implementation Schedule	6 – 9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost
Discussion	This public education program would be based on the hazards that the City of Alma identified. The program will educate residents on the hazards and mitigation actions for each.

Section 5.2.B – City of Alma Action Items

City of Alma Action Item	Develop, implement, and enforce water conservation codes and ordinances.
Hazard(s) Addressed	Drought
Goal/Objective	1-A
Priority	Medium
Estimated Cost	Staff time
Potential Funding Sources	HMPG, General Fund
Potential Matching Sources	General Fund
Lead Department	Mayor
Implementation Schedule	12 Months
Effect on Old Buildings	This action will publicize water conservation efforts that can be incorporated into existing structures.
Effect on New Buildings	This action will publicize water conservation efforts that can be incorporated into new construction.
Cost Effectiveness	Municipal codes can have a great effect on resident actions for little cost beyond staff time.
Discussion	The City of Alma will adopt and enforce water conservation codes and ordinances for its residents in order to prevent excessive use of water.

City of Alma Action Item	Purchase and distribute hail and wind resistant window coverings to vulnerable populations.
Hazard(s) Addressed	Hail, Tornado, High Winds
Goal/Objective	4-A
Priority	Low
Estimated Cost	Unknown currently, based on current population and vendor
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, in-kind
Lead Department	Emergency Management
Implementation Schedule	12 Months
Effect on Old Buildings	Potentially can reduce damage caused by severe weather
Effect on New Buildings	Potentially can reduce damage caused by severe weather
Cost Effectiveness	Low cost and will provide great benefit to the community
Discussion	Alma will purchase window coverings to protect vulnerable populations from damage from hail, debris, and wind damage.

City of Alma Action Item	Adopt and Promote the National Flood Insurance Program
Hazard(s) Addressed	Flooding
Goal/Objective	4-B
Priority	High
Estimated Cost	\$1,000
Potential Funding Sources	HMGP, PDM
Potential Matching Sources	General Fund, In-kind
Lead Department	Mayor
Implementation Schedule	1-2 years
Effect on Old Buildings	Would allow the city of develop more in-depth flood mitigation programs for homes already in the floodplain.
Effect on New Buildings	Would allow the city of develop codes and ordinances for blocking construction in areas vulnerable to flooding.
Cost Effectiveness	Potential to save lives
Discussion	Alma would become a member of NFIP and develop a long-term plan for flood mitigation.

City of Alma Action Item	Adopt and enforce mandatory insulation and lightning protection codes for new construction.
Hazard(s) Addressed	Winter Storms, Extreme Heat, Lightning
Goal/Objective	1-C, 1-D, 4-A, 4-B
Priority	Low
Estimated Cost	Staff time
Potential Funding Sources	Local funds
Potential Matching Sources	General Fund, in-kind
Lead Department	Mayor
Implementation Schedule	12-18 months
Effect on Old Buildings	This action will provide information concerning natural hazard mitigation that can be incorporated into existing buildings.
Effect on New Buildings	This action will require practices that mitigate natural hazards to be incorporated into new construction
Cost Effectiveness	The low cost is effective when compared to benefits provided to citizens.
Discussion	Codes will mandate higher insulation standards to mitigate impacts of extreme heat and winter storm for all new construction, and require lightning protection measures, including enhanced grounding and/or rods, on all new public buildings

City of Alma Action Item	Partner with the Texas Fire Service in establishing Alma as a "Firewise" community
Hazard(s) Addressed	1-B
Goal/Objective	Wildland Fire
Priority	Low
Estimated Cost	\$13,000
Potential Funding Sources	HMGP, PDM, Texas Forest Service grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Mayor
Implementation Schedule	24 months
Effect on Old Buildings	This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures.
Effect on New Buildings	This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures.
Cost Effectiveness	Program cost is low compared to benefits
Discussion	Creating "Firewise" Communities will provide a wider buffer between residential and commercial properties and the wild land environment.

City of Alma Action Item	Conduct earthquake assessment study to determine potential for earthquakes to affect public facilities and utilities.
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects.

City of Alma Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

City of Alma Action Item	Hire consultant to complete new inundation studies of all high and moderate hazard dams.
Hazard(s) Addressed	Dam Failure, Flood
Goal/Objective	Protect existing and new properties from the effects of all natural hazards.
Priority	High
Estimated Cost	\$75,000
Potential Funding Sources	HMPG, Water Shed Authorities, Dam Sponsors
Potential Matching Sources	Local Sponsors, In-Kind
Lead Department	Planning and Zoning/ NRCS
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low
Discussion	Identify all structures and infrastructures that would be impacted by a potential dam failure.

City of Bardwell Action Item	Develop and implement a comprehensive public education program.
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	\$10,000
Potential Funding Sources	General funds, State, federal grant funding
Potential Matching Sources	Local funds, private donations
Lead Department	Emergency Management
Implementation Schedule	6 – 9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost
Discussion	This public education program would be based on the hazards that the City of Bardwell identified. The program will educate residents on the hazards and mitigation actions for each.

Section 5.2.C – City of Bardwell Action Items

City of Bardwell Action Item	Develop, implement, and enforce water conservation codes and ordinances.
Hazard(s) Addressed	Drought
Goal/Objective	1-A
Priority	Medium
Estimated Cost	Staff time
Potential Funding Sources	HMPG, General Fund
Potential Matching Sources	General Fund
Lead Department	Mayor
Implementation Schedule	12 Months
Effect on Old Buildings	This action will publicize water conservation efforts that can be incorporated into existing structures.
Effect on New Buildings	This action will publicize water conservation efforts that can be incorporated into new construction.
Cost Effectiveness	Municipal codes can have a great effect on resident actions for little cost beyond staff time.
Discussion	The City of Bardwell will adopt and enforce water conservation codes and ordinances in order to prevent excessive use of water.

City of Bardwell Action Item	Purchase and distribute hail and wind resistant window coverings to vulnerable populations.
Hazard(s) Addressed	Hail, Tornado, High Winds
Goal/Objective	4-A
Priority	Low
Estimated Cost	Unknown currently, based on current population and vendor
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, in-kind
Lead Department	Emergency Management
Implementation Schedule	12 Months
Effect on Old Buildings	Potentially can reduce damage caused by severe weather
Effect on New Buildings	Potentially can reduce damage caused by severe weather
Cost Effectiveness	Low cost and will provide great benefit to the community
Discussion	Bardwell will purchase window coverings to protect vulnerable populations from damage from hail, debris, and wind damage.

City of Bardwell Action Item	Adopt and Promote the National Flood Insurance Program
Hazard(s) Addressed	Flooding
Goal/Objective	4-B
Priority	High
Estimated Cost	\$1,000
Potential Funding Sources	HMGP, PDM
Potential Matching Sources	General Fund, In-kind
Lead Department	Mayor
Implementation Schedule	1-2 years
Effect on Old Buildings	Would allow the city of develop more in-depth flood mitigation programs for homes already in the floodplain.
Effect on New Buildings	Would allow the city of develop codes and ordinances for blocking construction in areas vulnerable to flooding.
Cost Effectiveness	Potential to save lives
Discussion	Bardwell would become a member of NFIP and develop a long-term plan for flood mitigation.

City of Bardwell Action Item	Adopt, implement, and enforce International Residential Code
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning
Goal/Objective	1-D
Priority	Low
Estimated Cost	Staff time
Potential Funding Sources	Local funds
Potential Matching Sources	General Fund, in-kind
Lead Department	Mayor
Implementation Schedule	12 months
Effect on Old Buildings	This action will provide information concerning natural hazard mitigation that can be incorporated into existing buildings.
Effect on New Buildings	This action will require practices that mitigate natural hazards to be incorporated into new construction
Cost Effectiveness	The low cost is effective when compared to benefits provided to citizens.
Discussion	Bardwell would mandate requirements consistent with the International Residential Code for all new construction.

City of Bardwell Action Item	Partner with the Texas Fire Service in establishing Bardwell as a "Firewise" community
Hazard(s) Addressed	1-B
Goal/Objective	Wildland Fire
Priority	Low
Estimated Cost	\$13,000
Potential Funding Sources	HMGP, PDM, Texas Forest Service grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Mayor
Implementation Schedule	24 months
Effect on Old Buildings	This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures.
Effect on New Buildings	This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures.
Cost Effectiveness	Program cost is low compared to benefits
Discussion	Creating "Firewise" Communities will provide a wider buffer between residential and commercial properties and the wild land environment.

City of Bardwell Action Item	Conduct earthquake assessment study to determine potential for earthquakes to affect public facilities and utilities.
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects.

City of Bardwell Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

City of Bardwell Action Item	Hire consultant to complete new inundation studies of all high and moderate hazard dams.
Hazard(s) Addressed	Dam Failure, Flood
Goal/Objective	Protect existing and new properties from the effects of all natural hazards.
Priority	High
Estimated Cost	\$75,000
Potential Funding Sources	HMPG, Water Shed Authorities, Dam Sponsors
Potential Matching Sources	Local Sponsors, In-Kind
Lead Department	Planning and Zoning/ NRCS
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low
Discussion	Identify all structures and infrastructures that would be impacted by a potential dam failure.

City of Ennis Action Item	Adopt and promote a comprehensive public education program.
Hazard(s) Addressed	Tornado, Hail, High Winds, Expansive Soils, Drought, Winter Storms, Extreme Heat, Wildfire, Flooding, Lightning, Earthquake, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	\$10,000
Potential Funding Sources	General funds, State, federal grant funding
Potential Matching Sources	Local funds, private donations
Lead Department	Emergency Management
Implementation Schedule	6 – 9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost
Discussion	This public education program would be based on the hazards that the city identified as being vulnerable to. The program would use a combination of distributed literature, social media, and civic presentations to educate residents on natural hazards and promote hazard mitigation.

Section 5.2.D – City of Ennis Action Items

City of Ennis Action Item	Develop and implement new building codes to mitigate against natural hazards.
Hazard(s) Addressed	Tornado, Hail, High Winds, Expansive Soils, Drought, Winter Storms, Extreme Heat, Wildfire, Flooding, Lightning, Earthquake
Goal/Objective	2-B
Priority	High
Estimated Cost	\$10,000
Potential Funding Sources	General funds, State, federal grant funding
Potential Matching Sources	Local funds, private donations
Lead Department	Emergency Management
Implementation Schedule	6 – 9 months
Effect on Old Buildings	New building codes would give property owners an incentive to retrofit their structures.
Effect on New Buildings	New construction would be built in accordance with the new building codes
Cost Effectiveness	Municipal codes are extremely effective mitigation for low cost.
Discussion	The City of Ennis will adopt and enforce stricter building codes and ordinances for new construction These measures include hail-resistant roofing and windows; wind and impact resistant doors, windows, and roofing ; wildfire breaks and fire resistant building materials; stricter foundation standards for earthquake and expansive soils; increased elevation (BFE) standards for flooding; higher grade insulation to mitigate extreme heat and winter weather; and resource-efficient (low- flow) plumbing for drought. Also, additional codes for dry-proofing and lightning protection (rods, grounding) for public buildings to mitigate flood and lightning.

City of Ennis Action Item	Purchase and install CASA WX Radar.
Hazard(s) Addressed	Tornado, high winds, hail, winter storm, wildfire, flooding, lightning
Goal/Objective	3-A
Priority	High
Estimated Cost	\$2.5 Million
Potential Funding Sources	HMGP, PDM, County budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Emergency Management
Implementation Schedule	1-2 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The cost of this project is low compared to the potential benefits
Discussion	The CASA radars provide jurisdictions more accurate weather data and geographically specific weather data culled from the most active levels of the atmosphere. This data could save lives by providing the public more time to react and prepare appropriately as severe weather affects their location. Currently the City is a member of the CASA Radar project with the closest radar in Midlothian Texas; the radar coverage for our City is 50% with the Midlothian radar. By installing the CASA Radar in our jurisdiction; it would give Meteorologist and Emergency Preparedness Personnel a greater ability to predict and warn of approaching violent weather.

City of Ennis Action Item	Expand Outdoor Warning Systems to New Populations
Hazard(s) Addressed	Tornado, high winds, hail, wildfire, flooding, lightning
Goal/Objective	3-В
Priority	High
Estimated Cost	30,000.00
Potential Funding Sources	HMGP, PDM, County budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Public Works
Implementation Schedule	1-2 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The cost of this project is low compared to the potential reduction in loss of life by the ability to warn of approaching violent storms.
Discussion	Adding one (1) additional out-door warning siren to the system in place to get warning coverage to newly developed parts of the city. Early warnings have been shown to help save lives and property from severe weather events

City of Ennis Action Item	Install redundant OWS activation switches
Hazard(s) Addressed	3-В
Goal/Objective	Tornado, High winds, hail, wildfire, flooding
Priority	Medium
Estimated Cost	8,000.00
Potential Funding Sources	HMGP, PDM, County budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Police Department/Emergency Management
Implementation Schedule	6-12 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The costs estimated for this project are insignificant in comparison to the opportunity to warn our citizens more effectively of impending dangers associated with weather and natural disasters
Discussion	Currently the City has one activation point for the seven sirens in the City. The redundant activation point gives the Emergency Management Staff the reliability of two points to warn the city of an approaching weather hazard in the case of building or equipment failure.

City of Ennis Action Item	Develop and Implement Expansive Soil Code Enforcement Program
Hazard(s) Addressed	2-B
Goal/Objective	Drought, Expansive Soils
Priority	Medium
Estimated Cost	5,000.00
Potential Funding Sources	HMGP, PDM, County budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Public Works
Implementation Schedule	12-18 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The cost of this project is low compared to the potential reduction in property loss due to failure of foundations systems and expansive soil.
Discussion	The Building Department will take the role in ensuring that Builders and project managers are educated as to the types of soil in the jurisdiction and that foundations are engineered and/or geo technical data is provided for each project to ensure adherence to new codes. Inspections will verify construction adheres to plans submitted.

City of Ennis Action Item	Develop and implement drought mitigation plan
Hazard(s) Addressed	1-A
Goal/Objective	Drought
Priority	Medium
Estimated Cost	\$10,000
Potential Funding Sources	HMGP, PDM, County budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Public Works/ Code Enforcement/Emergency Management
Implementation Schedule	12-18 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The estimated cost would quickly be recovered through preservation of city water source and avoidance of cost associated with secondary water sources.
Discussion	The City of Ennis draws it water from Lake Bardwell which is a Flood control lake through the Corps of Engineering. The City does have an agreement with Tarrant County Regional Water for water, at a costly rate for out tax payers.

City of Ennis Action Item	Purchase and install two lightning guard systems
Hazard(s) Addressed	Lightning
Goal/Objective	4-B
Priority	Medium
Estimated Cost	30,000.00
Potential Funding Sources	HMGP, PDM, County budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Public Works/ Code Enforcement/Emergency Management
Implementation Schedule	12-18 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The cost of this project is low compared to the potential life saving benefits
Discussion	The lightning guard would be installed at two parks that serve as sports complexes for the City's youth. The lightning guard systems are standalone systems that warn of lightning up to thirty minutes away allowing for advanced notice and evacuations of both parks.

City of Ennis Action Item	Replace Water Lines with Larger Pipe
Hazard(s) Addressed	Drought
Goal/Objective	1-A
Priority	Medium
Estimated Cost	1.5 Million
Potential Funding Sources	HMGP, PDM, County budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Public Works
Implementation Schedule	2-3 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The cost of this project is low compared to the potential life benefits reducing the loss of water in the water system.
Discussion	The City plans on replacing four inch cast iron water line pipe that is eighty to one hundred year old. Replacing this system with larger pipe would expand water delivery capabilities and increase efficiency and sustainability.

City of Ennis Action Item	Develop and implement wildfire mitigation public education program
Hazard(s) Addressed	Wildfire
Goal/Objective	1-B
Priority	Medium
Estimated Cost	5,000.00
Potential Funding Sources	HMGP, PDM, County budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Fire Department
Implementation Schedule	12-18 months
Effect on Old Buildings	This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures.
Effect on New Buildings	This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures.
Cost Effectiveness	Public education has high rewards from low costs.
Discussion	Wildfire mitigation measures are not widely known in urban areas. This action would increase citizens' knowledge of wildfire mitigation measures and help reduce casualties and damages from wildfires.

City of Ennis Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

City of Ennis Action Item	Hire consultant to complete new inundation studies of all high and moderate hazard dams that could potentially affect property and populations within the city.
Hazard(s) Addressed	Dam Failure, Flood
Goal/Objective	4-B
Priority	High
Estimated Cost	\$75,000
Potential Funding Sources	HMPG, Water Shed Authorities, Dam Sponsors
Potential Matching Sources	Local Sponsors, In-Kind
Lead Department	Planning and Zoning/ NRCS
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low
Discussion	Identify all structures and infrastructures that would be impacted by a potential dam failure.

City of Ennis Action Item	Conduct earthquake assessment study to determine potential for earthquakes to affect public facilities and utilities.
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects

City of Ferris Action Item	Purchase and Install a CASA-WX Radar
Hazard(s) Addressed	Tornado, High Winds, Hail, Winter Storms, Flooding
Goal/Objective	3-A
Priority	High
Estimated Cost	\$1,000 pro-rated to the City of Ferris
Potential Funding Sources	General fund, HMGP, PDM
Potential Matching Sources	Donations, local funds, in-kind.
Lead Department	Emergency Management
Implementation Schedule	1-2 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Cost effectiveness is derived from the ability to accurately track tornadoes and warn citizens early to prevent the heavy loss of life or severe injuries.
Discussion	Would be used in conjunction with early warning sirens and code red to alert citizens to take shelter, thus reducing loss of life and severe injuries.

Section 5.2.E – City of Ferris Action Items

City of Ferris Action Item	Stricter building code adoption, implementation, and enforcement.
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Earthquake, High Winds, Extreme Heat, Expansive Soils, Wildfire, Lightning
Goal/Objective	2-B
Priority	High
Estimated Cost	\$5,000.00 plus staff time
Potential Funding Sources	State and Federal Grants, City Budget
Potential Matching Sources	City budget
Lead Department	Code Enforcement
Implementation Schedule	6 months with proper funding
Effect on Old Buildings	Substandard buildings will be brought within code or mitigated through the proper processes.
Effect on New Buildings	Building will be designed and constructed to withstand the forces of natural hazards
Cost Effectiveness	The small cost of this project is easily offset by the savings from minimizing property damage to residents and business owners. This project has the chance to save lives by minimizing structural collapse and dangerous flying debris.
Discussion	City of Ferris will adopt and enforce stricter applicable building codes and ordinances. These measures include hail-resistant roofing and windows; wind and impact resistant doors, windows, and roofing ; wildfire breaks and fire resistant building materials; stricter foundation standards for earthquake and expansive soils; increased elevation (BFE) standards for flooding; higher grade insulation to mitigate extreme heat and winter weather; and resource-efficient (low-flow) plumbing for drought. Also, additional codes for dry-proofing and lightning protection (rods, grounding) for public buildings to mitigate flood and lightning.

City of Ferris Action Item	Harden City Hall Against Severe Weather-related Natural Hazards
Hazard(s) Addressed	Tornado, Hail, Extreme Heat, Flooding, Winter Storms, High Winds, Lightning
Goal/Objective	4-B
Priority	High
Estimated Cost	\$25,000.00
Potential Funding Sources	PDM, HMGP, other federal / state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Emergency Management, City Manager
Implementation Schedule	2 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Hardening City Hall will protect lives and property.
Discussion	Currently, City Hall is vulnerable to natural hazards. Windows and doors would be reinforced, insulation would be updated, and a lightning rod would be installed to mitigate against extreme weather.

City of Ferris Action Item	Addition of 2 Early Warning Sirens for New Populations
Goals/Objectives	Tornado, Hail, Wildfire, High Winds
Hazards Addressed	3-В
Priority (High, Medium, Low)	High
Estimated cost	\$40,000
Potential Funding sources	HMGP, PDM, general fund.
Potential Matching sources	Grants, local funds, in-kind, donations.
Lead Agency / Department Responsible	Emergency Management, city manager, building department, ONCOR electrical
Implementation Schedule	Within 6-12 months of actual funding.
Effect on New Building	None
Effect on Existing buildings	None
Cost Effectiveness	The cost-effectiveness is the ability given from EWS to save lives by early warning people who are outside at their residences, businesses, city parks to take proper shelter inside to a safe refuge during severe weather or tornadoes.
Discussion	Adding two (2) additional out-door warning sirens to the system in place, would expand early warning coverage area to newly developed parts of the city. Early warnings have been shown to help save lives and property from severe weather events

City of Ferris Action Item	Establish select city buildings as cooling centers and warming centers to allow citizens, especially vulnerable populations, to seek refuge from extreme hot and cold temperatures.
Goals/Objectives	1-C, 1-D
Hazards Addressed	Extreme Heat, Winter Storm
Priority (High, Medium, Low)	Medium
Estimated cost	TBD
Potential Funding sources	HGMP, PDM, City budget
Potential Matching sources	General fund
Lead Agency / Department Responsible	Emergency Management
Implementation Schedule	12 months
Effect on New Building	City to identify current city owned facilities that could be utilized.
Effect on Existing buildings	None
Cost Effectiveness	Cost will be minimal by using existing city owned facilities.
Discussion	This action will mitigate impacts of extreme temperatures or winter storms on vulnerable populations.

City of Ferris Action Item	Implement Individual Tornado Safe Room Rebate Program
Goals/Objectives	4-A
Hazards Addressed	Tornadoes, High Winds
Priority (High, Medium, Low)	Medium
Estimated cost	\$100,000
Potential Funding sources	FEMA safe room grants, the federal government makes funds available for the construction of safe rooms and community shelters. Sources include FEMA's Hazard Mitigation Grant program (states and local government), U.S Small Business Administration, PDM grant, and resident match.
Potential Matching sources	Local match or in-kind match from residents
Lead Agency / Department Responsible	Emergency Management, public works, building official.
Implementation Schedule	2-3 years
Effect on New Building	Some structures modified for a retro to enable completion of shelter.
Effect on Existing buildings	Moderate
Cost Effectiveness	Risk to lives can be improved through construction and retro fitting of safe rooms in homes, schools, businesses, and shelter areas of low income areas.
Discussion	With assistance from federal, state and local begin planning and implementation of tornado safe room rebate programs.

City of Ferris Action Item	Create, implement and enforce water rationing ordinance
Goals/Objectives	2-B
Hazards Addressed	Drought
Priority (High, Medium, Low)	Medium
Estimated cost	\$5,000.00
Potential Funding sources	HMGP, PDM, other state and federal grants
Potential Matching sources	Local funds, users fees, donations, in-kind
Lead Agency / Department Responsible	Public Works
Implementation Schedule	1-2 years
Effect on New Building	None
Effect on Existing buildings	None
Cost Effectiveness	The benefit of creating this ordinance would be costs saving to the city of Ferris by not having to buy water from an outside source, thus increasing price to the citizens.
Discussion	State of Texas is still recovering from drought conditions, plan will mitigate against future drought impacts.

City of Ferris Action Item	Purchasing and distributing NOAA Weather Radios to public facilities
Goals/Objectives	3-C
Hazards Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, High Winds, Extreme Heat , Earthquake, Lightning, Dam Failure
Priority (High, Medium, Low)	High
Estimated cost	\$2500.00
Potential Funding sources	General Fund, HMGP, PDM
Potential Matching sources	Local funds, donations, In-kind
Lead Agency / Department Responsible	Emergency Management, Fire Department
Implementation Schedule	2-4 years
Effect on New Building	None
Effect on Existing buildings	None
Cost Effectiveness	Distributing NOAA radios has the potential to save lives through early warning
Discussion	Provide early warning and hazard information by increasing the use of NOAA All-Hazard Weather Radios in public facilities, including schools

City of Ferris Action Item	Expansive Soil Enforcement Program
Hazard(s) Addressed	2-B
Goal/Objective	Expansive Soils
Priority	Medium
Estimated Cost	5,000.00
Potential Funding Sources	HMGP, PDM, County budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Public Works
Implementation Schedule	12-18 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The cost of this project is low compared to the potential reduction in property loss due to failure of foundations systems and expansive soil.
Discussion	The Building Department will take the role in ensuring that Builders and Project Managers (General Contractors) are educated to the types of soil in the jurisdiction. That foundations are engineered and or Geo Technical data is provided for each project. Inspections will verify construction to plans submitted.

City of Ferris Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

City of Ferris Action Item	Conduct earthquake study to assess potential for earthquakes and their impacts
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects

City of Ferris Action Item	Hire consultant to complete new inundation studies of all high and moderate hazard dams within the county.
Hazard(s) Addressed	Dam Failure, Flood
Goal/Objective	4-A
Priority	High
Estimated Cost	\$75,000
Potential Funding Sources	HMPG, Water Shed Authorities, Dam Sponsors
Potential Matching Sources	Local Sponsors, In-Kind
Lead Department	Planning and Zoning/ NRCS
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Identify all structures and infrastructures that would be impacted by a potential dam failure.

City of Garrett Action Item	Develop and implement a comprehensive public education program.
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	\$10,000
Potential Funding Sources	General funds, State, federal grant funding
Potential Matching Sources	Local funds, private donations
Lead Department	Emergency Management
Implementation Schedule	6 – 9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost
Discussion	This public education program would be based on the hazards that the City of Garrett identified. The program will educate residents on the hazards and mitigation actions for each.

Section 5.2.F - City of Garrett Action Items

City of Garrett Action Item	Develop, implement, and enforce water conservation codes and ordinances.
Hazard(s) Addressed	Drought
Goal/Objective	1-A
Priority	Medium
Estimated Cost	Staff time
Potential Funding Sources	HMPG, General Fund
Potential Matching Sources	General Fund
Lead Department	Mayor
Implementation Schedule	12 Months
Effect on Old Buildings	This action will publicize water conservation efforts that can be incorporated into existing structures.
Effect on New Buildings	This action will publicize water conservation efforts that can be incorporated into new construction.
Cost Effectiveness	Municipal codes can have a great effect on resident actions for little cost beyond staff time.
Discussion	The City of Garrett will adopt and enforce water conservation codes and ordinances in order to prevent excessive use of water.

City of Garrett Action Item	Purchase and distribute hail and wind resistant window coverings to vulnerable populations.
Hazard(s) Addressed	Hail, Tornado, High Winds
Goal/Objective	4-A
Priority	Low
Estimated Cost	Unknown currently, based on current population and vendor
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, in-kind
Lead Department	Emergency Management
Implementation Schedule	12 Months
Effect on Old Buildings	Potentially can reduce damage caused by severe weather
Effect on New Buildings	Potentially can reduce damage caused by severe weather
Cost Effectiveness	Low cost and will provide great benefit to the community
Discussion	Garrett will purchase window coverings to protect vulnerable populations from damage from hail, debris, and wind damage.

City of Garrett Action Item	Adopt and Promote the National Flood Insurance Program
Hazard(s) Addressed	Flooding
Goal/Objective	4-B
Priority	High
Estimated Cost	\$1,000
Potential Funding Sources	HMGP, PDM
Potential Matching Sources	General Fund, In-kind
Lead Department	Mayor
Implementation Schedule	1-2 years
Effect on Old Buildings	Would allow the city of develop more in-depth flood mitigation programs for homes already in the floodplain.
Effect on New Buildings	Would allow the city of develop codes and ordinances for blocking construction in areas vulnerable to flooding.
Cost Effectiveness	Potential to save lives
Discussion	Garrett would become a member of NFIP and develop a long-term plan for flood mitigation.
City of Garrett Action Item	Adopt, implement, and enforce International Residential Code
-------------------------------	--
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning
Goal/Objective	1-D
Priority	Low
Estimated Cost	Staff time
Potential Funding Sources	Local funds
Potential Matching Sources	General Fund, in-kind
Lead Department	Mayor
Implementation Schedule	12-18 months
Effect on Old Buildings	This action will provide information concerning natural hazard mitigation that can be incorporated into existing buildings.
Effect on New Buildings	This action will require practices that mitigate natural hazards to be incorporated into new construction
Cost Effectiveness	The low cost is effective when compared to benefits provided to citizens.
Discussion	Garrett would mandate requirements consistent with the International Residential Code for all new construction.

City of Garrett Action Item	Partner with the Texas Fire Service in establishing Garrett as a "Firewise" community
Hazard(s) Addressed	1-B
Goal/Objective	Wildland Fire
Priority	Low
Estimated Cost	\$13,000
Potential Funding Sources	HMGP, PDM, Texas Forest Service grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Mayor
Implementation Schedule	24 months
Effect on Old Buildings	This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures.
Effect on New Buildings	This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures.
Cost Effectiveness	Program cost is low compared to benefits
Discussion	Creating "Firewise" Communities will provide a wider buffer between residential and commercial properties and the wild land environment.

City of Garrett Action Item	Conduct earthquake study to assess potential for earthquakes and their impacts
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects

City of Garrett Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

City of Garrett Action Item	Hire consultant to complete new inundation studies of all high and moderate hazard dams.
Hazard(s) Addressed	Dam Failure, Flood
Goal/Objective	Protect existing and new properties from the effects of all natural hazards.
Priority	High
Estimated Cost	\$75,000
Potential Funding Sources	HMPG, Water Shed Authorities, Dam Sponsors
Potential Matching Sources	Local Sponsors, In-Kind
Lead Department	Planning and Zoning/ NRCS
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low
Discussion	Identify all structures and infrastructures that would be impacted by a potential dam failure.

This page intentionally left blank

City of Italy Action Item	Adopt and promote a comprehensive public education program.
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	\$10,000
Potential Funding Sources	General funds, State, federal grant funding
Potential Matching Sources	Local funds, private donations
Lead Department	Emergency Management
Implementation Schedule	6 – 9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost
Discussion	This public education program would be based on the hazards that the city identified as being vulnerable to. The program would use a combination of distributed literature, social media, and civic presentations to educate residents on natural hazards and promote hazard mitigation activities.

Section 5.2.G – City of Italy Action Items

City of Italy Action Item	Adopt, implement, and enforce International Residential Code
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning
Goal/Objective	1-D
Priority	Low
Estimated Cost	Staff time
Potential Funding Sources	Local funds
Potential Matching Sources	General Fund, in-kind
Lead Department	City Administrator
Implementation Schedule	12 months
Effect on Old Buildings	This action will provide information concerning natural hazard mitigation that can be incorporated into existing buildings.
Effect on New Buildings	This action will require practices that mitigate natural hazards to be incorporated into new construction
Cost Effectiveness	The low cost is effective when compared to benefits provided to citizens.
Discussion	Garrett would mandate requirements consistent with the International Residential Code for all new construction.

City of Italy Action Item	Implement Individual Tornado Safe Room Rebate Program
Hazard(s) Addressed	High Wind, Tornadoes
Goal/Objective	4-A
Priority	Medium
Estimated Cost	\$100,000
Potential Funding Sources	FEMA safe room grants, the federal government makes funds available for the construction of safe rooms and community shelters. Sources include FEMA's Hazard Mitigation Grant program (states and local government), U.S Small Business Administration, PDM grant, and resident match.
Potential Matching Sources	Local match or in-kind match from residents
Lead Department	Emergency Management, public works, building official.
Implementation Schedule	2-3 years
Effect on Old Buildings	Some structures modified for a retro to enable completion of shelter.
Effect on New Buildings	Moderate
Cost Effectiveness	Risk to lives can be improved through construction and retro fitting of safe rooms in homes, schools, businesses, and shelter areas of low income areas.
Discussion	With assistance from federal, state and local plan and implement a tornado safe room rebate program.

City of Italy Action Item	Develop and implement a tree-trimming program
Hazard(s) Addressed	Winter Storms, Wildfire, High Winds, Tornados
Goal/Objective	1-B, 1-D
Priority	Medium
Estimated Cost	Staff time and resources
Potential Funding Sources	City budget, private donations
Potential Matching Sources	None
Lead Department	Public Works
Implementation Schedule	12-18 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Cost to implement this program is low compared to the benefits of program.
Discussion	Removing tree branches from power line areas mitigates against power outages and minimizes the amount of debris generated during severe weather events.

City of Italy Action Item	Develop and Implement a Plan for Clearing Roadways
Hazard(s) Addressed	Winter Storm
Goal/Objective	1-D
Priority	Medium
Estimated Cost	\$15,000
Potential Funding Sources	Federal grants, state grants, local funds
Potential Matching Sources	Local funds, in-kind match
Lead Department	Public works
Implementation Schedule	12 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Developing a plan ahead of time would save time, money, and lives.
Discussion	Plan would mitigate impacts of natural disasters on roadways by reducing available debris

City of Italy Action Item	Harden City Hall Against Severe Weather-related Natural Hazards
Hazard(s) Addressed	Tornado, Hail, Extreme Heat, Flooding, Winter Storms, High Winds, Lightning
Goal/Objective	4-B
Priority	High
Estimated Cost	\$25,000.00
Potential Funding Sources	PDM, HMGP, other federal / state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Emergency Management, City Manager
Implementation Schedule	1-2 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Hardening City Hall will protect lives and property.
Discussion	Currently, City Hall is vulnerable to natural hazards. Windows and doors would be reinforced, insulation would be updated, and a lightning rod would be installed to mitigate against extreme weather.

City of Italy Action Item	Purchase and implement telephone based mass notification system.
Hazard(s) Addressed	Tornado, high winds, hail, winter storm, wildfire, flooding
Goal/Objective	3-D
Priority	High
Estimated Cost	5,000.00
Potential Funding Sources	HMGP, PDM, City budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Police Department/Emergency Management
Implementation Schedule	12 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The costs estimated for this project are insignificant in comparison to the opportunity to warn our citizens more effectively of impending dangers associated with weather and natural disasters.
Discussion	The City of Italy will purchase a mass notification system to notify its population of imminent hazards.

City of Italy Action Item	Dig New Ditches Along Floodplains to Mitigate Flooding
Hazard(s) Addressed	Flooding
Goal/Objective	4-B
Priority	Low
Estimated Cost	\$25,000
Potential Funding Sources	Federal grants, state grants, local funds
Potential Matching Sources	Local funds, in-kind match
Lead Department	Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	New construction adjacent to floodplains would be better protected against flood damage
Effect on New Buildings	Existing construction in floodplains or adjacent to floodplains would be better protected against flood damage
Cost Effectiveness	Implementing this program now would prevent exponential amount of damage from flooding, saving time and money.
Discussion	New channels for water drainage would be created in floodplains and/or areas of repetitive flooding to mitigate flooding potential.

City of Italy Action Item	Conduct earthquake study to assess potential for earthquakes and their impacts
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects

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

City of Italy Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

City of Maypearl Action Item	Develop and implement comprehensive public education program.
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	\$10,000
Potential Funding Sources	General funds, State, federal grant funding
Potential Matching Sources	Local funds, private donations
Lead Department	Emergency Management
Implementation Schedule	6 – 9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost
Discussion	City of Maypearl would develop and implement its own comprehensive public education program based on the hazards identified in this plan. Program would include mitigation information

Section 5.2.H – City of Maypearl Action Items

City of Maypearl Action Item	Establish public cooling/warming stations in city hall, fire department, school buildings, and/or churches
Hazard(s) Addressed	Extreme Heat, Winter Storms
Goal/Objective	1-C
Priority	Medium
Estimated Cost	\$2,500
Potential Funding Sources	State/Federal grants, city budget, private donations
Potential Matching Sources	City budget, local funds, in-kind donations
Lead Department	Police Department, city administration
Implementation Schedule	Within 1 year of funding
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Using existing facilities for this effort will save time and money.
Discussion	Great care must be taken when working with special populations. This project will help mitigate the impacts of extreme heat/cold on vulnerable populations

City of Maypearl Action Item	Develop and implement water rationing regulations
Hazard(s) Addressed	Drought
Goal/Objective	1-A
Priority	Low
Estimated Cost	\$5,000
Potential Funding Sources	Local funds, user fees, donations, in-kind, state/federal grants
Potential Matching Sources	City budget, private donations
Lead Department	Public Works
Implementation Schedule	Within 12-18 months of funding
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Benefits outweigh costs.
Discussion	Stricter control over our water system is needed to ensure that we have water when needed.

City of Maypearl Action Item	Implement the "Firewise" program from the Texas Forest Service.
Hazard(s) Addressed	Wildfire
Goal/Objective	1-B
Priority	Low
Estimated Cost	\$3000
Potential Funding Sources	State/federal grants, VFD budget
Potential Matching Sources	City budget, private donations
Lead Department	Volunteer fire department/city administration
Implementation Schedule	Within 1 year of funding
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Program benefits outweigh the costs.
Discussion	Implementation of buffer-zones around homes in the Wildland-Urban Interface.

City of Maypearl Action Item	Develop and implement a tree-trimming program.
Hazard(s) Addressed	Winter Storms, Tornado, Wildfire, High Winds, Lightning
Goal/Objective	1-D
Priority	Medium
Estimated Cost	Staff time and resources
Potential Funding Sources	City budget, private donations
Potential Matching Sources	None
Lead Department	Public Works
Implementation Schedule	12-18 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Cost to implement this program is low compared to the benefits of program.
Discussion	Removing tree branches from power line areas mitigates against power outages during hazard events.

City of Maypearl Action Item	Create a Storm Water Management Program to analyze historical and current conditions contributing to flooding. Program would offer a better understanding of flooding patters and allow for better development of mitigation projects.
Hazard(s) Addressed	Flooding
Goal/Objective	4-A
Priority	Low
Estimated Cost	Unknown
Potential Funding Sources	Grants, city budget
Potential Matching Sources	City budget, private donations
Lead Department	Public Works
Implementation Schedule	As funds become available
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Cost to implement this program is low compared to the benefits of program.
Discussion	Develop Feasibility Study to identify sites where stream, rain, and low water crossing gauges are needed in order to study the flow patterns of rain runoff during and immediately after heavy rains. Develop improved drainage of rainwater.

City of Maypearl Action Item	Purchase and distribute hail and wind resistant window coverings to vulnerable populations.
Hazard(s) Addressed	Hail, Tornado, High Winds
Goal/Objective	4-A
Priority	Low
Estimated Cost	Unknown currently, based on current population and vendor
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, in-kind
Lead Department	Emergency Management
Implementation Schedule	12 Months
Effect on Old Buildings	Potentially can reduce damage caused by severe weather
Effect on New Buildings	Potentially can reduce damage caused by severe weather
Cost Effectiveness	Low cost and will provide great benefit to the community
Discussion	Maypearl will purchase window coverings to protect vulnerable residential windows from damage from hail, debris, and wind damage.

City of Maypearl Action Item	Conduct earthquake study to assess potential for earthquakes and their impacts
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects

City of Maypearl Action Item	Purchase and Install a Generator for City Hall.
Hazard(s) Addressed	4-B
Goal/Objective	Extreme Heat, Flooding, Hail, High Winds, Tornado, Wildfire, Winter Storms, Earthquake
Priority	Medium
Estimated Cost	\$200,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	City Hall would have a redundant source of power.
Effect on New Buildings	N/A
Cost Effectiveness	Low
Discussion	City Hall is currently vulnerable to power failure. This generator would be used as a redundant source of power to mitigate against impacts on the power grid caused by natural hazards.

City of Maypearl Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

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

City of Midlothian Action	Develop and implement a comprehensive public education program.
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	\$10,000
Potential Funding Sources	General funds, State, federal grant funding
Potential Matching Sources	Local funds, private donations
Lead Department	Fire Marshal/EMC
Implementation Schedule	6 – 9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost
Discussion	This public education program would be based on the hazards that the City of Midlothian identified. The program will educate residents on the hazards and mitigation actions for each.

Section 5.2.I – City of Midlothian Action Items

City of Midlothian Action Item	Expand Outdoor Warning Systems to New Populations
Hazard(s) Addressed	Hail, High Winds, Tornado, Wildfire, Dam Failure
Goal/Objective	3-C
Priority	Medium
Estimated Cost	\$80,000
Potential Funding Sources	HMGP, General Fund
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Fire Department/Emergency Management
Implementation Schedule	36 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Cost is outweighed by the benefits of Outdoor Warning Systems
Discussion	Adding three outdoor warning sirens to the system to new residential sub-divisions would increase early warning coverage area to areas of new population and development.

City of Midlothian Action Item	Implement the Texas Tornado Safe Room Rebate Program
Hazard(s) Addressed	Tornado, High Winds
Goal/Objective	4-A
Priority	Low
Estimated Cost	\$150,000
Potential Funding Sources	HMGP, PDM
Potential Matching Sources	Homeowner match
Lead Department	Engineering
Implementation Schedule	1 to 2 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low compared to potential benefits
Discussion	By installing safe rooms throughout the community, the vulnerability of citizens to tornadoes, hail, and high winds could be reduced.

City of Midlothian Action Item	Harden new City facilities to withstand impacts from natural hazards.
Hazard(s) Addressed	Drought, Tornado, Hail, Winter Storms, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning
Goal/Objective	4-A
Priority	Low
Estimated Cost	Staff time
Potential Funding Sources	General Fund, HMGP
Potential Matching Sources	General Fund, In Kind
Lead Department	Engineering
Implementation Schedule	2 years
Effect on Old Buildings	Existing buildings could be hardened based on new codes.
Effect on New Buildings	New buildings would be constructed to stronger code.
Cost Effectiveness	Low compared to potential benefits
Discussion	Project would implement construction standards on new city facilities, requiring them to be built to withstand impacts from hazards identified by the City of Midlothian. Low flow facilities to mitigate drought, reinforced doors and windows for severe weather mitigation, reinforced foundations for expansive soils and earthquake mitigation, lightning rods for lightning mitigation, insulation for extreme temperatures.

City of Midlothian Action Item	Assist citizens with funding for purchase of NOAA Weather Alert Radios.
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, High Winds, Extreme Heat, Lightning, Dam Failure
Goal/Objective	3-C
Priority	Low
Estimated Cost	\$2,500
Potential Funding Sources	HMGP, other grant funding
Potential Matching Sources	Local funds, cost share
Lead Department	Fire Department/Emergency Management
Implementation Schedule	12 to 18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Early warning systems have been shown to save lives, justifying costs.
Discussion	Weather Alert Radios are a proven means to provide information, alert, and warn citizens about natural hazard events, mitigating their impacts.

City of Midlothian Action Item	Develop public education campaign to encourage "hail resistant" roofing in new construction and roof replacements.
Hazard(s) Addressed	Hail
Goal/Objective	4-A
Priority	Low
Estimated Cost	\$2,500
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund
Lead Department	Engineering
Implementation Schedule	12 Months
Effect on Old Buildings	Potentially can reduce damage to existing buildings caused by hailstorms.
Effect on New Buildings	Potentially can reduce damage to new buildings caused by hailstorms.
Cost Effectiveness	Relatively low cost and provides a great benefit to the community.
Discussion	Public education has proven to be a low cost effective means to achieve changes in public behavior. Recommending hail resistant roofing can benefit citizens through reduced damage, businesses through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced requests for assistance.

City of Midlothian Action	Expand building codes to include stricter requirements for mitigating
ltem	impacts of natural hazards on private structures.
Hazard(s) Addressed	Drought, Extreme Heat, Hail, High Winds, Tornado, Wildfire, Winter Storms, Expansive Soils, Earthquake
Goal/Objective	2-B
Priority	Low
Estimated Cost	Staff time
Potential Funding Sources	General fund
Potential Matching Sources	None
Lead Department	Engineering
Implementation Schedule	12 months
Effect on Old Buildings	This action could potentially decrease the damage caused by high winds in existing buildings.
Effect on New Buildings	This action could potentially decrease the damage caused by high winds in new buildings.
Cost Effectiveness	New building codes would save money by implementing standards before a disaster.
Discussion	Midlothian will adopt and enforce stricter building codes. These measures include hail-resistant roofing and windows; wind and impact resistant doors, windows, and roofing ; wildfire breaks and fire resistant building materials; stricter foundation standards for earthquake and expansive soils; increased elevation (BFE) standards for flooding; higher grade insulation to mitigate extreme heat and winter weather; and resource-efficient (low-flow) plumbing for drought. Also, additional codes for dry-proofing and lightning protection (rods, grounding) for public buildings to mitigate flood and lightning.

City of Midlothian Action Item	Educate builders and residents about mitigating wind damage.
Hazard(s) Addressed	High Winds
Goal/Objective	2-B
Priority	Low
Estimated Cost	\$1500
Potential Funding Sources	General fund
Potential Matching Sources	None
Lead Department	Engineering
Implementation Schedule	12-18 Months
Effect on Old Buildings	This action could potentially decrease the damage caused by high winds in existing buildings.
Effect on New Buildings	This action could potentially decrease the damage caused by high winds in new buildings.
Cost Effectiveness	Educating builders on stronger building standards would save money by implementing standards before a disaster.
Discussion	Public Education has proven to be an effective way to change behavior.

City of Midlothian Action Item	Increase public education concerning winter storm mitigation.
Hazard(s) Addressed	Winter Storms
Goal/Objective	1-D
Priority	Low
Estimated Cost	\$2,500
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, in-kind
Lead Department	Fire Department/Emergency Management
Implementation Schedule	6-12 months
Effect on Old Buildings	This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings.
Effect on New Buildings	This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings.
Cost Effectiveness	The low cost is effective when compared to benefits provided to citizens.
Discussion	Winter weather mitigation has not been emphasized in Midlothian as much as severe thunderstorms have in the past. This action will provide winter storm mitigation information to citizens.

City of Midlothian Action Item	Conduct a study to determine feasibility of monitoring populations at risk from extreme heat.
Hazard(s) Addressed	Extreme Heat
Goal/Objective	1-C
Priority	Low
Estimated Cost	Staff time
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund
Lead Department	Fire Department/Emergency Management
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Prevents special populations from requiring advanced care, saving EMS/Fire Dept. time and money.
Discussion	This action could determine the feasibility of monitoring populations at risk from extreme heat.

City of Midlothian Action Item	Develop public education program on the dangers of excessive heat.
Hazard(s) Addressed	Extreme Heat
Goal/Objective	1-C
Priority	Low
Estimated Cost	\$3,000
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund
Lead Department	Fire Department/Emergency Management
Implementation Schedule	12 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education programs can provide significant results for relatively low costs.
Discussion	Public education on severe weather in the City of Midlothian has traditionally focused on severe thunderstorms and associated hazards (tornadoes, lighting, high winds, flooding). Public education on mitigation actions for extreme heat is needed.

City of Midlothian Action Item	Determine how the community and its water sources have been impacted by droughts in the past.
Hazard(s) Addressed	Drought
Goal/Objective	1-A
Priority	Low
Estimated Cost	Staff Time
Potential Funding Sources	Water Use Fees, Impact Studies
Potential Matching Sources	Normal budgeting process
Lead Department	Water Utilities
Implementation Schedule	6 Months
Effect on Old Buildings	This action could identify drought impacts in the city of Waxahachie thus providing specific information for builders of new structures to incorporate drought mitigation into their structures.
Effect on New Buildings	This action could identify drought impacts in the city of Waxahachie thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures.
Cost Effectiveness	This planning effort will have a low cost with the potential for significant benefits for the entire community.
Discussion	This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects.

City of Midlothian Action Item	Design water delivery systems to accommodate drought events and develop new and/or upgrade existing water delivery systems to eliminate breaks and leaks.
Hazard(s) Addressed	Drought
Goal/Objective	1-D
Priority	Medium
Estimated Cost	Undetermined
Potential Funding Sources	Hazard Mitigation Grant Program, Texas Water Development Board Grant Program
Potential Matching Sources	Certificate of Obligation Bonds; Water usage fees, In-kind Match
Lead Department	Public Works/Water Utilities
Implementation Schedule	60 Months
Effect on Old Buildings	This action could allow for additional new building construction by providing adequate water supplies for sanitation, drinking and fire protection during drought conditions.
Effect on New Buildings	This action will provide existing buildings adequate water supplies for sanitation, drinking and fire protection during drought conditions.
Cost Effectiveness	Very high cost with long term benefit for the community.
Discussion	To mitigate drought conditions in the city, the water distribution system requires new components. Old mains need to be replaced and water system loops added.

City of Midlothian Action Item	Design and implement specific water conservation public education efforts to complement existing programs.
Hazard(s) Addressed	Drought
Goal/Objective	1-D
Priority	Low
Estimated Cost	\$1,000
Potential Funding Sources	General Fund
Potential Matching Sources	Impact Fees, In-kind Match
Lead Department	Public Works
Implementation Schedule	12 Months
Effect on Old Buildings	This action will publicize water conservation efforts that can be incorporated into new construction.
Effect on New Buildings	This action will publicize water conservation efforts that can be incorporated into existing buildings.
Cost Effectiveness	Public education programs can provide significant results for relatively low costs.
Discussion	Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action could develop a specific program that would complement existing programs in the City of Midlothian.

City of Midlothian Action Item	Increase public education on how to reduce the risks from wildfires.
Hazard(s) Addressed	Wildland Fire
Goal/Objective	1-B
Priority	Low
Estimated Cost	\$3,000
Potential Funding Sources	HMGP, PDM
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Fire Department
Implementation Schedule	12 Months
Effect on Old Buildings	This action could reduce the threat of wildfire on existing buildings through increased use of wildfire mitigation measures.
Effect on New Buildings	This action could reduce the threat of wildfire on new buildings through increased use of wildfire mitigation measures.
Cost Effectiveness	Public education has high rewards from low costs.
Discussion	Wildfire mitigation measures are not widely known in urban areas. This action could increase citizens' awareness of wildfire mitigation measures and help reduce casualties and damages from wildfires.

City of Midlothian Action Item	Increase code enforcement activity for high grass and debris clean up.
Hazard(s) Addressed	Wildland Fire
Goal/Objective	1-B
Priority	Low
Estimated Cost	Staff time
Potential Funding Sources	General fund
Potential Matching Sources	N/A
Lead Department	Code Enforcement
Implementation Schedule	6 months
Effect on Old Buildings	This action will reduce the effects of wildfire on new buildings through increased use of code enforcement measures.
Effect on New Buildings	This action will reduce the effects of wildfire on existing buildings through increased use of code enforcement measures.
Cost Effectiveness	Program cost is low compared to benefits
Discussion	Increasing code enforcement activity on high grass, weeds and debris clean-up will help prevent the spread of unwanted fire and help decrease the intensity of any fire that is started.

City of Midlothian Action Item	Increase public education about the effects of expansive soils.
Hazard(s) Addressed	Expansive Soils
Goal/Objective	2-A
Priority	Low
Estimated Cost	\$1,000
Potential Funding Sources	General Fund
Potential Matching Sources	None
Lead Department	Engineering
Implementation Schedule	Three Months
Effect on Old Buildings	This action will reduce the effects of expansive soils on existing buildings through increased use of public education.
Effect on New Buildings	This action will reduce the effects of expansive soils on new buildings through increased use of public education.
Cost Effectiveness	Public education has high rewards from low costs.
Discussion	Public Education has proven to be an effective way to change behavior.

City of Midlothian Action Item	Expansive soil building codes for developers and builders.
Hazard(s) Addressed	Expansive Soils
Goal/Objective	2-B
Priority	Low
Estimated Cost	\$1,000
Potential Funding Sources	General fund
Potential Matching Sources	None
Lead Department	Engineering
Implementation Schedule	Three Months
Effect on Old Buildings	This action will potentially decrease the damage in new buildings caused by expansive soils.
Effect on New Buildings	This action will potentially decrease the damage in old buildings caused by expansive soils.
Cost Effectiveness	Cost effective
Discussion	Create code requirements; provide information to builders and developers regarding building codes for construction in areas with expansive soils. Codes will help address structural needs, site requirements and soil preparation to help protect buildings from the effects of expansive soils.

City of Midlothian Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

City of Midlothian Action Item	Conduct earthquake study to assess potential for earthquakes and their impacts
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects

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

This page intentionally left blank

City of Milford Action Item	Develop and implement a comprehensive public education program.
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	\$10,000
Potential Funding Sources	General funds, State, federal grant funding
Potential Matching Sources	Local funds, private donations
Lead Department	Fire department
Implementation Schedule	6 – 9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public education is extremely effective for low cost
Discussion	This public education program would be based on the hazards that the City of Milford identified. The program will educate residents on hazards and mitigation actions for each.

Section 5.2.J – City of Milford Action Items

City of Milford Action Item	Develop, implement, and enforce water conservation codes and ordinances.
Hazard(s) Addressed	Drought
Goal/Objective	1-A
Priority	Medium
Estimated Cost	Staff time
Potential Funding Sources	HMPG, General Fund
Potential Matching Sources	General Fund
Lead Department	Fire department, City Administration
Implementation Schedule	12 Months
Effect on Old Buildings	This action will publicize water conservation efforts that can be incorporated into existing structures.
Effect on New Buildings	This action will publicize water conservation efforts that can be incorporated into new construction.
Cost Effectiveness	Municipal codes can have a great effect on resident actions for little cost beyond staff time.
Discussion	The City of Milford will adopt and enforce water conservation codes and ordinances in order to prevent excessive use of water.

City of Milford Action Item	Purchase and distribute hail and wind resistant window coverings to vulnerable populations.
Hazard(s) Addressed	Hail, Tornado, High Winds
Goal/Objective	4-A
Priority	Low
Estimated Cost	Unknown currently, based on current population and vendor
Potential Funding Sources	HMGP
Potential Matching Sources	General Fund, in-kind
Lead Department	Emergency Management
Implementation Schedule	12 Months
Effect on Old Buildings	Potentially can reduce damage caused by severe weather
Effect on New Buildings	Potentially can reduce damage caused by severe weather
Cost Effectiveness	Low cost and will provide great benefit to the community
Discussion	City of Milford will purchase window coverings to protect vulnerable populations from damage from hail, debris, and wind.

City of Milford Action Item	Create and Implement Long-Term Stormwater Management Program
Hazard(s) Addressed	Drought, Flooding
Goal/Objective	4-C
Priority	High
Estimated Cost	\$50,000
Potential Funding Sources	HMGP, PDM
Potential Matching Sources	General Fund, In-kind
Lead Department	Public Works
Implementation Schedule	1 year
Effect on Old Buildings	Would mitigate flooding, protecting existing structures
Effect on New Buildings	Would allow for public works to plan for new construction
Cost Effectiveness	Potential to save lives
Discussion	City of Milford will develop and implement a long-term stormwater management program to plan for the collection, storage, and distribution of stormwater to mitigate flooding and drought.

City of Milford Action Item	Adopt, implement, and enforce stricter construction requirements through ordinances.
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning
Goal/Objective	1-D
Priority	Low
Estimated Cost	Staff time
Potential Funding Sources	Local funds
Potential Matching Sources	General Fund, in-kind
Lead Department	Fire Chief
Implementation Schedule	6-12 months
Effect on Old Buildings	This action will provide information concerning natural hazard mitigation that can be incorporated into existing buildings.
Effect on New Buildings	This action will require stricter practices that mitigate natural hazards to be incorporated into new construction
Cost Effectiveness	The low cost is effective when compared to benefits provided to citizens.
Discussion	Milford would mandate higher construction requirements consistent with the International Residential Code for all new construction. These measures include hail-resistant roofing and windows; wind and impact resistant doors, windows, and roofing ; wildfire breaks and fire resistant building materials; stricter foundation standards for earthquake and expansive soils; increased elevation (BFE) standards for flooding; higher grade insulation to mitigate extreme heat and winter weather; and resource-efficient (low-flow) plumbing for drought. Also, additional codes for dry-proofing and lightning protection (rods, grounding) for public buildings to mitigate flood and lightning.

City of Milford Action Item	Partner with the Texas Fire Service to establish Milford as a "Firewise" community.
Hazard(s) Addressed	1-B
Goal/Objective	Wildland Fire
Priority	Low
Estimated Cost	\$130,000
Potential Funding Sources	HMGP, PDM, Texas Forest Service grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Fire Department
Implementation Schedule	24 months
Effect on Old Buildings	This action will reduce the effects of wildfire on new buildings through increased use of wildfire mitigation measures.
Effect on New Buildings	This action will reduce the effects of wildfire on existing buildings through increased use of wildfire mitigation measures.
Cost Effectiveness	Program cost is low compared to benefits
Discussion	Creating "Firewise" Communities will provide a wider buffer between residential and commercial properties and the wild land environment.

City of Milford Action Item	Conduct a soil analysis to determine the scope, impact, and extent of
only of million Action Rem	expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

City of Milford Action Item	Conduct earthquake study to assess potential for earthquakes and their impacts
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects

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

This page intentionally left blank

City of Oak Leaf Action Item	Mitigate the Effects of Severe Weather to Citizens Through Outdoor Warning Systems.
Hazard(s) Addressed	Tornado, Hail, Wildfire, High Winds, Dam Failure
Goal/Objective	3-В
Priority	High
Estimated Cost	\$25,000.00
Potential Funding Sources	Hazard Mitigation Grant Program, Pre-Disaster Mitigation (PDM)
Potential Matching Sources	Local Funds, Donations, In-Kind Contributions
Lead Department	Emergency Management
Implementation Schedule	3-4 Years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Potential to Save Lives
Discussion	Expected Population Growth with a Greater Need to Notify

Section 5.2.K – City of Oak Leaf Action Items

City of Oak Leaf Action Item	Mitigate the Effects of Hazards to Citizens Through Public Education Program
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	\$5,000
Potential Funding Sources	Hazard Mitigation Grant Program, Pre-Disaster Mitigation (PDM)
Potential Matching Sources	Local Funds, In-Kind Contributions
Lead Department	Emergency Management
Implementation Schedule	1 to 6 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Potential to Save Lives
Discussion	This public education program would be based on the hazards that Oak Leaf identified. The program will educate residents on hazards and mitigation actions for each through various media outlets.

City of Oak Leaf Action Item	Purchase Generator to Provide Power to City Municipal Buildings
Hazard(s) Addressed	Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Lightning, Dam Failure
Goal/Objective	4-B
Priority	Medium
Estimated Cost	\$70,000
Potential Funding Sources	Hazard Mitigation Grant Program, Pre-Disaster Mitigation (PDM)
Potential Matching Sources	Local Funds, Donations
Lead Department	Emergency Management
Implementation Schedule	2-3 Years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Potential to Save Lives
Discussion	Generator is Necessary to Support Main Municipal Building and Critical Functions Impacted by Hazard Events

City of Oak Leaf Action Item	Installation of Community Saferoom	
Goal/Objective	Tornado, High Winds	
Priority	4-A	
Estimated Cost	Low	
Potential Funding Sources	\$40,000	
Potential Matching Sources	Hazard Mitigation Grant Program, Pre-Disaster Mitigation (PDM)	
Lead Department	Local Funds, Donations, In-Kind Contributions	
Implementation Schedule	Emergency Management	
Effect on Old Buildings	5 Years	
Effect on New Buildings	None	
Cost Effectiveness	None	
Discussion	Apply for Grants to Secure a Community Safe Room. Potential to Save Lives	
City of Oak Leaf Action Item	Conduct earthquake study to assess potential for earthquakes and their impacts	
---------------------------------	---	--
Hazard(s) Addressed	4-B	
Goal/Objective	Earthquake	
Priority	Low	
Estimated Cost	\$20,000	
Potential Funding Sources	HMGP	
Potential Matching Sources	Local Funds	
Lead Department	Public Works	
Implementation Schedule	6 months – 18 months	
Effect on Old Buildings	n/a	
Effect on New Buildings	n/a	
Cost Effectiveness	Low	
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects	

City of Oak Leaf Action Item	Develop, implement and enforce a water rationing plan		
Hazard(s) Addressed	Drought		
Goal/Objective	1-A		
Priority	Low		
Estimated Cost	\$5,000		
Potential Funding Sources	Local funds, user fees, donations, in-kind, state/federal grants		
Potential Matching Sources	City budget, private donations		
Lead Department	Public Works		
Implementation Schedule	Within 12-18 months of funding		
Effect on Old Buildings	None		
Effect on New Buildings	None		
Cost Effectiveness	Benefits outweigh costs.		
Discussion	This project would entail the creation of a ration enforcement plan to mitigate against drought. Glenn Heights and Rockett SUD are water provider partners and would assist in establishing capability.		

City of Oak Leaf Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils		
Hazard(s) Addressed	Expansive Soils		
Goal/Objective	4-A		
Priority	Low		
Estimated Cost	TBD		
Potential Funding Sources	Federal grants, state grants		
Potential Matching Sources	Local funds		
Lead Department	Emergency management, Public works		
Implementation Schedule	12-18 months		
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.		
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.		
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.		
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.		

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

City of Ovilla Action Item	Mitigate the Effects of Hazards to Citizens Through Public Education		
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure		
Goal/Objective	2-A		
Priority	High		
Estimated Cost	\$5,000		
Potential Funding Sources	Hazard Mitigation Grant Program, Pre-Disaster Mitigation (PDM)		
Potential Matching Sources	Local Funds, In-Kind Contributions		
Lead Department	Emergency Management		
Implementation Schedule	1 to 6 Months		
Effect on Old Buildings	None		
Effect on New Buildings	None		
Cost Effectiveness	Potential to Save Lives		
Discussion	This public education program would be based on the hazards that Ovilla has identified. The program will educate residents on the hazards and mitigation actions for each through flyers, information on City website, classes		

Section 5.2.L – City of Ovilla Action Items

City of Ovilla Action Item	Purchase and implement communication early warning system connected to NOAA Weather Service, such as Blackboard Connect		
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, High Winds, Extreme Heat, Lightning, Dam Failure		
Goal/Objective	3-D		
Priority	Moderate		
Estimated Cost	\$2,500.00 annually		
Potential Funding Sources	State grants, Federal grants		
Potential Matching Sources	City general fund		
Lead Department	Police Department		
Implementation Schedule	6 months		
Effect on Old Buildings	none		
Effect on New Buildings	none		
Cost Effectiveness	An early warning system that will give citizens prior warning in the case of any of the above hazards.		
Discussion	Sign an annual contract with Blackboard Connect to issue warnings and information to citizens about hazards.		

City of Ovilla Action Item	Purchase and install an outdoor early warning system.		
Hazard(s) Addressed	3-В		
Goal/Objective	Tornado, Hail, Wildfire, High Winds, Dam Failure		
Priority	High		
Estimated Cost	\$250,000.00		
Potential Funding Sources	Government funding/grants		
Potential Matching Sources	Donations		
Lead Department	Fire Department		
Implementation Schedule	2 years		
Effect on Old Buildings	None		
Effect on New Buildings	None		
Cost Effectiveness	An early warning siren system will give citizens prior warning in the case of a tornado to ensure safety of all involved.		
Discussion	Buy and install enough warning sirens throughout the 6.5 square miles		

City of Ovilla Action Item	Install covered parking areas		
Hazard(s) Addressed	4-B		
Goal/Objective	Hail		
Priority	low		
Estimated Cost	\$20,000.00		
Potential Funding Sources	Federal and state grants		
Potential Matching Sources	City General Fund		
Lead Department	Public Works		
Implementation Schedule	12 months		
Effect on Old Buildings	N/A		
Effect on New Buildings	N/A		
Cost Effectiveness	Cost would be minimal in comparison to the effectiveness of paying to repair damaged vehicles and insurance		
Discussion	Mitigate against severe hail damage with covered parking to protect City of Ovilla vehicles against hail.		

City of Ovilla Action Item	Conduct earthquake study to assess potential for earthquakes and their impacts		
Hazard(s) Addressed	4-B		
Goal/Objective	Earthquake		
Priority	Low		
Estimated Cost	\$20,000		
Potential Funding Sources	HMGP		
Potential Matching Sources	Local Funds		
Lead Department	Public Works		
Implementation Schedule	6 months – 18 months		
Effect on Old Buildings	n/a		
Effect on New Buildings	n/a		
Cost Effectiveness	Low		
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects		

City of Ovilla Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils		
Hazard(s) Addressed	Expansive Soils		
Goal/Objective	4-A		
Priority	Low		
Estimated Cost	TBD		
Potential Funding Sources	Federal grants, state grants		
Potential Matching Sources	Local funds		
Lead Department	Emergency management, Public works		
Implementation Schedule	12-18 months		
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.		
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.		
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.		
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout iurisdiction.		

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

Section 5.2.M – Cit	y of Palmer	Action Items
---------------------	-------------	---------------------

City of Palmer Action Item	Develop and implement telephone warning program for residents and businesses to receive early warning from the National Weather Service and local agencies.
Hazard(s) Addressed	Tornado, Hail, Flooding, Winter Storms, Wildfire, High Winds, Extreme Heat, Lightning, Dam Failure
Goal/Objective	3-D
Priority	High
Estimated Cost	\$6,600 annually
Potential Funding Sources	ESD #9, City Budget
Potential Matching Sources	General Fund
Lead Department	PVFD, City Administration
Implementation Schedule	1-2 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	More effective and less cost than sirens
Discussion	To reduce impacts of hazards, use programs for residents and businesses to receive early warning from the National Weather Service and local agencies. City to implement Blackboard Connect, Code Red, Nixel or similar telephone program for telephone notifications.

City of Palmer Action Item	Mitigate extreme weather by building covered patios in public parks
Hazard(s) Addressed	Extreme Heat, Hail, Lightning
Goal/Objective	1-C, 4-B
Priority	Medium
Estimated Cost	\$7,500 per covered patio
Potential Funding Sources	Hazard Mitigation Grant Program, Pre-Disaster Mitigation, City Budget
Potential Matching Sources	General Fund
Lead Department	City Administration
Implementation Schedule	6-9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Cost is low compared to loss of life from heat illnesses and funding spent for Emergency Services responses
Discussion	Covered patios are an effective means of temporary relief from severe weather

City of Palmer Action Item	Develop and implement a public education program
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure
Goal/Objective	3-A
Priority	Medium
Estimated Cost	\$1,000
Potential Funding Sources	General Fund, Hazard Mitigation Grant Program, Pre-Disaster Mitigation, other state/federal grants
Potential Matching Sources	Local funds, citizen cost-share, donations
Lead Department	City Administration
Implementation Schedule	6-9 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Public Education is extremely effective for low cost
Discussion	This public education program would be based on the hazards that the city of Palmer has identified. The program will educate residents on the hazards and mitigation actions for each.

City of Palmer Action Item	Develop and implement a watering ordinance and enforcement capabilities
Hazard(s) Addressed	Drought, Extreme Heat
Goal/Objective	1-A
Priority	Medium
Estimated Cost	\$10,000
Potential Funding Sources	Hazard Mitigation Grant Program, Pre-Disaster Mitigation, Other Grants, General Fund
Potential Matching Sources	Local funds, user fees, donations, in-kind
Lead Department	Code Enforcement/Public Works
Implementation Schedule	12 - 18 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Water restriction codes preserve resources at a very low cost
Discussion	With Texas currently in its fourth consecutive year of drought conditions, it is important to consider the benefits of stricter controls on public water use.

City of Palmer Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

City of Palmer Action Item	Develop Expansive Soil Code and Enforcement
Hazard(s) Addressed	2-B
Goal/Objective	Drought, Expansive Soils
Priority	Medium
Estimated Cost	2,000.00
Potential Funding Sources	HMGP, PDM, County budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Public Works
Implementation Schedule	12-18 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The cost of this project is low compared to the potential reduction in property loss due to failure of foundations systems and expansive soil.
Discussion	Project based on previously mentioned study. The Building Department will take the role in ensuring that foundations are engineered and/or Geo Technical data is provided for each project. Inspections will verify construction conforms to plans submitted.

City of Palmer Action Item	Conduct earthquake study to assess potential for earthquakes and their impacts
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects

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

City of Palmer Action Item	Develop, Adopt, and Enforce an Ordinance to Require Underground Power Lines for New Construction
Hazard(s) Addressed	High Winds, Tornado, Wildfire, Winter Storms
Goal/Objective	1-B, 1-D, 4-A
Priority	Low
Estimated Cost	Staff Time
Potential Funding Sources	Local Funds
Potential Matching Sources	N/A
Lead Department	City Administrator
Implementation Schedule	Within One Year
Effect on Old Buildings	Existing construction could be retrofitted to meet the new ordinance requirements.
Effect on New Buildings	New construction and developments would be required to have underground power lines.
Cost Effectiveness	Cost effective. Developers would bear the cost of implementation, while the citizens of Palmer benefit from decreased vulnerability to natural hazards.
Discussion	City of Palmer would develop, adopt, and enforce an ordinance to require new developments to have underground power lines. This would mitigate high winds, tornados, wildfire, and winter storms by limiting the opportunities for wind, debris, fire, or ice to damage or destroy power lines.

City of Palmer Action Item	Develop, Adopt, and Enforce an Ordinance to Limit Debris on Private Properties
Hazard(s) Addressed	High Winds, Tornado, Wildfire, Winter Storms
Goal/Objective	1-B, 1-D, 4-A
Priority	Low
Estimated Cost	Staff Time
Potential Funding Sources	Local Funds
Potential Matching Sources	N/A
Lead Department	City Administration, Code Enforcement
Implementation Schedule	Within One Year
Effect on Old Buildings	Existing building owners would be require to remove potential debris from areas of their property that could cause damage to surrounding properties during an event.
Effect on New Buildings	During construction of new developments, developers would be required to secure their equipment and building supplies in such a way that would limit damage caused by debris due to improper storage to surrounding properties during an event.
Cost Effectiveness	Cost effective. Property owners and developers would bear any clean-up costs, and enforcement would not have any significant impact on the local budget.
Discussion	City of Palmer would develop, adopt, and enforce an ordinance to require property owners and developers to limit the amount and types of debris from accumulating in open-area sections of their properties. This would mitigate high winds, tornados, and winter storms by limiting the potential for debris to damage or destroy infrastructure. This would mitigate wildfire by preventing combustible materials from accumulating and increasing vulnerability.

This page intentionally left blank

Section 5.2.N – City of Red Oak Action Items

City of Red Oak Action Item	Purchase and Install a CASA-WX Radar
Hazard(s) Addressed	Tornado, High Winds, Hail, Winter Storms, Flooding
Goal/Objective	3-A
Priority	High
Estimated Cost	\$1,000 pro-rated to the City of Red Oak
Potential Funding Sources	General fund, HMGP, PDM
Potential Matching Sources	Donations, local funds, in-kind.
Lead Department	Emergency Management
Implementation Schedule	1-2 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Cost effectiveness is derived from the ability to accurately track tornadoes and warn citizens early to prevent the heavy loss of life or severe injuries.
Discussion	Would be used in conjunction with early warning sirens and code red to alert citizens to take shelter, thus reducing loss of life and severe injuries.

City of Red Oak Action	Minimize loss of life and property from natural hazards through code
Item	adoption, implementation, and enforcement.
Hererd(c) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake,
nazaru(s) Audresseu	High Winds, Extreme Heat, Expansive Soils, Lightning
Goal/Objective	2-B
Priority	High
Estimated Cost	\$5,000.00 plus staff time
Potential Funding Sources	State and Federal Grants, City Budget
Potential Matching Sources	City budget
	Orde Enforcement
Lead Department	Code Enforcement
Implementation Schedule	6 months with proper funding
Effect on Old Buildings	Substandard buildings will be brought within code or mitigated through
Enect on Old Buildings	the proper processes.
Effect on New Buildings	Building will be designed and constructed to withstand the forces of
Effect on New Buildings	natural hazards
	The small cost of this project is easily offset by the savings from
Cost Effortivonoss	minimizing property damage to residents and business owners. This
COSt Effectiveness	project has the chance to save lives by minimizing structural collapse
	dangerous flying debris, and other hazard impacts.
	City of Red Oak will adopt and enforce applicable codes and ordinances
Discussion	for construction, development, water usage, and retrofit standards in
	order to mitigate against natural hazards.

City of Red Oak Action Item	Harden City Hall Against Severe Weather-related Natural Hazards
Hazard(s) Addressed	Tornado, Hail, Extreme Heat, Flooding, Winter Storms, High Winds, Lightning
Goal/Objective	4-B
Priority	High
Estimated Cost	\$25,000.00
Potential Funding Sources	PDM, HMGP, other federal / state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Emergency Management, City Manager
Implementation Schedule	1-2 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Hardening City Hall will protect lives and property.
Discussion	Currently, City Hall is vulnerable to natural hazards. Windows and doors would be reinforced, insulation would be updated, and a lightning rod would be installed to mitigate against extreme weather.

City of Red Oak Action Item	Addition of 2 Early Warning Sirens
Goals/Objectives	Tornado, Hail, Wildfire, High Winds
Hazards Addressed	3-В
Priority (High, Medium, Low)	High
Estimated cost	\$40,000
Potential Funding sources	HMGP, PDM, general fund.
Potential Matching sources	Grants, local funds, in-kind, donations.
Lead Agency / Department Responsible	Emergency Management, city manager, building department, ONCOR electrical
Implementation Schedule	Within 6-12 months of actual funding.
Effect on New Building	None
Effect on Existing buildings	None
Cost Effectiveness	The cost-effectiveness is the ability given from EWS to save lives by early warning people who are outside at their residences, businesses, city parks to take proper shelter inside to a safe refuge during severe weather or tornadoes.
Discussion	Adding two (2) additional out-door warning sirens to the system in place to address new populations and development. Early warnings have been shown to help save lives and property in severe weather events

City of Red Oak Action Item	Establish select city buildings as cooling centers and warming centers to allow citizens, especially vulnerable populations, to seek refuge from extreme hot and cold temperatures.
Goals/Objectives	1-C, 1-D
Hazards Addressed	Extreme Heat, Winter Storm
Priority (High, Medium, Low)	Medium
Estimated cost	TBD
Potential Funding sources	HGMP, PDM, City budget
Potential Matching sources	General fund
Lead Agency / Department Responsible	Emergency Management
Implementation Schedule	6-12 months
Effect on New Building	City to identify current city owned facilities that could be utilized.
Effect on Existing buildings	None
Cost Effectiveness	Cost will be minimal by using existing city owned facilities.
Discussion	This action will mitigate impacts of extreme temperatures or winter storms on vulnerable populations.

City of Red Oak Action Item	Implement Individual Tornado Safe Room Rebate Program
Goals/Objectives	4-A
Hazards Addressed	Tornadoes, High Winds
Priority (High, Medium, Low)	Medium
Estimated cost	\$100,000
Potential Funding sources	FEMA safe room grants, the federal government makes funds available for the construction of safe rooms and community shelters. Sources include FEMA's Hazard Mitigation Grant program (states and local government), U.S Small Business Administration, PDM grant, and resident match.
Potential Matching sources	Local match or in-kind match from residents
Lead Agency / Department Responsible	Emergency Management, public works, building official.
Implementation Schedule	2-3 years
Effect on New Building	Some structures modified for a retro to enable completion of shelter.
Effect on Existing buildings	Moderate
Cost Effectiveness	Risk to lives can be improved through construction and retro fitting of safe rooms in homes, schools, businesses, and shelter areas of low income areas.
Discussion	With assistance from federal, state and local, begin planning and implementation of tornado safe room rebate programs.

City of Red Oak Action Item	Create and implement ordinance detailing enforcement for water rationing
Goals/Objectives	2-B
Hazards Addressed	Drought
Priority (High, Medium, Low)	Medium
Estimated cost	\$5,000.00
Potential Funding sources	HMGP, PDM, other state and federal grants
Potential Matching sources	Local funds, users fees, donations, in-kind
Lead Agency / Department Responsible	Public Works
Implementation Schedule	1-2 years
Effect on New Building	None
Effect on Existing buildings	None
Cost Effectiveness	The benefit of creating this ordinance would be costs saving to the city of Red Oak by not having to buy water from an outside source, thus increasing price to the citizens.
Discussion	The State of Texas is still behind in recovering from drought conditions for the past 4 years. Stricter control over our water system is needed to ensure that we have water when needed for human consumption.

City of Red Oak Action Item	Purchasing and distributing NOAA Weather Radios to public facilities
Goals/Objectives	3-C
Hazards Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, High Winds, Extreme Heat , Lightning, Dam Failure
Priority (High, Medium, Low)	High
Estimated cost	\$2500.00
Potential Funding sources	General Fund, HMGP, PDM
Potential Matching sources	Local funds, donations, In-kind
Lead Agency / Department Responsible	Emergency Management, Fire Department
Implementation Schedule	2-4 years
Effect on New Building	None
Effect on Existing buildings	None
Cost Effectiveness	Distributing NOAA radios has the potential to save lives through early warning
Discussion	Provide early warning and mitigate hazard impacts by increasing the use of NOAA All-Hazard Weather Radios in public facilities, including schools

City of Red Oak Action Item	Expansive Soil Code Enforcement Program
Hazard(s) Addressed	2-B
Goal/Objective	Expansive Soils
Priority	Medium
Estimated Cost	5,000.00
Potential Funding Sources	HMGP, PDM, County budget, other federal/state grants
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Public Works
Implementation Schedule	6-12 months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The cost of this project is low compared to the potential reduction in property loss due to failure of foundations systems and expansive soil.
Discussion	The Building Department will take the role in ensuring that builders and project managers (general contractors) are educated as to the types of soil in the jurisdiction and that foundations are engineered and/or geo technical data is provided for each project to ensure adherence to new codes. Inspections will verify construction adheres to plans submitted.

City of Red Oak Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils
Hazard(s) Addressed	Expansive Soils
Goal/Objective	4-A
Priority	Low
Estimated Cost	TBD
Potential Funding Sources	Federal grants, state grants
Potential Matching Sources	Local funds
Lead Department	Emergency management, Public works
Implementation Schedule	12-18 months
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.

City of Red Oak Action Item	Conduct earthquake study to assess potential for earthquakes and their impacts
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects

City of Red Oak Action Item	Hire consultant to complete new inundation studies of all high and moderate hazard dams within the county.
Hazard(s) Addressed	Dam Failure, Flood
Goal/Objective	4-A
Priority	High
Estimated Cost	\$75,000
Potential Funding Sources	HMPG, Water Shed Authorities, Dam Sponsors
Potential Matching Sources	Local Sponsors, In-Kind
Lead Department	Planning and Zoning/ NRCS
Implementation Schedule	12-18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Identify all structures and infrastructures that would be impacted by a potential dam failure.

City of Waxahachie Action Item	Develop and implement a comprehensive public education program
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Expansive Soils, Lightning, Dam Failure
Goal/Objective	2-A
Priority	High
Estimated Cost	\$5,000
Potential Funding Sources	Hazard Mitigation Grant Program, Pre-Disaster Mitigation (PDM)
Potential Matching Sources	Local Funds, In-Kind Contributions
Lead Department	Emergency Management
Implementation Schedule	1 to 6 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Potential to Save Lives
Discussion	This public education program would be based on the hazards that the City of Waxahachie identified. The program will educate residents on the hazards and mitigation actions for each.

Section 5.2.0 – City of Waxahachie Action Items

City of Waxahachie Action Item	Purchase and implement telephone-based notification system
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, High Winds, Extreme Heat, Lightning, Dam Failure
Goal/Objective	3-D
Priority	High
Estimated Cost	\$88,000
Potential Funding Sources	General Fund, HMGP
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Emergency Management/ Police
Implementation Schedule	1 to 3 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	The potential to save lives outweighs the costs.
Discussion	Provide emergency notifications and information through purchasing and implementing a telephone-based notification system.

City of Waxahachie Action Item	Expand outdoor warning systems to new developments
Hazard(s) Addressed	Tornado, Hail, Wildfire, High Winds, Dam Failure
Goal/Objective	3-В
Priority	High
Estimated Cost	\$66,000
Potential Funding Sources	HMGP, General Fund
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Emergency Management/ Police Dept.
Implementation Schedule	36 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Cost is outweighed by the benefits of Outdoor Warning Systems
Discussion	Adding three outdoor warning sirens to the system in new residential sub-divisions would help increase the coverage area to all parts of the city. Early warnings have been shown to help save lives and property from severe weather events.

City of Waxahachie Action Item	Apply for grants to install safe rooms to reduce the injuries and deaths to citizens associated with high winds and debris from a tornado or severe weather event.
Hazard(s) Addressed	Tornado, High Winds
Goal/Objective	4-A
Priority	Low
Estimated Cost	\$150,000
Potential Funding Sources	HMGP, other grant funding
Potential Matching Sources	Homeowner match
Lead Department	Engineering/Emergency Management
Implementation Schedule	1 to 3 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low compared to potential benefits
Discussion	By installing safe rooms throughout the community, the vulnerability of citizens to tornadoes and high winds could be reduced.

City of Waxahachie Action Item	Install public accessible safe rooms in new construction city facilities to reduce the injuries and deaths to citizens associated with high winds and debris from a tornado or severe weather event.
Hazard(s) Addressed	Tornado, High Winds
Goal/Objective	4-A
Priority	Low
Estimated Cost	\$1 Million
Potential Funding Sources	General Fund, HMGP
Potential Matching Sources	General Fund, In Kind
Lead Department	Engineering/Emergency Management
Implementation Schedule	1-4 years
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Low compared to potential benefits
Discussion	By installing safe rooms accessible for the public, the vulnerability of citizens to tornadoes and high winds could be reduced.

City of Waxahachie Action Item	Assist citizens with funding for purchase of Weather Alert Radios.
Hazard(s) Addressed	Drought, Tornado, Hail, Flooding, Winter Storms, Wildfire, Earthquake, High Winds, Extreme Heat, Lightning, Dam Failure
Goal/Objective	3-C
Priority	Low
Estimated Cost	\$2,500
Potential Funding Sources	HMGP, other grant funding
Potential Matching Sources	Local funds, cost share
Lead Department	Police Dept./Emergency Management
Implementation Schedule	12 to 18 Months
Effect on Old Buildings	None
Effect on New Buildings	None
Cost Effectiveness	Early warning systems have been shown to save lives, justifying costs.
Discussion	Weather Alert Radios are a proven means to provide information, and alert and warn citizens about natural hazards, mitigating their impacts.

City of Waxahachie Action Item	Develop public education campaign to encourage "hail resistant" roofing in new construction and roof replacements.
Hazard(s) Addressed	Hail
Goal/Objective	2-A
Priority	Low
Estimated Cost	\$2,500
Potential Funding Sources	HMGP, General Fund
Potential Matching Sources	General Fund, In Kind Match
Lead Department	Engineering/Emergency Management
Implementation Schedule	12-18 Months
Effect on Old Buildings	Potentially can reduce damage to existing buildings caused by hailstorms.
Effect on New Buildings	Potentially can reduce damage to new buildings caused by hailstorms.
Cost Effectiveness	Relatively low cost and provides a great benefit to the community.
Discussion	Public education has proven to be a low cost effective means to achieve changes in public behavior. Recommending hail resistant roofing can benefit: citizens through reduced damage, businesses through reduced damage to their buildings and reduced claims against insurance companies, and government through reduced requests for assistance.

City of Waxahachie Action Item	Develop public education concerning winter storm mitigation.
Hazard(s) Addressed	Winter Storms
Goal/Objective	1-D
Priority	Low
Estimated Cost	\$2,500
Potential Funding Sources	HMGP, General Fund
Potential Matching Sources	General Fund, in-kind
Lead Department	City Administration/Emergency Management
Implementation Schedule	6-12 months
Effect on Old Buildings	This action will provide information concerning severe winter storm mitigation that can be incorporated into existing buildings.
Effect on New Buildings	This action will provide information concerning severe winter storm mitigation that can be incorporated into new buildings.
Cost Effectiveness	The low cost is effective when compared to benefits provided to citizens.
Discussion	Winter weather mitigation has not been emphasized in Waxahachie as much as severe thunderstorms have in the past. This action will provide winter storm mitigation information to citizens.

City of Waxahachie Action Item	Determine how the community and its water sources have been impacted by droughts in the past.
Hazard(s) Addressed	Drought
Goal/Objective	1-A
Priority	High
Estimated Cost	Staff Time
Potential Funding Sources	Water Use Fees, Impact Studies
Potential Matching Sources	Normal budgeting process
Lead Department	Water Utilities/ Public Works
Implementation Schedule	6 Months
Effect on Old Buildings	This action could identify drought impacts in the city of Waxahachie thus providing specific information for builders of new structures to incorporate drought mitigation into their structures.
Effect on New Buildings	This action could identify drought impacts in the city of Waxahachie thus providing specific information for owners of existing structures to incorporate drought mitigation into the structures.
Cost Effectiveness	This planning effort will have a low cost with the potential for significant benefits for the entire community.
Discussion	This planning effort will focus attention on the effects of drought on the community. Specific drought effects will be identified and efforts can be made to mitigate those effects.

City of Waxahachie Action Item	Improve water supply and delivery systems to save water by installing new water delivery system to eliminate breaks and leaks.
Hazard(s) Addressed	Drought
Goal/Objective	1-A
Priority	Medium
Estimated Cost	Undetermined
Potential Funding Sources	Hazard Mitigation Grant Program, Texas Water Development Board Grant Program, General Fund
Potential Matching Sources	Certificate of Obligation Bonds; Water usage fees, In-kind Match
Lead Department	Public Works/Water Utilities
Implementation Schedule	5-10 Years
Effect on Old Buildings	This action could allow for additional new building construction by providing adequate water supplies for sanitation, drinking and fire protection during drought conditions.
Effect on New Buildings	This action will provide existing buildings adequate water supplies for sanitation, drinking and fire protection during drought conditions.
Cost Effectiveness	Very high cost with long term benefit for the community.
Discussion	To ensure adequate water supply during drought conditions in the city, the water distribution system needs to be evaluated for upgrading. Old mains need to be replaced and water system loops added.

City of Waxahachie Action Item	Design and implement specific water conservation public education efforts to complement existing programs.
Hazard(s) Addressed	Drought
Goal/Objective	1-A
Priority	Low
Estimated Cost	\$1,000
Potential Funding Sources	General Fund, State Grants
Potential Matching Sources	Impact Fees, In-kind Match
Lead Department	Public Works/ Water Utilities
Implementation Schedule	12 Months
Effect on Old Buildings	This action will publicize water conservation efforts that can be incorporated into new construction.
Effect on New Buildings	This action will publicize water conservation efforts that can be incorporated into existing buildings.
Cost Effectiveness	Public education programs can provide significant results for relatively low costs.
Discussion	Most cities in the area have existing water conservation programs designed to educate the public and businesses on ways to conserve water. This action could develop a specific program that would complement existing programs in the City of Waxahachie. Previous public education efforts have been very successful in attracting the attention of local citizens.

City of Waxahachie Action Item	Development and implement wildfire mitigation public education program
Hazard(s) Addressed	Wildland Fire
Goal/Objective	1-B
Priority	Low
Estimated Cost	\$3,000
Potential Funding Sources	HMGP, Other Grant Funding
Potential Matching Sources	Local funds, donations, in-kind
Lead Department	Fire Department/ Emergency Management
Implementation Schedule	12-24 Months
Effect on Old Buildings	This action could reduce the threat of wildfire on existing buildings through increased use of wildfire mitigation measures.
Effect on New Buildings	This action could reduce the threat of wildfire on new buildings through increased use of wildfire mitigation measures.
Cost Effectiveness	Public education has high rewards from low costs.
Discussion	Wildfire mitigation measures are not widely known in urban areas. This action could increase citizens' use of wildfire mitigation measures and help reduce casualties and damages from wildfires.

City of Waxahachie Action Item	Conduct earthquake study to assess potential for earthquakes and their impacts
Hazard(s) Addressed	4-B
Goal/Objective	Earthquake
Priority	Low
Estimated Cost	\$20,000
Potential Funding Sources	HMGP
Potential Matching Sources	Local Funds
Lead Department	Public Works
Implementation Schedule	6 months – 18 months
Effect on Old Buildings	n/a
Effect on New Buildings	n/a
Cost Effectiveness	Low
Discussion	Data deficiency identified in Chapter 3. Project outputs will guide development of future earthquake mitigation projects.

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

City of Waxahachie Action Item	Conduct a soil analysis to determine the scope, impact, and extent of expansive soils			
Hazard(s) Addressed	Expansive Soils			
Goal/Objective	4-A			
Priority	Low			
Estimated Cost	TBD			
Potential Funding Sources	Federal grants, state grants			
Potential Matching Sources	Local funds			
Lead Department	Emergency management, Public works			
Implementation Schedule	12-18 months			
Effect on Old Buildings	Study would identify existing construction most at risk for expansive soil damage.			
Effect on New Buildings	Study would be used to identify undeveloped areas at risk for expansive soil damage for real estate disclosure.			
Cost Effectiveness	High. This study would lead to targeted mitigation projects to lower vulnerability to expansive soils.			
Discussion	Expansive soil data deficiency identified in Chapter 3. Study would be used to identify scope, impact, and extent of expansive soils throughout jurisdiction.			

City of Waxahachie Action Item	Mitigate hazard of dam failure at South Prong Dam and emergency spillway			
Hazard(s) Addressed	Dam Failure			
Goal/Objective	4-A			
Priority	High			
Estimated Cost	TBD			
Potential Funding Sources	Federal grants, state grants			
Potential Matching Sources	Local funds			
Lead Department	Emergency management, Utilities, City Engineering			
Implementation Schedule	1-2 years			
Effect on Old Buildings	Risk and vulnerabilities would be mitigated for structures associated with dam and spillway			
Effect on New Buildings	Risk and vulnerabilities would be reduced by addition of any new structures to mitigate dam failure			
Cost Effectiveness	Cost low compared to lost lives, injuries and property damage			
Discussion	Based on result of engineering study, identify risk and vulnerability to dam failure at South Prong Dam and emergency spillway, take action to mitigate hazard.			

5.3 National Flood Insurance Program (NFIP) Compliance

The National Flood Insurance Program (NFIP)



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

Community Participation

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

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

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

Ellis County Jurisdiction Participation

Ellis County jurisdictions are participating in the National Flood Insurance Program and have identified their respective areas as vulnerable to flooding. This is incorporated into all current and future planning for dealing with repetitive loss vulnerabilities. Below is a chart documenting the NFIP Status of all jurisdictions participating in the Ellis County HazMAP.

CID	Community Name	County	Initial FHBM Identified	Initial FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
481546#	ALMA, TOWN OF	ELLIS COUNTY	04/29/1980	01/20/1999	06/03/2013	N/A	No
481087#	BARDWELL, CITY OF	ELLIS COUNTY	07/30/1976	03/1/1991	06/03/2013	N/A	No
480798#	ELLIS COUNTY*	ELLIS COUNTY	08/16/1977	08/19/1987	06/03/2013	08/19/1987	No
480207#	ENNIS, CITY OF	ELLIS COUNTY	06/28/1974	06/15/1982	06/03/2013	06/15/1982	No
481076#	FERRIS, CITY OF	DALLAS COUNTY/ ELLIS COUNTY	02/01/1974	08/22/1978	06/03/2013	08/22/1978	No
-	GARRETT, CITY OF	ELLIS COUNTY	-	-	-	N/A	No
480800#	ITALY, CITY OF	ELLIS COUNTY	8/15/1975	1/20/1999	6/3/2013	8/12/2010	No

CID	Community Name	County	Initial FHBM Identified	Initial FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
480208#	MAYPEARL, CITY OF	ELLIS COUNTY	11/29/1974	1/20/1999	6/3/2013	1/3/2012	No
480801#	MIDLOTHIAN, CITY OF	ELLIS COUNTY	7/9/1976	9/4/1985	6/3/2013	9/4/1985	No
480802#	MILFORD, CITY OF	ELLIS COUNTY	8/29/1975	1/20/1999	6/3/2013	3/6/2001	No
481672#	OAK LEAF, CITY OF	ELLIS COUNTY	-	1/20/1999	6/3/2013	9/15/2000	No
481155#	OVILLA, CITY OF	DALLAS COUNTY/ ELLIS COUNTY	7/11/1975	4/15/1980	6/3/2013	4/15/1980	No
480209#	PALMER, CITY OF	ELLIS COUNTY	8/13/1976	6/1/1990	6/3/2013	6/1/1990	No
481650#	RED OAK, CITY OF	ELLIS COUNTY	-	1/20/1999	6/3/2013	1/20/1999	No
480211#	WAXAHACHIE, CITY OF	ELLIS COUNTY	6/28/1974	8/1/1980	6/3/2013	8/1/1980	No

* - Unincorporated Ellis County

-: Information Not Available

Source: <u>http://www.fema.gov/cis/TX.html</u>

Jurisdiction Compliance

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

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

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

Jurisdiction Activities

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

Jurisdiction	Community Floodplain Administrator	NFIP Activity	Activity Description	Enforcement
Ellis County	County Engineer	Complete and maintain FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Permits are issued through the Department of Development. Ellis County requires 1 foot of freeboard above the base flood elevation for the top of bottom floor on residential structures and non- residential structures that will be built on properties created or platted after the effective date of the Flood Damage Prevention Order	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and compliance inspections pending approval. Failure to comply with County's flood damage prevention order shall result in fines up to \$500 per violation plus court costs.
		Floodplain development permits	Permits are required for any new construction in a floodplain.	
		Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	Ellis County participates in Risk Assessment, Mapping and Planning Partners (RAMPP) meetings held by FEMA and/or their contractors to better identify areas that are flood prone that are not shown on current Flood Insurance Rate Maps.	
		Future Mitigation Projects	Ellis County will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	

Alma	N/A	The City of Alma does not participate in NFIP.	The City of Alma lacks the municipal capability to maintain an NFIP Program.	N/A
Bardwell	N/A	The City of Bardwell does not participate in NFIP.	The City of Bardwell lacks the municipal capability to maintain an NFIP Program.	N/A
	Ennis Chief Building Inspector	Complete and maintain FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Permits are issued through the Department of Building Inspections. The City of Ennis requires 2 feet of freeboard above the base flood elevation for the top of bottom floor on residential structures and non- residential structures that will be built on properties created or platted after the effective date of the Flood Damage Prevention Order	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit
		Floodplain development permits	Permits are required for any new construction in a floodplain.	
Ennis		Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	The City of Ennis participates in Risk Assessment, Mapping and Planning Partners (RAMPP) meetings held by FEMA and/or their contractors to better identify areas that are flood prone that are not shown on current Flood Insurance Rate Maps.	requirements, and compliance inspections pending approval. Failure to comply with City's flood damage prevention order shall result in fines up to \$500 per violation plus court costs.
		Take action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	The City of Ennis Street Department installs signs at low water crossings that indicate "When flooded turn around don't drown".	

		Future Mitigation Projects	The City of Ennis will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	
Ferris	s City Manager	Complete and maintain FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Permit is issued through the City Manager's office. City of Ferris requires at least 1 foot of freeboard above the base flood elevation for the top of bottom floor on residential structures and non- residential structures that will be designed so that the structure is watertight up to one foot above the base flood level; with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and compliance inspections pending approval from the City Manager office. Failure to comply with City's flood damage prevention order shall result in
		shall be required to ensure conformance with the provisions of the Flood Damage Prevention ordinance # 0-13- 753	Permits are required for any new construction in a floodplain.	order shall result in fines up to \$2,000.00 per violation plus court costs. Every day a violation occurs shall constitute a separate
		Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	City of Ferris Texas participates in Risk Assessment, Mapping and Planning Partners (RAMPP) meetings held by FEMA and/or their contractors to better identify areas that are flood prone that are not shown on current Flood Insurance Rate Maps.	offense.

		Take action to minimize the effects of flooding, by provisions designed to, protect human life and health on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning.	City's Public Works Department installs barricades at low water crossings that stops flow of traffic into area.	
		Future Mitigation Projects	will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	
Garrett	N/A	N/A	The City of Garrett lacks the municipal capability to maintain an NFIP Program	N/A
	Maura	Complete and maintain FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Permits are issued through the Office of the Mayor. City of Italy requires 2 feet of freeboard above the base flood elevation for the top of bottom floor on residential structures and non- residential structures that will be built on properties created or platted after the effective date of the Flood Damage Prevention Order	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and
Italy	Mayor	Floodplain development permits	Permits are required for any new construction in a floodplain.	compliance inspections pending approval. Failure to comply with City's flood damage
		Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	city of italy does not currently participate in Risk Assessment, Mapping and Planning Partners (RAMPP) meetings held by FEMA and/or their contractors to better identify areas that are flood prone that are not shown on current Flood Insurance Rate	prevention order shall result in fines up to \$500 per violation plus court costs.

			Maps.	
		Take action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Street department installs signs at low water crossings that indicate "When flooded turn around don't drown".	
		Future Mitigation Projects	City of Italy will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	
Maypearl	Chair of Planning and Zoning	Take action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	City of Maypearl will install signs at any identified low water crossings that indicate "When flooded, turn around - Don't drown".	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and compliance
	Commission	Future Mitigation Projects	City of Maypearl will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	inspections pending approval. Failure to comply with City's flood damage prevention order shall result in fines up to \$500 per violation plus court costs.
Midlothian	City Engineer	Complete and maintain FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Floodplain Development permit applications are submitted to the Engineering Department and permits are issued by our department.	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building
Midlothian	City Engineer	Floodplain development permits	Floodplain Development permit applications are submitted to the Engineering Department and permits are issued by our department.	requirements, and compliance inspections pending approval. Violation of any provisions of this ordinance, upon conviction and found to be guilty, shall

		Future Mitigation Projects	The City of Midlothian will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	constitute a misdemeanor and shall be fined not more than \$1,000 for each violation and each day a violation occurs is a separate offense.
		Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	The City of Midlothian participates in Risk Assessment, Mapping and Planning Partners (RAMPP) meetings held by FEMA and/or their contractors to better identify areas that are flood prone that are not shown on current Flood Insurance Rate Maps.	
		Take action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	The Engineering Department incorporates flood control measures in new and existing projects, and re- evaluates existing infrastructure for improvements to flood control.	
Milford	Code Enforcement Officer	Maintain FEMA elevation maps-no structures in flood plain in jurisdiction	City of Milford requires plan Review and permitting and requires what is approved to be built with flood resistant materials on non- residential structures and prevents-residential structures that will be built on properties created or platted after the effective date of the Flood Damage Prevention Order	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and compliance inspections pending approval. Failure to comply with City's flood damage
		Floodplain development permits plan reviews Participate with FEMA in identifying Special Flood	Plan reviews and Permits are required for any new construction in a floodplain. City of Milford participates in Risk Assessment, Mapping and	prevention order shall result in fines per violation plus court costs.

			Diamain - Da t	
			(RAMPP) meetings held by FEMA and/or their contractors to better identify areas that are flood prone that are not shown on current Flood Insurance Rate Maps.	
		Future Mitigation Projects	The City of Milford will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	
October	Maura	Complete and maintain FEMA Elevation Certificates for pre-FIRM and post-Firm buildings	Permits are issued through Oak Leaf City Hall. The city requires two feet of freeboard above the base flood elevation for the top of the bottom floor on residential structures and non- residential structures that will be built on properties created or platted after the effective date of the flood damage prevention ordinance (Ordinance No. 1309).	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA Floodplain Maps, permit issuance, building requirements and compliance
Oak Leaf	Mayor	Floodplain Development Permits	Permits are required for any new construction in a floodplain.	inspections pending approval. Failure to comply with Oak Leaf's flood damage prevention ordinance
		Take action to minimize the effects of flooding on people, property, and building contents through measures including flood warning and evacuation planning.	City Staff will install "Road Closed" barricades when storm water rises to bridge level.	(Ordinance No. 1309) shall result in fines up to \$500 per violation plus court fines.
		Future Mitigation Projects	The City of Oak Leaf will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	
Ovilla	Director of Public Works	Complete and maintain FEMA elevation certificates	Permits are issued through the Department of	NFIP compliance is implemented and enforced through a

		for pre-FIRM and or	Environmental	process of floodplain
		post-FIRM buildings	Health. Ovilla	identification using
			freeboard above the	maps, permit
			base flood elevation	issuance, building
			for the top of bottom	requirements, and
			floor on residential	compliance
			residential	approval. Failure to
			structures that will	comply with Ovilla's
			be built on	flood damage
			or platted after the	prevention order shall result in fines
			effective date of the	up to \$500 per
			Flood Damage	violation plus court
			Prevention Order	costs.
		Floodplain	for any new	
		development permits	construction in a	
			floodplain.	
			Ovilla participates in Rick Assocsment	
			Mapping and	
			Planning Partners	
		Participate with	(RAMPP) meetings	
		FEMA in identifying	and/or their	
		Special Flood	contractors to better	
		future FIRM maps	identify areas that	
			are flood prone that	
			current Flood	
			Insurance Rate	
		Taka astisa ta	Maps.	
		minimize the effects		
		of flooding on	Low lying areas are	
		people, property,	heavy rains and	
		contents through	flood warnings,	
		measures including	according to the City	
		flood warning,	Water Management	
		emergency	Plan.	
		evacuation planning		
			Ovilla will continue	
		Euturo Mitigation	to monitor for new	
		Projects	that have not been	
		,	previously identified	
			for mitigation.	NEID compliance is
			through the	implemented and
			Department of	enforced through a
		Complete and	Environmental	process of floodplain
Palmer	City	elevation certificates	Palmer requires 2	FEMA floodplain
	Administrator	for pre-FIRM and or	feet of freeboard	maps, permit
		post-FIRM buildings	above the base	issuance, building
			the top of bottom	compliance
			floor on residential	inspections pending
		F		
---------	--------------	---	--	---
		Floodplain development permits Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	structures and non- residential structures that will be built on properties created or platted after the effective date of the Flood Damage Prevention Order Permits are required for any new construction in a floodplain. City of Palmer participates in Risk Assessment, Mapping and Planning Partners (RAMPP) meetings held by FEMA and/or their contractors to better identify areas that are flood prone that are not shown on current Flood Insurance Rate Maps.	approval.
		Take action to minimize the effects of flooding on people, property, and building contents through	City of Palmer Public Works	
		measures including flood warning, emergency response, and evacuation planning	pumps to divert flood water from clogged drainage	
Red Oak	City Manager	Complete and maintain FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	City of Red Oak requires at least 1 foot of freeboard above the base flood elevation for the top of bottom floor on residential structures and non- residential structures that will be designed so that the structure is watertight up to one foot above the base flood level; with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and compliance inspections pending approval. Failure to comply with City's flood damage prevention order shall result in fines up to \$500 per violation plus court costs.

			buoyancy.	
		A floodplain development permit shall be required to ensure conformance with the provisions of the Flood Damage Prevention ordinance #13-023	Application for a floodplain development permit shall be presented to the Floodplain Administrator of which is the City Manager. Permit is issued through the City Manager's	
		Participate with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	City of Red Oak Texas participates in Risk Assessment, Mapping and Planning Partners (RAMPP) meetings held by FEMA and/or their contractors to better identify areas that are flood prone that are not shown on current Flood Insurance Rate Maps.	
		Take action to minimize the effects of flooding, by provisions designed to, protect human life and health on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning.	City's Public Works Department installs barricades at low water crossings that stops flow of traffic into area.	
		Future Mitigation Projects	City of Red Oak will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	
Waxahachie	Public Works Director	Complete and maintain FEMA elevation certificates for pre-FIRM and or post-FIRM buildings	Permits are issued through the Public Works Department. The City of Waxahachie requires 1 foot of freeboard above the base flood elevation for the top of bottom floor on residential structures and non-	NFIP compliance is implemented and enforced through a process of floodplain identification using FEMA floodplain maps, permit issuance, building requirements, and compliance inspections pending

		residential structures that will be built on properties created or platted after the effective date of the Flood Damage Prevention Order.	approval. Failure to comply with City's flood damage prevention order does not currently result in criminal penalties, but a fine is being considered.
	Floodplain development permits	Permits are required for any new construction in a floodplain.	
	The City of Waxahachie plans to increase participation with FEMA in identifying Special Flood Hazard Areas for future FIRM maps	The City of Waxahachie plans to participate in Risk Assessment, Mapping and Planning Partners (RAMPP) meetings held by FEMA and/or their contractors to better identify areas that are flood prone that are flood prone that are not shown on current Flood Insurance Rate Maps.	
	Take action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning	Road Operations department installs signs at low water crossings that indicate "When flooded turn around don't drown".	
	Future Mitigation Projects	The City of Waxahachie will continue to monitor for new areas of flooding that have not been previously identified for mitigation.	

The Community Rating System (CRS)

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

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

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

Chapter Six: Plan Maintenance Process

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

6.1 Monitoring, Evaluating and Updating the Plan

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

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

The Ellis County Emergency Management Coordinator will be responsible for ensuring the Ellis County Hazard Mitigation Action plan and its components are monitored, evaluated, and reviewed biannually by the responsible personnel in each participating jurisdiction. The Ellis EMC will use email to request the monitoring activities noted below be implemented and changes documented. The progress of the action items will be tracked electronically as "in progress", "deferred" or "completed." These and other changes affecting the plan will be documented within the local jurisdiction's plan file and identified as updates. Biannual updates will be shared between participants by email or in a meeting if deemed appropriate, and included in the annual evaluations/reviews and 5 year update of the plan.

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

Jurisdiction	Responsible Personnel	Activity	Update Schedule
	_	Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Ellis County Ma	Emergency Management Coordinator	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
Alma	Mayor	Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually

Jurisdiction	Responsible Personnel	Activity	Update Schedule
		Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
		Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Bardwell	Mayor	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
		Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Ennis	Fire Marshal	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
	Fire Chief	Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Ferris		Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
		Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Garrett	Mayor	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
tabu	City Secretary	Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Italy	City Secretary	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually

Jurisdiction	Responsible Personnel	Activity	Update Schedule
		Update Plan	Once every 5 years
		Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Maypearl	Mayor	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
		Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Midlothian	Fire Marshal	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
		Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Milford	Fire Chief	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
		Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Oak Leaf	City Secretary	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
		Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Ovilla	Police Chief	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years

Jurisdiction	Responsible Personnel	Activity	Update Schedule
		Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Palmer	City Administrator	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
Red Oak	Fire	Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
	Chief/Emergency Management Coordinator	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years
		Monitoring Plan : Track implementation and action items, changes to risk assessment, changes to planning team members, changes to capabilities, plan integrations	Biannually
Waxahachie	Emergency Management Coordinator	Evaluate Plan: Assess effectiveness by evaluating completed actions, implementation processes, responsible personnel and lessons learned.	Annually
		Update Plan	Once every 5 years

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

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

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

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

Jurisdiction	Responsible Personnel	Activity	Update Schedule	Integration Plan
	County Commissioners	Budget Meetings	As Needed	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
	Emergency Management Coordinator	Emergency Operations Plan updates	Every five years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
Ellis County	Designated Floodplain Manager	Floodplain ordinances	As needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	County Commissioners	Capital improvement plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	County Commissioners, Public Works Director	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
	Director of Development	Natural Resource Conservation Plan	Annually	Integrate conservation measures by directing development away from hazard- prone areas identified in HazMAP.
	City Council	Budget Meetings	As Needed	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
Alma	Mayor	Emergency Operations Plan updates	5 Years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
	City Council	Capital improvement plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	City Council	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education

Jurisdiction	Responsible Personnel	Activity	Update Schedule	Integration Plan
	City Council	Budget Meetings.	As Needed	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
Bardwall	Mayor	Emergency Operations Plan updates	5 Years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
Daluweii	City Council	Capital improvement plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	City Council	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
Ennis	City Manager, City Council	Budget Meetings.	As Needed	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
	Fire Marshal/Emergency Management Coordinator	Emergency Operations Plan updates	5 Years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
	Designated Floodplain Manager	Floodplain ordinances	As needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	Planning and Zoning Commission	Capital improvement plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	Director of Public Works	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
	Planning and Zoning Commission	Natural Resource Conservation Plan	Annually	Integrate conservation measures by directing development away from hazard- prone areas identified in HazMAP.

Jurisdiction	Responsible Personnel	Activity	Update Schedule	Integration Plan
	City Council	Budget Meetings	Annually	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
Ferris	Fire Chief	Emergency Action Plan updates	Triennially	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
	Designated Floodplain Administrator	Floodplain ordinances	As needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	City Council	Capital improvement plans	Annually	Integrate drought actions such as xeriscaping, water restrictions, and public education
Garrett	City Council	Budget Meetings.	As Needed	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
	Mayor	Emergency Operations Plan updates	5 Years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
	City Council	Capital improvement plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	City Council	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
Itobu	City Council, City Administrator	Budget Meetings.	Annually	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
	City Administrator	Emergency Action Plan updates	Every 5 years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards

Jurisdiction	Responsible Personnel	Activity	Update Schedule	Integration Plan
	Designated Floodplain Administrator	Floodplain ordinances	As needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	City Council	Capital improvement plans	Annually	Integrate drought actions such as xeriscaping, water restrictions, and public education
	City Council	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
	City Council	Budget Meetings	Annually	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
Maypearl	Mayor, Police Chief	Emergency Action Plan updates	Every five years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
	Planning and Zoning Chair	Floodplain ordinances	As needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	Planning and Zoning Chair, City Council	Capital improvement plans	Annually	Integrate drought actions such as xeriscaping, water restrictions, and public education
	City Council	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
	City Manager, City Council	Budget Meetings	Annually	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
Malothan	Fire Marshal/Emergency Management Coordinator	Emergency Action Plan updates	As needed	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards

Jurisdiction	Responsible Personnel	Activity	Update Schedule	Integration Plan
	Designated Floodplain Manager	Floodplain ordinances	As needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	City Manager, Planning and Zoning Commission	Capital improvement plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	Director of Public Works	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
	Planning and Zoning Commission	Natural Resource Conservation Plan	Annually	Integrate conservation measures by directing development away from hazard- prone areas identified in HazMAP.
	City Council	Budget Meetings	Annually	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
	Fire Chief	Emergency Action Plan updates	Every five years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
Milford	Designated Floodplain Manager	Floodplain ordinances	As needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	City Council	Capital improvement plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	City Council	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
Oak Leaf	City Council	Budget Meetings	Annually	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs

Jurisdiction	Responsible Personnel	Activity	Update Schedule	Integration Plan
	City Secretary	Emergency Action Plan	Every five years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
	Designated Floodplain Administrator	Floodplain Ordinance	As Needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	Planning and Zoning Commission	Capital Improvement Plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	City Council	Drought Contingency Plans	As Needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
	City Manager, City Council	Budget Meetings	Annually	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
	Police Chief	Emergency Action Plan updates	Every five years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
Ovilla	Designated Floodplain Administrator	Floodplain ordinances	As needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	Planning and Zoning Commission	Capital improvement plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	Director of Public Works	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
Palmer	City Administrator, City Council	Budget Meetings	Annually	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs

Jurisdiction	Responsible Personnel	Activity	Update Schedule	Integration Plan
	City Administrator	Emergency Action Plan updates	Every five years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
	Designated Floodplain Administrator	Floodplain ordinances	As needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	City Administrator	Capital improvement plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	Public Works Director	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
	City Manager, City Council	Budget Meetings	Annually	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs
	Emergency Management Coordinator	Emergency Action Plan updates	Every five years	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
Red Oak	Designated Floodplain Administrator	Floodplain ordinances	As needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	Planning and Zoning Commission	Capital improvement plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	Director of Public Works	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
Waxahachie	City Manager, City Council	Budget Meetings	Annually	Integration of mitigation projects identified in HazMAP, grants, and other fiscal allowances for mitigation actions and related costs

Jurisdiction	Responsible Personnel	Activity	Update Schedule	Integration Plan
	Emergency Management Coordinator	Emergency Action Plan updates	Every five years, or as needed	EAP Mitigation annex updates based on HazMAP HIRA; update preparedness, response and recovery actions related to identified hazards
	Designated Floodplain Manager	Floodplain ordinances	As needed	Enhance mitigation of flood hazards using HazMAP flood data for floodplain management and community development.
	Building Official	Capital improvement plans	Annually	Strengthen critical infrastructure and key resources based on HazMAP hazard analysis, incorporate vulnerability data and action items.
	Public Works Director	Drought Contingency plans	As needed	Integrate drought actions such as xeriscaping, water restrictions, and public education
	Director of Planning, Planning and Development Coordinator	Natural Resource Conservation Plan	Annually	Integrate conservation measures by directing development away from hazard- prone areas identified in HazMAP.

Although it is recognized there are many possible benefits to integrating components of this HazMAP into other planning mechanisms, the Ellis County Hazard Mitigation Planning Team considers this HazMAP, including development and maintenance, to be the primary vehicles to ensure implementation of local hazard mitigation actions.

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

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

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

Appendix A: Planning and Public Meeting Documentation

This page intentionally left blank.

				Ę	7	net	EALL OR	('n	sn,							
	2013	s mte Courthouse	e-Nail	11 million Brithoulle.	האכווויכה להביוויכות	mayor - city of may pear ledectisp.	KEVIN. COFFEY O LITYOFMAN	ghowelle enispulse in a future f	dyounge ci palmer, cx. u	david schrotterid nid lothian.tx	Cwilson @ Oakled texas.org	1 taby City hall @ yahoo com	MEroway & warah achie p6. org	joc. stewart Bco. cllis. tx w	+ birdwell @ redocktx. org		
	Meeting Date: 10/00	Place/Room: Pale Pi	Phone	CELL 214 - 395-1463	C/C/-/-0-2/6	412-435-31250 972-435-2380	972 921 - 4019 972 435 - 3671	973-876-2234	46 765 6533	1 872-475-7660	24.769.254	942-483-7329	1: 465 - 307. 4452	972-825-5555	469-218-7712		
	feeting		Company		WILLA FIRE DEPI	City of Naupearl	CITY OF HAVYEARD	City of Fright	City or Parmen	CITY OF MIDLOTHIN	CITY OF CAR LEAF	City of Itals	City of Whatachic	Ellis County	Rod Oak Five		
LA CONTRACTOR	Hazard Mitigation Plan Kickoff N	LaGrassa	The summary set		CAPTRIN	Mayne	CUINT ON POULS	Fin Musher	GTY HOMINS REPEN	FIRE CHIEF	MAYOR	City Secretary/	Emercencia Micount Conso	Enc	Deputy Fixe Chief The Nurshall		
L'NSISCIERT	Meeting:	Facilitator: Nicholas F.	Name	1	LYANDON DENNEDY	Adele Mooner	KENII CHEFEN	Gare Housel	Dove Youne	DAULD SCHRODT	CRAIG WILSON	TERI Murdock	MARCUS Brown	Joe Stewart	Tim Birdwell		

				ĩ	\sim	-8	, T	lic	Fety. Net					
	4/2013	s Fire Station		alwills n PNFraam	medening native at	1941 Datana (geak/eat tx	Jhowelle envispablic safety.	MRICHAG SON OFNNISPUB	24					
	Meeting Date: 11/1-	Place/Room: Ennis	Phone	317 695999	317-6959128	972-617-21060	214-298-2186	14 402 S218						
			eempany	TUTTON	NCTCOG	City of Oak Ind	chot Emis	A CityOF						
	unty Hazard Mitigation Meeting	s F. LaGrassa, NCTCOG		NCTC OF	esv. Soulst.	or file Martan	Rive Mores had	chier day Building OFFic						
VOI COMPERA	Meeting: Ellis Co	Facilitator: Nichola	Name	AnolealyWill	Mellurie Devir	Amda Juntan	Garg W. Howell	MACK W. RichAc						

TICING SIGN-IN SHEET IG: Ellis County HazMAP Meeting		Meeting Date:	12/03/2013
licholas F. LaGrassa, NCTCOG		Place/Room:	Ellis County Courthouse
	COMPANY	Phone	
W EMC	City of Uproproduc	465 309 Kr	152 Mbrown Quip Kahachitodara
iry is cenacification	2) City of Bardwood	1 272.646 5.	
VC City Aon	arron Prina	465 765 65	33 dyoung Qci falmer. tr. 45
.722-MOH 2	City of Palmer	465-383-158	4 Statez O.C. Palmer. TX.US
winesy Spelst	· Norcoa	817895913	3 Maurice nation.
Wilson Thread	NCTCOA	B17-69593	91 RUWILSON ONFLOOR
uele Fin chip	Ferris FO	972-842-28	98 tim birduelle ein funistrior
ene Capt/	Red Oak	469-2.8-77.	3 Cgleene Credocher ora
lack Hoministrator	Ttaly	972-463-73	29 Hale of tube 11 @ Waken com
Oney Mayor	Mayparl	972-935-37	23 Mayor city of may bear a ectissing
FED MAYPEAL DI	May park	10H 126 1LB	9 KEVIN. COFFEY (2) EITVORMENT
-	>		
		-	

A

Facilitator: N Name MEUN LUC	licholas F.					
Name KEUN LUC Tim Birdu		LaGrassa, NCTCOG		Place/Room:	Waxahachie City Co	uncil Chambers
KEUN LUC Tim Birdu		Title	Company	Phone	E-Mail	
Tim Birdu	14	FIRE MARSHAL	MIDLO THIAN FIRE	972-215-26.	2 Kevin-luci	ia CMIBLORIHAN, TXIUS
	lell	Fire Chief Eme	Ferris Fire	972-842-20	898 tim. bil	dwell @ ci. ferristx.
Barg W. Hou	1/000	fire Murshel / EMC	KNNI FD	972-878-123	4 ghowe	11 c Annispublicsad
Joshya Hibs	ich man	Fire manshall	EIIIS CO	961-398-86b	6 Jesh. hib.	Schmarle co. Plijs. 74.4
MArcus Browl		Energeney Mannaponer Con	Waxahadhie 151115C	141-522-69/	2 mbrown	1 @ Warn hachie pd. org
CRANE WILSON	N	MATOR	CITY OF DAK LEAF	214-769-2542	CWilson,	Q aak leaf texas. ora
Cusey Gree	ere	Capt.	City of Rod Oak	214-794-0845	- Cyleere	@fedaaktx.org
)						



MEETING SIGN-1	IN SHEET			
Meeting: Ellis Count	y MitStrat Meeting (Ellis HazMA	(d	Meeting Date: Marc	1 27, 2014
Facilitator: Nicholas F.	LaGrassa, NCTCOG		Place/Room: Ellis (county Courthouse
Name	Title	Company	Phone	E-Mail
Marcus Brown	Errergency Waynat	City of Waxahachie	-CS 205 44 50E 994	Moraus @ waxabacturepd. org
Bary W. Howell	Fire Marshel / EMC	City of Envis	214-296.2586	Showell emissisticularly
Joe Stewart	Fire Marshed / Bre	Ellis Courty	922-825-500	joe, Stevarta conditionty.
Dove Yourc	GTY Burn	CITON PRIMA	46765653	dyoung Qc. palmer. the us
Sid Levez	Police Sel	city of Jalmer	#851-282-128H	Slopez Cci. Japar. Th. US
Adele Mooney	Mayor	City of Maypearl	912-435-2380	mayor-cityof maypearle ectisp. net
AnchearLuitson	EPINTERN	NCTCOL	917 6959391	ALWILSON CACTCOP. Org.
Nichrias Labersia	EP Rogian Assistant	NCTCOG	817 608 2333	Alasta Stag alt cog, org
Tim Birdwell	Fire chiet EMC	City Ferris	972-842-289	& tim. birdwell @ ci, ferris tr. org
Ronda Quintana	City Secretary / Emerginey Mant Cu	oral. City of Oaklea	f 972 -617. 2104	0 rguintara Boakleaf lexas. 09
KEVIN LUCIA	FIDE MARSHAL	CITY OF MURLOFIHM	277-512-766	Kevin. Incia - Midlothian, +x.US



Meeting:	Ellis County	HazMAP: Public Meeting #2		Meeting Date: Jun	e 23, 2014
Facilitator:	Nicholas F.	LaGrassa, NCTCOG	·	Place/Room: Wa	kahachie City Council Chambers
Name		Title	Company ,	Phone	E-Mail
Mille M	1 oran	Chiel of Blief	CHA of	972-617-726	W WBONO
Wayne (f	zule	P D	Mid lothiau Eneral	972-923-744	6 Wayne, rule @ 0
han Hour	11	Fire Marshal /Emc	City of Emis	714-298-2581	Shawell & Emisticol
MARCUS	Brown	EMC	Cily Waxahachio	1/66-282-141 +	M brown & warralisedine
Jor Stel	Jack	Fine Marshel	Elin Co.	555-58-763	I ive stewart 2 co. ellis trus
Tim Bico	hwell	fire chief	Ferris FD	972-542- 298	tim. birdwell . Ci. Feristr. u
KEVIN LUCI	*	FIRE MUSHAL	MIQLOTHAN FO	972-775-7662	Kevin. lucia e mullothian. tx. us